

MOSFET

StrongIRFET™ 2 Power-Transistor

Features

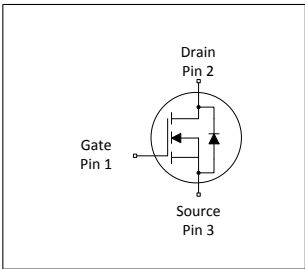
- Optimized for a wide range of applications
- N-Channel, normal level
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Qualified according to JEDEC Standard



PG-TO220 FP



RoHS

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	8.2	mΩ
I_D	46	A
Q_{oss}	38	nC
Q_G	28	nC

Type / Ordering Code	Package	Marking	Related Links
IPA082N10NF2S	PG-TO220 FullPAK	082N10NS	-

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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 ¹⁾	I_D	-	-	46 32	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	184	A	$T_A=25\text{ °C}$
Avalanche energy, single pulse ³⁾	E_{AS}	-	-	80	mJ	$I_D=40\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	35	W	$T_C=25\text{ °C}$
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	-

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	4.3	°C/W	-

3 Electrical characteristics

at $T_j=25\text{ °C}$, 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	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.2	3.0	3.8	V	$V_{DS}=V_{GS}$, $I_D=46\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1.0 100	μA	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance ⁴⁾	$R_{DS(on)}$	-	7.3 8.9	8.2 10.3	m Ω	$V_{GS}=10\text{ V}$, $I_D=30\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=15\text{ A}$
Gate resistance	R_G	-	1.1	-	Ω	-
Transconductance ⁵⁾	g_{fs}	31	-	-	S	$ V_{DS} \geq 2 I_D /R_{DS(on)max}$, $I_D=30\text{ A}$

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

²⁾ See Diagram 3 for more detailed information

³⁾ See Diagram 13 for more detailed information

⁴⁾ $R_{DS(on)}$ is specified at a distance of 1.8 mm distance to the package body; mounting at a larger distance increases the overall package resistance of approximately 0.04 m Ω /mm per leg.

⁵⁾ Defined by design. Not subject to production test.

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	2000	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	320	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	15	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	11	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	20	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	16	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	5	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	9.3	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	6.0	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	Q_{gd}	-	6.0	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	9.3	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ²⁾	Q_g	-	28	42	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.7	-	V	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge	Q_{oss}	-	38	-	nC	$V_{DS}=50\text{ V}$, $V_{GS}=0\text{ V}$

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	26	A	$T_C=25\text{ }^\circ\text{C}$
Diode pulse current	$I_{S,pulse}$	-	-	184	A	$T_C=25\text{ }^\circ\text{C}$
Diode forward voltage	V_{SD}	-	0.83	1.2	V	$V_{GS}=0\text{ V}$, $I_F=15\text{ A}$, $T_j=25\text{ }^\circ\text{C}$
Reverse recovery time	t_{rr}	-	33	-	ns	$V_R=50\text{ V}$, $I_F=15\text{ A}$, $di_F/dt=500\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}	-	199	-	nC	$V_R=50\text{ V}$, $I_F=15\text{ A}$, $di_F/dt=500\text{ A}/\mu\text{s}$

¹⁾ See "Gate charge waveforms" for parameter definition

²⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

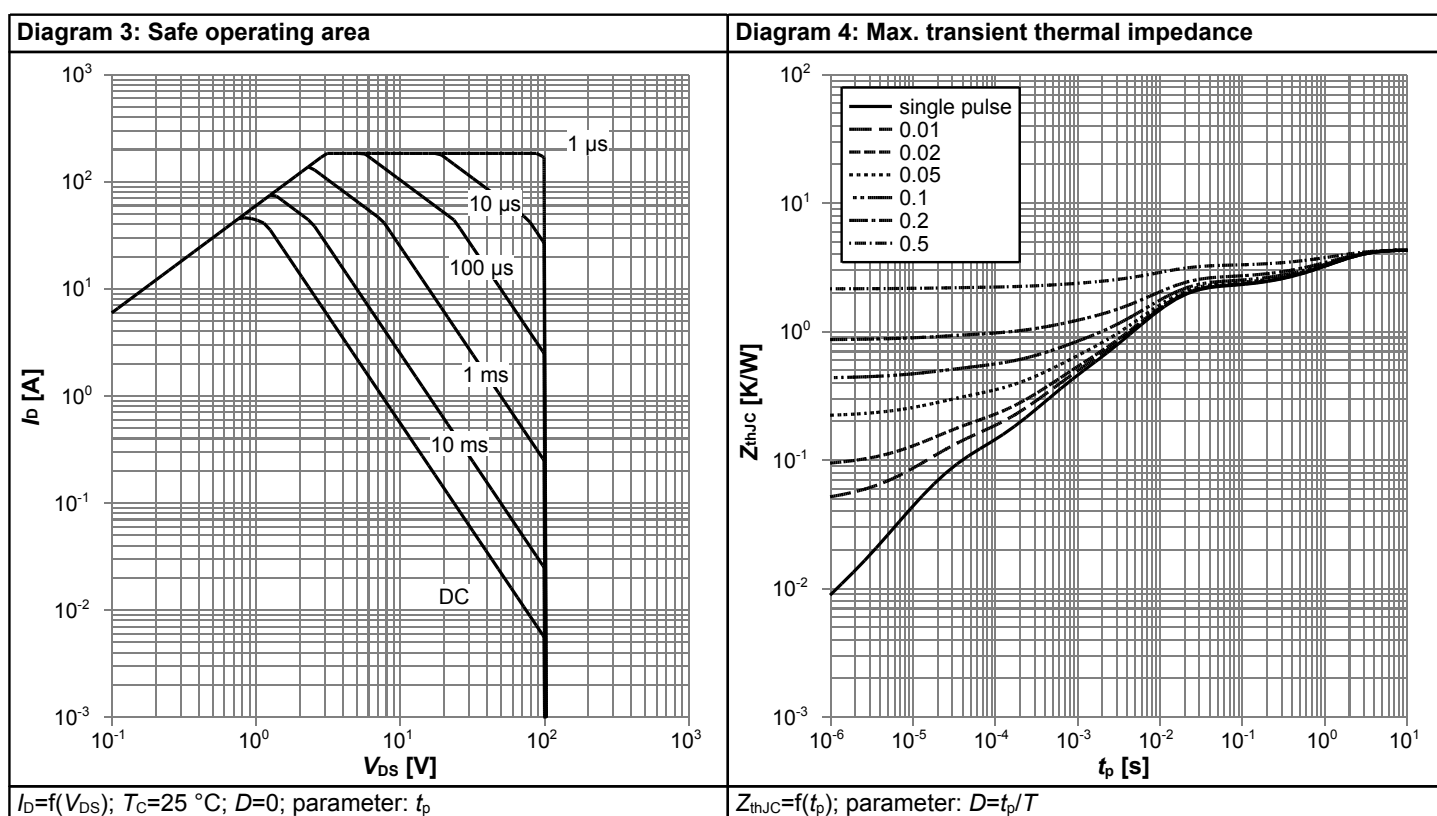
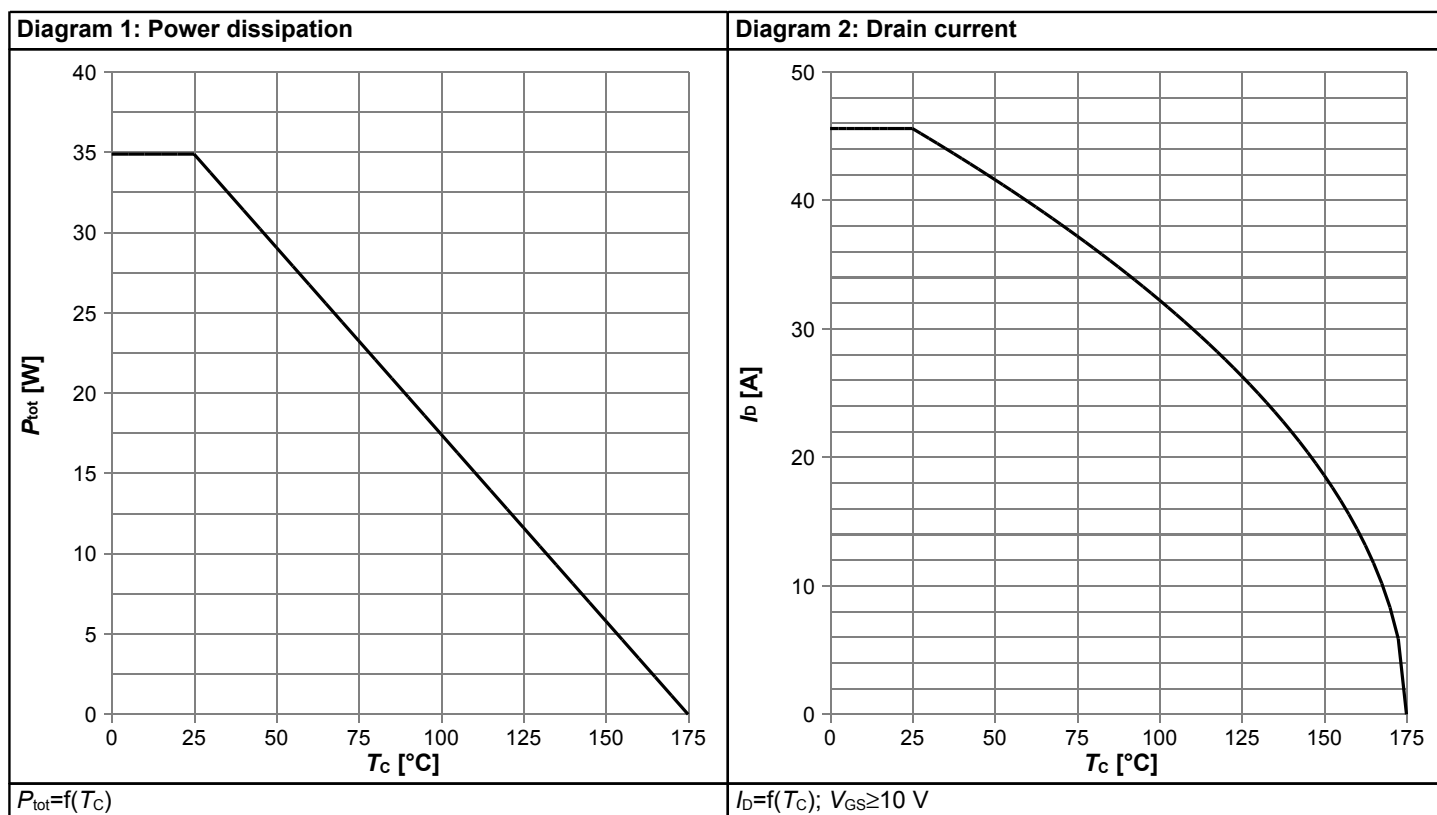
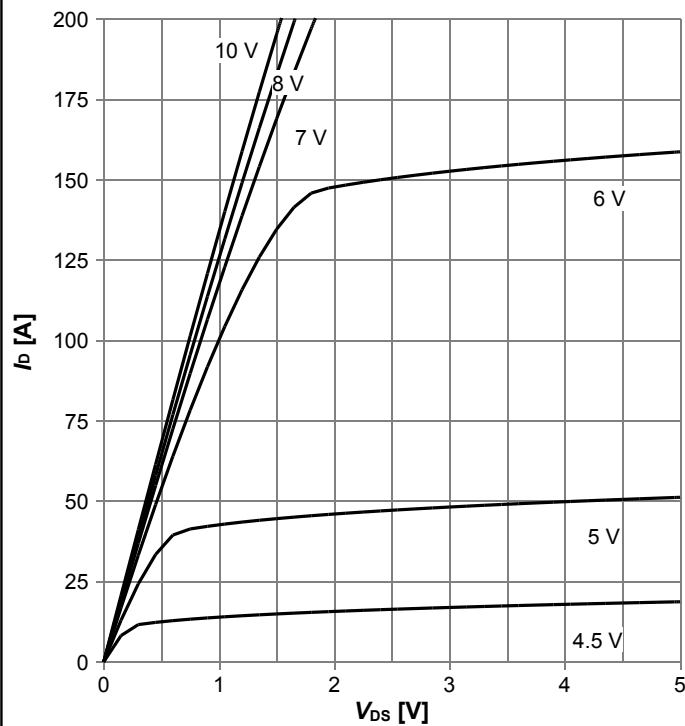
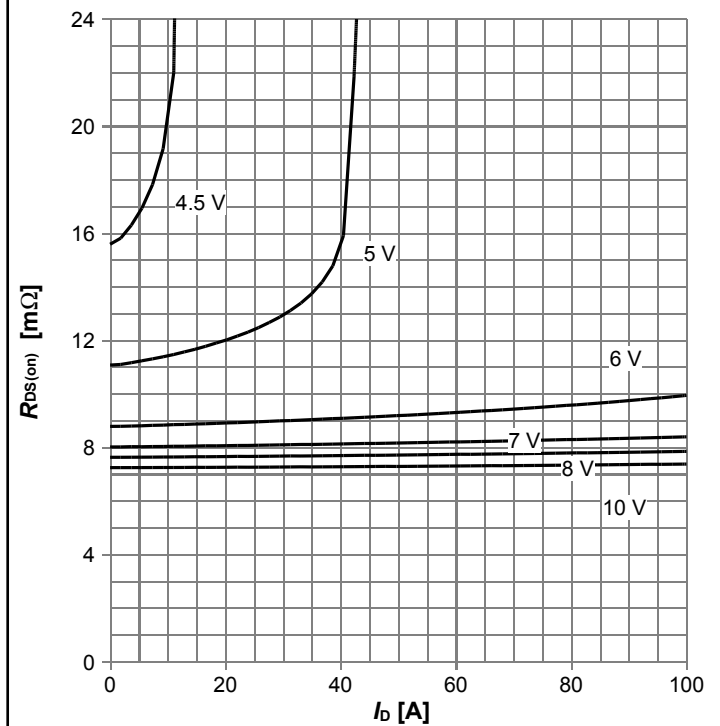


Diagram 5: Typ. output characteristics



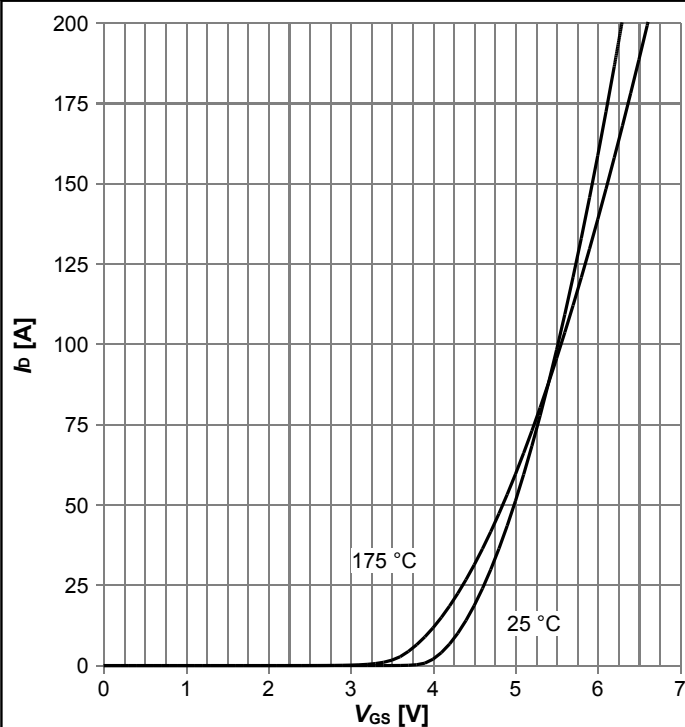
$I_D = f(V_{DS})$, $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



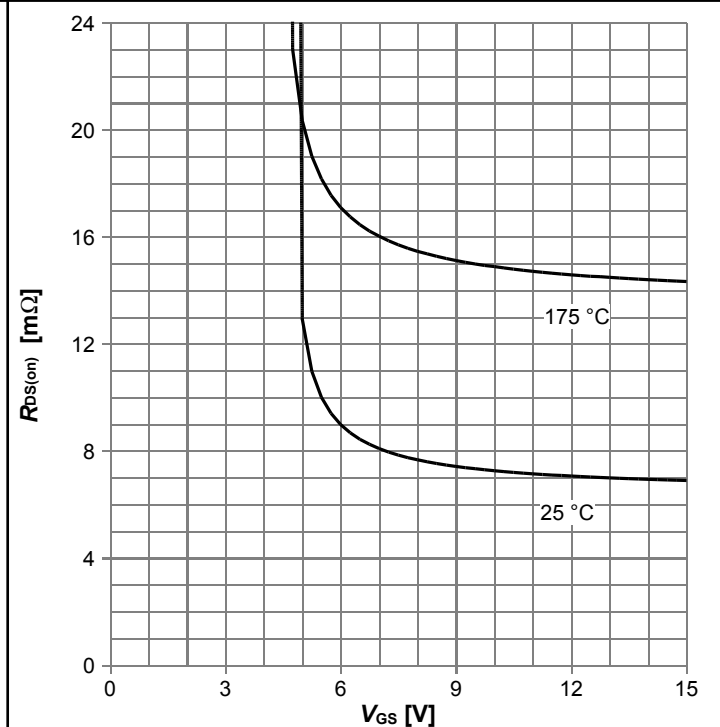
$R_{DS(on)} = f(I_D)$, $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



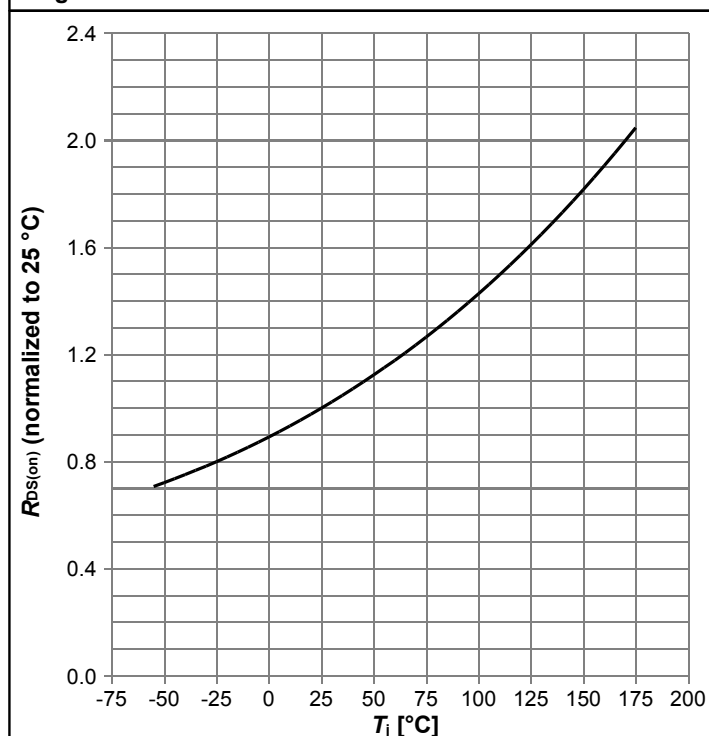
$I_D = f(V_{GS})$, $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



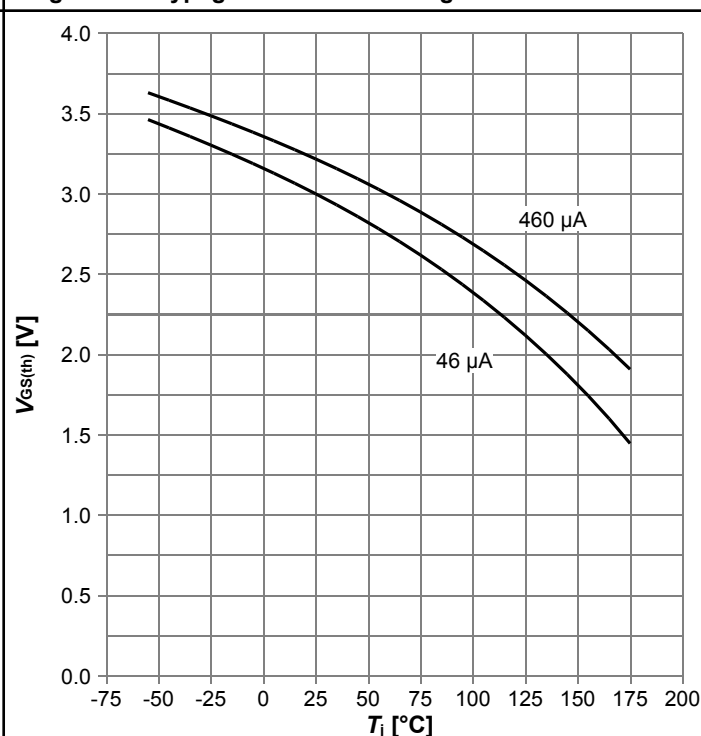
$R_{DS(on)} = f(V_{GS})$, $I_D = 30\text{ A}$; parameter: T_j

Diagram 9: Normalized drain-source on resistance



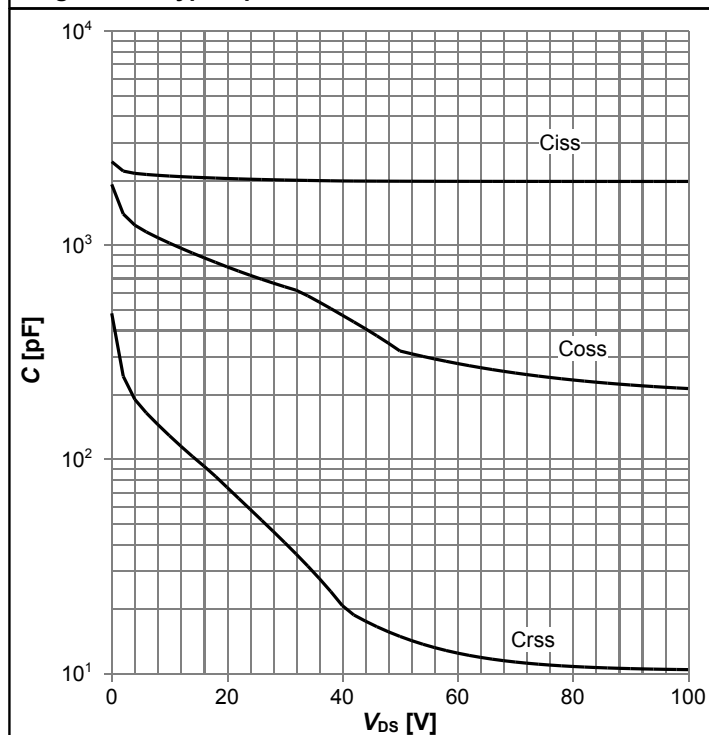
$R_{DS(on)}=f(T_j)$, $I_D=30$ A, $V_{GS}=10$ V

Diagram 10: Typ. gate threshold voltage



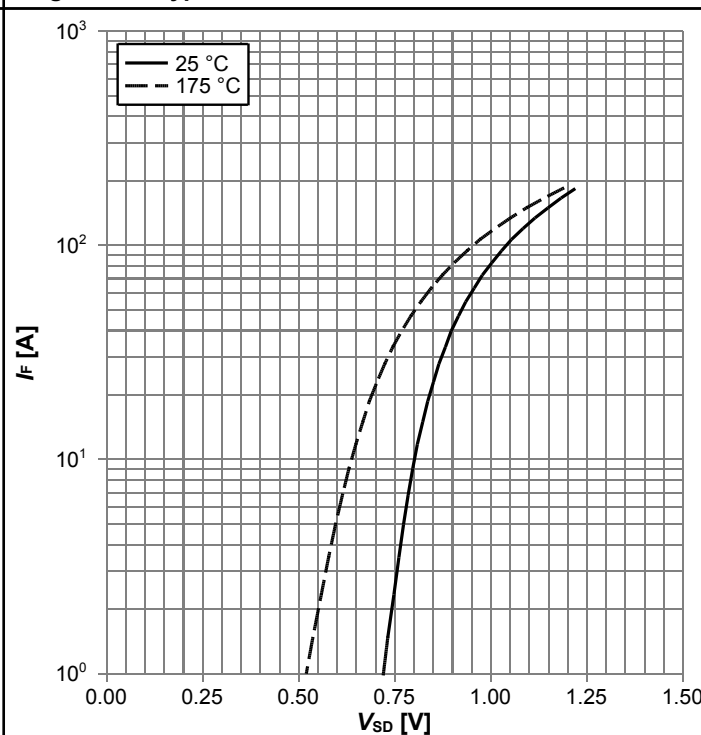
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



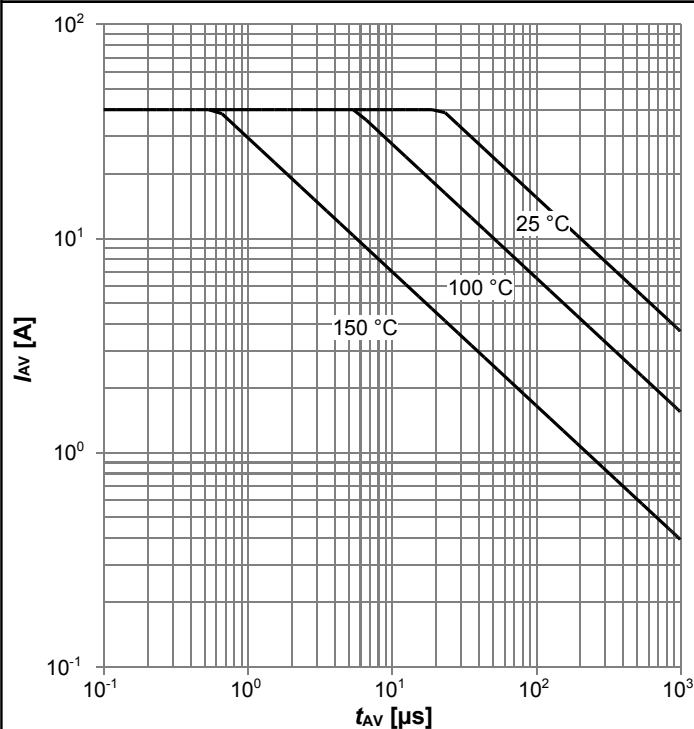
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Typ. forward characteristics of reverse diode



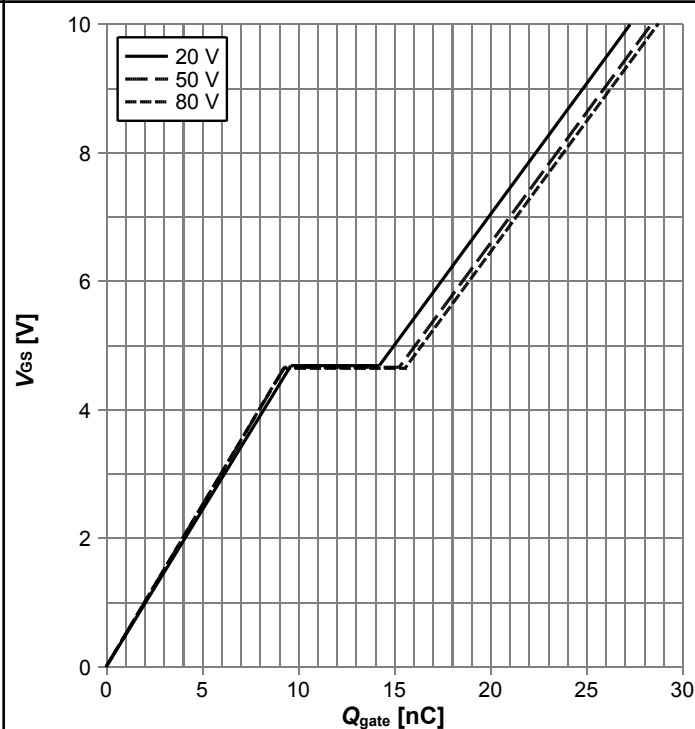
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



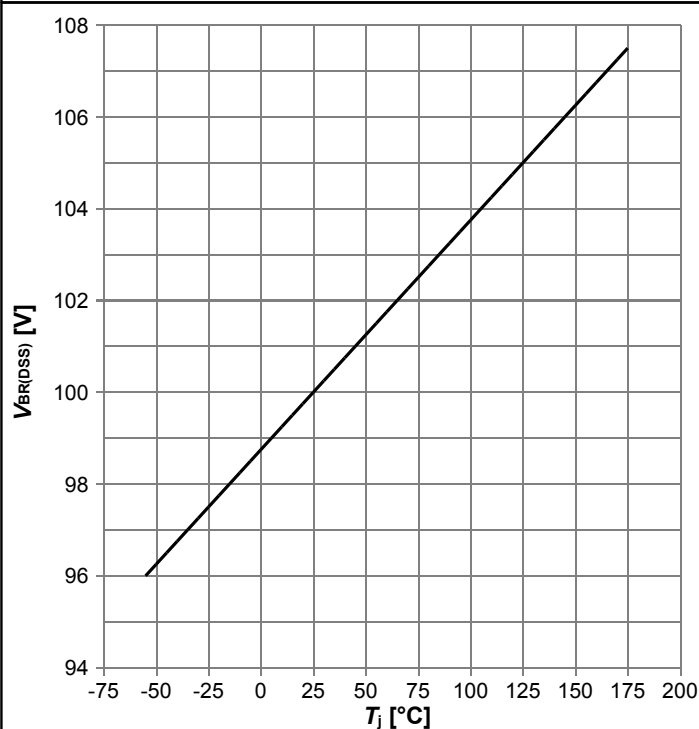
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



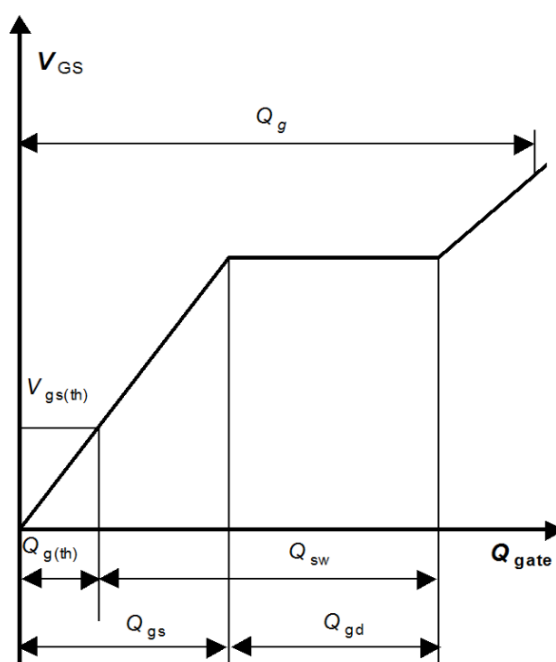
$V_{GS}=f(Q_{gate})$, $I_D=30\text{ A}$ pulsed, $T_j=25\text{ °C}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



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

Diagram Gate charge waveforms



5 Package Outlines

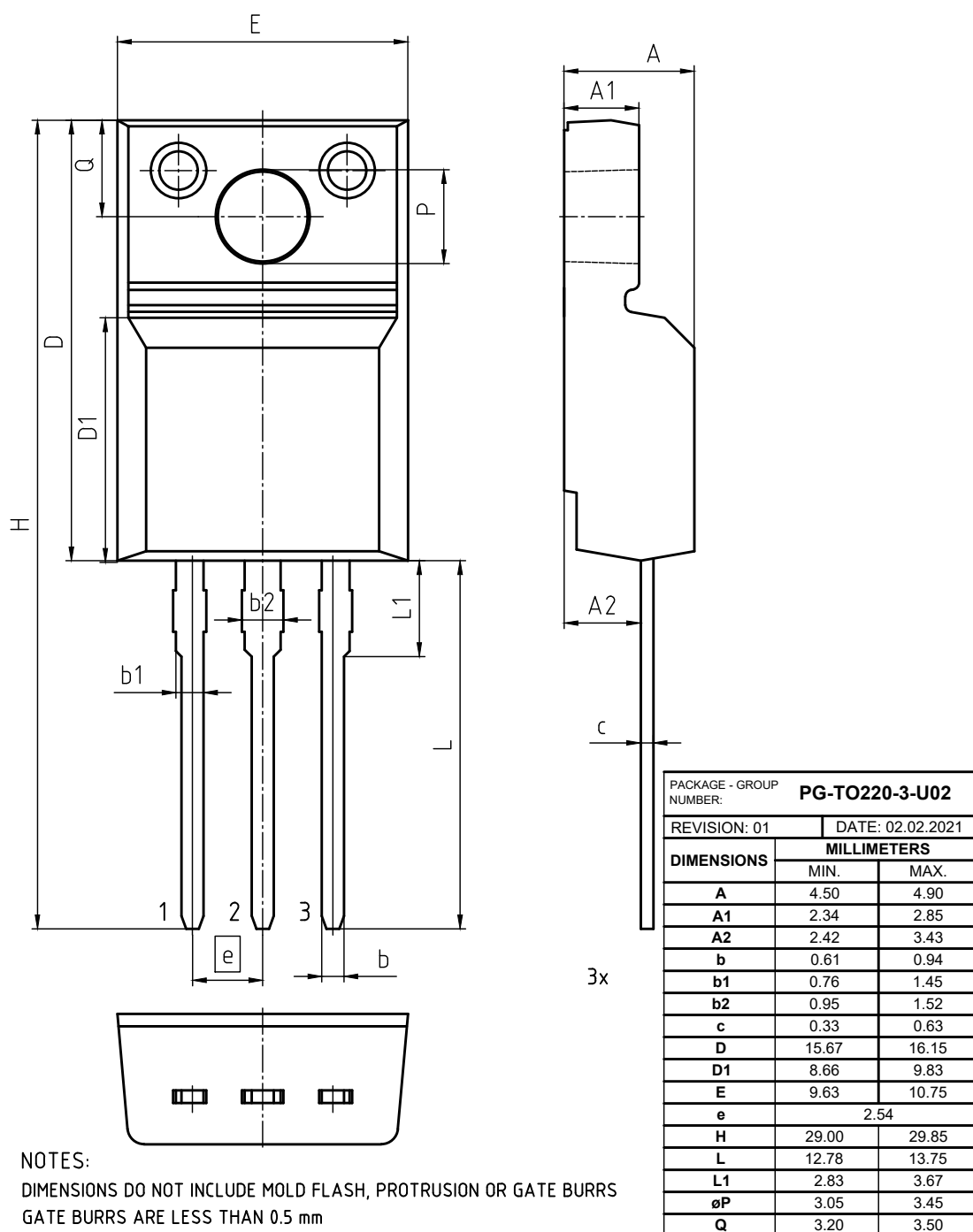


Figure 1 Outline PG-TO220 FullPAK, dimensions in mm

Revision History

IPA082N10NF2S

Revision: 2022-06-14, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2021-03-16	Release of final version
2.1	2022-06-14	Skip condition "Operating and storage tempt.", update trr, Qrr and Diagram 12

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