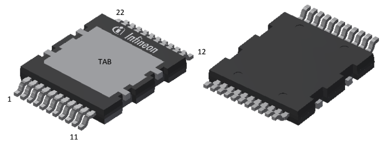
MOSFET

600V CoolMOS™ CM8 Power Transistor

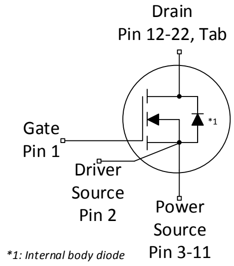
Q-DPAK



Built on Infineon's world-class super-junction MOSFET platform with an integrated fast body diode, making it suitable for a wide range of applications. It enables highest power density at lowest possible system cost with superior reliability. It is enhancing Infineon's WBG offering and the successor of the 600 V CoolMOS™ 7 MOSFET family.

Features

- Best-In-Class SJ Mosfet Performance
- Address broad hard and soft switching applications with outstanding commutation ruggedness
- Integrated fast body diode and ESD protection
- .XT interconnection technology for best-in-class thermal performance



Benefits

- Provides the best price performance ratio with Best-In-Class SJ Mosfet Performance
- Ease of use and shorter design in cycle
- Enable multiple topologies
- 14-42% lower R_{th} for improved thermal performance

Potential applications

- Datacenter, AI server, Telecom Power Supply
- Micro and Residential Hybrid Inverter
- Portable and Residential Energy Storage, UPS
- EV Charging, Light electric vehicles, Electric Forklift
- High Voltage Solid State Power Distribution
- Home & Professional Tools

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
$R_{DS(on),max}$	24	mΩ
$Q_{g,typ}$	122	nC
$I_{D,pulse}$	359	A
E_{oss} @ 400V	16.4	µJ
Body diode di_F/dt	1300	A/µs

Type / Ordering code	Package	Marking	Related links
IPDQ60R024CM8	PG-HDSOP-22	60R024C8	see Appendix A

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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	-	-	97	A	T_C=25°C
Continuous drain current	I_D	-	-	60	A	T_C=100°C
Pulsed drain current [2]	$I_{D,pulse}$	-	-	359	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	211	mJ	I_D=6.0A; V_{DD}=50V; see table 10
Avalanche energy, repetitive	E_{AR}	-	-	1.06	mJ	I_D=6.0A; V_{DD}=50V; see table 10
Avalanche current, single pulse	I_{AS}	-	-	6.0	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}	-	-	480	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	-	-	97	A	T_C=25°C
Diode pulse current [2]	$I_{S,pulse}$	-	-	359	A	T_C=25°C
Reverse diode dv/dt [3]	dv/dt	-	-	70	V/ns	V_{DS}=0...400V, I_{SD}≤97A, T_j=25°C see table 8
Maximum diode commutation speed	di_F/dt	-	-	1300	A/µs	V_{DS}=0...400V, I_{SD}≤97A, 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}	-	-	0.26	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}	-	-	-	K/W	-
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=1.06mA
Zero gate voltage drain current	I_{DSS}	-	- 151	1.5 -	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	$R_{DS(on)}$	-	0.020 0.044	0.024 -	Ω	V_{GS}=10V, I_D=41.7A, T_j=25°C V_{GS}=10V, I_D=41.7A, T_j=150°C
Gate resistance	R_G	-	1.1	-	Ω	f=1MHz

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	5382	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Output capacitance	C_{oss}	-	66	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Effective output capacitance, energy related [4]	$C_{o(er)}$	-	205	-	pF	V_{GS}=0V, V_{DS}=0...400V
Effective output capacitance, time related [5]	$C_{o(tr)}$	-	2127	-	pF	I_D=constant, V_{GS}=0V, V_{DS}=0...400V
Turn-on delay time	$t_{d(on)}$	-	23.4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=21.1A, R_G=3.3Ω; see table 9
Rise time	t_r	-	7.1	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=21.1A, R_G=3.3Ω; see table 9
Turn-off delay time	$t_{d(off)}$	-	111.4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=21.1A, R_G=3.3Ω; see table 9
Fall time	t_f	-	4.9	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=21.1A, R_G=3.3Ω; see table 9

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

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

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	32	-	nC	V_{DD}=400V, I_D=21.1A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	44	-	nC	V_{DD}=400V, I_D=21.1A, V_{GS}=0 to 10V

Table 6 Gate charge characteristics

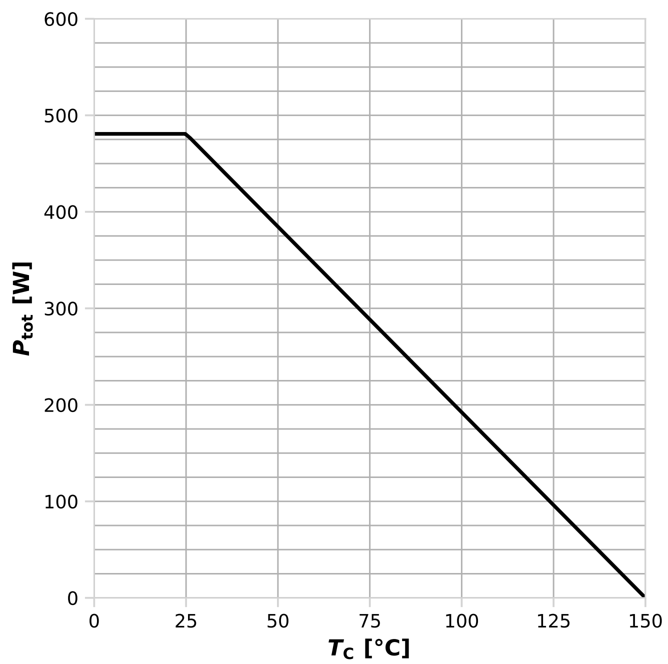
Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate charge total	Q_g	-	122	-	nC	V_{DD}=400V, I_D=21.1A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	5.9	-	V	V_{DD}=400V, I_D=21.1A, V_{GS}=0 to 10V

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=21.1A, T_j=25°C
Reverse recovery time	t_{rr}	-	149.8	187.3	ns	V_R=400V, I_F=21.1A, di_F/dt=100A/µs; see table 8
Reverse recovery charge	Q_{rr}	-	1.11	1.66	µC	V_R=400V, I_F=21.1A, di_F/dt=100A/µs; see table 8
Peak reverse recovery current	I_{rrm}	-	16.1	-	A	V_R=400V, I_F=21.1A, di_F/dt=100A/µs; see table 8

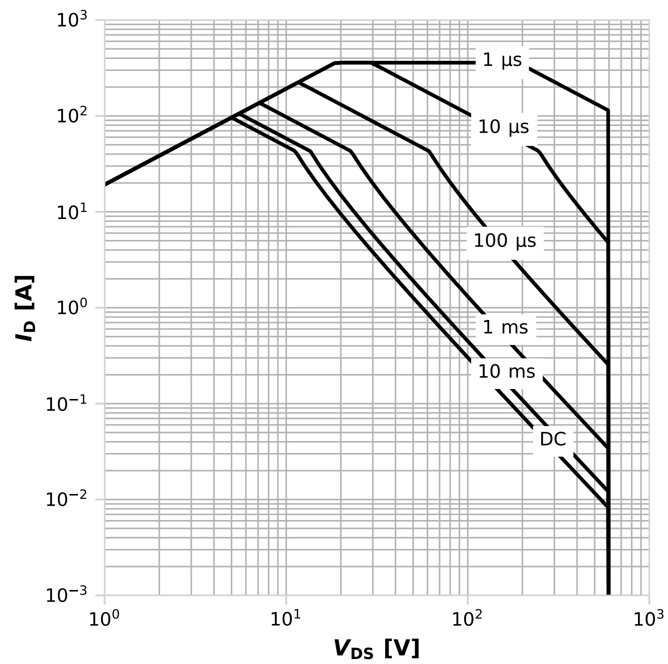
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



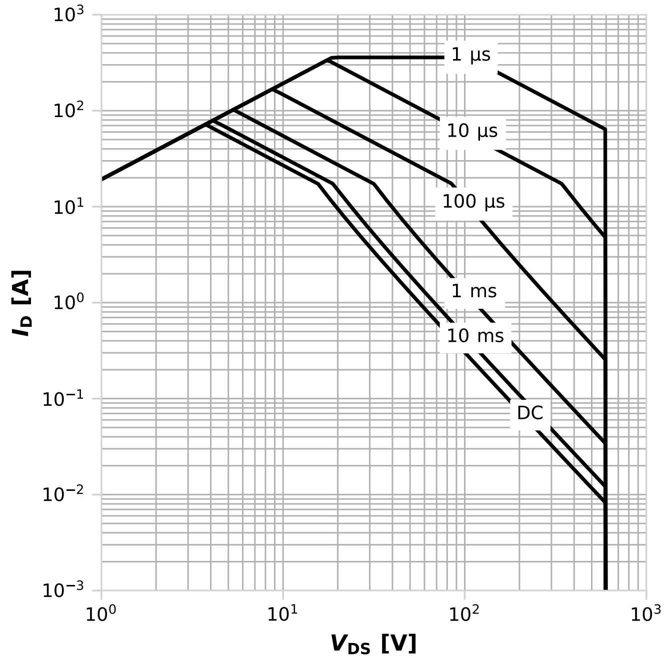
P_{tot}=f(T_C)

Diagram 2: Safe operating area



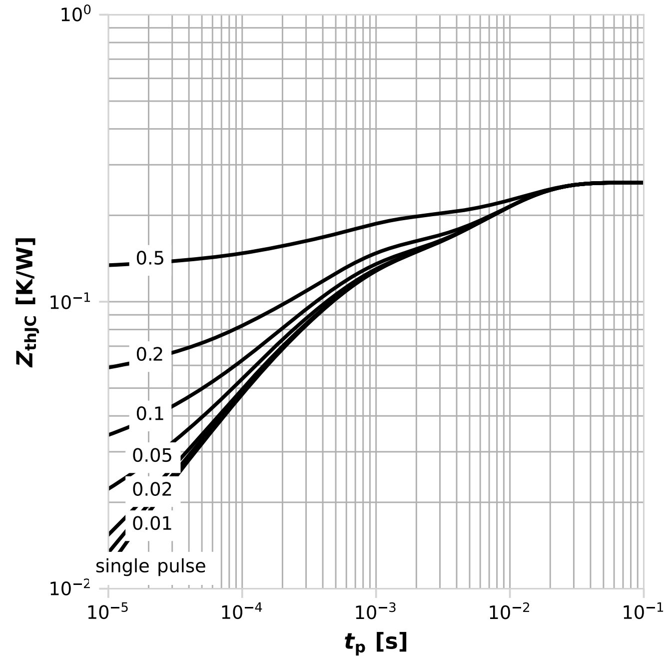
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 3: Safe operating area



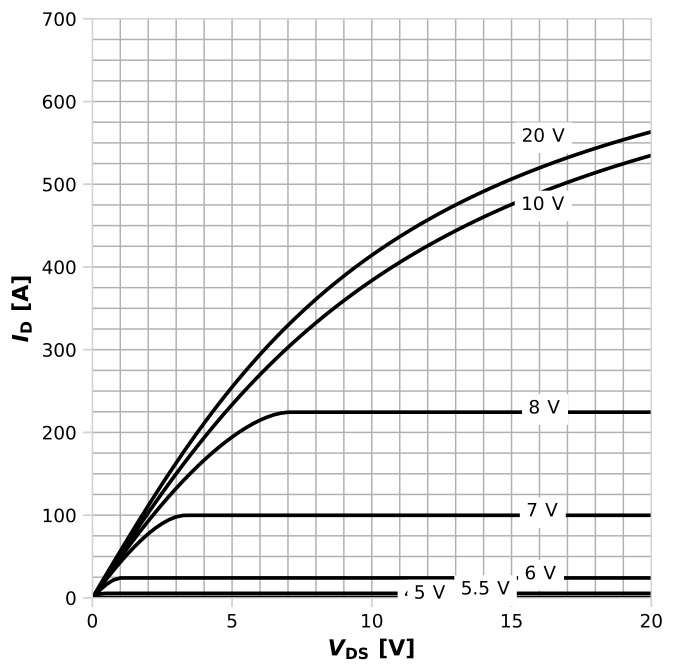
I_D=f(V_{DS}); T_C=80 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



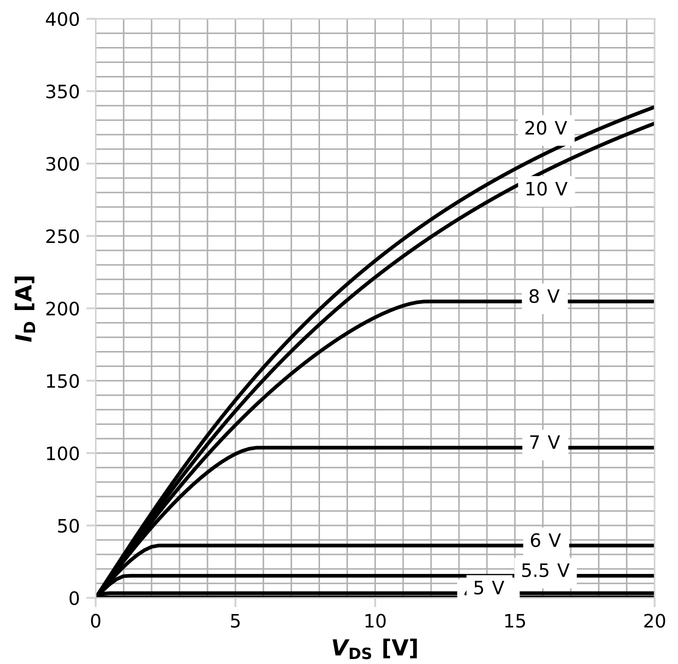
Z_{thJC} =f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



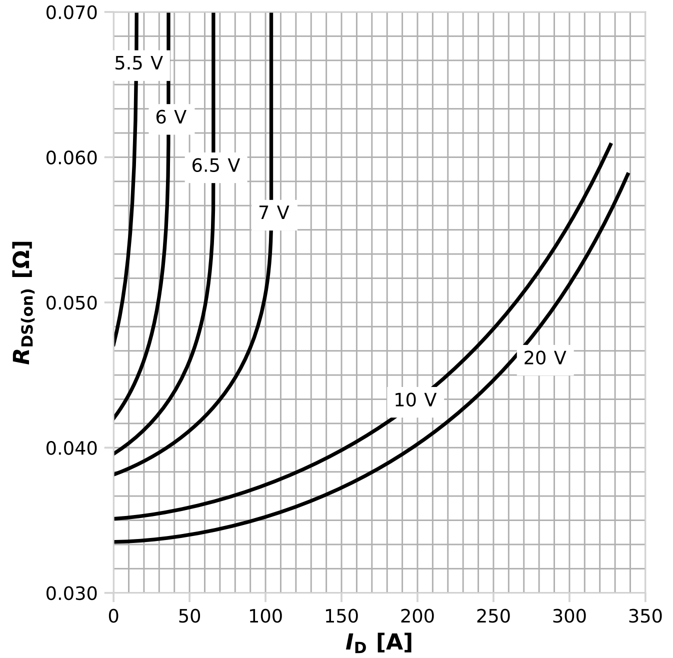
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



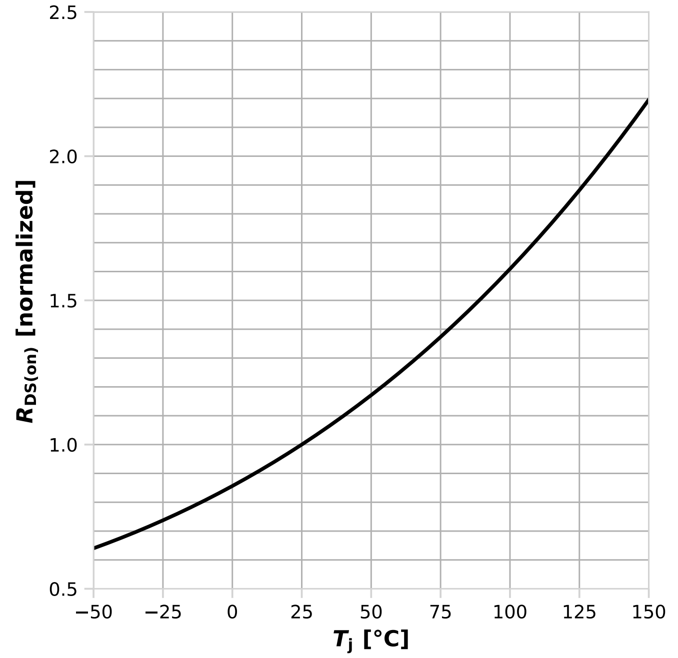
I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

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



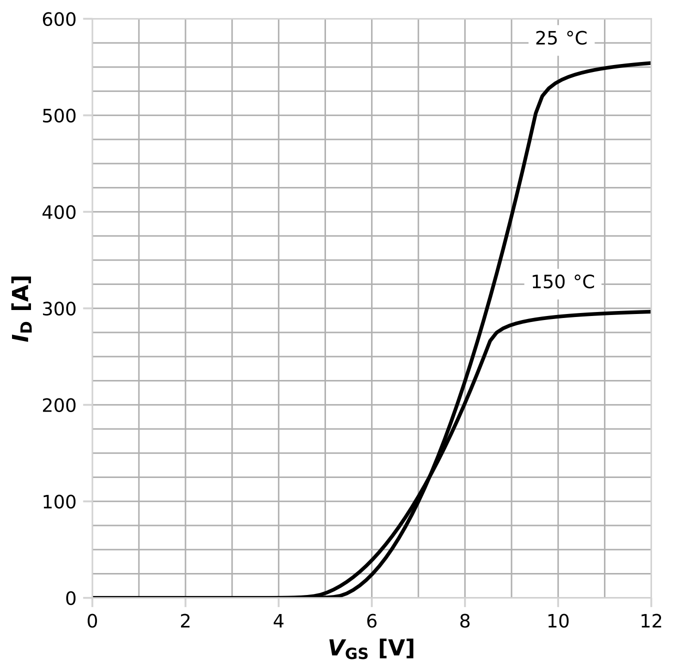
$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



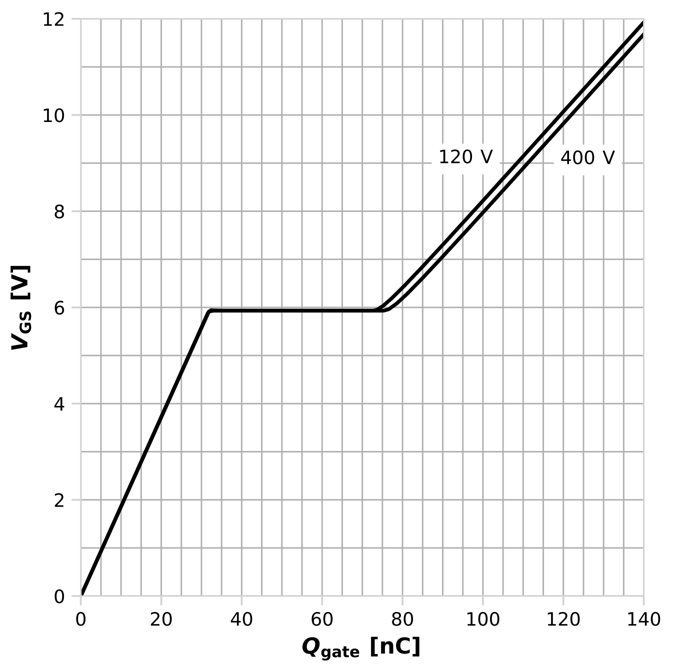
$R_{DS(on)}$=f(T_j); I_D=41.7 A; V_{GS}=10 V

Diagram 9: Typ. transfer characteristics



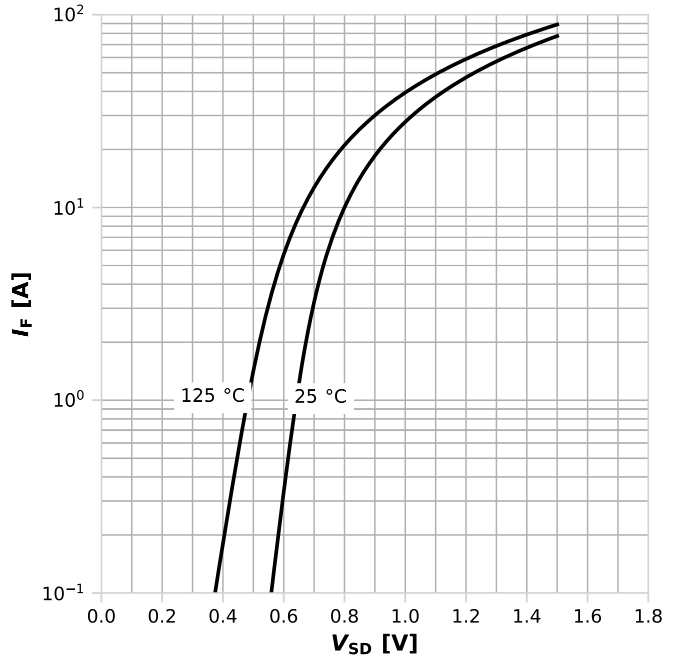
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



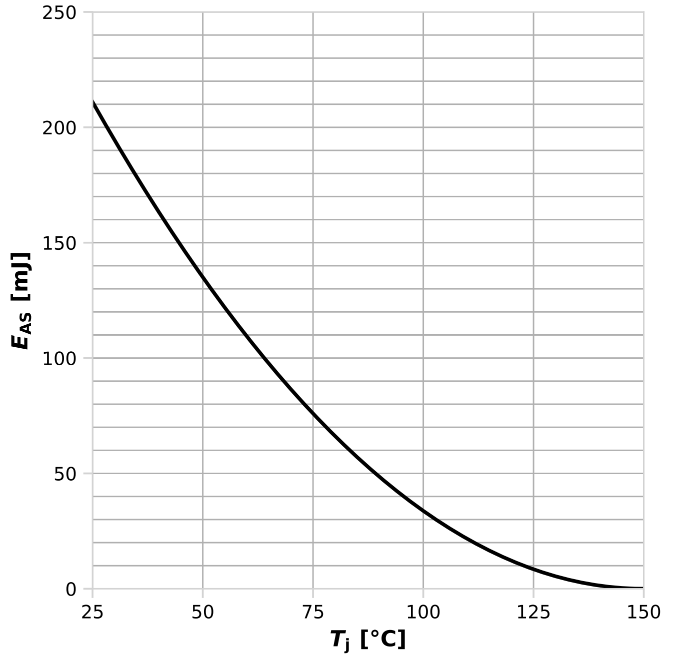
V_{GS}=f(Q_{gate}); I_D=21.1 A pulsed; parameter: V_{DD}

Diagram 11: Forward characteristics of reverse diode



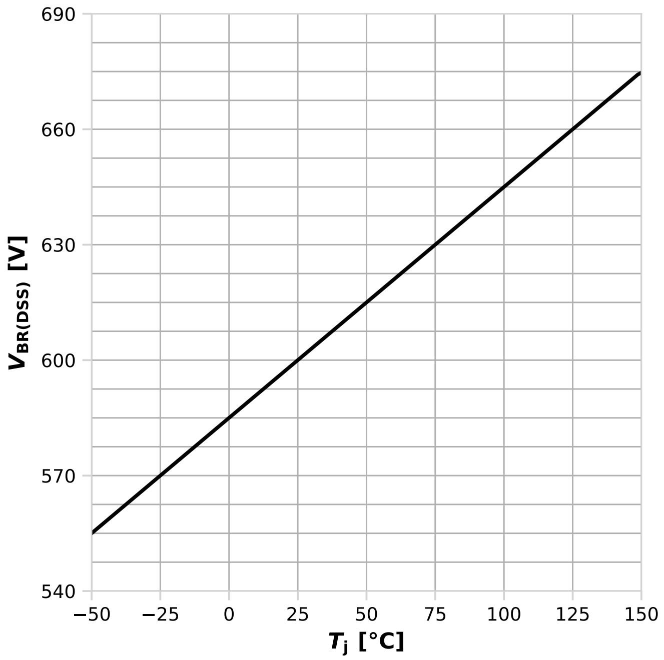
I_F=f(V_{SD}); parameter: T_j

Diagram 12: Avalanche energy



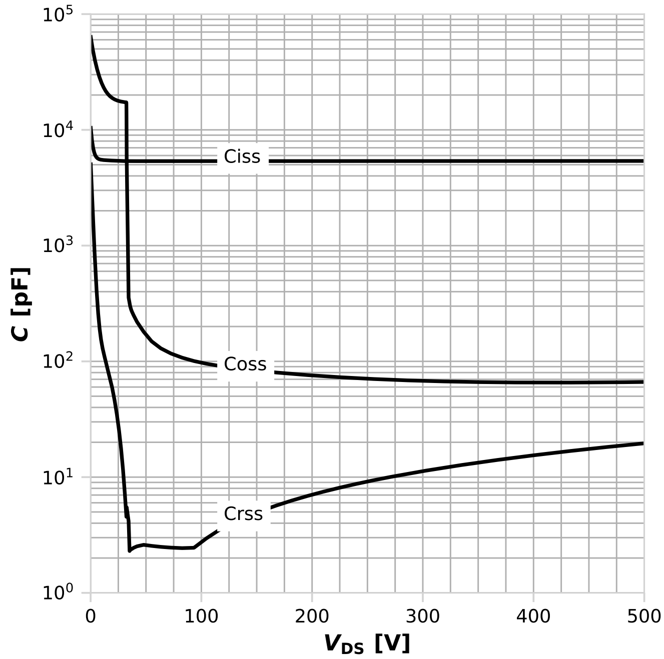
E_{AS}=f(T_j); I_D=6.0 A; V_{DD}=50 V

Diagram 13: Drain-source breakdown voltage



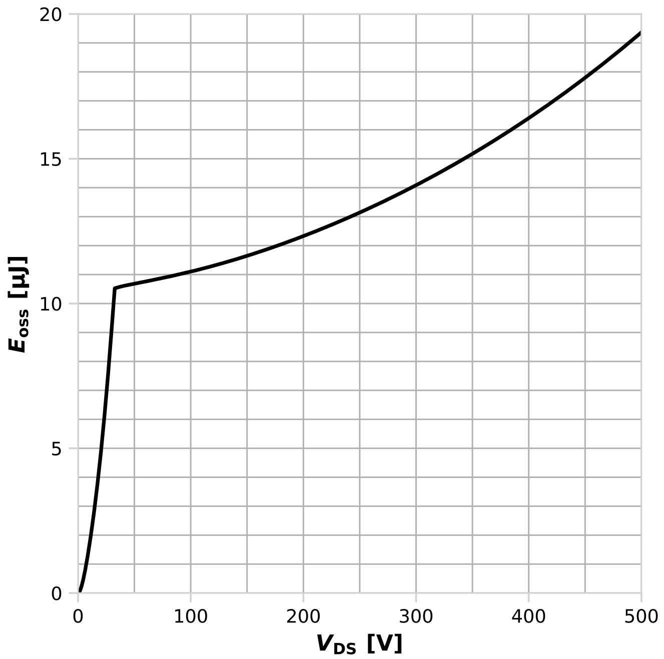
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

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

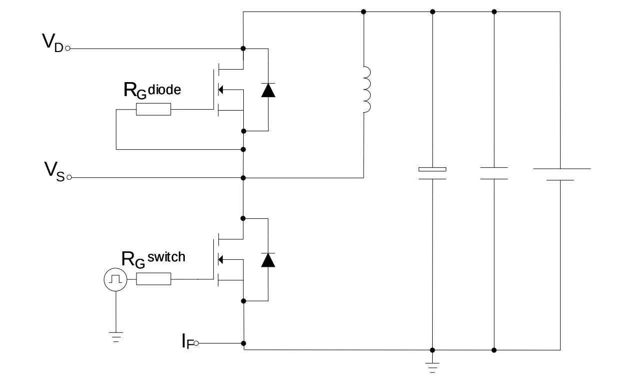
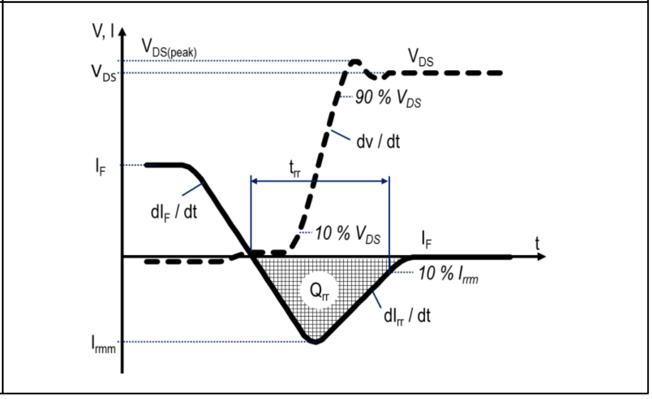
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times

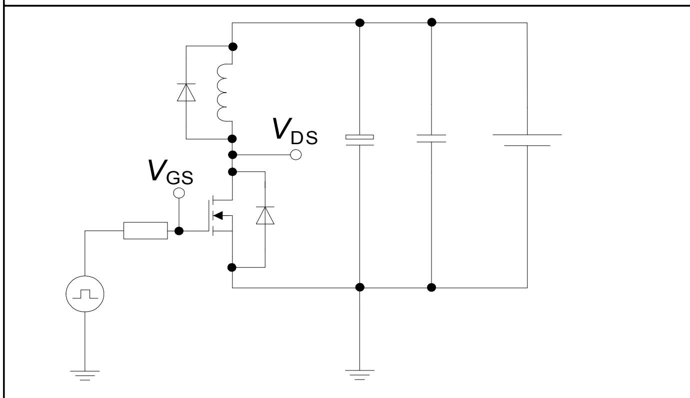
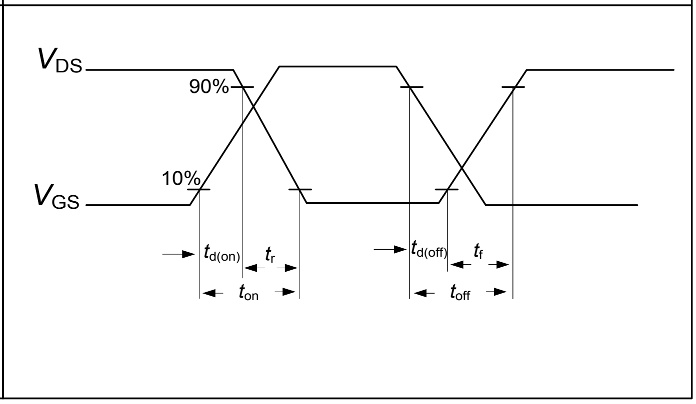
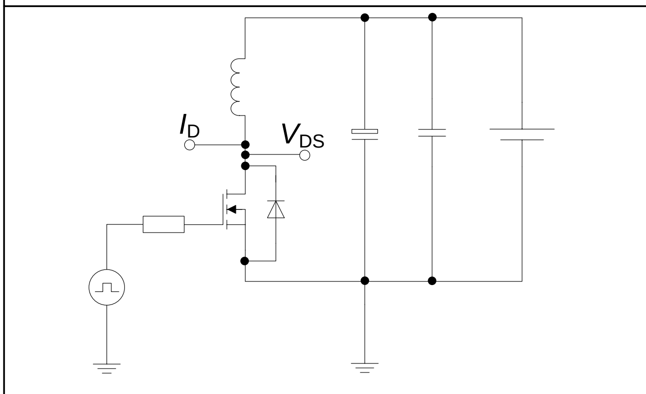
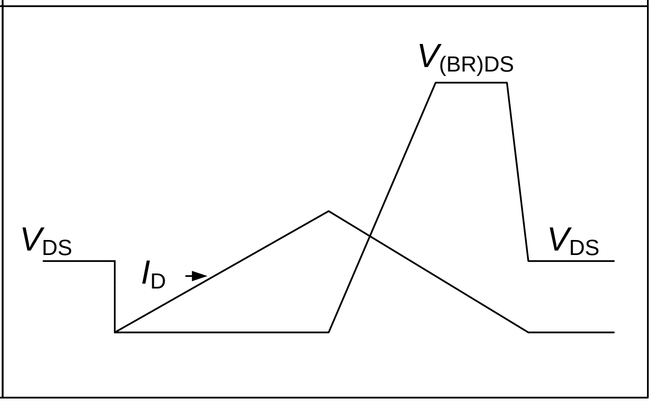
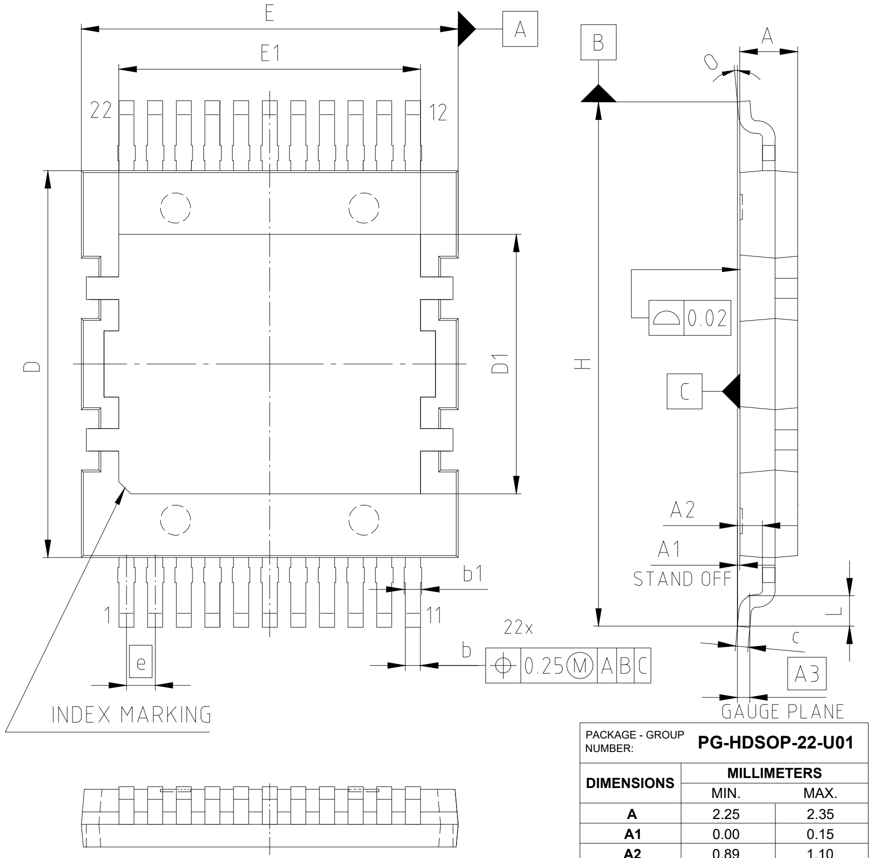
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package outlines



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°

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.

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

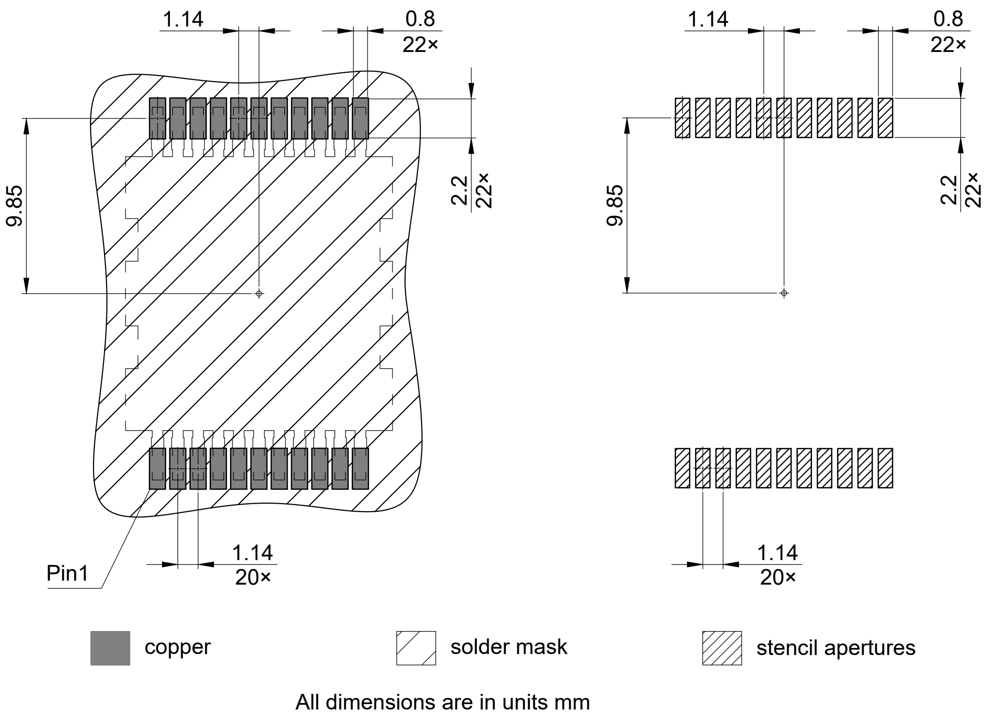
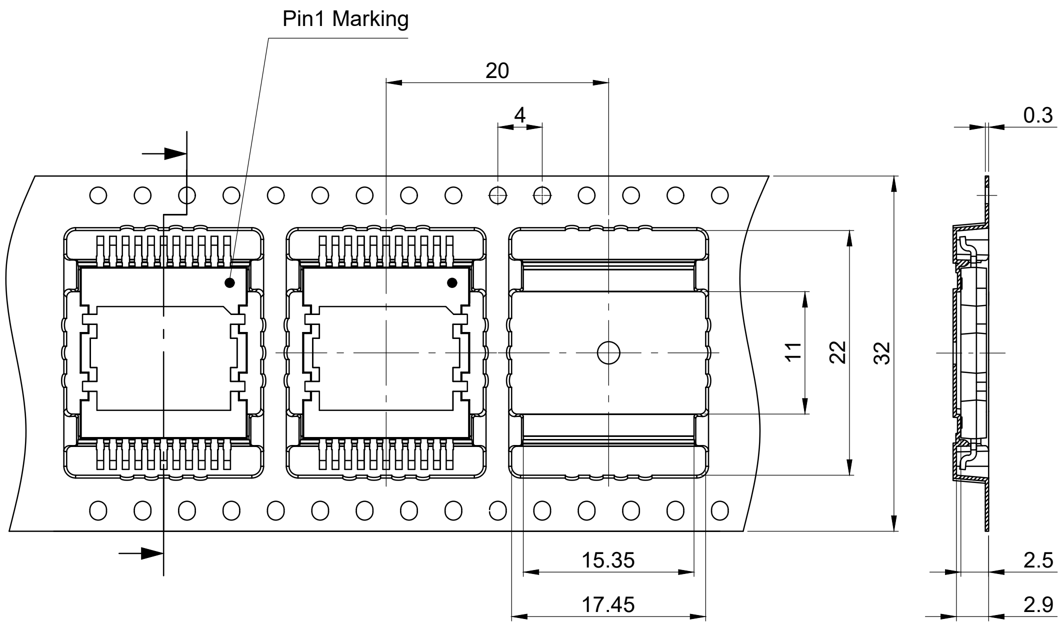


Figure 2 Footprint drawing PG-HDSOP-22, dimensions in mm



All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

Figure 3 Packaging variant PG-HDSOP-22, dimensions in mm

7 Appendix A

Table 11 Related links

- IFX CoolMOS CM8 Webpage
- IFX CoolMOS CM8 application note
- IFX CoolMOS CM8 simulation model
- IFX Design tools

Revision history

IPDQ60R024CM8

Revision 2024-10-30, Rev. 2.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
2.0	2024-10-30	Change of Rth, Update of SOA diagram

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