

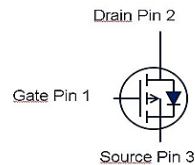
SIPMOS® Small-Signal-Transistor

Features

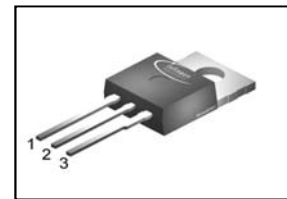
- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- 175°C operating temperature
- Pb-free lead finishing; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Qualified according to AEC Q101

Product Summary

V_{DS}	-60	V
$R_{DS(on),max}$	0.13	Ω
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 $T_j=25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
			steady state	
Continuous drain current	I_D	$T_A=25^\circ\text{C}$	-18.7	A
		$T_A=100^\circ\text{C}$	-13.2	
Pulsed drain current	$I_{D,pulse}$	$T_A=25^\circ\text{C}$	-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	$I_D=18.7\text{ A}$, $V_{DS}=48\text{ V}$, $di/dt=-200\text{ A}/\mu\text{s}$, $T_{j,max}=175^\circ\text{C}$	-6	kV/ μs
Gate source voltage	V_{GS}		± 20	V
Power dissipation	P_{tot}	$T_A=25^\circ\text{C}^{(1)}$	81.1	W
Operating and storage temperature	T_j , T_{stg}		"-55 ... +175"	$^\circ\text{C}$
ESD class			Class 1C(>1000V <2000V)	
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 ² cooling area ¹⁾	-	-	40	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=-250\text{ }\mu\text{A}$	-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}	$V_{DS}=-60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	-0.1	-1	μA
		$V_{DS}=-60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=150\text{ °C}$	-	-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 Ω
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=-13.2\text{ A}$	5	10	-	S

¹⁾ Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm 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

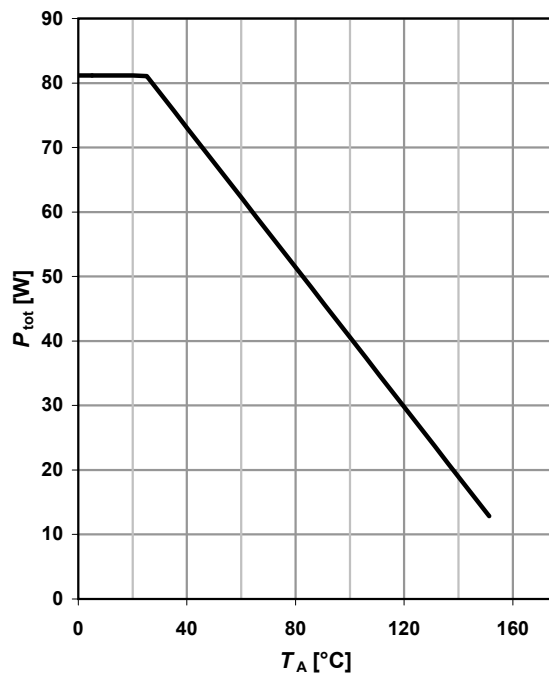
Gate to source charge	Q_{gs}	$V_{DD}=-48\text{ V}, I_D=-18.6\text{ A}, V_{GS}=0\text{ to }-10\text{ V}$	-	-4.1	-5.5	nC
Gate to drain charge	Q_{gd}		-	-11	-17	
Gate charge total	Q_g		-	-21	-28	
Gate plateau voltage	$V_{plateau}$		-	-5.94	-	V

Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ °C}$	-	-	18.60	A
Diode pulse current	$I_{S,pulse}$		-	-	-74.8	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=-18.6\text{ A},$ $T_j=25\text{ °C}$	-	-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	nC

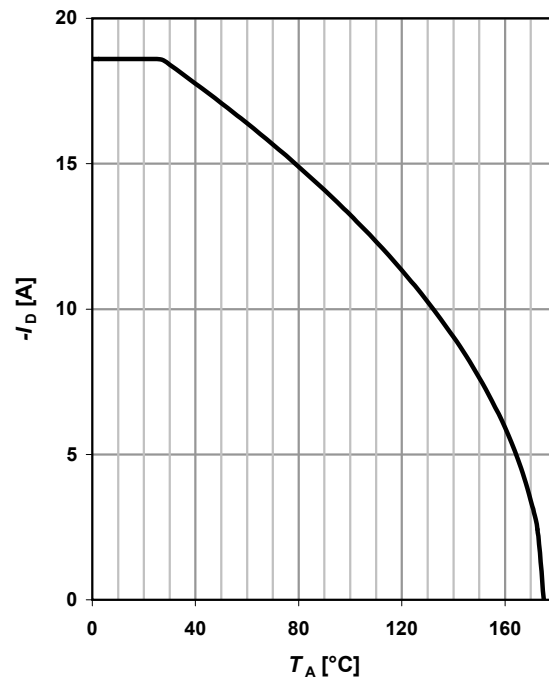
1 Power dissipation

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



2 Drain current

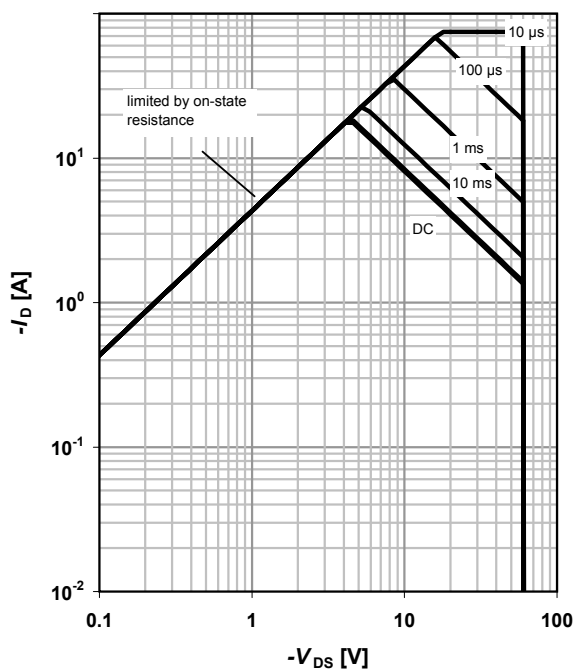
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}$$



3 Safe operating area

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

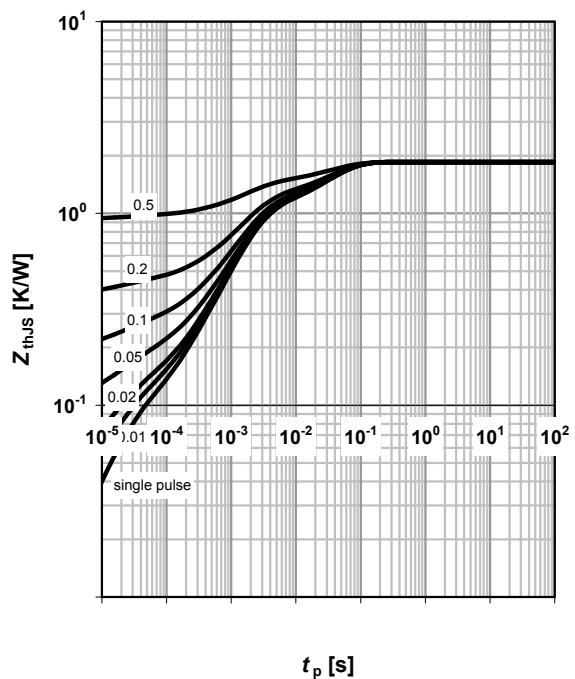
parameter: t_p



4 Max. transient thermal impedance

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

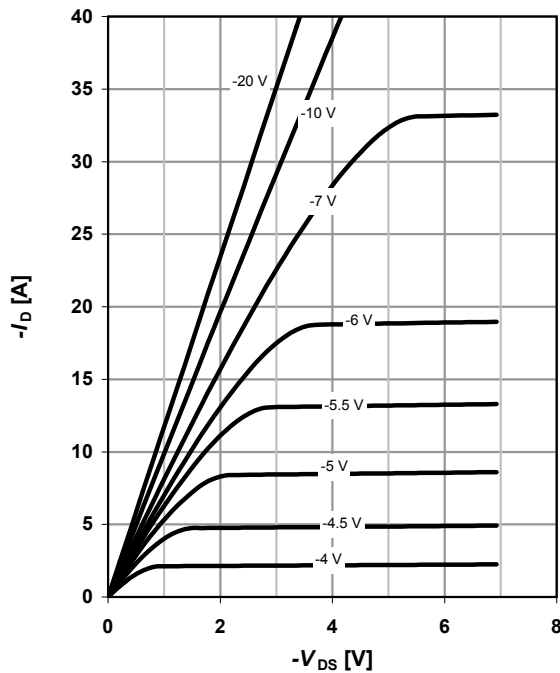
parameter: $D = t_p/T$



5 Typ. output characteristics

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

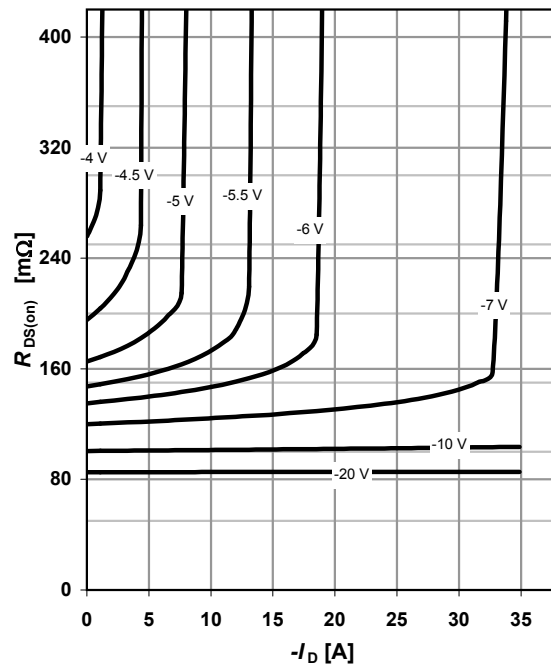
parameter: V_{GS}



6 Typ. drain-source on resistance

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

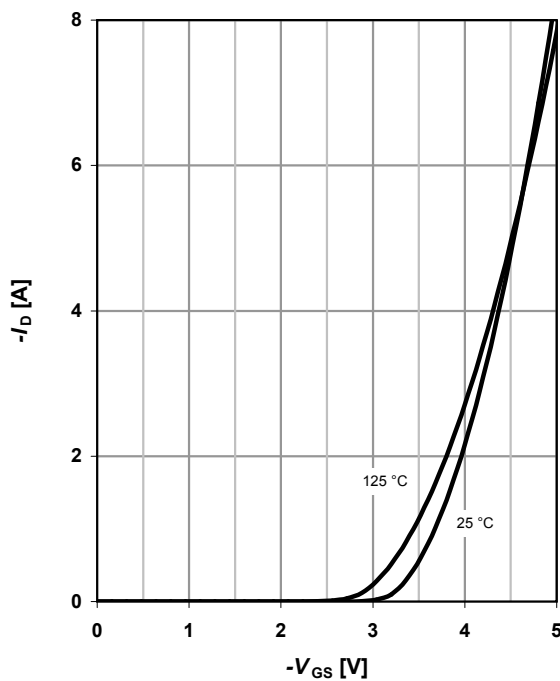
parameter: V_{GS}



7 Typ. transfer characteristics

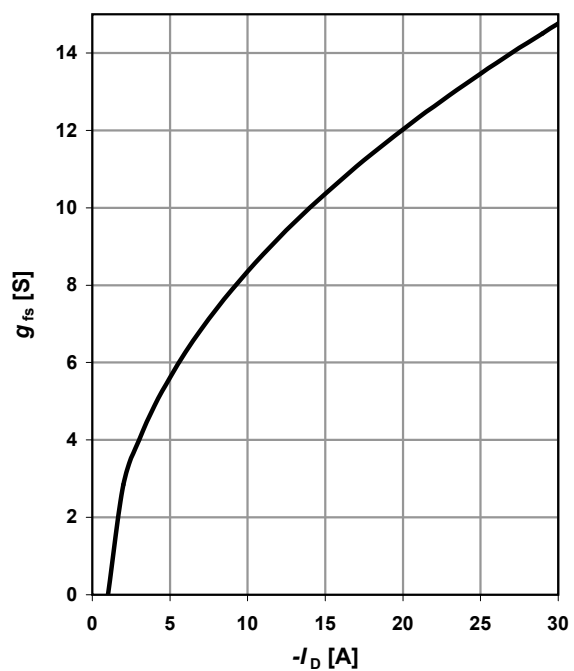
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter: T_j



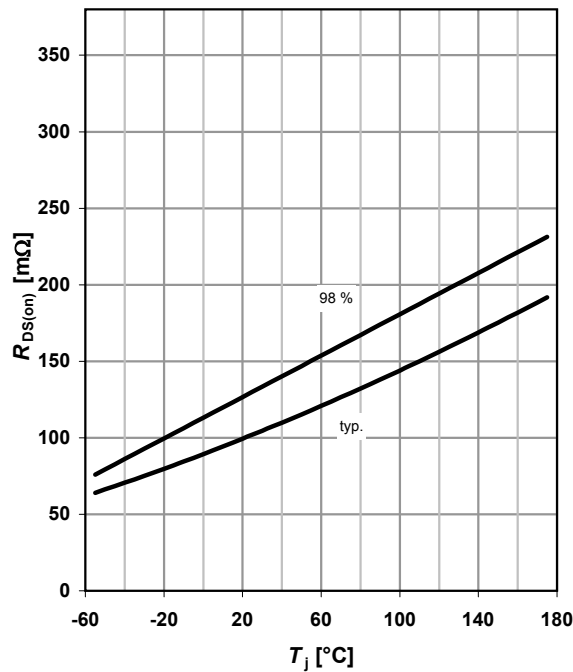
8 Typ. forward transconductance

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



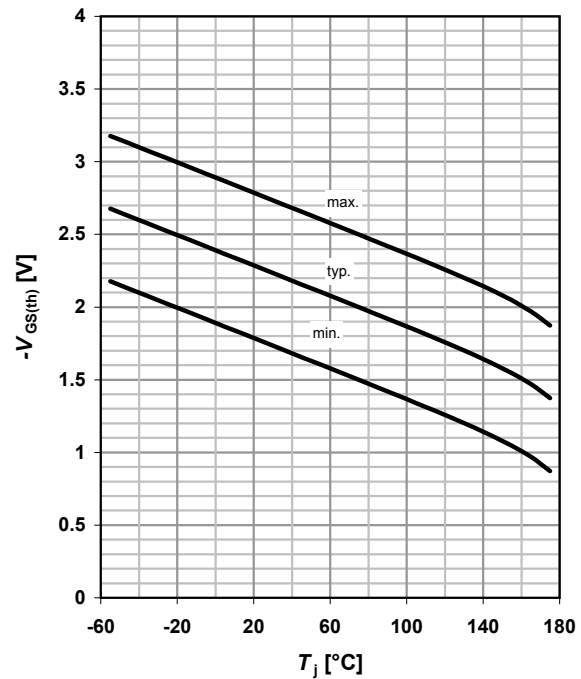
9 Drain-source on-state resistance

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



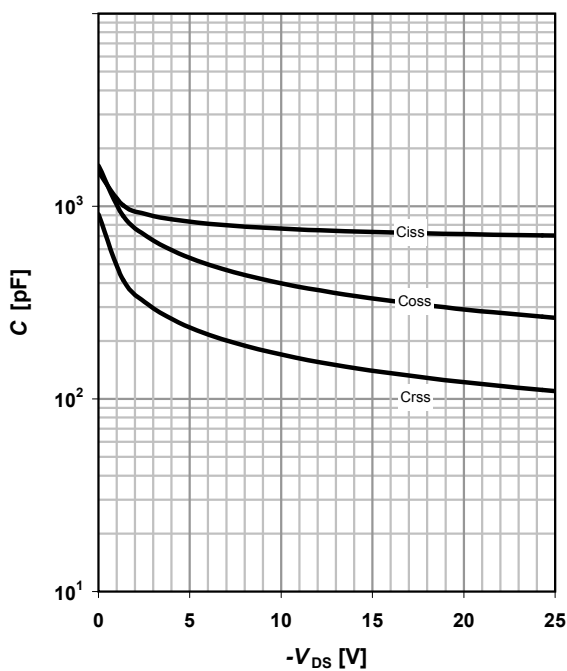
10 Typ. gate threshold voltage

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



11 Typ. capacitances

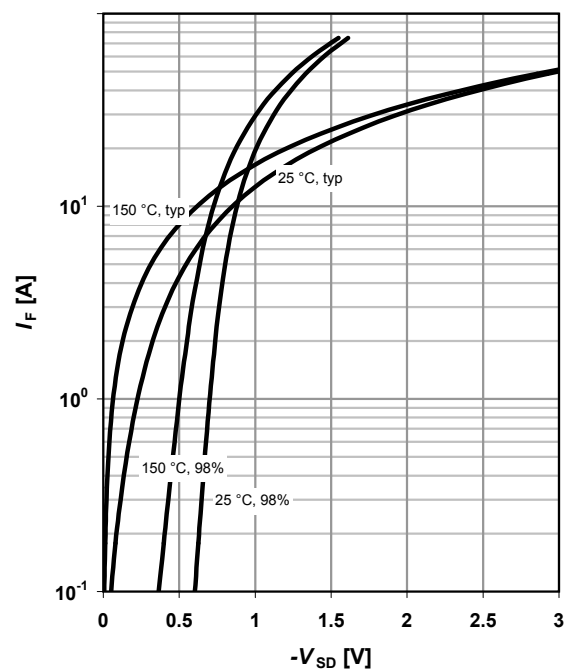
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

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

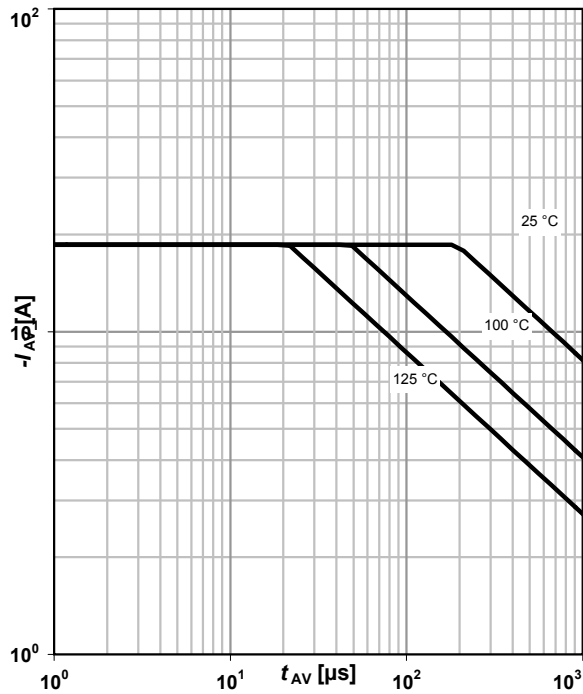
parameter: T_j



13 Avalanche characteristics

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

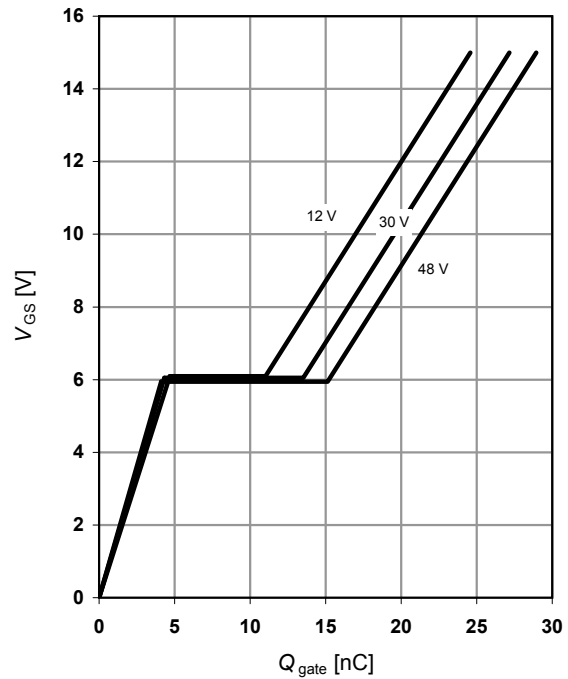
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

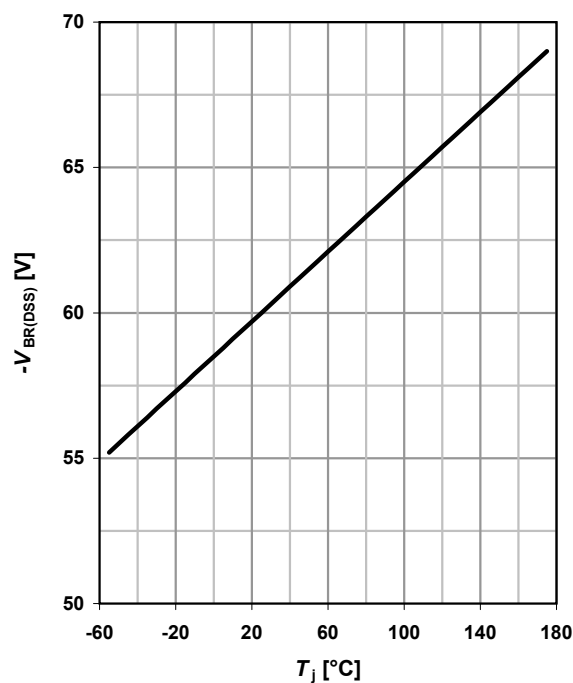
$$V_{GS}=f(Q_{\text{gate}}); I_D=-18.6\ \text{A pulsed}$$

parameter: V_{DD}

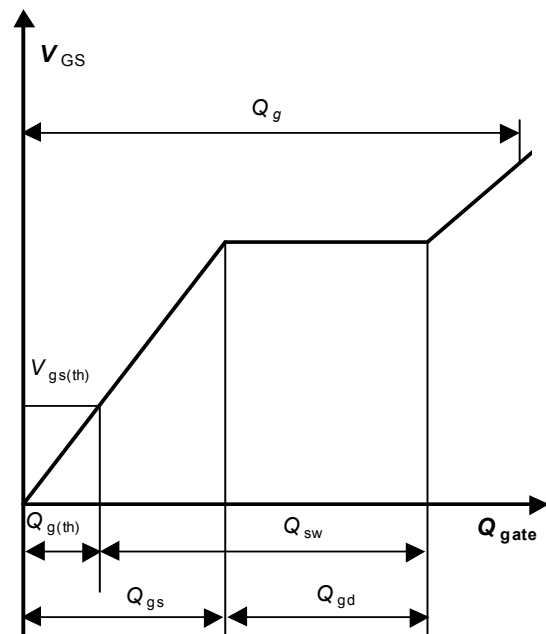


15 Drain-source breakdown voltage

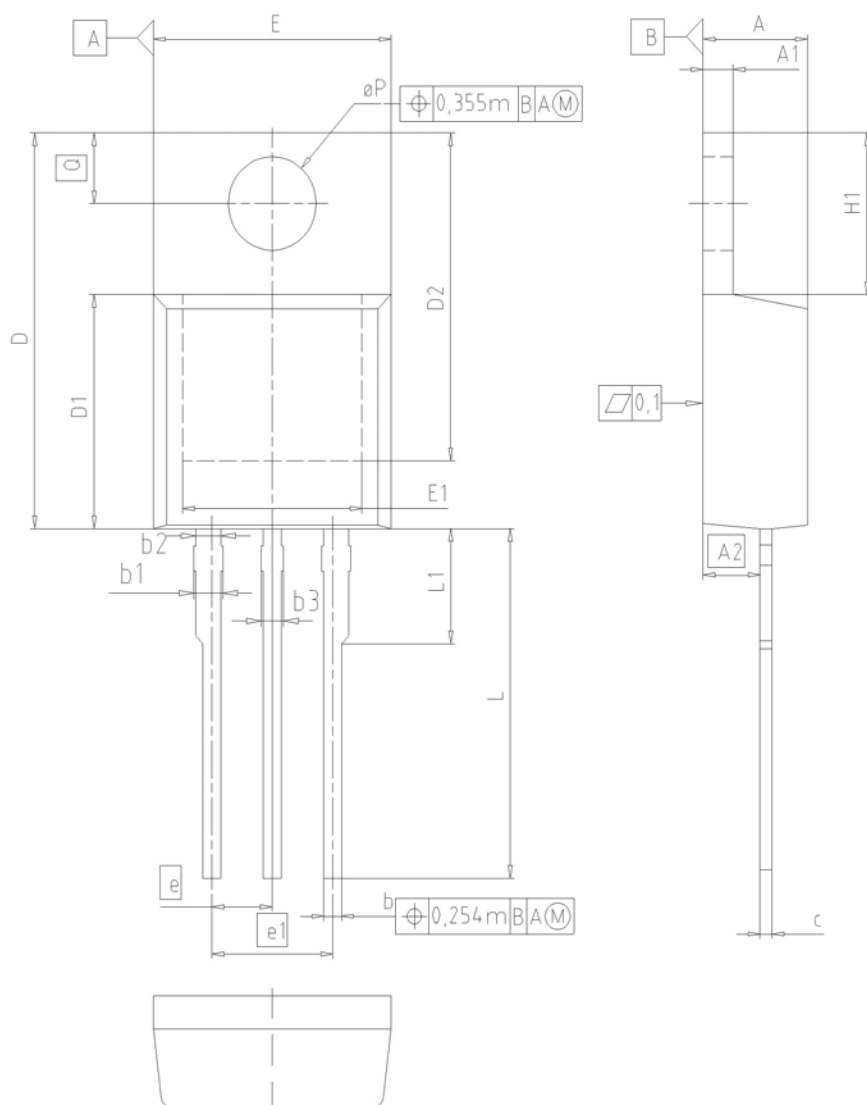
$$V_{BR(DSS)}=f(T_j); I_D=-250\ \mu\text{A}$$



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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