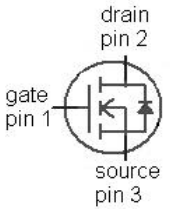
OptiMOS™2 Power-Transistor

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
- Ideal for high-frequency switching and synchronous rectification
- Halogen-free according to IEC61249-2-21

Product Summary

V_{DS}	100	V
$R_{DS(on),max}$ (TO252)	12.4	mΩ
I_D	67	A



RoHS

Halogen-Free

Type	IPB12CN10N G	IPD12CN10N G	IPI12CN10N G	IPP12CN10N G
				
Package	PG-TO263-3	PG-TO252-3	PG-TO262-3	PG-TO220-3
Marking	12CN10N	12CN10N	12CN10N	12CN10N

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C	67	A
		T_C=100 °C	48	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	268	
Avalanche energy, single pulse	E_{AS}	I_D=67 A, R_{GS}=25 Ω	154	mJ
Reverse diode dv/dt	dv/dt	I_D=67 A, V_{DS}=80 V, di/dt=100 A/µs, $T_{j,max}$=175 °C	6	kV/µs
Gate source voltage[3]	V_{GS}		±20	V
Power dissipation	P_{tot}	T_C=25 °C	125	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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.2	K/W
Thermal resistance, junction - ambient (TO220, TO262, TO263)	R_{thJA}	minimal footprint	-	-	62	
		6 cm2 cooling area[4)]	-	-	40	
Thermal resistance, junction - ambient (TO252)		minimal footprint	-	-	75	
		6 cm2 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	100	-	-	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}=80 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=80 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=67 A, (TO252)	-	9.3	12.4	mΩ
		V_{GS}=10 V, I_D=67 A, (TO263)	-	9.5	12.6	
		V_{GS}=10 V, I_D=67 A, (TO220, TO262)	-	9.8	12.9	
Gate resistance	R_G		-	1.5	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=67 A	39	77	-	S

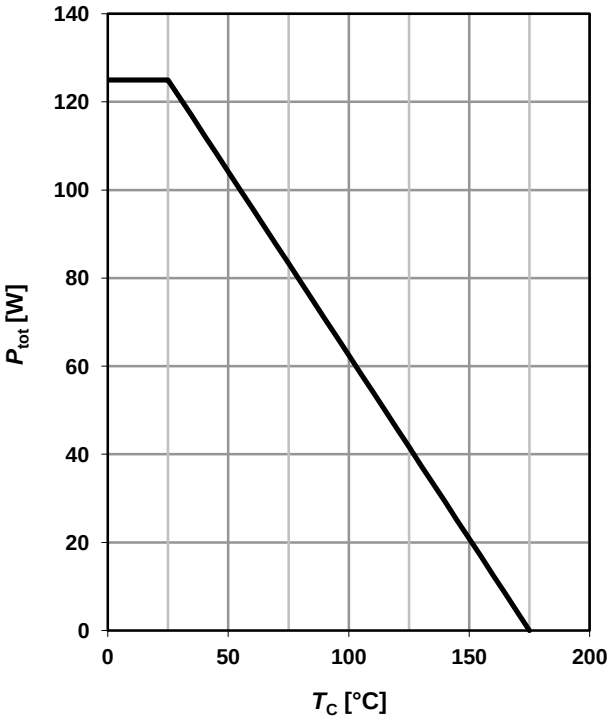
[4)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz	-	3250	4320	pF
Output capacitance	C_{oss}		-	489	650	
Reverse transfer capacitance	C_{rss}		-	29	44	
Turn-on delay time	$t_{d(on)}$	V_{DD}=50 V, V_{GS}=10 V, I_D=33.5 A, $R_{G,ext}$=1.6 Ω	-	17	26	ns
Rise time	t_r		-	21	32	
Turn-off delay time	$t_{d(off)}$		-	32	48	
Fall time	t_f		-	8	12	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=50 V, I_D=67 A, V_{GS}=0 to 10 V	-	18	24	nC
Gate to drain charge	Q_{gd}		-	12	18	
Switching charge	Q_{sw}		-	20	29	
Gate charge total	Q_g		-	49	65	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V
Output charge	Q_{oss}	V_{DD}=50 V, V_{GS}=0 V	-	52	69	nC
Reverse Diode						
Diode continous forward current	I_S	T_C=25 °C	-	-	67	A
Diode pulse current	$I_{S,pulse}$		-	-	268	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=67 A, T_j=25 °C	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=50 V, I_F=I_S, di_F/dt=100 A/µs	-	105		ns
Reverse recovery charge	Q_{rr}		-	255	-	nC

[5)] See figure 16 for gate charge parameter definition

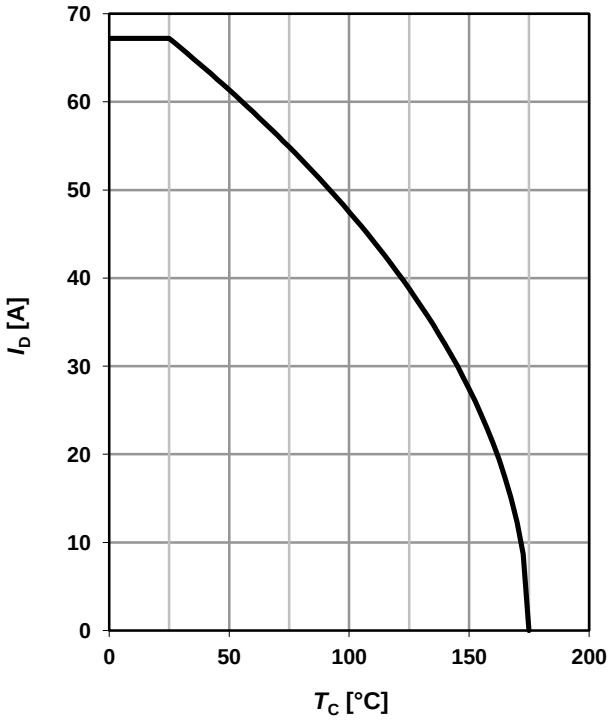
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

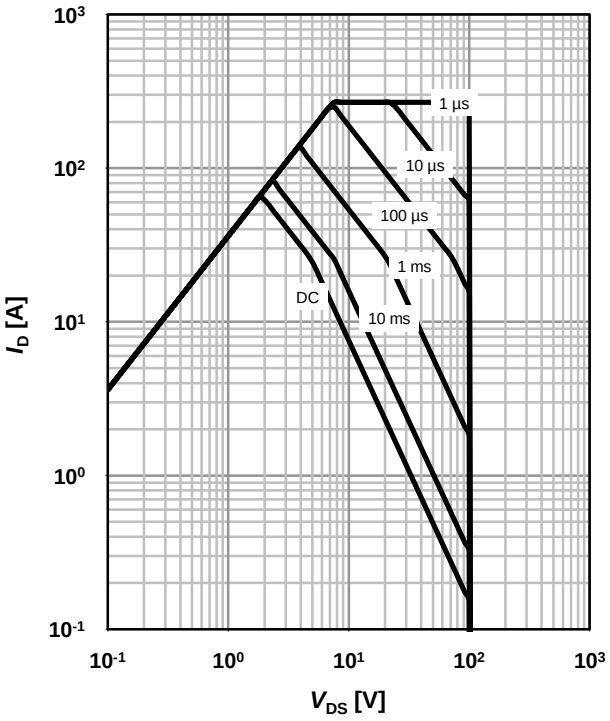
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

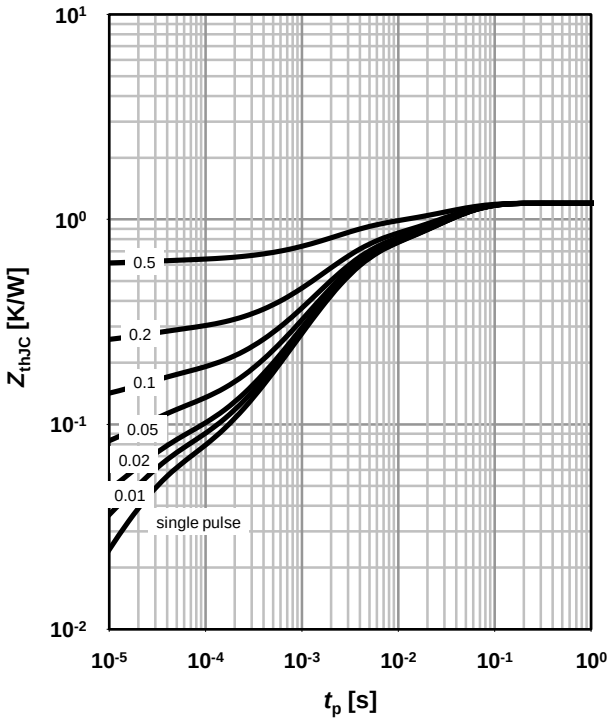
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

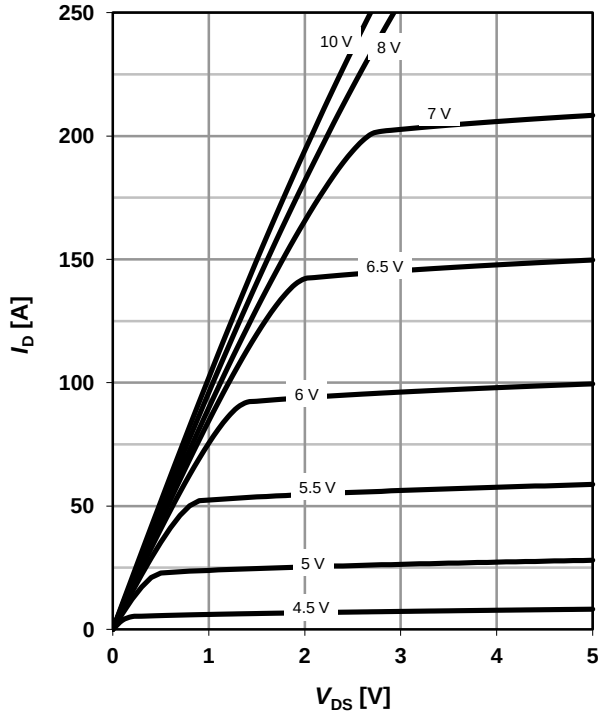
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D=f(V_{DS})$; T_j=25 °C

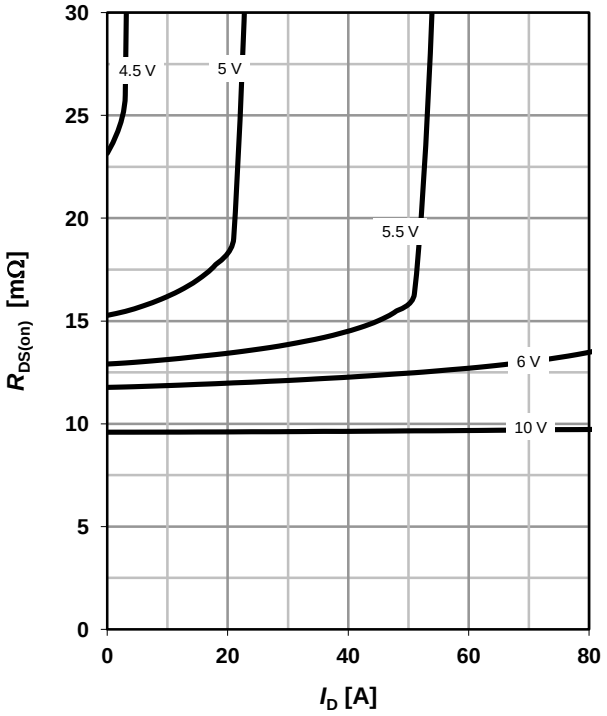
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; T_j=25 °C

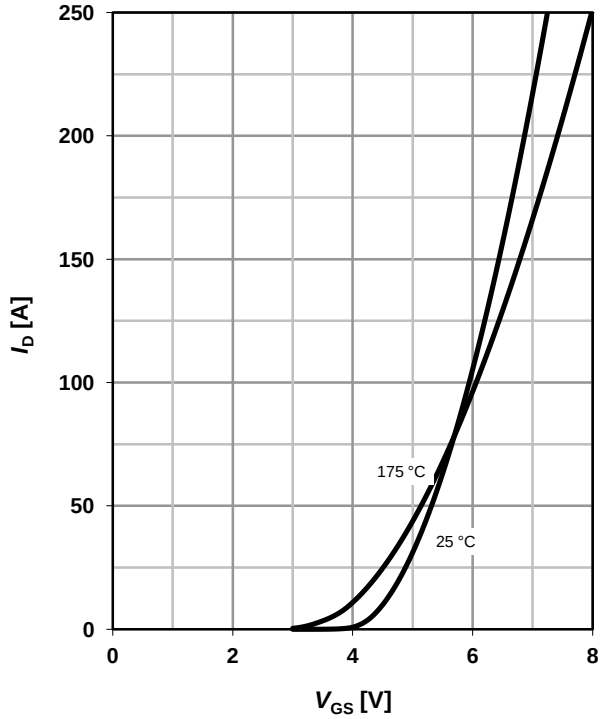
parameter: V_{GS}



7 Typ. transfer characteristics

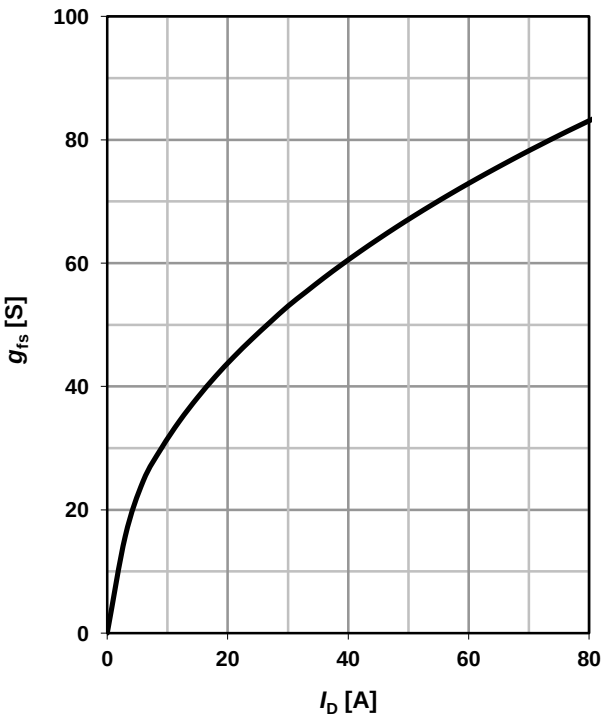
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



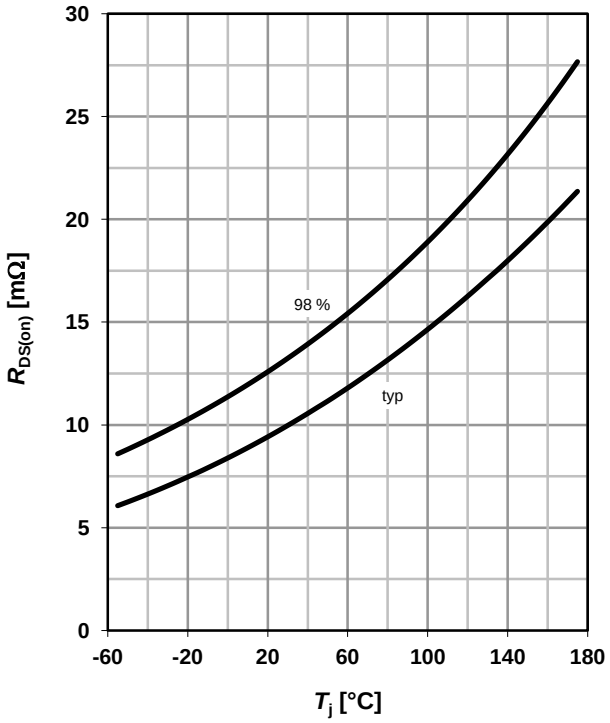
8 Typ. forward transconductance

$g_{fs}=f(I_D)$; T_j=25 °C



9 Drain-source on-state resistance

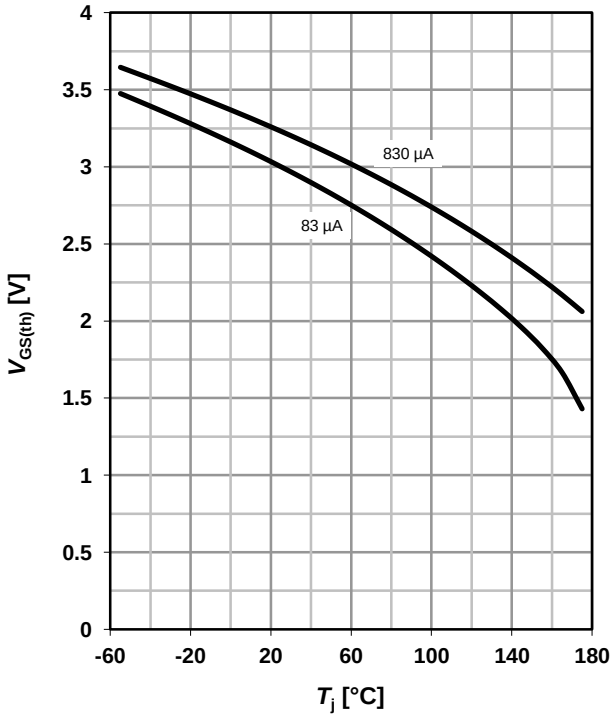
$R_{DS(on)}=f(T_j)$; $I_D=67$ A; $V_{GS}=10$ V



10 Typ. gate threshold voltage

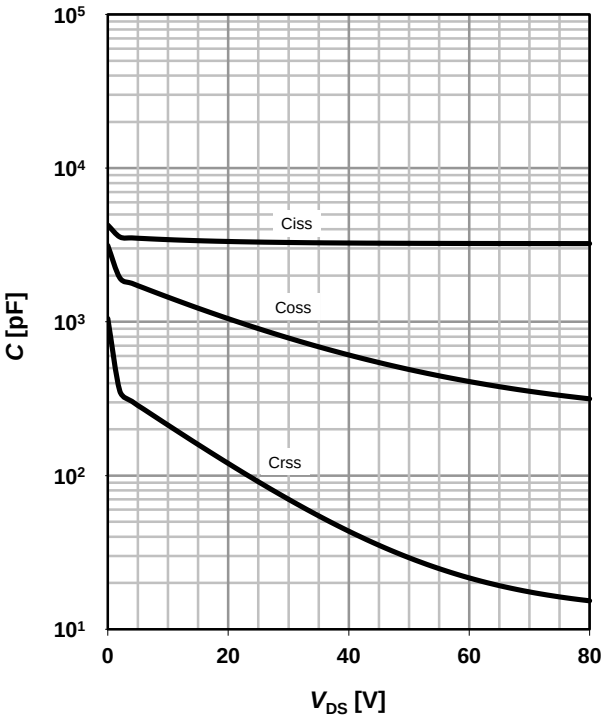
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$

parameter: I_D



11 Typ. capacitances

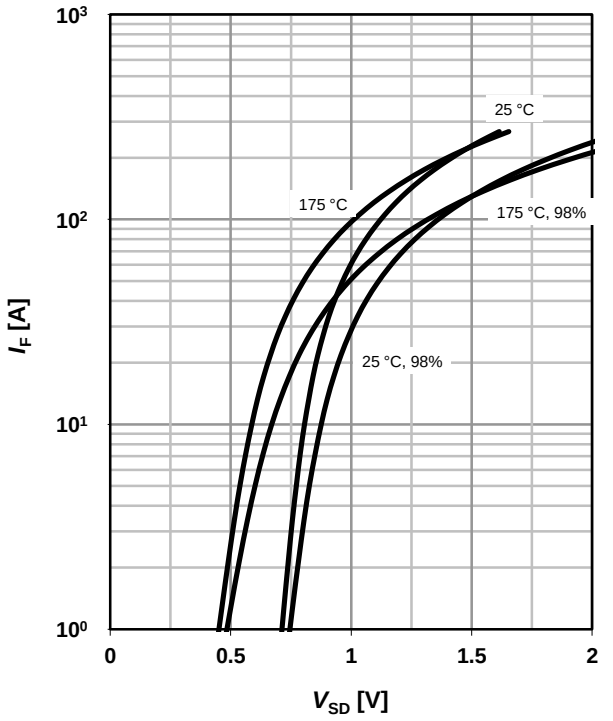
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

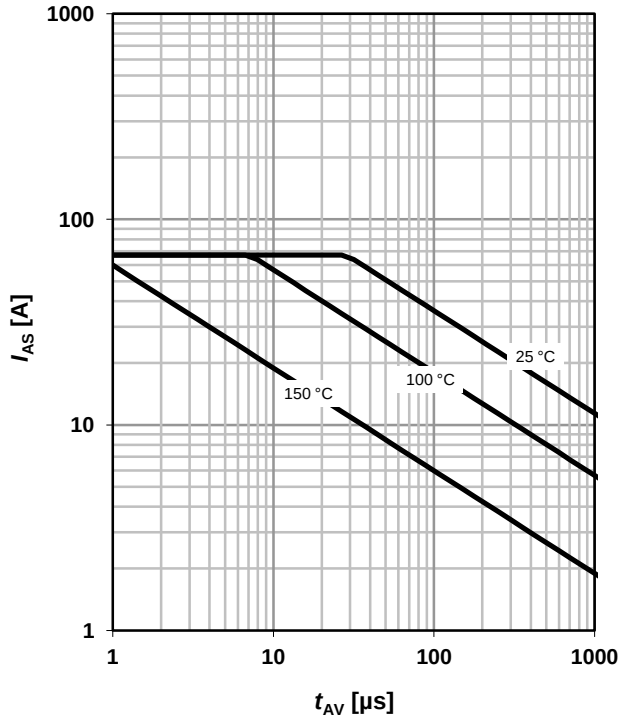
parameter: T_j



13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

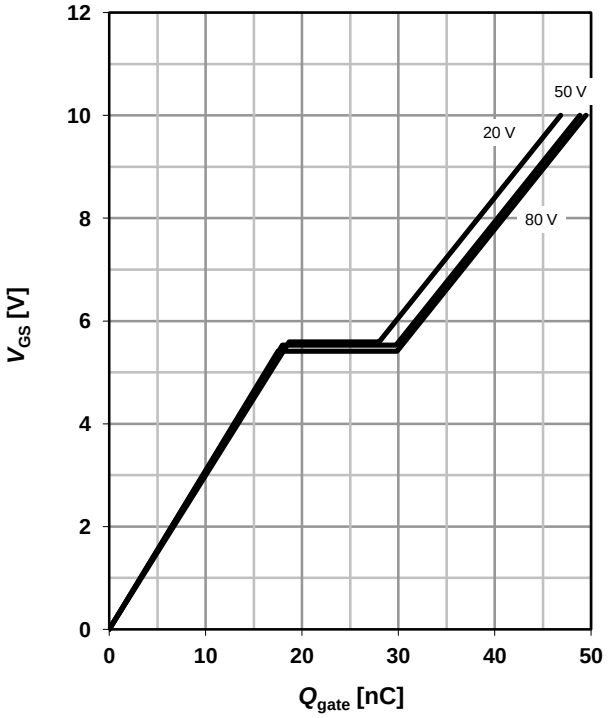
parameter: $T_{j(start)}$



14 Typ. gate charge

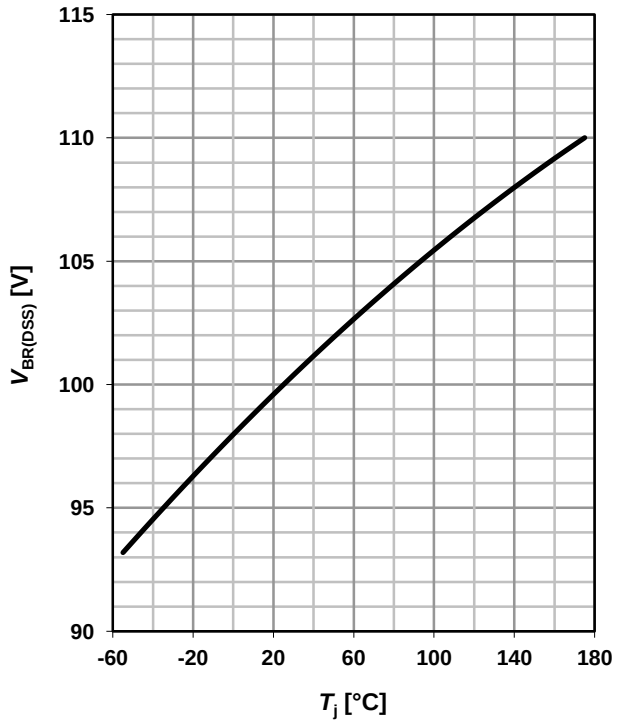
V_{GS}=f(Q_{gate}); I_D=67 A pulsed

parameter: V_{DD}

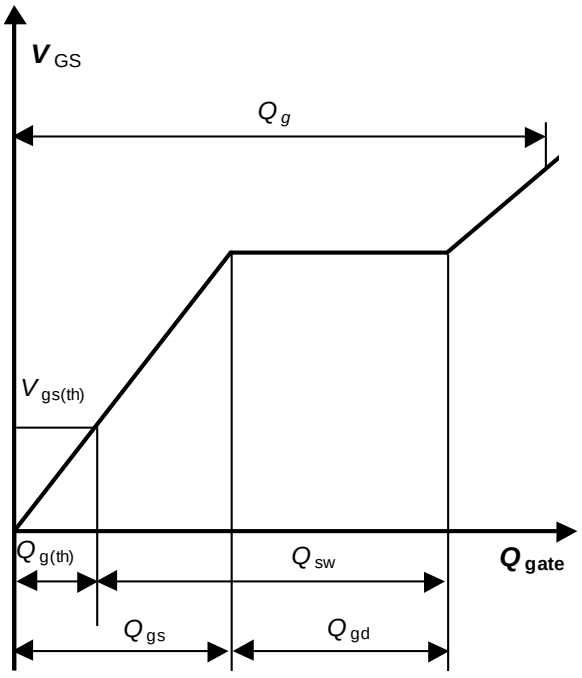


15 Drain-source breakdown voltage

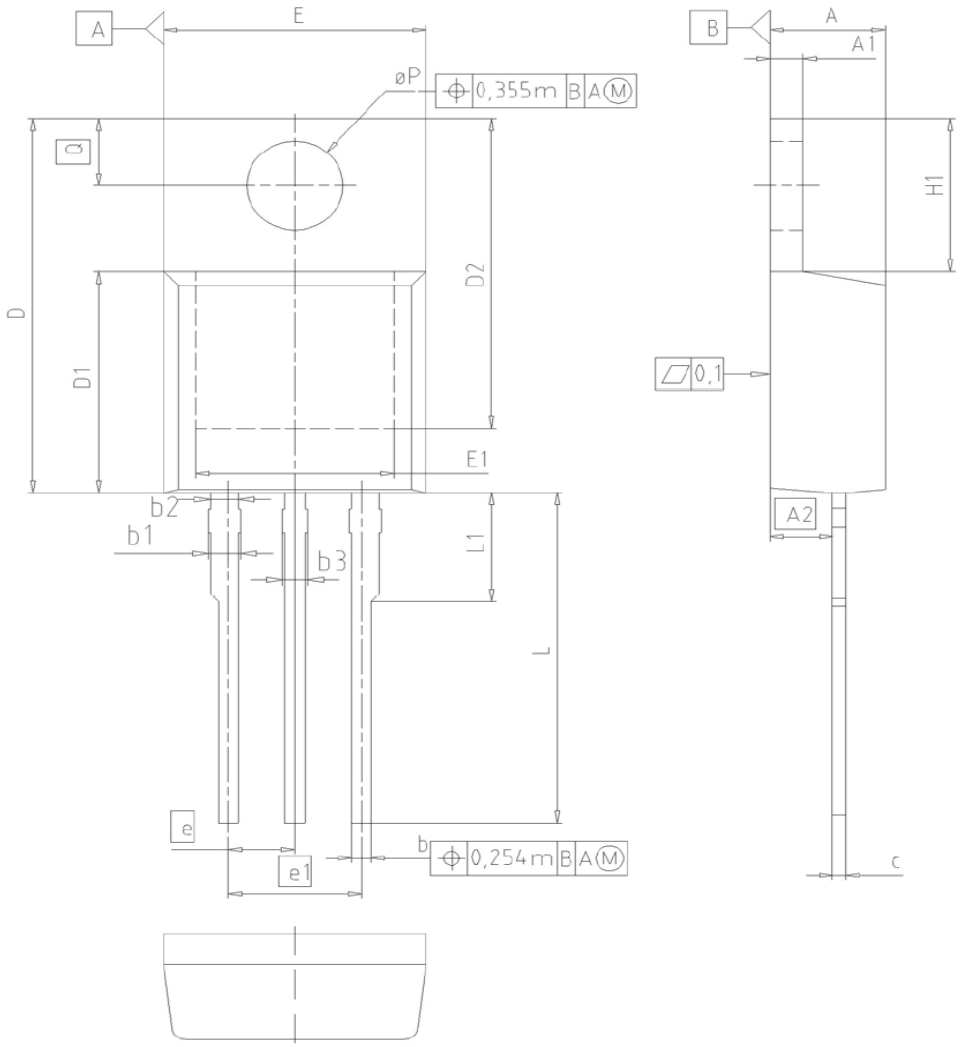
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



16 Gate charge waveforms



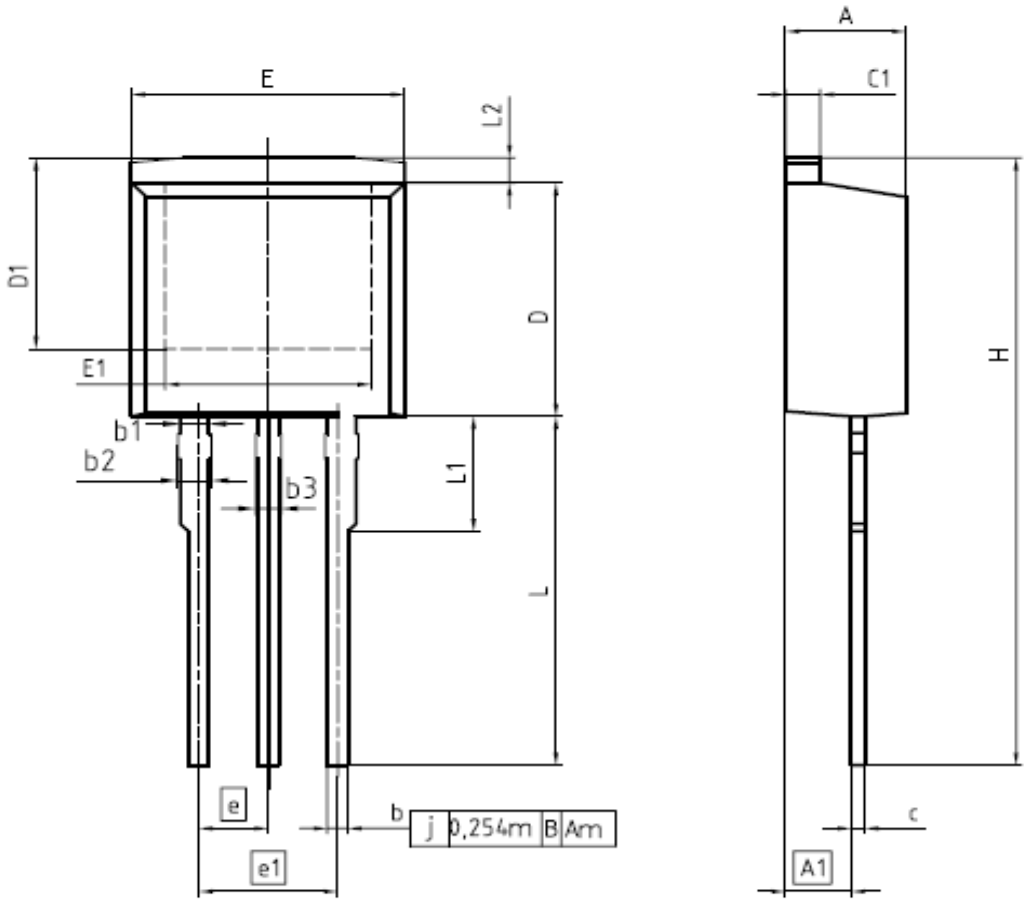
PG-TO220-3: Outline



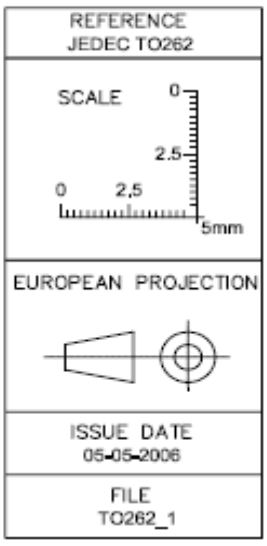
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
øP	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

DOCUMENT NO.	Z8B00003318
SCALE	0, 2.5, 0, 2.5, 5mm
EUROPEAN PROJECTION	
ISSUE DATE	23-08-2007
REVISION	05

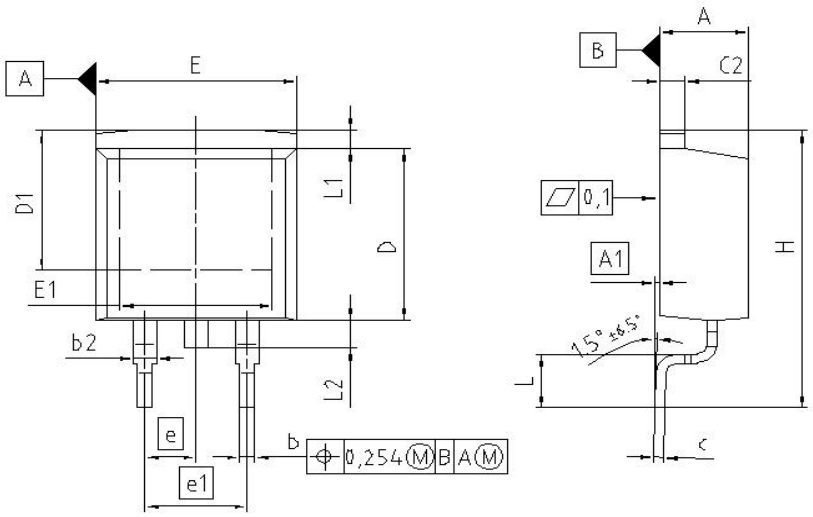
PG-TO262-3-1 (I²PAK)



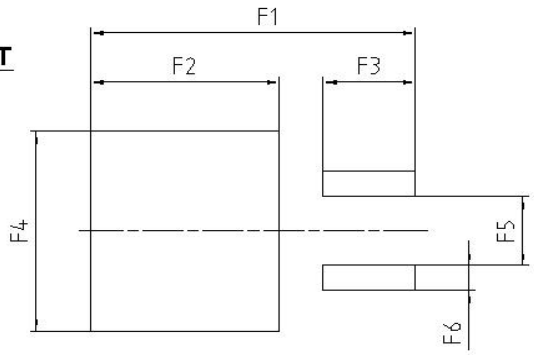
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4,300	4,572	0,169	0,180
A1	2,150	2,718	0,085	0,107
b	0,650	0,864	0,026	0,034
b1	0,950	1,093	0,037	0,043
b2	0,950	1,400	0,037	0,055
b3	0,650	1,118	0,026	0,044
c	0,330	0,600	0,013	0,024
c1	1,170	1,400	0,046	0,055
D	8,509	9,450	0,335	0,372
D1	6,900	-	0,272	-
E	9,700	10,363	0,382	0,408
E1	6,500	8,600	0,256	0,339
e	2,540		0,100	
e1	5,080		0,200	
N	3		3	
L	13,000	14,000	0,512	0,551
L1	-	4,800	-	0,189
L2	-	1,727	-	0,068



PG-TO-263 (D²-Pak)



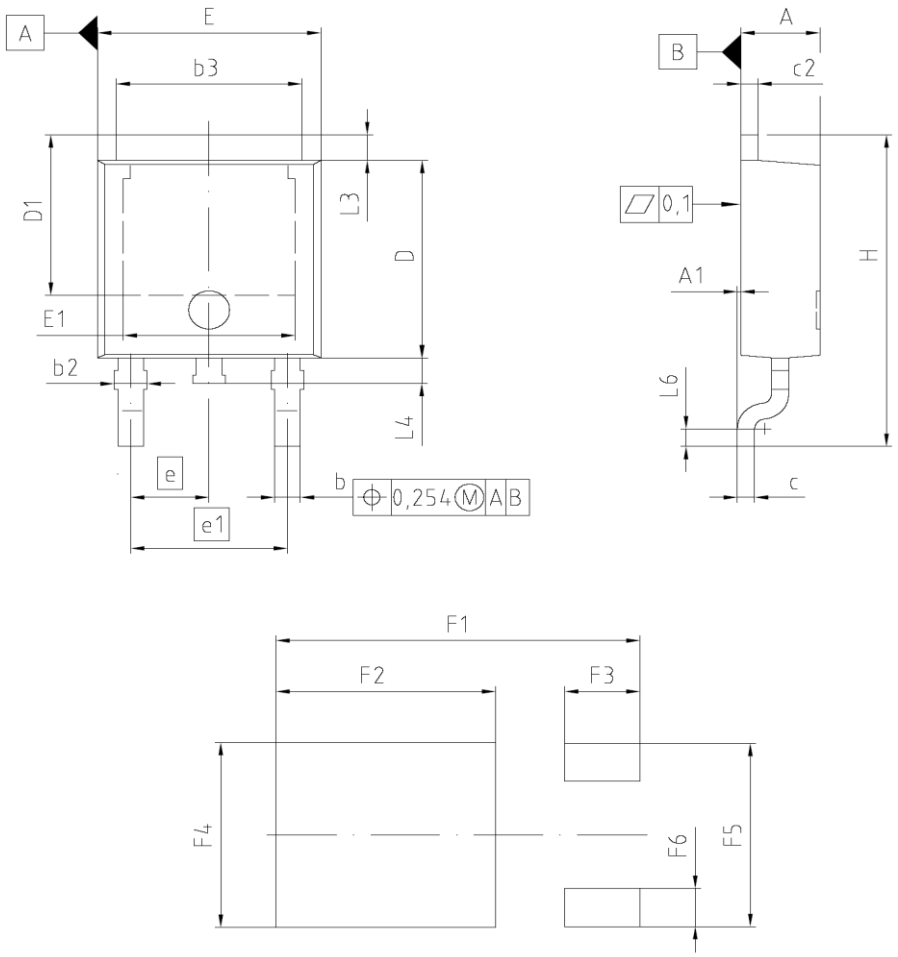
FOOTPRINT



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	0.000	0.254	0.000	0.010
b	0.650	0.850	0.026	0.033
b2	0.950	1.321	0.037	0.052
c	0.330	0.650	0.013	0.026
c2	0.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	7.100	-	0.280	-
E	9.800	10.312	0.386	0.406
E1	6.500		0.256	
e	2.540		0.100	
e1	5.080		0.200	
N	2		2	
H	14.605	15.875	0.575	0.625
L	2.200	3.000	0.087	0.118
L1	-	1.600	-	0.063
L2	1.000	1.778	0.039	0.070
F1	16.050	16.250	0.632	0.640
F2	9.300	9.500	0.366	0.374
F3	4.500	4.700	0.177	0.185
F4	10.700	10.900	0.421	0.429
F5	3.630	3.830	0.143	0.151
F6	1.100	1.300	0.043	0.051

REFERENCE	JEDEC TO263
SCALE	0 5 5 7.5mm
EUROPEAN PROJECTION	
ISSUE DATE	12-02-2006
FILE	TO263_2

PG-TO252-3: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.159	2.413	0.085	0.095
A1	0.000	0.150	0.000	0.006
b	0.635	0.889	0.025	0.035
b2	0.650	1.150	0.026	0.045
b3	5.004	5.500	0.197	0.217
c	0.457	0.580	0.018	0.023
c2	0.460	0.980	0.018	0.039
D	5.969	6.223	0.235	0.245
D1	5.020	5.842	0.198	0.230
E	6.400	6.731	0.252	0.265
E1	4.850	5.207	0.191	0.205
e	2.286		0.090	
e1	4.572		0.180	
N	3		3	
H	9.400	10.480	0.370	0.413
L3	0.900	1.143	0.035	0.045
L4	0.584	0.950	0.023	0.037
L6	0.510	0.686	0.020	0.027
F1	10.500	10.700	0.413	0.421
F2	6.300	6.500	0.248	0.256
F3	2.100	2.300	0.083	0.091
F4	5.700	5.900	0.224	0.232
F5	5.660	5.860	0.222	0.231
F6	1.100	1.300	0.043	0.051

REFERENCE
JEDEC TO252

SCALE
0 2.0 4mm

EUROPEAN PROJECTION

ISSUE DATE
21-09-2005

FILE
TO252_1

Published by
Infineon Technologies AG
81726 Munich, Germany

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