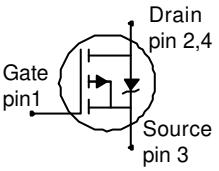
SIPMOS® Small-Signal-Transistor

Feature

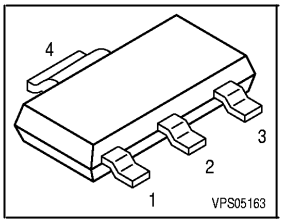
- P-Channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated
- Ideal for fast switching buck converter
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

Product Summary

V_{DS}	-60	V
$R_{DS(on)}$	0.13	Ω
I_D	-2.9	A



PG-SOT223



Halogen-Free AEC Qualified RoHS

Type	Package	Tape and reel	Packaging	Marking
BSP613P	PG-SOT223	H6327: 1000pcs/r.	Non Dry	BSP613P

Maximum Ratings, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current T_A=25°C T_A=70°C	I_D	 -2.9 -2.3	A
Pulsed drain current T_A=25°C	$I_{D\ puls}$	-11.6	
Avalanche energy, single pulse I_D=2.9 A , V_{DD}=-25V, R_{GS}=25Ω	E_{AS}	150	mJ
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.18	
Reverse diode d*v*/d*t* I_S=2.9A, V_{DS}=-48V, d*i*/d*t*=-200A/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 and storage temperature	T_j , T_{stg}	-55... +150	°C
IEC climatic category; DIN IEC 68-1		55/150/56	
ESD Class JESD22-A114-HBM		Class 1c	

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - soldering point (Pin 4)	R_{thJS}	-	-	19	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	100	-	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	100	
@ 6 cm^2 cooling area [1)]		-	-	70	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS}=0, I_D=-250µA	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D=-1mA	$V_{GS(th)}$	-2.1	-3	-4	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS}=-60V, V_{GS}=0, T_j=25°C		-	-0.1	-1	
V_{DS}=-60V, V_{GS}=0, T_j=125°C		-	-10	-100	
Gate-source leakage current V_{GS}=-20V, V_{DS}=0	I_{GSS}	-	-10	-100	nA
Drain-source on-state resistance V_{GS}=-10V, I_D=2.9A	$R_{DS(on)}$	-	0.11	0.13	Ω

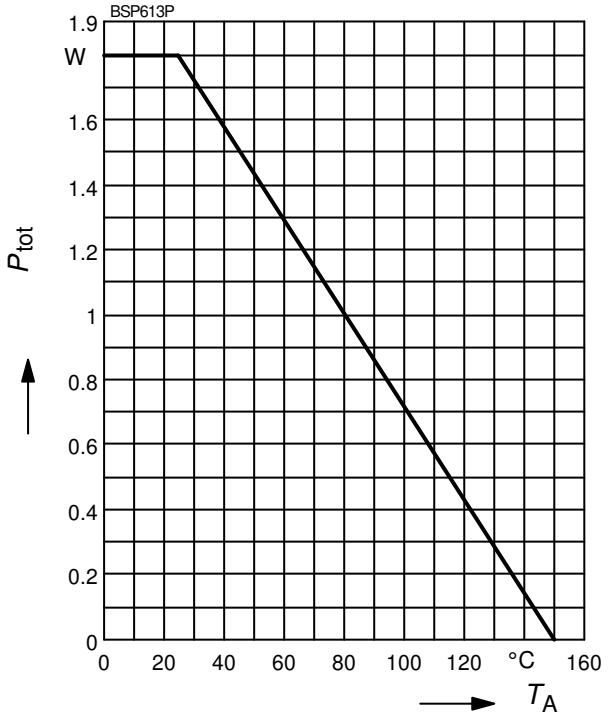
[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$\|V_{DS}\|\geq 2*\|I_D\|*R_{DS(on)max}$, I_D=2.9A	2.7	5.4	-	S
Input capacitance	C_{iss}	V_{GS}=0, V_{DS}=-25V, f=1MHz	-	715	875	pF
Output capacitance	C_{oss}		-	230	295	
Reverse transfer capacitance	C_{rss}		-	90	120	
Turn-on delay time	$t_{d(on)}$	V_{DD}=-30V, V_{GS}=-10V, I_D=2.9A, R_G=2.7Ω	-	6.7	17	ns
Rise time	t_r		-	9	18	
Turn-off delay time	$t_{d(off)}$		-	26	52	
Fall time	t_f		-	7	19	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=-48V, I_D=2.9A	-	2.5	3.8	nC
Gate to drain charge	Q_{gd}		-	8.9	14.3	
Gate charge total	Q_g	V_{DD}=-48V, I_D=2.9A, V_{GS}=0 to -10V	-	22	33	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=-48V, I_D=2.9A	-	-3.9	-	V
Reverse Diode						
Inverse diode continuous forward current	I_S	T_A=25°C	-	-	-2.9	A
Inv. diode direct current, pulsed	I_{SM}		-	-	-11.6	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, $\|I_F\|$ = $\|I_S\|$	-	-0.8	-1.1	V
Reverse recovery time	t_{rr}	V_R=-30V, $\|I_F\|$ = $\|I_S\|$, di_F/dt=100A/µs	-	37.2	79	ns
Reverse recovery charge	Q_{rr}		-	59.8	112	nC

1 Power Dissipation

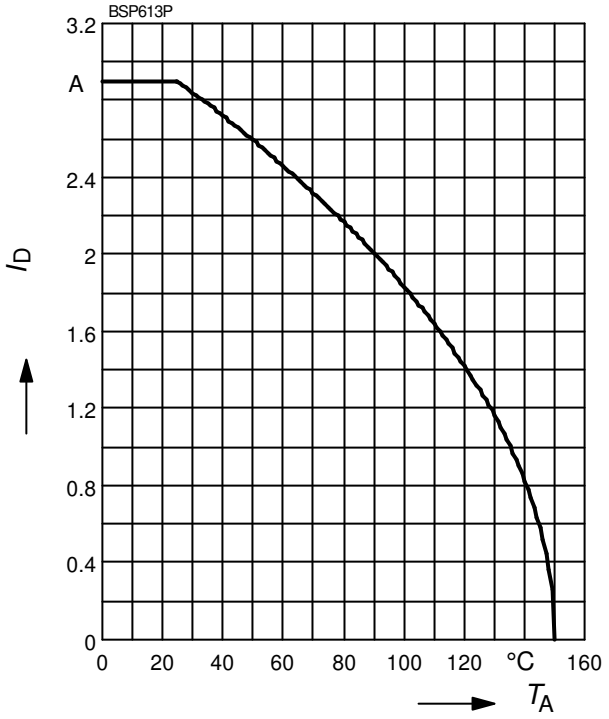
$P_{tot} = f(T_A)$



2 Drain current

$I_D = f(T_A)$

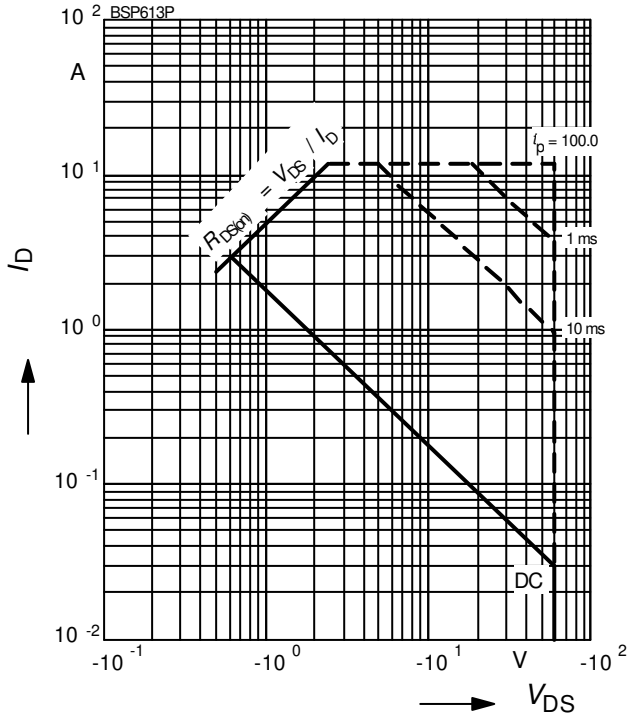
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

$I_D = f(V_{DS})$

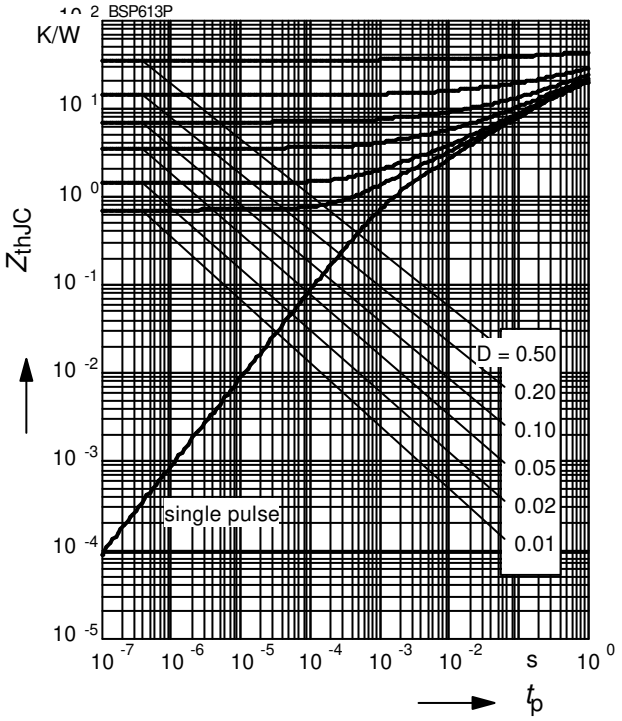
parameter : $D = 0$, $T_A = 25$ °C



4 Transient thermal impedance

$Z_{thJC} = f(t_p)$

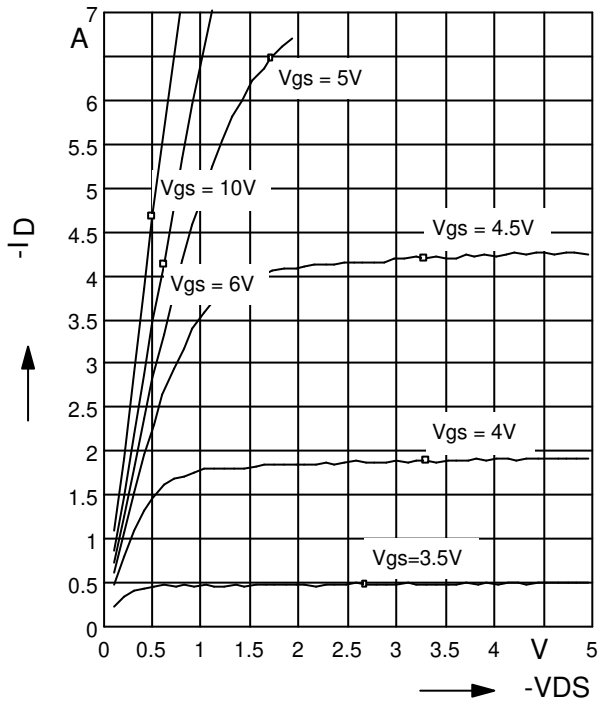
parameter: $D = t_p / T$



5 Typ. output characteristic

$I_D = f(V_{DS})$

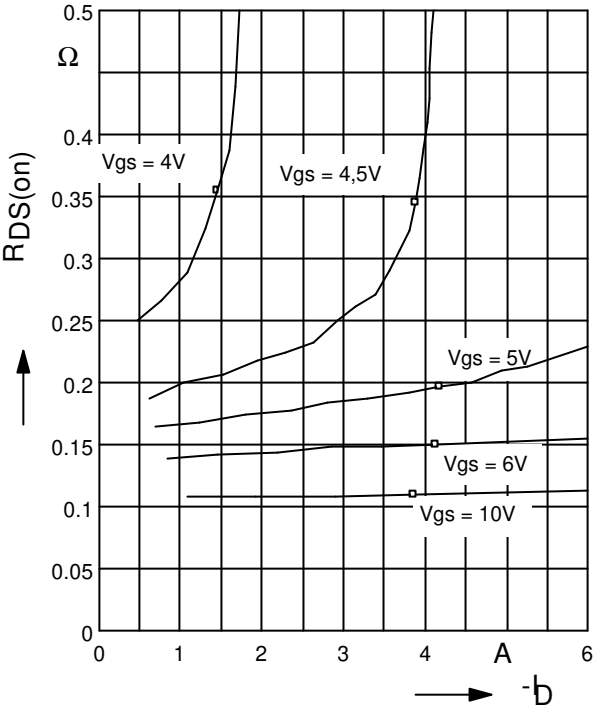
parameter: T_j =25°C



6 Typ. drain-source on resistance

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

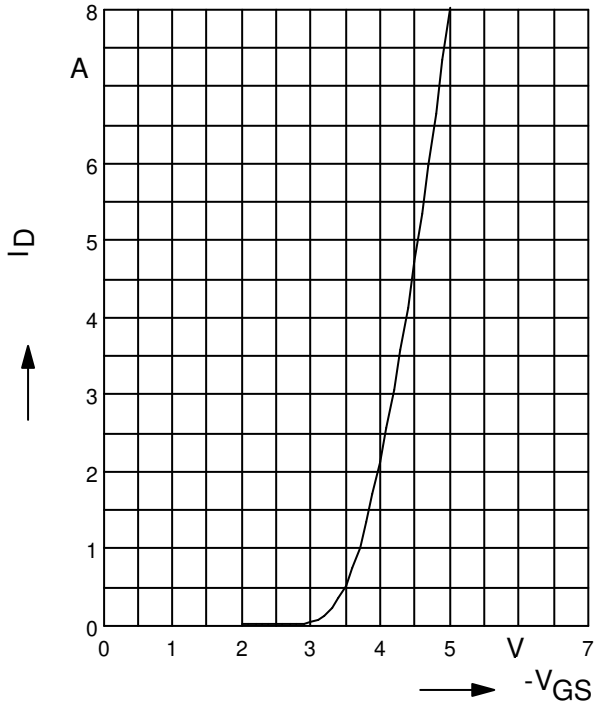
parameter: V_{GS}; T_j = 25 °C



7 Typ. transfer characteristics

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

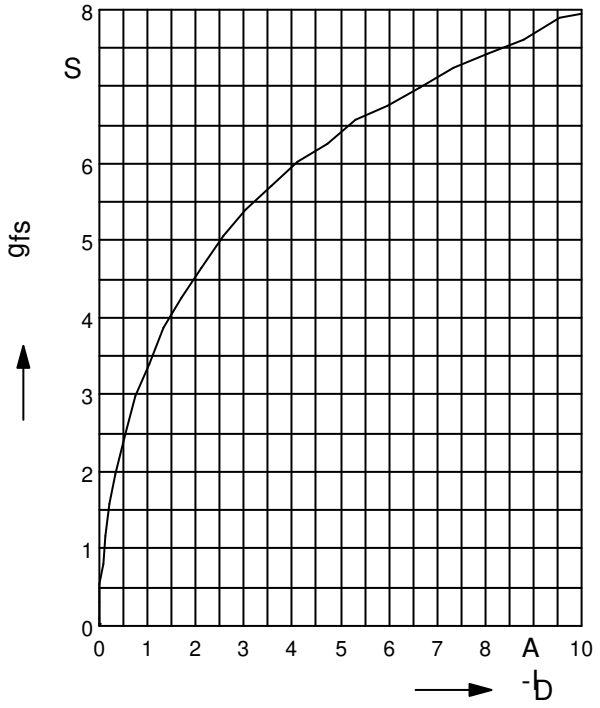
parameter: T_j = 25 °C



8 Typ. forward transconductance

$g_{fs} = f(I_D)$

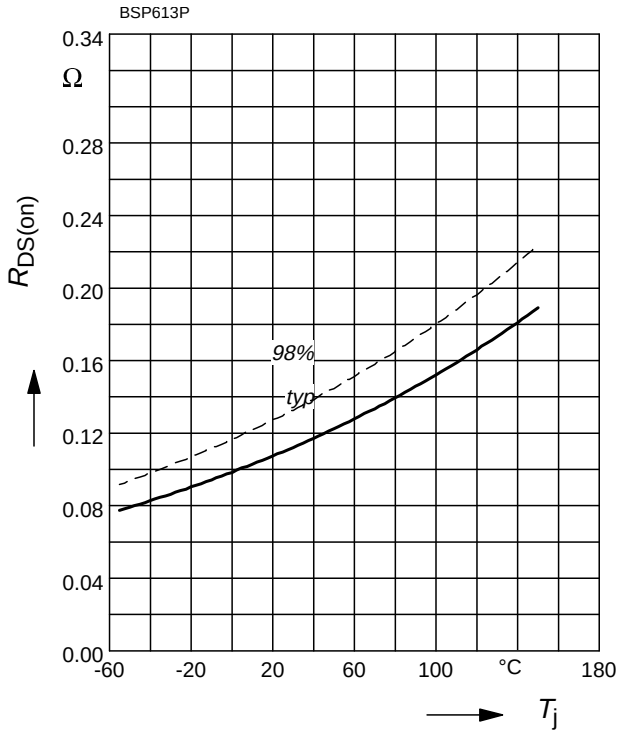
parameter: T_j = 25 °C



9 Drain-source on-state resistance

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

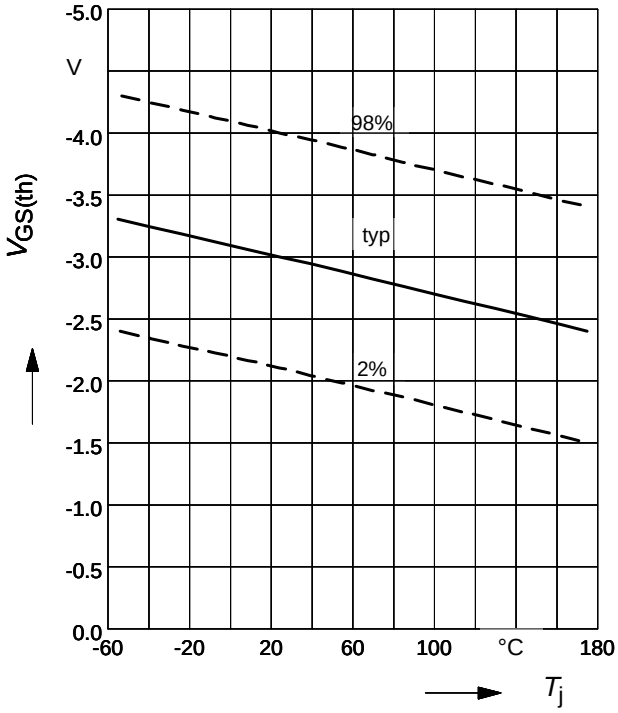
parameter : I_D = -2.9 A, V_{GS} = -10 V



10 Gate threshold voltage

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

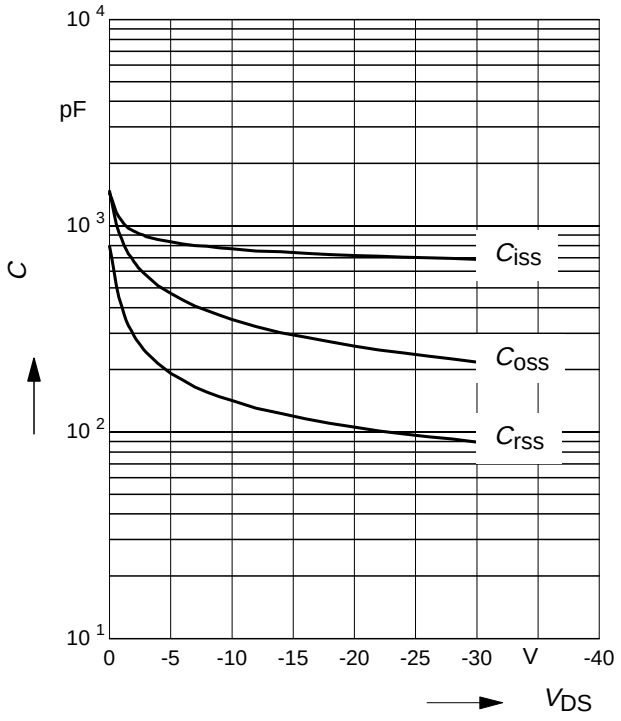
parameter: $V_{GS} = V_{DS}$, I_D = -1 mA



11 Typ. capacitances

$C = f(V_{DS})$

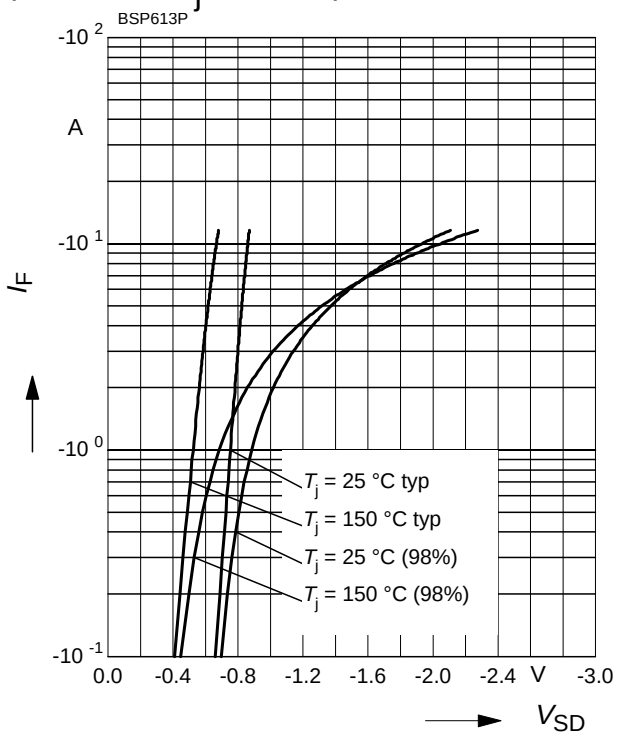
parameter: V_{GS}=0V, f=1 MHz



12 Forward characteristics of reverse diode

$I_F = f(V_{SD})$

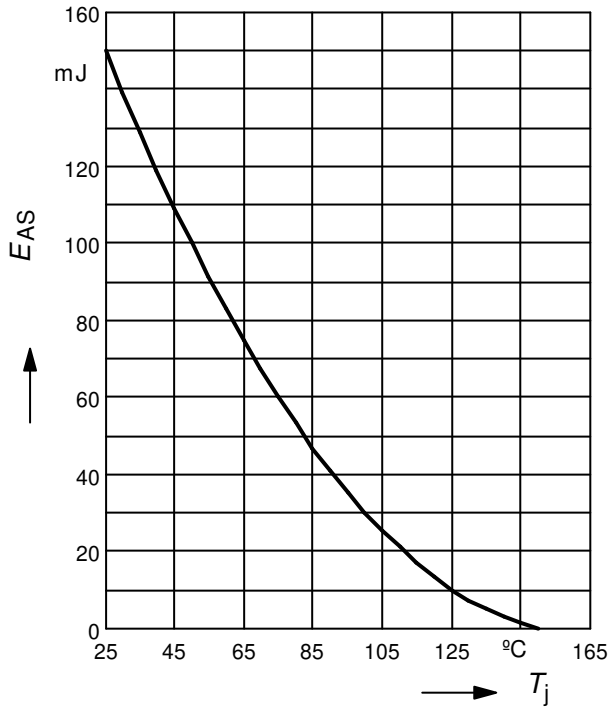
parameter: T_j , tp = 80 µs



13 Typ. avalanche energy

$E_{AS} = f(T_j)$

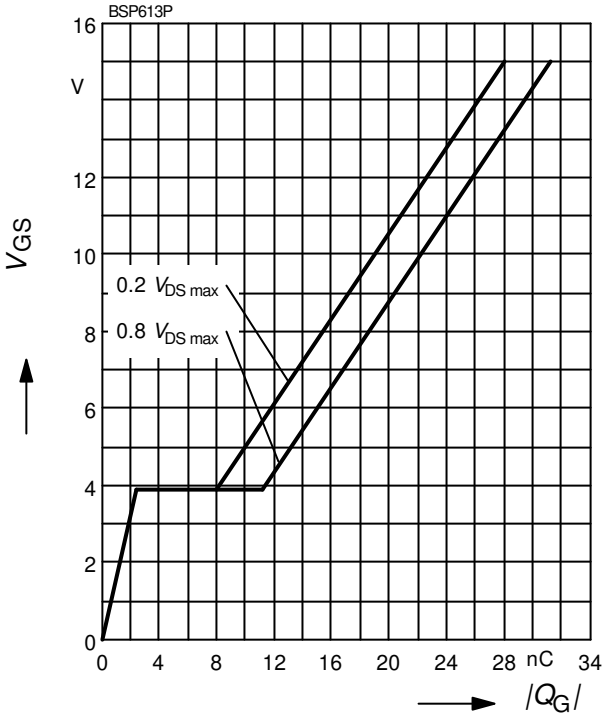
par.: $I_D = 2.9$ A , $V_{DD} = -25$ V, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

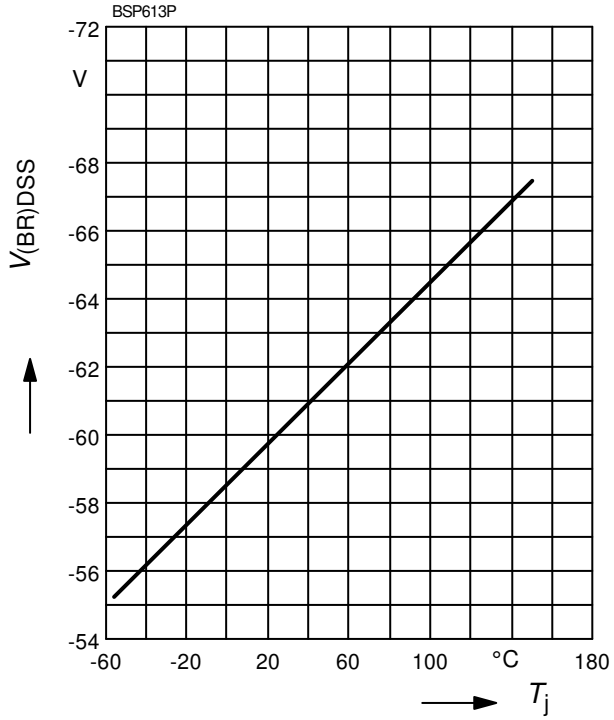
$V_{GS} = f(Q_G)$, parameter: V_{DS} ; $T_j = 25$ °C

$I_D = 2.9$ A pulsed;



15 Drain-source breakdown voltage

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



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