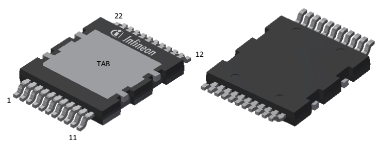
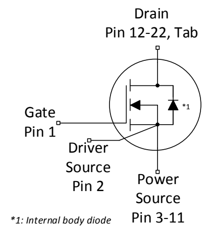
MOSFET

600V CoolMOS™ CM8 Power Transistor

The CoolMOS™ 8th generation platform is a revolutionary technology for high voltage power MOSFETs, designed according to the superjunction (SJ) principle and pioneered by Infineon Technologies. The 600V CoolMOS™ CM8 series is the successor to the CoolMOS™ 7.
It combines the benefits of a fast switching SJ MOSFET with excellent ease of use, e.g low ringing tendency, implemented fast body diode (CFD) for all products with outstanding robustness against hard commutation and excellent ESD capability. Furthermore, extremely low switching and conduction losses of CM8, make switching applications even more efficient.

PG-HDSOP-22





Features

- Suitable for hard and soft switching topologies thanks to an outstanding commutation ruggedness
- Significant reduction of switching and conduction losses
- Best in class $R_{DS(on)}$ per package products enabled by ultra low $R_{DS(on)}$*A

Benefits

- Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
- Simplified thermal management thanks to our advanced die attach technique
- Increased power density solutions enabled by using products with smaller footprint and higher manufacturing quality due state of the art ESD protection
- Suitable for a wide variety of applications and power ranges

Potential applications

- Power supplies and converters
- PFC stages & LLC resonant converters
- High efficiency switching applications
- e.g. Server, Telecom, EV Charging, UPS

Product validation

Fully qualified according to JEDEC for Industrial Applications

Please note: For MOSFET paralleling the use of ferrite beads on the gate or separate totem poles is generally recommended.

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	650	V
$R_{DS(on),max}$	16	mΩ
$Q_{g,typ}$	171	nC
$I_{D,pulse}$	505	A
E_{oss} @ 400V	22.9	µJ
Body diode di_F/dt	1300	A/µs
ESD class (HBM)	2	-

Type / Ordering Code	Package	Marking	Related Links
IPDQ60R016CM8	PG-HDSOP-22	60R016C8	see Appendix A

Table of Contents

1 Maximum ratings

at T_j = 25°C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1]	I_D	- -	- -	135 85	A	T_C=25°C T_C=100°C
Pulsed drain current[2]	$I_{D,pulse}$	-	-	505	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	297	mJ	I_D=10.1A; V_{DD}=50V; see table 10
Avalanche energy, repetitive	E_{AR}	-	-	1.48	mJ	I_D=10.1A; V_{DD}=50V; see table 10
Avalanche current, single pulse	I_{AS}	-	-	10.1	A	-
MOSFET dv/dt ruggedness	dv/dt	-	-	120	V/ns	V_{DS}=0...400V
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC (f>1 Hz)
Power dissipation	P_{tot}	-	-	625	W	T_C=25°C
Storage temperature	T_{stg}	-55	-	150	°C	-
Operating junction temperature	T_j	-55	-	150	°C	-
Extended operating junction temperature	T_j	150	-	175	°C	≤50 h in the application lifetime
Mounting torque	-	-	-	-	Ncm	-
Continuous diode forward current	I_S	-	-	135	A	T_C=25°C
Diode pulse current[2]	$I_{S,pulse}$	-	-	505	A	T_C=25°C
Reverse diode dv/dt[3]	dv/dt	-	-	70	V/ns	V_{DS}=0...400V, I_{SD}≤135A, T_j=25°C see table 8
Maximum diode commutation speed	di_F/dt	-	-	1300	A/µs	V_{DS}=0...400V, I_{SD}≤135A, T_j=25°C see table 8
Insulation withstand voltage	V_{ISO}	-	-	n.a.	V	V_{rms}, T_C=25°C, t=1min

[1] Limited by $T_{j,max}$.
[2] Pulse width t_p limited by $T_{j,max}$
[3] Identical low side and high side switch with identical R_G

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.2	K/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	K/W	device on PCB, minimal footprint
Thermal resistance, junction - ambient for SMD version	R_{thJA}	-	45	55	K/W	Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70µm thickness) copper area. Tap exposed to air. PCB is vertical without air stream cooling.
Soldering temperature, reflow soldering allowed	T_{sold}	-	-	260	°C	reflow MSL1

3 Electrical characteristics

at T_j=25°C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{(GS)th}$	3.7	4.2	4.7	V	V_{DS}=V_{GS}, I_D=1.48mA
Zero gate voltage drain current	I_{DSS}	- -	- 244	2 -	µA	V_{DS}=600V, V_{GS}=0V, T_j=25°C V_{DS}=600V, V_{GS}=0V, T_j=150°C
Gate-source leakage current	I_{GSS}	-	-	0.1	µA	V_{GS}=20V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	0.013 0.028	0.016 -	Ω	V_{GS}=10V, I_D=62.5A, T_j=25°C V_{GS}=10V, I_D=62.5A, T_j=150°C
Gate resistance	R_G	-	1	-	Ω	f=1MHz

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	7545	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Output capacitance	C_{oss}	-	91	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Effective output capacitance, energy related[1]	$C_{o(er)}$	-	286	-	pF	V_{GS}=0V, V_{DS}=0...400V
Effective output capacitance, time related[2]	$C_{o(tr)}$	-	2976	-	pF	I_D=constant, V_{GS}=0V, V_{DS}=0...400V
Turn-on delay time	$t_{d(on)}$	-	29.4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=29.7A, R_G=1.8Ω; see table 9
Rise time	t_r	-	9	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=29.7A, R_G=1.8Ω; see table 9
Turn-off delay time	$t_{d(off)}$	-	125.7	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=29.7A, R_G=1.8Ω; see table 9
Fall time	t_f	-	4.4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=29.7A, R_G=1.8Ω; see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	45	-	nC	V_{DD}=400V, I_D=29.7A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	61	-	nC	V_{DD}=400V, I_D=29.7A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	171	-	nC	V_{DD}=400V, I_D=29.7A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	5.9	-	V	V_{DD}=400V, I_D=29.7A, V_{GS}=0 to 10V

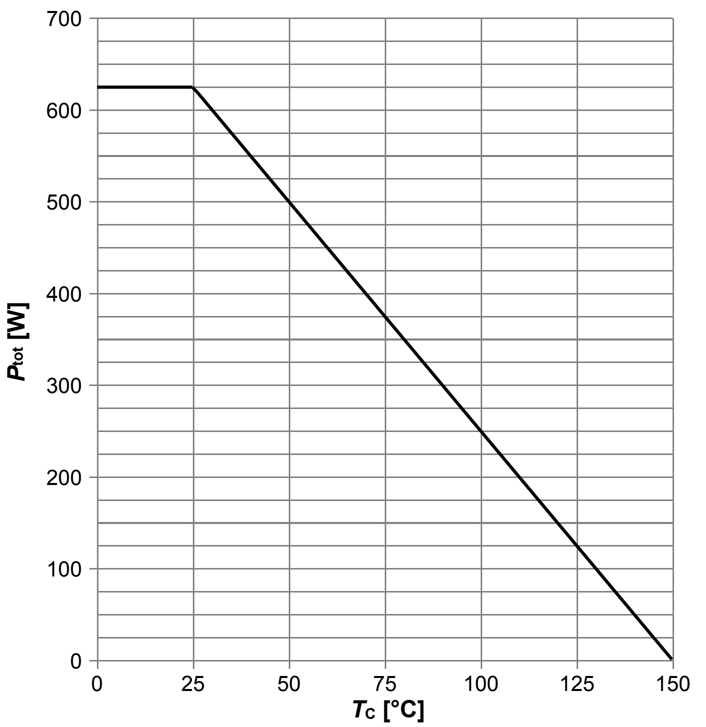
[1] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V
[2] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.9	-	V	V_{GS}=0V, I_F=29.7A, T_j=25°C
Reverse recovery time	t_{rr}	-	180	225	ns	V_R=400V, I_F=29.7A, di_F/dt=100A/µs; see table 8
Reverse recovery charge	Q_{rr}	-	1.54	2.31	µC	V_R=400V, I_F=29.7A, di_F/dt=100A/µs; see table 8
Peak reverse recovery current	I_{rrm}	-	16.4	-	A	V_R=400V, I_F=29.7A, di_F/dt=100A/µs; see table 8

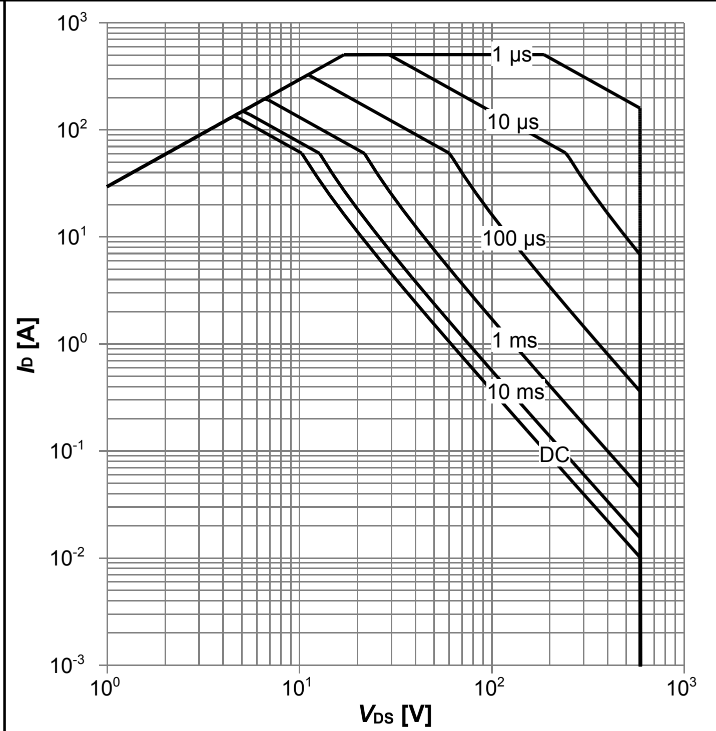
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



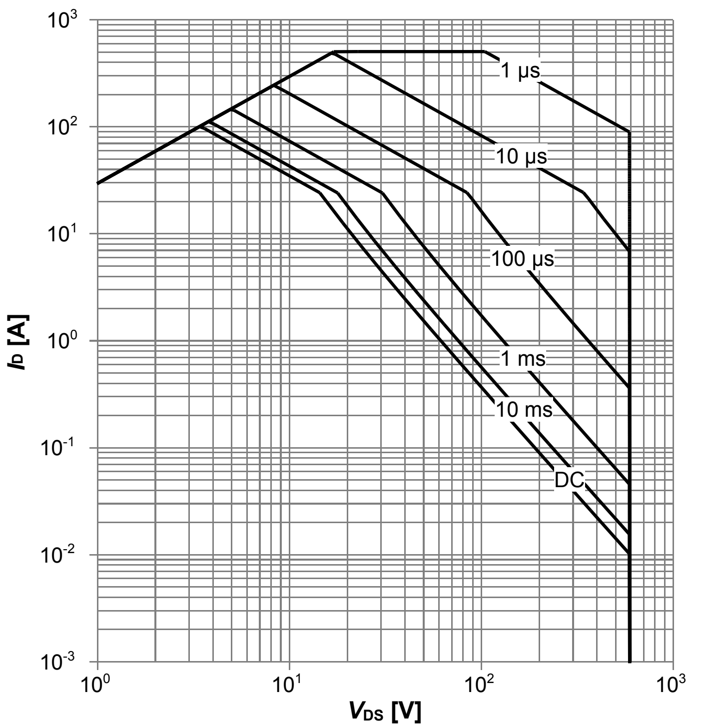
P_{tot}=f(T_C)

Diagram 2: Safe operating area



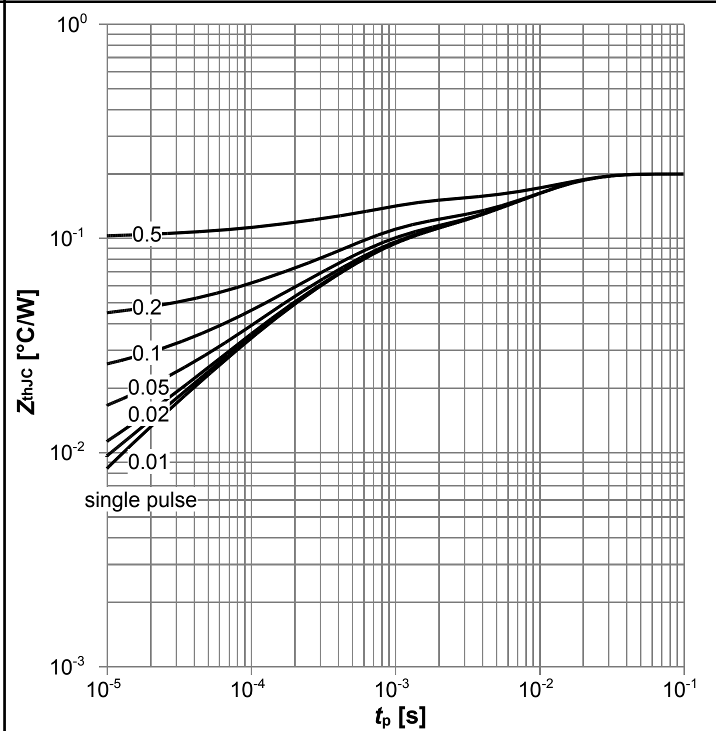
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 3: Safe operating area



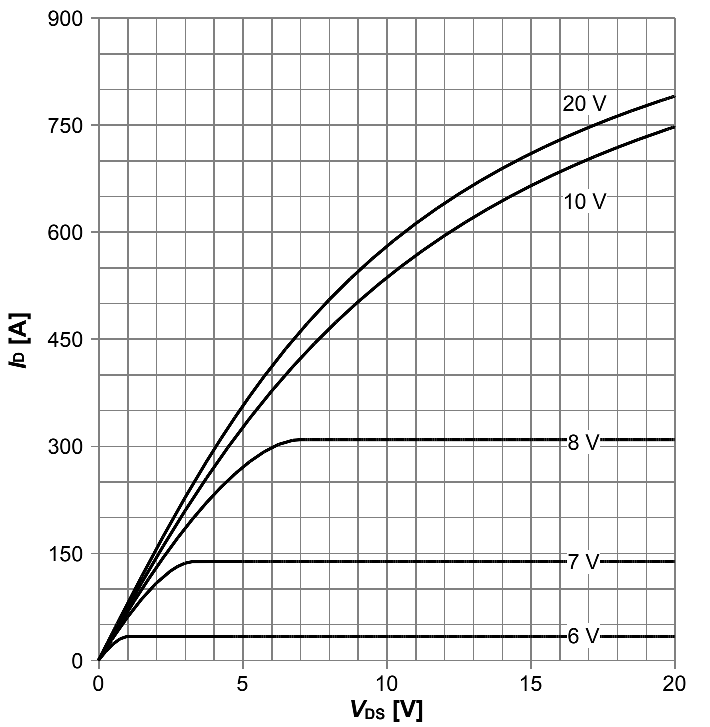
I_D=f(V_{DS}); T_C=80 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



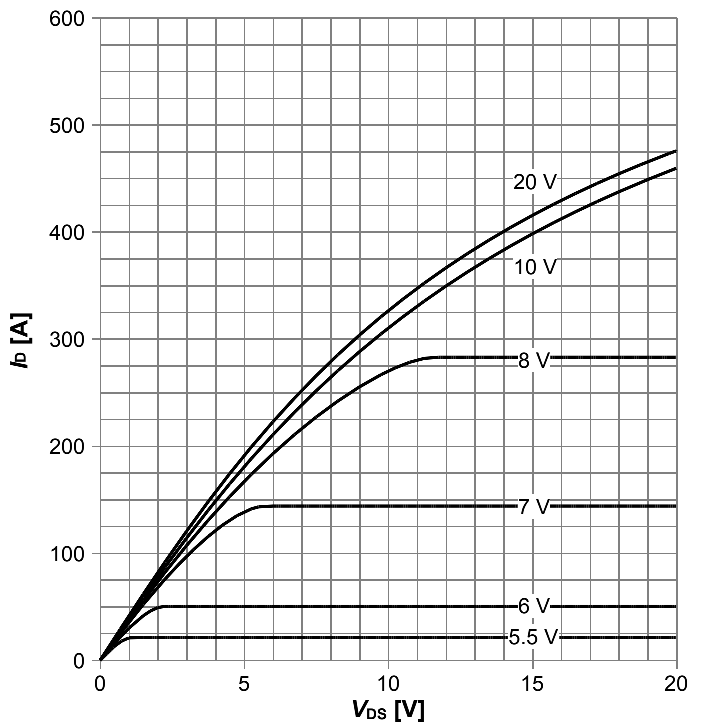
Z_{thJC} =f(t_P); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



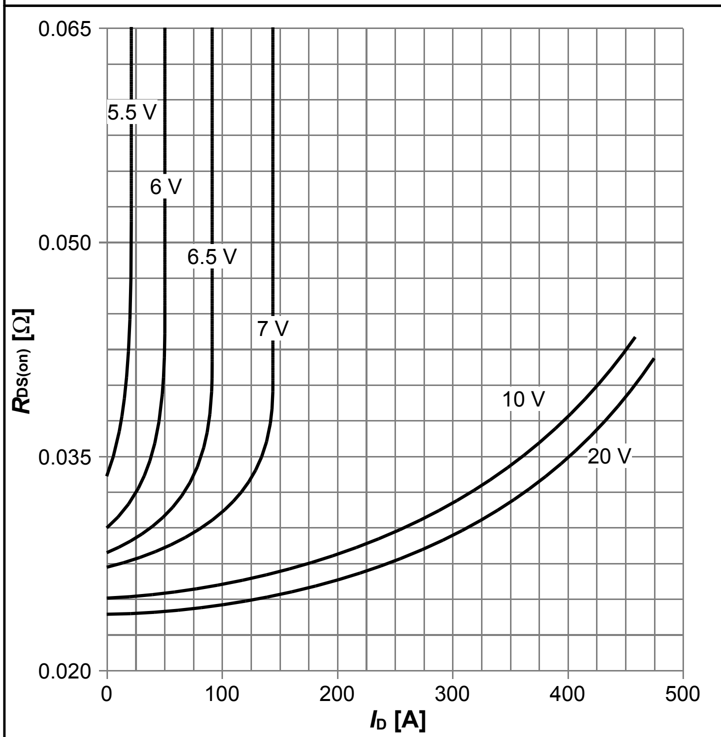
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



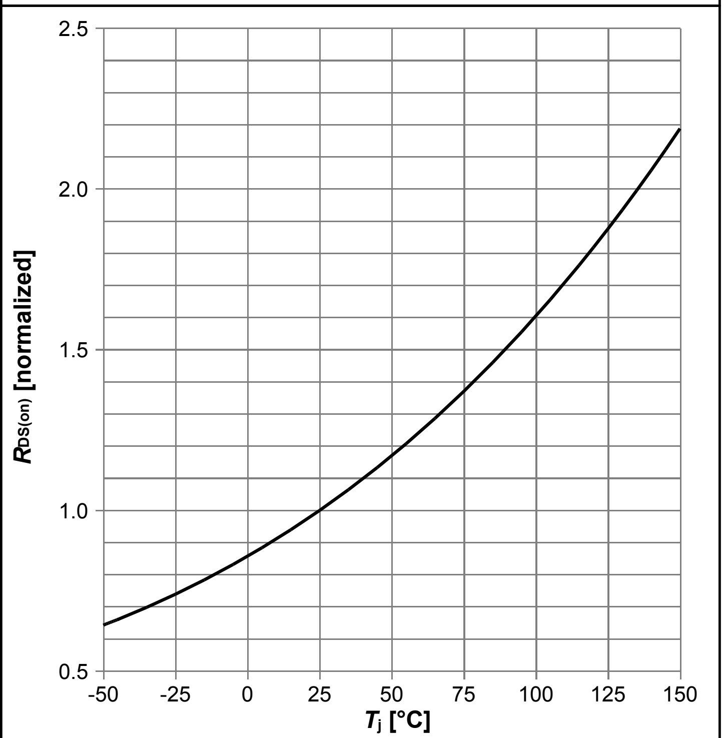
I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

Diagram 7: Typ. drain-source on-state resistance



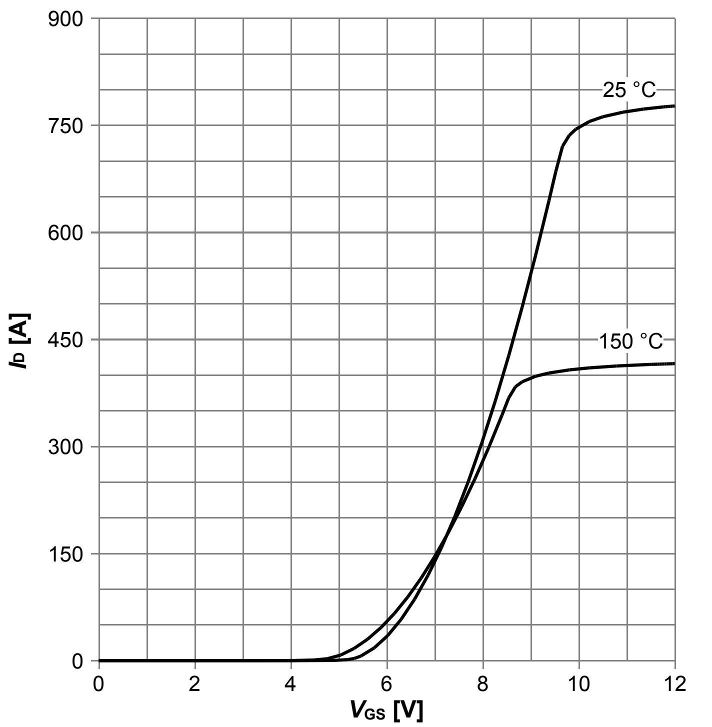
$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



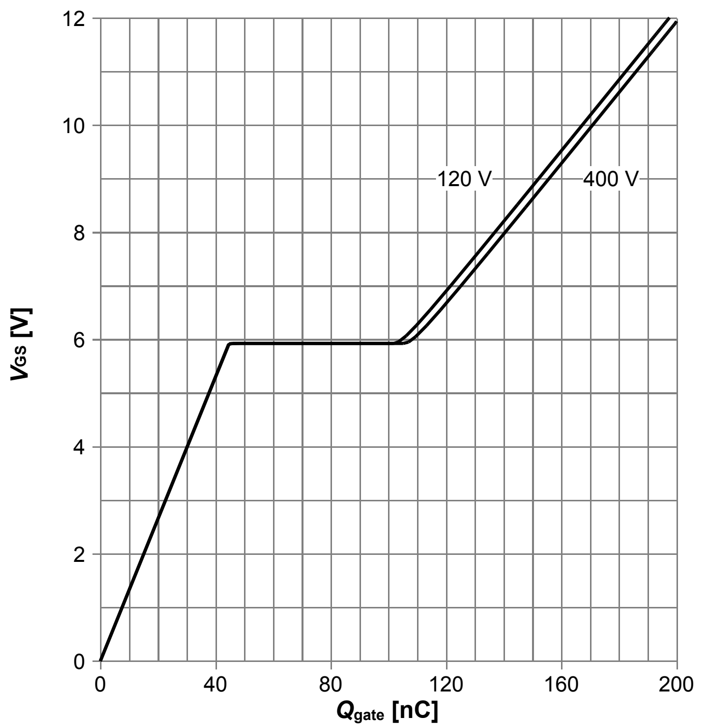
$R_{DS(on)}$=f(T_j); I_D=62.5 A; V_{GS}=10 V

Diagram 9: Typ. transfer characteristics



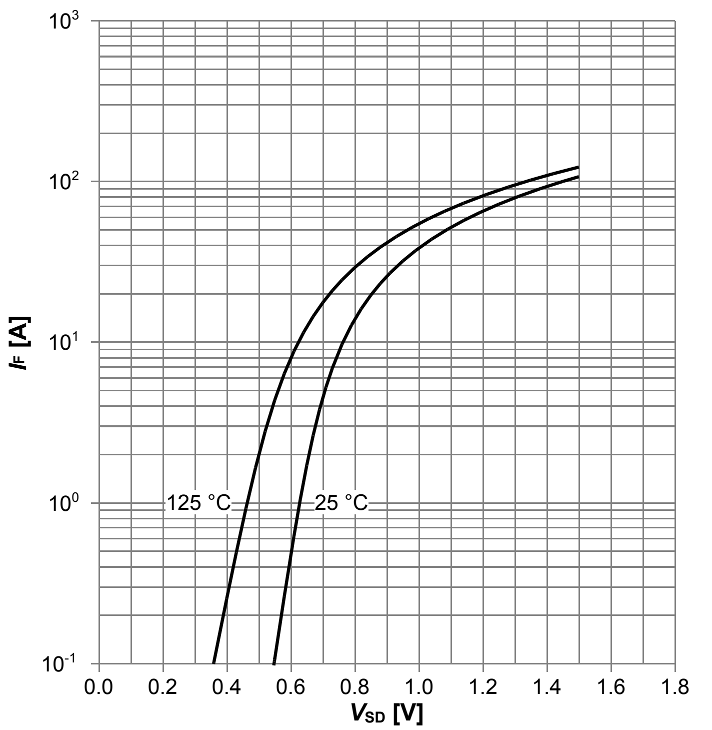
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



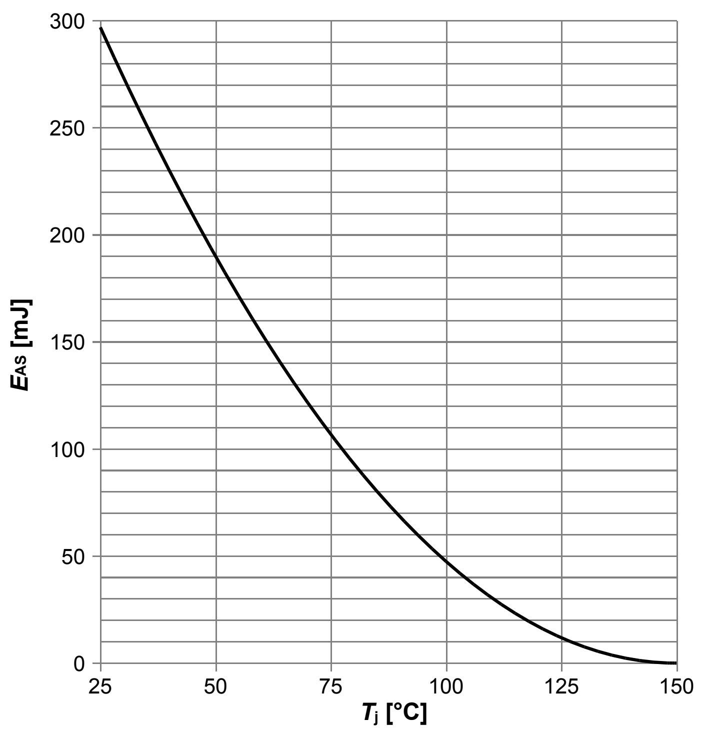
V_{GS}=f(Q_{gate}); I_D=29.7 A pulsed; parameter: V_{DD}

Diagram 11: Forward characteristics of reverse diode



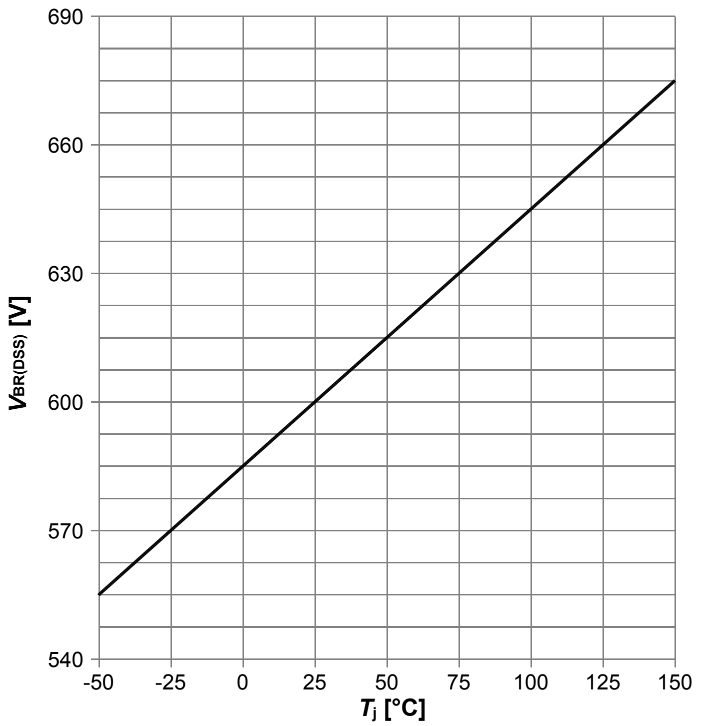
I_F=f(V_{SD}); parameter: T_j

Diagram 12: Avalanche energy



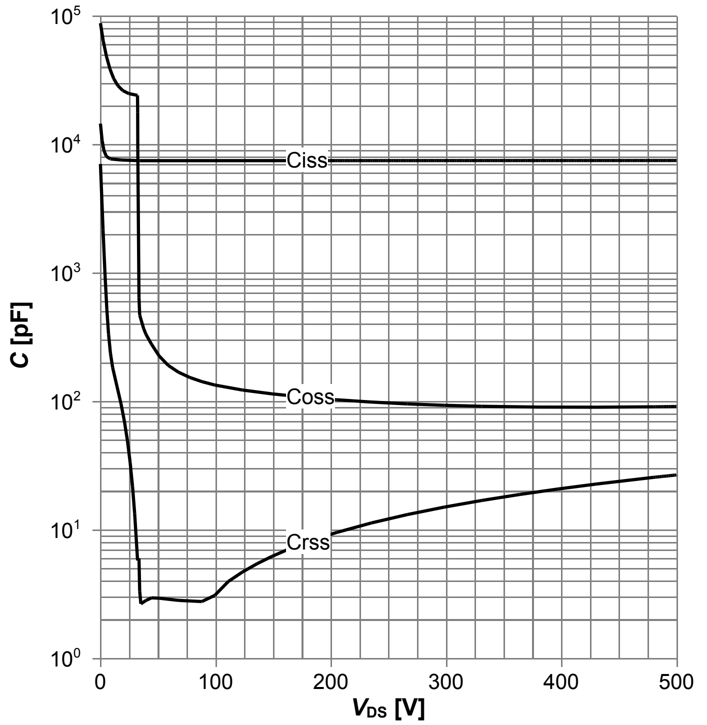
E_{AS}=f(T_j); I_D=10.1 A; V_{DD}=50 V

Diagram 13: Drain-source breakdown voltage



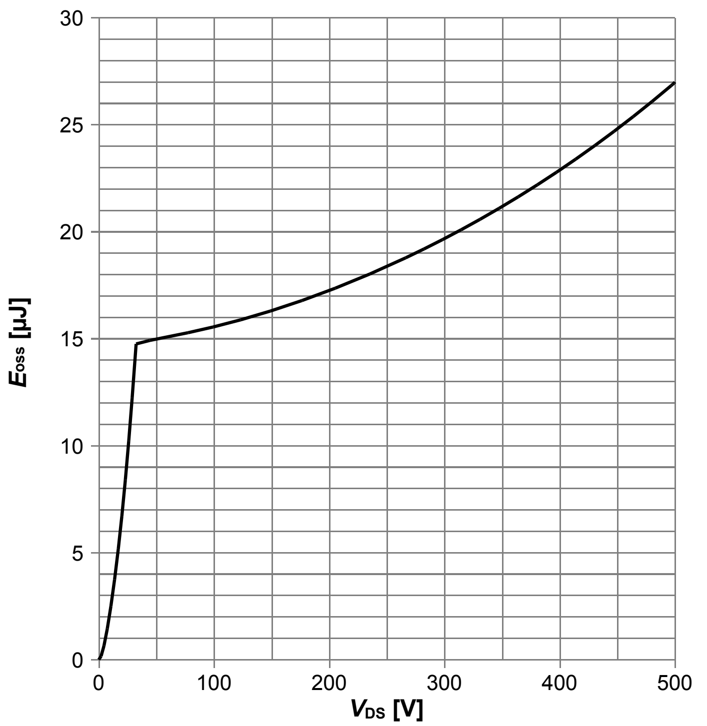
$V_{BR(DSS)}$=f(T_j); I_D=10 mA

Diagram 14: Typ. capacitances



C=f(V_{DS}); V_{GS}=0 V; f=250 kHz

Diagram 15: Typ. Coss stored energy



E_{oss}=f(V_{DS})

5 Test Circuits

Table 8 Diode characteristics

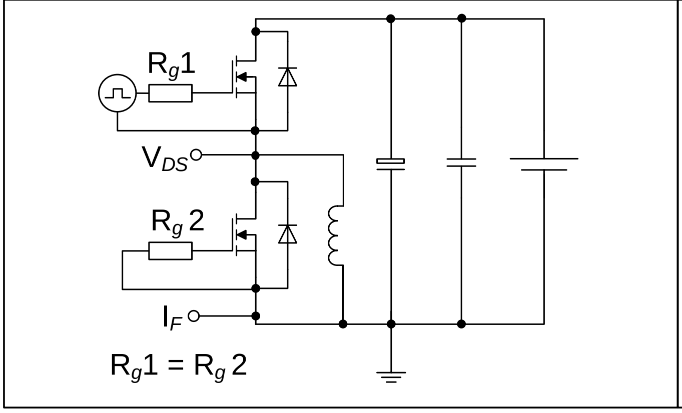
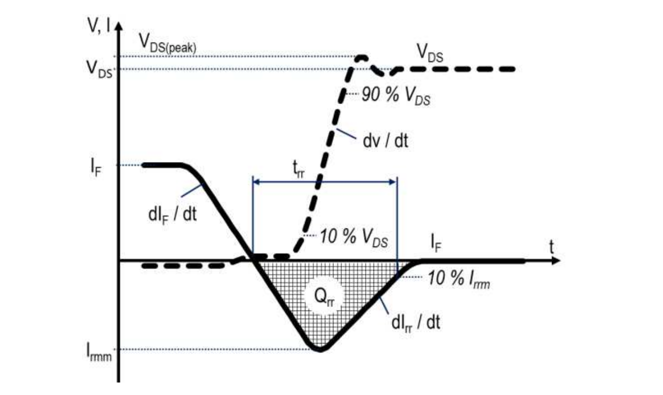
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times (ss)

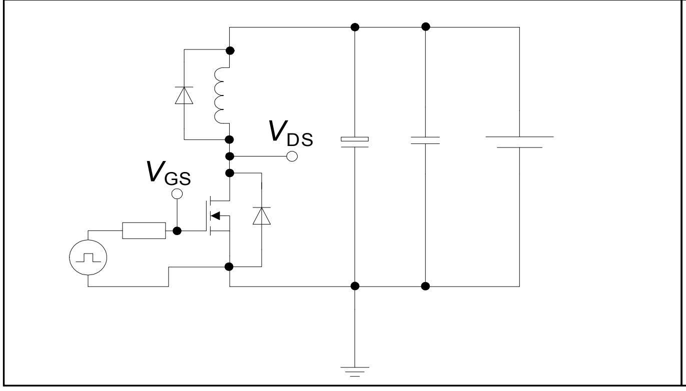
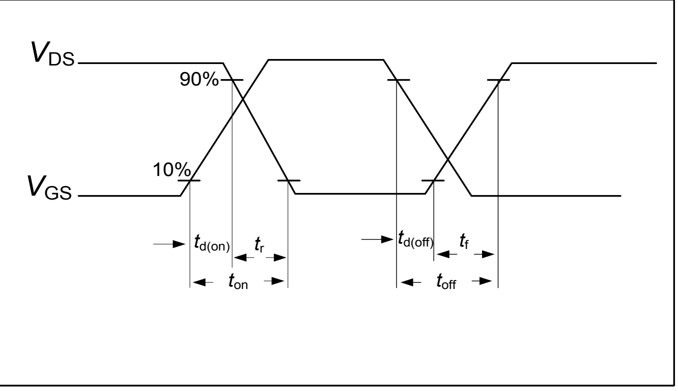
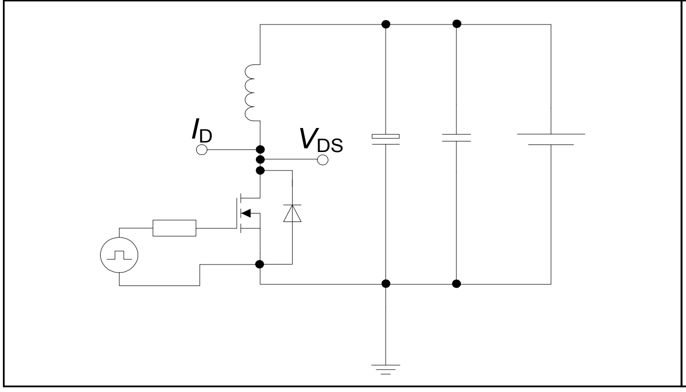
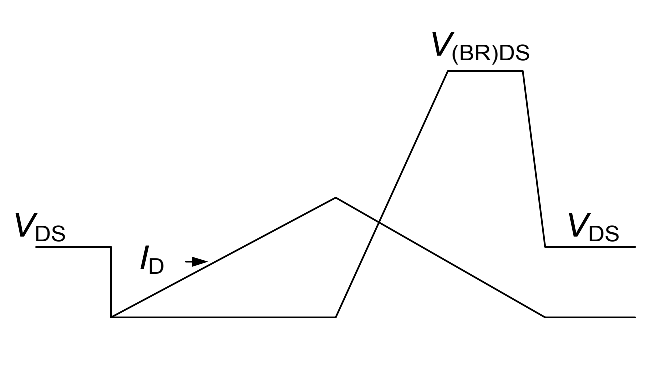
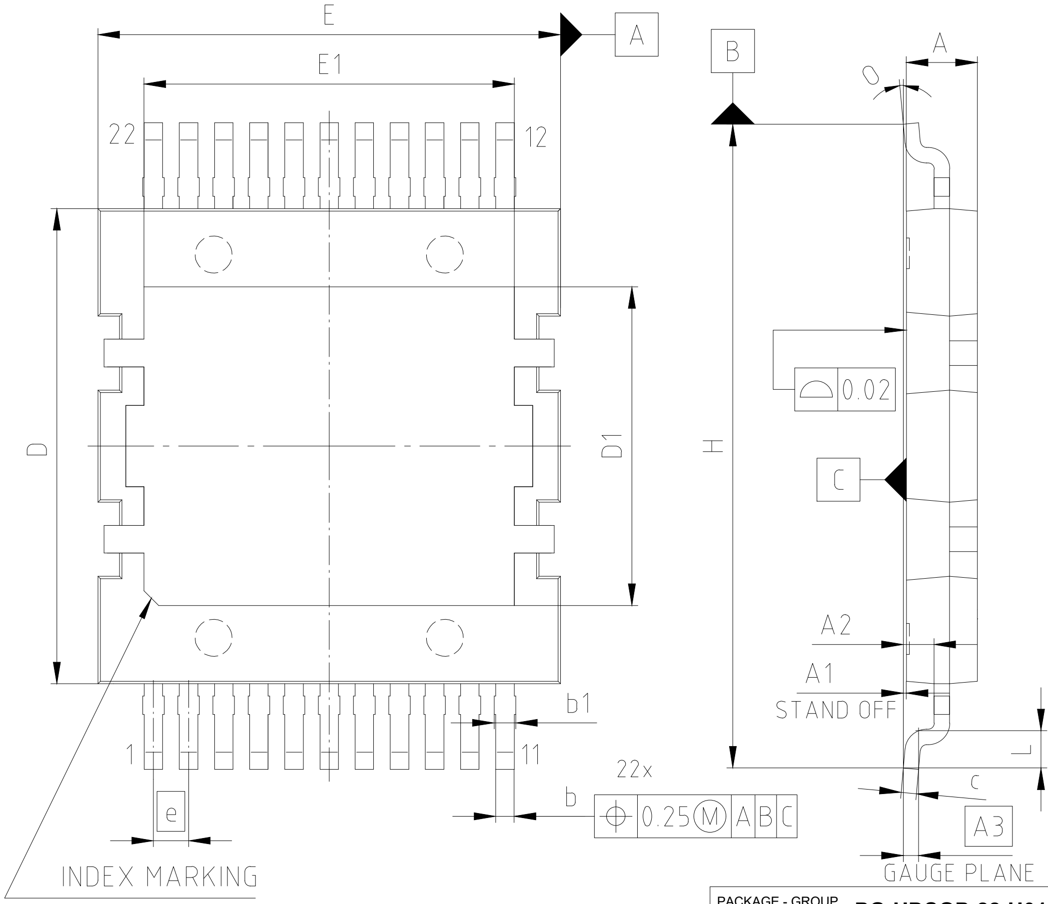
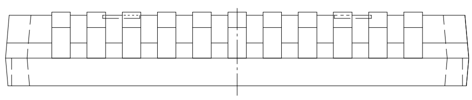
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load (ss)

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines





NOTES:

1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 AND DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2. ALL METAL SUFACES ARE TIN PLATED, EXCEPT AREA OF CUT.

PACKAGE - GROUP NUMBER:	PG-HDSOP-22-U01	
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	2.25	2.35
A1	0.00	0.15
A2	0.89	1.10
A3	0.5	
b	0.50	0.70
b1	0.50	0.90
c	0.46	0.58
D	15.30	15.50
D1	10.23	10.43
E	14.90	15.10
E1	11.91	12.11
e	1.14	
N	22	
H	20.86	21.06
L	1.20	1.40
O	0°	8°

Figure 1 Outline PG-HDSOP-22, dimensions in mm

7 Appendix A

Table 11 Related Links

- **IFX CoolMOS CM8 Webpage:** www.infineon.com
- **IFX CoolMOS CM8 application note:** www.infineon.com
- **IFX CoolMOS CM8 simulation model:** www.infineon.com
- **IFX Design tools:** www.infineon.com

Revision History

IPDQ60R016CM8

Revision: 2024-03-21, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2023-10-25	Release of final version
2.1	2024-03-21	Update of R_{thJC}

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