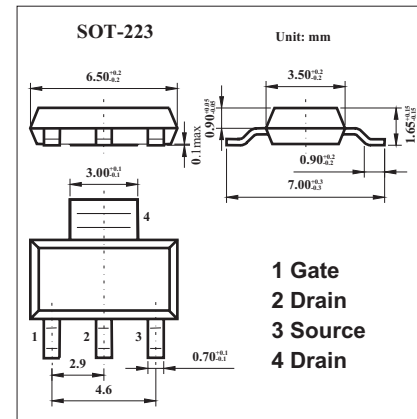
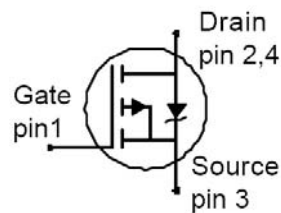


SIPMOS Small-Signal-Transistor

BSP613P

■ Features

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- Ideal for fast switching buck converter



■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Continuous drain current $T_A=25^\circ\text{C}$	I_D	-2.9	A
Pulsed drain current $T_A=25^\circ\text{C}$	I_{DP}	-11.6	A
Avalanche energy, single pulse *1	E_{AS}	150	mJ
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.18	mJ
Reverse diode dv /dt *2	dv /dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation	P_D	1.8	W
Operating and storage temperature	T_j, T_{stg}	-55 to +150	$^\circ\text{C}$
Thermal resistance, junction - soldering point	R_{thJS}	19	K/W
Operating and storage temperature	T_j, T_{stg}	-55 to 150	$^\circ\text{C}$

*1 $I_D=-2.9\text{A}$, $V_{DS}=-25\text{V}$, $R_{GS}=25\ \Omega$

*2 $I_S=2.9\text{A}$, $V_{DS}=-48\text{V}$, $d_i/dt=-200\text{A}/\mu\text{s}$, $T_{j,max}=150^\circ\text{C}$

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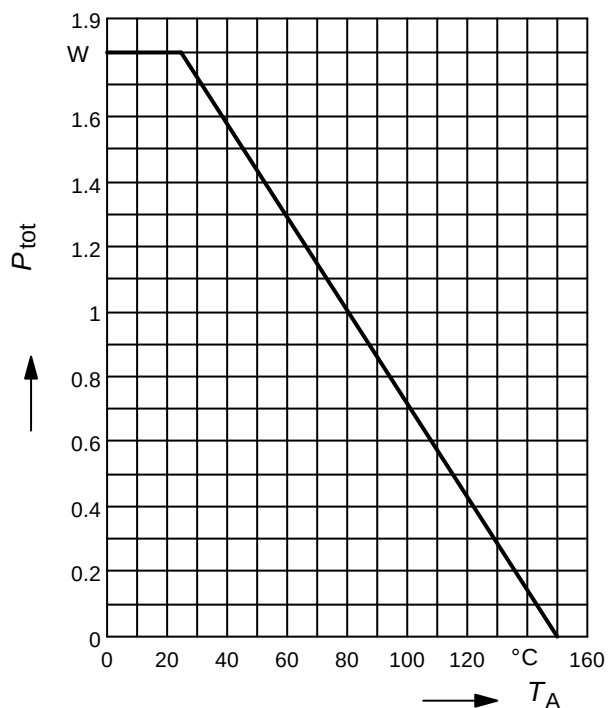
■ Electrical Characteristics Ta = 25℃

Parameter	Symbol	Testconditons	Min	Typ	Max	Unit
Drain-source breakdown voltage	V _{DSS}	V _{GS} =0 V, I _D =-250 μ A	-60			V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V, T _j =25 ℃		-0.1	-1	μ A
		V _{DS} =-60 V, V _{GS} =0 V, T _j =125 ℃		-10	-100	
Gate-source leakage current	I _{GSS}	V _{GS} =-20 V, V _{DS} =0 V		-10	-100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-1mA	-2.1	-3	-4	V
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =-10V, I _D =2.9A		0.11	0.13	Ω
Forward Transconductance	g _{fs}	V _{DS} >2 I _D R _{DS(on)} max, I _D =2.9 A	2.7	5.4		S
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =-25V, f =1 MHz		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} =-30 V, V _{GS} =-10 V, I _D =-2.9A, R _G =2.7 Ω		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 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 recovery time	t _{rr}	V _R =-30V, I _F = I _S , diF/dt=100A/μ s		37.2	79	ns
Reverse recovery charge	Q _{rr}			59.8	112	nC
Diode continous forward current	I _S	T _A =25℃			-2.9	A
Diode pulse curret	I _{SM}				-11.6	A
Diode forward voltage	V _{SD}	V _{GS} =0V, I _F = I _S		-0.88	-1.1	V

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1 Power Dissipation

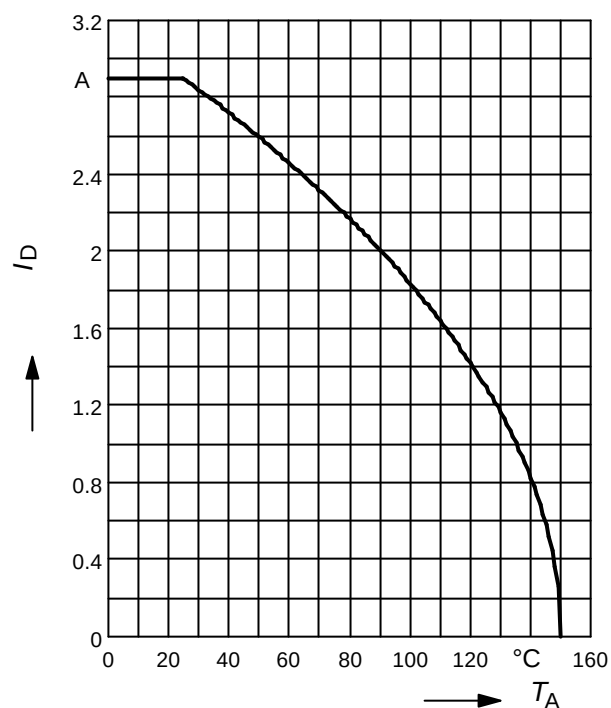
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

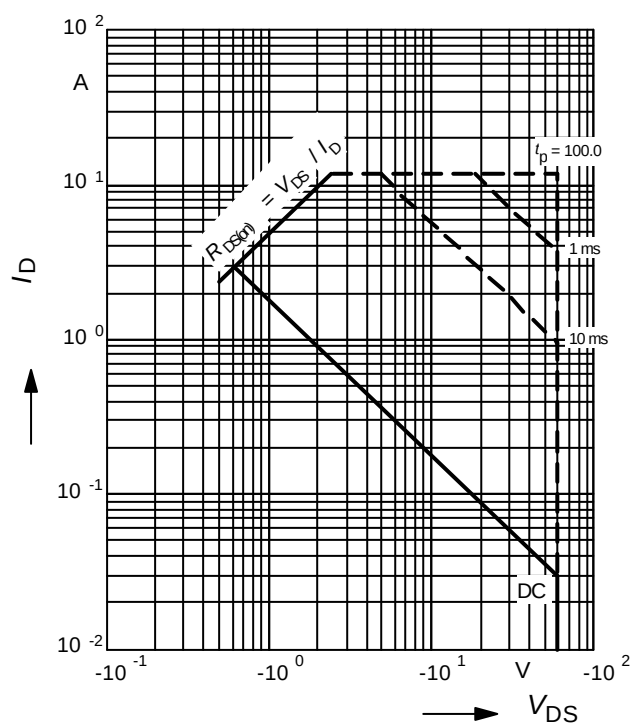
parameter: $V_{\text{GS}} \geq 10 \text{ V}$



3 Safe operating area

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

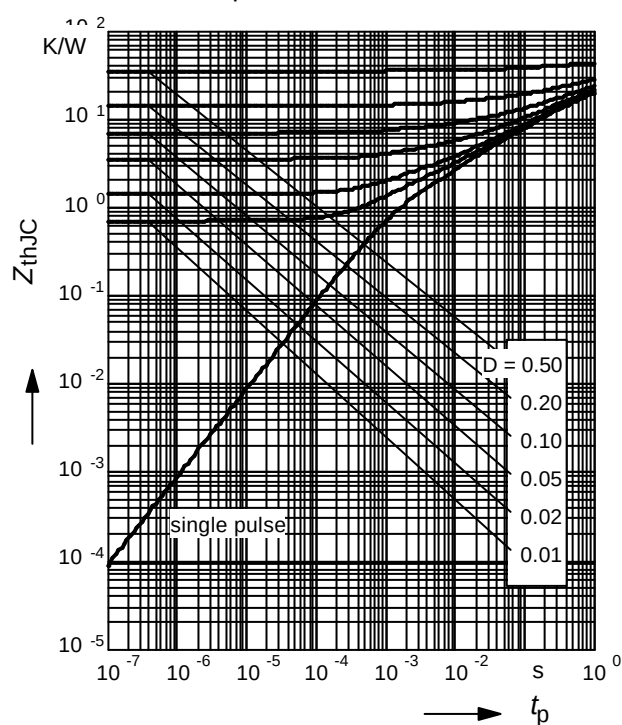
parameter: $D = 0$, $T_A = 25^{\circ}\text{C}$



4 Transient thermal impedance

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

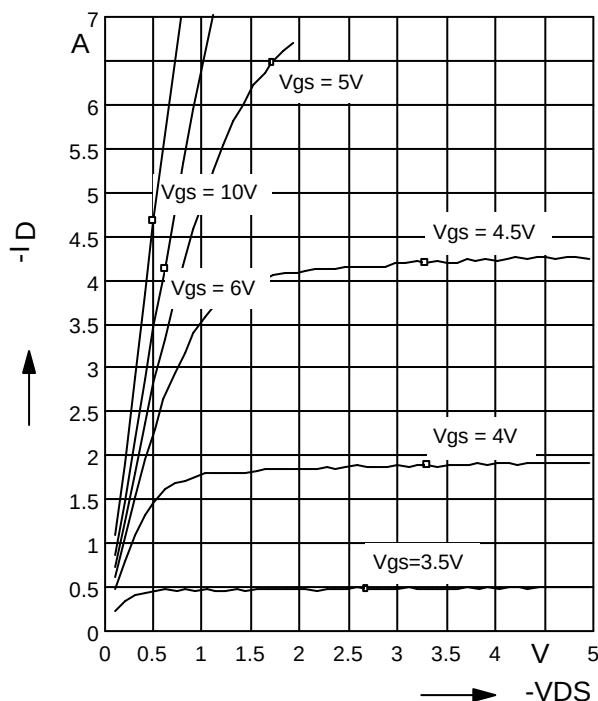
parameter: $D = t_p / T$



BSP613P**5 Typ. output characteristic**

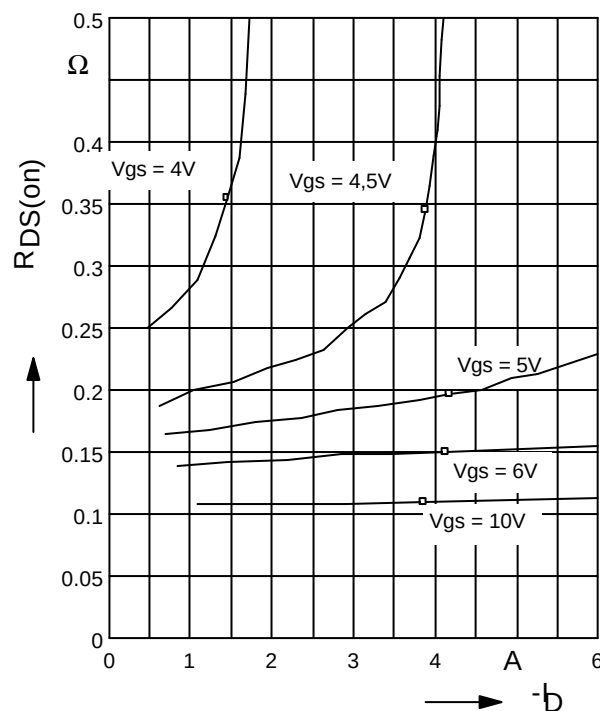
$$I_D = f(V_{DS})$$

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

**6 Typ. drain-source on resistance**

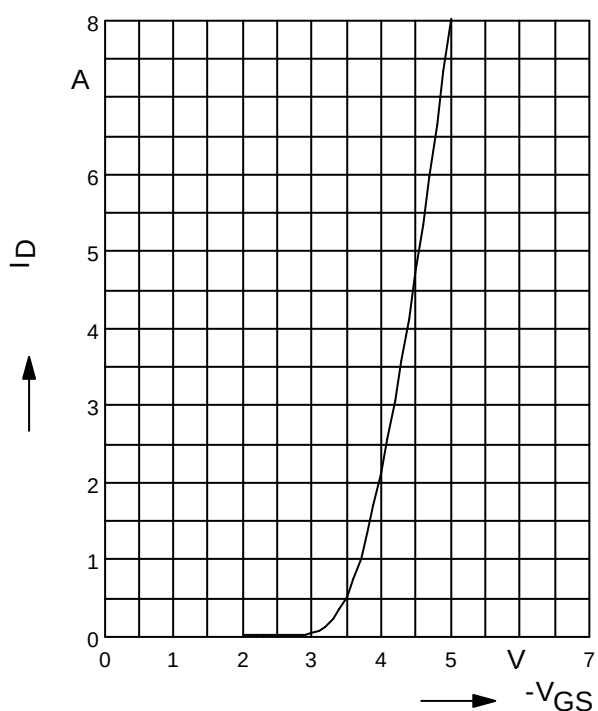
$$R_{DS(on)} = f(I_D)$$

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

**7 Typ. transfer characteristics**

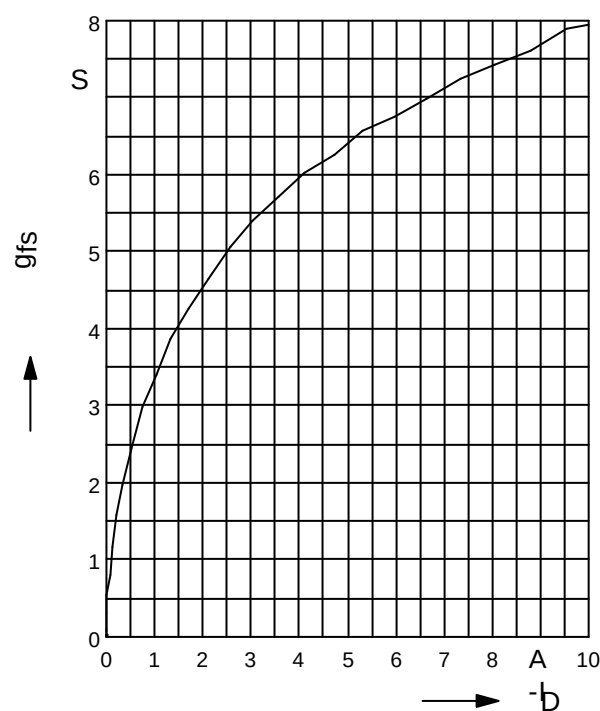
$$I_D = f(V_{GS}); |V_{DS}| \geq 2 \times |I_D| \times R_{DS(on)max}$$

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

**8 Typ. forward transconductance**

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

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

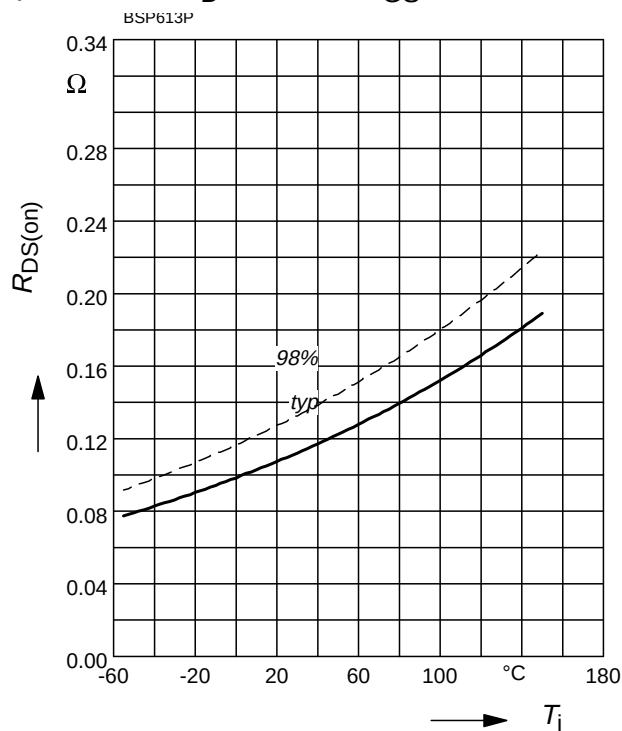


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9 Drain-source on-state resistance

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

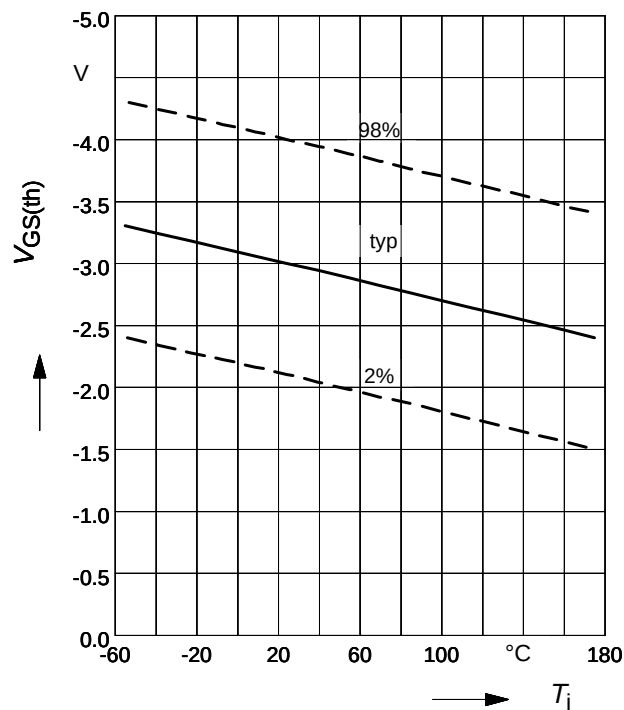
parameter: $I_D = -2.9\text{ A}$, $V_{GS} = -10\text{ V}$



10 Gate threshold voltage

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

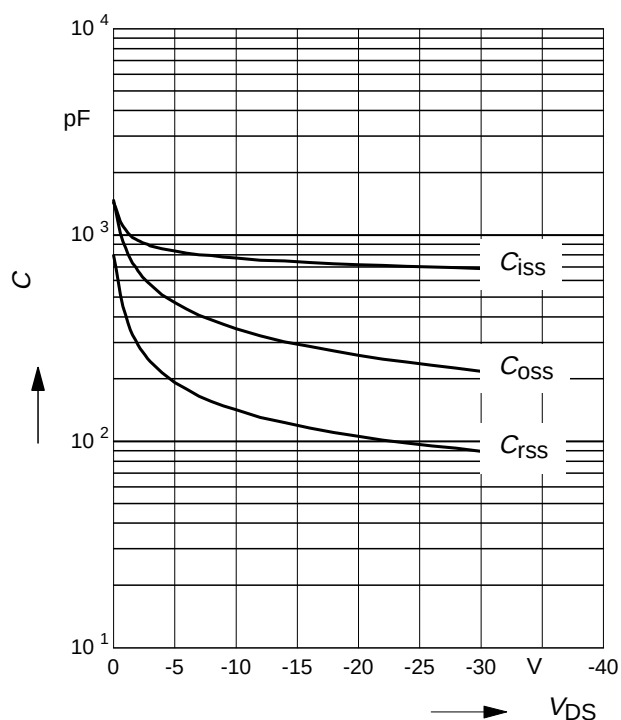
parameter: $V_{GS} = V_{DS}$, $I_D = -1\text{ mA}$



11 Typ. capacitances

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

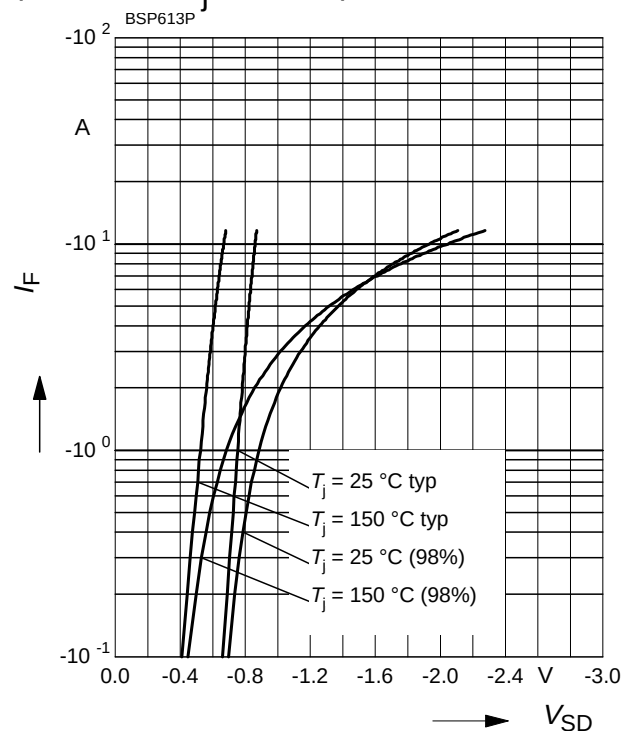
parameter: $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$



12 Forward characteristics of reverse diode

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

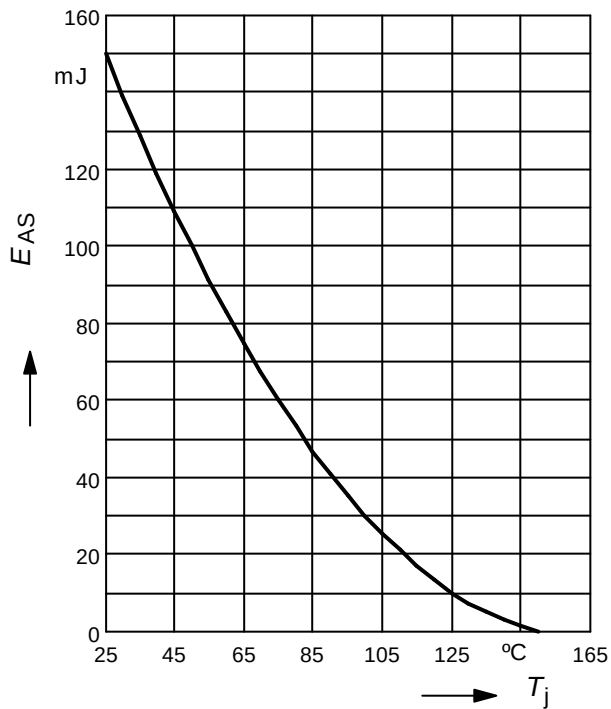
parameter: T_j , $t_p = 80\text{ }\mu\text{s}$



BSP613P**13 Typ. avalanche energy**

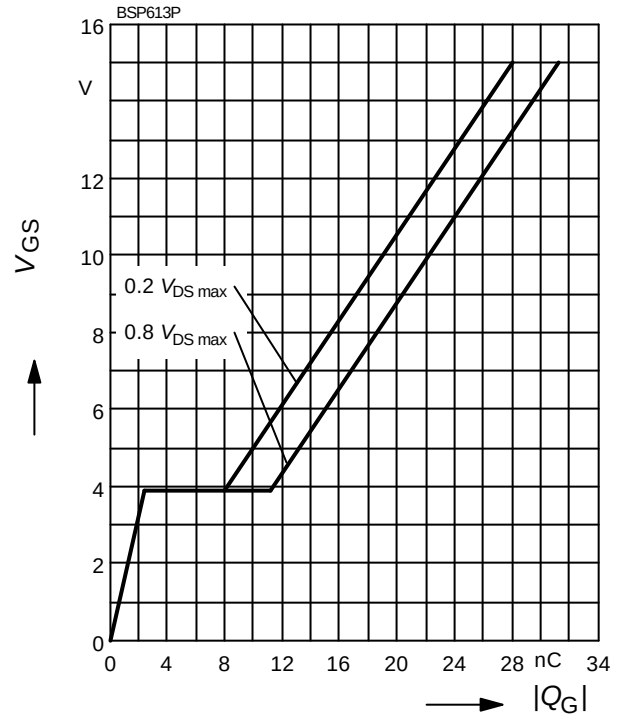
$$E_{AS} = f(T_j)$$

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

**14 Typ. gate charge**

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

$I_D = 2.9\text{ A}$ pulsed;

**15 Drain-source breakdown voltage**

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

