

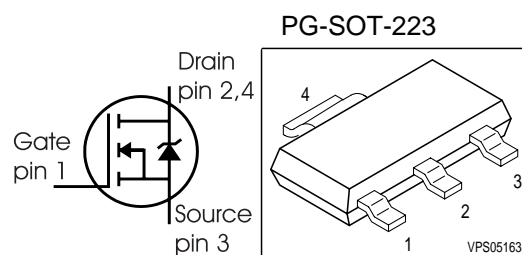
## SIPMOS® Small-Signal-Transistor

### Feature

- N-Channel
- Enhancement mode
- $dv/dt$  rated
- Pb-free lead plating; RoHS compliant

### Product Summary

$V_{DS}$	60	V
$R_{DS(on)}$	0.3	$\Omega$
$I_D$	1.8	A



Type	Package	Tape and Reel Information	Marking
BSP295	PG-SOT-223	L6327: 1000 pcs/reel	BSP295

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ °C}$ $T_A=70\text{ °C}$	$I_D$	1.8 1.44	A
Pulsed drain current $T_A=25\text{ °C}$	$I_{D\text{ puls}}$	7.2	
Reverse diode $dv/dt$ $I_S=1.8\text{ A}$ , $V_{DS}=40\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j\text{max}}=150\text{ °C}$	$dv/dt$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
ESD Sensitivity (HBM) as per MIL-STD 883		Class 1	
Power dissipation $T_A=25\text{ °C}$	$P_{\text{tot}}$	1.8	W
Operating and storage temperature	$T_j, T_{\text{stg}}$	-55... +150	$\text{°C}$
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	$R_{thJS}$	-	15	25	K/W
SMD version, device on PCB:	$R_{thJA}$	-	80	115	
@ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	48	70	

**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 $V_{GS}=0, I_D=250\mu\text{A}$	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=400\mu\text{A}$	$V_{GS(th)}$	0.8	1.1	1.8	
Zero gate voltage drain current $V_{DS}=60\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=60\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$	$I_{DSS}$	-	-	0.1	$\mu\text{A}$
		-	8	50	
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0$	$I_{GSS}$	-	1	10	nA
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=1.8\text{A}$ $V_{GS}=4.5\text{V}, I_D=1.8\text{A}$	$R_{DS(on)}$	-	0.22	0.3	$\Omega$
		-	0.39	0.5	

<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	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 1.44\text{A}$	0.8	1.7	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	-	295	368	pF
Output capacitance	$C_{oss}$		-	95	118	
Reverse transfer capacitance	$C_{rss}$		-	45	67	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}, V_{GS} = 4.5\text{V}$ , $I_D = 1.44\text{A}, R_G = 15\Omega$	-	5.4	8.1	ns
Rise time	$t_r$		-	9.9	15	
Turn-off delay time	$t_{d(off)}$		-	27	41	
Fall time	$t_f$		-	19	28	

**Gate Charge Characteristics**

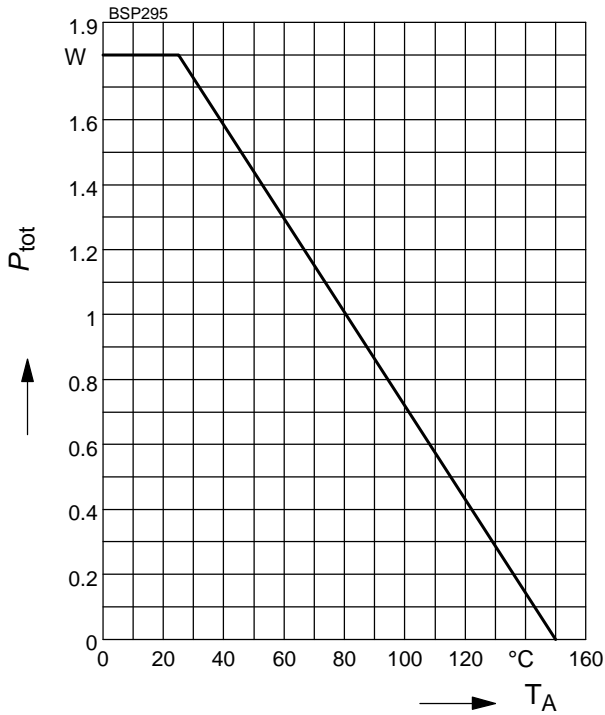
Gate to source charge	$Q_{gs}$	$V_{DD} = 24\text{V}, I_D = 1.8\text{A}$	-	0.9	1.1	nC
Gate to drain charge	$Q_{gd}$		-	5.6	8.4	
Gate charge total	$Q_g$	$V_{DD} = 24\text{V}, I_D = 1.8\text{A}$ , $V_{GS} = 0\text{ to }10\text{V}$	-	14	17	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24\text{V}, I_D = 1.8\text{A}$	-	3.1	3.8	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	1.8	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	7.2	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0, I_F = I_S$	-	0.84	1.3	V
Reverse recovery time	$t_{rr}$	$V_R = 25\text{V}, I_F = I_S$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	36	45	ns
Reverse recovery charge	$Q_{rr}$		-	38	48	nC

### 1 Power dissipation

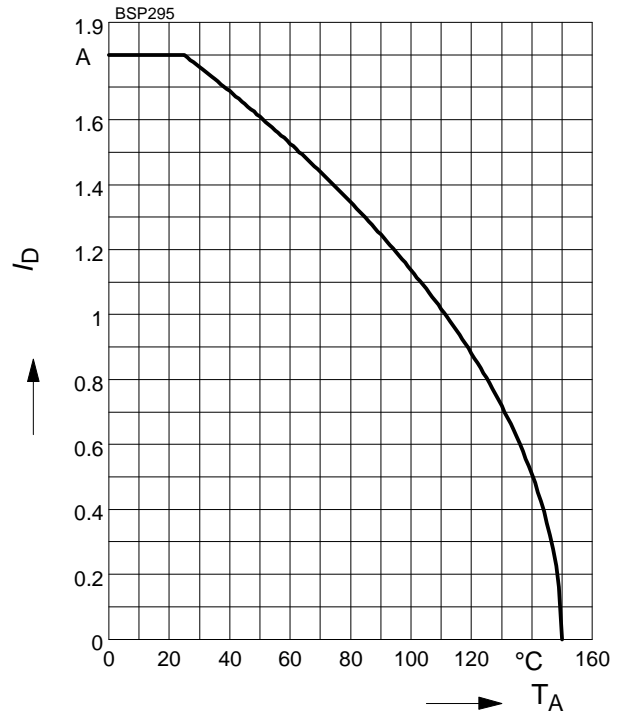
$$P_{\text{tot}} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

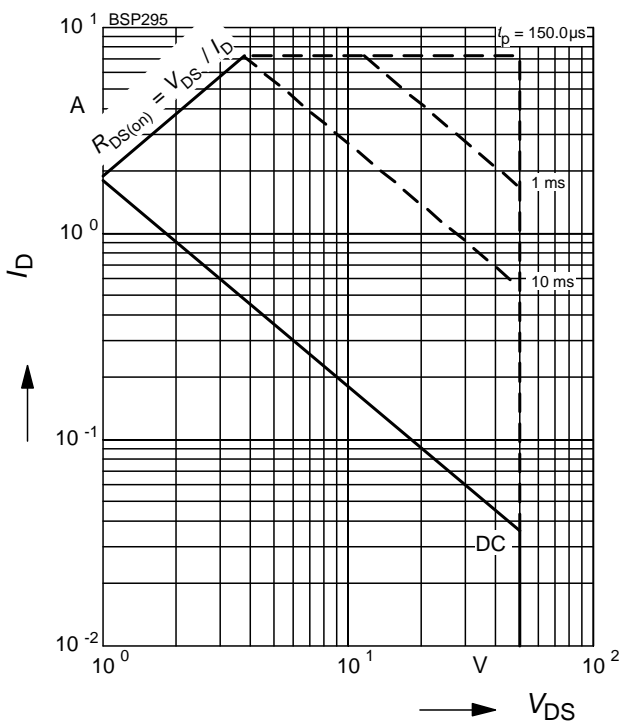
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

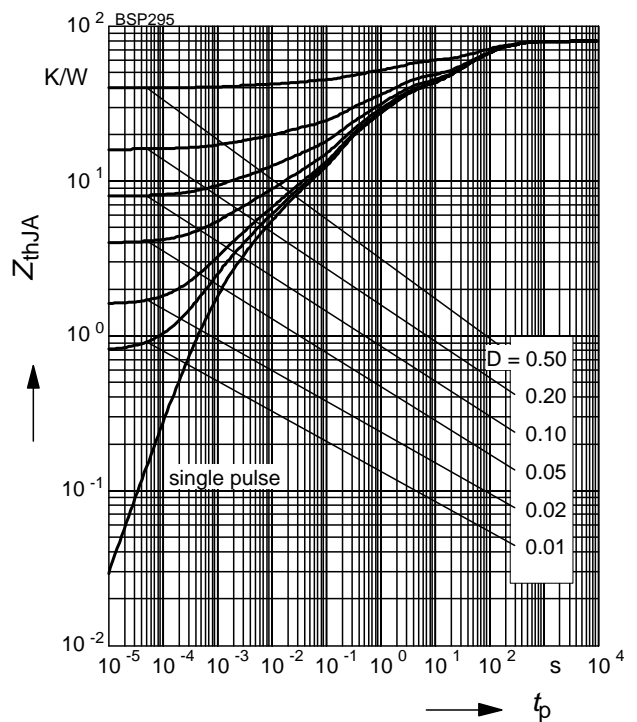
parameter:  $D = 0$ ,  $T_A = 25 \text{ °C}$



### 4 Transient thermal impedance

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

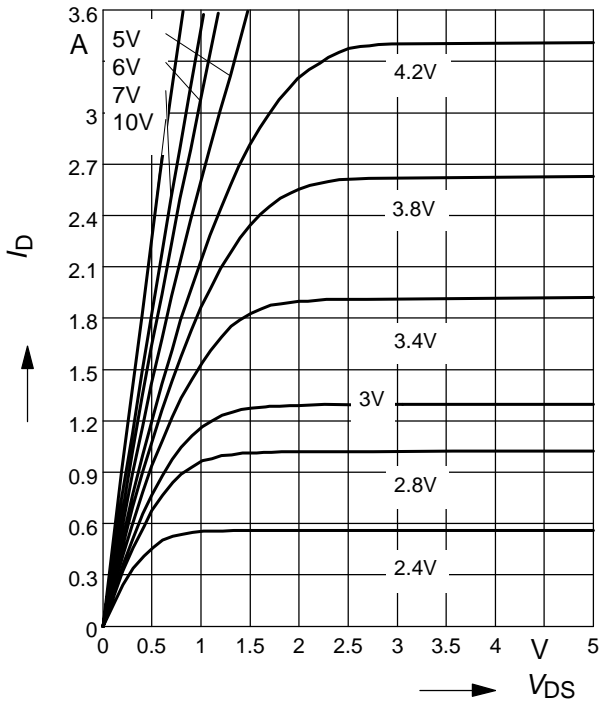
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

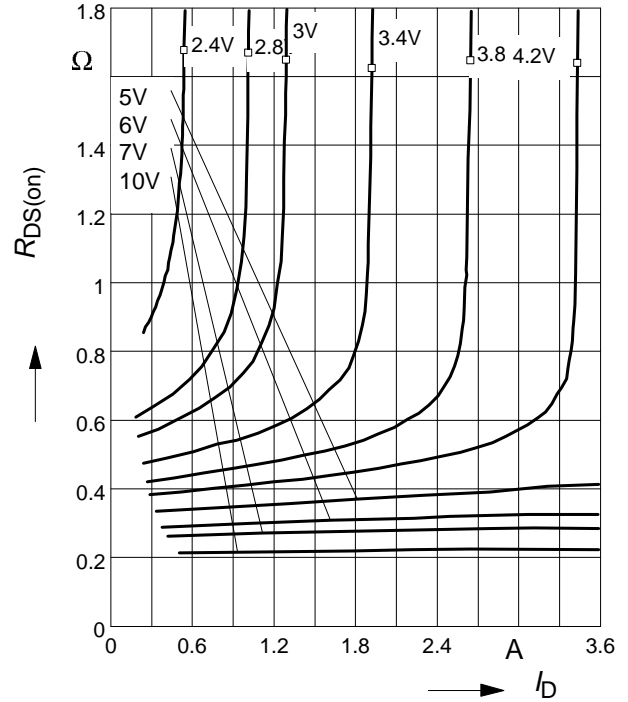
parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$



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

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

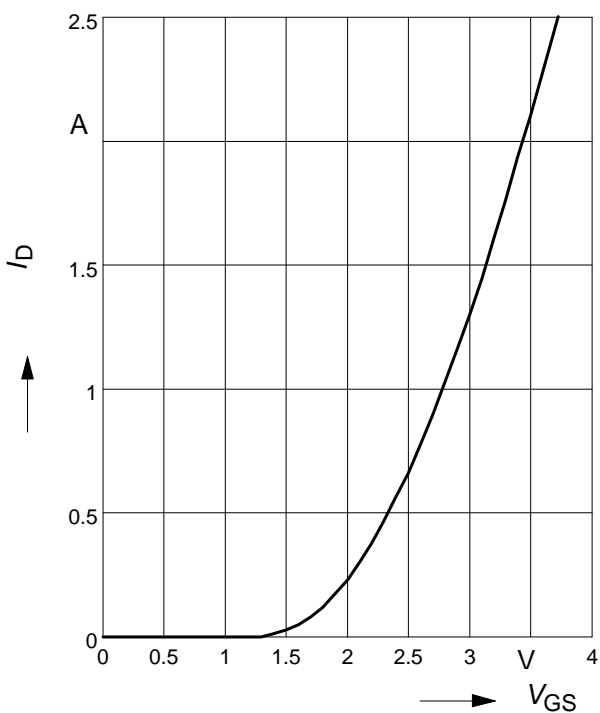
parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$



**7 Typ. transfer characteristics**

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

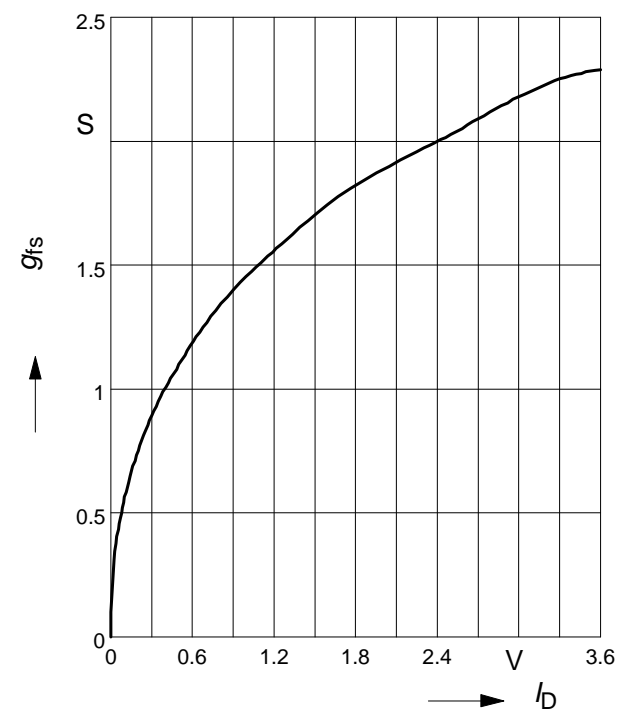
parameter:  $T_j = 25\text{ }^\circ\text{C}$



**8 Typ. forward transconductance**

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

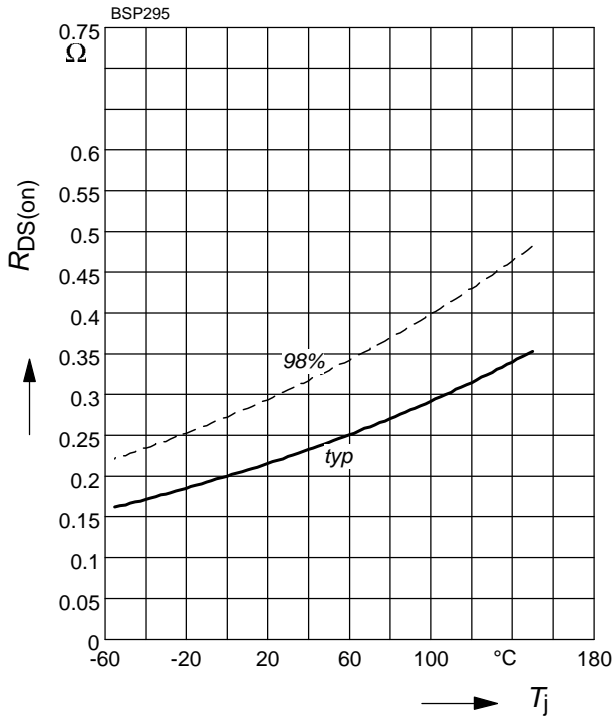
parameter:  $T_j = 25\text{ }^\circ\text{C}$



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

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

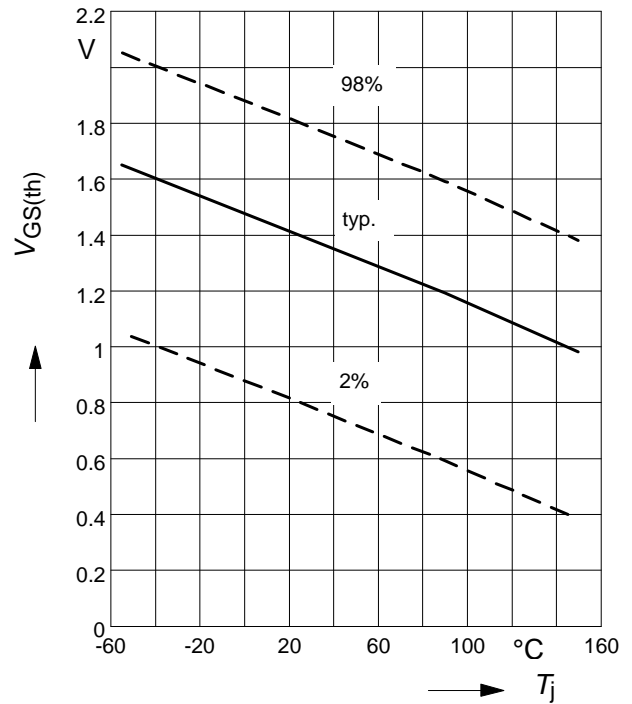
parameter:  $I_D = 1.8 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

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

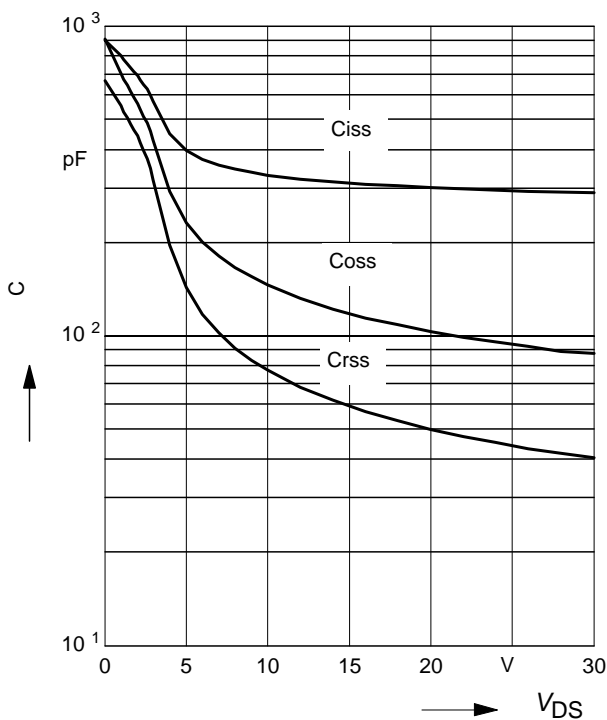
parameter:  $V_{GS} = V_{DS}$ ;  $I_D = 1 \text{ mA}$



**11 Typ. capacitances**

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

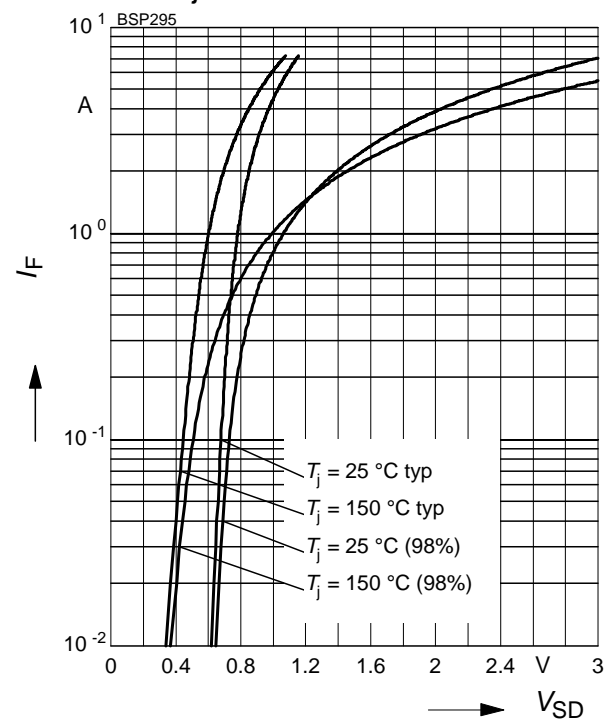
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**12 Forward character. of reverse diode**

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

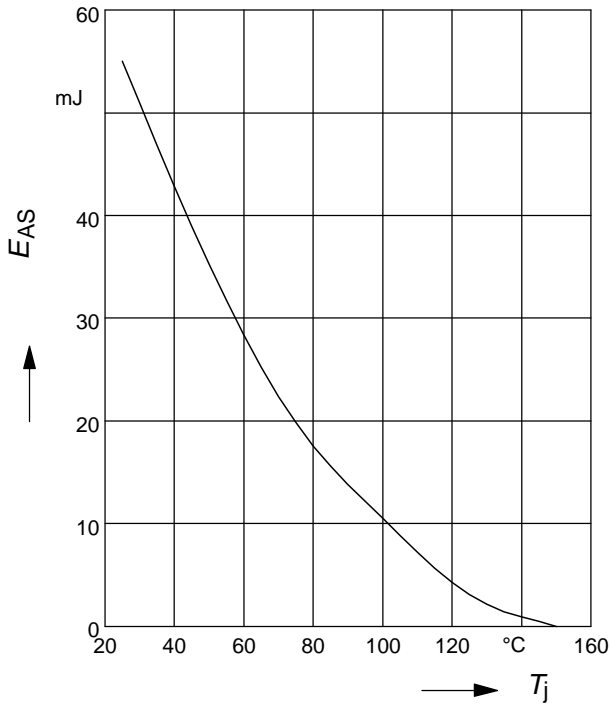
parameter:  $T_j$



**13 Typ. avalanche energy**

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

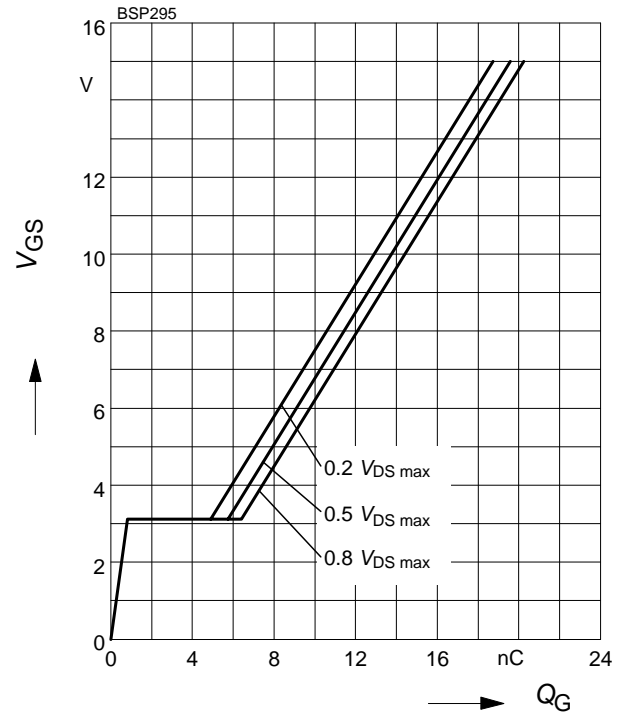
par.:  $I_D = 3.9 \text{ A}$ ,  $V_{DD} = 25 \text{ V}$ ,  $R_{GS} = 25 \Omega$



**14 Typ. gate charge**

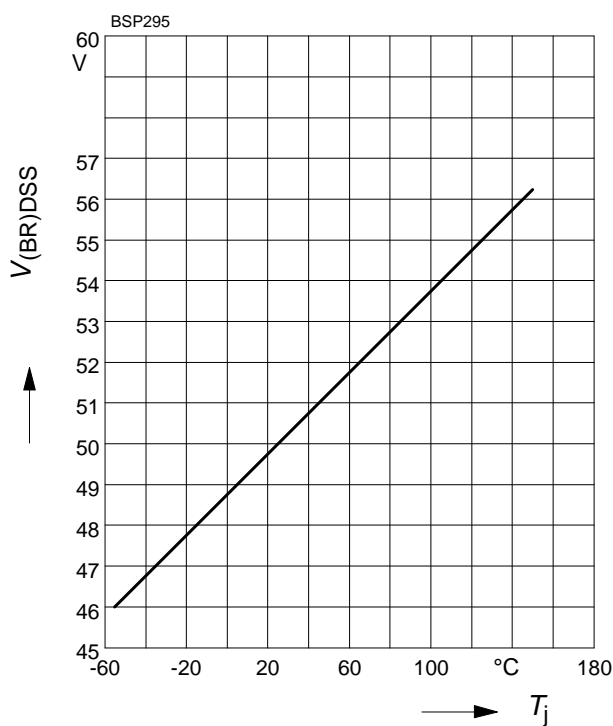
$$V_{GS} = f(Q_G); \text{ parameter: } V_{DS}$$

$I_D = 1.8 \text{ A pulsed}$ ,  $T_j = 25 \text{ °C}$



**15 Drain-source breakdown voltage**

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



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