

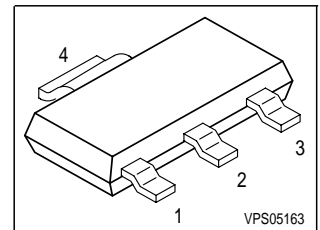
## SIPMOS® Small-Signal-Transistor

### Features

- N-Channel
- Enhancement mode
- Avalanche rated
- Logic Level
- dv/dt rated

### Product Summary

Drain source voltage	$V_{DS}$	60	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.09	$\Omega$
Continuous drain current	$I_D$	2.6	A



Type	Package	Ordering Code
BSP318S	SOT-223	Q67000-S4002

Pin 1	Pin 2, 4	PIN 3
G	D	S

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

Parameter	Symbol	Value	Unit
Continuous drain current	$I_D$	2.6	A
Pulsed drain current $T_A = 25\text{ °C}$	$I_{D\text{ puls}}$	10.4	
Avalanche energy, single pulse $I_D = 2.6\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	60	mJ
Avalanche current, periodic limited by $T_{jmax}$	$I_{AR}$	2.6	A
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	0.18	mJ
Reverse diode dv/dt $I_S = 2.6\text{ A}$ , $V_{DS} = 20\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 150\text{ °C}$	dv/dt	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_A = 25\text{ °C}$	$P_{tot}$	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.	
<b>Characteristics</b>					
Thermal resistance, junction - soldering point (Pin 4)	$R_{thJS}$	-	17	-	K/W
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	- -	100 -	- 70	

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 20\text{ }\mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ °C}$	$I_{DSS}$	- -	0.1 -	1 100	$\mu\text{A}$
Gate-source leakage current $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	-	10	100	nA
Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$ , $I_D = 2.6\text{ A}$	$R_{DS(on)}$	-	0.12	0.15	$\Omega$
Drain-Source on-state resistance $V_{GS} = 10\text{ V}$ , $I_D = 2.6\text{ A}$	$R_{DS(on)}$	-	0.07	0.09	

<sup>1</sup>Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 2.6\text{ A}$	$g_{fs}$	2.4	5.5	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	300	380	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	90	120	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	50	65	
Turn-on delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 2.6\text{ A}$ , $R_G = 16\ \Omega$	$t_{d(on)}$	-	12	20	ns
Rise time $V_{DD} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 2.6\text{ A}$ , $R_G = 16\ \Omega$	$t_r$	-	15	25	
Turn-off delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 2.6\text{ A}$ , $R_G = 16\ \Omega$	$t_{d(off)}$	-	20	30	
Fall time $V_{DD} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 2.6\text{ A}$ , $R_G = 16\ \Omega$	$t_f$	-	15	25	

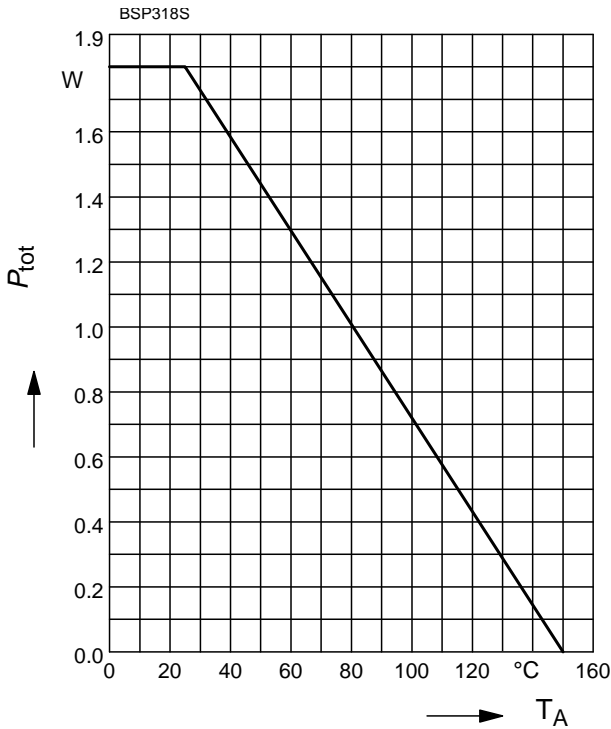
**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Gate charge at threshold $V_{DD} = 40\text{ V}$ , $I_D = 0.1\text{ A}$ , $V = 1\text{ V}$	$Q_{G(th)}$	-	0.4	0.6	nC
Gate charge at $V_{GS} = 5\text{ V}$ $V_{DD} = 40\text{ V}$ , $I_D = 2.6\text{ A}$ , $V_{GS} = 0\text{ to }5\text{ V}$	$Q_{g(5)}$	-	7	10	
Gate charge total $V_{DD} = 40\text{ V}$ , $I_D = 2.6\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$	$Q_g$	-	14	20	
Gate plateau voltage $V_{DD} = 40\text{ V}$ , $I_D = 2.6\text{ A}$	$V_{(plateau)}$	-	3.6	-	V

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Reverse Diode</b>					
Inverse diode continuous forward current $T_A = 25\text{ °C}$	$I_S$	-	-	2.6	A
Inverse diode direct current,pulsed $T_A = 25\text{ °C}$	$I_{SM}$	-	-	10.4	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 5.2\text{ A}$	$V_{SD}$	-	0.95	1.2	V
Reverse recovery time $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	50	75	ns
Reverse recovery charge $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.1	0.15	$\mu\text{C}$

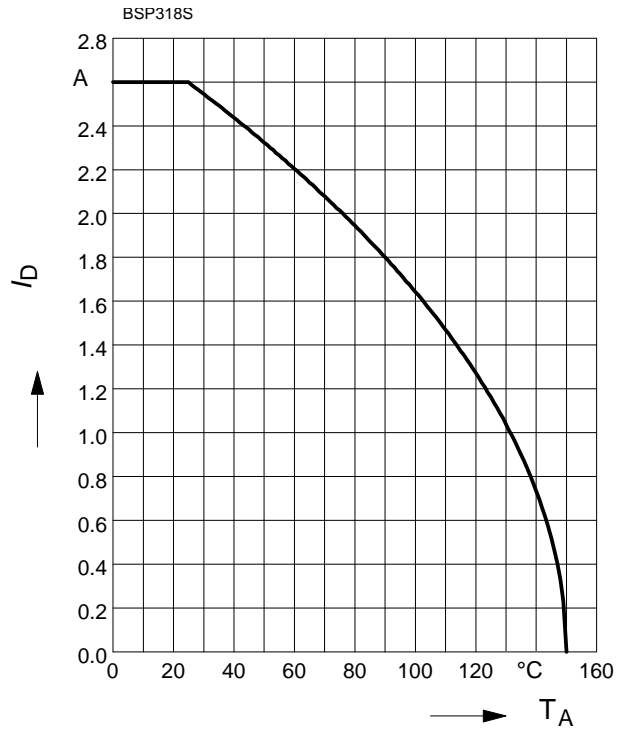
**Power Dissipation**

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



**Drain current**

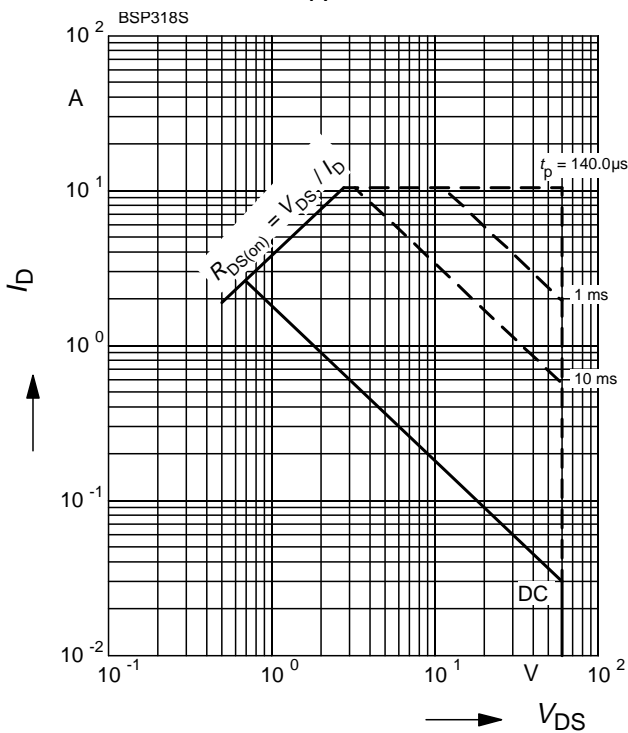
$$I_D = f(T_A)$$



**Safe operating area**

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

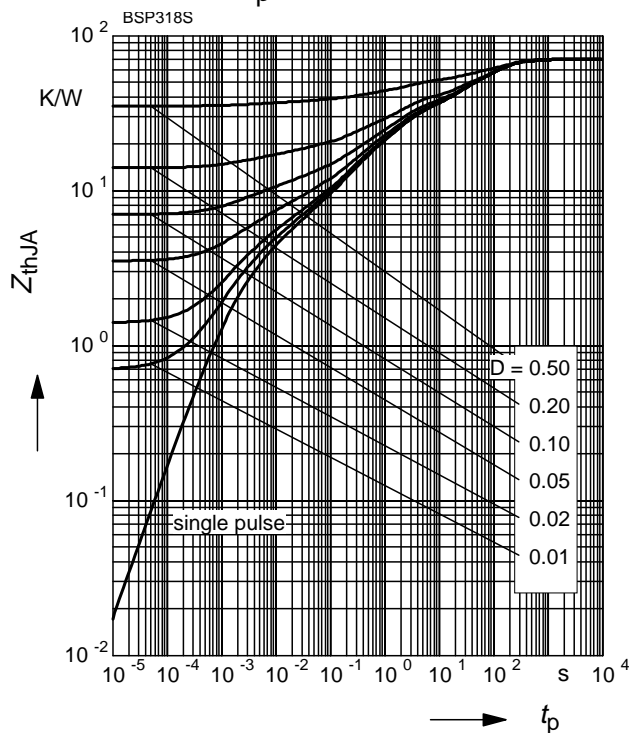
parameter :  $D = 0$  ,  $T_A = 25\text{ °C}$



**Transient thermal impedance**

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

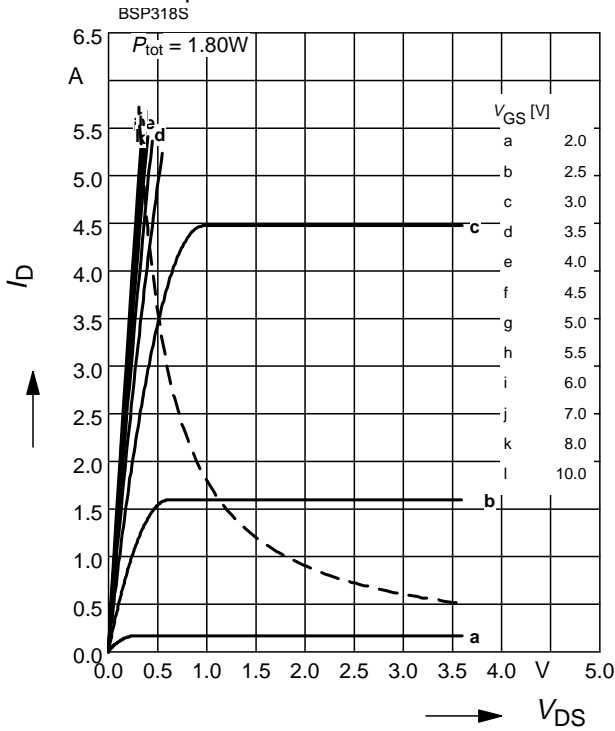
parameter :  $D = t_p/T$



**Typ. output characteristic**

$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

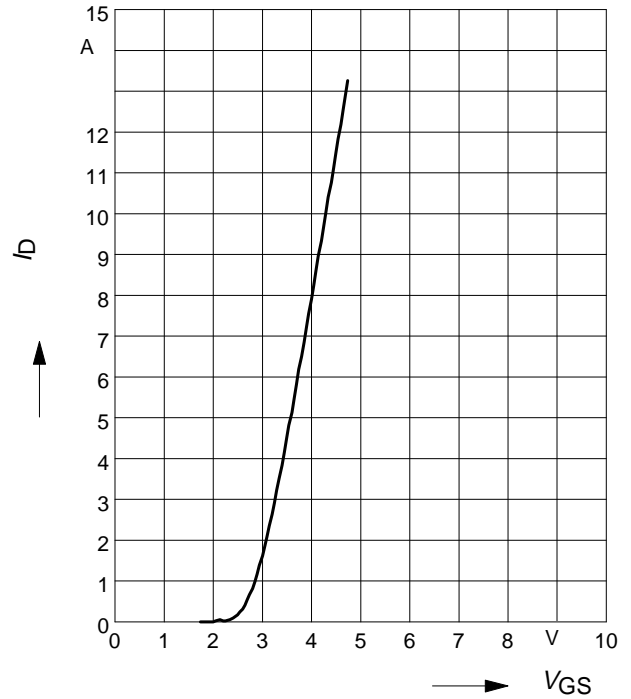
parameter:  $t_p = 80 \mu\text{s}$



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

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

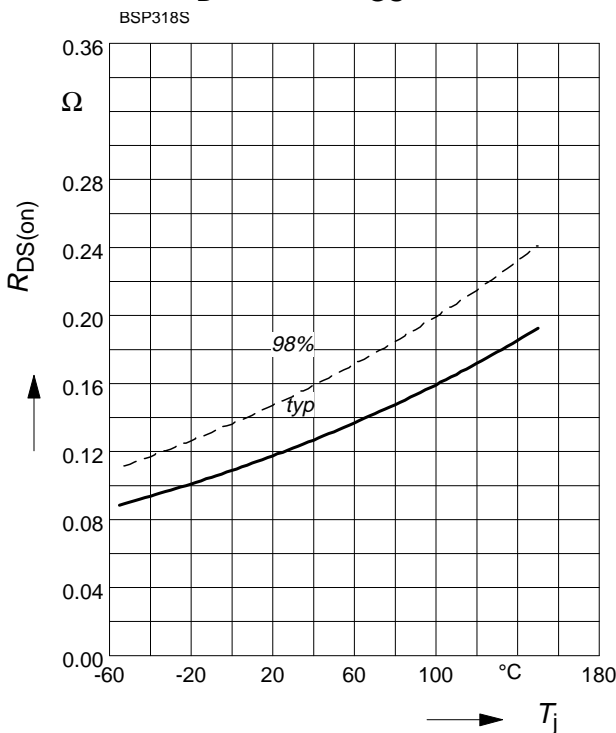
parameter:  $t_p = 80 \mu\text{s}$



**Drain-source on-resistance**

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

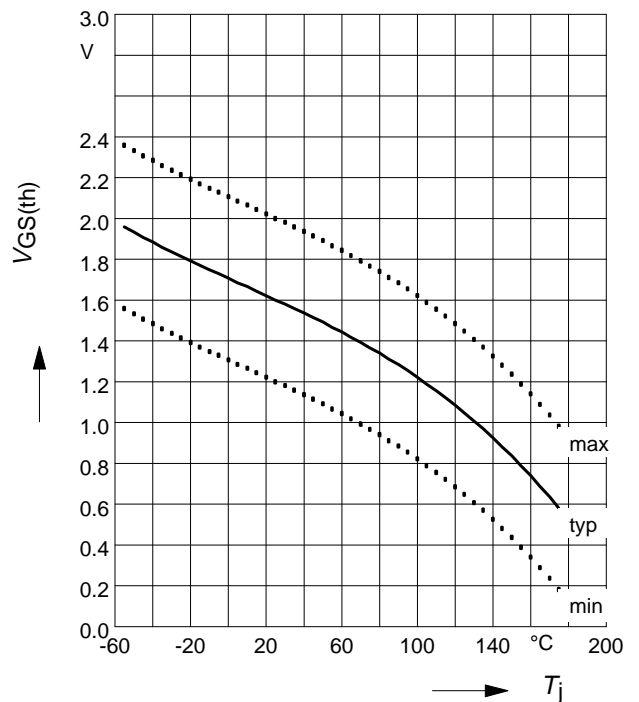
parameter:  $I_D = 2.6 \text{ A}, V_{GS} = 4.5 \text{ V}$



**Gate threshold voltage**

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

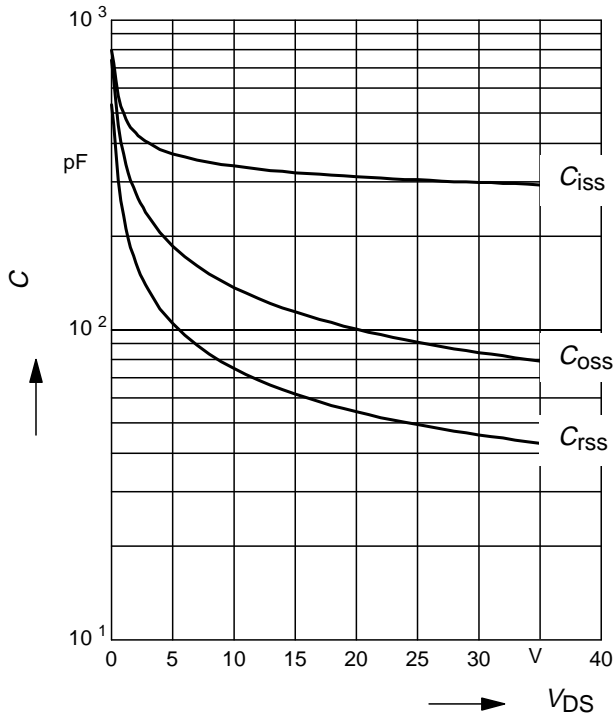
parameter:  $V_{GS} = V_{DS}, I_D = 20 \mu\text{A}$



**Typ. capacitances**

$C = f(V_{DS})$

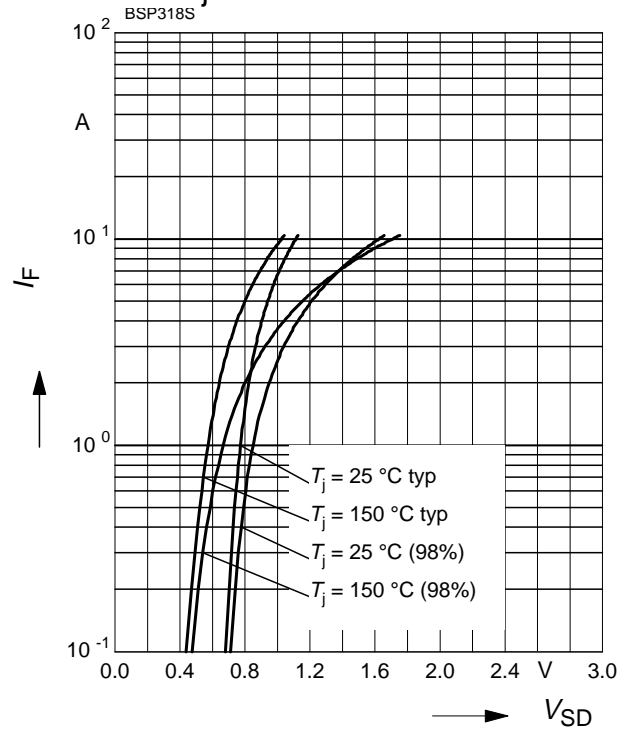
parameter:  $V_{GS}=0\text{ V}$ ,  $f=1\text{ MHz}$



**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

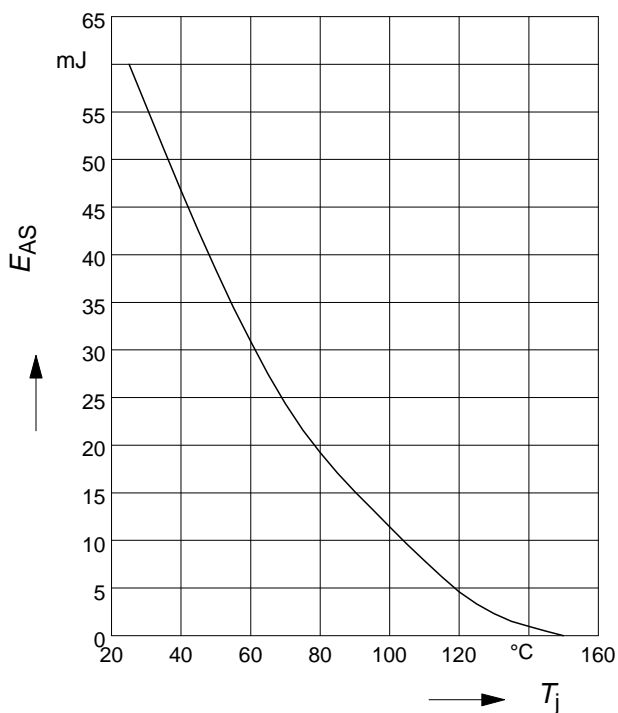
parameter:  $T_j$ ,  $t_p = 80\ \mu\text{s}$



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

parameter:  $I_D = 2.6\text{ A}$ ,  $V_{DD} = 25\text{ V}$

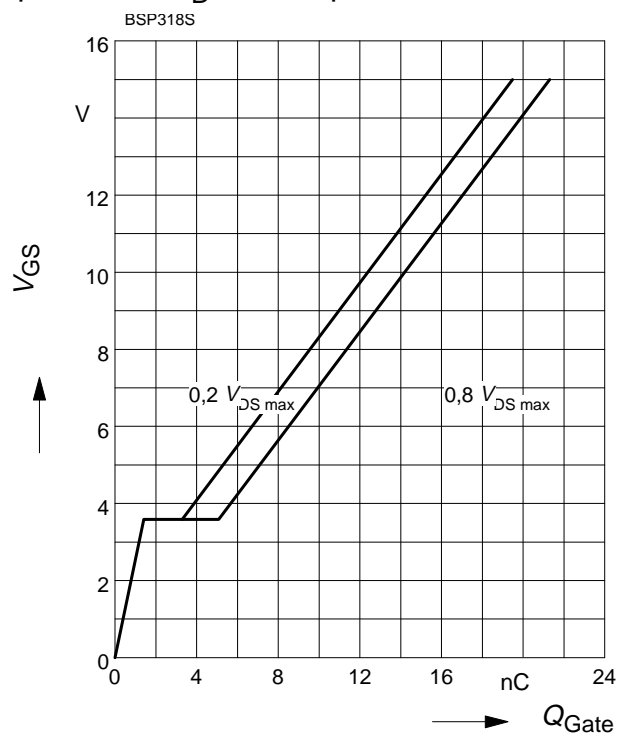
$R_{GS} = 25\ \Omega$



**Typ. gate charge**

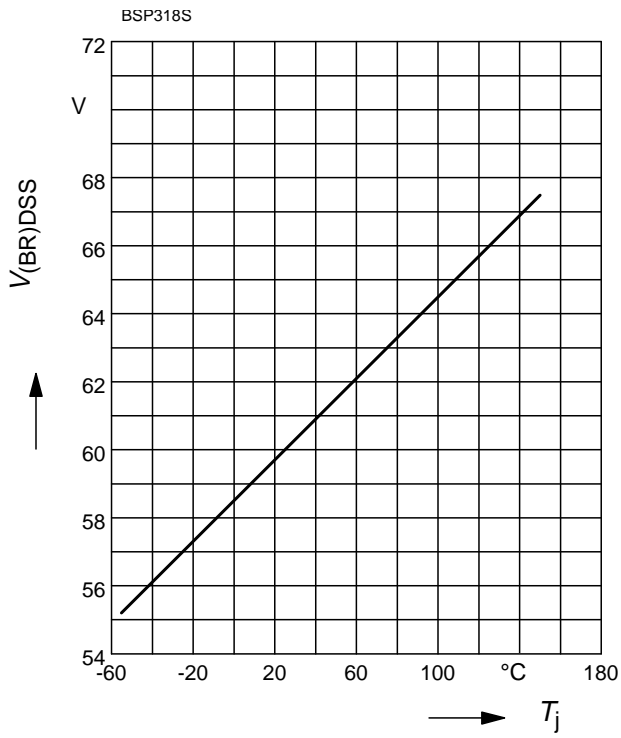
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = 2.6\text{ A pulsed}$



**Drain-source breakdown voltage**

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





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