# OptiMOS®-P Small-Signal-Transistor

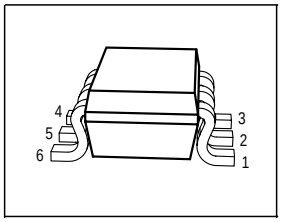
## Feature

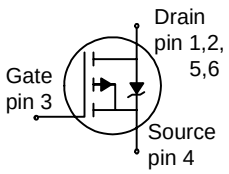
- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- d*v*/d*t* rated
- Pb-free lead plating; RoHS compliant

**Product Summary**

| | | |
|---|---|---|
| $V_{DS}$ | -20 | V |
| $R_{DS(on)}$ | 67 | mΩ |
| $I_D$ | -4.7 | A |

P-TSOP6-6




| Type | Package | Tape and reel | Marking |
|---|---|---|---|
| BSL211SP | P-TSOP6-6 | L6327: 3000pcs/r. | sPB |

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Continuous drain current | $I_D$ | | A |
| $T_A$=25°C | | -4.7 | |
| $T_A$=70°C | | -3.8 | |
| Pulsed drain current | $I_{D\ puls}$ | -18.8 | |
| $T_A$=25°C | | | |
| Avalanche energy, single pulse | $E_{AS}$ | 26 | mJ |
| $I_D$=-4.7 A , $V_{DD}$=-10V, $R_{GS}$=25Ω | | | |
| Reverse diode d*v*/d*t* | d*v*/d*t* | -6 | kV/µs |
| $I_S$=-4.7A, $V_{DS}$=-16V, d*i*/d*t*=200A/µs, $T_{jmax}$=150°C | | | |
| Gate source voltage | $V_{GS}$ | ±12 | V |
| Power dissipation | $P_{tot}$ | 2 | W |
| $T_A$=25°C | | | |
| 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 | $R_{thJS}$ | - | - | 50 | K/W |
| SMD version, device on PCB: | $R_{thJA}$ | | | | |
| @ min. footprint | | - | - | 230 | |
| @ 6 cm$^2$ cooling area [1)] | | - | - | 62.5 | |

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

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain-source breakdown voltage<br>$V_{GS}$=0V, $I_D$=-250µA | $V_{(BR)DSS}$ | -20 | - | - | V |
| Gate threshold voltage, $V_{GS}$ = $V_{DS}$<br>$I_D$=-25µA | $V_{GS(th)}$ | -0.6 | -0.9 | -1.2 | |
| Zero gate voltage drain current | $I_{DSS}$ | | | | µA |
| $V_{DS}$=-20V, $V_{GS}$=0, $T_j$=25°C | | - | -0.1 | -1 | |
| $V_{DS}$=-20V, $V_{GS}$=0, $T_j$=150°C | | - | -10 | -100 | |
| Gate-source leakage current<br>$V_{GS}$=-12V, $V_{DS}$=0 | $I_{GSS}$ | - | -10 | -100 | nA |
| Drain-source on-state resistance<br>$V_{GS}$=-2.5V, $I_D$=-3.7A | $R_{DS(on)}$ | - | 94 | 110 | mΩ |
| Drain-source on-state resistance<br>$V_{GS}$=-4.5, $I_D$=-4.7A | $R_{DS(on)}$ | - | 54 | 67 | |

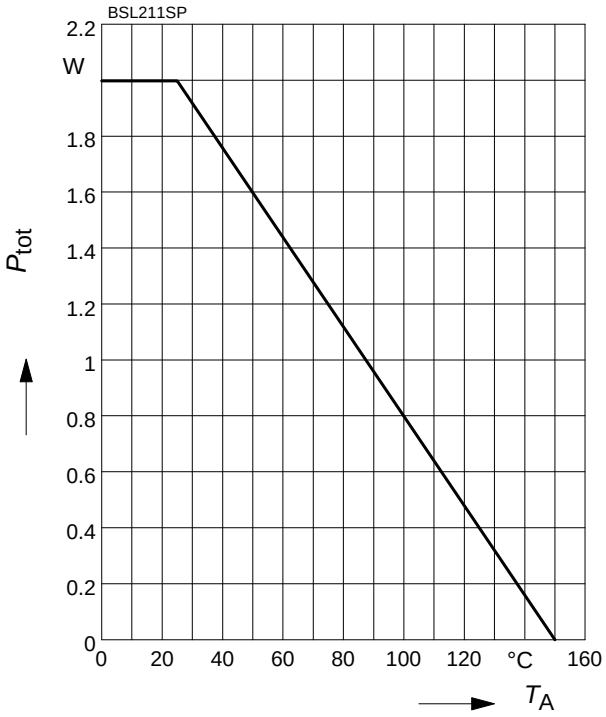
[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm$^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air; t≤ 5 sec.

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | | |
| Transconductance | $g_{fs}$ | $\lvert V_{DS}\rvert \geq 2 * \lvert I_D\rvert * R_{DS(on)max}$, $I_D$=-3.8A | 6.2 | 12.4 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0, $V_{DS}$=-15V, $f$=1MHz | - | 654 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 241 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 197 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=-10V, $V_{GS}$=-4.5V, $I_D$=-1A, $R_G$=6Ω | - | 8.7 | 13 | ns |
| Rise time | $t_r$ | | - | 13.9 | 21 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 25 | 37.3 | |
| Fall time | $t_f$ | | - | 23.3 | 35 | |
| **Gate Charge Characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=-10V, $I_D$=-4.7A | - | -1.3 | -2 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | -4.7 | -7 | |
| Gate charge total | $Q_g$ | $V_{DD}$=-10V, $I_D$=-4.7A, $V_{GS}$=0 to -4.5V | - | -8.3 | -12.4 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$=-10V, $I_D$=-4.7A | - | -2 | - | V |
| **Reverse Diode** | | | | | | |
| Inverse diode continuous forward current | $I_S$ | $T_A$=25°C | - | - | -2 | A |
| Inverse diode direct current, pulsed | $I_{SM}$ | | - | - | -18.8 | |
| Inverse diode forward voltage | $V_{SD}$ | $V_{GS}$=0, $\lvert I_F\rvert = \lvert I_D\rvert$ | - | -0.94 | -1.4 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=-10V, $\lvert I_F\rvert = \lvert I_D\rvert$, $di_F/dt$=100A/µs | - | 20.6 | 25.8 | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 6.3 | 7.9 | nC |

## 1 Power dissipation

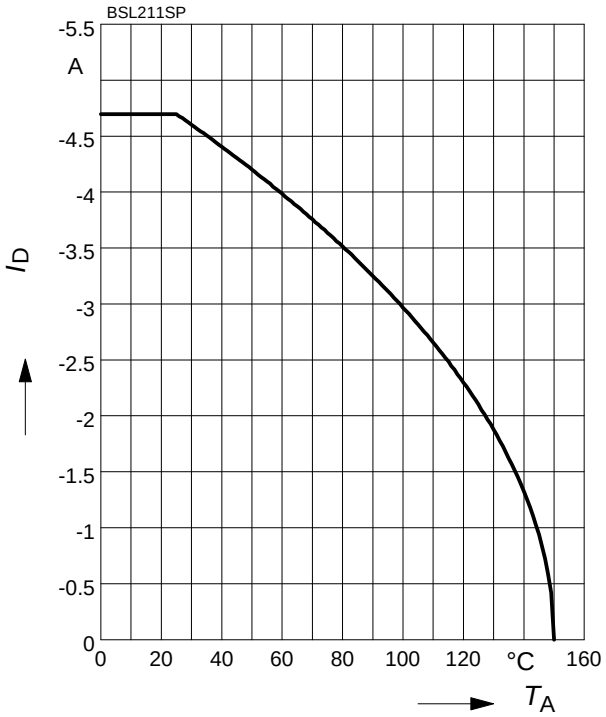
$P_{tot} = f(T_A)$




## 2 Drain current

$I_D = f(T_A)$

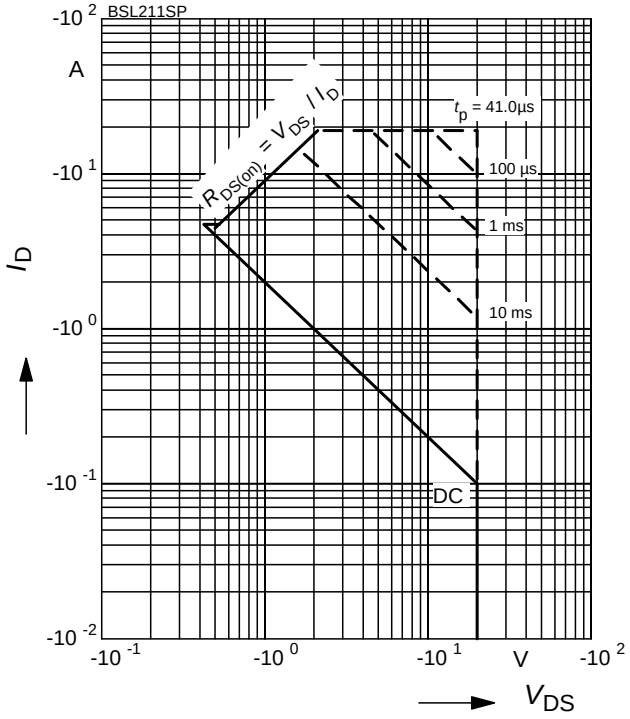
parameter: $|V_{GS}| \geq 4.5$ V




## 3 Safe operating area

$I_D = f(V_{DS})$

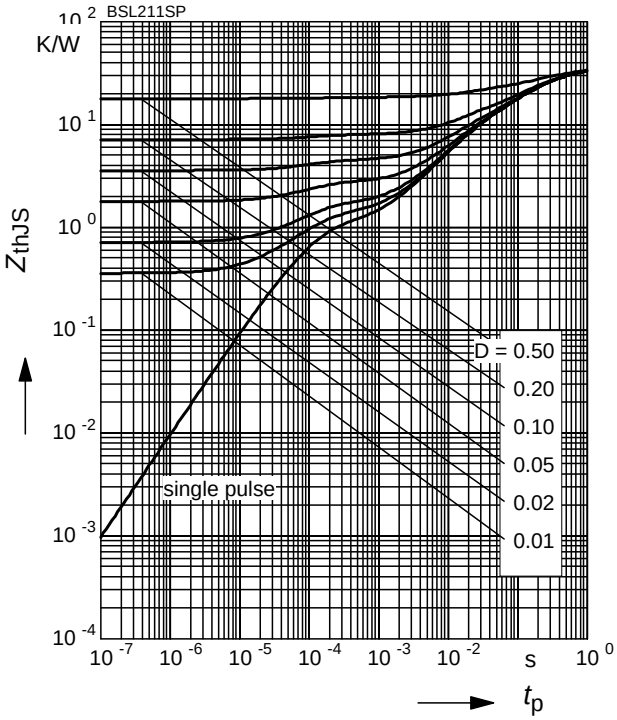
parameter : $D = 0$ , $T_A = 25$ °C




## 4 Transient thermal impedance

$Z_{thJS} = f(t_p)$

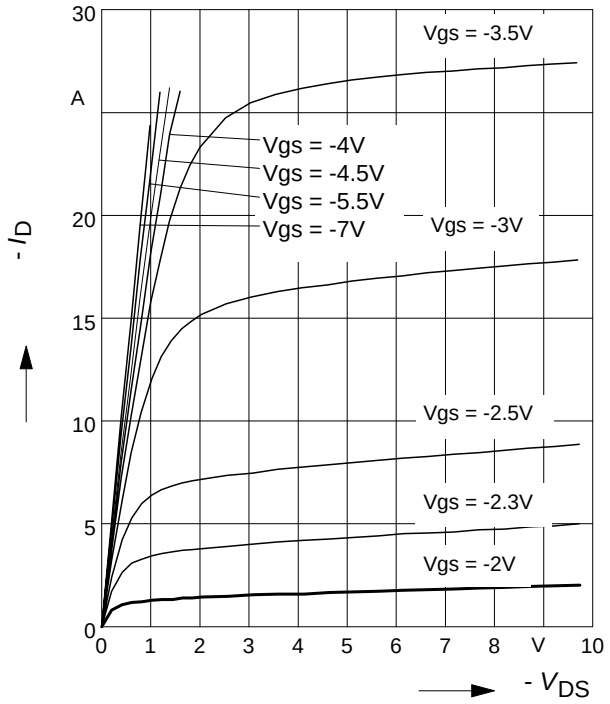
parameter : $D = t_p/T$



## 5 Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=25°C

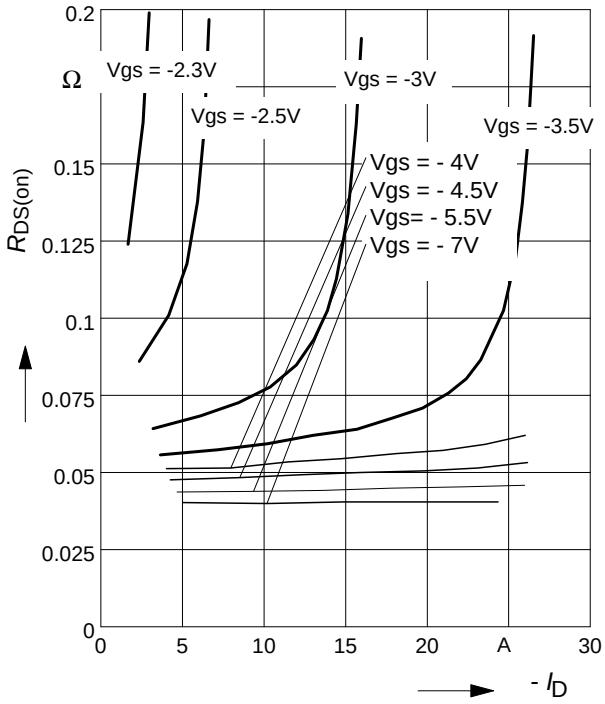
parameter: $t_p$ = 80 µs




## 6 Typ. drain-source on resistance

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

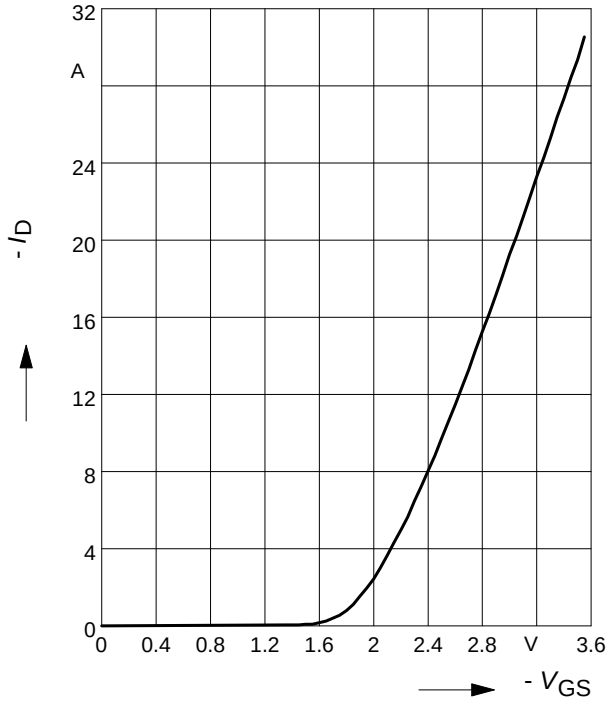
parameter: $V_{GS}$




## 7 Typ. transfer characteristics

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

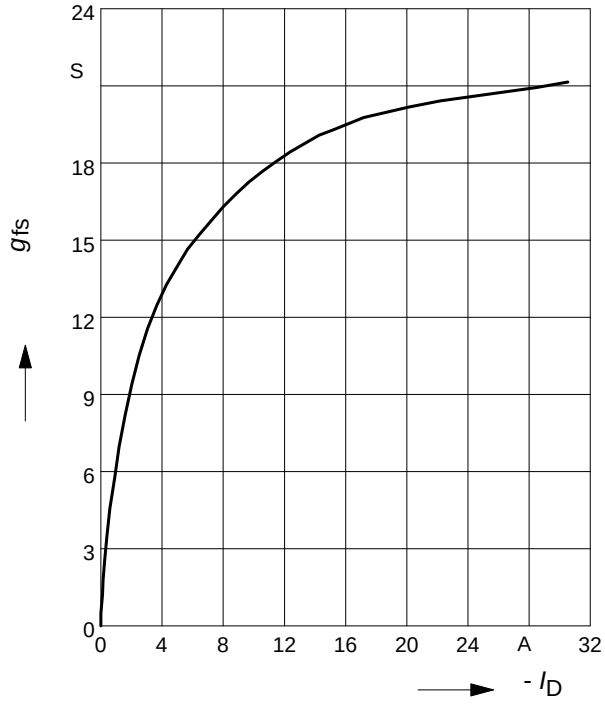
parameter: $t_p$ = 80 µs




## 8 Typ. forward transconductance

$g_{fs}$ = f($I_D$); $T_j$=25°C

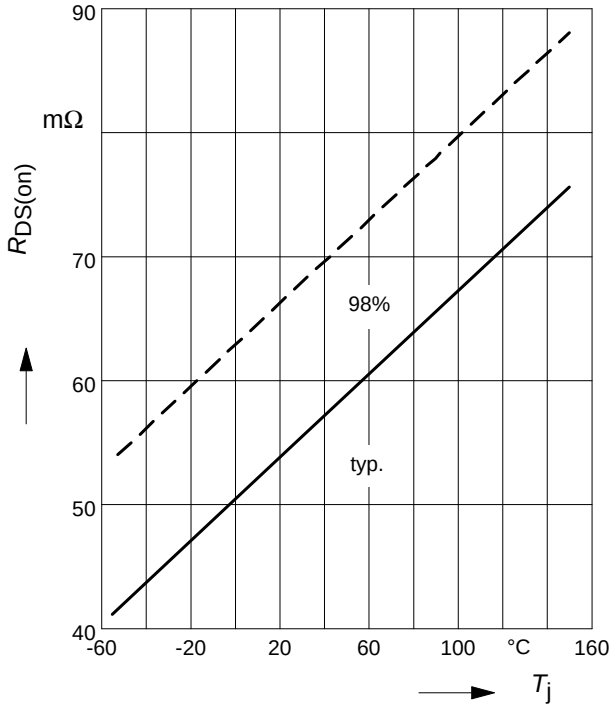
parameter: $t_p$ = 80 µs



### 9 Drain-source on-resistance

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

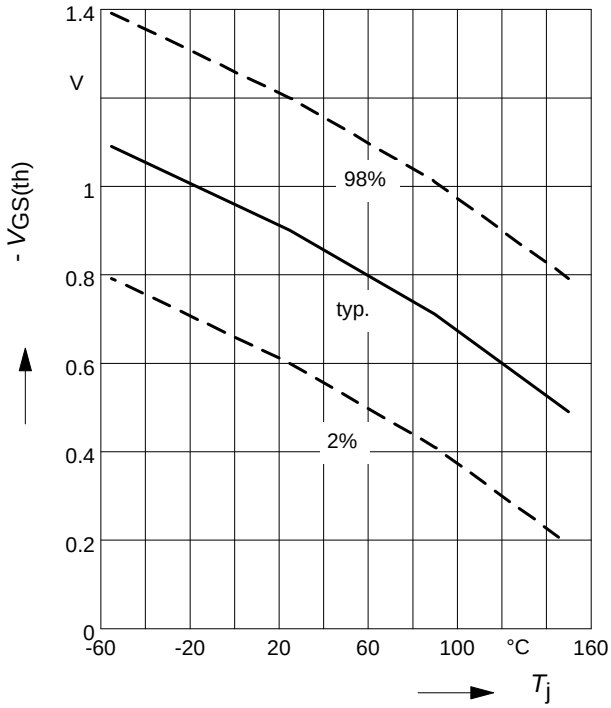
parameter: $I_D$ = -4.7 A, $V_{GS}$ = -4.5 V




### 10 Gate threshold voltage

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

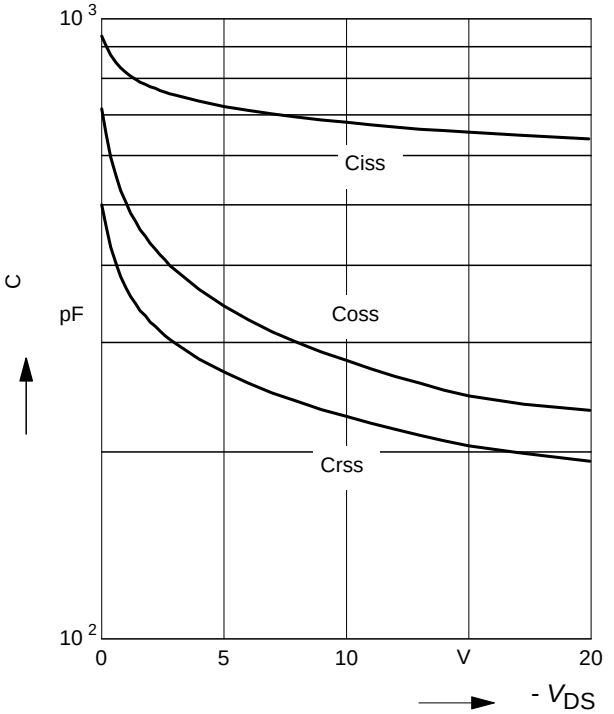
parameter: $V_{GS} = V_{DS}$, $I_D$ = -25 µA




### 11 Typ. capacitances

$C = f(V_{DS})$

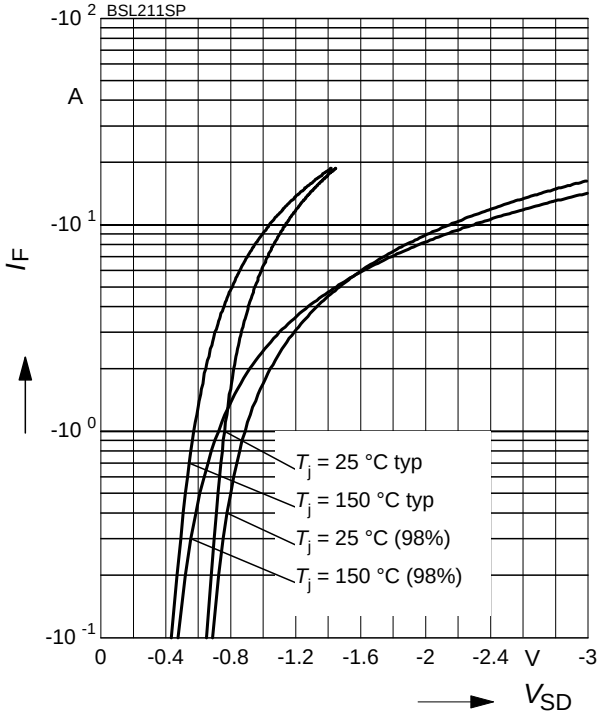
parameter: $V_{GS}$=0, $f$=1 MHz




### 12 Forward character. of reverse diode

$I_F = f(V_{SD})$

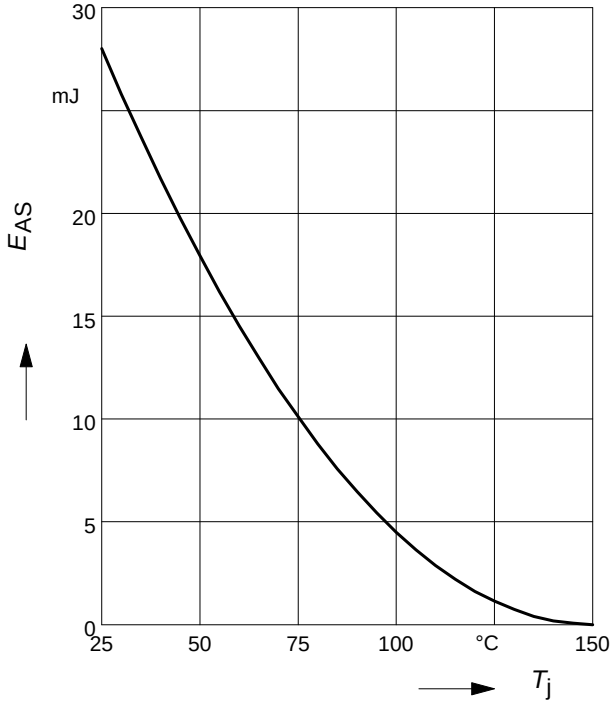
parameter: $T_j$ , tp = 80 µs



### 13 Typ. avalanche energy

$E_{AS} = f(T_j)$, par.: $I_D$ = -4.7 A

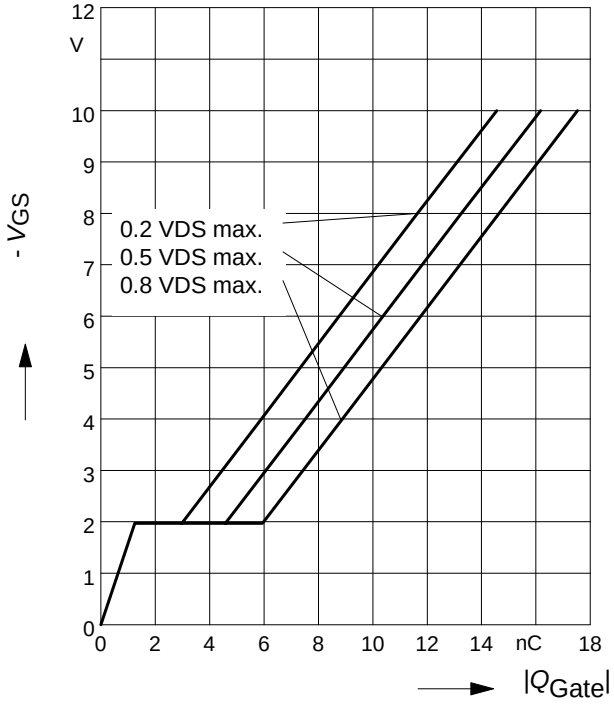
$V_{DD}$ = -10 V, $R_{GS}$ = 25 Ω




### 14 Typ. gate charge

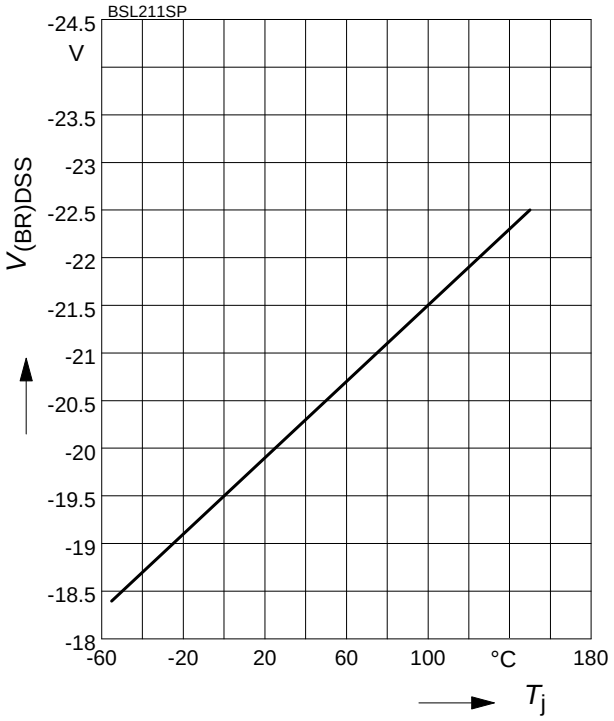
$|V_{GS}| = f(Q_{Gate})$

parameter: $I_D$ = -4.7 A pulsed




### 15 Drain-source breakdown voltage

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



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