

**OptiMOS™3 Power-Transistor**
**Features**

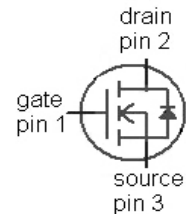
- N-channel, normal level
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Very low on-resistance  $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target application
- Ideal for high-frequency switching and synchronous rectification

**Product Summary**

$V_{DS}$	100	V
$R_{DS(on),max}$	3	mΩ
$I_D$	100	A



Type	IPP030N10N3 G	IPI030N10N3 G
<b>Package</b>	PG-TO220-3	PG-TO262-3
<b>Marking</b>	030N10N	030N10N


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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25\text{ °C}^{2)}$	100	A
		$T_C=100\text{ °C}$	100	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	400	
Avalanche energy, single pulse	$E_{AS}$	$I_D=100\text{ A}, R_{GS}=25\text{ }\Omega$	1000	mJ
Gate source voltage	$V_{GS}$		±20	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	300	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

<sup>1)</sup>J-STD20 and JESD22

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	0.5	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	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	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=275\text{ }\mu\text{A}$	2	2.7	3.5	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.1	1	$\mu\text{A}$
		$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=100\text{ A}$	-	2.6	3	m $\Omega$
		$V_{GS}=6\text{ V}, I_D=50\text{ A}$	-	3.1	4.8	
Gate resistance	$R_G$		-	1.9	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=100\text{ A}$	94	188	-	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	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V},$ $f=1\text{ MHz}$	-	11100	14800	pF
Output capacitance	$C_{oss}$		-	1940	2580	
Reverse transfer capacitance	$C_{rss}$		-	69	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=100\text{ A}, R_G=1.6\ \Omega$	-	34	-	ns
Rise time	$t_r$		-	58	-	
Turn-off delay time	$t_{d(off)}$		-	84	-	
Fall time	$t_f$		-	28	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=50\text{ V}, I_D=100\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	49	-	nC
Gate to drain charge	$Q_{gd}$		-	28	-	
Switching charge	$Q_{sw}$		-	43	-	
Gate charge total	$Q_g$		-	155	206	
Gate plateau voltage	$V_{plateau}$		-	4.4	-	
Output charge	$Q_{oss}$	$V_{DD}=50\text{ V}, V_{GS}=0\text{ V}$	-	205	273	nC

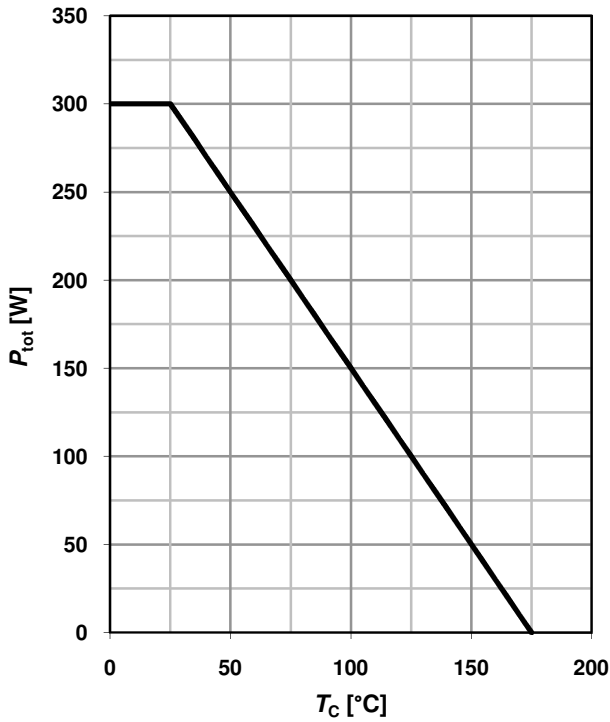
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	100	A
Diode pulse current	$I_{S,pulse}$		-	-	400	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=100\text{ A},$ $T_J=25\text{ }^\circ\text{C}$	-	1	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	86	-	ns
Reverse recovery charge	$Q_{rr}$		-	232	-	nC

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

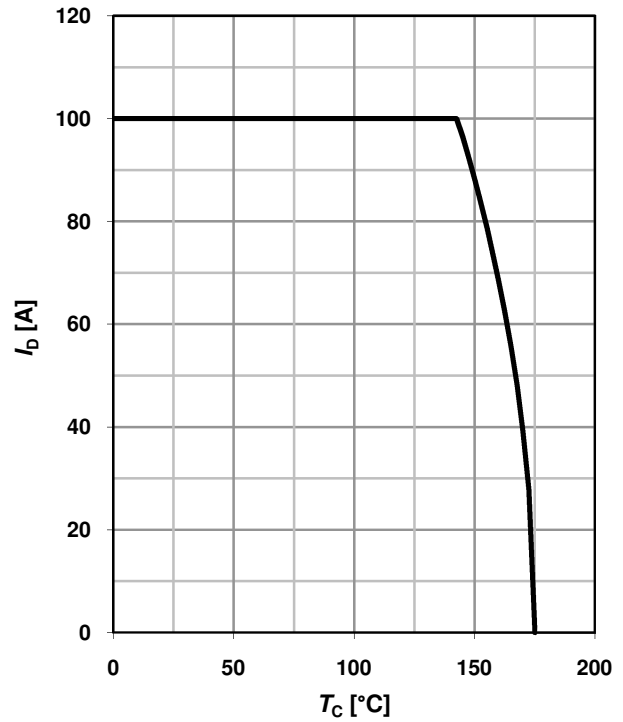
### 1 Power dissipation

$$P_{tot}=f(T_C)$$



### 2 Drain current

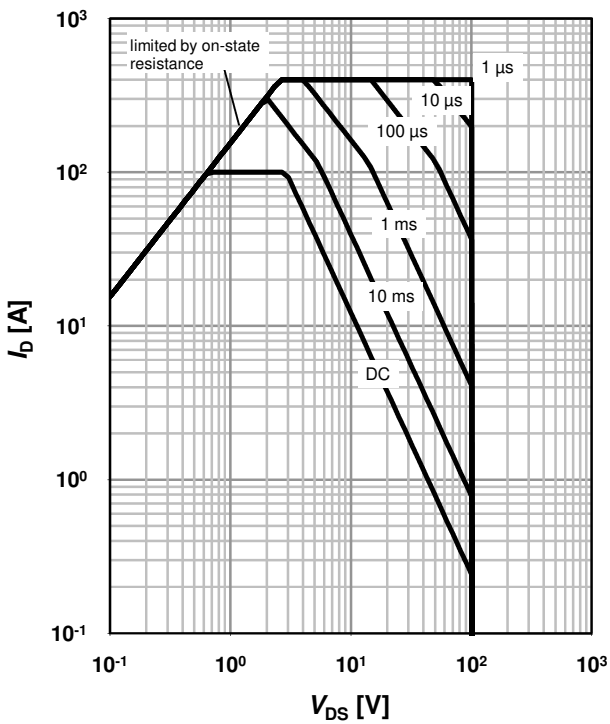
$$I_D=f(T_C); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

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

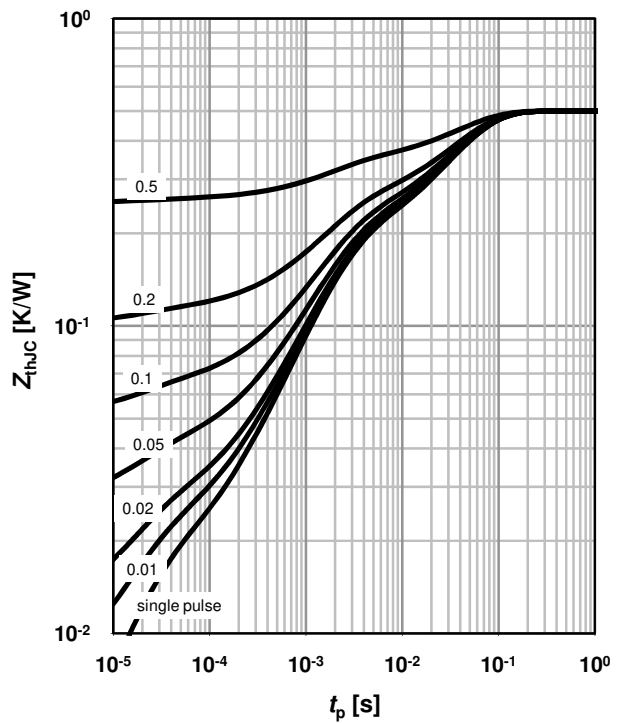
parameter:  $t_p$



### 4 Max. transient thermal impedance

$$Z_{thJC}=f(t_p)$$

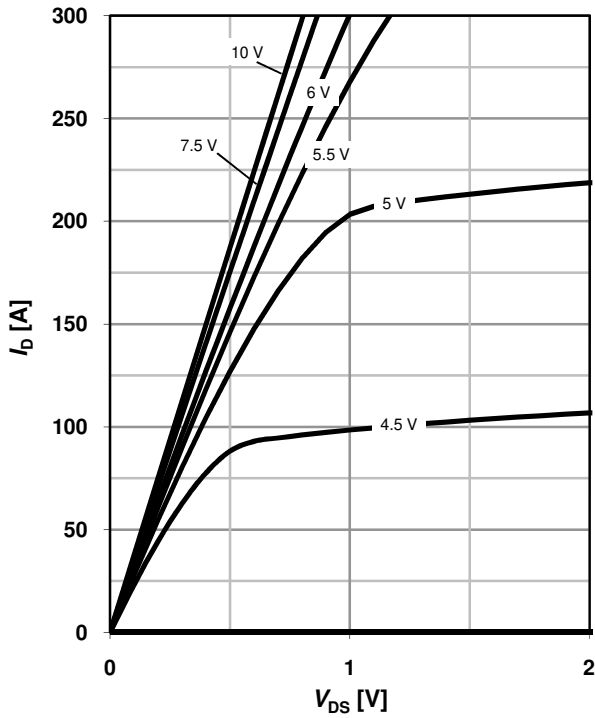
parameter:  $D=t_p/T$



### 5 Typ. output characteristics

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

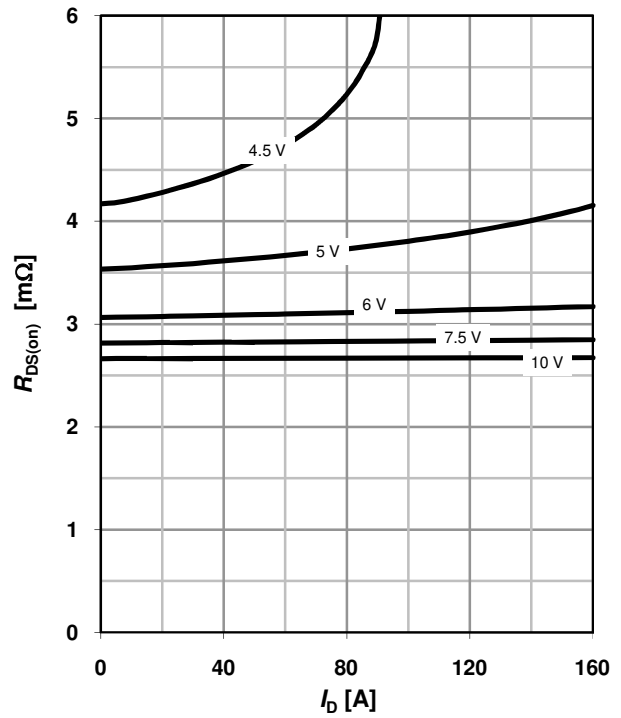
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

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

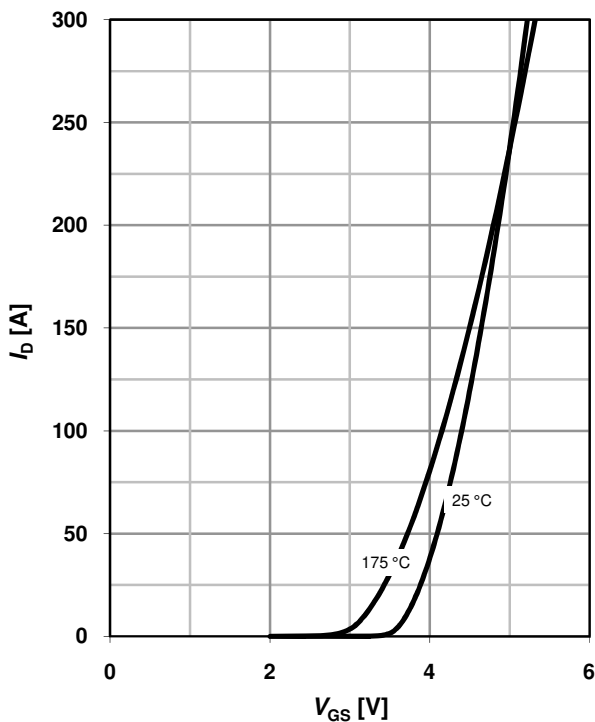
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

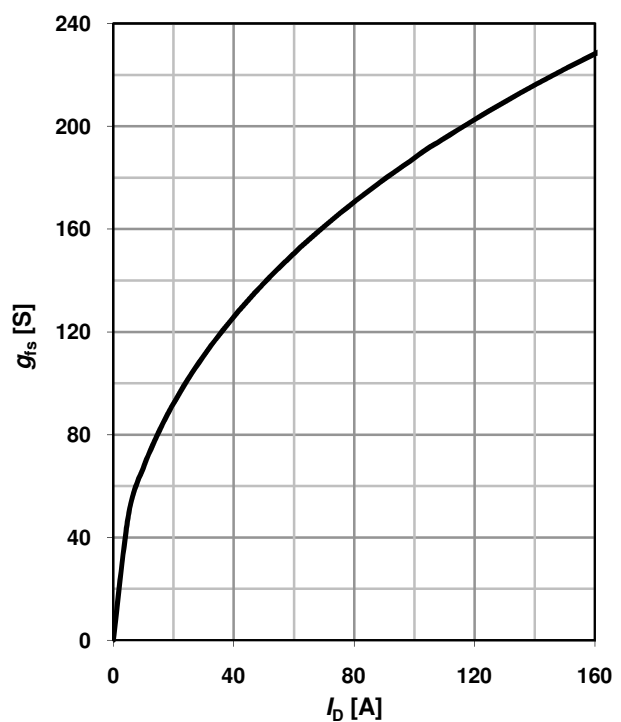
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



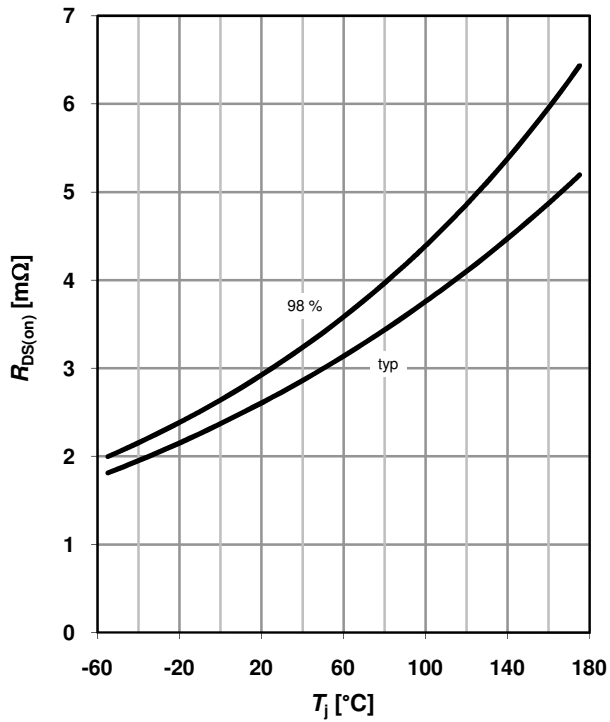
### 8 Typ. forward transconductance

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

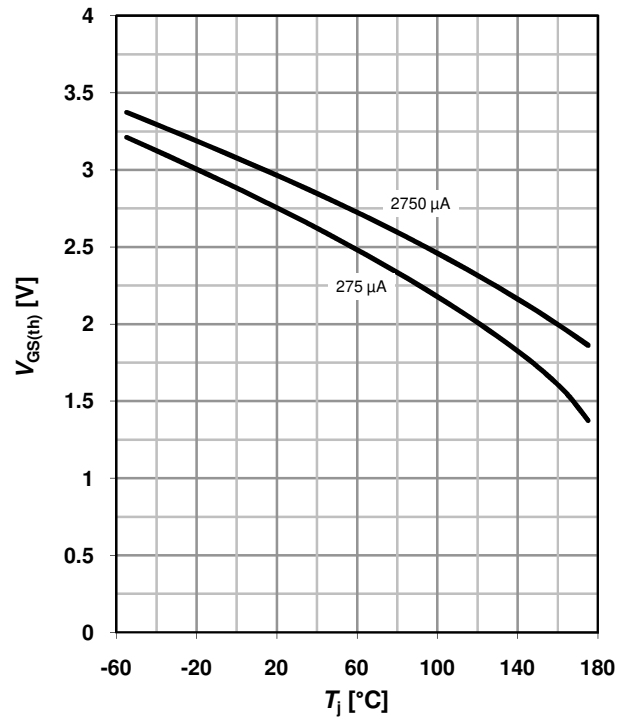


**9 Drain-source on-state resistance**

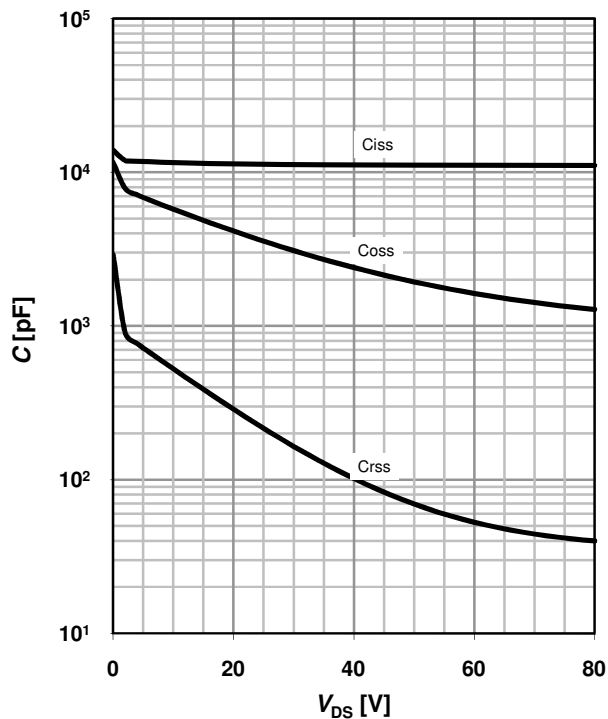
$$R_{DS(on)} = f(T_j); I_D = 100 \text{ A}; V_{GS} = 10 \text{ V}$$


**10 Typ. gate threshold voltage**

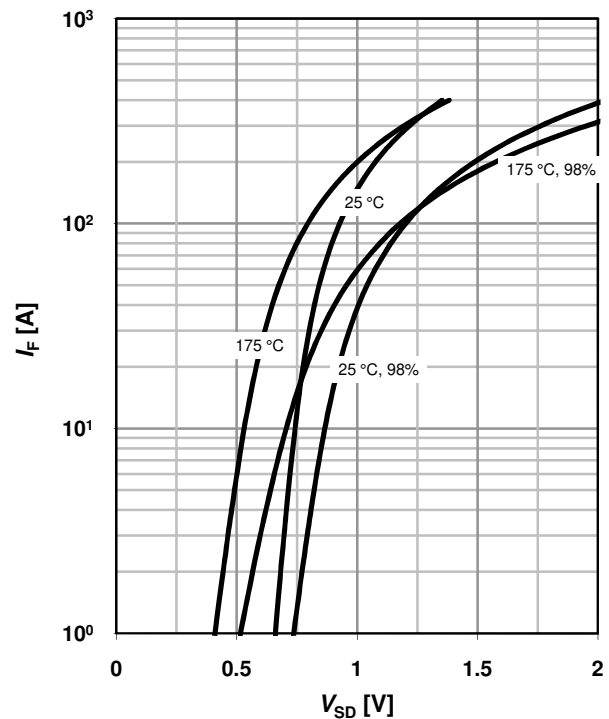
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

 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**

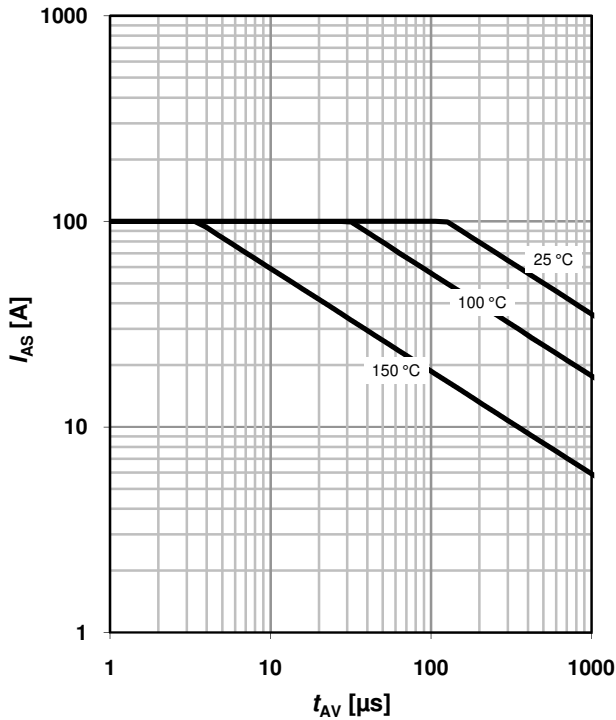
$$I_F = f(V_{SD})$$

 parameter:  $T_j$ 


### 13 Avalanche characteristics

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

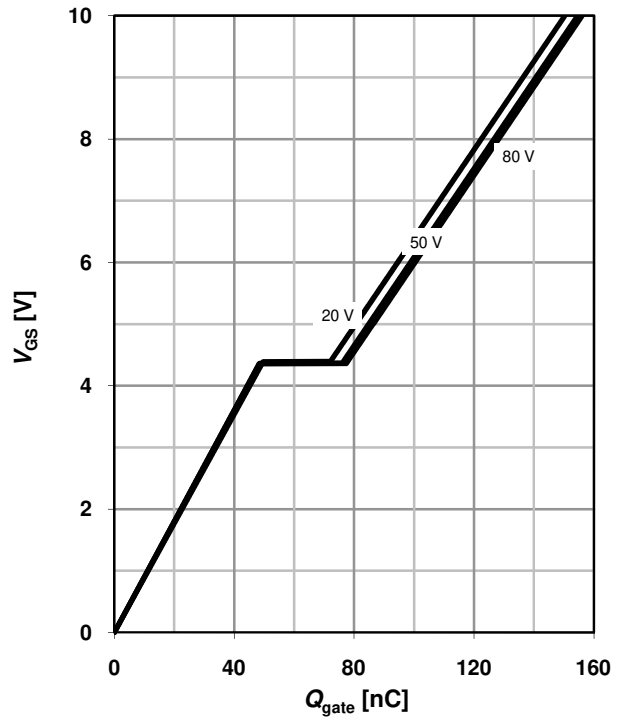
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

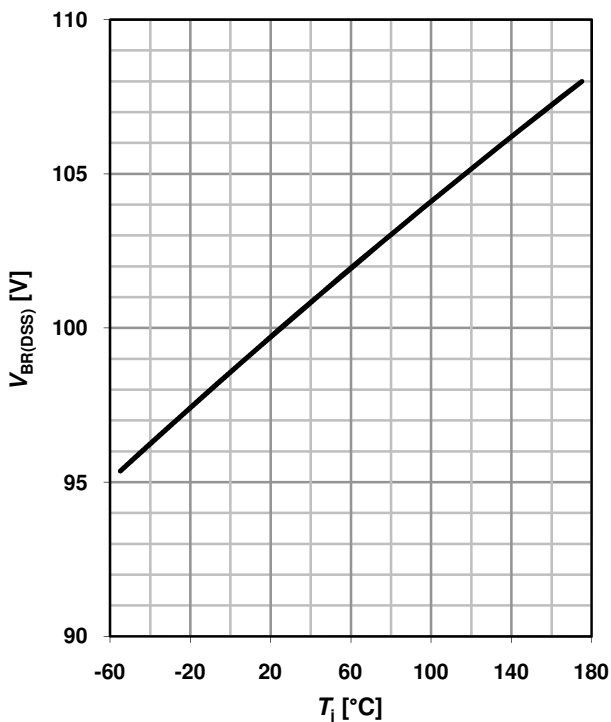
$$V_{GS} = f(Q_{\text{gate}}); I_D = 100 \text{ A pulsed}$$

parameter:  $V_{DD}$

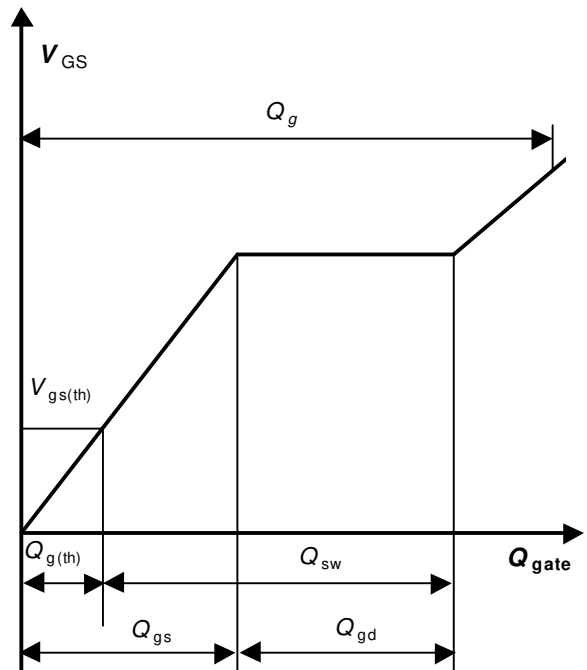


### 15 Drain-source breakdown voltage

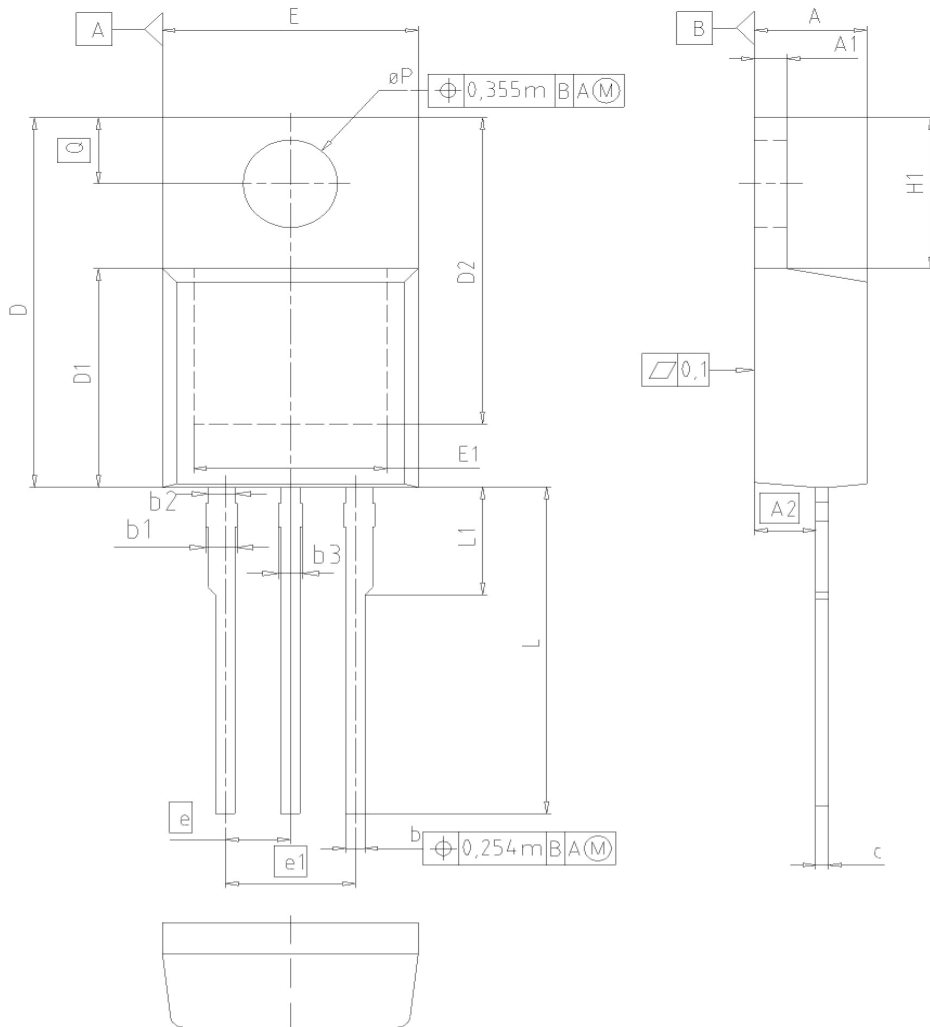
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



### 16 Gate charge waveforms



## PG-TO220-3: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	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
$\phi P$	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

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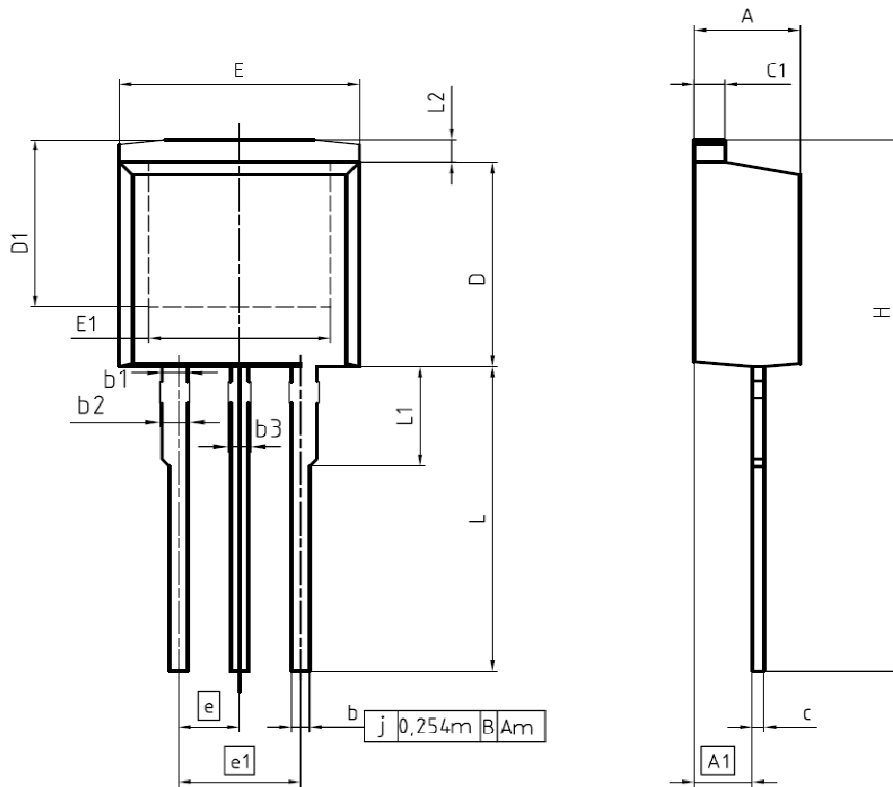
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## PG-TO262-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	2.150	2.718	0.085	0.107
b	0.650	0.864	0.026	0.034
b1	0.950	1.093	0.037	0.043
b2	0.950	1.400	0.037	0.055
b3	0.650	1.118	0.026	0.044
c	0.330	0.600	0.013	0.024
c1	1.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	6.900	-	0.272	-
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	
L	13.000	14.000	0.512	0.551
L1	-	4.800	-	0.189
L2	-	1.727	-	0.068

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