SIPMOS® Small-Signal-Transistor **BSP320S**

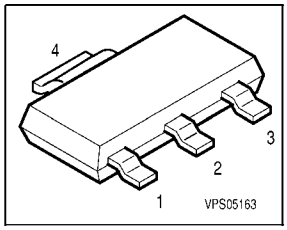
Features

- N channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101

AEC Qualified RoHS

Product Summary

Drain source voltage	V_{DS}	60	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.12	Ω
Continuous drain current	I_D	2.9	A



Type	Package	Tape and Reel	Packaging
BSP320S	PG-SOT223	L6327: 1000pcs/r	Non dry
BSP320S	PG-SOT223	L6433: 4000pcs/r	Non dry

Maximum Ratings , at Tj = 25 ˚C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current	I_D	2.9	A
Pulsed drain current T_A = 25 ˚C	I_{Dpulse}	11.6	
Avalanche energy, single pulse I_D = 2.9 A, V_{DD} = 25 V, R_{GS} = 25 Ω	E_{AS}	60	mJ
Avalanche current,periodic limited by T_{jmax}	I_{AR}	2.9	A
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.18	mJ
Reverse diode d*v*/d*t* I_S = 2.9 A, V_{DS} = 20 V, d*i*/d*t* = 200 A/µs, T_{jmax} = 150 ˚C	d*v*/d*t*	6	kV/µs
Gate source voltage	V_{GS}	±20	V
Power dissipation T_A = 25 ˚C	P_{tot}	1.8	W
Operating temperature	T_j	-55 ... +150	˚C
Storage temperature	T_{stg}	-55 ... +150	
IEC climatic category; DIN IEC 68-1		55/150/56	

Electrical Characteristics

Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Thermal Characteristics					
Thermal resistance, junction - soldering point (Pin 4)	R_{thJS}	-	17	-	K/W
SMD version, device on PCB:	R_{thJA}				K/W
@ min. footprint		-	110	-	
@ 6 cm^2 cooling area[1)]		-	-	70	

Static Characteristics

Drain- source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = 20 µA	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 60 V, V_{GS} = 0 V, T_j = 25 °C		-	0.1	1	
V_{DS} = 60 V, V_{GS} = 0 V, T_j = 150 °C		-	-	100	
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}	-	10	100	nA
Drain-Source on-state resistance V_{GS} = 10 V, I_D = 2.9 A	$R_{DS(on)}$	-	0.09	0.12	Ω

1 Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6 cm2 (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics

Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D = 2.9 A	g_{fs}	2.5	5.8	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	275	340	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	90	120	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	50	65	
Turn-on delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A, R_G = 33 Ω	$t_{d(on)}$	-	11	17	ns
Rise time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A, R_G = 33 Ω	t_r	-	25	40	
Turn-off delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A, R_G = 33 Ω	$t_{d(off)}$	-	25	40	
Fall time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A, R_G = 33 Ω	t_f	-	35	55	

Electrical Characteristics

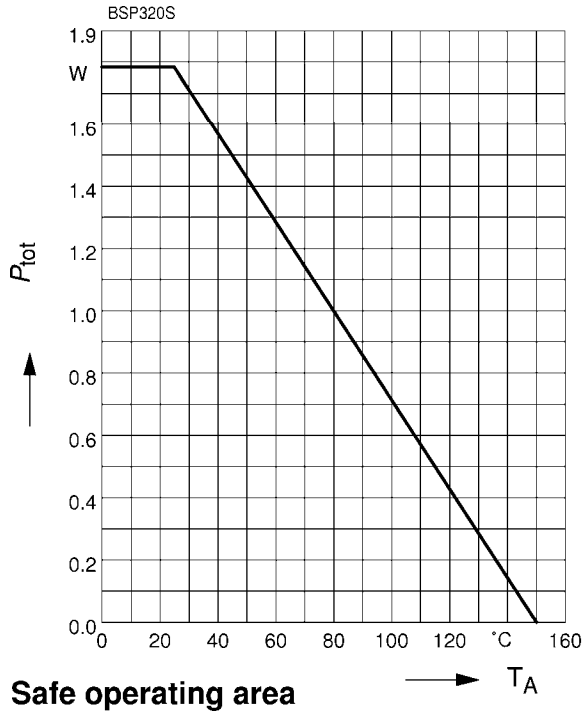
Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate charge at threshold V_{DD} = 40 V, I_D = 0.1 A, V_{GS} = 1 V	$Q_{G(th)}$	-	0.25	0.3	nC
Gate charge at V_{gs}=7V V_{DD} = 40 V, I_D = 2.9 A, V_{GS} = 0 to 7 V	$Q_{g(7)}$	-	7.4	9.3	nC
Gate charge total V_{DD} = 40 V, I_D = 2.9 A, V_{GS} = 0 to 10 V	Q_g	-	9.7	12	
Gate plateau voltage V_{DD} = 40 V, I_D = 2.9 A	$V_{(plateau)}$	-	4.7	-	V

Reverse Diode

Inverse diode continuous forward current T_A = 25 °C	I_S	-	-	2.9	A
Inverse diode direct current,pulsed T_A = 25 °C	I_{SM}	-	-	11.6	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 5.8 A	V_{SD}	-	0.95	1.2	V
Reverse recovery time V_R = 30 V, I_F=I_S , di_F/dt = 100 A/µs	t_{rr}	-	45	56	ns
Reverse recovery charge V_R = 30 V, I_F=I_S , di_F/dt = 100 A/µs	Q_{rr}	-	0.08	0.12	µC

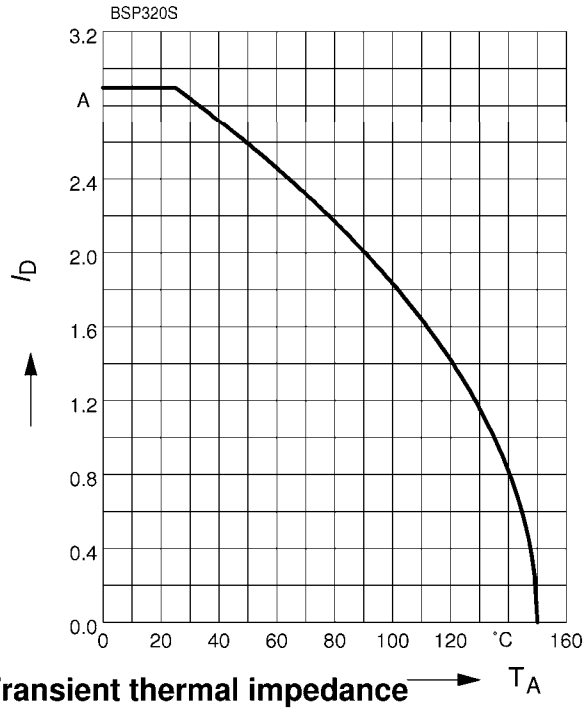
Power Dissipation

$P_{tot} = f(T_A)$



Drain current

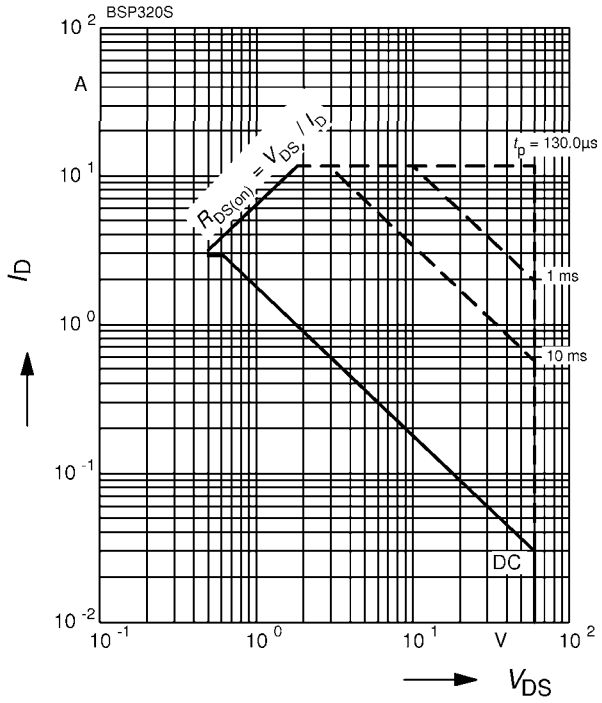
$I_D = f(T_A)$



Safe operating area

$I_D = f(V_{DS})$

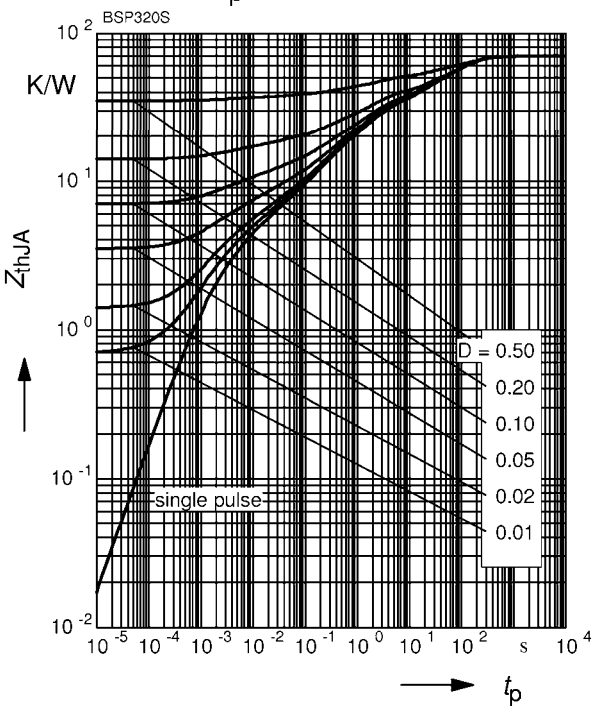
parameter : $D = 0$, $T_A = 25$ °C



Transient thermal impedance

$Z_{thJA} = f(t_p)$

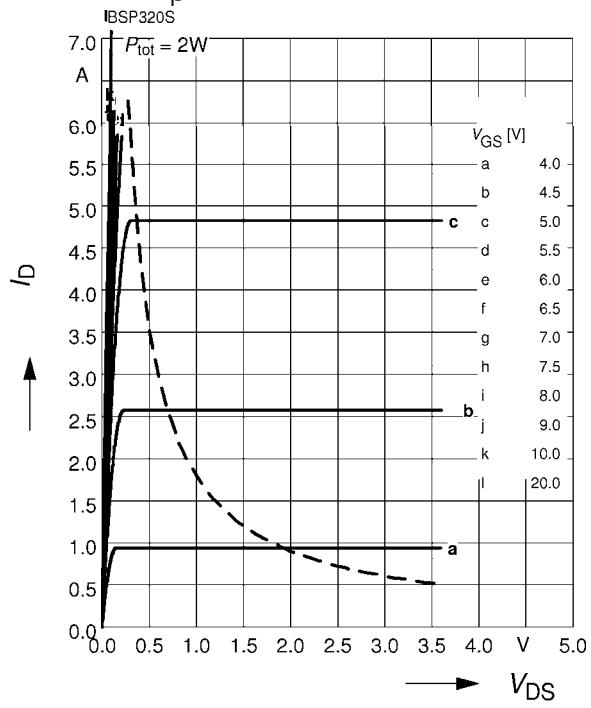
parameter : $D = t_p/T$



Typ. output characteristics

$I_D = f(V_{DS})$

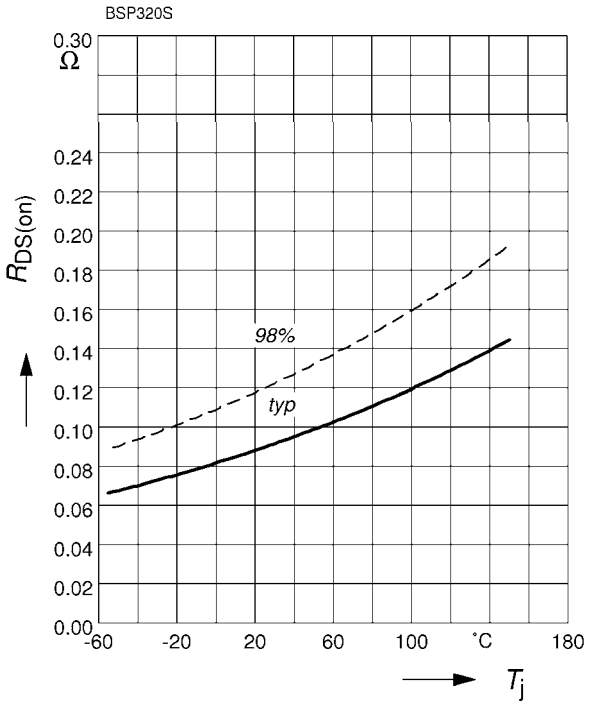
parameter: t_p = 80 µs



Drain-source on-resistance

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

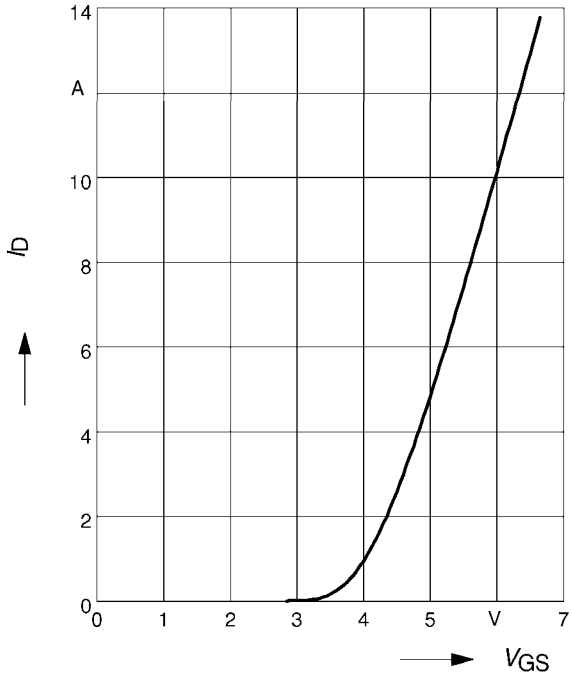
parameter : I_D = 2.9 A, V_{GS} = 10 V



Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: t_p = 80 µs

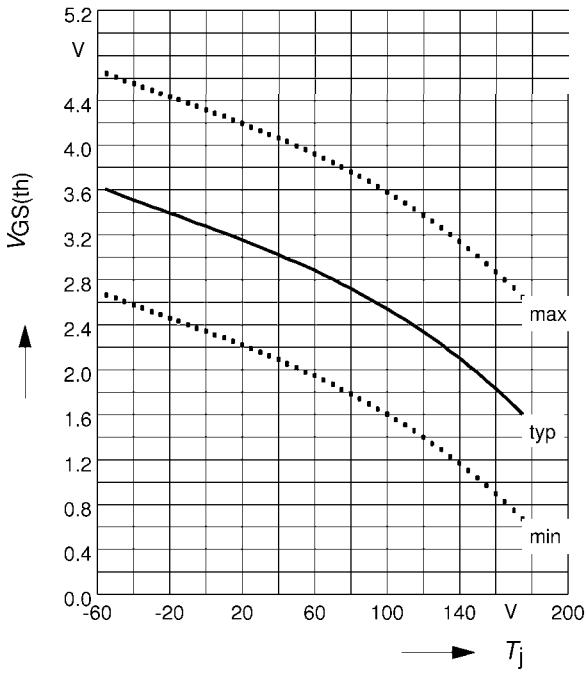
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Gate threshold voltage

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

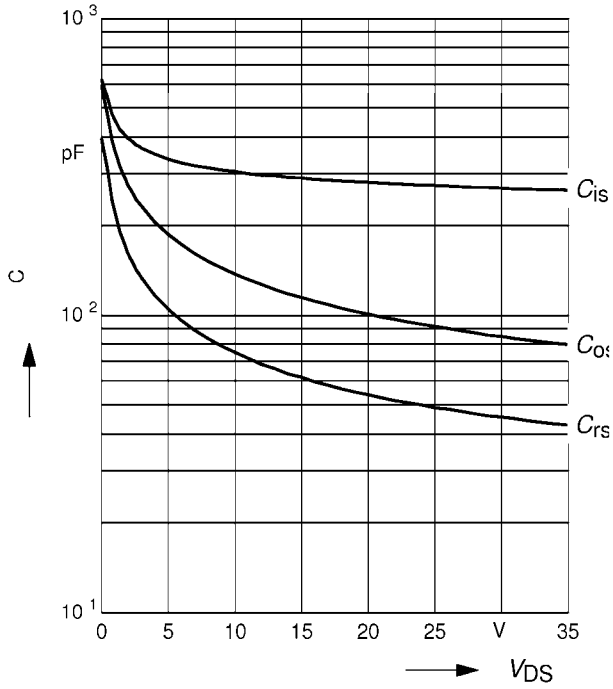
parameter : $V_{GS} = V_{DS}$, I_D = 20 µA



Typ. capacitances

$C = f(V_{DS})$

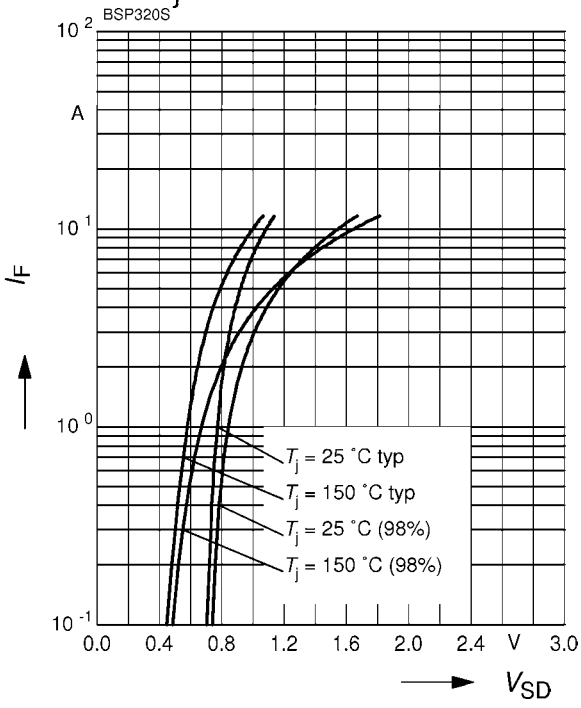
Parameter: V_{GS}=0 V, f=1 MHz



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

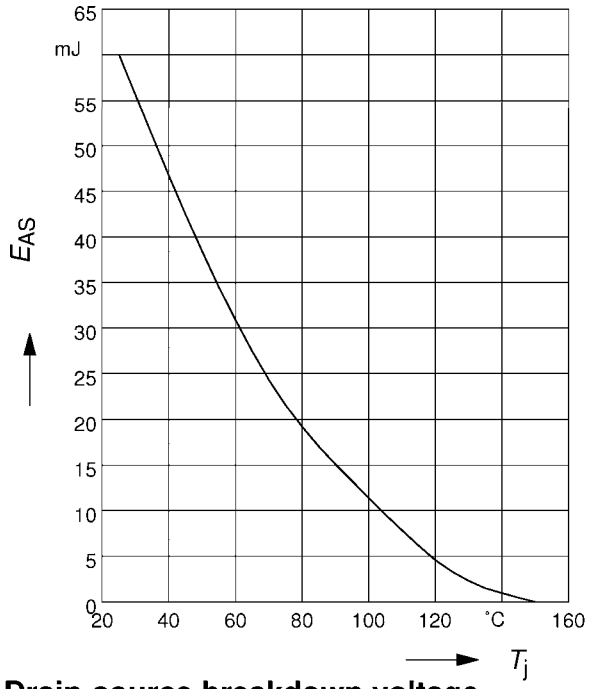
parameter: T_j , tp = 80 µs



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

parameter: I_D = 2.9 A, V_{DD} = 25 V

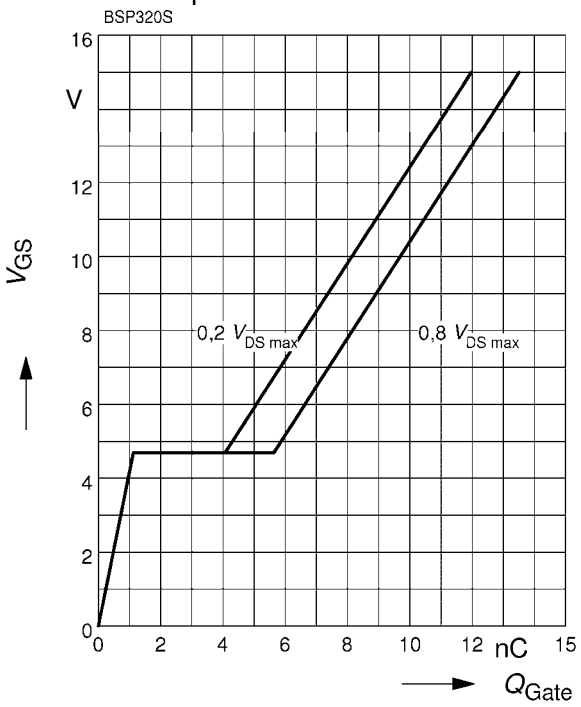
R_{GS} = 25 Ω



Typ. gate charge

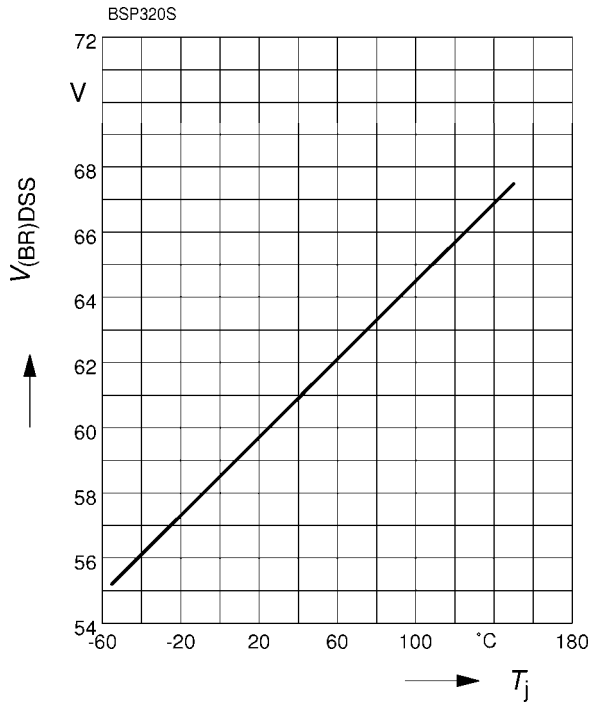
$V_{GS} = f(Q_{Gate})$

parameter: $I_{D\ puls}$ =2.9A



Drain-source breakdown voltage

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



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