MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™

OptiMOS™3 Power-Transistor, 100 V

IPT020N10N3

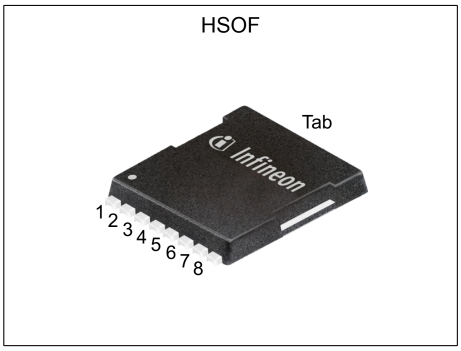
Data Sheet

Rev. 2.0

Final

Power Management & Multimarket

1 Description



Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Extremely low on-resistance $R_{DS(on)}$
- High current capability
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC [1] for target application
- Halogen-free according to IEC61249-2-21

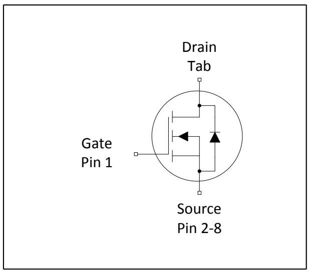


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	2	mΩ
I_D	300	A

Type / Ordering Code	Package	Marking	Related Links
IPT020N10N3	PG-HSOF-8-1	020N10N3	-

[1] J-STD20 and JESD22

Table of Contents

2 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	I_D	- -	- -	300 212	A	T_C=25 °C [1] T_C=100 °C
Pulsed drain current [1]	$I_{D,pulse}$	-	-	1200	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	800	mJ	I_D=150 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	375	W	T_C=25 °C
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

3 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 cm² cooling area [2]	R_{thJA}	-	-	40	K/W	-

[1] See figure 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.

4 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	2.7	3.5	V	V_{DS}=V_{GS}, I_D=272 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=100 V, V_{GS}=0 V, T_j=25 °C V_{DS}=100 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	1.7 2.2	2 3.7	mΩ	V_{GS}=10 V, I_D=150 A V_{GS}=6 V, I_D=75 A,
Gate resistance	R_G	-	1.9	2.9	Ω	-
Transconductance	g_{fs}	125	250	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=150 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	11200	14896	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance	C_{oss}	-	2010	2673	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	69	138	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	34	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	58	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	84	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	18	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics [1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	48	-	nC	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	27	-	nC	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	42	-	nC	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	-	156	207	nC	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.3	-	V	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V
Output charge	Q_{oss}	-	55	-	nC	V_{DD}=50 V, V_{GS}=0 V

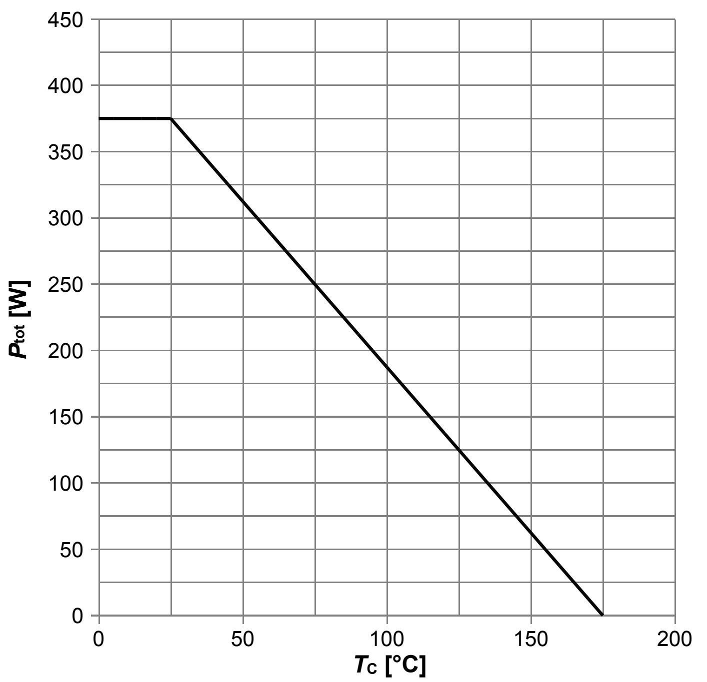
[1)] See ″Gate charge waveforms″ for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	300	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	1200	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.89	1	V	V_{GS}=0 V, I_F=150 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	86	172	ns	V_R=50 V, I_F=I_S, di_F/dt=100 A/μs
Reverse recovery charge	Q_{rr}	-	232	-	nC	V_R=50 V, I_F=I_S, di_F/dt=100 A/μs

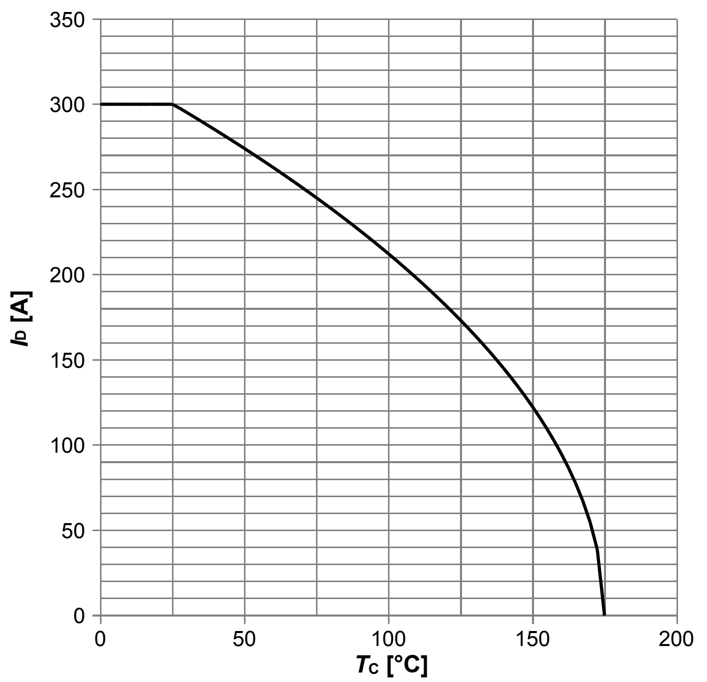
5 Electrical characteristics diagrams

Diagram 1: Power dissipation



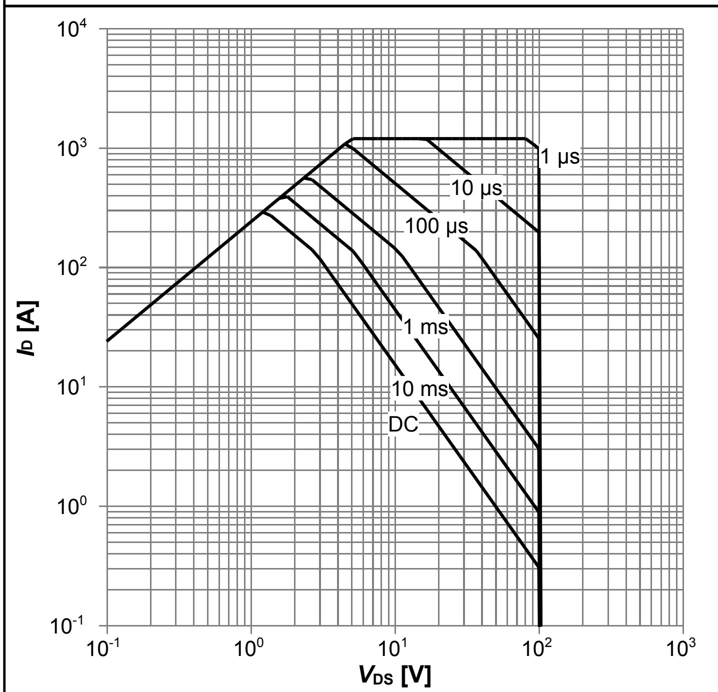
P_{tot}=f(T_C)

Diagram 2: Drain current



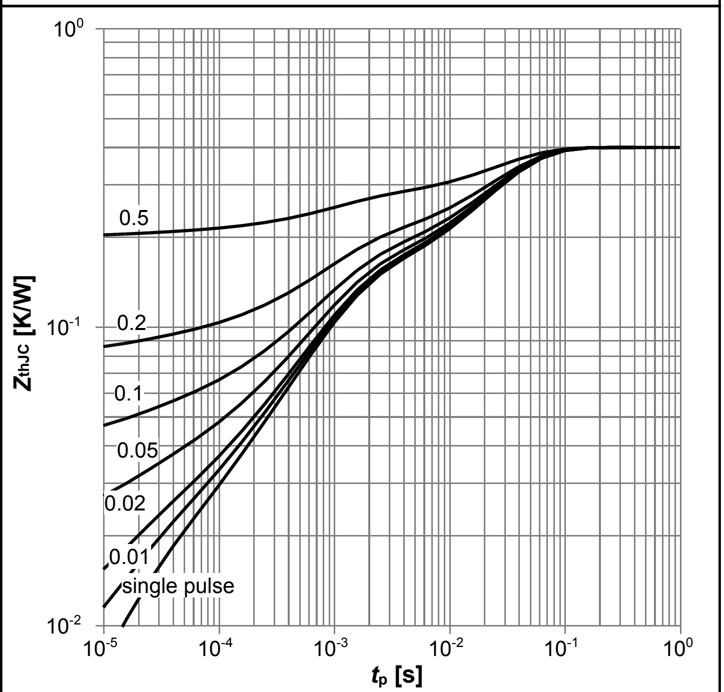
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



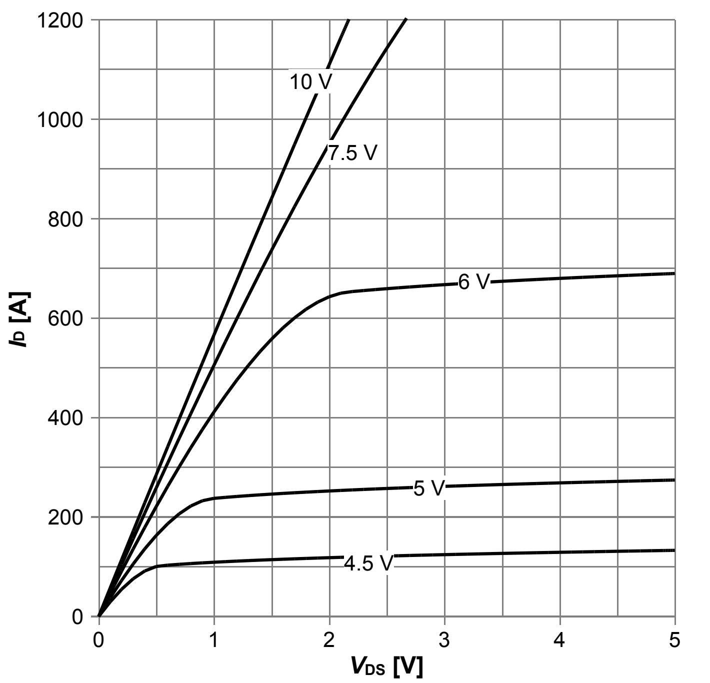
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



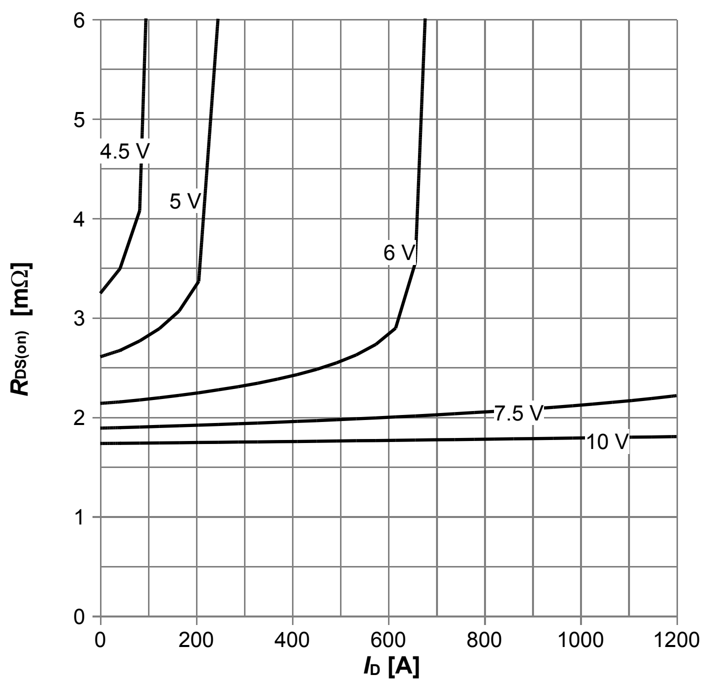
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



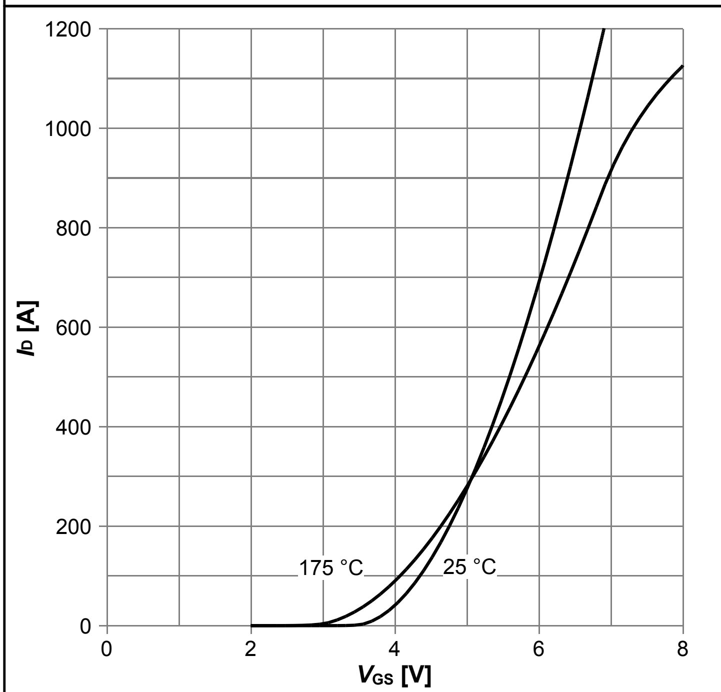
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



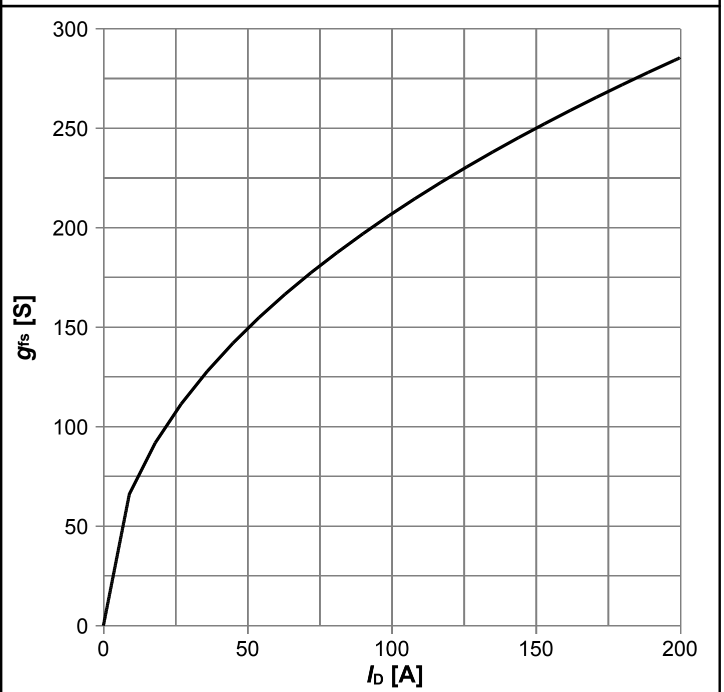
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



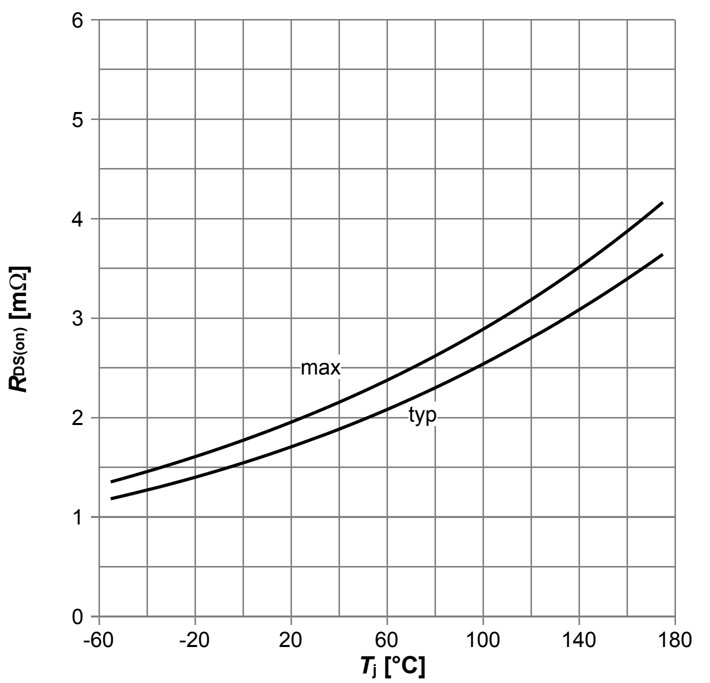
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



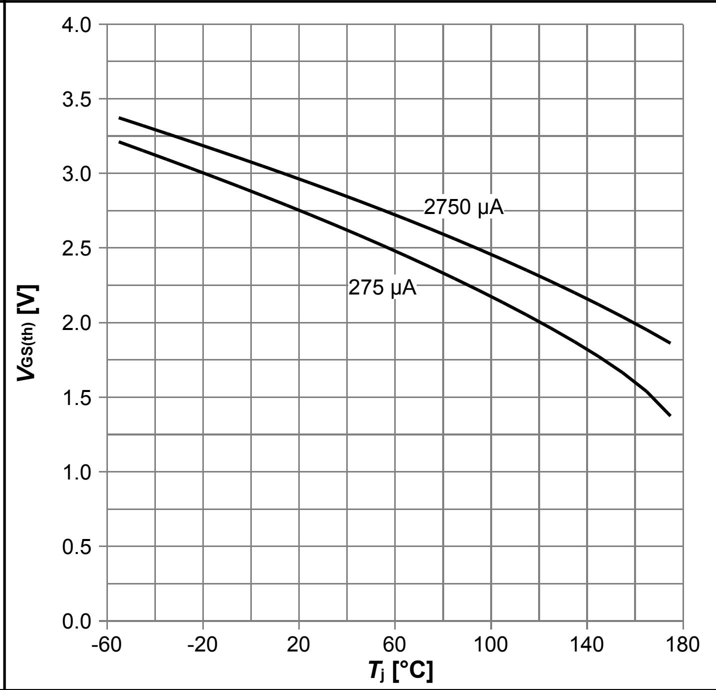
g_{fs}=f(I_D); T_j=25 °C

Diagram 9: Drain-source on-state resistance



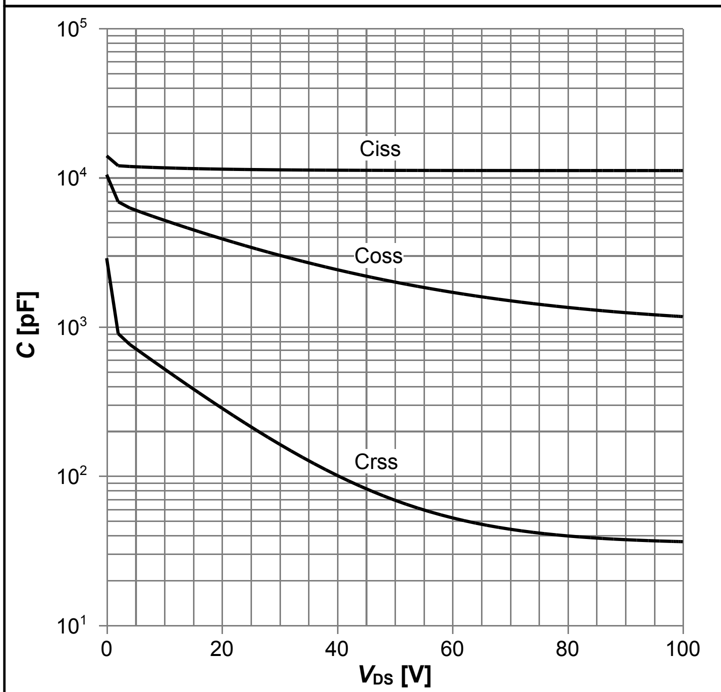
$R_{DS(on)}$=f(T_j); I_D=150 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



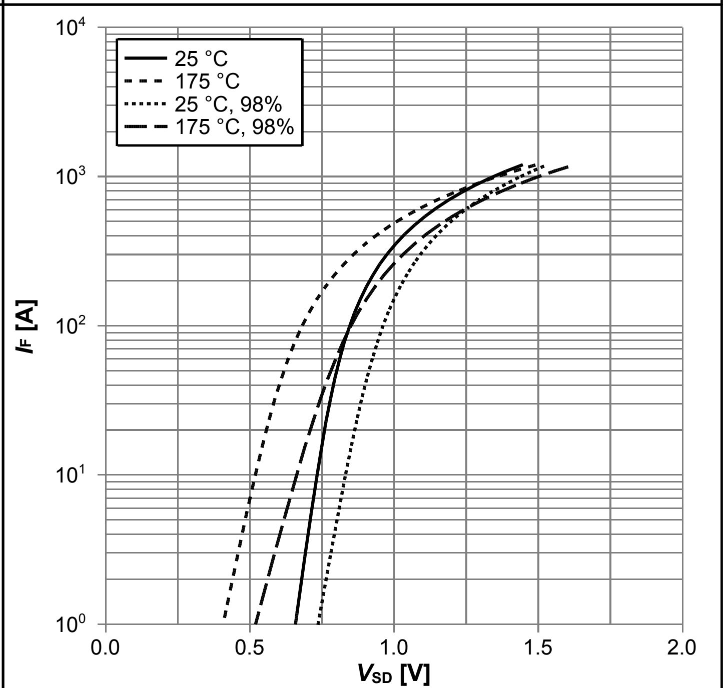
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



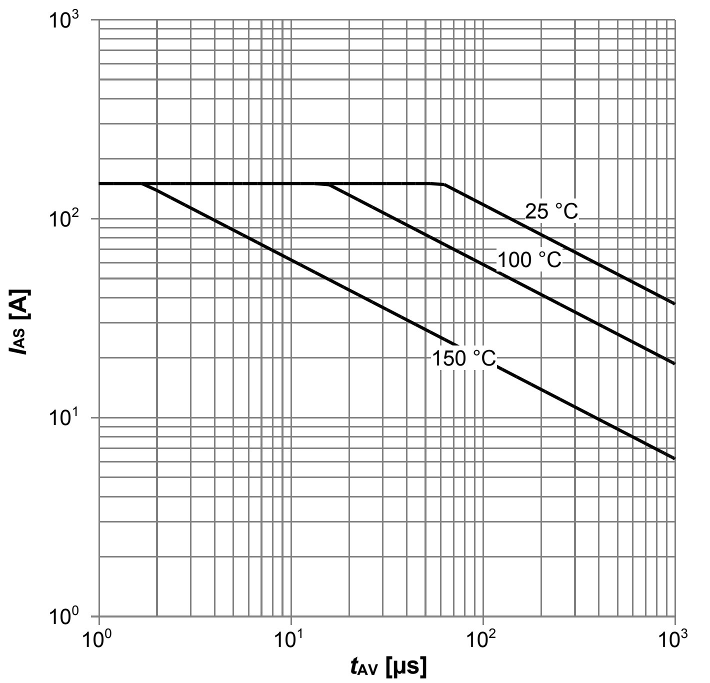
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



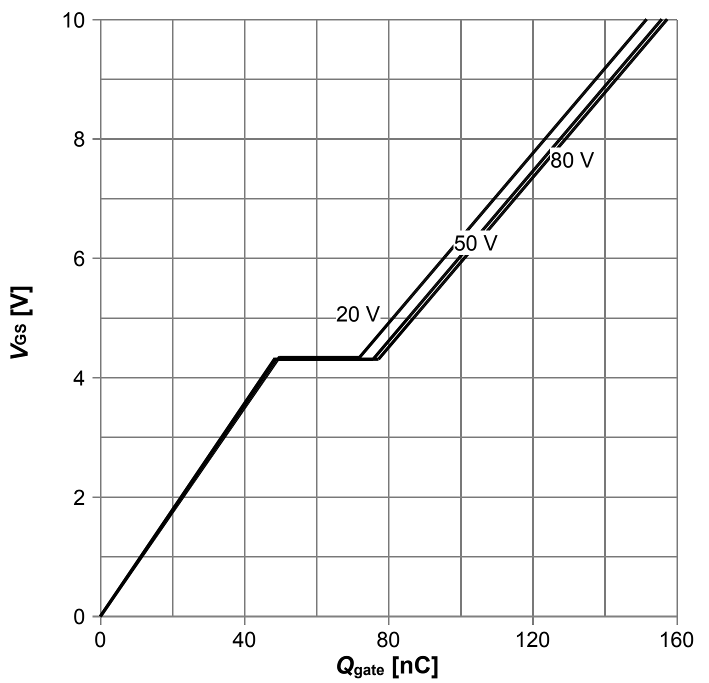
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



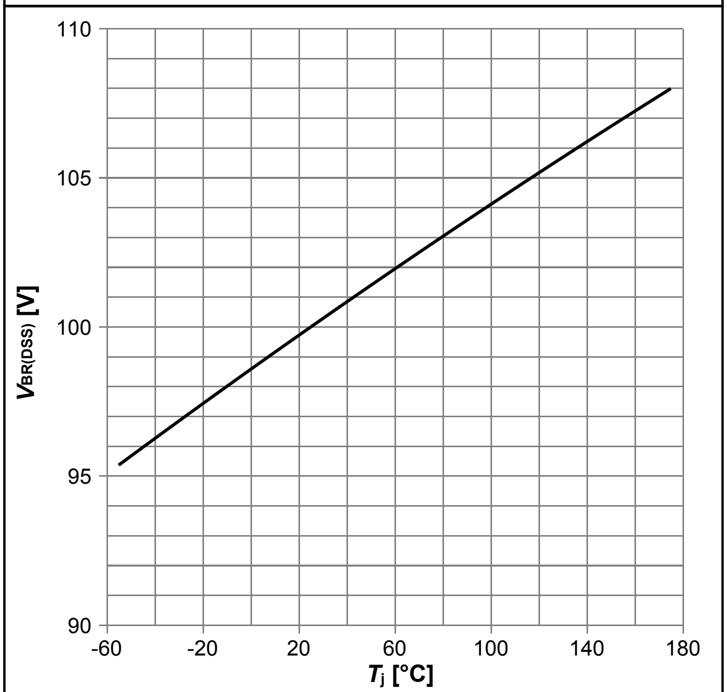
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



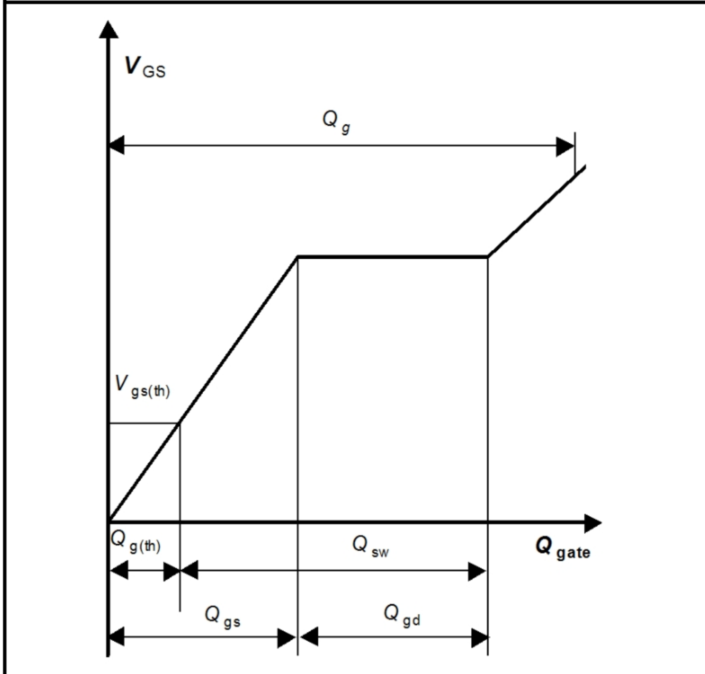
V_{GS}=f(Q_{gate}); I_D=100 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

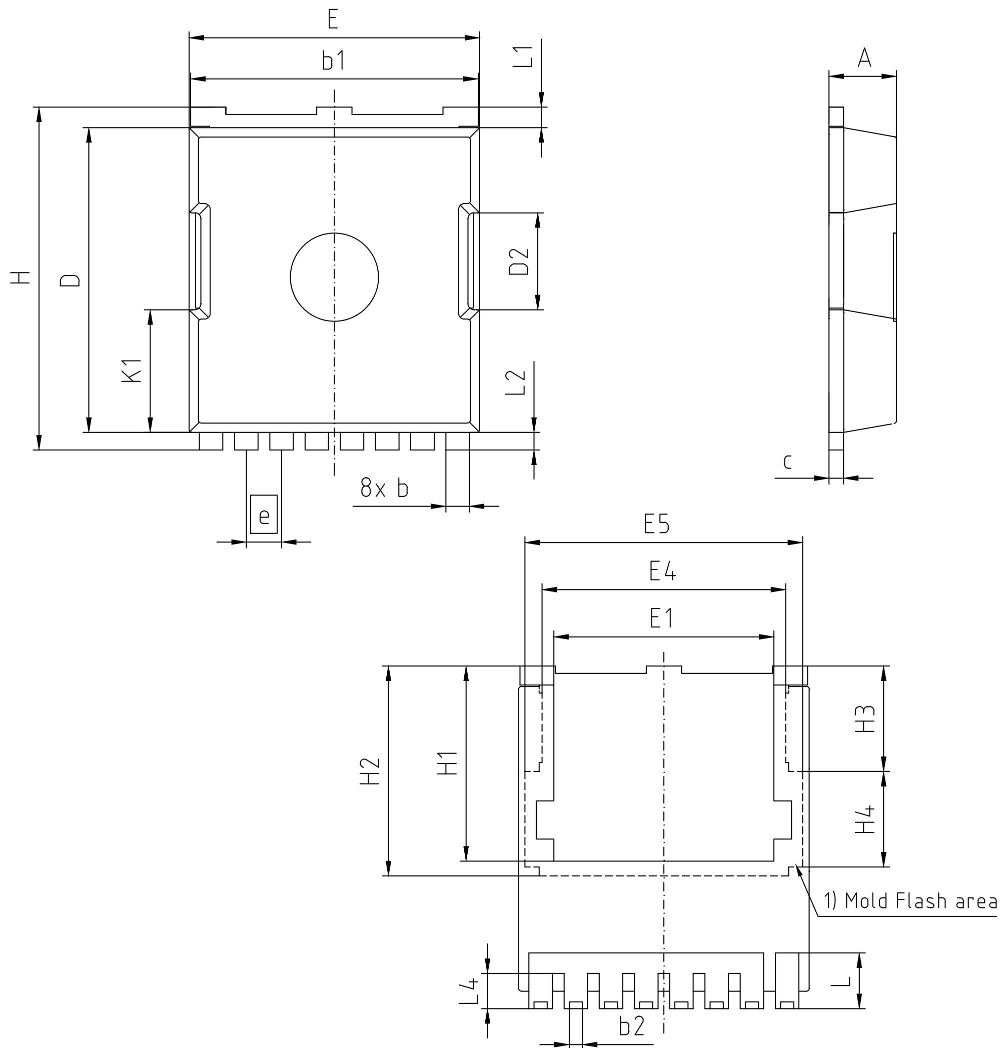


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Gate charge waveforms



6 Package Outlines



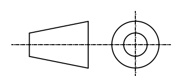
1) partially covered with Mold Flash

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	0.50	0.90	0.020	0.035
L2	0.50	0.70	0.020	0.028
L4	1.00	1.30	0.039	0.051

DOCUMENT NO.
Z8B00169619

SCALE 0 2 4mm

EUROPEAN PROJECTION



ISSUE DATE
14-06-2013

REVISION
01

Figure 1 Outline PG-HSOF-8-1, dimensions in mm/inches

Revision History

IPT020N10N3

Revision: 2014-02-17, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2014-02-17	Release of final version

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