

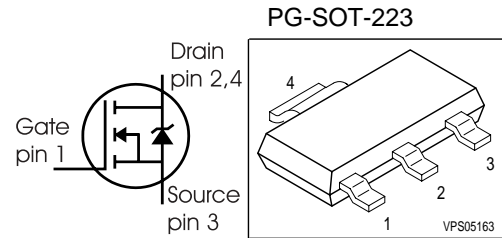
## SIPMOS<sup>®</sup> Small-Signal-Transistor

### Feature

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

### Product Summary

$V_{DS}$	100	V
$R_{DS(on)}$	0.7	$\Omega$
$I_D$	1.1	A



Type	Package	Tape and Reel Information	Marking
BSP296	P-SOT-223	E6327	BSP296
BSP296	PG-SOT-223	L6327	BSP296

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ }^\circ\text{C}$ $T_A=70\text{ }^\circ\text{C}$	$I_D$	1.1 0.88	A
Pulsed drain current $T_A=25\text{ }^\circ\text{C}$	$I_D$ puls	4.4	
Reverse diode $dv/dt$ $I_S=1.1\text{A}$ , $V_{DS}=80\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{jmax}=150\text{ }^\circ\text{C}$	$dv/dt$	6	$\text{kV}/\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
ESD Sensitivity (HBM) as per MIL-STD 883		Class 1	
Power dissipation $T_A=25\text{ }^\circ\text{C}$	$P_{tot}$	1.79	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 (Pin 4)	$R_{thJS}$	-	-	25	K/W
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	-	-	115 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 $V_{GS}=0, I_D=250\mu\text{A}$	$V_{(BR)DSS}$	100	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=400\mu\text{A}$	$V_{GS(th)}$	0.8	1.4	1.8	
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 50	$\mu\text{A}$
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0$	$I_{GSS}$	-	10	100	
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=0.95\text{A}$	$R_{DS(on)}$	-	0.62	1	$\Omega$
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=1.1\text{A}$	$R_{DS(on)}$	-	0.43	0.7	

<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	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ $I_D = 0.88\text{A}$	0.6	1.2	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = 25\text{V},$ $f = 1\text{MHz}$	-	291	364	pF
Output capacitance	$C_{oss}$		-	53	66	
Reverse transfer capacitance	$C_{rss}$		-	29	36	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 50\text{V}, V_{GS} = 10\text{V},$ $I_D = 1.1\text{A}, R_G = 6\Omega$	-	5.2	7.8	ns
Rise time	$t_r$		-	7.9	11.8	
Turn-off delay time	$t_{d(off)}$		-	37.4	56.1	
Fall time	$t_f$		-	21.4	32.1	

**Gate Charge Characteristics**

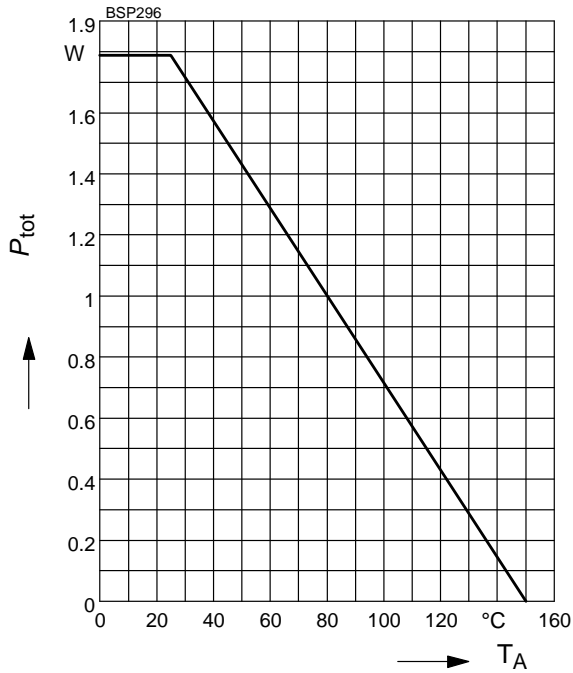
Gate to source charge	$Q_{gs}$	$V_{DD} = 80\text{V}, I_D = 1.1\text{A}$	-	0.7	0.9	nC
Gate to drain charge	$Q_{gd}$		-	5	7.5	
Gate charge total	$Q_g$	$V_{DD} = 80\text{V}, I_D = 1.1\text{A},$ $V_{GS} = 0 \text{ to } 10\text{V}$	-	13.8	17.2	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 80\text{V}, I_D = 1.1\text{A}$	-	2.7	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	1.1	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	4.4	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0, I_F = I_S$	-	0.82	1.2	V
Reverse recovery time	$t_{rr}$	$V_R = 50\text{V}, I_F = I_S,$	-	44.3	55.4	ns
Reverse recovery charge	$Q_{rr}$	$di_F/dt = 100\text{A}/\mu\text{s}$	-	71.9	89.8	

### 1 Power dissipation

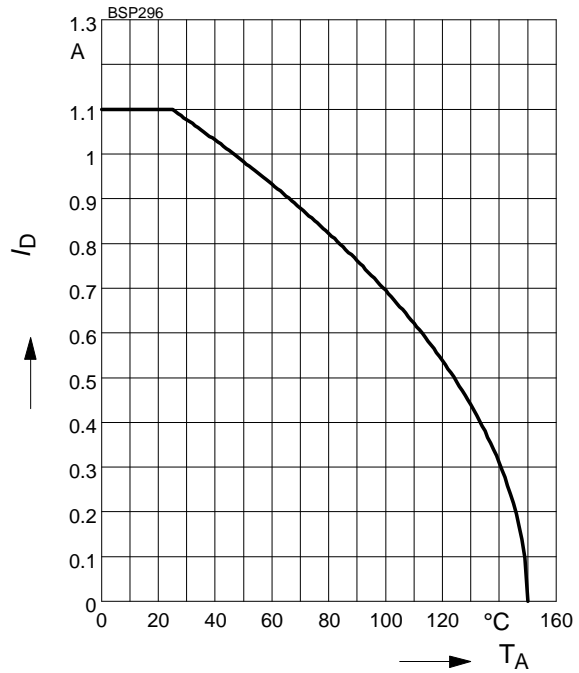
$$P_{tot} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

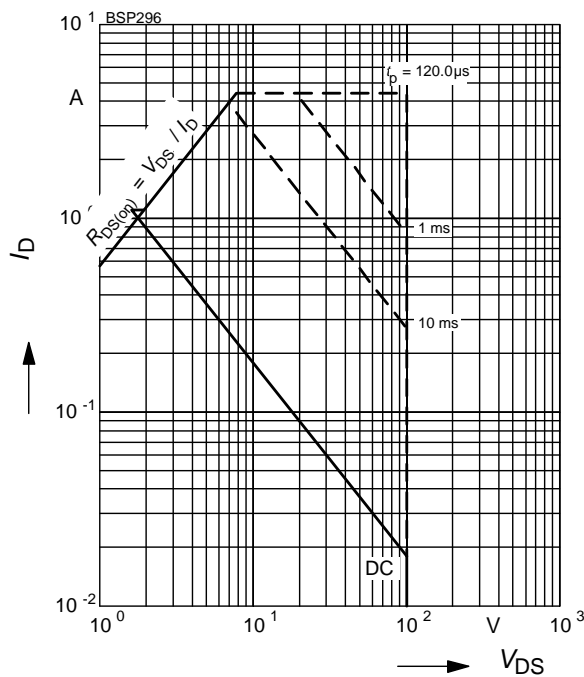
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

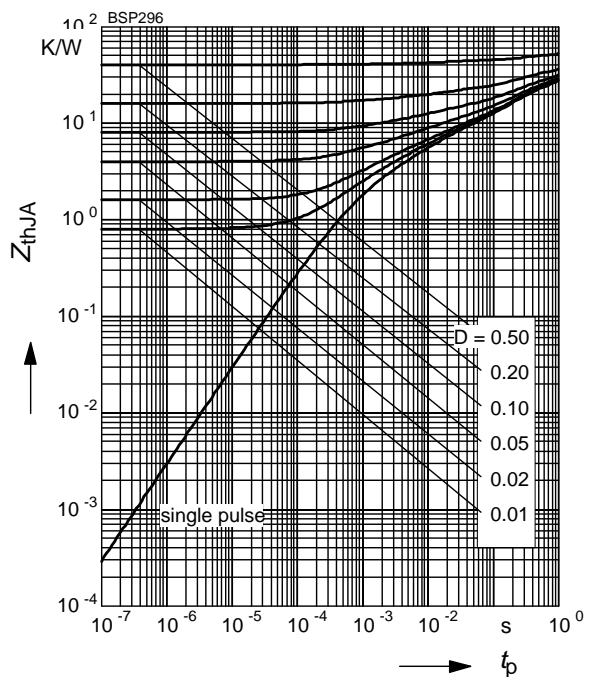
parameter:  $D = 0$ ,  $T_A = 25 \text{ °C}$



### 4 Transient thermal impedance

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

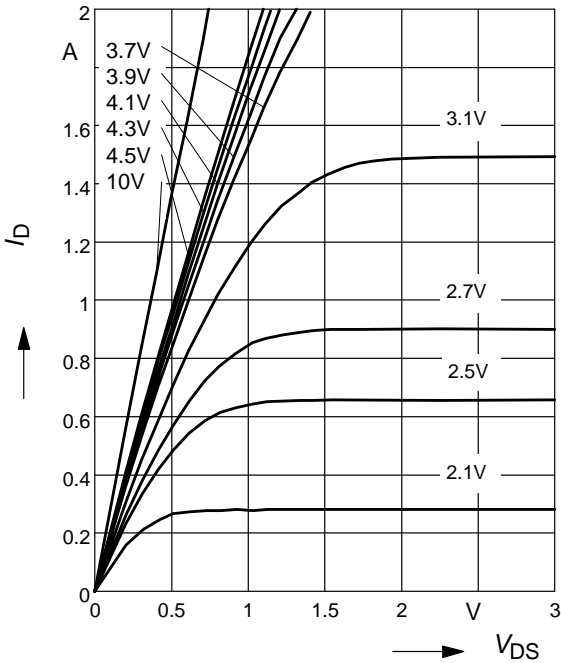
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

$I_D = f(V_{DS})$

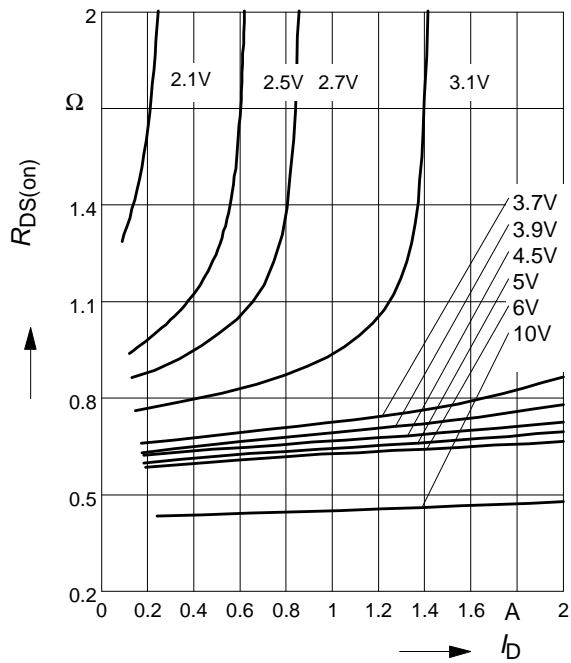
parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$



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

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

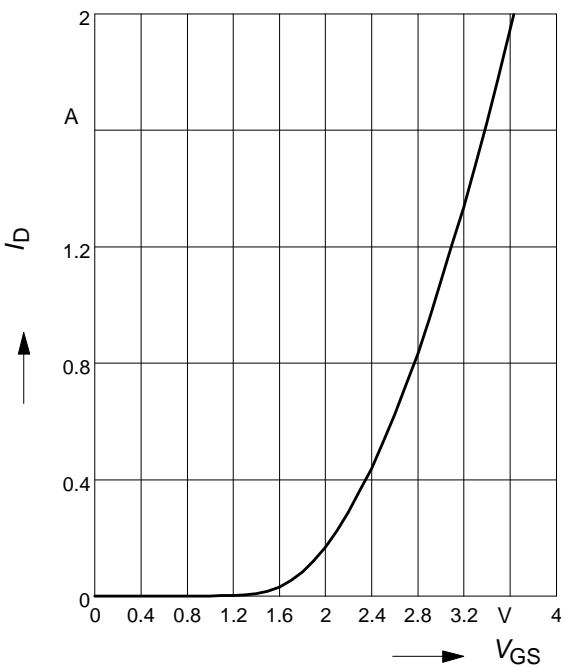
parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$



**7 Typ. transfer characteristics**

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

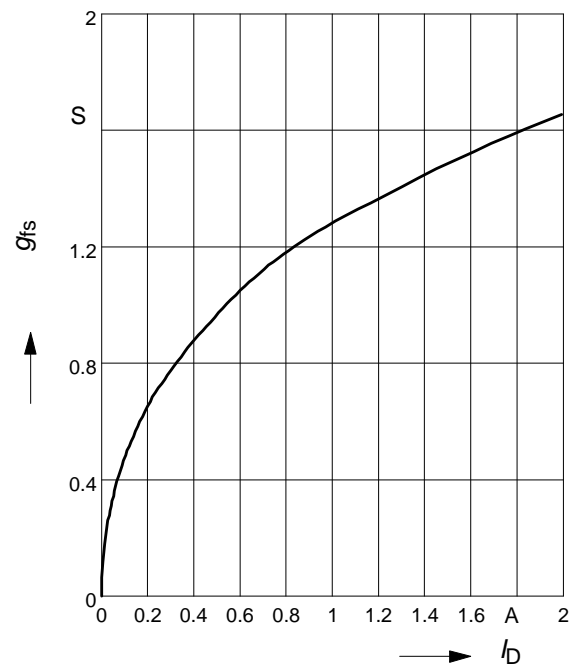
parameter:  $T_j = 25\text{ }^\circ\text{C}$



**8 Typ. forward transconductance**

$g_{fs} = f(I_D)$

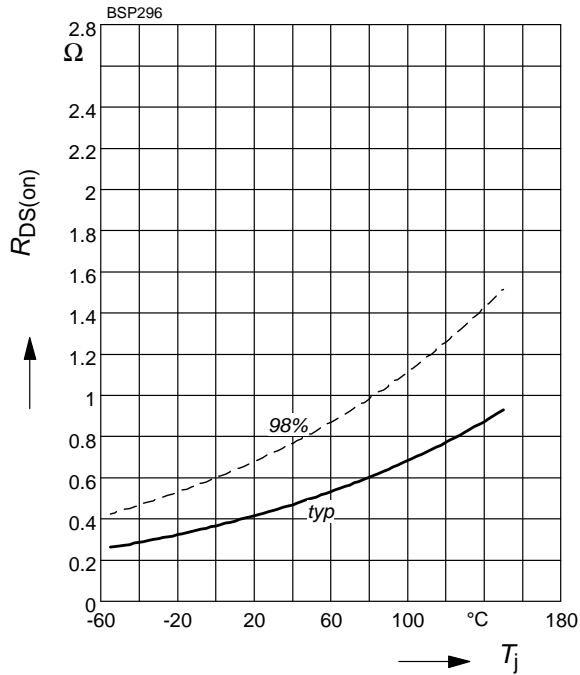
parameter:  $T_j = 25\text{ }^\circ\text{C}$



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

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

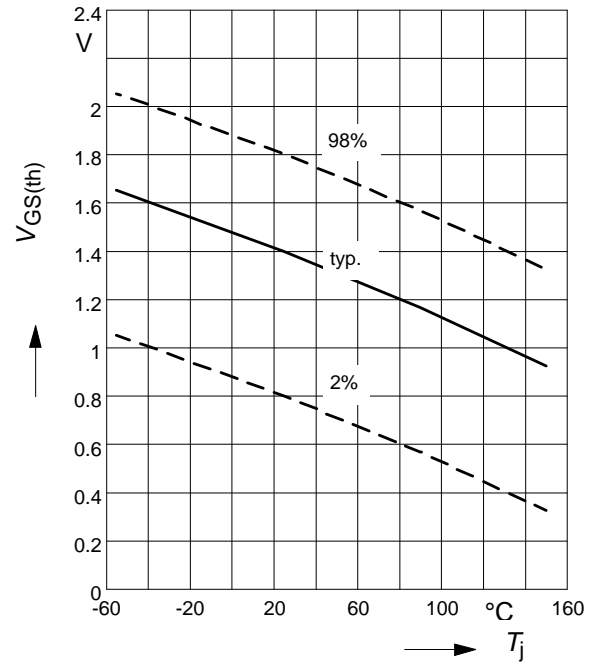
parameter :  $I_D = 1.1 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

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

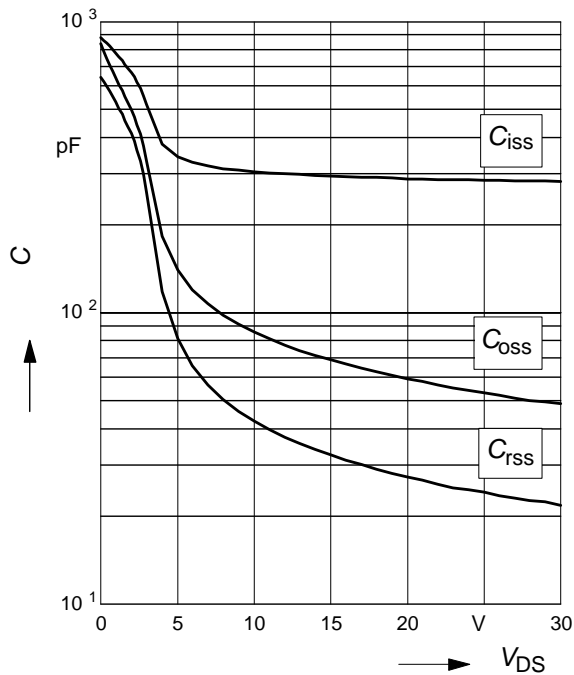
parameter:  $V_{GS} = V_{DS}$ ;  $I_D = 400 \mu\text{A}$



**11 Typ. capacitances**

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

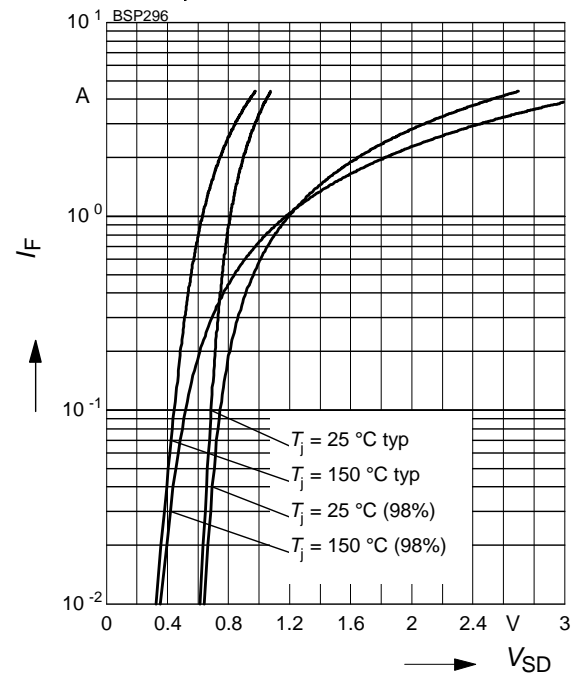
parameter:  $V_{GS} = 0$ ,  $f = 1 \text{ MHz}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**12 Forward character. of reverse diode**

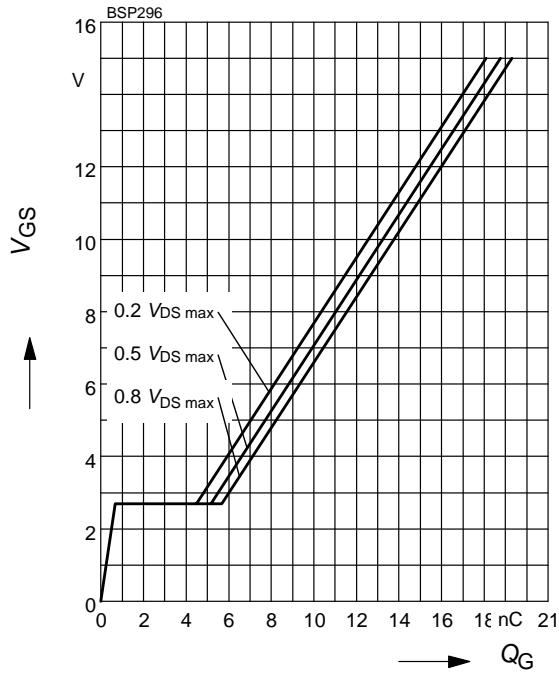
$$I_F = f(V_{SD})$$

parameter:  $T_j$



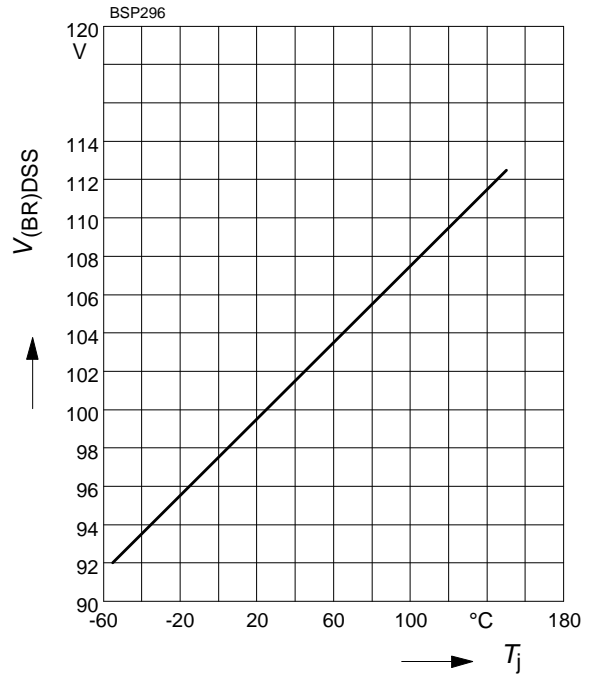
**13 Typ. gate charge**

$V_{GS} = f(Q_G)$ ; parameter:  $V_{DS}$ ,  
 $I_D = 1.1 \text{ A pulsed}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**14 Drain-source breakdown voltage**

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



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