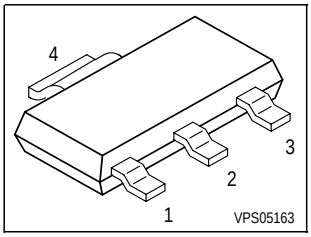
SIPMOS® Small-Signal-Transistor

Features

- P-Channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated

Product Summary

Drain source voltage	V_{DS}	-60	V
Drain-source on-state resistance	$R_{DS(on)}$	0.13	Ω
Continuous drain current	I_D	-2.9	A



Type	Package	Ordering Code
BSP613P	SOT-223	Q67040-S4190

Pin 1	Pin 2/4	PIN 3
G	D	S

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} = -25 V, R_{GS} = 25 Ω	E_{AS}	150	mJ
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.18	
Reverse diode d*v*/d*t* I_S = -2.9 A, V_{DS} = -48 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 and storage temperature	T_j , T_{stg}	-55...+150	°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}	-	-	19	K/W
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 V, I_D = -250 µA	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = -1 mA	$V_{GS(th)}$	-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 = 125 °C		-	-10	-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	$R_{DS(on)}$	-	0.11	0.13	Ω

[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm^2 (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	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}	2.3	4.6	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = -25 V, f = 1 MHz	C_{iss}	-	700	875	pF
Output capacitance V_{GS} = 0 V, V_{DS} = -25 V, f = 1 MHz	C_{oss}	-	235	295	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = -25 V, f = 1 MHz	C_{rss}	-	95	120	
Turn-on delay time V_{DD} = -30 V, V_{GS} = -10 V, I_D = -2.9 A, R_G = 2.7 Ω	$t_{d(on)}$	-	11.5	17	ns
Rise time V_{DD} = -30 V, V_{GS} = -10 V, I_D = -2.9 A, R_G = 2.7 Ω	t_r	-	12	18	
Turn-off delay time V_{DD} = -30 V, V_{GS} = -10 V, I_D = -2.9 A, R_G = 2.7 Ω	$t_{d(off)}$	-	35	52	
Fall time V_{DD} = -30 V, V_{GS} = -10 V, I_D = -2.9 A, R_G = 2.7 Ω	t_f	-	13	19	

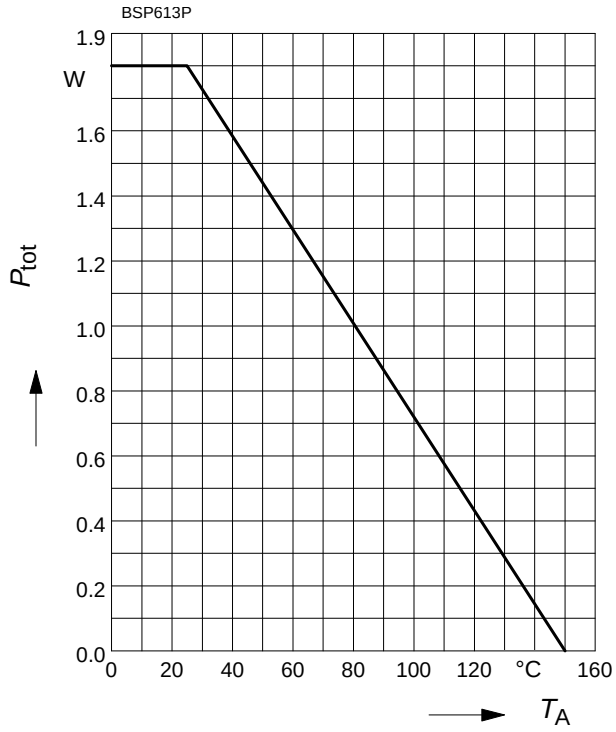
Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate to source charge V_{DD} = -48 V, I_D = -2.9 A	Q_{gs}	-	1.7	2.6	nC
Gate to drain charge V_{DD} = -48 V, I_D = -2.9 A	Q_{gd}	-	9.5	14.3	
Gate charge total V_{DD} = -48 V, I_D = -2.9 A, V_{GS} = 0 to -10 V	Q_g	-	22	33	
Gate plateau voltage V_{DD} = -48 V , I_D = -2.9 A	$V_{(plateau)}$	-	-3.7	-	V

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
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 = -2.9 A	V_{SD}	-	-0.8	-1.1	V
Reverse recovery time V_R = -30 V, I_F=I_S , di_F/dt = 100 A/µs	t_{rr}	-	46.6	79	ns
Reverse recovery charge V_R = -30 V, I_F=I_S , di_F/dt = 100 A/µs	Q_{rr}	-	75	112	nC

Power Dissipation

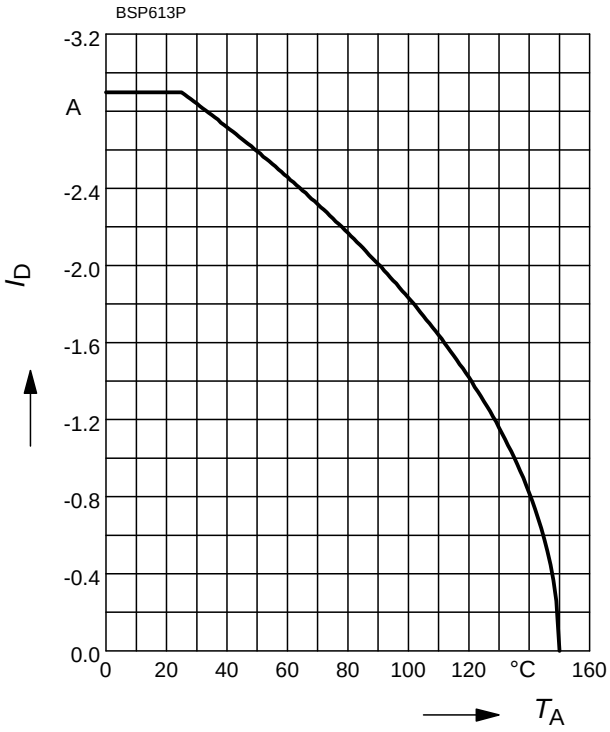
$P_{tot} = f(T_A)$



Drain current

$I_D = f(T_A)$

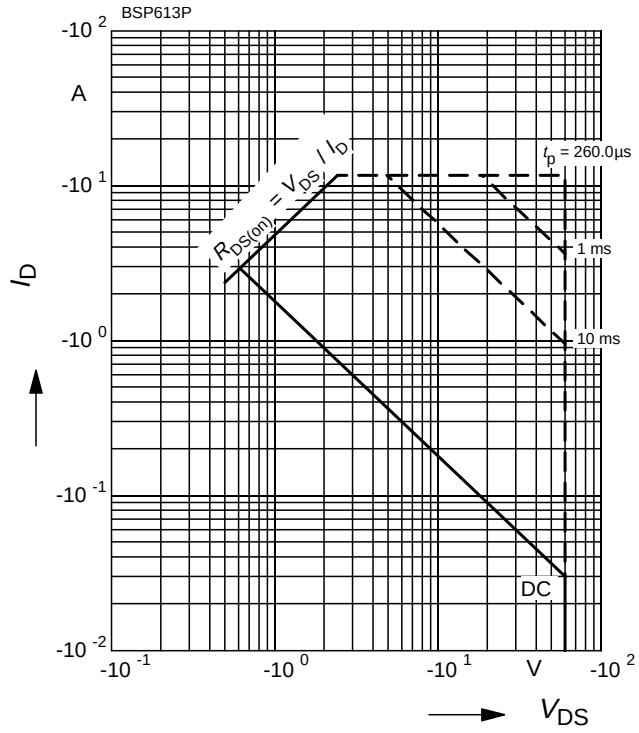
parameter: $V_{GS} \geq 10$ V



Safe operating area

$I_D = f(V_{DS})$

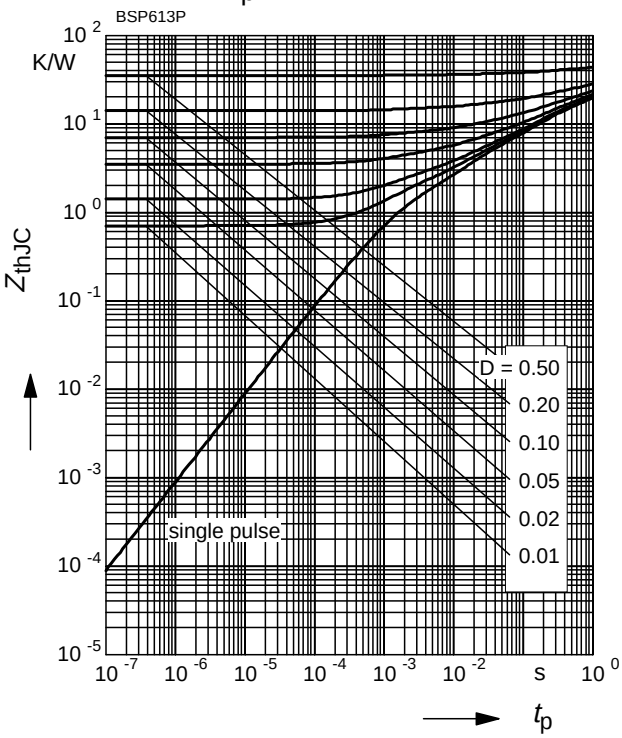
parameter : $D = 0$, $T_A = 25$ °C



Transient thermal impedance

$Z_{thJC} = f(t_p)$

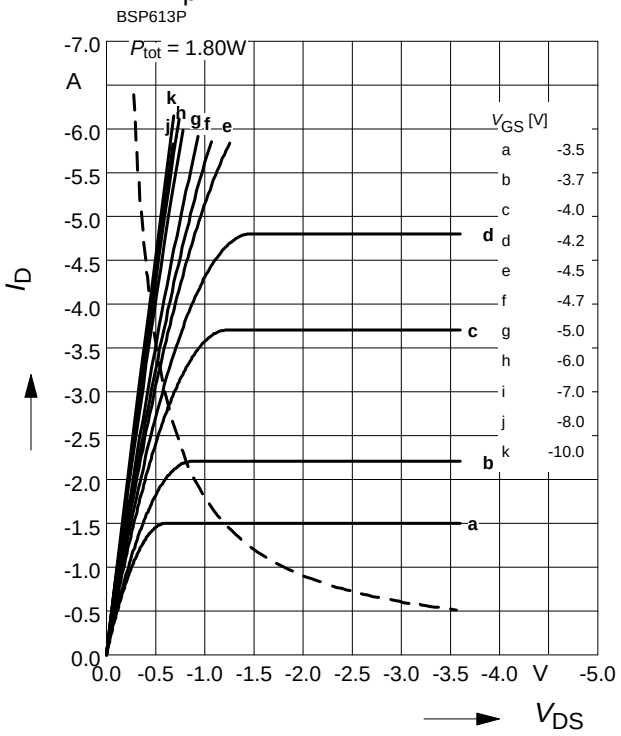
parameter: $D = t_p / T$



Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

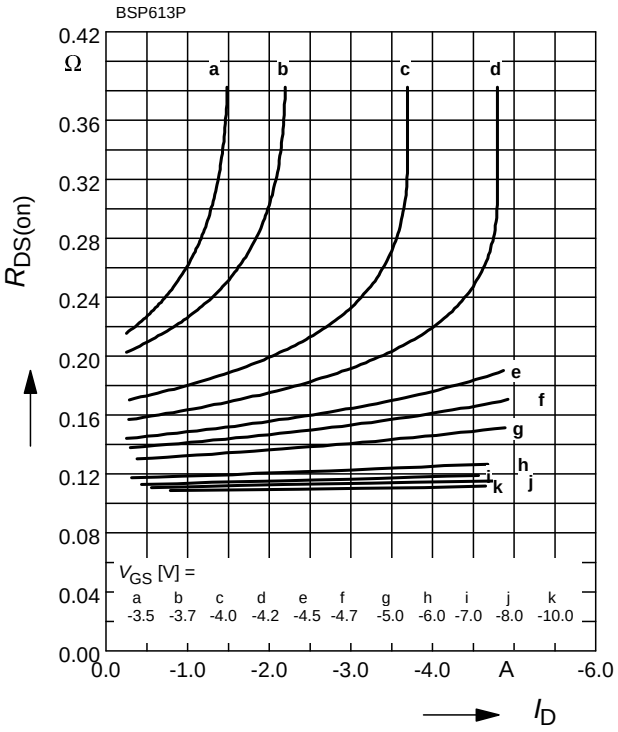
parameter: t_p = 80 µs



Typ. drain-source-on-resistance

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

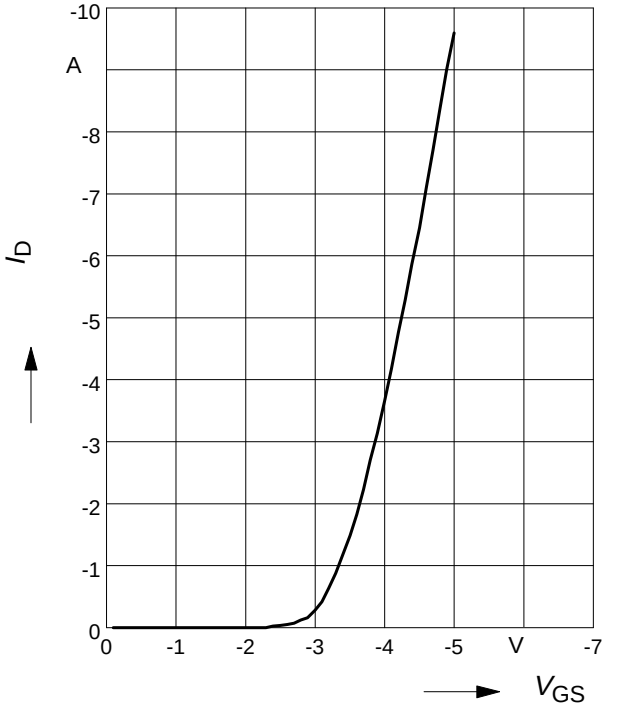
parameter: V_{GS}



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

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

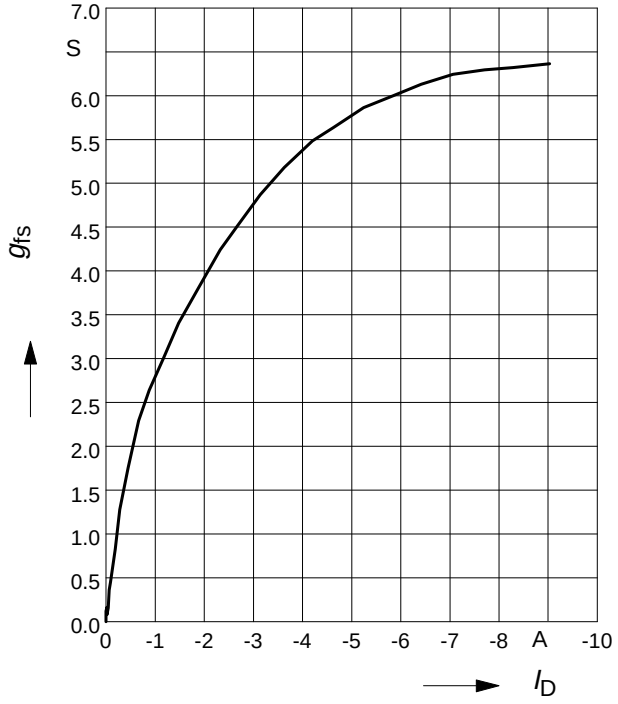
parameter: t_p = 80 µs



Typ. forward transconductance

g_{fs} = f(I_D); T_j=25°C

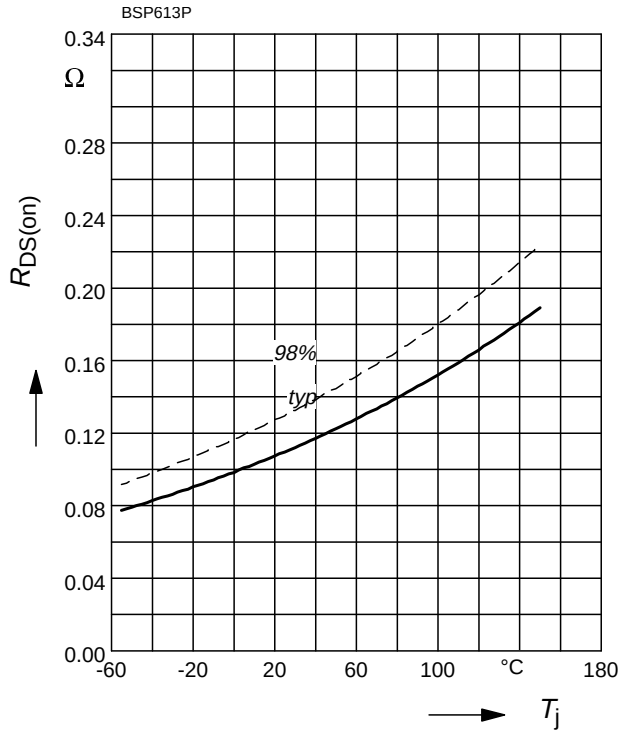
parameter: g_{fs}



Drain-source on-state resistance

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

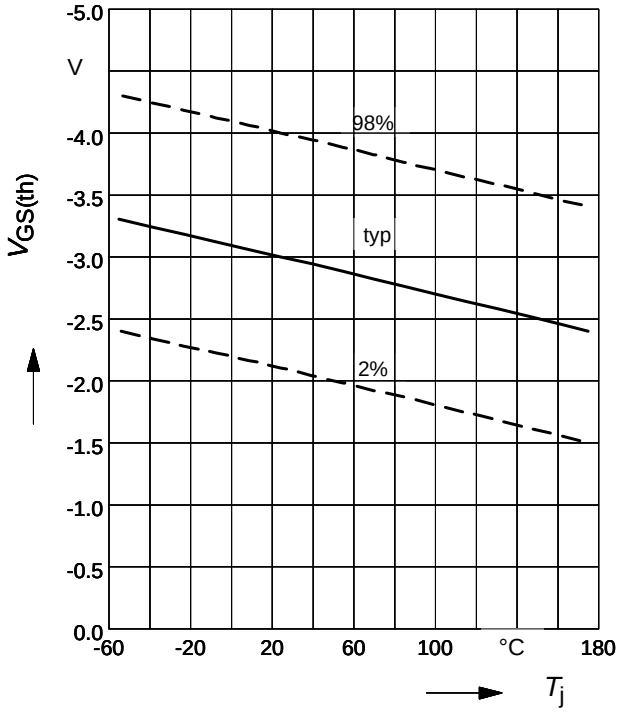
parameter : I_D = -2.9 A, V_{GS} = -10 V



Gate threshold voltage

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

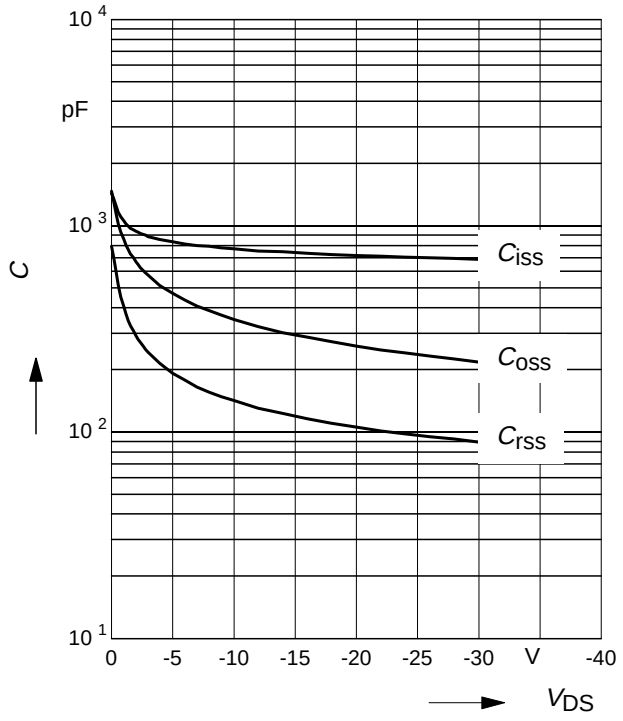
parameter: $V_{GS} = V_{DS}$, I_D = -1 mA



Typ. capacitances

$C = f(V_{DS})$

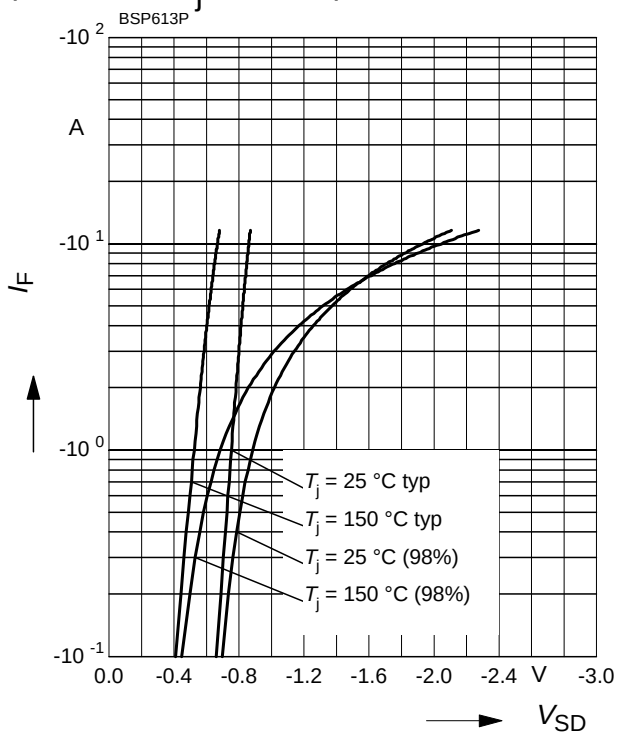
parameter: V_{GS}=0V, f=1 MHz



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

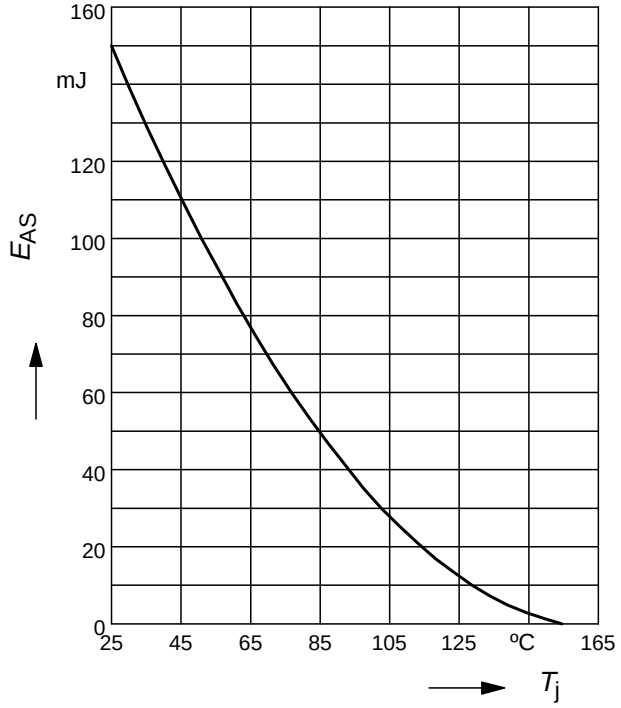
parameter: T_j , tp = 80 µs



Avalanche energy

$E_{AS} = f(T_j)$

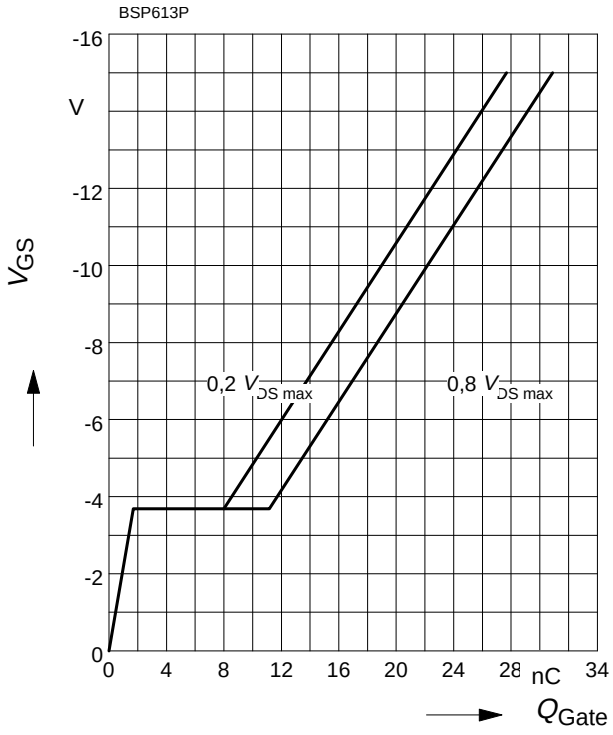
para.: I_D = -2.9 A , V_{DD} = -25 V, R_{GS} = 25 Ω



Typ. gate charge

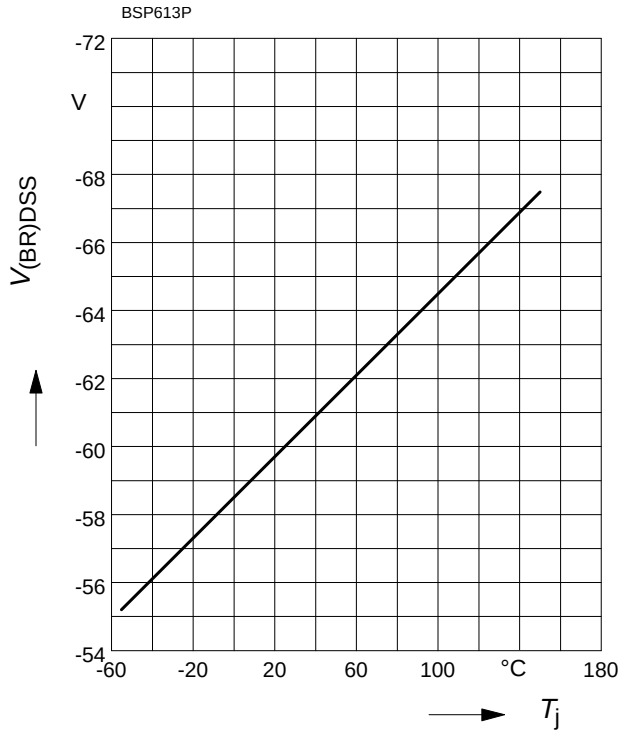
$V_{GS} = f\ (Q_{Gate})$

parameter: I_D = -2.9 A pulsed



Drain-source breakdown voltage

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



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