

MOSFET

OptiMOS™ 5 Linear FET, 100 V

Features

- Ideal for hot-swap and e-fuse applications
- Very low on-resistance $R_{DS(on)}$
- Wide safe operating area SOA
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Halogen-free according to IEC61249-2-21

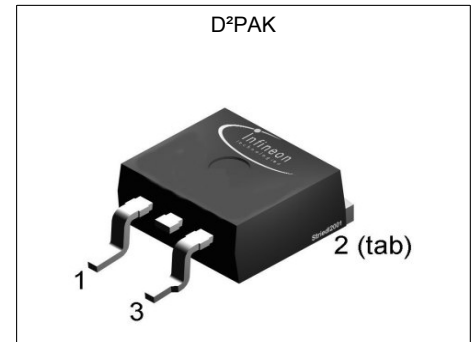
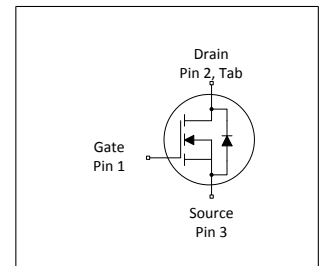


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	3.3	mΩ
I_D (silicon limited)	170	A
I_D (package limited)	120	A
I_{pulse} ($V_{DS}=56$ V, $t_p=10$ ms)	7	A



Type / Ordering Code	Package	Marking	Related Links
IPB033N10N5LF	PG-TO 263-3	033N10LF	-

¹⁾ J-STD20 and JESD22

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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	-	-	120 108 23	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$, $R_{thJA}=40\text{ K/W}^{(1)}$
Pulsed drain current ⁽²⁾	$I_{D,pulse}$	-	-	480	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁽³⁾	E_{AS}	-	-	273	mJ	$I_D=100\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	179	W	$T_C=25\text{ °C}$
Operating and storage temperature	T_j , T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	0.45	0.7	K/W	-
Device on PCB, minimal footprint	R_{thJA}	-	-	62	K/W	-
Device on PCB, 6 cm ² cooling area ⁽¹⁾	R_{thJA}	-	-	40	K/W	-

⁽¹⁾ 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.

⁽²⁾ See Diagram 3 for more detailed information

⁽³⁾ See Diagram 13 for more detailed information

3 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	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.5	3.3	4.1	V	$V_{DS}=V_{GS}$, $I_D=150\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	1 10	10 100	μA	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ }^\circ\text{C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	2 -2	5 -5	μA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ $V_{GS}=-10\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.7	3.3	$\text{m}\Omega$	$V_{GS}=10\text{ V}$, $I_D=100\text{ A}$
Gate resistance ¹⁾	R_G	-	40	60	Ω	-
Transconductance	g_{fs}	23	46	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=100\text{ A}$

Table 5 Dynamic characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	350	460	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	1100	1400	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	13	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	8	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	32	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	64	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	48	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	3	-	nC	$V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	72	-	nC	$V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ¹⁾	Q_g	-	102	-	nC	$V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	6.9	-	V	$V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	116	-	nC	$V_{DD}=50\text{ V}$, $V_{GS}=0\text{ V}$

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

²⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	120	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	480	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.93	1.2	V	$V_{GS}=0\text{ V}$, $I_F=100\text{ A}$, $T_J=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	58	-	ns	$V_R=50\text{ V}$, $I_F=50\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	94	-	nC	$V_R=50\text{ V}$, $I_F=50\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$

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

4 Electrical characteristics diagrams

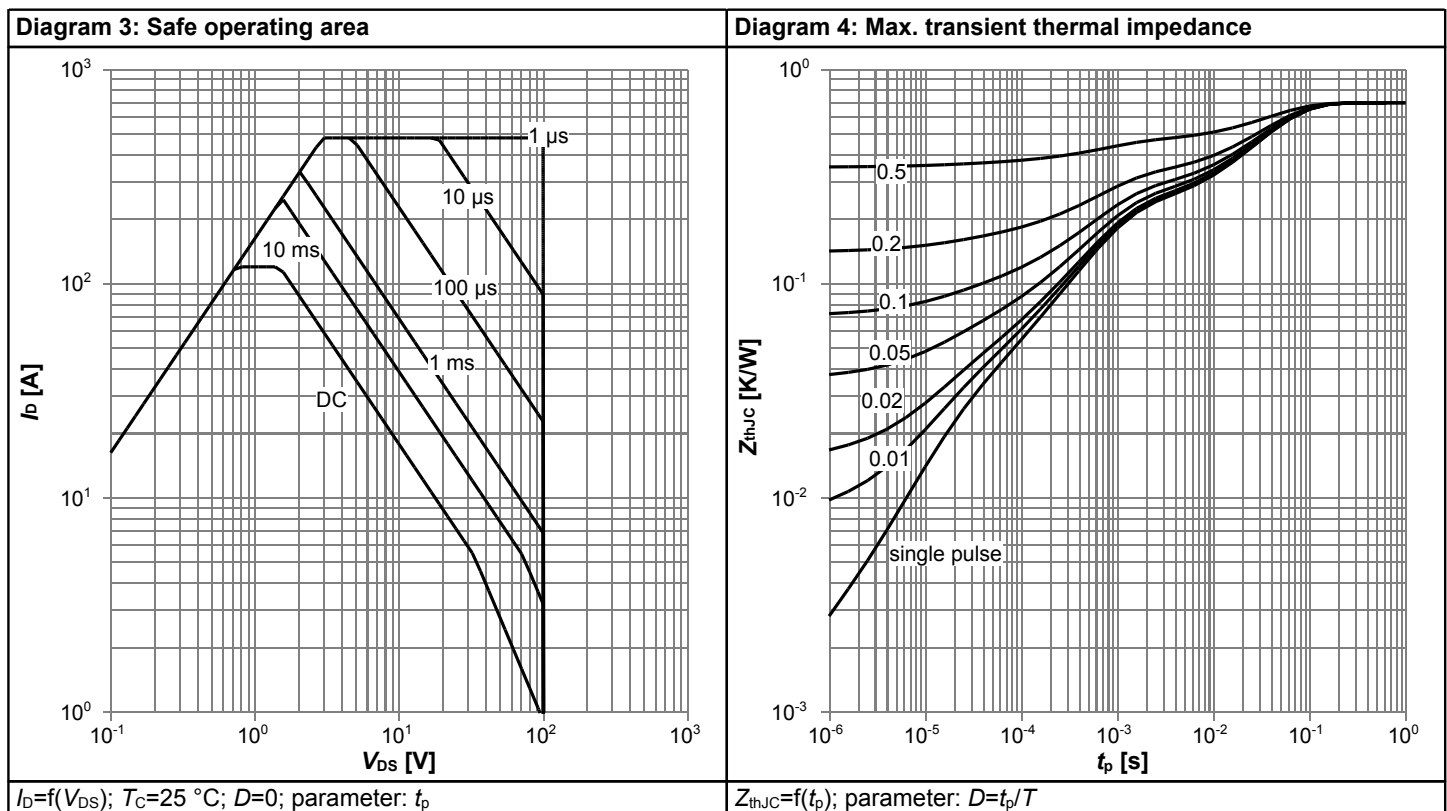
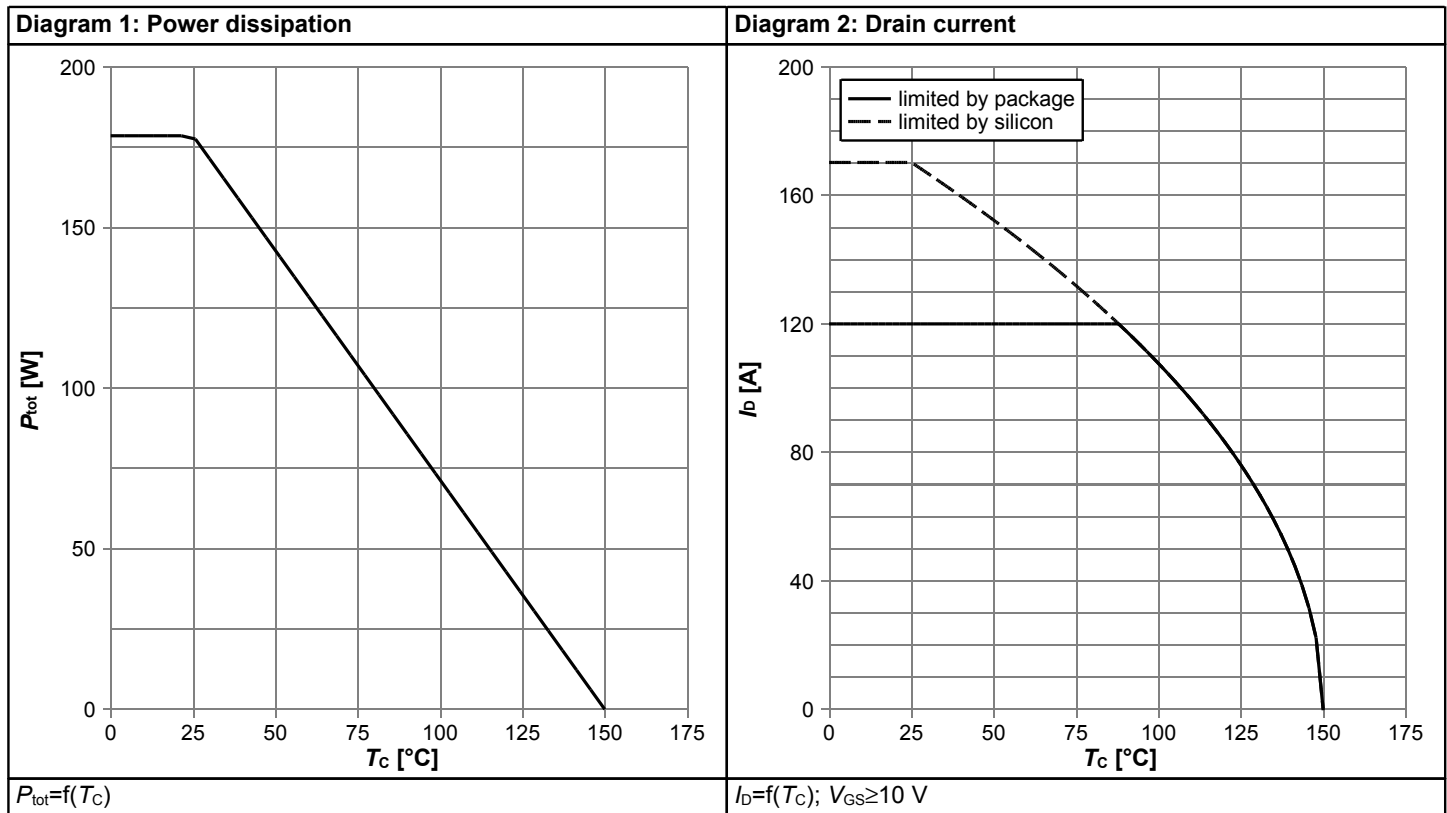
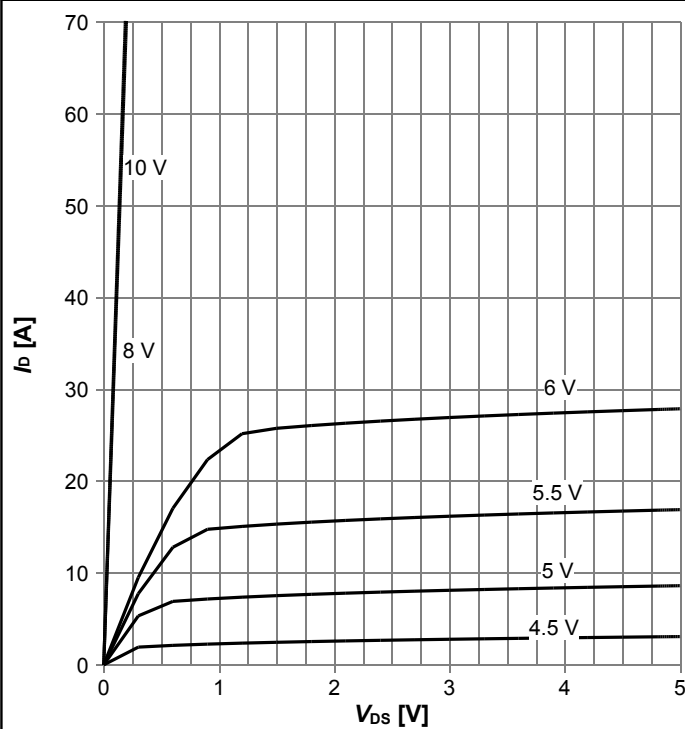
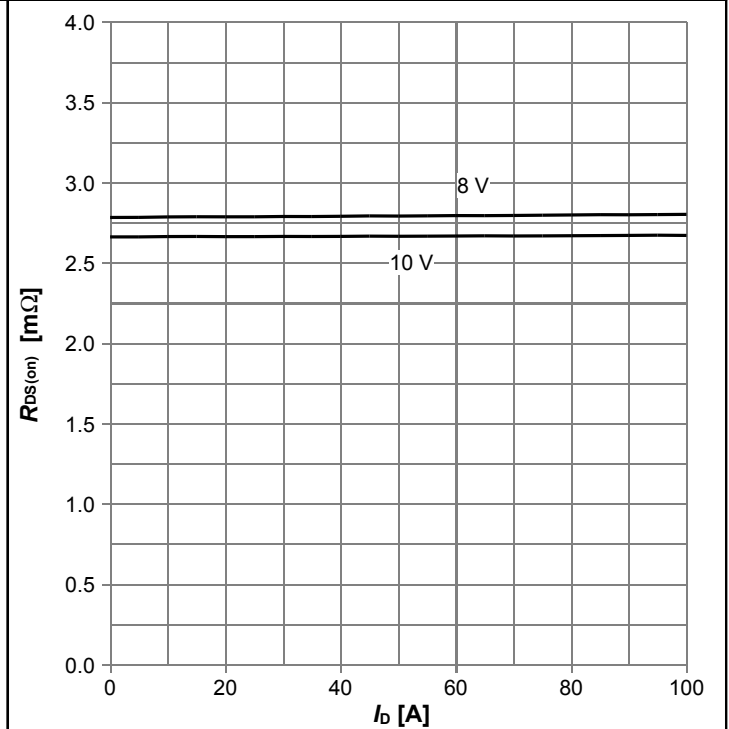


Diagram 5: Typ. output characteristics



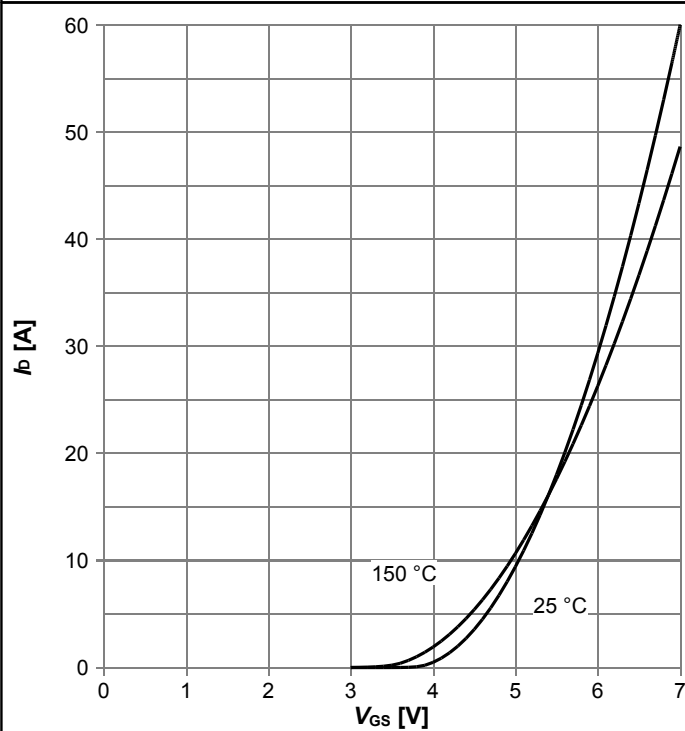
$I_D = f(V_{DS})$; $T_j = 25^\circ\text{C}$, $t_p = 30\ \mu\text{s}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



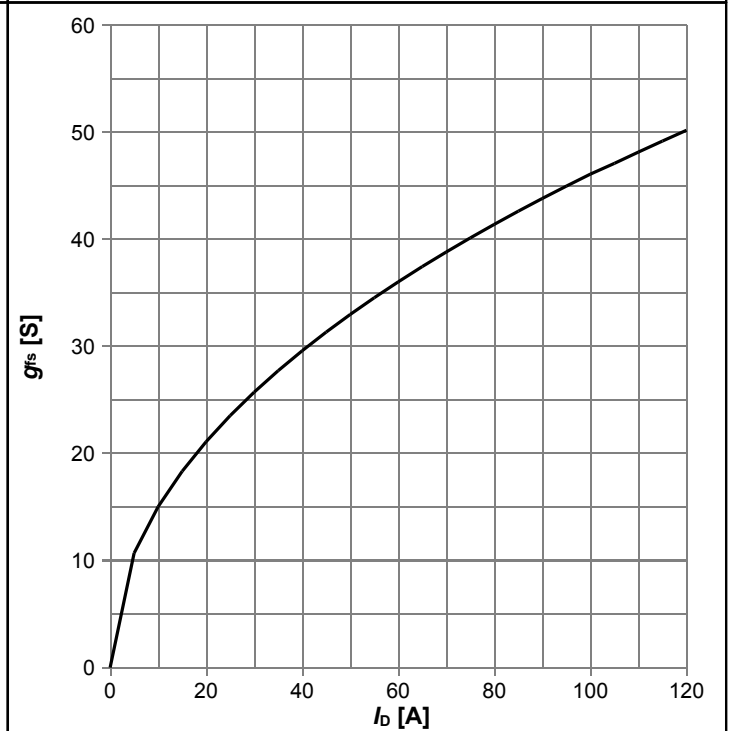
$R_{DS(on)} = f(I_D)$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



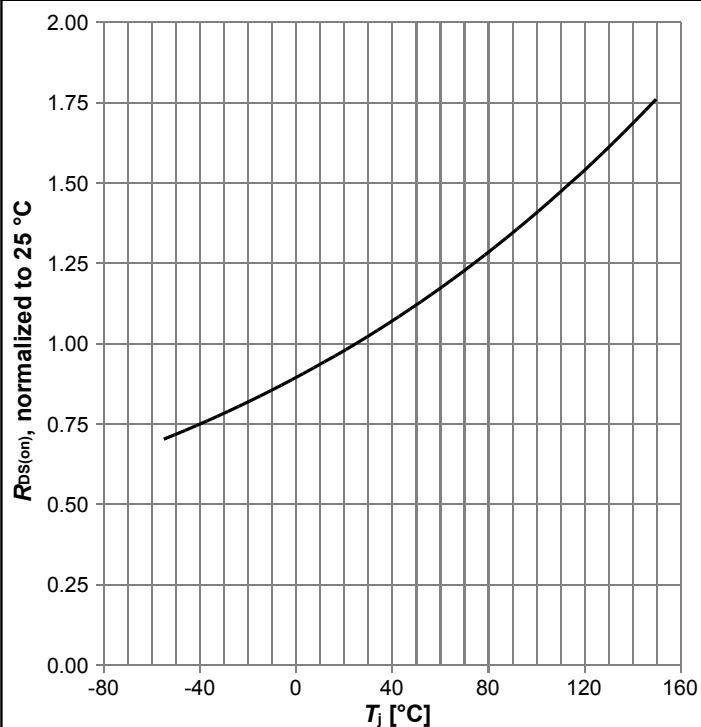
$I_D = f(V_{GS})$; $V_{DS} = 10\text{ V}$; parameter: T_j

Diagram 8: Typ. forward transconductance



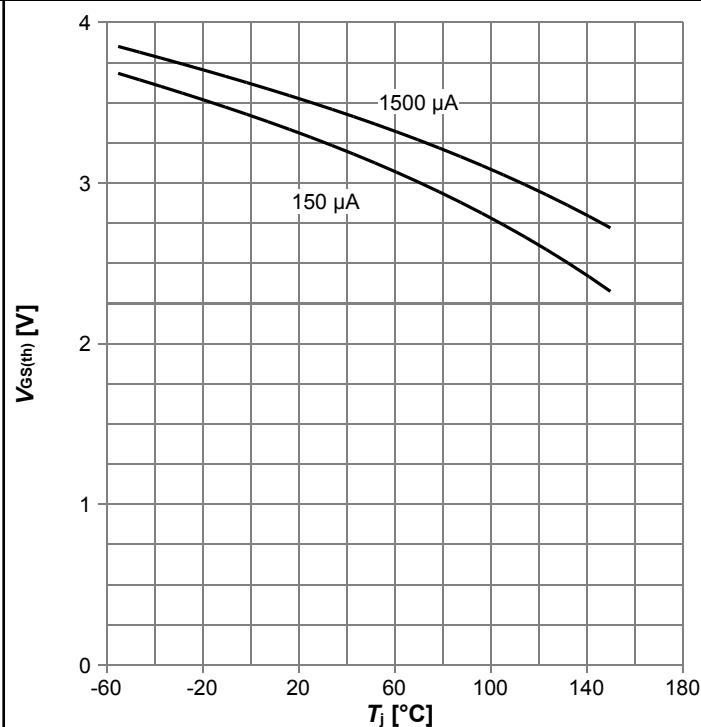
$g_{fs} = f(I_D)$; $T_j = 25^\circ\text{C}$

Diagram 9: Normalized drain-source on-state resistance



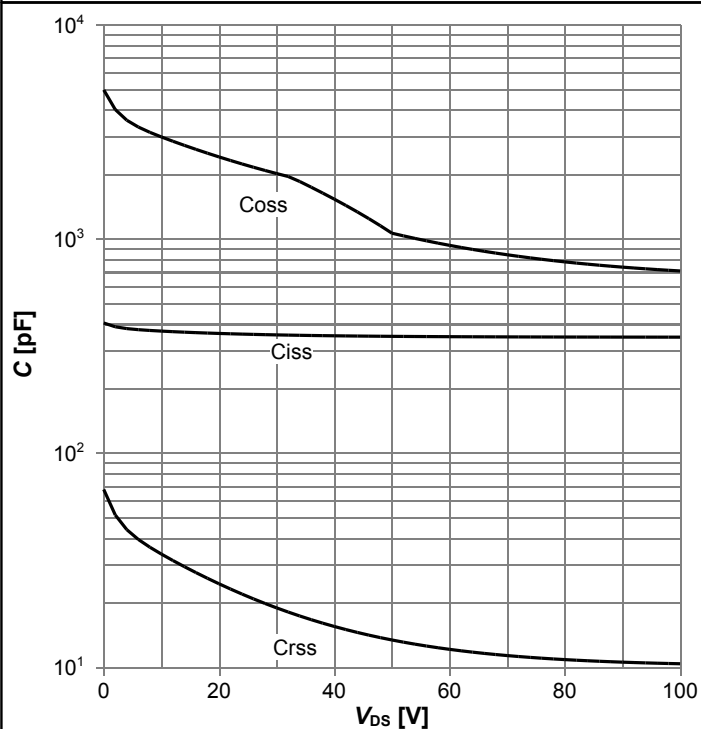
$R_{DS(on)} = f(T_j)$, $I_D = 100$ A, $V_{GS} = 10$ V

Diagram 10: Typ. gate threshold voltage



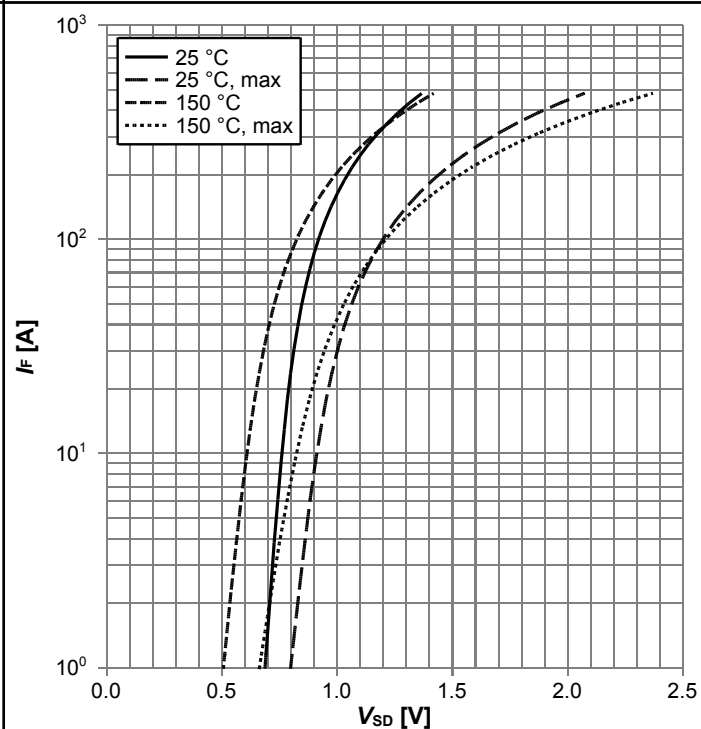
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

Diagram 11: Typ. capacitances



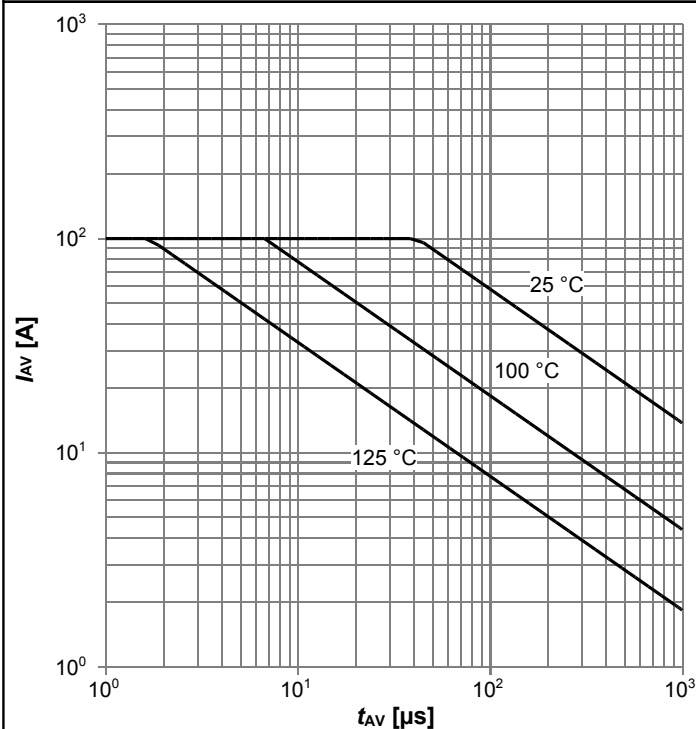
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz

Diagram 12: Forward characteristics of reverse diode



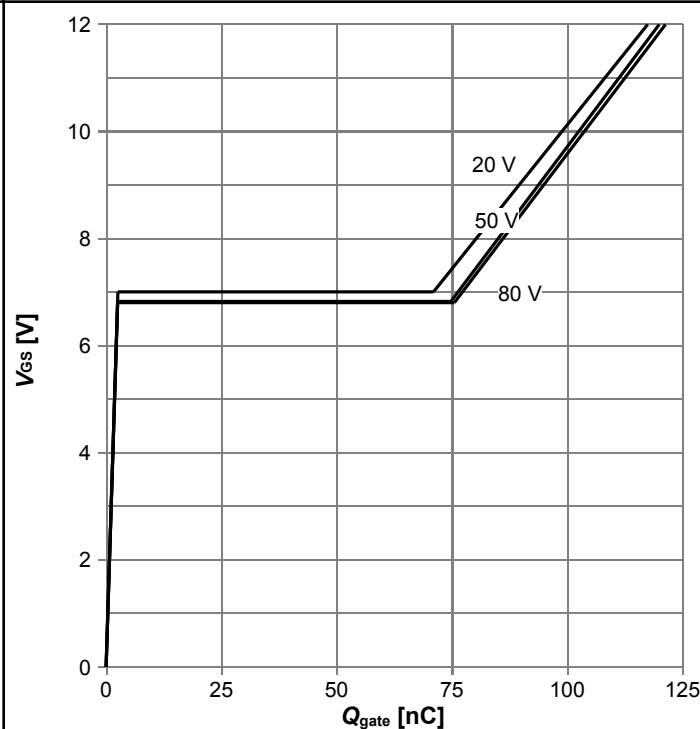
$I_F = f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



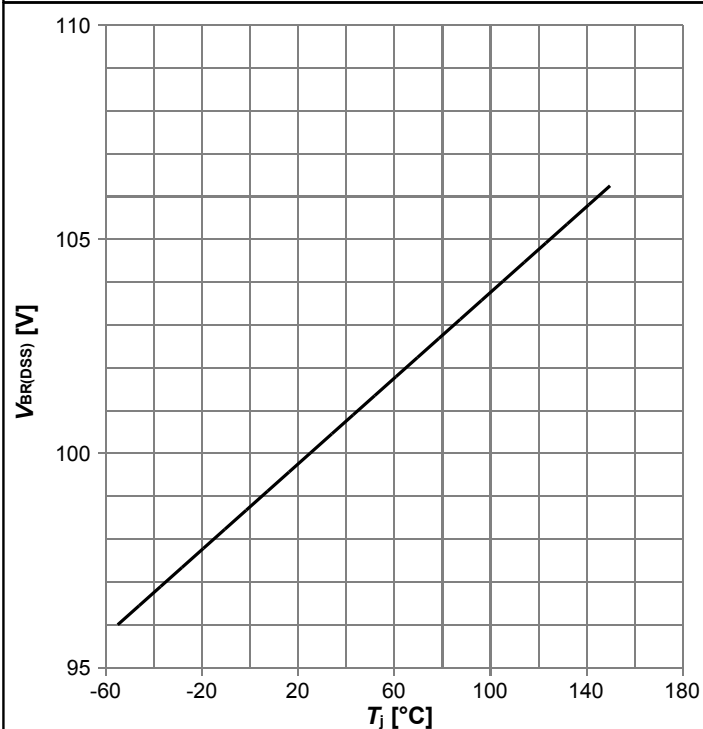
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



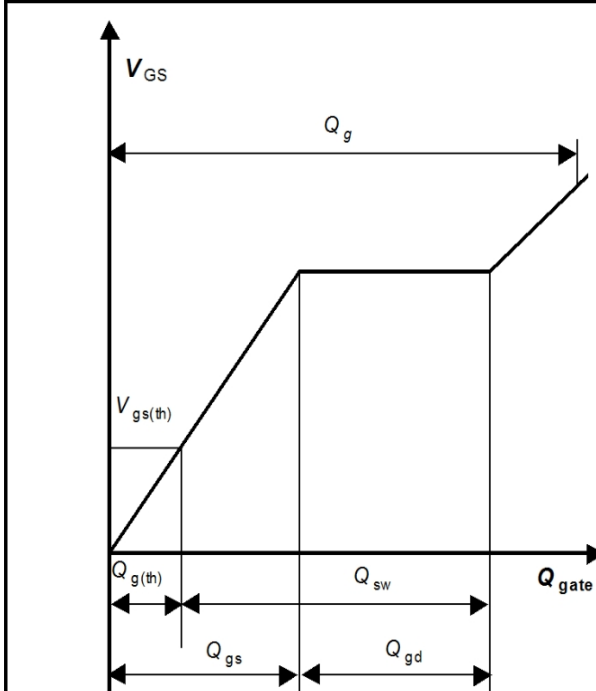
$V_{GS}=f(Q_{gate})$; $I_D=100\text{ A}$ pulsed, resistive load; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



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

Gate charge waveforms



5 Package Outlines

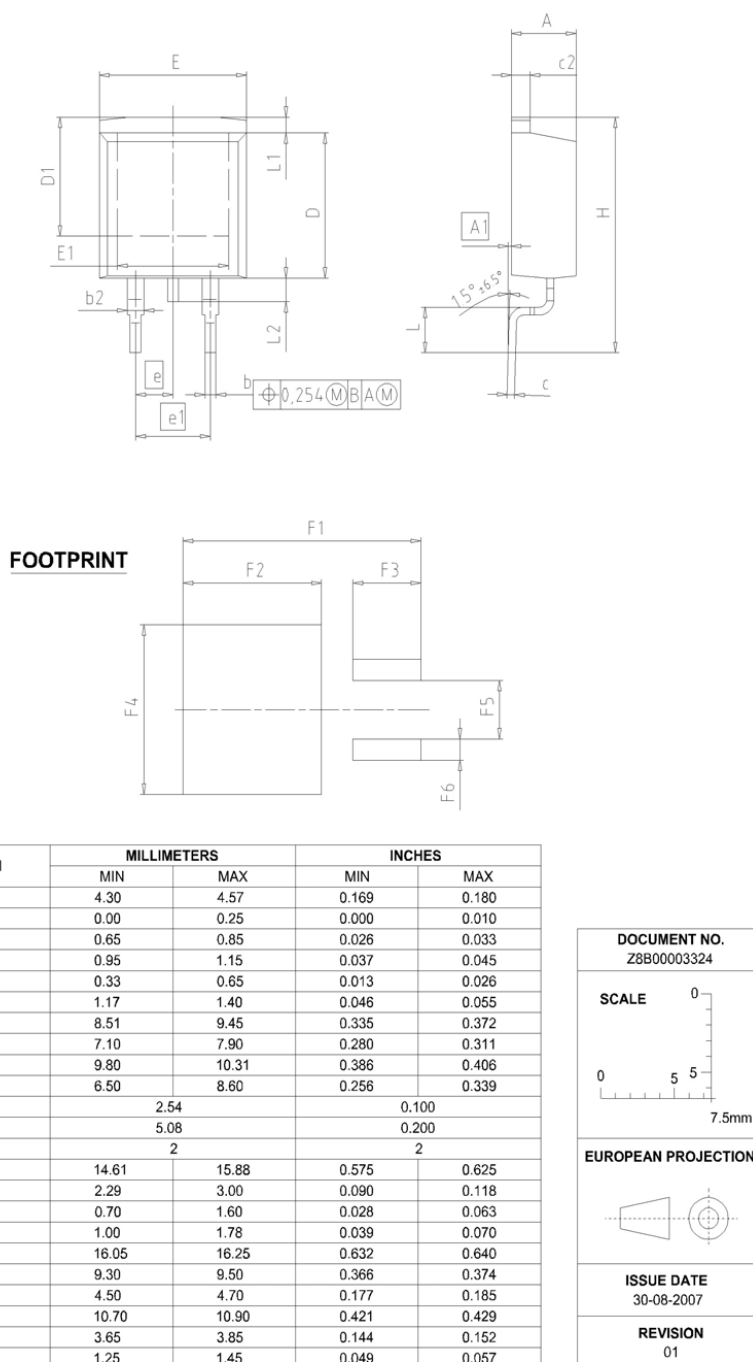


Figure 1 Outline PG-TO 263-3, dimensions in mm/inches

Revision History

IPB033N10N5LF

Revision: 2017-02-16, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2016-12-15	Release of final version
2.1	2017-02-16	Update technology heading

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