

MOSFET

OptiMOS™ Power-Transistor, -100 V

Features

- P-channel
- 100% avalanche tested
- Normal level
- Enhancement mode
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Fully qualified according to JEDEC for Industrial Applications

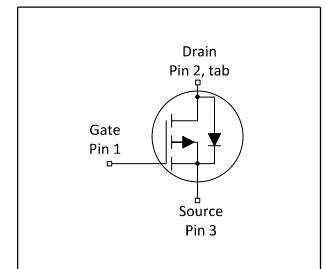
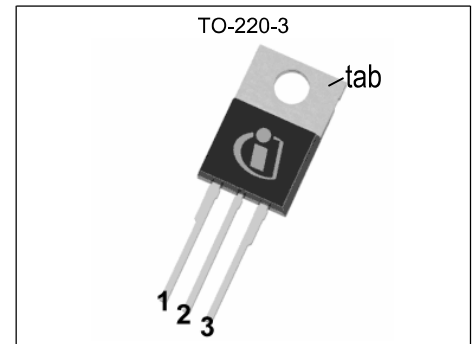


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	-100	V
$R_{DS(on),max}$	33	m Ω
I_D	-62	A
Q_{oss}	-66	nC
Q_G	-189	nC



Type / Ordering Code	Package	Marking	Related Links
IPP330P10NM	PG-TO220-3	330P10NM	-

Table of Contents

Description	1
Maximum ratings	3
Thermal characteristics	3
Electrical characteristics	4
Electrical characteristics diagrams	6
Package Outlines	10
Revision History	11
Trademarks	11
Disclaimer	11

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	-	-	-62 -44 -6.9	A	$V_{GS}=-10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=-10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=-10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=40\text{ °C/W}^2)$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	-248	A	$T_A=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	1960	mJ	$I_D=-53\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	300 3.8	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=40\text{ °C/W}^2)$
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}	-	-	0.5	°C/W	-
Thermal resistance, junction - ambient, 6 cm ² cooling area	R_{thJA}	-	-	40	°C/W	-
Thermal resistance, junction - ambient, minimal footprint ²⁾	R_{thJA}	-	-	62	°C/W	-

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

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ See Diagram 3 for more detailed information

⁴⁾ See Diagram 13 for more detailed information

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	$V_{GS(th)}$	-2.1	-3.0	-4.0	V	$V_{DS}=V_{GS}$, $I_D=-5550\text{ }\mu\text{A}$
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	$R_{DS(on)}$	-	27.1	33	m Ω	$V_{GS}=-10\text{ V}$, $I_D=-53\text{ A}$
Gate resistance	R_G	-	5.4	-	Ω	-
Transconductance	g_{fs}	-	75	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}$, $I_D=-53\text{ A}$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance ¹⁾	C_{iss}	-	8200	11000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	580	750	pF	$V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance ¹⁾	C_{riss}	-	110	190	pF	$V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	13	-	ns	$V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-53\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	45.35	-	ns	$V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-53\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	155.05	-	ns	$V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-53\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	84.05	-	ns	$V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-53\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	-39	-	nC	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	-25	-	nC	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	-59	-89	nC	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Switching charge	Q_{sw}	-	-74	-	nC	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Gate charge total ¹⁾	Q_g	-	-189	-236	nC	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	-4.8	-	V	$V_{DD}=-50\text{ V}$, $I_D=-53\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	-66	-88	nC	$V_{DS}=-50\text{ V}$, $V_{GS}=0\text{ V}$

¹⁾ Defined by design. Not subject to production test.

²⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	-62	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	-248	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	-0.88	-1.2	V	$V_{GS}=0\text{ V}, I_F=-53\text{ A}, T_j=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	110	220	ns	$V_R=-50\text{ V}, I_F=-53\text{ A}, di_F/dt=-100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	557.58	1115.1	nC	$V_R=-50\text{ V}, I_F=-53\text{ A}, di_F/dt=-100\text{ A}/\mu\text{s}$

¹⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

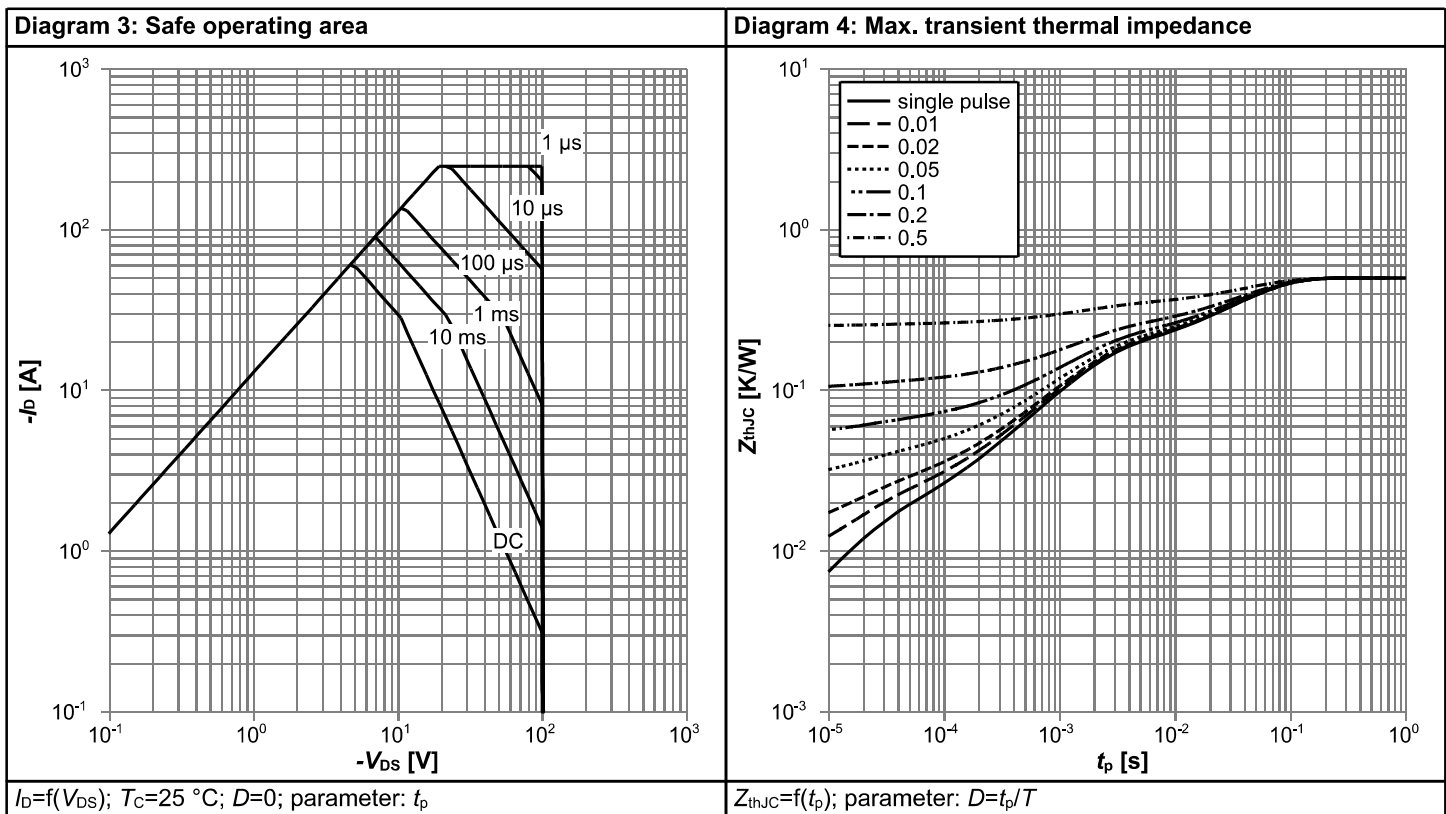
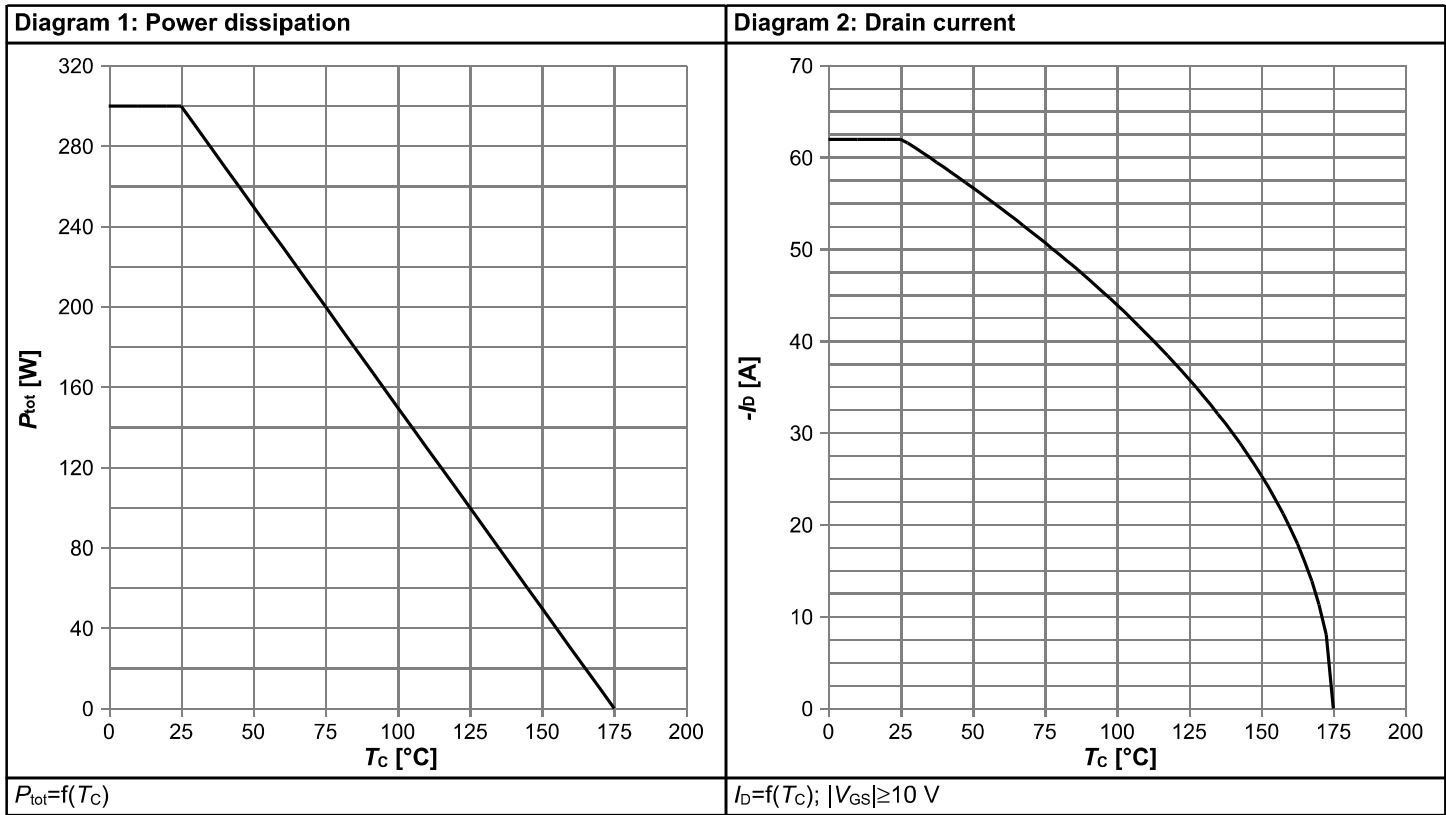
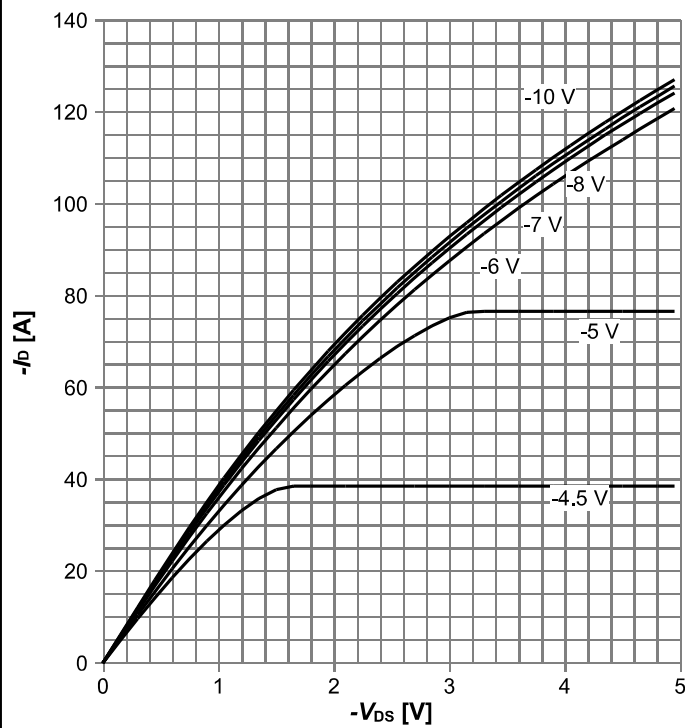
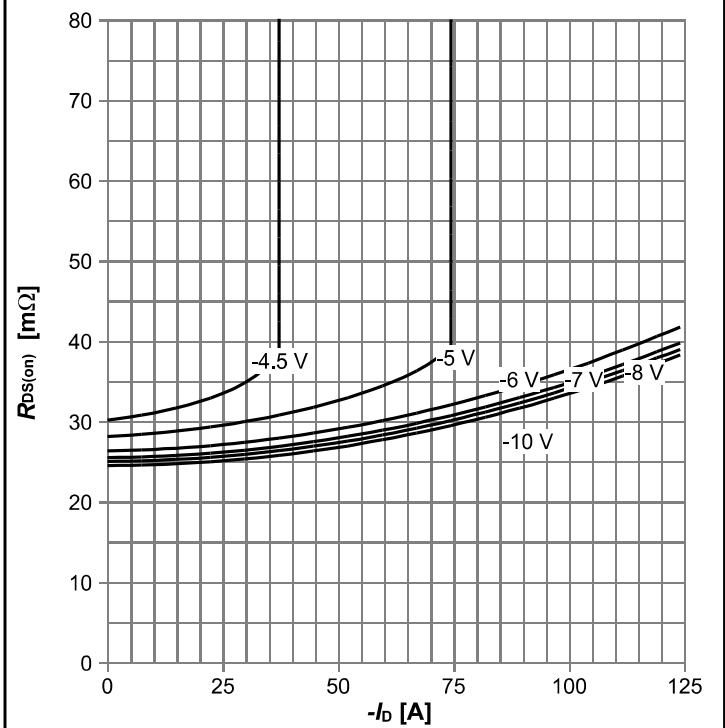


Diagram 5: Typ. output characteristics



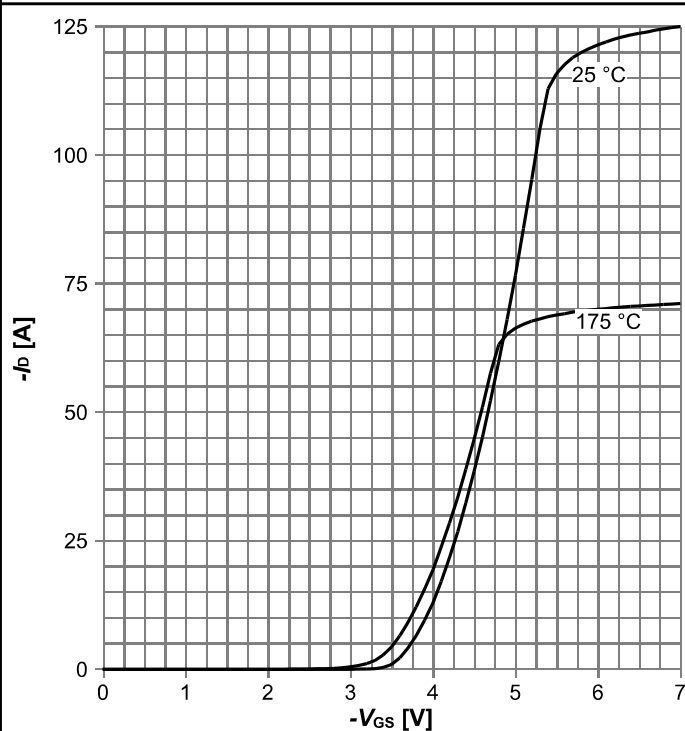
$I_D=f(V_{DS})$, $T_J=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



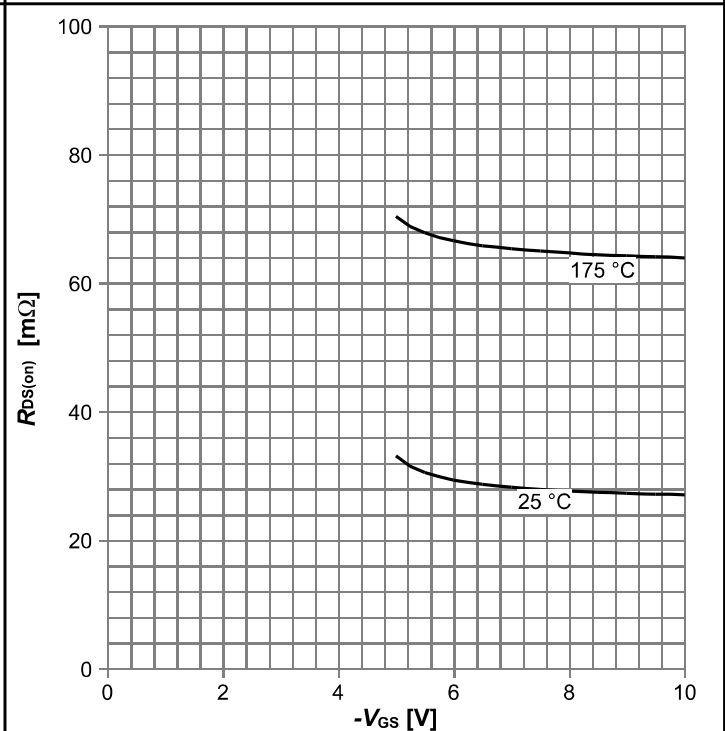
$R_{DS(on)}=f(I_D)$, $T_J=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



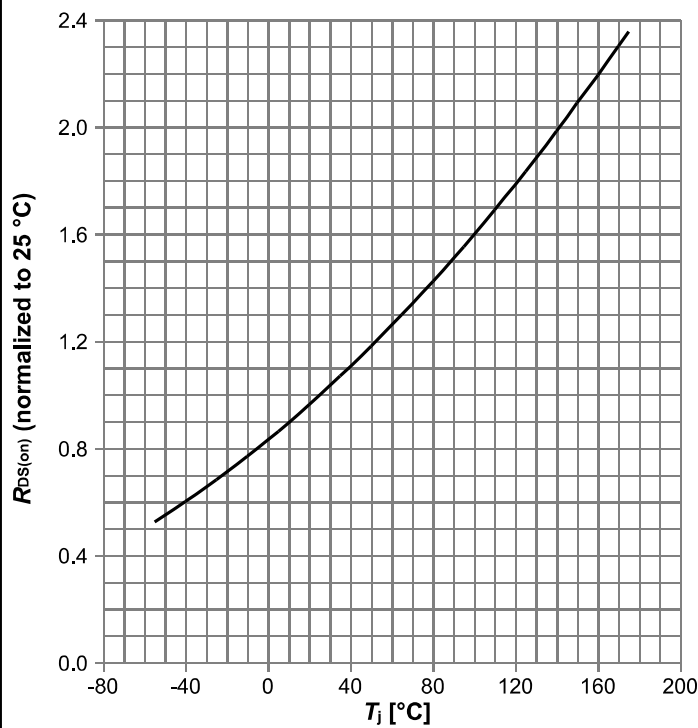
$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_J

Diagram 8: Typ. drain-source on resistance



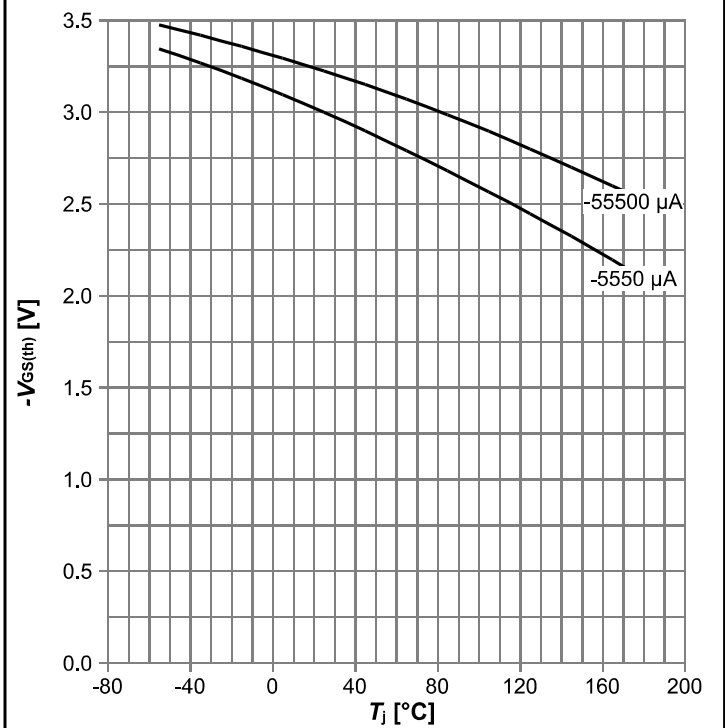
$R_{DS(on)}=f(V_{GS})$, $I_D=-53\text{ A}$; parameter: T_J

Diagram 9: Normalized drain-source on resistance



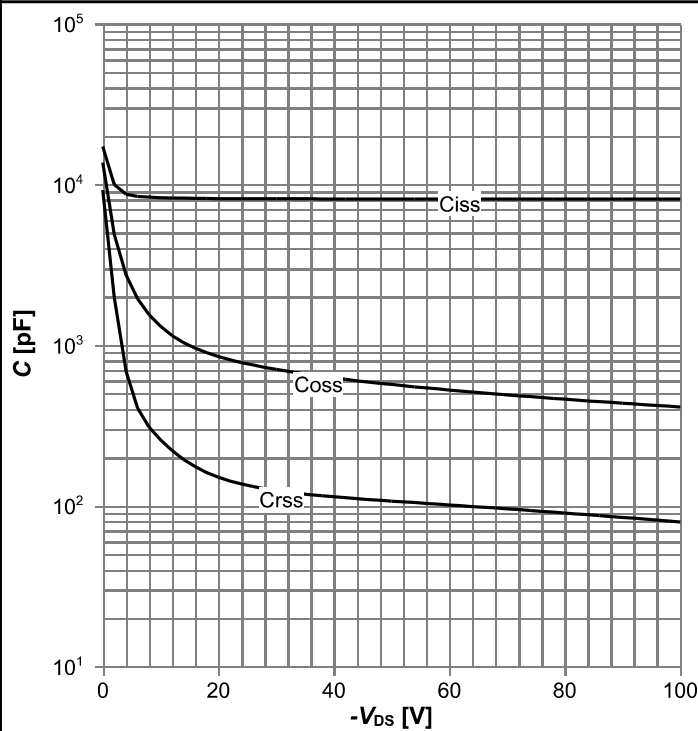
$R_{DS(on)}=f(T_j)$, $I_D=-53$ A, $V_{GS}=-10$ V

Diagram 10: Typ. gate threshold voltage



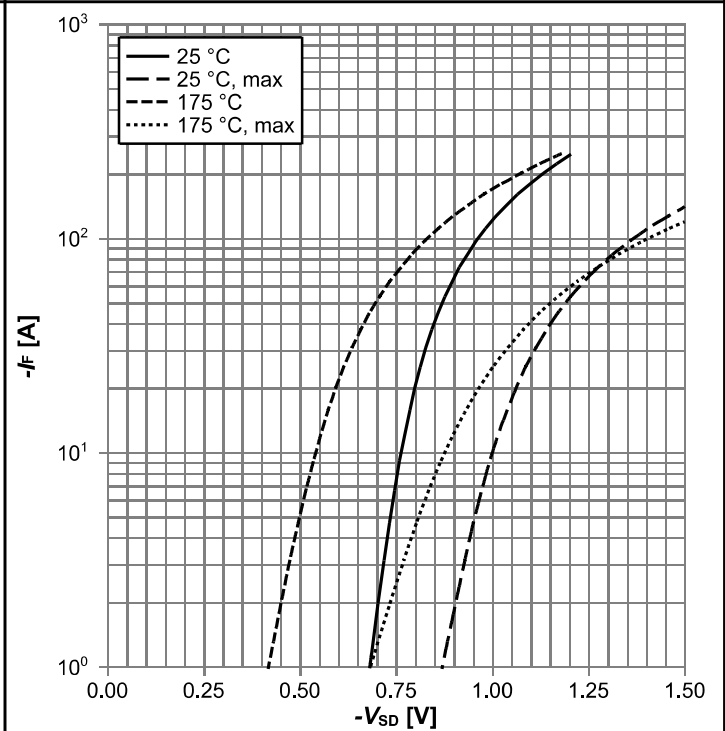
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



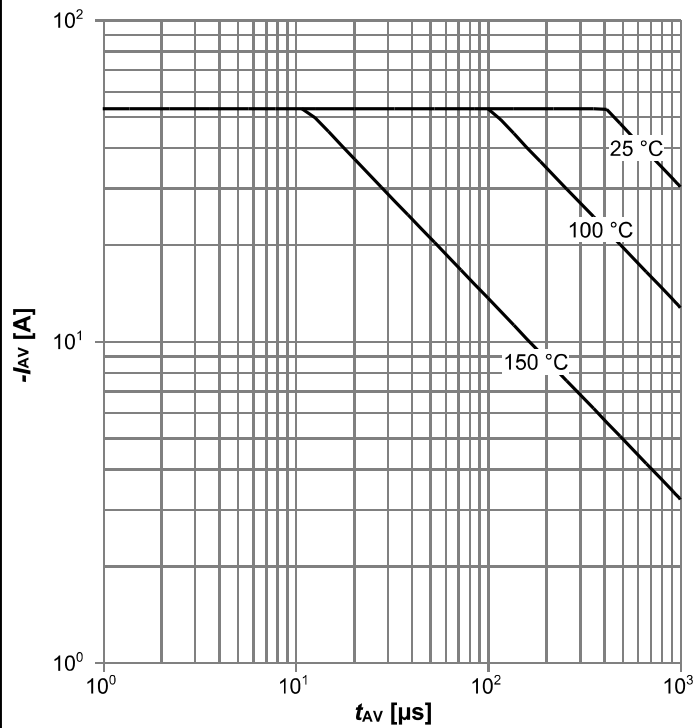
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Forward characteristics of reverse diode



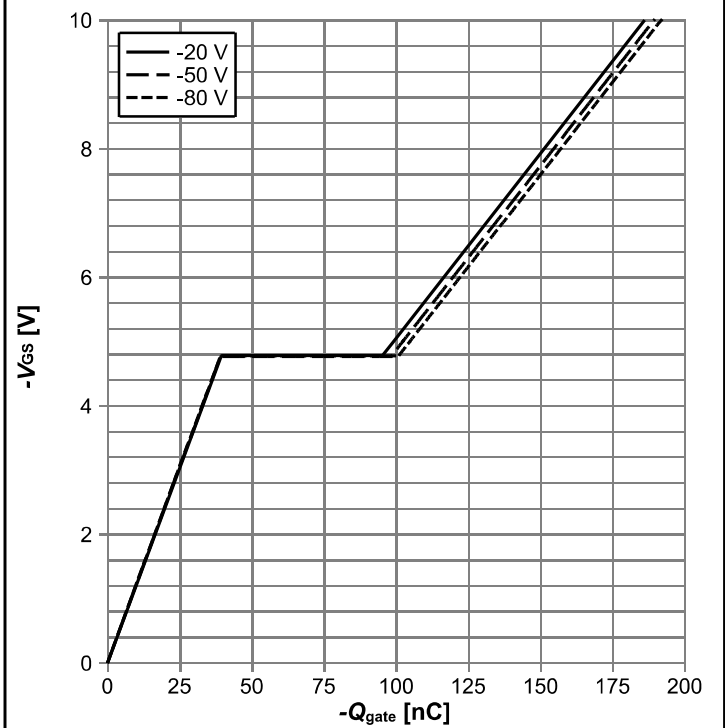
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



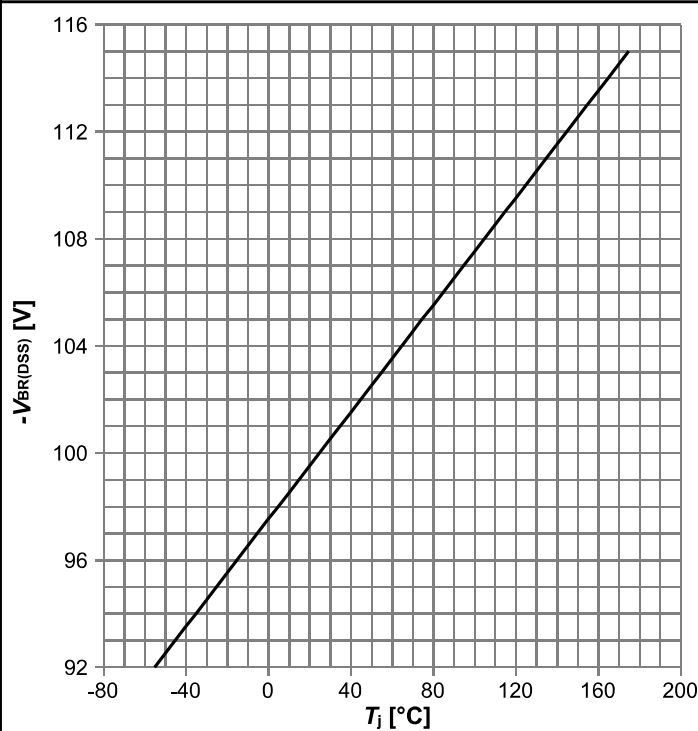
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega; \text{parameter: } T_{j,start}$

Diagram 14: Typ. gate charge



$V_{GS}=f(Q_{gate}), I_D=-53 \text{ A pulsed}, T_j=25 \text{ °C}; \text{parameter: } V_{DD}$

Diagram 15: Drain-source breakdown voltage

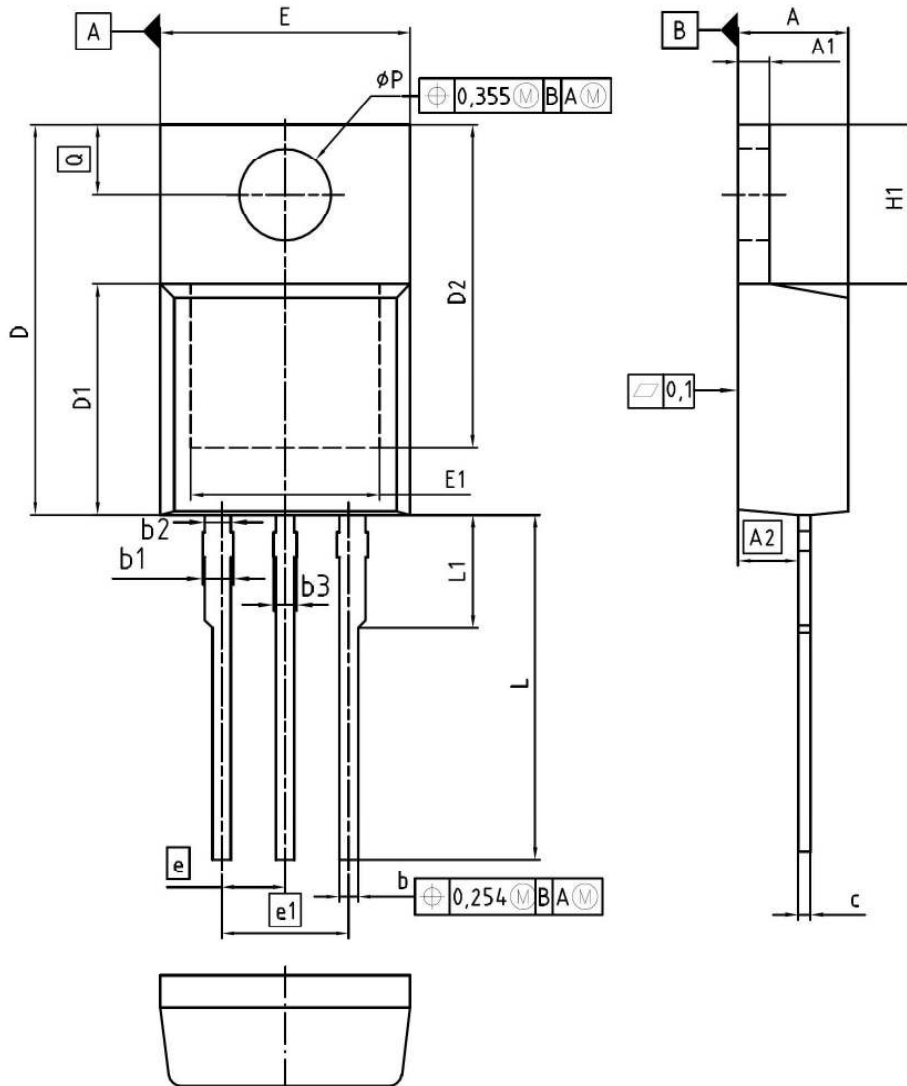


$V_{BR(DSS)}=f(T_j); I_D=-1 \text{ mA}$

Diagram Gate charge waveforms



5 Package Outlines



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

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REVISION
06

Figure 1 Outline PG-TO220-3, dimensions in mm/inches

Revision History

IPP330P10NM

Revision: 2021-05-10, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2021-05-10	Release of final version

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