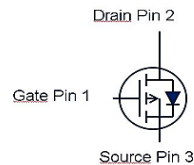
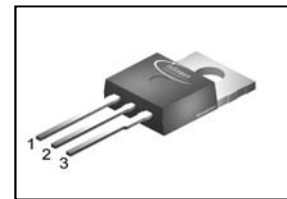


**SIPMOS<sup>®</sup> Small-Signal-Transistor**
**Features**

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- 175°C operating temperature
- Pb-free lead finishing; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Qualified according to AEC Q101

**Product Summary**

$V_{DS}$	-60	V
$R_{DS(on),max}$	0.13	$\Omega$
$I_D$	-18.7	A


**PG-TO220-3-1**

**Halogen-Free**


Type	Package	Tape and reel information	Marking	Lead free
SPP18P06PH	PG-TO220-3	50pcs/tube	18P06P	Yes

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

Parameter	Symbol	Conditions	Value	Unit
			steady state	
Continuous drain current	$I_D$	$T_A=25\text{ °C}$	-18.7	A
		$T_A=100\text{ °C}$	-13.2	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	-74.8	
Avalanche energy, single pulse	$E_{AS}$	$I_D=18.7\text{ A}$ , $R_{GS}=25\ \Omega$	151	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$		8	
Reverse diode dv/dt	dv/dt	$I_D=18.7\text{ A}$ , $V_{DS}=48\text{ V}$ , $di/dt=-200\text{ A}/\mu\text{s}$ , $T_{j,max}=175\text{ °C}$	-6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
Power dissipation	$P_{tot}$	$T_A=25\text{ °C}^{(1)}$	81.1	W
Operating and storage temperature	$T_j$ , $T_{stg}$		"-55 ... +175"	$^{\circ}\text{C}$
ESD class			Class 1C( >1000V <200V)	
Soldering temperature			260 $^{\circ}\text{C}$	
IEC climatic category; DIN IEC 68-1			55/150/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	1.85	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$		-	-	62	
SMD version, device on PCB:	$R_{thJA}$	minimal footprint	-	-	62	K/W
		6 cm <sup>2</sup> cooling area <sup>1)</sup>	-	-	40	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=-250\text{ }\mu\text{A}$	-60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-1000\text{ }\mu\text{A}$	-2.1	2.7	-4	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	-0.1	-1	$\mu\text{A}$
		$V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ }^\circ\text{C}$	-	-10	-100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	-	-10	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-10\text{ V}, I_D=-13.2\text{ A}$	-	102	130	m $\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=-13.2\text{ A}$	5	10	-	S

<sup>1)</sup> Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=-25\text{ V},$ $f=1\text{ MHz}$	-	690	860	pF
Output capacitance	$C_{oss}$		-	230	290	
Reverse transfer capacitance	$C_{rss}$		-	95	120	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-30\text{ V}, V_{GS}=-$ $10\text{ V}, I_D=-13.2\text{ A},$ $R_G=2.7\ \Omega$	-	12.0	18.0	ns
Rise time	$t_r$		-	5.8	8.7	
Turn-off delay time	$t_{d(off)}$		-	25	37	
Fall time	$t_f$		-	11	16.5	

**Gate Charge Characteristics**

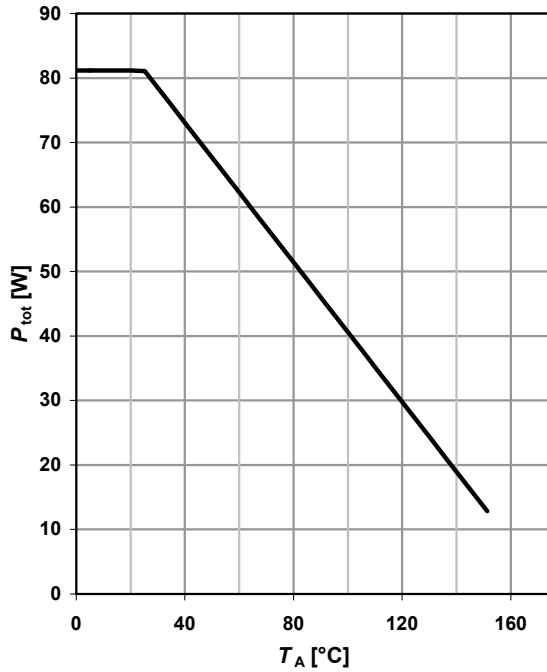
Gate to source charge	$Q_{gs}$	$V_{DD}=-48\text{ V}, I_D=-$ $18.6\text{ A}, V_{GS}=0\text{ to }-10\text{ V}$	-	-4.1	-5.5	nC
Gate to drain charge	$Q_{gd}$		-	-11	-17	
Gate charge total	$Q_g$		-	-21	-28	
Gate plateau voltage	$V_{plateau}$		-	-5.94	-	V

**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	18.60	A
Diode pulse current	$I_{S,pulse}$		-	-	-74.8	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=-18.6\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	-0.99	-1.33	V
Reverse recovery time	$t_{rr}$	$V_R=30\text{ V}, I_F= I_S ,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	70	105	ns
Reverse recovery charge	$Q_{rr}$		-	139	208	

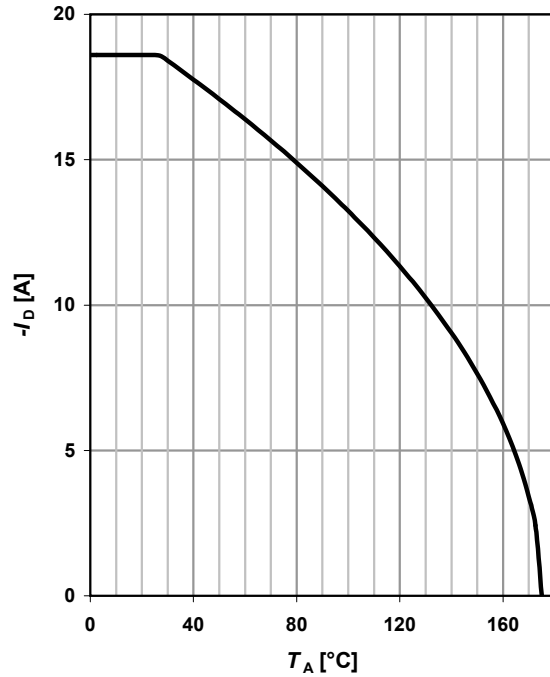
**1 Power dissipation**

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



**2 Drain current**

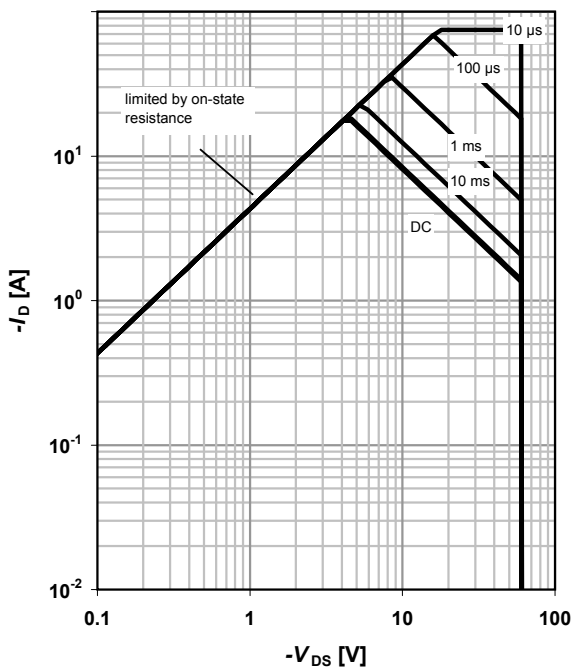
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}$$



**3 Safe operating area**

$$I_D = f(V_{DS}); T_A = 25 \text{ °C}^1; D = 0$$

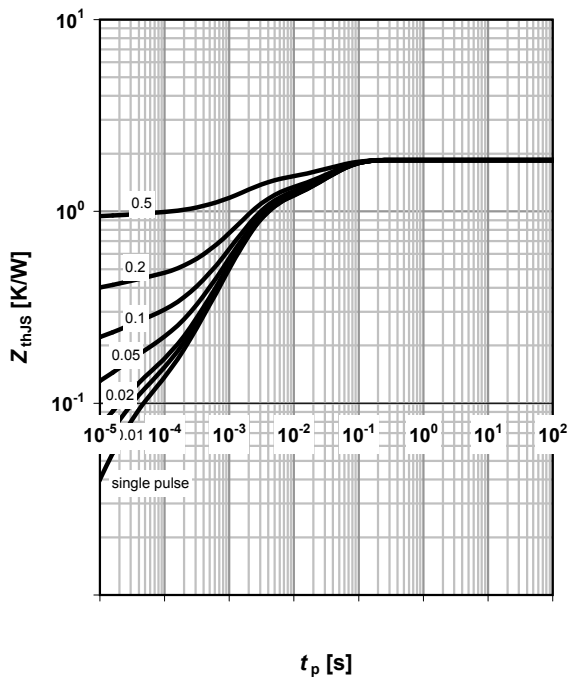
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

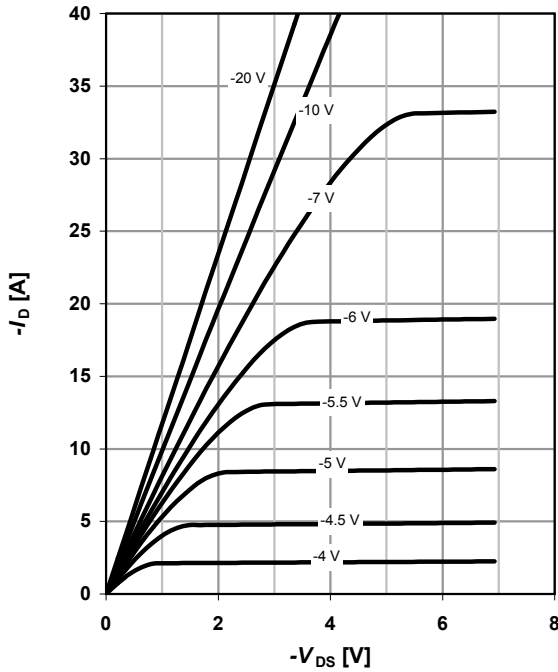
parameter:  $D = t_p / T$



**5 Typ. output characteristics**

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

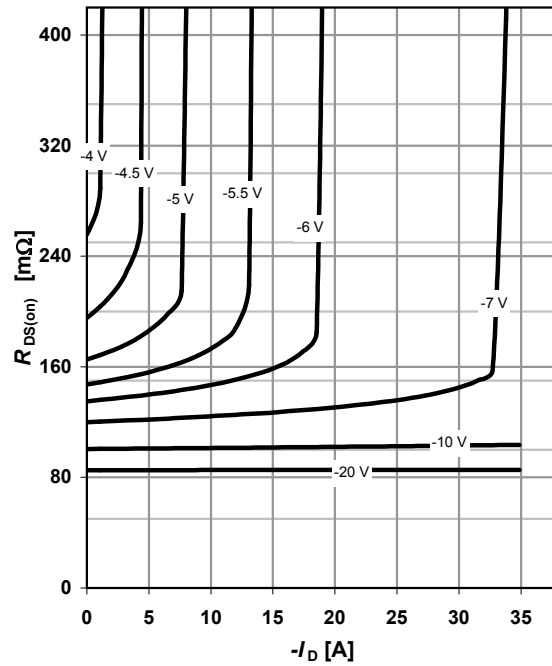
parameter:  $V_{GS}$



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

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

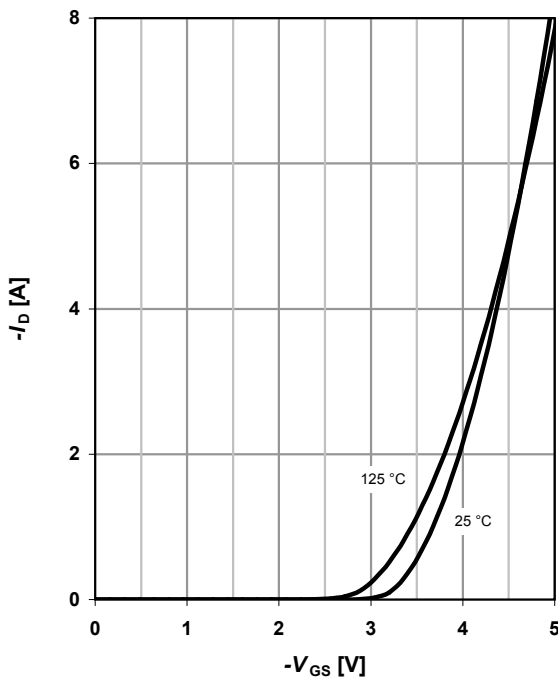
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

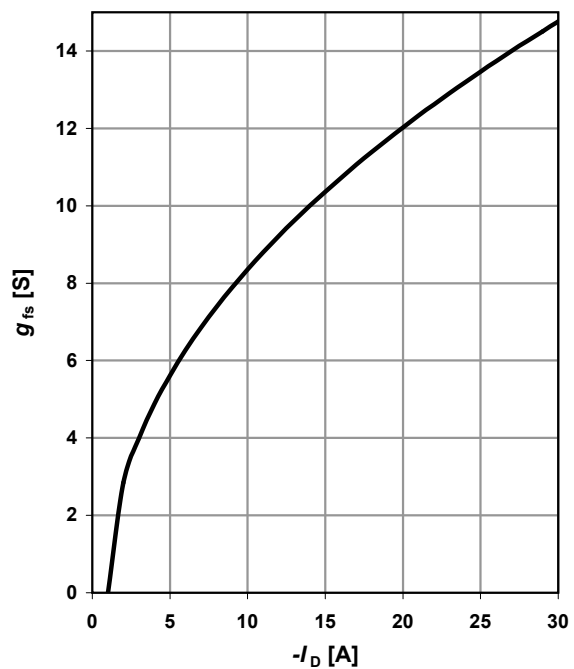
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



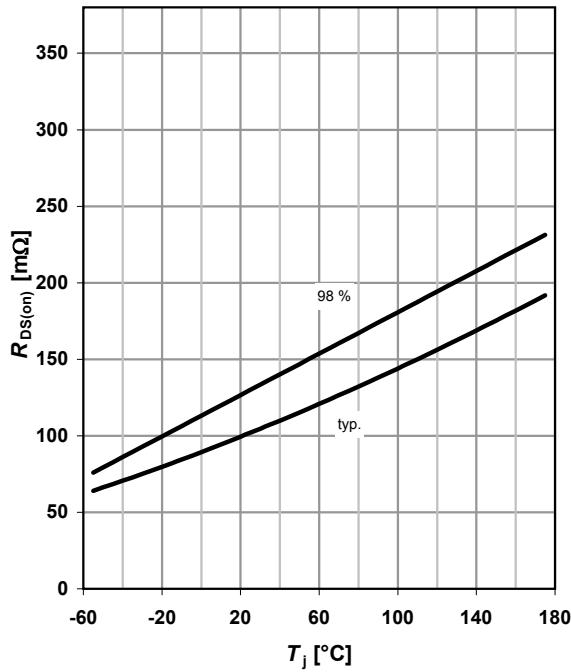
**8 Typ. forward transconductance**

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



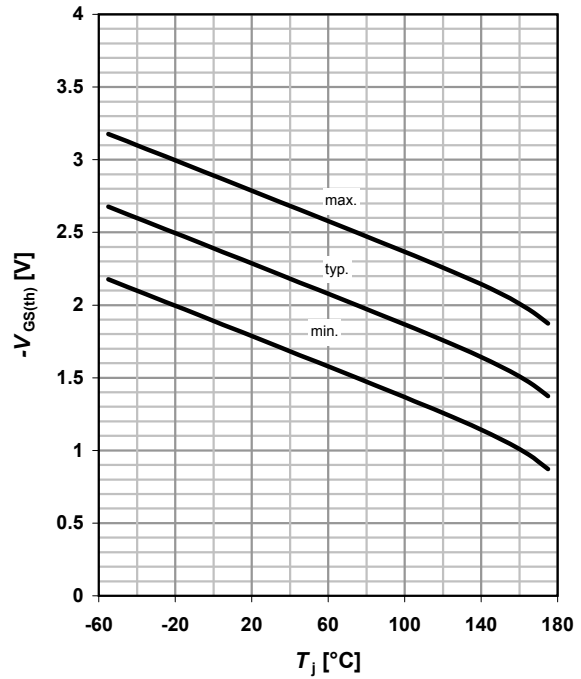
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = -13.2 \text{ A}; V_{GS} = -10 \text{ V}$



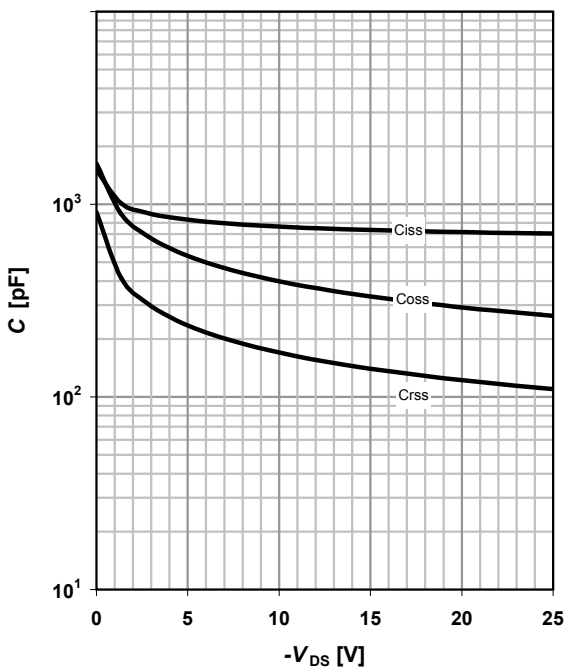
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -1000 \mu\text{A}$



**11 Typ. capacitances**

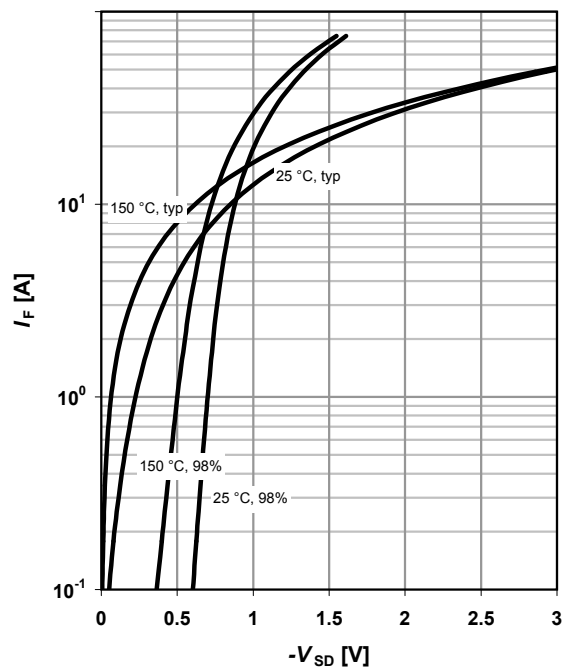
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

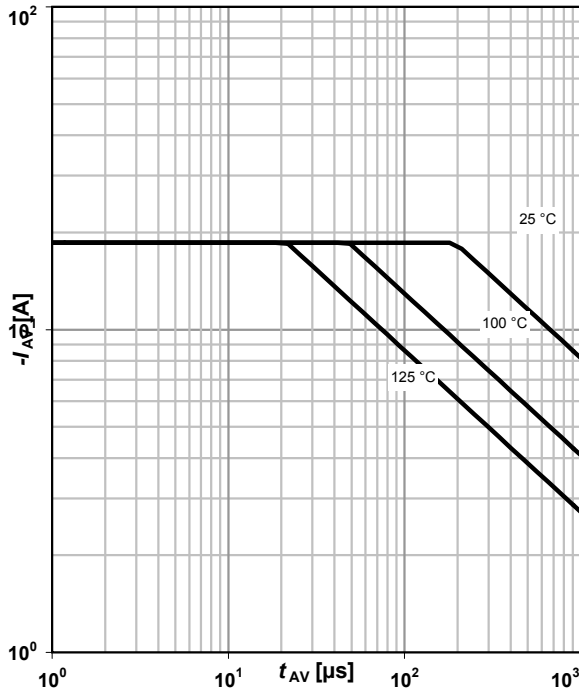
parameter:  $T_j$



**13 Avalanche characteristics**

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

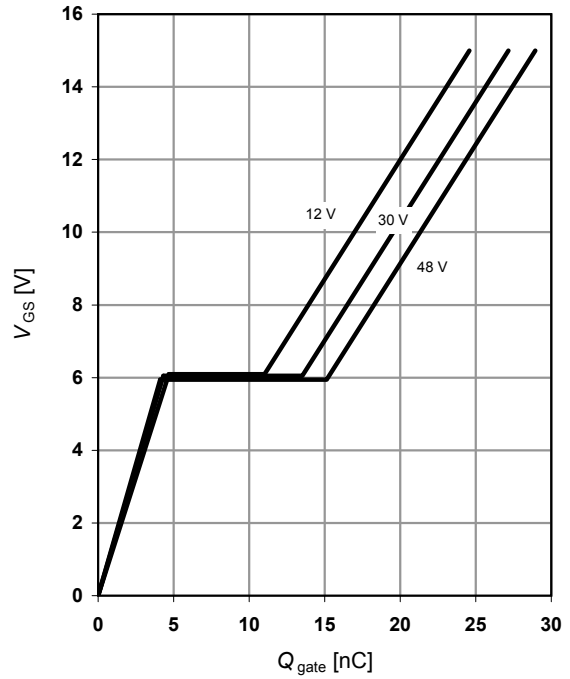
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

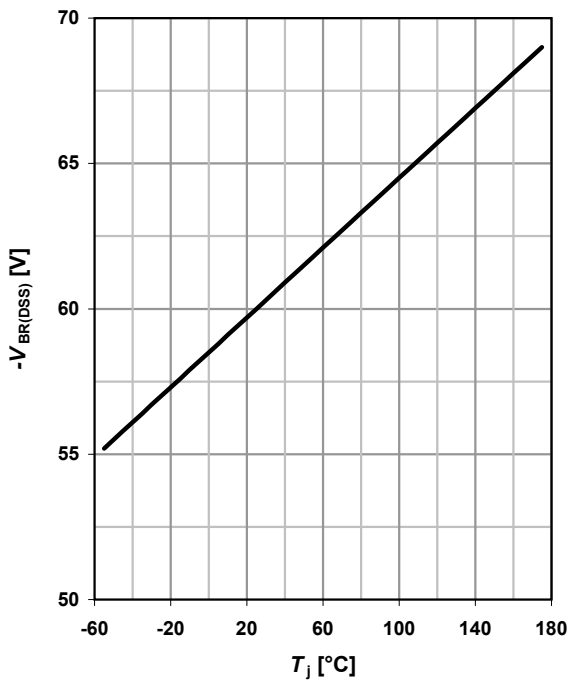
$V_{GS}=f(Q_{gate}); I_D=-18.6 A$  pulsed

parameter:  $V_{DD}$

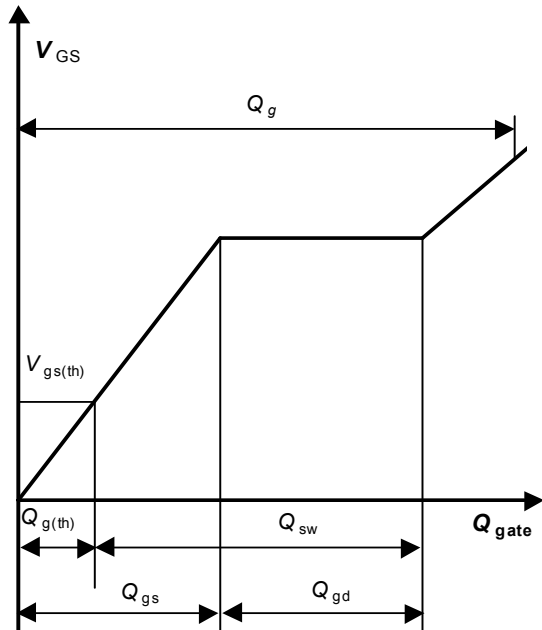


**15 Drain-source breakdown voltage**

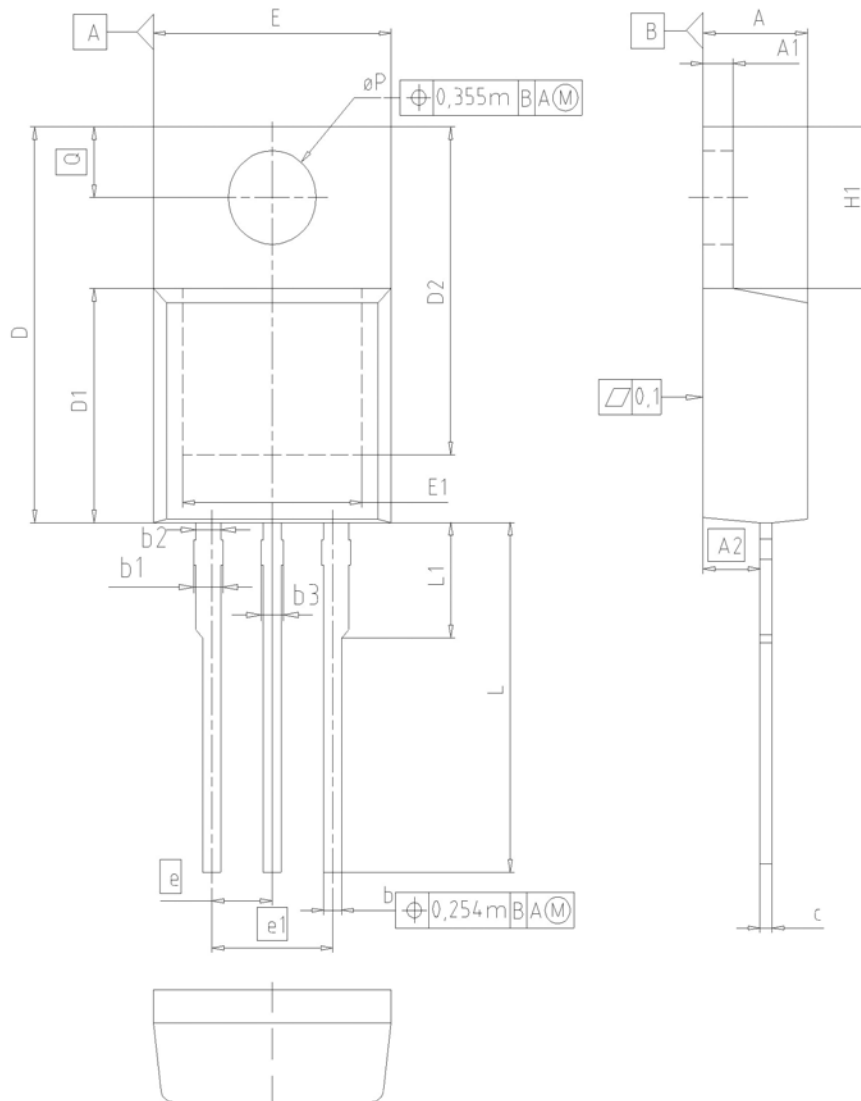
$V_{BR(DSS)}=f(T_j); I_D=-250 \mu A$



**16 Gate charge waveforms**



Package Outline: PG-TO220-3



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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