

SIPMOS® Small-Signal-Transistor

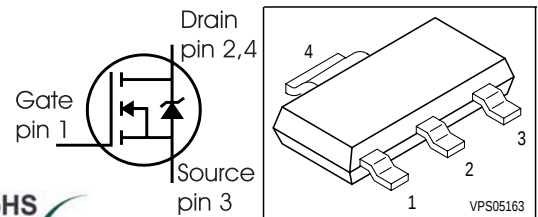
Feature

- N-Channel
- Enhancement mode
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- 4.5V rated
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

Product Summary

V_{DS}	240	V
$R_{DS(on)}$	6	Ω
I_D	0.35	A

PG-SOT223



Type	Package	Tape and Reel Information	Marking	Packaging
BSP89	PG-SOT223	H6327: 1000 pcs/reel	BSP89	Non dry

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25^\circ\text{C}$ $T_A=70^\circ\text{C}$	I_D	0.35 0.28	A
Pulsed drain current $T_A=25^\circ\text{C}$	$I_{D \text{ puls}}$	1.4	
Reverse diode dv/dt $I_S=0.35\text{A}$, $V_{DS}=192\text{V}$, $di/dt=200\text{A}/\mu\text{s}$, $T_{jmax}=150^\circ\text{C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
ESD class (JESD22-A114-HBM)		1A (>250V, <500V)	
Power dissipation $T_A=25^\circ\text{C}$	P_{tot}	1.8	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 - soldering point (Pin 4)	R_{thJS}	-	-	25	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	115	
@ 6 cm ² cooling area ¹⁾		-	-	70	

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 $V_{GS}=0, I_D=250\mu A$	$V_{(BR)DSS}$	240	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=108\mu A$	$V_{GS(th)}$	0.8	1.4	1.8	
Zero gate voltage drain current $V_{DS}=240V, V_{GS}=0, T_j=25^{\circ}C$ $V_{DS}=240V, V_{GS}=0, T_j=150^{\circ}C$	I_{DSS}	- -	- -	0.1 10	μA
Gate-source leakage current $V_{GS}=20V, V_{DS}=0$	I_{GSS}	-	-	10	
Drain-source on-state resistance $V_{GS}=4.5V, I_D=0.32A$	$R_{DS(on)}$	-	4.9	7.5	Ω
Drain-source on-state resistance $V_{GS}=10V, I_D=0.35A$	$R_{DS(on)}$	-	4.2	6	

¹⁾Device 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}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 0.28\text{A}$	0.18	0.36	-	S
Input capacitance	C_{iss}	$V_{GS} = 0$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	80	140	pF
Output capacitance	C_{oss}		-	11.2	16.8	
Reverse transfer capacitance	C_{rss}		-	5.2	7.8	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 120\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 0.35\text{A}$, $R_G = 6\Omega$	-	4	6	ns
Rise time	t_r		-	3.5	5.3	
Turn-off delay time	$t_{d(off)}$		-	15.9	23.8	
Fall time	t_f		-	18.4	27.6	

Gate Charge Characteristics

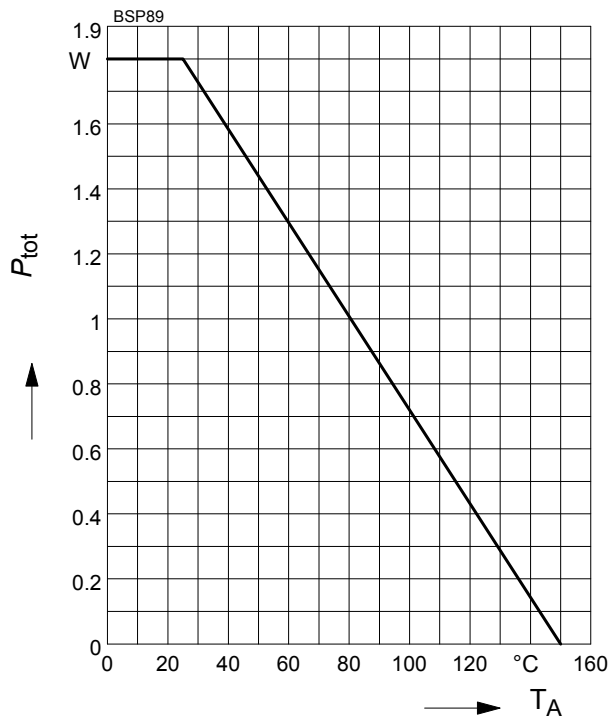
Gate to source charge	Q_{gs}	$V_{DD} = 192\text{V}$, $I_D = 0.35\text{A}$	-	0.2	0.3	nC
Gate to drain charge	Q_{gd}		-	2	3	
Gate charge total	Q_g	$V_{DD} = 192\text{V}$, $I_D = 0.35\text{A}$, $V_{GS} = 0$ to 10V	-	4.3	6.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 192\text{V}$, $I_D = 0.35\text{A}$	-	3.1	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25^\circ\text{C}$	-	-	0.35	A
Inv. diode direct current, pulsed	I_{SM}		-	-	1.4	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0$, $I_F = I_S$	-	0.85	1.2	V
Reverse recovery time	t_{rr}	$V_R = 120\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	67	100	ns
Reverse recovery charge	Q_{rr}		-	123	184	nC

1 Power dissipation

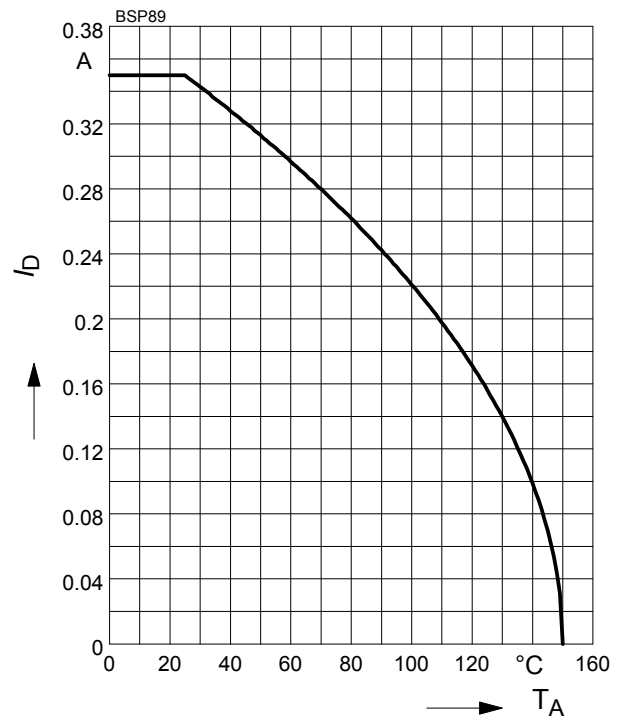
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

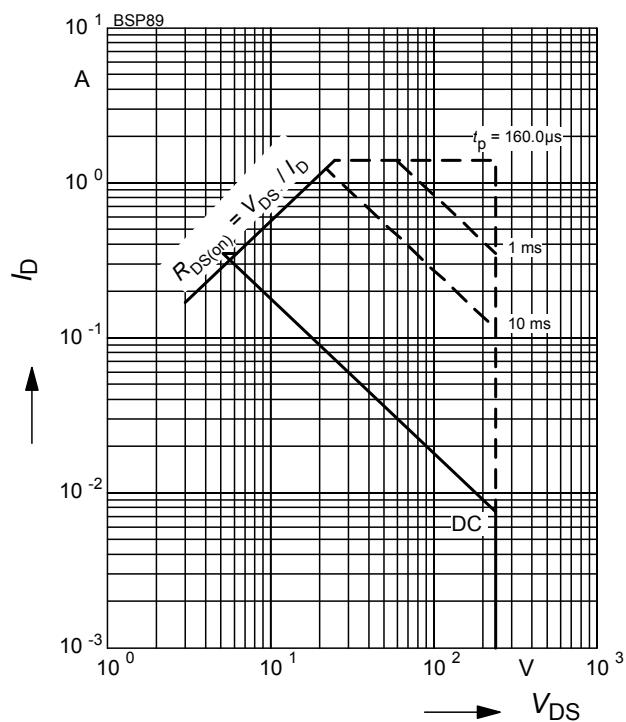
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

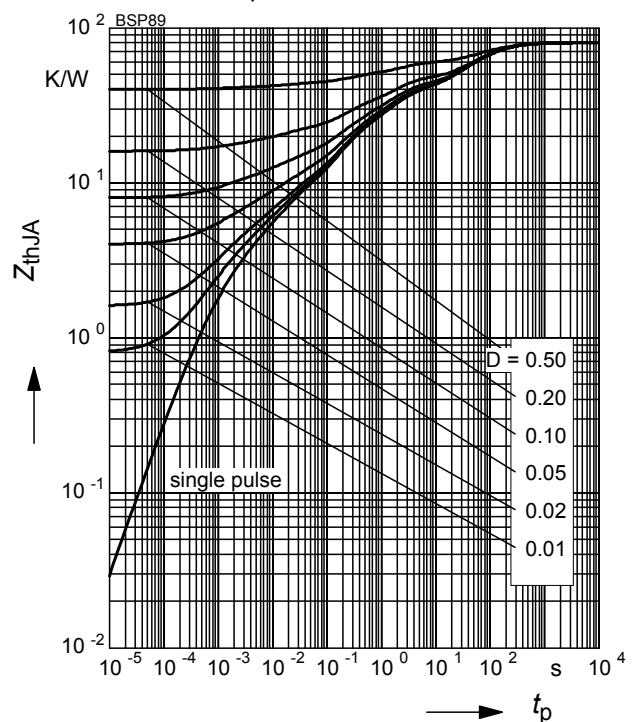
parameter: $D = 0$, $T_A = 25 \text{ °C}$



4 Transient thermal impedance

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

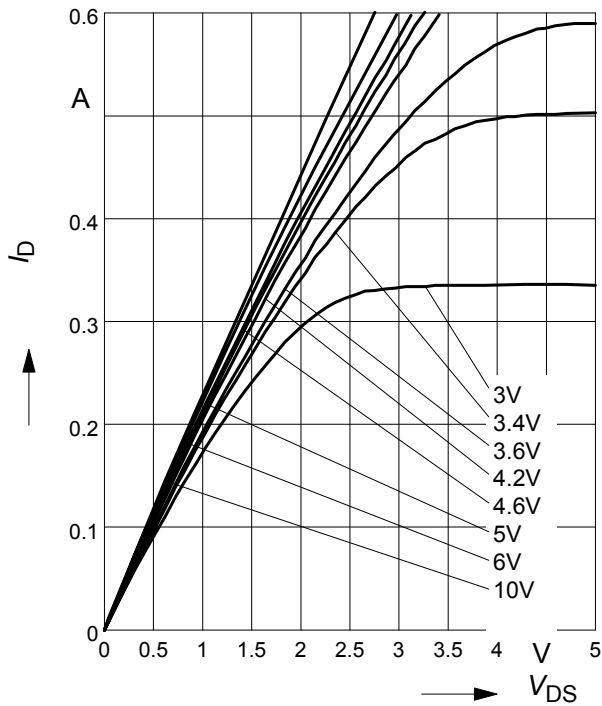
parameter: $D = t_p/T$



5 Typ. output characteristic

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

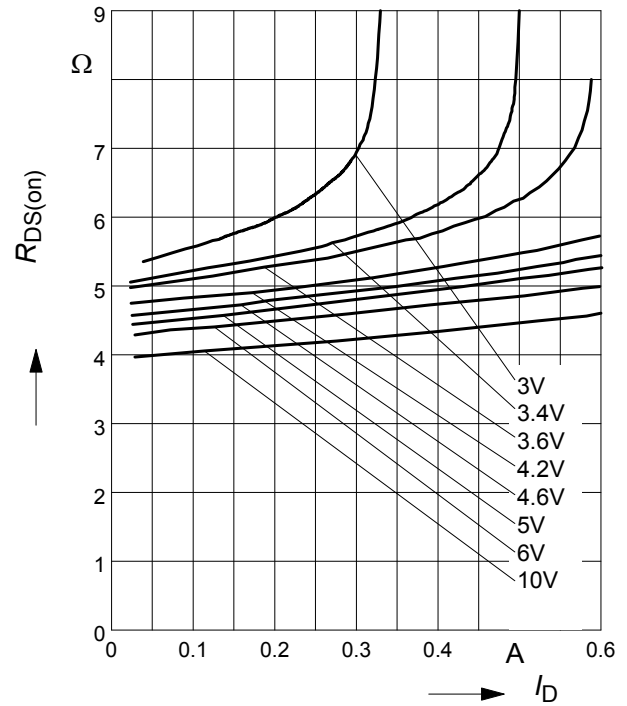
parameter: $T_j = 25\text{ }^{\circ}\text{C}$, V_{GS}



6 Typ. drain-source on resistance

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

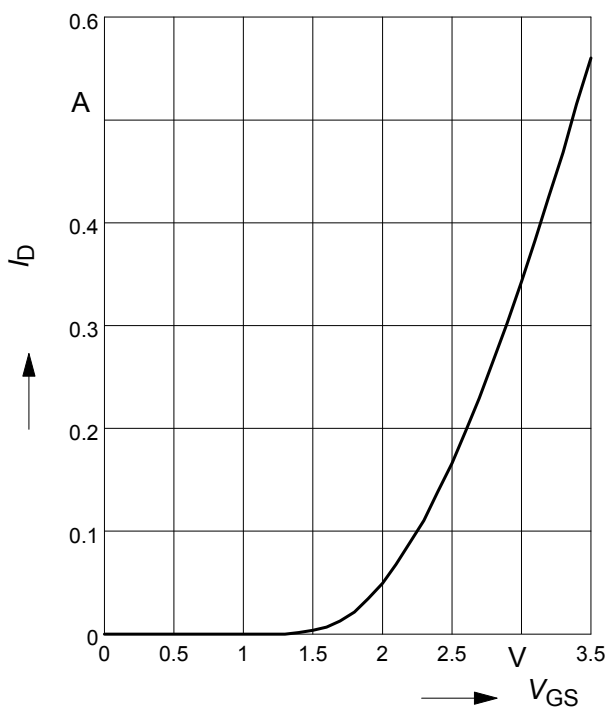
parameter: $T_j = 25\text{ }^{\circ}\text{C}$, V_{GS}



7 Typ. transfer characteristics

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

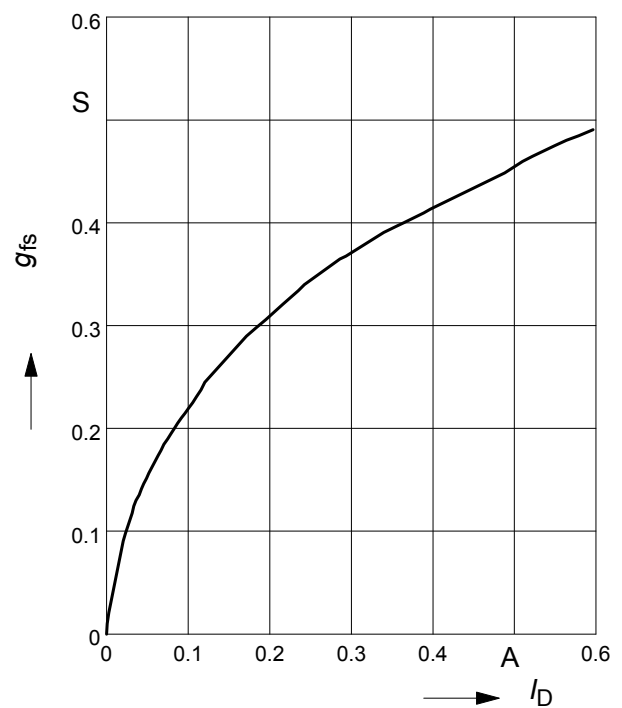
parameter: $T_j = 25\text{ }^{\circ}\text{C}$



8 Typ. forward transconductance

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

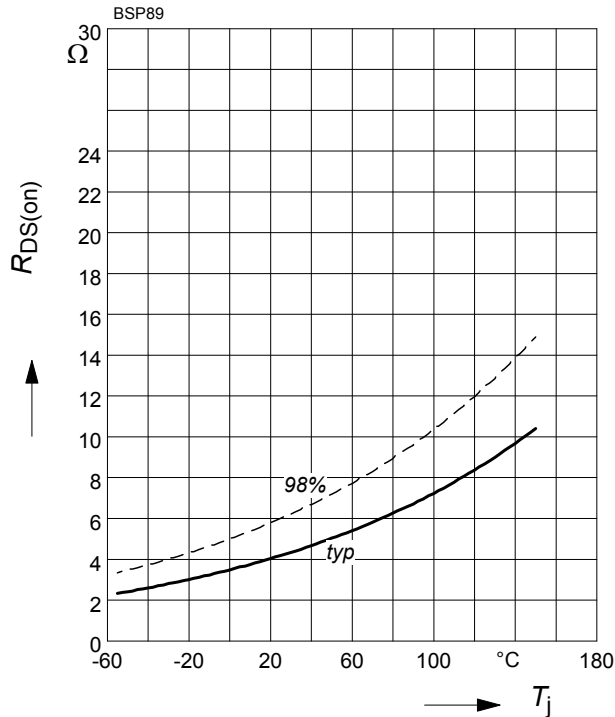
parameter: $T_j = 25\text{ }^{\circ}\text{C}$



9 Drain-source on-state resistance

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

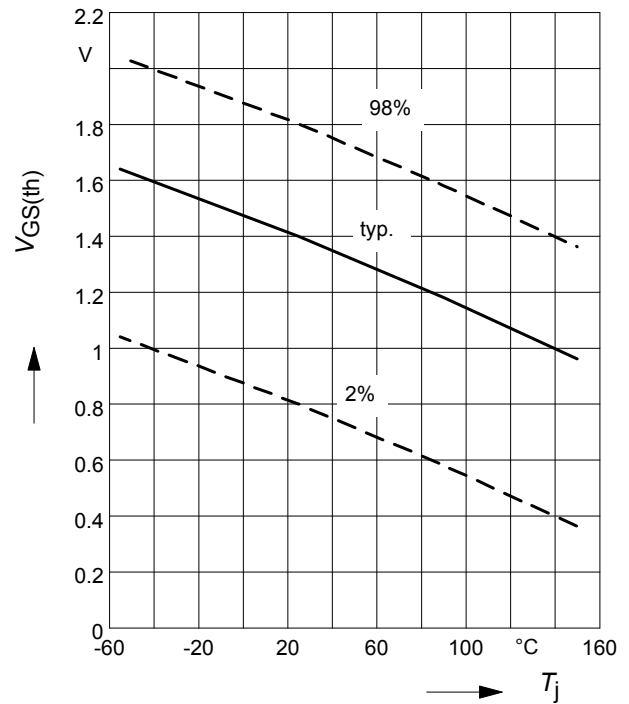
parameter: $I_D = 0.35 \text{ A}$, $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

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

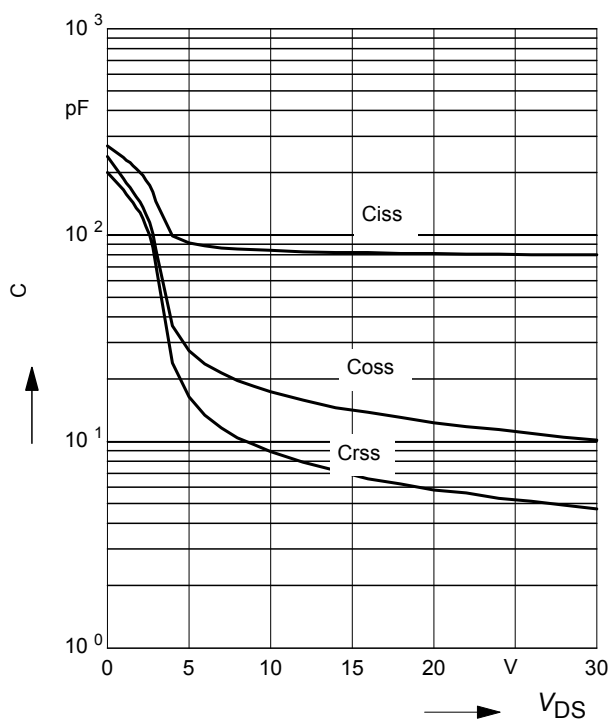
parameter: $V_{GS} = V_{DS}$; $I_D = 108 \mu\text{A}$



11 Typ. capacitances

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

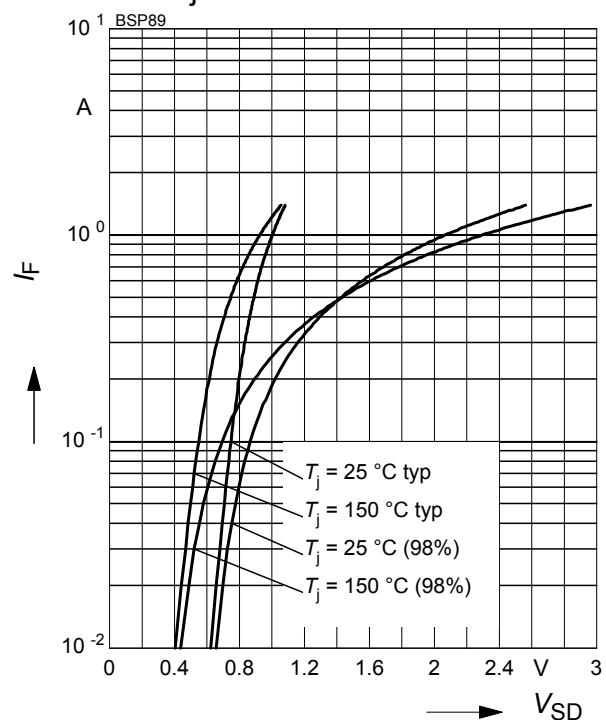
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$, $T_j = 25^{\circ}\text{C}$



12 Forward character. of reverse diode

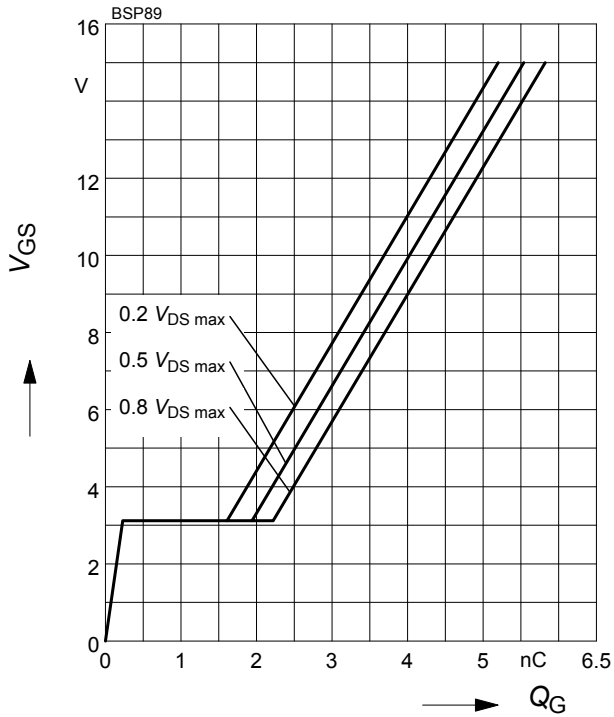
$$I_F = f(V_{SD})$$

parameter: T_j

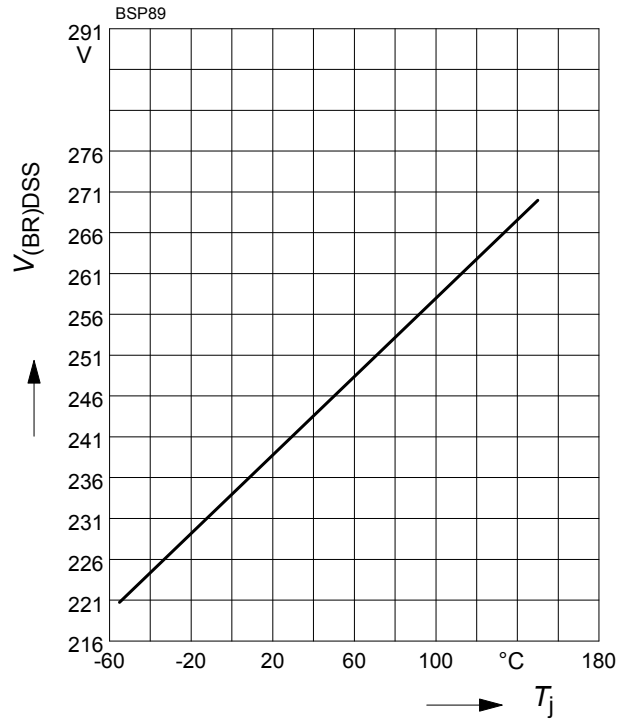


13 Typ. gate charge

 $V_{GS} = f(Q_G)$; parameter: V_{DS} ,

 $I_D = 0.35 \text{ A pulsed}, T_j = 25^\circ\text{C}$


14 Drain-source breakdown voltage

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


Published by
Infineon Technologies AG
81726 Munich, Germany
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