

SIPMOS[®] Small-Signal-Transistor

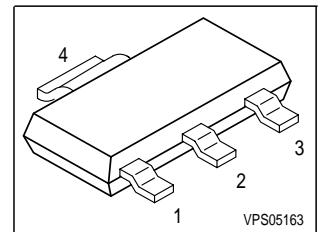
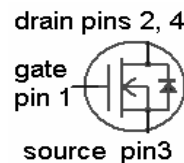
Features

- N-Channel
- Enhancement mode
- Avalanche rated
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21



Product Summary

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



| Type | Package | Tape and Reel | Marking | Packaging |
|---------|-----------|-------------------|---------|-----------|
| BSP318S | PG-SOT223 | H6327: 1000 pcs/r | BSP318S | Non dry |

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/ μs |
| Gate source voltage | V_{GS} | ± 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 | |
| ESD Class JESD22-A114-HBM | | Class 1b | |

Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|------------|--------|----------|---------|------|
| | | min. | typ. | max. | |
| Characteristics | | | | | |
| Thermal resistance, junction - soldering point (Pin 4) | R_{thJS} | - | 17 | - | K/W |
| SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ¹⁾ | R_{thJA} | - - | 100 - | - 70 | |

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

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|----------|----------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| 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 | μA |
| 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 | Ω |
| Drain-Source on-state resistance $V_{GS} = 10\text{ V}$, $I_D = 2.6\text{ A}$ | $R_{DS(on)}$ | - | 0.07 | 0.09 | |

¹Device on 50mm*50mm*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 $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|--|--------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| 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 | |

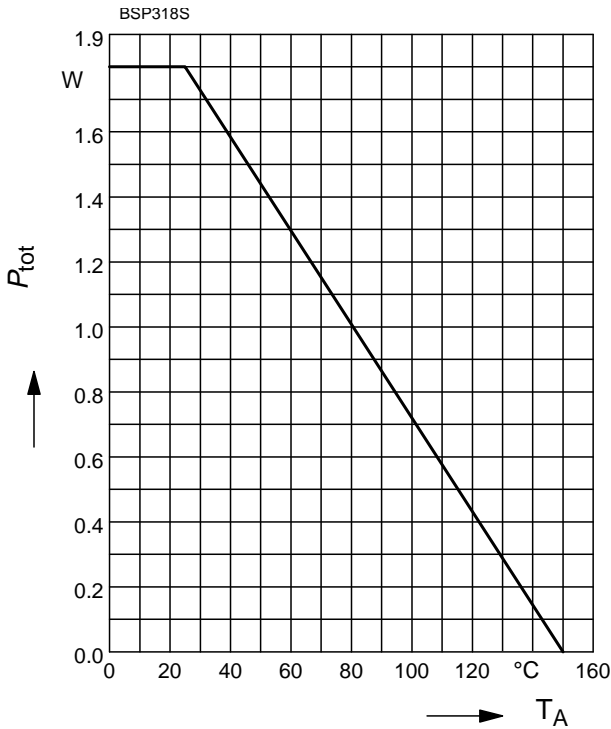
Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| 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. | |
| Reverse Diode | | | | | |
| 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 | μC |

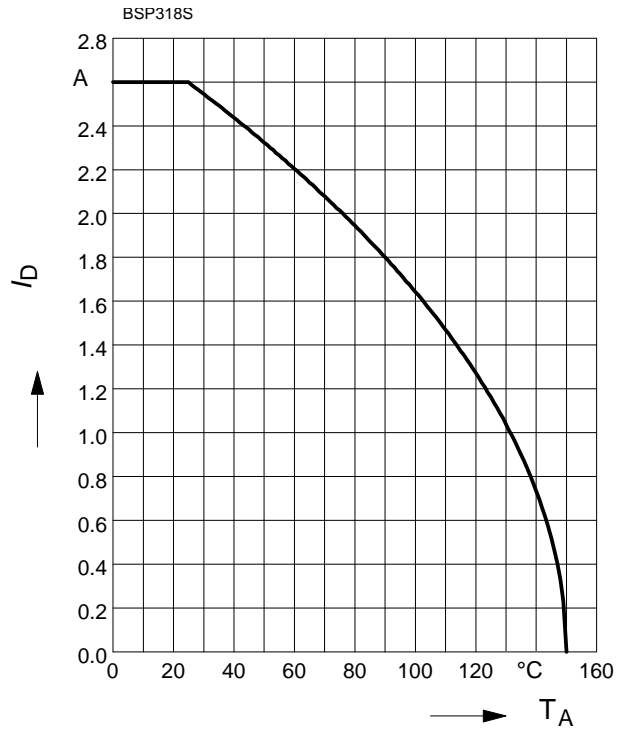
Power Dissipation

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



Drain current

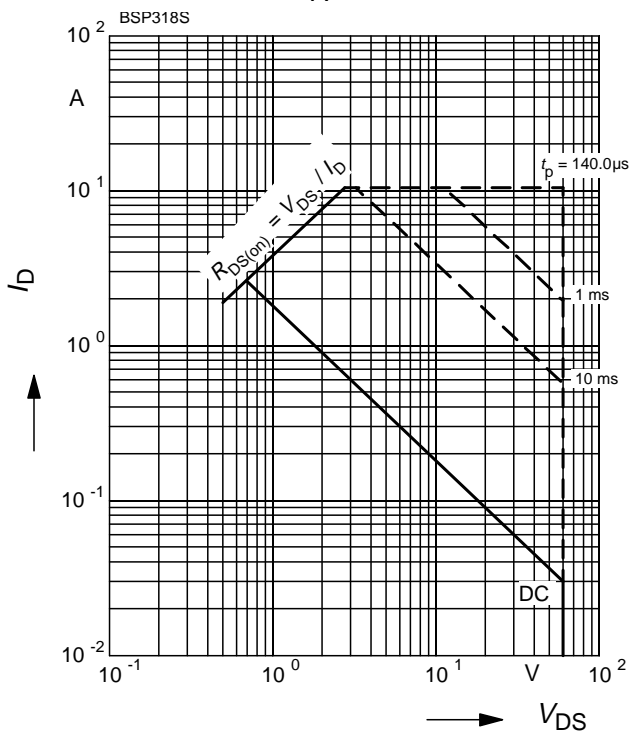
$$I_D = f(T_A)$$



Safe operating area

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

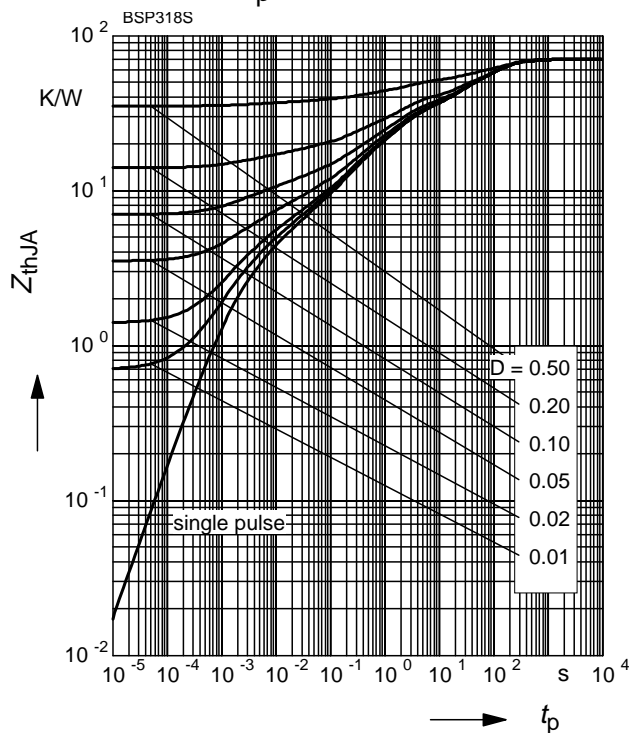
parameter : $D = 0$, $T_A = 25\text{ °C}$



Transient thermal impedance

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

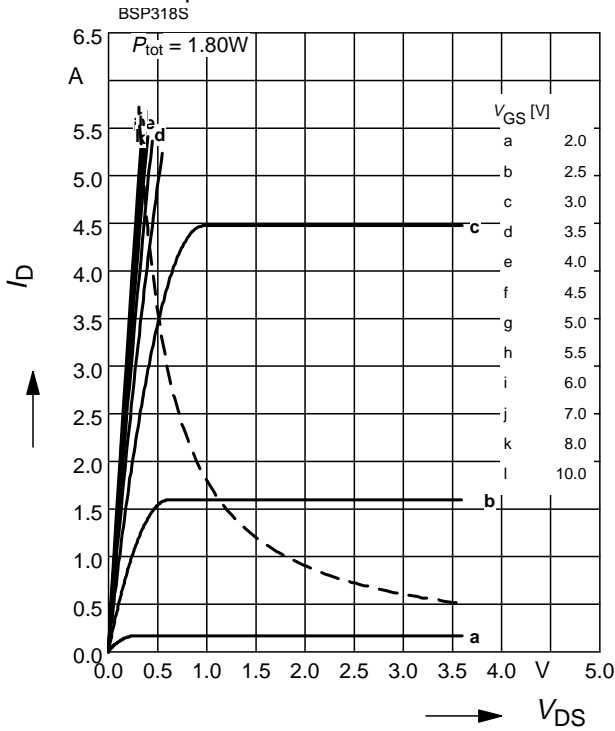
parameter : $D = t_p/T$



Typ. output characteristic

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

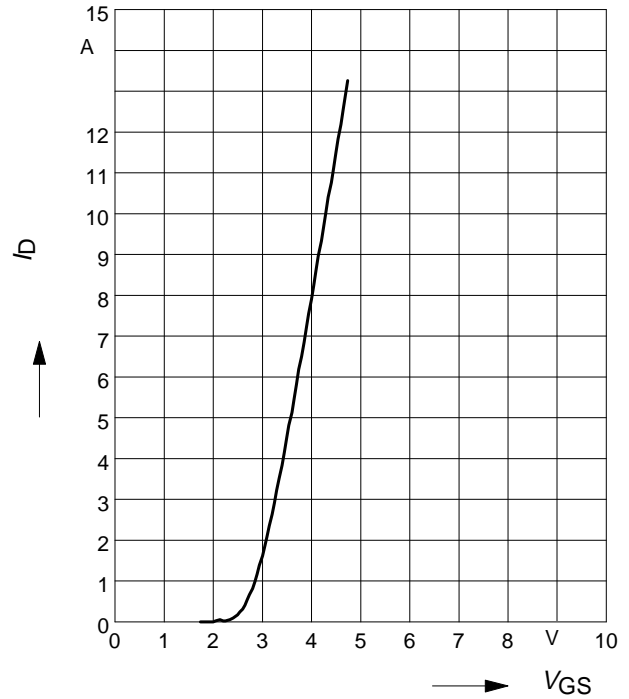
parameter: $t_p = 80 \mu\text{s}$



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

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

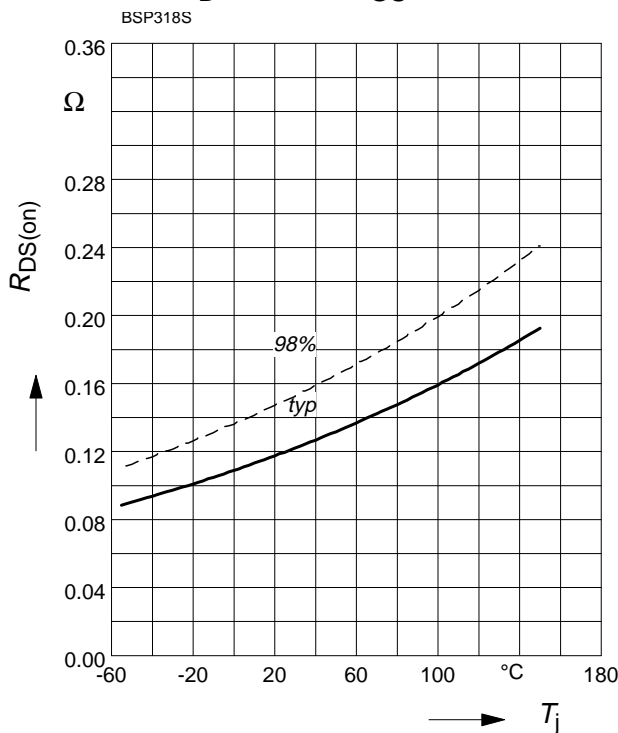
parameter: $t_p = 80 \mu\text{s}$



Drain-source on-resistance

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

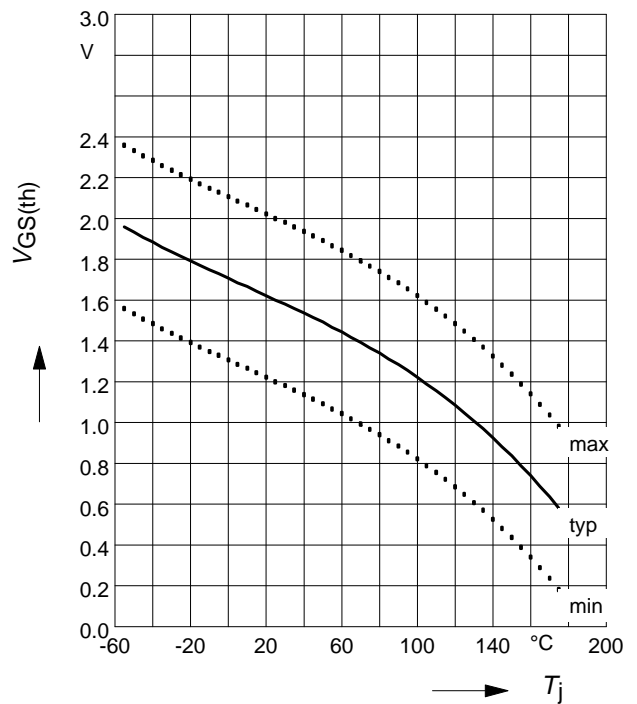
parameter: $I_D = 2.6 \text{ A}, V_{GS} = 4.5 \text{ V}$



Gate threshold voltage

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

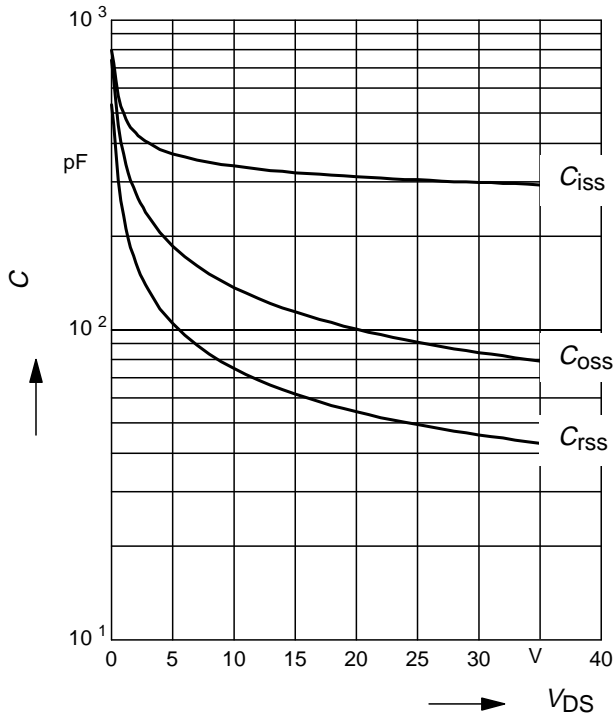
parameter: $V_{GS} = V_{DS}, I_D = 20 \mu\text{A}$



Typ. capacitances

$C = f(V_{DS})$

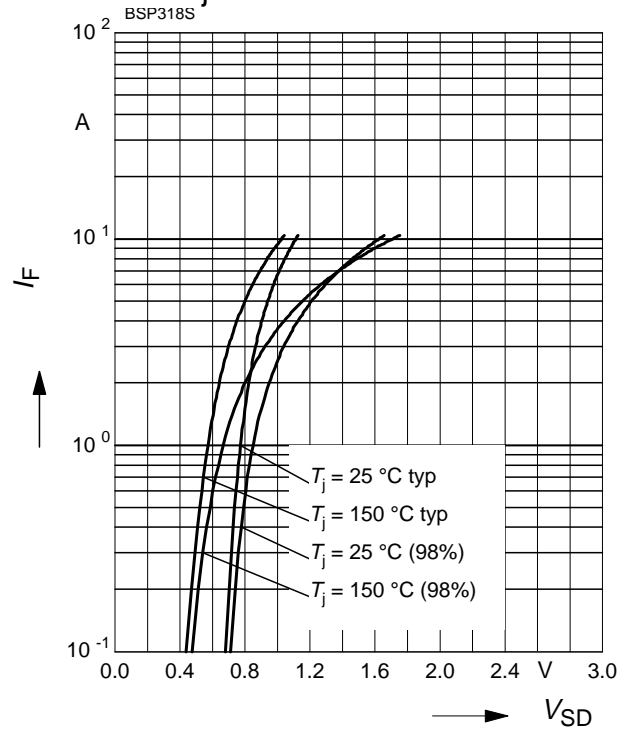
parameter: $V_{GS}=0\text{ V}$, $f=1\text{ MHz}$



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

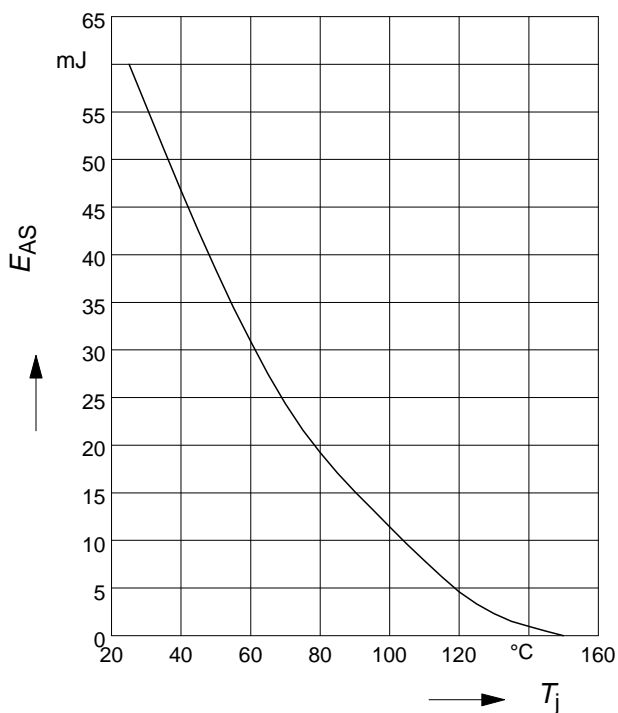
parameter: T_j , $t_p = 80\ \mu\text{s}$



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

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

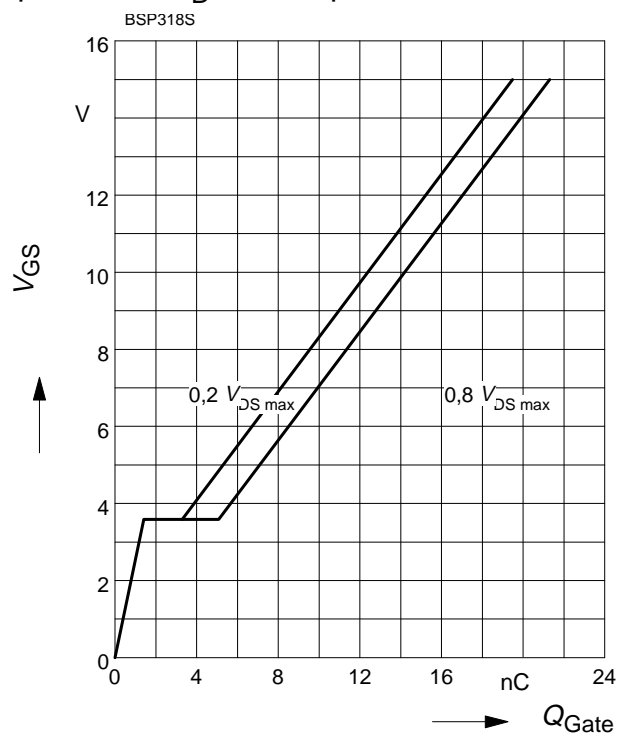
$R_{GS} = 25\ \Omega$



Typ. gate charge

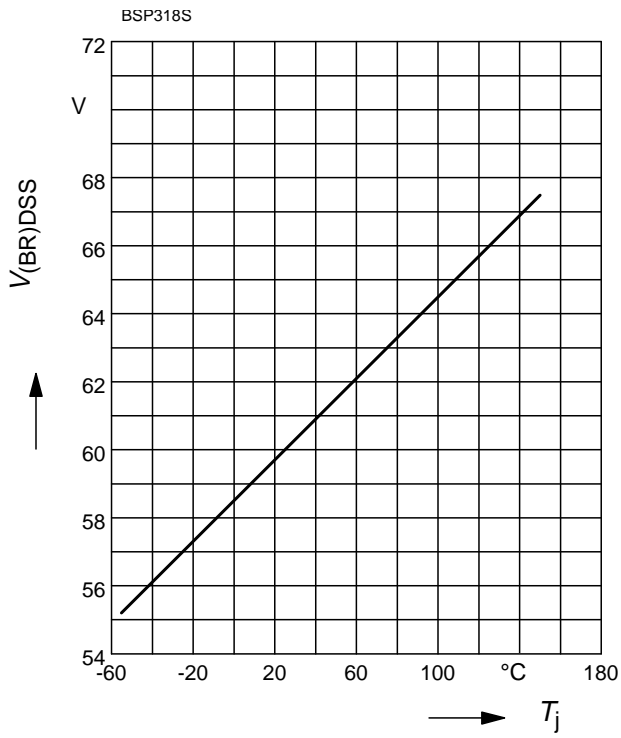
$V_{GS} = f(Q_{Gate})$

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



Drain-source breakdown voltage

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



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