



Preliminary data

BSA 223SP

### OptiMOS<sup>0</sup>-P Small-Signal-Transistor

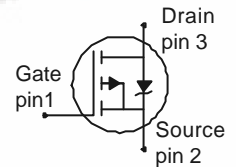
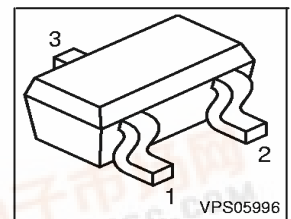
#### Feature

- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated

#### Product Summary

$V_{DS}$	-20	V
$R_{DS(on)}$	1.2	$\Omega$
$I_D$	-0.39	A

SC-75



Type	Package	Ordering Code	Marking
BSA 223SP	SC-75	Q67042-S4176	BPs

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ }^\circ\text{C}$ $T_A=70\text{ }^\circ\text{C}$	$I_D$	-0.39 -0.31	A
Pulsed drain current $T_A=25\text{ }^\circ\text{C}$	$I_{D\text{ puls}}$	-1.56	
Avalanche energy, single pulse $I_D=-0.39\text{ A}$ , $V_{DD}=-10\text{ V}$ , $R_{GS}=25\text{ }\Omega$	$E_{AS}$	1.4	mJ
Reverse diode dv/dt $I_S=-0.39\text{ A}$ , $V_{DS}=-16\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j\text{ max}}=150\text{ }^\circ\text{C}$	dv/dt	-6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 12$	V
Power dissipation $T_A=25\text{ }^\circ\text{C}$	$P_{tot}$	0.25	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +150	$^\circ\text{C}$
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 - soldering point	$R_{thJS}$	-	-	150	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	500	

**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 $V_{GS}=0, I_D=-250\mu\text{A}$	$V_{(BR)DSS}$	-20	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.5\mu\text{A}$	$V_{GS(th)}$	-0.6	-0.9	-1.2	
Zero gate voltage drain current $V_{DS}=-20\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=-20\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$	$I_{DSS}$	-	-0.1 -10	-1 -100	$\mu\text{A}$
Gate-source leakage current $V_{GS}=-12\text{V}, V_{DS}=0$	$I_{GSS}$	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-2.5\text{V}, I_D=-0.29\text{A}$	$R_{DS(on)}$	-	1.27	2.1	$\Omega$
Drain-source on-state resistance $V_{GS}=-4.5, I_D=-0.39\text{A}$	$R_{DS(on)}$	-	0.7	1.2	

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 *  I_D  * R_{DS(on)max}$ , $I_D = -0.31\text{A}$	0.35	0.7	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = -15\text{V}$ , $f = 1\text{MHz}$	-	45	56	pF
Output capacitance	$C_{oss}$		-	21	26	
Reverse transfer capacitance	$C_{rss}$		-	17	22	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10\text{V}, V_{GS} = -4.5\text{V}$ , $I_D = -0.39\text{A}, R_G = 6\Omega$	-	3.8	5.7	ns
Rise time	$t_r$		-	5	7.5	
Turn-off delay time	$t_{d(off)}$		-	5.1	7.6	
Fall time	$t_f$		-	3.2	4.8	

### Gate Charge Characteristics

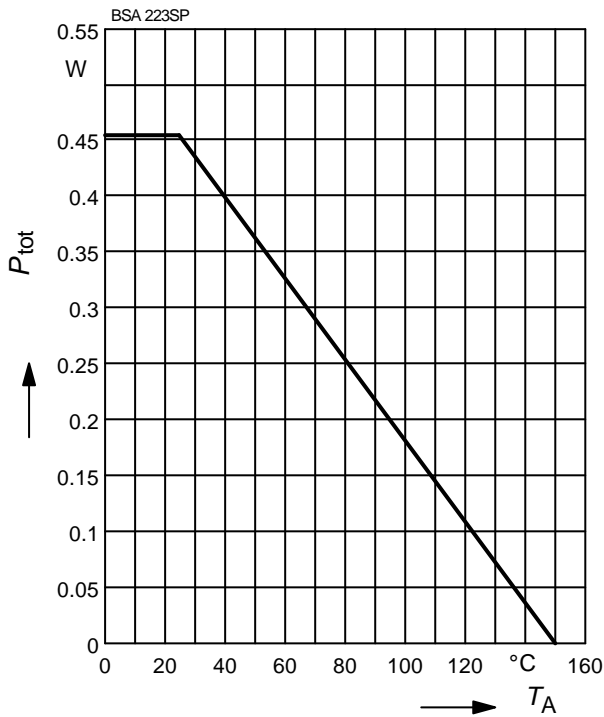
Gate to source charge	$Q_{gs}$	$V_{DD} = -10\text{V}, I_D = -0.39\text{A}$	-	-0.04	-0.05	nC
Gate to drain charge	$Q_{gd}$		-	-0.4	-0.5	
Gate charge total	$Q_g$	$V_{DD} = -10\text{V}, I_D = -0.39\text{A}$ , $V_{GS} = 0 \text{ to } -4.5\text{V}$	-	-0.5	-0.62	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -10\text{V}, I_D = -0.39\text{A}$	-	-2.2	-2.7	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	-0.39	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	-1.56	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0, I_F = -0.39$	-	-1	-1.33	V
Reverse recovery time	$t_{rr}$	$V_R = -10\text{V},  I_F  =  I_D $	-	7.6	9.5	ns
Reverse recovery charge	$Q_{rr}$	$dI_F/dt = 100\text{A}/\mu\text{s}$	-	1.1	1.4	nC

### 1 Power dissipation

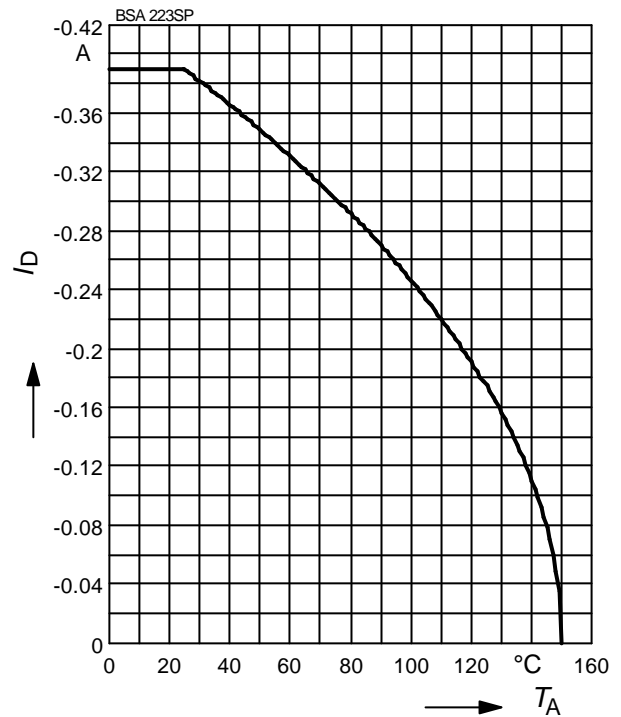
$$P_{tot} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

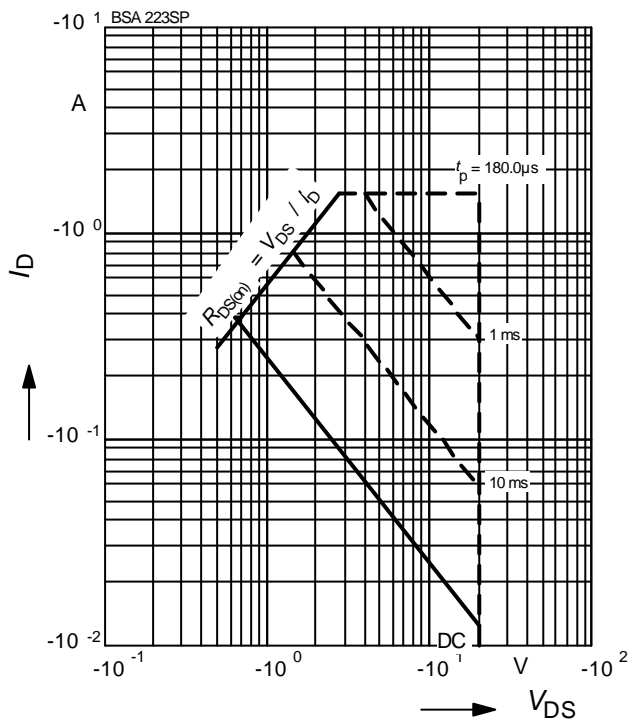
parameter:  $|V_{GS}| \geq 4.5 \text{ V}$



### 3 Safe operating area

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

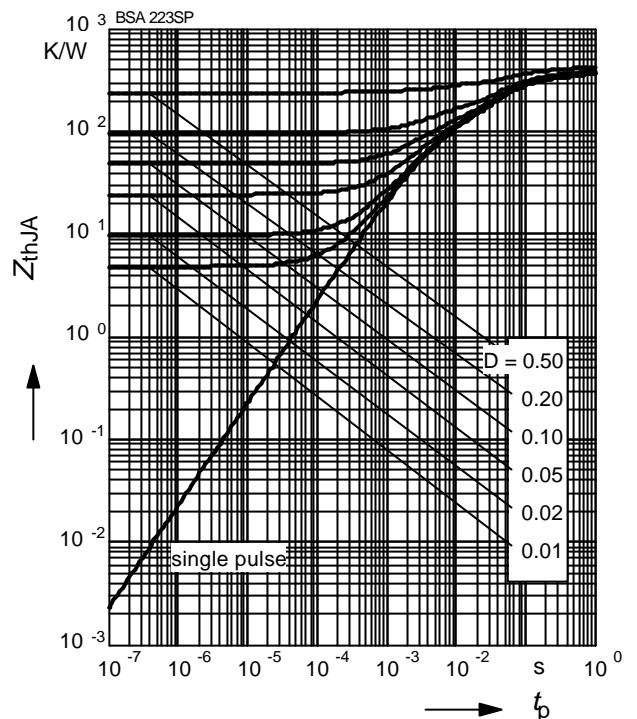
parameter:  $D = 0, T_A = 25 \text{ °C}$



### 4 Transient thermal impedance

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

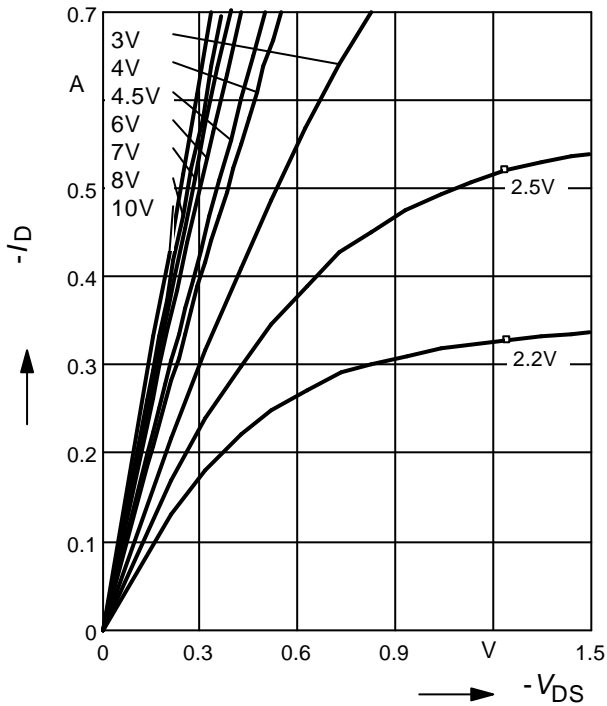
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

$I_D = f(V_{DS})$

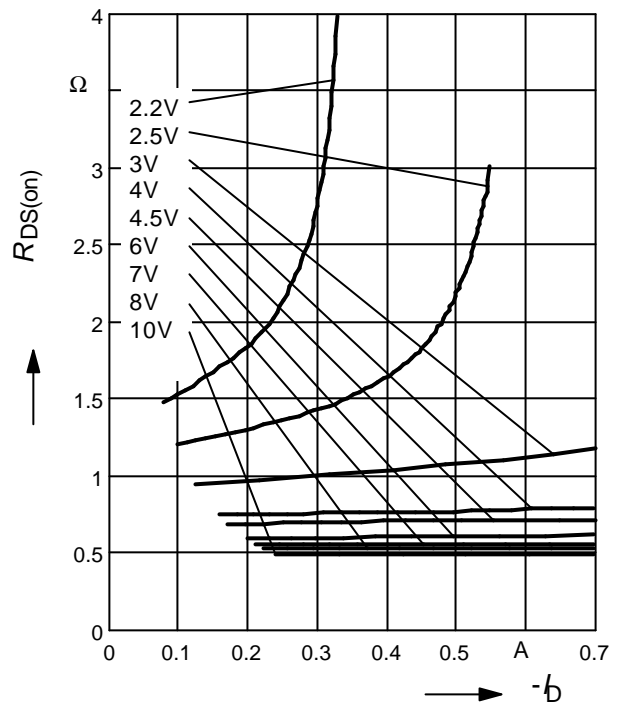
parameter:  $T_j = 25^\circ\text{C}$



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

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

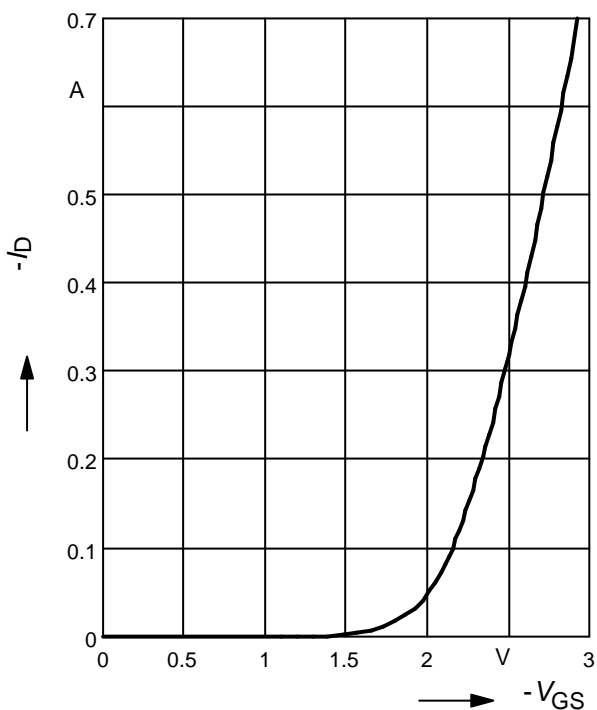
parameter:  $V_{GS}, T_j = 25^\circ\text{C}$



**7 Typ. transfer characteristics**

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

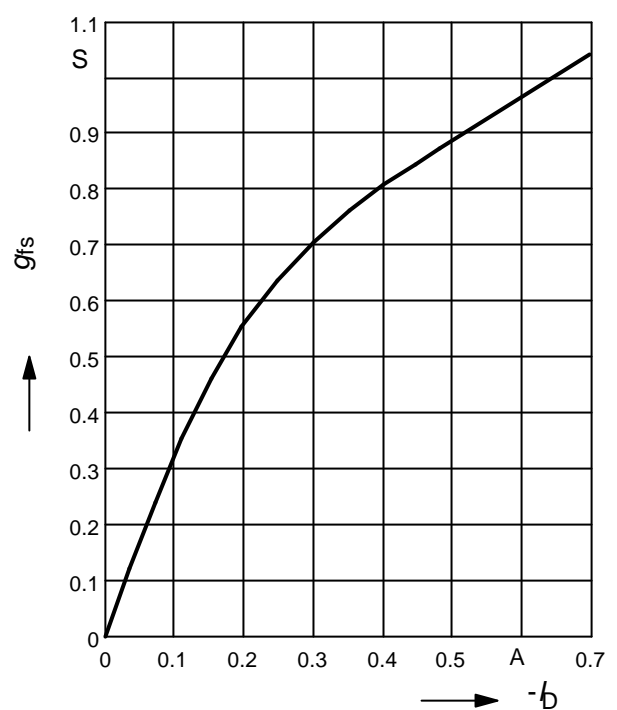
parameter:  $T_j = 25^\circ\text{C}$



**8 Typ. forward transconductance**

$g_{fs} = f(I_D)$

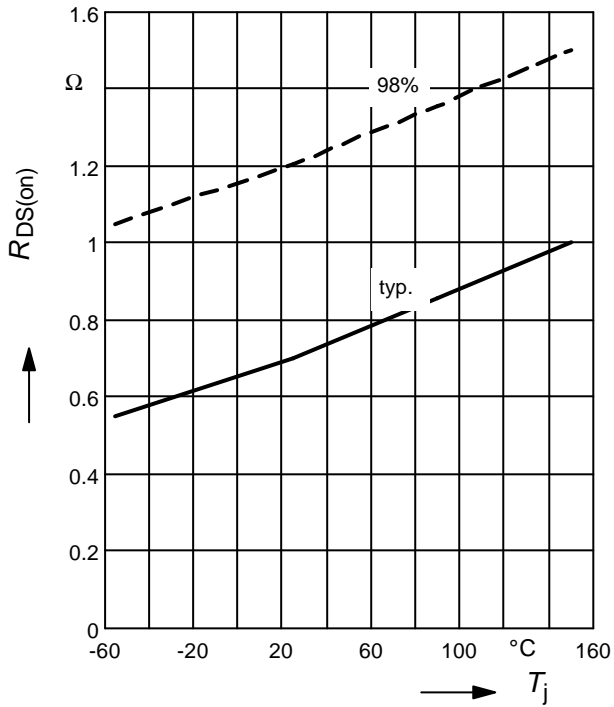
parameter:  $T_j = 25^\circ\text{C}$



**9 Drain-source on-resistance**

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

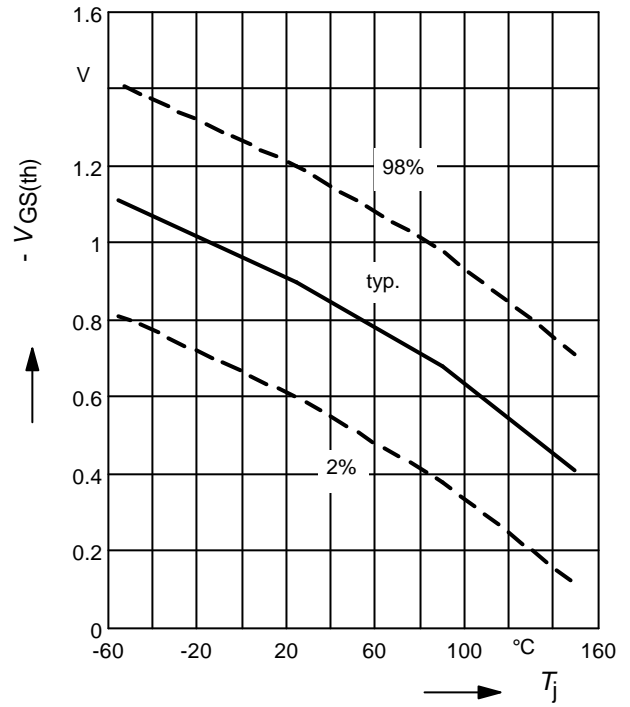
parameter:  $I_D = -0.39 \text{ A}$ ,  $V_{GS} = -4.5 \text{ V}$



**10 Typ. gate threshold voltage**

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

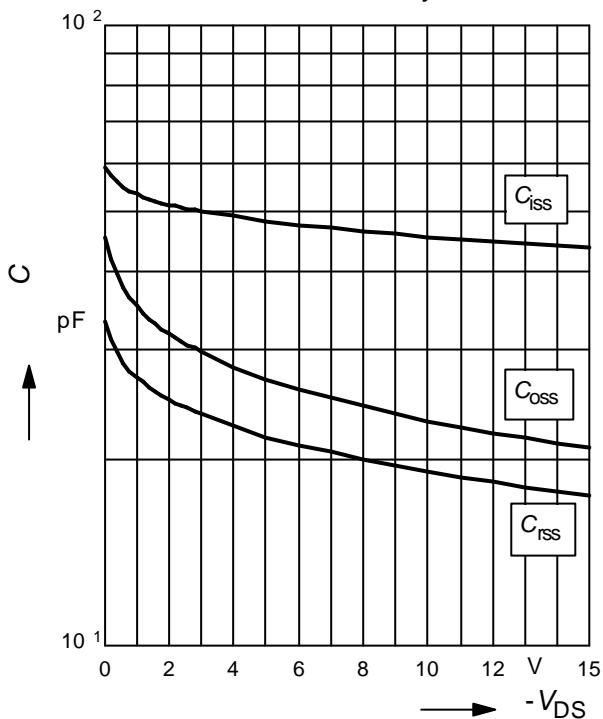
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

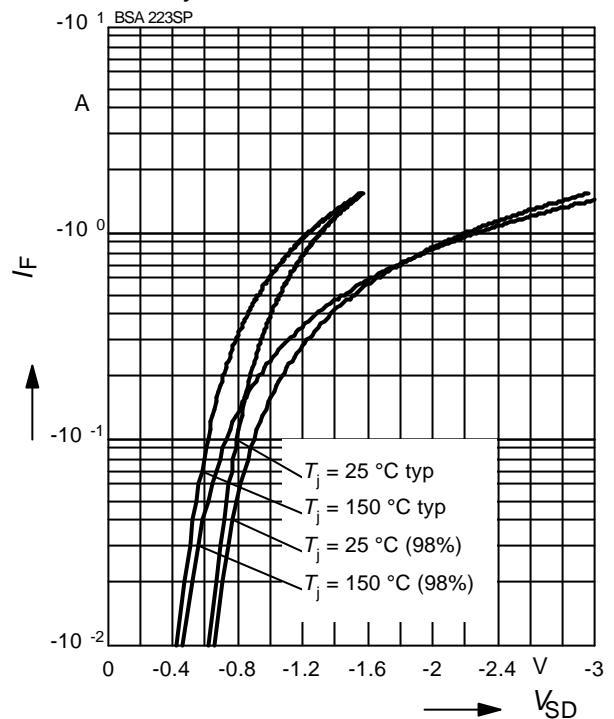
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**12 Forward character. of reverse diode**

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

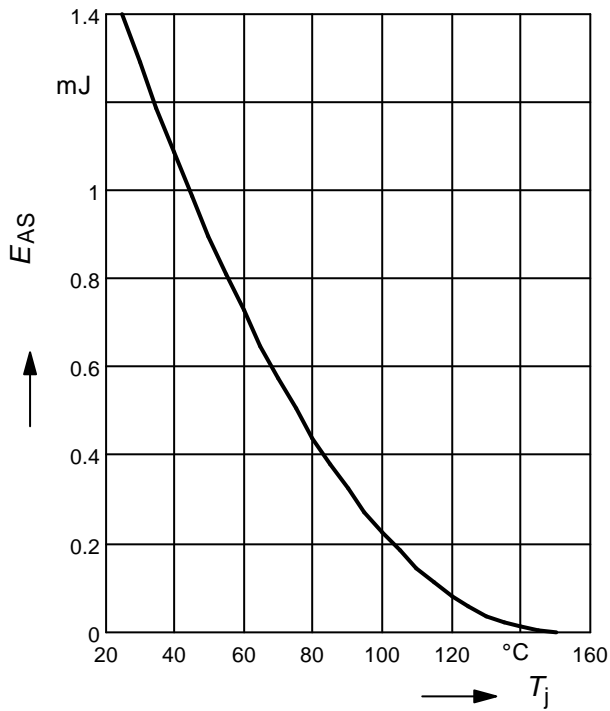
parameter:  $T_j = 25 \text{ }^\circ\text{C}$



**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$ , par.:  $I_D = -0.39$  A

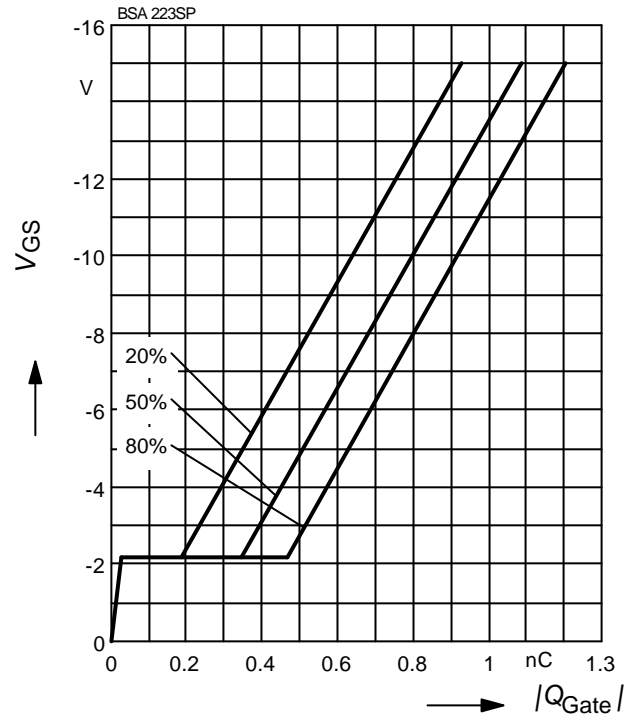
$V_{DD} = -10$  V,  $R_{GS} = 25$   $\Omega$



**14 Typ. gate charge**

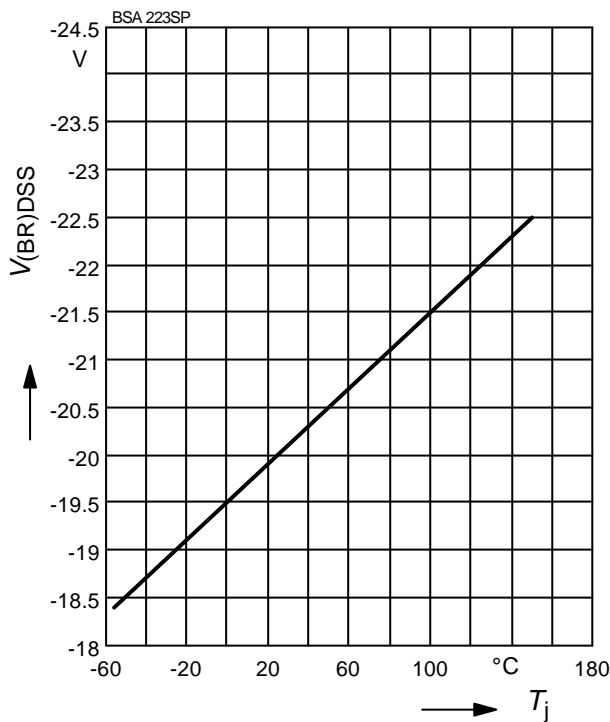
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = -0.39$  A pulsed,  $T_j = 25$  °C



**15 Drain-source breakdown voltage**

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





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