

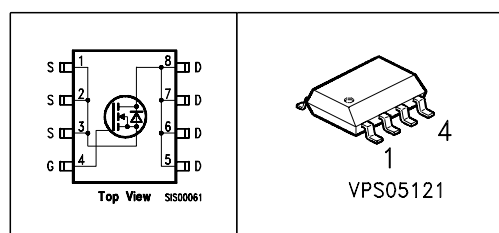
OptiMOS® Small-Signal-Transistor

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25^\circ\text{C}$	I_D	13	A
Pulsed drain current $T_A=25^\circ\text{C}$	$I_{D \text{ puls}}$	52	
Avalanche energy, single pulse $I_D=13 \text{ A}$, $V_{DD}=25\text{V}$, $R_{GS}=25\Omega$	E_{AS}	230	mJ
Reverse diode dv/dt $I_S=13\text{A}$, $V_{DS}=24\text{V}$, $dI/dt=200\text{A}/\mu\text{s}$, $T_{j\text{max}}=150^\circ\text{C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_A=25^\circ\text{C}$	P_{tot}	2.5	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.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	-	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint; t ≤ 10 sec.		-	-	110	
@ 6 cm ² cooling area ¹⁾ ; t ≤ 10 sec.		-	-	50	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
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	μA
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	

¹Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

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

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

Gate Charge Characteristics

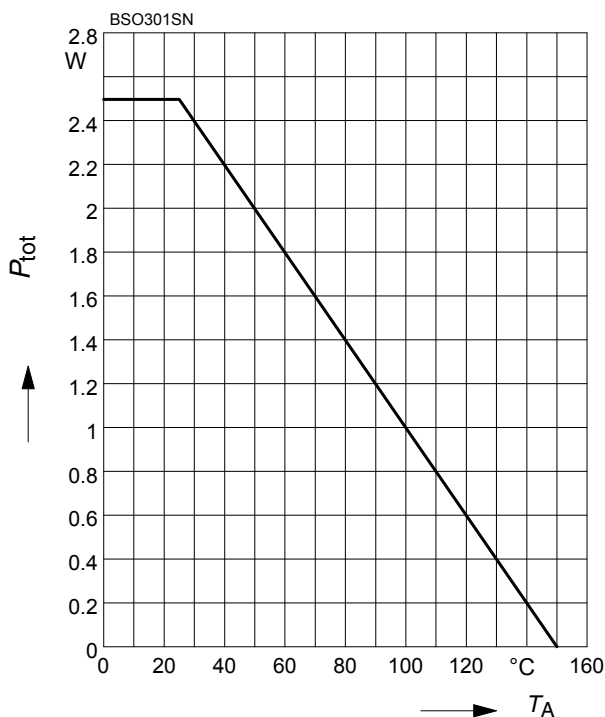
Gate to source charge	Q_{gs}	$V_{DD} = 15\text{V}$, $I_D = 13\text{A}$	-	4.9	6.1	nC
Gate to drain charge	Q_{gd}		-	12.8	16	
Gate charge total	Q_g	$V_{DD} = 15\text{V}$, $I_D = 13\text{A}$, $V_{GS} = 0$ to 10V	-	46.3	56.6	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 15\text{V}$, $I_D = 13\text{A}$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

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25^\circ\text{C}$	-	-	2.2	A
Inverse diode direct current, pulsed	I_{SM}		-	-	52	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0\text{V}$, $I_F = 2.2\text{A}$	-	0.85	1.13	V
Reverse recovery time	t_{rr}	$V_R = 15\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	32	48	ns
Reverse recovery charge	Q_{rr}		-	43.6	70	nC

1 Power dissipation

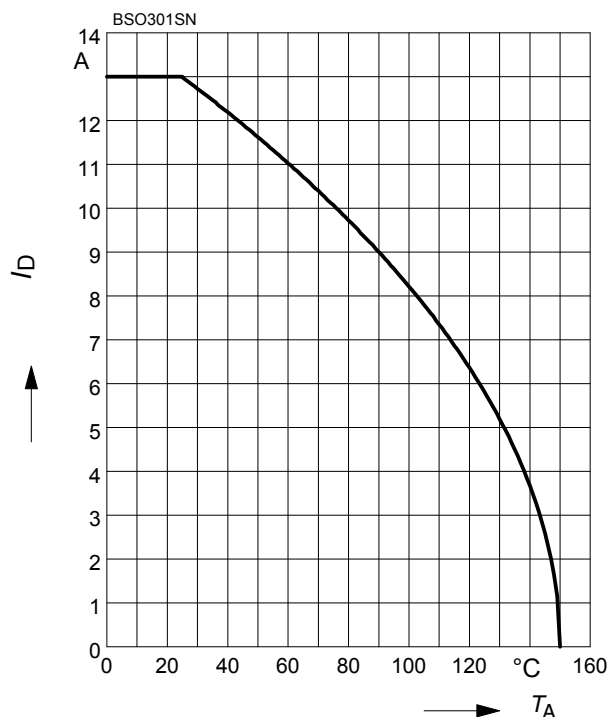
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

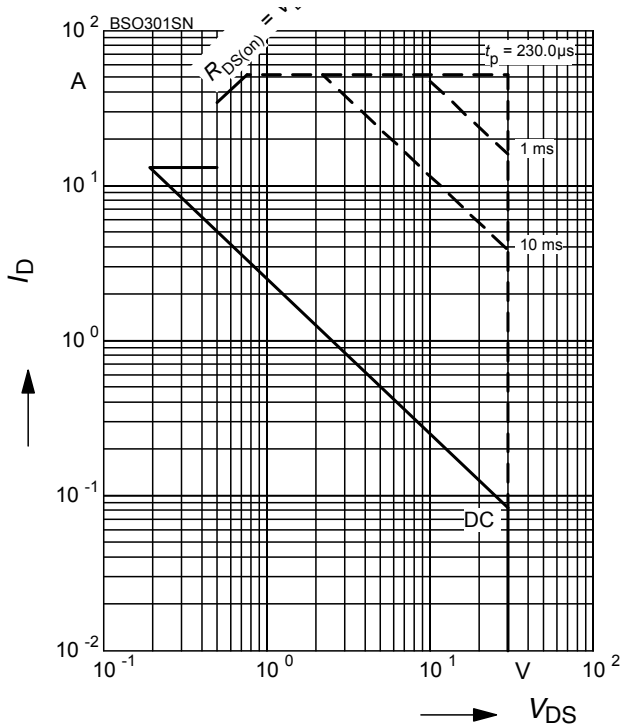
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

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

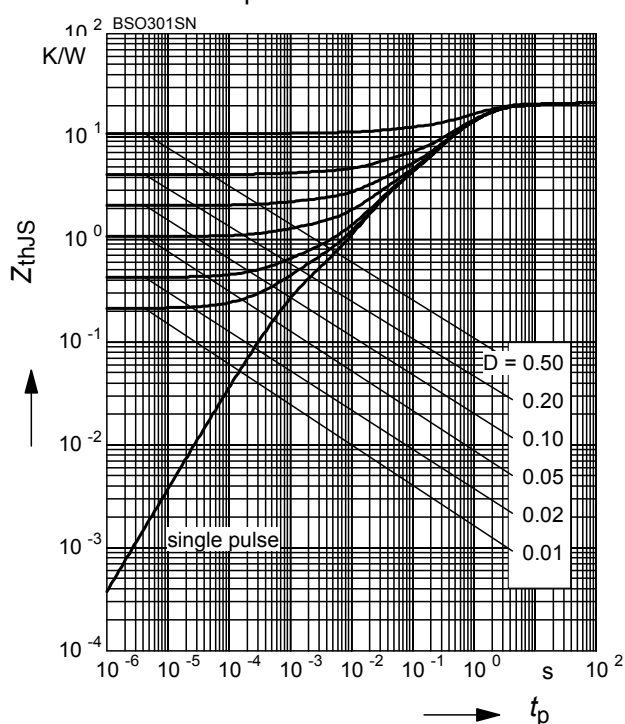
parameter: $D = 0$, $T_A = 25$ °C



4 Transient thermal impedance

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

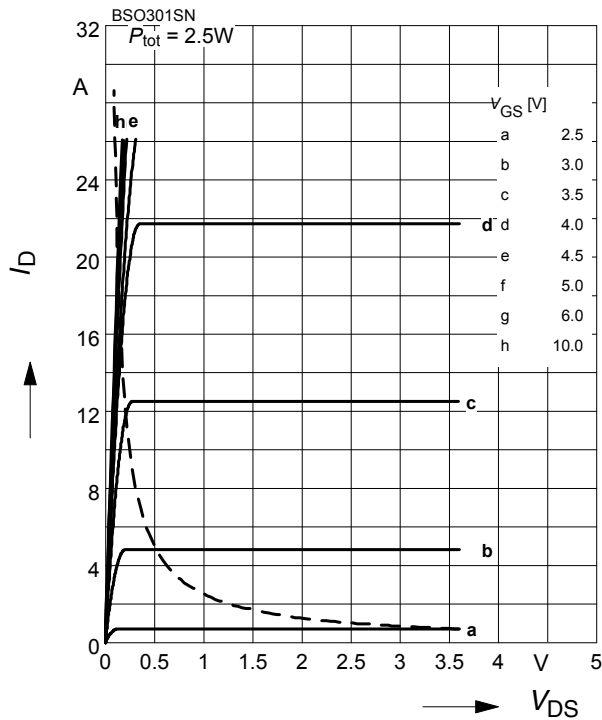
parameter: $D = t_p/T$



5 Typ. output characteristic

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

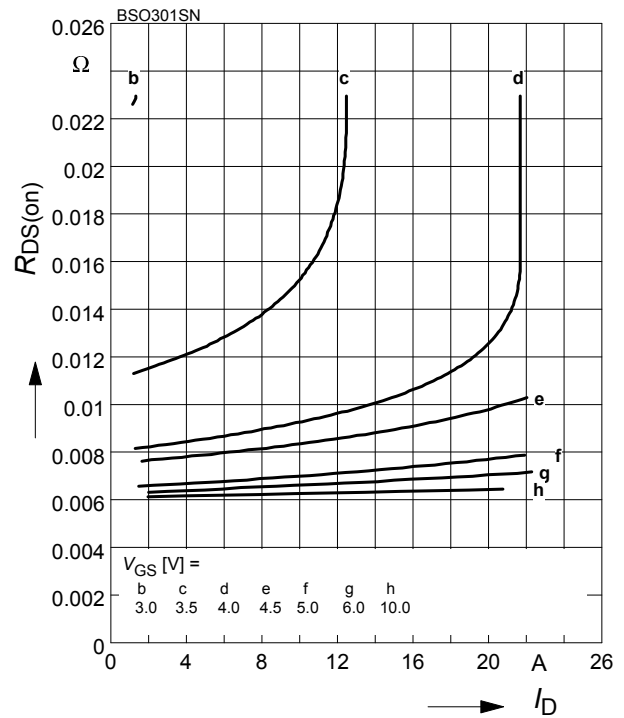
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

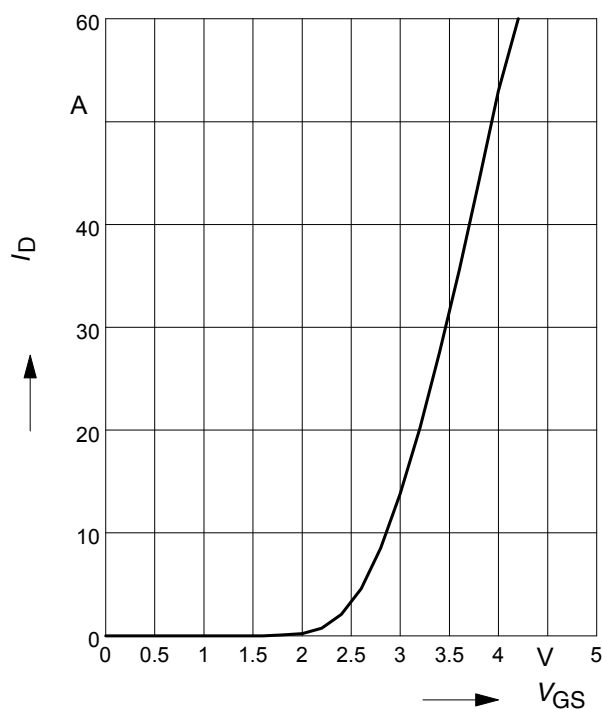
parameter: V_{GS}



7 Typ. transfer characteristics

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

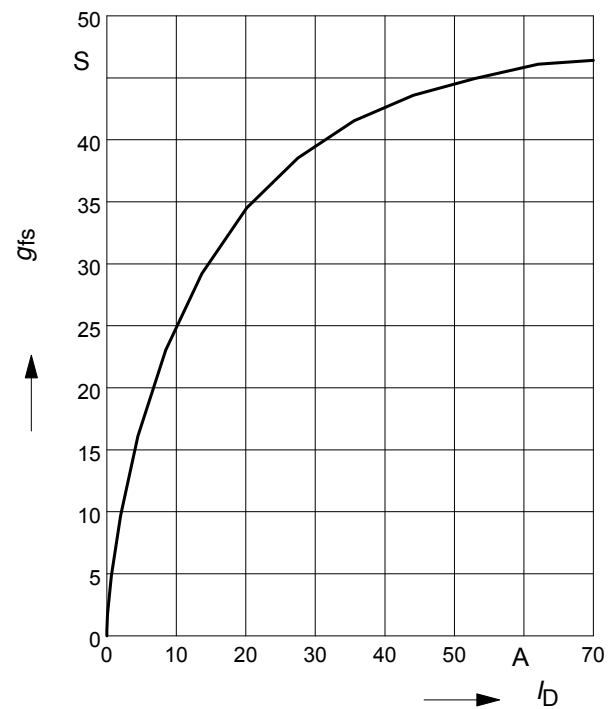
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

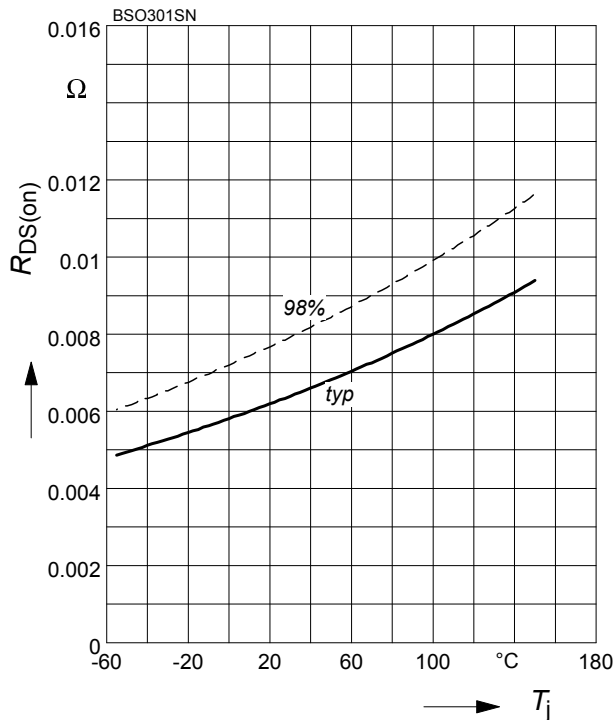
parameter: g_{fs}



9 Drain-source on-state resistance

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

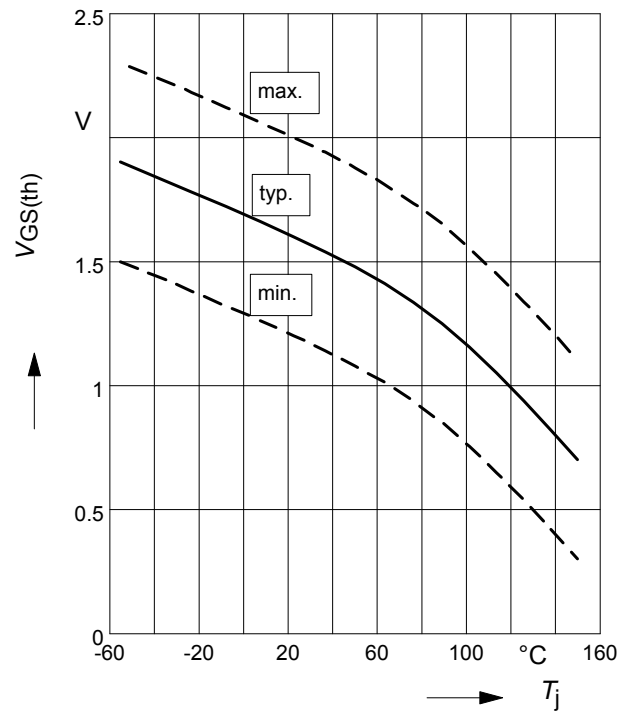
parameter: $I_D = 13\text{ A}$, $V_{GS} = 10\text{ V}$



10 Gate threshold voltage

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

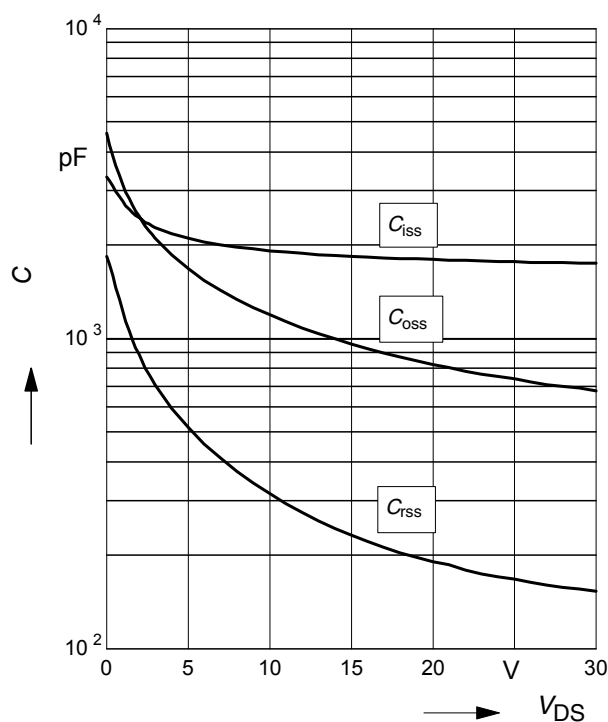
parameter: $V_{GS} = V_{DS}$, $I_D = 80\text{ }\mu\text{A}$



11 Typ. capacitances

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

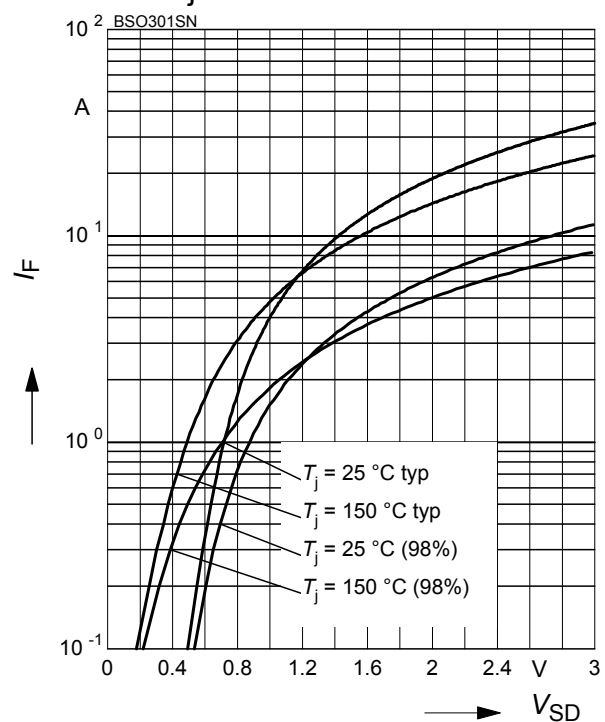
parameter: $V_{GS}=0\text{ V}$, $f=1\text{ MHz}$



12 Forward character. of reverse diode

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

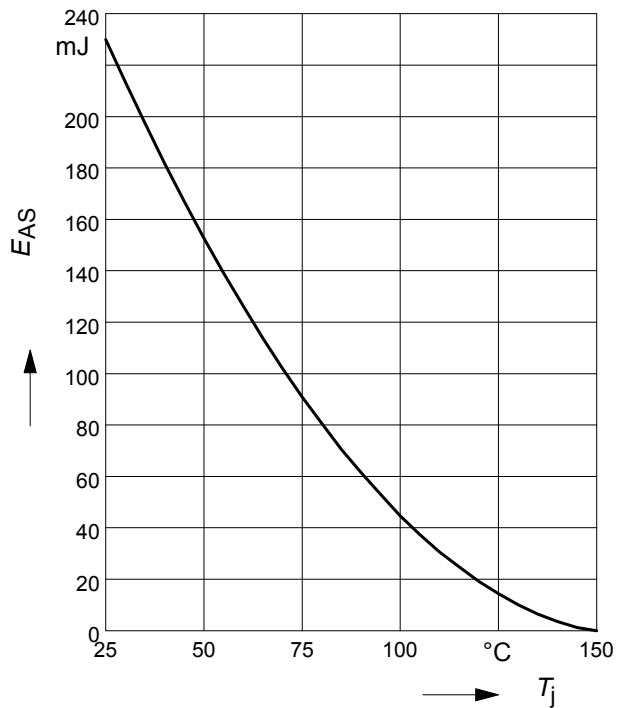
parameter: T_j , $t_p = 80\text{ }\mu\text{s}$



13 Typ. avalanche energy

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

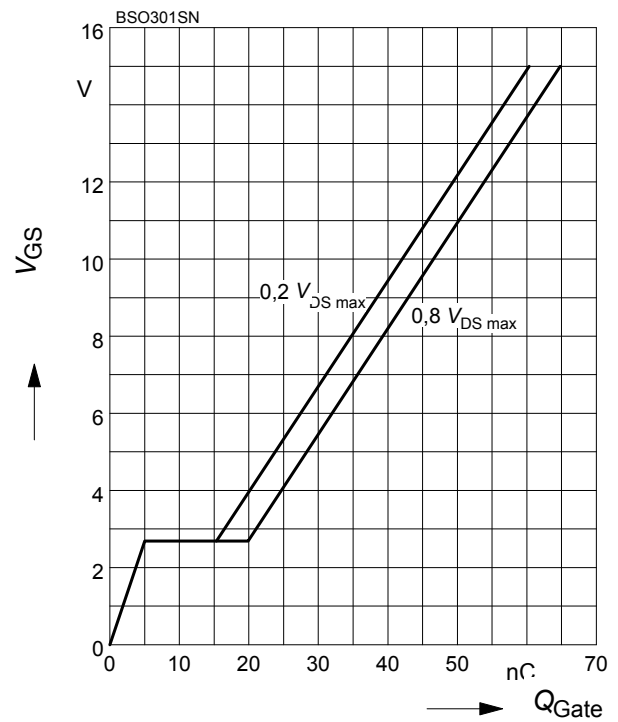
par.: $I_D = 13\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

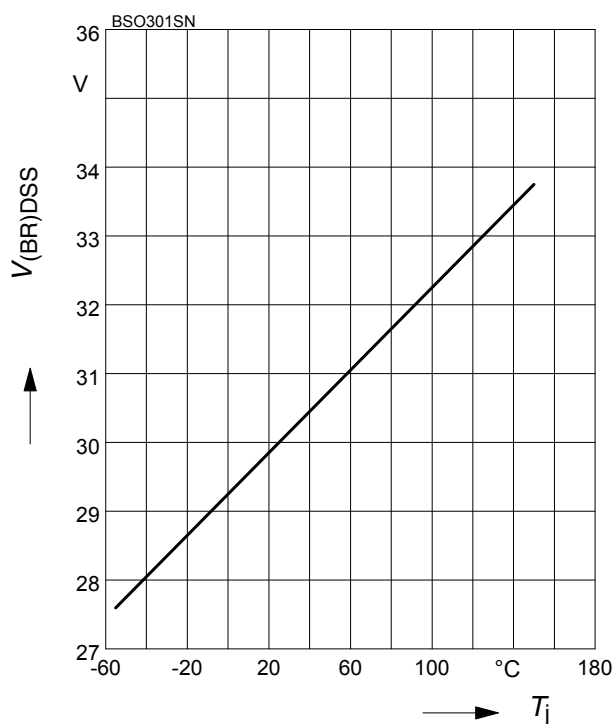
parameter: $I_D = 13\text{ A}$ pulsed



15 Drain-source breakdown voltage

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

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



Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München
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