

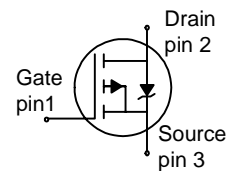
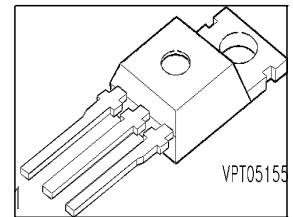
**SIPMOS® Small-Signal-Transistor**
**Feature**

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant

**Product Summary**

$V_{DS}$	-100	V
$R_{DS(on)}$	0.24	$\Omega$
$I_D$	-15	A

PG-TO220-3-1



Type	Package	Marking
SPP15P10P	PG-TO220-3-1	15P10P

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

Parameter	Symbol	Value	Unit
Continuous drain current	$I_D$		A
$T_C=25\text{ }^\circ\text{C}$		-15	
$T_C=100\text{ }^\circ\text{C}$		-10.6	
Pulsed drain current	$I_D \text{ puls}$	-60	
$T_C=25\text{ }^\circ\text{C}$			
Avalanche energy, single pulse	$E_{AS}$	230	mJ
$I_D=-15\text{ A}$ , $V_{DD}=-25\text{ V}$ , $R_{GS}=25\text{ }\Omega$			
Reverse diode dv/dt	dv/dt	6	kV/ $\mu\text{s}$
$I_S=-15\text{ A}$ , $V_{DS}=-48\text{ V}$ , $dI/dt=-200\text{ A}/\mu\text{s}$ , $T_{jmax}=150\text{ }^\circ\text{C}$			
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation	$P_{tot}$	128	W
$T_C=25\text{ }^\circ\text{C}$			
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$
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	$R_{thJC}$	-	-	1.17	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	75	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	-	45	

**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 $V_{GS}=0, I_D=-250\mu\text{A}$	$V_{(BR)DSS}$	-100	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.54\text{mA}$	$V_{GS(th)}$	-4	-3	-2.1	
Zero gate voltage drain current $V_{DS}=-100\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=-100\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$	$I_{DSS}$	-	-0.1	-1	$\mu\text{A}$
Gate-source leakage current $V_{GS}=-20\text{V}, V_{DS}=0$	$I_{GSS}$	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-10\text{V}, I_D=-10.6\text{A}$	$R_{DS(on)}$	-	0.18	0.24	$\Omega$

<sup>1)</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<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	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic Characteristics**

Transconductance	$g_{fs}$	$ V_{DS}  \geq 2 \cdot  I_D  \cdot R_{DS(on)max}$ $I_D = -10.7\text{A}$	4.7	9.3	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = -25\text{V},$ $f = 1\text{MHz}$	-	944	1180	pF
Output capacitance	$C_{oss}$		-	226	283	
Reverse transfer capacitance	$C_{rss}$		-	91	114	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -50\text{V}, V_{GS} = -10\text{V},$ $I_D = -15\text{A}, R_G = 6\Omega$	-	8.9	13.4	ns
Rise time	$t_r$		-	30	45	
Turn-off delay time	$t_{d(off)}$		-	35	53	
Fall time	$t_f$		-	22	33	

**Gate Charge Characteristics**

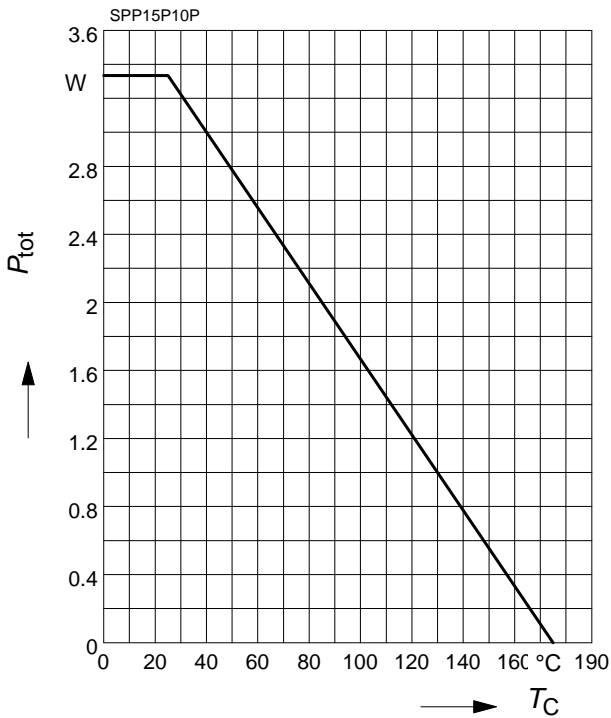
Gate to source charge	$Q_{gs}$	$V_{DD} = -80\text{V}, I_D = -15\text{A}$	-	-4.5	-6.7	nC
Gate to drain charge	$Q_{gd}$		-	-15.3	-23	
Gate charge total	$Q_g$	$V_{DD} = -80\text{V}, I_D = -15\text{A},$ $V_{GS} = 0 \text{ to } -10\text{V}$	-	-33.4	-50	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -80\text{V}, I_D = -15\text{A}$	-	-5.7	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	-15	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	-60	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0,  I_F  =  I_S $	-	-0.94	-1.35	V
Reverse recovery time	$t_{rr}$	$V_R = -50\text{V},  I_F  =  I_S ,$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	100	150	ns
Reverse recovery charge	$Q_{rr}$		-	419	628	

### 1 Power dissipation

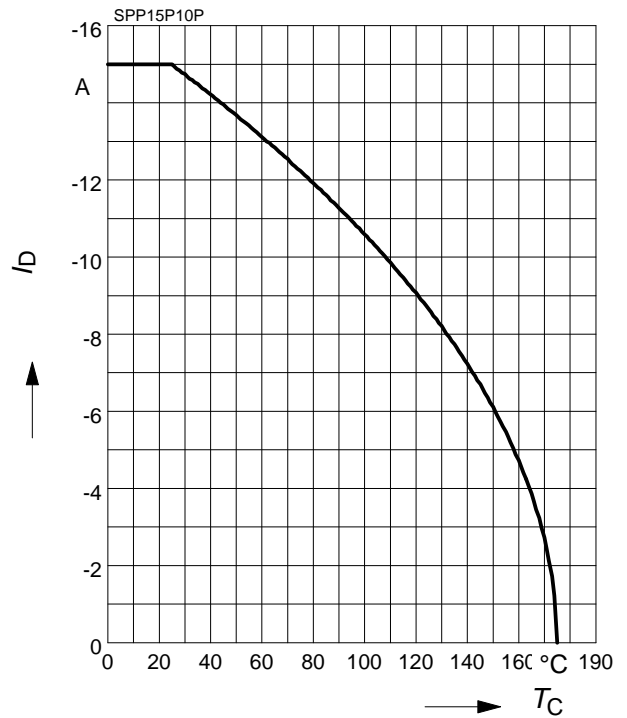
$$P_{tot} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

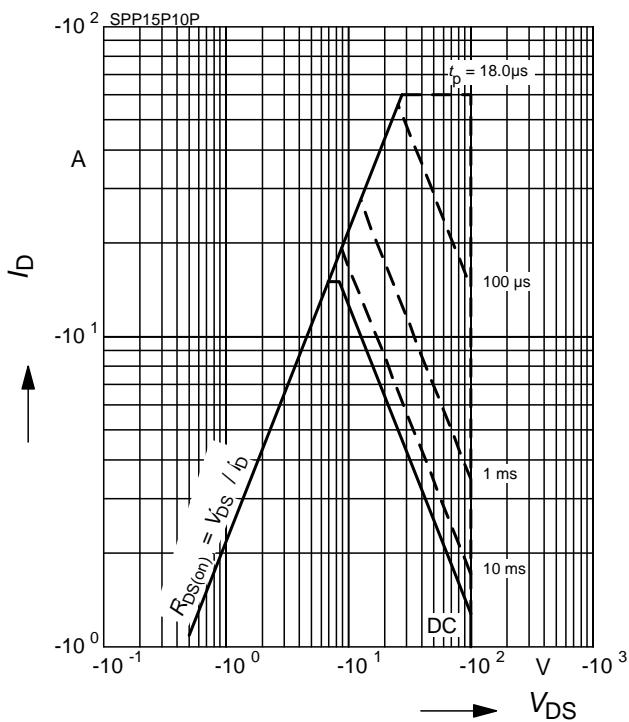
parameter:  $|V_{GS}| \geq 10V$



### 3 Safe operating area

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

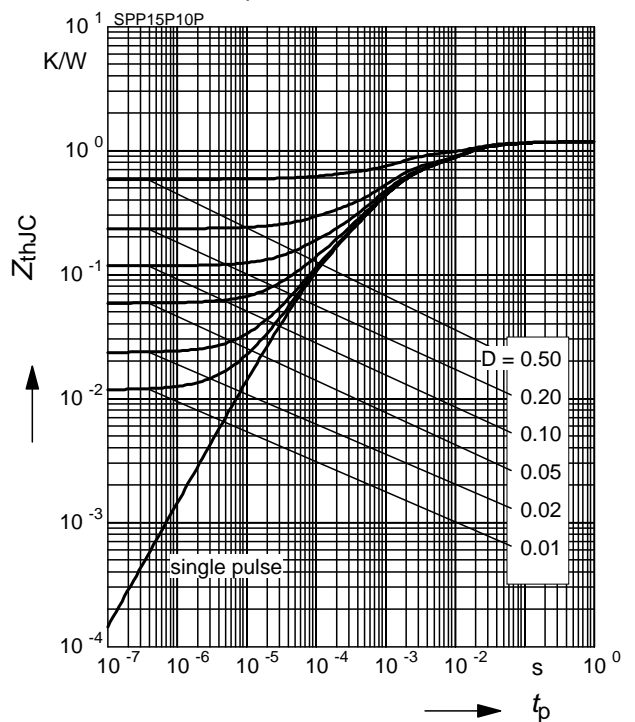
parameter:  $D = 0, T_C = 25\text{ °C}$



### 4 Max. transient thermal impedance

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

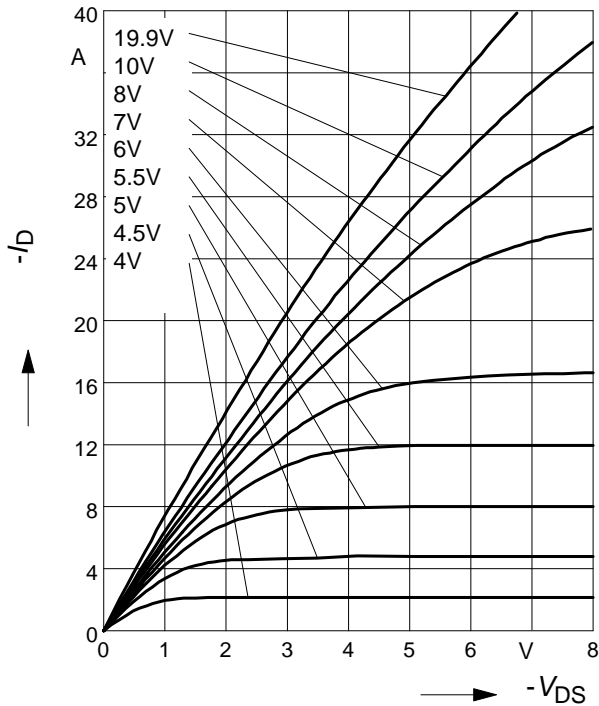
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

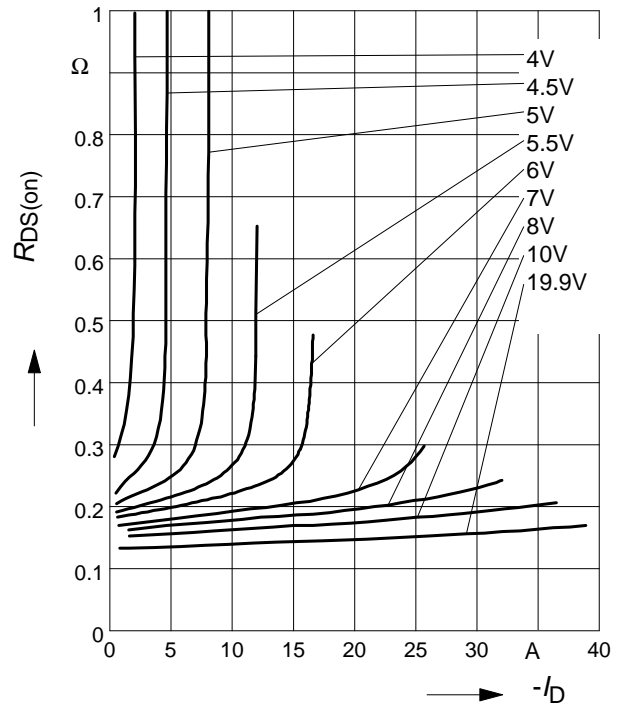
parameter:  $T_j = 25^\circ\text{C}$ ,  $-V_{GS}$



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

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

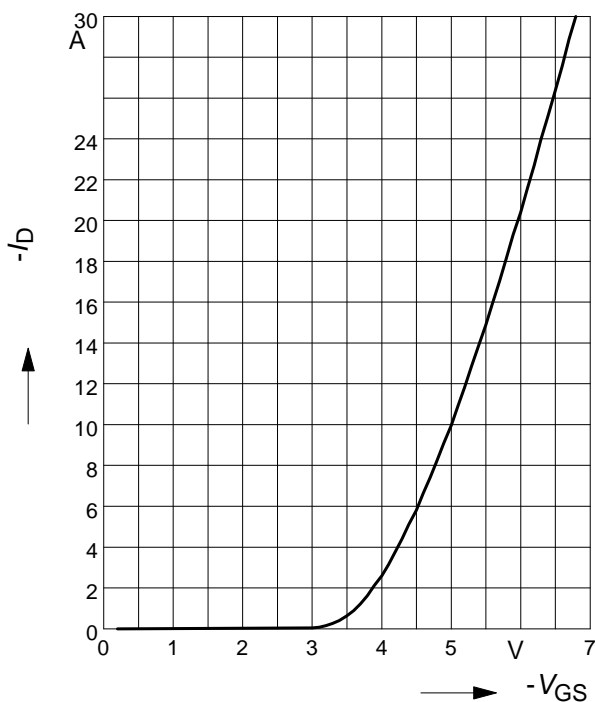
parameter:  $V_{GS}$ ;  $T_j = 25^\circ\text{C}$ ,  $-V_{GS}$



**7 Typ. transfer characteristics**

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

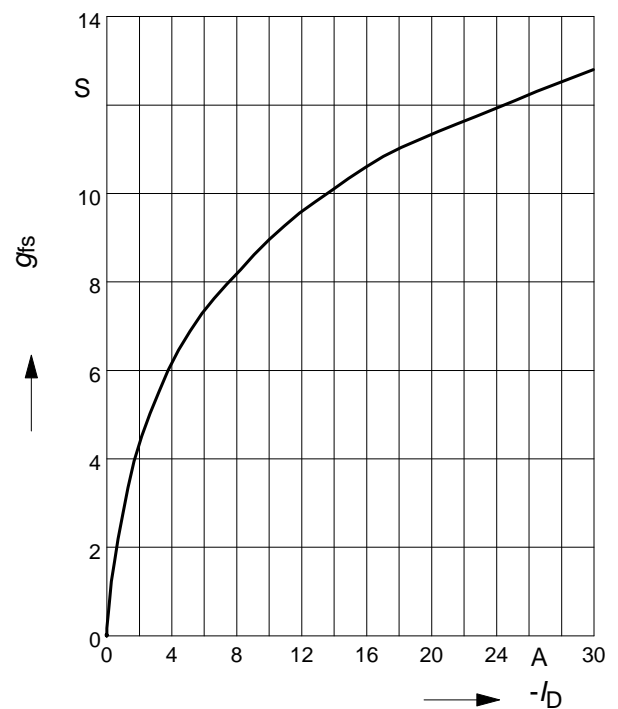
parameter:  $T_j = 25^\circ\text{C}$



**8 Typ. forward transconductance**

$$g_{fs} = f(I_D)$$

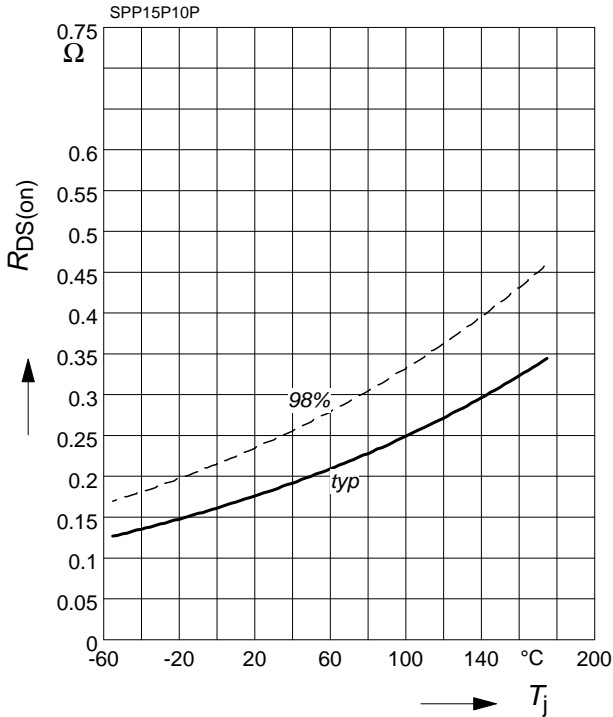
parameter:  $T_j = 25^\circ\text{C}$



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

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

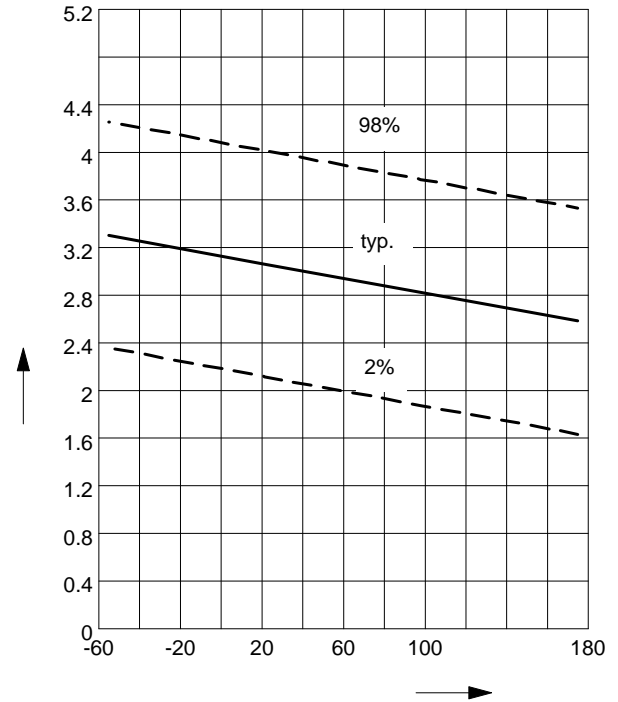
parameter :  $I_D = -10.6 \text{ A}$ ,  $V_{GS} = -10 \text{ V}$



**10 Typ. gate threshold voltage**

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

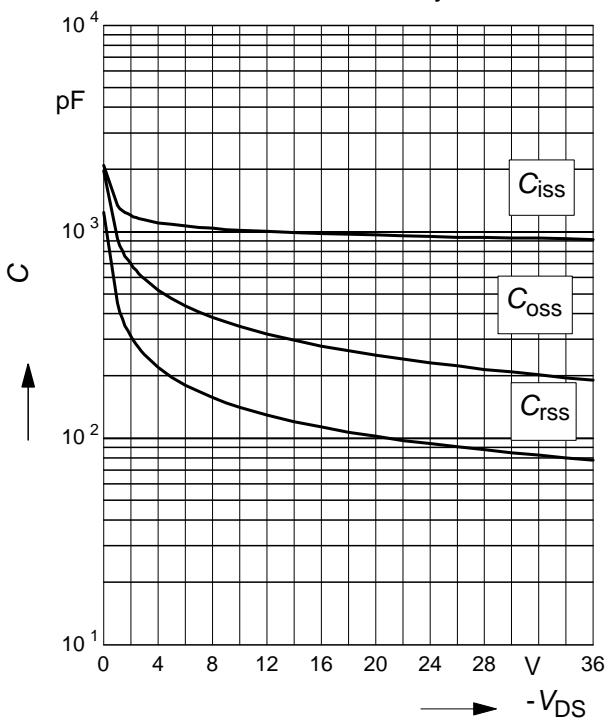
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

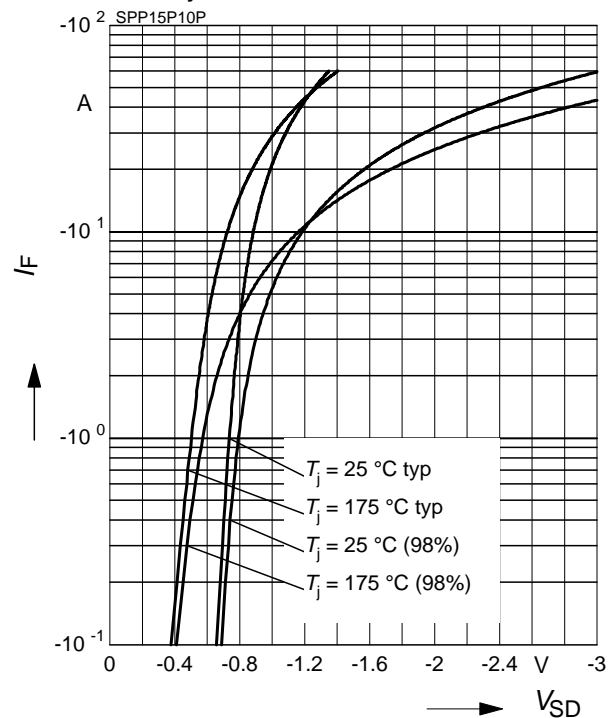
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**12 Forward character. of reverse diode**

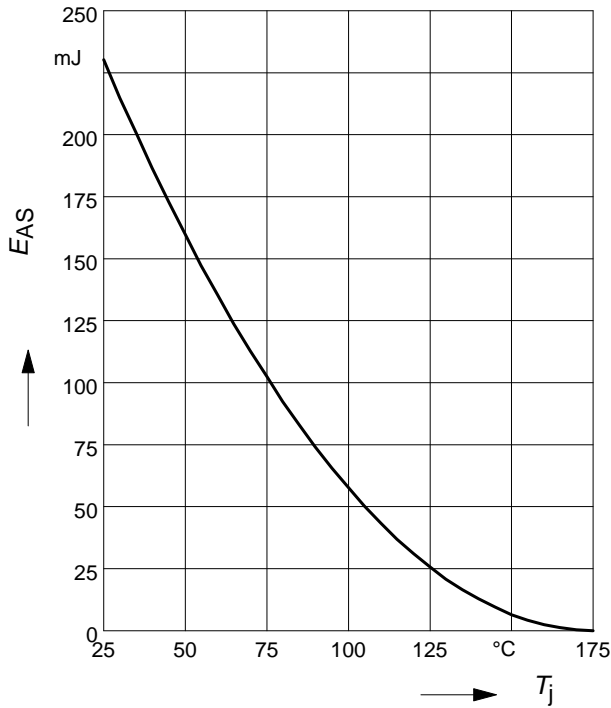
$$I_F = f(V_{SD})$$

parameter:  $T_j$



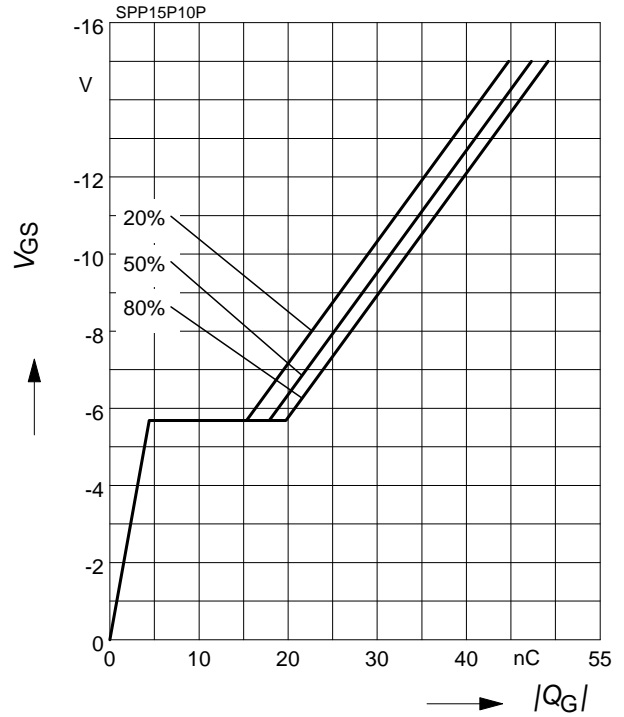
**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$ ; par.:  $I_D = -15\text{ A}$  ,  
 $V_{DD} = -25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



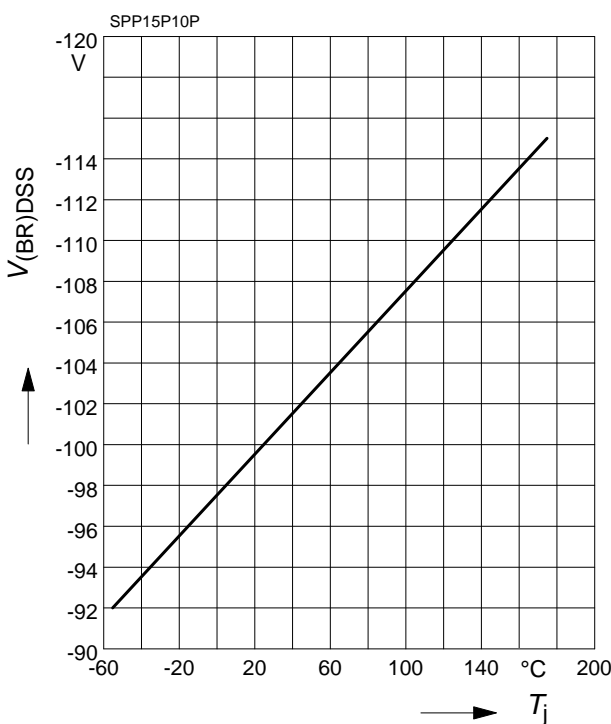
**14 Typ. gate charge**

$V_{GS} = f(Q_{Gate})$   
 parameter:  $I_D = -15\text{ A}$  pulsed,  $T_j = 25^\circ\text{C}$



**15 Drain-source breakdown voltage**

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



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