Ultimate Power – Perfect Control

Complete automotive solutions from Infineon

www.infineon.com/automotivepower

Never stop thinking

Introduction

The ultimate power to control your applications (including automotive, transportation, lighting and motor control)

FOR A COMPREHENSIVE and reliable portfolio of products for automotive and other applications, look no further than the product range from Infineon. We have used our 35 years of experience of developing and producing products to meet the demands of the automotive market, and our innovative technologies to design and produce a large number of power products that meet all requirements of the automotive industry and also the transportation, lighting and motor drive industries.

OUR COMMITMENT TO QUALITY is demonstrated through our focus on Automotive Excellence™, the most rigourous zero defect program in the industry.

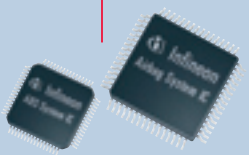
THIS SELECTION GUIDE PROVIDES an overview of our state of the ICs and their packages, which are automotive qualified and available for your current and future electronic system designs.

FOR MORE DETAILED INFORMATION, please visit our website at www.infineon.com/automotivepower, or contact your sales partner listed on the back of this selection guide.

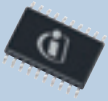
We meet all requirements for cost-effective application solutions

Embedded Power
- Single Package
- Smart Power and Controller Integration

Power System ICs
- Smart Power
- System Integration:
  - ABS/Airbag
  - Powertrain
  - Body



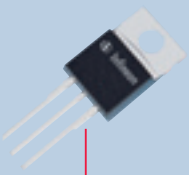
Smart Power ICs
- Smart Multichannel Switches
- Motor Bridges
- NovalithIC™/Trilith IC: High Current Motor Drivers
- Driver ICs
- Voltage Regulators
- CAN/LIN Transceivers
- DC/DC Converters



PROFET™/SPOC
Protected High-Side Switches
- Integrated charge pump
- Overload protection
- Current limitation
- Short circuit protection
- Overvoltage protection
- Open load detection
- Diagnostic feedback
- SPOC: multichannel with SPI control and add-on features

HITFET™
Protected Low-Side Switches
- Overload protection
- Current limitation
- Short circuit protection
- Overvoltage protection
- Open load detection
- Thermal shutdown

TEMPFET™
Protected Low-Side Switches
- Overload protection
- Thermal shutdown



MOSFET

Requirements

Integration

Symbols

I_D : DC Drain Current

$I_{D(ISO)}$: ISO Drain Current
(T_C = 85°C, voltage drop ≤ 0.5V, $T_j \leq T_{j\,max.}$)

$I_{D(lim)}$: Drain Current limit

$I_{D(NOM)}$: Nominal Drain Current
(T_a = 85°C, specified PCB)

I_{IS} : Current Sense Output Current

$I_{L(ISO)}$: ISO Load Current
(T_C = 85°C, voltage drop ≤ 0.5V, $T_j \leq T_{j\,max.}$)

$I_{L(NOM)}$: Load Current (T_a = 85°C, specified PCB)

$I_{L(lim)}$: Load Current limit

$I_{L(sat)}$: Saturation Load Current

$I_{L(SCr)}$: Short Circuit Current Limit at Thermal Shutdown

$I_{L(SCp)}$: Initial Peak Short Circuit Current Limit

R_{CC} : Current Sense Resistor

$R_{DS(on)}$: Drain Source Resistance in ON state (T_j = 25°C)

$V_{bb(AZ)}$: Supply Voltage (Active Zener)

$V_{bb(op.)}$: Operation Supply Voltage

V_{CE} : Collector Emitter Voltage

$V_{CE(sat)}$: Saturation Collector Emitter Voltage

V_{DS} : Drain Source Voltage

$V_{DS(AZ)}$: Drain Source Voltage (Active Zener)

V_S : Supply Voltage

Inverse : normal V_{bb} polarity and inverse load current

Reverse : reverse V_{bb} polarity and reverse load current

Contents

Automotive MOSFET

INFINEON TECHNOLOGIES consistently develops silicon technologies and assembly processes to better serve the automotive industry, setting the standard for quality and reliability.

AS A PART OF the Automotive Excellence™ Program, our latest automotive MOSFETs are green and robust. "Green" enables solutions in compliance with the RoHS / WEEE guidelines, and "robust" improves the reliability of both the component and the application.

THE ROBUST PACKAGE allows Automotive MOSFETs to sustain 260°C GREEN reflow processes at MSL1 and still pass automotive qualification. No special handling or dry-pack is needed. Real world performance confirms Infineon has extended the lead in MOSFET quality and reliability.

NEW OptiMOS™-T AND OptiMOS™-T2 trench technologies have been launched to address the latest automotive applications. These new trench products with exist alongside the existing OptiMOS™ 30V, 40V, 55V and 75V products Infineon Technologies has launched.

THE 30V OptiMOS™-T2 FAMILY includes a 2mΩ 90A DPAK which can be used for reverse battery protection and bridge topologies.

THE 40V OptiMOS™-T FAMILY includes a sub-2mΩ 180A D²PAK and a 3.8mΩ 90A DPAK. The 40V technology is well suited for electrical power steering, wipers, electric parking brake, fuel pump and any other PWM motor bridge topology.

THE 55V OptiMOS™-T FAMILY includes a 3mΩ 100A D²PAK and a 5mΩ 90A DPAK. The 55V technology adroitly handles valves, solenoids, lighting, single ended motors and other general purpose automotive loads.

THE 100V OptiMOS™-T FAMILY includes a 5mΩ 120A D²PAK to provide low $R_{DS(on)}$ MOSFET for direct diesel injection, direct gasoline injection, camless engine, boosted systems and direct injection.

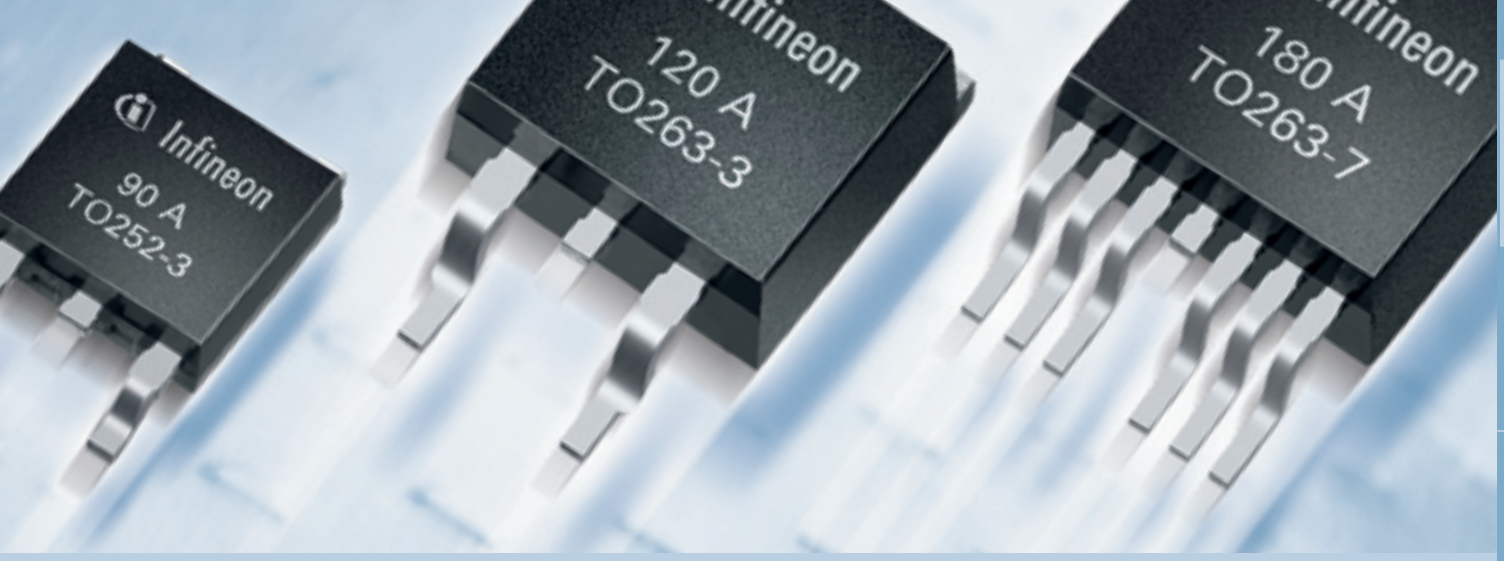
THE 30V OptiMOS™-T P-CHANNEL PFET addresses the growing need for reverse battery protection without requiring a charge pump or ground path limitation. The 4mΩ, 100A PFET can be connected above the load to allow low-loss forward conduction. It will also prevent reverse current flow in the event of reverse battery connection.

THESE NEW MOSFET TECHNOLOGIES are optimized for low $R_{DS(on)}$, high current and robustness to provide the best possible balance of reliability, performance and price.

- RoHS-compliant with MSL1 and 260°C reflow
- New OptiMOS™-T 30V, 40V and 100V trench MOSFETs
- Up to 90A in DPAK and 180A in D²PAK
- OptiMOS™ provides excellent Rth and EAS capability
- OptiMOS™-T provides ultra-low $R_{DS(on)}$ in both DPAK and D²PAK

AEC Qualified

RoHS



Naming system

I	P	D	90	N	06	S3	L	–	05

Company:
- S for Non-Green products
- I for Green products

Device:
- P for Power-MOSFET

Package type:
- G for Dual TDSN08
- P for TO220
- B for TO263/D²-PAK
- D for D-PAK (TO252)
- I for I²-PAK (TO262)

Continuous Drain Current/$I_{Dmax.}$

- P for P-Channel
- N for N-Channel

Breakdown voltage divided by 10

- S for SIPMOS® Planar N-Channel
- S2 for OptiMOS™ Planar N-Channel
- S3 for OptiMOS™-T Trench N-Channel
- S4 for OptiMOS™-T2 Trench N-Channel
- P3 for OptiMOS™-T Trench P-Channel
- P4 for OptiMOS™-T2 P-Channel

- L for Logic level

$R_{DS(on)}$ in mΩ

H5 for 5.5mΩ

All Automotive MOSFETs beginning with the letter "I" are robust and Green with full RoHS Compliance

▸ www.infineon.com/automotivemosfet

Automotive N-Channel MOSFET

OptiMOS™ 30V (Planar)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 50N03S2L-06	✓	6.4	50	1.1	⑩
IPD 30N03S2L-07	✓	6.7	30	1.1	⑩
IPD 50N03S2-07	✓	7.3	50	1.1	⑩
IPD 30N03S2L-10	✓	10.0	30	1.5	⑩
IPD 30N03S2L-20	✓	20.0	30	2.5	⑩

*See packages on page 66

OptiMOS™-T2 30V (Trench)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 90N03S4L-02	✓	2.2	90	1.1	⑩
IPD 90N03S4L-03	✓	3.1	90	1.8	⑩
IPD 70N03S4L-04	✓	4.3	70	2.2	⑩
IPD 50N03S4L-06	✓	6.0	50	3.3	⑩
IPD 30N03S4L-09	✓	9.0	30	5.0	⑩
IPD 30N03S4L-14	✓	14.4	30	4.7	⑩
IPP /I80N03S4L-03	✓	2.6	80	1.1	②, ⑨
IPP /I80N03S4L-04	✓	3.7	80	1.8	②, ⑨
IPP /I20N03S4L-15	✓	15.4	20	4.7	②, ⑨
IPB 80N03S4L-02	✓	2.3	80	1.1	⑫
IPB 80N03S4L-03	✓	3.4	80	1.8	⑫
IPB 20N03S4L-15	✓	15.1	20	4.7	⑫

*See packages on page 66

OptiMOS™ 40V (Planar)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPP 100N04S2L-03	✓	3.3	100	0.5	②
IPP 80N04S2L-03	✓	3.4	80	0.5	②
IPP 100N04S2-04	✓	3.6	100	0.5	②
IPP /I80N04S2-04	✓	3.7	80	0.5	②, ⑨
IPP /I80N04S2-H4	✓	4	80	0.5	②, ⑨
IPB 160N04S2L-03	✓	2.7	160	0.5	⑯
IPB 160N04S2-03	✓	2.9	160	0.5	⑯
IPB 100N04S2L-03	✓	3.0	100	0.5	⑫
IPB 80N04S2L-03	✓	3.1	80	0.5	⑫
IPB 100N04S2-04	✓	3.3	100	0.5	⑫
IPB 80N04S2-04	✓	3.4	80	0.5	⑫
IPB 80N04S2-H4	✓	4	80	0.5	⑫

*See packages on page 66

OptiMOS™-T 40V (Trench)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 90N04S3-04	✓	3.6	90	1.1	⑩
IPD 80N04S3-06	✓	5.2	70	1.3	⑩
IPD 70N04S3-07	✓	6.0	78	1.9	⑩
IPD 50N04S3-08	✓	7.5	50	1.7	⑩
IPP /I120N04S3-02	✓	2.3	120	0.5	②, ⑨
IPP /I100N04S3-03	✓	2.8	100	0.7	②, ⑨
IPP /I80N04S3-03	✓	3.5	80	0.8	②, ⑨
IPP /I80N04S3-04	✓	4.1	80	1.1	②, ⑨
IPP /I80N04S3-06	✓	5.7	80	1.3	②, ⑨
IPP /I70N04S3-07	✓	6.5	78	1.9	②, ⑨
IPB 180N04S3-02	✓	1.5	180	0.5	⑯
IPB 120N04S3-02	✓	2.0	120	0.5	⑫
IPB 160N04S3-H2	✓	2.1	160	0.7	⑯
IPB 100N04S3-03	✓	2.5	100	0.7	⑫
IPB 80N04S3-03	✓	3.2	80	0.8	⑫
IPB 80N04S3-04	✓	3.8	80	1.1	⑫
IPB 80N04S3-06	✓	5.4	80	1.3	⑫
IPB 70N04S3-07	✓	6.2	78	1.9	⑫

*See packages on page 66

Automotive N-Channel MOSFET

OptiMOS™ 55V (Planar)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 30N06S2L-13	✓	12.7	30	1.1	⑩
IPD 50N06S2L-13	✓	13.0	50	1.1	⑩
IPD 50N06S2-14	✓	14.4	50	1.1	⑩
IPD 30N06S2-15	✓	14.7	30	1.1	⑩
IPD 30N06S2L-23	✓	23.0	30	1.5	⑩
IPD 30N06S2-23	✓	23.0	30	1.5	⑩
IPD 26N06S2L-35	✓	35.0	26	2.2	⑩
IPD 25N06S2-40	✓	40.0	25	2.2	⑩
IPD 15N06S2L-64	✓	64.0	15	3.2	⑩
IPD 14N06S2-80	✓	80.0	14	3.2	⑩
IPP 100N06S2L-05	✓	4.7	100	0.5	②
IPP /I80N06S2L-05	✓	4.8	80	0.5	②, ⑨
IPP 100N06S2-05	✓	5	100	0.5	②
IPP 80N06S2-05	✓	5.1	80	0.5	②
IPP 80N06S2L-H5	✓	5.3	80	0.5	②
IPP 80N06S2-H5	✓	5.5	80	0.5	②
IPP 80N06S2L-06	✓	6.3	80	0.6	②
IPP /I80N06S2-07	✓	6.6	80	0.6	②, ⑨
IPP 80N06S2L-07	✓	7	80	0.7	②
IPP /I80N06S2-08	✓	8	80	0.7	②, ⑨
IPP 80N06S2L-09	✓	8.5	80	0.8	②
IPP 80N06S2-09	✓	9.1	80	0.8	②
IPP 80N06S2L-11	✓	11	80	0.95	②
IPP 77N06S2-12	✓	12	77	0.95	②
IPB 100N06S2L-05	✓	4.4	100	0.5	⑫
IPB 80N06S2L-05	✓	4.5	80	0.5	⑫
IPB 100N06S2-05	✓	4.7	100	0.5	⑫
IPB 80N06S2-05	✓	4.8	80	0.5	⑫
IPB 80N06S2L-H5	✓	5	80	0.5	⑫
IPB 80N06S2-H5	✓	5.5	80	0.5	⑫
IPB 80N06S2L-06	✓	6.3	80	0.6	⑫
IPB 80N06S2-07	✓	6.6	80	0.6	⑫
IPB 80N06S2L-07	✓	7	80	0.7	⑫
IPB 80N06S2-08	✓	8	80	0.7	⑫
IPB 80N06S2L-09	✓	8.5	80	0.8	⑫
IPB 80N06S2-09	✓	9.1	80	0.8	⑫
IPB 80N06S2L-11	✓	11	80	0.95	⑫
IPB 77N06S2-12	✓	12	77	0.95	⑫
BSP 603S2L	✓	33.0	5.2	20.0	㉑
BSP 615S2L	✓	90.0	2.8	23.0	㉑
BSO 604NS2	✓	35.0 x 2	5.0	2.0	㉒

▸ www.infineon.com/automotivemosfet

*See packages on page 66

Automotive N-Channel MOSFET

OptiMOS™-T 55V (Trench)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 90N06S3L-05	✓	5.0	90	1.1	⑩
IPD 90N06S3-06	✓	6.0	90	1.1	⑩
IPD 50N06S3L-06	✓	6.0	50	1.1	⑩
IPD 50N06S3-07	✓	6.9	50	1.1	⑩
IPD 90N06S3L-07	✓	7.1	90	1.4	⑩
IPD 50N06S3L-08	✓	7.8	50	1.4	⑩
IPD 80N06S3-09	✓	8.4	80	1.4	⑩
IPD 50N06S3-09	✓	9.0	50	1.4	⑩
IPD 50N06S3L-13	✓	12.6	50	2.3	⑩
IPD 50N06S3-15	✓	15.0	50	2.3	⑩
IPD 30N06S3L-20	✓	20.0	30	3.3	⑩
IPD 30N06S3-24	✓	24.0	30	3.3	⑩
IPP /I100N06S3L-03	✓	3.0	100	0.5	②, ⑨
IPP /I100N06S3-03	✓	3.3	100	0.5	②, ⑨
IPP /I100N06S3L-04	✓	3.8	100	0.7	②, ⑨
IPP /I100N06S3-04	✓	4.4	100	0.7	②, ⑨
IPP /I80N06S3L-05	✓	4.8	80	0.9	②, ⑨
IPP /I80N06S3-05	✓	5.4	80	0.9	②, ⑨
IPP /I80N06S3L-06	✓	5.9	80	1.1	②, ⑨
IPP /I80N06S3-07	✓	6.8	80	1.1	②, ⑨
IPP /I80N06S3L-08	✓	7.9	80	1.4	②, ⑨
IPP /I77N06S3-09	✓	9.1	77	1.4	②, ⑨
IPP /I45N06S3L-13	✓	13.1	45	2.3	②, ⑨
IPP /I45N06S3-16	✓	15.7	45	2.3	②, ⑨
IPP /I25N06S3L-22	✓	21.6	25	3.3	②, ⑨
IPP /I25N06S3-25	✓	25.1	25	3.3	②, ⑨
IPB 100N06S3L-03	✓	2.7	100	0.5	⑫
IPB 100N06S3-03	✓	3.0	100	0.5	⑫
IPB 100N06S3L-04	✓	3.5	100	0.7	⑫
IPB 100N06S3-04	✓	4.1	100	0.7	⑫
IPB 80N06S3L-05	✓	4.5	80	0.9	⑫
IPB 80N06S3-05	✓	5.1	80	0.9	⑫
IPB 80N06S3L-06	✓	5.6	80	1.1	⑫
IPB 80N06S3-07	✓	6.5	80	1.1	⑫
IPB 80N06S3L-08	✓	7.6	80	1.4	⑫
IPB 77N06S3-09	✓	8.8	77	1.4	⑫
IPB 45N06S3L-13	✓	13.0	45	2.3	⑫
IPB 45N06S3-16	✓	15.4	45	2.3	⑫
IPB 25N06S3L-22	✓	21.3	25	3.3	⑫
IPB 25N06S3-25	✓	24.8	25	3.3	⑫

*See packages on page 66

Automotive N-Channel MOSFET

OptiMOS™ 75V (Planar)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 30N08S2L-21	✓	20.5	30	1.1	⑩
IPD 30N08S2-22	✓	21.5	30	1.1	⑩
IPD 22N08S2L-50	✓	50.0	22	2.0	⑩
IPP 100N08S2L-07	✓	6.8	100	0.5	②
IPP 100N08S2-07	✓	7.1	100	0.5	②
IPP 80N08S2L-07	✓	7.1	80	0.5	②
IPP 80N08S2-07	✓	7.4	80	0.5	②
IPB 100N08S2L-07	✓	6.5	100	0.5	⑫
IPB 100N08S2-07	✓	6.8	100	0.5	⑫
IPB 80N08S2L-07	✓	6.8	80	0.5	⑫
IPB 80N08S2-07	✓	7.1	80	0.5	⑫

*See packages on page 66

OptiMOS™-T 100V (Trench)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPD 70N10S3-12[1)]	✓	12	70	1.2	⑩
IPD 70N10S3L-12[1)]	✓	12	70	1.2	⑩
IPD 50N10S3L-16[1)]	✓	16	50	1.5	⑩
IPD 35N10S3L-26[1)]	✓	26	35	2.1	⑩
IPD 30N10S3L-34[1)]	✓	34	30	2.6	⑩
IPP /I100N10S3-05[1)]	✓	5.3	100	0.5	②, ⑨
IPP /I70N10S3-12[1)]	✓	12.3	70	1.2	②, ⑨
IPP /I70N10S3L-12[1)]	✓	12.3	70	1.2	②, ⑨
IPP /I50N10S3L-16[1)]	✓	16.3	50	1.5	②, ⑨
IPB 100N10S3-05[1)]	✓	5	100	0.5	⑫
IPB 70N10S3-12[1)]	✓	12	70	1.2	⑫
IPB 70N10S3L-12[1)]	✓	12	70	1.2	⑫
IPB 50N10S3L-16[1)]	✓	16	50	1.5	⑫

[1)] Available from Q1 2008 onward

*See packages on page 66

Automotive P-Channel MOSFET

OptiMOS™-T 30V (Trench)

Type	Green	max. $R_{DS(on)}$ [mΩ]	I_D [A]	max. R_{thJC} [K/W]	Package*
IPB 100P03P3L-04	✓	4.0	100	0.65	⑫
IPP /I100P03P3L-04	✓	4.3	100	0.65	②, ⑨

*See packages on page 66

TEMPFET™/HITFET™: Low-Side Switches

Secure driving of low-side applications with HITFET™ and SPEED TEMPFET™

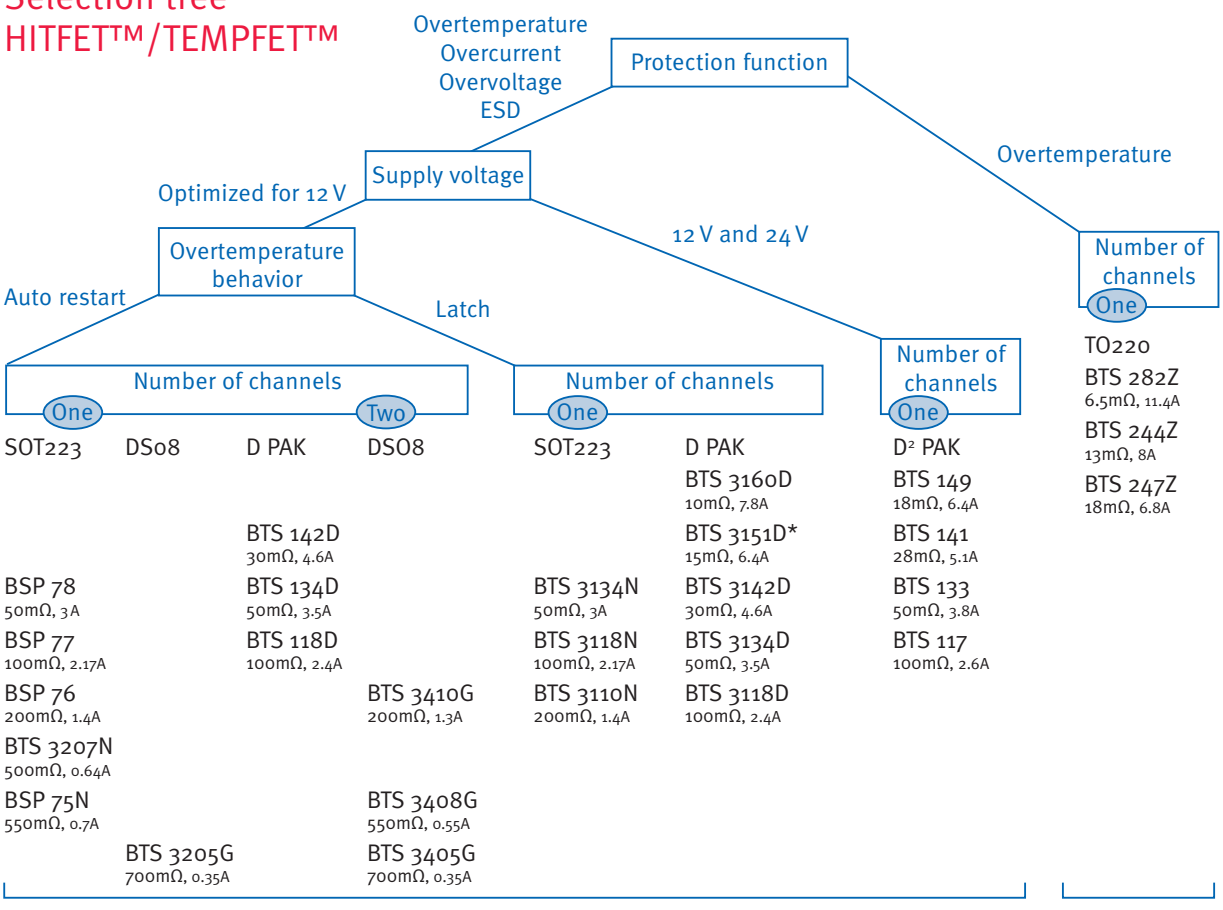
IF YOU NEED more protection for low-side applications, it's time to look at the Infineon's HITFET™ and SPEED TEMPFET™. Depending on the level of protection required, the developer can choose between HITFET™ and SPEED TEMPFET™.

SPEED TEMPFET™ provides the first level of protection with its temperature sensor. The sensor is available on external pins to enable FAST switching and flexible temperature response control.

HITFET™ provides a higher level of protection with overtemperature, short circuit, overcurrent, overvoltage and ESD. HITFET™ combines all these protection features in one easy-to-use device. Infineon has expanded the HITFET™ portfolio with even lower $R_{DS(on)}$ devices like the BTS 3160D and BTS 3151D. These devices combine familiar HITFET™ protection features of higher PWM capability and digital status feedback.

WITH THESE FEATURES and Infineon's reknowned quality and reliability you can be confident the HITFET™ can meet even the most challenging application requirements.

Selection tree HITFET™/TEMPFET™



▸ www.infineon.com/low-side-switches

*Available second half of 2008

TEMPFET™/HITFET™: Low-Side Switches

SPEED TEMPFET™

(S-FET technology)

Features

- Logic level input
- Analog driving capability
- Potential free temperature sensor
- Overload protection and thermal shutdown with external circuit
- High-speed switching (100kHz)
- Avalanche rated

Logic level enhancement types (N-channel) at V_{IN} = 10V

Type	Green	V_{DS} [V]	$R_{DS(on)max.}$ [mΩ]	$I_{D(ISO)}$ [A]	$I_{D\ max.}$ at T_C = 100 °C [A]	Package**
BTS 247Z	√*	55	18	19	33	③, ④, ⑮
BTS 244Z	√*	55	13	26	35	③, ④, ⑮
BTS 282Z	√*	49	6.5	36	80	⑥, ⑰

*Green available second half of 2008

**See packages on page 66

Function table TEMPFET™/HITFET™

Device	TEMPFET	HITFET			
	BTS 244 BTS 247 BTS 282	BSP 76, 77, 78 BTS 118D BTS 134D BTS 142D BTS 3207N BTS 3410G	BSP 75N BTS 3408	BTS 117 BTS 133 BTS 141 BTS 149	BTS 3160D BTS 3151D
Technology	S-FET	Smart	SPT	Smart MOS	SPT Top Chip S-FET Base Chip
Power stage	MOS	MOS	MOS	MOS	MOS
Linear drive capability	•	•		•	
Logic level input	•	•	•	•	TTL/CMOS
Overload protection	•	•	•	•	•
Overcurrent shutdown					•
Current limitation		•	•	•	
Short-circuit protection		•	•	•	•
Thermal shutdown	•	•	•	•	•
PWM capability	100kHz	500Hz	500Hz	500Hz	1000Hz
Overvoltage protection		•	•	•	•
ESD protection		•	•	•	•
Status/diagnostic	Analog		Analog	Analog	Digital

HITFET™

(Smart SIPMOS® [a] /SPT [b] technology)

Features

- Overtemperature protection
- Overload protection
- Current limitation
- Short-circuit protection
- Thermal shutdown with auto-restart or latch behavior
- Overvoltage protection
- Logic level input
- Electrostatic discharge (ESD) protection
- Linear drive capability
- Status feedback:
  - digital flag
  - analogous with external resistor at input

HITFET™ 1st generation

Type	Green	$V_{DS(AZ)}$ [V]	$R_{DS(on)}$ [3] [mΩ]	$I_{D(NOM)\ min.}$ [A]	$I_{D(lim)\ min.}$ [A]	Package**
BTS 117 [2]	√*	60	100	2.6	7	②, ⑫
BTS 133 [2]	√*	60	50	3.8	21	②, ⑫
BTS 141 [2]	√*	60	28	5.1	25	②, ⑫
BTS 149 [2]	–	60	18	6.4	30	②, ⑫

*Green available first half of 2008

HITFET™ 2nd generation

**See packages on page 66

Type	Green	$V_{DS(AZ)}$ [V]	$R_{DS(on)}$ [3] [mΩ]	$I_{D(NOM)\ min.}$ [A]	$I_{D(lim)\ min.}$ [A]	Package**
BSP 75N [1]	√	55	550	0.7	1	㉑
BSP 76 [1]	√	42	200	1.4	5	㉑
BSP 77 [1]	√	42	100	2.17	10	㉑
BSP 78 [1]	√	42	50	3	18	㉑
BTS 118D [1]	√	42	100	2.4	10	⑩
BTS 134D [1]	√	42	50	3.5	18	⑩
BTS 142D [1]	√	42	28	4.6	30	⑩
BTS 3110N [2]	√	42	200	1.4	5	㉑
BTS 3118D [2]	√	42	100	2.4	10	⑩
BTS 3118N [2]	√	42	100	2.4	10	㉑
BTS 3134D [2]	√	42	50	3.5	18	⑩
BTS 3134N [2]	√	42	50	3.5	18	㉑
BTS 3142D [2]	√	42	28	4.6	30	⑩
BTS 3151D [2]	√*	40	15	6.4	40	⑪
BTS 3160D [2]	√	40	10	7.8	70 [4]	⑪
BTS 3205G [1]	√	42	700	0.35	0.6	㉒
BTS 3207N [1]	√	42	500	0.64	5	㉑
BTS 3405G [1]	√	42	2 x 700	0.35	0.6	㉒
BTS 3408 [1]	√	60	2 x 550	2 x 0.45	2 x 1	㉒
BTS 3410G [1]	√	42	2 x 200	2 x 1.1	2 x 5	㉒

*Green available second half of 2008

**See packages on page 66

[1] Thermal shutdown with auto-restart
[2] Thermal shutdown with latch
[3] $R_{DS(on)}$ Max. at 25 °C
[4] Min. shutdown current
[a] Smart SIPMOS® = Smart Power MOS
[b] SPT = Smart Power Technology

▸ www.infineon.com/hitfet

Smart Multichannel Switches

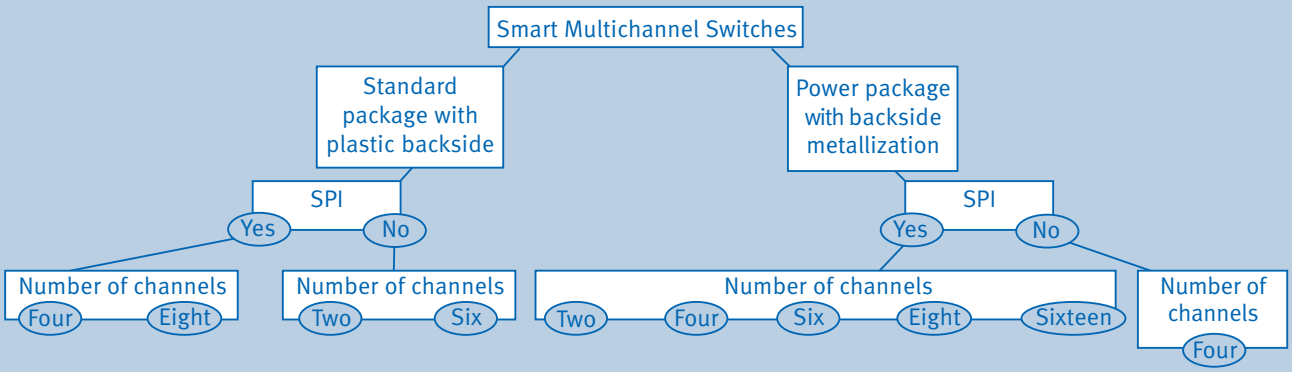
THE SMART MULTICHANNEL SWITCHES FAMILY for body and comfort, powertrain and safety electronics is specifically designed for automotive requirements. Most drivers feature advanced diagnosis via SPI and open drain DMOS output stages. All Smart Multichannel Switches are equipped with embedded protection functions. For details on the protection and diagnosis of this product family, please see table on the right.

APPLICATIONS FOR THESE multipurpose devices range from relays and LEDs up to injector valves, oxygen probe heaters and general-purpose solenoids. We offer a complete solution and leading edge functionality that enhances driving comfort and performance.

Your Benefits

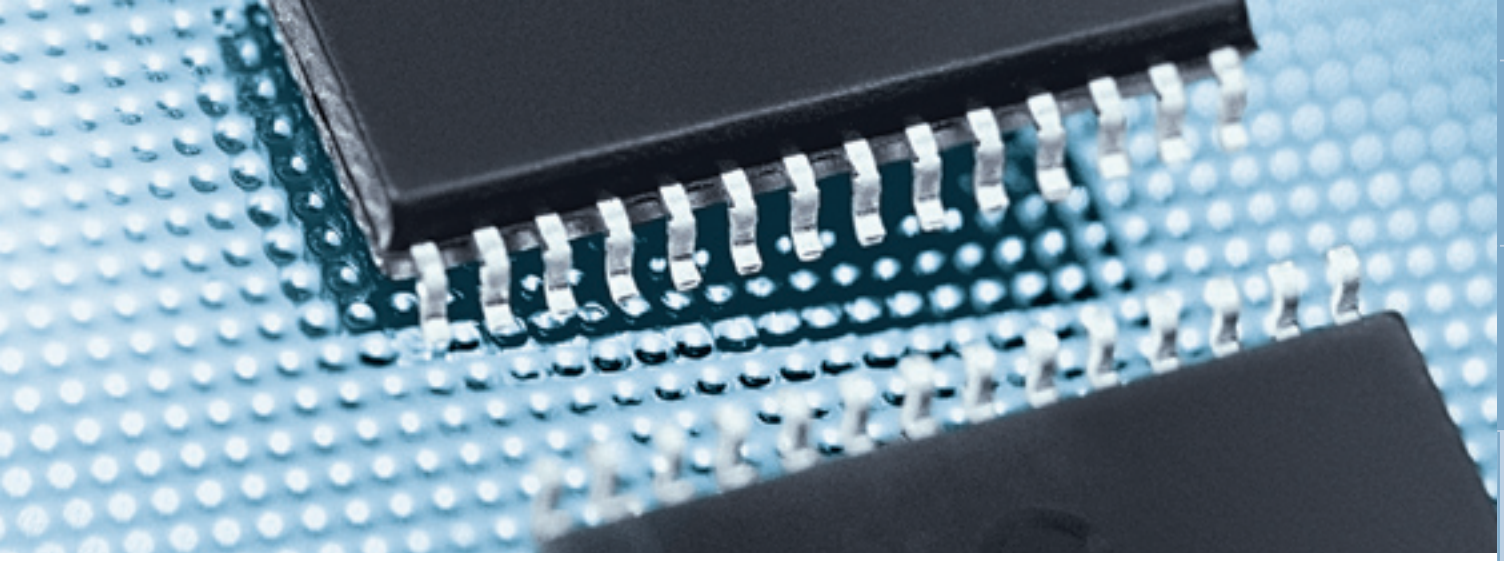
- One family concept with full scalability from 2 to 16 channels depending on your system requirements
- Designed for dedicated applications, but also available for off-the-shelf use as a standard product
- Integrated self-protection and diagnosis
- Early error detection for improved system reliability
- Control via standard SPI BUS, suitable for daisy-chain configuration to save I/O ports
- Programmable standby mode for power consumption

Selection tree – Smart multichannel switches



TLE 7231G TLE 7233G	TLE 7230G TLE 7232G TLE 7230GS TLE 7232GS	TLE 6215G	TLE 4226G	TLE 6214L	TLE 6220GP	TLE 6232GP	TLE 6230GP TLE 7230R TLE 7230R1	TLE 6240GP	TLE 6216GP TLE 6217GP TLE 6228GP

▸ www.infineon.com/smart-multichannel-switches



General Features

- Overload protection
- Current limitation
- Short circuit protection
- Thermal shutdown
- Overvoltage protection
- Diagnostic feedback
- Open load detection
- TTL and CMOS compatible input
- Electrostatic discharge (ESD) protection

Additional Features

- SPI interface, 2-bit diagnosis per channel
- Serial and parallel control of the output
- Standby mode
- Parallel inputs high/low active programmable
- General fault pin
- Compatible with 3.3V µC
- Short to GND detection

In Smart Power Technology (SPT)

Type	Green	V_S [V]	$V_{DS(AZ)\ max.}$ [V]	$R_{DS(on)\ max.}$ at T_j = 25 °C [mΩ]	$I_{D(NOM)}$ [A]	$I_{L(lim)\ min.}$ [A]	Package*
TLE 6214L	–	4.5 ... 5.5	60	2 x 220	2 x 2	2 x 5	(24)
TLE 6215G	–	6.5 ... 40	60	2 x 250	2 x 1.3	2 x 4	(29)
TLE 6216GP	–	4.8 ... 32	60	2 x 260 2 x 400	2 x 2 2 x 1	2 x 5 2 x 3	(28)
TLE 6217GP	–	4.8 ... 32	60	2 x 260 2 x 400	2 x 2 2 x 1	2 x 5 2 x 3	(28)
TLE 6220GP	–	5	60	4 x 400	4 x 1.5	4 x 3	(28)
TLE 6228GP	✓	4.8 ... 32	60	2 x 260 2 x 400	2 x 1 2 x 2	2 x 3 2 x 5	(28)
TLE 6230GP	–	5	60	8 x 1000	8 x 0.5	8 x 1	(33)
TLE 6232GP	✓	5	60	4 x 280 2 x 550	4 x 2 2 x 1	4 x 3 2 x 1.5	(33)
TLE 6240GP	–	5	60	4 x 350 4 x 400 8 x 1300	4 x 1.5 4 x 1.5 8 x 0.5	4 x 3 4 x 3 8 x 1	(33)
TLE 7231G	✓	4.5 ... 5.5	48	4 x 1300	4 x 0.25	4 x 0.5	(25)
TLE 7233G	✓	4.5 ... 5.5	48	4 x 1300	4 x 0.25	4 x 0.5	(40)
TLE 7230G	✓	4.5 ... 5.5	48	8 x 1000	8 x 0.3	8 x 1	(29)
TLE 7230R	✓	4.5 ... 5.5	48	8 x 1000	8 x 0.5	8 x 1	(33)
TLE 7232G	✓	4.5 ... 5.5	48	8 x 1200	8 x 0.5	8 x 1	(29)
TLE 7230GS	✓	4.5 ... 5.5	48	8 x 1000	8 x 0.3	8 x 1	(40)
TLE 7232GS	✓	4.5 ... 5.5	48	8 x 1200	8 x 0.24	8 x 1	(40)

*See packages on page 66

In DOPL[1)] technology (bipolar)

Type	V_S [V]	$V_{CE\ max.}$ [V]	$V_{CE(sat)}$ [V]	$I_{L(sat)}$ at $V_{CE(sat)}$ [A]	$I_{L(lim)\ min.}$ [A]	Package*
TLE 4226G	5	35	2 x 0.5 4 x 0.4	2 x 0.4 4 x 0.05	2 x 0.5 4 x 0.06	(29)

[1)] DOPL = Smart Bipolar Technology

*See packages on page 66

▸ www.infineon.com/smart-multichannel-switches

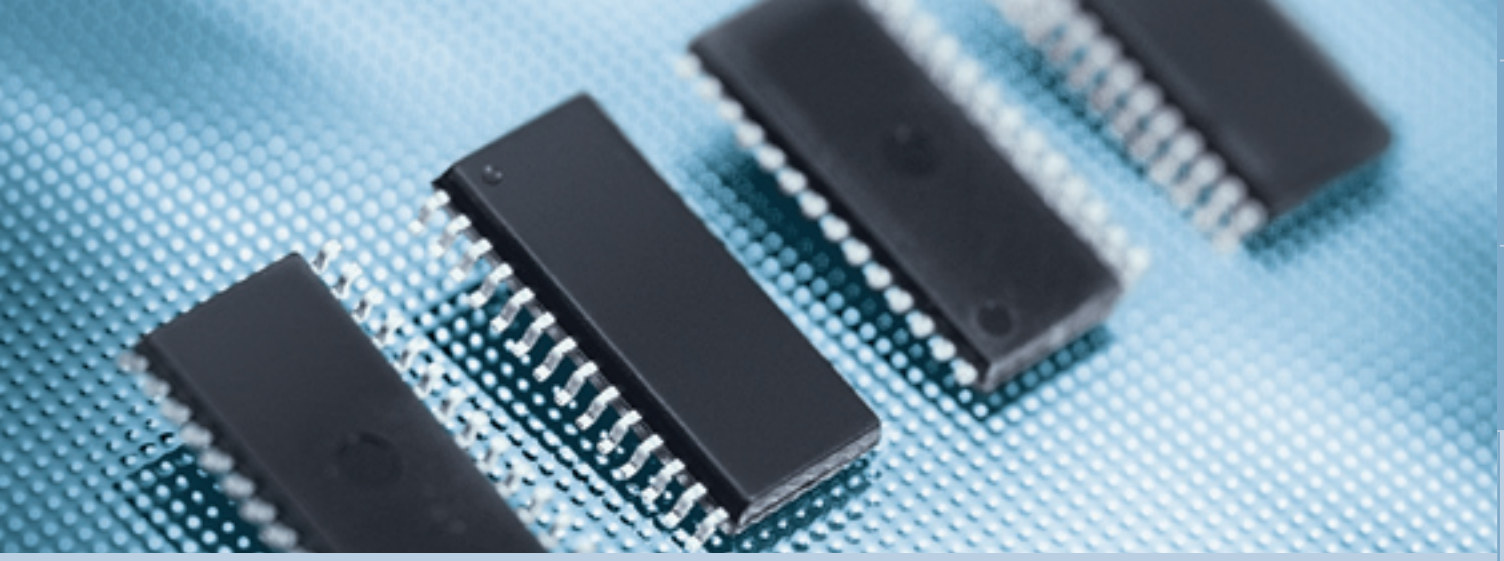
Smart Multichannel Switches

General Features for all Devices

- Overtemperature shutdown
- Short circuit/ overload protection
- Overvoltage protection
- ESD protection
- 5V supply
- Enable/reset pin
- 3.3V µC compatible
- Open load detection off state
- Overtemperature/ overload diagnosis

Function table

Name	TLE 6214L	TLE 6215G	TLE 6216GP	TLE 6217GP	TLE 6220GP	TLE 6228GP
Output channels	2	2	4	4	4	4
$R_{DS(on)\ max.}$ at T_j = 25°C [mΩ]	2 x 220	2 x 250	2 x 260 2 x 400	2 x 260 2 x 400	400	2 x 260 2 x 400
Nominal current [A]	2 x 2	2 x 1.3	2 / 1	2 / 1	1	2 / 1
Parallel channel control	2	2	4	4	4	4
Special features						
Overload shutdown	•	•	•	•		
Current limitation	•				•	
Overload switch-off delay time	•	•	•	•		•
Delayed status for pulse width operation		•	•	•		•
Failure extension time for status				•		•
Short to GND detection	•	•	•	•	•	
Open load detection state	off / on	off / on	off / on	off / on	off	off / on
Standby mode	•		•	•	•	•
Extended supply voltage		•	•	•		•
Hi/low active programmable inputs					•	
1 status/output	•	•	•	•		•
General fault flag	•				•	
SPI	8-bit				8-bit	
Open load programmable pin						
Undervoltage shutdown	•				•	•
Daisy-chain capability	•				•	
Autorestart	•				•	
Latch after shutdown	•	•	•	•		•



TLE 6232GP	TLE 6230GP	TLE 7231G	TLE 7233G	TLE 7230G	TLE 7230R/R1	TLE 7232G	TLE 7230GS	TLE 7232GS	TLE 6240GP
6	8	4	4	8	8	8	8	8	16
4 x 280 2 x 550	1000	1300	1300	8 x 1000	8 x 1000	8 x 1200	1000	1200	4 x 350 4 x 400 8 x 1300
2 / 1	6 x 1.5 0.5	0.250	0.250	8 x 0.3	8 x 0.5	8 x 250	0.300	0.240	1.5 / 0.5
6	4	1	4	1	4	1	1	1	8
•		•	•	•	•	•	•	•	
•	•			•	•	•	•	•	•
		•	•	•	•	•	•	•	
		•	•						
		•	•						
•	•	•	•	•	•	•	•	•	•
off	off	off	off	off	off	off	off	off	off
•		•	•	•	•	•	•	•	•
•	•			•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
16-bit	16-bit	8-bit	8-bit	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
•	•	•	•	•	•	•	•	•	•
		•	•	•	•	•	•	•	•
•	•			•	•	•	•	•	•
		•	•	•	•	•	•	•	

PROFET™: High-Side Switches

THE HIGHLY INTEGRATED PROFET™ family (PROtected FET) incorporates a broad range of smart features. PROFET™ intelligent power switches consist of a DMOS power transistor and CMOS logic circuitry for complete built-in protection.

THE PROFET™ FAMILY offers protection against: overload, overvoltages, short circuits, excess temperature, ground loss, power supply loss and electrostatic discharge. The PROFET™ family products are also capable of protecting against dynamic overvoltage such as load dump and inductive load turn-off. For the benefits and the functionality of the protection features, please refer to details in the datasheets (www.infineon.com/profet).

THE PROFET™ DIAGNOSTICS offer the choice of either status or current sense features, or a combination of both. In the event of a malfunction, the status feature is able to diagnose overtemperature or open load. The PROFET™ diagnostic features also provide the user with precise information about switch and load. Diagnostic feedback and load current sensing minimize costs by eliminating the need for additional discrete circuitry and assembly.

THIS VAST RANGE of smart features makes the PROFET™ ideal for a variety of automotive and industrial applications.

THIS RANGE, WHICH INCLUDES all types of resistive, conductive and capacitive loads, particularly supports the trend towards the replacement of electromechanical relays, fuses and discrete circuits.

Application Examples

- Automotive lighting
- HVAC
- 24V applications
- Solenoid
- Solid state relay
- Battery management
- Various industrial applications

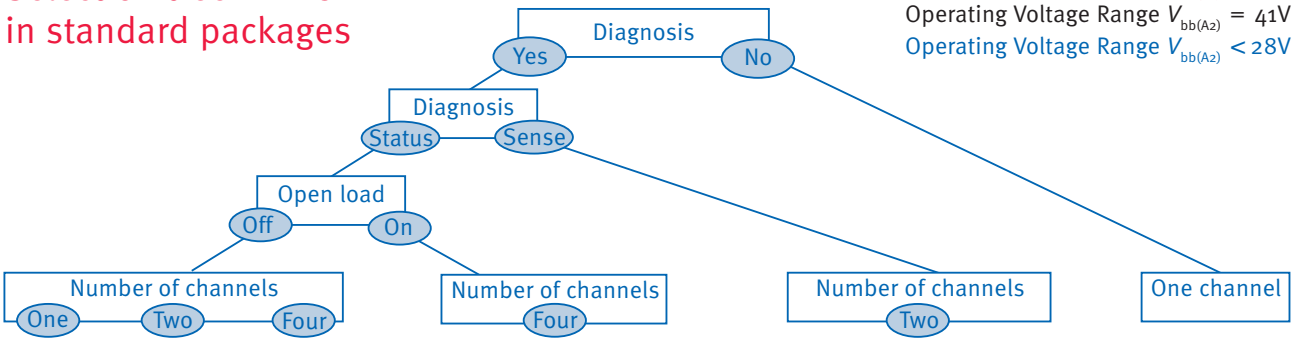
Basic Features

- Overload protection
- Current limitation
- Short circuit protection
- Thermal shutdown
- Overvoltage protection (including load dump)
- Fast demagnetization of inductive loads
- Reverse battery protection with external resistor
- Undervoltage and overvoltage shutdown with auto-restart and hysteresis (optional)
- Diagnostic feedback
- Open load detection
- CMOS and TTL compatible input
- Loss of ground and loss of V_{bb} protection
- Electrostatic discharge (ESD) protection
- Proportional load current sense (optional)

RoHS

Selection tree – PROFET™ in standard packages

Operating Voltage Range $V_{bb(A2)}$ = 60V
Operating Voltage Range $V_{bb(A2)}$ = 41V
Operating Voltage Range $V_{bb(A2)}$ < 28V



BSP 742R
BSP 752R
BTS 4175SGA
BTS 4300SGA

BTS 723GW
BTS 5210G
BTS 4160DGA

BTS 716G
BTS 716GB
BTS 724G
BTS 712N1
BTS 4130QGA

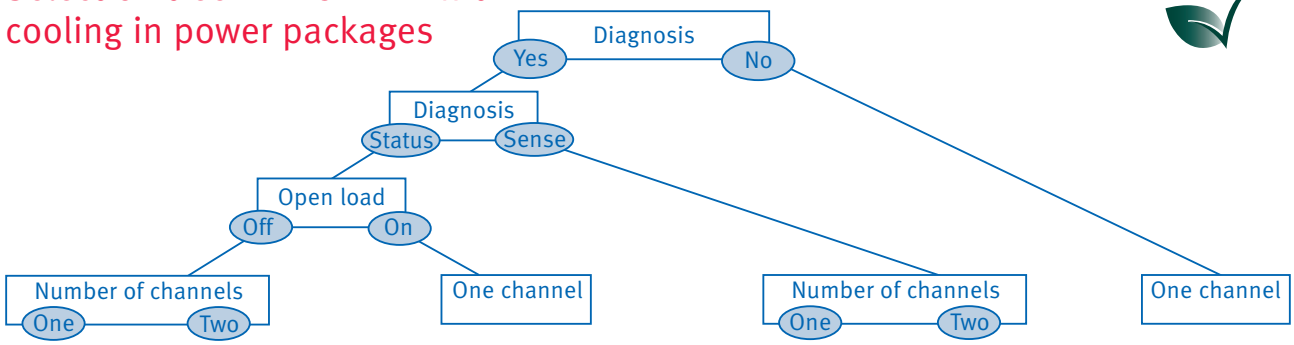
BTS 711L1
BTS 721L1

BTS 740S2
BTS 5231-2GS
BTS 5235-2G
BTS 5236-2GS

BSP 452
BSP 742T
BSP 752T
BSP 762T
BSP 772T
BTS 4140N
BTS 4141N
BTS 4142N
BTS 730

Selection tree – PROFET™ with cooling in power packages

RoHS



BTS 441R
BTS 452R

BTS 5210L
BTS 5215L

BTS 428L2

BTS 640S2G
BTS 443P
BTS 550P
BTS 555
BTS 650P
BTS 6510B
BTS 660P
BTS 6133D
BTS 6142D
BTS 6143D
BTS 6144P/B
BTS 6163D

BTS 5235-2L
BTS 5242-2L
BTS 5246-2L

BTS 441T
BTS 452T
BTS 462T

▸ www.infineon.com/profet

Overview PROFET™ in smart SIPMOS® or smart power technology

$R_{DS(ON)\ (max)}$ [mΩ] $T_j = 25°C$	1 Channel	Page	2 Channel	Page	4 Channel	Page	Package**
1500	BTS 4140N	23					(21)
350	BSP 742T/742R	23					(22)
300	BTS 4300SGA	23					(22)
200	BSP 452	23					(21)
	BSP 752T/752R	23					(22)
	BTS 452T/452R	23					(11)
	BTS 4141N	23					(11), (21)
	BTS 4142N	23					(21)
					BTS 711L1		(27)
					BTS 712N1		(27)
175	BTS 4175SGA						(22)
160			BTS 4160DGA				(25)
140			BTS 5210L/G	24			(24), (25)
			BTS 5231-2GS	24			(25)
					BTS 716GB	25	(27)
					BTS 716G	25	(27)
130					BTS 4130QGA		(27)
105			BTS 723GW	24			(25)
100	BSP 762T	23					(22)
	BTS 462T	23					(11)
					BTS 721L1		(27)
90			BTS 5215L	24			(24)
					BTS 724G	25	(27)
70	BTS 730	23					(11), (27)
60	BSP 772T	23					(22)
	BTS 428L2	23					(11)
			BTS 5235-2G	24			(27)
			BTS 5235-2L	24			(24)
						25	(30)
50			BTS 5236-2GS	24			(25)
30	BTS 640S2G	23					(16)
			BTS 740S2	24			(27)
25			BTS 5242-2L	24			(24)
20	BTS 6163D	23					(11)
	BTS 441T/441R	23					(3), (4), (14)
19			BTS 5246-2L	26			(24)
16	BTS 443P	23					(11)
12	BTS 6142D	23					(11)
10	BTS 6143D	23					(11)
	BTS 6133D	23					(11)
9	BTS 660P	23					(6), (17)
	BTS 6144P/B	23					(7), (17)
6	BTS 650P	23					(6), (17)
	BTS 6510B	23					(17)
3.6	BTS 550P	23					(1)
2.5	BTS 555	23					(1)

**See packages on page 66

PROFET™: High-Side Switches

1 channel switches

RoHS

Producttype	Green	$V_{BB\ (AZ)\ (min)}$ [V]	$R_{ON\ (max)}$ [mΩ]	$I_{L(ISO)}$ / $I_{L(nom)\ (min)}$ [A]	$I_{L(SCp)\ (typ)}$ [A]	Package**
BTS 4140N	✓	62	1500	0.2	0.9	(21)
BSP 742R [2]	✓	41	350	› 0.4	1.2	(22)
BSP 742T [1] [2]	✓	41	350	0.8	4	(22)
BTS 4300SGA	✓	41	300	0.4	1.2	(22)
BTS 4141N	✓*	47	200	0.7	1.4	(21)
BTS 4142N	✓	47	200	1.4	3	(21)
BSP 452	✓	41	200	› 0.7	1.5	(21)
BSP 752T [1] [2]	✓	62	200	1.3	6.5	(22)
BSP 752R [2]	✓	62	200	1.3	6.5	(22)
BTS 452T [1] [2]	✓	62	200	1.7	6.5	(11)
BTS 452R [2]	✓	62	200	1.7	6.5	(11)
BB 4175SGA	✓	62	175	1.3	6.5	(22)
BSP 762T [1] [2]	✓	41	100	2	10	(22)
BTS 462T [1] [2]	✓*	41	100	2.3	14	(11)
BTS 730	✓	› 40	70	3.5	20	(11), (27)
BSP 772T [1] [2]	✓	41	60	2.6	17	(22)
BTS 428L2 [2]	✓*	› 40	60	3.6	22	(11)
BTS 640S2G [3]	✓	› 40	30	4.0	50	(16)
BTS 6163D [3]	✓	63	20	5.5	80	(11)
BTS 441T [1] [2]	✓	› 40	20	7.2	65	(3), (4), (14)
BTS 441R [2]	✓	› 40	20	7.2	65	(3), (4), (14)
BTS 443P [2]	✓	38	16	6.2	35	(11)
BTS 6142D	✓	39	12	7	100	(11)
BTS 6133D	✓	39	10	8	105	(11)
BTS 6143D [3]	✓	39	10	8	105	(11)
BTS 660P [3]	✓	62	9	9.9	90	(6), (17)
BTS 6144P/B	✓	39	9	9.5	130	(7), (17)
BTS 6510B	✓*	39	6	13.6	130	(17)
BTS 650P [3]	✓	39	6	13.6	130	(6), (17)
BTS 550P [3]	–	40	3.6	18.2	220	(1)
BTS 555 [3]	–	40	2.5	23	400	(1)

[1] Without status
[2] With overvoltage shutdown
[3] Without proportional load current sense

*Green available second half of 2008
**See packages on page 66

PROFET™: High-Side Switches

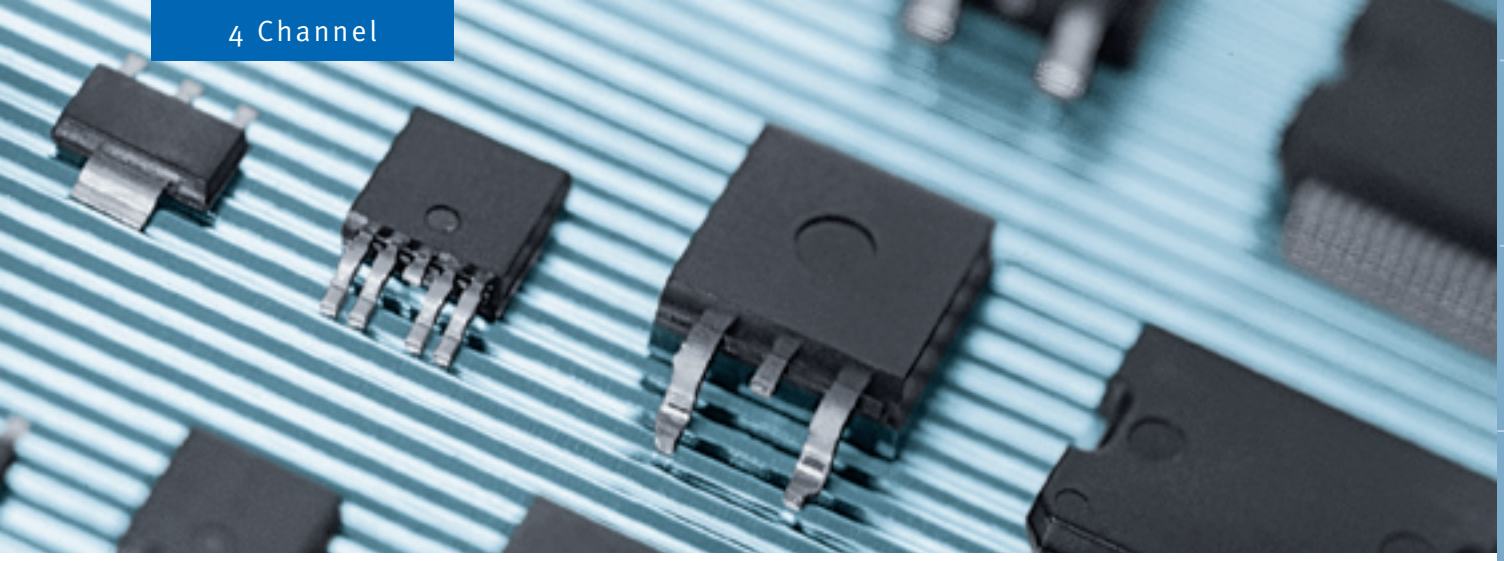
2 channel switches

RoHS

Producttype	Green	$V_{BB\ (AZ)\ (min)}$ [V]	$R_{ON\ (max)}$ [mΩ]	$I_{L(nom)}$ One channel active $_{(min)}$ [A]	$I_{L(nom)}$ All channels active $_{(min)}$ [A]	$I_{L(SCp)\ (typ)}$ [A]	Package*
BTS 4160DGA	✓	› 40	2 x 160	1.7	1.2	9	(25)
BTS 5210L	✓	› 40	2 x 140	1.8	1.7	9	(24)
BTS 5210G	✓	› 40	2 x 140	1.8	1.7	9	(25)
BTS 5231-2GS [1]	✓	› 40	2 x 140	1.8	1.3	8	(25)
BTS 723GW	✓	› 56	2 x 105	2.5	2.0	9	(25)
BTS 5215L	✓	› 40	2 x 90	3.7	3.7	15	(24)
BTS 5235-2G [1]	✓	› 40	2 x 60	3.3	2.5	23	(27)
BTS 5235-2L [1]	✓	› 40	2 x 60	3.5	2.6	23	(24)
BTS 5236-2GS [1]	✓	41	2 x 50	3.2	2.3	6	(25)
BTS 740S2 [1]	✓	› 40	2 x 30	4.9	3.9	50	(27)
BTS 5242-2L [1]	✓	› 40	2 x 25	6.0	4.1	7/40 [2]	(24)
BTS 5246-2L [1]	✓	› 40	2 x 19	6.0	4.3	7/40 [2]	(24)

[1] With proportional load current sense
[2] Adjustable

*See packages on page 66

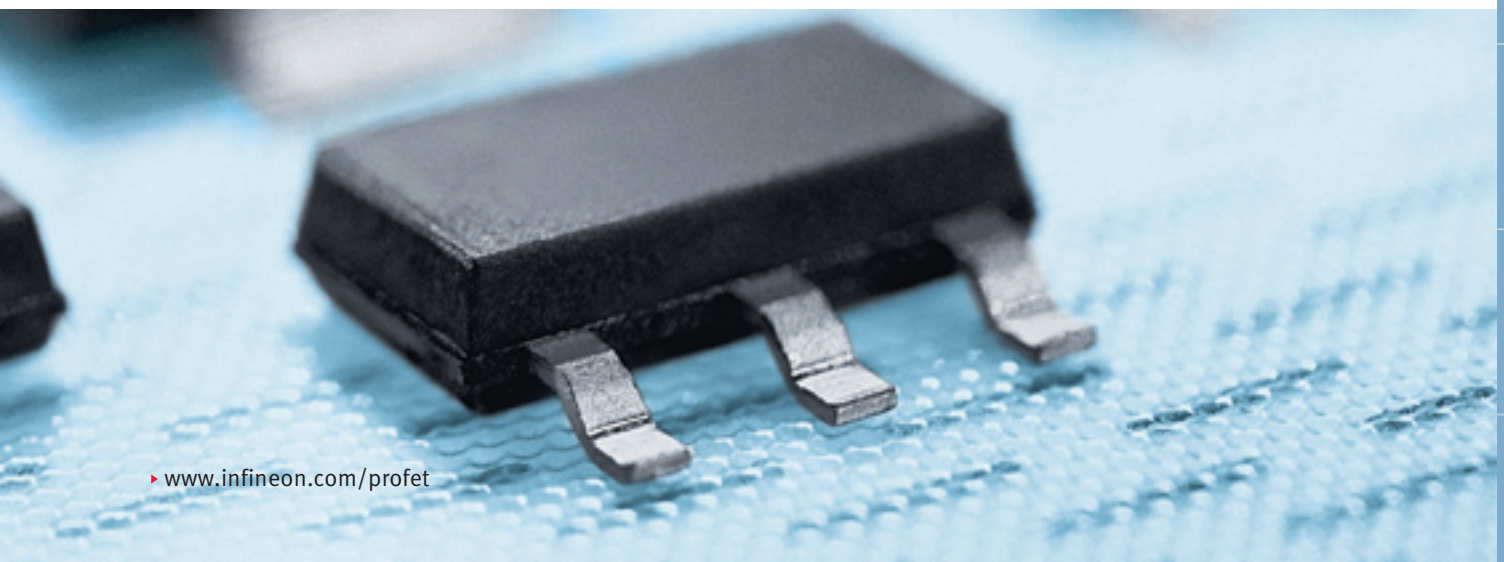


4 channel switches

RoHS

Producttype	Green	$V_{BB\ (AZ)\ (min)}$ [V]	$R_{ON\ (max)}$ [mΩ]	$I_{L(nom)}$ One channel active $_{(min)}$ [A]	$I_{L(nom)}$ All channels active $_{(min)}$ [A]	$I_{L(SCp)\ (typ)}$ [A]	Package*
BTS 711L1	✓	› 40	4 x 200	1.7	1.1	7.5	㉗
BTS 712N1	✓	› 40	4 x 200	1.7	1.1	7.5	㉗
BTS 716G	✓	› 40	4 x 140	2.3	1.2	9	㉗
BTS 716GB	✓	› 40	4 x 140	2.3	1.2	9	㉗
BTS 4130QGA	✓	› 40	4 x 130	2.1	1.1	9	㉗
BTS 721L1	✓	› 40	4 x 100	2.5	1.6	14	㉗
BTS 724G	✓	› 40	4 x 90	3	1.4	15	㉗

*See packages on page 66



PROFET™: High-Side Switches

Device	BTS 4140N	BSP 742T	BTS 4141N	BTS 4142N	BTS 452T	BSP 452	BSP 752T	BSP 762T	BSP 772T	BTS 730	BTS 441T	BSP 742R	BTS 4300SGA	BTS 452R	BSP 752R	BTS 712N1	BTS 711L1	BTS 4175SGA
$R_{DS(on)}$	1500	350	200	200	200	200	200	100	60	70	20	350	300	200	200	200	200	175
Number of channel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1
Power net																		
12V capable	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
24V capable	•				•										•			•
Load current limit																		
high level (high inrush current compatible)		•	•		•		•	•	•	•	•	•	•		•	•	•	•
low level (better protection for inductive loads)	•			•		•								•				
multiple levels																		
Short circuit to GND protection																		
latch																		
restart	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Over temperature protection																		
latch																		
restart	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Overvoltage																		
no shutdown	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•
shutdown with auto-restart																•	•	
Loss of inductive load																		
with additional external diode																		
protected	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Reverse battery protection																		
Resistor integrated																		
via body diode	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
reversafe																		
Inverse current operation capability																		
Status type																		
digital (open drain)												•	•	•	•	•	•	•
current sense																		
mixed																		
Status feedback for																		
Over temperature												•	•	•	•	•	•	•
Short circuit to GND												•	•	•	•			•
Short circuit to VBB												•	•	•	•	•		•
open load in OFF												•	•	•	•	•		•
open load in ON																	•	
Open load detection																		
in OFF state with test current												•	•	•	•			•
in OFF state with external pull up resistor																•		
accross power transistor in ON state																	•	
Current sense																		
analog signal proportional to load current																		
current sense + digital status																		
Sense enable																		
Current limit adjustement																		

BTS 4160DGA	BTS 5210	BTS 716G	BTS 716GB	BTS 4130QGA	BTS 723GW	BTS 721L1	BTS 5215	BTS 724G	BTS 428L2	BTS 441R	BTS 640S2G	BTS 740S2	BTS 5231-2GS	BTS 5235-2L/G	BTS 5236-2GS	BTS 5242-2L	BTS 5246-2L	BTS 6163D	BTS 443P	BTS 6142	BTS 6143	BTS 6133	BTS 660P	BTS 6144P	BTS 6510P	BTS 650P	BTS 550P	BTS 555P
160	140	140	140	130	105	100	90	90	60	20	30	30	140	60	50	25	19	20	16	12	10	10	9	9	6	6	3,5	2,5
2	2	4	4	4	2	4	2	4	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
					•													•					•					
•	•	•	•	•		•	•	•	•	•	•	•				•	•											
					•											•	•											
													•	•	•			•	•	•	•	•	•	•	•	•	•	•
																		•	•	•	•	•	•	•		•	•	•
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•								•			
																												•
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•		•	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
						•					•	•																
																		•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•											
													•	•	•			•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•											
																		•	•	•	•	•	•	•	•	•	•	•
													•	•	•	•	•		•			•			•	•	•	•
•	•	•	•	•	•	•	•	•	•	•																		
													•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
											•	•																
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
					•						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•											
•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•											
									•		•	•	•	•	•						•							
					•																							
•	•	•	•	•		•	•	•		•	•	•	•	•	•	•	•											
									•				•	•	•	•	•				•							
													•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
											•	•																
													•	•	•													
																•	•											

New SPOC SPI Power Controller Family for Advanced Light Control

THE SPOC PRODUCTS are five channel high-side smart power switches in PG-DSO-36-20 package providing embedded protective functions. They are especially designed to control standard exterior front and rear lighting in automotive applications.

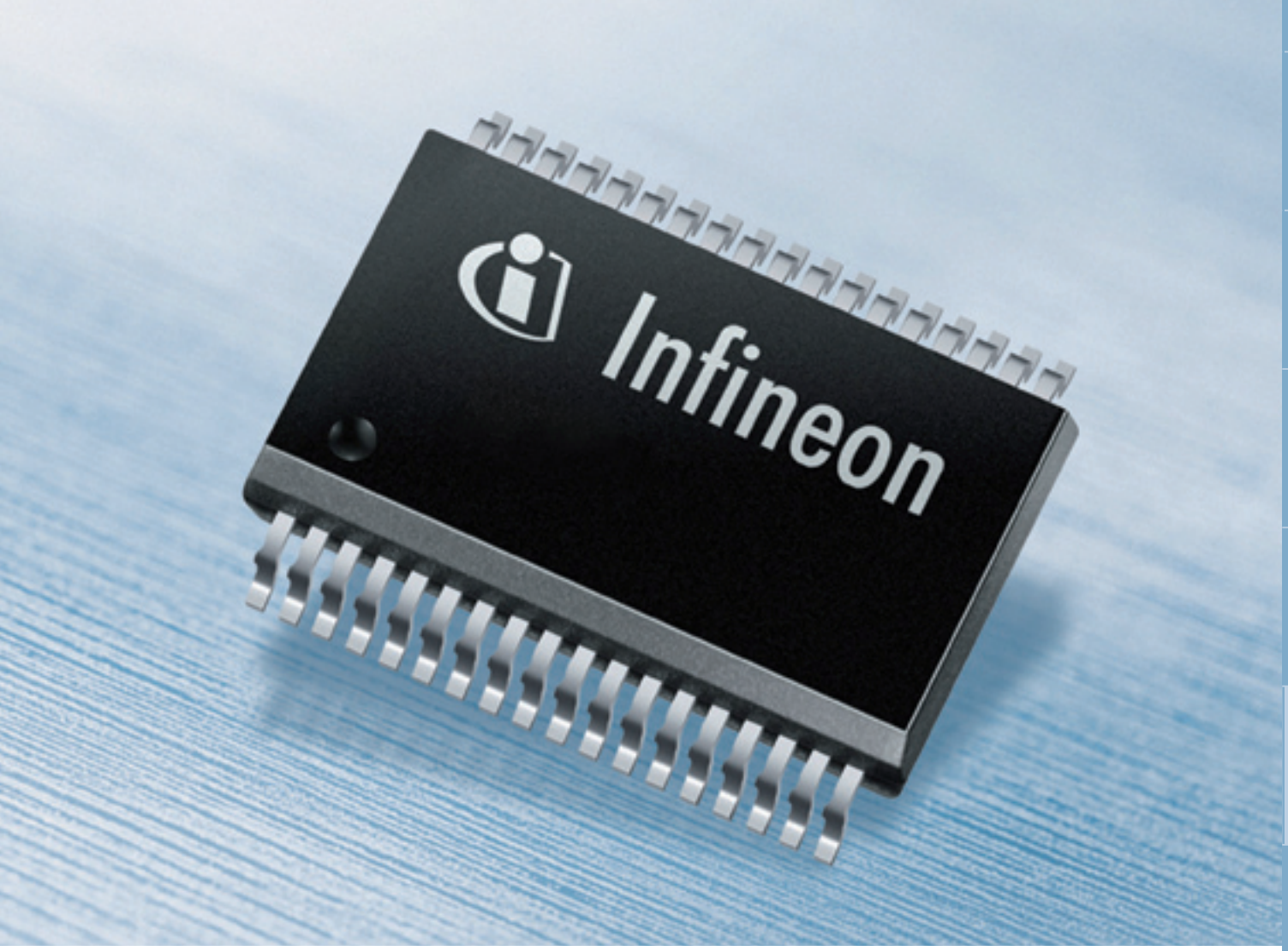
IN ORDER to use the same hardware with bulbs and LEDs, the device can be configured to bulb or LED mode. As a result, both load types are handled optimally in switching and diagnosis accuracy (not BTS 5566G).

CONFIGURATION and diagnosis are done via SPI. Additionally, there is a current sense signal available for each channel that is routed via a multiplexer to one diagnosis pin. SPOC provide a secure limp-home functionality via a limp-home input pin.

Parameter	Symbol	Value
Operating Voltage Power Switch	V_{bb}	4.5 ... 28V
Logic Supply Voltage	V_{dd}	3.8 ... 5.5V
Over Voltage Protection	$V_{bb(AZ, min)}$	41V
Nominal Loads (bulbs)		
■ Channel 0, 1		21W (27W)
■ Channel 2		21W (27W) flasher
■ Channel 3, 4		5W/10W
SPI Access Frequency	$f_{SCLK(max)}$	1MHz (BTS 5590G) 2MHz (BTS 5576G, BTS 5566G)

Parameter	BTS 5590G	BTS 5576G	BTS 5566G
Bulb Application	Yes	Yes	Yes
LED Application	Yes	Yes	No
Watchdog functionality	Yes	No	No
On-state Resistances $R_{DS(on)\ max.}$			
■ Channel 0, 1	50mΩ	49mΩ	49mΩ
■ Channel 2	80mΩ	64mΩ	64mΩ
■ Channel 3, 4	200mΩ	180mΩ	180mΩ
Package*	⓭	⓭	⓭

*See packages on page 66



Basic Features

- 8-bit serial peripheral interface (daisy-chain capable SPI) for control and diagnosis
- CMOS-compatible parallel input pins for each channel provide straightforward PWM operation
- Very low standby current
- Optimized electromagnetic compatibility (EMC) for bulbs as well as LEDs

Diagnosis Functions

- Multiplexed proportional load current sense signals
- High accuracy of current sense signal at wide load current range
- Current sense ratio (k_{ILIS}) configurable for LEDs or bulbs (not BTS 5566G)
- Very fast diagnosis in LED mode (< 2% duty cycle at 100Hz) (not BTS 5566G)
- Latching feedback on overtemperature and over load via SPI

Protective Functions

- Reverse battery protection with external components
- Short circuit and overload protection
- Multistep current limitation
- Thermal shutdown with latch
- Overvoltage protection
- Loss of ground protection

Application Specific Functions

- Integration of adjustable watchdog timer with external capacitor (BTS 5590G only)
- Sophisticated trigger state machine with 2-bit increment and lock, served via SPI
- Fail-safe activation via LHI pin and configuration via input pins
- Load type configuration between bulbs and LEDs (not BTS 5566G)

▸ www.infineon.com/spoc

Gate Driver ICs for external MOSFETs

H-bridge/dual half-bridge drivers family overview

	TLE 6281G/TLE 6284G	TLE 6282G
Control inputs	2	4
Target Applications	Clutch, Gear Box, Transfer case, Active Suspension, Belt Pretentioner EPS	Injection Valve Unipolar 4-phase motor Boost Converter
Diagnosis	2 bits	1-bit
Over Temperature Warning	Yes	No
Adjustable SCD and disable	Yes TLE 6284G/No TLE 6281G	Yes
Supply Voltage range	7.5 ... 60V	7.5 ... 60V

TLE 6281G
H-bridge driver IC*

- Driver IC for 7.5 ... 60V supply voltage
- Short circuit protection by V_{DS} monitor
- PWM/DIR inputs for DC brush motors
- Low quiescent current (inhibit mode)
- Diagnostic ERR flag provides detailed feedback
- Adjustable dead time/deactivation possible

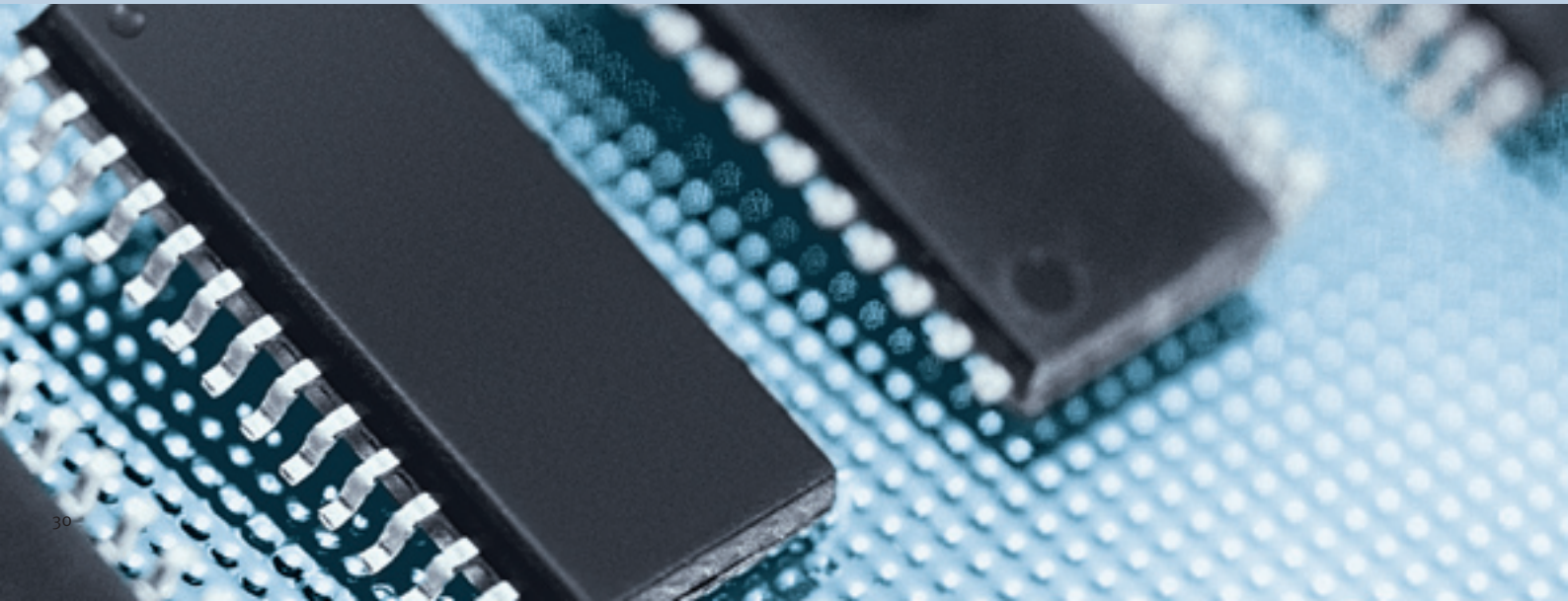
TLE 6284G
H-bridge driver IC*

- Adjustable V_{DS} detection level

TLE 6282G
Dual half-bridge driver IC*

- All four switches can be used independently
- Split of outputs allows connection of load between high and low-side switch
- Diagnostic ERR flag
- Adjustable short circuit protection level down to $0.75 V_{DS}$
- Can be configured as an H-bridge, dual half-bridge, 2 high-sides + 2 low-sides, 4 low-sides

* Green available second half of 2008



3-phase drivers family overview

	TLE 6280GP	TLE 7183F	TLE 7189F	TLE 7185E
Supply voltage (operation)	8 ... 30V	5.5 ... 28V	5.5 ... 28V	5.5 ... 32V
Duty cycle	0 ... 95%	0 ... 100%	0 ... 100%	0 ... 95%
Low quiescent mode	No	Yes	Yes	Yes
OpAmps	–	1	3	–
Adjustable Dead time	Yes	Yes	Fix	Yes
Adjustable short circuit detection level	Yes	No (several fixed versions)	Yes	Yes

TLE 6280GP 3-phase driver

RoHS

- High driver capacity (six times 2–4mΩ MOSFETs)
- Driver IC for 3-bridge designed for EPS and EHPS applications
- Excellent thermal properties in DSO36 package
- Adjustable dI/dt limitation reduces EMI
- Active freewheeling reduces power dissipation
- Separate source connection for each MOSFET
- Adjustable short circuit protection for the MOSFETs
- Charge pump guarantees full $R_{DS(on)}$ with $V_{BAT} > 9V$
- Diagnostic error flag

TLE 7183F 3-phase driver

RoHS

- Compatible to very low ohmic, normal level input N-channel MOSFETs
- PWM frequency up to 30kHz
- Meets specifications down to 5.5V supply voltage
- Low EMC sensitivity and emission
- Power package V-QFN-48
- TTL-compatible control inputs
- Separate gate-source connection for each MOSFET
- Integrated minimum dead time
- Shoot-through protection
- Short circuit protection with fixed detection level
- Disable function and sleep mode
- Detailed diagnosis
- Thermal overload warning for Driver IC
- Integrated overcurrent warning
- Integrated current sense amplifier
- 0 to 100% duty cycle without refresh pulses

TLE 7189F 3-phase driver

RoHS

- Green Product (RoHS-compliant)
- AEC (Automotive Electronics Council) qualified
- Compatible to very low ohmic normal level input N-channel MOSFETs
- Separate input for each MOSFET
- PWM frequency up to 30kHz
- Fulfils specification down to 8V supply voltage
- Low EMC sensitivity and emission
- Control inputs with TTL characteristics
- Separate source connection for each MOSFET
- Integrated minimum dead time
- Shoot through protection
- Short circuit protection with adjustable detection level
- Disable function and sleep mode
- Detailed diagnosis
- Over temperature warning
- Three integrated current sens amplifiers
- 0 to 100% duty cycle
- Over- and under voltage check of 5V µC supply
- Power package V-QFN-48

TLE 7185E 3-phase driver

RoHS

- Drives 6 N-channel Power MOSFETs
- Separate control input for each MOSFET
- Separate source pin for each MOSFET
- Integrated charge pump for operation at low battery voltages
- Adjustable dead time
- Shoot through protection and shoot through option
- Analog adjustable short circuit protection levels
- Low quiescent current mode
- 2-bit diagnosis/ERRx
- Over temperature warning
- Overvoltage warning
- Undervoltage warning
- Undervoltage lockout
- 0 ... 95% duty cycle of high-side MOSFETs
- DSO-36 exposed pad

▸ www.infineon.com/driver-ic

Integrated High Current Motor Drivers

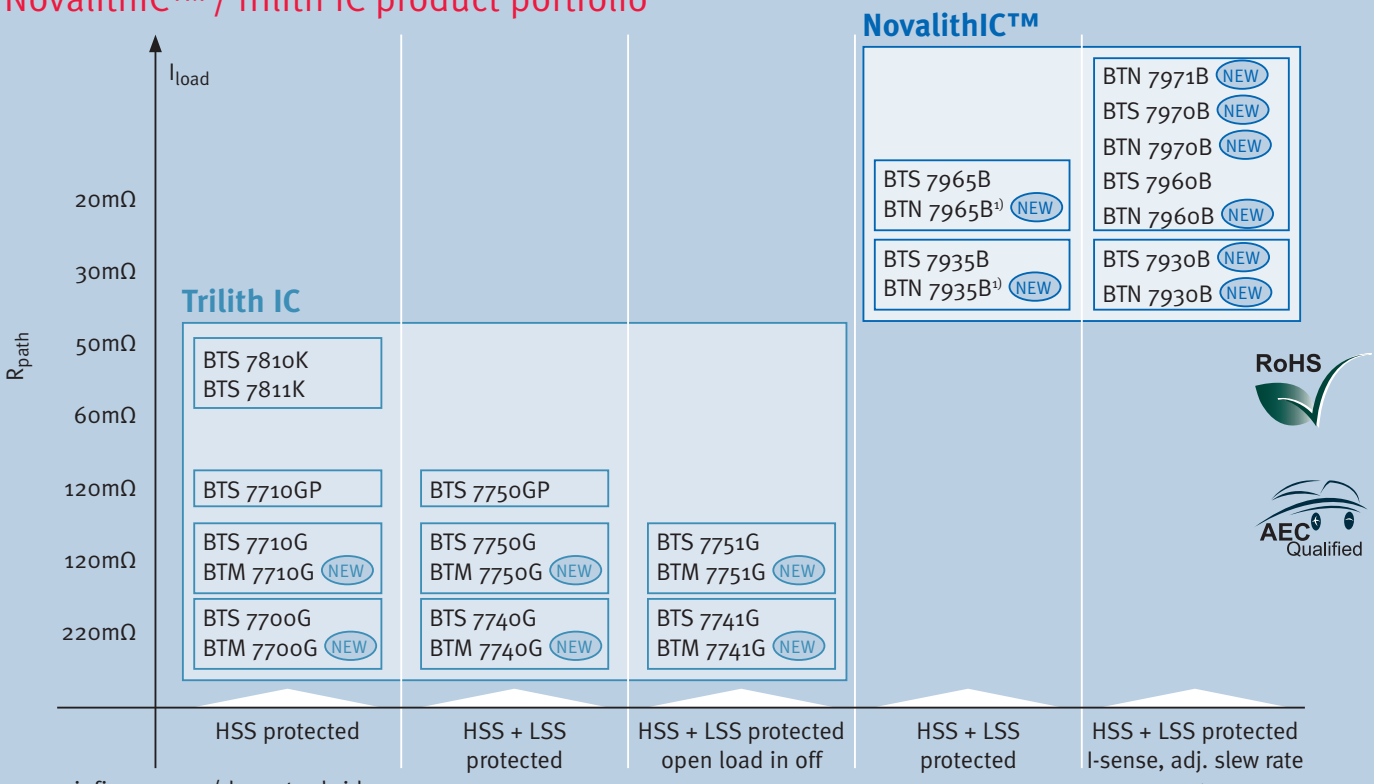
NovalithIC™/Trilith IC

NOVALITHIC™ – A NovalithIC™ provides a complete low-ohmic-protected half-bridge in a single package. It can be combined with additional NovalithIC™ to create an H-bridge or 3-phase bridge as well. The NovalithIC™ family has the capability to switch to up to 25kHz while providing overcurrent, overvoltage and overtemperature protection. Common sense is optionally available to monitor load current. The NovalithIC™ family offers cost-optimized solutions for protected high-current PWM motor drives with very low board-space consumption – scaled to your needs.

TRILITH IC – The Trilith IC family members combine two high-side and two low-side switches in one package. They are geared to driving high-current DC motors in an H-bridge configuration but can also be used as single independent switches. All Trilith ICs include overcurrent and overtemperature protection for the high-side switches. For the low-side switches the user can choose between fast unprotected switches for PWM applications as well as protected switches for lower frequencies.

GREEN RoHS-compliant devices will be available soon. The Green Trilith IC will receive new part numbers: BTS 7xxx will be renamed to BTM 7xxx. The Green NovalithIC™ will also get new part numbers: BTS 79xx will be renamed to BTN 79xx.

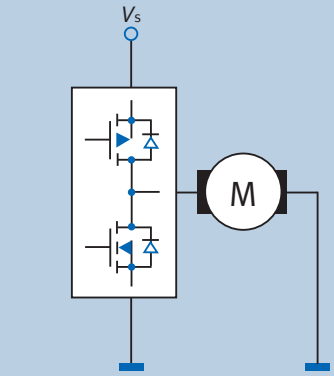
NovalithIC™ / Trilith IC product portfolio



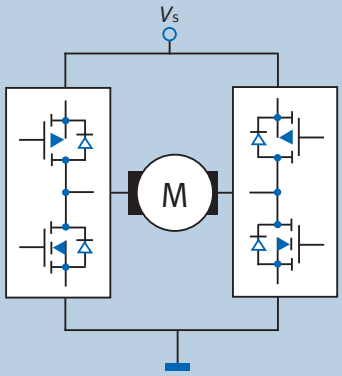
▸ www.infineon.com/dc-motor-bridges

[1] In concept

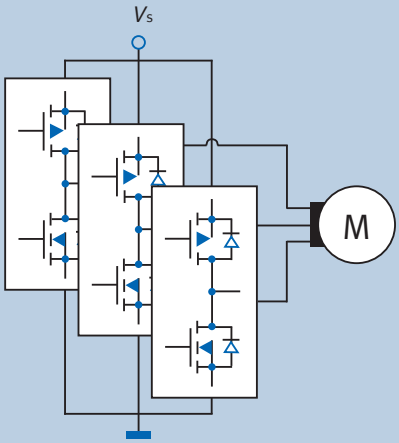
NovalithIC™ configurations – flexibility in design



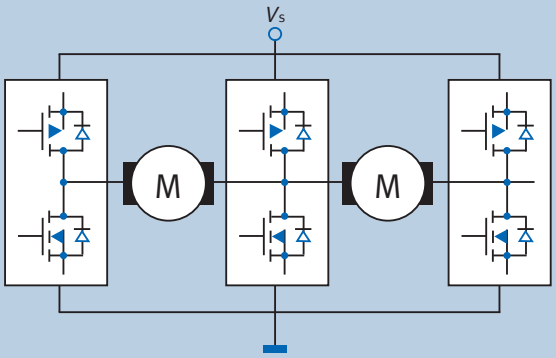
Half-bridge
DC brush motors
unidirectional



H-bridge
DC brush motors
bidirectional



B6-bridge
Brushless DC
(BLDC) motors



Sharing Half-bridge
Driving two bidirectional DC brush motors
using only three half-bridges

NovalithIC™

Type	Green	Peak current typ. [A]	Peak current min.[A]	Quiescent current [uA]	Operating range [V]	Path $R_{DS(on)}$ typ. [mΩ]	Path $R_{DS(on)}$ max. [mΩ]	Switching frequency f max. [kHz]	Short-circuit protection	Load current sense	Self-protection	Error flag	Package*
BTS/BTN 7930B	✓	25	18	7	5.5 – 28	28	55	25	load + GND + battery	analog sense + overload det.	OT, OC, OV	OT, OC, OV	⑰
BTN 7935B [1)]	✓	25	18	7	5.5 – 28	28	55	2	load + GND + battery	overload det.	OT, OC, OV	OT, OC, OV	⑰
BTS/BTN 7960B	✓	43	33	7	5.5 – 28	16	30.5	25	load + GND + battery	analog sense + overload det.	OT, OC, OV	OT, OC, OV	⑰
BTN 7965B [1)]	✓	43	33	7	5.5 – 28	16	30.5	2	load + GND + battery	overload det.	OT, OC, OV	OT, OC, OV	⑰
BTS/BTN 7970B	✓	68	50	7	5.5 – 28	16	30.5	25	load + GND + battery	analog sense + overload det.	OT, OC, OV	OT, OC, OV	⑰
BTN 7971B	✓	68	50	7	4.5 – 28	16	30.5	25	load + GND + battery	analog sense + overload det.	OT, OC, OV	OT, OC, OV	⑰

[1)] In concept BTN = Green NovalithIC

*See packages on page 66

▸ www.infineon.com/novalithic

NovalithIC™/Trilith IC: High Current Motor Drivers

Trilith IC

Type	Green	1 sec. pulse current [A]	Peak current [A]	Quiescent current [µA]	Operating range [V]	Path $R_{DS(on)}$ typ. [mΩ]	Path $R_{DS(on)}$ max. [mΩ]	Switching frequency f max.	Short-circuit protection	Self-protection [1), 2), 3)]	Error flag	Package*
BTS/BTM 7700G	✓	4.3	9	8	5 – 42	200	500	HSS: 1kHz LSS: 1kHz	load + GND	OT + OC	OT	(30)
BTS/BTM 7710G	✓	5.8	15	8	5 – 42	110	260	HSS: 1kHz LSS: 1kHz	load + GND	OT + OC	OT	(30)
BTS 7710GP	–	9	15	8	5 – 42	110	260	HSS: 1kHz LSS: 1kHz	load + GND	OT + OC	OT	(18)
BTS/BTM 7740G	✓	4.2	8	8	5 – 42	210	500	HSS: 1kHz LSS: 1kHz	load + GND + battery	OT + OC	OT	(30)
BTS/BTM 7741G	✓	4.2	8	8	5 – 42	210	500	HSS: 1kHz LSS: 1kHz	load + GND + battery	OT + OC	OT + OL	(30)
BTS/BTM 7750G	✓	5.6	12	8	5 – 42	115	285	HSS: 1kHz LSS: 1kHz	load + GND + battery	OT + OC	OT	(30)
BTS/BTM 7751G	✓	5.6	12	8	5 – 42	115	285	HSS: 1kHz LSS: 1kHz	load + GND + battery	OT + OC	OT + OL	(30)
BTS 7810K	–	25	42	9	5 – 42	40	100	HSS: 1kHz LSS: 1kHz	load + GND	OT + OC	OT + OL	(18)
BTS 7811K	–	25	42	9	5 – 42	40	100	HSS: 1kHz LSS: 20kHz[4)]	load + GND	OT + OC	OT + OL	(18)

[1)] OL = Open load [2)] OT = Overtemperature [3)] OC = Overcurrent [4)] Above 5 A load current 1kHz

BTM = Green Trilith IC

*See packages on page 66

Integrated Smart Power Motor Drivers

THE INFINEON low-current DC motor bridge family consists of a broad variety of bridges designed for use in automotive and industrial applications.

Door Module ICs (DoMoPo)

THE TLE 8201R is an ASSP for door-module applications. It includes those power stages necessary to drive the following loads in a typical front door: central lock, mirror fold, mirror position, mirror defrost plus 5 and 10W lamps. It is designed as a monolithic circuit in Infineon's latest version of mixed technology SPT which combines bipolar and CMOS control circuit with DMOS power devices.

THE TLE 8203E is a derivative of the TLE 8201R for automotive mirror control applications. The following output stages are included in this monolithic device, mirror position, mirror defrost and one lamp driver for 5 or 10W.

Type	Green	Out-puts	Output Current $[A]_{(max.)}$	$R_{DS(on)}$	Driver Stage	Quiescent Current [uA]	Operating Range [VS]*	Protection / Diagnosis	Interface	Package*
TLE 8201[2]	√	Out 1, 2	8	150 mΩ (max @ Tj=25°C) 260 mΩ (max @ Tj=150°C)	Half-bridge	6	8-20	overcurrent, over-temperature, over- and undervoltage lookout, open load diagnosis, current sense	SPI for programming and diagnostic, INH and PWM input	(32) (33)
		Out 3, 4	3	400 mΩ (max @ Tj=25°C) 700 mΩ (max @ Tj=150°C)	Half-bridge					
		Out 5, 6	1.25	800 mΩ (max @ Tj=25°C) 1.3 Ω (max @ Tj=150°C)	Half-bridge					
		Out 7	6.25	100 mΩ (max @ Tj=25°C) 170 mΩ (max @ Tj=150°C)	High Side Switch (mirror defrost)					
		Out 8 – 11	1.8	500 mΩ (max @ Tj=25°C) 800 mΩ (max @ Tj=150°C)	Lamp driver					
TLE 8203[1] [2]	√	Out 4	3	400 mΩ (max @ Tj=25°C) 700 mΩ (max @ Tj=150°C)	Half-bridge	6	8-20	overcurrent, over-temperature, over- and undervoltage lookout, open load diagnosis, current sense	SPI for programming and diagnostic, INH and PWM input	(32)
		Out 5, 6	1.25	800 mΩ (max @ Tj=25°C) 1.3 Ω (max @ Tj=150°C)	Half-bridge					
		Out 7	6.25	100 mΩ (max @ Tj=25°C) 170 mΩ (max @ Tj=150°C)	High Side Switch (mirror defrost)					
		Out 8, 10	1.8	500 mΩ (max @ Tj=25°C) 800 mΩ (max @ Tj=150°C)	Lamp driver					

[1] Product in development
[2] See application example page 56

*See packages on page 66

▸ www.infineon.com/door-module-ic

Integrated Smart Power Motor Drivers

Motor control ICs

THE TLE 4207, TLE 4208, TLE 6208-3G/-6G are multipurpose bridges designed to drive DC brush motors with load currents < 1A for automotive and industrial applications. The TLE 4207 and TLE 4208 parts are built using Infineon's robust bipolar technology DOPL. TLE 6208-3G/-6G use SPT, a technology combining bipolar, CMOS and DMOS cells.

Type	Green	Configuration	Output current [A]	Peak current [A]	Quiescent current [µA]	Operating range [V]	Protection	Diagnostic interface	HIGHLIGHT	V_{sat}/ $R_{DS(on)}$	Package*
TLE 4207	–	2 x half-bridge	2 x 0.8	2 x 1	20	6 – 18	Over-tempera-ture, over-/ under-voltage lock-out, short circuit	Status flag	Very low saturation Voltage + error det.	1.6V at 0.4A[1)]	(25)
TLE 4208	–	4 x half-bridge	4 x 0.8	4 x 1	20	6 – 18		Status flag	Dual full-bridge	1.6V at 0.4A[1)]	(30)
TLE 6208-3	–	3 x half-bridge	3 x 0.6	3 x 1.5	10	6 – 40		16-bit SPI	detailed diagnosis via SPI	800mΩ/ switch	(25)
TLE 6208-6	–	6 x half-bridge	6 x 0.6	6 x 1.5	12	6 – 40		16-bit SPI	single switch usage	800mΩ/ switch	(30)

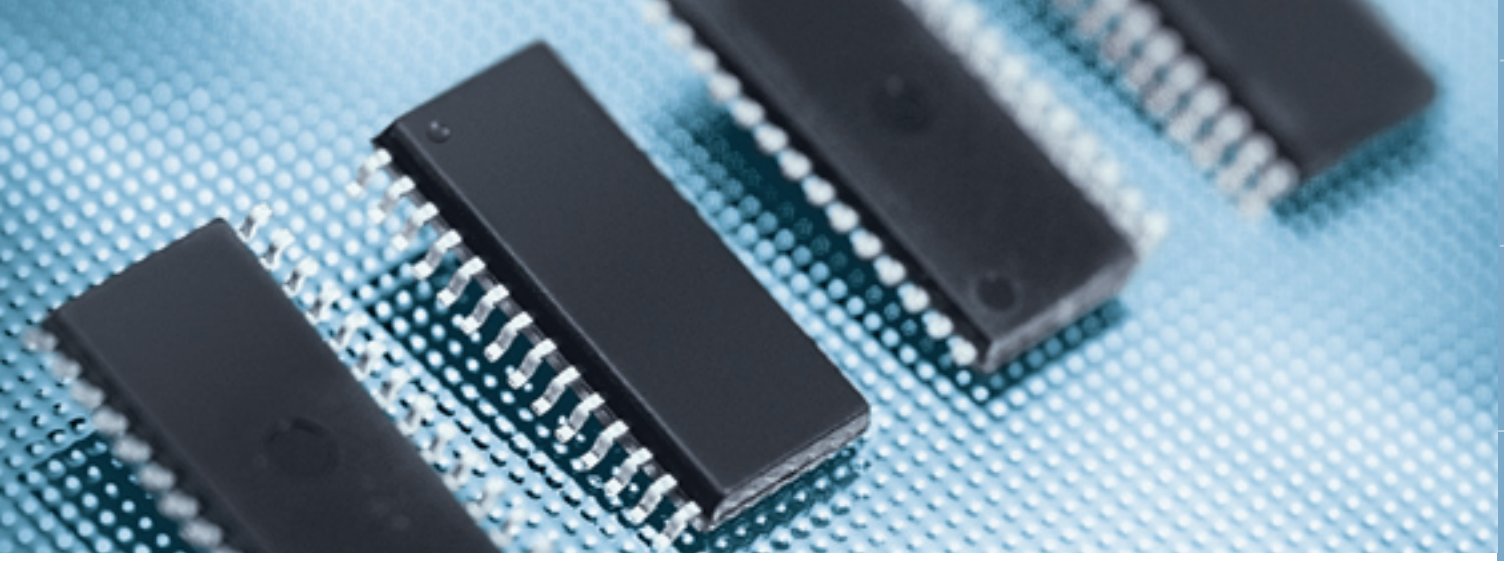
[1)] Total Drop Saturation Voltage typ. value @ 25°C and 0.4A

*See packages on page 66

THE TLE 5205 AND TLE 5206 are designed for powertrain applications and support load currents up to 5A. The parts are build using Infineon's SPT technology combining bipolar, CMOS and DMOS cells.

Type	Green	Configuration	Output current [A]	Peak current [A]	Quiescent current [µA]	Operating range [V]	Protection	Diagnostic interface	HIGHLIGHT	$R_{DS(on)}$	Package*
TLE 5205-2	√	Full-bridge	4	5	10	6 – 40	Protected	Status flag	Open load detection	220 mΩ/ switch	(6),(7) (17),(28)
TLE 5206-2	√	Full-bridge	4	5	10	6 – 40	Protected	Status flag	Break high and low	220 mΩ/ switch	(6),(7) (17),(28)

*See packages on page 66



Stepper motor drivers

THE TCA 3727 AND TLE 4726 et seqq. cover a broad range of applications from automotive to industry. The TLE 4726 can be used in 24V applications. All types are produced in DOPL, Infineon's robust bipolar technology.

Type	Green	Output current [A]	Peak current [A]	Step operations	Operating range [V]	Protection	Diagnostic interface	HIGHLIGHT	Package*
TCA 3727	–	2 x 0.75	2 x 1	Full to mini step	5 – 50	Over-temperature	–	High operating voltage	(29), (38)
TLE 4726	–	2 x 0.75	2 x 1	Full to mini step	5 – 50	Over-temperature	–	Low quiescent current	(29)
TLE 4727	–	2 x 0.75	2 x 1	Full to mini step	5 – 16	Openload, over-temperature, short circuit	Status flag	One error flag	(38)
TLE 4728	–	2 x 0.75	2 x 1	Full to mini step	5 – 16		Status flag	Two error flags	(29)
TLE 4729	–	2 x 0.75	2 x 1	Full to mini step	5 – 16		Status flag	Inhibit, very low quiescent current	(29)

*See packages on page 66

Servo drivers

THE TLE 4205, TLE 4206 AND TLE 4209 are protected H-Bridge drivers for automotive applications like headlight beam control and industrial servo control applications. The part is built using DOPL, Infineon's automotive bipolar technology.

Type	Green	Output current [A]	Peak current [A]	Current Consumption [mA]	Operating range [V]	Protection	Inhibit	HIGHLIGHT	$V_{sat}/R_{DS(on)}$	Package*
TLE 4205	–	0.8	1	0.01	6 – 32	Short circuit	✓	Dual power comparator for higher	2.1V at 0.6A[1] supply voltage	(27), (37)
TLE 4206	✓	0.8	1	12	6 – 18	Over-temperature, over-/under-voltage lockout, short circuit	No	Servo driver with current peak blanking	1.2V at 0.4A[1]	(25)
TLE 4206-2	✓	0.8	1	12	6 – 18		No	Switching hysteresis on range input	1.2V at 0.4A	(25)
TLE 4209	✓	0.8	1	12	6 – 18		No	Servo driver	1.2V at 0.4A[1]	(24), (36)

[1] Total Drop Saturation Voltage typ. value @ 25°C and 0.4A

*See packages on page 66

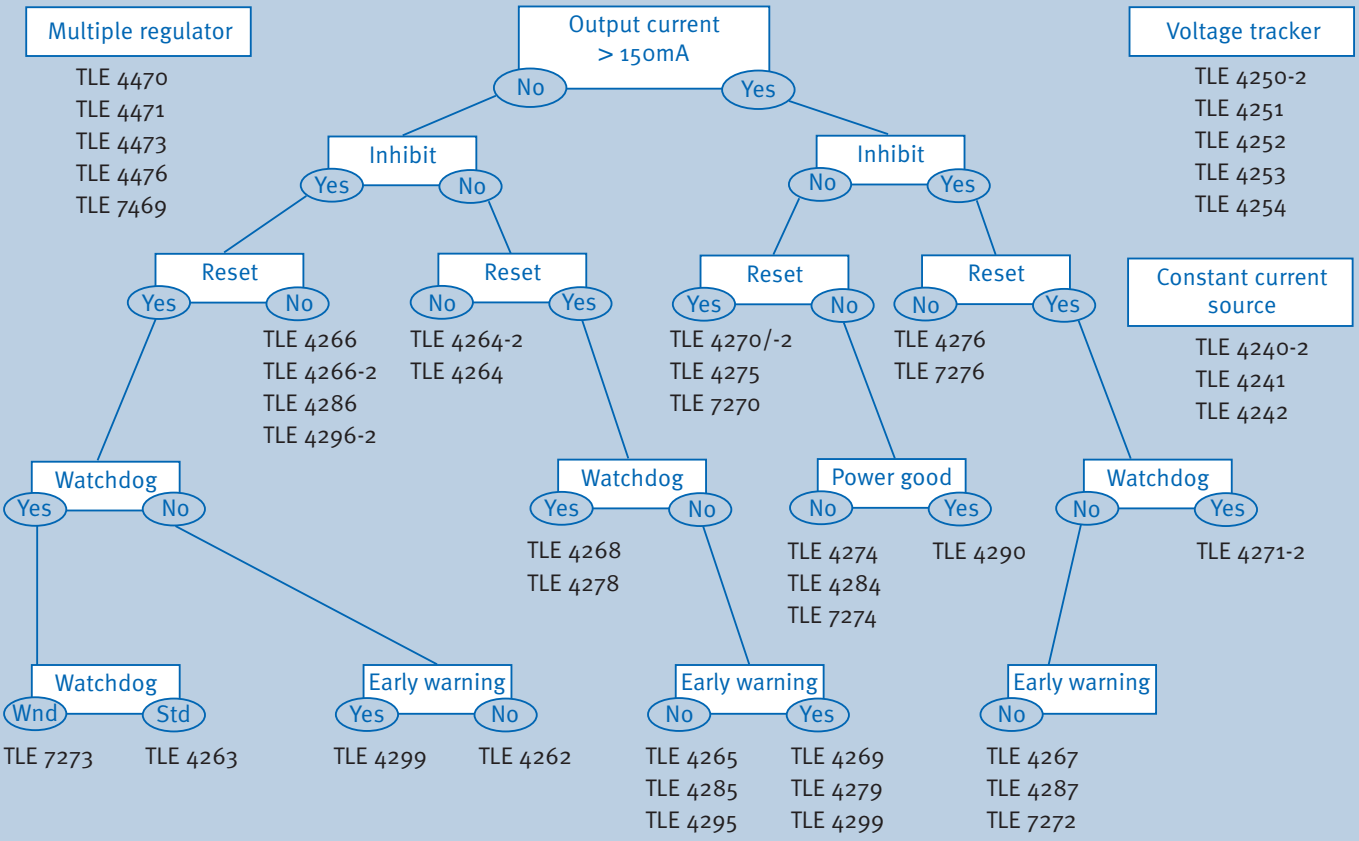
▸ www.infineon.com/dc-motor-bridges

Power Supply

Short Description

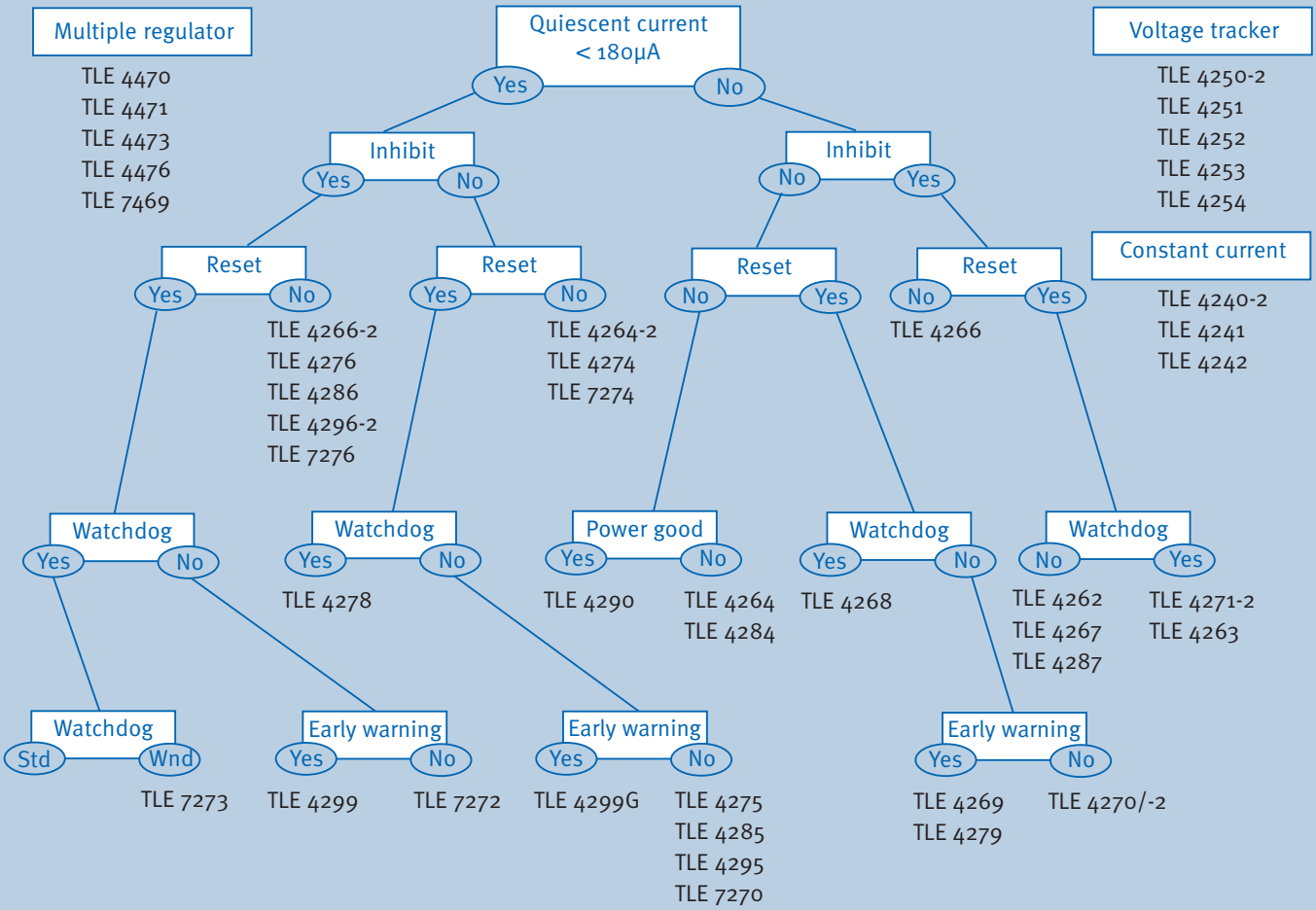
- Wide operation range: up to 45V
- Very low dropout
- Wide temperature range: – 40°C up to + 150°C
- Low quiescent current consumption in standby mode
- Disable function for main output
- Adjustable threshold reset
- Standard and window watchdog
- Power-on reset circuit sensing the standby voltage
- Early-warning comparator for supply undervoltage
- Short-circuit protection
- Reverse polarity protection
- Overtemperature protection
- Overload protection

Voltage regulator selection tree by output current



▸ www.infineon.com/voltage-regulator

Voltage regulator selection tree by quiescent current



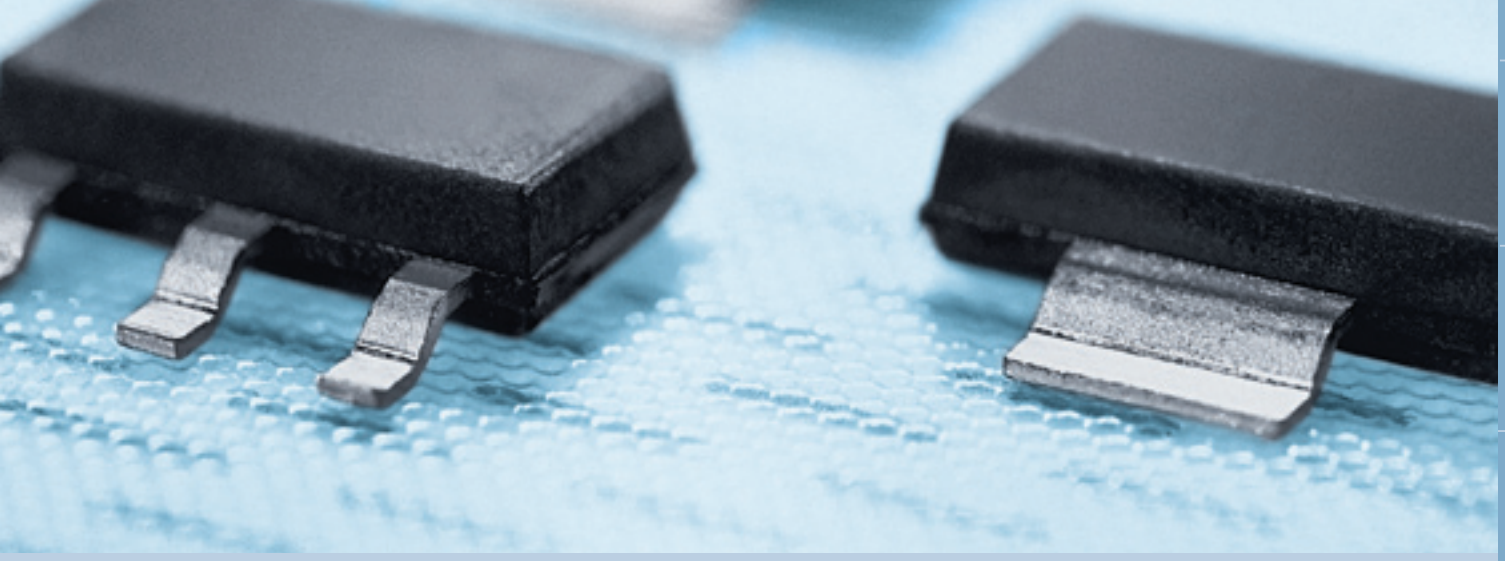
▸ www.infineon.com/voltage-regulator

Power Supply by Output Current

Single regulators

Type	Green	Output current [mA]	Operating range [V]	Output voltage [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage off-mode(max) [µA]
TLE 4284	√**	1000	40	adj; 1.25;1.5;1.8;3.3;5.0		1	3	
TLE 4270/-2	√	550	42	5	65	0.35	2	
TLE 4271-2	√	550	40	5	65	0.35	2	6
TLE 4290	√**	450	42	5		0.25	2	
TLE 4275	√	400	42	5; 3.3		0.25	2	
TLE 4267	√**	400	40	5	65	0.3	2	10
TLE 4274	√**	400	40	5;8.5;10		0.25	4	
TLE 4274	√**	400	40	2.5;3.3		0.7	4	
TLE 4276	√**	400	40	5;8.5;10		0.25	4	10
TLE 7270	–	300	42	5		0.2	2	
TLE 7272	–	300	42	5		0.25	2	9
TLE 7274	–	300	42	5		0.25	2	
TLE 7276	–	300	42	5		0.25	2	9
TLE 4287	√	250	42	5		1.8	2	10
TLE 4262	√**	200	45	5		0.35	2	50
TLE 4263	√**	200	45	5		0.35	2	50
TLE 4278	√	200	45	5		0.25	2	
TLE 4268	√**	180	45	5		0.25	2	
TLE 7273	–	180	45	2.6;5		0.25	2	3
TLE 4269	√**	150	45	5		0.25	2	
TLE 4279	√	150	45	5		0.25	2	
TLE 4299GM	√	150	45	3.3; 5		0.25	2	1
TLE 4299G	√	150	45	5		0.25	2	
TLE 4264-2	√*	150	45	5		0.22	2	
TLE 4264	√*	120	45	5		0.25	2	
TLE 4266	√*	120	45	5;10		0.25	2	10
TLE 4266-2	√*	120	45	3.3;5		0.25	2	
TLE 4295	√	30	45	2.6;3.0;3.3;5.0		0.25	4	
TLE 4296-2	√	30	45	3.3;5		0.25	4	1
TLE 4285	√	15	42	5		0.8	4	
TLE 4286	√	15	42	5		0.8	2	1

*Green available second half of 2008 **For package details, please contact your sales partner [1] Power Good



Quiescent current on-mode [µA]	Short-circuit protection	Overvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package***
1000	X		X						⑩
1000	X	X	X	X					③, ⑤, ⑪, ⑮
800	X	X	X	X		X	X		⑥, ⑧, ⑰
200	X		X					X[1)]	③, ⑪, ⑮
150	X		X	X					③, ⑤, ⑪, ⑮
1300	X	X	X	X		X			⑥, ⑦, ⑰, ㉕
100	X		X						②, ⑩, ⑬
100	X		X						⑩, ㉑
100	X		X			X			③, ④, ⑪, ⑮
30	X		X	X					⑪, ⑮
30	X		X	X		X			⑪, ⑮
15	X		X						⑩, ⑬
20	X		X			X			⑪, ⑮
1000	X		X	X		X			㉕
900	X		X	X	X	X			㉕, ㉗
900	X		X	X	X	X	X		㉒, ㉕, ㉗
180	X		X	X	X		X		㉕
300	X		X	X	X		X		㉒, ㉗
20	X		X	X		X	X		㉕
240	X		X	X	X			X	㉒, ㉕, ㉗
150	X		X	X	X			X	㉒, ㉕
65	X		X	X	X	X		X	㉕
65	X		X	X	X			X	㉒
40	X		X						㉑
300	X		X						㉑
300	X		X			X			㉑
40	X		X			X			㉑
120	X		X	X					⑲
130	X		X			X			⑲
100	X		X	X					⑲
60	X		X			X			⑲

***See packages on page 66

Power Supply by Quiescent Current

Single regulators

Type	Green	Quiescent current on-mode [µA]	Operating range [V]	Output voltage [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage off-mode$_{(max)}$ [µA]
TLE 7274	–	15	42	5		0.25	2	
TLE 7276	–	20	42	5		0.25	2	9
TLE 7273	–	20	45	2.6;5		0.25	2	3
TLE 7270	–	30	42	5		0.2	2	
TLE 7272	–	30	42	5		0.25	2	9
TLE 4264-2	√*	40	45	5		0.22	2	
TLE 4266-2	√*	40	45	3.3;5		0.25	2	
TLE 4286	√	60	42	5		0.8	2	1
TLE 4299G	√	65	45	5		0.25	2	
TLE 4299GM	√	65	45	3.3;5		0.25	2	1
TLE 4285	√	100	42	5		0.8	4	
TLE 4276	√**	100	40	5;8.5;10		0.25	4	10
TLE 4274	√**	100	40	5;8.5;10		0.25	4	
TLE 4274	√**	100	40	2.5;3.3		0.7	4	
TLE 4295	√	120	45	2.6;3.0;3.3;5		0.25	4	
TLE 4296-2	√	130	45	3.3;5		0.25	4	1
TLE 4275	√	150	42	3.3;5		0.25	2	
TLE 4279	√	150	45	5		0.25	2	
TLE 4278	√	180	45	5		0.25	2	
TLE 4290	√**	200	42	5		0.25	2	
TLE 4269	√**	240	45	5		0.25	2	
TLE 4264	√*	300	45	5		0.25	2	
TLE 4266	√*	300	45	5;10		0.25	2	10
TLE 4268	√**	300	45	5		0.25	2	
TLE 4271-2	√	800	40	5	65	0.35	2	6
TLE 4262	√**	900	45	5		0.35	2	50
TLE 4263	√**	900	45	5		0.35	2	50
TLE 4270/-2	√	1000	42	5	65	0.35	2	
TLE 4284	√**	1000	40	adj; 1.5;1.8;2.6;3.3;5.0		1	3	
TLE 4287	√	1000	42	5		1.8	2	10
TLE 4267	√**	1300	40	5	65	0.3	2	10

[1] Power good *Green available second half of 2008 **For package details, please contact your sales partner

Output current [mA]	Short-circuit protection	Overvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package***
300	X		X						⑩, ⑬
300	X		X			X			⑪, ⑮
180	X		X	X		X	X		㉕
300	X		X	X					⑪, ⑮
300	X		X	X		X			⑪, ⑮
150	X		X						㉑
150	X		X			X			㉑
15	X		X			X			⑲
150	X		X	X	X			X	㉒
150	X		X	X	X	X		X	㉕
15	X		X	X					⑲
400	X		X			X			③, ④, ⑪, ⑮
400	X		X						②, ⑩, ⑬
400	X		X						⑩, ㉑
30	X		X	X					⑲
30	X		X			X			⑲
400	X		X	X					③, ⑤, ⑪, ⑮
150	X		X	X	X			X	㉒, ㉕
200	X		X	X	X		X		㉕
450	X		X					X[1)]	③, ⑪, ⑮
150	X		X	X	X			X	㉒, ㉕, ㉗
120	X		X						㉑
120	X		X			X			㉑
180	X		X	X	X		X		㉒, ㉗
550	X	X	X	X		X	X		⑥, ⑧, ⑰
200	X		X	X	X	X			㉕, ㉗
200	X		X	X	X	X	X		㉒, ㉕, ㉗
550	X	X	X	X					③, ⑤, ⑪, ⑮
1000	X		X						⑩
250	X		X	X		X			㉕
400	X	X	X	X		X			⑥, ⑦, ⑰, ㉕

***See packages on page 66

Power Supply

Multiple regulators

Type	Green	Output current 1 [mA]	Output current 2/3 [mA]	Operating range [V]	Output voltage 1 [V]	Output voltage 2/3 [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage current [µA]
TLE 4470	√*	350	180	45	5	adj.		0.3	2	
TLE 4471	√	450	100/50	40	5	5 and 5	65	0.25	2	20
TLE 4473	√*	300	180	42	5	3.3 or 2.6 or 5		0.3	2	1
TLE 4476	√	430	350	42	5	3.3	65	0.3	4	100
TLE 7469	√	215	215	45	5	3.3 or 2.6		0.3	2	9

*For package details, please contact your sales partner

Trackers

Type	Green	Output current 1 [mA]	Output current 2/3 [mA]	Operating range [V]	Output voltage 1 [V]	Output voltage 2/3 [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage current [µA]
TLE 4250-2	√	50		45	adj.			0.1	0.5	20
TLE 4251	√	400		45	adj.			0.28	0.2	2
TLE 4252	√	250		40	adj.			0.28	0.2	2
TLE 4253	√	250		45	adj.[1)]			0.28	0.1	2
TLE 4254	√	70		45	adj.[1)]			0.28	0.1	5

[1)] $V_Q > V_{ref\ possible}$

Quiescent curr. IQ = 1 mA	Short-circuit protection	Overvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package**
180	X		X	X	X	X		X	(25), (27)
1100	X	X	X	X	X	X	X		(28)
200	X		X	X		X	X		(24)
300	X	X	X			X			(11)
55	X		X	X		X	X		(24)

**See packages on page 66

Quiescent curr. IQ = 1 mA	Short-circuit protection	Overvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package**
140	X		X			X			(19)
230	X		X			X			(11), (14)
100	X		X			X			(11)
100	X		X			X			(22)
50	X		X			X			(22)

**See packages on page 66

Power Supply

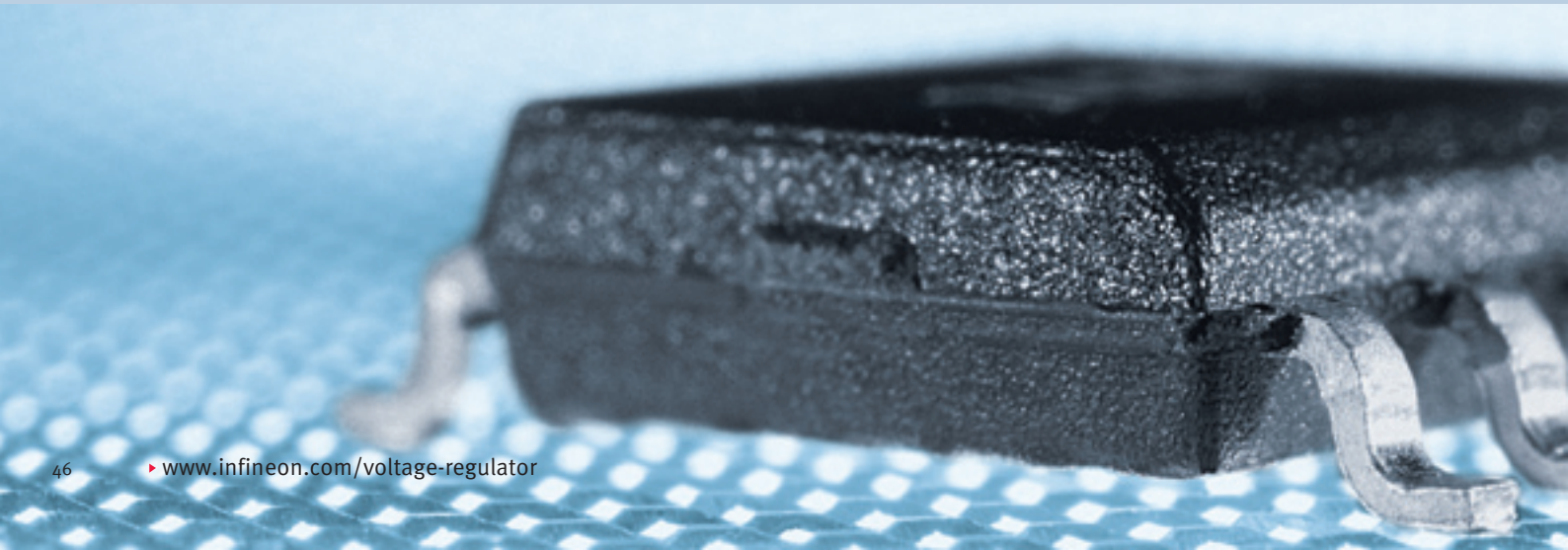
Short Description

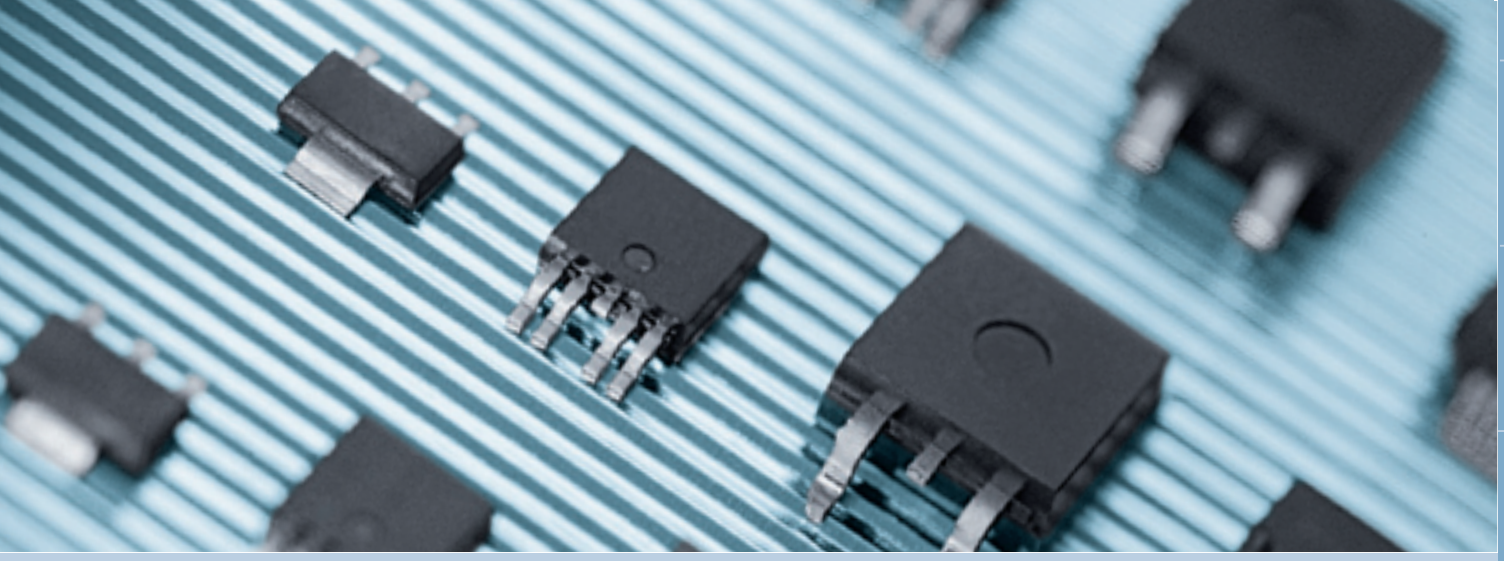
- Step-up and step-down converters
- High-efficiency regulators
- Wide supply voltage operation range
- Very low current consumption operation
- Suitable for standard 12V/24V PowerNets
- Output undervoltage reset with delay
- Overtemperature shutdown
- Wide ambient operation range: – 40°C up to + 125°C

DC/DC

Type	Green	Topology	Input voltage range [V]	Output voltage 1 [V]	Output voltage 2 [V]	Output voltage 3 [V]	Output voltage 4 [V]	Additional output voltages	Output current 1 [mA]	Output current 2 [mA]	Output current 3 [mA]	Output current4 [mA]	Additional output currents	Accuracy 1 (%)
TLE 6361	–	Buck plus linear	8 (5.5) – 60	5.5	5	2.6 or 3.3	5 or 3.3	6 x 5V	1500	800	500	350	6 x 17V	10
TLE 6368	√	Buck plus linear	5.5 – 60	5.5	5	2.6 or 3.3	2.6 or 3.3	6 x 5V	1500	800	500	350	6 x 17V	10
TLE 6363	–	Boost plus buck	4 – 40	adj. up to 33V	5				1000	250				10
TLE 6365	√*	Buck	8 – 40	5					400					2
TLE 6389-2GV	√*	Buck	5 – 60	adj.					2300					3
TLE 6389-2GV50	√*	Buck	5 – 60	5					2300					3
TLE 6389-3GV50	√*	Buck	5 – 60	5					2300					3
TLE 7368	√**	Buck plus linear	4.5 – 45	5.5	5	2.6 or 3.3	1.5	2 x 5	2500	800	700	adj.	105 and 50	9

[1] Volt reset hysteresis *Green available second half of 2008 **For package details, please contact your sales partner





Accuracy 2 (%)	Accuracy 3 (%)	Accuracy 4 (%)	Additional output accuracy	Quiescent current at I_Q = 1 mA [µA]	Standby regulator	PFM operation	Short-circuit protection	Over-temperature protection	Reset	Window watchdog	SPI and add logic	Enable/ disable possibility	Early warning	Package ***
2	5	4	2	30	X		X	X	X	X	X	X		㉝
2	5	4	2	30	X		X	X	X	X	X	X		㉝
2				1500			X	X	X	X				㉕
				1500			X	X	X					㉒
				140		X	X	X	X			X	X	㉕
				130		X	X	X	X			X	X	㉕
				130		X	X	X	X[1)]			X	X	㉕
2	2	2	2	120	X		X	X	X	X		X		㉝

***See packages on page 66

LED Drivers

TO ADDRESS THE INCREASING GROWTH of LED usage in the automotive market, Infineon offers power supplies specifically developed for these applications.

OUR PRODUCTS ARE designed to supply constant current to white or color LEDs up to 500mA, independently from supply voltage or LED forward voltage class. This provides appropriate operating conditions to the connected LEDs, enabling constant brightness and ensuring extended LED lifetime.

PRODUCTS WITH ADJUSTABLE output current and PWM input, enable flexible use of LEDs in applications that require brightness regulation avoiding colour shift. Diagnostic capability is also offered with the open load detection feature.

INFINEON LED DRIVERS ARE the best solutions to benefit from the advantages of LEDs providing full protection to your lighting application in automotive: connected LEDs are fully protected in case of short circuit, overheat, reverse polarity transients as well as against input voltages up to 45V.

LED drivers

Short Description

- Constant output current, therefore constant brightness and extended LED lifetime
- Wide input voltage range
- Low drop voltage
- Open load detection
- Overtemperature protection
- Short-circuit proof
- Reverse polarity proof
- Wide temperature range
- Very small SMD packages

Parameters	Green	Output current [mA]	Output current [mA]	Operating range [V]	Drop voltage [V]	Accuracy (%)	Quiescent curr. IQ [µA]
TLE 4240-2	√	60	fixed	45	0.5	10	N. A.
TLE 4240-3	√	60	fixed	45	0.5	10	N. A.
TLE 4241	√	8/65	adj.	45	0.3	20	2
TLE 4242	√	500	adj.	45	0.35	5	2

Short-circuit protection	Overvoltage protection	Overtemperature protection	Inhibit input	PWM	Open load detection	Package*
X	X	X				⑲
X	X	X			X	⑲
X	X	X	X	X	X	㉒
X	X	X	X	X	X	⑰

*See packages on page 66

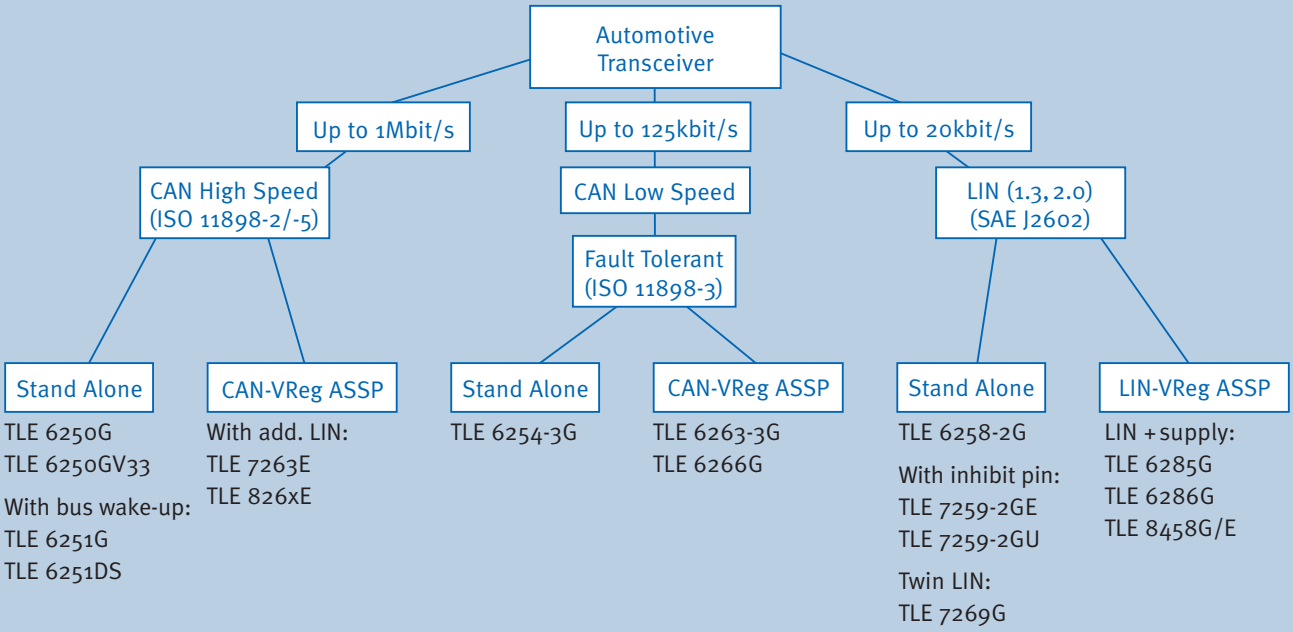
Automotive Transceivers

BECAUSE OF THE EVER-INCREASING DEMAND for information exchange in modern vehicles, the automotive industry implemented data communication networks using the CAN (Controller Area Nework) and LIN (Local Interconnect Network) protocol-based bus systems.

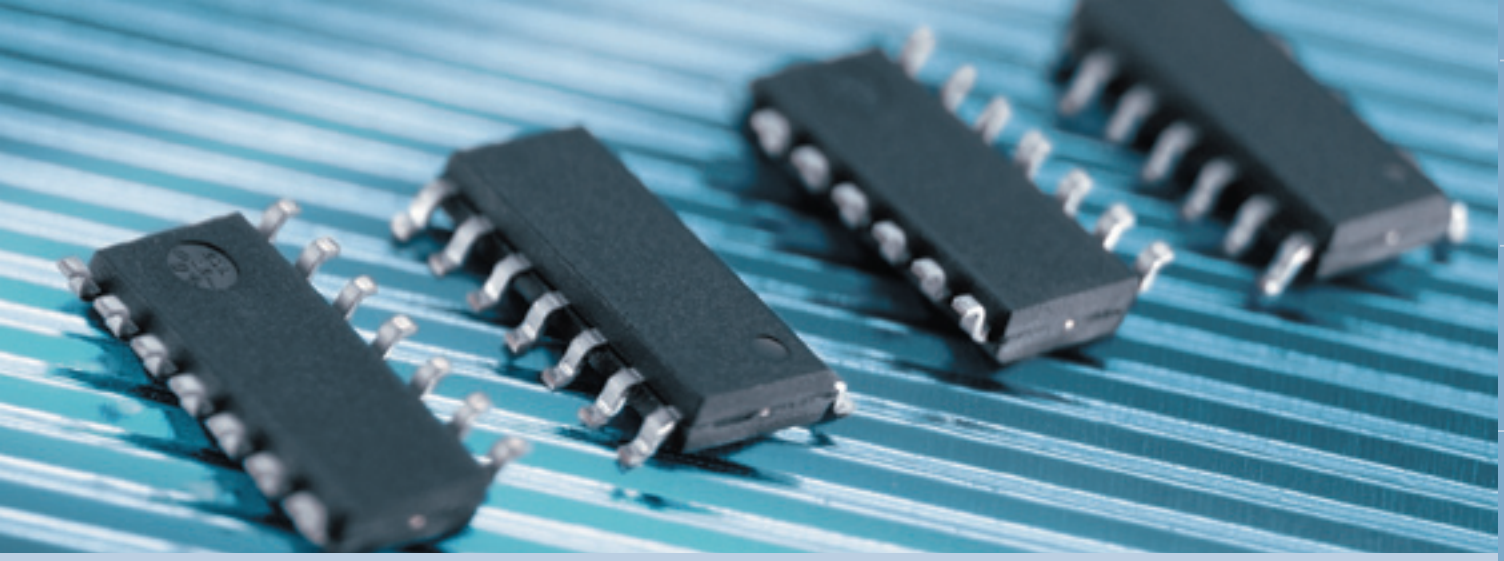
TRANSCEIVERS ARE THE LINK between the protocol unit (the controller) and the physical transmission medium (bus cable). In addition to their driving function (reception/transmission of signals from the bus to ECU) the transceivers also provide a wide range of protective and fault-diagnosis functions.

INFINEON OFFERS AN EXTENSIVE PRODUCT RANGE of transceivers and integrated system basis chips solutions for CAN high speed, CAN low speed and LIN protocols, featuring the best ESD and EMC combined performances of the market.

Selection tree transceivers



▸ www.infineon.com/transceiver



Product overview

Type	Transceiver type	Transmission rate max.	Voltage regulator output
Stand-alone transceivers			
TLE 6250	High-speed CAN	1Mbit/s	No
TLE 6251	High-speed CAN, with bus wake-up	1Mbit/s	No
TLE 6254-3	Low speed CAN	125kbit/s	No
TLE 6258-2	LIN	20kbit/s	No
TLE 7259-2	LIN, with inhibit output	20kbit/s	No
TLE 7269	Twin LIN, with inhibit output	20kbit/s/10.4kbit/s	No
Communication and supply ICs			
TLE 6263-3	Standard body SBC, low-speed CAN	125kbit/s	120mA, @ 5V
TLE 6266	Door Module SBC, low-speed CAN	125kbit/s	45mA, @ 5V
TLE 6285	Standard LIN-LDO with reset function	20kbit/s	150mA, @ 5V
TLE 6286	Standard LIN-LDO with watchdog function	20kbit/s	150mA, @ 5V
TLE 7263	Standard body SBC, high-speed CAN+LIN	1Mbit/s (CAN)	200mA, @ 5V
TLE 826x	Standard body SBC high-speed CAN + multiLIN	1Mbit/s (CAN)	multiple 5V
TLE 8458	Standard LIN-LDO	20kbit/s/10.4kbit/s	50mA, @ 5V/3,3V

Automotive Transceivers

Feature matrix

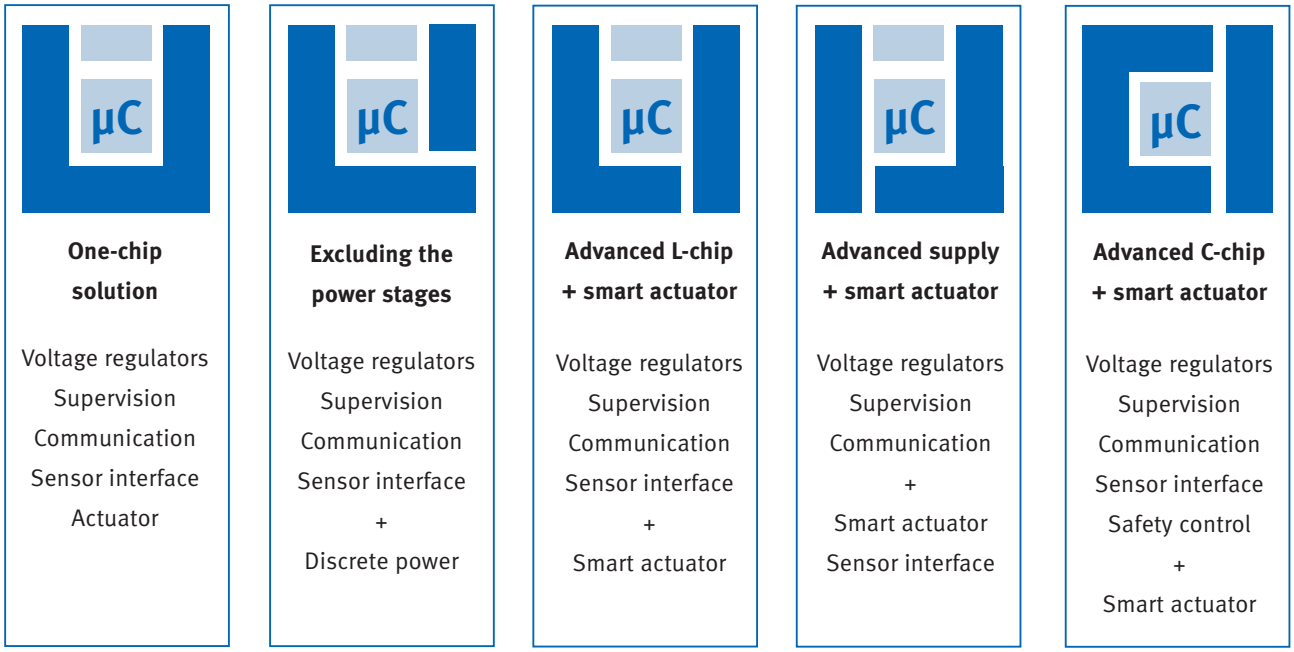
Type	Green	Transceiver type	Transmission rate max.	Quiescent current	Standby current	Bus wake-up capability
TLE 6250G	√	HighSpeedCAN ISO11898-2	1Mbit/s	< 10µA @ 5V standby	< 10mA receive only	No
TLE 6250GV33	√	HighSpeedCAN ISO11898-2	1Mbit/s	< 10µA @ 5V standby	< 10mA receive only	No
TLE 6251G	–	HighSpeedCAN ISO11898-5	1Mbit/s	< 30µA sleep mode	< 100µA	Yes
TLE 6251DS	√	HighSpeedCAN ISO11898-5	1Mbit/s	< 30µA @ 5V standby	< 30µA	Yes
TLE 6254-3G	√	FaultTolerantCAN ISO 11898-3	125kbit/s	< 65µA sleep mode	< 6mA receive only	Yes
TLE 6258-2G	√	LIN 1.3; 2.0/k-line	20kbit/s	< 40µA standby mode	< 40µA	No
TLE 7269G	√	LIN 1.3; 2.0/SAE J2602	20kbit/s/ 10.4kbit/s	< 10µA sleep mode	< 3mA	Yes
TLE 6263-3G	√*	FaultTolerantCAN ISO 11898-3	125kbit/s	< 85µA sleep mode	< 500µA @ 5V standby	Yes
TLE 6266G	√*	FaultTolerantCAN ISO 11898-3	125kbit/s	< 85µA @ 5V standby	< 400µA @ 5V on	Yes
TLE 6285G	–	LIN 1.3; 2.0/k-line	20kbit/s	< 40µA sleep mode	< 140µA @ 5V standby	Yes
TLE 6286G	–	LIN 1.3; 2.0/k-line	20kbit/s	< 80µA sleep mode	< 1.3mA @ 5V standby	Yes
TLE 7263E	√	High Speed CAN ISO 11898-5 LIN 1.3;2.0/SAE J2602	1Mbit/s (CAN) 20kbit/s/ 10.4kbit/s (LIN)	< 60µA sleep mode	< 80µA @ 5V (V_{CC1}) standby	Yes
TLE 7259-2GE	√	LIN 1.3, 2.0, 2.1	20kbit/s	< 10µA sleep mode	< 3mA	Yes
TLE 7259-2GU	√	SAE J2602	10.4kbit/s	< 10µA sleep mode	< 3mA	Yes
TLE 826x	√	High Speed CAN, ISO 11898-5 LIN 2.1; SAE J2602	1Mbit/s (CAN) 20kbit/s/ 10.4kbit/s (LIN)	< 60µA sleep mode	< 90µA stop mode	Yes
TLE 8458	√	LIN 2.1, SAE J2602	20kbit/s/ 10.4kbit/s	< 10µA sleep mode		Yes

*Green available mid of 2008 **See packages on page 66

Suitable for applications	Voltage regulator output	Wake-up inputs	Watchdog	Output drivers	Bus failure management	Package**
12 + 24V applications	No	No	No	No	No	(22)
12 + 24V applications	No	No	No	No	No	(22)
12 + 24V applications	No	Bus wake-up + wake-up pin	No	No	Bus failure detection	(25)
12 + 24V applications	No	Bus wake-up	No	No	No	(22)
12V applications	No	Bus wake-up + wake-up pin	No	No	Fault tolerant failure management	(25)
12V applications	No	No	No	No	No	(22)
12 + 24V applications	No	Bus wake-up + wake-up pin	No	No	LIN bus to GND short-circuit detection	(25)
12V applications	120mA, @ 5V	2 wake-up pin bus wake-up	Window watchdog	1 high-side switch 150 mA	Fault tolerant failure management	(30)
12V applications	45mA, @ 5V	Bus wake-up + wake-up pin	Window watchdog	2 low-side relay driver 3 high-side driver	Fault tolerant failure management	(30)
12V applications	150mA, @ 5V	Bus wake-up	No	No	LIN bus to GND short-circuit detection	(26)
12V applications	150mA, @ 5V	Bus wake-up	Watchdog	No	LIN bus to GND short-circuit detection	(26)
12 + 24V applications	200mA, @ 5V	Bus wake-up + 4 wake-up pins	Window watchdog	1 high-side switch 150 mA	Bus failure detection Fail-safe output	(32)
12 + 24V applications	No	Bus wake-up an wake-up pin	No	No	LIN bus to GND short-circuit detection	(22)
12 + 24V applications	No	Bus wake-up an wake-up pin	No	No	LIN bus to GND short-circuit detection	(22)
12V	2 x 150mA, @ 5V 400mA, @ 5V	Bus wake-up an wake-up pin	Yes	Yes	Bus failure detection, Limp-home	(33)
12V	50mA, @ 5V/3,3V	Bus wake-up an wake-up pin	No	No	LIN bus to GND short-circuit detection	(22)

Automotive System ICs

Integration of system components



One-chip solution

Voltage regulators
Supervision
Communication
Sensor interface
Actuator

Excluding the power stages

Voltage regulators
Supervision
Communication
Sensor interface
+
Discrete power

Advanced L-chip + smart actuator

Voltage regulators
Supervision
Communication
Sensor interface
+
Smart actuator

Advanced supply + smart actuator

Voltage regulators
Supervision
Communication
+
Smart actuator
Sensor interface

Advanced C-chip + smart actuator

Voltage regulators
Supervision
Communication
Sensor interface
Safety control
+
Smart actuator

Body system ICs

System basis chips

Type	Green	Transceiver type	Transmission rate	Quiescent rate	Standby current	Bus wakeup capability	Suitable for
TLE 6263-3G	√*	FaultTolerantCAN ISO 11898-3	125kbaud	< 85µA sleep mode	< 500µA @ 5V standby	Yes	12V
TLE 6266G	√*	FaultTolerantCAN ISO 11898-3	125kbaud	< 85µA sleep mode	< 400µA @ 5V On	Yes	12V
TLE 7263E	√	High Speed CAN ISO 11898-5 LIN 1.3; 2.0/ SAE J2602	1Mbaud (CAN) 20kbaud/ 10.4kbaud (LIN)	< 60µA sleep mode	< 80µA @ 5V (V_{CC1}) standby	Yes	12 + 24V applications

*Green available mid of 2008

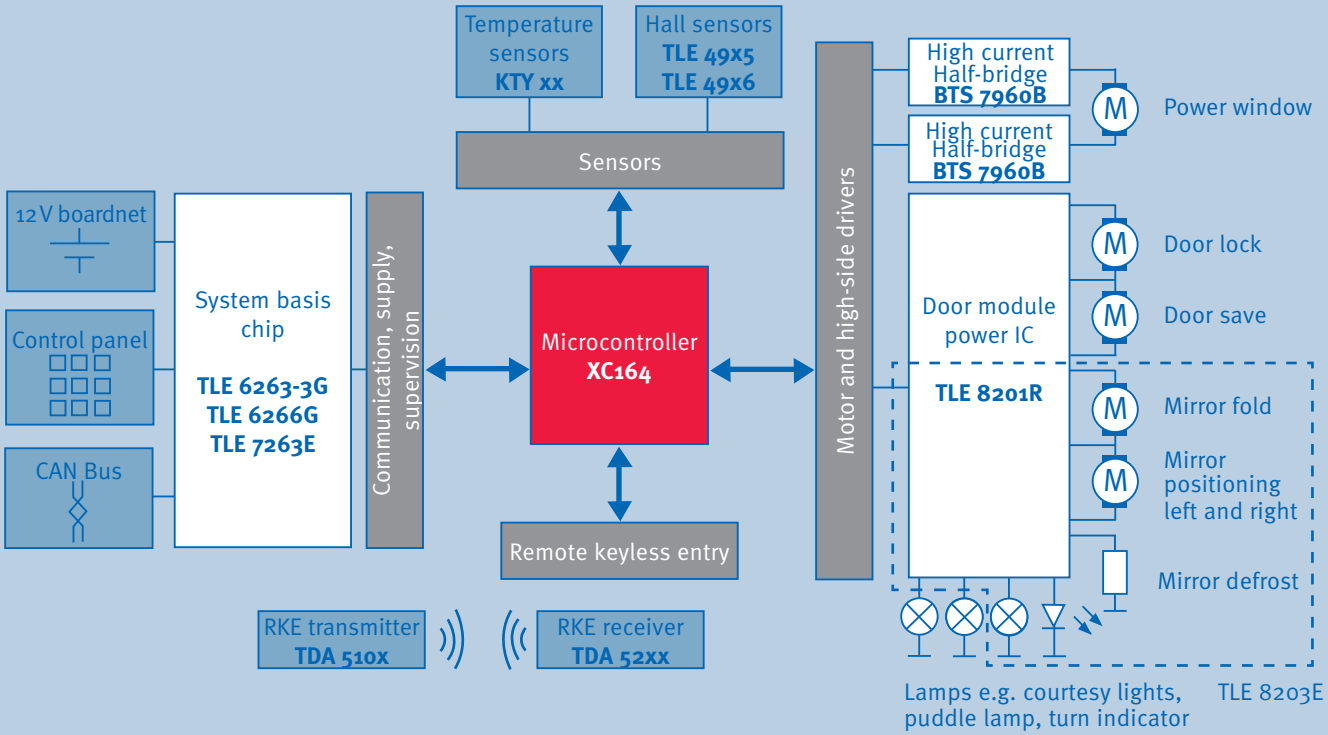
▸ www.infineon.com/transceiver

	Voltage regulator output	Wake-up inputs	Watchdog	Output drivers	Bus failure management	Package**
	120mA, @ 5V	2 wake-up pins and bus wake-up	Window watchdog	1 high-side switch 150mA	Fault tolerant failure management	㉚
	45mA, @ 5V	bus wake-up and wake-up pin	Window watchdog	2 low-side relay driver 3 high-side driver	Fault tolerant failure management	㉚
	200mA, @ 5V	bus wake-up and 4 wake-up pins	Window watchdog	1 high-side switch 150mA	Bus failure detection fail-safe output	㉜

**See packages on page 66

Comfort management

Door module



Door Module ICs (DoMoPo)

Type	Green	Out-puts	Output Current [A]	$R_{DS(on)}$	Driver Stage	Quiescent Current [uA]	Operating Range [VS] 1)	Protection / Diagnosis	Interface	Package*
TLE 8201	√	Out 1, 2	8	150mΩ (max @ Tj=25°C) 260mΩ (max @ Tj=150°C)	Half-bridge	6	8-20	overcurrent, over-temperature, over- and undervoltage lookout, open load diagnosis, current sense	SPI for programming and diagnostic, INH and PWM input	(32) (33)
		Out 3, 4	3	400mΩ (max @ Tj=25°C) 700mΩ (max @ Tj=150°C)	Half-bridge					
		Out 5, 6	1.25	800mΩ (max @ Tj=25°C) 1,3mΩ (max @ Tj=150°C)	Half-bridge					
		Out 7	6.25	100mΩ (max @ Tj=25°C) 170mΩ (max @ Tj=150°C)	High Side Switch (mirror defrost)					
		Out 8 – 11	1.8	500mΩ (max @ Tj=25°C) 800mΩ (max @ Tj=150°C)	Lamp driver					
TLE 8203 1)	√	Out 4	3	400mΩ (max @ Tj=25°C) 700mΩ (max @ Tj=150°C)	Half-bridge	6	8-20	overcurrent, over-temperature, over- and undervoltage lookout, open load diagnosis, current sense	SPI for programming and diagnostic, INH and PWM input	(32)
		Out 5, 6	1.25	800mΩ (max @ Tj=25°C) 1,3mΩ (max @ Tj=150°C)	Half-bridge					
		Out 7	6.25	100mΩ (max @ Tj=25°C) 170mΩ (max @ Tj=150°C)	High Side Switch (mirror defrost)					
		Out 8, 10	1.8	500mΩ (max @ Tj=25°C) 800mΩ (max @ Tj=150°C)	Lamp driver					

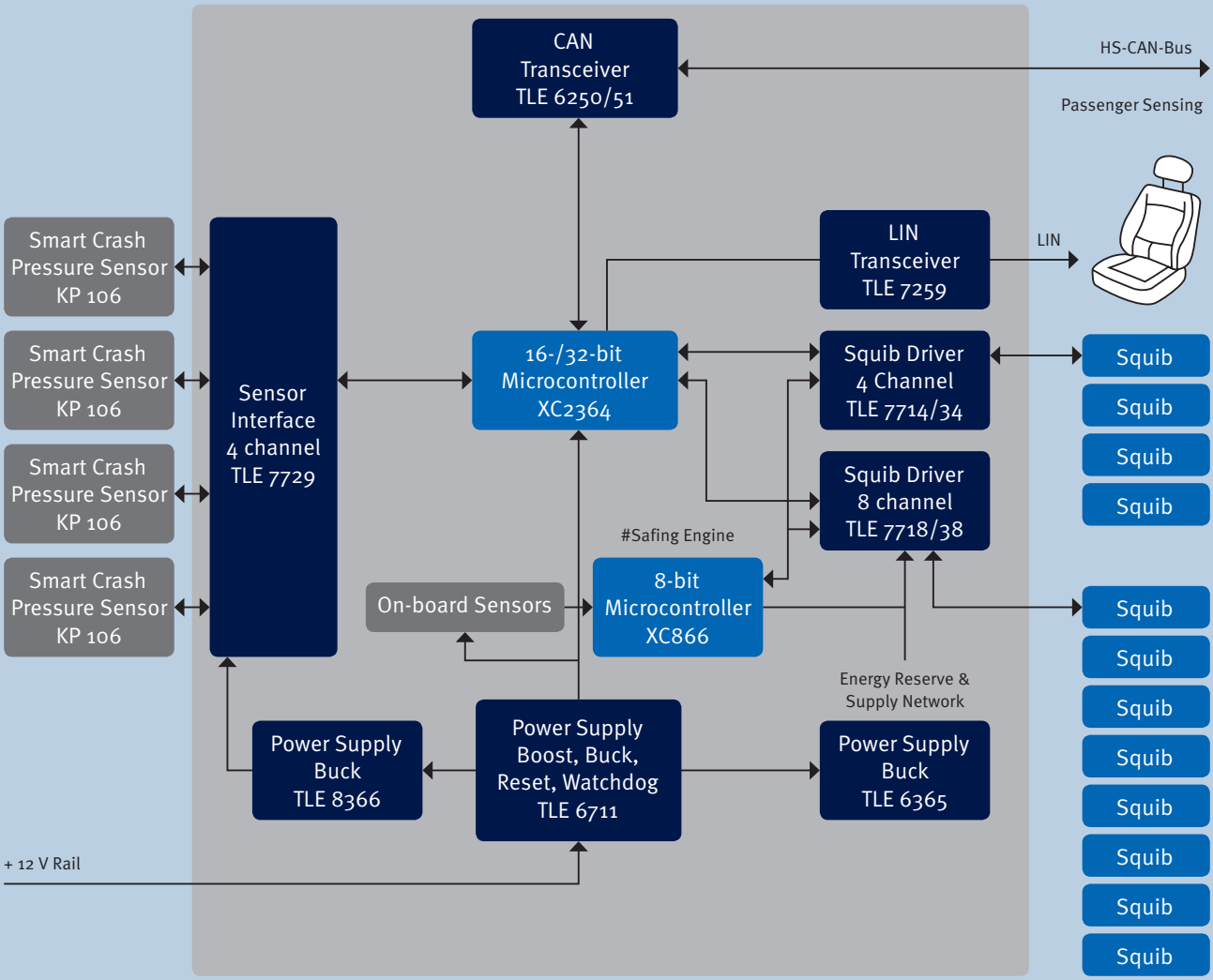
1) Product in development

*See packages on page 66

▸ www.infineon.com/door-module-ic

Safety system ICs

Airbag system ICs



▸ www.infineon.com/airbag-system-ic

Automotive System ICs

TLE 6712
2 channel airbag firing IC

- Two independent thermally protected firing squib drivers
- High-side and low-side switch for each firing circuit
- Maximum firing current limitation for each firing circuit
- Discrete level output for minimum firing current detection
- Precision squib resistance measurement with programmable gain. Measurement Retrieval through analog output.
- Squib leakage measurement to ground or to battery supply set by external resistor with analog or digital output
- Voltage measurements multiplexed to an analog output pin
- 16-bit Serial Peripheral Interface (SPI)
- Logic and analog output signals for sensing and diagnostics
- Two hardware firing loop enable inputs
- Buckle switch detection
- Package P-DSO-24

TLE 6714
4 channel airbag firing IC

- Four independent thermally protected firing squib drivers
- High-side and low-side switch for each firing circuit
- Maximum firing current limitation for each firing circuit
- Discrete level output for minimum firing current detection
- Precision squib resistance measurement with programmable gain. Measurement Retrieval through analog output.
- Squib leakage measurement to ground or to battery supply set by external resistor with analog or digital output
- Voltage measurements multiplexed to an analog output pin
- 16-bit Serial Peripheral Interface (SPI)
- Logic and analog output signals for sensing and diagnostics
- Two hardware firing loop enable inputs
- Buckle switch detection
- Package P-DSO-28

TLE 7718/7738
8-loop airbag deployment ASSP CrossSave™

- Eight independent squib channels with high-side and low-side switch
- Eight independent programmable deployment firing timer
- Digital inputs allow independent safing logic to prevent/enable deployment
- All digital I/O pins are 3.3V and 5V compatible
- 16-bit full duplex 8MHz SPI
- Multiplexed analog output for signal monitoring

TLE 7714/7734
4-loop airbag deployment ASSP CrossSave™

- Four independent squib channels with high-side and low-side switch
- Four independent programmable deployment firing timer
- Digital inputs allow independent safing logic to prevent/enable deployment
- All digital I/O pins are 3.3V and 5V compatible
- 16-bit full duplex 8MHz SPI
- Multiplexed analog output for signal monitoring

▸ www.infineon.com/airbag-system-ic

TLE 6710

Combined airbag power supply and 4 channel firing IC

- Step-up converter 30V (boost converter)
- Step-down converter 5V (buck converter)
- Four independent firing squib drivers with current limitation
- High-side and low-side switch for each firing circuit
- Digital output for firing current detection
- Squib resistance measurement with analog outputs
- Selectable gain factor (10/30) for squib resistance measurement
- Programmable squib leakage measurement to ground or to battery
- Several supply voltage measurements on external pins
- Digital output for detection of safing sensor closure
- Power on/off reset generator and watchdog circuit
- Precise 100kHz oscillator
- Serial interface line driver (ISO 9141 and TTL level)
- Four voltage/current sources for diagnostic purposes
- Two warning lamp driver with diagnostic
- 16-bit Serial Peripheral Interface (SPI)
- Logic and analog output signals for diagnostics
- Package P-MQFP-64

TLE 6711

Multifunctional regulator and watchdog

- Boost converter 30V
- Boost over- and undervoltage lockout
- Buck converter 5V
- Logic over- and undervoltage lockout
- Power on/off reset generator
- System enable output
- Low-voltage detection
- Very low current consumption
- Package PG-DSO-14 or PG-DSO-20
- Internal window watchdog

TLE 6365

- Step-down converter
- Supply over- and undervoltage-lockout
- Low output voltage tolerance
- Output overvoltage lockout
- Output undervoltage operation range
- Overtemperature shutdown
- Wide ambient operation range – 40°C to 125°C
- Wide supply voltage operation range
- Very low current consumption
- Very small PG-DSO-8 SMD package
- Green product (RoHS-compliant)
- AEC qualified

TLE 7729

4 channel satellite receiver IC (SatRIC)™

- 4 independent satellite receiver channels for current modulated data
- Each channel can support up to two satellites
- Data rate 125kbit/s
- Support of 11-; 13-; 18-bit Manchester 1 or 2 encoded messages
- Channel configuration in pairs (Bus Mode, Protocoll Type)
- Supply of satellite channels via 4 independent voltage regulators
- Adjustable current level detection thresholds
- Asynchronous and synchronous data transmission modes
- All digital I/Os are 3.3V and 5V compatible
- 4 Digital outputs for voltage-converted received satellite signals
- 16-bit 8MHz Serial Peripheral Interface (SPI)
- Embedded protocoll handler for data preprocessing
- Current limitation in case of satellite output shorted to GND or Battery
- Channel specific over-temperature shutdown
- Leakage detection to GND and Battery
- Ground loss detection
- Short to GND and open detection at every reference pins
- Package PG-TSSOP-28

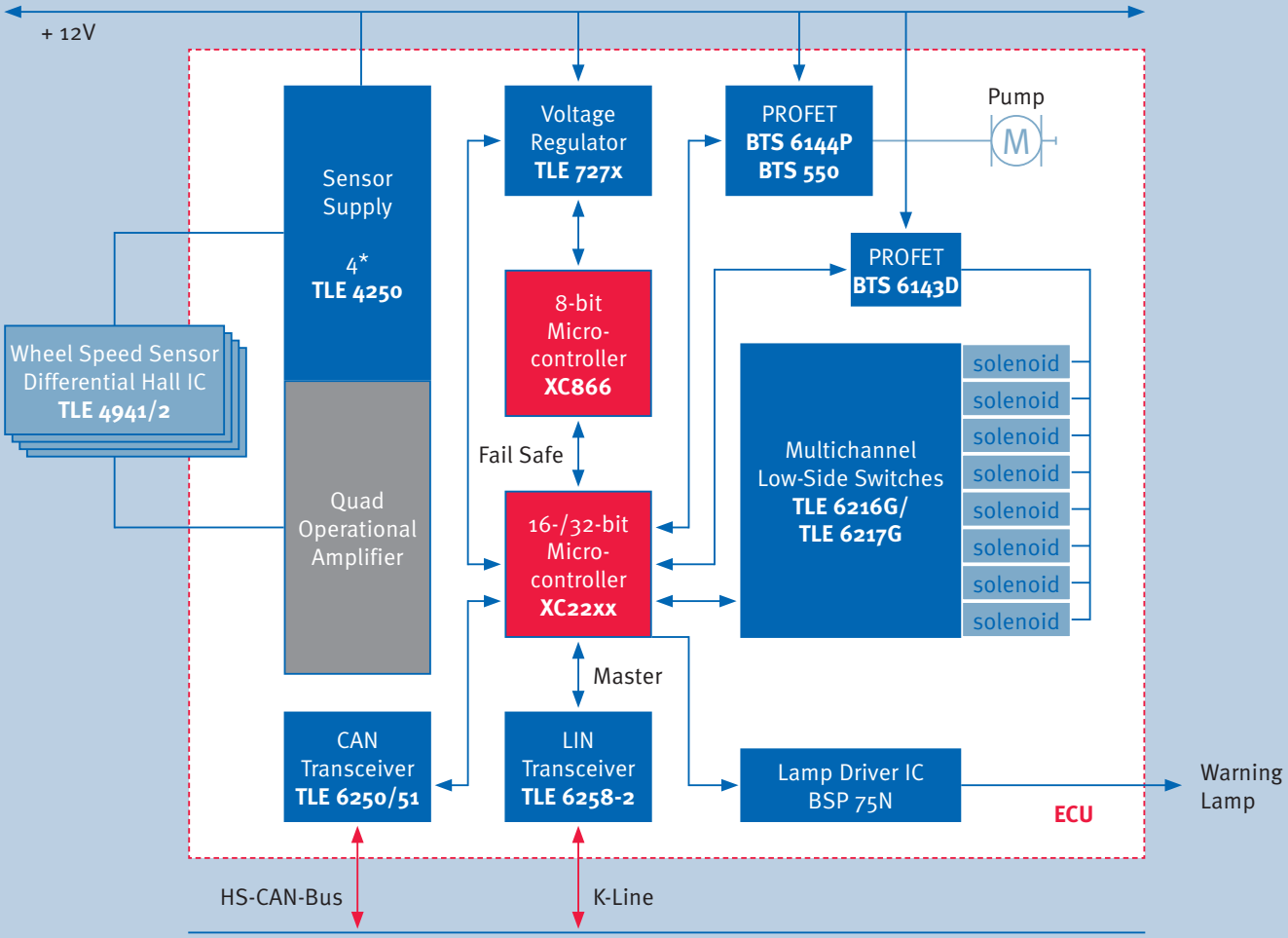
TLE 8366

- 1.8A step-down voltage regulator
- Output voltage versions: 5.0V, 3.3V and adjustable
- ± 2% output voltage tolerance ± 4% for full load current range)
- Integrated power transistor
- PWM regulation with feedforward
- Input voltage range from 4.75V to 45V
- 370kHz switching frequency
- Synchronization input
- Very low shutdown current consumption (< 2µA)
- Soft-start function
- Input undervoltage lockout
- Suited for automative applications: T_j = – 40°C to + 150°C
- Green product (RoHS-compliant)
- AEC qualified
- Package PG-DSO-8

Automotive System ICs

Safety

ABS/ESP system



TLE 6228GP

4-fold low-side switch

RoHS

- All kinds of resistive and inductive loads (relays, electromagnetic valves)
- Protection against short circuit, overtemperature, overvoltage and ESD
- Parallel control of the inputs (PWM applications)
- Open load (on/off)
- Separate diagnostic pin for each channel
- Standby mode with low current consumption
- µC-compatible input
- Four open-drain output stages
- $R_{DS(on)\,1.2}$ = 0.2Ω, $R_{on\ 3.4}$ = 0.35Ω, $ID_{1.2}$ = 2 x 5A , $ID_{3.4}$ = 2 x 3A
- PG-DSO-20-12 (Power-SO) package or bare die

TLE 6216

4-fold low-side switch

- EMV optimized version of TLE 6228
- With cross open load detection
- P-DSO-20-12 (Power-SO) package or bare die

TLE 6217

4-fold low-side switch

- EMV optimized version of TLE 6228
- P-DSO-20-12 (Power-SO) package or bare die

Automotive System ICs

Powertrain system ICs

Powertrain multichannel system ICs

Type	Green	V_s [V]	$V_{DS(AZ)\ max.}$ [V]	$R_{DS(on)}$ typ.at T_j = 25°C [mΩ]	$I_{D(NOM)}$ [A]	$I_{L(lim)\ min.}$ [A]	HIGHLIGHTS	Package*
TLE 6244X	✓	5	50/77	6 x 320 (70V) 6 x 300 2 x 220 4 x 620	6 x 1.5 6 x 1.5 2 x 2 4 x 0.5	6 x 2.2 6 x 2.2 2 x 3 4 x 1.1	18-fold low-side switch with SPI and microsecond bus, including six channels optimized for fuel injectors	㉞
TLE 6288R	✓	4.5 ... 5.5	40	6 x 0.270	6 x 2	Programmable	Six channel peak and hold driver optimized for p&h transmission valves	㉝

▸ www.infineon.com/smart-multichannel-switches

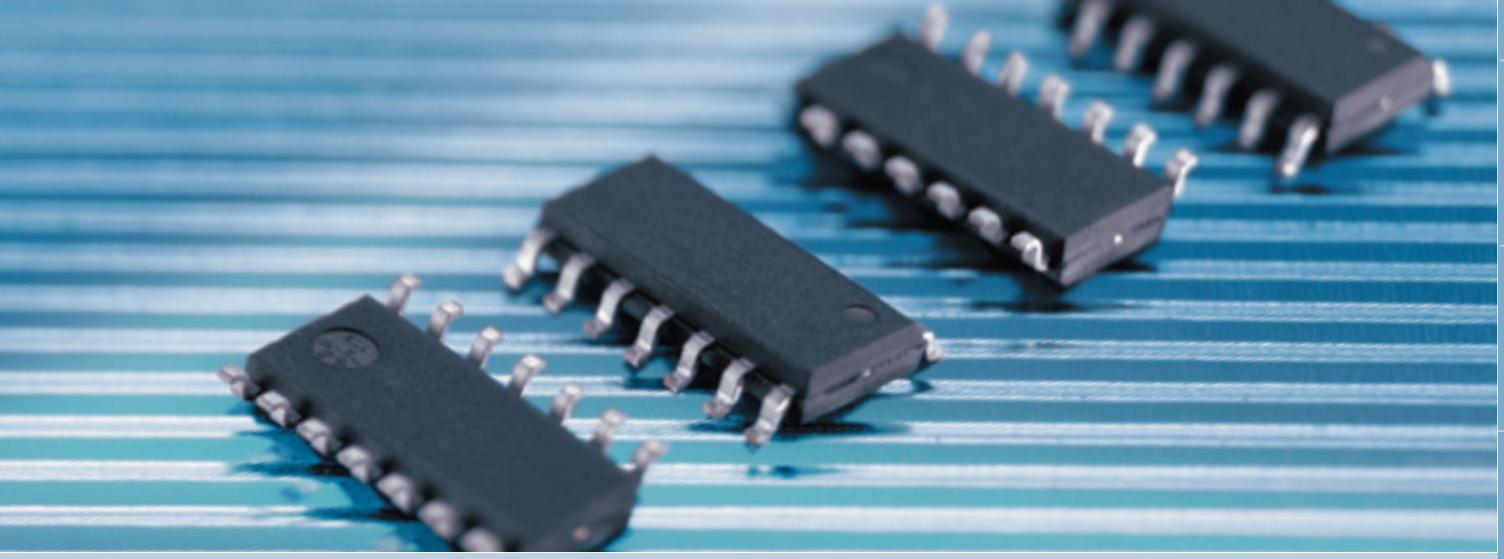
*See packages on page 66

Constant current control ICs

Type	Green	Output channels	Output transistors	Max. output average current (1Ω)	Output average current resolution	Output current switch point	Dither frequency range	Dither amplitude range (1Ω)
TLE 7241E	–	2	integrated	1.2A	1.2mA	+/– 2%	40Hz to > 1KHz	12.5ma (pp) to 390ma (pp)

Type	Green	Output channels	Output transistors	Max Output average current (0.2Ω)	Output average current resolution	Gain accuracy
TLE 7242G	–	4	External	Approx 1.2A	0.78mA	+/– 2%

▸ www.infineon.com/bridges



Bridges for idle speed and throttle control

Type	Green	Output current [A]	Peak current [A]	Quiescent current [mA]	Operating range [V]	Short-circuit protection	Diagnostic interface	HIGHLIGHT	$R_{DS(on)}$	Package*
TLE 5205-2	√	4	5	10	6 – 40	Protected	Status flag	Open load detection	220mΩ/ switch	⑥,⑦ ⑰,㉘
TLE 5206-2	√	4	5	10	6 – 40	Protected	Status flag	Break high and low	220mΩ/ switch	⑥,⑦ ⑰,㉘
TLE 6209	√	6	7	0.02	5 – 40	Protected	SPI	SPI, chopper current limitation, temp. prewarning	150mΩ/ switch	㉘
TLE 7209-2R	√	6	7	20	5 – 28	Protected	SPI	SPI, chopper current limitation, temp. prewarning	150mΩ/ switch	㉘

▸ www.infineon.com/dc-motor-bridges

*See packages on page 66

Hysteresis range (1Ω) sense	Current limit	Open load detection	Short to ground detection	Shorted load detection	Over-temperature shutdown	Overvoltage shutdown	SPI	Package *
40ma (pp) 110ma (pp)	3.0A (min)	in on-/off-state	in off-state	in on-state	Yes	Yes	16-bit	㉗

Current limit	Open load detection	Short to ground detection	Shorted Load Detect	Overtemperature shutdown	SPI	Package *
programmable	in on-/off-state	in off-state	in on-state	none	32-bit	㉚

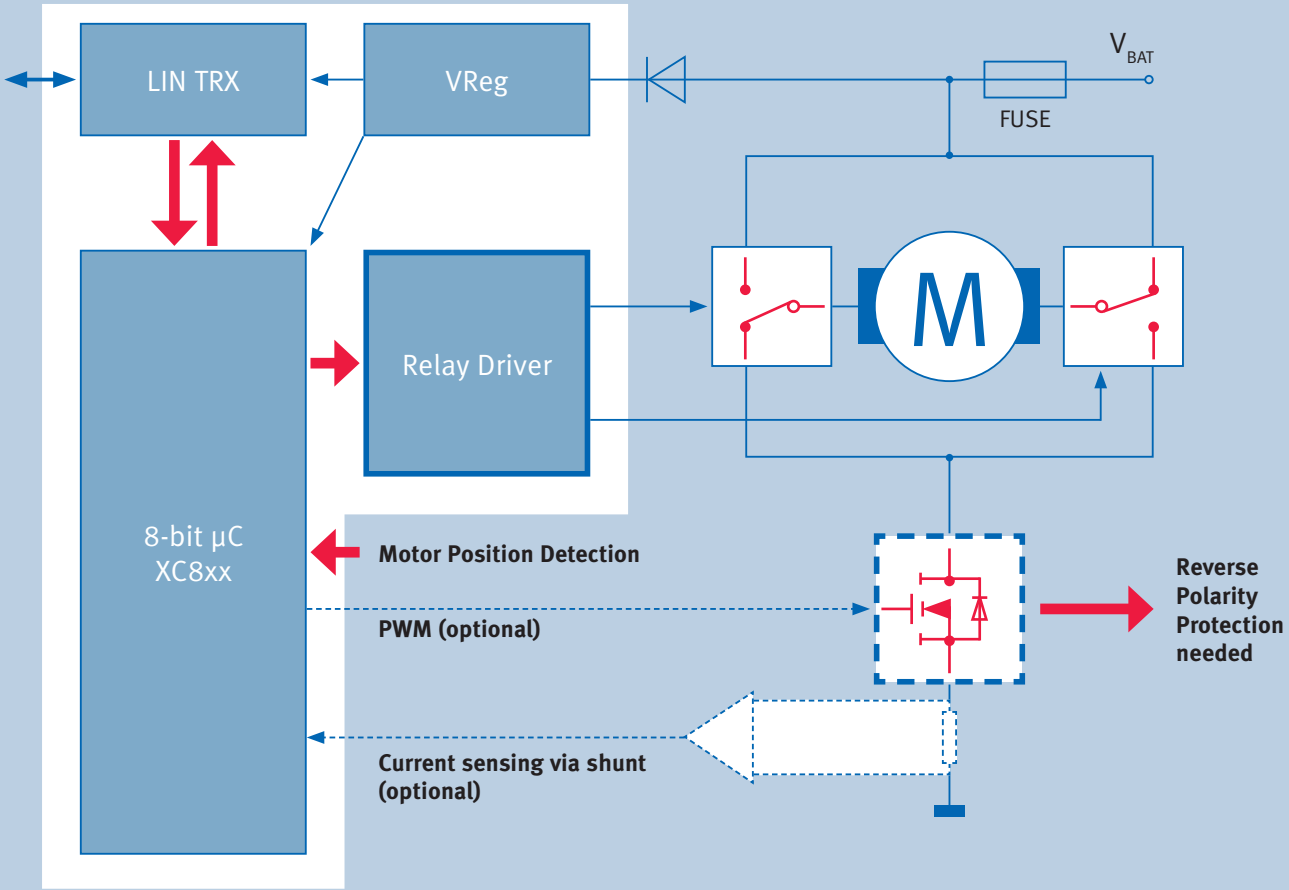
*See packages on page 66

Embedded Power

EMBEDDED POWER is a single packaged solution. It incorporates an 8-bit microcontroller compatible to the standard 8051 core with On-Chip Debug Support (OCDS) and a System-Basis-Chip (SBC). The SBC is equipped with LIN 2.0; 1.3/SAEJ2602 compliant LIN Transceiver, Low-Dropout voltage regulator (LDO) as well as two low-side switches (relay driver) and supply, e.g. to supply hall sensors (TLE 4966). An additional high-side driver for driving LEDs is also available.

THIS INTEGRATED CIRCUIT is realized as Multi-Chip-Module (MCM) in a DSO-28 or DSO-32 package, and is designed to withstand the severe conditions of automotive and industrial applications.

Embedded power products with microcontroller: TLE 7826/10/09



▸ www.infineon.com/embeddedpower

TLE 7810/09

General characteristics

- AEC (Automotive Electronics Council) qualified (TLE 7810)
- Package P-DSO-28
- Therm. resistance Rth = 65K/W
- Wide temperature range T_j = – 40 ... + 150°C (TLE 7810)
- Sleep mode current < 40µA (max)

Features

Features of Relay Driver

- Voltage regulator 5V
- LIN transceiver (single wire), compliant with LIN Spec. 2.0, 1.3/SAE J2602
- 2 low-side drivers
- 5 high-voltage wake-up inputs
- Progr. window watchdog
- Over-temperature protection

Features of 8-bit Microcontroller

- 256Byte RAM/512Byte XRAM
- 16KByte flash memory for program code and data
- 10-bit A/D converter, 3 channels (temperature & +*V*s supervision)
- Three 16-bit timers
- Capture/compare unit (PWM)

TLE 7826

General characteristics

- AEC (Automotive Electronics Council) qualified
- Package P-DSO-28
- Therm. resistance Rth = 65K/W
- Temperature range T_j = – 40 ... + 150°C
- Sleep mode current < 40µA (max)

Features

Features of Relay Driver

- Voltage regulator 5V
- LIN transceiver (single wire), compliant with LIN Spec. 2.0, 1.3/SAE J2602
- 2 low-side drivers
- 5 high-voltage wake-up inputs
- Progr. window watchdog
- Over-temperature protection

Features of 8-bit Microcontroller

- 256Byte RAM/1536Byte XRAM
- 32KByte flash memory for program code and data
- 10-bit A/D converter, 3 channels (temperature & +*V*s supervision)
- Three 16-bit timers
- Capture/compare unit (PWM)

Applications

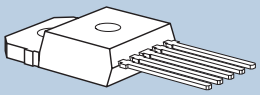
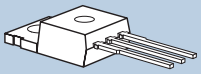
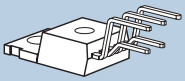
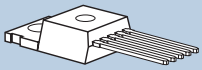
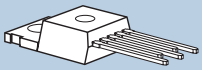
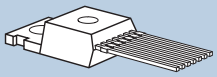
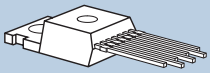
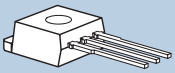
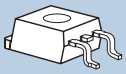
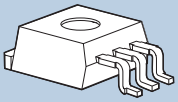
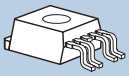
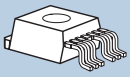
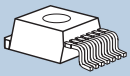
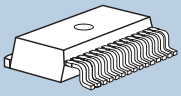
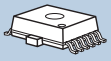
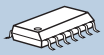
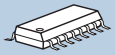
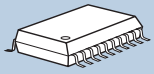
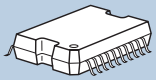
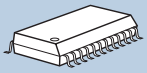
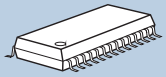
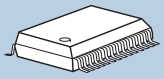
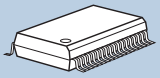
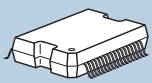
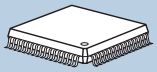
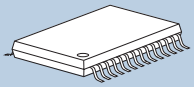
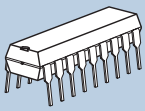
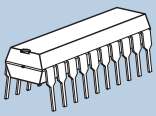
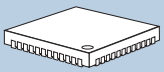
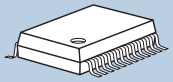
Automotive Applications for the TLE 7826/10

- Window lift module
- Seat module
- Sun-roof module
- Industrial automation: intelligent actuators

Industrial Application for the TLE 7809

- Motor control: sun blinds (jalousie, marquee), door opener (window gate, garage), pumps, stoves, escalators, elevators, caddies
- Vending machines: soda machines, coffee dispensers, food vending machines

Packages

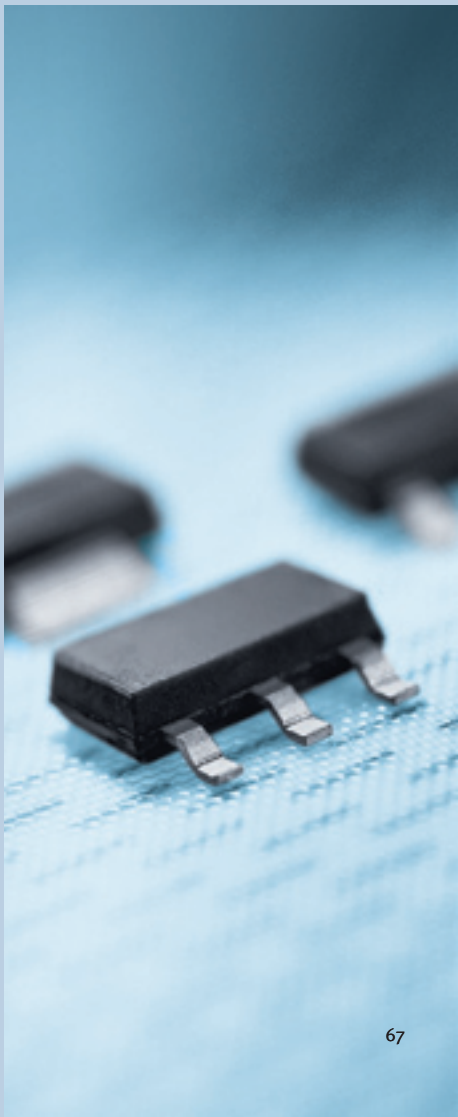
1 TO218-5 	2 TO220-3 	3 TO220-5 	4 TO220-5 
5 TO220-5 	6 TO220-7 	7 TO220-7 	8 TO220-7 
9 TO262-3 	10 TO252-3 (D-PAK) 	11 TO252-5 (D-PAK 5-leg) 	12 TO263-3 (TO220-3 (SMD)) 
13 TO263-3 	14 TO263-5 (TO220-5 (SMD)) 	15 TO263-5 (TO220-5 (SMD)) 	16 TO263-7 (TO220-7 (SMD)) 
17 TO263-7 (TO220-7 (SMD)) 	18 TO263-15 	19 SCT-595 	20 SOT-23 
21 SOT-223 	22 DSO-8 	23 DSO-8 Exposed pad 	24 DSO-12 
25 DSO-14 	26 DSO-16 	27 DSO-20 	28 DSO-20 (Power-SO) 
29 DSO-24 	30 DSO-28 	31 DSO-32 	32 DSO-36 
33 DSO-36 (Power-SO) 	34 MQFP-64 (Power) 	35 TSSOP-28 	36 DIP-8 
37 DIP-18 	38 DIP-20 	39 V-QFN-48 	40 SSOP-24 

More Detailed Information on Automotive Power Products is Available

On our Internet Homepage

www.infineon.com/automotivepower

for
- Data sheets
- Application notes
- Technical articles
- Automotive applications
- Product briefs
- Other documents



Edition 2008-03
Published by
Infineon Technologies AG
81726 Munich, Germany

INFINEON TECHNOLOGIES SALES OFFICES WORLDWIDE*

(COUNTRY/AREA)

Australia

Infineon Technologies Australia Pty. Ltd.
885 Mountain Highway
Bayswater, Victoria 3153
☎ (+61) 3-97 21 88 88
Fax (+61) 3-97 21 88 08

Austria

Infineon Technologies Austria AG
Production/Development Center
Siemensstraße 2
9500 Villach
☎ (+43) 5-17 77 0
Fax (+43) 5-17 77 35 01

Infineon Technologies Austria AG
Operngasse 20B/31
1040 Wien
☎ (+43) 1-51 77 71 11 00
Fax (+43) 1-51 77 71 15 00

Belgium/Luxembourg
Netherlands

Infineon Technologies Holding B.V.
Generaal
Lemanstraat 67
2018 Antwerpen
☎ (+31) 10-21 76 80 0
Fax (+31) 10-21 76 81 9

Infineon Technologies Holding B.V.
Westblaak 32
3012 KM Rotterdam
☎ (+31) 10-21 76 80 0
Fax (+31) 10-21 76 81 9

Brazil

Infineon Technologies
South America Ltda.
Avenida Paulista
nº 1337-Cj 172
01311-200 Cerqueira Cesar
São Paulo
☎ (+55) 11-33 72 92 40
Fax (+55) 11-33 72 92 30

Canada

Infineon Technologies
North America Corp.
340 March Road, Suite 301
Kanata, Ontario K2K 2E2
☎ (+1) 866-95 19 51 95 1
Fax (+1) 613-59 18 95 4

China

Infineon Technologies
Center of Competence (Shanghai) Co., Ltd.
12th Floor, Quantum Plaza
No.27 Zhi Chun Road
Haidian District
Beijing 100083
☎ (+86) 10-82 35 61 18
Fax (+86) 10-82 35 54 74

Infineon Technologies
Hong Kong Ltd.
Suite 302, Level 3 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Hong Kong
☎ (+852) 28-32 05 00
Fax (+852) 28-27 97 62

Infineon Technologies
International Trade (Shanghai) Co., Ltd.
No. 7 & 8, Lane 647, Song Tao Road
Zhang Jian Hi-Tech Park
Shanghai 201203
☎ (+86) 21-61 01 90 00
Fax (+86) 21-50 80 62 04

Infineon Technologies
China Co., Ltd.
Shenzhen Office, Room 1502, Block A
Tian An International Building
Renmin Nan Road
Shenzhen 518 001
☎ (+86) 755- 22 19 24 00
Fax (+86) 755- 82 28 02 17

Infineon Technologies
Taiwan Co., Ltd.
12F-1, No. 3-2 Yuan Qu Street
Nan Kang District
Taipei 115
☎ (+886) 2-26 55 75 00
Fax (+886) 2-26 55 75 01 8

Denmark

Infineon Technologies Nordic AB
Herlev Hovedgade 201A
2730 Herlev
☎ (+45) 44-50 77 00
Fax (+45) 44-50 77 01

Finland

Infineon Technologies Nordic AB
Visitor's Address Upseerinkatu 1
P.O. Box 276
02601 Espoo
☎ (+358) 10-6 80 84 00
Fax (+358) 10-6 80 84 01

France

Infineon Technologies France S.A.S.
Centre de vie Agora – Bat. A2
Z.I. des Paluds
13400 Aubagne
☎ (+33) 44-28 24 61 0
Fax (+33) 44-28 24 61 8

Infineon Technologies France S.A.S.
Burolines 2
2 ter, rue Marcel Doret
31700 Blagnac
☎ (+33) 5-34 55 13 30
Fax (+33) 5-34 55 13 34

Infineon Technologies France S.A.S.
39-47, Boulevard Ornano
93527 Saint-Denis CEDEX 2
☎ (+33) 1-48 09 72 00
Fax (+33) 1-48 09 72 90

Germany

Comneon GmbH
Südwestpark 2-4
90449 Nuremberg
☎ (+49) 911-37 88 0
Fax (+49) 911-37 88 10 00

Hitex Development Tools GmbH
Greschbachstraße 12
76229 Karlsruhe
☎ (+49) 72-19 62 80
Fax (+49) 72-19 62 81 89

Infineon Technologies AG
Siemensstraße 31-33
71254 Ditzingen/Stuttgart
☎ (+49) 7156-17 91 90
Fax (+49) 7156-17 91 99 0

Infineon Technologies AG
Düsseldorfer Landstraße 401
47259 Duisburg
☎ (+49) 203-72 98 71 1
Fax (+49) 203-72 98 76 0

Infineon Technologies AG
Naegelsbacherstraße 26
91052 Erlangen
☎ (+49) 9131-97 00 10
Fax (+49) 9131-97 00 19 9

Infineon Technologies AG
Lindenplatz 2
20099 Hamburg
☎ (+49) 40-23 51 94 74
Fax (+49) 40-23 51 94 75

Infineon Technologies AG
Paderborner Straße 1
30539 Hannover
☎ (+49) 511-87 65 62 0
Fax (+49) 511-87 65 62 90

Infineon Technologies AG
Am Campeon 1-12
85579 Neubiberg
☎ (+49) 89-23 40
Fax (+49) 89-23 42 46 94

Infineon Technologies AG
Südwestpark 65
90449 Nuremberg
☎ (+49) 911-25 29 30
Fax (+49) 911-25 29 39 3

Infineon Technologies AG
Max-Planck-Straße 5
59581 Warstein
☎ (+49) 2902-76 40
Fax (+49) 2902-76 41 25 6

Hungary

Infineon Technologies Cegléd Kft.
Gizella u. 51-57
1143 Budapest
☎ (+36) 1-47 12 82 4
Fax (+36) 1-47 12 82 5

India

Infineon Technologies India Pvt. Ltd.
10th Floor, Discoverer Building
International Technology Park
Whitefield Road
Bangalore 560 066
☎ (+91) 80-41 39 20 01
Fax (+91) 80-41 39 23 33

Iran

Siemens SSK
No. 32 Taleghani Ave.
15875-4773 Teheran
☎ (+98) 2-16 14 23 17
Fax (+98) 2-16 46 30 60

Ireland

Infineon Technologies Ireland Ltd.
69 Fitzwilliam Lane
Dublin 2
☎ (+353) 1-79 99 50 0
Fax (+353) 1-79 99 50 1

Israel

Nisko Ltd.
2A, Habarzel Street
Tel Aviv 69710
☎ (+972) 3-76 57 30 0
Fax (+972) 3-76 57 33 3

Italy

Infineon Technologies Italia S. r. l.
Via Vipiteno, 4
20128 Milan
☎ (+39) 2-25 20 41
Fax (+39) 2-25 20 44 39 5

Japan

Infineon Technologies Japan K. K.
Maruyama Nissei Building 14F
2-14-21 Nishiki, Naka-ku
Nagoya-shi, Aichi 460-0003
☎ (+81) 52-22 31 57 0
Fax (+81) 52-22 31 46 1

Infineon Technologies Japan K. K.
ORIX-Dojima Building 8F
2-1-31, Dojima, Kita-ku
Osaka-shi
Osaka 530-0003
☎ (+81) 6-47 97 44 60
Fax (+81) 6-47 97 44 62

Infineon Technologies Japan K.K.
Gate City Osaki, East Tower
21Fl / 22Fl / 23Fl
1-11-2 Osaki
Shinagawa-ku
Tokyo 141-0032
☎ (+81) 3-57 45 71 00
Fax (+81) 3-57 45 74 10

Korea

Infineon Technologies Korea Co., Ltd.
4th Floor Sigma Tower
7-19 Shincheon-dong Songpa-gu
Seoul 138-734
☎ (+82) 2-34 60 09 50
Fax (+82) 2-34 60 09 01

Infineon Technologies Korea Co., Ltd.
15th Floor SJ Technoville 60-19
Gasan-dong Geumcheongu
Seoul 153-801
☎ (+82) 2-34 60 08 80
Fax (+82) 2-34 60 09 09

Mexico

Everest Sales & Solutions
Av. Manuel Acunia 2674-101
Col. Ladron de Guevara
44680 Guadalajara, J. AL
☎ (+52) 33-36 42 21 01
Fax (+52) 33-36 40 65 62

Poland

Siemens Sp. z.o.o.
Ul. Zupnicza 11
03-821 Warsaw
☎ (+48) 22-87 09 15 0
Fax (+48) 22-87 09 15 9

Puerto Rico

Klamco Electronics
527 Street QH No. 1
Country Club
Carolina, PR 00982
☎ (+1787) 257-79 22
Fax (+1787) 257-79 61

Russia

Infineon Technologies RUSS LLC
Leninsky prospect 113/1
117 198 Moscow
☎ (+7) 495-95 65 19 5
Fax (+7) 495-95 65 19 5

Singapore

Infineon Technologies Asia
Pacific Pte. Ltd.
8 Kallang Sector
Singapore 349 282
☎ (+65) 68-76 28 88
Fax (+65) 68-76 31 22

South Africa

Siemens Components
P.O. Box 3438
Halfway House 1680
2146 Sandton
☎ (+27) 11-70 66 09 9
Fax (+27) 11-70 69 04 9

Spain

Infineon Distribution Sales Office IBERIA
c/ Chile, 10 1a Planta – Oficina 141
Edificio Madrid 92
28290 Las Rozas de Madrid, Madrid
☎ (+34) 91-63 05 72 8
Fax (+34) 91-63 05 72 8

Siemens, S.A.
División de Componentes
Ronda de Europa, 5
28760 Tres Cantos-Madrid
☎ (+34) 91-51 47 15 5
Fax (+34) 91-51 47 01 4

Sweden

Infineon Technologies Sweden AB
Isafjordsgatan 16
16481 Kista
☎ (+46) 8-75 75 00 0
Fax (+46) 8-75 74 61 2

Switzerland

Infineon Technologies Schweiz AG
Badener Strasse 623
P.O. Box 1570
8048 Zurich
☎ (+41) 1-49 78 04 0
Fax (+41) 1-49 78 05 0

Turkey

Infineon Technologies Turkey
Sehit Mehmet Fatih Ongul Sok.
Bagdatlioglu Plaza No:3
Office:4 Kozyatagi
34742 Kozyatagi, Istanbul
☎ (+90) 216-46 40 75 5
Fax (+90) 216-46 40 75 6

United Kingdom

Infineon Technologies
Kingswood
Kings Ride
Ascot SL5 8AD
☎ (+44) 1344-86 59 00

Infineon House
Great Western Court
Hunts Ground Road
Stoke Gifford
Bristol BS34 8HP
☎ (+44) 11-79 52 88 23

U.S.A.

Infineon Technologies
North America Corp.
2529 Commerce Drive, Suite H
Kokomo, IN 46902
☎ (+1) 765-45 61 92 8
Fax (+1) 765-45 63 83 6

Infineon Technologies
Industrial Power, Inc.
1050 Route 22
Lebanon, NJ 08833
☎ (+1) 908-23 65 62 1
Fax (+1) 908-23 65 62 0

Infineon Technologies
North America Corp.
1880 W. Winchester Drive, Suite 108
Libertyville, IL 60048
☎ (+1) 847-99 60 48 0

Infineon Technologies
North America Corp.
19111 Victor Parkway
Livonia, MI 48152
☎ (+1) 734-77 95 00 0
Fax (+1) 734-77 95 00 1

Infineon Technologies
North America Corp.
640 N. McCarthy Blvd.
Milpitas, CA 95035
☎ (+1) 866-95 19 51 9

Infineon Technologies
North America Corp.
12770 High Bluff Drive, Suite 100
San Diego, CA 92130
☎ (+1) 858-50 92 16 0
Fax (+1) 858-50 92 16 1

* and representative offices

www.infineon.com

Published by Infineon Technologies AG

Order No. B112-H6731-G16-X-7600