

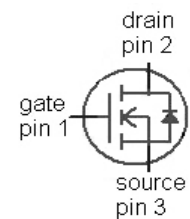
**OptiMOS<sup>®</sup> Power-Transistor**
**Features**

- Low gate charge for fast switching applications
- N-channel enhancement - normal level
- 175 °C operating temperature
- Avalanche rated
- Pb-free lead plating, RoHS compliant

**Product Summary**

$V_{DS}$	60	V
$R_{DS(on),max}$ SMDversion	6.7	m $\Omega$
$I_D$	80	A

Type	IPB070N06N G	IPP070N06N G
		
<b>Package</b>	P-TO263-3-2	P-TO220-3-1
<b>Marking</b>	070N06N	070N06N


**Maximum ratings, at  $T_j=25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25\text{ °C}^{1)}$	80	A
		$T_C=100\text{ °C}$	80	
Pulsed drain current	$I_{D,pulse}$	$T_C=25\text{ °C}^{2)}$	320	
Avalanche energy, single pulse	$E_{AS}$	$I_D=80\text{ A}, R_{GS}=25\text{ }\Omega$	530	mJ
Reverse diode $dv/dt$	$dv/dt$	$I_D=80\text{ A}, V_{DS}=48\text{ V},$ $di/dt=200\text{ A}/\mu\text{s},$ $T_{j,max}=175\text{ °C}$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	250	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 175	$^{\circ}\text{C}$
IEC climatic category; DIN IEC 68-1			55/175/56	

<sup>1)</sup> Current is limited by bondwire; with an  $R_{thJC}=0.6\text{ K/W}$  the chip is able to carry 127 A.

<sup>2)</sup> See figure 3

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	0.6	K/W
SMD version, device on PCB	$R_{thJA}$	minimal footprint	-	-	62	
		6 cm <sup>2</sup> cooling area <sup>3)</sup>	-	-	40	

**Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified**
**Static characteristics**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=180\text{ }\mu\text{A}$	2.1	3.0	4	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=60\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.01	1	$\mu\text{A}$
		$V_{DS}=60\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	1	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=60\text{ V}$	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=80\text{ A},$	-	5.9	7	m $\Omega$
		$V_{GS}=10\text{ V}, I_D=80\text{ A},$ SMD version	-	5.6	6.7	
Gate resistance	$R_G$		-	1.5	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max},$ $I_D=80\text{ A}$	49	98	-	S

<sup>3)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$ $f=1\text{ MHz}$	-	3100	4100	pF
Output capacitance	$C_{oss}$		-	860	1100	
Reverse transfer capacitance	$C_{rss}$		-	210	315	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=80\text{ A}, R_G=3.3\ \Omega$	-	16	24	ns
Rise time	$t_r$		-	37	56	
Turn-off delay time	$t_{d(off)}$		-	61	91	
Fall time	$t_f$		-	36	54	

**Gate Charge Characteristics<sup>4)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=30\text{ V}, I_D=80\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	16	21	nC
Gate charge at threshold	$Q_{g(th)}$		-	9	12	
Gate to drain charge	$Q_{gd}$		-	39	59	
Switching charge	$Q_{sw}$		-	46	68	
Gate charge total	$Q_g$		-	89	118	
Gate plateau voltage	$V_{plateau}$		-	5.3	-	V
Output charge	$Q_{oss}$	$V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$	-	40	54	

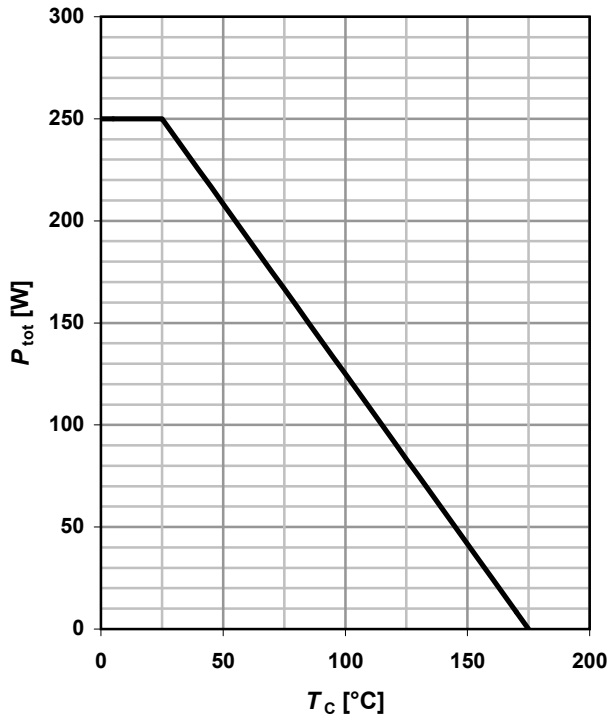
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	80	A
Diode pulse current	$I_{S,pulse}$		-	-	320	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=80\text{ A},$ $T_J=25\text{ }^\circ\text{C}$	-	0.95	1.3	V
Reverse recovery time	$t_{rr}$	$V_R=30\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	55	70	ns
Reverse recovery charge	$Q_{rr}$		-	96	120	nC

<sup>4)</sup> See figure 16 for gate charge parameter definition

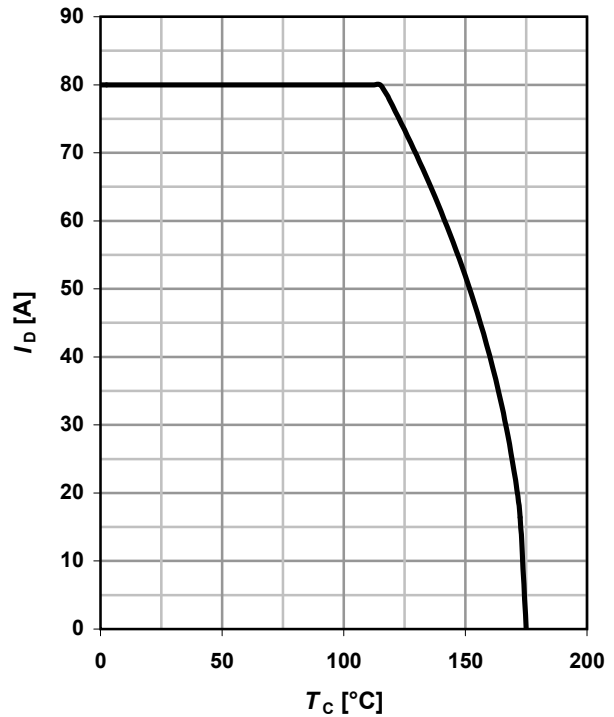
**1 Power dissipation**

$P_{tot}=f(T_C)$



**2 Drain current**

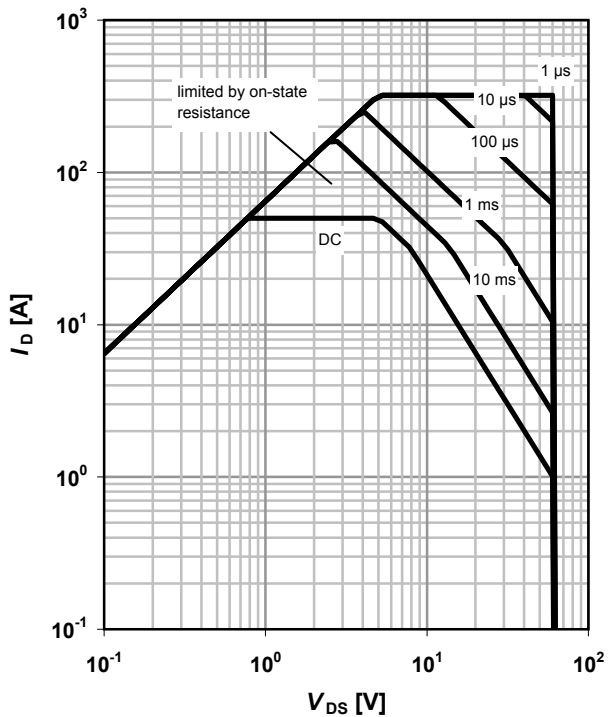
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

$I_D=f(V_{DS}); T_C=25\text{ °C}; D=0$

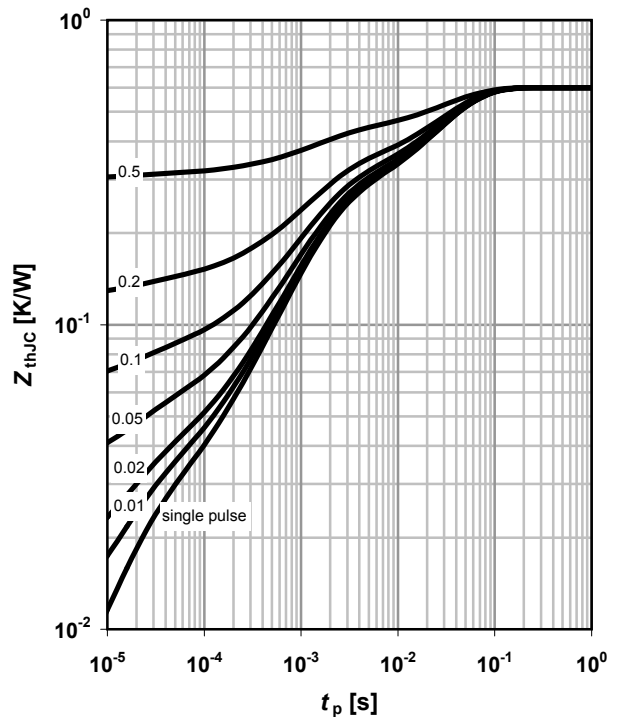
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

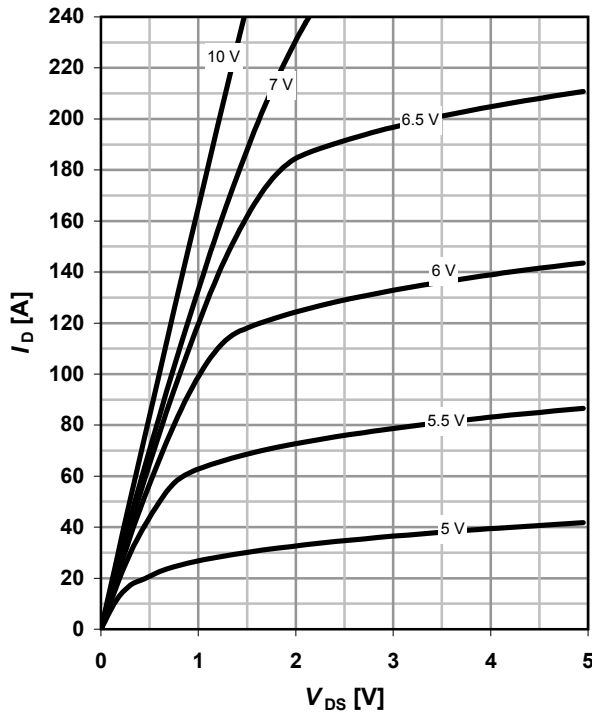
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

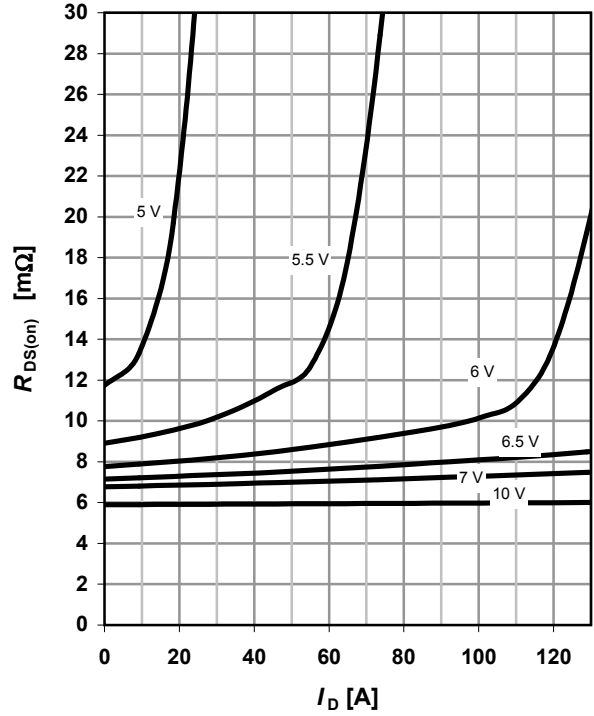
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$

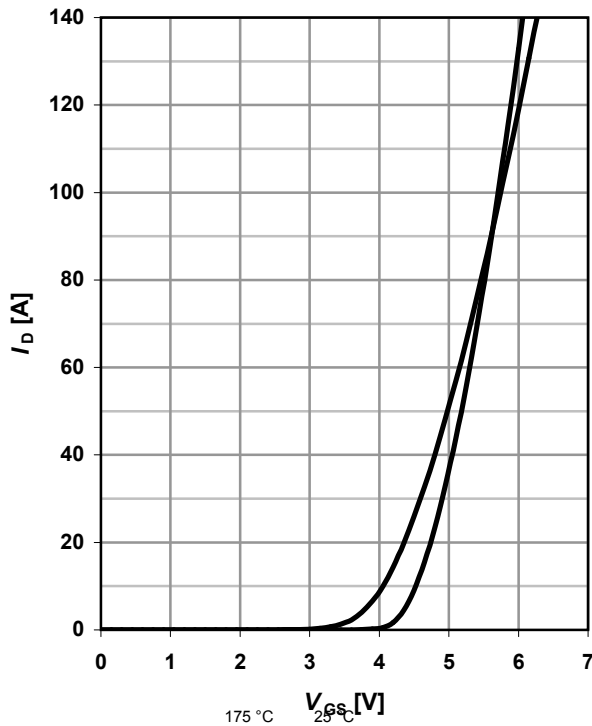
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

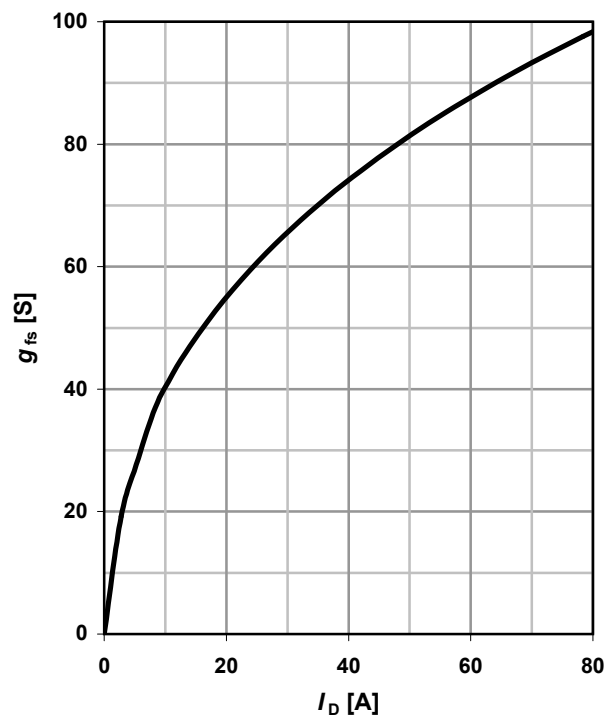
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



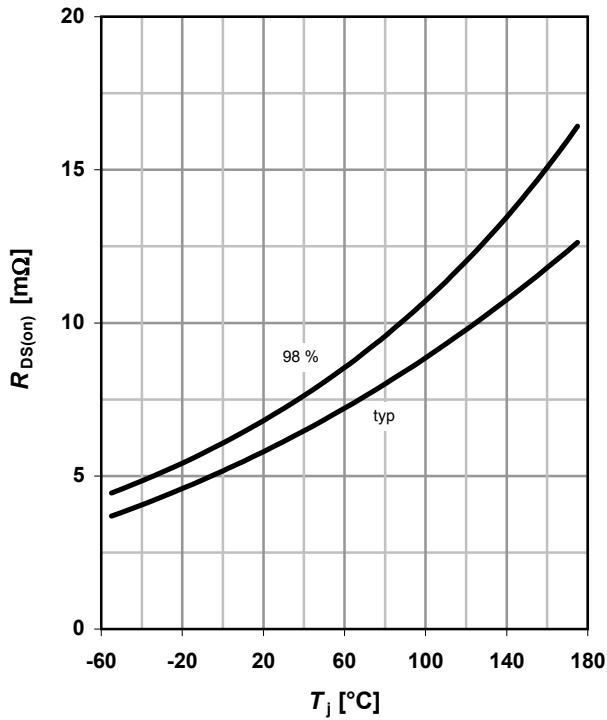
**8 Typ. forward transconductance**

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



**9 Drain-source on-state resistance**

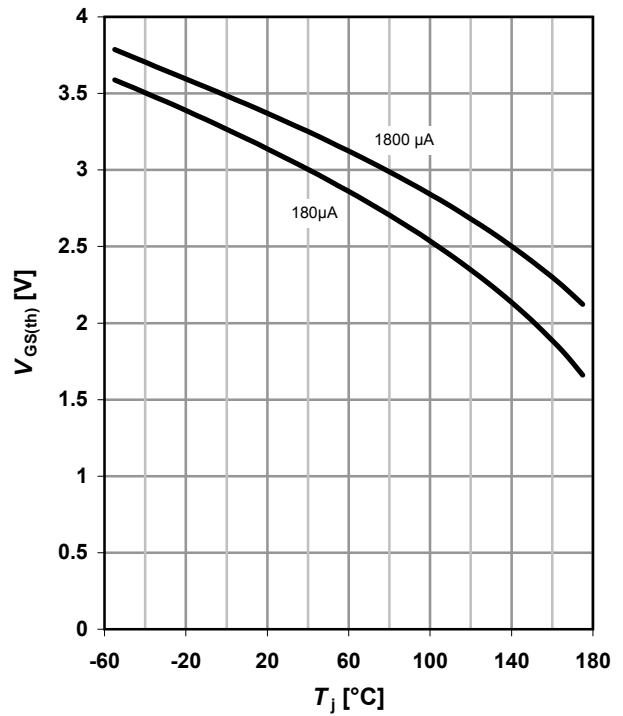
$R_{DS(on)}=f(T_j); I_D=80\text{ A}; V_{GS}=10\text{ V}$



**10 Typ. gate threshold voltage**

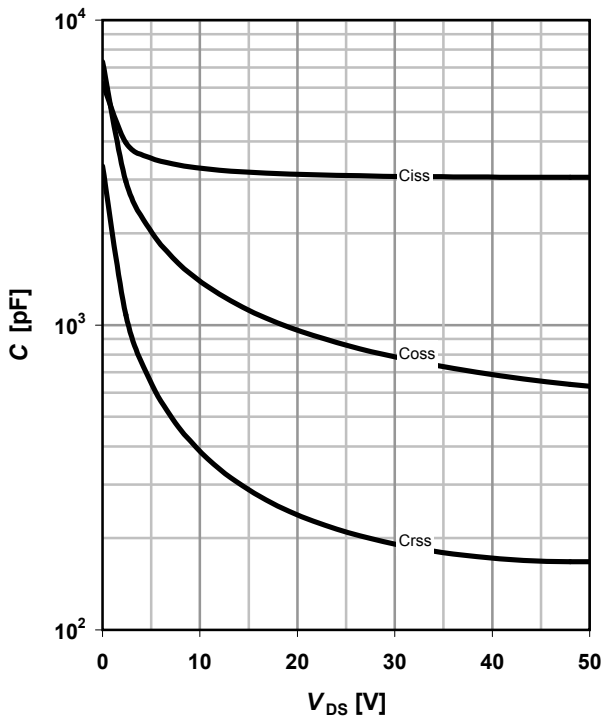
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

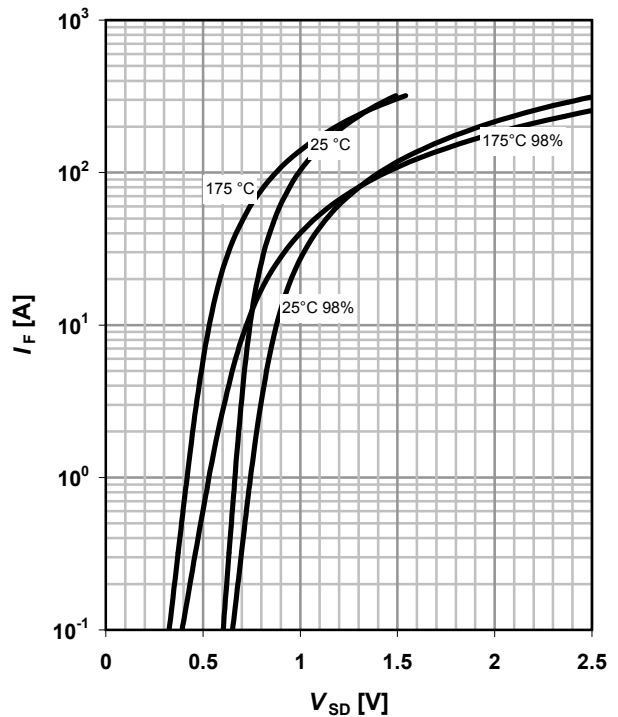
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

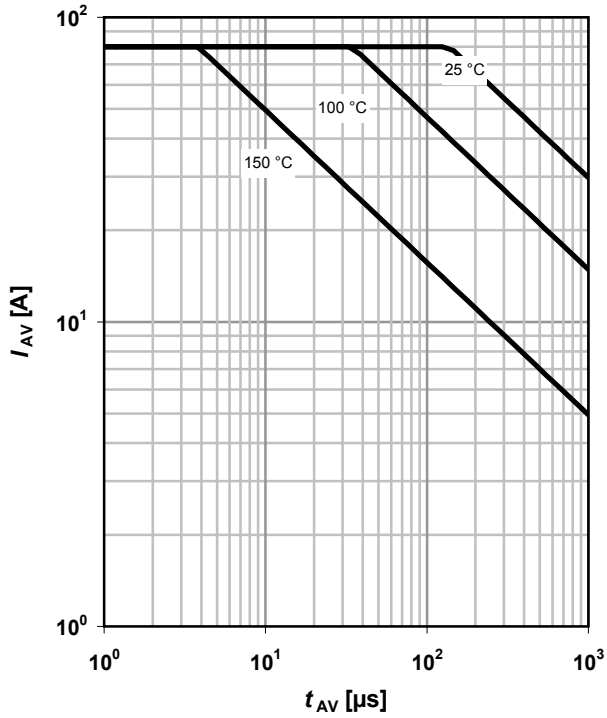
parameter:  $T_j$



**13 Avalanche characteristics**

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

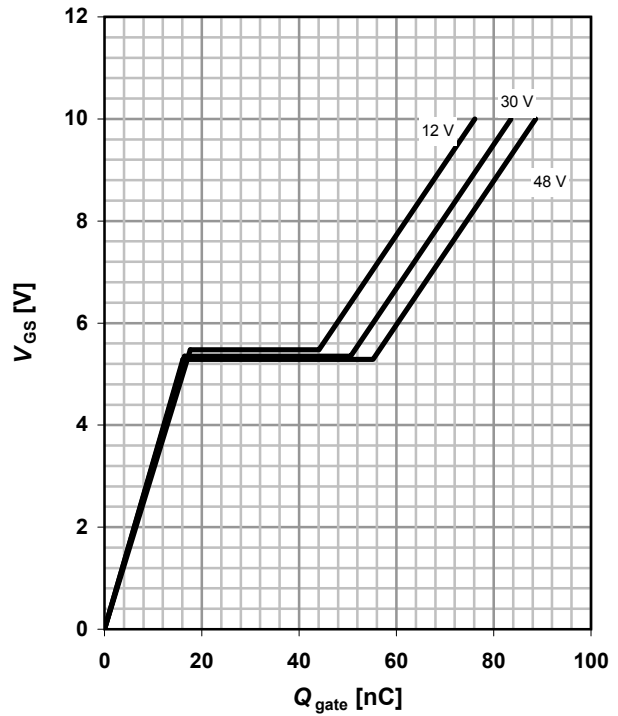
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

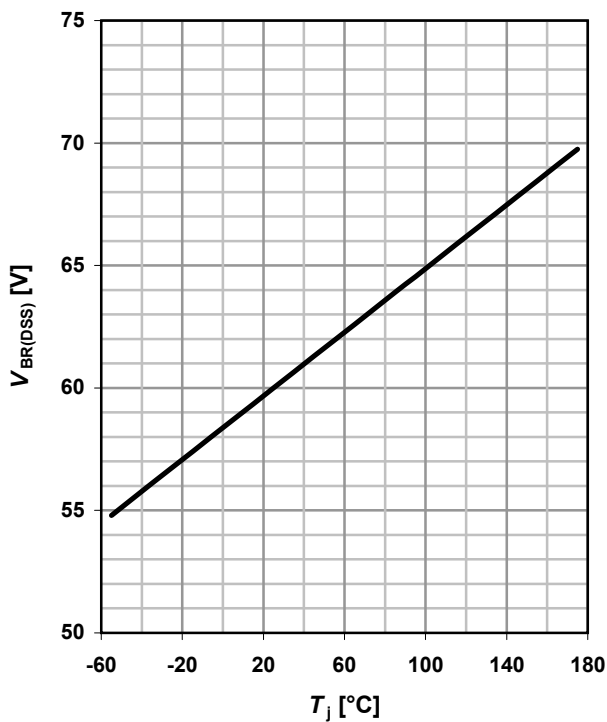
$V_{GS}=f(Q_{gate}); I_D=80 \text{ A pulsed}$

parameter:  $V_{DD}$

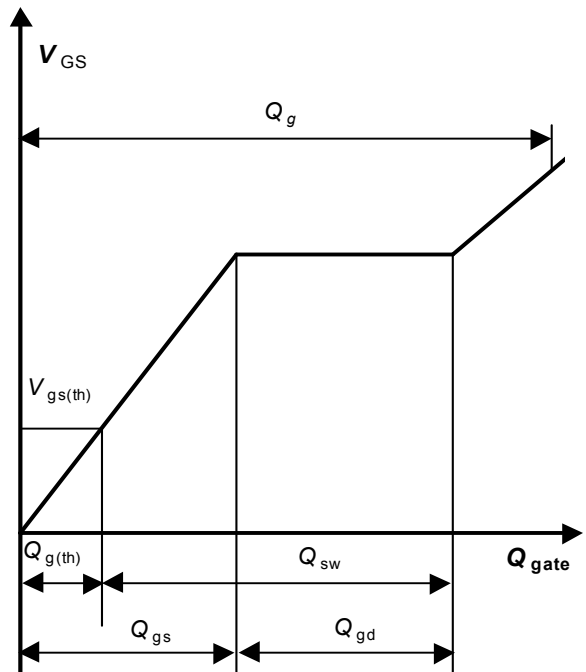


**15 Drain-source breakdown voltage**

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



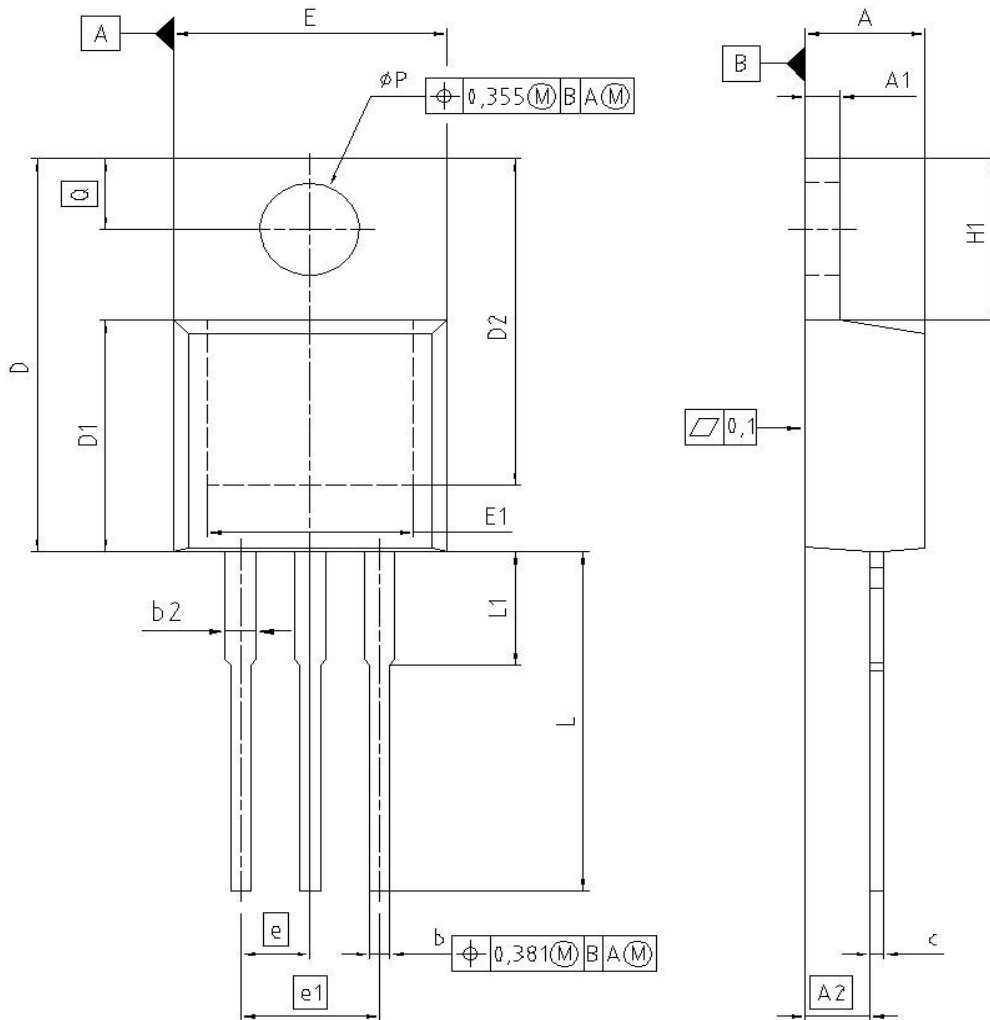
**16 Gate charge waveforms**







PG-TO220-3: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	1.170	1.400	0.046	0.055
A2	2.215	2.718	0.087	0.107
b	0.650	0.864	0.026	0.034
b2	0.635	1.778	0.025	0.070
c	0.330	0.600	0.013	0.024
D	14.808	15.950	0.583	0.628
D1	8.509	9.450	0.335	0.372
D2	12.850	13.100	0.506	0.516
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	
H1	5.900	6.900	0.232	0.272
L	13.000	14.000	0.512	0.551
L1	-	4.800	-	0.189
pP	3.700	3.886	0.146	0.153
Q	2.600	3.000	0.102	0.118

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