

## SIPMOS® Power Transistor

## SPD 07N20 G

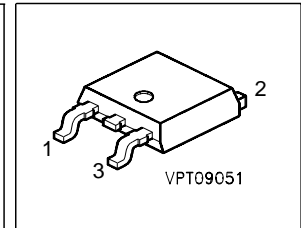
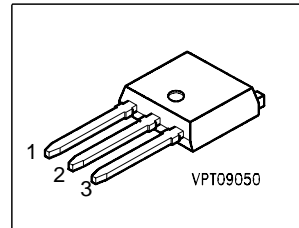
### Features

- N channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant



### Product Summary

Drain source voltage	$V_{DS}$	200	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.4	$\Omega$
Continuous drain current	$I_D$	7	A



Type	Package	Pb-free	Packaging	Pin 1	Pin 2	Pin 3
SPD07N20 G	PG-TO252	Yes	Tape and Reel	G	D	S
SPU07N20 G	PG-TO251	Yes	Tube			

### Maximum Ratings, at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ }^\circ\text{C}$ $T_C = 100\text{ }^\circ\text{C}$	$I_D$	7 4.5	A
Pulsed drain current $T_C = 25\text{ }^\circ\text{C}$	$I_{Dpulse}$	28	
Avalanche energy, single pulse $I_D = 7\text{ A}$ , $V_{DD} = 50\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	120	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	4	
Reverse diode dv/dt $I_S = 7\text{ A}$ , $V_{DS} = 160\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 175\text{ }^\circ\text{C}$	dv/dt	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25\text{ }^\circ\text{C}$	$P_{tot}$	40	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-		3.1	K/W
Thermal resistance, junction - ambient, leded	$R_{thJA}$	-	-	100	
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	-	-	75 50	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	200	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 1\text{ mA}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS} = 200\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = 200\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$	$I_{DSS}$	-	0.1	1 100	$\mu\text{A}$
Gate-source leakage current $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	-	10	100	nA
Drain-Source on-state resistance $V_{GS} = 10\text{ V}$ , $I_D = 4.5\text{ A}$	$R_{DS(on)}$	-	0.3	0.4	$\Omega$

<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.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 4.5\text{ A}$	$g_{fs}$	3	4.2	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	400	530	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	85	130	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	45	70	
Turn-on delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_{d(on)}$	-	10	15	ns
Rise time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_r$	-	40	60	
Turn-off delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_{d(off)}$	-	55	75	
Fall time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_f$	-	30	40	

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

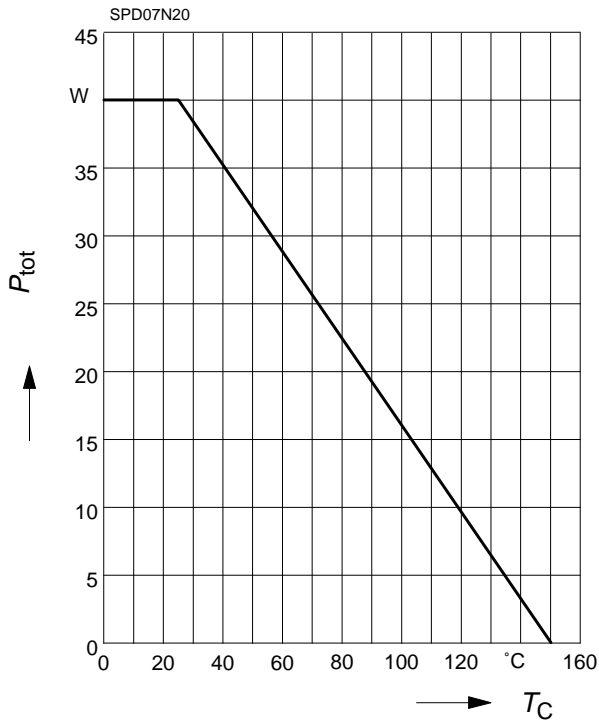
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Gate to source charge $V_{DD} = 160\text{ V}, I_D = 7\text{ A}$	$Q_{gs}$	-	5	7.5	nC
Gate to drain charge $V_{DD} = 160\text{ V}, I_D = 7\text{ A}$	$Q_{gd}$	-	10	22.5	
Gate charge total $V_{DD} = 160\text{ V}, I_D = 7\text{ A}, V_{GS} = 0\text{ to }10\text{ V}$	$Q_g$	-	21	31.5	
Gate plateau voltage $V_{DD} = 160\text{ V}, I_D = 7\text{ A}$	$V_{(plateau)}$	-	7	-	V

**Reverse Diode**

Inverse diode continuous forward current $T_C = 25\text{ }^\circ\text{C}$	$I_S$	-	-	7	A
Inverse diode direct current, pulsed $T_C = 25\text{ }^\circ\text{C}$	$I_{SM}$	-	-	28	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = 14\text{ A}$	$V_{SD}$	-	1.3	1.7	V
Reverse recovery time $V_R = 100\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	200	300	ns
Reverse recovery charge $V_R = 100\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.6	0.9	$\mu\text{C}$

**Power Dissipation**

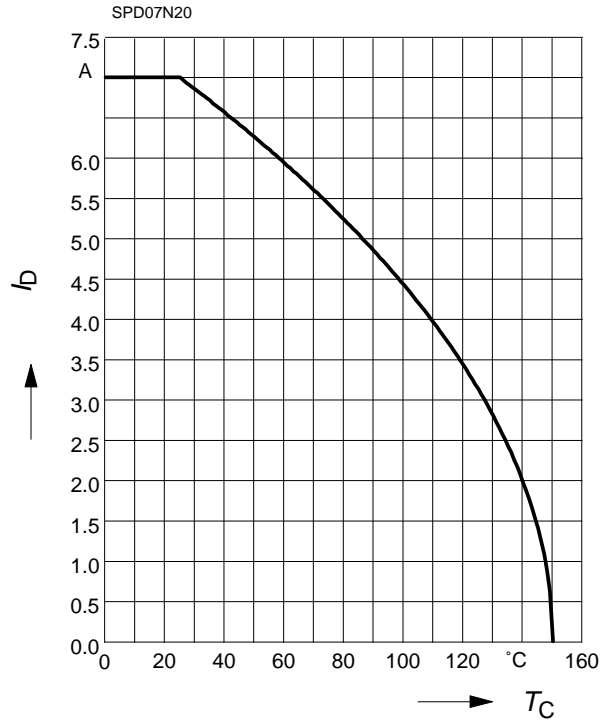
$P_{tot} = f(T_C)$



**Drain current**

$I_D = f(T_C)$

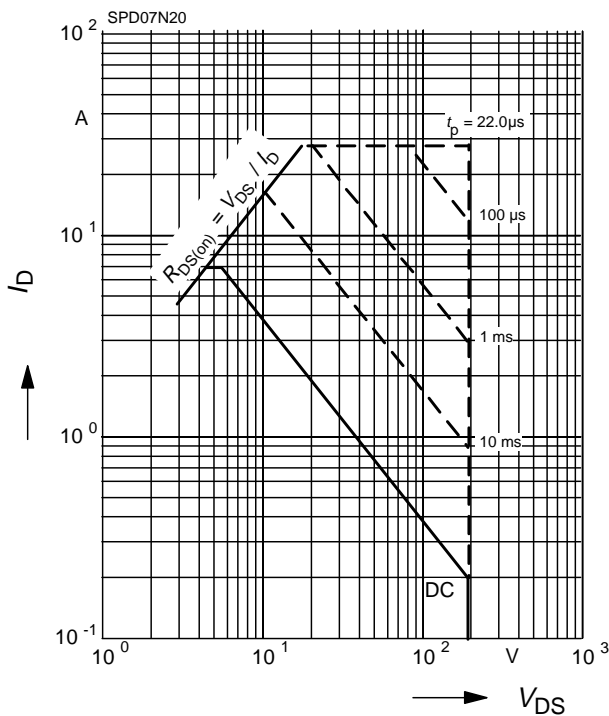
parameter:  $V_{GS} \geq 10\text{ V}$



**Safe operating area**

$I_D = f(V_{DS})$

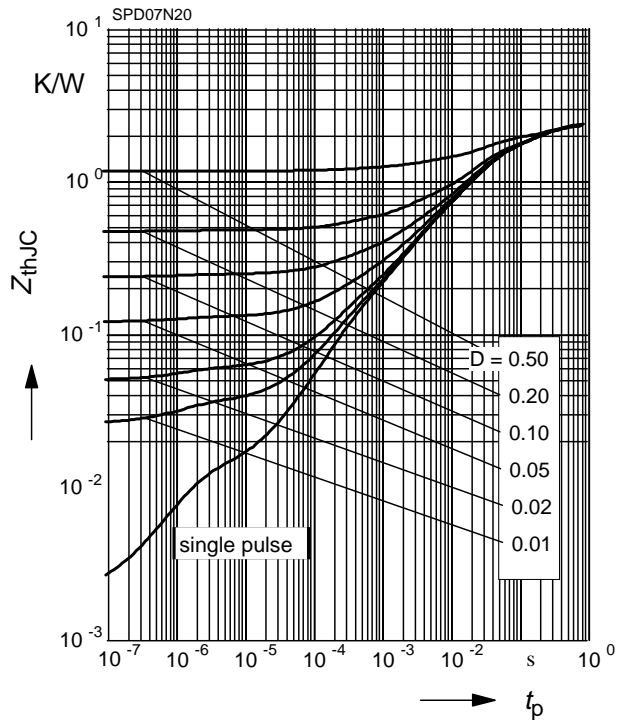
parameter :  $D = 0, T_C = 25\text{ °C}$



**Transient thermal impedance**

$Z_{thJC} = f(t_p)$

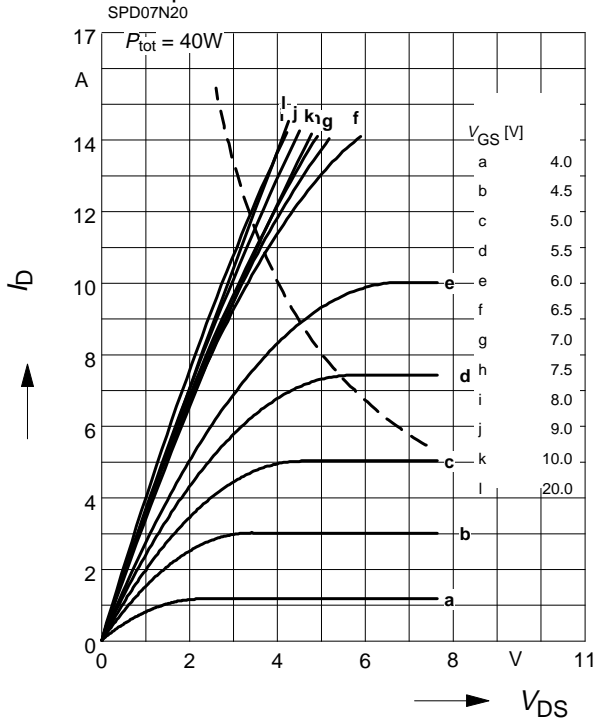
parameter :  $D = t_p/T$



**Typ. output characteristics**

$I_D = f(V_{DS})$

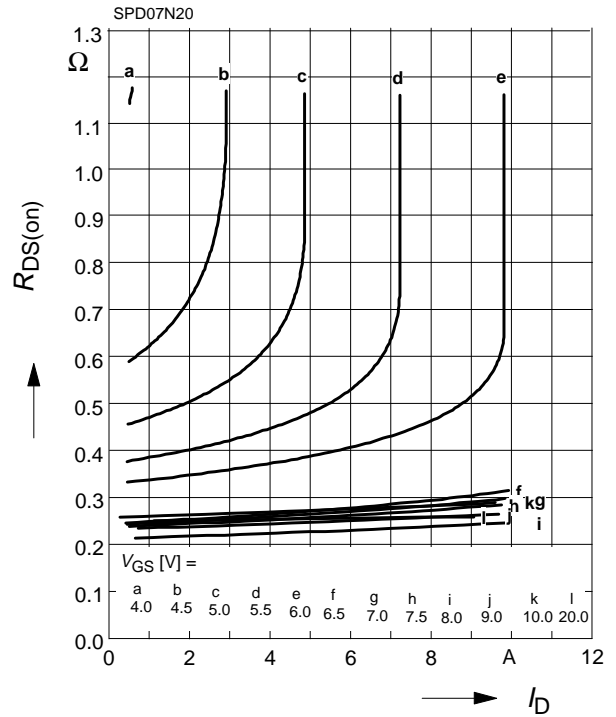
parameter:  $t_p = 80 \mu s$



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

$R_{DS(on)} = f(I_D)$

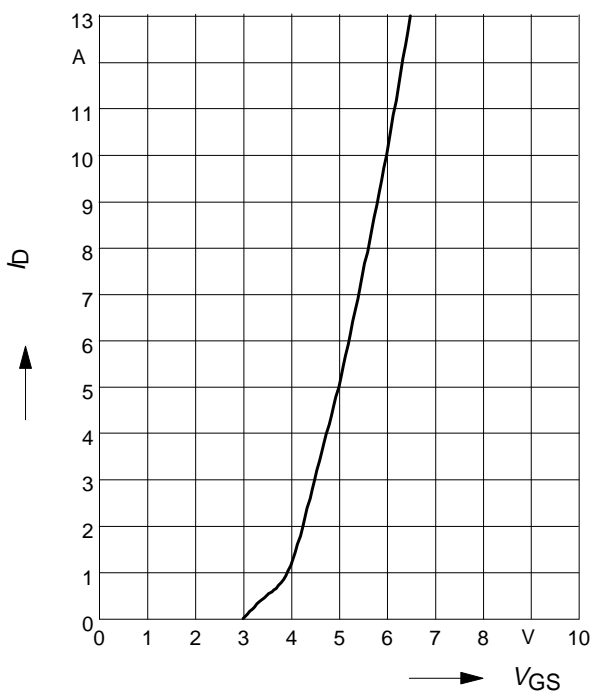
parameter:  $V_{GS}$



**Typ. transfer characteristics  $I_D = f(V_{GS})$**

parameter:  $t_p = 80 \mu s$

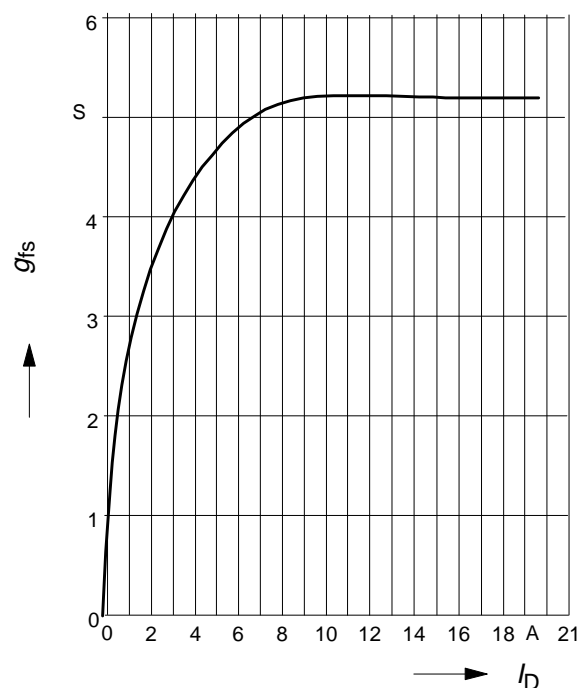
$V_{DS} \geq 2 \times I_D \times R_{DS(on)} \text{ max}$



**Typ. forward transconductance**

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

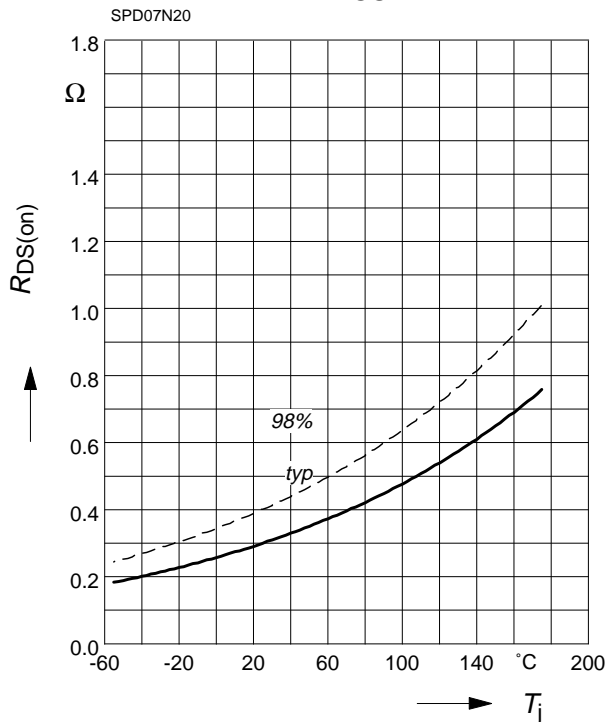
parameter:  $g_{fs}$



**Drain-source on-resistance**

$$R_{DS(on)} = f(T_j)$$

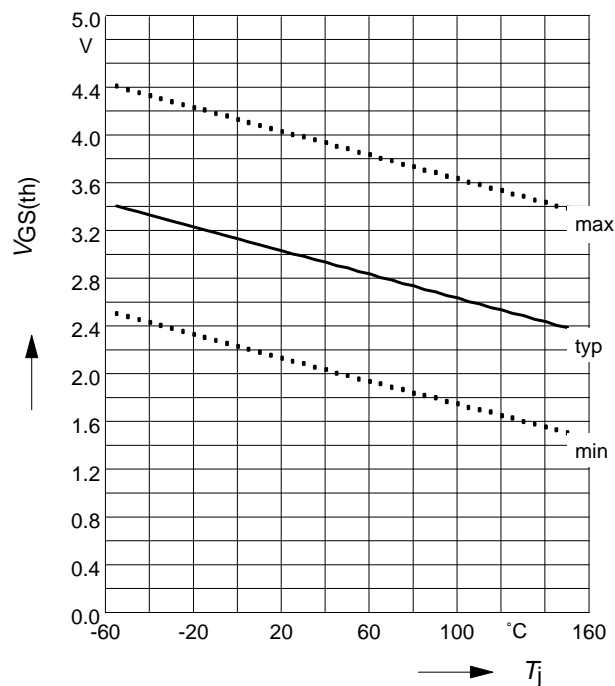
parameter :  $I_D = 4.5 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**Gate threshold voltage**

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

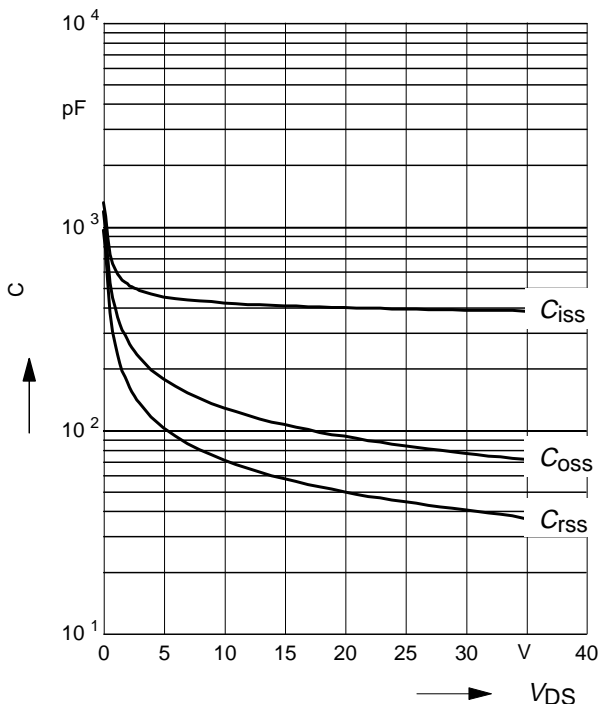
parameter :  $V_{GS} = V_{DS}$ ,  $I_D = 1 \text{ mA}$



**Typ. capacitances**

$$C = f(V_{DS})$$

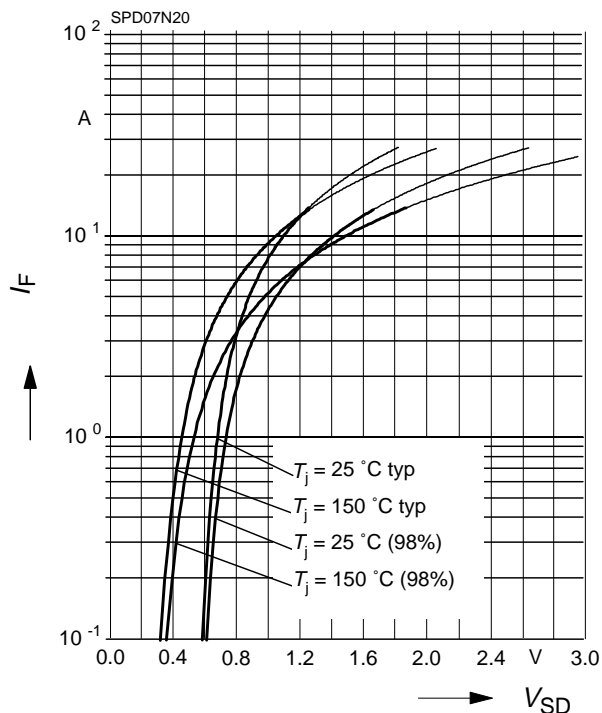
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



**Forward characteristics of reverse diode**

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

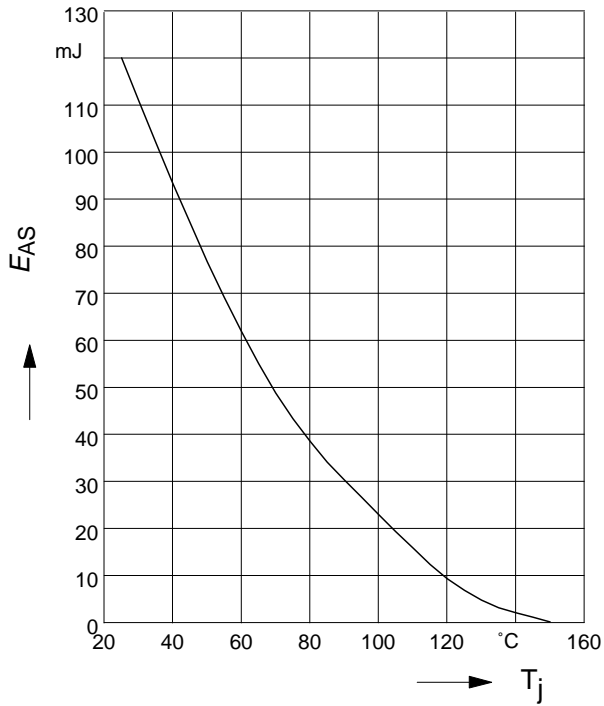
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**Avalanche Energy  $E_{AS} = f(T_j)$**

parameter:  $I_D = 7\text{ A}$ ,  $V_{DD} = 50\text{ V}$

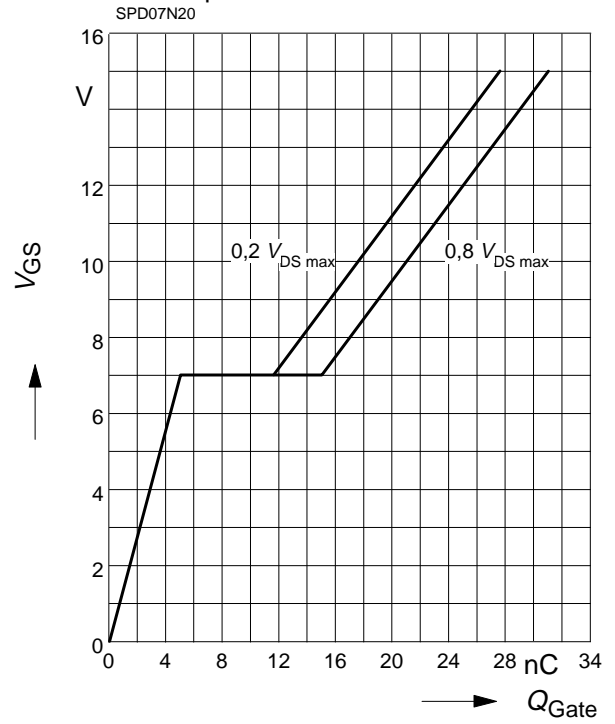
$R_{GS} = 25\ \Omega$



**Typ. gate charge  $V_{GS} = f(Q_{Gate})$**

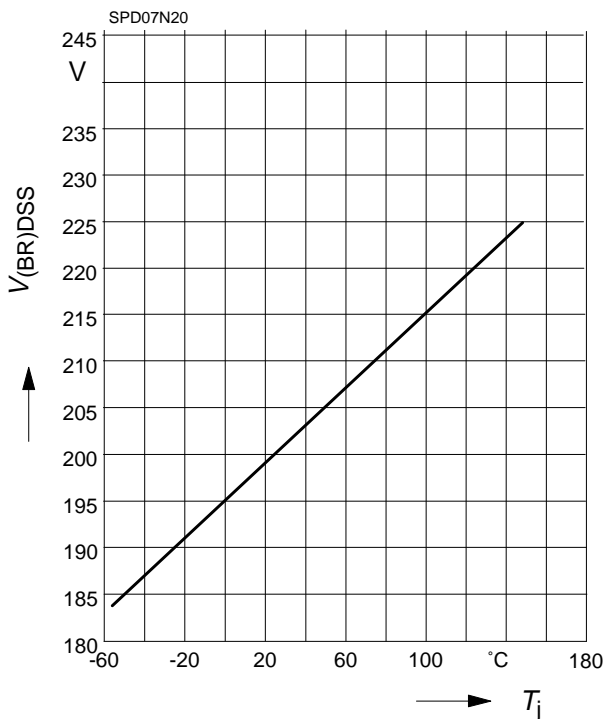
parameter:  $I_{D\ puls} = 7\text{ A}$

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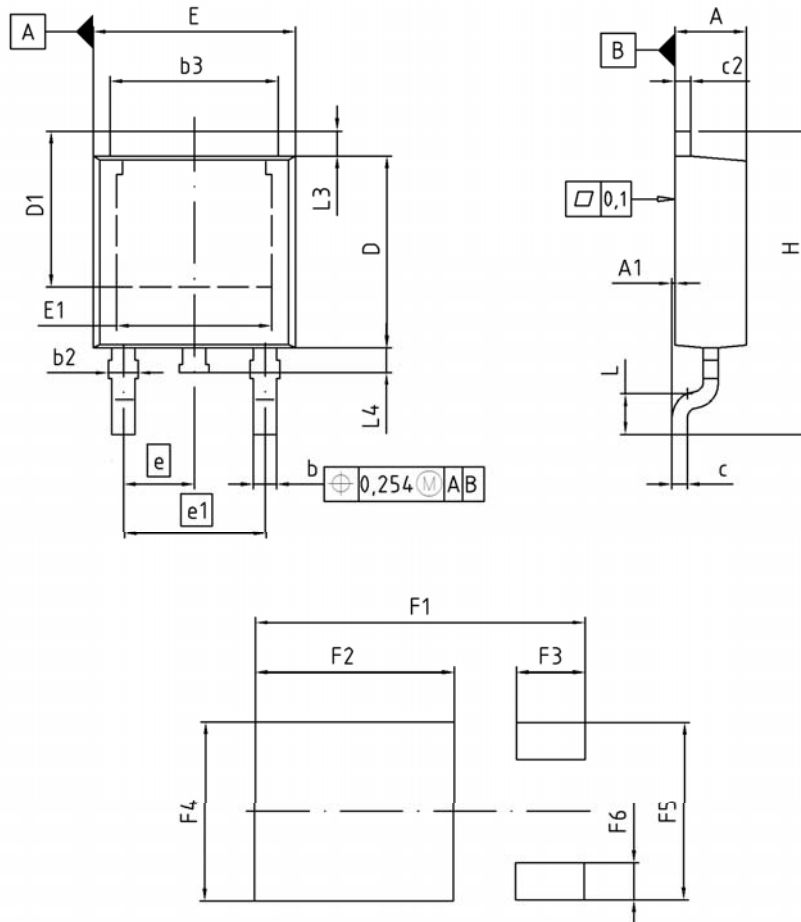
**Drain-source breakdown voltage  $V_{(BR)DSS} = f(T_j)$**

parameter:  $I_{D\ puls} = 7\text{ A}$





Package outline: PG-TO252-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.00	0.15	0.000	0.006
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b3	5.00	5.50	0.197	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.98	0.018	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.40	6.73	0.252	0.265
E1	4.70	5.21	0.185	0.205
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
H	9.40	10.48	0.370	0.413
L	1.18	1.70	0.046	0.067
L3	0.90	1.25	0.035	0.049
L4	0.51	1.00	0.020	0.039
F1	10.50	10.70	0.413	0.421
F2	6.30	6.50	0.248	0.256
F3	2.10	2.30	0.083	0.091
F4	5.70	5.90	0.224	0.232
F5	5.66	5.86	0.223	0.231
F6	1.10	1.30	0.043	0.051

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