

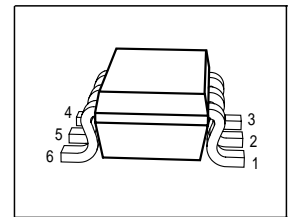
## OptiMOS<sup>®</sup>-P Small-Signal-Transistor Feature

- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen free according to IEC 61249-2-21

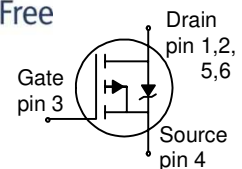
## Product Summary

$V_{DS}$	-20	V
$R_{DS(on)}$	67	m $\Omega$
$I_D$	-4.7	A

P-TSOP6-6



Halogen-Free



Type	Package	Tape and reel	Marking
BSL211SP	P-TSOP6-6	H6327: 3000pcs/r.	sPB

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ }^\circ\text{C}$ $T_A=70\text{ }^\circ\text{C}$	$I_D$	-4.7 -3.8	A
Pulsed drain current $T_A=25\text{ }^\circ\text{C}$	$I_D$ puls	-18.8	
Avalanche energy, single pulse $I_D=-4.7\text{ A}$ , $V_{DD}=-10\text{ V}$ , $R_{GS}=25\text{ }\Omega$	$E_{AS}$	26	mJ
Reverse diode dv/dt $I_S=-4.7\text{ A}$ , $V_{DS}=-16\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{jmax}=150\text{ }^\circ\text{C}$	dv/dt	-6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 12$	V
Power dissipation $T_A=25\text{ }^\circ\text{C}$	$P_{tot}$	2	W
Operating and storage temperature	$T_j$ , $T_{stg}$	-55... +150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	
ESD Class JESD22-A114-HBM		Class 0	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - soldering point	$R_{thJS}$	-	-	50	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	230	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	-	62.5	

**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 $V_{GS}=0V, I_D=-250\mu A$	$V_{(BR)DSS}$	-20	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-25\mu A$	$V_{GS(th)}$	-0.6	-0.9	-1.2	
Zero gate voltage drain current $V_{DS}=-20V, V_{GS}=0, T_j=25^\circ C$ $V_{DS}=-20V, V_{GS}=0, T_j=150^\circ C$	$I_{DSS}$	-	-0.1	-1	$\mu A$
Gate-source leakage current $V_{GS}=-12V, V_{DS}=0$	$I_{GSS}$	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-2.5V, I_D=-3.7A$	$R_{DS(on)}$	-	94	110	m $\Omega$
Drain-source on-state resistance $V_{GS}=-4.5, I_D=-4.7A$	$R_{DS(on)}$	-	54	67	

<sup>1</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;  $t \leq 5$  sec.

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}$ $I_D = -3.8\text{A}$	6.2	12.4	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = -15\text{V},$ $f = 1\text{MHz}$	-	654	-	pF
Output capacitance	$C_{oss}$		-	241	-	
Reverse transfer capacitance	$C_{rss}$		-	197	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10\text{V}, V_{GS} = -4.5\text{V},$ $I_D = -1\text{A}, R_G = 6\Omega$	-	8.7	13	ns
Rise time	$t_r$		-	13.9	21	
Turn-off delay time	$t_{d(off)}$		-	25	37.3	
Fall time	$t_f$		-	23.3	35	

**Gate Charge Characteristics**

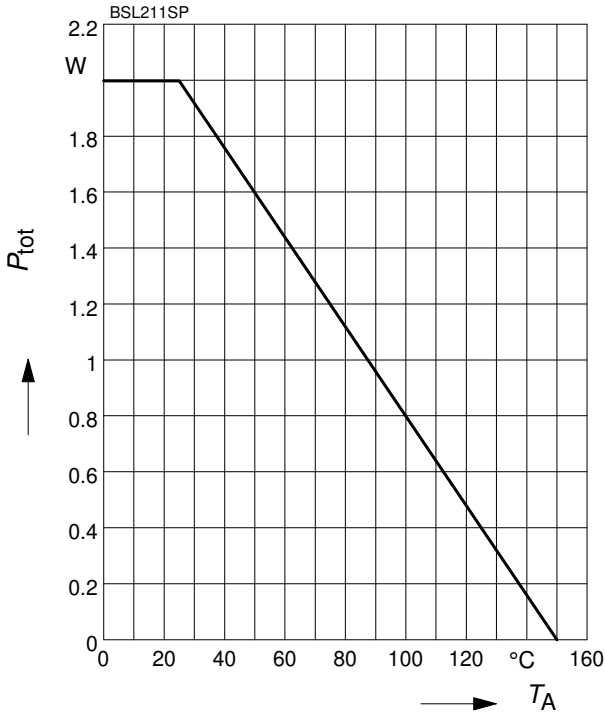
Gate to source charge	$Q_{gs}$	$V_{DD} = -10\text{V}, I_D = -4.7\text{A}$	-	-1.3	-2	nC
Gate to drain charge	$Q_{gd}$		-	-4.7	-7	
Gate charge total	$Q_g$	$V_{DD} = -10\text{V}, I_D = -4.7\text{A},$ $V_{GS} = 0 \text{ to } -4.5\text{V}$	-	-8.3	-12.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -10\text{V}, I_D = -4.7\text{A}$	-	-2	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	-2	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	-18.8	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0,  I_F  =  I_D $	-	-0.94	-1.4	V
Reverse recovery time	$t_{rr}$	$V_R = -10\text{V},  I_F  =  I_D ,$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	20.6	25.8	ns
Reverse recovery charge	$Q_{rr}$		-	6.3	7.9	

### 1 Power dissipation

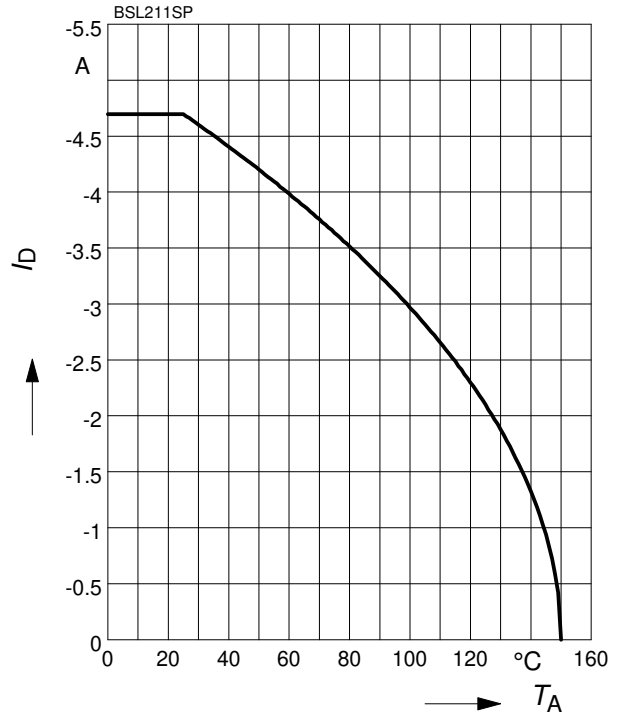
$$P_{tot} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

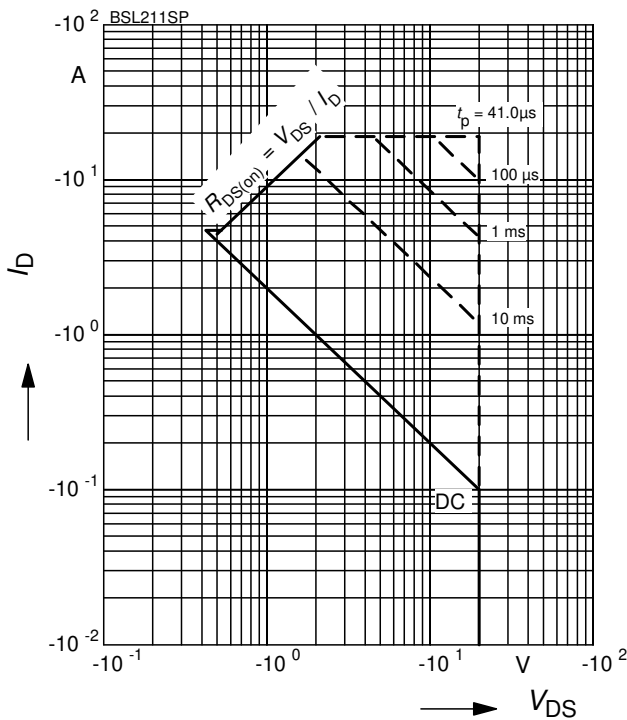
parameter:  $|V_{GS}| \geq 4.5 \text{ V}$



### 3 Safe operating area

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

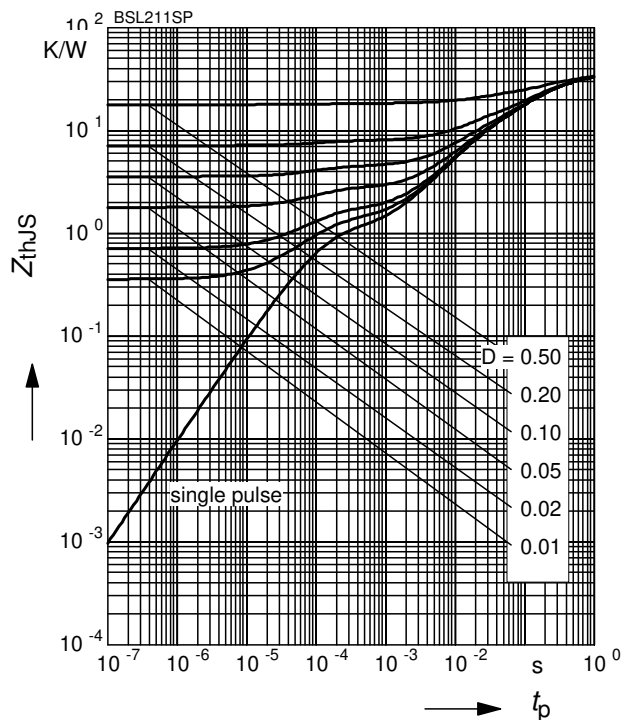
parameter:  $D = 0, T_A = 25 \text{ °C}$



### 4 Transient thermal impedance

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

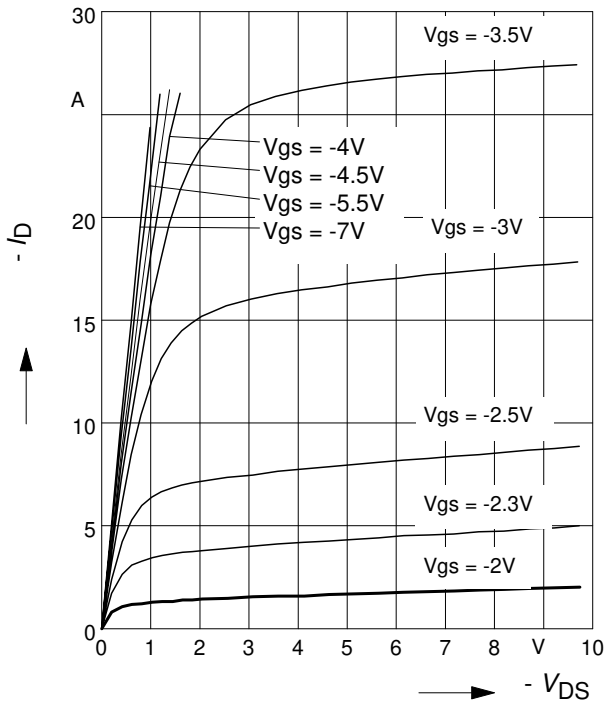
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

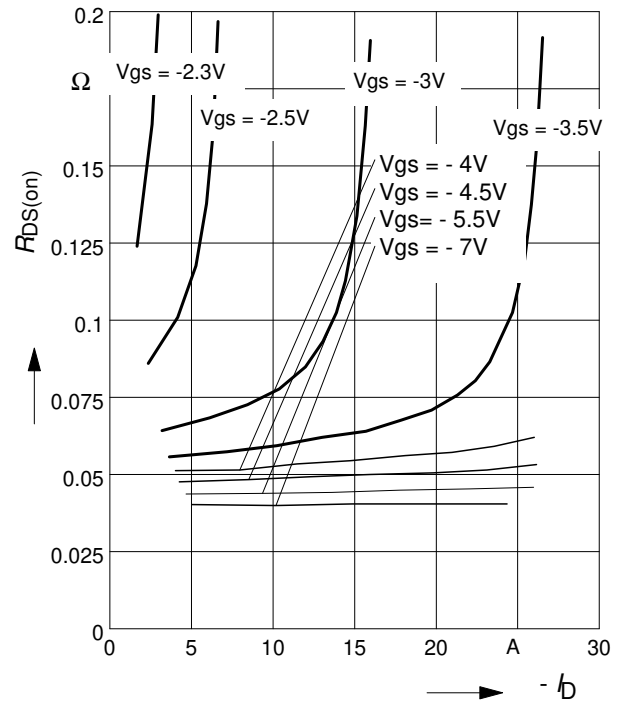
parameter:  $t_p = 80 \mu\text{s}$



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

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

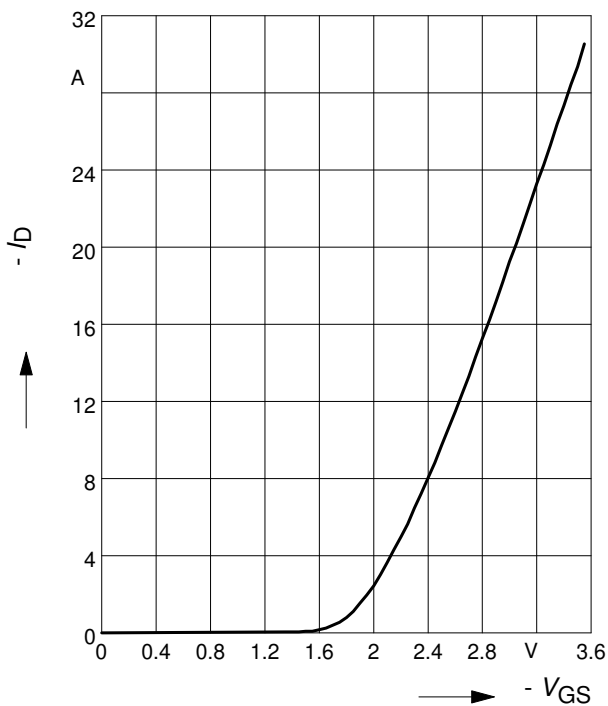
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

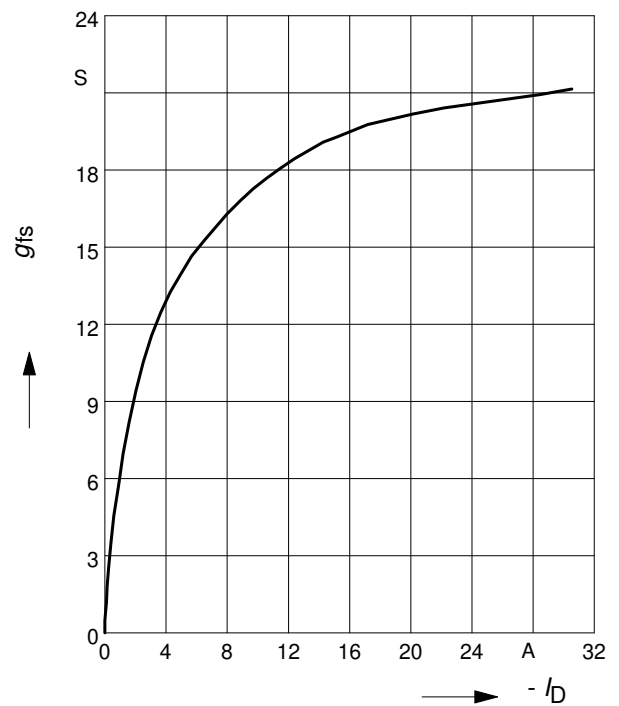
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

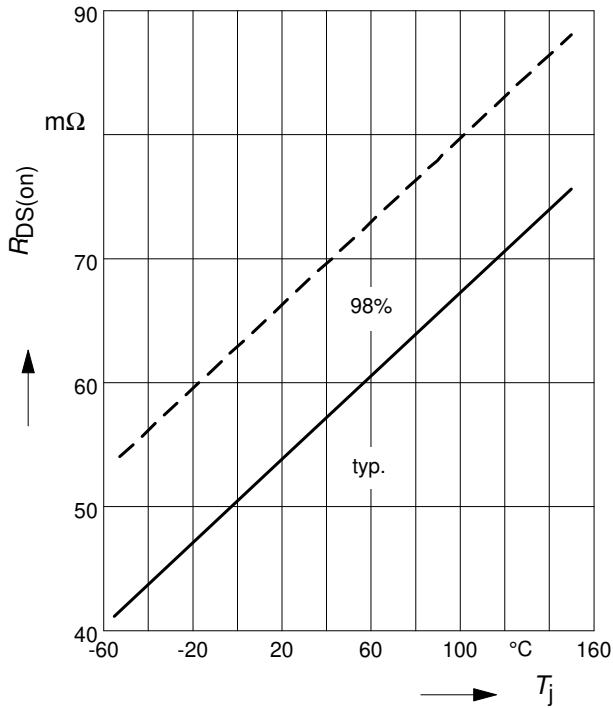
parameter:  $t_p = 80 \mu\text{s}$



**9 Drain-source on-resistance**

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

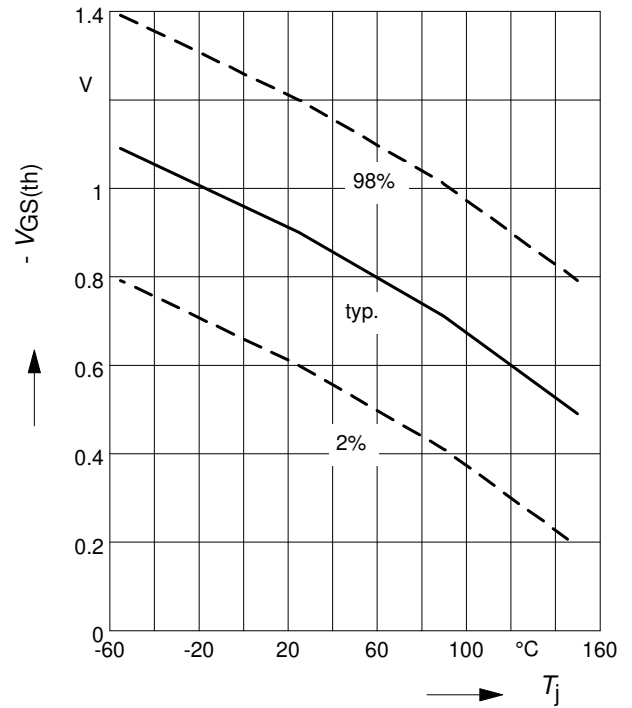
parameter:  $I_D = -4.7 \text{ A}$ ,  $V_{GS} = -4.5 \text{ V}$



**10 Gate threshold voltage**

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

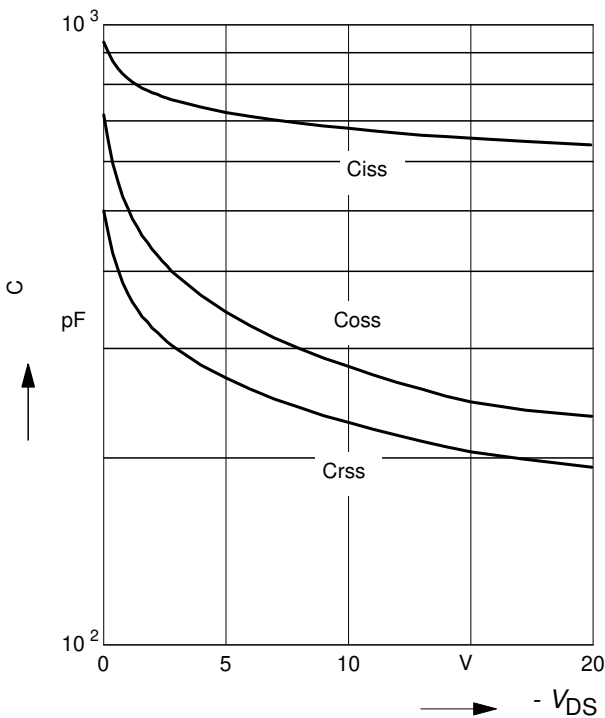
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -25 \mu\text{A}$



**11 Typ. capacitances**

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

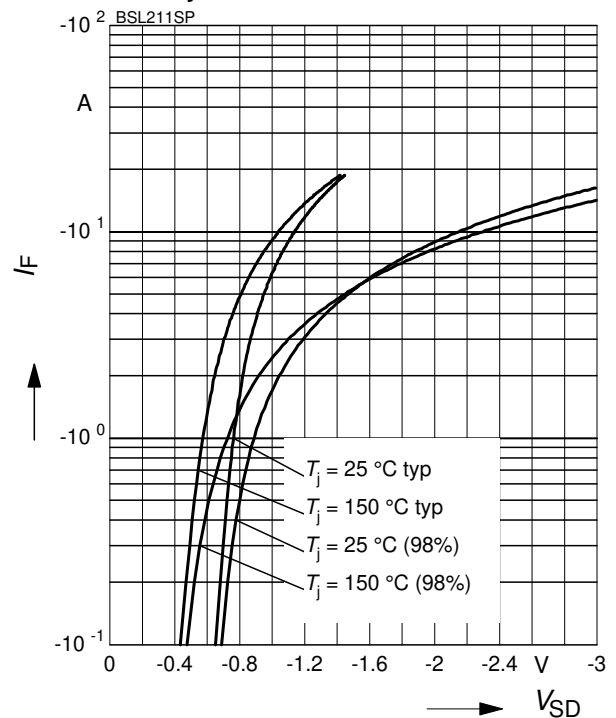
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$



**12 Forward character. of reverse diode**

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

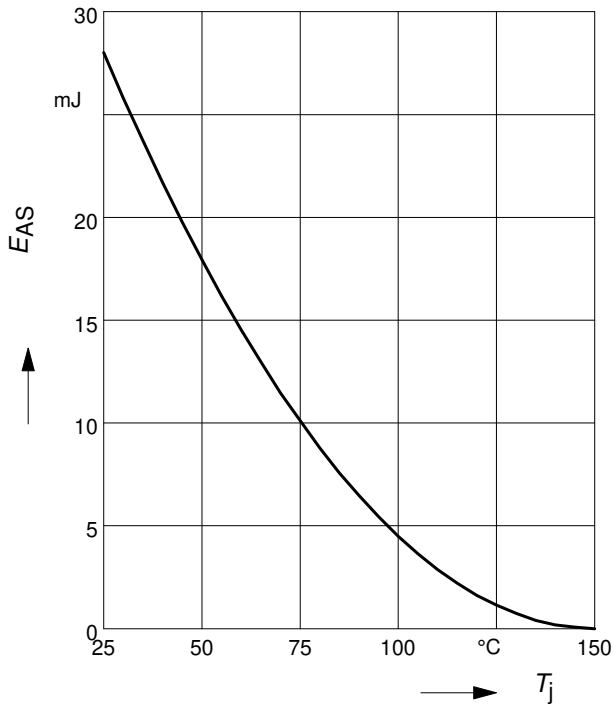
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$ , par.:  $I_D = -4.7\text{ A}$

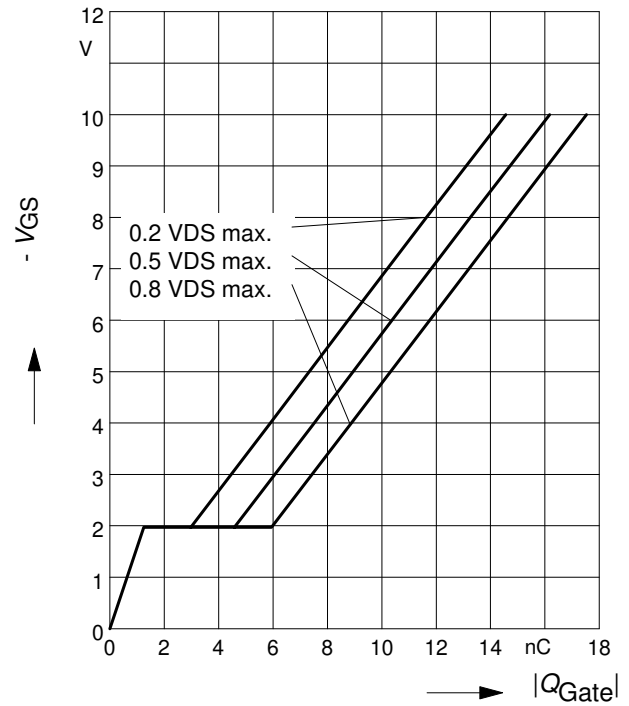
$V_{DD} = -10\text{ V}$ ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

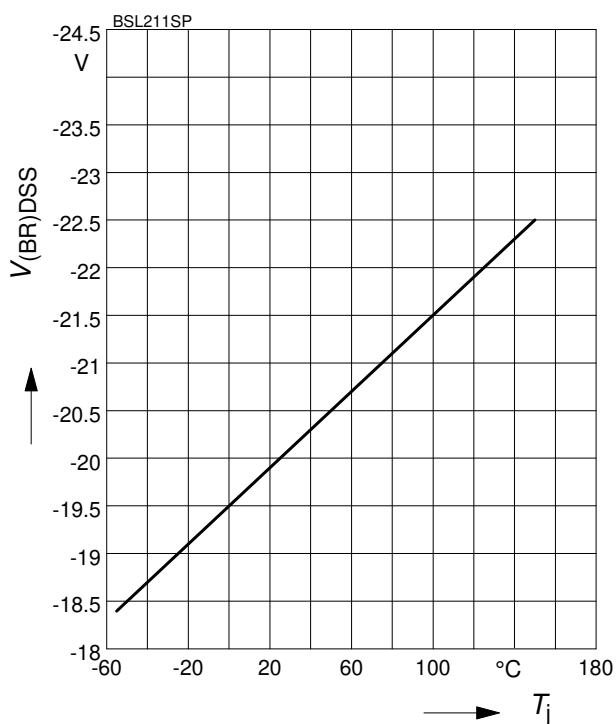
$|V_{GS}| = f(Q_{Gate})$

parameter:  $I_D = -4.7\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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



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