



Power and sensing

Selection guide 2024-2025

www.infineon.com



Driving decarbonization and digitalization. Together.

数字低碳 共创未来



Adam White,
Division President of
Power and Sensor Systems
电源与传感系统事业部总裁

Dear customer,

Semiconductors are essential for enabling a climate-neutral and digitalized world. Infineon semiconductors are enablers to help avoid carbon emissions, use resources sustainably, manage power effectively and intelligently, give “things” smart senses, and process data quickly and reliably. This is our offering to you, our valued customers, to support you in making a difference with your products.

“Driving decarbonization and digitalization. Together.” is Infineon’s vision as a leader in power systems as well as the Internet of Things (IoT) and the purpose all Infineon employees are committed to. We are privileged to offer and promise you leading-edge technology with the highest quality and a stable delivery of reliability. Our portfolio includes power, connectivity, RF, and sensor system technologies to develop smaller, lighter, smarter, and more efficient solutions for consumer devices, smart home/building applications, robotics, computing and data centers, charging devices, power tools, and more. The next generation of silicon and wide-bandgap (SiC and GaN) solutions provides unparalleled performance and reliability to power AI, 5G, big data, and renewable energy applications.

What differentiates us as an industry leader?

- We can leverage the full potential of all three technologies, Si, SiC, and GaN, to provide the best possible solution to our customers’ needs.
- We significantly increased our GaN offering with the acquisition of GaN Systems, now offering the broadest product and IP portfolio in the market for MV and HV GaN products, including system-enabling components (e.g., drivers and controllers).
- We have a large portfolio of ambient sensors for consumers, smart homes, IoT, and automotive.
- We follow the “Product to System” approach and offer optimized system solutions comprising hardware, software, and algorithms.

To further expand our leadership in power systems, we are accelerating our wide bandgap offering and, therefore, strengthening our market position by adding significant manufacturing capacities for SiC and GaN in Kulim, Malaysia. Such innovative technologies will further lead to solutions addressing decarbonization and digitalization. These semiconductors offer added value to our customers because of better system performance in terms of efficiency, size, and cost compared to silicon-based solutions.

To answer to the structurally growing demand for semiconductors and to support our customers’ business continuity, we are expanding manufacturing capacities worldwide. We broke ground in Dresden, Germany to manufacture analog/mixed-signal components used in power supply systems, for example, in energy-efficient charging systems, in data centers, industrial, renewables or applications for the IoT. The interaction of power semiconductors and analog/mixed-signal components makes creating energy-efficient and intelligent system solutions possible. Customer commitments to new design wins in automotive and industrial applications as well as pre-payments back this expansion.

The **Power and Sensing Selection Guide 2024-2025** is the most comprehensive overview of our products and the latest power and sensing technology advancements designed to cater your needs. We strongly believe that this digital catalog will support your roadmap planning to stay ahead of competition. Please get in touch with our talented teams for personal support on any product-related questions.

Let’s drive decarbonization and digitalization. Together.

尊敬的客户，

半导体是实现气候中和与数字化世界的关键。英飞凌半导体有助于避免碳排放、可持续地利用资源、有效而智能地管理电力、赋予“物”以智能感知，以及快速而可靠地处理数据。这也是我们为您--我们尊贵的客户提供的服务，以支持您用自己的产品改变世界。

“数字低碳 共创未来”这是英飞凌作为电力系统和物联网 (IoT) 领导者的愿景，也是英飞凌全体员工孜孜以求的目标。我们有幸为您提供并承诺交付具有最高质量和稳定可靠的领先技术。我们的产品组合包括电源、连接、射频和传感器系统技术，可为消费类设备、智能家居/智能楼宇、机器人、计算和数据中心、充电设备、电动工具等应用开发更小、更轻、更智能、更高效的解决方案。下一代硅和宽带隙 (SiC 和 GaN) 解决方案可为人工智能、5G、大数据和可再生能源应用提供无与伦比的性能和可靠性。

作为行业领导者，我们有何与众不同之处？

- 我们可以充分利用 Si、SiC 和 GaN 这三种技术的全部潜力，为客户的需求提供最佳解决方案。
- 通过收购 GaN Systems，我们大幅增加了氮化镓产品的供应量，目前可为中压和高压氮化镓产品提供市场上最广泛的产品和 IP 组合，包括系统使能元件 (如驱动器和控制器)。
- 我们拥有面向消费类、智能家居、物联网和汽车应用的大量环境传感器产品组合。
- 我们遵循“从产品到系统”的方法，提供包括硬件、软件和算法在内的优化系统解决方案。

为了进一步扩大我们在电力系统领域的领先地位，我们正在加快宽带隙产品的开发，通过在马来西亚库林 (Kulim) 增加 SiC 和 GaN 的重要生产能力来加强我们的市场地位。这些创新技术将进一步引领实现低碳化和数字化的解决方案。与硅基解决方案相比，这些半导体在效率、尺寸和成本方面具有更好的系统性能，因此能为我们的客户带来更多价值。

为了满足对半导体结构性增长的需求，支持客户的业务连贯性，我们正在全球范围内扩大生产能力。我们在德国德累斯顿破土动工，生产模拟/混合信号元件，这些元件可用于电源供应系统，例如节能充电系统、数据中心、工业设备、可再生能源或物联网应用。

功率半导体与模拟/混合信号元件的相互作用，使创建高效、智能化的系统解决方案成为可能。此次产能扩张得到了客户的支持，包括汽车和工业应用领域的新设计订单以及预付款项。

《电源与传感选型手册 2024-2025》最全面地概述了我们的产品以及最新的电源和传感技术进展，旨在满足您的需求。我们坚信，这份电子手册将为您的战略规划提供支持，使您在竞争中保持领先地位。如有任何产品相关问题，请联系我们的专业团队，我们将为您提供个性化支持。

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Solutions

SMPS, battery management systems, motor control, UPS, contactless power and sensing

- Industrial SMPS
- Desktop PC power supply
- Power over Ethernet (PoE)
- Fast/wireless EV-charging
- Wireless charging
- Battery chargers
- USB-C chargers and adapters
- Condition monitoring and predictive maintenance
- Battery protection
- Battery monitoring and control
- Class D audio
- Motor control for power tool and robotics
- Motor control for LEV and e-forklift
- Smart devices with NFC interface
- Solutions for solid-state relays
- Solutions for solid-state circuit breakers



Industrial SMPS

Reliable and robust

The industrial SMPS category covers a wide range of applications, ranging from 15 W up to 1 kW and higher. They must be efficient, able to deliver maximum power, and function with many different input voltages while at the same time remaining highly reliable in rugged environments. Infineon's solutions for industrial SMPS deliver all of this and more. Our wide range of system solutions, enabled by Infineon's stringent quality standards and our cutting-edge silicon and wide-bandgap technology, for example, will allow you to reliably deliver efficient power to your industrial application.

In addition to our expansive product portfolio, Infineon also offers several other tools to assist you in your design journey, including our library of simulation tools, reference designs, and evaluation boards, empowering you to get to market even faster.

Strike the perfect balance between decarbonization, power density, and saving operating costs with Infineon's solutions for industrial SMPS.

Features and benefits

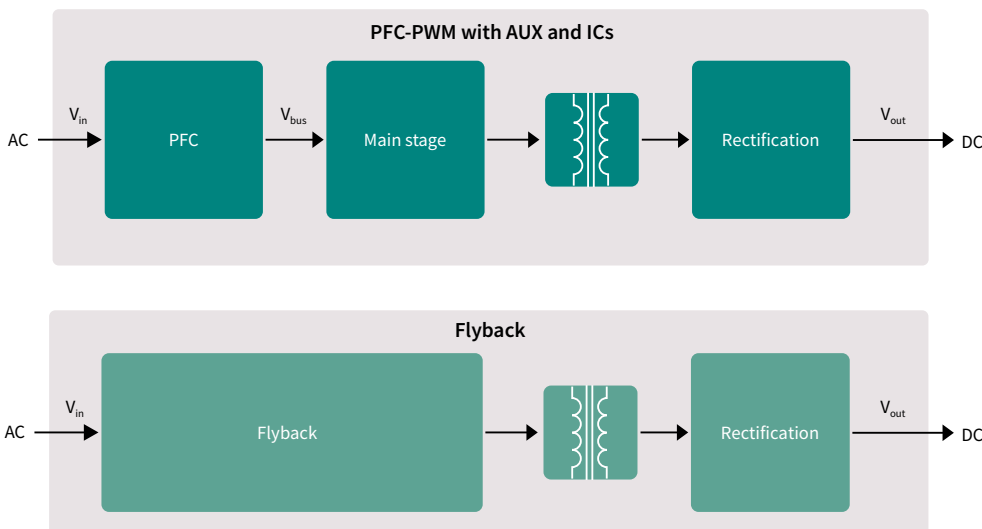
Key features

- Wide universal input range
- Infineon's stringent quality standards
- High-density designs
- Cutting edge silicon (Si) and silicon carbide (SiC) MOSFETs
- Advanced wide-bandgap (WBG) technology
- Digitally controlled stages (600 W up to >1 kW designs)
- Online simulation tools, reference designs, and evaluation boards

Key benefits

- Enables worldwide usage to conform to different grid AC categories
- Highest quality, robustness, and reliability in challenging environments
- Save space while still delivering max power
- High peak efficiency and lowest standby power
- Future-proofed systems for long lifecycles
- Higher density, efficiency, and switching frequency plus enabling ZVS
- Easier design stages and get to market faster

Application diagrams



Click here to learn more:
www.infineon.com/smps

Product portfolio

Functional block	Product category	Topology	Technology	Benefits
PFC/Main stage	High-voltage MOSFETs	CrCM/DCM PFC	600 V/800 V/950 V CoolMOS™ P7 SJ MOSFET	<ul style="list-style-type: none"> – Best thermal performance – Rugged body diode – ESD enhancement for production line – Wide $R_{DS(on)}$ portfolio including both THD and SMD packages
			600 V CoolMOS™ P6 SJ MOSFET	<ul style="list-style-type: none"> – Fast-switching speed for improved efficiency and thermals – Low gate charge for enhanced light-load efficiency and low power consumption at no load condition – Optimized VGS threshold for low turn-off losses
			600 V CoolMOS™ S7 SJ MOSFET	<ul style="list-style-type: none"> – PFC efficiency boost ~1% – Lowest $R_{DS(on)}$ in SMD packages
			600 V CoolMOS™ 8 SJ MOSFET	<ul style="list-style-type: none"> – Best price/performance, integrating fast body diode – Simplified product portfolio – Highest quality and reliability – Better energy efficiency and cost targets with providing good enough power density – TSC package offerings and 7mohm available
	High voltage SiC MOS-FETs	Totem-pole PFC	650 V CoolSiC™ MOSFET	<ul style="list-style-type: none"> – Highest power handling – Best thermal capability
	Boost diodes	DCM PFC	650 V TRENCHSTOP™ IGBT7 with emitter controlled 7 (EC7) diode	<ul style="list-style-type: none"> – Improved diode softness and humidity rugged. – Allows a more reliable design with lower failure rates
			650 V TRENCHSTOP™ IGBT7 with emitter controlled 7 (EC7) diode	
Control ICs	CCM PFC ICs	ICE3PCS0xG	<ul style="list-style-type: none"> – High PFC and low THD 	
Main stage	Control ICs	HB LLC ICs	650 V ICE1HS01G-1/ICE2HS01G	<ul style="list-style-type: none"> – High efficiency and low EMI
Synchronous rectification	Medium-voltage diodes MOSFETs	HB LLC + center-tap	OptiMOS™ 30 V/40 V/60 V/80 V/150 V/250 V	<ul style="list-style-type: none"> – Optimized cost/performance and low thermals
PFC/Main stage/ Synchronous rectification	Gate driver ICs	Boost PFC	EiceDRIVER™ low side gate driver IC: 1ED44173N01B	<ul style="list-style-type: none"> – Single-channel with fast, accurate ($\pm 5\%$), integrated overcurrent protection (OCP)
		Totem-pole PFC/HB LLC	EiceDRIVER™ Compact gate driver IC: 1ED160N12AF, 1ED3124MU12F	<ul style="list-style-type: none"> – Isolated gate driver, up to 14 A, 100 ns propagation delay
		EiceDRIVER™ level-shift gate driver IC: 2ED2181S06F, 2ED21814S06J	<ul style="list-style-type: none"> – 650 V half-bridge SOI driver with integrated bootstrap diode – Superior -VS transient voltage immunity – High-frequency switching (500 kHz) 	
		EiceDRIVER™ level-shift gate driver IC: IRS2186S, IRS21864S	<ul style="list-style-type: none"> – 4 A/4 A high- and low-side gate driver 	
		Interleaved PFC/HB LLC	EiceDRIVER™ low side gate driver IC: 2ED24427N01F	<ul style="list-style-type: none"> – Dual-channel, 10 A low-side driver in DSO-8 with power-pad – Integrated UVLO protection and enable (EN) function – High frequency, high power operation with BOM savings
Flyback	Control ICs	QR flyback	ICE5QSBG	<ul style="list-style-type: none"> – High efficiency and low standby power
	High-voltage MOSFETs	Flyback	700 V/800 V CoolMOS™ P7 SJ MOSFET	<ul style="list-style-type: none"> – Best price-competitive CoolMOS™ family – Lower switching losses versus standard MOSFET – Controlled dV/dt and di/dt for better EMI
			600 V CoolMOS™ 8 SJ MOSFET	<ul style="list-style-type: none"> – Best price/performance, integrating fast body diode – Simplified product portfolio – Highest quality and reliability – Better energy efficiency and cost targets with providing good enough power density – TSC package offerings and 7mohm available
Auxiliary power supply	Control ICs	QR/FF flyback	700 V/800 V CoolSET™ integrated power stage ICE5QRxx70/80A(Z)(G)	<ul style="list-style-type: none"> – Low standby power, high efficiency, and robustness
Isolation	Digital isolator		ISOFACE™ digital isolator 2DIB0410F	<ul style="list-style-type: none"> – 2+0 digital isolator with TTL input threshold and fail-safe default low output state – 3 kVRMS isolation voltage (UL 1577) in DSO-8 package – High common mode transient immunity > 100 kV/μs



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PC power

Desktop PC power supply

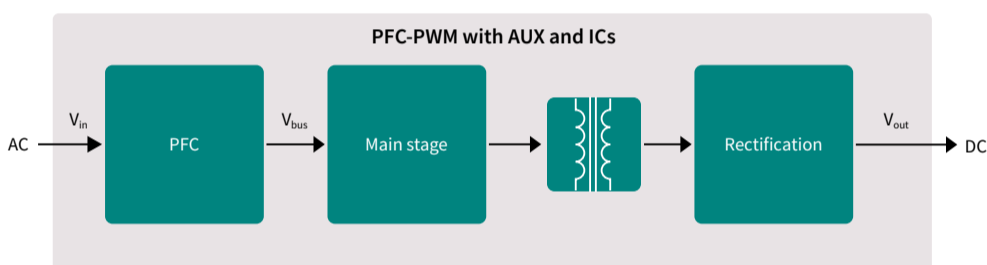
More efficient SMPS with higher output power

Switched-mode power supply for a desktop PC should deliver efficient power conversion, a compact design, stable power output, protective features, and effective cooling, contributing to the reliable and efficient operation of desktop PCs of any type. Infineon’s wide portfolio of semiconductors does all of this and more. We offer a complete system solution to meet desktop power supply unit (PSU) requirements and trends such as higher power and efficiency. In addition to our impressive silicon products, we also offer wide bandgap options that bring many additional benefits and options into the picture.

The desktop PC power market is divided into high-end gaming or mining PCs and enterprise systems. Both types of PCs use the x86 CPU, which requires a much higher peak current and higher power than previous solutions. Whether your design is meant for use in gaming/mining systems or less demanding enterprise workstations, Infineon has you covered with our solutions for a wide range of topologies.

Our wide semiconductor portfolio meets and, in some cases, exceeds needs and requirements. For example, our CoolMOS™ high-voltage MOSFETs, OptiMOS™ mid- and low-voltage MOSFETs, EiceDRIVER™ gate drivers, and CoolSET™ auxiliary SMPS controllers are all best-fit products for the current trends in desktop PC SMPS designs.

Application diagram

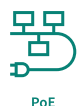


Product portfolio

Functional block	Product category	Topology	Technology	Benefits
PFC/main stage	High voltage MOSFETs	CrCM/DCM PFC	600 V CoolMOS™ P7	<ul style="list-style-type: none"> Best thermal performance Rugged body diode ESD enhancement for production line Wide $R_{DS(on)}$ portfolio including both THD and SMD packages
			600 V CoolMOS™ P6	<ul style="list-style-type: none"> Fast switching speed for improved efficiency and thermals Low gate charge for enhanced light-load efficiency and low power consumption at no load condition Optimized VGS threshold for low turn-off losses
			500 V CoolMOS™ CE	<ul style="list-style-type: none"> Optimized cost/performance Lower transition losses versus standard MOSFET
			600 V CoolMOS™ 8	<ul style="list-style-type: none"> Best price/performance, integrating fast body diode Simplified product portfolio Highest quality and reliability Better energy efficiency and cost targets with providing good enough power density TSC package offerings and 7mohm available
Boost diodes		DCM PFC	650 V EC7	<ul style="list-style-type: none"> Improved diode softness and humidity rugged Allows a more reliable design with lower failure rates
		CCM/interleaved PFC	CoolSiC™ Schottky diode 650 V G6	<ul style="list-style-type: none"> Low FOM $V_F \cdot Q_C$
Control ICs		CCM PFC ICs	ICE3PCS0xG	<ul style="list-style-type: none"> High PFC and low THD
Main stage	Control ICs	HB LLC ICs	650 V – ICE1HS01G-1/ICE2HS01G	<ul style="list-style-type: none"> High efficiency and low EMI
Synchronous rectification	Medium voltage diodes	HB LLC + center-tap	OptiMOS™ 40 V	<ul style="list-style-type: none"> Optimized cost/performance and low thermals
			OptiMOS™ 60 V	<ul style="list-style-type: none"> Layout tolerance and low thermals



Click here to learn more:
www.infineon.com/smps



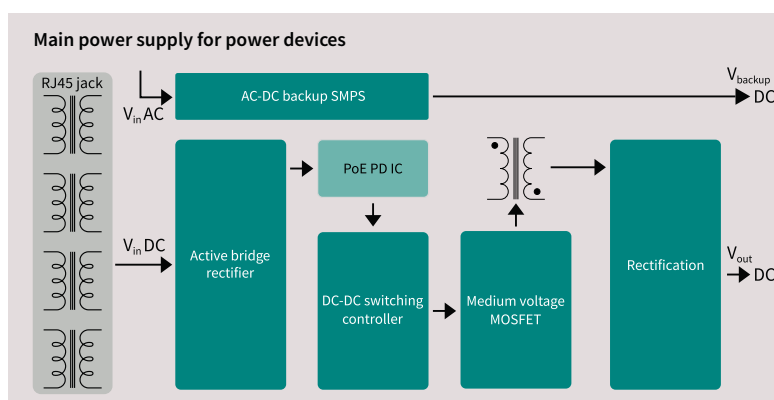
Power over Ethernet (PoE)

Designing reliable and power-efficient PoE power supplies

The latest IEEE 802.3bt standard for Power over Ethernet (PoE) not only increased the available power via PoE but also changed requirements for its power supply. Power sourcing equipment (PSE) now provides up to 100 W per port via a twisted pair of Ethernet cabling, whereas powered devices (PD) have up to 71 W available. Adopting this new PoE standard also largely depends on the capability to increase the power density on the PSE side while maintaining the same form factor as wide load conditions and higher power budgets change requirements. Infineon has long-standing expertise in switched-mode power supply (SMPS) designs and offers a highly reliable, rugged and efficient high-quality MOSFET portfolio for your PoE PSE and PD designs.

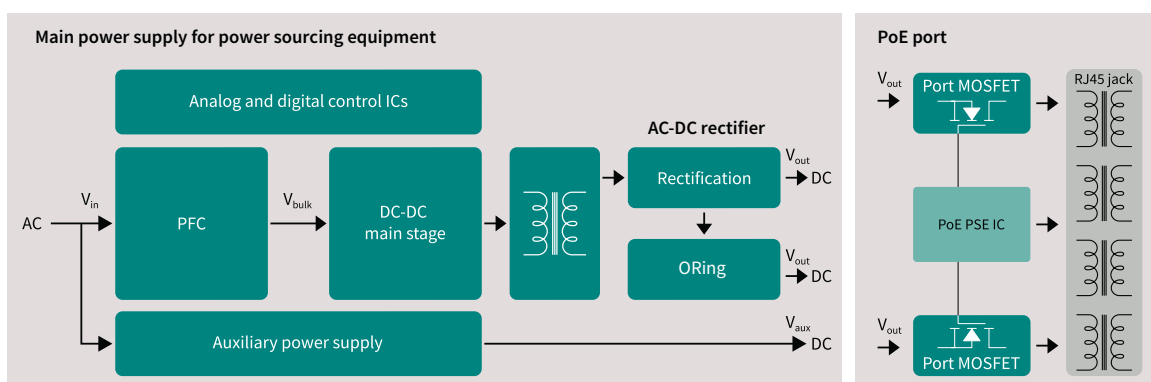
Powered devices

Powered devices (PD) include devices powered by PoE such as wireless access points, 5G small-cell radio units, IP cameras, conference systems, thin clients or public address systems. DC-DC SMPS designs need to be power efficient to maximize the available power for the PD itself with the simultaneous increase of power density. Moreover, PDs need to function reliably in the field, even under potentially rough conditions for a long time.



Power sourcing equipment

Power sourcing equipment (PSE) is any equipment that is able to provide and source power on the twisted pair Ethernet cable, such as PoE switches, PoE extenders and PoE injectors. PSE needs to be highly reliable to prevent device failure and ensure uninterrupted operations of connected power devices. With IEEE 802.3bt PoE, the power demand for PoE switches significantly increases with highest efficiency over wide load conditions. For example, to fully enable a switch with twenty-four 802.3bt compliant PoE ports, up to 2.4 kW of available PoE power budget is required. Fulfilling these requirements makes modifications in AC-DC SMPS designs necessary.



Click here to learn more:
www.infineon.com/poe

Recommended product portfolio for power sourcing equipment

Functional block	Product category	Topology	Product family	Benefits
PFC	High-voltage MOSFETs	DCM, CrCM, CCM,	600 V/650 V CoolMOS™ C7 600 V CoolMOS™ P7	<ul style="list-style-type: none"> Best FOM $R_{DS(on)} \times Q_G$ and $R_{DS(on)} \times E_{oss}$ Lowest $R_{DS(on)}$ per package Lowest dependency of switching losses from $R_{g,ext}$ Low turn-off losses, low Q_{oss} and low Q_G
	Control ICs	DCM, CrCM, CCM	ICE3PCS0xG	<ul style="list-style-type: none"> Simple external circuitry High PFC and low THD
	High-voltage GaN	CCM totem-pole	CoolGaN™ GIT HEMT 600 V	<ul style="list-style-type: none"> Highest efficiency and highest power density
	GaN driver ICs	CCM totem-pole	EiceDRIVER™ 1EDF5673Fx/1EDS5663H	<ul style="list-style-type: none"> Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) Input-output propagation delay accuracy: ± 5 ns Functional and reinforced isolation available
	SiC Schottky diode	DCM, CrCM, CCM	CoolSiC™ Schottky diode 650 V G5/G6	<ul style="list-style-type: none"> Low FOM $V_F \times Q_C$
	Silicon power diode	DCM, CrCM, CCM	650 V EC7	<ul style="list-style-type: none"> Improved diode softness and humidity rugged. Allows a more reliable design with lower failure rates
DC-DC main stage	High-voltage MOSFETs	Flyback (ACF), HB LLC, FB LLC, ITTF, ZVS	600 V CoolMOS™ P7/C7/CFD7 650 V TRENCHSTOP™ F5	<ul style="list-style-type: none"> Best FOM $R_{DS(on)} \times Q_G$ and $R_{DS(on)} \times E_{oss}$ Lowest $R_{DS(on)}$ per package Lowest dependency of switching losses from $R_{g,ext}$ Low turn-off losses, low Q_{oss} and low Q_G
	Low- and medium-voltage MOSFETs	Isolated DC-DC primary-side PWM	OptiMOS™ 60 V-200 V StrongIRFET™ 60 V-200 V Small-signal MOSFETs 60 V-200 V	<ul style="list-style-type: none"> Industry's lowest $R_{DS(on)}$ and power density Highest system efficiency Outstanding quality and reliability Reduces the need for a snubber circuit
	Gate-driver ICs	-	EiceDRIVER™ 1EDNx/1EDI/2EDN7x/2EDLx/2EDFx/2EDSx	<ul style="list-style-type: none"> Broadest portfolio in terms of isolation, channels, and protection
	Control ICs	HB LLC PWM-QF PWM-FF	ICE2HS01G ICE2QS03G/ICE5QSBG ICE5ASAG/ICE5GSAG	<ul style="list-style-type: none"> High efficiency and low EMI
	High-voltage GaN	Flyback (ACF), HB LLC, FB LLC, ZVS	CoolGaN™ GIT HEMT 600 V	<ul style="list-style-type: none"> Highest efficiency and highest power density
	GaN driver ICs	-	EiceDRIVER™ 1EDF5673Fx/1EDS5663H	<ul style="list-style-type: none"> Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) Input-output propagation delay accuracy: ± 5 ns Functional and reinforced isolation available
PFC-main stage combo	High-voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	<ul style="list-style-type: none"> Low turn-off losses, low Q_{oss} and low Q_G and thermals Fast-switching speed for improved efficiency
Synchronous rectification	Low- and medium-voltage MOSFETs	Synchronous rectification	OptiMOS™ 100 V-150 V OptiMOS™ 40 V-120 V StrongIRFET™ 40 V-100 V	<ul style="list-style-type: none"> Industry's lowest $R_{DS(on)}$ and power density Highest system efficiency Outstanding quality and reliability Reduces the need for a snubber circuit
	Gate-driver ICs	-	EiceDRIVER™ 1EDNx/1EDI/2EDN7x/2EDLx/2EDFx/2EDSx	<ul style="list-style-type: none"> Broadest portfolio in terms of isolation, channels, and protection
ORing	Low- and medium-voltage MOSFETs	ORing MOSFETs	OptiMOS™ 25 V-200 V	<ul style="list-style-type: none"> Industry's lowest FOM ($R_{DS(on)} \times Q_G$) Highest system efficiency and power density
Auxiliary power supply	AC-DC integrated power stage	Fixed-frequency (FF) Quasi-resonant (QR)	CoolSET™ ICE5Rxx80AG CoolSET™ ICE5QRxx80BG	<ul style="list-style-type: none"> Quasi-resonant switching operation for high efficiency and low EMI signature Fixed-frequency switching operation for ease of design
Analog and digital control IC	32-bit XMC™ industrial microcontroller based on Arm® Cortex®-M	-	32-bit XMC1000 32-bit XMC4000	<ul style="list-style-type: none"> Flexibility, HR PWM, digital communication Arm® based standard MCU family and wide family
Port MOSFET	Medium-voltage MOSFETs	-	OptiMOS™ 100 V OptiMOS™ Linear FET StrongIRFET™ 100 V	<ul style="list-style-type: none"> Wide SOA and outstanding reliability for PoE ports Low $R_{DS(on)}$ Space-saving 3.3 x 3.3 S308/PQFN package
Functional block	Product category	Topology	Product family	Benefits
Active bridge rectifier	Medium-voltage MOSFETs	Active bridge rectifier	OptiMOS™ 100 V-150 V StrongIRFET™ 100 V	<ul style="list-style-type: none"> Industry's lowest $R_{DS(on)}$ Highest system efficiency and power density
Synchronous rectification	Low- and medium-voltage MOSFETs	Synchronous rectification	OptiMOS™ 25 V-100 V OptiMOS™ 40 V IR MOSFET™ 20 V-100 V	<ul style="list-style-type: none"> Industry's lowest $R_{DS(on)}$ and power density Highest system efficiency Outstanding quality and reliability
DC-DC switching stage	Medium-voltage MOSFETs	Flyback (ACF)	OptiMOS™ 100 V-150 V	<ul style="list-style-type: none"> Low conduction losses, reduced overshoot Logic level switching
AC-DC backup SMPS	High-voltage MOSFETs	Flyback (ACF)	600 V to 950 V CoolMOS™ P7	<ul style="list-style-type: none"> Fast-switching speed for improved efficiency and thermals Reduced gate charge for enhanced light load efficiency Optimized gate-to-source voltage (V_{GS}) threshold for lower turn-off losses
	AC-DC integrated power stage	Fixed-frequency (FF) Quasi-resonant (QR)	CoolSET™ 800 V ICE5GRxx80AG, 800 V ICE5ARxx80BZS, 700 V ICE5ARxx70AG, 700 V ICE5ARxx70BZS CoolSET™ 700 V ICE5QRxx70A(Z) (G), 800 V ICE5QRxx80A(Z) (G), 800 V ICE5QRxx80BG	<ul style="list-style-type: none"> Quasi-resonant switching operation for high efficiency and low EMI signature operation for ease of design Fixed-frequency switching

 [Click here to learn more: www.infineon.com/poe](http://www.infineon.com/poe)

Solutions Applications 15-300 V MOSFETs 500-950 V MOSFETs Gate-driver ICs Digital isolators IGBT discretes and silicon power diodes Intelligent power switches and modules Microcontrollers USB-C controllers and peripherals Power management ICs WBG semiconductors Sensors Support



EV charger

Fast/wireless EV-charging

Advanced solutions for DC EV-charging

As e-mobility increasingly becomes part of daily life, there is a growing need for more efficient charging solutions. Fast electric vehicle (EV) charging stations equipped with powerful DC chargers are the answer. DC EV-chargers are an attractive choice because they allow much faster charging than the standard AC EV ones that many EV owners have at home. Today, a DC charger with 150 kW can put a 200 km charge on an EV in around 15 minutes. As fast charging and battery technologies continue to evolve and improve in the near future, experts anticipate the charging time to drop even further.

As a market leader and the global front-runner in power electronics, Infineon enables you to bring energy-efficient DC EV-charger designs to life, with our highly efficient components and in-depth technical support. We cover power ranges from kilowatts to megawatts in our broad portfolio of high-quality power semiconductors, microcontrollers, gate drivers, security, safety, and authentication solutions. Our CoolMOS™ and CoolSiC™ MOSFETs, together with EiceDRIVER™ gate drivers, for example, are ideal in a wide range of DC EV-charging designs. Their matchless advantages include high-frequency operation, high power density and reduced switching losses, allowing you to reach high efficiency levels in any battery charging system.

Infineon offering and customer benefits

Infineon offering

- CoolMOS™ and CoolSiC™ discrete and power module semiconductor solutions
- EiceDRIVER™ gate driver and XMC™ microcontroller
- XENSIV™ magnetic current sensor
- OPTIGA™
- Power supply ICs (LDO, DC-DC)
- Connectivity (CAN transceiver, AIROC™ Wi-Fi + Bluetooth® Combos)

Customer benefits

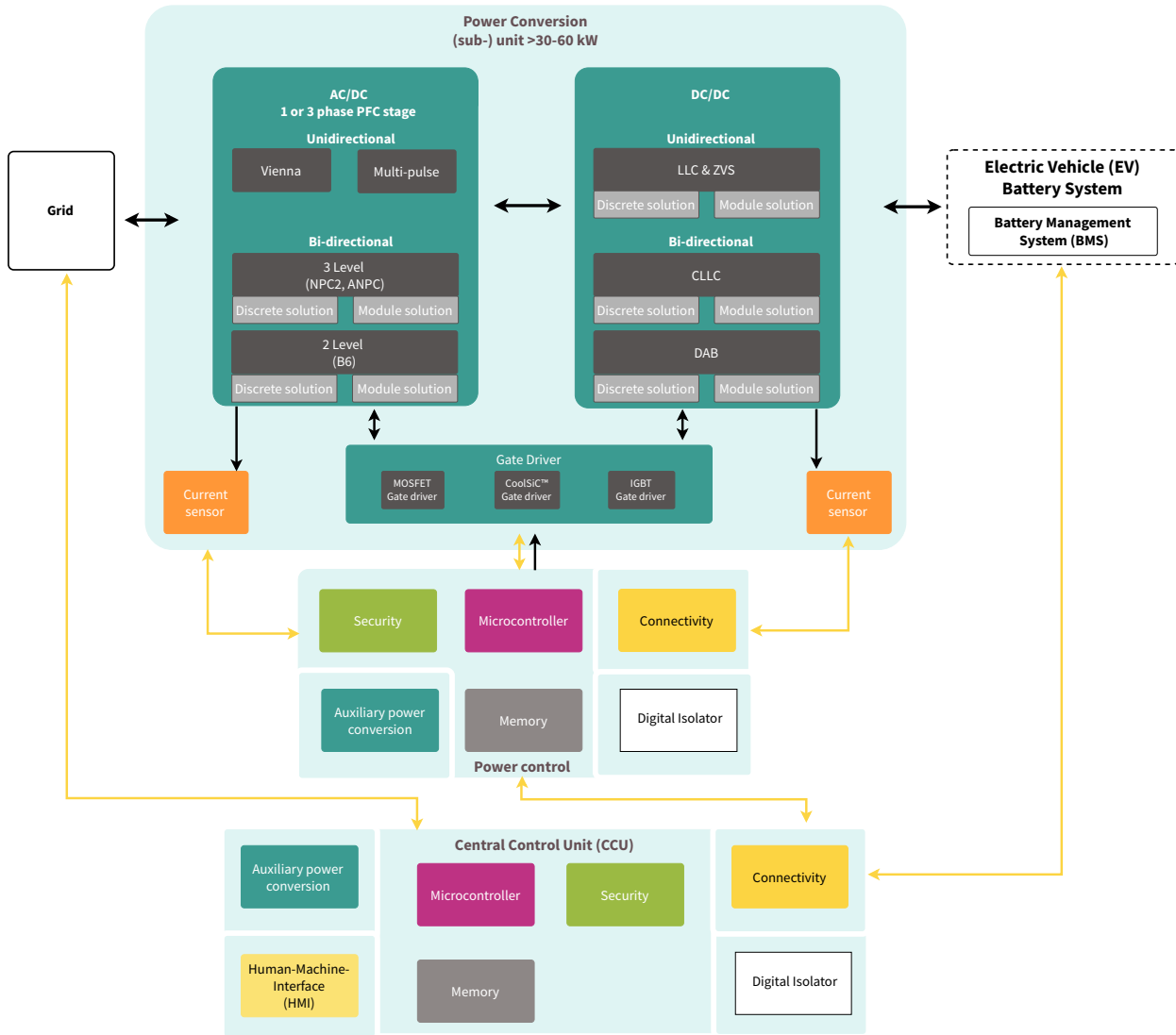
- Highly efficient power conversion for reducing system size by up to 50 percent and reduced cooling efforts
- Scalability across various platforms for upgrading system power charger levels on demand
- Safe drive, advanced protection and ease of control
- Bidirectional high precision current sensing
- Identity protection against fake devices and protection against the manipulation of the data
- Robust quality and easy to use implementation shorten time to market and guarantee long operation



Click here to learn more:

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Application diagram



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Power conversion

Product category	Product family	Product	Additional information
AC/DC (PFC)	600 V/650 V CoolMOS™ P7/C7/CFD7	TO-247-3 TO-247-4	<ul style="list-style-type: none"> Large portfolio with granular $R_{DS(on)}$ selection Different space-saving and high-performance packages Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	600 V CoolMOS™ 8	TO-247-3 TO-247-4	<ul style="list-style-type: none"> Simplified portfolio compared to previous families with granular $R_{DS(on)}$ selection TO247-4 and Top-side cooled D-PAK package options Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	TRENCHSTOP™ IGBT7 650 V/1200 V HighSpeed 3 H3 IGBTs 1200 V	TO-247-3 TO-247-4	<ul style="list-style-type: none"> High speed/high power IGBT First tailless/low-loss IGBT on market Market proven and recognized quality leader
	CoolSiC™ MOSFET 650 V/750 V/1200 V/2000 V	TO-247-3 TO-247-4 TO-263-7	<ul style="list-style-type: none"> CoolSiC™ MOSFETs are built on a state-of-the-art trench semiconductor process Optimized to allow for both the lowest losses in the application and the highest reliability in operation TO-247-4pin package versions with additional connection to the source, resulting in even lower switching losses than for TO247-3pin version, especially at higher currents and higher switching frequencies.
	CoolSiC™ Schottky diodes 650 V/1200 V	TO-220-2 TO-247-2 TO-247-3	<ul style="list-style-type: none"> CoolSiC™ Schottky diodes convince with better efficiency compared to Silicon diode alternatives
	CoolSiC™ MOSFET modules - sixpack 1200 V CoolSiC™ MOSFET modules - halfbridge 1200 V	EasyPACK™ 1B EasyPACK™ 2B EasyPACK™ 3B	<ul style="list-style-type: none"> CoolSiC™ MOSFET modules with PressFIT contact technology and optimal pinout Integrated NTC temperature sensor Versions with pre-applied thermal interface material (TIM) Optional AlN substrate with low thermal resistance versions Enlarged gate drive voltage window
	1200 V HighSpeed 3 H3 IGBTs modules- 3-level	EasyPACK™ 1B EasyPACK™ 2B	<ul style="list-style-type: none"> IGBT HighSpeed 3 with active "Neutral Point Clamp 2" topology PressFIT contact technology and optimal pinout Integrated NTC temperature sensor
DC/DC	600 V/650 V CoolMOS™ P7/C7/CFD7	TO-247-3 TO-247-4 TO-263-7 (D2PAK) HSDSOP (D-PAK)	<ul style="list-style-type: none"> Large portfolio with granular $R_{DS(on)}$ selection Different space-saving and high-performance packages Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	600 V CoolMOS™ 8	TO-247-3 TO-247-4	<ul style="list-style-type: none"> Simplified portfolio compared to previous families with granular $R_{DS(on)}$ selection TO247-4 and Top-side cooled D-PAK package options Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	CoolSiC™ MOSFET 650 V/750 V/1200 V/2000 V	TO-247-3 TO-247-4 TO-263-7	<ul style="list-style-type: none"> CoolSiC™ MOSFETs are built on a state-of-the-art trench semiconductor process Optimized to allow for both the lowest losses in the application and the highest reliability in operation TO-247-4pin package versions with additional connection to the source, resulting in even lower switching losses than for TO247-3pin version, especially at higher currents and higher switching frequencies.
	CoolSiC™ Schottky diodes 1200 V	TO-247-2 TO-247-3	<ul style="list-style-type: none"> CoolSiC™ Schottky diodes convince with better efficiency compared to Silicon diode alternatives.
	1200 V CoolSiC™ MOSFET modules - fourpack 1200 V CoolSiC™ MOSFET modules - halfbridge	EasyPACK™ 1B EasyPACK™ 2B EasyPACK™ 3B	<ul style="list-style-type: none"> CoolSiC™ MOSFET modules with PressFIT contact technology and optimal pinout Integrated NTC temperature sensor Versions with pre-applied thermal interface material (TIM) Optional AlN substrate with low thermal resistance versions Enlarged gate drive voltage window
	1200 V CoolSiC™ EasyBRIDGE diode module	EasyPACK™ 1B	<ul style="list-style-type: none"> 1200 V diode bridge module with CoolSiC™ Schottky diode PressFIT contact technology with optimal pinout Integrated NTC temperature sensor
	Gate driver	EiceDRIVER™ 2EDB gate driver EiceDRIVER™ 2EDR gate driver	DSO-14-WB
EiceDRIVER™ Compact gate driver EiceDRIVER™ Enhanced gate driver		DSO-8 DSO-16	<ul style="list-style-type: none"> Single-channel isolated driver with versions comprising active Miller clamp or separate-output (Compact) and DESAT, soft-off and active Miller Clamp (Enhanced) Variants with different isolation levels and optional two-level slew-rate control
Current sensors	XENSIV™ - high-precision coreless current sensors	VSON-6 TISON-8 TDSO-16	<ul style="list-style-type: none"> High-precision coreless open-loop current sensors for current ranges up-to ± 132 A Less bulky, and cost less compared to core-based current sensors Variants with integrated and for external current rail UL variants



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Power control and auxiliary power supply

Product category	Product family	Product	Additional information
Microcontroller	XMC™ families XMC1400 (for PFC)/XMC4000/XMC7000	various depending on feature set	<ul style="list-style-type: none"> – 32-bit MCU subsystem 48/144/250/350MHz – Arm® Cortex®-M0+, M4 or M7 CPU – Single or dual core versions – Up to up to 8 MB flash – 32 kB SRAM – Up to 10-ch CAN, 11-ch SCB and up to 2x Ethernet and USB/up to 4 serial channels
	32-bit TriCore™ AURIX™ TC3xxx MCU	TQFP LQFP BGA LFBGA	– Tri-Core Microcontroller to control PFC + DC/DC stage with one device HSM (hardware secure module) full EVITA compliance
Memory	Serial SPI F-RAM EXCELON™ F-RAM	DSO-8	<ul style="list-style-type: none"> – Zero-delay writes – 1014 read/write cycles – 10-year data retention at +85°C temperature – 200x lower energy than EEPROM – No complex wear-leveling overheads – Radiation Tolerant - Immune to soft errors caused by radiation that can produce bit flips
Connectivity	CAN Transceivers	DSO-8 DSO-14	<ul style="list-style-type: none"> – Broad portfolio with scalable feature set like – With/without bus wake up – Sleep Mode versions – Different CAN Speeds from 1Mbit/s to 8Mbit/s
	CoolSET™ AC-DC integrated power stages	DSO-12	<ul style="list-style-type: none"> – Compact, robust and easy to use solution – Fixed frequency and Quasi Resonant versions available
	PWM-FF (fixed frequency) Flyback ICs PWM-QR (quasi resonant) Flyback ICs	DSO-8	<ul style="list-style-type: none"> – Fixed frequency and Quasi Resonant versions available – Extensive protection coverage to increase system robustness – Rapid start-up performance with cascode configuration
	OPTIREG™ PMIC	VQFN-48 LQFP-64	– Multichannel power supply IC, optimized for AURIX™ MCU, up to ASIL-D rated
	1700 V CoolSiC™ MOSFET discrete	TO263-7	– Perfect voltage class and $R_{DS(on)}$ fit for flyback based auxiliary power supplies
	800 V/ 950V CoolMOS™ P7 MOSFET	SOT-223	– Perfect voltage class and $R_{DS(on)}$ fit for flyback based auxiliary power supplies

Central Control Unit (CCU)

Product category	Product family	Product	Additional information
Microcontroller	XMC™ families XMC1400/XMC4000/XMC7000	various depending on feature set	<ul style="list-style-type: none"> – 32-bit MCU subsystem 48/144/250/350MHz – Arm® Cortex®-M0+, M4 or M7 CPU – Single or dual core versions – Up to up to 8 MB flash – 32 kB SRAM – Up to 10-ch CAN, 11-ch SCB and up to 2x Ethernet and USB/up to 4 serial channels
	32-bit PSoC™ 4/PSoC™ 6	various depending on feature set	<ul style="list-style-type: none"> – PSoC™ 4 portfolio include a customizable analog front end through programmable analog blocks as well as wired and wireless connectivity options such as USB, CAN, and Bluetooth Low Energy – PSoC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm® – Both families with the industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable
Memory	Serial SPI F-RAM EXCELON™ F-RAM	DSO-8	<ul style="list-style-type: none"> – Zero-delay writes – 1014 read/write cycles – 10-year data retention at +85°C temperature – 200x lower energy than EEPROM – No complex wear-leveling overheads – Radiation Tolerant - Immune to soft errors caused by radiation that can produce bit flips
	SEMPER™ NOR Flash		<ul style="list-style-type: none"> – Endurance flex architecture: up to 25 years of data retention or 1+ million cycles endurance – SafeBoot and error checking to ensure safe and reliable operation – Read bandwidth of up to 400 MB/s for direct program execution from long-term storage instead of code shadowing to RAM – Enhanced reliability: Supports ECC (SECCDED) along with CRC protection over interface and memory data
Connectivity	AIROC™ Wi-Fi + Bluetooth® Combos	WLBGA	<ul style="list-style-type: none"> – Wi-Fi® and Bluetooth® combos – Bluetooth® and Bluetooth® Low Energy – Reduced power consumption, including very low sleep
	CAN Transceivers	DSO-8 DSO-14	<ul style="list-style-type: none"> – Broad portfolio with scalable feature set like – With/without bus wake up – Sleep Mode versions – Different CAN Speeds from 1Mbit/s to 8Mbit/s
Security	OPTIGA™ Trust OPTIGA™ TPM	USON-10-2	<ul style="list-style-type: none"> – The OPTIGA™ Trust family includes turnkey products for smaller platforms as well as programmable solutions – The OPTIGA™ TPM family offers a broad portfolio of standardized security controllers to protect the integrity and authenticity of embedded devices and systems.



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Authentication and encryption

As embedded systems are increasingly becoming targets of attackers, Infineon offers OPTIGA™ - a turnkey security solution.

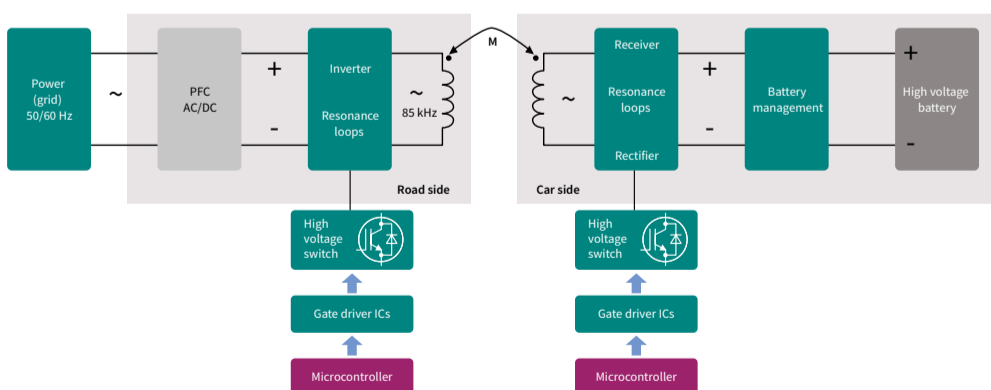
Product category	Product family	Product	Additional information
Security	OPTIGA™ Trust B	SLE95250000XTSA1	Asymmetric ECC authentication with individual certificate key pair and an extended temperature range of -40 to 110°C
	OPTIGA™ Trust TPM	SLB9670XQ2.0	Fully TCG TPM 2.0 standard compliant module with the SPI interface
	SLC37	SLC37ESA2M0, SLI97CSIFX1M00PE	New class of performance and security cryptocontroller adhering to CC EAL6+ high targeted and EMVCo targeted certifications for payment and eSIM applications

Communication

Product category	Product family	Product	Additional information
CAN transceiver	Automotive CAN transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps

Wireless EV-charging

Wireless methods for power transfer to charge the batteries of electric vehicles are gaining attention. Several concepts for wireless power transfer systems have been proposed, which in general seek to compensate the significant stray inductances on primary and secondary sides of the magnetic couplers by adaptive resonant methods. There are several standards for wireless power transfer (WPT) in EV charging, such as SAE J2954 and SAE TIR J2954/2, which defines power levels up to 500 kW and the use of the 85 kHz frequency band. Infineon's CoolMOS™ CFD7, C7, and P7 series along with TRENCHSTOP™ 5 and 7 IGBTs, CoolSiC™ diodes, and EiceDRIVER™ gate-driver ICs are perfectly suited for driving inductive power transfer systems on the road side which operate inside the 80 to 90 kHz band.



Infineon's solution recommendation for DC EV-charging system blocks

Our solutions have been designed for harsh environmental conditions and long lifetime thanks to Infineon's deep understanding of quality requirements. Take the next step by exploring our product portfolio for DC EV-charging systems.



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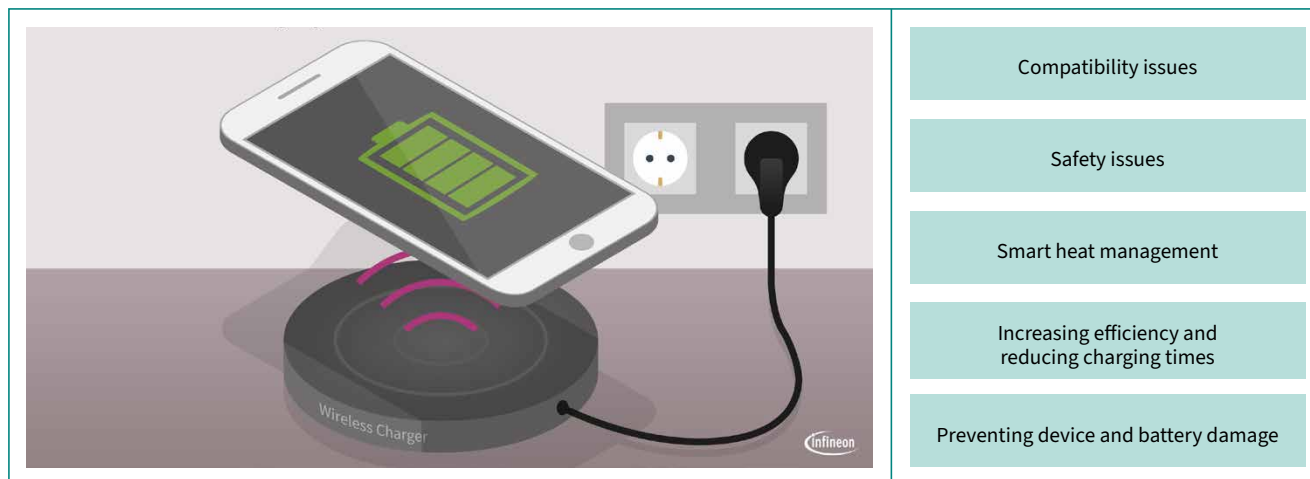
Wireless charging

Wireless charging

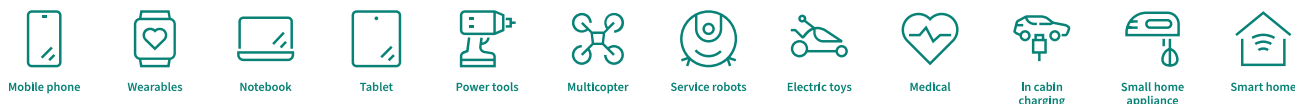
Cost-effective and secure system solutions for consumer, industrial and automotive applications

Infinion offers a broad portfolio of efficient, high-quality products and solutions to serve the key requirements of the dominant market standards: inductive (Qi (WLC)) and resonant (AirFuel) in consumer, industrial, and automotive.

Overcome common design challenges with Infineon



Applications that benefit from wireless charging



Infinion's key enabling products for wireless charging

- Wireless charging ICs (WLC)
- Power MOSFETs – OptiMOS™, StrongIRFET™, and CoolMOS™
- P-channel and N-channel small signal power MOSFETs
- Gate-driver ICs – EiceDRIVER™: MOTIX™ 3-phase gate-driver IC
- Authentication - OPTIGA™ Trust Automotive, OPTIGA™ trust auto
- XMC™, XMC™-SC (including software IP), TRAVEO™ MCU Automotive, AURIX™, PSoC™
- USB-C and power delivery (PD): EZ-PD™ CCG3PA, EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG7S, EZ-PD™ CCG7D
- PWM/flyback controllers and integrated power stage ICs – CoolSET™
- GaN GIT HEMT - CoolGaN™
- Voltage and buck regulators for component and bridge supply
- Reverse Conducting IGBTs R5/R6 - 650 V



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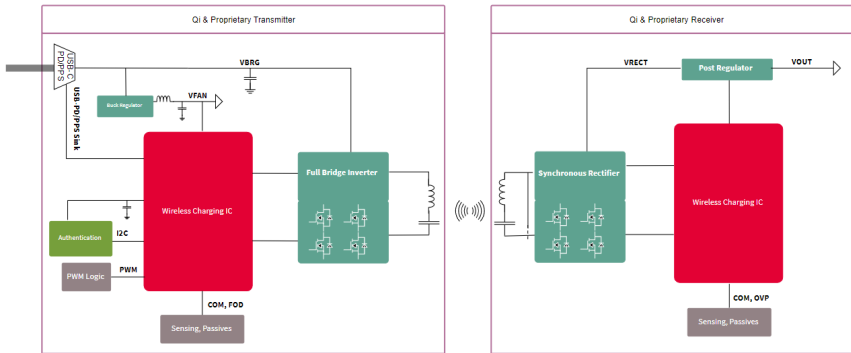
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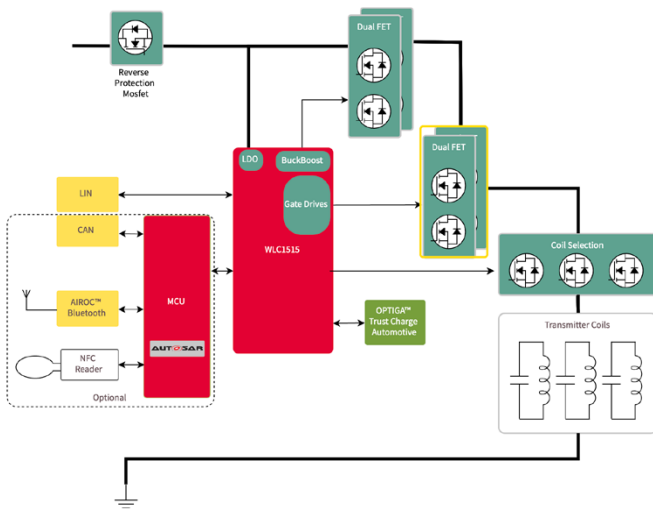
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Inductive wireless charging for consumer and industrial

Example: 50 W inductive system solution



Inductive wireless charging for automotive



Key components for inductive designs for consumer, industrial and automotive

Wireless charging product portfolio for inductive

Sub-application	Products
Wireless charging IC	WLC1115-68LQXQ transmitter IC WLC1150-68LQXQ transmitter IC WLC1515-68LQXQ transmitter IC for automotive
MOSFETs*	30 V: BSC0996NS, BSC0993ND, BSZ0909NS, BSZ0909ND, BSZ0910ND, IRLFHS8342 40 V: BSZ097N04LS, BSZ063N4LS6, BSC035N04LSG, BSC072N04LD 60 V: BSZ099N06LS5, BSZ065N06LS5, BSZ040N06LS5 80 V: IRL80HS120 100 V: IRL100HS121, BSZ146N10LS5, BSZ096N10LS5
Driver IC	WCDSC006, PX3519, IRS2301S, 1EDN7512B, 1ED44173N01B, 1EDI60N12AF, 2EDN7524G, IRS2007M, 2ED2182S06F, 6EDL7141
Microcontroller	XMC™, AURIX™ XMC™-SC (including software IP), PSoC™ family 4, TRAVEO™ (automotive)
Voltage regulators	TLE4296G V33, TLF50211EL, TLE8366EV
MCU + BLE controller	PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)
AIROC™ Bluetooth® LE and Bluetooth®	CYW20719B2 / CYW20721B2
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)
Small-signal MOSFETs	See the portfolio on our webpage small-signal MOSFETs
Authentication	SLS32AIA020Ux – OPTIGA™ Trust Charge (USON10 3x3 package) OPTIGA™ Trust Charge automotive
Reverse conducting IGBTs R5/R6 - 650 V	Package TO-247 IHW30N65R5 (30 A), IHW40N65R5 (40 A), IHW50N65R5 (50 A)
Reference designs and kits	REF_WLC_TX15W_C1 – 15 W Qi power transmitter solution REF_WLC_TX50W_N1 – 50 W transmitter solution REF_WLCAUTO_TX15W_C1



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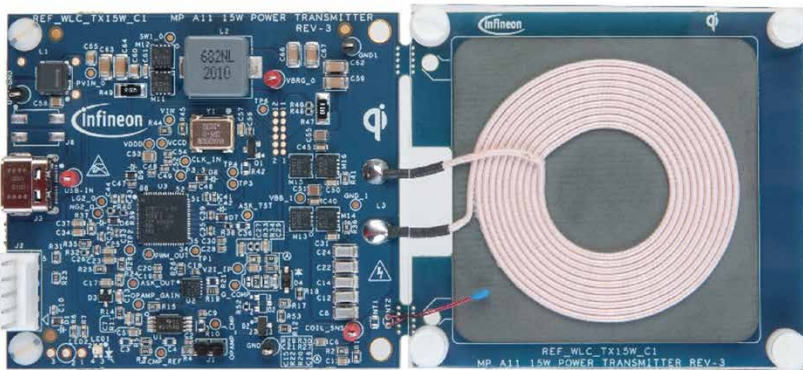
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* Explore more MOSFET offerings on our webpage

15 W Qi transmitter solution with Infineon's wireless charging IC WLC1115

The REF_WLC_TX15W_C1 MP A11 power transmitter solution board is a highly integrated, Qi v1.3 compliant extended power profile (EPP) transmitter design. This reference board is powered using a USB PD 3.0-compliant USB-C power adapter and can support DC connector input of 9 - 20 V through firmware option. Combined with the OptiMOS™ power MOSFETs and OPTIGA™ Trust Charge, this solution offers a highly efficient and secure wireless charging platform. The solution board supports firmware upgrades using USB-C or I²C interface the included dongle and the wireless charging configuration graphical user interface (GUI). There are additional options provided for firmware updates using serial wire debug (SWD) while using the ModusToolBox™ and programmer.



Key components

- Wireless charging IC – WLC1115-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux
- Small Signal MOSFETs



Features and benefits

Key features

- Qi v1.3 compliant transmitter
- UDB-PD/legacy protocol input >9 V_{DC}
- Peak system efficiency >83%
- Typical active charging area ±10 mm
- Serial communication ports: I²C, UART
- Programming, EXT clock option
- Foreign object detection with LEDs
- Configurable using wireless charging GUI

Key benefits

- Compliant Qi stack with library support
- Programmable solution for evolving Qi standard
- Zero voltage switching for high efficiency
- Configurable gate drivers for EMC
- Configurable thresholds for FOD, protection



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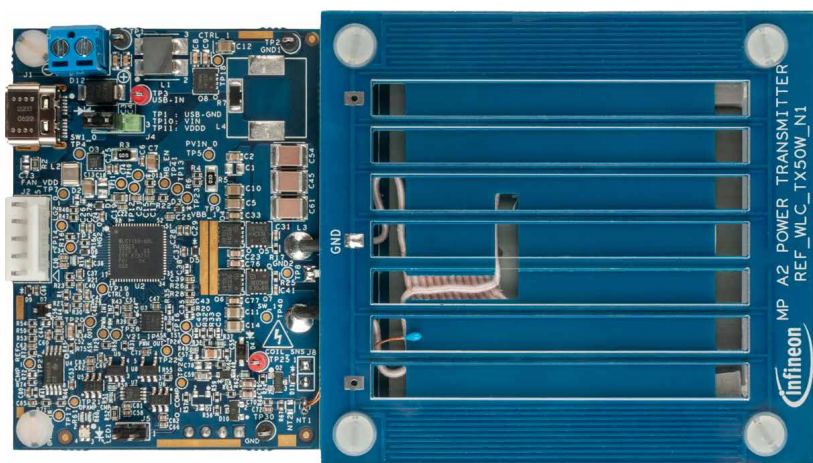
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50 W transmitter solution with Infineon's wireless charging IC WLC1150

The REF_WLC_TX_50W_N1 transmitter solution board using WLC1150 enables high-performance and low-cost wireless charging solutions for various applications up to 50 W output power. The configurable WLC1150 solution, with Infineon's OptiMOS™ power devices offer highly efficient charging with flexible thermal management options. Combined with Infineon's USB-C charger solutions, it offers a complete product package that can help meet stringent regulatory and compliance requirements. The WLC1150 uses Infineon high power proprietary protocol to deliver 50 W power. It is also compatible to Qi 1.3.x specification with extended power profile (EPP), basic power profile (BPP), and proprietary power delivery extension (PPDE). The controller is offered with both configuration utility and ModusToolbox™ software options to develop your wireless charging solutions for proprietary charging protocols as well as Qi latest specification.



Key components

- Wireless charging IC – WLC1150-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux (optional)
- Small signal MOSFETs



Features and benefits

Key features

- High power proprietary charging up to 50 W
- Qi v1.3.x compliant transmitter (MP-A2 and similar)
- Integrated USB-PD/PPS sink functionality
- Integrated DC-DC controller for fan that enables thermal management
- Integrated gate drivers for buck-boost, inverter
- Input voltage range: 4.5 - 24 V
- Communication ports: I²C, UART
- Temperature range: -40°C - 105°C
- Packing type: tray

Key benefits

- 50 W transmitter with software included
- Adaptive foreign object detection (FOD)
- Adjustable protection – OVP, OCP, OTP
- Graphical utility tool for ease of configuration, debug without code
- ModusToolbox™ Software Library for Infineon Proprietary, Qi Stack

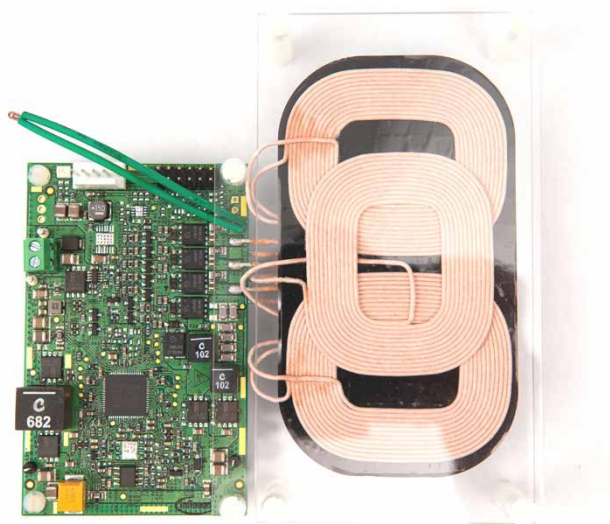


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15 W automotive transmitter solution with Infineon's wireless charging IC WLC1515

The REF_WLCAUTO_TX15W_C1 MP A13 power transmitter solution board using WLC1515 is a highly integrated, Qi v1.3 compliant Extended Power Profile (EPP) transmitter design ideal as a scalable platform for automotive in-cabin charger. It can also support basic power profile (BPP), Proprietary power delivery Extensions (PPDE), and custom protocols. This reference board operates with variable automotive battery input voltage of 9 - 18 V, supporting reverse polarity protection and auto transients. Its integrated buck-boost controller enables a low EMI fixed frequency mode of operation. On-chip LIN or serial communication interfaces with the Host system for additional functionality. With an optional external automotive MCU such as TRAVEO™ T2G, it is possible to add AUTOSAR, CAN, and NFC interface functionality. The solution board supports firmware updates using Serial Wire Debug (SWD) while using the ModusToolbox™ and programmer.



Key components

- Wireless charging IC - WLC1515-68LDXS
- OptiMOS™ automotive MOSFETs
- OPTIGA™ Trust Charge auto

Features and benefits

Key features

- Integrated Qi controller
- Input voltage range: 4.5 - 24 V (40 V tolerant)
- Output power: 15 W Qi EPP free position
- Programmable high-side current sense amplifier
- Gate drivers for full-bridge inverter
- Coil selection control
- Integrated buck-boost controller
- 150 - 600 kHz switching frequency for synchronous buck-boost
- Integrated gate drivers with slew rate and dithering controls
- Comprehensive protection: UVLO, OVP, OCP, and OTP
- LIN and Host Interface
- In-built LIN interface to LIN transceiver
- Interface for external MCU over I2C
- Configurable firmware registers

Key benefits

- Qi stack with library support
- Fixed frequency operation for low EMI
- Configurable gate drivers for EMC
- Configurable thresholds for FOD, protections
- ModusToolbox™ code examples



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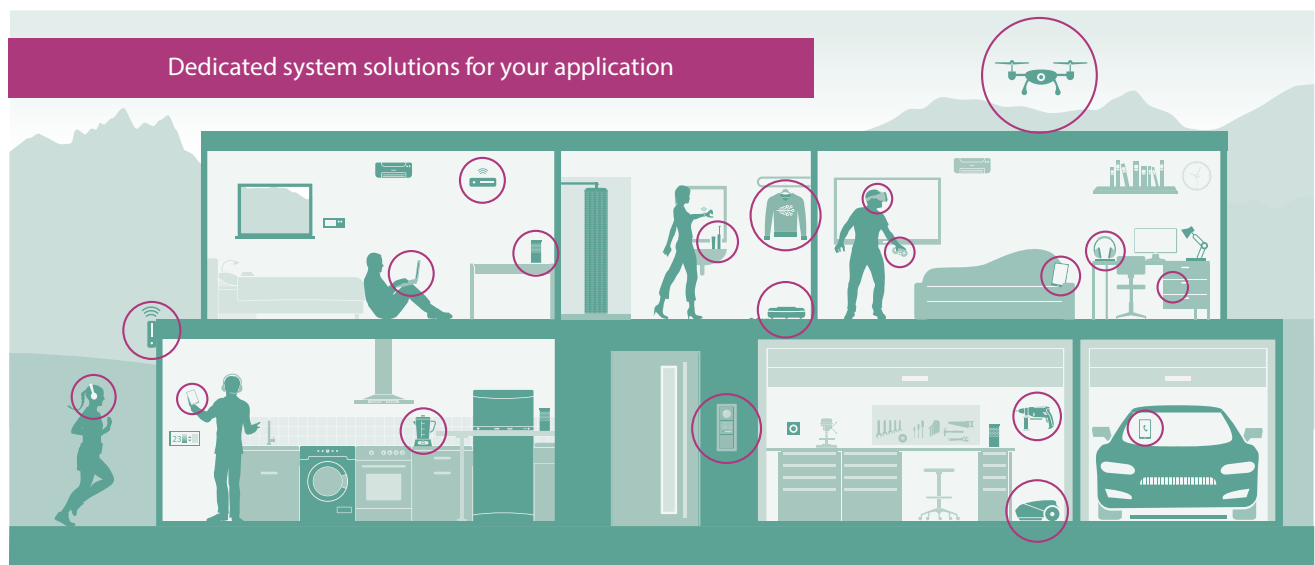
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Key components for resonant designs for consumer and industrial

Wireless charging product portfolio for resonant

Sub-application	Products	
MOSFETs**	30 V	IRLHS6376PBF, BSZ0909ND, BSZ0910ND, IRLML0030PBF
	40 V	IRLML0040
	60 V	IRLML0060
	80 V	IRL80HS120
	100 V	IRL100HS121
	150 V	BSZ900N15NS3, BSZ520N15NS3
	200 V	BSZ900N20NS3, BSZ22DN20NS3, BSZ12DN20NS3
	250 V	BSZ42DN25NS3
Driver ICs	EiceDRIVER™ 2EDL71, 1EDN7512, 2EDN7524, 2ED2182S06F, 2ED24427N01F, 1EDI60N12AF, 1ED44173N01B	
	EiceDRIVER™ for CoolGaN™ GIT HEMTs 1EDS5663H, 1EDF5673F, 1EDF5673K	
GaN e-mode HEMTs	CoolGaN™ GIT HEMT 600 V IGT60R190D1 (HDSOF-8-3)	
Microcontroller	XMC™, AURIX™ MCU and wireless power controller XMC™-SC (including software IP), PSoC™ family 4	
MCU + BLE Controller	PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)	
AIROC™ Bluetooth® LE & Bluetooth®	CYW20719B2 / CYW20721B2	
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG7S, EZ-PD™ CCG7D, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)	
Voltage regulators	TLE4296G V33, TLE4296G V50, TLE4296-2G V33, TLE4296-2G V50, TLF50211EL, TLE8366EV, TLE8366EV33, TLE8366EV50	
Small signal MOSFETs	See the portfolio on our webpage small-signal MOSFETs	

Are you searching for a turnkey solution for your application?



Wireless power has become an important part of our connected lifestyles. Infineon emphasizes the development of next-generation technologies and standards that allow easy charging without the limitation of wires. What started with phones will quickly evolve - applications such as tablets, laptops, robots, drones, power tools, handheld gaming devices, medical devices, infrastructure, and applications around Industry 4.0 will include wireless charging. For more information, please get in touch with us via www.infineon.com/support to get your customized system solution.



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Battery chargers

Charging solutions for battery-powered equipment

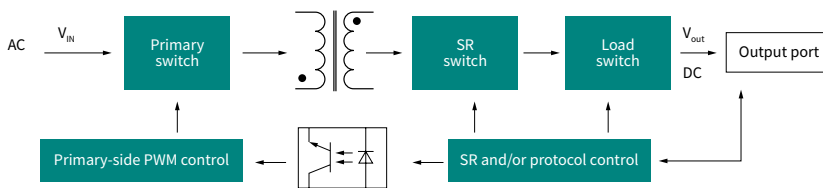
Infiniteon's solutions for battery chargers are designed to fit the large variety of topologies and power ratings for applications like e-bike or cordless power tools. Whether the design requires ultra-high efficiency or a cost-performance oriented implementation, we help you simplify the design process and accelerate time-to-market.

The REF_ICL8810_116W_BPA uses the PFC-flyback converter topology to design a cost-effective yet efficient charger solutions with a 116 W power output. ICL8810 forces the peak drain current to follow the shape of the input voltage, similar to a PFC pre-regulator in boost topology, which allows removing the bulk capacitor. The reference design covers the full AC input voltage range and supports output voltage range between 30 V to 58 V. The XDP™ XDPS2221 controller is a highly integrated IC that combines both a multimode PFC controller and a multimode DC-DC hybrid-flyback controller, offering harmonized operation of the two power stages. The further integration of all gate drivers and a 600 V high-voltage start-up cell for the initial IC voltage supply enables a low external component count. Infiniteon's reference designs, such as the REF_XDPS2201_170W_BPA2, feature a very wide output voltage and smaller transformer size which are one of the key advantages of the topology. The ZVS operation of the hybrid flyback topology and the advantages of CoolGaN™ technology can be combined to design a high-efficient and compact charger. Infiniteon's CoolGaN™ portfolio includes 650 V power transistors in a broad range of different packages and a variety in typical $R_{DS(on)}$.

Features and benefits

Key features	Key benefits
- Wide output voltage range	- Scalable design to support different battery cell configurations
- High efficiency (>90 % for flyback, >94 % for hybrid flyback)	- Fewer heatsinks and fanless operation for outdoor use
- High level of integration	- Ease of design and BOM cost reduction
- Externally configurable parameters	- Flexible system parameterization
- Inrush current, reverse polarity protection	- Robust operation
- No auxiliary voltage supply, no PFC stage	- Suitable for cost-conscious designs

Application diagram



Product portfolio

Application	Topology	Product type	Product/product family	Package
Chargers for battery-powered applications	QR flyback	QR flyback controller	ICC80QSG	DSO-8
		High-voltage MOSFETs	700 V CoolMOS™ P7	SOT-223
	Hybrid flyback	Standalone digital controller	XDP™ digital power XDPS2201	DSO-14
		Combo digital controller	XDP™ digital power XDPS2221	DSO-14
		High-voltage switches	600 V CoolMOS™ P7 CoolGaN™ power transistors 650 V	TO-220-FP Multiple
		Medium-voltage MOSFETs	OptiMOS™ 5 60 V/80 V/100 V	Multiple
		Medium-voltage MOSFETs	OptiMOS™ 5 150 V	SuperSO8
		AC/DC integrated power stage	CoolSET™ Gen 5	DIP-7



Click here to learn more:

www.infineon.com/batterychargers
www.infineon.com/XDPS2221

www.infineon.com/ICC80QSG
www.infineon.com/ICL8810

www.infineon.com/CoolSET-FF



USB-C chargers and adapters

Outstanding solution offering for mobile chargers and laptop adapters

USB-C power delivery (USB-PD) has become the standard for charger and adapter solutions. Furthermore, from smartphones to laptops, smart speakers to TVs - USB-PD is now the go-to power supply and the enabler of fast charging. USB-C power delivery (USB-PD) has revolutionized the way we charge our mobile devices, providing a unified and speedy charging experience. The implementation of USB-C technology has significantly enhanced the convenience for end-users. In addition, with the incorporation of GaN power transistors and higher switching frequencies, it is now possible to produce chargers and adapters that are both compact and lightweight.

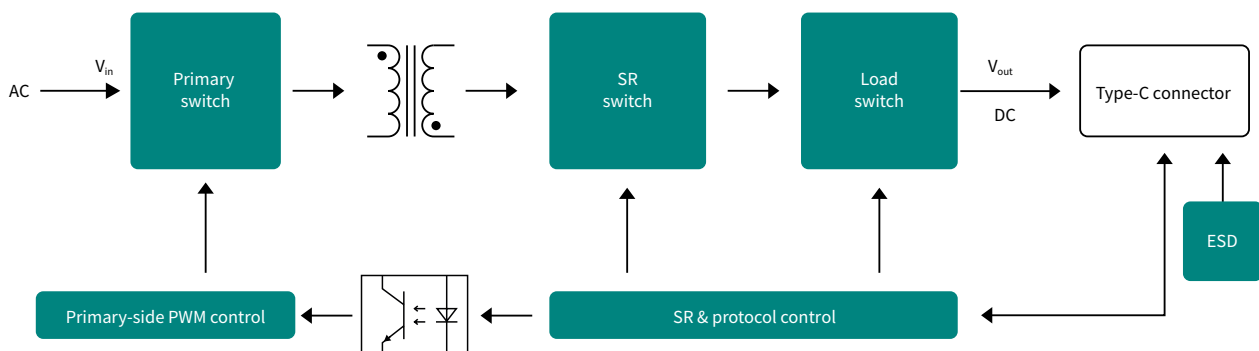
Infineon offers a leading portfolio of power controllers, flexible and programmable USB Type-C controllers, high-voltage CoolMOS™ superjunction MOSFETs, medium- and low-voltage OptiMOS™ MOSFETs as well as CoolGaN™ discretes and integrated power stages.

Our USB-C reference and demo designs are based on quasi-resonant (QR), zero-voltage switching (ZVS), and hybrid flyback (HFB) operation for different power levels and power density requirements and for single- and dual-output chargers.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Ready-to-use reference designs – Comprehensive offering of power and protocol controllers, high- and low-voltage switches and TVS diodes allow customers to source all components from a single supplier – Highly integrated solutions 	<ul style="list-style-type: none"> – Ease-of-use and reduced complexity
<ul style="list-style-type: none"> – Smallest form factor, low $R_{DS(on)}$ and low parasitic capacitances, Kelvin-source engaged ThinPAK and PQFN packages – Digital controllers enabling high-efficiency designs 	<ul style="list-style-type: none"> – High-efficiency designs
<ul style="list-style-type: none"> – Fully programmable USB-C PD port controllers – Configurability and upgradability 	<ul style="list-style-type: none"> – Differentiation and short time to market
<ul style="list-style-type: none"> – Infineon has the largest installed in-house power semiconductor capacity with 12" wafer production for discretes for maximum supply security – Dedicated supply chain programs to secure capacity and enable flexibility to demand fluctuations 	<ul style="list-style-type: none"> – Secured supply chain

Application diagram



Click here to learn more:

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www.infineon.com/usb-charging-solutions
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Recommended products

Functional block	Product category	Topology	Product family	Benefits
Flyback converter	High-voltage power devices (Si MOSFETs and GaN transistors)	Quasi-resonant flyback (QR)	600 V/700 V/800 V CoolMOS™ P7	<ul style="list-style-type: none"> Fast switching speed for improved efficiency and thermals Reduced gate charge for enhanced light-load efficiency Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			600 V/650 V CoolMOS™ C7	<ul style="list-style-type: none"> High switching performance enabling highest efficiency Ease of use level high Optimized devices for highest efficiency switched-mode power supplies
		Active-clamp flyback (ACF) Hybrid flyback (HFB)	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> Robustness and reliability with integrated robust fast body diode and up to 2 kV ESD protection Reduced gate charge for enhanced light-load efficiency Lower hysteresis loss
		Flyback (QR, ZVS, ACF, HFB)	CoolGaN™ Transistors 650 V/700 V	<ul style="list-style-type: none"> Highest efficiency Highest power density
	Controller	Hybrid flyback controller	XDPS2201	<ul style="list-style-type: none"> Asymmetrical half-bridge ZVS control to maximize efficiency Supports a wide range of configurable parameters Supports ultra-high power density (20 W/in³) design
		QR flyback controller	EZ-PD™ PAG1P/S	<ul style="list-style-type: none"> Secondary-side-controlled flyback solution Dual-chip flyback solution with integrated SR+PD controller
	EZ-PD™ PAG2P/S		<ul style="list-style-type: none"> Secondary-side-controlled flyback solution Dual-chip flyback solution with integrated SR+PD controller supports 28 V EPR and SPR ACF topology supported Leakage energy recycling and ZVS switching 	
	Gate-driver IC	Active-clamp flyback (ACF)	IRS25752L	<ul style="list-style-type: none"> High-side gate driver enables active clamp mode of operation Cost-effective, 600 V, single-channel driver in SOT23 package
			IRS21271S	<ul style="list-style-type: none"> High-side gate driver enables active clamp mode of operation 600 V, single-channel driver with over-current protection (OCP)
	PFC DC-DC	High-voltage power devices (Si MOSFETs and GaN HEMTs)	DCM PFC	600 V CoolMOS™ P7
DCM/CCM PFC			CoolGaN™ Transistors 650 V/700 V	<ul style="list-style-type: none"> Highest efficiency contribution via less parasitic parameter Space saving with SMD smaller package
Boost diode		DCM/PFC	650 V Rapid 1 diodes	<ul style="list-style-type: none"> Low conduction losses
Controller		PFC/LLC combo	IDP2308	<ul style="list-style-type: none"> Digital multimode PFC and LLC combined controller with a floating high-side driver and a startup cell Comprehensive and configurable protection features Wide set of configurable parameters
Controller		PFC/HFB combo	XDPS2221	<ul style="list-style-type: none"> Digital multimode PFC and HFB combined controller High-side driver and a 600 V startup cell Integrated gate drivers supporting GaN switches Configurability for protections and system performance
			XDPS2222	<ul style="list-style-type: none"> Digital multimode PFC and HFB combined controller High-side driver and a 600 V startup cell- Integrated gate drivers supporting GaN switches- Configurability for protections and system performance Supports extra wide output voltage range with MFIO switching depending on output voltage
High-voltage power devices (Si MOSFETs and GaN HEMTs)		HB LLC	600 V CoolMOS™ P7	<ul style="list-style-type: none"> Fast switching speed for improved efficiency and thermals Reduced gate charge for enhanced light load efficiency Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			CoolGaN™ integrated power stages	<ul style="list-style-type: none"> Highest efficiency and highest power density Isolated gate driver integrated
Gate-driver IC		HB LLC	EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	<ul style="list-style-type: none"> Isolated gate driver, up to 14 A, 100 ns propagation delay
Synchronous rectifier		Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ PD 60-150 V
	Control ICs	Synchronous rectification	EZ-PD™ PAG1S	<ul style="list-style-type: none"> Integration of synchronous rectification and PD controller Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc.
EZ-PD™ PAG2S			<ul style="list-style-type: none"> Integration of synchronous rectification and PD3.1 controller Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc. 	
Protocol controller	USB-C ICs	Protocol controller	EZ-PD™ PAG1S	<ul style="list-style-type: none"> Supports USB PD 2.0, PD 3.1 with PPS, QC4+, QC 4.0, QC 3.0, QC 2.0, Samsung AFC, Apple charging, and BC v1.2 charging protocols
			EZ-PD™ PAG2S	<ul style="list-style-type: none"> Supports PD3.1 28 V EPR and SPR
		PD controller	EZ-PD™ CCG3PA-NFET	<ul style="list-style-type: none"> Supports USB PD 3.1 with Programmable Power Supply (PPS) Independent constant current (CC) and constant voltage (CV) modes Configurable OVP, OCP, and OTP Integrates NFET gate driver to drive the load switch 64 kB flash memory
			EZ-PD™ CCG3PA	<ul style="list-style-type: none"> Supports USB PD 3.1 with PPS, QC4, Apple 2.4 A charging, AFC, BC1.2 etc. Supports 1C and 1A port 64 kB flash memory
		Multi-port controller	EZ-PD™ CCG7DC	<ul style="list-style-type: none"> Integrates 2 USB-C PD controllers + 2 DC-DC controllers in one single chip Supports latest USB-C PD v3.0 with PPS, QC4+, QC4.0, Samsung AFC, Apple 2.4A, Cv1.2 Configurable switching frequency of 150 kHz - 600 kHz Arm® Cortex®-M0 with flash allows users to implement custom features
Connector	ESD	ESD protection	Multi-purpose diodes for ESD protection	<ul style="list-style-type: none"> Small packaging to support minimum board space consumption High linearity - reducing harmonic generation/enabling suppression EMC problems Exceptional quality and reliability



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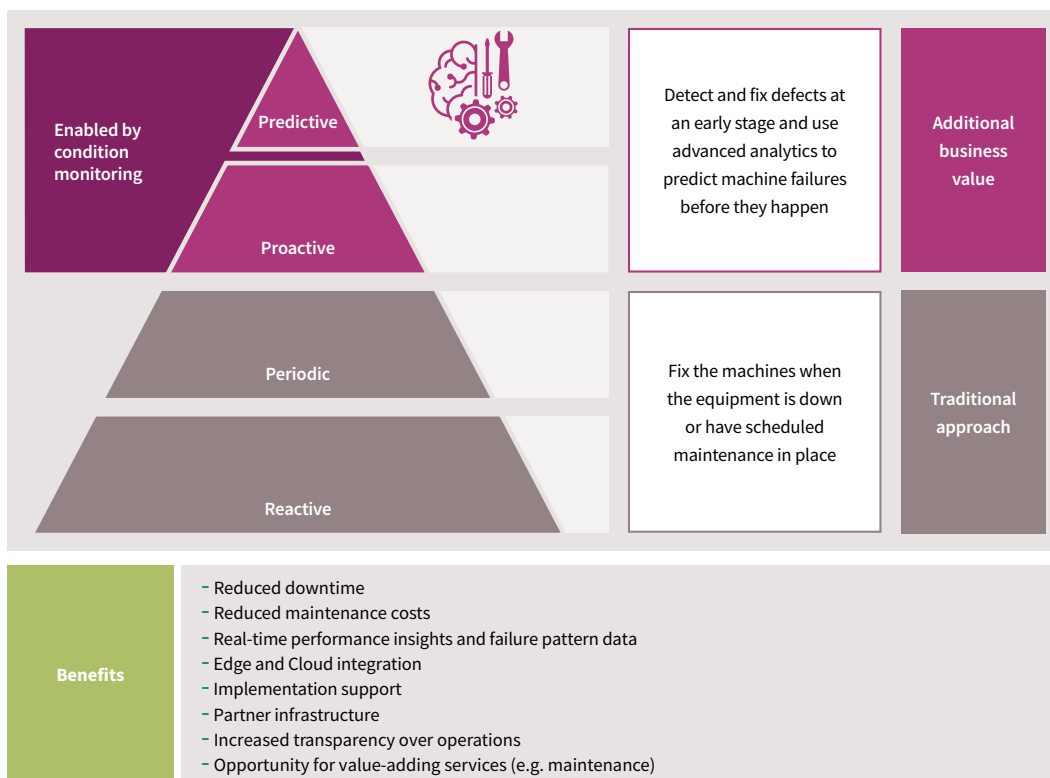
Condition monitoring and predictive maintenance

Cutting-edge predictive maintenance solutions enable assets performance tracking in real-time and transform the maintenance approach

Predictive maintenance is a game-changing offering that empowers businesses to manage assets and devices proactively. By leveraging advanced hardware technologies for data collection and condition monitoring combined with predictive analytics dashboards, you can revolutionize after-sales services & asset performance management. Our solution ensures minimized downtime, optimized maintenance schedules, and operational efficiency, leading to unparalleled customer satisfaction and business success.

Reliably and continuously monitoring the condition of a single asset or a system is the base for predictive maintenance. As one of the most innovative maintenance schemes on the market, it offers numerous benefits to businesses across various industries - especially when critical operational equipment is involved. Predicting the next needed maintenance based on real-time asset health data can reduce unexpected downtime and save costs. It enhances equipment reliability and machinery longevity. Ensuring optimal working conditions for a piece of equipment leads to higher safety and increased efficiency in operations. The collected data processed by the algorithms allows data-driven decision-making and optimized asset performance management.

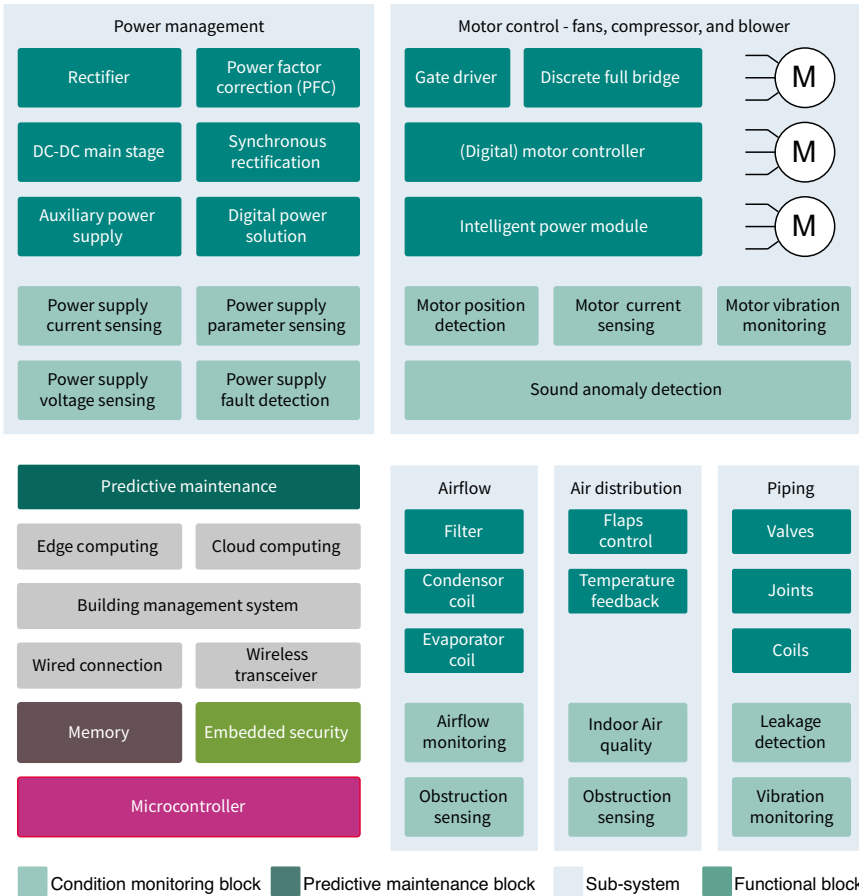
Infineon’s sensors, microcontrollers, connectivity, security and memory solutions offer all you need to leverage predictive maintenance’s full potential. Thanks to our partner network, you can use advanced analytics and artificial intelligence to predict machine failures before they happen or to anticipate maintenance needs before they become urgent – on the Edge or in the Cloud.



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Application diagram



XENSIV™ Predictive Maintenance Evaluation Kit

Our XENSIV™ Predictive Maintenance Evaluation Kit empowers clients to harness the power of predictive maintenance. It is a comprehensive kit, designed to give businesses a deeper understanding of the benefits and potential of predictive maintenance’s different enabling blocks and components. The XENSIV™ Predictive Maintenance Evaluation Kit lets you quickly and efficiently evaluate various condition monitoring and predictive maintenance use cases. It utilizes Infineon’s XENSIV™ sensor portfolio along with the FreeRTOS-enabled XMC™ microcontroller to monitor the condition of any crucial element such as filters, compressors, motors, or fans - even in legacy systems. Based on collected sensor data, e.g., of current consumption, airflow, and other system parameters, combined with the power of algorithms and deep learning techniques, system failures can be detected. Solution templates and a FreeRTOS-enabled software stack deliver a full end-to-end solution from the edge to the cloud.

Features and benefits

Key features
- Extension for the XMC4700 XMC™ Relax Kit
- Full software support of the FreeRTOS kernel
- AWS Cloud integration
- Full AWS CloudFormation template and software application stack
- On-board Wi-Fi and ethernet connectivity
- mikroBUS™ ClickBoard interface for extending connectivity
- XENSIV™ sensor satellite boards with a broad range of sensors for data collection and condition monitoring
- Multi-account registration support with OPTIGA™ Trust M

Key benefits
- Current monitoring (up to 120 A), e.g. for overall current anomaly detection
- Vibration and position sensing, e.g., for drives and compressor
- Airflow and pressure measurement, e.g., for filters
- Open/closed lid detection, e.g., for detecting status of service lids
- Hall speed sensors, e.g., for blocked fan and fan speed monitoring
- Sound anomaly detection, e.g., for gears and joints



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www.infineon.com/sensor
www.infineon.com/c-hvac

www.infineon.com/industrial-drives

Recommended products portfolio

Functional block	Product category	Product family	Benefits
Sensing	XENSIV™ sensors	XENSIV™ DPS368 pressure sensor	Ultrasmall waterproof pressure sensor, environmentally protected against water (IPx8), dust and humidity, ideal for harsh environments
		XENSIV™ TLI4971 magnetic current sensor	Magnetic current sensor for AC and DC measurements in industrial applications with an analog interface and dual fast over-current detection outputs
		XENSIV™ TLI493D-W2BW 3D magnetic sensor	Small WLB-5 package with low current consumption of 7 nA in a power-down mode for compact system designs
		XENSIV™ IM69D128S MEMS microphone	Ultra-low power digital XENSIV™ MEMS microphone for building automation and IoT devices with high sensitivity
		XENSIV™ TLE4997E Hall sensor	Hall sensor for highly accurate rotation and position detection, ideally suited to analog-to-digital (A/D) conversion with the supply voltage as a reference
		XENSIV™ TLE4964-3M Hall effect magnetic switch	Hall effect switch dedicated for position detection applications highly accurate applications with superior supply voltage capability
		XENSIV™ TLI4966G double Hall switch	Double Hall switch with two output pins for industrial applications with a rotating pole wheel
Security	OPTIGA™	OPTIGA™ Trust M	A high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud
		OPTIGA™ Trust M Express	Offered with CIRRENT™ Cloud ID – Infineon's cloud service automates IoT device certificate registration and device provisioning in the product cloud at scale with zero manual intervention
Control	XMC™ microcontrollers	XMC4800 microcontroller	32-bit first-ever EtherCAT® node on an ARM® Cortex®-M microcontroller with on-chip flash and analog/mixed-signal capabilities
		XMC4700 microcontroller	32-bit optimized solution to meet the performance challenges of today's embedded control applications, ideal for motor control and SMPS
	PSoC™ microcontrollers	PSoC™ 6 series	Dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture with ultra-low power consumption purpose-built for IoT applications
		PSoC™ 4 series	32-bit microcontroller tackling some of the complex portions of embedded system design, making it easier and more flexible
Connectivity	Wireless connectivity	AIROC™ Wi-Fi + Bluetooth® Combos	IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip for small-factor IoT designs



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Battery protection

Battery protection

Solutions that allow easy design-in ensuring safe charging/discharging

The high-power density of lithium-ion batteries has made them very popular. However, the unstable behavior of lithium-ion cells under critical conditions requires them to be handled with care. That means a battery management system (BMS) is needed to monitor the battery state and ensure safe operation. BMS is typically equipped with an electronic switch that disconnects the battery from the charge or load under critical conditions that can lead to dangerous reactions. A battery protection unit (BPU) prevents possible damage to the battery cells and the failure of the battery.

Such critical conditions include:

- Over-charge that occurs when the battery is charged over the allowed maximum capacity
- High and low temperature when the internal temperature of the battery cells exceeds their safe operational temperature range
- Over-discharge when the battery is discharged under the allowed minimum capacity
- Overcurrent when the battery is exposed to a short circuit condition or a high inrush turn-on current
- Reverse polarity when the battery terminals are wrongly plugged into the device

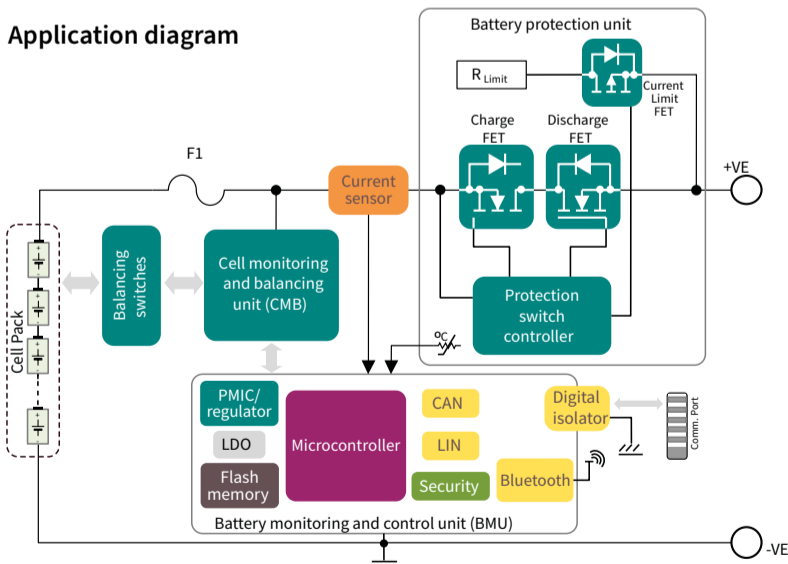
Failing to disconnect the battery during such conditions can lead to the following problems:

- Thermal runaway often due to over-charging or overheating of the battery. The overheating event can be due to a rise in the ambient temperature or due to charging/discharging the batteries with high current rates. Thermal runaway damages the battery cells and can lead to fires
- Death of the cell often due to the discharge of batteries below its specified thresholds
- Damage of load device often due to either improper inrush current management or reverse polarity

In order to prevent these failures, Infineon offers a wide range of battery protection solutions that increase the lifetime and efficiency of lithium-ion batteries under stressful conditions.

Features and benefits

Key features	Key benefits
- $R_{DS(on)}$ and safe operating area (SOA)	- Higher performance with lower $R_{DS(on)}$ and wider safe operating area (SOA)
- Compact bill of material (BOM)	- Cheaper solutions with a more compact bill of material and more effective parallelization solutions
- Short circuit protection	- Short circuit protection with higher peak current rates to withstand higher current values
- Turn-on and turn-off capabilities	- Turn-on and turn-off solutions tailored to applications needs
- All voltage class solutions	- Up to 600 V MOSFET protection solutions (including single- and multi-module)



Click here to learn more: www.infineon.com/battery-protection

Product portfolio

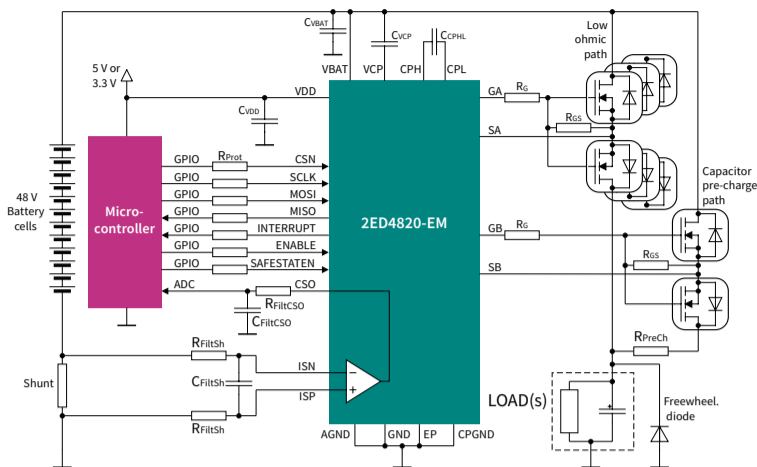
Battery voltage	Application	Recommended power MOSFETs				
18 V	Charge and discharge MOSFET	IST006N04NM6 40 V, 0.6 mΩ, sTOLL	PB012N04NF2S 40 V, 1.25 mΩ D ² PAK	BSC005N03LS5I 30 V, 0.55 mΩ, SuperSO8	IQE008N03LM5CG 30 V, 0.85 mΩ, PQFN 3.3x3.3 Source- Down Center-Gate	BSZ0500NSIATMA1 30 V, 1.5 mΩ, PQFN 3.3x3.3
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSC084P03NS3 G -30 V, 8.4 mΩ, SuperSO8	IRFH9310 -30 V, 4.6 mΩ, SuperSO8	SPD50P03L G -30 V, 7.0 mΩ, DPAK	BSZ180P03NS3E G -30 V, 18 mΩ, PQFN 3.3x3.3	BSZ120P03NS3 G -30 V, 12 mΩ, PQFN 3.3x3.3
24 V	Charge and discharge MOSFET	IST006N04NM6 40 V, 0.6 mΩ, sTOLL	PB012N04NF2S 40 V, 1.25 mΩ, D ² PAK	ISC007N04NM6 40 V, 0.7 mΩ, SuperSO8	IQE013N04LM6CG 40 V, 1.35 mΩ, PQFN 3.3x3.3 Source- Down Center-Gate	BSZ018N04LS6 40 V, 1.8 mΩ, PQFN 3.3x3.3
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD650P06NM -60 V, 65 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
36 V	Charge and discharge MOSFET	IPT007N06N 60 V, 0.75 mΩ, TOLL	IPTG007N06N 60 V, 0.75 mΩ, TOLG	IPF010N06NF2S 60 V, 1.05 mΩ, D ² PAK 7pin	IPT008N06NM5LF 60 V, 0.8 mΩ, D ² PAK	IST011N06NM5 60 V, 1.1 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD650P06NM -60 V, 65 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
48 V	Charge and discharge MOSFET	IPT012N08N5 80 V, 1.2 mΩ, TOLL	IPTC011N08NM5 80 V, 1.1 mΩ, TOLT	IPT010N08NM5 80 V, 1.0 mΩ, TOLT	IPB016N08NF2S 80 V, 1.65 mΩ, D ² PAK	IPT013N08NM5LF 80 V, 1.3 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC750P10LM* -100 V, 75 mΩ, SuperSO8	IPD19DP10NM -100 V, 186 mΩ, DPAK	ISZ24DP10LM* -100 V, 245 mΩ, PQFN 3.3x3.3	ISP16DP10LM -100 V, 250 mΩ, SOT-223	BSP322P -100 V, 800 mΩ, SOT-223
72 V	Charge and discharge MOSFET	IPT020N13NM6 135 V, 2 mΩ, TOLL	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D ² PAK 7pin	IPB048N15N5 150 V, 4.8 mΩ, D ² PAK	IPT111N20NFD 200 V, 11.1 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
96 V	Charge and discharge MOSFET	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D ² PAK 7pin	IPB048N15N5 150 V, 4.8 mΩ, D ² PAK	IPB060N15N5 150 V, 6 mΩ, D ² PAK 7-pin	IPT111N20NFD 200 V, 11.1 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
144 V	Charge and discharge MOSFET	IPT129N20NM6 200 V, 12.9 mΩ, TOLL	IPTG111N20NM3FD 200 V, 11.1 mΩ, TOLG	IPT210N25NFD 250 V, 21.0 mΩ, TOLL	IPTG210N25NM3FD 250 V, 11.1 mΩ, TOLG	IPB107N20N3 G 200 V, 10.7 mΩ, D ² PAK
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSP317P -250 V, 4000 mΩ, SOT-223	BSP92P -250 V, 12000 mΩ, SOT-223	BSR92P -250 V, 12000 mΩ, SC59	BSS192P -250 V, 12000 mΩ, SOT-89	



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Gate drivers



Main reasons to use 2ED4820-EM in dependable 48 V power supplies

- Faster reaction time (~ 10 μ s)
- Integrated bidirectional high or low side current sense amplifier
- High current source or sink support
- Robust against under-/overvoltage in the board-net
- Flexible configuration of protection features plus the accessibility of diagnosis information via SPI

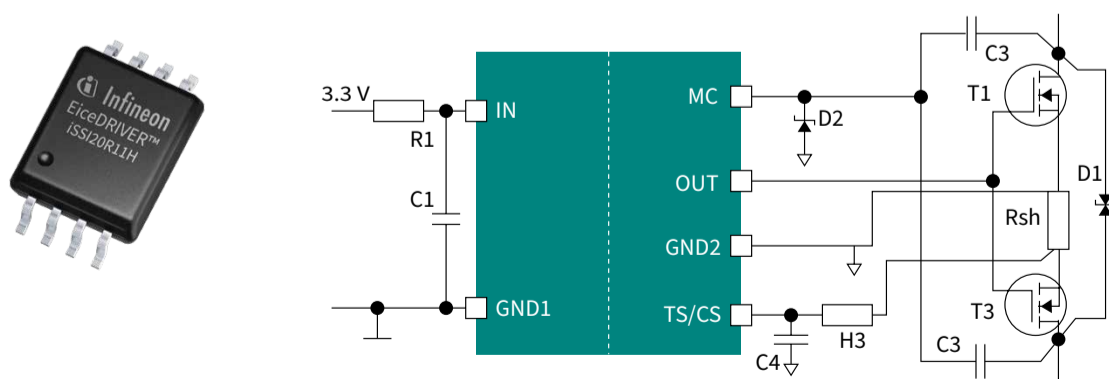
Solid state isolators

Coreless transformer isolators provide galvanically isolated gate drive for a broad range of MOSFET and IGBT switches in SSR applications

Solid state isolators (SSI) enable the ability to create custom solid state relays capable of controlling loads in excess of 1000 V and 100 A. The CT-based isolators enable energy transfer across the isolation barrier capable of driving large MOSFET or IGBT's without the added circuitry of a power supply on the isolated side. The innovative protection features enable the design of reliable and robust Solid State Relays.

Features

- Solid state isolators using Infineon's coreless-transformer technology
- No isolated gate bias supply required for gate driving
- Perfect match for CoolMOS™, OptiMOS™, and TRENCHSTOP™ IGBT
- Low power, large input voltage range from 2.6 to 3.5 V (internally clamped)
- High-impedance, CMOS input (buffered variants)
- High output voltage up to 18 V - no series or parallel configuration required for powerful gate driving
- High output peak current of 185 μ A (direct drive variants) or 400 mA (buffered variants)
- Fast turn-off for safe switches' SOA operation
- Temperature sensor and current sensor protection inputs
- Latch-off in case of a failure event (overcurrent or overtemperature)
- Dynamic Miller clamping protection
- Wide-body package with high creepage and clearance for UL 1577 (planned) and reinforced isolation according to IEC 60747-17 (planned)



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Battery
monitoring

Battery monitoring and control

Optimize system performance by cell balancing and monitoring key battery parameters

Dedicated cell monitoring controllers are being used to keep lithium-ion cells within their allowed operational ranges regarding voltages, currents, and temperatures. They monitor the state of each cell according to pre-adjusted voltages and temperatures using high-precision ADCs. Synchronizing the distributed measurements across all cells inside a battery is key to achieving the best possible insights into the battery's dis-/charging state (SOD/SOC) and overall battery health (SOH). The critical battery state assessment becomes less precise if these measurements are spread across wider time windows and if the measurement accuracy for each parameter is not high enough. A robust high-speed communication link across multiple daisy-chained monitoring devices supports complex cell topologies for a battery. For additional robustness, the daisy-chaining realizes a redundant ring, which keeps communication up between all connected ICs in case of a broken link. CRC-protected data frames complement communication robustness. To achieve extremely low-power dedicated housekeeping functions such as periodically scheduled cell measurements and state analysis required for functional safety, the cell controller can perform independently from the master controller of the BMS. Safety features for signaling over-/undervoltage, thermal stress, etc., including emergency alarms, are triggered autonomously. When the number of cells increases, a reliable transfer of information from the cell balancing IC to the BMS controller becomes very important. Digital isolators can be used to ensure that the right data is transferred reliably by isolating the low-voltage side (BMS controller) from the high-voltage battery side.

TLE9012DQU – Li-ion battery monitoring and balancing IC

Features

- Voltage monitoring of up to 12 battery cells connected in series
- Hot plugging support
- Dedicated 16-bit delta-sigma ADC for each cell with selectable measurement mode
- High accuracy measurement for SOC and SOH calculation
- Integrated stress sensor with digital compensation algorithm and temperature-compensated measurements
- Secondary ADC with the same averaging filter characteristics as an advanced end-to-end safety mechanism
- Five temperature measurement channels for external NTCs
- Internal temperature sensors
- Integrated balancing switch allows up to 200 mA balancing current
- Differential robust serial 2 Mbit/s communication interface
- Additional four GPIO pins to e.g., connect an external EEPROM
- Internal round-robin cycle routine triggers the majority of diagnostics mechanisms
 - Automatic balancing over- and undercurrent detection scheme
 - Automatic open load and open wire detection scheme
 - Automatic NTC measurement unit monitoring scheme
- End to end CRC secured iso UART/UART communication
- Emergency mode for communication
- ISO 26262 safety element out of context for safety requirements up to
- Automotive safety integrity level D
- Green product (RoHS compliant)



 ISO 26262
 compliant



 RoHS



 AEC
 Qualified


Click here to learn more:

www.infineon.com/battery-monitoring

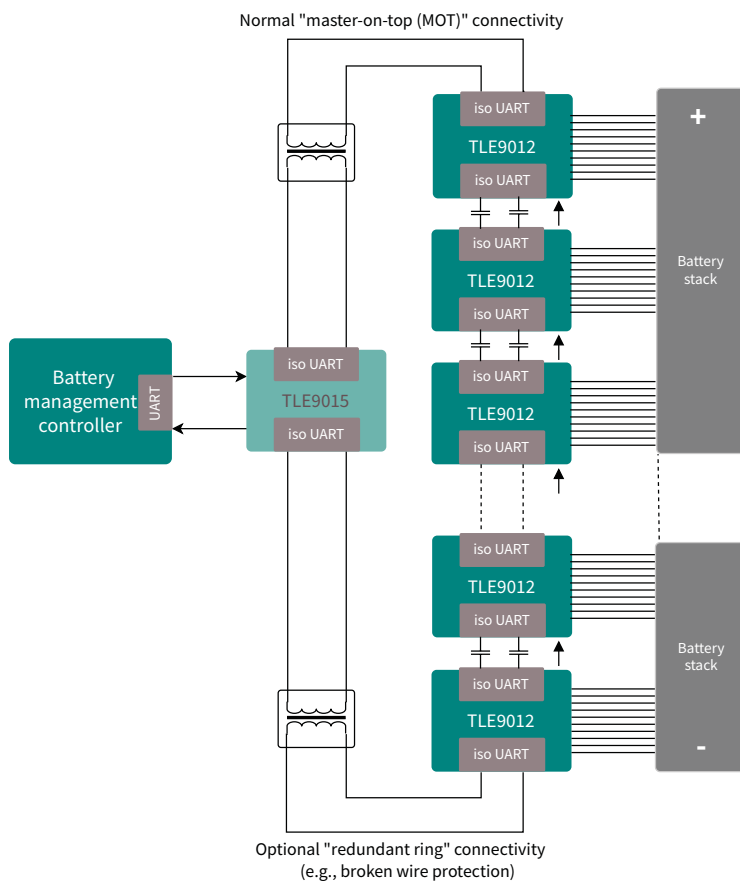
TLE9015QU – BMS transceiver IC - UART to iso UART



Features

- General
 - Two UART ports for serial communication to host microcontroller
 - Two iso UART interfaces for communication to other BMS ICs
 - 2 Mbit/s data rate for fast communication
 - Fully transparent communication scheme from UART to iso UART
 - Ring mode topology compatible
- Communication ports
 - Integrated internal logic to minimize pin count on the UART side
 - Differential current edge triggered iso UART communication interface
 - High robustness against external noise
- General purpose error pin
 - Two external fault inputs (EMM and ERRQ_ext)
 - Latching error output pin to trigger external microcontroller
- Supporting diagnosis features
 - Internal supply monitoring
 - Green product (RoHS compliant)

Application diagram

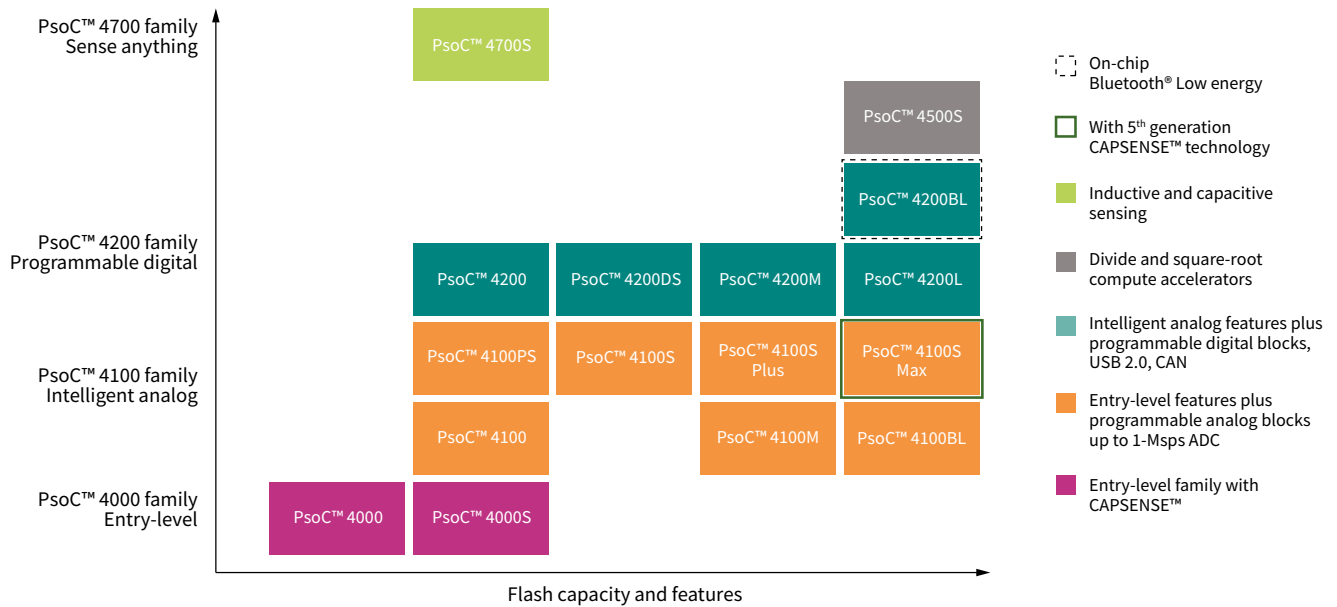


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Digital isolators for battery monitoring

Part number	Isolation ring	Safety certifications	Channel configuration ¹⁾	Input thresholds	Default output state	Package
2DIB0400F	V _{ISO} = 3000 V _{RMS} (UL1577 Ed. 5)	UL1577 (Ed. 5)	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 x 4 mm
2DIB0401F					High	
2DIB1400F		Low				
2DIB1401F		High				
2DIB0410F		VDE 0884-11 VDE 0844-17 IEC 62368-1 IEC 60601-1 IEC 61010-1 GB4943.1	2 forward 0 reverse (2+0)	Fixed (TTL)	Low	
2DIB0411F					High	
2DIB1410F			1 forward 1 reverse (1+1)	Low		
2DIB1411F				High		

Microcontrollers for BMS



Battery security and authentication

OPTIGA™ Authenticate S provides enhanced device authentication to protect against counterfeits

Rich set of customization options	Effortless implementation	Security to rely on
<ul style="list-style-type: none"> – 4 authentication modes – 4 separate life cycle counters to prevent manipulation – 3 temperature ranges – 2 communication profiles – 3 sets of memory 	<ul style="list-style-type: none"> – Full turnkey solution – no security know-how required – Full system integration support including embedded software, host software and advanced ecosystem support tools 	<ul style="list-style-type: none"> – Enhanced HW security with an extended key length – Asymmetric cryptography – Protection against reverse engineering – Provisioning in a common criteria certified environment



[Click here to learn more: www.infineon.com/battery-monitoring](http://www.infineon.com/battery-monitoring)

1)Certifications planned



Audio amplifier

Class D audio

No compromise on quality – products for exceptional audio performance

At Infineon, we manufacture power-efficient class D audio amplifier solutions that maintain best-in-class audio quality, without heating up the surroundings. Our amplifier solutions help you design robust and flexible products that meet the needs of your customers and the market. Choose from our high-performance class D audio amplifier solutions from the high-efficiency high power-density multi-chip modules (MCM) to the highly scalable driver and power MOSFET combinations (for a full portfolio, see [Audio amplifier ICs](#)).

Design with Infineon’s solutions to benefit from:



Maximized power efficiency



Maximized output power



Design freedom



Fast time to market

Home audio applications

- Multiroom systems
- Audio hub
- Sound bar subwoofers
- Home theater systems

Professional audio applications

- Audio systems
- Touring amplifiers
- Active speakers
- Public announcement 70-100 V systems
- Music instrument amplifiers

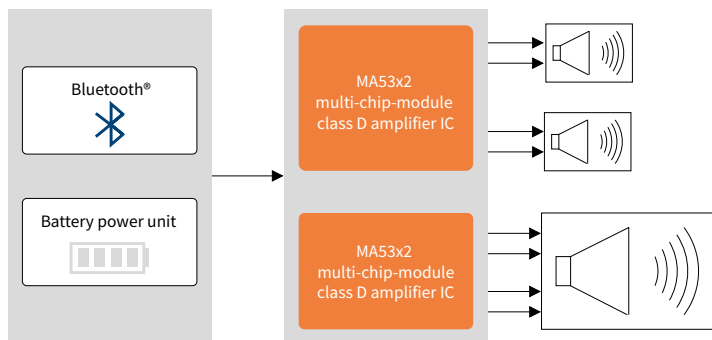
Car & marine audio applications

- After-market car audio
- Marine audio
- Motorcycle audio

Home audio

Modern home audio products vary in shape, size, and configuration, but a common requirement is a great sound in combination with outstanding industrial and acoustic design. Infineon’s high performance class D audio amplifier solutions allow the design of new innovative and great-sounding home audio products in form factors and shapes that were previously unthinkable.

Solution example: 2.1 configuration (2xBTL + 1xPBTL)



Solution specification

Number of audio channels:

2 single-ended load (SE) and 1 BTL channel

Peak power output: 2x200 W at 4 Ω, 10% THD and 400 W at 2 Ω, 10% THD

Featured audio ICs: MA5302MS, MA5332MS, MA5342MS



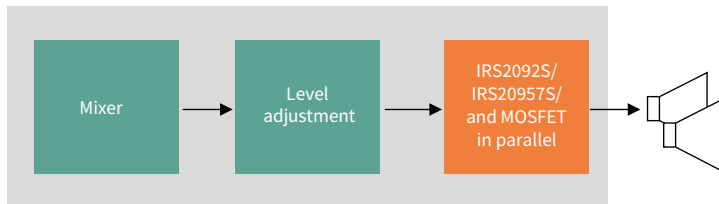
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www.infineon.com/merus
www.infineon.com/audio

Professional audio

Professional audio equipment is all about maximizing output power and power density. With the conception of Infineon's MERUS™ multilevel class D technology and GaN-based CoolGaN™ HEMTs, it is now possible to conceive both amplifiers and power supply units with great audio performance and high efficiency in a very compact design. For engineers developing amplifiers, Infineon offers varied chip-set solutions with versatile MOSFET combinations for the scaling of output power.

Solution example: active speakers



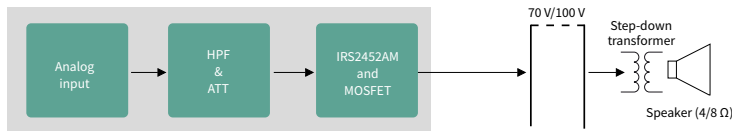
Solution specification

Number of audio channels: 2 half-bridge channels

Peak power output: >500 W at 4 Ω, 1% THD

Featured audio ICs: IRS2092S, IRS20957S, IRS2461S, IRS2452AM

Solution example: public announcement 70-100 V system



Solution specification

Number of channels: 2 half-bridge channels

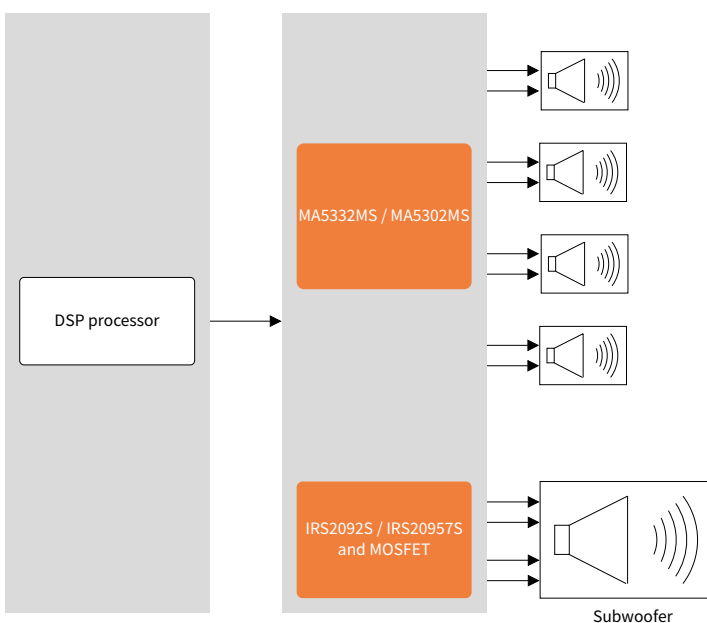
Peak power output: 500 W, 70 V_{RMS}/100 V_{RMS}, 1% THD

– **Featured audio IC:** IRS2452AM

Car and marine audio

Car and marine audio systems need to generate powerful and great sound while limiting the system size and heat generation to a minimum level. Infineon's MERUS™ multi-chip module integrated class D amplifiers and class D controller + MOSFETs combinations enable high-level power density and design flexibility to deliver the best music listening experience regardless of where you are, whether it's in your car, on your motorcycle, or on the water.

Solution example: 5 channel car audio amplifier



Solution specification

Number of audio channels: 5 half-bridge channels

Peak power output: 150 W at 4/2 Ω, 1% THD;
500 W at 4 Ω, 1% THD

Featured audio ICs: MA5332MS, MA5302MS, IRS2092S, IRS20957S



Click here to learn more:

www.infineon.com/merus
www.infineon.com/audio



Motor control

Motor control for power tool and robotics

Driving BLDC motors efficiently and precisely

When it comes to increased efficiency and durability, brushless DC (BLDC) motors offer the ideal solution for power electric motor applications. Compared to traditional brushed motors, brushless DC motors are quieter, lighter, and offer an overall smaller design footprint while providing increased reliability. These improvements, however, come with an increased need for monitoring and control, requiring significantly more complex electronics and supporting algorithms. This move toward BLDC motors occurs in concert with a continuous push towards higher energy efficiency, resulting in trade-offs between power delivery and battery lifetime. This, in turn, puts a significant burden on semiconductor technologies to deliver high performance in motor control applications. In parallel, shortening life cycles and increased product diversity put an additional burden on suppliers to provide that same high performance, cost-efficient solutions across an increasing variety of use cases.

With industry-leading technology and reliability, Infineon's extensive portfolio of discrete and integrated circuits offers the breadth and depth of solutions necessary to meet the demands across a wide spectrum of motor control needs.

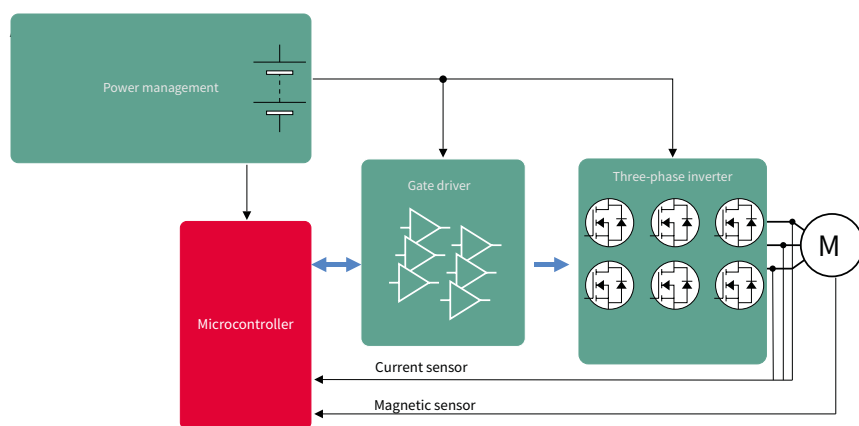
Features and benefits

Key features

- A complete eco-system of simulations, documentation and demonstration boards
- Comprehensive portfolio of products and solutions
- Best in class MOTIX™ gate drivers for OptiMOS™ and StrongIRFET™ MOSFETs offering high efficiency and protection
- World-class broad and deep portfolio of LV FETs with SMD packaging improves capability and reliability while reducing assembly cost
- Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest $R_{DS(on)}$
- High reliability of Infineon components results in prolonged product life spans

Key benefits

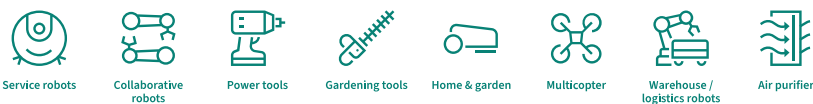
- Fast time-to-market
- Broad portfolio allows for right product fit to meet application needs
- Extended battery life and product life span
- Reduction overall system size and cost



Key enabling products

- Power MOSFETs – OptiMOS™, StrongIRFET™
- MOTIX™ low-voltage motor control solutions
- XMC1000 microcontrollers
- XMC4000 microcontrollers
- PSoC™ 4100 microcontrollers
- PSoC™ 62 microcontrollers
- XENSIV™ angle sensor
- XENSIV™ magnetic sensor
- XENSIV™ current sensor
- XENSIV™ Hall switch

Target end applications



Click here to learn more:

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www.infineon.com/bdc

Product portfolio

Product category	Product family	Package options	Battery voltage support [V]	Voltage class [V _{DS} max.]	Representative part numbers
Inverter/MOSFETs	StrongIRFET™ OptiMOS™	SuperSO8 SuperSO8 SC PQFN 3x3 DirectFET™ S/M/L-Can PQFN 5x6 Source Down TOLL TOLG TOLT TO-220 TO-247 DPAK D ² PAK D ² PAK 7-pin	12-16	25-30	BSC005N03LS5, IQE006NE2LM5, IPT004N03L, IQE006NE2LM5CGSC, ISZ019N03LS5, IQE008N03LM5,
			18	40	IRL40DM247, BSC010N04LS, IST011N06NM5, IRF40SC240, IPB011N04NF2S, IPB023N04NF2S, IPF013N04NF2S, ISC012N04NF2S, IST006N04NM6, ISC007N04NM6, IQD005N04NM6CG, IQE013N04LM6, ISC017N04NM5
			36-48	60	IST011N06NM5, BSC012N06NS, BSZ100N06NS, IPT007N06N, IRFS7534, BSC014N06NS, IPTC007N06NM5, IPB013N06NF2S, IPB015N06NF2S, IRF60DM206, IQE030N06NM5SC, ISC010N06NM5, BSC028N06NS5
			48-60	75-80	BSC021N08NS5, BSC030N08NS5, IPT010N08NM5, IPTG011N08NM5, IPP040N08NF2S, IPB049N08NS5, IPB016N08NF2S, IPB040N08NF2S, IPB024N08NF2S, IPF017N08NF2S, IQE050N08NM5, BSC023N08NS5SC, IST019N08NM5, BSC026N08NM5, IQE050N08NS5
			60-72	100-120	BSC035N10NS5, ISZ080N10NM6, IPT015N10NF2S, IPTC015N10NM5, IPP050N10NF2S, IPB018N10NS5, ISC030N12NM6, IPP018N10NS5, IPT014N10NS5, IPTC017N12NM6, IQD020N10NM5CG, IST026N10NM5, ISC030N12NM6, ISC027N10NM6
			72-96	150	BSC074N15NS5, BSC110N15NS5, BSC110N15NS5SC, BSC093N15NS5SC, IPTG039N15NM5, IPTG044N15NM5, IPTC054N15NM5, IPTC039N15NM5, ISQD063N15NMCG
			96-144	200	BSC220N20NSFD, IPTG111N20NM3FD, IPT111N20NFD, IRFP4127, IRF200P222, IRF6785, IRFP4668, IRFH5020, BSC500N20NS3 G

Product category	Voltage class [V]	Configuration	Part number	Current source/sink	Comment
Gate drivers	25	Low-side	1ED44173	2.6 A/2.6 A	Integrated fast over-current protection, fault re- porting and enable functionality, SOT-23 package
	60	Three-phase	6EDL7141	1.5 A/1.5 A	Fully configurable gate driver for battery operated motor control applications, integrated power management and current sense amplifiers, VQFN-48 package, >50 SPI programmable parameters. Highly integrated with MOSFET slew rate control, 3 OpAmps, Buck+LDO, dual charge pump
	70	Three-phase	6EDL7151	1.5 A/1.5 A	High performance, highly integrated, programmable, PSU integrated, space saving, slew rate control, MOSFET optimizations, >50 SPI programmable parameters, slew rate control, 3 OpAmps, Buck+LDO, dual charge pump, and VDS sensing for hardware system protection
	135	High-Side	1EDL8011	1 A sink	1EDL8011 high-side gate driver provides a simple and highly robust solution to drive a high side disconnect switch to protect battery operated systems, OCP protection, adjustable current setting threshold, time delay, safe start, UVLO.
	160	Three-phase	6ED2742S01Q	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Support multi protection features. Pre-regulated three phase SOI gate driver with integrated charge pump, current sense amplifier, overcurrent protection and fault out report in 5x5 VQFN-32 package, 2K HBM ESD.
	160	High- and low-side	2ED2732S01G	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, high side/ low side's own dead-time, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use, 2ED2734 adds 7.5 V/ 6.8 V pos/neg UVLO
	160	High- and low-side	2ED2734S01G NEW	2A/4A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, high side/ low side's own dead-time, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	Half-bridge	2ED2742S01G	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, integrated shoot-through protection logic, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use, 2ED2742 adds 7.5 V/ 6.8 V pos/neg UVLO
	160	Half-bridge	2ED2744S01G NEW	2A/4A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, integrated shoot-through protection logic, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	Half-bridge	2ED2748S01G NEW	4 A/8 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. High current drive for parallel MOSFET applications. Separate VSS/COM, thermal pad, DFN10 package, integrated shoot-through protection logic, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	High- and low-side	2ED2738S01G NEW	4 A/8 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. High current drive for parallel MOSFET applications. Separate VSS/COM, thermal pad, DFN10 package, high side/ low side's own dead-time, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	200	Three-phase	6EDL04N02	0.165 A/0.375 A	SOI, integrated BSD, OCP, enable, fault reporting, TSSOP-28 package
	200	High- and low-side	IRS2005S	0.29 A/0.6 A	V _{CC} and V _{BS} UVLO, matched propagation delay, DSO-8 package
	200	Half-bridge	IRS2007S	0.29 A/0.6 A	V _{CC} and V _{BS} UVLO, matched propagation delay, DSO-8 package
	200	Low- or high-side	1EDN7550	4 A/8 A	Low propagation delay, differential input, high common-mode input, UVLO, SOT23-6 and TSNP-6 package options
	300	Three-phase	6EDL04N03PR	0.165A/0.375A	SOI, Strong -Vs immunity, Integrated BSD, OCP, enable, fault reporting, TSSOP-25 package, >2 kV HBM ESD, P2P with 6EDL04N02
	600	Half-bridge	IRS21867S	4 A/4 A	High current level-shift gate driver with low V _{CC} operation, DSO-8 package
600	Three-phase	6EDL04N06PT	0.165 A/0.375 A	SOI, integrated BSD, tolerant to -VS up to 100 V, OCP, enable, fault reporting, DSO-28W package	
650	Half-bridge	2ED2304S06F	0.36 A/0.7 A	SOI, integrated BSD, tolerant to -Vs up to 100 V, DSO-8 package	



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Category	Product name		Description
Integrated devices	MOTIX™	IFX9201SG	Integrated brushed DC motor driver
		TLE9140EQW NEW	3-Phase BLDC motor gate driver IC, voltage to 110 V, 24 V/48 V systems, gate driving capability: ~230 nC/MOSFET up to 20 kHz, gate-shaping, diagnostics and protections, developed acc. to ISO26262 achieving ASIL-B
		IMD701A	Fully programmable motor controller integrating XMC1404 microcontroller with MOTIX™ 6EDL7141 3-phase gate driver IC in one package. Include hardware MATH Co-Processor (96 MHz) for FOC algorithms, includes PWM timers, position interface (POSIF) or serial communication modules including CAN
Microcontrollers	XMC™	XMC1300 XMC1400	Arm® Cortex® -M0 core. 32/48 MHz core, math coprocessor, peripherals up to 96 MHz peripherals, CCU4/CCU8 PWM timers, 2x serial channels, hall and encoder interface, analog comparators, 12-bit ADC, up to 200 kB flash/16 kB RAM 16-64 pins
		XMC4400	Arm® Cortex® -M4F core, up to 144 MHz, up to 512 kB flash/80 kB RAM, 4xCCU4/2xCCU8/2xPOSIF timers, serial channels, up to 4x 12-bit ADC/2x DAC, 4xΔΣ demodulator, 64-100 pins
	PSoC™	PSoC™ 4100	Arm® Cortex® -M0/M0+ CPU with DMA controller, up to 384 kB flash/32 kB SRAM, cryptographic coprocessor, 12-bit ADC/13-bit DAC, configurable amplifiers, 16-bit PWM timers, configurable serial communication blocks, up to 84 GPIO, 28-100 pin packages
		PSoC™ 62	Dual-core 150 MHz Arm® Cortex® -M4 and 100 MHz M0/M0+, ultra-low power and low-power operation modes, up to 2 MB flash, 1 MB SRAM with DMA, 24x16-bit and 8x32-bit timer blocks, USB 2.0, up to 104 GPIOs
Sensors	Hall switches	XENSIV™ TLI4963	3-5.5 V operation, active error compensation, high stability magnetic thresholds, low jitter
	Angle sensor	XENSIV™ TLI5012	Integrated angle calculation, incremental interface, SPI with 8 Mbit/s, ≤ 1.9o angle error over-t emperature/life, integrated giant magnetoresistance-based angle sensor, 15-bit representation of angle value with 0.01o resolution, bi-directional SSC interface
	3D magnetic sensor	XENSIV™ TLI493D	± 50 to ±v 160 mT ranges, up to 30.8 LSB12/MT sensitivity, low-power mode, low offset and match drift, wake-up function
	Magnetic coreless current sensor	XENSIV™ TLI4971	25 to 120 A measurement range, 240 kHz bandwidth, low sensitivity error over temperature, galvanic functional isolation up to 1150 V, differential sensing, two independent overcurrent detection outputs

Evaluation platforms

Category	Product name	Description
Application	DEMO-PTOOL-300W-M	This design kit for cordless power tools uses the DirectFET™ ME/MF and firmware developed using the XMC1300 family
	KIT_MOTOR_DC_250W_24V	3-phase DC motor control power card (V_{DC} 24 V, 250 W motor drive power card for XMC1000 and XMC4000)
	Stepper motor control shield with IFX9201 and XMC1300	The stepper motor control shield based on Infineon's H-bridge IFX9201 and XMC1300 microcontroller can drive the two coils in a stepper motor featuring a dual-H-bridge configuration. This current stepper motor control board is compatible with Arduino microcontroller boards and Infineon's XMC™ microcontroller kits using the Arduino form factor
	KIT_XMC1X_AK_MOTOR_001	XMC1000 motor control application kit
Product	CY8CKIT-037	The CY8CKIT-037 is used for PSoC™ 4 solution evaluation for motor control application. The kit supports BLDC motors, PMSM (permanent magnetic synchronous motors), and stepper motors. We provide example projects including single-shunt and sensorless FOC (field-oriented control), sensored BLDC control, sensorless BLDC control, and stepper motor control example projects
	EVAL_6EDL7141_TRAP_1SH	The EVAL_6EDL7141_TRAP_1SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses trapezoidal commutation based on the MOTIX™ 6EDL7141 smart three-phase driver and XMC1400 series micro-controller
	EVAL_6EDL7141_FOC_3SH	The EVAL_6EDL7141_FOC_3SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses sensor-less FOC based on the MOTIX™ 6EDL7141 smart three-phase driver and XMC1400 series micro-controller
	EVAL_IMD700A_FOC_3SH	The EVAL_IMD700A_FOC_3SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses sensor-less FOC based on the MOTIX™ IMD700/1A integrated XMC1400 series microcontroller with 6EDL7141 smart three-phase driver in a single package
	EVAL_TOLT_DC48V_3KW	The evaluation board features a motor drive inverter power stage using high efficiency, OptiMOS™ 5 100 V power MOSFETs in top-side cooling TOLT package. The top-side cooled MOSFET solution for 3-phase BLDC motor drive leads to increase power handling capability. The power board operates with Infineon's XMC1300 Drive Card (KIT_XMC1300_DC_V1). Firmware is provided with trapezoidal control for 48 V BLDC motor with hall sensors
	S2GO_CUR-SENSE_TLI4971	For evaluation purposes of the latest XENSIV™ current sensor TLI4971, we rely on our proven evaluation concept of Shield2Go and 2GO Kits – therefore the TLI4971 evaluation environment is also offered in those two configurations: – TLI4971 MS2GO: 2GO Kit version – TLI4971 S2GO: Shield2Go version
	EVAL_TOLL_72VDC_2KW	The EVAL_TOLL_72VDC_2kW evaluation power board uses new OptiMOS™ 6 120 V power MOSFET technology devices for battery-powered 60 V - 84 V BLDC motor drives application suitable for high-power power tools. This evaluation board is designed to be driven by the Infineon XMC1300 drive card KIT_XMC1300_DC_V1 (or higher) loaded with the correct firmware. Both, power board and drive card, are needed for this application. A 32-pin male-female connector (MAB32B2-FAB32Q2) is needed to connect the power board and drive card.
	EVAL_TOLT_DC36V_2KW	The evaluation board features a motor drive inverter power stage using high efficiency, OptiMOS™ 5 power MOSFETs 60 V in top-side cooling TOLT package. The top-side cooled MOSFET solution for 3-phase BLDC motor drive leads to increase power handling capability. The power board operates with Infineon's XMC1300 Drive Card (KIT_XMC1300_DC_V1). Firmware is provided with trapezoidal control for 36 V BLDC motor with hall sensors. Additionally, the evaluation board includes three current shunts to allow compatibility with FOC commutation with XMC4400 drive card.



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Motor control

Motor control for LEV and e-forklift

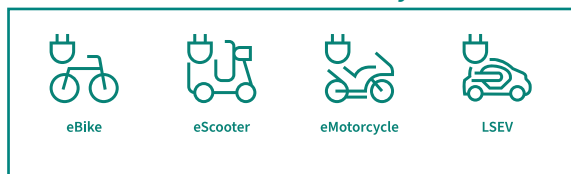
Powering light e-mobility and material handling

High-power low-voltage motor drives power both personal light e-mobility vehicles such as e-bikes, e-scooters, e-motorcycles, micro EVs, as well as material handlers such as e-forklifts, delivery vehicles (xDVs), autonomous mobile robots (AMR), automated guided vehicles (AGV), and commercial, construction and agricultural vehicles (CAV). These applications can be collectively referred to as light electric vehicles (LEVs). LEVs have an ever-growing need for highly efficient, intelligent, and powerful motor-drive systems to address requirements such as high speed, high peak and continuous torque, safety, reliability, and most of all, long battery lifetime. Infineon offers a comprehensive, end-to-end solution for every segment and variation of this diverse market with power levels ranging from 200 W to even greater than 50 kW. The OptiMOS™ and StrongIRFET2™ MOSFET families form a powerful yet efficient muscle of the system, while the EiceDRIVER™ and MOTIX™ gate driver families offer a broad range of both isolated and non-isolated gate drivers. An array of motor control MCUs such as XMC™, PSoC™, TRAVEO™ T2G and AURIX™ along with their software/tools ecosystem, enable quick, easy, and tailor-made implementations of advanced motor control algorithms while meeting increasing safety requirements. The XENSIV™ current and angle/position sensors enable accurate closed-loop control. Along with an extensive product portfolio, Infineon simplifies and accelerates the design process by offering demonstration, evaluation, and reference boards, simulation models, application notes, comprehensive technical support, and a vibrant developer community.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – MOSFETs with best FOMs for drives with low $R_{DS(on)}$; low Q_{rr}; low $\Delta V_{GS(th)}$ – Broad and deep microcontroller portfolio enabling varied design approaches (plug n-play, optimized custom design), S/W tool libraries, hall and encoder I/F MATH Co-processor, $\Delta\Sigma$ demodulator, functional safety – Gate drivers with robust isolation, TDI, high/programmable output current, active miller clamp – Current sensors having high current range, coreless sensing, high resolution, noise immunity and programmability – Hall switches, angle/position sensors and 3D angle sensors with high accuracy, low jitter and low power consumption 	<ul style="list-style-type: none"> – Extended range/increase in battery life – Precise motor control – Enable compact motor drive design – Quick and easy system design enabling fast time-to-market – Rugged, reliable and safe motor drives

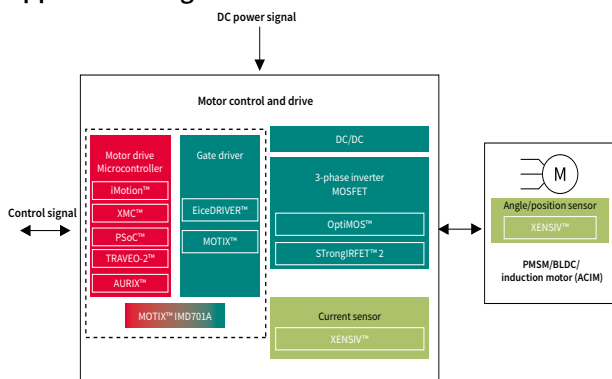
Personal e-mobility



Material handling



Application diagram



Product	Product family
3-phase inverter (MOSFETs)	OptiMOS™, StrongIRFET™
Microcontroller	XMC™, PSoC™, TRAVEO™ T2G, AURIX™
Gate driver	EiceDRIVER™, MOTIX™
Position/speed sensor	XENSIV™ angle sensors and Hall switches
Current sensor	XENSIV™ current sensor
Software and Design Enablement	IPOSIM, ModusToolbox™, AURIX™ Development Studio, DAVE™ Drive



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Typical power level of the inverter system: 200 W-4 kW

Component	Product family	Battery voltage (V)	Voltage class (V _{DS max})	Package options	Battery voltage support (V)	Voltage class (V _{DS max})	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	24-36	60	TOLL TOLG TOLT D ² PAK 7-pin D ² PAK TO-220 TO-247 SuperSO8	24-36	60	IPTC007N06NM5*, IPTC012N06NM5*, ISC015N06NM5LF, IPF010N06NF2S, IPF012N06NF2S, IPF016N06NF2S, IPB029N06NF2S, IPB018N06NF2S, IPB015N06NF2S, IPB013N06NF2S, IPP040N06NF2S, IPTG007N06NM5, IPT008N06NM5LF, BSC014N06NSSC, IPP030N06NF2S, IPP019N06NF2S, IPP016N06NF2S, IPP014N06NF2S, IQD009N06NM5CG, IQDH88N06LM5CG IQFH68N06NM5*, IQFH68N06NM5*, ISG0614N06NM5H* IAUC120N06S5N011*, IAUC120N06S5N017*, IAUC120N06S5N022*, IAUTN06S5N008, IAUTN06S5N008G	Low R _{DS(on)} and low conduction losses, tight V _{GS(th)} spread for efficient paralleling, low Q _{rr} , soft body diode, innovative packages
		36-48	80		36-48	80	IPTG011N08NM5, IPTC012N08NM5, IPT012N08NM5, IPT010N08NM5, IPB015N08N5, IPB017N08N5, BSC019N08NS5, IPP024N08NF2S, IPB024N08NF2S, IPP016N08NF2S, IPP040N08NF2S, BSC037N08NS5, IPB049N08N5, IPTC011N08NM5, IPTC014N08NM5, ISC025N08NM5LF, IPT009N08NM6, IPF011N08NM6, ISC015N08NM6, IQD016N08NM5CG, IPF023N08NF2S, IPF039N08NF2S, IPT012N08NF2S, IPF017N08NF2S, IAUCN08S7N013, IAUC100N08S5N031, IAUC100N08S5N034, IAUT300N08S5N011, IAUT300N08S5N012, IAUS300N08S5N011, IAUS300N08S5N014, IAUS300N08S5N011T, IAUS300N08S5N014T, IPF014N08NF2S, IPB055N08NF2S, IPB040N08NF2S, IPB024N08NF2S, IPB019N08NF2S, IPB016N08NF2S	Catering to diverse application mission profile requirements with OptiMOS™ (industrial and automotive (AEC-Q101) grade) and StrongIRFET™ 2 (standard grade and grade with broad availability from distribution partners)

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	60	Three-phase	6EDL7141	1.5 A/1.5 A	VQFN48	Configurable smart gate driver, integrated power management, 3 x current sense amplifiers (CSA)
	70	Three-phase	6EDL7151	1.5 A/1.5 A		Configurable smart gate driver, integrated power management, 3 x current sense amplifiers (CSA) and VDS sensing for hardware system protection
	90	Three-phase	TLE9140EQW	0.48 A	DSO32	Active LS freewheeling during overvoltage, ASIL-B functional safety, automotive grade 0 qualified
	90	Three-phase	TLE9180D-32QK	2 A/2 A	LQFP64	3 x current sense amplifiers (CSA), ASIL-C Functional safety, automotive grade 1 qualified
	160	Three-phase	6ED2742S01Q	1 A/2 A	QFN32	SOI, integrated BSD, trickle charge pumps, power management and current sense amplifiers, RFE
	160	Half-bridge	2ED2742	1 A/2 A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	160	High- and low-side	2ED2732	1 A/2 A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	160	Half-Bridge	2ED2772S01G	1A/2A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD, 7.5 V / 6.8 V pos/neg UVLO
	160	High- and low-side	2ED2734S01G*	2A/4A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	160	Half-Bridge	2ED2744S01G*	2A/4A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	200	Three-phase	6EDL04N02PR	0.165 A/0.375 A	TSSOP-28	SOI, integrated BSD, OCP, enable, fault reporting, UVLO enable
	200	High- and low-side	IRS2005S	0.29 A/0.6 A	DSO-8	V _{CC} and V _{BS} UVLO, matched propagation delay
	200	High- and low-side	IRS2011S	1/1 A	DSO-8	UVLO, MTON/OFF, max =20 ns, 3.3 - 5 V input
	300	Three-phase	6EDL04N03PR*	0.165A/0.375A	TSSOP-25	SOI, Strong -Vs immunity, Integrated BSD, OCP, enable, fault reporting, package, >2kV HBM ESD, P2P with 6EDL04N02 with improved voltage, ESD
	600	High- and low-side	2EDL05N06PF	0.36/0.7 A	DSO-8	SOI, UVLO, MTON/OFF, max=60 ns, 3.3 - 15 V input, BSD
	600	Single high-side	IRS21271S	0.2/0.42 A	DSO-8	UVLO, OCP, 3 - 15 V input, fault reporting
600	Three-phase	6EDL04N06PT	0.165 A/0.375 A	DSO-28	SOI, integrated BSD, OCP, enable, fault reporting, UVLO enable	



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* Coming soon

Typical power level of the inverter system: 4 kW-11 kW

Component	Product family	Package options	Battery voltage support (V)	Voltage class (V _{DS max})	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	TOLL, TOLG TOLT D ² PAK 7-pin D ² PAK TO-220 TO-247 SuperSO8 SuperSO8 SourceDown	48-72	100-120	IPTG014N10NM5, IPTC014N10NM5, IPT015N10N5, IPT015N10NF2S*, IPB020N10N5, ISC022N10NM6, IPB017N10N5, IPP039N10N5, IPP050N10NF2S, IPT017N12NM6, IPTC017N12NM6, IPF019N12NM6, IPB055N08NF2S, IPF016N10NF2S, IPF050N10NF2S, IPF042N10NF2S, IPF024N10NF2S, IPP082N10NF2S, IPP026N10NF2S, IPP050N10NF2S, IPT022N10NF2S, IPT017N10NF2S, IPT015N10NF2S, IQD020N10NM5CG, IPF019N12NM6, IPB035N12NM6, IPTC026N12NM6, IAUCN10S7N021*, IAUC100N10S5L040, IAUT300N10S5N014, IAUS300N10S5N015T, IAUTN12S5N017, IAUTN12S5N018T	Low R _{DS(on)} and low conduction losses, tight V _{GS(th)} spread for efficient paralleling, low Q _{rr} , soft body diode, innovative packages Catering to diverse application mission profile requirements with OptiMOS™ (industrial and automotive „AEC-Q101“ grade) and StrongIRFET™ 2 (standard grade and with broad availability from distribution partners)
			72-96	135-150	IRF150P220, IPT039N15N5, IPTG039N15NM5, IPTC039N15NM5, IPB044N15N5, IPT044N15N5, IPB048N15N5, IPT054N15N5, IQD063N15NM5CG, IPTC020N13NM6*, IPT020N13NM6* IPF021N13NM6*, IPF031N13NM6*, IPP073N13NM6*, IPTG020N13NM6*, IPTG029N13NM6*, ISC037N13NM6*, ISC046N13NM6*, IPTC025N15NM6*, IPTG025N15NM6*, IPT025N15NM6*, IPF026N15NM6*, IPB029N15NM6*, IPP029N15NM6*, IPP089N15NM6*, ISC044N15NM6*, ISC055N15NM6*, ISC079N15NM6*, BSC093N15NS5, IRFP4568, IPT063N15N5, IPB073N15N5, IRF7779L2, IPP076N15N5, IRFS4115	

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	160	High- and low-side	2ED2738S01G	4/8 A	DFN10	SOI, integrated BSD, integrated dead time, integrated shoot-through protection logic, 2 kV HBM ESD
	160	Half-bridge	2ED2748	4/8 A	DFN10	Truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 8 V UVLO
	160V	Half-Bridge	2ED2778S01G*	4A/8A	DFN10	Truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 7.5 V / 6.8 V pos/neg UVLO
	200	1-ch non-isolated	1EDN8550B	4/8 A	SOT23-6	Truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 8 V UVLO
	200	1-ch non-isolated	1EDN7550U	4/8 A	TSNP	Compact package, truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 4 V UVLO
	250	Half-bridge	2EDF5215F	5/9 A	DSO-8	Dual channel, 7 V UVLO, functional isolation gate driver, in compact package
	500	High- and low-side	IRS2110S	2/2 A	DSO-16W	MTON/OFF, max=10 ns, separate power and logic ground, SD pin, 3 - 20 V input
	600	High- and low-side	2EDL23N06PJ	2.3/2.8 A	DSO-14	3.3 - 15 V input, -100 V transient, PGND, SOI, integrated BSD, OCP, UVLO, enable, fault reporting
	600	High- and low-side	IRS21867S	4/4 A	DSO-8	High current level shift gate driver with low V _{CC} operation
	600	1-ch isolated	IR2127	0.25/0.5 A	DIP8	Over current protection and fault reporting
	650	High- and low-side	2ED2181S06 F/J	2.5/2.5 A	DSO-8 (F) DSO-14 (J)	SOI, integrated BSD, 3.3 - 15 V input, MTON/OFF, max=35 ns, -100 V transient, separate logic and power ground (only J version)

Note: The MOSFET parts listed under various power-levels in the above tables is only for guidance purposes; higher power levels can be achieved even with lower voltage class MOSFETs through paralleling.

Typical power level of the inverter system: >11 kW

Component	Product family	Package options	Battery voltage support (V)	Voltage class [V _{DS max}]	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	TOLL TOLG TOLT D ² PAK 7-pin D ² PAK SuperSO8 TO-220 TO-247	96-144	200	IRF200P222, IPTG111N20NM3FD, IRFP4668, IRFS4127, IPT067N20NM6, ISC130N20NM6*, IPT129N20NM6, IPP339N20NM6*, IPP069N20NM6, IPF067N20NM6, IPB068N20NM6	Low R _{DS(on)} and low conduction losses, tight V _{GS(th)} spread for efficient paralleling, low Q _{rr} , soft body diode, innovative packages Catering to diverse application mission profile requirements with OptiMOS™ (industrial and automotive “AEC-Q101” grade) and StrongIRFET™ 2 (standard grade and with broad availability from distribution partners)
			144-200	250-300	IRF250P224, IRF300P226, IPT210N25NFD, IPTG210N25NM3FD, IPB407N30N, IPB600N25N3 G, IRFP4868, IRFB4229, IRFS4229	

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	650	1-ch isolated	1EDB8275F	5/9 A	DSO-8	3 kV basic isolation with CT technology, (UL1577), separate SRC/SNK output, UVLO (4 types), CMTI > 300 V/ns
	1200		1EDI60N12AF	10/9 A		Short circuit clamping, active shut-down, UVLO, separate SRC/SNK output, 3.3 - 15 V input
	1200	2-ch isolated	2EDB8259F/ 2EDB8259Y	5/9 A	DSO16/ DSO14	3 kV basic isolation w. CT technology, (UL1577), 8 V UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
	1200	2-ch with reinforced isolation	2EDR8259X	5/9 A	DSO-14	Dual-channel, 8 V UVLO, gate driver with increased ch to ch creepage
	1200	2-ch with reinforced isolation	2EDR7259X	5/9 A	DSO-14	Dual-channel, 4 V UVLO, gate driver with increased ch to ch creepage



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Microcontrollers and sensors for precision control and accurate sensing (power-level agnostic)

Component	Product family	Core/MaxClock speed	Representative parts	Package	Features
	XMC™	Arm® Cortex® M0, 32 MHz	XMC13xx	TSSOP-16/28/38, VQFN-24/40,	UART, SPI, I²C, I²S, POSIF, MATH, 3x ACMP, CCU8
		Arm® Cortex® M0, 48 MHz	XMC14xx	TSSOP-38, VQFN-0/48, LQFP-64	UART, SPI, I²C, I²S, CAN, POSIF, MATH, 4x ACMP, 2x CCU8
		Arm® Cortex® M4F, up to 144 MHz	XMC4xxx	VQFN-48, TQFP-64	UART, SPI, I²C, I²S, CAN, POSIF, HRPWM, CCU8, Ethernet, EtherCAT
		Single and dual core Arm® Cortex®-M7 and Cortex®-M0+	XMC7100, XMC7200	TQFP-100/176, LFBGA-272	TCPWM timers of 102-ch 16-bit and 16-ch 32-bit, cryptography engine support, CAN-FD
	TRAVEO™ T2G	Single and Dual Arm® Cortex® M7 and M0+ Arm® Cortex® M4F and M0+	TRAVEO™ T2G	LQFP-64/100/176	ASIL-B functional safety, 16-bit dedicated motor TCPWM and 32-bit TCPWM, clock extension peripheral, CAN-FD, cryptography engine support, SOTA support
	AURIX™	up to 6x TriCore™ at 300 MHz +	AURIX™ TC3xx	LQFP-144/176, LFBGA-292/516	ASIL-D functional safety with up to 4-lockstep cores, CAN-FD, cryptography engine support, support high PWM (5 ns at 200 MHz), SOTA support
Motor Control IC	MOTIX™	Arm® Cortex® M0, 48 MHz	IMD701A	VQFN-64	XMC1404 microcontroller integrated with 6EDL7141 3-ph smart gate driver in a single package

Component	Product family	Representative parts	Features
Angle/position sensors	XENSIV™ Hall switches (end of shaft/out of shaft)	XENSIV™ TLx4961/68	3 - 32 V operation, active error compensation, high stability magnetic thresholds, low jitter
	XENSIV™ angle sensor (end of shaft)	XENSIV™ TLI5012	Integrated angle calculation, incremental interface, SPI with 8 Mbit/s, ≤ 1.9° angle error over temperature/life, integrated giant magneto resistance-based angle sensor, 15-bit representation of angle value with 0.01° resolution, bi-directional SSC interface
		XENSIV™ TLE5501	Sin/cos output via analog interface, precise rotation sensing (typ. angle error of 1 deg), very-low current consumption (~2 mA), extended magnetic field range up to 100 mT, ISO-26262 (functional safety) compliant option
	XENSIV™ 3D magnetic sensor (end of shaft/out of shaft)	XENSIV™ TLI493D	Enables out-of-shaft angular sensing, ±50 mT to ±160 mT ranges, up to 30.8 LSB12/MT sensitivity, low power mode, low offset and match drift, wake up function; recommended for motors with max-speed up to 3000 rpm
Current sensor	XENSIV™ magnetic coreless current sensor	XENSIV™ TLI4971	±25 A, ±50 A, ±75 A and ±120 A measurement range, 240 kHz bandwidth, low sensitivity error over temperature, galvanic functional isolation up to 1150 V, differential sensing, two independent over current detection outputs, user programmable parameters
		XENSIV™ TLE4972	Analog output, up to ±2000 A measurement range, 210 kHz bandwidth, fast overcurrent detection output with programmable threshold, differential sensing, galvanic isolation between current rail and sensor, user programmable parameters
		XENSIV™ TLI4973	Available in both integrated-current-rail (up to +132A measurement range) and external-current-rail (up to +2000 A measurement range) options, 210 kHz bandwidth, 5 V supply voltage; ease of use with In-circuit programming, single-wire UART interface; differential sensing, galvanic isolation, fast overcurrent detection, user programmable parameters

Design resources

- Low-voltage drives scalable power demoboard platform
- XMC™ demonstration and eval boards
- ModusToolbox™
- TRAVEO™ T2G Motor Control



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System specification example

$V_{bat} = 36\text{ V}$, 250 W (continuous power) PMSM motor with dual-core controller and smart gate driver

BoM example

Component	Part numbers	Description
MOSFETs	BSC012N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr} , soft body diode
Microcontroller	XMC7100-F100K1088AA	Single 250-MHz Arm® Cortex®-M7 and 100 MHz Cortex®-M0+; Timers up to 12-ch 16-bit motor control, 63-ch 16-bit timer/counter/pulse-width modulation (TCPWM) and 8-ch 32-bit TCPWM
Gate driver	6EDL7141	3-phase configurable gate driver with >50 configurable parameters (slew rate, output voltage etc.); fully integrated programmable buck (7,9,10,15 V) + LDO (3.3,5 V) power supply; Three integrated current sense amplifiers (CSA)
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 μs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds



System specification example

$V_{bat} = 48\text{ V}$, 250 W (continuous power) PMSM motor with dedicated motor control MCU

BoM example

Component	Part numbers	Description
MOSFETs	BSC019N08NS5	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr} , soft body diode
Microcontroller	XMC1302-T038X-0032	Core: 32 MHz Arm® Cortex®-M0, peripherals clock: 64 MHz; communication: UART, SPI, I ² C, motor control peripherals: POSIF, MATH, 1x CCU8
Gate driver	6ED2742S01Q	3-phase gate driver built on silicon on insulator (SOI) technology with integrated BSD, trickle charge pumps, power management and current sense amplifiers
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 μs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds



System specification example

$V_{bat} = 36\text{ V}$, 250 W (continuous power) PMSM motor with functional safety requirement

BoM example

Component	Part numbers	Description
MOSFETs	BSC016N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, Low Q_{rr} , soft body diode
Microcontroller	CYT4BB5CEBQ0AESGS	Core: One/two Arm® Cortex®-M7 at 250MHz + Arm® Cortex®-M0+ at 100 MHz, 4 MB flash, Up to 12 16-bit counters for motor control, Up to 220 programmable I/Os
Gate driver	TLE9180D-32QK	3-phase gate driver with three current sense amplifiers (CSA), ASIL-C functional safety; automotive grade 1 qualified
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 μs), high ESD performance
Current sensor	TLE4973-R120T5-U-S0010	132 A measurement range with integrated current rail, UL1577 certified, AEC-Q100, ISO 26262-compliant, digital control interface



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www.infineon.com/high-power-drive-up-to-200v
www.infineon.com/pmsm-below-200v

www.infineon.com/lev
www.infineon.com/eforklift



System specification example

$V_{bat} = 48\text{ V}$, 3 kW PMSM motor inverter

Component	Part numbers	Description
MOSFETs	IPTC012N08NM5	OptiMOS™ 5 80 V power MOSFET in TOLT package enabling top-side cooling, high current rating >300 A, low Q_g of 175 nC
Microcontroller	XMC1403-Q048X0200 AA	Core: 48 MHz arm cortex M0, peripherals clock: 96 MHz; communication: UART, SPI, I ² C, 2*MultiCAN; motor control peripherals: POSIF, MATH, 4x ACMP, 2x CCU88
Gate driver	2ED2738S01G	2-channel (half-bridge) gate driver with SOI isolation, integrated BSD, UVLO, separate V_{ss}/COM , thermal pad
Position/speed sensor	TLE5012B E1000	Giant magneto resistive (GMR) based analog sensor with a high magnetic field range of 20 - 100 mT; Max. 1.0° angle error over lifetime, discrete bridge with differential sine and cosine output
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with Integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds



System specification example

$V_{bat} = 48\text{ V}$, 20 kW PMSM motor inverter with ASIL-D MCU and AEC-Q 101 MOSFETs

Component	Part numbers	Description
MOSFETs	IAUS300N10S5N015T	Automotive 100V MOSFET in TOLT package (top-side-cooled), high current rating of 300 A, low Q_g of 166 nC
Microcontroller	SAK-TC377TX-96F300S AB	AURIX™ TC377TX 3 * Tricore at 300 MHz; functional safety ASIL - D; HSM (hardware security module); communication: 12-ch CAN-FD, 128-ch DMA
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
Position/speed sensor	TLE5014(D)	Giant magneto resistive (GMR) angle sensors with a wide range of selectable interfaces (SPC, SENT, PWM, SPI), low error rate < 1.0°, easy-to-use pre-configured sensors with high flexibility
Current sensor	TLE4973-AE35S5-S0001	High-precision coreless current sensor with full-scale up to 34 mT for high current applications; Diagnostics: overcurrent detection (OCD), overvoltage (OV), undervoltage (UV), diagnosis mode



System specification example

$V_{bat} = 96\text{ V}$, 3 kW PMSM motor

Component	Part numbers	Description
MOSFETs	IPT025N15NM6*	OptiMOS™ 6 150 V power MOSFET in TOLL package, high current rating > 261A, low Q_g of 104nC
Microcontroller	XMC4700-F100K1536 AA	Core: ARM® Cortex®-M4 at 144 MHz Communication: channel USIC (configurable to SPI, UART, IIC, IIS) Motor Control Peripherals: 2 x POSIF, 4-channel $\Delta\Sigma$ Demodulator, 4 x 12-bit ADC, 18 input channels, 4 x parallel sampling and conversion
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
Position/speed sensor	TLE5501	Tunnel magneto resistive (TMR) based pre-calibrated sensor with 360° angle measurement; Max. 1.0° (1.9°) angle error over lifetime, 16-bit representation of sine/cosine values
Current sensor	TLE4973-AE35S5-S0001	High-precision coreless current sensor with full-scale up to 34 mT for high current applications; Diagnostics: overcurrent detection (OCD), overvoltage (OV), undervoltage (UV), diagnosis mode



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Smart devices with NFC interface

NFC-based configuration, actuation and sensing applications

Near-field communication (NFC) is a mature technology for contactless exchange of data over short distances. Besides the data exchange, NFC technology itself can also transfer power from the polling device to the receiver devices. Due to the working principle of resonant coupling, power transmission via NFC is efficient and user-friendly because it is less sensitive to antenna/coil alignment. The combination of data exchange and energy transfer in one interface and the availability in billions of smartphones make NFC an exciting enabler for the following novel use cases:

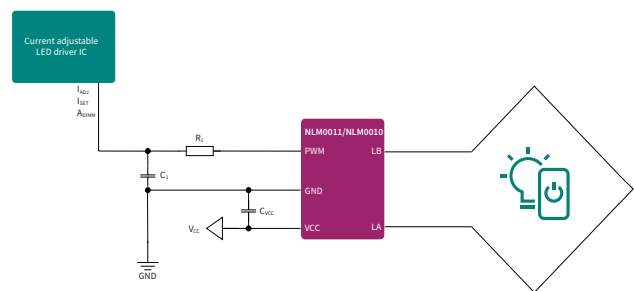
Passive device parameter configuration: Programming or configuring product operation parameters is sometimes complicated because of access problems or equipment requirements. Using an NFC interface, contactless or even passive operation can be performed anywhere. Modern LED power supplies are already equipped with the NFC interface to enable output current configuration in production, sales channel, and the field. Infineon's NLM product series supports customers to enable NFC configuration functions effectively.

Smart actuator and sensing devices: In the IoT age, smart devices help people make their life easier and more sustainable. NFC technology provides an option to develop battery-less smart devices that operate when the NFC reader device, like a mobile phone, is present. As a complement to mainstream active IoT technology, passive NFC technology is suitable for use cases like a passive smart lock, passive sensor inlay, medical care patch, etc.

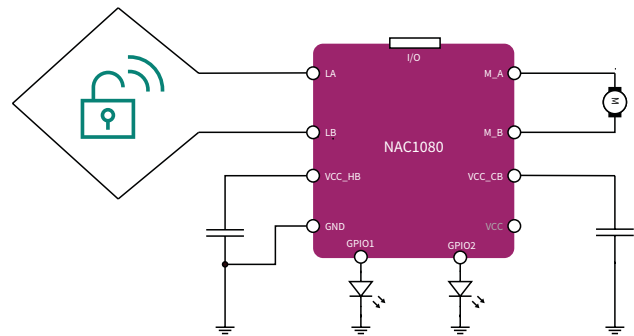
With Infineon's new **NFC tag-side controller** family a single-chip solution is available to develop cost-effective, miniaturized, actuation or sensing applications operating in either passive or active mode. The NAC1080, with integrated H-bridge and energy harvesting modules, enables cost-effective development of passive smart actuators like passive locks. AC1081 is a package variant in VQFN32 package.

The NGC1081 is a low-power controller with ADC/DAC unit, integrated temperature sensor, and sophisticated analog and digital I/Os. It is the ideal solution for contactless sensing applications like temperature logger, gas detector, sensor inlay, medical patch, etc. Furthermore, both sensing and actuation control capability make the NGC1081 a unique product in the market, ideally suited for applications that require these functions – for example, radiator thermostats.

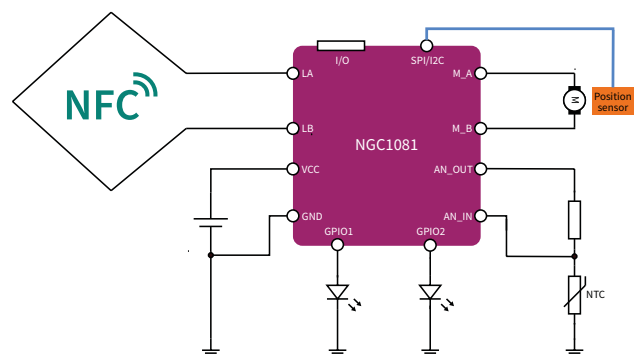
Example: NFC LED power supply



Example: NFC passive lock



Example: Smart radiator thermostat



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NFC configuration – NLM series

Type	Description	Package	Ordering code
NLM0011	Dual-mode NFC configuration IC with PWM output and CLO function	SOT23-5	NLM0011XTSA1
NLM0010	Dual-mode NFC configuration IC with PWM output, without CLO function	SOT23-5	NLM0010XTSA1

See [LED lighting chapter](#) for more information.

NFC actuation and sensing – NAC1080 and NGC1081

Highly integrated single-chip solution

The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, sensing unit, motor driver, and energy harvesting function enables customers to develop smart actuation and sensing devices with minimum system BOM requirement.

Full flexible software-defined functions

The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize the utilization of software-defined functions.

Build-in security functions to meet the application requirements

These ICs include hardware security functions such as secure area in flash, 128 bit AES accelerator and true random generator. A separate secure element can be connected via the digital interface on demand.

Type	NFC	Processor	RAM	NVM	ADC	DAC	I2V	H-Bridge	I ² C	SPI	UART	GPIO	Analog-in	Package
NAC1080	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	no	no	no	yes	no	yes	yes	7x	no	PG-DSO-16
NAC1081	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	no	no	no	yes	no	yes	yes	7x	no	PG-VQFN-32
NGC1081	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	12 bit	10 bit	yes	yes	yes	yes	yes	16x	X4	PG-VQFN-32



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Solutions for solid-state relays

Best-in-class $R_{DS(on)} \times A$ enables unprecedented low losses in combination with advanced control and diagnostics features

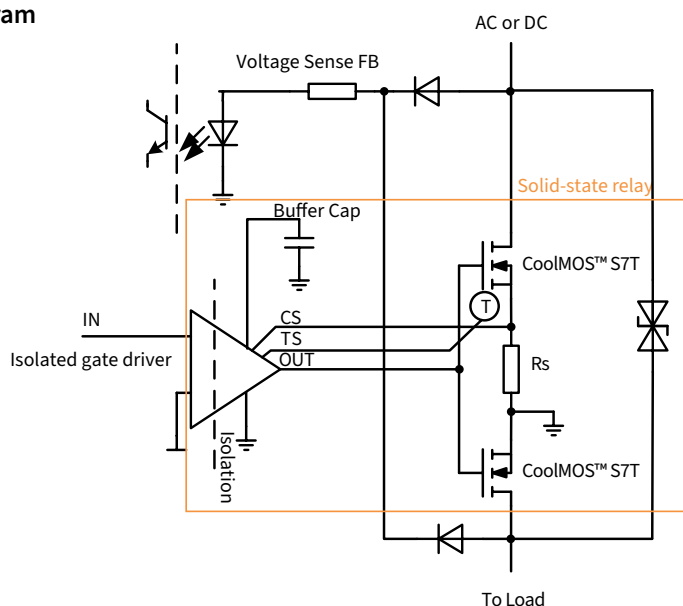
Electromechanical relays are a mature and well-established technology. However, they suffer from some inherent weaknesses. The mechanical movement of metal contacts causes noise. The high voltages can arc before the contacts are completely opened or closed, which leads to contact degradation. An increase in contact resistance over the lifetime causes the behavior to become less predictable. Triacs (or silicon-controlled rectifiers, SCRs) are widely used as solid-state relays in AC applications. However, their controllability is limited and they suffer from high power dissipation in the range of 1 W/A.

FET-based solid-state solutions offer many benefits in relay applications. This includes significantly faster switching while eliminating arcing and the noise associated with electromechanical devices. Inherently, this results in higher reliability and more stable performance. When considering the maintenance, repair and operations (MRO) cost, a strong argument can be made for using solid-state relays. Compared to triacs, a FET-based solution offers advanced control and protection methods. Built-in temperature and current sensing along galvanic isolation and secondary-side internal DC power supply allow power-dissipation-optimized FETs to work in Safe Operation Area and minimize cooling efforts. The latest CoolMOS™ S7T technology along the new isolated EiceDRIVER™ iSSI gate driver family are perfect matches for solid-state relay applications. They offer sophisticated diagnostics, protection and control capabilities along an unprecedentedly low $R_{DS(on)} \times A$ figure of merit addressing contactors, actuator and print relay applications in industries, which so far have been based on electromechanical relays.

Features and benefits

Key features	Key benefits
– Operational lifetime: tens of millions of operations	– Maintenance-free (no degradation of contacts), MRO cost savings
– No mechanical parts	– Arcing-free operation, no contact bounce, clicking noise is eliminated
– Significantly faster switching	– Advanced control superior to EMR
– No increasing resistance vs. lifetime	– Stable performance, predictable behavior
– Lowest $R_{DS(on)} \times A$ in class	– Highest power density, minimized cooling effort, parallelization and scalability
– Temperature and current sensing	– Protecting FETs
– Minimum activation power	– Less energy consumption, minimized cooling effort

Application diagram



Click here to learn more:

www.infineon.com/ssr
www.infineon.com/S7



Product portfolio

Product	Product family	Voltage class [V _{DS max}]	R _{DS(on)}	Package	Part number
MOSFETs	CoolMOS™ S7T*	600 V	10-22 mΩ	Q-DPAK top-side cooled (TSC)	IPDQ60T022S7, IPDQ60T017S7, IPDQ60T010S7
			22 mΩ - 65 mΩ	Q-DPAK bottom-side-cooled (BSC)	IPQC60T022S7, IPQC60T017S7, IPQC60T010S7
				TOLL	IPT60T022S7, IPT60T040S7, IPT60T065S7
	CoolMOS™ S7 Industrial	600 V	22 mΩ - 65 mΩ	TO-220	IPP60R022S7, IPP60R040S7, IPP60R065S7
			10 mΩ to 65 mΩ	Q-DPAK top-side cooled	IPDQ60R010S7, IPDQ60R022S7, IPDQ60R040S7,
10 mΩ to 65 mΩ			Q-DPAK bottom-side cooled	IPQC60R010S7, IPQC60R040S7, IPDQ60R017S7	
CoolMOS™ S7A Automotive	600 V	10 mΩ to 40 mΩ	Q-DPAK top-side cooled	IPDQ60R010S7A, IPDQ60R017S7A, IPDQ60R022S7A, IPDQ60R040S7A	
IGBTs	IGBT TRENCHSTOP™ 5	650 V	50 A	TO-247-4	IKZ50N65EH5, IKZ75N65EH5

Product	Product family	Output voltage	Output current [typ.]	Isolation type	Part number
Gate drivers	EiceDRIVER™	20 V	5 A/9 A	functional/basic isolation	1EDB6275F, 1EDB8275F, 1EDB9275F
			5 A/9 A	non-isolated	1EDN6550B, 1EDN8550B, 1EDN9550B, 1EDN8511B
			±2 A to ±6 A	functional isolation	1EDI10I12MF, 1EDI20I12MF, 1EDI30I12MF
			400 mA	reinforced isolation	iSSI20R0xH, iSSI20R11H, iSSI30R1xH
		25 V	±2.6 A <<	non-isolated	1ED44173N01B
		40 V	±3 A to ±6 A	functional isolation	1ED3431MU12M, 1ED3461MU12M
			±3 A to ±6 A	reinforced isolation	1ED3431MC12M, 1ED3461MC12M

Product	Product family	Load voltage	Output/load current	Isolation voltage	Part number
Integrated solid-state relays	Photovoltaic isolators (PVI)	-	8 μA	4 kV	PVI5080N
				4 kV	PVI1050NS
	Photovoltaic relays (PVR)	60 V	2 A	4 kV	PVG612A
				400 V	240 mA



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*MOSFET with integrated temperature sensor



SSCB

Solutions for solid-state circuit breakers

Smart solid-state circuit breakers integrate advanced functionality into one single device

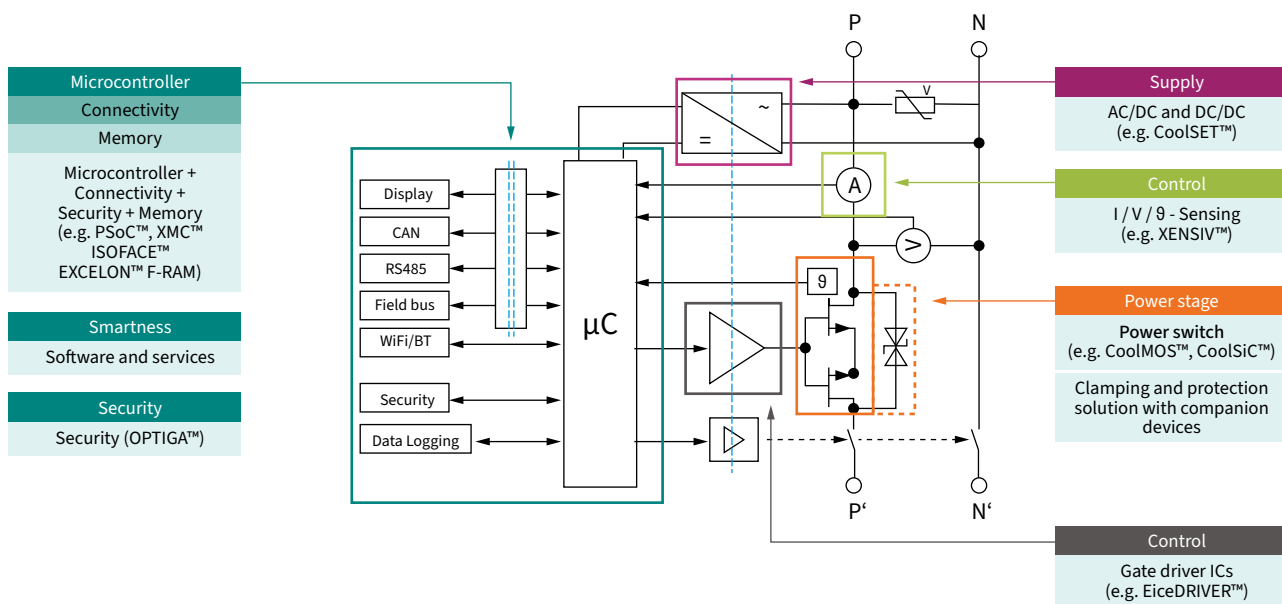
The first electromechanical circuit breakers emerged a century ago. Fast-forward to today, the demand for a shift towards smart and intelligent solid-state devices is undeniable. In contrast to their traditional counterparts, solid-state solutions offer exceptional control and protection capabilities. In the past, the adoption of solid-state technology faced obstacles such as limited availability and high costs, restricting its usage to niche applications. However, thanks to Infineon's groundbreaking power semiconductors, designers can now deploy cost-effective and advanced solid-state solutions on a broader scale.

Infineon's comprehensive solutions for solid-state circuit breakers are covering all system needs from sense – compute – actuate to the next level of connectivity and security.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Combines protection, actuation, load control, diagnostic, metering and secure communication 	<ul style="list-style-type: none"> – Provides noise-less and wear-free load switching with real-time control capability
<ul style="list-style-type: none"> – AC and DC agnostic 	<ul style="list-style-type: none"> – Enables remote load control and diagnostic in real time
<ul style="list-style-type: none"> – Offers secure web/IoT connectivity 	<ul style="list-style-type: none"> – Optimized system performance thanks to highly accurate and user programmable tripping characteristics
<ul style="list-style-type: none"> – Captures and logs data in real time 	<ul style="list-style-type: none"> – Supports smart billing, even for sub-branches by accurately monitoring energy usage
<ul style="list-style-type: none"> – Enables smart power balancing and control of peak loads 	<ul style="list-style-type: none"> – Provides state-of-health diagnostics of connected loads
<ul style="list-style-type: none"> – Detects and isolates faults in sub μs range 	<ul style="list-style-type: none"> – Easy to install and replace, since it matches current MCB's form factor
	<ul style="list-style-type: none"> – Supports OCP, AFDD/AFCI and RCD/GFCI, all-in-one, for enhanced safety and protection for both AC and DC grids
	<ul style="list-style-type: none"> – Compliant with industrial certification standards and support ZVS and ZCS for smart and soft switching
	<ul style="list-style-type: none"> – Smart power balancing and peak load control for optimal energy efficiency as it can be applied for AC and DC grids
	<ul style="list-style-type: none"> – Secure web and I-o-T connectivity, along with state-of-health diagnostics of connected loads, makes solid-state circuit breakers a highly advanced and reliable solution for modern power systems

Application diagram



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Product portfolio

Product	Product family	Voltage class [V _{DS} max]	R _{DS(on)}	Package	Part number
SJ MOSFETs	CoolMOS™ S7	600 V	10-22 mΩ	Q-DPAK	IPDQ60R010S7; IPDQ60R017S7, IPDQ60R022S7
	CoolMOS™ S7T*				IPDQ60T010S7; IPDQ60T017S7, IPDQ60T022S7
SiC MOSFETs	CoolSiC™	750 V	8- 16 mΩ	Q-DPAK	IMDQ75R008M1H, IMDQ75R016M1H
	CoolSiC™	650 V	7-15 mΩ	D2PAK	IMBG65R007M2H IMBG65R015M2H

Product	Product family	Output voltage	Output current	Isolation type	Part number
Gate drivers	EiceDRIVER™	20 V	4 A/8 A	Non-isolated	1EDN8550B, 1EDN9550B
		40 V	+/- 5 A	Reinforced isolation	1ED3121MC12H
		35 V	6.5 A	Functional isolation	1ED3142MU12F
		20 V	5 A/9 A		2EDB8259Y

Product	Product family	Current rail	Accuracy	Package	Part number
Current sensors	XENSIV™	internal	2 %	PG-TISON 8	TLI4971-A120T5
		external	1.5 %	PG-TDSO-16	TLE4972-AE35D5
				PG-VSON-6	TLE4972-AE35S5
				PG-TDSO-16	TLE4973-AE35D5
				PG-VSON-6	TLE4973-AE35S5

Product	Product family	Power stage	P _{out} max.	Package	Part number
AC-DC Power conversion	CoolSETTM	Integrated	15 W	PG-DSO-12	ICEAR4770AG
	Flyback ICs	Non-integrated	>60 W	PG-DSO-8	ICE5GSAG, ICE5ASAG



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Applications

Home appliances and consumer electronics, ITC infrastructure, renewables, robotics, e-mobility

- Air conditioning systems
- Ceiling fan
- Refrigerators
- Air purifier
- Induction cooking
- Laundry machine
- Tumble dryer
- Cordless vacuum cleaner
- Cordless power tools and outdoor power equipment
- Smart TV
- Smart speaker
- Smartwatches, feature watches, wristbands, and smart rings
- Security camera and video doorbell
- Smart conferencing systems
- LED lighting
- Plug & LEDs play solutions
- Smart lighting solutions
- Telecommunication infrastructure
- Data center and computing
- Solar PV
- Energy storage systems
- Robotics
- Light electric vehicles and electric forklift
- On-board charger for xEV applications



Air conditioning systems

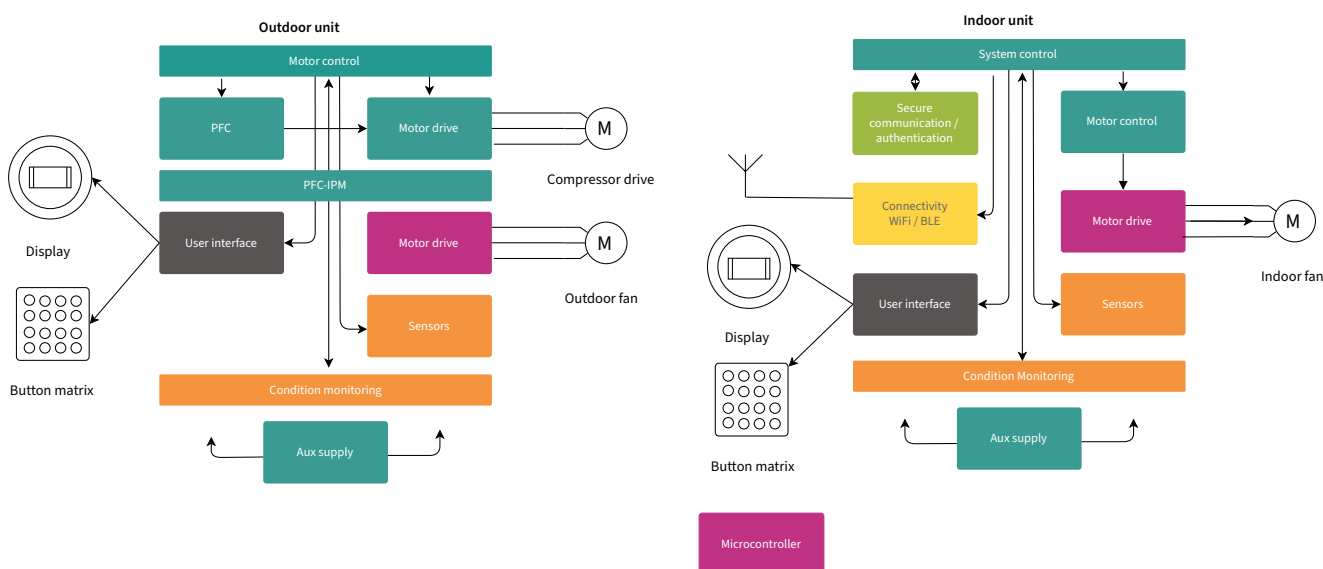
Reliable semiconductors for smart and efficient HVAC systems

Smart, smaller, more powerful, and energy-efficient: Today's air conditioning systems must meet growing demands. Since they are used in private households, quiet air conditioning systems are in high demand. Functions such as smooth starting, a wide range of operating speeds, and vibration suppression are necessary. In addition, it must be possible to integrate them easily and securely into a smart home to support remote control and condition monitoring. Moreover, innovative features like people tracking and CO₂ sensing help them stand out. By integrating IoT capabilities, our HVAC systems offer enhanced functionality and greater efficiency while enabling seamless integration with other smart home devices.

Designing air conditioning systems that boast such capabilities requires highly reliable power semiconductors. The enabling semiconductor solutions must be energy-efficient and reflect new form factors. Infineon's solutions offer high integration, comprehensive features, and robust protection while reducing time-to-market. Infineon offers the entire portfolio to develop inverters and active PFC for compressors, fans, and pumps. Our extensive portfolio of motor controllers, intelligent power modules, power integrated modules, discrete IGBTs, MOSFETs, and gate drivers provide you with everything you need to innovate. Go for ultimate efficiency with Silicon Carbide (SiC), high-frequency PFC topologies, and your own algorithms.

The block diagram of an air conditioning system is shown below and the product selection table on the next page, provide an effective recommendation for engineers to select the right component for each power management stage.

Application diagram



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Recommended products

Functional block	Product family	Voltage class	Technology/product family	Selection/benefit
Outdoor unit (ODU) PFC	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	Non-isolated EiceDRIVER™	25 V	1ED44175N01B	Integrated overcurrent protection
	Non-isolated EiceDRIVER™	25 V	1ED44171N01B	Cost/performance
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	TRENCHSTOP™ 5 IGBT WR5/WR6	650 V	IKW30N65WR5, IKWH30N65WR6	Recommended
	TRENCHSTOP™ 5 IGBT advanced isolation	650 V	IKFW40N65DH5	Easy to use
	TRENCHSTOP™ IGBT7	650 V	IKW30N65ET7	Recommended
	EC7	650 V	IDWD60E65E7	Recommended
	CIPOS™ Mini	600 V	CIPOS™ Mini PFC interleaved IPM series IFCM20T60GD/ IFCM20U60GD/IFCM30T60GD/IFCM30U60GD CIPOS™ Mini PFC integrated IPM series IFCM10P60GD/ IFCM10S60GD/IFCM15P60GD/IFCM15S60GD IM564-X6D	Easy to use/system size saving
CoolMOS™ SJ MOSFETs	600 V	IPP60R120P7	Recommended	
ODU motor drive (compressor)	iMOTION™ controller	-	IMC302T-F064	Motor/PFC controller incl. software
	CIPOS™ IPM	-	CIPOS™ Mini	Easy to use/system size saving
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD15N60RC2	Recommended
	Easy IGBT Power Modules	600 V 650 V 1200 V	EasyPIM™;	Recommended
	Econo IGBT Power Modules	650 V 1200 V	EconoDUAL™, EconoPIM™	Recommended
ODU motor drive (outdoor fan)	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Micro IM241 series	Easy to use/system size saving
	Level-shift EiceDRIVER™	600V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD06N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPD60R1K0PFD7S	Recommended
Condition monitoring and predictive maintenance	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
	XENSIV™ pressure sensor	-	DPS368	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall sensors	-	TLE4961, TLE4964, TLE4913, TLI4966G	Recommended
	XENSIV™ 3D magnetic sensor	-	TLI493D-W2BW	Vibration and position monitoring
	XMC4000 microcontroller	-	XMC4700	Recommended
Indoor unit (IDU)	XMC™ microcontroller	-	XMC1400, XMC4100	Recommended
	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	PSoC™ 6	-	CY8C62x4/5	Recommended
IDU motor control	XMC™ microcontroller	-	XMC1300, XMC1400	Recommended
	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Nano	Easy to use/system size saving
IDU motor drive	iMOTION™ IPM	-	IMI111T-026H, IMI111T-046H	Motor controller incl. software, driver and power stage
	Level-shift EiceDRIVER™	-	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKN03N60RC2, IKD04N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPN60R1K5PFD7S	Recommended
Security	OPTIGA™ Trust family	-	OPTIGA TRUST M SLS32AIA	Recommended
Connectivity Wi-Fi/BLE	AIROC™	-	CYW43439	Recommended
User interface	PSoC™ 6	-	CY8C62x4/5	Recommended
Sensors	XENSIV™ radar	-	BGT60LTR11AIP	Recommended
	XENSIV™ PAS CO ₂	-	PASCO2V01	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
Auxiliary supply	CoolMOS™ SJ MOSFETs	800 V	IPN80R4K5P7	Recommended
	CoolSET™	700 V	ICE5AR4770BZS	Flyback with error amplifier
UV-C LED for health	LED driver ICs	42 V	BCR43x	Recommended



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Ceiling fan

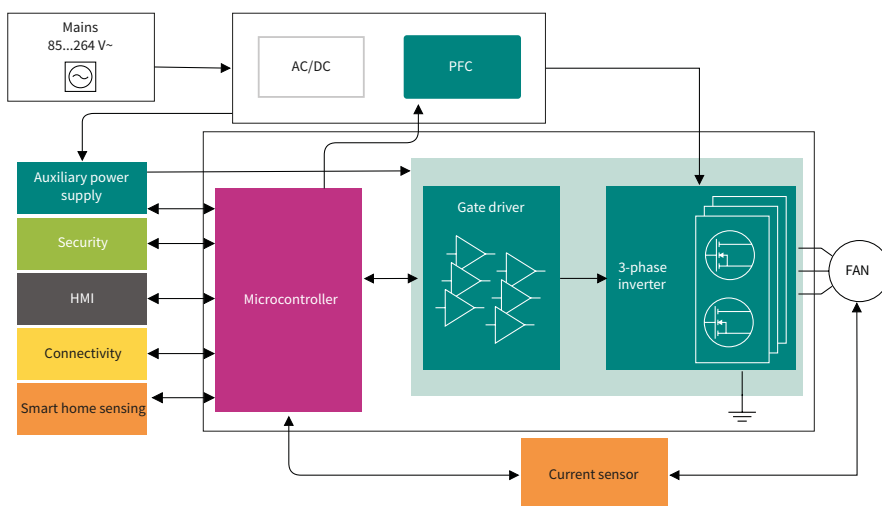
Energy-efficient and cost-effective solutions with high integration for system size reduction

Ceiling fan manufacturers face more stringent regulations regarding the application's form factor and are under constant pressure to reduce cost. Infineon is here to help with a compact, energy-efficient, cost-effective motor drive solution. We propose a competitive solution with an extensive portfolio, high integration for system size reduction, and low cost. Therefore, Infineon is your ideal partner for all ceiling fan designs. In our portfolio, you will find a wide range of solutions for inverterized fan motor control – whether your priority is achieving the highest level of integration using our IPMs or showcasing ultimate flexibility with the right price-performance ratio using our discrete IGBTs or MOSFETs. No matter your target, our power semiconductors, drivers, IPMs, MCUs, sensors, connectivity combos, security solutions, and iMOTION™ motor controllers are designed to work together seamlessly. This means you can effortlessly realize a smoother-running, quieter, more connected system with low energy consumption and a small form factor, all the while getting to market even faster.

Features and benefits

Key features	Key benefits
– Reference design for ready-to-copy PCB	– Compact and cost-effective system solution
– Turnkey PFC and motor control with MCE	– Eliminate the need for motor control software development
– Integrated infrared remote control	– Easy evaluation and system verification
– Suitable for single-sided PCB assembly process	– Reduce design-in effort and speed up time to market
– Compatible with low- and high-voltage motors	– Achieve maximum system cost-performance
– MCU design option for higher flexibility	– Higher system reliability
– IEC61000-4-5 4 kVs surge compliant and EN55032 class B EMI compliant	– One-stop-shop for simplified development to ensure fast time to market

Application diagram



Click here to learn more:
www.infineon.com/ceiling-fan

Product portfolio

Functional block	Product category	Product family	Part number	Benefits
AC-DC power supply	PFC	AC-DC LED Driver	ICL8810	<ul style="list-style-type: none"> Low BOM for 2-stage topologies Cost-effective with optimal efficiency DCM for frequency foldback QR operation for high efficiency
Aux power	Integrated power stage	Fixed frequency CoolSET™	ICE5GR4780AG	<ul style="list-style-type: none"> Reduce BOM count and cost with integrated line input over voltage protection and error amplifier Increase mid and light load efficiency with digital frequency reduction High power delivery with slope compensation for CCM operation
	PWM-PFC Controller	Quasi Resonant CoolSET™		<ul style="list-style-type: none"> The 5th generation quasi-resonant CoolSET™ controller combines the industry's benchmark for thermal performance with the latest innovation in quasi-resonant technology for unparalleled performance and efficiency.
Motor Control and drive	Intelligent power module	CIPOS™ Nano IPMs		<ul style="list-style-type: none"> Innovative Power QFN package, which utilizes PCB copper traces to dissipate heat from the module, CIPOS™ Nano family delivers a new benchmark in device size, offering up to a 60 percent smaller footprint than existing three-phase motor control power IPMs.
	Discrete IGBT	600 V Reverse Conducting Drive 2	IKD04N60RC2, IKD06N60RC2, IKN03N60RC2, IKA08N65H5,	<ul style="list-style-type: none"> Adequate performance at competitive price Good enough di/dt controllability in order to reduce electromagnetic noise Improved humidity robustness (HV-H3TRB test passed) Wide portfolio with current classes range from 4 A to 15 A and 1 A to 6 A in SOT-223
	MOSFET	CoolMOS™	IPA80R1K4P7	<ul style="list-style-type: none"> 0.1% to 0.6% efficiency gain and 2°C to 8°C lower MOSFET temperature as compared to CoolMOS™ C3 Enabling higher power density designs, BOM savings and lower assembly cost Easy to drive and to design-in Better production yield by reducing ESD related failures Less production issues and reduced field returns Easy to select right parts for fine tuning of designs
		StrongIRFET™	IRLML0040	<ul style="list-style-type: none"> Standard pinout allows for drop in replacement Industry standard qualification level High performance in low frequency applications Increased power density
	Gate driver IC	EiceDRIVER™ 500 - 700 V Level Shift Gate Driver ICs	6EDL04I06PT	<ul style="list-style-type: none"> Space saving package Improved energy efficiency
		600 V half-bridge gate driver IC	2EDL23I06PJ	<ul style="list-style-type: none"> Space saving package Improved energy efficiency
		650 V, 0.7 A high-side and low-side gate driver	2ED2106S06F	<ul style="list-style-type: none"> Integrated bootstrap diode - Space saving, reduced BOM cost, smaller PCB at lower cost with simpler design 50% lower level-shift losses Excellent ruggedness and noise immunity against negative transient voltages on VS pin
		650 V, 2.5 A high current half-bridge gate driver IC	2ED2184S06F	<ul style="list-style-type: none"> High current gate driver - suitable for high current power device, and high frequency application Integrated bootstrap diode (BSD) - Space saving, reduced BOM cost, smaller PCB at lower cost with simpler design 50% lower level-shift losses Excellent ruggedness and noise immunity against negative transient voltages (-100 V) on VS pin
	Microcontroller	XMC series	XMC1302-T038X0032AB	<ul style="list-style-type: none"> Significant CPU performance, integrated peripheral functionality and rapid development environment enabling short time-to market, without compromising cost efficiency.
		iMotion™ series	IMC102T-F064, IMD112T-6F040, IMD111T-6F040	<ul style="list-style-type: none"> iMOTION™ ICs integrate all the control and analog interface functions required for sensor less field oriented control (FOC) of PM motors using DC link or leg shunt current measurements. In addition they feature Infineon's patented and field proven motion control engine (MCE) that eliminates software coding from the motor control algorithm development process. Implementing a variable speed drive is reduced to configuring the MCE for the respective motor. Assisted by the powerful tool iMOTION™ Solution Designer (iSD), it is possible to have the motor up and running in less than an hour.
Sensor system	Current sensors		<ul style="list-style-type: none"> High-precision coreless open-loop current sensors are less bulky, and cost less compared to core-based current sensors 	
Security	Authentication/security	OPTIGA™ Trust	OPTIGA TRUST M SLS32AIA	<ul style="list-style-type: none"> Easiest way to add security Works with any MCU/MPU Robust, future-proof security Easy integration NDA-free product documentation MIT-licensed public host software
HMI	InfraRED interface	PSoC™ 4: 32-bit Arm® Cortex®-M0 MCU		<ul style="list-style-type: none"> The most flexible and scalable low-power mixed-signal architecture.
Connectivity	WiFi + Bluetooth®	AIROC™ Wi-Fi + Bluetooth® Combos		<ul style="list-style-type: none"> A single-chip solution to enable small-form-factor IoT designs
Smart Home Sensing	MEMS microphones	XENSIV™ MEMS microphones		<ul style="list-style-type: none"> Capturing audio signals with unprecedented precision and quality
	Radar sensor	XENSIV™ Radar	BGT60LTR11AIP, BGT60UTR11AIP, BGT60TR13C	<ul style="list-style-type: none"> Energy, lifetime saving, and small formfactor
	CO ₂ sensor	XENSIV™ PAS CO ₂ sensor	PASCo2V01	<ul style="list-style-type: none"> Space savings and opening up consumer application market High-quality data and compliance with most stringent regulations for indoor air quality (e.g., title 24 in California) Cost-effective high-volume assembly and easy system integration Suitable for high volume standard high-speed pick & place for fast & automatic assembly - No need of post calibration Customer flexibility thanks to variety of configuration options



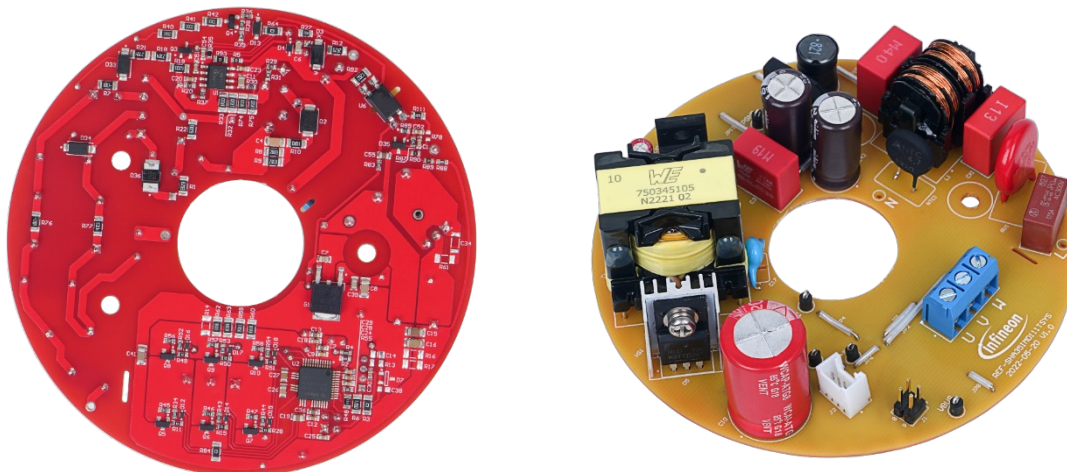
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REF-SHA35IMD111TSYS reference design

The REF-SHA35IMD111TSYS is a turnkey solution for low-voltage BLDC ceiling fans, focusing on high efficiency and a ready-to-use solution for motor and PFC control. It uses the iMOTION™ IMD111T-6F040 driver with field-proven motion control engine (MCE) which eliminates software coding from the motor control algorithm development process.

Assisted by the powerful iMOTION™ Solution Designer (iSD), it is possible to have the motor up and running in less than an hour.



Summary of features

- Wide AC input range of 90~300 V_{rms}
- High PF value > 0.95, THD < 10% at max load
- High efficiency of > 0.85 at maximum load
- Standby power < 1 W
- 4 kV L-N surge meets IEC61000-4-5
- iMOTION™ motion control engine (MCE)
- Infrared remote control with last-speed-saving
- Full protection: brown-in/out, overvoltage, overcurrent
- Single-layer PCB for compact, low-cost design
- RoHS compliance

Benefits

- Cost-effective single-layer design with a ready-to-copy PCB
- No motor control algorithm development is required
- Tested according to the regulations which apply to the Indian Market



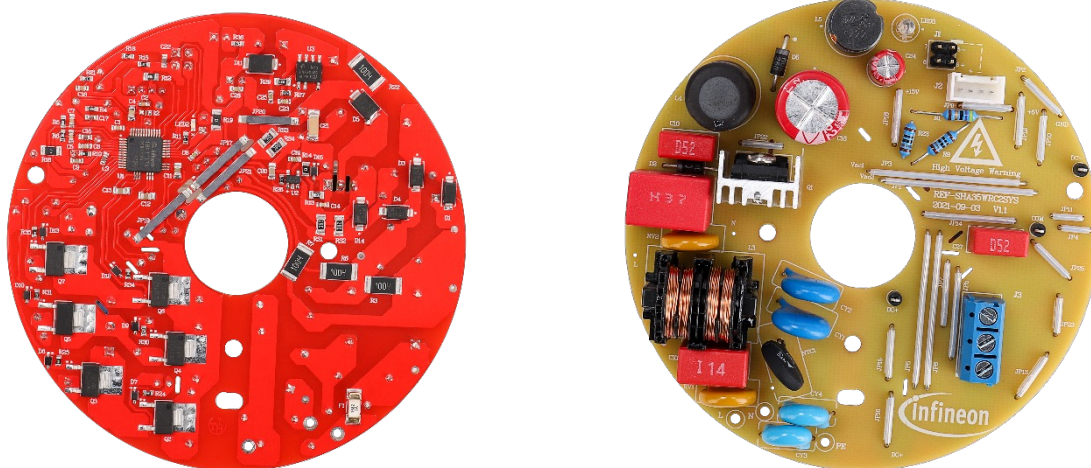
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REF-SHA35WRC2SYS reference design

REF-SHA35WRC2SYS (high voltage) is a full-featured starter kit which consists of a main board plus a daughter card with IrDa sensor and a suitable remote-control box. The main board includes IMD112T iMOTION™ driver which provides turnkey PFC and motor control with the field-proven motor control engine (MCE), that eliminates software coding from the ceiling fan motor control algorithm development process. Moreover, a PFC stage with IKA08N65H5 as switch plus 1ED44171N01B as suitable gate driver and IKN03N60RC2 for the inverter stage are also included.

The single layer PCB with 90 mm diameter provides a cost-effective and ready-to-copy reference for common ceiling fan designs.



Summary of features

- Input voltage range 120~300 V_{rms}
- Maximum input power 35 W
- PFC factor ≥ 0.9 and iTHD $\leq 10\%$ at 230 V_{rms}
- PFC stage on-board (up to 60 kHz)
- IEC61000-4-5 4 kV surge compliant
- EN55032 Class B EMI compliant
- Overcurrent protection and auxiliary supply on-board

Benefits

- Cost-effective single-layer design with a ready-to-copy PCB
- Easy evaluation of the complete system, including infrared control
- Ready-to-use motor control algorithms (incl. PFC) for high-efficiency permanent magnet synchronous motors (PMSM)



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www.infineon.com/ceiling-fan

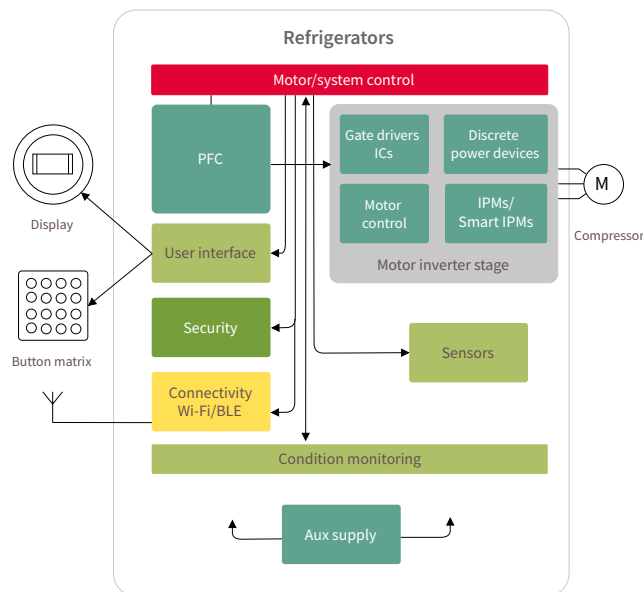


Fridge

Refrigerators

Higher efficiency at lower cost

Today, consumers are not only looking at energy consumption and noise levels. Compact design coupled with maximum storage space is also playing an increasingly important role. In addition, there is a desire for intelligent appliances that can be easily integrated into the home network. From the manufacturer's point of view, the challenge is to meet the stricter regulations on energy efficiency while at the same time ensuring the form factor and a reduction in costs. Our intelligent, compact, energy- and cost-efficient drive solutions for refrigerators and freezers meet the high customer requirements.



Infinite offers a comprehensive portfolio for refrigerator compressors. Whether you choose the highest level of integration with our intelligent power modules (IPM) or aim for the best price/performance ratio with discrete components, our IGBTs, MOSFETs, gate drivers, and microcontrollers are designed to work together seamlessly. CIPOST™ family of IPMs is the optimal solution for highly integrated compressor drives whilst discrete solutions like the 600 V RC-D2 IGBT or the CoolMOS™ PFD7 SJ MOSFET along with EiceDRIVER™ 600 V level-shift gate driver are the best choice whenever layout flexibility and thermal performance optimization are the key design targets. If full-load operation and EMI performance are key for the design, the 600 V RC-D2 IGBT is the best choice. The diode is monolithically integrated and its current rating has been optimized for price and performance. Both RC-D2 IGBT and CoolMOS™ PFD7 SJ MOSFET have introduced SOT-223 package to further improve the price with a smaller package that is pin-to-pin compatible and substitutable with the DPAK package. Beside inverter, motor control is also critical. Both PSoC™ and XMC™ microcontroller families are recommended. For the auxiliary power supply, the CoolSET™ family rounds up our power portfolio by offering increased robustness and performance. Our PSoC™ microcontroller family, AIROC™ Wi-Fi + Bluetooth® Combos connectivity products and XENSIV™ sensors complete the portfolio needed for a truly smart refrigerator. The energy-efficient CIPOST™ modules integrate various power and control components to increase reliability, optimize board size, and reduce system costs. This simplifies power supply design and shortens time-to-market. Infineon offers the OPTIGA™ Trust hardware security solution and enables secure access to all major cloud providers.



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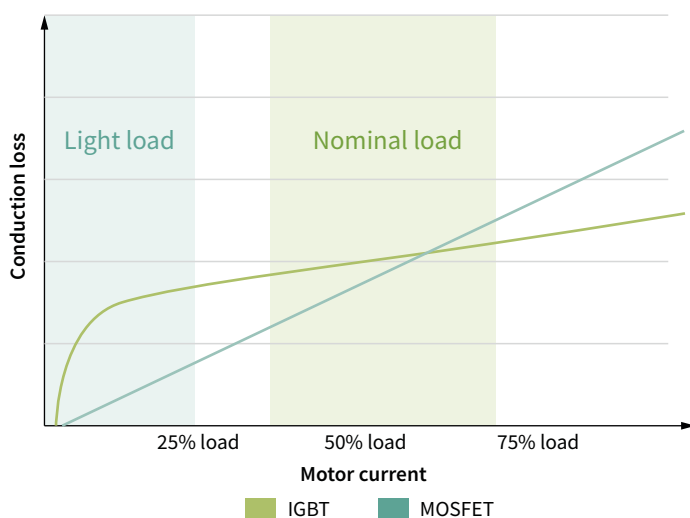
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CoolMOS™ PFD7 for next-level energy saving

Although both MOSFETs and IGBTs can be used in refrigerator compressor drives, as most of the time, the refrigerator operates under light load, the MOSFET is highly recommended due to its lower conduction loss, thus reducing overall power loss at this condition.

The 600 V CoolMOS™ PFD7 high-voltage MOSFET series, shaped by Infineon's experience of more than twenty years in pioneering in superjunction SJ technology innovation, sets a new benchmark in 600 V SJ technologies. This product family combines best-in-class performance with state-of-the-art ease of use, features an integrated fast body diode ensuring a robust device and allowing for reduced BOM for the customer.



Smart, connected and secured – system solutions for the new home appliance era

Modern refrigerators can sense their environment by being smart and connected. They provide data to their users as well as to the manufacturer (who can remotely analyze the performance data and suggest preventive maintenance). In this data exchange, secure communication systems play a crucial role.

Components and system solutions from Infineon enable you to build smart home appliances while providing secure data acquisition, control, and device connectivity. Furthermore, they enable the highest device efficiency, smallest form factors, and improved carbon footprint with smart power supply designs. Benefit from one of the most comprehensive, out-of-the-box product and design portfolios on the market to best meet your unique application needs.



Click here to learn more:

www.infineon.com/homeappliance

www.infineon.com/refrigerator

Recommended products

Functional block	Product family	Voltage class	Technology/product family	Selection/benefit
PFC	iMOTION™ driver	-	IMD112T-6F040	Motor/PFC controller incl. software and integrated driver
	Non-isolated EiceDRIVER™	25 V	1ED44171N01B	Integrated overcurrent protection
		25 V	1ED44175N01B	Cost/performance
	CoolMOS™ SJ MOSFETs	600 V	IPP60R120P7	Active and preferred
	CoolSiC™ Diodes	650 V	IDW30G65C5	Active and preferred
Compressor drive	EiceDRIVER™ gate driver ICs	600 V 650 V	6EDL04N06PT 2ED2304S06F	Level-shift three-phase or half bridge gate drivers with integrated bootstrap diode
	XMC™ and PSoC™ microcontroller	-	XMC1400; XMC1300: PSoC™ 4	Recommended
	iMOTION™ controller	-	IMC102T-F048	Motor/PFC controller incl. software
	iMOTION™ driver	-	IMD111T-6F040	Motor controller incl. software and integrated driver
	iMOTION™ IPM	-	IMM101T-046M	Motor/PFC controller incl. software, driver and power stage
	CIPOS™ IPM	-	CIPOS™ Micro IM241 series	Easy to use/system size saving Improved performance with RC-D2 technology
	RC-D2 IGBT	600 V	IKN04N60RC2 IKD06N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPN60R600PFD7S, IPD60R600PFD7S	Both DPAK and SOT-223 packages recommended while SOT-223 package achieve more cost-effective and improved form factor inverter design.
HMI	PSoC™ 6 and PSoC™ 4	-	CY8C62x4/5, CY8C40xx	Recommended
Connectivity Wi-Fi/BLE	AIROC™	-	CYW43439	Recommended
Auxiliary supply	CoolMOS™ SJ MOSFETs	800 V	IPN80R4K5P7	Active and preferred
	CoolSET™	700 V	ICE5AR4770BZS	Integrated package, BOM saving and simple to design
Security	OPTIGA™ Trust family	-	OPTIGA TRUST M SLS32AIA	Recommended
Sensing and condition monitoring	XENSIV™ radar sensor	-	BGT60LTR11AIP, BGT60UTR11, BGT60TR13C	Recommended
	XENSIV™ pressure sensor	-	DPS368	Recommended
	XENSIV™ MEMS microphones	-	IM69D130	Recommended
	XENSIV™ PAS CO ₂ sensor	12 V	PASCO2V01	Recommended
	XENSIV™ PAS CO ₂	5 V	PASCO2V15	Recommended
	XENSIV™ magnetic position sensors	-	TLV493D-A1B6	Recommended

XENSIV™ sensor solutions for smart refrigerators

Product category	Product family	Benefits
Sensors	XENSIV™ PAS CO ₂ sensor	Miniaturized, real CO2 sensor which fulfills WELL™ Building Standard; Ideal CO2 solution for commercial, residential and IoT applications
	XENSIV™ MEMS microphones IM69D130	High-performance microphone with low self-noise (high SNR) and low distortions enables noise monitoring for advanced predictive maintenance analytics
	XENSIV™ digital barometric pressure sensors DPSxxx	Advanced predictive maintenance analytics are enabled based on highest precision and relative accuracy over a wide temperature range to detect anomalies in airflow
	XENSIV™ TLV493D-A1B6 3D magnetic sensor	Accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package to enable vibration and position monitoring of the compressor
	XENSIV™ TLI4970 current sensor	Fully digital solution featuring high precision and ease of use, significantly reduces overall implementation efforts as well as PCB space to enable cost fan and compressor current measurement
	XENSIV™ 60 GHz radar sensor	Thanks to their small form factor and low power consumption, Infineon's highly integrated mmWave XENSIV™ 60GHz radar sensor solutions bring innovative and intuitive sensing capabilities to appliances like refrigerators. Radar has been demonstrated to be a powerful sensor for short range localization especially in smart home appliances



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www.infineon.com/homeappliance

www.infineon.com/refrigerator



Air purifier

Air purifier

Smart and efficient air quality improvement

Breathing in fresh, clean air has never been more vital for our health — and the next generation of air purifiers lets you take air quality to a whole new level. Today, the best smart air purifiers boast intelligent features like voice control apps that allow you to monitor particle levels, and schedule cleanings days in advance.

It takes time to filter all the air in a room, meaning these units usually operate continuously, making low energy consumption essential. Also since they operate in living spaces, low noise and vibration are also significant factors to consider. Sensors measure air quality, detect presence, and recognize gestures. Connectivity to integrate the air purifier into a smart home remote control can be achieved through Wi-Fi. At the same time, the user can interact with the device through a modern Human-Machine Interface (HMI) or voice control.

Highly integrated Infineon components for air purifiers provide high efficiency, low noise, and low energy consumption in motor drivers. A reliable wireless connectivity solution combined with high-accuracy sensing provides environmental intelligence and seamless connection with smart homes.

Features and benefits

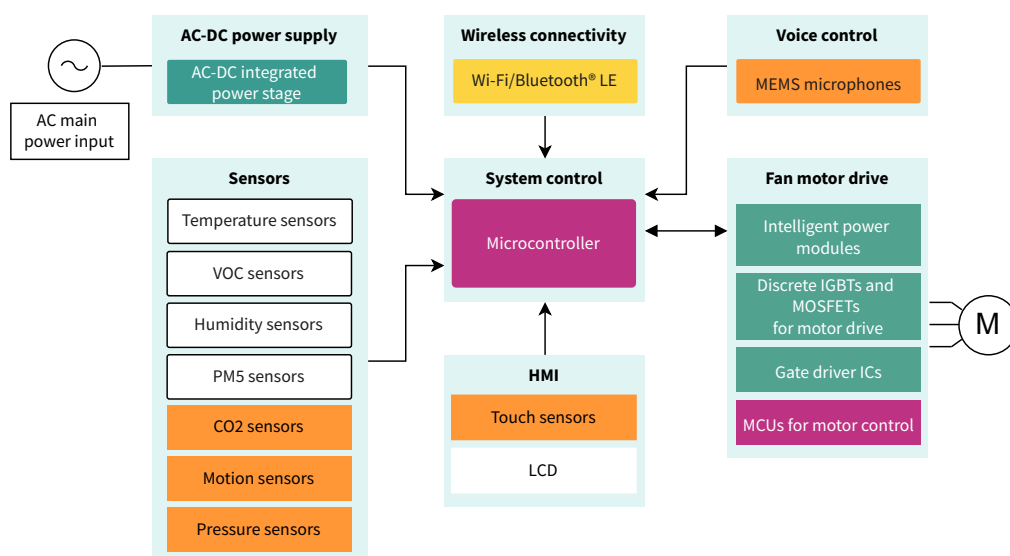
Key features

- Wide portfolio of highly integrated solutions
- Robust IPM motor control solutions
- Broad portfolio of innovative sensor solutions
- Reliable connectivity with Wi-Fi / BLE
- High reliable and market-proven Infineon products

Key benefits

- Reduced BOM cost and development effort, increased space saving
- Optimized system performance and reliability compared to discrete
- Measure air quality, turn off when not needed, save energy
- Smart home appliance
- Extend system lifetime

Application diagram



Click here to learn more:
www.infineon.com/air-purifier



Product portfolio

Functional block	Product	Product family	Specification	Benefits
AC-DC power supply	AC-DC integrated power stage	CoolSET™ AC-DC integrated power stages	ICE5AR4770BZS	<ul style="list-style-type: none"> Reduce BOM count and cost with integrated error amplifier Increase mid and light load efficiency with digital frequency reduction High power delivery with slope compensation for CCM operation
Sensing	CO2 sensor	XENSIV™ PAS CO2 sensors	PASCO2V01BUMA1	<ul style="list-style-type: none"> Superior accuracy, providing a direct readout of the real CO₂ level, not simply a correlation Size and cost advantages
	Motion sensing	XENSIV™ Radar	BGT60TR13C	<ul style="list-style-type: none"> Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy, Both stand-alone chip as well as system solution available
	Pressure sensor	XENSIV™ pressure sensors for IoT	DPS368	<ul style="list-style-type: none"> Fast, ultra-low noise read-out allows for precise measurement of air flow, and can be used in harsh environments with water, dust, or humidity
Wireless connectivity	Wi-Fi + Bluetooth® Combos	AIROC™ Wi-Fi + Bluetooth® Combos	CYW43439	<ul style="list-style-type: none"> Best-in-class interoperability to the widest deployed wireless IP Whole Home Range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks Ultralow-power technology designed with battery operation in mind
Central control	Microcontroller	PSoC™ 6 microcontrollers with Arm® Cortex®-M4 / M0+	CY8C6116BZI-F54, CY8C6145LQI-S3F42	<ul style="list-style-type: none"> Highly integrated HMI solution with capacitive touch sensing and TFT display PSoC™ 6 + Wi-Fi and Bluetooth® Combo: providing the total solution of IoT connectivity and security (cloud service, Mesh gateway)
Voice control	MEMS microphone	XENSIV™ MEMS microphones for consumer	-	<ul style="list-style-type: none"> High-performance microphone with low self-noise (high SNR) and low distortions, setting a the new performance benchmark for a superior user experience
HMI	Capacitive touch sensing controller	CAPSENSE™ capacitive touch sensing controllers	-	<ul style="list-style-type: none"> State-of-the-art noise immunity (SNR > 100:1) and water rejection Advanced inductive touch sensors make sleek, futuristic user interfaces possible
Motor control and drive (fan)	Intelligent power module	CIPOS™ Nano ultra compact three-phase MOSFET IPMs	IRSM836-045MA, IRSM836-035MB	<ul style="list-style-type: none"> Optimal solution for highly integrated fan motor drives and made for space-constrained applications with ultra compact footprint
		iMOTION™ highly integrated motor control IPMs	IMM101T-046M	<ul style="list-style-type: none"> Fastest time to market with no software development required, no inverter hardware design needed, and easy motor parametrization and tuning Lowest BOM cost with reduced BOM count and PCB size, sensorless FOC algorithm, and no need for additional PFC controller Additional application flexibility via scripting Smallest PCB footprint for 3-phase inverter with PQFN 12x12 mm, and no need for heatsink up to 80W
		iMOTION™ highly integrated motor controllers (IMC)	IMC101T-T038	<ul style="list-style-type: none"> Fastest time to market with no programming required and easy motor parametrization and tuning Lowest BOM cost with no external OPAMP or comparators required and single shunt sensorless FOC operation (leg shunt/ hall sensors optional) Full protection for power stage and motor Full flexibility on gate driver and power stage
	Discrete IGBT	600 V reverse conducting drives 2 RC-D2	IKN03N60RC2, IKN04N60RC2	<ul style="list-style-type: none"> Low switching losses and competitive price Improved controllability Humidity ruggedness Easy to design in products drop in SMD replacement in DPAK and SOT-223 High system reliability Enables inverterization of Small Appliance applications with SOT-223
	MOSFET	600 V CoolMOS™ PFD7 superjunction MOSFETs	IPN60R1K5PFD7S, IPN60R1K0PFD7S	<ul style="list-style-type: none"> Minimized switching losses Power density improvement compared to latest CoolMOS™ charger technology Increased efficiency and improved thermal behavior compared to CoolMOS™ CE technology for low power drives applications BOM cost reduction and easy manufacturing Robustness and reliability
	Gate driver IC	EiceDRIVER™ 600 V full-bridge three-phase gate driver ICs	6EDL04I06PT	<ul style="list-style-type: none"> Excellent ruggedness and noise immunity Integrated bootstrap diode, overcurrent protection, enable and fault reporting
		EiceDRIVER™ 650 V Infineon SOI half-bridge gate driver ICs	2ED2304S06F	<ul style="list-style-type: none"> Integrated Bootstrap Diode for reduced BOM cost 50% lower level shift losses leads lower temperature operation and higher reliability Latch-up immune increased reliability Flexible, small PCB footprint
	Microcontroller	XMC™ 32-bit XMC1000 industrial microcontrollers with Arm® Cortex®-M0	XMC1301-T038F0032 AB	<ul style="list-style-type: none"> Easy 3-phase inverter implementation with a single CCU8 PWM unit, offering shadow register transfer, external input for fault control, binary and floating pre-scaler, 16-bit to 64-bit width POSIF interface to directly connect hall sensors and incremental encoder. 12-bit ADC with on-chip adjustable gain of x1, x3, x6 or x12



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www.infineon.com/air-purifier



Induction cooking

Enabled by Infineon's high-efficiency power switches, secured connectivity, and touch sensor technology for the best cooking experience

The huge global market for induction cooking appliances, such as induction ranges, microwave ovens, and rice cookers, is characterized by great competition and price pressure. Along with this, manufacturers must meet rising consumer expectations and produce more reliable, energy-efficient appliances that offer a wide range of functions. Benefits such as faster cooking, advanced functionalities, easy cleaning, and safety features play a crucial role. Infineon products are well equipped to help you overcome all the challenges common to induction cooking appliances. Our solutions target the increased consumer expectations regarding modern home appliances: appliances must be energy-efficient and fully integrable, ensuring a high levels of safety and reliability. An intelligent, user-friendly, and secure user interface is essential. We support you in creating intuitive devices with an intelligent touch interface.

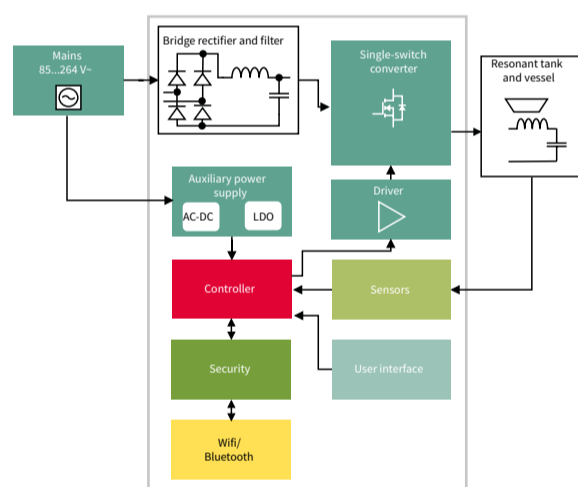
Features and benefits

Key features
- Complete system solution offerings for inverter, system control, auxiliary power, HMI, connectivity, sensor, security blocks
- Highly reliable and market-proven Infineon products
- Evaluation and reference boards
- Innovative reverse conducting IGBT technology
- Cutting-edge touch-sensing technologies
- Next generation CAPSENSE™ touch-sensing technology

Key benefits
- Faster time-to-market and saving system design efforts
- One-stop-shop
- Extend system lifetime and product life spans
- Fast prototyping and system verification
- Higher efficiency and better reliability
- "Just work" and deliver robustness and intelligence
- Fast user feedback even with wet interface

Induction heating inverter (voltage resonance)

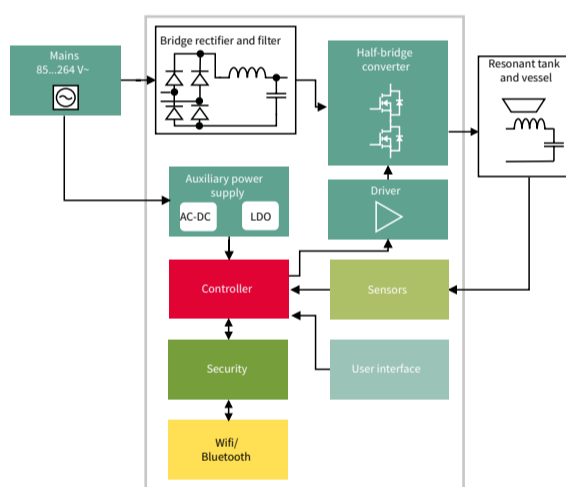
Single-switch



- Topology ideal for use in table top cookers up to 2.5 kW
- Using up to 1600 V rated reverse conducting IGBT
- Operation range: 20 - 40 kHz

Induction heating inverter (current resonance)

Half-bridge

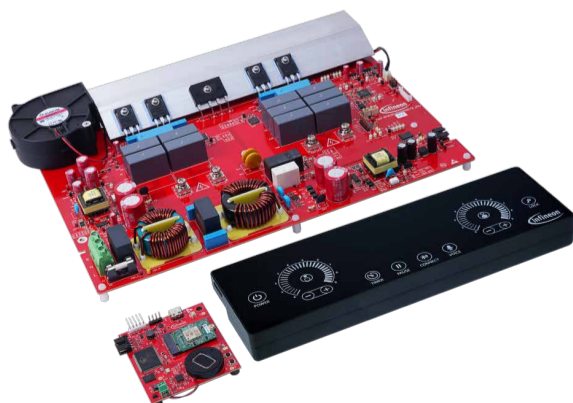


- Topology ideal for multi-hob induction integrated induction cooktop designs
- Operation range 25 - 75 kHz
- Half-bridge design allows use of lowest loss 650 V IGBT for high system efficiency

Induction cooking reference design REF-SHA3K3IHWR5SYS

The REF-SHA3K3IHWR5SYS Infineon induction cooktop reference design is a ready-to-go solution that offers a modern high performance half bridge topology, next generation CAPSENSE™ user interface and PSoC6™ AI connectivity module.

- PSoC™ with high sensitivity CAPSENSE™ control interface
- High efficiency 650 V 40 A IGBT half bridge inverter
- PSoC6™ for edge AI voice control and AIROC™ connectivity module



Click here to learn more:

www.infineon.com/induction-cooking
www.infineon.com/rch5

www.infineon.com/psoc64

Product portfolio

Functional block	Product	Product family	Specification	Benefits
Inverter (half-bridge/quasi-resonant)	IGBT discretes	Reverse conducting R6	650 V up to 75 kHz	– High performance and low losses
		Reverse conducting R5	650 V/1100 V/1200 V/1350 V/1600 V up to 60 kHz	– High performance and low losses
		Reverse conducting R5L	1400 V up to 60 kHz	– High performance and lower losses
	Gate driver	EiceDRIVER™ 1ED44173N01B, 1ED44175N01B,	Low-side gate driver/25 V	– 1ED integrated with overcurrent- protection fault and enable functions
		EiceDRIVER™ 1ED44171N01B		– Cost-effective
		EiceDRIVER™ 2ED2304S06F, 2ED2182S06F, 2EDL23I06PJ	Half-bridge gate driver/650 V/600 V	– SOI with integrated bootstrap diode
System control	Microcontroller	XMC™ 1000 series	32-bit Arm® Cortex®-M0	– #1 choice to bring traditional 8-bit designs to the next level
		XMC™ 4000 series	32-bit Arm® Cortex®-M4	– Successor to traditional DSP/DSC and 32-bit MCU solutions.
		PSoC™ 4 series	32-bit Arm® Cortex®-M0	– Tackled some of the complex portions of embedded system design making it easier
		PSoC™ 6 series	32-bit Arm® Cortex®-M4	– Dual-core Arm® Cortex®-M4 and Cortex®-M0+ architecture
Connectivity	Wireless connectivity	AIROC™ Wi-Fi + Bluetooth® combo	IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip	– Technical support through our global network of IoT partners
Aux power	CoolSET™	ICE5AR4770BZS	Up to 15 W flyback controller with integrated 700 V MOSFET	– Higher switching frequency to take advantage of smaller magnetics
HMI (Human-machine interface)	Microcontroller	PSoC™ 4 series	CAPSENSE™ technology	– Most flexible and scalable low-power mixed-signal architecture
Security	OPTIGA™ Trust	OPTIGA™ Trust M SLS32AIA	High-end security solution for connected consumer devices	– The OPTIGA™ Trust M is a high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud
Sensor	XENSIV™ radar sensors	BGT60LTR11AIP, BGT60UTR11AIP, BGT60TR13C	XENSIV™ highly integrated 60 GHz radar sensors for consumer electronics and IoT applications	– Energy and lifetime saving, small form factor



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Laundry machine

Laundry machine

Trusted solutions for efficient, secure, and intelligent performance

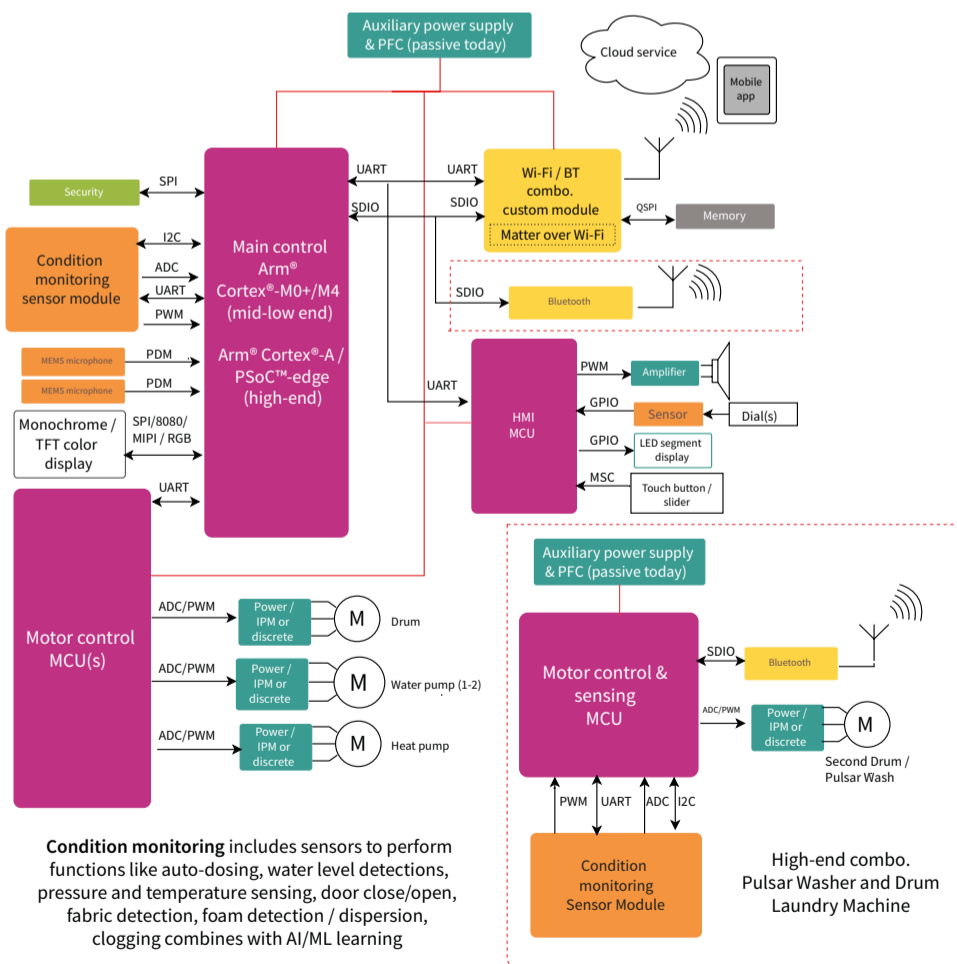
Modern laundry machines feature improved energy efficiency, low acoustic noise, water and detergent savings, as well as smart operating cycles. Thanks to our comprehensive product portfolio, we can support any type of laundry machines: fully-automatic front- or top-loading, semi-automatic top-loading, and fully-automatic washer-dryer combinations or twin-type washing machines.

Our laundry machine product portfolio addresses solutions across the system: power, motor power, drive and control, main controller, HMI, condition monitoring and sensing, and even security and networking such as our Matter-compliant connectivity solution.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> Full product portfolio coverage with Infineon CoolMOS™ MOSFET's, CoolSiC™ MOSFET's, IGBT's and CoolGa™ HEMT switching technologies 	<ul style="list-style-type: none"> One-stop-shop solutions provider for laundry machines
<ul style="list-style-type: none"> Leading position in motor control power with CIPOS™ Micro/Tiny/Mini Integrated Power Modules (IPM), EiceDRIVER™ gate drives, TRENCHSTOP™ IGBT6/7, CoolMOS™, CoolSiC™ and CoolGa™ together with 5th generation CoolSET™ auxiliary power supply technology 	<ul style="list-style-type: none"> System cost savings
<ul style="list-style-type: none"> Robust and reliable wireless connection coverage Wi-Fi 4 to Wi-Fi 6/6E, flexible usage, and future-proof compliant to Matter over Wi-Fi and Matter over Thread 	<ul style="list-style-type: none"> Highest power density and efficiency
<ul style="list-style-type: none"> XENSIV™ sensor solutions covering a wide range of use cases 	<ul style="list-style-type: none"> Ease of use and full compatibility
<ul style="list-style-type: none"> Total solution and reference design, e.g. mature CAPSENSE™ Touch, motor control, Wi-Fi/BT connectivity, advantage sensing, power and drives 	<ul style="list-style-type: none"> Advanced sensing solutions for holistic condition monitoring
<ul style="list-style-type: none"> Trust anchor for higher cryptographic operations required, OPTIGA™ Trust M hardware cryptographic accelerators will support host MCU with Matter onboarding 	<ul style="list-style-type: none"> Shorter time to market
	<ul style="list-style-type: none"> Enhanced security

Application diagram



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Product portfolio

Functional block	Product	Product family	Specifications	Benefits
Auxiliary power supply & PFC (passive)	ICE3BR0665J ICE3A2065ELJ ICE3RBR065JG ICE3A1065ELJ ICE3BR1765J ICE2QR1765G ICE2QR0665	CoolSET™ 5 th generation AC-DC integrated power stages	<ul style="list-style-type: none"> Integrated with 700 V and 800 V avalanche rugged CoolMOS™ P7 family Comprehensive protection features Integrated frequency reduction mode Auto-restart scheme to minimize interruption 	<ul style="list-style-type: none"> Increased robustness Higher efficiency Lower switching frequency at medium and light loads Zero standby power consumption
Motor power and drive – drum motor	IM323	CIPOS™ Tiny	<ul style="list-style-type: none"> Optimized for inverter power rating up to 1.5 hp Rugged SOI gate driver technology Latest TRENCHSTOP™ RCD2 technology with max. junction temperature 175°C Robust and pin-compatible design 	<ul style="list-style-type: none"> High integration and reduced footprint Fast time to market System cost savings from smaller footprint and reduced PCB space Optimized performance and package options available UL-certified package
	IM523-S/M/L/X	CIPOS™ Mini IM523 intelligent power modules (IMPs)	<ul style="list-style-type: none"> Best optimized performance for consumer and low power drive applications especially under high switching frequency applications Latest TRENCHSTOP™ 600 V RCD2 technology Market proven and reliable solution with high volume shipment record 	<ul style="list-style-type: none"> Fast time to market System cost savings from smaller footprint and reduced PCB space Optimized performance and package options available UL-certified package
	IKD06N65ET6 IKD08N65ET6 IKA08N65ET6 IKA10N65ET6 IKA15N65ET6	650 V TRENCHSTOP™ IGBT6	<ul style="list-style-type: none"> Lowest switching losses and improved EMI SC rating up to 3 μs For medium to high frequency converters Portfolio: 6 to 15 A, with/out FWD diodes, DPAK, TO-220FP 	<ul style="list-style-type: none"> Design flexibility and customization Excellent thermal performance, especially at higher frequencies Performance optimized up to 30 kHz
	IKD10N60RC2 IKD15N60RC2	600 V TRENCHSTOP™ RC-D2	<ul style="list-style-type: none"> SC rating up to 3 μs For low to medium frequency converters Portfolio: 3 to 15 A DPAK, 1 to 6 A SOT-223 	<ul style="list-style-type: none"> Cost-optimized monolithically integrated diode in surface mount packages Design flexibility and customization – drop-in replacement available in DPAK and SOT223 Thermal optimization
	IPD/IPN /IPS/ IPLK/IPAN 70R360P7S IPD/IPN /IPS/ IPLK/IPAN 70R600P7S IPD/IPN / IPS/IPLK/ IPAN70R900P7S IPD/IPN / IPS/IPLK/ IPAN70R1K4P7S	CoolMOS™ P7 SJ MOSFETs CoolMOS™ PFD7 SJ MOSFETs	<ul style="list-style-type: none"> Supports increased switching frequency to reduce magnetics Integrated Zener diode for ESD protection ≤ HBM class 2 Increased design flexibility while maintaining the industry's fastest reverse recovery time (trr) optimized for home-appliance motor drives 	<ul style="list-style-type: none"> Perfect combination of highest efficiency, excellent ease-of-use and an outstanding portfolio granularity Price competitiveness compared to similar technologies Extra safety margin for repetitive hard commutation and reduced design-in effort
	2ED2304S06F 6EDL04x06xT	Half-bridge & 3-phase EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Fully operational up to +650 V Integrated bootstrap diode (BSD) Tolerant to negative transient voltage (-VS) up to 100 V Low level-shift loss in high frequency applications (below) 	<ul style="list-style-type: none"> 30 years of product leadership (first HVIC driver in 1989) State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	Motor power and drive – water drain pump/pulsar or water circulation pump	IM241-S6S1J/B IM241-M6S1J/B IM241-L6S1B IM241-S6T2J/B IM241-M6T2J/B IM241-L6T2B	CIPOS™ Micro intelligent power modules (IPMs) IM241 series	<ul style="list-style-type: none"> 600 V 3-phase inverter including gate drivers and bootstrap function Fault reporting and programmable fault clear Optimized dV/dt for loss and EMI trade offs Accurate overcurrent shutdown (±5%) Advanced input filter with shoot-through protection Compact package dimension (29x12x2.9 mm)
IKD06N65ET6 IGD06N65T6		650 V TRENCHSTOP™ IGBT6	<ul style="list-style-type: none"> Lowest switching losses and improved EMI, SC rating up to 3 μs For medium to high frequency converters Portfolio: 6 to 15 A, with/out FWD diodes, DPAK, TO220FP 	<ul style="list-style-type: none"> Design flexibility and customization Excellent thermal performance, especially at higher frequencies Performance optimized up to 30 kHz
IKN01N60RC2 IKN03N60RC2 IKN04N60RC2 IKN06N60RC2 IKD04N60RC2 IKD06N60RC2		600V TRENCHSTOP™ RC-D2	<ul style="list-style-type: none"> SC rating up to 3 μs For low to medium frequency converters Portfolio: 1 to 6 A SOT-223 	<ul style="list-style-type: none"> Cost optimized monolithically integrated diode in surface mount packages Design flexibility and customization – drop-in replacement available in DPAK and SOT223 Thermal optimization



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Functional block	Product	Product family	Specifications	Benefits
Motor power and drive – water drain pump/pulsar or water circulation pump	IPD60R1K0PFD7S IPN60R1K5PFD7S	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> Integrated Zener diode for ESD protection (HBM Class 2) Integrated fast body diode with ultralow Qrr Portfolio with wide range of $R_{DS(on)}$ values $\leq 2 \Omega$ Supporting cost effective designs with SMD solutions 	–
	6EDL04x06xT 2ED2304S06F	Half-bridge and 3-phase EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Fully operational up to +650 V Integrated bootstrap diode (BSD) Tolerant to negative transient voltage (-VS) up to 100 V Low level-shift loss in high frequency applications 	<ul style="list-style-type: none"> 30 years of product leadership from (first HVIC driver in 1989) State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	1ED44173/5/6N01 1ED44171N01B IR4427 IRS4427 IRS44273	Low-side EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Integrated overcurrent protection (OCP) and fault reporting Accurate (+/-5%), fast, overcurrent protection for PFC in home appliances 	<ul style="list-style-type: none"> Comprehensive portfolio of single and dual channel low-side drivers Cost and space-effective Market-proven
Motor power and drive – heat pump	IKCM15/20L60GA IKCM20L60GD IM535 U6D (30 A)	CIPOS™ Mini intelligent power modules (IMPs)	<ul style="list-style-type: none"> Broad portfolio from inverter (3ph) to PFC+ inverter in a single package High integration of bootstrap circuit, thermistor, as well as PFC Excellent peak current capability to handle high current at startup 	<ul style="list-style-type: none"> Market proven solution chosen by global leading washing machine OEMs/ODMs Excellent thermal performance Higher power capability Minimized system size and assembly process
	IKD10N60RC2	TRENCHSTOP™ 6 IGBT RC-D2	<ul style="list-style-type: none"> Monolithically integrated diode Operating range up to 20 kHz Short circuit capability 3 μs at 400 V Vcc , TC = 150°C Drop-in SMD replacement in DPAK and SOT Pb-free lead plating, RoHs compliant 	<ul style="list-style-type: none"> Low switching losses on competitive price Humidity ruggedness improvement High system reliability Improved controllability Easy to design in products
	6EDL04N06PT	Half-bridge and 3-phase EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Integrated bootstrap diode Overcurrent protection Enable and fault reporting 	<ul style="list-style-type: none"> Space saving package Improved energy efficiency State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	IKWH20N65WR6	TRENCHSTOP™ 5 IGBT	<ul style="list-style-type: none"> Lowest $V_{CE(sat)}$ 1.4 V at 25°C Monolithically integrated diode Lowest E_{sw} High creepage and clearance package 	<ul style="list-style-type: none"> Improved price-performance ratio Optimized diode for PFC and welding applications Lowest switching losses Improved reliability against package contamination
	IKWxxN65RH5 IKWxxN65SS5 IKZAxN65RH\5 AIKWxxN65RF5 IKZAxN65SS5	CoolSiC™ hybrid discretes	<ul style="list-style-type: none"> Reduced voltage-overshoots (caused by di/dt of silicon diode), low EMI Ultra-short IGBT response time due to sense pin Best-in-class fast switching TRENCHSTOP™ 5 IGBT combined with with SiC Schottky barrier diode 4-pin Kelvin emitter package 	<ul style="list-style-type: none"> High efficiency for reduced cooling effort or increased power density Higher frequency operations Bidirectional current flow Easy design replacement with TRENCHSTOP™ 5 IGBT
	F3L200Ro7W255F_B11 F3LxxRO7W2H3F_B11 FS3LxxRO7W2H5F_B11 DFxxRO7WIH5FP_Bxx	EasyPACK™ IGBT modules	<ul style="list-style-type: none"> Compact module design Reliable mounting system PCB layout-friendly Configuration flexibility High reliability and quality 	<ul style="list-style-type: none"> Great platform flexibility for customized solutions optimized for end-system needs Comprehensive portfolio of available chip technologies
Motor control microcontroller	PSoC™ 4100S PSoC™ 4100s Plus PSoC™ 4500S	PSoC™ 4	<ul style="list-style-type: none"> Integrated with OPA/CMP, TCPWM, Supported by mature, validated and reliable motor control algorithm and total solution for home appliances 	<ul style="list-style-type: none"> Reduce system BOM cost Total solution with full set of features and protections Fast time to market
	XMC7000 XMC1302 XMC1402	XMC™	<ul style="list-style-type: none"> Versatile real-time motor and power stage control peripherals CORDIC maths processor for complex trigonometric calculation for motor control algorithms 	<ul style="list-style-type: none"> Scalable to various control schemes from single motor up to dual motor and PFC control
Main controller microcontroller	PSoC™ 4100S Plus PSoC™ 4100T	PSoC™ 4	<ul style="list-style-type: none"> HMI and system control (2-in-1 solution) Large pin pitch package, Wide voltage range Integrated with OPA/CMP, TCPWM 	<ul style="list-style-type: none"> Reliable and stable capacitive touch sensing Full set of features and protections, Fast time to market Reduced BOM cost
HMI, MPU, & Edge Ai/ML computing	PSoC™ E81 PSoC™ E83 PSoC™ E84	PSoC™ Edge	<ul style="list-style-type: none"> 32-bit MCU subsystems Based on high performance Arm® Cortex®-M55, including Helium™ DSP support paired with Arm® Ethos™-U55 and Cortex®-M33 paired Infineon's ultra-low power NNLite neural network accelerator Secured enclave based on Infineon Edge Protect Technology 	<ul style="list-style-type: none"> Supporting both "always-on" low power and high-performance operation, in a fully integrated MCU with right-sized peripheral and on-chip memories Advanced machine learning capabilities: voice and natural language processing, vision, pressure/gesture/motion, predictive maintenance, and anomaly detection Audio/voice Motor control



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Functional block	Product	Product family	Specifications	Benefits
Condition monitoring & sensing	DPS368	XENSIV™ barometric pressure sensor	<ul style="list-style-type: none"> Pressure sensor for water pressure and filter clogage High precision and accuracy: Precision: ±0.002 hPa Rel. accuracy: ± 0.06 hPa 	<ul style="list-style-type: none"> IPX8 certified for additional robustness (water, dust, humidity) Software solution and turnkey solution available for high-end presence detection Small size
	BGT60TR13C	XENSIV™ Radar 60 GHz	<ul style="list-style-type: none"> Sense presence up to 10 m (very high sensitivity, even recognizes breathing and tiny motions) 	<ul style="list-style-type: none"> 60 GHz with integrated antennas to reduce design-effort Software solution and turnkey solution available for high-end presence detection
	BGT60LTR11AIP	XENSIV™ Radar 60 GHz	<ul style="list-style-type: none"> Sense motion up to 10 m without using a microcontroller 	<ul style="list-style-type: none"> System cost effective Motion detection
	TLI493D-W2BW TLx496x TLI4971 TLI4966G TLE4997E2	XENSIV™ Hall sensors XENSIV™ current sensors	<ul style="list-style-type: none"> Contactless measurement principle minimizing wear and tear: position, speed and direction monitoring of components, linear movement and vibration open/close lid detection 	<ul style="list-style-type: none"> Contactless measurement principle minimizing wear and tear Door contact, weight and imbalance measurements using XENSIV™ Hall sensors Better design flexibility as with mechanical/resistive solution
	TLI493D-W2BW	3D magnetic sensors	<ul style="list-style-type: none"> 3D sensor in WLB package Software modules supporting XMC™ and PSoC™ 	<ul style="list-style-type: none"> Improved mechanical design flexibility with 3D hall technology Push and rotation functionality with a single sensor (e.g., HMI interfaces) Extremely small size, slim PCB design, high design flexibility (lateral, vertical)
	IM69D128S IM72D128 IM68A130 IM70A135 IM73A135	XENSIV™ MEMS microphone	<ul style="list-style-type: none"> Highest SNR to detect voice in noisy devices and from long distances Ultrasonic measurements 	<ul style="list-style-type: none"> Noise monitoring at motor and compressor
Water level detection (CAPSENSE™ & inductive sensing)	PSoC™ 4000T	PSoC™ 4	<ul style="list-style-type: none"> 32-bit MCU subsystem, 48-MHz Arm® Cortex®-M0+ CPU with single-cycle multiply Low-power 1.71 V to 5.5 V operation Fifth-generation CAPSENSE™ sensing Serial communication - reconfigurable I2C, SPI or UART functionality in one block with master/slave I2C functionality in the other Timing and pulse-width modulation Up to 21 programmable GPIO pins ModusToolbox™ software 	<ul style="list-style-type: none"> Ultralow power touch HMI solution based on an integrated "Always-On" sensing technology Robust and reliable touch HMI solution for harsh environments Low power operation and improved performance to enable next generation of user experience Industry-standard tool compatibility Comprehensive collection of multi-platform tools and software libraries
Security	OPTIGA™ Trust X	OPTIGA™ Trust	<ul style="list-style-type: none"> CC EAL 6+ security level Connected device security 10 kByte NWM ECC384 cryptography I2C interface 	<ul style="list-style-type: none"> Shorter time to market Cost effective solution Zero touch provisioning Protection Future-proven
	OPTIGA™ Trust M	OPTIGA™ Trust	<ul style="list-style-type: none"> Connected device security, toolbox based CC EAL 6+ security level 10 kByte security level ECC384 /RSA2K cryptography I2C interface 	<ul style="list-style-type: none"> One-stop-shop turnkey solution Shorter time to market Cost reduction Zero touch provisioning Protection Future-proven
Authentication	OPTIGA™ Trust B	OPTIGA™ Trust	<ul style="list-style-type: none"> Basic security level Authentication 64 Byte NWM ECC131 cryptography SWI interface 	<ul style="list-style-type: none"> One-stop-shop turnkey solution Shorter time to market - Cost reduction Zero touch provisioning Protection Future-proven
	SLE954150017XTSA1	OPTIGA™ Authenticate S	<ul style="list-style-type: none"> 4 authentication modes (one-way, mutual, host binding and host support) 4 lifecycle counters with independent kill structures 3 types of lockable NVM sizes (1 K, 2 K, 5 Kbit) 3 temperature options (standard -40 to 85°C/ extended -40 to 105°C/ special -40 to 120°C) 2 ECC 163-bit key pairs and 193-bit ODC 2 serial communication options (on-chip SWI&I2C + GPO) Host code software - with new OS library 1.5 x 1.5 x 0.38 mm PG-TSNP-6-12 package Asymmetric cryptography with secured unique identity for each chip Infinion proprietary protection against reverse engineering (PRE) Message authentication code providing mutual authentication Capless Low dropout (LDO) regulator 	<ul style="list-style-type: none"> Protection of OEMs and consumers against counterfeited devices Additional customer services, such as alerts when spare parts need replacing No need to invest in security know-how Effortless implementation with full system integration support including embedded software, host software, full reference board based on PSoC™ 6 and with demo software and full documentation Tiny and robust TSNP SMD package optimized for small devices gives freedom to design even very small products
Connectivity	CYW4338/9, CYW43012	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 4	<ul style="list-style-type: none"> Unique home appliances solution offering Wi-Fi 4, Bluetooth® 5 and WPA 3 allowing smart home certification (WFA certificate) 	<ul style="list-style-type: none"> Ease of use and full compatibility Connectivity for remote management Cost-effective solution
	CYW4373/E	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 5	<ul style="list-style-type: none"> Wi-Fi 5 dual band (2.4 GHz and 5 GHz) Capable of beam-forming for increased range External PA (E-version) on module also increasing range 	<ul style="list-style-type: none"> Ease of use and full compatibility Connectivity for remote management High data throughput
	CYW55513 CYW55571/2/3	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 6	<ul style="list-style-type: none"> Tri-band, (2.4 GHz, 5 GHz, 6 GHz) Target wake time (TWT): Today router is master, but it allows end device to negotiate with the router when to wake up Higher modulation schemes: Even higher data throughput 	<ul style="list-style-type: none"> Ease of use and full compatibility Congestion and future proof Low power consumption
	CYW20829	AIROC™ Bluetooth® LE BT5.2	<ul style="list-style-type: none"> Highly integrated Bluetooth® LE 5.4 MCU 96 MHz Arm Cortex M33 - Application MCU 48 MHz Arm Cortex M33 - Bluetooth® Sub-system 256 KB / 96 KB SRAM - Bluetooth® LE 48 MHz QSPI/SMIF with XIP, 32 KB Cache On-the-fly encryption for off-chip Flash Secure Boot & Crypto HW engine TX Power: up to +10 dBm Robust Receive sensitivity of -106 dBm 1.7 to 3.6 V supply voltage range 32 Programmable GPIO Upto 85°C operating temperature 	<ul style="list-style-type: none"> Industry's best range and noise immunity Future proof your designs and unlock new use cases with Bluetooth® LE 5.4 Reduce system cost with highly integrated MCU and "right sized" external flash Longer battery life with low power connection No dongle for ultra low latency HID
	CYW20835	AIROC™ Bluetooth® LE BT5.4	<ul style="list-style-type: none"> 96 MHz Arm® Cortex® M4 microcontroller unit MCU with floating point unit (FPU) Supports serial wire debug (SWD) Runs Bluetooth® stack and application Complies with Bluetooth® core specification 5.4 Supports Adaptive Frequency Hopping (AFH) Programmable TX power up to 12 dBm Rx sensitivity -94.5 dBm (Bluetooth® LE) 	<ul style="list-style-type: none"> Reliable and robust connectivity due to superior RF performance Ability to do compute at the edge for Bluetooth® LE use cases Built on market proven wireless IP maximum interoperability



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Tumble dryer

Tumble dryer

Elevating performance with smart, efficient, and secure semiconductor solutions

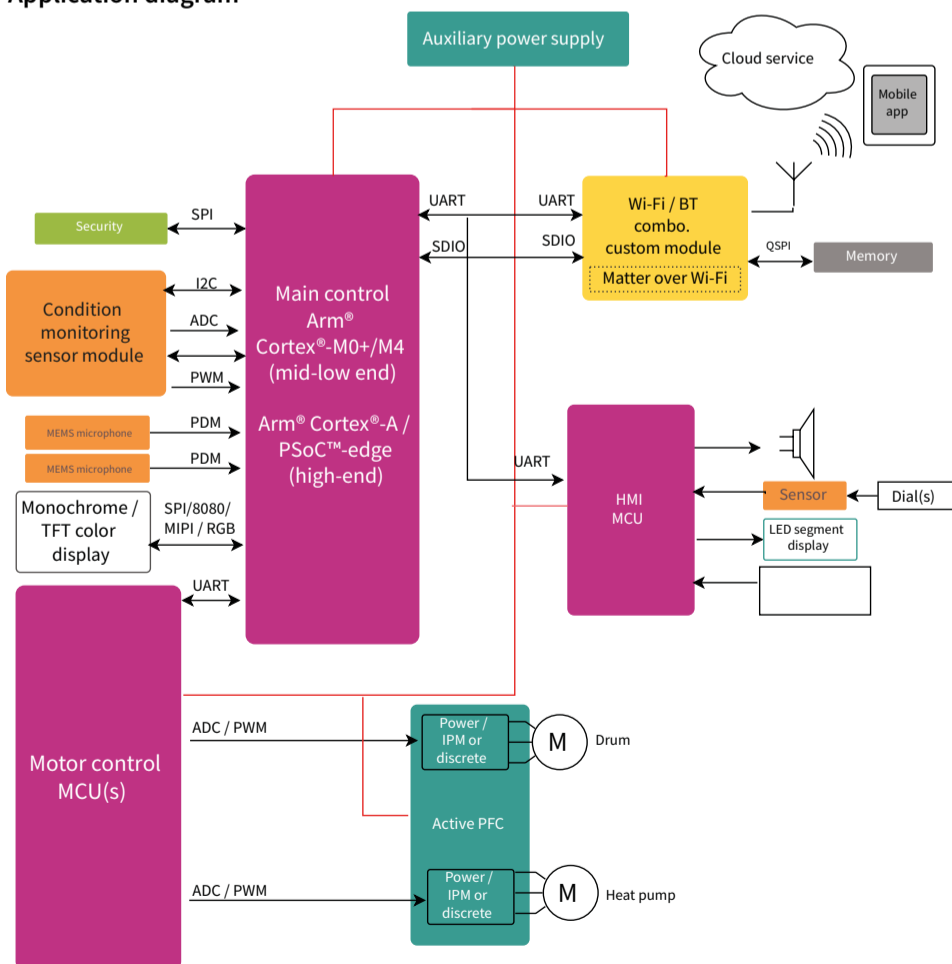
Smart dryer designs keep evolving with new features such as wireless connectivity, voice recognition, advanced sensing capabilities, predictive maintenance, and energy-efficient heat pump systems to enhance functionality, efficiency, and seamless integration into both commercial and residential IoT ecosystems. Our products and system solutions help you design dryers with maximum energy efficiency, reliable and precise sensing solutions, and advanced control, connectivity, and security solutions.

Infiniteon offers complete system solutions for all major components ranging from AC-DC power supply to advanced motor control systems and embedded microcontroller units (MCU), through connectivity, security, power management systems, and interfacing, to home networking solutions. Also, in a smarter world, our new machine learning (ML) and artificial intelligence (AI), edge-based MCUs offer real cost-effective ways to improve the user experience and appeal of home appliances.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> Full product portfolio coverage with Infineon CoolMOS™ MOSFET's, CoolSiC™ MOSFET's, IGBT's and CoolGaN™ HEMT switching technologies. Leading position in motor control power with CIPOS™ Micro/Tiny/Mini Integrated Power Modules (IPM), EiceDRIVER™ gate drive, TRENCHSTOP™ IGBT6/7, CoolMOS™, CoolSiC™ and CoolGaN™ together with 5th generation CoolSET™ auxiliary power supply technology Robust and reliable wireless connection coverage Wi-Fi 4 to Wi-Fi 6/6E, flexible usage, and future-proof compliant to matter over Wi-Fi and matter over Thread XENSIV™ sensor solutions covering a wide range of use cases Total solution and reference design, e.g., Mature CAPSENSE™ Touch, motor control, Wi-Fi/BT connectivity, advantage sensing, power drive, and more Trust anchor for higher cryptographic operations required, OPTIGA™ Trust M hardware cryptographic accelerators will support host MCU with Matter onboarding 	<ul style="list-style-type: none"> One-stop-shop solutions for the tumble dryers covering System cost-savings Highest power density and efficiency Ease of use and full compatibility Advanced sensing solutions for holistic condition monitoring Shorter time to market Enhanced security

Application diagram



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Product portfolio

Functional block	Product	Product family	Specifications	Benefits
Auxiliary power supply	ICE3BR0665J ICE3A2065ELJ ICE3RBR065JG ICE3A1065ELJ ICE3BR1765J ICE2QR1765G ICE2QR0665	CoolSET™ 5 th generation AC-DC integrated power stages	<ul style="list-style-type: none"> Integrated with 700 V and 800 V avalanche rugged CoolMOS™ P7 family Comprehensive protection features Integrated frequency reduction mode Auto-restart scheme to minimize interruption 	<ul style="list-style-type: none"> Increased robustness Higher efficiency Lower switching frequency at medium and light loads Zero standby power consumption
Motor power and drive – drum motor inverter	IM241-L6T2B IM241-L6S1B	CIPOS™ Micro intelligent power modules (IPMs)	<ul style="list-style-type: none"> Compact package size (20%+ smaller than competitors) Wide range of footprint compatible part numbers Temperature feedback option Screw hole available for heatsink mount 	<ul style="list-style-type: none"> Fast time to market System cost savings from smaller footprint and reduced PCB space Optimized performance and package options available UL certified package
	IM523-S/M/L/X	CIPOS™ Mini IM523 intelligent power modules (IPMs)	<ul style="list-style-type: none"> Best optimized performance for consumer and low power drive applications especially under high switching frequency applications Latest TRENCHSTOP™ 600 V RCD2 technology Market proven and reliable solution with high volume shipment record 	<ul style="list-style-type: none"> Fast time to market System cost savings from smaller footprint and reduced PCB space Optimized performance and package options available UL certified package
	IKN01N60RC2 IKN03N60RC2 IKN04N60RC2 IKN06N60RC2 IKND04N60RC2 IKND06N60RC2 IKND10N60RC2 IKND15N60RC2	TRENCHSTOP™ 6 IGBT RC-DC	<ul style="list-style-type: none"> Optimized half rated diode and 3 μs SC capability -600 V reverse conducting drives 	<ul style="list-style-type: none"> Better controllability over the di/dt in order to further reduce EMI compared to RC-DC series Improved high voltage humidity robustness Ease to design products – drop-in replacement RC-DC2 available in DPAK and SOT-223 Low switching losses at competitive price, setting a new price/performance standard
	IPD/IPN /IPS/ IPLK/IPAN 70R360P7S IPD/IPN /IPS/ IPLK/IPAN 70R600P7S IPD/IPN / IPS/IPLK/ IPAN70R900P7S IPD/IPN / IPS/IPLK/ IPAN70R1K4P7S	CoolMOS™ P7 SJ MOSFETs CoolMOS™ PFD7 SJ MOSFETs	<ul style="list-style-type: none"> Supports increased switching frequency to reduce magnetics Integrated Zener diode for ESD protection ≤ HBM class 2 Increased design flexibility while maintaining the industry's fastest reverse recovery time (trr) optimized for home appliance motor drives 	<ul style="list-style-type: none"> Perfect combination of highest efficiency, excellent ease of use and an outstanding portfolio granularity Price competitiveness compared to similar technologies Extra safety margin for repetitive hard commutation and reduced design-in effort
	2ED2304S06F 6EDL04x06xT	Half-bridge and 3-phase EiceDRIVER™ gate driver ICs	<ul style="list-style-type: none"> Fully operational up to +650 V Integrated bootstrap diode (BSD) Tolerant to negative transient voltage (-VS) up to 100 V Low level-shift loss in high frequency applications (below) 	<ul style="list-style-type: none"> 30 years of product leadership from IRF portfolio (first HVIC driver in 1989) State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	IM241-S6S1J/B IM241-M6S1J/B IM241-L6S1B IM241-S6T2J/B IM241-M6T2J/B IM241-L6T2B	CIPOS™ Micro intelligent power modules (IPMs) IM241 series	<ul style="list-style-type: none"> 600 V 3-phase inverter including gate drivers and bootstrap function Fault reporting and programmable fault clear Optimized dV/dt for loss and EMI trade offs Accurate overcurrent shutdown (±5%) Advanced input filter with shoot-through protection Compact package dimension (29x12x2.9 mm) 	<ul style="list-style-type: none"> Easy design-in and fast time to market High performance and efficiency for motor drives up to 500 W Optimized loss/EMI based for washing machines Superior humidity robustness (H3TRB-test qualified) Cost and space-effective
IKN01N60RC2 (SOT-223) IKN03N60RC2 (SOT-223) IKN04N60RC2 (SOT-223) IKN06N60RC2 (SOT-223) IKD04N60RC2 (DPAK) IKD06N60RC2 (DPAK)	TRENCHSTOP™ 6 IGBT RC-D2 600 V	<ul style="list-style-type: none"> Cost optimized monolithically integrated diode in surface mount packages SC rating up to 3 μs For low to medium frequency converters Portfolio: 3 to 15 A DPAK; 1 to 6 A SOT-223 	<ul style="list-style-type: none"> Better controllability over the di/dt to further reduce EMI compared to RC-D/DF series Improved high voltage humidity robustness Easy to design products - drop in replacement RC-D2 available in DPAK and SOT-223 Low switching losses at competitive price, setting a new price/performance standard 	



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Functional block	Product	Product family	Specifications	Benefits
Motor power and drive – water drain pump/ pulsar or water circulation pump inverter	6EDL04x06xT 2ED2304S06F	Half-bridge and 3-phase EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Fully operational up to +650 V Integrated bootstrap diode (BSD) Tolerant to negative transient voltage (-VS) up to 100 V Low level-shift loss in high frequency applications 	<ul style="list-style-type: none"> 30 years of product leadership from IRF portfolio (first HVIC driver in 1989) State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	1ED44173/5/6N01 1ED44171N01B IR4427 IRS4427 IRS44273	Low-side EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Integrated overcurrent protection (OCP) and fault reporting Accurate (+/-5%), fast, overcurrent protection for PFC in home appliances 	<ul style="list-style-type: none"> Comprehensive portfolio of single and dual channel low-side drivers Cost and space-effective Market-proven
Motor power and drive – heat pump inverter	IKCM15/20L60GA IKCM20L60GD IM535-U6D (30 A)	CIPOS™ Mini intelligent power modules (IMPs)	<ul style="list-style-type: none"> Broad portfolio from inverter (3ph) to PFC+ inverter in a single package High integration of bootstrap circuit, thermistor, as well as PFC Excellent peak current capability to handle high current at startup 	<ul style="list-style-type: none"> Market proven solution chosen by global leading washing machine OEMs/ODMs Excellent thermal performance Higher power capability Minimized system size & assembly process
	IKD10N60RC2	TRENCHSTOP™ 6 IGBT RC-D2	<ul style="list-style-type: none"> Monolithically integrated diode Operating range up to 20 kHz Short circuit capability 3 μs at 400V Vcc , TC = 150°C Drop-in SMD replacement in DPAK and SOT Pb-free lead plating, RoHs compliant 	<ul style="list-style-type: none"> Low switching losses on competitive price Humidity ruggedness improvement High system reliability Improved controllability Easy to design in products
	6EDL04N06PT	Half-bridge & 3-phase EiceDRIVER™ Gate Driver ICs	<ul style="list-style-type: none"> Integrated bootstrap diode Overcurrent protection Enable and fault reporting 	<ul style="list-style-type: none"> Space saving package Improved energy efficiency State-of-the-art Infineon SOI technology for superior operational ruggedness and higher frequency switching
	IKWH20N65WR6	TRENCHSTOP™ 5 IGBT	<ul style="list-style-type: none"> Lowest $V_{CE(sat)}$ 1.4 V at 25°C Monolithically integrated diode Lowest E_{sw} High creepage and clearance package 	<ul style="list-style-type: none"> Improved price-performance ratio Optimized diode for PFC and welding applications Lowest switching losses Improved reliability against package contamination
	IKWxxN65RH5 IKWxxN65SS5 IKZAxxN65RH\5 AIKWxxN65RF5 IKZAxxN65SS5	CoolSiC™ hybrid discretes	<ul style="list-style-type: none"> Reduced voltage-overshoots (caused by dI/dt of silicon diode), low EMI Ultrashort IGBT response time due to sense pin Best-in-class fast switching TRENCHSTOP™ 5 IGBT combined with SiC Schottky barrier diode 4-pin Kelvin emitter package 	<ul style="list-style-type: none"> High efficiency for reduced cooling effort or increased power density Higher frequency operations Bidirectional current flow Easy design replacement with TRENCHSTOP™ 5 IGBT
	F3L200Ro7W255F_B11 F3LxxRO7W2H3F_B11 FS3LxxRO7W2H5F_B11 DFxxxRO7WIH5FP_Bxx	EasyPACK™ IGBT modules	<ul style="list-style-type: none"> Compact module design Reliable mounting system PCB layout-friendly Configuration flexibility High reliability and quality 	<ul style="list-style-type: none"> Great platform flexibility for customized solutions optimized for end-system needs Comprehensive portfolio of available chip technologies
Motor control – microcontroller HMI, CAPSENSE™, & inductive sensing on PSoC™ 4 Series	PSoC™ 4100S PSoC™ 4100s Plus PSoC™ 4500S	PSoC™ 4	<ul style="list-style-type: none"> HMI and system control (2-in-1 solution) Large pin pitch package, Wide voltage range Integrated with OPA/CMP, TCPWM 	<ul style="list-style-type: none"> Reliable & stable capacitive and inductive touch sensing Full set of features and protections, Fast time to market Reduced BOM cost
	XMC7000 XMC1302 XMC1402	XMC™	<ul style="list-style-type: none"> Versatile real-time motor and power stage control peripherals CORDC Maths accelerator for complex algorithm functions for motor control 	<ul style="list-style-type: none"> Scalable to various control schemes from single motor up to dual motor and PFC control
Main controller - microcontroller	PSoC™ 4100S Plus PSoC™ 4100T	PSoC™ 4	<ul style="list-style-type: none"> HMI and system control (2-in-1 solution) Large pin pitch package, Wide voltage range Integrated with OPA/CMP, TCPWM 	<ul style="list-style-type: none"> Reliable and stable capacitive touch sensing Full set of features and protections, Fast time to market Reduced BOM cost
HMI, MPU, & Edge Ai/ML computing	PSoC™ E81 PSoC™ E82 PSoC™ E84	PSOC™ Edge	<ul style="list-style-type: none"> 32-bit MCU subsystems Based on high performance Arm® Cortex®-M55, including Helium™ DSP support paired with Arm® Ethos™-U55 and Cortex®-M33 paired Infineon's ultra-low power NNLite neural network accelerator Secured enclave based on Infineon Edge Protect Technology 	<ul style="list-style-type: none"> Supporting both “always-on” low power and high-performance operation, in a fully integrated MCU with right-sized peripheral and on-chip memories. Advanced machine learning capabilities: voice and natural language processing, vision, pressure/gesture/motion, predictive maintenance and anomaly detection Audio/voice Motor control



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Functional block	Product	Product family	Specifications	Benefits
Conditional monitoring & sensing	DPS368	XENSIV™ barometric pressure sensor	<ul style="list-style-type: none"> High precision and accuracy: Precision: ±0.002 hPa Rel. accuracy: ± 0.06 hPa IPX8 certified for additional robustness (water, dust, humidity) 	<ul style="list-style-type: none"> Very rugged (IPX8 certified) even for A/C outdoor use Small size Software solution and turnkey solution available for high-end presence detection Air flow measurement in the system
	BGT60TR13C	XENSIV™ Radar 60 GHz	<ul style="list-style-type: none"> Sense presence up to 10 m (very high sensitivity, even recognizes breathing and tiny motions) 	<ul style="list-style-type: none"> 60 GHz with integrated antennas to reduce design-effort Software solution and turnkey solution available for high-end presence detection
	BGT60LTR11AIP	XENSIV™ Radar 60 GHz	<ul style="list-style-type: none"> Sense motion up to 10 m without using a microcontroller 	<ul style="list-style-type: none"> System cost effective Motion detection
	TLI493D-W2BW TLx496x TLI4971 TLI4966G TLE4997E2	XENSIV™ Hall sensors XENSIV™ current sensors	<ul style="list-style-type: none"> Contactless measurement principle minimizing wear and tear: position, speed & direction monitoring of components, linear movement and vibration open/close lid detection 	<ul style="list-style-type: none"> Contactless measurement principle minimizing wear and tear Door contact, weight and imbalance measurements using XENSIV™ Hall sensors Better design flexibility as with mechanical/resistive solution
	TLI493D-W2BW	3D magnetic sensors	<ul style="list-style-type: none"> 3D sensor in WLB package Software modules supporting XMC™ and PSoC™ 	<ul style="list-style-type: none"> Improved mechanical design flexibility with 3D hall technology Push and rotation functionality with a single sensor (e.g., HMI interfaces) Extremely small size, slim PCB design, high design flexibility (lateral, vertical)
	IM69D128S IM72D128 IM68A130 IM70A135 IM73A135	XENSIV™ MEMS	<ul style="list-style-type: none"> Highest SNR to detect voice in noisy devices and from long distances 	<ul style="list-style-type: none"> Noise monitoring at motor and compressor, remote diagnostics and voice activation
Water level detection (CapSense™ & inductive sensing)	PSoC™ 4000T	PSoC™ 4	<ul style="list-style-type: none"> 32-bit MCU subsystem, 48-MHz Arm® Cortex®-M0+ CPU with single-cycle multiply Low-power 1.71 V to 5.5 V operation Fifth-generation CAPSENSE™ sensing Serial communication - reconfigurable I2C, SPI or UART functionality in one block with master/slave I2C functionality in the other Timing and pulse-width modulation Up to 21 programmable GPIO pins ModusToolbox™ software 	<ul style="list-style-type: none"> Ultralow power touch HMI solution based on an integrated “always-on” sensing technology Robust and reliable touch HMI solution for harsh environments Low power operation and improved performance to enable next generation of user experience Industry-standard tool compatibility Comprehensive collection of multi-platform tools and software libraries
Security	OPTIGA™ Trust X, TPM & MTR OPTIGA™ Trust B,	OPTIGA™ Trust	<ul style="list-style-type: none"> Easy certificate-based device registration to all major cloud service providers 	<ul style="list-style-type: none"> One-stop-shop turnkey solution Shorter time to market Cost reduction Zero touch provisioning Protection Future-proven
	SLE954150017XTSA1	OPTIGA™ Authenticate S	<ul style="list-style-type: none"> 4 authentication modes (one-way, mutual, host binding and host support) 4 lifecycle counters with independent kill structures 3 types of lockable NVM sizes (1 K, 2 K, 5 Kbit) 3 temperature options (standard -40 to 85°C/ extended -40 to 105°C/ special -40 to 120°C) 2 ECC 163-bit key pairs and 193-bit ODC 2 serial communication options (on-chip SWI&I2 C + GPO) Host code software – with new OS library 1.5 x 1.5 x 0.38 mm PG-TSNP-6-12 package Asymmetric cryptography with secured unique identity for each chip Infinion proprietary protection against reverse engineering (PRE) Message authentication code providing mutual authentication Capless Low dropout (LDO) regulator 	<ul style="list-style-type: none"> Protection of OEMs and consumers against counterfeited devices Additional customer services, such as alerts when spare parts need replacing No need to invest in security know-how Effortless implementation with full system integration support including embedded software, host software, full reference board based on PSoC™ 6 and with demo software and full documentation Tiny and robust TSNP SMD package optimized for small devices gives freedom to design even very small products
Connectivity	CYW4338/9, CYW43012 CYW43022	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 4	<ul style="list-style-type: none"> Unique home appliances solution offering Wi-Fi 4, Bluetooth® 5 and WPA 3 allowing smart home certification (WFA certificate) WPA3 security Voice command Audio/video transfer 	<ul style="list-style-type: none"> Cost-effective
	CYW4373E	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 5	<ul style="list-style-type: none"> Wi-Fi 5 dual band (2.4 GHz and 5 GHz) Capable of beam-forming for increased range External PA (E-version) on module also increasing range 	<ul style="list-style-type: none"> High data throughput Congestion/future-proof
	CYW55513 CYW55571/2/3 -	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 6	<ul style="list-style-type: none"> Tri-band, (2.4 GHz, 5 GHz, 6 GHz) Target wake time (TWT): allowing end-device to negotiate with the router when to „wake up“ Higher modulation schemes: even higher data throughput 	<ul style="list-style-type: none"> High data throughput Congestion/future-proof Low power consumption
	CYW20829	AIROC™ Bluetooth® LE BT5.2	<ul style="list-style-type: none"> Highly integrated Bluetooth® LE 5.4 MCU 96 MHz Arm® Cortex®-M33 – Application MCU 48 MHz Arm® Cortex®-M33 – Bluetooth® Subsystem 256 KB / 96 KB SRAM – Bluetooth® LE 48 MHz QSPI/SMIF with XIP, 32 KB Cache On-the-fly encryption for off-chip Flash Secure Boot and Crypto HW engine TX Power: up to +10 dBm Robust Receive sensitivity of -106 dBm 1.7 to 3.6 V supply voltage range 32 Programmable GPIO Upto 85°C operating temperature 	<ul style="list-style-type: none"> Industry’s best range and noise immunity Future proof your designs and unlock new use cases with Bluetooth® LE 5.4 Reduce system cost with highly integrated MCU and “right sized” external flash Longer battery life with low power connection No dongle for ultra low latency HID
CYW20835	AIROC™ Bluetooth® LE BT5.4	<ul style="list-style-type: none"> 96 MHz Arm® Cortex®-M4 microcontroller unit MCU with floating point unit (FPU) Supports serial wire debug (SWD) Runs Bluetooth® stack and application Complies with Bluetooth® core specification 5.4 Supports Adaptive Frequency Hopping (AFH) Programmable TX power up to 12 dBm Rx sensitivity -94.5 dBm (Bluetooth® LE) 	<ul style="list-style-type: none"> Reliable and robust connectivity due to superior RF performance Ability to do compute at the edge for Bluetooth® LE use cases Built on market proven wireless IP maximum interoperability 	



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Cordless vacuum cleaner

Cordless vacuum cleaner

Efficient, compact, and quieter motor control solution for designing next-generation cordless vacuum cleaner

It is a common misconception that cordless vacuum cleaners are less powerful than their corded counterparts. With Infineon’s solution, we help to create a battery-powered cordless vacuum that delivers as much suction power as a corded vacuum and maintains the convenience and flexibility of moving in the room.

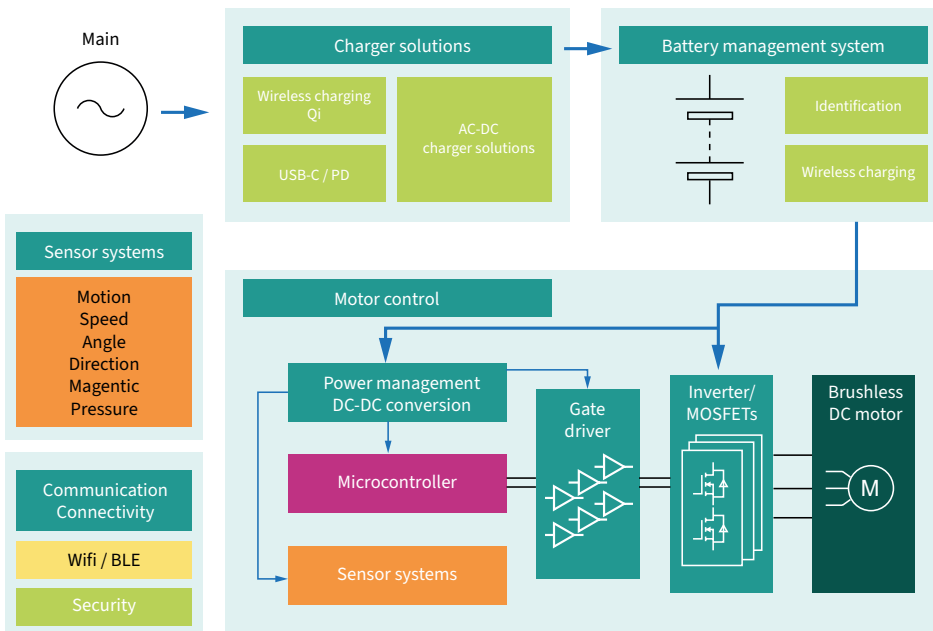
Our products aim to revolutionize the cleaning experience with

- Efficient and compact motor control to deliver optimal cleaning performance
- Fast battery charger with USB-C charging and wireless charging to reduce charging time
- Advanced battery management system (BMS)
- Reliable HMI, wireless connectivity, and a variety of sensors

Features and benefits

Key features	Key benefits
– High reliable and market-proven Infineon products	– Extend system lifetime
– Comprehensive product/solution portfolio for motor drives and charging	– Convenient selection of the right-fit products
– Complete selection for connectivity and sensors	– One-stop-shop for building smart home appliance
– Overall system size and BOM reduction	– Compact design reducing system size and cost for the highest power density
– High complete design support with documentation and demo board	– Fast time-to-market

Application diagram



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Product portfolio

Functional block	Topology	Product category	Product family	Part number
Motor control	12 V, 15 V, 18 V, 22 V	MOSFET	OptiMOS™ 6	BSZ018N04LS6, IQE013N04LM6, BSC007N04LS6, BSC010N04LS6, ISG0613N04NM6
			OptiMOS™ 5	BSZ013NE2LS5I, BSZ0500NSI, IQE006NE2LM5, BSC010N04LSC, ISC019N04NM5
		Gate drivers	MOTIX™	6EDL6171, IDM700A, 2ED2742S01G, ED2744S01G, ED2748S01G, ED2732S01G, ED2734S01G, ED2738S01G
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4100, PSoC™ 62
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
	Magentic coreless current		TLI4971	
	36 V	MOSFET	OptiMOS™ 5	BSZ099N06LS5, IQE022N06LM5, BSC012N06NS, BSC028N06NS
			StrongIRFET™, StrongIRFET™ 2	IRFH7545, IPD038N06NF2S
		Gate drivers	MOTIX™	6EDL7141, IDM 700A, 6ED2742 NEW, 2ED2742 NEW, 2ED2732 NEW
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4500S PSoC™ 6
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
Magnetic coreless current			TLI4971	
Charging	MOSFET	CoolMOS™ P7	IPA60R280P7S, IPD60R280P7S, IPD60R360PFD7S	
	Controller IC	-	ICC80QSG, XDPS2201, XDPS2221, ICE3PCS01G	
	HEMTs	CoolGa™	IGI60F1414A1L IGI60F200A1L, IGLD60R190D1	
	Gate drivers	EiceDRIVER™	1EDB9275F, 2EDB7259Y, 2EDF9275F, 2EDL05N06PF, 2EDR8259X, 2EDS9265H	
	Schottky diodes	CoolSiC™ G5 CoolSiC™ G6	IMZA65R020M2H, IMZA65R050M2H, IMW65R020M2H, IMW65R050M2H	
	SR switch	OptiMOS™ 5	BSC040N10NS5, BSC160N15NS5, IPP200N15N3	
	Load switch	OptiMOS™ 5	BSC040N10NS5, BSC0902NSI, IPP034N08N5	
	USB-PD	EZ-PD™ PMG1-B1	CYPM1115-48LQXI, CYPM1116-48LQXI	
		EZ-PD™ PAG1	PAG1P, PAG1S	
		EZ-PD™ BCR	CYPD3177-24LQXQ, CYPD3177-24LQXQT	
	Microcontroller	XMC™	XMC1400	
BMS	12 V	Protection MOSFET	OptiMOS™ StrongIRFET™	BSZ009NE2LS5, IQE006NE2LM5, BSC004NE2LS5, IRFH6200
	18 V		BSZ0500NSI, IQE008N03LM5, BSC005N03LS5	
	24 V		BSZ018N04LS6, IQE013N04LM6, BSC007N04LS6	
	36 V		ISZ034N06LM5, IQE022N06LM5, ISC009N06LM5	
		Monitoring balancing IC	-	TLE9012
		Cell balancing MOSFETs	StrongIRFET™	IRLML9303, IRFTS9342, IRLML9301
	Microcontrollers	XMC™, PSoC™	XMC1100, XMC1200, XMC1400, XMC1400, XMC4100, CY8C41x4/5/65, CY8C41x6/75, CY8C4147-S5	
Communication and HMI	Authentication/security	OPTIGA™ Trust	-	
	Bluetooth®	AIROC™	CYBT-213043-02, CYW20736, CYW20706, CYW20704	
	Wi-Fi	AIROC™	CYW43907, CYW43439, CYW954907	
	Pressure sensor	XENSIV™ Pressure Sensor	DPS368	



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Power tools

Cordless power tools and outdoor power equipment

Battery-powered devices for home and professional applications

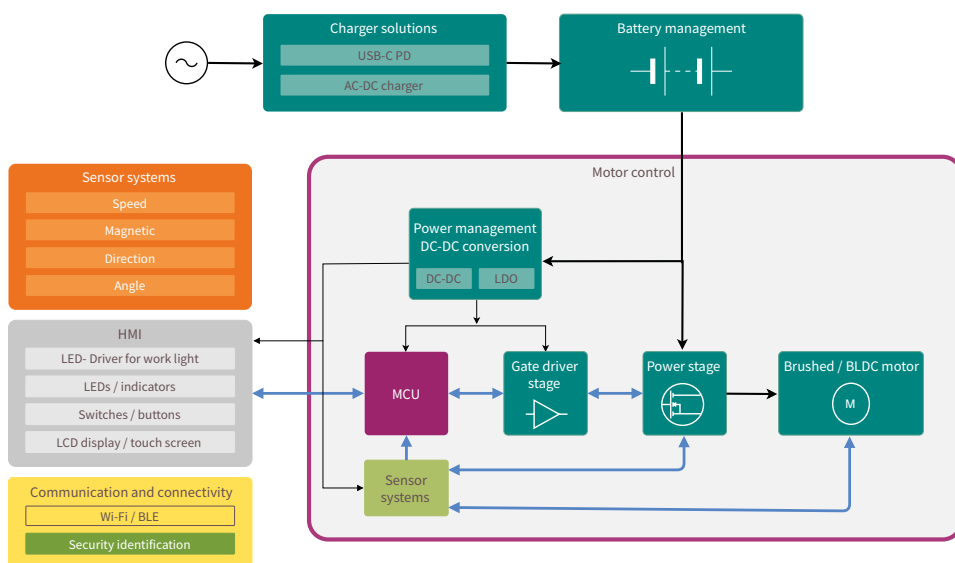
Millions of households worldwide rely on power tools to complete daily tasks or creative projects around the home. Consumers want robust, reliable, and easy-to-use portable power tools with low prices and long battery life as key selection criteria. High quality standards to earn the trust of the consumer also require diagnostic and safety features. Infineon's product portfolio is made to bring performance, safety and reliability to consumer projects. We help our customers meet all consumer needs at a reduce total costs. In addition to the extensive product portfolio, we offer wireless-charging reference designs. They deliver high performance and are easily optimized in our DAVE™ development platform. Configure your BOM and exceed expectations with Infineon components in your cordless power tool designs.

Features and benefits

Key features
- Comprehensive product and solution portfolio, easy to tailor to any design specification
- Infineon offers complete solutions for power supplies, chargers, and motor drives
- Best in class MOTIX™ and EiceDRIVER™ gate drivers
- High reliability of Infineon components
- Offering LV FETs with SMD packaging improves the productive capability by automatic production, improves reliability and reduces assembly cost
- Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest $R_{DS(on)}$
- Trustworthy hardware-based security
- Highest quality standards and a safety-certified development process
- Proven track record and outstanding partner network for embedded security
- OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries etc.)
- Evaluation and demonstration boards for fast prototyping
- Available simulations, documentation, and system support to reduce development time and cost

Key benefits
- Convenient selection of the right fit products thanks to broad portfolio and
- Complete solutions
- Extended battery lifetime and product life span
- Increased production capability
- Overall system size and cost reduction
- Security, quality, and safety
- Authentication
- Short time-to-market

Application block diagram example: cordless power tools



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www.infineon.com/powertools
www.infineon.com/motorcontrol

www.infineon.com/gatedriver
www.infineon.com/mosfets

www.infineon.com/xmc
www.infineon.com/usbpd

Product portfolio

Functional block	Topology	Product category	Product family	Part number
Motor control	12 V, 15 V, 18 V, 22 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	BSC005N03, IQE006NE2, IPT004N, IPP055N IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRF40SC, IPB011N04, IRL40B215
		Gate drivers	MOTIX™	IDM700A, 2ED2742S01G, ED2744S01G, ED2748S01G, ED2732S01G, ED2734S01G, ED2738S01G, 1ED44173, 6EDL7141, 6EDL7151, 6ED2742S01Q, TLE9140EQW, IFX9201SG
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4100, PSoC™ 62
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
		36 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™
	Gate drivers		MOTIX™	6EDL7141, IDM 700A, 6ED2742, 2ED2742, 2ED2732, 1ED44173, 6EDL7141, 6EDL7151, 6ED2742S01Q, TLE9140EQW, IFX9201SG
			EiceDRIVER™	1ED44173N01B
	Microcontroller		XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4500S PSoC™ 6
	Sensor systems		Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
	48 V, 56 V, 72 V		MOSFET	OptiMOS™ 3 OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™
		Gate drivers	MOTIX™	TLE9140EQW, 1EDN755X, 6ED2742, 2ED2732, 2ED2734, 2ED2748
Microcontroller		XMC™ series	XMC1400, XMC1400, XMC4400	
		PSoC™	PSoC™ 4500S PSoC™ 6	
Sensor systems		Hall switches	TLV4963	
		Angle	TLI5012	
		3D magnetic	TLV493D	
		Magnetic coreless current	TLI4971	
Charging		MOSFET	CoolMOS™ P7	IPA60R280P7S, IPD60R080P7, IPD60R280P7S, IPD60R360PFD7S, IPN70R450P7S
		Controller IC	-	ICC80QSG, XDPS2201, XDPS2221, ICE3PCS01G
	HEMTs	CoolGaN™	IGI60F1414A1L IGI60F200A1L, IGLD60R190D1	
	Gate drivers	EiceDRIVER™	1EDB9275F, 2EDB7259Y, 2EDF9275F, 2EDL05N06PF, 2EDR8259X, 2EDS9265H	
	Schottky diodes	CoolSiC™ G5 CoolSiC™ G6	IMZA65R027M1H, IMZA65R048M1H, IMW65R027M1H, IMW65R048M1H	
	SR switch	OptiMOS™ 5	BSC040N10NS5, BSC160N15NS5, IPP200N15N3	
	Load switch	OptiMOS™ 5	BSC040N10NS5, BSC0902NSI, IPP034N08N5	
	USB-PD	EZ-PD™ PMG1-B1	CYPM1115-48LQXI, CYPM1116-48LQXI	
		EZ-PD™ PAG1	PAG1P, PAG1S	
		EZ-PD™ BCR	CYPD3177-24LQXQ, CYPD3177-24LQXQT	
Microcontroller	XMC™	XMC1400		
BMS	12 V	Protection MOSFET	OptiMOS™ StrongIRFET™	BSC004NE2LS5, IQE006NE2LM5, BSB008NE2LX, BSZ009NE2LS5, IRFH6200, IRF6200, IRF1324
	18 V			IPT004N03L, BSC005N03LS5, BSZ0500NSI, IRF6726M, IRLS3813, IRLB3813, BSC079N03LSCG
	24 V			IRL7472L1, IRL40SC228, BSC007N04LS6, IRL40T209, IRFS7430, IRL40B209, BSZ018N04LS6
	36 V			IPT007N06N, IRF60SC241, BSC014N06NS, IRF7749L1, IRL60B216, IRL60S216
	48 V			IPT012N08N5, IPP020N08N5, BSC025N08LS5, BSB044N08NN3G, BSZ070N08LS5, BSZ096N10LS5,
	72 V			IPP041N12N3G, BSC077N12NS3G, BSZ240N12NS3G, IRF135SA204, IRF135S203, IRF135B203
		Monitoring balancing IC	-	TLE9012
		Cell balancing MOSFETs	StrongIRFET™	IRLML9303, IRFTS9342, IRLML9301
	Microcontrollers	XMC™, PSoC™	XMC1100, XMC1200, XMC1400, XMC1400, XMC4100, CY8C41x4/5/65, CY8C41x6/75, CY8C4147-S5	
Communication and HMI	Authentication/security	OPTIGA™ Trust	SLE 95250, SLS 32AIA010MH	
	Bluetooth®	AIROC™	CYBT-213043-02, CYW20736, CYW20706, CYW20704	
	Wi-Fi	AIROC™	CYW43907, CYW43439, CYW954907	
	Pressure sensor	XENSIV™	DPS368	



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www.infineon.com/powertools
www.infineon.com/motorcontrol

www.infineon.com/gatedriver
www.infineon.com/mosfets

www.infineon.com/xmc
www.infineon.com/usbpd



Smart TV

Complete system solution for smarter, slimmer, more powerful, more energy-efficient smart TVs

The requirements for new generations of TVs and smart TVs are increasing with the growing access to massive amounts of streaming content, the need for superior pictures, and the highest audio quality. Designers face a great challenge combining all the required features in smart TV designs while keeping the system compact, secure, and power efficient. In Infineon's wide portfolio of semiconductors, sensors, MCUs, connectivity solutions, and security, we offer a complete system solution to cover all the needs, and enable a design of highly efficient, compact, easy to use, and powerful systems. Complementary to our wide product portfolio, we offer evaluation boards, enabling an even faster time to market. For example, our digital PFC-LLC converter evaluation board specifically for TV power systems, DEMO-IDP2308-120W, contains a 120 W digital PFC-LLC converter with 8 x 5 V AC~265 V AC input and 12 V/24 V output. It is controlled by Infineon's 2nd generation XDP™ SMPS digital multi-mode PFC-LLC combo controller IDP2308 and is the perfect solution to reduce the complexity of TV power system design.

Features and benefits

Key features
- Complete smart TV system solution
- Presence detection radar
- Powerful SMPS
- IoT security and authentication
- HMI and sensor fusion solutions

Key features
- One-stop-shop for the complete system
- Energy saving with switching off the TV when not in the room
- High energy efficiency
- Protection against unauthorised connection to the device
- Ease of use, allowing responsive touch control

Application diagram



Click here to learn more:
www.infineon.com/smart-tv



Recommended products

Functional block	Product category	Topology	Product family	Benefits
Main stage/PFC combo non-AUX	High-voltage MOSFETs	Active bridge	600 V CoolMOS™ S7	<ul style="list-style-type: none"> Body diode robustness at AC line commutation Improved thermal resistance Absolute lowest $R_{DS(on)}$ in the market Enables top-side cooling with D-PAK and Q-PAK Ideal fit for solid-state and hybrid relays and circuit breakers
		Active bridge DCM PFC HB LLC	600 V CoolMOS™ P7	<ul style="list-style-type: none"> Fast-switching speed for improved efficiency Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition Optimized VGS threshold for lower turn-off losses Rugged body diode for HB LLC application
		DCM PFC, HB LLC	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> Robustness and reliability with integrated robust, fast body diode and up to 2 kV ESD protection in gate Reduced gate charge for enhanced light-load efficiency, and lower hysteresis loss
			600 V CoolMOS™ 8	<ul style="list-style-type: none"> Best price/performance, integrating fast body diode Simplified product portfolio Highest quality and reliability Better energy efficiency and cost targets with providing good enough power density TSC package offerings and 7 mΩ available
	Gate-driver IC	HB LLC	EiceDRIVER™ level shift: 2ED2181S06F, 2ED21814S06J	<ul style="list-style-type: none"> 650 V half-bridge SOI driver with integrated bootstrap diode High-frequency switching (500 kHz)
	Control ICs	IDP2308	PFC-LLC non-AUX digital IC for TV embedded PSU	<ul style="list-style-type: none"> Low BOM count/system cost due to high integration Low standby power High system reliability Shorter development cycles and higher design and production flexibility
		IDP2303A	PFC-LLC non-AUX digital IC for TV adapter	<ul style="list-style-type: none"> Low BOM count/system cost due to high integration Low standby power Small form factor designs High system reliability
Synchronous rectification	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ 5 100-150 V StrongIRFET™ 2 100 V	<ul style="list-style-type: none"> Low conduction losses, reduced overshoot FullPAK package available
PFC	Boost diodes	DCM PFC	650 V Rapid diode	<ul style="list-style-type: none"> Low conduction losses
	Control ICs	CCM PFC ICs	ICE3PCS0xG	<ul style="list-style-type: none"> High PFC and low THD
	WBG	PFC	CoolGaN™ 600 V e-mode HEMTs	<ul style="list-style-type: none"> Highest efficiency contribution via less parasitic parameter Space saving with SMD smaller package
	Gate-driver IC	PFC	1ED44173N01B	<ul style="list-style-type: none"> Single-channel with fast, accurate ($\pm 5\%$), integrated overcurrent protection (OCP)
High voltage MOSFETs	Active bridge DCM PFC HB LLC		600 V CoolMOS™	<ul style="list-style-type: none"> Fast switching speed for improved efficiency Low gate charge for enhanced light load efficiency and low power consumption at no-load condition Optimized VGS threshold for lower turn-off losses Rugged body diode for HB LLC application
Main stage	Control ICs	HB LLC ICs	ICE1HS01G-1/ICE2HS01G	<ul style="list-style-type: none"> High efficiency and low EMI
	WBG	HB LLC	CoolGaN™ 600 V Integrated Power Stage	<ul style="list-style-type: none"> Highest efficiency, highest power density High reliability Isolated gate driver integrated
	High-voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	<ul style="list-style-type: none"> Fast-switching speed for improved efficiency Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition Optimized VGS threshold for lower turn-off losses Rugged body diode for HB LLC application
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	QR CoolSET™ - ICE5QRxx80BG FF CoolSET™ - ICE5RxxxxXX	<ul style="list-style-type: none"> Low standby power, high efficiency and robustness
Flyback	Control ICs	QR flyback	ICE2QS03G	<ul style="list-style-type: none"> Forced resonant ZVS control reduces the switching loss Multilevel protection enables the robust design Flexible firmware provides more differentiation for OEMs
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7	<ul style="list-style-type: none"> Optimized for flyback topologies Best price competitive CoolMOS™ SJ MOSFET family Lower switching losses versus standard MOSFET Controlled dV/dt and dI/dt for better EMI



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Product portfolio

Functional block	Product	Product family	Benefits
Gesture control	Sensor	XENSIV™ 24GHz radar sensors for IoT	<ul style="list-style-type: none"> Infineon's XENSIV™ 24GHz radar transceiver family offers multiple variants Low-power motion sensing and distance measurements >100 m detection range
		XENSIV™ 60GHz radar sensors for IoT	<ul style="list-style-type: none"> Detection of submillimeter movements Up to 10 m detection range
	Microcontroller	32-bit XMC4000 industrial microcontroller ARM® Cortex®-M4	<ul style="list-style-type: none"> Arm® Cortex®-M4 with floating point unit (FPU), single-cycle DSP MAC, 80-144 MHz CPU frequency
		32-bit XMC1000 industrial microcontroller ARM® Cortex®-M0	<ul style="list-style-type: none"> Arm® Cortex®-M0 core, up to 48 MHz and 80 CoreMark
Presence detection	Sensor	XENSIV™ 24GHz radar sensors for IoT	<ul style="list-style-type: none"> Multiple variants in the family Low-power radar chip options
		XENSIV™ 60GHz radar sensors for IoT	<ul style="list-style-type: none"> Detection of people up to 15 m Accurate measurements down to distances of ~1cm and higher doppler velocity
	Microcontroller	32-bit XMC4000 industrial microcontroller ARM® Cortex®-M4	<ul style="list-style-type: none"> 4-channel high-resolution, PWM (150 ps) (XMC4400, XMC4200, XMC4100) Up to 6 multi-functional serial interface modules configurable to SPI, I2C, I2S, UART
		32-bit XMC1000 industrial microcontroller ARM® Cortex®-M0	<ul style="list-style-type: none"> The MATH co-processor boosts standard Cortex®-M0 computing performance enabling divisions and trigonometric operations like SIN and COS
CO ₂ sensor	CO ₂ sensor	XENSIV™ PAS CO2 sensor	<ul style="list-style-type: none"> Space savings in customers' end products High-quality data and compliance with smart building standards Cost-effective high-volume assembly and easy system integration Plug & play for fast design-to-market
		PASCO2V01	<ul style="list-style-type: none"> Exceptionally small form factor Highest accuracy and robust performance at ppm level (±30 ppm ±3% of reading) Advanced compensation and self-calibration algorithms
USB-C	USB-C power delivery controller	EZ-PD™	<ul style="list-style-type: none"> Reversible connector, measuring only 2.4 mm in height Compliant with USB Power Delivery 2.0, providing up to 100 W Double the bandwidth of USB 3.0, increasing to 10 Gbps with SuperSpeed+ USB 3.1 Combines multiple protocols in a single cable, including DisplayPort, PCIe or Thunderbolt
Silicon microphone	MEMS microphone	IM69D127	<ul style="list-style-type: none"> Very-low self-noise / very-high SNR (69 dB) Selectable power modes for battery critical applications Sealed Dual Membrane (SDM) technology with IP57 ingress protection at microphone level
		IM72D128	<ul style="list-style-type: none"> Ultra-high dynamic range and high acoustic overload point (AOP) of 128dB SPL Very tight part-to-part phase and sensitivity matching (± 1dB) Flat frequency response with a very low LFRO (low frequency roll-off) of 20 Hz
		IM73A135	<ul style="list-style-type: none"> Crystal clear audio pick up of the quietest and the loudest sounds High ingress protection (IP57) at a microphone level Enablement of advanced audio features (ANC, transparent hearing, audio zoom, beamforming)
Wi-Fi 6	AIROC™ Wi-Fi + Bluetooth® combos	CYW4373	<ul style="list-style-type: none"> Dual-Band ePA/eLNA reference design available for increased range Dedicated Bluetooth® path for best Coex performance Complies with Bluetooth® core specification version 5.4
Security	Security and smart card solutions	OPTIGA™ TPM - Trusted Platform Module	<ul style="list-style-type: none"> High-end security controller with advanced cryptographic algorithms implemented in hardware (e.g., RSA & ECC256, SHA-256) Common Criteria (EAL4+) and FIPS security certification Flexible integration thanks to SPI, I2C or LPC interface support Extended temperature range (-40 to +85°C) for a variety of applications
		OPTIGA™ Trust	<ul style="list-style-type: none"> Full range of security chips
		OPTIGA™ Authenticate	<ul style="list-style-type: none"> Strong turnkey solutions combining robust hardware security and genuine user experience Suited to all anti-counterfeit challenges Combination of robust authentication with unprecedented levels of configuration flexibility
		OPTIGA™ Authenticate NFC solutions	<ul style="list-style-type: none"> Contactless communication technology based on 13.56 MHz RF field Standalone plain tags and secured NFC tags for stickers Embedded NFC-I2C bridge tags for IoT devices Multiple user memory options for NDEF data storage On-chip high capacitance to enable small antenna designs and improved RF performance
Bluetooth® LE transceiver	Wireless connectivity	AIROC™ CYW20835 Bluetooth® LE system on Chip	<ul style="list-style-type: none"> High levels of integration to minimize external components Supports the entire spectrum of Bluetooth® Low Energy use cases Fully integrated modules with onboard crystal oscillator, passive components, flash memory, and the CYW20835 system on chip Globally certified to support fast time-to-market
Touch controller	Microcontroller	32-bit PSoC™ 4 Arm® Cortex®-M0/M0+	<ul style="list-style-type: none"> Industry-leading capacitive-sensing solution for touch buttons and sliders State-of-the-art noise immunity and water rejection
		32-bit PSoC™ 6 Arm® Cortex®-M4 / M0+	<ul style="list-style-type: none"> Ultra-low-power architecture Highest level of protection defined by the Platform Security Architecture (PSA) from Arm Enabling modern touch and gesture-based interfaces that are robust and reliable

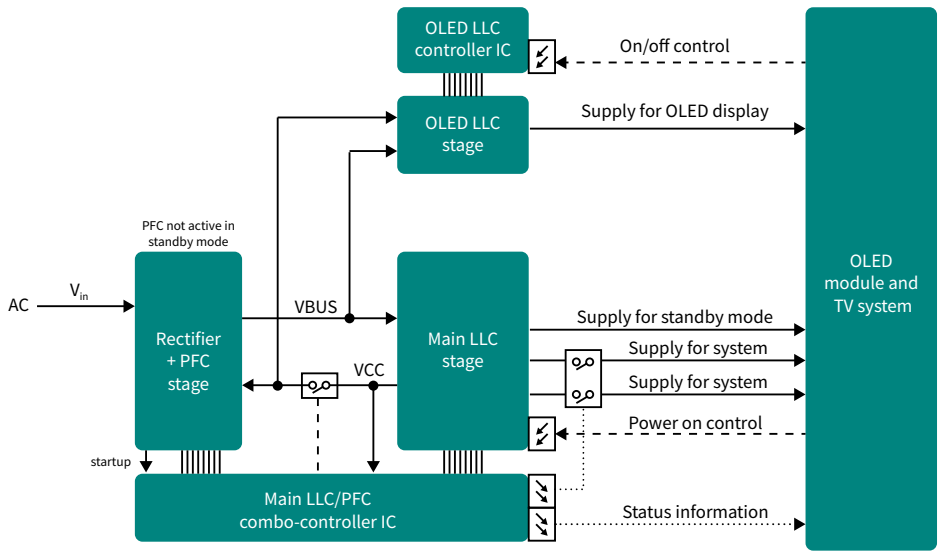


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OLED TV power block diagram



OLED TVs improve user experience as they can be thinner, lighter, more flexible and consume less power than LCD/LED TVs.

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Smart speaker

Smart speaker

Speakers for an intuitive and outstanding user experience

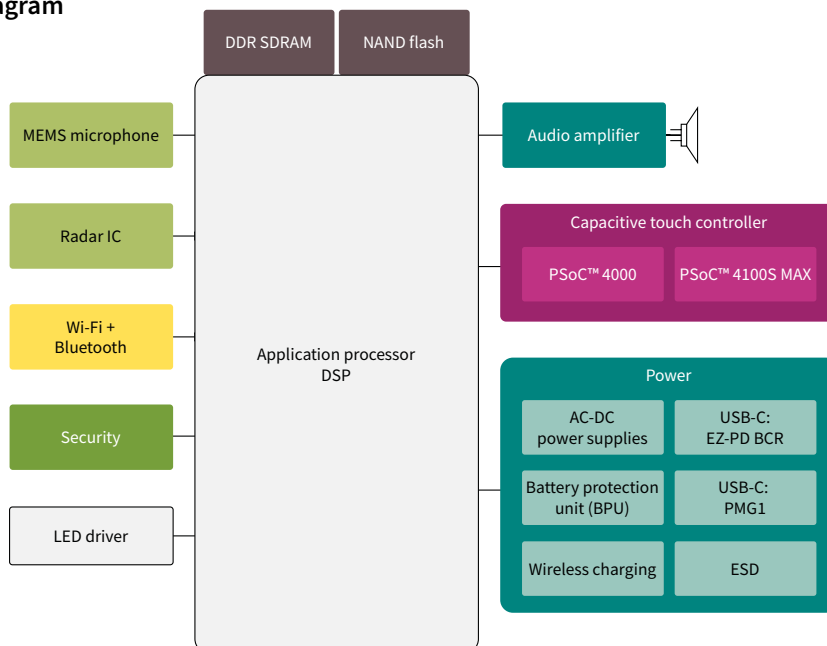
Once a novelty in households, smart speakers are more and more becoming increasingly commonplace. Rising user expectations accompany this rapid adoption. However, frustration with devices that do not understand or hear commands leads to lower user adoption. Consequently, growth rates for smart speakers are failing to reach their full potential. Components such as MEMS microphones, touch controllers, and new technologies such as radar are vital in improving the user experience in the smart speaker segment.

Infinion has long-standing expertise in sensors, connectivity, and power solutions that fulfill the consumer market requirements in terms of outstanding performance, reliability, and energy efficiency.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> High sensitivity, low self-noise (high SNR) and distortion, wide dynamic range, and high acoustic overload point with XENSIV™ MEMS microphones 	<ul style="list-style-type: none"> Improved audio input and thus voice command recognition, especially in extended use cases such as whispering or longer distances to the speaker for a better user experience
<ul style="list-style-type: none"> Multilevel switching technology at fully rated power in a wide range of MERUS™ class D amplifiers 	<ul style="list-style-type: none"> Best-in-class audio quality and lowest power consumption enable the class D audio amplifier to be used in filterless configurations
<ul style="list-style-type: none"> Ultralow-power AIROC™ Wi-Fi and Bluetooth® combo in a single-chip solution enables small-form-factor IoT designs 	<ul style="list-style-type: none"> Connectivity for high interoperability and performance without dropouts anywhere in the home, extended battery playback time, or the reduction of battery size without compromising on battery playback time to save cost
<ul style="list-style-type: none"> Reliable, elegant, and durable CAPSENSE™ touch controller with advanced capacitive touch sensors 	<ul style="list-style-type: none"> Noise immunity, water resistance, and sleek, futuristic user interfaces and gesture recognition
<ul style="list-style-type: none"> XENSIV™ 60 GHz radar sensor brings innovative, intuitive sensing capabilities 	<ul style="list-style-type: none"> Precise presence detection for more contextual awareness to ease interaction, sub-millimeter motion tracking to capture movement at high speed accurately, vital sensing for monitoring health status such as respiratory and heart rate
<ul style="list-style-type: none"> Highly efficient and power-dense SMPS solutions 	<ul style="list-style-type: none"> Highly efficient charger in a small form factor
<ul style="list-style-type: none"> Highly integrated EZ-PD™ USB-C controller supports all USB-PD profiles 	<ul style="list-style-type: none"> USB-IF certified with market-proven USB-PD stack, ensuring specification compliance and interoperability, requiring no firmware development
<ul style="list-style-type: none"> IoT security controller OPTIGA™ Trust M maintains the unique identity and integrity of the speaker 	<ul style="list-style-type: none"> Easy and secure cloud provisioning services

Application diagram



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- www.infineon.com/smart-speaker
- www.infineon.com/psoc-4000t
- www.infineon.com/radar-sensors-iot
- www.infineon.com/mems
- www.infineon.com/merus
- www.infineon.com/optiga-trustm-express



Recommended products

Functional block	Product family	Product	Benefits	
Audio input	Microphones	XENSIV™ MEMS microphones	<ul style="list-style-type: none"> High-performance microphone with low self-noise (high SNR) and low distortions, setting a the new performance benchmark for a superior user experience 	
Audio output	Class D amplifier	MERUS™ class D audio amplifiers MA2304DNS	<ul style="list-style-type: none"> Cooler, smaller, and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in the product form factors for great-sounding audio products Extended battery playback time or the reduction of battery size without compromising on battery playback time to save cost 	
Connectivity	Wi-Fi + Bluetooth® combos	AIROC® Wi-Fi + Bluetooth® combos	<ul style="list-style-type: none"> Best-in-class interoperability to the widest deployed wireless IP Whole Home Range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks Ultralow-power technology designed with battery operation in mind 	
Sensing	Capacitive sensing touch controller	CAPSENSE™ capacitive touch sensing controller	<ul style="list-style-type: none"> State-of-the-art noise immunity (SNR > 100:1) and water rejection have made CAPSENSE™ the industry leader Advanced inductive touch sensors make possible sleek, futuristic user interfaces with metallic overlay 	
	Radar sensor	XENSIV™ 60 GHz radar sensor	<ul style="list-style-type: none"> Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy Both stand-alone chip as well as system solution available 	
	CO ₂ sensor	XENSIV™ PAS CO ₂ sensor	<ul style="list-style-type: none"> Superior accuracy, providing a direct readout of the real CO₂ level, not simply a correlation Size and cost advantages 	
Security	IoT security controller	OPTIGA™ Trust M	<ul style="list-style-type: none"> Easy and secure provisioning services with OPTIGA™ Trust M for maintaining speaker's unique identity and integrity Unify different products under unified PKI architecture 	
Power	USB-C PD controller	EZ-PD™ USB-C controller	<ul style="list-style-type: none"> USB-IF certified with market-proven USB-PD stack, ensuring spec compliance and interoperability Supports all USB-PD profiles commonly used in USB-C power adapters and requires no firmware development A highly-integrated solution that minimizes incremental BOM costs 	
	ESD protection	ESD111, ESD245	<ul style="list-style-type: none"> Outstanding low capacitance devices for best signal integrity High protection performance by ultralow clamping voltage 	
	Wireless charging	15 W inductive wireless power transmitter	<ul style="list-style-type: none"> Powerful and cost-effective wireless charging solutions for high performance, smart, and secure charging solutions supported by Infineon's unique wireless power controllers 	
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7 (standard grade)	<ul style="list-style-type: none"> Best price-competitive CoolMOS™ SJ MOSFET family Lower switching losses than a standard MOSFET
		ACF, FMCI	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> Lower Q_{rr}, lower hysteresis loss, low $R_{DS(on)}$
	SMPS Flyback converter Control ICs	QR flyback ICs	ICE5QSAG	<ul style="list-style-type: none"> High efficiency and low standby power
		FFR flyback IC	XDPS21071	<ul style="list-style-type: none"> High power density and ideal for USB-PD
SMPS synchronous rectification	Low-voltage MOSFETs	OptiMOS™ PD	<ul style="list-style-type: none"> Low conduction losses and reduced overshoot Logic level switching / S308 / PQFN 3.3x3.3 packages available 	
	Control ICs	IR1161LTRPBF	<ul style="list-style-type: none"> High efficiency Simple external circuitry 	
SMPS load switch	Low voltage MOSFETs	OptiMOS™ 30 V	<ul style="list-style-type: none"> Low conduction losses S308 / PQFN 3.3x3.3 packages available 	



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www.infineon.com/smart-speaker
www.infineon.com/mems

www.infineon.com/psoc-4000t
www.infineon.com/merus

www.infineon.com/radar-sensors-iot
www.infineon.com/optiga-trustm-express



Wearables

Smartwatches, feature watches, wristbands, and smart rings

All in one marketplace for wearable devices with Infineon’s excellent computing, connectivity, security, sensing, RF, and memory solutions

With its broad product portfolio, Infineon enables enhanced intelligent devices that are both “always-on” with low power consumption and high performance.

We help manufacturers overcome design challenges across all wearable device categories:

- Powerful computing, advanced graphics, responsive Machine Learning accelerated with neural net compute, audio and sound processing
- Ultra low power wireless connectivity (Wi-Fi, Bluetooth®, and Bluetooth® Low Energy), with a reliable and robust RF connection
- Need for strong, yet easy to implement, device and data security to protect personal and sensitive information
- Highly sensitive microphones for powerful audio and acoustic event detection
- Accurate sensing for surrounding awareness, precise detection and recognition
- Longer battery life and small form factor for elegant, unobtrusive designs



A smartwatch runs an operating system enabling third party apps (e.g., Wear OS). Its Arm® Cortex®-A application processor is based on multi-wireless connectivity, such as Bluetooth®, Wi-Fi, cellular, and UWB. The smartwatch monitors user health with advanced sensing technology. Its battery life is limited, usually 1-2 days.



A feature watch, including a sports watch, is RTOS-based with limited customized third-party apps. It is powered by an Arm® Cortex®-M processor with low power consumption. The battery life is usually 1 or 2 weeks. More and more feature watches provide a two-way connection via Bluetooth®. Fitness, health tracking, payments, communication, and other main use cases are covered.



A wristband or fitness band might not offer a broad spectrum of functionalities, but it is a useful tool for tracking and monitoring fitness activities. It covers several use cases, including step counting, sleep monitoring, location tracking, and access control.



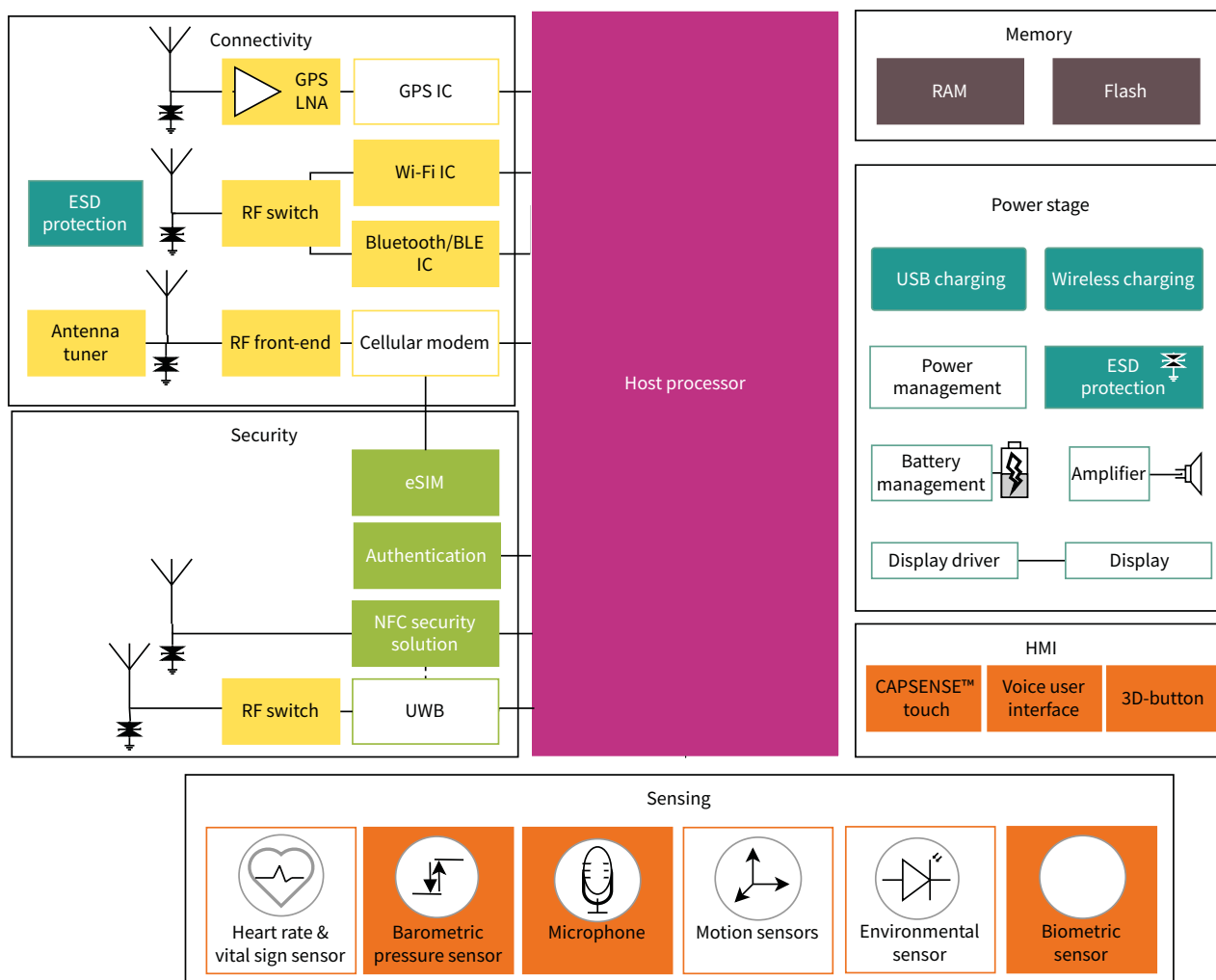
A smart ring is a jewelry-like tracker of personal vitals, payments, voice, or other digital activities. It is an alternative to a watch or wristband for monitoring fitness.



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Block diagram for smartwatch, feature watch, wristband and smart ring



Functional block	Product family	Functional block	Recommended products and solutions
Host processor	<ul style="list-style-type: none"> PSoC™ Edge 84 with Arm® Cortex®-M55 and Ethos U55 NPU for machine learning PSoC™ 6 ARM® Cortex®-M4 and -M0+ microcontroller with BLE 	Security	<ul style="list-style-type: none"> OPTIGA™ Connect Consumer eSIM solution (e.g., OC1120) SECORA™ Connect X payment (NFC booster)
Connectivity	<ul style="list-style-type: none"> AIROC™ Wi-Fi & Bluetooth® Combos (CYW43022, CYW55512) AIROC™ dual mode Bluetooth® (CYW20721) 	Human-machine interface	<ul style="list-style-type: none"> PSoC™ 4000T with CAPSENSE™ technology for touch
Connectivity RF	<ul style="list-style-type: none"> GPS LNA (e.g., BGA123L4, BGA524N6) 4G / 5G LTE LNAs (e.g., BGA5x1BN6 family) Antenna tuners (e.g., BGS12UGL8, BGS14GN10) RF switches (e.g., BGS12WN6, BGS14WMA9) 	Sensing	<ul style="list-style-type: none"> XENSIV™ pressure sensor (e.g., DPS368) XENSIV™ MEMS microphones (e.g., IM69D120/D130/D128S)
Memory	<ul style="list-style-type: none"> SEMPER™ Nano NOR flash 	Power stage	<ul style="list-style-type: none"> USB type-C controller (e.g., EZ-PD™ CCG2) ESD protection (e.g., ESD119-B1, ESD131-B1, ESD307-U1)



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Features and benefits

Key features
- High performance MCU with machine learning
- Mature dual mode Bluetooth®
- Ultra low power Wi-Fi combo
- Options for hardware integration
- Total solution provider

Key benefits
- Synchronized multi-modal HMI, situation awareness
- Audio/voice/music function support with high reliability
- Bulk data transmission with low power, co-existence solution
- Flexible integration option to customer due to wide portfolio
- One-stop-shop supplier (MCU, connectivity, sensor, payment, etc.)

Infineon, the right partner to solve your design challenges



Strong computing capability with machine learning in edge for autonomous operation and situation awareness



2.5D graphic capability to drive fancy display



High reliability and data throughput with Wi-Fi connectivity



Integrated lowest power compute, BLE connectivity, and most robust capacitive touch



Low power consumption to increase battery lifetime



Easy, convenient, and secure payment by NFC



Bluetooth® audio streaming with BT/BLE SoC and Wi-Fi combo



Secure cellular network connection



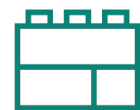
Best performance for voice call and voice assistant with MEMS microphones



Highest accuracy and fast signal pick-up for location tracking and altitude measurement



Reliable and low-power code and data storage in a tiny footprint



Products with smallest form factors enable high functional integration



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Security camera and video doorbell

Make your wire-free camera smarter

Advancements in video surveillance technology take indoor and outdoor security solutions to the next level. Smart cameras connected to management systems and cloud platforms can detect intruders more easily and alert users when they sense danger. By equipping cameras and doorbells with reliable connectivity and accurate sensor solutions, security-enhancing IoT features can be implemented, significantly improving the detection of intrusions and other unusual behavior.

Camera hardware improvement enables differentiated features to move from the cloud to the edge. Cameras become an active component in smart homes, not just passive observers. Wireless cameras and doorbells often demand low power with high integration features.

Infineon offers a broad range of products to make security cameras and video doorbells smart and connected. The ultra-low power, high-performance AIROC™ wireless connectivity solution portfolio for matter-enabled Wi-Fi and Bluetooth® solutions offer reliable, secure connections to cloud and management systems at all times, while linking cameras and doorbells to the whole smart home. Sensors such as Infineon’s XENSIV™ radar sensors can help overcome bandwidth limitations, for example, by the waking-up function and reducing false positives when motion near the camera is detected. The XENSIV™ MEMS Microphone enables sound or voice and notification. At the same time, Infineon’s embedded security solutions make connected cameras more robust against cyberattacks. Infineon’s best-in-class low-power MCU and wireless support for cameras and doorbells often are battery-operated and rely on a persistent connection to the cloud with low-latency wakeup capability.

Features and benefits

Key features	Key benefits
- Reliable and robust connectivity with Wi-Fi6/E	- Improvement in coverage, deploy density, latency, throughput, etc.
- Low-power Wi-Fi and MCU	- Longer battery life
- Connectivity processor in wireless solution	- Offloading host burden for power saving; BOM reduction
- Infineon leading solution of Matter	- Interoperability between devices in smart home
- Highly accurate set of sensors with low power consumption	- Accurate data collection for new use cases, e.g. wake-up functions with radar sensor
- Turnkey embedded security solutions	- Ensuring device integrity and robust design against cyber attacks

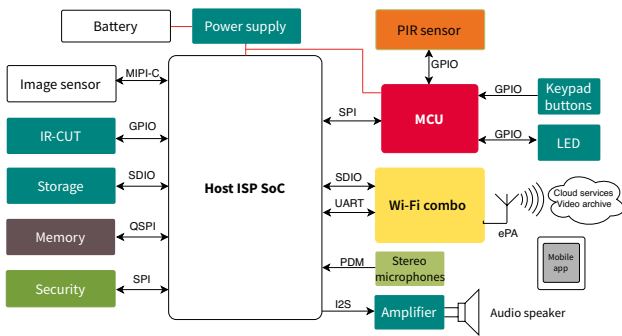


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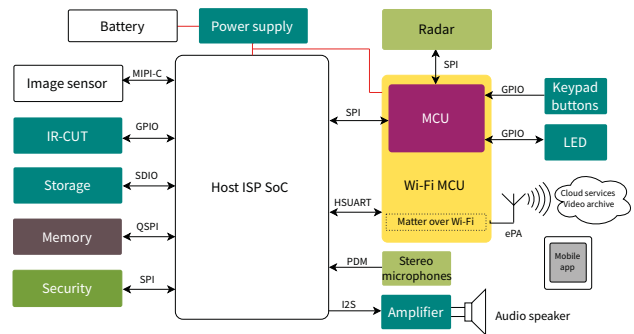
www.infineon.com/doorbell-camera



Current generation block diagram – battery powered



Next generation block diagram – battery powered



Sensing		Security	MCU	Memory
MEMS Microphone – IM69D128S (low power) – IM72D128 (high SNR) – IM68A130 (low power) – IM73A135 (high SNR/AOP)	Radar IC – BGT60LTR11AIP (60 GHz) – BGT60UTR11AIP (60 GHz) – BGT60TR13C (60 GHz)	OPTIGA™ Trust M OPTIGA™ TPM – SLB 9670 TPM 2.0	– PSoC™ 4 Arm® Cortex®-M0/M0+ – PSoC™ 6 Arm® Cortex®-M4 / M0+	– SEMPER™ Nano flash

Wi-Fi			
Good	Better	Best	Wi-Fi 6/6E
CYW43439 – Single band, 1x1 11 n, iPA. SDIO – Low power – BT/BLE 5.0 UART – TCP/IP keep alive – WPA3 – Antenna diversity – Cost-effective connectivity	CYW4373 – 1x1 11 ac dual-band, USB and SDIO – TCP/IP keep alive – WPA3 – Antenna diversity – External PA for long range CYW43012 for low power – Ultra-low-power, 28 nm – 802.11a/b/g/n-compliant, dual-band – TCP/IP keep a live – High volume production, field-proven in battery cameras – No capacity constraints	CYW5459x for high performance – RSDB, MU-MIMO, 2x2 11 ac – 80 MHz channel, up to 867Mbps – PCIe3.0 and SDIO 2.0 Wi-Fi – BT/BLE 5.1 – 2- and 3-antenna configurations CYW43022 for ultra-low power – 43012 pin-compatible “drop-in” replacement with no RBOM change – New Deep Sleep mode enabling improved DTIM power states – ROM update frees up run-time RAM space for features and patches	CYW5557x for High performance – 2x2 11 ax, tri-band capable – Integrated high-power front end – Highest throughput -1.2 Gbps max. – Advanced Coexistence – Novel long-range extension modes for devices CYW55x13 for ULP and offloading – 1x1 11 ax, Tri-band, 20 MHz for IoT – Ultra low power, extended battery life – WiFi MCU with connectivity processor for system-level power saving and BOM reduction – Improved transmit power and sensitivity for long range



Click here to learn more:

www.infineon.com/doorbell-camera



Smart conferencing systems

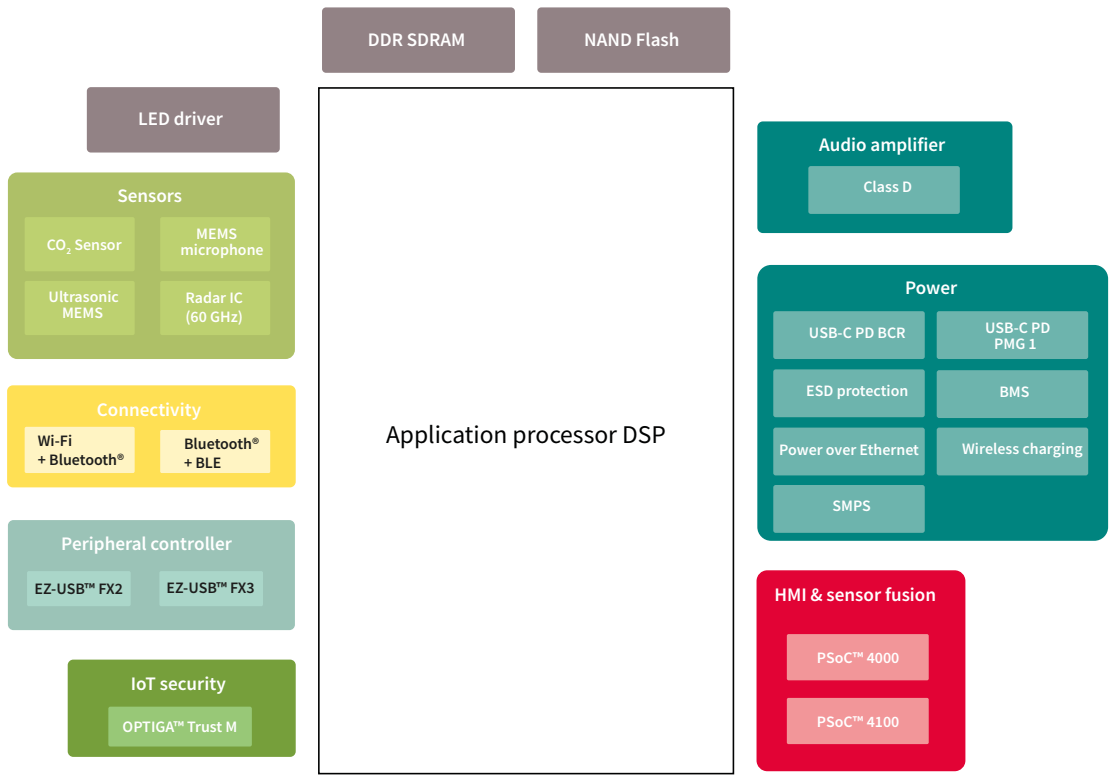
Design conference phones and video conferencing systems for exceptional performance and user experience

The last few years have changed how we interact with our colleagues in the workspace. With the rise of remote work and flexible office spaces new challenges arise – new soft skills, but more importantly, new technology is needed to meet the hybrid way of working. In this changing environment, conferencing systems and speakerphones are essential to enhance the productivity of remote teams and serve customers effectively. The user experience and functionality are further enhanced by smart features, including voice assistants for businesses, user tracking, and new connectivity technologies. Infineon’s portfolio provides exceptional performance, user experience, and energy efficiency for the next generation of conferencing systems and speakerphones.

Features and benefits

Key features	Key benefits
– Best-in-class figures of merit	– Lower system power consumption and energy savings and enablement of deep sleep modes
– Reliable connectivity and power solutions	– Less failure and increased up-time with stable connectivity of surveillance camera to cloud and management platforms
– Co-processor in connectivity solutions	– Keep-alive feature in connectivity solutions
– Small footprints of components	– Sleeker designs and space savings
– Turnkey embedded security solutions	– More robust designs against cyberattacks in connected eco-systems
– Highly accurate set of sensors with low power consumption	– Accurate data collection for IoT use cases, e.g., wake-up functions with radar sensors

Application diagram



Click here to learn more:

www.infineon.com/smart-conference-systems
www.infineon.com/optiga-trustm-express

www.infineon.com/mems
www.infineon.com/psoc-4000t

www.infineon.com/merus
www.infineon.com/wi-fi-6-6e

Product portfolio

Functional block	Product family		Product	Benefits
Audio input	Microphones		XENSIV™ MEMS microphones	<ul style="list-style-type: none"> High-performance microphone with low self-noise (high SNR) and low distortions, setting a new performance benchmark for a superior user experience
Audio output	Class D amplifier		MERUS™ class D audio amplifiers	<ul style="list-style-type: none"> Cooler, smaller, and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in product form factors for great-sounding audio products Extended battery playback time or the reduction of battery size
Connectivity	Bluetooth® modules and Wi-Fi + Bluetooth® combos		AIROC™ Wi-Fi + Bluetooth® combos and Bluetooth® modules	<ul style="list-style-type: none"> Best-in-class interoperability to the widest deployed wireless IP Whole Home Range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks Ultra-low-power technology designed with battery operation in mind
Sensing	Capacitive sensing touch controller		CAPSENSE™ capacitive touch sensing controller	<ul style="list-style-type: none"> State-of-the-art noise immunity (SNR > 100:1) and water rejection have made CAPSENSE™ the industry leader Advanced inductive touch sensors make possible sleek, futuristic user interfaces with metallic overlay
	Radar sensor		XENSIV™ 60 GHz radar sensor	<ul style="list-style-type: none"> Accurate presence detection and vibration detection based on the ability to track sub-millimeter motion at high speed and accuracy, both stand-alone chip as well as system solution available
	CO ₂ sensor		XENSIV™ PAS CO ₂ sensor	<ul style="list-style-type: none"> Along with size and cost advantages, the sensor delivers superior accuracy, providing a direct readout of the real CO₂ level
Security	IoT security controller		OPTIGA™ Trust M	<ul style="list-style-type: none"> Easy and secure provisioning services with OPTIGA™ Trust M for maintaining the speaker's unique identity and integrity Unify different products under unified PKI architecture
Data communication	USB peripheral controllers		EZ-USB™ FX SuperSpeed controllers	<ul style="list-style-type: none"> Most versatile USB peripheral controller which can add a USB 5 Gbps connectivity to any system
Power	USB-C PD controller		EZ-PD™ USB-C controller	<ul style="list-style-type: none"> USB-IF certified with market-proven USB PD stack, ensuring spec compliance and interoperability Supports all USB PD profiles commonly used in USB-C power adapters A highly-integrated solution that minimizes incremental BOM costs
	ESD protection		ESD111, ESD245	<ul style="list-style-type: none"> Outstanding low capacitance devices for best signal integrity High protection performance by ultra low clamping voltage
	Wireless charging		15 W inductive wireless power transmitter	<ul style="list-style-type: none"> Powerful and cost-effective wireless charging solutions for high performance, smart and secure charging solutions supported by Infineon's unique wireless power controllers
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7 (standard grade)	<ul style="list-style-type: none"> Best price-competitive CoolMOS™ SJ MOSFET family Lower switching losses than a standard MOSFET
		ACF, FMCI	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> Lower Q_{rr}, lower hysteresis loss, low R_{DS(on)}
	SMPS flyback converter control ICs	QR flyback ICs	ICE5QSAG	<ul style="list-style-type: none"> High efficiency and low standby power
		FFR flyback IC	XDPS21071	<ul style="list-style-type: none"> High power density and ideal for USB-PD
	SMPS synchronous rectification	Low-voltage MOSFETs	OptiMOS™ PD	<ul style="list-style-type: none"> Low conduction losses and reduced overshoot Logic-level switching/S308/PQFN 3.3 x 3.3 packages available
Control ICs		IR1161LTRPBF	<ul style="list-style-type: none"> High efficiency/simple external circuitry 	
SMPS load switch	Low-voltage MOSFETs	OptiMOS™ 30 V	<ul style="list-style-type: none"> Low conduction losses S308/PQFN 3.3 x 3.3 packages available 	



Click here to learn more:

www.infineon.com/smart-conference-systems
www.infineon.com/optiga-trustm-express

www.infineon.com/mems
www.infineon.com/psoc-4000t

www.infineon.com/merus
www.infineon.com/wi-fi-6-6e



LED lighting

Solutions for cost-sensitive applications as well as for smart lighting

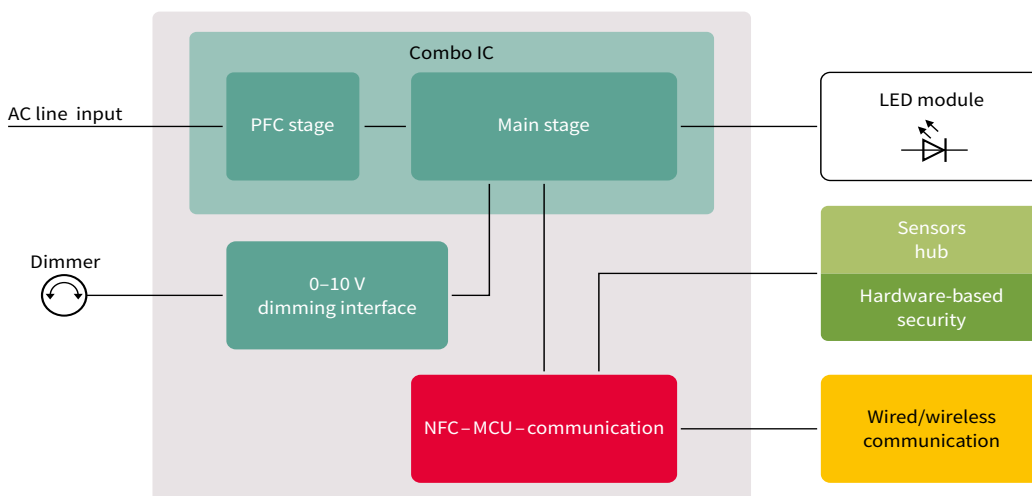
Infineon supplies tailored products for LED drivers, LED strips, horticultural, and smart lighting. Our broad portfolio of LED lighting comprises LED driver ICs, MOSFETs, and microcontrollers suited for LED drivers as well as sensors and dedicated ICs for secure communication. In addition to offering products of proven quality, a competent global lighting team supports our lighting customers in designing LED lighting products and systems in collaboration with our channel partners.

Key trends and challenges in LED lighting and our offering:

- Human-centric lighting (HCL)
 - The lowest cost implementation of tunable white with single-stage flyback constant voltage and smart linear regulators with advanced headroom control ensuring high efficiency
- Configuration of output current and some further parameters
 - Our NFC controller allows the configuration of the output current without the need for an additional microcontroller
 - Our XDPL lighting IC family allows, besides output current, also adjustment of other features like protection, dimming curves, etc.
- Cost reduction combined with efficiency increase
 - Integration of resonance inductor for PFC + resonant topology enables highest efficiency at low cost
 - Integration is enabled by the coreless transformer technology that enables high switching frequencies
- Higher performance in efficiency and power density
 - Infineon GaN solutions enable innovative system designs that meet the highest standards and deliver outstanding performance



LED drivers

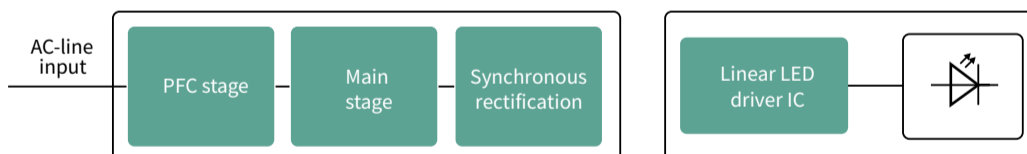


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Recommended LED driver products

Functional block	Product type	Product family	MOSFET technology	Voltage class
PFC stage	PFC	IRS2505	CoolMOS™ P7 CoolMOS™ 8	600 V/700 V/800 V/950 V ¹⁾ 600 V
Main stage	PFC + LCC (constant current) PFC + LLC (constant current)	ICL5102 ²⁾	CoolMOS™ P7 (up to 600 mΩ) CoolMOS™ PFD7 CoolMOS™ 8	600 V/600 V 600 V
			CoolMOS™ CE (above 600 mΩ) CoolMOS™ 8	600 V
		ICL5102HV ²⁾	CoolMOS™ PFD7 CoolMOS™ 8	950 V 600 V
	PFC + flyback (dual-stage)	XDPL8221 ³⁾	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant current)	XDPL8105	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant voltage)	XDPL8219	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant voltage)	ICL8800/ICL8810/ ICL8820	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC, flyback low-side gate driver	1EDN7550B	any CoolMOS™ SJ MOSFETs	-
		2EDN8524F	any CoolMOS™ SJ MOSFETs	-
	Half-bridge LLC gate driver		2ED2101S06F	any CoolMOS™ SJ MOSFETs
1EDI20N12AF			any CoolMOS™ SJ MOSFETs	1200 V (coreless transformer/CT)
2EDF7275F			any CoolMOS™ SJ MOSFETs	650 V (coreless transformer/CT)
CoolGaN™			-	600 V - 700 V
Buck/linear solutions	Secondary buck (single-channel) Secondary buck (multichannel)	ILD8150	integrated	80 V
	High-side buck gate driver	1EDB8275F	any CoolMOS™ SJ MOSFETs	650 V
	Low-side buck gate driver	1EDN8511B	any CoolMOS™ SJ MOSFETs	-
	Secondary linear controller with feedback	BCR601	small-signal MOSFETs	75 V/100 V
	Tunable white with linear LED driver	BCR601, BCR602	small-signal MOSFETs	75 V/100 V
Dimming	0-10 V dimming interface IC	CDM10V	-	-
		CDM10VD	-	-
NFC	NFC configuration IC	NLM0010/NLM0011 ⁴⁾	-	-
Microcontroller	XMC™ microcontroller	XMC1100, XMC1200, XMC1300, XMC1400	-	-
	PSOC Microcontroller	PSOC™ C3	-	-

LED driver with constant voltage output and linear/switch mode LED driver ICs



Linear LED driver IC product portfolio

Functional block	Topology	IC product family	MOSFET technology
Lowest cost LED driver IC	Linear	BCR400W series	Integrated
Low voltage drop LED driver IC		BCR430U/BCR431U	
Robust LED driver IC		BCR40xU/BCR42xU	

For additional portfolio, take a look at [Lighting ICs](#).

1) 700 V, 800 V and 950 V CoolMOS™ P7 are optimized for PFC and flyback topologies. 600 V CoolMOS™ P7 is suitable for hard as well as soft switching topologies (flyback, PFC and LLC)

2) PFC and resonant combo controllers

3) Higher input voltage

4) In addition to current configuration also constant lumen output (CLO) feature included



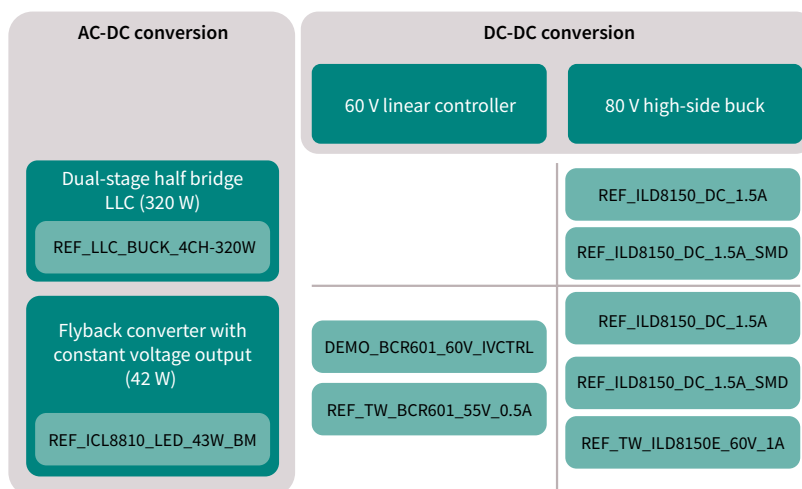
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Plug & LEDs play solutions

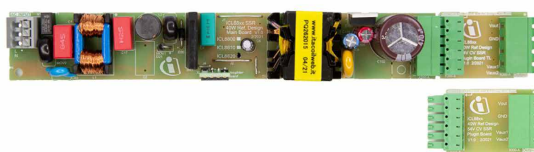
Modular LED lighting reference designs for LLC, buck, and PFC flyback topologies

LED lighting has become a mature technology with stringent requirements on light quality. In order to achieve high light quality, there is a strong trend towards two-stage topologies. These two-stage topologies ensure that the light flicker, also called light ripple, remains at low levels according to the IEEE 1789 standard and other new upcoming regulations. Primary constant voltage output, followed by a DC-DC buck, enables dimming, efficiency, cost, and scalability benefits. Infineon has solutions for both the primary AC-DC stage as well as for the secondary DC-DC buck stage. These solutions can be combined in a plug-and-play concept. In other words, the suitable AC-DC stage and the best-fitting DC-DC stage can be selected and tested depending on the requirements.



Our solutions include but are not limited to:

Low to medium power platform promising tunable white at low cost



REF_ICL8810_LED_43W_BM



REF_TW_BCR601_55V_0.5A

320 W DCM PFC cost-effective and scalable platform design with up to 4 DC-DC channels



REF_LLC_BUCK_4CH_320W



REF_ILD8150_DC_1.5A



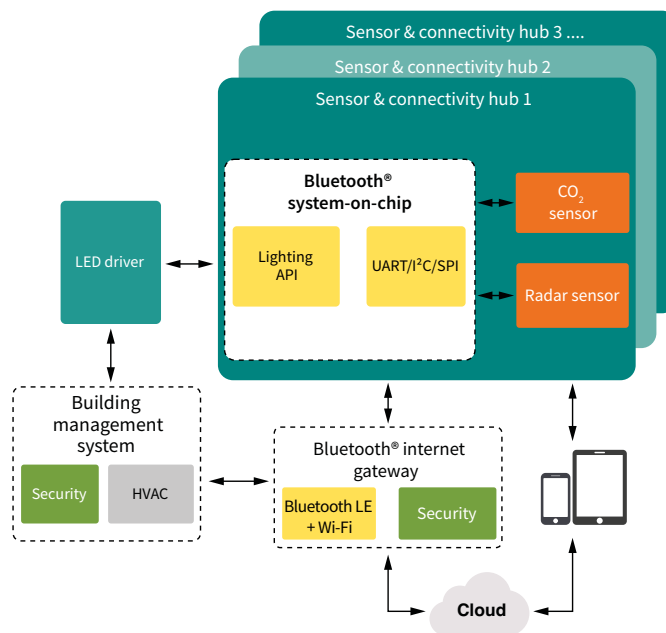
Click here to learn more: www.infineon.com/leddriver-reference-solutions



Smart lighting solutions

Connectivity and sensor solutions for connected and smart lighting to facilitate everyday life

In the last few years, connected and smart lighting have gained high momentum in the lighting industry. In this application field, sensing and connectivity play an essential role. Besides helping realize energy savings, they also enable new use cases beyond lighting controls.



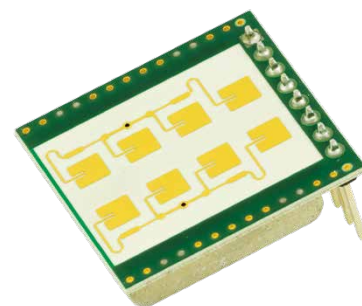
Radar sensor solutions

For energy saving, passive infrared (PIR) sensors are used. Novel sensors like radar can overcome weaknesses of PIR sensors like poor design, limited detection of micro-movements, and limited area coverage, to name a few. Radar sensors can be seamlessly integrated into the luminaires enabling nice design as well as platform design of luminaires since there is no need for drilling holes as in the case of PIR sensors. Advanced use cases like people counting and people tracking can also be ensured with radar technology. In order to add more intelligence to the entire system, connectivity is a key element.

Our partners:

Our system design house partners deliver both standard products and customized solutions to fit specific lighting applications from movement detection through automatic light activation to person counting. In addition, they offer all levels of support to get your intelligent lighting system up and running as quickly and efficiently as possible. See below a list of some of our partner solutions:

Functional block	Topology	IC product family
RF Beam	K-LD2	Presence detection including slight movements
	K-LD7	
InnoSent	INS-313x	Motion detection range up to 5 m
	INS-333x	Motion detection range up to 10 m
Novelic	RIOT100 – NRM302	Turnkey motion and presence sensor solution up to 15 m



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www.infineon.com/smart-lighting
www.infineon.com/makeradar

Bluetooth® Mesh devices and modules for connected and smart lighting applications

Embedding Bluetooth® Mesh networking in lighting systems, including luminaires, fixtures, and wall switches, opens a range of system applications to manage lighting brightness or color, efficiency based on occupancy movements, and correlation of lighting ecosystem components. The range and coverage of Bluetooth® Mesh devices allow for low latency, whole building coverage of automation and occupancy interaction via smartphone and tablet applications, and cloud applications for building management. Infineon provides a range of Bluetooth® Mesh MCUs and certified modules that enable lighting control functionality, safety and occupancy sensor management, and robust, secure, reliable networked managed solutions.

Bluetooth® Mesh SoCs and certified modules: solutions and benefits

Bluetooth® Mesh system-on-a-chip (SoCs) and certified modules offer a range of efficient and future-proof upgradeable solutions:

Solutions	Benefits
<ul style="list-style-type: none"> Module diversity with integrated components ranging from the basic battery-powered sensor to the most sophisticated detection and safety devices 	<ul style="list-style-type: none"> Accommodating different needs now and in future
<ul style="list-style-type: none"> Fully-integrated modules 	<ul style="list-style-type: none"> Accelerate time-to-market Reducing development and manufacturing costs
<ul style="list-style-type: none"> Ultra-high-transmit power designs with integrated antennas 	<ul style="list-style-type: none"> Enabling long range and unailing node-node connections
<ul style="list-style-type: none"> Integrated CPU, memory (flash and RAM) and I/O 	<ul style="list-style-type: none"> Suiting all foreseeable applications hosting

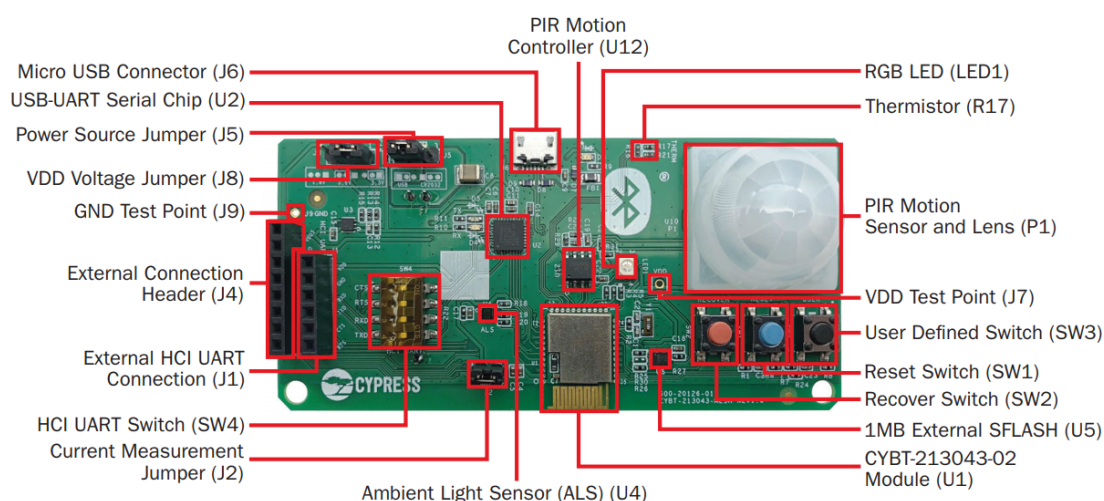
Bluetooth® Mesh evaluation kit CYBT-213043-MESH

The Bluetooth® Mesh evaluation kit (CYBT-213043-MESH) enables you to evaluate SIG Mesh functionality and features using the CYBT-213043-02 module. The CYBT-213043-02 module is an integrated, fully certified, 12.0 mm x 16.61 mm x 1.70 mm, programmable Bluetooth® Smart Ready module designed to reduce your time-to-market.

Utilized device: CYW20819

Kit contents:






- 4x mesh evaluation boards
- 4x USB A to micro-B cables
- 1x quick-start guide



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Mesh-enabled, silicon, dual-mode Bluetooth® 5.0 AIROC™ MCUs

	CYW20706	CYW20735	CYW20819	CYW20820	CYW20829
Product features					
TBA processor	CM3	CM4 w/FPU	CM4	CM4	CM33
TBA radio	-	ULP RF	ULP RF	ULP RF	ULP RF
Operating temperature	105°C	85°C	125°C planned	125°C planned	85°C
Transmit power	10 dBm Tx	10 dBm Tx	4 dBm Tx	10 dBm Tx	10 dBm TX
Memory	-	-	256 kB flash	256 kB flash	256 kB flash



Interested in more? We offer a broad silicon portfolio to support your Bluetooth® Mesh design.

Fully-certified Bluetooth® modules (FCC, ISED, MIC, CE)

	<p>Load range Up to 20 dBm transmit power</p>  <p>CYBT-483056-02</p>	<p>Size and simplicity EZ-Serial support enables fast time to market and 9x9 mm size for small form factor application</p>  <p>CYBT-353027-02</p>	
	<p>Value Balance of features for cost sensitive applications</p>  <p>CYBT-343052-02</p>	<p>Integration Fully integrated SoC with lowest power and extended range</p>  <p>CYBT-273063-02</p>	



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Wi-Fi enterprise networking and internet connectivity

Wi-Fi networking is the backbone of enterprise, retail, and home internet connectivity. Wi-Fi is the bridging medium for Bluetooth® Mesh networks to enterprise networks and cloud applications capturing messaging from across the lighting installation for secure enterprise building management applications. Wi-Fi can also connect sensors and fixtures directly to enterprise or home access points for long-range solutions or integrated solutions including security lighting and cameras. Infineon offers a range of secure, high-performance enterprise-ready Wi-Fi solutions that can be added to switches, panels, and lighting bays. These solutions can be stand-alone network nodes or offer Bluetooth® Mesh Gateway services bridging Mesh-networked devices to cloud applications.

IoT Wi-Fi portfolio







Technology	Wi-Fi	Wi-Fi + MCU	Wi-Fi + Bluetooth® Combos
Wi-Fi 4 (802.11n)	CYW43364 SB 1x1 11n SDIO		CYW43439 SB 1x1 11n + BT5.2 SDIO/SPI
		CYW43903 SB 1x1 11n + 160-MHz R4	CYW43012 ULP DB 1x1 11n + BT5.1 SDIO/SPI WLBGA/WLCSP
		CYW43907 1x1 DB 11n + 320-MHz R4	
Wi-Fi 5 (802.11ac)		CYW54907 1x1ac DB + 320-MHz R4	CYW54590 DB 2x2 11ac + BT 5.1 PCIe/SDIO
			CYW4373 DB 1x1 11ac + BT5.0 USB/SDIO/PCIe
			CYW54591 DB 2x2 11ac, RSDB, BT5.1 PCIe/SDIO

Infineon’s Wi-Fi portfolio provides high-performance, flexible connectivity for Linux, Android, and RTOS. Many of the Wi-Fi + Bluetooth® Combos are supported on Infineon’s WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK) which provide code examples, tools and development support.

Infineon’s Wi-Fi and Bluetooth® Combos use production-ready, fully-certified Wi-Fi + Bluetooth® Combo modules based on both Linux and RTOS based platforms. Many of the Wi-Fi + Bluetooth® Combos are supported on Infineon’s WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK) which provide code examples, tools and development support for **easier and faster development.**

 **Click here to learn more:**
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Wi-Fi enterprise networking and internet connectivity

 + 	 + 	 + 
CYW43907: MCU + Wi-Fi	PSoC™: PSoC™ running RTOS 3 rd -party SoC running Linux OS	P/N: CY8CKIT-06S2-43012 PSoC™ 6: Ultralow-power dual-core MCU
CYW20829: Dedicated Bluetooth® LE 5.4 MCU	CYW43439*: 1x1n Wi-Fi + Bluetooth® Combo SoC	CYW43012 (Murata Type 1LV): Dedicated low-power Wi-Fi + Bluetooth® 5 Combo SoC

We offer a broad platform portfolio to support your Bluetooth® Mesh gateway.

IoT Wi-Fi portfolio

A global Wi-Fi module partner ecosystem enables support and development for your IoT application.



Design, build, and sell RF Modules with limited software and hardware certification support

Module makers



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Telecommunication infrastructure

Cutting-edge semiconductors for mobile communication, network equipment and beyond

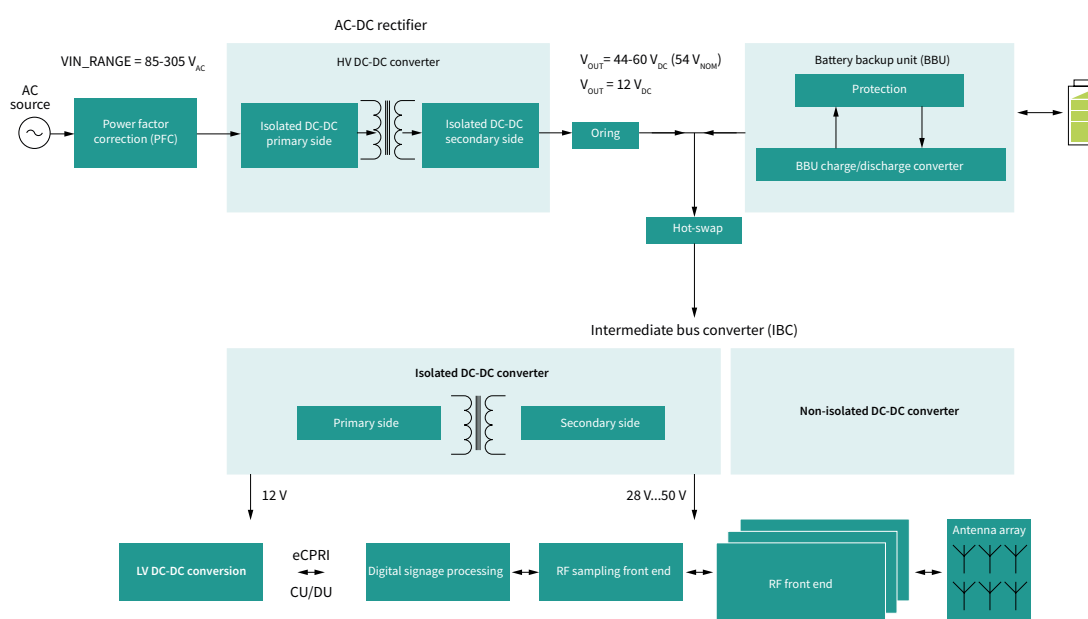
As the global demand for data grows, the call for improved connectivity, performance, and coverage has reached peak significance. Alongside these demands, enhancing energy efficiency has also emerged as a critical factor in our collective journey towards a greener world. A significant step in this direction is the introduction of 5G mobile telecommunications: known for its high-speed and reliable connectivity, 5G also brings substantial advantages in power consumption, providing a more energy-efficient solution to meet our increasing data needs.

Over the years, Infineon has gathered a wealth of expertise and insights in the telecommunications sector, building an extensive portfolio of high-quality semiconductors spanning from “grid to air” to enable efficient power conversion, robust security, seamless connectivity and playing a pivotal role in powering a greener and more sustainable world.

Features and benefits

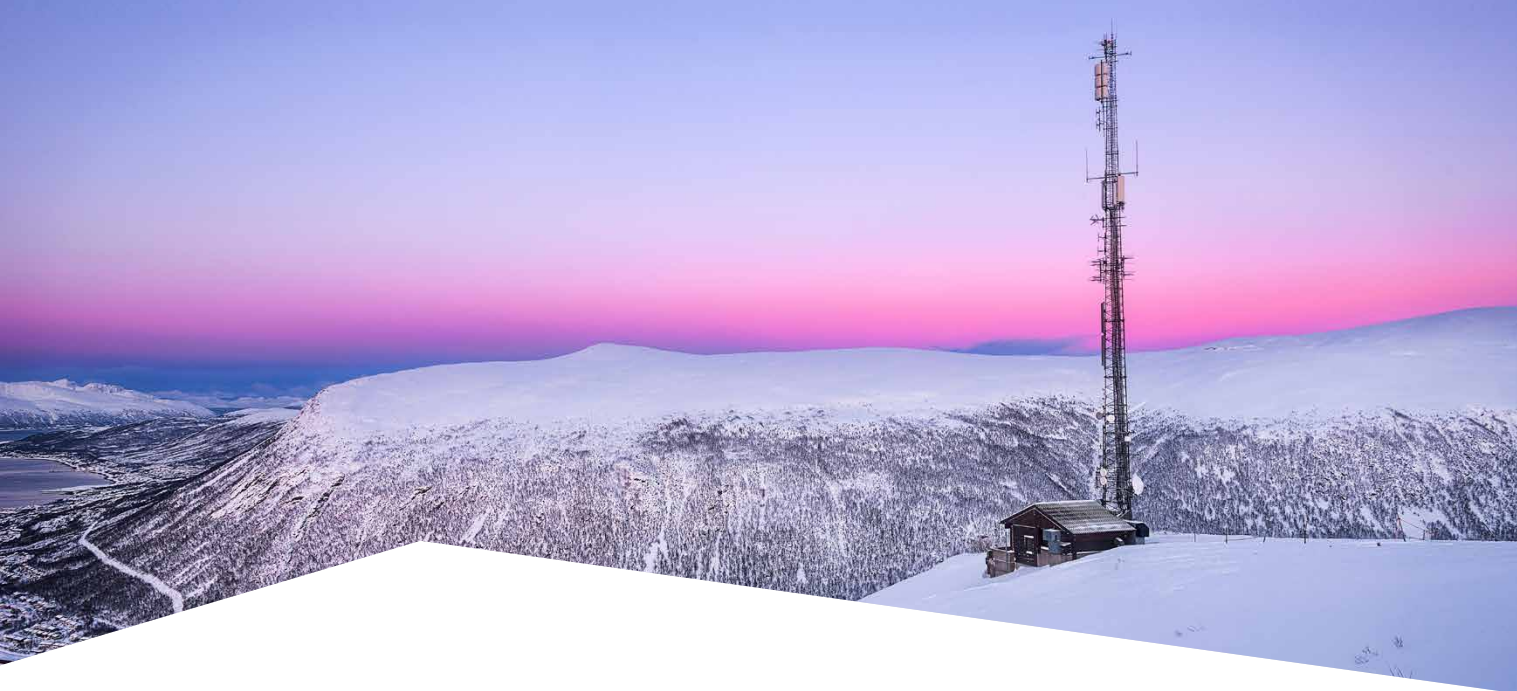
Key features	Key benefits
- Broad portfolio covering the complete power flow and more	- One-stop-shop, complete offering and deep system competence
- Best-in-class power semiconductor solutions based on Si, SiC, and GaN	- High power density, efficiency and reliability
- 20+ years of quality track record in the telecommunications industry	- Robust solutions, reliable performances
- Trusted partner with reliable manufacturing capabilities	- Continuous investments in capacity and business continuity

Application diagram



Click here to learn more:

- www.infineon.com/telecominfrastructure
- www.infineon.com/bms-server-telecom
- www.infineon.com/memory
- www.infineon.com/telecom-acdc
- www.infineon.com/fpga-telecom
- www.infineon.com/ict-security



Product portfolio

Functional block	Description	Featured products
Rectifier	The telecom rectifier typically converts the single or the three-phase AC input into 12 V, 48 V, or 54 V DC output. The power factor correction (PFC) shapes the power supply's input current to be in synchronization with the AC input voltage to maximize the real power drawn from the mains. Followed by an isolated DC-DC converter and synchronous rectification stage, the telecom rectifiers achieve the highest efficiency and power density levels.	<ul style="list-style-type: none"> – CoolMOS™ high voltage MOSFETs – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – XMC™ microcontrollers – ISOFACE™ digital isolators – CoolSET™ auxiliary SMPS controllers – CoolGaN™ GaN HEMTs ideal for soft-switched and hard-switched high frequencies topologies – CoolSiC™ MOSFETs ideal for high-current applications in hard-switched topologies
Auxiliary power	Telecom rectifiers require an auxiliary SMPS power source that works separately from the main power supply to support, for instance, standby operation. Power ratings can vary from a few to a few tens of watts for these auxiliary supplies, which can be either isolated or non-isolated.	<ul style="list-style-type: none"> – CoolSET™ AC-DC integrated power stages – XENSIV™ high-precision coreless current sensors
Battery Management System (BMS)	The battery management system ensures the high performance and safe operation of Li-ion batteries. It performs actions such as state of charge (SOC) and state of health (SOH) estimations. In battery back-up systems, the BMS circuit is coupled with a DC-DC converter to ensure a regulated output voltage. The DC-DC stage is bidirectional and usually a buck-boost topology, single or multiphase.	<ul style="list-style-type: none"> – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – PSoC™ microcontrollers for power management
Hotswap	Industry's first wide voltage range hot-swap controller with a programmable digital safe operating area (SOA) control and a superior current reporting accuracy of $< \pm 0.75\%$.	<ul style="list-style-type: none"> – XDP™ XDP710 hot-swap controller with a programmable digital SOA control
DC-DC conversion	Infineon provides DC-DC conversion solutions for radio units, AAS, and DU/CU servers. Infineon's growing portfolio targets all stages of DC-DC conversion from 48 V intermediate bus converters (IBC) down to point-of-loads used to supply analog front-end (AFE), field-programmable gate arrays (FPGA), or application-specific integrated circuits (ASIC). The multiphase controller plus integrated power stage solutions allow the power designer to address the most stringent dynamic requirements when providing supply to high-performance processors.	<ul style="list-style-type: none"> – XDP™ XDPP1100 Digital power controller – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – ISOFACE™ digital isolators – XENSIV™ high-precision coreless current sensors – Integrated power stages: combining OptiMOS™ with intelligent gate drivers through Infineon's superior packaging technologies – Integrated Point of Loads: including digital, analog, and constant on-time options – Digital multiphase controllers: a wide portfolio supporting multiple communication protocols such as Intel SVID, AMD SV12, AVS bus and PMBus, and offering a variety of programmable features – High performance memory solutions
RF front-end	Discover Infineon's RF front-end components for massive MIMO antenna systems in telecom infrastructure applications. Our portfolio of compact and efficient devices such as bias and control ICs and driver amplifiers ensure reliable signal transmission and reception with high quality and top-notch performance.	<ul style="list-style-type: none"> – RF front-end driver amplifiers: these small yet mighty amplifiers can be used as pre-drivers or drivers in RF applications such as mMIMO 5G base stations to small cells and access points – RF front-end bias and control ICs: these highly integrated ICs are used to bias radio-frequency power amplifiers by generating accurate voltage with high-precision DACs
Security	Security in 5G networks is vital for data privacy, maintaining network integrity, preventing cyber-attacks, ensuring regulatory compliance, building user trust, securing IoT, and enabling new technologies. It helps protect sensitive data, prevent disruptions, and promotes safe, reliable operations.	<ul style="list-style-type: none"> – OPTIGA™ TPM - Trusted platform module – OPTIGA™ Authenticate for authenticity verification of devices and systems – OPTIGA™ Trust M high-end security solution offering a wide range of security features
Memory	Reliable and performant NOR Flash and RAM memory solutions for code storage, efficient data logging, high-speed cache and more.	<ul style="list-style-type: none"> – SEMPER™ NOR Flash – Broad RAM portfolio



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Datacom

Data center and computing

Energy-efficient and top-performing data storage technologies

The trend towards digitalization and rapid adoption of generative AI is creating exponential growth in global data generation, substantially impacting data center and computing infrastructure requirements. The chips performing the AI acceleration tasks are expected to complete training cycles faster. With each generation of AI processor, the power requirements are increasing to meet the required computational performances. This drives system power requirements up dramatically, creating significant power density challenges. Effective data center and computing designs must, hence, combine high power density with efficiency: our solutions enable green and efficient computing platforms that reduce the overall power consumption in data centers and actively contribute to the decarbonization of our world.

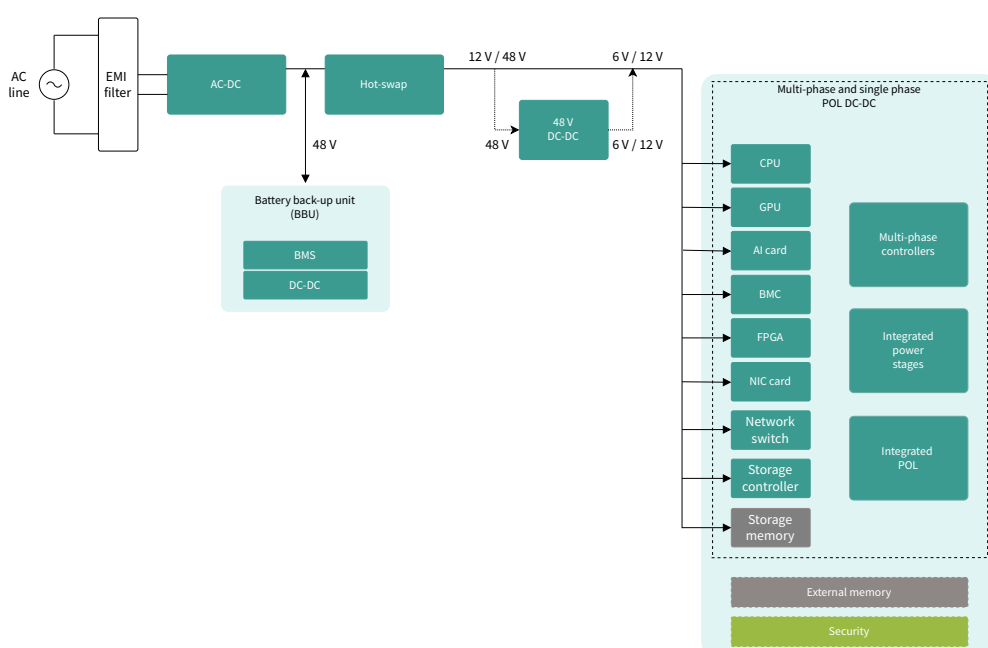
Infineon's multi-pronged innovation strategy with power semiconductor technologies, including silicon and wide band gap, advanced packaging technologies with discrete and multi-die, as well as system architectures, smart control and software, offers a unique opportunity to offer a truly optimized system solution from AC-to-core, offering improved data center TCO by saving up to 48.3 TWh per year, ~\$10 Bn electricity cost and 34.2 M metric tons CO2 equivalents.

Features and benefits

Key features
- Broad portfolio from AC-to-core
- Best-in-class SMPS densities achieved with Si, SiC, GaN hybrid solutions
- Industry-best vertical power delivery solutions for next gen power processor
- Broad portfolio of solutions to support 48 V DC-DC and hot-swap
- Trusted partner with reliable manufacturing capabilities

Key benefits
- One-stop-shop, system offering and deep system competence
- Enables SMPS designs up to 12 kW with 100 W/in ³ power density
- Achieves 2% higher efficiency versus competition and 12% TCO savings versus lateral power delivery solutions
- Solutions support all DC-DC step-down ratios, and reliable SOA protection for hot-swap
- Continuous investments in capacity and business continuity

Application diagram



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- www.infineon.com/datacenter
- www.infineon.com/server-power-supplies
- www.infineon.com/bms-server-telecom
- www.infineon.com/acceleratorcard
- www.infineon.com/48v-power-distribution
- www.infineon.com/fgpa-datacenter



Product portfolio

Functional block	Description	Featured products
Server power supply unit	Infinion's wide portfolio of semiconductors offers a complete system solution to meet the diverse requirements of server and data center SMPS. From high-voltage and low-voltage MOSFETs to gate drivers, microcontrollers, and auxiliary SMPS controllers. A wide portfolio of robust and reliable Wide Band Gap solutions is available to boost efficiency and density further: SiC is perfect for hard-switching topologies and high temperature operating conditions, while GaN is better suited for hard- and soft-switching and high frequency. A hybrid approach achieves the best trade off between efficiency, power density and system cost.	<ul style="list-style-type: none"> – CoolMOS™ high voltage MOSFETs – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – XMC™ microcontrollers – CoolSET™ auxiliary SMPS controllers – CoolGaN™: thanks to their low Qg and Qoss charges, they are ideal for soft-switched and hard-switched high frequencies topologies – CoolSiC™: thanks to their low increase of Rds(on) over temperature, they are ideal for high-current server PSU applications in hard-switched topologies
Battery backup unit (BBU)	The battery management system ensures the high performance and safe operation of Li-ion batteries. It performs actions such as SOC (state of charge) and SOH (state of health) estimations. In BBU systems, the BMS circuit is coupled with a DC-DC converter to ensure a regulated output voltage. The DC-DC stage is bidirectional and usually a buck-boost topology, single or multiphase.	<ul style="list-style-type: none"> – OptiMOS™ MOSFETs: explore Infineon's portfolio of protection switches preventing damage and failures to meet the necessary telecommunication's safety requirements – Power management ICs: PCIMs support comprehensive power supplies with a small form factor footprint for system solutions using TRAVEO™, AURIX™ and PSoC™ MCU families – Gate drivers: every switch needs a driver and it is important to select the right one, that is why Infineon has over 500 EiceDRIVER™ gate driver IC solutions covering different output current options and offering different combinations of protection features
Hot-swap	Industry's first wide voltage range hot-swap controller with a programmable digital SOA (Safe Operating Area) control and has superior current reporting accuracy of $\pm 0.75\%$. Use with OptiMOS™ and OptiMOS™ Linear FET for reliable SOA performance.	<ul style="list-style-type: none"> – XDP™ XDP710 hot-swap controller with a programmable digital SOA control
48 V DC-DC	The 48 V conversion ecosystem is being driven primarily by high power applications such as AI, where system-level power distribution losses need to be reduced and legacy 12 V architectures are no longer able to meet the requirements. This includes Infineon's new intermediate bus converter (IBC) solutions, for HSC and ZSC topologies, for high efficiency and high-power density applications.	<ul style="list-style-type: none"> – XDP™ XDP1100 Digital power controller – OptiMOS™ MOSFETs: explore Infineon's portfolio of protection switches preventing damage and failures to meet the necessary telecommunication's safety requirements – EiceDRIVER™ gate drivers
Multi-phase and single phase POL DC-DC	Digital controllers: Industry's most mature and advanced controller technology with best-in-class transient response. Flexibility with ARM® Cortex® M0 microcontroller for faster design cycle and tailored performance. Multi-protocol support with up to 16-phases & support 1500A+ current levels. Smart power stages: Best-in-class efficiency and robustness with OptiMOS™ MOSFETs and superior packaging technologies. Greater current reporting accuracy ($\pm 2\%$) with current-mirror sense technology. Industry standard footprints with higher electrical and thermal performance. Integrated POL: Best-in-class performance and robustness with OptiMOS™ MOSFET and superior packaging technologies. Ease of use with analog and digital smart POL solutions. Industry's best transient performance with Fast Constant On-Time (COT) control.	<ul style="list-style-type: none"> – Digital multiphase controllers: a wide portfolio supporting multiple communication protocols such as Intel SVID, AMD SV12, AVS bus and PMBus, and offering a variety of programmable features – Integrated power stages: combining OptiMOS™ MOSFETs with intelligent gate drivers through Infineon's superior packaging technologies – Integrated point of loads: including digital, analog and constant on-time options – Voltage regulator for Ampere, Intel, and AMD server CPUs – Voltage regulator for AI accelerator card, SmartNIC card, networking and switch platform – Power management solutions for FPGAs – Network switch – Storage controllers – Raid storage solutions
Dual-phase power modules	Industry's first common footprint module that enables vertical power delivery. Highest efficiency and superior thermal performance enabled through OptiMOS™ smart power stages, inductor-on-top topology (IFX patented IP) and chip embedded packaging to enable $<1\text{ }^{\circ}\text{C}/\text{W}$.	<ul style="list-style-type: none"> – TDM22544D and TDM22545D dual-phase power modules integrate two phases of a multiphase buck regulator, lowering the area of 40% compared to an equivalent discrete solutions



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Solar PV

High efficient solutions for photovoltaic energy systems

Infineon provides a comprehensive portfolio to deliver the best efficiency and reliability for solar applications. Cutting-edge technologies such as CoolMOS™ SJ MOSFETs, CoolSiC™ Schottky diodes, CoolSiC™ MOSFETs, CoolGaN™ HEMT and TRENCHSTOP™ IGBTs. All these power transistors can be safely operated by EiceDRIVER™ coreless transformer gate drivers. Beyond power stage with the rich experience and highest quality ensure Infineon's unique supplier position, which enables one-stop-shop for solar applications. 32-bit ARM® Cortex® MCU families enable easy and high-efficiency design for power conversion blocks. Additionally, our Arm® Cortex®-M0-PSoc™ 4 entry-level family can also be used for PLC (Power Line Communication). Wi-Fi connectivity can be provided by our AIROC™ family of devices.

	Power optimizer 250 W - 1300 W	Micro inverter 250 W - 1500 W	String inverter 2 kW - 350 kW	Central inverter 500 kW - 5000 kW
Si MOSFETs	OptiMOS™ SuperSO8/TOLL/TOLT 60 - 200 V	OptiMOS™ SuperSO8/TOLL 60 - 150 V	OptiMOS™ 150 V - 300 V	-
	-	CoolMOS™ TOLL/D²PAK 600 - 950 V	CoolMOS™ TO-247-3/TO-247-4/D²PAK/TOLL/Q-DPAK 600 - 950 V	-
SiC MOSFETs - discrete	-	CoolSiC™ MOSFET discrete D²PAK-7/TOLL 650 V/1200 V	CoolSiC™ MOSFET discrete TO-247-3/TO-247-4/D²PAK-7 650 V/1200 V/1700 V/2000 V	-
SiC MOSFETs - power modules	-	-	CoolSiC™ hybrid modules Easy 1B/2B/3B 650 V to 1200 V	-
GaN HEMT	-	CoolGaN™ DSO-20/TOLL 100 - 700 V	CoolGaN™ DSO-20/TOLL 100 - 700 V	-
IGBTs - discrete	-	-	650 V/1200 V TRENCHSTOP™ 7 H7 TO-247-3/TO-247-4/TO-247PLUS 600 V/650 V/1200 V	CoolSiC™ hybrid modules 650 V to 1200 V
IGBTs - power modules	-	-	Easy 1B/2B/3B/4B	PrimePACK™ 3+/EconoDUAL™ 3/62 mm
Gate driver ICs	EiceDRIVER™ 2EDi/1ED Compact/2EDL/1EDN	EiceDRIVER™ 2EDi/1EDB/2EDL/ 1ED Compact(1ED-AF) 650 V SOI/1EDB	EiceDRIVER™ 2EDi/650 V SOI/ X3 Compact(1ED31xx) X3 Analog(1ED34xx) 1ED-F3/1EDB/IRS2011	EiceDRIVER™ High-side isolated (1ED020112-xx) Single-channel isolated (1ED3890, 1ED3491) Driver Boards (2ED300C17-xx)
SiC diodes	-	CoolSiC™ Schottky diodes DPAK/D²PAK 650 V/1200 V	CoolSiC™ Schottky diodes TO-220/TO-247/D²PAK 650 V/1200 V	-
Si diodes	-	-	BAT165 Schottky diode 650 V/ 1200 V Emitter Controlled 7	-
Connectivity	AIROC™ Wi-Fi + Bluetooth® Combos/PLC	AIROC™ Wi-Fi + Bluetooth® Combos/PLC	AIROC™ Wi-Fi + Bluetooth® Combos	XMC4400 ARM® Cortex®-M4
Auxiliary power supply	-	CoolSET™	CoolSET™ / CoolSiC™	CoolSiC™
Memory	EXCELON™ F-RAM	EXCELON™ F-RAM	EXCELON™ F-RAM/Asynchronous SRAM	EXCELON™ F-RAM F-RAM/Asynchronous SRAM
Current sensing	XENSIV™	XENSIV™	XENSIV™	XENSIV™
Microcontrollers	XMC1000 Arm® Cortex®-M0 XMC4000 Arm® Cortex®-M4	32-bit PSoc™ 4 Arm® Cortex®-M0/M0+ XMC4000 Arm® Cortex®-M4	32-bit XMC7000 Industrial Microcontroller Arm® Cortex®-M7 XMC4000 Arm® Cortex®-M4	32-bit XMC7000 Industrial Microcontroller Arm® Cortex®-M7 XMC4000 Arm® Cortex®-M4

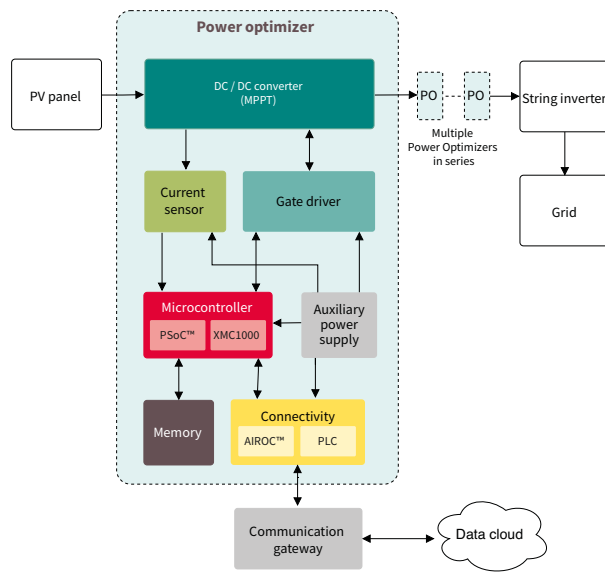


Infineon's product portfolio supports full solar ecosystem including energy storage and EV-charging. Solar power optimizers and micro inverter find their place on the roof right under PV panels. They are exposed to very high ambient temperatures, high thermal cycling and have to meet 25 years life-time, which is equivalent to PV panels. With Infineon's stringent quality measures and production screening processes all these can be met.

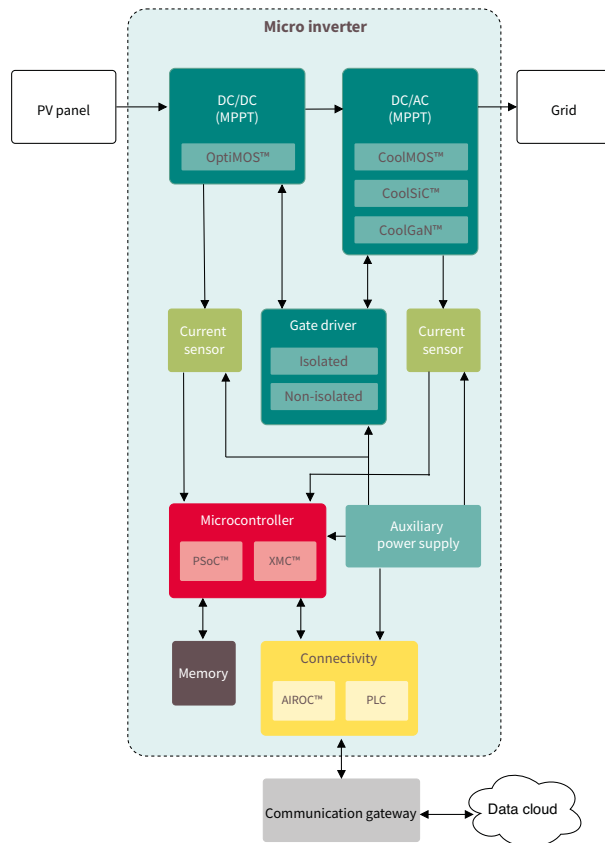
We see on the picture string inverter installed on the wall. Its product offering is shown below for single-phase and three-phase configurations. Energy Storage Solutions (ESS) and EV-charging solutions are placed in respective application chapters in this selection guide.

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www.infineon.com/solar](http://www.infineon.com/solar)

Power optimizer



Micro inverter

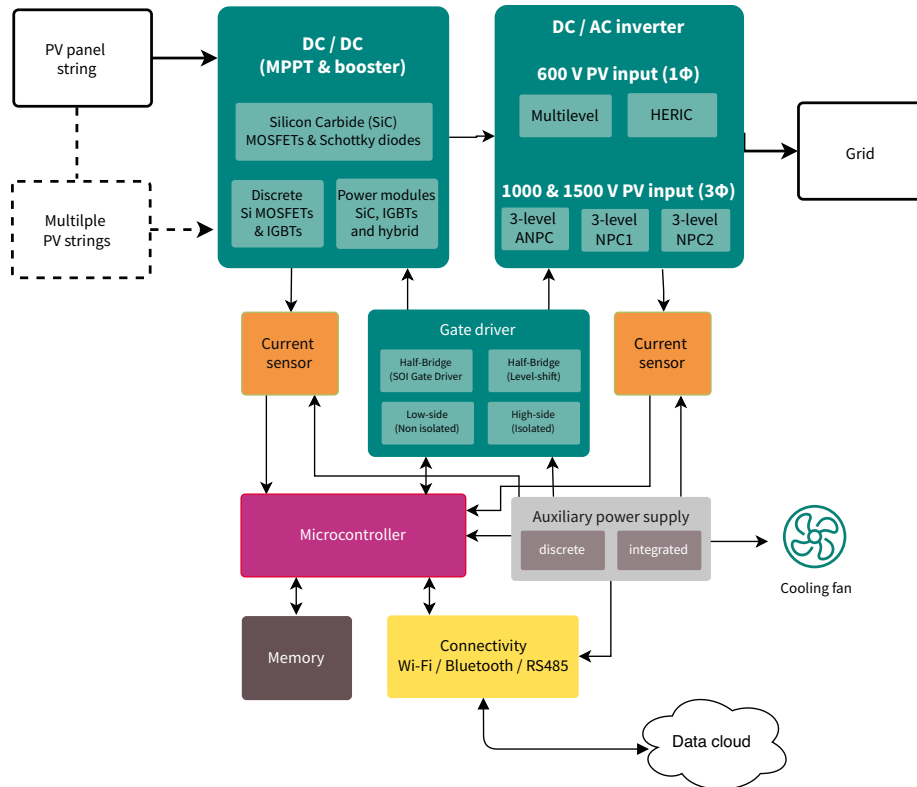


Functional block	Product family	Voltage class [V _{DS max}]	Package*	Part number*	R _{DS(on)}
DC-DC converter	OptiMOS™	60 V	SuperSO8	ISC058N04NM5	5.8 mΩ
					ISC060N06NM6*
		80 V	SuperSO8 SC	BSC028N06NSSC	2.8 mΩ
			SuperSO8	BSC021N08NS5	2.1 mΩ
		100 V	SuperSO8	ISC031N08NM6*	3.1 mΩ
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ
			TOLT	IPTC044N15NM5	4.4 mΩ
		200 V	SuperSO8	ISC130N20NM6	11.9 mΩ
TOLL	IPT067N20NM6		6.7 mΩ		
Gate driver	EiceDRIVER™	Single channel	PG-SOT23-6	1EDN8550	
			SON-10	1EDN7116G	
		Dual channel	SON-8	2EDL8024G	
			DSO	IRS2011	
				2EDL8034F5B	
Microcontroller	XMC™ / PSoc™	XMC1000 for control loop / PSoc™ 4 for PLC communication			
Memory	EXCELON™	CY15B102QN-50SXE (F-RAM)			
Auxiliary power supply	-	TLE8366EV (PWM step-down DC/DC converter)			
Connectivity	AIROC™	CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5)			
	PLC	CY8CPLC20-48LTXIT			
Current sensor	XENSIV™	TLI4971-A025T5			

Functional block	Product family	Voltage class [V _{DS max}]	Package*	Part number*	R _{DS(on)}	
MPPT – Boost stage	OptiMOS™	60 V	SuperSO8	BSC066N06NS	6.6 mΩ	
					ISC060N06NM6	6.0 mΩ
			SuperSO8 SC	BSC028N06NSSC	2.8 mΩ	
		80 V	SuperSO8	BSC026N08NS5	2.6 mΩ	
					ISC031N08NM6	3.1 mΩ
			SuperSO8 SC	IQD016N08NM5CG	1.6 mΩ	
		100 V	SuperSO8	ISC060N10NM6	6.0 mΩ	
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ	
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ	
			SuperSO8	BSC093N15NS5	9.3 mΩ	
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ	
			TOLT	IPTC044N15NM5	4.4 mΩ	
			SuperSO8	ISC130N20NM6	11.9 mΩ	
		200 V	SuperSO8	ISC130N20NM6	11.9 mΩ	
			TOLL	IPT067N20NM6	6.7 mΩ	
CoolSiC™ Schottky diode		1200 V	DPAK	IDM02G120C5	2 A	
				IDM05G120C5	5 A	
Gate driver: EiceDRIVER™			DSO	2EDN7524F		
				2ED24427N01F		
				IRS2011S, IRS2005S, IRS2007S, IRS2008S		
				2EDL8034F5B		
Inverter stage	CoolMOS™	600 V	TO-Leadless	IPT60R102G7	102 mΩ	
			D ² PAK	IPB60R145CDF7	145 mΩ	
			D-PAK	IPDD60R105CFD7	105 mΩ	
		650 V	D ² PAK	IPB65R125CFD7	125 mΩ	
			D-PAK	IPB65R041CFD7	41 mΩ	
	CoolGaN™	600 - 700 V	DSO-20-87	IGOT60R070D1	70 mΩ	
			TO-Leadless	IGT60R070D1	70 mΩ	
	CoolSiC™ MOSFET	650 V	TO-Leadless	IMT65R163M1H	163 mΩ	
			D ² PAK-7	IMBG65R163M1H	163 mΩ	
	Gate driver: EiceDRIVER™	650 V	DSO		IMBG120R181M2H	181 mΩ
				2EDS8165H		
				2EDR8259X		
				2EDS9265H		
				1EDI60112AF, 1EDI30112MF		
Microcontroller	XMC™ / PSoc™	XMC4000 for control loop / PSoc™ 4 for PLC communication				
Memory	EXCELON™ F-RAM	CY15B102QN-50SXE				
Auxiliary power supply	CoolSET™	ICE5QR4780BG (800 V, 15 W, Quasi-Resonant) ICE5GR4780AG (800 V, 15 W, Fixed-Frequency)				
Connectivity	AIROC™	CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5)				
	PLC	CY8CPLC20-48LTXIT				
Current sensor	XENSIV™	TLI4971-A025T5				

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Single- and three-phase string inverter



Inverter type	Functional block	Product category	Product technology	Voltage	Package	Part number	$R_{DS(on)}$	[A]		
Single-phase	MPPT – Boost stage	Si MOSFET	CoolMOS™ C7	650 V	TO-247-3	IPW65R019C7	19 mΩ	-		
					TO-247-4	IPZ65R019C7	19 mΩ	-		
		SiC MOSFET	CoolSiC™ MOSFET	650 V	TO-247-4	IMZA65R015M2H	15 mΩ	-		
					TO-263-7	IMBG65R015M2H	15 mΩ	-		
		TO-Leadless	IMBG65R015M2H	650 V	TO-247-3	IKWH50N65EH7	-	50 A		
							TO-247-4	IKZA50N65EH7	-	50 A
	Diode	CoolSiC™ diode	650 V	TO-247	IDW20G65C5	-	20 A			
						IDW32G65C5B	-	32 A		
	Inverter 5-level	Si MOSFET	OptiMOS™ 5	150 V	SuperSO8		BSC093N15NS5	9.3 mΩ	-	
	Inverter 2-level, e.g. Heric	Si MOSFET	CoolMOS™ CFD7	650 V	TO-247-3	IPW65R018CFD7	18 mΩ	-		
					TO-247-4	IPZA65R018CFD7	18 mΩ	-		
					TO-247-4	IPZA65R029CFD7	29 mΩ	-		
Q-PAK					IPDQ65R017CFD7	17 mΩ	-			
SiC MOSFET					CoolSiC™ MOSFET	650 V	TO-247-4	IMZA65R015M2H	15 mΩ	-
							TO-247-3	IMW65R020M2H	20 mΩ	-
TO-263-7		IMBG65R015M2H	650 V	TO-Leadless	IMT65R022M1H	15 mΩ	-			
						22 mΩ	-			
IGBT		TRENCHSTOP™ 7 H7	650 V	TO-247-4	IKZA50N65EH7	-	50 A			
						TO-247-3	IKWH50N65EH7	-	50 A	
				TO-247-3	IKW40N120CH7			-	40 A	
						TO-247PLUS-3	IKQ75N120CH7	-	75 A	
	TO-247PLUS-3			IKQ100N120CH7	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-	
								40 mΩ	-	
IMW120R040M1H, MZA120R040M1H	60 mΩ	-	IMW120R060M1H, IMZ120R060M1H	19 mΩ	120 A					
					120 A					
Three-phase	MPPT – Boost stage	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A		
					TO-247PLUS-3	IKQ75N120CH7	-	75 A		
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-		
							40 mΩ	-		
		IMW120R040M1H, MZA120R040M1H	60 mΩ	-	IMW120R060M1H, IMZ120R060M1H	19 mΩ	120 A			
							120 A			
	Silicon carbide MOSFET module	CoolSiC™ MOSFET	2000 V	Easy 3B	DF4-19MR20W3M1HF_B11	19 mΩ	120 A			
						120 A				
	Inverter	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A		
					TO-247PLUS-3	IKQ75N120CH7	-	75 A		
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-		
							40 mΩ	-		
IMW120R040M1H, MZA120R040M1H		60 mΩ	-	IMW120R060M1H, IMZ120R060M1H	650 mΩ	-				
						12 mΩ	-			
Silicon carbide MOSFET module	CoolSiC™ MOSFET	1200 V	Easy 2B	IF3L8MR12W2M1HP_B11	8.1 mΩ	-				
					-					
Gate-driver ICs	EiceDRIVER™			650 V	DSO-16		2EDS7165H			
							2ED2181S06F			
							IR2214SS, IR2213S			
							1EDI60I12AF, 1EDI30I12MF			
							1ED3124MU12H, 1ED3122MU12H			
							1ED3322MC12N, 2ED020I12-F2			
							1ED3491MU12M, 1ED3890MU12M			
							EiceDRIVER™ 2EDN family, EiceDRIVER™ 1EDB			
Microcontroller	XMC4000 and XMC7000									
Memory	EXCELON™ F-RAM / Asynchronous SRAM									
Auxiliary power supply	Integrated: CoolSET™ Quasiresonant (QR) / CoolSET™ with Fixed Frequency (FF) Discrete: CoolSET™ (QR or FF) + CoolMOS™ P7									
Connectivity	AIROC™ CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5) ISOFACE™ digital isolators for RS485									
Sensing	XENSIV™ TLI4971									

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Battery

Energy storage systems

Make energy storage systems the backbone of the new energy era with our semiconductor system solutions

Facing diminishing fossil reserves, the world nonetheless needs to manage the rising demand for electrical energy while meeting the growing call for urgent climate action. The transition to renewable energies has become inevitable.

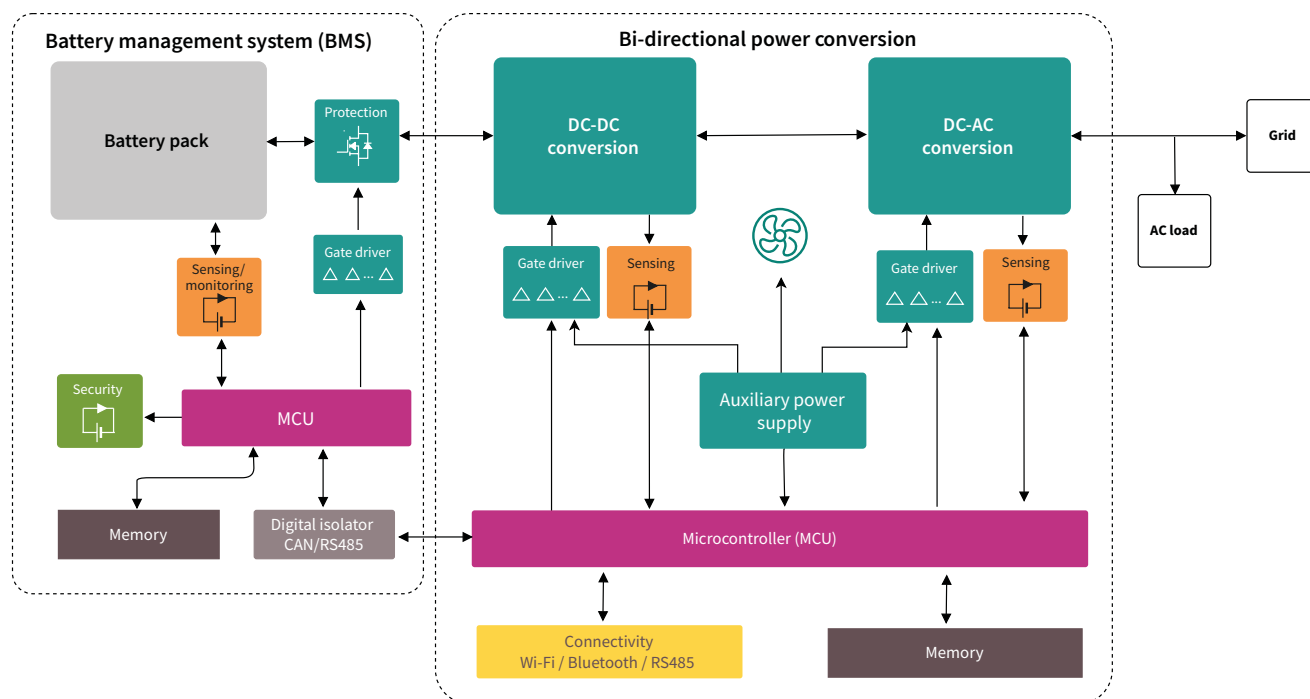
Energy storage systems play a vital role in managing this transition successfully. Our system solutions help to make energy storage the backbone of the new energy era. Our unique application expertise and comprehensive offering make us the natural choice to advance energy storage solutions in efficiency, performance, optimal cost, and innovation.

Features and benefits

Key features
- Efficient power conversion in DC-DC and AC-DC stage
- Power-dense design
- Bi-directional power flow
- Li-ion battery safety and predictive maintenance
- Long battery lifetime
- Safe data transfer is essential

Key benefits
- Improvement of system performance with industry-leading semiconductor
- Offering such as OptiMOS™, CoolMOS™, CoolSiC™ MOSFETs, CoolGaN™ HEMT but also best-in-class modules and matching EiceDRIVER™ gate drivers
- Trust in a true partnership during the whole system's lifetime
- Full system provider from power conversion stage (PCS) to the battery management system (BMS), monitoring of battery's SOC, SOH, and cell capacity through constant logging of critical parameters to measure the battery health
- OPTIGA™ Trust family protects BMS and inverter against cyber attacks
- Ultra-low-energy data-logging of key battery health parameters in F-RAM
- XMC7000, XMC4000 and PSoC4 ARM® Cortex®-M7, ARM® Cortex®-M4 and Cortex®-M0 MCU families enable easy-to-design and stable control over the system
- ISOFACE™ digital isolators, AIROC™ Wi-Fi + Bluetooth® Combos

Application diagram



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Highlight/recommended product portfolio

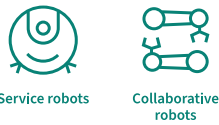
Functional block	Power/battery voltage	Voltage class [V _{DS} max]	Product family	Package	Benefits
Power conversion systems (PCS)	< 10 kW	40 - 300 V	OptiMOS™ and StrongIRFET™	SuperSO8, TOLL, TOLT, TO-220, D ² PAK	- High power density and system cost reduction
		600 V/650 V	CoolMOS™ CFD7 CoolMOS™ 8	TO-220/247, TOLL, Q-DPAK	- Highest efficiency, enabling increased power density/more compact and easier design
		650 V	CoolSiC™ Schottky diode	TO-220, D ² PAK, D-DPAK	- Improved system efficiency and extremely fast switching
		650 V	CoolSiC™ MOSFET	TO-247, D ² PAK, TOLL*	- Combination of high performance, high reliability, and ease of use
		600 V / 650 V	CoolGaN™ HEMT	DSO-20/TOLL	- Ultra high-power density and efficiency
		650 V	TRENCHSTOP™ 5 H5/ CoolSiC™ hybrid devices	TO-247	- Conventional designs, high current operations
	10-100 kW	40 - 300 V	OptiMOS™ and StrongIRFET™	TOLL, TOLT, TO-220, D ² PAK	- High power density and system cost reduction
		600 - 950 V	CoolMOS™ C7/P7	TO-247, Q-DPAK, TOLL	- Ease of use and fast design-in
		650 V	CoolSiC™ MOSFET	TO-247, D ² PAK, TOLL*	- Combination of high performance, high reliability and ease of use
		650 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymmetric (3 & 4 pin)	- Best-in-class performance and controllability
		600 V / 650 V	CoolSiC™ Schottky diode	TO-220, D ² PAK, D-DPAK	- Higher frequency and increased power density
		1200 - 2000 V	CoolSiC™ MOSFET	TO-247, TO-247-HCC	- Highest efficiency and increased power density
		650 - 1200 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymmetric (3 & 4 pin)	- Best-in-class performance and controllability
		200 V	EiceDRIVER™ 1EDN gate driver	PG-SOT23-6/ PG-SOT23-5 WSO6-6 / TSNP-6	- Single-channel non-isolated
650 V		EiceDRIVER™ 2EDR gate driver	PG-DSO-14-WB	- Dual-channel reinforced (safe) isolated	
650 V		EiceDRIVER™ 2EDB gate driver	PG-DSO-14-NB	- Dual-channel functional isolated	
2300 V	EiceDRIVER™ Compact gate driver	DSO-8	- Single-channel isolated driver with Miller clamp/sep-out		
1200 V/2300 V	EiceDRIVER™ Enhanced gate driver	DSO-16	- Single-channel isolated driver with DESAT and Miller clamp		
BMS – battery protection	40 - 100 V	60 - 200 V	OptiMOS™ Linear FET	TOLL, D ² PAK	- Minimize parallelization of MOSFETs - Market-leading MOSFETs with lowest R _{DS(on)} enabling low conduction losses - Widest SOA area with LinearFET™
	150 - 400 V	600 V	CoolMOS™ S7	TOLL, Q-DPAK	- Lowest R _{DS(on)} MOSFET
BMS Monitoring and balancing	-	-	Battery management IC (TLE9012DQU)	PG-TQFP-48	- ASIL-D compliant - Cell balancing with integrated switches with up to 150 mA using external resistors to reduce chip power consumption - 12x delta-sigma ADCs ensure that the voltage of all cells is measured synchronously - ISO UART includes an 8-bit CRC to ensure data integrity until microcontroller register
BMS transceiver	-	-	Battery management IC (TLE9015QU)	PG-TQFP-48	- UART to ISO UART communication - General purpose error pin - Support diagnosis feature
Digital isolators	-	-	ISOFACE™ digital isolators 2DIB/4DIR	PG-DSO-8-8 PG-DSO-8-16	- Isolated CAN/UART communication - Support diagnosis feature, general purpose error pin
Current sensors	-	-	XENSIV™ - high-precision coreless current sensors	PG-TISON-8	- High accuracy of current sensing - Noise robustness
Auxiliary power supply	-	650 - 950 V	CoolSET™	DSO-12	- Compact, robust, and easy to use solution
Microcontroller	-	-	XMC™ families XMC4000/XMC7000 PSoC™ 4	PG-VQFN-40 PG-VQFN-56 PG-TSSOP-16 PG-TSSOP-38	- 32-bit MCU subsystem - 48/144/350MHz Arm® Cortex®-M0+ CPU - Up to up to 8 MB flash - 32 kB SRAM - Up to 2 CAN - USB/up to 4 serial channels
Memory	-	-	Serial SPI F-RAM EXCELON™ F-RAM	PG-DSO-8	- Zero-delay writes - 1014 read/write cycles - 10-year data retention at +85°C temperature - 200x lower energy than EEPROM - No complex wear-leveling overheads
Security	-	-	OPTIGA™ Trust family	PG-USON-10-2	- The OPTIGA™ Trust family includes turnkey products for smaller platforms as well as programmable solutions
Connectivity	-	-	AIROC™ Wi-Fi + Bluetooth® Combos	WLBGA	- High integration, quick implementation - It supports Wi-Fi 4, Wi-Fi 5



Click here to learn more:

www.infineon.com/energy-storage-systems

*Coming soon



Robotics

Superior solutions for smart and safe robots

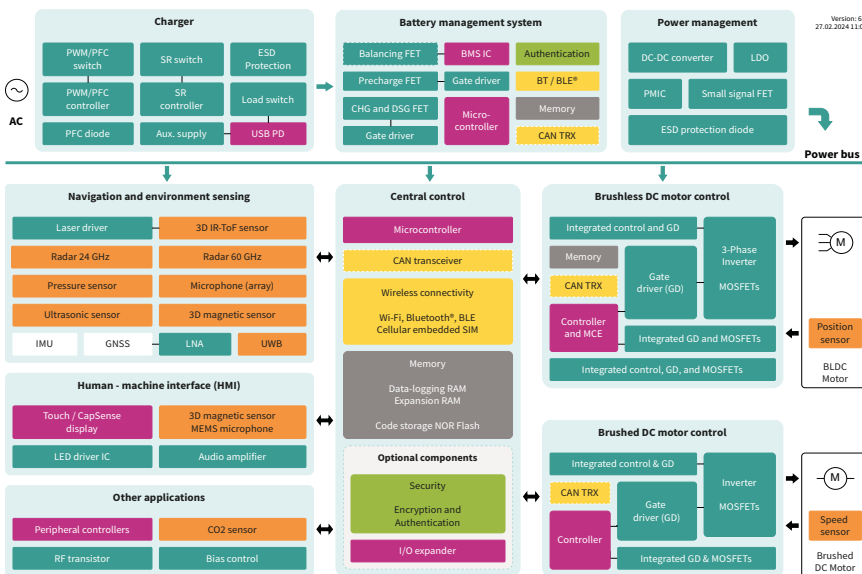
Disruptive technologies have significantly changed our lifestyle in the past few decades. Now a new era is on the horizon – the age of robots. Today’s robots can identify and navigate through surroundings, work alongside and even interact with humans. All this would not be possible without the recent advancements in semiconductor solutions. Drawing on Infineon’s insights into all facets of the robotics field and with a comprehensive portfolio of power products and sensors on offer, Infineon provides reliable system solutions that address the latest trends in robotics, whether it is Artificial Intelligence, Internet of Things, smart home, cloud-based services, human-machine interface, or any robotics-related field.

Features and benefits

Key features	Key benefits
– Complete ecosystem of simulations, documentation, and demonstration boards	– Faster time to market
– Comprehensive portfolio of products and solutions	– Design flexibility
– High reliability of components	– Prolonged product life spans
– Small form factor and compact design of components	– Reduction of overall system size and cost
– Lowest $R_{DS(on)}$ of the transistors	– BOM savings
– Hardware-based security	– Trustworthy system solution
– Components authentication	– Highest system quality and ease of safety certification process
– Security market leader with a proven track record and outstanding partner network for embedded security	

Domestic robots - simplifying everyday life and work

Structural system overview: domestic robots



The latest generation of domestic robots, e.g., vacuum, lawn or pool robots, provide a new level of assistance and simplicity in homes and professional environments. They directly interact with humans, which imposes unique design challenges, especially in domestic environments. Energy efficiency, long battery life, security, sensing capabilities, and intelligent mind are key to user-friendly and safe designs. By choosing Infineon, you get a one-stop semiconductor shop for all your robot design needs.



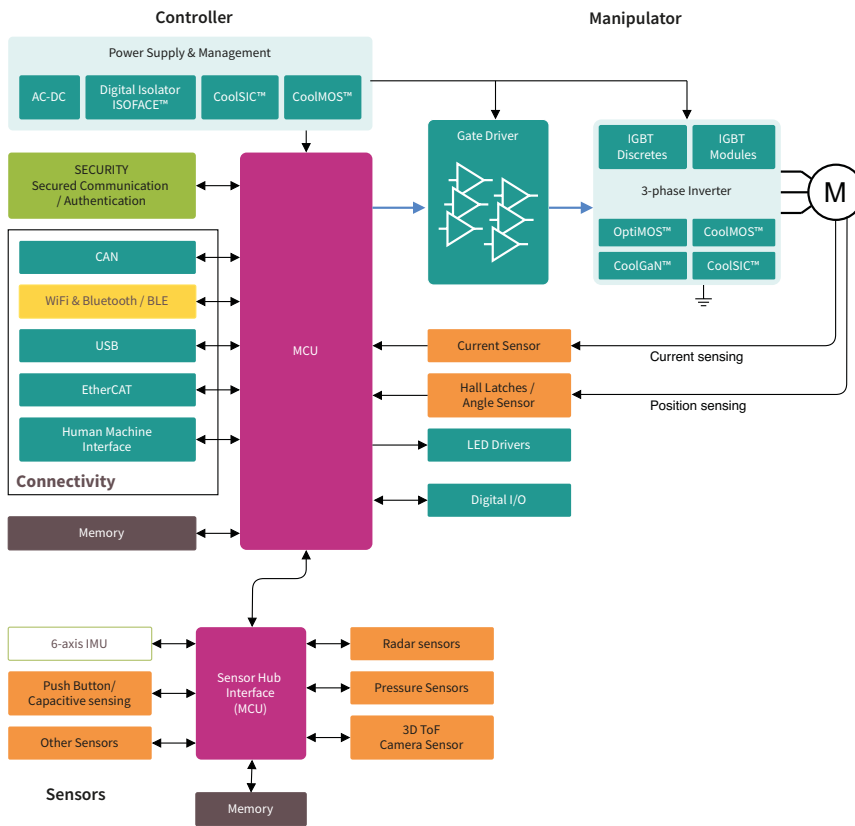
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Industrial robots and cobots – advance through collaboration

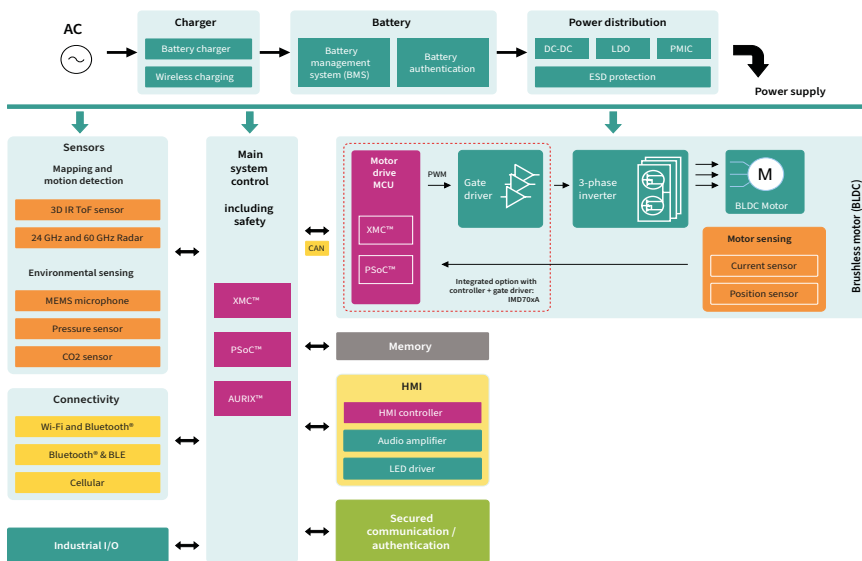
Structural system overview: industrial robots and cobots



With the experience we gained by serving industrial robot manufacturers with the best system solutions for years, Infineon is well set to provide the right fit products for the next generations of collaborative robots. Cobots, as they are shortly called, work outside the limitation of a safety cell, directly interacting with humans. This setup requires a precise set of design features, especially for the sake of workplace safety. With Infineon’s semiconductors for cobot systems, you benefit from the expertise of an experienced and reliable partner.

Mobile robots – driving production and automation forward

Structural system overview: Mobile robots (AGV, AMR)



Autonomous mobile robots (AMRs) are a self-driving force behind automated processes and offer the highest degree of flexibility within working environments due to battery-powered systems. With its complete product portfolio for robotics applications- from the power supply to motor drives and sensors for navigation and environment scanning -Infineon makes it possible for mobile robots to find their way through nearly all environments.



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Recommended products

		Industrial robots		Cobots	Mobile robots (AMR, AGV)	Domestic robots	
Common system power		> 5 KW	< 5 KW	100 – 1000 W	200- 500 W	10 – 100 W	
Common operating/battery voltage		3-phase 400 V _{AC}	1-phase 110 V-220 V _{AC}	1-phase 110 V-220 V _{AC} / 48 V _{DC} Bus	24 V – 48 V _{DC}	12 V – 36 V _{DC}	
Power supply and charger	Power switch	650 V and 1200 V CoolSiC™ MOSFET 600 V/650 V IGBT HighSpeed 5 650 V IGBT TRENCHSTOP™ 7 IGBT7 T7 and H7 650 V and 1200 V EasyPACK™ Module		600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™ CoolGaN™	600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™ CoolGaN™	600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™ CoolGaN™	
	PFC power diodes	650 V CoolSiC™ Schottky diode					
	Gate driver EiceDRIVER™ family	low-side single-channel: 1EDN7550B, 1EDN8550B, 1ED44175N01B, 1ED44173N01B low-side dual-channel: 2ED24427N01F, 2EDN7523G 1200 V single-channel isolated: 1ED3124MU12F, 1EDI60N12AF		650 V half-bridge: 2EDF9275F, 2EDF7175F, 2ED2304S06F, 2ED2182S06F, 2ED2110S06M 650 V high-side: 1EDB9275F, 1EDB6275F, 1EDB8275F			
	ISOFACE Digital Isolators ISOFACE Isolated Industrial Interface	ISO1I813T, ISO1H816G 2DIB0410F					
	Microcontroller (MCU)	Arm® Cortex®-M0: XMC1100 or XMC1300 Arm® Cortex®-M4: XMC4200 EZ-PD™ PMG1 High voltage MCU with USB-C and PD					
Motor control and drive	Power switch	1200 V IGBT 7 S7 1200 V CoolSiC™ MOSFET 1200 V CoolSiC™ Easy1B Module	600V/650V CoolMOS™ 650 V and 1200 V CoolSiC™ CoolGaN™ GIT HEMT 600 V 600 V/650 V/1200 V TRENCHSTOP™ 600 V EasyPIM™ and EasyPACK™ 600 V CIPOS™ (full integration)	60 – 100 V OptiMOS™ and StrongIRFET™ Recommended packages: PQFN 3 x 3 (space savings) Super SO8 (price/performance) TOLL (high current) 100V CoolGaN™ IGC033S10S1	60 – 150 V OptiMOS™ and StrongIRFET™ Recommended packages: PQFN 3 x 3 (space savings) Super SO8 (price/performance) TOLL (high current) 100V CoolGaN™ IGC033S10S1	25 – 60 V OptiMOS™ and StrongIRFET™ single- and dual-channel MOSFETs Recommended packages: SO8 Dual MOSFET (integration) PQFN 3 x 3 (space savings) SSO8 (price/performance)	
	Gate driver EiceDRIVER™ family	1200V single-channel isolated Compact: 1ED31xx and 1ED-MF 1200 V single-channel isolated Enhanced: 1ED34xx and 1ED-F2 1200 V half-bridge IR2214SS 1200 V three-phase: 6ED2230S12T	650 V half-bridge: 2EDF9275F, 2EDF7275F, 2EDF7175F, 2ED2304S06F, 2ED2182S06F, 650 V high-side: 1EDB8275F, 1EDB9275F, 1EDB6275F 650 V three-phase: 6EDL04N06PT	600 V half-bridge: IRS21867S, IRS2186S 200 V half-bridge: IRS2005S, IRS2007S, IRS2008S, 2EDF7275K 200 V three-phase: 6EDL04N02 160 V three-phase: 6ED2742S01 200 V high-side: 1EDN7550B & 1EDB8550B 160 V half-bridge: 2ED2748S01G, 2ED2738S01G 120 V half- bridge: 2EDL8124G 60 V three-phase programmable: 6EDL7141 25 V low-side: 1ED44173N01B, IRS44273L			
	Microcontroller (MCU)	PSoC™: single-core Arm® Cortex®-M4F PSoC™ 61, dual-core Arm® Cortex®-M4F and M0+ PSoC™ 62 XMC™: Arm® Cortex®-M0 XMC1000 family, Arm® Cortex®-M4F with EtherCAT™ XMC4300 / XMC4800, Arm® Cortex®-M7 & M0+ XMC7000 family AURIX™: TriCore → TC337					
	ISOFACE Digital Isolators ISOFACE Isolated Industrial Interface	2DIB0410F ISO1I813T, ISO1H816G					
	Hall switch	XENSIV™ TLx496x					
	Current sensor	XENSIV™ TLI4971					
	Angle sensor	XENSIV™ TLE/TLI5012B, TLE5014SP					
	Battery management system (BMS)	Microcontroller (MCU)			XMC™: Arm® Cortex®-M0 XMC 1000 family, Arm® Cortex®-M4F XMC4000 family PSoC™: single-core Arm® Cortex®-M0 / M0+ PSoC™ 4, single-core Arm® Cortex®-M4F and dual-core Arm® Cortex®-M4F & M0+ PSoC™ 6 EZ-PD™ PMG1-B1 High Voltage MCU		
		Protection switches			100 OptiMOS™. e.g., LinearFET IPT017N10NM5LF2 StrongIRFET™ 2: IPT017N10NF2S	30 V – 80 V LinearFET™ Gen.2 OptiMOS™, StrongIRFET™ BSC007N04LS6, IRL40T209, IRFS7430 20 V or 30 V N/P MOSFETs in SOT23, TSOP6 or SOT363 dual-channel	
		Balancing switches (small signal)					
Monitoring and balancing IC				TLE9012AQU (sensing IC), TLE9015QU (transceiver IC)			
Battery authentication				OPTIGA™ Authenticate S			
Sensing (e.g., ranging, room mapping, localization, collision avoidance, HMI, air quality, tactile)	Radar	XENSIV™ 60 GHz: BGT60LTR11 / BGT60UTR11AIP, BGT60TR13C XENSIV™ 24 GHz: BGT24LTR11N16, BGT24LTR22					
	ToF (Time-of-Flight) 3D image sensors	XENSIV™ REAL3™ 3D image sensor: IRS1125A, IRS2877AS (functional safety ISO26262) XENSIV™ VCSEL Driver: IRS9100C, IRS9102C				XENSIV™ Real 3™ 3D ToF: Hybrid ToF IRS2875C XENSIV™ VCSEL Driver: IRS9100C, IRS9102C	
	MEMS microphones	XENSIV™ MEMS microphones: analog or digital interface, SNR 68 to 73 dB(A)					
	Other sensors	Pressure sensor: XENSIV™ DPS368 (e.g., airflow control), DPS368 (e.g. airflow control, tactile) CO ₂ Sensor: XENSIV™ PAS CO ₂					
	Connectivity and human-machine interface (HMI)	Wi-Fi + Bluetooth® CYW43439 (1x1 2.4GHz Wi-Fi 4) CYW4373 (1x1 dual-band Wi-Fi 5) CYW55571 (1x1 Tri-band Wi-Fi 6) CYW55571 (1x1 Tri-band Wi-Fi 6E)					
Security	HMI - Touch sensing	PSoC™ 4000 - entry-level PSoC™ 4100 - more touch buttons PSoC™ 4700 - inductive sensing PSoC™ CAPSENSE™ family					
	Main control MCU	Single / dual-core Arm® Cortex®-M7 and M0+ XMC7000					
	Authentication and protection	OPTIGA™ Trust M, OPTIGA™ TPM					
Memory	NOR flash	S25FL-L serial NOR flash memories Densities 64 MB to 256 MB					
Others	Voltage regulator	DC-DC voltage regulator 12 V/5 V or 3.3 V, watchdog, error monitoring, safe state control, BIST, etc.					
	LED Driver	Driving currents from 10 mA to 250 mA – linear driver ICs: BCR3xx, BCR4xx Support currents from 150 mA to 3 A – DC-DC switch-mode: ILD4xxx, ILD6xxx					

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Robotics development platform

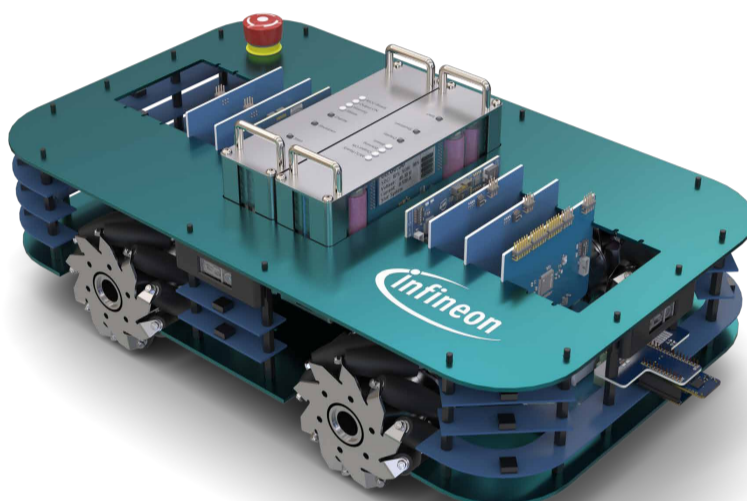
Infineon’s system solutions for Robotics

Get a head start on developing your robot with Infineon’s robotics development platform, powered by our state-of-the-art hardware and software.

The Infineon Mobile Robot, or IMR for short, is a robotics development platform that demonstrates the latest robotics application that Infineon offers. Whether you are shopping for one specific sub-system/functional block or looking to build an entire system with Infineon, we have you covered with our powerful, convenient, and efficient hardware and software solutions. The windows below will help guide you to the information most helpful for your expertise level. Visit www.infineon.com/community-robotics for more information.

Features and benefits

Key features	Key benefits
– Broad product portfolio	– Wide variety and flexibility of system designs
– System solutions	– Easy integration
– Reliability and safety	– Ease the process for safety certifications
– One stop shop	– Simplify procurement process
– Software	– Reduced development time and therefore faster time to market



Fast and efficient robot designs with leading technologies and a broad product portfolio to choose from

Product family	Part number
Main control	DEMO_IMR_MAINCTRL_V1
Power distribution	DEMO_IMR_PWR_V1
Motor control and angle sensing	DEMO_IMR_MTRCTRL_V1 DEMO_IMR_ANGLE_SENS_V1
Battery management system	DEMO_IMR_BMSCTRL_V1 DEMO_IMR_BMSPWR_V1
Time-of-Flight sensor	Hybrid Time of Flight (hToF)
60 GHz Radar	KIT_CSK_BGT60TR13C



DEMO_IMR_MAINCTRL_V1



DEMO_IMR_PWR_V1



DEMO_IMR_ANGLE_SENS_V1



DEMO_IMR_MTRCTRL_V1



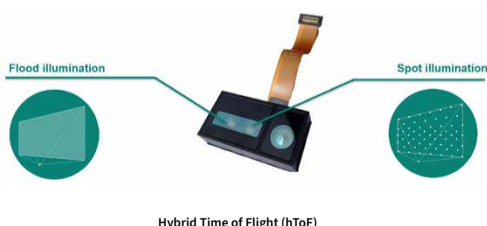
DEMO_IMR_BMSCTRL_V1



DEMO_IMR_BMSPWR_V1



KIT_CSK_BGT60TR13C

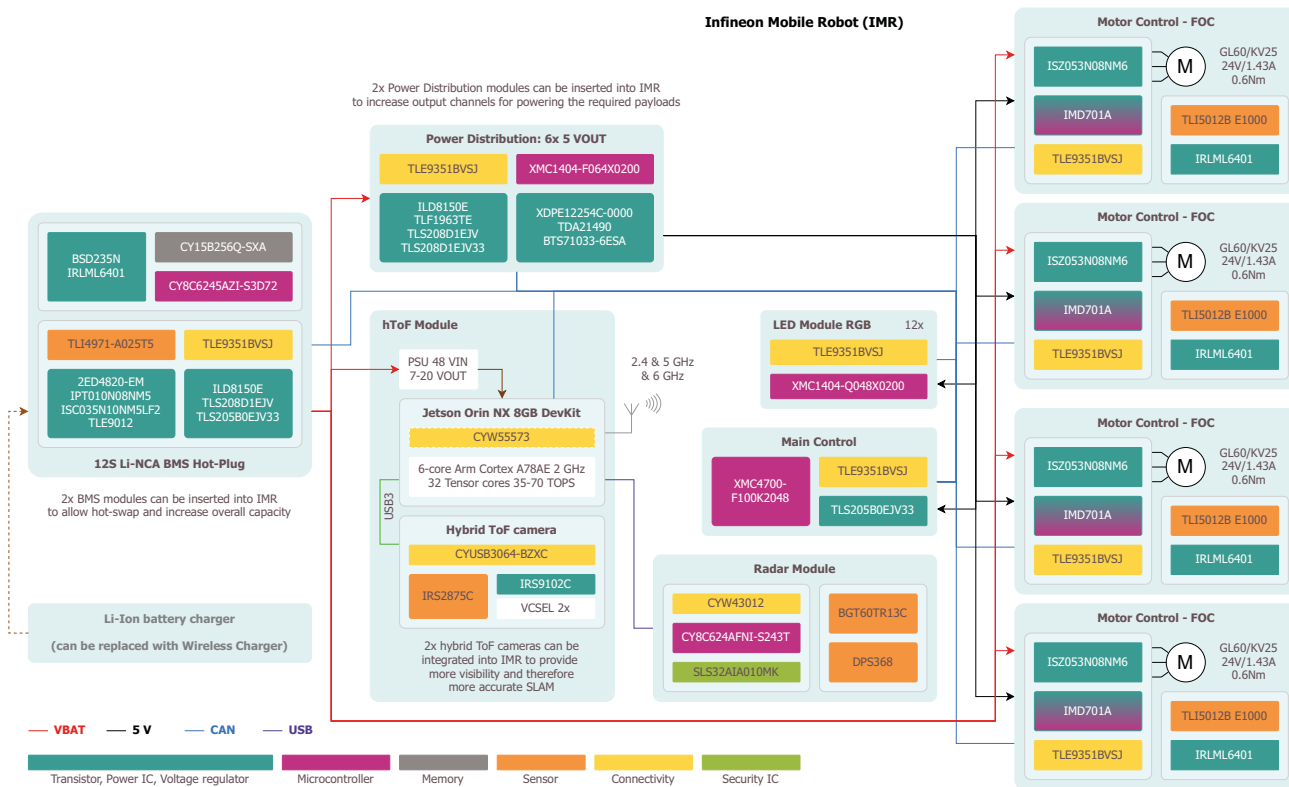


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Application diagram



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LEV

Light electric vehicles and electric forklift

eBike, eScooter, eMotorcycle, eRickshaw, eMicroCar, eForklift

As a leader in power semiconductors, Infineon strives to enable the most efficient, reliable, and smart solutions for the e-Mobility, Minimobility, and Micromobility markets. Keeping up with the latest market trends worldwide, Infineon prepares for the ramp-up of all forms of light electric vehicles (LEVs):

- Micromobility: electric bicycle (e-bike), electric kick-scooter
- Electric powered 2/3 wheelers (EPTW): e-moped, e-scooter, e-rickshaw, e-motorcycle
- MicroEV: electric microcars, low-speed electric vehicles (LSEV), neighborhood EV (NEV), electric quadricycle
- Other electric transporters (e.g., e-forklift, e-golf cart, e-ATV) with less than 200 V batteries

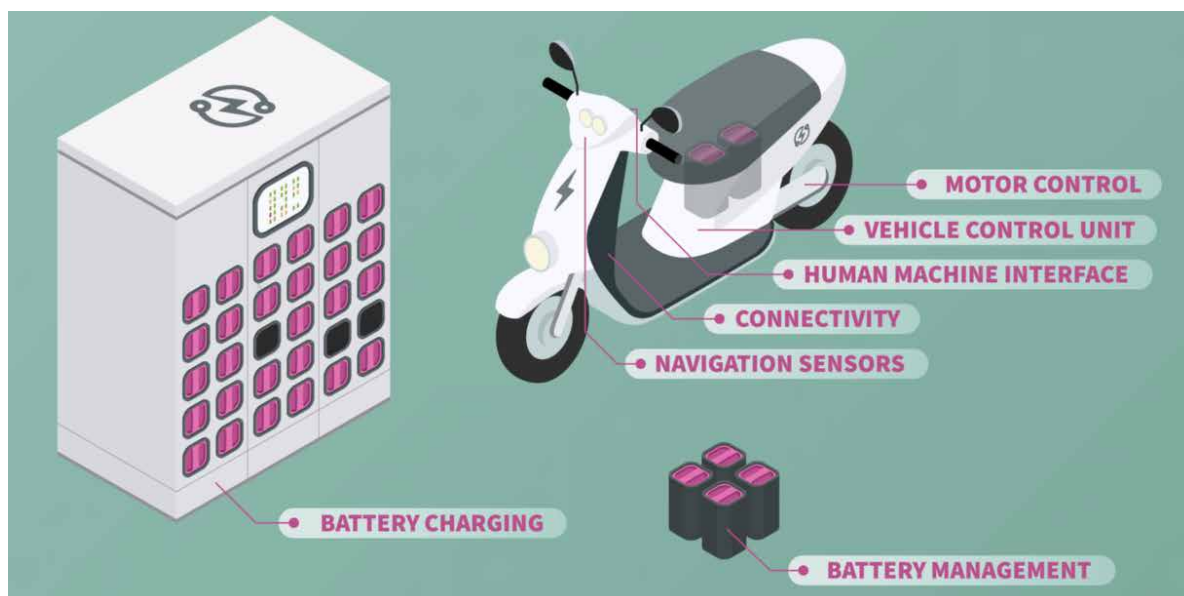
Contrasting to automotive (passenger car) requirements, L-category (light) vehicles require different sets of safety and qualification standards. For example, the newest motorcycle standards place more responsibility on the operator than the vehicle itself to mitigate risks. Infineon considers mission profiles of different applications and offers suitable non-automotive and automotive components for this wide range of use cases.

Unlike traditional vehicles with internal combustion engines, these vehicles are powered by battery technology with bus voltage ranging from 28 V to 168 V. The commonalities among these different types of LEVs are motor inverters/drives, battery management systems, battery chargers/battery charging stations/battery swapping stations. Additionally, LEVs house increasingly popular smart features and electronics, which are possible due to their larger battery sizes.

Features and benefits

Key features	Key benefits
– Leading power MOSFET technology	– Highest power density and increased range
– Track record of reliability and quality	– Prolonged lifetime and low failure rate
– Complete portfolio for driver, microcontroller, and sensors	– One-stop shop for designers
– Broad connectivity products compliant with various standards	– Enabling smart features
– Complete design support with simulations, documentation, and demonstration boards for high-end solutions	– Faster time-to-market

Application diagram



Click here to learn more:
www.infineon.com/lev

6 kW motor drive with 96 V battery voltage

Functional block	Topology	Product category	Product family	Part number
Motor drive	3-phase half-bridge (B6)	LV MOSFETs	OptiMOS™	IPT025N15NM6
		Microcontrollers ^{MSIL-relevant}	AURIX™	SAK-TC334LP-32F200F ^{MSIL-ready}
		Gate driver ^{MSIL-relevant}	EiceDRIVER™	2EDB8259F
		Position/speed sensor ^{MSIL-relevant}	XENSIV™	TLE5501 E0002
		Current sensor ^{MSIL-relevant}	XENSIV™	TLE4973-AE35S5 ^{MSIL-ready}

For additional configurations, please refer to [High power low voltage drives](#).

Swappable 48 V 1.2 kWh battery

Functional block	Topology	Product category	Product family	Part number
BMS	Back-to-back with pre-charge	LV MOSFETs (charge)	OptiMOS™	IPTC015N10NM5
		LV MOSFETs (discharge)	OptiMOS™	IPTC015N10NM5
		LV MOSFETs (pre-charge)	OptiMOS™	BSC070N10NS5
		Microcontrollers ^{MSIL-relevant}	PSoC™	CY8C4146/7AZI-S463
		Gate driver ^{MSIL-relevant}	EiceDRIVER™	2ED4820 ^{MSIL-ready}
		Current sensor ^{MSIL-relevant}	XENSIV™	TLE4972 ^{MSIL-ready}
		Cell balancing IC ^{MSIL-relevant}	TLE9012	TLE9012 ^{MSIL-ready}
		Memory (RAM)	NOR flash	S25FL256LAGMFB001
		Bluetooth®	AIROC™	CYW20719B1KUMLG
		Security	OPTIGA™ Authenticate S	SLE95401TSNP6XTSA1

For additional configurations, please refer to [Battery management systems](#).

3 kW 48 V battery charger

Functional block	Topology	Product category	Product family	Part number
Battery charger	CCM boost PFC	HV switch	CoolMOS™ P7	IPP60R060P7
		PFC diode	CoolSiC™ G6	IDH12G65C6
		Gate driver IC	EiceDRIVER™	1EDB8275F
		Controller IC	ICE3x family	ICE3PCS01G
	Resonant FB LLC	HV switch	CoolMOS™ P7	IPP60R160P7
		Gate driver IC	EiceDRIVER™	2EDS8265H
		Digital controller	XMC™ Industrial MCU	XMC4200-F64k256BA
		Digital isolator	ISOFACE™	4DIR1400H
	HB SR	MV switch	OptiMOS™ 6	ISC060N10NM6
		Gate driver IC	EiceDRIVER™	2EDF7275F
	QR flyback	Aux power controller	CoolSET™	ICE5QR2280G

For additional configurations, please refer to [Battery chargers](#).

250 W off-board charger

Functional block	Topology	Product category	Product family	Part number
Battery charger	CrCM PFC	Controller IC	XDP™	XDPS2222
		HV switch	CoolMOS™ P7	IPP60R060P7
	Hybrid flyback	HV switch	CoolMOS™ P7	IPA60R160P7
	Active SR	MV switch	OptiMOS™ 5	BSC160N15NS5
	QR flyback	Aux power IC	CoolSET™	ICE5QR2280G

For additional configurations, please refer to [Battery chargers](#).



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On-board charger for xEV applications

Best solutions for electrified powertrain in xEV applications: on-board chargers and HV/LV DC-DC converter

The electrification of the powertrain enables local emission-free mobility and driving pleasure. The car becomes a part of the energy ecosystem, with smart charging from renewables, efficient driving with electrified mobility and future energy use cases with V2X. Infineon offers complete and complementing chipsets to develop modular and scalable on-board battery chargers (OBC) and DC-DC units. Leveraging our expertise in power electronics and semiconductors, our solutions use Si, SiC, and GaN power technologies. They are designed to meet the high quality and safety standards in automotive applications. Wide-band gap (WBG) semiconductors enable future optimizations and highly contributes to sustainable solutions.

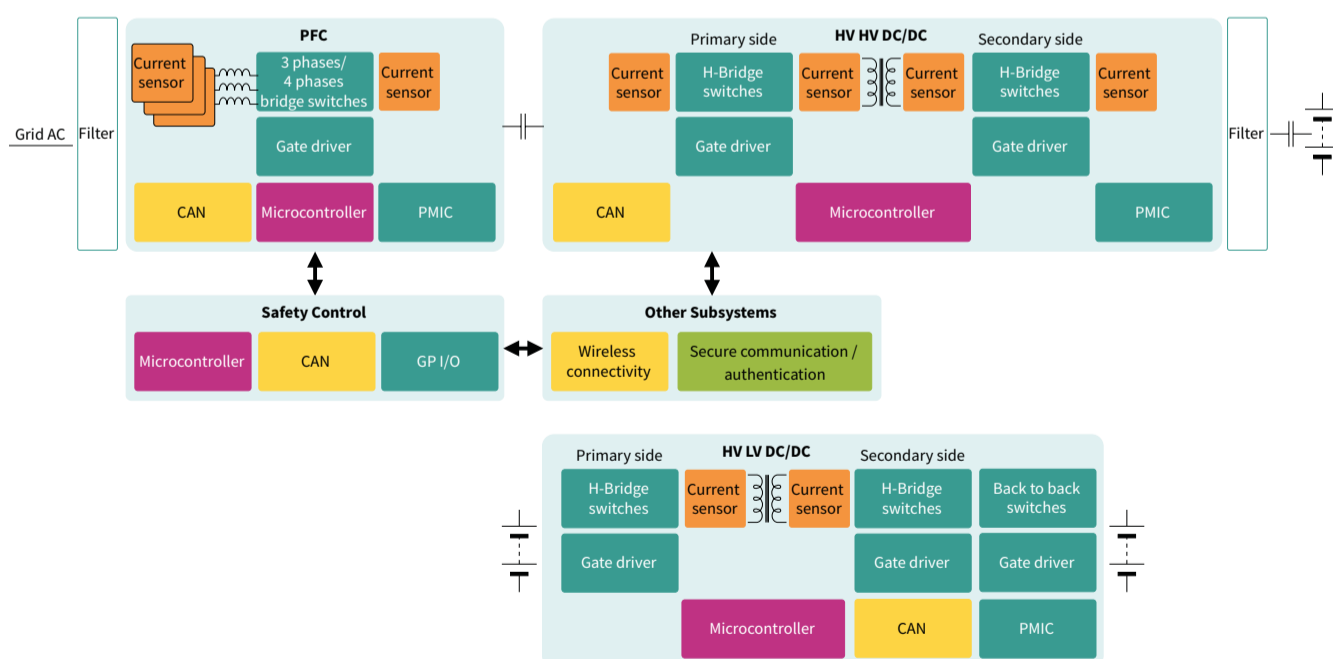
On-board chargers

All plug-in hybrid electric vehicles (PHEV) and pure electric cars are equipped with at least one on-board charger, allowing battery recharge from any standard AC power outlet. Available power depends on regional regulations and installation base, typically providing up to 11 kW for PHEVs and up to 22 kW or even 44 kW maximum power for pure electrical vehicles. System designers face the challenge of supporting varied voltage and current levels while increasing power density efficiency under cost optimizations for strong solutions. The key success factors regarding on-board charging involve efficiency and a high power density for a small form factor. The long-term trend is moving towards bidirectional charging, where the charger feeds power from the car to the homes, smart grid, and smart loads.

High-voltage DC-DC converter

The architecture of electric vehicles comprises at least one low-voltage sub-network with low-voltage energy storage and multiple electrical loads and one high-voltage sub-network with high-voltage energy storage. The auxiliary HV/LV DC-DC converter enables the bidirectional energy flow between these two electrical subnets. Typical design challenges are achieving the greatest possible efficiency and controlling overall system costs. The space required for the DC-DC converter should also be kept to an absolute minimum. Infineon's portfolio is specially designed to help overcome these barriers easily.

HV/LV DC-DC converter: functional blocks



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Product portfolio for on-board charger and HV/LV DC-DC applications

Infineon's comprehensive portfolio of semiconductors (sensors, microcontrollers, power semiconductors, etc.) lends itself perfectly to designing compact units for on-board chargers and DC-DC converters. Infineon power transistors support high-switching frequencies at the lowest possible on-state resistance ($R_{DS(on)}$) to enable compact and efficient designs. Various technology offerings from Si/IGBT to SiC and GaN enable high customer scalability, from cost-efficient to highly power-dense and highly efficient systems. The complete portfolio further simplifies designs enabled by Infineon solutions; thus, our optimized gate driver, current sensors, safe and highly scalable microcontroller, and PMIC solutions round up the complete offering and make OBC and DC-DC designs easy to select an scale according to customer needs.

Automotive products for on-board charger units

Product family	Part number	Description
650 V CoolMOS™	IPx65RxxCFD7A	650 V MOSFETs with integrated fast body diode
TRENCHSTOP™ 5 IGBT	AIKW50N, AIKW40N, AIGW40	IGBT discrete dedicated to automotive applications
TRENCHSTOP™ 5 Hybrid Discrete IGBT	AIKW50N65RF5	IGBT and SiC discrete dedicated to automotive applications offering higher performance
CoolSiC™ 750 V	AIMx750RxM1H	Automotive 750 V discrete SiC MOSFET in TO247, Q-DPAK, D2PAK
CoolSiC™ 1200 V	AIMW120Rx, AIMCQ120Rx, AIMBG120Rx, AIMZH120Rx	Automotive 1200 V discrete SiC MOSFET in TO247, Q-DPAK, D2PAK
CoolGaN™ 650V	IGLT65R0xx*, IGDQ65R0xx*	Automotive qualified GaN power transistors in TOLT and Q-DPAK
EiceDRIVER™ gate driver for Si, IGBT	2EDB7259Q1, 2EDR825xQ1, 2EDB9259Q1	Automotive gate driver for high-voltage silicon MOSFETs and IGBTs
EiceDRIVER™ gate driver for SiC	1EDR3147HQ1, 2EDR3143/7XA	Automotive gate driver optimized for 750 V and 1200 V SiC
EiceDRIVER™ gate driver for LV Si	2EDN7534FQ1, 2EDBx259KQ1, 2EDFx259KQ1	Automotive gate driver for secondary side of the HVLV DCDC converter
EiceDRIVER™ gate driver for GaN	2EDR7259XQ1, 2EDB7259YQ1	Automotive gate driver for HV GaN automotive switches
AURIX™ microcontroller	TX36x*, TC37X*, TC4X*	32-bit lockstep microcontroller optimized for power conversion
OPTIREG™ PMIC	TLF35584, TLF35585	ISO 26262 – system-supply optimized for AURIX™
CAN FD transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps
OPTIREG™ SBC	TLE9461, TLE9471	High integrated solution for microcontroller supply and communication
OPTIREG™ linear and switcher	TLS810, TLS820, TLS850, TLS4120	Automotive linear and DCDC voltage regulators
XENSIV™ current sensor	TLE4971-3, TLE4978*	Coreless magnetic current sensors for automotive

Modules for on-board charger units

Product family	Part number	Description
650 V CoolMOS™ Easy module	F4-35MR07W1D7S8_B11/A*	650 V MOSFET in H-bridge configuration with integrated capacitor inEasy 1B package
650 V CoolMOS™ Easy module	F4-35MR07W2D7S8_B13/A*	650 V MOSFET in H-bridge configuration with IGBT H5, rapid diode & integrated capacitor inEasy 2B package
650 V CoolMOS™ Easy module	F4-xxMR07WxD7_Bxx/A	650 V MOSFET in H-bridge configuration inEasy package
650 V CoolMOS™ Easy module	FSxxMR07WxD7_Bxx/A	650 V MOSFET in SixPACK configuration inEasy package
650 V CoolMOS™ Easy module	FFxxMR07WxD7_Bxx/A	650 V MOSFET in half-bridge configuration inEasy package
1200 V CoolSiC™ Easy module	F4-xxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in H-bridge configuration inEasy package
1200 V CoolSiC™ Easy module	FSxxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in SixPACK configuration inEasy package
1200 V CoolSiC™ Easy module	FFxxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in half-bridge configuration inEasy package

Get more information about our state-of-the-art demo kits here:

www.infineon.com/cms/en/product/promopages/wbg-for-obc

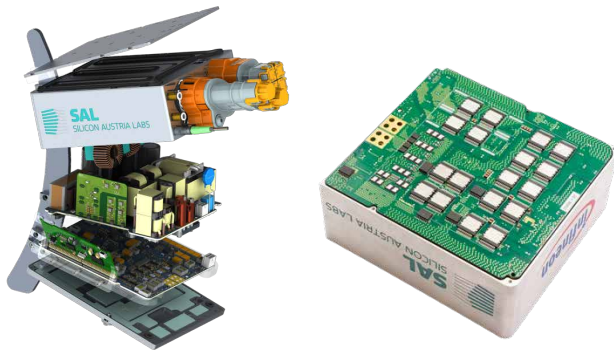
For more information about off-board chargers, refer to the [Fast/wireless EV-charging](#) chapter.



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Wide-bandgap demo kits



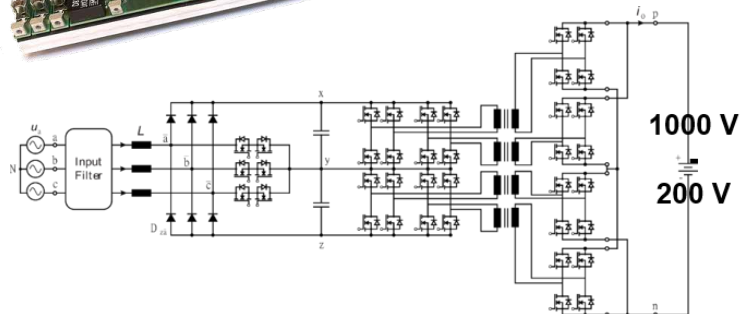
Tiny on-board charger SiC-based real demonstrator 3.6 kW/L

- 7.0 kW bidirectional OBC
- Integrated HVLV DC-DC with 2.4 kW
- 97.5% peak total efficiency
- 98.5% peak DC-DC efficiency
- 99.0% peak PFC efficiency
- Top-side cooling power

High power density 10 kW GaN-based demonstrator

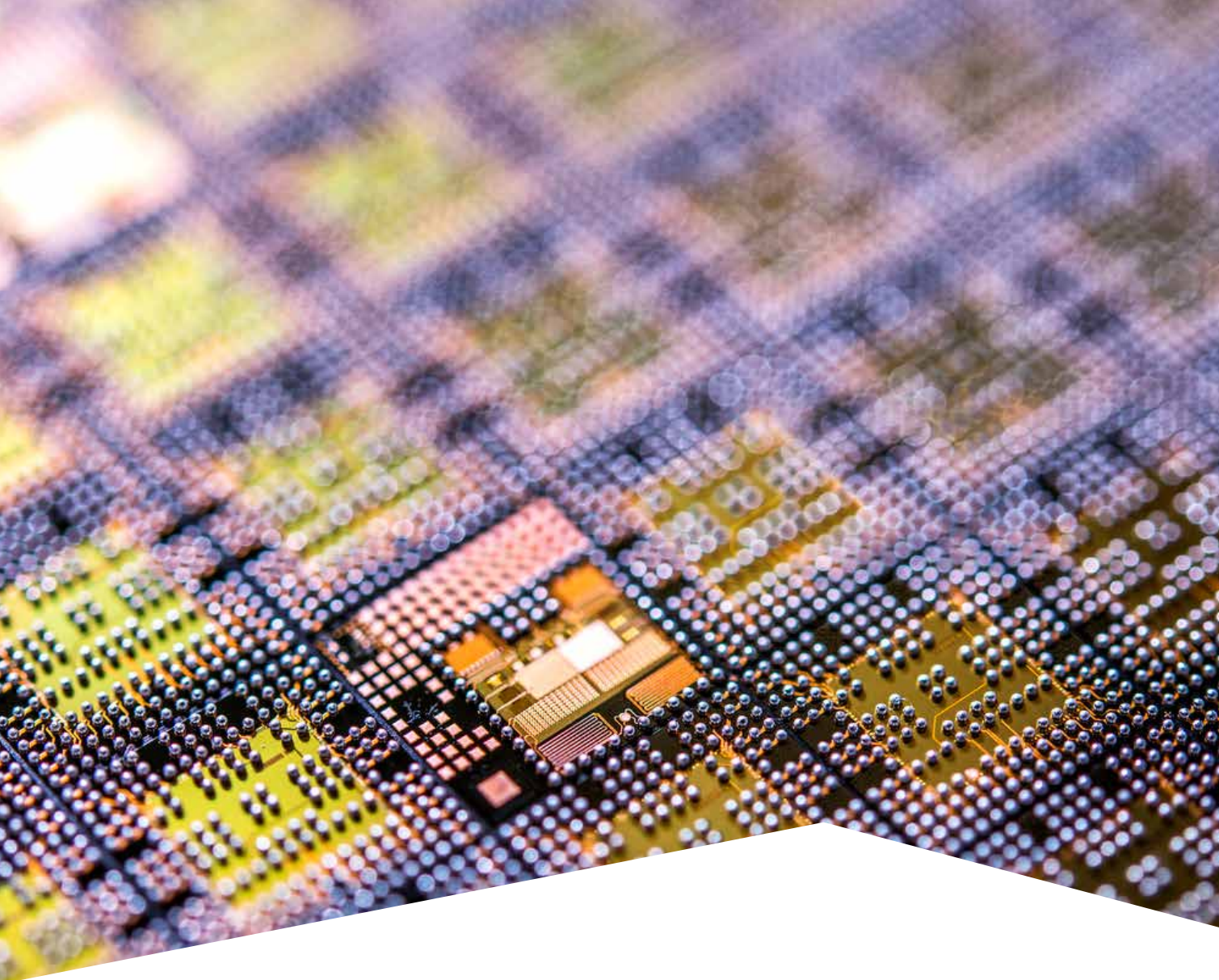
- Wide EV battery voltage range
- Wide input range
- AC/DC: 3- Φ Vienna Rectifier
- 550 kHz: CoolGaN™ GIT +
- Novel Synergetic Control: 1/3 PWM
- DC/DC: 4x dual-active bridges (DABs)
- 140...270 kHz: CoolGaN™ power transistor

Measurements:
400 mm x 140 mm x 17.8 mm



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Products

- 15-300 V MOSFETs
- 500-950 V MOSFETs
- Gate-driver ICs
- Digital Isolators
- Discrete IGBTs and silicon power diodes
- Intelligent power switches and modules
- Microcontrollers
- USB-C controllers and peripherals
- Power management ICs
- Wide bandgap semiconductors
- XENSIV™ sensor technologies for automotive, industrial and consumer applications
- Infineon powerful support

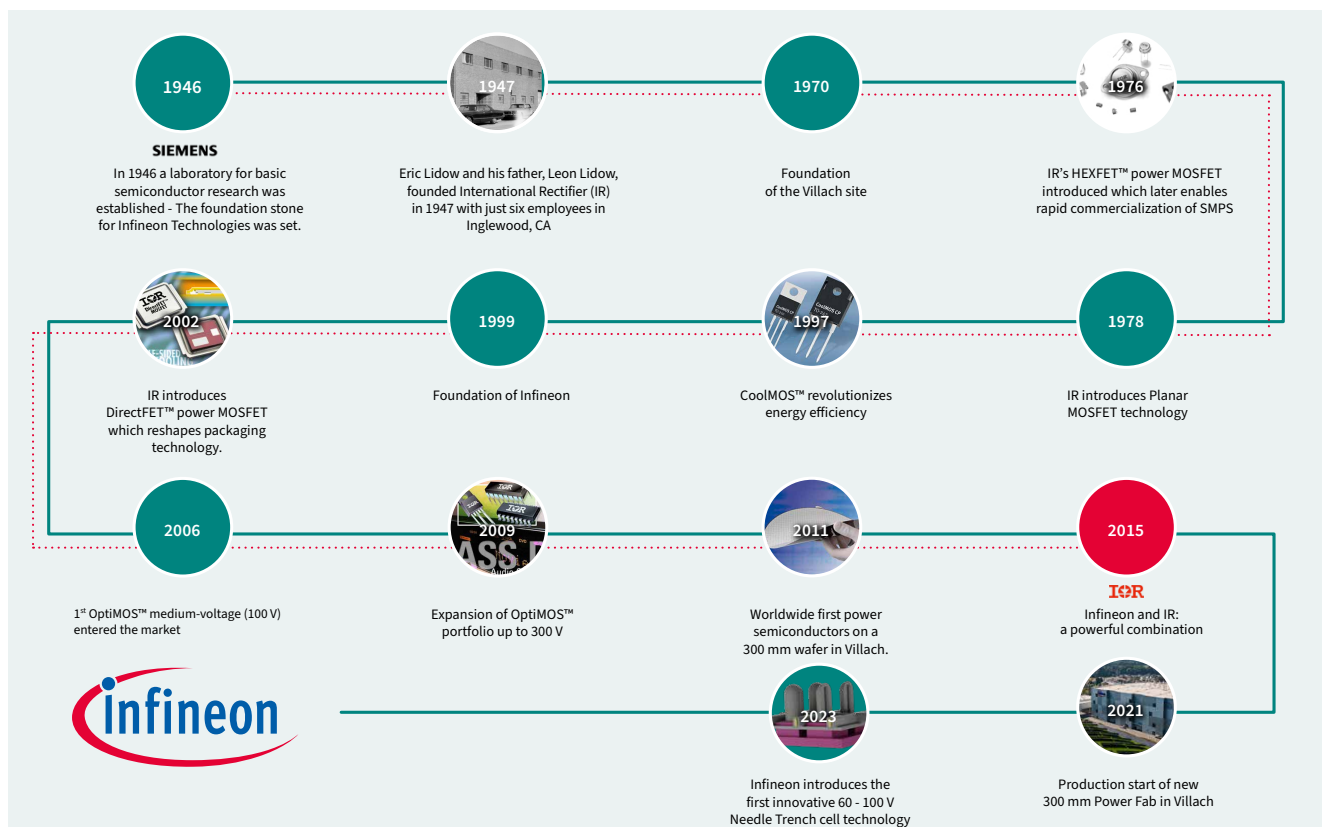


15-300 V MOSFETs

- 15-300 V MOSFETs N-channel power MOSFETs
 - Technology development and product family positioning
- Guidance for applications and voltage classes
- Space-saving and high-performance packages
- Discrete packages
- OptiMOS™ 7 15 V
- OptiMOS™ 7 40 V
- OptiMOS™ Scalable Power Block
- StrongIRFET™ 2 MOSFETs -30 V/40 V/60 V/80 V/100 V
- OptiMOS™ Linear FET
- OptiMOS™ 6 120 V
- OptiMOS™ 6 135 V and 150 V
- OptiMOS™ 6 200 V
- OptiMOS™ 40 V in PQFN 8x6
- Small-signal/small-power MOSFETs -250 to 600 V
- OptiMOS™ power MOSFETs 15 -150 V Source-Down
- OptiMOS™ PD
- TOLx family
- Product portfolio
- Nomenclature

Infineon shapes power for growth through MOSFET innovation

With more than 40 years of experience in power MOSFET innovation, Infineon has led the way in solving the challenges design engineers face on a daily basis while enabling them achieve their targets. Although these targets may have changed over the years, the innovative spirit behind Infineon's product offering has persisted – from device design, technology, package and product development through manufacturing. Looking at the evolution of MOSFETs in the industry, numerous advancements in MOSFET technology have enabled the applications and trends that have become an indispensable part of our lives. Infineon power MOSFET innovation has proven that optimization at the component level brings significant system-level performance advantages and contributes to an easier, safer and greener future.



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OptiMOS™ and StrongIRFET™

15-300 V N-channel power MOSFETs

Infiniteon's semiconductors are designed to bring greater efficiency, power density, and cost-effectiveness. The full range of OptiMOS™ and StrongIRFET™ power MOSFETs enables innovation and performance in applications such as switch mode power supplies (SMPS), battery powered applications, motor control, drives, inverters, and computing.

Infiniteon's highly innovative OptiMOS™ and StrongIRFET™ families consistently meet the highest quality and performance demands in key specifications for power system designs such as on-state resistance ($R_{DS(on)}$) and figure of merit (FOM).

OptiMOS™ power MOSFETs provide best-in-class performance. Features include ultra low $R_{DS(on)}$, as well as low charge for high switching frequency applications. StrongIRFET™ power MOSFETs are designed for drives applications and are ideal for designs with a low switching frequency, as well as those that require a high current carrying capability.

Technology development and product family positioning

StrongIRFET™	OptiMOS™
<p>Robust and excellent price/performance ratio</p> <ul style="list-style-type: none"> – Optimized for switching frequency < 100 kHz – Designed for industrial applications – High current carrying capability – Rugged silicon 	<p>Best-in-class technology</p> <ul style="list-style-type: none"> – Optimized for broad switching frequency – Designed for high performance applications – Industry's best figure of merit – High efficiency and power density
<p>StrongIRFET™ and IR MOSFET™ for switching frequency <100 kHz</p> <ul style="list-style-type: none"> › Low $R_{DS(on)}$ › Rugged silicon and broad portfolio selection 	<p>OptiMOS™ for broad switching frequency</p> <ul style="list-style-type: none"> › Industry's best Figure of Merit (FOM) › High efficiency and power density
<p>Active and preferred (high-performance optimized)</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #800040; color: white; padding: 5px;"> <p>StrongIRFET™ 2 30 V / 40 V / 60 V / 80 V / 100 V</p> </div> <div style="background-color: #800040; color: white; padding: 5px;"> <p>StrongIRFET™ 20-300 V</p> </div> </div> <p>Active (price/performance optimized)</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid #800040; padding: 5px;"> <p>StrongIRFET™ 80-100 V</p> </div> <div style="border: 1px solid #800040; padding: 5px;"> <p>IR MOSFET™ 20-250 V</p> </div> </div>	<p>Active and preferred (high-performance optimized)</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #008080; color: white; padding: 5px;"> <p>OptiMOS™ 7</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #008080; color: white; padding: 2px;">15 V</div> <div style="background-color: #008080; color: white; padding: 2px;">40 V</div> </div> </div> <div style="background-color: #92D050; color: white; padding: 5px;"> <p>OptiMOS™ 6</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">40 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">100 V</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">120 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">135 V</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">160 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">200 V</div> </div> </div> <div style="background-color: #92D050; color: white; padding: 5px;"> <p>OptiMOS™ 5</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">25 V / 30 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">40 V / 60 V</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">80 V / 100 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">150 V</div> </div> </div> </div> <p>Active (price/performance optimized)</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid #92D050; padding: 5px;"> <p>OptiMOS™ 25-60 V</p> </div> <div style="border: 1px solid #92D050; padding: 5px;"> <p>OptiMOS™ 80 V / 100 V / 150 V</p> </div> <div style="background-color: #92D050; color: white; padding: 5px;"> <p>OptiMOS™ 3</p> <div style="display: flex; justify-content: space-around;"> <div style="background-color: #92D050; color: white; padding: 2px;">25 V / 120 V</div> <div style="background-color: #92D050; color: white; padding: 2px;">200-300 V</div> </div> </div> </div>



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With more than 40 years of experience in power MOSFET innovation, Infineon offers a broad portfolio of products. The product portfolio is divided into “active and preferred”, referring to the latest technology available offering best-in-class performance, and “active”, consisting of well-established technologies which complete this broad portfolio.

StrongIRFET™ 2 power MOSFETs are the latest generation to be added to the family. Available in 30 V, 40 V, 60 V, 80 V and 100 V, this family offers broad availability and excellent price/performance ratio and are suitable for a broad range of applications.

Building on its legacy of innovation, Infineon now unveils the industry’s premier 15 V trench power MOSFETs, using the brand-new OptiMOS™ 7 technology. The OptiMOS™ 7 15 V series primarily targets optimized DC-DC conversion for servers, computing, datacenter, and artificial intelligence applications.

OptiMOS™ 6 power MOSFETs 40 V, 80 V, 100 V, and 120 V are the newest addition to the OptiMOS™ product family. They are the perfect solution when best-in-class (BiC) products and high efficiency over a wide range of output power are required. For other voltage classes, from 15 V up to 150 V, OptiMOS™ 5 represents the latest generation in the market, offering low conduction losses and high switching performance.

For high and low frequency applications OptiMOS™ 3 power MOSFETs is our largest OptiMOS™ family and complements our existing product portfolio as well as providing additional options when best-in-class is not required. StrongIRFET™ is recommended for 20-300 V applications when the high performance is not essential and the cost is a more significant consideration.



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Guidance for applications and voltage classes

OptiMOS™ and StrongIRFET™ portfolio, covering from 15 up to 300 V MOSFETs, can address a broad range of needs from low to high switching frequencies. The tables below provide a guidance on the recommended OptiMOS™ or StrongIRFET™ products for each major sub-application and voltage class.

Recommended voltage		15 V to 30 V	40 V	60 V	75 V to 80 V	100 V	120 V to 150 V	200 V	250 V	300 V	
Battery powered	Low power <small>Power tools, multicopter, battery, industrial drives</small>	OptiMOS™	✓	✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	High power <small>(LEV, LSEV)</small>	OptiMOS™			✓		✓	✓	✓		
		StrongIRFET™			✓	✓	✓	✓	✓		
Inverters	Solar	OptiMOS™			✓	✓	✓	✓			
		StrongIRFET™			✓	✓	✓				
	Online UPS	slow switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		fast switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Offline UPS	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
SMPS	Adapter / Charger	OptiMOS™		✓	✓	✓	✓				
		StrongIRFET™		✓	✓	✓	✓				
	PC Power	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
	LCD TV	OptiMOS™			✓	✓	✓				
		StrongIRFET™			✓	✓	✓				
	Server	OptiMOS™		✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	AC-DC	OptiMOS™				✓	✓	✓	✓		
		StrongIRFET™				✓	✓				
	Telecom	OptiMOS™	✓	✓	✓	✓	✓	✓			
		StrongIRFET™	✓	✓	✓	✓	✓				

StrongIRFET™ recommended
StrongIRFET™ available

OptiMOS™ recommended
OptiMOS™ available



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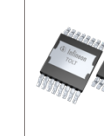
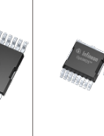
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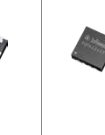



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Space-saving and high-performance packages

	TO-247	TO-220	TO-220 FullPAK	D ² PAK	D ² PAK 7-pin	TO-Leadless	TOLT (Top-side cooling)	TOLG (Gullwing leads)
								
	Optimized for high power applications and high current capability						Optimized for top-side cooling	Optimized for TCoB ¹⁾ robustness
Special features	-						Optimized for top-side cooling	Optimized for TCoB ¹⁾ robustness
Height [mm]	5.0	4.4	4.5	4.4	4.4	2.3	2.3	2.3
Outline [mm]	40.15 x 15.9	29.5 x 10.0	29.5 x 10.0	15.0 x 10.0	15.0 x 10.0	11.7 x 9.9	15.0 x 9.9	11.7 x 9.9
Thermal resistance R _{thJC} [K/W]	2.0	0.5	2.5	0.5	0.5	0.4	0.4	0.4

	sTOLL	PQFN 8x6	SuperSO8	SuperSO8 dual-side cooling (DSC)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)	Power Block	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3	PQFN 3.3x3.3 Source Down dual-side cooling (DSC)	PQFN 2x2	DirectFET™
												
	Optimized for high power in small form factor	Highest power density in the industry	For highest efficiency and power management	Optimized for dual-side cooling	Highest power density per area	Optimized thermal performance	Significant design shrink	Highest power density per area	High efficiency in small form factor	Optimized thermal performance	Enables significant space saving	Optimized for dual side cooling
Height [mm]	2.3	1.0	1.0	0.75	1.0	0.7	5.0 x 6.0: 1.0 6.3 x 6.0: 0.9 6.3 x 6.0 DSC: 0.7	1.0	1.0	1.0	0.9	Small: 0.65 Medium: 0.65 Large: 0.71
Outline [mm]	8.0 x 7.0	8.0 x 6.0	5.15x6.15	5.0 x 6.0	5.0 x 6.0	5.0 x 6.0	5.0 x 6.0 6.3 x 6.0	3.3 x 3.3	3.3 x 3.3	3.3 x 3.3	2.0 x 2.0	Small: 4.8 x 3.8 Medium: 6.3 x 4.9 Large: 9.1 x 6.98
Thermal resistance R _{thJC} [K/W]	0.6	0.5	0.8	0.5	0.45	0.45	1.5	1.4	3.2	1.4	11.1	0.5

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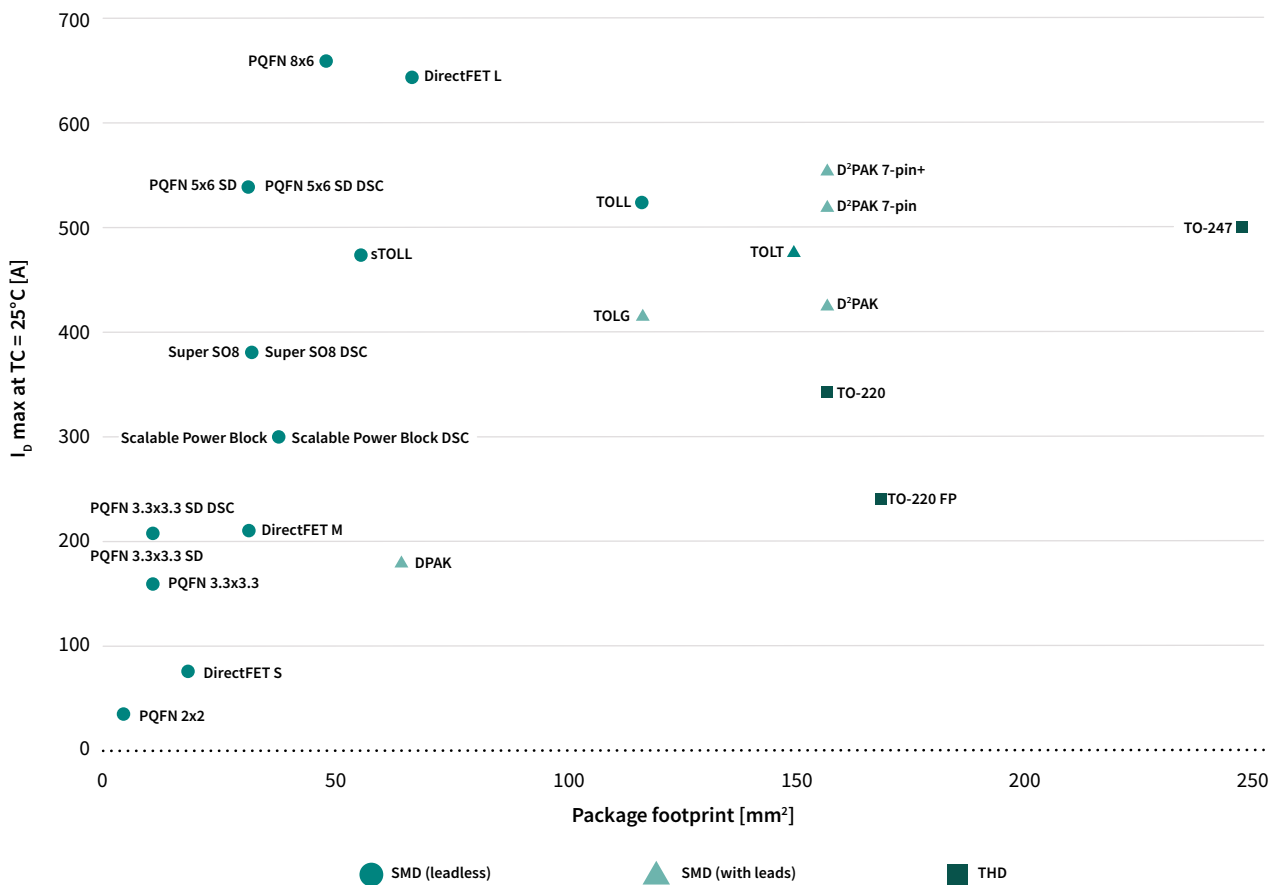
1) Temperature cycling on board

Discrete packages

Infineon has been making an impact in the MOSFET industry with innovation in MOSFET manufacturing techniques and processes as well as pioneering new packages to meet the changing demands of cutting-edge designs in various applications. OptiMOS™ and StrongIRFET™ technologies are available in different packages to address demands for high current carrying capability and significant space saving. The broad portfolio enables footprint reduction, boosted current rating, and optimized thermal performance. While the surface mount leadless devices are enabled for footprint reduction, through-hole packages are characterized by a high-power rating.

Infineon offers innovative packages such as DirectFET™ and TO-Leadless (TOLL). DirectFET™ is designed for high frequency applications by offering the lowest parasitic resistance. This package is available in three different can sizes: small, medium, and large. TO-Leadless is optimized to dissipate power up to 375 W, increasing power density with a substantial reduction in footprint.

New package innovations include the SuperSO8 Source-Down package offering high power density and performance; the TOLG (Gullwing leads) optimized for TCoB (Thermal cycling on board) robustness; TOLT (top-side cooling) optimized for superior thermal performance; sTOLL optimized for high power in small form factor; and the SuperSO8 dual-side cooling (DSC) optimized for dual-side cooling in a standard 5x6 mm² footprint.



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OptiMOS™ 7 15 V

Infinion's latest technology with the industry's first 15 V trench power MOSFETs provides the next level of system efficiency and performance

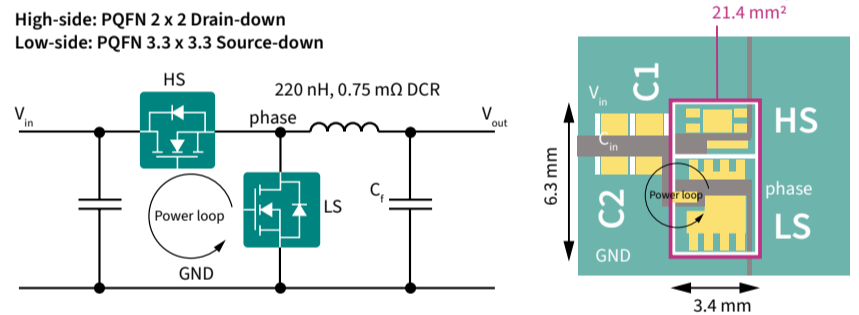
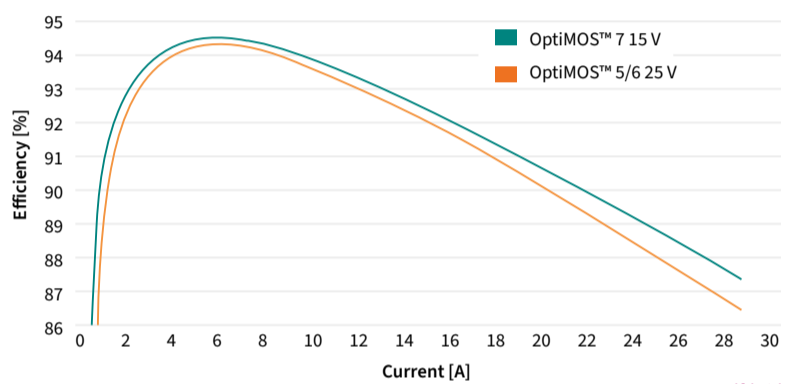
Infinion introduced the industry's first 15 V trench power MOSFETs, utilizing the brand-new OptiMOS™ 7 technology. This system and application-optimized technology targets DC-DC conversion with low server and computing applications output voltages.

Compared to OptiMOS™ 5 25 V, the OptiMOS™ 7 15 V MOSFET family offers a lower breakdown voltage, significantly reducing $R_{DS(on)}$ and $FOMQ_g/FOMQ_{OSS}$. The best-in-class product portfolio comprises Source-Down PQFN 3.3x3.3 packages with bottom and dual-side cooling variants in Standard and Center-Gate footprints for flexible and optimal PCB design and a PQFN 2x2 package with a reinforced clip. The latter offers a pulsed current capability of more than 500 A, with an R_{thJC} of 1.6 K/W. Reducing conduction and switching losses in combination with the Source-Down package, simplifies thermal management, pushing power density and efficiency to the next level.

The high-side MOSFET uses the PQFN 2x2 (taking advantage of the lower switching losses) and the low-side MOSFET uses the Source-Down (taking advantage of the low conduction losses).

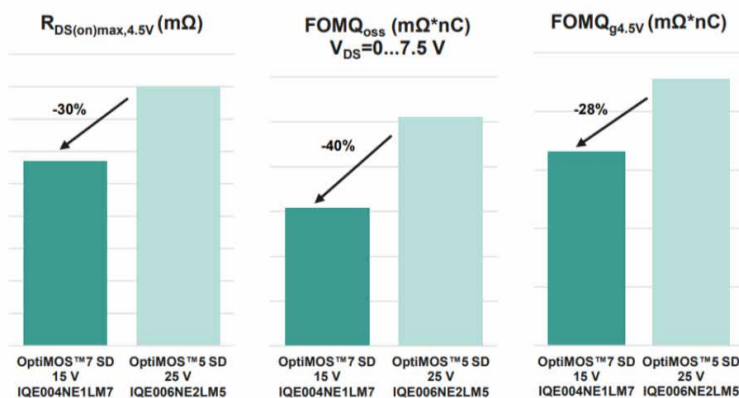
OptiMOS™ 7 15 V vs. OptiMOS™ 5 / 6 25 V

- Outstanding $FOMQ_g/FOMQ_{OSS}$ improves peak efficiency by 0.2 percent while enabling high frequency operation
- Lower $R_{DS(on)}$ improves full load efficiency by 0.85 percent while enabling output power increase



Features and benefits

Key features	Key benefits
– First 15 V trench power MOSFETs	– Improved efficiency in sub 12 V DC-DC output stages where 25 V MOSFETs are used
– Benchmark $R_{DS(on)}$ compared to 25 V node	– Reduced conduction losses
– Outstanding $FOMQ_g/FOMQ_{OSS}$	– Highest efficiency with best switching performance
– Ultralow package parasitics	– Center-Gate for ideal parallelization, Standard-Gate for easy layout fit-in
– Standard and Center-Gate footprints with dual-side cooling variants	– Better thermal management with significant space saving enablement



The OptiMOS™ 7 15 V product family offers a leap forward in technology supporting new trends in power distribution architectures, e.g., high ratio DC-DC conversion, enabling further advancements in server, datacom, and artificial intelligence applications while minimizing CO₂ footprint.



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- www.infineon.com/optimos-strongirfet-packages
- www.infineon.com/optimos7
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OptiMOS™ 7 40 V

Unleash maximum power with the next best-in-class OptiMOS™ 7 40 V power MOSFET in a SuperSO8 5x6

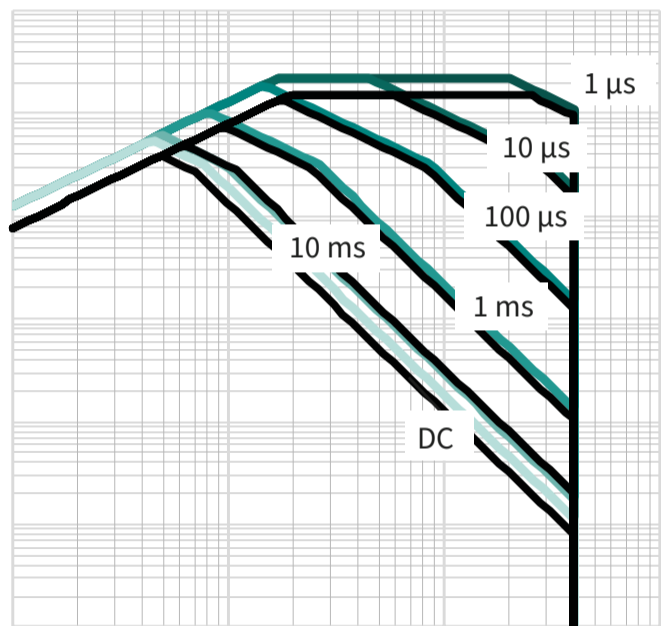
Infiniteon introduces the best-in-class 40 V power MOSFET in the latest OptiMOS™ 7 trench technology. This new product expands the OptiMOS™ 7 portfolio from the industry's first 15 V power MOSFETs to the lowest $R_{DS(on)}$ in a SuperSO8 5x6 40 V power MOSFET, minimizing the energy loss in the system and making it best fit in BMS applications. The $R_{DS(on)}$ is improved by 40 percent compared to the existing OptiMOS™ 6 40 V products. In addition, the SuperSO8 5x6 package makes a 50 percent PCB real estate area reduction possible when compared to the DirectFET™ (L) solution while making the need for parallelization obsolete.

The new OptiMOS™ 7 40 V power MOSFET offers a leap forward in terms of $R_{DS(on)}$ reduction, a product feature highly beneficial in BMS applications, facilitating increased power density, improved system efficiency and cost reduction.

ISCH42N04LM7 has a higher DC current capability than the BSC007N04LS6 mainly driven by the lower $R_{DS(on)}$:
 at 0.1 V DC > 40%
 at 40 V DC > 30%

Also in short pulse regime and high V_{DS} there is noticeable current capability improvement:
 at 40 V 1 ms > 20%
 at 40 V 100 μ s > 10%

Safe operating area
 $I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D = 0$ parameter: t_p



Features and benefits

Key features	Key benefits
- BiC 40 V power MOSFET in a SuperSO8 5x6 in the market	- Best fit in BMS applications
- Outstanding $R_{DS(on)}$	- Energy loss minimization with highest power density
- Industry standard footprint	- Multiple sourcing possibility
- Wide safe operating area	- Increased reliability and robustness



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BMS



Power tools



Gardening tools



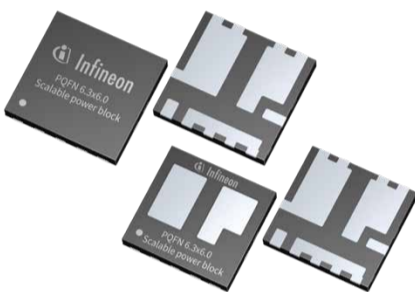
Home & garden

OptiMOS™ Scalable Power Block

Symmetric half-bridge solution enabling 50 percent improvement in power density

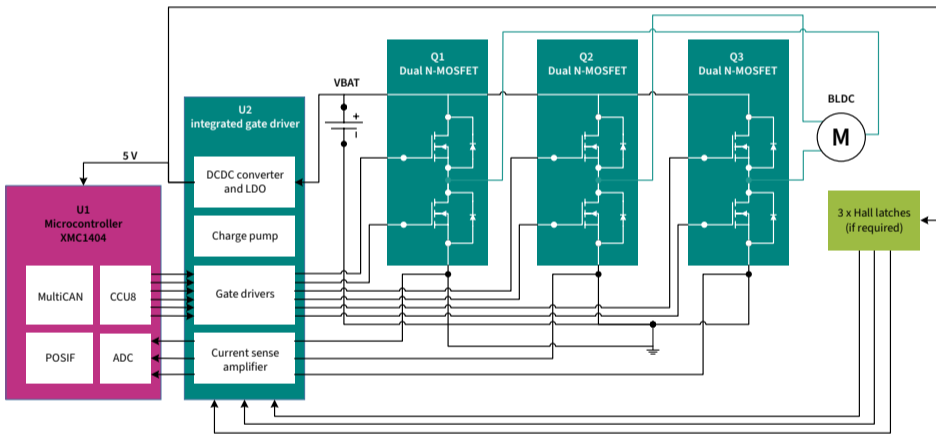
OptiMOS™ 6 40 V and OptiMOS™ 5 100 V Symmetric power block (Q1 and Q2 of similar $R_{DS(on)}$) integrates a low-side and a high-side MOSFET in a compact leadless SMD 6.3x6.0 mm² package targeting a variety of applications (drives, SMPS). By replacing two separate discrete packages, e.g., SuperSO8 (PQFN 5x6), customers can shrink the power section on the board by at least 50 percent.

The MOSFET half-bridge family features Infineon's proven OptiMOS™ 5 and 6 technologies, offering very low on-state resistance ($R_{DS(on)}$) and figure of merits (Q_g , Q_{gd}). The reduction in the package's parasitic inductance of the package results in improved switching performance and EMI, as well as reduced overall BOM cost. Optimized lead-frame and Cu-clip significantly improve the package's thermal performance. The dual-side cooling version of the package boosts the power throughput by an additional 25 percent.

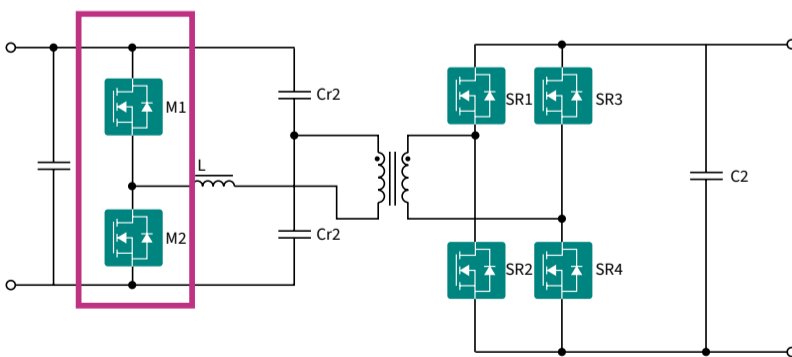


Integrated symmetric half-bridge solution using the latest OptiMOS™ silicon technology offered in both over-molded and dual-side cooling options for supreme power density and performance advantage.

Half-bridge replacement in Inverter circuit for drives



Power switches in LLC circuit



Features and benefits

Key features	Key benefits
- High chip/package ratio	- High power capability
- Optimized lead-frame and Cu-clip design	- Optimum thermal performance
- Internally connected low-side and high side (lowest loop inductance)	- Compact and simplified layout design
- Dual-side cooling available	- Superior switching performance/EMI



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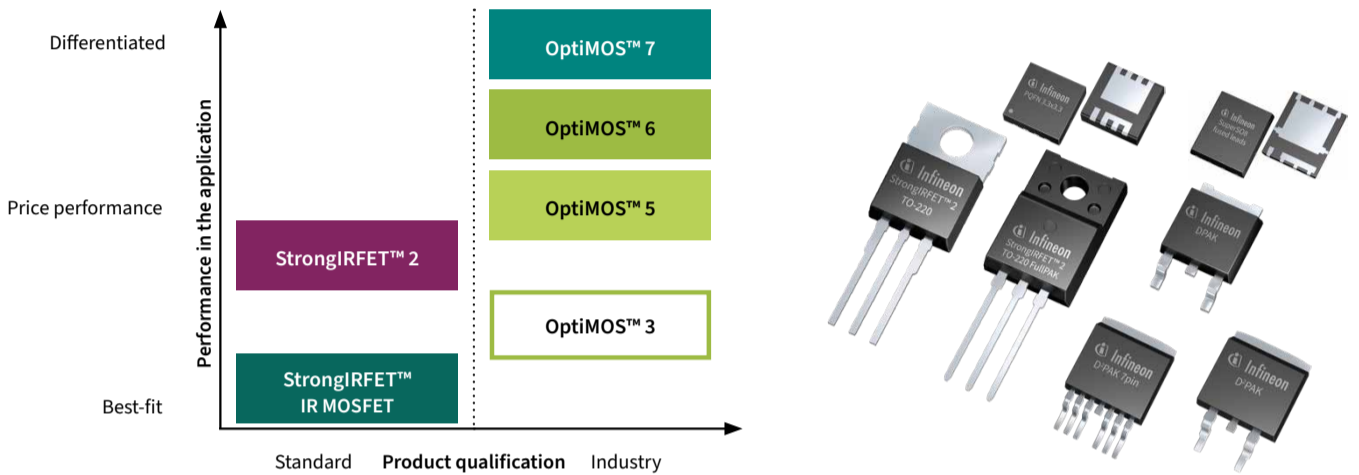
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StrongIRFET™ 2 MOSFETs – 30 V/40 V/60 V/80 V/100 V

Right-fit products for a broad range of applications

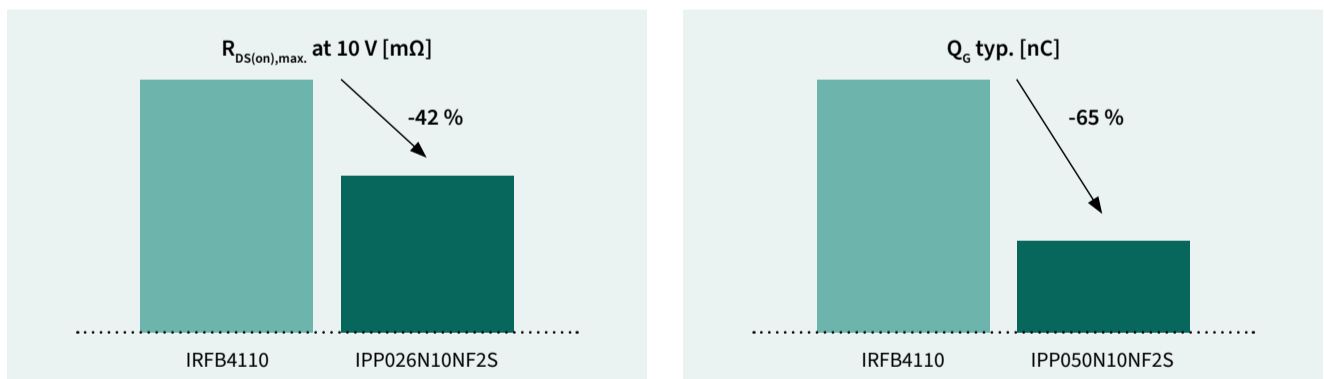
The new StrongIRFET™ 2 power MOSFETs are the latest generation of MOSFETs addressing a wide range of applications such as adapters, motor drives, e-scooters, battery management systems, light electric vehicles, robotics, power and gardening tools, and other consumer applications. Featuring broad availability and excellent price/performance ratio and robustness, this new technology offers right-fit products with an easy choice for designers interested in convenient selection and purchasing. Optimized for both low- and high-switching frequencies, the family supports a broad range of applications enabling flexibility in design.



Features and benefits

Key features	Key benefits
- Broad availability from distribution partners	- Increased security of supply
- Excellent price/performance ratio	- Right-fit products
- Ideal for high and low switching frequency	- Supports wide variety of applications
- Industry standard footprint	- Standard pin out allows for drop-in replacement
- High current rating	- Increased product ruggedness

StrongIRFET™ 2 vs. previous generation 100 V performance comparison



Compared to the previous StrongIRFET™ generation in 100 V TO-220 package, StrongIRFET™ 2 shows significant improvements such as ~40 percent lower $R_{DS(on)}$ and ~65 percent reduced Q_G . This results in better efficiency and longer life time.



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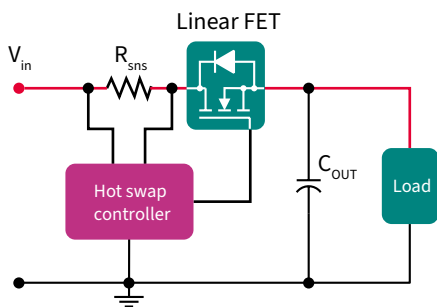
OptiMOS™ Linear FET

Combining a low $R_{DS(on)}$ with a wide safe operating area (SOA)

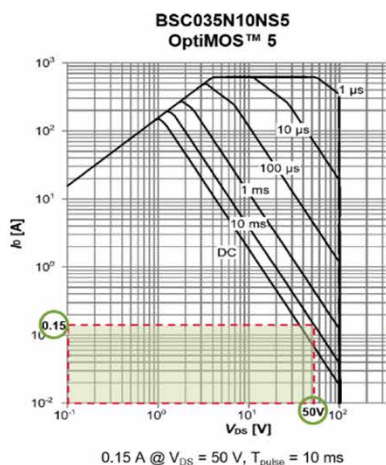
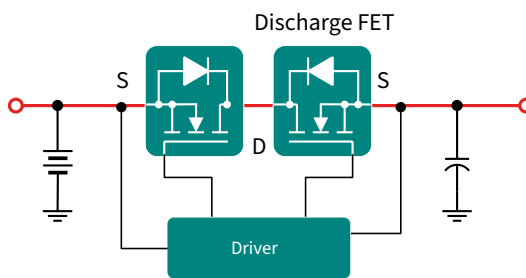
With Infineon's OptiMOS™ Linear FET you can avoid settling between on-state resistance ($R_{DS(on)}$) and linear mode capability – operation in the saturation region of an enhanced mode MOSFET. The OptiMOS™ Linear FET revolutionary approach offers the state-of-the-art $R_{DS(on)}$ of a trench MOSFET together with the wide safe operating area (SOA) of a classic planar MOSFET.

OptiMOS™ Linear FET MOSFETs prevent damage at the load by limiting high in-rush current. This product is the perfect fit for hot-swap, e-fuse (electronic fuse), and battery protection functions commonly found in telecom, servers, and battery management system (BMS). A new 100 V Linear FET in PQFN 3.3x3.3 is also a fit for soft start in Power-over-Ethernet (PoE) application.

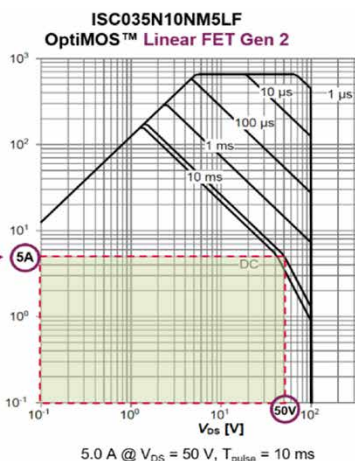
Protection in eFuse/Hot-swap/Soft start circuit



Charge and Discharge FET in BMS circuit



Linear FET offers >30x Improvement in SOA
+4.85 A



OptiMOS™ Linear FET offers a much wider safe operating area (SOA) compared to standard OptiMOS™ MOSFETs with similar $R_{DS(on)}$.

Features and benefits

Key features
– Wide safe operating area (SOA)
– Low $R_{DS(on)}$
– High maximum pulse current
– High maximum continuous current
– Multiple packages: D ² PAK, D ² PAK 7-pin, TOLL, PQFN 5x6 and 3.3x3.3

Key benefits
– Rugged linear mode operation
– Low conduction losses
– Higher in-rush current enabled
– Faster start-up and shorter down time
– Compatible footprint for drop-in replacement



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OptiMOS™ 6 120 V

Fully optimized best-in-application performance power MOSFET at 120 V

Infiniteon's extensive experience in trench MOSFET technology development, and the knowledge gained from customer support are the key motivators of the development of the new OptiMOS™ 6 120 V MOSFETs. The new OptiMOS™ 6 120 V power MOSFET technology offers devices with extremely low on-state resistance and very low gate charges, yielding the industry's best figure of merit (FOM). These features make the OptiMOS™ 6 the best fit for high-switching frequency applications, such as battery-powered power tools, solar applications, and SMPS.

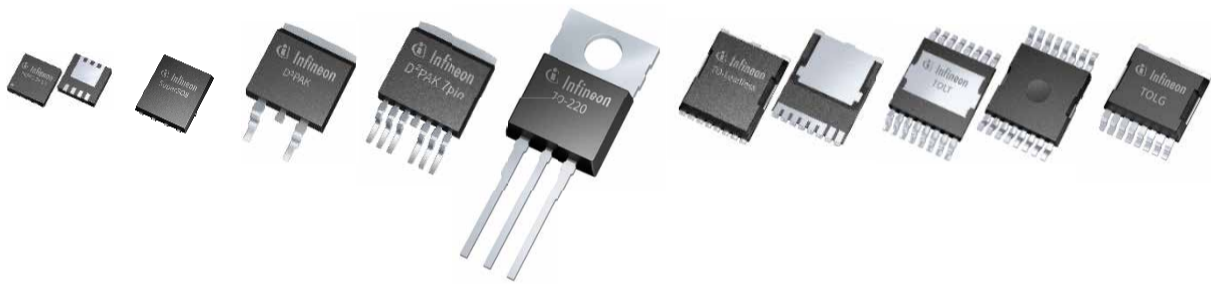
Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Industry's lowest $R_{DS(on)}$ in 120 V – Best balance between switching and conduction losses – Significantly improved FOMs compared to OptiMOS™ 3 	<ul style="list-style-type: none"> – Highest efficiency – Less paralleling required – High power density

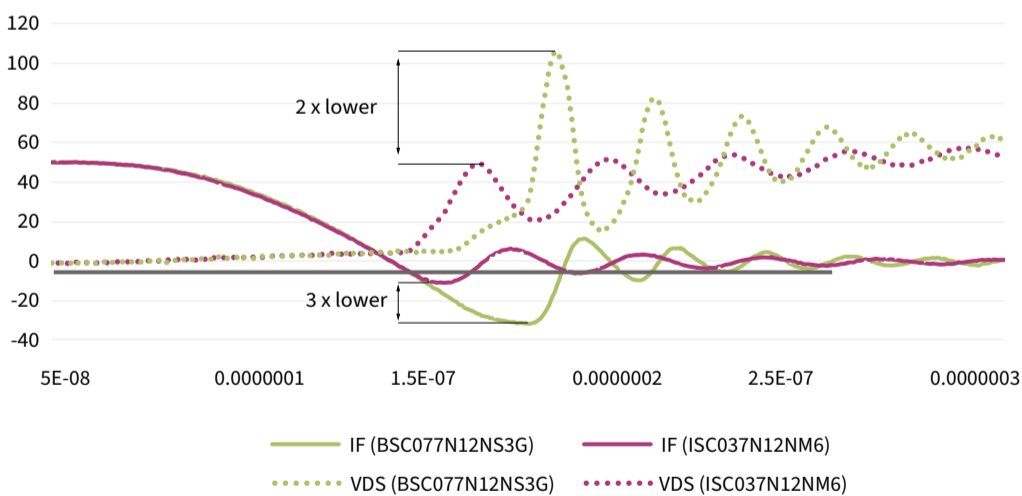
Key Applications

OptiMOS™ 6 120 V is available in logic level and normal level versions to accommodate different application requirements. It includes the following packages: PQFN 3.3x3.3, SuperSO8, D²PAK, D²PAK-7, TO-220, TOLL, TOLT, TOLG

- Gardening tools
- Power tools
- eScooter
- USB PD charger
- Solar



Lower reverse recovery voltage peak, resulting in significantly improved safety margins for your system design



- OptiMOS™ 6's reverse recovery voltage peak is two times lower compared to its predecessor resulting in much better safety margins in system design.
- Lower QRR decreases voltage overshoot and switching loss



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OptiMOS™ 6 135 V and 150 V*

Best-in-application offering with the latest OptiMOS™ 6 products

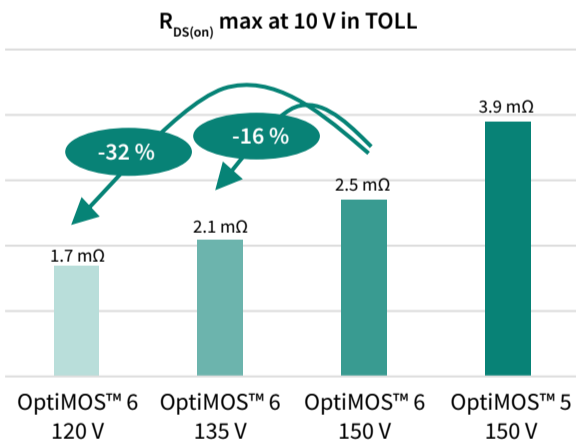
The new OptiMOS™ 6 135 V and 150 V technologies were designed to fulfill the requirements of various applications, from synchronous rectification sockets in telecom and server SMPS to motor inverters in eForklifts and light electric vehicles (LEV), solar optimizers, and high-power USB chargers. With industry's lowest $R_{DS(on)}$, improved switching performance and excellent EMI behavior both technologies bring unparalleled efficiency, power density, and reliability into the highly competitive 150 V market. Both newly released product families bring significant improvements upon its predecessor OptiMOS™ 5 150V. This offering provides the customer best-in-application products with different possibilities. Our ability to scale sets us apart as the industry's leading supplier of power MOSFETs.

Features and benefits

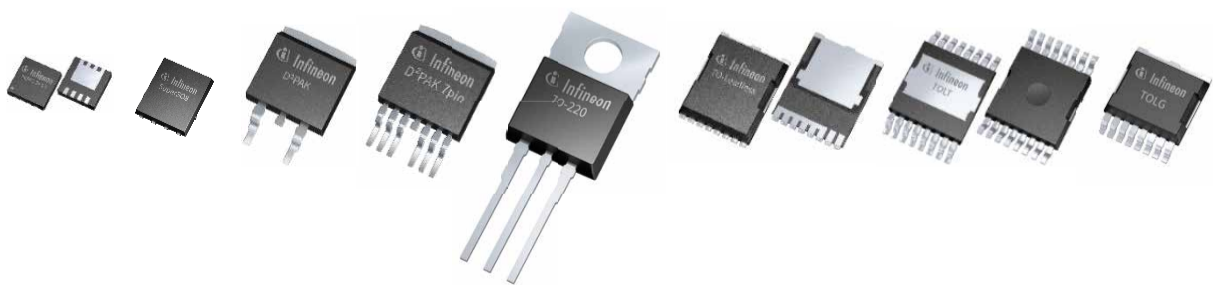
Key features	Key benefits
- Best-in-class $R_{DS(on)}$ and FOMg in 135 V and 150 V	- Low conduction and switching losses, in hard and soft switching
- Lower $Q_{rr(typ)}$ and improved diode softness compared to OptiMOS™ 3	- Stable operation with improved EMI enabling less overshoot
- Tight $V_{gs(th)}$ spread	- Better paralleling performance
- High avalanche ruggedness	- Enhanced robustness
- Max junction temperature of 175°C and MSL1	- Longer lifetime and improved reliability

Key Applications

- Forklift
- eScooter
- Telecom and Server
- Solar
- Power and gardening tools
- Charger
- UPS



Which is the right MOSFET voltage for your application?
 OptiMOS™ 6 135 V and 150 V new product families complement the recently released OptiMOS™ 6 120 V. With a complete portfolio, we offer our customers alternatives to choose between higher breakdown voltage margin and lower losses.



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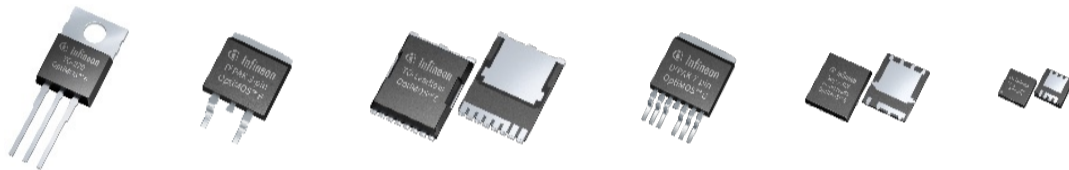
OptiMOS™ 6 200 V

Setting the new industry standard

The OptiMOS™ 6 200 V employs an advanced cell design to set the new technology standard in its voltage class. It addresses the need for high power density, efficiency, and reliability. The OptiMOS™ 6 200 V technology was designed for optimal performance in motor drive applications such as light electric vehicles (LEV), forklifts, and drones. It features industry-leading $R_{DS(on)}$, improved switching and current sharing capability, enabling high power density, less paralleling, and excellent EMI performance. The improved switching behavior makes the OptiMOS™ 6 200 V family an ideal choice for switching applications such as telecom, server, or audio. Additionally, the combination of wide SOA and industry-leading $R_{DS(on)}$ results in a perfect fit for static switching applications such as battery management systems (BMS).

Features and benefits

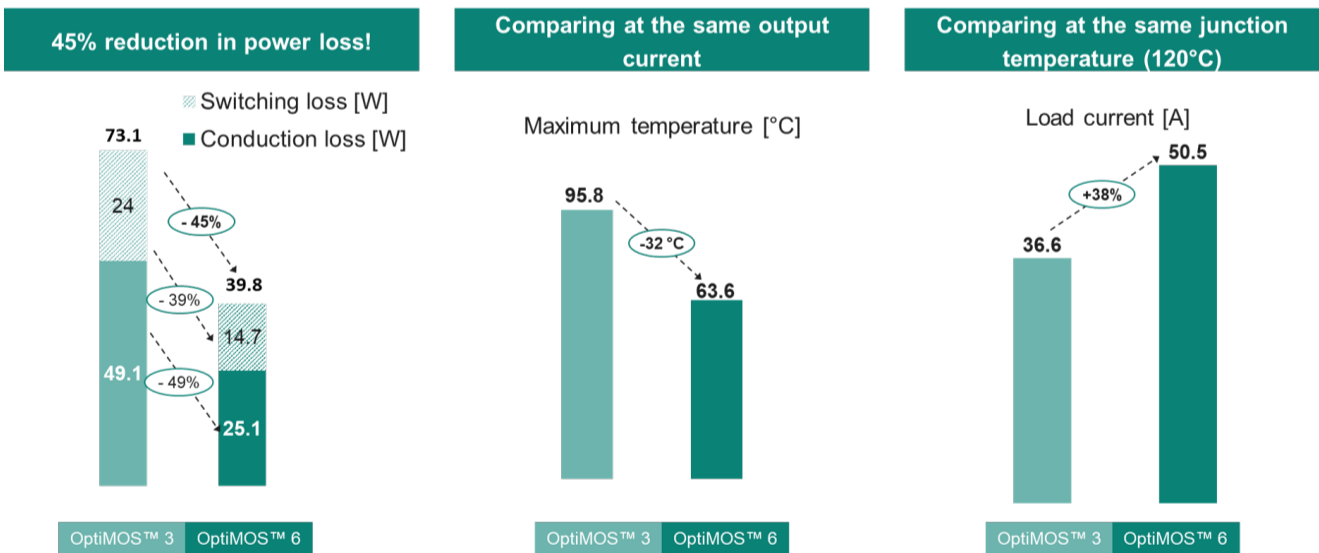
Key features	Key benefits
- Best-in-class $R_{DS(on)}$ in 200 V	- Low conduction losses
- Lower $Q_{r(typ)}$ and improved diode softness compared to OptiMOS™ 3	- Low switching losses
- Improved capacitance linearity	- Stable operation with improved EMI
- Wide SOA	- Enhanced robustness
- Tight $V_{GS(th)}$ parametric spread	- Less paralleling required and better current sharing



Application test results

OptiMOS™ 6 vs. OptiMOS™ 3 in 200 V

- 42 percent lower $R_{DS(on)}$ enables reduced conduction losses
- Improved switching behavior enables reduced switching losses



- At the same output power, the maximum device temperature reduction of 32°C was achieved.
- At the same Junction temperature, 38 percent higher load current was achieved.



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SMPS



Audio



BMS



Drives

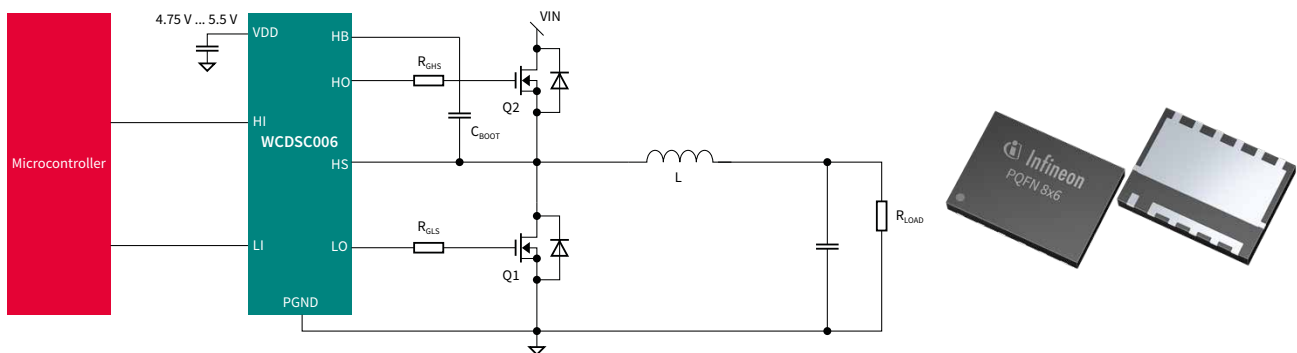


Solar

OptiMOS™ 40 V in PQFN 8x6

A high-power density package family

Infineon's family of OptiMOS™ N-channel power MOSFETs in PQFN 8x6 packages are benchmark products optimized for very low $R_{DS(on)}$ and high-current capability, alongside Infineon's renowned quality standard for robust industry designs. This makes the PQFN 8x6 MOSFET package the ideal solution for various battery powered, battery protection, and battery formation applications requiring low package resistance and high-current handling MOSFETs. The PQFN 8x6 family of MOSFETs is available in a small 8x6 mm leadless package to reduce the physical footprint and overall BOM of end products. The improved $R_{DS(on)}$ and I_D ratings, continuous and pulsed, enable increased battery run time and higher power density.



Features and benefits

Key features

- >50% reduction in footprint compared to TOLL
- Best-in-class continuous current rating and competitive avalanche energy rating
- Excellent package area utilization
- Ultralow package parasitics
- Footprint compatibility with SuperSO8 5x6

Key benefits

- Power density increase enabling higher power designs while maintaining the space constraints
- Good design margin in worst case conditionals (e.g., in-rush motor stall/short)
- Ultralow $R_{DS(on)}$ with good thermal resistance R_{thJC}
- EMI improvement due to lower device parasitics
- Simple PCB design change based on SuperSO8 provides scalability across varying power requirements



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Small-signal/small-power MOSFETs -250 to 600 V

Combining latest high-performance silicon technology with small and innovative packaging

Small-signal/small power products are ideally suited for space-constrained automotive and non-automotive applications. With an optimal price/performance ratio and small footprint packages, Infineon's small-signal and small-power MOSFETs are the best fit for a wide range of applications and circuits. These include low-voltage drives, linear battery charger, battery protection, load switches, DC-DC converters, reverse polarity protection and many more.

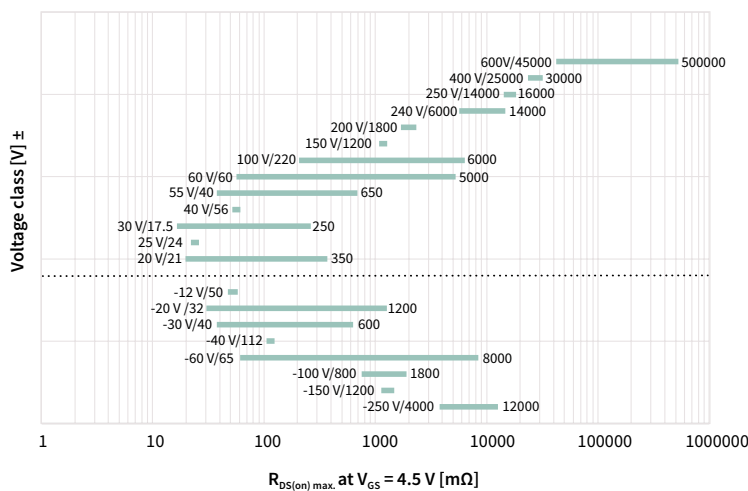
The entire family includes different packages:

SOT-223, SOT-23, SOT-323, SOT-363, SOT-89, TSOP-6, and SC59

The product portfolio covers N-channel and P-channel enhancement mode MOSFETs as well as N-channel depletion mode products:

- 250 to -12 V P-channel enhancement mode (available in single and dual configurations)
- 20 to 600 V N-channel enhancement mode (available in single and dual configurations)
- 20/+20 V and -30/+30 V complementary (P + N channel) enhancement mode
- 60 to 600 V N-channel depletion mode

Key features	Key benefits
- Products available in Automotive, Industrial, and Standard qualification levels	- Suitable for automotive and high quality demanding applications
- Four $V_{GS(th)}$ classes available for 1.8 V, 2.5 V, 4.5 V, and 10 V gate drives	- Easy interface to MCU
- ESD protected P-channel parts	- Reduction of design complexity
- V_{DS} range from -250 to 600 V	- Wide selection of products available
- RoHS compliant and halogen free	- Environmentally friendly



Small-signal/small-power MOSFETs are available in seven industry-standard package types ranging from the largest SOT-223 to the smallest SOT-323.

Products are offered in single, dual and complementary configurations and are suitable for a wide range of applications, including battery protection, LED lighting, low-voltage drives, and DC-DC converters.



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OptiMOS™ power MOSFETs 15 -150 V Source-Down

An innovative PQFN 3.3x3.3 mm² and PQFN 5x6 mm² product family

Once again, Infineon is setting a new standard in MOSFET performance with the new Source-Down package to support the requirement for high power density and optimized system-level efficiency. In comparison with a normal Drain-Down device, in the Source-Down technology, the source potential is connected to the thermal pad. The OptiMOS™ power MOSFET 3.3x3.3 mm² Source-Down packages are now available in 15-150 V in BSC (bottom-side cooling) and in DSC (dual-side cooling). The latest addition to the family is the OptiMOS™ power MOSFET 5x6 mm² Source-Down, available in BSC. Optional Center-Gate footprint is also available for both families. Here the gate pin is moved to the center supporting easy parallel configuration of multiple MOSFETs. With the larger drain-to-source creepage distance, it is possible to connect the gates of multiple devices on a single PCB layer.

	Standard Drain-Down	New Source-Down Bottom-Side Cooling	New Source-Down dual-side cooling	SuperSO8	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)
						
	PQFN 3.3 x 3.3 mm standard Drain-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint	For highest efficiency and power managemen	Highest power density per area	Optimized thermal performance
R_{thJC} [C/W]	1.8°C/W	1.4°C/W	1.4°C/W	0.8°C/W	0.45°C/W	0.45°C/W

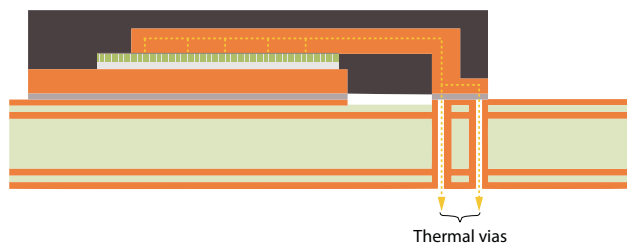
Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> Major reduction in $R_{DS(on)}$, up to 30% due to larger silicon die in same package outline Improved R_{thJC} overcurrent PQFN package technology High power density Standard-Gate and Center-Gate footprint options Available in standard and logic level options 	<ul style="list-style-type: none"> Enabling highest power density and performance Superior thermal performance Form factor reduction Optimized layout possibilities Simplifying parallel configuration of multiple MOSFETs with Center-Gate footprints Simplified gate drive

Optimized thermal management

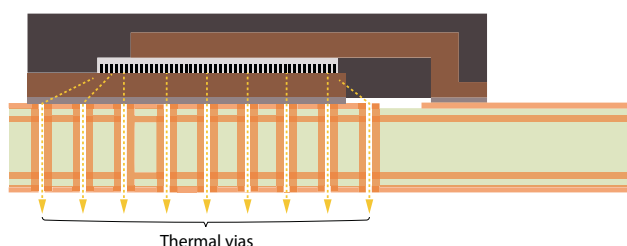
Drain-Down

PQFN 3.3x3.3



Source-Down

PQFN 3.3x3.3



In the Source-Down package technology, the heat is dissipated directly into the PCB through a thermal pad instead of over the bond wire or the copper clip. The package significantly improves the thermal resistance (R_{thJC}) of this product family. In most cases, thermal vias cannot be used on the thermal pad if it is connected to the noisy switch node potential. With Source-Down, the thermal pad of the low-side MOSFET is now on the ground potential enabling the use of thermal vias right underneath the device. This considerably improves the thermal performance and the power density in the end application.



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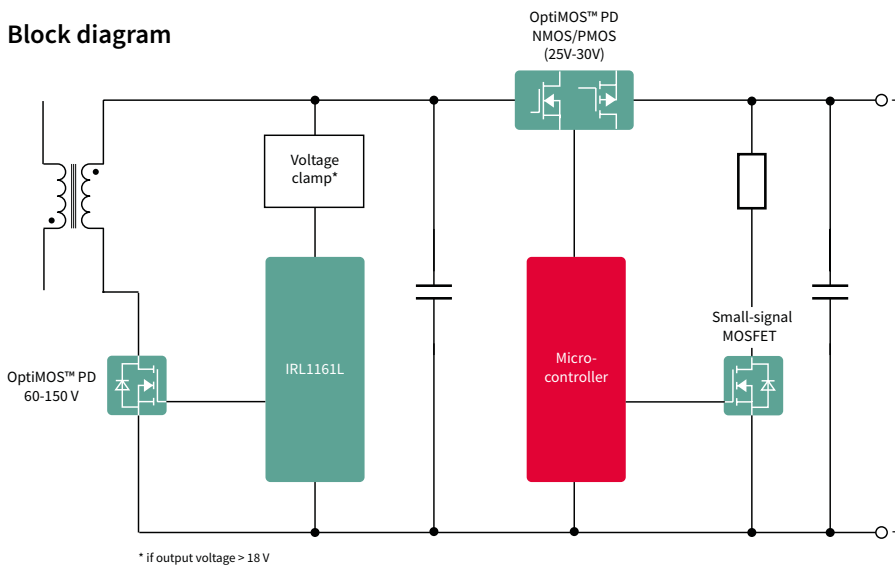
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OptiMOS™ PD

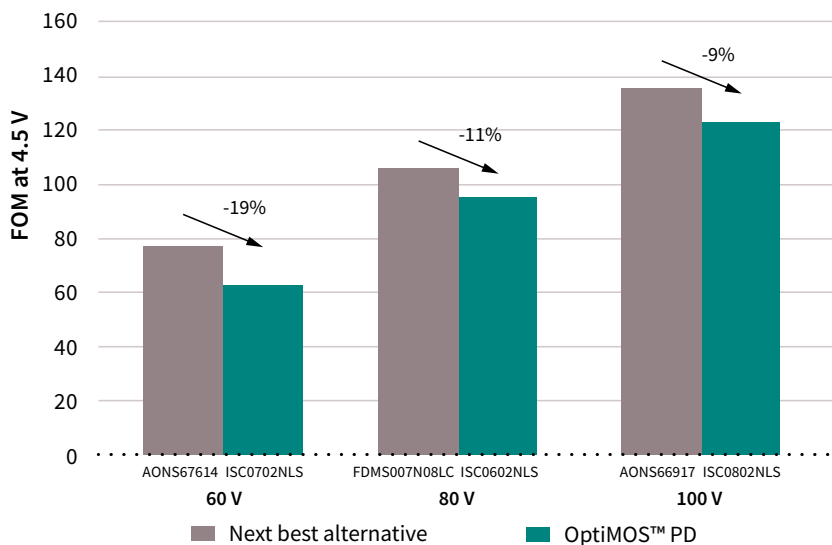
The best fit for USB-PD and fast charger designs

OptiMOS™ PD is Infineon's new MOSFET portfolio representing the best fit for USB-PD and fast charger designs and is available in 2 small standard packages: PQFN 3.3x3.3 and SuperSO8. Logic level availability enables parts to be fully driven from 4.5 V or directly from microcontrollers resulting in a lower part count in the application. The portfolio ranges from 25 V up to 150 V MOSFETs where 25 V and 30 V products represent the fit as load switch and 60-150 V parts are the optimal choice to function as synchronous rectification FETs in charger and adapter designs.

Block diagram



OptiMOS™ PD comparison of $R_{DS(on)}$ in 60 V, 80 V, and 100 V



The OptiMOS™ PD family features MOSFETs offering a low on-state resistance ($R_{DS(on)}$), less switching losses as well as low gate-, output- and reverse-recovery charges. The reduction in overall losses results in an excellent price/performance ratio leading to a decrease in total system BOM cost.



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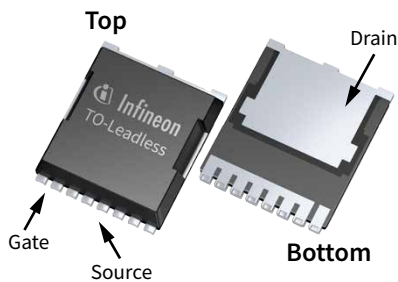
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TOLx family



TO-Leadless (TOLL)

Optimized for high power applications

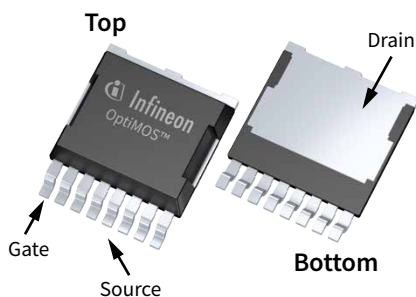
TO-Leadless is optimized to handle currents up to 500 A, increasing power density with a substantial reduction in footprint. A footprint reduction of 30 percent compared to D²PAK, together with a height reduction of 50 percent, results in an overall space saving of 60 percent enabling much more compact designs.

Key features

- Best-in-class technology
- High current rating > 500 A
- 60% space reduction compared to D²PAK 7-pin

Key benefits

- High performance capability
- High system reliability
- Optimized board utilization



TOLG (Gullwing leads)

Optimized for better TCoB robustness

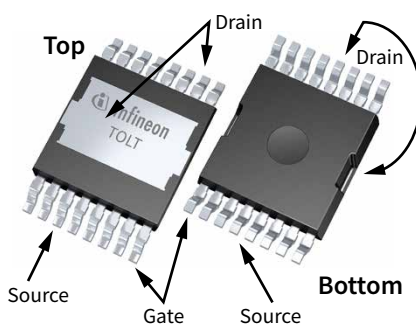
TOLG package offers a compatible footprint to the TO-Leadless with the additional feature of Gullwing leads resulting in two times higher TCoB performances compared to TO-Leadless. This package is excellent on aluminum insulated metal substrate boards (Al-IMS).

Key features

- Best-in-class technology
- High current rating > 450 A
- Low ringing and voltage overshoot
- 60% space reduction compared to D2PAK 7-pin
- Gullwing leads

Key benefits

- High performance capability
- High system reliability
- High efficiency and lower EMI
- Optimized board utilization
- High thermal cycling on board performance



TOLT (Top-side cooling)

Optimized for superior thermal performance

TOLT is the new top-side cooling package within the TOLx family. With top-side cooling, the drain is exposed at the surface of the package allowing for 95 percent of the heat to be dissipated directly to the heatsink, achieving 20 percent better R_{thJA} and 50 percent improved R_{thJC} compared to the TOLL package. With bottom-side cooling packages, like the TOLL or the D²PAK, the heat is dissipated via the PCB to the heatsink resulting in high power losses.

Key features

- Low $R_{DS(on)}$
- High current rating
- Top-side cooling
- Negative standoff

Key benefits

- Reduction in conduction losses
- Increased product ruggedness
- Superior thermal performance
- Minimize thermal resistance to heatsink



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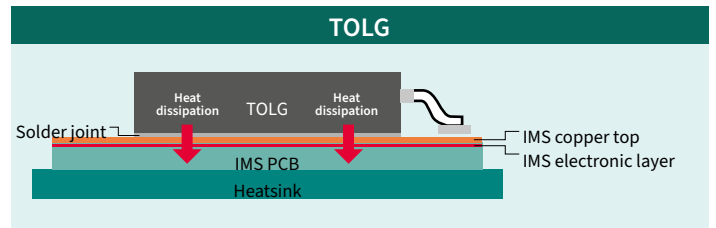
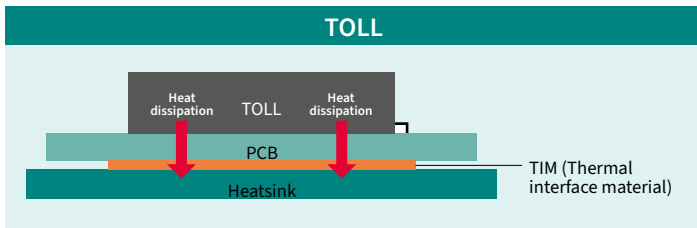
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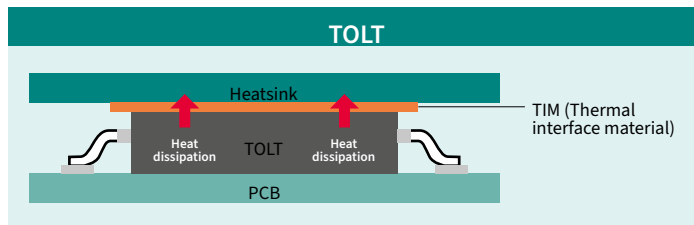
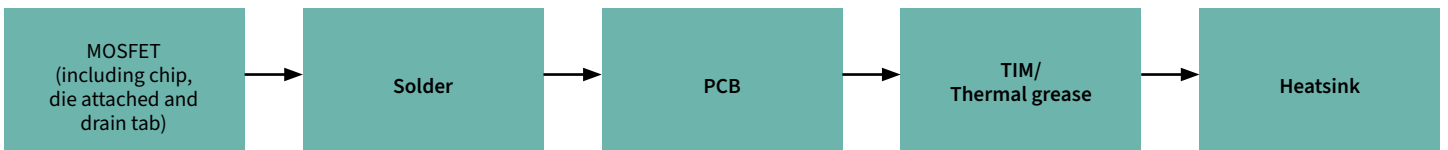
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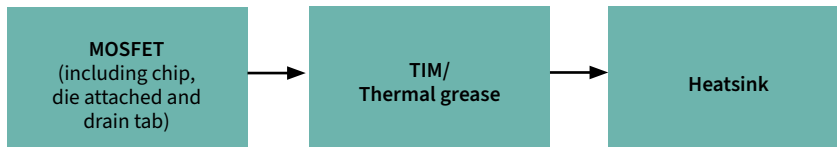
TOLx family – Cooling concept



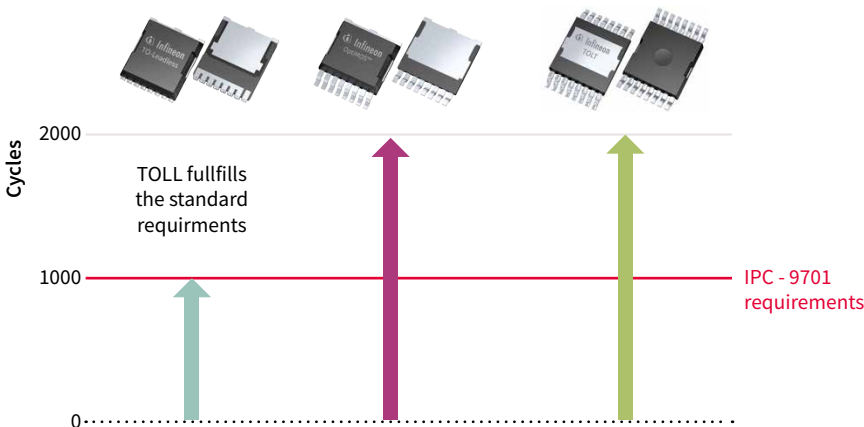
With TOLL/TOLG, board mounting, the heat is dissipated through the PCB to the heatsink. Due to the PCB thermal resistance, power losses occur.



With top-side cooling setup, the drain pad is exposed on the top of the package allowing the majority of the heat to be dissipated into the top-mounted heatsink. This pulls heat away from the PCB resulting in at least 20 percent better R_{thJA} compared to standard over-molded TOLL.



Thermal cycling on IMS board (TCoB) performance



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OptiMOS™ 7 15 V logic level



$R_{DS(on),max}$ at $V_{GS}=4.5\text{ V}$ [mΩ]	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down dual-side cooling (DSC)	PQFN 2x2
< 1	IQE004NE1LM7 $R_{DS(on)}=0.57\text{ m}\Omega$	IQE004NE1LM7SC $R_{DS(on)}=0.57\text{ m}\Omega$	
	IQE004NE1LM7CG $R_{DS(on)}=0.57\text{ m}\Omega$	IQE004NE1LM7CGSC $R_{DS(on)}=0.57\text{ m}\Omega$	
2-4			ISK018NE1LM7 $R_{DS(on)}=2.15\text{ m}\Omega$

OptiMOS™ and StrongIRFET™ 20 V (super) logic level



$R_{DS(on),max}$ at $V_{GS}=4.5\text{ V}$ [mΩ]	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
< 1			IRFH6200TRPBF ¹⁾ $R_{DS(on)}=0.99\text{ m}\Omega$
2-4		IRLHM620TRPBF ^{** 1)} $R_{DS(on)}=2.5\text{ m}\Omega$	
> 10	IRLHS6242TRPBF $R_{DS(on)}=11.7\text{ m}\Omega$		

OptiMOS™ and StrongIRFET™ 25 V logic level



$R_{DS(on),max}$ at $V_{GS}=10\text{ V}$ [mΩ]	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)
< 1			BSC004NE2LS5 $R_{DS(on)}=0.45\text{ m}\Omega$	IQE006NE2LM5 $R_{DS(on)}=0.65\text{ m}\Omega$	IQE006NE2LM5CGSC $R_{DS(on)}=0.58\text{ m}\Omega$	IQDH29NE2LM5CG $R_{DS(on)}=0.29\text{ m}\Omega$	IQDH29NE2LM5SC $R_{DS(on)}=0.29\text{ m}\Omega$
				IQE006NE2LM5CG $R_{DS(on)}=0.65\text{ m}\Omega$	IQE006NE2LM5SC $R_{DS(on)}=0.58\text{ m}\Omega$	IQDH29NE2LM5 $R_{DS(on)}=0.29\text{ m}\Omega$	IQDH29NE2LM5CGSC $R_{DS(on)}=0.29\text{ m}\Omega$
		BSZ009NE2LS5 $R_{DS(on)}=0.9\text{ m}\Omega$	BSC009NE2LS5 [*] $R_{DS(on)}=0.95\text{ m}\Omega$			IQDH29NE2LM5SC $R_{DS(on)}=0.29\text{ m}\Omega$	
2-4		BSZ011NE2LS5I $R_{DS(on)}=1.1\text{ m}\Omega$				IQDH29NE2LM5CGSC $R_{DS(on)}=0.29\text{ m}\Omega$	
		BSZ013NE2LS5I [*] $R_{DS(on)}=1.3\text{ m}\Omega$					
		BSZ014NE2LS5IF ^{**} $R_{DS(on)}=1.45\text{ m}\Omega$	BSC015NE2LS5I [*] $R_{DS(on)}=1.5\text{ m}\Omega$				
			BSC018NE2LS $R_{DS(on)}=1.8\text{ m}\Omega$				
		BSZ018NE2LS $R_{DS(on)}=1.8\text{ m}\Omega$					
2-4	ISK024NE2LM5 $R_{DS(on)}=2.4\text{ m}\Omega$	BSZ031NE2LS5 $R_{DS(on)}=3.1\text{ m}\Omega$					
			BSC026NE2LS5 $R_{DS(on)}=2.6\text{ m}\Omega$				
			BSC032NE2LS $R_{DS(on)}=3.2\text{ m}\Omega$				
4-10		BSZ060NE2LS $R_{DS(on)}=6.0\text{ m}\Omega$	BSC050NE2LS $R_{DS(on)}=5.0\text{ m}\Omega$				



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^{*} Optimized for resonant applications (e.g. LLC converter) ^{**} Monolithically-integrated Schottky-like diode ^{***} $R_{DS(on),max}$ at $V_{GS}=4.5\text{ V}$ 1) 2.5 V_{GS} capable



OptiMOS™ 25 V in Power Block 5x6

Part number	Package	Monolithically-integrated Schottky-like diode	BV _{DSS} [V]	R _{DS(on),max} [mΩ] at V _{GS} =4.5 V max.		Q _G [nC] at V _{GS} =4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSG0810NDI	SuperSO8	✓	25	4.0	1.2	5.6	16.0
BSG0811ND	SuperSO8	-	25	4.0	1.1	5.6	20.0
BSG0813NDI	SuperSO8	✓	25	4.0	1.7	5.6	12.0

OptiMOS™ 25/30 V symmetrical and asymmetrical dual N-channel MOSFETs in 5x6 and 3x3 PQFN

Integrates the low-side and high-side MOSFET of a synchronous DC-DC converter into a single package. The small outline and the interconnection of the two MOSFETs within the package minimize the loop inductance which boosts efficiency.

Part number	Package	Monolithically-integrated Schottky-like diode	BV _{DSS} [V]	R _{DS(on),max} [mΩ] at V _{GS} =4.5 V max.		Q _G [nC] at V _{GS} =4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSC0911ND*	asymmetrical dual 5x6	-	25	4.8	1.7	7.7	25
BSC0921NDI*	asymmetrical dual 5x6	✓	30	7	2.1	5.8	21
BSC0923NDI*	asymmetrical dual 5x6	✓	30	7	3.7	5.2	12.2
BSC0924NDI*	asymmetrical dual 5x6	✓	30	7	5.2	5.2	8.6

OptiMOS™ 40 V and 100 V in Symmetrical Power Block 6.3x6.0

Part number	Package	Dual-side cooling	BV _{DSS} [V]	R _{DS(on)} [mΩ] at V _{GS} = 10 V max	Q _G [nC] at V _{GS} = 10 V typ.
ISG0613N04NM6H	Power Block 6.3x6.0	-	40 V	0.88	69
ISG0613N04NM6HSC	Power Block 6.3x6.0	✓	40 V	0.88	69
ISG0616N10NM5HSC	Power Block 6.3x6.0	✓	100 V	3.4	52

OptiMOS™/StrongIRFET™ 30 V - 100 V dual N-channel MOSFETs

Integrates two independent N-channel MOSFETs into a single package for high power density and compact design. Ideal for DC motors with power rating < 200 W

Part number	Package	Monolithically integrated Schottky like diode	BV _{DSS} [V]	R _{DS(on),max} [mΩ] at V _{GS} =10 V max.		Q _G [nC] at V _{GS} =10 V typ.	
				High-side	Low-side	High-side	Low-side
IRF7907*	asymmetrical dual SO8	-	30	16.4	11.8	6.7**	14**
IRLHS6376*	symmetrical dual PQFN 2x2	-	30	63**	63**	2.8**	2.8**
BSC072N04LD*	symmetrical dual 5x6	-	40	7.2	7.2	39	39
BSC076N04ND	symmetrical dual 5x6	-	40	7.6	7.6	28	28
BSC155N06ND	symmetrical dual 5x6	-	60	15.5	15.5	21	21
IRF7351	symmetrical dual SO8	-	60	17.8	17.8	24	24

Dual N-channel audio MOSFETs

Digital audio MOSFET half-bridges are specifically designed for class D audio amplifier applications. They consist of two power MOSFET switches connected in half-bridge configuration.

Part number	Package	Monolithically-integrated Schottky like diode	BV _{DSS} [V]	R _{DS(on),max} [mΩ] at V _{GS} =4.5 V max.		Q _G [nC] at V _{GS} =4.5 V typ.	
				High-side	Low-side	High-side	Low-side
IRFI4212H-117P	half-bridge in TO220FP	-	100	72.5	72.5	12	12



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* Logic level (capable of 4.5 V gate drive)

** R_{DS(on)} at V_{GS}=4.5V

1) Coming soon

OptiMOS™ and StrongIRFET™ 30 V normal level



$R_{DS(on), max.}$ at $V_{GS} = 10\text{ V}$ [mΩ]	SuperSO8	TOLL (TO-Leadless)
< 1		IPT004N03L $R_{DS(on)} = 0.04\text{ m}\Omega$
2-4	IRF8788TRPBF $R_{DS(on)} = 2.8\text{ m}\Omega$	
	IRF7862TRPBF $R_{DS(on)} = 3.3\text{ m}\Omega$	
	IRF7832TRPBF $R_{DS(on)} = 4.0\text{ m}\Omega$	
4-10	IRF8736TRPBF $R_{DS(on)} = 4.8\text{ m}\Omega$	

OptiMOS™ and StrongIRFET™ 30 V logic level



$R_{DS(on), max.}$ at $V_{GS} = 10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-220
1-2		IPP011N03LF2S $R_{DS(on)} = 1.1\text{ m}\Omega$
		IPP018N03LF2S $R_{DS(on)} = 1.8\text{ m}\Omega$
		IPP020N03LF2S $R_{DS(on)} = 2.0\text{ m}\Omega$
2-4	IPD031N03L G $R_{DS(on)} = 3.1\text{ m}\Omega$	IPP023N03LF2S $R_{DS(on)} = 2.3\text{ m}\Omega$
		IPP033N03LF2S $R_{DS(on)} = 3.3\text{ m}\Omega$
4-10		IPP044N03LF2S $R_{DS(on)} = 4.4\text{ m}\Omega$
		IPP050N03LF2S $R_{DS(on)} = 5.0\text{ m}\Omega$

OptiMOS™ and StrongIRFET™ 30 V logic level



$R_{DS(on), max.}$ at $V_{GS} = 10\text{ V}$ [mΩ]	PQFN 3.3 x 3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	PQFN 3.3 x 3.3	SuperSO8
< 1	IQE008N03LM5 $R_{DS(on)} = 0.85\text{ m}\Omega$	IQE008N03LM5CGSC $R_{DS(on)} = 0.85\text{ m}\Omega$	IQDH35N03LM5 $R_{DS(on)} = 0.35\text{ m}\Omega$	IQDH35N03LM5SC $R_{DS(on)} = 0.35\text{ m}\Omega$		BSC005N03LSS $R_{DS(on)} = 0.55\text{ m}\Omega$
	IQE008N03LM5CG $R_{DS(on)} = 0.85\text{ m}\Omega$	IQE008N03LM5SC $R_{DS(on)} = 0.85\text{ m}\Omega$	IQDH35N03LM5CG $R_{DS(on)} = 0.35\text{ m}\Omega$	IQDH35N03LM5CGSC $R_{DS(on)} = 0.35\text{ m}\Omega$		BSC005N03LSS1* $R_{DS(on)} = 0.5\text{ m}\Omega$
1-2						BSC011N03LS $R_{DS(on)} = 1.1\text{ m}\Omega$
						BSC011N03LS1* $R_{DS(on)} = 1.1\text{ m}\Omega$
					BZ0500NSI* $R_{DS(on)} = 1.5\text{ m}\Omega$	
					BZ019N03LS $R_{DS(on)} = 1.9\text{ m}\Omega$	
					BZ0501NSI* $R_{DS(on)} = 2.0\text{ m}\Omega$	BSC0901NS $R_{DS(on)} = 1.9\text{ m}\Omega$
						BSC0501NSI** $R_{DS(on)} = 1.9\text{ m}\Omega$



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*Monolithically-integrated Schottky-like diode

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OptiMOS™ and StrongIRFET™ 30 V logic level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	PQFN 3.3x3.3	SuperSO8	PQFN 2x2
2-4	BSZ0902NS $R_{DS(on)}=2.6\text{ m}\Omega$		ISK036N03LM5 $R_{DS(on)}=3.6\text{ m}\Omega$
	BSZ0502NSI** $R_{DS(on)}=2.8\text{ m}\Omega$	BSC0902NS $R_{DS(on)}=2.6\text{ m}\Omega$	
		BSC0902NSI* $R_{DS(on)}=2.8\text{ m}\Omega$	
		BSC030N03LS G $R_{DS(on)}=3.0\text{ m}\Omega$	
		BSC0504NSI* $R_{DS(on)}=3.7\text{ m}\Omega$	
	BSZ0904NSI** $R_{DS(on)}=4.0\text{ m}\Omega$		
4-10	BSZ0506NS $R_{DS(on)}=4.4\text{ m}\Omega$	BSC0906NS $R_{DS(on)}=4.5\text{ m}\Omega$	
	BSZ065N03LS $R_{DS(on)}=6.5\text{ m}\Omega$		

OptiMOS™ and StrongIRFET™ 40 V normal level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-220	PQFN 5.x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	sTOLL	SuperSO8	TOLL (TO-Leadless)
<1					IQD005N04NM6CG $R_{DS(on)}=0.5\text{ m}\Omega$	IQD005N04NM6SC $R_{DS(on)}=0.47\text{ m}\Omega$	IST006N04NM6 $R_{DS(on)}=0.6\text{ m}\Omega$	ISC007N04NM6 $R_{DS(on)}=0.7\text{ m}\Omega$	IRL40T209 $R_{DS(on)}=0.72\text{ m}\Omega$
			IPF009N04NF2S $R_{DS(on)}=0.9\text{ m}\Omega$		IQD005N04NM6 $R_{DS(on)}=0.5\text{ m}\Omega$	IQD005N04NM6CGSC $R_{DS(on)}=0.47\text{ m}\Omega$	IST010N04NM5 $R_{DS(on)}=1.0\text{ m}\Omega$	ISC010N04NM6 $R_{DS(on)}=1.0\text{ m}\Omega$	
1-2		IPB012N04NF2S $R_{DS(on)}=1.25\text{ m}\Omega$		IPP011N04NF2S $R_{DS(on)}=1.15\text{ m}\Omega$				ISC012N04NM6 $R_{DS(on)}=1.2\text{ m}\Omega$	
				IPP013N04NF2S $R_{DS(on)}=1.3\text{ m}\Omega$					
		IPB014N04NF2S $R_{DS(on)}=1.45\text{ m}\Omega$	IPF013N04NF2S $R_{DS(on)}=1.35\text{ m}\Omega$	IPP015N04NF2S $R_{DS(on)}=1.5\text{ m}\Omega$				ISC015N04NM5 $R_{DS(on)}=1.5\text{ m}\Omega$	
		IRFS7437TRLPBF $R_{DS(on)}=1.8\text{ m}\Omega$						ISC017N04NM5 $R_{DS(on)}=1.7\text{ m}\Omega$	
2-4	IPD023N04NF2S $R_{DS(on)}=2.3\text{ m}\Omega$			IRFB7440PBF $R_{DS(on)}=2.5\text{ m}\Omega$				ISC019N04NM5 $R_{DS(on)}=1.9\text{ m}\Omega$	
	IPD029N04NF2S $R_{DS(on)}=2.9\text{ m}\Omega$							IRFH7440TRPBF $R_{DS(on)}=2.4\text{ m}\Omega$	
4-10								ISC028N04NM5 $R_{DS(on)}=2.8\text{ m}\Omega$	
								ISC046N04NM5 $R_{DS(on)}=4.6\text{ m}\Omega$	
								ISC058N04NM5 $R_{DS(on)}=5.8\text{ m}\Omega$	



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** Monolithically-integrated Schottky-like diode

*** $R_{DS(on)}$ max. at $V_{GS}=4.5\text{ V}$

**** Normal level

1) 2.5 V_{GS} capable



OptiMOS™ and StrongIRFET™ 40 V logic level

$R_{DS(on), max.}$ at $V_{GS} = 10\text{ V}$ [mΩ]	TO-263 (D2PAK)	PQFN 5x6 Source-Down	PQFN 2x2	PQFN 5x6 Source-Down DSC (dual-side cooling)	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 3.3x3.3	SuperSO8	SuperSO8 dual-side cooling (DSC)
<1		IQDH45N04LM6CG $R_{DS(on)} = 0.45\text{ m}\Omega$		IQDH45N04LM6SC $R_{DS(on)} = 0.45\text{ m}\Omega$				ISCH42N04LM7 $R_{DS(on)} = 0.42\text{ m}\Omega$	BSC007N04LS6SC $R_{DS(on)} = 0.7\text{ m}\Omega$
				IQDH45N04LM6CGSC $R_{DS(on)} = 0.45\text{ m}\Omega$				BSC007N04LS6 $R_{DS(on)} = 0.7\text{ m}\Omega$	BSC009N04LSSC $R_{DS(on)} = 0.94\text{ m}\Omega$
1-2	IRL40S212 $R_{DS(on)} = 1.9\text{ m}\Omega$				IQE013N04LM6 $R_{DS(on)} = 1.35\text{ m}\Omega$	IQE013N04LM6CGSC* $R_{DS(on)} = 1.35\text{ m}\Omega$			
					IQE013N04LM6CG $R_{DS(on)} = 1.35\text{ m}\Omega$	IQE013N04LM6SC* $R_{DS(on)} = 1.35\text{ m}\Omega$		BSC010N04LS6 $R_{DS(on)} = 1.0\text{ m}\Omega$	
								BSC010N04LSI $R_{DS(on)} = 1.05\text{ m}\Omega$	
								ISC012N04LM6 $R_{DS(on)} = 1.2\text{ m}\Omega$	
								BSC014N04LS $R_{DS(on)} = 1.4\text{ m}\Omega$	
								BSZ018N04LS6 $R_{DS(on)} = 1.8\text{ m}\Omega$	BSC014N04LSI $R_{DS(on)} = 1.45\text{ m}\Omega$
2-4								BSC019N04LS $R_{DS(on)} = 1.9\text{ m}\Omega$	
							BSZ021N04LS6 $R_{DS(on)} = 2.1\text{ m}\Omega$		
							BSZ024N04LS6 $R_{DS(on)} = 2.4\text{ m}\Omega$		
								BSC026N04LS $R_{DS(on)} = 2.6\text{ m}\Omega$	
							BSZ028N04LS $R_{DS(on)} = 2.8\text{ m}\Omega$		
4-10			ISK057N04LM6 $R_{DS(on)} = 5.75\text{ m}\Omega$					BSZ034N04LS $R_{DS(on)} = 3.4\text{ m}\Omega$	BSC032N04LS $R_{DS(on)} = 3.2\text{ m}\Omega$
							BSZ063N04LS6 $R_{DS(on)} = 6.3\text{ m}\Omega$		
								BSC059N04LS6 $R_{DS(on)} = 5.9\text{ m}\Omega$	



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OptiMOS™ and StrongIRFET™ 60 V normal level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-262 (I ² PAK)	PQFN 5x6 Source-Down	TO-220	TO-220 FullPAK	TO-247	SuperSO8 DSC (dual side cooling)
>1					IQD009N06NM5CG $R_{DS(on)} = 0.9\text{ m}\Omega$				
					IQD009N06NM5 $R_{DS(on)} = 0.9\text{ m}\Omega$				
1-2			IPB010N06N ¹⁾ $R_{DS(on)} = 1.0\text{ m}\Omega$						
			IPF010N06NF2S $R_{DS(on)} = 1.05\text{ m}\Omega$						
			IPF012N06NF2S $R_{DS(on)} = 1.2\text{ m}\Omega$						
		IPB013N06NF2S $R_{DS(on)} = 1.3\text{ m}\Omega$	IPB014N06N $R_{DS(on)} = 1.4\text{ m}\Omega$						
						IPP014N06NF2S $R_{DS(on)} = 1.4\text{ m}\Omega$			BSC014N06NSSC $R_{DS(on)} = 1.4\text{ m}\Omega$
						IPP016N06NF2S $R_{DS(on)} = 1.6\text{ m}\Omega$			BSC016N06NSSC $R_{DS(on)} = 1.6\text{ m}\Omega$
						IPP019N06NF2S $R_{DS(on)} = 1.9\text{ m}\Omega$			
		IPB015N06NF2S $R_{DS(on)} = 1.5\text{ m}\Omega$							
			IPF016N06NF2S $R_{DS(on)} = 1.7\text{ m}\Omega$						
		IPB018N06NF2S $R_{DS(on)} = 1.8\text{ m}\Omega$							
						IPP020N06N ¹⁾ $R_{DS(on)} = 2.0\text{ m}\Omega$		IRFP7530PBF $R_{DS(on)} = 2.0\text{ m}\Omega$	
2-4	IPD025N06N ¹⁾ $R_{DS(on)} = 2.5\text{ m}\Omega$								BSC028N06NSSC $R_{DS(on)} = 2.8\text{ m}\Omega$
	IPD028N06NF2S $R_{DS(on)} = 2.85\text{ m}\Omega$			IPI029N06N ¹⁾ $R_{DS(on)} = 2.9\text{ m}\Omega$					
		IPB026N06N ¹⁾ $R_{DS(on)} = 2.6\text{ m}\Omega$				IPP029N06N ¹⁾ $R_{DS(on)} = 2.9\text{ m}\Omega$			
		IPB029N06NF2S $R_{DS(on)} = 2.9\text{ m}\Omega$					IPA029N06N ¹⁾ $R_{DS(on)} = 2.9\text{ m}\Omega$		
						IPP030N06NF2S $R_{DS(on)} = 3.05\text{ m}\Omega$			
	IPD033N06N ¹⁾ $R_{DS(on)} = 3.3\text{ m}\Omega$								
IPD038N06NF2S $R_{DS(on)} = 3.85\text{ m}\Omega$	IRFS7537TRL PBF $R_{DS(on)} = 3.3\text{ m}\Omega$				IPP040N06NF2S $R_{DS(on)} = 4.0\text{ m}\Omega$		IRFP7537PBF $R_{DS(on)} = 3.3\text{ m}\Omega$		
4-10						IPP040N06N ¹⁾ $R_{DS(on)} = 4.0\text{ m}\Omega$	IPA040N06N ¹⁾ $R_{DS(on)} = 4.0\text{ m}\Omega$		
	IPD053N06N ¹⁾ $R_{DS(on)} = 5.3\text{ m}\Omega$								
		IPB057N06N ¹⁾ $R_{DS(on)} = 5.7\text{ m}\Omega$				IRFB7545PBF $R_{DS(on)} = 5.9\text{ m}\Omega$			
	IRFR7546TRPBF $R_{DS(on)} = 7.9\text{ m}\Omega$						IPA060N06N ¹⁾ $R_{DS(on)} = 6.0\text{ m}\Omega$		



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1) 6 V rated ($R_{DS(on)}$ also specified at $V_{GS}=6\text{ V}$)



OptiMOST™ and StrongIRFET™ 60 V normal level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down dual-side cooling (DSC)	SO8	SuperSO8	TOLT	TO-Leadless	sTOLL
<1				IQD009N06NM5SC $R_{DS(on)}=0.9\text{ m}\Omega$			IPTC007N06NM5 $R_{DS(on)}=0.7\text{ m}\Omega$	IPT007N06N ¹⁾ $R_{DS(on)}=0.7\text{ m}\Omega$	IST011N06NM5 $R_{DS(on)}=1.1\text{ m}\Omega$
				IQD009N06NM5CGSC $R_{DS(on)}=0.9\text{ m}\Omega$					
1-2						ISC010N06NM5 $R_{DS(on)}=1.05\text{ m}\Omega$	IPTC012N06NM5 $R_{DS(on)}=1.2\text{ m}\Omega$		IST015N06NM5 $R_{DS(on)}=1.5\text{ m}\Omega$
						BSC012N06NS $R_{DS(on)}=1.2\text{ m}\Omega$		IPT012N06N ¹⁾ $R_{DS(on)}=1.2\text{ m}\Omega$	
								IPT008N06NM5LF $R_{DS(on)}=0.8\text{ m}\Omega$	
						BSC019N06NS ¹⁾ $R_{DS(on)}=1.9\text{ m}\Omega$			
2-4		IQE030N06NM5CG $R_{DS(on)}=3\text{ m}\Omega$	IQE030N06NM5CGSC* $R_{DS(on)}=3.0\text{ m}\Omega$			BSC028N06NS ¹⁾ $R_{DS(on)}=2.8\text{ m}\Omega$			
		IQE030N06NM5 $R_{DS(on)}=3\text{ m}\Omega$	IQE030N06NM5SC* $R_{DS(on)}=3.0\text{ m}\Omega$			ISC0702NLS $R_{DS(on)}=2.8\text{ m}\Omega$			
						BSC034N06NS ¹⁾ $R_{DS(on)}=3.4\text{ m}\Omega$			
						BSC039N06NS ¹⁾ $R_{DS(on)}=3.9\text{ m}\Omega$			
	BSZ042N06NS ¹⁾ $R_{DS(on)}=4.2\text{ m}\Omega$				IRF7855TRPBF $R_{DS(on)}=9.4\text{ m}\Omega$	IRFH7545TRPBF $R_{DS(on)}=5.2\text{ m}\Omega$			
						BSC066N06NS ¹⁾ $R_{DS(on)}=6.6\text{ m}\Omega$			
	BSZ068N06NS ¹⁾ $R_{DS(on)}=6.8\text{ m}\Omega$								
BSZ100N06NS ¹⁾ $R_{DS(on)}=10.0\text{ m}\Omega$									
5-20						BSC097N06NS ¹⁾ $R_{DS(on)}=9.7\text{ m}\Omega$			
					IRF7351TRPBF $R_{DS(on)}=17.8\text{ m}\Omega$	BSC155N06ND $R_{DS(on)}=15.5\text{ m}\Omega$			



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1) 6 V rated ($R_{DS(on)}$ also specified at $V_{GS} = 6\text{ V}$)

* Coming soon



OptiMOS™ and StrongIRFET™ 60 V logic level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	PQFN 5x6 Source-Down	PQFN 5x6 Source- Down dual-side cooling (DSC)	PQFN 3.3x3.3 Source-Down	TO-263 (D ² PAK 7-pin)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
< 1		IQDH88N06LM5CG $R_{DS(on)} = 0.88\text{ m}\Omega$	IQDH88N06LM5SC* $R_{DS(on)}=0.86\text{ m}\Omega$						ISC009N06LM5 $R_{DS(on)} = 0.9\text{ m}\Omega$
		IQDH88N06LM5 $R_{DS(on)} = 0.88\text{ m}\Omega$	IQDH88N06LM5CGSC* $R_{DS(on)}=0.86\text{ m}\Omega$						
1-2									ISC011N06LM5 $R_{DS(on)} = 1.1\text{ m}\Omega$
					IRLS3036TRL7PP $R_{DS(on)} = 1.9\text{ m}\Omega$				ISC015N06NM5LF ¹⁾ $R_{DS(on)} = 1.5\text{ m}\Omega$
					IRLS3036TRL7PP $R_{DS(on)} = 1.9\text{ m}\Omega$		ISZ034N06LM5 $R_{DS(on)} = 3.4\text{ m}\Omega$		
2-4				IQE022N06LM5 $R_{DS(on)} = 2.2\text{ m}\Omega$		IRLB3036PBF $R_{DS(on)} = 2.4\text{ m}\Omega$			BSC027N06LS5 $R_{DS(on)} = 2.7\text{ m}\Omega$
				IQE022N06LM5CG $R_{DS(on)} = 2.2\text{ m}\Omega$					
				IQE022N06LM5SC $R_{DS(on)} = 2.2\text{ m}\Omega$					
				IQE022N06LM5CGSC $R_{DS(on)} = 2.2\text{ m}\Omega$					
4-10	IPD048N06L3 G $R_{DS(on)} = 4.8\text{ m}\Omega$							BSZ040N06LS5 $R_{DS(on)} = 4.0\text{ m}\Omega$	BSC065N06LS5 $R_{DS(on)} = 6.5\text{ m}\Omega$
	IRLR3636TRPBF $R_{DS(on)} = 6.8\text{ m}\Omega$							BSZ065N06LS5 $R_{DS(on)} = 6.5\text{ m}\Omega$	BSC094N06LS5 $R_{DS(on)} = 9.4\text{ m}\Omega$
	IPD079N06L3 G $R_{DS(on)} = 7.9\text{ m}\Omega$							BSZ099N06LS5 $R_{DS(on)} = 9.9\text{ m}\Omega$	
	IPD088N06N3 G $R_{DS(on)} = 8.8\text{ m}\Omega$								
>10	IPD220N06L3 G $R_{DS(on)} = 22\text{ m}\Omega$						IRL60HS118 $R_{DS(on)} = 17.0\text{ m}\Omega$		



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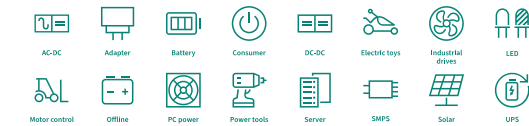
1) Linear FET

*Coming soon



OptiMOS™ and StrongIRFET™ 75 V normal level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-220	TO-247
1-2			IRFS7730TRL7PP $R_{DS(on)}=2.0\text{ m}\Omega$		IRFP4368PBF $R_{DS(on)}=1.85\text{ m}\Omega$
2-4		IRFS7730TRLPBF $R_{DS(on)}=2.6\text{ m}\Omega$		IRFB7730PBF $R_{DS(on)}=2.6\text{ m}\Omega$ IRFB7734PBF $R_{DS(on)}=3.5\text{ m}\Omega$	IRFP3077PBF $R_{DS(on)}=3.3\text{ m}\Omega$
5-10	IRFR3607PBF $R_{DS(on)}=9.0\text{ m}\Omega$	IRFS3607TRLPBF $R_{DS(on)}=9.0\text{ m}\Omega$		IRFB3307ZPBF $R_{DS(on)}=5.8\text{ m}\Omega$	



OptiMOS™ and StrongIRFET™ 80 V normal level/logic level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-220	TO-220 FullPAK	SuperSO8 DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)	PQFN 3.3x3.3 Source-Down	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	TO-Leadless
1-2		IPB016N08NF2S $R_{DS(on)}=1.65\text{ m}\Omega$	IPB015N08N5 $R_{DS(on)}=1.5\text{ m}\Omega$	IPP016N08NF2S $R_{DS(on)}=1.6\text{ m}\Omega$			IQD016N08NM5CG $R_{DS(on)}=1.6\text{ m}\Omega$	IQD016N08NM5SC* $R_{DS(on)}=1.57\text{ m}\Omega$					
			IPF014N08NF2S $R_{DS(on)}=1.4\text{ m}\Omega$	IPP019N08NF2S $R_{DS(on)}=1.9\text{ m}\Omega$			IQD016N08NM5 $R_{DS(on)}=1.6\text{ m}\Omega$	IQD016N08NM5CGSC* $R_{DS(on)}=1.57\text{ m}\Omega$					IPT010N08NM5 $R_{DS(on)}=1.0\text{ m}\Omega$
		IPB019N08NF2S $R_{DS(on)}=1.95\text{ m}\Omega$	IPF017N08NF2S $R_{DS(on)}=1.7\text{ m}\Omega$										IPT012N08N5 $R_{DS(on)}=1.2\text{ m}\Omega$
													IPT012N08NF2S $R_{DS(on)}=1.23\text{ m}\Omega$
2-4		IPB020N08N5 $R_{DS(on)}=2.0\text{ m}\Omega$	IPB019N08N5 $R_{DS(on)}=1.95\text{ m}\Omega$	IPP024N08NF2S $R_{DS(on)}=2.4\text{ m}\Omega$		BSC023N08NS5SC $R_{DS(on)}=2.3\text{ m}\Omega$							IPT013N08NM5LF $R_{DS(on)}=1.3\text{ m}\Omega$
			IPF023N08NF2S $R_{DS(on)}=2.3\text{ m}\Omega$	IPP023N08N5 $R_{DS(on)}=2.3\text{ m}\Omega$		BSC033N08NS5SC $R_{DS(on)}=3.3\text{ m}\Omega$						BSC025N08LS5 $R_{DS(on)}=2.5\text{ m}\Omega$	IPT014N08NM5 $R_{DS(on)}=1.4\text{ m}\Omega$
		IPB024N08NF2S $R_{DS(on)}=2.4\text{ m}\Omega$	IPF039N08NF2S $R_{DS(on)}=3.9\text{ m}\Omega$									BSC026N08NS5 $R_{DS(on)}=2.6\text{ m}\Omega$	IPT019N08N5 $R_{DS(on)}=1.9\text{ m}\Omega$
												BSC030N08NS5 $R_{DS(on)}=3.0\text{ m}\Omega$	
4-10		IPB031N08N5 $R_{DS(on)}=3.1\text{ m}\Omega$		IPP034N08N5 $R_{DS(on)}=3.4\text{ m}\Omega$									
		IPB040N08NF2S $R_{DS(on)}=4\text{ m}\Omega$		IPP040N08NF2S $R_{DS(on)}=4.0\text{ m}\Omega$								BSC037N08NS5 $R_{DS(on)}=3.7\text{ m}\Omega$	
		IPB049N08N5 $R_{DS(on)}=4.9\text{ m}\Omega$										BSC040N08NS5 $R_{DS(on)}=4.0\text{ m}\Omega$	
	IPD040N08NF2S $R_{DS(on)}=4\text{ m}\Omega$	IPB055N08NF2S $R_{DS(on)}=5.5\text{ m}\Omega$		IPPA052N08NM5S $R_{DS(on)}=5.2\text{ m}\Omega$								BSC052N08NS5 $R_{DS(on)}=5.2\text{ m}\Omega$	
	IPD055N08NF2S $R_{DS(on)}=5.5\text{ m}\Omega$			IPP055N08NF2S $R_{DS(on)}=5.5\text{ m}\Omega$								BSC052N08NS5 $R_{DS(on)}=5.2\text{ m}\Omega$	
												BSC075N08NS5 $R_{DS(on)}=7.5\text{ m}\Omega$	BSC061N08NS5 $R_{DS(on)}=6.1\text{ m}\Omega$
												BSC072N08NS5 $R_{DS(on)}=7.2\text{ m}\Omega$	
												BSC084N08NS5 $R_{DS(on)}=8.4\text{ m}\Omega$	
>10												BSC117N08NS5 $R_{DS(on)}=11.7\text{ m}\Omega$	
										IRL80HS120 $R_{DS(on)}=32.0\text{ m}\Omega$	BSZ110N08NS5 $R_{DS(on)}=11.0\text{ m}\Omega$		

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OptiMOS™ and StrongIRFET™ 80 V normal level/logic level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TOLT (TO-Leaded top-side cooling)	sTOLL	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	SuperSO8
1-2	IPTC011N08NM5 $R_{DS(on)} = 1.2\text{ m}\Omega$	IST019N08NM5 $R_{DS(on)} = 1.9\text{ m}\Omega$			
	IPTC014N08NM5 $R_{DS(on)} = 1.4\text{ m}\Omega$				
3-5			IQE050N08NM5 $R_{DS(on)} = 5\text{ m}\Omega$	IQE050N08NM5SC $R_{DS(on)} = 5\text{ m}\Omega$	
			IQE050N08NM5CG $R_{DS(on)} = 5\text{ m}\Omega$	IQE050N08NM5CGSC $R_{DS(on)} = 5\text{ m}\Omega$	
5-20					IRF7854TRPBF $R_{DS(on)} = 13.4\text{ m}\Omega$

OptiMOS™ and StrongIRFET™ 100 V normal level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-220	TO-220 FullIPAK	TO-247
1-2						IRF100P218 $R_{DS(on)} = 1.1\text{ m}\Omega$
			IPF016N10NF2S $R_{DS(on)} = 1.6\text{ m}\Omega$			IRF100P219 $R_{DS(on)} = 2.1\text{ m}\Omega$
			IPB017N10N5 $R_{DS(on)} = 1.7\text{ m}\Omega$			
2-4		IPB020N10N5 $R_{DS(on)} = 2.0\text{ m}\Omega$		IPP023N10N5 $R_{DS(on)} = 2.3\text{ m}\Omega$	IPA030N10NF2S $R_{DS(on)} = 3.0\text{ m}\Omega$	IRFP4468PBF $R_{DS(on)} = 2.6\text{ m}\Omega$
		IPB020N10N5LF $R_{DS(on)} = 2.0\text{ m}\Omega$	IPB024N10N5 $R_{DS(on)} = 2.4\text{ m}\Omega$	IPP026N10NF2S $R_{DS(on)} = 2.6\text{ m}\Omega$		
		IPB026N10NF2S $R_{DS(on)} = 2.65\text{ m}\Omega$	IPB032N10N5 $R_{DS(on)} = 3.2\text{ m}\Omega$	IPP030N10N5 $R_{DS(on)} = 3.0\text{ m}\Omega$		
		IPB027N10N5 $R_{DS(on)} = 2.7\text{ m}\Omega$		IPP039N10N5 $R_{DS(on)} = 3.9\text{ m}\Omega$		
4-10	IPD050N10N5 $R_{DS(on)} = 5.0\text{ m}\Omega$	IPB033N10N5LF $R_{DS(on)} = 3.3\text{ m}\Omega$	IPF042N10NF2S $R_{DS(on)} = 4.25\text{ m}\Omega$			IRFP4110PBF $R_{DS(on)} = 4.5\text{ m}\Omega$
	IPD052N10NF2S $R_{DS(on)} = 5.2\text{ m}\Omega$	IPB043N10NF2S $R_{DS(on)} = 4.35\text{ m}\Omega$	IPF050N10NF2S $R_{DS(on)} = 5.05\text{ m}\Omega$	IRFB4110PBF $R_{DS(on)} = 4.5\text{ m}\Omega$		IRFP4310ZPBF $R_{DS(on)} = 6.0\text{ m}\Omega$
				IPP050N10NF2S $R_{DS(on)} = 5.0\text{ m}\Omega$		
		IPB050N10NF2S $R_{DS(on)} = 5.05\text{ m}\Omega$			IPA082N10NF2S $R_{DS(on)} = 8.2\text{ m}\Omega$	
		IRFS4310ZTRLPBF $R_{DS(on)} = 7.0\text{ m}\Omega$		IPP082N10NF2S $R_{DS(on)} = 8.2\text{ m}\Omega$	IPA083N10N5 $R_{DS(on)} = 8.3\text{ m}\Omega$	
10-25				IPP083N10N5 $R_{DS(on)} = 8.3\text{ m}\Omega$		
				IRFB4410ZPBF $R_{DS(on)} = 9.0\text{ m}\Omega$		
10-25	IPD130N10NF2S $R_{DS(on)} = 13.0\text{ m}\Omega$			IPP129N10NF2S $R_{DS(on)} = 12.9\text{ m}\Omega$		
>25	IPD78CN10N G $R_{DS(on)} = 78.0\text{ m}\Omega$					



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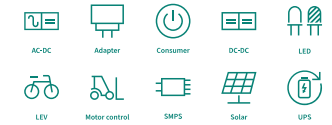
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OptiMOS™ and StrongIRFET™ 100 V normal level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	SuperSO8	SuperSO8 DSC (dual-side cooling)	SO8	TOLL (TO-Leadless)	TOLT (TO-Leaded top-side cooling)	TOLG (TO-Leaded Gullwing)	sTOLL
1-2		ISZ080N10NM6 $R_{DS(on)} = 8.0\text{ m}\Omega$									IPTC015N10NM5 $R_{DS(on)} = 1.5\text{ m}\Omega$	PTG014N10NM5 $R_{DS(on)} = 1.4\text{ m}\Omega$	
							ISC022N10NM6 $R_{DS(on)} = 2.2\text{ m}\Omega$			IPT015N10N5 $R_{DS(on)} = 1.5\text{ m}\Omega$		IPTG018N10NM5 $R_{DS(on)} = 1.8\text{ m}\Omega$	
							ISC027N10NM6 $R_{DS(on)} = 2.7\text{ m}\Omega$			IPT015N10NF2S $R_{DS(on)} = 1.5\text{ m}\Omega$		IPTG025N10NM5 $R_{DS(on)} = 2.5\text{ m}\Omega$	
2-4													
4-10													
10-25													
>25													

OptiMOS™ and StrongIRFET™ 100 V logic level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
1-4						BSC034N10LS5 $R_{DS(on)} = 3.4\text{ m}\Omega$
4-10						BSC070N10LS5 $R_{DS(on)} = 7.0\text{ m}\Omega$
						BSC096N10LS5 $R_{DS(on)} = 9.6\text{ m}\Omega$
10-25						BSC146N10LS5 $R_{DS(on)} = 14.6\text{ m}\Omega$
						BSC146N10LS5 $R_{DS(on)} = 14.6\text{ m}\Omega$

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OptiMOS™ and StrongIRFET™ 120 V normal level/logic level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-263 (D ² PAK 7-pin)	PQFN 3.3x3.3	SuperSO8	TO-220	TO-263 (D ² PAK)	TOLG (TO-Leaded Gullwing)	TOLL (TO-Leadless)	TOLT (TO-Leaded top-side Cooling)
1-2	IPF019N12NM6 $R_{DS(on)} = 1.9\text{ m}\Omega$					IPTG017N12NM6 $R_{DS(on)} = 1.7\text{ m}\Omega$		IPTC017N12NM6 $R_{DS(on)} = 1.7\text{ m}\Omega$
2-4			ISC030N12NM6 $R_{DS(on)} = 3.04\text{ m}\Omega$	IPP022N12NM6* $R_{DS(on)} = 2.2\text{ m}\Omega$	IPB022N12NM6* $R_{DS(on)} = 2.2\text{ m}\Omega$		IPT017N12NM6 $R_{DS(on)} = 1.7\text{ m}\Omega$	IPTC028N12NM6* $R_{DS(on)} = 2.8\text{ m}\Omega$
			ISC032N12LM6 $R_{DS(on)} = 3.2\text{ m}\Omega$		IPB035N12NM6* $R_{DS(on)} = 3.5\text{ m}\Omega$			
			ISC037N12NM6 $R_{DS(on)} = 3.7\text{ m}\Omega$					
4-10			ISC073N12LM6 $R_{DS(on)} = 7.3\text{ m}\Omega$					
			ISC078N12NM6 $R_{DS(on)} = 7.8\text{ m}\Omega$					
			BSC080N12LS $R_{DS(on)} = 8.0\text{ m}\Omega$					
10-25		ISZ106N12LM6 $R_{DS(on)} = 10.6\text{ m}\Omega$	ISC104N12LM6 $R_{DS(on)} = 10.4\text{ m}\Omega$		IPB133N12NM6* $R_{DS(on)} = 13.3\text{ m}\Omega$			
		ISZ330N12LM6 $R_{DS(on)} = 33.0\text{ m}\Omega$	ISC110N12NM6 $R_{DS(on)} = 11.0\text{ m}\Omega$					
			BSC120N12LS $R_{DS(on)} = 12.0\text{ m}\Omega$					
			ISC320N12LM6 $R_{DS(on)} = 32.0\text{ m}\Omega$					



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OptiMOS™ and StrongIRFET™ 135-150 V normal/logic level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	SuperSO8 DSC (dual-side cooling)	SuperSO8	TOLL (TO-Leadless)
1-10			IQD063N15NM5CGSC $R_{DS(on)} = 6.3\text{ m}\Omega$	IQD063N15NM5SC* $R_{DS(on)} = 6.32\text{ m}\Omega$	BSC093N15NS5SC $R_{DS(on)} = 9.3\text{ m}\Omega$	ISC037N13NM6 $R_{DS(on)} = 3.7\text{ m}\Omega$	IPT020N13NM6 $R_{DS(on)} = 2.0\text{ m}\Omega$
				IQD063N15NM5CGSC* $R_{DS(on)} = 6.32\text{ m}\Omega$		ISC044N15NM6 $R_{DS(on)} = 4.4\text{ m}\Omega$	IPT025N15NM6* $R_{DS(on)} = 2.5\text{ m}\Omega$
						ISC055N15NM6 $R_{DS(on)} = 5.5\text{ m}\Omega$	IPT039N15N5 $R_{DS(on)} = 3.9\text{ m}\Omega$
						ISC079N15NM6 $R_{DS(on)} = 7.9\text{ m}\Omega$	IPT044N15N5 $R_{DS(on)} = 4.4\text{ m}\Omega$
						ISC046N13NM6 $R_{DS(on)} = 4.6\text{ m}\Omega$	IPT054N15N5 $R_{DS(on)} = 5.4\text{ m}\Omega$
						BSC074N15NS5 ²⁾ $R_{DS(on)} = 7.4\text{ m}\Omega$	IPT063N15N5 $R_{DS(on)} = 6.3\text{ m}\Omega$
						BSC088N15LS5 $R_{DS(on)} = 8.8\text{ m}\Omega$	
10-25	IRF7779L2TRPBF ²⁾ $R_{DS(on)} = 11.0\text{ m}\Omega$	ISZ143N13NM6 $R_{DS(on)} = 14.3\text{ m}\Omega$			BSC110N15NS5SC $R_{DS(on)} = 11.0\text{ m}\Omega$	BSC105N15LS5 $R_{DS(on)} = 10.5\text{ m}\Omega$	
	IRF150DM115 $R_{DS(on)} = 11.3\text{ m}\Omega$	ISZ173N15NM6* $R_{DS(on)} = 17.3\text{ m}\Omega$			BSC160N15NS5SC $R_{DS(on)} = 16.0\text{ m}\Omega$	BSC152N15LS5 $R_{DS(on)} = 15.2\text{ m}\Omega$	
						BSC110N15NS5 $R_{DS(on)} = 11.0\text{ m}\Omega$	
>25	IRF6775MTRPBF $R_{DS(on)} = 56.0\text{ m}\Omega$					BSC160N15NS5 $R_{DS(on)} = 16.0\text{ m}\Omega$	



OptiMOS™ and StrongIRFET™ 135-150 V normal/logic level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-262 (I ² PAK)	TOLT (TO-Leaded top-side cooling)	TOLG (TO-Leaded Gullwing)	TO-220	TO-247
1-10		IPB029N15NM6* $R_{DS(on)} = 2.9\text{ m}\Omega$	IPF021N13NM6 $R_{DS(on)} = 2.1\text{ m}\Omega$	IPI051N15N5 $R_{DS(on)} = 5.1\text{ m}\Omega$	IPTC020N13NM6 $R_{DS(on)} = 2.0\text{ m}\Omega$	IPTG020N13NM6 $R_{DS(on)} = 2.0\text{ m}\Omega$	IPPO29N15NM6* $R_{DS(on)} = 2.9\text{ m}\Omega$	IRF150P220 $R_{DS(on)} = 2.5\text{ m}\Omega$
		IPB044N15N5 $R_{DS(on)} = 4.4\text{ m}\Omega$	IPF026N15NM6* $R_{DS(on)} = 2.6\text{ m}\Omega$		IPTC025N15NM6 $R_{DS(on)} = 2.5\text{ m}\Omega$	IPTG025N15NM6* $R_{DS(on)} = 2.5\text{ m}\Omega$	IPPO51N15N5 ²⁾ $R_{DS(on)} = 5.1\text{ m}\Omega$	IRF150P221 $R_{DS(on)} = 4.8\text{ m}\Omega$
		IPB048N15N5 $R_{DS(on)} = 4.8\text{ m}\Omega$	IPF031N13NM6 $R_{DS(on)} = 3.1\text{ m}\Omega$		IPTC039N15NM5 $R_{DS(on)} = 3.9\text{ m}\Omega$	IPTG029N13NM6 $R_{DS(on)} = 2.9\text{ m}\Omega$	IPPO73N13NM6 $R_{DS(on)} = 7.3\text{ m}\Omega$	IRFP4568PBF $R_{DS(on)} = 5.9\text{ m}\Omega$
		IPB048N15N5LF $R_{DS(on)} = 4.8\text{ m}\Omega$		IPI076N15N5 $R_{DS(on)} = 7.6\text{ m}\Omega$	IPTC044N15NM5 $R_{DS(on)} = 4.4\text{ m}\Omega$	IPTG039N15NM5 $R_{DS(on)} = 3.9\text{ m}\Omega$	IPPO76N15N5 $R_{DS(on)} = 7.6\text{ m}\Omega$	
		IPB060N15N5 $R_{DS(on)} = 6.0\text{ m}\Omega$			IPTC054N15NM5 $R_{DS(on)} = 5.4\text{ m}\Omega$	IPTG044N15NM5 $R_{DS(on)} = 4.4\text{ m}\Omega$	IPPO89N15NM6* $R_{DS(on)} = 8.9\text{ m}\Omega$	
		IPB073N15N5 $R_{DS(on)} = 7.3\text{ m}\Omega$			IPTC063N15NM5 $R_{DS(on)} = 6.3\text{ m}\Omega$	IPTG054N15NM5 $R_{DS(on)} = 5.4\text{ m}\Omega$		
10-25						IPTG063N15NM5 $R_{DS(on)} = 6.3\text{ m}\Omega$	IRFB4115PBF $R_{DS(on)} = 11.0\text{ m}\Omega$	
		IRFS4321TRLPBF $R_{DS(on)} = 15.0\text{ m}\Omega$					IRFB4321PBF $R_{DS(on)} = 15.0\text{ m}\Omega$	IRFP4321PBF $R_{DS(on)} = 15.5\text{ m}\Omega$
		IRFS4115TRLPBF $R_{DS(on)} = 12.1\text{ m}\Omega$						
>25		IRFS4615TRLPBF $R_{DS(on)} = 42.0\text{ m}\Omega$						
	IRFR4615TRLPBF $R_{DS(on)} = 42.0\text{ m}\Omega$						IRFB5615PBF $R_{DS(on)} = 39.0\text{ m}\Omega$	
								IRFB4019PBF $R_{DS(on)} = 95.0\text{ m}\Omega$



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OptiMOS™ and StrongIRFET™ 200 V normal level

$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-263 (D ² PAK 7-pin)	TO-220	TO-247
4-10		IPB068N20NM6 $R_{DS(on)} = 6.8\text{ m}\Omega$	IPF067N20NM6 $R_{DS(on)} = 6.7\text{ m}\Omega$	IPP069N20NM6 $R_{DS(on)} = 6.9\text{ m}\Omega$	IRF200P222 $R_{DS(on)} = 6.6\text{ m}\Omega$
					IRFP4668PBF $R_{DS(on)} = 9.7\text{ m}\Omega$
10-25		IPB107N20N3 G $R_{DS(on)} = 10.7\text{ m}\Omega$	IPF129N20NM6 $R_{DS(on)} = 12.9\text{ m}\Omega$	IPP110N20N3 G $R_{DS(on)} = 11.0\text{ m}\Omega$	
				IRFB4127PBF $R_{DS(on)} = 20.0\text{ m}\Omega$	IRFP4227PBF $R_{DS(on)} = 25.0\text{ m}\Omega$
>25		IRFS4127TRLPBF $R_{DS(on)} = 22.0\text{ m}\Omega$			
				IRFB4227PBF $R_{DS(on)} = 26.0\text{ m}\Omega$	
	IPD320N20N3 G $R_{DS(on)} = 32.0\text{ m}\Omega$	IPB320N20N3 G $R_{DS(on)} = 32.0\text{ m}\Omega$		IPP319N20NM6 ¹⁾ $R_{DS(on)} = 31.9\text{ m}\Omega$	
		IPB339N20NM6 $R_{DS(on)} = 33.9\text{ m}\Omega$		IPP320N20N3 G $R_{DS(on)} = 32.0\text{ m}\Omega$	
	IRFR4620TRLPBF $R_{DS(on)} = 78.0\text{ m}\Omega$	IRFS4620TRLPBF $R_{DS(on)} = 78.0\text{ m}\Omega$		IPP339N20NM6 $R_{DS(on)} = 33.9\text{ m}\Omega$	
			IRFB5620PBF $R_{DS(on)} = 72.5\text{ m}\Omega$		
			IRFB4020PBF $R_{DS(on)} = 100.0\text{ m}\Omega$		

OptiMOS™ and StrongIRFET™ 200 V normal level



$R_{DS(on), max.}$ at $V_{GS}=10\text{ V}$ [mΩ]	DirectFET™	PQFN 3.3x3.3	SuperSO8	TOLL (TO-Leadless)	TOLG (TO-Leaded Gullwing)
1-25			ISC119N20NM6* $R_{DS(on)} = 11.9\text{ m}\Omega$	IPT067N20NM6 $R_{DS(on)} = 6.7\text{ m}\Omega$	
			ISC130N20NM6 $R_{DS(on)} = 13.0\text{ m}\Omega$		IPTG111N20NM3FD $R_{DS(on)} = 11.1\text{ m}\Omega$
			ISC151N20NM6 $R_{DS(on)} = 15.1\text{ m}\Omega$	IPT129N20NM6 $R_{DS(on)} = 12.9\text{ m}\Omega$	
>25			BSC320N20NS3 G $R_{DS(on)} = 32.0\text{ m}\Omega$		
			BSC500N20NS3G $R_{DS(on)} = 50.0\text{ m}\Omega$		
		ISZ520N20NM6 $R_{DS(on)} = 52.0\text{ m}\Omega$	IRFH5020TRPBF $R_{DS(on)} = 55.0\text{ m}\Omega$		
		BSZ900N20NS3 G $R_{DS(on)} = 90.0\text{ m}\Omega$	BSC900N20NS3 G $R_{DS(on)} = 90.0\text{ m}\Omega$		
	IRF6785MTRPBF $R_{DS(on)} = 100.0\text{ m}\Omega$				
	BSZ22DN20NS3 G $R_{DS(on)} = 225.0\text{ m}\Omega$				



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OptiMOS™ and StrongIRFET™ 250 V normal level

$R_{DS(on), max.}$ at $V_{GS} = 10 V$ [mΩ]	TO-252 (DPAK)	TO-263 (D ² PAK)	TOLG (TO-Leaded Gullwing)	TO-220	TO-247	PQFN 3.3x3.3	SuperSO8	TOLL (TO-Leadless)
10-25		IPB200N25N3 G $R_{DS(on)} = 20.0 m\Omega$	IPTG210N25NM3FD $R_{DS(on)} = 21.0 m\Omega$		IRF250P224 $R_{DS(on)} = 12.0 m\Omega$			
				IPP220N25NFD $R_{DS(on)} = 22.0 m\Omega$	IRFP4768PBF $R_{DS(on)} = 17.5 m\Omega$			IPT210N25NFD $R_{DS(on)} = 21.0 m\Omega$
					IRF250P225 $R_{DS(on)} = 22.0 m\Omega$			
>25							BSC430N25NSFD $R_{DS(on)} = 43.0 m\Omega$	
		IRFS4229TRL PBF $R_{DS(on)} = 48.0 m\Omega$		IRFB4332PBF $R_{DS(on)} = 33.0 m\Omega$	IRFP4332PBF $R_{DS(on)} = 33.0 m\Omega$		BSC600N25NS3 G $R_{DS(on)} = 60.0 m\Omega$	
	IPD600N25N3 G $R_{DS(on)} = 60.0 m\Omega$	IPB600N25N3 G $R_{DS(on)} = 60.0 m\Omega$		IRFB4229PBF $R_{DS(on)} = 46.0 m\Omega$			BSC670N25NSFD $R_{DS(on)} = 67.0 m\Omega$	
				IPP600N25N3 G $R_{DS(on)} = 60.0 m\Omega$	IRFP4229PBF $R_{DS(on)} = 46.0 m\Omega$	BSZ16DN25NS3 G $R_{DS(on)} = 165.0 m\Omega$		
					BSZ42DN25NS3 G $R_{DS(on)} = 425.0 m\Omega$	BSC16DN25NS3 G $R_{DS(on)} = 165.0 m\Omega$		

OptiMOS™ and StrongIRFET™ 300 V normal level



$R_{DS(on), max.}$ at $V_{GS} = 10 V$ [mΩ]	TO-220	TO-247	SuperSO8
0-25		IRF300P226 $R_{DS(on)} = 19.0 m\Omega$	
>25	IPP410N30N $R_{DS(on)} = 41.0 m\Omega$		
		IRF300P227 $R_{DS(on)} = 40 m\Omega$	BSC13DN30NSFD $R_{DS(on)} = 130.0 m\Omega$

Power MOSFETs complementary



Voltage [V]		PQFN 3.3x3.3	SO8
Complementary	-20/20	BSZ15DC02KD H**/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
	>50 mΩ	BSZ215C H**/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
	-30/30		IRF9389TRPBF N: 27 mΩ, 6.8 A P: 64 mΩ, -4.6 A



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*Products are qualified to Automotive AEC Q101 ** $R_{DS(on)}$ specified at 4.5 V

Power P-channel MOSFETs



Voltage [V]	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-220	PQFN 3.3x3.3	SuperSO8	SO8	PQFN 2x2
-20						BSO201SP H R _{DS(on)} = 7.0 mΩ	
							IRLHS2242TRPBF** R _{DS(on)} = 31.0 mΩ
-30	IPD042P03L3 G R _{DS(on)} = 4.2 mΩ				BSC030P03NS3 G R _{DS(on)} = 3.0 mΩ BSC060P03NS3E G R _{DS(on)} = 6.0 mΩ; ESD	IRF9310 R _{DS(on)} = 4.6 mΩ IRF9317 R _{DS(on)} = 6.6 mΩ	
	SPD50P03L G 1)* R _{DS(on)} = 7.0 mΩ			BSZ086P03NS3 G R _{DS(on)} = 8.6 mΩ BSZ086P03NS3E G R _{DS(on)} = 8.6 mΩ	IRFH9310 R _{DS(on)} = 4.6 mΩ	IRF9321 R _{DS(on)} = 7.2 mΩ	
					BSC084P03NS3 G R _{DS(on)} = 8.4 mΩ		
				BSZ120P03NS3 G R _{DS(on)} = 12.0 mΩ		BSO301SP H R _{DS(on)} = 8.0 mΩ IRF9388TRPBF R _{DS(on)} = 11.9 mΩ	
						IRF9358 R _{DS(on)} = 16 mΩ; dual	
				BSZ180P03NS3 G R _{DS(on)} = 18.0 mΩ BSZ180P03NS3E G R _{DS(on)} = 18.0 mΩ; ESD			
							IRFHS9301TRPBF R _{DS(on)} = 37.0 mΩ
							IRF9362 R _{DS(on)} = 21 mΩ; dual IRF9335 R _{DS(on)} = 59 mΩ
-60	IPD380P06NM R _{DS(on)} = 38 mΩ	IPB110P06LM R _{DS(on)} = 11 mΩ	SPP80P06P H* R _{DS(on)} = 23.0 mΩ	ISZ810P06LM R _{DS(on)} = 81 mΩ	ISC240P06LM R _{DS(on)} = 24 mΩ		
	IPD650P06NM R _{DS(on)} = 65 mΩ	SPB80P06P G* R _{DS(on)} = 23.0 mΩ			ISC800P06LM R _{DS(on)} = 80 mΩ		
	SPD30P06P G* R _{DS(on)} = 75.0 mΩ						
	IPD900P06NM R _{DS(on)} = 90 mΩ						
	SPD18P06P G* R _{DS(on)} = 130.0 mΩ						
	SPD09P06PL G* R _{DS(on)} = 250.0 mΩ						
	IPD25DP06NM R _{DS(on)} = 250 mΩ						
	SPD08P06P G* R _{DS(on)} = 300.0 mΩ						
	IPD40DP06NM R _{DS(on)} = 400 mΩ						
-100	SPD15P10PL G* R _{DS(on)} = 200.0 mΩ	IPB320P10LM R _{DS(on)} = 32 mΩ		ISZ24DP10LM R _{DS(on)} = 245 mΩ	ISC750P10LM R _{DS(on)} = 75 mΩ		
	SPD15P10P G* R _{DS(on)} = 240.0 mΩ	IPB330P10NM R _{DS(on)} = 33 mΩ	IPP330P10NM R _{DS(on)} = 33 mΩ				
	SPD04P10PL G* R _{DS(on)} = 850.0 mΩ	IPB19DP10NM R _{DS(on)} = 185 mΩ					
	IPD11DP10NM R _{DS(on)} = 111 mΩ						
	IPD18DP10LM R _{DS(on)} = 178 mΩ						
	IPD19DP10NM R _{DS(on)} = 186 mΩ						
-150	IPD42DP15LM R _{DS(on)} = 420 mΩ	IPB720P15LM R _{DS(on)} = 72 mΩ		ISZ56DP15LM R _{DS(on)} = 560 mΩ ISZ75DP15LM R _{DS(on)} = 750 mΩ ISZ15EP15LM R _{DS(on)} = 1500 mΩ	ISC16DP15LM R _{DS(on)} = 160 mΩ		

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Voltage [V]	SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
20 V		BSL202SN ⁴⁾ 36 mΩ, 7.5 A, SLL		BSR802N ⁵⁾ 32 mΩ, 3.7 A, ULL		BSS816NW ⁵⁾ 240 mΩ, 1.4 A, ULL	BSD214SN ⁴⁾ 250 mΩ, 1.5 A, SLL
		IRLMS2002 ¹⁾⁴⁾ 45 mΩ, 6.5 A, SLL		BSR202N ⁴⁾ 33 mΩ, 3.8 A, SLL	IRLML6244 ¹⁾⁴⁾ 27 mΩ, 6.3 A, SLL	BSS214NW ⁴⁾ 250 mΩ, 1.5 A, SLL	BSD840N ⁵⁾ 560 mΩ, 0.88 A, ULL, dual
		BSL806N ⁵⁾ 82 mΩ, 2.3 A, ULL, dual			IRLML6246 ¹⁾⁴⁾ 66 mΩ, 4.1 A, SLL		BSD235N ⁴⁾ 600 mΩ, 0.95 A, SLL, dual
					IRLML2502 ¹⁾⁴⁾ 80 mΩ, 4.2 A, SLL		
					BSS806N ⁵⁾ 82 mΩ, 2.3 A, ULL		
					BSS806NE ⁵⁾ 82 mΩ, 2.3 A, ULL, ESD		
					BSS205N ⁴⁾ 85 mΩ, 2.5 A, SLL		
25 V					BSS214N ⁴⁾ 250 mΩ, 1.5 A, SLL		
30 V		IRLTS6342 ¹⁾⁴⁾ 22 mΩ, 8.3 A, SLL			IRFML8244 ¹⁾³⁾ 41 mΩ, 5.8 A, LL		
		IRFTS8342 ¹⁾³⁾ 29 mΩ, 8.2 A, LL			IRLML6344 ¹⁾⁴⁾ 37 mΩ, 5.0 A, SLL		BSD316SN ³⁾ 280 mΩ, 1.4 A, LL
		IRLMS1503 ¹⁾³⁾ 200 mΩ, 3.2 A, LL			IRLML0030 ¹⁾³⁾ 40 mΩ, 5.3 A, LL		
					IRLML6346 ¹⁾⁴⁾ 80 mΩ, 3.4 A, SLL		
40 V					BSS306N ³⁾ 93 mΩ, 2.3 A, LL		
					IRLML2030 ¹⁾³⁾ 154 mΩ, 2.7 A, LL		
					BSS316N ³⁾ 280 mΩ, 1.4 A, LL		
					IRLML2803 ³⁾ 400 mΩ, 1.2 A, LL		
55 V	IRFL024Z ¹⁾²⁾ 57.5 mΩ, 5.1 A, NL				IRLML0040 ¹⁾³⁾ 78 mΩ, 3.6 A, LL		
	IRLL2705 ¹⁾³⁾ 65 mΩ, 3.8 A, LL				BSS670S2L ³⁾ 825 mΩ, 0.54 A, LL		
	IRFL4105 ¹⁾²⁾ 45 mΩ, 3.7 A, NL						
	IRLL024N ¹⁾³⁾ 100 mΩ, 3.5 A, LL						
	IRLL014N ¹⁾³⁾ 280 mΩ, 2.0 A, LL						
60 V	IRFL014N ¹⁾²⁾ 160 mΩ, 1.9 A, NL						
	ISP670P06NMA* 67 mΩ, 3.7 A, NL	BSL606SN ³⁾ 95 mΩ, 4.5 A, LL	BSS606N ³⁾ 90 mΩ, 3.2 A, LL		IRLML0060 ¹⁾³⁾ 116 mΩ, 2.7 A, LL	BSS138W ³⁾ 4 Ω, 0.28 A, LL	2N7002DW ³⁾ 4 Ω, 0.3 A, LL, dual
	ISP12DP06NMA* 125 mΩ, 2.8 A, NL				IRLML2060 ¹⁾³⁾ 640 mΩ, 1.2 A, LL	SN7002W ³⁾ 7.5 Ω, 0.23 A, LL	
	ISP25DP06LMA* 250 mΩ, 1.9 A, LL				2N7002 ¹⁾³⁾ 4 Ω, 0.3 A, LL		
	ISP25DP06NMA* 250 mΩ, 1.9 A, NL				BSS138I ¹⁾³⁾ 4 Ω, 0.23 A, LL		
	BSP295 ³⁾ 500 mΩ, 1.8 A, LL				BSS138N ³⁾ 4 Ω, 0.23 A, LL		
					SN7002I ¹⁾³⁾ 7.5 Ω, 0.2 A, LL		
100 V	BSP373N ²⁾ 240 mΩ, 1.8 A, NL				SN7002N ³⁾ 7.5 Ω, 0.2 A, LL		
	BSP372N ³⁾ 270 mΩ, 1.8 A, LL				BSS159N ⁶⁾ 8 Ω, 0.13 A, depletion		
	BSP296N ³⁾ 800 mΩ, 1.2 A, LL				ISS20EP06LMA* 2.0 Ω, 0.3 A, LL		
	ISP16DP10LMA* 167 mΩ, 2.2 A, LL				ISS75EP06LMA* 7.5 Ω, 0.18 A, LL		
					IRLML0100 235 mΩ, 1.6 A, LL		
150 V	IRFL4315 ¹⁾²⁾ 185 mΩ, 2.6 A, NL	IRF5802 ¹⁾²⁾ 1.2 Ω, 0.9 A, NL			BSS119N ³⁾ 10 Ω, 0.19 A, LL		
	BSP297 ³⁾ 3 Ω, 0.66 A, LL	IRF5801 ¹⁾²⁾ 2.2 Ω, 0.6 A, NL			BSS123I ¹⁾³⁾ 10 Ω, 0.19 A, LL		
200 V	BSP149 ⁶⁾ 3.5 Ω, 0.14 A, LL, depletion				BSS123N ³⁾ 10 Ω, 0.19 A, LL		
	BSP88 ³⁾ 7.5 Ω, 0.35 A, SLL		BSS87 ³⁾ 7.5 Ω, 0.26 A, LL		BSS169I ¹⁾⁶⁾ 12 Ω, 0.09 A, depletion		
240 V	BSP89 ³⁾ 7.5 Ω, 0.35 A, LL				BSS169 ⁶⁾ 12 Ω, 0.09 A, depletion		
	BSP129 ⁶⁾ 20 Ω, 0.05 A, LL, depletion						
250 V							
					BSS139I ¹⁾⁶⁾ 30 Ω, 0.10 A, LL, depletion		
400 V	BSP324 ³⁾ 22 Ω, 0.17 A, LL				BSS139 ⁶⁾ 30 Ω, 0.10 A, LL, depletion		
	BSP125 ³⁾ 60 Ω, 0.12 A, LL		BSS225 ³⁾ 45 Ω, 0.09 A, LL				
600 V	BSP135I ¹⁾⁶⁾ 60 Ω, 0.02 A, LL, depletion				BSS127I ¹⁾³⁾ 600 Ω, 0.021 A, LL		
	BSP135 ⁶⁾ 60 Ω, 0.02 A, LL, depletion				BSS127 ³⁾ 600 Ω, 0.021 A, LL		
					BSS126I ¹⁾⁶⁾ 700 Ω, 0.021 A, LL, depletion		
				BSS126 ⁶⁾ 700 Ω, 0.021 A, LL, depletion			

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www.infineon.com/smallsignal

1) not qualified to Automotive AEC-Q101

2) R_{DS(on)} specified at 10 V

3) R_{DS(on)} specified at 4.5 V

4) R_{DS(on)} specified at 2.5 V

5) R_{DS(on)} specified at 1.8 V

6) R_{DS(on)} specified at 0 V

Small-signal/small-power P-channel



Voltage [V]	SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
-250 V	BSP317P ³⁾ 5 Ω, -0.43 A, LL		BSS192P ³⁾ 15 Ω, -0.19 A, LL	BSR92P ³⁾ 13 Ω, -0.14 A, LL			
	BSP92P ³⁾ 15 Ω, -0.26 A, LL						
-150 V	ISP14EP15LM ^{1) 3)} 1.4 Ω, -1.29 A, LL						
-100 V				BSR316P ³⁾ 2.2 Ω, -0.36 A, LL			
	BSP322P ³⁾ 1 Ω, -1.0 A, LL						
	BSP316P ³⁾ 2.3 Ω, -0.68 A, LL						
	ISP16DP10LM ^{1) 3)} 190 mΩ, -3.9 A, LL						
	ISP98DP10LM ^{1) 3)} 1.05 Ω, -1.55 A, LL						
	ISP20EP10LM ^{1) 3)} 2.2 Ω, -0.99 A, LL						
-60 V	ISP650P06NM ^{1) 2)} 65 mΩ, -3.7 A, NL			BSR315P ³⁾ 1.3 Ω, -0.62 A, LL	ISS17EP06LM ^{1) 3)} 2.2 Ω, -0.3 A, LL	BSS84PW ³⁾ 12 Ω, -0.15 A, LL	
	ISP12DP06NM ^{1) 2)} 125 mΩ, -2.8 A, NL						
	ISP13DP06NMS ^{1) 2)} 125 mΩ, -2.8 A, NL				BSS83P ³⁾ 3 Ω, -0.33 A, LL		
	BSP613P ²⁾ 130 mΩ, -2.9 A, NL				ISS55EP06LM ^{1) 3)} 7 Ω, -0.18 A, LL		
	ISP25DP06NM ^{1) 2)} 250 mΩ, -1.9 A, NL				BSS84P ³⁾ 12 Ω, -0.17 A, LL		
	ISP26DP06NMS ^{1) 2)} 260 mΩ, -1.9 A, NL						
	BSP170P ²⁾ 300 mΩ, -1.9 A, NL						
	ISP25DP06LM ^{1) 3)} 310 mΩ, -1.9 A, LL						
	ISP25DP06LMS ^{1) 3)} 310 mΩ, -1.9 A, LL						
	BSP171P ³⁾ 450 mΩ, -1.9 A, LL						
	ISP75DP06LM ^{1) 3)} 1 Ω, -1.1 A, LL						
	BSP315P ³⁾ 1.4 Ω, -1.17 A, LL						
	-40 V		IRF5803 ^{1) 2)} 112 mΩ, -3.4 A, NL				
-30 V		IRF7S9342 ^{1) 2)} 40 mΩ, -5.8 A, NL			IRLML9301 ^{1) 3)} 103 mΩ, -1.3 A, LL		
		BSL307SP ³⁾ 74 mΩ, -5.5 A, LL			BSS308PE ³⁾ 130 mΩ, -2.1 A, LL, ESD		
		BSL308PE ³⁾ 130 mΩ, -2.1 A, LL, dual, ESD			IRLML5203 ^{1) 3)} 165 mΩ, -3.0 A, LL		
					BSS314PE ³⁾ 230 mΩ, -1.5 A, LL, ESD		
					BSS315P ³⁾ 270 mΩ, -1.5 A, LL		
-20 V		BSL207SP ⁴⁾ 41 mΩ, -6.0 A, SLL			IRLML9303 ^{1) 4)} 270 mΩ, -2.3 A, LL		
		IRLTS2242 ^{1) 4)} 55 mΩ, -6.9 A, SLL			IRLML5103 ^{1) 3)} 1000 mΩ, -0.76 A, LL		
		IRLMS6802 ^{1) 4)} 100 mΩ, -5.6 A, SLL			IRLML2244 ^{1) 4)} 95 mΩ, -4.3 A, SLL	BSS209PW ⁴⁾ 900 mΩ, -0.58 A, SLL	BSV236SP ⁴⁾ 285 mΩ, -1.5 A, SLL
		BSL211SP ⁴⁾ 110 mΩ, -4.7 A, SLL			IRLML6402 ^{1) 4)} 135 mΩ, -3.7 A, SLL	BSS223PW ⁴⁾ 2.1 Ω, -0.39 A, SLL	BSD223P ⁴⁾ 2.1 Ω, -0.39 A, SLL, dual
-12 V				BSS215P ⁴⁾ 280 mΩ, -1.5 A, SLL			
				IRLML6401 ⁴⁾ 125 mΩ, -4.3 A, ULL			

Small-signal/small-power complementary



Voltage [V]	TSOP-6	SOT-363
Complementary -20/20	BSL215C ⁴⁾ N: 250 mΩ, 1.5 A, SLL P: 280 mΩ, -1.5 A, SLL	BSD235C ⁴⁾ N: 600 mΩ, 0.95 A, SLL P: 2.1 Ω, -0.53 A, SLL
	BSL308C ³⁾ N: 93 mΩ, 2.3 A, LL P: 130 mΩ, -2.0 A, LL	
Complementary -30/30	BSL316C ³⁾ N: 280 mΩ, 1.4 A, LL P: 270 mΩ, -1.5 A, LL	



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1) not qualified to Automotive AEC-Q101
 2) $R_{DS(on)}$ specified at 10 V

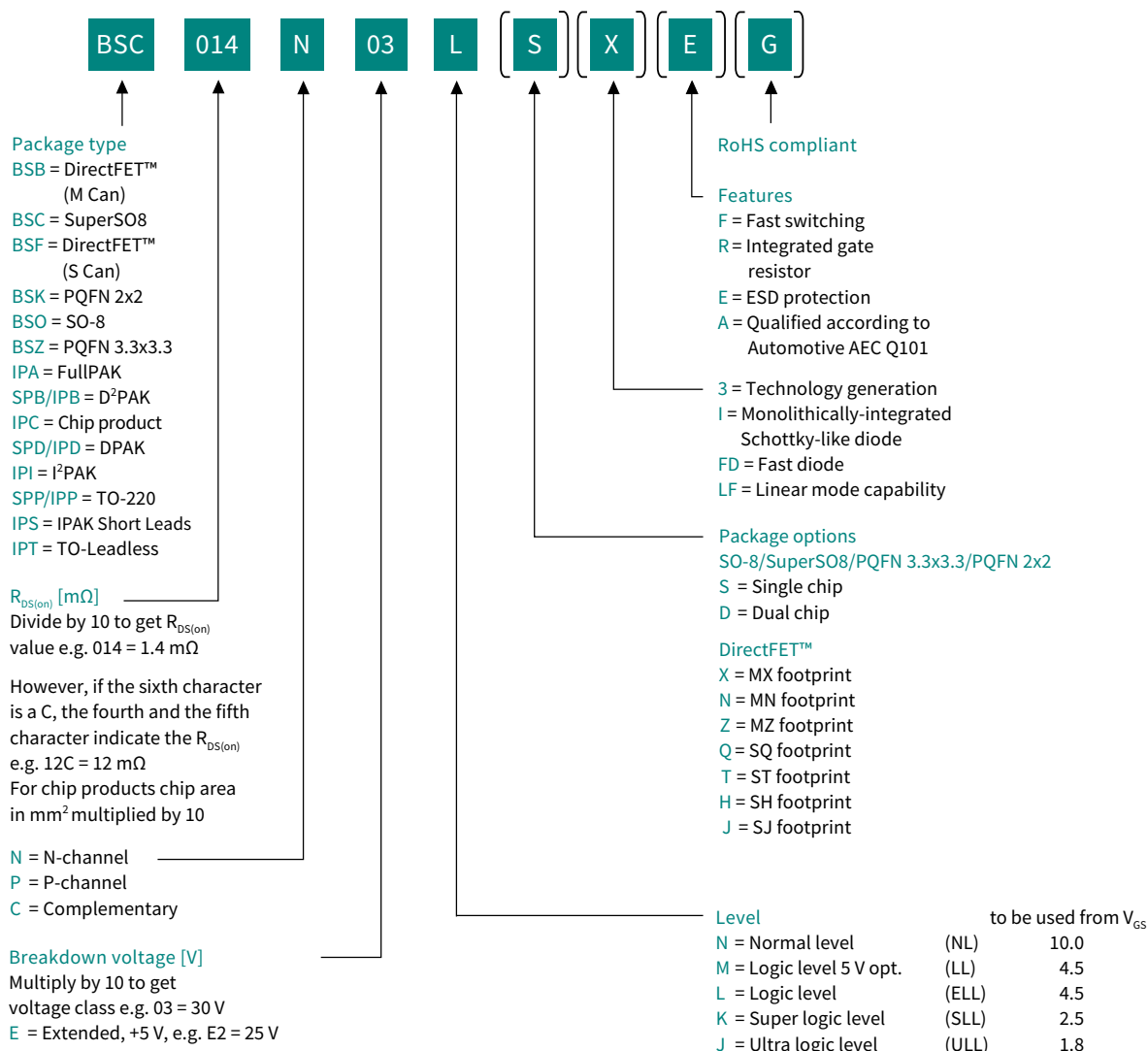
3) $R_{DS(on)}$ specified at 4.5 V
 4) $R_{DS(on)}$ specified at 2.5 V

5) $R_{DS(on)}$ specified at 1.8 V
 6) $R_{DS(on)}$ specified at 0 V

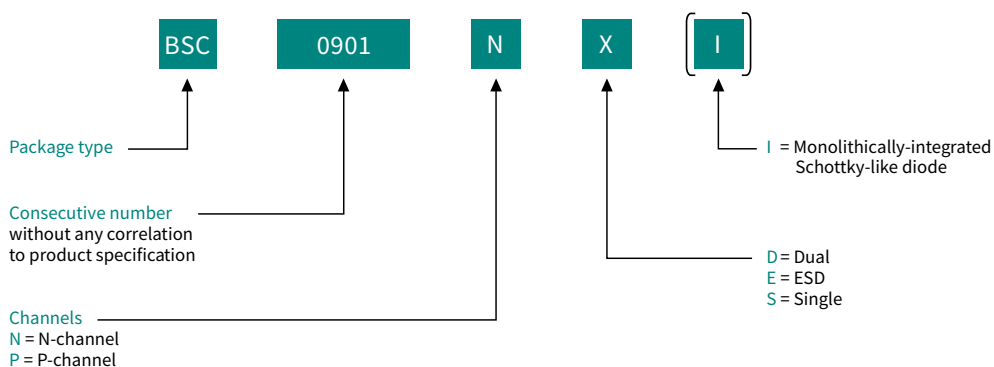
*Coming soon

Nomenclature

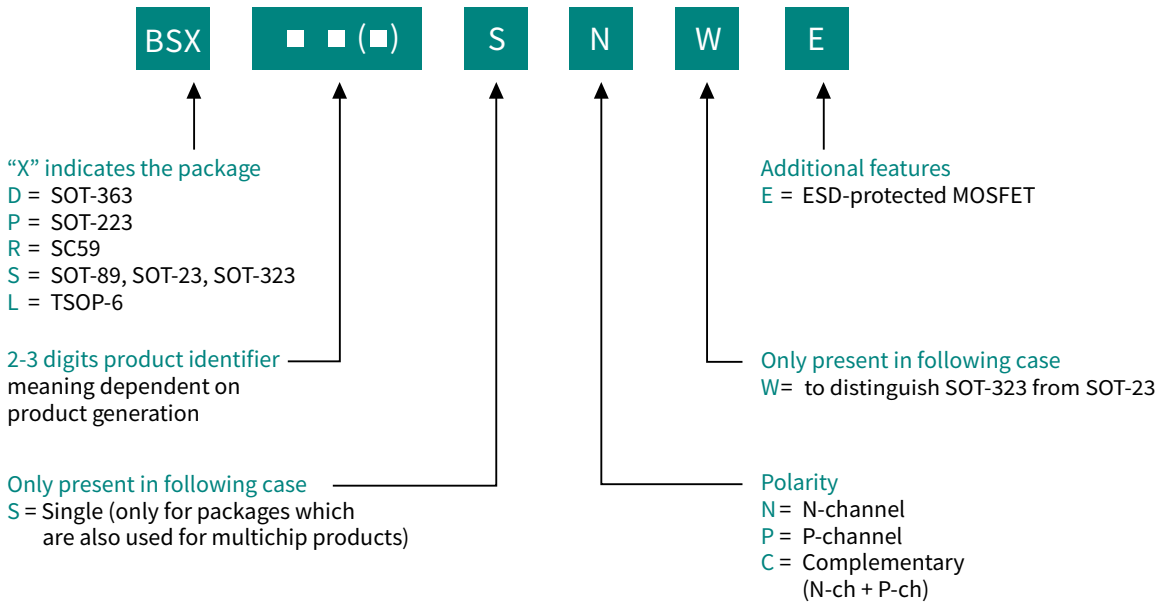
OptiMOS™



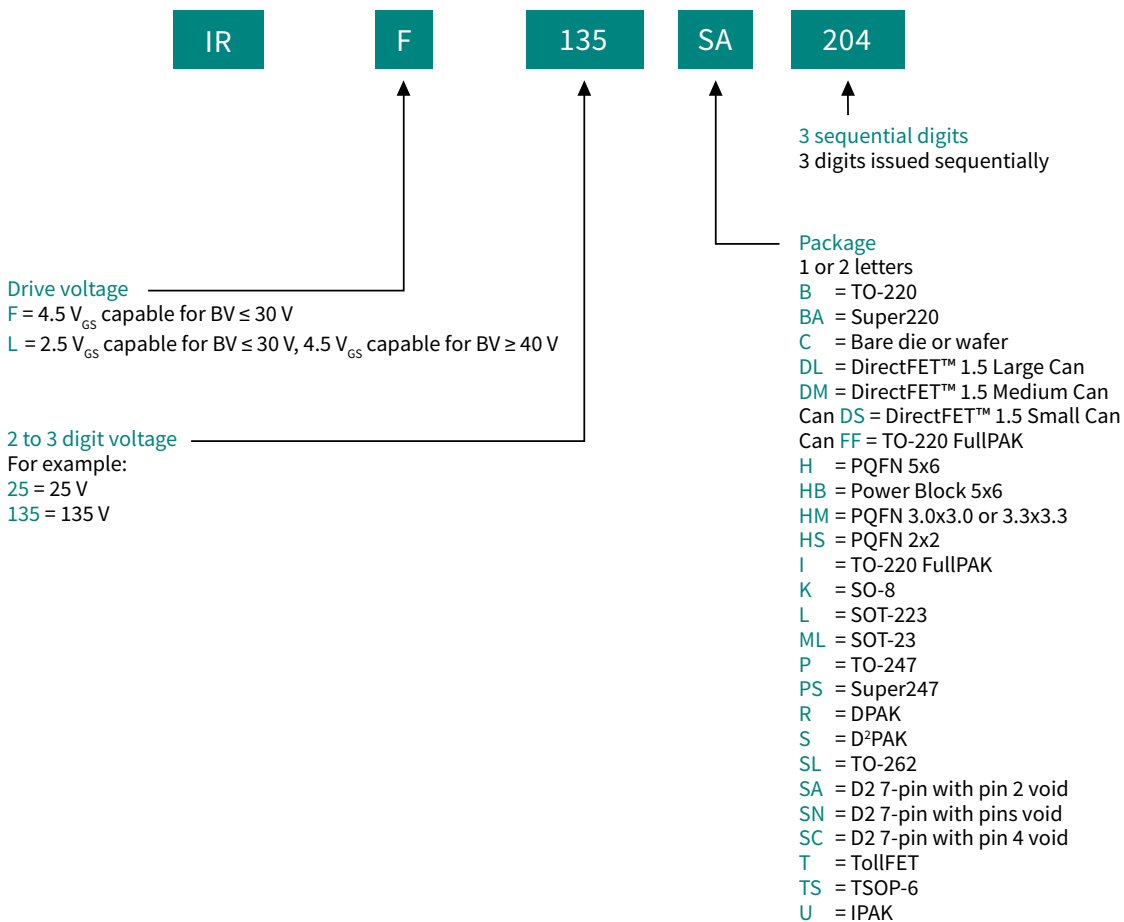
OptiMOS™ 30 V



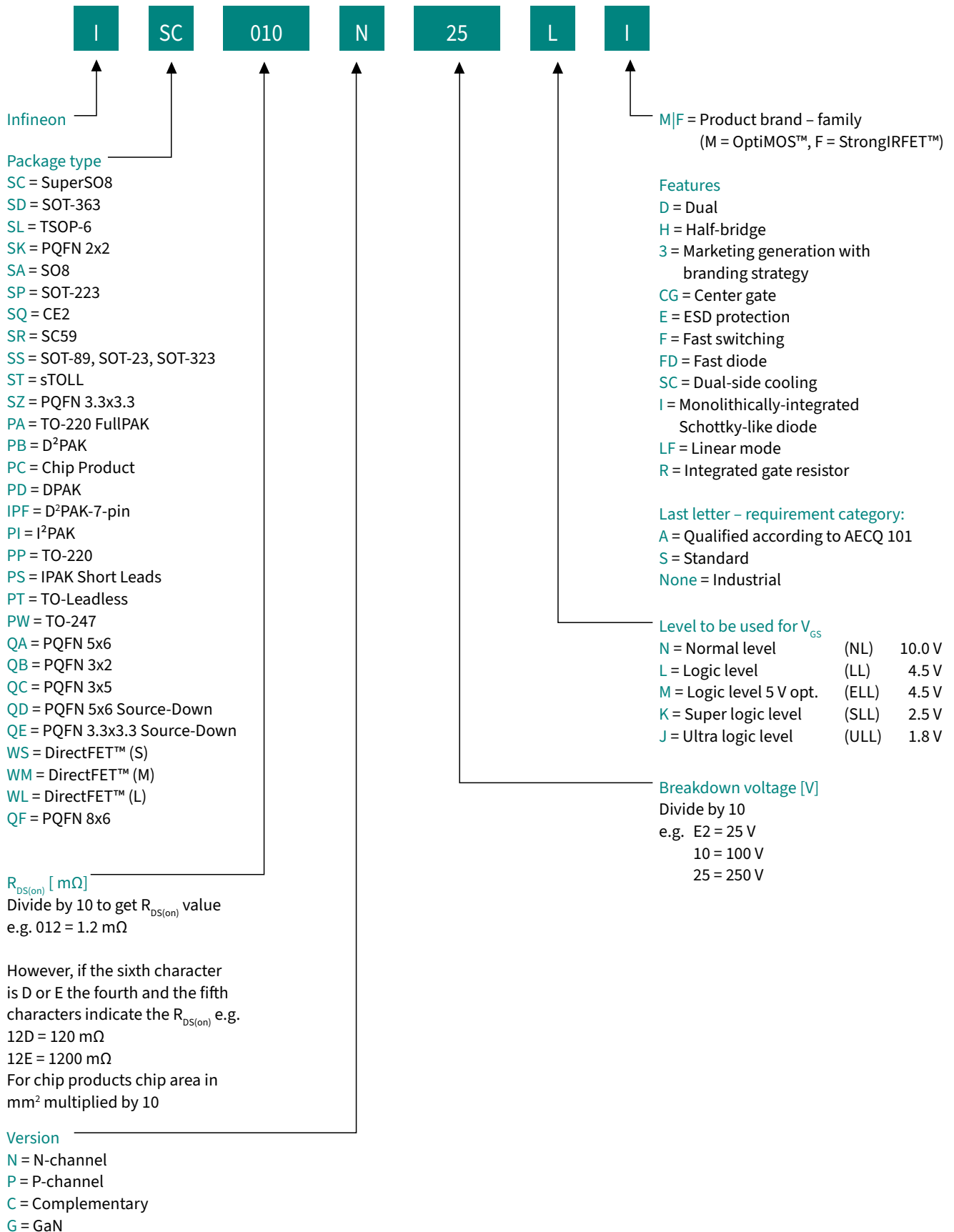
Small signal



StrongIRFET™ (from May 2015 to 2019)



New nomenclature for OptiMOS™ and StrongIRFET™ MOSFETs (2019 onward)





Infineon support for low voltage MOSFETs

Useful links and helpful information

Further information, data sheets and documents

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MOSFET Cross Reference

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For more information regarding StrongIRFET™ and OptiMOS™ power MOSFET bare die products, please contact the Infineon Service Center or your local sales counterpart.

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Support



Evaluation board



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Simulation



500-950 V MOSFETs

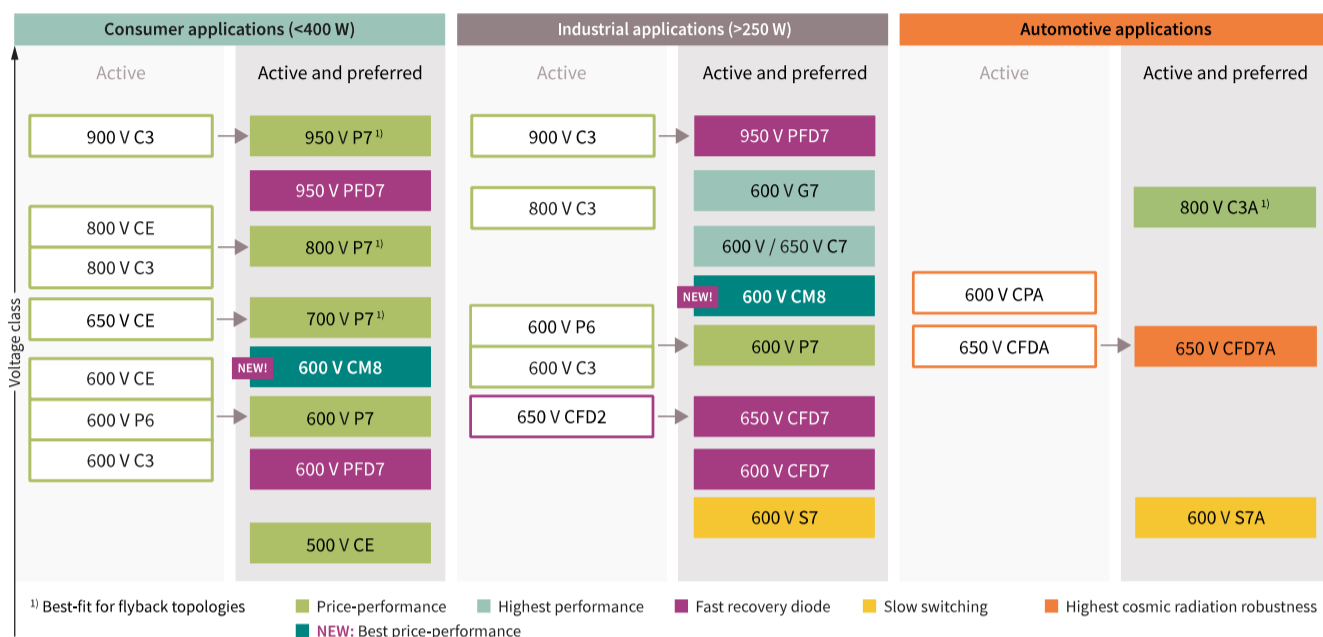
- CoolMOS™ SJ MOSFETs
- 950 V CoolMOS™ P7 SJ MOSFETs
- 950 V CoolMOS™ PFD7 SJ MOSFETs
- 800 V CoolMOS™ P7 SJ MOSFETs
- 700 V CoolMOS™ P7 SJ MOSFETs
- 600 V CoolMOS™ 8 SJ MOSFETs
- 600 V CoolMOS™ P7 SJ MOSFETs
- 600 V CoolMOS™ PFD7 SJ MOSFETs
- 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs
- 600 V CoolMOS™ S7 SJ MOSFETs
- 600V CoolMOS™ S7-T SJ MOSFETs
- 600 V CoolMOS™ CFD7 SJ MOSFETs
- 650 V CoolMOS™ CFD7 SJ MOSFETs
- CoolMOS™ CE SJ MOSFETs
- CoolMOS™ SJ MOSFETs for automotive
- 600 V CoolMOS™ S7A SJ MOSFETs
- 600 V CoolMOS™ S7A-T SJ MOSFETs
- CoolMOS™ SJ MOSFET package innovations
- 500-950 V MOSFETs product portfolio
- 500-950 V MOSFETs nomenclature

CoolMOS™ SJ MOSFETs

Trusted leader in high-voltage MOSFETs

Infiniteon's CoolMOS™ products offer a significant reduction of conduction, switching and driving losses, and enable high power density as well as efficiency for superior power conversion systems.

CoolMOS™ SJ MOSFETs overview*



High-voltage superjunction MOSFETs address consumer applications, such as home appliance drives, smartphone/tablet chargers, notebook adapters, LED lighting, PC power, as well as audio and TV power supplies. Customers are increasingly replacing standard MOSFETs with superjunction MOSFETs to benefit from higher efficiency and lower power consumption for end users. CoolMOS™ P7 offers high performance and a competitive price. The CoolMOS™ PFD7 series is a state-of-the-art solution for high density chargers/adapters, lighting applications as well as home appliance drives (e.g., refrigerator compressors).

Also for industrial applications such as server, telecom, PC power, solar, ESS, UPS, EV-charging and others, Infineon's CoolMOS™ 7 superjunction MOSFETs with the C7, G7, CFD7, P7, and S7(T) product families offer what you need. The S7 product family specifically addresses slow switching applications such as solid state relay and solid state circuit breaker offering the best-in-class $R_{DS(on)}$ within the industry. The new 600 V CoolMOS™ 8 supersedes the CoolMOS™ 7 MOSFET family offering best price-performance. The series is equipped with an integrated fast body diode, making it suitable for a wide range of applications like server and industrial SMPS, EV charging, and micro solar. Complementary to the silicon CoolMOS™ portfolio, Infineon offers a broad wide-bandgap (WBG) portfolio of CoolGa™ GIT HEMTs, CoolGa™ IPS, and CoolSiC™ MOSFETs to further optimize efficiency and system cost (see [Wide bandgap semiconductors chapter](#)).

Infiniteon's industrial- and consumer-qualified CoolMOS™ superjunction MOSFET offering is complemented by the automotive-qualified series 600 V CPA, 650 V CFDA, 800 V C3A, and the latest 650 V CFD7A as well as 600 V S7A/S7TA. Infineon's excellent-performing automotive series address on-board chargers, DC-DC converters, active pre-charge and discharge function, insulation monitor, HV eFuse, and HV eDisconnect with proven outstanding quality standards going well beyond the AEC-Q101, supporting customers to gain momentum in the rapidly growing xEV market.



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950 V CoolMOS™ PFD7 SJ MOSFETs

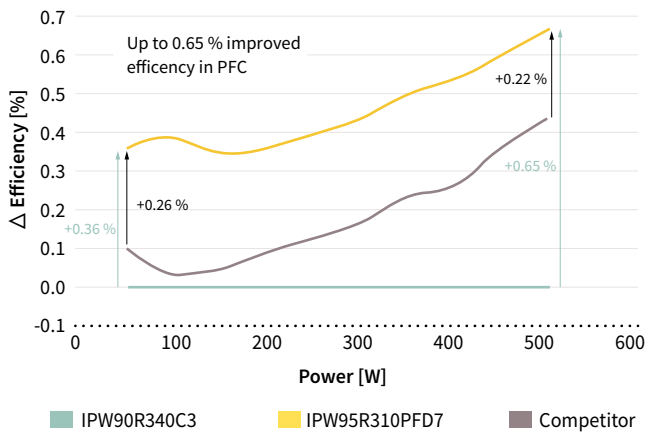
Perfect fit for soft- and hard-switching topologies

The 950 V CoolMOS™ PFD7 is a revolutionary superjunction technology for high-voltage power MOSFETs, with an integrated fast body diode to address lighting and industrial SMPS applications. The new series is tailor-made for usage across several topologies, such as PFC, LLC, and flyback.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Integrated ultrafast body diode with BiC Q_{rr} – Best-in-class FOM $R_{DS(on)} \times E_{oss}$; reduced Q_{G^*}, C_{iss} and C_{oss} – BiC $R_{DS(on)}$ in various packages like 450 mΩ in DPAK and 60 mΩ in TO-247 – $V_{GS(th)}$ of 3 V and smallest $V_{GS(th)}$ variation of ± 0.5 V – ESD protection up to class 2 (HBM) – Offering the highest quality and reliability – Price competitiveness over previous CoolMOS™ families 	<ul style="list-style-type: none"> – Hard commutation ruggedness that enables the usage of PFD7 in different circuit topologies – Improved efficiency and thermal behavior over internal and external comparable products – Enabling higher power density designs and BOM savings – Easy to drive and design-in – Improved production yield by reducing ESD-related failures and reduced field returns – Cost-competitive designs with superjunction

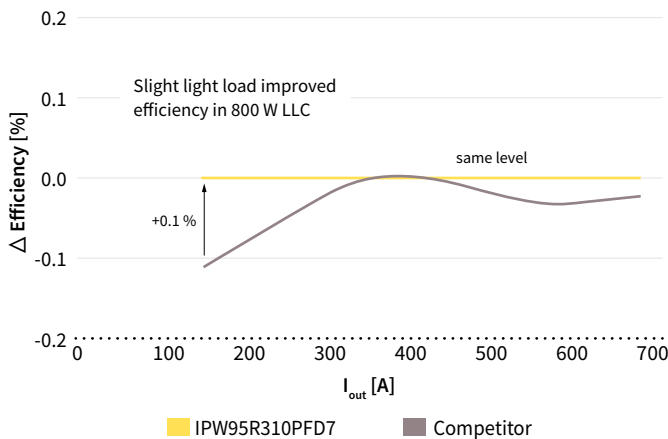
Efficiency measurements for 310 mΩ devices at 90 V_{AC} ($R_{g,ext} = 10 \Omega$)



950 V CoolMOS™ PFD7 outperforms previous CoolMOS™ families as well as the main competition concerning PFC efficiency:

- Improvement of 0.26 percent in light-load and 0.22 percent in full-load efficiency compared to the main competition
- Improvement of 0.36 percent in light-load and 0.65 percent in full-load efficiency compared to 900 V CoolMOS™ C3

Efficiency measurements for 310 mΩ in 880 W ZVS FB set up



950 V CoolMOS™ PFD7 closes the gap and matches the performance of the main competition regarding LLC efficiency:

- Improvement of 0.1 percent in light-load efficiency compared to the main competition



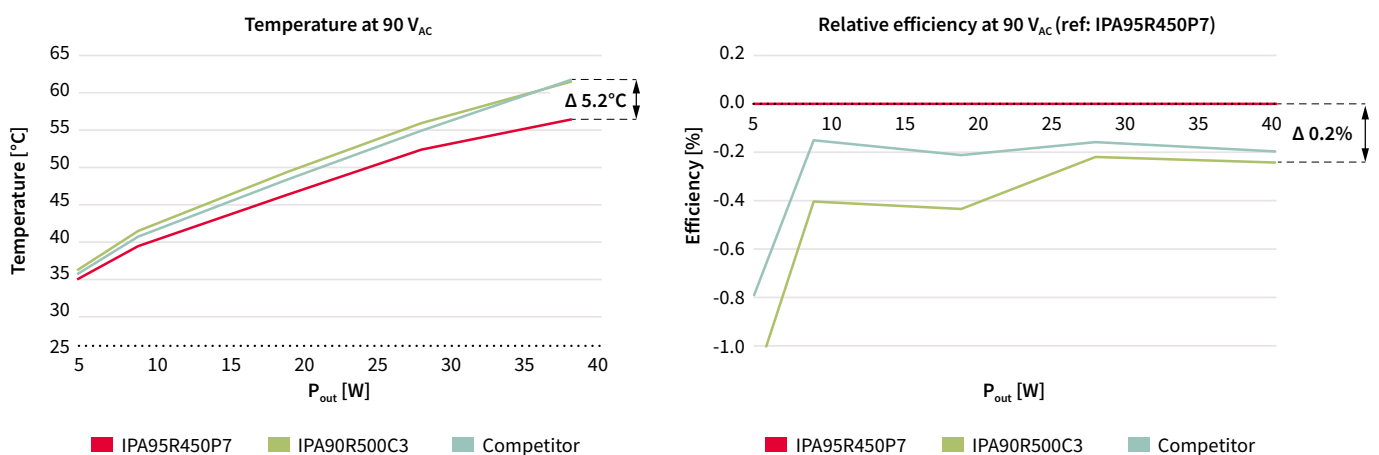
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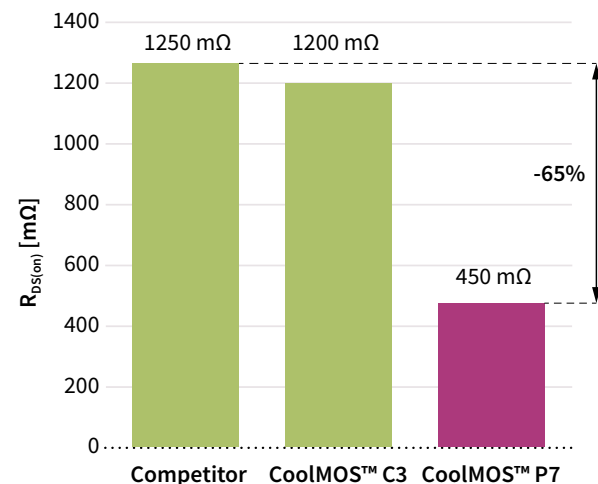
950 V CoolMOS™ P7 SJ MOSFETs

Perfect fit for PFC and flyback topologies

Designed to meet the growing consumer needs in the high-voltage MOSFETs arena, the 950 V CoolMOS™ P7 technology focuses on the low-power SMPS market. The P7 family addresses applications ranging from lighting, smart meter, mobile phone charger, notebook adapter, to AUX power supply and industrial SMPS. Offering 50 V more blocking voltage than its predecessor 900 V CoolMOS™ C3, the 950 V CoolMOS™ P7 series delivers outstanding performance in terms of efficiency, thermal behavior, and ease of use. As all other P7 family members, the 950 V CoolMOS™ P7 series comes with an integrated Zener diode ESD protection. The integrated diode considerably improves ESD robustness, thus reducing ESD-related yield loss and reaching exceptional ease-of-use levels. CoolMOS™ P7 is developed with a best-in-class threshold voltage ($V_{GS(th)}$) of 3 V and a narrow tolerance of only ± 0.5 V, which makes it easy to drive and design-in.



Compared to competition, the 950 V CoolMOS™ P7 delivers best-in-class efficiency and thermal performance. Plug-and-play at 90 V_{AC} in a 40 W adapter reference design, featuring the snubberless concept, demonstrates excellent efficiency gains of up to 0.2 percent and lower MOSFET temperature of up to 5.2°C compared to similar competitor technology. With over 20 years of experience in superjunction technology, Infineon introduces 950 V CoolMOS™ P7 with best-in-class DPAK on-resistance ($R_{DS(on)}$). This SMD device comes with the $R_{DS(on)}$ of 450 mΩ - more than 60 percent lower $R_{DS(on)}$ compared to the nearest competitor. Such low $R_{DS(on)}$ value enables higher density designs while decreasing BOM and assembly cost.



Best-in-class DPAK $R_{DS(on)}$

Customer benefits:

- Possible change from leaded to SMD packages
- High power density
- Lower BOM cost
- Lower production cost



Lighting



Smart metering



Charger



Adapter



AUX power



Industrial SMPS



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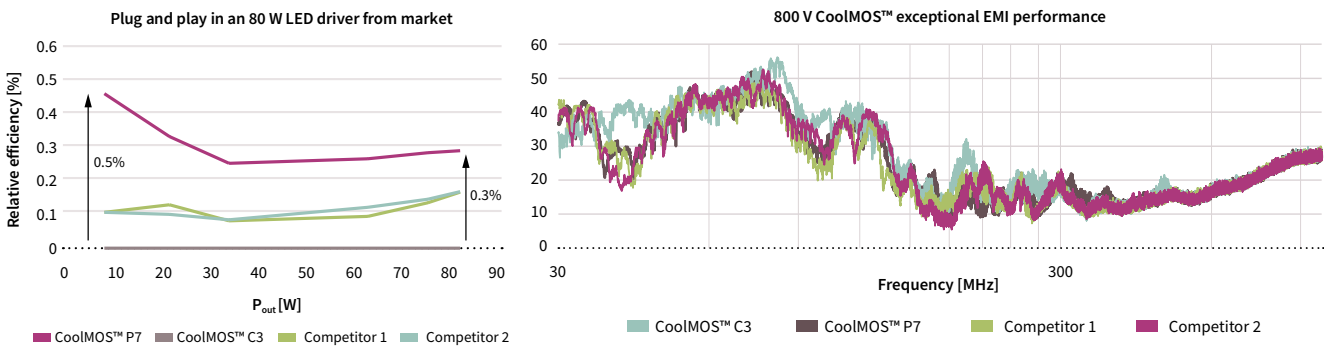
www.infineon.com/coolmos8

800 V CoolMOS™ P7 SJ MOSFETs

A benchmark in efficiency and thermal performance

With the 800 V CoolMOS™ P7 series, Infineon sets a benchmark in 800 V superjunction technologies and combines best-in-class performance with the remarkable ease of use. This product family is a perfect fit for flyback-based consumer and industrial SMPS applications. In addition, it is also suitable for PFC stages within consumer, as well as solar applications, fully covering the market needs in terms of its price/performance ratio.

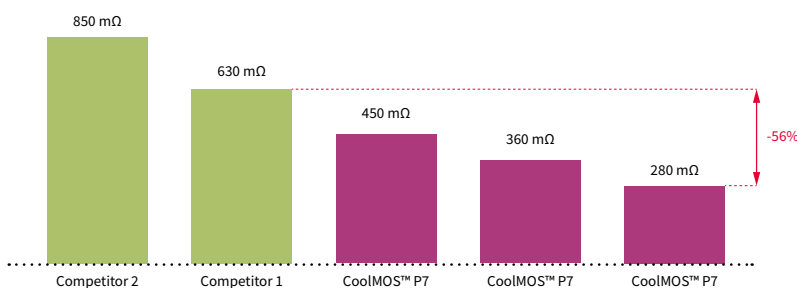
The technology offers fully optimized key parameters to deliver best-in-class efficiency as well as thermal performance. As demonstrated on an 80 W LED driver, bought on the market, the >45 percent reduction in switching losses (E_{oss}) and output capacitance (C_{oss}) as well as the significant improvement in input capacitance (C_{iss}) and gate charge (Q_G), compared to competitor technologies, lead to 0.5 percent higher efficiency at light load which helps to reduce standby power in the end application. At full load, the observed improvement is up to 0.3 percent higher efficiency and 6°C lower device temperature.



EMI is a system level topic, and the optimization needs to be done on the system level only. Nevertheless, a pure plug-and-play measurement on Infineon's 45 W adapter reveals that 800 V CoolMOS™ P7 shows similar EMI performance to Infineon's previous technologies as well as to competitors' technologies.

Compared to competition, the 800 V CoolMOS™ P7 technology allows to integrate much lower $R_{DS(on)}$ values into small packages, such as a DPAK. This finally enables high power density designs at highly competitive price levels.

Overview of lowest DPAK $R_{DS(on)}$ for 800 V superjunction MOSFET



CoolMOS™ P7 sets a new benchmark in best-in-class DPAK $R_{DS(on)}$

Customer benefits:

- High power density
- Lower BOM cost
- Lower production cost

The complete P7 platform has been developed with an integrated Zener diode that is used as an electrostatic discharge (ESD) protection mechanism, which increases the overall device ruggedness up to human body model (HBM) class 2 level.



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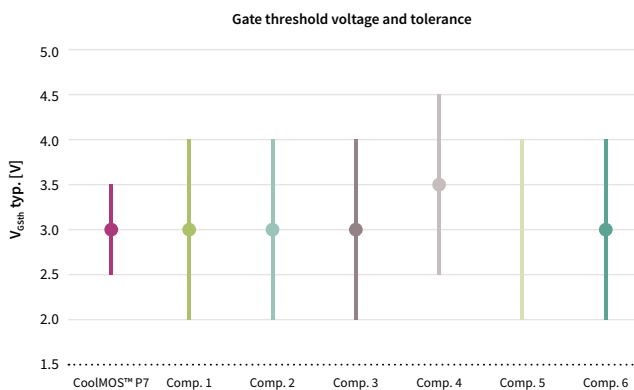
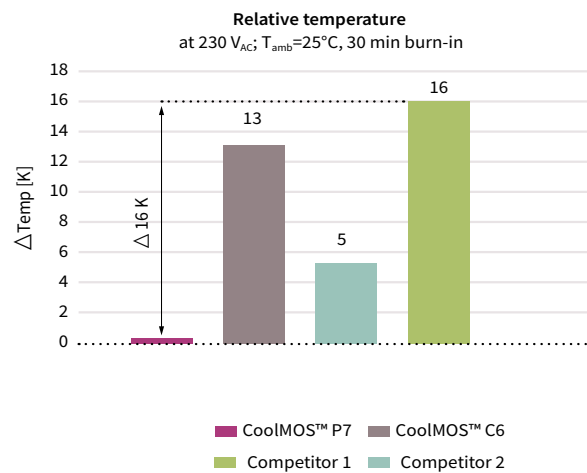
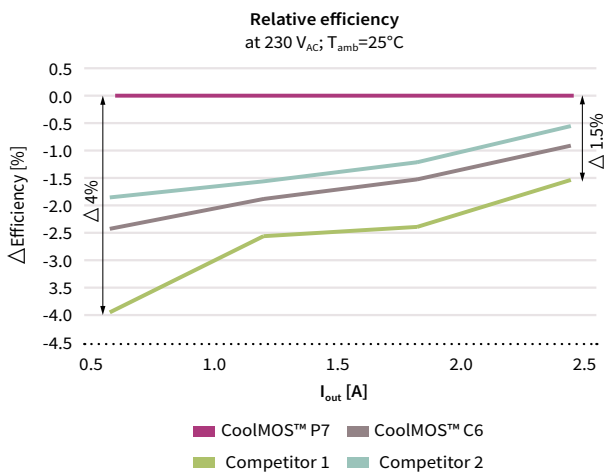
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700 V CoolMOS™ P7 SJ MOSFETs

Infineon's solution for flyback topologies

The 700 V CoolMOS™ P7 family has been developed to serve today's and, especially, tomorrow's trends in flyback topologies. The products address the low-power SMPS market, mainly focusing on mobile phone chargers and notebook adapters, but are also suitable for power supplies, used within lighting applications, home entertainment (TV, game consoles, or audio), and auxiliary power supplies. 700 V CoolMOS™ P7 achieves outstanding efficiency gains of up to 4 percent and a decrease in device temperature of up to 16 K compared to the competition. In contrast with the previous 650 V CoolMOS™ C6 technology, 700 V CoolMOS™ P7 offers 2.4 percent gain in efficiency and 12 K lower device temperature, measured at a flyback-based charger application, operated at 140 kHz switching speed.



Keeping the ease of use in mind, Infineon has developed the technology with a low threshold voltage ($V_{GS(th)}$) of 3 V and a very narrow tolerance of ± 0.5 V. This makes the CoolMOS™ P7 easy to design-in and enables the usage of lower gate source voltage, which facilitates its driving and leads to lower idle losses. To increase the ESD ruggedness up to HBM class 2 level, 700 V CoolMOS™ P7 has an integrated Zener diode. This helps to support increased assembly yield, leads to reduction of production related failures and, finally, manufacturing cost savings on customer side.

Features and benefits

Key features

- Highly performant technology
 - Low switching losses (E_{oss})
 - Highly efficient
 - Excellent thermal behavior
- Allowing high-speed switching
- Integrated protection Zener diode
- Optimized $V_{GS(th)}$ of 3 V with very narrow tolerance of ± 0.5 V
- Finely graduated portfolio

Key benefits

- Cost-competitive technology
- Further efficiency gain at higher switching speed
- Supporting less magnetic size with lower BOM costs
- High ESD ruggedness up to HBM class 2 level
- Easy to drive and design-in
- Enabler for smaller form factors and high power density designs
- Excellent choice in selecting the best-fitting product



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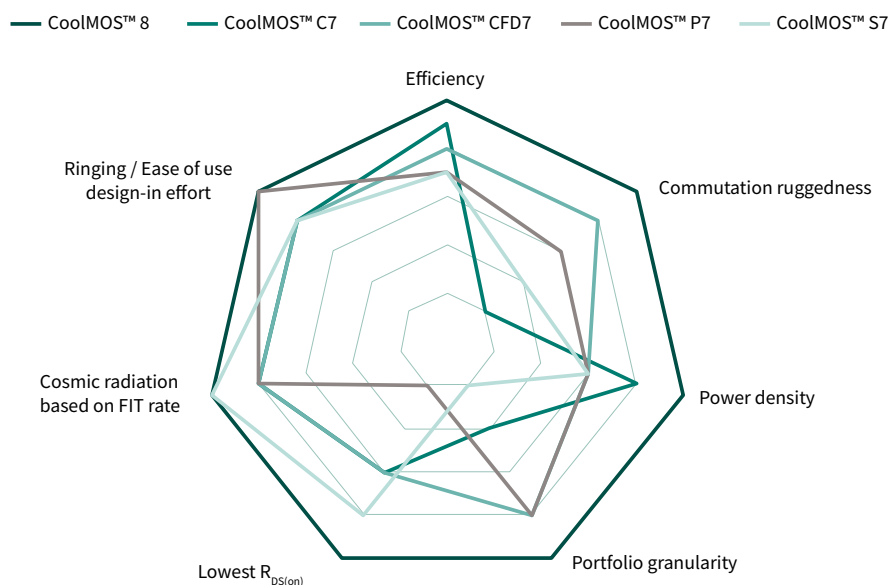
600 V CoolMOS™ 8 SJ MOSFETs

The high voltage super-junction MOSFET family combines the best out of the 600 V CoolMOS™ 7 families

Infiniteon's newest CoolMOS™ 8 at 600 V is leading the way in high voltage super-junction MOSFET technology worldwide, setting the standard for both technology and price performance on a global scale. The series is equipped with an integrated fast body diode, making it suitable for a wide range of applications. It enhances Infineon's WBG offering and the successor of the 600 V CoolMOS™ 7 MOSFET family including P7, PFD7, C7, CFD7, G7, and S7.

The 600 V CoolMOS™ 8 SJ MOSFET comes with reduced gate charge (Q_g) of 18 percent over CFD7 and 33 percent over P7 at 10 V, 50 percent lower COSS than CFD7 and P7 at 400 V, reduction in turn-off losses (E_{oss}) is further improved by 12 percent over CFD7 and P7, reverse recovery charge (Q_{rr}) is 3 percent lower compared to the CFD7, as well as the lowest reverse recovery time (t_{rr}) in the market. The R_{th} thermal performance also improved with 14-42 percent comparing previous generation. Due to these features the devices offer the highest efficiency and best-in-class reliability in soft-switching topologies such as LLC and ZVS phase-shift full-bridge. Furthermore, it provides an outstanding level of performance in PFC, TTF, and other hard-switching topologies. In addition, the 600 V CoolMOS™ 8 SJ MOSFETs enable higher power density thanks to its optimized $R_{DS(on)}$ which allows us to bring our best-in-class (BiC) products down to a single digit of 7 mΩ in a Si-based super-junction (SJ) technology.

The portfolio offers has innovative SMD Q-DPAK, TOLL, and Thin-TOLL 8x8 package offerings to simplify and reduce assembly costs.



Features and benefits

Key features

- World class $R_{DS(on)}$ *A
- Integrated fast body diode
- Excellent commutation ruggedness
- Advanced interconnect technology
- Gradual portfolio including from 7 mΩ
- Top-side cooling packages

Key benefits

- 0.17% efficiency gain over P7, and 0.05% over C7
- Ease of use and fast design-in
- Low ringing tendency
- 14-42% lower R_{th}
- Simplified portfolio
- System level innovation



Server



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SMPS



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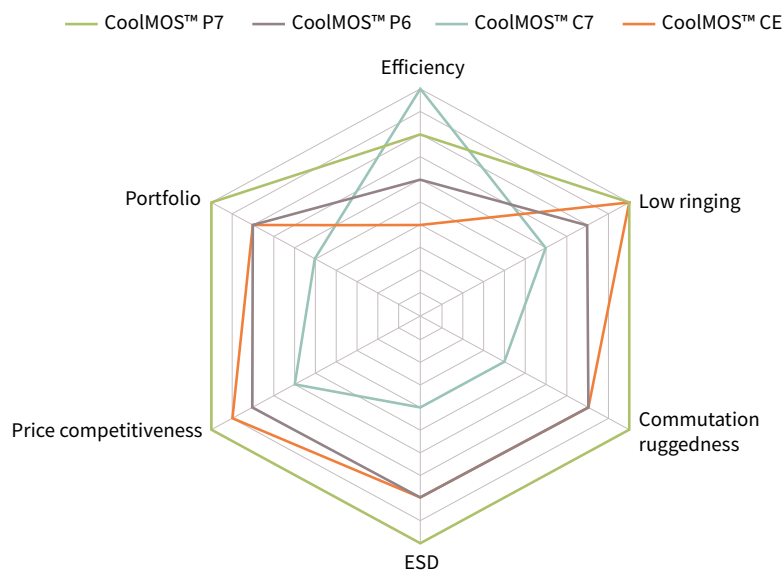
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600 V CoolMOS™ P7 SJ MOSFETs

Perfect combination of high efficiency and ease of use

The 600 V CoolMOS™ P7 is a general purpose series, targeting a broad variety of applications, ranging from low-power SMPS up to the highest power levels. In the low-power arena, it is the successor of the 600 V CoolMOS™ CE, and for high-power SPMS applications, it is the replacement for the 600 V CoolMOS™ P6, which makes it the perfect choice for applications such as chargers, adapters, lighting, TV and PC power supplies, solar, small light electric vehicles, server and telecom power supplies, and electric vehicle (EV) charging.

The 600 V CoolMOS™ P7 is Infineon's most well-balanced CoolMOS™ technology in terms of combining ease of use and excellent efficiency performance. Compared to its predecessors, it offers higher efficiency and improved power density due to the significantly reduced gate charge (Q_g) and switching losses (E_{oss}) levels, as well as optimized on-state resistance ($R_{DS(on)}$). The carefully selected integrated gate resistors enable very low ringing tendency and, thanks to its outstanding robustness of body diode against hard commutation, it is suitable for hard as well as soft-switching topologies, such as LLC. In addition, an excellent ESD capability helps to improve the quality in manufacturing. The 600 V CoolMOS™ P7 family offers a wide range of on-resistance ($R_{DS(on)}$)/package combinations, including THD, as well as SMD devices, at an $R_{DS(on)}$ granularity from 24 to 600 mΩ and comes along with the most competitive price/performance ratio of all 600 V CoolMOS™ offerings.



Features and benefits

Key features

- Suitable for hard and soft switching (PFC and LLC) due to an outstanding commutation ruggedness
- Optimized balance between efficiency and ease of use
- Significant reduction of switching and conduction losses leading to low MOSFET temperature
- Excellent ESD robustness >2 kV (HBM) for all products
- Better $R_{DS(on)}$ /package products compared to competition
- Large portfolio with granular $R_{DS(on)}$ selection qualified for a variety of industrial and consumer applications

Key benefits

- Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
- Improved efficiency and simplified thermal management due to low switching and conduction losses
- Higher manufacturing quality due to >2 kV ESD protection
- Increased power density solutions enabled by using products with smaller footprint
- Suitable for a wide variety of applications and power ranges



Charger



Adapter



Lighting



TV



PC power



Solar



LSEV



Server



Telecom



EV charger



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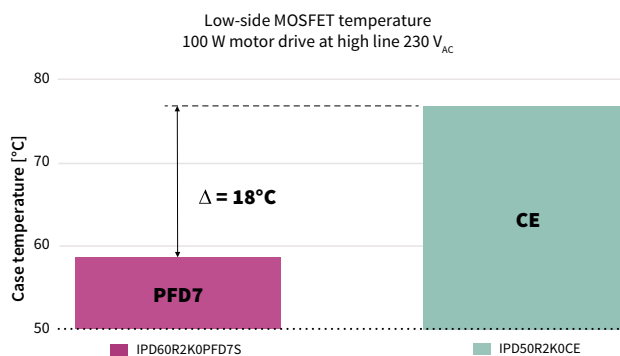
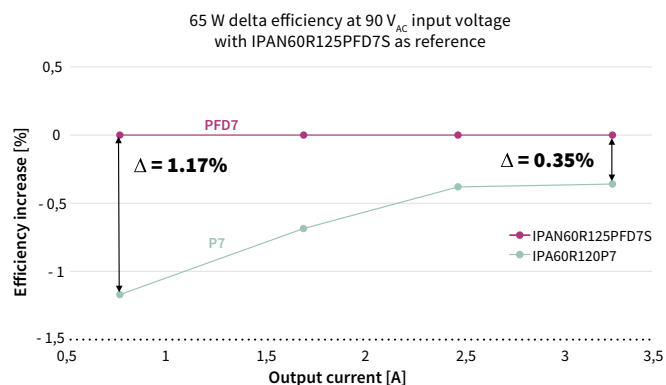
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600 V CoolMOS™ PFD7 SJ MOSFETs

The next level for ultrahigh power density designs and energy-efficient home appliance drives

The 600 V CoolMOS™ PFD7 MOSFET series set the benchmark in 600 V superjunction (SJ) technologies, shaped by Infineon's experience of more than 20 years in pioneering in superjunction technology innovation. The series combines best-in-class performance with state-of-the-art ease of use and features an integrated fast body diode ensuring a robust device and in turn reduced BOM for the customer. This product family offers up to 1.17 percent efficiency increase compared to the CoolMOS™ P7 technologies, which leads to a power density increase of 1.8 W/in³. CoolMOS™ PFD7 pushes the SJ MOSFET technology to new limits leading to outstanding improvement of lower conduction and charge/discharge losses as well as a reduced turn-off and gate-driving losses.

A broad range of $R_{DS(on)}$ values in combination with a variety of packages helps in selecting the right part to optimize designs. Furthermore, an integrated ESD protection of up to 2 kV eliminates ESD-related yield loss. Infineon's industry-leading SMD package offering contributes to bill-of-material and PCB space savings and simplifies manufacturing. This unique set of product features and their resulting benefits, position the CoolMOS™ PFD7 superjunction MOSFET family exceptionally well for ultrahigh density applications like chargers and adapters, USB power delivery but also for home appliance drives (e.g., refrigerator compressors) and specific lighting SMPS applications.



600 V CoolMOS™ PFD7 increases efficiency in light- and full-load conditions. This results in a power density increase of 1.8 W/in³ for ultrahigh power chargers and adapters.

600 V CoolMOS™ PFD7 provides up to 2 percent higher efficiency at 100 W, which results in an 18°C thermal improvement. Its excellent commutation ruggedness makes it the perfect fit for low-power drives.

Features and benefits

Key features

- Very low FOM $R_{DS(on)} \times E_{oss}$
- Integrated robust fast body diode
- Ultralow Q_{rr} and industry's fastest recovery time (T_{rr})
- Up to 2 kV ESD protection (HBM class 2)
- Wide range of $R_{DS(on)}$ values and broad package portfolio
- Excellent commutation ruggedness

Key benefits

- Minimized switching losses
- Power density improvement compared to latest CoolMOS™ charger technology
- Increased efficiency (especially at light-load operation) and improved thermal behavior compared to CoolMOS™ CE technology for home appliance motor drives
- BOM cost reduction and easy manufacturing
- Robustness and reliability
- Easy to select right parts for design fine-tuning



Consumer



Charger



Adapter



Pumps



Fans



Fridge



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600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs

Infiniteon's superjunction MOSFET series for highest efficiency

The 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFET series are designed to achieve record level efficiency performance – they offer substantial efficiency benefits over the whole load range in hard-switching applications compared to previous series and competition. This is achieved by minimizing switching losses via ultralow levels of switching losses (E_{oss}) (approximately 50 percent reduction compared to the CoolMOS™ CP), reduced gate charge (Q_g) and a careful balance of other relevant product key parameters. The low E_{oss} and Q_g also enable operation at higher switching frequency and related size reduction of the circuit magnetics.

The outstanding figures of merit (FOM) and the best-in-class on-state resistance ($R_{DS(on)}$) offerings make the CoolMOS™ C7 and C7 Gold series key enablers for highest efficiency and power density. While the 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFETs are solely designed for hard-switching applications such as PFC, the 600 V version is also well suited for high-end LLC stages due to its rugged body diode that withstands slew rates up to 20 V/ns. The product portfolio contains TO-247 4-pin, ThinPAK 8x8, TO-Leadless and top-side cooled Double DPAK (D-DPAK) packages which come with additional Kelvin source contacts enabling further efficiency advantages over the classical 3-pin approach.

Features and benefits

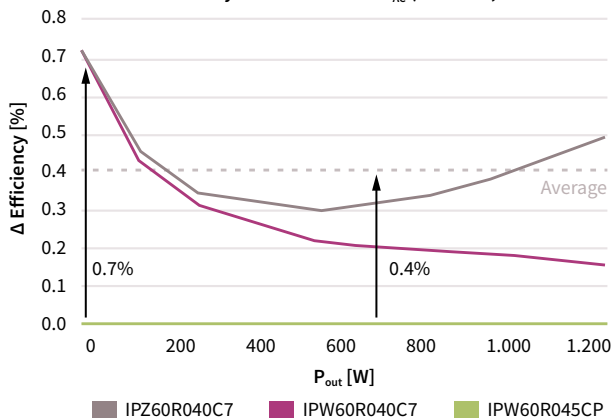
Key features

- Reduced switching loss parameters such as Q_g and C_{oss} , enabling higher switching frequency
- 50% E_{oss} reduction compared to older CoolMOS™ CP
- Suitable for hard-switching topologies (650 V and 600 V)
- Suitable for high-end resonant (600 V only) topologies

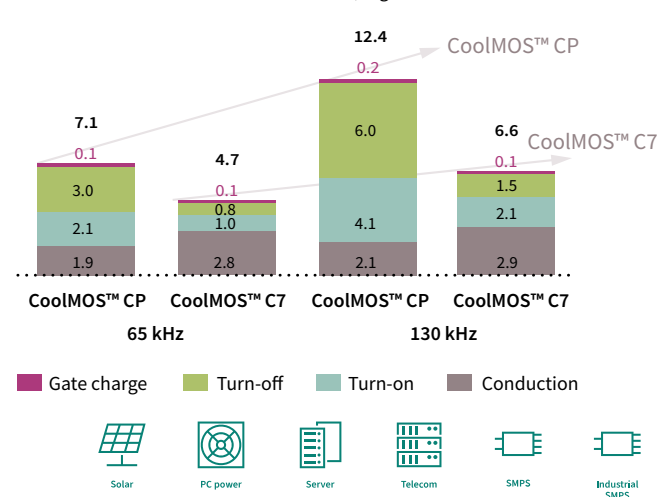
Key benefits

- Increased efficiency in hard-switching topologies such as PFC and TTF
- Reduced size and cost of magnetic components by increased switching frequency (e.g., 65-130 kHz)
- Increased power density by smaller packages for the same $R_{DS(on)}$

PFC CCM 1200 W efficiency difference for 90 V_{AC} (PFC CCM, 1.150 W at 65 kHz)



MOSFET losses [W]
IPW60R045CP vs. IPZ60R060C7, highline 2.5 kW

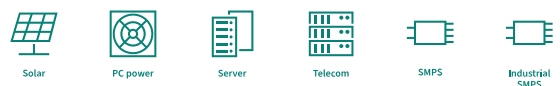


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600 V CoolMOS™ S7 SJ MOSFETs

The best price/performance SJ MOSFET for low frequency switching applications

The 600 V CoolMOS™ S7 superjunction MOSFET is the perfect fit for applications where MOSFETs are switched at low frequency, such as active bridge rectification, inverter stages, in-rush relays, PLCs, power solid state relays, and solid state circuit breakers. The new MOSFET design with the best conduction performance allows the CoolMOS™ S7 to offer cost-optimized distinctively low on-resistance ($R_{DS(on)}$) values, ideally suited for applications looking to minimize conduction losses at the best price.

Use cases

Typically, CoolMOS™ S7 is used in active rectification bridges, where diodes are replaced or paralleled with MOSFETs, obtaining an increase in efficiency without the need for extensive system redesign. In this application, the TO-leadless (TOLL) package in low $R_{DS(on)}$ allows the most efficient and compact modular design based on daughter cards. The CoolMOS™ S7 delivers also tremendous value to solid state relay (SSR) and solid state circuit breaker (SSCB) designs, by bringing the superjunction MOSFET advantages to a system level cost comparable to other silicon alternatives. In addition, any socket or topology switching at low frequency can greatly benefit from the leading low $R_{DS(on)}$ x price.

Features and benefits

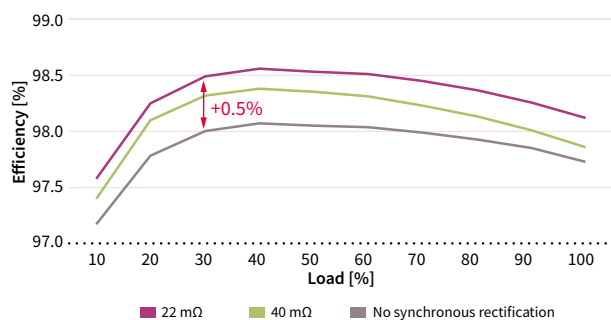
Key features

- Best-in-class $R_{DS(on)}$ in SMD packages
- Optimized for conduction performance, reaching the lowest $R_{DS(on)}$ values
- High pulse current capability
- Improved thermal resistance

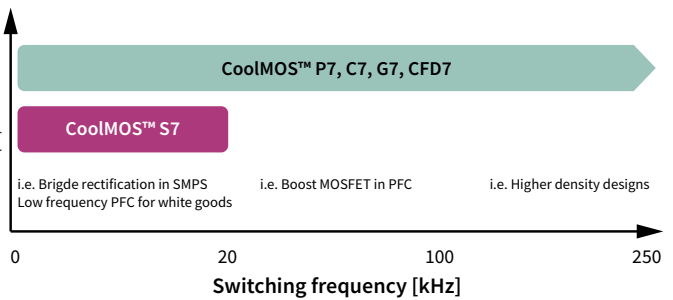
Key benefits

- Minimizes conduction losses
- An easy step into Titanium level SMPS
- Modular, more compact and easier designs
- Eliminates or reduces heat sink in solid state relays and circuit breakers
- Lower TCO cost or BOM cost

Efficiency in 2400 W PFC at $V_{in} = 230 V_{AC}$ Difference between using or not using the active-bridge rectification



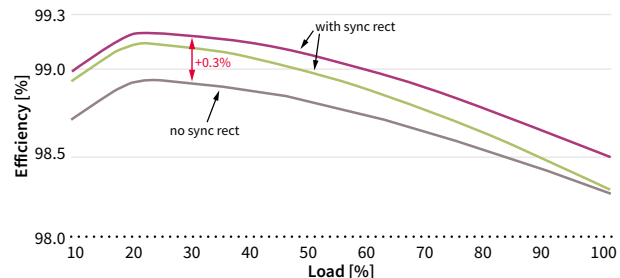
CoolMOS™ S7 brings more efficiency to power supplies when used in an active rectification bridge.



The CoolMOS™ S7 leads the way for power density, uniquely fitting a 22 mΩ $R_{DS(on)}$ chip into an innovative small TO-Leadless (TOLL) SMD package.

3 kW GaN-based totem pole PFC efficiency calculation with and without synchronous rectification when

$$V_{in} = 230 V_{AC}, V_{out} = 400 V, f_{sw} = 65 \text{ kHz}$$



CoolMOS™ S7 is the perfect complement for CoolSiC™ MOSFETs and CoolGaN™ GIT HEMTs in totem pole PFC topologies.



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600 V CoolMOS™ S7-T SJ MOSFETs with integrated temperature sensor

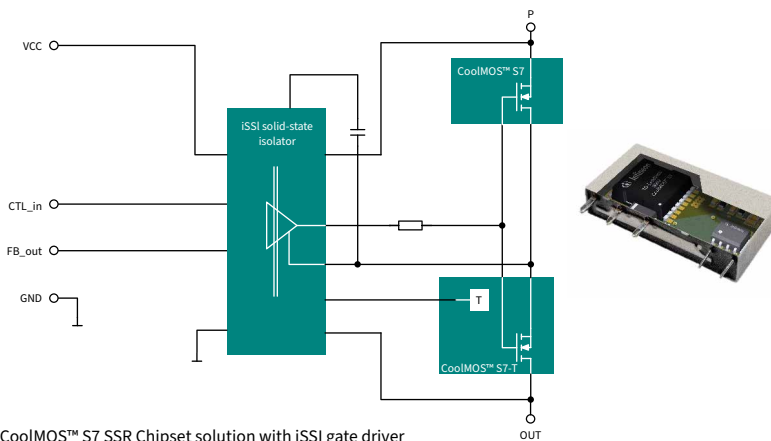
The best fit for solid-state applications

As an addition to our 600 V CoolMOS™ S7 product family, the 600 V CoolMOS™ S7-T is introduced as an optimized low-frequency and high-current switching applications with an integrated temperature measuring functionality, which is an ideal fit for solid-state relay, circuit breaker designs, and line rectification in SMPS. The 600 V CoolMOS™ S7-T has a monolithically embedded temperature sensor, which increases junction temperature sensing accuracy and robustness while enabling easy implementation. It optimizes the thermal utilization of power transistor design, and simplifies heat sink design, as well as and reduction of external sensing elements. Essentially this lower overall system complexity and reduces system cost.

The CoolMOS™ S7-T comes in TOLL and Q-DPAK top-side cooled (TSC) package, with a compatible $R_{DS(on)}$ matching those of the S7 portfolio offerings. The best-in-class silicon base $10\text{ m}\Omega$ comes in the Q-DPAK TSC and BSC. The top-side cooling concept enables thermal decoupling between the PCB material and semiconductor overcome thermal limit, making it a compelling solution in addressing higher power level. Combined with the low $R_{DS(on)}$, the SMD package is able to drive the efficiency and power density to the next level.

The solid state isolators (iSSI) gate driver is a dedicated pin-to-pin gate driving solution to complement the S7-T MOSFET, offering customers ease of use as a complete system solution. More information about the iSSI gate drive can be found in Infineon Solid State Isolators (iSSI).

A back-to-back configuration, using CoolMOS™ S7 on the high side and the S7-T at the low side



Features and benefits

Key features

- Enabled lowest $R_{DS(on)}$ in the smallest footprint
- High pulse current capability
- Seamless diagnostic at the lowest system cost
- Temperature sense feature for protection and optimized thermal device utilization

Key benefits

- Minimized conduction losses
- Increased system performance
- Reduction of external sensing elements
- Lower BOM or/and TCO over a prolonged lifetime
- More compact and simplified design



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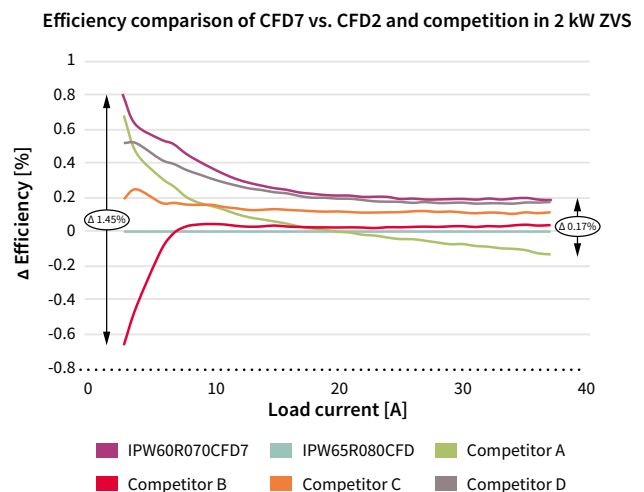
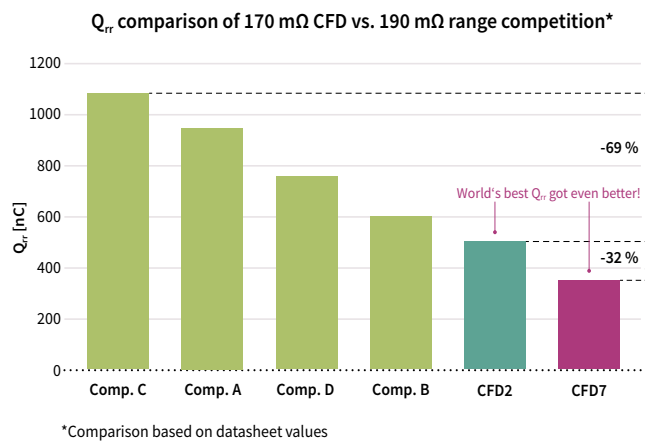
600 V CoolMOS™ CFD7 SJ MOSFETs

Infiniteon's solution for resonant switching high-power applications

The 600 V CoolMOS™ CFD7 is one of Infineon's high-voltage superjunction MOSFET series with an integrated fast body diode. It is the ideal choice for resonant topologies, such as LLC and ZVS PSFB, and targets the high SMPS market.

As a result of significantly reduced gate charge (Q_G), improved turn-off behavior, a reverse recovery charge (Q_{rr}) of up to 69 percent lower compared to the competition, as well as the lowest reverse recovery time (t_{rr}) in the market, it combines the highest efficiency and best-in-class reliability in soft-switching applications, without sacrificing the easy implementation in the design-in process.

In addition, the 600 V CoolMOS™ CFD7 enables higher power density solutions by offering the best-in-class on-state resistance ($R_{DS(on)}$) package combinations in through-hole devices, as well as in surface mount devices. In ThinPAK 8x8 and TO-220 with CoolMOS™ CFD7, a $R_{DS(on)}$ of around 30 percent below the next best competitor offering can be achieved. All this together makes CoolMOS™ CFD7 the perfect fit for server and telecom applications, and it is also suitable for EV-charging stations.



Features and benefits

Key features

- Ultrafast body diode
- Best-in-class reverse recovery charge (Q_{rr})
- Improved reverse diode dv/dt and dif/dt ruggedness
- Lowest figure of merit ($R_{DS(on)} \times Q_G \times E_{oss}$)
- Best-in-class $R_{DS(on)}$ /package combinations

Key benefits

- Best-in-class hard commutation ruggedness
- Highest reliability for resonant topologies
- Highest efficiency with outstanding ease of use/performance trade-off
- Enabling increased power density solutions



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Solar



SMPS



Server



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EV charger

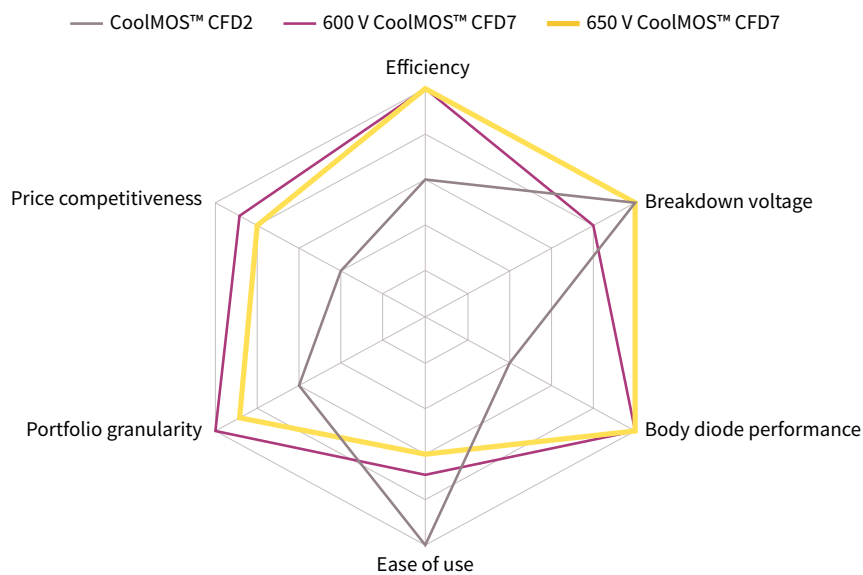
650 V CoolMOS™ CFD7 SJ MOSFETs

Tailored to win in resonant topologies

The need for improved efficiency and higher power density in industrial SMPS applications is driven by the megatrends of the 21st century such as big data, digitalization, and e-mobility. Furthermore, over the last few years, due to the higher nominal input voltages in the US, a trend towards 450 V bus voltage, and the need for worldwide applicable designs, the demand for 650 V breakdown voltage has increased significantly - also for resonant topologies.

The 650 V device family is the voltage-range extension of Infineon's renowned CoolMOS™ CFD7 family, the successor to the well-established CoolMOS™ CFD2. It comes along with an additional 50 V breakdown voltage, integrated fast body diode, improved switching performance (compared to previous generations), and excellent thermal behavior. Thanks to these features, the 650 V CoolMOS™ CFD7 allows for the highest efficiency and power density levels in soft-switching applications such as LLC and ZVS phase-shift-full-bridge.

The best-in-class $R_{DS(on)}$ in TO-247, TO-220, and D²PAK enables customers to increase the power density level of their designs primarily addressing telecom, server, solar, and (off-board) EV-charging applications.



Features and benefits

Key features

- 650 V blocking voltage
- Ultrafast body diode
- Reduced switching losses
- Low $R_{DS(on)}$ dependency over temperature

Key benefits

- 50 V extra margin for increased bus voltage
- Excellent hard commutation ruggedness
- Outstanding light load efficiency
- High full load efficiency



Telecom



Server



EV charger



Solar



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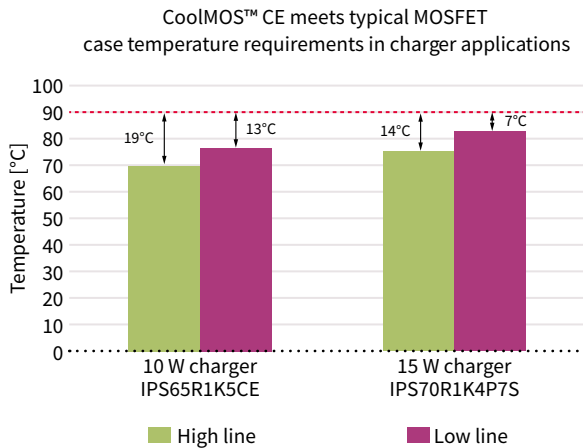
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CoolMOS™ CE SJ MOSFETs

High-voltage superjunction MOSFETs for consumer applications

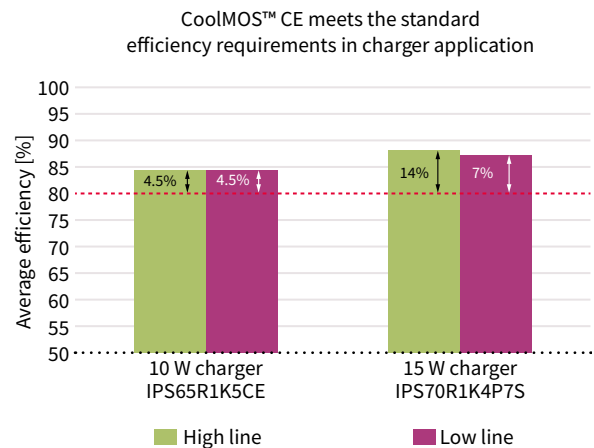
Infiniteon's CoolMOS™ CE is a product family that addresses consumer and lighting applications. It offers benefits in efficiency and thermal behavior versus standard MOSFETs and is optimized for ease of use and cost-competitiveness, while delivering the right-fit performance and excellent Infineon quality.

Application example: 10 W and 15 W smartphone charger



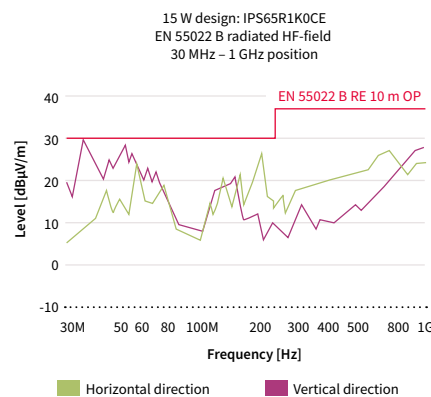
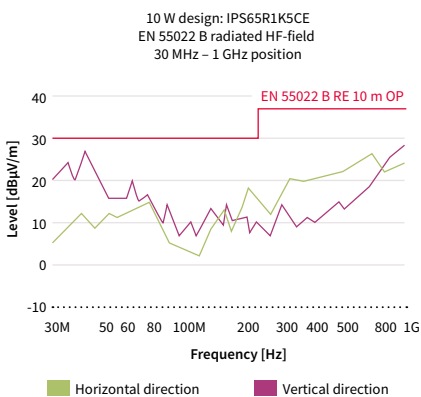
CoolMOS™ CE case temperature:

The maximum MOSFET case temperature is required to be below 90°C. CoolMOS™ CE meets this requirement and offers enough margin required for design-in flexibility.



CoolMOS™ CE efficiency performance:

CoolMOS™ CE meets the 80 percent standard efficiency requirement and offers enough margin required for design-in flexibility.



The performance of CoolMOS™ CE in the 10 W and 15 W design demonstrates that the series meets common EMI requirements for charger applications and thus, is also offering design-in flexibility.

CoolMOS™ CE customer benefits

Product portfolio	Broad portfolio covering five voltage classes in both through-hole and SMD packages
Quality	Field failure rates are as low as 0.1 DPM
Design-in support	Large field application engineering team to provide professional and flexible support for your design



Consumer



Lighting



LCD TV



LED



Adapter



Charger



PC power



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CoolMOST™ SJ MOSFETs for automotive

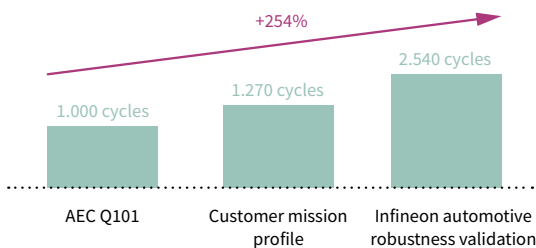
600 V CoolMOST™ CPA, 650 V CoolMOST™ CFDA, 800 V CoolMOST™ C3A, 650 V CoolMOST™ CFD7A – on the fast lane in automotive applications

The highest system performance in a size and weight constrained environment, outstanding and proven product quality and reliability, as well as 100 percent reliable delivery, are key requirements for manufacturers in the automotive market. With the high-voltage automotive MOSFET series 600 V CoolMOST™ CPA and 650 V CoolMOST™ CFDA, 800 V CoolMOST™ C3A, and 650 V CoolMOST™ CFD7A, Infineon is perfectly prepared to take the challenges in the strongly growing automotive market.

Product series	Key features	Applications	Quality
600 V CoolMOST™ CPA	Best choice for demanding hard-switching applications <ul style="list-style-type: none"> Lowest $R_{DS(on)}$ per package Lowest gate charge value Q_g 	<ul style="list-style-type: none"> Hard-switching topologies (with SiC diode) PFC boost stages in on-board charger 	Quality level well beyond the formal requirements of the AEC Q101 standard through Special screening measures in front end, back end Mission-profile based qualification procedures
650 V CoolMOST™ CFDA	Easy implementation of layout and design <ul style="list-style-type: none"> Integrated fast body diode Limited voltage overshoot during hard commutation – self-limiting dI/dt and dV/dt Low $Q_{g,ss}$ at repetitive commutation on body diode and low Q_{oss} 	<ul style="list-style-type: none"> Resonant-switching topologies DC-DC stage of OBC LLC or full-bridge phase shift (ZVS) in DC-DC converter HID lamp Active DC link discharge Pre-charge 	
800 V CoolMOST™ C3A	<ul style="list-style-type: none"> Outstanding performance in terms of efficiency, thermal behavior and ease-of-use High blocking voltage 	<ul style="list-style-type: none"> Flyback low-power auxiliaries On-board charger HV-LV DC-DC converter Battery disconnect unit Traction inverter auxiliaries DC-link pre-charge DC-link active discharge Isolation monitoring 	
650 V CoolMOST™ CFD7A	<ul style="list-style-type: none"> Improved 650 V CoolMOST™ CFDA Higher application voltage possible (at the same proven reliability level) D²PAK 7-pin with increased creepage distance and Kelvin source Considerable improvement in key parameters (higher efficiency) 	<ul style="list-style-type: none"> On-board charger <ul style="list-style-type: none"> Hard-switching topologies (with SiC diode) PFC boost stages DC-DC stage of OBC HV-LV DC-DC converter <ul style="list-style-type: none"> LLC or full-bridge phase shift (ZVS) Auxiliary power supplies 	

CoolMOST™ SJ MOSFET automotive – benchmark in quality and reliability

Robustness validation – example for thermal cycling test



Focus on top-notch quality and reliability without any compromise – that is the principle Infineon applies during development and qualification of all CoolMOST™ superjunction technologies. For our automotive grade derivatives, the great quality levels of the industrial-based technologies are further boosted by special screening measures in front- and back-end, as well as by extended qualification procedures. The Infineon robustness validation approach with extended stress-test procedures, doubling the real

application requirements, is one of our key measures to ensure a quality level well beyond the formal requirements of the AEC Q101 standard. Aside from extended stress times on standard qualification tests, it comprises test procedures, specially developed by Infineon to ensure highest quality of e.g., the power metallization of our devices. Usage of robust package technologies, 100 percent gate oxide screening, and top-notch production monitoring, including yield screening measures, part average testing (PAT), statistical bin alarm (SBA), and pattern recognition procedures, complete our package to guarantee highest automotive quality. This holistic approach results in an unrivalled quality position of Infineon's CoolMOST™ SJ MOSFETs for automotive.



On-board charger



eMobility



HV-LV DC-DC converter



Lighting



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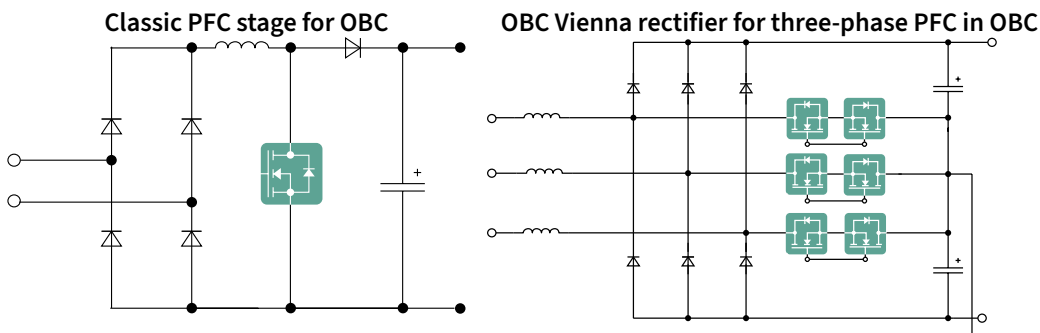
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CoolMOS™ SJ MOSFET automotive – ready to support future application trends

Driven by the carbon dioxide (CO₂) reduction initiatives, the market of plug-in hybrid PHEV and pure EV is strongly growing. Higher ranges of the electric vehicles are realized by increasing the battery capacity and the energy efficiency of the used electric components. The used battery voltage classes tend to become standardized at approximately 450 V with a trend towards the higher voltages, as this supports faster charging times and enables lighter cabling within the vehicle. Discrete high-voltage components are widely used for on-board charger (OBC) and DC-DC converter (LDC) applications, as price pressure increasingly displaces module-based solutions. The trend towards fast charging impacts on the power range demanded from OBC topologies. Presently, as well as in the past, a vast majority of OBC topologies have been found in the range up to 7.2 kW, whereas the future tends to stir the trend towards 11 kW or even up to 22 kW. This development, paired with a demand for high efficiency and power density at low system cost, is a strong driver for the usage of three-phase solutions.



While for the lower power OBC solutions classic PFC approaches are the well-established approaches in the market, the Vienna rectifier is the optimal solution for the higher power levels. As a true three-phase topology, it delivers full power if attached to a three-phase input but is flexible enough to run on a single-phase if required. The three-level topology minimizes the filter effort compared to other solutions. By using the doubled frequency on the magnetic components, it also helps to significantly reduce the size of the passives. As a three-level topology, the Vienna rectifier, followed by two paralleled DC-DC stages, furthermore leads to a relaxed voltage stress level on the power MOSFETs. This way, it enables to handle upcoming higher battery voltage levels. The $R_{DS(on)}$, required to yield a desired efficiency level in a Vienna Rectifier, is a function of applied switching frequency and demanded power level. With our 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA portfolio, covering an $R_{DS(on)}$ range from 45 to 660 mΩ, we are well-prepared to support your next-generation three-phase Vienna rectifier design. With CoolMOS™ you are ready to seize your share in the emerging high-power on-board charger markets.



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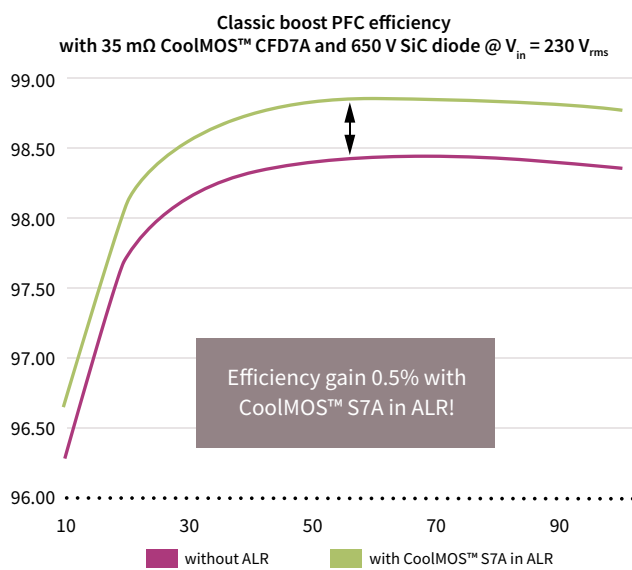
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600 V CoolMOS™ S7A

Best-in-class $R_{DS(on)}$ x A SJ MOSFET for slow-switching automotive applications

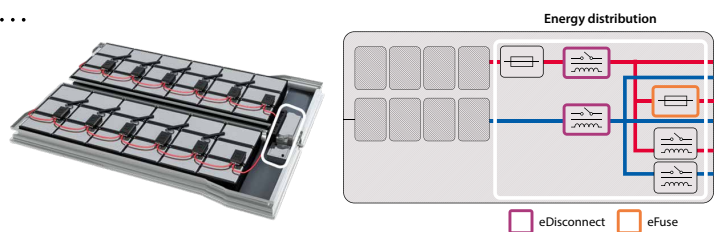
The automotive-grade 600 V CoolMOS™ S7A superjunction MOSFET addresses xEV applications where MOSFETs are switched at low frequency, such as HV eFuse, HV eDisconnect, and on-board charger in the slow-switching leg of the PFC stage. The more stringent requirements for increased power density, safety, and reliability in these applications are met by combining the superior robustness and performance of the S7A MOSFET with the innovative package concept offered by the Q-DPAK TSC. The new MOSFET design offers a cost-optimized, distinctively low on-resistance $R_{DS(on)}$ of 10 mΩ, enabling increased power density and minimized conduction losses. The top-side cooled Q-DPAK package offers increased efficiency and controllability thanks to its intrinsic Kelvin source, high power dissipation capability, and innovative cooling concept.



CoolMOS™ S7A is the ideal device for the ALR active line rectification in a classic boost PFC topology, which offers a power loss reduction up to 30 percent and an overall PLC efficiency improvement of 0.5 percent.

CoolMOS™ S7A is the semiconductor solution for HV eDisconnect and HV eFuse. It answers e-mobility needs with respect to reliability (maintenance-free), flexible and cost-optimized system integration, scalability, and minimized failure propagation.

HV power distribution unit



Features and benefits

Key features

- Best-in-class $R_{DS(on)}$: 10 mΩ
- Smallest $R_{DS(on)}$ in SMD packages
- Optimized for conduction performance
- Industry's leading heat-sinking capability
- High pulse current capability
- Body diode robustness at AC line commutation
- Kelvin-source concept

Key benefits

- Minimized conduction losses
- Increased energy efficiency
- More compact and easier designs
- Increased power density
- Lower TCO cost or BOM cost
- Flexible system integration
- Variable cooling strategy



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On-board charger



eMobility



Battery disconnect



Fuses and relay

600 V CoolMOS™ S7A-T SJ MOSFETs with integrated temperature sensor

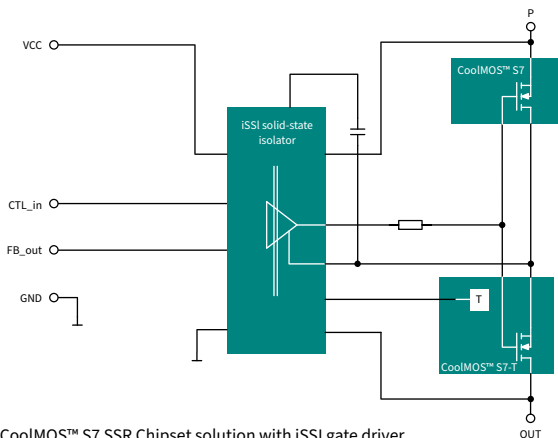
Pioneering solid-state applications in automotive

In addition to our 600 V CoolMOS™ S7A product family, the 600 V CoolMOS™ S7A-T is introduced as an optimized solution for the automotive sector's low-frequency and high-current switching applications. Featuring an embedded temperature sensor, the S7A-T enhances junction temperature sensing accuracy and robustness, ensuring easy and seamless implementation. This monolithically embedded temperature sensor optimizes power transistor design and simplifies heat sink design, lowering system complexity and cost. The temperature sense feature also provides protection and optimized thermal device utilization, resulting in a more compact design than electromechanical devices.

The 600 V CoolMOS™ S7A-T is well-suited for potential applications such as circuit breakers (HV eDisconnect switch, DC and AC low-frequency switch, HV eFuse, onboard charger) and line rectification in high-power/performance automotive applications.

Available in the Q-DPAK in both TSC and BSC configurations, the CoolMOS™ S7A-T offers a compatible RDS(ON) matching those of the 600 V CoolMOS™ S7A portfolio offerings. Its silicon base's best-in-class 10 mΩ in the Q-DPAK, in both TSC and BSC configurations, combined with the top-side cooling concept, enables thermal decoupling between the PCB material and semiconductor. This feature overcomes thermal limits and addresses higher power levels, driving efficiency and power density to the next level.

A back to back configuration, using CoolMOS™ S7 on the high side and the S7-T at the low side



CoolMOS™ S7 SSR Chipset solution with iSSI gate driver



CoolMOS™ S7 SSR Chipset solution with iSSI gate driver

Features and benefits

Key features

- Optimized price performance in low-frequency switching applications
- High pulse current capability
- Seamless diagnostic at the lowest system cost
- Temperature sense feature for protection and optimized thermal device utilization

Key benefits

- Reduction of external sensing elements, hence a more compact design compared to electromechanical devices
- Increased system performance
- Minimized conduction losses
- More reliability and longer system lifetime
- Shock and vibration resistance with no contact arcing or bouncing



On-board charger



eMobility



Battery disconnect



Fuses and relay



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CoolMOS™ SJ MOSFET high-power package innovations

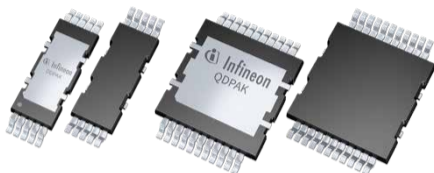
Space-saving and high performance packages



An SMD package for high efficiency and controllability in automotive applications

TO-263-7 (D²PAK-7-pin)

The TO-263-7-pin package is a SMD package addressing automotive-specific requirements including high efficiency and controllability. The Kelvin source pin leads to reduced switching losses. Furthermore, the 7-pin design increases the creepage distance at the PCB and therefore helps to improve the manufacturability.



Innovative top-side cooled SMD solution for high-power applications

Top-side cooled Double & Quadruple DPAK (D-DPAK + Q-DPAK)

These top-side cooled surface mount device (SMD) packages (available today in 600 V CFD7, G7, S7, CM8, CoolSiC™ MOSFET 750 V) address high-power SMPS applications such as PC power, solar, telecom, solid state circuit breaker as well as automotive applications like HV eDisconnect, HV eFuse and on-board charger. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded packages such as the TO-247 package. In today's SMD-based designs, the output power is restricted by the thermal limit of the PCB material because the heat must be dissipated through the board. Thanks to the top-side cooling concept of D-DPAK and Q-DPAK, the thermal decoupling of board and semiconductor is possible, enabling higher power density or improved system lifetime.



Innovative bottom-side cooled SMD solution for high-power applications

Bottom-side cooled Q-DPAK

The bottom-side cooled surface mount device (SMD) packages address high-power SMPS applications such as solar, server, telecom as well as automotive applications. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded package. Furthermore, SMD packages simplify assembly and reduce cost, while minimizing space requirements for the overall packages. The bottom-side cooled variant of Q-DPAK allow designers to benefit from these advantages, while implementing a more traditional cooling scheme for high power switches compared to the novel top-side cooled variants. Tried and tested PCB materials and assembly can be used, while improving the power path routing thanks to multiple source pins, as well as benefiting from advanced features such as multiple gate pins for safety applications.



For highest efficiency and controllability in high-power SMPS markets

TO-247 4-pin with asymmetric leads

The TO-247 4-pin package with asymmetric leads is an optimized version of the standard TO-247 4-pin and enables highest efficiency and controllability in the high-power SMPS market. The fourth pin acts as a Kelvin source. The main current of the switch is placed outside of the gate loop and the feedback is eliminated. This leads to less switching losses, especially at high currents. Secondly, the EMI will be reduced due to cleaner waveforms. In addition, the asymmetric leads further improve the ease of use in the design-in process.

Compared to the standard TO-247 4-pin the distance between the critical pins has been increased to enable simplified wave soldering and reduced board yield loss.



Enabling significant space savings

ThinPAK 8x8

With a very small footprint of only 64 mm² (vs. 150 mm² for the D²PAK) and a very low profile with only 1 mm height (vs. 4.4 mm for the D²PAK) the ThinPAK 8x8 leadless SMD package for high-voltage MOSFETs is a first choice to decrease system size in power-density driven designs.

Low parasitic inductance and a separate 4-pin Kelvin source connection offer best efficiency and ease of use. The package is RoHS compliant with halogen-free mold compound.



Optimized for high-power applications

TO-Leadless

Combined with the CoolMOS™ C7 Gold (G7) technology, the TO-Leadless (TOLL) package is Infineon's flagship SMD package for high power/high current SMD solutions. Compared to D²PAK 7-pin, TO-Leadless shows a 30 percent reduction in footprint, yet offers improved thermal performance. This, and the 50 percent height reduction result in a significant advantage whenever highest power density is demanded. Equipped with 4-pin Kelvin source connection and low parasitic inductances the package offers best efficiency and ease of use. The package is MSL1 compliant and reflow solderable.



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CoolMOS™ SJ MOSFET low-power package innovations

Addressing today's consumer needs



Cost-effective drop-in replacement for DPAK

SOT-223

The SOT-223 package without middle pin is a cost-effective alternative to DPAK, addressing the need for cost reductions in price-sensitive applications. It offers a smaller footprint, while still being pin-to-pin compatible with DPAK, thus, allowing a drop-in replacement for DPAK and second sourcing. Moreover, SOT-223 achieves comparable thermal performance to DPAK and enables customers to achieve improved form factors or space savings in designs with low power dissipation.



Solution for slim and small adapters and chargers

ThinPAK 5x6

ThinPAK 5x6 reduces the PCB area by 52 percent and height by 54 percent when compared to the DPAK package which is widely used in chargers and adapters. ThinPAK 5x6 is the right device to replace DPAK and meet the market demands of slimmer and smaller designs. Also, ThinPAK 5x6 enables a reduced charger and adapter case hot spot temperature by increasing the space between the MOSFET and the charger and adapter case.



Solution for height reduction in adapters and chargers

TO-220 FullPAK Narrow Lead

Infineon's TO-220 FullPAK Narrow Lead addresses customer needs with regards to height reduction requirements in adapter and charger applications. By offering an optimized standoff width and height and improved creepage distance, the package can be fully inserted into the PCB without any production concerns and, therefore, is especially suitable for slim and semi-slim adapter solutions.



Improved creepage distance for open frame power supplies

TO-220 FullPAK Wide Creepage

This package solution has an increased creepage distance between the pins to 4.25 mm compared to 2.54 mm of a TO-220 FullPAK package. It targets open frame power supplies such as TV sets and PC power, where dust can enter the case through air vents. Dust particles can reduce the effective creepage between pins over time, which may lead to high voltage arcing. The package meets the requirements of open frame power supplies without any additional measures. Thus, it reduces system cost by offering an alternative to frequently used approaches to increase creepage distance.



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950 V CoolMOS™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO247	TO252 (DPAK)	TO263 (D ² PAK)
60		IPW95R060PFD7		
130	IPA95R130PFD7	IPW95R130PFD7		IPB95R130PFD7
310	IPA95R310PFD7	IPW95R310PFD7		IPB95R310PFD7
450	IPA95R450PFD7		IPD95R450PFD7	IPB95R450PFD7

950 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	SOT-223	TO-251 Long lead	TO-252 (DPAK)
450		IPA95R450P7			IPD95R450P7
750		IPA95R750P7		IPU95R750P7	IPD95R750P7
1200		IPA95R1K2P7	IPN95R1K2P7		IPD95R1K2P7
2000					IPD95R2K0P7
3700			IPN95R3K7P7		

800 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-251 (IPAK)	SOT-223	TO-220 FullPAK narrow lead	ThinPAK 5x6
280		IPA80R280P7		IPD80R280P7				
360		IPA80R360P7		IPD80R360P7			IPAN80R360P7	
450		IPA80R450P7		IPD80R450P7				
600		IPA80R600P7		IPD80R600P7	IPU80R600P7			IPLK80R600P7
750		IPA80R750P7		IPD80R750P7				IPLK80R750P7
900		IPA80R900P7		IPD80R900P7	IPU80R900P7			IPLK80R900P7
1200				IPD80R1K2P7				IPLK80R1K2P7
1400	IPP80R1K4P7	IPA80R1K4P7		IPD80R1K4P7	IPU80R1K4P7	IPN80R1K4P7		IPLK80R1K4P7
2000				IPD80R2K0P7	IPU80R2K0P7			IPLK80R2K0P7
2400				IPD80R2K4P7		IPN80R2K4P7		
3300				IPD80R3K3P7				
4500				IPD80R4K5P7	IPU80R4K5P7	IPN80R4K5P7		



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800 V CoolMOS™ C3



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D ² PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)
85				SPW55N80C3	
290					
450					
650	SPP08N80C3				
900					
1300					
2700					

700 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-251 (IPAK Short Lead)	TO-220 FullPAK	TO-252 (DPAK)	TO-220 FullPAK narrow lead	SOT-223	ThinPAK 5x6
360		IPA70R360P7S	IPD70R360P7S	IPAN70R360P7S	IPN70R360P7S	
450					IPN70R450P7S	
600		IPA70R600P7S	IPD70R600P7S	IPAN70R600P7S	IPN70R600P7S	IPLK70R600P7
750						IPLK70R750P7
900			IPD70R900P7S			IPLK70R900P7
1200						IPLK70R1K2P7
1400	IPS70R1K4P7S		IPD70R1K4P7S		IPN70R1K4P7S	IPLK70R1K4P7
2000					IPN70R2K0P7S	IPLK70R2K0P7



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650 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D ² PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 8x8
19				IPW65R019C7	IPZ65R019C7		
45	IPP65R045C7	IPB65R045C7	IPA65R045C7	IPW65R045C7	IPZ65R045C7		
65	IPP65R065C7	IPB65R065C7	IPA65R065C7	IPW65R065C7	IPZ65R065C7		
70							IPL65R070C7
95	IPP65R095C7	IPB65R095C7	IPA65R095C7	IPW65R095C7	IPZ65R095C7		
99							IPL65R099C7
125	IPP65R125C7	IPB65R125C7	IPA65R125C7	IPW65R125C7			
130							IPL65R130C7
190	IPP65R190C7	IPB65R190C7	IPA65R190C7	IPW65R190C7		IPD65R190C7	
195							IPL65R195C7
225	IPP65R225C7					IPD65R225C7	
230							IPL65R230C7

650 V CoolMOS™ CFD2



$R_{DS(on)}$ [mΩ]	TO-220	TO-262 (I ² PAK)	TO-263 (D ² PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8
41					IPW65R041CFD		
80					IPW65R080CFD		
110	IPP65R110CFD		IPB65R110CFD	IPA65R110CFD	IPW65R110CFD		
150	IPP65R150CFD		IPB65R150CFD	IPA65R150CFD	IPW65R150CFD		
165							IPL65R165CFD
190	IPP65R190CFD		IPB65R190CFD	IPA65R190CFD	IPW65R190CFD		
210							
310	IPP65R310CFD		IPB65R310CFD	IPA65R310CFD			
420	IPP65R420CFD					IPD65R420CFD	
660						IPD65R660CFD	
950						IPD65R950CFD	

650 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D ² PAK)	TO-247	TO-247 4-pin	TO-Leadless (TOLL)	ThinPAK 8x8	Q-DPAK BSC	Q-DPAK TSC
17							IPQC65R017CFD7	IPDQ65R017CFD7
18			IPW65R018CFD7	IPZA65R018CFD7				
29			IPW65R029CFD7	IPZA65R029CFD7				IPDQ65R029CFD7
40					IPT65R040CFD7		IPQC65R040CFD7	IPDQ65R040CFD7
41	IPP65R041CFD7	IPB65R041CFD7	IPW65R041CFD7					
60	IPP65R060CFD7		IPW65R060CFD7		IPT65R060CFD7			IPDQ65R060CFD7
65						IPL65R065CFD7		
80					IPT65R080CFD7			IPDQ65R080CFD7
90	IPP65R090CFD7	IPB65R090CFD7	IPW65R090CFD7					
95						IPL65R095CFD7		
99					IPT65R099CFD7			IPDQ65R099CFD7
110	IPP65R110CFD7	IPB65R110CFD7	IPW65R110CFD7					
115						IPL65R115CFD7		
125		IPB65R125CFD7	IPW65R125CFD7		IPT65R125CFD7			IPDQ65R125CFD7
130						IPL65R130CFD7		
155	IPP65R155CFD7	IPB65R155CFD7	IPW65R155CFD7		IPT65R155CFD7			
160						IPL65R160CFD7		
190	IPP65R190CFD7				IPT65R190CFD7			
200						IPL65R200CFD7		



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$R_{DS(on)}$ [mΩ]	Q-DPAK TSC	D-DPAK	TOLL	Thin-TOLL 8x8	DPAK	TO 247-3	TO 247-4	TO 220	TO 220 FullPAK narrow lead
7	IPDQ60R007CM8								
16	IPDQ60R016CM8		IPT60R016CM8			IPW60R016CM8	IPZA60R016CM8	IPP60R016CM8	
24	IPDQ60R024CM8*		IPT60R024CM8*			IPW60R024CM8*	IPZA60R024CM8*		
37	IPDQ60R037CM8	IPDD60R037CM8	IPT60R037CM8			IPW60R037CM8	IPZA60R037CM8	IPP60R037CM8	
55	IPDQ60R055CM8*		IPT60R055CM8*			IPW60R055CM8*	IPZA60R055CM8*		
70	IPDQ60R070CM8*		IPT60R070CM8*			IPW60R070CM8*	IPZA60R070CM8*		
99			IPT60R099CM8*			IPW60R099CM8*	IPZA60R099CM8*		
120			IPT60R120CM8*			IPW60R120CM8*			
160			IPT60R160CM8*						
180		IPDD60R180CM8	IPT60R180CM8	IPTA60R180CM8	IPD60R180CM8			IPP60R180CM8	IPAN60R180CM8
600					IPD60R600CM8				

600 V CoolMOST™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK Narrow Leads	TO-252 (DPAK)	SOT-223	ThinPAK 5x6
125	IPAN60R125PFD7S			
210	IPAN60R210PFD7S	IPD60R210PFD7S		
280	IPAN60R280PFD7S	IPD60R280PFD7S		
360	IPAN60R360PFD7S	IPD60R360PFD7S	IPN60R360PFD7S	IPLK60R360PFD7
600		IPD60R600PFD7S	IPN60R600PFD7S	IPLK60R600PFD7
1000		IPD60R1K0PFD7S	IPN60R1K0PFD7S	IPLK60R1K0PFD7
1500		IPD60R1K5PFD7S	IPN60R1K5PFD7S	IPLK60R1K5PFD7
2000		IPD60R2K0PFD7S	IPN60R2K0PFD7S	

600 V CoolMOST™ P7 industrial grade



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8	TO-263 (D ² PAK)
24			IPW60R024P7			
37			IPW60R037P7			
45			IPW60R045P7			IPB60R045P7
60	IPP60R060P7	IPA60R060P7	IPW60R060P7			IPB60R060P7
65					IPL60R065P7	
80/85	IPP60R080P7	IPA60R080P7	IPW60R080P7		IPL60R085P7	IPB60R080P7
99	IPP60R099P7	IPA60R099P7	IPW60R099P7			IPB60R099P7
105					IPL60R105P7	
120	IPP60R120P7	IPA60R120P7	IPW60R120P7			IPB60R120P7
125					IPL60R125P7	
160	IPP60R160P7	IPA60R160P7				
180	IPP60R180P7	IPA60R180P7	IPW60R180P7	IPD60R180P7		IPB60R180P7
185					IPL60R185P7	
280	IPP60R280P7	IPA60R280P7		IPD60R280P7		IPB60R280P7
285					IPL60R285P7	
360	IPP60R360P7			IPD60R360P7		IPB60R360P7
600		IPA60R600P7		IPD60R600P7		



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600 V CoolMOS™ P7 standard grade



$R_{DS(on)}$ [mΩ]	TO-220 FullIPAK	TO-220 FullIPAK Narrow lead	TO-252 (DPAK)	SOT-223
180	IPA60R180P7S	IPAN60R180P7S	IPD60R180P7S	
280	IPA60R280P7S		IPD60R280P7S	
360	IPA60R360P7S		IPD60R360P7S	IPN60R360P7S
600	IPA60R600P7S		IPD60R600P7S	

600 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D ² PAK)	TO-220 FullIPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8	D-DPAK	TO-Leadless (TOLL)	Q-DPAK
15									IPDQ60R015CFD7
18				IPW60R018CFD7					
20									IPDQ60R020CFD7
24				IPW60R024CFD7					
25									IPDQ60R025CFD7
31/35				IPW60R031CFD7				IPT60R035CFD7	IPDQ60R035CFD7
37				IPW60R037CSFD					
40/45		IPB60R040CFD7		IPW60R040CFD7			IPDD60R045CFD7	IPT60R045CFD7	IPDQ60R045CFD7
55		IPB60R055CFD7		IPW60R055CFD7			IPDD60R055CFD7	IPT60R055CFD7	IPDQ60R055CFD7
60						IPL60R060CFD7			
70	IPP60R070CFD7	IPB60R070CFD7		IPW60R070CFD7					
75						IPL60R075CFD7	IPDD60R075CFD7	IPT60R075CFD7	IPDQ60R075CFD7
90/95	IPP60R090CFD7			IPW60R090CFD7		IPL60R095CFD7	IPDD60R090CFD7	IPT60R090CFD7	
105/115		IPB60R105CFD7		IPW60R105CFD7		IPL60R115CFD7	IPDD60R105CFD7	IPT60R105CFD7	
125/140	IPP60R125CFD7		IPA60R125CFD7	IPW60R125CFD7			IPDD60R125CFD7	IPT60R125CFD7	
145/160	IPP60R145CFD7				IPD60R145CFD7	IPL60R160CFD7	IPDD60R145CFD7		
170	IPP60R170CFD7		IPA60R170CFD7		IPD60R170CFD7		IPDD60R170CFD7		
185						IPL60R185CFD7			
210/225	IPP60R210CFD7								
280	IPP60R280CFD7		IPA60R280CFD7						
360									



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600 V CoolMOS™ S7



$R_{DS(on)}$ [mΩ]	TO-220	TO-Leadless (TOLL)	TO-Leadless (TOLL) incl. temperature sensor	Q-DPAK BSC incl. temperature sensor	Q-DPAK TSC incl. temperature sensor	Q-DPAK TSC	Q-DPAK BSC
10				IPQC60T010S7	IPDQ60T010S7	IPDQ60R010S7	IPQC60R010S7
17				IPQC60T017S7	IPDQ60T017S7	IPDQ60R017S7	IPQC60R017S7
22	IPP60R022S7	IPT60R022S7	IPT60T022S7	IPQC60T022S7	IPDQ60T022S7	IPDQ60R022S7	
40	IPP60R040S7	IPT60R040S7	IPT60T040S7			IPDQ60R040S7	IPQC60R040S7
65	IPP60R065S7	IPT60R065S7	IPT60T065S7			IPDQ60R065S7	

600 V CoolMOS™ C7 Gold (G-series)



$R_{DS(on)}$ [mΩ]	TO-Leadless (TOLL)	TO-252 (Double DPAK)
28	IPT60R028G7	
50	IPT60R050G7	IPDD60R050G7
80	IPT60R080G7	IPDD60R080G7
102	IPT60R102G7	IPDD60R102G7
125	IPT60R125G7	IPDD60R125G7
150		IPDD60R150G7
190		IPDD60R190G7

600 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D ² PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 8x8
17				IPW60R017C7	IPZ60R017C7		
40	IPP60R040C7	IPB60R040C7		IPW60R040C7	IPZ60R040C7		
60	IPP60R060C7	IPB60R060C7	IPA60R060C7	IPW60R060C7	IPZ60R060C7		
65							IPL60R065C7
99	IPP60R099C7	IPB60R099C7	IPA60R099C7	IPW60R099C7	IPZ60R099C7		
104							IPL60R104C7
120	IPP60R120C7		IPA60R120C7	IPW60R120C7			
125							IPL60R125C7
180	IPP60R180C7	IPB60R180C7	IPA60R180C7	IPW60R180C7		IPD60R180C7	
185							IPL60R185C7

600 V CoolMOS™ P6



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-263 (D ² PAK)	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 8x8
41				IPW60R041P6			
70				IPW60R070P6			
99	IPP60R099P6	IPA60R099P6		IPW60R099P6	IPZ60R099P6		
125	IPP60R125P6	IPA60R125P6		IPW60R125P6			
160	IPP60R160P6	IPA60R160P6	IPB60R160P6	IPW60R160P6			
180							IPL60R180P6
190	IPP60R190P6	IPA60R190P6		IPW60R190P6			
210							IPL60R210P6
230		IPA60R230P6					
280		IPA60R280P6					
380		IPA60R380P6				IPD60R380P6	
600		IPA60R600P6				IPD60R600P6	

500 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-252 (DPAK)	SOT-223
190	IPP50R190CE	IPA50R190CE		
280	IPP50R280CE	IPA50R280CE	IPD50R280CE	
380	IPP50R380CE	IPA50R380CE	IPD50R380CE	
500		IPA50R500CE	IPD50R500CE	
800		IPA50R800CE		
950		IPA50R950CE	IPD50R950CE	
1400				IPN50R1K4CE
2000				IPN50R2K0CE



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CoolMOS™ SJ MOSFET automotive

800 V CoolMOS™ C3A



$R_{DS(on)}$ at $T_j = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	TO-247	TO-252 (DPAK)	TO-263 (D ² PAK)
290	IPW80R290C3A		IPB80R290C3A
2700		IPD80R2K7C3A	

650 V CoolMOS™ CFDA



$R_{DS(on)}$ at $T_j = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	TO-220	TO-247	TO-252 (DPAK)	TO-263 (D ² PAK)
48		IPW65R048CFDA		
80		IPW65R080CFDA		
110	IPP65R110CFDA	IPW65R110CFDA		IPB65R110CFDA
150		IPW65R150CFDA		
190				IPB65R190CFDA
310				IPB65R310CFDA
420			IPD65R420CFDA	
660			IPD65R660CFDA	IPB65R660CFDA



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650 V CoolMOS™ CFD7A



$R_{DS(on)}$ at $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	TO-220	TO-247	TO-247 Short leads	TO-263-3 (D ² PAK 3-pin)	TO-263-7 (D ² PAK 7-pin)	Q-DPAK BSC	Q-DPAK TSC
17						IPQC65R017CFD7A	IPDQ65R017CFD7A
22		IPW65R022CFD7A	IPWS65R022CFD7A				
29							IPDQ65R029CFD7A
35		IPW65R035CFD7A	IPWS65R035CFD7A				
40						IPQC65R040CFD7A	IPDQ65R040CFD7A
50	IPP65R050CFD7A	IPW65R050CFD7A	IPWS65R050CFD7A	IPB65R050CFD7A	IPBE65R050CFD7A		
60							IPDQ65R060CFD7A
75	IPP65R075CFD7A	IPW65R075CFD7A	IPWS65R075CFD7A	IPB65R075CFD7A	IPBE65R075CFD7A		
80							IPDQ65R080CFD7A
99	IPP65R099CFD7A	IPW65R099CFD7A		IPB65R099CFD7A	IPBE65R099CFD7A		IPDQ65R099CFD7A
115	IPP65R115CFD7A	IPW65R115CFD7A		IPB65R115CFD7A	IPBE65R115CFD7A		
125						IPQC65R125CFD7A	IPDQ65R125CFD7A
145	IPP65R145CFD7A	IPW65R145CFD7A		IPB65R145CFD7A	IPBE65R145CFD7A		
190	IPP65R190CFD7A	IPW65R190CFD7A		IPB65R190CFD7A	IPBE65R190CFD7A		
230		IPW65R230CFD7A		IPB65R230CFD7A	IPBE65R230CFD7A		

600 V CoolMOS™ CPA



$R_{DS(on)}$ at $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	TO-247	TO-263 (D ² PAK)
45	IPW60R045CPA	
99	IPW60R099CPA	IPB60R099CPA

600 V CoolMOS™ S7A



$R_{DS(on)}$ at $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	Q-DPAK TSC	Q-DPAK BSC
40	IPDQ60R040S7A	IPQC60R040S7A
22	IPDQ60R022S7A	IPQC60R022S7A
17	IPDQ60R017S7A	IPQC60R017S7A
10	IPDQ60R010S7A	IPQC60R010S7A

600 V CoolMOS™ S7A-T with integrated temperature sensor



$R_{DS(on)}$ at $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	Q-DPAK TSC	Q-DPAK BSC
40	IPDQ60T040S7A	IPQC60T040S7A
22	IPDQ60T022S7A	IPQC60T022S7A
17	IPDQ60T017S7A	IPQC60T017S7A
10	IPDQ60T010S7A	IPQC60T010S7A



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CoolMOS™ SJ MOSFETs – packages



SOT-223

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
500	CE										1400	2000
600	P7						360	600				
	PFD7						360	600			1000/1500	2000
700	P7						360	450/600			1400	2000
	CE											
800	P7										1400	2400/4500
950	P7										1200	3700

TO-247

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
600	P7	24/37/45	60/80	99/120	180							
	C7	17/40	60	99/120	180							
	P6	41	70	99/125	160/190							
	CFD7	18/24/31/37/40/55	70	90/125								
	CPA	45		99								
	CM8	16/24/37/55	70	99/120								
650	CFD7	18/29/37/41	60	90/110/125	155							
	C7	19/45	65	95/125	190							
	CFD2	41	80	110	150/190			420				
	CFDA	48	80	110	150							
	CFD7A	22/35/50	75	99/115/145	190	230						
800	P7											
	C3		85			290						
950	PFD7		60	130			310					

TO-247 short leads

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
650	CFD7A	22/35/50	75									

TO-247 4-pin

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
600	C7	17/40	60	99								
	P6			99								
650	C7	19/45	65	95								

TO-247 4-pin asymmetric leads

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
600	P7	37/45	60/80	99								
	CM8	16/24/37/55	70	99								
650	CFD7	18/29										

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IPAK

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
800	P7							600			900/1400	2000/4500
950	P7								750			



IPAK Short Lead

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
700	P7										1400	

I²PAK

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
600	CPA			99/125	165/199							
	C6				190							
650	CFD2				190							
	C6				190		380					
900	C3						340	500				



DPAK

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]										
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500	
500	CE					280	380	500		950		
	CP						399					
600	P7				180	280	360	600				
	C7				180							
	CE											
	P6						380	600				
600	CFD7			145	170							
	PFD7					210/280	360	600		1000/1500	2000	
	CM8				180			600				
650	C7				190	225						
	CFD2							420	660	950		
650	CFDA							420	660			
	P7						360	600		900/1400		
800	P7					280	360	450/600	750	900/1200/1400	2000/2400 3300/4500	
	C3A										2700	
950	P7							450	750	1200	2000	
	PFD7							450				

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D²PAK

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	C3	50									
	CP			140	199						
600	P6				160						
	C7	40	60	99	180						
	P7	45	60/80	99/120	180	280	360				
	CPA			99							
	CFD7	40 55	70	105							
	CFD7	41		90/110/125	155						
650	C7	45	65	95/125	190	225					
	CFD2			110	150/190		310				
	CFDA			110	190		310		660		
	CFD7A	50	75	99/115/145	190	230					
800	C3A					290					
950	PFD7			130			310	450			

D²PAK 7-pin



Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
650	CFD7A	50	75	99/115	145/190	230					

Double DPAK (D-DPAK)



Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CFD7	45/55	75	90/105/ 125/145	170						
	G7	50	80	102/125	150/190						
	CM8	37			180						

Q-DPAK TSC



Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	10/17/22/40	65								
	S7A	10/17/22/40									
650	CFD7	17/29/40	60/80	99/125							
	CFD7A	17/29/40	60/80	99/125							
	CM8	8/18									

Q-DPAK BSC



Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	10/17/22/40									
	S7A	10/17/22*/40									
650	CFD7	17/40									
	CFD7A	17/40		125							

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TO-220 FullPAK

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE				190	280	380	500	800	950	
	CP			140							
600	P7		60/80	99/120	160/180	280	360	600			
	P7S				180	280	360	600			
	C7		60	99/120	180						
	CFD7			125	170	280					
	P6			99/125	160/190	230/280	380	600			
650	C7	45	65	95/125	190						
	CFD2			110	150/190		310				
700	P7						360	600			
800	P7					280	360	450/600	750	900/1400	
950	P7							450	750	1200	
	PFD7			130			310	450			

TO-220 FullPAK Narrow Lead

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
700	P7				180						
	PFD7			125		210/280	360				
	CM8				180						
700	P7						360	600			
800	P7						360				

TO-Leadless

Voltage [V]	Series	$R_{DS(on)}$ group [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CFD7	35/45/55	75	90/105/125							
	G7	28/50	80	102/125	150						
	S7	22/40	65								
	CM8	16/24* 37/55*	70*	99*/120*	160*/180						
650	CFD7	40	60/80	99/125	155/190						

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TO-220

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE				190	280	380				
	CP					250					
600	P7		60/80	99/120	160/180	280	360				
	C7	40	60	99/120	180						
	P6			99/125	160/190						
	CFD7		70	90/125/145	170	210/280					
	S7	22/40	65								
	CM8	16/37			180						
650	CFD7	41	60	90/110	155	190					
	C7	45	65	95/125	190	225					
	CFD2			110	150/190		310	420			
	CFDA			110							
	CFD7A	50/75		99/115/145	190						
800	P7									1400	
	C3								650		



ThinPAK 5x6

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	PFD7						360	600		1000/1500	
700	P7							600	750	900/1200/1400	2000
800								600	750	900/1200/1400	2000



ThinPAK 8x8

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7		65/85	105/125	185	285					
	C7		65	104/125	185						
	CFD7		60/75	95/115/140	160/185	225					
	P6				180	210					
650	CFD7		65	95/115/130	160	200					
	C7		70	99/130	195	230					
	CFD2				165		340				



Thin-TOLL 8x8

Voltage [V]	Series	$R_{DS(on)}$ [mΩ]									
		0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CM8				180						

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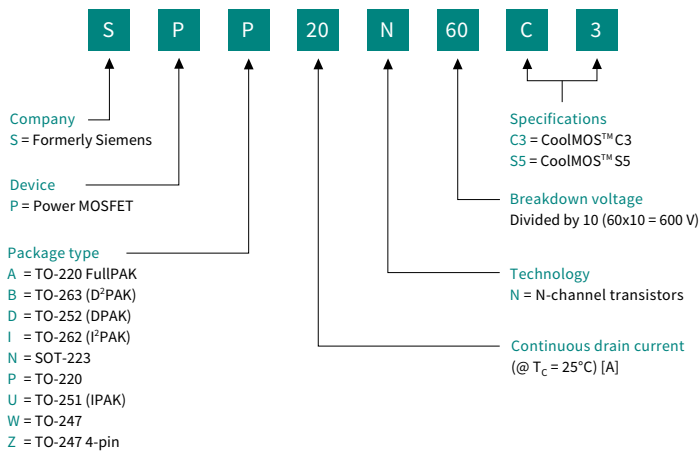


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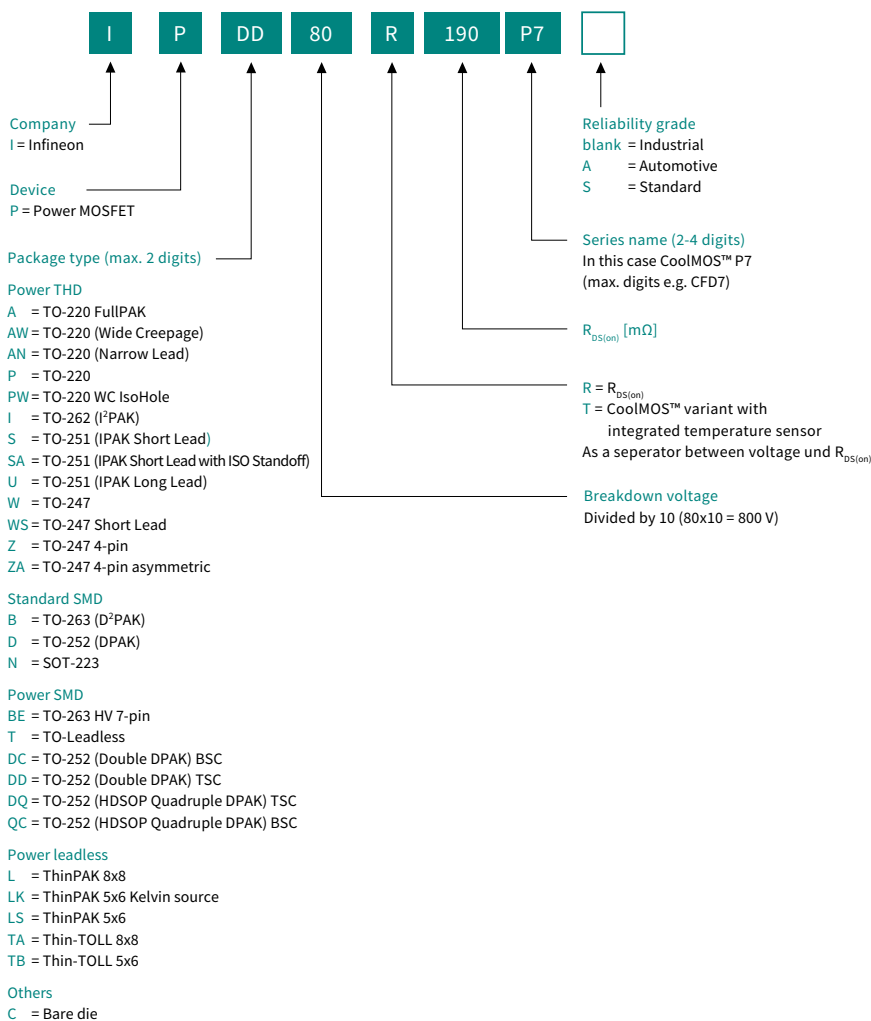
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Nomenclature

Power MOSFETs (until 2005)



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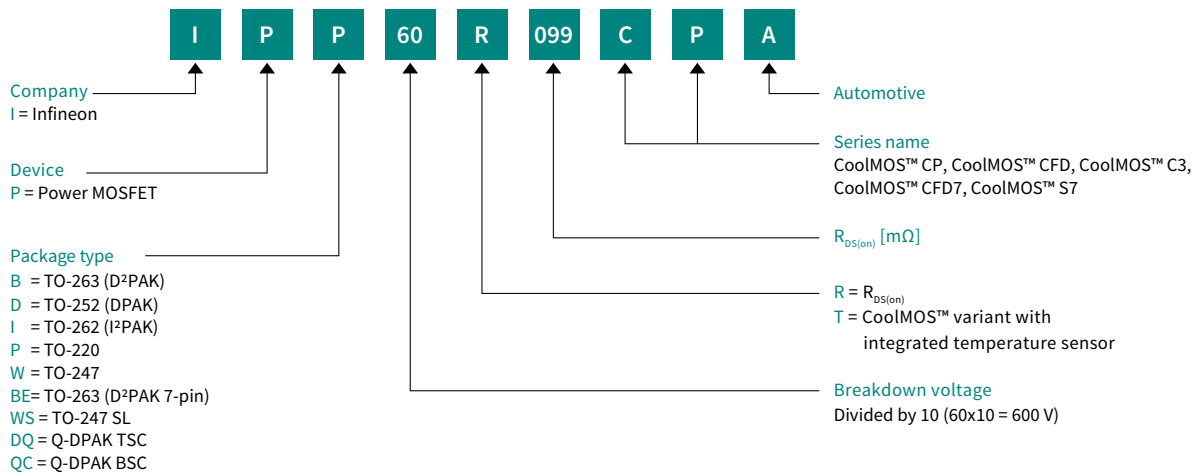
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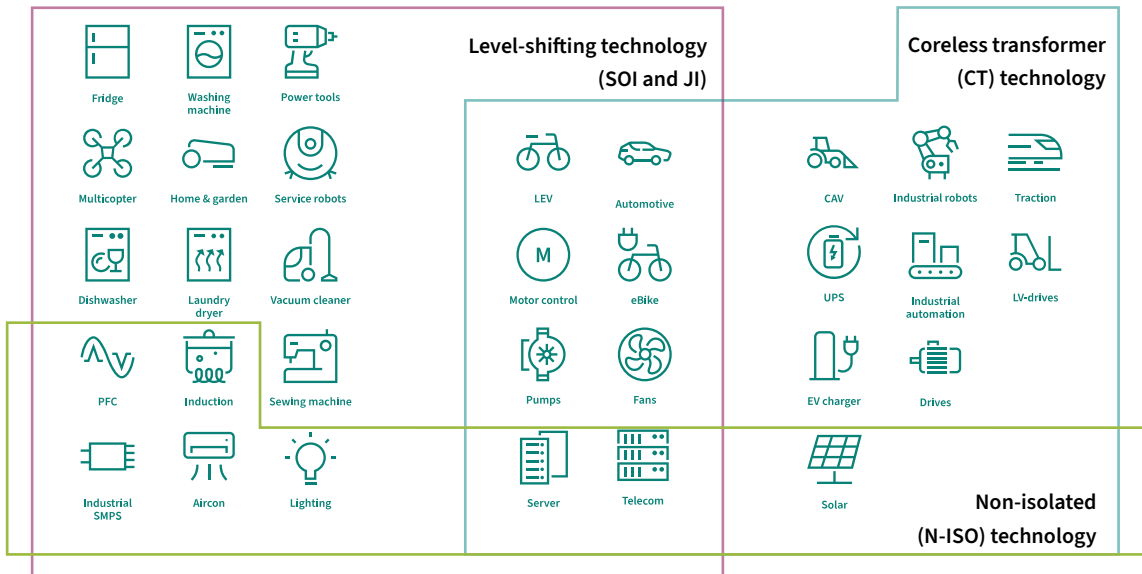
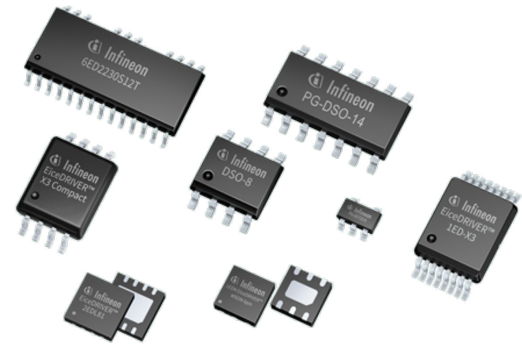


Gate-driver ICs

- Infineon gate-driver IC applications
- Driver configuration overview
- EiceDRIVER™ and MOTIX™ gate-driver IC
- Choosing a gate-driver
- Infineon gate driver IC package options
- Gate-driver ICs for GaN HEMTs
- Gate-driver ICs portfolio
- Infineon solid-state relay package options
- Gate-driver ICs for SiC MOSFETs
- EiceDRIVER™ non-isolated low-side gate drivers
- 2EDN EiceDRIVER™ family
- EiceDRIVER™ 1EDN71x6G/U family
- EiceDRIVER™ 1EDL8011, 135 V high-side driver
- EiceDRIVER™ 2EDL8x2x family
- MOTIX™ 6EDL7141 high performance motor control
- MOTIX™ 6EDL7151 3-phase smart gate drive controller IC
- MOTIX™ 160 V SOI gate-driver family
- EiceDRIVER™ 650 V level-shift SOI gate driver family
- EiceDRIVER™ 1200 V level-shift SOI gate driver family
- 2EDi EiceDRIVER™ family
- EiceDRIVER™ X3 Compact and 2L-SRC Compact
- EiceDRIVER™ X3 Compact Gen 2 product family
- EiceDRIVER™ X3 Compact 2ED314xMC12H family
- EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog
- EiceDRIVER™ Enhanced X3 Digital
- EiceDRIVER™ APD 2ED4820-EM
- EiceDRIVER™ 1EDI302xAS/1EDI303xAS/1EDI305xAS
- Infineon solid-state relays (SSR) technologies
- Gate driver nomenclature

Infinion gate-driver IC applications

Leveraging the application expertise and advanced technologies of Infineon and International Rectifier, EiceDRIVER™ gate-driver ICs are well-suited for many applications such as industrial motor drives, home appliances, solar inverters, automotive applications, EV-charging, UPS, switch-mode power supplies (SMPS), high-voltage lighting, battery-powered applications, and so on.



Infinion gate-driver IC technologies

Non-isolated GD	Level-shift GD		Isolated GD
● Non-isolated (N-ISO)	● Junction isolation (JI)	● Silicon on insulator (SOI)	● Coreless transformer (CT)
<p>Monolithic construction of ground-reference gate drivers for 20 to 25 V supply voltage applications</p> <p>Comprehensive families of single- and dual-low-side drivers with flexible options for output current, logic configurations and UVLOs (plus non-isolated TDI)</p> <p>Uses rugged and high-performance technologies of HVIC process or state-of-the-art 130 nm process</p>	<p>Monolithic construction of one to six gate drive channels up to 1200 V rating</p> <p>Industrial pioneering high-voltage IC (HVIC) technology used in all high-voltage gate drive applications</p> <p>Gen 2 technology (IR prefix): Industrial pioneering HVIC process</p> <p>Gen 5 technology (IRS prefix): Cost-effective pin-to-pin versions of Gen 2</p>	<p>Monolithic construction of 2 to 6 gate drive channels up to 1200 V rating</p> <p>Built-in PN-based bootstrap diode (36 Ω typ.) for simplified bootstrap operation & reduced PCB area</p> <p>Negative transient immunity to prevent latch-up: -100 V for 300 ns</p> <p>>50 percent lower level-shift losses for higher efficiency, higher frequency operation, smaller heat sinks, and higher reliability</p>	<p>Two separate chips solution with magnetic coupling providing galvanically isolated single- and dual channel gate drivers</p> <p>IEC 60747-17 isolation technology providing isolation up to 8 kVpk V_{iOTM} and up to ±2300 V functional isolation</p> <p>CMTI of more than 300 V/ns</p> <p>Strongest gate-drive output currents (up to ±18 A) reducing need for external booster</p>



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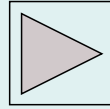
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Driver configuration overview

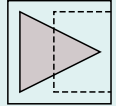
1-channel low-side driver

Allows low offset of the voltage between input and output



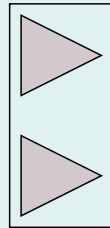
1-channel high-side driver

Allows high voltage offset between input and output



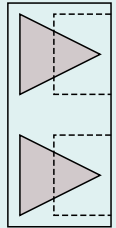
2-channel low-side driver

Both channels allow individual low voltage offsets, no interlock



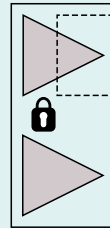
2-channel high-side driver

Both channels allow individual high voltage offsets, no interlock



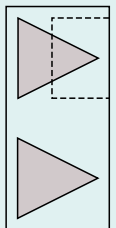
Half-bridge driver

Two interlocked channels for shoot through protection where one of the channels allows a high voltage offset.



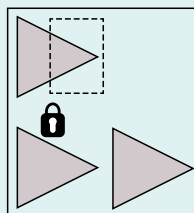
High- and low-side driver

Two non-interlocked channels, one for high voltage, one for low voltage offsets. The industry may also refer this as half-bridge.



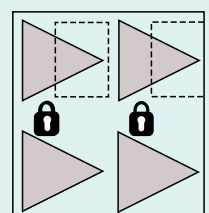
Half-bridge plus single low-side driver

Half-bridge with one additional low-side driver.



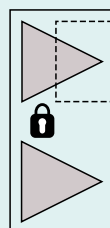
Full-bridge driver

Four channels in a package with two independent half bridges.



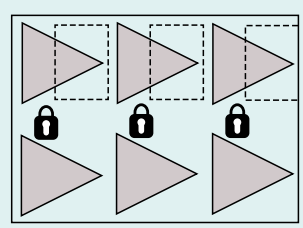
Synchronous-buck drivers

High speed drivers for dual high side and low side MOSFETs in synchronous rectified buck converters.



Three-phase bridge

Six channels in a package with three independent half bridges



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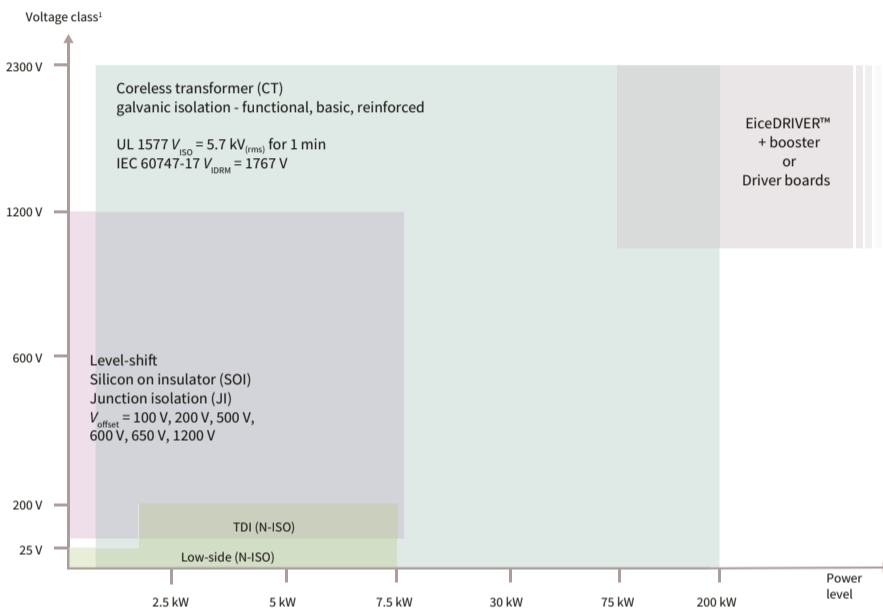
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EiceDRIVER™ and MOTIX™ gate-driver IC

Gate-driver ICs serve as the interface between control signals (digital or analog controllers) and power switches (IGBTs, MOSFETs, SiC MOSFETs, and GaN HEMTs). Integrated gate driver solutions reduce design complexity, development time, bill of materials (BOM), and board space while improving reliability over discretely-implemented gate-drive solutions.

Every switch needs a driver, the right driver makes a difference. Infineon offers a comprehensive portfolio of EiceDRIVER™ gate-driver ICs with a variety of configurations, voltage classes, isolation levels, protection features, and package options. EiceDRIVER™ gate-driver ICs are complementary to Infineon IGBT discretes and modules, silicon (CoolMOS™, OptiMOS™, and StrongIRFET™) and silicon carbide MOSFETs (CoolSiC™), gallium nitride HEMTs (CoolGaN™), or as part of integrated power modules (CIPOS™ IPM and iMOTION™ IPM).

In addition, MOTIX™ motor gate driver ICs part of the MOTIX™ scalable product portfolio for low-voltage motor control solutions including MOTIX™ Driver, MOTIX™ Bridge, MOTIX™ SBC, and MOTIX™ MCU (SoC/SiP).



Gate driver configuration			25 V	25 - 105 V	200 V	500 V	600 V	650 V	1200 V	2300 V
Gate drivers	1-Channel	Isolated			●	●	●	●	●	●
		High-side		● ●	● ●	●	●			
		Low-side	●							
	2-Channel	Isolated			●	●	●	●	●	
		High-side		●						
		Low-side	●							
		High-side + Low-side			● ●	●	● ●	●	●	
	4-Channel	Half-bridge		●	● ●		● ●	●	●	
	6-Channel	Three-phase			●		● ●		● ●	
							● ●		● ●	

● Non-isolated (N-ISO) ● Junction isolation (JI) ● Silicon on insulator (SOI) ● Coreless transformer (CT)

Note 1 Voltage class on the top row is defined base on different driver configurations for the maximum Voltage class.
 1. For single high-side, high-side and low-side, half bridge and three phase gate drivers, voltage class is defined as switch break down voltage in applications.
 2. For low side drivers (N-ISO), voltage class is defined as maximum operating range supply voltage.
 3. For special cases as 1EDNx550 (1EDN-TDI, N-ISO), voltage class is defined as maximum bus voltage (highest floating voltage it can manage).



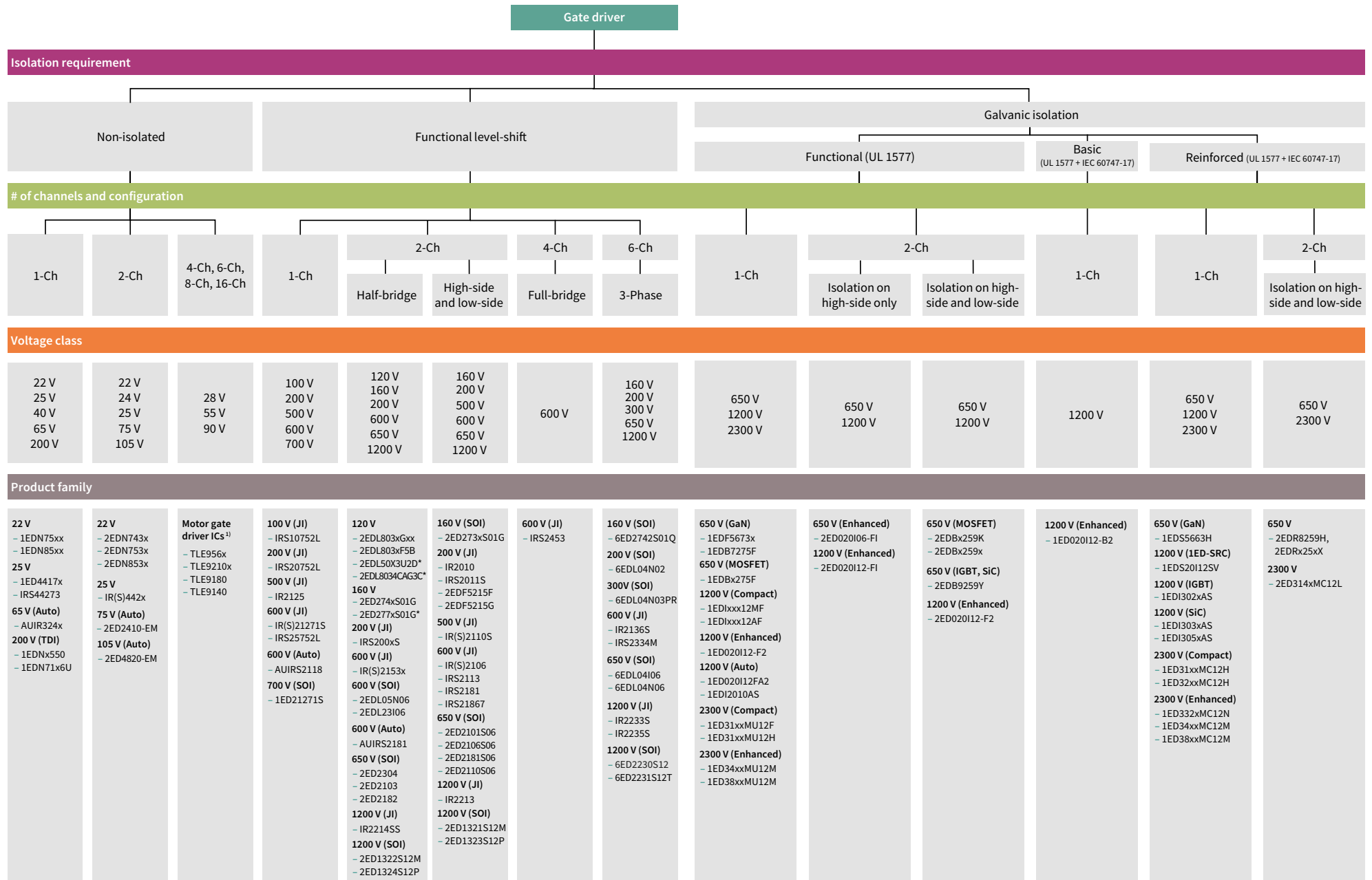
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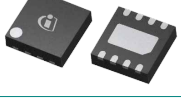


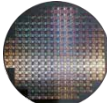




Choosing a gate-driver IC



*Coming soon

1) Find out more on Motor gate driver ICs on [page 432](#)

Infinion gate-driver IC package options

DSO-8 (SOIC-8N)		DSO-24 (DSO-28 without 4 pins)		TSSOP-8	
TSSOP-25		DSO-8 with power pad		DSO-28 (SOIC-28WB)	
TSSOP-28		DSO-8 300-mil (SOIC-8WB)		DSO-36	
VDSO-8		DSO-14 (SOIC-14N)		LCC-32 (PLCC-44)	
VQFN-14 (MLPQ 4X4 14L)		DSO-14 150mil		LQFP-64	
VQFN-28 (MLPQ 5x5 28L)		DSO-14 300 mil (DSO-16 without 2 pins)		MQFP-64	
VQFN-32 5x5 mm		DSO-16		SOT23-5	
VQFN-34 (MLPQ 7X7 48L)		DSO-16 300-mil (SOIC-16WB)		SOT23-6	
VQFN-48		DSO-16 (fine pitch)		SSOP-24	
VSON-10 3x3 mm		DSO-18		TFLGA-13	
WSO-6		DSO-19		TQFN-48	
WSO-8		DSO-20 (SOIC-20WB)		TSDSO-24	
CHIP		TSNP-6		TSNP-7	
DSO-20 (fine pitch)		DSO-20 WB			



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Gate-driver ICs for GaN HEMTs

GaN HEMTs represent a key technology for modern power electronics systems, providing high efficiency and power density. Infineon's CoolGaN™ HEMT families and EiceDRIVER™ gate-driver ICs are designed to provide the best possible performance in GaN-based systems, minimizing R&D effort and cost. Infineon offers a broad range of EiceDRIVER™ gate-driver ICs optimized for driving GaN GIT (gate injection transistor) and SG (Schottky gate) HEMTs.

Recommended drivers for GaN GIT HEMTs and 650 V GaN HEMTs

Infineon's CoolGaN™ GIT technology is based on a hybrid-drain HEMT with p-GaN gate resulting in a robust normally-off power switch. To deal with the particularities of this concept, an innovative differential gate-drive concept has been implemented in tailor-made gate driver ICs of the EiceDRIVER™ 1EDx56x3 product family optimized for CoolGaN™ GIT HEMTs. These drivers ensure robust and highly efficient operation of the high-voltage GaN switch, and at the same time concurrently minimizing R&D efforts and shortening time-to-market. Infineon's EiceDRIVER™ 1EDx56x3 provide negative V_{GS} voltage, which leads to safe off-states during switching transients. Additionally, it protects the GaN switch against spurious turn-on, even for the first pulse or after a burst mode operation. Thanks to the integrated galvanic isolation, Infineon's EiceDRIVER™ GaN gate-driver ICs are best suited to drive high-voltage GaN HEMTs in hard-switching half-bridge applications, such as the totem-pole PFC topology. If the PWM signals have to cross the safe isolation barrier, such as in the resonant LLC with secondary-side control, the 1EDS5663H with reinforced isolation is the right choice. Nevertheless, in many applications, standard gate-driver ICs with right fit UVLO protection can also be employed when coupled to an RC circuit to generate both the required small steady-state current and the turn-on/turn-off peak currents. Dual-channel drivers of the EiceDRIVER™ 2EDxx259 product family feature dead-time control (DTC) and shoot-through protection (STP) to ensure safe operation in half-bridge topologies using a single IC. A hybrid gate driving configuration for half-bridge topologies, composed of two single-channel gate driver ICs of the EiceDRIVER™ 1EDBx275F and 1EDNx550B, allows optimizing the driver IC placement on the PCB in order to minimize the gate loop parasitic inductances. This results in a PCB area saving (compared with a dual-channel gate-driver IC) and it comes with a highly competitive bill-of-material (BOM).

To summarize, the 1-channel and 2-channel gate-driver ICs of the EiceDRIVER™ family are the best choices to match with Infineon's CoolGaN™ GIT HEMTs and other 650 GaN HEMTs technologies (e.g., Schottky gate, Cascode) to achieve an optimum combination of efficiency, power density, and robustness in high-performance power conversion applications.

Product family	Part number	Current peak sink/source	VCC2 (-Vee2)	UVLO*	Prop delay	CMTI	Other features	Package
1EDi-G1	1EDF5673K	4 A / -8 A	20 V	5 V	37 ns	200 V/ns	Gate driver ICs for high-voltage GaN power switches (CoolGaN™, GIT technology based products), functional isolation	LGA-13 5x5mm
	1EDF5673F							DSO-16 150 mil
	1EDS5663H						Gate driver ICs for high-voltage GaN power switches (CoolGaN™, GIT technology based products), reinforced isolation, UL 1577	DSO-16 300 mil
1EDB	1EDB7275F	5 A / -9 A	20 V	4 V	45 ns	300 V/ns	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8 150 mil
	1EDB8275F			8 V				
1EDN-TDI	1EDN7550B	5 A / -9 A	20 V	4 V	45 ns	n. a.	Truly differential inputs to provide high common-mode robustness	SOT23 6-pin
	1EDN8550B	5 A / -9 A		8 V				
2EDB	2EDB7259Y	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	fast start-up times and fast output clamping, basic isolation, UL 1577	DSO-14 150 mil
	2EDB8259Y			8 V				
2EDR	2EDR7259X	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	fast start-up times and fast output clamping, reinforced isolation, UL 1577, VDE 0884-17, IEC 60747-17	DSO-14 300 mil
	2EDR8259X			8 V				



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* 8 V UVLO parts recommended for bipolar driving or for unipolar driving with $V_{DD} \geq 10V$

Evaluation boards with gate-driver ICs for GaN GIT HEMTs and 650 V GaN HEMTs

Our evaluation board helps you to set up and test GaN driving solutions quickly and easily.

EVAL_1EDF_G1B_HB_GAN	EVAL_2EDB_HB_GAN	KIT_1EDB_AUX_GAN
		
High-frequency half-bridge evaluation board featuring EiceDRIVER™ 1EDi-G1.	CoolGaN™ GIT HEMT half-bridge evaluation board with EiceDRIVER™ 2EDB.	Complete driving solution for GaN HEMTs including an isolated gate driver IC with a configurable floating auxiliary supply supporting unipolar and bipolar driving.
www.infineon.com/cms/en/product/evaluation-boards/eval_1edf_g1b_hb_gan/	www.infineon.com/cms/en/product/evaluation-boards/eval_2edb_hb_gan/	www.infineon.com/cms/en/product/evaluation-boards/kit_1edb_aux_gan/

Recommended drivers for GaN SG HEMTs

The 1EDN71x6Gx is a single-channel gate-driver IC product family optimized for driving Infineon CoolGaN™ SG HEMTs, as well as other GaN SG HEMTs and Si MOSFETs. This gate driver includes several key features that enable a high-performance system design with fast-switching transistors, including truly differential input (TDI), four driving strength options, active Miller clamp, bootstrap voltage clamp, and with or without adjustable charge pump in PG-SON-10 and PG-TSNP-7 package respectively.

Product family	PN	Current peak sink/source	CMR _{static} / CMR _{dynamic}	UVLO	Prop delay	CMTI	Other features	Package	
1EDN71x6x	1EDN7116G	2.0 A/2.0 A	150 V/200 V	4 V	55 ns	100 V/ns	Negative charge pump, miller clamp	PG-VSON-10	
	1EDN7126G	1.5 A/1.5 A							
	1EDN7136G	1.0 A/1.0 A							
	1EDN7146G	0.5 A/0.5 A							
	1EDN7116U	2.0 A/2.0 A	150 V/200 V		4 V	55 ns	100 V/ns	Miller clamp	PG-TSNP-7
	1EDN7126U	1.5 A/1.5 A							
	1EDN7136U	1.0 A/1.0 A							
	1EDN7146U	0.5 A/0.5 A							
1EDB	1EDB7275F	5 A / -9 A	20 V	4 V	45 ns	300 V/ns	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8 150 mil	
	1EDB8275F			8 V					
1EDN-TDI	1EDN7550B	5 A / -9 A	20 V	4 V	45 ns	n. a.	Truly differential inputs to provide high common-mode robustness	SOT23 6-pin	
	1EDN8550B	5 A / -9 A		8 V					
2EDB	2EDB7259Y	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, basic isolation, UL 1577	DSO-14 150 mil	
	2EDB8259Y			8 V					
2EDR	2EDR7259X	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, reinforced isolation, UL 1577, VDE 0884-17, IEC 60747-17	DSO-14 300 mil	
	2EDR8259X			8 V					



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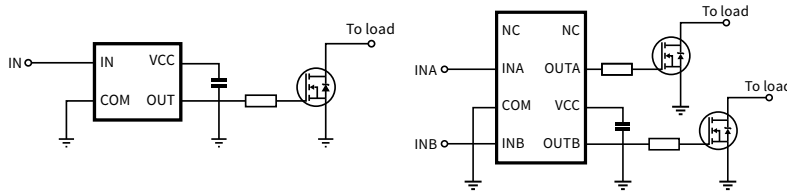
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Product overview

Infiniteon's gate-driver IC solutions are the expert's choice. With more than 400 reliable and efficient gate driver solutions, we provide a comprehensive portfolio for virtually any application. To ease the selection process, this overview is structured along the configurations of the gate-driver ICs, as opposed to application topology.

Non-isolated low-side gate-driver IC

Typical connection



Configuration	Voltage class [V]	I _{o+/o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features						Package								
							Disable	Enable	Fault reporting	Overcurrent protection	Programmable fault clear time	Separate sink/source outputs	DSO-8	DIP-8	SOT23-5	SOT23-6	WSON-6	WSON-8	TSSOP-8	TSNP-6	
1-channel	25	2.6/2.6	8.0/7.3	34/34	1ED44173N01B	NEW	N-ISO	✓	✓	✓					✓						
		2.6/2.6	11.9/11.0	50/50	1ED44175N01B	NEW	N-ISO	✓	✓	✓					✓						
		0.8/1.75	11.9/11.4	50/50	1ED44176N01F	NEW	N-ISO	✓	✓	✓	✓	✓									
		2.6/2.6	11.9/11.0	50/50	1ED44171N01B	NEW	N-ISO	✓	✓						✓						
	22	1.5/1.5	10.2/9.2	50/50	IRS44273L		N-ISO								✓						
		4/8	4.2/3.9	19/19	1EDN7511B		N-ISO	✓				✓				✓					
		4/8	4.2/3.9	19/19	1EDN7512B		N-ISO	✓						✓							
2-channel	25	4/8	4.2/3.9	19/19	1EDN7512G		N-ISO	✓			✓					✓					
		4/8	8.0/7.0	19/19	1EDN8511B		N-ISO	✓			✓				✓						
		5	1.6/3.3	8.9/8	200/150	IR2121		N-ISO		✓	✓			✓							
		22	2.3/3.3	10.2/9.2	50/50	IRS44262S		N-ISO							✓						
			2.3/3.3	N.A.	50/50	IRS4426S		N-ISO							✓						
	2.3/3.3		N.A.	50/50	IRS4427S		N-ISO							✓							
	2.3/3.3		N.A.	65/85	IR4426S		N-ISO							✓							
	2.3/3.3		N.A.	65/85	IR4427S		N-ISO							✓							
	5/5		4.2/3.9	19/19	2EDN7523F		N-ISO	✓				✓									
	5/5		4.2/3.9	19/19	2EDN7523G		N-ISO	✓										✓			
	5/5		4.2/3.9	19/19	2EDN7523R		N-ISO	✓											✓		
	5/5		4.2/3.9	19/19	2EDN7524F		N-ISO	✓				✓									
	5/5		4.2/3.9	19/19	2EDN7524G		N-ISO	✓											✓		
	5/5		4.2/3.9	19/19	2EDN7524R		N-ISO	✓											✓		
	5/5		8.0/7.0	19/19	2EDN8523F		N-ISO	✓					✓								
	5/5		8.0/7.0	19/19	2EDN8523R		N-ISO	✓												✓	
	5/5		8.0/7.0	19/19	2EDN8524F		N-ISO	✓					✓								
	5/5		8.0/7.0	19/19	2EDN8524R		N-ISO	✓												✓	
	4/4	4.2/3.9	19/19	2EDN7424F		N-ISO	✓				✓										
	4/4	4.2/3.9	19/19	2EDN7424R		N-ISO	✓												✓		
4/4	4.2/3.9	19/19	2EDN7434F		N-ISO	NEW	✓				✓										
4/4	4.2/3.9	19/19	2EDN7434R		N-ISO	NEW	✓											✓			
5/5	4.2/3.9	19/19	2EDN7533B		N-ISO	NEW								✓							
5/5	4.2/3.9	19/19	2EDN7533F		N-ISO	NEW	✓				✓										
5/5	4.2/3.9	19/19	2EDN7533R		N-ISO	NEW	✓											✓			
5/5	4.2/3.9	19/19	2EDN7534U		N-ISO	NEW													✓		
5/5	4.2/3.9	19/19	2EDN7534B		N-ISO	NEW							✓								
5/5	4.2/3.9	19/19	2EDN7534F		N-ISO	NEW	✓				✓										
5/5	4.2/3.9	19/19	2EDN7534R		N-ISO	NEW	✓											✓			
5/5	4.2/3.9	19/19	2EDN7534G		N-ISO	NEW	✓										✓				
5/5	8.0/7.0	19/19	2EDN8533F		N-ISO	NEW	✓				✓										
5/5	8.0/7.0	19/19	2EDN8533R		N-ISO	NEW	✓											✓			
5/5	8.0/7.0	19/19	2EDN8534F		N-ISO	NEW	✓				✓										
5/5	8.0/7.0	19/19	2EDN8534R		N-ISO	NEW	✓											✓			



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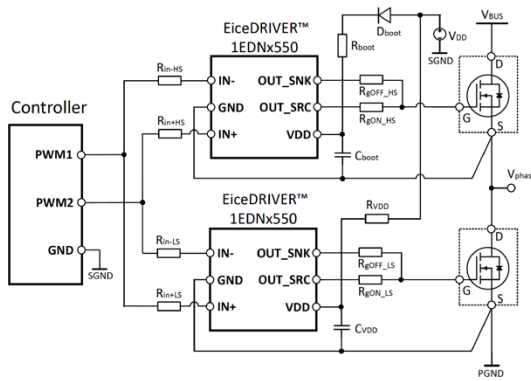
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Non-isolated TDI gate-driver IC

Typical connection



Adjustable Negative charge pump
Active Miller clamp
Separate sink/source outputs
Truly differential inputs
SOT23-6
TSNP-6
TSNP-7
VSON-10

Configuration	Voltage class [V]	I_{ON}/I_{OP} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features				Package			
1-channel	200	4/8	4.2/3.9	45/45	1EDN7550U	N-ISO			✓	✓	✓			
		4/8	4.2/3.9	45/45	1EDN7550B	N-ISO			✓	✓	✓			
		4/8	8.0/7.0	45/45	1EDN8550B	N-ISO			✓	✓	✓			
		4/8	12.2/11.5	45/45	1EDN6550B	NEW N-ISO			✓	✓	✓			
		4/8	14.9/14.4	45/45	1EDN9550B	NEW N-ISO			✓	✓	✓			
		2/2	3.85/3.75	55/55	1EDN7116G	NEW N-ISO	✓	✓		✓				✓
		2/2	3.85/3.75	55/55	1EDN7116U *	N-ISO		✓		✓				✓
		1.5/1.5	3.85/3.75	75/75	1EDN7126G	NEW N-ISO	✓	✓		✓				✓
		1.5/1.5	3.85/3.75	75/75	1EDN7126U *	N-ISO		✓		✓				✓
		1/1	3.85/3.75	105/105	1EDN7136G	NEW N-ISO	✓	✓		✓				✓
		1/1	3.85/3.75	105/105	1EDN7136U *	N-ISO		✓		✓				✓
		0.5/0.5	3.85/3.75	125/125	1EDN7146G	NEW N-ISO	✓	✓		✓				✓
0.5/0.5	3.85/3.75	125/125	1EDN7146U *	N-ISO		✓		✓				✓		



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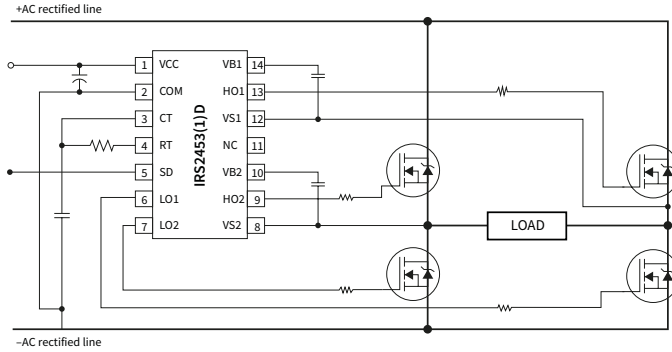
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Full-bridge gate-driver ICs

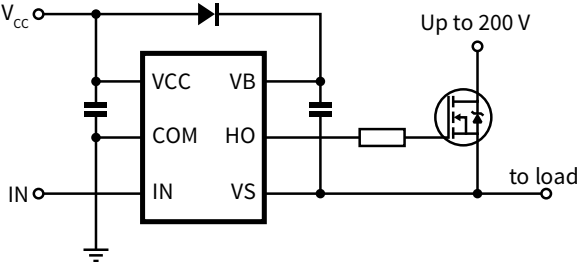
Typical connection



Voltage class [V]	I_{o1}/I_{o2} typ. [A]	UVLO on/off typ. [V]	Base PN	Technology	Features	Package
600	0.18/0.26	11/9	IRS2453DS	J1	Integrated bootstrap diode Shoot-through protection Shutdown	DSO-14

Single high-side gate-driver ICs

Typical connection



Voltage class [V]	I_{o1}/I_{o2} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features	Package
700	4.0/4.0	7.2/6.8	50/50	1ED21271S07F*	SOI	Integrated bootstrap diode Fault reporting Overcurrent protection	DSO-8
600	0.16/0.24	9/8	215/140	IRS25752L	J1		DSO-16 WB
	0.25/0.5	8.6/8.2	105/125	IR2117S	J1		SOT23-6
	0.25/0.5	8.6/8.2	105/125	IR2118S	J1		TSNP-6
	0.25/0.5	10.3/9	150/200	IR2127S	J1	Integrated bootstrap diode Fault reporting Overcurrent protection	
	0.25/0.5	10.3/9	150/200	IR2128S	J1		
	0.25/0.5	7.2/6.8	150/200	IR21271S	J1		
	0.29/0.6	8.6/8.2	105/125	IRS2117S	J1		
	0.29/0.6	8.6/8.2	105/125	IRS2118S	J1		
	0.29/0.6	10.3/9	150/150	IRS2127S	J1		
0.29/0.6	7.2/6.8	150/150	IRS21271S	J1			
500	1.6/3.3	9.2/8.3	200/170	IR2125S	J1		
200	0.16/0.24	9/8	215/140	IRS20752L	J1		
	4/8	4.2/3.9	5/45	1EDN7550B	TDI		
	4/8	8/7	45/45	1EDN8550B	TDI		
	4/8	12.2/11.5	45/45	1EDN6550B	TDI		
	4/8	14.9/14.4	45/45	1EDN9550B	TDI		
	4/8	4.2/3.9	45/45	1EDN7550U	TDI		
100	0.16/0.24	9/8	215/140	IRS10752L	J1		



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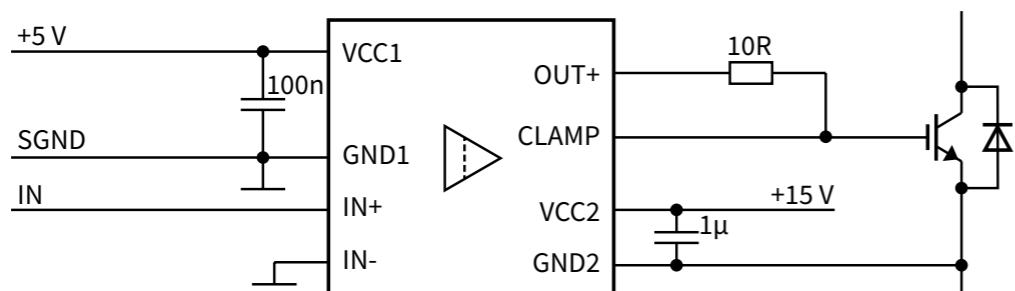
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Galvanic isolated gate-driver ICs



Configuration	Voltage class [V]	Isolation type	Isolation rating	I_{OH}/I_L typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features	Package	
1-channel	2300	Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	10/8	90/90	1ED3120MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	10/8	90/90	1ED3120MU12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	12.5/10.5	90/90	1ED3121MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	12.5/10.5	90/90	1ED3121MU12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	12.5/10.5	280/280	1ED3131MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	5.5/5.5	12.5/10.5	280/280	1ED3131MU12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	10/9	10/8	90/90	1ED3122MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	10/9	10/8	90/90	1ED3122MU12H	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	10/9	12.5/10.5	90/90	1ED3125MU12F	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	10/9	12.5/10.5	90/90	1ED3127MU12F	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	13.5/14	10/8	90/90	1ED3123MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	13.5/14	10/8	90/90	1ED3123MU12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	13.5/14	12.5/10.5	90/90	1ED3124MC12H	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	13.5/14	12.5/10.5	90/90	1ED3124MU12H	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	13.5/14	12.5/10.5	90/90	1ED3124MU12F	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	6/6.5	8.5/9.3	45/45	1ED3140MU12F	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	6/6.5	11/12	45/45	1ED3141MU12F	NEW CT			
		Functional	$V_{ISO} = 3 \text{ kV(rms)}$	6/6.5	12.5/13.6	45/45	1ED3142MU12F	NEW CT			
		Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV(rms)}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	11.0/12.0	45 / 45	1ED3141MC12H*	CT			
		Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV(rms)}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	12.5/13.6	45 / 45	1ED3142MC12H*	CT			
		Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV(rms)}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	11.0/12.0	45 / 45	1ED3143MC12H*	CT			
		Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV(rms)}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	12.5/13.6	45 / 45	1ED3144MC12H*	CT			
		Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV(rms)}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	Adjustable	45 / 45	1ED3145MC12H*	CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	10/10	12.5/10.4	110/110	1ED3240MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	10/10	12.5/10.4	110/110	1ED3250MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	18/18	12.5/10.4	110/110	1ED3251MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	18/18	12.5/10.4	110/110	1ED3241MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	3.3/6	12.6/10.4	86/80	1ED3320MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6/8.5	12.6/10.4	86/80	1ED3321MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6/8.5	14.2/11.9	86/80	1ED3322MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6/8.5	12.6/10.4	86/80	1ED3323MC12H	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	3.8/2.5	12.6/10.4	236/244	1ED3431MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	3.8/2.5	12.6/10.4	236/244	1ED3431MU12M	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	3.8/2.5	Adjustable	236/244	1ED3830MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	3.8/2.5	Adjustable	236/244	1ED3830MU12M	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	7.5/5	12.6/10.4	236/244	1ED3461MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	7.5/5	12.6/10.4	236/244	1ED3461MU12M	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	7.5/5	Adjustable	236/244	1ED3860MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	7.5/5	Adjustable	236/244	1ED3860MU12M	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	11/7.5	12.6/10.4	236/244	1ED3491MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	11/7.5	12.6/10.4	236/244	1ED3491MU12M	NEW CT			
		Reinforced	$V_{IOBM} = 1.7 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	11/7.5	Adjustable	236/244	1ED3890MC12M	NEW CT			
		Functional	$V_{ISO} = 5.7 \text{ kV(rms)}$	11/7.5	Adjustable	236/244	1ED3890MU12M	NEW CT			
		Basic	$V_{IOBM} = 1.4 \text{ kV}$; $V_{OTM} = 6 \text{ kV}$; $V_{ISO} = 3.7 \text{ kV(rms)}$	2/2	12/11	165/170	1ED020112-B2	CT			
		Basic	$V_{IOBM} = 1.4 \text{ kV}$; $V_{OTM} = 6 \text{ kV}$; $V_{ISO} = 3.7 \text{ kV(rms)}$	2/2	12/11	1750/1750	1ED020112-BT	CT			
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	2/2	12/11	165/170	1ED020112-F2	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	2/2	12/11	1750/1750	1ED020112-F2	CT					
Reinforced	$V_{IOBM} = 1.4 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	4/8	5.0/4.5	37/37	1EDS5663H	CT					
Functional	$V_{OTM} = 4.2 \text{ kV(peak)}$; $V_{ISO} = 3 \text{ kV(rms)}$	5.4/9.8	12.2/11.5	45/45	1EDB6275F	CT					
Functional	$V_{OTM} = 4.2 \text{ kV(peak)}$; $V_{ISO} = 3 \text{ kV(rms)}$	5.4/9.8	4.2/3.9	45/45	1EDB7275F	CT					
Functional	$V_{OTM} = 4.2 \text{ kV(peak)}$; $V_{ISO} = 3 \text{ kV(rms)}$	5.4/9.8	8/7	45/45	1EDB8275F	CT					
Functional	$V_{OTM} = 4.2 \text{ kV(peak)}$; $V_{ISO} = 3 \text{ kV(rms)}$	5.4/9.8	14.9/14.4	45/45	1EDB9275F	CT					
Functional	$V_{IOBM} = 510 \text{ V(rms)}$; $V_{ISO} = 1.5 \text{ kV(rms)}$	4/8	5/4.5	37/37	1EDF5673F	CT					
Functional	$V_{IOBM} = 460 \text{ V(rms)}$; $V_{ISO} = 1.5 \text{ kV(rms)}$	4/8	5/4.5	37/37	1EDF5673K	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	1.3/0.9	12/11.1	300/300	1EDI05112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	1.3/0.9	12/11.1	300/300	1EDI05112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	1.3/0.9	12/11.1	300/300	1EDC05112AH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	2.2/2.3	12/11.1	300/300	1EDI10112MF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	2.2/2.3	12/11.1	300/300	1EDI10112MH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	2.2/2.3	12/11.1	300/300	1EDC10112MH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4/3.5	9.1/8.5	120/115	1EDI20112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4/3.5	12/11.1	125/120	1EDI20112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	4/3.5	12/11.1	125/120	1EDC20112AH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4/3.5	12/11.1	300/300	1EDI20112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4/3.5	12/11.1	300/300	1EDI20112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	4/3.5	12/11.1	300/300	1EDC20112AH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4.4/4.1	12/11.1	300/300	1EDI20112MF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	4.4/4.1	12/11.1	300/300	1EDI20112MH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	4.4/4.1	12/11.1	300/300	1EDC20112MH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	5.9/6.2	12/11.1	300/300	1EDI30112MF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	5.9/6.2	12/11.1	300/300	1EDI30112MH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	5.9/6.2	12/11.1	300/300	1EDC30112MH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	7.5/6.8	12/11.1	300/300	1EDI40112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	7.5/6.8	12/11.1	300/300	1EDI40112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	7.5/6.8	12/11.1	300/300	1EDC40112AH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	10/9.4	9.1/8.5	120/115	1EDI60112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	10/9.4	12/11.1	125/120	1EDI60112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	10/9.4	12/11.1	125/120	1EDC60112AH	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	10/9.4	12/11.1	300/300	1EDI60112AF	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	10/9.4	12/11.1	300/300	1EDI60112AH	CT					
Functional	$V_{ISO} = 2.5 \text{ kV(rms)}$	10/9.4	12/11.1	300/300	1EDC60112AH	CT					
Reinforced	$V_{IOBM} = 1.4 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5 \text{ kV(rms)}$	SRC/2	11.9/11	460/460	1EDS20112SV	CT					
Functional	$V_{ISO} = 5 \text{ kV(rms)}$	SRC/2	11.9/11	460/460	1EDU20112SV	CT					
Functional	$V_{ISO} = \pm 1.2 \text{ kV}$	SRC/2	11.9/11	460/460	1EDI20112SV	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	8.5 / 9.3	50 / 50	2ED3140MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	11.0/12.0	50 / 50	2ED3141MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	12.5/13.6	50 / 50	2ED3142MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	14.7/16.0	50 / 50	2ED3143MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	8.5/9.3	50 / 50	2ED3144MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7 \text{ kV(rms)}$	6.5 / 6.5	11.0/12.0	50 / 50	2ED3145MC12L*	CT					
Reinforced	$V_{IOBM} = 1.767 \text{ kV(rms)}$; $V_{OTM} = 8 \text{ kV}$; $V_{ISO} = 5.7$										

Automotive gate driver ICs

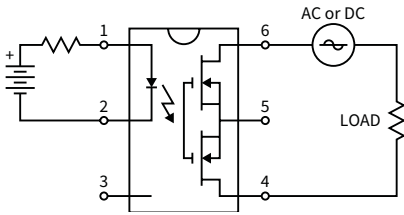
Configuration	Voltage class [V]	I _o /I _o typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features													Package																
							Buffer	Desaturation protection	Enable	Fault reporting	Operational amplifier	Overcurrent protection	Programmable frequency	Programmable dead time	Self-oscillating (Oscillator)	Separate pin for logic ground	Shoot-through protection	Shutdown	SPI interface	Synchronous rectification	Two-level turn-off	Soft-off	UL 1577	VDE 0884-11	ISO 26262 ready	ISO 26262 compliant	DSO-8	DSO-14	DSO-16 NB	DSO-16 WB	DSO-20 (sine pitch)	DSO-28	DSO-36	TSDSO-24		
1-channel isolated	1200	12/12	12.6/11.8	60/60	1EDI3020AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3021AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3023AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3030AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3031AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3033AS	CT	✓	✓	✓	✓	✓					✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3050AS	NEW	CT	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓												✓	
		12/12	12.6/11.8	60/60	1EDI3051AS	NEW	CT	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓											✓		
		12/12	12.6/11.8	60/60	1EDI3025AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3026AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3028AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3035AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓								
		12/12	12.6/11.8	60/60	1EDI3036AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓								
12/12	12.6/11.8	60/60	1EDI3038AS*	NEW	CT	✓	✓	✓	✓	✓				✓	✓			✓	✓	✓	✓					✓										
Half-bridge	100	1/1	7.3/6.8	N.A.	AUIR2085S	JI		✓		✓	✓	✓	✓													✓										
High-side and low-side	600	1.9/2.3	8.9/8.2	135/135	AUIRS21811S	JI																				✓										
		1.9/2.3	8.9/8.2	200/160	AUIRS21814S	JI										✓											✓									
		1.9/2.3	8.9/8.2	200/160	AUIRS2181S	JI																					✓									
		3.5/3.5	8.9/8.2	90/90	AUIRS2191S	JI											✓												✓							
		0.2/0.35	4.1/3.8	200/220	AUIRS2301S	JI																						✓								
Single high-side	65	0.3/0.3	10/6.5	2500/2500	AUIR3241STR	N-ISO		✓	✓																	✓										
	65	0.3/0.3	10/6.5	2500/2500	AUIR3242STR	N-ISO		✓	✓																		✓									
Dual high-side	75	0.3/1.4	12.5/10.0	4000/7000	2ED2410-EM	NEW		✓	✓	✓																								✓		
	105	0.3/1.0	7.0/6.6	3000/3000	2ED4820-EM	NEW		✓	✓	✓									✓								✓							✓		


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Complementary: Opto-isolated solid state relays

Typical connection



Microelectronic relays (MER) are power MOSFET or IGBT output photovoltaic relays where the output switch is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output. MERs are a good choice to replace mechanical relays.

Load voltage [V]	Load current [mA]	$R_{DS(on)}$ [Ω]	Isolation voltage [V_{RMS}]	Base PN	DIP-6	SMT-6	DIP-8	SMT-8	DIP-4	SMT-8 (with 4 pins)
	140 AC-DC	27/7	4000	PVU414		✓				
	120 AC-DC	35/9	4000	PVT412L	✓			✓		
	240 AC-DC	6/2	4000	PVT412A	✓	✓				
	140 AC-DC	27/7	4000	PVT412	✓	✓				
	120 AC-DC	35	4000	PVT422			✓	✓		
300	150 AC-DC	24	4000	PVA3354N					✓	✓
				PVA3324N					✓	
	50 AC-DC	160	4000	PVA3055N					✓	✓
				PVA3054N						✓
250	170 AC-DC	15/4.25	4000	PVT312L	✓	✓				
	190 AC-DC	10/3	4000	PVT312		✓				
	170 AC-DC	8	4000	PVT322A				✓		
	170 AC-DC	10	4000	PVT322			✓	✓		
200	150 AC-DC	24	4000	PVA2352N					✓	
150	550 AC-DC	0.7/0.25	4000	PVT212		✓				
100	550 DC	1.5	4000	PVD1354N					✓	✓
				PVD1352N					✓	✓
	375 AC-DC	5	4000	PVA1354N					✓	
				PVA1352N					✓	✓
60	1500 DC	0.25	4000	PVDZ172N					✓	✓
	2000 AC/4000 DC	0.1/0.035	4000	PVG612A	✓	✓				
	1000 AC/2000 DC	0.5/0.15	4000	PVG612	✓	✓				



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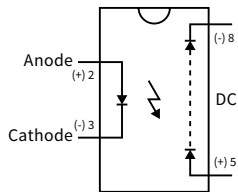
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Infineon solid state relay package options



Complementary: Opto-isolated solid state relays

Typical connection



Photovoltaic isolators generate an electrically isolated DC voltage upon receipt of a DC input signal and are capable of directly driving MOSFET or IGBT gates. The output is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output

Output voltage DC [V]	Short current [μ A]	Nominal control current (DC) [mA]	Isolation voltage [V_{RMS}]	Base PN	Package			
					DIP-8	SMT-8	DIP-8 (with 4 pins)	SMT-8 (with 4 pins)
5/10	10/5	5	3570	PVI5033R	✓	✓		
5/10	10/5	10	2500	PVI1050N	✓	✓		
5	8	10	4000	PVI5080N			✓	✓
5	5	10	4000	PVI5050N				✓



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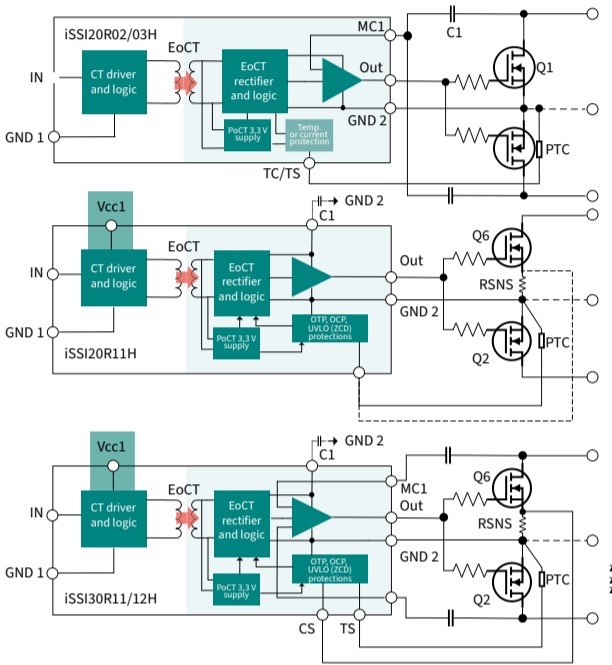
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Coreless Transformer Solid State Isolators

ISSI20RXXH, ISSI30RXXH

The new Infineon Solid State Isolator (SSI) family of products use Infineon's Coreless Transformer technology for a high-performance isolator. They allow driving high power and low on-state resistance MOSFETs, thus allowing to replace SCRs and TRIACs with the advantage of dramatically reducing the power dissipation and extending the field application range of the SSR. Solid State Relays (SSR) built by using the SSI can easily replace most Electromechanical Relay (EMR) in a wide range of power applications where conventional SSR had no success until today. The new SSI come also with precise and fast-acting protection functions such as Miller Clamp, overcurrent, and overtemperature protections to achieve unprecedented reliability and availability of SSR designs.

Typical connection diagram



Product specifications at a glance

Part Number	V _{in} range	V _{cc} range	I _{out peak}	V _{out typ}	Features	Package
iSSI20R02H	TTL /CMOS	2.85 V - 3.5 V	175 uA	13 V (at Vin = 2.3 V) >17 V at Vin= 3.4 V	TS/CS + MC	DSO-8-66
iSSI20R03H						DSO-8-66
iSSI20R11H	TTL /CMOS	2.85 V - 3.5 V	400 mA	13 V (at Vin = 2.3 V) >17 V at Vin= 3.4 V	TS, CS	DSO-8-66
iSSI30R11H	TTL /CMOS	2.85 V - 3.5 V	400 mA	13 V (at Vin = 2.3 V) >17 V at Vin= 3.4 V	CS, TS, MC (2)	DSO-16-33
iSSI30R12H	TTL /CMOS	2.85 V - 3.5 V	400 mA	13 V (at Vin = 2.3 V) >17 V at Vin= 3.4 V	CS, TS, MC (2), D-Sense (30R12H)	DSO-16-33

TS: Temperature Sense (input pin for overtemperature protection)
CS: Current Sense (input pin for overcurrent protection)
MC: Miller Clamp
D-Sense: Diode Sense (30R12H Only)



Features and benefits

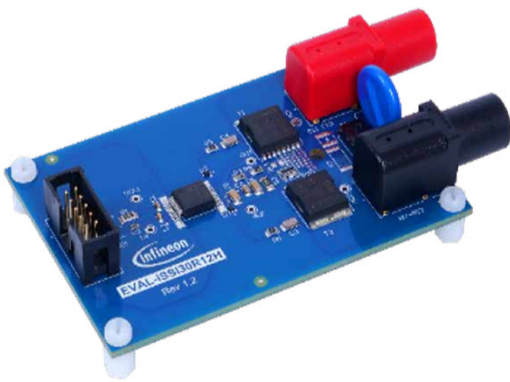
- Product features**
- Large input voltage range, compatible with photovoltaic isolators.
 - Self-supplied output stage with very high output short circuit
 - Very high output voltage, suitable for MOSFETs and IGBTs
 - Thermal protection
 - Overcurrent protection
 - Miller Clamp
 - Fast turn-off / on of output devices
 - Power on reset and safety clamp on input stage

- Product benefits**
- Replaces PVI and improves circuit performances
 - No need for isolated supply for the output stage, smaller BOM
 - Direct drive of switches' gate, no need for series/parallel
 - Switches protection in temperature and current, avoids CdV/dT effect by Miller Clamp
 - Ensures safe switching transition of MOSFETs

Full Featured Evaluation Board: EVAL-iSSI30R12H

EVAL-iSSI30R12H is intended for evaluating the product features of Infineon's iSSI solid-state isolator, iSSI30R12H, in an application circuit.

- Evaluation board with iSSI30R12H and two CoolMOS™ IPT60T022S7 MOSFETs in an AC switch configuration
- Ultrafast overcurrent detection that is triggered at the typical peak current of 35 A
- Direct-chip temperature measurement of CoolMOS™ with shutdown at 155°C
- Fast turn-on
- Fast turn-off after overcurrent and overtemperature protection
- Dynamic Miller clamping



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Features

Addressing various application requirements, Infineon delivers solutions with an assortment of features intended to optimize performance, minimize size and reduce cost. Below is a table of additional gate-driver IC features available in the current portfolio.

Features	Abbreviation	Benefits
Active Miller clamp	M-CLAMP	Protection against inadvertent dynamic turn-on because of parasitic Miller effects
Active shutdown	SD-ACT	Ensures a safe IGBT off-state in case the output chip is not connected to the power supply or an undervoltage lockout is in effect
Brake chopper	BRAKE	Integrated brake IGBT driver with protection
Comparator	CMP	General purpose comparator included
Desaturation protection	DESAT	Protects the IGBT at short circuit
Enable	EN	Dedicated pin terminates all outputs
Fault reporting	FAULT-RPT	Indicates an overcurrent or undervoltage shutdown has occurred
Fault reset	FAULT-RST	Dedicated pin resets the DESAT-FAULT-state of the chip
High-voltage start-up	HVSTART	Provides easy and fast circuit start-up while enabling low circuit standby losses
Integrated bootstrap diode	BSD	Integrated bootstrap reduces BOM
Operational amplifier	OPAMP	An independent op-amp for current measurement or overcurrent detection
Oscillator	OSC	Integrated front end oscillator
Over-current protection (ITRIP)	OCP	Ensures safe application operation in case of overcurrent
Programmable dead time	DT-PROG	Dead time is programmable with external resistor for flexible design
Programmable fault clear time	FLTC	The length of the fault clear time period (t_{FLTC}) is programmed by external capacitor which connected between FLTC and $V_{SS}(C_{FLTC})$.
Programmable shutdown	SD-PROG	A shutdown feature has been designed into a pin
Separate pin for logic ground	SEP-GND	Dedicated pin or logic ground for improved noise immunity
Separate sink/source outputs	SEP-OUT	Simplifies gate resistor selection, reduces BOM, and improves dV/dt control
Shoot-through protection	STP	Additional shoot-through protection logic such as interlock
Short-circuit clamping	SC-CLAMP	During short circuit the IGBT's gate voltage tends to rise because of the feedback via the Miller capacitance. An additional protection circuit connected to OUT+ limits this voltage to a value slightly higher than the supply voltage.
Shutdown	SD	Dedicated pin disables the IC outputs
Soft overcurrent shutdown	SD-SOFT	Dedicated pin turns off the desaturated transistor, preventing overvoltages
Truly Differential Inputs	TDI	Control inputs independent from gate driver GND, robust against ground shifts from power MOSFET switching
Two-level turn-off	TLTO	Lowers VCE overshoots at turn-off during short circuits or overcurrent events
UL 1577	UL	Double galvanic isolation certification
Undervoltage lockout	UVLO	Ensures safe application operation by avoiding unexpected driver behavior at low voltages
VDE 0884-10 or VDE 0884-11	VDE	Reinforced galvanic isolation certifications for non-optical couplers



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Gate driver ICs for SiC MOSFETs

Ultrafast switching from 650 V to 2000 V power transistors, such as CoolSiC™ SiC MOSFETs, can be more easily handled by isolated gate driver solutions.

The following EiceDRIVER™ gate driver ICs incorporate the most important key features for driving SiC MOSFET such as tight propagation delay matching, precise input filters, wide output supply voltage range, negative gate voltage capability, extended CMTI capability, Miller clamp, and DESAT protection.

Product family	Part number	Typ. current	V_{CC2} $-V_{EE2}$	UVLO	Prop. delay (accuracy)	CMTI	Isolated	Other key features	Package
Achieve high efficiency and power density: take advantage of low propagation delay and high CMTI									
EiceDRIVER™ 1EDB 1-channel family	1EDB9275F 1EDB6275F	5/9 A	20 V	14.9/14.4 V 12.2/11.5 V	45 ns (+6/-4 ns)	300 V/ns	✓	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8, 150 mil
EiceDRIVER™ 2EDi 2-channel family	2EDR9259X 2EDR9258X 2EDR6258X	5/9 A	20 V	14.9/15.4 V 14.9/15.4 V 12.5/11.5 V	38 ns (+9/-5 ns)	150 V/ns	✓	2EDi Gen 2, dead-time control, disable/enable, reinforced isolation, UL 1577, VDE-11, IEC 62368-1, GB4943.1	DSO-14, 300mil
	2EDB9259Y			14.9/15.4 V			✓	2EDi Gen 2, dead-time control, basic isolation, UL 1577, GB4943.1	DSO-14, 150 mil
EiceDRIVER™ 1EDN-TDI 1-channel family	1EDN6550B 1EDN9550B	4/8 A	20 V	12.2/11.5 V 14.9/14.4 V	45 ns (+10/-7 ns)	N/A	-	Separate source/sink outputs	SOT23-6
EiceDRIVER™ X3 Compact 2-channel family	2ED3146MC12L	6.5/6.5 A	35 V	12.5 / 13.6 V	50 ns (+/- 8ns)	300 V/ns	✓	Active shutdown, dead-time (DT) control with arm shoot-through prevention in half-bridge operation, Individual channel control operation (DT: open or tied to VCC1), Enable, Reinforced isolation IEC 60747-17, UL 1577	DSO-14, 300mil
Avoid parasitic turn-on: take advantage of Miller clamp options									
EiceDRIVER™ 1ED Compact 1-channel family	1EDI20I12MF 1EDI60N12AF	4 A 10 A	20 V 35 V	12.7/10.5 V 10/8 V	300 ns 125 ns	100 V/ns 100 V/ns	✓ ✓	Miller clamp, functional isolation Separate source/sink outputs, functional isolation	DSO-8, 150 mil
EiceDRIVER™ X3 Compact 1-channel family	1ED1342MU12F	6.5/6.5 A	35 V	12.5 / 13.6 V	45 ns (+/- 7ns)	300 V/ns	✓	Active shutdown, functional isolation UL 1577	DSO-8, 150 mil
EiceDRIVER™ 2L-SRC Compact 1-channel family	1ED3145MC12H 1ED32xxMC12H	6.5/6.5 A 10/18 A	35 V 35 V	12.5 / 13.6 V 12.5/10.4 V	45 ns (+/- 7ns) 110 ns (+/- 15 ns)	300 V/ns 200 V/ns	✓ ✓	Active shutdown, reinforced isolation IEC 60747-17, UL 1577 Two-level slew-rate control, Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-8, 300 mil DSO-8, 300 mil
Short-circuit protect your CoolSiC™: take advantage of the fast and accurate DESAT protection									
EiceDRIVER™ 1ED-F3 1-channel family	1ED332xMC12N	3/6 A	35 V	12.6/10.4 V 13.6/12.6 V	85 ns	300 V/ns	✓	Miller clamp, short circuit protection, soft-off, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Analog 1-channel family	1ED34x1MC12M	3/6/9 A	35 V	12.6/10.4 V	244 ns (+/- 30 ns)	200 V/ns	✓	Analog configurable, fast and accurate short circuit protection and soft turn-off Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Digital 1-channel family	1ED38x0MC12M	3/6/9 A	35 V	12.6/10.4 V default, but adjustable	244 ns (+/- 30 ns)	200 V/ns	✓	Digital configurable (I ² C), fast and accurate short circuit protection, rich monitoring functionality (predictive maintenance) Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ 2ED-F2 2-channel family	2ED020I12-F2	2 A	28 V	12.6/10.4 V	170 ns	50 V/ns	✓	Miller clamp, short circuit protection	DSO-36, 300mil



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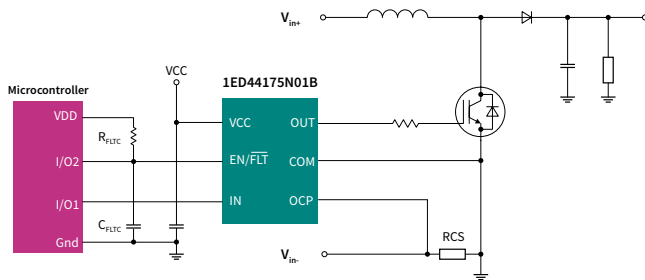
EiceDRIVER™ non-isolated low-side gate drivers

1ED4417x, 1-ch, low-side drivers with integrated protection features

EiceDRIVER™ 1ED4417x family are 25 V, 1-channel low-voltage, non-inverting, low-side gate drivers designed for ground-referenced applications such as power-factor correction (PFC) circuits. Typically, overcurrent protection (OCP) is implemented by a current measurement with a comparator and multiple resistors and capacitors. The 1ED44176N01F, 1ED44175N01B, and 1ED44173N01B provides up to 20 percent cost and 50 percent space savings by integrating a fast and accurate OCP. The new family of low-side gate drivers utilize Infineon's proprietary latch immune CMOS technologies to enable a rugged monolithic construction while realizing best-in-class fault reporting accuracy with OCP threshold tolerance of +/-5 percent. In addition, Infineon's IC technology enables a tiny PG-SOT23 package (or DSO-8 for 1ED44176N01) by combining the fault output and enable functions into a single pin.

The family also includes 1ED44171N01B, a cost-effective, simple driver with enable and fault reporting functions. With a single PCB layout, 1ED44171N01B can be used as a second source option to the popular IRS44273L. Enabling a single-supplier, dual sourcing strategy for fast-reacting supply flexibility.

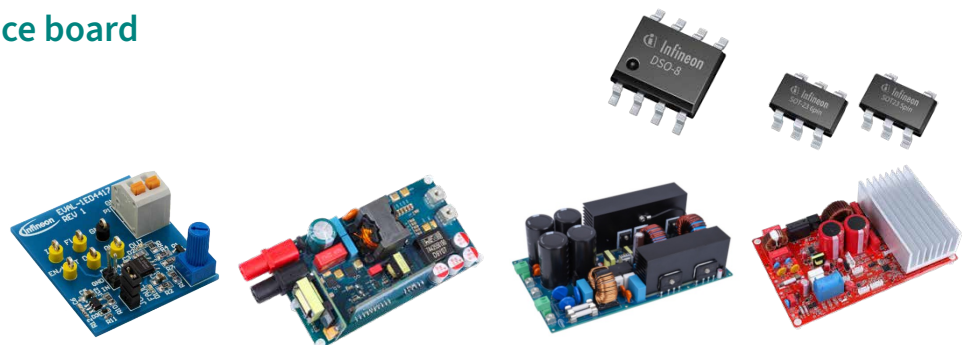
Simplified application diagram



Part Number	Package	I _{o2} [A]	UVLO [V]	V _{OCTH} [mV]	T _{on/off} [ns]	Ground pins	Feature
1ED44171N01B	SOT23-5	2.6/2.6 A	11.9/11.4 V	N/A	50/50 ns	COM	Enable, Fault, cost-effective
1ED44173N01B	SOT23-6	2.6/2.6 A	8/7 V	-250 mV	34/34 ns	COM	OCP (negative current sensing), Enable, Fault
1ED44175N01B	SOT23-6	2.6/2.6 A	11.9/11.4 V	-250 mV	50/50 ns	COM	OCP (positive current sensing), Enable, Fault, Programmable fault clear time
1ED44176N01F	DSO-8	0.8/1.75 A	11.9/11.4 V	500 mV	50/50 ns	V _{SS} /COM	OCP (positive current sensing), Enable, Fault, Programmable fault clear time

Evaluation and reference board

- › EVAL-1ED44176N01F
- › EVAL-1ED44175N01B
- › EVAL-1ED44173N01B
- › EVAL-PFC5KIKWWR5SYS
- › REF-SHA35WRC2SYS
- › REF-AIRCON-C302A-IM564



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2EDN EiceDRIVER™ family

Rugged, fast, dual-channel low-side 4 A/5 A gate-driver ICs

EiceDRIVER™ 2EDN family overview

Dual-channel driver ICs are the crucial link between control ICs and powerful MOSFET, wide band gap (WBG) switching devices. Driver ICs enable high system level efficiencies, excellent power density and consistent system robustness.

EiceDRIVER™ 2EDN family: Fast, precise and compatible

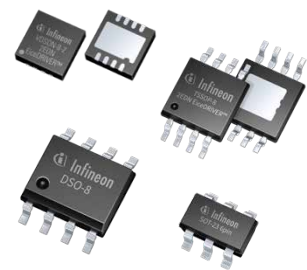
- Highly efficient SMPS enabled by 19 ns propagation delay and 2 ns channel-to-channel mismatch precision for fast MOSFET and WBG switches
- Diversified applications driven by strong output current 4 A/5 A per channel
- Unique designs are supported by the availability of numerous packages

EiceDRIVER™ 2EDN family: The new reference in ruggedness and low power dissipation

- 4 V and 8 V UVLO (undervoltage lock out) options for instant FETs protection under abnormal conditions, further improved with active output voltage clamping
- -10 V robustness of control and enable inputs provides crucial safety margin when driving pulse transformers or driving FETs in various packages
- 5 A reverse output current robustness eliminates the need for Schottky switching diodes and reduces bill-of-material
- Cool driver ICs from true rail-to-rail low impedance output stages

Applications

- Server
- Telecom
- DC-DC Converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverter
- LED lighting



Key features	Product benefits	System benefits
<ul style="list-style-type: none"> – 5 A source/sink current – 2 ns channel-to-channel mismatch – 10 ns minimum input pulse width 	<ul style="list-style-type: none"> – Fast Miller plateau transition – Precise timing 	<ul style="list-style-type: none"> – High power efficiency <ul style="list-style-type: none"> – in hard switching PFC with SiC diode – in half-bridges and synchronous rectifications
<ul style="list-style-type: none"> – True rail-to-rail low impedance output stages 	<ul style="list-style-type: none"> – Low power dissipation in driver IC 	<ul style="list-style-type: none"> – Cooler driver IC operation – Higher FETs drive capability
<ul style="list-style-type: none"> – 4 V and 8 V UVLO options, with active output voltage clamping – 19 ns propagation delay for both control and enable 	<ul style="list-style-type: none"> – Fast and reliable FETs turn-off, independent of control IC 	<ul style="list-style-type: none"> – Instant FETs protection under abnormal operation
<ul style="list-style-type: none"> – -10 V robustness of control and enable inputs 	<ul style="list-style-type: none"> – Increased GND-bounce robustness 	<ul style="list-style-type: none"> – Crucial safety margin to drive pulse transformer
<ul style="list-style-type: none"> – 5 A reverse output current robustness 	<ul style="list-style-type: none"> – Saves switching diodes 	<ul style="list-style-type: none"> – Increases power density – BOM savings
<ul style="list-style-type: none"> – 2 independent channels 	<ul style="list-style-type: none"> – Option to increase drive current by truly concurrent switching of 2 channels 	<ul style="list-style-type: none"> – One IC covering many applications
<ul style="list-style-type: none"> – Industry standard pinout and packages 	<ul style="list-style-type: none"> – Straight forward design upgrades 	<ul style="list-style-type: none"> – Short time to market



SMPS



Server



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Motor control



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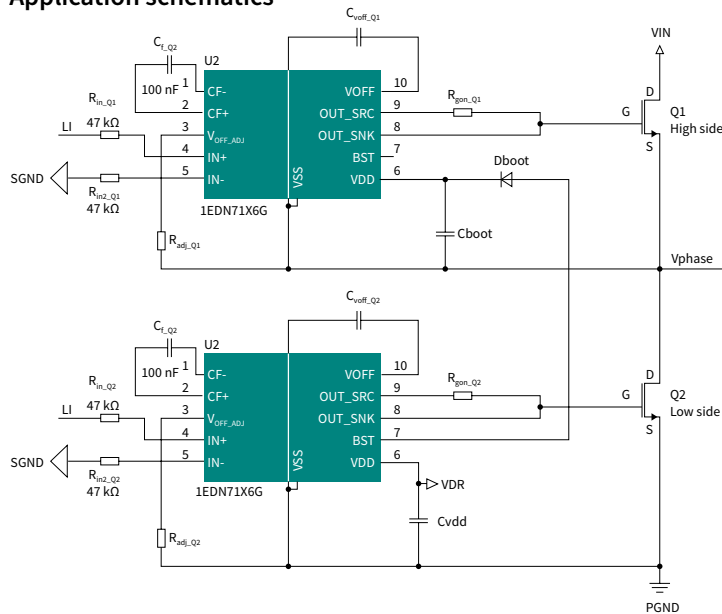
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EiceDRIVER™ 1EDN71x6G/U family

200 V 1-ch gate drivers with truly differential input (TDI)

The 1EDN71x6G/U is a 1-channel gate driver family optimized for Infineon CoolGaN™ Schottky-gate (SG) HEMTs, and also compatible with other GaN SG HEMTs and silicon MOSFETs. The TDI feature eliminates the risk of false triggering due to ground bounce in low-side applications and enable 1EDN71x6G/U to address even high-side applications. The TDI feature works by controlling the gate driver output state exclusively by the voltage difference between the two inputs, completely independent of the driver's reference (ground) potential as long as the common-mode voltage is below 150 V (static) and 200 V (dynamic).

Application schematics



Features and benefits

Product features

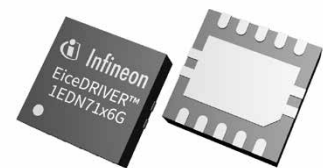
- Truly differential logic input (TDI)
- Four driving strengths
- Active Miller clamp
- Optional negative charge pump
- Active bootstrap capacitor

Product benefits

- High-side driving and low-side ground bounce immunity
- Optimize switching speed without external gate resistors
- Prevent induced turn-on
- Additional induced turn-on immunity
- No overcharging the bootstrap capacitor during deadtime

Product family

Product	Output current	Source/sink resistance	Input pulse blanking time	Package
1EDN7116G	2 A	0.8 Ω	20 ns	VSON-10
1EDN7126G	1.5 A	1.0 Ω	40 ns	VSON-10
1EDN7136G	1 A	1.5 Ω	60 ns	VSON-10
1EDN7146G	0.5 A	3.0 Ω	80 ns	VSON-10
1EDN7116U*	2 A	0.8 Ω	20 ns	TSNP-7
1EDN7126U*	1.5 A	1.0 Ω	40 ns	TSNP-7
1EDN7136U*	1 A	1.5 Ω	60 ns	TSNP-7
1EDN7146U*	0.5 A	3.0 Ω	80 ns	TSNP-7



DC-DC



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Artificial intelligence



Collaborative robots



Multicopter



Audio



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EiceDRIVER™ 1EDL8011, 135 V high-side driver

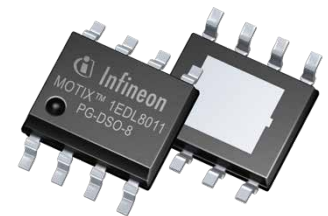
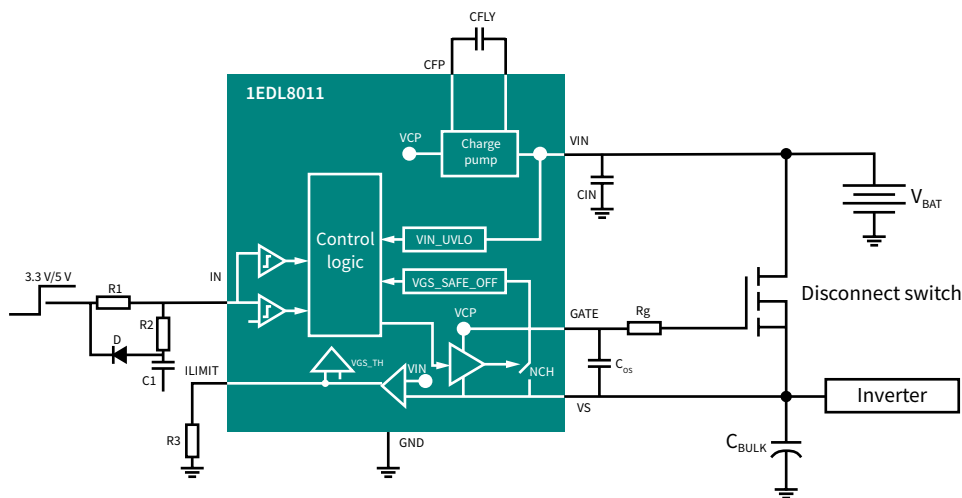
Integrated high-side driver with strong gate drive and integrated charge pump

Infineon's upcoming EiceDRIVER™ 1EDL8011 high-side gate driver provides a simple and highly robust solution to drive a disconnect switch to protect battery operated systems during potential short conditions. 1EDL8011 enables fast turn on/off control of high side N-channel MOSFETs due to the powerful internal gate sourcing and sinking current capabilities. It consists of an integrated charge pump with an external capacitor to provide support for strong start-up and turn-off and scalable FETs in parallel application scenarios. The internal charge pump provides proper MOSFET gate voltage during low operating input voltage conditions. High-side protection avoids faulty shorting conditions in the load and the dangerous presence of in-rush currents for battery-powered applications.

1EDL8011 features include OCP protection, the adjustable current setting threshold, time delay as well as a safe start-up mechanism with flexible blanking during MOSFET turn-on transition. Input voltage under-voltage lockout (UVLO) avoids operation under hazardous conditions and ensures the right level of gate voltage to fully enhance the MOSFET.

The 1EDL8011 gate driver addresses two main use cases in battery operated systems:

- In-rush current control: allows controlled turn-on of the disconnect switch by using an external R_g combined with a safe start-up and blanking mechanism.
- Short circuit protection: whenever a short occurs at the load side, it allows disconnecting the load from the source by quickly turning off the disconnect switch. This is made possible by the strong pull-down inside the 1EDL8011, therefore protecting the whole system.



Features and benefits

Product features

- Operating voltage: 7 – 135 V
- Powerful gate sinking current up to 1 A
- Off-mode quiescent current 1 μ A

Product benefits

- Wide voltage operating range
- Fast turn off for proper protection
- Efficiency and long battery life

Product family

Product	Package	Voltage [A]
1EDL8011*	DSO-8	7 – 135 V



Power tools



Gardening tools



Multicopter



Service robots



eBike



Vacuum cleaner



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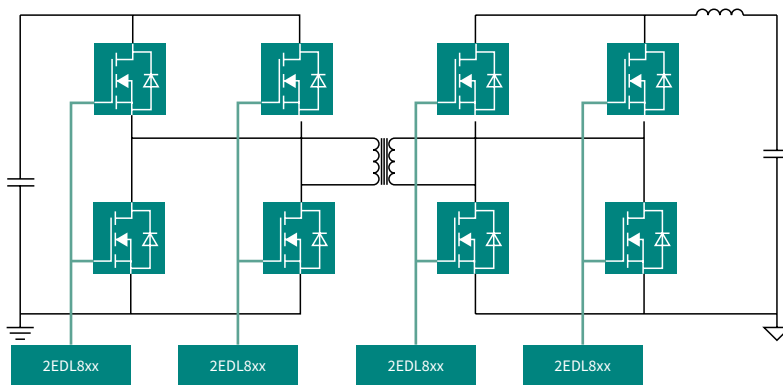
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EiceDRIVER™ 2EDL8x2x family

120 V, 3/4 A, junction-isolated high- and low-side gate drivers

The 2EDL8x2x is a family of high- and low-side gate driver designed for advanced switching DC-DC converters. The 2EDL802x takes in independent inputs while 2EDL812x takes in differential inputs with both having built-in hysteresis for enhanced noise immunity. The gate-driver family comes in two packages: VDSO-8 4x4 mm and VSON-10 3x3 mm.

Application schematics



Features and benefits

Product features

- 120 V integrated boot-strap diode with 10 ns reverse recovery time
- 2 to 4 A output source currents
- 6 A output sink currents
- -8 V/+ 15 V differential input robustness
- 5 A reverse current output robustness
- ±1 ns (typ.) channel-to-channel delay matching

Product benefits

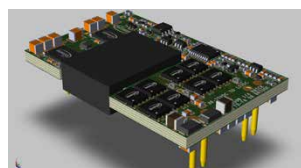
- Drive strength for fast Miller plateau transition
- Fast and robust
- Immunity against false triggering from ground bounce
- No need for Schottky clamping diodes

Product family

Part nu	Input	Source current	Sink current	Min. input pulse width	Propagation delay (typ.)	Matching delay (typ.)	ESD	Package
2EDL8123G	Differential	3 A	6 A	40 ns	45 ns	2 ns	2 kV	VDSO-8 4x4 mm
2EDL8124G		4 A						
2EDL8023G	Independent	3 A						
2EDL8024G		4 A						
2EDL8123G3C*	Differential	3 A						VSON-10 3x3 mm
2EDL8124G3C*		4 A						
2EDL8023G3C*	Independent	3 A						
2EDL8024G3C*		4 A						

Evaluation board:

EVAL_HB_2EDL8x2xG*
REF_600W_FFB_QB*



DC-DC



Battery formation



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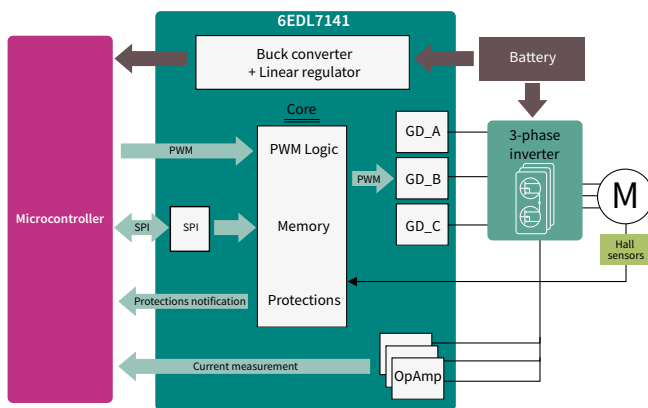
MOTIX™ 6EDL7141 high performance motor control

Next-generation fully programmable three-phase gate driver

6EDL7141, Infineon's latest three-phase motor control gate-driver IC allows our customers to develop their next generation of high performance battery operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 fully programmable parameters using built-in digital SPI interface, 6EDL7141 is fully configurable to drive a wide range of MOSFET's to yield the best possible system efficiency. The integrated buck regulator provides the power for both the microcontroller and the Hall sensors in the motor, further reducing peripheral components and required PCB area. In addition, with a full suite of system protection features such as OCP, UVLO, overtemperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.

Block diagram

Three-phase BLDC battery-powered motor control



Features and benefits

Key features
– Integrated power supply
– Programmable slew rate
– Programmable gate drive supply
– 3x current shunt amplifier
– ADC ref. of 5 V
– Complete dedicated motor control protection suite

Key benefits
– Reduced external components and PCB area
– Optimized efficiency and EMI
– Maximum flexibility to use different inverter FETs
– Highly accurate current sense while saving external components
– Higher dynamic range to increase signal resolution
– Improve reliability and fault detection



EVAL_6EDL7141_TRAP_1SH

BC 1 shunt evaluation board

Parallel 40 V OptiMOS™5 PQFN

XMC1404 MCU

On-board programming dongle

Featured module IC: 6EDL7141



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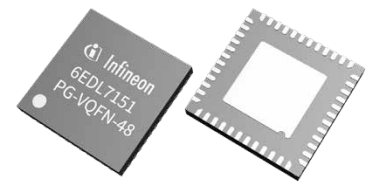
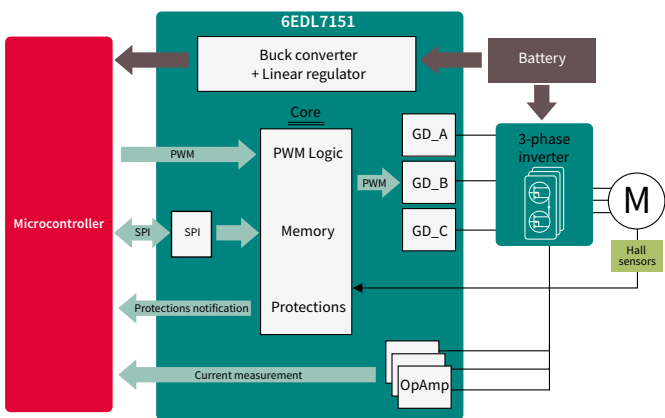
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MOTIX™ 6EDL7151 3-phase smart gate drive controller IC

Three-phase motor control gate-driver IC for battery supplied BLDC motor control

The 6EDL7151 is Infineon's latest 3-phase gate driver which includes added V_{ds} sensor to allow additional hardware system protection for battery supplied motor control products. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using built-in digital SPI interface, 6EDL7151 is fully configurable to drive a wide range of MOSFET's to yield the best possible system efficiency. 6EDL7151 is also designed for maximum performance. Features include programmable dead time delays for preventing current shoot through between HS and LS switches in normal operation and separate charge pumps for low and high side gate drivers support 100 percent duty cycle and low voltage supply operation. Supplies for the gate drivers are programmable to one of the following levels: 7 V, 10 V, 12 V, or 15 V. Additionally, the slew rate of the driving signal can be programmed with fine granularity to reduce EMI emissions. An integrated synchronous buck converter provides an efficient supply of current to the rest of the system. The 6EDL7151 also integrates a linear voltage regulator (up to 300 mA), powered by the buck converter to supply the MCU and other sensitive components in the system. 6EDL7151 includes three current sense amplifiers for accurate current measurements that support bi directional low side current sensing with programmable gain. $R_{DS(on)}$ sensing is supported through internal connection of the phase nodes to the current sense amplifiers inputs. Temperature compensation if needed shall be provided by the user application. 6EDL7151 also includes highly programmable V_{DS} sensors for inverter MOSFET protection. In addition, 6EDL7151 provides numerous protections features for improving application robustness during adverse conditions like monitoring of power supply voltages as well as system parameters. The failure behavior, threshold voltages and filter times of the supervisions of the device are adjustable via SPI. Monitored aspects include inverter currents, gate drive voltages and currents, device temperature, and rotor locked.



Features and benefits

Product features

- Integrated power supplies
- Adjustable slew rate
- 3x current shunt amplifier
- Complete dedicated motor control protection suite
- V_{DS} sensing

Product benefits

- Reduced external component count and PCB area
- Lower voltage overshoots and EMI reduction
- Maximum flexibility to use different inverter MOSFET's
- Highly accurate integrated current sense saves external components
- Improved reliability and fault detection

Product family

Product	Package	Voltage [V]	DVDD regulator output [V]
6EDL7151*	VQFN 48 7mm x 7mm	5.5 – 70 V	5.0 V



Power tools



Gardening tools



Multicopter



Service robots



eBike



Vacuum cleaner



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* Coming soon

MOTIX™ 160 V SOI gate-driver family

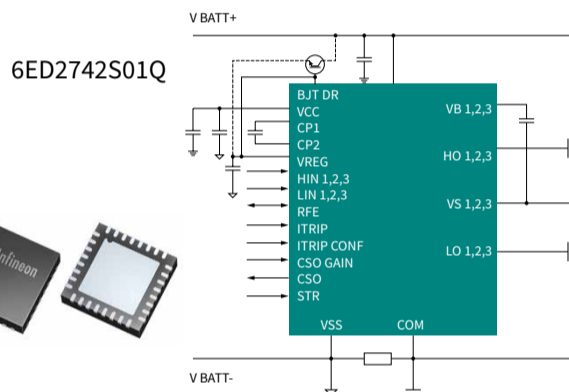
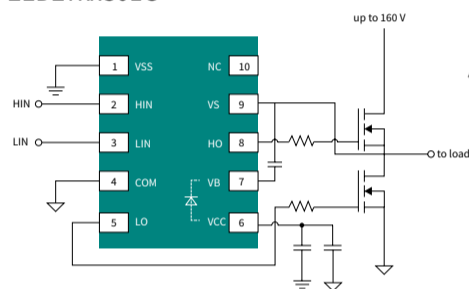
2ED27xxS01G half-bridge and high- and low-side gate-driver family with integrated bootstrap diode

6ED2742S01Q three-phase driver with charge pump, current sense amplifier, OCP and bootstrap diode

MOTIX™ 160 V SOI gate-driver family is designed for the BLDC motor drive applications. The SOI technology enables integrated bootstrap diodes, which can be used to supply the external high-side bootstrap capacitor. The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. MOTIX™ 2ED27xxS01G family consists of three half-bridge and three high- and low-side 160 V SOI gate drivers. The UVLO protection is on both V_{CC} and V_B pins. Fast propagation delays (50 ns) are suitable for motor drive and power conversion applications in VSON-10 (3x3 mm) package with exposed ground pad. MOTIX™ 6ED2742S01Q is a 160 V three-phase SOI gate driver, which supports 100 percent duty cycle operation by a trickle charge pump. Protection features include UVLO, OCP with configurable threshold, fault, and automatic fault clear. A current sense operational amplifier (CSA) with selectable gain is integrated between the V_{SS} and COM.

Simplified application diagram

2ED27xxS01G



Product	Package	Output current	Configuration	Deadtime	Propagation delay	
2ED2732S01G NEW	VSON-10 3x3 mm	1/2 A	High- and low-side (HS+LS)	None	50 ns	
2ED2734S01G*		2/4 A			65 ns	
2ED2738S01G NEW		4/8 A	65 ns			
2ED2742S01G NEW		1/2 A	Half-bridge		50 ns	50 ns
2ED2744S01G*		2/4 A				65 ns
2ED2748S01G NEW		4/8 A				65 ns
6ED2742S01Q	VQFN-32 5x5 mm	1/2 A	Three-phase	100 ns		100 ns
2ED772S01G*	VSON-10 3x3 mm	1/2 A	Half-bridge	30 ns		50 ns
2ED2778S01G*	VSON-10 3x3 mm	4/8 A	Half-bridge	30 ns		65 ns

Applications for MOTIX™ 160 V SOI gate driver family

- Servo/stepper drives in robotics and factory automation
- General purpose low-voltage drives
- Battery-operated small home appliances (SHA)
- Professional and consumer service robotics
- Logistics vehicles (e-forklifts, autonomous warehouse robotics)
- Commercial and agricultural drones
- Hand-held battery-operated power tools
- Garden or outdoor power equipment (OPE) tools
- e-scooters, e-bikes, and other e-vehicles that do not require automotive qualification (LSEV)

6ED2742S01Q key features

- Integrated power management with charge pump and pre-regulator supports wide input voltage range of 6 to 140 V
- Integrated overcurrent protection comparator for single-shunt low side operation with programmable +/-5% reference threshold
- Integrated current sense amplifier with programmable voltage gain and ability to read output voltage offset during zero phase current
- Always positive output voltage offset to reduce need for +/- V_{REF} for downstream ADC in microcontroller.
- Integrated, per phase, high-side trickle charge pumps to enable 100% duty cycle operation
- Integrated, multi-function RFE pin combines FAULT, FAULT Clear, and Enable functionality



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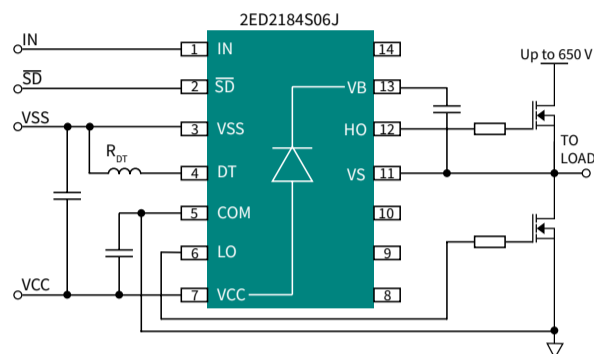
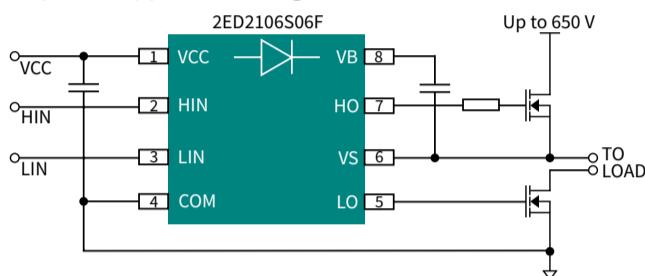
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EiceDRIVER™ 650 V level-shift SOI gate driver family

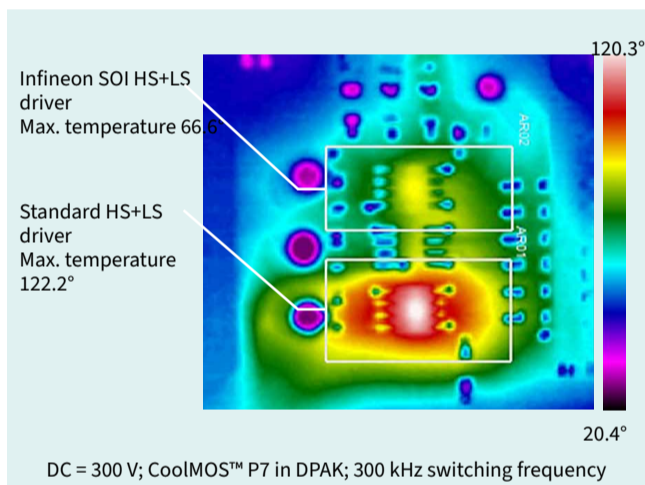
2ED2101/3/4 and 2ED2110: EiceDRIVER™ fast level-shift SOI family with 90 ns prop delay
 2ED2106/8/9 and 2ED2181/2/3/4: EiceDRIVER™ general purpose SOI family

EiceDRIVER™ 650 V SOI is a family of high-voltage, high-speed MOSFET and IGBT gate drivers. Based on Infineon's SOI technology, this family features an integrated, ultra-fast, low $R_{DS(on)}$ bootstrap diode and offers excellent ruggedness and noise immunity with tolerance to negative transient voltages of up to -100 V. The absence of parasitic thyristor structures ensures superior latch up immunity. The level-shift loss is significantly reduced on the EiceDRIVER™ SOI gate drivers compared to other technologies.

Simplified application diagrams

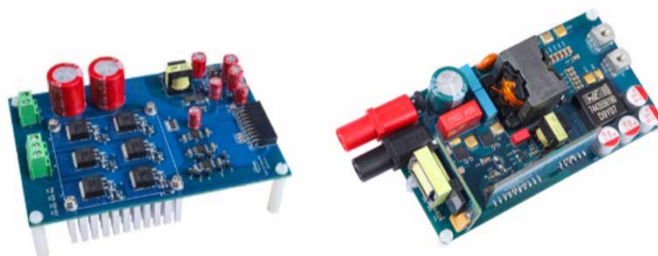


Power dissipation of Infineon SOI



Evaluation board

EVAL-M1-2ED2106S
 EVAL-2ED2101 HB-LLC



Product family	Part number	Output current	Prop. delay	Input logic	Configuration	Package
EiceDRIVER™ fast level-shift SOI	2ED2101S06F	0.29/0.7 A	90 ns	HIN, LIN	High- and low-side	DSO-8
	2ED2103S06F			HIN, LIN	Half-bridge	
	2ED2104S06F			IN, SD	Half-bridge	
	2ED2388S06F*			HIN, LIN	Half-bridge	
	2ED2110S06M	2.5/2.5 A	HIN, LIN	High- and low-side	DSO-16 WB	
EiceDRIVER™ general purpose SOI	2ED2106S06F	0.29/0.7 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21064S06J			HIN, LIN	High- and low-side	DSO-14
	2ED2108S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21084S06J			HIN, LIN	Half-bridge	DSO-14
	2ED2109S06F	740/200 ns	IN, SD	Half-bridge	DSO-8	
	2ED21094S06J		IN, SD	Half-bridge	DSO-14	
	2ED21091S06F		IN, DT/SD	Half-bridge	DSO-8	
	2ED21091S06F		IN, DT/SD	Half-bridge	DSO-8	
	2ED2181S06F	2.5/2.5 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21814S06J			HIN, LIN	High- and low-side	DSO-14
	2ED2182S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21824S06J			HIN, LIN	Half-bridge	DSO-14
	2ED2183S06F	600/200 ns	200/200 ns	HIN, LIN	Half-bridge	DSO-8
	2ED21834S06J			HIN, LIN	Half-bridge	DSO-14
2ED2184S06F	IN, SD			Half-bridge	DSO-8	
2ED21844S06J	IN, SD			Half-bridge	DSO-14	



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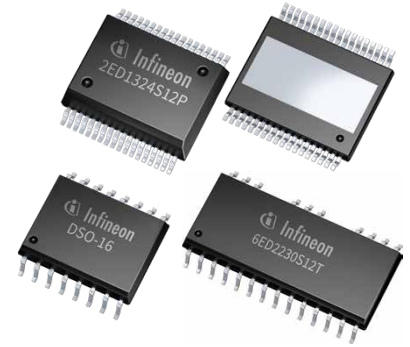
* Coming soon

EiceDRIVER™ 1200 V level-shift SOI gate driver family

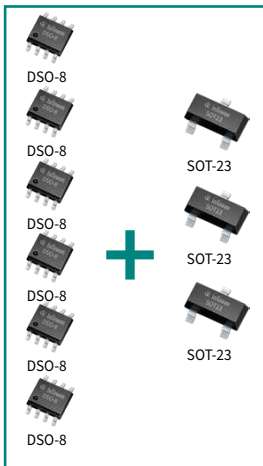
6ED223x: 1200 V three-phase SOI driver with OCP, bootstrap diode

2ED132x: 1200 V half-bridge and high- and low-side SOI driver with OCP, Miller clamp and bootstrap diode

The 6ED2231S12T is a 1200-V three-phase SOI gate driver, with 0.35 A/0.65 A current in DSO-24 package (DSO-28 with 4 pins removed). The 2ED132x family consists of four 1200 V SOI gate drivers, in half-bridge or high- and low-side configurations. 2ED132x family offers 2.3 A output current in high creepage (8 mm)/clearance DSO-20 wide body package or higher sink option (4.6 A) in DSO-16 wide body package. Both 6ED2231S12T and the 2ED132x family integrates ultra-fast over-current protection (OCP) with ± 5% accuracy, and bootstrap diode. In addition, the 2ED132x family also integrates active Miller clamp.



Current solutions
6 x opto-isolated drivers +
3 x 1200 V bootstrap diodes



- Space savings
- Cost savings
- Easy to design
- Higher reliability
- Faster time to market

New 6ED2231S12T
Integrates 6x gate-driver
functionality and
3x boot-strap diodes
Over-current protection
IGBT/SiC MOSFET UVLOs



**6ED2231S12T easily fits within
EasyPIM™ 1B module footprint**



EVAL-M1-6ED2231-B1

Features and benefits

Key features	Key benefits	Customer value
<ul style="list-style-type: none"> – Leading negative VS immunity – > 50% lower level-shift switching losses – Integrated bootstrap diode – 1200 V breakdown voltage – Integrated input filters 	<ul style="list-style-type: none"> – Increased robustness and reliability resulting in reduced manufacturing and field failures – Reduced power dissipation, lower temperature – Faster frequency switching – Smaller PCB footprints – Reduced BOM costs – Improved noise sensitivity – Latch-up immunity 	<ul style="list-style-type: none"> – Increased profitability from lower lifecycle costs – Faster time-to-market for higher share capture – Enables new applications – Increased flexibility – Increased reliability

Product Name	Configuration	Package	Output current	Key features	Deadtime	T _{ON} /T _{OFF}
6ED2231S12T	NEW Three-phase	DSO-24 (DSO-28 with 4 pins removed)	0.35/0.65 A	OCP, RFE	460 ns	700/650 ns
2ED1324S12P	NEW Half-bridge	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	380 ns	500 ns
2ED1323S12P	NEW HS+LS	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	None	350 ns
2ED1322S12M	NEW Half-bridge	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	400 ns	500 ns
2ED1321S12M	NEW HS+LS	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	None	350 ns

Click here to learn more:
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2EDi EiceDRIVER™ family

Fast, robust, dual-channel galvanic isolated gate-driver ICs

Galvanic isolated EiceDRIVER™ family overview

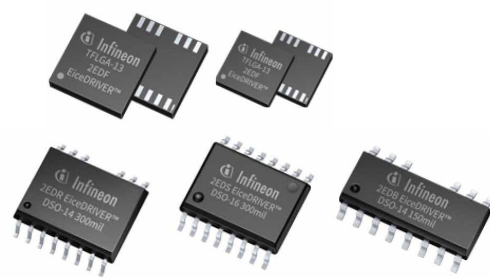
The 2EDi is a family of dual-channel isolated gate driver ICs designed to drive Si MOSFETs, SiC MOSFETs and GaN power switches. Isolation is achieved by means of Infineon's coreless transformer (CT) technology which guarantees robust operation and industry benchmark common-mode rejection (CMTI). The high propagation delay accuracy and low channel-to-channel mismatch makes the product ideal for use in fast-switching power system. In addition, high CMTI, high reverse current capability and fast clamping of the output below UVLO guarantees reliable operation in the application.

2EDi Gen 2: What is new?

- New DSO8 4x4 package
- DSO-14 packages with increased channel-to-channel creepage to easier the layout or enable the use with higher working voltages or worst pollution layout
- Fulfills the latest component standard for magnetic couplers (IEC 60747-17)
- Programmable dead-time and shoot-through functionality

Applications

- Server
- Telecom
- DC-DC converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverter
- LED lighting
- Home appliances air conditioner
- Motor driver
- Battery charger
- EV chargers
- OBC-DCDC
- Microinverters



Features and benefits

Key features	Key benefits	Customer value
<ul style="list-style-type: none"> – Fast power switching with accurate timing – 5 A/9 A source/sink currents – Propagation delay typ. 38 ns with 6 ns channel-to-channel precision 	<ul style="list-style-type: none"> – Efficiency gain and lower losses – Strong driving enables reduced switching losses – Accurate timing enables deadtime optimization or synchronized driving in case of parallel MOSFETs 	<ul style="list-style-type: none"> – Enabling higher system efficiency and higher power density designs
<ul style="list-style-type: none"> – Optimized for area and system BOM – < 1 Ω source and sink output resistance – Output stages with 5 A reverse current capability 	<ul style="list-style-type: none"> – Improved thermal behavior at smaller form factor – Most of the driving power is dissipated externally with reduced thermal stress on the driver – Eliminates two costly protection diodes on the gate driver outputs 	<ul style="list-style-type: none"> – Improving long term competitive cost position, integration and mass manufacturability
<ul style="list-style-type: none"> – Robust – CMTI >150 V/ns – Under voltage lockout function for switch protection – Deadtime control and shoot through protection 	<ul style="list-style-type: none"> – Protection and safe operation – Reliable driver operation against fast switching transients – MOSFET is protected from thermal stress in abnormal conditions – Protection against noise and spurious pulses 	<ul style="list-style-type: none"> – Extending end-product lifetime – by improving safe operation of power switches in normal and abnormal field (grid) conditions
<ul style="list-style-type: none"> – Output-to-output channel isolation – Functional level galvanic isolation 	<ul style="list-style-type: none"> – Flexible configurations – High-side + low-side, high-side + high-side, low-side + low-side 	<ul style="list-style-type: none"> – Lower EMI by ground isolation
<ul style="list-style-type: none"> – Input-to-output channel isolation – Functional, basic and reinforced galvanic isolation 	<ul style="list-style-type: none"> – Regulatory safety – Functional for level-shifting and ground bounce immunity – Reinforced for control of primary-side MOSFETs from secondary-side controller 	<ul style="list-style-type: none"> – Simplified safety approval – through component standards (UL1577, IEC60747-17) and system standards (IEC62368) certificates



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EiceDRIVER™ X3 Compact and 2L-SRC Compact

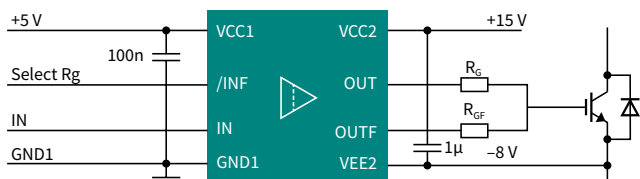
5.7 kV, 18 A, 1-ch, isolated drivers with Miller clamp and two-level slew rate control

The EiceDRIVER™ X3 Compact family (1ED31xx) provides Miller clamp or separate output options with up to 14 A current, in DSO-8 150 mil and 300 mil package. The EiceDRIVER™ 2L-SRC Compact family (1ED32xx) provides Miller clamp or 2-level slew rate control options with up to 18 A current, in DSO-8 300 mil package. The Miller clamp function is highly recommended for SiC MOSFET 0 V turn off and TRENCHSTOP™ IGBT7 against parasitic turn on. The two-level slew rate control function allows customers to change the output current on the fly. It is highly recommend for industrial drives application, where customer suffer from the EMI and switching loss optimization. Both EiceDRIVER™ X3 Compact and 2L-SRC Compact families are rated up to 2300 V functional isolation and 200 kV/μs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

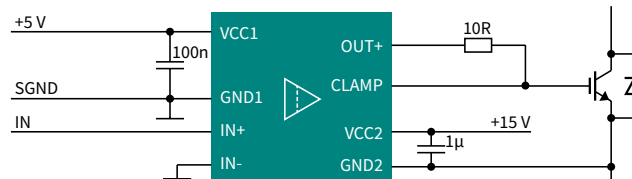


Simplified application diagram

Two-level slew rate control (1ED3241MC12H)



Active Miller clamp (1ED3122MC12H)



Evaluation board

- EVAL-1ED3121MX12H
- EVAL-1ED3122MX12H
- EVAL-1ED3124MX12H
- EVAL-1ED3241MC12H
- EVAL-1ED3251MC12H
- REF-22K-GPD-INV-EASY3B



Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop. delay matching	Package	Isolation rating	
EiceDRIVER™ X3 Compact	1ED3127MU12F	10 A	Miller clamp	90 ns	30 ns	12 V	7 ns	DSO-8 150mil	UL 1577: V _{ISO} = 3 kV _{RMS}	
	1ED3125MU12F	10 A	Separate output	45 ns	15 ns	10.5 V				
	1ED3140MU12F	6.5 A				8.5 V				
	1ED3141MU12F	6.5 A				11 V				
	1ED3142MU12F	6.5 A				12.5 V				
	1ED3124MU12F	14 A				90 ns				30 ns
	1ED3141MC12H*	6.5 A				45 ns		15 ns		11 V
	1ED3142MC12H*	6.5 A	45 ns	15 ns	12.5 V					
	1ED3143MC12H*	6.5 A	UVLO2 refers GND2	45 ns	15 ns	11 V				
	1ED3144MC12H*	6.5 A	45 ns	15 ns	12.5 V					
	1ED3145MC12H*	6.5 A	UVLO2 adjustable	45 ns	15 ns	Adjustable				
	1ED3122MC12H	10 A	Miller clamp	90 ns	30 ns	8 V				
	1ED3123MC12H	14 A	Separate output			8 V				
1ED3124MC12H	14 A	10.5 V								
EiceDRIVER™ 2L-SRC Compact	1ED3240MC12H	10 A	Turn-on and turn-off slew rate control	110 ns	30 ns	10.5 V	15 ns	DSO-8 300mil	UL 1577: V _{ISO} = 5.7 kV _{RMS} IEC 60747-17 V _{IORM} = 1.767 kVrms	
	1ED3241MC12H	18 A				10.5 V				
	1ED3250MC12H	10 A	Turn-on slew rate control and Miller clamp			10.5 V				
	1ED3251MC12H	18 A				10.5 V				
										VDE 0884-11: V _{ISO} = 5.7 kV _{RMS} V _{IORM} = 1767 V (reinforced)



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* Coming soon

EiceDRIVER™ X3 Compact Gen 2 product family

Single channel isolated gate driver for functional or reinforced isolation

**1ED3140MU12F, 1ED3141MU12F, 1ED3142MU12F, 1ED3141MC12H
1ED3142MC12H, 1ED3143MC12H, 1ED3144MC12H, 1ED3145MC12H**

The EiceDRIVER™ Compact 1ED314x products are high-performance single-channel galvanically isolated gate driver ICs. This family is available in either a 150 mil DSO-8 package with 4 mm creepage and clearance or in a 300 mil DSO-8 package with 8 mm creepage and clearance suitable for most industrial applications. The creepage and clearance offered by these packages meet the requirements for fulfilling the functional or reinforced isolation in applications. The excellent part-to-part propagation delay matching of only 7 ns reduces the required deadtime during switching and the strong output stage provides driving currents up to 6.5 A. These features enable high-efficiency power conversion when using IGBTs or SiC MOSFETs in high switching frequency applications. The best-in-class common mode transient immunity (CMTI) rating of 300 kV/μs ensures smooth operation of the gate driver and the system even under very fast switching conditions. The high absolute maximum rating of the output supply voltage enables the straightforward driving of SiC MOSFET and IGBT with both unipolar and bipolar voltage configurations. Undervoltage Lockout (UVLO) options in the 1ED314x family cater to the driving voltage requirements of silicon MOSFETs, IGBTs, and SiC MOSFETs. The isolation capabilities of the gate drivers are planned to be certified under both UL 1577 and IEC 60747-17. The 1ED314x product family is an excellent choice for applications such as electric vehicle charging station, solar inverter, energy storage system, uninterruptible power supply, high voltage air-conditioner, switched-mode power supply, and industrial drives.

Features

Product features

- 35 V absolute maximum output supply voltage
- 6.5 A peak output driving current
- Very short propagation delay (40 ns) and part-to-part tolerance (7 ns)
- UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs
- Active shutdown
- 150 mil and 300 mil DSO 8-pin standard packages
- Certified according to UL 1577 and IEC 60747-17 (planned) standards



DSO-8 150 mil package



DSO-8 300 mil package

150 mil product family

Product Name	Package Information			Typical UVLO2 (VUVLOL2 / VUVLOH2)	UVLO Ref.	Output Type	Certification	Isolation Voltage
	Type	CTI	CLR / CPG					
1ED3140MU12F	DSO-8, 150 mil	400	4 mm / 4 mm	8.5 V / 9.3 V	VEE2	Separate	UL 1577	V _{ISO} = 3000 V (rms)
1ED3141MU12F				11.0 V / 12.0 V				
1ED3142MU12F				12.5 V / 13.6 V				

300 mil product family

Product Name	Package Information			Typical UVLO2 (VUVLOL2 / VUVLOH2)	UVLO Ref.	Output Type	Certification	Isolation Voltage
	Type	CTI	CLR / CPG					
1ED3141MC12H	DSO-8, 300 mil	600	8 mm / 8 mm	11.0 V / 12.0 V	VEE2	Separate	UL 1577 (pending) IEC 60747-17 (planned)	V _{ISO} = 5700 V (rms) V _{IORM} = 1767 V (pk)
1ED3142MC12H				12.5 V / 13.6 V	VEE2	Separate		
1ED3143MC12H				11.0 V / 12.0 V	GND2	Combined		
1ED3144MC12H				12.5 V / 13.6 V	GND2	Combined		
1ED3145MC12H				Adjustable	VCC2	Combined		



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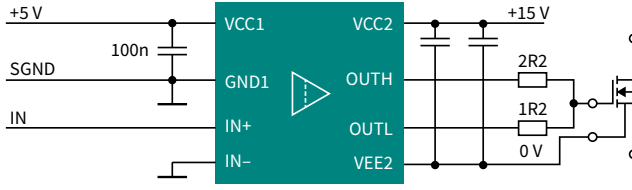
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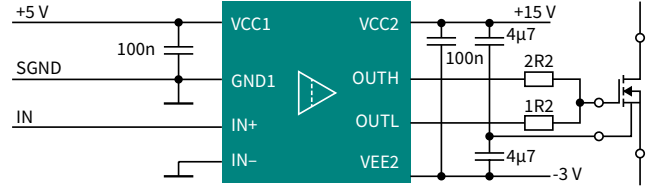
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Typical Application Schematic

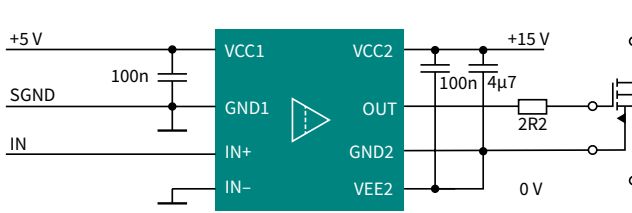
Separate output for unipolar driving,
UVLO2 referred to VEE2



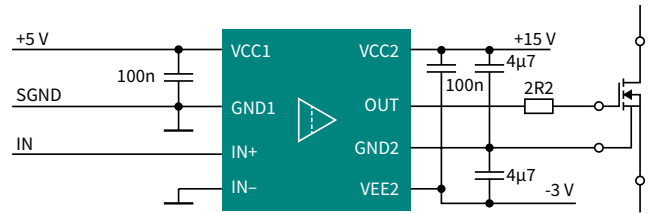
Separate output for bipolar driving,
UVLO2 referred to VEE2



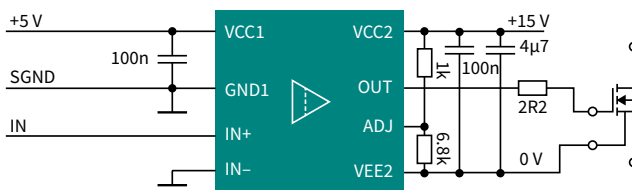
Combined output for unipolar driving,
UVLO2 referred to GND2



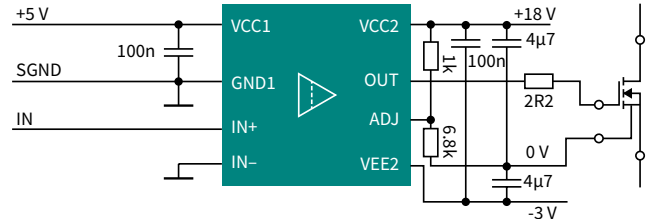
Combined output for bipolar driving,
UVLO2 referred to GND2



Combined output for unipolar driving,
UVLO2 adjustable



Combined output for bipolar driving,
UVLO2 adjustable



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EiceDRIVER™ X3 Compact 2ED314xMC12H

Dual channel isolated gate driver with reinforced isolation

2ED3140MC12L, 2ED3141MC12L, 2ED3142MC12L, 2ED3143MC12L, 2ED3144MC12L, 2ED3145MC12L, 2ED3146MC12L, 2ED3147MC12L

The EiceDRIVER™ Compact 2ED314x products are high-performance dual-channel galvanically isolated gate driver ICs. The 300 mil DSO-14 package offers an input-to-output creepage and clearance of 8 mm and an output channel-to-channel distance of 3.3 mm. The reinforced isolation between input and output and the functional isolation between the outputs meet the requirements of most industrial applications. With only a 39 ns propagation delay and 8 ns channel-to-channel mismatch, the gate drivers support all high frequency switching applications. The 6.5 A output current allows using these ICs with many IGBT and SiC MOSFETs in discrete and power module packages. The dead-time control pin (DT) enables the dual-channel or the half-bridge mode. In half-bridge mode, the gate driver implements a shoot-through protection with configurable dead-time. The established coreless transformer isolation technology offers high common mode transient immunity (CMTI) for robust signal transmission in high dV/dt application conditions. The maximum output supply rating of 35 V is optimized to drive SiC MOSFET and IGBT with unipolar or bipolar gate voltages. The 2ED314x has UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs. The products are planned with UL 1577 and IEC 60747-17 certification to support a broad range of applications, such as electric vehicle charge station, solar inverter, energy storage system, uninterruptible power supply, high voltage air-conditioner, and switched-mode power supply.

Features

Product features
– 35 V absolute maximum output supply voltage
– 6.5 A peak output driving current
– Short propagation delay (39 ns) and part-to-part tolerance (8 ns)
– UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs
– Active shutdown
– Output enable or disable logic control pin
– Selectable dual-channel (non-interlocked) or half-bridge (interlocked) mode
– Shoot-through protection with configurable dead time in half-bridge mode
– 300 mil DSO-14 package
– UL1577 (pending) and IEC 60747-17 certified (planned)

Product family

Product Name	Package Information			Typical UVLO2 (VUVLOL2 / VUVLOH2)	UVLO Ref.	Output Type	Certification	Isolation Voltage
	Type	CTI	CLR / CPG					
2ED3140MC12L	DSO-14, 300 mil	400	8 mm / 8 mm	3.3 mm / 3.3 mm	8.5 V / 9.3 V	DIS	UL 1577 (pending) IEC 60747-17 (planned)	$V_{ISO} = 5700 \text{ V (rms)}$ $V_{IORM} = 1767 \text{ V (pk)}$
2ED3141MC12L					11.0 V / 12.0 V	DIS		
2ED3142MC12L					12.5 V / 13.6 V	DIS		
2ED3143MC12L					14.7 V / 16.0 V	DIS		
2ED3144MC12L					8.5 V / 9.3 V	EN		
2ED3145MC12L					11.0 V / 12.0 V	EN		
2ED3146MC12L					12.5 V / 13.6 V	EN		
2ED3147MC12L					14.7 V / 16.0 V	EN		



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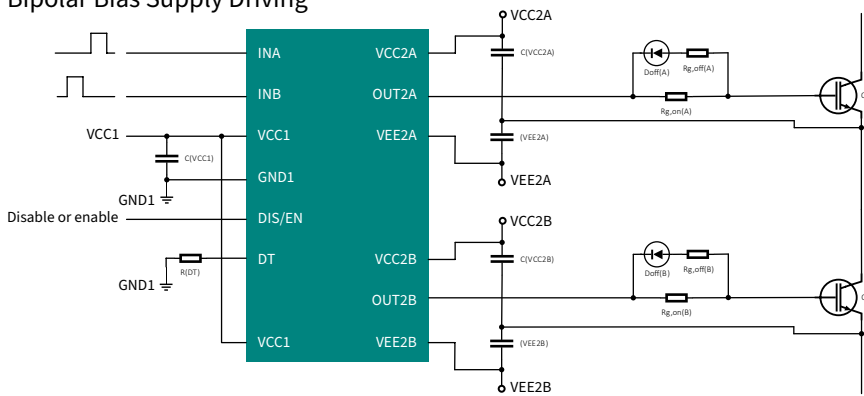
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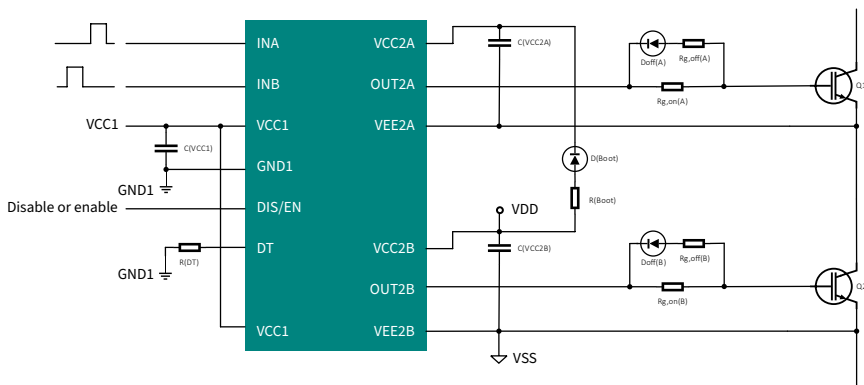
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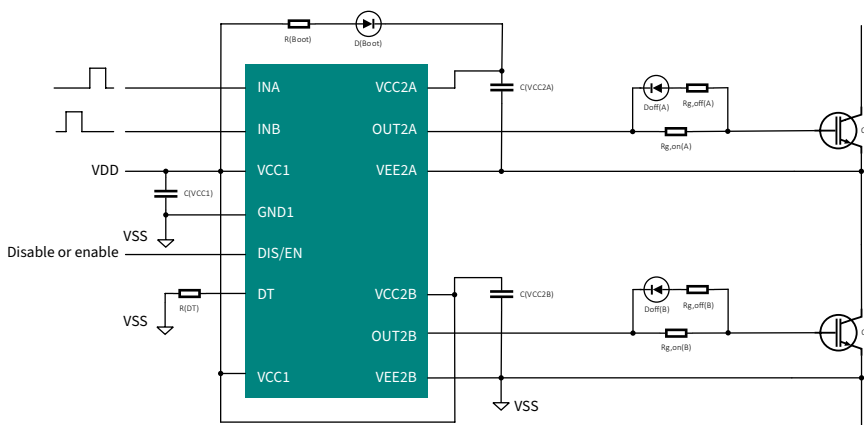
Half-Bridge, Full Isolation Configuration of Input, Output, and Ch-to-Ch with Bipolar Bias Supply Driving



Half-Bridge, Isolation Configuration of Input and Output only, Ch-to-Ch with Unipolar Bootstrap Bias Supply Driving



Half-Bridge, Non-isolation Configuration of Input, Output, and Ch-to-Ch with Unipolar Bootstrap Bias Supply Driving



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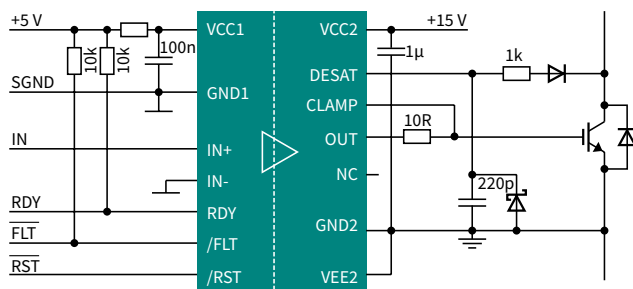
EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog

5.7 kV, 9 A, 1-ch, isolated drivers with DESAT, Miller clamp and soft-off

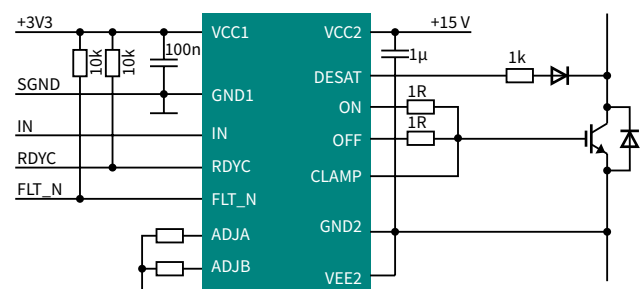
The EiceDRIVER™ Enhanced 1ED-F3 family (1ED332x) provides DESAT, Miller clamp and soft-off features with up to 6 A current, in DSO-16 300 mil package. The EiceDRIVER™ Enhanced X3 Analog family (1ED34xx) provides Miller clamp, resistor configurable DESAT and soft-off function with up to 9 A current, in DSO-16 300 mil fine pitch package. The 1ED-F3 family (1ED332x) is pin-to-pin with our previous generation 1ED020I12-F2 (1ED-F2), with higher current, shorter propagation delay, higher isolation ratings, and additional soft-off function. The X3 Analog family (1ED34xx) offers best-in-class DESAT protection accuracy with the resistor configurability on DESAT filter and leading edge blanking time and soft-off current. Both EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog families are rated up to 2300 V functional isolation and 200 kV/μs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

Simplified application diagram

1ED-F3 (1ED332x)



X3 Analog (1ED34xx)



Evaluation board



EVAL-1ED3321MC12N

EVAL-1ED3491MX12M

Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop. delay matching	Package	Isolation rating
EiceDRIVER™ Enhanced 1ED-F3	1ED3320MC12N	3/6 A	Miller clamp, DESAT, soft-off	80 ns	35 ns	10.5 V	15 ns	DSO-16 300mil	UL 1577: $V_{ISO} = 5.7 \text{ kV}_{RMS}$ VDE 0884-11: $V_{IORM} = 1767 \text{ V}$ (reinforced)
	1ED3321MC12N	6/8.5 A				10.5 V			
	1ED3322MC12N	6/8.5 A	Miller clamp, DESAT			12 V			
	1ED3323MC12N	6/8.5 A				10.5 V			
EiceDRIVER™ Enhanced X3 Analog	1ED3431MC12M	3 A	Miller clamp, resistor adjustable DESAT and soft-off	236 ns	100 ns	10.5 V	30 ns	DSO-16 300mil fine pitch	
	1ED3461MC12M	6 A	Clamp driver, resistor adjustable DESAT and soft-off			10.5 V			
	1ED3491MC12M	9 A				10.5 V			

+SiC



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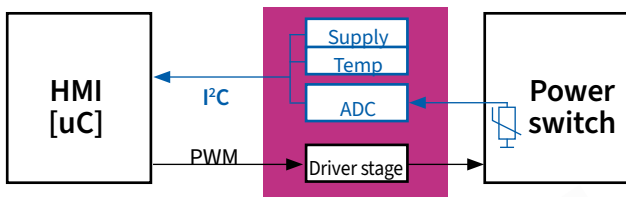
EiceDRIVER™ Enhanced X3 Digital

5.7 kV, 9 A, 1-ch, isolated drivers with I²C configurability for DESAT, Miller clamp, soft-off and many more

The EiceDRIVER™ Enhanced X3 Digital family (1ED38xx) provides I²C configurability for DESAT, soft-off, UVLO, Miller clamp, two-level turn off (TLTO), and fault function to simplify the design of highly reliable systems. All adjustments are done from the input side via the I²C interface (pin SDA and SCL). The 1ED38xx offers up to 9 A current, in DSO-16 300 mil fine-pitch package. The EiceDRIVER™ Enhanced X3 Digital family is rated up to 2300 V functional isolation and 200 kV/μs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs especially due to the configurability of DESAT and UVLO. This family is recommended in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc. Two noticeable advantages of the digitally configurable approach for customers are predictive maintenance in sophisticated industrial systems and rapid prototyping for fast solution development.

Predictive maintenance

Using the I²C interface, the 1ED38xx is able to register the counts of UVLO spikes, monitor the supply voltage and temperature increase. With the long-term analysis of the collected data, customers are able to decide when is the best time to schedule a maintenance cycle before the system fails.



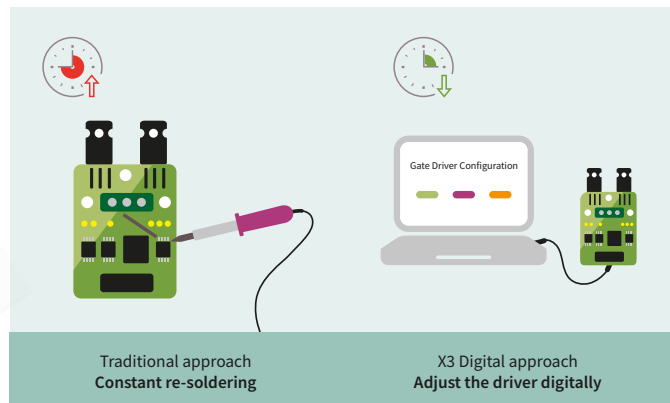
Evaluation board

EVAL-1ED3890Mx12M
EVAL-1ED38x0DCT



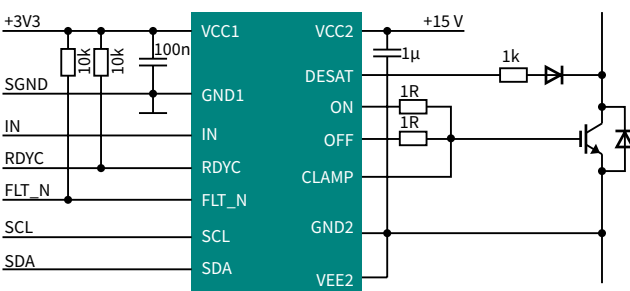
Rapid prototyping

The I²C interface enables rapid prototyping without hardware changes. Using a traditional gate driver, customers have to first design an initial PCB board, and then adjust and replace the components on the board during evaluation. However, with the 1ED38xx I²C interface, customers can configure up to 27 parameters to optimize the board without replacing the components. This feature extremely shortens the development flow.



Simplified application diagram

X3 Digital (1ED38xx)



Family	Part Number	Typ. output current	Feature	Isolation rating
EiceDRIVER™ Enhanced X3 Digital	1ED3830MC12M	3 A	I ² C configurability, Miller clamp, DESAT, soft-off, two-level turn-off, integrated ADC	UL 1577: VISO = 5.7 kV _{RMS} VDE 0884-11: VIORM = 1767 V (reinforced)
	1ED3860MC12M	6 A		
	1ED3890MC12M	9 A		



+SiC



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EiceDRIVER™ Full-Bridge Transformer Driver

Isolated power supply for IGBT and SiC MOSFET gate driver supply

2EP100R, 2EP101R, 2EP110R, 2EP130

The 2EP is a full-bridge transformer driver to enable customers to build an isolated gate driver power supply. The highly integrated and resistor configurable 2EP reduces the external component count. The open-loop controller drives the integrated full-bridge power MOSFETs and is therefore also able to offer various protection features. These features include overcurrent protection, thermal shutdown, and a ready signal. The adjustable duty cycle and switching frequency allow customers to customize the operation to the gate voltage requirements of various power switches like IGBT and SiC MOSFETs. The EiceDRIVER™ Power 2EP products come in a small TSSOP-8 package with an exposed pad for optimized thermal behavior. The small footprint additionally allows for space saving PCB designs in area constrained applications. The broad frequency range of up to 695 kHz together with the output power capability of 5 W or more enable isolated gate driver supply designs for a wide range of discrete and power modules. This flexibility allows the product to be used many applications such as uninterruptible power supply, solar inverter, energy storage system, electric vehicle charge station, and motor drive inverters.

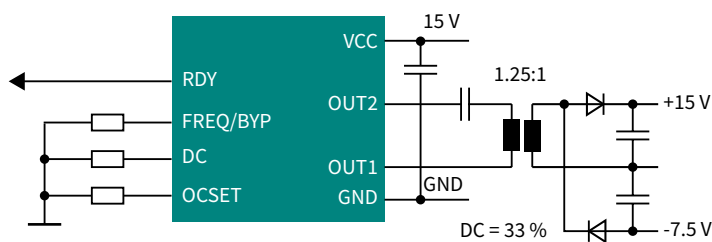
Features

Product features
– Wide input voltage range 4.5 to 20 V
– Wide range of switching frequency from 50 to 695 kHz
– Higher accuracy duty cycle adjustment from 10% to 50%
– Peak-current controlled soft start
– Overcurrent and overtemperature protection
– Ready signal to indicate successful completion of soft start
– 3x3 mm ² TSSOP-8 package with exposed pad

Product Family

Product name	Package	Switching frequency	Duty cycle	Bypass mode	Over-current protection
2EP100R	TSSOP-8	65 kHz, 103 kHz	33%, 50%	No	Fixed
2EP101R	TSSOP-8	50 kHz, 65 kHz	12%, 17%	No	Fixed
2EP110R	TSSOP-8	50 kHz, 65 kHz	10% to 50%	No	Fixed
2EP130R	TSSOP-8	50 kHz to 695 kHz	10% to 50%	Yes	Adjustable

Application schematic



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EiceDRIVER™ APD 2ED4820-EM

48 V smart high-side MOSFET gate driver with SPI for automotive applications

The EiceDRIVER™ 2ED4820-EM is a smart high side N-channel MOSFET gate driver with two outputs controlled via SPI. The integrated powerful charge pump allows external MOSFETs to stay continuously on. Thanks to the enhanced turn-on and turn-off ability of the driver, the number of MOSFETs could be easily scaled up to manage large currents in the order of several hundred amps, while ensuring fast switch on and off. The MOSFETs could be controlled in a back to back configuration either common mode or common source. The integrated current sense amplifier supports high-side and even load-side current measurement with a dedicated monitoring output. The 2ED4820-EM comes along with several latching failure detections, to implement protections for the external MOSFETs, the load and the power source. Parameters can be adjusted by SPI; monitoring data, configuration, warning and failure detection registers can be read.

Summary of features

- Extended supply voltage range: 20 - 70 V
- Two independent high-side gate driver outputs with 1 A pull down, 0.3 A pull up for fast switch off/on
- Low supply current in sleep mode $IBAT_Q < 5 \mu A$
- Device control, configuration and diagnostic via SPI
- Configurable overcurrent/short circuit protection
- Configurable Drain-Source overvoltage protection
- Gate undervoltage lockout (V_{GS})
- Ground loss detection
- AEC-Q100 qualification

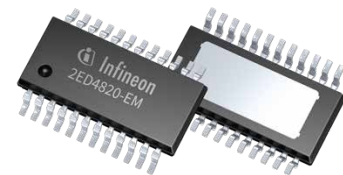
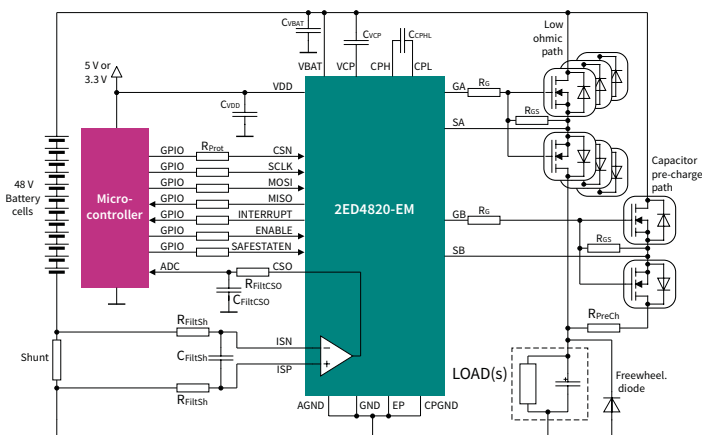


Benefits

- Supports back-to-back MOSFET topologies (common drain or common source)
- SAFESTATEN input to trigger safe state mode in case of μC failure
- One bidirectional high or low side analog current sense interface with configurable gain to optimize power losses
- Robust against V_{bat} voltages up to 105 V and V_{source} voltages versus V_{bat} of -90 V

Potential applications

- Battery protection switch
- Input protection switch
- Static load and supply switch for high currents



Products and evaluation boards

Product	Description	Ordering code	Package
2ED4820-EM	48 V smart high-side MOSFET gate driver with SPI	SP005629911	PG-TSDSO-24
2ED4820 EB2 2HSV48	2ED4820 dual high-side switch – 48 V evaluation board	SP005353778	BOARD
R 48V BATT Switch10	48 V battery disconnect switch - reference design	SP005595834	BOARD



Click here to learn more:

www.infineon.com/eicedriver
www.infineon.com/gatedriver

www.infineon.com/driver-gan
www.infineon.com/driver-gan-sg

www.infineon.com/driver-gan-git
www.infineon.com/gdfinder

EiceDRIVER™ 1EDI302x/1EDI303x/1EDI305xAS

1200 V galvanically isolated automotive gate driver IC family

EiceDRIVER™ 1EDI302xAS, 1EDI303xAS and 1EDI305xAS are automotive-qualified single-channel high-voltage gate drivers optimized for IGBT and SiC technologies. They are galvanically isolated using Infineon coreless transformer (CT) technology. Comprehensive safety features and ISO 26262 compliance enable ASIL-D classification on the system level. Accompanying safety documents ease and speed-up FMEDA analysis in the application.

The EiceDRIVER™ 1EDI302x/1EDI303xAS product family offers a compact package design, and its high level of feature integration save valuable PCB space and system cost, while the pre-configured settings reduce design efforts. Pin-compatible product variants make switching between variants easy and swiftly adjusting ECUs to different application needs (i.e., SiC MOSFET vs. IGBT).

1EDI305xAS offers full configurability via SPI, which enables platform development. The integrated high-accuracy flyback controller can optimize the supply architecture and reduce conduction losses in power devices.

Potential applications

- Traction inverters for HEV and EV
- Auxiliary inverters for HEV and EV
- High-power DC-DC converters

Product feature	1EDI302xAS & 1EDI303xAS (x=0,1,3)	1EDI302xAS & 1EDI303xAS (x=5,6,8)	1EDI305xAS (x=0,1)
Isolation and CMTI	Reinforced 6.8kV, CMTI >150V/ns		
Interface	Fast pins and PWM data stream		Fast pins and SPI
Power technology	Pre-configured variants either for IGBT (302x) or SiC (303x)		SPI to configure for SiC or IGBT
Drive stage strength	20 A	20 A (15 A for 1EDI3028/38)	20 A
Drive stage	TOUT (ext. diode needed to separate R_{on} and R_{off})	Split output (TON and TOFF)	Split output (TON and TOFF)
Active miller clamp	Yes, internal	Yes, internal and 1EDI3036 also external	Yes, internal and external
STP1 and dead time	Yes		Yes, configurable via SPI
SC detection	DESAT and OCP	DESAT (incl. BIST) or OCP (1EDI3036)	DESAT & OCP (both incl. BIST)
SC reaction	Internal soft-off ramp	Soft-off pin (only 1EDI3036 internal ramp)	Internal soft-off ramp
ISO 26262-compliant	Yes, ASIL B (D)		
Safe state pin (ASC)	Yes, on secondary side (1EDI3031 & 1EDI3021)	Yes, on primary and secondary side	Yes, on primary and secondary side
Integrated flyback	No		Yes, with 2% accuracy
ADC	Yes, 12-bit DS-ADC (1EDI3020/3 & 1EDI3030/3)	Yes, 12-bit DS-ADC (except 1EDI3038)	Yes, 12-bit DS-ADC, 2 ext. channels
Package	DSO-20 (10.3 mm x 6.4 mm)		DSO-36 (10.3 mm x 10.3 mm)



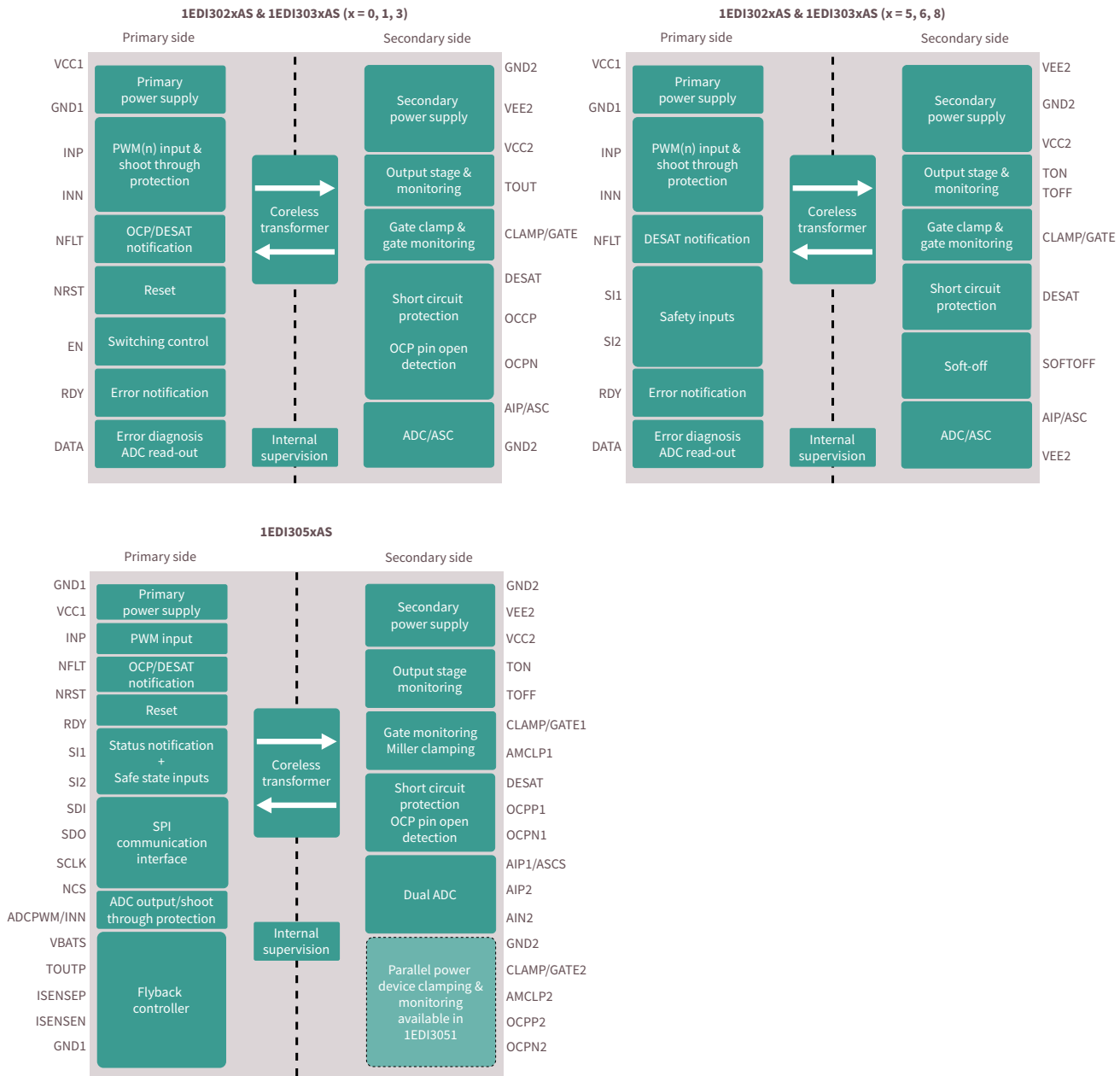
Click here to learn more:

www.infineon.com/eicedriver-xEV
www.infineon.com/gatedriver

www.infineon.com/driver-gan
www.infineon.com/driver-gan-sg

www.infineon.com/driver-gan-git
www.infineon.com/gdfinder

Block diagrams



The following evaluation boards are available:

- 1EDI303XAS EVALBOARD
- 1EDI302XAS EVALBOARD
- 1EDI3050 EVAL BOARD
- 1EDI3051 EVAL BOARD



Click here to learn more:

www.infineon.com/eicedriver-xEV
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Infineon Solid State Relays (SSR) technologies

Using Infineon power-switch technologies, Infineon Solid State Relays (SSRs) are remotely controlled switches (on/off) with complete galvanic isolation from input to output. No power supply is needed on the output.

Two main sub-groups:

- Isolated: Photovoltaic (PVI) And Coreless Transformer (Solid State Isolators-SSI)
 - Isolated, low-power DC voltage sources capable of driving MOSFET or IGBT gates directly
- Photovoltaic relays (PVR)
 - PVI plus internal power MOSFET

Main benefits of Infineon SSR technology:

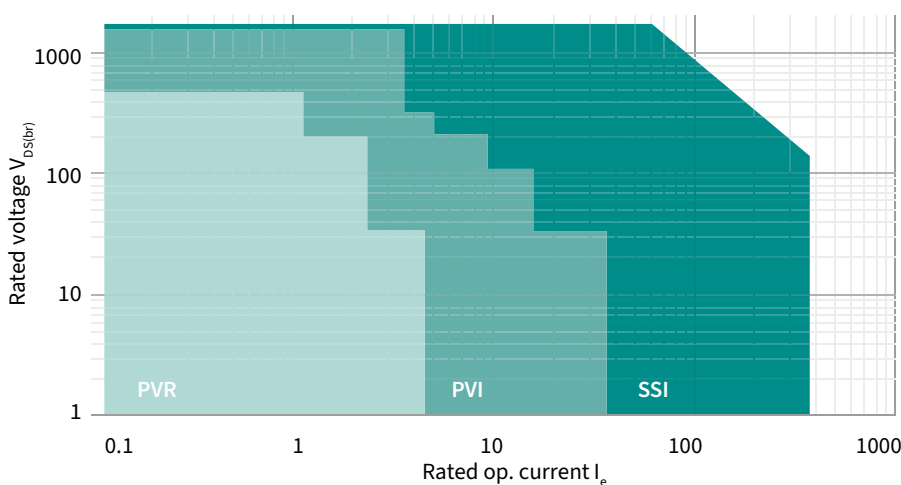
- Optically isolated and Coreless Transformer – based technology provides galvanic isolation for safety applications
- Wide range of applications from industrial automation to test equipment
- Established and reliable products with over 20 years of history

Key advantages over electromechanical relays:

- Low total cost of ownership
- Silent operation
- No contact bounce
- Compact solution
- Fast response time
- High input sensitivity
- High reliability with long operational life
- Insensitivity to stray EMF, shock, and vibration
- Stable contact resistance over life

Infineon SSRs can be used in a wide range of applications:

- Electro-mechanical relay (EMR) replacement
- Battery management systems
- UPS
- Automatic test equipment
- Instrumentation systems
- Industrial automation
- Thermostats
- Programmable logic controller
- Power Distribution Units (PDU)
- Building Automation
- HVAC Controllers



Click here to learn more:

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www.infineon.com/driver-gan

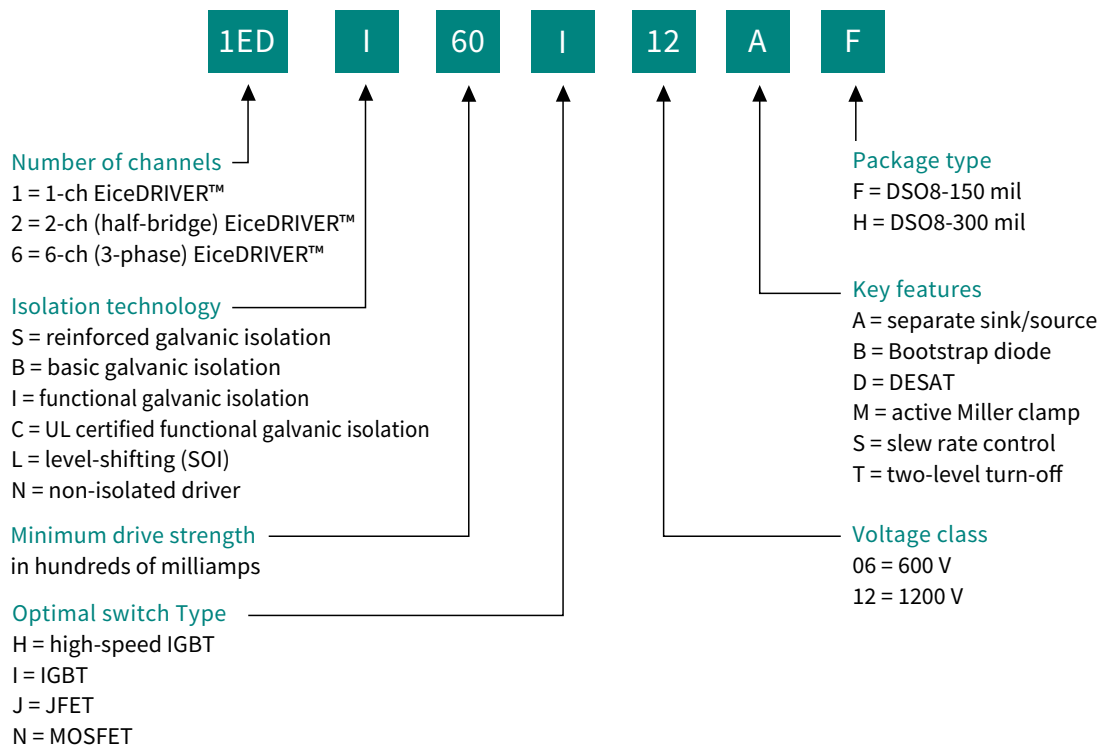
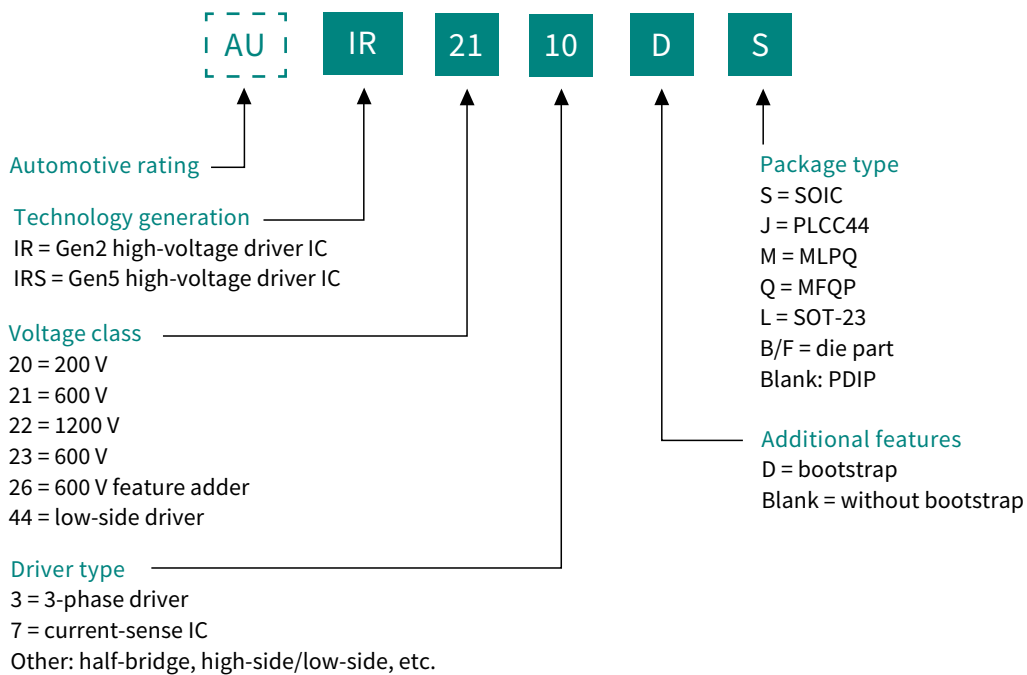
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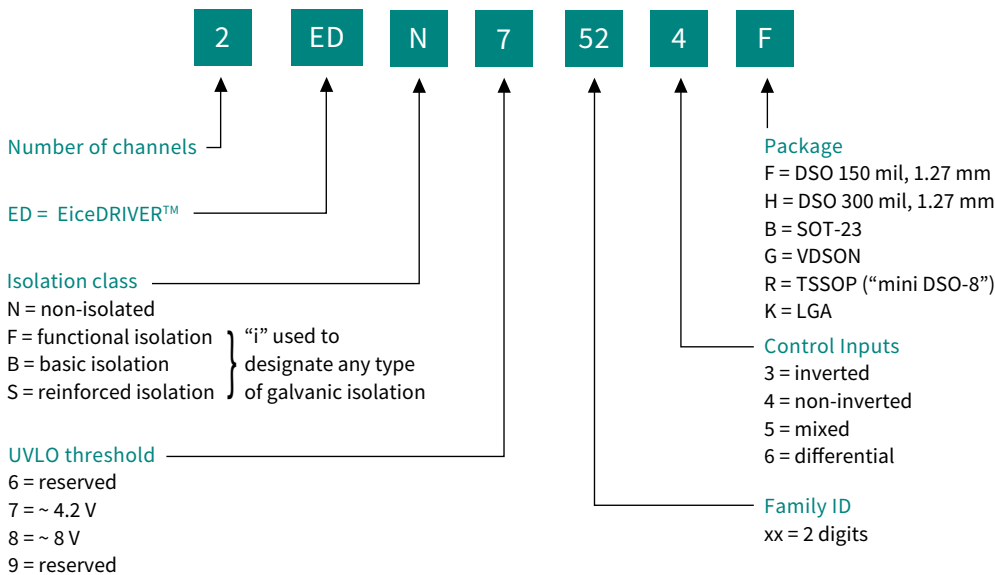
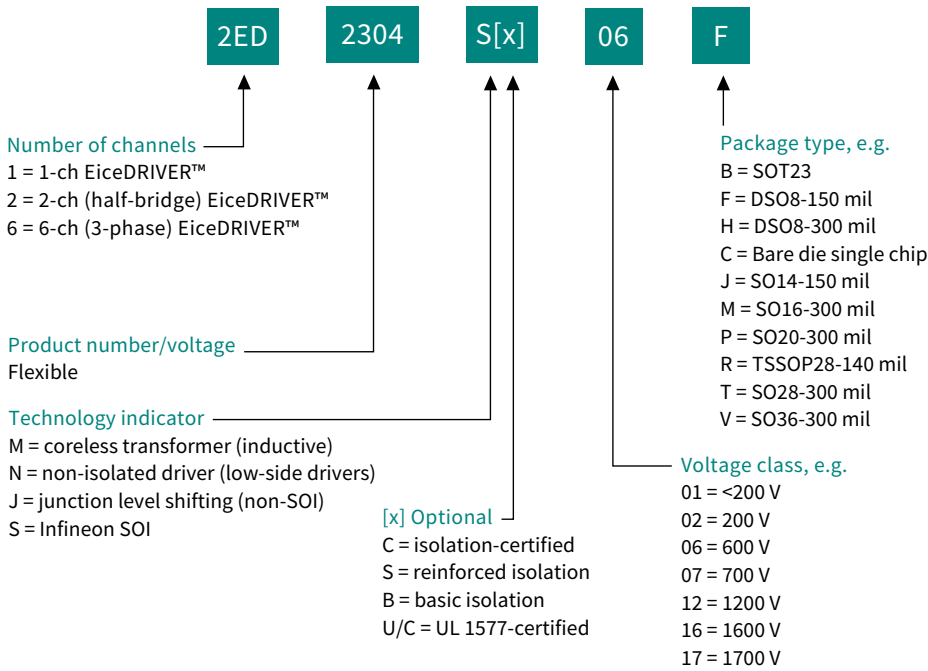
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Nomenclature

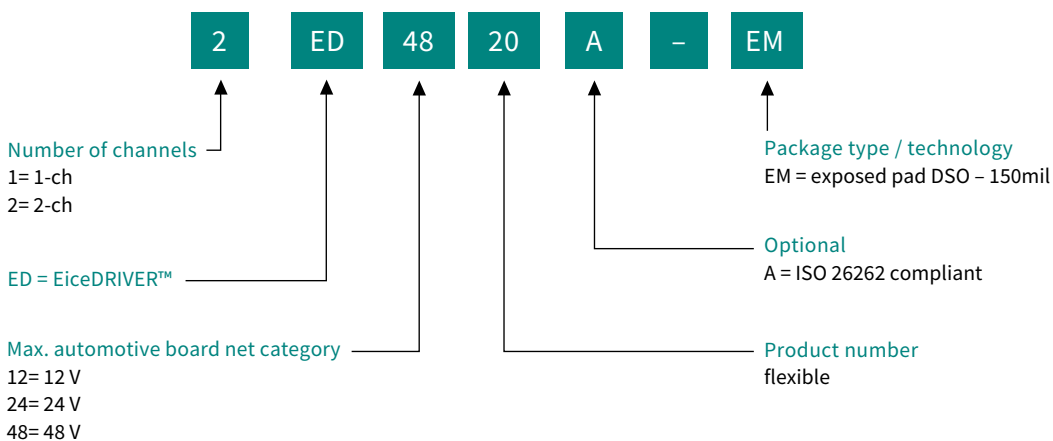
Naming convention for existing families of gate-driver ICs



Naming convention for existing and upcoming families of gate-driver ICs



Naming convention for existing and upcoming families of gate-driver ICs





Infineon support for gate-driver ICs

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/200vhvic
www.infineon.com/700vhvic
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Gate driver IC community FAQs

www.infineon.com/gdforum

Gate driver selection tools

www.infineon.com/gdfinder

Gate driver simulation (SPICE) models

www.infineon.com/gdmodel

Cross reference tool

www.infineon.com/crs



Support



Evaluation board



Tools

Digital isolators

- ISOFACE™ dual-channel digital isolators
- ISOFACE™ quad-channel digital isolators



ISOFACE™ dual-channel digital isolators

Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon's coreless transformer (CT) technology and provide robust isolation for high voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART or CAN.

The 2DIBx4xxF family features

- Dual-channel digital isolators with eight variants and data rates up to 40 Mbits/s
- 3 kV_{RMS} isolation voltage
- CMOS/TTL input thresholds
- High common-mode transient immunity (CMTI)
- Accurate timing performance
- Wide operating supply voltage from 2.7 to 6.5 V



Product variants

Part number	Isolation rating	Channel configuration	Input thresholds	Default output state	Package
2DIB0400F	V _{ISO} = 3000 V _{RMS} (UL1577 Ed. 5)	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 x 4 mm
2DIB0401F				High	
2DIB1400F		1 forward 1 reverse (1+1)		Low	
2DIB1401F				High	
2DIB0410F		Fixed (TTL)	2 forward 0 reverse (2+0)	Low	
2DIB0411F				High	
2DIB1410F			1 forward 1 reverse (1+1)	Low	
2DIB1411F				High	

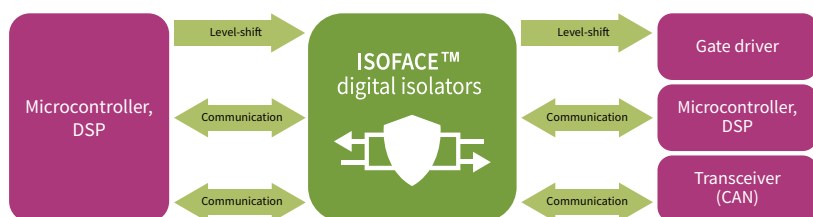
Features and benefits

Key features

- High CMTI > 100 V/ns
- Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)
- TTL or CMOS input threshold
- Typical propagation delay 26 ns with -4/+6 ns spread
- Both high and low fail-safe default output state
- Both component and system level certification
- Pin-to-pin compatibility

Key benefits

- High immunity against system noise or high dv/dt
- Reliable performance in SMPS with switching noise on IC power supply
- Optimized noise margin for different applications
- For high system power efficiency
- Reliable high or low default output state in case of failures
- Simplified system certification process
- For easy device replacement and alternative sourcing



Infineon ISOFACE™ dual-channel digital isolators are used to transfer gate driving and communication signals like CAN and UART over the isolation barrier. With high robustness and accurate switching characteristics, they are suitable for high power density designs and isolated communication systems.



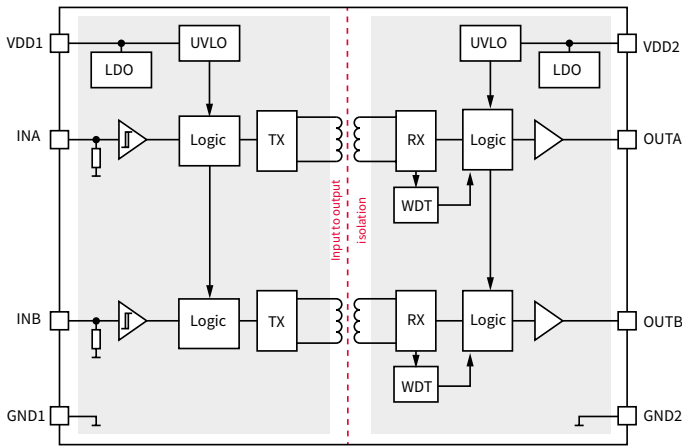
Click here to learn more:

www.infineon.com/digitalisolators

Dual-channel digital isolator 2DIB0410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F (with 2 forward channels) provides robust isolation for high voltage applications. With a wide supply voltage range, TTL input thresholds and default output state low, it is the perfect fit for high-power density DC-DC brick applications.

Block diagram of 2DIB041xF with two forward data channels



Features and benefits

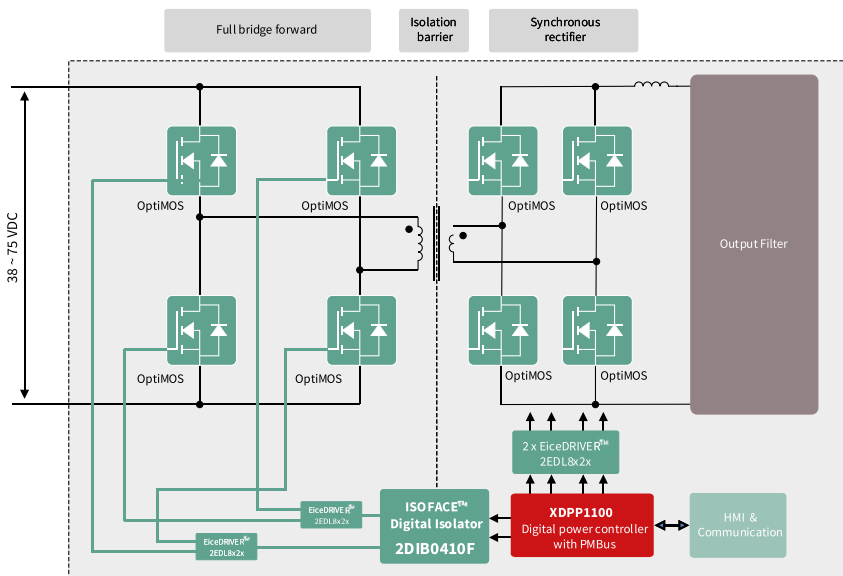
Key features

- High CMTI > 100 V/ns
- Wide operating supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)
- TTL input threshold
- Integrated glitch filter
- Default low fail-safe output state
- Both component and system-level certification

Key benefits

- High immunity against system noise
- Reliable performance in SMPS with switching noise on IC power supply
- Optimized noise margin for SMPS applications
- Effective noise suppression in SMPS applications
- Reliable low output state in case of failures
- Simplified system certification process

2DIB0410F used in isolated DC-DC brick application



Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F is a perfect fit for isolated DC-DC brick applications to transfer half- or full-bridge gate driving signals. The two-channel configuration allows transfer of low- and high-side gate-signals over the isolation barrier.

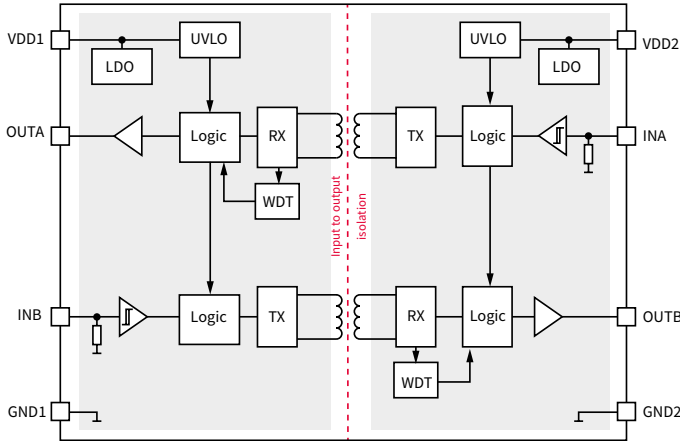


[Click here to learn more: www.infineon.com/digitalisolators](http://www.infineon.com/digitalisolators)

Dual-channel digital isolator 2DIB1410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F (with one forward and one reverse channel) provides robust isolation for high voltage applications. With high common-mode transient immunity (>100 V/ns), TTL input threshold, and default low output state, it is the perfect match for GaN-IPS with high dv/dt in high-density power designs (GaN with integrated non-isolated gate driver).

Block diagram of 2DIB14xxF with one forward and one reverse data channel

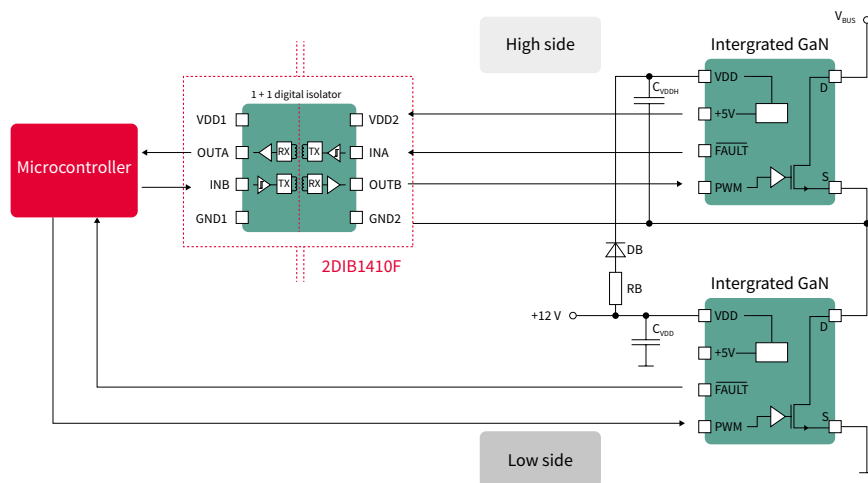


Features and benefits

Key features
- High CMTI > 100 V/ns
- Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)
- TTL input threshold
- Integrated glitch filter
- Default low fail-safe output state
- Both component and system-level certification

Key benefits
- For GaN with integrated non-isolated gate driver with high dv/dt
- Reliable performance in SMPS with switching noises on IC power supply
- Optimized noise margin for SMPS applications
- Effective noise suppression in SMPS applications
- Reliable low output state in case of failures
- Simplified system certification process

2DIB1410F used in totem-pole PFC with GaN IPS



Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F can be used together with GaN IPS for high-side floating drive. One forward channel is used to transfer the gate signal. The reverse channel can be used for protection signal.



[Click here to learn more: www.infineon.com/digitalisolators](http://www.infineon.com/digitalisolators)

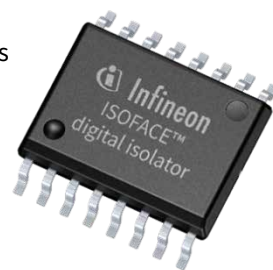
ISOFACE™ quad-channel digital isolators

Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon's coreless transformer (CT) technology and provide reinforced isolation for high-voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART/CAN and SPI. The quad-channel digital isolators also offer AEC-Q variants to meet even stringent customer application requirements.

The 4DIRx4xxH family features

- Quad-channel digital isolators with eight variants and data rates up to 40 Mbits/s
- 5.7 kV_{RMS} isolation voltage
- Active high or low enable logic level for the output on Side 1
- High common-mode transient immunity (CMTI)
- Accurate timing performance
- Wide operating supply voltage from 2.7 to 6.5 V

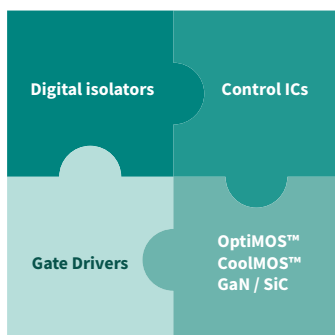


Product variants

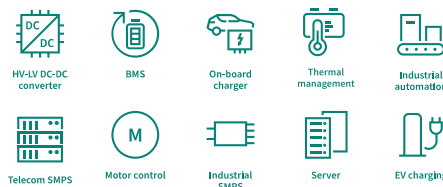
Part number	Channel configuration	Output enable	Default output state	Package		
4DIR0400H(A) ¹⁾	4 forward 0 reverse (4+0)	Active-high	Low	PG-DSO-16 300 mil		
4DIR0401H(A) ¹⁾			High			
4DIR1400H(A) ¹⁾	3 forward 1 reverse (3+1)		Low			
4DIR1401H(A) ¹⁾			High			
4DIR2400H(A) ¹⁾	2 forward 2 reverse (2+2)		Low			
4DIR2401H(A) ¹⁾			High			
4DIR1420H(A) ¹⁾	3 forward 1 reverse (3+1)		Active-low		Low	PG-DSO-16 300 mil
4DIR1421H(A) ¹⁾					High	

Features and benefits

Key features	Key benefits
– High CMTI > 100 V/μs	– High immunity against system noise and high dv/dt
– Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)	– Reliable performance in UART/CAN and SPI communication
– Active high or low enable logic level for the output on Side 1	– Compatible with chip select function in SPI communication
– Typical propagation delay 26 ns with -5/+6 ns spread	– For high system power efficiency
– Both high and low fail-safe default output state	– Reliable high or low default output state in case of failures
– Both component- and system-level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators transfer gate driving and communication signals like CAN/UART and SPI over the isolation barrier.



Click here to learn more:

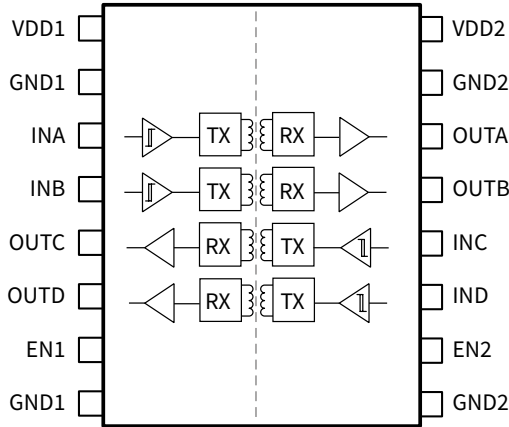
www.infineon.com/digitalisolators

1) (A)* = AEC-Q100 qualified

Quad-channel digital isolator 4DIR2401H in SOIC-16 wide body package

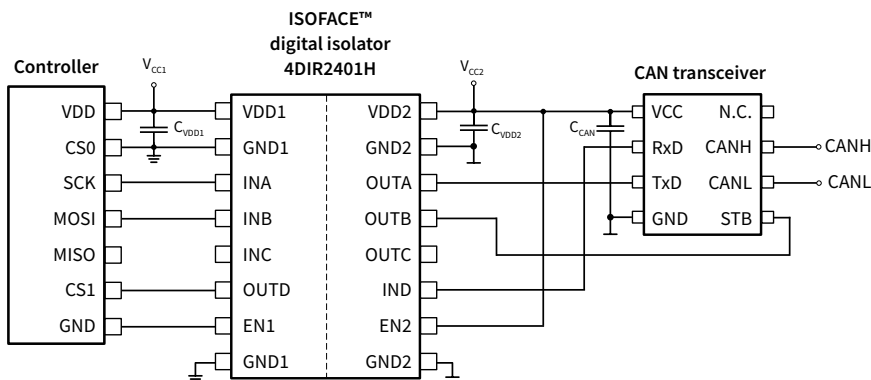
Infineon ISOFACE™ quad-channel digital isolator 4DIR2401H (with 2 forward and 2 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, CMOS input threshold, and default output state high, it is the perfect fit for a wide range of SMPS applications and isolated communication like UART/CAN.

4DIR240xH with 2 forward and 2 reverse data channels



Features and benefits

Key features	Key benefits
- High CMTI > 100 V/μs	- High immunity against system noise
- Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)	- Reliable performance in UART/CAN and SPI communication
- Active high enable logic level for the output on Side 1	- Output enable function for system-level protection
- Typical propagation delay 26 ns with -5/+6 ns spread	- For high system power efficiency
- Low fail-safe default output state	- Reliable low default output state in case of failures
- Both component- and system-level certification	- Simplified system certification process
- Pin-to-pin compatibility	- For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators 4DIR2401H can be used in SMPS applications for inter-board communication and other isolated communication like UART/CAN.

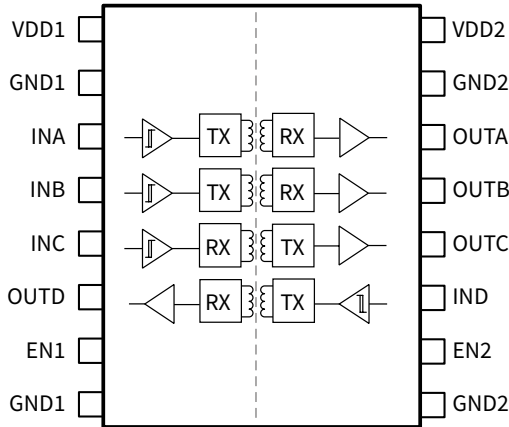


[Click here to learn more:](http://www.infineon.com/digitalisolators)
www.infineon.com/digitalisolators

Quad-channel digital isolator 4DIR1421H in SOIC-16 wide body package

Infineon ISOFACE™ quad-channel digital isolator 4DIR1421H (with 3 forward and 1 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, active-low enable logic level for the output on side 1 and default output state low; it is the perfect fit for isolated SPI communication.

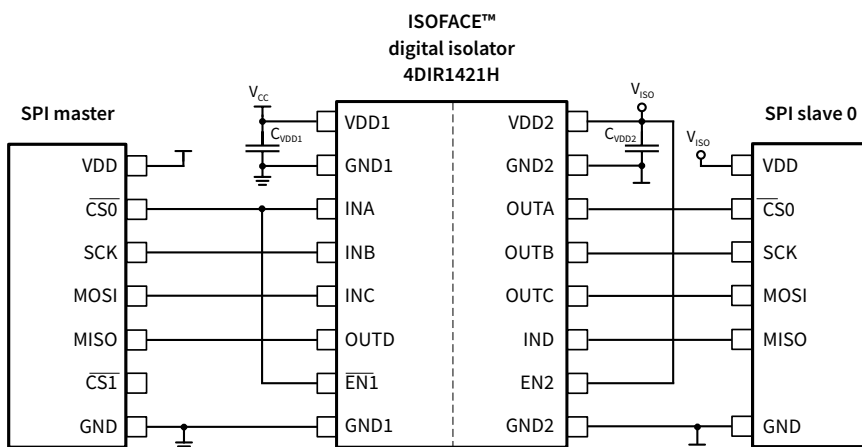
4DIR142xH with 3 forward and 1 reverse data channels



Features and benefits

Key features
– High CMTI > 100 V/μs
– Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)
– Active low enable logic level for the output on Side 1
– Typical propagation delay 26 ns with -5/+6 ns spread
– High fail-safe default output state
– Both component- and system-level certification
– Pin-to-pin compatibility

Key benefits
– High immunity against system noise
– Reliable performance in SPI communication
– Compatible with chip select function in SPI communication
– For high system power efficiency
– Reliable high output state in case of failures
– Simplified system certification process
– For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolator 4DIR1420H is designed for isolated SPI communication. The negative enable logic level for output on side 1 is compatible with the chip select function of SPI communication controllers. The default high output state is designed not to block the SPI communication bus in case of failure on the input side.

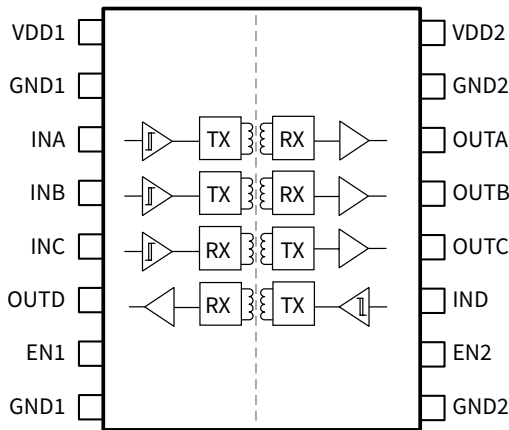


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Quad-channel digital isolator 4DIR1400H in SOIC-16 wide body package

Infineon ISOFACE™ quad-channel digital isolator 4DIR1400H (with 3 forward and 1 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, active-high enable logic level for the output on side 1 and default output state low. It is the perfect fit for a wide range of applications, including telecom/server PSU, industrial SMPS, EV-charging, and industrial drives.

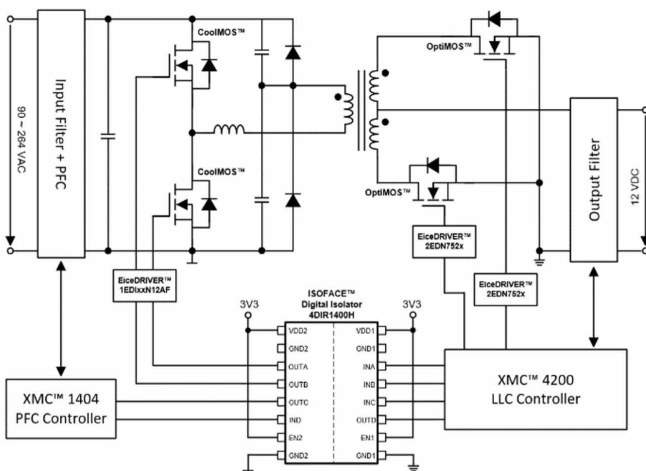
4DIR140xH with 3 forward and 1 reverse data channels



Features and benefits

Key features
- High CMTI > 100 V/μs
- Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)
- Active high enable logic level for the output on Side 1
- Typical propagation delay 26 ns with -5/+6 ns spread
- Low fail-safe default output state
- Both component and system-level certification
- Pin-to-pin compatibility

Key benefits
- High immunity against system noise
- Reliable performance in UART/CAN and SPI communication
- Output enable function for system level protection
- For high system power efficiency
- Reliable low default output state in case of failures
- Simplified system certification process
- For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators 4DIR1400H can be used for HV DC-DC Converter in PSU for telecom and server. The quad-channel digital isolator controls the primary LLC converter indirectly and communicates with the PFC controller through the reinforced isolation barrier. Two data channels are used to transfer the half-bridge PWM control signals (HS and LS). The remaining two data channels are used for UART communication between the primary-side PFC controller and the secondary-side LLC controller. The default low output state ensures the safe turn-off of the half-bridge MOSFETs in any fault condition.



[Click here to learn more: www.infineon.com/digitalisolators](http://www.infineon.com/digitalisolators)



Infineon support for digital isolators

Useful links and helpful information

Further information, datasheets, and documents

www.infineon.com/digitalisolators



Support



Evaluation board



Tools



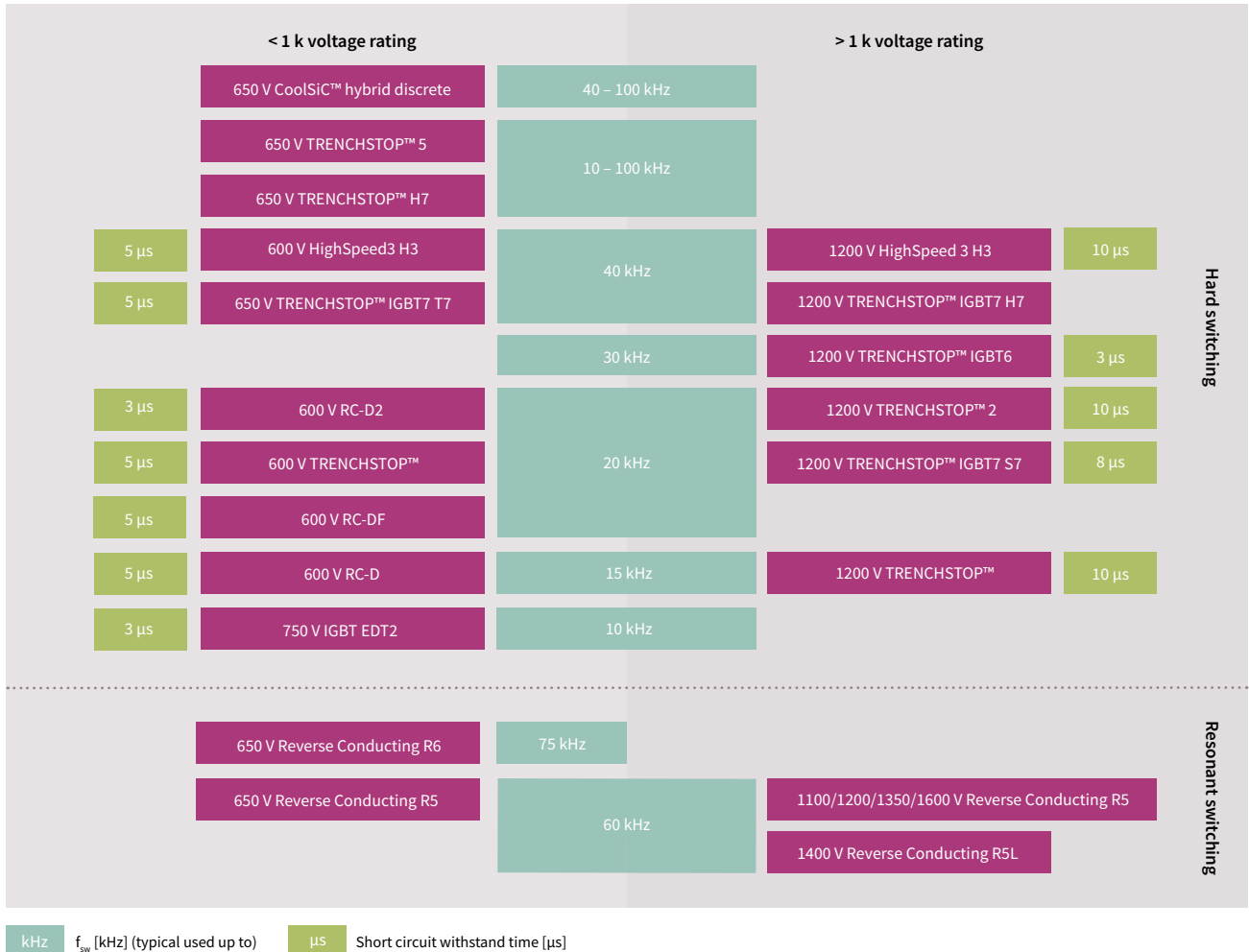
Discrete IGBTs and silicon power diodes

- Discrete IGBTs
- 650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7 and S7
- 1200 V and above IGBT families
- 650 V TRENCHSTOP™ IGBTs
- Lower power drive IGBT portfolio
- 650 V Reverse Conducting R6 IGBT
- TRENCHSTOP™ advanced isolation
- TRENCHSTOP™ 5 selection tree
- IGBT selection tree
- Discrete IGBTs product portfolio
- Silicon power diodes
- CoolSiC™ hybrid devices portfolio
- Discrete IGBT nomenclature
- Silicon power diodes nomenclature

Discrete IGBTs

Market leadership through groundbreaking innovation and application focus

Resolute to achieve the highest standards in performance and quality, Infineon offers a comprehensive portfolio of application-specific discrete IGBTs. From 600 V up to 1600 V, we offer a wide range of IGBT voltage classes to meet different voltage requirements in each application.



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It's time to SWITCH!

Infiniteon has revolutionized the world of IGBTs with the 7th generation of TRENCHSTOP™ IGBTs, designed with the latest micro-pattern trench technology. This advanced technology offers unparalleled control and performance, resulting in significant loss reduction, improved efficiency, and increased power density in your applications.

650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7, and S7

The 7th generation of TRENCHSTOP™ IGBTs sets a new benchmark in the world of discrete IGBT and diode technology. With its outstanding performance, it is the fastest IGBT on the market and boasts the highest power density with current rating devices up to 150 A. For the first time ever, this technology is now available in the 650 and 1200 V discrete IGBT market.

Fulfilling the needs of decarbonization and industry 4.0



IGBT7

2 voltage classes 650 V and 1200 V
3 flavours T7, H7, and S7
5 Packages



Produced in 300 mm fab
Enabling future growth

The extensive portfolio of 650 V/1200 V TRENCHSTOP™ IGBT7 T7, H7, and S7 is specifically designed to meet the demands of various applications, including solar photovoltaic, uninterruptible power supplies, battery chargers, and industrial drives. This unique discrete offering provides a high current rating portfolio up to 150 A in four different package types, with conduction parameter $V_{(CE)sat}$ 50 percent lower compared to previous generations and switching losses up to 84 percent lower.

Dynamic requirements

IGBT7



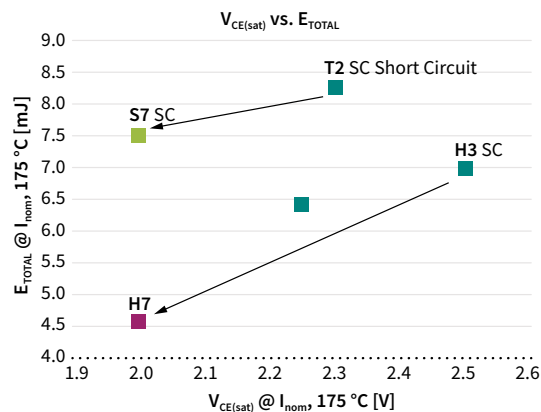
Harsh environments

Critical operation profiles

Long operation hours

Higher power density

1200 V IGBTs key parameters



Make the switch today and revolutionize your applications!

Don't miss out on this opportunity to upgrade your applications with the latest and greatest in IGBT technology. The 7th generation of TRENCHSTOP™ IGBTs offers unparalleled performance and efficiency, making it the perfect choice for any application looking to take their power and performance to the next level. Make the switch today!



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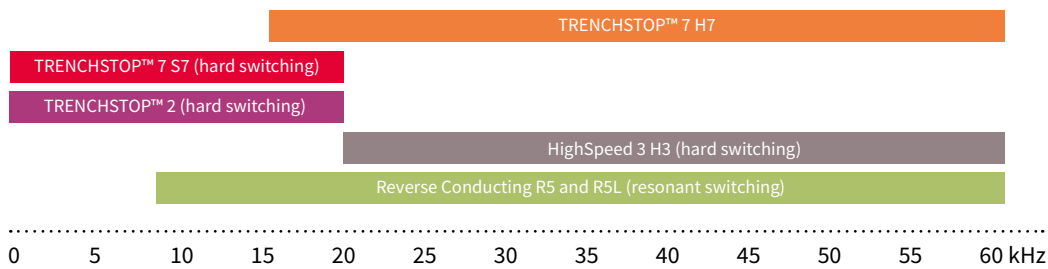
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1200 V and above IGBT families

The 7th generation of TRENCHSTOP™ IGBTs, known as 650 V IGBT T7 and H7 and 1200 V IGBT7 H7 and S7, are setting new standards in the market. With its unparalleled speed, it is the fastest IGBT currently available. Furthermore, the IGBT7 boasts a remarkable power density, making it a top performer in terms of efficiency and performance. As a direct replacement for all previous industrial IGBT generations, including the high-voltage TRENCHSTOP™ T2 and HighSpeed 3 H3 series, these devices are an excellent choice for those looking to upgrade their technology and improve their system's overall performance.

The Reverse Conducting R5 and R5L are the latest generations in the RC-H series of reverse conducting IGBT. With a monolithically integrated diode, they offer optimized performance for resonant switching applications such as induction cooking. R5 devices are available in 1100 V, 1200 V, 1350 V, and 1600 V blocking voltage while R5L devices are available in 1400 V blocking voltage.

EiceDRIVER™ isolated gate driver like X3 Compact family and EiceDRIVER™ 1200 V level shift gate driver family are perfect match for the 1200 V IGBT in motor control, general purpose inverter, solar, and UPS applications. EiceDRIVER™ low-side gate driver with overcurrent protection is widely used in induction cooking application.



Reverse Conducting R5 and R5L	World-class Reverse Conducting RC-H products – High performance and low losses	Induction cooking Resonant switching – Medium to high frequency converters
TRENCHSTOP™ 7 H7	– High speed/high power IGBT – First tailless/low-loss IGBT on market – Market proven and recognized quality leader	Solar, ESS, UPS, welding – Medium frequency converters
TRENCHSTOP™ IGBT7 S7	– New low switching losses and high power IGBTs – Optimized for operation up to 20 kHz – Best-in-class $V_{CE(sat)}$ and low switching losses	– Industrial drives, solar, HVAC – Low/medium frequency converters



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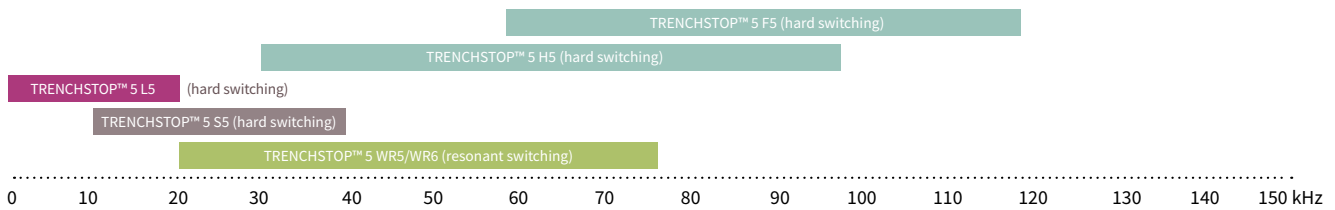
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650 V TRENCHSTOP™ 5 IGBT

Ideally suited for customers who are looking for outstanding efficiency and power density, the TRENCHSTOP™ 5 is optimized to comprehend various switching frequencies. Wafer thickness has been reduced by more than 25 percent, which enables a dramatic improvement in both switching and conduction losses while providing an increased breakthrough voltage of 650 V. Based on the TRENCHSTOP™ 5 IGBT technology, Infineon has developed six different product families targeting specific applications, allowing designers to optimize for high efficiency, system cost or reliability demands of the market. The quantum leap of efficiency improvement provided by the TRENCHSTOP™ 5 IGBT families opens up new opportunities for designers to explore. EiceDRIVER™ isolated gate driver such as the X3 Compact family which is perfect for 650 V IGBTs in solar and UPS applications. EiceDRIVER™ low side gate driver with overcurrent protection is widely used in induction cooking application and PFC stage.



TRENCHSTOP™ 5 L5	Best-in-class IGBT low $V_{CE(sat)}$ IGBT – $V_{CE(sat)}$ IGBT – 1.05 V – Best trade-off $V_{CE(sat)}$ vs E_{ts} for frequencies below 20 kHz	Solar, UPS, welding – Ultralow frequency converters – Three-level inverter type I NPC 1 and NPC 2 – Modified HERIC inverter – AC output (aluminum/magnesium welding)
TRENCHSTOP™ 5 S5	Best-in-class ease-of-use IGBT Elimination of: – Collector-emitter snubber capacitor and gate capacitor in low inductance designs (<100 nH) – Softer switching than TRENCHSTOP™ 5 H5	UPS, battery charger, solar, welding – Medium frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 H5/F5	Best-in-class high frequency IGBT – Bridge to SJMOSFET performance – Highest efficiency, especially under light load conditions	UPS, solar, welding – High frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 WR5	Price optimized reverse conducting TRENCHSTOP™ 5 with an optimized monolithically integrated diode tailored for specific hard switching applications – Monolithic diode optimized for PFC and welding applications – Excellent R_g controllability – Perfect fit to mainstream design for 20 kHz < fsw < 60 kHz	Air conditioning, welding – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding
TRENCHSTOP™ 5 WR6	Outstanding price/performance ratio with the latest 650 V reverse-conducting IGBT in the new high creepage TO-247-3 package – Very low $V_{CE(sat)}$ of 1.45 V at 25°C – High creepage and clearance TO-247 package – Optimized for full-rated hard switching turn-off	Air conditioning, welding – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding



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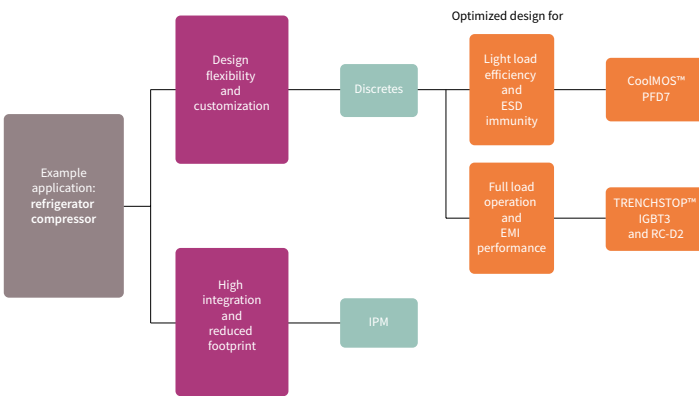
Lower power drive IGBT portfolio

600 V TRENCHSTOP IGBT 3 and 600 V RC-D2

Motor drives up to 1 kW are used in a wide variety of applications, from home appliance fans and compressors to pumps. The market for these products demands design flexibility, EMI performance, and easy controllability. Therefore, these compact motors require power electronics with the lowest losses and best thermal performance. The TRENCHSTOP™ IGBT3 family of discrete devices has been designed for the low switching losses, which is particularly important in systems with higher switching frequencies (up to 20 kHz). Additionally, the IGBTs are co-packed with the soft, fast-recovery full-rated external Rapid 1 free-wheeling diode soft, fast-recovery anti-parallel Emitter Controlled Diode for the reduced total losses. With a blocking voltage at 600 V, and short-circuit rating of 5 μ s, TRENCHSTOP™ IGBT3 is a key contributor to robust motor designs.

The RC-D2 family of discrete devices has been cost-optimized in surface-mounted packages. The device contains a monolithically integrated diode and has HV-H3TRB ruggedness capability. With a blocking voltage at 600 V, and 3 μ s short-circuit rating, the RC-D2 is a key contributor to cost-effective motor designs.

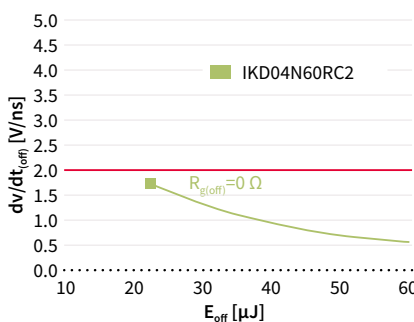
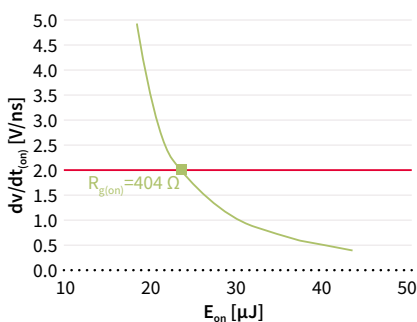
Switch selection for low power drives < 300 W



Features and benefits

Key features	Key benefits
- Available in surface-mounted packages	- Enable space limited application
- IGBT3 co-packed with and without diodes (D ² PAK, TO-220, TO-220FP)	- Performance improvement
- RC-D2 monolithically integrated diode (DPAK, SOT-223)	- Cost-optimized solution
- SC rating up to 5 μ s	- SC protection
- Low EMI due to easy controllability	- No need for additional components on PCB

EMI performance



- $R_{g(on)}$ and $R_{g(off)}$ are selected to meet dv/dt of 2 V/ns at 500 mA and T_j of 100°C
- IGBTs (IKD04N60RC2) are easily controllable by optimizing R_g values
- EMI performance can be enhanced with additional passive components



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Reverse Conducting for soft-switching applications

650 V Reverse Conducting R6 IGBT in TO-247 package

The 650 V R6 IGBT offers the lowest $V_{CE(sat)}$ and optimized E_{off} for best efficiency, minimized power losses and cooling effort. The good EMI behavior simplifies filtering design, reduces system costs and effort for the designers. Thanks to the best system performances and high compatibility with the existing gate driver solution, 650 V R6 IGBT represents the optimal choice for soft switching topologies.












Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Very low $V_{CE(sat)}$ and low E_{off} 	<ul style="list-style-type: none"> – Lowest losses on IGBT, high system efficiency for higher power output
<ul style="list-style-type: none"> – High ruggedness and stable temperature behavior 	<ul style="list-style-type: none"> – Fast and easy replacement of predecessor R5 portfolio
<ul style="list-style-type: none"> – Maximum operating T_j of 175 °C 	<ul style="list-style-type: none"> – High device reliability
	<ul style="list-style-type: none"> – Good EMI behavior

Package innovations

Discrete IGBT package overview

Infinion discrete IGBT package portfolio contains SMD (surface mount device) packages, for example, D2PAK, DPAK, SOT-223, and through-hole packages, for example, TO-220, TO-220 FP, TO-247, TO-247-3-HCC, TO-247-4, TO-247-4 asymmetric (650V, 1200V; 76-136 A), TO-247PLUS, TO-247PLUS-4, and TO-247 advanced isolation packages. It provides discrete IGBTs solutions with and without anti-parallel diode, which is an excellent fit to use in industrial, home appliance, and automotive applications.

	SOT-223 SMD	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-220	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-247PLUS	TO-247PLUS 4-pin	TRENCHSTOP™ advanced isolation TO-247	TO-247-3-HCC
Package options											
Voltage class	600 V, 650 V, 1100 V, 1200 V, 1350 V, 1600 V									600 V, 650 V	650 V
Configuration	DuoPack (with diode), single IGBTs									DuoPack IGBTs with diode and single diodes	
Continuous collector current $T_c = 100^\circ\text{C}$	3-120 A									40-90 A	20 -70 A



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TRENCHSTOP™ advanced isolation

Fully isolated TO-247 package with industry leading IGBTs

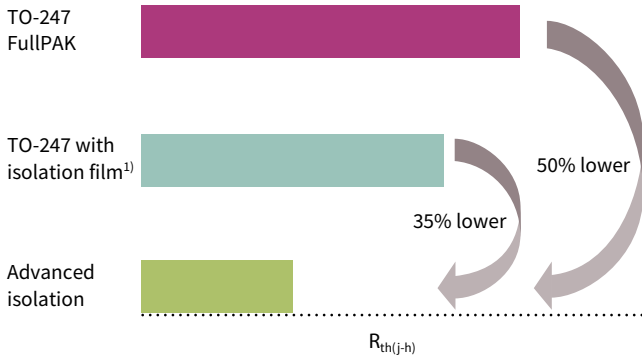
TRENCHSTOP™ advanced isolation solution breaks the limits reached by traditional packaging and isolation techniques. This new isolated package enables the highest power density, the best performance and the lowest cooling effort thanks to an effective and reliable thermal path from the IGBT die to the heatsink.

In addition to providing 100 percent electrical isolation, TRENCHSTOP™ advanced isolation also eliminates the need for thermal grease or thermal interface sheets. The new package delivers at least 35 percent lower thermal resistivity, helping designers to increase power density, as well as lower system complexity and assembling costs. This new package solution allows industrial and home appliance designs to fully utilize the high performance of TRENCHSTOP™ IGBTs without compromises for isolation and cooling.

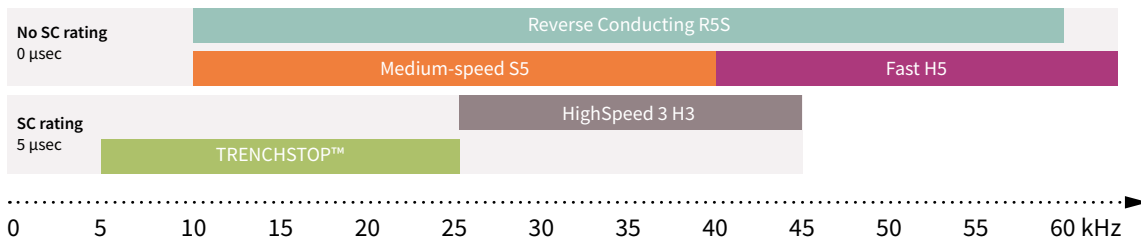
Features and benefits

Key features	Key benefits
– 2500 V _{RMS} electrical isolation, 50/60 Hz, t = 1 min	– Up to 35 percent reduction in assembly time reduces manufacturing cost
– 100 percent tested isolated mounting surface	– Increased power density
– Lowest R _{th(j-h)}	– Improved reliability from higher yield and no isolation film misalignment
– Low coupling capacitance, 38 pF	– Less EMI filter design effort
– No need for isolation film or thermal interface material	– Decreased heatsink size

Thermal resistivity of package and isolation types



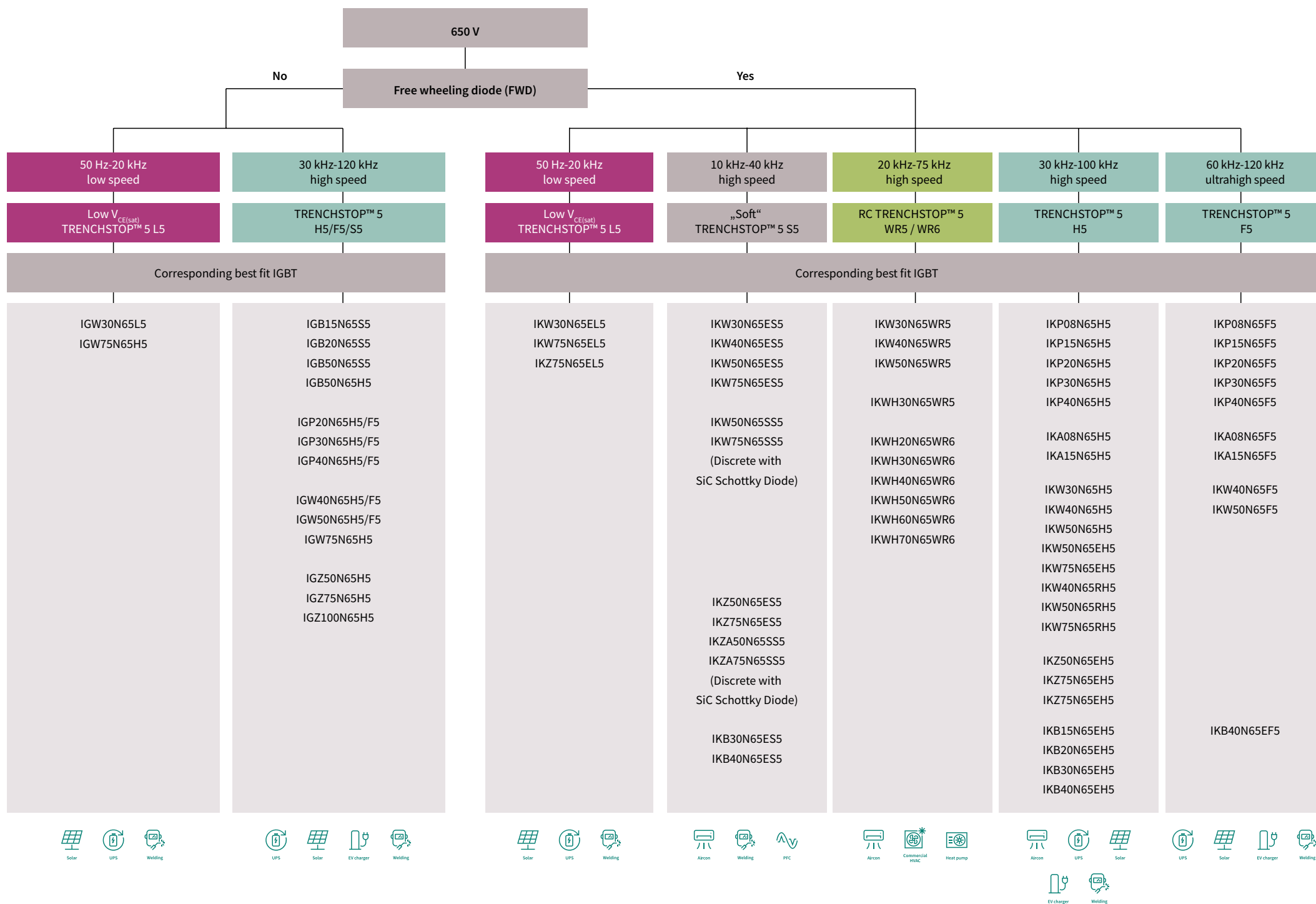
1) Isolation material: standard polyimide based reinforced carrier insulator film with 152 µm thickness, 1.3 W/mK thermal conductivity



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TRENCHSTOP™ 5 selection tree



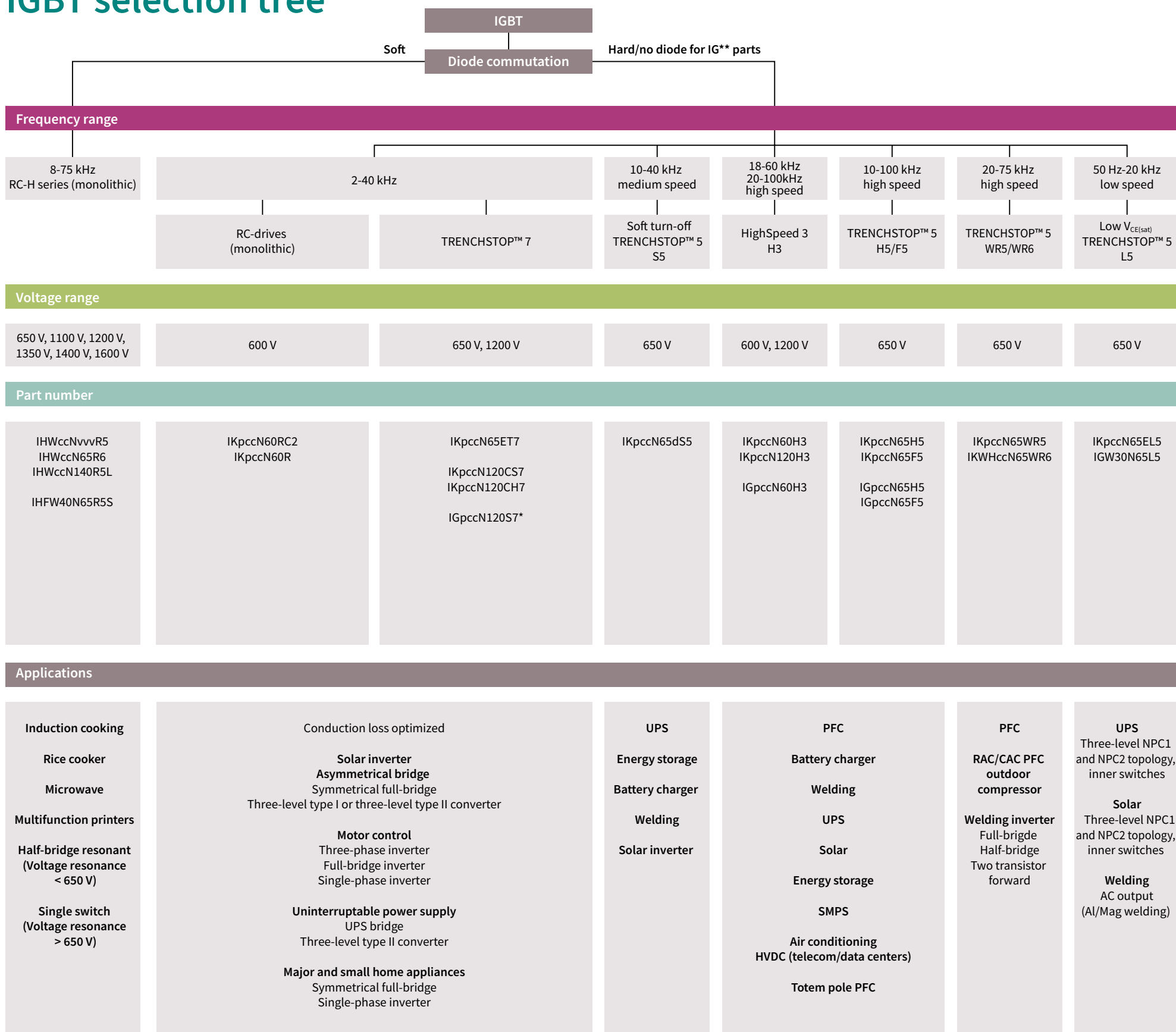
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IGBT selection tree



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*Coming soon

TRENCHSTOP™ and RC-Drives

600 V/650 V product family together with 650 V SOI gate driver family



Continuous collector current at $T_c=100^\circ\text{C}$ [A]		TO-251 (IPAK)	TO-252 (DPAK)	TO-263 (D ² PAK)	TO-220	TO-247 advanced isolation	TO-220 FullPAK	TO-247	TO-247PLUS/ Super 247 (TO-247AA)	SOT-223
Single IGBT	4	IGU04N60T								
	6		IGD06N60T		IGP06N60T					
	10			IGB10N60T	IGP10N60T					
	15			IGB15N60T	IGP15N60T					
	30			IGB30N60T				IGW30N60T		
	40									
	50			IGB50N60T	IGP50N60T			IGW50N60T		
	75							IGW75N60T		
IGBT and diode	1									IKN01N60RC2
	3									IKN03N60RC2
	4		IKD04N60RC2 IKD04N60R		IKP04N60T					IKN04N60RC2
	6		IKD06N60RC2 IKD06N60R	IKB06N60T	IKP06N60T		IKA06N60T			IKN06N60RC2
	10		IKD10N60RC2 IKD10N60R	IKB10N60T	IKP10N60T		IKA10N60T			IKN10N60RC2
	15		IKD15N60RC2 IKD15N60R	IKB15N60T	IKP15N60T		IKA15N60T			
	20			IKB20N60T	IKP20N60T			IKW20N60T		
	30							IKW30N60T		
	40									
	50					IKFW50N60ET		IKW50N60T		
	75					IKFW75N60ET		IKW75N60T		
	100								IKQ100N60T	
	120								IKQ120N60T	



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TRENCHSTOP™ IGBT7 S7

1200 V product family together with isolated driver and 1200 V level-shift driver family



Continuous collector current at T _c =100°C [A]		TO-247 	TO-247PLUS 3-pin 	TO-247 4-pin 	D ² PAK 	DPAK
Single IGBT	40			IKZA40N120CS7		
	75		IGQ75N120S7			
	100		IGQ100N120S7			
	120		IGQ120N120S7			
DuoPack	3				IGB03N120S7*	IGD03N120S7*
	8	IKW08N120CS7			IGB08N120S7*	IGD08N120S7*
	15	IKW15N120CS7			IGB15N120S7*	
	25	IKW25N120CS7				
	40	IKW40N120CS7				
	50	IKW50N120CS7				
	75		IKQ75N120CS7			
	100		IKQ100N120CS7			
120		IKQ120N120CS7				

TRENCHSTOP™ IGBT7 T7

Together with isolated driver, 650 V SOI driver, and low-side driver family



Continuous collector current at T _c =100°C [A]		TO-247-3
DuoPack	20	IKW20N65ET7
	30	IKW30N65ET7
	40	IKW40N65ET7
	50	IKW50N65ET7
	75	IKW75N65ET7

TRENCHSTOP™ IGBT7 H7

1200 V product family together with isolated driver and 1200 V level-shift driver family



Continuous collector current at T _c =100°C [A]	TO247-3 	TO-247 4-pin assymetric 	TO-247PLUS 3-pin 	TO-247PLUS 4-pin
40	IKW40N120CH7	IKZA40N120CH7		
50	IKW50N120CH7	IKZA50N120CH7	IKQ50N120CH7	IKY50N120CH7
75	IKW75N120CH7	IKZA75N120CH7	IKQ75N120CH7	IKY75N120CH7
100			IKQ100N120CH7	IKY100N120CH7
120			IKQ120N120CH7	IKY120N120CH7
140			IKQ140N120CH7	IKY140N120CH7



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Reverse Conducting IGBTs



Continuous collector current at $T_c=100^\circ\text{C}$ [A]	TO-247 advanced isolation (Hal)	TO-247 (Hal)					
		650 V	1100 V	1200 V	1350 V	1400 V	1600 V
20		IHW20N65R5*		IHW20N120R5	IHW20N135R5	IHW20N140R5L	
25						IHW25N140R5L	
30		IHW30N65R6 IHW30N65R5	IHW30N110R5	IHW30N120R5	IHW30N135R5	IHW30N140R5L	IHW30N160R5
40	IHF40N65R5S	IHW40N65R6 IHW40N65R5		IHW40N120R5	IHW40N135R5	IHW40N140R5L	
50		IHW50N65R6 IHW50N65R5					

600 V HighSpeed 3 H3

Together with isolated driver, 650 V SOI driver, and low-side driver family



Continuous collector current at $T_c=100^\circ\text{C}$ [A]		TO-263 (D ² PAK)	TO-220	TO-247 advanced isolation	TO-247
		(Hal)	(Hal)	(Hal)	(Hal)
IGBT	20	IGB20N60H3	IGP20N60H3		IGW20N60H3
	30	IGB30N60H3	IGP30N60H3		IGW30N60H3
	40				IGW40N60H3
	50				IGW50N60H3
	60				IGW60N60H3
	75				IGW75N60H3
	100				IGW100N60H3
Duo-Pack	20	IKB20N60H3	IKP20N60H3		IKW20N60H3
	30				IKW30N60H3
	40			IKFW40N60DH3E	IKW40N60H3
	50			IKFW50N60DH3E IKFW50N60DH3	IKW50N60H3
	60			IKFW60N60DH3E IKFW60N60EH3	IKW60N60H3
	75				IKW75N60H3
	90			IKFW90N60EH3	

CoolSiC™ hybrid discrete

DuoPack	Continuous collector current at $T_c=100^\circ\text{C}$ [A]	TO-247 3-pin		TO-247-4pin
DuoPack	TRENCHSTOP™ 5 H5 + „half“ rated diode	40	IKW40N65RH5	IKZA40N65RH5
		50	IKW50N65RH5	IKZA50N65RH5
		75	IKW75N65RH5	IKZA75N65RH5
	TRENCHSTOP™ 5 S5 + „full“ rated diode	50	IKW50N65SS5	IKZA50N65SS5
		75	IKW75N65SS5	IKZA75N65SS5

For the CoolSiC™ MOSFET portfolio and our broad WBG offering, please check the [Wide bandgap semiconductors](#) chapter.



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TRENCHSTOP™ 5 F5, H5, and S5

Together with isolated driver, 650 V SOI driver, and low-side driver family



Continuous collector current at T _c =100°C [A]		TO-263 (D ² PAK) 	TO-220 	TO-247 advanced isolation 	TO-220 FullIPAK 	TO-247 	TO-247 4-pin
IGBT	15	IGB15N65S5					
	20	IGB20N65S5	IGP20N65F5/IGP20N65H5				
	30		IGP30N65F5/IGP30N65H5				
	40		IGP40N65F5/IGP40N65H5			IGW40N65F5/IGW40N65H5	
	50	IGB50N60H5 IGB50N60S5				IGW50N65F5/IGW50N65H5	IGZ50N65H5
	75					IGW75N65H5	IGZ75N65H5
	100						IGZ100N65H5
DuoPack	8		IKP08N65F5/IKP08N65H5		IKA08N65F5/IKA08N65H5		
	15	IKB15N65EH5	IKP15N65F5/IKP15N65H5		IKA15N65F5/IKA15N65H5		
	20	IKB20N65EH5	IKP20N65H5/IKP20N65F5				
	28		IKP28N65ES5				
	30	IKB30N65EH5	IKP30N65H5/IKP30N65F5			IKW30N65H5	
		IKB30N65ES5				IKW30N65ES5	
	39		IKP39N65ES5				
	40	IKB40N65ES5	IKP40N65F5/IKP40N65H5	IKFW40N65DH5		IKW40N65F5/IKW40N65H5	
		IKB40N65EH5				IKW40N65ES5	
		IKB40N65EF5					
	50			IKFW50N65ES5		IKW50N65F5/IKW50N65H5	IKZ50N65EH5
				IKFW50N65DH5 IKFW50N65EH5		IKW50N65EH5 IKW50N65ES5	IKZ50N65ES5
60			IKFW60N65ES5				
75			IKFW75N65ES5		IKW75N65EH5	IKZ75N65EH5	
			IKFW75N65EH5		IKW75N65ES5		
90			IKFW90N65ES5				

TRENCHSTOP™ 5 L5 low V_{CE(sat)}

650 V product family together with low-side driver family



Continuous collector current at T _c =100°C [A]		TO-251 (IPAK)	TO-252 (DPAK) 	TO-263 (D ² PAK) 	TO-220 	TO-262 (I ² PAK) 	TO-220 FullIPAK 	TO-247 	TO-247 4-pin
IGBT	30							IGW30N65L5	
Duo-Pack	30							IKW30N65EL5	
	75							IKW75N65EL5	IKZ75N75EL5

TRENCHSTOP™ 5 WR5/WR6

650 V product family together with low-side driver family



Continuous collector current at T _c =100°C [A]		TO-247 	TO-247 HCC
DuoPack	20		IKWH20N65WR6
	30	IKW30N65WR5	IKWH30N65WR5/IKWH30N65WR6
	40	IKW40N65WR5	IKWH40N65WR6
	50	IKW50N65WR5	IKWH50N65WR6
	60		IKWH60N65WR6
	70		IKWH70N65WR6



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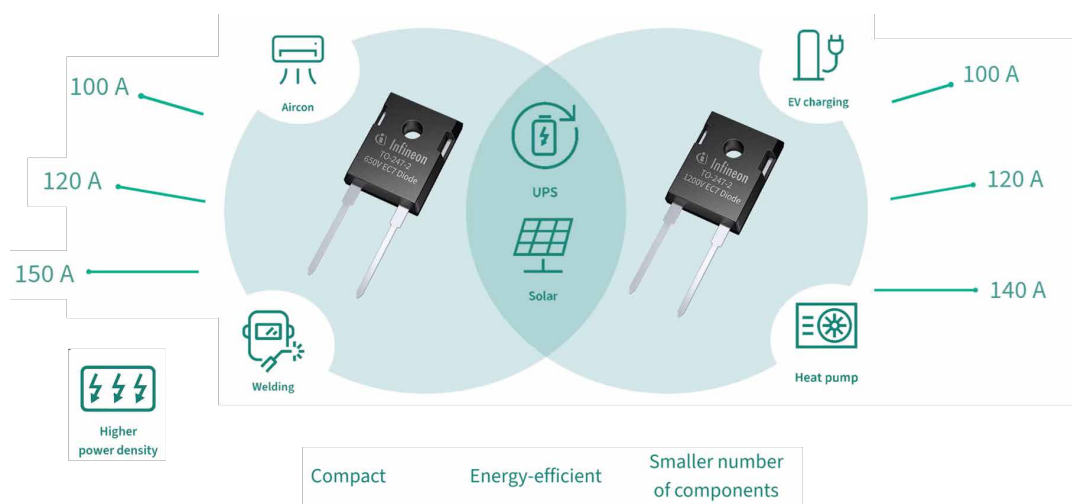
Silicon power diodes

Discrete Emitter controlled 7 silicon diodes

Emitter Controlled (EC) 7 is Infineon's latest single-packed standalone diode in a discrete TO247 2-lead package.

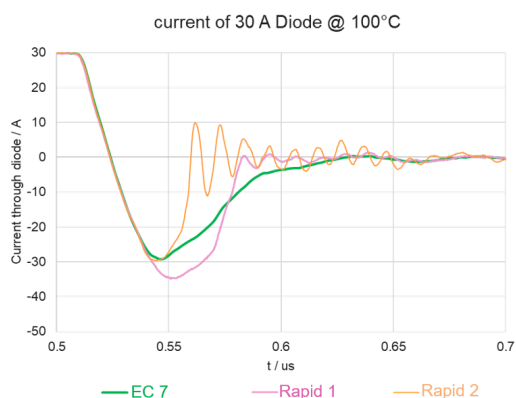
The EC7 diode technology has been developed in two different voltage classes for specific reasons

- 650 V to enhance softness (as indicated in the diagram below), compared to previous generations of discrete diodes such as EC3, Rapid 1, and Rapid 2
- 1200 V, Infineon introduces a Power Diode in a discrete TO247 Package for the first time, offering an alternative to wide-bandgap silicon carbide diodes



The EC7 Families also offer enhanced reliability through the TO247-2 package, reducing discharge-related failure modes. Their unique high current ratings (up to 150 A) increase power density in the discrete package, enabling smaller and lighter designs. These diodes are qualified for industrial applications according to the relevant tests of JEDEC47/20/22. A standout feature unique to the EC7 is its HV-H3TRB robustness, ensuring higher system reliability in challenging operating conditions.

Diode dynamic waveforms at 30 A, 10 Ω , 100 $^{\circ}\text{C}$



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Rapid 1 diodes

650 V product family



Continuous current I_F at $T_C=100^\circ\text{C}$ [A]	TO-220 	TO-220 FullPAK 	TO-247 	TO-247 common cathode 	TO-247 advanced isolation
8	IDP08E65D1				
15	IDP15E65D1				
20		IDV20E65D1			
30	IDP30E65D1		IDW30E65D1	IDW30C65D1	
40			IDW40E65D1		IDFW40E65D1E
60				IDW60C65D1	IDFW60C65D1
75				IDW75D65D1	
80				IDW80C65D1	IDFW80C65D1

Rapid 2 diodes

650 V product family



Continuous current I_F at $T_C=100^\circ\text{C}$ [A]	TO-220 	TO-220 FullPAK 	TO-220 common cathode 	TO-247 	TO-247 common cathode
8	IDP08E65D2	IDV08E65D2			
15	IDP15E65D2	IDV15E65D2		IDW15E65D2	
20	IDP20E65D2		IDP20C65D2		IDW20C65D2
30	IDP30E65D2	IDV30E65D2	IDP30C65D2		IDW30C65D2
40	IDP40E65D2			IDW40E65D2	
80					IDW80C65D2

Emitter controlled diodes

600 V and 1200 V product families



Continuous current I_F at $T_C=100^\circ\text{C}$ [A]	TO-263 (D ² PAK) 	TO-220 Real 2-pin 	TO-247
600 V	30		IDW30E60
	50		IDW50E60
	75		IDW75E60
	100		IDW100E60
1200 V	12	IDP12E120	
	18	IDP18E120	
	30	IDB30E120	IDP30E120

Emitter controlled 7 diodes

650 V and 1200 V product families



Continuous current I_F at $T_C=100^\circ\text{C}$ [A]	TO-247-2pin 	
650 V	20	IDWD20E65E7
	30	IDWD30E65E7
	40	IDWD40E65E7
	50	IDWD50E65E7
	60	IDWD60E65E7
	75	IDWD75E65E7
	100	IDWD100E65E7
	120	IDWD120E65E7
1200 V	150	IDWD150E65E7
	30	IDWD30E120D7
	40	IDWD40E120D7
	50	IDWD50E120D7
	60	IDWD60E120D7
	75	IDWD75E120D7
	100	IDWD100E120D7
	120	IDWD120E120D7
140	IDWD140E120D7	

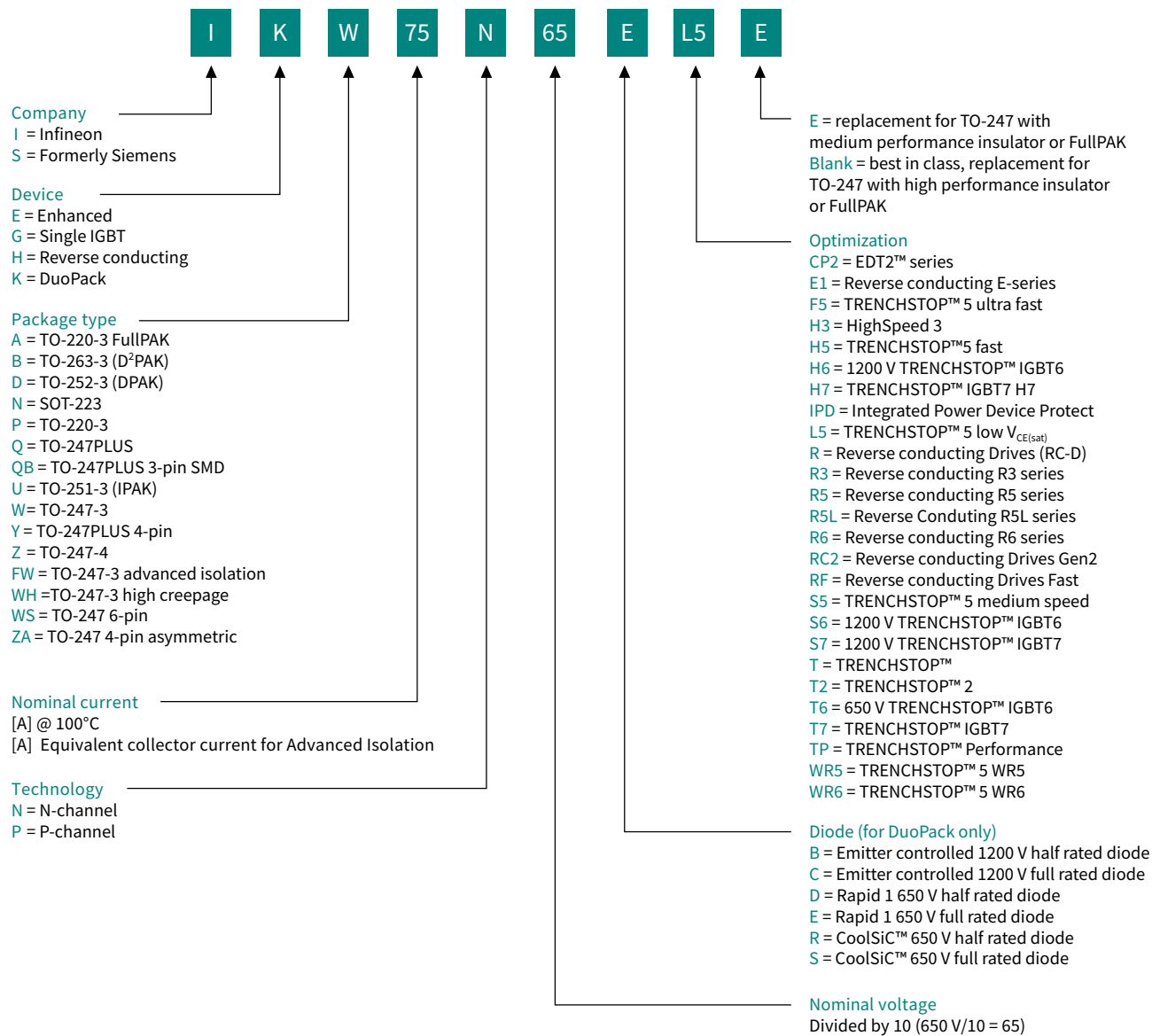


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Nomenclature

IGBT (after 03/2013)



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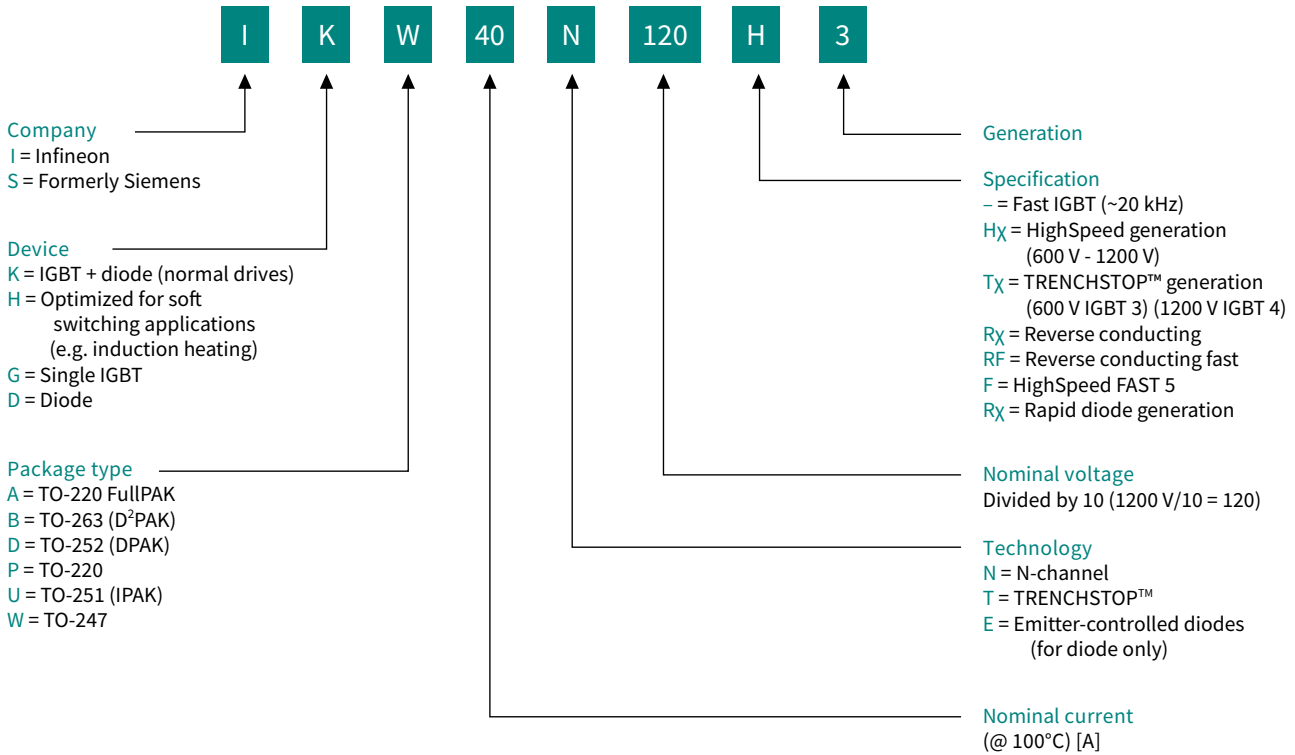
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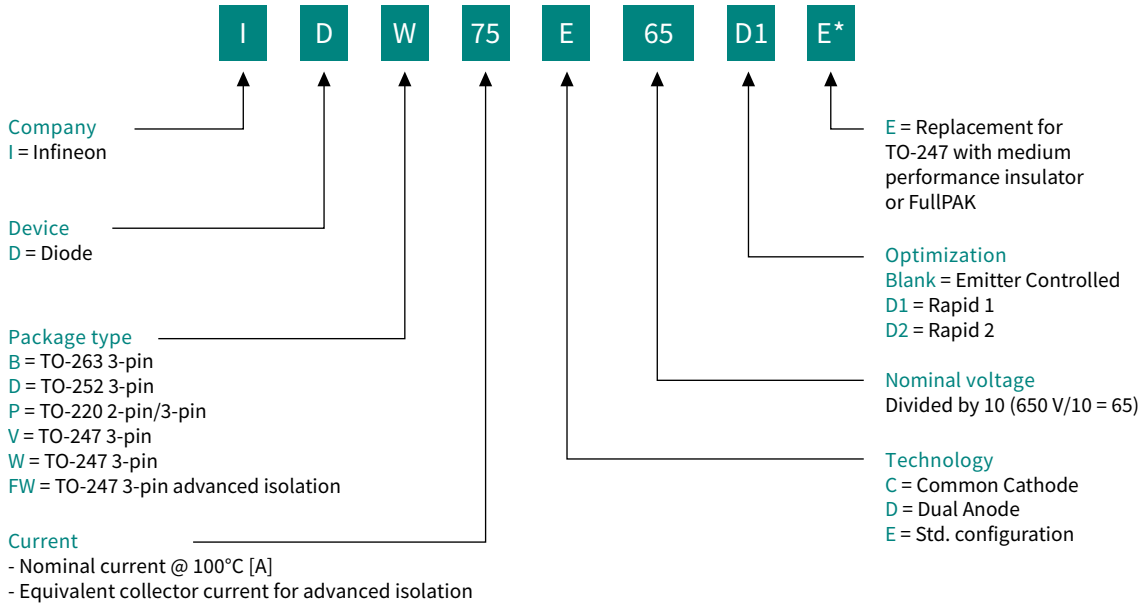
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Nomenclature

Silicon power diodes



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* Only for advanced isolation



Infineon support for discrete IGBTs and silicon power diodes

Useful links and helpful information

Further information, datasheets and documents

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Evaluation boards and simulation models

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www.infineon.com/igbt discrete-simulation models



Support



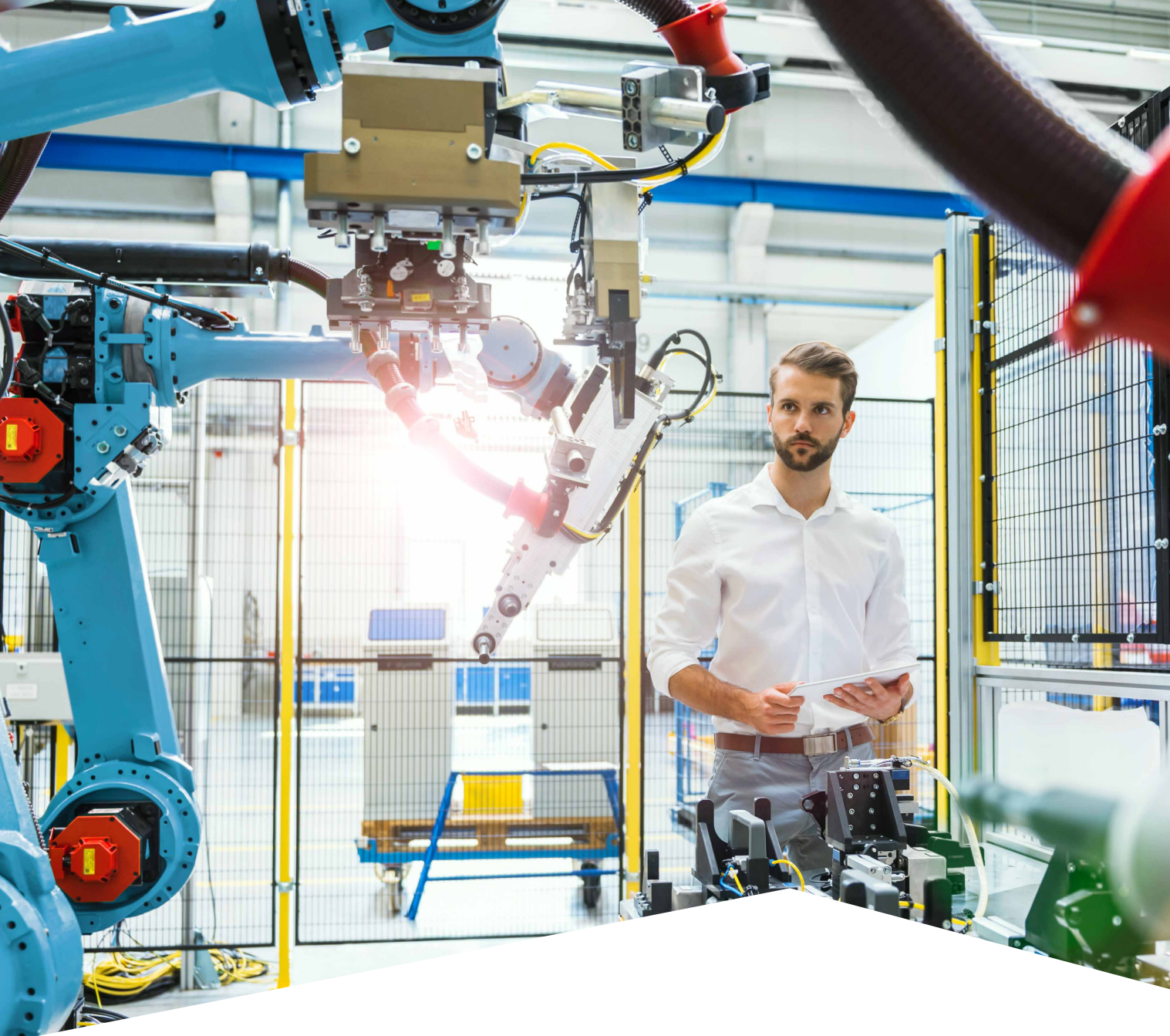
Evaluation board



Tools



Simulation



Intelligent power switches and modules

- CIPOS™ IPM family
- iMOTION™ IPM
- ISOFACE™ isolated industrial interface
- Industrial PROFET™
- HITFET™
- CIPOS™, iMOTION™, ISOFACE™, industrial PROFET™ and HITFET™ product portfolio

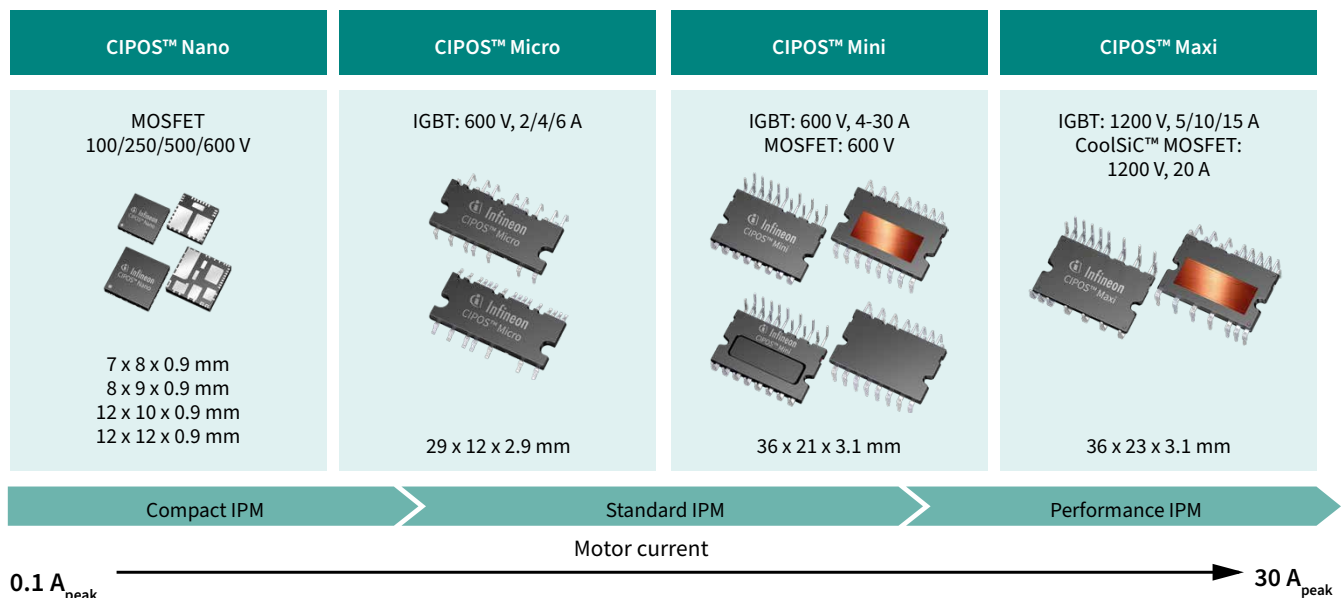
CIPOS™ IPM family

CIPOS™ intelligent power modules in different packages, voltage and current classes

Infiniteon has a broad portfolio of intelligent power modules (IPMs) with different semiconductors combined in various packages in varying voltage and current classes. These IPMs are separated into Compact, Standard, and Performance families.

Part of the IPMs is divided into CIPOS™ Nano, CIPOS™ Micro, CIPOS™ Mini, and CIPOS™ Maxi families. CIPOS™ IPMs are families of highly integrated, compact power modules designed to drive motors in applications ranging from home appliances, fans, pumps, HVAC to industrial drives. These energy-efficient intelligent power modules integrate the latest power semiconductor and ICs technologies from Infineon.

CIPOS™ product overview



Key benefits

- Fast time-to-market
- Increased reliability
- Reduced system design complexity
- Improved manufacturability



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CIPOS™ Nano

Smallest IPM in the world with various topology and voltage options

The ultra-compact CIPOS™ Nano is a family of highly integrated power modules for high-efficiency consumer and light industrial applications. CIPOS™ Nano is designed for the rectifier, converter, and inverter stage in power management circuits and motor drives for applications like fans, hair dryers, air purifiers, and circulation pumps. By implementing an innovative Power QFN package, which utilizes PCB copper traces to dissipate heat from the module, CIPOST™ Nano family delivers a new benchmark in device size, offering up to a 60 percent smaller footprint than existing three-phase motor control power IPMs.

The family is comprised of a series of fully integrated three-phase, half-bridge, and H-bridge surface-mount motor control circuit solutions. The new alternative approach utilizes PCB copper traces to dissipate heat from the module, providing cost savings through a smaller package design and even eliminating the need for an external heat sink.





Features and benefits

Key benefits	Key advantages
<ul style="list-style-type: none"> – Various switch technologies such as HEXFETs, Trench FREDFETs, Trench MOSFETs, CoolMOS™ and OptiMOS™ apply to motor drivers – Multiple package platforms with various topologies to suitable for a variety of application scenarios – Integrated bootstrap functionality and gate drivers – Realize a variety of protection (overcurrent protection, under-voltage lockout, over-temperature protection, fault reporting and etc.) – Accessible for heat sink-less operation 	<ul style="list-style-type: none"> – Smallest modules in the market – Cost savings from smaller footprint and reduced PCB space – Easy implementation of two- or three-phase motor drives – Half bridge configuration enables more flexible board design w/better thermal performance – Same PCB footprint to address multiple application markets (100 VAC – 230 VAC)

Key applications

- Hair dryer
- Fan motor
- Pump
- Air conditioner Indoor Unit
- Air purifiers
- Small kitchen appliances

Package overview

QFN 7x8 7 x 8 x 0.9 mm	QFN 8x9 8 x 9 x 0.9 mm	QFN 12x10 12 x 10 x 0.9 mm	QFN 12x12 12 x 12 x 0.9 mm
			



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CIPOS™ Micro

Solution for low power motor drive applications

CIPOS™ Micro is a family of compact, three-phase IPMs (intelligent power modules) for low-power (i.e., up to 500 W with heatsink) motor drive applications, including ventilation fans, circulation pumps, air purifiers, dish washer, and refrigerator compressor drives. CIPOS™ Micro has several protection features, including precise overcurrent protection and a UL-certified temperature sensor. Available in both surface mount and through-hole configurations, the family features rugged and efficient high voltage IGBTs specially optimized for variable frequency drives with a 600 V rating. Also, these IPMs utilize high-voltage gate drivers tuned to achieve an optimal balance between EMI and switching losses.

Features and benefits

Key features

- Wide range of product coverage
- Optimized dv/dt for loss and EMI trade offs
- HV H3TRB qualified
- Compatible with mass-market TO-2xx heat sinks and clips
- Power capability up to 500 W at isolation 2000 V_{RMS} 1 min

Key benefits

- Save system space and cost through the enhanced power capability
- Offer application-optimized solution for both fast switching and low EMI version
- Improve system ruggedness thru enhanced protection features and isolation voltage

Key applications

- RAC outdoor fan
- Dish washer
- Fan motor and pump
- Washing machine
- Refrigerator
- General purpose drive

Package overview



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CIPOS™ Mini

Broad range of configurations from PFC to inverter

CIPOS™ Mini is a family of highly efficient intelligent power modules that has the highest power density with 4 A to 30 A rated products built into a single package platform. It integrates various power and control components to increase reliability, and optimize PCB size and system costs. Utilizing multiple configurations, CIPOS™ Mini IPMs apply to a wide range of applications to control variable speed drives, such as air conditioners, washing machines, refrigerators, vacuum cleaners, compressors, and industrial drives up to 3 kW.

The configurations offered within the CIPOS™ Mini family are IGBT three-phase inverter, integrated PFC, and two-phase and three-phase interleaved PFC. All options include an integrated gate driver and a built-in temperature sensor. CIPOS™ Mini provides optimized performance for power applications, which need good thermal conduction and electrical isolation, but also EMI-safe control, innovative FAULT indication, and overload protection.

Infineon's TRENCHSTOP™ IGBTs and reverse-conducting IGBTs are combined with newly optimized Infineon SOI gate driver IC for excellent electrical performance. Also, CIPOS™ Mini family offers IPMs with DCB substrates, improving heat dissipation to provide higher power capability.

Features and benefits

Key features

- Wide range of current rating: 4 to 30 A
- High integration (bootstrap circuit, thermistor, single boost PFC)
- Optimized for target application requirements (separate version for washing machine and air conditioner)

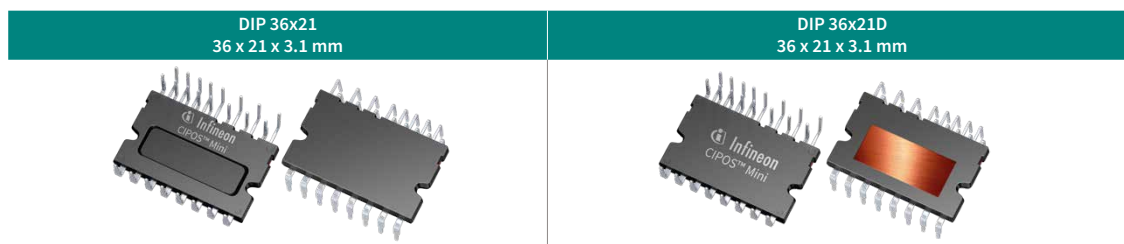
Key benefits

- Lower PCB size and system cost
- Easy power extension from 300 W to 3 kW
- Optimized performance for each application
- UL-certified package and temperature sensor

Key applications

- Refrigerator
- Washing machine
- Room air conditioning
- Fans and pumps
- HVAC outdoor fan
- General purpose drives

Package overview



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CIPOS™ Maxi

Smallest package in 1200 V IPM class while still offering high power density and best performance

The high-performance CIPOS™ Maxi intelligent power modules (IPMs) integrate various switching devices and control components to increase reliability, optimize PCB size and system costs. CIPOS™ Maxi IPMs are designed to control three-phase AC motors and permanent magnet motors in variable speed drive applications such as low-power industrial motor drives, pumps, fan drives, and active filters for HVAC (heating, ventilation, and air conditioning). The product concept is specially adapted to power applications, which need excellent thermal performance and electrical isolation as well as meeting EMI requirements and overload protection.

The existing IGBT 4 -based portfolio IM818 series offers 5 A , 10 A and 15 A in 1200 V class up to 3.0 kW power rating, while the newly IGBT 7 -based IM12BxxxC1 series offers 10 A, 15 A, and 20 A to extend the power rating up to 4.0 kW. IM828 series offers superior efficiency up to 99 percent and optimal reliability up to 4.8 kW power rating through the 6 revolutionary CoolSiC™ MOSFETs with an optimized 1200 V 6-channel SOI gate driver. IM828 series provides the exceptional power density with a wide switching speed range up to 80 kHz to adapt to fast-switching applications with superior lower power losses.

Features and benefits

Key benefits

- Fully isolated dual in-line molded module with DCB
- 1200 V TRENCHSTOP™ IGBT 4, IGBT 7
- 1200 V CoolSiC™ MOSFET
- Rugged 1200 V SOI gate driver technology
- Integrated bootstrap functionality
- Overcurrent shutdown
- Undervoltage lockout at all channels
- All of six switches turn-off during protection
- Cross-conduction prevention
- Independent NTC for temperature monitoring
- Allowable negative VS potential up to -11 V for signal transmission at V_{BS} of 15 V
- Low side emitter pins accessible for all phase current monitoring (open emitter)
- Programmable fault clear timing
- Enable input

Key advantages

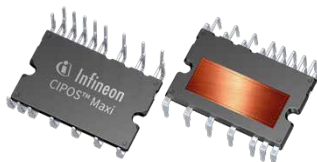
- The smallest package size in 1200 V IPM class with high power density and best performance
- Enhanced robustness of gate driver technology for excellent protection
- High efficiency
- Adapted to high switching application with lower power loss
- Simplified design and manufacturing
- Time-to-market

Key applications

- Fan and pump
- HVAC outdoor fan
- Heat pump
- Low-power general purpose drives (GPI, servo drive)
- Active filter (active power factor correction) for HVAC

Package overview

DIP36x23D
36 x 22.7 x 3.1 mm



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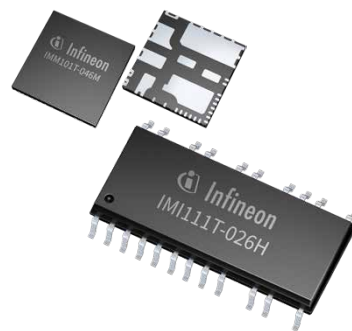
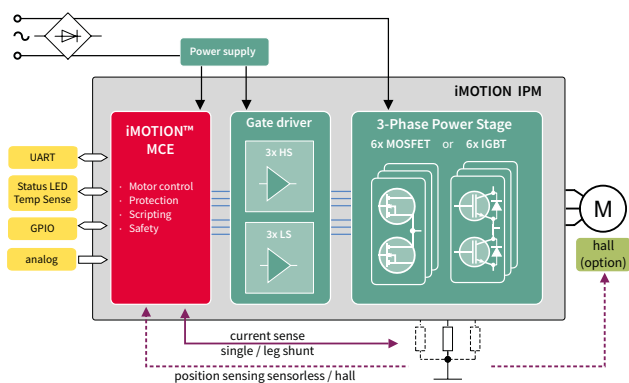
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iMOTION™ IPM

Fully integrated iMOTION™ IPM for BLDC motor control

iMOTION™ IPM is a family of fully integrated modules for the control of three-phase motors, optimized for low-power devices. Within the iMOTION™ IPM family, there are two different series: The IMM100 and IMI110, which combine the motor controller IC and a three-phase inverter stage in a single package, minimizing external components count and PCB area. The three-phase inverter stage is based either on six MOSFETs or six IGBTs. These iMOTION™ IPMs offer the highest integration level by making use of the field-proven iMOTION™ Motion Control Engine (MCE) in combination with providing all required hardware functions: From single shunt current sensing to bootstrap capability, signal filtering and several hardware protections like dead-time insertion and shoot through prevention. An iMOTION™ IPM does not require a heatsink and addresses motor drives with a rated output power between 30 W and 80W with 600 V maximum DC blocking voltage, depending on the chosen product variant. All IMM100 and IMI110 devices support the functional safety requirements according to the IEC/UL 60730-1 (“class B”).



Features and benefits

Key benefits

- Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series
- Up to 80 W without heatsink
- Support for IEC 60335-1 (“Class B”)
- Controller, gate driver and power stage in one package
- IMI in DSO-22 package with single layer layout option

Key advantages

- Fastest time-to-market with easy parametrization and tuning of motor and PFC control
- Applicable for fans and small pumps
- Support for functional safety integrated
- Minimizing BOM count and PCB area
- Reducing PCB and production costs



EVAL-IMM101T-046 is a Starter Kit for iMOTION™ IMM101T-046M IPMs. Together with the iMOTION™ Solution Designer the board can be used for an easy system configuration, controlling, tuning and monitoring. EVAL-IMM101T-046 enables rapid prototyping of various inverterized motor control systems, for example fans, pumps and compressors.

Product portfolio

Product	Function	Integration	Description	Package
IMI111T-026H	Motor inverter	MCE incl Scripting, gate driver, IGBT based inverter	Output rating: 600V/2 A, single shunt sensorless operation	PG-DSO-22-1
IMI111T-046H	Motor inverter	MCE incl Scripting, gate driver, IGBT based inverter	Output rating: 600V/4 A, single shunt sensorless operation	PG-DSO-22-1
IMM101T-046M	Motor inverter	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/1.4 Ω R _{DS(on)} , single/leg shunt, sensorless/hall	PG-IQFN-38-1
IMM101T-056M	Motor inverter	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/0.95 Ω R _{DS(on)} , single/leg shunt, sensorless/hall	PG-IQFN-38-2



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ISOFACE™ isolated industrial interface

Galvanic-isolated output switch and digital input ICs offers unmatched system uptime, high reliability and up to 50% shortened product launch time

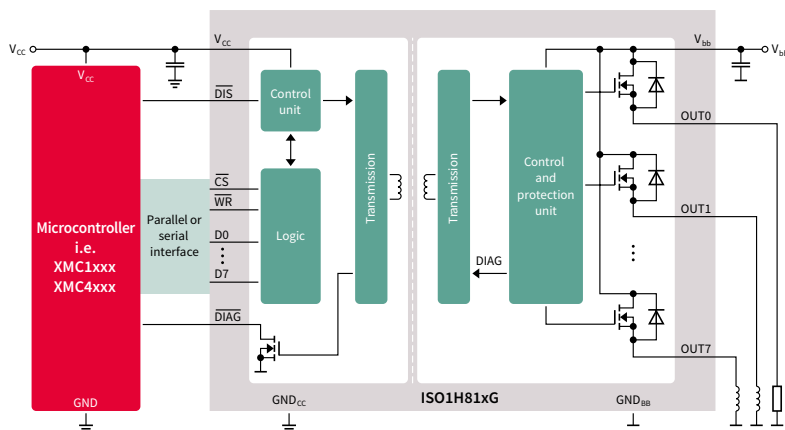
The ISOFACE™ product family provides robust and intelligent galvanic-isolation for various industrial control applications such as programmable logic controllers, sensor input modules, distributed control systems, control panels and general control equipment. The output switches are compact in design, enabling robust and reliable operation at low system cost. The input ICs are equally robust, offers reliable operation in a compact form factor and offers industry leading superior EMI robustness setting a new standard in diagnostics.

ISOFACE™ galvanic-isolated 8-channel output switches

The ISO1H81xG¹⁾ product family integrates:

- Robust galvanic isolation (UL508 and C22.2 NO14 certified) to protect the 3.3 V/5 V control domain of an industrial control system from the harsh 24 V process side
- 8-channel high-side power-switching capabilities of up to 1.2 A per channel
- Active current limitation and overtemperature protection
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage

Isolated output switch block diagram



Isolated output switches



Features and benefits

Key features

- Integrated galvanic isolation (500 V_{Ac})
- Eight channels (0.6 or 1.2 A, each)
- Inductive load switching
- Diagnostic feedback (overtemperature, overload)
- Serial and parallel MCU interface

Key benefits

- Robust and reliable
- Compact system solution
- Lower system cost
- System status feedback
- Directly interfacing with all MPUs and MCUs



Robotics



Industrial automation



PLC



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ISOFACE™ galvanic-isolated 8-channel high-side switch with 10-fold diagnostics

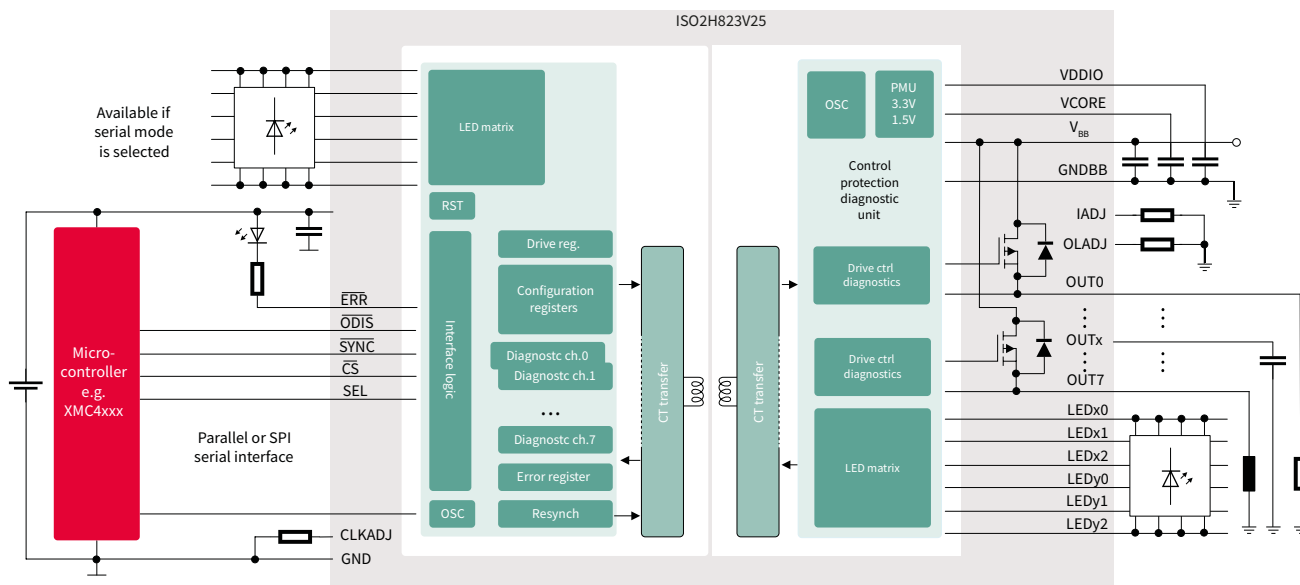
The ISO2H823V establishes a new standard in diagnostics for industrial control applications. For example, in industrial plants with capital-intensive single-tool equipment at work or with time-critical chemical processes running, obtaining in real-time differentiated feedback from the factory floor enables both, preventive maintenance and drastic reduction of the time to fix a problem. This is why the ISO2H823V is a highly desirable system solution. System designers benefit from the ISO2H823V through short time to market, reduced PCB area and uncompromised product reliability.

The ISO2H823V integrates:

- Robust 2.5 kV AC galvanic isolation:
 - UL508 and CSA C22.2 No.14 certified
 - Protecting the 3.3 V control domain of an industrial control system from the harsh 24 V process side
 - Exceeding the IEC 61131-2 requirements for reinforced isolation
- 8-channel high-side power-switching capabilities of up to 0.6 A per channel with active current limitation and overtemperature protection
- 10-fold diagnostic feedback
 - 5 types of feedback which are available individually for each of the eight outputs
 - 5 types of IC-level feedback
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage



Typical application



Features and benefits

Key features	Key benefits
- Robust 2.5 kV AC galvanic isolation	- Reliable and UL certified
- Eight channels (up to 0.6 A per channel)	- Small form factor solution
- 10-fold diagnostic feedback (over-temperature, overload)	- Preventive maintenance and short down-times



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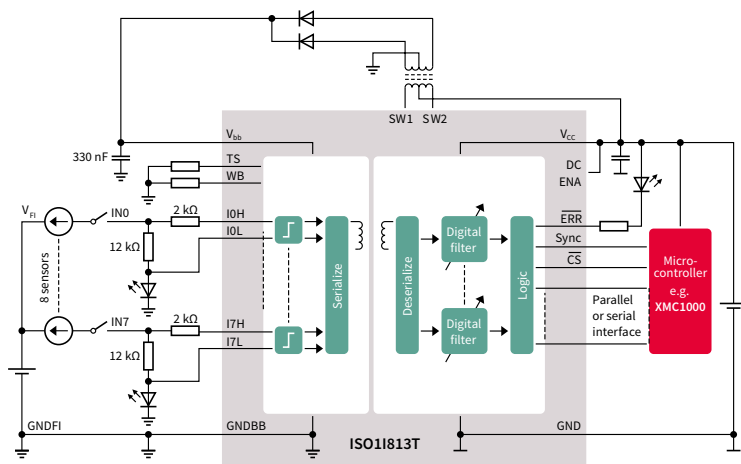
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ISOFACE™ galvanic-isolated digital input ICs

The UL1577 certified ISO1181xT digital input IC family is an intelligent system solution offering robust galvanic isolation between the microcontroller on the “control side” and the 24 V factory floor environment, frequently referred to as the “process side”.

Digital input switch block diagram



Galvanic-isolated digital input ICs



Features and benefits

Key features

- Integrated galvanic isolation (500 V_{rms})
- Eight channels (IEC type 1/2/3)
- Up to 500 kHz sampling speed
- Programmable input filters
- Channel-resolved diagnostics (wire-break, undervoltage)

Key benefits

- Robust and reliable
- Compact system solution
- High-speed applications
- Superior EMI robustness
- System status feedback
- Valuable maintenance support



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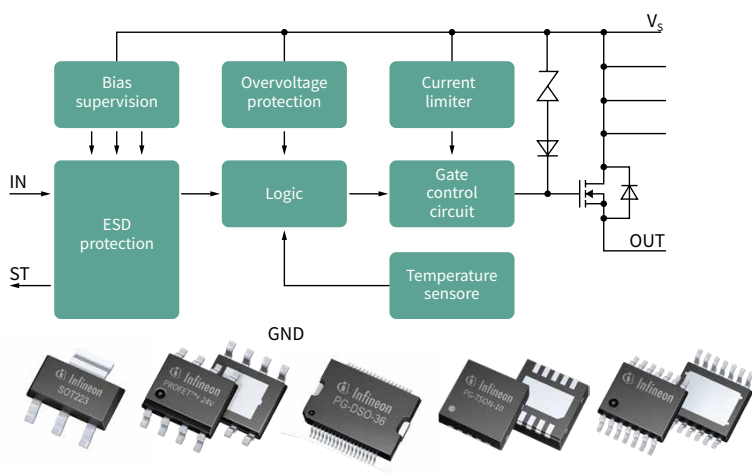


Industrial PROFET™

Protected high-side switches

Infiniteon's market-proven high-side switch Industrial PROFET™ products have been designed to target various industrial applications that drive all types of resistive, inductive and capacitive loads. Due to their outstanding energy robustness, they are perfectly suitable for switching challenging inductive loads and driving relays. Their main application areas include high-voltage and (V_{supply} up to 60 V) and PWM applications up to 1 kHz. Industrial PROFET™ can be applied to drive any kind of sensor units, indicators, displays, LEDs, relays, valves, and magnetic actuators or replace electromechanical relays, fuses, and discrete circuitry. Industrial PROFET™ products are also perfect for applications with long wiring or any other kind of inductive loads or applications with space constraints. Failsafe systems do make use of them as well.

PROFET™ typical block diagram



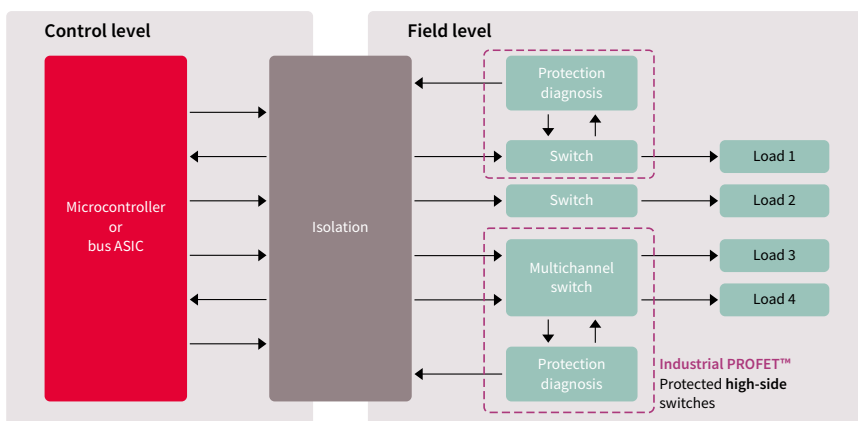
Key applications

- Industrial automation
- Programmable logic controller (PLC)
- Digital DCS and PC I/O modules
- Robotics
- Building and home automation
- Solar applications
- Wind energy systems
- Failsafe systems
- Smart grid
- Motor control and drives
- Power supplies

Features and benefits

Key features	Key benefits
- Right fit for digital output modules, motor or robot control, protected switching of decentralized loads like sensors or auxiliary supply	- Small system form factor
- Outstanding robustness and reliability as required by industrial mission profiles	- No/little downtime of system in operation
- Thermally optimized products with low $R_{DS(on)}$ to deal with the high ambient temperatures in applications with limited or even no cooling	- Low heating up of a system
- Diagnosis and protection for safe system operation	- System cost saving by built-in protection and tailored featureset
- Small and compact design for higher integration and applications with space constraints	- Reduced system maintenance efforts by providing optimized diagnostics

PLC – programmable logic controller digital output modules



PROFET™ as actuators typically address I/O modules supplying nominal currents of 2 A or 0.5 A. However, PROFET™ portfolio also provides devices for lower and higher currents. PROFET™ parts are suitable for switching resistive, capacitive and, by featuring high EAS, inductive loads.

Corresponding PROFET™ evaluation boards are available on request.



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HITFET™

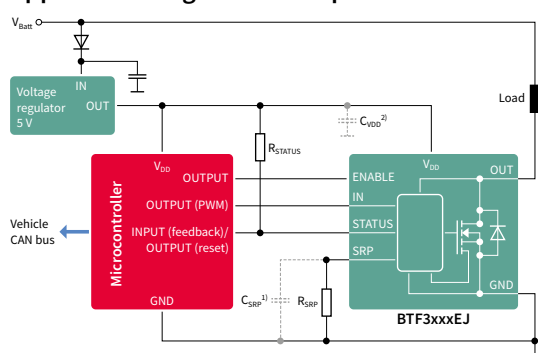


ISO 26262 ready

Low-side smart protected switches

HITFET™ stands for highly-integrated temperature-protected MOSFET. These well-established low-side switches offer a compelling feature set with protection against overtemperature, short circuit and overload conditions as well as ESD robustness. The HITFET™ + family is the new generation based on new technology, enabling a significant shrink compared to the existing Classic HITFET™ portfolio (up to 50 percent shrink). This novel generation consists of standard and fully-featured protected low-side switches (11 to 125 mΩ) in the TO-252-3 DPAK/TO-252-5 DPAK and TDSO-8 packages. Classic HITFET™ and HITFET™ + devices address a wide range of applications, including resistive, inductive, and capacitive loads.

Application diagram example for HITFET™ +



1) $C_{SRP-GND} < 100 \text{ pF}$ – maximum permitted parasitic capacitance at the SRP-pin
 2) Filter capacitor on supply, recommended 100 nF

Key applications

- Industrial automation*
- Programmable logic controller (PLC)**
- Digital I/O modules
- Building and home management
- All kind of solenoid or valve driving
- Power modules
- Solar power inverters

Features and benefits

Key features

- Low-side switches with integrated protection features
- Scalable in $R_{DS(on)}$ ranges from 800 mΩ down to 11 mΩ
- Adjustable slew rate control (BTFxxx and BTT30xxEJ)
- Thermal shutdown with auto restart or latch behavior
- Status feedback via
- Increased input current (HITFET™ +12 V/24 V)
- Digital readout via SRP (BTF3050TE)
- Via status pin (BTF3xxxEJ)

Key benefits

- High design flexibility with scalable $R_{DS(on)}$ and package
- Driving applications with high switching speed requirements up to 25 kHz (e.g., valve, solenoid)
- Easy to design
- Choice of packages to match individual application needs

Low-side switch shield with BTF3050TE for Arduino



Featured products: Three BTF3050TE low-side switches of the HITFET™ +12 V family
Compatible with: Microcontroller boards using the Arduino form factor and the corresponding Infineon's kits with Arm® powered XMC™ microcontroller
Orderable part number: SHIELDBTF3050TETOBO1

Evaluation board based on BTT3050EJ



Featured products: One single-channel low-side switch of BTT3050EJ a device of the HITFET™ +24 family
Compatible with: Can be used as single stand and is also pin-compatible with microcontroller boards using the Arduino form factor (e.g., XMC1100 Boot Kit, Arduino Uno)
Orderable part number: BTT3050EJDEMOBOARDTOBO1



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ISOFACE™ product portfolio

ISOFACE™ output switches

Product overview		ISO1H801G	ISO1H811G	ISO1H812G	ISO1H815G	ISO1H816G	ISO2H823V
Switch	V _{bb} operational range: 11 V to 35 V	✓	✓	✓	✓	✓	✓
	Max. continuous load current per channel	0.6 A	0.6 A	0.6 A	1.2 A	1.2 A	0.6 A
	Load current increase by using outputs in parallel	✓	✓	✓	✓	✓	✓
	Inductive clamping energy per channel: 1 Joule	✓	✓	✓	✓	✓	150 mJ
Microcontroller interface	Type	Parallel	Parallel	Serial	Parallel	Serial	Serial/Parallel
	Nominal voltages	5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V
Safety features	Isolation voltage: V _{iso} = 500 VAC UL508 and EN 61131-2 certified	✓	✓	✓	✓	✓	2.5 kV AC
	Active current limitation	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓
	Common output disable pin	✓	✓	✓	✓	✓	✓
Diagnostics feedback	Overtemperature		✓	✓	✓	✓	✓
	V _{bb} undervoltage		✓	✓	✓	✓	✓
Package DSO-36 (16x14 mm)		✓	✓	✓	✓	✓	VQFN-70
Ordering code		ISO1H801GAUMA1	ISO1H811GAUMA1	ISO1H812GAUMA1	ISO1H815GAUMA1	ISO1H816GAUMA1	ISO2H823V25XUMA1

ISOFACE™ digital input IC

Product overview		ISO1I811T	ISO1I813T
Input characteristics	IEC type: I, II, III	✓	✓
	Input status LED	✓	✓
	Max. sampling frequency	125 kHz	500 kHz
	Deglinting filter setting	Hard wired	Software, individual per channel
	Synchronous data acquisition	-	✓
µC interface	3.3 V/5 V	✓	✓
	Serial and parallel	✓	✓
Safety features	500 VAC isolation voltage	✓	✓
Diagnostic feedback	Wire break, channel-specific	-	✓
	V _{bb} undervoltage	✓	✓
Support for external V _{bb} supply		-	✓
Package TSSOP-48 (8x12.5 mm)		✓	✓
Ordering code		ISO1I811TXUMA1	ISO1I813TXUMA1



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Industrial PROFET™ product portfolio

Feature / Product	ITS6035S-EP-K	ITS6080S-EP-D	ITS4035S-EP-D	ITS4080S-EP-D	ITS4040 / ITS4075 ITS4090 / ITS4130
Status	Active & preferred	Active & preferred**	Active & preferred	Active & preferred**	Active & preferred
Max. supply voltage	60 V	60 V	45 V	45 V	45 V
Adj. current limit	3 – 13.2 A	see datasheet	3 – 13.2 A	see datasheet	–
Digital diagnosis	✓	✓	✓	✓	✓
Overvoltage lockout	✓	✓	–	–	–
Synchronized discharge functionality	✓	✓	–	–	–
Analog diagnosis	✓	–	–	–	–
Analog current sense	✓	–	–	–	–
Open load in OFF-state	✓	✓	✓	✓	–
Open load in ON-state	–	✓	–	–	–

Product	Number of channels	R _{DS(on)} (typ) [mΩ]	Nominal load current [A]	E _{AS} [mJ]	Recommended operating voltage range [V]	I _{L(SC)} (typ) [A]	Diagnosis	Package
ITS4035S-EP-D	1	35	2.0 ... 5.0	350 at 2.0 A	8.0 .. 36.0 [ext. V upto 45V]	3...13.2	Digital and analog	TSDSO-14
ITS6035S-EP-K	1	35	2.0 ... 5.0	350 at 2.0 A	8.0 .. 36.0 [ext. V upto 60V]	3...13.2	Digital	TSDSO-14
ITS4060S-SJ-N	1	50	3.10	900 at 1.50 A	5.00 ... 34.00	17.0	n/a	DSO-8
ISP772T	1	50	2.60	900 at 1.50 A	5.00 ... 34.00	17.0	n/a	DSO-8
ITS428L2	1	60	7.00	190 at 7.00 A	4.75 ... 41.00	22.0	Digital	TO252-5
ITS4100S-SJ-N	1	70	2.40	870 at 1.00 A	5.00 ... 34.00	10.0	n/a	PG-DSO-8
ISP762T	1	70	2.00	870 at 1.00 A	5.00 ... 34.00	10.0	n/a	DSO-8
ITS4080S-EP-D	1	75	see datasheet	300 at 0.5 A	8.0 .. 36.0 [ext. V up to 45 V]		Digital	TSDSO-14
ITS6080S-EP-D	1	75	see datasheet	300 at 0.5 A	8.0 .. 36.0 [ext. V up to 60 V]		Digital	TSDSO-14
ITS4200S-ME-O	1	150	1.10	700 at 0.50 A	11.00 ... 45.00	1.4	n/a	SOT-223-4
ITS4141N	1	150	1.10	700 at 0.50 A	12.00 ... 45.00	1.4	n/a	SOT-223-4
ITS4200S-ME-P	1	150	2.20	160 at 1.00 A	11.00 ... 45.00	3.0	n/a	SOT-223-4
ITS4142N	1	150	2.20	160 at 1.00 A	12.00 ... 45.00	3.0	n/a	SOT-223-4
ITS4200S-ME-N	1	160	1.20	500 at 0.50 A	5.00 ... 34.00	1.5	n/a	DSO-8
ISP452	1	160	1.20	500 at 0.50 A	5.00 ... 34.00	1.5	n/a	SOT-223-4
ITS4200S-SJ-D	1	150	1.70	125 at 1.00 A	6.00 ... 52.00	6.5	Digital	DSO-8
ISP752R	1	200	1.70	125 at 1.00 A	6.00 ... 52.00	6.5	Digital	DSO-8
ISP752T	1	200	1.70	125 at 1.00 A	6.00 ... 52.00	6.5	n/a	DSO-8
ITS4300S-SJ-D	1	250	0.80	800 at 0.30 A	5.00 ... 34.00	1.2	Digital	DSO-8
ISP742RI	1	350	0.80	800 at 0.30 A	5.00 ... 34.00	1.2	Digital, inverted	DSO-8
ITS41K0S-ME-N	1	1000	0.55	1000 at 0.15 A	4.90 ... 60.00	0.9	n/a	SOT-223-4
ITS4140N	1	1000	0.55	1000 at 0.15 A	4.90 ... 60.00	0.9	n/a	SOT-223-4
ITS4040D-EP-D	2	40	2 x 2.00	185 at 2 A	5.00 ... 45.00	4.1	Digital	TSDSO-14
ITS5215L	2	90	2 x 2.00	178 at 3.50 A	5.50 ... 40.00	15.0	Digital	DSO-12
ITS4075Q-EP-D	4	75	4 x 2.00	60 at 2 A	5.00 ... 45.00	4.1	Digital	TSDSO-14
ITS4090Q-EP-D	4	90	4 x 0.50	410 at 0.5 A	5.00 ... 45.00	1.5	Digital	TSDSO-14
ITS724G	4	90	4 x 2.00	120 at 3.30 A	5.50 ... 40.00	15.0	Digital	DSO-20
ITS4130Q-EP-D	4	130	4 x 0.50	380 at 0.5 A	5.00 ... 45.00	1.25	Digital	TSDSO-14
ITS716G	4	140	4 x 1.00	76 at 2.30 A	5.50 ... 40.00	9.0	Digital	DSO-20
ITS711L1	4	200	4 x 1.00	150 at 1.90 A	5.00 ... 35.00	7.5	Digital	DSO-20
ITS42008-SB-D	8	200	8 x 0.60	10,000 at 625 mA	11.00 ... 45.00	3.0	Digital	DSO-36
ITS4880R	8	200	8 x 0.60	10,000 at 625 mA	11.00 ... 45.00	3.0	Digital	DSO-36



Evaluation board

- ITS4035S-EP-D
- ITS4080S-EP-D
- ITS6035S-EP-K
- ITS6080S-EP-D



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* Per one channel

** Coming soon

HITFET™ product portfolio

Product type	Product family	Channels	$R_{DS(on)}$ at 25°C [mW]	Nominal load current [A]	EAS [mJ]	Operating voltage range [V]	$I_{L(lim)}$ (typ) [A]	$I_{L(lim), TRIGGER}$ (typ) [A]	Diagnosis	Package
BTS3011TE	HITFET™ +	1	10.7	10	300 at 5 A	up to 28	35	70	Status pin	TO-252-5 (DPAK 5-leg)
BTT3018EJ	HITFET™ +	1	16	7.0	150	up to 36	45	–	Status pin	TDSO-8
BTS3035EJ	HITFET™ +	1	28	5.00	105 at 5 A	up to 31	20.00	–	Status pin	TDSO-8
BTS3035TF	HITFET™ +	1	30	5.00	106 at 5 A	up to 31	20.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3035EJ	HITFET™ +	1	28	5.00	95 at 5 A	up to 32	14.00	41.00	Status pin	TDSO-8
BTF3050TE	HITFET™ +	1	40	3.00	120 at 3 A	up to 28	8.00	30.00	Through SRP pin	TO-252-5 (DPAK 5-leg)
BTS3050EJ	HITFET™ +	1	40	4.00	62 at 3 A	up to 31	15.00	–	Status pin	TDSO-8
BTS3050TF	HITFET™ +	1	44	4.00	64 at 4 A	up to 31	15.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3050EJ	HITFET™ +	1	40	4.00	62 at 4 A	up to 32	10.00	29.00	Status pin	TDSO-8
BTS3060TF	HITFET™ +	1	50	3.00	55 at 3 A	up to 35	10.50	–	–	TO-252-3 (DPAK 3-leg)
BTS3080EJ	HITFET™ +	1	64	3.00	35 at 3 A	up to 31	10.00	–	Status pin	TDSO-8
BTS3080TF	HITFET™ +	1	69	3.00	38 at 3 A	up to 31	10.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3080EJ	HITFET™ +	1	64	3.00	33 at 3 A	up to 32	7.00	18.00	Status pin	TDSO-8
BTS3125EJ	HITFET™ +	1	100	2.00	30 at 2 A	up to 31	7.00	–	Status pin	TDSO-8
BTS3125TF	HITFET™ +	1	108	2.00	24 at 2 A	up to 31	7.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3125EJ	HITFET™ +	1	100	2.00	23 at 2 A	up to 32	5.00	12.00	Status pin	TDSO-8
BTS3018TC	Classic HITFET™	1	14	6.00	1900	up to 36	30.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS141TC	Classic HITFET™	1	25	5.10	4000	up to 36	25.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3028SDL	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3028SDR	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS133TC	Classic HITFET™	1	40	3.80	2000	up to 36	21.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3046SDL	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3046SDR	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS117TC	Classic HITFET™	1	80	3.50	1000	up to 36	7.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3104SDL	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3104SDR	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3408G	Classic HITFET™	2	480	0.55	800	up to 36	1.00	–	Through input pin	DSO-8
BSP75N	Classic HITFET™	1	490	0.70	550	up to 36	1.00	–	Through input pin	SOT-223



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CIPOS™ IPM product portfolio

MOSFET based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	$R_{DS(on),max}^*$ [Ω]	Package	Product name
	100	Half-bridge	0.021	QFN 7x8	IRSM005-301MH
	250	H-bridge	0.063	QFN 12x10	IM111-X3Q1B
		Half-bridge	0.15	QFN 8x9	IRSM808-204MH
		3-phase inverter	0.45 ~ 2.40	QFN 12x12	IRSM836-044MA IRSM836-084MA
	500	Half-bridge	0.80/1.70	QFN 8x9	IRSM808-105MH/IRSM807-045MH
		3-phase inverter	1.70 ~ 6.00	QFN 12x12	IRSM836-025MA/IRSM836-035MA IRSM836-045MA IRSM836-035MB
		H-bridge	0.28	QFN 12x10	IM111-X6Q1B
CIPOS™ Maxi	1200	3-phase inverter	0.055	DIP 36x23D	IM828-XCC

IGBT based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	Rated current [A]	Package	Product name
CIPOS™ Micro	600	3-phase inverter	2.0/4.0/6.0	DIP 29x12	IM241-S6T2B/IM241-M6T2B/IM241-L6T2B IM241-S6T2J/IM241-M6T2J
			2.0/4.0/6.0	SOP 29x12	IM241-S6S1B/IM241-M6S1B/IM241-L6S1B IM241-S6S1J/IM241-M6S1J
CIPOS™ Mini	600	PFC integrated	10.0 ~ 20.0	DIP 36x21D	IFCM10S60GD/IFCM10P60GD IFCM15S60GD/IFCM15P60GD IM564-X6D
		3-phase inverter	4.0 ~ 30.0	DIP 36x21	IGCM04F60GA/IGCM04G60GA/IGCM06F60GA/IGCM06G60GA IGCM10F60GA/IKCM10H60GA/IKCM10L60GA IGCM15F60GA/IKCM15L60GA/IKCM15F60GA/IKCM15H60GA IGCM20F60GA/IKCM20L60GA IKCM30F60GA IM523-S6A/IM523-M6A/IM523-L6A/IM523-X6A
			15.0 ~ 30.0	DIP 36x21D	IKCM15L60GD/IKCM20L60GD/IKCM30F60GD IM535-U6D
	650	3-phase interleaved PFC	20.0/30.0	DIP 36x21D	IFCM20T65GD/IFCM30T65GD
	2-phase interleaved PFC	30.0	DIP 36x21D	IFCM30T65GD/IFCM30U65GD	
CIPOS™ Maxi	1200	3-phase inverter	5.0 ~ 15.0	DIP 36x23D	IM818-SCC/IM818-MCC/IM818-LCC



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Infineon support for intelligent switches and modules

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Evaluation board



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- XMC™ peripherals
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- AURIX™ TC2xx family system architecture
- AURIX™ TC3xx family system architecture
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- Application example: Industrial robotics
- Microcontroller PDH partner
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- MOTIX™ 32-bit motor control SoC
- BLDC Motor Control Shield for Arduino
- CAN-FD transceivers

XMC™

One microcontroller platform – countless solutions

Infiniteon's XMC™ 32-bit industrial microcontroller portfolio is designed for efficiency and demanding industrial applications.

XMC™ MCU portfolio

- RAM: 8 kB up to 1 MB
- Flash: 16 kB up to 8 MB
- Accurate analog mixed-signal peripherals
- Fast timer/PWM peripherals
- Rich communication interfaces
- 16-pin to 272-pin count packages

XMC1000 family

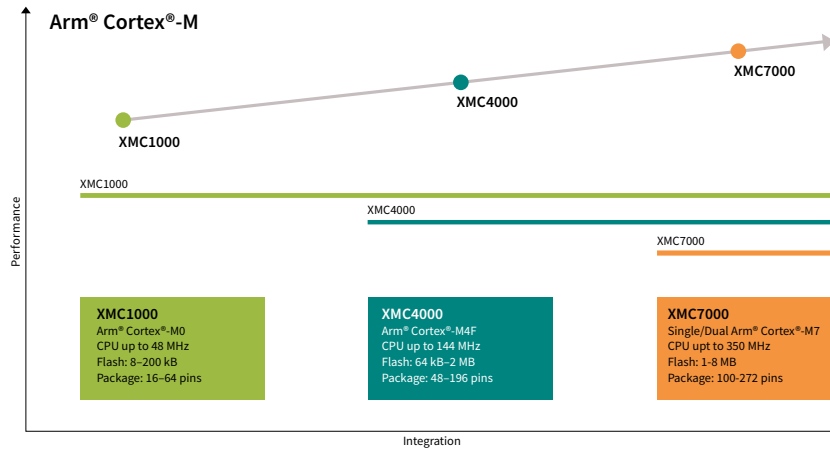
- Arm® Cortex®-M0 up to 48 MHz
- Peripherals up to 96 MHz
- One-time event request unit (ERU)
- V_{DD} : 1.8 to 5.5 V
- $T_{Ambient}$: -40°C to 105°C

XMC4000 family

- Arm® Cortex®-M4 up to 144 MHz
- Built-in DSP, SFPU
- EtherCAT
- Event request unit (ERU)
- $T_{Ambient}$: -40°C to 125°C

XMC7000 family

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- Up to 8 MB flash
- Up to 10x CAN FD and 2x Ethernet
- $T_{Ambient}$: -40°C to 125°C



XMC7000 Dual Arm® Cortex®-M7 up to 350MHz core, 1MB - 8MB flash, up to 125°C Tamb 2,7V-5.5V	XMC7100 Basic control & Connectivity single core at 250MHz TQFP-100/144	XMC7100/7200 EV-Charging, TCPWM, CAN-FD TQFP-144/176, LFBGA-272	XMC7100/7200 Industrial Drives, TCPWM, CAN-FD, up to 125°C Tamb TQFP-176, LFBGA-272	XMC7200 GB Ethernet, ADCs with 1MSPS, TCPWM, CAN-FD TQFP-176, LFBGA-272	
XMC4000 Arm® Cortex®-M4F up to 144MHz core 64kB-2MB flash up to 125°C	XMC4100 Basic control and connectivity VQFN-48 LQFP-64	XMC4200 Server power 150 ps HRPWM LQFP-64/100	XMC4700/4800 Industrial drives, Hall and encoder I/F, ΔΣ demodulator, LQFP-100/144 LFBGA-196	XMC4800, XMC4300 EtherCAT, +drives MultiCAN - 6 nodes LQFP-100/144 LFBGA-196	
XMC1000 Arm® Cortex®-M0 up to 48 MHz core/ 96 MHz peripheral 8-200 KB flash up to 105°C 1.8-5.5 V	XMC1100 Basic control and connectivity TSSOP-16/38 VQFN-24/40	XMC1400 Flicker-free, 4-Ch LED, SMPS, connectivity VQFN-40/64 LQFP-64	XMC1400 SMPS control, connectivity VQFN-40/64 LQFP-64	XMC1400 Hall and encoder I/F, MATH co-processor, CAN VQFN-40/64 LQFP-64	
	XMC1200, XMC1300 Flicker-free, 4-Ch LED, SMPS, connectivity TSSOP-16/28/38 VQFN-24, -40	XMC1300 SMPS control, connectivity, TSSOP-16/38 VQFN-24/40	XMC1300 Hall and encoder I/F, MATH co-processor, TSSOP-16/38 VQFN-24/40	XMC1400 Multi CAN - 2 nodes VQFN-48/64 LQFP-64	
	XMC™ entry	LED lighting	Digital power	Motor control	Industrial I/O

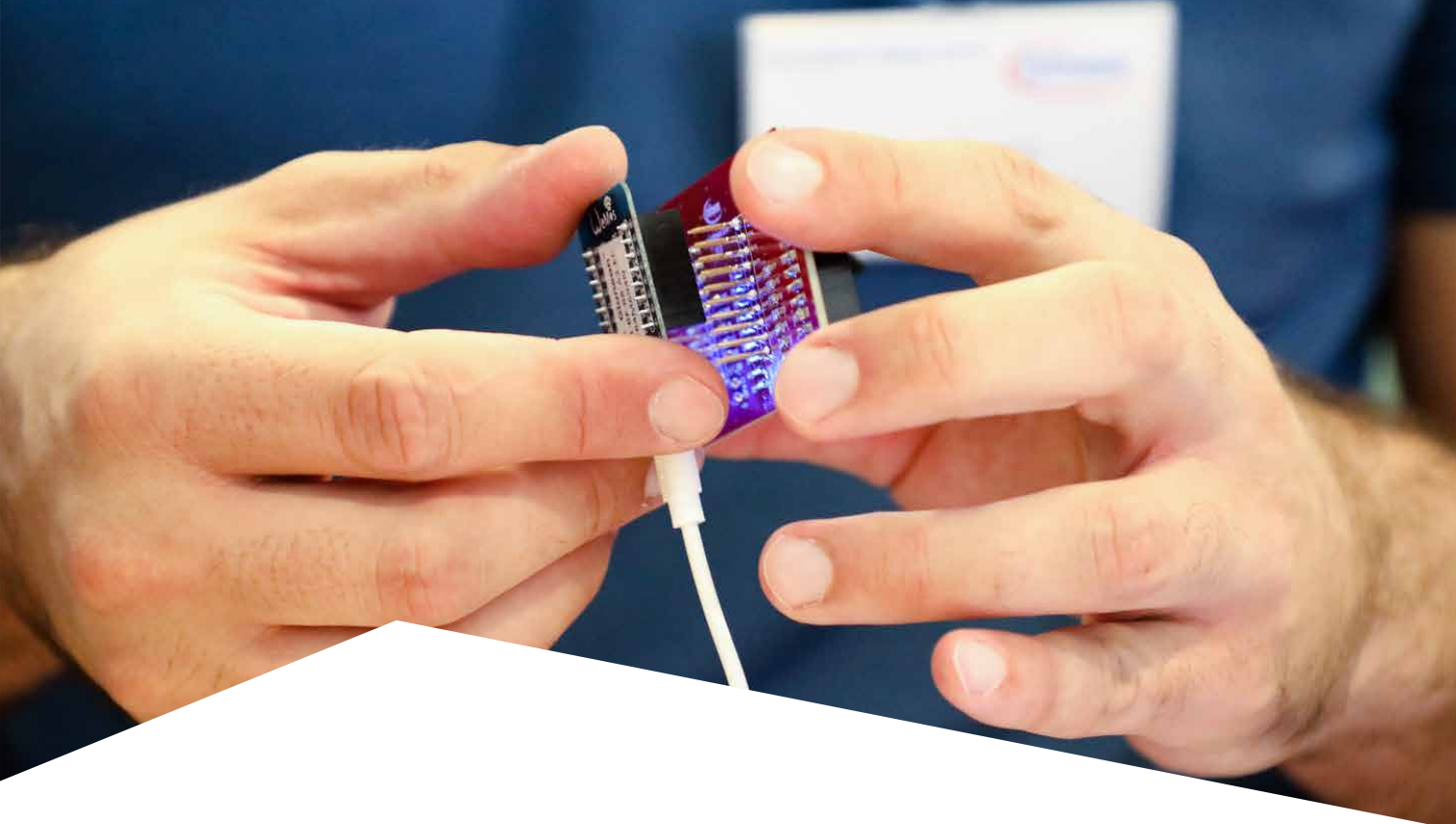


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Professional and free-of-charge development platform

XMC™ library for Embedded Coder® – www.infineon.com/matlab

Model-based design from MATLAB® and Simulink® environment, download free of charge

IEC60730 class B library for XMC™ – www.infineon.com/iec60730

Available for XMC™ industrial microcontrollers free of charge

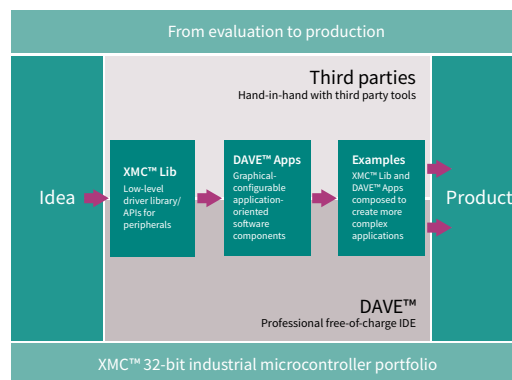
Microcontroller/Probe™ XMC™ – www.infineon.com/ucprobexmc

Free-of-charge version of microcontroller/Probe™ for XMC™ MCUs to build user interfaces for visualizing, observing, and control of the internals of XMC™ MCUs

XMC™ link – www.infineon.com/xmmlink

Functional isolated debug probe, based on SEGGER J-Link technology

In addition to a rich third party ecosystem and enablement landscape, which support the entire development cycle from evaluation to production.
For more click here.



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Infinion's XMC™ 32-bit industrial microcontroller portfolio is designed for system cost and efficiency for demanding industrial applications. It comes with the most advanced peripheral set in the industry. Fast and largely autonomous peripherals can be configured to support individual needs.

Highlights include analog mixed-signal, timer/PWM, and communication peripherals powered by either an Arm® Cortex®-M0 core (XMC1000 family) or an Arm® Cortex®-M4 core with a floating point unit (XMC4000 family).

Arm® Cortex®-M0	Co-processor	Clocks		Memory		Analog			Timer/PWM				Connectivity		Package
		Frequency	Peripherals			ADCI 2-bit/S&H	Number of channels	Analog comparators	CCU4 (4 ch)	CCU8 (4 ch)	POSIF	BCCU	USIC	CAN 2.0B	
XMC11x	-	32	64	Flash	8-64 kB	1/1	Up to 12	-	1x	-	-	-	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC12x	-	32	64	Flash	16-200 kB	1/2	Up to 12	Up to 3	1x	-	-	✓	2x	-	VQFN 24/40 TSSOP 16/28/38
				RAM	16 kB										
XMC13x	✓	32	64	Flash	8-200 kB	1/2	Up to 12	Up to 3	1x	1x	✓	✓	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC14x	✓	48	96	Flash	32-200 kB	1/2	Up to 12	Up to 4	2x	2x	✓	✓	4x	✓	VQFN 40/48/64 LQFP 64
				RAM	16 kB										

Supply voltage range 1.8-5.5V

Temperature range -40°C ... 85°C/105°C

Arm® Cortex®-M0	Frequency [MHz]	Memory		Analog				Timer/PWM					Connectivity					SDIO/SD/MMC	External BUS Unit (EBU)	Package
				ADCI 2-bit/S&H	Number of channels	DAC1 2-bit	CCU4 (4 ch)	CCU8 (4 ch)	HRPWM (150 ps)	POSIF	Σ Demodulator	USIC	CAN 2.0B	USB	Ethernet	EtherCAT®				
XMC41x	80	Flash	64-128 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	Up to 2	✓	-	-	-	-	-	VQFN 48 TQFP 64
		RAM	20 kB																	
XMC42x	80	Flash	256 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	2x	✓	-	-	-	-	-	VQFN 48 TQFP 64
		RAM	40 kB																	
XMC43x	144	Flash	256 kB	2/2	14	2 ch	2x	1x	-	-	-	4x	2x	✓	✓	✓	✓	-	-	LQFP 100
		RAM	128 kB																	
XMC44x	120	Flash	256-512 kB	4/4	Up to 18	2 ch	4x	2x	✓	2x	4 ch	4x	2x	✓	✓	-	-	-	-	TQFP 64 LQFP 100
		RAM	80 kB																	
XMC45x	120	Flash	512 kB-1 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	4x	Up to 3	✓	✓	-	✓	✓	-	LQFP 100/144 LFBGA 144
		RAM	128-160 kB																	
XMC47x	144	Flash	1.5-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	-	✓	✓	-	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																	
XMC48x	144	Flash	1-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	✓	✓	✓	-	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																	

Supply voltage range 3.1-3.6V

Temperature range -40°C ... 85°C/125°C

Arm® Cortex®-M7	Frequency [MHz]	Memory		Analog		Timer/TCPWM			Connectivity					Package
				ADC 12bit	Number of Channels	16 bit motor-control	16 bit general-purpose	32 bit general-purpose	SCB	CAN-FD	Ethernet	Gb Ethernet	SDHC (eMMC, SD, SDIO)	
XMC71xx	250	Flash	4 MB	3	18 ch	12 ch	63 ch	8 ch	up to 11 ch	up to 8	✓	-	✓	QFP-100, QFP-144, QFP-176, BGA-272
		RAM	768 kB											
XMC72xx	350	Flash	8 MB	3	18 ch	15 ch	87 ch	16 ch	up to 11 ch	up to 10	✓	✓	✓	QFP-176, BGA-272
		RAM	1 MB											

Supply voltage range 2.7-5.5V

Temperature range -40 ...125°C



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XMC™ 7000 microcontrollers

High-quality grade MCU platform for industrial applications

The XMC7000 is the latest entry in Infineon's industrial microcontroller portfolio, equipped with peripherals such as CAN-FD, TCPWM and Gb Ethernet, which increase flexibility and offer added value. The XMC7000 architecture is built on a low-power 40-nm process technology and the MCUs offer best-in-class compute performance addressing high-end industrial applications.

The XMC7000 offers both single and dual-core Arm® Cortex®-M7 options, supported by an Arm® Cortex®-M0+ enabling designers to optimize their end products to meet the dynamic and demanding business conditions of industrial applications. The advanced peripheral set and robust security features make it attractive to customers, who need a high-quality MCU platform. The MCU can operate in harsh environments with a temperature range of -40°C to 125°C, and it is ideal for power-critical applications based on its low-power modes, which go down to 8 µA. The flexible XMC7000 comes in four package/pin types with 17-part number variants to meet many design requirements.

XMC7100/7200

4 MB flash / 768 kB RAM,
250 MHz single/dual core
100 – 272 pin (QFP/BGA)

XMC7200

8 MB flash / 1 MB RAM,
350 MHz single/dual core
176 – 272 pin (QFP/BGA)

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- M7 CPU core Frequency up to 350 MHz
- Temperature range: Ta = -40 to 125°C
- Memory Up to 8 MB flash, 1 MB RAM
- TCPWM timers of 102Ch 16-bit and 16Ch 32-bit
- Cryptography Engine support
- Interfaces such as CAN-FD, Gb Ethernet
- SMIF and SDHC interface supported
- Extended voltage operating range: 2.7 to 5.5 V
- Low power modes(LP/deep sleep, hibernate)
- Read While Write (RWW) flash capability



BGA-272



QFP-176

Features and benefits

Key benefits

- Best-in-class computing performance
- Low power to support electrification and digitization
- Optimal solution for motor control and power conversion applications
- Advanced security options
- Ability to operate in high ambient environments
- XMC7000 is easy to adapt to existing PCB
- Different core/memory/package combinations



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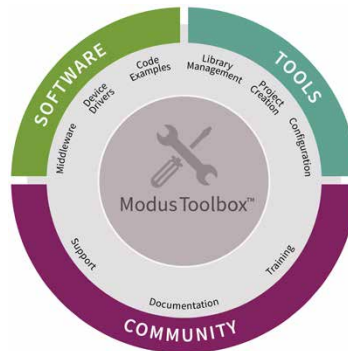
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XMC™ 7000 part numbers

Type	Description
XMC7100-F100K1088AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 1 MB flash
XMC7100-F100K2112AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100-F100K4160AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100D-F100K2112AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100D-F100K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100-F144K2112AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100-F144K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100D-F144K2112AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100D-F144K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100-F176K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100D-F176K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100-E272K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), LFBGA 272 pins, 4 MB flash
XMC7100D-E272K4160AA	Dual Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), LFBGA 272 pins, 4 MB flash
XMC7200-F176K8384AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200D-F176K8384AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200-E272K8384AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash
XMC7200D-E272K8384AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash

Software

ModusToolbox™ Software Environment



ModusToolbox™ software supports application development using the XMC7200 evaluation kit by providing board support package (BSP) and validated code examples to help you get started. To download the latest version of the software, please visit the ModusToolbox™ webpage.



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XMC™ digital power explorer kit

The new digital power explorer kit is designed with the particular goal of making it easy for engineers to take the first steps into digital power control with XMC™ microcontrollers. It showcases both XMC™ families Arm® Cortex®-M microcontrollers: XMC4000 and XMC1000, 30 V dual n-channel OptiMOS™ MOSFETs and IRS2011S gate drivers. The kit includes two different control card options, XMC1300 control card (Arm® Cortex®-M0) and XMC4200 control card (Arm® Cortex®-M4F), which allow designers to evaluate both XMC™ microcontroller families and make the right price/performance choice for their application.

Features and benefits

Key features

- Synchronous buck converter evaluation kit controlled with XMC4200 or XMC1300 Arm® Cortex®-M MCUs
- Onboard resistive load banks
- Featuring BSC0924ND1 dual n-channel OptiMOS™ MOSFET and IRS2011S high- and low-side gate driver
- Different control schemes possible
- Voltage mode control
- Peak current mode control (with slope compensation)

Key benefits

- Easy entry in digital power control applications
- Understand the details of voltage/peak current control and how to extract the maximum of XMC™ devices
- DAVE™ v4 APPs for buck converter and many more example



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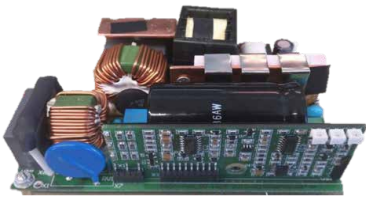
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High power density 800 W 130 kHz platinum server design with XMC1300

The 800 W PFC CCM evaluation board demonstrates design and practical results of an 800 W 130 kHz platinum server PFC evaluation board based on Infineon devices, in terms of power semiconductors, non-isolated gate drivers, analog and digital controllers for the PFC converter, as well as flyback controller for the auxiliary supply. This evaluation board verifies the performance of the latest 600 V CoolMOS™ C7 superjunction MOSFET technology working at 130 kHz in a PFC CCM boost converter along with EiceDRIVER™ ICs and CoolSiC™ Schottky diode 650 V G5 using digital control.

Features and benefits

Key features	Customer benefits
<ul style="list-style-type: none"> – Classic PFC boost stage digitally controlled with XMC1302 including voltage and current loops – Protections, including cycle-by-cycle current protection – Run time debug with isolated UART to PC interface and PC software 	<ul style="list-style-type: none"> – High efficient PFC stage with a complete system solution from Infineon – HW and SW available – Higher switching frequency permits higher power density

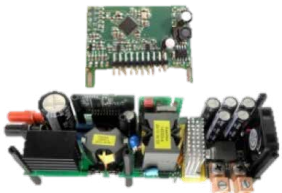
800 W PFC CCM with XMC1300	Specification	Infineon components		
	V_{in}	90-265 V_{AC}	MCU	XMC1302 (TSSOP38)
	V_{out_nom}	380 V_{DC}	MOSFET	600 V CoolMOS™ C7
	I_{out}	2 A	MOSFET driver	EiceDRIVER™ 2EDN7524F non-isolated
	PWM frequency	130 kHz	Diode	CoolSiC™ Schottky diode 650 V G5
	THD	<10%	Auxiliary PSU	ICE2QR4780Z
	Power factor	>0.9 from 20% load		
	Efficiency	97% (peak)		

600 W half-bridge LLC evaluation board with 600 V CoolMOS™ C7 SJ MOSFET with digital control

The 600 W LLC digital control evaluation board shows how to design the half-bridge LLC stage of a server SMPS with the target to meet 80+ Titanium standard efficiency requirements. For this purpose, the latest CoolMOS™ technologies, 600 V CoolMOS™ C7 or P6 superjunction MOSFETs have been used on the primary side and OptiMOS™ low-voltage power MOSFET in SuperSO8, BSC010N04LS, in the synchronous rectification secondary stage in combination with QR CoolSET™ ICE2QR2280Z, high- and low-side driver 2EDL05N06PF, low-side gate driver 2EDN7524F, and an XMC4200 microcontroller.

Features and benefits

Key features	Customer benefits
<ul style="list-style-type: none"> – 600 W LLC half-bridge stage with synchronous rectification (SR) <p>All controlled with XMC4200 including:</p> <ul style="list-style-type: none"> – Start up (PWM to PFM) and burst-mode algorithms – Adaptive dead time and capacitive-mode detection – No hard commutation at any condition 	<ul style="list-style-type: none"> – Learn LLC topology with a complete system solution from Infineon – HW and- SW available – Close to customer solution – High efficiency → 97.8% – Reliability and power density

600 W LLC digital control	Specification	Infineon components		
	V_{in}	350-410 V_{DC}	MCU	XMC4200 (VQFN48)
	V_{out_nom}	12 V_{DC}	MOSFET SR	BSC010N04LS
	I_{out}	50 A	HB driver	2EDL05N06PF
	P_{out}	600 W	LLC HB MOSFET	CoolMOS™ IPP60R190P6
	f_{res}	157 kHz	Auxiliary PSU	ICE2QR2280Z



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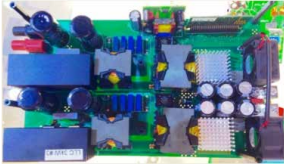
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3 kW dual-phase LLC converter using XMC4400

The 3 kW dual-phase LLC demonstration board is an example of a high-efficiency isolated DC-DC converter using the state-of-the-art Infineon components, both power devices and controller/driver ICs. Using an advanced digital control using the XMC4400 microcontroller, together with the latest generation of CoolMOS™ and OptiMOS™ devices, achieves a very flat efficiency curve in the entire load range. The demonstration board targets the high-voltage DC-DC stage of high-end telecom rectifiers.

Features and benefits

Key features	Customer benefits
<ul style="list-style-type: none"> – Full digital control by XMC4400 on the secondary side – Digital current sharing with phase shedding – Accurate algorithm able to prevent hard commutation and capacitive load mode in LLC operation 	<ul style="list-style-type: none"> – Full digital control by XMC4400 on the secondary side – Efficiency peak 98.5% and more than 97.2% in the entire load range – Easy monitoring and parameter setting via a graphic user interface

3 kW dual-phase LLC converter using XMC4400	Specification	Infineon components		
	V_{in}	350-410 V _{DC}	MCU	XMC4400 (LQFP64)
	V_{out_nom}	54.3 V _{DC}	SR MOSFET	OptiMOS™ BSC093N15NS5
	I_{out_max}	55 A	Drivers	1ED160N12AF 2EDN7524R
	P_{out}	3000 W	LLC Half-bridge MOSFET	CoolMOS™ P6 IPW60R041P6
	f_{range}	90-200 kHz	Auxiliary PSU	ICE2QR2280Z
	Peak efficiency	>98.4%		

RGB LED lighting shield with XMC1202 for Arduino

The RGB LED lighting shield with XMC1202 for Arduino uses a DC-DC buck topology and can drive up to three LED channels with a constant current. The shield is powered by a programmable XMC™ 32-bit Arm® MCU with an embedded brightness color control unit (BCCU, XMC1200 MCU series), for flicker-free LED dimming and color control.

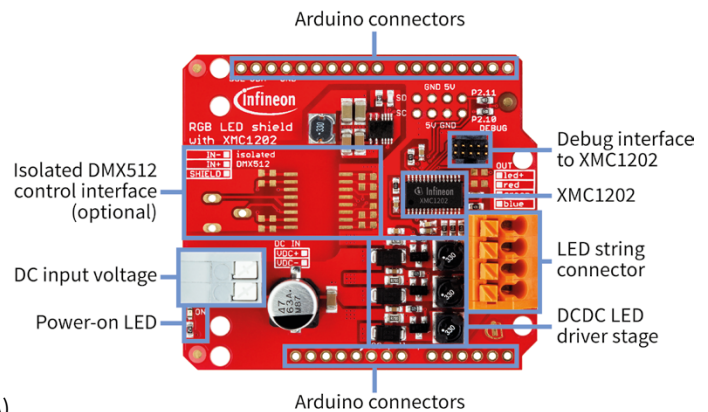
Features

- › Compatible with Arduino Uno R3 and XMC1100 boot kit from Infineon
- › Easily configurable for various light engines and any input voltage (within operating conditions)
- › Wide DC input voltage range
- › Simple I²C interface

Operating conditions

- › Nominal: 12-48 V input voltage (max. 6-60 V)
- › Average LED current up to 700 mA (max. peak current 1 A)

The Infineon shields mentioned above are hardware compatible with Arduino and Infineon’s XMC™ boot and relax kits.



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3 kW dual-phase LLC converter

XMC4800 automation board V2 – explore XMC4800 microcontroller based on Arm® Cortex®-M4

The XMC4800 automation board V2 uses Infineon's industry-leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface, communication, and safety products. The XMC4800 automation board V2 is designed to evaluate the capabilities of the XMC4800 microcontroller, especially in EtherCAT® slave applications and can be used with a wide range of development tools, including Infineon's free-of-charge ModusToolbox™ Software.

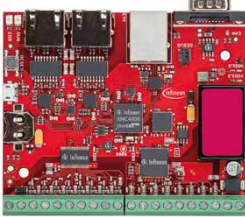
Features and benefits

Key features

- XMC4800-E196 MCU based on Arm® Cortex®-M4 at 144 MHz
- EtherCAT® slave controller, 2 MB flash and 352 kB RAM
- OPTIGA™ Trust E embedded security solution (CC EAL6+)
- Real time clock crystal
- SPI FRAM (64 kB non-volatile memory)
- EtherCAT® slave node (2 EtherCAT® PHY and RJ45 Jacks)
- 24 V ISOFACE™ 8-channel inputs and 8-channel outputs CAN transceiver
- CAN transceiver

Customer benefits

- Complete automation kit gateway
- Combined MCU with EtherCAT® slave application
- Isolated interfaces with diagnose
- Ethernet connectivity with software examples available
- 24 V supply
- CAN connectivity
- Full software DAVE™ examples

XMC4800 automation board V2	Type	Description	OPN
	KIT_XMC48_AUT_BASE_V2	The XMC4800 automation board V2 utilizes Infineon's industry leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface/communication and safety products	KITXMC48AUTBASEV2TOBO1
	XMC4800-E196K2048	Arm® Cortex®-M4 microcontroller	XMC4800E196K2048AAXQMA1
	ISO2H823V2.5	24 V 8-channel isolated output	ISO2H823V25XUMA1
	ISO1I813T	24 V 8-channel isolated input	ISO1I813TXUMA1
	SLS 32AIA020A4 USON10	OPTIGA™ Trust E – embedded security solution	SLS32AIA020A4USON10XTMA2
	TLE6250GV33	Infineon CAN transceiver	TLE6250GV33XUMA1
	IFX54441LDV	Infineon voltage regulator	IFX54441LDVXUMA1



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XMC™ wireless power controller – enabling wireless charging transmitter applications

Infineon's XMC™ wireless power controller, based on the Arm® Cortex®-M0 core, provides a powerful and cost-effective platform for high-performance, smart, and safe wireless charging applications. The XMC™ wireless power controller helps the next-generation wireless charging systems to meet strict safety, environmental, and regulatory requirements while still enabling industry-leading charging performance and efficiency. This controller works seamlessly with Infineon's power devices in a scalable architecture provide a complete charging solution for everything from a fast-charge smartphone to a 20 W robot or a 60 W drone and beyond.

Features and benefits

Key features	Customer benefits
– Supports inductive and resonant charging methods	– Supports 15 W charging and existing standards, including fast charging of smartphones
– Power levels up to 60 W	– Full power 15 W without exotic thermal management
– Multiple industry standard and custom charging profiles using the same hardware architecture	– Achieves charging rates equivalent to wired charging
– Single- and multi-coil transmitters	– Supports custom-charging profiles and industry standards on the same hardware
– Half- and full-bridge support	– Foreign object detection (FOD) with improved accuracy quality-factor monitoring
– Variable and fixed-frequency transmitter types	– Foreign object detection capability can be extended beyond existing standards to improve detection
– Buck and boost topologies	– Supports custom coils, and greater than three coils
– Integrated flash for parameter storage	
– Voltage supply 1.8-5.5 V	
– Space saving VQFN-40 package	

For a detailed overview of Infineon's wireless charging solutions, check the Wireless charging chapter.



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XMC™ starter kits

Kits and evaluation boards

Xtreme2Go

Order number: **KIT_XMC_2GO_XTR_XMC1400**

- XMC1400 family kit with ADAFRUIT, MikroE and Shields2Go connectivity. Extension for IoT and other cloud applications.
- The XMC1400 series devices are optimized for motor control, power conversion and LED Lighting applications and Human-Machine Interface (HMI).

For more information on this product, please contact our product support.

Platform2Go XMC4400

Order number: **KIT_XMC_PLT_2GO_XMC4400**

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller, the XMC4400 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4400 microcontroller. It can be used with a wide range of development tools including Infineon's free of charge ModusToolbox™ Software.
- This kit has the XMC4400 device with debugger plus Ethernet, CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:

www.infineon.com/XMC4400platform2go



XMC1400 Arduino

Order number: **KIT_XMC1400_ARDUINO**

- This kit utilizes Infineon's industry leading Arm® Cortex® M0 microcontroller in combination with Arduino form factor.
- It can be used with a wide range of development tools including Infineon's free of charge ModusToolbox™ Software and much more.

Click on the following to find/purchase the kit:

www.infineon.com/xmc1400_ARDUINO



Platform2Go XMC4200

Order number: KIT_XMC_PLT 2GO_XMC 4200

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller from Infineon Technologies AG, the XMC4200 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4200 microcontroller.
- It can be used with a wide range of development tools including Infineon's free of charge ModusToolbox™ Software.
- This kit has the XMC4200 device with debugger plus CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:

www.infineon.com/XMC4200platform2go



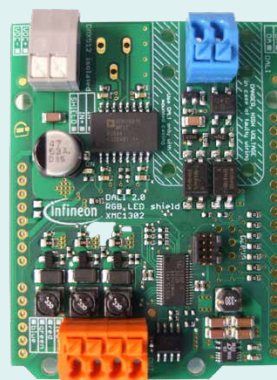
RGB LED Lighting Shield

Order number: KIT_XMC_LED_DALI_20_RGB

- One of the first intelligent evaluation boards compatible with Arduino as well as Infineon's XMC1100 BOOT KIT.
- Designed to be easily configurable and combinable for different LED light engines and lamps, for fast prototyping and in-expensive evaluation of LED lighting applications.
- The RGB LED lighting shield with XMC1302 uses a DC-DC buck topology.

Click on the following to find/purchase the kit:

www.infineon.com/cms/en/product/evaluation-boards/kit_xmc_led_dali_20_rgb/

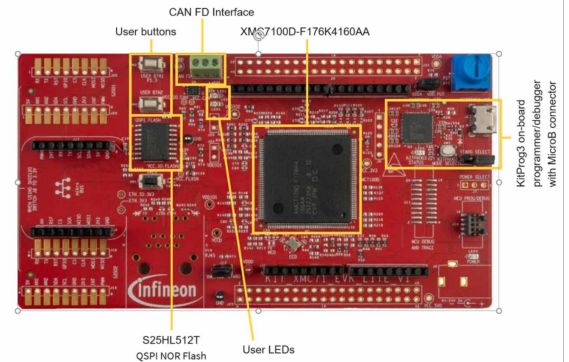


XMC7000 evaluation kits

KIT_XMC71_EVK_LITE_V1

The XMC7100 Evaluation Board (KIT_XMC71_EVK_LITE_V1) enables you to evaluate and develop your applications using the XMC7100D microcontroller. The XMC7100D is designed for industrial applications and is a true programmable embedded system-on-chip, integrating up to two 250-MHz Arm® Cortex®-M7 as the primary application processor, 100-MHz Arm® Cortex®-M0+ that supports the following:

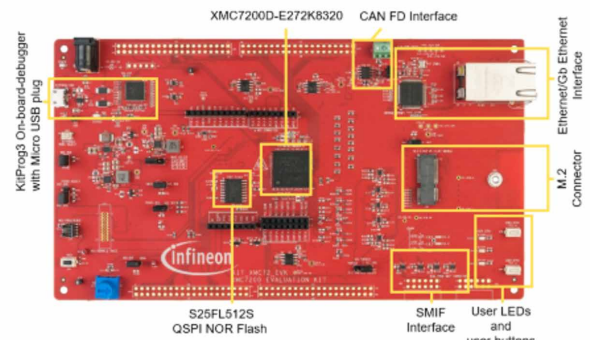
- Low-power operations
- CAN-FD interface
- Programmable analog and digital peripherals that allow faster time-to-market



KIT_XMC72_EVK

The XMC7200D is a true programmable embedded system-on-chip, integrating up to two 350-MHz Arm® Cortex®-M7 as the primary application processor, a 100-MHz Arm® Cortex®-M0+ and is designed for industrial applications. This kit enables you to evaluate and develop your applications using the XMC7200D microcontroller. Some of the features of this kit include:

- High performance
- Gigabit Ethernet
- Secure Digital Host Controller (SDHC) supporting SD/SDIO/eMMC interfaces



Software Technology Partners

Software stacks, UI/UX, compilers, debuggers



Independent Design House Partners

Designs and builds solutions for customers using Infineon products




XMC™ peripherals

IEC60730 class B library for XMC™

Supporting the XMC1xxx and XMC4xxx families

In collaboration with the Hitex consultancy, Infineon developed the IEC60730 – class B software library for XMC™ industrial microcontrollers for household electrical appliances. This is a dedicated software library for XMC™ MCUs with routines for internal supervisory functions and self-diagnostics.

Extended documentation and pre-certified software libraries to XMC™ Cortex® Arm®-based controllers are free of charge. For more information, please check: www.hitex.com/classb

Documentation	Consultancy
Safety application note Failure mode report FMEDA tool by Infineon, revised in workshops by TÜV Süd	 EMBEDDED TOOLS & SOLUTIONS Implementation support by Hitex



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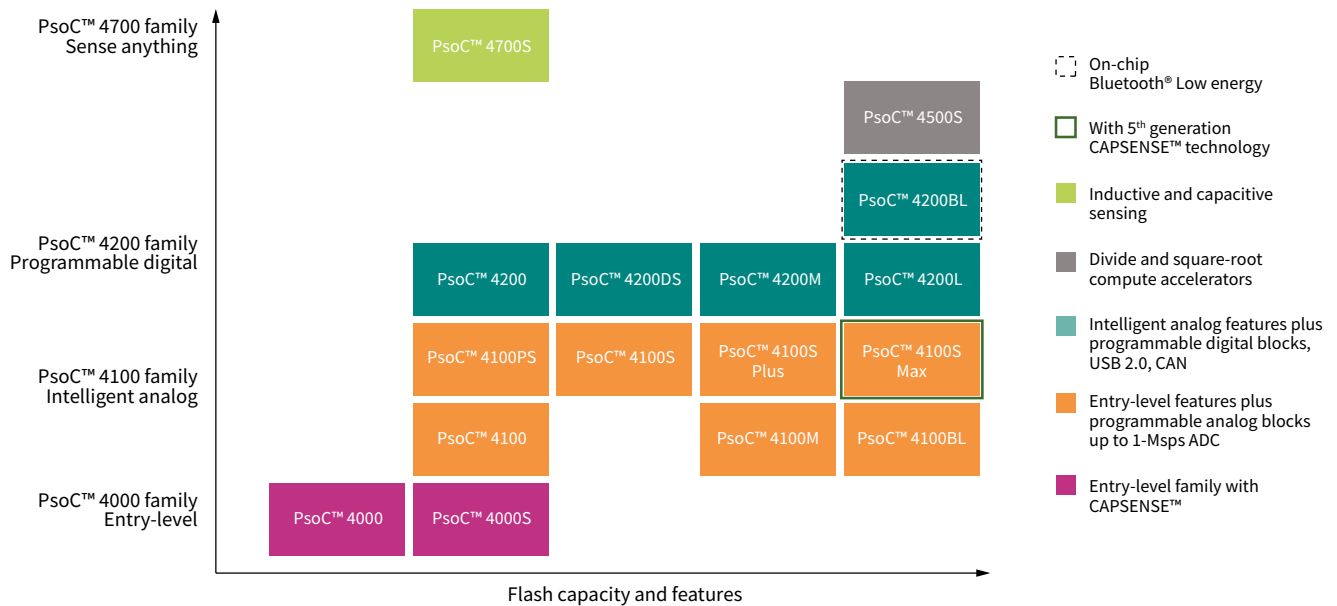
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PSoC™ 4 microcontrollers

Your problem solver on chip

PSoC™ 4 has tackled some of the complex portions of embedded system designs making it easier for you to get your product to market. Functions such as analog sensor integration, capacitive touch, and wireless connectivity have been integrated and optimized in PSoC™ 4 just to work.

The PSoC™ 4 portfolio consists of several families of Arm® Cortex®-M0 and Cortex-M0+ microcontrollers. Most devices in the portfolio include Infineon's CAPSENSE™ technology for capacitive-sensing applications. Other key features in the PSoC™ 4 portfolio include a customizable analog front end through programmable analog blocks and wired and wireless connectivity options such as USB, CAN, and Bluetooth® Low Energy. These unique features make PSoC™ 4 the industry's most flexible and scalable low-power mixed-signal architecture.



Features and benefits

Sense anything

Programmable analog and digital blocks in PSoC™ 4 enable you to customize your analog-front-end, apply simple glue logic and easily integrate intelligent analog sensors into an application

Intelligent sensor integration

Easy-to-use HMI

PSoC™ 4 simplifies complex HMI interfaces such as capacitive and inductive sensing enabling sleek, robust, and easy-to-use interfaces

Capacitive and inductive sensing

Connected

Bluetooth® Low Energy (BLE) integrated into some PSoC™ 4 devices simplifies RF design. Additional wired interfaces such as USB and CAN are also available

Wired and wireless connectivity



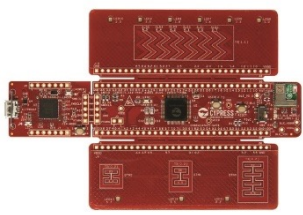

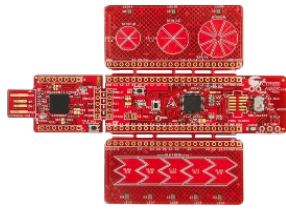





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Evaluation kits

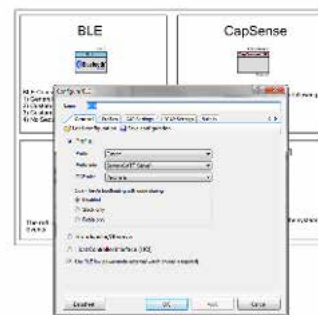
Make it smarter	Make it connected	Make it easy to use
 <p>PSoC™ 4100S Plus prototyping kit (CY8CKIT-149)</p>	<p>Bluetooth® Low Energy kits</p>  <p>CY8CKIT-143-A CY8CKIT-141</p>	<p>HMI kits for capacitive/inductive sensing</p>  <p>PSoC™ 4000S prototyping kit (CY8CKIT-145-40xx)</p>
 <p>PSoC™ 4100PS prototyping kit (CY8CKIT-147)</p>	<p>PSoC™ 4 Bluetooth® LE modules* with PCB or external antenna</p>  <p>PSoC™ 4 Bluetooth® LE Pioneer kit (CY8CKIT-042-BLE-A)</p>	 <p>PSoC™ 4700S Inductive Sensing Evaluation kit (CY8CKIT-148)</p>
 <p>PSoC™ 4100S Max pioneer kit (CY8CKIT-041S-MAX)</p>	 <p>CySmart BLE USB Dongle (CY5677)</p>	

Software

ModusToolbox™ Software Environment



PSoC™ Creator IDE with graphical front ends



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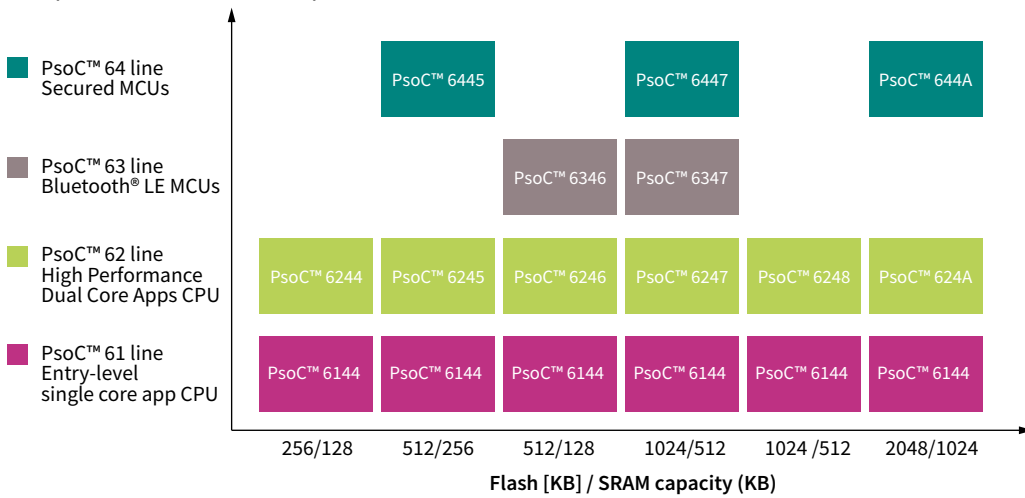
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PSoC™ 6 microcontrollers

Purpose-Built for IoT

The PSoC™ 6 family is built on an ultra-low-power architecture, and the MCUs feature low-power design techniques ideal for battery-powered applications. The dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture lets designers optimize power and performance simultaneously. Using its dual cores combined with configurable memory and peripheral protection units, the PSoC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm. Designers can use the MCU's rich analog and digital peripherals to create custom analog front ends (AFEs) or digital interfaces for innovative system components such as MEMS sensors and electronic ink displays. The PSoC™ 6 MCU features the latest generation of industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable. PSoC™ 6 MCU, paired with Infineon's AIROC™ Wi-Fi, AIROC™ Bluetooth®, or AIROC™ combos radio modules, is the perfect solution for secure, low-power, feature-rich IoT products.



Features and benefits

Lowest power

IoT devices are often portable, making battery life a critical factor. The PSoC™ 6 MCU architecture is built on a cutting-edge, ultra-low-power, 40-nm process technology with a dual Arm® Cortex®-M core architecture. Active power consumption is as low as 22-µA/MHz for the M4 core and 15-µA/MHz for the M0+ core. PSoC™ 6 delivers extended battery life without sacrificing performance.

Most flexibility

The PSoC™ 6 MCU architecture's best-in-class flexibility enables the addition of new features and addresses the need for unique IoT products with multiple connectivity options, such as USB and BLE. PSoC™ 6 also offers software-defined peripherals to create custom analog and digital circuits, and the industry's best capacitive-sensing solution, CAPSENSE™. In addition, a flexible dual-core architecture is used to optimize for system power consumption and performance. The possibilities are endless.

Built-in security

The PSoC™ 6 MCU architecture supports multiple, simultaneous, secure environments without the need for external memories or secure elements. It offers scalable, secure memory for multiple, independent user-defined security policies, preventing your IoT device from becoming a security liability. PSoC™ 6 provides a new standard for IoT security.



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PSoC™ 6 Kits

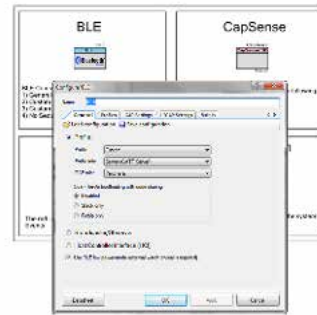
Product family	Kit type	Kit MPN	Selection factors
PSoC™ 61, PSoC™ 62 product family			
PSoC™ 62xA, 62x8, 61xA, 61x8	Prototyping	CY8CPROTO-062-4343W	Highest-end MCU, single-band Wi-Fi
	Pioneer	CY8CKIT-062S2-43012	Highest-end MCU, machine learning, graphics, dual-band/low power Wi-Fi, Arduino shield capability
	Evaluation	CY8CEVAL-062S2	Highest-end MCU, machine learning, graphics, flexible M.2 card-based Wi-Fi module evaluation (single-band, dual-band), Arduino shield capability, mikroBUS interface
PSoC™ 62x7, 62x6, 61x7, 61x6	Pioneer	CY8CKIT-062-WIFI-BT	Standalone MCU, graphics, single-band Wi-Fi, analog rich, Arduino shield capability
PSoC™ 62x5, 61x5	Prototyping	CY8CPROTO-062S3-4343W	Standalone MCU, single-band Wi-Fi connectivity processor, industrial (CAN-FD)
PSoC™ 62x4, 61x4	Pioneer	CY8CKIT-062S4	Standalone MCU, low power analog, sensor coprocessor, Arduino shield capability
PSoC™ 64 Product Family			
PSoC™ 64xA	Pioneer	CY8CKIT-064B0S2-4343W	Standalone secured MCU, trusted firmware-M, single-band Wi-Fi, Arduino shield capability
PSoC™ 64x7	Prototyping	CY8CPROTO-064S1-SB	Standalone secured MCU
PSoC™ 64x5	Prototyping	CY8CPROTO-064B0S3	Standalone secured MCU, industrial (CAN-FD)

Software

ModusToolbox™ Software Environment



PSoC™ Creator IDE with graphical front ends



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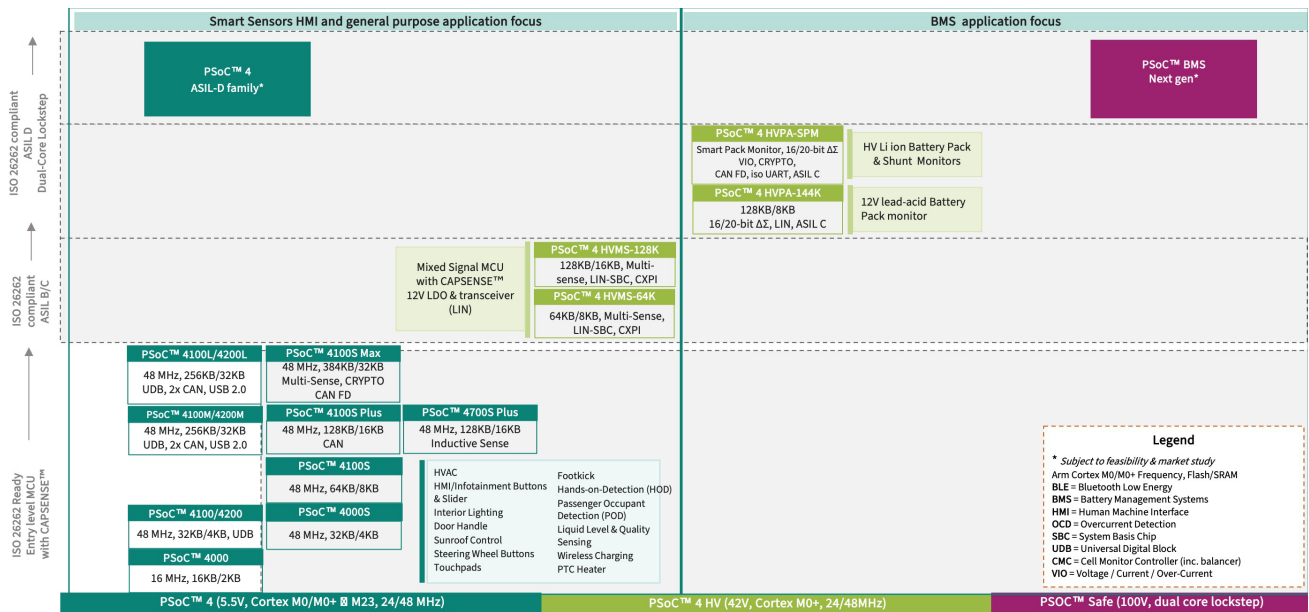
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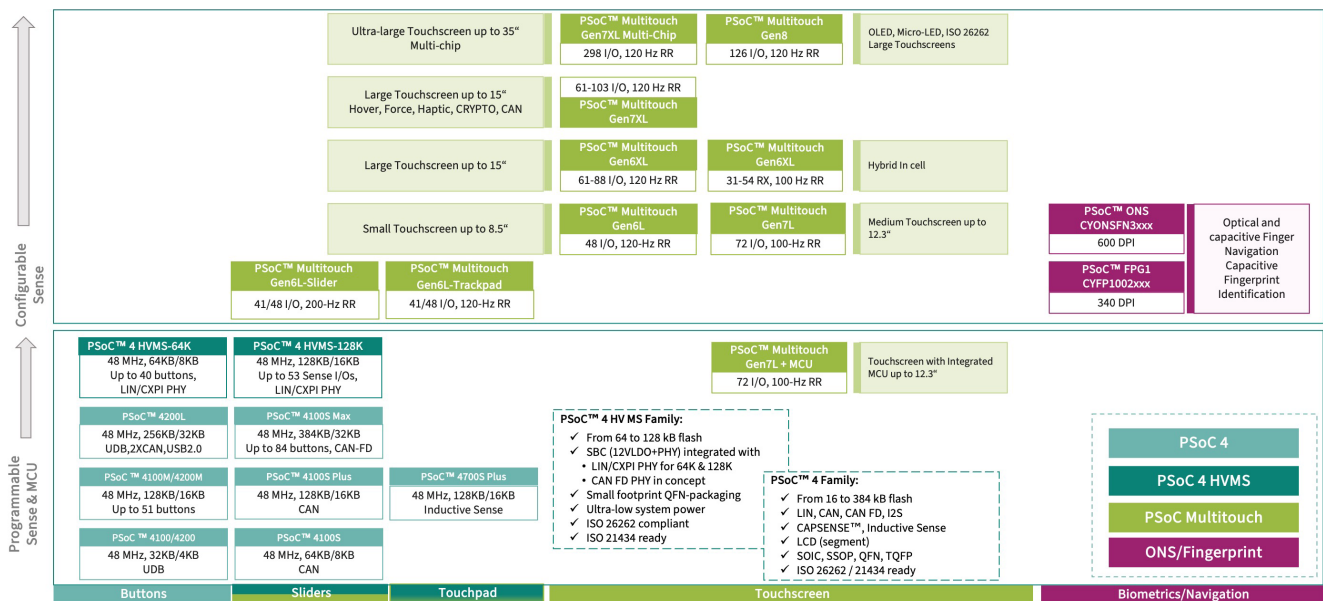
Automotive PSoC™

Our automotive PSoC™ offers a low-power solution based on the robust and reliable CAPSENSE™ technology, inductive sense, and multi-sense converter capabilities. It features edge-connectivity through LIN, CXPI, CAN FD, and iso-UART, with options for integrated LIN-SBC functionality. Furthermore, the automotive PSoC™ ensures safety compliance with ISO 26262 up to ASIL-B (SEoC) / ASIL-C (App-specific) standards, while also providing ISO 21434-ready security with process compliance and partial (“off the shelf”) product support.

Scalable PSoC™ 4 Product lineup for general purpose and BMS sensing



Automotive PSoC™ 4 scalable Human Machine Interface roadmap



Click here to learn more:

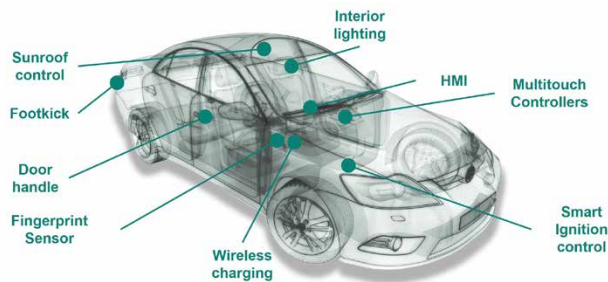
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PSoC™ 4 scalable family

One stop shop for Driver Information, POS systems, and HMI



HMI (Capacitive/Inductive buttons, sliders and touchpads)

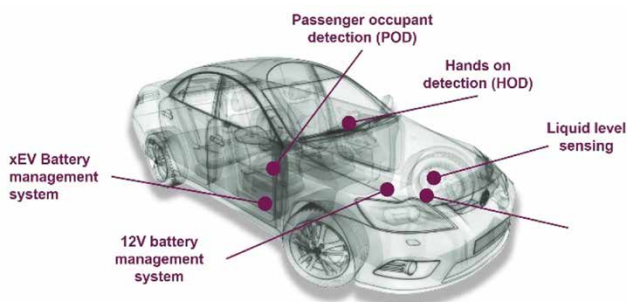
- High accuracy CapSense or Multi Sense converter IPs enable high performance capacitive and inductive sensing on Human-Machine interfaces such as buttons, sliders, and touchpads.
- Targeted for HVAC controls, infotainment buttons, sliders and touchpads, door handles, POD, HOD, steering wheel buttons, sunroof control, and foot kick/trunk opener.
- ASIL-B ready, integrated CRYPTO hardware accelerator

Multitouch-Touch & Fingerprint Controllers

- Wide portfolio to support touch screens from 8” to 35”, trackpads, slider, and buttons.
- Gen7XL controller supports advanced features: Hover, force sensing, haptic, acoustic, and wet finger tracking.
- Gen8 device to support OLED display.

PSoC™ 4 high voltage - enabling Smart Sensing for future mobility

Enabling safe smart sensing systems



Battery management system

(Cell-balancing, Current-Sensing)

- High precision analog performance for longer range driving and better battery life
- Functional safety support up to ASIL-D ISO 26262
- Scalable and comprehensive solution supporting the latest xEV trend.

Smart sensing

(POD, HOD, Liquid level sensing, PTC heater ctrl)

- Multiple sensing interface support with robust operation
- Small footprint and cost-effective integrated solution with newest communication stacks
- Software solution for easy to design and quick market launch.



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Features and benefits

Automotive interior HMI

Key features

- PSoC™ 4100S: Max 48MHz, 384KB/32KB, MSC, CRYPTO, CAN-FD
- PSoC™ 4100L/4200L: 48MHz, 256KB/32KB, 2x CAN, UDB, 2xCSD, USB2.0
- PSoC™ 4700S Plus: 48MHz, 128KB/16KB, Inductive Sense
- PSoC™ 4xxxS Plus: 48MHz, 128KB/16KB, CAN, CapSense (CSDv2)
- PSoC™ 4xxxM: 48MHz, 128KB/16KB, UDB, 2xCAN, 2xCSD

Key benefits

- Touch-sensing buttons/sliders/touchpads with very thick overlays (>5 mm) can be supported by CAPSENSE™
- High refresh rates to provide intuitive / responsive HMI
- Support force-sensing with CAPSENSE™ (capacitive) or Inductive Sensing
- Metal touch surfaces can be enabled by Inductive Sense
- Drive LEDs brightness / effects with PWMs
- Scalable solution from 16KB/2KB (Flash/SRAM) up to 384KB/32KB

Multitouch touch controllers and fingerprint

Key features

- CYAT8168X 61-88 I/O, 120-Hz RR
- CYAT81761-103 I/O, 120-Hz RR
- PSoC 4700S Plus 48MHz, 128KB/16KB, Inductive Sense
- CYAT817LS 72 I/O, 100-Hz RR, MCU
- CYAT818xxOLED
- Fingerprint

Key benefits

- High performance Multitouch technology supporting self and mutual capacitance sensing with high refresh rate (RR)
- Small footprint packages in TQFP / QFN
- Thick glove (5 mm) and water rejection support
- Extensive EMI/EMC testing completed to CISPR-25 standard
- Automotive quality software with Auto SPICE level-2 and safety features to enable configuration and tuning
- Fingerprint: Excellent biometric performance: < 1% FRR at FAR 1:50K, 360° finger placement, 8.0x 8.0 mm sensing area, 340 DPI

Battery management system

Key features

- PSoC™ 4 HVPA-SPM: 48MHz 128KB
- PSoC™ 4 HVPA-144k: 48MHz 128KB

Key benefits

- Integrated PSoC-solution with programmable MCU and high precision analog for current and voltage monitoring
- Scalable high voltage technology from 12 V battery to HV battery
- NVM for increased flexibility, data-preconditioning, compression and storage (eg. for calibration, SOH for 2nd life)
- Synchronous cell voltage and current measurement with integrated transceivers (isoUART, BLE)
- Integrated overcurrent detection and drivers/triggers for battery disconnect switch
- Safety components supporting up to ISO 26262 ASIL-D
- Automotive quality and safety supported software

Smart sensing

Key features

- PSoC 4 HVMS-64K: 48MHz 64kB
- PSoC 4 HVMS-128K: 48MHz 128kB

Key benefits

- High performance analog (12b SAR ADC at 1MSPs), integrated OpAmps, comparators, CAPSENSE™, Multi-Sense Converter
- Serial communication block supporting I2C, SPI, UART, LIN, CAN, CXPI
- Small footprint packages in wettable flank QFN
- Extensive EMI/EMC testing completed to CISPR-25 standard
- 12 V battery directly operation with integrated high voltage subsystem (LDO, LIN PHY)
- Automotive quality and safety supported software



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AURIX™ – 32-bit microcontrollers

32-bit multicore TriCore™ – safety joins performance

AURIX™ is Infineon’s family of microcontrollers serving the needs of industrial applications in terms of performance and safety. Its innovative multicore architecture, based on up to six independent 32-bit TriCore™ CPUs at 300 MHz, has been designed to meet the highest safety standards while increasing performance at the same time. Using the AURIX™ scalable platform, developers will be able to implement applications such as motor control and drives, PLC, or any other automation application. Developments using AURIX™ require less effort to achieve the SIL/IEC61508 standard based on its innovative safety concept and multiple HW safety features. Furthermore, AURIX™ has enhanced communication capabilities to support communication between CAN, LIN, FlexRay, and Ethernet buses.

Features and benefits

Key features
– TriCore™ with DSP functionality
– Best-in-class real-time performance: up to six TriCore™ with up to 300 MHz per core
– Supporting floating point and fix point with all cores
– Up to 6.9 MB of internal RAM, up to 16 MB of flash
– Innovative single supply 5 V or 3.3 V
– IEC61508 conformance to support safety requirements up to SIL 3
– Embedded EEPROM
– Advanced communication peripherals: CAN FD, LIN, SPI, FlexRay, Ethernet

Customer benefits
– High scalability gives the best cost-performance fit
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– Innovative supply concept leads to best-in-class power consumption



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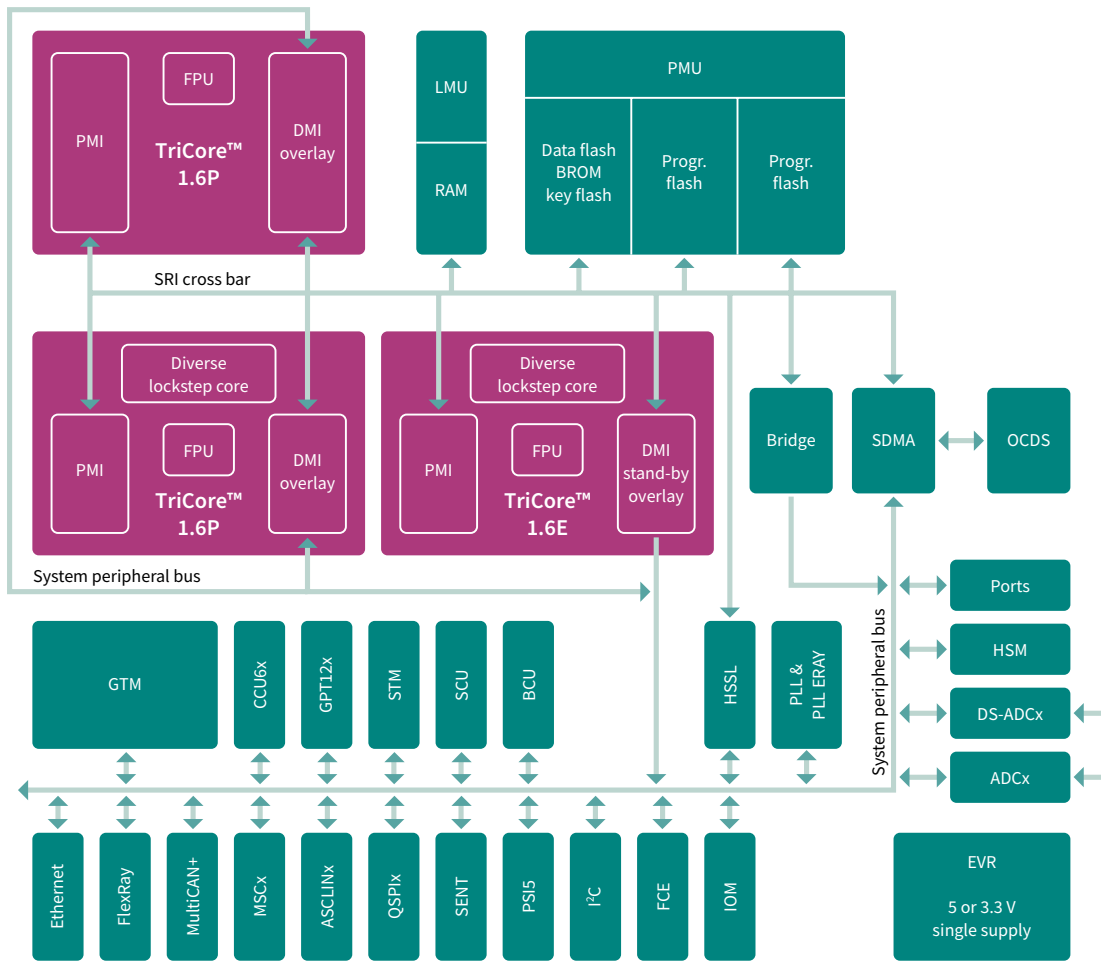
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AURIX™ TC2xx family system architecture

Powerful 1st generation AURIX™ TC2xx system architecture



AURIX™ TC2xx family package scalability

9x series up to 8 MB					TC297 300 MHz	TC298 300 MHz	TC299 300 MHz
7x series up to 4 MB					TC275 200 MHz	TC277 200 MHz	
6x series up to 2.5 MB			TC264 200 MHz	TC265 200 MHz	TC267 200 MHz		
3x series up to 2 MB		TC233 200 MHz	TC234 200 MHz		TC237 200 MHz		
2x series up to 1 MB	TC222 133 MHz	TC223 133 MHz	TC224 133 MHz				
1x series up to 512 KB	TC212 133 MHz	TC213 133 MHz	TC214 133 MHz				
Flash Package	TQFP-80	TQFP-100	LQFP-144 TQFP-144	LQFP-176	LFBGA-292	BGA-416	LFBGA-516

↑ Upgrade/downgrade with pin-compatible packages



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AURIX™ TC2xx portfolio

Product type	Max. clock frequency [MHz]	Program memory [kB]	SRAM (incl. cache) [kB]	Co-processor ¹⁾	Cores/lockstep	Timed I/O	Number of ADC channels	External bus interface	CAN nodes	Communication interfaces ²⁾	Temperature ranges ³⁾	Packages	Additional features/remarks ⁴⁾
TC299TX	300	8000	2728	FPU	3/1	263	84/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-516	EVR, STBU, HSM
TC299TP	300	8000	728	FPU	3/1	263	84/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-516	EVR, STBU, HSM
TC298TP	300	8000	728	FPU	3/1	232	60/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LBGA-416	EVR, STBU, HSM
TC297TA	300	8000	2728	FPU, FFT, CIF	3/1	169	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC297TX	300	8000	2728	FPU	3/1	263	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC297TP	300	8000	728	FPU	3/1	169	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI ² C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC277TP	200	4000	472	FPU	3/2	169	60/6 DS	no	4	4xASCLIN, 4xQSPI, 2xMSC, HSSL, 2xI ² C, 10xSENT, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, WUT, HSM
TC275TP	200	4000	472	FPU	3/2	112	60/6 DS	no	4	4xASCLIN, 4xQSPI, 2xMSC, HSSL, 2xI ² C, 10xSENT, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-176	EVR, WUT, HSM
TC267D	200	2500	240	FPU	2/1	169	50/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI ² C, 10xSENT, 3xPSI5, HSSL, FlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU
TC265D	200	2500	240	FPU	2/1	112	50/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI ² C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-176	EVR, STBU
TC264DA	200	2500	752	FPU, FFT, CIF	2/1	88	40/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI ² C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-144	EVR, STBU
TC264D	200	2500	240	FPU	2/1	88	40/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI ² C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-144	EVR, STBU
TC237LP	200	2000	192	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	LFBGA-292	EVR, WUT, HSM
TC234LA	200	2000	704	FPU, FFT	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, Ethernet	K	TQFP-144	EVR, WUT, HSM
TC234LX	200	2000	704	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, Ethernet	K	TQFP-144	EVR, WUT, HSM
TC234LP	200	2000	192	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	TQFP-144	EVR, WUT, HSM
TC233LP	200	2000	192	FPU	1/1	78	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	TQFP-100	EVR, WUT, HSM
TC224L	133	1000	96	FPU	1/1	120	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-144	EVR, WUT
TC223L	133	1000	96	FPU	1/1	78	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-100	EVR, WUT
TC222L	133	1000	96	FPU	1/1	59	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-80	EVR, WUT
TC214L	133	500	96	FPU	1/1	120	14	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-144	EVR, WUT
TC213L	133	500	96	FPU	1/1	78	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-100	EVR, WUT
TC212L	133	500	96	FPU	1/1	59	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-80	EVR, WUT

¹⁾ CIF = camera and external ADC Interface, FFT = fast fourier transform accelerator, FPU = floating point unit, PCP = peripheral control processor
²⁾ ASC = asynchronous serial channel, ASCLIN = asyn/synchronous local interconnect network, HSSL = high-speed serial link, I²C = inter-integrated circuit, LIN = local interconnect network, MLI = micro link interface, MSC = micro second channel, PSI5 = peripheral sensor interface 5, QSPI = queued serial peripheral interface, SENT = single edge nibble transmission, SSC = synchronous serial channel, CAN FD ISO11898-1:2015
³⁾ Ambient temperature range: A = -40°C ... 140°C, B = 0°C ... 70°C, F = -40°C ... 85°C, H = -40°C ... 110°C, K = -40°C ... 125°C, L = -40°C ... 150°C, X = -40°C ... 105°C
⁴⁾ EVR = embedded voltage regulator, HSM = hardware security module, STBU = stand-by control unit, WUT = wake-up timer

Evolution from TC2xx to TC3xx - Easy migration with focus on reuse

- Fast conversion of existing AURIX™ TC2xx designs
 - Backwards compatibility
 - High AURIX™ TC3xx compatibility to pinout of existing QFP100/144/176 and BGA packages
- Flexibility - scalability within the AURIX™ TC3xx family
 - Up-/Downgrade paths for devices in identical packages
 - Compatible pin-out of QFP/BGA package options enabling combination designs
- Pin-to-pin compatibility between the devices of AURIX™ TC2xx/TC3xx and from generation to generation
- A high scalability with a very large portfolio for both AURIX™ TC2xx and TC3xx



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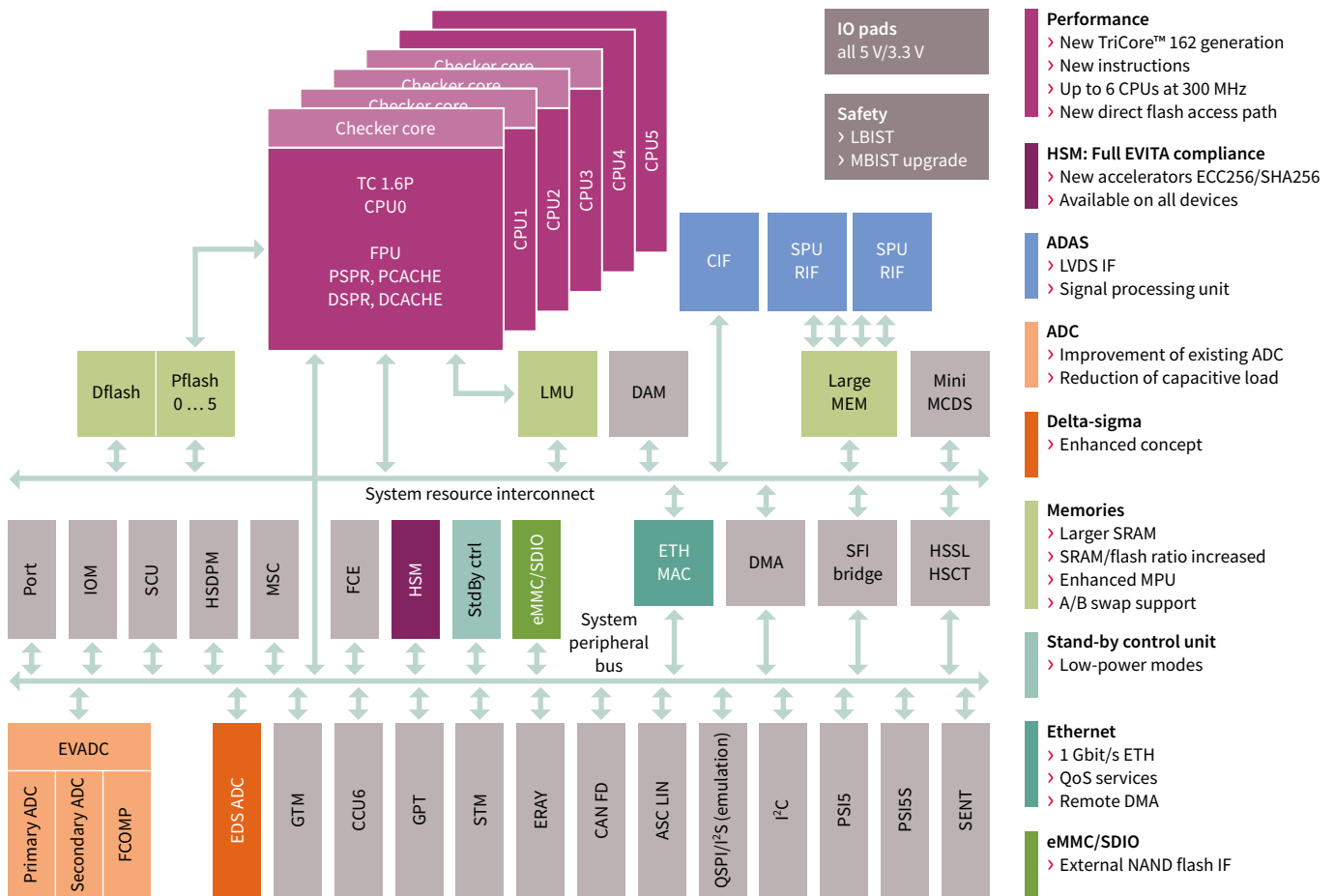
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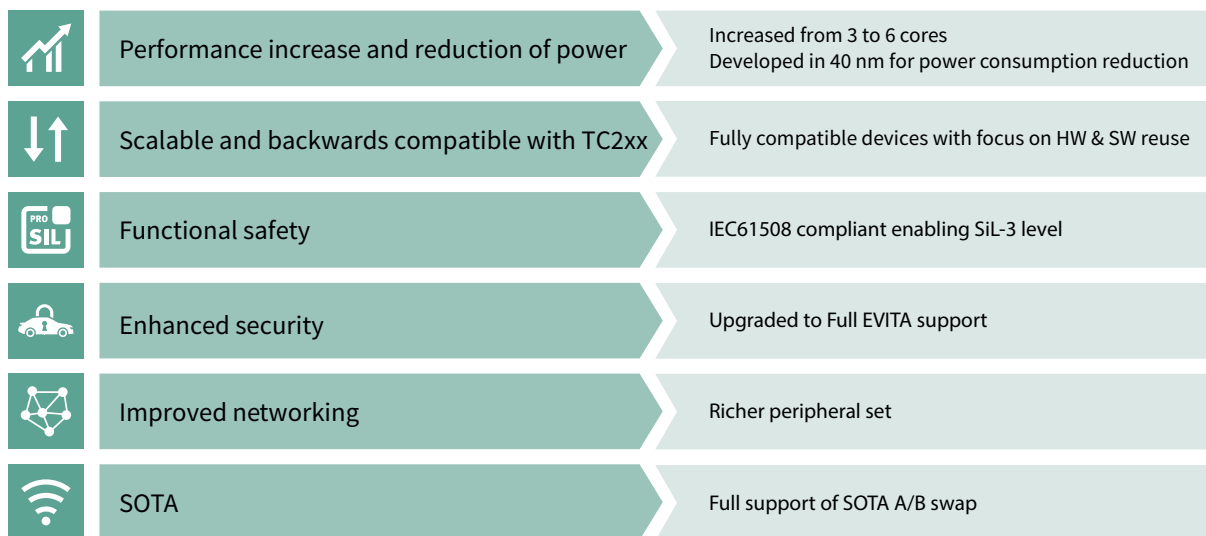
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AURIX™ TC3xx family system architecture

AURIX™ TC3xx – scalable family - from low-cost to high-performance applications



AURIX™ TC3xx provides an upgrade on key parameters with focus on SW and HW reuse



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AURIX™ TC3xx package scalability

6x 300 MHz	9x A series 16 MB								TC397XA 300 MHz	
6x 300 MHz	9x series 16 MB								TC397x 300 MHz	TC399x 300 MHz
4x 300 MHz	Ex series 12 MB								TC387Qx 300 MHz	
4x 300 MHz	8x series 10 MB								TC387Q 300 MHz	TC389Q 300 MHz
3x 300 MHz	7x X series 6 MB								TC377TX 300 MHz	
3x 300 MHz	7x series 6 MB						TC375T 300 MHz		TC377T 300 MHz	
2x 300 MHz	6x series 4 MB			TC364D 300 MHz	TC366D 300 MHz	TC365D 300 MHz			TC367D 300 MHz	
4x 300 MHz	Ax series 4 MB							TC3A8Q 300 MHz	TC3A7Q 300 MHz	
3x 300 MHz	5x A series 4 MB				TC356TA 300 MHz				TC357TA 300 MHz	
2x 300 MHz	3x A series 2 MB				TC336DA ¹⁾ 200 MHz				TC337DA ¹⁾ 200 MHz	
1x 300 MHz	3x series 2 MB	TC332L ¹⁾ 200 MHz	TC333L ¹⁾ 200 MHz	TC334L ¹⁾ 200 MHz	TC336L ¹⁾ 200 MHz				TC337L ¹⁾ 200 MHz	
1x 300 MHz	2x series 1 MB	TC322L 160 MHz	TC323L 160 MHz	TC324L 160 MHz					TC327L 160 MHz	
Flash	Package	TQFP-80	TQFP-100	T/LQFP-144	BGA-180	LQFP-176	BGA-233	LFBGA-292	LFBGA-516	

L – Single lockstep core D – Dual core T – Triple core Q – Quadruple core X – Sextuple core
 1) An option of 300 MHz is also available

Control and actuate Sense and compute


- Advanced package technologies deliver the best price/performance ratio
- Customers can choose between different devices in the same pin-compatible package

MCU scalability

- > Performance and flash
- > Pin compatibility
- > Binary-compatible cores

Safety/security concept

- > ISO 26262 compliance
- > IEC61508 compliant



AURIX™ TC3xx

Power consumption

- > On-chip SC DC-DC high-efficiency power supply
- > Integrated standby controller

Connectivity

- > Ethernet: up to 2x1 GB
- > CAN FD: up to 12 channels
- > eMMC IF

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AURIX™ TC3xx portfolio

Product type	Cores/lockstep	Max clock frequency [MHz]	Program memory [kB]	SRAM (incl. cache) [kB]	Radar accelerator/radar interface ¹⁾	CAN/CAN FD nodes	Ethernet 100/1000 Mbit	External bus interface ²⁾	Communication interfaces	HSM	Temperature ranges	Packages	Additional features/remarks ³⁾
AURIX™ TC3xx family													
TC399XX	6/4	300	16000	6912	no	12	1	EBU, eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSi5, 2x I ² C, 4x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC399XP	6/4	300	16000	2816	no	12	1	EBU, eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSi5, 2x I ² C, 4x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC397XX	6/4	300	16000	6912	no	12	1	eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSi5, 2x I ² C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC397XP	6/4	300	16000	2816	no	12	1	eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSi5, 2x I ² C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC397XA	6/4	300	16000	6912	2x SPU/ 8x 400 Mbit/s LVDS	12	1	2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSi5, 2x I ² C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC389QP	4/2	300	10000	1568	no	12	1	HSSL	5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSi5, 2x I ² C, 3x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC387QP	4/2	300	10000	1568	no	12	1	HSSL	5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSi5, 2x I ² C, 3x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC377TX	3/3	300	6000	4208	no	12	2	eMMC, HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSi5, 1x I ² C, 2x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC377TP	3/2	300	6000	1136	no	8	1	HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSi5, 1x I ² C, 2x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC375TP	3/2	300	6000	1136	no	8	1	HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSi5, 1x I ² C, 2x MSC	EVITA full	K, L	LQFP-176	5 V/3.3 V EVR, 8-bit SCR
TC367DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSi5, 1x I ² C, 1x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC366DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSi5, 1x I ² C, 1x MSC	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC365DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSi5, 1x I ² C, 1x MSC	EVITA full	K, L	LQFP-176	5 V/3.3 V EVR, 8-bit SCR
TC364DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSi5, 1x I ² C, 1x MSC	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC364DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSi5, 1x I ² C, 1x MSC	EVITA full	K, L	LQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC357TA	3/2	300	4000	3664	2x SPU/ 8x 400 Mbit/s LVDS	8	1	no	4x SPI, 1x FlexRay, 4x LIN	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC356TA	3/2	300	4000	3664	2x SPU/ 8x 400 Mbit/s LVDS	8	1	no	4x SPI, 1x FlexRay, 4x LIN	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC337DA	2/1	200	2000	1568	1x SPU/ 4x 400 Mbit/s LVDS	8	1	eMMC	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC336DA	2/1	200	2000	1568	1x SPU/ 4x 400 Mbit/s LVDS	8	1	eMMC	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC337LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC336LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC334LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC333LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-100	5 V/3.3 V EVR, 8-bit SCR
TC332LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-80	5 V/3.3 V EVR, 8-bit SCR
TC327LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC324LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC323LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-100	5 V/3.3 V EVR, 8-bit SCR
TC322LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-80	5 V/3.3 V EVR, 8-bit SCR



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1) SPU – Signal processing unit

2) HSSL – High-speed serial link

3) 8-bit SCR – Standby controller for low power modes

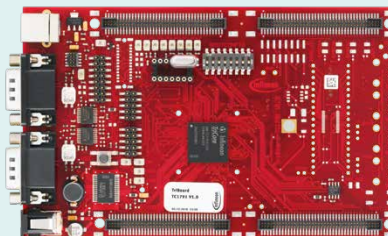
4) EVR – Embedded voltage regulator

AURIX™ starter and application kits

Infinion starter kits – 32-bit microcontrollers

AURIX™ Triboards Kits

- Full evaluation board for development to write and debug your first programs
 - Includes getting started advice, free TriCore™ entry tool chain, technical documentation, compiler, and debugger
 - TriBoard available for all productive silicon
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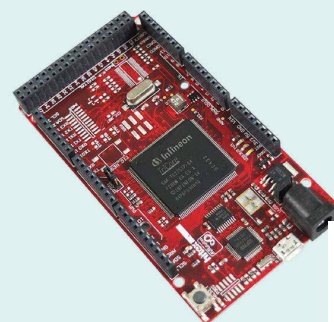
AURIX™ TFT Kits

- Low cost board for early evaluation with limited access to signals
 - Additional touchscreen display for convenient handling
 - TFT board available for every silicon
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Arduino AURIX™ TC275 ShieldBuddy Kit

- The Hitex TC275/TC375 ShieldBuddy follows the Arduino standard
 - Compatible with hundreds of Arduino application shields
 - Evaluation licenses available
 - Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists
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Arduino AURIX™ TC375 ShieldBuddy Kit

Order number: **KIT_A2G_TC375_ARD_SB**

- Compatible with hundreds of Arduino application shields
 - Evaluation licenses available
 - Ethernet
 - Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists
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AURIX™ TC275 Lite kit

- AURIX™ TC275 device in LQFP-176 package
 - FTDI based debugger with micro USB
 - Use of Arduino Uno/compatible platform
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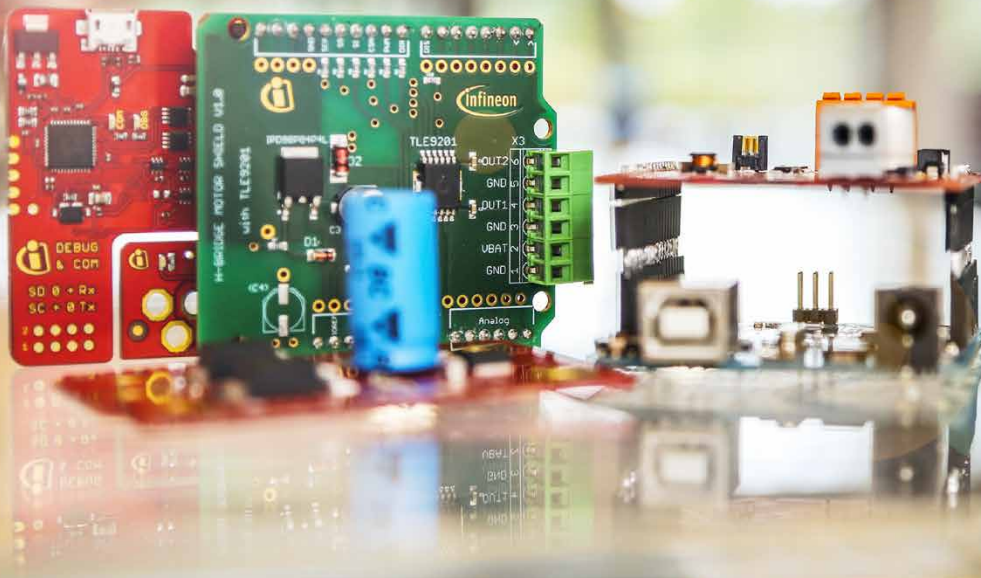
AURIX™ TC375 Lite kit

- AURIX™ TC375 device in LQFP-176 package
 - Ethernet PHY
 - FTDI based debugger with micro USB
 - Use of Arduino Uno/compatible platform
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Infiniteon application kits – 32-bit microcontrollers

24 GHZ Radar

Based on the Infineon AURIX™ and MMIC BGT24A families

- BGT24A transceiver MMIC family, e.g. BGTA24ATR12,
- 2-bit radar microcontroller family, e.g. SAK-TC264DA- 40F200
- FFT acceleration engine and extended memory for radar image storage
- Ethernet as measurement interface

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60 GHZ Radar

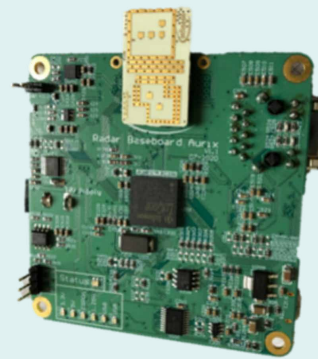
XENSIV™ BGT60ATR24C

+ AURIX™ TC356TA

+ OPTIREG™ TLS4120D0EPV33/TLS715B0EJV50

- Modular architecture
- Automotive qualified components
- Virtual array processing (TDM MIMO)
- Ultra-wideband operation of 4 GHz
- Optimized performance versus power with SPU

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Motor control

Order number: KIT_AURIX_TC234_MOTORCTR

- TC234 application kit with TFT display incl. safety supply TLF35584
- Driving of a 3-phase PMSM/BLCD (12 V/max. 50 W)
- BLDC motor from Nanotec integrated
- Software available with flexible configuration

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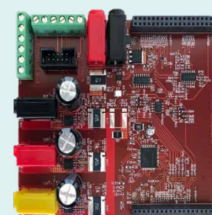


Motor control board AURIX™ TC387

Order number: KIT_AURIX_TC234_MOTORCTR

- TC387 Application Kit with TFT Display incl. safety supply TLF35584
- eMotor Power board: 3-phase motor control power board with TLE9180D-31QK 3-phase gate driver IC, MOSFET power stage, and auxiliary components
- Commands and monitoring via TFT touch screen
- Field oriented control (FOC) algorithm using 3-phase current sensing (EVADC) encoder as position sensor (GPT12) and AURIX™ GTM as PWM generator

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Industrial robotics

Application example

Application features

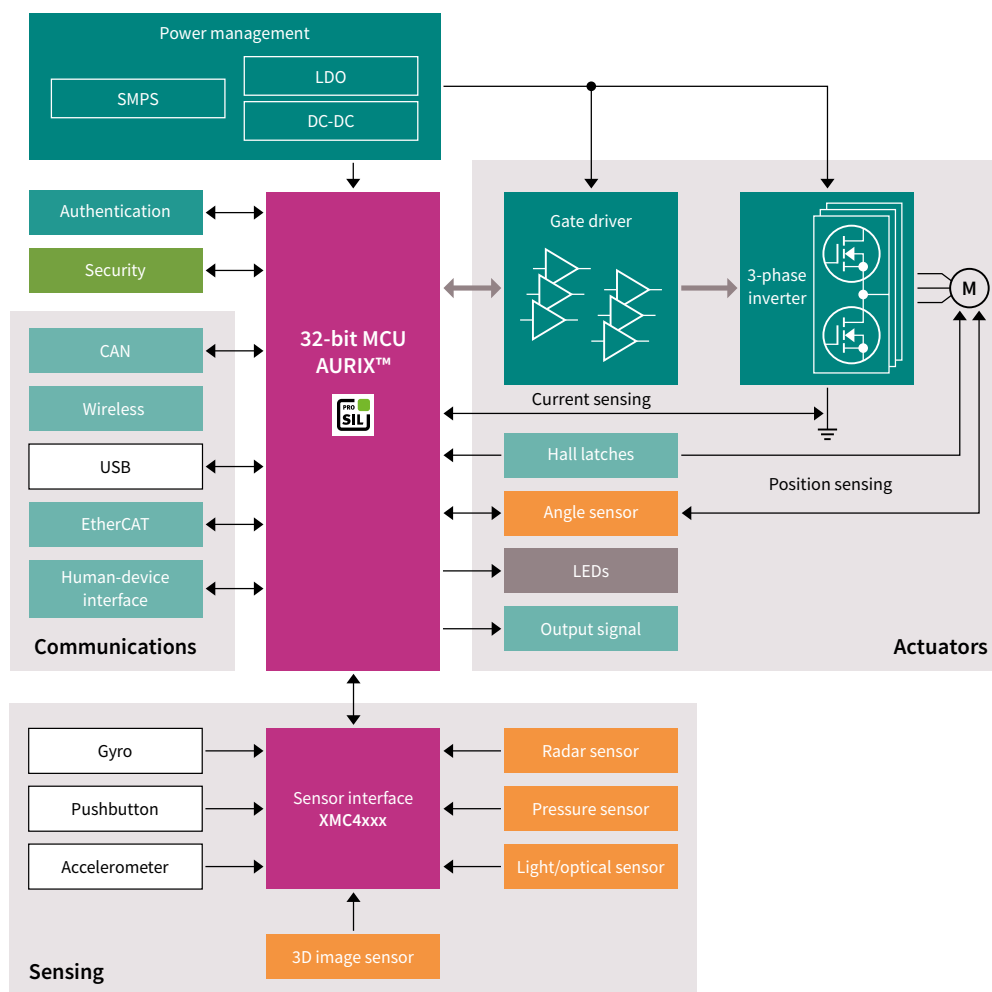
- High computing performance
- High level of accuracy, integration, and efficiency
- Safety management in line with current norms
- Various topologies for axis, joints, and motors
- Security features that protect intellectual property from counterfeiting

Suggested products

- TC23x
- TC33x
- TC36x
- TC37x
- TC38x
- TC39x
- XMC4xxx

System benefits

- High computing performance: up to 6x 300 MHz
- High flexibility thanks to tailored peripherals
- Integrated safety support (EN ISO 10218 and ISO/TS15066)
- Integrated security with hardware security module
- Robust 3 V-, 5 V-, LVDS – PortPins
- Large portfolio with long-term availability



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Microcontroller PDH partner

Preferred Design Houses (PDH) and software resellers – AURIX™ Traveo and PSoC™, AURIX™ tools and software

AURIX™ Tools and Software

To enable customers to achieve optimal performance when using the powerful AURIX™ architecture, Infineon has built a network of strong partnerships with companies highly specialized in multicore software development. Infineon's multicore partners can offer the best multicore expertise and tools on the market for each stage of the software design process, covering everything from the initial multicore knowledge acquisition phase to the final optimization of the multicore software.

AURIX™ Embedded Software



- AURIX™ Applications software
- Autosar
- Non-Autosar OS/RTOS
- Middleware
- Communication and connectivity
- Bootloader/OTA
- Safety

AURIX™ Tools



- AURIX™ Free Tools
- Calibration/Measurement/Prototyping
- Compilers
- Debugger, Test Tools
- Flash Tools
- Simulation/Modelling
- SW Automation/Autocoding

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<p>Classic (Free of charge)</p>	<ul style="list-style-type: none"> – First level customer support covering Infineon products/solutions – Technical interface and support to the customer 	<ul style="list-style-type: none"> – Driving design at customer – Basic training for design teams at customer – 24 h response time to the customer
<p>Premium (Consultancy mode)</p> <p>To be agreed between customers and PDH</p>	<ul style="list-style-type: none"> – Project management and project-specific application support – Specification of general software architecture, defining required layers, control and data flow structure etc. – Specification and implementation of custom device drivers – Optimization of software components with regard to speed/code size 	<ul style="list-style-type: none"> – Software testing – Support for project-specific functional safety engineering – Project-specific support for security solution – Safety support – Security support – Multicore support



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Preferred Design Houses – PDH

Empower your innovations with MCU experts.

Our microcontroller preferred design houses are a trusted partners’ ecosystem that extends the support force by tailoring their know-how to meet your specific needs. By partnering with one of our qualified preferred design houses, you can be assured that you will receive expert advice and customized support to help you achieve your goals. Our team of professionals brings added value to customer service, working together to optimize your design and help you succeed in your business objectives. We understand that every customer is unique, which is why we offer tailored solutions to meet your specific needs. From product-specific support to application-specific advice, our preferred design house is fully trained to use AURIX™, TRAVEO™ T2G, and automotive PSoC™ and provides a wealth of knowledge and expertise to help you succeed. Together with our partners, we offer optimized customer support for systems using our products. Our preferred design houses are committed to delivering exceptional service and support to ensure your success. So why wait? Contact us today to learn more about how our preferred design house can help you achieve your goals and take your business to the next level.

	Product Family					Supported Region(s)						
	AURIX™	TRAVEO™ T2G Body	TRAVEO™ T2G Cluster	PSoC™ Automotive	PSoC™ High Voltage	PSoC™ Multitouch & Fingerprint	Global	EMEA	AMR	JP	GC	AP
Alta			•				•					
Amarakasha Technologies	•										•	•
Avin Systems	•						•					•
AVL	•				•		•					
Bluewind	•							•				
Candera			•				•					
CATARC	•										•	
ClickMosh				•		•		•				
Colorado Engineering/CEI Colorado Engineering	•							•				
Crewed		•					•					
D3 Engineering	•							•				
Digital Edge Solutions	•											•
DriveExpert/Drive Expert	•	•						•				
Eagle Wings Design	•	•	•	•	•			•	•			
Eboata											•	
elbtech		•	•	•	•		•					
Embedded Office	•	•	•	•	•			•				
Embarc Technologies			•									•
Elektronik Automotive GmbH	•	•	•				•					
FESCARO	•											•
Frodas	•						•					
Galaxi Engineering Technology Services	•											•
S-Pulse	•	•	•	•	•						•	
GRMN	•							•				
Hampo				•			•					
Hightec	•	•	•	•	•		•					
Hitachi Industry & Control Solutions, Ltd.									•			
Hitex	•	•	•	•	•		•					
IAV	•							•				
IMST	•							•				
Inteco Solutions	•							•				
Integra Sources	•							•				
Jingwei HiRain		•		•							•	
KPT Technologies Ltd.	•						•					
LAB software			•									
Leadmove	•										•	
Maconica	•	•	•	•					•			
MecTronic	•							•				
Microfuzzy	•	•		•				•				
Mixed Mode	•							•				
Neutron Controls	•	•	•	•	•			•	•			
NETX Electronic Corporation	•								•		•	
Olva	•							•				
PinTeam	•							•				
Precise Biometric	•					•		•				
QianQin	•										•	
QT	•		•				•					
Revatech	•	•	•									•
SDM Group/SDM Automotive	•							•				
Samsotec	•			•	•	•		•				
Seasoltech	•							•				
Sigma Connectivity	•					•		•				
Sili Auto	•		•					•				
T & S Engineering	•							•				
Tbench Solutions	•							•				
Techwin	•	•	•									•
Toggl	•									•		
Tress Energy	•											•
ULMA Embedded Solutions	•							•				
VALCORE Technologies	•	•										•
VECCENTER	•										•	
Wireko			•				•					

Features and benefits

- Key features**
- To be agreed between customers and PDH
 - First level customer support covering Infineon products and solutions
 - Technical interface and support to the customer
 - Driving design at customer
 - Basic training for design teams at customer
 - 24 h response time to the customer

- Customer benefits**
- Project management and project-specific application support
 - Specification of general software architecture, defining required layers, control and data flow structure etc
 - Specification and implementation of custom device drivers and project-specific application support
 - Optimization of software components with regards to speed/code size
 - Software testing
 - Functional safety engineering and project-specific support for security solution
 - Project-specific support for security solution
 - Safety, security, Multicore, and Arm support
 - Project-specific support for security solution



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TRAVEO™ T2G portfolio

Thanks to its special features, the TRAVEO™ T2G family family is the perfect match for industrial applications. With processing power and network connectivity built into a single Arm® Cortex®- M4F and dual Cortex®- M7F, the TRAVEO™ T2G family comes up with an enhanced performance up to 1500 DMIPS and a high-performance CPU operating up to 350 MHz.



Product type	Supply Voltage [V]	Main Core frequency [MHz]	Flash (Code + Work) [kB]	SRAM [kB]	GPIO	ADC Channels	CAN/CAN FD Channels	Ethernet 100/1000 Mbit	SCB Channel	CXPI Channel	SMIF (SPI/HyperBus)	LIN Channel	I ² S Channel	eMMC Channels	HSM	Temperature ranges	Packages	SIL Level
TRAVEO™ T2G CYT2B7 series																		
CYT2B75CADQ0AZECS	2,7 to 5,5	160	1088 + 96	128	78	39	6	no	8	0	-	7	-	0	Yes	E	100-LQFP	ASIL-B
CYT2B78CADQ0AZECS	2,7 to 5,5	160	1088 + 96	128	152	64	6	no	8	0	-	8	-	0	Yes	E	176-LQFP	ASIL-B
TRAVEO™ T2G CYT2B9 series																		
CYT2B95CACQ0AZECS	2,7 to 5,5	160	2112 + 128	256	78	39	8	no	8	4	-	9	-	0	Yes	E	100-LQFP	ASIL-B
CYT2B98CACQ0AZECS	2,7 to 5,5	160	2112 + 128	256	152	64	8	no	8	4	-	12	-	0	Yes	E	176-LQFP	ASIL-B
TRAVEO™ T2G CYT4BF series																		
CYT3BB8CEBQ0AESGS	2,7 to 5,5	250	4160 + 256	768	148	64	8	1	10	0	1	16	TX 3ch, RX 3ch (3 instances)	1	Yes	S	176-TEQFP	ASIL-B
CYT3BBBCEB-Q0BZEGS	2,7 to 5,5	250	4160 + 256	768	220	72	8	1	11	0	1	16	TX 3ch, RX 3ch (3 instances)	1	Yes	E	272-BGA	ASIL-B
TRAVEO™ T2G CYT4BF series																		
CYT4BF8CEDQ0AEEGS	2,7 to 5,5	350	8384 + 256	1024	148	81	10	1	10	0	1	17	TX 3ch, RX 2ch (3 instances)	1	Yes	E	176-TEQFP	ASIL-B
CYT4BFCCJDQ0BZEGS	2,7 to 5,5	350	8384 + 256	1024	240	86	10	2	11	0	1	20	TX 3ch, RX 2ch (3 instances)	1	Yes	E	320-BGA	ASIL-B



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TRAVEO™ T2G portfolio

Infinion TRAVEO™ T2G MCUs are suitable for connected car applications with their high-performance 32-bit Arm® Cortex®-M4F and M7F CPUs operating up to 350 MHz. The low-power MCUs provide great connectivity capabilities like CAN FD, CXPI, Ethernet, and FlexRay for faster communication and increased data bandwidth. TRAVEO™ T2G offers high-speed SPI (single, dual, quad, or octal) or HYPERBUS™ interface for external memory interface, a Secure Digital High Capacity (SDHC) interface supporting embedded Multimedia Card (eMMC), Secure Digital (SD), or Secure Digital Input Output (SDIO), as well as Inter-IC Sound (I2S) interfaces to connect digital audio devices in the high-end series (CYT4BF series). Infineon's TRAVEO™ T2G Body line-up (CYT2B.../CYT3B.../CYT4B...) for the body segment is a good choice for a wide variety of applications e.g., HVAC systems, seat control units, immobilizers, TPMS sensors, door control units, central gateways, and body control modules. The TRAVEO™ T2G Cluster microcontroller family (CYT2C.../CYT3D.../CYT4D...) is a dedicated line-up for applications such as instrument clusters, head-up displays, digital mirrors, HVAC systems with displays, and matrix LED headlight control.

TRAVEO™ T2G body entry				TRAVEO™ T2G body high		TRAVEO™ T2G cluster	TRAVEO™ T2G graphics	
						CYT6BJ Coming soon		
				CYT4BF 2 x Cortex®-M7 350 MHz, 8 MB flash 1024 kB RAM 176 TEQFP 272-300 ball BGA7			CYT4EN Coming soon	
				CYT3BB 2 x Cortex®-M7 250 MHz, 512 kB RAM 100-176 pins4 TEQFP 272-ball BGA7		CYT2CL Cortex®-M4 160 MHz, 2 M / 4 M flash 144-/176 pin LQFP	CYT4DN 2 x Cortex®-M7 320 MHz, 6 MB flash 896 kB RAM TEQFP 327-ball BGA	
CYT2B6 Cortex®-M4 80 MHz, 512 kB flash 64 kB RAM 64-100 pins LQFP	CYT2B7 Cortex®-M4 160 MHz, 1 MB flash 128 kB RAM 64-176 pins LQFP	CYT2B9 Cortex®-M4 160 MHz, 2 MB flash 256 kB RAM 64-176 pins LQFP	CYT2BL Cortex®-M4 160 MHz, 4 MB flash 512kB RAM 64-176 pins LQFP					
TRAVEO™ T2G body						TRAVEO™ T2G body		

Instrument cluster, HUD, lighting, other display

Body/gateway/infotainment

TRAVEO™ T2G body entry key features and benefits

CYT2B6/CYT2B7/CYT2B9/CYT2BL

Key features
- Single Arm® Cortex® - M4F TM running up to 160 MHz delivering 200 DMIPS
- First level customer support covering Infineon products and solutions
- Operating voltage 2.7 to 5.5 V
- Up to 8 CAN FD channels/Up to 12 LIN channels/ Up to 4 CXPI channels living design at customer
- ISO 26262 ASIL-B support eVita Full and ARM® Cortee-M0+ for HSM security customer
- AUTOSAR 4.2 support
- 125°C temperature support response time to the customer

Customer benefits
- Best-in-class performance enabling ASIL-B designs
- Backward compatibility with CYT3B/CYT4B family and data flow structure etc.
- A/B swap software update over the air support
- Best-in-class power consumption

TRAVEO™ T2G body high key features and benefits

CYT2B6/CYT2B7/CYT2B9/CYT2BL

Key features
- Dual Arm® Cortex® - M7 running up to 350 MHz delivering 1500 DMIPS
- Up to 8 MB flash and up to 1 MB SRAM
- Up to 1 Gbit Ethernet 2 channels and 10 CAN FD channels
- Up to 8 CAN FD channels/Up to 12 LIN channels/ - Up to 4 CXPI channels
- ISO 26262 ASIL-B support eVita Full and Arm® Cortex®-M0+ for HSM security customer
- AUTOSAR 4.2 support
- 125°C temperature support
- 125°C temperature support response time to the customer

Customer benefits
- Best-in-class performance enabling ASIL-B designs
- Backward compatibility with CYT2B family
- A/B swap software update over the air support
- Best-in-class power consumption



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TRAVEO™ T2G kits

CYTVII-B-E-BB

- The CYTVII-B-E-BB is a generic base board that can be connected to compatible TRAVEO™ T2G entry or high-end evaluation boards so as to extend its functionality
 - Connects to most CYTVII-B-E-xxx and CYTVII-B-H-xxx evaluation boards
- www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-bb



CYTVII-B-E-176-SO

- The CYTVII-B-E-176-SO evaluation board is based on the TRAVEO™ T2G entry family of devices.
 - TRAVEO™ T2G is CYT2B78CADES
- www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-176-so



CYTVII-B-E-1M-SK

- The CYTVII-B-E-1M-SK is a low-cost easy-to-use evaluation board based on the TRAVEO™ T2G entry family of devices.
 - TRAVEO™ T2G CYT2B75CADES MCU
 - Designed in an Arduino form factor so that users can connect many off-the-shelf Arduino shields to it, to expand its functionality
- www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-1m-sk



CYTVII-B-H-8M-320-CPU

- The CYTVII-B-H-8M-320-CPU evaluation board is based on the TRAVEO™ T2G high-end family of devices.
 - TRAVEO™ T2G CYT4BFCCHCES MCU
 - Audio, Ethernet, SD Card, SMIF
- www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-h-8m-320-cpu



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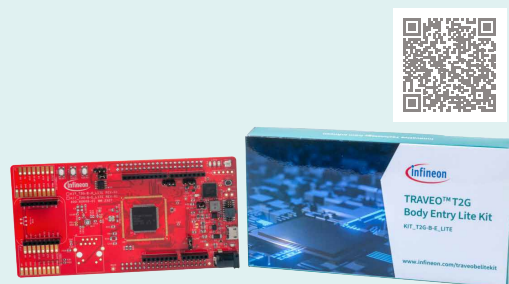
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TRAVEO™ T2G kits

KIT_T2G-B-E_LITE

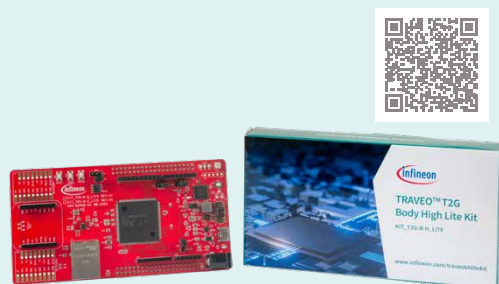
- TRAVEO Body Entry Lite kit
- Arduino compatible connectors, Shield2Go connector, mikroBUS™ connector
- Fully supported by Modutoolbox



www.infineon.com/cms/en/product/evaluation-boards/kit_t2g-b-e_lite

KIT_T2G-B-H_LITE

- TRAVEO Body High Lite kit
- Arduino compatible connectors, Shield2Go connector, mikroBUS™ connector
- Fully supported by Modutoolbox



www.infineon.com/cms/en/product/evaluation-boards/kit_t2g-b-h_lite



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MOTIX™ 32-bit motor control SoC

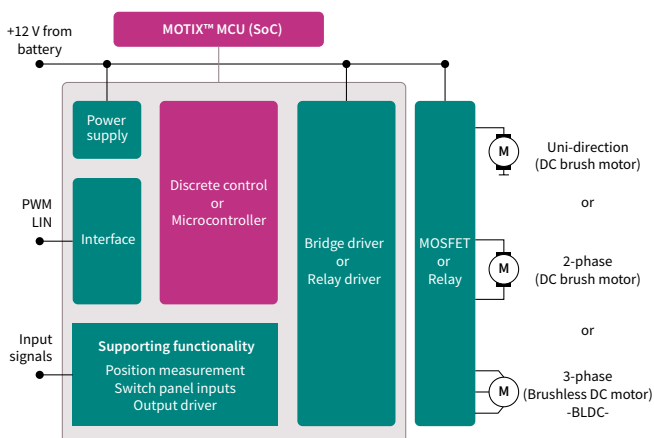
System-on-chip solution for motor control applications

Infiniteon's MOTIX™ 32-bit motor control SoC include a 32-bit Arm® Cortex®-M microcontroller, a voltage regulator, the communication interfaces, along with the driving stages for motor control applications. These system-on-chip solutions offer an unmatched level of integration of all functions required to sense, control, and actuate a motor. They save space and energy, improve the overall system reliability through advanced diagnosis features, and reduce the overall cost due to a minimum number of external components. They perfectly fit a range of DC and BLDC motor control applications where a small package form factor and a minimum number of external components are essential.

	MOTIX™ 32-bit motor control SoC with integrated relay driver	MOTIX™ 32-bit motor control SoC with integrated half-bridge driver	MOTIX™ 32-bit motor control SoC with integrated h-bridge driver	MOTIX™ 32-bit motor control SoC with integrated 3-phase bridge driver
Product families	TLE984x	TLE985x	TLE985x, TLE986x, TLE988x	TLE987x, TLE989x
Controller	Arm® Cortex®-M0	Arm® Cortex®-M0	Arm® Cortex®-M0/M3	Arm® Cortex®-M3
Core frequency	25/40 MHz	40 MHz	20-60 MHz	24-60 MHz
Flash size	36-64 kByte	48-64 kByte	36-256 kByte	36-256 kByte
Driver stage	Relay d	Half-bridge for NFET	H-bridge for NFET	B6 bridge for NFET
Communication interface	PWM, LIN	PWM, LIN	PWM, LIN, CAN (FD)	PWM, LIN, CAN (FD)
Temperature	≤ 150°C	≤ 175°C	≤ 175°C	≤ 175°C
ISO 26262-compliance	QM	QM	QM, ASIL B	QM, ASIL B
Packages	VQFN-48	VQFN-48	VQFN-48, TQFP-48	VQFN-48, TQFP-48, LQFP-64

Features and benefits

Key features	Customer benefits
<ul style="list-style-type: none"> – Extensive diagnostics and protections embedded within the system-on-chip – Move to customer benefits and make it the first bullet point – Platform based approach with compatible software between the product families – Data processing, actuation and sensing integrated into the product with 32-bit Arm® Cortex®-M – Compact package with 7x7 mm footprint (VQFN-48/TQFP-48) – Intelligent power saving modes including stop and sleep mode and energy management for external sensors (on demand) 	<ul style="list-style-type: none"> – High levels of system reliability – Reduced cost – Supports multiple and flexible designs with minimal effort – Space saving – Energy saving



MOTIX™ 32-bit motor control (SoC) solutions are supported by a complete development tool chain provided by Infineon and third-party vendors. Infineon's design-in tools include configuration tools, simulation and modeling tools, finder and selection tools, and utilities for free.

In addition to tools, the MOTIX™ Low-Level Driver and Motor Control Library for optimized application performance is also part of Infineon's system solution.



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BLDC Motor Control Shield for Arduino

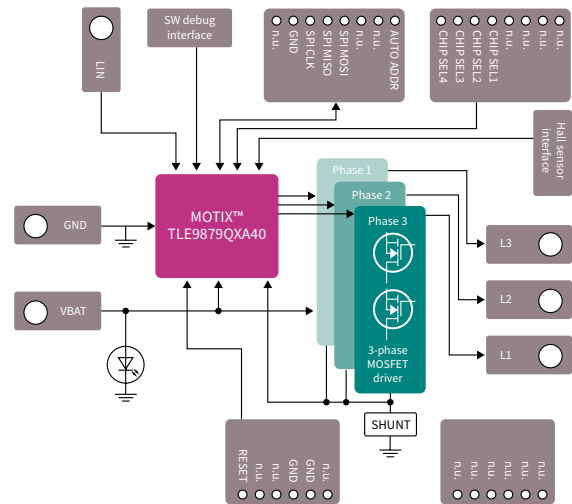
3-phase motor control shield with MOTIX™ TLE9879QXA40

The BLDC Shield for Arduino uses TLE9879QXA40, a part of the MOTIX™ TLE987x family of the Infineon MOTIX™ MCU (SoC) portfolio. It enables the shield to drive 3-phase BLDC motors with a variety of different features. One Arduino base board can control up to four BLDC shields via SPI. The BLDC Shield firmware provides auto-addressing functionality. Every shield in the stack can be controlled independently and run completely different motor control algorithms if desired.

The shield implements three different advanced motor control algorithms:

- Sensorless field-oriented control (FOC)
- Block commutation with back EMF (BEMF)
- Hall based block commutation (HALL)

The firmware can be changed using the SWD Interface. Additional connectors for voltage supply, motor-phases and hall sensors speed up the evaluation.



Features and benefits

- Key features**
- Implemented motor control algorithms (FOC, BEMF, Hall)
 - Controlled over Arduino via SPI
 - Compatible with the Arduino Uno or the Infineon XMC™ baseboard
 - Up to four shields can be used simultaneously
 - Each shield can be controlled independently
 - Motor parameters can be set for each shield individually

- Customer benefits**
- Easy-to-use API, allowing the user to quickly setup an application
 - High performance BLDC motor control in form of the TLE987x chip



Our BLDC Shield for Arduino comes with a library which includes a collection of code that makes it easy for you to run your project. The Arduino library offers an intuitive API to quickly setup and configure an application.



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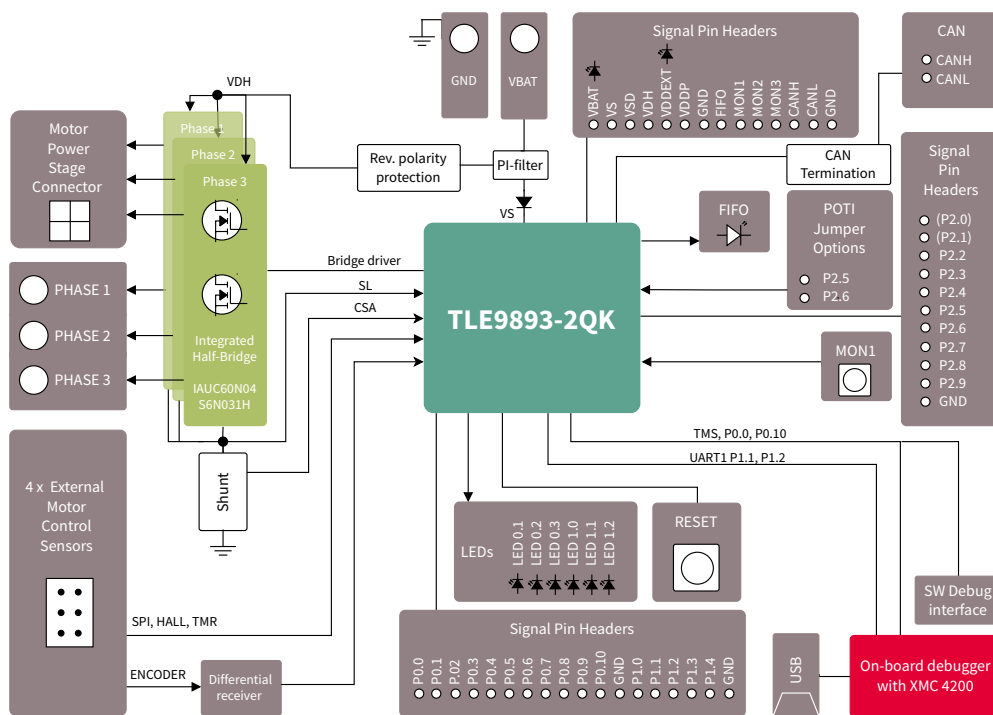
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TLE9893-2QK Evaluation Kit

BLDC motor control kit with MOTIX™ TLE9893-2QKW62S

The TLE9893-2QK Evaluation Kit allows a complete evaluation of all functions and peripherals of the TLE9893-2QKW62S, allowing a direct connection of a BLDC motor over MOSFETs in a B6-bridge configuration. The TLE9893-2QKW62S is a super set device which features all the functionalities of the MOTIX™ TLE989x family.



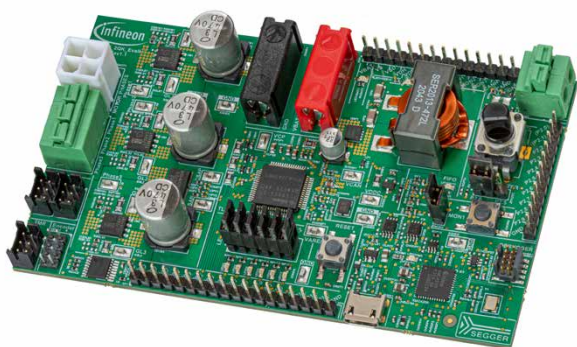
Features and benefits

Key features

- 3-phase MOSFET bridge for BLDC motor control with safe switch off path
- CAN-FD protocol handler and transceiver
- Sensorless and sensor-based BLDC motor control
- Onboard debug interface

Customer benefits

- High-performance BLDC motor control in form of the TLE989x chip
- Easy evaluation and fast prototyping
- Availability of various software example code



Use Infineon Developer Center to find helpful information such as data sheets, user manual, getting started guide, application notes and design-in-tools like MOTIX™ MCU Configuration Wizard. In addition, if you register this Evaluation Kit, you can get access to PCB design files.

 Infineon
Developer Center



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CAN-FD transceivers

High- and low-speed CAN-FD Transceivers for automotive and many other applications

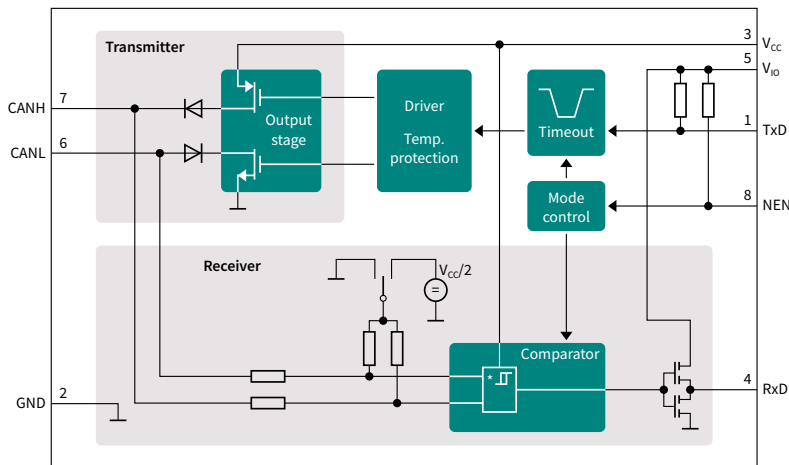
The automotive industry recently established the CAN-FD (Flexible data rate) protocol for faster CAN communication up to 5Mbit/s and CAN PN (Partial Networking) for improved energy efficiency.

Different transceiver types are used depending on the respective network architecture and the related ECU supply path. Infineon transceivers ensure reliable communication and help minimize the current consumption. The products provide the best value through high performance, ruggedness, and reliability.

Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Transmission rates up to 5 Mbit/s ISO11898 compliant – Low-power modes – Receive-only mode – Standby/sleep mode – Bus wake up – Thermal protection – CAN FD compliance 	<ul style="list-style-type: none"> – Low current consumption – Excellent EMI performance and robustness – Pin-to-pin replacements for industry-standard parts

Block diagram TLE9250V



PG-DSO-8-65	PG-TSON-8-1
TLE9250SJ_GRN	TLE9250LE_GRN
TLE9250VSJ_GRN	TLE9250VLE_GRN
TLE9250XSJ_GRN	TLE9250XLE_GRN
TLE9251SJ_GRN	TLE9251LE_GRN
TLE9251VSJ_GRN	TLE9251VLE_GRN
	TLE9251VLE

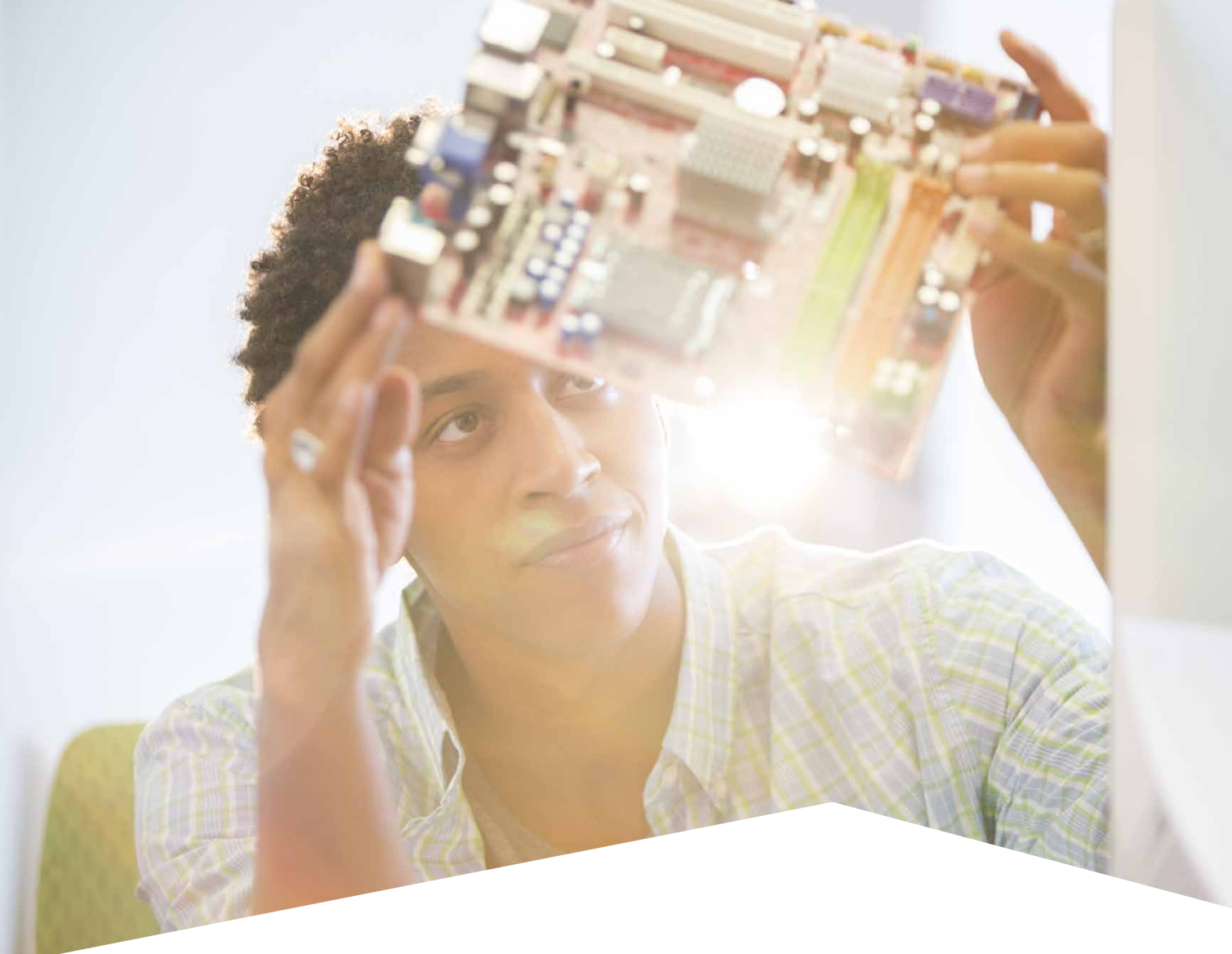


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Infineon support for industrial microcontrollers

One platform, countless solutions

Further information, datasheets and documents

www.infineon.com/xmc

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www.infineon.com/xmc4000

www.infineon.com/aurix

www.infineon.com/makers

XMC SC Wireless power controller:

www.infineon.com/xmcswirelesspowercontrollers

www.infineon.com/motix-mcu



XMC™ MCUs ecosystem and enablement – kits, board, tools and software

Boards and kits:

www.infineon.com/xmc-dev

www.infineon.com/connectivitykit

www.infineon.com/ethercat

Ecosystem and tools:

www.infineon.com/xmc-ecosystem



Evaluation board



Tools





USB-C controllers and peripherals

- Moving to USB-C with EZ-PD™ family
 - USB-C charging port controllers
 - USB-C high voltage microcontrollers
- USB-C power delivery controllers
 - EZ-PD™ CCG8 – USB-C PD controller
 - EZ-PD™ CMG2 – USB-C EMCA controller
- USB-C AC-DC and DC-DC charging solutions
 - EZ-PD™ CCG7DC – USB-C PD and DC-DC controller
 - EZ-PD™ PAG2 – USB-C PD and DC-DC controller
- Peripheral controllers for USB 5Gbps
 - EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers
 - EZ-USB™ FX3 - USB 5Gbps peripheral controllers
 - EZ-USB™ SX3 - FIFO to USB 5Gbps controllers
- USB 2.0 peripheral controllers
 - EZ-USB™ serial bridge controller
- USB hub and USB Type-C port controllers
 - EZ-USB™ HX3
 - EZ-USB™ HX2LP and HX2VL
 - EZ-USB™ HX3PD

Moving to USB-C with EZ-PD™ family

A wide portfolio for your easy transition to the new universal connector

More and more products in consumer, industrial, and communications segments are adopting USB-C ports to source power. Infineon offers dedicated solutions to integrate USB-C ports into customers' embedded applications. Typical use cases include smart speakers, cameras, headphones, game consoles, power tools, VR headsets, and other portable electronics and home appliances. As the leader in USB-C end-to-end solutions, Infineon provides a comprehensive portfolio of solutions for USB-C chargers and power adapters.

System approach:

- Market-proven USB-C power delivery stack (USB-C PD)
- Complete and easy-to-use design portfolio to build robust, efficient and cost-effective system solutions
- Robust evaluation kits for quick prototyping

The EZ-PD™ portfolio includes two different families of solutions to help you easily integrate USB-C into your embedded application: EZ-PD™ PMG1 (Power Delivery Microcontroller Gen 1) and EZ-PD™ BCR (Barrel Connector Replacement).

Are you looking for a plug-and-play solution to replace an old barrel connector or legacy USB connector with USB-C?



Or do you need additional control and want to add some extra functions to your device with a USB-C port controller + MCU in a single-chip solution?



Smart speaker



Smartwatch



Power tools



Body care



Click here to learn more:

www.infineon.com/usb

www.infineon.com/ez-pd-pmg1

www.infineon.com/ez-pd-bcr

www.infineon.com/superspeed

www.infineon.com/usbhubs

www.infineon.com/usb2.0

USB-C charging port controllers

EZ-PD™ BCR: the easiest solution for moving to USB-C

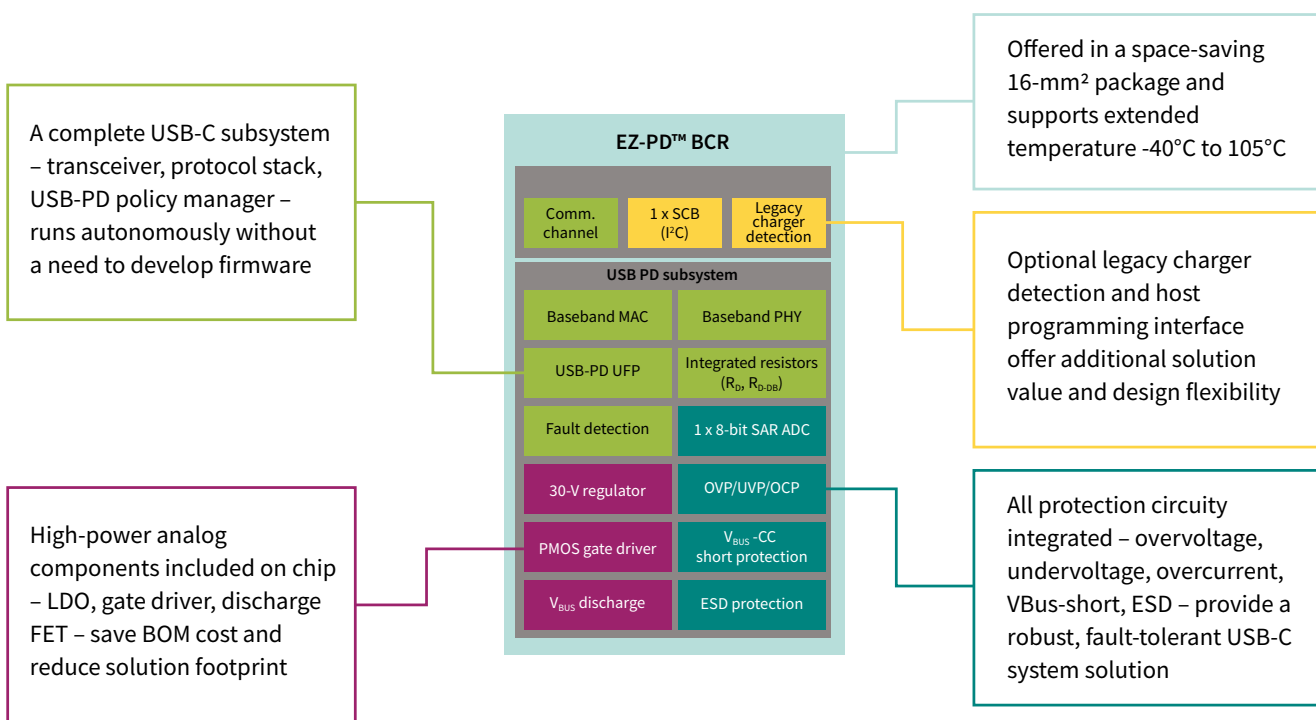
EZ-PD™ BCR is a highly-integrated pre-programmed USB Type-C charging port controller targeting all electronic devices with legacy barrel connectors up to 100 W or USB micro-B connectors. It easily adds USB-C power consumer capability to a device, allowing it to be powered by any USB-C power source including USB-C chargers, power adapters, power banks, and in-wall or in-car charging ports.

EZ-PD™ BCR is compliant with the latest Type-C and USB PD 3.0 standards, it allows designers to quickly convert their devices' power input from a barrel connector to a USB-C connector without invasive changes to their existing designs. It contains a market-proven, fully-automated USB power delivery policy manager that interoperates with virtually any USB-C power source. To safeguard against system-level fault conditions, EZ-PD BCR™ controllers integrate various protection circuitries including VBus-to-CC short, overvoltage, overcurrent and ESD.

No expert knowledge of the USB-C and power delivery standards or firmware development is required to develop a robust USB-C powered system with EZ-PD™ BCR.

Features and benefits

Key features	Key benefits
- Highly integrated one-chip solutions	- Area and BOM saving
- No firmware programming required	- Shorter development cycle, faster time to market
- Market-proven solution with mature design tools	- No implementation risk
- Availability of software utilities	- Configurability, product differentiation
- USB-IF compliant and certified	- Pre-certified silicon to support USB logo certification
- No expert knowledge of USB-C or USB-PD required	- No steep learning curve
- Extended industrial temperature -40°C to 105°C	- Suitable for virtually any commercial or industrial application



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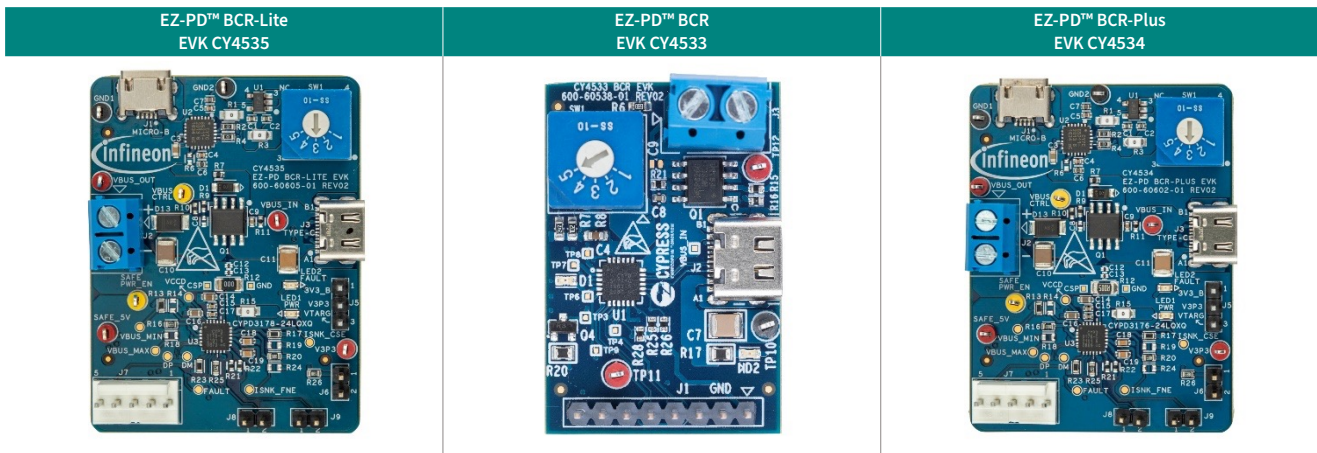
- www.infineon.com/usb
- www.infineon.com/ez-pd-bcr
- www.infineon.com/usbhubs
- www.infineon.com/ez-pd-pmg1
- www.infineon.com/superspeed
- www.infineon.com/usb2.0

The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:

Features	EZ-PD™ BCR family		
Product name	EZ-PD™ BCR-Plus	EZ-PD™ BCR	EZ-PD™ BCR-Lite
Part number	CYPD3176-24LQXQ CYPD3176-24LQXQT	CYPD3177-24LQXQ CYPD3177-24LQXQT	CYPD3178-24LQXQ CYPD3178-24LQXQT
USB PD role	UFP (power sink)	UFP (power sink)	-
Programmable power supply (PPS)	✓	-	-
USB Type-C charging (5V at 0.5 A, 0.9 A, 1.5 A, 3 A)	✓	✓	✓
Legacy charging support (BC 1.2 and others)	✓	-	✓
USB data compatible	✓	✓	✓
VBUS gate driver	PFET	PFET	PFET
Supply voltage	3.0 V – 24.5 V	3.0 V – 24.5 V	3.0 V – 24.5 V
VBUS to CC short protection (20 V)	✓	✓	✓
OVP/UVP	✓	✓	✓
OCP	✓	-	-
ESD protection on CC, D+/D-, ±8 kV (contact), ±15 kV (air)	✓	✓	✓
I ² C Interface	1	1	1
EZ-PD BCR HPI utility	✓	✓	✓
EZ-PD configuration utility	✓	-	-

Boards

Once the preferred characteristics are identified, it is possible to get started with the product of choice by utilizing the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, selective GPIOs and I²C interface are available on headers to easily control or monitor the BCR chip from an external microcontroller.



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www.infineon.com/usb
www.infineon.com/ez-pd-pmg1

www.infineon.com/ez-pd-bcr
www.infineon.com/superspeed

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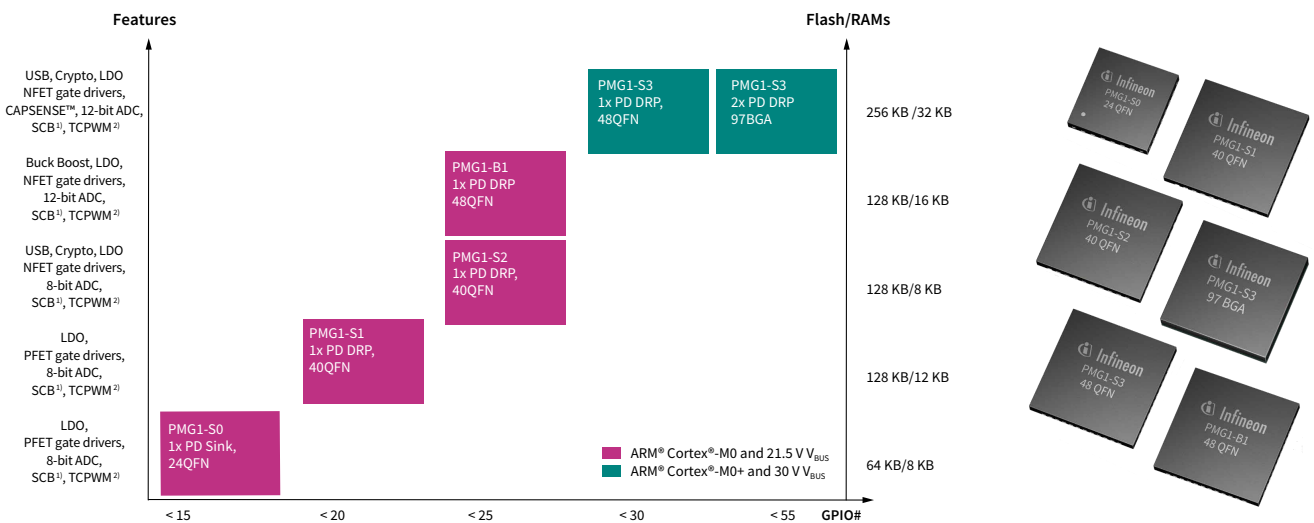
USB-C high voltage microcontrollers

EZ-PD™ PMG1: the single-chip solution for moving to USB-C

Power Delivery Microcontroller Gen 1 (EZ-PD™ PMG1) is a high-voltage USB-C power delivery microcontroller (PD MCU) targeted to any embedded system that provides/consumes power to/from a high-voltage USB-C PD port and leverages the microcontroller to provide additional control capability.

The EZ-PD™ PMG1 family of devices has a market-proven USB power delivery stack, ensuring spec compliance and interoperability. It's the only high-voltage, programmable USB power delivery solution on the market today, and comes with an integrated ARM® Cortex®-M0/M0+, up to 256 kB flash and 32 kB RAM, a USB full-speed device, and analog and digital peripherals. With an SDK supported in ModusToolbox™, EZ-PD™ PMG1 family provides customers with a unified firmware view, facilitating seamless migration between all EZ-PD™ PMG1 devices.

The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:



³ SCB stands for Serial Communication Block ² TCPWM stands for Timer Counter Pulse Width Modulator

Features and benefits

- Key features**
- Highly-integrated single-chip solution, included high-voltage protection
 - Configuration utility and wide support material available
 - Market-proven solution with mature design tools
 - Integrated flash/MCU
 - USB-IF compliant and certified
 - Extended industrial temperature -40°C to 105°C

- Key benefits**
- Area and BOM saving
 - Faster time-to-market
 - No implementation risk
 - Programmability, product differentiation
 - Interoperability
 - Suitable for virtually any commercial or industrial application



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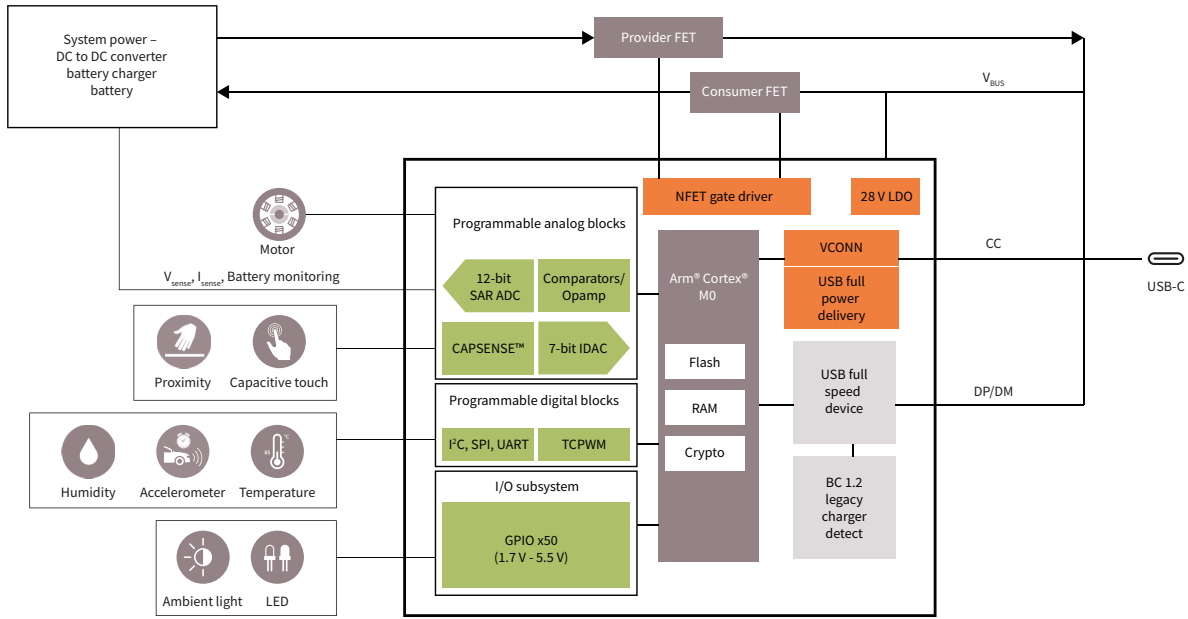
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Block diagram



Product portfolio

Part number	Product name	CPU	Flash [kB]	GPI-Os	I/O Pins	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]	Serial communication blocks	Termination resistor	Type-C ports
CYPM1011-24LQXI	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2.7	5.5	2	Rd, Rd-db	1
CYPM1011-24LQXIT	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2.7	5.5	2	Rd, Rd-db	1
CYPM1111-40LQXI	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1111-40LQXIT	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1115-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1115-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1116-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1116-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1211-40LQXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1211-40LQXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1211-42FNXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp, Rd	1
CYPM1211-42FNXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp, Rd	1
CYPM1311-48LDXI	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2.7	5.5	7	Rp,Rd, Rd-db	1
CYPM1311-48LDXIT	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2.7	5.5	7	Rp,Rd, Rd-db	1
CYPM1321-97BZXI	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1321-97BZXIT	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1322-97BZXI	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2.7	5.5	8	Rp,Rd, Rd-db	2
CYPM1322-97BZXIT	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2.7	5.5	8	Rp,Rd, Rd-db	2



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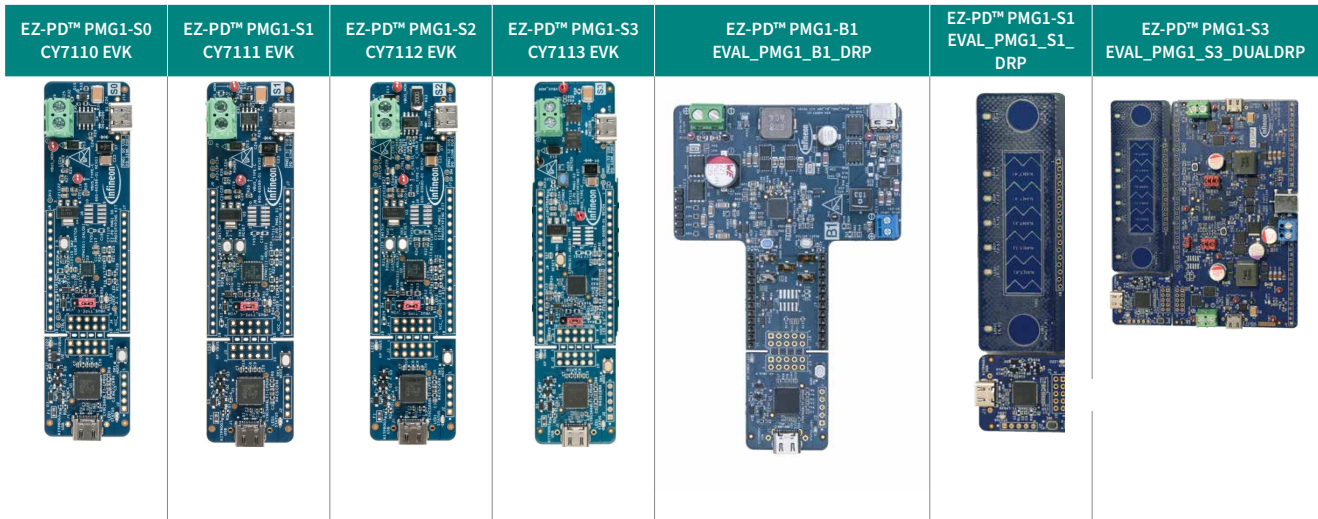
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Boards

Once the preferred characteristics are identified, it is possible to get started with the product of choice by utilizing the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, all the GPIOs and serial interfaces (UART, I²C, SPI) are available on connectors to easily integrate external sensors and test the microcontroller functions.



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USB-C power delivery controllers

Leading the industry with over one billion USB-C devices shipped

USB-C is the universal connector of choice and has gained rapid industry support thanks to its flexibility to transmit multiple data protocols such as USB4, Thunderbolt, HDMI, and simultaneously provide up to 240 Watts of power via USB PD, the possibility to enable slim industrial designs and its easy-to-use connectors and cables. Its adoption also has a significant impact on the environment, dramatically reducing the e-waste produced by the more than one million tons of proprietary chargers that get shipped every year. Infineon's EZ-PD™ portfolio is the industry's most complete portfolio of USB-C power delivery solutions, enabling more robust end-to-end power delivery and charging solutions for laptop and mobile devices. USB-C power delivery standard supports fast charging up to 240 watts, USB4 data speeds and DisplayPort connectivity over an industry-standard USB-C connector for transmitting both data and power on a single cable.

Infineon also offers AEC-Q100 certified versions of its controllers for automotive-grade performance.

As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for **USB-C adapters and chargers**.

Features and benefits

Key features
- Supports latest USB-C power delivery protocols
- Offers programmable USB-C PD solution
- Offers firmware upgradability with in-built flash
- Support secure firmware update with hardware crypto
- Integrates high-voltage circuits
- Integrates VBUS fault protections
- Offered in QFN, BGA, and WLCSP packages

Key benefits
- Interoperability
- Easy customization using software development kit (SDK)
- Easy integration into your application
- Programmability for higher flexibility and shorter time to market
- Highly integrated dual/single port USB-C PD controllers for optimized area and BOM

Power source	Power source (auto)	Cable	Dock	Notebook/PC	Broad market electronics
USB-PD controllers: EZ-PD™ CCG3PA EZ-PD™ CCG3PA-NFET	EZ-PD™ CCG3PA USB-C PD controller EZ-PD™ CCG7D Dual-port USB-C PD + DCDC controller	EZ-PD™ CCG2 USB-C port controller (active cable)	EZ-PD™ CCG3 USB-C PD port controller EZ-PD™ CCG4 Two-port USB-C & PD	EZ-PD™ ACG1F Dual-single port USB-C PD EZ-PD™ CCG5 Two-port USB-C & PD	Move to USB-C: EZ-PD™ BCR EZ-PD™ PMG1
USB-PD + DC-DC controllers: EZ-PD™ CCG7DC EZ-PD™ CCG7SC	EZ-PD™ CCG7S Single-port USB-C PD + DCDC controller	EZ-PD™ CMG1 USB-C EMCA controller EZ-PD™ CMG2 USB-C EMCA controller with EPR (passive cable)	EZ-PD™ CCG5 Two-port USB-C PD EZ-PD™ CCG5C One-port USB-C PD	EZ-PD™ CCG5C One-port USB-C PD EZ-PD™ CCG6DF Dual-port USB-C PD	Wireless charging: WLCx
USB-PD + AC-DC controllers: EZ-PD™ PAG1 EZ-PD™ PAG2	Wireless charging: WLC1515		EZ-USB™ HX3PD 10 Gbps hub controller with USB PD EZ-PD™ PMG1-S3	EZ-PD™ CCG6SF Single-port USB-C PD EZ-PD™ CCG8 Dual-single port controller	



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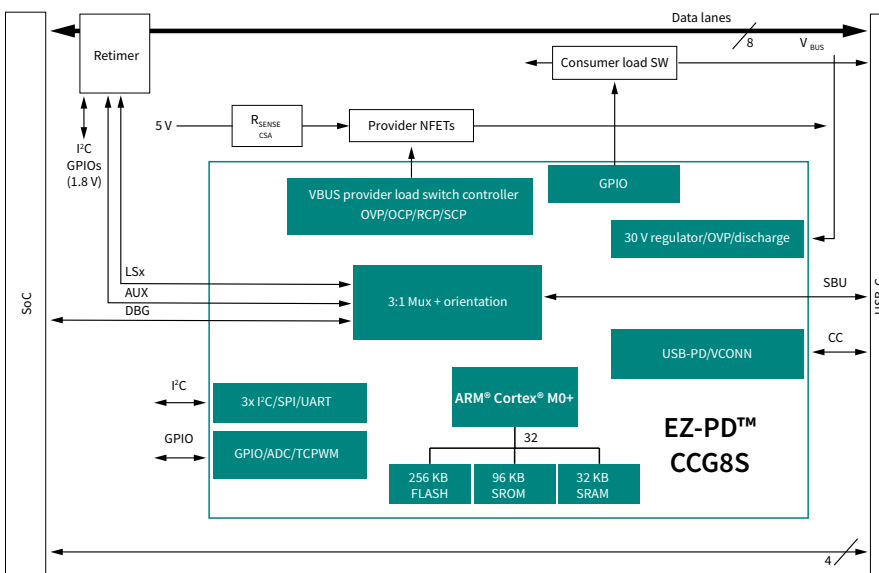
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EZ-PD™ CCG8 – USB-C controller

USB-C power delivery solution for PC host with EPR

EZ-PD™ CCG8 is the first in the industry dual/single-port USB Type-C controller complying with the latest USB-C and power delivery (PD) specifications that offers a complete USB-C and PD port control solution for PCs and notebooks. It integrates a discrete N-channel field effect transistor (NFET) gate driver with fault protection and slew rate, a 32-bit 48 MHz Arm® Cortex®-M0 Plus processor and a complete Type-C transceiver including termination resistors Rp, Rd, and dead battery Rd. While EZ-PD™ CCG8D (dual port) is available in a 97-BGA package, EZ-PD™ CCG8S (single port) is only available in a 48-pin QFN package. Both can be requested in tray or tape and reel packing options, and support extended power range (EPR) up to 28 V without needing external components.

Block diagram



Features and benefits

- Key features**
- USB-C and PD 3.1 with EPR up to 28 V supporting USB3 and USB4, Thunderbolt, display port alternate mode platforms
 - 32-bit, 48 MHz Arm® Cortex®-M0+ processor
 - Integrates a complete Type-C transceiver and a load switch controller for driving NFETs on VBus provider path
 - Slew rate controller to turn on the VBUS provider path
 - Configurable hardware-controlled VBus overvoltage, undervoltage, overcurrent, short circuit, reverse current protection, and thermal shutdown
 - Integrated 3:1 SBU Muxes for alternate modes and closed chassis debug
 - Integrated digital and analog blocks

- Key benefits**
- Reduced area and BOM thanks to the high degree of integration
 - Ideal for EPR-based DRP solutions
 - Programmable solution which allows the implementation of custom features



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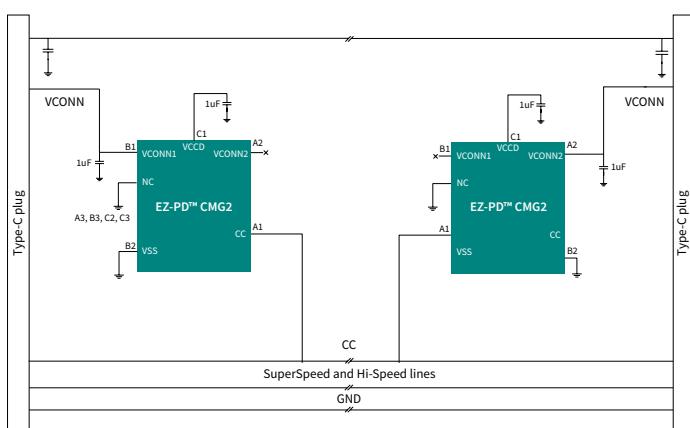
EZ-PD™ CMG2 – USB-C EMCA controller

EMCA controller with VBUS to CC short protection for passive USB-C cables

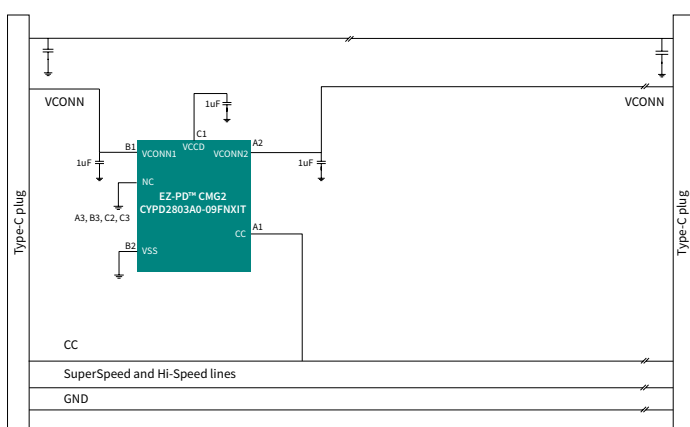
EZ-PD™ CMG2 is Infineon’s dedicated electronically marked cable assembly (EMCA) controller targeting passive non-Thunderbolt and Thunderbolt Type-C cables. It offers integrated VBus-CC short protection up to 54 V, VBus-VCONN short protection up to 54 V, power delivery 3.1, Type-C 2.1, and ESD protection, all these in a compact 9-ball WLCSP package. EZ-PD™ CMG2 has a 47-byte storage space for vendor- and cable-specific configuration data and is designed to operate from a 2.7 to 5.5 V VCONN supply range.

Block diagram

Passive EMCA application - Single EZ-PD™ CMG2 chip per plug:



Passive EMCA application - Single EZ-PD™ CMG2 chip per cable:



Features and benefits

Key features

- Supports USB PD 3.1 specification and USB Type-C specification version 2.1
- Supports USB4, TBT4 and extended power range (EPR)
- PD protocol
- Integrated high-voltage protection on CC, VCONN1, and VCONN2 pins to protect against accidental shorts to the VBus pin on the Type-C connector up to 54 V
- Integrated 47 bytes for storing vendor- and cable-specific configuration data termination resistor RA on VCONN1 and VCONN2
- IEC ESD protection on VCONN and CC
- Package: 9-ball WLCSP

Key benefits

- No programming required
- Easy to use, faster design cycle
- Robust solution with short protection up to 54 V



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USB-C AC-DC and DC-DC charging solutions

The one-stop shop for charger and adapter designs

Infineon offers a one-stop shop for a wide variety of USB PD AC-DC and DC-DC conversion solutions for charger adapters from 18 to 140 W. The portfolio includes a scalable PD controller architecture to support both single-port and multi-port charger configurations. Our reference designs allow the quick and easy development of prototypes, meaning customers can benefit from new, fast-charging adapter technology while reducing development costs and time to market. Moreover, the high degree of programmability and the ability to support custom protocols and updates enables a high degree of flexibility for customers. With decades of experience in the electronics industry, Infineon drives the trend of adapter miniaturization without compromising product efficiency and performance.

As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C adapters and chargers.

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPAP211A1-14SXI	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP211A1-14SXIT	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXI	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXIT	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPET121	Pulse edge transformer	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	N/A
CYPAS212A1-32LQXQ	USB-PD + SR + PWM controller	PAG2S-AC	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS212A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-AC	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS213A1-24SXQ	USB-PD + SR controller	PAG2S-PS	ARM® Cortex®- M0	64	8	4	0	1	-40 to 105
CYPAS213A1-24SXQT	USB-PD + SR controller	PAG2S-PS	ARM® Cortex®- M0	64	8	4	0	1	-40 to 105
CYPAS213A1-32LQXQ	USB-PD + SR controller	PAG2S-PS	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS213A1-32LQXQT	USB-PD + SR controller	PAG2S-PS	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS211A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-QZ	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS211A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-QZ	ARM® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPET131	Pulse edge transformer	PAG1P	N/A	N/A	N/A	0	N/A	N/A	N/A
CYPAP111A3-10SXQ	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP111A3-10SXQT	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP112A3-10SXQ	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP112A3-10SXQT	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAS111A1-24LQXQ	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPAS111A1-24LQXQT	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3184A1-24LQXQ	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3184A1-24LQXQT	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3135-32LQXQ	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	14	4	1	-40 to 105
CYPD3135-32LQXQT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	14	4	1	-40 to 105
CYPD3135-40LQXI	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXIT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQ	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3171-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3171-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3172-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3174-16SXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	6	1	1	-40 to 105
CYPD3174-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3174-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD7271-68LQXQ	USB-PD + DCDC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 105
CYPD7271-68LQXQT	USB-PD + DCDC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 105
CYPD7272-68LQXQ	USB-PD + DCDC controller	CCG7DC	ARM® Cortex®- M0	128	16	19	4	2	-40 to 125
CYPD7272-68LQXQT	USB-PD + DCDC controller	CCG7DC	ARM® Cortex®- M0	128	16	19	4	2	-40 to 125
CYPD7171-40LQXQ	USB-PD + DCDC controller	CCG7SC	ARM® Cortex®- M0	128	16	13	3	1	-40 to 125
CYPD7171-40LQXQT	USB-PD + DCDC controller	CCG7SC	ARM® Cortex®- M0	128	16	13	3	1	-40 to 125



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EZ-PD™ CCG7SC and CCG7DC

Single- and dual-port USB-C PD and DC-DC controller

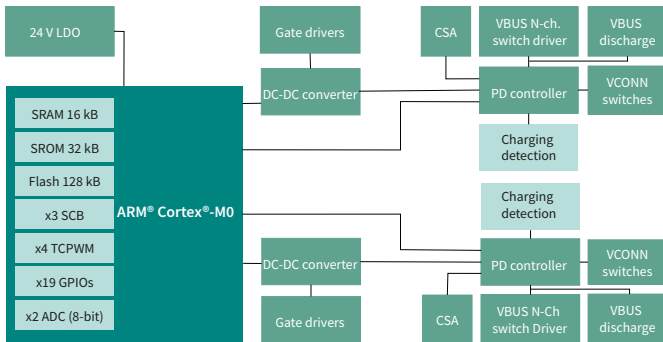
Infinion's EZ-PD™ CCG7SC and CCG7DC are highly integrated single- and dual-port USB Type-C power delivery (PD) solutions with built-in buck-boost controllers; they are designed for multi-port consumer charging applications and comply with the most recent USB Type-C and PD specifications. With an on-chip 32-bit Arm® Cortex®-M0 processor, 128 kB flash, 16 kB RAM, and 32 kB ROM, EZ-PD™ CCG7xC is the most programmable USB-PD solution for DC-DC applications, leaving the flash available for user application's use. Custom system management features, like dynamic load sharing and temperature monitoring, are part of the feature set thanks to the inclusion of this fully programmable MCU with analog and digital peripherals. EZ-PD™ CCG7xC also integrates gate drivers for Vbus NFET on the provider path and hardware-controlled protection features on the Vbus. The high degree of integration lowers the system BOM and provides a footprint-optimized solution to support higher power density designs.

Features and benefits

Key features
– One/two USB-C PD controllers + DC-DC controllers
– Supports latest USB-C PD 3.1 with PPS, QC4+, Samsung AFC, Apple 2.4 A, BCv1.2
– ARM® Cortex®-M0 with flash for custom features implementation
– Integrated Vbus NFET gate drivers, buck-boost NFET gate drivers, VCONN FETs and high-side current sense amplifier (HSCSA)
– DC-DC controller: configurable switching frequency of 150 – 600 kHz, PSM/ FCCM mode of operation, wide input voltage range of 4 – 24 V (40 V tolerant), and programmable spread spectrum frequency for low EMI
– Protection features: OVP, UVP, SCP, OCP, OTP, and Vbus-CC short
– Advanced features: dynamic load sharing, power throttling, field firmware upgrade, optimized-efficiency control methods for flyback converter, and buck-bypass

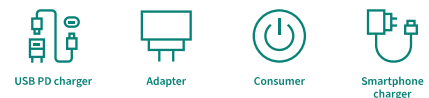
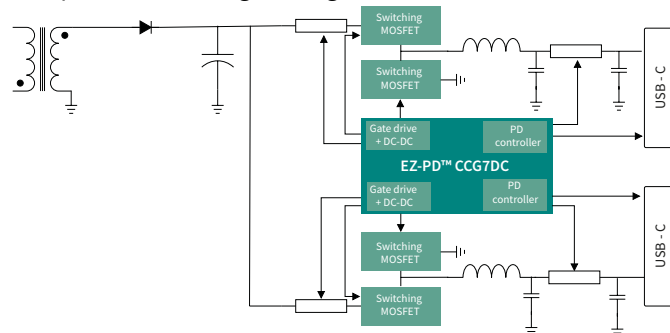
Key benefits
– Enables high power density designs
– Dynamic load sharing enables intelligent redistribution of power among ports
– Capable of support 2-port, 3-ports, 4-port, or more configuration
– Does not require additional MCU externally for system peripheral

Block diagram



Application example

Two-port USB-C charger using EZ-PD™ CCG7DC



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EZ-PD™ PAG2 - USB-C PD and DC-DC controller

ZVS flyback converter chipset with integrated USB PD, synchronous rectification (SR), and PWM

EZ-PD™ PAG2 is a complete AC-DC charger and adapter solution with integrated USB PD. It is a 2-chip secondary-side controlled flyback converter chipset (EZ-PD™ PAG2P and EZ-PD™ PAG2S) with integrated USB PD, synchronous rectifier (SR), and PWM controllers. EZ-PD™ PAG2 supports quasi-resonance flyback with zero voltage switching (QR-ZVS) and active clamp flyback (ACF). Its design supports PD 3.1 SPR and 28 V EPR. EZ-PD™ PAG2S standalone can pair with PWM controllers through an optocoupler by acting as USB PD and SR.

EZ-PD™ PAG2P



EZ-PD™ PAG2P is a primary start-up controller designed to receive PWM signals from EZ-PD™ PAG2S, which performs the PWM regulation. It provides HV start-up, PET receiver via CYPET121, boosts VCC, low-side NFET gate driver, and high-side logical driver. EZ-PD™ PAG2P supports both X-cap discharge and non-X-cap discharge mode. It pairs with EZ-PD™ PAG2S-AC to support ACF converters and EZ-PD™ PAG2S-QZ to support QR-ZVS flyback converters.

Key features

- Integrated high-voltage start-up
- Integrated low-side gate driver
- Integrated high-side logical driver
- Integrated V_{cc} boost switch
- Support x-cap discharge mode
- Brown-in/out and line OVP/UVP
- Support OCP and SCP
- Startup secondary VBUS OVP
- Programmable soft-start
- Integrated PET receiver

EZ-PD™ PAG2S



EZ-PD™ PAG2S supports secondary-side controlled flyback converters by pairing with EZ-PD™ PAG2P. PAG2S-AC is a secondary-side ACF controller enabling leakage energy recycling and ZVS operation. PAG2S-QZ is a secondary-side QR-ZVS controller achieving ZVS using an SR control scheme. EZ-PD™ PAG2S-PS standalone acts as a USB PD and SR-integrated secondary-side controller by pairing with third-party primary-side PWM controllers via an optocoupler.

Key features

- Support PD 3.1 SPR and 28 V EPR
- 20-300 kHz switching frequency
- Support DCM, CCM, and CrCM
- Support PSR and SSR PWM regulation
- BC1.2, QC5, Apple 2.4 A, and AFC
- Support VBUS fault protection
- Support V_{conn} current limit
- Supports VBUS-CC short
- Short SR turn-on and off delay
- Support non-logical level MOSFETs



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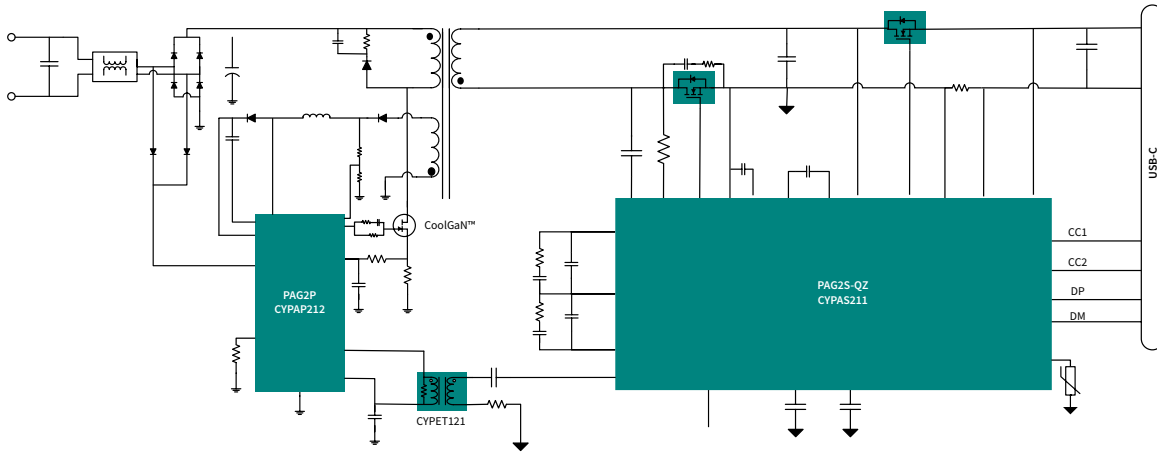
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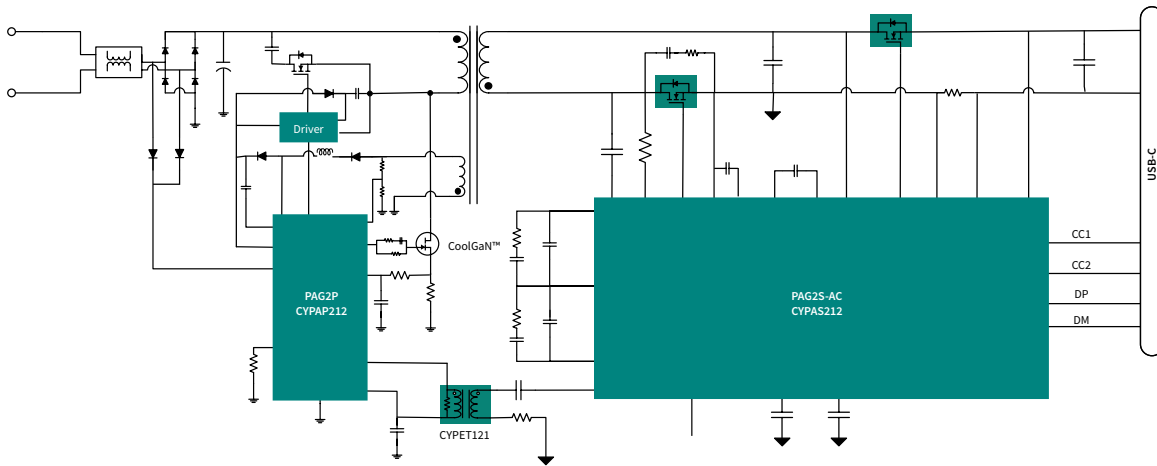
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EZ-PD™ PAG2-QZ chipset: secondary-side controlled QR-ZVS



EZ-PD™ PAG2-AC chipset: secondary-side controlled ACF



Comparison table: EZ-PD™ PAG1 vs EZ-PD™ PAG2

Feature	EZ-PD™ PAG1 Quasi-Resonant (QR)	EZ-PD™ PAG2 QR-ZVS	EZ-PD™ PAG2 ACF
USB-PD, subsystem and peripheral	ARM® Cortex®-M0 USB-PD MCU, Memory (Flash / SRAM)	Yes, 64 KB/ 4 KB	Yes, 64 KB/ 8 KB
	PD compliance spec	PD 3.1 SPR with PPS	PD 3.1 SPR with PPS/28 V EPR
	VCONN switches and LDO	No	Yes
LP-SMPS features	Switching frequency range	20 – 150 kHz	20 – 300 kHz
	Zero voltage switching (ZVS)	Yes, 1st valley through SR off delay	Yes, any valley through SR turn on/off
	Recycle leakage energy	No	No
	Primary side protection	– Brown in/out, line UV/OP – Secondary start-up VBUS OVP – OCP (single level)	– Brown in/out, line UV/OP – Secondary start-up VBUS OVP – OCP (dual level), SCP
	Primary VCC supply	– Supply through external LDO – Single/Dual AUX winding	– Integrated VCC Boost Switch – Without external LDO circuit
	Secondary side protection	– VBUS OVP, UVP, OCP, SCP, – CC1/CC2 OVP	– VBUS OVP, UVP, OCP, SCP, – Rsense short protection – CC1/CC2/DP/DM OVP
	Digital control feature	– Digital valley table – Dead time	– Digital valley table – Dead time and ZVS pulse width
Efficiency compliant standard	Standby < 30 mW; DoE VI; CoC tier 2	Standby < 30 mW; DoE VI; CoC tier 2; EuP Lot6	
Others	Packaging	PAG1S: 24-QFN/ PAG1P: 10-SOIC	PAG2S: 32-QFN/ PAG2P: 14-SOIC



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Peripheral controllers for USB 5Gbps

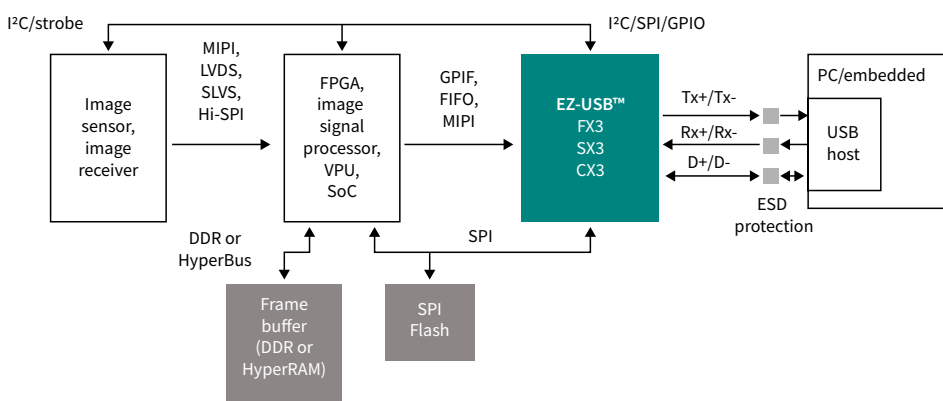
From USB 1.1 to USB 5Gbps innovation, heading towards 20Gbps

Infinion’s EZ-USB™ peripheral controllers family offers the most comprehensive USB product portfolio in the industry. Since 1996, EZ-USB™ has set the industry’s standard by improving the capabilities of programmable USB peripheral controllers, enabling designers to build USB devices that can handle the most demanding performance requirements in industrial and medical imaging applications. Machine vision, medical imaging, 3D scanners, biometric scanners, and many other applications requiring safe and dependable high-speed plug-and-play connectivity can benefit from the high-performance EZ-USB™ 5 Gbps controllers.

Infinion’s EZ-USB™ peripheral controllers provide 5Gbps bandwidth today, and will soon move forward to 10 and then 20 Gbps.

	EZ-USB™ FX3	EZ-USB™ CX3	EZ-USB™ SX3
Function	Programmable peripheral	MIPI CSI-2 to USB3 bridge	FIFO-USB3 bridge
Part numbers	CYUSB3011 CYUSB3012 CYUSB3013 CYUSB3014	CYUSB3064 CYUSB3065	CYUSB3015 CYUSB3016 CYUSB3017
Transfer rate	5Gbps	5Gbps	5Gbps
System interface	32-bit GPIF, 100 MHz	4x MIPI CSI-2	32-bit FIFO, 100 MHz
USB-C Mux	-	-	-
Processor	Arm9™	Arm9™	Arm9™
RAM / flash	512 KB / 0 KB	512 KB / 0 KB	512 KB / 0 KB
USB endpoints	32	2	2
Hardware DVK	SuperSpeed Explorer Kit	CX3 Camera RDK	SX3 Explorer it
SDK	EZ-USB™ FX3 SDK	EZ-USB™ FX3 SDK	-
Configuration utility	-	-	EZ-USB™ SX3 configuration utility

Block diagram



The block diagram shows a typical USB3 Vision-based machine vision camera. An image sensor using one of many different interface standards is connected to an FPGA or an image signal processor (ISP), which processes and optimizes the image and translates data into parallel data (or MIPI CSI-2) connected to an EZ-USB™ controller (FX3, SX3 or CX3). The EZ-USB™ controllers transfer uncompressed video in USB3 Vision standard to a PC or an embedded system via a standard USB cable.



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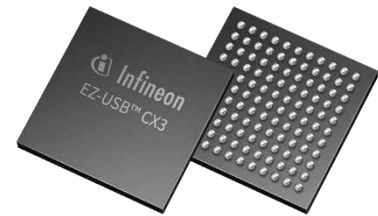
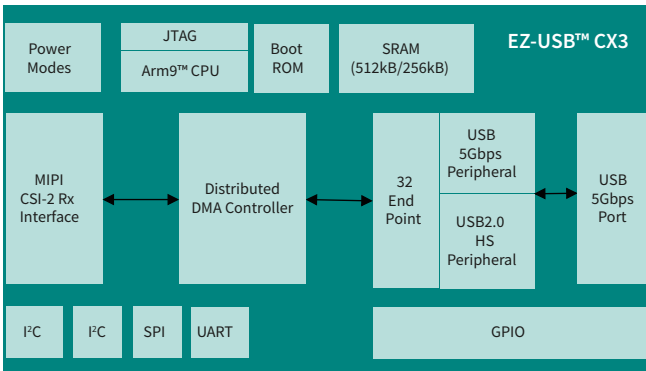
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EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers

Adding USB 5Gbps connectivity to image sensors with MIPI CSI-2 interface

Infineon's EZ-USB™ CX3 enables USB 5Gbps connectivity to any image sensor compliant with the mobile industry processor interface (MIPI) camera serial interface Type 2 (CSI-2) standard. It is based on the proven EZ-USB™ FX3 platform and comes with a 200 MIPS fully accessible Arm9™ CPU and 512 kB SRAM. For configuring image sensors, EZ-USB™ CX3 also supports camera control interface (CCI). Pan, tilt, and zoom functions, as well as other camera control functions, can be supported by programming the EZ-USB™ CX3's numerous peripheral interfaces, including I²C, SPI, and UART.

Block diagram



Features and benefits

Key features

- Capable of streaming uncompressed video, including:
 - 4K UHD video at 15 fps
 - 1080p video at 30 fps
 - 720p video at 60 fps
- Connectivity: MIPI CSI-2 to USB 5 Gbps bridge controller with an integrated USB 5 Gbps PHY
- Bandwidth: 4x CSI-2 lanes, 1 Gbps per lane
- Color format support: RAW8/10/12/141, YUV422/4442, RGB888/666/5653
- Camera protocol: UVC or proprietary
- Programmability: fully accessible Arm9™ CPU with 200 MHz operation and 512 kB SRAM

Key benefits

- Adds USB 5Gbps connectivity to any MIPI CSI-2 based camera
- Turnkey solutions on industrial standards
- Quick time-to-market with low development costs



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Automation



Security and surveillance

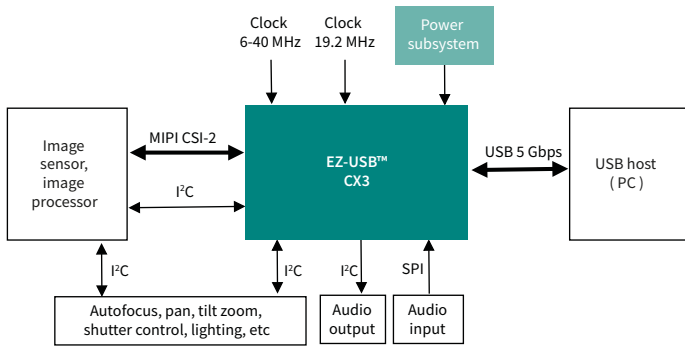


Retail



Medical and life sciences

Application diagram



In the block diagram a typical EZ-USB™ CX3-based camera is depicted. The EZ-USB™ CX3 is connected to an image sensor with a MIPI CSI-2 (up to four lanes) interface. A standard USB cable is then used by the peripheral controller to transfer uncompressed video in compliance with the USB video class standard to a PC or an embedded system.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3064-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3064-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25
CYUSB3065-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3065-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25



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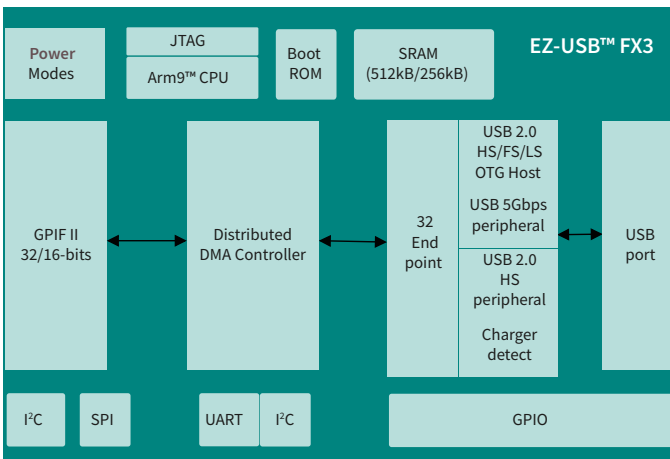
EZ-USB™ FX3 - USB 5Gbps peripheral controllers

USB 5Gbps to 32-bit data bus with Arm9™

Infineon's EZ-USB™ FX3 is the industry's most adaptable USB peripheral controller which can add USB 5Gbps connectivity to any system. A processor, an image sensor, an FPGA, or an ASIC can all be connected using the EZ-USB™ FX3's second-generation general programmable interface (GPIF II). Users can configure the general programmable interface (GPIF) to operate like a FIFO, an asynchronous SRAM, an address/data multiplexed interface, a CompactFlash, or a custom interface.

EZ-USB™ FX3 will enable applications like machine vision and medical imaging to achieve higher quality at a lower cost because USB 5Gbps and USB-C are now standard connectivity in all PCs.

Block diagram



Features and benefits

- Key features**
- Full accessible 32-bits, 200 MHz, Arm9™ core with up to 512 kB of embedded SRAM
 - Hi-speed on-the-go (HS-OTG) host and peripheral compliant with on-the-go Supplement Version 2.0
 - USB 2.0 OTG compliance
 - Compliant with USB BC v1.1
 - Additional connectivity to peripherals
 - Improved battery charging capabilities

- Key benefits**
- Adds USB 5Gbps capability to any system
 - Quick time-to-market with low development costs
 - Turnkey solutions on industrial standards
 - Easy code development and integration
 - Easy connectivity to peripherals such as I²C, I2S, UART, SPI and GPIOs



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Automation



Security and surveillance



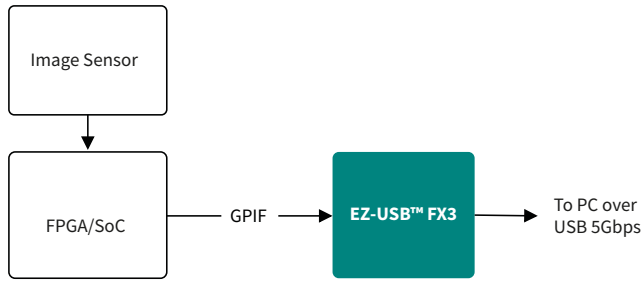
Retail



Medical and life sciences

Application diagram

EZ-USB™ FX3 HD video / 3D imaging



USB 3.0 provides 5Gbps bandwidth and supports the streaming of HD video without the need for compression. EZ-USB™ FX3 connects directly with a variety of image sensors, enabling USB 5 Gbps camera and 3D imaging designs while saving bill-of-material cost and PCB footprint.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3011-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3012-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3013-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXCT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXI	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	-40 to 85	1.7	3.6
CYUSB3014-BZXIT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I ² C, UART, I2S, SPI	-40 to 85	1.7	3.6

Boards

EZ-USB™ FX3 DEMO_FX3_U3V_CAM01	EZ-USB™ FX3 CYRB4111	EZ-USB™ FX3 CYUSB3KIT-003	EZ-USB™ FX3 DEMO_FX3_LVDS_CAM01
The EZ-USB™ FX3 DEMO_FX3_U3V_CAM01 Camera Kit is based on the EZ-USB™ FX3. The kit includes a MIPI CSI-2 camera module connected to an FPGA on one PCB mounting on an updated EZ-USB™ FX3 Explorer kit.	The EZ-USB™ FX3 CYRB4111 USB3 vision solution demo kit is based on the EZ-USB™ FX3. This kit enables users to stream 4K 30 fps videos from an external HDMI source to PC via USB-C interface in USB3 Vision standard.	The EZ-USB™ FX3 CYUSB3KIT-003 is an easy-to-use and inexpensive development platform enabling developers to add USB 3.0 device functionality to any system.	The EZ-USB™ FX3 DEMO_FX3_LVDS_CAM01 consists of a MIPI CSI-2 camera module connected to an FPGA on one PCB mounting on an updated EZ-USB™ FX3 Explorer kit.



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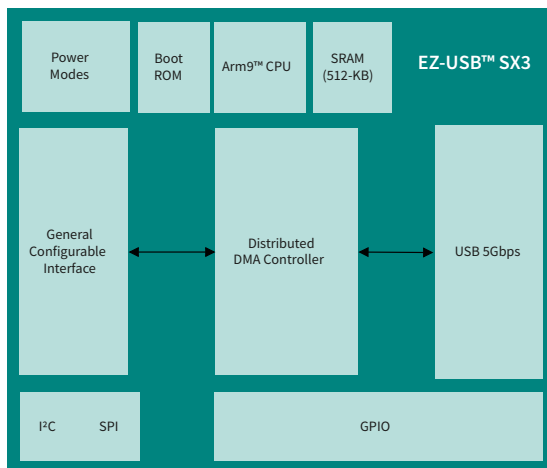
EZ-USB™ SX3 - FIFO to USB 5Gbps controllers

USB 5Gbps easily configured for UVC/UAC or USB3 Vision applications

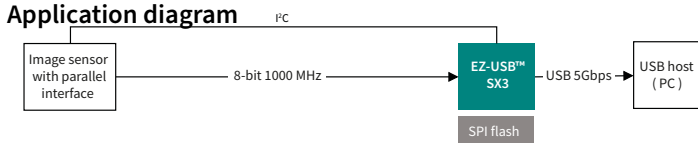
Infineon's EZ-USB™ SX3 can be configured by tuning a wide range of parameters such as VID/PID, product strings, serial numbers, FIFO settings, GPIOs, USB endpoints and auxiliary interface via its easy-to-use Graphic User Interface (GUI) utility. The utility can also produce USB video class (UVC) and USB audio class (UAC) configurations that are specification compliant without the need for firmware development, significantly shortening the time-to-market for end products. In addition to the configurable parameters, developers can also utilize the integrated 32-bit Arm9™ processor to further customize their devices, differentiating in the market and gaining a competitive advantage.

Additionally, Infineon provides a wide range of USB Type-C port controllers that can be used with the EZ-USB™ SX3 to enhance cameras, video capturing, and other data acquisition applications with USB-C and USB power delivery features.

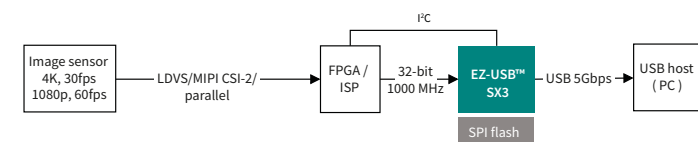
Block diagram



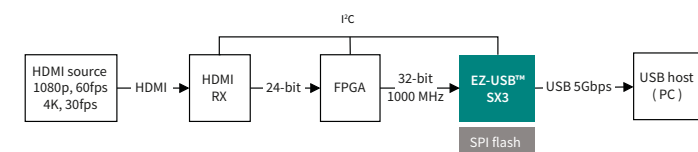
Application diagram



Direct image sensor interface to EZ-USB™ SX3



USB 5Gbps Camera



4K HDMI USB 5Gbps capture card



Automation



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Features and benefits

Key features

- Universal Serial Bus (USB) integration
 - USB 3.2, Gen 1 and USB 2.0 peripherals compliant with USB 3.2 specification revision 1.0
 - 5 Gbps PHY compliant with USB 3.2 Gen 1
 - Three physical endpoints
 - Supports UVC, UAC, and USB vendor class protocol
- 32 bit CPU ARM926EJ core with 200 MHz operation with 512 kB embedded SRAM
- General configurable interface (supports up to 100 MHz; 8-, 16-, 24-, and 32 bit data bus; slave FIFO, parallel camera interface)
- Additional connectivity to SPI boot flash and I²C slaves at 100/400 kHz and 1 MHz
- Firmware ready for USB video class (UVC), USB3 Vision, and many standard USB class applications
- Less than 60 μ A with V_{BATT} on and 20 μ A with V_{BATT} off

Key benefits

- Lowest total cost (bandwidth per dollar) solution for any high-speed system
- Turnkey solutions on industrial standards
- Quick time-to-market with low development costs
- Industry gold standard with highly integrated features
- Easy customization via configuration utility

Product portfolio

Product	USB standard	USB speed [Gbit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3015-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3015-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3015-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6
CYUSB3015-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6
CYUSB3016-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3016-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3016-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6
CYUSB3016-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6
CYUSB3017-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3017-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	0 to 70	1.7	3.6
CYUSB3017-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6
CYUSB3017-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I ² C, SPI	-40 to 85	1.7	3.6

Boards

CY-SD4210 EZ-USB™ SX3 HDMI 4K to USB 5 Gbps demo kit



EZ-USB™ SX3 HDMI 4K to USB 5Gbps demonstration kit is based on Infineon's EZ-USB™ SX3. An FPGA captures a video stream from the HDMI interface and transfers it via USB 5Gbps connection to a PC. The kit can be configured as a USB video class (UVC) device or a USB3 Vision device easily via EZ-USB™ SX3 Configuration Utility and supports up to 4K 30 frame-per-second video stream.



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USB 2.0 peripheral controllers

Solutions for low-speed, full-speed and high-speed devices

Since 1996, EZ-USB™ has been setting the standard for the industry by enhancing the capabilities of programmable USB peripheral controllers, this has enabled developers to design USB devices that can meet the most stringent performance requirements in industrial and imaging applications. More significantly, Infineon's first-rate customer service and long-term supply guarantee your successful product life cycles last for more than ten years. The complete portfolio of USB programmable peripheral controllers supports low-speed and full-speed options with EZ-USB™ encore and high-speed options with EZ-USB™ FX2LP and EZ-USB™ FX2G2.

EZ-USB™ FX2LP/FX2G2 are highly integrated USB microcontrollers that serve as the basis for any USB high-speed peripheral device. To take full advantage of the USB 2.0 480-Mbps signaling rate, EZ-USB™ FX2LP and EZ-USB™ FX2G2 contain specialized hardware to buffer USB data and to connect seamlessly to a variety of high-bandwidth external devices such as MCUs, ASICs, and FPGAs.

EZ-USB™ encore is a family of full-speed USB controllers based on Infineon's flexible PSoC™ architecture. These USB controllers have configurable analog and digital blocks, allowing you to customize the part based on your target application. Moreover, EZ-USB™ encore also integrates components such as RAM, clock generator and USB termination resistors reducing the overall system cost and area.

	EZ-USB™ encore	EZ-USB™ FX2LP	EZ-USB™ FX2G2
Function	Device controller	Device controller	Device controller
USB Spec (Speed)	USB2.0 Full speed (12 Mbps)	USB2.0 High speed (430 Mbps)	USB2.0 High speed (430 Mbps)
Interfaces	I ² C, SPI, UART, PS/2, ADC	Parallel 8/16-bit GPIF* [48 MHz] I ² C, USART	Parallel 16/32-bit GPIF* (100 MHz) I ² C, UART, SIN
MCU subsystem	M8C	8051	Arm9™
RAM	1 kB	16 kB	512 kB
Hardware DVK	NA	CY3539	CYUSB3KIT-003
Software SDK	SuiteUSB	SuiteUSB	EZ-USB™ FX3 SDK
Package	28-SOP/32-QFN/56-QFN/16-COLQFN	56-SSOP/VFBGA/QFN, 100-TQFP/128-TQFP	121-BGA
Temperature	0°C to 70°C -40°C to + 85°C	0°C to 70°C -40°C to + 105°C	0°C to 70°C -40°C to + 85°C



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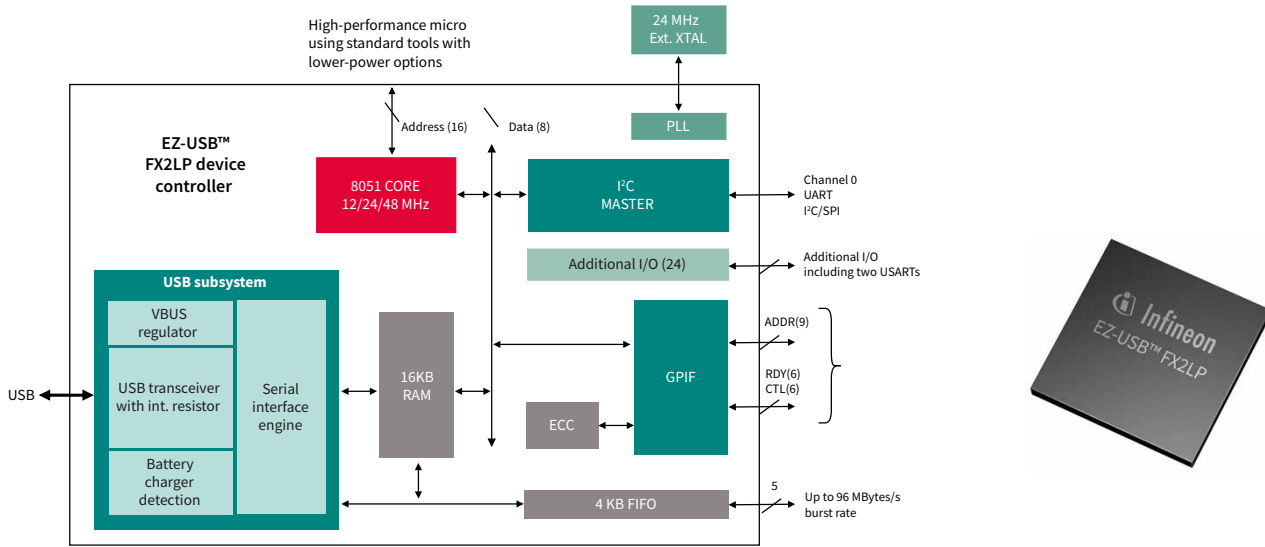
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* general programmable interface

Block diagram



Features and benefits

Key features
- USB 2.0 USB IF high speed certified (TID # 40460272)
- GPIF supports 8-bit/16-bit external data interface
- Ultralow power: ICC no more than 85 mA in any mode
- Ideal for bus- and battery-powered applications
- Configurability for VID/PID using EPROM
- Single-chip integrated USB 2.0 transceiver, smart SIE, and enhanced 8051 microprocessor
- Integrated FIFOs, integrated I²C controller
- Commercial and industrial temperature grade

Key benefits
- Wide portfolio of peripheral controllers supporting low-speed, full-speed, and high-speed options
- Quick time-to-market with hardware and software development kit
- Market-proven solutions since 1996
- Premium customer support and long-term supply commitment



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EZ-USB™ serial bridge controller

Discover a wide portfolio of full-speed bridge controllers with configurable and fixed functions

EZ-USB™ serial bridge controller is a family of full-speed bridge controllers offering both configurable and fixed-function options that provides connectivity between USB and serial interfaces UART, SPI, I²C. With the lowest power consumption in standby mode (5 µA), these bridge controllers are the first in the market to offer programmable serial channels for UART/I²C/SPI interfaces. With the latest addition of fixed-function controllers, they can be easily configured to work as USB to UART, USB to I²C, or USB to SPI bridges without requiring any firmware development by the user. The EZ-USB™ Serial Bridge Controller family integrates the industry-leading CAPSENSE™ capacitive-touch sensing technology (for touch-sensitive key switches) and battery charger detection compliant with USB-IF battery charging specification ver. 1.2 to detect the source of power on the USB port.

	USB-UART bridge controller			USB-I ² C bridge controller	USB-SPI bridge controller	USB-Serial configurable bridge controller			USB-billboard controller		
	CY7C65213/A	CY7C65223/D	CY7C65223-24LQXS/T	CY7C65216/D	CY7C652148/214D	CY7C65211/A	CY7C65215/A	CY7C65211A-24LQXS/T	CY7C65210/A	CY7C65217/217A1	CY7C65210A-24LQXS/T
Application	Industrial, consumer	Industrial, consumer	Automotive	Industrial, consumer	Industrial, consumer	Industrial, consumer	Industrial, consumer	Automotive	Industrial, consumer	Industrial, consumer	Automotive
Number of channels	Single	Single/dual	Single	Single/dual	Single/dual	Single	Dual	Single	Single	Dual	Single
GPIOs	8	4 / 7	4	8/12	6/8	10	17	10	9/11	7/9	11
Interface supported	UART	UART	UART	I ² C	SPI	SPI I ² C UART	SPI I ² C UART	SPI I ² C UART	I ² C	I ² C	I ² C
SPI width	-	-	-	-	4-16 bits	4-16 bit	4-16 bit	4-16 bit	-	-	-
Main/replica	-	-	-	main/replica	main	main/replica	main/replica	main/replica	main	main	main
UART speed, pins	3 Mbps, 8	3 Mbps, 4	3 Mbps, 2/4/6	-	-	3 Mbps, 2/4/6	3 Mbps, 2/4/6	3 Mbps, 2/4/6	-	3 Mbps, 2	-
Battery charger detection (BCD)	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓
CAPSENSE™ buttons	-	-	-	-	-	8	5	5	-	-	-
Flow control	HW	HW, SW	HW, SW	-	-	HW	HW	HW	-	-	-
Packages	32-QFN/28-SSOP	24-QFN/32-QFN	24-QFN	24-QFN/32-QFN	24-QFN/32-QFN	24-QFN	32-QFN	24-QFN	24-QFN	24-QFN	24-QFN



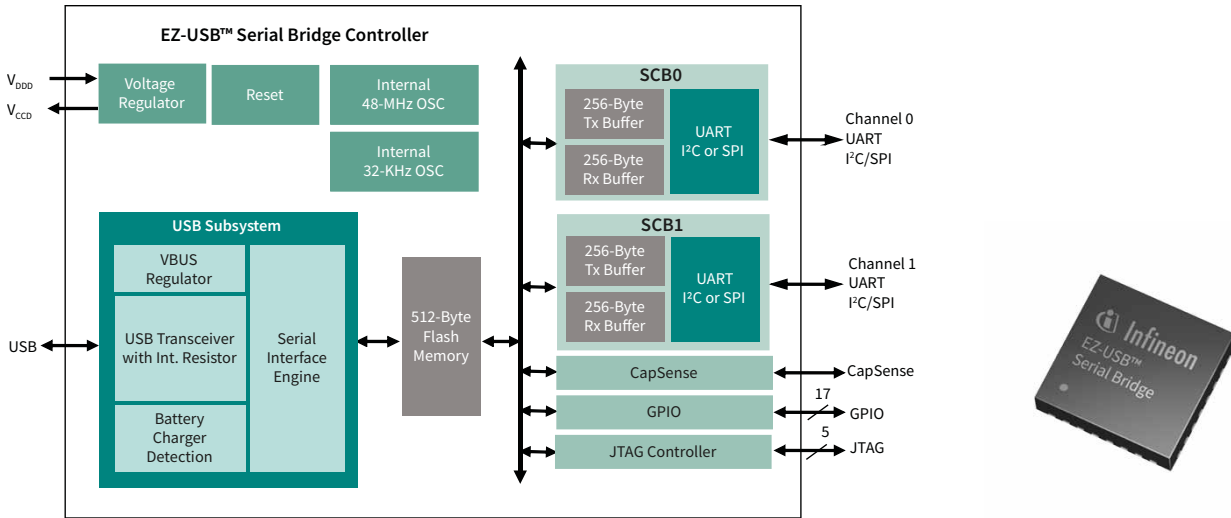
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Block diagram



Features and benefits

Key features
– Dual-channel UART, I²C, or SPI to USB bridge
– Supports up to 8 CAPSENSE™ buttons
– Configurable and fixed function options
– BCD compliant to USB-IF battery charging revision 1.2
– Integrated regulator, oscillator and termination resistors
– Driver support for major operating systems
– Configuration utility for VID/PID and serial interfaces
– Support multiple USB device classes: CDC, PHDC, HID and vendor specific device classes

Key benefits
– Easy to design, without firmware nor software development
– Industry's lowest power consumption in standby mode
– Ideal for low-power devices
– Compatibility
– Minimization of switching costs

Boards

EZ-USB™ serial bridge controller CYUSBS234	EZ-USB™ serial bridge controller CYUSBS236	EZ-USB™ serial bridge controller CYUSBS232
<p>CYUSBS234 development kit (DVK) helps evaluate the features of the single-channel EZ-USB™ Serial Bridge Controller CY7C65211. The kit provides a copper pad on PCB to test CAPSENSE™ feature, a set of EEPROMs to test I²C and SPI interfaces, a RS232 line driver to test UART interfaces.</p> <p>Kit based on CY7C65211-24LTXI</p>	<p>CYUSBS236 development kit (DVK) helps evaluate the features of the dual-channel EZ-USB™ serial bridge controller CY7C65215. The kit provides two copper pads on the PCB to test CAPSENSE™ feature, two pairs of EEPROMs to test I²C and SPI interfaces, two RS232 line drivers to test UART interfaces.</p> <p>Kit based on CY7C65215-32LTXI</p>	<p>CYUSBS232 reference design kit (RDK) is a low-cost kit to evaluate EZ-USB™ serial bridge controller CY7C65213. The kit, along with its hardware documentation, serves as a reference design for applications like USB-to-UART cables.</p> <p>Kit based on CY7C65213-32LTXI</p>



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USB hubs and USB Type-C port controllers

Robust interoperability, extensive charging support, and full configurability

Infinion offers a wide portfolio of hub controllers supporting USB 2.0, USB 3.x 5 Gbps, 10 Gbps and USB Type-C ports with robust backwards interoperability with legacy USB speeds. The USB 3.x hub controllers provide advanced USB-PD and battery charging capabilities, featuring up to eight downstream ports for full configurability and flexible design.

The wide portfolio offers different combinations of features to address all possible needs for notebook PCs, docking stations, TV, STB, DVR, gaming, home gateways, Wi-Fi routers, and automotive and industrial applications:

USB hub family		EZ-USB™ HX2LP	EZ-USB™ HX2VL	EZ-USB™ HX3	EZ-USB™ HX3 automotive	EZ-USB™ HX3PD
USB standard		USB 2.0 480 Mbps	USB 2.0 480 Mbps	USB 3.x 5 Gbps	USB 3.x 5 Gbps	USB 3.x 10 Gbps
Part numbers		CY7C6562x CY7C6563x	CY7C6563x CY7C65642	CYUSB330X CYUSB331X CYUSB332X CYUSB230X	CYUSB332x CYUSB330x	CYUSB4347 CYUSB4357
Nr. of downstream ports		2/4	2/4	2/4	2/4	7 (5x SS, 2x USB 2.0)
USB Type-C						✓
USB power delivery						2 PD ports
Battery charging v1.2				✓	✓	✓
ACA-dock				✓	CYUSB3324	
USB billboard						✓
Dock management controller (DMC)						✓
Multi-TT (one TT per port)			✓	✓	✓	✓
Serial interface		SPI	SPI/I ² C	I ² C	I ² C	2x I ² C/SPI
MCU				Arm® Cortex®-M0	Arm® Cortex®-M0	Arm® Cortex®-M0
Flash						2x 128KB
Multi-TT (one TT per port)			✓	✓	✓	✓
In system programming (ISP)		✓	✓	✓	✓	✓
Configurable USB PHYs				✓	✓	✓
Shared link				✓	✓	✓
Vendor command				✓	✓	
External power switch control	Individual			CYUSB3326		✓
	Ganged			CYUSB330x	CYUSB3304	
	Both			CYUSB3324	CYUSB3324	
Pin-strap				CYUSB332x	CYUSB3324	
Port indicator				CYUSB3324	CYUSB3324	
Packages		56QFN	48TQFP, 28QFN	88QFN, 68QFN	100BGA	192BGA
Temperature (-40°C - 85°C)		✓		✓	Automotive	✓



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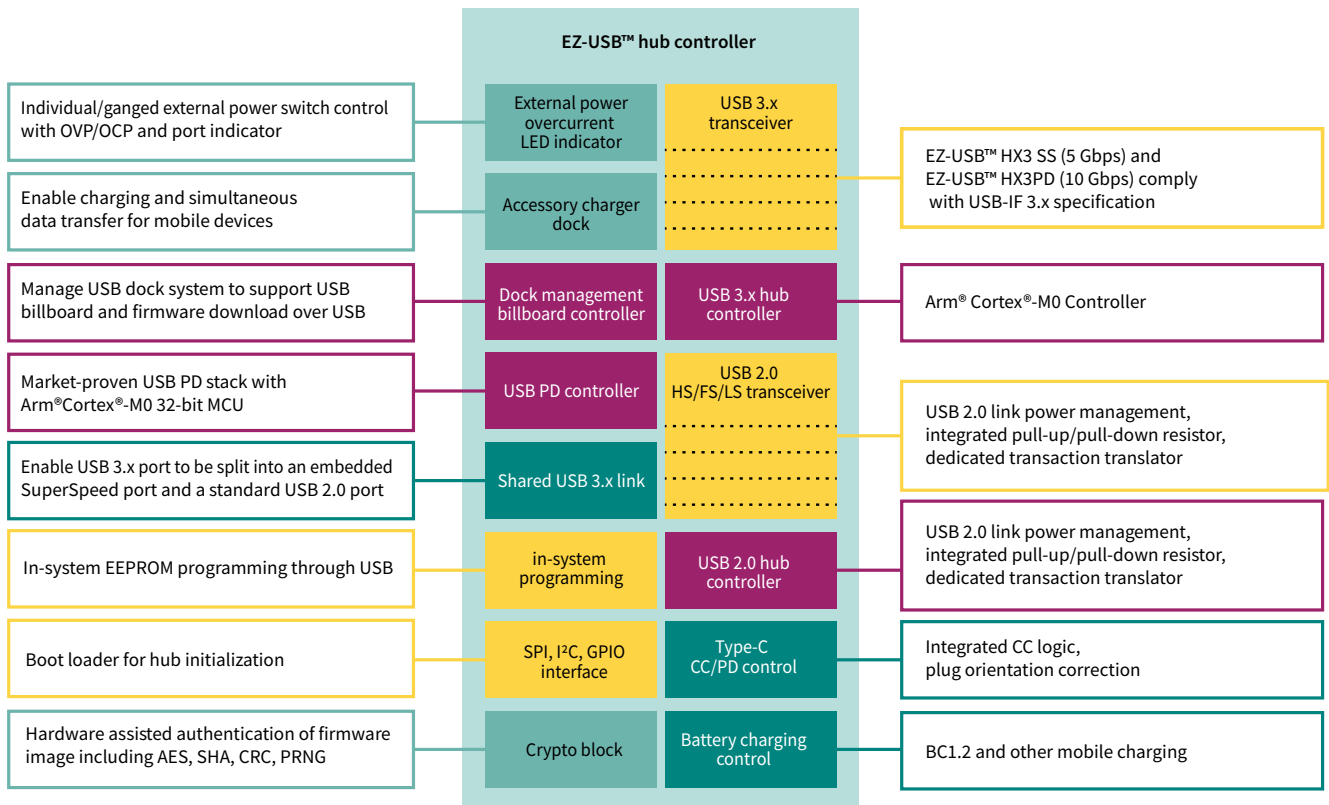
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Features



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EZ-USB™ HX3

USB 3.x 5Gbps 4-port hub controller with SS/USB 2.0 PHY shared link, DS ports charging and automotive grade

EZ-USB™ HX3 is Infineon's USB-IF-certified 4-port hub controller. It has been repeatedly tested at every USB plug-fest and in independent labs, demonstrating compatibility with all recognized host controllers, device classes, and operating systems. It supports most USB charging standards, including battery charging specification v1.2, Apple charging standard, YD/T 1591-2006 and ACA-dock. This last feature of the EZ-USB™ HX3 enables simultaneous use of USB devices connected to the downstream ports and charging of a smartphone or tablet that supports USB OTG. Without a host attached to the upstream port, it also supports battery charging on the downstream ports.

The configurable USB 5 Gbps and USB 2.0 PHY of the EZ-USB™ HX3 enhance signal quality, giving board designers more flexibility and simplifying USB-IF compliance. EZ-USB™ HX3 also supports shared USB link, a proprietary feature that doubles the number of USB ports, creating 8 ports from a 4-port hub controller.

Features/Part	CYUSB3302	CYUSB3304	CYUSB3312	CYUSB3314	CYUSB3324	CYUSB3326	CYUSB3328	CYUSB2302	CYUSB2304
Number of DS ports	2 (USB 3.0)	4 (USB 3.0)	2 (USB 3.0)	4 (USB 3.0)	4 (USB 3.0)	6 (4 SS, 2 USB 3.0, 2 USB 2.0)	8 (4 SS, 4 USB 2.0)	2 (USB 2.0)	4 (USB 2.0)
Number of shared links ports	0	0	0	0	0	2	4	0	0
BC v1.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ACA-dock	No	No	No	No	Yes	No	Yes	No	No
External power switch control	Ganged	Ganged	Individual and ganged	Individual and ganged	Individual and ganged	Individual	Individual	Ganged	Ganged
Pin-strap support	No	No	Yes	Yes	Yes	Yes	Yes	No	No
I2C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vendor command	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Port indicators	No	No	Yes	Yes	Yes	No	n	No	No
Packages	"68-QFN, 100-ball BGA"	"68-QFN, 100-ball BGA"	"88-QFN, 100-ball BGA"	"88-QFN, 100-ball BGA"	"88-QFN, 100-ball BGA"	"88-QFN, 100-ball BGA"	"88-QFN, 100-ball BGA"	"68-QFN, 100-ball BGA"	"68-QFN, 100-ball BGA"
Temperature range	Industrial, commercial and automotive	Industrial, commercial and automotive	Industrial and commercial	Industrial, commercial and automotive	Industrial, commercial and automotive	Industrial and commercial	Industrial (88-QFN only) and commercial	Industrial, commercial and automotive	Industrial, commercial and automotive



Automotive



Desktop



Dock



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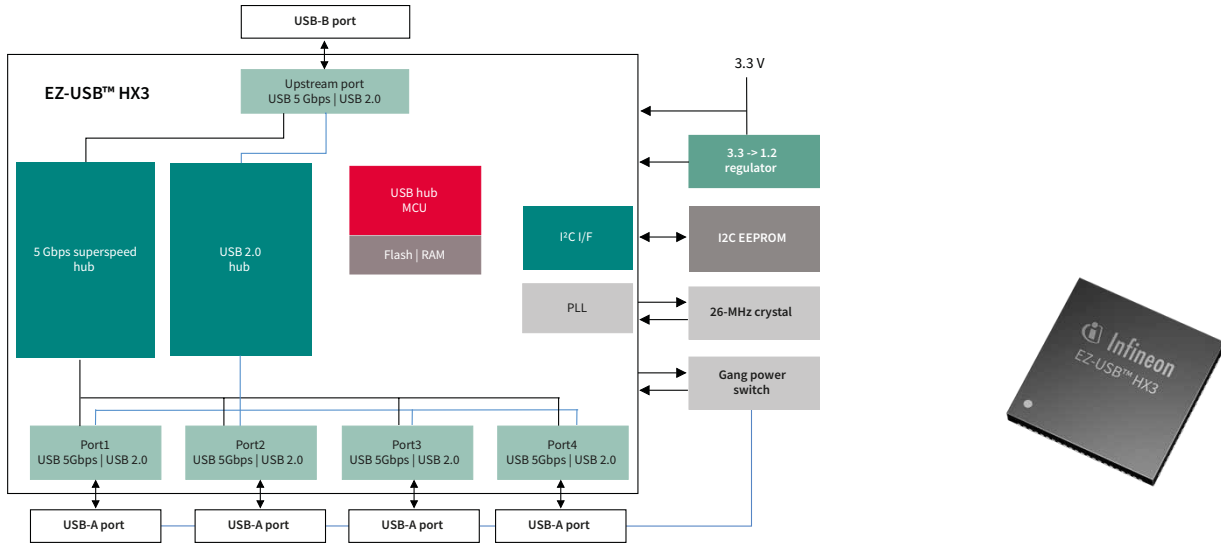
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Block diagram



Features and benefits

Key features	Key benefits
– Compliance with USB 3.2 Gen 1 (USB-IF and WHQL certified)	– Supports up to 4 USB 3.0 compliant DS ports
– Shared link feature (supports simultaneous USB 2.0 and SuperSpeed USB devices on the same port)	– Enables extra downstream (DS) ports for on-board connections in embedded applications
– Enables USB charging while the hub is disconnected from a hub host	– Enables charging of devices connected to the DS ports when no host is connected on the upstream (US) port
– Supports BC v1.2 and Apple charging	– Easy-to-customize configuration parameters
– Allows firmware upgrades using I2C EEPROM or an external I2C master	– High quality and reliability
– Integrated ARM® Cortex®-M0 CPU	
– LED status indicators – suspend, SS, and USB 2.0 operation	

Boards

EZ-USB™ HX3 CY4613	EZ-USB™ HX3 CY4609	EZ-USB™ CY4603
It's a development kit aimed to demonstrate EZ-USB™ HX3's shared link feature in a 6-port configuration supporting ACA-dock functionality.	It's a reference design kit that can be used as a reference design for standalone USB 3.0 hub applications.	It's a development kit that demonstrates EZ-USB™ HX3's application in a 4-port 3.0 USB hub.

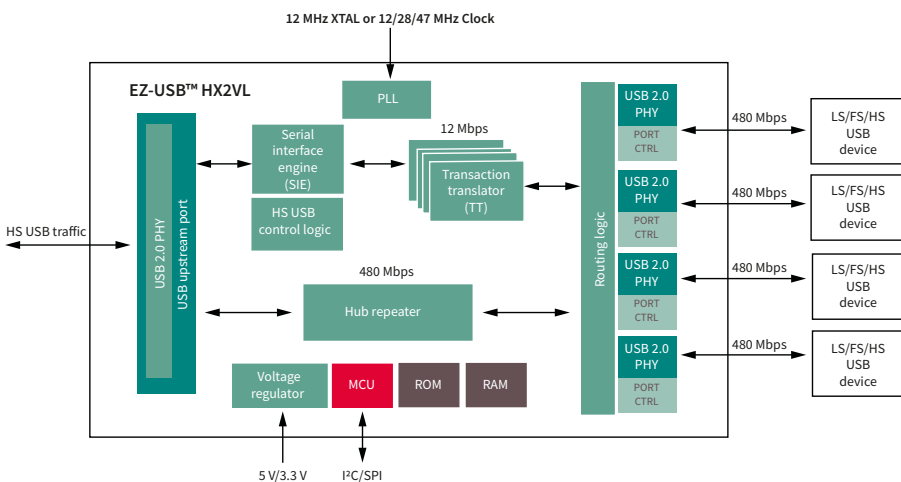
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EZ-USB™ HX2LP and HX2VL hub controllers

4-port single- and multi-TTs hub USB controllers

Infineon’s EZ-USB™ HX2LP and HX2VL are Infineon’s first-generation high-speed hub controllers available in 2-port and 4-port versions. These USB 2.0 hub controllers have integrated upstream and downstream transceivers, a USB serial interface engine (SIE), USB hub control and repeater logic, and TT logic. Many of its external passive components such as pull-ups and pull-down resistors are integrated into the chip, significantly reducing the overall bill of materials required to implement a hub design.

Family	Part number	Number of ports	Number of TTs	I/O options	Temperature grade
EZ-USB™ HX2VL	CY7C65634	2	Single	SPI, I ² C, GPIO	Commercial
	CY7C65632	4	Single		
	CY7C65642	4	Multi		
EZ-USB™ HX2LP	CY7C65620/1	2	Single	SPI	Commercial, industrial
	CY7C65630/1	4	Single		



Features and benefits

- Key features**
- Up to 4 downstream ports
 - Very low power consumption (82 mA)
 - Integrated internal regulator, pull-up and pull-down resistors for all downstream ports
 - Selectable XTAL/CLK inputs, power switch polarity, EEPROM interface
 - VID, PID configurable through external EEPROM
 - Integrated ARM® Cortex®-M0 CPU
 - LED status indicators – suspend, SS, and USB 2.0 operation

- Key benefits**
- Reduced area
 - Reduced BOM



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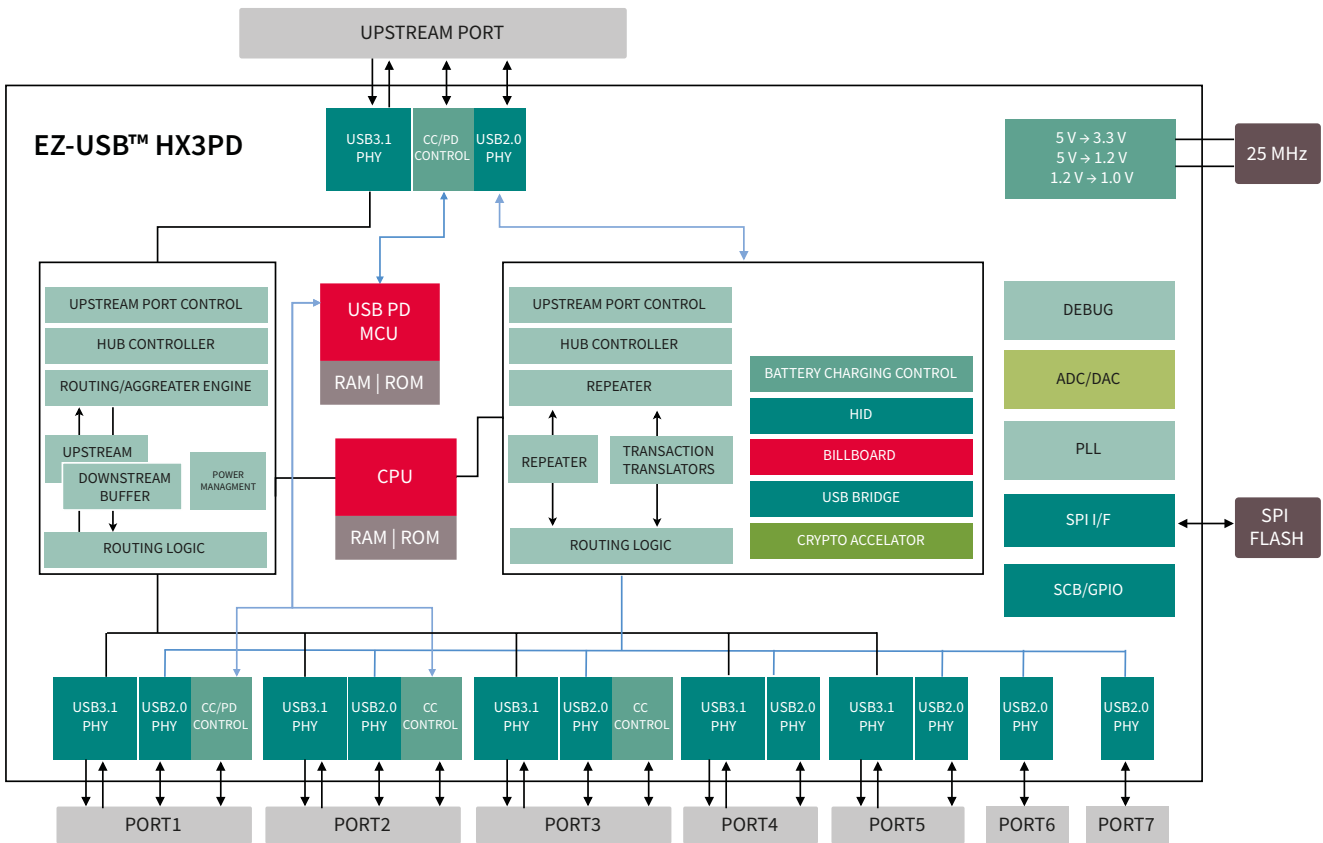
EZ-USB™ HX3PD

Industry's first 7-port USB 10Gbps hub controller with power delivery

EZ-USB™ HX3PD is the industry's first 7-port USB 10Gbps Type-C hub controller with power delivery, supporting two USB-C + PD ports (one upstream and one downstream), and five downstream USB 10Gbps ports.

With five chips (two 4-port USB hub controllers, two USB PD controllers, and a dock management controller) integrated into one, EZ-USB™ HX3PD is the most integrated USB 10Gbps hub in the market. This leads to a significant reduction of BOM component cost and PCB footprint, which makes EZ-PD™ HX3PD a perfect fit for USB-C dongles, docks, and monitors. Configurable shared USB 10 Gbps and USB 2.0 PHY functionality can improve USB 10Gbps signal transmission quality, allowing board designers more freedom and simplifying USB-IF compliance.

Block diagram



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Features and benefits

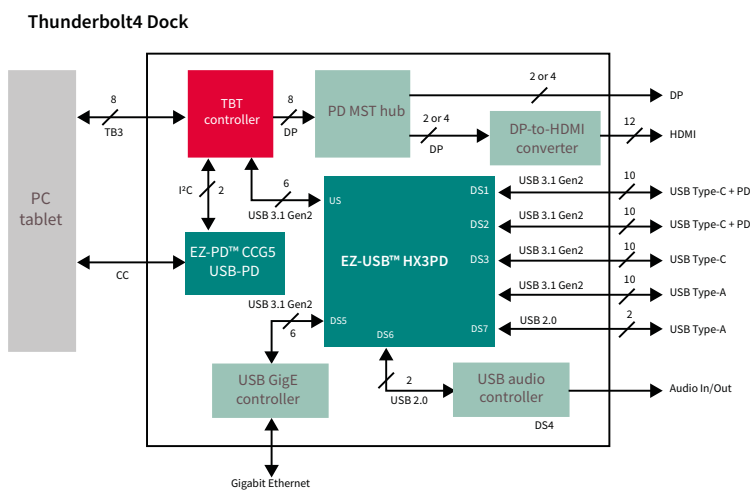
Key features

- Compliant with USB 3.1 gen 2
 - Upstream (US): 10 Gbps; Type-A or Type-C plus PD
 - Downstream (DS): 7 ports; 5x 10 Gbps, 2x 480 Mbps; 1 Type-C Plus PD, 2 Type-C only and 4 Type-A ports
- Integrated DFP (RP) and UFP (RD) termination resistors
- Integrated billboard controller
- Charging support: BC v1.24, Apple Charging standard
- PD policy engine configures power profiles dynamically
- Charging DS without US connection
- Optional signed firmware upgradable via dock management controller (DMC)

Key benefits

- USB-IF compliant 2x4-port USB hubs with 2x USB-PD 3.0
- Integrated total five chips into a single chip for BOM components and PCB board size reduction
- Integrated Crypto AES/SHA/CRC blocks for secured firmware upgrades via dock management controller
- Intel USB4 / Thunderbolt 4 Dock reference design available
- Support USB PD 3.0, BC1.2, Apple, Samsung, and QC 4.0 charging standards
- Provides USB PHY configurability to compensate signal loss over PCB traces

Application diagram



EZ-USB™ HX3PD allows to solve several challenges in the development of Thunderbolt docks designs such as:

- Thunderbolt dock design is complex, requiring many discrete components
- Thunderbolt dock requires pre-approved USB-PD controller and a large BOM
- USB-C dock must support USB PD and all legacy charging standards
- USB 3.1 Gen2 signal integrity is difficult to handle at 10 Gbps
- USB 3.1 Gen2 and PD need FW upgrade to keep pace with USB spec changes

Boards

EZ-USB™ HX3PD CY6611

This evaluation kit is based on the CYUSB4347-BZXC, a 7-port evaluation kit designed to demonstrate the USB 3.1 Gen 2 hub, USB PD 3.0, and USB battery charging (BC 1.2) functionalities.



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Infineon support for USB-C controllers and peripherals

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/universal-serial-bus
community.infineon.com
mycases.infineon.com



Support



Evaluation board



Tools



Power management ICs

- XDP™ SMPS controllers
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- PFC controllers
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- Resonant LLC half-bridge controller ICs
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- Power modules
- Audio amplifier ICs
- AC-DC LED driver ICs
- DC-DC LED driver ICs
- iMOTION™ integrated motor control solutions
- MOTIX™ motor control ICs

XDP™ SMPS

IDP2308 and IDP2303A – digital multimode PFC+LLC combo controller

The IDP2308 and IDP2303A are high-performance digital combo controllers with integrated drivers and a 600 V depletion cell designed for boost PFC and half-bridge LLC targeting switched mode power supplies (SMPS) from 75 to 300 W.

- Support non-AUX operation with the lowest standby performance and start-up cell
- Support multimode PFC operation for optimized efficiency curve
- Configurable frequency setting for LLC soft-start and normal operation
- Synchronous PFC and LLC burst mode control with soft-start to prevent acoustic noise
- Excellent dynamic response by adaptive LLC burst mode
- Configurable and comprehensive protections for PFC/LLC/IC temperature
- IEC62368-1 certified active X-cap discharge function
- Flexible IC parameter setting with digital UART interface supports PSU platform approach

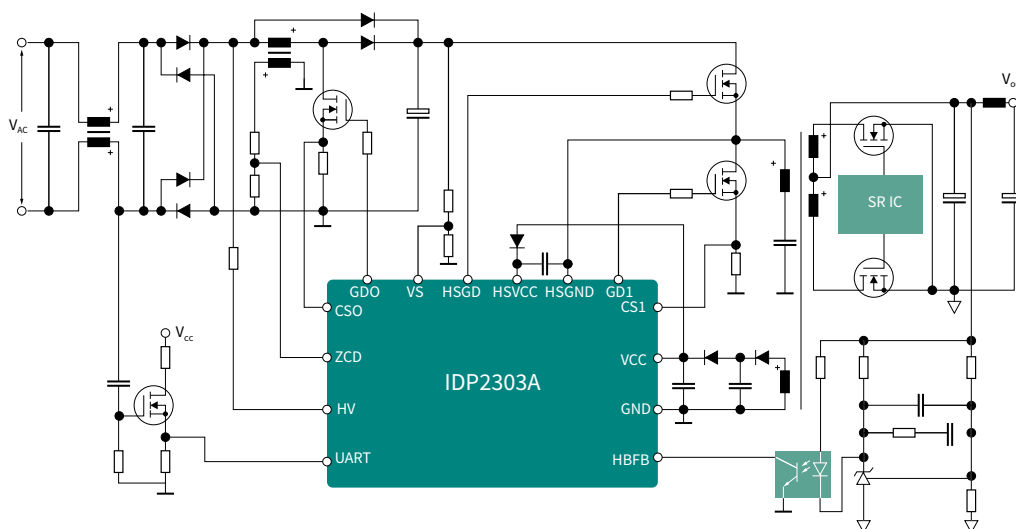
Key benefits

- Low BOM count due to high integration of digital control
- No auxiliary power supply needed
- Easy design of system schematic and PCB layout
- Small form factor design
- Higher system reliability
- Shorter development cycles and higher design and production flexibility



Product	Target application	Major difference	Package
IDP2308	TV embedded PSU	2 nd redundant PFC output overvoltage protection	DSO-14 (with enhanced HV creepage distance)
IDP2303A	Adapter, general SMPS	Constant output voltage	DSO-16

IDP2303A – power adapter



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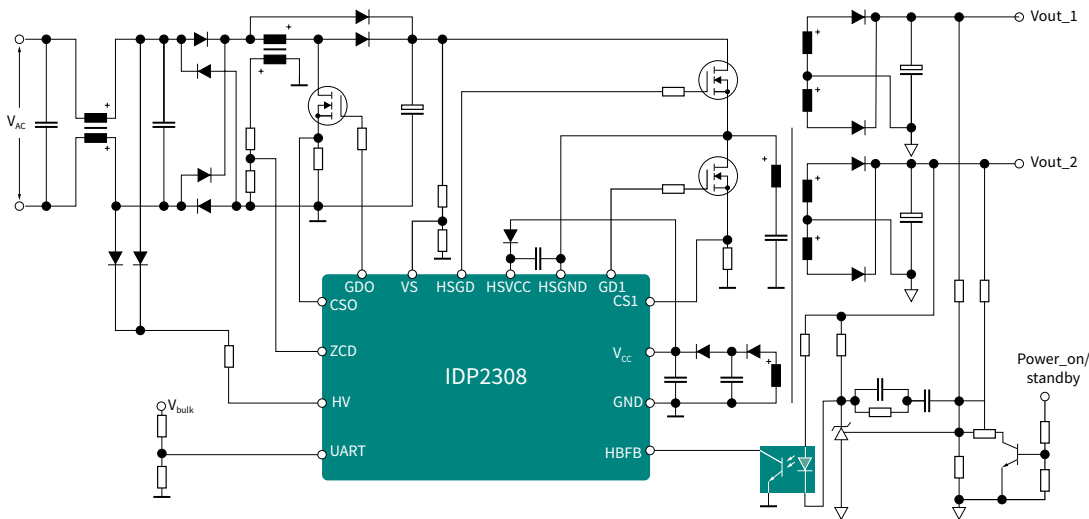
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IDP2308 – embedded PSU



Target applications

- LCD TV power supply
- General SMPS
- Power adapter



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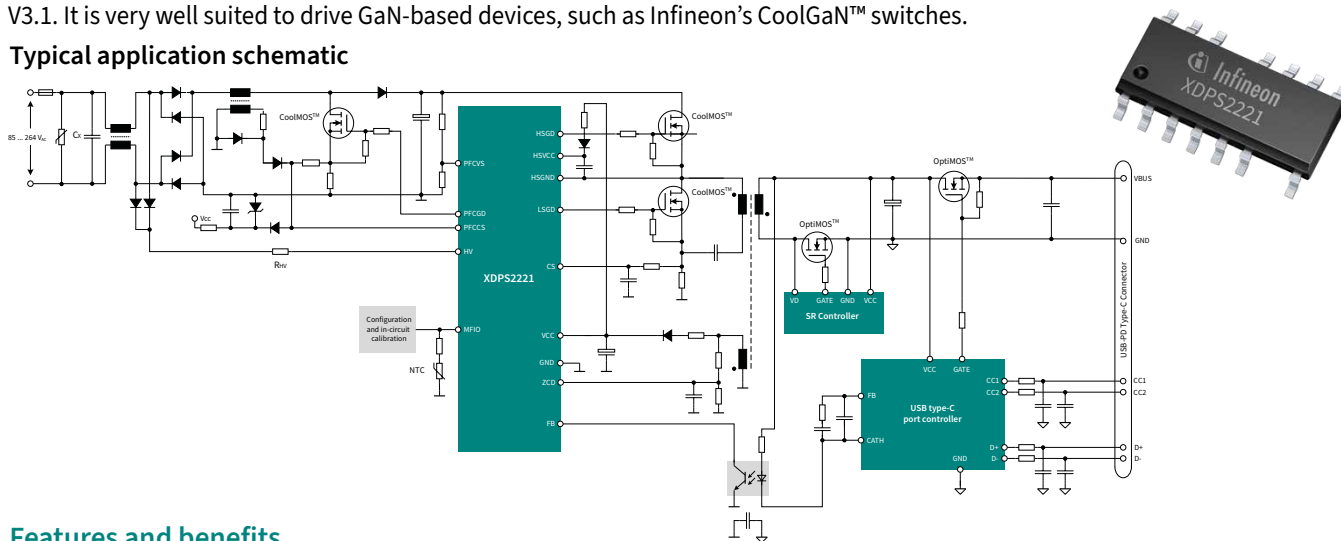
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XDP™ SMPS

XDPS2221 - digital hybrid flyback combo controller

The XDP™ digital power XDPS2221 is a highly integrated device combining PFC boost and hybrid flyback (HFB) (asymmetrical half-bridge as from literature) conversion features. The high level of integration allows for seamless operation and optimal control of the two conversion stages, delivering class-leading performance. This innovative controller enables high power density designs and high system efficiency, meeting international regulatory standards on power efficiency (such as EU CoC Version 5 Tier 2 and DoE Level VI) as well as an effective control of the wide output voltage for the latest USB-PD extended power range (EPR) standard V3.1. It is very well suited to drive GaN-based devices, such as Infineon's CoolGaN™ switches.

Typical application schematic

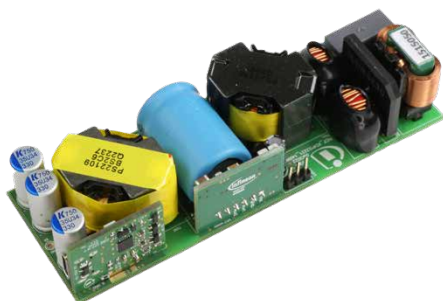


Features and benefits

Key features
- IEC62368-1 certified active X-cap discharge function
- High-performance multi-mode PFC with critical conduction mode operation
- High efficiency multi-mode hybrid-flyback topology with adaptive resonant period
- Supports USB-PD standard V3.1 extended power range (EPR) with wide output voltage up to 28 V
- Highly integrated combo controller for the PFC and hybrid flyback topology, including a 600 V start-up cell with X-cap discharge functionality
- DSO-14 (150-mil) package

Key benefits
- Low no-load input standby power performance
- Low BOM cost and count
- Low standby and high efficiency across various line/load conditions
- High power density and high switching frequency
- Easily configurable
- Optimization via GUI tools

REF_XDPS2221_140W1



140 W reference design with PFC + hybrid flyback combo IC XDP™ XDPS2221 and CoolGaN™ GIT HEMTs:

This is a 140 W USB-PD type-C charger reference design. It demonstrates the high performance of the PFC + hybrid flyback combo controller XDP™ digital power XDPS2221 together with CoolGaN™ switches for wide input AC and wide output voltage applications. Besides the combo IC XDPS2221, it features three CoolGaN™ power transistors 650 V as PFC and HFB main switches, OptiMOS™ BSC040N10NS5 as SR switch, the EZ-PD™ CCG3PA controller CYPD3175 serves as the USB-PD controller, and the HEXFET™ IRF7240 as load switch.

Ordering code: REF XDPS2221140W1TOB01

For design support material, please click here.

Target applications:

- Adapters and chargers
 - with ultra-high power density
 - with extended power range (EPR)



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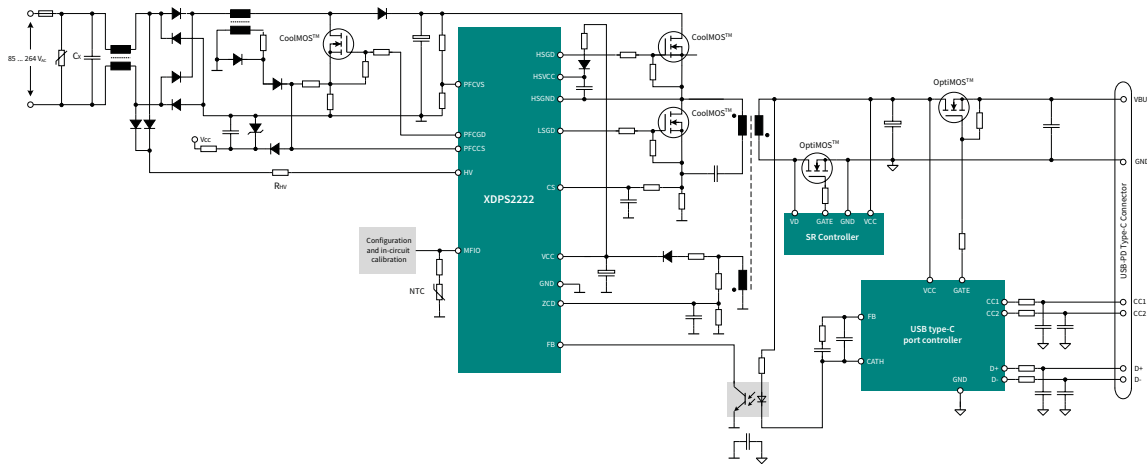
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XDP™ SMPS

XDPS2222 – digital hybrid flyback combo controller

The XDP™ digital power XDPS2222 is a highly integrated device combining PFC boost and hybrid flyback (HFB) (asymmetrical half-bridge as from literature) conversion features. The high level of integration allows for seamless operation and optimal control of the two conversion stages, delivering class-leading performance. This innovative controller enables high power density designs and high system efficiency, meeting international regulatory standards on power efficiency (such as EU CoC Version 5 Tier 2 and DoE Level VI) as well as effective control of the wide output voltage up to 48 V for the latest USB-PD extended power range (EPR) standard V 3.1.



Features and benefits

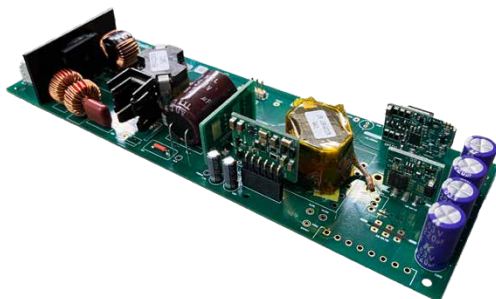
Key features

- High-performance multi-mode PFC with critical conduction mode operation
- High-efficiency multi-mode hybrid-flyback topology
- High-efficiency multi-mode hybrid-flyback topology
- Combo controller including a 600 V start-up cell
- DSO-14 (150-mil) package

Key benefits

- Low no-load input standby power performance, meets DoE-7 standards
- Low BOM cost and count
- Low standby and high efficiency across various line/load conditions
- High power density and high switching frequency
- Easily configurable

REF_XDPS2222_240W1



XDP™ XDPS2222: PFC + hybrid flyback combo IC for 240 W USB PD form factor reference design:

- HFB ZVS operation of high- and low-side
- Fast responding HFB peak current control
- Harmonized PFC and HFB operations
- 240 W output power
- High system efficiency and high-power density design



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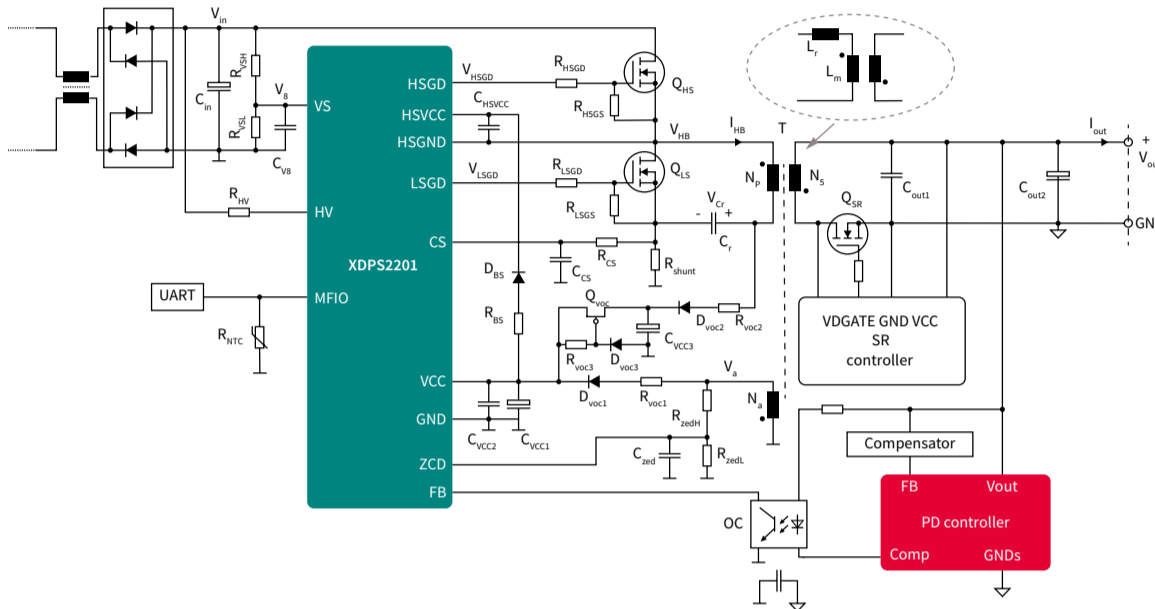
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XDP™ SMPS

XDPS2201 – digital hybrid flyback controller

XDPS2201 is a multimode, digital configurable hybrid flyback controller that combines the simplicity of a traditional flyback topology with the performance of a resonant converter. By utilizing two high-voltage MOSFETs, such as CoolMOS™, the controller can drive both high- and low-side MOSFETs in an asymmetric half-bridge flyback topology. Both zero voltage and current switching are achieved through means of regulating the polarity of the magnetizing current to increase efficiency. Also, transformer leakage energy is recycled, thereby further increasing efficiency.



Features and benefits

Key features
– Zero voltage and current switching across all line and load conditions
– Multimode operation (active burst mode, DCM, ZV-RCS, and CRM)
– Integrated high-side driver and 600 V start-up cell
– Single auxiliary transformer winding and resonant cap to supply power to IC
– Comprehensive suite of protection feature sets
– Digital platform with configurable parameters

Key benefits
– Reduce switching loss and achieve high efficiency
– Optimize efficiency across various line/load conditions
– Optimize light and no-load efficiency
– Save BOM count and cost with no messy external driver
– Easy to drive, low cost, and widely available off the shelf 60 V MOSFET
– Fail-safe mechanism to limit output power in the event of PD controller failure
– Avoid CCM operation and no potential of shoot-through with SR MOSFET

DEMO_XDPS2201_65W1



65 W USB-PD PPS Type-C demo board in a miniature form factor based on XDPS2201.

- Up to 65 W output power with 31 W/in³ power density
- Universal input range 90~264 V_{AC}
- Supported output: 5 V/3 A, 9 V/3 A, 12 V/3 A, 15 V/3 A and 20 V/3.25 A, 5~20 V/3 A
- Peak efficiency of more than 93.8 percent
- Low no-load standby input power of less than 75 mW OR Low no-load standby input power (less than 75 mW)

Ordering code: DEMOXDPS220165W1TOB01

REF_XDPS2201_170W_BPA



170 W AC-DC reference design with input voltage range for e-bike and power tool battery chargers

Features

- 170 W output power
- Output voltage range from 18 to 42 V
- Up to 95% at full load
- Aimed for 24 V and 36 V battery packs

Ordering code: REF XDPS2201170WBPA2TOB01



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AC-DC power management ICs

Technology leadership in power supply

By offering a wide variety of highly efficient control ICs, we enable our customers to meet new demands like PFC regulations and ultralow standby power requirements in a very cost-effective way. A comprehensive array of safety features helps to minimize the number of external components, reduces design in time, and improves the reliability of the SMPS.



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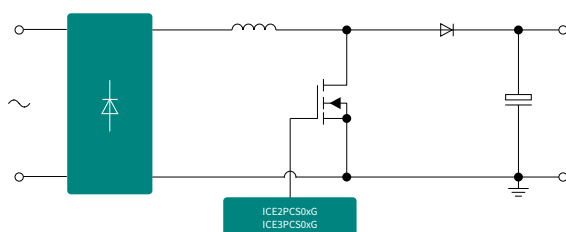
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Continuous conduction mode (CCM) PFC ICs

High efficiency and very low system cost

Compared to the first generation of ICE1PCS01/02, the second generation of CCM PFC controller ICs, ICE2PCS01/02, have lower internal reference trimmed at 3 V. They also have other advantages such as a wider V_{CC} operating range, an improved internal oscillator, and additional direct bulk capacitor overvoltage protection. Compared to the first and second generations of ICE1PCS0x and ICE2PCS0x, the third generation of CCM PFC has the lowest internal reference trimmed at 2.5 V and integrated digital control voltage loop. The third generation also features a low peak current limit at 0.2 V, an adjustable gate switching frequency range from 21 to 100 KHz, and can synchronize with an external frequency range from 50 kHz to 100 kHz. The third generation can now to achieve 95 percent efficiency at full load for the entire input voltage range.

Application diagram



2nd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Lowest count of external components
- Adjustable and fixed switching frequencies
- Frequency range from 20 to 250 kHz
- Versions with brown-out protection available
- Wide input range supported
- Enhanced dynamic response during load jumps
- Cycle-by-cycle peak current limiting
- Integrated protections OVP, OCP
- DIP-8 and DSO-8
- Lead-free, RoHS compliant

3rd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Integrated digital voltage loop compensation
- Boost follower function
- Bulk voltage monitoring signals, brown-out
- Multi protections such as double OVP
- Fast output dynamic response during load jump
- External synchronization
- Extra-low peak current limitation threshold
- SO8 and SO-14
- Lead-free, RoHS compliant

	ICE2PCS01G ICE2PCS05G	ICE2PCS02G ICE2PCS03G	ICE3PCS03G	ICE3PCS02G	ICE3PCS01G
Digital control voltage loop		–	✓	✓	✓
Variable frequency	✓	–	✓	✓	✓
Synchronous frequency		–	✓	✓	✓
Open loop protection	✓	✓	✓	✓	✓
Low peak current limit	-1 V	-1 V	-0.4 V	-0.4 V	-0.2 V
Brown-out protection	–	✓	✓	–	✓
Overvoltage protection	✓	✓	✓	✓	✓
Second overvoltage protection		–		✓	✓
PFC enable function			–		✓
Boost follower mode			–		✓
5 V regulator			–		✓



TV



PC power



Server



Telecom



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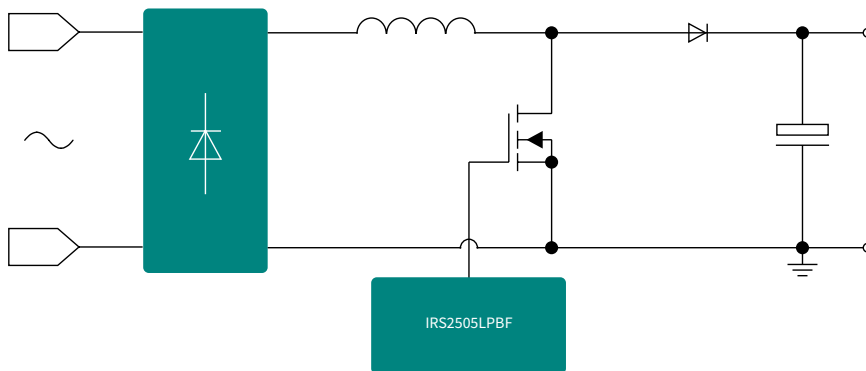
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Critical conduction mode (CrCM) PFC

Easy design and lowest system cost

Fully compatible with the world standard, these devices are optimized to offer extremely compact and cost-effective PFC solutions for electronic ballast and offline SMPS.

Application diagram



IRS2505LPBF

- Critical conduction mode PFC control
- High power factor and ultralow THD
- Wide load and line range
- Regulated and programmable DC bus voltage
- No secondary winding required
- MOSFET cycle-by-cycle overcurrent protection
- DC bus overvoltage protection
- Low EMI gate drive
- Ultralow start-up current
- 20.8 V internal Zener clamp on V_{CC}
- Excellent ESD and latch immunity
- RoHS compliant
- 5-pin SOT-23 package



SMPS



PC power



Desktop



Server



Adapter



Lighting



TV



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PFC controller portfolio

Critical conduction mode (CrCM) PFC IC portfolio

Product	V_{CC} min.	V_{CC} max.	Package
IRS2505L	9 V	20.8 V	SOT-23

Continuous conduction mode PFC ICs

2nd generation continuous conduction mode PFC IC product portfolio

Product	Frequency - f_{sw}	Current drives	Package
ICE2PCS01G	50-250 kHz	2.0 A	DSO-8
ICE2PCS02G	65 kHz	2.0 A	
ICE2PCS03G	100 kHz	2.0 A	
ICE2PCS05G	20-250 kHz	2.0 A	

3rd generation continuous conduction mode PFC IC product portfolio

Product	Frequency - f_{sw}	Current drives	Features	Package
ICE3PCS01G	Adjustable	0.75 A	OVP+brown-out	SO-14
ICE3PCS02G		0.75 A	OVP	SO-8
ICE3PCS03G		0.75 A	Brown-out	SO-8



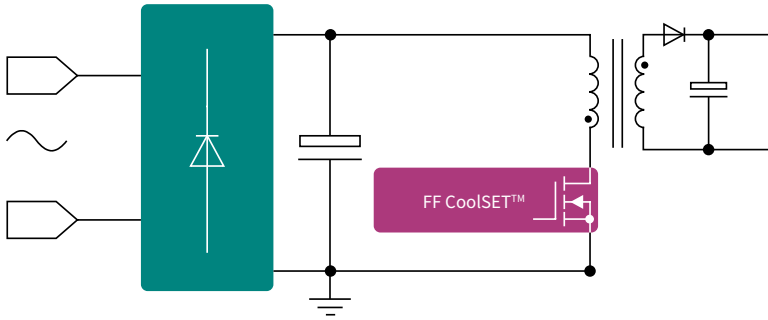
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5th generation fixed-frequency PWM IC and CoolSET™



- Integrated CoolMOS™ in 700 V, 800 V, and 950 V MOSFETs
- Cascode configuration for brown-in protection, fast and robust start-up
- Available in 65 kHz, 100 kHz, and 125 kHz fixed switching frequency
- Frequency reduction in tandem with load reduction to increase efficiency
- Selectable active burst mode entry/exit profile to optimize standby power and ability to disable
- Supports CCM flyback operation with built-in slope compensation
- Integrated error amplifier for direct feedback non-isolated flyback and buck
- Adjustable line input overvoltage protection (only ICE5xRxxxxAG and ICE5xRxxxxCZ)
- V_{CC} pin short-to-ground protection
- Auto restart protection mode to minimize interruption of operation
- DSO-8 package (stand-alone controller), DIP-7 and DSO-12 package for CoolSET™

5th generation fixed-frequency CoolSET™



Output power ¹⁾ 85 V _{AC} ~300 V _{AC} T _a =50°C		15 W	17 W	23 W	27 W	40 W
R _{DS(on),max.}		5.18 Ω	4.05 Ω	2.35 Ω	1.75 Ω	0.80 Ω
700 V	DIP-7	ICE5AR4770BZS				
	DSO-12	ICE5AR4770AG				
800 V	DIP-7	ICE5AR4780BZS ICE5BR4780BZ		ICE5AR2280CZ ICE5BR2280BZ		ICE5AR0680BZS
	DSO-12	ICE5GR4780AG		ICE5GR2280AG	ICE5GR1680AG	ICE5AR0680AG
950 V	DIP-7		ICE5AR3995BZ ICE5BR3995BZ ICE5BR3995CZ			

3rd generation fixed-frequency CoolSET™

Output power ¹⁾ 85 V _{AC} ~300 V _{AC} T _a =50°C		10~15 W	19~21 W	23~26 W	30~34 W	37~41 W
R _{DS(on),max.}		11.1~5.44 Ω	3.42~2.62 Ω	1.96~1.71 Ω	1.11~1.05 Ω	0.75~0.71 Ω
650 V	DIP-7	ICE3RBR4765JZ		ICE3RBR1765JZ		ICE3RBR0665JZ
	DIP-8	ICE3BR4765J	ICE3A1065ELJ	ICE3BR1765J	ICE3A2065ELJ	ICE3BR0665J
	DSO-12	ICE3RBR4765JG		ICE3RBR1765JG		ICE3RBR0665JG
800 V	DIP-7	ICE3AR4780JZ	ICE3AR2280JZ	ICE3AR1580VJZ	ICE3AR1080VJZ	ICE3AR0680JZ
		ICE3AR4780VJZ	ICE3BR2280JZ			ICE3BR0680JZ
		ICE3AR4780CJZ	ICE3AR2280VJZ			ICE3AR0680VJZ
		ICE3AR10080CJZ	ICE3AR2280CJZ			
	DSO-12	ICE3AR4780JG	ICE3AR2280JG		ICE3AR1080JG	



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1) Calculated DCM maximum output power in an open-frame design based on T_a=50°C and T_j=125°C without copper area as heatsink



Fixed-frequency PWM IC

FF PWM IC	Gen5		Gen3	
	ICE5ASAG	ICE5GSAG	ICE3AS03LJG	ICE3BS03LJG
Package	DSO-8		DSO-8	
Switching frequency	100 kHz	125 kHz	100 kHz	65 kHz
Operating temperature	-40°C~129°C		-25°C~130°C	
Start-up cell	Cascode		✓	
V _{cc} on/off threshold	16 V/10 V		18 V/10.5 V	
Soft-start time	12 ms		10 ms	20 ms
Frequency jittering	✓		✓	
Modulated gate drive	✓		✓	
Active burst mode	✓ (3-level selectable)		✓	
Slope compensation for CCM	✓		-	
Frequency reduction	✓		-	
Integrated error amplifier for direct feedback	✓		-	
Adjustable line input overvoltage protection	✓ with auto restart		-	
Adjustable brown-in protection	✓ with auto restart		-	
V _{cc} pin short-to-ground protection	✓ (no start-up)		-	
V _{cc} undervoltage protection	✓ with auto restart		✓ with auto restart	
V _{cc} overvoltage protection	✓ with auto restart		✓ with latch-up	
Overload/open loop protection	✓ with auto restart		✓ with auto restart	
Overtemperature protection	✓ with auto restart and hysteresis		✓ with latch-up	
External blanking time extension	-		✓ with auto restart	
External protection enable pin	-		✓ with latch-up	



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Fixed-frequency CoolSET™

	700 V CoolSET™		650 V CoolSET™	
	Gen5 ICE5ARxx70AG(BZS)	Gen3 ICE3ARxx65ELJ	Gen3R ICE3BRxx65J	Gen3R ICE3RBRxx65JZ(G)
Package	DIP-7, DSO-12		DIP-8	
Output power range	15 W		15 W-41 W	
Operating temperature range	-40°C~129°C		-25°C~130°C	
Switching frequency	100 kHz		65 kHz	
Frequency reduction	✓		-	
Integrated error amplifier	✓		-	
Slope compensation for CCM mode	✓		-	
V _{cc} on/off threshold	16 V/10 V		18 V/10.5 V	
Soft-start time	12 ms		20 ms	
Active burst mode selection	3 level		1 level	
V _{cc} pin short-to-ground protection	No start-up		-	
V _{cc} overvoltage protection	Auto restart		Latch	
Overtemperature protection	Auto restart with hysteresis		Latch	
External protection enable pin	-		Latch	
Adjustable brown-in/-out protection	Brown-in only		-	
Adjustable line input overvoltage protection	Only ICE5ARxx70AG		-	
Fast AC reset	-			
Product available	ICE5AR4770AG ICE5AR4770BZS		ICE3A1065ELJ ICE3A2065ELJ	
			ICE3BR4765J ICE3BR1765J ICE3BR0665J	
			ICE3RBR4765JZ ICE3RBR1765JZ ICE3RBR0665JZ ICE3RBR4765JG ICE3RBR1765JG ICE3RBR0665JG	

	800 V CoolSET™						950 V CoolSET™	
	Gen3R ICE3A(B)Rxx80JZ	Gen3R ICE3ARxx80CJZ	Gen3R ICE3ARxx80JG	Gen3R ICE3ARxx80VJZ	Gen5 ICE5BRxx80BZ	Gen5 ICE5ARxx80AG(BZS)	Gen5 ICE5GRxx80AG	Gen5 ICE5BRxx95xZ
Package	DIP-7		DSO-12		DIP-7		DIP-7	
Output power range	10 W-40 W		11 W-23 W		14 W-30 W		15 W-39 W	
Non-isolated buck output current range					450 mA~700 mA		550 mA	
Operating temperature range	-25°C~130°C		-40°C~130°C		-40°C~129°C		-40°C~129°C	
Switching frequency	100 kHz/65 kHz		100 kHz		65 kHz		100 kHz	
Frequency reduction	-		-		✓		✓	
Integrated error amplifier	-		-		✓		✓ (except ICE5ARxx80CZ)	
Slope compensation for CCM mode	-		✓		-		✓	
V _{cc} on/off threshold	17 V/10.5 V		17 V/10.5 V		16 V/10 V		16 V/10 V	
Soft-start time	10 ms		10 ms		12 ms		12 ms	
Active burst mode selection	4-level		3-level		4-level		3-level	
V _{cc} pin short-to-ground protection	-		-		No start-up		No start-up	
V _{cc} overvoltage protection	Auto restart		Auto restart		Auto restart		Auto restart	
Overtemperature protection	Auto restart with hysteresis		Auto restart with hysteresis		Auto restart with hysteresis		Auto restart with hysteresis	
External protection enable pin	Auto restart		Latch		Auto restart		-	
Adjustable brown-in/-out protection	Auto restart		-		Brown-in only		Brown-in	
Adjustable line input overvoltage protection	-		Auto restart		Yes (except ICE5ARxx80BZS)		Auto restart	
Fast AC reset	-		✓		-		-	
Product available	ICE3AR10080JZ ICE3AR4780JZ ICE3AR2280JZ ICE3AR0680JZ ICE3BR2280JZ ICE3BR0680JZ		ICE3AR10080CJZ ICE3AR4780CJZ ICE3AR2280CJZ		ICE3AR4780JG ICE3AR2280JG ICE3AR1080JG		ICE3AR4780VJZ ICE3AR2280VJZ ICE3AR1580VJZ ICE3AR1080VJZ ICE3AR0680VJZ	
					ICE5BR4780BZ ICE5BR2280BZ		ICE5AR0680AG ICE5AR4780BZS ICE5AR2280CZ ICE5AR0680BZS	
					ICE5GR4780AG ICE5GR2280AG ICE5GR1680AG		ICE5BR3995BZ ICE5BR3995CZ	
							ICE5AR3995BZ	

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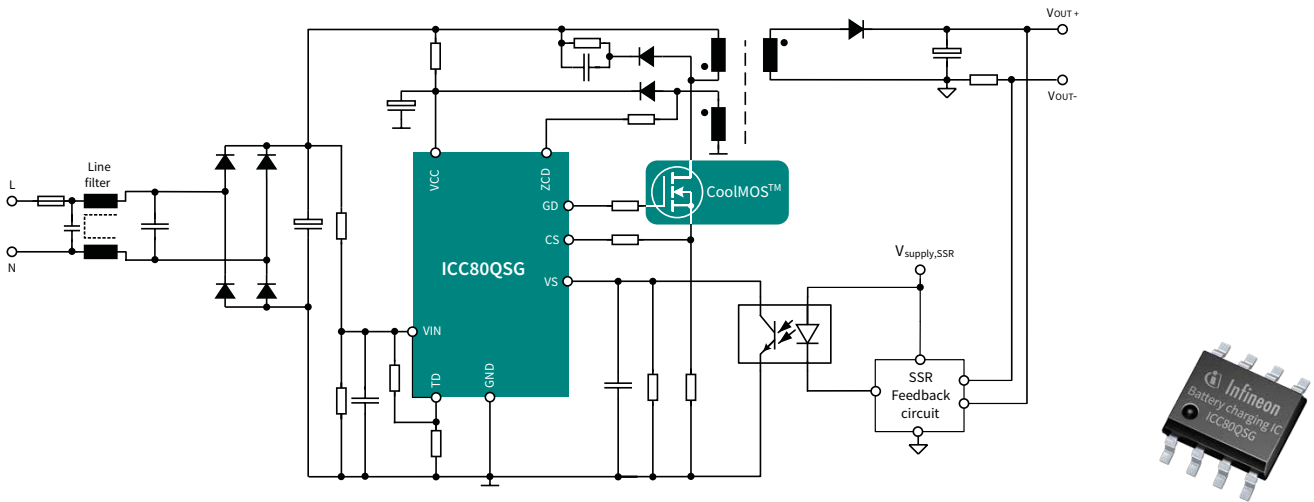
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ICC80QSG

Single-stage flyback controller IC for battery charging

The ICC80QSG is a PWM controller for flyback topologies operating in quasi-resonant mode and valley-switching DCM to achieve high power transfer efficiency across a wide operating range. The IC offers a wide power range and a comprehensive set of protections for battery charging applications. It is easy to design and requires a minimum number of external components. The gate driver current enables reasonable designs up to 130 W with state-of-the-art MOSFETs. System performance and efficiency can be optimized using Infineon CoolMOS™ P7 power MOSFETs.



Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Quasi-resonant mode (QRM) operation with continuous conduction mode (CCM)-prevention and valley-switching discontinuous conduction mode (DCM) in mid to light load 	<ul style="list-style-type: none"> – Ideal for battery charging current control
<ul style="list-style-type: none"> – Secondary-side regulation (SSR) 	<ul style="list-style-type: none"> – BoM cost reduction
<ul style="list-style-type: none"> – Burst mode for very light loads 	<ul style="list-style-type: none"> – High efficiency and low electromagnetic interference (EMI)
<ul style="list-style-type: none"> – Adjustable maximum on-time 	<ul style="list-style-type: none"> – Low power consumption in stand-by mode
<ul style="list-style-type: none"> – Comprehensive set of protections 	<ul style="list-style-type: none"> – Design flexibility with adjustable maximum switching frequency and configurability of brown-in and brown-out
<ul style="list-style-type: none"> – Externally configurable hysteresis of brown-in and brown-out 	<ul style="list-style-type: none"> – Protection of primary components from overheating and saturation with higher brown-out level at higher input/output power
<ul style="list-style-type: none"> – Soft start 	<ul style="list-style-type: none"> – Safe, robust, and reliable operation

Applications

The ICC80QSG is tailored for battery charger applications up to 130 W, such as cordless appliances, e-bike chargers, power tools, consumer drones, and gardening tools.



eBike



Power tools



Gardening tools



Cordless vacuum cleaner



Multicopter



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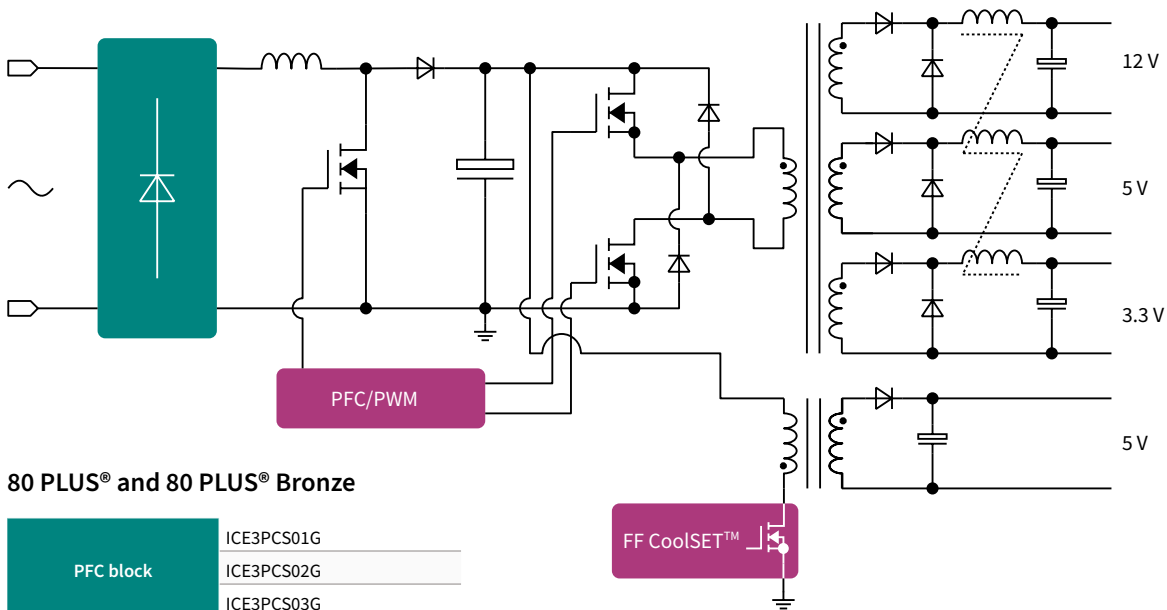
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Climate saver systems

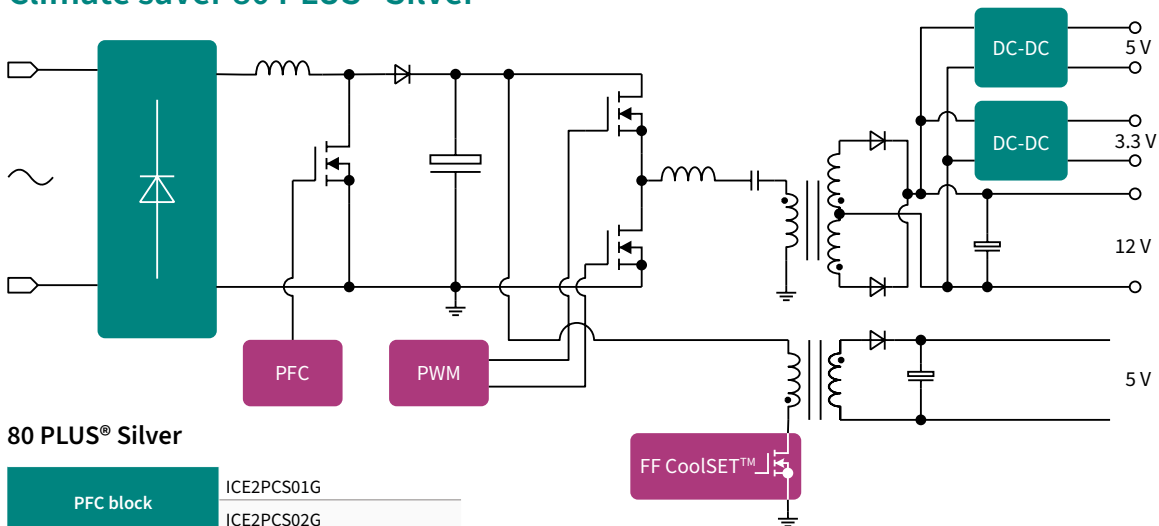
Climate saver 80 PLUS® and 80 PLUS® Bronze



80 PLUS® and 80 PLUS® Bronze

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
	ICE5GR4780AG
Standby block FF CoolSET™	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG
	ICE5AR0680AG

Climate saver 80 PLUS® Silver



80 PLUS® Silver

PFC block	ICE2PCS01G
	ICE2PCS02G
PWM block	ICE1HS01G-1
	ICE5GR4780AG
Standby block FF CoolSET™	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG
	ICE5AR0680AG



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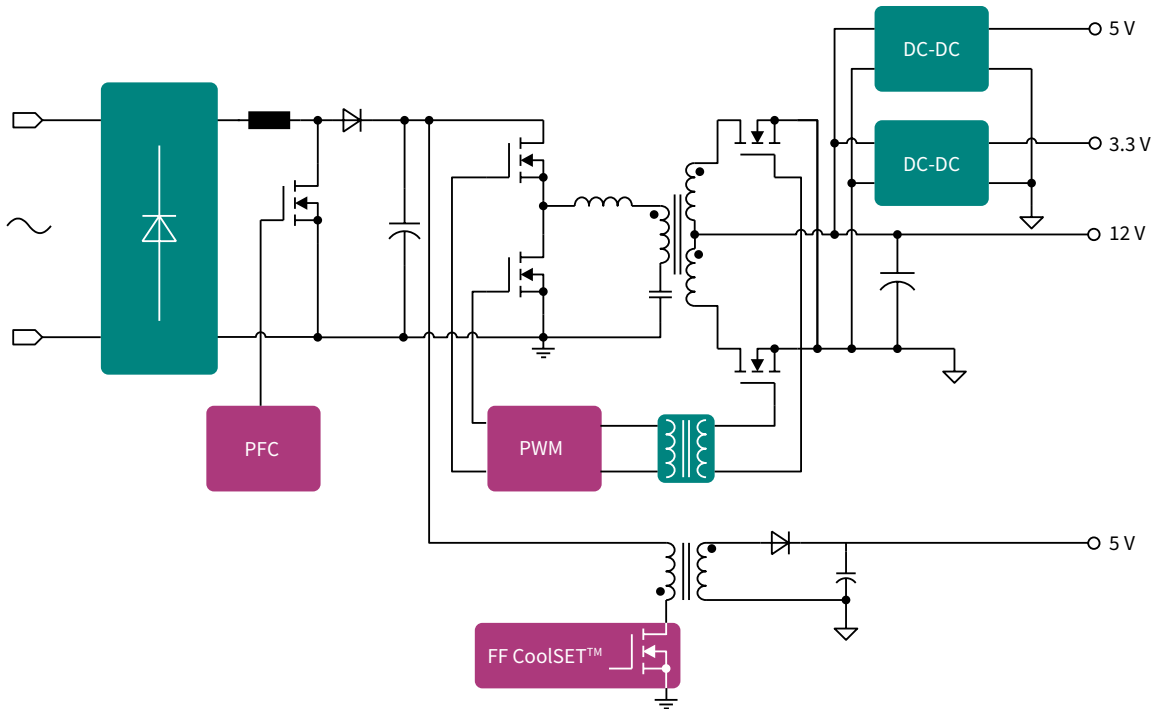
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Climate saver 80 PLUS® Gold

Climate saver 80 PLUS® Platinum

Certification for Infineon's PC power reference design



80 PLUS® Gold

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block FF CoolSET™	ICE5GR4780AG
	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG

80 PLUS® Platinum

Certification for Infineon's PC power reference design

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block QR CoolSET™	ICE5QR4780BG
	ICE5QR2280BG
	ICE5QR1680BG
	ICE2QR1080G
	ICE5QR0680BG



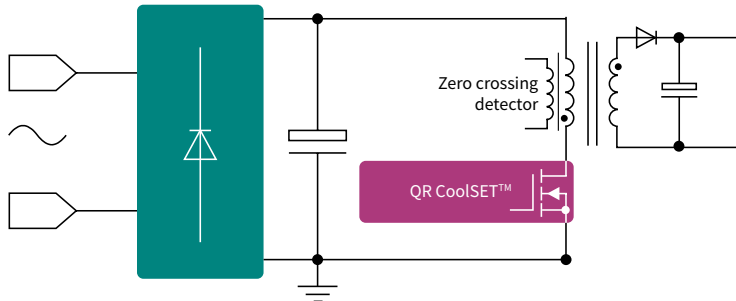
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5th generation quasi-resonant PWM IC and CoolSET™



- Integrated CoolMOS™ in 800 V MOSFET with cascode configuration
- Digital frequency reduction with reduced load
- Novel quasi-resonant to minimize the spread of switching frequency between low- and high-line AC input
- Selectable active burst mode entry/exit profile
- Auto restart mode for line overvoltage protection
- Auto restart mode for brown-out protection
- Auto restart mode for V_{CC} under-/overvoltage protection
- Auto restart mode for open loop and output overload protection
- Auto restart mode for overtemperature protection with hysteresis
- Auto restart mode for output overvoltage
- Limited charging current during V_{CC} pin short-to-ground protection
- Peak power limitation with input voltage compensation
- Minimum switching frequency limitation (no audible noise on power units on/off)
- DSO package (controller) and DSO-12 (CoolSET™)



5th generation quasi-resonant CoolSET™

Output power ¹⁾ 85 V _{AC} ~300 V _{AC} T _a =50°C		15 W	22 W	27 W	41 W~42 W
$R_{DS(on),max}$		5.18 Ω	2.35 Ω	1.75 Ω	0.80 Ω
800 V	DSO-12	ICE5QR4780BG	ICE5QR2280BG	ICE5QR1680BG	ICE5QR0680BG

2nd generation quasi-resonant CoolSET™

Output power ¹⁾ 85 V _{AC} ~300 V _{AC} T _a =50°C		14 W~15 W	20 W~21 W	23 W~26 W	31 W	38 W~42 W
$R_{DS(on),max}$		5.44 Ω~5.18 Ω	2.62 Ω	1.96 Ω	1.11 Ω	0.75 Ω~0.71 Ω
650 V	DIP-7	ICE2QR4765Z		ICE2QR1765Z		ICE2QR0665Z
	DIP-8	ICE2QR4765		ICE2QR1765		ICE2QR0665
	DSO-12	ICE2QR4765G		ICE2QR1765G		ICE2QR0665G
800 V	DIP-7		ICE2QR2280Z			ICE2QR0680Z
	DSO-12	ICE2QR4780G	ICE2QR2280G ICE2QR2280G-1		ICE2QR1080G	



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¹⁾ Calculated maximum output power in an open-frame design at T_a=50°C, T_j=125°C and without copper area as heat sink

Quasi-resonant PWM IC

Feature	ICE5QSBG	ICE2QS02G	ICE2QS03G
Package	DSO-8	DSO-8	DSO-8
Switching scheme	Novel QR with 10 zero crossing counters	QR with 7 zero crossing counters	QR with 7 zero crossing counters
Operating temperature	-40°C~129°C	-25°C~130°C	-25°C~130°C
Start-up cell	Cascode	-	✓
V _{cc} on/off	16 V/10 V	12 V/11 V	18 V/10.5 V
Power saving during standby	✓ active burst mode in QR switching 2-level selectable burst mode entry/exit level	-	✓ active burst mode 52 kHz
Digital frequency reduction for high average efficiency	✓	✓	✓
OLP blanking time	Fixed	Adjustable	Fixed
Auto restart timer	Through V _{cc} charging/discharging	Setting with external components	Through V _{cc} charging/discharging
Maximum input power limitation	V _{in} pin voltage dependent	Adjustable through ZC resistor	Adjustable through ZC resistor
V _{cc} undervoltage protection	✓ with auto restart	✓ with latch	✓ with auto restart
Adjustable output overvoltage protection	✓ with auto restart	✓ with latch	✓ with latch
Adjustable line input overvoltage protection	✓	-	-
Brown-out feature	✓	✓	-
V _{cc} pin short-to-ground protection	✓	-	-
Target application	Home appliances, set-top-box, AUX SMPS	AUX power supply to V _{cc} eg., LCD TV multi/main, audio main, PDP TV multi/address	Self-power supply to V _{cc} eg., smart meter, industrial applications

Quasi-resonant CoolSET™

Feature	2 nd generation ICE2QRxxxZ/G	2 nd generation ICE2QRxx80G-1	5 th generation ICE5QRxx80BG
Switching scheme	QR with 7 zero crossing counters		Novel QR with 10 zero crossing counters
Integrated MOSFET	650 V and 800 V	800 V	800 V
High-voltage start-up cell	✓		Cascode
Power saving during standby	Active burst mode f _{sw} at 52 kHz		2 level selectable active burst mode quasi-resonant
V _{cc} on/off threshold (typ.)	18 V/10.5 V	18 V/9.85 V	16 V/10 V
Adjustable output overvoltage protection	✓ with latch		✓ with auto restart
V _{cc} over/undervoltage protection	✓ with auto restart		✓ with auto restart
Overload/open loop protection	✓ with auto restart		✓ with auto restart
Overtemperature protection	✓ with auto restart		✓ (Auto restart with hysteresis)
Adjustable line input overvoltage protection	-		✓ with auto restart
Brown-out	-		✓ with auto restart
V _{cc} pin short-to-ground	-		✓ (No start-up)
Package	DIP-7 DIP-8 DSO-12	DIP-7 DSO-12	DSO-12



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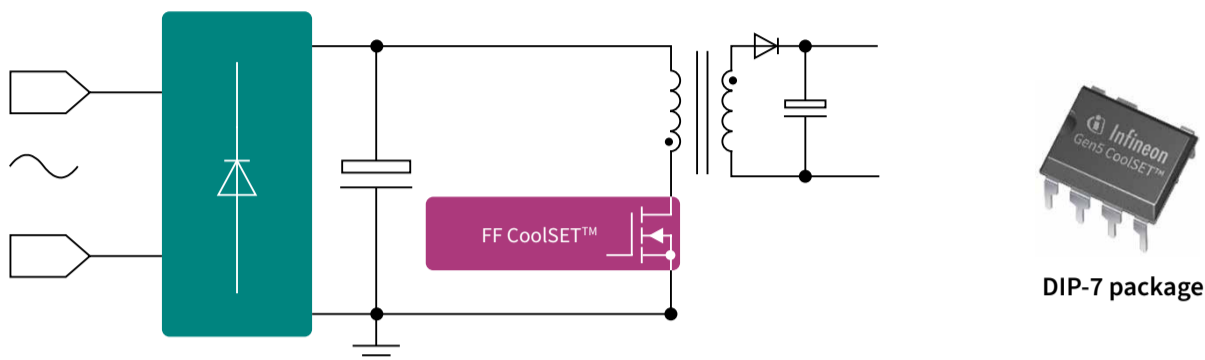
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5th generation Plus fixed-frequency CoolSET™

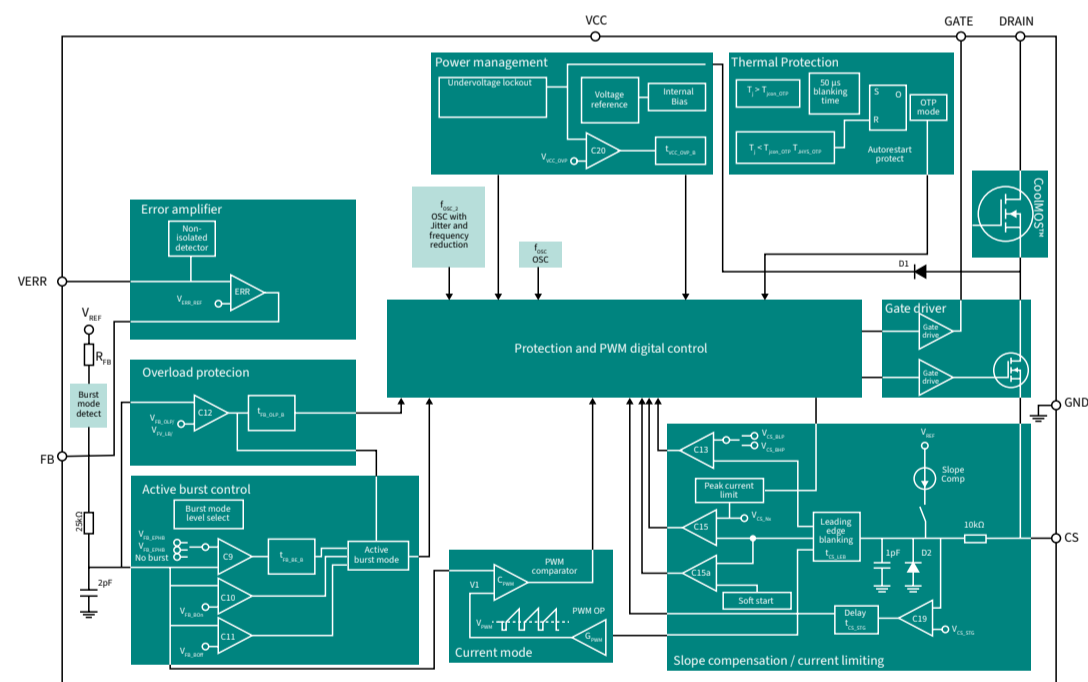
Single-stage controller IC for auxiliary power supply

The 5th Generation Plus fixed-frequency CoolSET™ is a PWM controller that helps achieve high power transfer efficiency across a wide operating range and includes a comprehensive set of protections. The IC is easy to design and requires a minimum number of external components.



Features and benefits

Key features	Key benefits
<ul style="list-style-type: none"> – Integrated avalanche rated CoolMOS™ in 700 V, 800 V and 950 V MOSFETs – Cascode configuration – Available in 65 kHz, 100 kHz fixed switching frequency – Frequency reduction in tandem with load reduction and jitter – Adjustable Burst Mode – Auto restart protection mode – Supports CCM Flyback operation with built-in slope compensation – Integrated error amplifier 	<ul style="list-style-type: none"> – Ease of power scaling and high reliability – Fast and robust start-up – Flexibility of design – Improves light load efficiency and EMI – Optimize standby power and disable burst mode to eliminate audible noise – Minimize interruption of operation – Stable operation ensuring higher power delivery – Design non-isolated topologies with lesser external component



5th generation Plus fixed-frequency CoolSET™

Output power ¹⁾ 85 V _{AC} ~ 300 V _{AC} T _a = 50°C		15 W	17 W	23 W	40 W
R _{DS(on)}		4.13 Ω / 4.73 Ω	3.46 Ω	2.13 Ω	0.71 Ω
700 V	DSO-12	ICE5AR4770BZS-1		ICE5BR2280BZ-1	ICE5AR0680BZS-1
800 V		ICE5AR4780BZS-1 ICE5BR4780BZ-1			
950 V			ICE5AR3995BZ-1 ICE5BR3995BZ-1		



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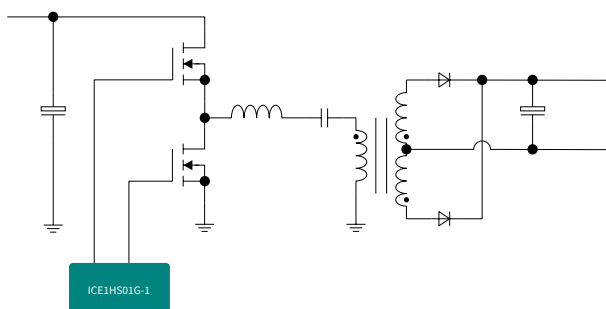
Resonant LLC half-bridge controller ICs

Best-in-class converters and controllers to support LLC HB resonant mode topology

Resonant mode power supplies vary over SMPS circuits where the switching losses are significantly reduced by adapting zero-voltage or zero-current switching techniques, also known as soft-switching techniques. In non-resonant mode SMPS circuits, the switches are subjected to hard switching. LLC HB resonant operates in ZVS mode, whereby switching loss is reduced to operate the converter at a higher switching frequency. In addition, the converter can be further optimized at a high input voltage. This topology eliminates the secondary filter inductor, adopts better rectifier diodes, and reduces secondary conduction loss. The converter utilizes the leakage and magnetizing inductance of a transformer. With the magnetic integration concept, all the magnetic components can be built in one magnetic core.

LLC resonant (no SR)

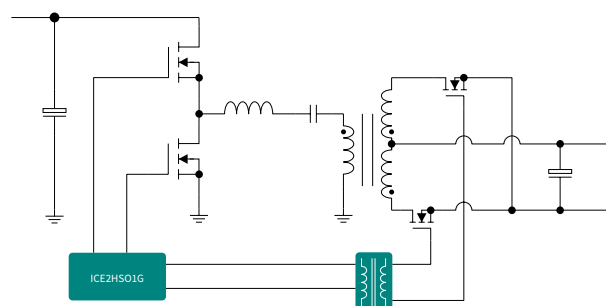
Application diagram – LLC resonant (no SR)



- Novel and simple design (12 components + HB driver)
- Minimum operating frequency is adjustable externally
- Burst mode operation for output voltage regulation during no load and/or bus overvoltage
- Multiple protections in case of fault
- Input voltage sense for brown-out protection
- Open loop/overload fault detection by FB pin with auto restart and adjustable blanking/restart time
- Frequency shift for overcurrent protection
- Lead-free, RoHS compliant package
- DSO-8 package

Resonant LLC half-bridge controller IC with integrated synchronized rectifier control

LLC resonant + SR



- Novel LLC/SR operation mode and controlled by primary-side controller
- Multiple protections for SR operation
- Tight tolerance control
- Accurate setting of switching frequency and dead time
- Simple system design
- Optimized system efficiency
- Multiple converter protections: OTP, OLP, OCP, latch-off enable
- External disable for either SR switching or HB switching
- Lead-free, RoHS compliant package
- DSO-20 package



Audio amplifier



Notebook



Projector



TV



PC power



Server



Telecom



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LLC half-bridge controller IC	ICE1HS01G-1	ICE2HS01G
Package	DSO-8	DSO-20
Switching frequency range	up to 600 kHz	up to 1 MHz
LLC soft-start	✓	✓
LLC burst mode	✓	✓
Adjustable minimum frequency	✓	✓
Overload/open loop protection	✓	✓
Mains undervoltage protection with hysteresis	✓	✓
Overcurrent protection	2-level	3-level
Drive signal for synchronous rectification	-	✓
Adjustable dead time	-	✓
External latch-off and OTP	-	✓
Target application	LCD-TV, audio, etc.	Server, PC, LCD-TV, etc.

	Product	Frequency – f_{sw}	Dead time	Current drives	Package
ICE1HS01G-1	LLC resonant (no SR)	30 kHz~600 kHz	380 ns	1.5 A	DSO-8
ICE2HS01G	Resonant LLC half-bridge controller IC with integrated synchronized rectifier control (LLC resonant + SR)	30 kHz~1 MHz	100 ns~1000 ns	0.3 A	DSO-20



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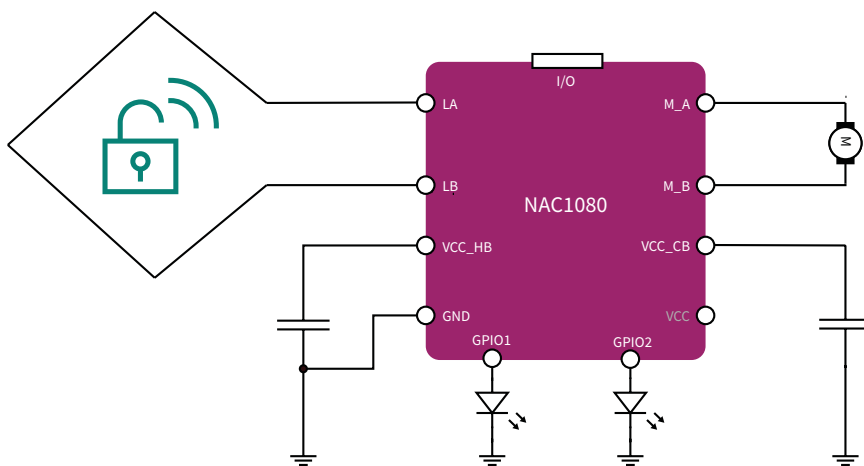
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NAC1080 – NFC smart actuation controller

The NAC1080 is an NFC actuation controller with integrated half-bridge and energy harvesting modules, enabling the cost-effective development of passive smart actuators like passive locks. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, motor driver, and energy harvesting function enables customers to develop smart actuation devices with minimum system BOM requirement.

The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize software-defined functions. Furthermore, the NAC1080 includes hardware security functions such as a secure area in flash, a 128-bit AES accelerator, and a true random generator. A separate secure element can be connected via the digital interface on demand.

Users can program this NAC1080 with the industry-wide standard solutions for Cortex®-M0 processors. Especially for the smart lock application, SDK packages for firmware and mobile application development in Android and iOS systems are available to support a fast development cycle.



Applications

- Passive/active NFC lock
- Emergency power source for battery devices
- NFC configuration of electronic devices

Features and benefits

Key features

- NFC interface compliant to ISO 14443 type A
- Arm® 32 bit Cortex®-M0 microcontroller core
- Dual-operation mode: passive or battery mode
- 60 kB NVM, 16 kB RAM, 16 kB boot ROM
- Integrated H-bridge
- Energy harvesting output
- 128-bit AES accelerator, true random number generator

Key benefits

- A single-chip solution to build batteryless NFC actuators, like passive lock
- Batteryless IoT devices without battery exchange efforts and costs
- Intuitive connection via smartphone to enable cloud-based business models
- Minimum system BOM for easy and cost effective implementation



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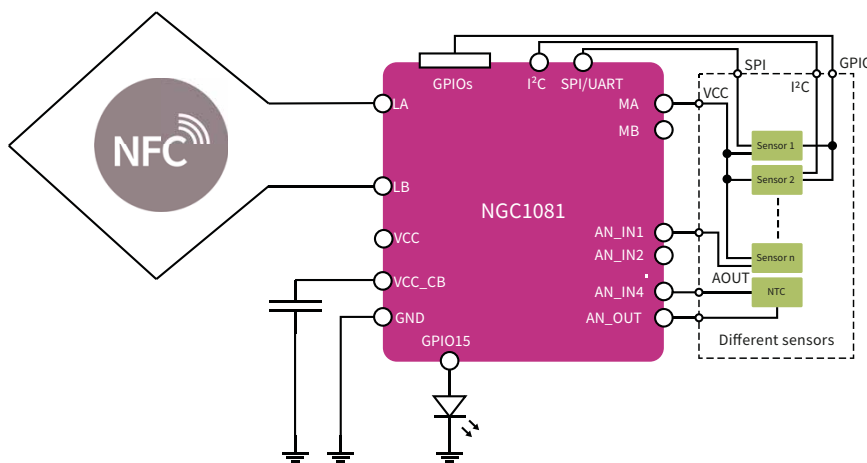
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NGC1081 – NFC smart sensing controller

The NGC1081 is an NFC sensing controller with an integrated temperature sensor and ADC/DAC sensing unit in addition to the features provided by NAC1080. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC connectivity, sensing unit, and energy harvesting function in one device enables customers to develop miniaturized smart edge computing/sensing devices with minimum system BOM requirement.

NGC1081 works in both passive mode and battery mode. In passive mode, it can communicate wirelessly with a mobile phone while also harvesting energy from the NFC field to power the whole sensing system, including the IC and its connected sensors. Working in battery mode simplifies the implementation of many sensing applications, like temperature, humidity, and vibration tracking devices. With the smartphone as the human interaction interface, the system functions are widely extended to cloud functionalities, such as uploading data and data analysis on the cloud.

NGC1081 has a 12-bit SAR ADC and a 10-bit DAC. It provides one analog output (DAC) and four analog inputs (ADC). The ADC has three sample and hold stages, which allow parallel signal sampling. A temperature sensor is integrated as well. Users can program the NGC1081 with the industry-wide standard solutions for Cortex®-M0 processors.



Applications

- Passive sensor device, inlay
- Medical, healthcare sensor patch
- Data logger, temperature logger
- Radiator thermostat
- Galvanic isolated sensor front end

Features and benefits

Key features

- NFC interface compliant to ISO 14443 type A
- Arm® 32-bit Cortex®-M0 microcontroller core
- Dual-operation mode: passive or battery mode
- 60 kB NVM, 16 kB RAM, 16kB boot ROM
- 12-bit SAR ADC, 10-bit DAC
- Integrated temperature sensor
- Integrated H-bridge
- Energy harvesting output
- 128-bit AES accelerator, true random number generator

Key benefits

- A single-chip solution to build a batteryless smart sensor for miniaturized design with low BOM cost
- Multiple power supply options for sensors: GPIO for low current or energy harvesting output for high current
- Natural galvanic isolated sensing interface for applications with direct human body contact
- Intuitive connection via smartphone to enable cloud-based business models



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Digital isolators

Gate-driver ICs

500-950 V MOSFETs

15-300 V MOSFETs

Applications

Solutions

Digital Power Controller

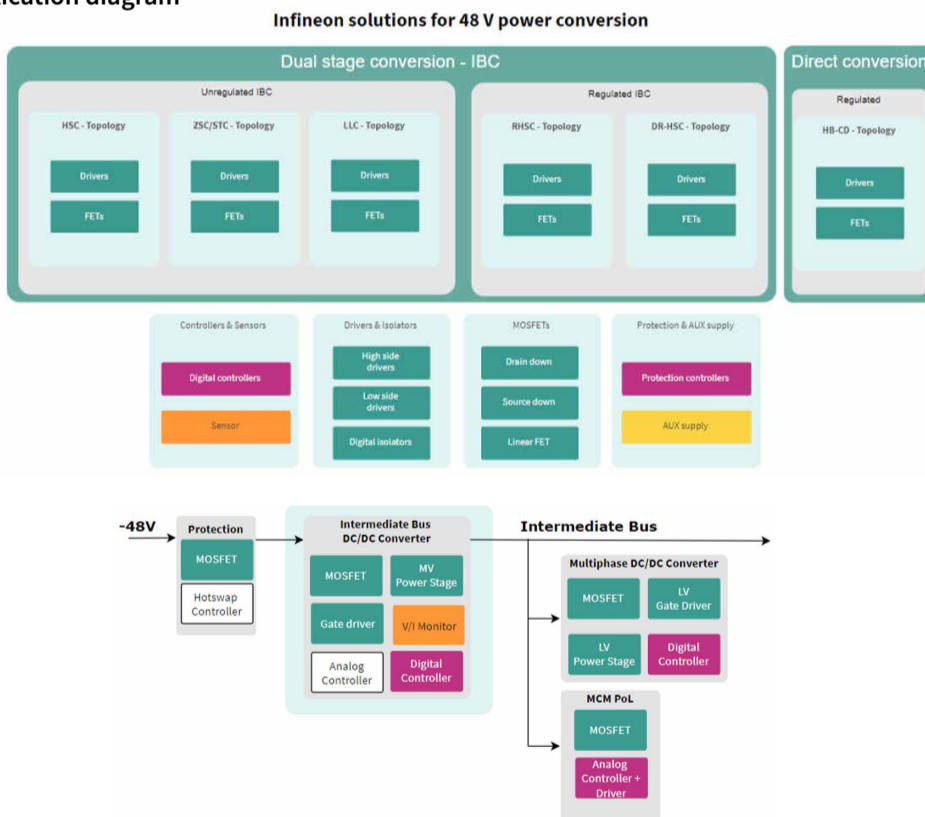
The smallest DPC with PMBus interface

Infiniteon supplies the XDPP11xx family of highly integrated, programmable, and configurable digital power controllers that enable the design of high-density and high-power 48 V DC-DC converters with isolated and non-isolated topologies requiring minimum external components. The XDPP11xx architecture consists of a low-latency state-machine-based digital control loop with associated firmware, a high-performance Analog-Front-End (AFE) for control loop feedback, a Power Management Bus (PMBus1.3) interface for system communication, GPIOs, and an ARM® CORTEX®-M0 subsystem for housekeeping, telemetry, and Blackbox functions. With the onboard OTP and provided Graphic User Interface (GUI), firmware customization, optimization, and configuration make it easy to develop differentiated solutions. For ease of design and fast time-to-market with minimum R&D cost, XDPP11xx products are supported by EVB board and several reference designs optimized for 48 V IBC, such as AI servers datacenter and Telecom infrastructure such as base unit and radio unit. In addition to offering products of proven quality, a competent global power supply team supports our telecom/ AI server customers in designing telecom/ AI server products and systems in collaboration with our channel partners.

Features and benefits

Key features	Key benefits
- Application optimized digital control	- Pre-programmed advanced digital control reduces firmware development
- State machine based digital control for up to 2 independent voltage loops	- Allows design diffraction and customization
- Configurable feedback control dedicated hardware peripherals	- Optimized for isolated converter topologies and Brick applications brings superior performance
- ARM® Cortex®-M0 processor	- Enhanced control and excellent dynamic transient performance
- Accurate current sense	- No external comparator allows lower BOM and denser designs information
- High-performance ADCs	- 4x4 mm package makes high-density design possible
- Small footprint	

Application diagram



Product portfolio

Functional block	Product Family	Product MOSFET technology and voltage class
Hot-swap stage	Positive rail hot-swap controller	XDP710-002
	Negative rail hot-swap controller	XDP700-002
DC-DC stage	Digital PWM controller XDP™	XDPP1100-Q024
		XDPP1100-Q040
	Digital PWM/LLC controller XDP™	XDPP1140-100B
		XDPP1148-100B
	Gate driver EiceDRIVER™	2EDL8 family
		2EDi family
	2EDN family	
	1EDN family	
Digital isolator ISOFACE™	2DIB family	
	4DIR family	



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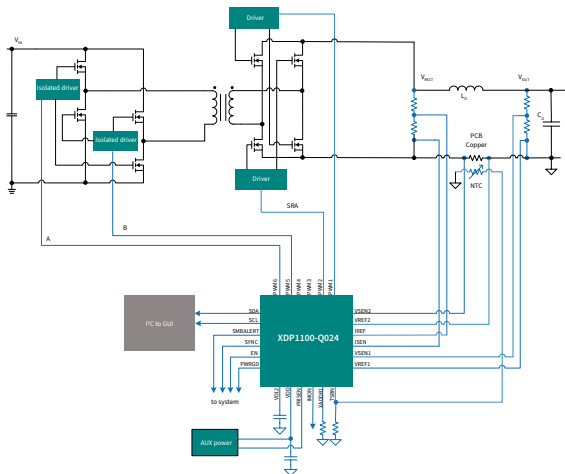
XDPP1100 Digital Power Controller

The smallest DPC with PMBus™ interface

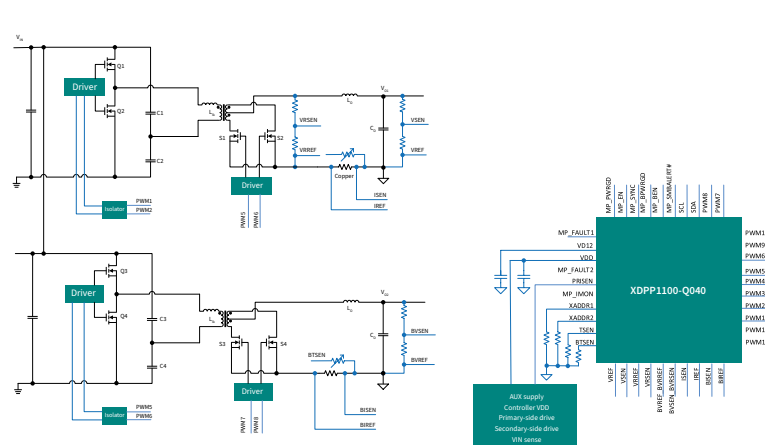
The XDPP1100, the first member of the Infineon’s feature-rich Digital Power Controller product family, is a highly programmable and versatile device with advanced features that is an ideal power controller for isolated and non-isolated modern high-density, high-power systems deployed in AI Servers, 48 V server motherboards, telecom infrastructure, and industrial 4.0 applications. A combination of low-latency state machine-based digital control loop with associated firmware, high-performance AFE for current and voltage sensing and feedback, Power Management Bus (PMBus™1.3) interface for system communication and an Arm® Cortex®-M0 sub-system for housekeeping integrated into a single chip, supplemented by Graphical User Interface (GUI) and EVB, enables the design of a family of DC-DC power solution for the targeted application with a fast time-to-market. Built-in non-volatile memory provide extensive programming and customization of functions such as frequency dithering, GPIO signal timing, non-linear transient suppression schemes, soft start timing and sequencing, and feature rich protection response. The XDPP1100 architecture allows maximum design flexibility and provides, excellent digital control for, transformer based isolated DC-DC converters and non-isolated topologies. All the major fixed frequency topology designs, such as pulse width modulation (PWM) half-bridge (HB), PWM full-bridge (FB), phase-shift full-bridge (PSFB), active clamp forward (ACF), open loop fix-frequency resonant half-bridge or full-bridge (FF open-loop LLC), non-isolated Buck, Boost and Buck-boost may be achieved in compact 4x4 mm 24-pin VQFN Package. The XDPP1100 supports interleaved operation of any of the topologies mentioned. To support post-buck or post-boost regulation XDPP1100 is also offered in a 6x6 mm 40-pin VQFN package. XDPP1100 is supported by several reference designs in various topologies ideal for AI servers, 48 V server motherboards, and Telecom infrastructure for a faster time-to-market and reduced development cost.

Application schematic

XDPP1100 Full-Bridge to Full-Bridge



XDPP1100 Dual Loop Half-Bridge Center Tap



Features and benefits

- Key features**
- State machine-based digital control for up to two independent voltage loops
 - Configurable feedback control
 - Arm® Cortex®-M0 processor
 - Up to 16 Configurable GPIOs, 12 high-resolution Digital Modulated PWM outputs
 - Input voltage feed-forward control scheme
 - Small footprint

- Key benefits**
- Digital compensator increases stability and saves external BOM cost
 - Flexible mode: voltage mode, peak current mode, and constant current and power mode
 - Fast process and control
 - Easy to use and fast time-to-market with digital interface
 - Fully manageable and controllable with both input and output information
 - 4x4 mm package makes high-density design possible

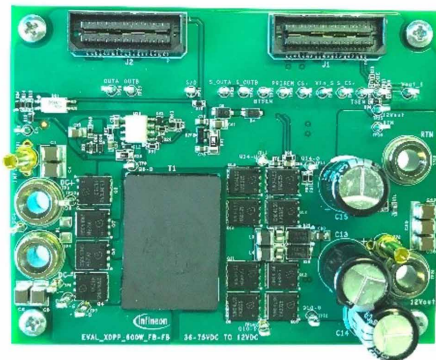


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EVAL_600W_FBFB_XDPP EVAL_XDPP1100_Q024_DB

Evaluate Infineon DC-DC digital IC controllers for telecom and server applications

- XDPP1100-Q040
- 2x 2EDL8024G,
- 2x 2EDL8124G
- 4x BSC050N10NS5
- 8x BSC010N04LS6

Reference Designs

- REF_275W_HBCT_XDPP1100 (released reference design)
- REF_600W_FBFB_XDPP1100 (released reference design)
- REF_1KW_LLC_XDPP1100 (released reference design)
- VD_REF_XDP_48V_TO_POL (virtual design)
- VD_1000W_GaN_PSFb_XDP (virtual design)
- REF_780W_INV_BB_XDP (virtual reference design)
- REF_750W_FBFB_50V_QB (virtual reference design)
- REF_1100W_4TO1_ZSC_QB (released reference design; Infineon Topology)
- REF_500W_HSC_6V (released reference design, Infineon Topology)
- REF_600W_DRHSC_XDP (released reference design, Infineon Topology)
- REF_DRHSC_2200W (virtual design, Infineon Topology)



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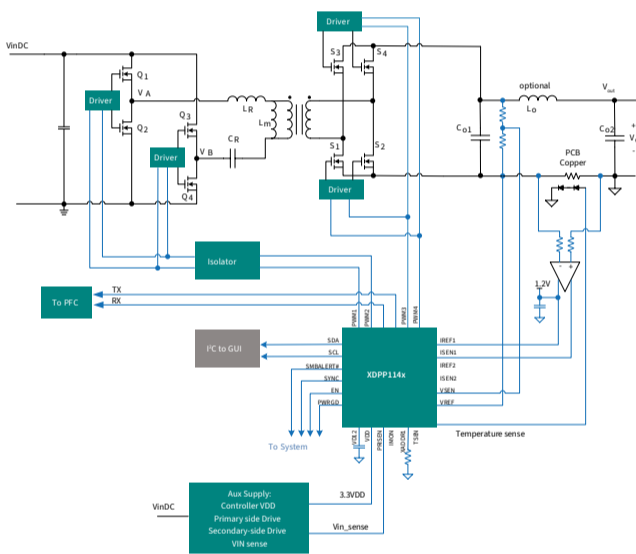
XDPP1140\XDPP1148 Digital Power Controllers

The smallest DPC with PMBus™ Interface

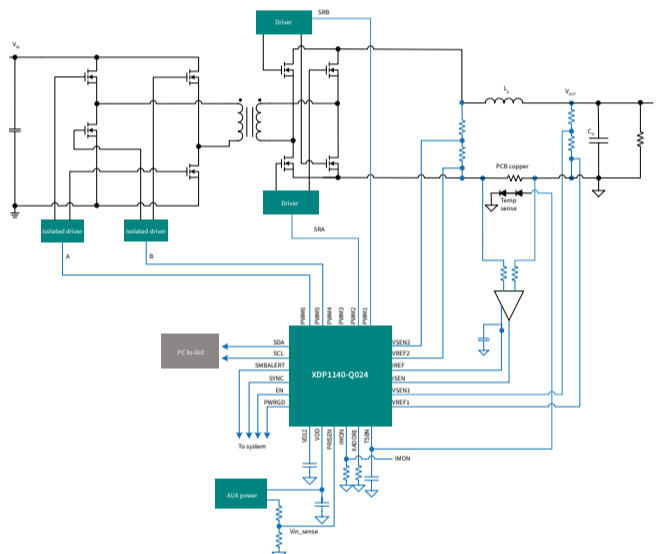
The XDPP1140\XDPP1148 are new members of Infineon’s feature-rich Digital Power Controller product family that are highly programmable and versatile devices with advanced features that make them an ideal power controller for isolated and non-isolated modern high-density, high-power systems deployed in AI servers, 48 V server motherboards, telecom infrastructure, and industrial 4.0 applications. A combination of low-latency state machine-based digital control loop with associated firmware, high-performance AFE for current and voltage sensing and feedback, Power Management Bus (PMBus™1.3) interface for system communication, and an Arm® Cortex®-M0 sub-system for housekeeping integrated in a single chip, supplemented by Graphical User Interface (GUI) and EVB enables design of family of DC-DC power solution for the targeted application with a fast time to market. Built-in non-volatile memory provides extensive programming and customization of functions such as frequency dithering, GPIO signal timing, non-linear transient suppression schemes, soft start timing and sequencing, and feature rich protection response. Both XDPP1148 and XDPP1140 are provided in a 4x4 mm 24-pin VQFN package and are backward compatible with XDPP1100; however, enhanced features are designed to provide excellent digital control for resonant LLC topologies, including half-bridge (HB) LLC, full-bridge (FB) LLC, phase-shift full-bridge (PSFB) LLC. XDPP1140\XDPP1148 also support all the major fixed frequency topologies such as pulse width modulation (PWM) HB, PWM FB, PWM PSFB, active clamp forward (ACF), non-isolated Buck, Boost, and Buck-boost. The XDPP1148 supports the interleaved operation of Buck, Boost, and Buck-boost.

Block diagram

FB LLC, 4 8V to 12 V, XDPP114x, Datacom



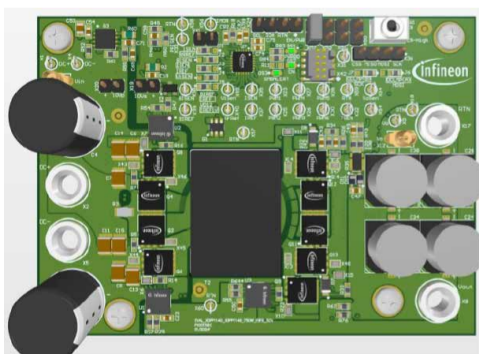
FB-FB, -48 V to 50 V, XDPP1140, Telecom



Features and benefits

- | Key features |
|---|
| - High-performance (100 MHz) current and Voltage ADCs |
| - Configurable feedback control |
| - Frequency modulation |
| - Hardware based feed-forward |
| - Current sense with high tracking slew rate |
| - Fast GPIO input |

- | Key benefits |
|--|
| - Supports Resonant LLC Topologies |
| - Flexible mode: voltage mode, peak current mode, and constant current and power |
| - Supports close loop LLC; Hybrid soft-start for LLC |
| - Supports Buck-boost, Boost Topologies |
| - Supports symmetric input for primary current sense |
| - Configurable offset for secondary current sense |
| - Allows using external signal to define SR rising or falling edge |



EVAL_750W_FBFB_XDPP1140

Infineon Evaluation Board DC/DC digital IC controllers for telecom and server applications

- XDPP1148-100B
- 8x ISC031N08NM6
- 6x BSC110N15NS5
- 5x 2EDF7275K

Reference Designs

- REF_IBC_1600W_GAN (to be released reference design in 2024)



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Digital Power Controller portfolio

Product Feature	XDPP1100-Q024	XDPP1100-Q040	XDPP1140-100B	XDPP1148-100B
ARM®-M0 core processor	100 MHz	100 MHz	100 MHz	100 MHz
High-resolution DPWM outputs (78.125ps resolution)	6	12	6	6
Number of high-speed independent feedback rails	1	2	1	1
Number of voltage sense ADC	2	3	2	1
Number of current sense ADC	1	2	1	2
General purpose ADC channels	4	6	4	4
OTP	64 kB	64 kB	64 kB	64 kB
RAM	32 kB	32 kB	32 kB	32 kB
ROM	80 kB	80 kB	80 kB	80 kB
DPWM switching frequency	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz
Secondary serial bus (I2C M/S)	-	✓	-	
SPI Serial bus	-	-	✓	✓
UART	✓	✓	✓	✓
PMBus	✓	✓	✓	✓
Watchdog	✓	✓	✓	✓
On chip oscillator	✓	✓	✓	✓
Sync in and sync out functions	✓	✓	✓	✓
Temperature sense inputs	1	2	1	1
Enable inputs	1	2	1	1
Power good outputs	1	2	1	1
Total GPIO (General purpose I/O pins)	11	16	11	11
Package offering	VQFN-24 (4x4 mm ²)	VQFN-40 (6x6 mm ²)	VQFN-24 (4x4 mm ²)	VQFN-24 (4x4 mm ²)
Number of loops	1	1	1	2
Number of ramps	2+1	2+1	2	2
Number of VS ADC	1	2	2	2
Number of IS ADC	2	1	1	2
Topology				
HB/CT; HB/FB	✓	✓	✓	✓
FB/CT; FB/FB (VMC with Flux balance)		✓	✓	✓
FB/CT; FB/FB (PCMC)	✓			✓
ACF	✓	✓	✓	✓
PSM-FB/CT; PSM-FB/FB	✓	✓	✓	✓
LLC-HB; LLC-FB; LLC-PSFB; secondary CT or FB	✓	✓		
Buck	✓	✓	✓	✓
Buck-boost	✓	✓	✓	✓
Boost	✓	✓	✓	✓
Interleaved Buck	✓			✓
Interleaved Buck-boost	✓			✓
Interleaved Boost	✓			✓
Interleaved HB/CT; HB/FB; FB/CT; FB/FB; PSM-FB/CT; PSM-FB/FB				✓
Interleaved ACF				✓
Dual loop (single phase of each loop)				✓
Interleaved Buck + open loop converter	✓			
Interleaved 3-level Buck+ open loop converter	✓			



USB PD charger



Adapter



Consumer



Smartphone charger



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Protection IC

Hot swap controllers with a programmable digital SOA control

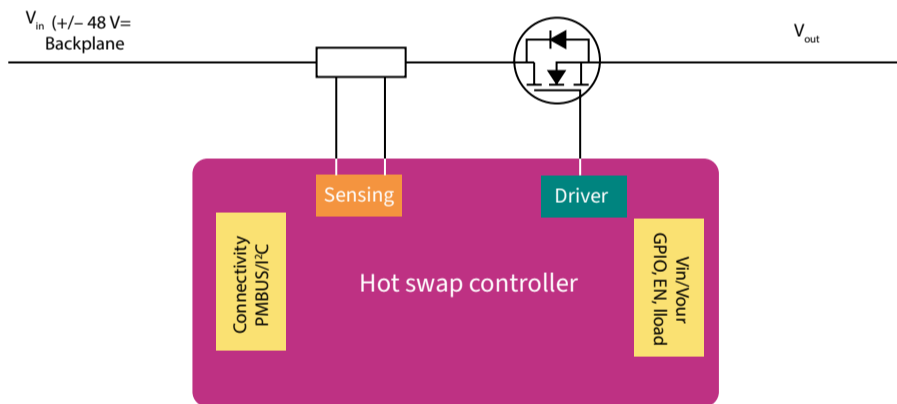
Infinion XDP™ XDP7x0 family is the industry’s first wide input voltage range hot swap and system monitoring Controller IC with a programmable digital SOA control that is designed to meet the reliability and high availability requirements of pluggable Artificial Intelligence (AI) accelerator cards and baseboards and spectrum of telecom and datacom applications including remote radio head power, base station power distribution, and live and passive antenna systems of 5G and telecom UPS.

XDP™ XDP7x0 family architecture employs a three-block architecture that combines high-precision telemetry for monitoring and fault detection, digital SOA control optimized for power MOSFETs, and integrated gate drivers for n-channel power MOSFETs. The advanced closed-loop SOA control and the fully digital operating mode of XDP™ XDP7x0 results in lower bill-of-material (BOM) costs due to the minimum number of external components and reduced design time, allowing faster time to market. The XDP™ XDP7x0 can also support legacy systems in Analog-Assisted Digital Mode.

Features and benefits

Key features	Key benefits
- Digital configuration	- Reduces external components; reduction in system BOM
- Analog- assisted mode	- Support legacy systems; external MOSFET selection using resistor strapping
- Multiple SOA configuration profiles in NVM	- Reduces design time and time-to-market
- Input transient and MOSFET SOA protection, Fast shut down of <1 μs	- Enables the use of wider selection of FETs; improved system BOM cost
- Small package	- Improved density

Application diagram



Product portfolio

Functional block	Product Family	Product MOSFET technology and voltage class	
Hot-swap stage	Positive rail hot-swap controller	XDP710-002	OptiMOS™ 100 V
	Negative rail hot-swap controller	XDP700-002	Linear FET 100 V
DC-DC stage	XDP™ Digital PWM controller	XDPP1100-Q024	OptiMOS™ 200 V 150 V 100 V 80 V 60 V 40 V 25 V
		XDPP1100-Q040	
	XDP™ Digital PWM/LLC controller	XDPP1140-100B	
		XDPP1148-100B	
	EiceDRIVER™ Gate driver	2EDL8 family	
		2EDi family	
		2EDN family	
1EDN family			
ISOFACE™ Digital isolator	2DIB family		
	4DIR family		



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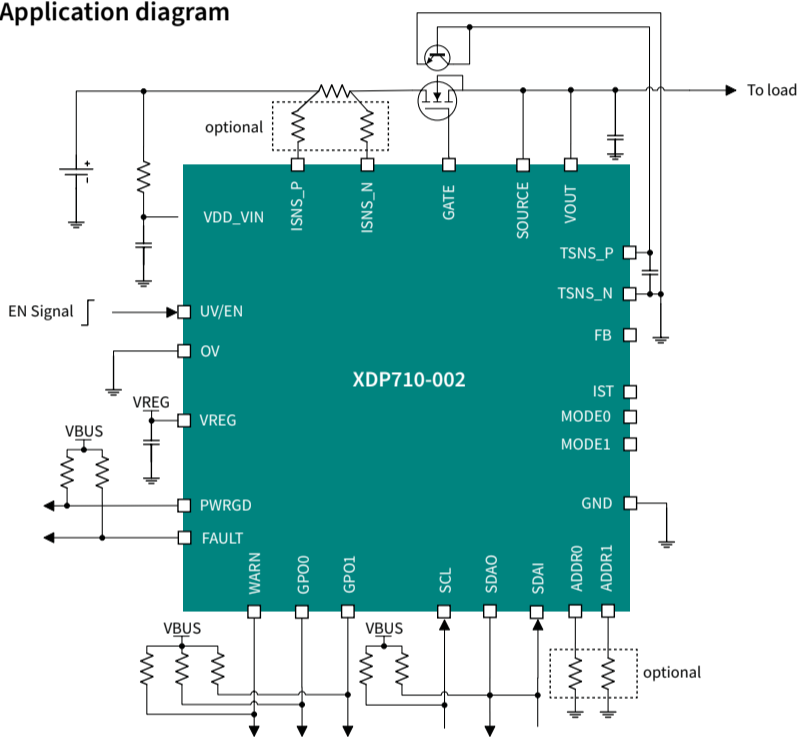
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XDP710-002 hot swap for datacenter

5.5 – 80 V input range with a programmable digital SOA Control

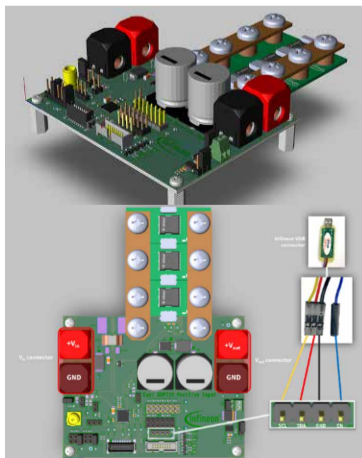
The XDP™ XDP710-002 is the next generation IC of XDP710-001 industry's first wide input voltage hot swap and system monitoring Controller IC with digital SOA control with improvements and enhancement to meet the high-availability and protection requirements of AI Servers while maintaining backward compatibility. A detailed list of feature enhancements and improvements is provided in its datasheet. XDP710-002 drives single or multiple parallel N-Channel MOSFETs. In addition to a controlled turn ON, continuous system health monitoring such as OCP, OVP, UVLO, and communication to the main MCU via PMBus interface. The high-speed communication through PMBus allows system designers to disable the downstream sub-systems fully or partially. XDP710-002 incorporates a wide variety of system protections for safety operation and generates various protection responses depending on the severity of the incidents. Latch off, reset, system shutdown, and retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe conditions. Additional features of XDP710-002 are fast shut-down in catastrophic failures and onboard non-volatile memory, making multi-level system configuration possible.

Application diagram



Features and benefits

Key features	Key benefits
– Integrated gate driver: 0 to 250 μ A	– Drives single or multiple parallel N-channel MOSFETs ; Scalable designs
– Dedicated high-precision 12-bit current and voltage ADCs:	– Active monitoring: $V \leq 0.4\%$, $I \leq 0.75\%$, $P \leq 1.15\%$, $E \leq 5\%$
– Programmable two-step gate shutdown: ~ 1.5 A (typ.)	– Fast shutdown of < 1 μ As in catastrophic events
– Non-volatile OTP memory	– Multi-configuration allows multi-platform design
– Telemetry with I2C, PMBus Interface: 1 MHz	– Dynamic configuration of fault and warnings, remote load and power monitoring and diagnostics
– Programmable and pre-set FET active SOA protection	– Pre-configured SOA profiles of Infineon's OptiMOS™ and OptiMOS™ Linear FET families reduce design time



XDP710-002 Evaluation Board IPT015N10N5

Server and datacenter

- 24 -48 V industrial systems
- Power distribution systems
- Power distribution systems
- Intelligent e-fuse
- Network router and switches



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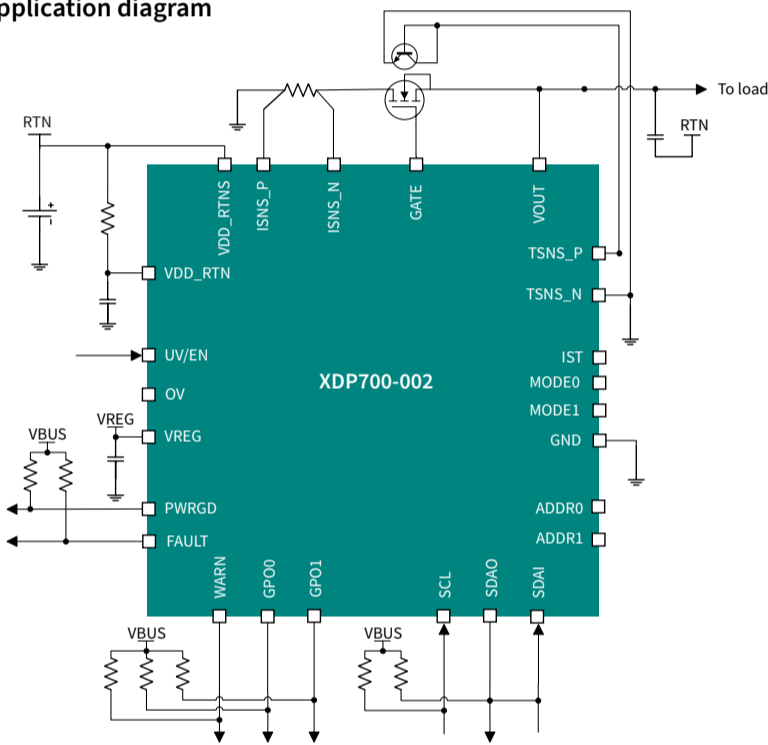
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XDP700-002 hot swap for telecom

Industry's first -6.5 to -80 V input range with a programmable digital SOA

The XDP™ XDP700-002 is a new member of the XDP™ XDP7x0 family and is the industry's first wide voltage range hot-swap controller with a programmable digital SOA control ideal for -48 V pre-isolated DC-DC telecom infrastructure, network routers, switches, or applications requiring -24 V/-48 V input voltage support. XDP700-002 drives single or multiple parallel N-Channel MOSFETs. In addition to a controlled turn ON, XDP700 provides continuous system health monitoring such as OCP, OVP, UVLO, and communication to the main MCU via the PMBus interface. The high-speed communication through PMBus allows system designers to disable the downstream sub-systems fully or partially. XDP700-002 incorporates an extensive variety of system protections for safety operation and generates various protection responses depending on the severity of the incident. Latch off, reset, system shutdown, and retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe conditions. Additional features of XDP700-002 are fast shutdown in catastrophic failures and onboard non-volatile memory, making multi-level system configuration possible.

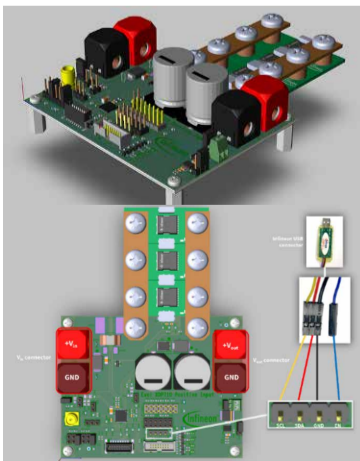
Application diagram



Features and benefits

Key features
- Integrated gate driver: 0 to 250 μ A
- Dedicated high-precision 12-bit current and voltage ADCs:
- Programmable two-step gate shutdown: ~1.5 A (typ.)
- Non-volatile OTP memory
- Telemetry with I2C, PMBus Interface: 1 MHz
- Programmable and pre-set FET active SOA protection

Key benefits
- Drives single or multiple parallel N-channel MOSFETs ; Scalable designs
- Active monitoring: $V \leq 0.4\%$, $I \leq 0.75\%$, $P \leq 1.15\%$, $E \leq 5\%$
- Fast shutdown of $<1 \mu$ s in catastrophic events
- Multi-configuration allows multi-platform design
- Dynamic configuration of fault and warnings, remote load and power monitoring and diagnostics
- Pre-configured SOA profiles of Infineon's OptiMOS™ and OptiMOS™ Linear FET families reduce design time



XDP700-002 Evaluation Board IPB017N10N5

- 48 V pre-isolated DC-DC telecom infrastructure
- -24 V/-48 V industrial systems
- Power distribution systems
- Intelligent e-fuse
- Network router and switches



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Hot swap controller

Functional block	XDP710-002	XDP700-002
Input voltage range	+5.5 to +80 V	-6.5 to -80 V
Current and voltage ADCs	12-bit	12-bit
Programmable FET active SOA protection	✓	✓
Charge pump	✓	-
Configurable shutdown: Two steps turn-off or 1.5 A pull-down current	✓	✓
PMBus interface	1 MHz	1 MHz
Analog comparator	OV,FB,UV/EN	OV,UV/EN
Precision input and output voltage monitoring and reporting	≤0.4%	≤0.5%
FET's current monitoring and reporting	≤ 0.75% at full ADC range	≤ 1.3% at full ADC range
Input power monitoring and reporting:	≤ 1.15%	≤ 1.8%
Energy monitoring and reporting	✓	✓
Programmable input and output OV and UV protections	✓	✓
Support for external temperature sensor and OT protection	✓	✓
Sequential turn-on capability	✓	✓
Package	29-lead (6 mm x 6 mm)	29-lead (6 mm x 6 mm)
Junction temperature	-40°C to 125°C	-40°C to 125°C



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Integrated POL voltage regulators

Highest density high efficiency integrated POL (IPOL) for smart enterprise systems

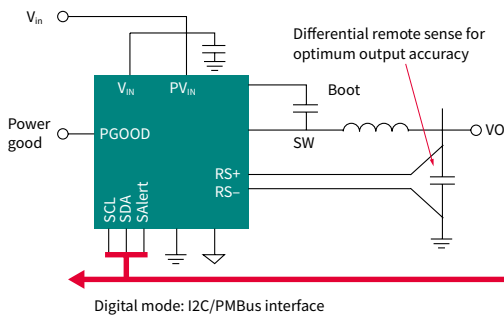
Infineon's integrated POL switching converters deliver benchmark efficiency and dramatically reduce system size. Solutions up to 40 A are available in compact PQFN packages. Target applications include servers, AI, storage, routers and switches, telecom base stations, digital home media, mobile computing, and embedded data processing. PMBus digital communication is available in a single output format.

Point-of-load products – how to choose



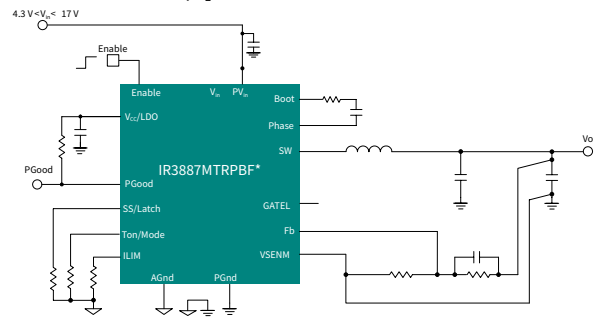
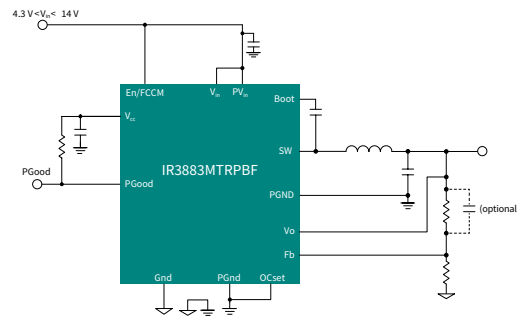
- Telemetry
- Margining
- Intel SVID support
- TDA387xx: 40 A/25 A PMBus
- IR3806x: 6-35 A with PMBus
- IR3816x: 15 A, 30 A with PMBus and Intel SVID
- IRPS5401M: PMBus I²C

- IR3883MTRPBF, IR3823AMTRPBF (3 A)
- IR3888BMTRPBF (16 A)
- IR3888AMTRPBF (20 A)
- IR3888MTRPBF, IR3447AMTRPBF (25 A),
- IR3889MTRPBF, IR3887MTRPBF (30 A)
- IR3846AMTRPBF (40 A)
- TDA38825/6 (20 A)
- TDA38827 (25 A)
- TDA38812/3 (12 A)
- TDA38540 (40 A, stackable)



PMBus IC capabilities

Inventory	Device ID
Configuration	On/off configuration fault/warnings
Control	Sequencing delay/ramp fault response
Telemetry	V _{out} , I _{out} , power temperature, peak values
Status	Comms, data, temps



Ready-to-go reference designs and the online PowerDesk simulator simplify the task of designing regulated voltage rails. Different control topologies are available to meet an application's specific requirements.



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*Coming soon

Digital IPOL voltage regulators

For the next generation of computing applications

The digital interface IPOL devices are easy-to-use, fully integrated, and highly efficient DC-DC regulators offering I2C/PMBus, Intel SVID. The on-board PWM controller and MOSFETs make the family a space-efficient solution, providing accurate power delivery for low output voltage and high current applications.

The latest generation of digital POL regulators, TDA3864X/TDA387XX, use best in class OptiMOS™ FETs with integrated bootstrap diode providing high-efficiency power delivery. Furthermore, it uses a fast Constant On-Time (COT) control scheme, simplifying design efforts and achieving fast transient response.

TDA3864X/TDA387XX support wide input and output voltage ranges, offering programmable switching frequency from 400 kHz to 2 MHz programmable DC loadline, feature provides an additional tool to manage the transient response.

Features and benefits

Key features	Key benefits
– OptiMOS™ MOSFET	– Best-in-class efficiency and thermals
– PMBUS 1.3 compliance	– Stable and reliable design
– Proprietary Fast COT Architecture	– Comprehensive telemetry features
– Digitally programmable loadline	– Voltage setting and margining
– Comprehensive protection features	– Improved transient response
– Operation temp: -40° to 125° C	– No external compensation minimizes passives

Digital interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in} [V]	Max. f_{sw} [kHz]	Distinctive features
IR38060M	6	5 x 6	16	1500	PMBus
IR38062M	15	5 x 7	21	1500	
IR38063M	25	5 x 7	21	1500	
IR38064MTRPBF	35	5 x 7	21	1500	
IR38163M	30	5 x 7	16	1500	OptiMOS™ 5, SVID + PMBus
IR38164M	30	5 x 7	16	1500	OptiMOS™ 5, SVID + PMBus, enhanced Imon
IR38165M	30	5 x 7	16	1500	OptiMOS™ 5, SVID
IR38263M	30	5 x 7	16	1500	OptiMOS™ 5, PVID + PMBus
IR38265M	30	5 x 7	16	1500	OptiMOS™ 5, PVID
IR38363M	15	5 x 7	16	1500	OptiMOS™ 5, SVID + PMBus
IR38365M	15	5 x 7	16	1500	OptiMOS™ 5, SVID
IRPS5401M	4+4+2+2+0.5	7 x 7	14	1500	5 output PMIC, PMBus
TDA38640/A-0000	40	5 x 6	5	2000	OptiMOS™ 5, SVID
TDA38725-0000	25	5 x 6	4,5	2000	OptiMOS™ 5 + PMBus
TDA38740-0000	40	5 x 6	4,5	2000	OptiMOS™ 5 + PMBus



Artificial intelligence



Datacom



Telecom



Server



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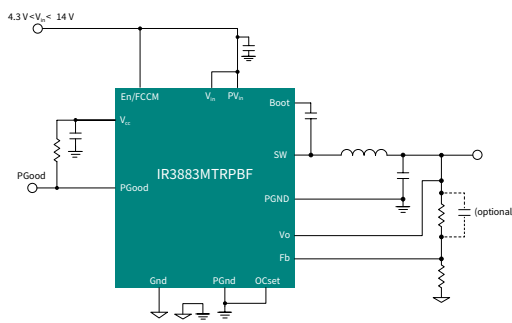
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Analog IPOL voltage regulators with fast COT

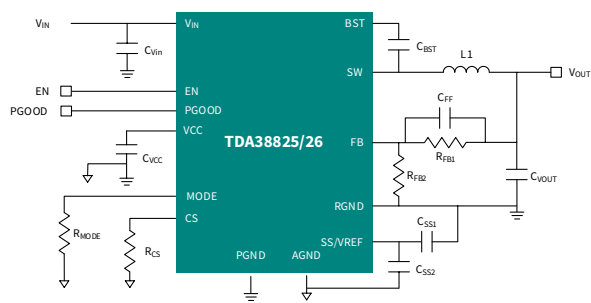
3 – 40 A-rated, easy-to-use with no external compensation and smallest BOM

A broad portfolio of Analog voltage regulator products supports a wide range of computing application requirements. Featuring a proprietary FAST COT architecture, these regulators enable ease of use and provide excellent transient response while minimizing passive count, creating a very compact and cost-effective solution. The devices increase efficiency and power density and simplify design for POL applications in servers, AI, enterprise storage, netcom routers and switches, datacom, and telecom base stations.

Block diagram IR3883M



Block diagram IR3887M (30 A)



Features and benefits

Key features	Key benefits
– Fast COT control engine	– Ease of use, improved transient response, optimized BOM, cost effective
– No external compensation	– Small solution size
– Feature rich: programmable Fsw, supports FCCM/DEM modes	– Stable with all ceramic caps, flexible design and easy tuning
– Comprehensive protection features	– Enabling stable design and long term reliability
– Industry common footprints available	

Analog interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in} [V]	Max. f_{sw} [kHz]	Distinctive features
IR3447AMTRPBF	25	5 x 6	17	600	Costant-on-time (COT)
IR3823AMTRPBF	3	3.5 x 3.5	17	2000	Costant-on-time (COT)
IR3846AMTRPBF	40	5 x 7	17	600	Costant-on-time (COT)
IR3883MTRPBF	3	3 x 3	14	800	Costant-on-time (COT)
IR3887MTRPBF	30	4 x 5	17	2000	Costant-on-time (COT)
IR3888MTRPBF	25	5 x 6	17	2000	Costant-on-time (COT)
IR3889MTRPBF	30	5 x 6	17	2000	Costant-on-time (COT)
IR3899AMTRPBF	9	4 x 5	17	2000	Costant-on-time (COT)
TDA38812	12	3 x 4	16	1000	
TDA38813	12	3 x 4	16	1000	
TDA38820	20	4 x 5	17	2000	Costant-on-time (COT)
TDA38825	20	3 x 4	16	1000	
TDA38826	20	3 x 4	16	1000	
TDA38827	25	5 x 6	17	2000	
TDA38840	40	5 x 6	17	2000	Costant-on-time (COT)



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DC-DC digital multiphase controllers

Point-of-load power management

Infiniteon's digital multiphase and multi-rail controllers provide power for today's medium- and high-current POL applications in telecom, datacom, server, and storage environments. The digital controller family enables OEMs and ODMs to improve efficiency and total cost of ownership while increasing power density and optimizing the total system footprint of the voltage regulator. The products highlighted in the table below represent our seventh-generation digital controller family and support up to two rails with 1-16 phases on individual rails. The I2C/PMBus interface connects the digital controllers to the application system and provides real-time telemetry information, monitoring, and control capabilities. The digital controllers are fully configurable through our graphical user interfaces, enabling ease of use and simplified design optimization.

Feature Controller family									
Configurable output rails		Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail
Part number	PMBus	XDPE15284D	XDPE152C4D	XDPE19283B	XDPE192C3B	XDPE19284C	XDPE192C4C	XDPE1A2G5B	XDPE132G5C
Phase configuration	Main	8 ph	12 ph	8 ph	12 ph	8 ph	12 ph	16 ph	16 ph
	Subconfigurations	N+M=8	N+M=12	N+M=8	N+M=12	N+M=8	N+M=12	N+M=16	8+8
Vout_max		3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V
Switching frequency		Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 2 MHz
Operating temperature range		-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 120°C
VQFN package		40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch
Typical application		Intel server, workstation, high-end desktop	Intel server, workstation, high-end desktop	AMD server, workstation, high-end desktop	AMD server, workstation, high-end desktop	Intel server, workstation, high-end desktop	Intel server, workstation, high-end desktop	GPU, ASIC, net-working	AMD server, GPU, ASIC, net-working

Advantages of a digital controller

The protection features include a set of sophisticated overvoltage, undervoltage, overtemperature, and overcurrent protection. Each controller in the table above also detects and protects against an open circuit on the remote sensing inputs. These attributes provide a complete and advanced protection feature for microprocessor, DSP, FPGA, or ASIC power systems. Accurate current sense telemetry is achieved through internal calibration that measures and corrects current sense offset error sources upon start-up.



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OptiMOS™ power stages

High current integrated power stages with current and temperature telemetry

Infiniteon's integrated OptiMOS™ power stage family contains a synchronous buck gate driver IC co-packed with control and synchronous MOSFETs and a Schottky diode to improve efficiency further. When layout guidelines are followed, the packages are optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU, ASIC, and DDR memory designs. The integrated power stage's internal MOSFET current sense algorithm, with integrated temperature compensation, achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Switching frequency up to 1.5 MHz enables high-performance transient response and allows the miniaturization of output inductors as well as input and output capacitors, while maintaining industry-leading efficiency. The integrated power stage family is optimized for GPU and CPU core power delivery in AI, server, cloud, and data center applications. The ability to meet the stringent requirements of the server market also makes them ideally suited for powering GPU, ASIC, DDR memory, and other high-current designs.

Features

- Integrated driver, Schottky diode, control MOSFET, and synchronous MOSFET
- 5 mV/A or 5 μ A/A on-chip MOSFET current sensing with temperature-compensated reporting
- Input voltage (V_{in}) range of 4.5 to 15 V VCC and VDR V supply of 4.5 to 7 V
- Output voltage range from 0.25 up to 5.5 V
- Output current capability of 90 A
- Operation up to 2.0 MHz
- VCC under-voltage lockout (UVLO)
- 8 mV/°C temperature analog output and thermal flag pull-up to 3.3 V
- Overtemperature protection (OTP)
- Cycle-by-cycle self-preservation overcurrent protection (OCP)
- MOSFET phase fault detection and flag
- Preliminary overvoltage protection (pre-OVP)
- Compatible with 3.3 V tri-state PWM input
- Body-braking load transient support through PWM tri-state
- Diode emulation mode (DEM) for improved light-load efficiency
- Thermally enhanced packages

Part type	Package	I_{out} [A]	V_{in} [V]	V_{out} [V]	Switching frequency [MHz]
TDA21470	5x6 x 0.9 mm PQFN	70	4.5 to 15	0.25 to 5.5	1.0
TDA21490	5x6 x 0.9 mm PQFN	90	4.5 to 15	0.25 to 5.5	1.0
TDA21570	5x6 x 0.9 mm PQFN	70	4.5 to 15	0.25 to 5.5	1.2
TDA21590	5x6 x 0.9 mm PQFN	90	4.5 to 15	0.25 to 5.5	1.2
TDA21435	4x5 x 0.9 mm PQFN	35	4.5 to 15	0.25 to 5.5	1.2
TDA21550	4x5 x 0.9 mm PQFN	50	4.5 to 15	0.25 to 5.5	1.5
TDA22590	4x6 x 0.47 mm Chip Embedded	90	4.5 to 15	0.25 to 5.5	1.5



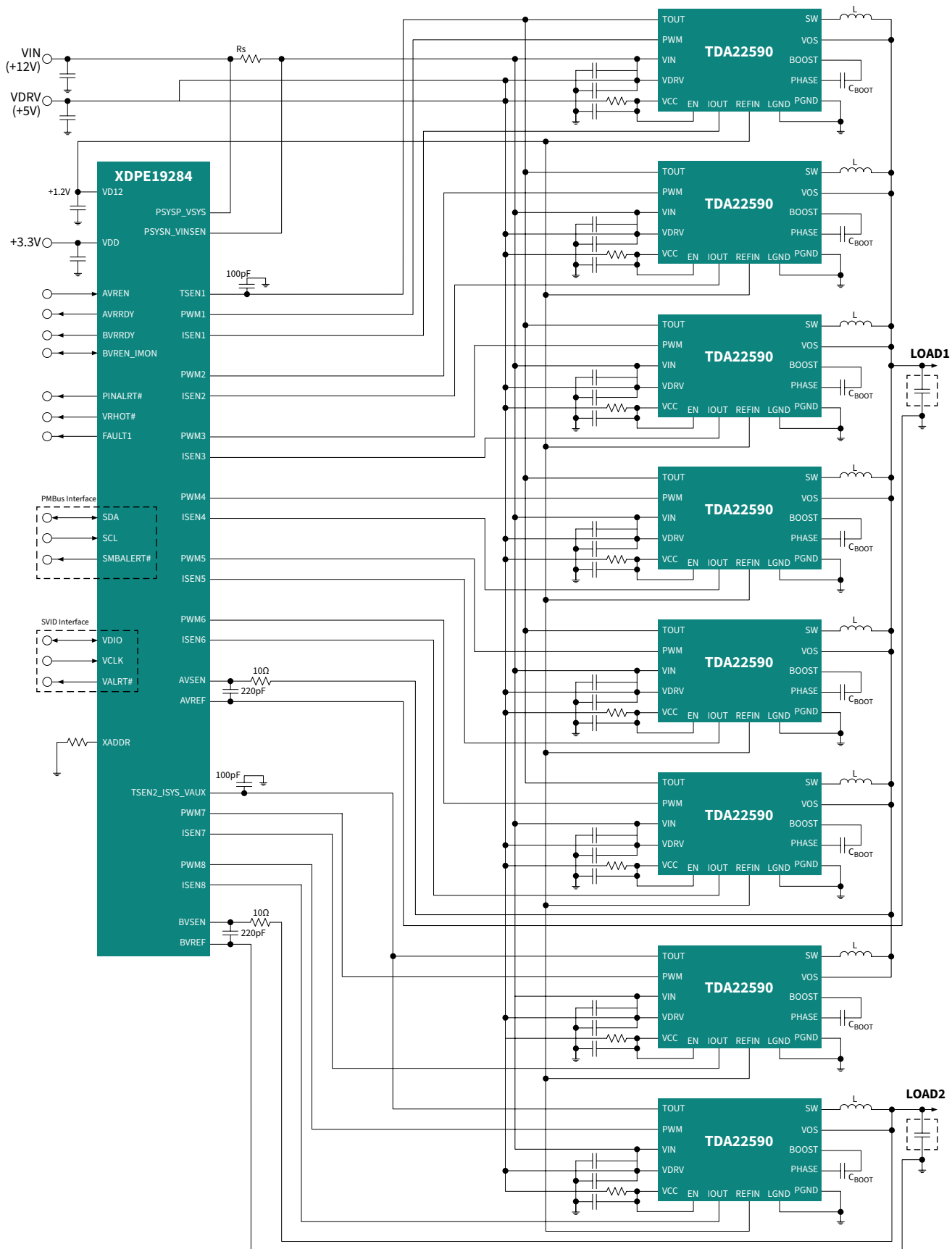
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Typical multiphase application circuit



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Dual-phase power modules

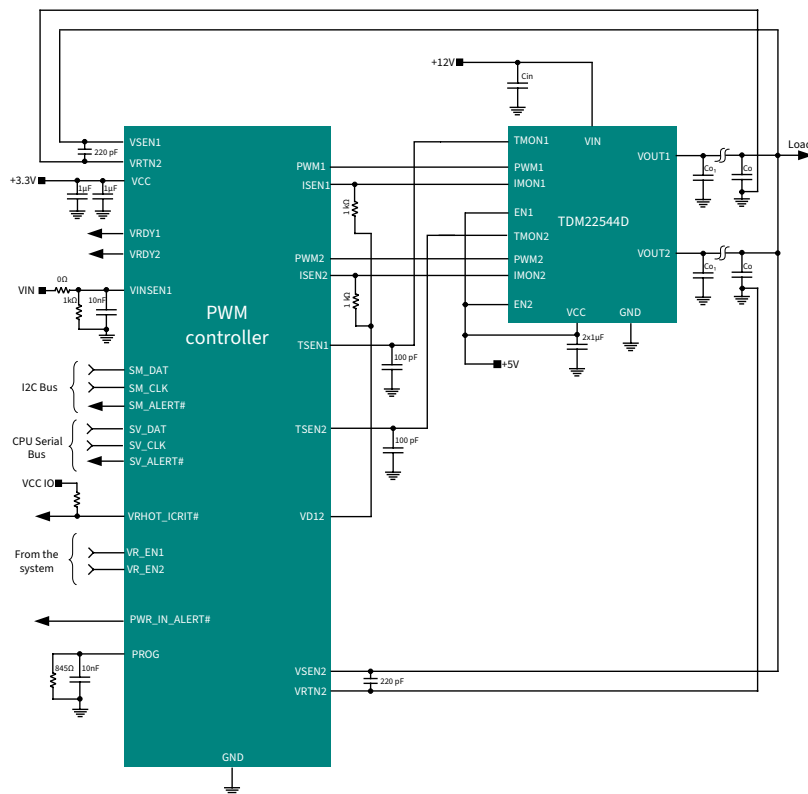
120-A OptiMOS™ TDM22544D and TDM22545D

Artificial intelligence is driving an exponential increase in global data generation and consequently increasing the energy demand of the chips that support this enormous data growth, now approaching a thermal design power of >1000 W. As AI servers require three times more energy than traditional servers, and as data centers are already consuming more than two percent of the global energy supply, it is essential to find innovative power solutions and architecture designs that can lead to a measurable impact on global energy savings, as well as better total cost of ownership for data centers.

To meet this demand, TDM2254xD dual-phase power modules offer a best-in-class power density and efficiency, contributing to a substantial decrease in the total cost of ownership of data centers and, hence, a greener AI.

Block diagram

Dual Phase 120 A Power Stage Module



Features and benefits

Key features

- 10x9x8 mm + 10x9x5 mm for 160 A peak
- +2% higher efficiency than competition at full load
- -5°C cooler than competition at full load
- Minimized PDN losses
- 70 A per phase thermally managed

Key benefits

- High power density solution (>1A/mm²)
- Best-in-class efficiency and TCO
- Optimal thermal management
- Enabling vertical power delivery
- Improved signal integrity



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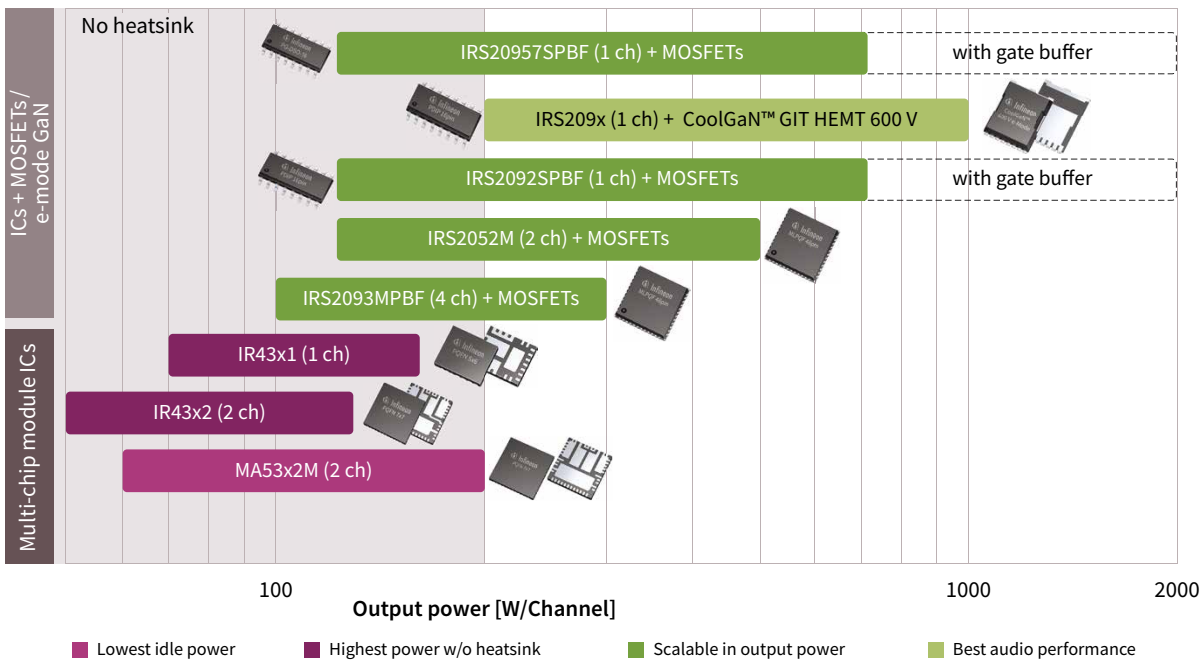
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Integrated class D audio amplifier ICs


Cooler, smaller, and lighter class D audio amplifiers for great sounding products

Infiniteon's MERUS™ audio solutions enable audio designers to improve the performance of their products while increasing efficiency and reducing solution size. In combination with new innovative architectures, advances in semiconductor processes are behind a portfolio of class D technologies that allow professional, commercial/home, and portable audio applications to benefit from unparalleled performance, power density, and reliability. The broad portfolio covers power ranges from 100 W to 2 kW per channel, from the multi-chip modules (MCMs) to highly scalable discrete audio amplifier solutions consisting of powerful MOSFET/CoolGaN™ HEMT and driver ICs combinations.




By combining our core principles, competencies, and leadership in groundbreaking power semiconductors with revolutionary audio amplifier technologies, such as MERUS™, we provide smaller, lighter, more robust, and flexible solutions that run with less heat dissipation. In addition to outstanding quality and reliability, Infineon's amplifier solutions are designed to maximize power efficiency and dynamic range while providing best-in-class performance in product form factors that make them an optimal fit for any high-end application.


Design with Infineon's solutions to benefit from:




Maximized power efficiency



Maximized output power



Design freedom



Fast time to market



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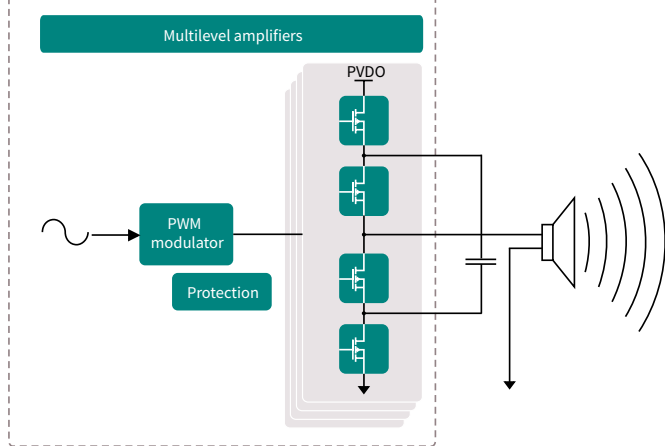
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Integrated MERUS™ multilevel amplifier ICs for class D audio solutions

High power efficiency and density in small packages

With its revolutionary MERUS™ integrated multilevel class D audio amplifier ICs, Infineon is leading in efficiency and power density. Compared to traditional class D amplifier ICs, which produce only two voltage output levels, multilevel amplifier ICs use additional on-chip MOSFETs and capacitors to produce outputs with a higher signal granularity, i.e., higher switching frequencies and multiple output signal levels – typically up to five voltage levels.

Filterless topology with “flying capacitor” of an integrated class D IC

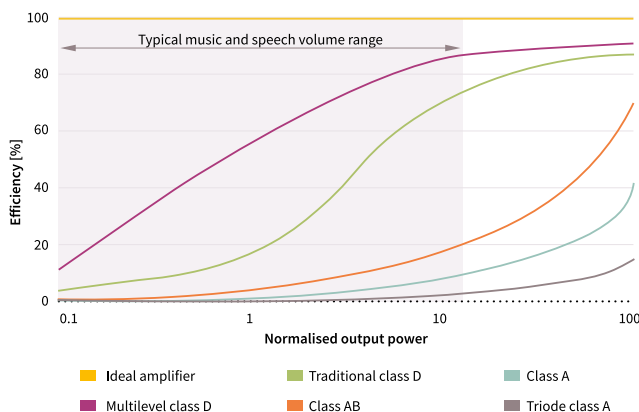


Features and benefits

Key features
– Multilevel switching technology
– Scalable signal “granularity”
– Proprietary circuits architecture

Key benefits
– Highest efficiency and power density
– Potential LC filter removal
– Low THD+N
– Cooler operation
– Low power loss
– Virtually no switching loss measurable in idle mode

Efficiency where it matters for audio reproduction



For MERUS™ integrated multilevel audio amplifier ICs, amplifier efficiency at average output power is key. The graph on the left shows that the MERUS™ multilevel amplifier is much more effective than the traditional class D amplifier, translating into less power consumption in AC input and battery-powered audio applications.



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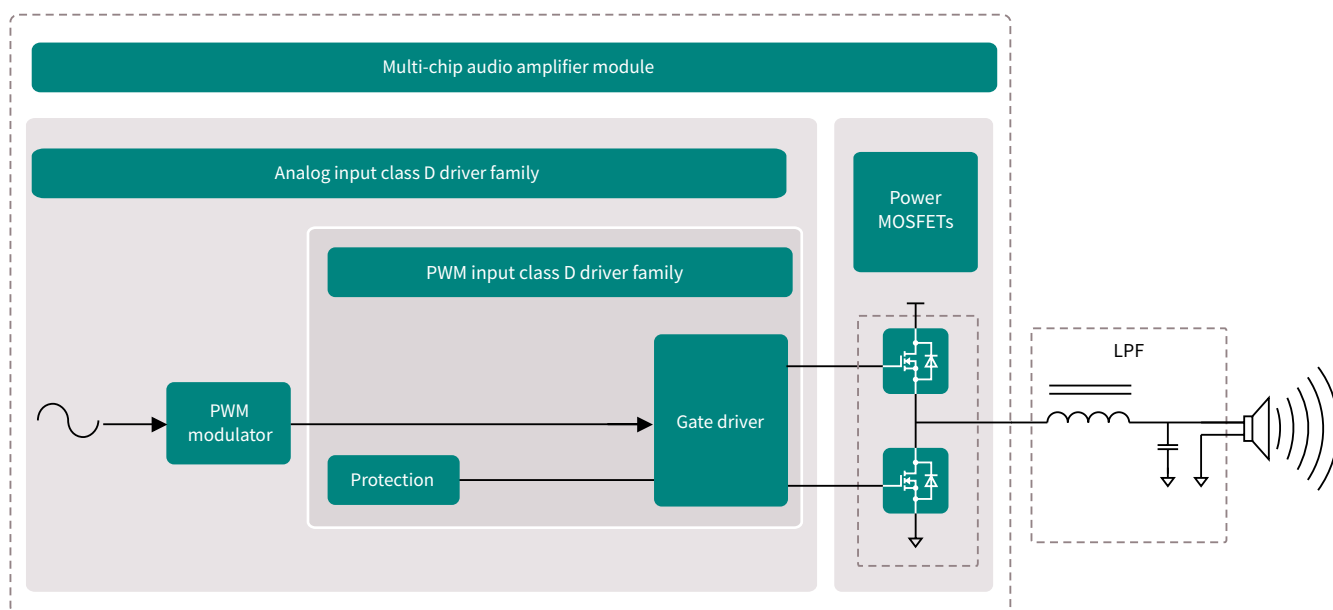
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MERUS™ integrated audio amplifier multi-chip modules (MCM)

Integrated components for scalable output power and superb audio performance

Multi-chip modules integrate PWM controller and power MOSFETs in a single package to offer a highly efficient, compact solution that reduces component count, shrinks PCB size up to 70 percent, and simplifies class D amplifier design.

Multi-chip audio amplifier module



Features and benefits

Key features

- Single package with integrated PWM controller and audio-performance-optimized power MOSFET
- Overcurrent protection
- Thermal shutdown
- Floating differential input
- Clip detection
- Best-in-class power efficiency and audio performance
- Lower component count, leading to design simplification
- Compatible with single supply or split rail configuration
- Click noise reduction

Key benefits

- Extended battery playback time
- Unrivalled audio performance
- Smaller solution size (BOM reduction, system level cost savings)
- Eliminated need for heatsink
- High noise immunity
- Reliable operation
- Thermal efficiency



Audio amplifier



Wireless audio



Audio



PoE



Audio



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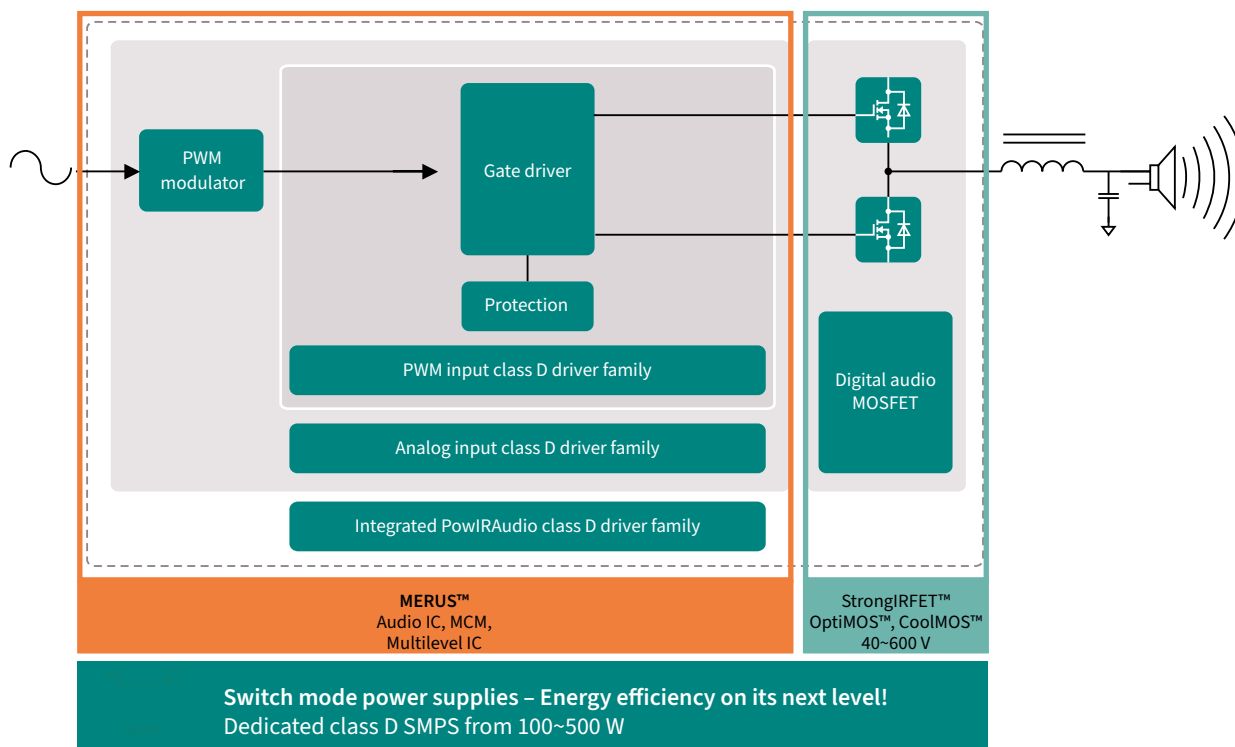
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Discrete MERUS™ audio amplifier driver ICs with MOSFET and gallium nitride CoolGaN™ HEMT

Scalable output power with a unified design platform

Infinion’s discrete audio solutions are scalable to various output power levels by replacing the driver-transistor combinations’ external MOSFETs or CoolGaN™ HEMTs. Key parameters for the transistors used in discrete class D audio applications include on-state resistance ($R_{DS(on)}$), gate charge (Q_g), and reverse recovery charge (Q_{rr}). Our products are specifically suitable for class D audio applications and optimized for these parameters to achieve maximized efficiency, THD, and EMI amplifier performance. The CoolGaN™ HEMT portfolio is specifically built for class D audio requirements, with high-performing SMD packages to fully utilize the benefits of gallium nitride.

Audio solution overview



Features and benefits

Key benefits
– Unified design platform
– Scalable output power up to over 2 kW per channel
– Simple yet effective - exchange of external MOSFET triggers alteration in output power level
– Best-in-class power efficiency

Key advantages
– Superior audio performance
– Increased reliability
– Unique audio experience



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Integrated class D audio amplifier IC portfolio

MERUS™ integrated audio amplifier multi-chip modules (MCMs)

	IR4321M	IR4301M	IR4322M	IR4302M	MA5302MS*	MA5332MS	MA5342MS*	
Specifications	Number of audio channels	1	1	2	2	2	2	
	Max. power per channel	90W	160W	100W	130W	200W	200W	
	Supply voltage	~ ± 25 V or 50 V	~ ± 31 V or 62 V	~ ± 25 V or 50 V	~ ± 31 V or 62 V	~ ± 32 V or 64 V	~ ± 40 V or 80 V	~ ± 60 V or 120 V
	Max. PWM frequency	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz
	Differential audio input	✓	✓	✓	✓	✓	✓	✓
Features	Overcurrent protection	✓	✓	✓	✓	✓	✓	
	Integrated power MOSFET	✓	✓	✓	✓	✓	✓	
	Abs. max voltage	60V	80V	60V	80V	80V	100V	150V
	PWM controller	✓	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓	✓
	Click noise reduction	✓	✓	✓	✓	✓	✓	✓
	Clip detection			✓	✓	✓	✓	✓
	Package type	5x6 mm QFN	5x6 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN
	Evaluation boards	IRAUDAMP21	IRAUDAMP12 IRAUDAMP19	IRAUDAMP22	IRAUDAMP16 IRAUDAMP17	EVAL_MA5302MS_200Wx2 REF_MA5302BTLSPS_400W	EVAL_AUDAMP25 REF_MA5332BTLSPS	EVAL_MA5342MS_200Wx2

MERUS™ discrete audio amplifier driver IC product portfolio

	IRS20957SPBF	IRS2092SPBF	IRS2052M	IRS2093MPBF	IRS2452AM	IRS2461S	
Specifications	Number of audio channels	1	1	2	4	2	1
	Max. power per channel	500W	500W	300W	300W	500W	500W
	Supply voltage	± 100 V	± 100 V	± 100 V	± 100 V	± 200 V	± 200 V
	Gate sink/source current	1.2/1.0 A	1.2/1.0 A	0.6/0.5 A	0.6/0.5 A	0.6/0.5 A	0.6/0.5 A
	Overcurrent protection	✓	✓	✓	✓	✓	✓
Features	PWM input	✓	✓				
	Floating input	✓	✓	✓	✓	✓	✓
	Dead time		✓	✓	✓	✓	✓
	Protection control logic	✓	✓	✓	✓	✓	✓
	PWM controller		✓	✓	✓	✓	✓
	Clip detection			✓			
	Click noise reduction		✓	✓	✓	✓	✓
	Temperature sensor input			✓		✓	✓
	Thermal shutdown			✓			
	Clock input			✓		✓	
	Package type	16-pin SOIC narrow	16-pin SOIC narrow	MLPQ48	MLPQ48	MLPQ32	20-lead SOIC wide
Evaluation boards	IRAUDAMP4A IRAUDAMP6	IRAUDAMP5 IRAUDAMP7S IRAUDAMP9	IRAUDAMP10	tbd	IRAUDAMP23	REF_IRS2461S_5KW	



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Recommended MOSFET (through-hole) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRFB4019	IRFB4019	IRFI4020H-117P
200 W	IRS2052M	IRFB5615	IRFB4019	IRFI4020H-117P
300 W	IRS2092SPBF	IRFB4228PBF	IRFB4227	IRFB4229
500 W	IRS20957SPBF	IRFB4228PBF	IRFB4227	IRFB4229
750 W		IRFB4227	IRFB4229	
1000 W		IRFP4668	IRFB4229 x 2	

IRS2093MPBF works up to 150 W and IRS2052M works up to 300 W.

IRS2092SPBF and IRS20957SPBF work with all power levels listed above.

Recommended MOSFET (DirectFET™) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRF6645	IRF6665	IRF6775M
200 W	IRS2052M	IRF6646	IRF6775M	IRF6775M
300 W	IRS2092SPBF	IRF6644	IRF6775M	IRF6785
500 W	IRS20957SPBF	IRF6643	IRF6641	



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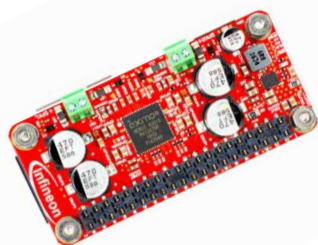
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Recommended audio evaluation boards

Enabling fast time to market and device performance evaluation



KIT_40W_AMPHAT_ZW

Kit board - MERUS™ audio amplifier HAT ZW class D audio amplifier 40 W for Raspberry Pi Zero W featuring MA12070P

Summary of features

- Equipped with MERUS™ MA12070P proprietary multilevel amplifier
- Compatible with Raspberry Pi Zero and Raspberry Pi Zero wireless
- Power input: 5 V/2.5 A - sourced from the same single supply as the Raspberry Pi
- No need for external or extra power supplies
- Up to 40 W instantaneous peak output power with the Raspberry Pi official 5 V/2.5 A supply

Benefits

- Compatibility with major streaming applications for Raspberry Pi (Volumio, JustBoom Player, Max2Play)
- Up to 48 kHz of sample rate and 24-bit of music playback
- Full hardware control, customization, and error monitoring through Linux Alsa mixer

Potential Applications

- DIY on the go wireless speakers
- DIY intelligent home audio systems



KIT_ARDMKR_AMP_40W

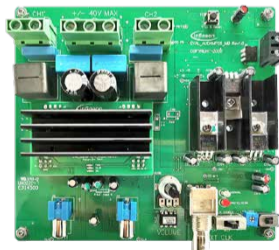
Kit board MA12070P audio amplifier - compatible with Arduino MKR boards

Summary of features

- Equipped with MERUS™ MA12070P proprietary multilevel amplifier
- Power input: 5 V/2.5 A - sourced from the same single USB-C power supply or battery pack
- No need for external or extra power supplies
- Up to 40 W instantaneous peak output power with a USB-C power supply or battery pack

Benefits

- Compatible with Arduino MKRZERO and MKR1000 WIFI
- Full hardware control and customization
- Error monitoring through Arduino programming framework



EVAL_AUDAMP25

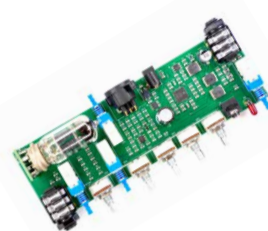
Number of audio channels: 2

Output power per channel [RMS]: 200 W

Featured class D IC: MA5332MS

Input: analog

OPN: EVALAUDAMP25TOBO1



DEMO_BASSAMP_60W_MA12070

Reference design demoboard MERUS™ MA12070 as musical instrument bass amplifier

Summary of features

- 1 x 60 W at 4 Ω speaker output
- Powered by off-the-shelf regulated wall adapter
- 12AU7 vacuum-tube preamplifier
- Stereo 3.5 mm AUX input
- XLR D.I. output with ground lift switch
- Bright switch for slap-bass sound
- Low idle power consumption

Benefits

- Superior sound quality
- Modelled after classic bass amplifier topology
- Genuine vacuum-tube preamplifier
- Small size and scalable platform
- Excellent efficiency



REF_MA5332BTLSPS

Number of audio channels: 1

Output power per channel [RMS]: 200 W

Featured class D IC: MA5332MS

Input: analog

OPN: REFMA5332BTLSPSTOBO1



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MERUS™ integrated audio amplifier multi-chip module (MCM) evaluation boards



IRAUDAMP12

Number of audio channels: 2
Output power per channel [RMS]: 130 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP12

IRAUDAMP17

Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4302M
Input: Analog
OPN: IRAUDAMP17

IRAUDAMP19

Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP19

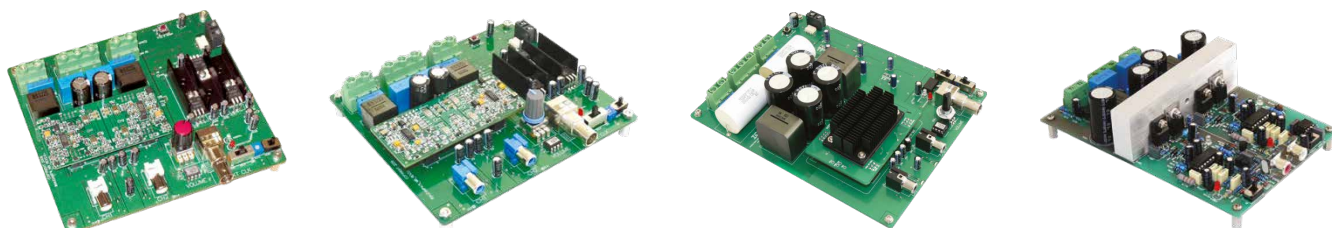
IRAUDAMP21

Number of audio channels: 2
Output power per channel [RMS]: 135 W
Featured class D IC: IR4321M
Input: Analog
OPN: IRAUDAMP21

IRAUDAMP22

Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4322M
Input: Analog
OPN: IRAUDAMP22

Discrete MERUS™ audio amplifier driver IC and MOSFET evaluation boards



IRAUDAMP4A

Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP4A

IRAUDAMP5

Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS2092S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP5

IRAUDAMP6

Number of audio channels: 2
Output power per channel [RMS]: 250 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6785MTRPbF
OPN: IRAUDAMP6

IRAUDAMP7S

Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IRFI4019H-117P
OPN: IRAUDAMP7S



IRAUDAMP9

Number of audio channels: 1
Output power per channel [RMS]: 1700 W
Featured driver IC: IRS2092S
Featured MOSFET: IRFB4227PbF
OPN: IRAUDAMP9



IRAUDAMP10

Number of audio channels: 2
Output power per channel [RMS]: 370 W
Featured driver IC: IRS2052M
Featured MOSFET: IRF6775MTRPbF
OPN: IRAUDAMP10



IRAUDAMP23

Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IPP60R180C7
OPN: IRAUDAMP23



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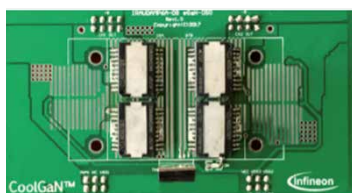
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Discrete audio amplifier driver IC and CoolGaN™ GIT HEMT 400 V evaluation board



EVAL_AUDAMP24

Number of audio channels: 2

Output power per channel [RMS]: 300 W at 1%

Featured driver IC: IRS20957S

Featured HEMT:

IGOT40R070D1

IGT40R070D1

OPN: EVAL_AUDAMP24



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AC-DC LED driver ICs

Digital and mixed-signal, single- and dual-stage high-voltage control ICs for LED drivers

XDP™ digital power – digital single- and dual-stage flyback combo controllers

The XDP™ portfolio of high-performance digital power control ICs addresses today's challenges, such as smart or connected lighting, meeting demanding LED driver requirements with unique features.

Mixed-signal control ICs for solid-state lighting luminaires

Infineon's mixed-signal control ICs for LED drivers deliver excellent power quality and high efficiency for LED lighting applications, supporting down to 1 percent dimming levels. The integration of advanced functions saves external components and minimizes system costs. The wide variety of features and functions gives the option to choose the best-fitting part for the application.

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LEDs
plug & play



LED



Lighting

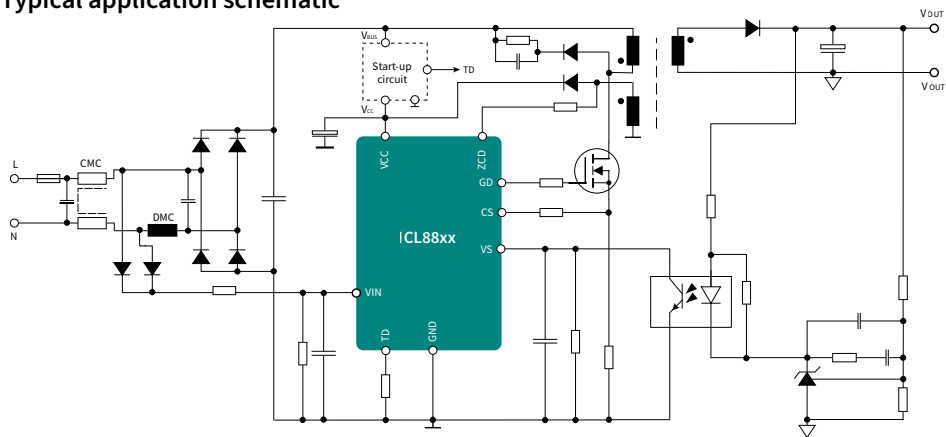
ICL8800/ICL8810/ICL8820

Single-stage flyback LED controllers for constant voltage output

The ICL88xx family of single-stage flyback controllers for constant voltage output is tailored for LED lighting applications to meet the required performance cost-effectively. All three ICs offer benchmarking performance for power factor correction and total harmonic distortion at full-load and low-load conditions. Their comprehensive protection features (see table below) and bottom-up design make them easy to design and require a minimum number of external components. The controllers are optimized as secondary-side regulated (SSR) constant voltage (CV) output flyback controllers and are also well suited for primary-side regulation (PSR).

Additionally, the controllers' low standby power due to the integrated BM (in ICL8810, ICL8820) is ideally suited for smart lighting systems' requirements. The jitter function (in ICL8820) eases the design of emergency lighting LED drivers without additional circuitry. It fulfills EMI requirements in DC operations and improves EMI performance.

Typical application schematic



Features and benefits

Key benefits

- Optimized for SSR CV output flyback operation, additionally suited for PSR
- $PF > 0.9$ and $THD < 10\%$ across a wide load range (AC input up to $277 V_{RMS}$)
- CCM and QRM with smart valley hopping
- ICL8810 also contains burst mode (BM) to ensure low standby power ($< 100 mW$)
- ICL8820 also contains built-in jitter function

Key advantages

- Low BOM for wide range of applications with PFC functionality where dual-stage topologies are required
- Enables platform design and window drivers
- Optimum efficiency and low EMI at low BOM without compromising light quality
- ICL8810 enables in addition: smart lighting in connection with microcontrollers (standby power $< 500 mW$, i.e., more power budget for additional components)
- ICL8820 enables in addition: Fulfillment complying with EMI regulations in DC operation at low cost and effort

Order information for ICL88xx

Board name	Description	Ordering code
ICL8800	Single-stage flyback controller for constant voltage output	ICL8800XUMA1
REF_ICL8800_LED_43W*	Demoboard with ICL8800	REFICL8800LED43W
ICL8810	Single-stage flyback controller for constant voltage output with low standby power	ICL8810XUMA1
REF_ICL8810_LED_43W_BM*	Demoboard with ICL8810 with burst mode	REFICL8810LED43WBM
REF_ICL8810_LED_42W_PSR	Demoboard with ICL8810 for primary side regulation	REFICL8810LED42WPSR
ICL8820	Single-stage flyback controller for constant voltage output with low standby power and jitter function	ICL8820XUMA1
REF_ICL8820_LED_43W_JT*	Demoboard with ICL8820 with jitter function	REFICL8820LED43WJT



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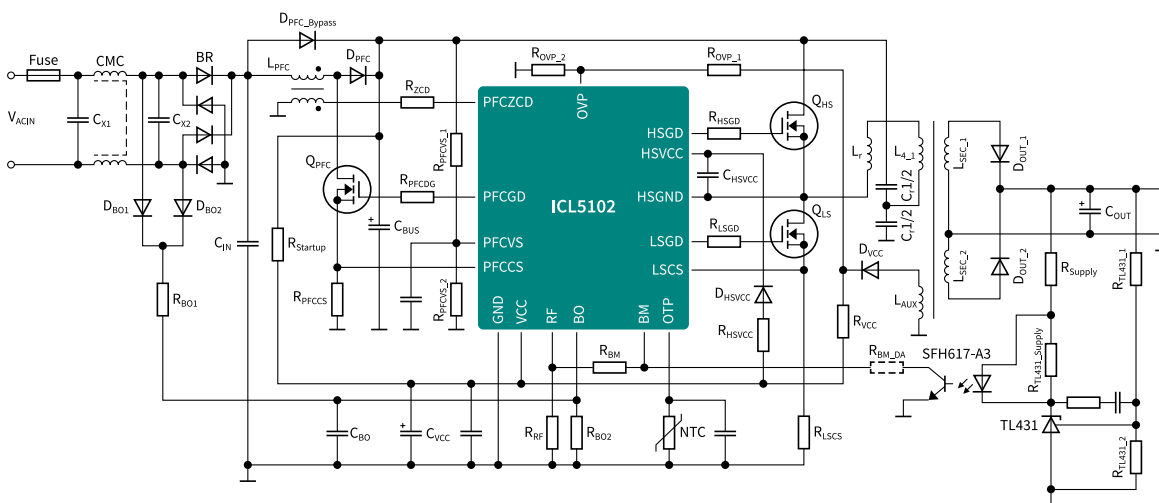
*See Plug & LEDs play, ideally to be combined with secondary-side boards

ICL5102

High-performance PFC + resonant controller for LCC and LLC

With ICL5102, Infineon offers a highly integrated combo controller IC with a universal input of 70 V to 325 V. This allows manufacturers to realize global designs, keeping the cost for product variety and stock low. The highest efficiency of up to 94 percent by resonant topology, a THD factor less than 3.5 percent, and a high power factor of more than 0.95 allow for more lumen output and less thermal load, enabling cost-effective designs and keeping the cost for LEDs and heat sink low. Thanks to the high integration, there is no need for additional expensive components in the PFC and LLC stage, reducing the overall BOM cost. In addition, integrated protection features complement the ICL5102 features.

Typical application schematic



Features and benefits

Key features and benefits

- Small form factor LED driver and low BOM**
 The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications
- High performance, digital PFC, and advanced HB driver**
 The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditions down to 0.1 percent of the nominal power without audible noise
- Fast time-to-light and low standby**
 With a start-up current of less than 100 μ A the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW
- Safety first**
 The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102

Type	Description	Ordering code
ICL5102	PFC and resonant controller for LCC and LLC	ICL5102XUMA2
REF-ICL5102-U130W-CC	PFC/LLC-CC constant current evaluation board 130 W LED driver	REFICL5102U130WCCTOBO1
REF-ICL5102-U52W-CC	Low-cost PFC/LCC reference design 52 W LED driver, non-dimmable	REFICL5102U52WCCTOBO1
REF_ICL5102_U100W_LCC	Low-cost PFC/LCC reference design 100 W, dimmable	REFICL5102U100WLCC
REF_LLC_BUCK_4CH_320W*	Scalable 320 W multichannel high-power LED driver (using ICL5102 board and ILD8150E board)	REFLLCBUCK4CH320WTBOB1



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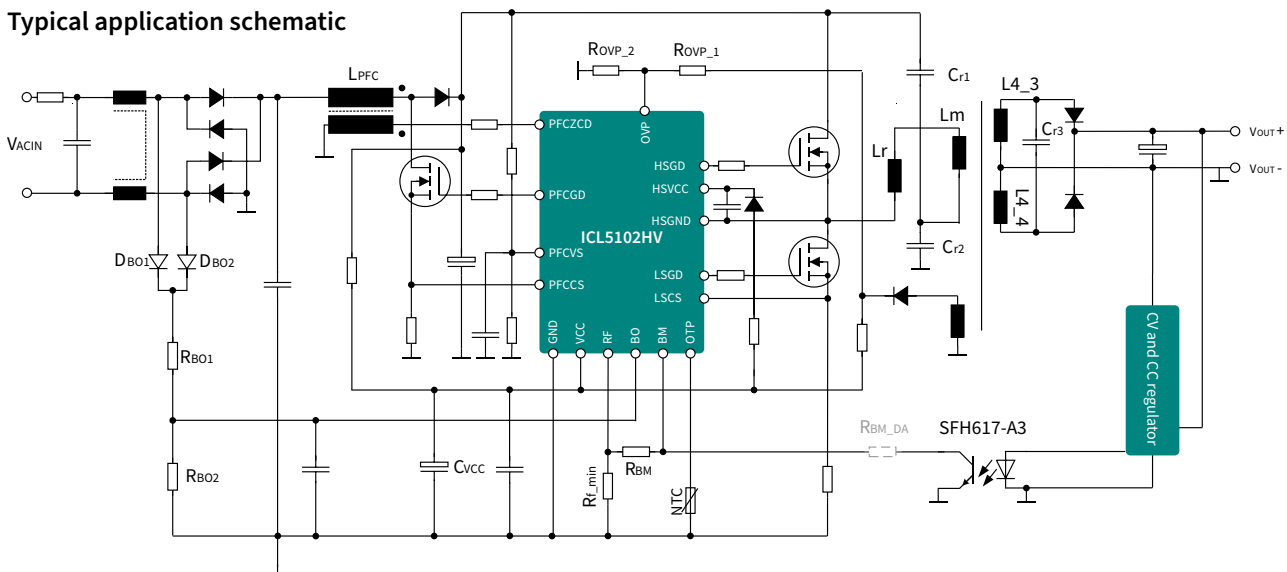
*See Plug & LEDs play, ideally to be combined with secondary-side boards

ICL5102HV

High-performance PFC + resonant controller for LCC and LLC, supporting 980 V high side

ICL5102HV control IC for LED drivers offers a unique one-package solution for lighting applications up to 350 W, supporting LLC/LCC topology. It is particularly designed to deliver best performance of total harmonic distortions (THD) and power factor (PF). Compared to level-shifter technology, the integrated coreless transformer not only further reduces the loss at high operation frequency, but also enhances the capability of handling a huge negative voltage (-600 V on HSGND). Reduce the number of external components to optimize the form factor and reduce the bill of materials (BOM) with the integrated two-stage combination controller (PFC + LLC/LCC) for lighting applications. Simplify your design and shorten time-to-market.

Typical application schematic



Features and benefits

Key features and benefits

- Small form factor LED driver and low BOM**
 The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications
- High performance, digital PFC, and advanced HB driver**
 The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditions down to 0.1 percent of the nominal power without audible noise
- Fast time-to-light and low standby**
 With a start-up current of less than 100 μ A the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW
- Safety first**
 The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102HV

Type	Description	Ordering code
ICL5102HV	PFC and resonant controller for LCC and LLC	ICL5102HVXUMA1
REF-ICL5102HV-U150W	PFC/LCC evaluation board 150 W, CC LED driver	REFICL5102HVU150WTBO1



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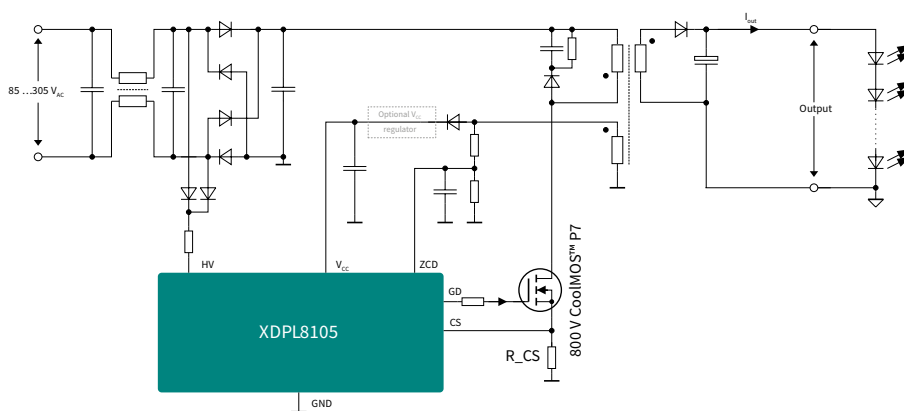
XDP™ LED

The IC family XDP™ is the first all-in-one package solution combining a digital controller with key power peripherals. Such integration provides exceptional flexibility and performance. The XDP™ family addresses essential features for advanced LED driver.

XDPL8105 – digital flyback controller IC for LED driver

The XDPL8105 is a digital, single-stage flyback controller with a high power factor for a constant current LED driver. The IC is available in a DSO-8 package and provides a wide feature set, requiring a minimum of external components. The advanced control algorithms in the digital core of the XDPL8105 provide multimode operation for high efficiency. Configurable parameters allow last-minute changes, shorten the product development time, and reduce hardware variants. The extensive configurable standards and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver device for diverse use cases.

Typical application schematic



Features and benefits

Key features and benefits

- Constant current with primary-side regulation
- Supports AC and DC input
- Nominal input voltage range 90-305 V_{AC} or 120-350 V_{DC}
- Integrated 600 V start-up cell
- Power factor > 0.9 and THD < 15 percent over wide load range
- Highly accurate primary-side control output current typ. ± 3 percent
- Reference board efficiency > 90 percent
- Internal temperature guard with adaptive thermal management
- Multimode operation
 - QRM (quasi-resonant mode)
 - DCM (discontinuous conduction mode)
 - ABM (active burst mode)
- Digital parameters
 - Relevant error conditions are monitored and protected
 - Undervoltage
 - Overvoltage
 - Open load
 - Output shorted

Order information for XDPL8105

Type	Description	Ordering code
XDPL8105	Digital flyback constant current controller IC	XDPL8105XUMA1
REF-XDPL8105-CDM10V	40 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8105CDM10VTOBO1



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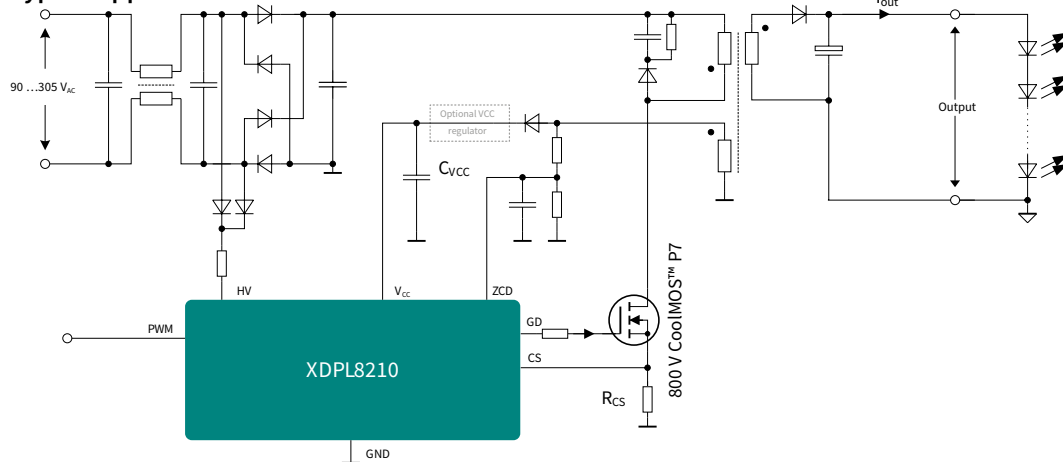
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XDPL8210 – digital flyback constant current controller IC for LED driver with 1 percent dimming

The XDPL8210 is a digital, single-stage, quasi-resonant flyback controller with a high power factor and high precision primary-side controlled constant current output. The IC is available in a DSO-8 package and provides a wide feature set, which requires only a small number of external components. Sophisticated algorithms provide flicker-free dimming below one percent. The driver fully supports IEC61000-3-2 class C designs. The limited power mode improves functional safety, while configurable parameters allow last-minute changes, shorten product development time, and reduce hardware variants. The extensive configurable standards and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver for many use cases.

Typical application schematic



Features and benefits

Key features and benefits

- Constant current with primary-side regulation
- Supports AC and DC input
- Nominal input voltage range 90-305 V_{AC} or 90-430 V_{DC}
- Reference board efficiency > 90 percent
- Power factor > 0.9 and THD < 15 percent over wide load range
- Standby power < 100 mW
- Internal temperature guard with adaptive thermal management
- Multimode operation
 - QRM (quasi-resonant mode)
 - DCM (discontinuous conduction mode)
 - ABM (active burst mode)
- Digital parameters
 - Relevant error conditions are monitored and protected
 - Undervoltage
 - Overvoltage
 - Open load
 - Output shorted

Order information for XDPL8210

Type	Description	Ordering code
XDPL8210	Digital flyback constant current controller IC	XDPL8210XUMA1
REF-XDPL8210-U35W	35 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8210U35WTOB01



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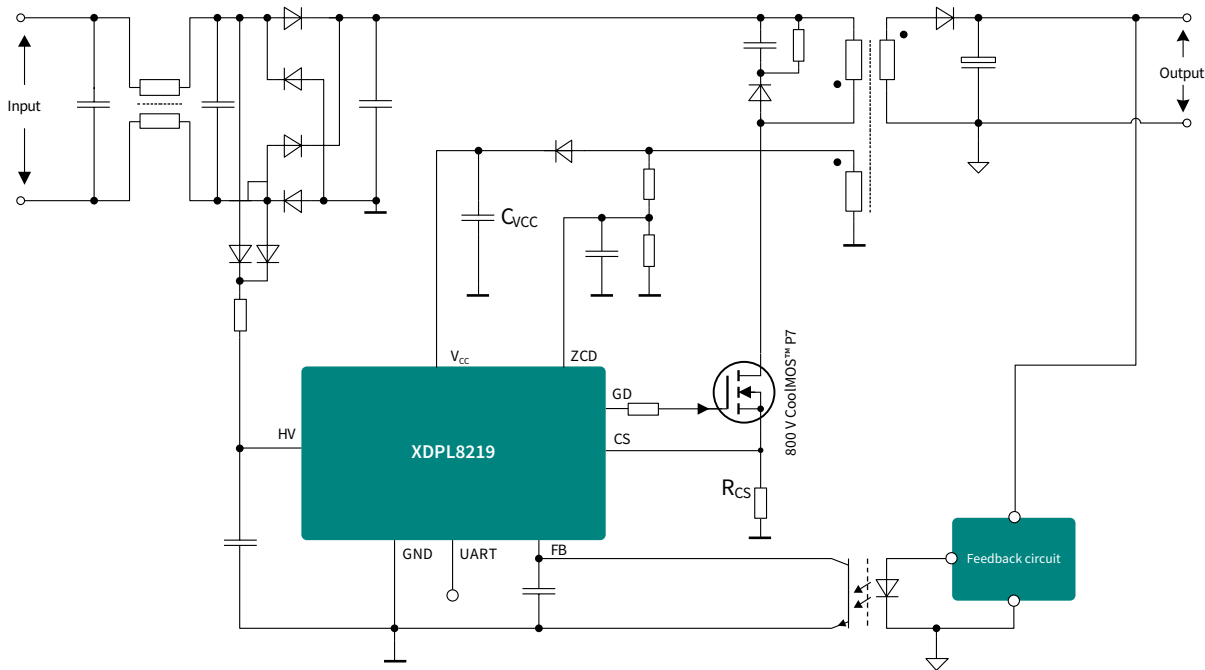
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XDPL8219 – PFC/flyback controller with enhanced total harmonic distortion

The XDPL8219 is a digital high-performance secondary-side regulated flyback controller with constant voltage output. With its high power factor, the controller is the perfect fit for cost-effective, dual-stage LED drivers and enables smart lighting applications. The device operates in quasi-resonant mode (QRM) to maximize efficiency and minimize electromagnetic interference (EMI) over a wide load range. It enters active burst mode (ABM) at light load to prevent audible noise from being heard while achieving no-load standby power as low as <math><100\text{ mW}</math>. The XDPL8219 is available in a DSO-8 package.

Typical application schematic



Features and benefits

Key benefits

- Secondary-side-regulated (SSR) constant voltage (CV) output
- Flyback controller with power factor correction
- Depending on load condition, either quasi-resonant, discontinuous conduction mode or active burst mode (ABM)
- Integrated 600 V start-up cell

Key benefits

- Supports wide load range and fast and stable reaction to dynamic load changes
- $\text{PF} > 0.9$ and $\text{THD} < 10\%$ across a wide load range (AC input up to $277\text{ V}_{\text{RMS}}$)
- Optimal efficiency, power factor, and THD can be achieved by best-suited mode. In addition, DCM eases compliance with EMI at low-load condition
- Very low standby power $< 100\text{ mW}$ can be achieved
- Integrated start-up cell enables very high efficiency

Order information for XDPL8218

Type	Description	Ordering code
XDPL8219	Digital flyback CV output controller IC	XDPL8219XUMA1
REF-XDPL8219-U40W*	Efficient 40 W reference circuit design for XDPL8219 with high power factor and low THD. It is built for universal input voltage 120–277 V AC or 127–432 V DC	REFXDPL8219U40WTOB01



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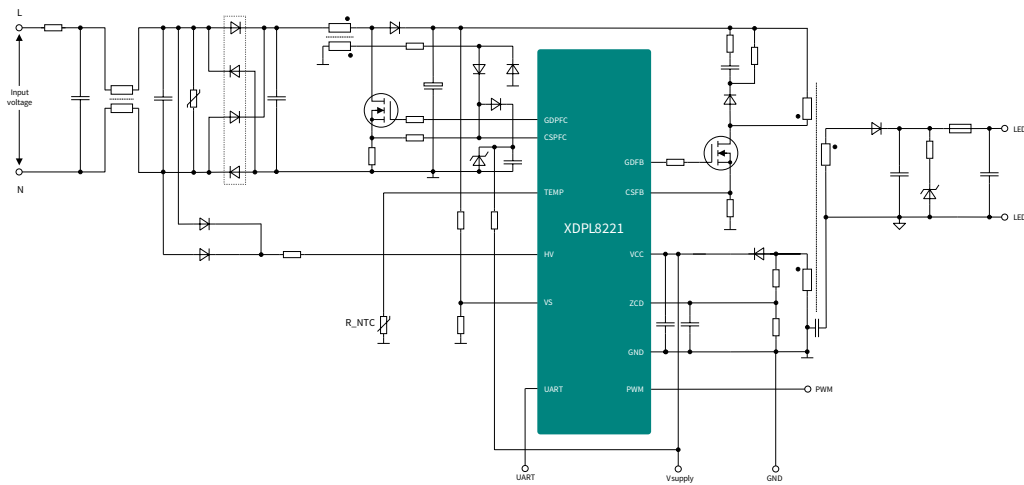


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XDPL8221 - digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming and serial interface

The XDPL8221 is a digital, highly integrated, future-proof device combining a quasi-resonant PFC with a quasi-resonant flyback controller with primary-side regulation. A serial communication interface supports direct communication with an external microcontroller unit (MCU). The XDPL8221 is specially designed for advanced LED drivers in smart lighting or IoT applications, featuring flicker-free dimming down to 1 percent of the nominal current. The device enables a customizable LED driver and simplifies the generation and maintenance of different variants without increasing the number of stock-keeping units. The IC is available in a DSO-16 package.

Typical application schematic



Features and benefits

Key features and benefits

- Nominal input voltage range 100-305 V_{AC} or 90-430 V_{DC}
- Reference board efficiency > 90 percent
- Power factor > 0.9 and THD < 15 percent over wide load range
- UART interface for control and real-time monitoring
- Constant current, constant voltage, limited power with primary-side regulation
- 1 percent dimming
- Dim-to-off with low standby power < 100 mW
- Internal temperature guard with adaptive thermal management
- The UART interface and the command set enable to control the function of the XDPL8221 or inquire status information
- Multimode operation
 - QRM (quasi-resonant mode)
 - DCM (discontinuous conduction mode)
 - ABM (active burst mode)
- Digital parameters
 - Relevant error conditions are monitored and protected
 - Undervoltage
 - Overvoltage
 - Open load
 - Output shorted

Order information for XDPL8221

Type	Description	Ordering code
XDPL8221	Digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming	XDPL8221XUMA1
REF-XDPL8221-U50W	50 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U50WTOBO1
REF-XDPL8221-U100W	100 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U100WTOBO1



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DC-DC LED driver ICs

DC-DC switch mode LED driver ICs with efficiencies up to 98 percent, dimming level down to 0.5 percent

Infineon offers highly integrated DC-DC LED driver ICs that support currents up to 1.5 A, making these drivers ideal for high- and ultrahigh-power LEDs. These highly integrated DC-DC driver ICs achieve efficiency levels as high as 98 percent across a wide range of operation conditions. Integrated smart thermal protection, overvoltage, and overcurrent protection contribute to a longer LED lifetime.

Go for quality with Infineon's cost-efficient linear LED driver ICs

Infineon's BCR linear driver ICs are the best choice for driving LED strings supplied by a DC voltage source. The BCR regulators are suitable for driving currents from 10 to 250 mA, making them the best solution for low—and mid-power LEDs. The linear controller ICs and an external power stage allow for the greatest design flexibility for high-power LEDs.



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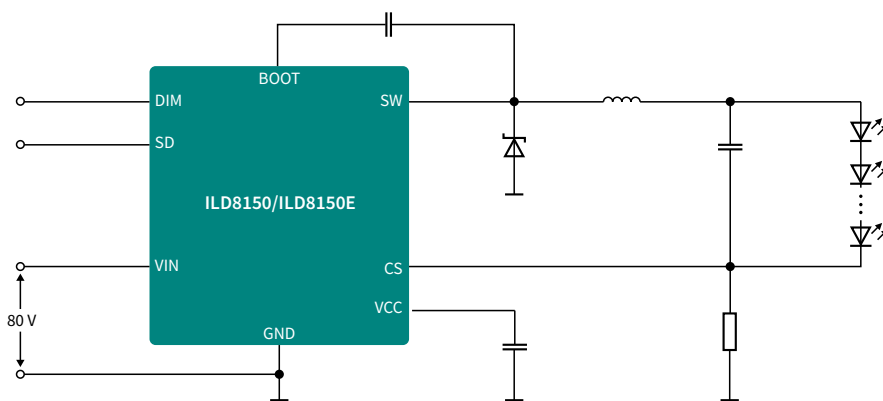
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ILD8150/ILD8150E – 80 V DC-DC buck LED driver IC for high-power LEDs and high-performance hybrid dimming

The ILD8150 is an 80 V DC-DC converter IC designed to be used in LED applications to drive high-power LEDs. It provides a high safety voltage margin for applications operating close to safe extra low voltage (SELV) limits. The buck LED driver IC is tailored for LEDs in general lighting applications with average currents up to 1.5 A using a high-side integrated switch. Several performance and protection features provide the right fit for professional LED lighting.

The hysteretic current control provides extremely fast regulation, stable LED current combined with good EMI performance. The efficiency of the LED driver IC is remarkably high, reaching more than 95 percent efficiency over a wide range. A PWM input signal between 250 Hz and 20 kHz controls dimming of the LEDs current in analog mode from 100 to 12.5 percent and 12.5 to 0.5 percent in PWM mode with flicker-free modulation frequency of 3.4 kHz.

Digital PWM dimming detection with high resolution makes ILD8150/E the perfect LED driver IC for use together with microcontrollers. Its precise output current accuracy from device to device under all loads and input voltage conditions makes it perfect for tunable white and flat panel designs where the current must be identical string to string.



Features and benefits

Key benefits

- Wide input voltage ranging from 8–80 V_{dc}
- Up to 1.5 A average output current, adjustable via shunt resistor
- Efficiency > 95 percent
- Up to 2 MHz switching frequency
- Soft-start
- PWM dimming input, with 250 Hz to 20 kHz PWM dimming frequency

Key advantages

- Hybrid dimming for flicker-free light down to 0.5 percent
- Analog dimming 100 percent – 12.5 percent
- PWM dimming 12.5 percent – 0.5 percent with 3.4 kHz flicker-free modulation, dim-to-off
- Typical 3 percent output current accuracy
- Overtemperature protection
- Pull-down transistor to avoid LED glowing in dim-to-off
- DSO-8 package to enable wave soldering
- DSO-8 with exposed pad for higher thermal performance (ILD8150E)

Type	Description	Package	Ordering code
ILD8150	80 V DC-DC buck LED driver IC	DSO-8	ILD8150XUMA1
ILD8150E	80 V DC-DC buck LED driver IC	DSO-8 exposed pad	ILD8150EXUMA1
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A with through hole inductor	Board with ILD8150E	REFILD8150DC15ATOB01
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A	Board with ILD8150E	REFILD8150DC15ATOB01
REF_TW_ILD8150E_60V_1A*	Reference board for professional tunable white and multichannel applications	Board with 2x ILD8150E	REFTWILD8150E60V1ATOB01
REF_ILD8150_DC_1.5A_SMD*	Reference design board 1 A with SMD inductor	Board with 2x ILD8150E	REFILD8150DC15ASMDTOB01



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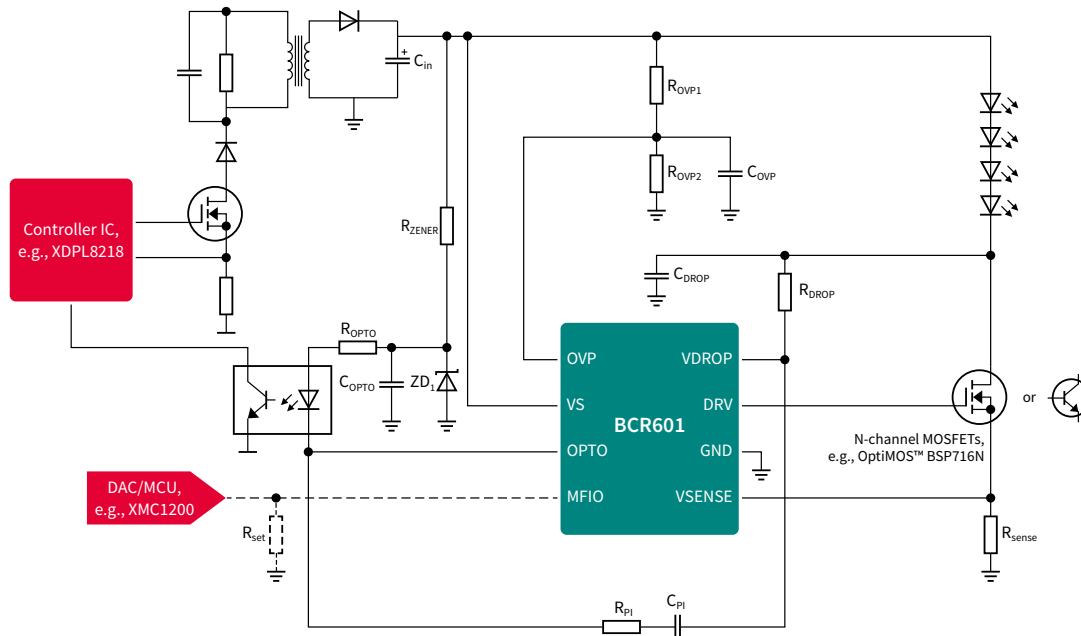
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Linear current regulators

60 V linear LED controller IC with active headroom control for power- and cost-efficient linear regulation on DC-DC side

A unique feature of BCR601 is to that it provides feedback to the primary side via an optocoupler to control the output voltage of the primary-side converter, e.g., XDPL8219 or ICL88xx. The integrated control loop minimizes the external driver transistor's voltage overhead and power dissipation. This capability, coupled with adjusting voltage overhead by external configuration according to application needs, leads to power- and cost-efficient LED systems. AC line ripple suppression, an analog dimming option, and various protection features round out this device for LED drivers, allowing for flicker-free light and LED longevity.

Typical application schematic



Features and benefits

Key features and benefits

- Active headroom control (supports an optocoupler feedback loop to primary side minimizing power losses)
- Dimming in pure analog mode down to 3%
- Suppresses the voltage ripple of the power supply driving a constant LED current for high light quality
- The embedded hot-plug protection allows plug in and plug out of any LED load during operation without damaging the LEDs
- Supports wide current range depending on external driver transistor
- Supply voltage range up to 60 V
- Gate driver current 10 mA
- LED current can be adjusted by R_{set} functionality
- Overtemperature protection and adjustable overvoltage protection

Order information for BCR601

Type	Description	Ordering code
BCR601	60 V linear LED controller IC with voltage feedback to primary side	BCR601XUMA1
DEMO_BCR601_60V_IVCTRL*	Demonstration board BCR601 current and voltage control, 700 mA	DEMOBCR60160VIVCTRLTOBO1
REF_TW_BCR601_55V_0.5A*	Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers, 500 mA	REFTWBCR60155V05ATOBO1



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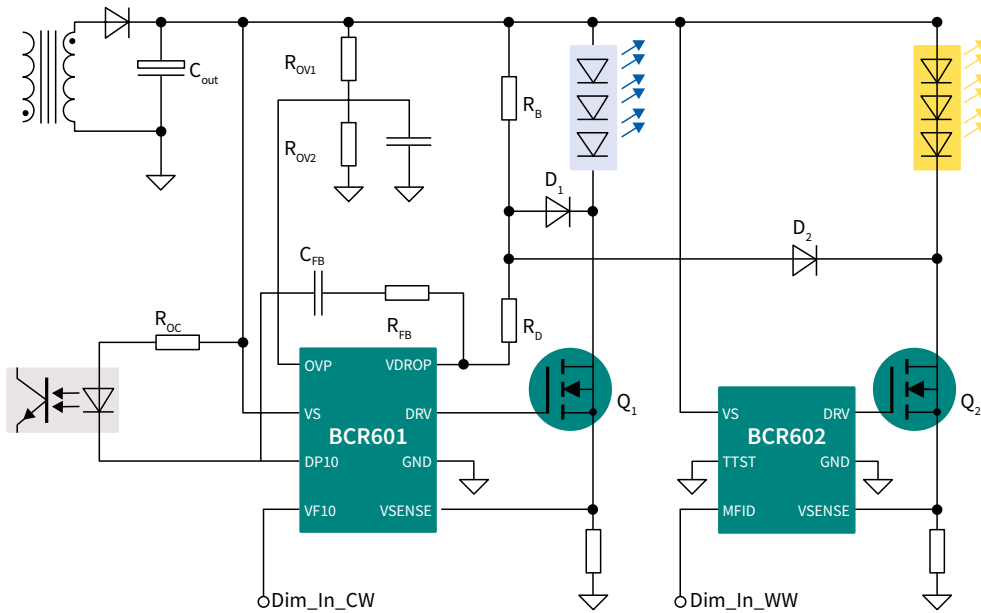
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BCR601/BCR602 – 60 V linear LED controller ICs for tunable white plus active headroom control and flexible dimming

BCR601 is a linear controller that enables high efficiency at low cost as a second-stage LED controller to replace DC-DC buck converters, especially in low- to mid-power LED drivers. The cost-effectiveness, especially in multichannel designs, can be further enhanced using BCR602 in a tiny SOT-23-6 package regulating the LED current for flicker-free deep dimming performance.



Features and benefits

Key benefits

- BCR601, as the master controller, controls the voltage overhead of both channels and the current of one channel
- BCR602, as slave controller, regulates current of second channel
- Input voltage up to 60 V
- Can be operated with either BJT or N-channel MOSFET
- Analog dimming down to 3%, PWM dimming down to 1% (BCR602)
- Current precision $\pm 3\%$
- OTP, OVP, hot-plug protection

Key advantages

- Linear regulators give considerable cost advantage over buck topology
- Cost advantage increases with additional channels
- Efficiency can be on par with buck (depends on output ripple of first stage)
- Highest light quality, zero ripple
- Deep, full analog dimming
- Easy to extend to additional outputs (e.g., RGBW)

Order information

Type	Description	Ordering code
REF_TW_BCR601_55V_0.5A*	Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers BCR601/BCR602, 500 mA	REFTWBCR60155V05ATOB01
BCR601	60 V linear LED controller IC with voltage feedback to primary side	BCR601XUMA1
DEMO_BCR601_60V_IVCTRL*	Demonstration board BCR601 current and voltage control, 700 mA	DEMOBCR60160VIVCTRLTOB01
BCR602	60 V linear LED controller IC	BCR602XTSA1
DEMO_BCR602_60V_ICTRL*	Demoboard for design evaluation of cost-efficient, highly reliable, dimmable LED engines/modules, 60 V, 200 mA	DEMOBCR60260VICTRLTOB01



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BCR43x linear LED driver ICs for low-power LEDs

The BCR3x family is the smallest and lowest-cost series of LED drivers. These products are perfectly suited for driving low-power LEDs in general lighting applications.

The advantages over resistor biasing are:

- Long lifetime of LEDs due to constant current in each LED string
- Homogenous LED light output independent of LED forward voltage binning, temperature increase, and supply voltage variations

The advantages over discrete semiconductors are:

- Reduced part count and assembly effort
- Pretested output current
- Defined negative temperature co-efficient protection

Need more details on replacing resistors?



Download now the application note
“Driving low power LEDs from
10 to 65 mA LED driver ICs”

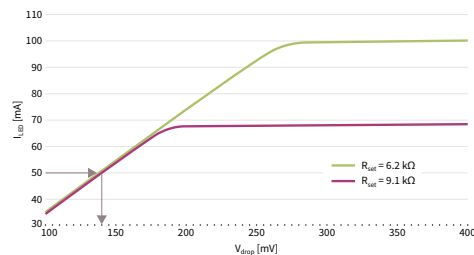
Features and benefits

Key features and benefits

- Output current from 8 to 100 mA (adjustable by external resistor)
- Supply voltage up to 40 V (BCR430U, BCR431U*)
- Reduction of output current at high temperature, contributing to long lifetime LED systems
- Extra low voltage drop for more voltage headroom and flexibility in designs (BCR430U, BCR431U)
- Excellent ESD performance on device and system level for BCR43xU
- Very small form factor packages with up to 600 mW max. power handling capability



LED current versus voltage drop ($V_s = 24\text{ V}$)



The voltage drop at the integrated LED driver stage can go down to 135 mV at 50 mA or less, improving the overall system efficiency and providing extra voltage headroom to compensate for LED forward voltage or supply voltage tolerances. With the BCR430U and BCR431U, additional LEDs can be added to lighting designs or longer LED strips can be created without changing the supply voltage.

Low-power LED driver ICs (5-100 mA)

Type	Group	Topology	V_s (min.) [V]	V_s (max.) [V]	I_{out} (typ.) [mA]	I_{out} (max.) [mA]	Dimming	Package	P_{tot} (max.) [mW]	Ordering code
BCR430U*	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	100	PWM by external transistor	SOT-23	600	BCR430UXTSA2
BCR431U**	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	42		SOT-23	600	BCR431UXTSA1

Type	Description	Ordering code
BCR430U LED BOARD	Low-power demoboard with 8 LEDs, 50 mA	BCR430ULEDBOARDTOB011
DEMO_BCR431U_LVDR0P	Low-power demoboard with 8 LEDs, 15 mA	DEMOBCR431ULVDR0PTOB01



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* Ultralow voltage drop version BCR430U with only 135 mV at 50 mA

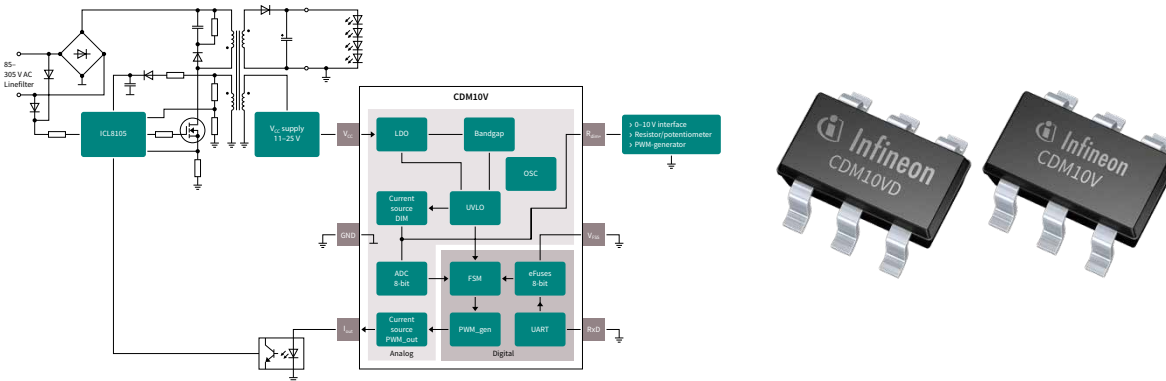
** Ultralow voltage drop version BCR431U with only 115 mV at 15 mA

CDM10V and CDM10VD – most flexible dimming interface ICs for 0-10 V input

Infineon's fully integrated dimming solutions

Infineon's CDM10V and CDM10VD are the industry's first single-chip lighting interface ICs. They can transform an analog 0–10 V input into a PWM or dimming input signal required by a lighting controller IC. CDM10V and CDM10VD devices are dedicated to commercial and industrial LED lighting applications. Compact and highly integrated devices allow designers to replace up to 25 discrete components with a single device used in conventional 0–10 V dimming schemes. Supplied in an ultra-miniature 6-pin SOT package, the CDM10Vx and CDM10VDx perfectly match small PCBs with high component densities.

Typical application schematic using CDM10V



Features and benefits

Key benefits

- Active dimming (0–10 V) and passive dimming (resistor)
- Embedded digital signal processing which maintains minimum variations from device to device
- PWM input
- One-time configurable device: CDM10V and preconfigured devices with various feature sets

Key advantages

- Single-device solution leading to low BOM and PCB savings
- Dimming ICs in small SOT-23 package for high power density designs
- Granular portfolio for highest flexibility and easy design-in
- Wide input V_{CC} range 11–25 V, extended range down to 6 V for CDM10V
- Attractive pricing and faster time to market

Product type	I_{out} [mA]	Min. duty cycle [%]	PWM output frequency [kHz]	Dimmer/resistor bias current [μ A]	Dimm-to-off	Ordering code
CDM10V	5	1/2/5/10	0.2/0.5/1/2	50/100/200/500	Disabled/enabled	CDM10VXTSA1
CDM10V-2	5	n.a.	1	200	Enabled	CDM10V2XTSA1
CDM10V-3	5	1	1	200	Disabled	CDM10V3XTSA1
CDM10V-4	5	n.a.	2	100	Enabled	CDM10V4XTSA1
CDM10VD	5	5	1	120	Enabled	CDM10VDXTSA1
CDM10VD-2	5	10	1	120	Enabled	CDM10V2DXTSA1
CDM10VD-3	1	5	1	120	Enabled	CDM10V3DXTSA1
CDM10VD-4	1	10	1	120	Enabled	CDM10V4DXTSA1

Board name	Description	Ordering code
REF-XDPL8105-CDM10V	40 W single-stage PFC FB digital power reference design with CDM10V	REFXDPL8105CDM10VTOBO1



Dimming



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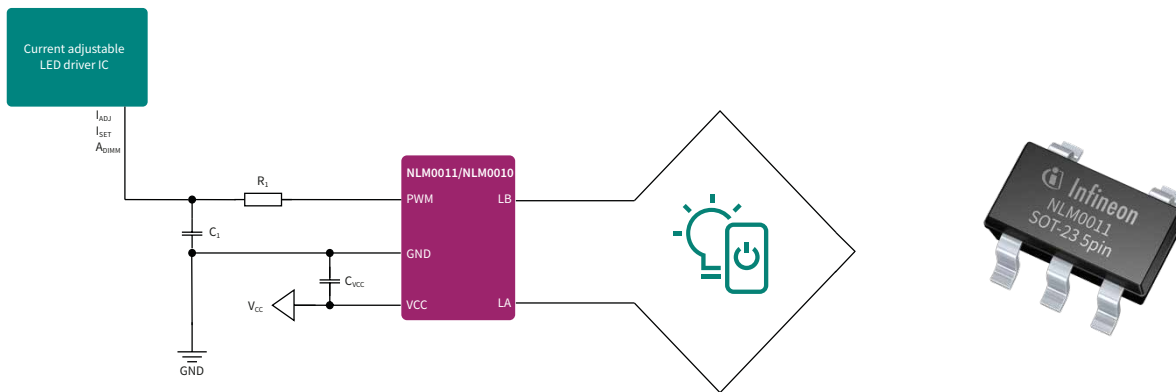
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NFC-PWM configuration ICs

Dual-mode NFC wireless configuration ICs with CLO function and pulse-width modulation (PWM) output for lighting applications

The NLM0011 is a dual-mode NFC wireless configuration IC with PWM output. It is compatible with existing analog LED driver designs and with the NFC-programming specification from the module-driver interface special interest group (MD-SIG). This device is primarily designed for LED applications to enable NFC programming. In addition, advanced features, such as the constant lumen output (CLO) and the on/off counting, are integrated, and there is no need for an additional microcontroller. Since the NLM0011 is designed to work with mainstream analog driver ICs, no firmware development efforts are needed. It can be easily adapted into existing designs to replace the “plug-in resistor” current configuration concept. The NLM0010 is a light version without the CLO function.

Typical example of NFC lighting application



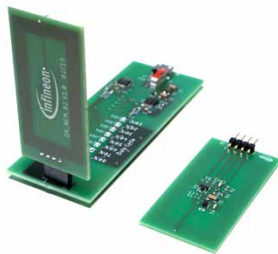
Features and benefits

Key benefits

- Configurable pulse-width modulation (PWM) output
- NFC contactless interface compliant to ISO/IEC 18000-3 mode 1 (ISO/IEC 15963)
- Constant light output (CLO) with 8 configurable points
- Integrated operation-time counter (OTC) and on/off counter
- Non-volatile memory (NVM) including UID and 20 bytes free memory for user data

Key advantages

- Fast and cost-effective implementation of NFC programming and CLO without the need of an additional microcontroller
- Compatible with most analog LED driver designs using the „plug-in resistor“ method
- Stable PWM output with fixed 2.8 V amplitude and $\pm 0.1\%$ duty cycle accuracy
- Internal voltage regulator (LDO) to avoid influence of instable external supply voltage



EVAL_NLM0011_DC – evaluation board demo kit

This evaluation board not only enables fast demonstration of NFC-PWM configuration ICs with NLM0011 through the NFC-PWM mobile app, but also accelerates the development of the NFC-reader software. EVAL_NLM0011_DC does not require a full system but allows NFC configuration for existing LED driver boards.

Ordering code: EVALNLM0011DCTOB01

Type	Description	Package	Ordering code
NLM0011	Dual-mode NFC configuration IC with PWM output and CLO function	SOT-23-5	NLM0011XTSA1
NLM0010	Dual-mode NFC configuration IC with PWM output, without CLO function	SOT-23-5	NLM0010XTSA1

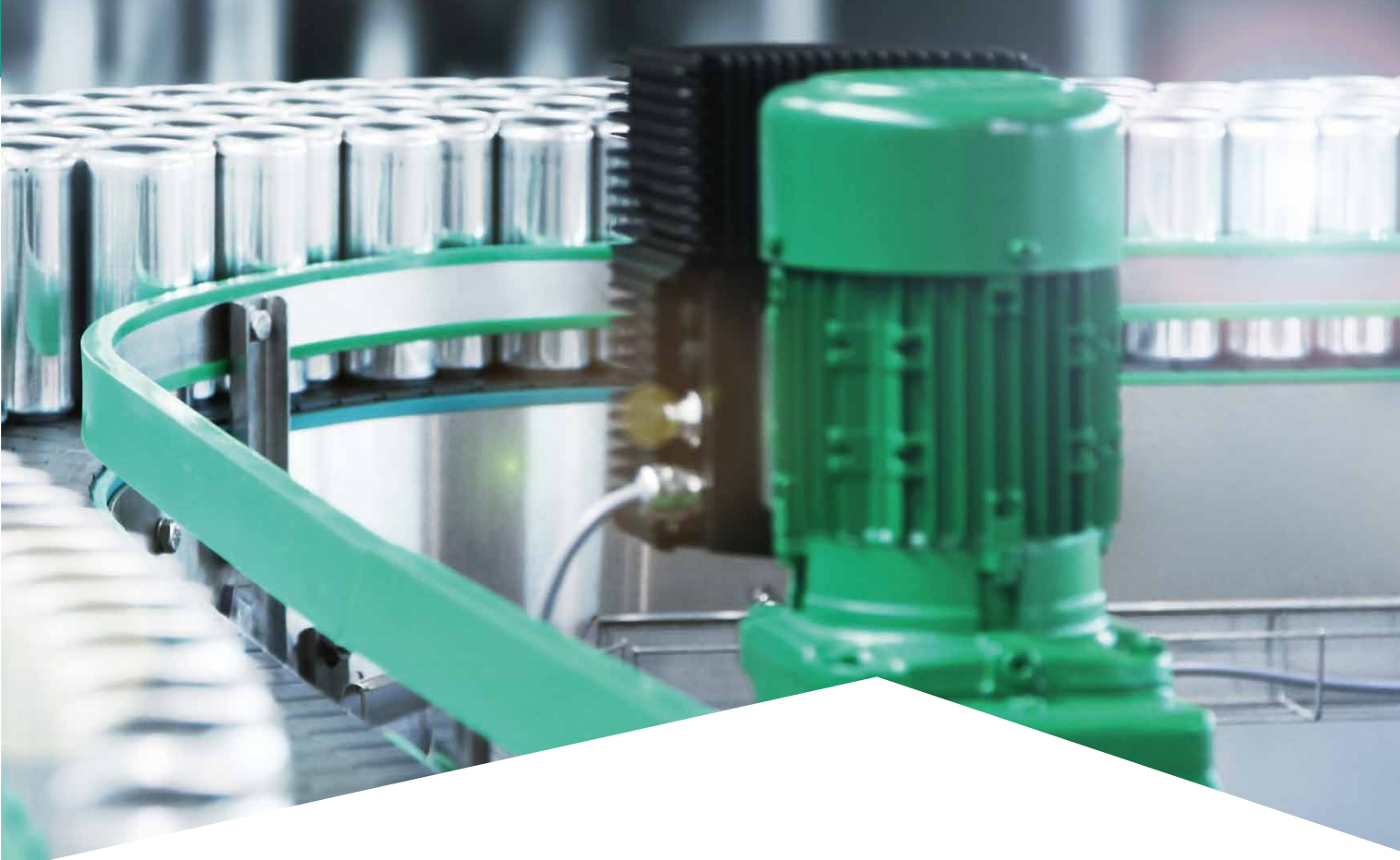


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iMOTION™ integrated motor control solutions

A family of highly integrated products for the control of a variable speed drive

iMOTION™ products are offered in several integration levels including hardware and software. The hardware integration comprises stand-alone motor controllers (iMOTION™ controller), motor controllers with integrated gate drivers (iMOTION™ driver), and fully integrated inverters-in-a-package (iMOTION™ IPM). In terms of software, Infineon offers full turnkey solutions as well as freely programmable modules.

Infineon's field-proven Motion Control Engine (MCE) eliminates software coding from the motor control development process, reducing the effort required to configure the respective motor and power stage.

The MCE implements highly efficient motor control and an optional power factor correction (PFC) and integrates all necessary protections and a flexible scripting engine. Assisted by powerful tools like the iMOTION™ Solution Designer (iSD), the motor can be up and running in less than an hour. Integrated support for functional safety for home appliances paves the way to meeting regulations in the global market.

Infineon provides complete solutions for motor control with its combined offering of iMOTION™ together with EiceDRIVER™ gate drivers, TRENCHSTOP™ IGBTs, CoolMOS™ MOSFETs, and CIPOS™ IPMs.



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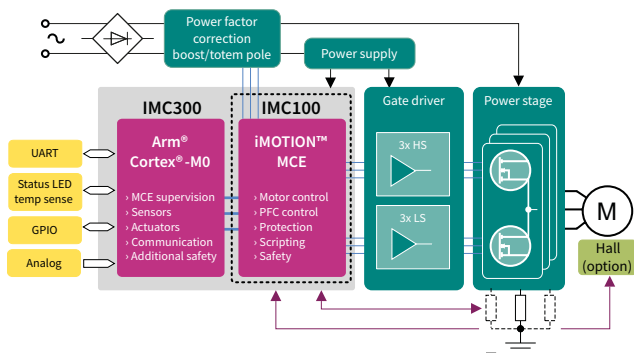
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iMOTION™ controller

Motor/PFC controller plus optional MCU for maximum flexibility

The iMOTION™ controllers consist of two families: iMOTION™ IMC100 is a series of highly integrated ICs for controlling variable speed drives. Integrating the required hardware and algorithm to perform control of a three-phase motor provides the shortest time-to-market for any motor system at the lowest system and development cost. Combining the iMOTION™ IMC100 with an additional microcontroller based on the Arm® Cortex®-M0 core the iMOTION™ IMC300 series is the perfect fit for applications requiring application flexibility beyond pure motor and PFC control.

Infineon's field-proven Motion Control Engine (MCE) implements field-oriented control (FOC) using single or leg shunt current feedback and uses space vector PWM with sinusoidal signals to achieve the highest energy efficiency. The MCE can run sensorless as well as using Hall sensors for low speed operation. It also integrates multiple protection features like over- and undervoltage, overcurrent, rotor lock etc. The integrated scripting engine grants flexibility for a wide range of applications. The IMC100/300 series is offered in several device variants. All devices can be used in applications requiring functional safety acc. to IEC/UL 60730 ('Class B'). With this wide application scope, the iMOTION™ controller is the perfect choice for any highly efficient variable speed drive - from low to high voltage.



Features and benefits

Key features

- Completely self-sustaining Motion Control Engine
- Option for boost or totem pole PFC
- Integrated protection features
- Scripting engine for application flexibility
- Additional independent microcontroller
- Support for IEC 60335-1 ('Class B')

Key benefits

- Easy motor parametrization and tuning
- Low BOM cost for active PFC applications
- Safeguard power stage and motor
- Maximum flexibility for customer functions
- Full flexibility for custom functions or communication
- Support for functional safety integrated



The REF-VACUUM_C101_2ED is a reference design kit featuring IMC101T iMOTION™ controller, 2ED2304 SOI half-bridge gate driver, and BSC030N04NS OptiMOS™. It demonstrates our thin-film-SOI and advanced MCE technologies for low-voltage, permanent-magnet motor drives up to 120 KRPM speed and inverter section ratings of 30 V and 25 A. It is optimized for major low-voltage home appliances like vacuums, fans, pumps, and compressors.



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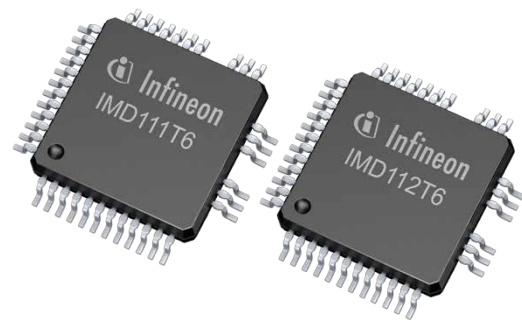
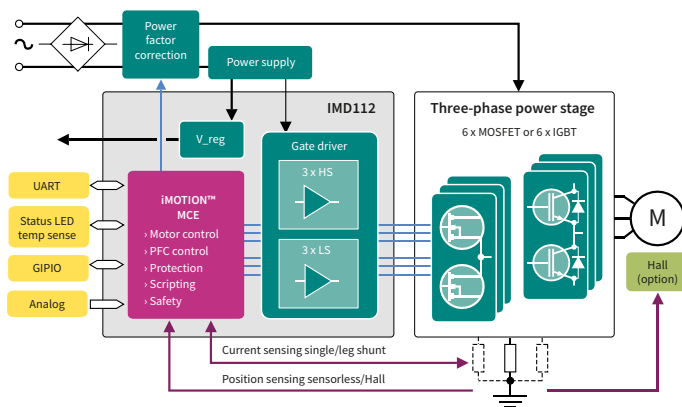
iMOTION™ driver

Motor/PFC controller with gate driver and voltage regulator

The iMOTION™ IMD110 is a series of highly integrated ICs for controlling three-phase motors. The IMD110 drivers are an optimal combination of a ready-to-use motor and (optional) PFC controller with a high-voltage three-phase SOI gate driver and a voltage regulator. They can be combined with almost any low- to high-voltage MOSFET or IGBT to create a very compact yet highly flexible drive solution. The full set of protections, improved clearance, and creepage make the IMD110 a highly robust and reliable driver family.

The family implements the identical field-proven Motion Control Engine (MCE) as the iMOTION™ controller family. The scripting engine that executes customer scripts with access to the MCE, a high number of GPIOs, analog inputs, and a configurable UART grants flexibility for a wide range of applications. Based on Infineon's latest SOI technology, the three-phase gate driver exhibits market-leading robustness and lowest failure rates. The very low level-shift losses reduce thermal stress and allow high-frequency operation, while the built-in bootstrap diodes help to reduce PCB space and cost. Protections like over- and undervoltage lockout and cross-conduction prevention safeguard the power stage during erroneous conditions. All IMD110 devices support the functional safety requirements according to the IEC/UL 60730-1 ('Class B').

Block diagram



Features and benefits

Key features

- Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series
- Option for boost or totem pole PFC
- High-voltage three-phase gate driver and built-in bootstrap diodes
- Single layer design possible
- Support for IEC 60335-1 ('Class B')

Key benefits

- Fastest time to market with easy parametrization and tuning of motor and PFC control
- Low BOM cost for active PFC applications
- Reducing BOM and PCB space
- Reducing PCB and production costs
- Support for functional safety integrated



The REF_FRIDGE_D111T_MOS board is a ready-to-use three-phase inverter designed for refrigerator compressors featuring the iMOTION™ driver. The 600 V CoolMOS™ PFD7 super junction MOSFET demonstrates market-leading light-load efficiency. The board provides a single-phase AC-connector, rectifier, and three-phase output for the motor. Targeting low-cost applications, the motor is run with sensorless field-oriented control (FOC) using single-shunt current sensing. The direct sensing of all voltages and currents does not require any OpAmp.



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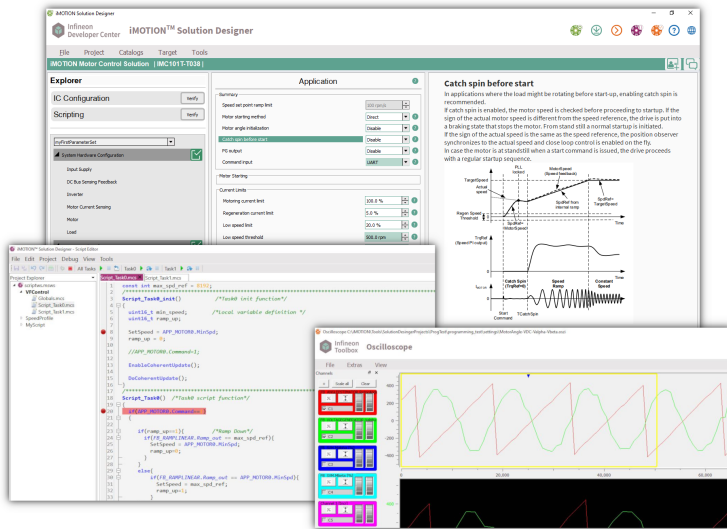
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iMOTION™ tools and development support

The easy way to get started with motor control



The iMOTION™ Solution Designer is the new all-in-one PC tool that supports the iMOTION™ products in all stages of a motor control project. A new project can be started by choosing one of the preconfigured applications, an evaluation board, or a specific device. Solution Designer offers individual views for all design steps, from configuration to the final tuning of the control loop.

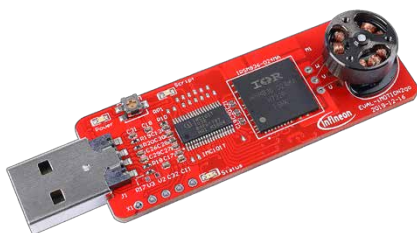
The integrated help describing all parameters in detail assists in drive configuration. After downloading the parameter sets into the iMOTION™ device, customer-configurable dashboards help with starting and running the motor and tuning the control loop parameters to the desired behavior. All relevant parameters, like voltages, currents, torque, and speed, can be visualized in real-time on the 8-channel oscilloscope. Going one step beyond the configuration of the motor and PFC, the integrated editor, compiler, and debugger help develop scripts for the iMOTION™ script engine.

Features and benefits

Key features	Key benefits
– Integrated PC tool for all devices in all project phases	– One common tool and consistent workflow for all iMOTION™ products
– Configuration wizard for motor and PFC parameter sets	– Easy handling of parameter sets with fully integrated help system
– Dashboards for typical design steps, customer configurable	– Fully configurable for individual testing and tuning stages
– Oscilloscope with 8 channels	– Real-time insight into all motor and PFC parameters
– Full IDE for editing, compiling, and debugging of scripts	– Assisted creation of scripts and live debugging including breakpoints
– Programmer for firmware, parameter sets, and scripts	– Unified data handling from project to device
– Catalogs for devices, boards, loads, and projects	– Project centric work and ease of creating derived projects

iMOTION2Go

Getting familiar with iMOTION™ firmware, features, and tools



The iMOTION2go kit is powered via USB and contains a complete motor control system on a small form factor board. It is particularly useful for a first evaluation of the iMOTION™ firmware and tools like the iMOTION™ Solution Designer. This combination of the IMC101 motor control IC with the Solution Designer supports all project stages from drive configuration up to optimization and tuning using dashboards and oscilloscope. Scripting can be practiced by downloading and debugging via the IDE integrated in the Solution Designer.



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iMOTION™ Modular Application Design Kit

Get a motor running in less than 1 hour!

Power boards
(Examples)

5 V/1 W ... 1200 V/10 kW

Controller boards
(Examples)

EVAL-M1-101T iMOTION™ IMC101T-T038	EVAL-M3-302F iMOTION™ IMC302A-F064	EVAL-M7-D111T iMOTION™ IMD111T-6F040
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M1/3/7 platform interface - multiple different combinations are possible

The iMOTION™ Modular Application Design Kit (MADK) is an evaluation platform targeting variable speed-drive applications up to 10 kW. The platform offers a modular and scalable system solution with different control board options and a wide range of power boards. Using the iMOTION™ MADK standardized platform interfaces, different control and power boards can be combined into a system that perfectly meets the requirements of the final application. This modular approach allows developers maximum flexibility and scalability during the evaluation and development phase at affordable costs.

While the M1 platform provides control of a permanent magnet synchronous motor (PMSM), the M3 platform additionally includes an active power factor correction (PFC) implemented as a CCM boost PFC. The M7 platform is based on the iMOTION™ driver series IMD110. The gate driver is contained on the control board, and the power boards use different types of discrete power devices, thus covering a wide voltage range from 20 to 600 V with either MOSFETs or IGBTs. Boards with M7 connectors are available with and without active PFC.

iMOTION™ Link

Isolated debug interface for final application boards



iMOTION™ Link is an isolated debug probe for all iMOTION™ motor control products. It connects to the user's target board (final application board) or any other evaluation or reference board via a galvanically isolated interface. iMOTION™ Solution Designer is then used for configuring, parameterizing, and tuning the respective iMOTION™ device. In addition to the serial interface, iMOTION™ Link provides a standard Arm® SWD debug connection for programming the MCU core in devices like the IMC300 series.



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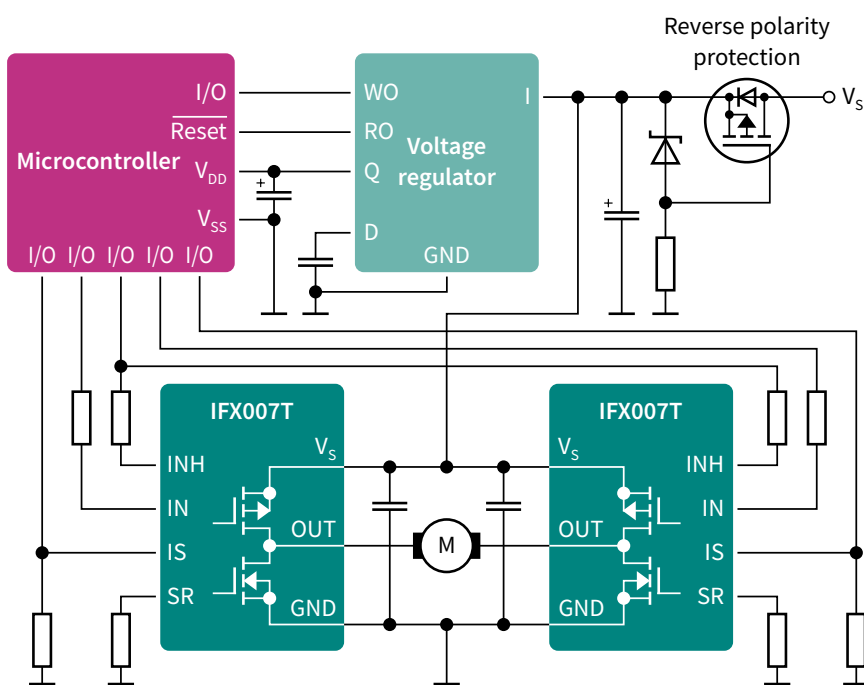
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MOTIX™ single half-bridge IC

Protected high-current half-bridge for industrial applications

MOTIX™ single half-bridge IC provides a complete, low-ohmic protected half-bridge in a single package (typical path resistance at 25°C down to 10 mΩ). It can also be combined with an additional MOTIX™ single half-bridge IC to create an H-bridge or three-phase bridge. It can switch high-frequency PWM while providing overcurrent, overvoltage, and overtemperature protection. The MOTIX™ single half-bridge ICs family offers cost-optimized, scalable solutions for protected high-current PWM motor drives with very restrictive board space. The P-channel high-side switch eliminates the need for a charge pump, thus minimizing EMI. The latest addition to the single half-bridge IC family is the IFX007T, optimized for industrial applications.

Application example for high-current PWM motor drives



High-current H-bridge



Features

Basic features	Protection features	Diagnostic features
- Low quiescent current	- Overtemperature shutdown	- Overtemperature
- Capable for high PWM frequency	- Overvoltage shutdown	- Overvoltage
- Logic level input	- Undervoltage	- Current sense and status
- Adjustable slew rate	- Overcurrent	
- Cross-current protection		

Product number	Operating range [V]	$R_{DS(on)}$ path (typ.) [mΩ]	$I_{D(lim)}$ (typ.) [A]	I_q (typ.) [μA]	Switch time (typ.) [μs]	Diagnosis	Protection	Package	Qualification
IFX007T	5.5 ... 40.0	10.0	70	7	0.25	OT, OC, CS	UV, OT, OC	PG-TO-263-7	JESD471

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BLDC motor control shield with IFX007T for Arduino

The BLDC motor control shield is a high-current motor control board compatible with Arduino and Infineon's XMC4700 boot kit. It is equipped with three smart MOTIX™ IFX007T single half-bridge ICs. The BLDC motor control shield can drive one BLDC motor. Alternatively, it can be used to drive one or two bidirectional DC motors (H-bridge configuration, cascaded to support second motor) or up to three unidirectional DC motors (half-bridge configuration). The implemented MOTIX™ IFX007T half-bridges can be controlled by a PWM via the IN-pin.

Features

Key features

- Capable of high-frequency PWM, e.g., 30 kHz
- Adjustable slew rates for optimized EMI by changing external resistor
- Driver circuit with logic level inputs
- Diagnosis with current sense

Target applications

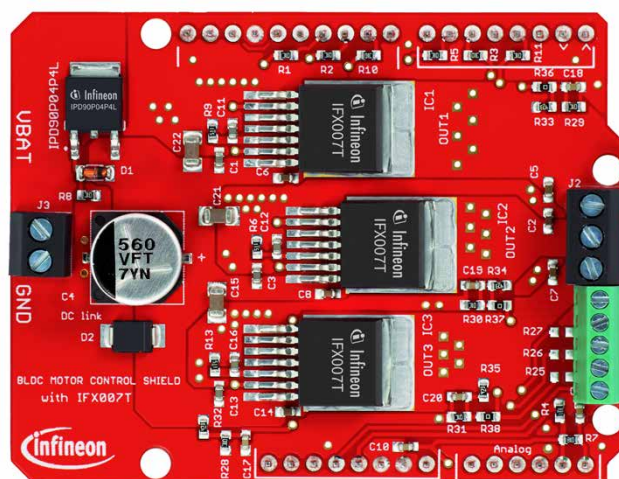
- Brushed DC motor control up to 250 W continuous load
- 24 V nominal input voltage (max. 6 - 40 V)
- Average motor current 30 A restricted due to PCB (IFX007T current limitation at 55 A min.)

BLDC-SHIELD_IFX007T

BLDC motor control with MOTIX™ IFX007T single half-bridge IC.

Infineon's shields for Arduino are compatible with microcontroller boards using the Arduino-compatible form factor, e.g., Infineon's XMC™ microcontroller kits.

Ordering code: BLDCSHIELDIFX007TTOB01



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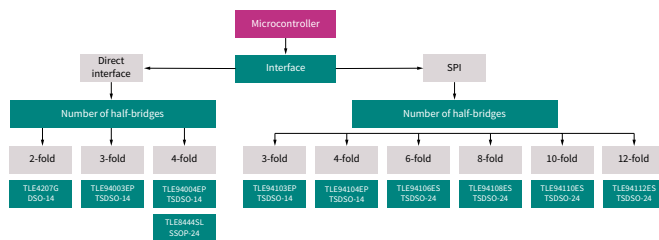
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MOTIX™ multi half-bridge ICs

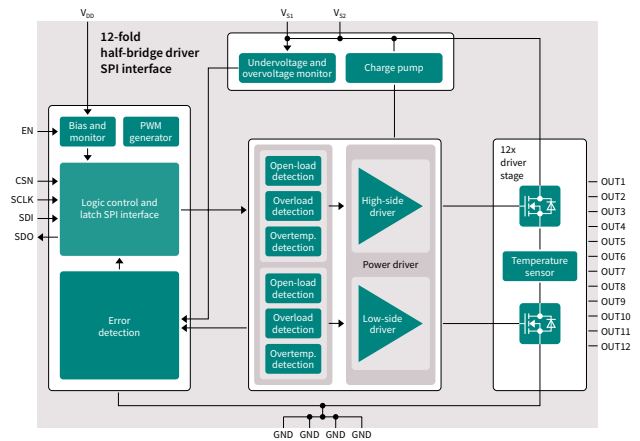
Extensive offering ranging from two-fold half-bridge ICs to twelve-fold half-bridge ICs

The MOTIX™ TLE94xyz products are protected half-bridge drivers designed for 12 V motion control applications such as small DC motors for heating, ventilation, and air conditioning (HVAC), as well as automotive mirror adjustment and fold. The family offers two-, three-, four-, six-, eight-, ten-, and twelve-fold integrated half-bridge drivers. All devices can drive DC motor loads up to 0.9 A per output, or the outputs can be used stand-alone or combined with increasing driving capability up to 3.6 A. They diagnose short circuits, open loads, power supply failures, and overtemperature for each half-bridge to ensure safe operation in HVAC or other systems. The TLE94xyz offers enhanced EMC performance, which combined with the low quiescent current and a small package, makes the product attractive for a wide range of 12 V automotive and industrial applications. In addition to TLE94xyz, Infineon's multi half-bridge offerings include a dual-half-bridge driver, TLE4207G.

Infineon's portfolio of MOTIX™ multi half-bridge ICs



Block diagram MOTIX™ TLE94112ES



Features and benefits

- Key features and benefits**
- Three-, four-, six-, eight-, ten-, and twelve-fold half-bridges with integrated output stages and PWM
 - 16-bit SPI or direct inputs for control and diagnosis
 - Voltage supply range: 5.5– 20 V
 - Variable driving schemes for up to 11 motors

Key applications

- 12 V automotive and industrial applications
- Flap motors in HVAC systems
- Mirror adjustment and fold
- Small DC motors (≤ 0.9 A/output)
- Bistable relays
- Bipolar stepper motors in full-step and half-step mode

Product name	Config.	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	I_g [μ A]	$V_{S(OP)}$ [V]	Protection	Diagnostic interface	Highlights	$V_{FE(sat)}/R_{DS(on)}$ [m Ω]	Package
TLE94003EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package	850/switch	TSDSO-14-
TLE94103EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94004EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package		TSDSO-14-
TLE94104EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94106ES	6 x half-bridge	6 x 0.30	6 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84106EL		TSDSO-24
TLE94108ES	8 x half-bridge	8 x 0.30	8 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept		TDSO-24
TLE94110ES	10 x half-bridge	10 x 0.30	10 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84110		TDSO-24
TLE94112ES	12 x half-bridge	12 x 0.30	12 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + 12 outputs in one package		TDSO-24
TLE4207G	2 x half-bridge	2 x 0.80	2 x 1.50	20	8 to 18	OC, OT, VS, UV/OV	Status flag	Error detection		DSO-14



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DC motor control HAT with MOTIX™ TLE94112ES

Complies with Raspberry Pi HAT specification

The Infineon motor control HAT with MOTIX™ TLE94112ES complies with Raspberry Pi HAT specifications and provides you with a unique evaluation experience. It is equipped with a 12-fold half-bridge driver TLE94112ES and comes with a ready-to-use software library. The HAT is also equipped with an Infineon TLS4125D0EP V50, a synchronous step-down converter, which can power the Raspberry Pi.

Features and benefits

Key features

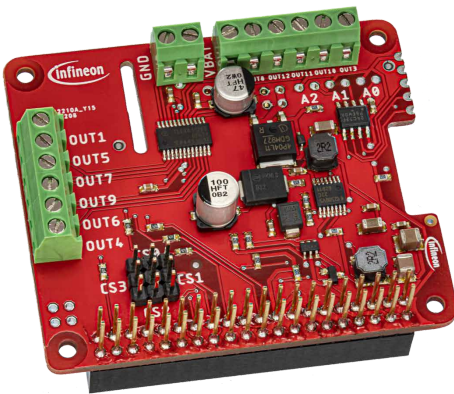
- Twelve half-bridge power outputs, 0.9 A each (combinable to up to 3.6 A)
- Wide input voltage range of 5.5 to 20 V
- Powering of Raspberry Pi by TLS4125D0EP V50
- Reverse polarity protection
- Driver is protected against overtemperature, overcurrent, overvoltage, undervoltage, and enables diagnosis of overcurrent, overvoltage, undervoltage
- SPI interface with zero clock diagnosis
- Enhanced EMC performance
- Integrated PWM generator with 3 different frequencies (80 Hz, 100 Hz, 200 Hz)

Benefits

- Compact design for multi-motor applications
- Quick and easy setup for evaluation and demo applications
- Wide range of applications

Target applications

- Automotive motor control: HVAC flap control
- Multi-motor applications
- DC motors and voltage controlled bipolar stepper motors



Ordering code: TLE94112ESRPIHATTOB01



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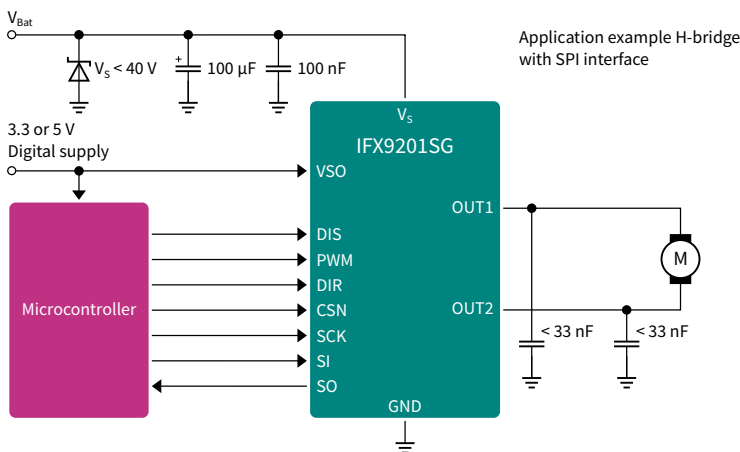
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MOTIX™ full-bridge ICs

General purpose 6 A H-bridges

MOTIX™ IFX9201SG is a general-purpose 6 A H-bridge for industrial applications, home appliance and building automation, power tools battery management, and medical applications, designed to control small DC motors and inductive loads. The outputs can be pulse-width modulated at frequencies up to 20 kHz, enabling operation above the human sonic range through PWM/DIR control. While the signal at the DIR input defines the direction of the DC motor, the PWM signal controls the duty cycle. The H-bridges switch into chopper current limitation mode for load currents above the current limitation threshold (8 A typically).

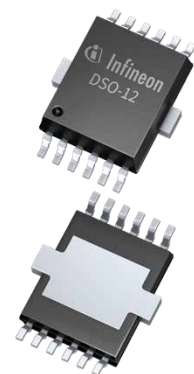
Applications examples



Features

Key features

- Up to nominal 36 V supply voltage
- Short circuit, overtemperature protection, and undervoltage shutdown
- Detailed SPI diagnosis or simple error flag
- Simple design with few external components
- Small and robust DSO-12-17 (IFX9201SG) and DSO-36-72 (IFX9202ED) packages



Product number	Operating voltage	Current limit (min.) [A]	Quiescent current (typ.) [μ A]	Operating range [V]	$R_{DS(on)}$ (typ./switch) [$m\Omega$]	Package	$R_{th,jc}$ (max.) [K/W]
IFX9201SG	4.5 to 36 V	6.0	19.0	5 to 36	100	PG-DSO-12 (power)	2.0



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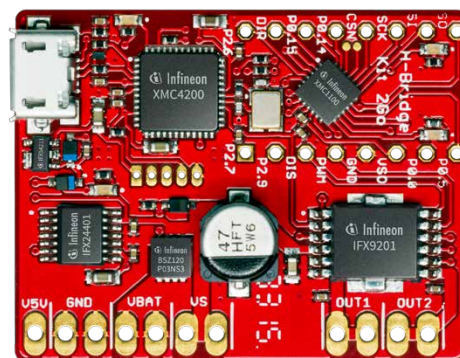
H-BRIDGE KIT 2GO with MOTIX™ IFX9201SG

Build your DC motor control with the H-bridge Kit 2GO, a ready-to-use evaluation kit. It is fully populated with all electronic components equipped with the H-bridge MOTIX™ IFX9201 combined with the XMC1100 microcontroller based on Arm® Cortex®-M0 CPU. It is designed for the control of DC motors or other inductive loads up to 6 A or up to 36 V of supply.

Target applications

- DC motor control for industrial applications
- Home and building automation
- Power tools battery management
- Industrial robotic applications
- Electric toys applications

Ordering code: HBRIDGEKIT2GOTOB01



KIT_XMC1300_IFX9201

Stepper motor control shield with MOTIX™ IFX9201SG and XMC1300 for Arduino

The stepper motor control shield from Infineon is one of the first high-current motor control boards compatible with Arduino and Infineon's XMC1100 boot kit. The stepper motor control shield can drive the two coils in a stepper motor featuring a dual-half-bridge configuration. A STEP signal can control the implemented integrated MOTIX™ IFX9201 half-bridges via the STEP pin. Interfacing to a microcontroller is made easy by the integrated XMC1300 microcontroller that holds the peripherals to allow high-speed current control. Microstepping of the stepper motor can be achieved using the internal comparators, while operational amplifiers are installed to adapt the motor current sense signal to the microcontroller's input levels.

Features and benefits

Key features

- Compatible with microcontroller boards using the Arduino form factor, e.g., Infineon's XMC™ microcontroller kits
- Capable of high-frequency PWM, e.g., 30 kHz
- Adjustable slew rates for optimized EMI by changing external resistor
- Driver circuit with logic level inputs
- Diagnosis with current sense

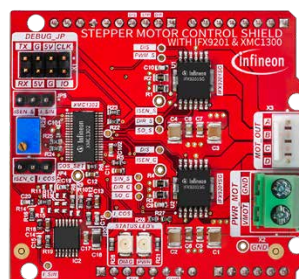
Key benefits

- Fast and inexpensive prototyping of stepper motor control
- Simple testing of microstepping algorithms
- Diagnose pin to allow hardware feedback during development
- Overtemperature shutdown with latch behavior and undervoltage shutdown of the power section

Target applications

- Stepper motors up to 5 A phase current
- 24 V nominal input voltage for the power stage
- Average motor current 3 A without additional cooling effort, 5 A possible with proper cooling

Ordering code: KITXMC1300IFX9201TOB01



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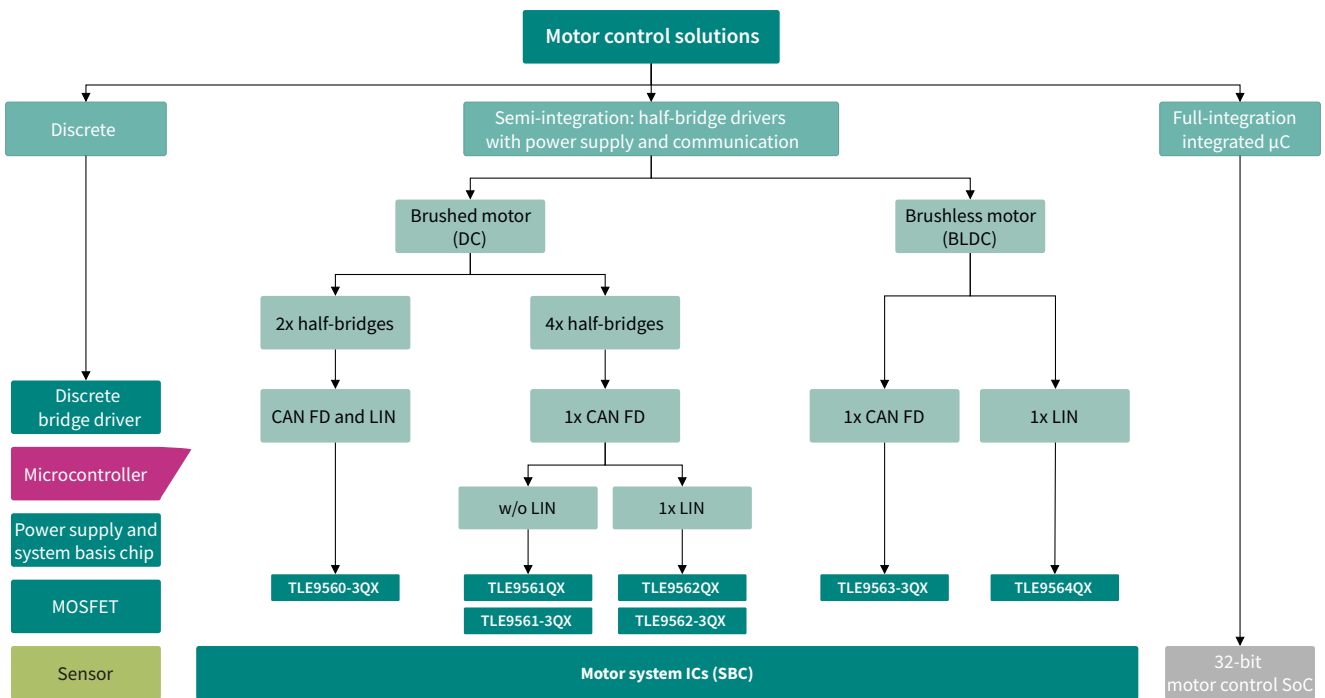
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MOTIX™ motor system ICs (SBC)

Motor system ICs (SBC) for BDC and BLDC motors combine power supply, communication, and multiple half-bridge MOSFET drivers

MOTIX™ motor system ICs (SBC) offer integration and high performance with optimized system cost for DC and BLDC motor control applications. All devices of the motor system IC family feature a low-dropout voltage regulator with an output current of 250 mA/5 V. The communication interface incorporates a CAN FD transceiver up to 5 Mbit/s according to ISO 11898-2:2016 (including partial networking (PN) option) and/or a LIN transceiver.



Features

- | Features |
|---|
| - 5 V linear regulator up to 250 mA |
| - CAN FD up to 5 Mbps CAN PN and FD tolerant ("3" variants) |
| - LIN2.2B/J2602 |
| - MOTIX™ TLE9560/1/2: up to 4 half-bridge gate drivers with adaptive MOSFET control up to 100 mA constant gate charge |
| - MOTIX™ TLE9563/4: three-phase gate driver with CSA and adaptive MOSFET control up to 150 mA constant gate charge |
| - Up to 4 high-side switches (with 7 on-resistance) Up to 5 wake inputs |
| - Up to 6 PWM inputs |

- | Benefits |
|---|
| - PCB savings up to 50 percent due to unique integration approach |
| - Lower switching losses and EMC optimization due to adaptive MOSFET control |
| - Automatic regulation of MOSFET pre-charge currents diminish need for production MOSFET calibration |
| - VS monitoring in sleep mode activates MOSFET to prevent from ECU damage when motor is in generator mode |



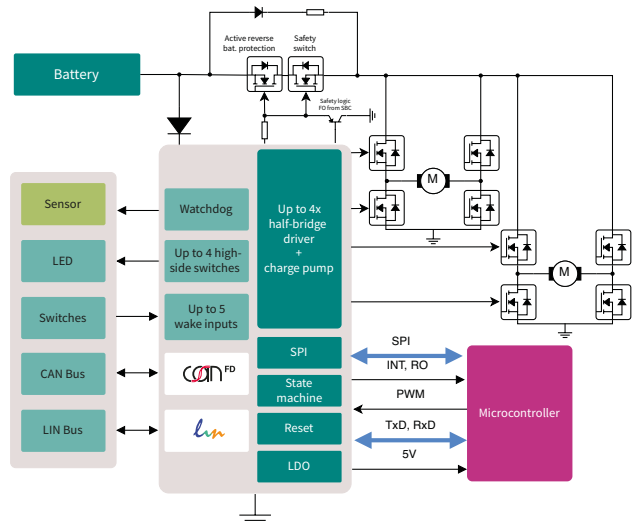
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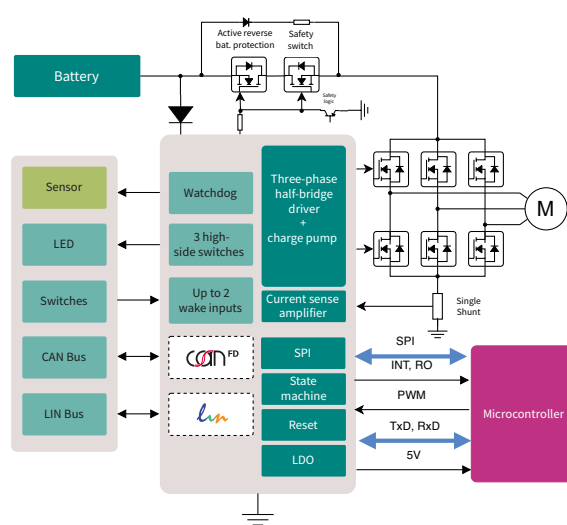
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Application diagram MOTIX™ TLE9560/1/2 for DC motor control



Application diagram MOTIX™ TLE9563/4 for BLDC motor control



Product table

Product variant	V _{cc1}	CAN FD	CAN PN	LIN	HS switches	PWM input	Driver
TLE9560-3QX	5 V up to 250 mA	✓	✓	✓	4	1	2x half-bridges (100 mA const.)
TLE9561QX	5 V up to 250 mA	✓	-	-	4	4	4x half-bridges (100 mA const.)
TLE9561-3QX	5 V up to 250 mA	✓	✓	-	4	4	4x half-bridges (100 mA const.)
TLE9562QX	5 V up to 250 mA	✓	-	✓	4	2	4x half-bridges (100 mA const.)
TLE9562-3QX	5 V up to 250 mA	✓	✓	✓	4	2	4x half-bridges (100 mA const.)
TLE9563-3QX	5 V up to 250 mA	✓	✓	-	3	6	3x half-bridges (150 mA const.)
TLE9564QX	5 V up to 250 mA	-	-	✓	3	6	3x half-bridges (150 mA const.)



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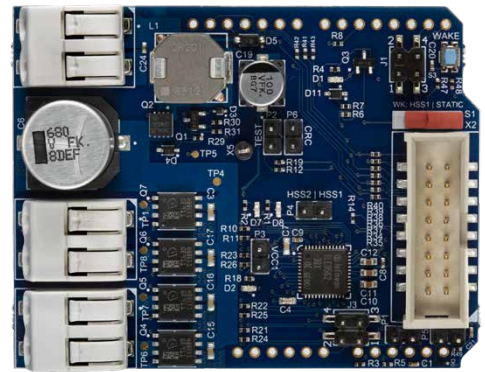
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DC and BLDC motor control shields and evaluation boards with MOTIX™ TLE9562-3QX and with MOTIX™ TLE9563-3QX

The purpose of these boards is to provide a quick evaluation solution for lab assessments. The evaluation boards offer a unique two-in-one solution: they can be connected via a UIO stick with the computer to evaluate features via config wizard (a graphical user interface) which can be found in the Infineon Developer Center. In addition, the evaluation boards feature an Arduino shield interface for rapid prototyping.

Summary of features BLDC motor control shield with MOTIX™ TLE9563-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Three integrated half-bridges MOSFET (2-in-1 MOSFET package)
- 5 mΩ low-side current sense
- High-power RGB LED driven by integrated high-side switches
- On-board back-EMF detection circuit and connector for Hall-sensor
- Arduino example codes available



Sales product name: BLDC SHIELD_TLE956X

Ordering code: BLDCSHIELDTLE956XTOBO1

Summary of features DC motor control shield with MOTIX™ TLE9562-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Four integrated half-bridge MOSFETs (2 in 1 MOSFET package)
- Easy interfacing of CAN and LIN transceiver
- Miniaturization/shrink of the PCB area
- Arduino example codes available

Sales product name: DC SHIELD_TLE956X

Ordering code: DCSHIELDTLE956XTOBO1

Benefits of DC and BLDC motor control shields

- 2-in-1 board with GUI and Arduino interface for evaluation and rapid prototyping
- 50 percent reduced internal operating current consumption
- Simplified and cost efficient ground network
- Smaller package size for area savings
- Very low quiescent current in sleep-mode



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MOTIX™ 6EDL7141

Three-phase smart gate drive controller IC

The MOTIX™ 6EDL7141 is Infineon's latest three-phase motor control gate driver IC, enabling the development of high-performance battery-operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using a built-in digital SPI interface, the MOTIX™ 6EDL7141 is fully configurable to drive a wide range of MOSFETs to yield the best possible system efficiency. The MOTIX™ 6EDL7141 is also designed for maximum flexibility. With an operating voltage from 5.5-70 V and configurable gate drive sink and source current up to 1.5 A, it can effectively drive a wide range of MOSFETs to fit the application best. Thanks to built-in dual charge pumps, it has an adjustable gate driver supply voltage setting between 7 V, 10 V, 12 V, and 15 V, even at low battery voltage. The MOTIX™ 6EDL7141 also has adjustable gate driver parameters to enable control of the slew rate to minimize system EMI. All of the MOTIX™ 6EDL7141 settings can be quickly changed with the available easy-to-use GUI. The integrated buck regulator requires only an external capacitor and inductor to provide power for the microcontroller and the Hall sensors in the motor, further reducing fault conditions.

EVAL_6EDL7141_TRAP_1SH

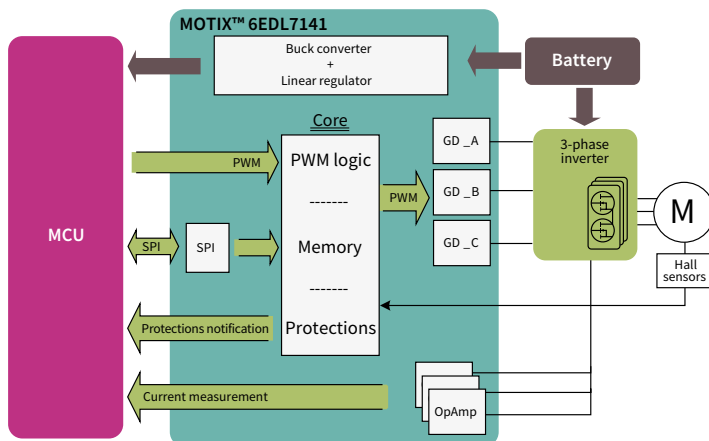
- Single shunt evaluation board for trapezoidal commutation of BLDC motors with 40 V OptiMOS™ 5 PQFN and XMC1404 MCU
- On-board programming dongle
- Featured IC: MOTIX™ 6EDL7141



Features and benefits

Key features	Key benefits
- Integrated power supplies	- Reduced external components and PCB area
- Adjustable slew rate	- Optimized efficiency and EMI
- Programmable gate drive parameters	- Maximum flexibility to use different inverter FETs
- 3x current shunt amplifier	- Highly accurate current sense while saving external components
- Complete dedicated motor control protection suite	- Higher dynamic range to increase signal resolution
	- Improve reliability and fault detection

Block diagram



Product portfolio

Part number	Package	Voltage [V]	$R_{DS(on),max}$ [mΩ]
6EDL7141	PG-VQFN-48-78	5.5 – 70 V	2.2



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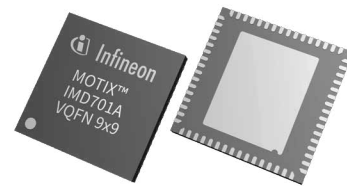
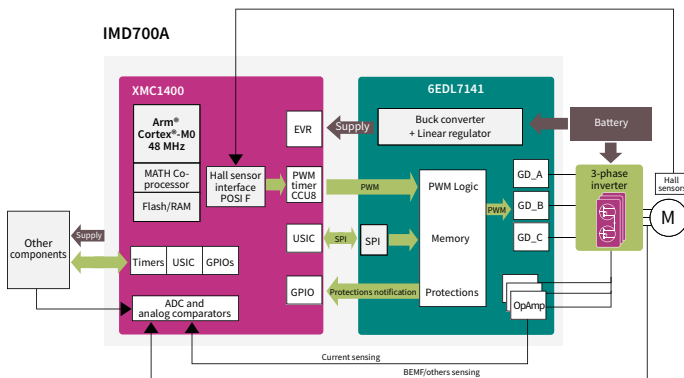
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MOTIX™ IMD700A/IMD701A integrated controller

Fully programmable motor controller combining microcontroller and gate driver IC

Today's newest battery-operated motor drive applications require increased power density and longer run-time, which needs higher efficiency. MOTIX™ IMD700A and IMD701A are Infineon's latest fully programmable motor controllers integrating XMC1404 microcontroller with MOTIX™ 6EDL7141 3-phase gate driver IC in one package to enable the development of next-generation battery-operated products using BLDC or PMSM motors. These controllers are ideal for applications such as professional cordless power tools, gardening products, e-bikes, and automated guided vehicles. With integrated precision power supply and current shunt amplifiers, much of the peripheral circuitry is no longer necessary, reducing PCB space and improving system packaging possibilities. XMC1404, Arm® Cortex®-M0 based microcontroller, incorporates dedicated features to improve motor drive control. A hardware MATH Co-Processor clocked at 96 MHz enhances calculations, including division and trigonometric functions commonly used in Field Oriented Control of PMSM. Additionally, XMC1404 inherits most of the high-end peripherals found in the XMC4000 family (ARM® Cortex®-M4), including PWM timers -CCU8 and CCU4-, position interface (POSIF) or serial communication modules including CAN, ensuring best in class control. The integrated 3-phase gate driver (6EDL7141) includes a configurable gate drive sink and source currents up to 1.5 A, enabling the ability to drive a wide range of MOSFETs effectively to minimize losses and increase efficiency. Thanks to built-in high and low side charge pumps, it has adjustable gate driver supply voltage settings between 7 V, 10 V, 12 V, and 15 V, even at low battery voltage. The 6EDL7141 also has dynamically adjustable gate driver parameters to enable control of the slew rate to minimize system EMI and voltage overshoots. In addition, with a full suite of system protection features such as OCP, UVLO, over-temperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.



Features and benefits

Key features

- Integrated power supplies
- Adjustable slew rate
- Programmable gate drive parameters
- 3x current shunt amplifier
- Complete dedicated motor control protection suite

Key benefits

- Reduced external component count and PCB area
- Lower voltage overshoots and EMI reduction
- Maximum flexibility to use different inverter MOSFETs
- Highly accurate integrated current sense saves external components
- Improved reliability and fault detection

Part number	Package	Voltage [V]	D_{VDD} regulator output [V]
IMD700A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 – 60 V	3.3 V
IMD701A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 – 60 V	5.0 V



Power tools



Gardening tools



Multicopter



Service robots



eBike



Vacuum cleaner



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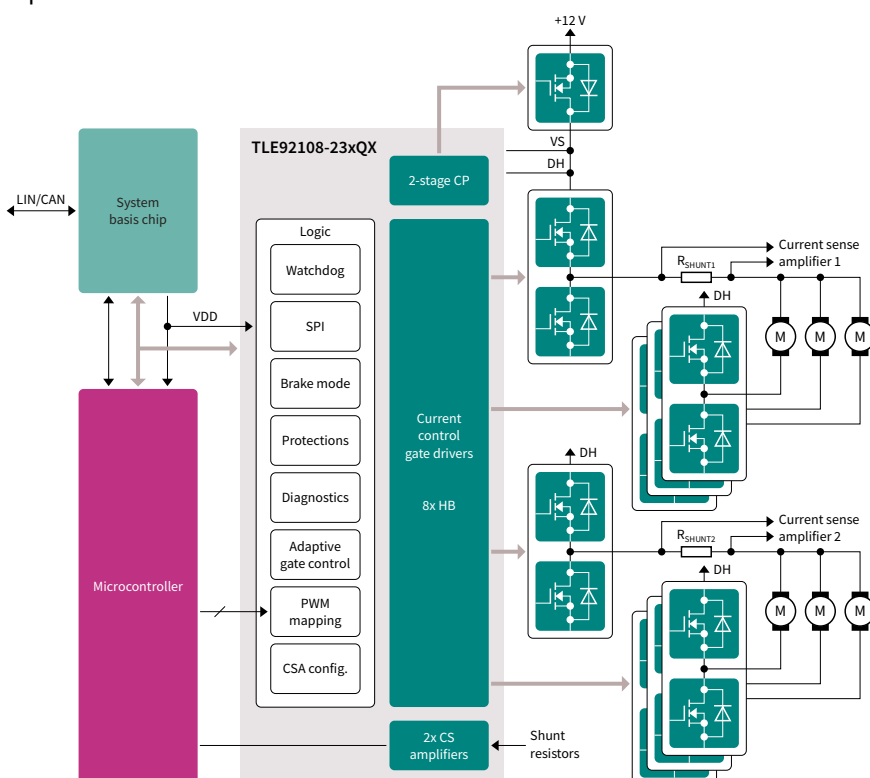
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MOTIX™ multi MOSFET gate driver ICs

Multiple half-bridge drivers designed to control up to eight half-bridges

Infineon's MOTIX™ TLE9210x is a family of multi MOSFET gate driver ICs, designed to control up to eight half-bridges (up to 16 N-channel MOSFETs) with one packaged device. Having only one device for several half-bridges enables further savings, such as less pick and place costs and less required PCB area than discrete solutions.

The MOTIX™ TLE92108 and MOTIX™ TLE92104 multiple MOSFET drivers offer a reliable and cost-optimized solution with state-of-the-art diagnostics and protection. The devices of the MOTIX™ TLE9210x family are pin and software-compatible. Furthermore, the product family allows motor cascading: with TLE92108 (8 half-bridges), up to 7 bidirectional DC motors can be driven.



Product table

Type	Description	Brake mode	Package	Ordering code
TLE92108-231QX	8-fold MOTIX™ multi MOSFET gate driver ICs	No	PG-VQFN-48	TLE92108231QXXUMA1
TLE92108-232QX	8-fold MOTIX™ multi MOSFET gate driver ICs	Yes	PG-VQFN-48	TLE92108232QXXUMA1
TLE92104-131QX	4-fold MOTIX™ multi MOSFET gate driver ICs	No	PG-VQFN-48	TLE92104131QXXUMA1
TLE92104-232QX	4-fold MOTIX™ multi MOSFET gate driver ICs	Yes	PG-VQFN-48	TLE92104232QXXUMA1



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MOTIX™ TLE92104-23QX APPKIT and MOTIX™ TLE92108-23QX APPKIT

Infineon's evaluation boards to measure and evaluate the hardware and software functionalities of the MOTIX™ multi MOSFET gate driver family.

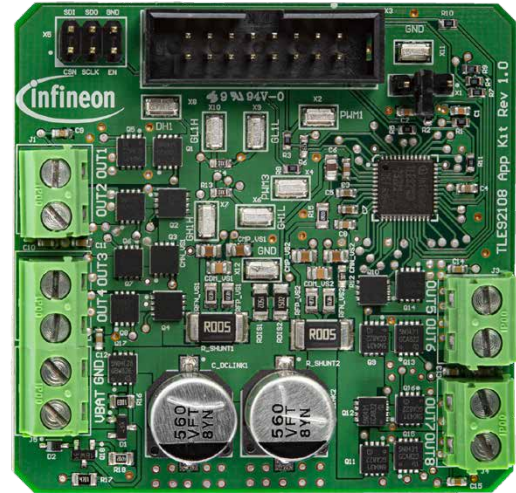
The TLE92104-23QX APPKIT contains the multi MOSFET gate driver IC TLE92104-232QX, and a typical application circuit, including 4 MOSFET half-bridges (OptiMOS™ 40 V MOSFETs in S308 package) to drive up to 3 bidirectional DC motors.

The TLE92108-23QX APPKIT contains the multi MOSFET gate driver IC the TLE92108-232QX and a typical application circuit, including 8 MOSFET half-bridges (OptiMOS™ 40 V in S308 package) to drive up to 7 bidirectional DC motors.

The application boards can be connected via a UIO stick with the computer to evaluate their features via config wizard (a graphical user interface), which can be found in the Infineon Developer Center.

Ordering code: TLE9210423QXAPPKITTOB01

Ordering code: TLE9210823QXAPPKITTOB01



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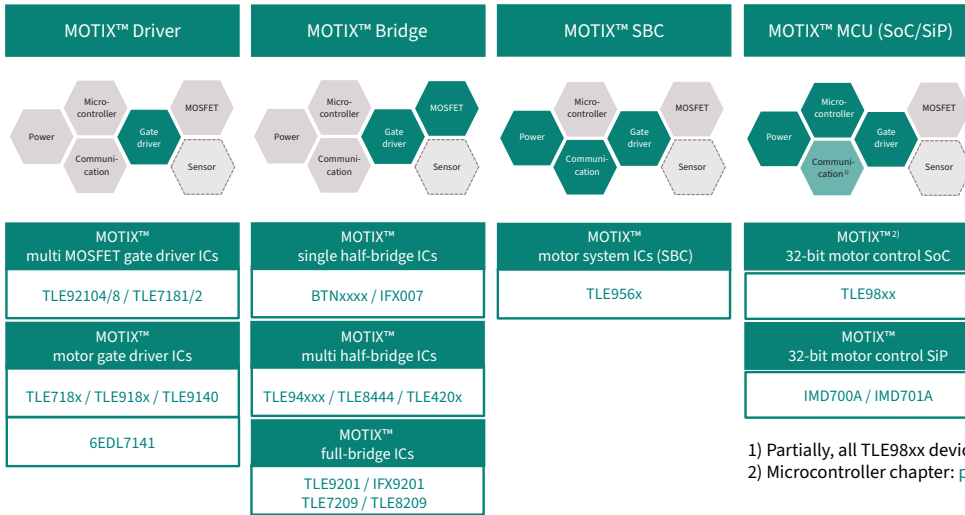
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MOTIX™ motor control ICs

Multiple half-bridge drivers designed to control up to eight half-bridges

Infiniteon is your trusted partner and one-stop shop for motor control solutions and offers with MOTIX™ a wide selection of different motor control ICs. Customers can choose from a scalable product portfolio from low to high integration levels and benefit from a well-rounded support ecosystem with tools and software.



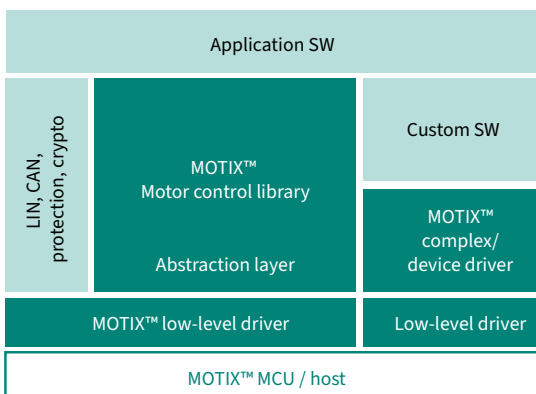
Accelerate your embedded motor control development with MOTIX™ Software

MOTIX™ Software system approach

- Portfolio of dependable SW building blocks for evaluation and productive use in vehicle motor control systems
- Developed and tested on motor control HW/SW reference systems
- Designed to utilize best HW capabilities of Infineon ICs and configurable to state of the art motor control use cases
- MOTIX™ Tools for evaluation and development

Your benefits

- Spare development efforts without compromising system performance
- Free source code evaluation option and production ready SW with comprehensive user documentation and verification/ test reports
- End-to-end engineering service provider MOTEON



- **MOTIX™ Low-level Driver** for MOTIX™ MCU (SoC)
- **MOTIX™ Device Driver** for initialization and in-system evaluation of MOTIX™/ EiceDRIVER™ devices
- **MOTIX™ Complex Device Driver** for ASIL D applications with MOTIX™/ EiceDRIVER™ devices on AURIX™
- **MOTIX™ Motor Control Library** featuring field-oriented control of BLDC motors in pumps, fans and compressors



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MOTIX™ TLE9140

Gate driver IC for BLDC motor control applications



MOTIX™ TLE9140 is a 3-phase motor gate drive IC targeting 24/48V battery supplied applications, where higher system reliability and faster switching behavior are necessary. The IC is the ideal complement to Infineon's MOTIX™ MCU TLE987x and TLE989x 32-bit motor control SoC solutions but is also suitable as a 48 V BLDC driver with common MCUs on the market. TLE9140 is applied as a 3-phase motor gate driver for applications in automotive, commercial, construction, and agricultural (CAV) vehicles as well as in light electric vehicles (LEV) such as eBikes, eScooters, or eMotorcycles.

The MOTIX™ TLE9140 gate driver IC for BLDC motors is ISO 26262-compliant (ASIL B) and equipped with comprehensive protection and diagnosis features. The IC enables SPI communication and has an active low-side (LS) freewheeling function during VSM overvoltage (OV). The integrated adaptive MOSFET control feature can help improve EME, reduce power losses, and save on external components needed in the application. Furthermore, the small TS-DSO-32 packing enables space and weight reduction on the PCB.

Features and benefits

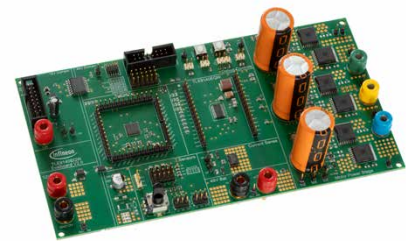
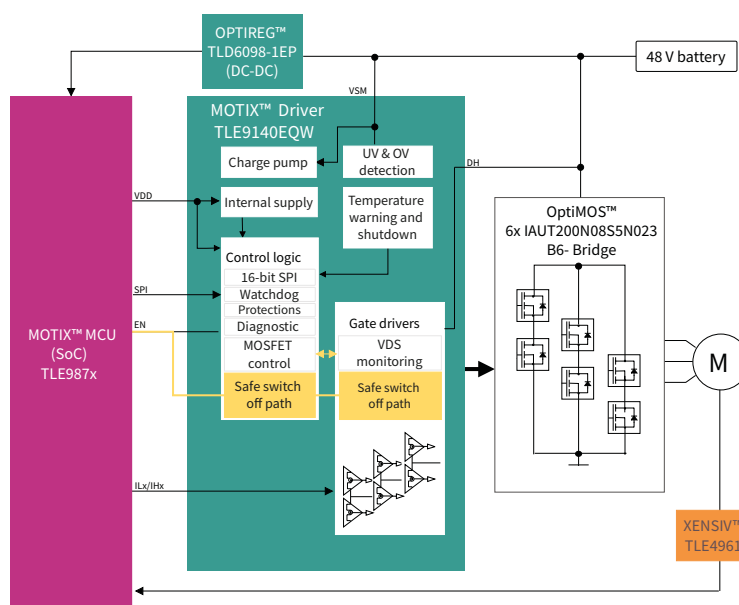
Key features

- Gate driving capability: ~230 nC / MOSFET up to 20 kHz
- Adaptive MOSFET control feature integrated into gate driver
- Comprehensive protection and diagnostic features integrated
- Designed in a compact package TS-DSO-32 (8.65 x 3,9 mm²)
- Automotive grade 0 qualified and ASIL B compliant

Key benefits

- Easy approach and scaling for 24 V/48 V applications in conjunction with our MOTIX™ MCU TLE987x / TLE989x or with any other open market MCU
- Can assist customers in achieving improved EMC performance and reduce power dissipation
- Allows for active monitoring of device state and protects system from damage
- Able to reduce PCB space requirements
- High system reliability and meets challenging mission profiles

Block diagram



The MOTIX™ TLE9140 Evaluation Board contains the TLE9140EQW, TLE987x, and their typical application circuits including three half-bridges to drive a BLDC motor.

Evaluate TLE9140EQW in two scenarios:

- MOTIX™ 48 V gate driver TLE9140EQW controlled by MOTIX™ MCU (SoC) device TLE987x
- Evaluate MOTIX™ 48 V gate driver TLE9140EQW with Configuration Wizard in the Infineon Developer Center (IDC)



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Infineon support for power ICs

Useful links and helpful information

Further information, datasheets and documents

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Support



Evaluation board



Tools



Simulation



Wide-bandgap semiconductors

Gallium nitride (GaN)

- CoolGaN™ Transistors
- High-voltage CoolGaN™ Transistors
- High-voltage CoolGaN™ Drive

Silicon carbide (SiC)

- CoolSiC™ MOSFETs discrete 650 V G1
- CoolSiC™ MOSFET discrete 750 V G1
- CoolSiC™ Automotive MOSFETs 750 V G1
- CoolSiC™ MOSFETs discrete 1200 V G1
- CoolSiC™ MOSFETs discrete 1700 V G1
- CoolSiC™ MOSFETs discrete 2000 V G1 in TO-247 PLUS-4-HCC package
- CoolSiC™ MOSFETs discrete 400 V G2
- CoolSiC™ MOSFETs discrete 650 V Generation 2
- CoolSiC™ MOSFET 1200 V G2
- CoolSiC™ Schottky diodes
- CoolSiC™ Schottky diodes 650 V
- CoolSiC™ Schottky diodes 1200 V
- CoolSiC™ Schottky diode 2000 V G5
- CoolSiC™ diodes product portfolio
- CoolGaN™ and CoolSiC™ nomenclature

Please click [here](#) to discover **CoolSiC™ hybrid devices**.

Wide-bandgap semiconductors

Gallium nitride (GaN) and silicon carbide (SiC)

The key step towards an energy-efficient world is the use of new materials, such as wide-bandgap semiconductors that allow for greater power efficiency, smaller size, lighter weight, lower overall cost – or all of these together. As the leading and trusted power supplier, Infineon offers the broadest product and technology portfolio of silicon (Si) and wide-bandgap (WBG) solutions with more than 40 years of heritage in silicon, and several decades of heritage in wide bandgap technology development. Infineon's offering in wide bandgap with CoolGaN™ and CoolSiC™ is complemented by EiceDRIVER™ gate drivers providing flexibility to implement different system partitioning with the right fit isolation rating.

Recent developments include the acquisition of GaN Systems in late 2023, supporting customers with an expanded offering and internal dual sourcing via independent manufacturing flows. In addition, the second generation CoolSiC™ is launched with a roll out through 2024 and 2025, extending the lead in performance and reliability via adoption of our field proven .XT™ advanced interconnection technology.

CoolGaN™ – ultimate efficiency and reliability

Compared to silicon (Si) MOSFETs, the breakdown field of Infineon's CoolGaN™ power transistors is ten times higher, and the electron mobility is double. Both the output charge and gate charge are ten times lower than with Si and the reverse recovery charge is almost zero, which is key to high frequency operations. GaN is well suited for hard-switching, and perfect for soft-switching and resonant topologies, enabling new approaches beyond the capabilities of silicon switches. CoolGaN™ power transistors from Infineon are based on the markets most robust and performing concept – the enhancement-mode concept - offering fast turn-on and turn-off speed. CoolGaN™ products focus on high performance and robustness and add significant value to a wide variety of systems across many applications such as AI servers, telecom, hyperscale data centers, USB-C adapters and chargers, and audio.

CoolSiC™ - revolution to rely on

Silicon carbide has a significantly higher thermal conductivity compared to silicon. SiC-based MOSFETs are best-suited for applications requiring high power, high breakdown, high temperature, and are operating at higher frequencies compared to traditional IGBTs. CoolSiC™ MOSFETs come along with a fast internal freewheeling diode, thus making hard commutation without additional diode chips possible. Due to its unipolar character, the MOSFETs have low temperature-dependence switching and low conduction losses, especially under partial load conditions. Based on proven, high-quality volume manufacturing, Infineon's CoolSiC™ solutions combine revolutionary technology with benchmark reliability.



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CoolGaN™ Transistors

Tailor-made for the highest efficiency and power density in switch-mode power supplies

Compared to the next best silicon alternative, CoolGaN™ enables higher power density and the highest efficiency, especially in the partial load range, through novel topologies such as the CCM totem-pole PFC stage. GaN transistor performance features a low reverse recovery charge and excellent dynamic performance in reverse conduction compared to silicon FET solutions. This characteristic enables more efficient operation at established frequencies and much higher frequency operation, improving power density by shrinking the size of passive components. CoolGaN™ enables doubled output power in a given energy storage slot size, freeing up space and realizing higher efficiency simultaneously. Infineon's CoolGaN™ comes with industry-leading reliability. During the quality management process, it is not only the device that is thoroughly tested but also its behavior in the application environment. The performance of CoolGaN™ goes beyond other GaN products in the market.

Features

- Low output charge and gate charge
- No reverse recovery charge

Design benefits

- High power density, small, and light design
- High efficiency in resonant circuits
- New topologies and current modulation
- Fast and (near-)lossless switching

Advantages

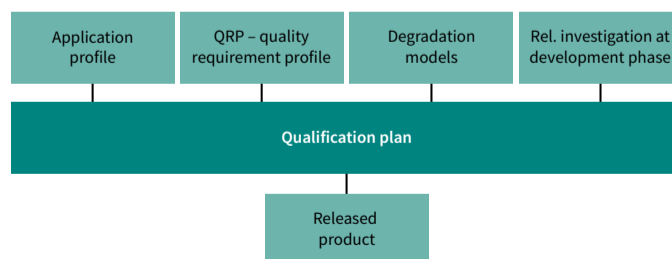
- Operational expenses (OPEX) and capital expenditure (CAPEX) reduction
- BOM and overall cost savings

Infineon's high- and low-voltage MOSFETs, gate-driver ICs and digital controllers complement the CoolGaN™ offering to fully exploit the benefits of GaN technology in systems.

The highest quality

The qualification of GaN switches requires a dedicated approach, well above existing silicon standards

- Infineon qualifies GaN devices well beyond industry standards
- Application profiles are an integral part of the qualification process
- Failure models, based on accelerated test conditions, ensure target lifetime and quality are met
- Infineon sets the next level of wide bandgap quality



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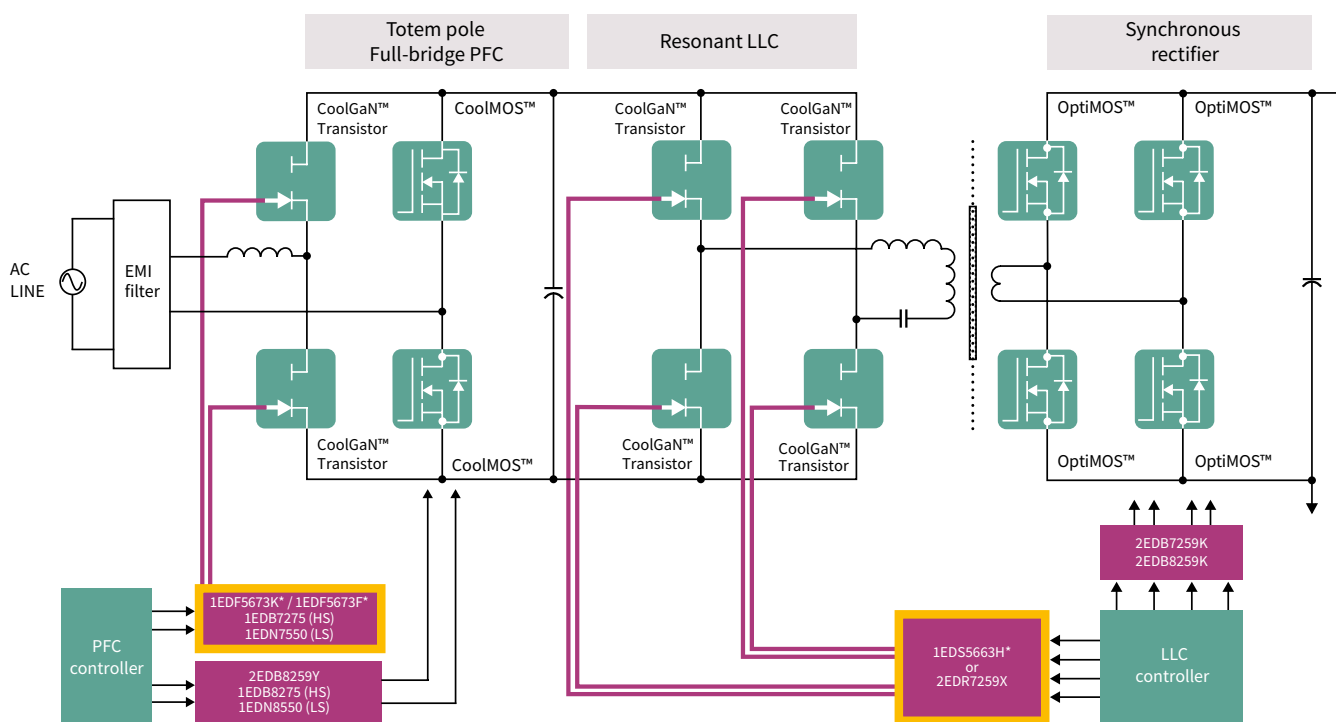
CoolGaN™ Transistors – bringing GaN technology to the next level

Infiniteon's CoolGaN™ Transistors enable more than 98 percent system efficiency and help customers make their end products smaller and lighter. Driving enhancement-mode devices requires additional features when choosing the correct gate driver IC. With the EiceDRIVER™ 1EDx56x3x family, Infineon offers dedicated single-channel galvanically isolated gate driver ICs, which are a perfect fit for e-mode GaN HEMTs with non-isolated gate (diode input characteristic) and low threshold voltage, such as CoolGaN™. However, CoolGaN™ technology does not require customized ICs, and in many applications, CoolGaN™ can be driven by standard gate drivers when coupled to an RC interface.

Complete support of all requirements specific to GaN power transistors operation:

- Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink)
- Resistor programmable gate current for steady on-state (typically 10 mA)
- Programmable negative gate voltage to completely avoid spurious turn-on in half-bridges

Block diagram: high-efficiency GaN switched-mode power supply (SMPS)



*Single-channel EiceDRIVER™ ICs dedicated for CoolGaN™ Power Transistor



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High-voltage CoolGaN™ Transistors

The highest efficiency and power density with reduced system costs

The e-mode concept offers fast turn-on and turn-off speed, as well as a better path towards integration. CoolGaN™ Transistors enable simpler and more cost-effective half-bridge topologies. As e-mode based products reach maturity, CoolGaN™ Transistors are gaining growing prominence thanks to their potential. Infineon manufactures their GaN devices according to a specific, GaN-tailored qualification process that goes far beyond the standard for silicon power devices. CoolGaN™ Transistors are designed for datacom and server SMPS, telecom rectifiers, as well as mobile chargers and adapters, and can be used as a general switch in many other industrial and consumer applications. It is the most rugged and reliable solution in the market. The CoolGaN™ portfolio is built around high-performing SMD packages to fully exploit the benefits of GaN.

CoolGaN™ Transistors for PFC

CoolGaN™ enables the adoption of simpler half-bridge topologies (including the elimination of the lossy input bridge rectifier). The result is record efficiency (>99%) with a potential for BOM savings.

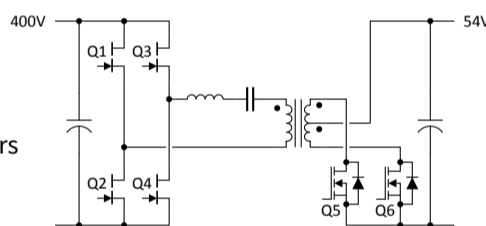
CoolGaN™ Transistors for resonant topologies

- In resonant applications, ten times lower Q_{oss} and Q_G enables high-frequency operations (>1 MHz) at the highest efficiency levels
- Linear output capacitance leads to 8 to 10 times lower dead time
- Devices can be easily paralleled
- Power density can be pushed even further by optimizing the thermal performance
- CoolGaN™ enables to push the efficiency forward, thus enabling high power density e.g., in low-power chargers/adapters

Applications

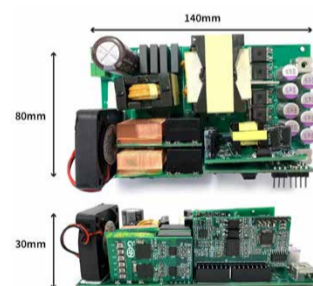
- Telecom
- Server
- AI data centers
- USB-C adapters and chargers
- Wireless charging
- SMPS

Full-bridge LLC



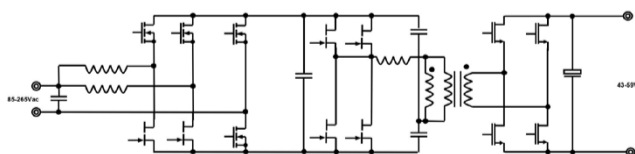
Demonstration board

3 kW full-bridge LLC board
GS-EVB-LLC-3KW-GS



- 50 mΩ CoolGaN™ Transistor in PG-VSON-8

Totem-pole PFC



Reference design 500 kHz
high density 3 kW rectifier:
REF_3K3W_HFHD_PSU



- 35 mΩ CoolGaN™ Transistor in PG-HSOF-8



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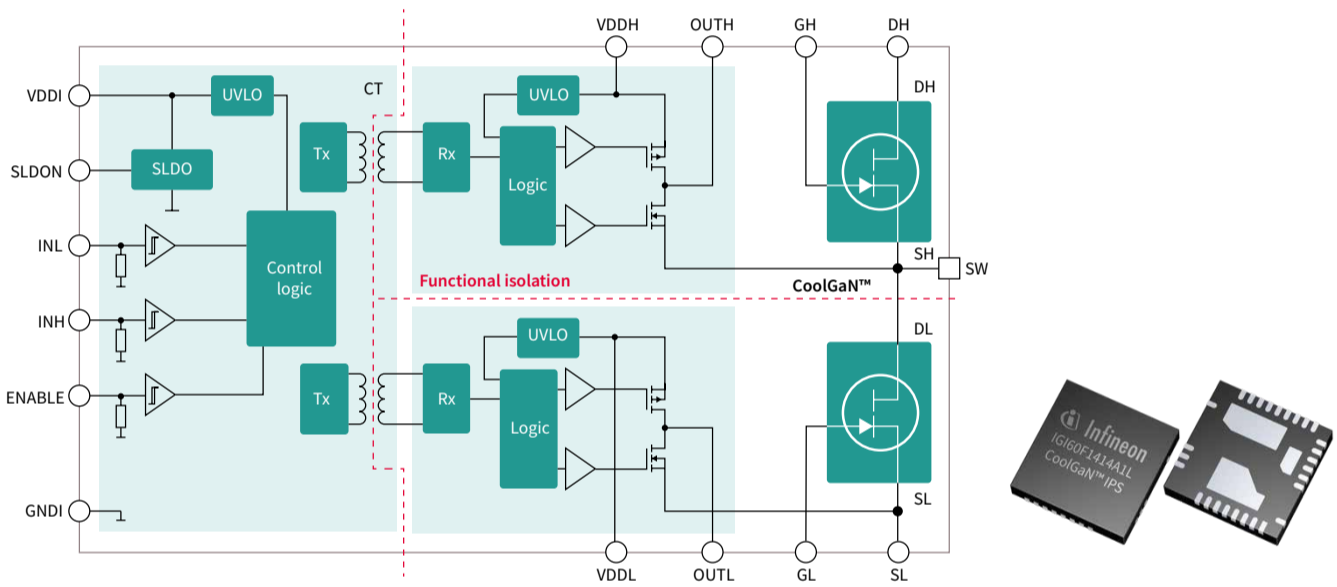
High-voltage CoolGaN™ Drive

Ease of use with integrated drivers for highest efficiency and power density

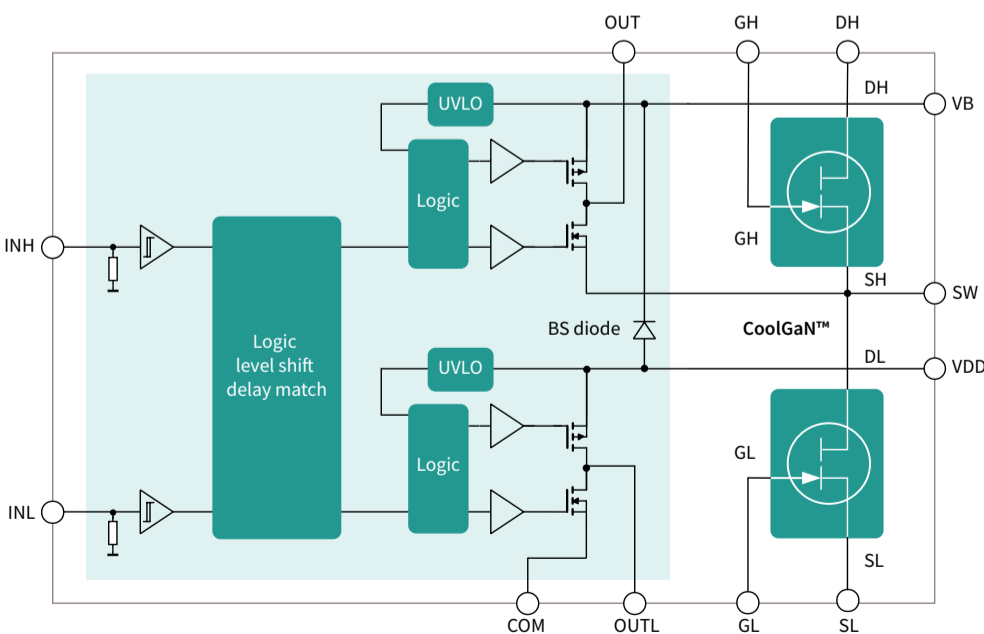
The CoolGaN™ Drive combines a half-bridge power stage consisting of two CoolGaN™ Transistors and a dedicated gate driver IC. It is thus ideally suited to support the design of compact appliances in the low-to-medium power area. Infineon's CoolGaN™ power switches provide a very robust gate structure. When driven by a continuous gate current of a few mA in the on-state, a minimum on-resistance $R_{DS(on)}$ is always guaranteed.

Due to the GaN-specific low threshold voltage and the fast-switching transients, a negative-gate drive voltage is required in specific applications to avoid spurious turn-on effects. This can be achieved by the well-known RC interface between the driver and the switch. A few external SMD resistors and capacitors allow for easy adaptation to different applications (low/medium power, hard/soft switching).

The CoolGaN™ Drive is available in typical $R_{DS(on)}$ 2x 140/200/270/500 mΩ in a thermally enhanced 8 x 8 mm QFN-28 package. The built-in driver utilizes an on-chip coreless transformer (CT) technology to achieve level-shifting to the high side. Besides, CT technology guarantees excellent robustness even for extremely fast-switching transients above 150 V/ns.



The CoolGaN™ Drive is also available in typical $R_{DS(on)}$ 2x 500 mΩ, in a 6x8 mm TFLGA-27 package. The built-in half-bridge driver integrates bootstrap diode to configure the high-side gate drive supply easily. With an application-configurable turn-on and turn-off speed, this part can be easily adapted in low power SMPS and motor driver applications aiming for high-power density design.



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CoolGaN™ Drive 600 V - 700 V



Package	QFN 8x8 Half-bridge with driver	QFN 5x6 single switch CS, OCP, OTP	QFN 6x8 single switch CS, OCP, OTP	TOLL single switch CS, OCP, OTP	QFN 6x8 half-bridge No driver	LGA 6x8 half-bridge integrated Bootstrap diode	QFN 6x8 half-bridge CS, OCP, OTP, bootstrap diode	QFN 8x8 half-bridge CS, OCP, OTP, bootstrap diode	Q-DPAK BSC half-bridge CS, OCP, OTP, bootstrap diode
500 mΩ	IGI650F5050A1L*	IGI70N500A2PS*	IGI70N500A2MS*			IGI60L5050B1M*			
350 mΩ							IGI65L3535A2M*		
270 mΩ	IGI650F2727A1L*	IGI70N270A2PS*	IGI70N270A2MS*			IGI60L2727B1M*	IGI65L2727A2M*		
200 mΩ	IGI650F2020A1L*	IGI70N200A2PS*	IGI70N200A2MS*		IGI65D2020A3MS*		IGI65L2020A2M*	IGI65L2020A2L*	
140 mΩ	IGI650F1414A1L*	IGI70N140A2PS*	IGI70N140A2MS*		IGI65D1414A3MS*	IGI60L1414B1M*	IGI65L1414A2M*	IGI65L1414A2L*	IGI65L1414A2QC*
100 mΩ			IGI70N100A2MS*					IGI65L1010A2L*	IGI65L1010A2QC*
70 mΩ			IGI70N070A2MS*						IGI65L070A2QC*
55 mΩ			IGI70N055A2MS*	IGI65N055A2T*					IGI65L0505A2QC*
35 mΩ				IGI65N035A2T*					
25 mΩ				IGI65N025A2T*					

CoolGaN™ Transistors 650 V - 700 V



Package	ThinPAK/PDFN 5x6	DFN/PDFN 8x8	GaN PX	TOLL	TOLT	DSO
450 mΩ	GS-065-004-1-L					
315 mΩ	GS-065-004-6-L					
260 / 270 mΩ	I GLR65R270D2* GS-065-006-6-L					
200 - 225 mΩ	I GLR65R200D2* GS-065-008-1-L		GS66502B			
165 mΩ	GS-065-008-6-L					
140 / 150 mΩ	I GLR65R140D2* GS-065-011-1-L	I GLD65R140D2* GS-065-011-2-L		IGT65R140D2*		
125 mΩ	GS-065-011-6-L	GS-065-011-6-LR				
110 mΩ		I GLD65R110D2*			I GLT65R110D2*	
95 / 100 mΩ	GS-065-014-6-L	GS-065-014-6-LR	GS66504B			
78 / 80 mΩ		I GLD65R080D2* GS-065-018-2-L				
62 / 67 mΩ		GS-065-018-6-LR	GS66506T			
45 - 55 mΩ		I GLD65R055D2* GS-065-030-2-L	GS66508B GS66508T	IGT65R055D2* IGT65R045D2*	I GLT65R055D2* I GLT65R045D2*	IGOT65R055D2* IGOT65R045D2*
30 - 37 mΩ		GS-065-030-6-LR		IGT65R035D2* GS-065-030-6-LL GS-065-045-6-LL*	I GLT65R035D2* GS-065-030-6-LT GS-065-045-6-LT	IGOT65R035D2*
25 mΩ			GS66516B GS66516T	IGT65R025D2*	I GLT65R025D2*	IGOT65R025D2*
17 mΩ				GS-065-075-6-LL	GS-065-075-6-LT	

EiceDRIVER™ family optimized for high-voltage CoolGaN™ Transistors



Product	Package	Input to output isolation				Propagation delay accuracy	Typ. high level (sourcing) output resistance	Typ. low level (sinking) output resistance
		Isolation class	Rating	Surge testing	Certification			
1EDF5673K	LGA, 13-pin, 5x5 mm	functional	$V_{IO} = 1.5 \text{ kV}_{DC}$	n.a.	n.a.	-6 ns/+7ns	0.85 Ω	0.35 Ω
1EDF5673F	DSO, 16-pin, 150 mil	functional	$V_{IO} = 1.5 \text{ kV}_{DC}$	n.a.	n.a.	-6 ns/+7ns	0.85 Ω	0.35 Ω
1EDS5663H	DSO, 16-pin, 300 mil	reinforced	$V_{IOTM} = 8 \text{ kV}_{pk}$ $V_{ISO} = 5.7 \text{ kV}_{RMS}$	$V_{ISOM} > 10 \text{ kV}_{pk}$	EN 62368-1 UL1577	-6 ns/+7ns	0.85 Ω	0.35 Ω

Gate driver ICs for GaN transistors

EiceDRIVER™ 2EDi, 1EDB and 1EDN-TDI product families



Family	Product	Package	Input to output isolation		Output UVLO	Output peak source/sink current	CMTI (min.)	Propagation delay (typ.)	Active Clamping	Separate Source/Sink Output
			Isolation class	Rating						
2EDi	2EDR7258X	DSO-14 300 mil	Reinforced	$V_{ISO} = 5.7 \text{ kV}_{RMS}$ UL 1577	4 V	5 A / 9 A	150 V/ns	38 ns	Yes	No
	$V_{IOTM} = 8 \text{ kV}_{pk}$ VDE 0884-11			8 V						
	2EDB7259Y	DSO-14 150 mil	Single Protection	$V_{ISO} = 3.0 \text{ kV}_{RMS}$ UL 1577	4 V	5 A / 9 A	300 V/ns	45 ns	Yes	Yes
	2EDB8259Y				8 V					
1EDB	1EDB7275F	DSO-8 150 mil	Single Protection	$V_{ISO} = 3 \text{ kV}_{RMS}$ UL 1577	4 V	5 A / 9 A	300 V/ns	45 ns	Yes	Yes
	1EDB8275F				8 V					
1EDN-TDI	1EDN7550B	SOT23 6-pin	Non-Isolated	n.a.	4 V	5 A / 9 A	n.a.	45 ns	No	Yes
	1EDN8550B				8 V					
1EDN-TDI	1EDN71X6G	VSON-10	Non-Isolated	n.a.	4 V	0.5 A / 0.5 A, 1 A / 1 A 1.5 A / 1.5 A, 2 A / 2 A	n.a.	125 ns / 105 ns / 75 ns / 55 ns	Yes	Yes
	1EDN71X6U	TSNP-7								



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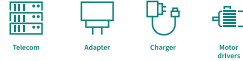
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CoolGaN™ Transistors 100 V



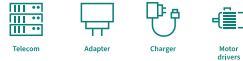
Package $R_{DS(on),max}$	PQFN 3x5 Bottom-side cooled	PQFN 3x5 Dual-side cooled	PQFN 3x3 Bottom-side cooled	PQFN 3x3 Dual-side cooled	ULGA
2.4 mΩ	IGC033S101*	IGC033S10S1*			
7 mΩ					GS61008P GS61008T
8 mΩ			IGB110S101*	IGB110S10S1*	
16 mΩ					GS61004B

CoolGaN™ Transistors 60 V



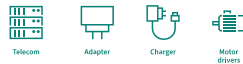
Package $R_{DS(on),max}$	PQFN 3x5 Dual-side cooled
1.4 mΩ	IGC01906S1*

CoolGaN™ Transistors 80 V



Package $R_{DS(on),max}$	PQFN 3x5 Dual-side cooled
1.9 mΩ	IGC025S08S1*

CoolGaN™ Transistors 120 V



Package $R_{DS(on),max}$	PQFN 3x5 Dual-side cooled
2.8 mΩ	IGC037S12S1*

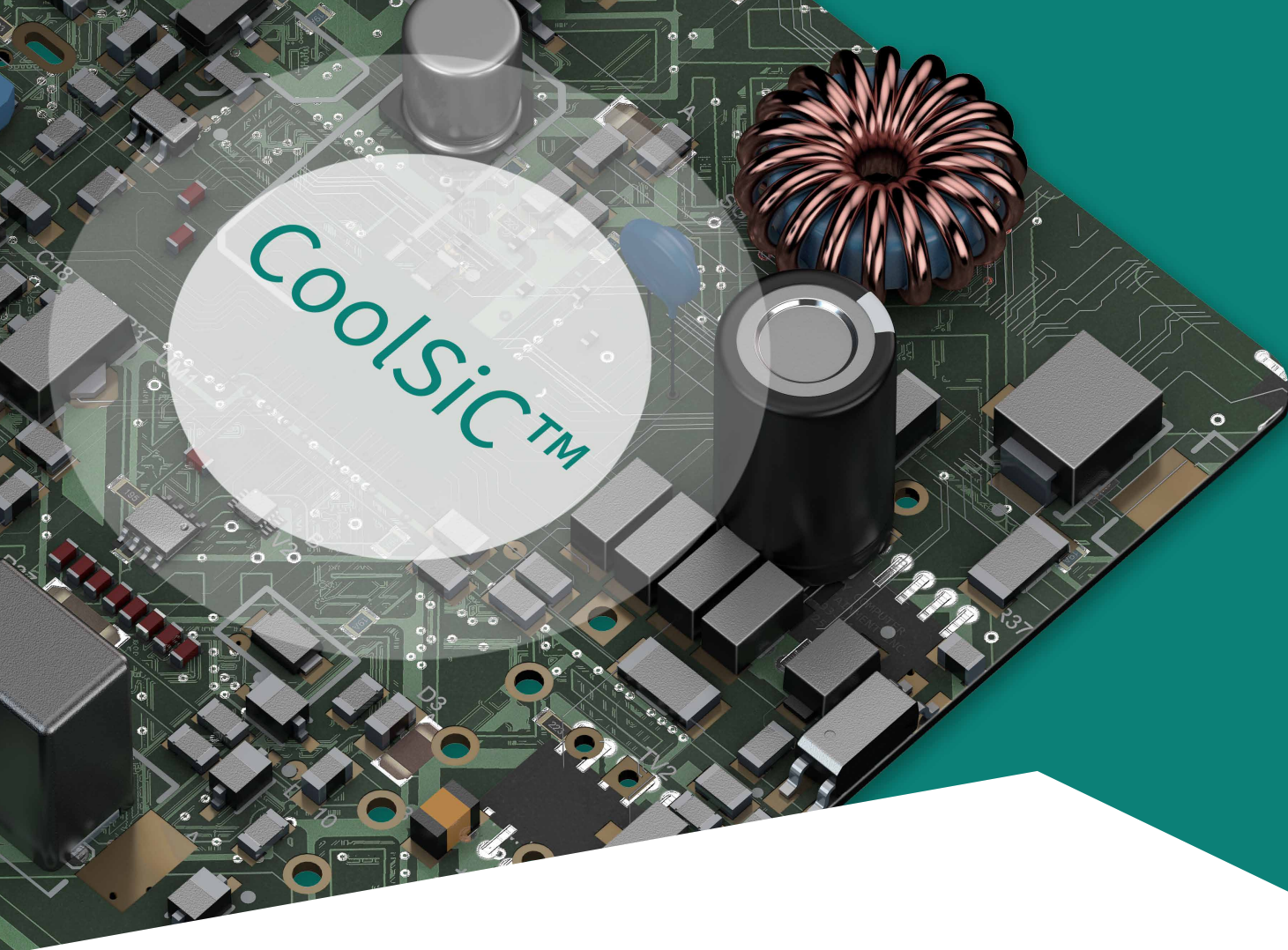


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* Coming soon



Silicon carbide

Silicon Carbide CoolSiC™ solutions are the next essential step towards an energy-smart world.

Silicon carbide (SiC) devices belong to the so-called wide bandgap semiconductor group, which offers many attractive characteristics for high voltage power semiconductors compared to commonly used silicon (Si). In particular, the much higher breakdown field strength and thermal conductivity of silicon carbide allow developing devices which by far outperform the corresponding silicon-based ones, and enable efficiency levels unattainable otherwise. Infineon's portfolio of SiC devices covers 600 to 2000 V Schottky diodes as well as the revolutionary CoolSiC™ MOSFETs 400 V, 650 V, 750 V, 1200 V, 1700 V, and 2000 V.

EiceDRIVER™ SiC MOSFET gate-driver ICs are well-suited to drive SiC MOSFETs, especially Infineon's ultrafast switching CoolSiC™ SiC MOSFETs. These gate drivers incorporate the most important key features and parameters for driving SiC, such as tight propagation delay matching, precise input filters, wide output-side supply range, negative gate voltage capability, active Miller clamp, DESAT protection, and extended CMTI capability.



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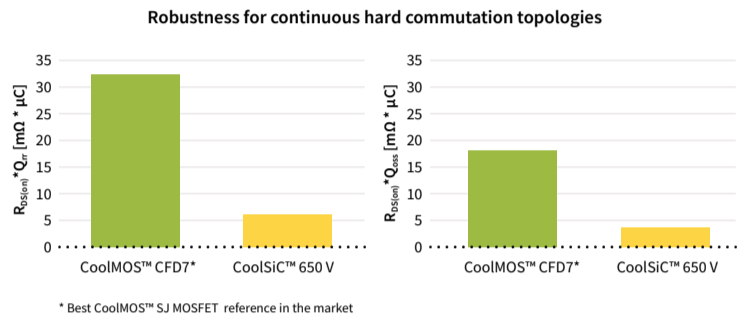
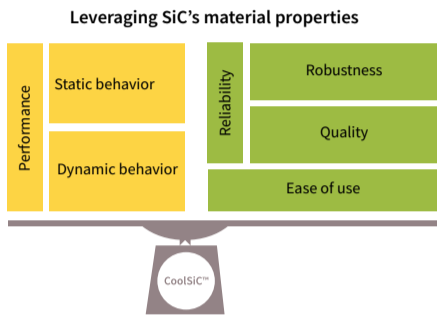
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CoolSiC™ MOSFETs discrete 650 V G1

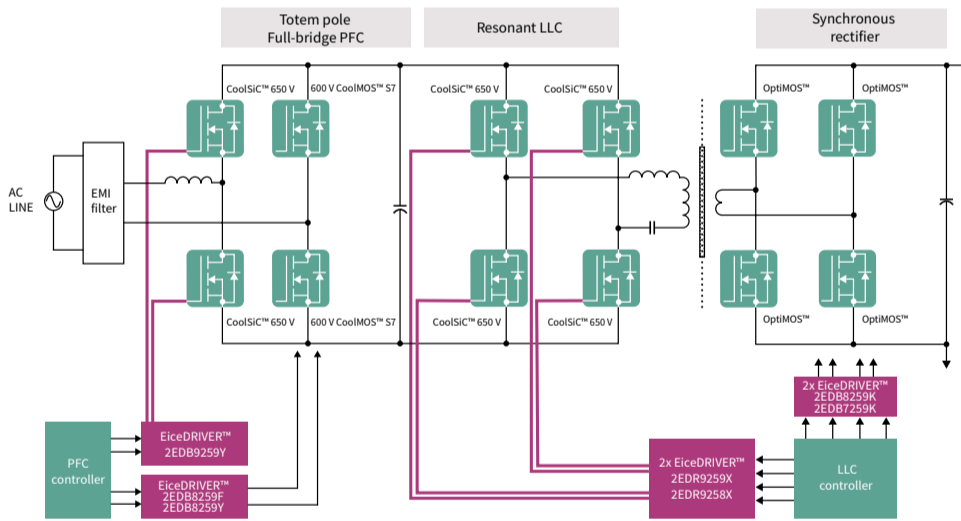
Delivering reliable and cost-effective top performance

Silicon carbide physical characteristics, from wide bandgap to electron mobility and thermal conductivity, provide the basis to engineer high-performance semiconductor technologies and products. The CoolSiC™ MOSFETs from Infineon maximize the advantages of silicon carbide, offering a high-performance product that also meets power electronics design requirements, like reliability and ease of use. As per performance, the CoolSiC™ MOSFETs show low $R_{DS(on)}$ dependency with temperature and low switching losses. The reliability is built on technological strengths and on flawless quality processes. Some aspects of Infineon's SiC technology, like superior gate oxide reliability, excellent thermal behavior, advanced avalanche ruggedness and short circuit capabilities, contribute to the robustness of the device. Infineon's benchmark quality was further improved for silicon carbide, with an application-focused qualification scope exceeding standards, complemented by SiC-specific screening measures. Additional unique features, like 0 V turn-off V_{GS} , wide V_{GS} range, and the use of silicon MOSFET drivers and driving schemas make CoolSiC™ MOSFETs 650 V easy to integrate and use.



CoolSiC™ MOSFETs can enable streamlined and cost-optimized system designs with fewer components, weight and size, reaching high energy efficiency and power density. For instance, the CoolSiC™ MOSFETs boast a low level of Q_{rr} , roughly 80 percent less of the best CoolMOS™ reference in the market, the CoolMOS™ CF7. This ensures the robustness of the body diode, making the CoolSiC™ MOSFETs suitable for topologies with continuous hard commutation, like the high-efficiency totem-pole PFC, a topology that enables > 99 percent of efficiency.

High-efficiency CoolSiC™ totem-pole PFC in server SMPS (switched-mode power supply)



CoolSiC™ MOSFET 650 V G1



$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	TO-247 4-pin	TO-247	D ² PAK-7	TOLL
13.6	9			IMBG65R009M1H	
30/34	22/27	IMZA65R027M1H	IMW65R027M1H	IMBG65R022M1H	IMT65R022M1H
42	30	IMZA65R030M1H	IMW65R030M1H	IMBG65R030M1H	IMT65R030M1H
50	39	IMZA65R039M1H	IMW65R039M1H	IMBG65R039M1H	IMT65R039M1H
64	48	IMZA65R048M1H	IMW65R048M1H	IMBG65R048M1H	IMT65R048M1H
74	57	IMZA65R057M1H	IMW65R057M1H	IMBG65R057M1H	IMT65R057M1H
94	72	IMZA65R072M1H	IMW65R072M1H	IMBG65R072M1H	IMT65R072M1H
111	83	IMZA65R083M1H	IMW65R083M1H	IMBG65R083M1H	IMT65R083M1H
141	107	IMZA65R107M1H	IMW65R107M1H	IMBG65R107M1H	IMT65R107M1H
217	163			IMBG65R163M1H	IMT65R163M1H
346	260			IMBG65R260M1H	IMT65R260M1H



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CoolSiC™ MOSFET discrete 750 V G1

Delivering enhanced robustness and reliability

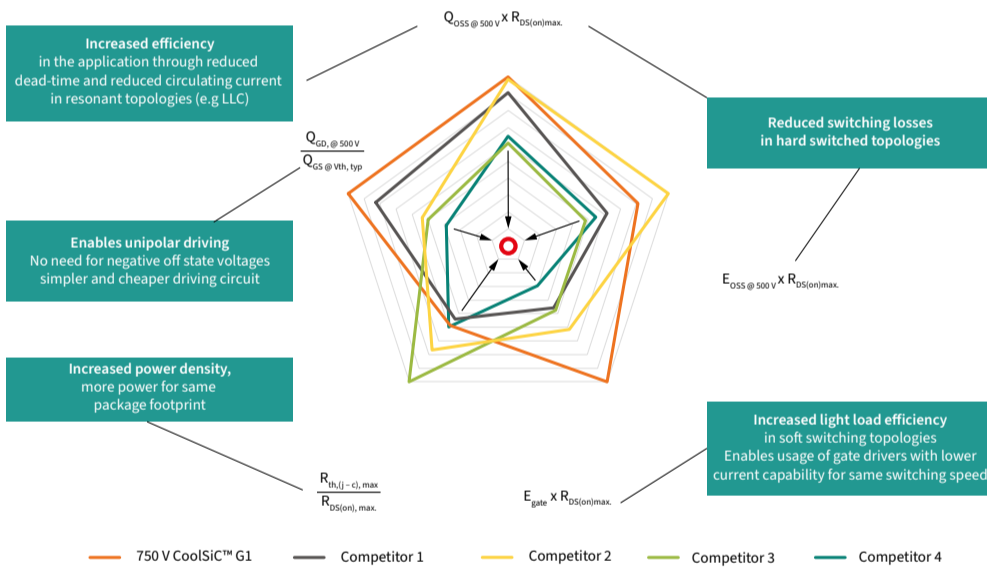
Infinion's CoolSiC™ MOSFETs 750 V extends the product family of CoolSiC™ MOSFETs 650 V G1, offering customers granularity in selecting an optimized solution in price and performance for their designs, with typical $R_{DS(on)}$ ranging from 8 to 140 mΩ. It addresses especially solid-state circuit breakers, EV charging, solar inverter, servers, and AI PSU where topologies like Totem-pole with CCM and TCM modulation, HERIC, Active Neutral Point Clamp (ANPC), Vienna Rectifier, Dual Active Bridge (DAB), Phase-Shifted full-bridge (PSFB), LLC and CLLC are used. The 750 V G1 best-in-class robustness to parasitic turn enables minimizing switching losses both with unipolar (i.e., $-V_{GS(off)} = 0$ V) and bipolar (i.e., $V_{GS(off)} < 0$ V) gate driving. Moreover, the low Q_G and Q_{OSS} make it suitable for ZVS topologies operating at high frequencies. Finally, the higher breakdown voltage enhances cosmic radiation ruggedness and gives more room to increase the DC-link voltage. CoolSiC™ MOSFET 750 V is available in the SMD top-side cooled Q-DPAK package, enabling increased power density by more efficient use of PCB space. The Kelvin-source connection and lower parasitic source inductance help reduce switching losses at high current. It improves heat dissipation, consequently reduces size and cost as well as extends system lifetime, creating the highest value for the customers.

Features and benefits

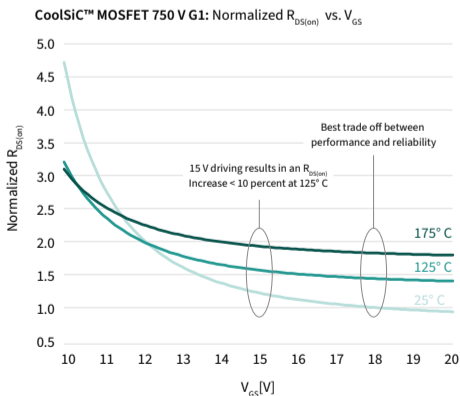
Key features	Key benefits
– Cosmic ray ruggedness	– High reliability and improved system lifetime
– Intrinsic diode with low reverse recovery charge	– Superior efficiency in hard and soft switching
– Low device capacitance	– Enables higher switching frequency
– Temperature independent switching losses	– Robust against parasitic turn-on
– Infineon die attach technology	– Reduced system complexity
	– Excellent thermal dissipation

CoolSiC™ 750 V is the most balanced technology combining ease of use, switching efficiency, and superior thermal performances.

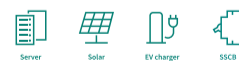
FoMs of competitor parts based on publicly available datasheets, reference products: SCT011H753AG, NVH4L018N075SC1, SCT4013DR, AOM015V75X2Q



The CoolSiC™ MOSFETs 750 V G1 is fully compatible with negative off state voltages and 15 V on state voltage for a seamless dual sourcing



CoolSiC™ MOSFET 750 V G1



$R_{DS(on) max.}$ [mΩ]	Q-DPAK TSC	TO-247 4-pin
140	IMDQ75R140M1H	IMZA75R140M1H*
90	IMDQ75R090M1H*	IMZA75R090M1H*
60	IMDQ75R060M1H*	IMZA75R060M1H*
40	IMDQ75R040M1H	IMZA75R040M1H*
27	IMDQ75R027M1H*	IMZA75R027M1H*
20	IMDQ75R020M1H*	IMZA75R020M1H*
16	IMDQ75R016M1H	IMZA75R016M1H*
8	IMDQ75R008M1H	IMZA75R008M1H*



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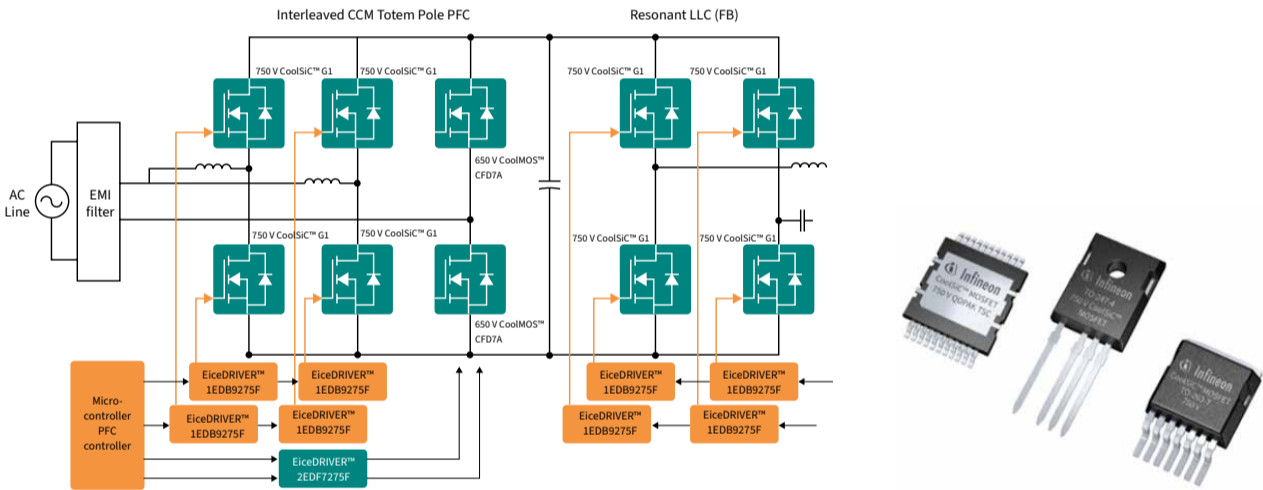
CoolSiC™ Automotive MOSFETs 750 V G1

Smaller, lighter, and more efficient solutions

Infinion's CoolSiC™ Automotive MOSFETs 750 V G1 represents a pioneering response to the evolving trends within electric vehicles (EVs) and high-voltage applications, with a keen focus on addressing critical facets of onboard chargers (OBCs) and related systems. Optimized for a wide array of topologies, these MOSFETs empower engineers to revolutionize onboard charger designs, aligning seamlessly with trends such as higher power density, bi-directionality, and increased demand for efficiency. The devices offer a granular portfolio with typical $R_{DS(on)}$ values ranging from 8 to 140 mΩ at 25°C, showcasing their versatility across diverse applications. Leveraging the intrinsic advantages of silicon carbide (SiC) technology, the CoolSiC™ 750 V MOSFETs exhibit lower $R_{DS(on)}$ temperature coefficient, reduced hard switching losses, and increased light-load efficiency. This, combined with their robustness against parasitic turn-on (PTO) and adherence to AEC Q101 automotive standards, underscores their unwavering commitment to reliability and longevity in safety-critical automotive applications. These MOSFETs stand as a testament to pioneering advancements in SiC-based semiconductor technology, tailored to meet the ever-evolving needs of automotive power applications.

Features and benefits

Key features	Key benefits
– Highly robust 750 V technology	– Superior efficiency in hard switching
– Best-in-class $R_{DS(on)} \times Q_G$	– Enables higher switching frequency
– Excellent $R_{on} \times Q_{oss}$ and $R_{on} \times Q_G$	– Higher reliability
– Low C_{rss}/C_{iss} together and high $V_{GS(th)}$	– Can withstand bus voltages beyond 500 V
– 100% avalanche tested	– Robustness against parasitic turn
– Infineon die attach technology	– Unipolar driving
– Cutting-edge top-side-cooled package	– Best-in-class thermal dissipation



Infinion's innovative top-side cooled Q-DPAK package, housing the CoolSiC™ Automotive MOSFETs 750 V G1, enables increased power density by better use of PCB space. The package's Kelvin-source connection and lower parasitic source inductance reduce switching losses at high currents, extending the system lifetime by shrinking the device and board temperature. Additionally, it allows for flexible PCB layout, efficient heat dissipation, and ultimately delivers more power from smaller enclosures. This advantage reduces manufacturing effort and costs, making electric vehicles a more attractive proposition for consumers.

CoolSiC™ Automotive MOSFETs 750 V G1



$R_{DS(on)}$ max. [mΩ]	Q-DPAK	D ² PAK 7-pin TO-263 7-pin	TO-247-4 pin
8	AIMDQ75R008M1H	AIMBG75R008M1H	AIMZA75R008M1H
16	AIMDQ75R016M1H	AIMBG75R016M1H	AIMZA75R016M1H
20	AIMDQ75R020M1H	AIMBG75R020M1H	AIMZA75R020M1H
27	AIMDQ75R027M1H	AIMBG75R027M1H	AIMZA75R027M1H
40	AIMDQ75R040M1H	AIMBG75R040M1H	AIMZA75R040M1H
60	AIMDQ75R060M1H	AIMBG75R060M1H	AIMZA75R060M1H
90	AIMDQ75R090M1H	AIMBG75R090M1H	AIMZA75R090M1H
140	AIMDQ75R140M1H	AIMBG75R140M1H	AIMZA75R140M1H



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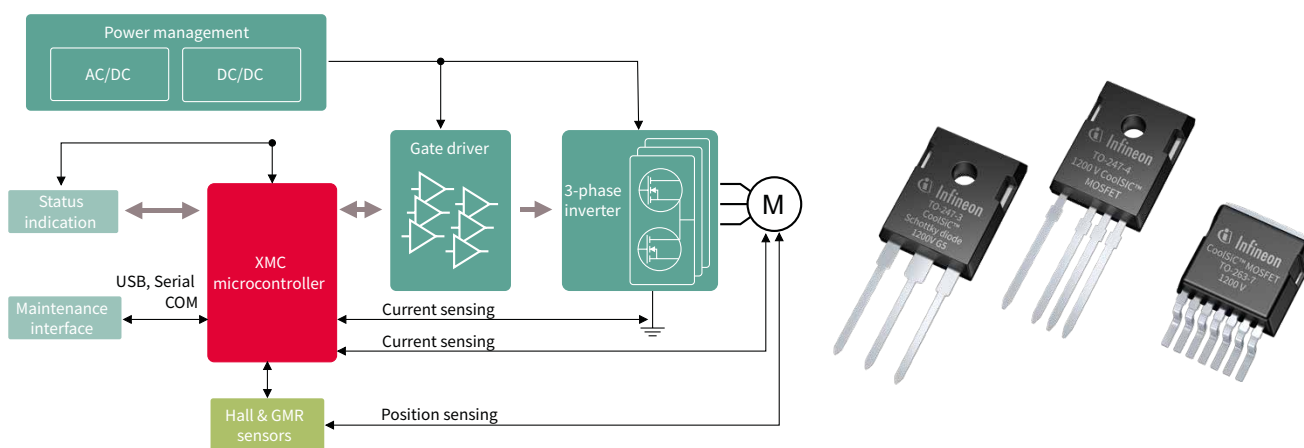
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CoolSiC™ MOSFETs discrete 1200 V G1

Infinion's CoolSiC™ technology enables radically new product designs

Silicon carbide (SiC) opens up new degrees of freedom for designers to harness unseen levels of efficiency and system flexibility. Compared to traditional silicon-based switches like IGBTs and MOSFETs, SiC MOSFETs offer many advantages. These include the low switching losses, the very low reverse recovery losses of the internal commutation-proof body diode, temperature-independent low switching losses, and threshold-free on-state characteristics. Based on volume experience and compatibility know-how, Infineon presents the revolutionary CoolSiC™ technology which enables radically new product designs with high performance and high reliability. CoolSiC™ MOSFET products are targeted for automotive, photovoltaic inverters, battery charging, EV-charging, industrial drives, UPS, SMPS, and energy storage.



Features and benefits

Key features

- Very low switching losses
- Superior gate-oxide reliability
- Threshold-free on-state characteristic
- Wide gate-source voltage range
- Benchmark gate threshold voltage, $V_{GS(th)} = 4.5\text{ V}$
- Fully controllable dV/dt
- Commutation robust body diode, ready for synchronous rectification

Key benefits

- Best-in-class system performance
- Efficiency improvement and reduced cooling effort
- Longer lifetime and higher reliability
- Enables higher frequency operation, allowing the increase in power density
- Reduction in system cost
- Ease of use



Energy storage



UPS



Drives



EV charging



SMPS



Solar



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The TO-247 4-pin package contains an additional connection to the source (Kelvin connection) used as a reference potential for the gate driving voltage, thereby eliminating the effect of voltage drops over the source inductance. The result is even lower switching losses than for the TO-247 3-pin version, especially at higher currents and higher switching frequencies.

The gate-source pin of the TO-263 7-pin package, similar to the TO-247 4-pin, eliminates the effect of voltage drops over the source inductance, further reducing turn-on switching loss. TO-263 7-pin package minimizes the leakage inductance between drain and source, reducing the risk of high turn-off voltage overshoot.

CoolSiC™ MOSFET discrete 1200 V G1



$R_{DS(on)}$ / Package	TO-247	TO-247-4	D ² PAK 7-pin TO-263 7-pin	Gate-driver ICs for CoolSiC™	
7 mΩ	IMW120R007M1H	IMZA120R007M1H		EiceDRIVER™ Compact: 1ED120I12MF 1ED160I12AF 1ED3124MU12F 1ED3125MU12F 1ED3122MC12H 1ED3124MC12H 1ED3241MC12H	EiceDRIVER™ Enhanced: 1ED3322MC12N 1ED3491MC12M 1ED3890MC12M 2ED020I12-F2
14 mΩ	IMW120R014M1H	IMZA120R014M1H			
20 mΩ	IMW120R020M1H	IMZA120R020M1H			
30 mΩ	IMW120R030M1H	IMZ120R030M1H IMZA120R030M1H	IMBG120R030M1H		
40/45 mΩ	IMW120R040M1H	IMZA120R040M1H	IMBG120R045M1H		
60 mΩ	IMW120R060M1H	IMZ120R060M1H	IMBG120R060M1H		
90 mΩ	IMW120R090M1H	IMZ120R090M1H	IMBG120R090M1H		
140 mΩ	IMW120R140M1H	IMZ120R140M1H	IMBG120R140M1H		
220 mΩ	IMW120R220M1H	IMZ120R220M1H	IMBG120R220M1H		
350 mΩ	IMW120R350M1H	IMZ120R350M1H	IMBG120R350M1H		



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CoolSiC™ MOSFETs discrete 1700 V G1

Best efficiency and reduced complexity for high voltage auxiliary power supplies

The CoolSiC™ MOSFET 1700 V G1 is optimized for flyback topologies that are used in auxiliary power supplies connected to DC-link voltages ranging from 600 V up to 1000 V. This makes it ideal for numerous power applications.

Features and benefits CoolSiC™ MOSFET 1700 V G1 in TO-263-7 package

Key features

- Optimized for flyback topologies
- Extremely low switching loss
- 12 V/0 V gate source voltage compatible with fly-back controllers
- Fully controllable dV/dt for EMI optimization
- SMD package with enhanced creepage and clearance distances, >7 mm

Key benefits

- The CoolSiC™ MOSFET 1700 V G1 enables simple single-ended flyback topology at high efficiency level for use in auxiliary power supplies
- SMD package enables direct integration into PCB, with natural convection cooling without extra heatsink
- Reduced isolation efforts due to extended creepage and clearance distance of package
- Reduced system complexity
- High power density

CoolSiC™ MOSFETS discrete 1700 V G1



Package $R_{DS(on)}$	D ² PAK 7-pin TO-263-7	TO-247-3 HCC
450 mΩ	IMBF170R450M1	IMWH170R450M1
650 mΩ	IMBF170R650M1	IMWH170R650M1
1000 mΩ	IMBF170R1K0M1	IMWH170R1K0M1



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CoolSiC™ MOSFETS discrete 2000 V G1 in TO-247 PLUS-4-HCC package

The CoolSiC™ MOSFET 2000 V G1 in TO-247PLUS-4 HCC package has been designed to offer increased power density without compromising the system's reliability even under demanding high voltage and switching frequency conditions. The low power losses of CoolSiC™ technology provide increased reliability thanks to the .XT interconnection technology in a 2000 V optimized package, enabling top efficiency in applications such as string inverters, EV-charging and energy storage systems. The CoolSiC™ MOSFET 2000 V product family is accompanied by the matching CoolSiC™ Schottky diodes 2000 V in TO-247PLUS-4-HCC and TO-247-2 (10-80 A).

Features and benefits

Key features	Key benefits
– $V_{DSS} = 2000$ V for high DC-link systems up to $1500 V_{DC}$	– High power density
– Very low switching losses	– Excellent reliability
– Innovative HCC package with 14 mm creepage and 5.5 mm clearance distances	– Highest efficiency
– Benchmark gate threshold voltage, $V_{GS(th)} = 4.5$ V	– Ease of design
– Robust body diode for hard commutation	
– .XT interconnection technology for best-in-class thermal performance	
– Improved humidity robustness proved through H3HVTRB stress tests	

CoolSiC™ MOSFETS discrete 2000 V G1



Package	TO-247PLUS-4-HCC
$R_{DS(on)}$	
12 mΩ	IMYH200R012M1H
24 mΩ	IMYH200R024M1H
50 mΩ	IMYH200R050M1H
75 mΩ	IMYH200R075M1H
100 mΩ	IMYH200R100M1H



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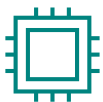
CoolSiC™

CoolSiC™ MOSFET Generation 2

Empowering the next generation of high-performance systems

The new Infineon CoolSiC™ MOSFET 650 V and 1200 V Generation 2 improve MOSFET key performance figures such as stored energies and charges by up to 20 percent compared to the previous generation without compromising quality and reliability levels leading to higher overall energy efficiency and further contributing to decarbonization.

CoolSiC™ MOSFET Generation 2 (G2) technology continues to leverage performance capabilities of silicon carbide by enabling lower energy loss that turns into higher efficiency during power conversion. This provides strong benefits to customers for various power semiconductor applications such as photovoltaics, energy storage, DC EV charging, motor drives, and industrial power supplies.



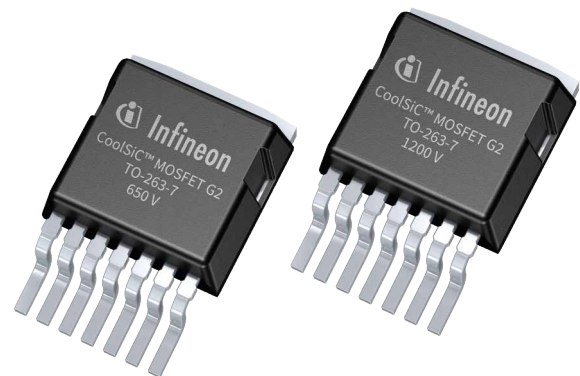
Improved chip performance and FOMs



Improved .XT package interconnect



Best-in-class $R_{DS(on)}$ and the most granular portfolio in the market



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www.infineon.com/coolbic-g2



CoolSiC™ MOSFETs discrete 400 V G2

Unique opportunity to provide applications with high performance MOSFETs between $200 V_{DS}$ and $600 V_{DS}$

The new CoolSiC™ MOSFET 400 V Generation 2 delivers improved system efficiency and power density thanks to ultra-low switching losses and on-state resistance while simultaneously offering system cost improvements.

The CoolSiC™ MOSFET 400 V family is the perfect performance and BOM-cost fit in 3- and 2-level topologies:

- 3-level topologies operating up to $400 V_{RMS AC} / 560 V_{DC_LINK}$ bus voltage for example:
 - 3L totem pole PFC, ANPC, and NPC2 topologies
- 2-level topologies operating up to $288 V_{DC_LINK}$ battery/bus voltage for example:
 - B6, full bridge buck / boost topologies

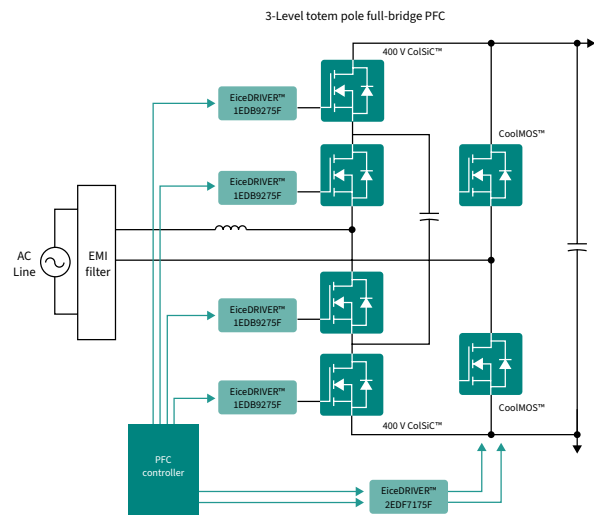
Features and benefits

Key features
– Brand new $400 V_{DS}$ voltage class
– Using infineon's latest CoolSiC™ Generation 2 technology
– $R_{DS(on)}$ with low positive temperature co-efficient
– Incorporates .XT connect technology
– Low turn-off voltage overshoot and excellent dV/dt controllability

Key benefits
– Optimum device selection for highest efficiency in multi-level topologies
– Proprietary technology with highest efficiency, reliability and best price position
– High efficiency operation during high load conditions
– Outstanding heat dissipation and highest reliability
– Optimum tuning for highest efficiency and fulfilling EMI requirements

Featured topology: 3-level flying-capacitor totem pole PFC

Used within a hard-switching 3-level totem pole PFC, the new CoolSiC™ MOSFET 400 V family delivers a clear advantage. For example, it represents the perfect choice for the next generation of server power supplies, enabling new power density and efficiency levels beyond the current limits!



CoolSiC™ MOSFETs discrete 400 V G2

$R_{DS(on)}$ typ. [mΩ]	TO-Leadless	D ² PAK-7 TO-263-7
11	IMT40R011M2H	IMBG40R011M2H
15	IMT40R015M2H	IMBG40R015M2H
25	IMT40R025M2H	IMBG40R025M2H
36	IMT40R036M2H	IMBG40R036M2H
45	IMT40R045M2H	IMBG40R045M2H



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CoolSiC™ MOSFETs discrete 650 V Generation 2

Empowering the next generation of high-performance systems

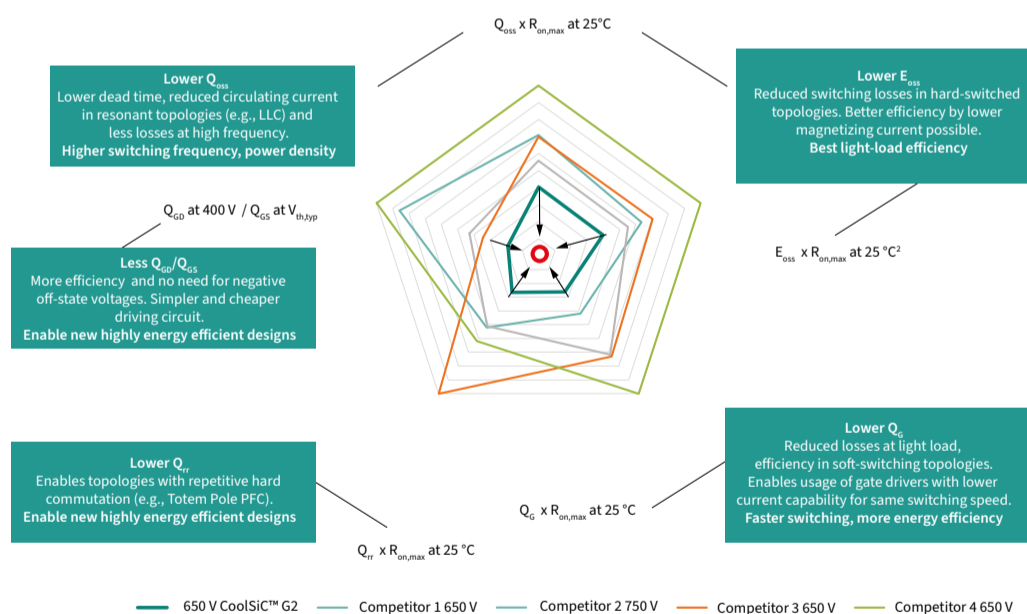
CoolSiC™ MOSFET G2 trench technology represents a significant advancement in harnessing the performance capabilities of silicon carbide. It builds upon the reliability of its predecessor, G1, while enabling lower power losses. It features excellent $R_{DS(on)} \times Q_{fr}$ and superior $R_{DS(on)} \times Q_{oss}$ figures-of-merits (FOMs), resulting in ultrahigh efficiency in hard-switching and soft-switching topologies respectively, making it a compelling power device for various applications such as photovoltaics, energy storage, server, telecom, and EV charging.

The best-in-class lowest $R_{DS(on)}$, the 7 mΩ rating, is feature in TO263-7 SMD package, which helps designer to reduce conduction loss and improve overall energy efficiency. Combining the fast switching capability which offers more than 30 percent improvement compared to previous generation, G2 offers the next level power density.

The G2 technology's unique combination of high threshold voltage ($V_{GS(th),typ}$ of 4.3 V) with low QGD/QGS ratio ensures high robustness against parasitic turn-on, which enables unipolar gate driving (i.e., $V_{GS(off)}=0$). This helps to increase power density and low cost of the systems. Moreover, it has more flexibility on driving voltage, which means customer can turn on the MOSFET with voltages between 15 V and 8 V and turn it off with voltages between -7 V and 0 V. Further advancement of Infineon's unique .XT interconnection technology serves to overcome the common challenge of improving semiconductor chip performance while maintaining its thermal capability. With a different interconnection technology, the thermal capability shows a 25 percent improvement for a given chip size, further boosting the chip figures-of-merit to a new level of SiC performance.

Features and benefits

Key features	Key benefits
– Outstanding switching performance	– Improved efficiency and achieving high power density
– Best-in-class $R_{DS(on)}$ and large granular portfolio	– Reduce conduction losses and improved efficiency
– Enlarged driving voltage range -7 V - +23 V static	– Ease of use and compatibility enabling second source
– Best immunity against unwanted turn-on events	– Enable Unipolar driving reaching >99% peak efficiency at PFC and reduced system size
– High reliability with record low DPM rates	– Increased system life time



CoolSiC™ MOSFET discrete 650 V G2



$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	TO-247-3	TO-247-4	D2PAK-7	TOLT TSC	Thin-TOLL 8x8
75	60				IMLT65R060M2H*	IMTA65R060M2H*
62	50	IMW65R050M2H	IMZA65R050M2H	IMBG65R050M2H	IMLT65R050M2H*	IMTA65R050M2H*
49	40	IMW65R040M2H	IMZA65R040M2H	IMBG65R040M2H	IMLT65R040M2H*	IMTA65R040M2H*
42	33				IMLT65R033M2H*	
33/30	26/25				IMLT65R026M2H*	
24	20	IMW65R020M2H	IMZA65R020M2H	IMBG65R020M2H	IMLT65R020M2H*	IMTA65R020M2H*
18/21	14.05.2016	IMW65R015M2H	IMZA65R015M2H	IMBG65R015M2H	IMLT65R015M2H*	
8.5	6.7/7	IMW65R007M2H*	IMZA65R007M2H*	IMBG65R007M2H		



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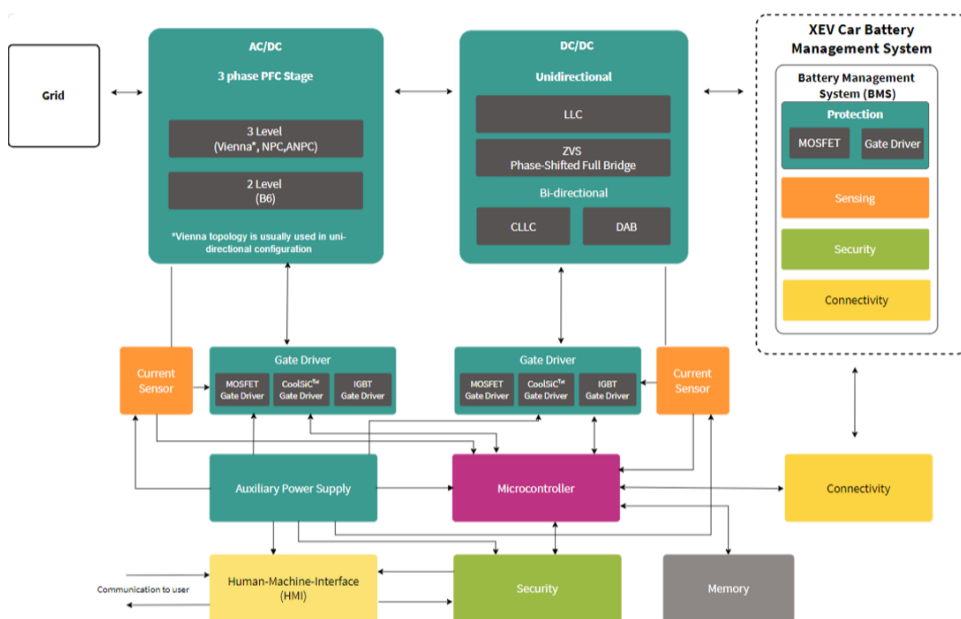
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CoolSiC™ MOSFET 1200 V G2

Striving for excellence in SiC MOSFETs

The CoolSiC™ MOSFET 1200 V G2 in a TO-263-7 package builds on the strengths of Generation 1 technology and enables the accelerated system design of more cost optimized, efficient, compact, and reliable solutions. Generation 2 comes with significant improvements in key figures-of-merit for both, hard-switching operation and soft-switching topologies, suitable for all common combinations of AC-DC, DC-DC, and DC-AC stages.

System diagram: DC EV chargers up to 150 kW



Features and benefits

Key features

- Very low switching losses
- Overload operation up to $T_{vj} = 200^{\circ}\text{C}$ (100h)
- Short circuit withstand time $2 \mu\text{s}$
- Benchmark gate threshold voltage, $V_{GS(th)} = 4.2 \text{ V}$
- Robust against parasitic turn on, 0 V turn-off gate voltage can be applied
- Robust body diode for hard commutation
- .XT interconnection technology for best-in-class thermal performance

Key benefits

- Better energy efficiency
- Cooling optimization
- Higher power density
- New robustness features
- Highly reliable

CoolSiC™ MOSFET 1200 V G2



$R_{DS(on)}$ typ. [mΩ]	TO-263-7 (D2PAK-7)	TO-247-4 HC	Q-DPAK TSC Half-bridge
7/8	IMBG120R008M2H	IMZC120R007M2H*	
12	IMBG120R012M2H	IMZC120R012M2H*	IMSQ120R012M2HH*
17	IMBG120R017M2H	IMZC120R017M2H*	
22	IMBG120R022M2H	IMZC120R022M2H*	
26	IMBG120R026M2H	IMZC120R026M2H*	IMSQ120R026M2HH*
34	IMBG120R034M2H*	IMZC120R034M2H*	
40	IMBG120R040M2H	IMZC120R040M2H*	IMSQ120R040M2HH*
53	IMBG120R053M2H	IMZC120R053M2H*	IMSQ120R053M2HH*
78	IMBG120R078M2H	IMZC120R078M2H*	
116	IMBG120R116M2H		
181	IMBG120R181M2H		
234	IMBG120R234M2H		



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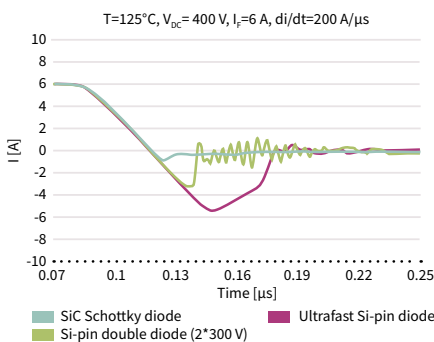
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CoolSiC™ Schottky diodes

The differences in material properties between silicon carbide and silicon limit the fabrication of practical silicon unipolar diodes (Schottky diodes) to a range up to 100-150 V, with a relatively high on-state resistance and leakage current. With SiC, Schottky diodes can reach a much higher breakdown voltage. With more than 20 years of field experience in SiC, Infineon is the world's first SiC discrete power supplier. Infineon offers products up to 2000 V in discrete packages and up to 2000 V in modules.

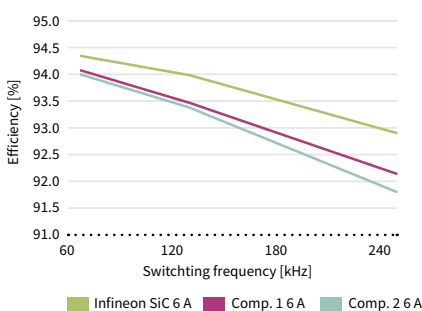
The long market presence and experience enable Infineon to deliver highly reliable, industry-leading SiC performance. With over ten years of pioneering experience in developing and manufacturing SiC diodes, Infineon's latest CoolSiC™ Schottky diode generation 6 family sets a benchmark in quality, efficiency and reliability.

Features	Advantages	Benefits	Applications
<ul style="list-style-type: none"> No reverse recovery charge Purely capacitive switching High operating temperature ($T_{j,max}$ 175°C) 	<ul style="list-style-type: none"> Low turn-off losses Reduction of CoolMOS™ or IGBT turn-on loss Switching losses independent from load current, switching speed, and temperature 	<ul style="list-style-type: none"> System efficiency improvement compared to Si diodes Reduced cooling requirements Enabling higher frequency/increased power density Higher system reliability due to lower operating temperature Reduced EMI 	<ul style="list-style-type: none"> Server Telecom Solar UPS EV-charging Energy storage PC power Motor drives Lighting CAV



Reverse-recovery charge of SiC Schottky diodes versus Si-pin diodes

The majority of carrier characteristics imply no reverse recovery charge and the only contribution to the switching losses comes from the tiny displacement charge of capacitive nature. In the same voltage range, silicon devices have a bipolar component resulting in much higher switching losses. The graph shows the comparison between various 600 V devices.



Improved system efficiency (PFC in CCM mode operation, full load, low line)

The fast switching characteristics of the SiC diodes provide clear efficiency improvements at a system level. The performance gap between SiC and high-end silicon devices increases with the operating frequency.



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CoolSiC™ Schottky diodes 650 V

CoolSiC™ Schottky diodes 650 V G6 and G5

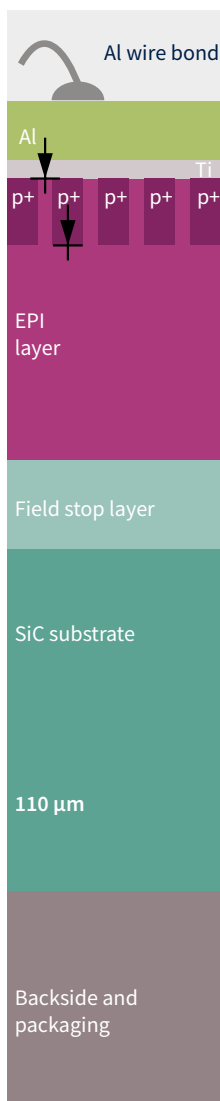
The CoolSiC™ Schottky diode 650 V G6 product family is built over the strong characteristics of the previous G5 generation, fully leveraging technology and process innovation to propose the best efficiency and price/performance products to date.

Foundation technology – CoolSiC™ Schottky diodes 650 V G5

The established CoolSiC™ Schottky diodes G5 product family has been optimized after all key aspects including junction structure, substrate and die attach. It represents a well-balanced product family which offers state-of-the-art performance and high surge current capability at a competitive cost level.

Innovation: optimized junction, substrate and die attach

Infinion's SiC Schottky diode generation 5 is optimized with regard to all key aspects relevant for high-power and high-efficiency SMPS applications.



Junction: merged PN structure

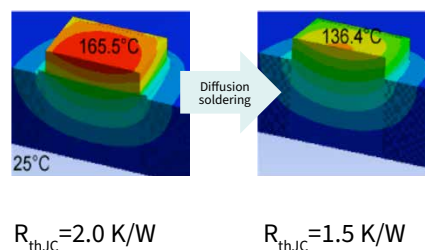
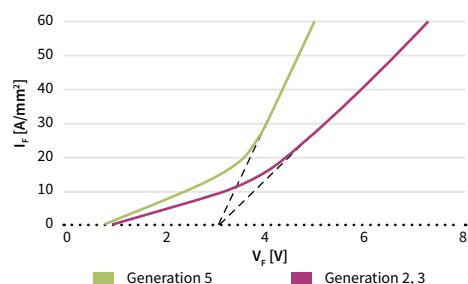
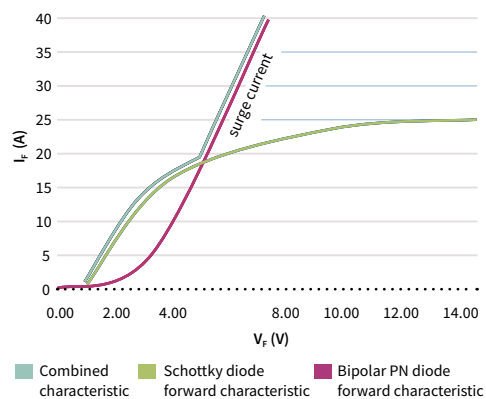
On the junction level, it has an optimized merged PN structure. Compared to competitors, Infineon's SiC diode has an additional P-doped area, which, together with the N-doped EPI layer, forms a PN junction diode. Thus, it is a combination of Schottky diode and PN junction diode. Under normal conditions, it works like a standard Schottky diode. Under abnormal conditions, such as lightning, AC line drop-out, it works like a PN junction diode. At high current level, the PN junction diode has a significantly lower forward voltage (V_F) than the Schottky diode, which leads to less power dissipation, thus significantly improving the surge current capability.

Substrate: thin wafer technology

On the substrate level, Infineon introduced the thin wafer technology. At the later stage of our SiC diode production, the thin wafer process is used to reduce the wafer thickness by about two-thirds, which significantly reduces the substrate resistance contribution, thus, improving both forward voltage (V_F) and thermal performance.

Die attach: diffusion soldering

On the backside, package level diffusion soldering is introduced, which significantly improves the thermal path between the lead frame and the diode, enhancing the thermal performance. With the same chip size and power dissipation, the junction temperature is reduced by 30°C.



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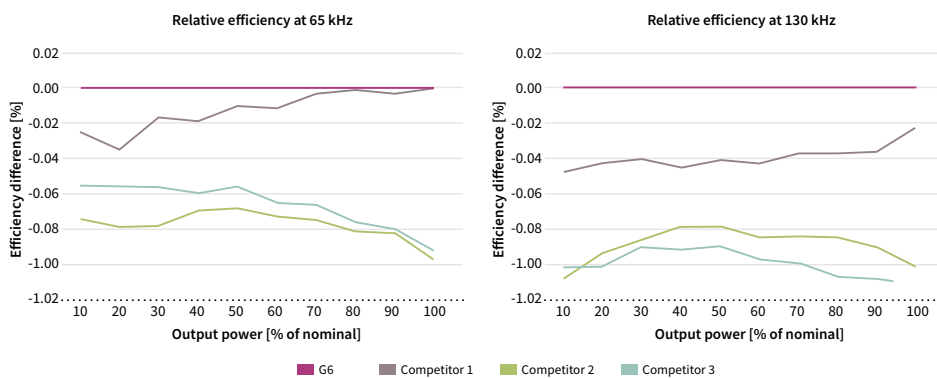
www.infineon.com/sic-diodes
www.infineon.com/cool-sic-diodes

www.infineon.com/cool-sic-gen2
www.infineon.com/SiCgd

Latest development - CoolSiC™ Schottky diodes 650 V G6

The CoolSiC™ Schottky diodes G6 product family introduces a novel and proprietary Schottky metal system. This contributes to reducing the forward voltage (VF) to challenging levels, determining a measurable decrease of conduction losses. Infineon's CoolSiC™ Schottky diodes enable optimum efficiency and ruggedness. Lower forward voltage (V_F) means lower conduction loss, and lower capacitive charge (Q_c) means lower switching loss. $Q_c \times V_F$ is the figure of merit for efficiency, and comparison indicates that the latest generation 6 products have the lowest $Q_c \times V_F$ on the market. Infineon's CoolSiC™ Schottky diodes offer a surge current robustness far better than the one offered by the most efficient products. Thus, under abnormal conditions, this surge current capability offers excellent device robustness.

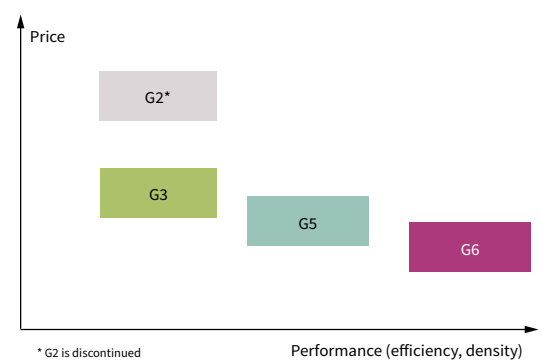
Efficiency comparison



In terms of efficiency, the 8 A G6 device has been tested in CCM PFC. The maximum output power is 3.5 kW. The left figure shows the relative efficiency at 65 kHz, while the figure on the right shows the relative efficiency at 130 kHz. This shows that Infineon's CoolSiC™ Schottky diode G6 delivers better efficiency over the full load range, keeping this advantage even at 130 kHz, therefore meeting the needs of designers who want to increase the switching frequencies in their designs to attain more power density.

The best price performance

CoolSiC™ Schottky diodes G6 are the outcome of Infineon's continuous technological and process improvements, which enable the design and development of SiC-based products, making them more price-competitive and increasing performance across generations. As a result, G6 is Infineon's best price/performance CoolSiC™ Schottky diode generation, offering the highest efficiency. In addition, Infineon offers the reliability of collaborating with the industry leader. Customers can leverage Infineon's proven quality and supply chain reliability. They can benefit from "one-stop-shop" advantages and maximize system performance, combining CoolSiC™ Schottky diodes with the SJ MOSFETs of the CoolMOS™ 7 family, such as 600 V C7, 650 V C7, 600 V G7, 650 V G7, and 600 V P7.



A comprehensive portfolio

The combined G6 and G5 CoolSiC™ Schottky diode 650 V diode portfolio offers a wide choice of packages and ampere class granularity to allow the best fit to applications. G6 comes in double DPAK, the first top-side cooled surface mount package, which allows thermal decoupling of PCB to chip junction and enables higher power dissipation and improved system lifetime thanks to the reduced board temperature.



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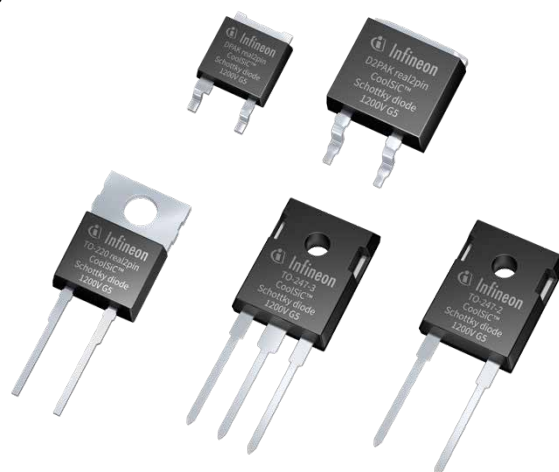
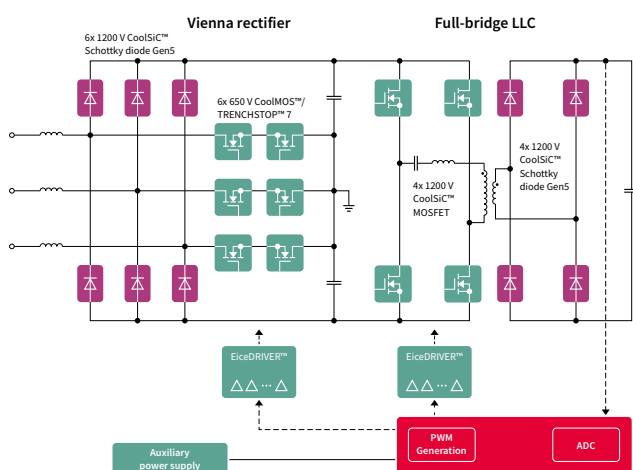
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www.infineon.com/SiCgd

CoolSiC™ Schottky diodes 1200 V

A new level of system efficiency and reliability

By using hybrid Si power switch/SiC diode sets, industrial application designers will gain flexibility for system optimization compared to purely silicon-based solutions. SiC diodes enable system improvements such as higher output power, greater efficiency or higher switching frequency. By implementing CoolSiC™ diodes generation 5, for example, in Vienna rectifier topology, in combination with Infineon's 650 V TRENCHSTOP™ IGBTs and 650 V CoolMOS™ MOSFETs, designers can achieve outstanding system-level performance and reliability.

One of the most commonly used topologies for EV DC charging



Features and benefits

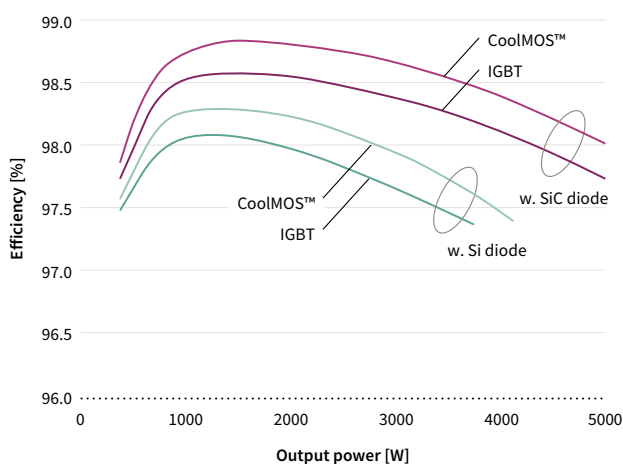
Key features

- Zero Q_{rr} leading to no reverse recovery losses
- High surge current capability up to fourteen times of the nominal current
- Tight forward voltage distribution
- Temperature-independent switching behavior
- Low forward voltage ($V_F = 1.4\text{ V}$) even at high operating temperature
- Available in both through-hole and SMD packages
- Up to 40 A rated diode

Key benefits

- System efficiency improvement over Si-based diodes
- Enabling higher frequency/increased power density solutions
- High system reliability by extended surge current
- Reduced cooling requirements through lower diode losses and lower case temperatures
- System size/cost saving due to reduced heatsink requirements and smaller magnetics

650 V Si IGBT/Si SJ MOSFET and 1200 V SiC diode/ultrafast Si diode in a Vienna rectifier topology, $f_{sw} = 48\text{ kHz}$



- 650 V SJ MOSFET + 1200 V SiC diode (IPW65R045C7 + IDW15G120C5B)
- 650 V IGBT + 1200 V SiC diode (IKW50N65EH5 + IDW15G120C5B)
- 650 V SJ MOSFET + 1200 V Si diode (IPW65R045C7 + Vendor A)
- 650 V IGBT + 1200 V Si diode (IKW50N65EH5 + Vendor A)

SiC vs. Si diode

- +0.8% higher efficiency
- Increased output power is possible



EV charging



SMPS



Solar



Drives



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CoolSiC™ Schottky diodes 650 V G6



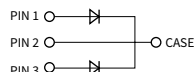
I_F [A]	TO-220 R2L	Double DPAK
4	IDH04G65C6	
6	IDH06G65C6	
8	IDH08G65C6	IDDD08G65C6
10	IDH10G65C6	
12	IDH12G65C6	
16	IDH16G65C6	IDDD16G65C6
20	IDH20G65C6	

CoolSiC™ Schottky diodes 650 V G5



I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	D ² PAK R2L	ThinPAK 8x8
4	IDH04G65C5				IDL04G65C5
6	IDH06G65C5			IDK06G65C5	IDL06G65C5
8	IDH08G65C5			IDK08G65C5	IDL08G65C5
10	IDH10G65C5		IDW10G65C5	IDK10G65C5	IDL10G65C5
12	IDH12G65C5		IDW12G65C5	IDK12G65C5	IDL12G65C5
16	IDH16G65C5		IDW16G65C5		
20	IDH20G65C5	IDW20G65C5B	IDW20G65C5		
24					
30/32		IDW32G65C5B	IDW30G65C5		
40		IDW40G65C5B	IDW40G65C5		

„B“ in product name refers to dual die with the common-cathode configuration.



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www.infineon.com/SiCgd

CoolSiC™ Schottky diodes 600 V G3



I_F [A]	TO-220 R2L	DPAK R2L
3		IDD03SG60C
4		IDD04SG60C
6	IDH06SG60C	IDD06SG60C
8	IDH08SG60C	IDD08SG60C
10	IDH10SG60C	IDD10SG60C
12		

CoolSiC™ Schottky diodes 1200 V G5



I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247 R2L	DPAK R2L	D ² PAK R2L
2	IDH02G120C5			IDM02G120C5	IDK02G120C5
5	IDH05G120C5			IDM05G120C5	IDK05G120C5
8	IDH08G120C5			IDM08G120C5	IDK08G120C5
10	IDH10G120C5	IDW10G120C5B ¹⁾	IDWD10G120C5	IDM10G120C5	IDK10G120C5
15/16	IDH16G120C5	IDW15G120C5B ¹⁾	IDWD15G120C5		IDK16G120C5
20	IDH20G120C5	IDW20G120C5B ¹⁾	IDWD20G120C5		IDK20G120C5
30		IDW30G120C5B ¹⁾	IDWD30G120C5		
40		IDW40G120C5B ¹⁾	IDWD40G120C5		

1) „B“ in product name refers to dual die with the common-cathode configuration.



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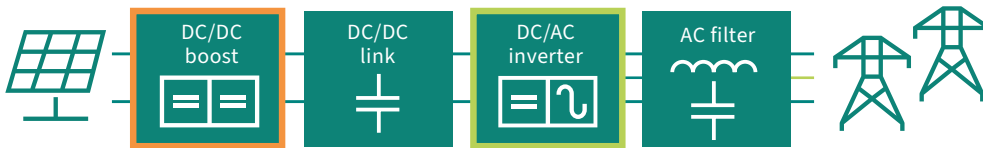
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www.infineon.com/SiCgd

CoolSiC™ Schottky diode 2000 V G5

CoolSiC™ Schottky diodes for up to 1500 V_{DC} applications

The CoolSiC™ Schottky diode 2000 V family is ideally suited for high DC link systems with up to 1500 V_{DC}. Compared to 1700 V SiC diode, the devices also provide a sufficiently high overvoltage margin for 1500 V_{DC} systems. Due to the .XT connection technology, the components offer first-class thermal performance. They are also highly resistant to humidity. The CoolSiC™ Schottky Diodes are offered in two package variants – TO-247PLUS-4 HCC and TO-247-2. These diodes are particularly suitable for solar and EV charging applications. A matching gate driver portfolio is also available.

Optimize your 1500 V_{DC} PV system with CoolSiC™ MOSFETs and diodes



Features and benefits

Key features

- High surge current capability
- Temperature independent switching behavior
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Specified dv/dt ruggedness
- .XT interconnection technology for best-in-class thermal performance

Key benefits

- Enables high DC-link systems up to 1500 V_{DC}
- Minimized conduction losses
- No reverse recovery current
- High power with half the part count
- Topology simplification
- Increased reliability

CoolSiC™ Schottky diodes 2000 V G5



I _F [A]	TO-247PLUS-4 HCC	TO-247 2-pin
10	IDYH10G200C5*	IDWD10G200C5*
25	IDYH25G200C5*	IDWD25G200C5*
40	IDYH40G200C5*	IDWD40G200C5*
50	IDYH50G200C5*	IDWD50G200C5*
80	IDYH80G200C5*	IDWD80G200C5*



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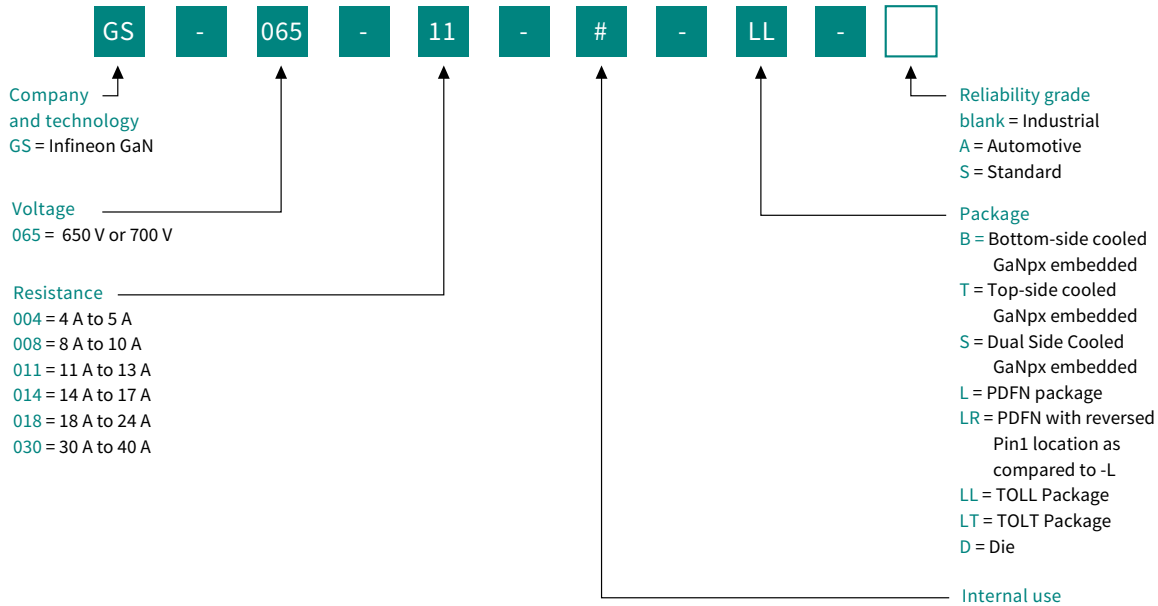
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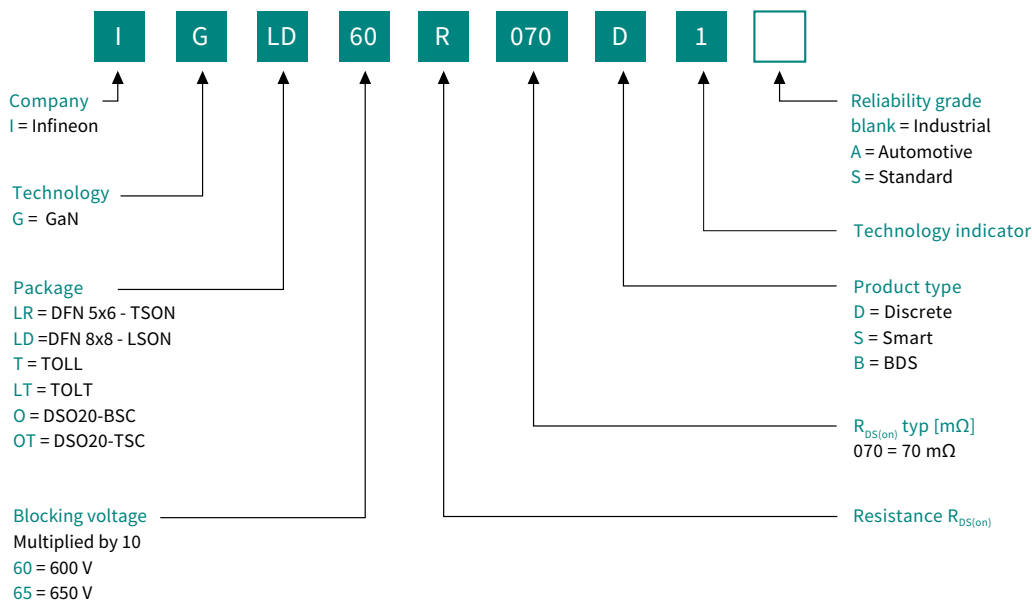
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Nomenclature

High-voltage CoolGaN™ Transistors



High-voltage CoolGaN™ Transistors

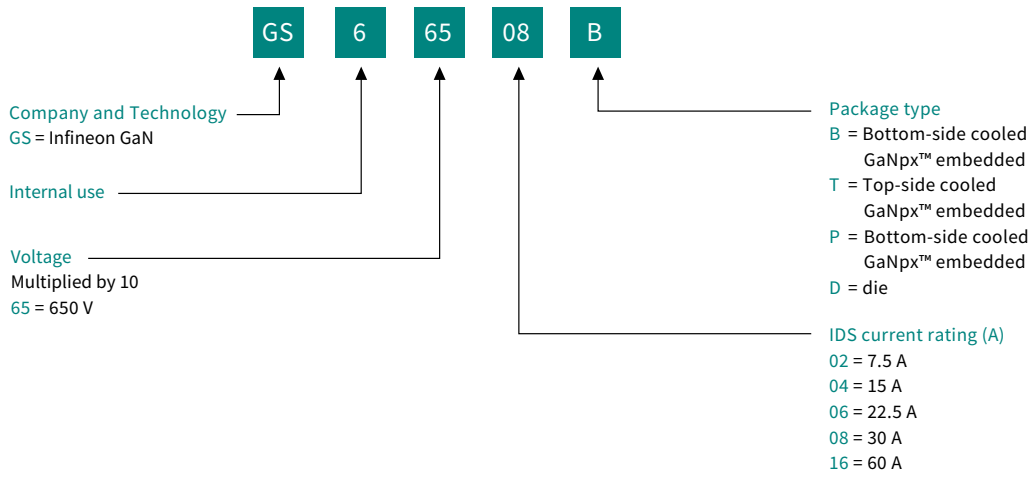


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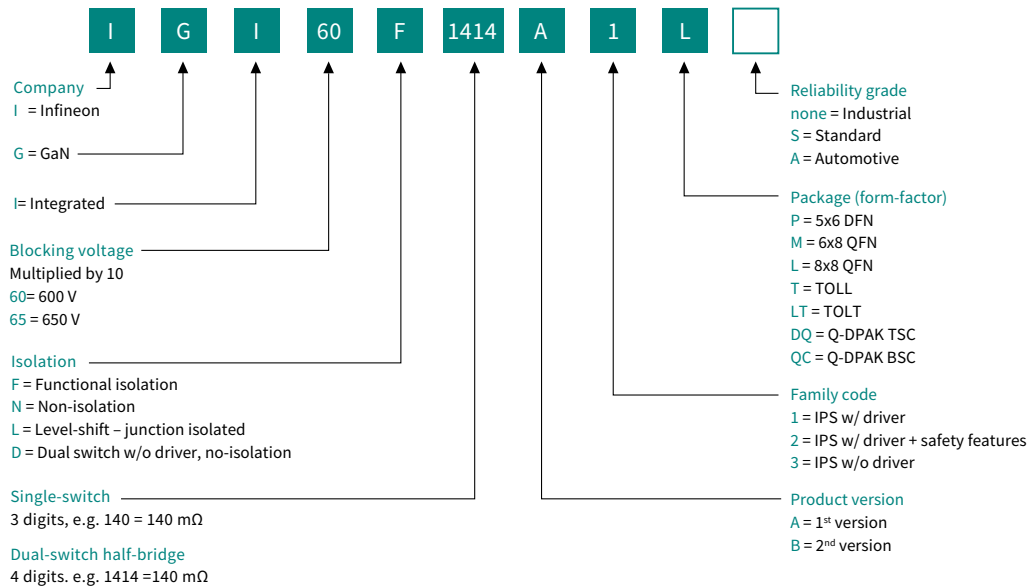
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High-voltage CoolGaN™ Transistors



High-voltage CoolGaN™ Drive

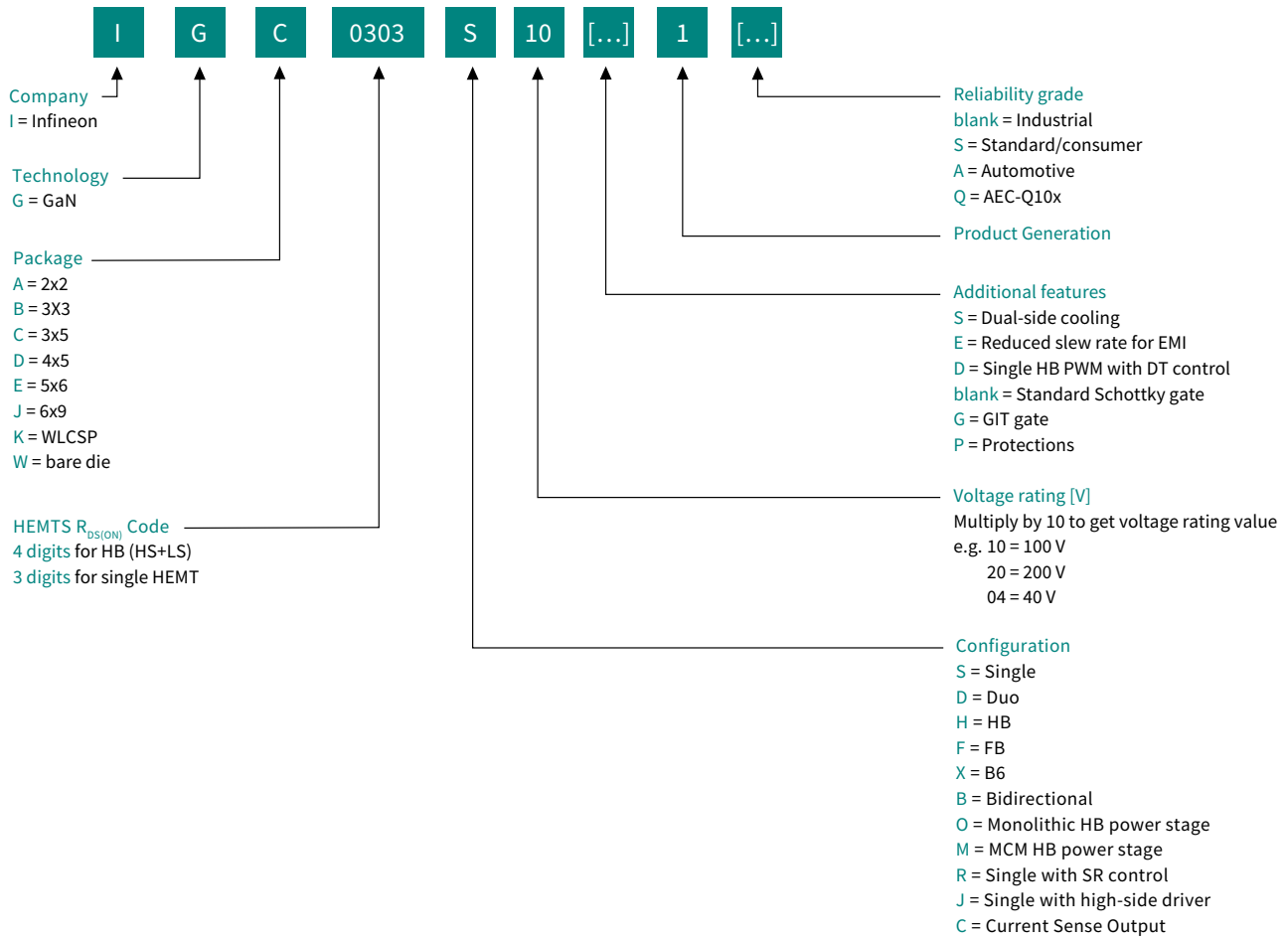


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Medium-voltage CoolGaN™ Transistors

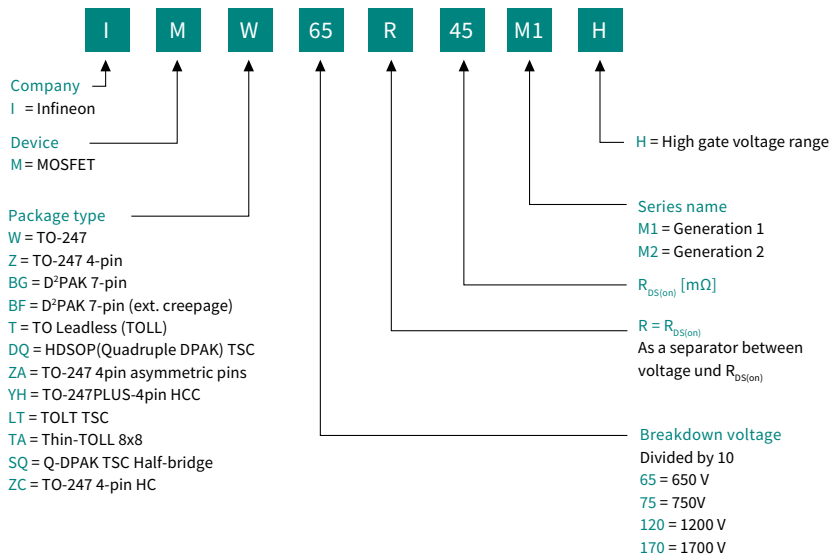


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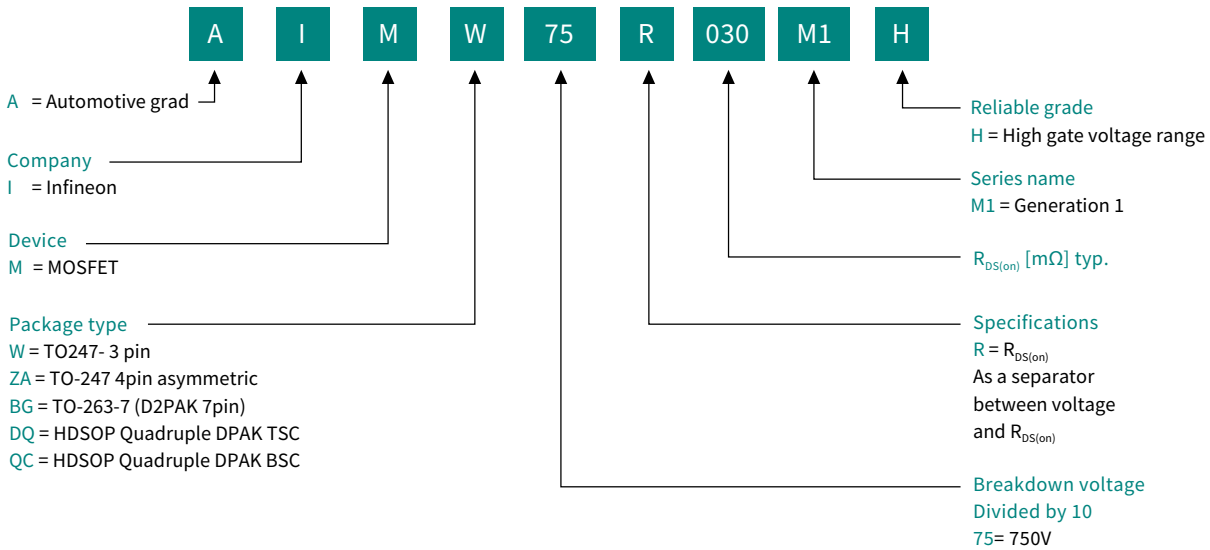
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CoolSiC™ MOSFET nomenclature



CoolSiC™ Automotive MOSFET discrete 750 V nomenclature



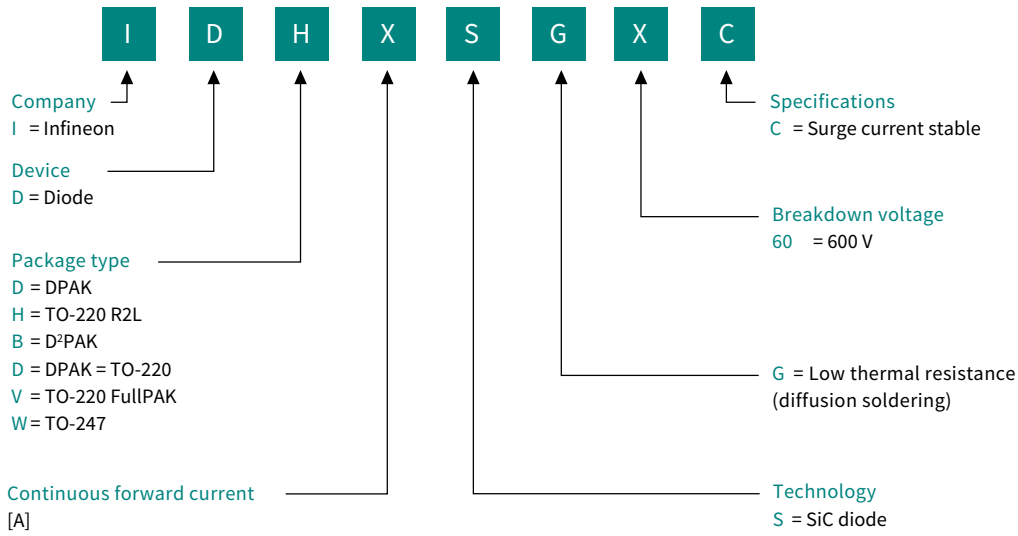
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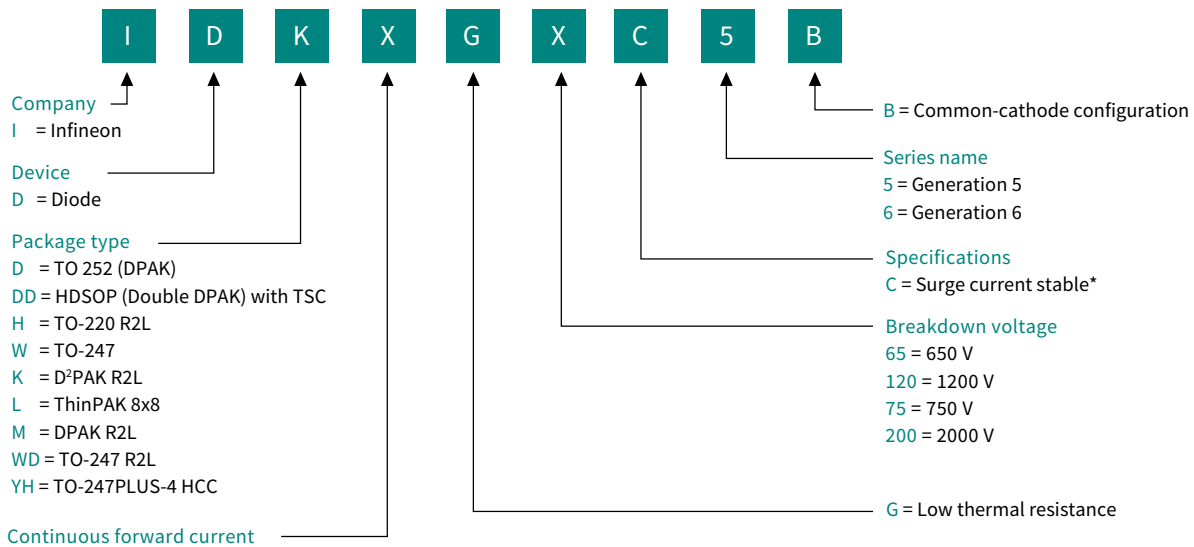
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CoolSiC™ Schottky diodes G2 and G3



CoolSiC™ Schottky diodes G5 and G6



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Infineon support for wide bandgap semiconductors

Useful links and helpful information

Further information, datasheets and documents

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Support



Evaluation board



Tools



Simulation

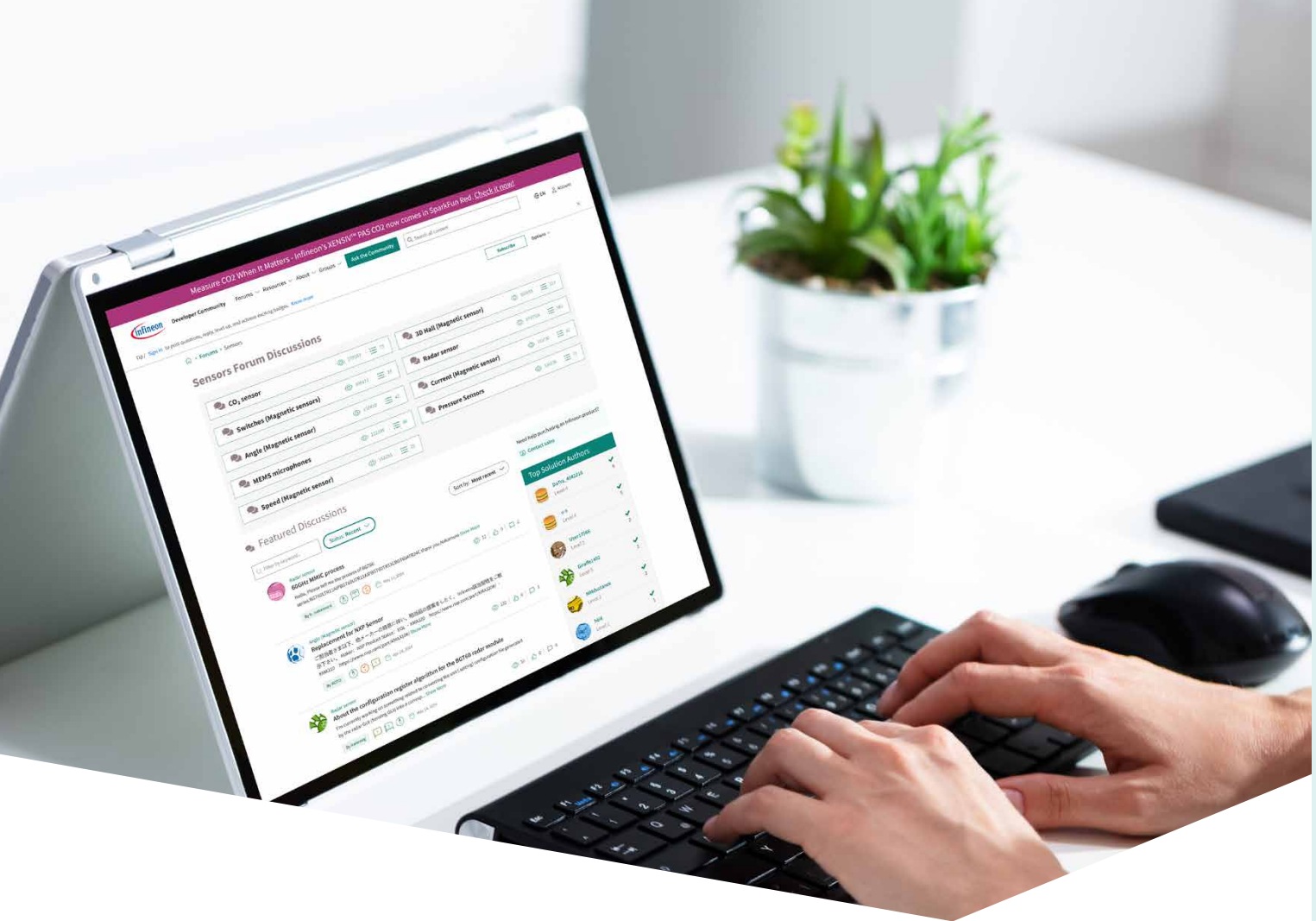


XENSIV™ sensor technologies for automotive, industrial, consumer and IoT applications

- XENSIV™ Developer Community
- Current sensors
- Magnetic sensors
- 3D magnetic sensors
- Linear sensors
- Angle sensors
- Magnetic speed sensors
- Pressure sensors
- MEMS microphone technology
- Radar sensors
- XENSIV™ PAS CO₂ sensor
- Intuitive sensing

Design support

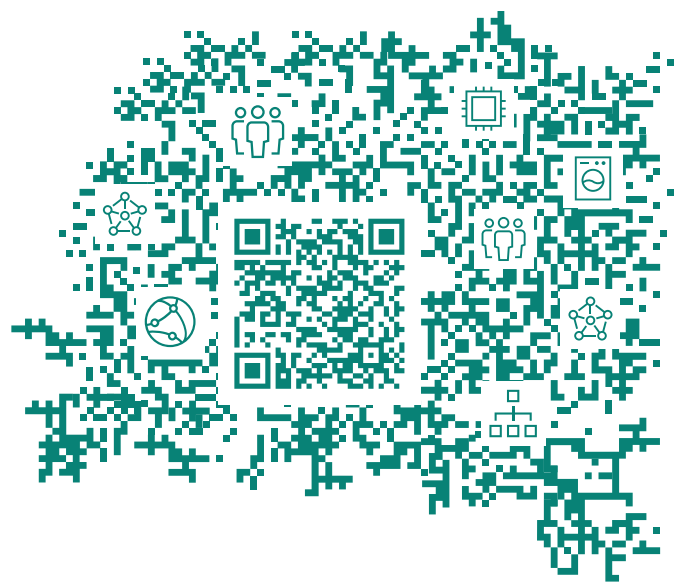
- XENSIV™ connected sensor kit
- Shield2Go
- Sensor 2GO kits
- Add ons for Sensor 2GO kits and Shield2Go
- Evaluations boards



Ask the XENSIV™ Developer Community

The Infineon Developer Community offers 24/7 self-service and lightning fast responses to customer demands. Any user, anywhere, anytime – any subject. The community is well-organized due to its multi-channel strategy. Unlike unmoderated forums, the developer community is based on high quality content that is professionally moderated and reviewed.

Check it out and be part of the XENSIV™ sensor community.





Current sensors

XENSIV™ – high-precision coreless current sensors for automotive and industrial

Used to measure both AC and/or DC currents, Infineon's current sensors provide accurate and stable current measurement up to 120 A or 31 mT respectively. Our magnetic current sensors include either an integrated current rail in the package for low currents or measure the magnetic field of an external current rail for medium to high currents. The products are intended for use in 48 V, as well as high voltage and/or wide bandgap applications such as traction inverters, industrial drives, photovoltaic inverters, or EV charging systems.

Infineon's XENSIV™ family of high-precision coreless open-loop current sensors are less bulky, and cost less compared to core-based current sensors. Based on Infineon's precise and stable Hall effect current sensor IC technology, the current sensor analog output signal is highly linear over temperature and lifetime. Due to lacking an iron core or a flux concentrator, the sensor signal shows neither hysteresis nor does it suffer from saturation.

The differential current sensor measurement with two Hall cells ensures high accuracy even in a noisy environment like crosstalk from adjacent current lines or magnetic stray fields. System designers can program the sensitivity of the sensor as well as the threshold levels

of the two dedicated overcurrent signals and therefore adapt them to individual requirements without any external components. The contactless current sensor IC also provides a warning signal in case of an over- or under-voltage condition for the supply voltage.

Product portfolio

Infineon's product portfolio includes wide bandgap current sensors for both industrial and automotive application needs. Our current sensors achieve high accuracy using the Hall effect, which enables current measurements from DC to AC with an internal bandwidth of up to 240 kHz without being disturbed by external magnetic fields.

On the one hand, we have the current sensors with an integrated current rail. The sensors in the TISON package allow the accurate measurement with high frequencies and small impact on the phase shift of the current signal. On the other hand, our current sensors for external current rails are non-invasive Hall effect current sensors and provide safe and reliable solutions for power electronics since there is no additional power dissipation. Our selection of isolated, non-contact current sensors can be used for current detection and monitoring in SiC and GaN applications, including motor control applications.



Click here to learn more:

www.infineon.com/current-sensors

TLI4971

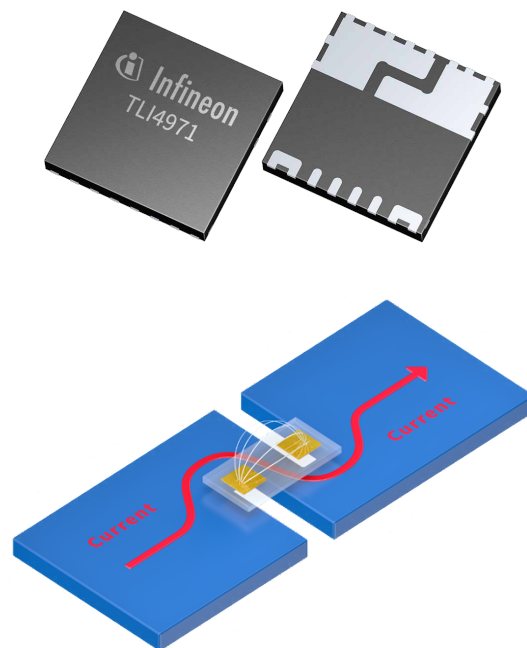
High-precision coreless sensors for industrial application

Features

- Integrated current rail with typical $220\ \mu\Omega$ insertion resistance enables ultralow power loss
- Small form factor, $8 \times 8\ \text{mm}$ SMD, for easy integration and board area saving
- Highly accurate, scalable, DC and AC current sensing
- Bandwidth of 240 kHz enables wide range of applications
- Very low sensitivity error over temperature ($< 2.0\%$)
- Excellent stability of offset over temperature and lifetime
- Galvanic functional isolation up to 1150 V peak V_{IORM} , partial discharge $3500\ \text{V}_{\text{RMS}}$, 4 mm clearance and creepage
- Differential sensor principle ensures superior magnetic stray field suppression
- Two independent fast Over-Current Detection (OCD) pins with configurable thresholds enable protection mechanisms for power circuitry (typical $0.7\ \mu\text{s}$)
- Pre-calibrated sensor

Applications

- Energy storage systems
- Electrical drives (up to $975\ \text{V}_{\text{pk}}$)
- Photovoltaic inverter
- General purpose & GaN-based inverters
- Chargers
- Power supplies



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TLE4971

High-precision coreless current sensor for automotive and industrial applications

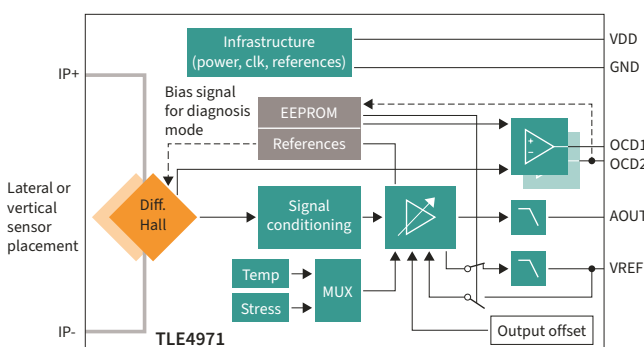
The Infineon TLE4971 is a high-precision current sensor for bi-directional AC and DC measurements. The device has an analog interface and two fast overcurrent detection outputs that support the power circuitry's protection. Galvanic isolation is provided due to magnetic sensing principle.

Infineon's well-established and robust monolithic Hall technology enables accurate and highly linear measurement of currents with a full scale up to 120 A. Negative effects, like saturation and hysteresis, commonly known from core-based sensor techniques, are not present in the Infineon open loop, coreless sensors principle. The smart current rail design (double U-shape) combined with a differential signal sensing makes the current sensor robust against stray fields. The sensor is shipped as a fully calibrated product without requiring any customer end-of-line calibration. It comes in a small 8 × 8 mm TISON-8 leadless package, which allows standard SMD assembly. The sensor can be reprogrammed for many parameters enabling the customer to achieve maximal adaption for his application requirements, such as industrial drives, xEV auxiliary drives, PV inverter, DC fast charger and On-Board-Charger (OBC).

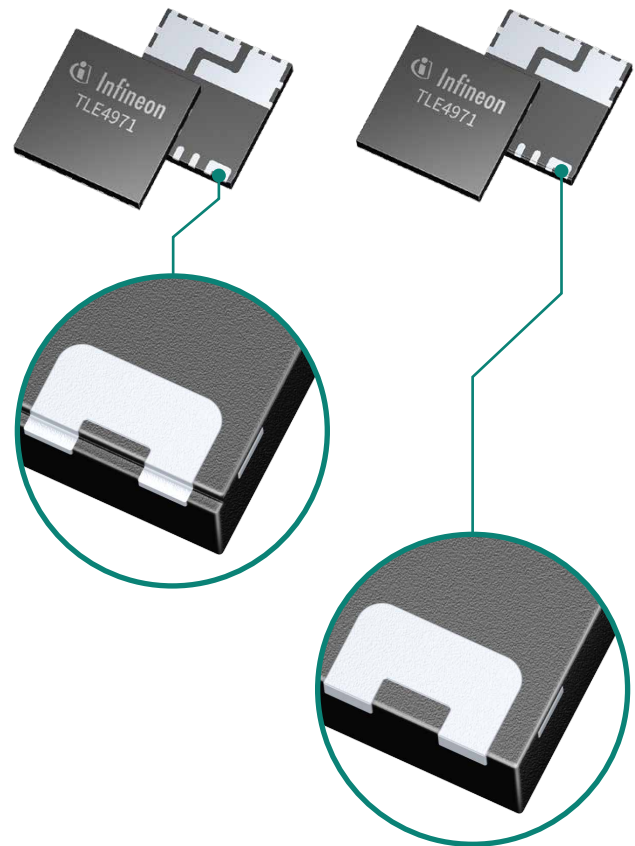
Features and benefits

- Measurement up to 70 ARMS at 690 VRMS
- Typical error at 25°C < 2%
- Current rail resistance at 220 μΩ and inductance < 1 nH specified typ
- Analog output signal (with typ. 210 kHz) bandwidth
- Fast (<0.7 μs) overcurrent detection up to 2 x IFSR

Block diagram



Difference between TISON-8-6 and TISON-8-5



- AEC-Q100 Grade 1 qualified (125°C)
- Ultra-low power loss due to minimal resistance of current rail
- Reliable current measurement over lifetime (no re-calibration)
- Functional isolation for high-voltage application
- Easy and compact package allows high-power density design
- Pre-programmed variants for 25, 50, 75 and 120 A
- High accuracy, low noise analog output

The integrated primary conductor (current rail) with very low insertion resistance and inductance minimizes the power loss and enables miniaturization of the sensing circuit. The analog output (AOUT) can be configured in single-ended, semi-differential, and fully-differential mode together with the voltage reference pin (VREF)

Two separate overcurrent pins (OCD1/OCD2) provide a fast output signal in case the current exceeds a pre-set threshold.



Click here to learn more:

www.infineon.com/current-sensors

TLE4972 / TLE4973

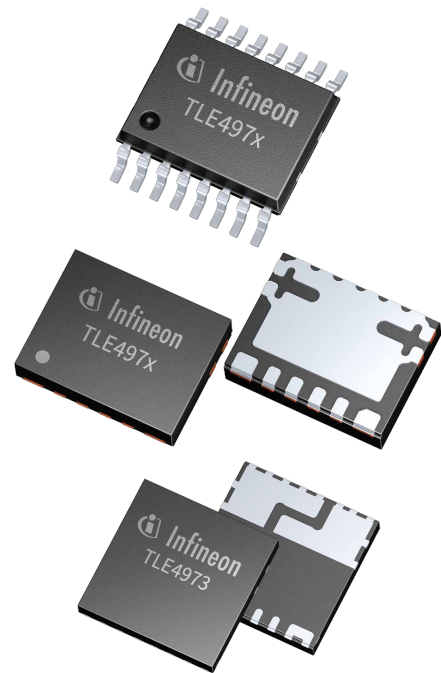
High-precision coreless current sensors for automotive and industrial applications

The Infineon TLE4972 product family of coreless magnetic current sensors specifically addresses requirements for current sensing in automotive applications. The well-established and robust Hall technology enables accurate and highly linear current measurements of the magnetic field induced by the current. With its compact design and diagnosis modes, the TLE4972 is ideal for xEV applications like traction inverters used in hybrid and battery-driven vehicles, as well as for battery main switches.

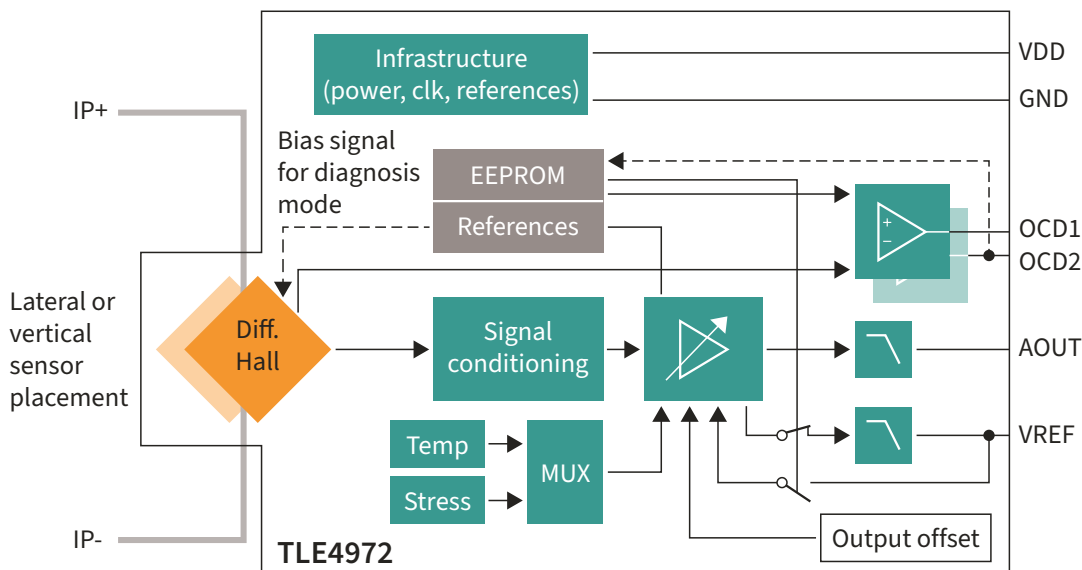
Infineon expanded the sensor portfolio with a new family of 5 V current sensors TLE4973. The new sensors will be available in three different packages to cover a wide range of applications in the automotive and industrial market. Target applications include traction inverter for xEV, auxiliary drives, PV inverter and on-board-charger (OBC).

Features and benefits

- Hall based coreless magnetic current sensor
- AC and DC sensing
- Two dedicated pins for overcurrent detection
- Scalable sensitivity
- ISO 26262-compliant
- ASIL B as SEooC
- Typical bandwidth of 210 kHz
- High accuracy up to 2 kA
- Very low error over temperature and lifetime
- Protection against overcurrent events for fast switching technologies, e.g. SiC
- No saturation or hysteresis effects
- Very low power losses through sensing structure
- Ideal for platform designs
- Fast reaction time of analog sensor output
- Simplified functional safety assessment



Block diagram



Click here to learn more:

www.infineon.com/current-sensors

Current sensors – overview

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [$\mu\text{A}/\sqrt{\text{Hz}}$]	Classification	Industrial	Auto-motive	Supply [V]	Current Rail	Package
TLI4971 family											
TLI4971-A025T5-E0001	25	240	48	< 2	350	IEC 62368-1	☐	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-E0001	50	240	24	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-E0001	75	240	16	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-E0001	120	240	10	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLI4971-A025T5-U-E0001	25	240	48	< 2	350	UL1577/ IEC 62368-1	☐	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-U-E0001	50	240	24	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-U-E0001	75	240	16	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-U-E0001	120	240	10	< 2	350		☐	–	3.3	Internal	TISON-8-5
TLE4971 family											
TLE4971-A025N5-E0001	25	210	48	< 2	260	AEC-Q100	☐	☐	3.3	Internal	TISON-8-5
TLE4971-A050N5-E0001	50	210	24	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A075N5-E0001	75	210	16	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A120N5-E0001	120	210	10	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A025N5-U-E0001	25	210	48	< 2	260	AEC-Q100/ UL 1577	☐	☐	3.3	Internal	TISON-8-5
TLE4971-A050N5-U-E0001	50	210	24	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A075N5-U-E0001	75	210	16	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A120N5-U-E0001	120	210	10	< 2	260		☐	☐	3.3	Internal	TISON-8-5
TLE4971-A025T5-E0001	25	210	48	< 2	260	AEC-Q100/ ISO 26262-compliant	☐	☐	3.3	Internal	TISON-8-6
TLE4971-A050T5-E0001	50	210	24	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4971-A075T5-E0001	75	210	16	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4971-A120T5-E0001	120	210	10	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4971-A025T5-U-E0001	25	210	48	< 2	260	AEC-Q100/ ISO 26262-compliant/ UL 1577	☐	☐	3.3	Internal	TISON-8-6
TLE4971-A050T5-U-E0001	50	210	24	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4971-A075T5-U-E0001	75	210	16	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4971-A120T5-U-E0001	120	210	10	< 2	260		☐	☐	3.3	Internal	TISON-8-6
TLE4972 family											
TLE4972-AE35D5	31 [mT]	210	39 ¹⁾ [mV/mT]	1	90 [nT/ $\sqrt{\text{Hz}}$]	AEC-Q100/ ISO 26262-compliant	☐	☐	3.3	external	TDSO-16
TLE4972-AE35S5	31 [mT]	210	39 ¹⁾ [mV/mT]	1	90 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	3.3	external	VSON-6

1) Can be reprogrammed by customer



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Current sensors – overview

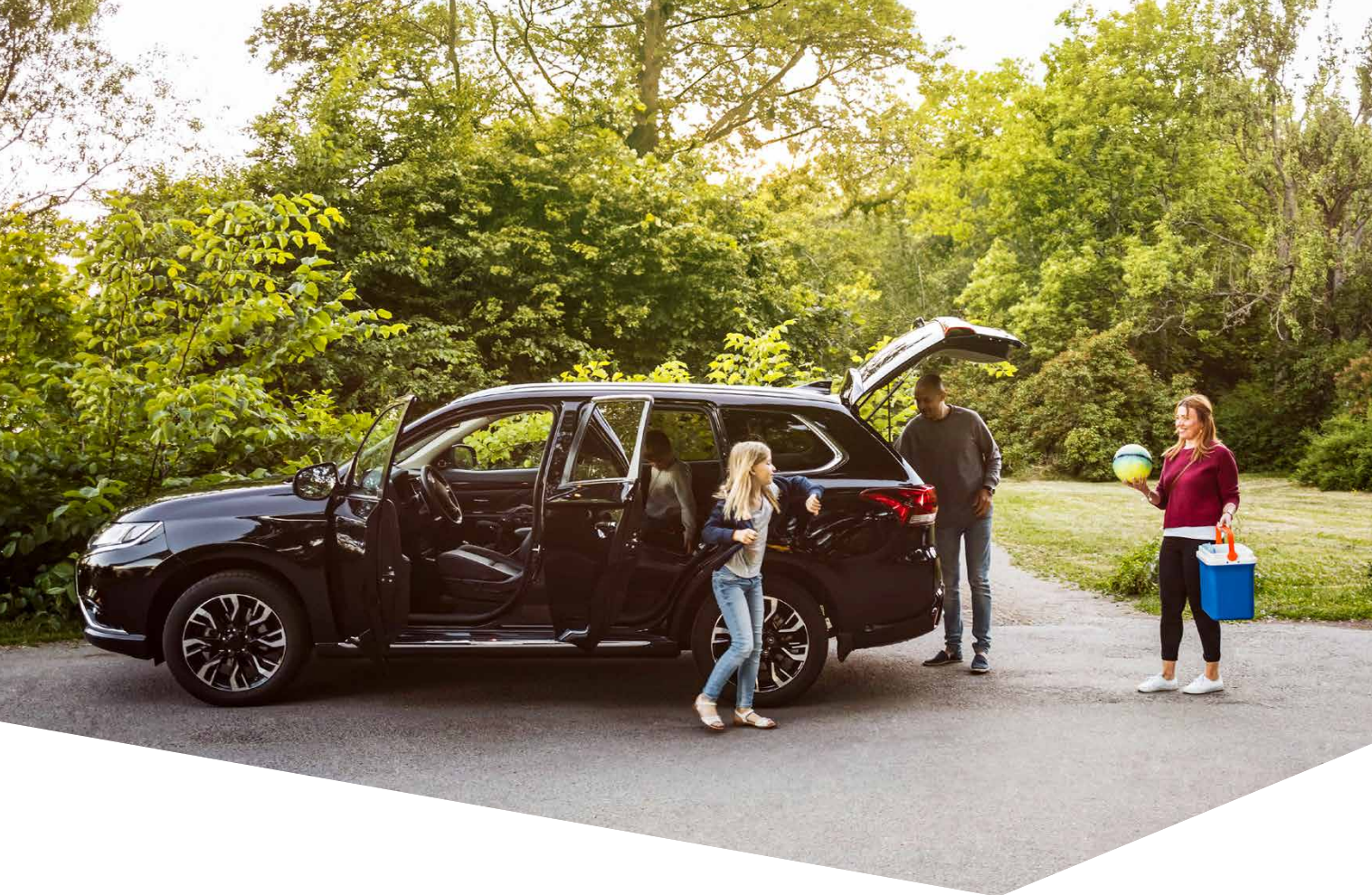
Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [$\mu\text{A}/\sqrt{\text{Hz}}$]	Classification	Industrial	Auto-motive	Supply [V]	Current Rail	Package
TLE4973 family											
TLE4973-A025T5-S0001	27.5	210	65.5	< 2	290	ISO 26262-compliant/ AEC-Q100	☐	☐	5.0	Internal	TISON-8-6
TLE4973-A050T5-S0001	55	210	32.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-A075T5-S0001	82.5	210	21.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-A120T5-S0001	132	210	13.7	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0001	27.5	210	65.5	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0001	55	210	32.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0001	82.5	210	21.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0001	132	210	13.7	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0010	27.5	210	65.5	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0010	55	210	32.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0010	82.5	210	21.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0010	132	210	13.7	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R025T5-U-S0010	27.5	210	65.5	< 2	290	ISO 26262-compliant/ AEC-Q100/ UL 1577	☐	☐	5.0	Internal	TISON-8-6
TLE4973-R050T5-U-S0010	55	210	32.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R075T5-U-S0010	82.5	210	21.8	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-R120T5-U-S0010	132	210	13.7	< 2	290		☐	☐	5.0	Internal	TISON-8-6
TLE4973-AE35D5-S0001	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]	ISO 26262-compliant/ AEC-Q100	☐	☐	5.0	external	TDSO-16
TLE4973-RE35D5-S0001	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	5.0	external	TDSO-16
TLE4973-RE35D5-S0010	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	5.0	external	TDSO-16
TLE4973-AE35S5-S0001	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	5.0	external	VSON-6
TLE4973-RE35S5-S0001	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	5.0	external	VSON-6
TLE4973-RE35S5-S0010	34 [mT]	210	53 ¹⁾ [mV/mT]	1	70 [nT/ $\sqrt{\text{Hz}}$]		☐	☐	5.0	external	VSON-6

1) Can be reprogrammed by customer



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Magnetic sensors

Exceptionally precise magnetic sensors comprising industry-leading switches, linear, angle, 3D and speed sensors

Infineon XENSIV™ sensors are exceptionally precise thanks to an industry-leading magnetic technology portfolio. Our benchmark and innovative magnetic sensor portfolio is the perfect fit for numerous customer applications in automotive, industrial and consumer markets. We offer all magnetic sensor technologies with in-house production, thus our customers can choose between Hall sensors, AMR (Anisotropic Magneto Resistive), GMR (Giant Magneto Resistive) or TMR (Tunnel Magneto Resistive) sensors in order to find their best-fit solution for their application.

Generally, magnetic sensors measure the strength and/or direction of an applied magnetic field which is generated by e.g. ferromagnetic materials and magnets, inductive coils like in motors, etc. The information on the measured field is processed within the sensor and converted into strength, position, speed, angular and/or direction information. The processed sensor information is transmitted to the application via specific analog or digital interfaces. A wide range of sensors is equipped with additional safety and diagnostic features, and ISO 26262-compliant developed.

Our portfolio includes a broad range of ISO 26262-compliant products meeting safety requirements as SEooC (Safety Element out of Context) up to the highest safety level of ASIL D, which are well perceived within the market and used in a wide range of automotive and industrial safety applications.

Magnetic switches

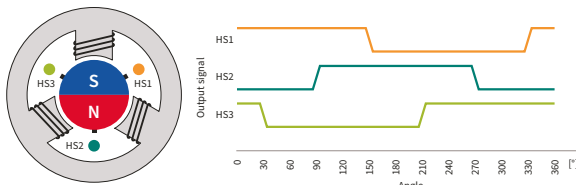
Broadest energy saving portfolio of high precision magnetic switches for automotive, industrial and consumer applications

TLE/TLI/TLV4961, TLE/TLI/TLV4964, TLE/TLI/TLV4968

Energy-efficient magnetic switch family for up to 32 V

The TLE/TLI/TLV496x-xM/L family of magnetic switches saves energy and enables designers to create precise and compact systems. With an operational current consumption of just 1.6 mA, TLE/TLI/TLV496x-xM/L products can cut energy consumption by up to 50 percent, compared with similar competitor products. Thanks to its small magnetic hysteresis, the family paves the way for precise switching points in systems. The integrated temperature profile compensates magnetic drifts and enables stable performance over temperature and lifetime.

TLE/TLI/TLV496x-xM products come in the smallest SOT23 package, thus reducing height by 10 percent compared with on the market predecessor products. The sensors also feature an integrated functionality test for better system control.



Features

- Current consumption of just 1.6 mA
- 3 to 32 V supply voltage range (over voltage up to 42 V)
- 7 kV ESD protection (HBM)
- Overtemperature and overcurrent protection
- Temperature compensation
- Smallest SOT23 package on the market
- Dedicated products for industrial applications (TLI496x) and consumer (TLV496x)
- AEC-Q100 qualified

Applications

- Window lifter
- Power closing
- Gear stick
- Seat belt
- BLDC commutation
(e.g. wiper, seat belt pretensioner, pump, seating)
- Service robots
- Power tools
- White goods

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4961-1M/L	Latch	2.0	-2.0	4.0	☐	☐	☐	SOT23/SSO-3-2
TLE4961-2M	Latch	5.0	-5.0	10	☐	☐	☐	SOT23
TLE4961-3M/L	Latch	7.5	-7.5	15	☐	☐	☐	SOT23/SSO-3-2
TLE4961-4M	Latch	10.0	-10.0	20	☐	☐	☐	SOT23
TLE4961-5M	Latch	15.0	-15.0	30	☐	☐	☐	SOT23
TLE4964-1M	Switch	18.0	12.5	5.5	☐	☐	☐	SOT23
TLE4964-2M	Switch	28.0	22.5	5.5	☐	☐	☐	SOT23
TLE4964-3M	Switch	12.5	9.5	3.0	☐	☐	☐	SOT23
TLE4964-4M	Switch	10.0	8.5	1.5	☐	☐	☐	SOT23
TLE4964-6M	Switch	3.5	2.5	1.0	☐	☐	☐	SOT23
TLE4964-5M	Switch	7.5	5.0	2.5	☐	☐	☐	SOT23
TLE4968-1M/L	Bipolar	1.0	-1.0	2.0	☐	☐	☐	SOT23/SSO-3-2
TLI4961-1M	Latch	2.0	-2.0	4.0	–	☐	☐	SOT23/SSO-3-2
TLV4961-1M	Latch	2.0	-2.0	4.0	–	–	☐	SOT23
TLV4961-3M	Latch	7.5	-7.0	15.0	–	–	☐	SOT23
TLV4964-1M	Switch	18.0	12.5	5.5	–	–	☐	SOT23
TLV4964-2M	Switch	28.0	22.5	5.5	–	–	☐	SOT23



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TLE/TLI4963, TLE/TLI4965

5 V high-precision automotive/industrial Hall-effect sensor

TLE/TLI496x-xM are integrated Hall-effect sensors specially designed for highly accurate applications. The sensors provide an easy-to-use and cost-effective solution for position sensing applications, requiring high temperature stability of the magnetic threshold.

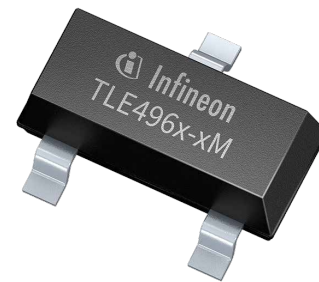
Target applications for TLE/TLI496x-xM are all low-power applications requesting a precision magnetic latch or switch with a broad operating temperature range.

Features

- 3.0 to 5.5 V operating supply voltage
- Low current consumption 1.4 mA
- ESD protection 4 kV HBM
- Active error compensation (chopped)
- High stability of magnetic thresholds
- Low jitter (typ. 0.35 μ s)
- Operating temperature range:
 - from -40 to +170°C (TLE496x-xM)
 - from -40 to +125°C (TLI496x-xM)
- Small SMD package SOT23
- TLE: AEC-Q100 qualified
- TLI: JEDEC qualified

By offering an excellent magnetic behavior Infineon's switches are ideally suited for:

- Index counting application with a pole wheel
- Rotor position detection (BLDC motors)
- Open/close detection



Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4963-1M	Latch	2.0	-2.0	4.0	☐	☐	☐	SOT23
TLE4963-2M	Latch	5.0	-5.0	10.0	☐	☐	☐	SOT23
TLE4965-5M	Unipolar switch	7.5	5.0	2.5	☐	☐	☐	SOT23
TLI4963-1M	Latch	2.0	-2.0	4.0	–	☐	☐	SOT23
TLI4963-2M	Latch	5.0	-5.0	10.0	–	☐	☐	SOT23
TLI4965-5M	Unipolar switch	7.5	5.0	2.5	–	☐	☐	SOT23



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TLV496x-xTA / TLV496x-xTB

Precise Hall-effect sensor for consumer applications in leaded package

The TLV496x-xTA/B Hall-effect sensor family comprises a line of magnetic switches for contactless position sensing. The sensors are specially designed to provide an easy-

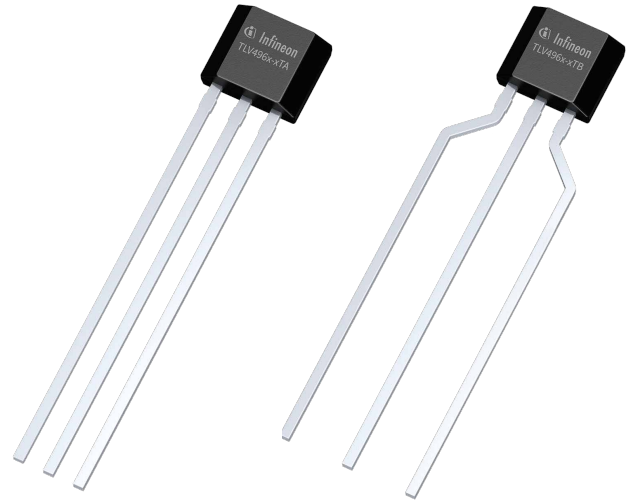
to-use and cost-effective solution for position sensing applications.

Features

- 3.0 to 26 V operating supply voltage
- Low current consumption 1.6 mA
- ESD protection 4 kV HBM
- Operating temperature range from -40 to +125 °C
- Leaded package TO92S

Applications

- BLDC motor commutation for consumer devices (e.g. e-bikes, fans, aircons)
- Position detection e.g. flaps and control buttons



Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Consumer	Package
TLV4961-1TA	Latch	2.0	-2.0	4.0	☐	TO92S-3-1
TLV4961-1TB	Latch	2.0	-2.0	4.0	☐	TO92S-3-2
TLV4961-3TA	Latch	7.5	-7.5	15.0	☐	TO92S-3-1
TLV4961-3TB	Latch	7.5	-7.5	15.0	☐	TO92S-3-2
TLV4964-4TA	Unipolar switch	10.0	8.5	1.5	☐	TO92S-3-1
TLV4964-4TB	Unipolar switch	10.0	8.5	1.5	☐	TO92S-3-2
TLV4964-5TA	Unipolar switch	7.5	5.0	2.5	☐	TO92S-3-1
TLV4964-5TB	Unipolar switch	7.5	5.0	2.5	☐	TO92S-3-2
TLV4968-1TA	Bipolar switch	1.0	-1.0	2.0	☐	TO92S-3-1
TLV4968-1TB	Bipolar switch	1.0	-1.0	2.0	☐	TO92S-3-2



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TLx4966 xG family Two-in-one double Hall-effect sensor

Our XENSIV™ TLx4966 xG family features two integrated, calibrated sensor elements for detecting direction and counting indexes in one device. This two-in-one feature eliminates the need for a second sensor, which in turn cuts engineering and production costs. Using just one sensor ensures perfect alignment of the sensor elements raising system quality and reliability.

Features

- Two Hall probes in one package
- Excellent matching between the two Hall probes
- Hall plate distance of 1.45 mm
- Outstanding quality
- Information on direction and speed
- TSOP6 package
- AEC-Q100 qualified

Applications

- Window lifter
- Sunroof
- Automatic tailgate
- Automated doors
- Sun blinds



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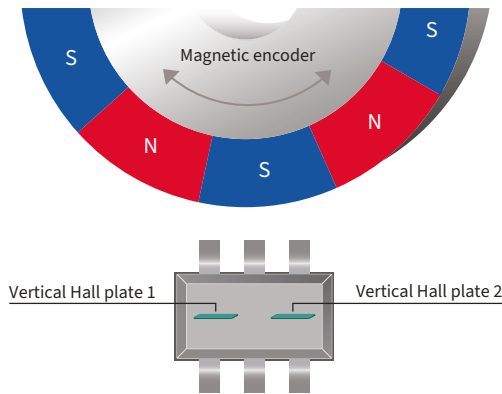
TLE4966V-1G

Vertical dual-Hall switch

The Infineon vertical double Hall-effect switch TLE4966V-1G is a further development of the TLX4966-xG family. Completely new is the vertical orientation of the Hall plates resulting into in-plane field sensitivity which enables entirely new application layouts. Designed in a new technology, this device

Features

- Saves space
- Easy mounting of sensor and PCB board
- Allows increased mounting flexibility
- Enables new, compact system designs



offers high voltage capabilities with very small current consumption. The product can be operated from unregulated power supplies, which offers our customers unique freedom of design for their system. This product is AEC-Q100 certified and enables our customers to build systems for the highest automotive quality requirements.



Product	Type	Output	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	☐	☐	☐	TSOP6/SSO-4-1
TLE4966L	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	☐	☐	☐	TSOP6/SSO-4-1
TLE4966-2G	Double Hall, two independent outputs	2 x speed	7.5	-7.5	15	☐	☐	☐	TSOP6
TLE4966-3G	Double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	☐	☐	☐	TSOP6
TLE4966V-1G	Vertical double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	☐	☐	☐	TSOP6
TLI4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	–	☐	☐	TSOP6



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TLE49x6 / TLI49x6 / TLV49x6 family

High-precision magnetic switches

The TLE49x6, TLI49x6, and the TLV49x6 family comprises high-precision, unipolar Hall-effect switches and latches for different magnetic sensitivities.

Features

- Broad, successful family concept
- Best in class quality
- Chopped Hall system for high sensitivity
- High jitter performance
- SMD and leaded packages
- Open collector or current interface
- Temperature compensation
- Up to 18 V supply
- Dedicated products for industrial (TLI49x6) and consumer applications (TLV49x6)
- AEC-Q100 qualified (TLE products)

TLE/TLI/TLV49x6 products have proven success in many automotive, industrial and consumer applications. The family includes two-wire sensors with a current interface.

Applications

- Power closing
- Gear stick
- Seat belt
- HVAC flap
- BLDC commutation
- 2-wheeler application

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HV} [mT]	Automotive	Industrial	Consumer	Package
TLE4906K	Unipolar switch	10.0	8.5	1.5	☐	☐	☐	SC59/SSO-3-2
TLE4906L	Unipolar switch	10.0	8.5	1.5	☐	☐	☐	SC59/SSO-3-2
TLE4906-2K	Unipolar switch	18.0	12.5	5.5	☐	☐	☐	SC59
TLE4906-3K	Unipolar switch	28.0	22.5	5.5	☐	☐	☐	SC59
TLE4946K	Latch	14.0	-14	28	☐	☐	☐	SC59
TLE4946-1L	Latch	15.0	-15	30	☐	☐	☐	SSO-3-2
TLE4946-2K	Latch	2.0	-2.0	4.0	☐	☐	☐	SC59/SSO-3-2
TLE4946-2L	Latch	2.0	-2.0	4.0	☐	☐	☐	SC59/SSO-3-2
TLE4976-1K	Unipolar switch/ Current interface	9.25	7.25	2.0	☐	☐	☐	SC59
TLE4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	☐	☐	☐	SC59
TLV4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	–	–	☐	SC59



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3D magnetic sensors

Infineon's 3D magnetic sensors (TLx493D-xxBx) combine high-accuracy magnetic field measurements with an extremely compact footprint and exceptionally low power consumption (min. 7 nA). Our sensors open up a lot of exciting new use cases including innovative human-machine interfaces in the form of industrial joysticks, ergonomic pushbuttons on domestic appliances and highly precise position control in robotics.

XENSIV™ TLE493D-P2B6 is our latest magnetic 3D sensor enabled by new and improved accuracy. It is the best product for high performance applications with respect to pricing and package size.

The TLE493D-P2B6 has an extremely low current and wake-up function in a small package. Also the sensor provides options for configuration to fit best to customer requirements (e.g. data communication, definition of measurements, etc.). The safety manual supports functional safety applications. The configurability of the sensor is used in application platforms to adapt to end customer wishes. TLE493D-P2B6 is available in 4 different address variants ending with A0, A1, A2 or A3. It's possible to connect up to 4 sensors to one I²C bus.



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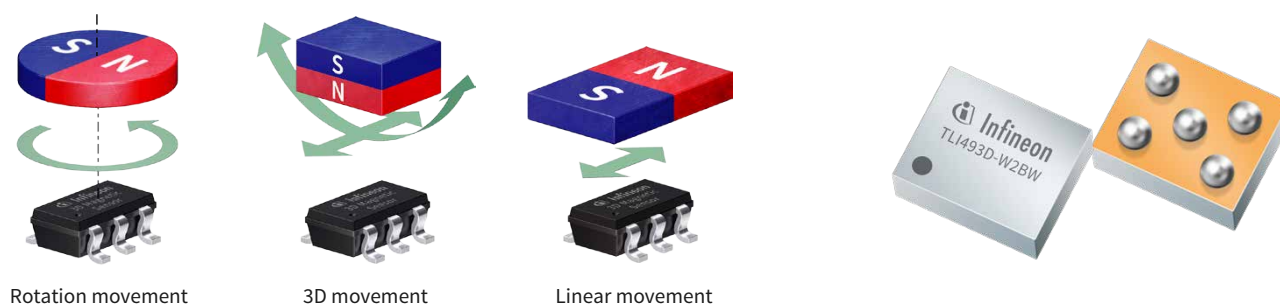
www.infineon.com/3d-magnetics

3D magnetic sensors

For consumer and industrial markets

The TLx493D-xxBx sensor realizes accurate three-dimensional sensing with extremely low power consumption in a small package. Capable of detecting the magnetic field in the x, y, and z-direction, the sensor is ideally suited for the measurement of linear, rotation, or 3-dimensional movements. Thanks to its small package and low power

consumption, the TLx493D-xxBx can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high-temperature stability of the magnetic measurement, the sensor allows systems to get smaller, more accurate, and more robust.



Features

- 3D magnetic sensing
- Integrated temperature sensing
- Low current consumption
 - 7 nA in power-down mode
- 2.8 to 3.5 V operating supply voltage
- Digital communication via a 2-wire standard I²C interface
- Bx, By and Bz linear field measurement up to ± 160 mT
- JESD47 qualified
- 12-bit data resolution for each measurement direction
- Various resolution options from 32 to 130 $\mu\text{T}/\text{LSB}_{12}$
- Operating temperature range from -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I _{DD}	Update rate XYZ measurement	Package	Ordering code
TLI493D-A2B6	-40 ... 105°C	JESD47	± 100 mT ± 160 mT	7.7 or 15.4 $\text{LSB}_{12}/\text{mT}$	7 nA – 3.4 mA	up to 8.4 kHz	TSOP6	SP001689844
TLI493D-W2BW A0 TLI493D-W2BW A1 TLI493D-W2BW A2 TLI493D-W2BW A3	-40 ... 125°C	JESD47	$\pm 50, \pm 100$ or ± 160 mT	7.7, 15.4 or 30.8 $\text{LSB}_{12}/\text{mT}$	7 nA – 3.4 mA	up to 11.6 kHz	WFWLB-5-2	SP005409964 SP005409966 SP005409968 SP005409970
TLV493D-A1B6	-40 ... 125°C	JESD47	± 130 mT (typ)	10.2 $\text{LSB}_{12}/\text{mT}$	7 nA – 3.7 mA	up to 3.3 kHz	TSOP6	SP001286056
TLV493D-A2BW	-20 ... 85°C	JESD47	$\pm 50, \pm 100$ or ± 160 mT	7.7, 15.4 or 30.8 $\text{LSB}_{12}/\text{mT}$	7 nA – 3.4 mA	up to 11.6 kHz	WFWLB-5-2	SP005542151

New features

- Advanced operation modes to provided a high flexibility
- Short mode range setting, focusing on the half of the magnetic range, ensuring higher accuracy
- Higher update frequency allows for an application field that requires faster update speed
- Angular mode (for x and y measurement only)

Applications

- Anti tempering protection in smart meters
- Joysticks
- CCTV-control, game consoles
- Control elements e.g. white goods multifunction knobs
- Ergonomic push- and control buttons on domestic appliances and power tools
- Position control in robotics
- Smart lock position detection



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www.infineon.com/3d-magnetics

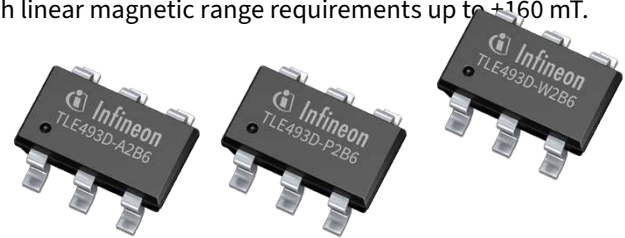
3D magnetic sensors

For automotive applications

Infineon's TLE493D-x2B6 enables automotive control element applications within the passenger compartment or under the hood with a temperature range of -40 to +125°C, with linear magnetic range requirements up to ±160 mT.

Features

- 3D magnetic sensing
- Integrated temperature sensing
- 2.8 to 3.5 V operating supply voltage
- Low current consumption
 - 7 nA in power-down mode
 - Up to 10 power modes
- Digital output via a 2-wire standard I²C interface
- B_x, B_y and B_z linear field measurement ±160 mT
- AEC-Q100 qualified
- 12-bit data resolution for each measurement direction
- Various resolution options from 65 to 130 μT/LSB₁₂
- Operating temperature range from -40 to +125°C



Applications

- Control elements for infotainment/navigation systems, air-conditions, multifunctional steering wheels, seat controls
- Top column modules e.g. direction indicator, wiper control
- Gear stick position sensing
- Multi-function knobs
- Pedal/valve position sensing

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I _{DD}	Update rate XYZ measurement	Wake-up	Package	Ordering code
TLE493D-A2B6	-40 ... 125°C	AEC-Q100	±160 mT ±100 mT	130 μT/LSB ₁₂ 65 μT/LSB ₁₂ ¹⁾	7 nA – 3.4 mA	Up to 8.4 kHz	No	TSOP6	SP001689848
TLE493D-W2B6 A0 TLE493D-W2B6 A1 TLE493D-W2B6 A2 TLE493D-W2B6 A3	-40 ... 125°C	AEC-Q100 ISO 26262-ready	±160 mT ±100 mT	130 μT/LSB ₁₂ 65 μT/LSB ₁₂ ¹⁾	7 nA – 3.4 mA	Up to 8.4 kHz	Yes	TSOP6	SP001655334 SP001655340 SP001655344 SP001655348
TLE493D-P2B6 A0 TLE493D-P2B6 A1 TLE493D-P2B6 A2 TLE493D-P2B6 A3	-40 ... 125°C	AEC-Q100/ ISO 26262-ready	±160 mT ±100 mT	130 μT/LSB ₁₂ 65 μT/LSB ₁₂ ¹⁾	7 nA – 3.4 mA	Up to 11.6 kHz	Yes	TSOP6	SP005557415 SP005557413 SP005557411 SP005557408

1) Short range mode

The XENSIV™ sensor TLE493D-A2B6 features include a sensor address read-back feature for additional communication verification, a short range mode focusing to half of the magnetic range, ensuring higher accuracy, and an angular mode (for x and y measurement only).

With the TLE493D-W2B6/ P2B6 A0-A3, a 3D sensor family with an enhanced dynamic wake-up feature was developed. Four pre-programmed address options (A0-A3) are available, enabling a fast start-up initialization when used in I²C bus configurations.

Our sensors include enhanced test options, and safety documentation is available to enable the usage of this sensor in the context of ASIL B systems.

Compared to the previous products of this family the TLE493D-P2B6 A0-A3 family offers enhance precision in x-, y-, z- sensing direction, while otherwise featuring the same dynamic wake-up features, programmability, and test options like TLE493D-W2B6 A0-A3.



ISO 26262
ready



Click here to learn more:
www.infineon.com/3d-magnetics



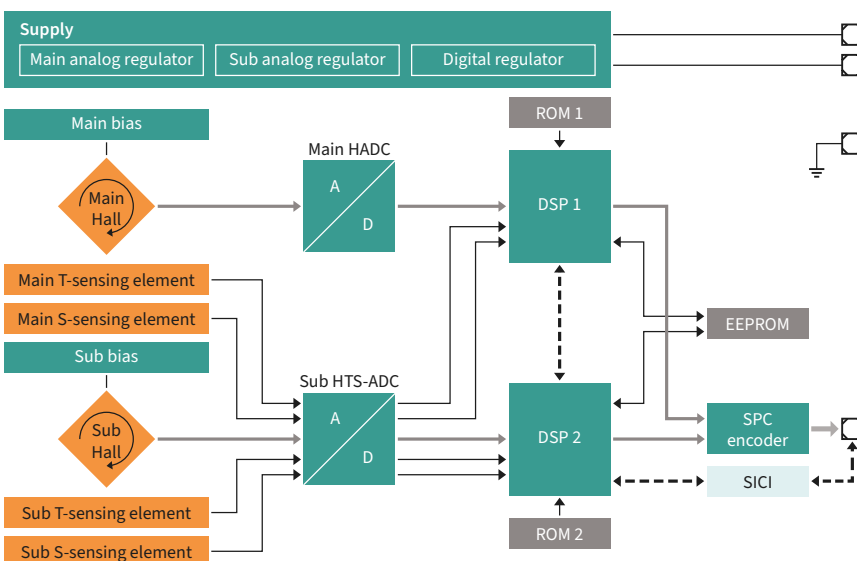
Linear sensors

Programmable dual channel linear Hall sensor with fast SPC interface for high precision applications

Infineon's TLE4999C8 is a programmable dual channel linear Hall sensor designed to meet the requirements of safety critical automotive and industrial applications. It is developed in full compliance with ISO 26262 by means of two sensor elements included within one monolithic silicon design. In order to fulfill the state-of-the-art safety requirements on system level and enable ASIL D system developments the sensor cells are designed in a complementary way. Their signals follow two independent analog paths. Each signal path has its own digital signal processing unit to ensure maximum independency (redundancy respectively). The sensor offers a multi-point calibration with up to 9 selectable set points for enhanced linearization of the output signal. For an easy and flexible adaptation to non-linearity of magnetic circuit design, the chip provides 5 different calibration

characteristics. TLE4999C features a digital Short-PWM-Code (SPC) interface, with a bus-capability for up to 4 sensor ICs on a single data output. The communication interface with min. 0.5 μ s unit time guarantees a fast transmission of complete 2 channel data signal in less than 500 μ s. The additionally implemented frame holder circuit enables the synchronicity of multiple sensors (e.g. in combination of angle sensors) via a SPC bus. The chip offers a 12, 14 and 16-Bit resolution of the output signal, ensuring highest flexibility and superior noise performance.

Highest accuracy over a wide temperature range and lifetime is achieved by an integrated digital temperature- and stress-compensation. The chip is available in a thin 8-pin SMD single sensor package.



[Click here to learn more: www.infineon.com/linear-sensors](https://www.infineon.com/linear-sensors)

Features

- Fully ISO 26262-compliant, supports ASIL D systems
- < 2 % sensitivity drift, < 100 μ T offset drift overtemperature and life time
- Integrated digital temperature- and stress-compensation
- Fast digital SPC interface (unit time 0.5–3.0 μ s)
- Multi-point calibration with up to 9 linearization set points

Key benefits

- High diagnostic coverage, ISO 26262-compliance and dual sensor cell integration enable development of fail operational systems
- Multi-point calibration for better fit into various magnetic circuit designs
- Easy system integration due to programmability of several sensor parameters

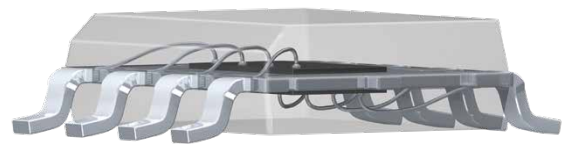
Applications

Automotive safety critical applications

- Electric power steering
- Linear movement position sensing
- Pedal position
- Electric throttle control
- Seat rail adjustment
- Headlight adjustment

Industrial applications

- Small home appliances
- Joystick applications



ISO 26262-ready / compliant dual channel linear sensors

Sales name	Interface	Magnetic linear range [mT]	Sensitivity	Sensitivity drift [%]	Gain	Magnetic offset drift [μ T] ¹⁾	Classification	Ordering code	Package
TLE4997A8D	Analog ratiometric	50, 100, 200	\pm 60 mV/mT default for 100 mT range, with gain 1.5	\pm 3	\pm 4	< \pm 400	ISO 26262-ready	SP000902760	TDSO-8
TLE4998P8D	Digital interface PWM	50, 100, 200	\pm 48 LSB ₁₂ /mT default for 100 mT range, with gain 1.5	\pm 2	\pm 4	< \pm 400	ISO 26262-ready	SP000902776	TDSO-8
TLE4998S8D	Digital interface SENT	50, 100, 200	\pm 48 LSB ₁₂ /mT default for 100 mT range, with gain 1.5	\pm 2	\pm 4	< \pm 400	ISO 26262-ready	SP000902784	TDSO-8
TLE4998C8D	Digital interface SPC	50, 100, 200	\pm 48 LSB ₁₂ /mT default for 100 mT range, with gain 1.5	\pm 2	\pm 4	< \pm 400	ISO 26262-ready	SP000902768	TDSO-8
TLE4999I3	Digital interface PSi5	12.5, 25	\pm 147.5 LSB ₁₂ /mT default for 25 mT range, with gain 1.5	\pm 2	\pm 7.59	< \pm 100/ < \pm 200 ²⁾	ISO 26262-compliant	SP001689862	SSO-3
TLE4999C8 (TLE4999C8-S0001)	Digital interface SPC	25, 50	\pm 36.875 LSB ₁₂ /mT default for in 50 mT range, with gain 1.0	\pm 2	\pm 7.59	< \pm 100/ < \pm 200 ²⁾	ISO 26262-compliant ASIL D (ASIL C)	SP002662500 (SP005727371)	TDSO-8
TLE4999C4 (TLE4999C4-S0001)	Digital interface SPC	25, 50	\pm 36.875 LSB ₁₂ /mT default for in 50 mT range, with gain 1.0	\pm 2	\pm 7.59	< \pm 100/ < \pm 200 ²⁾	ISO 26262-compliant ASIL D (ASIL C)	SP003420076 (SP005727375)	SSO-4

1) Maximum drift over temperature and life time
 2) Main channel/sub channel



ISO 26262 compliant



ISO 26262 ready



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www.infineon.com/linear-sensors

TLE499x family: programmable analog/digital single channel linear Hall sensor family

Infiniteon's family of TLE499x linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. These programmable linear Hall sensors come with different interface options: TLE4997 features ratiometric analog output, while TLE4998P comes with pulse width modulation (PWM), TLE4998S with single edge nibble transmission (SENT), and TLE4998C with short PWM codes (SPC).

Features

- Best-in-class accuracy with low drift of output signal temperature range lifetime (including stress compensation in TLE4998)
- Programmable transfer function (gain, offset), clamping, bandwidth, and temperature characteristics
- AEC-Q100 qualified
- Available in various packages including SSO-3-9 with two integrated capacitors to improve ESD and ESC behavior
- TLE4997, TLE4998 ISO 26262-ready

These high-precision 12-bit resolution linear Hall sensors feature EEPROM memory for flexible programming across a wide range of parameters.

Thanks to digital signal processing based on a 20-bit DSP architecture plus digital temperature compensation, these sensors deliver outstanding temperature stability compared with similar compensation methods. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-in-class accuracy over the device's lifetime.

Applications

- Detecting linear and angular position
- Detecting pedal and throttle position
- Steering torque measurement
- Headlight leveling
- High-current sensing
- Seat position and occupant detection
- Suspension control
- Detecting gear stick/lever positions
- Detecting liquid levels in fuel tanks
- Current sensing e.g. for battery management

Product	Programm.	Number of pins	Sensitivity (programmable range)	Magnetic offset	Supply voltage (extended range)	Automotive	Classification	Interface	Package
TLE4997	EEPROM	3/Single die SMD 8	±12.5 to ±300 mV/mT	< ±400 μT	5 V ±10% (7 V)	□	–	Analog	SSO-3-10 TDSO-8
TLE4998P	EEPROM	3/4/ Single die SMD 8	±0.2 to ±6%/mT	< ±400 μT	5 V ±10% (16 V)	□	ISO 26262-ready	PWM	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8
TLE4998S	EEPROM	3/4/ Single die SMD 8	±8.2 to ±245 LSB ₁₂ /mT	< ±400 μT	5 V ±10% (16 V)	□	ISO 26262-ready	SENT	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8
TLE4998C	EEPROM	3/4/ Single die SMD 8	±8.2 to ±245 LSB ₁₂ /mT	< ±400 μT	5 V ±10% (16 V)	□	ISO 26262-ready	SPC	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8

1) 147.44 LSB₁₃ converts to 294.88 LSB₁₂

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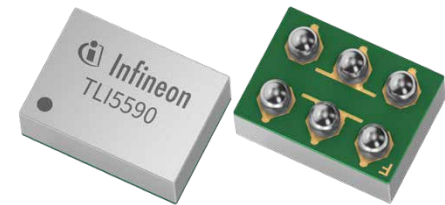
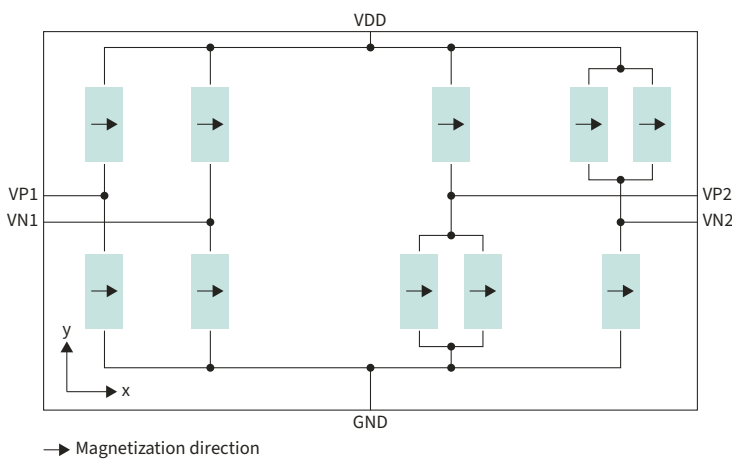
www.infineon.com/linear-sensors

Linear TMR sensor For consumer and industrial markets

The TLI5590-A6W is a dual-channel radiometric gradiometer designed for highly precise measurements. It meets the JEDEC JESD47K standard for industrial and consumer use. Its compact, green packaging facilitates miniaturized design and detailed measurements. The device achieves exceptional accuracy, surpassing 10 μm when coupled with an appropriate magnet for linear or rotary encoder. Additionally, it ensures superior channel matching with less than 5% variation across the full magnetic input spectrum of $\pm 5\text{ mT}$.

TMR technology enhances position sensing with its precise, high signal-to-noise ratio, enabling the use of smaller, cost-effective magnets. Its low power consumption suits battery-powered devices, while its hysteresis-free characteristic ensures accuracy during rapid directional changes. High integration density also allows for the miniaturization of sensors, making TMR ideal for compact applications.

Block diagram



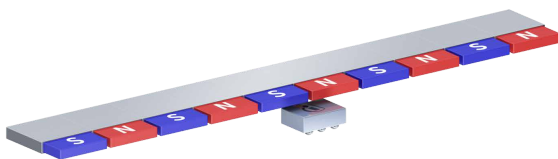
Features

- High signal-to-noise ratio allows small and cost-effective magnet design
- Low power consumption is beneficial for battery supplied applications
- High temperature-stable measurements make it perfect choice for use in harsh environments
- Hysteresis-free transfer characteristic allows accurate sensing where fast changing direction changes occur
- Higher integration density reduces the sensor size to support miniaturization and position sensing in microsystems

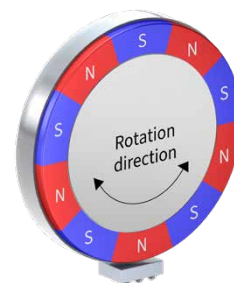
Applications

- Linear and angular incremental position sensing in industrial and consumer applications with highest accuracy requirements
- Lens positioning for zoom and focus adjusting in cameras

Linear position measurement



Rotary position measurement



Product	Temperature range [°C]	Sensitivity bridge 1/2	Linear magnetic range [mT]	Interface	Current	Supply voltage [V]	Package	Ordering code
TLI5590-A6W	-40 to 125	18/9 mV/V/mT	± 5	Analog	1 mA at 3.3 V	1-5.5	WFWLB-6-3	SP005631773



Click here to learn more:
www.infineon.com/linear-sensors/tli5590-a6w

Angle sensors

Compact designs in small outline packages – at highest functional safety

Highest variety – low end to high end, standardized and specialized in various technologies: GMR, AMR and TMR

Angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magneto resistive elements.

Infineon offers a large variety of high-precision angle sensors in all common technologies such as AMR (Anisotropic Magnetoresistive), GMR (Giant Magnetoresistive) and also TMR (Tunnel Magnetoresistive). The xMR technologies are complementary. Addressing any kind of rotation applications, Infineon's sensor portfolio consists of products with analog and digital outputs, as single and dual-chip variants and as products for safety-relevant applications. The two-channel analog TMR angle sensor TLE5501, the digital GMR angle sensor family TLE5014 and the high-precision AMR-based TLE5109 products are among the latest additions to the growing sensor portfolio, which includes all common technologies and is designed for both, industrial and automotive applications.

Infineon's TLE5501, is a fast analog TMR-based angle sensor dedicated to automotive applications.

Their fields of use range from steering angle applications, with the highest functional safety requirements, to motors for wipers, pumps and actuators and electric motors in general.

The TLE5109A16 AMR based products address the need for very precise, fast and yet cost-efficient angle measurement at the highest functional safety levels in automotive and industrial applications. These include position measurement in brushless DC motors (BLDC) for pumps, wipers or brakes, position measurements of valves, flaps or pedals and steering angle measurement.

Infineon's broad portfolio of GMR sensors are ideal for a wide range of angle applications, such as BLDC motors or steering angle sensors. They are pre-calibrated and ready-to-use. Different levels of signal processing integration from the straight forward TLE5012B to the highly complex and programmable TLE5014 enable designers to optimize system partitioning.

The large portfolio of Infineon angle sensors is equally suited to meet ready-to-use industrial and consumer applications like robotics or gimbal and highly safety critical automotive applications such as braking or steering.

GMR, AMR and TMR based angle sensors

Product	Technology	Die configuration	Sin/cos output	Angle output	Second interface	Accuracy	Classification	Package
TLE5009	GMR	Single die	Analog sin/cos	-	-	0.9°	ISO 26262-ready	DSO-8
TLE5009A16(D)	GMR	Dual die	Analog sin/cos	-	-	1.0°	ISO 26262-ready	TDSO-16
TLI5012B	GMR	Single die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.9°	JESD47	DSO-8
TLE5012B(D)	GMR	Single & dual die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.0°	ISO 26262-ready	DSO-8/ TDSO-16
TLE5014C16(D)	GMR	Single & dual die	-	SPC	-	1.0°	ISO 26262-compliant	TDSO-16
TLE5014P16(D)	GMR	Single & dual die	-	PWM	-	1.0°	ISO 26262-compliant	TDSO-16
TLE5014S16(D)	GMR	Single & dual die	-	SENT	-	1.0°	ISO 26262-compliant	TDSO-16
TLE5014SP16(D)	GMR	Single & dual die	-	SPI	-	1.0°	QM ISO 26262-compliant	TDSO-16
TLE5109A16(D)	AMR	Single & dual die	Analog sin/cos	-	-	0.5°	ISO 26262-ready	TDSO-16
TLE5309D	AMR + GMR	Dual die	Analog sin/cos	-	-	AMR 0.5°, GMR 1.0°	ISO 26262-ready	TDSO-16
TLE5501	TMR	Single die	Analog sin/cos	-	-	1.0°	ISO 26262-compliant	DSO-8

SPI = Serial peripheral interface

IIF = Incremental interface

PWM = Pulse width modulation



ISO 26262
compliant

ISO 26262
ready



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www.infineon.com/angle-sensors

TMR based angle sensors

Tunneling magnetoresistive (TMR) technology is offering high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification.

TLE5501

Infineon's TMR sensor TLE5501 is available in two versions.

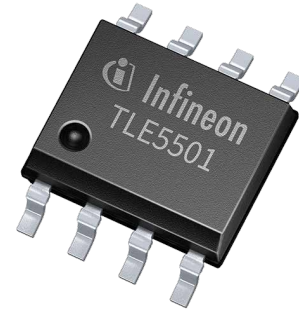
TLE5501 – product versions with different pin out:

- TLE5501 E0001: pin-compatible to TLE5009 automotive qualified acc. AEC-Q100
- TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D

Features

- Large output signals of up to 0.37 V/V for direct microcontroller connection
- Discrete bridge with differential sine and cosine output
- Very low supply current: ~2 mA
- Magnetic field range (20–100 mT)
- Typ. angle error ~ 1.0° (over temperature and lifetime)
- DSO-8 package
- AEC-Q100, grade 0: $T_A = -40 \dots +150^\circ\text{C}$ (ambient temperature)
- For TLE5501 E0002:
 - Reaching ASIL D with just one single sensor chip
 - ISO 26262-compliant development ASIL D

In addition, TMR technology shows a very low temperature drift, reducing external calibration and compensation efforts. The TMR technology is also well known for its low current consumption.



Applications

- Steering angle sensor
- BLDC motor commutation (e.g. wipers, pumps and actuators)
- Angular position sensing for e.g. robotics or gimbal
- Electric motors
- Industrial automation
- Safety applications

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GMR based angle sensors

TLE5014(D)

Digital GMR sensor with an easy-to-use plug-and-play concept for highest functional safety applications

All XENSIV™ TLE5014 angle sensors are available as single and dual die products. The products come pre-configured and pre-calibrated as plug-and-play sensors and are easy to use. Customers can choose between the interfaces SENT, PWM, SPC, and SPI.

On top of those protocol options, the sensors can be adapted to any kind of application setup via their programmable E²PROM interfaces. TLE5014 magnetic angle sensors meet ISO 26262 ASIL C for the single die and ISO 26262 ASIL D for the dual die versions.

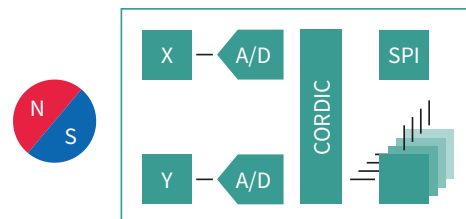
Features

- Easy-to-use, plug-and-play sensors, pre-configured and pre-calibrated
- Offering high flexibility:
 - Available as single and dual die products
 - 12-bit digital interface with protocol options PWM, SENT, SPC and SPI
 - E² PROM and look-up table for customer configuration and calibration
- High angle accuracy: max. 1.0° over temperature and lifetime
- High voltage capability up to 26 V
- Development fully compliant with ISO 26262
 - Developed acc. ASIL D level
 - Dual die sensors reaching ASIL D, single die sensors ASIL C metrics
- Safety manual and safety analysis summary report available on request

Applications

- Steering angle sensing (SAS)
- Motor commutation
- Rotor position measurement
- Pedal position
- Safety applications
- Any other kind of high-accuracy position measurement

All products are ready for applications with the highest functional safety requirements. The sensors show an extremely small angle error of less than 1° across the entire temperature profile and lifetime. This is particularly helpful in applications with the need for very accurate position sensing such as steering angle sensing or motor commutation. Further application areas range from rotor position measurement, electric power steering (EPS), pedal position to any other kind of position measurement.



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GMR based angle sensors

TLE5012B(D), TLI5012B

GMR sensor with integrated angle calculation and multiple interfaces

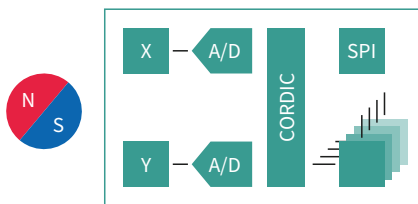
Features

- Integrated angle calculation with CORDIC algorithm
- 15-bit representation of calculated angle value
- High update rate up to 43 μ s (23 kHz)
- Range of selectable interfaces
- SPI compatible Synchronous Serial Communication (SSC)
- Bi-directional communication up to 8 Mbit/s
- Pulse Width Modulation (PWM)
- Hall Switch Mode (HSM) for motor commutation
- Incremental Interface (IIF)
- Temperature compensation and auto-calibration algorithm
- Diagnostic function for sensor elements and circuitry with PRO-SIL™ support
- Dual die SMD package (redundancy)
- ISO 26262-ready
- Available as single and dual die product
- Industrial version TLI5012B in line with JEDEC JESD47



Applications

- Steering angle
- Brushless DC motor commutation, i.e. electric power steering (EPS)
- Rotary switches
- General angular sensing
- Incremental or absolute magnetic encoders
- Gimbals, drones, robots



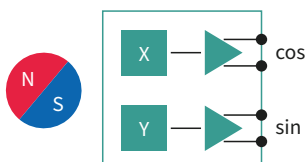
AMR based angle sensors

TLE5109A16(D)

Analog AMR sensor with temperature compensation

Features

- Features a differential or single-ended analog interface for sine and cosine values
- Internal temperature drift compensation for gain and offset
- Also available as a dual-sensor package
- ISO 26262-ready
- Available as single and dual die product



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www.infineon.com/angle-sensors

Combined AMR and GMR based angle sensors

TLE5309D

Dual angle sensor combining AMR and GMR technology

The TLE5309D is a diverse redundant angle sensor with analog outputs. It combines a Giant Magneto Resistance (GMR) sensor for full 360° angle range with an Anisotropic Magneto Resistance (AMR) sensor for high precision in a flipped configuration in one package. Sine and cosine angle components of a rotating magnetic field are measured by Magneto Resistive (MR) elements. The sensors provide analog sine and cosine output voltages that describe the magnetic angle in a range of 0 to 180° (AMR sensor), and 0 to 360° (GMR sensor), respectively.

Summary of features

- Separate supply pins for AMR and GMR sensor
- Diverse redundant design with one GMR sensor (top die) and one AMR sensor (bottom die) in one package
- Low current consumption and very fast start up
- 360° contactless angle measurement
- Immune to air gap variations due to MR based sensing principle
- Operating ambient temperature:
 - 40 ... +125°C/-40 ... +150°C (TLE5309DHT)

Potential applications

The TLE5309D angle sensor is designed for angular position sensing in safety critical automotive applications. Its high accuracy and 360° measurement range combined with short propagation delay makes it suitable for systems with high speeds and high accuracy demands such as brushless DC (BLDC) motors for actuators and electric power steering systems (EPS). At the same time its fast start-up

The differential MR bridge signals are independent of the magnetic field strength, and the analog output is designed for differential or single ended applications.

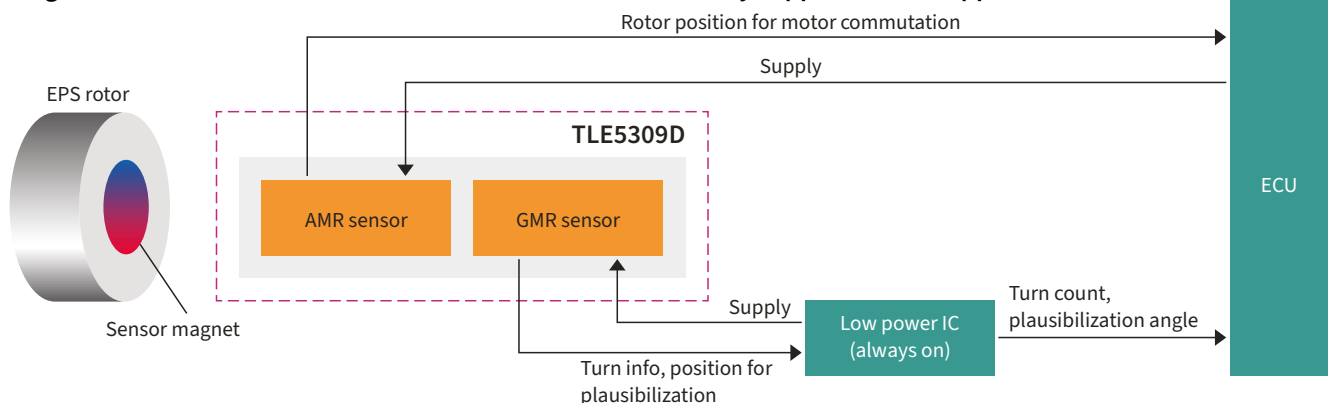
The output voltages are designed to use the dynamic range of an A/D-converter using the same supply as the sensor as voltage reference. Both sensor ICs are supplied independently by separate supply and ground pins.



time and low overall power consumption enables the device to be employed for low-power turn counting. Extremely low power consumption can be achieved with power cycling, where the advantage of fast power on time reduces the average power consumption.

- BLDC motors for electric power steering (EPS)
- Low-power turn counter

Diagnostic functions in combination with AMR and GMR diversity supports ASIL D applications



Click here to learn more:

www.infineon.com/angle-sensors



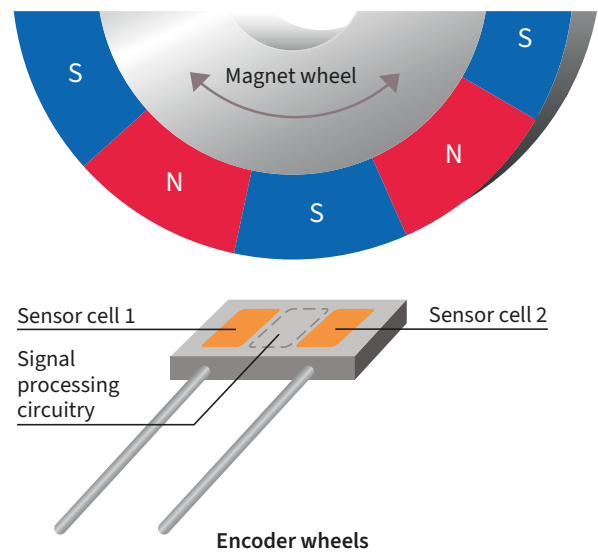
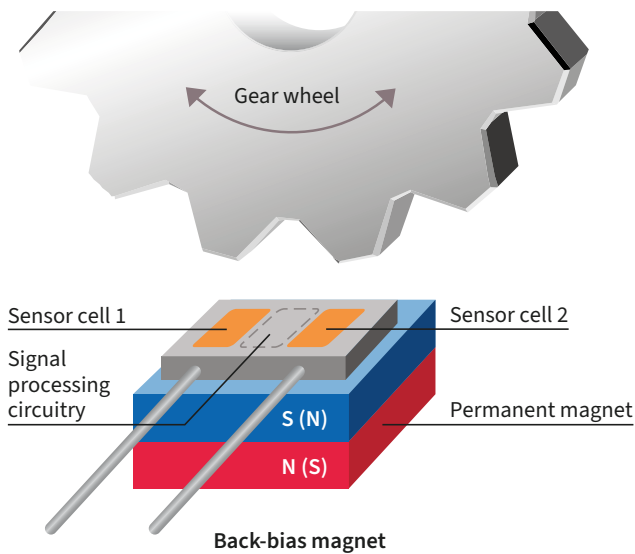
Magnetic speed sensors

Easy to use, robust and cost-effective sensors for speed measurement

Infinion’s Hall-, GMR- and TMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as speedometers, ABS, camshafts/crankshafts, and automatic transmissions. They are also used in similar applications in the industrial sector. The sensors use a ferromagnetic gear tooth

or encoder structure to measure linear or rotational speed and position. Hall sensor measuring rotational speed with a gear tooth and a magnetic encoder wheel. The majority of sensors also feature additional benefits such as integrated capacitors for high EMC robustness and the highest levels of ESD protection.

Typical application of a magnetic differential sensor



 [Click here to learn more: www.infineon.com/speed-sensors](http://www.infineon.com/speed-sensors)

TLE4922

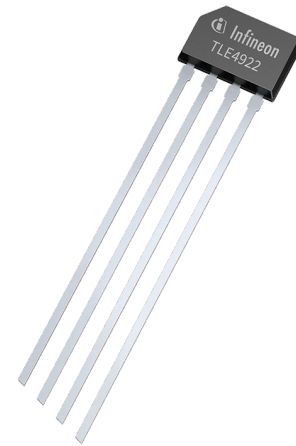
Highly robust, easy-to-use mono-Hall speed sensor with twist-independent mounting

This sensor is specially designed to provide an easy-to-use, robust and cost-effective solution for vehicle or industrial speed sensing applications. The TLE4922 can therefore, be back-biased using a simple, low-cost bulk magnet, while

providing a good air gap performance and switching accuracy. Its hidden adaptive hysteresis and calibration algorithm enable good accuracy over air gap jumps and immunity to vibration and run-out events.

Features

- Large operating air gap capability
- Flexible mounting (also known as twist-independent mounting)
- Hidden adaptive hysteresis
- Low current consumption
- Reverse magnetic polarity capability
- Advanced protection technology
 - Reverse voltage protection at VS-pin
 - Short-circuit protection
 - Overtemperature protection
- Wide operating temperature ranges of $-40^{\circ}\text{C} \leq T_j \leq \pm 150^{\circ}\text{C}$
- High ESD robustness up to ± 4 kV HBM
- 3-wire PWM voltage interface



Applications

- Industrial applications
- Two-wheeler and automotive vehicle speed

TLE4927C E6547

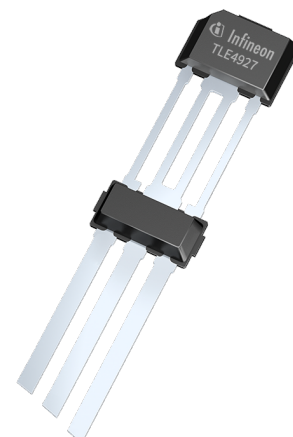
Differential Hall effect crankshaft sensor with hidden adaptive hysteresis

Infineon's TLE4927C detects the motion and position of ferromagnetic and permanent magnet structures by measuring the differential flux density of the magnetic field. A self-calibration mode ensures optimum accuracy in running mode in just a few transitions after

start up. The sensor combines a fast power up time with high accuracy and sensitivity for large operating air gaps. Qualified for automotive temperature range and meets the requirements of harsh environmental conditions prevalent in automotive applications. The TLE4927C comes with the SSO package with two integrated capacitors.

Features

- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Easy to use single chip solution in SSO-3-92
- Symmetrical switching point in the middle of the tooth/magnetic pole
- South and north pole pre-induction possible
- Digital output signal (voltage interface)
- Fast start-up time
- Reverse voltage protection at V_s -pin
- Short-circuit and over temperature protection of output
- Automotive operating temperature range



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TLE4929

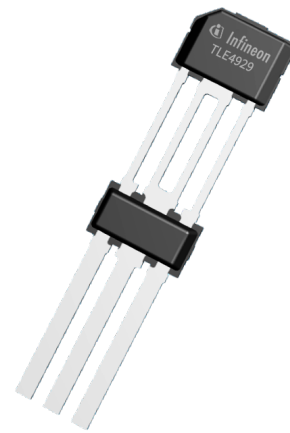
Fully programmable crankshaft sensor with direction detection

The TLE4929 is an active differential Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as a speedometer or any speed sensor with excellent accuracy and low jitter capabilities. It as well addresses new requirements for crankshaft speed sensing from hybrid powertrains. An advanced vibration detection algorithm ensures valid sensor data for any hybrid powertrain traction. This improves efficiency of the engine start

and helps to avoid misfiring or ECU error messages caused by wrongly calibrated sensor data. Also, the compatible 3-pin-package allows a one-to-one-replacement of the former generation of crankshaft sensors without direction detection, TLE4924/25/26/27/28, widely backward compatible functionality through flexible EEPROM configuration of parameters, means former TLE492x-family can be mimicked.

Features

- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Ease of use single chip solution in SSO-3-52
- Switching point in the middle of the tooth enables backward compatibility
- Robustness over magnetic stray-field due to the differential sensing principle
- Precise miss fire detection through excellent jitter performance
- Dedicated hybrid engine algorithm keeps combustion engine calibrated during an electric drive cycle
- Digital output signal with programmable output-protocol including diagnosis interface
- Direction detection and stop-start-algorithm
- High accuracy and low jitter
- High sensitivity enables large air gap
- End-of-line programmable to adapt engine parameters
- Can be used as a differential camshaft sensor
- Pre-programmed version TLE4929C-XAN available, TLE4929C-X2A available for 2-wheeler applications
- Automotive operating temperature range



Product	Sensor technology	Classification	Direction detection	Automotive	Industrial	Protocol	RoHS
TLE4922	Mono-Hall	AEC-Q100	–	☐	☐	Single pulse	☐
TLE4927	Differential Hall	AEC-Q100	–	☐	☐	Single pulse	☐
TLE4929	Differential Hall	AEC-Q100	☐	☐	☐	PWM, Single pulse	☐



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Safety first – wheel speed sensors

Nowadays, wheel speed sensors have to support an ever-growing list of applications. Years ago, ABS systems simply needed to know if a wheel was blocked, and then ESC used the accurate speed of all four wheels for its corrections. Since then, an increasing number of modules in the car take the wheel speed into account for their intelligent functions. The electrical parking brake, for example, needs to know about every inch a car moves when it's supposed to be stationary, and iTPMS uses sophisticated algorithms to determine if a wheel lacks air pressure, and even the central locking locks the doors after a couple of meters and the radio turns up the volume in line with increasing speed. All of the above rely on accurate information from the wheel speed sensor.

TLE4941plusC / TLE4942-1C / TLE4943C My car, how fast and far does it drive?

The TLE4941plusC, our bestseller is an industry standard for wheel speed sensing. TLE4942-1C and TLE4943C are complementing this sensor with additional direction information using PWM or AK protocol, respectively.

Features

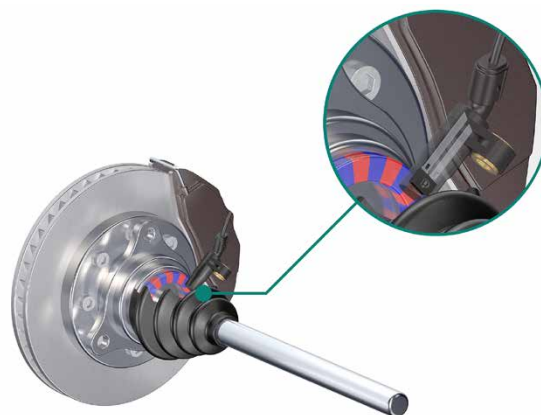
- Family of Hall sensors available with and without direction detection
- Excellent stray field robustness

Applications

- Pole wheel applications
- Steel/tooth wheel applications by using back bias magnet

Applications

- Wheel speed sensing in automotive applications
- Antilock braking systems (ABS)
- Electronic stability programs (ESP)
- Automatic transmissions
- iTPMS TLE5041plusC, TLE5045iC and TLE5046iC



As a single chip sensor it magnetically measures the cars wheel speed with its differential Hall technology, making it the ideal all-purpose sensor, equally suitable for pole wheel and steel wheel applications. These sensors are immune towards any kind of undesired magnetic stray fields, ferromagnetic particles or other disturbances, because of their differential principle.



Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE4941plusC	Hall differential	☐	☐	ISO 26262-compliant	–	Standard	–
TLE4942-1C	Hall differential	☐	☐	ISO 26262-compliant	☐	PWM	–
TLE4943C	Hall differential	☐	☐	–	☐	AK	–

PRO
SIL

ISO 26262
compliant



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TLE5045iC / TLE5046SiC

High end GMR wheel speed sensors

The TLE5045iC/TLE5046SiC is our next generation wheel speed sensor family, based on GMR technology. The family consists of a designed-to-cost speed-only TLE5045iC, and a high-end TLE5046SiC providing not only direction detection but also offering true “zero-speed” capability as well as possibilities of

Features

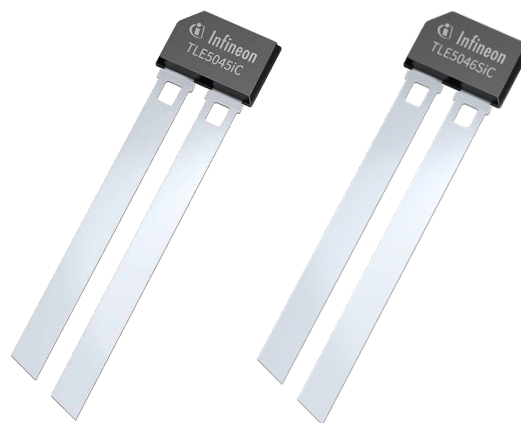
- One family of speed sensors for all wheel speed sensing applications in same package
- Best in class in sensitivity, jitter and duty cycle, independent from magnetic target wheel
- “Zero speed” capability
- ISO 26262-compliant ASIL B development, supporting ASIL D systems
- Multiple protocol variants with and without self-diagnosis functionality
- Integrated circuitry for improved EMC and ESD robustness even without external capacitor

Applications

- Pole wheel applications
- Autonomous driving (e.g. park assist)

self-diagnostics.

TLE5045iC and TLE5046SiC are developed according ISO 26262 to fulfill ASIL B, supporting ASIL D systems. The TLE5046SiC with direction detection is available with PWM or AK protocol.



Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE5045iC	iGMR differential	☐	–	ISO 26262-compliant	–	Standard	☐
TLE5046SiC-PWM	iGMR differential	☐	–	ISO 26262-compliant	☐	PWM	☐
TLE5046SiC-AK	iGMR differential	☐	–	ISO 26262-compliant	☐	AK	☐



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TLE4953C

Two-wire transmission speed sensor

The differential Hall sensor TLE4953C can detect direction and was developed specifically to meet the needs of high-end transmission applications. Its jitter performance and high sensitivity enables designers to create high-accuracy systems with excellent vibration suppression. Adaptive hysteresis and the dynamic

Features

- Detection of rotation direction
- Highly accurate speed measurements from zero to 12 kHz over large operating air gaps
- Excellent vibration suppression
- Broad operating temperature range
- AEC-Q100 qualified

Applications

- Automatic transmission systems
- Industrial speed sensing using current interface

TLE4955(C)

Leading the way in vibration robustness

TLE4955 family of differential Hall sensors specially designed to meet the latest requirements in transmission vibration suppression. It provides best-in-class vibration suppression for applications, that require a two-wire current interface. The TLE4955 family provides

Features

- Detection of rotation direction
- Best-in-class vibration suppression
- Highly accurate speed measurements from zero to 12 kHz over large operating air gaps
- Broad operating temperature range
- Four different interface protocols
- AEC-Q100 qualified

Applications

- Automatic transmission systems
- Industrial speed sensing using current interface

self-calibration algorithm ensure outstanding measurement results with both fine and coarse target wheels. As with other Infineon speed sensors, the south and north poles can be pre-inducted. TLE4953 features a current interface and comes in a two-wire package with an integrated 1.8 nF overmolded capacitor for improved EMC.



a similar algorithm plus dynamic self-calibration, jitter and sensitivity levels as our proven TLE4953, thus ensuring accurate speed measurements in the harshest of environments for both fine and coarse target wheels. Designers can choose different interface protocol versions.



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TLE4959C, TLE4959C-FX

State-of-the-art three-wire transmission speed sensor with direction detection

With our TLE4959 you now can also address your 3-wire applications with the latest state-of-the-art technology of IFX transmission sensors. Differential Hall sensor TLE4959 is your choice when you need a 3-wire-sensor with direction detection and active vibration suppression. Beside it's outstanding air gap and best of class Hall jitter performance, with it's high immunity against

strayfields it is the ideal match not only for traditional transmissions but also particularly for hybrid applications.

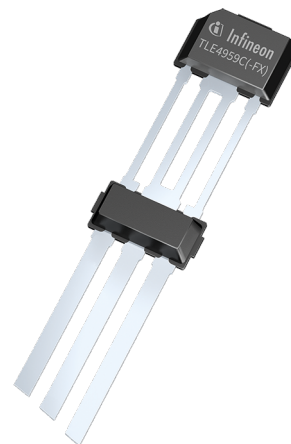
While TLE4959C is provided with the standard protocol, the FX version gives access to different protocols (e.g. speed only) as it is to be programmed at the customer's premises.

Features

- Active vibration suppression
- Highly accurate speed measurements from 0 Hz to 10 kHz over large operating air gaps (up to 20 k for -FX)
- Common three-wire voltage interface
- Broad operating temperature range
- AEC-Q100 qualified
- FX version customer programmable (protocol, hysteresis level)

Applications

- Automatic (hybrid) transmission systems



TLE4959-5U, TLE4959-5U-FX

State-of-the-art 4-wire transmission speed sensor with direction detection

XENSIV™ TLE4959-5U and TLE4959-5U-FX are 4-wire voltage interface differential Hall speed sensors for transmission speed applications with vibration suppression and direction detection output. The FX version flexible in terms of protocol, it offers customer programmable EEPROM.

integrated differential Hall speed sensor ideally suited for transmission applications. Its basic function is to provide rotational speed and direction of rotation information to the transmission control unit. Sophisticated vibration suppression with excellent air gap performance. TLE4959-5U (FX) includes a sophisticated algorithm which actively suppresses vibration while keeping excellent air gap performance.

State-of-the-art 4-wire transmission speed sensor with direction detection. The TLE4959-5U (FX) is an

Features

- Voltage interface
- Active vibration suppression
- Direction detection output
- Dynamic self-calibration
- 0 Hz capability
- FX: flexible protocol through customer programmable EEPROM

Target applications

- Automatic transmission applications
- Transmission applications with speed with direction detection



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TLE4983 / TLE4984

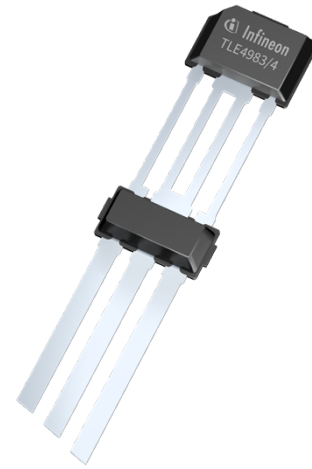
Mono-Hall based camshaft speed and position sensors

The TLE4983C, TLE4984C are active Hall sensors ideally suited for camshaft applications in automotive. Its basic function is to map either a tooth or a notch of a gear into a unique electrical output state, while the magnetically bipolar TLE4983C can map also a magnetic encoder wheel. The implemented electrical trimming option for post-fabrication trimming sets the sensor's switching

Features

- True power on functionality (TPO)
- Programmable switching points
- Pre-programmed temperature coefficient for SmCo back-bias magnet
- Single chip solution in SSO-3-9 package
- Twist independent mounting (TIM) for larger fabrication tolerances
- Advanced performance by dynamic self-calibrating principle
- High accuracy and high stability of the magnetic switching points
- High resistance to mechanical stress
- Digital output signal (voltage interface)
- Short-circuit protection
- Enhanced ESD performance
- AEC-Q100 qualified

points. This ensures its true power on capability (TPO) even in the case of production spreads such as different magnetic configurations or misalignment. Additionally, a self-calibration algorithm has been implemented to achieve optimum accuracy during normal running operation. The TLE4984C/83C come in a three-pin package SSO-3-9 that has two integrated capacitors for enhanced EMC and micro break performance.



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TLE4986

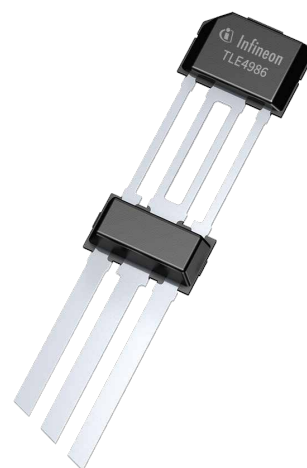
Mono-Hall based camshaft speed and position sensor

The TLE4986C is an active Hall sensor ideally suited for camshaft applications and similar industrial applications such as speedometer. Its basic function is to map either a tooth or a notch into a unique electrical output state. It has an electrical trimming option for post-fabrication trimming in order to achieve true power on (TPO) capability even in the case of production spreads

Features

- Hall switching sensor to measure speed or phase of pole/tooth wheels
- Digital output signal (voltage interface)
- Mono-cell chopped Hall system
- TPO true power on functionality
- TIM twist independent mounting
- Dynamic self-calibrating algorithm
- IST individual switching threshold
- End-of-line programmable switching points
- EEPROM for various algorithm options
- TC of back-bias magnet pre-programmed
- High resistance to mechanical stress
- Enhanced immunity against ESD and EMC
- Improved μ -cut capability
- Enhanced operating temperature range
- Module package SSO-3-52

such as different magnetic configurations or misalignment. Additionally, a self-calibration algorithm has been implemented to achieve optimum accuracy during normal running operation, which by its EEPROM is adaptable in various performance affecting parameter. It comes in a three-pin SSO-3-52 package for the supply voltage and an open drain output.



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TLE4988C

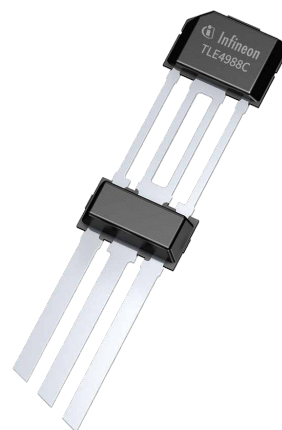
Mono-Hall based camshaft speed and position sensor with reduced dependence on rare-earth backbias magnets

The Infineon XENSIV™ TLE4988C products feature advanced camshaft sensing performance and improved application adaption. One major benefit of the advanced sensor performance is the reduced dependence from rare-earth backbias magnets for module manufacturers. The TLE4988C has proven right performance with a ferrite backbias magnet for all relevant parameters such as phase jitter, phase accuracy or speed effect across key temperature, air gap and rpm ranges. With automatic in car TPO calibration

a most accurate start up sensing in real application environment is ensured addressing tolerances of ferromagnetic wheels and magnetic encoders, as well as mounting tolerances of the sensor. Infineon's TLE4988C products are available optimized for the use with three different backbias magnet materials, such as Fe, SmCo and NdFeB. All products come inside the well-established camshaft sensor package SSO-3-52, allowing low design switch effort in terms of package and performance compatibility with predecessor products.

Features

- Digital output signal (voltage interface)
- True power on functionality (TPO)
- Auto TPO – automatic in car calibration
- Improved switching level/phase accuracy
- TC range including ferrite
- High speed digital interface for diagnosis / test
- Twist independent mounting (TIM)
- EEPROM for algorithm options and ID
- Increased ESD and EMC immunity, improved μ Cut feature
- Digital magnet temperature compensation
- Mechanical stress compensation
- Module package SSO-3-52



Product	Sensor technology	Magnet TC	Automotive	Industrial	Protocol	RoHS
TLE4983	Mono-Hall	SmCo	<input type="checkbox"/>	<input type="checkbox"/>	Single pulse	<input type="checkbox"/>
TLE4984	Mono-Hall	SmCo	<input type="checkbox"/>	<input type="checkbox"/>	Single pulse	<input type="checkbox"/>
TLE4986	Mono-Hall	SmCo	<input type="checkbox"/>	<input type="checkbox"/>	Single pulse	<input type="checkbox"/>
TLE4988	Mono-Hall	SmCo, NdFeB, Fe	<input type="checkbox"/>	<input type="checkbox"/>	Single pulse	<input type="checkbox"/>



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TLE5555iC(B)

State-of-the-art TMR transmission speed sensor for pole/toothed wheel in top/side read configuration with/without back-bias magnet

The TLE5555iC is a differential magnetic speed sensor based on tunnel magnetoresistive (TMR) sensing technology. This technology enables best-in-class jitter and air gap performance and allows sensing flexibility in top and side read configuration. Its basic function is providing information about the rotational speed and the direction of the rotation to the transmission control unit. Therefore, the sensor family includes a sophisticated algorithm which actively suppress vibration. The output has been designed as a two-wire current interface based on a PWM (pulse width modulation) principle. The TLE5555iC operates without external components and is fully EMC-compliant thanks to its capacitor integrated on silicon level.

Features

- High magnetic field sensitivity enables ultra-low jitter over high operating air gap range
- Two wire PWM current interface
- Direction detection
- Vibration suppression (active via protocol suppression; passive via adaptive hysteresis)
- Differential sensing principle enables magnetic stray field robustness
- Equipped with sintered ferrite back-bias magnets and algorithm optimized for toothed wheel applications
- Package options for top and side read mounting make bending of sensor leads obsolete
- EMC robust without the need of capacitors on sensor leads
- Comprehensive digital diagnostic interface, enabling readout of internal signals and electronic chip ID
- Customer configurable EEPROM in FX version

Potential applications

- Ideal for the use in harsh environments, particularly automotive transmissions
- Suitable for all kinds of transmission systems including DHT (dedicated hybrid transmission) and EV (electric vehicle) concepts

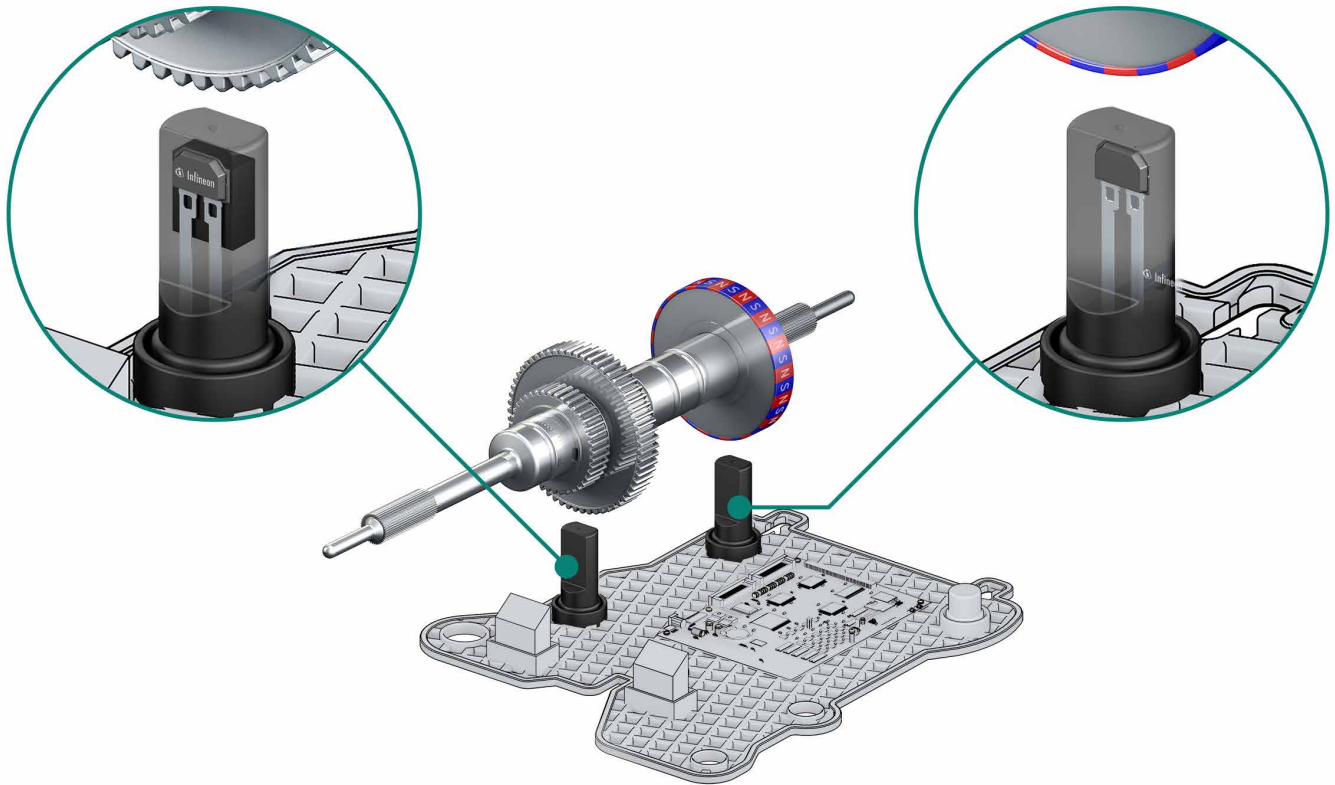
The "iCB-top" family members are designed for toothed wheel applications and have a ferrite back-bias magnet attached. It comes in a RoHS compliant two-pin-package, qualified for automotive usage. It is recommended to use the iCB-top within an overmolded module. For magnetic encoder (ME) applications, other sensors – called ME family – are available.

High flexibility is offered by the FX version which provides a programmable EEPROM. This sensor offers many protocol options established in transmission applications over the last decades. Additionally, it offers to configure the sensor algorithm (e.g. magnetic threshold, vibration robustness) to fully optimize the sensor performance to the target wheel.



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Available variants

Product	Description	Classification	SP Number	Package
TLE5555iC ME E0	For polewheel (top + side-read), E0 protocol	ISO 26262-compliant	SP003883456	SSO-2-51
TLE5555iC ME E1	For polewheel (top + side-read), E1 protocol		SP005832719	SSO-2-51
TLE5555iC ME E4B	For polewheel (top + side-read), E4B protocol		SP005829763	SSO-2-51
TLE5555iCB E0-top	For steelwheel (top-read), E0 protocol, incl. backbias magnet		SP003883500	SSOA22-2-51
TLE5555iCB E1-top	For steelwheel (top-read), E1 protocol, incl. backbias magnet		SP005401486	SSOA22-2-51
TLE5555iCB E4B-top	For steelwheel (top-read), E4B protocol, incl. backbias magnet		SP005832705	SSOA22-2-51



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Pressure sensors

For automotive, industrial and consumer applications – ensure the perfect fit for all performance and integrity needs

Infineon XENSIV™ pressure sensors measure the pressure of air and gases across various industries and applications. In their function as a pressure transducer sensor, they convert physical pressure into an electric signal. Infineon XENSIV™ pressure sensors combine the functions of sensing (via a pressure sensor element) and conversion into an electrical signal (via an absolute pressure transducer and signal processing) in one integrated silicon device.

The sensor element and its integrated circuits (IC) are the heart of pressure sensor technology. Infineon's small pressure sensor IC chips support various applications with best-in-class performance. Infineon is one of the world's largest semiconductor pressure sensor and transducer manufacturers, thanks to a varied portfolio of absolute air pressure sensor ICs. Our comprehensive family of XENSIV™ sensors includes a wide selection of pressure-sensitive sensors tailored specifically to the automotive, consumer and industrial sectors. XENSIV™ sensors are compact, designed to save energy, and offer a rapid time-to-market – a perfect fit for any performance and integrity need.



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Infineon XENSIV™ BAP sensors are calibrated for specific automotive applications, especially for BMS thermal runaway detection, pneumatic seats and electronic engine control. The BMS sensors are ISO 26262-compliant and support highest ASIL requirements on system level.



Powertrain systems have to fulfill the constantly increasing stringent media requirements. Environmental legislation aims to deliver cleaner air by ensuring a steady global decrease in CO₂ emissions. Thanks to their accurate measurement capability, Infineon MAP and turbo MAP product with analog or digital interface enable engines to meet these requirements.



Typical safety-related automotive pressure sensing applications such as side impact and pedestrian protection call for the highest quality and accuracy standards with full ISO 26262 compliance. Every year thousands of pedestrians are severely injured in traffic due to slow or failing sensing elements. Our Infineon XENSIV™ safety pressure sensor family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for safety-critical use cases. Our sensors support new safety systems, increasing the protection of pedestrians and car occupants in the event of a collision.



Infineon's tire pressure sensors perform all of the functions necessary to implement a state-of-the-art module for a Tire Pressure Monitoring System (TPMS). As part of our XENSIV™ pressure sensors portfolio, our SP49 TPMS sensor ICs are easy to integrate and feature a microcontroller, sensors, wireless communication, and convenient peripherals. They only need a few passive components and a battery to complete a full automotive TPMS sensor assembly.



Our family of digital barometric pressure sensors also gives designers the best choice when it comes to mobile and wearable devices. Highlights include small form factors to facilitate system integration, highest precision and relative accuracy over a wide temperature range, fast read-out speeds via the serial I²C/SPI interface, and low power consumption to ensure longer battery lifetimes.



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Absolute pressure sensors (MAP and BAP)

Highest accuracy and precision on the smallest footprint and energy bill

Infineon's pressure sensors offer the highest quality and accuracy for safety-relevant automotive, industrial, or consumer lifestyle applications. Typical safety-related automotive pressure sensing applications such as side-impact and pedestrian protection call for the

highest quality and accuracy standards with full ISO 26262 compliance. Our XENSIV™ family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for a safety-critical use case.



Click here to learn more:

www.infineon.com/bap-map-pressure

KP21x / KP22x – Analog manifold air pressure sensor family (MAP + turbo MAP)

Features

- Manifold air pressure measurement – MAP and turbo MAP
- Excellent accuracy of up to 1.0 kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated over pressure and temperature
- Pressure range from 10 to 400 kPa
- Temperature range from -40 to +140°C
- Output clamping (optional)
- Complete product family available with multiple transfer function
- Reverse polarity protection
- Green SMD package



KP23x – Analog barometric air pressure (BAP) sensor family

Features

- Absolute air pressure measurement
- Excellent accuracy of 1.0 kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated across pressure and temperature range
- Pressure range from 15 to 165 kPa
- Temperature range from -40 to +125°C
- Serial service interface
- Open bond detection (OBD) for supply and GND
- Reverse polarity protection
- Green SMD package

KP276 – Media robust MAP sensor with digital interface

Features

- Media robustness for current automotive requirements
- Digital single edge nibble transmission (SENT) interface (282 clock ticks)
- Excellent accuracy of ±0.77% FSS
- Temperature range -40 to +170°C (170°C for 20 min. max., 150°C operating)
- Integrated NTC temperature sensor functionality with fast start up time (typ. 10 ms)
- Green SMD package

Integrated pressure sensor ICs for manifold and barometric air pressure

Product	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial	Classification	Pressure range [kPa]
KP21x	1.0	140	☐	☐	–	10 ... 150
KP22x	2.5	140	☐	☐	–	10 ... 400
KP23x	1.0	125	☐	☐	–	15 ... 115
KP236N6165	1.0	125	☐	☐	–	60 ... 165
KP276	3.0	150 (170 time limited)	☐	☐	–	10 ... 400



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www.infineon.com/bap-map-pressure

KP46x – Digital barometric air pressure family in new DFN-8 package

Features

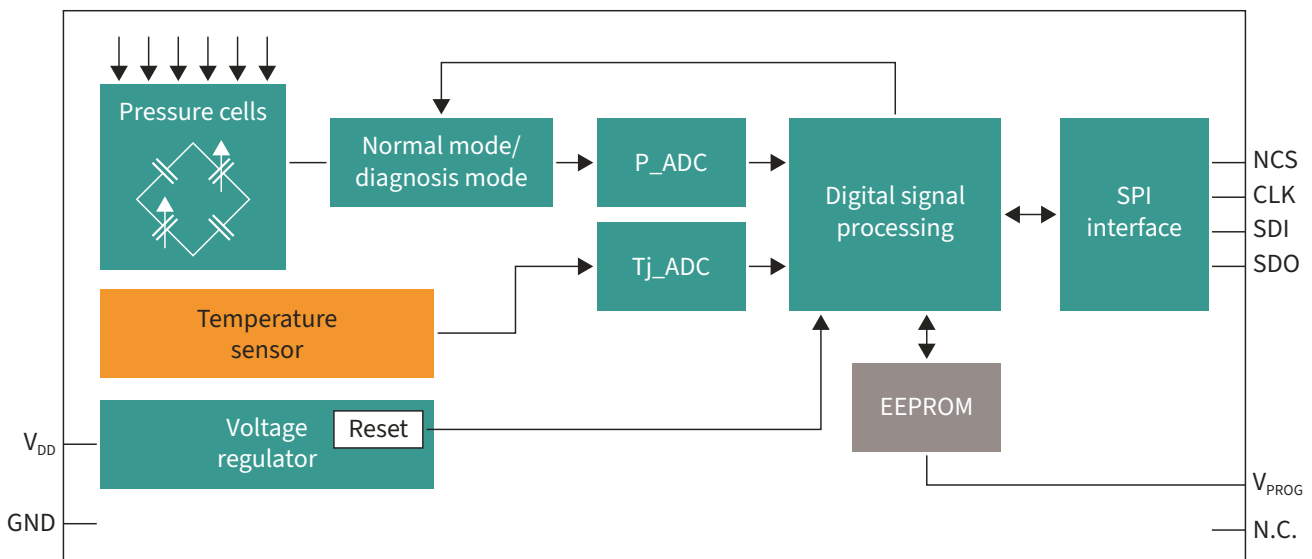
- High accuracy pressure sensing
- Pressure range according to different application needs:
 - ECU/MAF (40–115 kPa)
 - Pneumatic seats (60–165 kPa)
 - BMS thermal runaway (45–200 kPa)
- ISO 26262 compliance for KP467 (ASIL B)
- Operating ambient temperature range -40 ... +125°C, KP467 up to 105°C
- Best-in-class low power consumption with dedicated power-down mode for energy saving
- 10-, 12- or 14-bit resolution pressure and temperature values via SPI interface and backwards compatibility to legacy devices KP25x and KP264
- KP467 with autonomous low-power monitoring (LPM) feature for pressure event detection and host wake-up
- Integrated signal path diagnosis features
- Green, small 4.5×5.1 mm 8-pin DFN package for all KP46x



Applications

- KP464/KP464E for ECU and mass airflow sensing to control fuel supply and injection, for air management and ignition
- KP465 for higher pressure levels e.g. within compressed air in fuel-cell applications
- KP466 for pneumatic seat comfort application
- KP466P for pneumatic seat comfort application and thermal runaway detection in battery management system for xEVs
- KP467 for thermal runaway detection in battery management system for xEVs

Block diagram KP46x



Product	Operating pressure range [kPa]	P-accuracy -40°C [kPa]	P-accuracy 0 ... +85°C [kPa]	P-accuracy +125°C [kPa]	T-accuracy +25 ... +85 [°C]	Supply current I _{VDD} [mA]	Supply current power down I _{VDD_PD} [µA]	Classification
KP464	40 ... 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP464E	40 ... 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP465 ¹⁾	60 ... 320	±5.0	±3.0	±5.0	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP466	60 ... 165	±4.0	±1.0	±2.0	±3	5 (without SPI comm.)	10	AEC-Q103
KP466P	60 ... 165	±1.5	±1.0	±1.5	±3	5 (without SPI comm.)	10	AEC-Q103
KP467	45 ... 200	±3.0 kPa (lifetime) ±1.5 kPa (0h) ±4 % of LPM threshold (±2 kPa max.)			±3	– 3.5 mA (on mode without SPI comm.) – typ. 50 µA (in LPM)	10	AEC-Q103 ISO 26262-compliant

1) Coming Q1/2025



Click here to learn more:

www.infineon.com/bap-map-pressure

KP497 – Advanced digital barometric air pressure and acceleration sensor

Features

- Pressure range for thermal runaway detection: 20–250 kPa
- Integrated acceleration sensor for battery shock monitoring
- ISO 26262-compliant (ASIL A)
- High accuracy pressure sensing
- Operating ambient temperature range -40 ... +105°C
- Ultra low power consumption with dedicated power-down mode for energy saving
- Autonomous low-power monitoring (LPM) feature for event detection and host wake-up



Applications

- KP497 calibrated for thermal-runaway-detection in battery management systems for xEVs by sensing critical air pressure
- Determination of the economical value of the battery over the course of its life cycle in relation to mechanical influences and shocks; with that essential part of the information for battery passport for xEVs and for reprocessing and reuse of batteries

Product	Operating pressure range [kPa]	P-accuracy [kPa]	T-accuracy [°C]	Typ. supply current power down at 25°C I_{VDD_PD} [µA]	Classification
KP497 ¹⁾	20 ... 250	±2	±3	0.24	AEC-Q100 ISO 26262-compliant

1) Coming Q1/2025



ISO 26262 compliant



Click here to learn more:
www.infineon.com/bap-map-pressure

Side Crash Detection (SAB)

KP200 / KP201 / KP204

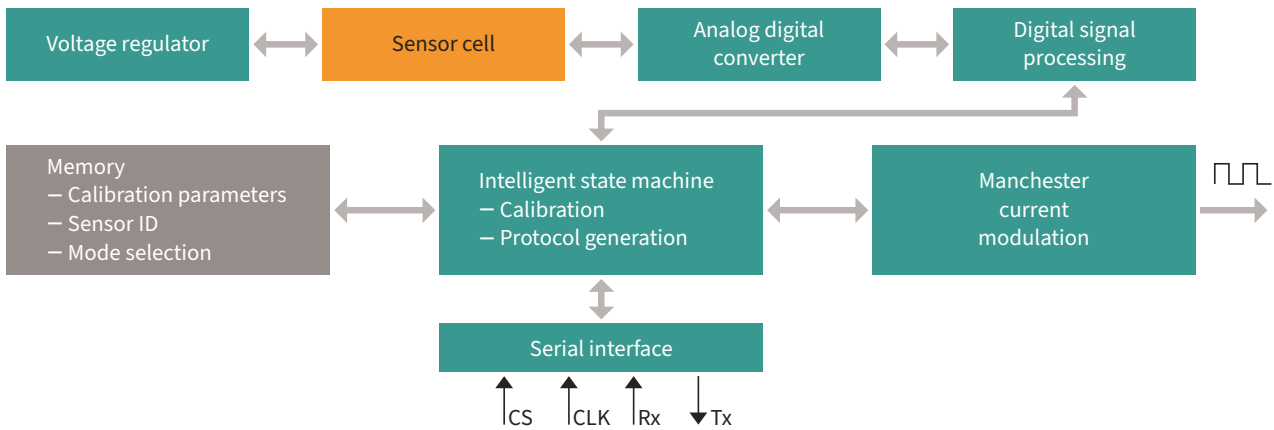
PSI5 PRO-SIL™ ready pressure sensor ICs for side crash detection and pedestrian protection

Features

- Two-wire interface with on-chip current modulator for PSI5 communication
- Fully PSI5 compliant with support for multiple modes
- Synchronous or asynchronous data transmission
- EEPROM for unique ID number, calibration and mode selection
- Serial service interface for EEPROM programming
- On-chip voltage regulator
- Reverse polarity protection
- Fully AK-LV29 and AK-LV38 compliant
- Patented on-chip diagnosis of pressure cells and circuitry
- PRO-SIL™ support in line with IEC 61508 and ISO 26262
- Green SMD package



- KP201 qualified for higher operating temperatures up to 125°C
- KP204 with 4-hole lid supporting insect intrusion protection



Integrated pressure sensor ICs for manifold and barometric air pressure

Product family KP20x	Key features of KP201 and KP204	Classification
KP200 / KP201 / KP204	KP201 qualified for higher operating temperatures up to 125°C KP204 with 4-hole lid supporting protection against insect intrusion	ISO 26262-ready



ISO 26262 ready

[Click here to learn more: www.infineon.com/sab-pressure](http://www.infineon.com/sab-pressure)

Tire pressure sensors (TPMS)

SP49 – Tire pressure monitoring sensors

The Infineon SP49 product family provides highly integrated devices which perform all functions for a wheel module of a tire pressure monitoring system (TPMS) suited for high-volume applications. The devices measure pressure in the range from 100 kPa up to 920 kPa and acceleration between -600g and 600g as well as temperature and supply voltage. Furthermore, they feature an efficient power management and an integrated microcontroller. An integrated LF receiver and RF transmitter allows wireless communication.

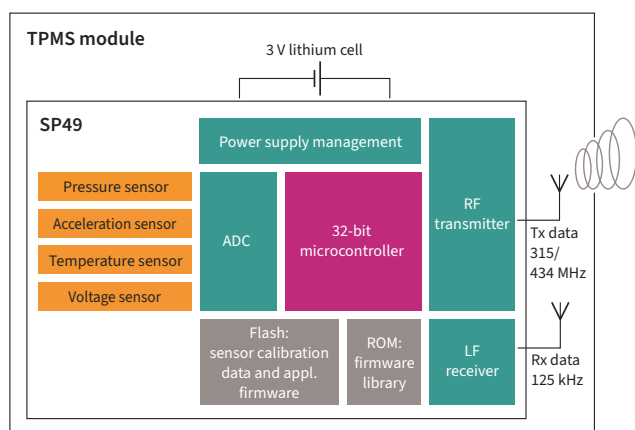
For wired data transfer, the hardware master/slave I²C interface can be used. Further wired interfaces such as UART, SPI or PWM can be realized in software. Infineon technical leadership in MEMS technology and Patented Glass-Silicon-Glass MEMS pressure sensor with best-in-class media compatibility ensures industry leading performance TPMS.

Features

Patented Glass-Silicon-Glass MEMS pressure sensor with best in class media compatibility

- Industry-standard power efficient 32-bit Arm® Cortex® 1)
- 19 kB of flash memory for the application code and/or user data storage; also usable for a bootloader
- 1 kB RAM plus 192 bytes of retention RAM
- Best in class lifetime charge consumption

1) ARM® and Cortex® are trademarks of ARM limited, UK

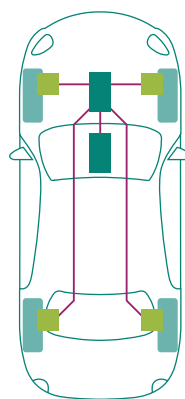


Customer benefits

Optimized for battery-powered applications, the system controller with flexible wake-up and power management, ultra-low power down current and the wide range of supply voltage ensures a long-lasting battery lifetime (for typical TPMS applications 10 years with a CR2032 battery). Together with the possibility to generate a wake-up from the integrated Interval timer, SP49 products are perfectly suited for standalone remote pressure sensing solutions demanding low charge consumption. For such applications, the LF receiver with wake-up capability and best-in-class sensitivity provides the possibility of on-demand measurements.

SP49 has the tailored ASIC which optimized for the following new intelligent tire features.

- On-tire auto-position-sensing (APS)
- Tire filling assist
- Tire burst detection
- Load detection



SP49 fully supports all necessary requirements for a tire pressure monitoring system (TPMS)

Product table

Product variant	Product name	Pressure range [kPa]	Flash size for code [kB]	Package	Ordering code
SP490-01-11	SP49	920	19	DSOSP-14-84	SP005878909
SP490-01-12	SP49i	920	19	DSOSP-14-84	SP005825051
SP49T-05-12	SP49iTruck	1600	19	DSOSP-14-84	SP005957469



Click here to learn more:

www.infineon.com/tpms-sensors

Pressure sensors for consumer and IoT

DPS368 – Digital barometric pressure sensor for mobile and wearable devices

Infineon's digital barometric pressure sensor DPS368 is the best choice for mobile and wearable devices due to its small form factor, high precision, and low power consumption. Pressure sensing is based on capacitive technology, which guarantees ultrahigh precision (± 2 cm) and excellent relative accuracy (± 0.06 hPa) over a wide temperature range. The sensor's internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The coefficients are used in the application to convert the measurement results to true pressure and temperature values. The sensor has a FIFO that can store the last 32 measurements. Since the host processor can remain in a sleep mode for a longer period between readouts, a FIFO can reduce the system power consumption. Sensor measurements and calibration coefficients are available via the serial I²C/SPI interface.

DPS368 offers the best-in-class resolution (± 2 cm), a very fast read-out speed, and low current consumption. The sensor can be used in harsh environments, as it is robust against water (IPx8 - 50 m underwater for 1 hour), dust and humidity. The small package size saves up to 80 percent of the space and makes the DPS368 ideal for mobile applications and wearable devices.



Typical applications

- Drones: altitude detection and height stability
- Health and fitness: accurate elevation gain and step counting (e.g. for smartwatches)
- Outdoor Navigation: GPS start-up time/accuracy improvement; dead reckoning (e.g. in tunnels)
- Indoor navigation: floor detection e.g. in shopping malls and parking garages
- Smart home: micro weather forecasting; room temperature control; intruder detection
- Airflow control: Smart filter replacement alarm (e.g. in home appliances); predictive maintenance
- Health care: fall detection; respiratory devices; smart inhalers

Key product features

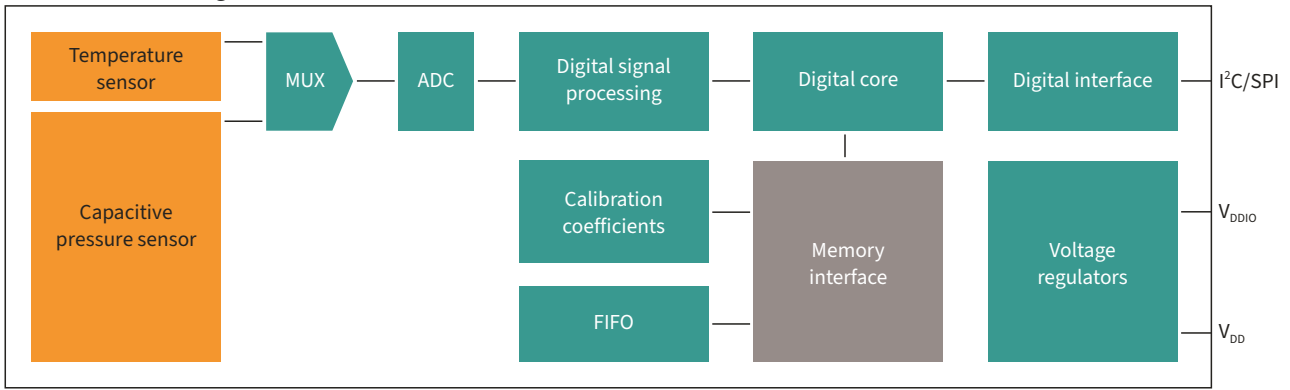
Package size	2.0 x 2.5 x 1.1 mm
Operating pressure range	300 ... 1200 hPa
Operating temperature range	-40 ... 85°C
Pressure level precision	± 0.002 hPa (or ± 0.02 m)
Relative accuracy	± 0.06 hPa (or ± 0.5 m)
Absolute accuracy	± 1 hPa (or ± 8 m)
Temperature accuracy	0.5°C
Pressure temperature sensitivity	0.5 Pa/K
Measurement time	3.6 ms (low precision); 27.6 ms (standard mode)
Average current consumption at 1 Hz sampling rate	1.7 μ A pressure measurement, 1.5 μ A temp. measurement, standby 0.5 μ A
Supply voltage	V_{DDIO} : 1.2–3.6 V; V_{DD} : 1.7–3.6 V
Operating modes	Command (manual), background (automatic), standby
Interface	I ² C and SPI, both with optional interrupt



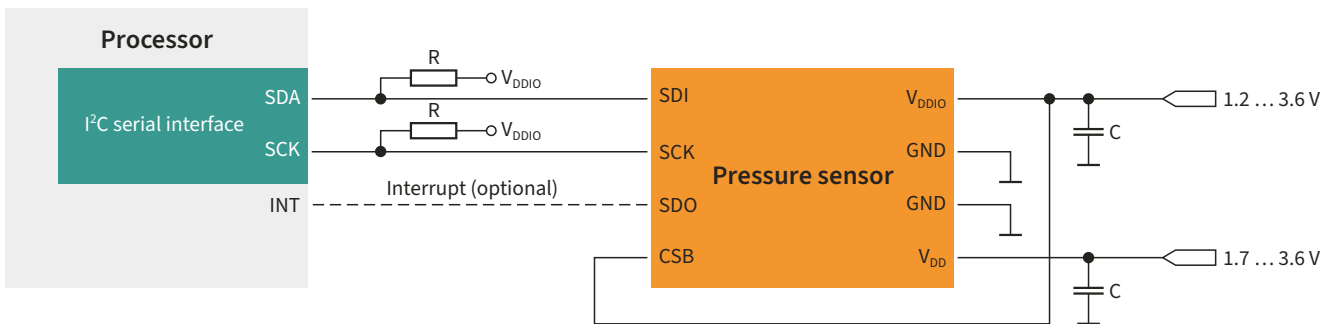
Click here to learn more:

www.infineon.com/pressure-sensors-iot

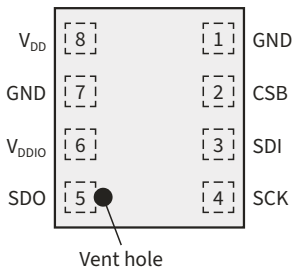
Functional block diagram



Application circuit example (in I²C configuration)



Pin configuration (top view)



Pin	Name	Function
1	GND	Ground
2	CSB	Chip select
3	SDI	Serial data in/out
4	SCK	Serial clock
5	SDO	Serial data out
6	VDDIO	Digital interface supply
7	GND	Ground
8	VDD	Analog supply

Infineon inside pressure sensor partners

Building upon its best-in-class technology, Infineon offers a full range of barometric pressure sensors as chipsets. Infineon's network of global partners offers customers a comprehensive portfolio of Infineon inside pressure sensors that will propel performance to the next level even for the most demanding applications.



Learn more about our partner program and purchase our partner solutions [here](#).



Click here to learn more: www.infineon.com/pressure-sensors-iot



MEMS microphones for consumer, industrial, and automotive applications

Infineon XENSIV™ MEMS microphones redefine a growing number of use cases

XENSIV™ MEMS microphones are setting new performance benchmarks across a growing number of industries. These innovative silicon microphones are designed to extend the benefits of the lowest possible self-noise (high SNR) and lowest distortion to an ever-expanding number of applications.

Dedicated digital and analog MEMS mics

Our digital and analog MEMS microphones for consumer applications bring a studio-quality audio experience to smartphone or earbud form factors, for instance. Our automotive-qualified solutions, on the other hand, enable the best audio performance in harsh automotive environments improving the in-cabin user experience and passenger comfort. Additionally, they enhance autonomous driving features and contribute to road safety.

MEMS for consumer and industrial applications

Infineon's XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones comprise Infineon's MEMS microphone chips and ASICs which are the world's best-selling microphone components. Due to advanced technical characteristics, high-quality standards, and robustness at the chip level,

XENSIV™ MEMS microphones add 'hearing' to many consumer applications (earbuds, headphones, wearables, smart speakers, laptops, tables, etc.) as well as in industrial and medical applications (predictive and preventive maintenance, security, patient monitoring systems, etc.). High SNR MEMS microphones play a pivotal role in AI audio applications like STT (speech-to-text), by capturing nuanced voice data.

MEMS microphones for automotive applications

We also offer high-performance MEMS microphones qualified to the AEC-Q103-003 automotive quality standard. They are suited for all applications inside and outside the car where the best audio performance in harsh automotive environments is required. The extended availability of these silicon devices matches the typical long lifecycle of a vehicle.

Typical applications include speech (hands-free/e-call/ICC), voice commands with microphone arrays and beam-forming, active and road noise cancellation, and detection of event sounds, sirens, contact, and road conditions.

The extended availability of these silicon devices matches the typical long lifecycle of a vehicle, revolutionizing the use of ATV microphones for a wide range of applications.



Click here to learn more:

www.infineon.com/mems-microphones

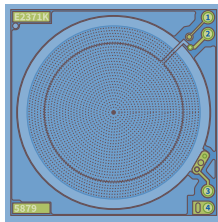
MEMS microphones technology

Infineon's XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones are comprised of

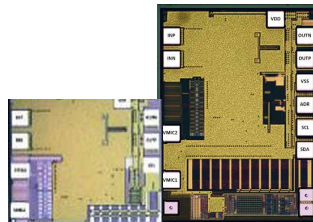
Infineon's MEMS microphone chips and ASICs which are not without reason the world's best-selling microphone components.

Infineon microphone system

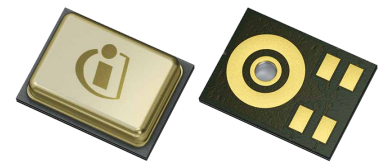
MEMS



ASIC



Package



Infineon owns all building blocks of MEMS microphones allowing to develop MEMS, ASIC and package combina-

tions which achieve the best possible performance and are optimized to each application.

Infineon XENSIV™ MEMS microphones shape the industry on the technology level

MEMS microphones use an electrically charged backplate and a membrane to form a capacitive sound transducer. The flexible membrane moves proportional to

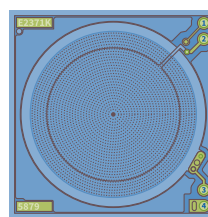
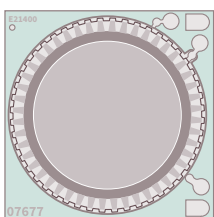
the amplitude and frequency of incoming sound waves. The resulting change in voltage is measured, processed and output by an integrated analog or digital ASIC. Infineon distinguishes two main MEMS technologies:

Single backplate technology (SBP)

Single Backplate technology (SBP) represents an industry standard for mid-end microphones with its simplicity and robustness. The SBP technology offers the best performance-to-cost ratio especially for small package sizes and SNR values up to 69 dB SNR.

Sealed Dual Membrane (SDM)

Sealed Dual Membrane (SDM) is Infineon's revolutionary MEMS microphone technology that utilizes two membranes and a charged stator to create a sealed low-pressure cavity and a differential output signal. The architecture enables ultra-high SNR (up to 75 dB SNR) and very low distortions and delivers high ingress protection (IP57) at a microphone level. Select SDM technology for best-in-class acoustic performance in medium and larger packages.



Click here to learn more:

www.infineon.com/mems-microphones

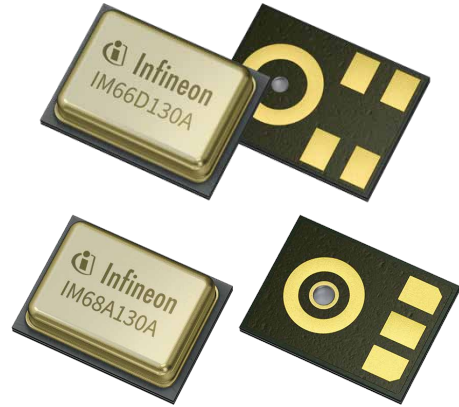
MEMS microphones for automotive applications

Qualified according to automotive standard, AEC-Q103-003

As part of our comprehensive XENSIV™ microphone family, we also offer automotive microphones, especially tested and qualified to the stringent needs of the automotive use cases. These microphones close the gap in the automotive industry, providing the best possible fit for automotive applications.

Special features and benefits of automotive qualified microphones

- Full automotive qualification according to AEC-Q103-003
- Increased operating temperature range up to +105°C ¹⁾
- Environmental robust up to IP57 ¹⁾
- Narrow sensitivity matching for enhanced performance of beam-forming arrays
- Flat frequency and stable phase response down to 7 Hz for optimal performance in acoustic noise cancellation (ANC) applications ¹⁾
- Very high AOP for high wind-noise robustness ensures



- stable performance in extremely loud environments of exterior use cases ¹⁾
- Best in class audio performance (SNR, AOP, THD) for optimum speech quality and capture of distortion-free audio signals in loud environments such as inside a car

¹⁾ Depending on selected product. See parameter table below for details.

Customer benefits of automotive qualified microphones

Cost saving	<ul style="list-style-type: none"> – Reduced re-qualification cost for Tier 1 due to minimized risk of qualification fails – Longer available parts enable platform concepts at Tier1/OEM
Quality	<ul style="list-style-type: none"> – Quality assured for the whole vehicle life by running qualification tests at three different temperatures over the full operating temperature range (-40°C ... +105°C) – Compliance with AEC-Q103 and automotive style documentation (PPAP, Qual report, ...) simplifies OEM discussions (no waivers needed)
Performance	<ul style="list-style-type: none"> – Characterization data over full temperature range provides full transparency of acoustic behavior and avoids late discrepancies – Best in class audio performance leads to increased speech intelligibility and improved satisfaction of the end user
Flexibility	<ul style="list-style-type: none"> – Extended temperature range allow flexible use in different operational areas (internal and external) and various applications – High acoustic-overload-point (AOP) allows flexible placement inside/outside the vehicle
Service and knowledge	<ul style="list-style-type: none"> – Good reputation of Infineon-Automotive simplifies product selection procedures with OEMs – Premium services with our worldwide support teams shortens the learning curve and design-in cycles – Fast FAR handling, including high traceability, facilitates efficient incident management



Click here to learn more:

www.infineon.com/mems-automotive

Parameter table: Digital microphones

Key parameters	IM67D130A IM67D120A Optimized for speech	IM66D130A IM66D120A Optimized for ANC and speech	IM64D130A IM64D121A Optimized for mid performance use cases	IM63D135A Optimized for external application
Signal-to-noise ratio (SNR)	67 dB(A)	66 dB(A)	64 dB(A)	63 dB(A)
Sensitivity	-36 / -26 dB FS	-36 / -26 dB FS	-36 / -26 dB FS	-41 dB FS
Acoustic overload point AOP (THD = 10%)	130 / 120 dB SPL	130 / 120 dB SPL	130 dB SPL	135 dB SPL
Frequency range	28 Hz ... 20 kHz	7 Hz ... >20 kHz	7 Hz ... >20 kHz	7 Hz ... >20 kHz
Package	4.0 x 3.0 mm ²	3.50 x 2.65 mm ²	3.50 x 2.65 mm ²	3.50 x 2.65 mm ²
Operating temp.	-40°C ... +105°C	-40°C ... +105°C	-40°C ... +85°C	-40°C ... +105°C
AEC-Q103-003 qualification	Yes	Yes	Yes	Yes
Environmental robustness	-	IP57	IP57	IP57
Status	Mass production	Mass production	Mass production	Coming soon (Q3/2024)

Parameter table: Analog microphones

Key parameters	Optimized for ANC	Optimized for mid performance use cases
Signal-to-noise ratio (SNR)	68 dB(A)	64 dB(A)
Sensitivity	-38 dB V	-38 dB V
Acoustic overload point AOP (THD = 10%)	130 dB SPL	130 dB SPL
Frequency range	10 Hz ... 18 kHz	10 Hz ... 18 kHz
Package	3.35 x 2.50 mm ²	3.35 x 2.50 mm ²
Operating temp.	-40°C ... +105°C	-40°C ... +85°C
AEC-Q103-003 qualification	Yes	Yes
Environmental robustness	IP57	IP57
Status	Mass production	Mass production



Click here to learn more:

www.infineon.com/mems-automotive

Typical applications for automotive MEMS microphones in-cabin and outside of the vehicle



Speech: Hands free / e-call / ICC

Enabling distortion free audio capturing for all speech related application thanks to the high SNR and low distortions.

Recommended products:

IM66D1x0A, IM68A130A, IM64D1xxA, IM64A130A

Interior



Speech: Microphone arrays / beamforming

Improved beam forming and noise suppression capabilities of microphone arrays, due to the narrow sensitivity and phase matching.

Recommended products:

IM67D1x0A, IM66D1x0A

Interior



Speech recognition / voice commands

Best speech intelligibility for speech recognition due to high SNR and low distortions.

Recommended products:

IM67D1x0A, IM66D1x0A, IM68A130A

Interior



Active and road noise cancellation (ANC / RNC)

Enabling a quiet environment for comfortable travels with best ANC performance, thanks to the flat and stable frequency and phase response at lowest frequencies.

Recommended products:

IM66D1x0A, IM68A130A

Interior



Event sound detection / siren detection

Contributing to road safety, by detecting sounds like sirens from emergency vehicles or even dangerous road conditions even thanks to the large dynamic range and high acoustic overload point.

Recommended products:

IM63D135A, IM66D130A, IM68A130A

Exterior



Voice recognition / external interaction

Allowing external interaction via voice commands and good speech intelligibility due to high SNR and low distortions (THD)

Recommended products:

IM66D130A, IM63D135A

Exterior











Click here to learn more:

www.infineon.com/mems-automotive

MEMS microphones for consumer applications

XENSIV™ MEMS microphones feature ultra-low self-noise (high SNR), extremely low distortions (THD) even at high sound pressure levels (SPL), very tight part-to-part phase and sensitivity matching, a flat frequency response with a low LFRO (low frequency roll-off) and an ultra-low group delay. Combined with selectable

power modes and their very small package size, Infineon XENSIV™ MEMS microphones are a perfect match for consumer electronics with excellent audio capturing functionalities and also for selected industrial applications such as predictive maintenance and security.


Low-noise capturing of the faintest sounds	High SNR	Wide dynamic range			Robustness	Integrated ingress protection and filters for RF suppression ensure stable performance in challenging environments
Enables best-in-class transparent hearing and active noise cancelling functionality					Low power consumption	Selectable power modes for long-lasting battery life
Low signal distortions even at high sound pressure levels	High AOP				Low part variability	Better manufacturability and performance with low group delay for multi-mic applications
Handling of high signal peaks for reliable ANC performance (e.g. concerts, traffic, tap noise)					Quality	Highest qualification standards and 100% test coverage during manufacturing

XENSIV™ MEMS product portfolio

	Infineon model	Main features	Interface	Package size [mm]	SNR	AOP (1/10%THD)	Current	Sensitivity	LFRO [Hz]
Digital	IM69D130	High SNR and high AOP	PDM	4.00 x 3.00 x 1.20	69 dB(A)	128/130 dB SPL	980 µA at 3.072 MHz	-36 dBFS	28
	IM69D120	High SNR and sensitivity	PDM	4.00 x 3.00 x 1.20	69 dB(A)	118/120 dB SPL	980 µA at 3.072 MHz	-26 dBFS	28
	IM69D127	High performance in small size	PDM	3.60 x 2.50 x 1.00	69 dB(A)	123/127 dB SPL	980 µA at 3.072 MHz	-34 dBFS	40
	IM69D128S	Ultra-low current consumption	PDM	3.50 x 2.65 x 1.00	69 dB(A)	125/128 dB SPL	520 µA at 3.072 MHz	-37 dBFS	30
	IM70D122	High SNR and sensitivity	PDM	3.50 x 2.65 x 1.00	70 dB(A)	120/122 dB SPL	980 µA at 3.072 MHz	-26 dBFS	30
	IM72D128	Ultra-high SNR	PDM	4.00 x 3.00 x 1.20	72 dB(A)	126/128 dB SPL	980 µA at 3.072 MHz	-36 dBFS	20
Analog	IM73D122	Ultra-high SNR & sensitivity	PDM	4.00 x 3.00 x 1.20	73 dB(A)	120/122 dB SPL	980 µA at 3.072 MHz	-26 dBFS	20
	IM68A130	Small package and low LFRO	Single ended	3.35 x 2.50 x 0.98	68 dB(A)	118/130 dB SPL	110 µA at 2.75 V	-38 dBV	10
	IM70A135	High SNR & high AOP	Differential	3.50 x 2.65 x 1.00	70 dB(A)	132/135 dB SPL	170 µA at 2.75 V	-38 dBV	37
	IM73A135	Ultra-high SNR & high AOP	Differential	4.00 x 3.00 x 1.20	73 dB(A)	132/135 dB SPL	170 µA at 2.75 V	-38 dBV	20

All XENSIV™ consumer microphones have bottom port. Due to SDM (Sealed Dual Membrane) XENSIV™ microphone deliver IP57 ingress protection on the component level for better manufacturability and robustness against water and dust.

XENSIV™ MEMS microphone boards

Product	Description	SP No.	OPN No.	Board
EVAL_AHNB_DIGITALV01	Digital XENSIV™ MEMS microphones evaluation board		EVALAHNB DIGITALV01 TOBO1	
EVAL_AHNB_ANALOGV01	Analog XENSIV™ MEMS microphones evaluation board	SP005568087	EVALAHNBANALOGV01 TOBO1	
EVAL_IM69D120_FLEXKIT	The flex evaluation kits allow simple and easy evaluation of XENSIV™ MEMS microphones. One microphone of the respective type is mounted on each flex board. A flex board can be easily connected to an audio testing setup with the included adapter board via a 6-position ZIF connector. Each kit includes five flex boards and one adapter board.	SP002153026	EVALIM69D120FLEXKIT TOBO1	
EVAL_IM69D130_FLEXKIT		SP002153022	EVALIM69D130FLEXKIT TOBO1	
KIT_IM68A130V01_FLEX		SP005728206	KITIM68A130V01FLEX TOBO1	
KIT_IM69D127V11_FLEX		SP005403891	KITIM69D127V11FLEX TOBO1	
KIT_IM69D128SV01_FLEX		SP005744505	KITIM69D128SV01FLEX TOBO1	
KIT_IM70A135V01_FLEX		SP005728204	KITIM70A135V01FLEX TOBO1	
KIT_IM70D122V01_FLEX		SP005826638	KITIM70D122V01FLEX TOBO1	
KIT_IM72D128V01_FLEX		SP005429924	KITIM72D128V01FLEX TOBO1	
KIT_IM73A135V01_FLEX		SP005415695	KITIM73A135V01FLEX TOBO1	
KIT_IM73D122V01_FLEX		SP005728208	KITIM73D122V01FLEX TOBO1	



Click here to learn more:

www.infineon.com/mems-consumer

Features, applications and use cases for MEMS microphones for consumer

Features

- Ultra-low self-noise / ultra-high SNR
- Selectable power modes for longer battery life
- Sealed Dual Membrane (SDM) technology with ingress protection at microphone level
- Extremely low distortions (THD) even at high sound pressure levels
- High dynamic range and very high acoustic overload points (AOP)
- Very tight part-to-part phase and sensitivity matching
- Flat frequency response with a low LFRO (low frequency roll-off)
- Ultra-low group delay for multi-mic applications
- Very small package sizes for various applications

Typical use cases

- Studio quality audio capturing for communication devices
- Low latency wide band audio signal capturing for active noise cancellation (ANC) and transparent hearing functionality
- Small form factor & current consumption for battery and size constraint devices
- Multi-microphone (array) based beamforming and source separation for audio zoom features and multi user audio capturing
- High range, far field voice pickup for multi room applications
- Capturing of audio signals in loud environments, such as outdoor
- Audio pattern detection for predictive and preventive maintenance and security

XENSIV™ MEMS microphone partners

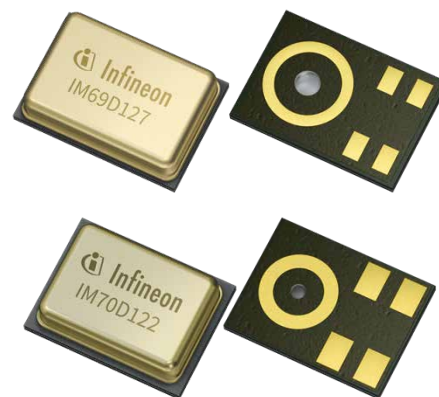
Building upon the superior XENSIV™ MEMS microphone performance, Infineon's extensive network of global partners offers customers a comprehensive portfolio of XENSIV™ MEMS microphone-based reference designs, as well as Infineon inside MEMS microphones that will propel audio performance to the next level even for the most demanding applications.

Learn more about our partner program and purchase our partner solutions [here](#).



Click here to learn more:

www.infineon.com/mems-consumer



Applications

- TWS earbuds
- ANC headphones
- Smart speakers
- Conference speakers
- Laptops / tablets
- Wearables
- AR/VR devices
- Cameras
- Video doorbells
- Smart home
- Smart infrastructure
- Home appliances
- Industrial applications
- Medical applications



Infineon
Partner Program



Radar sensors for consumer, industrial and automotive applications

Giving technology the ability to “see”

Radar offers a host of advantages over passive infrared (PIR) technology in motion detection applications. These include greater accuracy and more precise measurement of detected objects, paving the way for new capabilities in speed detection and motion sensing. These advanced capabilities enable all sorts of “things” such as robots, cars, smart home devices and even lights to “see” their surroundings and respond dynamically.

As market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ family. Designed to support different industrial, consumer and automotive applications, Infineon’s millimeter wave (mmWave) radar portfolio offers both FMCW as well as Doppler radar sensors supporting 24 GHz, 60 GHz and 77/79 GHz. In addition, customers can rely on us for the full range of automotive radar 24 GHz, 60 GHz and 77/79 GHz front-end MMICs (RASIC™) supporting everything from warning functions (e.g. LCA/BSD) to active safety systems such as Automatic Emergency Braking (AEB) and even to dynamic driving tasks like ACC.



Click here to learn more:
www.infineon.com/radar

Automotive radar 24GHz

XENSIV™ 24GHz pulsed doppler radar transceiver BGT24ATR22

The BGT24ATR22 is a Monolithic Microwave Integrated Circuit (MMIC) for 24GHz radar applications. It provides building blocks for analog signal generation and

reception, operating in the frequency range from 24 GHz up to 24.25 GHz.

Key features

- 24GHz radar transceiver
- 2 Tx channels
- 2 Rx channels
- Low-phase noise VCO
- Automatic frequency control
- Automatic DC offset compensation
- State machine with ultra-low power modes
- 12-bit ADC
- Digital radar data processing unit
- Temperature range: -40°C to +105°C
- VQFN-32 RoHS compliant, leadless package

Applications

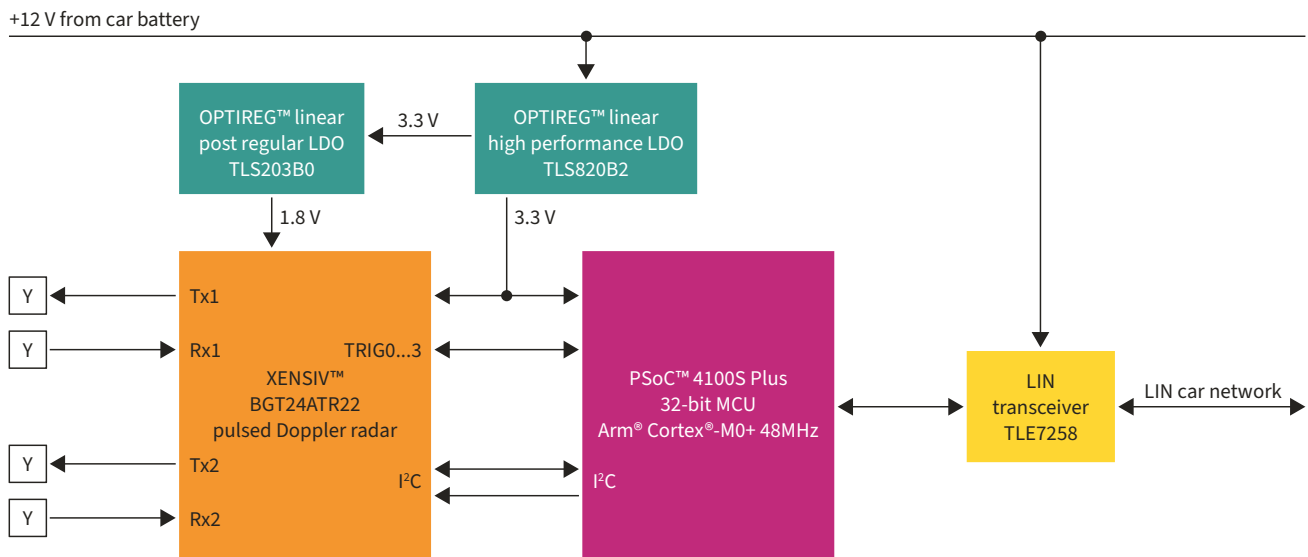
- Automotive short-range radar
- Hands-free trunk and door opening
- Motion detection
- Touchless switches



Benefits

- Compact PCB design due to high level of integration
- Ultra-low power consumption modes for 24/7 use cases
- Low system costs due entry-level only microcontrollers
- Autonomous motion sensing
- Globally approved 24GHz radar with excellent characteristics for robust and reliable performance in harsh environmental conditions

Smart trunk opener system diagram



24 GHz – Product overview

Product	OPN	Qualification	Frequency min Frequency max	NF	Packages
BGT24ATR22	BGT24ATR22E6433XUMA1 2	AEC-Q100	24–24.25	NFSSB: 13 dB at 1 kHz	VQFN-32-9

[Click here to learn more:](http://www.infineon.com/radar)
www.infineon.com/radar

Automotive radar 60GHz

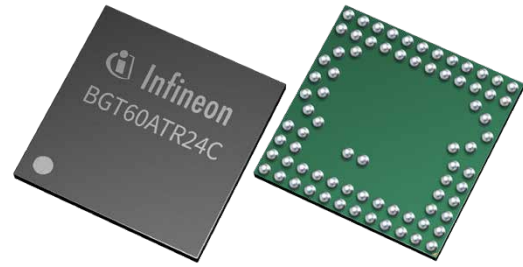
XENSIV™ 60GHz radar sensor for automotive enables highly reliable in-cabin monitoring systems

XENSIV™ BGT60ATR24C, an automotive 60GHz radar sensor, enables ultra-wide bandwidth FMCW operation in a small package. Sensor configuration and data acquisition are enabled with a digital interface and the

integrated state machine enables independent data acquisition with power mode optimization for lowest power consumption.

Summary of features

- 60GHz radar sensor for FMCW operation
- 4GHz bandwidth
- 2Tx/4Rx channels
- Digital interface for chip configuration and radar data acquisition
- Optimized power modes for low-power operation
- Integrated state machine for independent operation
- AEC-Q100/101 qualified

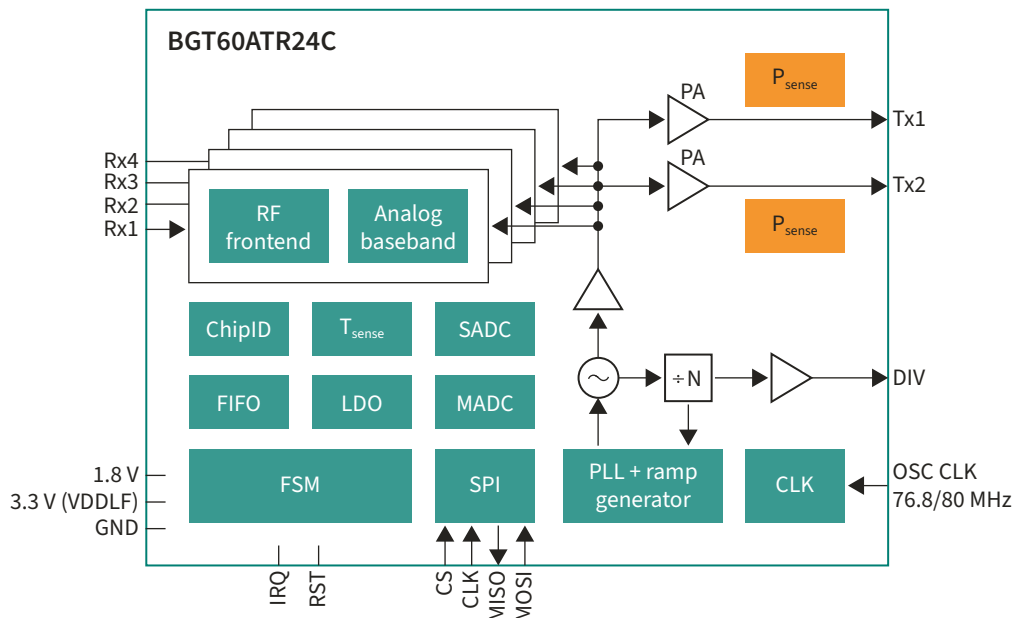


Benefits

- Low power consumption
- Accurate and robust performance
- Excellent thermal management
- Size and space optimized solution

Potential applications

- Radar frontend for gesture sensing
- High resolution FMCW radars
- Short range sensing operations
- Hidden sensing applications behind radome



60 GHz – Product overview

Product	Frequency [GHz]	SP number	Packages
BGT60ATR24C	58–62	SP005350514	VFWLB-76-1
SHIELD_60ATR24ES_01	58–62	SP005448216	VFWLB-76-1

 [Click here to learn more: www.infineon.com/radar](http://www.infineon.com/radar)

RASIC™ automotive radar 77/79GHz

Front-end ICs for automotive radars

RXS81xxx – family of transceiver MMICs for 77GHz automotive radar

Infineon has been delivering automotive 77GHz radar products for over 10 years. Infineon’s family of radar transceiver MEMS (RASIC™) addresses the needs of 77/79GHz radar for all safety-critical applications from automatic emergency-braking (AEB) to high-resolution radars in automated driving. It supports for precise distance measurement and simultaneous transmitter operation for MIMO.

RXS81xxx is a highly integrated device that performs all functions of a radar front-end in a single device – from FMCW signal conditioning to generation of digital receive data output. On-chip sensors for temperature, output power and multiple monitoring circuits allow for calibration and monitoring. Controlling the MMIC is done via SPI.

77 GHz – Product overview

Product	Config.	Key benefits	Features
RXS816xPL	3Tx4Rx	RXS8161PLx: Standalone transceiver MMIC RXS8162PLD: Transceiver MMIC for cascaded setup	<ul style="list-style-type: none"> – Transmit channels (2Tx or 3Tx, up to 1 GHz BW within 76–77GHz) – Receive channels: 4Rx – Integrated PLL (Phase Locked Loop) – Sequencer enabling the execution of an user-defined ramp configuration
RXS8156PLA	2Tx4Rx	RXS8156PLA: Cost-optimized transceiver MMIC	<ul style="list-style-type: none"> – Integrated Analog-to-Digital Converter (ADC) – Integrated calibration functionality – Build-in monitoring functionality – Compliant to ISO 26262; capable for up to ASIL C

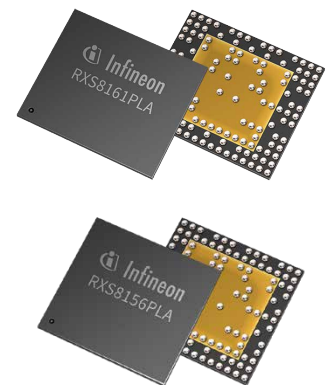
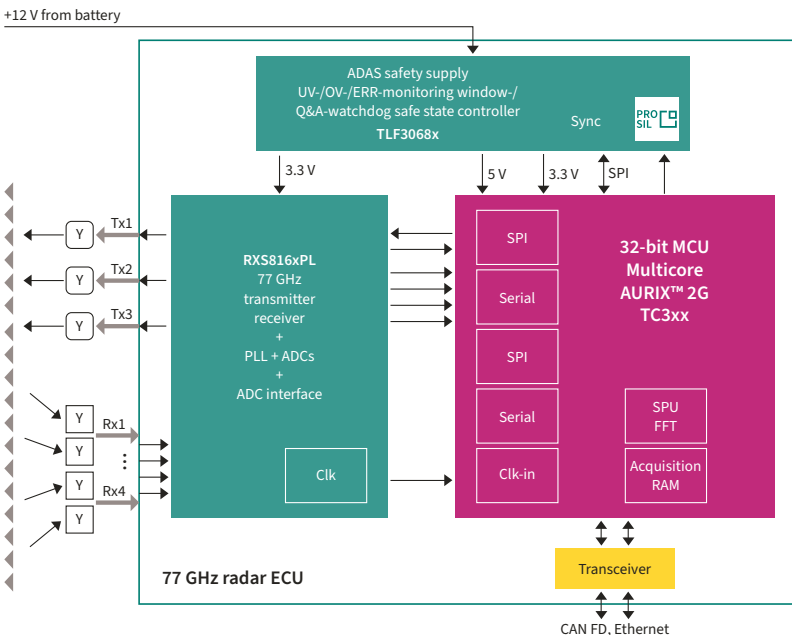
Infineon offers a complete suite of 77/79GHz radar chipsets consisting of

- Radar 77GHz transceiver MMIC (RASIC™) with RXS81xxx
- Radar MCU family featuring radar signal processing units (2nd generation AURIX™ TC3xx)
- Radar system power supply with numerous safety functions (TLF3068x)

Customer benefits:

- One 77/79GHz radar platform supporting all types of automotive radar applications
- Scalability by cascading multiple MMICs and MCUs enabling most advanced sensors
- Flexibility through numerous configuration parameters
- ASIL C support reducing customer R&D efforts

Please be aware that 77/79GHz radar products are not available via Infineon’s distribution partners.



ISO 26262 compliant

[Click here to learn more: www.infineon.com/rasic](http://www.infineon.com/rasic)

Radar sensors for IoT & consumer devices

As market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ sensor family – including Doppler radar as well as FMCW radar systems. This portfolio includes the smallest 24 GHz MMIC in the market as well as the most integrated and largest 24GHz radar transceiver family

currently available. These radar chips are designed to support different industrial, smart home, and consumer applications. In addition, we also offer radar sensors in the 60 GHz range, which are used in consumer products such as the Google Pixel 4 smartphone.

Motion detection with radar offers significant advantages over PIR and other motion-sensing technologies

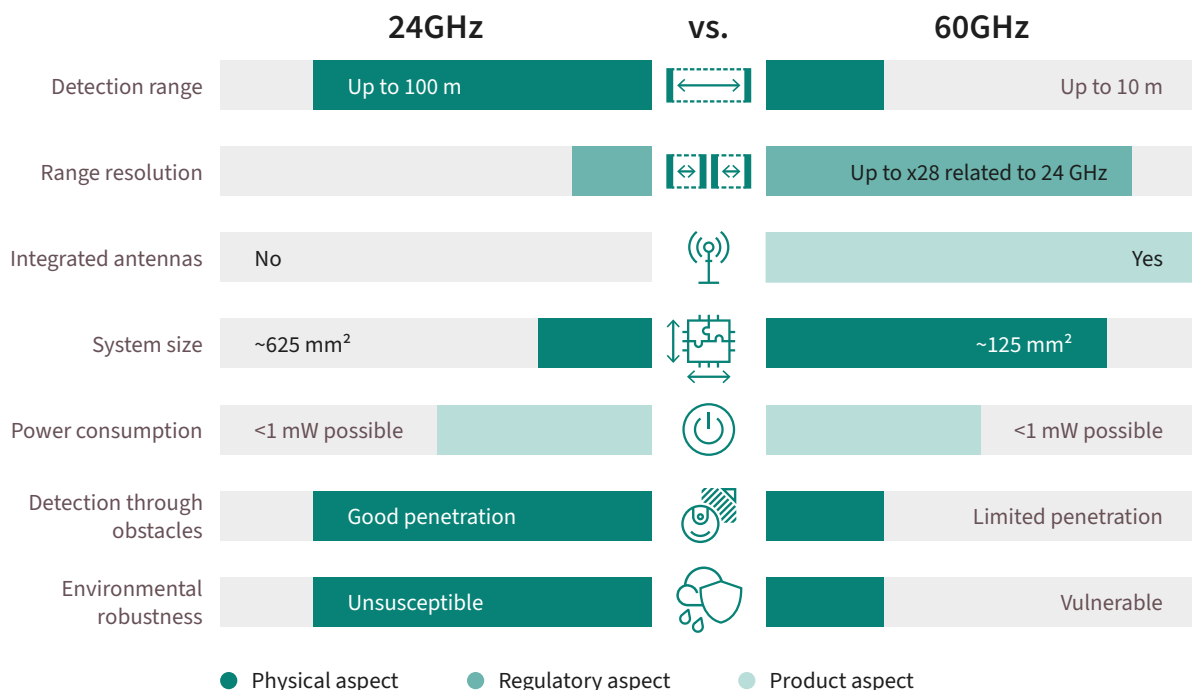
With our 24 and 60GHz radar sensors, we cover a wide range of applications. Many of them are based on motion detection triggering systems like lighting solutions, automatic doors, camera and security systems, or smart home devices. In contrast to other motion detection technologies like PIR, radar technology offers significant advantages.

These include smaller system sizes, greater accuracy, and more precise measurements of detected objects. In addition, radar can also determine the direction of a moving object, speed of an object, distance, and depending on the antenna configuration, even the position of a moving object.

When to use 24GHz or 60GHz radar technology















In the 24 GHz range, the bandwidth for FMCW radar operations covers 250 MHz within the regulated ISM band. In the 60 GHz regime, an unlicensed ultra-wide-band of up to 7 GHz can be used for short-range applications. Consequently, 60GHz FMCW radar systems can offer a better resolution and therefore allow additional

use cases such as human tracking and segmentation. Even gesture control, material classification, or the monitoring of various vital functions (respiration, heartbeat, or even blood pressure) is possible with radar technology due to micromotion detection.



Click here to learn more: www.infineon.com/radar-for-iot

Radars implementation can bring several benefits to different applications:

<p>Smart Home</p>  <p>Robust, discreet, small</p>	<p>Door opening</p>  <p>Direction of travel to remove false opening</p>	<p>Security</p>  <p>Security camera and doorbells</p>	<p>Lighting</p>  <p>Indoor and outdoor. Resistant to harsh weather</p>
<p>Monitors and laptops</p>  <p>Small, hidden, sensitive</p>	<p>Home appliances</p>  <p>Activate displays and control it with gestures</p>	<p>Air conditioners</p>  <p>Track people to move the airflow away from them</p>	<p>Smart speaker</p>  <p>Eliminate keyword based activation</p>
<p>TV</p>  <p>Safe energy & OLED lifetime by turning off</p>	<p>Gaming and VR</p>  <p>Enhance gaming experience</p>	<p>Smart toilet</p>  <p>Presence sensing and water level detection</p>	<p>Service robots</p>  <p>Robust, small footprint, accurate</p>
<p>Robotics</p>  <p>Safety, accuracy and efficiency</p>	<p>Sleep monitoring systems</p>  <p>Breathing & heart rate measurement</p>		

Summary of key benefits

- Direction, proximity, and speed detection
- Segmentation and tracking functionalities
- Target positioning
- Detection through non-conductive materials
 - Product design flexibility
 - Anonymous sensing
- Maintains operation through harsh environmental conditions such as rain, snow, fog, dust, etc.
- Sensitive enough to capture breathing and heart-beat
 - Radar can feel presence & vital functions
- Radar performance parameters can be adjusted
 - Adaptable to different application requirements



Click here to learn more:
www.infineon.com/radar-for-iot

60GHz radar sensors for consumer and IoT

Infineon's innovative XENSIV™ 60GHz radar chip enables things to see and revolutionizes the human-machine interface.

Product portfolio

Product	SP	OPN	Description	Packages
BGT60LTR11AIP	SP005537624	BGT60LTR11SAIPXUMA1	XENSIV™ 60GHz first completely autonomous radar sensor for motion sensing	UF2BGA-42
BGT60LTR11SAIP	SP005832449	BGT60LTR11SAIPXUMA1	XENSIV™ 60GHz first completely autonomous radar sensor for motion sensing	
DEMO BGT60LTR11AIP	SP005422969	DEMOBGT60LTR11AIPTOBO1	Demonstration kit (Shield + 60 GHz baseboard)	
SHIELD_AUTONOM_BGT60	SP005630363	SHIELDAUTONOMBGT60TOBO1	Shield for autonomous operation of BGT60LTR11AIP; directly fits on Arduino MKR board	
REF BGT60LTR11AIP M0	SP005894766	REFBGT60LTR11AIPM0TOBO1	Reference design with Cortex®-M0 MCU for data processing	
S2GO RADAR BGT60LTR11	SP005594890	S2GORADARBGT60LTR11TOBO1	Shield2Go version	
BGT60TR13C	SP002262606	BGT60TR13CE6327XUMA1	XENSIV™ 60GHz radar sensor for advanced sensing	VF2BGA-40
DEMO BGT60TR13C	SP005728718	DEMOBGT60TR13CTOBO1	XENSIV™ 60GHz radar sensor demo board for advanced sensing	
BGT60UTR11AIP	SP005407929	BGT60UTR11AIPXUMA1	XENSIV™ highly integrated 60GHz FMCW radar sensor	VF2BGA-28
DEMO BGT60UTR11AIP	SP005745304	DEMOBGT60UTR11AIPTOBO1	XENSIV™ BGT60UTR11AIP 60GHz radar sensor FMCW demo board	

BGT60LTR11AIP – XENSIV™ 60GHz first completely autonomous radar sensor for motion sensing

The BGT60LTR11AIP is a fully integrated microwave motion sensor including antennas in package (AIP) as well as built-in detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low power consumption of less than 2 mW. The [BGT60LTR11AIP](#) enables radar technology for everyone, since it does not require know-how in RF, antenna design, or radar signal processing. These features make the small-sized radar solution a compelling smart and cost-effective replacement for conventional PIR sensors in low power or battery-powered applications. Also, with its small form factor, Infineon's highly integrated radar sensor solutions bring innovative, intuitive sensing capabilities to many applications.

Radar has been demonstrating to be a powerful sensor for short-range motion detection. Through reliable presence and absence detection, smart devices equipped with radar sensors become more energy efficient and therefore smart and more sustainable. Users can also benefit from vacancy detection in applications such as televisions. For example BGT60LTR11AIP has been implemented in Samsung's Frame TV 2021, which puts the TV from art mode into sleep mode when there is no person nearby for a user-specified time. This function not only saves energy, but also displays lifetime. BGT60LTR11AIP has a high sensitivity and can detect if a person is present and if the device needs to be ready – similar to a screensaver that deactivates the PC monitor after a certain time without mouse or keyboard input and reactivates it as soon as new input is noticed.

Through this reliable presence and absence detection, Infineon's 60GHz radar powers the design of truly smart, energy-saving devices. Find out more on our [website](#).

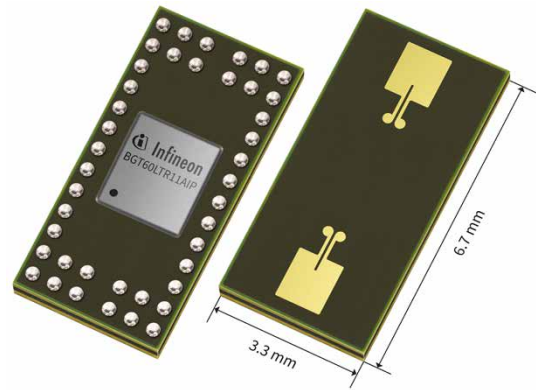


Click here to learn more:

www.infineon.com/60GHz

Key features

- 3.3 x 6.7 x 0.56 mm package size
- 1Tx 1Rx Antennas in Package (AIP) with 80° field of view
- Built-in motion detector
- Built-in direction of motion detector
- Multiple modes of operation incl. a completely autonomous mode
- Adjustable performance parameters: detection sensitivity, hold time and frequency of operation
- FR4 material for PCB design is sufficient



Target application

- Smart building and smart home
- Home appliances
- Smart home security
- Room air conditioners
- Automated door openers
- Smart entrance counter solution
- Displays such as TVs, monitors, laptops or tablets
- Lighting systems and lighting control

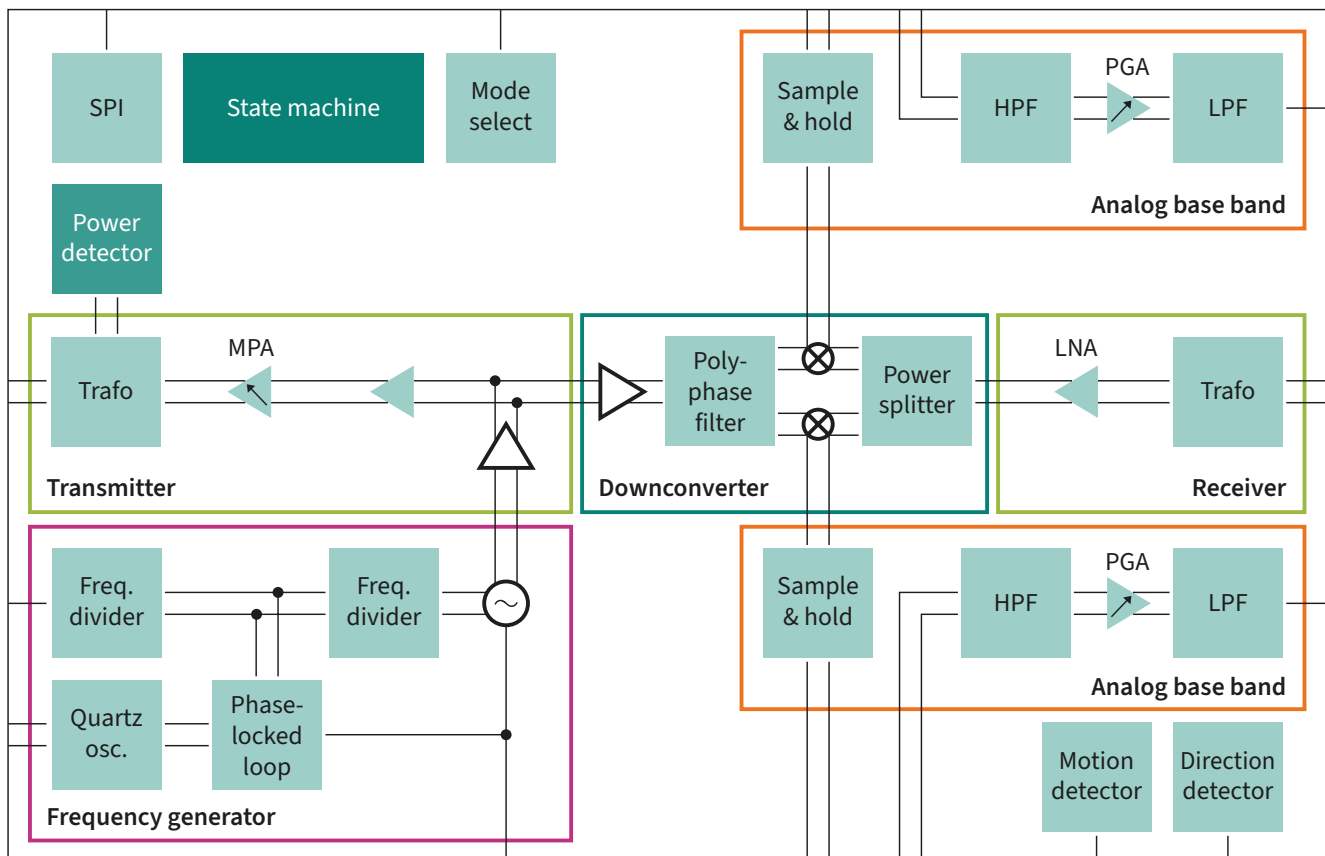
Key benefits

- Autonomous mode
- Up to 7 m detection range
- Less than 2 mW power consumption
- Requires minimal external circuitry incl. crystal, LDO and some resistors capacitors

Adding a M0 MCU extends flexibility

- Up to 14 m detection range (SPI mode)
- Less than 2 mW power consumption possible

Block diagram of the BGT60LTR11AIP



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DEMO BGT60LTR11AIP

For evaluation of the completely autonomous 60GHz radar sensor MMIC for motion sensing

This demo features Infineon's first completely autonomous radar sensor – the BGT60LTR11AIP. The 60GHz radar MMIC is a fully integrated microwave motion sensor including Antennas in Package (AIP) as well as integrated detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low-power consumption of less than 2 mW. These features make the small-sized radar solution a compelling, smart and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications.

For evaluation of the BGT60LTR11AIP MMIC, this demo includes the BGT60LTR11AIP shield as well as the Infineon Radar Baseboard MCU7.

The BGT60LTR11AIP shield can be attached to an Arduino MKR board or the included Infineon Radar Baseboard MCU7. Infineon's Toolbox supports this platform with a demonstration software and a Radar GUI to display and analyze acquired data in time and frequency domain. It further enables to change various performance parameters of the BGT60LTR11AIP in order to evaluate this radar sensor.



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www.infineon.com/60GHz

BGT60TR13C – XENSIV™ 60GHz radar sensor for advanced sensing

Enablement of horizontal and vertical angular measurement

The BGT60TR13C MMIC is a 60GHz radar sensor with integrated antennas and comes with one transmitting and three receiving antennas. Thanks to the antennas in package (AIP) concept, the antenna design complexity at the user end can be eliminated and the PCB designed with standard FR4 materials.

BGT60TR13C offers innovative and intuitive sensing capabilities

With its small form factor and low power consumption, BGT60TR13C MMIC brings innovative, intuitive sensing capabilities to many applications. Based on the devel-

Key features

- Integrated Finite-State-Machine (FSM)
- Very fast chirp speed: 400 MHz/μs
- High Signal-To-Noise Ratio (SNR)
- Ultra-wide bandwidth > 5 GHz
- FMCW operation
- Integrated L-shaped antennas + small package size (6.5 x 5.0 x 0.9 mm³)
- < 5 mW (duty cycling according to released FCC waiver)

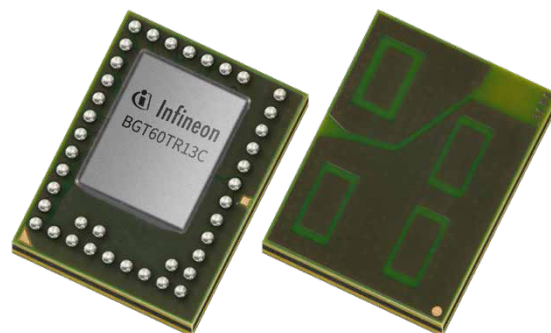
Key benefits

- Allows semi-autonomous operation
- Highly configurable modulation and power modes
- MCU only needs to configure sensor and fetch data
- High velocity resolution
- People can be detected up to 15 m
- High sensitivity allows submillimeter level motion detection
- Allows simultaneous measurement of target range and velocity
- High accuracy of range measurements
- Reduced interference with other sensors
- L-shape enables horizontal and vertical angular measurements
- Thanks to small package size, PCB area can be saved + design-in process simplified
- Reduces average power consumption
- Optimized power modes for low power consumption

oped algorithm the MMIC can serve established as well as new applications and use cases without intruding on privacy. Thanks to its feature-set, the MMIC can measure velocity, angle, horizontal as well as vertical.

BGT60TR13C has been demonstrating to be a powerful sensor for:

- Presence detection/segmentation/tracking: BGT60TR13C enables human presence detection, tracking, and segmentation while providing extremely high accuracy in detecting micro and macro motions
- Gesture sensing: BGT60TR13C ensures detection of submillimeter motions
- Vital sensing: BGT60TR13C is able to track vital signs in consumer electronics, healthcare as well as industrial applications



Target application

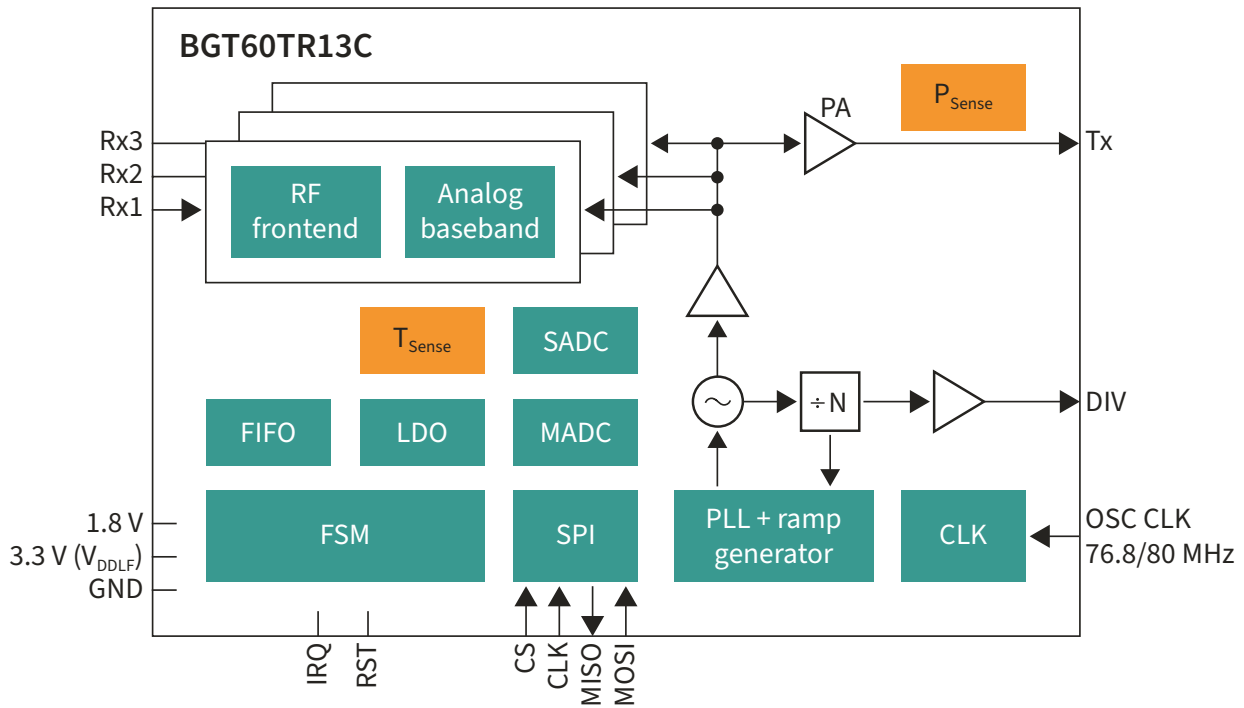
- Smart TVs
- Smart speaker
- Smart home
- Smart building
- Elderly monitoring
- Vital sensing
- Home appliances



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Block diagram of the BGT60TR13C



DEMO BGT60TR13C Getting started with the XENSIV™ 60GHz demo board for advanced sensing

BGT60TR13C offers innovative and intuitive sensing capabilities

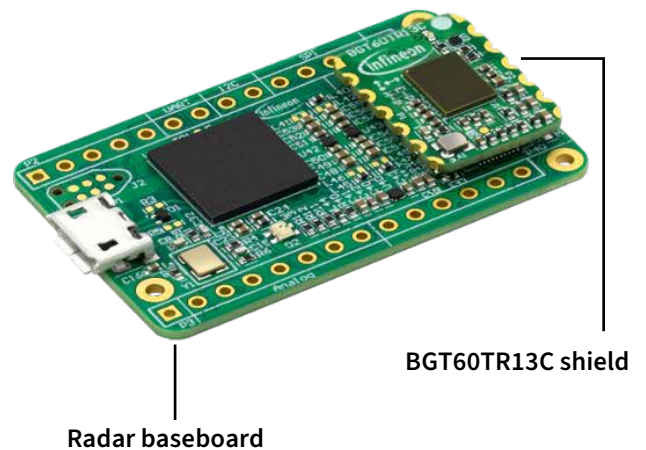
This demo board features Infineon’s XENSIV™ 60GHz radar sensor BGT60TR13C and consists of a radar baseboard as well as a BGT60TR13C shield.

The radar baseboard is a 40.64 x 25.4 mm² printed circuit board (PCB). Its main purpose is to provide a generic sensor interface for BGT60TR13C MMIC. The central microcontroller unit (MCU) can perform radar data processing or forward the sensor data to a USB interface or an Arduino MKR interface.

Several benefits come along with the BGT60TR13C demoboard:

- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on FMCW modulation
- Power consumption can be optimized according to use case

The BGT60TR13C shield presents a minimized form factor of 17 x 12.7 mm² and comes with an integrated BGT60TR13C Antenna-in-Package (AIP) radar chip of 6.5 x 5.0 x 0.85 mm³. Moreover, the shield contains a digital interface for configuration and transfer of the acquired radar data to a microcontroller board. The shield is optimized for fast prototyping designs and system integrations as well as initial product feature evaluations. In addition, it offers developers the flexibility to choose their own platform depending on their preferred use cases.



Click here to learn more:

www.infineon.com/demo-bgt60tr13c

BGT60UTR11AIP – Highly integrated 60GHz radar sensor for consumer electronics and IoT applications

The BGT60UTR11AIP is optimized for low power consumption and system cost optimization. With its compact size of only 16 mm², it is suitable for integration into the smallest devices. The MMIC is manufactured using Infineon's B11 SiGe BiCMOS technology, ensuring excellent RF performance.

Its 5.6 GHz ultra-wide bandwidth allows FMCW operations with extremely high resolution. The detection of sub-mm movements ensures not only extremely sensitive presence and motion detection up to a range of 15 m, but also enables mm precise range measurements, 1D gestures as well as the measurement of vital signs such as breathing rate and heart rate.

Features

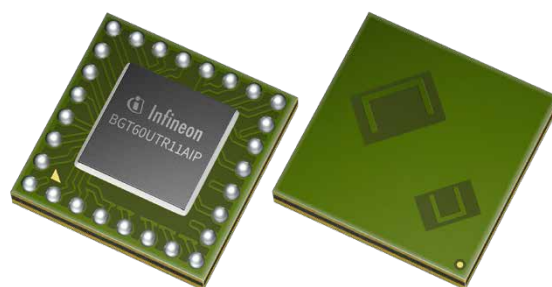
- 60GHz radar operating with 6 GHz bandwidth and ramp speed of up to 400 MHz/μs
- Antenna in package (AIP) with ±60° Field of View (FoV)
- Integrated finite state machine (FSM) for low power consumption and real-time operation
- 4 MSps ADC sampling rate
- Single 50 MHz SPI for chip configuration and data transfer
- Broadcast mode to trigger and configure multiple devices

Benefits

- High sensitivity to detect sub-mm movements for human presence detection and vital sensing applications
- High bandwidth for precise distance measurements with mm accuracy
- Small size for integration into space-constrained environments
- Low power consumption for battery-driven applications

The sensor features a 50 MHz digital SPI interface for configuration and data transfer, while an integrated state machine enables real-time data acquisition without requiring constant interaction with the processor. With three different power modes, users have flexibility to optimize between performance and power consumption. The BGT60UTR11AIP's sub-mA average current consumption makes it suitable for battery-powered devices.

For first evaluation of the radar sensor, we offer the DEMO BGT60UTR11AIP as well as the Radar Development Kit (RDK), which can be downloaded via the [Infineon Developer Center \(IDC\)](#).



Applications

- Smart building devices such as door locks, smart doorbells and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
- Wearables such as headphones and smartwatches
- TVs and notebooks



Click here to learn more:

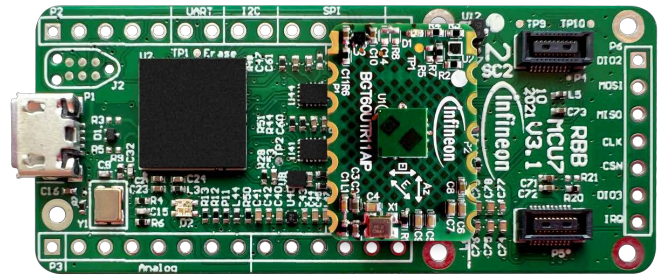
www.infineon.com/BGT60UTR11AIP

DEMO BGT60UTR11AIP – Getting started with the XENSIV™ BGT60UTR11AIP 60GHz radar sensor FMCW demo board

This demo board features Infineon's 60 GHz XENSIV™ radar sensor BGT60UTR11AIP. It consists of a Radar Baseboard MCU7 Plus and a BGT60UTR11AIP sensor shield. The board can be used for product feature evaluations, fast prototyping and radar algorithm development with the BGT60UTR11AIP.

The BGT60UTR11AIP MMIC has integrated antennas and is equipped with one transmit and one receive antenna. With its compact size of only 16 mm² and extremely high FMCW performance (5.6 GHz bandwidth), this radar sensor is suitable for a wide range of applications.

The DEMO BGT60UTR11AIP board is supported by our Radar Development Kit (RDK), which can be downloaded from the [Infineon Developer Center](#) (IDC).



It contains the Radar Fusion GUI for an instant display of the radar signals as well as predefined applications such as presence detection or distance measurement. For further development of application specific radar algorithms C, C++, Python and MATLAB interfaces are provided.

Features of BGT60UTR11AIP shield

- 19 mm x 12.7 mm small form factor
- Digital SPI interface for configuration and data transfer to an MCU
- Standard FR4 laminate
- Castellated holes on the PCB edges for additional signal access
- MCU-controllable LED on board indicating radar sensor status

Benefits

- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on the FMCW modulation
- Advanced functionalities by SPI configuration or further signal processing
- Power consumption can be optimized according to the radar use case

Features of Radar Baseboard MCU7 Plus

- 59 mm x 25.4 mm size
- Can perform radar data processing Arm® Cortex®-M7 processor or forward the sensor data to a USB interface or an Arduino MKR interface
- Hi-Speed USB 2.0 interface
- Operates with Radar Development Kit and radar fusion GUI

Applications

- Smart building devices such as door locks, smart doorbells and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
- Wearables such as headphones and smartwatches
- TVs and notebooks



Click here to learn more:

www.infineon.com/BGT60UTR11AIP

24GHz radar sensors

Infinion BGT24M / BGT24L family of MMIC chips

Infinion's range of 24 GHz industrial radar chips provides five configurations of transmit and receiver channels, ensuring that there is a chip to support your specific application. From basic applications such as motion detection in security systems, which only

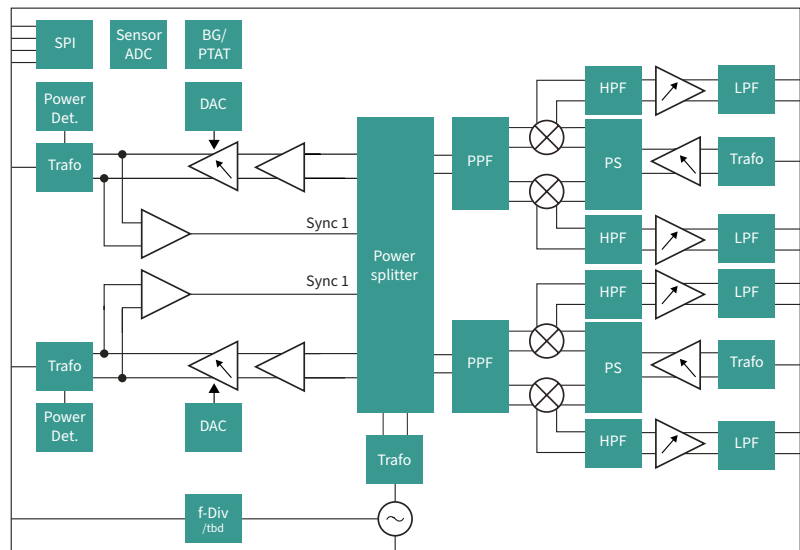
requires one transmit and one receive channel, to more complex applications like 3D positioning, which requires two or more receive channels, our range of radar chips supports all of your requirements.

Features	Infinion MMIC	Benefits
<ul style="list-style-type: none"> – 24GHz ISM band operation for motion, speed, direction movement and distance measurements – Five 24 GHz chips available – Highly integrated MMICs 		<ul style="list-style-type: none"> – Long-range distance detection of moving objects up to 50 m – Wide range speed detection up to ± 100 km/h – Low BOM costs

Product	Configuration	Features
BGT24MTR11	1Tx + 1Rx	<ul style="list-style-type: none"> – Measures, not just motion, but also speed, direction, and distance – Low power MMICs for energy saving
BGT24MTR12	1Tx + 2Rx	<ul style="list-style-type: none"> – Small form factor – Privacy protection
BGT24LTR11	1Tx + 1Rx	<ul style="list-style-type: none"> – Resistance to moisture, dirt, and temperature – Adaptable to different application requirements
BGT24LTR22	2Tx + 2Rx	<ul style="list-style-type: none"> – Increased area coverage – Highly integrated chips eliminating costly external components – Discrete design

The BGT24LTR22 key features

- 24GHz transceiver MMIC
- Fully integrated low phase noise VCO
- Integrated analog base band stage with programmable gain and filter settings
- Bi-directional pin for synchronization
- Built in temperature compensation circuit for VCO stabilization, no PLL needed
- Low power consumption
- Fully ESD protected device
- Single ended RF and IF terminals
- Single supply voltage 1.5 V

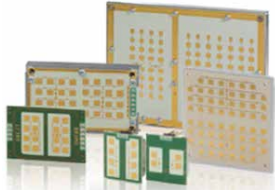


[Click here to learn more: www.infineon.com/24GHz](http://www.infineon.com/24GHz)

24 GHz partner modules

Partnering with the leading radar solution providers enables Infineon to connect our customers looking for turnkey solutions and design support for a complete

range of applications. Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules. Each of them contains Infineon's 24 GHz MMIC.

Features	Partner modules using Infineon chips	Benefits
<ul style="list-style-type: none"> – Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available) 	 <p>Module (RF module; RF module + MCU including SW)</p>	<ul style="list-style-type: none"> – Ease of design – Turnkey solution, no need for test and certification

By integrating Infineon's 24GHz MMIC chip into the partners easy-to-use and simple-to-integrate modules the complexity and time to market for a range of

applications such as smart home automation, camera & security systems, air conditioners, UAVs, robotics, and smart lighting, are reduced.

XENSIV™ radar sensor partners

Learn more about our partner program and purchase our partner solutions [here](#).



Do you have a question?

Learn more and ask questions in our [radar sensor community](#).

 [Click here to learn more: www.infineon.com/radar-for-iot](http://www.infineon.com/radar-for-iot)



XENSIV™ PAS CO2 sensors

High performance in a small size – disruptive CO₂ sensors based on photoacoustic spectroscopy (PAS)

CO₂ measurement contributes to improvements in health, comfort and productivity as well as energy efficiency. Even at moderate levels, CO₂ can have a negative impact on health and productivity, causing drowsiness and headaches. Fortunately, smart indoor air quality sensors can “smell” rising levels of CO₂ and either alert the user or trigger a system response. Awareness of indoor air quality is further increasing as a result of the COVID-19 pandemic, making accurate, affordable monitoring solutions like PAS CO₂ more important than ever. Given the correlation between CO₂ and aerosol concentration, CO₂ sensors can contribute mitigating the transmission of airborne illnesses such as COVID-19, cold or influenza. Furthermore, CO₂ sensors can facilitate demand controlled ventilation, leading to improvements in energy efficiency and significant savings on energy bills.

Accurate, real-time CO₂ measurement thanks to superior MEMS technology

Widespread adoption of real CO₂ sensors has so far been hampered by size, performance and cost constraints. Infineon’s PAS CO₂ sensors leverage photoacoustic spectroscopy (PAS) technology to provide an exceptionally small, highly accurate and cost-effective sensing solution. Infineon’s leading position in MEMS technology is the foundation for this unique and accurate CO₂ detection approach. Reliable CO₂ measurements



enable smart monitoring of indoor air quality, facilitating improvements in health, productivity and overall well-being. These features make the PAS CO₂ sensors ideal for heating, ventilation and air conditioning applications as well as for integration into consumer IoT devices such as air purifiers, thermostats, baby monitoring devices, wake-up alarms and smart speakers.

Disruptive environmental sensor technology from Infineon

PAS CO₂ integrates on the PCB a photoacoustic transducer, including an acoustic detector, infrared source and optical filter; a microcontroller for signal processing and a MOSFET chip to drive the infrared source. The exceptional sensitivity of the acoustic detector coupled with the integrated PCB design reduce space requirements by more than 75 percent compared to nowadays state-of-the-art NDIR CO₂ sensors.

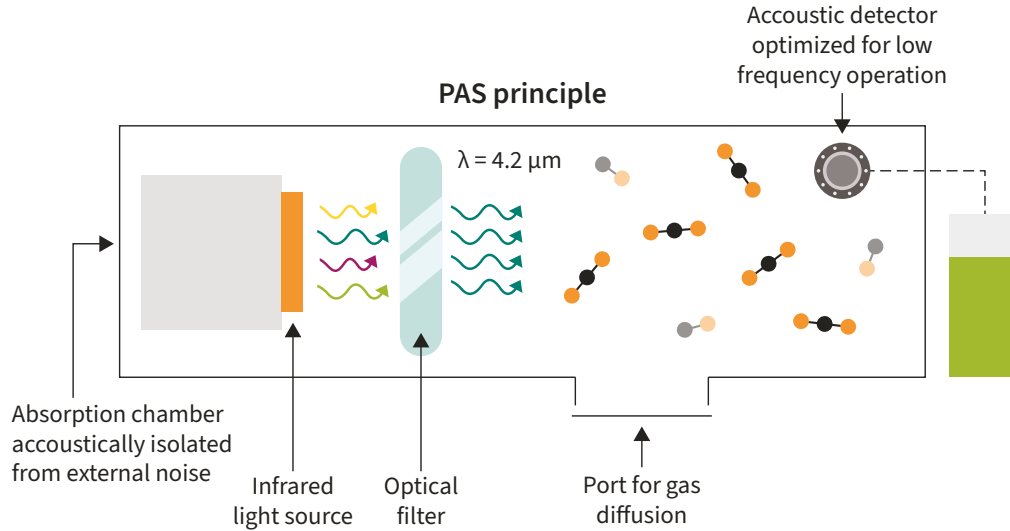


Click here to learn more:
www.infineon.com/CO2

The PAS (photoacoustic spectroscopy) principle:

The sensor is characterized by a disruptive measurement principle called PAS (photoacoustic spectroscopy). It works as follows: pulses of infrared light pass through an optical filter tuned to the CO₂ absorption wavelength. The CO₂ molecules absorb

the filtered light, causing them to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low frequency operation and converted to a CO₂ concentration reading by the microcontroller.



Features

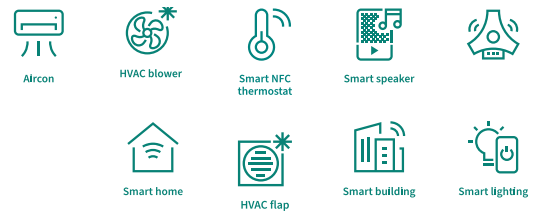
- Exceptionally small form factor (14 x 13.8 x 7.5 mm³)
- SMD package delivered in tape and reel
- Advanced compensation and self-calibration algorithms
- Various configuration options (e.g. sampling rate, baseline calibration) and interfaces (UART, I²C, PWM)
- Dust-proof design in compliance with ISO 20653:2013-02
 - Enhanced durability & minimized maintenance requirements

Benefits

- Space savings in customers' end products
- High-quality data and compliance with smart building standards
- Cost-effective high-volume assembly and easy system integration
- Plug & play for fast design-to-market
- Customer flexibility thanks to configuration options
- Fullfilment of WELL Building Standard®
 - Increased energy efficiency & enhanced real estate value

Applications

- HVAC (heating, ventilation and air conditioning) systems
- Smart home appliances such as air purifiers, air conditioners and thermostats
- Consumer devices for air quality monitoring such as personal assistants and CO₂ traffic lights
- Smart indoor lighting



Product overview

Product	Accuracy	Interfaces	Operating range [ppm]	Supply voltage [V]
PASCO2V01	± (30 ppm +3%) of reading between 400 ppm and 5000 ppm	I ² C, UART and PWM	0-32000	3.3-12
PASCO2V15	± (50 ppm +5%) of reading between 400 ppm and 3000 ppm	I ² C, UART and PWM	0-32000	3.3-5

Learn more and ask questions in our [XENSIV™ PAS CO2 sensor community](#).

[Click here to learn more: www.infineon.com/CO2](http://www.infineon.com/CO2)



Intuitive sensing

Giving things human-like senses for a better contextual awareness

Imagine a world where technology is unobtrusive and seamlessly integrated into our lives. Where intentional/deliberate communication between people and devices is no longer necessary. In this world, there is no need to push buttons or issue commands in order to activate devices, because technology is capable of interpreting implicit intentions and context. This enhances the user experience and makes it more natural – it almost seems like the devices around us intuitively understand what we want them to do. At Infineon, this future is already becoming reality. We develop sensor solutions that enable simple and effortless user interactions with all kinds of smart devices. Bridging the gap between the real and digital worlds, our technology is developed to

make life easier, safer, greener and more efficient. Our intuitive sensing solutions are at the very core of this mission. Reflecting our belief that the essential value of sensor technology lies in making our lives more convenient through seamless, natural interactions between people and sensing devices, our aim is to leave you free to focus on what really matters in life.

Choose your type of sense

Thanks to industry-leading technologies, Infineon XENSIV™ sensors are exceptionally precise. They are the perfect fit for various customer applications in automotive, industrial and consumer markets.

Pressure sensors

Our digital barometric pressure sensors give designers the best choice when it comes small form factors, highest precision and accuracy over a wide temperature range, fast read-out speeds and low power consumption.

Radar sensors

Radar supports existing applications while providing features that enable completely new use cases. It measures velocity, range and angle, both horizontal and vertical, for precise position mapping and 3D tracking.

MEMS microphones

MEMS microphones overcome existing audio chain limitations and are designed for applications where low self-noise (high SNR), wide dynamic range, low distortions and a high acoustic overload point are required.

PAS CO2 sensors

Leveraging photoacoustic spectroscopy (PAS), Infineon has developed an exceptionally small CO2 sensor that overcomes existing size, cost and performance challenges.

Today, sensors already enable interactions between people and devices

This interaction often depends on the interpretation and merging of information from different sources. Machines cannot yet read our minds and do not always have the information necessary to correctly evaluate a given situation. So, we sometimes have to explicitly tell devices what we want them to do. This can be inconvenient and time-consuming. Inspired by human nature, Infineon intuitive sensing solutions are designed to take the complexity out of our interaction with devices.

Reflecting a holistic approach, we combine different sensors with state-of-the-art software to create a comprehensive picture of the world around us. By fusing several smart sensors into one coherent intelligent system, our intuitive sensing solutions simplify complex technical processes and enable people to effortlessly interact with devices. These smart devices intuitively sense the world around them, determining what is expected and needed from them.

 [Click here to learn more: www.infineon.com/intuitivesensing](https://www.infineon.com/intuitivesensing)

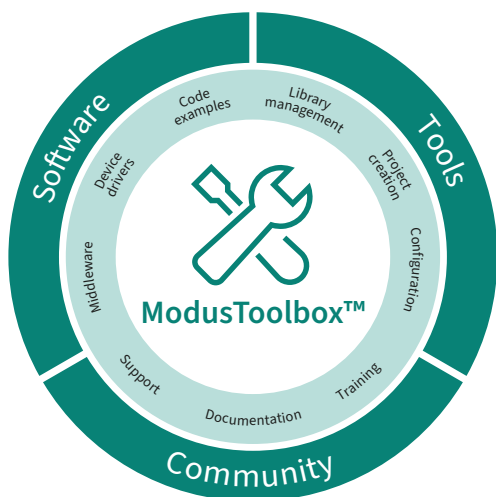
XENSIV™ connected sensor kit

Rapid IoT prototyping experience enabled by XENSIV™ sensors

The XENSIV™ connected sensor kit enables rapid development of a custom solution built on Infineon products. The CSK supports customers in testing sensor-driven IoT products and use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud-based sensor data visualization with sensor fusion. The development kit supports use cases based on XENSIV™ 60GHz radar and PAS CO2 with DPS368 pressure sensor (sense), PSoC™ 6 microcontroller embedded processing (compute), connectivity via Infineon AIROC™ CYW43012 Wi-Fi and Bluetooth® Combo (connect) and hardware security with OPTIGA™ Trust M (secure). Code examples and sensor libraries are available in the Infineon software ecosystem ModusToolbox™ to help customers create use case-specific application codes for new product offerings.

Key features

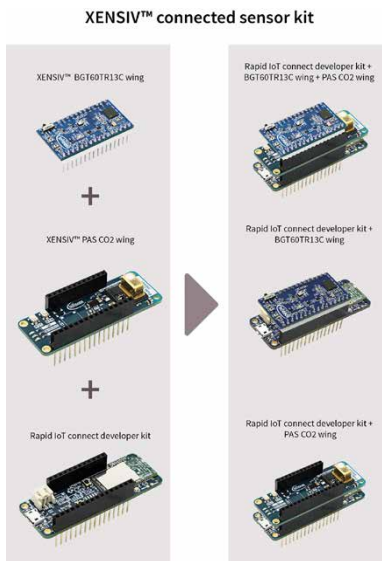
- Small form-factor (22.5×63×30 mm) adafruit feather compatible design
- AC and DC sensing
- Wi-Fi and Bluetooth® 5.0-compliant combo radio module
- Power optimized design, deployable with battery
- Interchangeable sensor wings – 60GHz radar, PAS CO2
- Seamless integration into ModusToolbox™
- FCC and CE certified



Key benefits

- Ideal for prototyping battery-powered IoT devices due to optimized power consumption. Suited for customer field trials.
- Rapid development and deployment via code examples in ModusToolbox™ for presence detection, entrance counter, air quality measurements. Enabler for multi-sensor data fusion.
- Secure cloud device onboarding and management with OPTIGA™ Trust M.
- Secure kit provisioning (unique user ID).

The Infineon Rapid IoT Connect SOM platform deployed on the XENSIV™ CSK provides hardware, firmware, and cloud artifacts to enable rapid onboarding to the Internet of Things. Bidirectional XENSIV™ sensor to cloud communication is securely enabled. The XENSIV™ CSK is a pre-implemented Infineon prototyping sensor system that makes it possible to provision, monitor and manage Infineon hardware remotely. Sensor2cloud kit set up takes 10 minutes with 12 months free user access to a dedicated cloud demo platform for sensor data collection and interpretation as well as sensor data download.



Product	Description	OPN No.
XENSIV™ KIT CSK PASCO2	Rapid prototyping platform for use cases based on Infineon's XENSIV™ PAS CO2 sensor	KITCSKPASCO2TOBO1
XENSIV™ KIT CSK BGT60TR13C	Rapid prototyping platform for use cases based on Infineon's XENSIV™ 60GHz radar sensor	KITCSKBGT60TR13CTOBO1



Click here to learn more:

www.infineon.com/connectedsensorkit

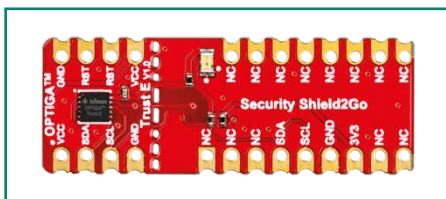
Shields2Go

Infineon's Shield2Go boards offer a unique customer and evaluation experience

The boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining 2GO boards together with Infineon MyIoT adapters.

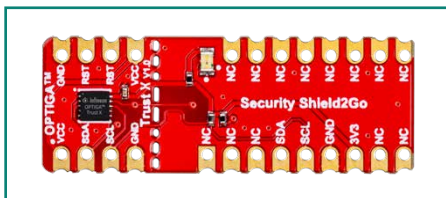
MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of the IoT system.

Security



Product name: OPTIGA™ Trust E Security Shield2Go
Sales name: S2GO_Security_OPTIGA_E
Ordering code: SP001820138

Product
information

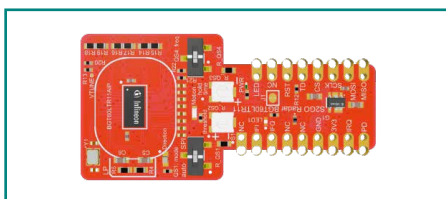


Product name: OPTIGA™ Trust X Security Shield2Go
Sales name: S2GO SECURITY OPTIGA X
Ordering code: SP002349576

Product
information

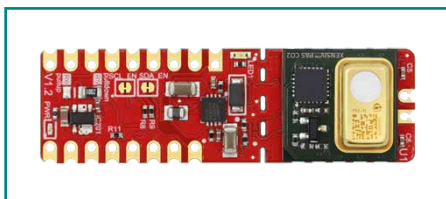


Sensors



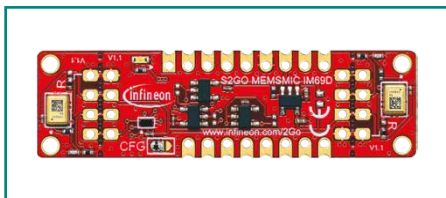
Product name: S2GO Radar Sensor BGT60LTR11
Sales name: S2GO RADAR BGT60LTR11
Ordering code: SP005594890

Product
information



Product name: PASCO2V01 Shield2Go
Sales name: SHIELD PASCO2 SENSOR
Ordering code: SP002851544

Product
information



Product name: IM69D130 Microphone Shield2Go
Sales name: S2GO MEMSMIC IM69D
Ordering code: SP002851544

Product
information

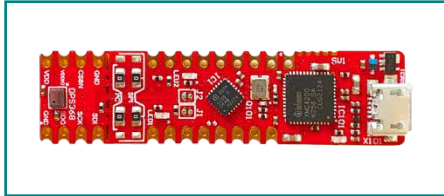


Click here to learn more:

www.infineon.com/sensor
www.infineon.com/makers

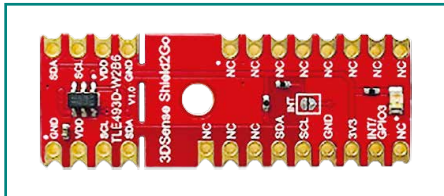
Shields2Go

Sensors



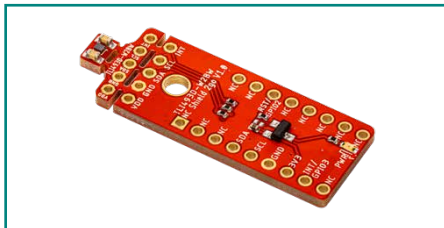
Product name: TLI4971 Current Sense Shield2Go
Sales name: S2GO_CUR-SENSE_TLI4971
Ordering code: SP005345472

Product
information



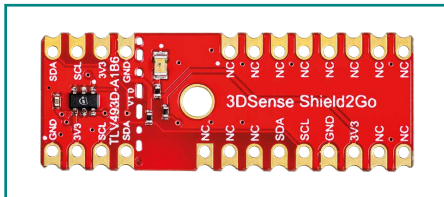
Product name: TLE493DW2B6 3DSense Shield2Go
Sales name: S2GO_3D_TLE493DW2B6-A0
Ordering code: SP004308594

Product
information



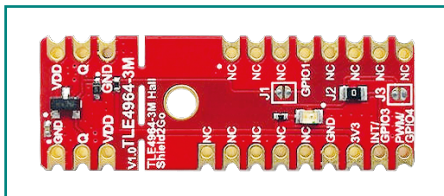
Product name: TLI493D-W2BW 3D Sense Shield2Go in
small WFWLB-5-2 package
(1.13 mm x 0.93 mm x 0.59 mm)
Sales name: S2GO_3D_TLI493DW2BW-A0
Ordering code: SP005410385

Product
information



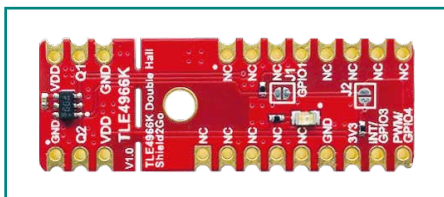
Product name: TLV493D 3D Sense Shield2Go
Sales name: S2GO_3D-SENSE_TLV493D
Ordering code: SP001823678

Product
information



Product name: TLE4964-3M Hall Sense Shield2Go
Sales name: S2GO_HALL_TLE4964-3M
Ordering code: SP004308590

Product
information



Product name: TLE4966K Double Hall Shield2G
Sales name: S2GO_2_HALL_TLE4966K
Ordering code: SP004308598

Product
information

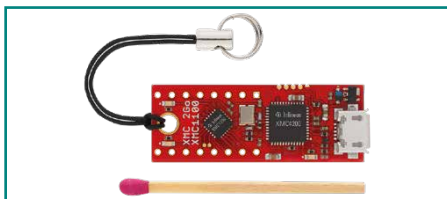


Click here to learn more:

www.infineon.com/sensor
www.infineon.com/makers

Shields2Go

Microcontroller

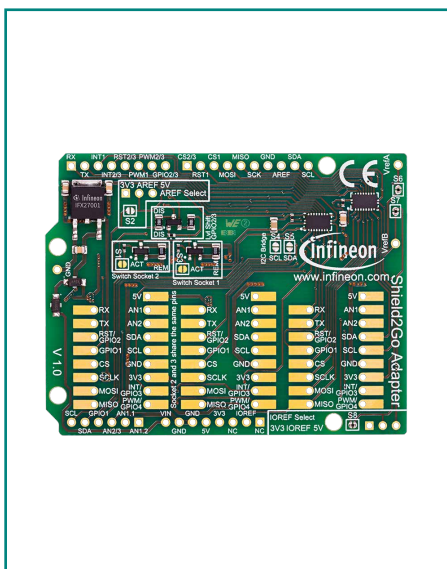


Product name: XMC 2Go Kit
Sales name: KIT_XMC_2GO_XMC1100_V1
Ordering code: SP001199544

Product
information



MyIoT – Adapter



Product name: MyIoT Adapter
Sales name: MYIOTADAPTERTOBO1
Ordering code: SP002434972

Infineon's 2Go boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining 2Go boards together with Infineon MyIoT adapters.

MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of IoT system.

Product
information



XENSIV™ Sensor Shield for Arduino



Product name: XENSIV™ Sensor Shield for Arduino
Sales name: SHIELD_XENSIV_A
Ordering code: SP006018677

Infineon's XENSIV™ Sensor Shield provides seamless hardware compatibility between sensors, microcontroller and connectivity products. When paired with a MCU / Wi-Fi base board via the Arduino UNO interface, the board enables developers to quickly evaluate and develop with environmental sensors like:

- 60 GHz radars
- PAS CO2 sensor
- PDM microphones
- Pressure sensors
- 6-axis IMU
- 3-axis magnetometer
- Temperature and humidity

The shield also features a TFT display (80x160), and OPTIGA™ Trust-M secure element, and a QWIIC connector for additional peripheral expandability.

Product
information



Click here to learn more:

www.infineon.com/sensor
www.infineon.com/makers

Sensor 2GO kits

Ready to use, budget-priced plug- and play boards

Already equipped with a sensor combined with an Arm® Cortex®-M0 CPU. The Sensor 2GO kits provide a complete set of on-board devices, including an on-board debugger. Build your own application and gadget with the Sensor 2GO kits.






Automotive pressure sensor 2GO kit Product name: KP215F1701-PS2GO-KIT KP229E3518-PS2GO-KIT KP236-PS2GO-KIT KP254-PS2GO-KIT KP276-PS2GO-KIT	Ordering code: SP002676652 SP002676656 SP002676664 SP002676664 SP005910372	Product information 
3D magnetic sensor 2GO kit Product name: TLE493D-A2B6 MS2GO TLE493D-W2B6 MS2GO TLV493D-A1B6 MS2GO	Ordering code: SP001707582 SP001707578 SP001707574	Product information 
Angle sensor 2GO kit Product name: TLE5012B_E1000_MS2GO TLI5012B_E1000_MS2GO TLE5012B_E5000_MS2GO TLE5012B_E9000_MS2GO	Ordering code: SP002133956 SP002133960 SP002133964 SP002133968	Product information 
TLI4971 current sensor 2GO kit Product name: TLI4971_MS2GO	Ordering code: SP005345474	Product information 
TLE4973 current sensor 2GO kit Product name: TLE4973 MS2GO	Ordering code: SP006039680	Product information 
Speed sensor 2GO kit Product name: TLE4922 MS2GO	Ordering code: SP003029974	Product information 
TLE4966 Hall switches 2GO kit Product name: TLE4966 MS2GO	Ordering code: SP005406992	Product information 



Click here to learn more:

www.infineon.com/sensors2go

Add ons for Sensor 2GO kits and Shield2Go

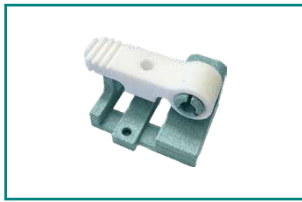
	<p>Joystick for all 3D magnetic sensor 2GO kits and Shield2Go Product name: JOYSTICK FOR 3D 2 GO KIT Ordering code: SP001491834</p>	<p>Product information</p> 
	<p>Rotate knob for all 3D magnetic sensor 2GO kits, Angle sensor 2GO kits and 3D magnetic sensor Shield2Go Product name: ROTATE KNOB 3D 2 GO KIT Ordering code: SP001504602</p>	<p>Product information</p> 
	<p>Linear slider for all 3D magnetic sensor 2GO kits and Shield2Go Product name: LINEAR-SLIDER 2GO Ordering code: SP002043034</p>	<p>Product information</p> 
	<p>Out of shaft adapter for all 3D magnetic sensor 2GO kits and Shield2Go Product name: OUT OF SHAFT FOR 3D 2 GO Ordering code: SP003475178</p>	<p>Product information</p> 
	<p>Linear control trigger for all 3D magnetic sensor 2GO kits and Shield2Go Product name: POWER_DRILL2GO Ordering code: SP005350194</p>	<p>Product information</p> 
	<p>Human machine interface (HMI) direction indicator for all 3D magnetic sensor 2GO kits and Shield2Go Product name: DIR_INDICATOR2GO Ordering code: SP005350196</p>	<p>Product information</p> 
	<p>HMI mini control with 4 directions and 360° rotation for all 3D magnetic sensor 2GO kits and Shield2Go Product name: MINI_CONTROL2GO Ordering code: SP005350192</p>	<p>Product information</p> 



Click here to learn more:

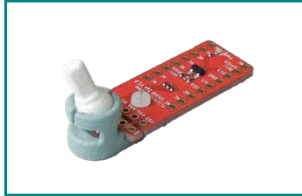
www.infineon.com/sensors2go

Add ons for Sensor 2GO kits and Shield2Go



OpenClose adapter for Hall switch Shield2Go
Product name: OPENCLOSE2GOHSTOB01

Product
information



Play2Go for 3D magnetic sensor
Product name: PLAY2GO
Ordering code: SP005731811

Product
information



Contactless switch array for all 3D magnetic sensor 2GO kits and Shield2Go
Product name: Contactless switch array
Ordering code:
 Simply use our 3D printing files, link to, and start your 3D print.

Product
information



Spindle2Go for all 3D magnetic sensor Shield2Go
Product name: SPINDLE2GO
Ordering code: SP005989689

Product
information



Click here to learn more:

www.infineon.com/sensors2go

Evaluation boards – for simple and easy evaluation

MEMS microphones flex evaluation kits

Product name:

EVAL_IM69D130_FLEXKIT
 EVAL_IM69D120_FLEXKIT
 EVAL_IM69D127_FLEXKIT
 EVAL_IM73D135_FLEXKIT
 EVAL_IM72D128_FLEXKIT
 EVAL_IM70A135_FLEXKIT
 EVAL_IM67D120_FLEXKIT
 EVAL_IM67D130_FLEXKIT
 KIT_IM68A130A_FLEX

Ordering code:

SP002153022
 SP002153026
 SP005403891
 SP005415695
 SP005429924
 SP005728204
 SP005560671
 SP005537489
 SP005834257

Product
information



Current sensors evaluation boards

Product name:

TLE4973 EVAL 120A
 TLE4973 EVAL INLAY
 TLE4973 EVAL STD PCB
 TLE4973 EVAL VER BAR
 TLE4973 EVAL LAT BAR
 TLE4972 EVAL LAT BAR
 TLE4972 EVAL STD PCB
 TLE4972 EVAL INLAY
 TLI4971 EVAL 120A
 TLE4971 EVAL 120A

Ordering code:

SP006015313
 SP005853842
 SP005853840
 SP005853847
 SP005853844
 SP005632140
 SP005632136
 SP005632138
 SP005876845
 SP005343588

Product
information



MEMS microphones for ATV plug and play boards

Product name:

EVAL_AHNB_DIGITALV01
 EVAL_AHNB_ANALOGV01

Ordering code:

SP005955184
 SP005568087

Product
information



TMR linear sensors evaluation boards

Product name:

TLI5590 SATELLITE
 TLI5590 EVAL KIT

Ordering code:

SP005857647
 SP005857645

Product
information



PAS CO2 sensor evaluation boards

Product name:

EVAL_CO2_5V_SENSOR2GO
 EVAL_CO2_5V_MINIBOARD
 EVAL_PASCO2_SENSOR2GO
 EVAL_PASCO2_MINIBOARD

Ordering code:

SP006037148
 SP006037150
 SP005582413
 SP005577475

Product
information



Click here to learn more:

www.infineon.com/evaluation-boards

Choose the best fit magnetic sensor solution from broadest portfolio

Our sensor simulation tools allow you to compare products in application conditions. The tools are easy-to-use and will guide you in identifying the most suitable Infineon XENSIV™ - sensor combined with the best-fit magnet.

 <p>Current sensor</p>	<p>XENSIV™ – Current sensor simulation tool</p> <p>Define and optimize the current sensing structure for your system. The tool supports design of lateral and vertical insertions for PCB (2 to 10 layer stack) or bus-bar based applications. The simulation will provide insertion resistance, field transfer factor, sensitivity range, measurement range and power dissipation as well as cross-talk in case of a 3-phase system.</p> <p>Direct link to the Current Sensor Simulation Tool: https://currentsensorsim.infineon.com/</p>
 <p>3D magnetic sensor</p>	<p>XENSIV™ – 3D magnetic sensors simulation tool</p> <p>3D magnetic field sensor for smaller, more accurate and robust designs. The sensor family, with low current consumption and cost-optimized design, specifically addresses the needs of new magnetic sensor applications in consumer, industrial and automotive. They are ideally suited for the measurement of three dimensional movement within a magnetic field, linear slide movement as well as 360° angle rotation.</p> <p>Direct link to the 3D Magnetic Sensors Simulation Tool: https://www.infineon.com/3dsim</p>
 <p>Magnetic switches</p>	<p>XENSIV™ – Magnetic switches simulation tool</p> <p>Discover Infineon's broad energy saving portfolio of Hall switches in smallest package. Simulate your Hall switch applications and see the results in an accurate simulation of the magnetic field and the switching behavior of the Hall switch in the application.</p> <p>Direct link to the Hall Switches Simulation Tool: https://www.infineon.com/hallsim</p>
 <p>Angle sensor</p>	<p>XENSIV™ – Magnetic angle sensor simulation tool</p> <p>Highest variety - low end to high end, standardized and specialized in all four magnetic technologies: Hall, GMR, AMR and TMR. This tool calculates the valid distance from the magnet surface to the sensor and the assembly error, given certain parameters: magnetic properties, sensor specification and assembly tolerances.</p> <p>Direct link to the Angle Sensors Simulation Tool: https://www.infineon.com/anglesim</p>
 <p>Speed sensors</p>	<p>Speed sensor solution tool</p> <p>Infineon's innovative SPEED SENSOR SOLUTION TOOL will provide a sensor recommendation for your tooth wheel and back bias magnet geometry. The sensors are ranked according their expected maximum air gap capability. Customer constraints like enhanced strayfield immunity, the necessity for a direction channel, or the sensor interface are considered in the selection process.</p> <p>Direct link to the Speed Sensor Solution Tool: https://speedsensortool.infineon.com</p>



Click here to learn more:

www.infineon.com/xensiv-simulation-tools

ISO 26262 – Functional Safety (FuSa)

Dependable electronics based on Functional Safety

Automotive Functional Safety – we ease the process for integrating safety features with our safety guidelines and services.

Infineon provides dependable electronics to support today’s safety-relevant systems and future fail-operational systems as essential components that allows customers fulfilling their safety requirements on application level. Highly integrated systems equipped with safe electronic semiconductors are essential for key application areas like connectivity, electromobility and higher levels of automated driving. The ISO 26262 set of standards sets out requirements and guidance for products in order to be integrated in an automotive safety applications.

- Discover Infineon’s products with ISO 26262 classification

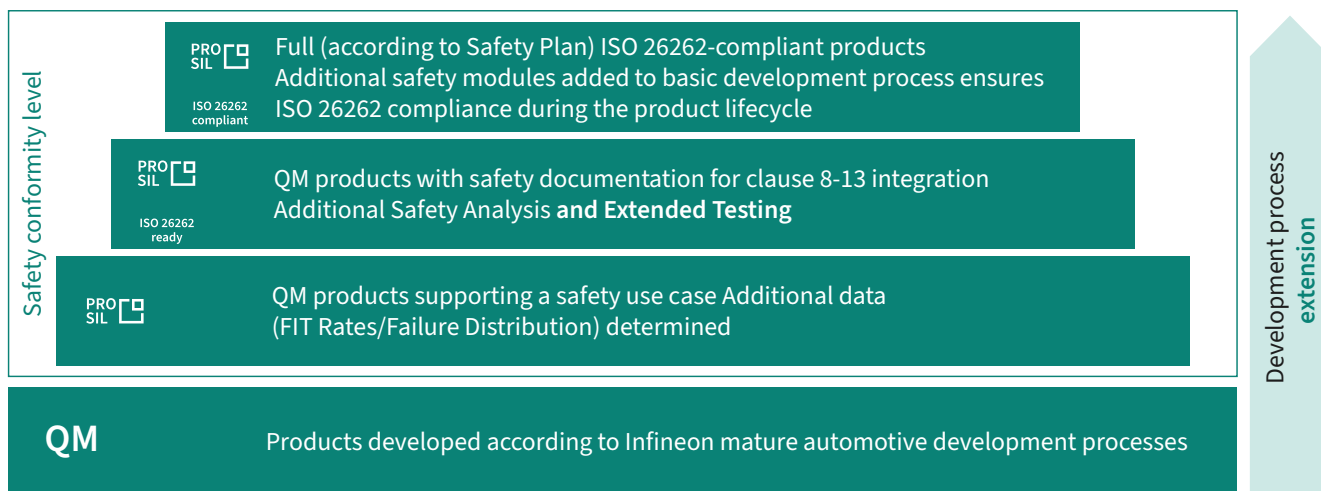
With our holistic approach towards functional safety, Infineon is responding to the increased complexity and strict requirements that make functional safety projects costly and time-consuming. We provide the necessary products, including documentation and supporting information, for easing the integration and reduce the effort at system integrator level.

Benefit from:

- Innovative solutions for automotive safety-related applications
- Improve time-to-market through comprehensive safety documentation of ISO 26262-compliant products
- Reduce the integrator’s efforts with ISO 26262-compliant and -ready products
- Broad portfolio of ISO 26262-compliant products already available
- Newly developed automotive parts will primarily be part of an ISO 26262-compliant development flow

Safety conformity levels:

- PRO-SIL™ ISO 26262-compliant devices meet all relevant requirements for semiconductors as defined in the ISO 26262 series of standards for automotive functional safety.
- The PRO-SIL™ ISO 26262-ready marking designates QM devices that can be integrated into a safety-related application by customer usage of the ISO 26262:2018 clause 8-13 class II hardware evaluation.
- The Infineon automotive Ensured Compliance process framework has been certified by SGS-TÜV Saar for process compliance with ISO 26262:2018 as of April 2022. This certification underpins our focus on automotive functional safety.



ISO 26262 ready



ISO 26262 compliant



Click here to learn more: www.infineon.com/iso26262

Dependability is the key driver for the megatrend towards autonomous driving

The future car is fully connected and always online. It is all-electric and autonomous. At Infineon, we believe that it takes both to realize it- technology and trust.

The increased need for safe electronic systems in vehicles, that drivers and passengers can rely on, are the foundation of trust and shape the future towards higher levels of automated driving.

Winning trust of tomorrow's passengers starts with dependable electronics that enable highly available, dependable, robust, safe and secure systems that operate in all conditions.

Infineon is your trusted partner offering all relevant ingredients for your dependable systems – automotive quality, Functional Safety, cybersecurity, innovative products, system understanding and operational excellence.

Dependable electronics based on quality

As vehicles become more reliant on electronic components, the demand for safe and reliable systems is growing. Especially the rising levels of automated driving depend on the trust that drivers and passengers have towards the quality and reliability of each component. The complexity and requirements in the automotive industry will continue to grow in terms of quality and dependability to keep vehicles running safely and smoothly over 15 years of lifetime.

Infineon's passion in high quality and dependable products create a portfolio with superior performance and unmatched durability through our Zero defect mentality. We go beyond the standards to fit the real application requirements.

Upgrade your automotive systems and applications with our high-quality semiconductor components for your design.

Dependable electronics based on quality

Automotive quality beyond the standards with a zero defect mindset

The complexity and functionalities of vehicles will continue to grow, thus driving the need for dependable electronics with quality being one of its key ingredients. We are convinced that our passion in quality creates a product portfolio that meets the high-quality requirements and leads to highly reliable and robust products.

How Infineon differentiates as a quality leader:

1. Our goal is to go beyond standards to better fit real application requirements: from intensive screening methods to detect production defects, to advanced AEC Q100/101 tests where required, to sub 1dpm validation to achieve low dpm rates.
2. Our track record of achievements, such as multiple quality awards from our customers Toyota (Honor Quality Award in 2020) & Continental (Supplier of the year in 2019) prove that we consistently achieved outstanding quality targets in the automotive industry.
3. Infineon offers the highest customer service, which includes a regional network of failure analysis labs and strong localized competencies, technical trainings and regional quality analysis lab capabilities with state of the art failure analysis.
4. Meeting customer needs through best-in-class product requirements, design, manufacturing and testing: We integrate quality criteria in the development processes (e.g. RDDF), Design rules (e.g. ADeGo), materials, large manufacturing processes and process controls, proprietary testing and screening methods.

Infineon's Zero Defect mentality is built upon:

- We produce 24/7/365 at sub dpm level: translated into a year's timeline: we deliver Zero Defect for all but the last 3 seconds of a year
- We deliver sub ppm quality levels
- 90% of our products are already Zero Defect

We go beyond the standards to better fit the real application requirements.



Click here to learn more:

www.infineon.com/dependable-electronics



Infineon support for sensors

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/sensors

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Infineon customized solutions

Your specific needs, realized.

A customized solution (commonly known in the industry as an ASIC – Application Specific IC or CSP – Customer Specific Product) is one that is designed, planned, developed and used for a specific purpose with the mission of being optimized, efficient, and having all the required functionalities and features to be used in a specific application for a single customer.

Working with Infineon from design through to delivery

Infineon as a market leader in customized solutions believes innovation comes through collaboration and exploring new paths. Working closely with our customers, understanding their needs, and combining them with our cutting edge solutions we know there is always a benefit for every customer and application. Whether the challenge is related to IP, BOM constraints, or simply required higher integration – an ASIC can be the solution.

More than just a product

A customized solution enabled by Infineon's extensive knowledge, experience, and partner network provides several more advantages such as IP protection, trusted Infineon quality and supply guarantee.



Click here to learn more:
www.infineon.com/asic



A process streamlined through efficiency, expertise, and experience

The journey starts with you and a focus on feasibility - we match your needs early on with our 40 years expertise in building world-class industry leading semiconductors and ensure successful implementation of your requirements.

From technology advantage to supply stability

Whether it's digital, analog, mixed signal devices an embedded processor or integrated sensors. We have the experience and product know-how. Being one of the largest semiconductor companies, we also have a vast array of IPs. We can integrate almost anything into your chip from the vast variety of our sensors, discrete devices, drivers, and many more, including support for higher voltage levels. Our in-house fabrication facilities and design centers around the globe are known for highest quality standards. We also have well established partnerships with all major silicon foundries and assembly test fabs to complement our in-house technologies. At every step along the way we take pride in the highest quality Infineon is known for.



Click here to learn more:
www.infineon.com/asic



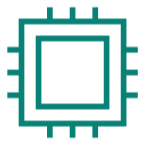
The Infineon Partner Program



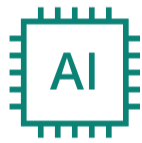
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Find solutions from our partners to accelerate your business of tomorrow. Infineon's global network of partners are experts in designing products, solutions or services leveraging Infineon components in 5 key domains: software, hardware, services, tools and end-applications.

The Infineon partner program is a global ecosystem of qualified companies, offering knowledge and experience to enable and implement Infineon products. Our associated, preferred, and premium partners help design your device and application based on our components. They have been carefully selected by us on the basis of their competence and ability to design and deliver strong and trustworthy solutions, especially for new technologies and use cases.



Hardware



Software



Tools



Services



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... jointly we create and commercialize value added solutions, while reaching new buyers

Partners programming various types of software, algorithms and operating systems

... jointly we enhance our portfolio with complementary components and expand technology know-how

Partners designing computer programs for the development of embedded systems

... jointly we enable a complete and immersive development experience for customers

Partners providing cloud and engineering services, application support or trainings

... jointly we build up engineering capabilities and offer it to a world class customer network

Partners creating end products and related applications

... jointly we provide customers with state of the art solutions and innovative use cases

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Additionally, use the “partner tab” on our product and application pages to find out more about Infineon’s partner solutions.



Click here to learn more:
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