

MOSFET

OptiMOS™ 3 Power-Transistor, 250 V

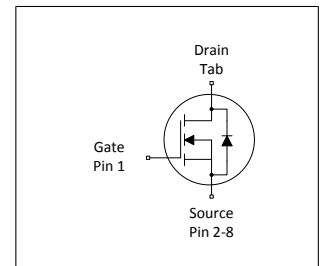
Features

- N-channel, normal level
- Fast Diode (FD) with reduced Q_{rr}
- Optimized for hard commutation ruggedness
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target application
- Halogen-free according to IEC61249-2-21



Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	250	V
$R_{DS(on),max}$	21.0	mΩ
I_D	69	A



Type / Ordering Code	Package	Marking	Related Links
IPT210N25NFD	PG-HSOF-8	210N25NF	-

¹⁾ J-STD20 and JESD22

Table of Contents

Description	1
Maximum ratings	3
Thermal characteristics	3
Electrical characteristics	3
Electrical characteristics diagrams	5
Package Outlines	9
Revision History	10
Trademarks	10
Disclaimer	10

1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	-	-	69 54	A	$T_C=25\text{ °C}$ $T_C=100\text{ °C}$
Pulsed drain current ¹⁾	$I_{D,pulse}$	-	-	276	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	610	mJ	$I_D=37\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	375	W	$T_C=25\text{ °C}$
Operating and storage temperature	T_j , T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

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	0.4	K/W	-
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}	-	-	62	K/W	-
Thermal resistance, junction - ambient, 6 cm ² cooling area ²⁾	R_{thJA}	-	-	40	K/W	-

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	250	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}$, $I_D=267\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=200\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=200\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	1	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	18.0	21.0	m Ω	$V_{GS}=10\text{ V}$, $I_D=69\text{ A}$
Gate resistance ³⁾	R_G	-	2.8	4.2	Ω	-
Transconductance	g_{fs}	70	139	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=69\text{ A}$

¹⁾ See Diagram 3

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ Defined by design. Not subject to production test.

Table 5 Dynamic characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	5300	7000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=125\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	300	400	pF	$V_{GS}=0\text{ V}$, $V_{DS}=125\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	6	9.4	pF	$V_{GS}=0\text{ V}$, $V_{DS}=125\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	13	-	ns	$V_{DD}=125\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=34.5\text{ A}$, $R_{G,ext}=1.6\ \Omega$
Rise time	t_r	-	13	-	ns	$V_{DD}=125\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=34.5\text{ A}$, $R_{G,ext}=1.6\ \Omega$
Turn-off delay time	$t_{d(off)}$	-	43	-	ns	$V_{DD}=125\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=34.5\text{ A}$, $R_{G,ext}=1.6\ \Omega$
Fall time	t_f	-	13	-	ns	$V_{DD}=125\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=34.5\text{ A}$, $R_{G,ext}=1.6\ \Omega$

Table 6 Gate charge characteristics²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	24	-	nC	$V_{DD}=125\text{ V}$, $I_D=69\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	8	-	nC	$V_{DD}=125\text{ V}$, $I_D=69\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	16	-	nC	$V_{DD}=125\text{ V}$, $I_D=69\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ¹⁾	Q_g	-	65	86	nC	$V_{DD}=125\text{ V}$, $I_D=69\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.5	-	V	$V_{DD}=125\text{ V}$, $I_D=69\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	144	-	nC	$V_{DD}=125\text{ V}$, $V_{GS}=0\text{ V}$

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	69	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	276	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.9	1.2	V	$V_{GS}=0\text{ V}$, $I_F=69\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	134	268	ns	$V_R=125\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	406	-	nC	$V_R=125\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$

¹⁾ Defined by design. Not subject to production test.

²⁾ See "Gate charge waveforms" for parameter definition

4 Electrical characteristics diagrams

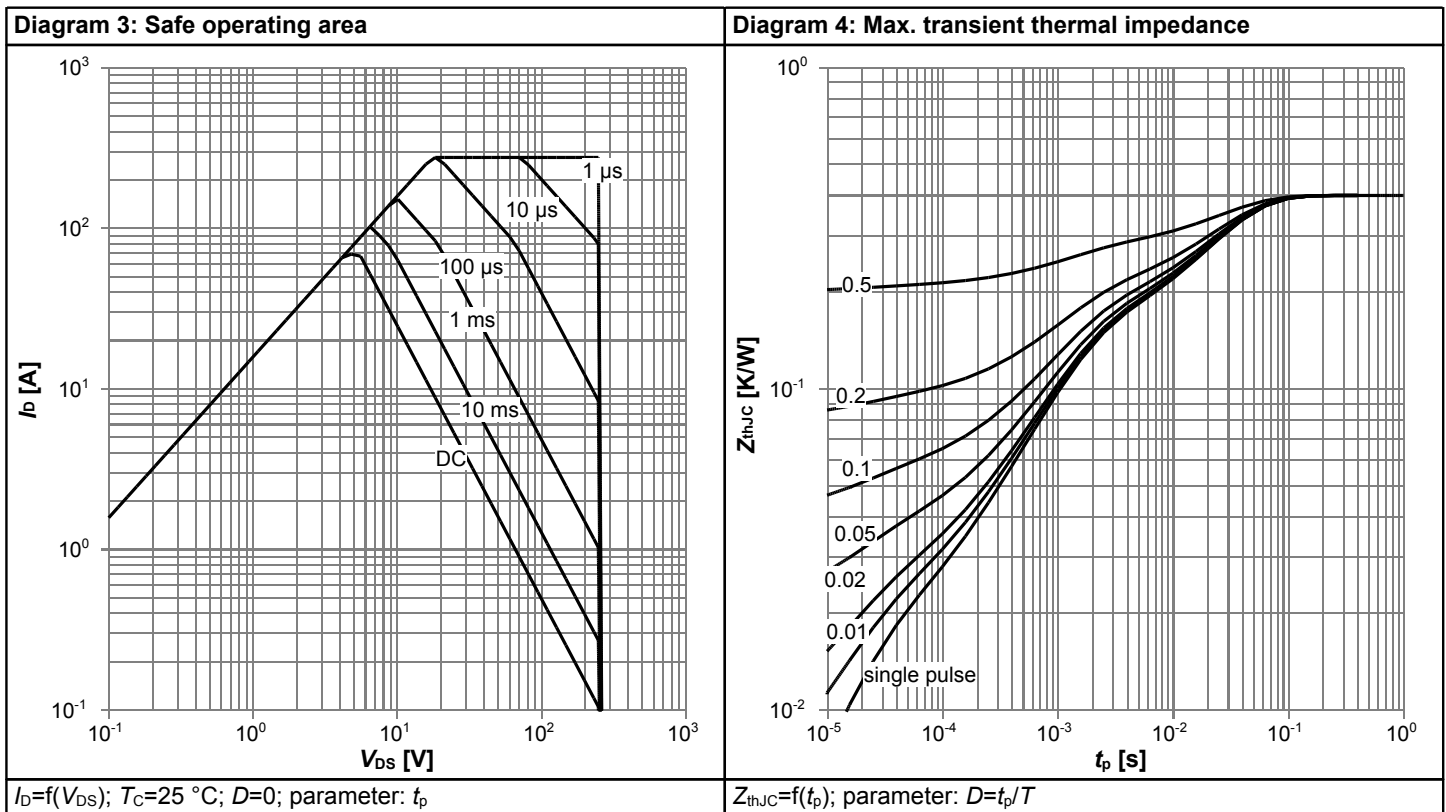
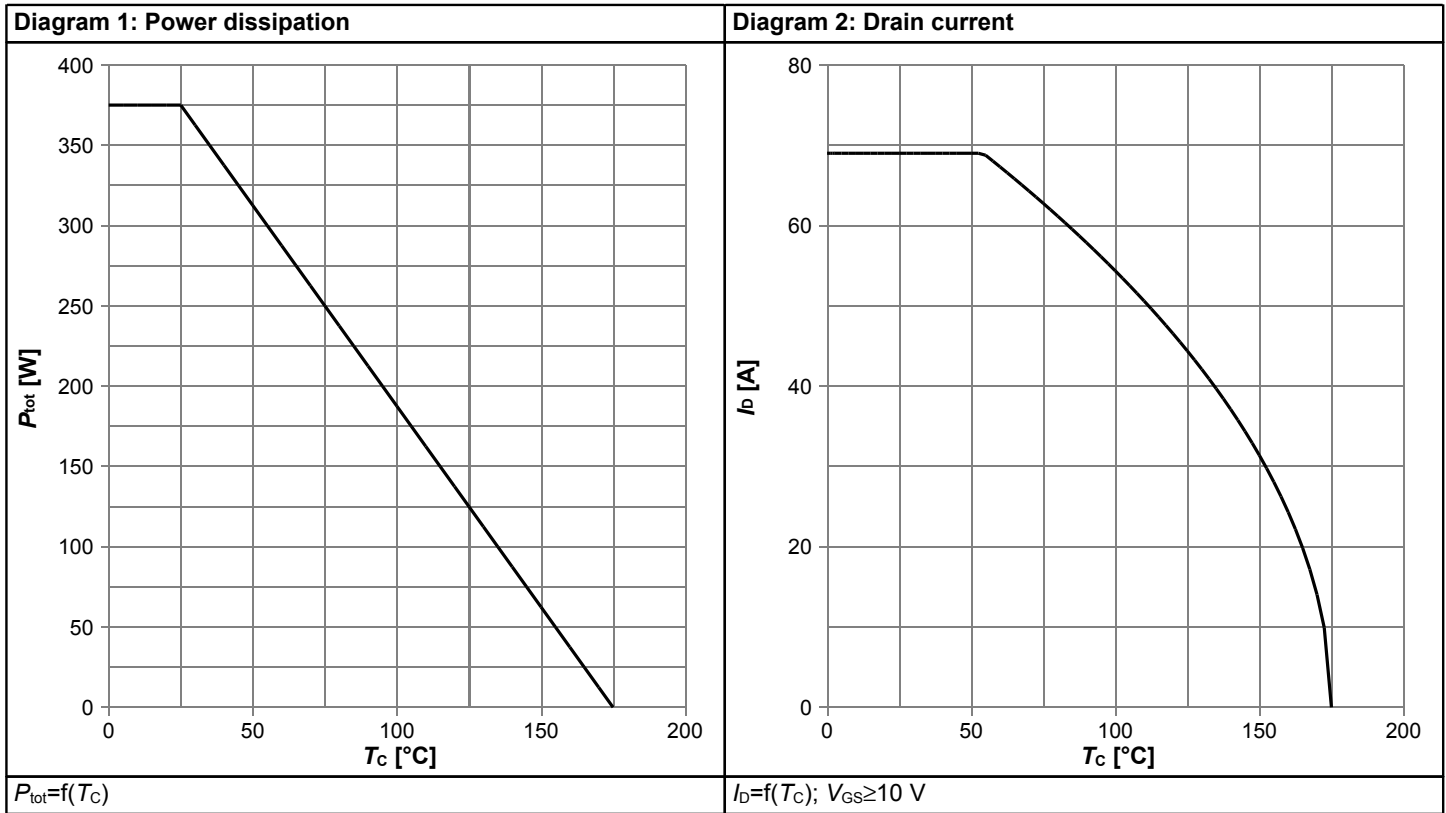
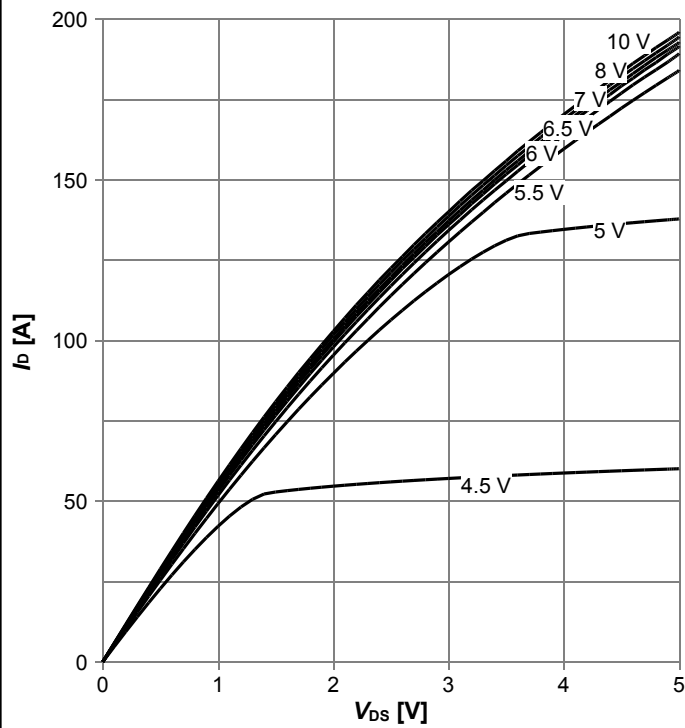
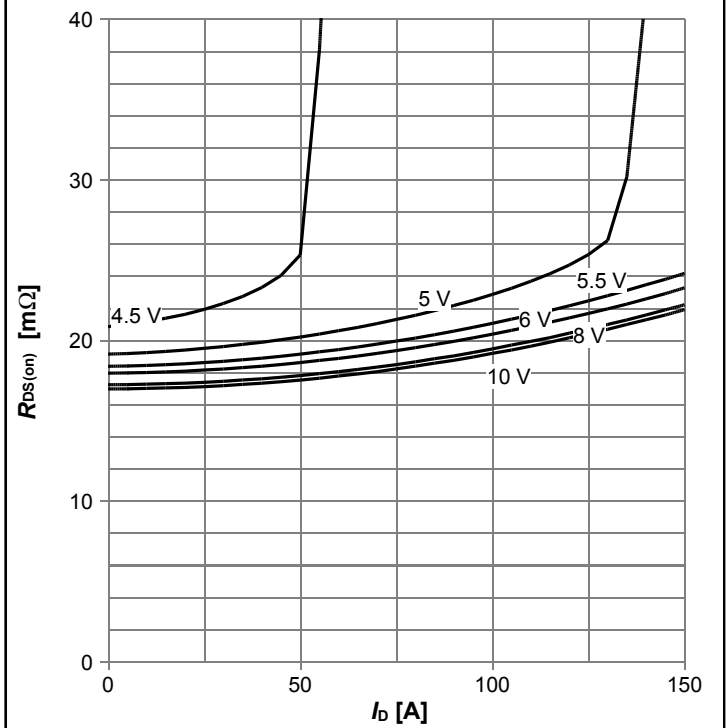


Diagram 5: Typ. output characteristics



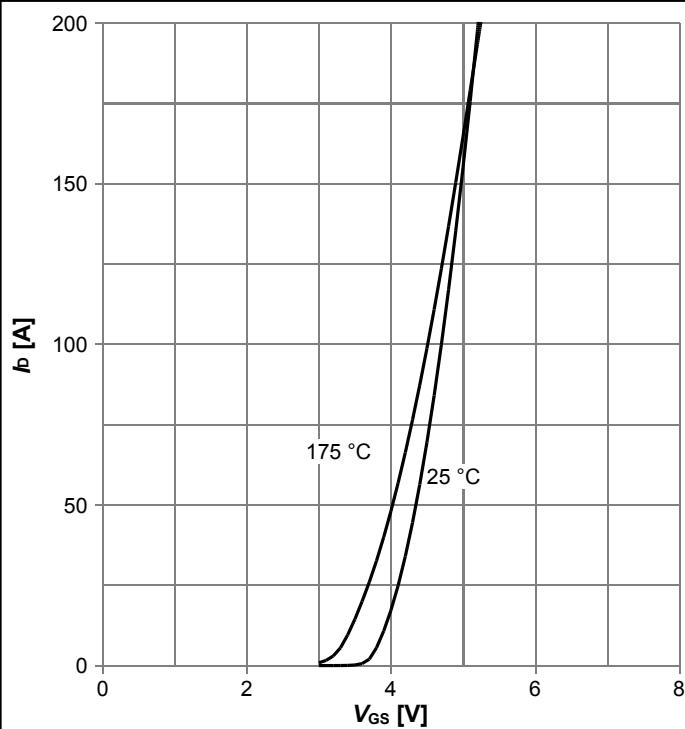
$I_D = f(V_{DS}); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



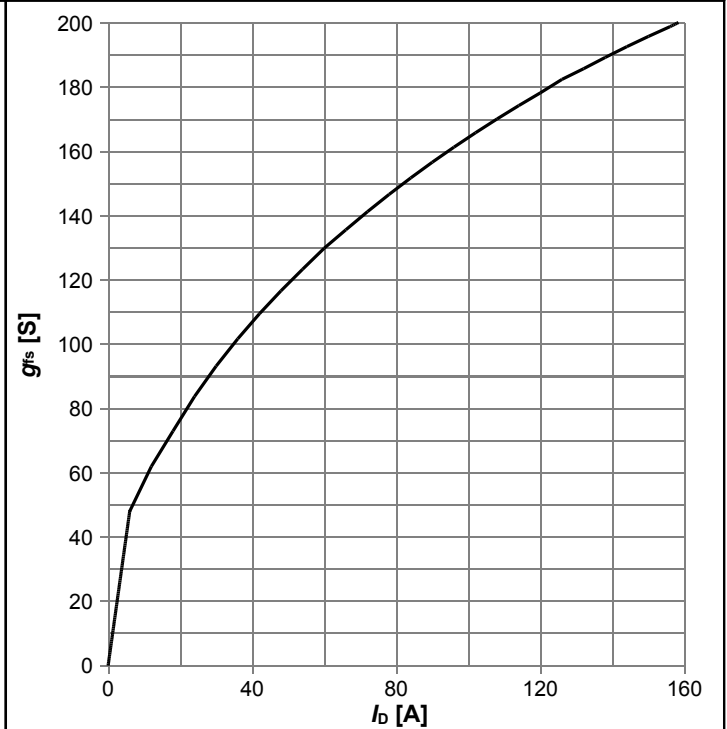
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



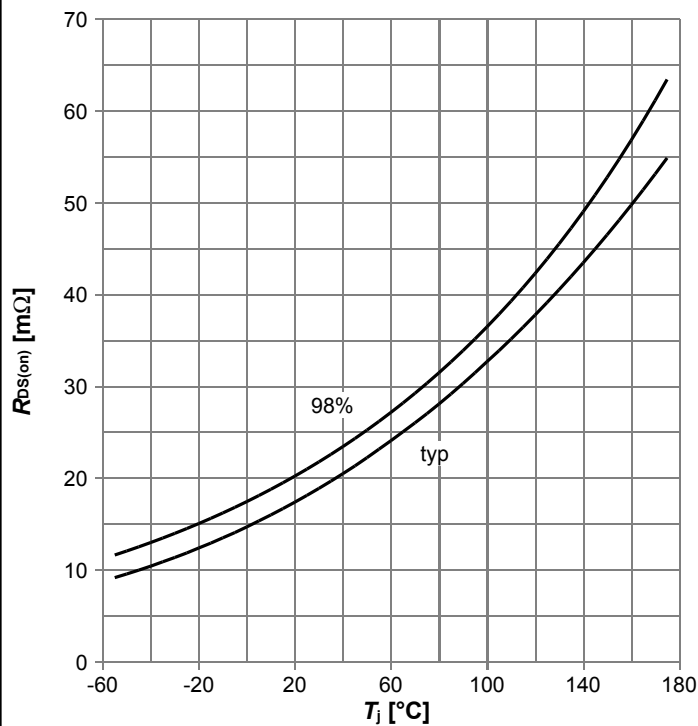
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. forward transconductance



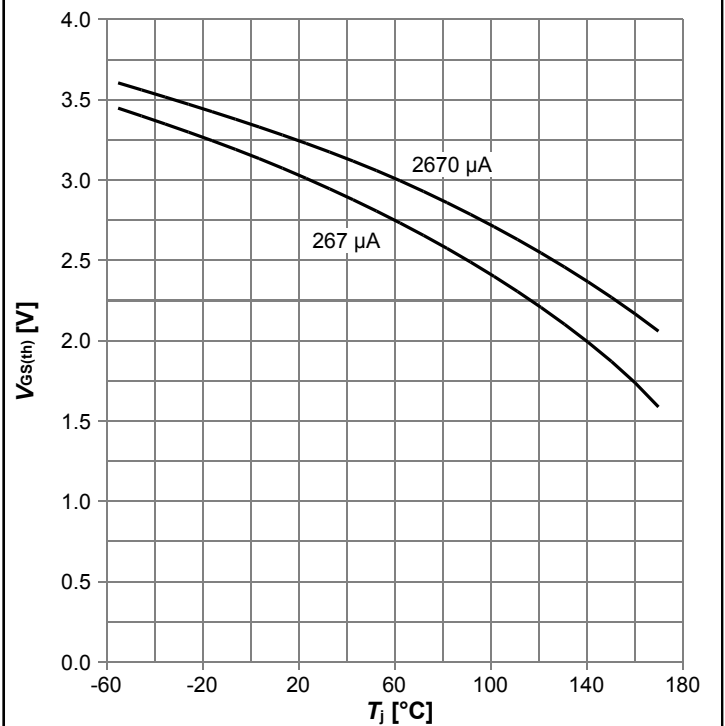
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



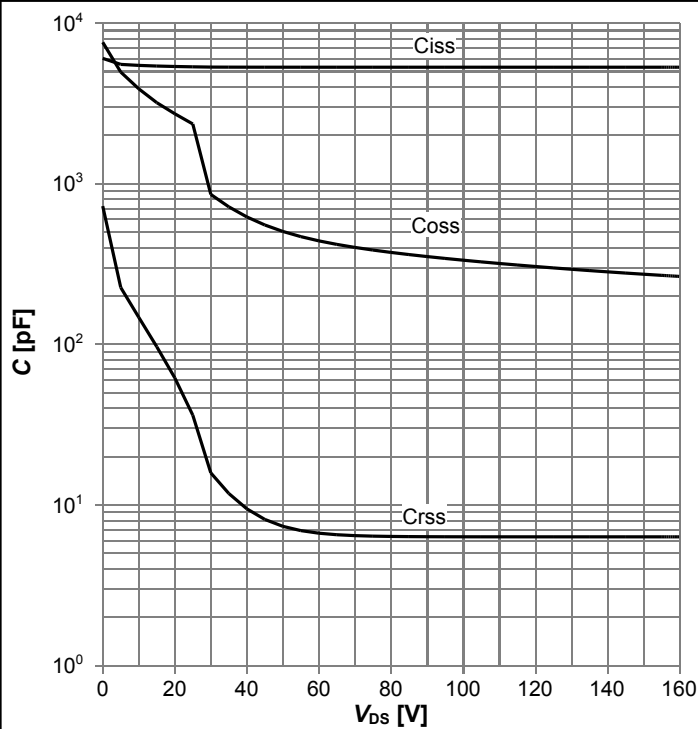
$R_{DS(on)}=f(T_j)$; $I_D=69\text{ A}$; $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



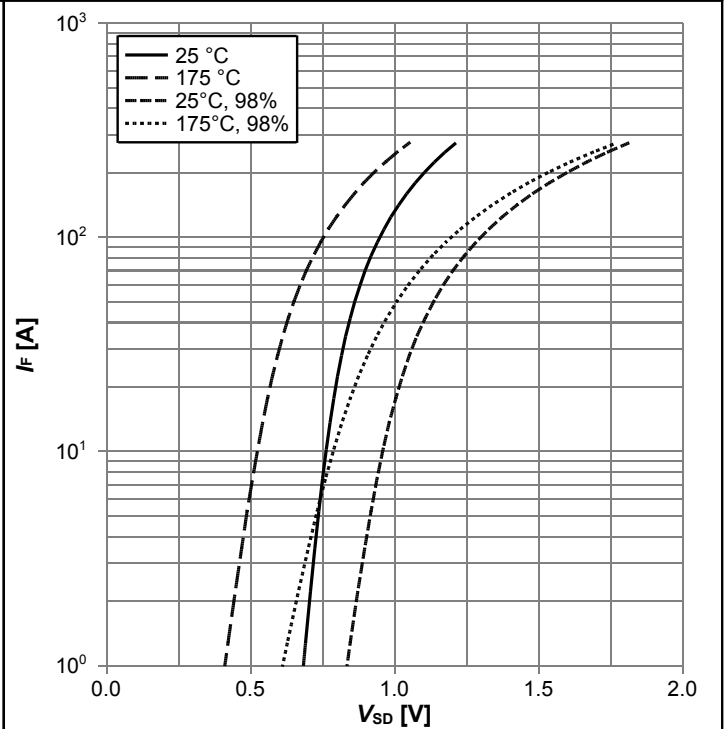
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



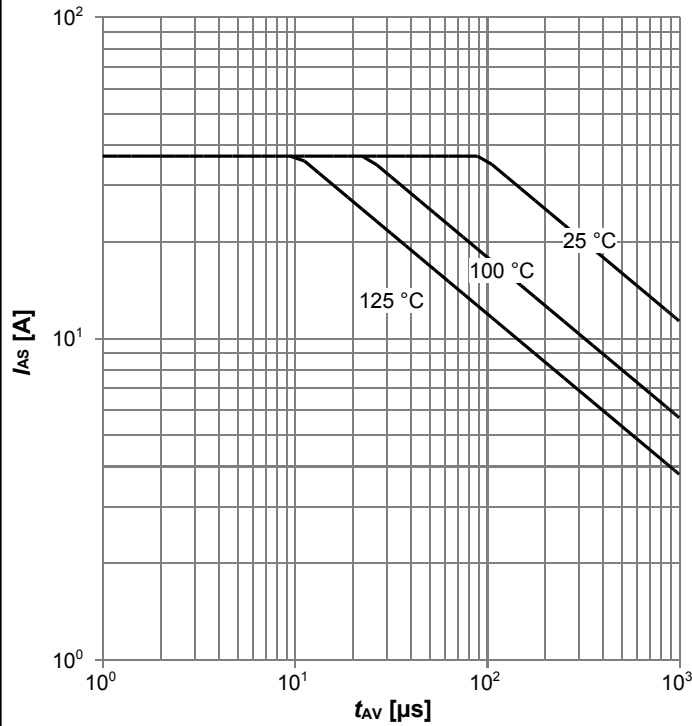
$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



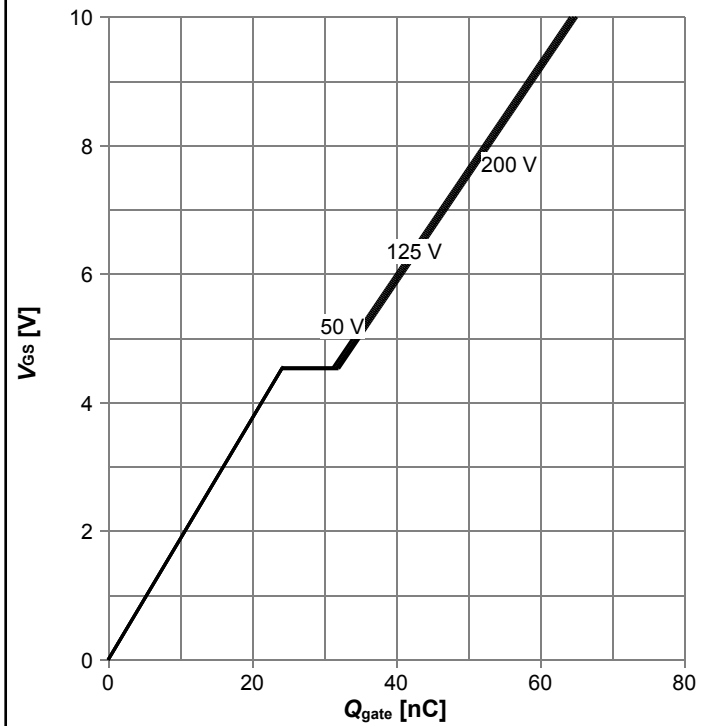
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



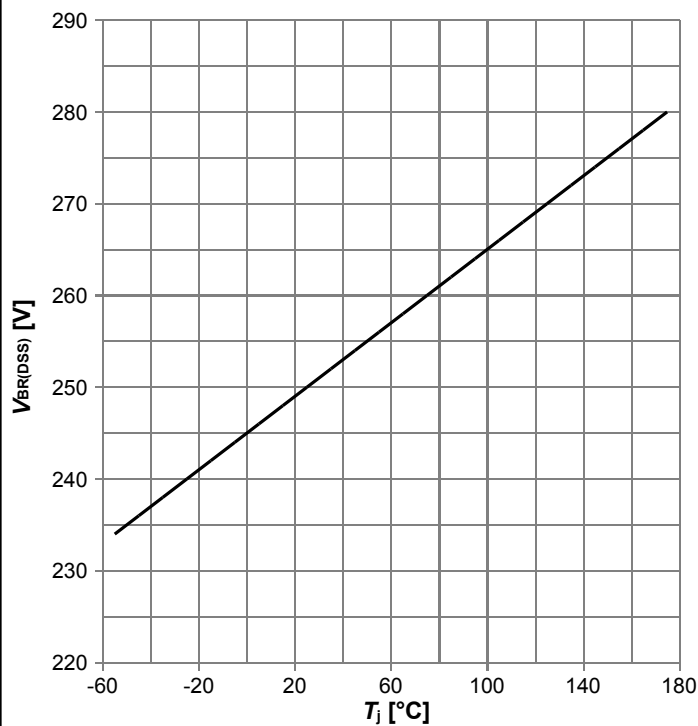
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



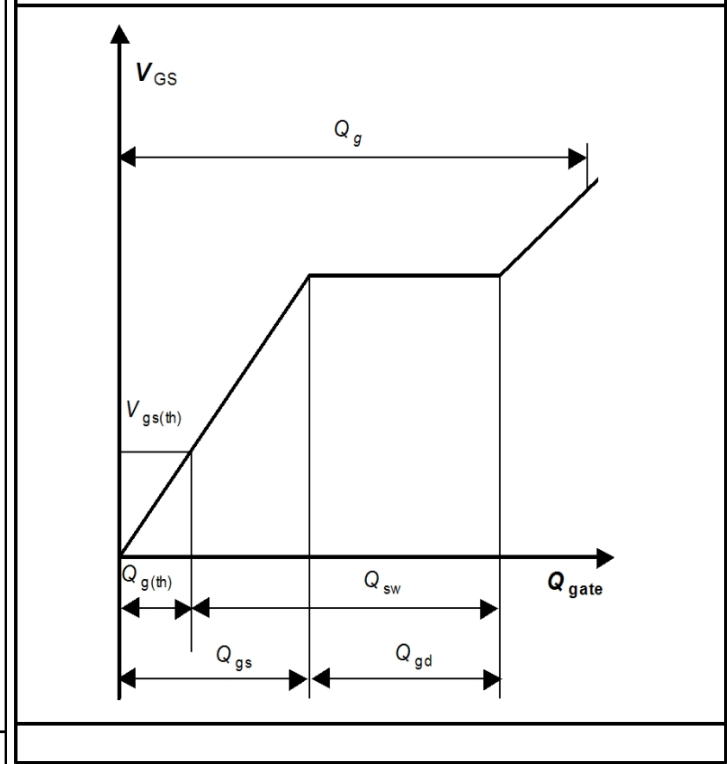
$V_{GS}=f(Q_{gate}); I_D=69 \text{ A pulsed}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

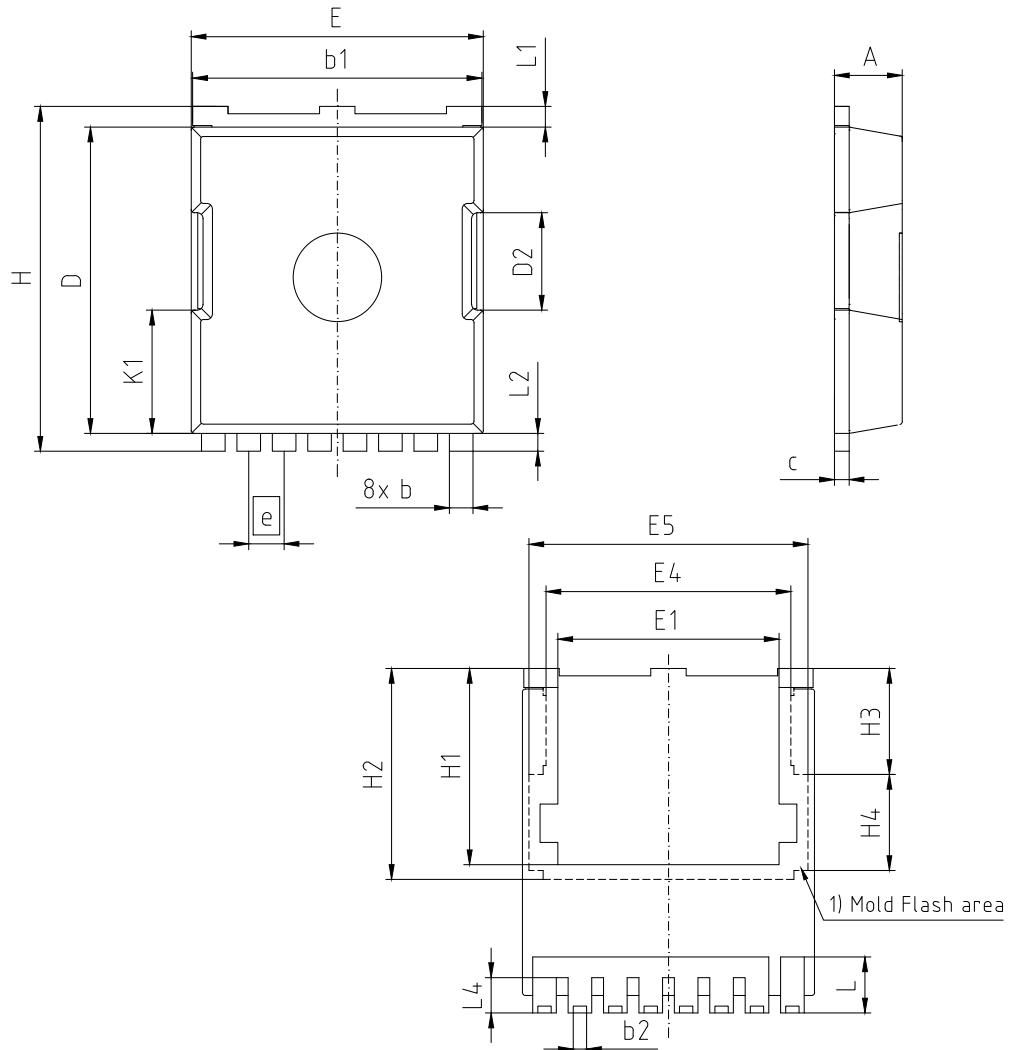


$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Gate charge waveforms



5 Package Outlines



1) partially covered with Mold Flash

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
b	0.70	0.90	0.028	0.035
b1	9.70	9.90	0.382	0.390
b2	0.42	0.50	0.017	0.020
c	0.40	0.60	0.016	0.024
D	10.28	10.58	0.405	0.416
D2	3.30		0.130	
E	9.70	10.10	0.382	0.398
E1	7.50		0.295	
E4	8.50		0.335	
E5	9.46		0.372	
e	1.20 (BSC)		0.047 (BSC)	
H	11.48	11.88	0.452	0.468
H1	6.55	6.75	0.258	0.266
H2	7.15		0.281	
H3	3.59		0.141	
H4	3.26		0.128	
N	8		8	
K1	4.18		0.165	
L	1.60	2.10	0.063	0.083
L1	0.70		0.028	
L2	0.60		0.024	
L4	1.00	1.30	0.039	0.051

DOCUMENT NO. Z8B00169619
SCALE 0 2 4mm
EUROPEAN PROJECTION
ISSUE DATE 20-02-2014
REVISION 02

Figure 1 Outline PG-HSOF-8

Revision History

IPT210N25NFD

Revision: 2016-01-11, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2016-01-11	Release of final version

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CoolGaN™, CoolMOS™, CoolSET™, CoolSiC™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, DrBlade™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, Infineon™, ISOFACE™, IsoPACK™, i-Wafer™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OPTIGA™, OptiMOS™, ORIGA™, POWERCODE™, PRIMARION™, PrimePACK™, PrimeSTACK™, PROFET™, PRO-SIL™, RASIC™, REAL3™, ReverSave™, SatRIC™, SIEGET™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, SPOC™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

Trademarks updated August 2015

Other Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:

erratum@infineon.com

Published by

Infineon Technologies AG

81726 München, Germany

© 2015 Infineon Technologies AG

All Rights Reserved.

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.