

**OptiMOS® Power-Transistor**
**Feature**

- N-Channel
- Enhancement mode
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- $dv/dt$  rated
- ° Pb-free lead plating; RoHS compliant

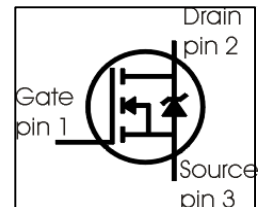
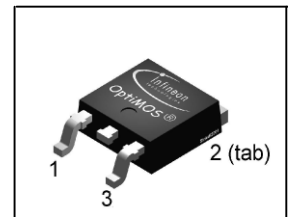


Type	Package	Marking
SPD50N03S2-07 G	PG-TO252-3	PN0307

**Product Summary**

$V_{DS}$	30	V
$R_{DS(on)}$	7.3	mΩ
$I_D$	50	A

PG-TO252-3


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

Parameter	Symbol	Value	Unit
Continuous drain current <sup>1)</sup> $T_C=25\text{ °C}$	$I_D$	50 50	A
Pulsed drain current $T_C=25\text{ °C}$	$I_{D\text{ puls}}$	200	
Avalanche energy, single pulse $I_D=50\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$	$E_{AS}$	250	mJ
Repetitive avalanche energy, limited by $T_{jmax}^{2)}$	$E_{AR}$	13	
Reverse diode $dv/dt$ $I_S=50\text{ A}$ , $V_{DS}=24\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{jmax}=175\text{ °C}$	$dv/dt$	6	kV/μs
Gate source voltage	$V_{GS}$	±20	V
Power dissipation $T_C=25\text{ °C}$	$P_{tot}$	136	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	°C
IEC climatic category; DIN IEC 68-1		55/175/56	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	0.7	1.1	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	100	
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>3)</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 $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=85\mu A$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^\circ C$	$I_{DSS}$	-	0.01 1	1 100	$\mu A$
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	
Drain-source on-state resistance $V_{GS}=10V, I_D=50A$	$R_{DS(on)}$	-	5.7	7.3	$m\Omega$

<sup>1</sup>Current limited by bondwire ; with an  $R_{thJC} = 1.1K/W$  the chip is able to carry  $I_D= 106A$  at  $25^\circ C$ , for detailed information see app.-note ANPS071E available at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>2</sup>Defined by design. Not subject to production test.

<sup>3</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics**

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic Characteristics**

Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 50A$	30	60	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0V$ , $V_{DS} = 25V$ , $f = 1MHz$	-	1630	2170	pF
Output capacitance	$C_{oss}$		-	750	1000	
Reverse transfer capacitance	$C_{rss}$		-	150	230	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15V$ , $V_{GS} = 10V$ , $I_D = 50A$ , $R_G = 6.8\Omega$	-	14	21	ns
Rise time	$t_r$		-	36	54	
Turn-off delay time	$t_{d(off)}$		-	27	40	
Fall time	$t_f$		-	25	38	

**Gate Charge Characteristics**

Gate to source charge	$Q_{gs}$	$V_{DD} = 24V$ , $I_D = 50A$	-	7.9	10.5	nC
Gate to drain charge	$Q_{gd}$		-	14.1	21.1	
Gate charge total	$Q_g$	$V_{DD} = 24V$ , $I_D = 50A$ , $V_{GS} = 0$ to $10V$	-	35	46.5	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24V$ , $I_D = 50A$	-	5.2	-	V

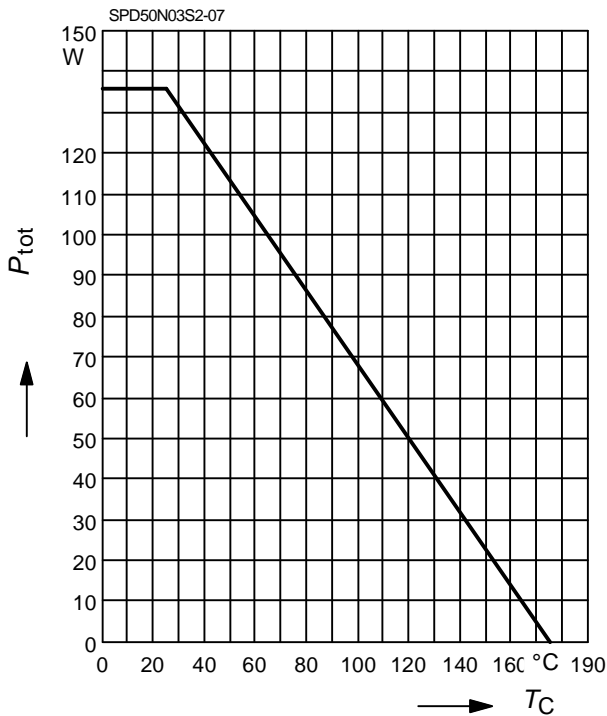
**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_C = 25^\circ C$	-	-	50	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	200	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0V$ , $I_F = 50A$	-	0.9	1.3	V
Reverse recovery time	$t_{rr}$	$V_R = 15V$ , $I_F = I_S$ , $di_F/dt = 100A/\mu s$	-	41	51	ns
Reverse recovery charge	$Q_{rr}$		-	46	58	

### 1 Power dissipation

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

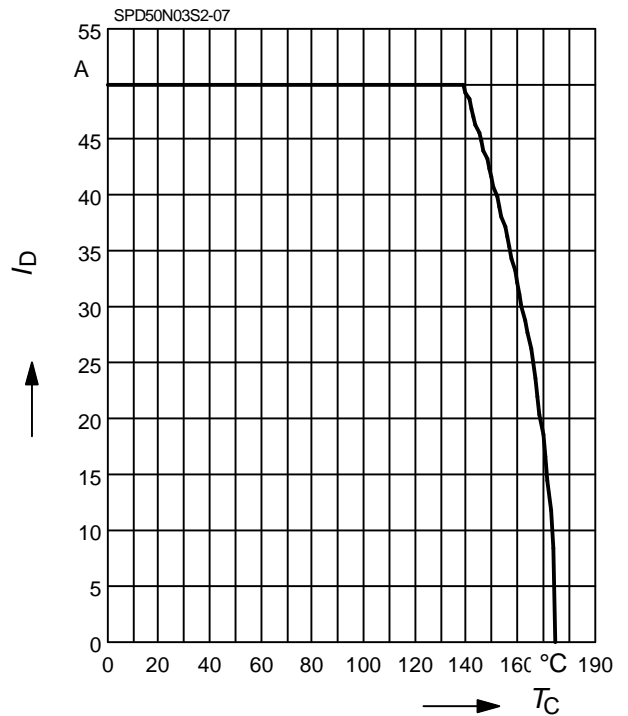
parameter:  $V_{GS} \geq 6\text{ V}$



### 2 Drain current

$$I_D = f(T_C)$$

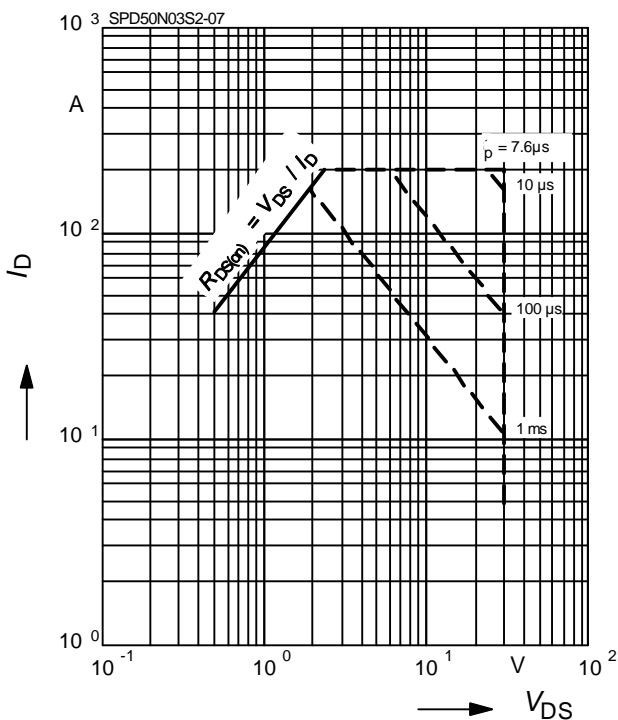
parameter:  $V_{GS} \geq 10\text{ V}$



### 3 Safe operating area

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

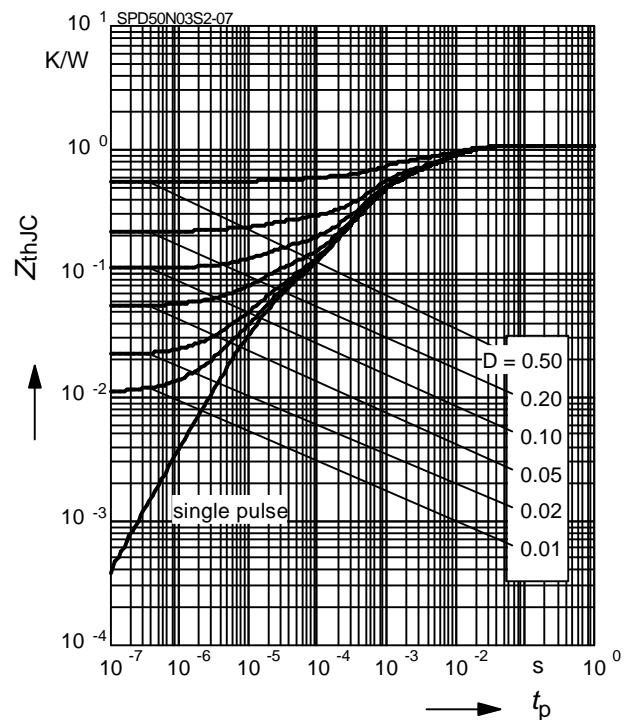
parameter:  $D = 0$ ,  $T_C = 25\text{ °C}$



### 4 Max. transient thermal impedance

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

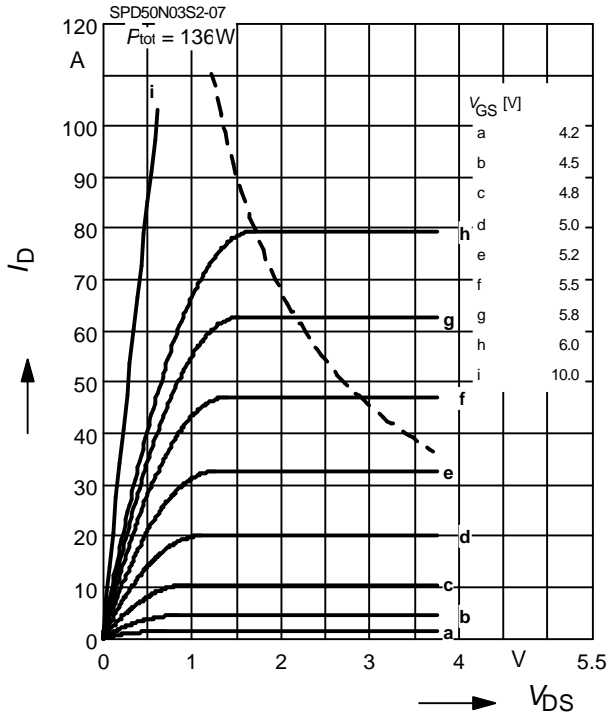
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

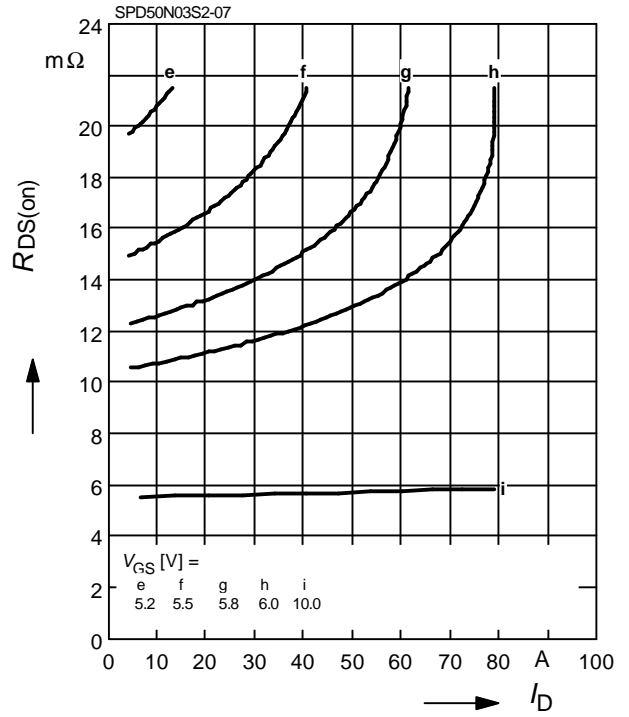
parameter:  $t_p = 80 \mu\text{s}$



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

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

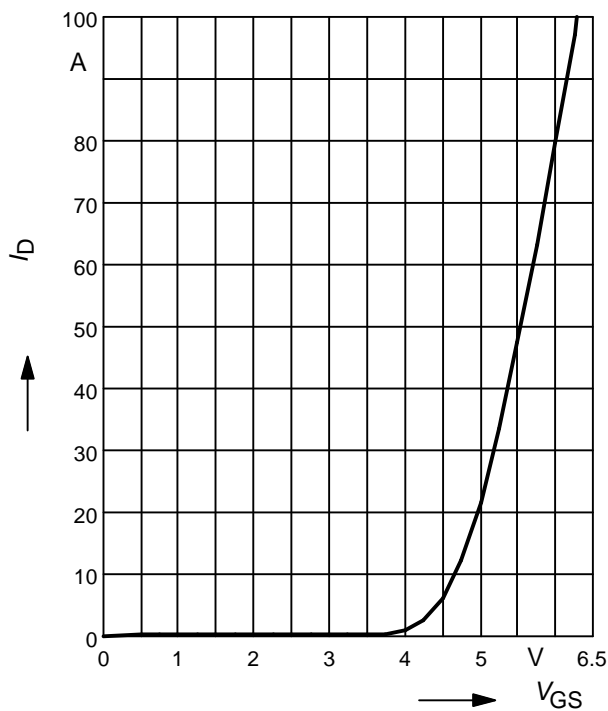
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

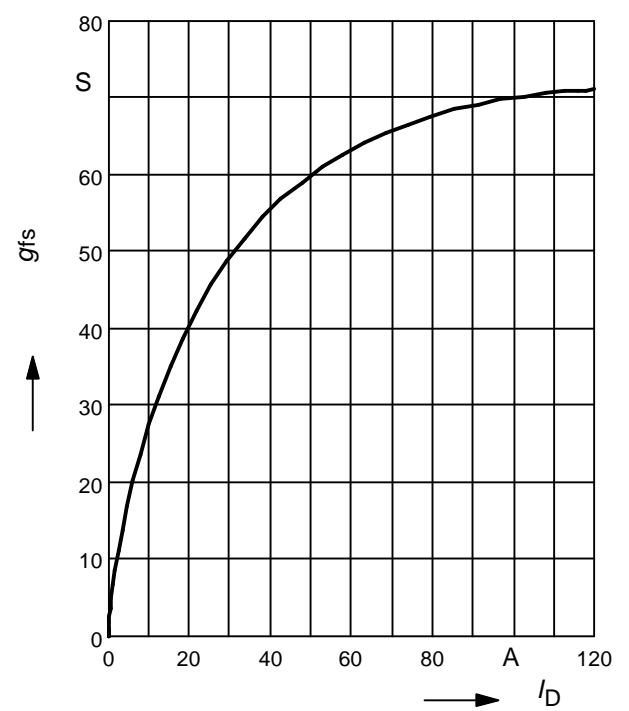
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

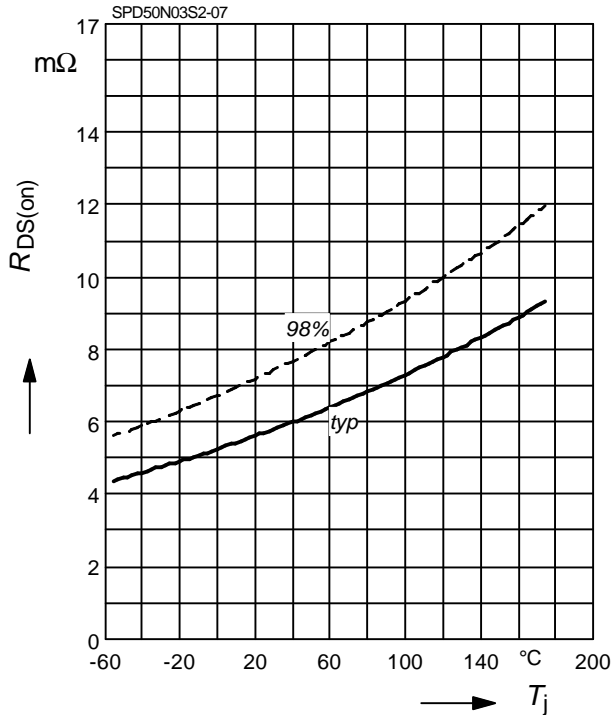
parameter:  $g_{fs}$



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

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

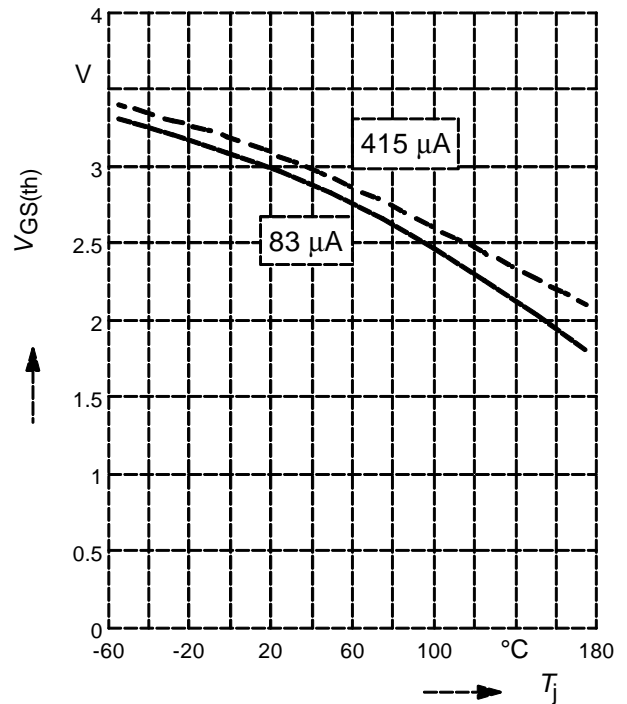
parameter :  $I_D = 50\text{ A}$ ,  $V_{GS} = 10\text{ V}$



**10 Typ. gate threshold voltage**

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

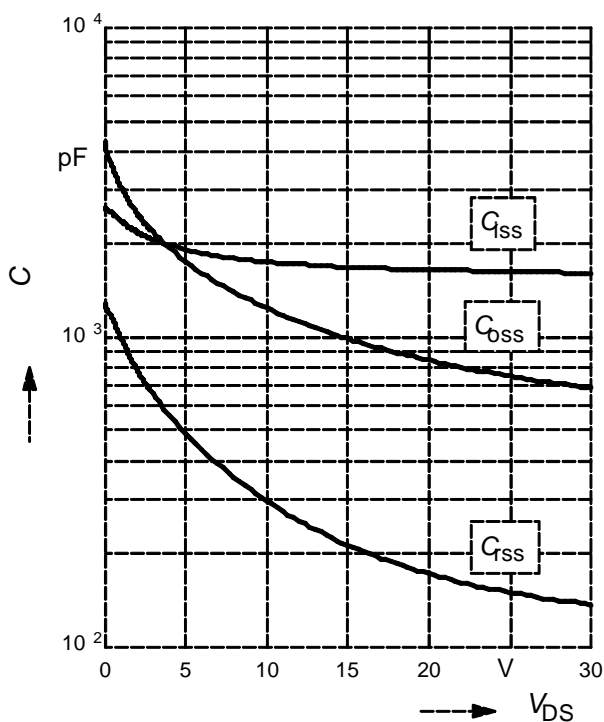
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

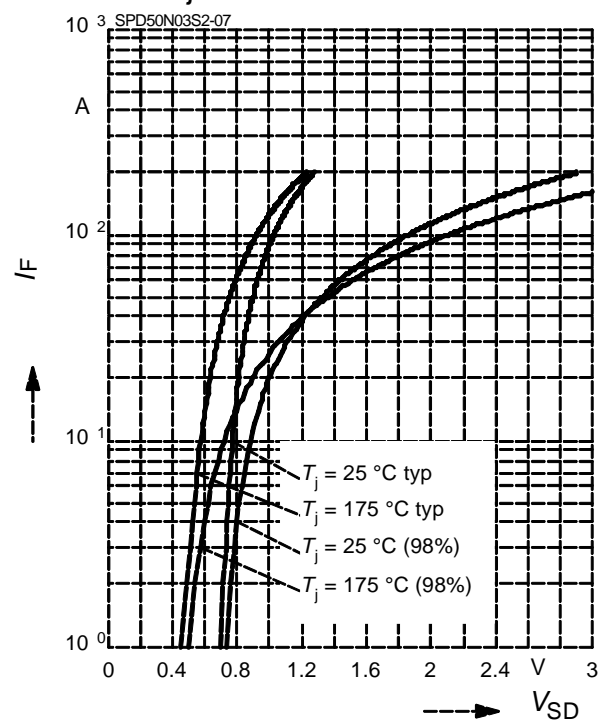
parameter:  $V_{GS}=0\text{V}$ ,  $f=1\text{ MHz}$



**12 Forward character. of reverse diode**

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

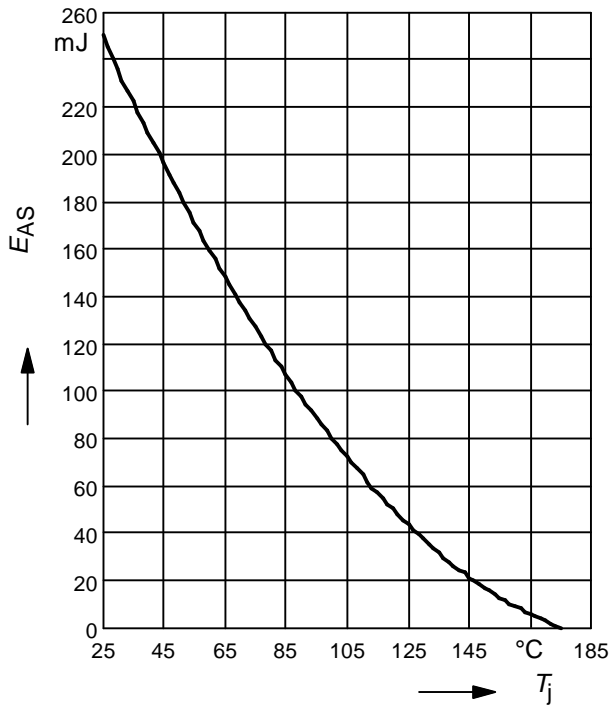
parameter:  $T_j$ ,  $t_p = 80\text{ μs}$



**13 Typ. avalanche energy**

$$E_{AS} = f(T_j)$$

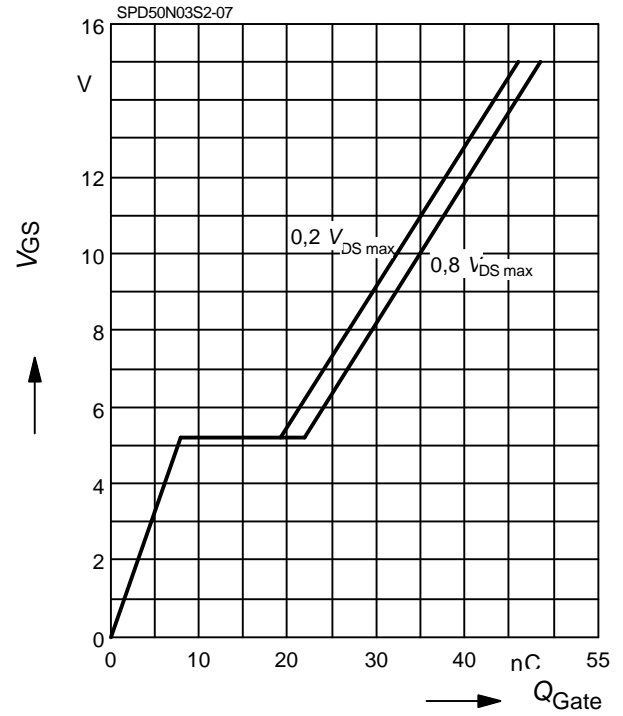
par.:  $I_D = 50 \text{ A}$  ,  $V_{DD} = 25 \text{ V}$  ,  $R_{GS} = 25 \Omega$



**14 Typ. gate charge**

$$V_{GS} = f(Q_{Gate})$$

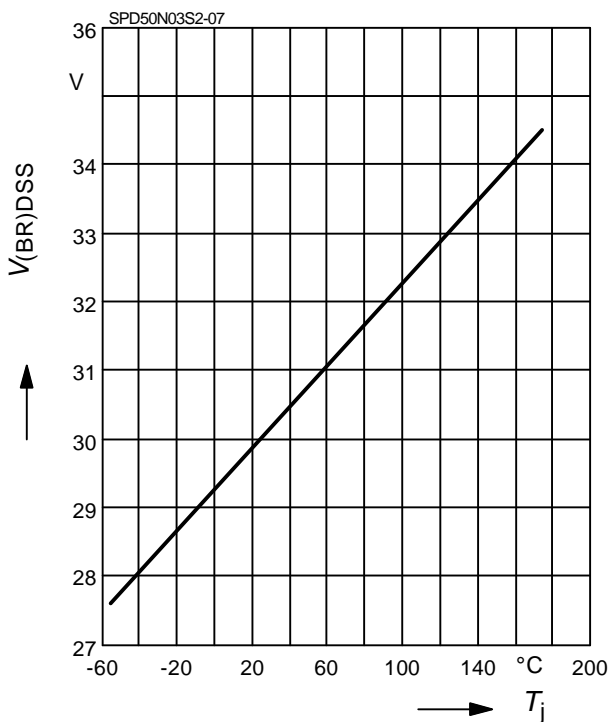
parameter:  $I_D = 50 \text{ A}$  pulsed



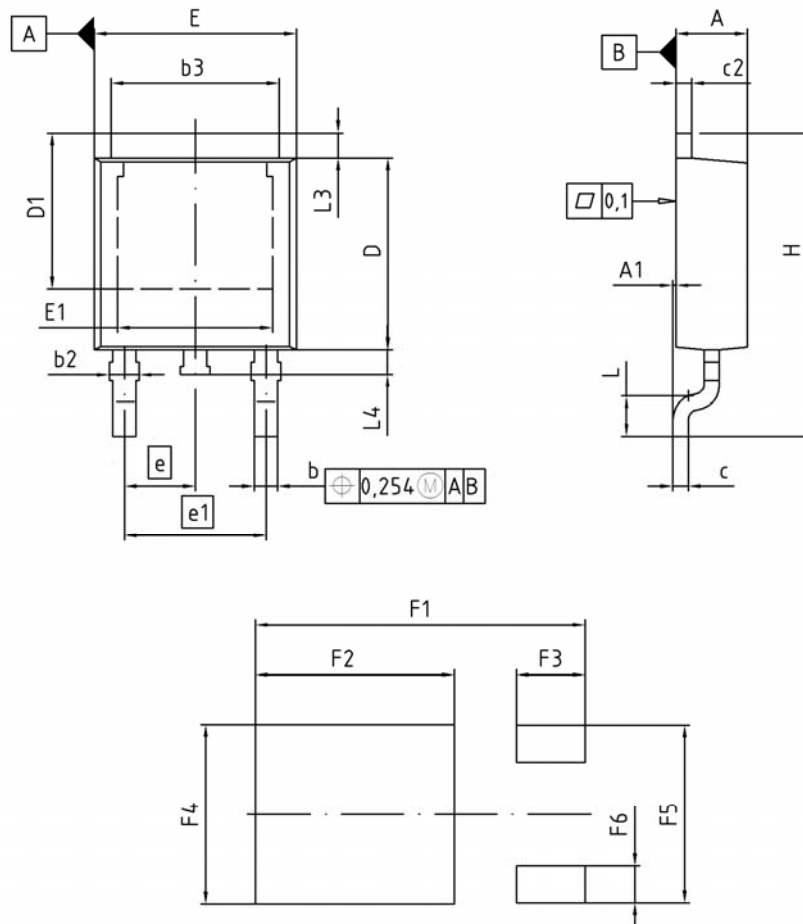
**15 Drain-source breakdown voltage**

$$V_{(BR)DSS} = f(T_j)$$

parameter:  $I_D = 10 \text{ mA}$



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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