

MOSFET  
OptiMOS™ 5 Linear FET 2, 100 V

Features

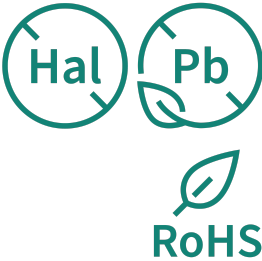
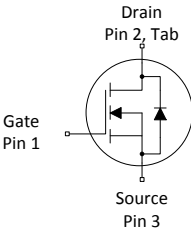
- Ideal for hot-swap and e-fuse applications
- Very low on-resistance  $R_{DS(on)}$
- Wide safe operating area SOA
- N-channel, normal level
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
$V_{DS}$	100	V
$R_{DS(on),max}$	2.1	mΩ
$I_D$	176	A
$I_{pulse}$ ( $V_{DS}=56\text{ V}$ , $t_p=10\text{ ms}$ )	10.7	A



Part number	Package	Marking	Related links
IPB021N10NM5LF2	PG-TO263-3	21N10LF2	-



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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 <sup>1)</sup>	$I_D$	-	-	176 136 136 30	A	$V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$ $V_{GS}=15\text{ V}$ , $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=40\text{ °C/W}$ <sup>2)</sup>
Pulsed drain current <sup>3)</sup>	$I_{D,pulse}$	-	-	704	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse <sup>4)</sup>	$E_{AS}$	-	-	1166	mJ	$I_D=100\text{ A}$ , $R_{GS}=25\text{ }\Omega$
Gate source voltage	$V_{GS}$	-20	-	20	V	-
Power dissipation	$P_{tot}$	-	-	375 3.8	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$ , $R_{thJA}=40\text{ °C/W}$ <sup>2)</sup>
Operating and storage temperature	$T_j$ , $T_{stg}$	-55	-	175	°C	-

<sup>1)</sup> Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

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

<sup>3)</sup> See Diagrams 3 and 4 for more detailed information

<sup>4)</sup> See Diagram 14 for more detailed information

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	0.4	°C/W	-
Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area <sup>5)</sup>	$R_{thJA}$	-	-	40	°C/W	
Thermal resistance, junction - ambient, minimal footprint	$R_{thJA}$	-	-	62	°C/W	

<sup>5)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

### 3 Electrical characteristics

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

**Table 4 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.3	3.1	3.9	V	$V_{DS}=V_{GS}$ , $I_D=280\text{ }\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	-	0.1 10	1 100	$\mu\text{A}$	$V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$ $V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$
Gate-source leakage current	$I_{GSS}$	-	10	100	nA	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	1.6 1.9	2.0 2.1	m $\Omega$	$V_{GS}=15\text{ V}$ , $I_D=100\text{ A}$ $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$
Gate resistance	$R_G$	-	1.3	2.0	$\Omega$	-
Transconductance	$g_{fs}$	48	95	-	S	$ V_{DS}  \geq 2 I_D  R_{DS(on)max}$ , $I_D=100\text{ A}$

**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance <sup>6)</sup>	$C_{iss}$	-	13000	17000	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$
Output capacitance <sup>6)</sup>	$C_{oss}$	-	1800	2300	pF	
Reverse transfer capacitance <sup>6)</sup>	$C_{rss}$	-	35	61	pF	
Turn-on delay time	$t_{d(on)}$	-	33	-	ns	$V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$ , $R_{G,ext}=1.6\text{ }\Omega$
Rise time	$t_r$	-	60	-	ns	
Turn-off delay time	$t_{d(off)}$	-	49	-	ns	
Fall time	$t_f$	-	23	-	ns	

<sup>6)</sup> Defined by design. Not subject to production test.

**Table 6 Gate charge characteristics** <sup>7)</sup>

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	84	-	nC	$V_{DD}=50\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	41	-	nC	
Gate to drain charge <sup>8)</sup>	$Q_{gd}$	-	27	41	nC	
Switching charge	$Q_{sw}$	-	69	-	nC	
Gate charge total <sup>8)</sup>	$Q_g$	-	165	206	nC	
Gate plateau voltage	$V_{plateau}$	-	6.3	-	V	$V_{DS}=0.1\text{ V}$ , $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	150	-	nC	
Output charge <sup>8)</sup>	$Q_{oss}$	-	211	281	nC	

<sup>7)</sup> See "Gate charge waveforms" for parameter definition

<sup>8)</sup> Defined by design. Not subject to production test.

**Table 7 Reverse diode**

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	$I_S$	-	-	156	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	704	A	
Diode forward voltage	$V_{SD}$	-	0.88	1.2	V	$V_{GS}=0\text{ V}$ , $I_F=100\text{ A}$ , $T_J=25\text{ °C}$
Reverse recovery time <sup>9)</sup>	$t_{rr}$	-	66	132	ns	$V_R=50\text{ V}$ , $I_F=100\text{ A}$ , $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge <sup>9)</sup>	$Q_{rr}$	-	109	218	nC	

<sup>9)</sup> Defined by design. Not subject to production test.

## 4 Electrical characteristics diagrams

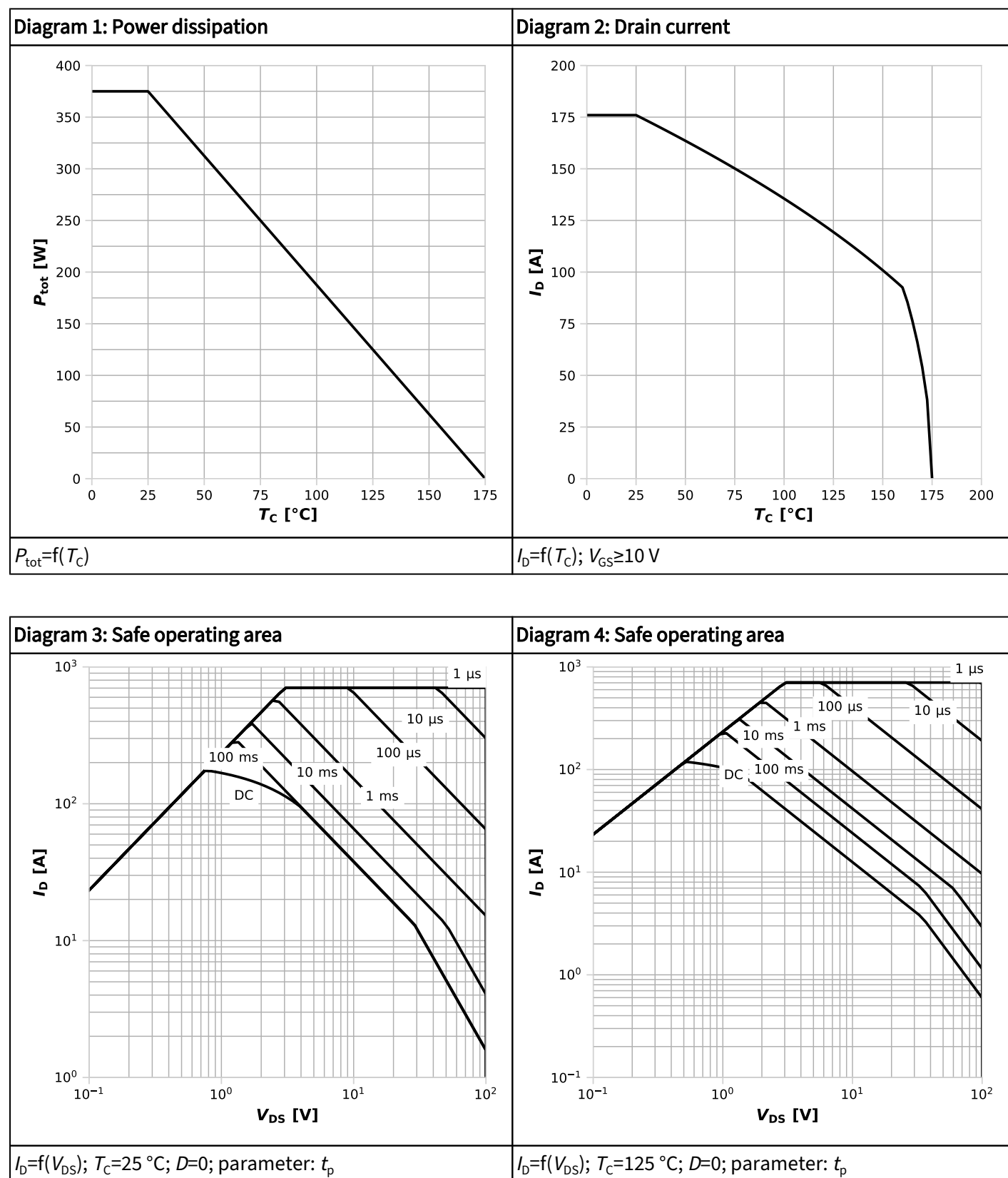
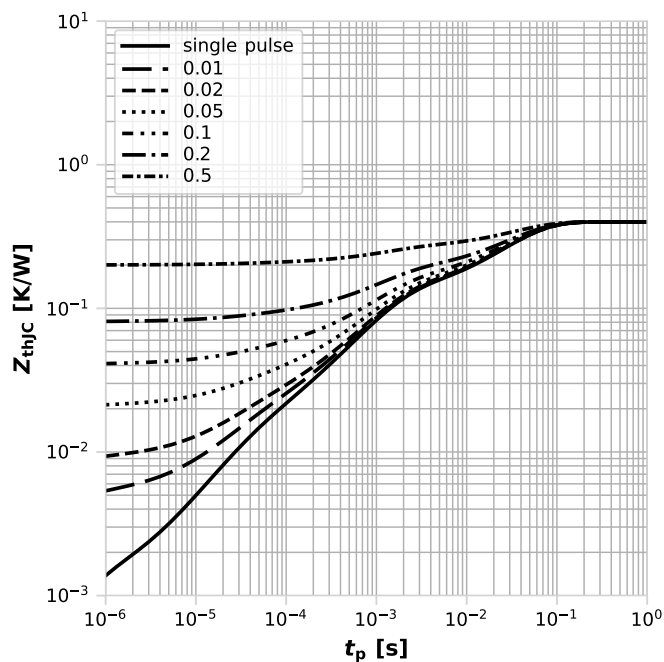
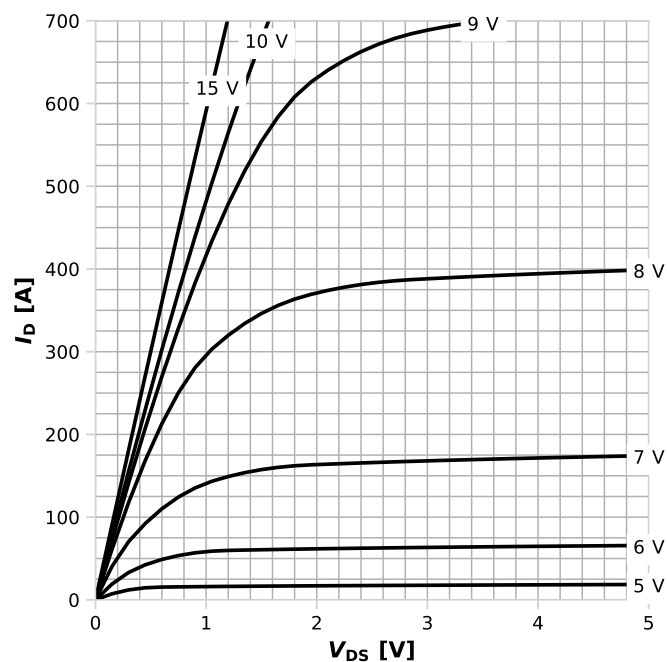


Diagram 5: Max. transient thermal impedance



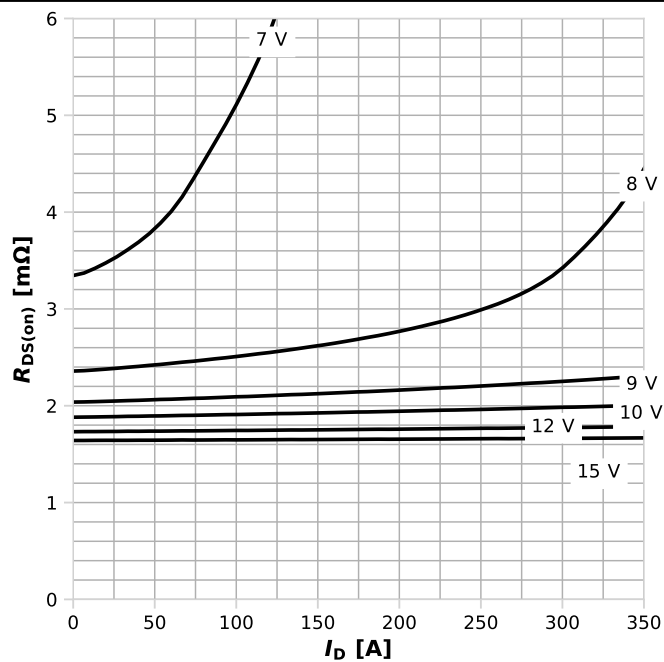
$Z_{thJC} = f(t_p)$ ; parameter:  $D = t_p / T$

Diagram 6: Typ. output characteristics



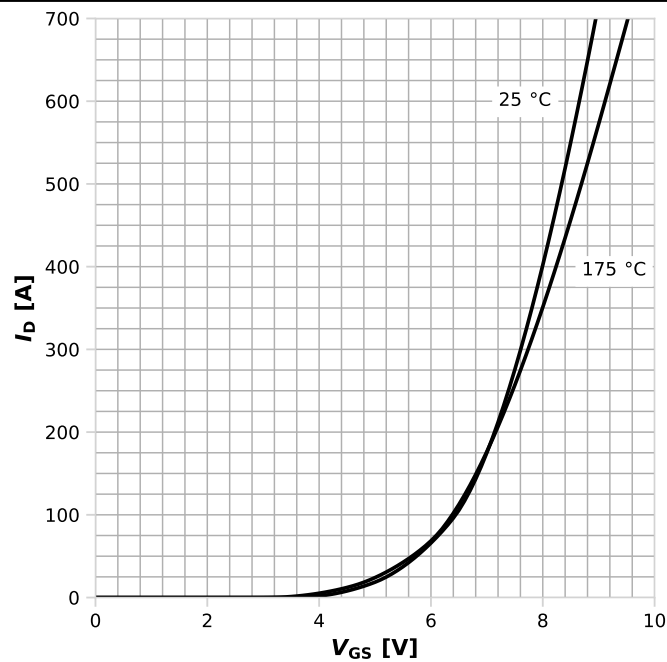
$I_D = f(V_{DS})$ ,  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 7: Typ. drain-source on resistance



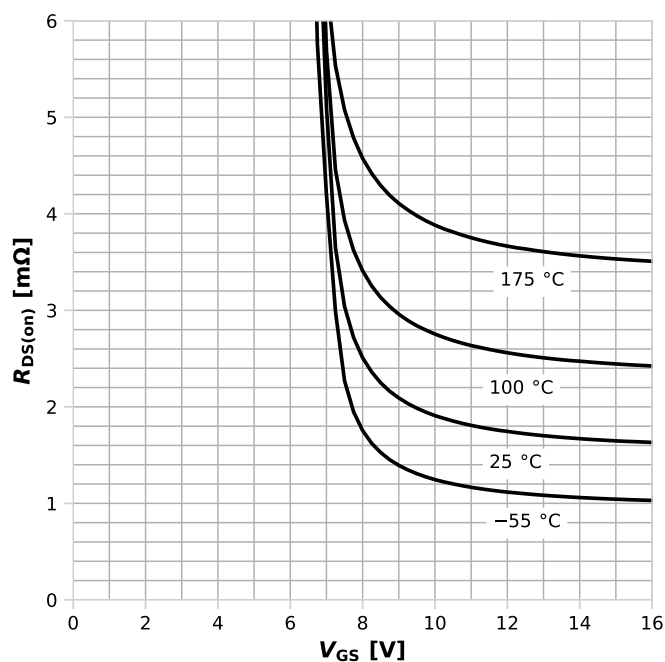
$R_{DS(on)} = f(I_D)$ ,  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 8: Typ. transfer characteristics



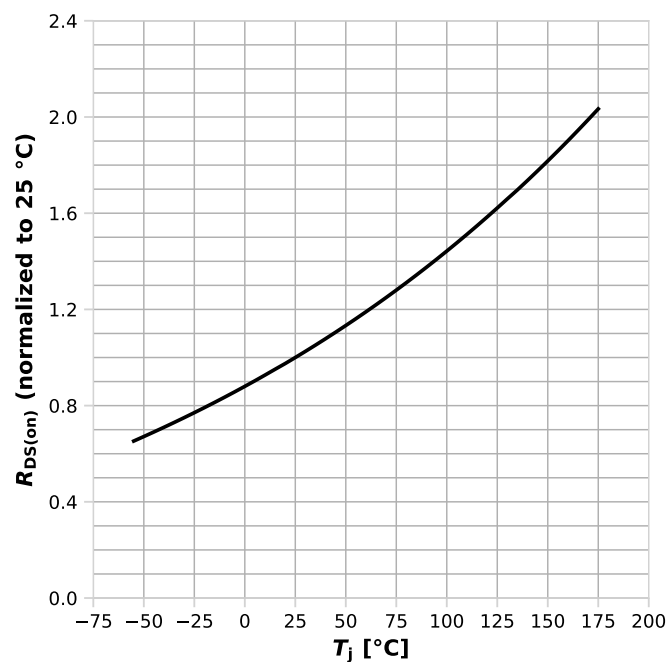
$I_D = f(V_{GS})$ ,  $|V_{DS}| > 2|I_D|R_{DS(on)max}$ ; parameter:  $T_j$

Diagram 9: Typ. drain-source on resistance



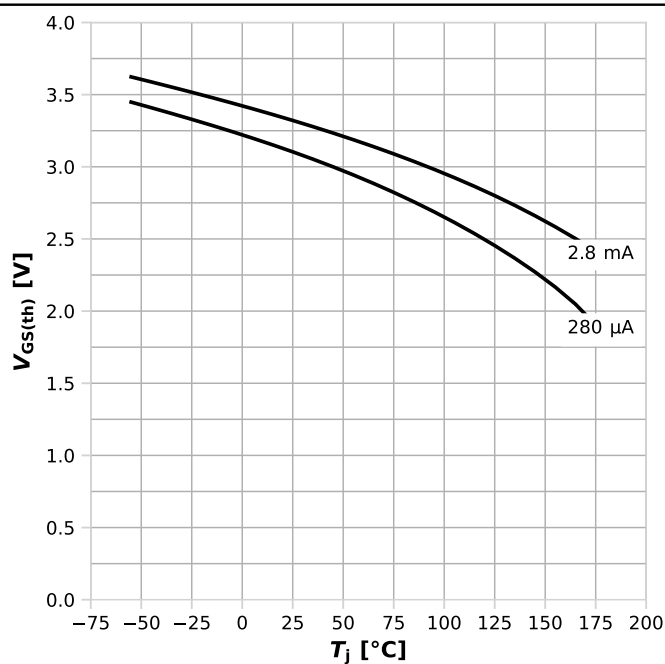
$$R_{DS(on)} = f(V_{GS}), I_D = 100 \text{ A; parameter: } T_j$$

Diagram 10: Normalized drain-source on resistance



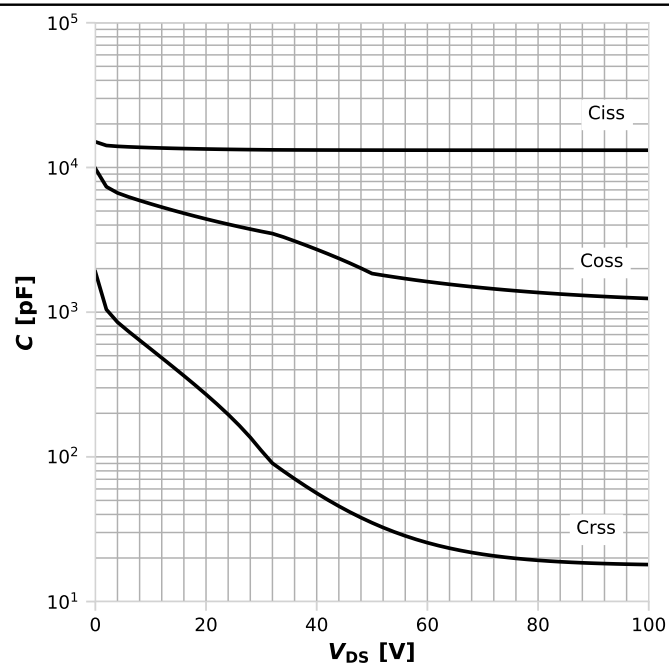
$$R_{DS(on)} = f(T_j), I_D = 100 \text{ A, } V_{GS} = 10 \text{ V}$$

Diagram 11: Typ. gate threshold voltage



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

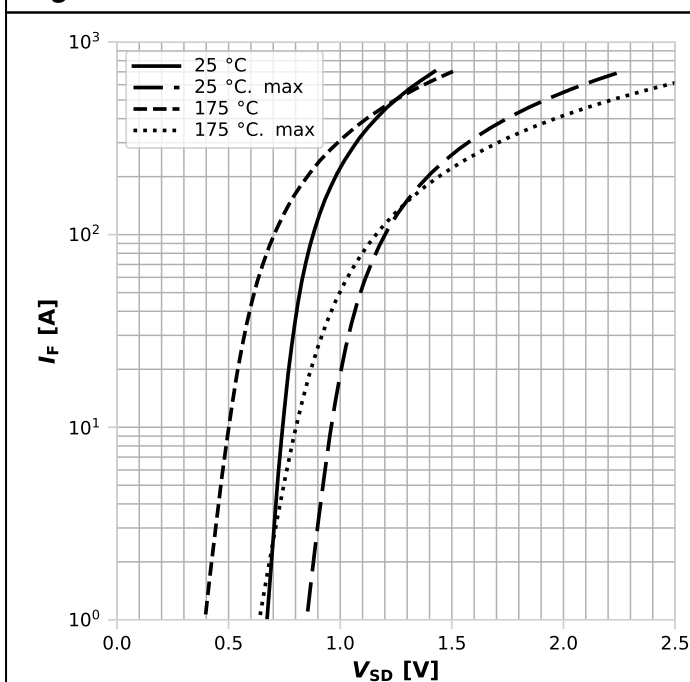
Diagram 12: Typ. capacitances



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

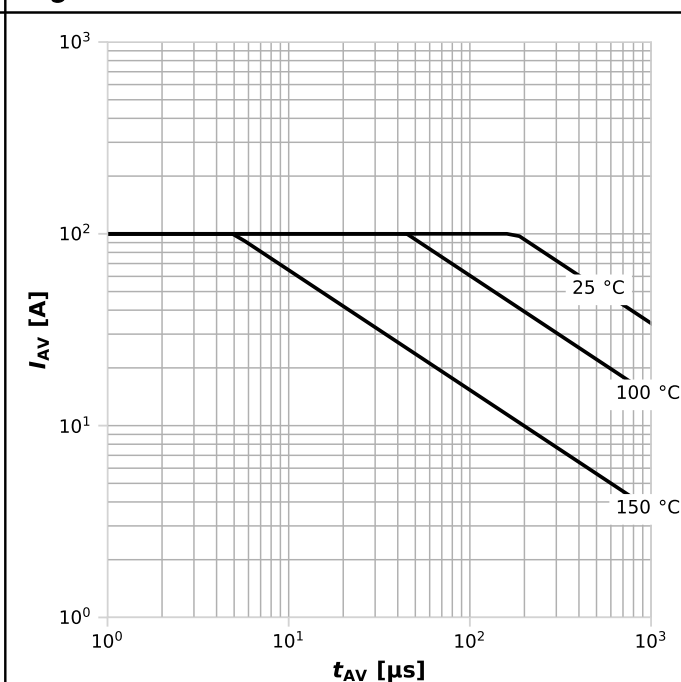


Diagram 13: Forward characteristics of reverse diode



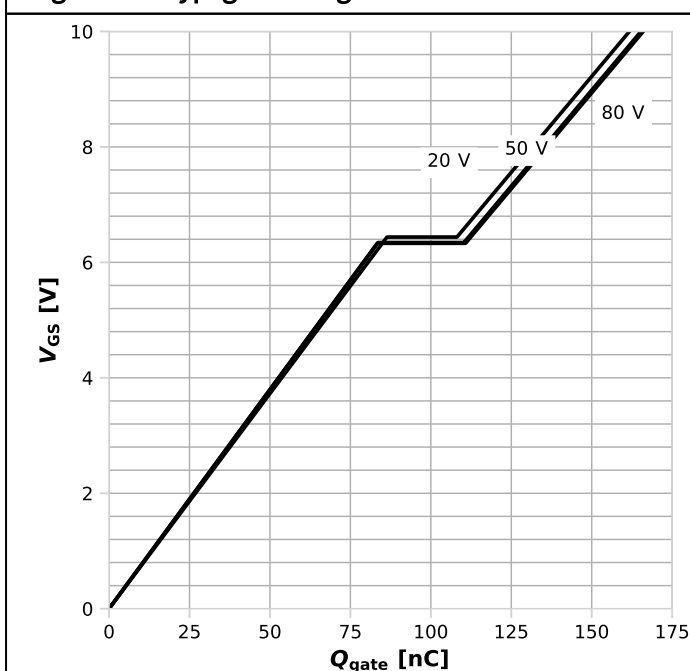
$I_F = f(V_{SD})$ ; parameter:  $T_j$

Diagram 14: Avalanche characteristics



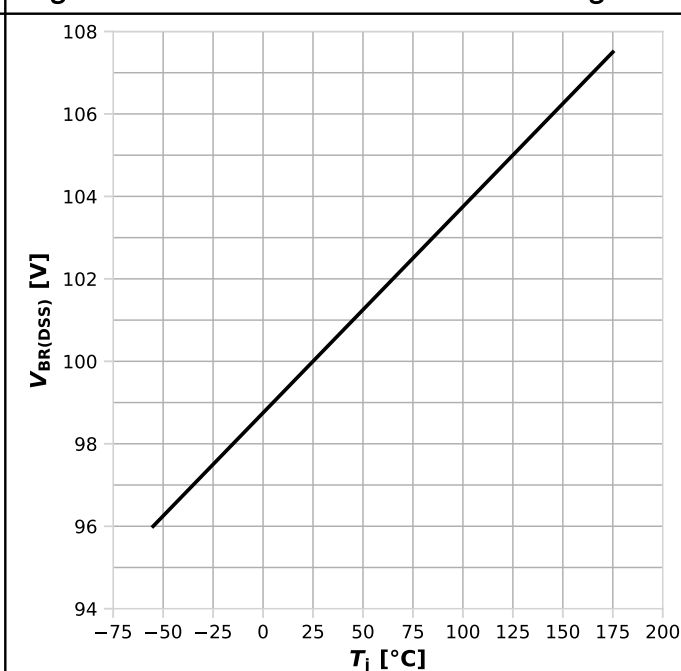
$I_{AS} = f(t_{AV})$ ;  $R_{GS} = 25 \Omega$ ; parameter:  $T_{j,start}$

Diagram 15: Typ. gate charge



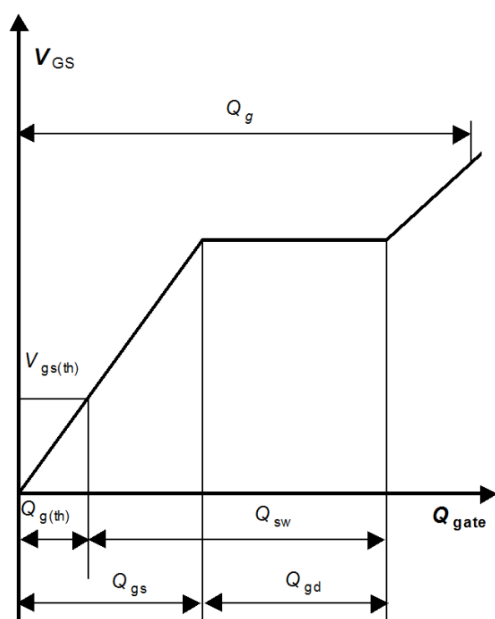
$V_{GS} = f(Q_{gate})$ ,  $I_D = 100 \text{ A}$  pulsed,  $T_j = 25 \text{ °C}$ ; parameter:  $V_{DD}$

Diagram 16: Min. drain-source breakdown voltage



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

Gate charge waveforms



## 5 Package outlines

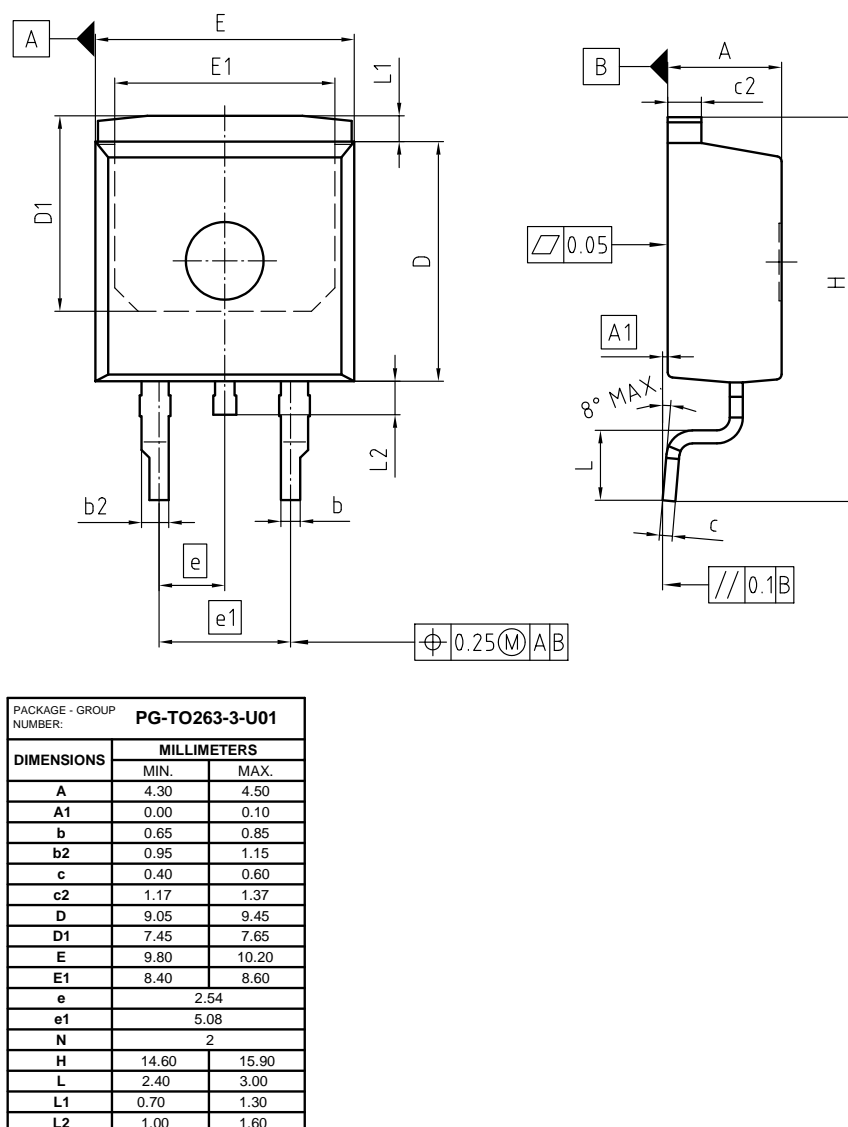


Figure 1 Outline PG-T0263-3, dimensions in mm

## Revision history

IPB021N10NM5LF2

### Revision 2025-01-24, Rev. 1.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-01-24	Release of final datasheet

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