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MOSFET

OptiMOS™ Power-Transistor, -100 V

D-PAK



Features

- P-channel
- 100% avalanche tested
- Normal level
- Enhancement mode
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Fully qualified according to JEDEC for Industrial Applications

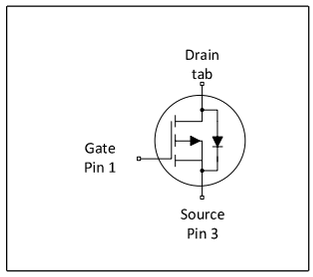


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	-100	V
$R_{DS(on),max}$	111	mΩ
I_D	-22	A
Q_{oss}	-21	nC
Q_G	-59	nC

Type / Ordering Code	Package	Marking	Related Links
IPD11DP10NM	PG-TO252-3	11DP10NM	-

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1 Maximum ratings

at T_A=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	- - -	- - -	-22 -15.4 -3.4	A	V_{GS}=-10 V, T_C=25 °C V_{GS}=-10 V, T_C=100 °C V_{GS}=-10 V, T_A=25°C, R_{THJA}=50°C/W[2]
Pulsed drain current[3]	$I_{D,pulse}$	-	-	-88	A	T_A=25 °C
Avalanche energy, single pulse[4]	E_{AS}	-	-	540	mJ	I_D=-18 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	125 3.0	W	T_C=25 °C T_A=25 °C, R_{THJA}=50 °C/W[2]
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}	-	-	1.2	°C/W	-
Thermal resistance, junction - ambient, 6 cm² cooling area	R_{thJA}	-	-	50	°C/W	-
Thermal resistance, junction - ambient, minimal footprint[2]	R_{thJA}	-	-	75	°C/W	-

[1] 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.
[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] See Diagram 3 for more detailed information
[4] See Diagram 13 for more detailed information

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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	$V_{(BR)DSS}$	-100	-	-	V	V_{GS}=0 V, I_D=-1 mA
Gate threshold voltage	$V_{GS(th)}$	-2.1	-3.0	-4.0	V	V_{DS}=V_{GS}, I_D=-1700 µA
Zero gate voltage drain current	I_{DSS}	- -	-0.1 -10	-1.0 -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}	-	-10	-100	nA	V_{GS}=-20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	88.9	111	mΩ	V_{GS}=-10 V, I_D=-18 A
Gate resistance	R_G	-	5.0	-	Ω	-
Transconductance	g_{fs}	-	24	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=-18 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1)]	C_{iss}	-	2500	3200	pF	V_{GS}=0 V, V_{DS}=-50 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	180	230	pF	V_{GS}=0 V, V_{DS}=-50 V, f=1 MHz
Reverse transfer capacitance[1)]	C_{rss}	-	36	63	pF	V_{GS}=0 V, V_{DS}=-50 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	6.92	-	ns	V_{DD}=-50 V, V_{GS}=-10 V, I_D=-18 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	14.89	-	ns	V_{DD}=-50 V, V_{GS}=-10 V, I_D=-18 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	51.25	-	ns	V_{DD}=-50 V, V_{GS}=-10 V, I_D=-18 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	25.13	-	ns	V_{DD}=-50 V, V_{GS}=-10 V, I_D=-18 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	-12.3	-	nC	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Gate charge at threshold	$Q_{g(th)}$	-	-7.6	-	nC	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Gate to drain charge[1)]	Q_{gd}	-	-18.9	-28	nC	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Switching charge	Q_{sw}	-	-24	-	nC	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Gate charge total[1)]	Q_g	-	-59	-74	nC	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Gate plateau voltage	$V_{plateau}$	-	-4.8	-	V	V_{DD}=-50 V, I_D=-18 A, V_{GS}=0 to -10 V
Output charge[1)]	Q_{oss}	-	-21	-28	nC	V_{DS}=-50 V, V_{GS}=0 V

[1)] Defined by design. Not subject to production test.
[2)] See ″Gate charge waveforms″ for parameter definition

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Table 7 Reverse diode

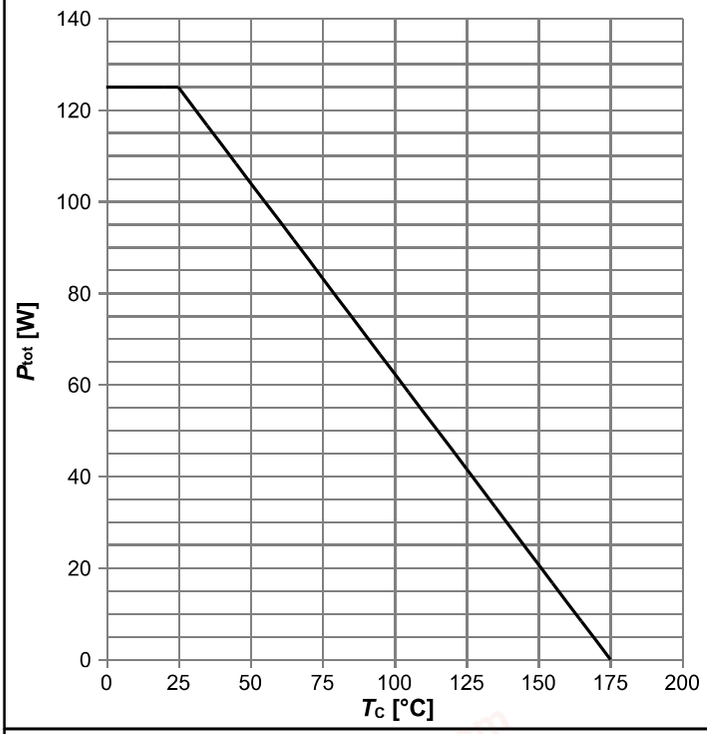
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	-22	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	-88	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	-0.87	-1.2	V	V_{GS}=0 V, I_F=-18 A, T_j=25 °C
Reverse recovery time[1)]	t_{rr}	-	81.8	163.6	ns	V_R=-50 V, I_F=-18 A, di_F/dt=-100 A/µs
Reverse recovery charge[1)]	Q_{rr}	-	318.55	637.1	nC	V_R=-50 V, I_F=-18 A, di_F/dt=-100 A/µs

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

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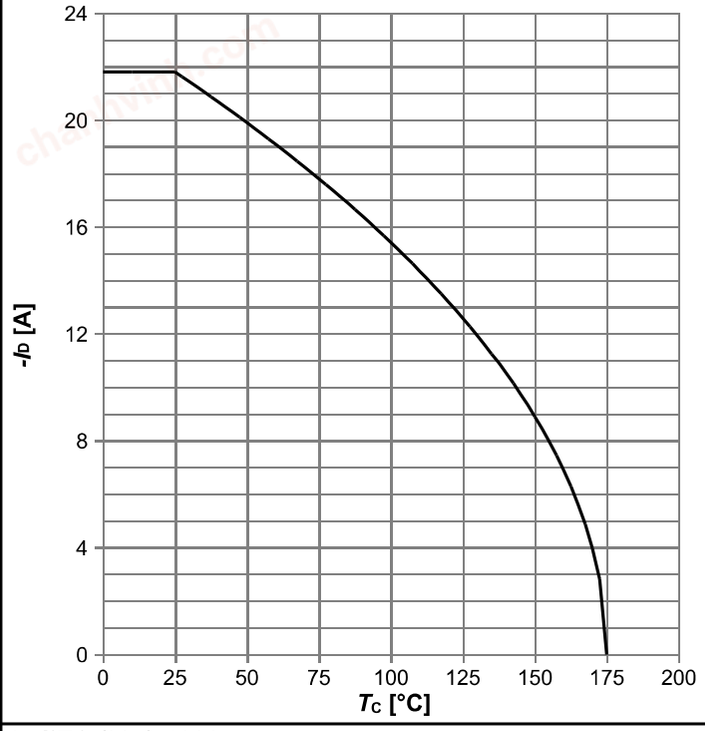
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



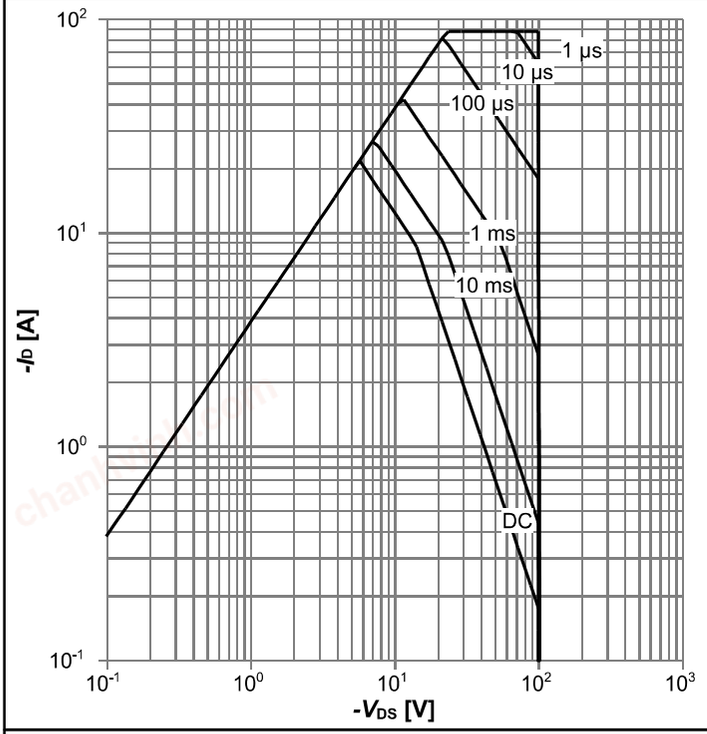
$P_{tot}=f(T_C)$

Diagram 2: Drain current



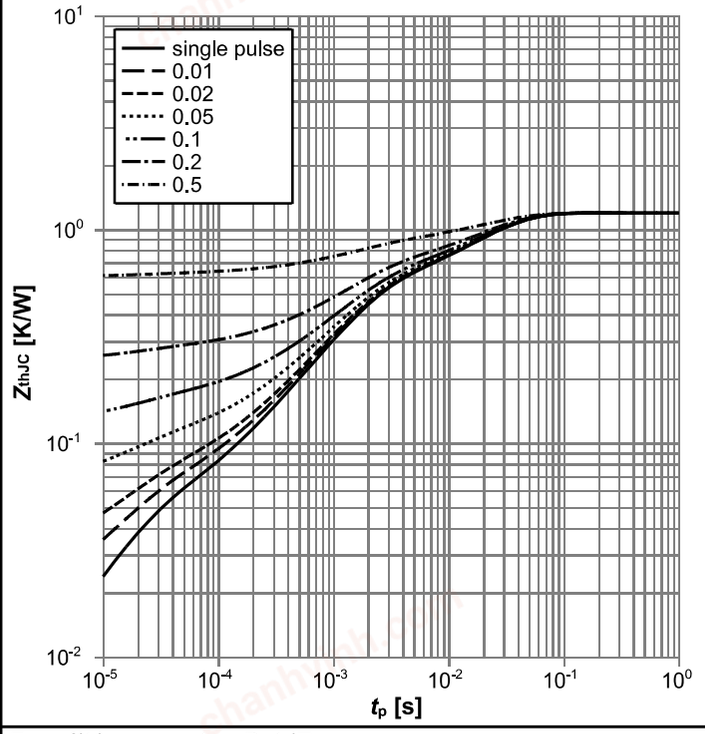
$I_D=f(T_C)$; $|V_{GS}|\geq 10$ V

Diagram 3: Safe operating area



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

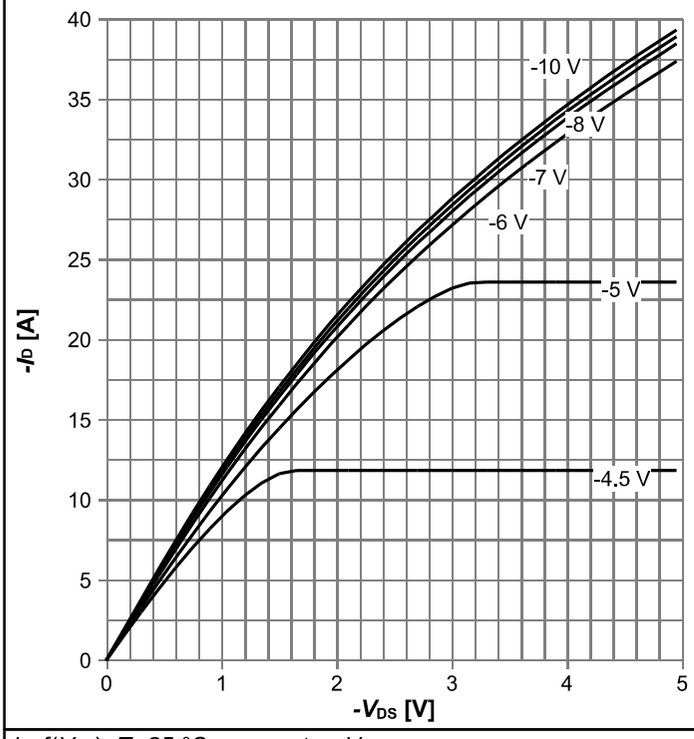
Diagram 4: Max. transient thermal impedance



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

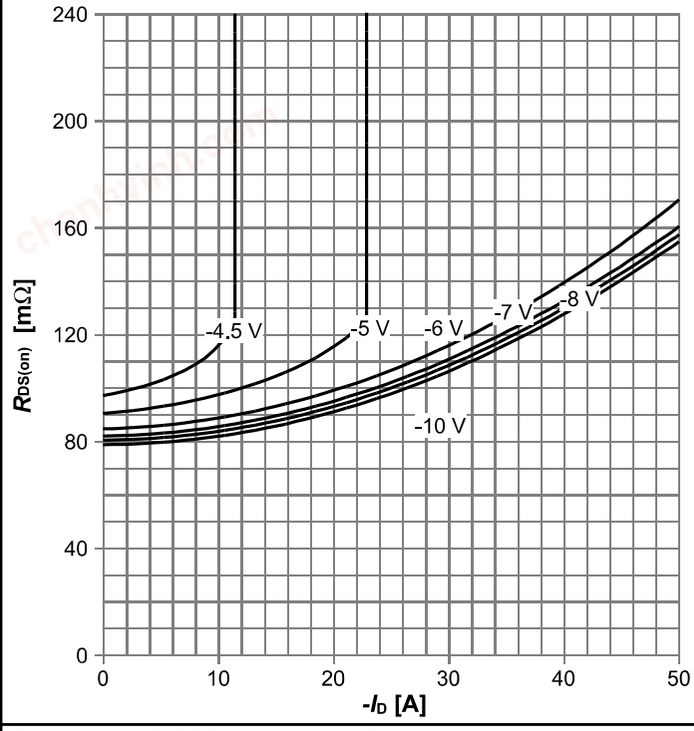
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Diagram 5: Typ. output characteristics



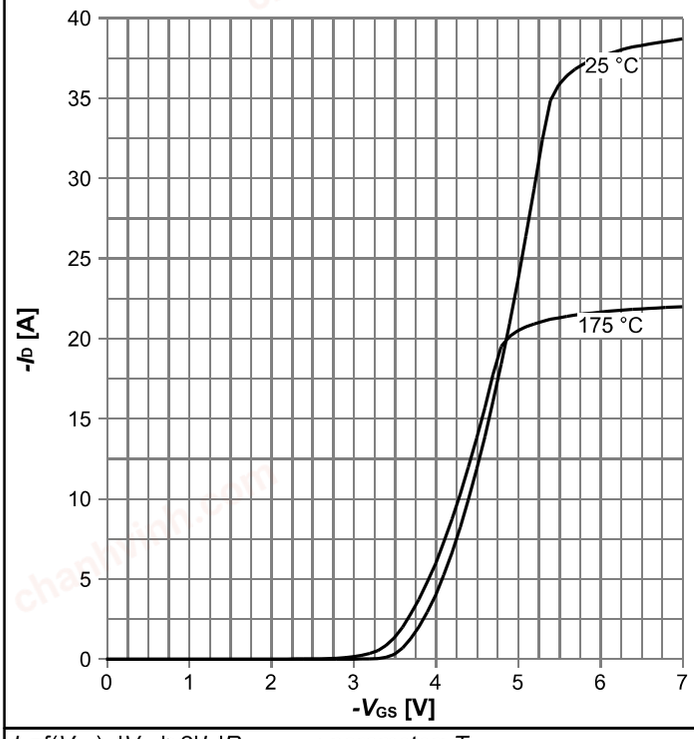
$I_D=f(V_{DS})$, $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



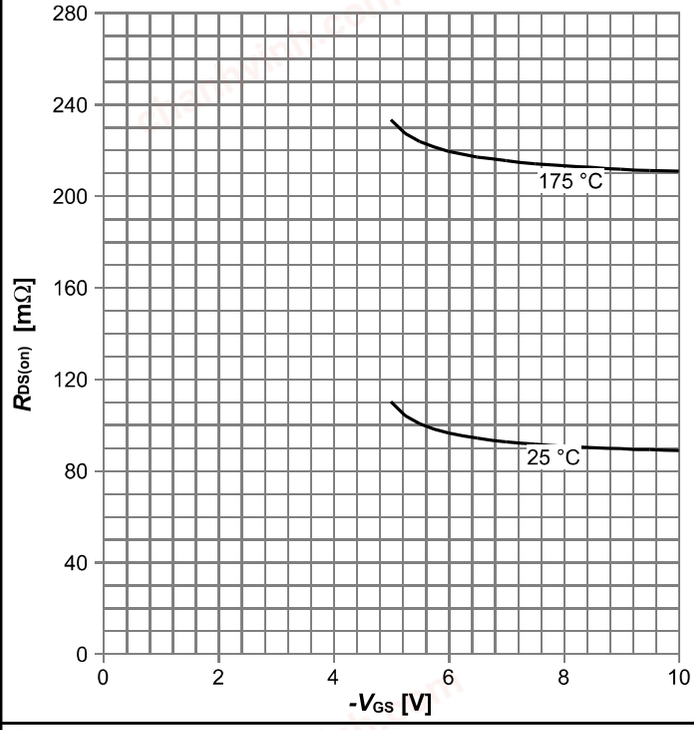
$R_{DS(on)}=f(I_D)$, $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



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

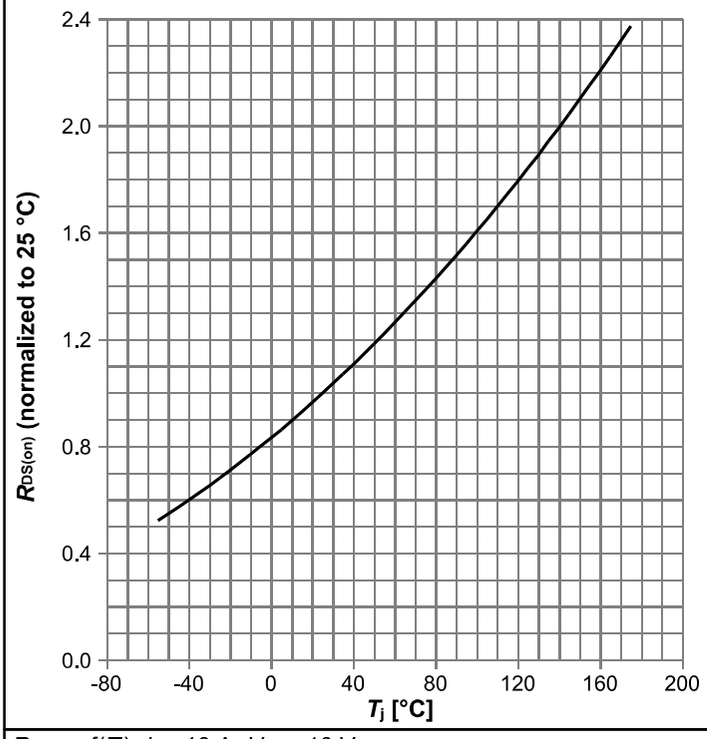
Diagram 8: Typ. drain-source on resistance



$R_{DS(on)}=f(V_{GS})$, I_D=-18 A; parameter: T_j

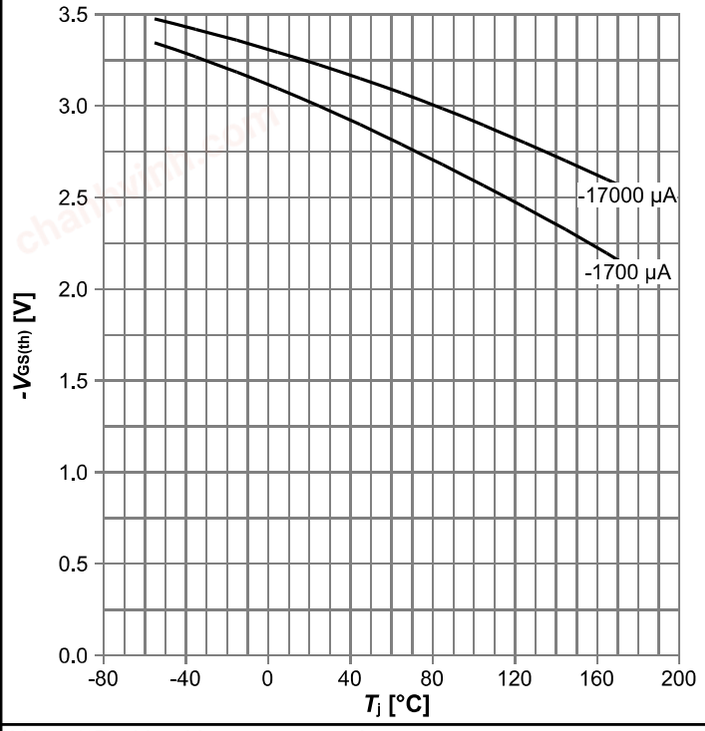
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Diagram 9: Normalized drain-source on resistance



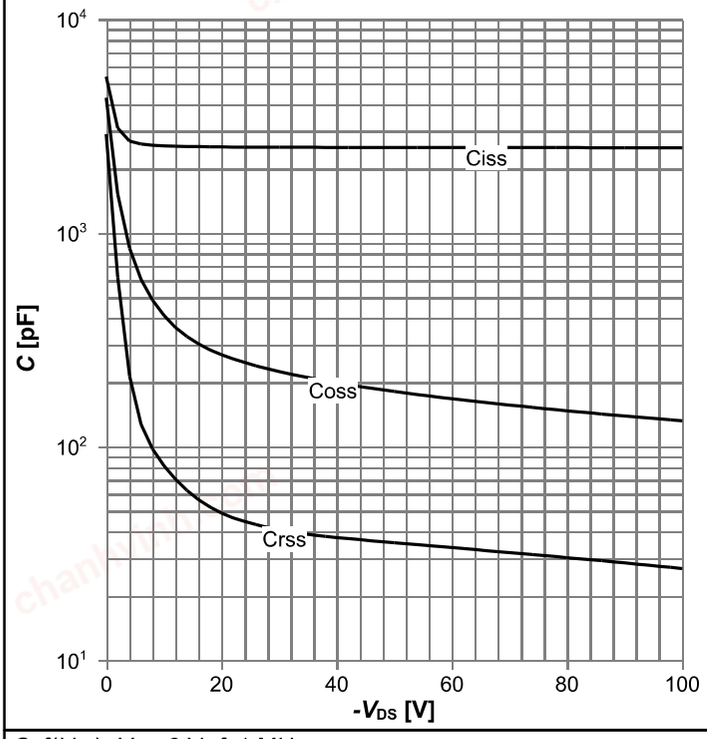
$R_{DS(on)}$=f(T_j), I_D=-18 A, V_{GS}=-10 V

Diagram 10: Typ. gate threshold voltage



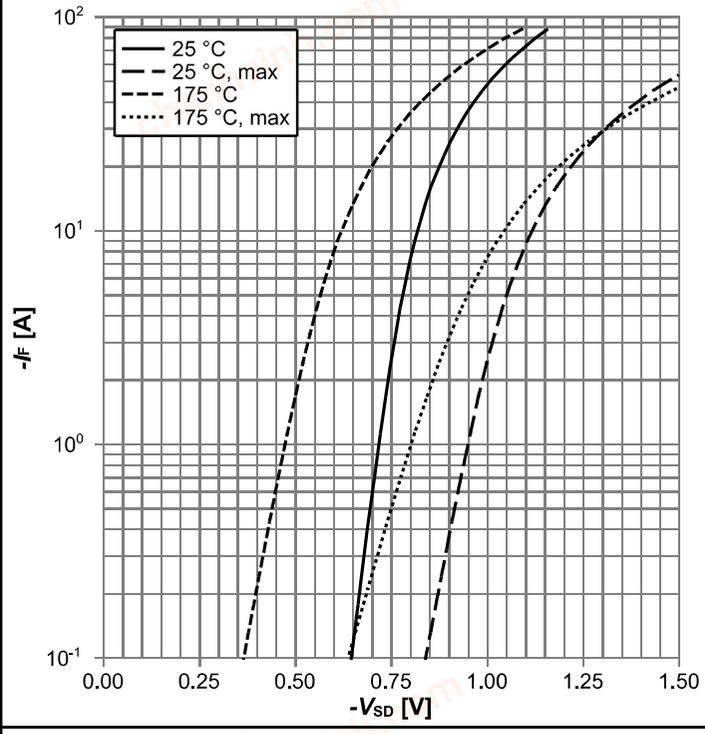
$V_{GS(th)}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



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

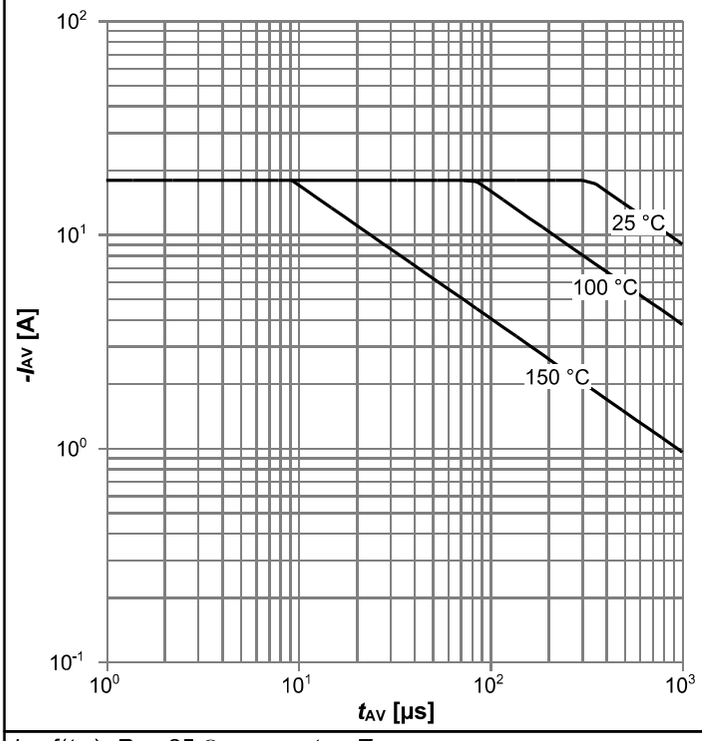
Diagram 12: Forward characteristics of reverse diode



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

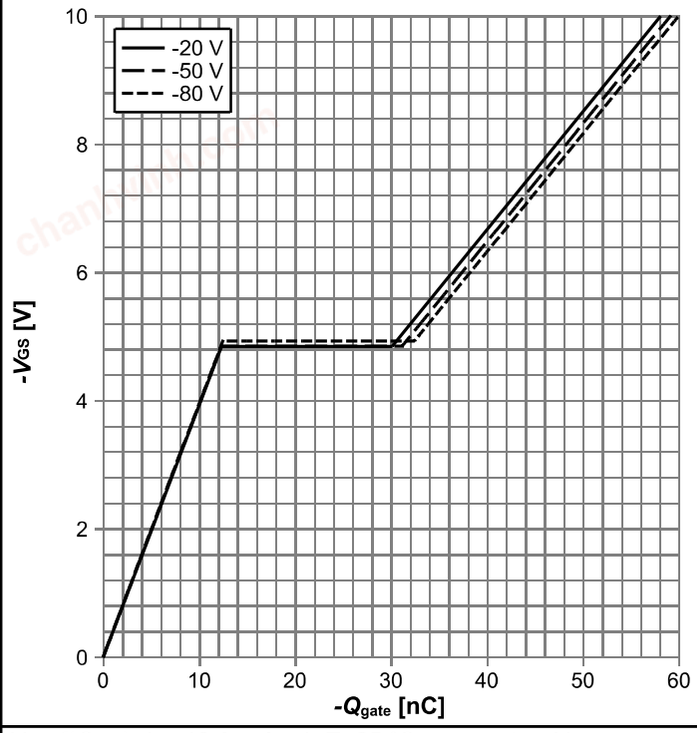
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Diagram 13: Avalanche characteristics



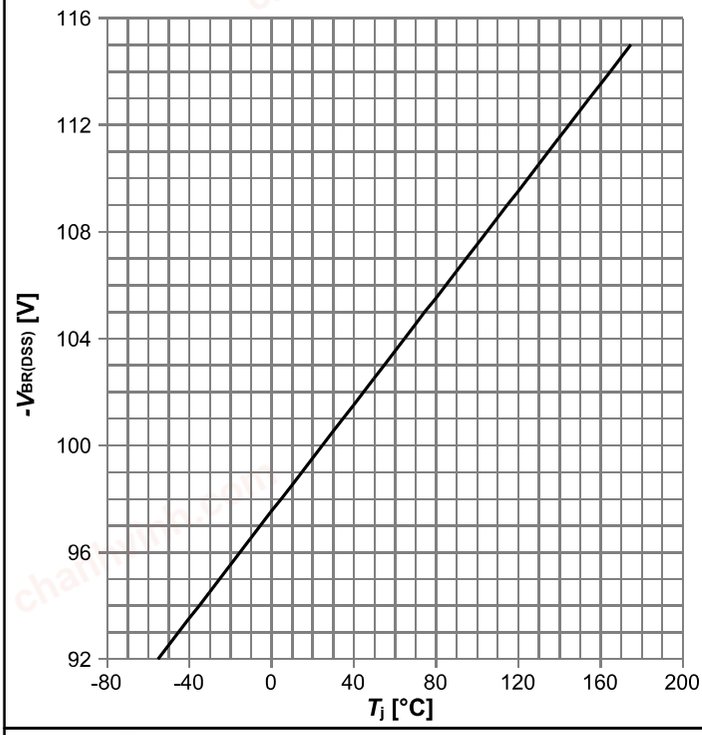
$I_{AS}=f(t_{AV})$; R_{GS}=25 Ω; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



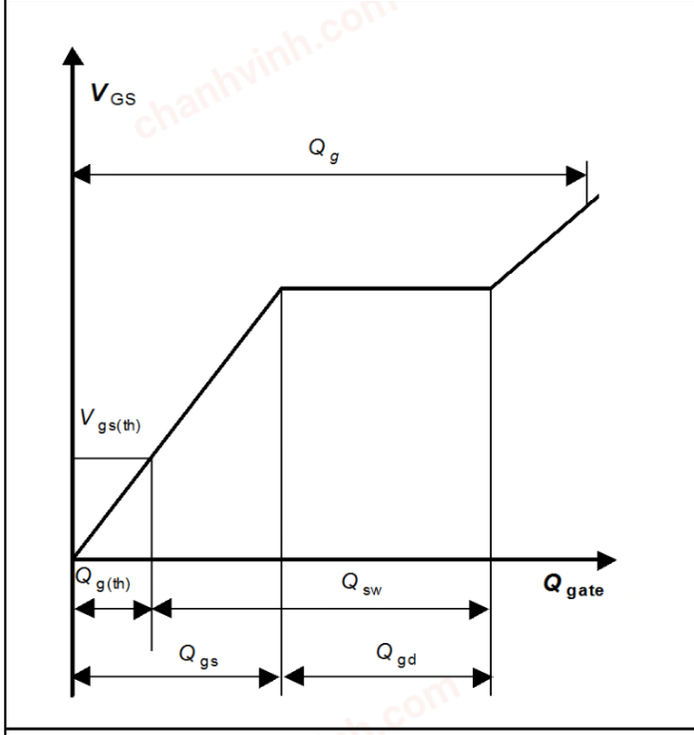
$V_{GS}=f(Q_{gate})$, I_D=-18 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



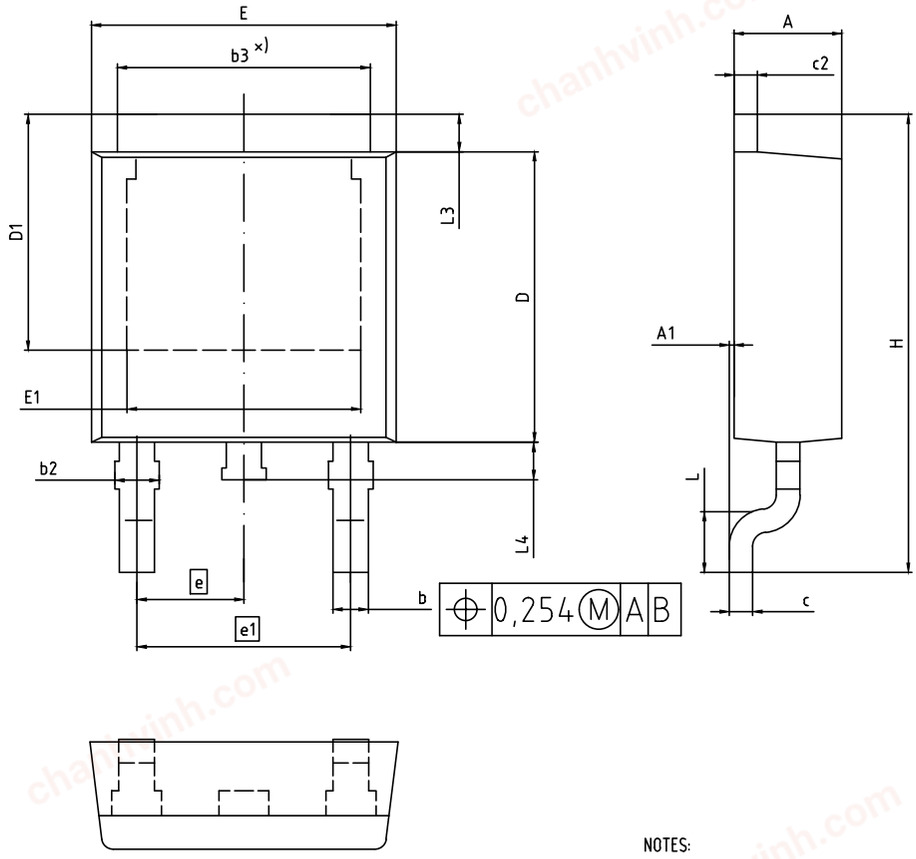
$V_{BR(DSS)}=f(T_j)$; I_D=-1 mA

Diagram Gate charge waveforms



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5 Package Outlines



NOTES:

1. INDUSTRIAL QUALITY GRADE
2. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2,16	2,41	0,085	0,095
A1	0.00	0.15	0.000	0.006
b	0,64	0,89	0,025	0,035
b2	0,65	1,15	0,026	0,045
b3	4,95	5,50	0,195	0,217
c	0,46	0,61	0,018	0,024
c2	0,40	0,98	0,016	0,039
D	5,97	6,22	0,235	0,245
D1	5,02	5,84	0,198	0,230
E	6,35	6,73	0,250	0,265
E1	4,32	5,21	0,185	0,205
e	2,29 (BSC)		0,090 (BSC)	
e1	4,57 (BSC)		0,180 (BSC)	
N	3		3	
H	9,40	10,48	0,370	0,413
L	1,18	1,78	0,046	0,070
L3	0,89	1,27	0,035	0,050
L4	0,51	1,02	0,020	0,040

DOCUMENT NO.	Z8B00003328
SCALE	0, 2.5, 0, 2.5, 5mm
EUROPEAN PROJECTION	
ISSUE DATE	05-02-2016
REVISION	06

Figure 1 Outline PG-TO252-3, dimensions in mm/inches

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Revision History

IPD11DP10NM

Revision: 2021-05-10, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2021-05-10	Release of final version

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