

MOSFET

OptiMOS™3 Power-Transistor, 80 V

Features

- Ideal for high frequency switching and sync. rec.
- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Halogen-free according to IEC61249-2-21

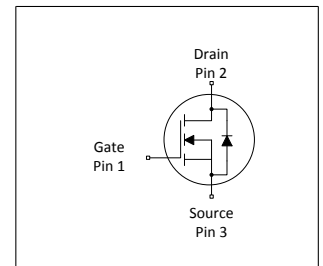


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	80	V
$R_{DS(on),max}$	2.8	m Ω
I_D	89	A



Type / Ordering Code	Package	Marking	Related Links
IPA028N08N3 G	PG-TO220-FP	028N08N	-

¹⁾ J-STD20 and JESD22

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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	I_D	-	-	89 62	A	$T_C=25\text{ °C}^{1)}$ $T_C=100\text{ °C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	352	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ³⁾	E_{AS}	-	-	1430	mJ	$I_D=89\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	42	W	$T_C=25\text{ °C}$
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}	-	-	3.6	K/W	-

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	80	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	2.8	3.5	V	$V_{DS}=V_{GS}$, $I_D=270\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=80\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=80\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	1	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.4 2.8	2.8 4.2	m Ω	$V_{GS}=10\text{ V}$, $I_D=89\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=44\text{ A}$
Gate resistance	R_G	-	2.7	-	Ω	-
Transconductance	g_{fs}	89	178	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=89\text{ A}$

¹⁾ Current is limited by package; with an $R_{thJC}=0.5\text{K/W}$ in a standard TO-220 package the chip is able

²⁾ See Diagram 3 for more detailed information

³⁾ See Diagram 13 for more detailed information

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	10700	14200	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	2890	3840	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	100	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	30	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=89\text{ A}$, $R_G=1.6\ \Omega$
Rise time	t_r	-	59	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=89\text{ A}$, $R_G=1.6\ \Omega$
Turn-off delay time	$t_{d(off)}$	-	77	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=89\text{ A}$, $R_G=1.6\ \Omega$
Fall time	t_f	-	26	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=89\text{ A}$, $R_G=1.6\ \Omega$

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	50	-	nC	$V_{DD}=40\text{ V}$, $I_D=89\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	Q_{gd}	-	30	-	nC	$V_{DD}=40\text{ V}$, $I_D=89\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	50	-	nC	$V_{DD}=40\text{ V}$, $I_D=89\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total	Q_g	-	155	206	nC	$V_{DD}=40\text{ V}$, $I_D=89\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.6	-	V	$V_{DD}=40\text{ V}$, $I_D=89\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge	Q_{oss}	-	210	279	nC	$V_{DD}=40\text{ V}$, $V_{GS}=0\text{ V}$

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	89	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	356	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.9	1.2	V	$V_{GS}=0\text{ V}$, $I_F=89\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time	t_{rr}	-	78	-	ns	$V_R=40\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}	-	181	-	nC	$V_R=40\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$

¹⁾ See "Gate charge waveforms" for parameter definition

4 Electrical characteristics diagrams

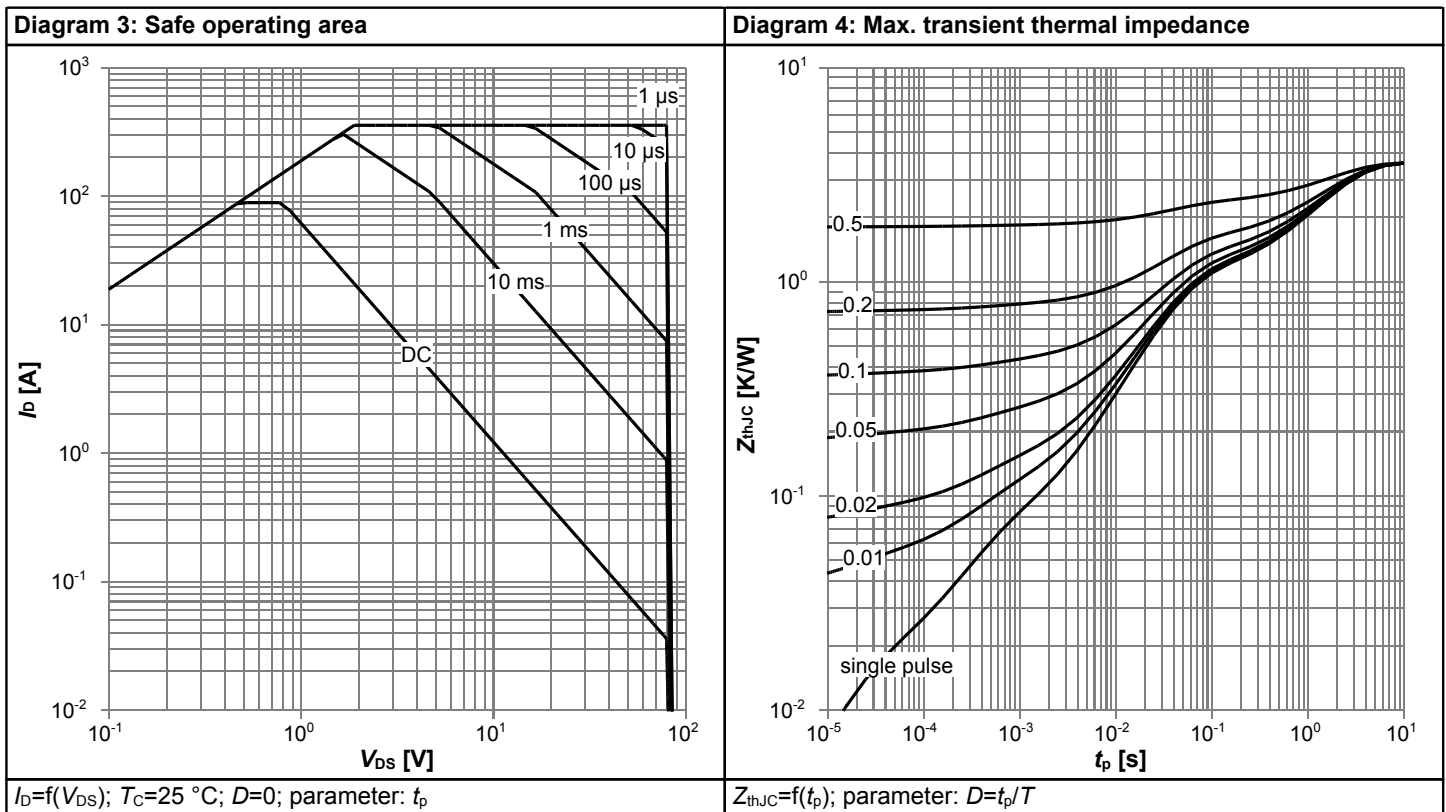
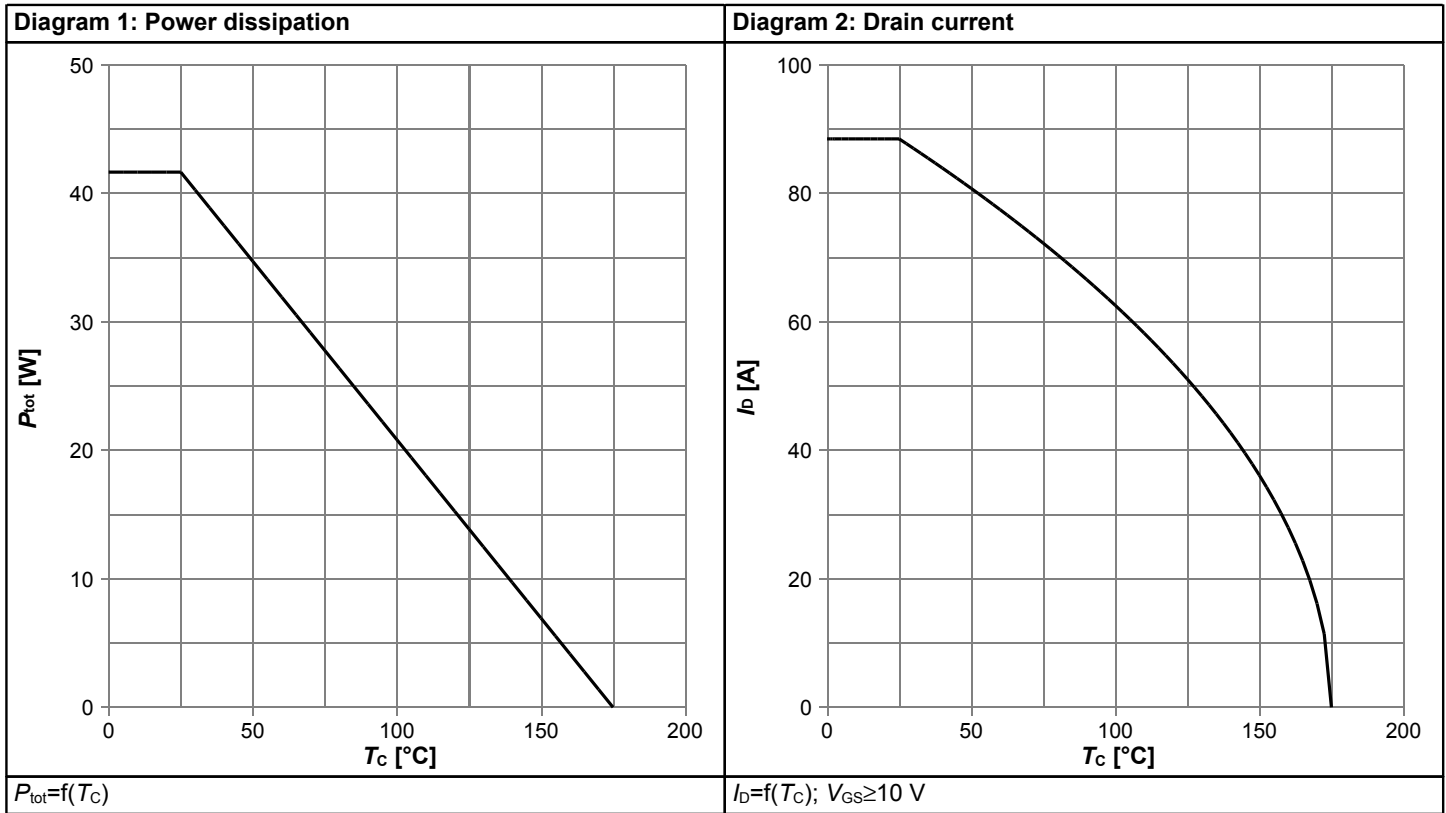
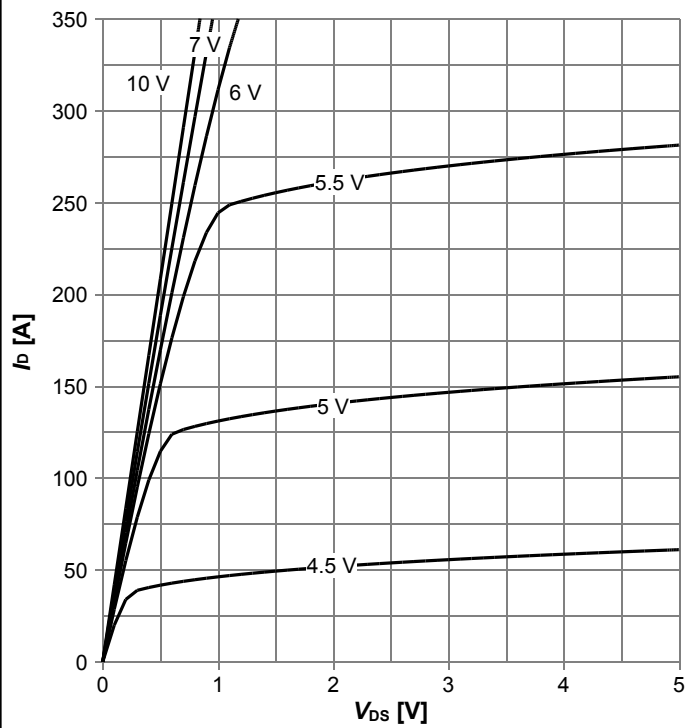
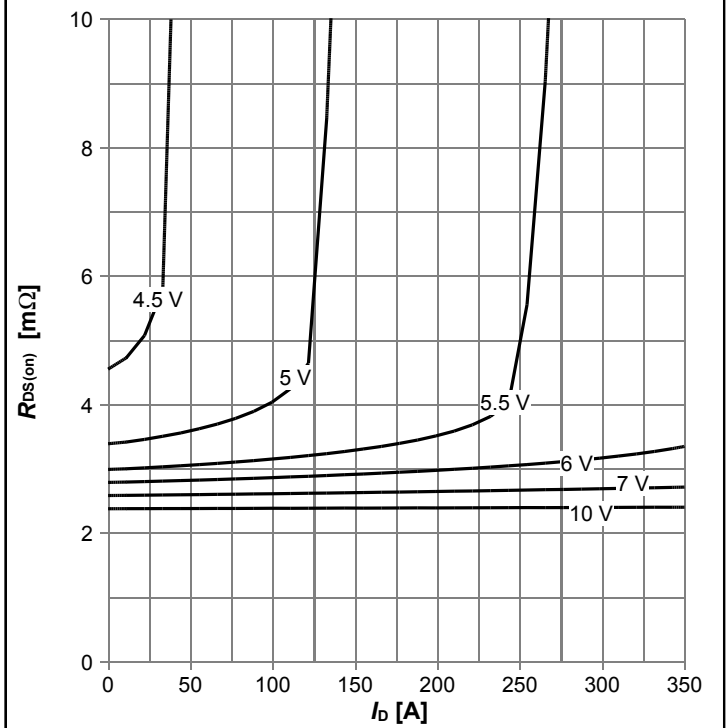


Diagram 5: Typ. output characteristics



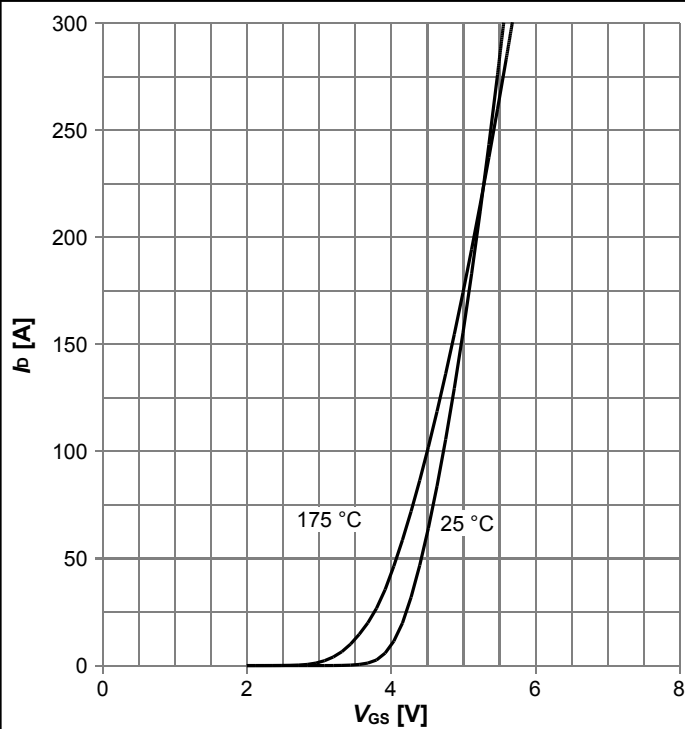
$I_D = f(V_{DS}); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



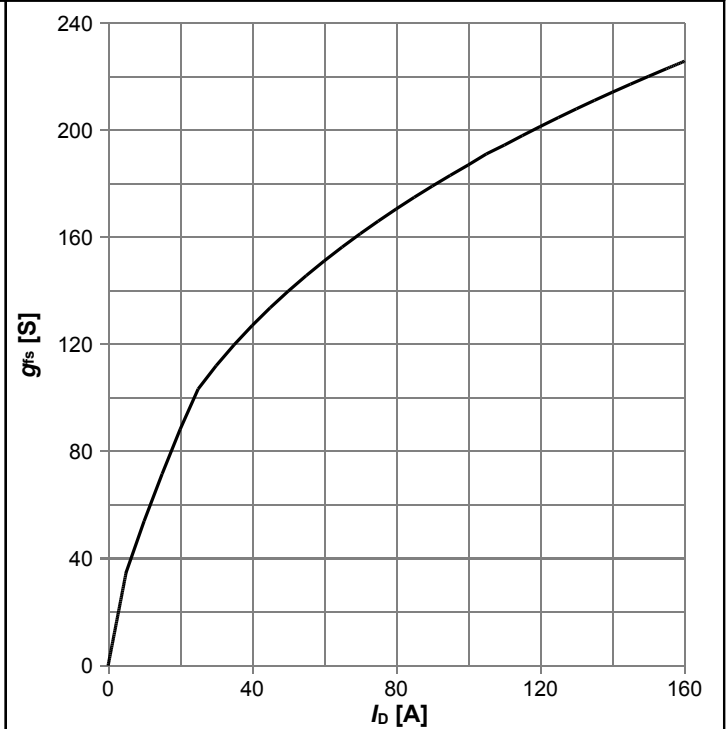
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



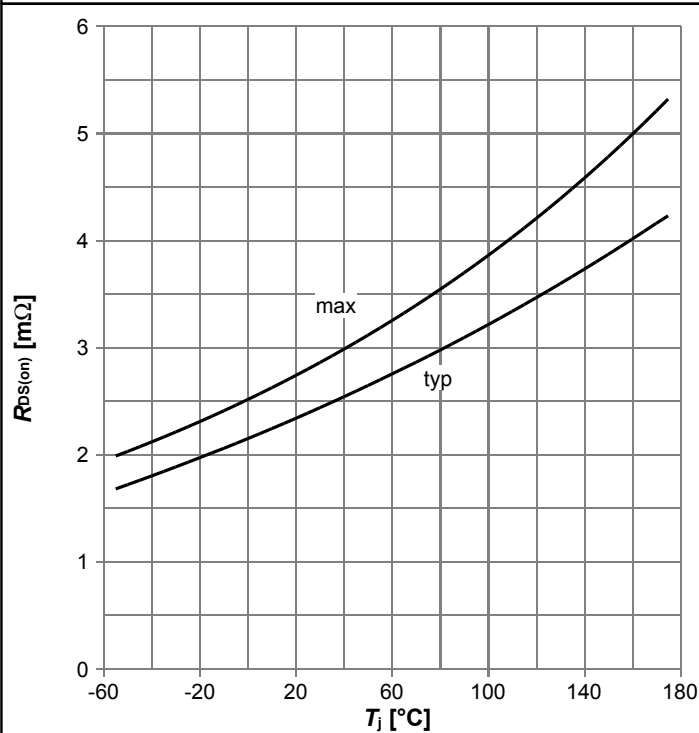
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. forward transconductance



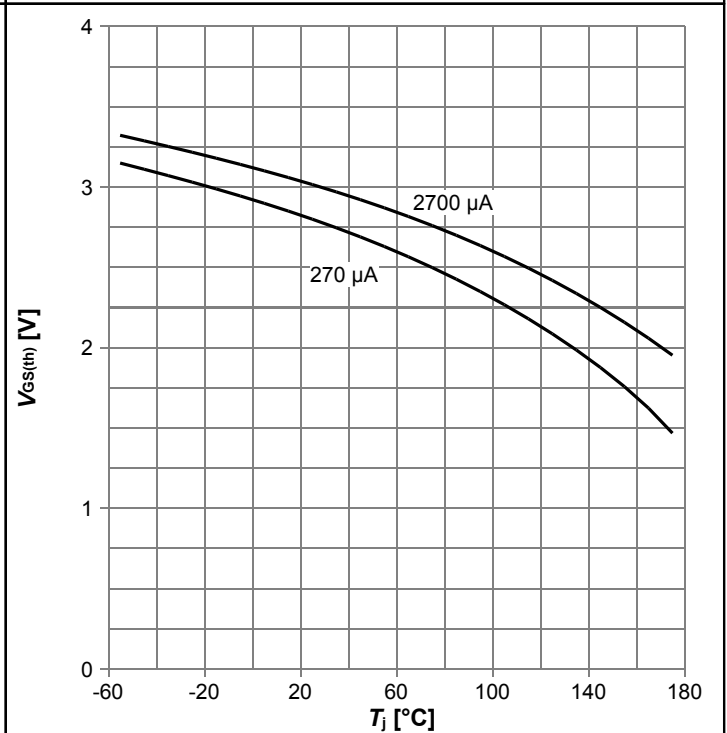
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



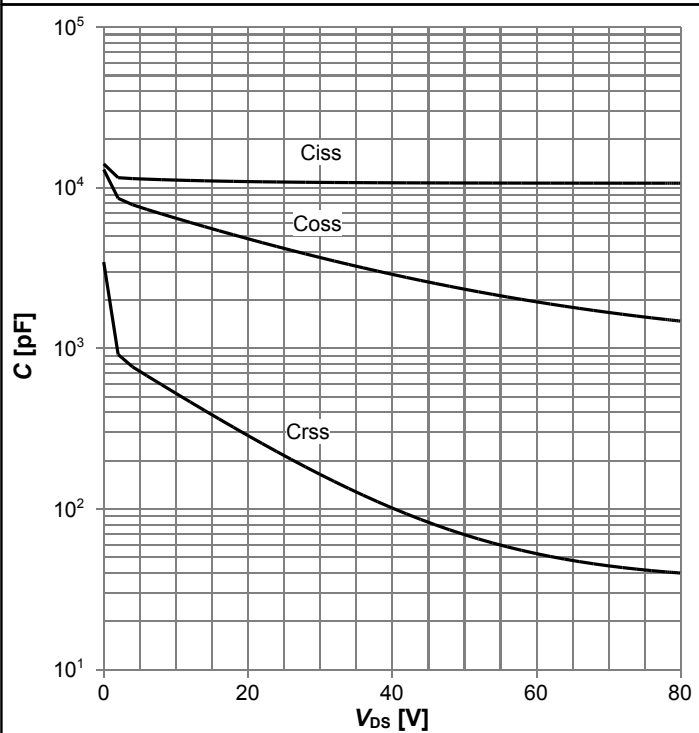
$R_{DS(on)}=f(T_j)$; $I_D=89\text{ A}$; $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



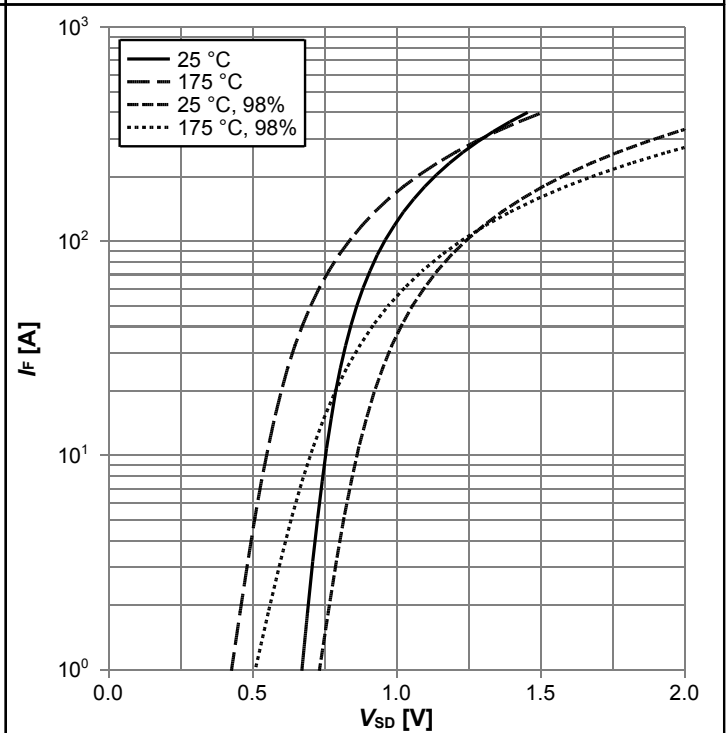
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



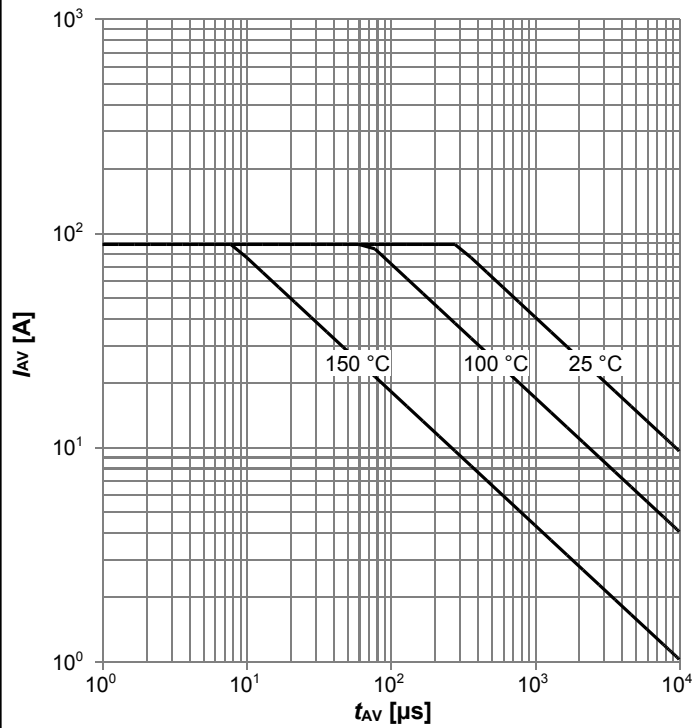
$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



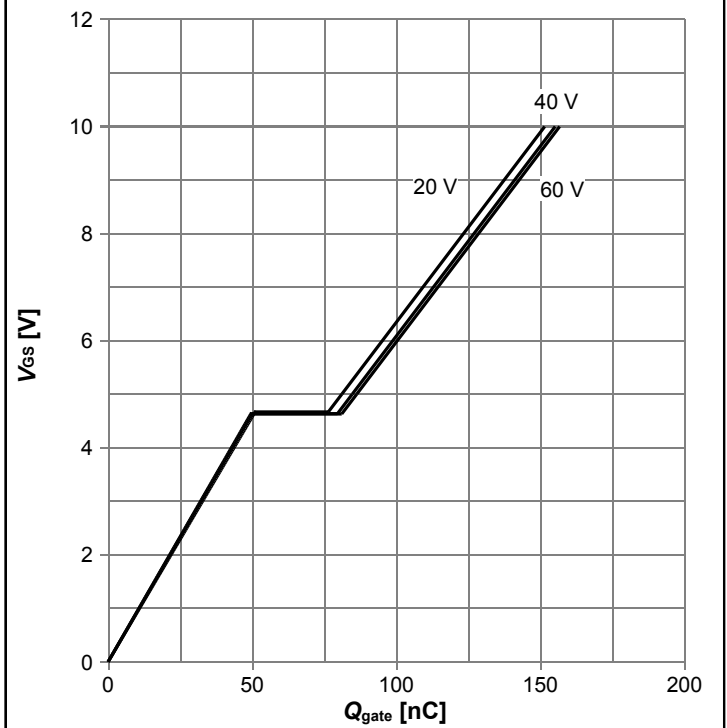
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



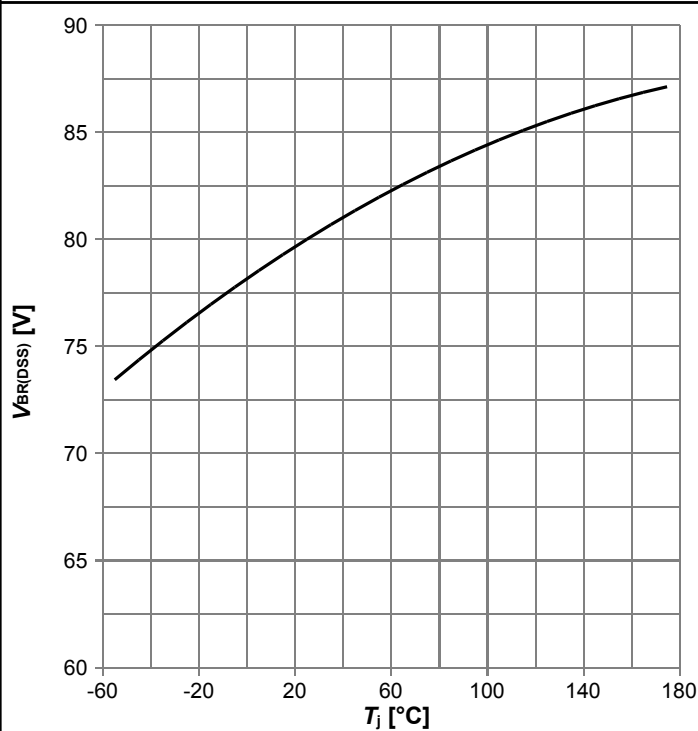
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



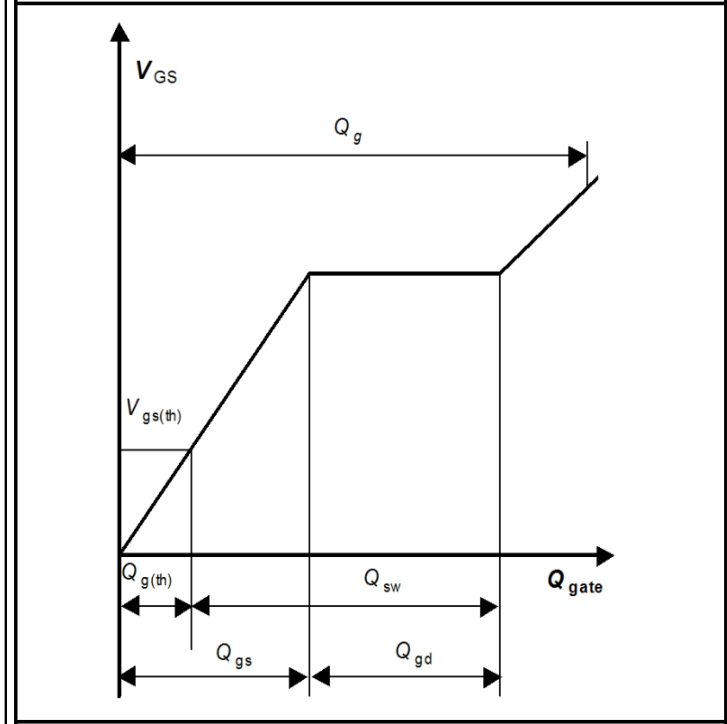
$V_{GS}=f(Q_{gate}); I_D=89A$ pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

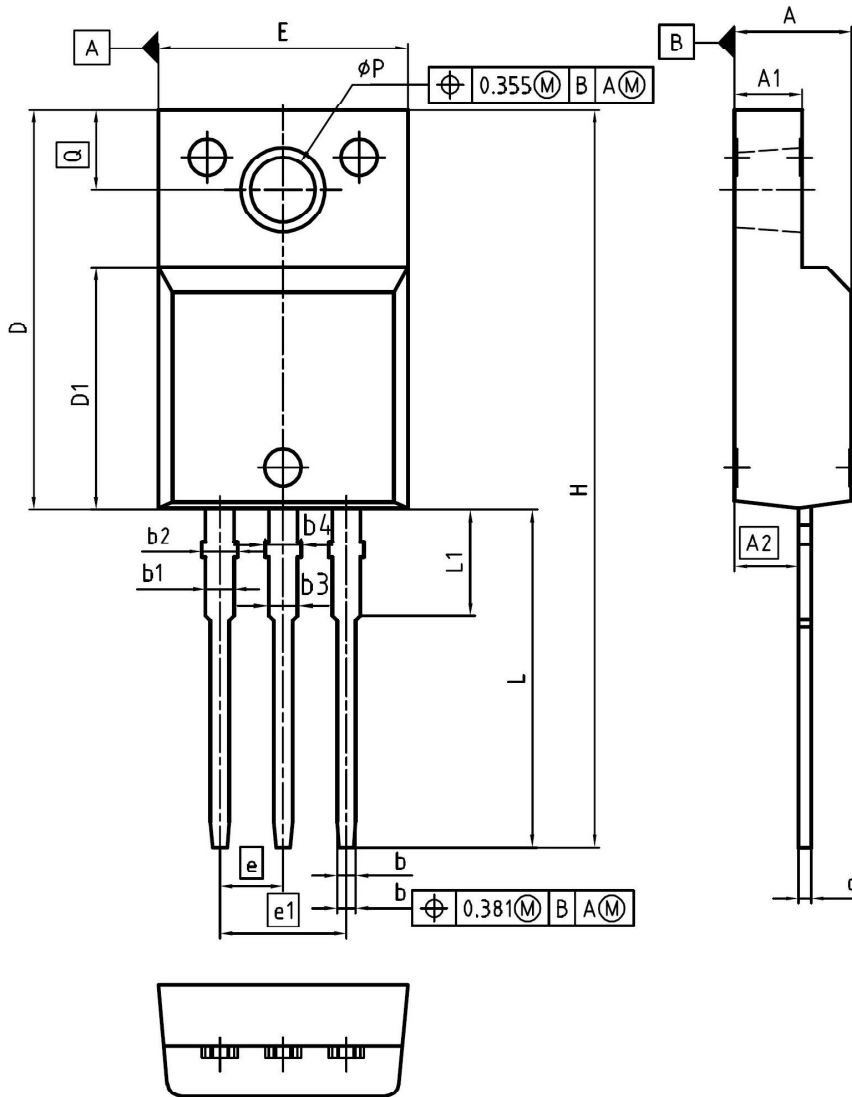


$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

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
phi P	2.95	3.20	0.116	0.126
Q	3.15	3.50	0.124	0.138

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REVISION
03

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

Revision History

IPA028N08N3 G

Revision: 2016-06-30, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2016-06-30	Release of final version

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