

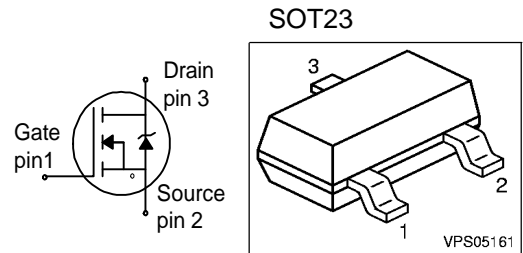
SIPMOS[®] Small-Signal-Transistor

Feature

- N-Channel
- Enhancement mode
- Logic Level
- dv/dt rated

Product Summary

V_{DS}	60	V
$R_{DS(on)}$	3.5	Ω
I_D	0.23	A



Type	Package	Ordering Code	Tape and Reel Information	Marking
BSS138N	SOT23	Q67042-S4184	E6327: 3000 pcs/reel	SKs
BSS138N	SOT23	Q67042-S4190	E6433: 10000 pcs/reel	SKs

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	0.23 0.18	A
Pulsed drain current $T_A=25\text{ }^\circ\text{C}$	$I_{D\text{ puls}}$	0.92	
Reverse diode dv/dt $I_S=0.23\text{A}$, $V_{DS}=48\text{V}$, $di/dt=200\text{A}/\mu\text{s}$, $T_{jmax}=150\text{ }^\circ\text{C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
ESD Sensitivity (HBM) as per MIL-STD 883		Class 1	
Power dissipation $T_A=25\text{ }^\circ\text{C}$	P_{tot}	0.36	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 - ambient at minimal footprint	R_{thJA}	-	-	350	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0, I_D=250\mu\text{A}$	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=26\mu\text{A}$	$V_{GS(th)}$	0.6	1	1.4	
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 5	μA
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0$	I_{GSS}	-	1	10	nA
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=0.03\text{A}$	$R_{DS(on)}$	-	3.3	4	Ω
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=0.19\text{A}$	$R_{DS(on)}$	-	3.5	6	
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=0.23\text{A}$	$R_{DS(on)}$	-	2.2	3.5	

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}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 0.18\text{A}$	0.1	0.2	-	S
Input capacitance	C_{iss}	$V_{GS} = 0, V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	32	41	pF
Output capacitance	C_{oss}		-	7.3	9.5	
Reverse transfer capacitance	C_{rss}		-	2.9	3.8	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{V}, V_{GS} = 10\text{V}$, $I_D = 0.23\text{A}, R_G = 6\Omega$	-	2.3	3.5	ns
Rise time	t_r		-	3	4.5	
Turn-off delay time	$t_{d(off)}$		-	6.7	10	
Fall time	t_f		-	8.2	12.3	

Gate Charge Characteristics

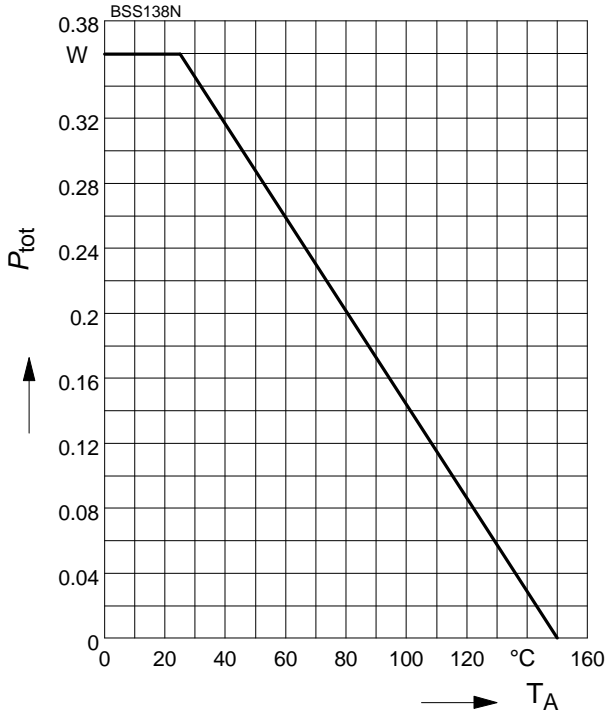
Gate to source charge	Q_{gs}	$V_{DD} = 48\text{V}, I_D = 0.23\text{A}$	-	0.09	0.14	nC
Gate to drain charge	Q_{gd}		-	0.41	0.6	
Gate charge total	Q_g	$V_{DD} = 48\text{V}, I_D = 0.23\text{A}$, $V_{GS} = 10\text{V}$	-	1.05	1.46	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 48\text{V}, I_D = 0.23\text{A}$	-	3.1	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25\text{ }^\circ\text{C}$	-	-	0.23	A
Inv. diode direct current, pulsed	I_{SM}		-	-	0.92	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0, I_F = I_S$	-	0.85	1.2	V
Reverse recovery time	t_{rr}	$V_R = 30\text{V}, I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	9.1	14.5	ns
Reverse recovery charge	Q_{rr}		-	3.3	5	

1 Power dissipation

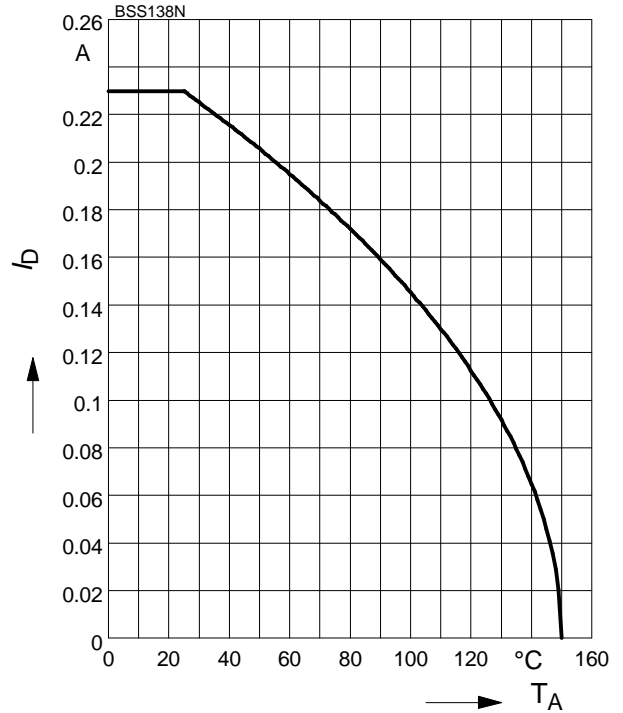
$$P_{tot} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

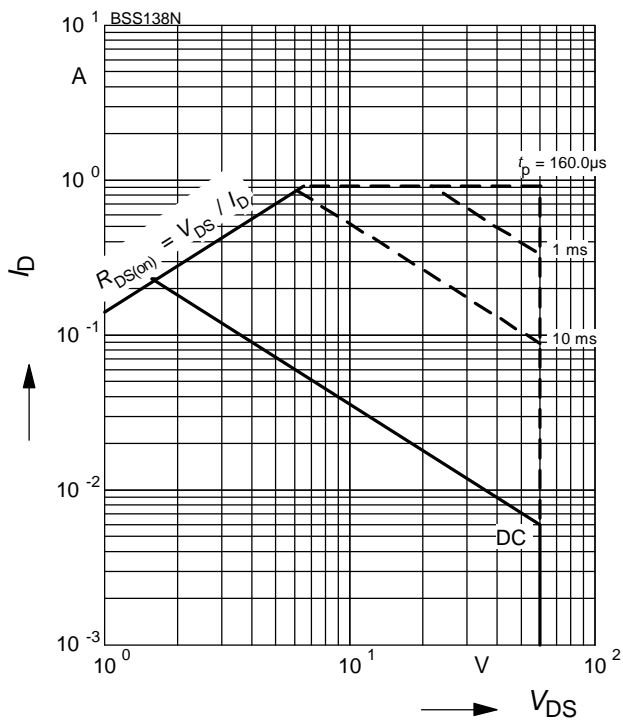
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

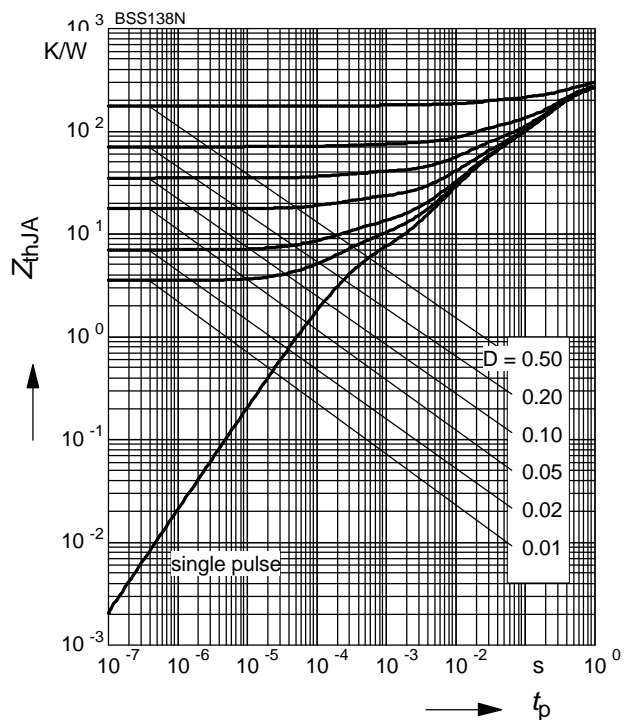
parameter: $D = 0, T_A = 25 \text{ °C}$



4 Transient thermal impedance

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

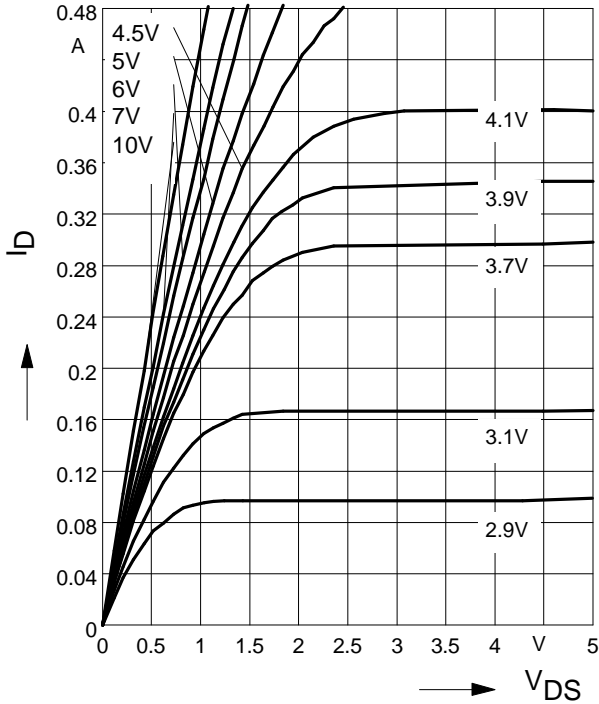
parameter: $D = t_p/T$



5 Typ. output characteristic

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

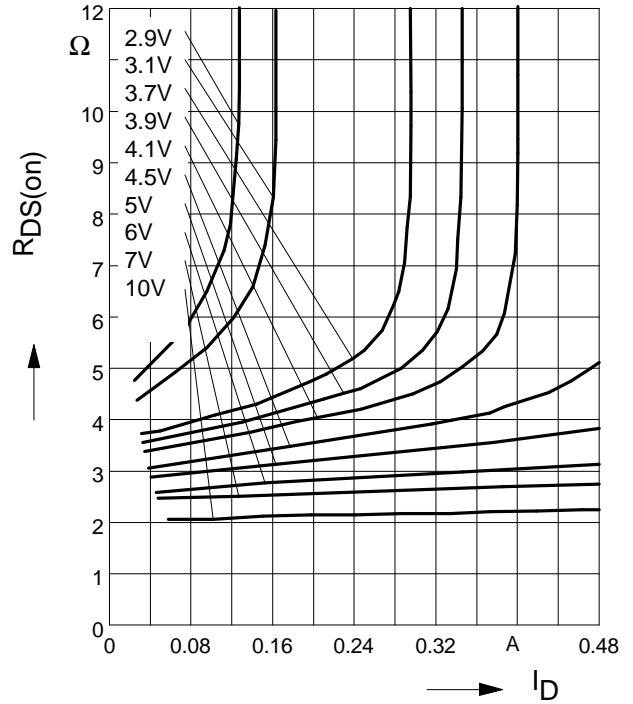
parameter: $T_j = 25\text{ }^\circ\text{C}$, V_{GS}



6 Typ. drain-source on resistance

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

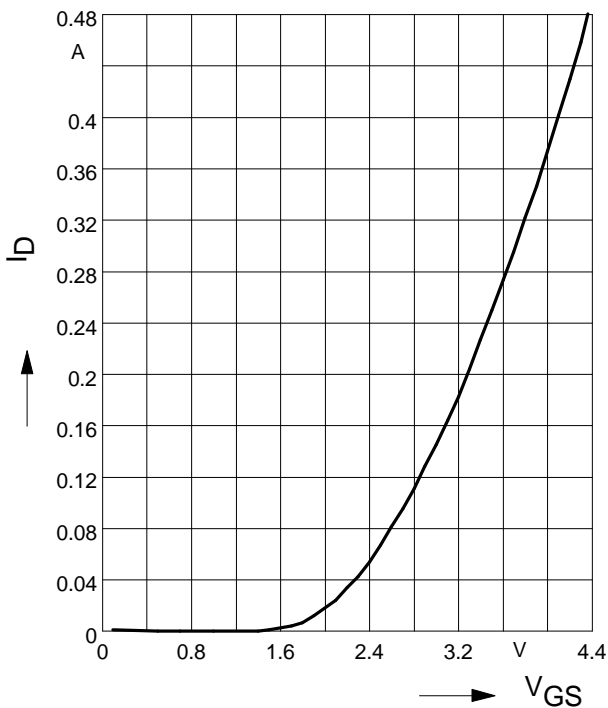
parameter: $T_j = 25\text{ }^\circ\text{C}$, V_{GS}



7 Typ. transfer characteristics

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

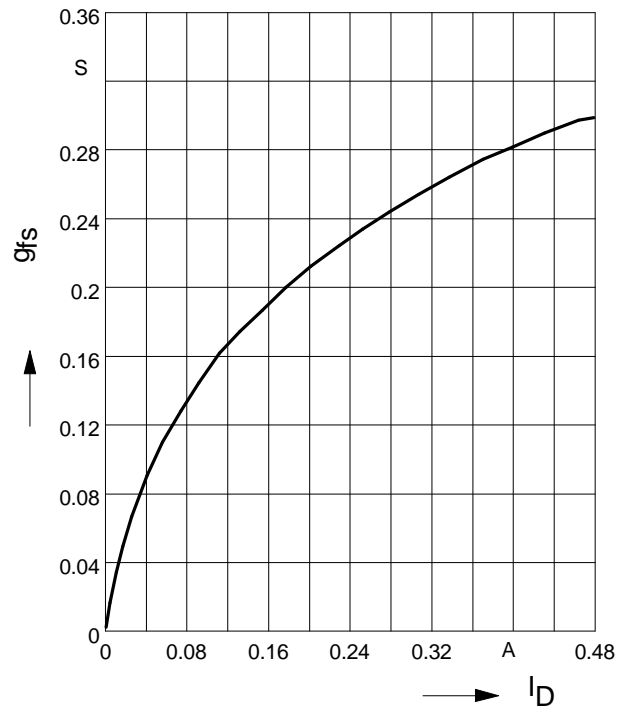
parameter: $T_j = 25\text{ }^\circ\text{C}$



8 Typ. forward transconductance

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

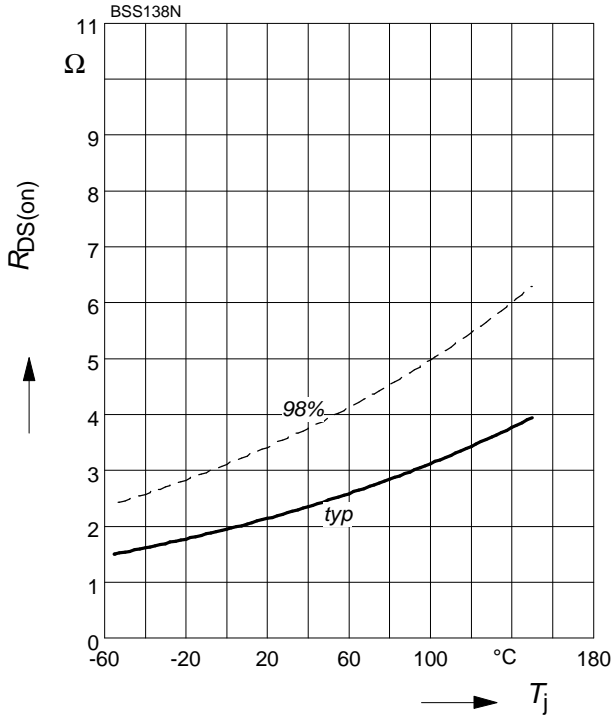
parameter: $T_j = 25\text{ }^\circ\text{C}$



9 Drain-source on-state resistance

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

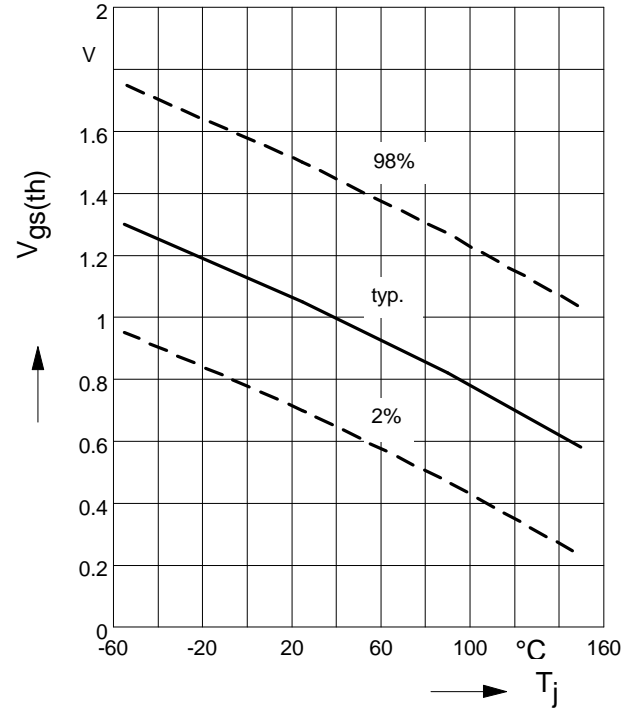
parameter : $I_D = 0.23 \text{ A}$, $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

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

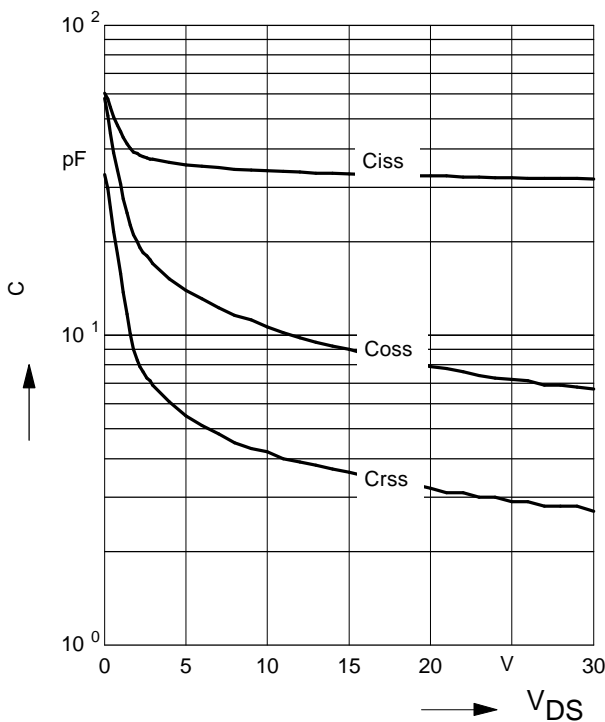
parameter: $V_{GS} = V_{DS}$; $I_D = 26 \mu\text{A}$



11 Typ. capacitances

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

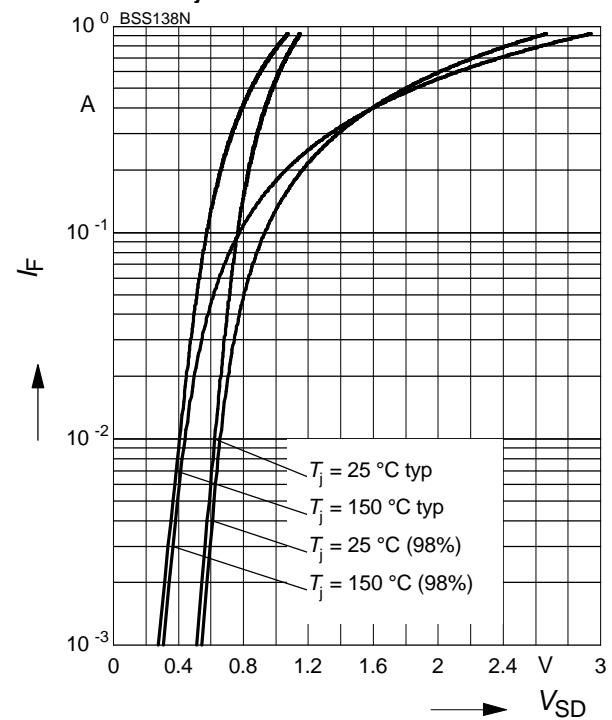
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$, $T_j = 25 \text{ }^\circ\text{C}$



12 Forward character. of reverse diode

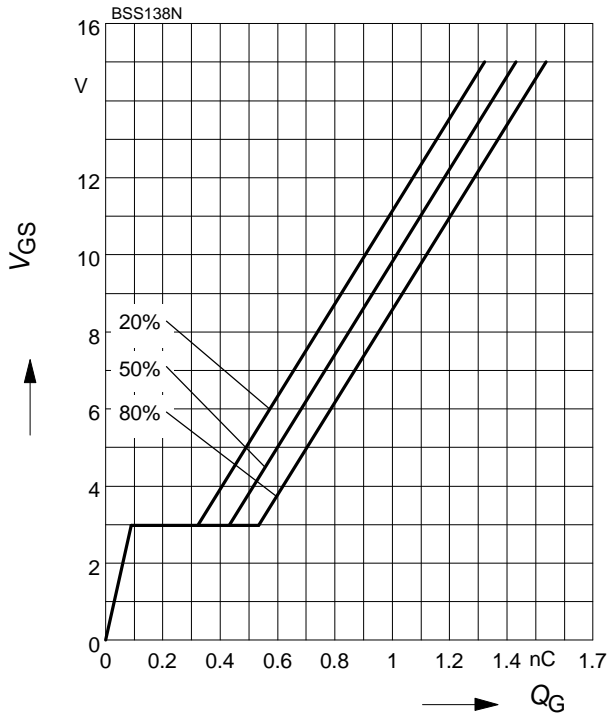
$$I_F = f(V_{SD})$$

parameter: T_j



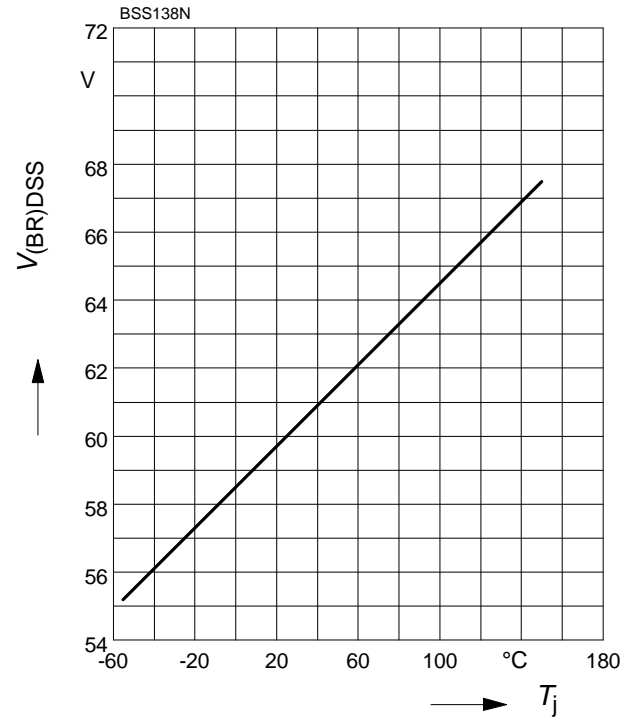
13 Typ. gate charge

$V_{GS} = f(Q_G)$; parameter: V_{DS} ,
 $I_D = 0.23 \text{ A pulsed}$, $T_j = 25 \text{ }^\circ\text{C}$



14 Drain-source breakdown voltage

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



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