

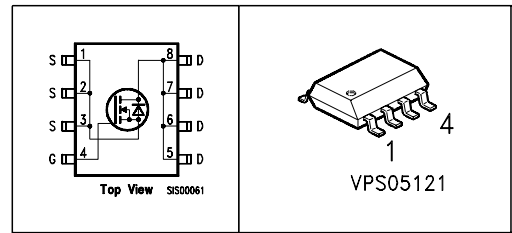
## OptiMOS® Small-Signal-Transistor

### Feature

- N-Channel
- Enhancement mode
- Logic Level
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 150°C operating temperature
- Avalanche rated
- dv/dt rated

### Product Summary

$V_{DS}$	30	V
$R_{DS(on)}$	7.8	mΩ
$I_D$	13	A



Type	Package	Ordering Code	Marking
BSO301SN	SO 8	Q67040-S4345	301SN

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ °C}$	$I_D$	13	A
Pulsed drain current $T_A=25\text{ °C}$	$I_{D\text{ puls}}$	52	
Avalanche energy, single pulse $I_D=13\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$	$E_{AS}$	230	mJ
Reverse diode dv/dt $I_S=13\text{ A}$ , $V_{DS}=24\text{ V}$ , $dI/dt=200\text{ A/μs}$ , $T_{j\text{ max}}=150\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	$V_{GS}$	±20	V
Power dissipation $T_A=25\text{ °C}$	$P_{\text{tot}}$	2.5	W
Operating and storage temperature	$T_j$ , $T_{\text{stg}}$	-55... +150	°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	$R_{thJS}$	-	-	30	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint; $t \leq 10$ sec.		-	-	110	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup> ; $t \leq 10$ sec.		-	-	50	

**Electrical Characteristics, at  $T_j = 25$  °C, unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=80\mu A$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^\circ C$	$I_{DSS}$	-	0.01 10	1 100	$\mu A$
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5V, I_D=11A$	$R_{DS(on)}$	-	9.3	10.9	m $\Omega$
Drain-source on-state resistance $V_{GS}=10V, I_D=13A$	$R_{DS(on)}$	-	6.7	7.8	

<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.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic Characteristics</b>						
Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 11.6\text{A}$	13.7	27.4	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	-	1770	2213	pF
Output capacitance	$C_{oss}$		-	740	925	
Reverse transfer capacitance	$C_{rss}$		-	165	206	
Gate resistance	$R_G$		-	1.3	-	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}$ , $V_{GS} = 10$ , $I_D = 11\text{A}$ , $R_G = 2.2\Omega$	-	9	13.5	ns
Rise time	$t_r$	$V_{DD} = 15\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = 11\text{A}$ , $R_G = 2.2\Omega$	-	44	66	
Turn-off delay time	$t_{d(off)}$		-	10	15	
Fall time	$t_f$		-	32	48	

**Gate Charge Characteristics**

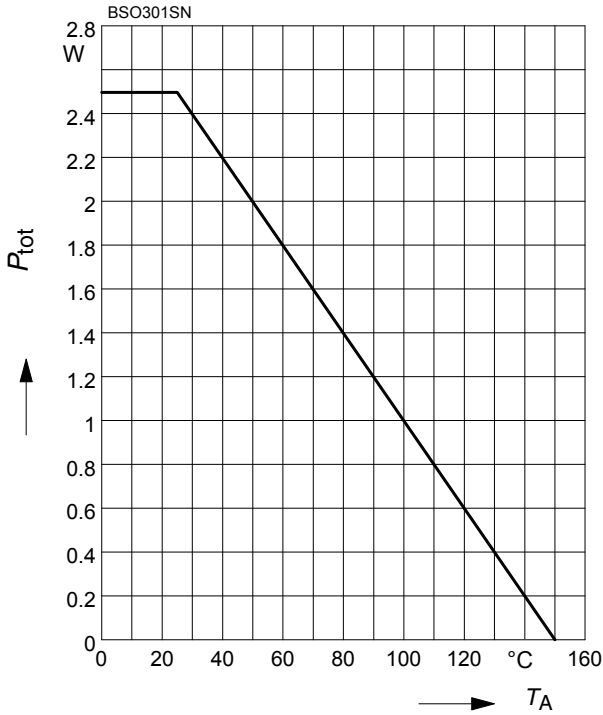
Gate to source charge	$Q_{gs}$	$V_{DD} = 15\text{V}$ , $I_D = 13\text{A}$	-	4.9	6.1	nC
Gate to drain charge	$Q_{gd}$		-	12.8	16	
Gate charge total	$Q_g$	$V_{DD} = 15\text{V}$ , $I_D = 13\text{A}$ , $V_{GS} = 0$ to $10\text{V}$	-	46.3	56.6	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 15\text{V}$ , $I_D = 13\text{A}$	-	2.7	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A = 25^\circ\text{C}$	-	-	13	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	52	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_F = 13\text{A}$	-	0.85	1.13	V
Reverse recovery time	$t_{rr}$	$V_R = 15\text{V}$ , $I_F = I_S$ ,	-	32	48	ns
Reverse recovery charge	$Q_{rr}$	$di_F/dt = 100\text{A}/\mu\text{s}$	-	43.6	70	

### 1 Power dissipation

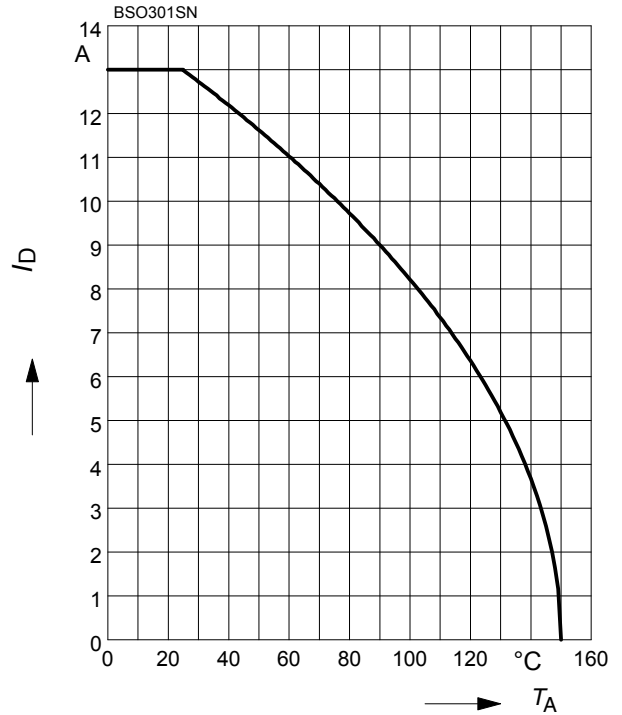
$$P_{tot} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

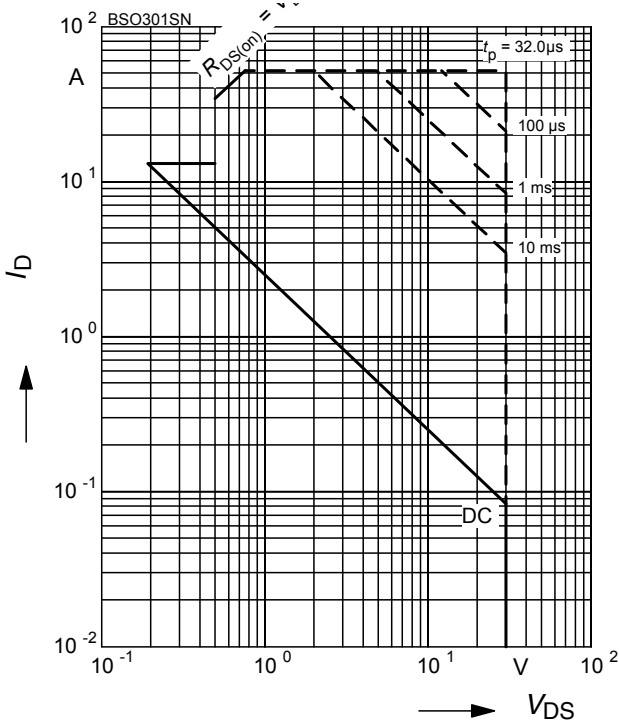
parameter:  $V_{GS} \geq 10$  V



### 3 Safe operating area

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

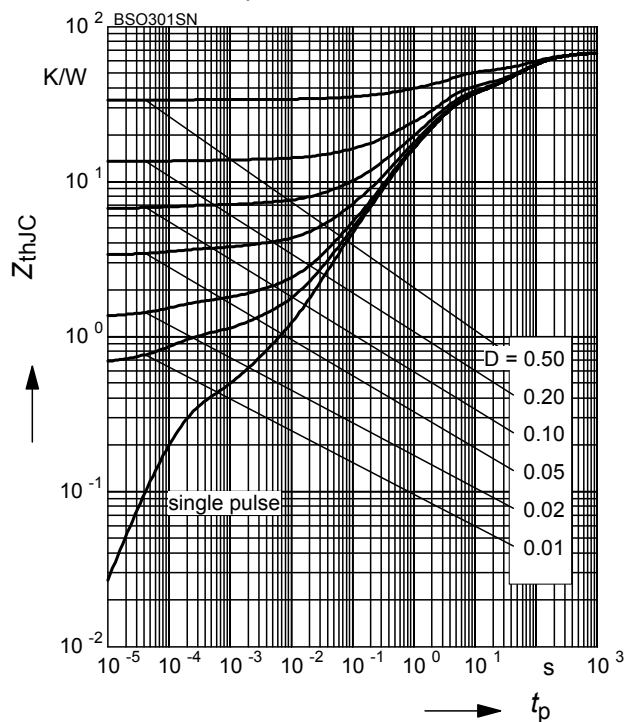
parameter:  $D = 0$ ,  $T_A = 25$  °C



### 4 Transient thermal impedance

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

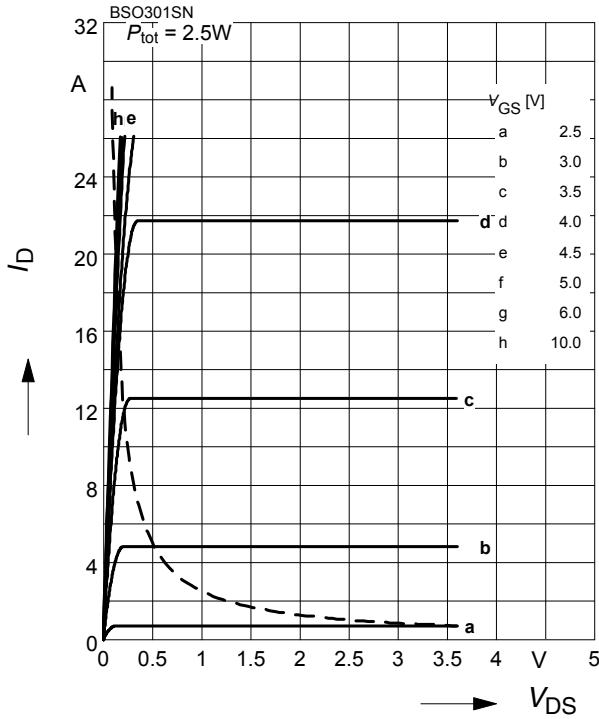
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

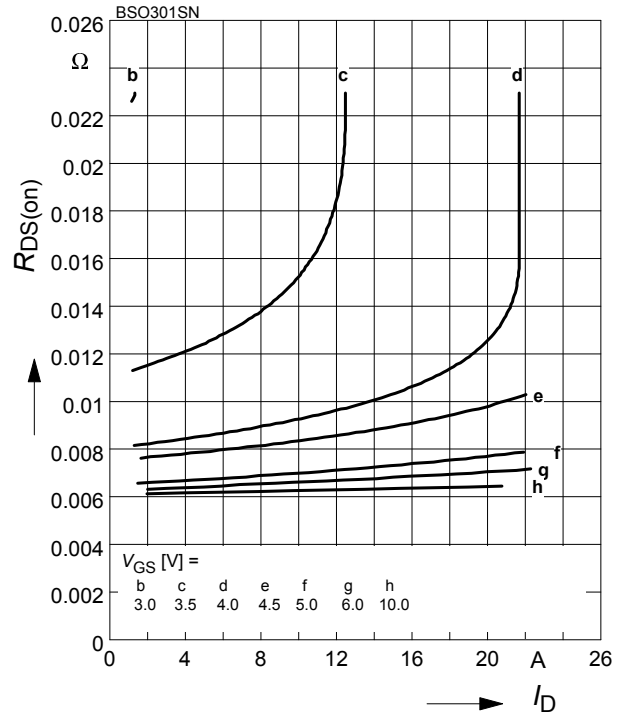
parameter:  $t_p = 80 \mu\text{s}$



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

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

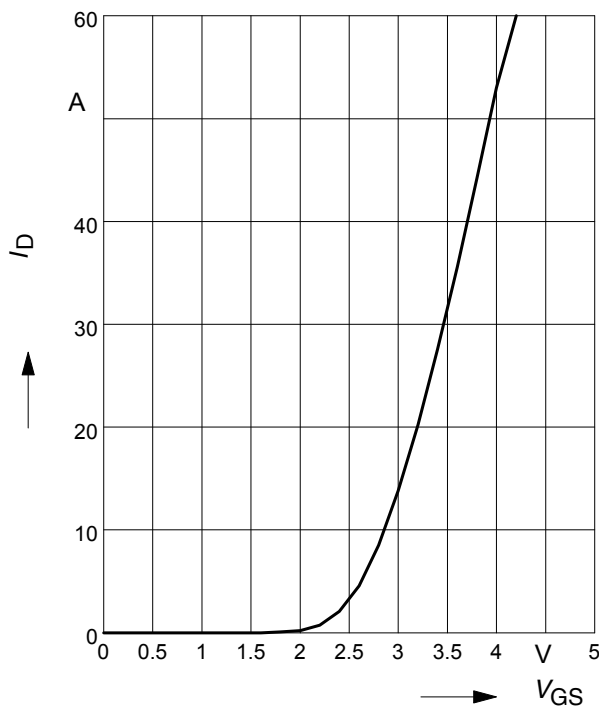
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

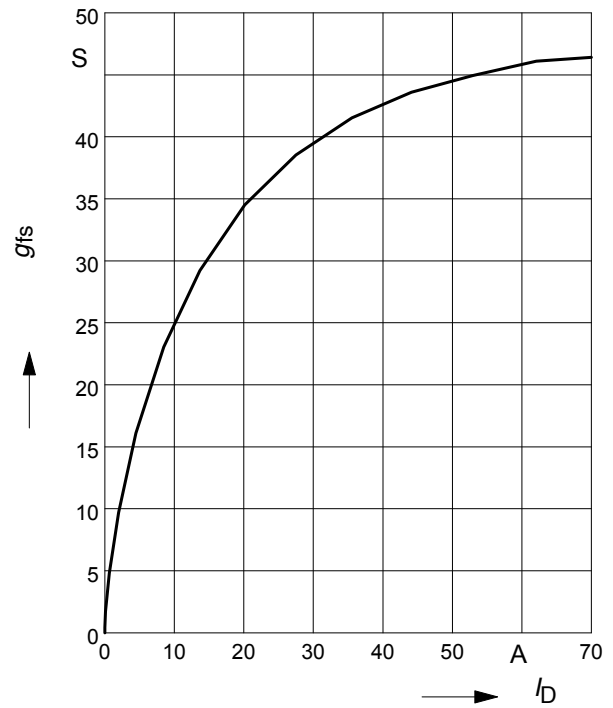
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

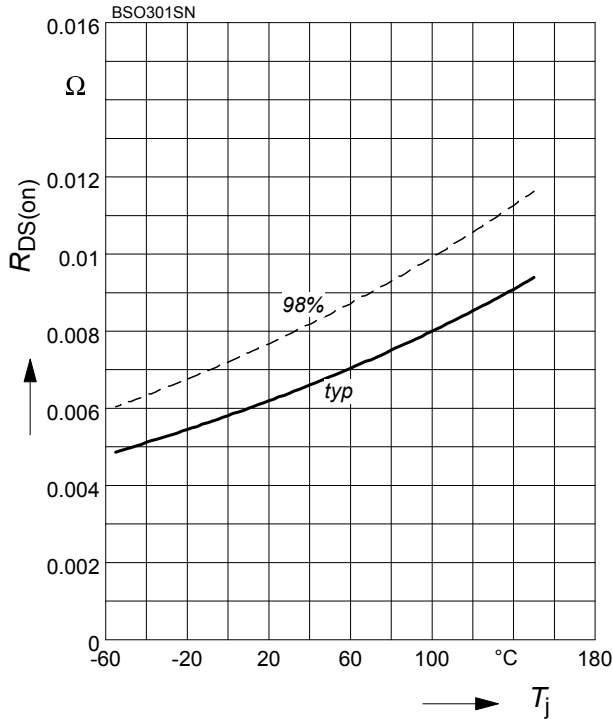
parameter:  $g_{fs}$



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

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

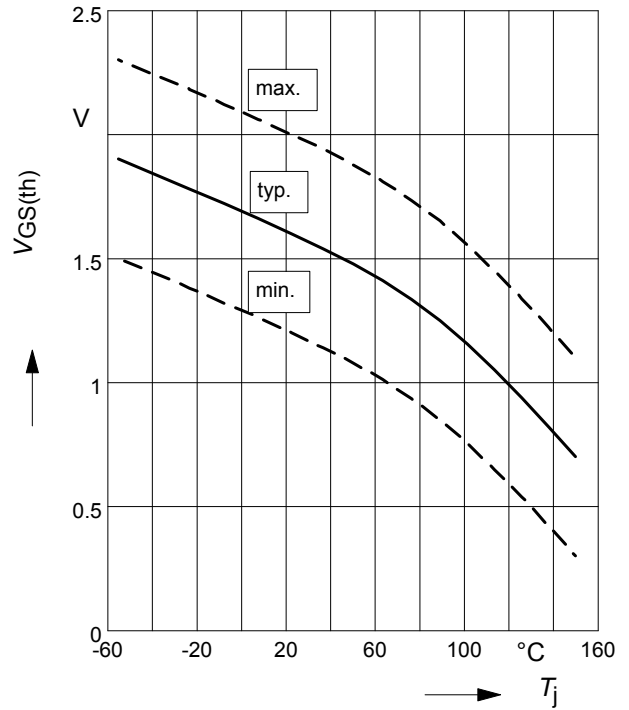
parameter :  $I_D = 13 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Gate threshold voltage**

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

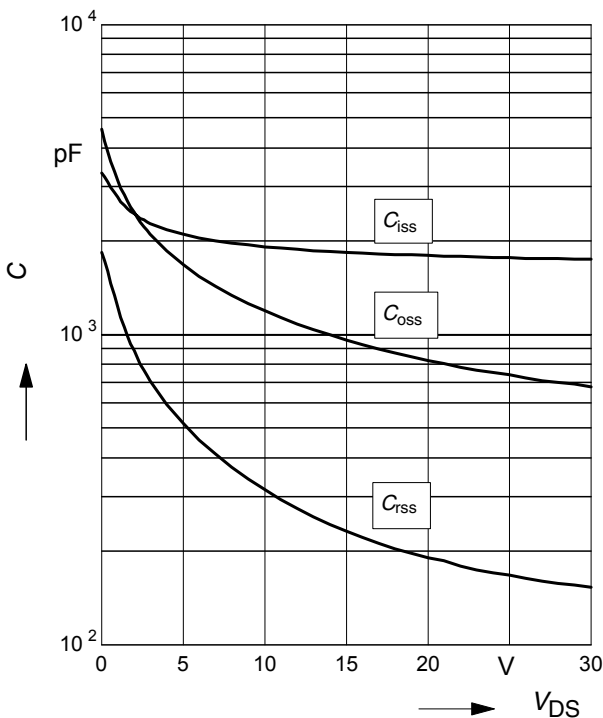
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 80 \mu\text{A}$



**11 Typ. capacitances**

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

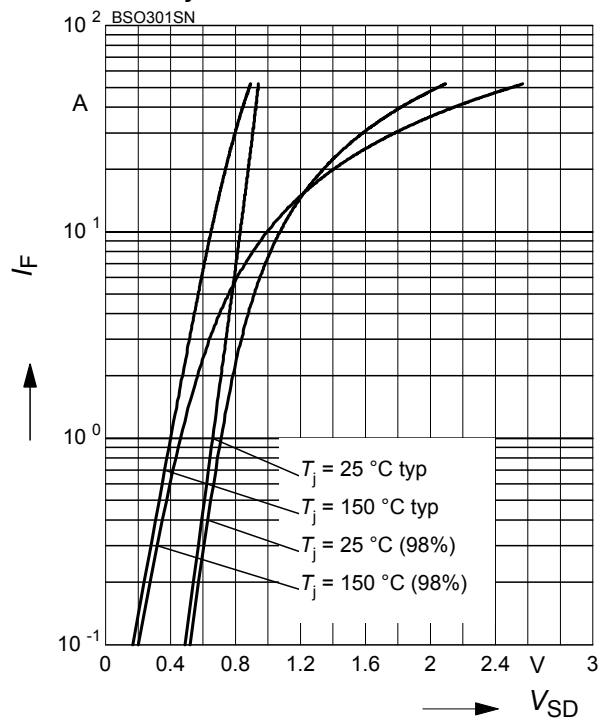
parameter:  $V_{GS}=0\text{V}$ ,  $f=1 \text{ MHz}$



**12 Forward character. of reverse diode**

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

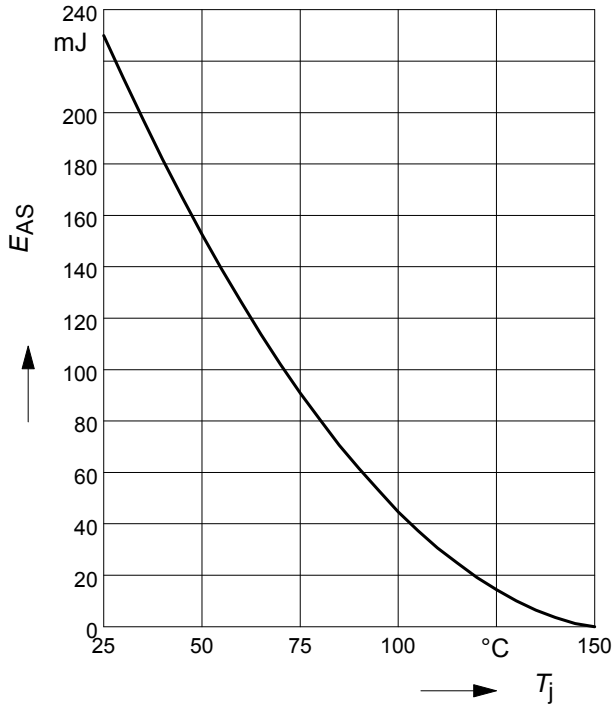
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

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

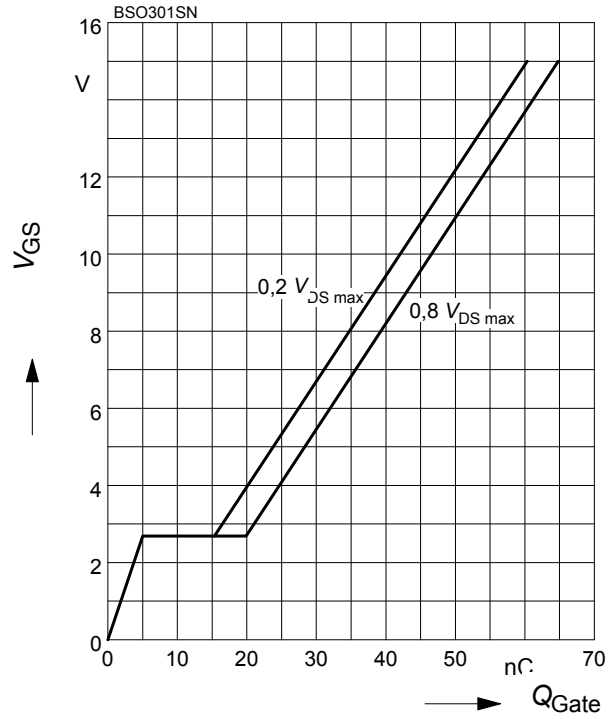
par.:  $I_D = 13\text{ A}$  ,  $V_{DD} = 25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

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

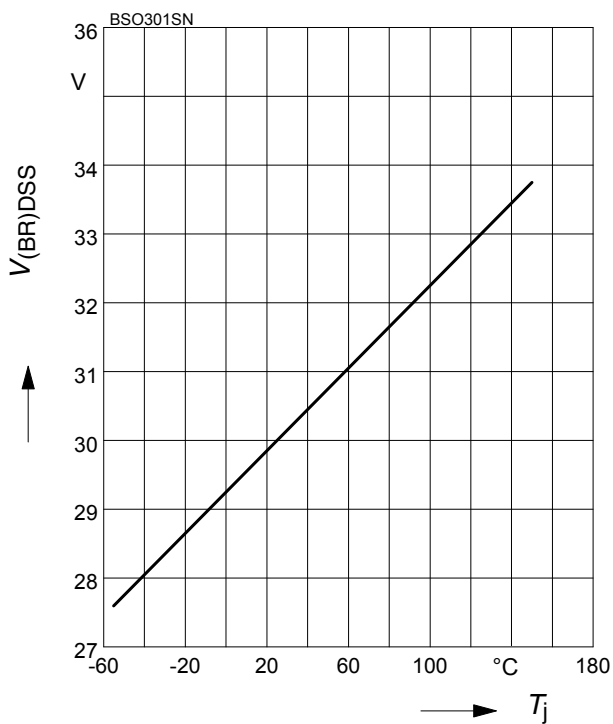
parameter:  $I_D = 13\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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

parameter:  $I_D = 10\text{ mA}$



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