MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™ Power-Transistor, 120V

OptiMOS™ 3 Power-Transistor
IPD_S110N12N3 G

Data Sheet

Rev. 2.4
Final

Industrial & Multimarket

OptiMOS™3Power-Transistor

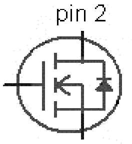
Product Summary

V_{DS}	120	V
$R_{DS(on),max}$	11	mΩ
I_D	75	A

Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 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 *
- Ideal for high-frequency switching and synchronous rectification

Type	IPS110N12N3 G	IPD110N12N3 G
		
Package	PG-TO251-3	PG-TO252-3
Marking	110N12N	110N12N



Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	**Symbol**	**Conditions**	**Value**	**Unit**
Continuous drain current	I_D	T_C=25 °C	75	A
		T_C=100 °C	54	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C=25 °C	300	
Avalanche energy, single pulse	E_{AS}	I_D=75 A, R_{GS}=25 Ω	120	mJ
Gate source voltage[3)]	V_{GS}		±20	V
	P_{tot}	T_C=25 °C	136	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

1) J-STD20 and JESD22

2) see figure 3

3) T_{jmax}=150°C and duty cycle D=0.01 for V_{gs}<-5V

* Except package TO251-3

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.1	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint	-	-	75	
		6 cm^2 cooling area[4)]	-	-	50	
Electrical characteristics, at T_j=25 °C, unless otherwise specified						
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	120	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=83 µA	2	3	4	
Zero gate voltage drain current	I_{DSS}	V_{DS}=100 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=100 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=75 A	-	9.2	11	mΩ
Gate resistance	R_G		-	1.5	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=75 A	42	83	-	S

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

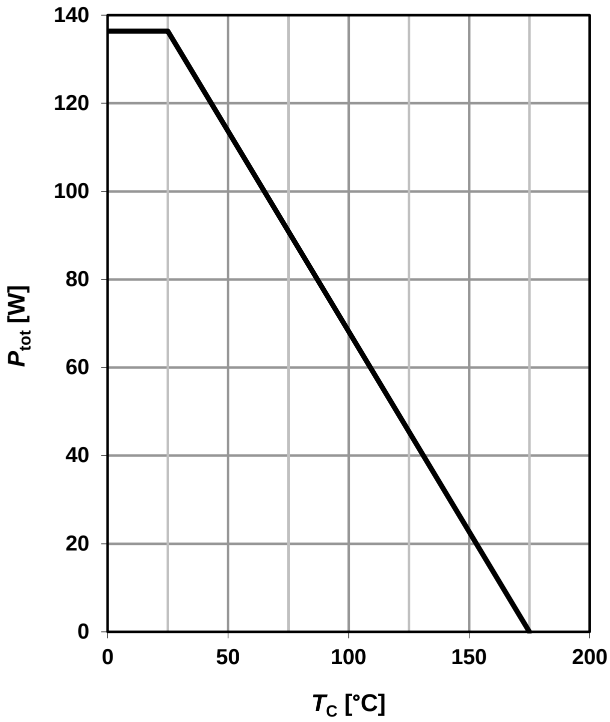
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics[6]						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=60 V, f=1 MHz	-	3240	4310	pF
Output capacitance	C_{oss}		-	408	543	
Reverse transfer capacitance	C_{rss}		-	22	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=60 V, V_{GS}=10 V, I_D=75 A, $R_{G,ext}$=1.6 Ω	-	16	-	ns
Rise time	t_r		-	16	-	
Turn-off delay time	$t_{d(off)}$		-	24	-	
Fall time	t_f		-	8	-	
Gate Charge Characteristics[5]						
Gate to source charge	Q_{gs}	V_{DD}=60 V, I_D=75 A, V_{GS}=0 to 10 V	-	18	-	nC
Gate to drain charge	Q_{gd}		-	12	-	
Switching charge	Q_{sw}		-	20	-	
Gate charge total[6]	Q_g		-	49	65	
Gate plateau voltage	$V_{plateau}$		-	5.6	-	V
Output charge[6]	Q_{oss}	V_{DD}=60 V, V_{GS}=0 V	-	56	75	nC
Reverse Diode						
Diode continous forward current	I_S	T_C=25 °C	-	-	75	A
Diode pulse current	$I_{S,pulse}$		-	-	300	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=75 A, T_j=25 °C	-	1	1.2	V
	t_{rr}	V_R=60 V, I_F=I_S, di_F/dt=100 A/µs	-	90		ns
Reverse recovery charge	Q_{rr}		-	249		nC

[5] See figure 16 for gate charge parameter definition

[6] Defined by design. Not subject to production test

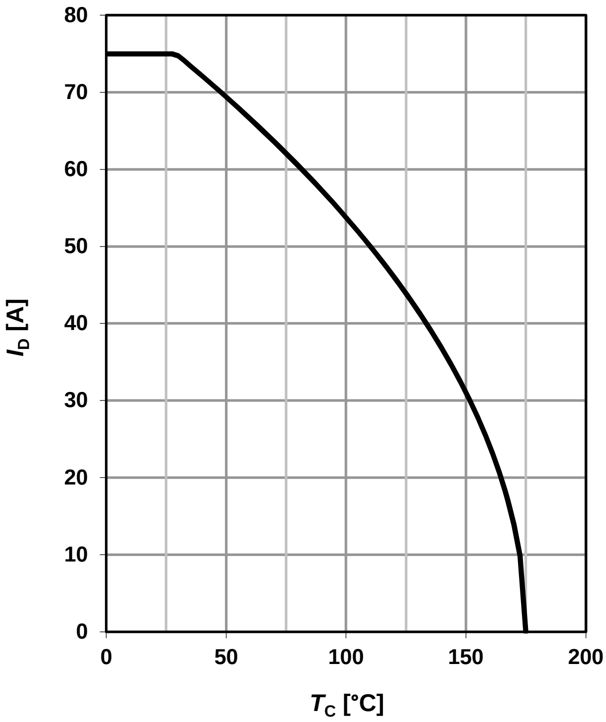
1 Power dissipation

P_{tot}=f(T_C)



2 Drain current

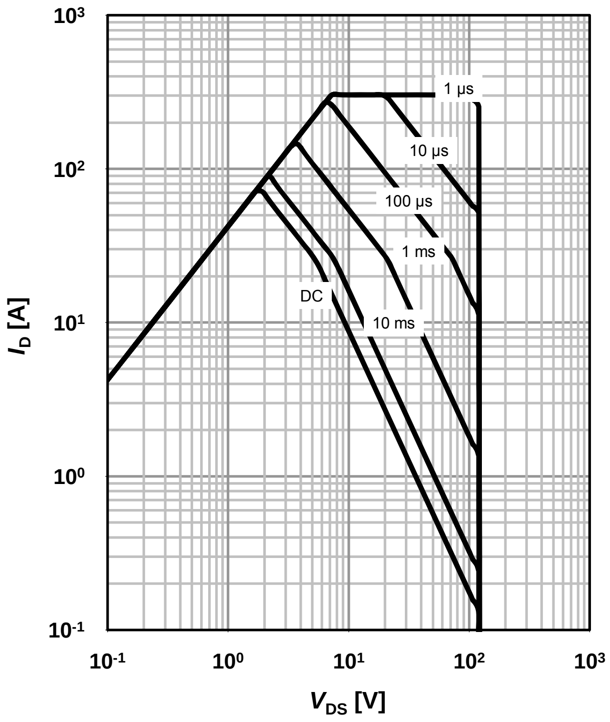
I_D=f(T_C); V_{GS}≥10 V



3 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

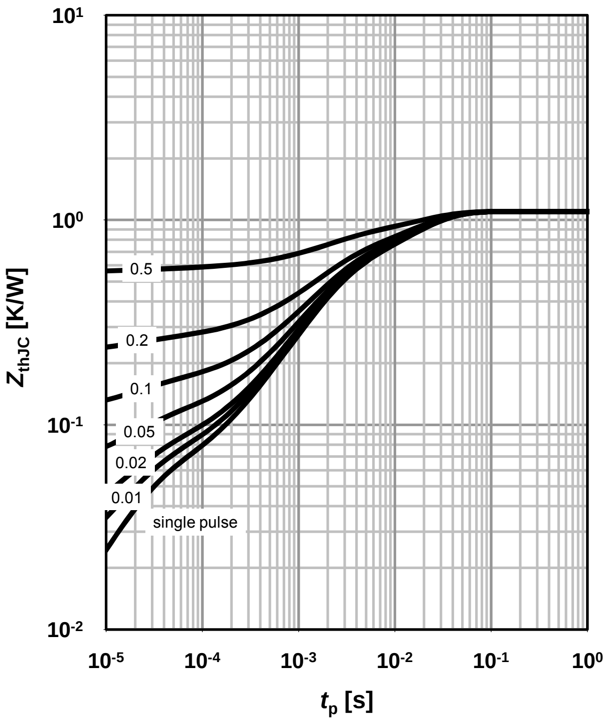
parameter: t_p



4 Max. transient thermal impedance

Z_{thJC}=f(t_p)

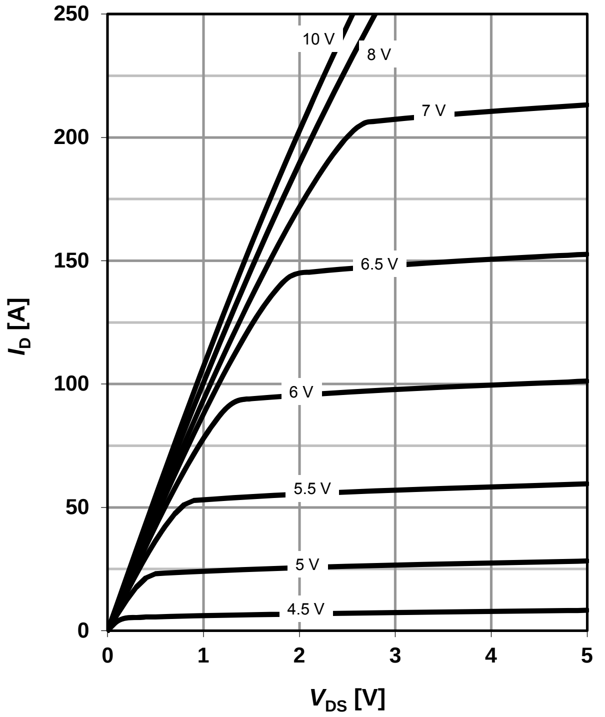
parameter: D=t_p/T



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C

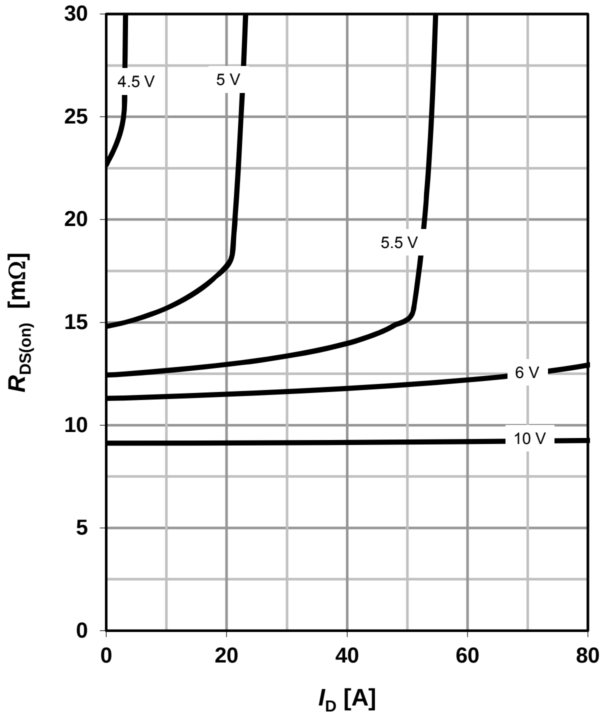
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}$=f(I_D); T_j=25 °C

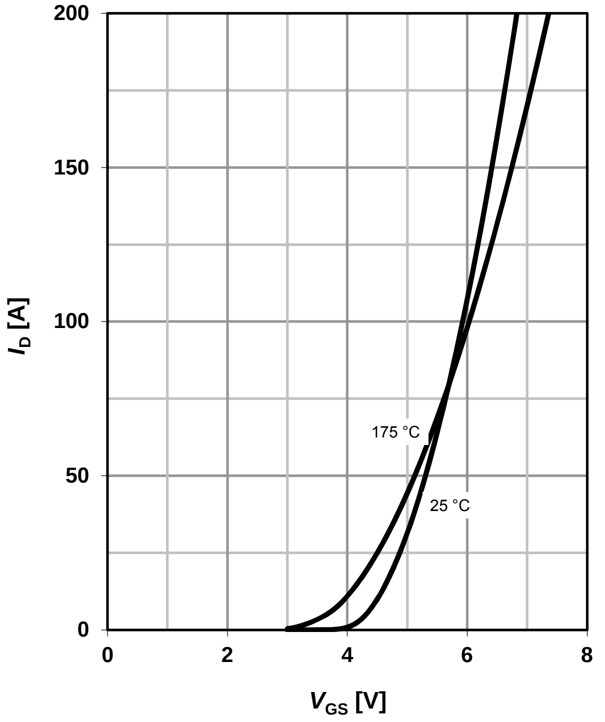
parameter: V_{GS}



7 Typ. transfer characteristics

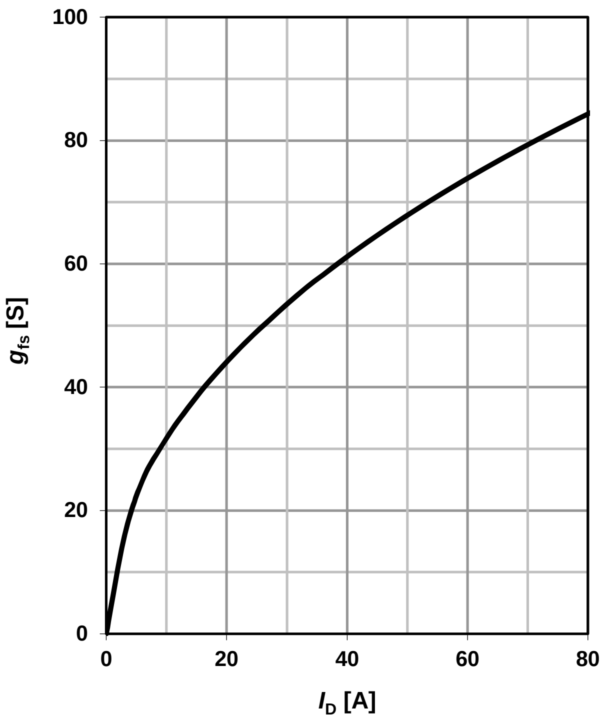
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$

parameter: T_j



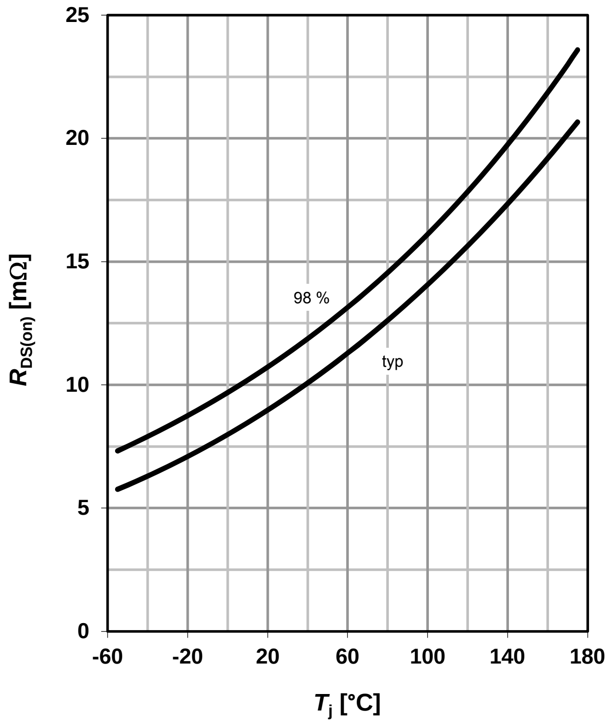
8 Typ. forward transconductance

g_{fs}=f(I_D); T_j=25 °C



9 Drain-source on-state resistance

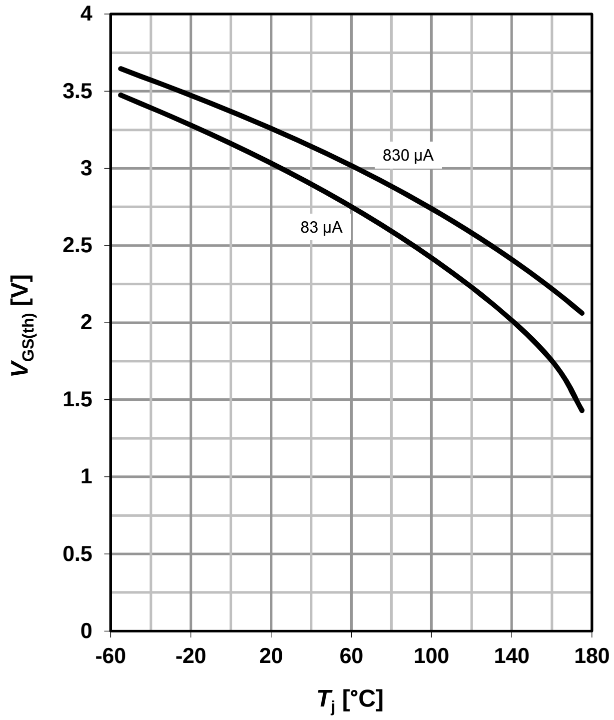
$R_{DS(on)}$=f(T_j); I_D=75 A; V_{GS}=10 V



10 Typ. gate threshold voltage

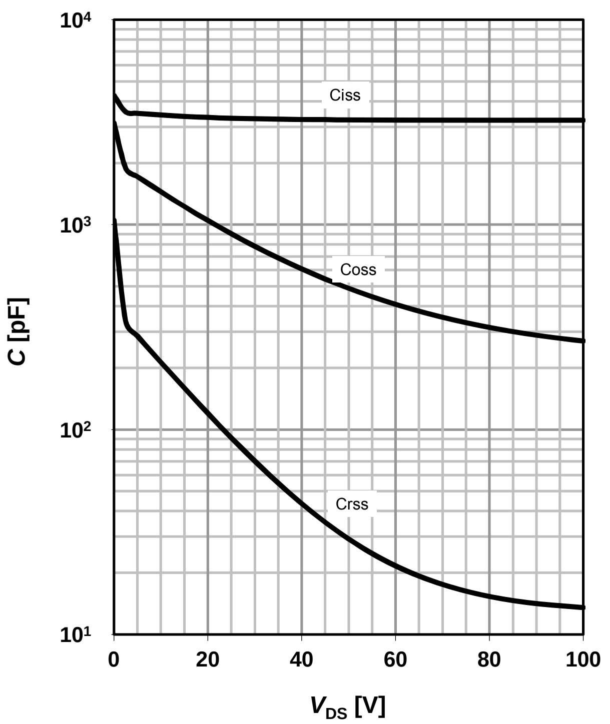
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}

parameter: I_D



11 Typ. capacitances

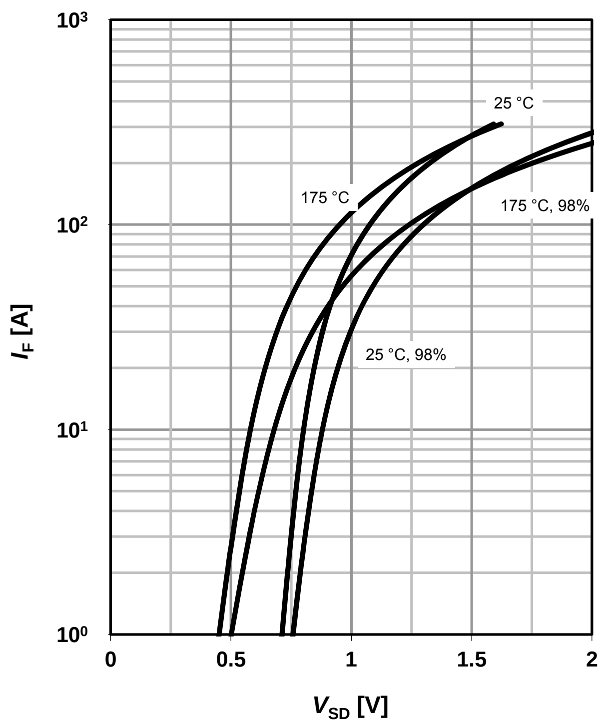
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

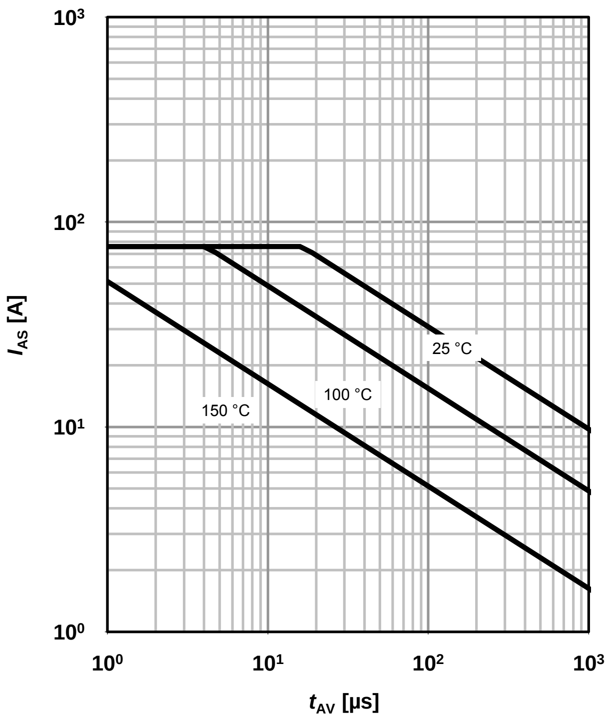
parameter: T_j



13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

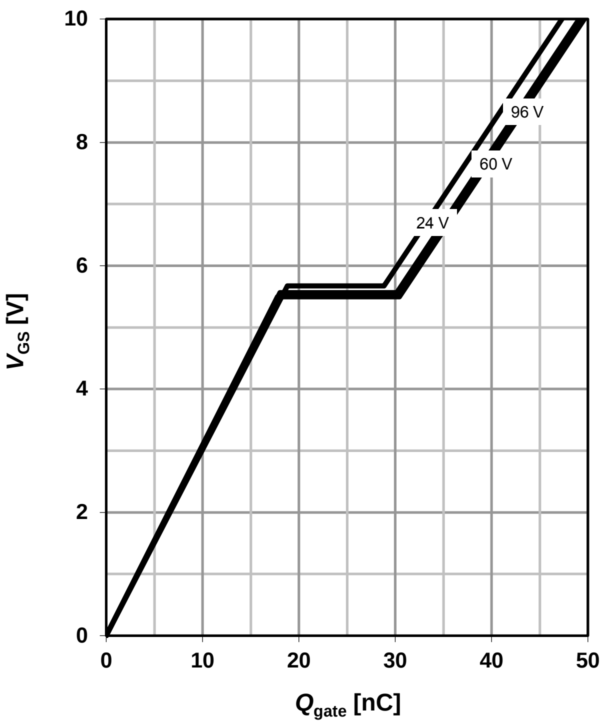
parameter: $T_{j(start)}$



14 Typ. gate charge

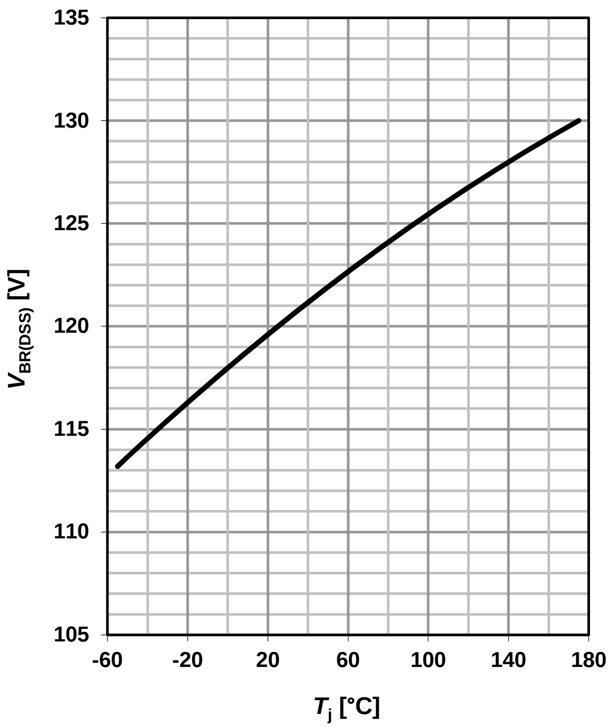
V_{GS}=f(Q_{gate}); I_D=67 A pulsed

parameter: V_{DD}

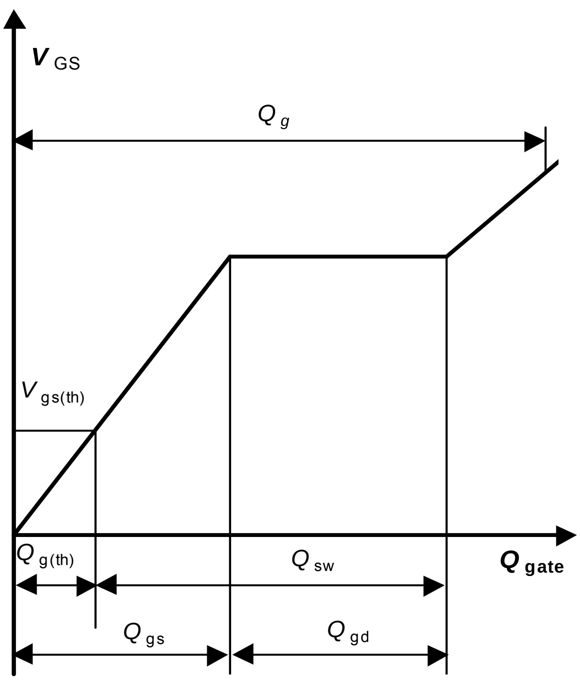


15 Drain-source breakdown voltage

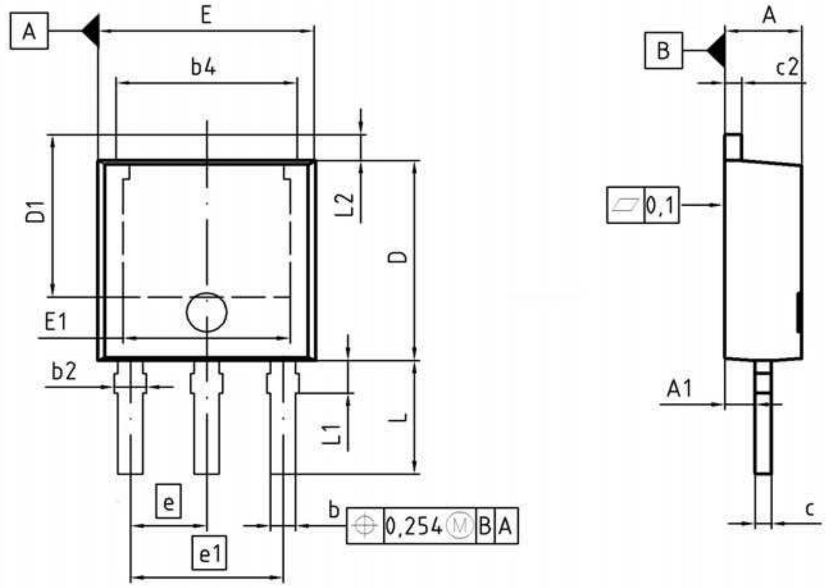
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



16 Gate charge waveforms



PG-TO-251SL : Outline

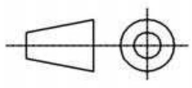


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.18	2.39	0.086	0.094
A1	0.80	1.14	0.031	0.045
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b4	4.95	5.50	0.195	0.217
c	0.46	0.58	0.018	0.023
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.04	5.44	0.198	0.214
E	6.35	6.73	0.250	0.265
E1	4.90	5.10	0.193	0.201
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
L	3.40	3.60	0.134	0.142
L1	0.90	1.10	0.035	0.043
L2	0.90	1.10	0.035	0.043

DOCUMENT NO.
Z8B00003329

SCALE 0 2.0 4mm

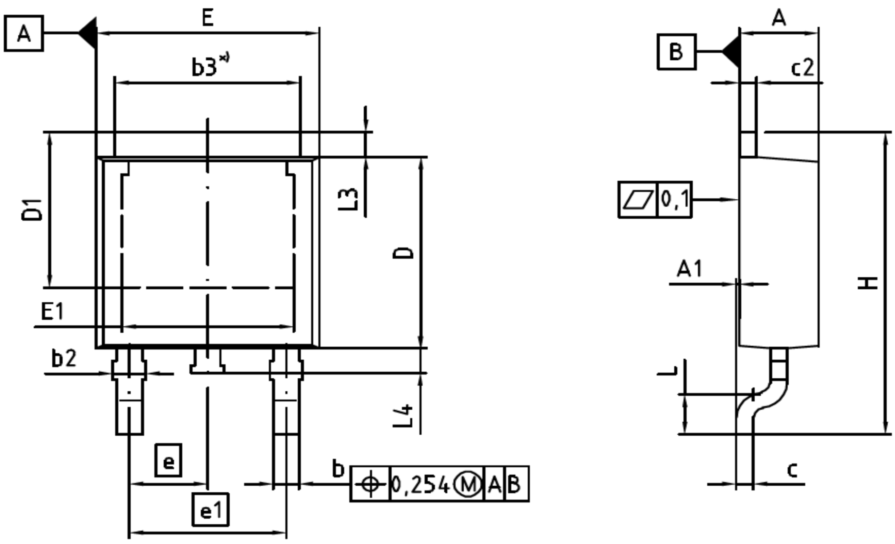
EUROPEAN PROJECTION

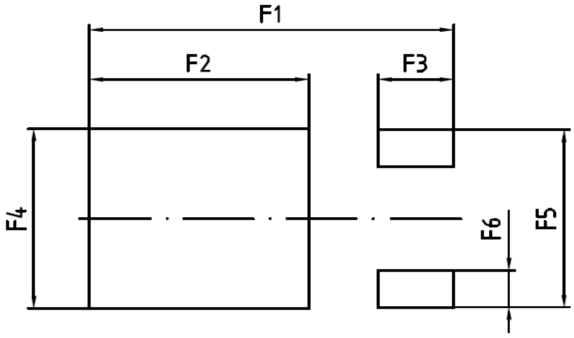


ISSUE DATE
17-01-2008

REVISION
03

PG-TO252-3: Outline





*) mold flash not included

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	5.00	5.50	0.197	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.98	0.018	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.40	6.73	0.252	0.265
E1	4.70	5.21	0.185	0.205
e	2.29 (BSC)		0.090 (BSC)	
e1	4.57		0.180	
N	3		3	
H	9.40	10.48	0.370	0.413
L	1.18	1.70	0.046	0.067
L3	0.90	1.25	0.035	0.049
L4	0.51	1.00	0.020	0.039
F1	10.60		0.417	
F2	6.40		0.252	
F3	2.20		0.087	
F4	5.80		0.228	
F5	5.76		0.227	
F6	1.20		0.047	

DOCUMENT NO.
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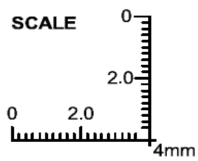
SCALE



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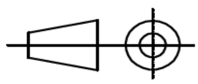

ISSUE DATE
16-02-2011

REVISION
04

Revision History

IPD_S110N12N3 G

Revision: 2015-07-16, Rev. 2.4

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.4	2015-07-16	Update VGS(th) and package outline TO252-3

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