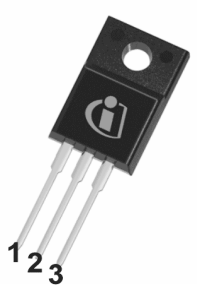
MOSFET

OptiMOS™3 Power-Transistor, 100 V

TO-220-FP



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

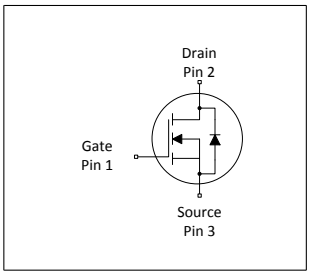


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	4.5	mΩ
I_D	64	A

Type / Ordering Code	Package	Marking	Related Links
IPA045N10N3 G	PG-TO220-FP	045N10N	-

[1] J-STD20 and JESD22

Table of Contents

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	I_D	- -	- -	64 45	A	T_C=25 °C[1)] T_C=100 °C
Pulsed drain current[1)]	$I_{D,pulse}$	-	-	256	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	540	mJ	I_D=64 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	39	W	T_C=25 °C
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}	-	-	3.8	K/W	-
Thermal resistance, juntion-ambient, Leaded	R_{thJA}	-	-	80	K/W	-

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 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	2.7	3.5	V	V_{DS}=V_{GS}, I_D=150 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	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}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	3.9 4.7	4.5 7.7	mΩ	V_{GS}=10 V, I_D=64 A V_{GS}=6 V, I_D=32 A
Gate resistance	R_G	-	1.4	-	Ω	-
Transconductance	g_{fs}	60	119	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=64 A

[1)] See Diagram 3

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	6320	8410	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance	C_{oss}	-	1100	1460	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	41	-	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	25	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=64 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	47	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=64 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	50	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=64 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	15	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=64 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	28	-	nC	V_{DD}=50 V, I_D=64 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	16	-	nC	V_{DD}=50 V, I_D=64 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	25	-	nC	V_{DD}=50 V, I_D=64 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	-	88	117	nC	V_{DD}=50 V, I_D=64 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.4	-	V	V_{DD}=50 V, I_D=64 A, V_{GS}=0 to 10 V
Output charge	Q_{oss}	-	117	155	nC	V_{DD}=50 V, V_{GS}=0 V

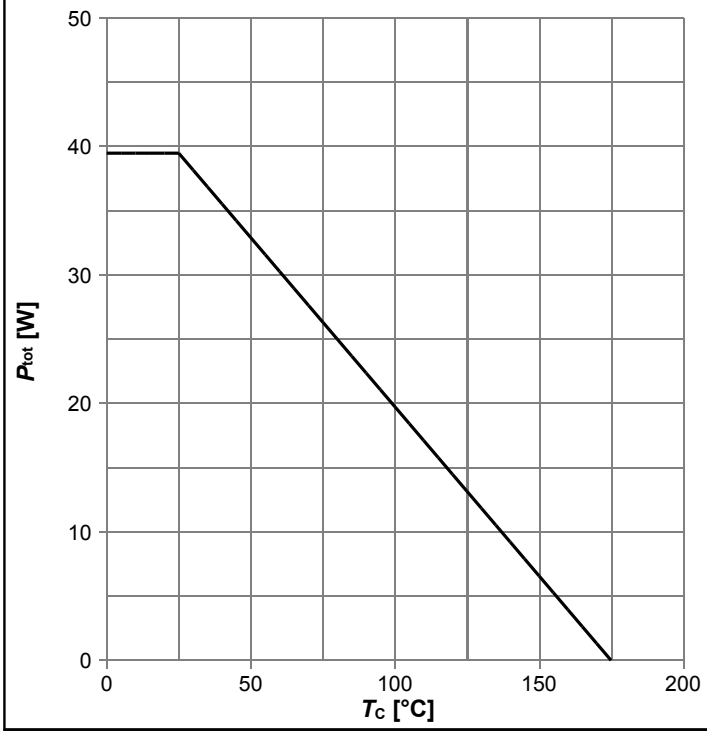
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	64	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	256	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1	V	V_{GS}=0 V, I_F=64 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	69	-	ns	V_R=50 V, I_F=64 A, di_F/dt=100 A/µs
Reverse recovery charge	Q_{rr}	-	140	-	nC	V_R=50 V, I_F=64 A, di_F/dt=100 A/µs

[1)] See ″Gate charge waveforms″ for parameter definition

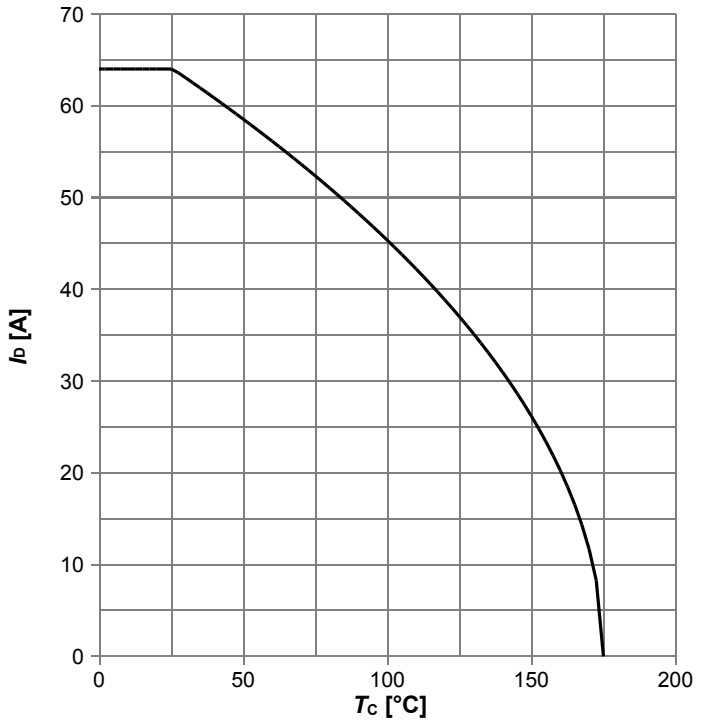
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



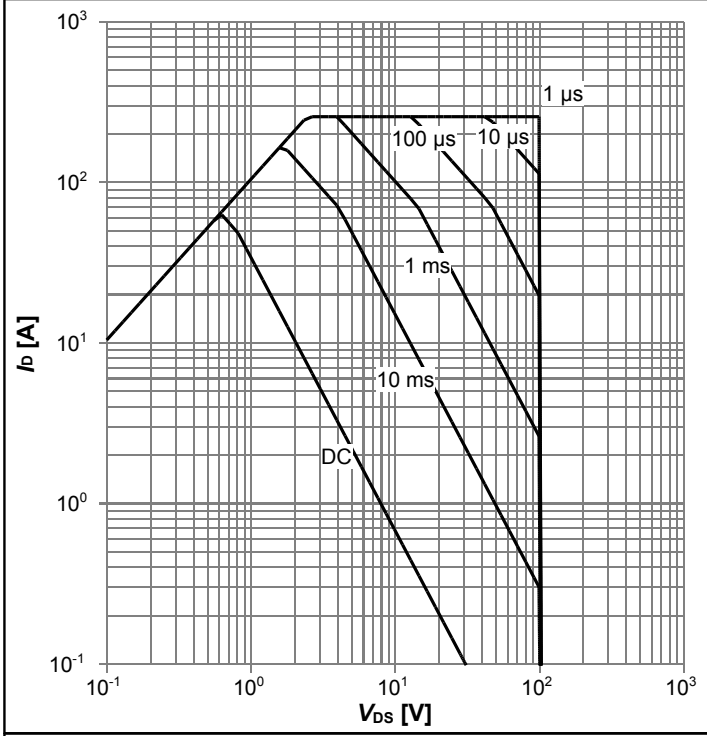
$P_{tot}=f(T_C)$

Diagram 2: Drain current



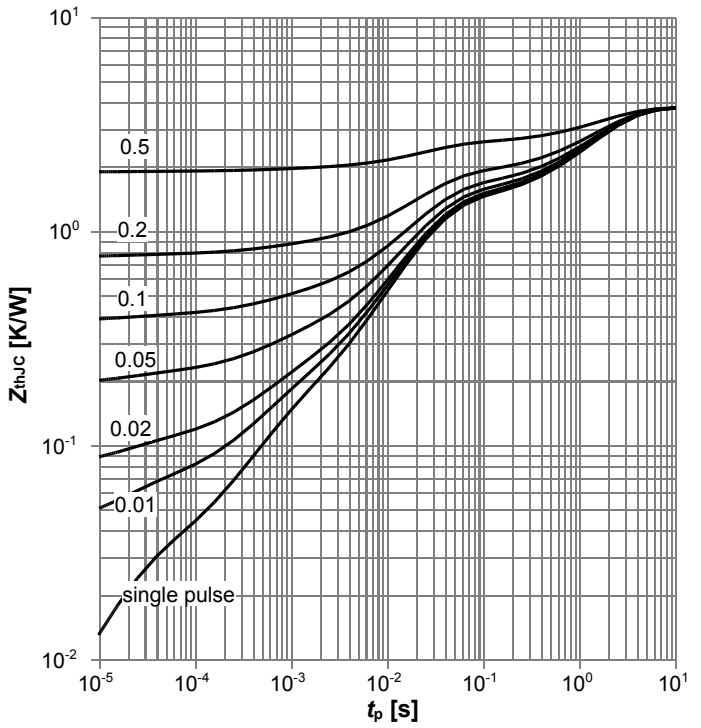
$I_D=f(T_C)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



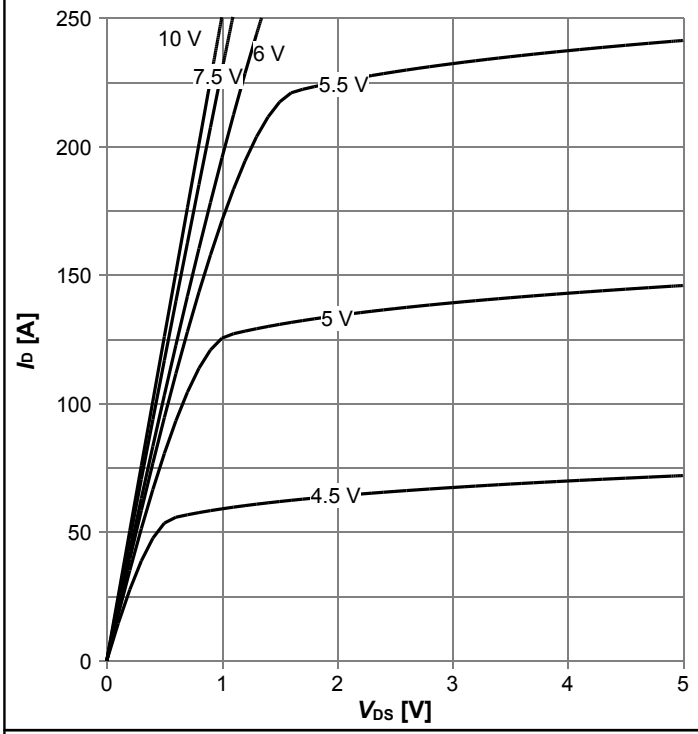
$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



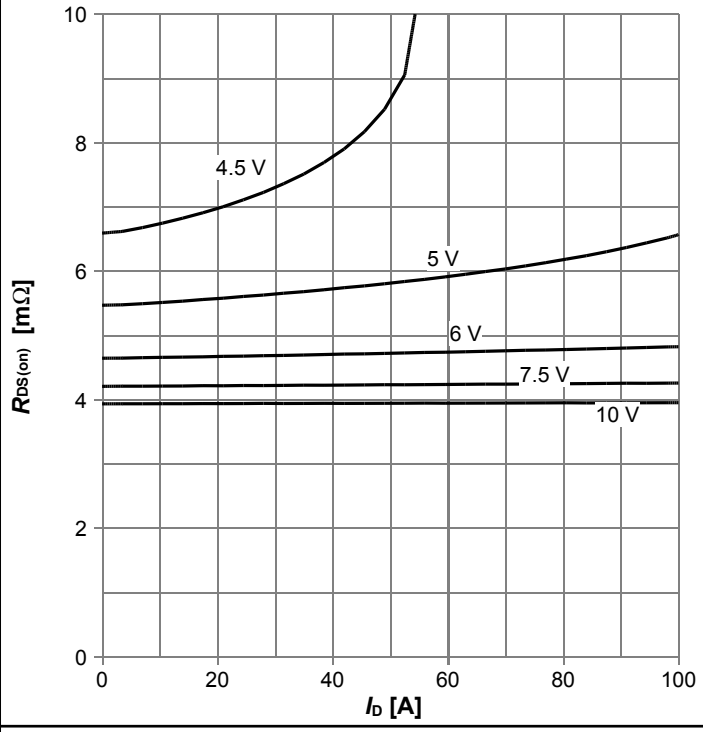
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



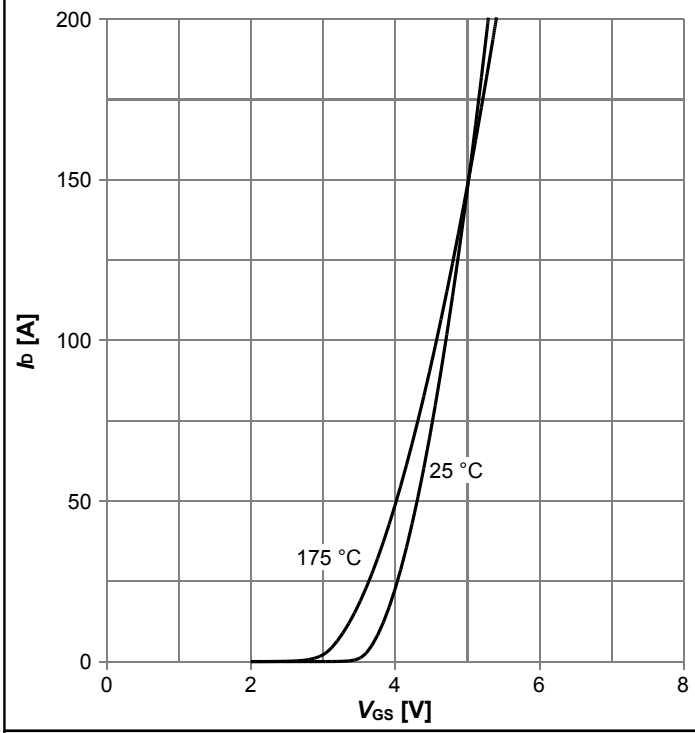
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



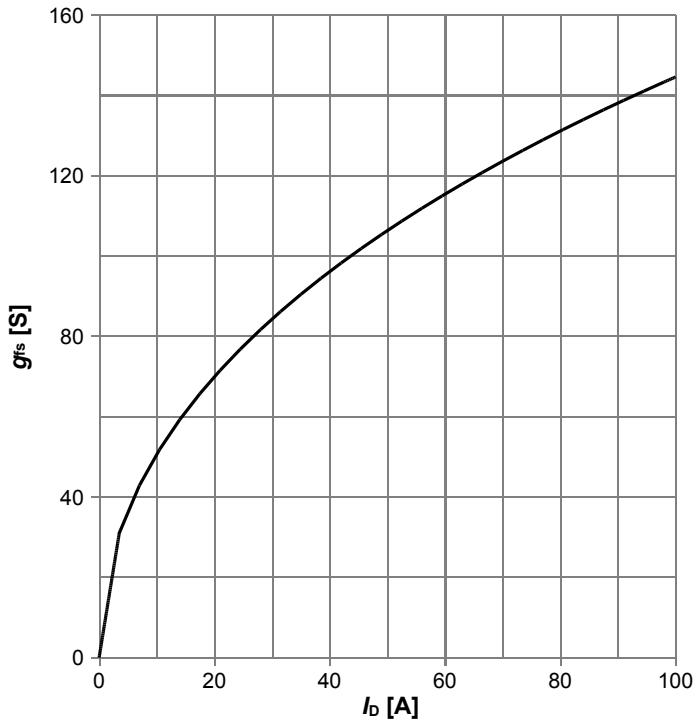
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



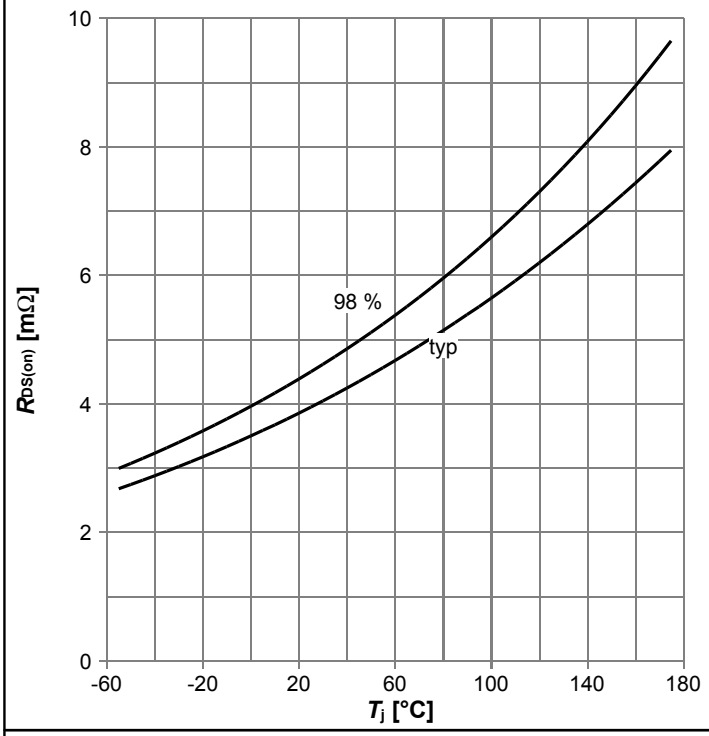
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



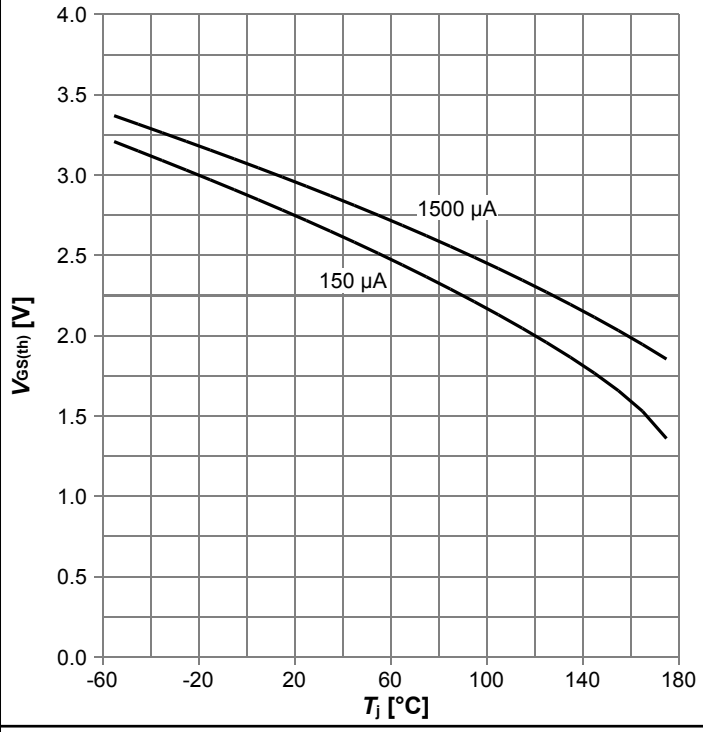
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



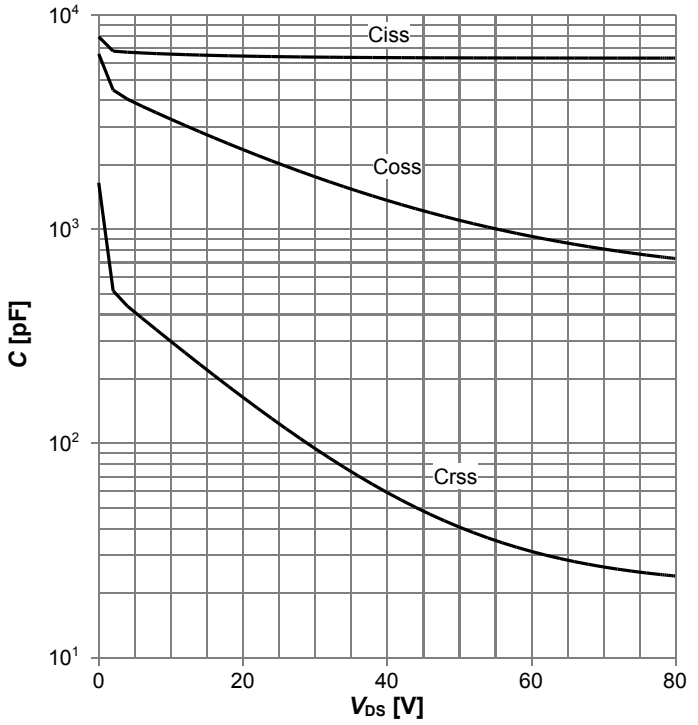
$R_{DS(on)}=f(T_j)$; I_D=64 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



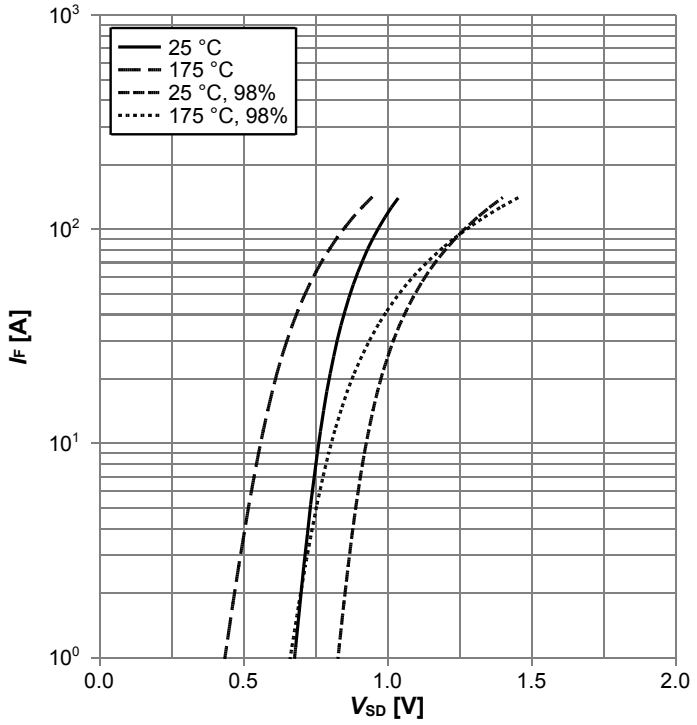
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



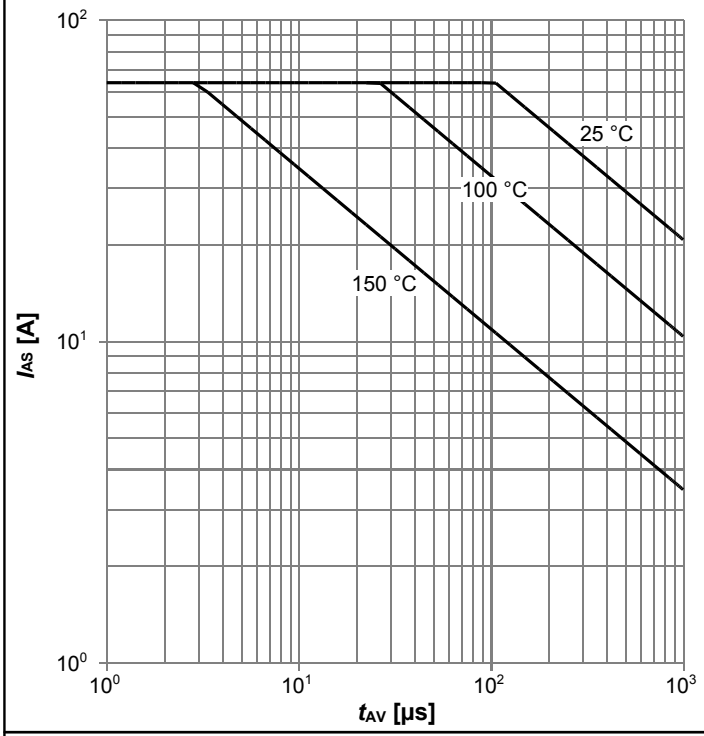
$C=f(V_{DS})$; V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



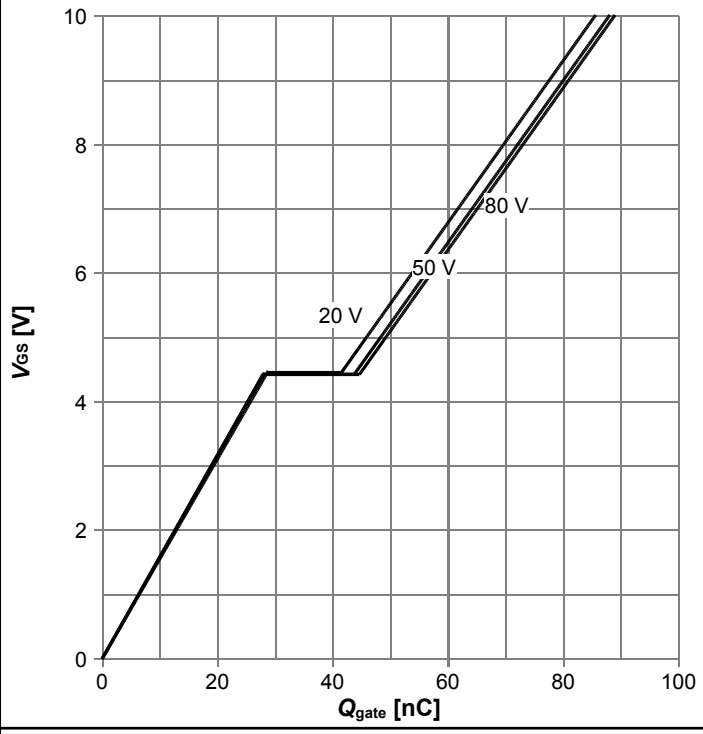
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



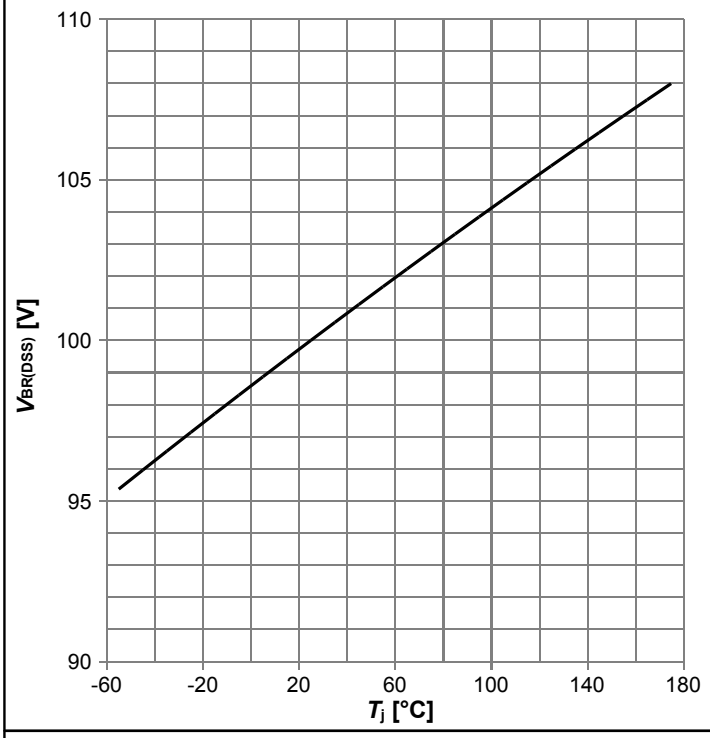
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



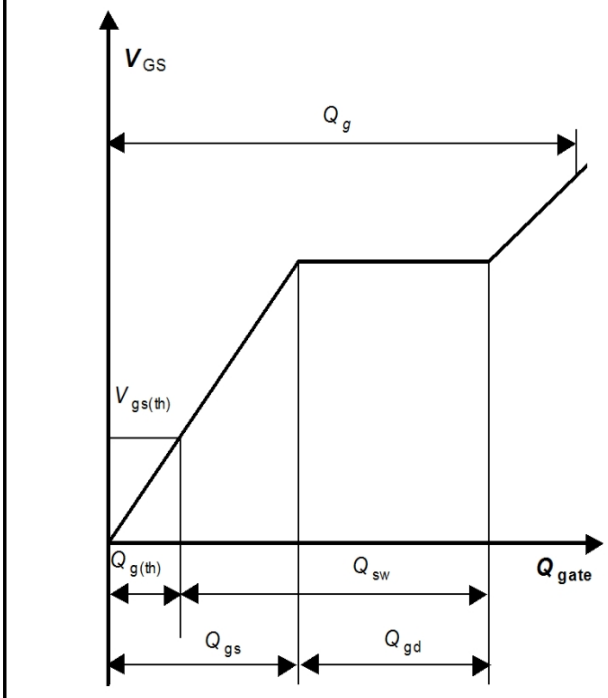
V_{GS}=f(Q_{gate}); I_D=64 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

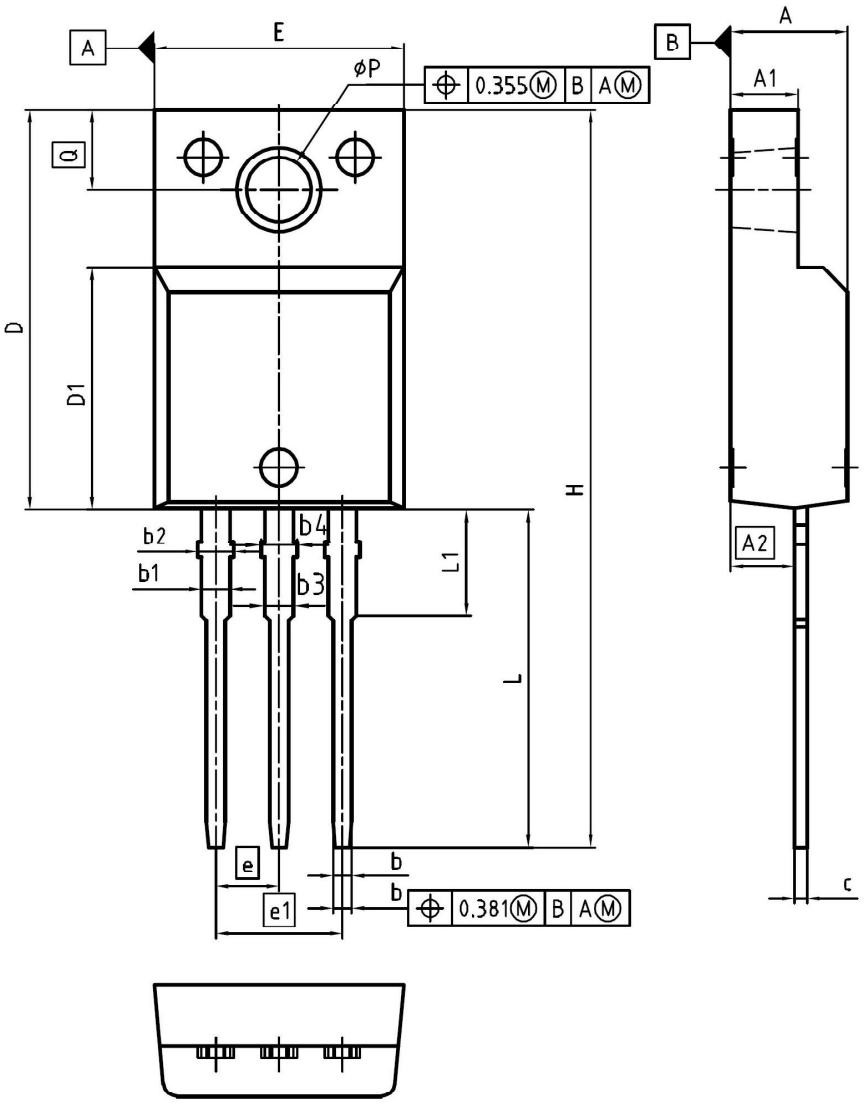


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Gate charge waveforms



5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.55	4.85	0.179	0.191
A1	2.55	2.85	0.100	0.112
A2	2.42	2.72	0.095	0.107
b	0.65	0.85	0.026	0.033
b1	0.95	1.33	0.037	0.052
b2	0.95	1.51	0.037	0.059
b3	0.65	1.33	0.026	0.052
b4	0.65	1.51	0.026	0.059
c	0.40	0.63	0.016	0.025
D	15.85	16.15	0.624	0.636
D1	9.53	9.83	0.375	0.387
E	10.35	10.65	0.407	0.419
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H	29.45	29.75	1.159	1.171
L	13.45	13.75	0.530	0.541
L1	3.15	3.45	0.124	0.136
øP	2.95	3.20	0.116	0.126
Q	3.15	3.50	0.124	0.138

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SCALE 0 2.5 0 2.5 5mm

EUROPEAN PROJECTION

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REVISION
03

Figure 1 Outline PG-TO220-FP, dimensions in mm/inches

Revision History

IPA045N10N3 G

Revision: 2016-01-22, Rev. 2.4

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.4	2016-01-22	Insert RthJA

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