

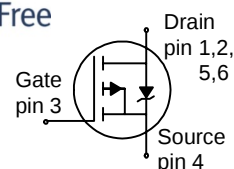
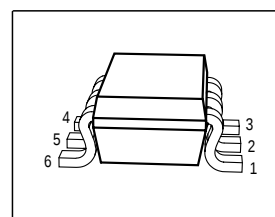
## OptiMOS®-P Small-Signal-Transistor Feature

- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen free according to IEC61249-2-21

## 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 | H6327: 3000pcs/r. | sPB     |

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

| Parameter                                                                                                               | Symbol              | Value        | Unit  |
|-------------------------------------------------------------------------------------------------------------------------|---------------------|--------------|-------|
| Continuous drain current<br>$T_A=25\text{ °C}$<br>$T_A=70\text{ °C}$                                                    | $I_D$               | -4.7<br>-3.8 | A     |
| Pulsed drain current<br>$T_A=25\text{ °C}$                                                                              | $I_{D\text{ puls}}$ | -18.8        |       |
| Avalanche energy, single pulse<br>$I_D=-4.7\text{ A}$ , $V_{DD}=-10\text{ V}$ , $R_{GS}=25\text{ Ω}$                    | $E_{AS}$            | 26           | mJ    |
| Reverse diode dv/dt<br>$I_S=-4.7\text{ A}$ , $V_{DS}=-16\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{jmax}=150\text{ °C}$ | dv/dt               | -6           | kV/μs |
| Gate source voltage                                                                                                     | $V_{GS}$            | ±12          | V     |
| Power dissipation<br>$T_A=25\text{ °C}$                                                                                 | $P_{tot}$           | 2            | W     |
| Operating and storage temperature                                                                                       | $T_j, T_{stg}$      | -55... +150  | °C    |
| IEC climatic category; DIN IEC 68-1                                                                                     |                     | 55/150/56    |       |
| ESD Class<br>JESD22-A114-HBM                                                                                            |                     | Class 0      |       |

## 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 <sup>2</sup> cooling area <sup>1)</sup> |            | -      | -    | 62.5 |      |

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

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

<sup>1)</sup>Device on 40mm\*40mm\*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;  $t \leq 5$  sec.

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

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Dynamic Characteristics

|                              |              |                                                                             |     |      |      |    |
|------------------------------|--------------|-----------------------------------------------------------------------------|-----|------|------|----|
| Transconductance             | $g_{fs}$     | $ V_{DS}  \geq 2 \cdot  I_D  \cdot R_{DS(on)max}$<br>$I_D = -3.8\text{A}$   | 6.2 | 12.4 | -    | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS}=0, V_{DS}=-15\text{V},$<br>$f=1\text{MHz}$                          | -   | 654  | -    | pF |
| Output capacitance           | $C_{oss}$    |                                                                             | -   | 241  | -    |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                             | -   | 197  | -    |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-10\text{V}, V_{GS}=-4.5\text{V},$<br>$I_D=-1\text{A}, R_G=6\Omega$ | -   | 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

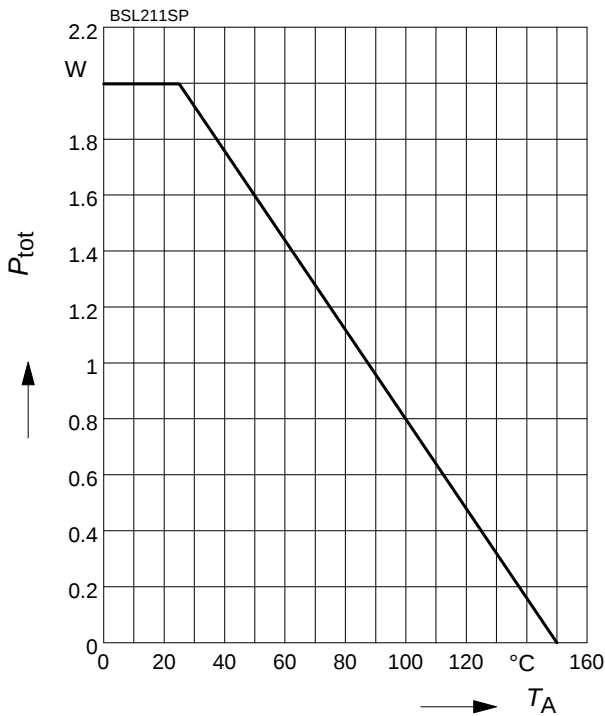
|                       |                 |                                                                                |   |      |       |    |
|-----------------------|-----------------|--------------------------------------------------------------------------------|---|------|-------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD}=-10\text{V}, I_D=-4.7\text{A}$                                         | - | -1.3 | -2    | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                                                | - | -4.7 | -7    |    |
| Gate charge total     | $Q_g$           | $V_{DD}=-10\text{V}, I_D=-4.7\text{A},$<br>$V_{GS}=0 \text{ to } -4.5\text{V}$ | - | -8.3 | -12.4 |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD}=-10\text{V}, I_D=-4.7\text{A}$                                         | - | -2   | -     | V  |

### Reverse Diode

|                                          |          |                                                                        |   |       |       |    |
|------------------------------------------|----------|------------------------------------------------------------------------|---|-------|-------|----|
| Inverse diode continuous forward current | $I_S$    | $T_A=25^\circ\text{C}$                                                 | - | -     | -2    | A  |
| Inverse diode direct current, pulsed     | $I_{SM}$ |                                                                        | - | -     | -18.8 |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS}=0,  I_F  =  I_D $                                              | - | -0.94 | -1.4  | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R=-10\text{V},  I_F  =  I_D ,$<br>$di_F/dt=100\text{A}/\mu\text{s}$ | - | 20.6  | 25.8  | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                                        | - | 6.3   | 7.9   |    |

### 1 Power dissipation

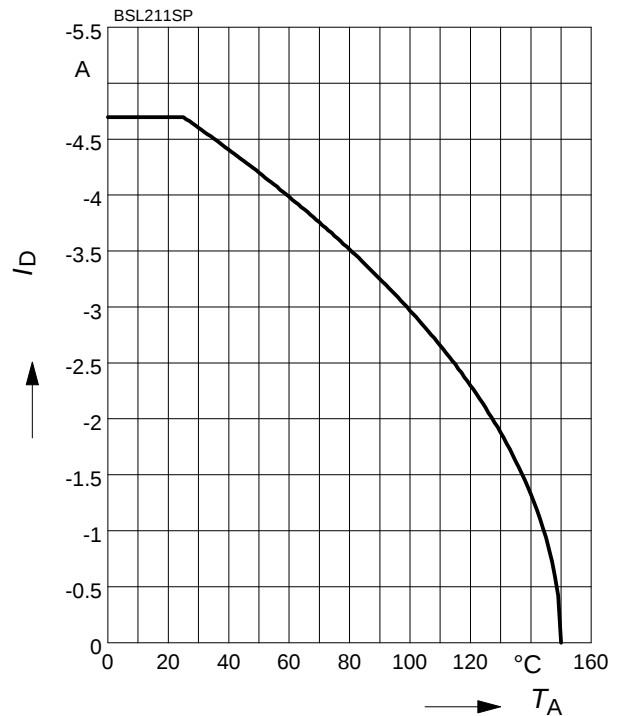
$$P_{\text{tot}} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

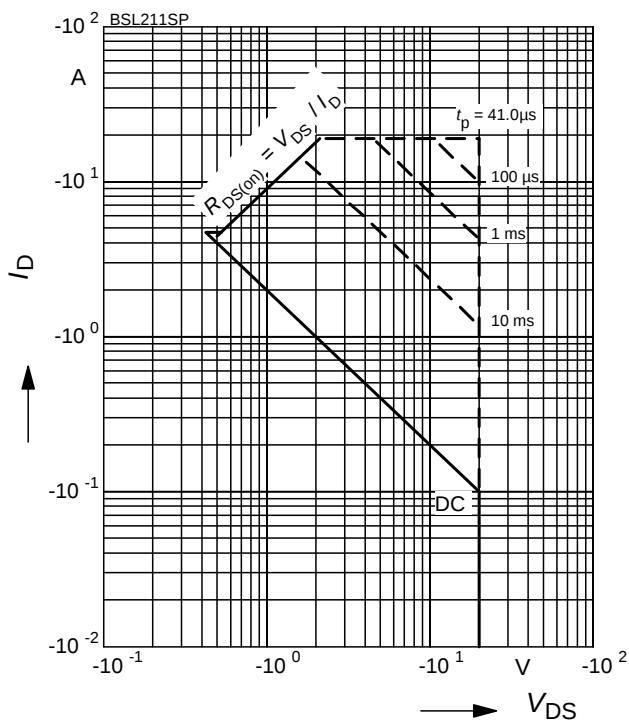
parameter:  $|V_{GS}| \geq 4.5 \text{ V}$



### 3 Safe operating area

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

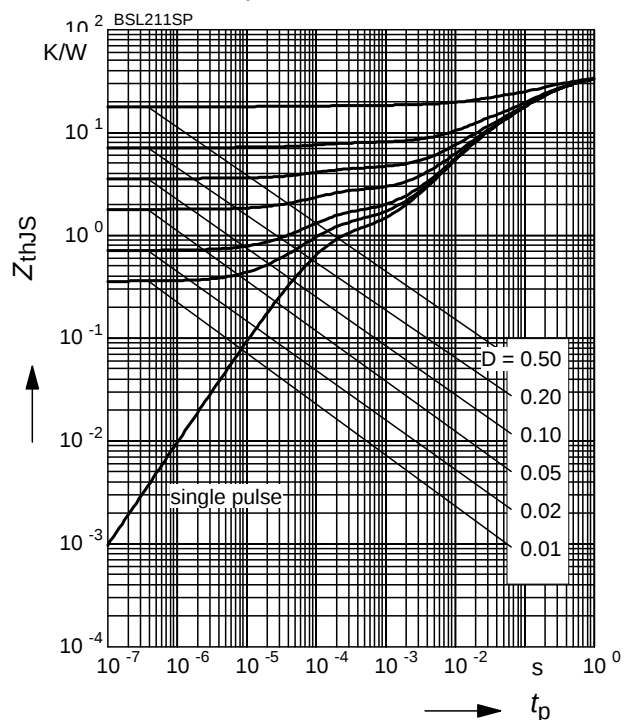
parameter:  $D = 0$ ,  $T_A = 25 \text{ °C}$



### 4 Transient thermal impedance

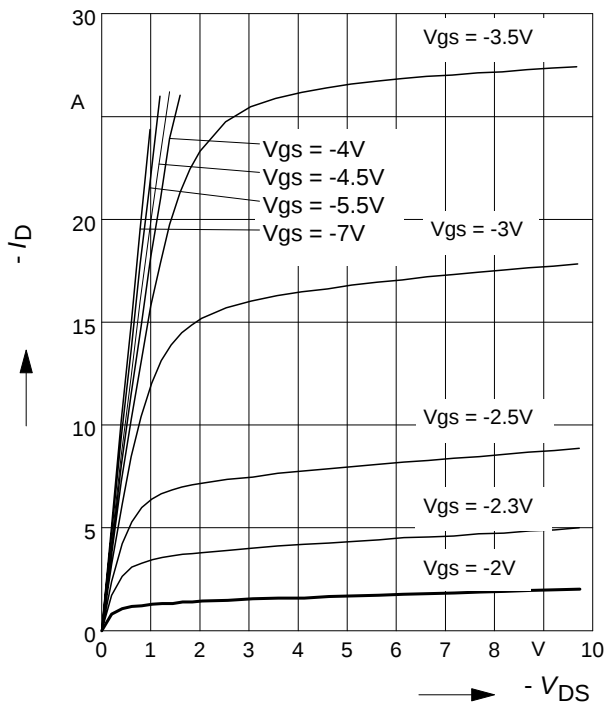
$$Z_{\text{thJS}} = f(t_p)$$

parameter:  $D = t_p / T$



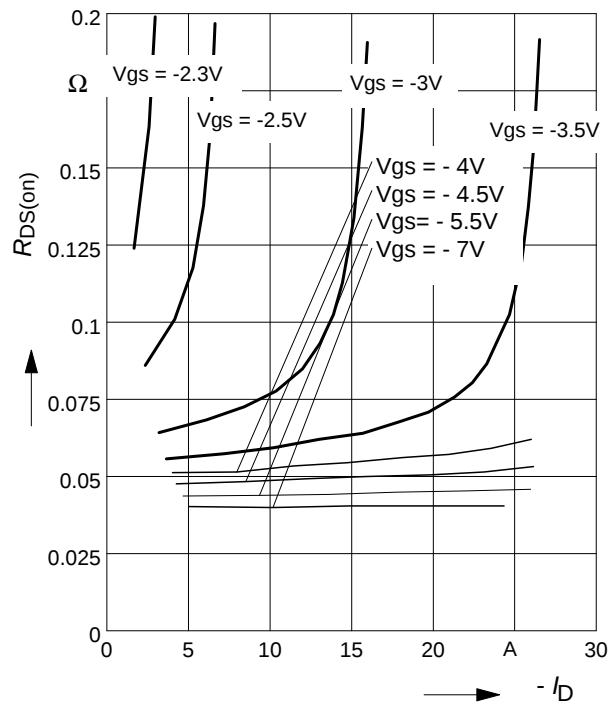
### 5 Typ. output characteristic

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

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


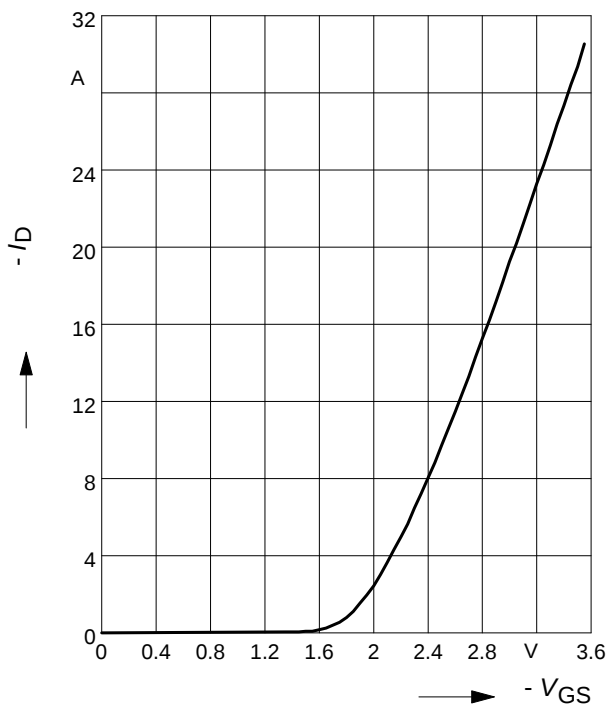
### 6 Typ. drain-source on resistance

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

parameter:  $V_{GS}$ 


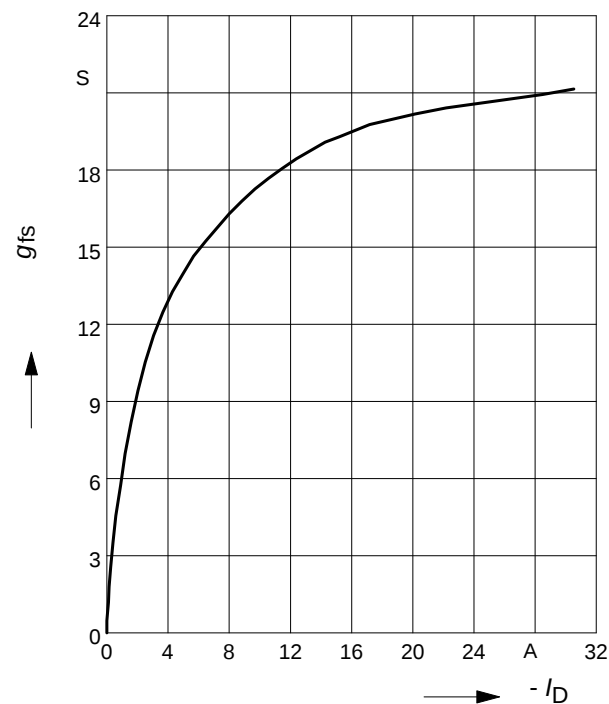
### 7 Typ. transfer characteristics

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

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


### 8 Typ. forward transconductance

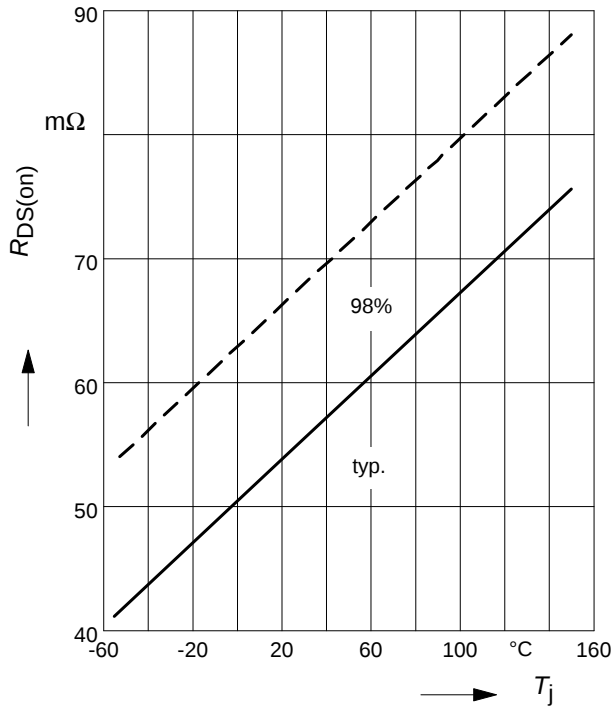
 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$ 

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


### 9 Drain-source on-resistance

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

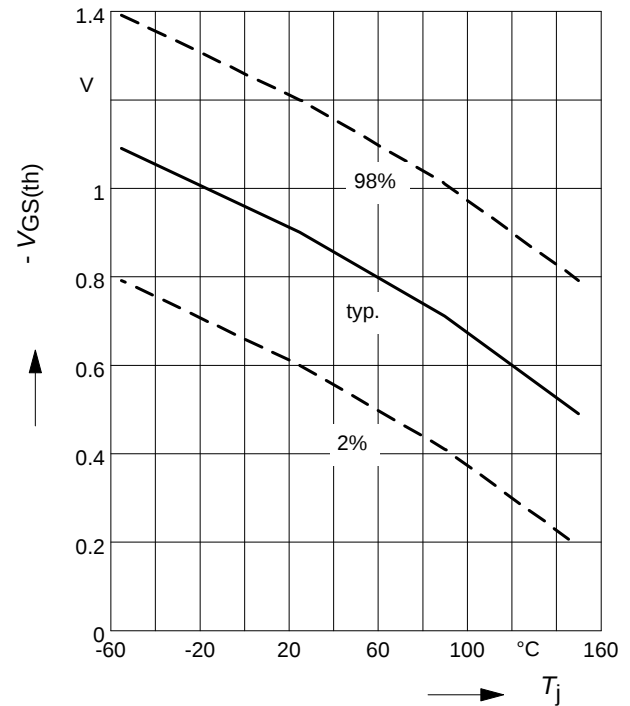
parameter:  $I_D = -4.7 \text{ A}$ ,  $V_{GS} = -4.5 \text{ V}$



### 10 Gate threshold voltage

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

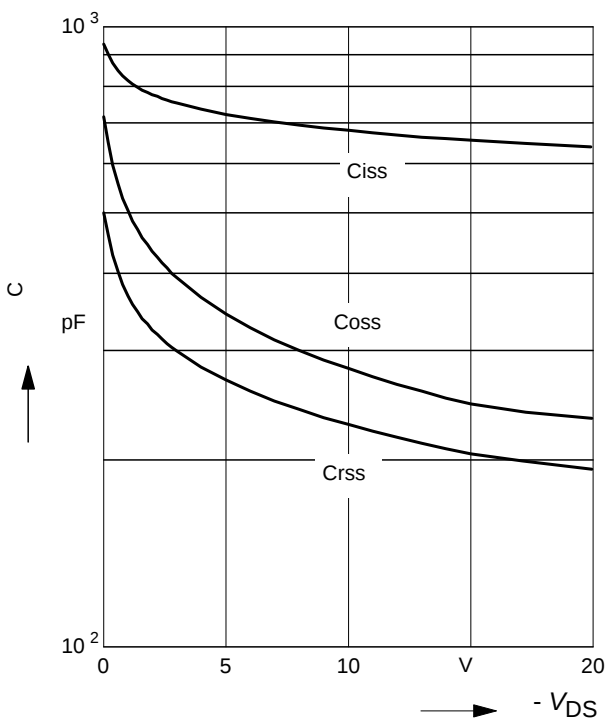
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -25 \mu\text{A}$



### 11 Typ. capacitances

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

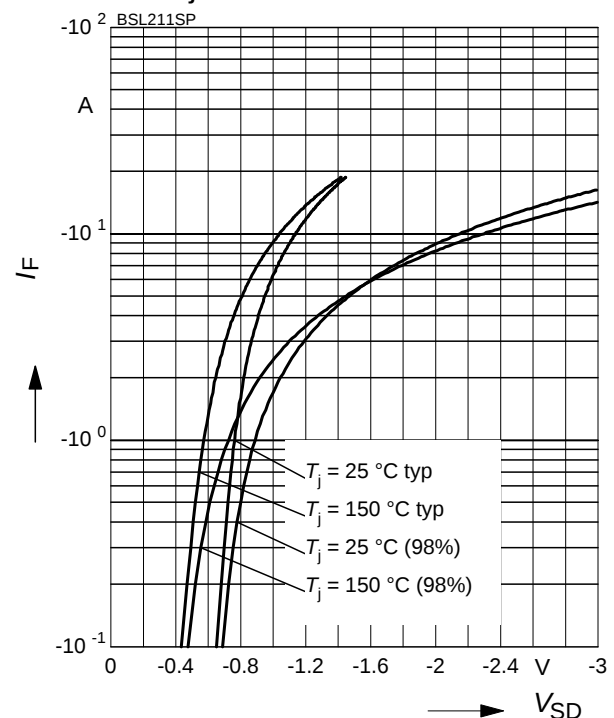
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$



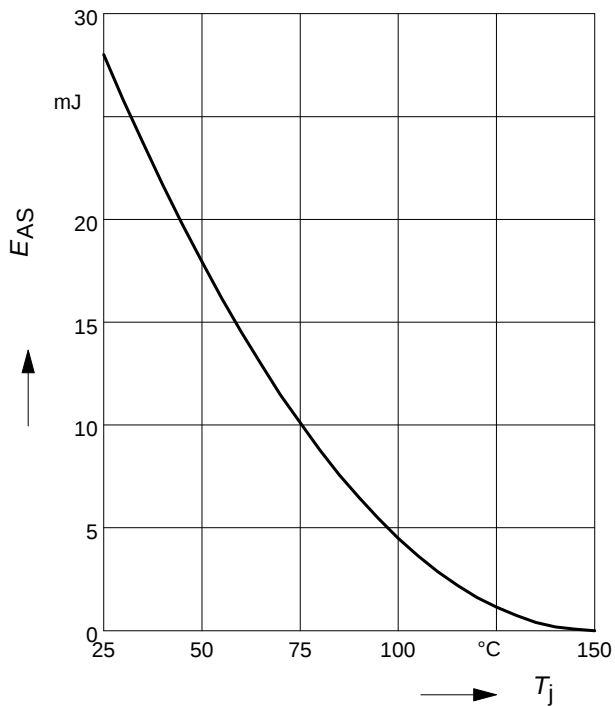
### 12 Forward character. of reverse diode

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

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

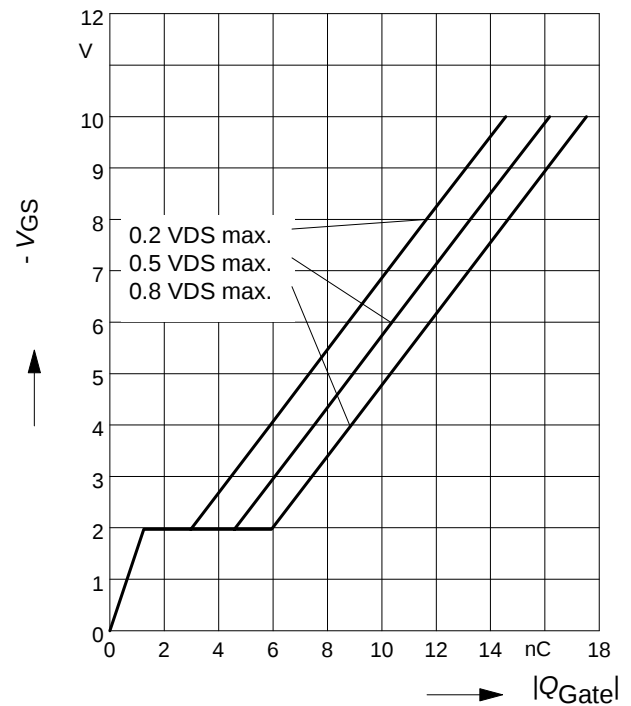


### 13 Typ. avalanche energy

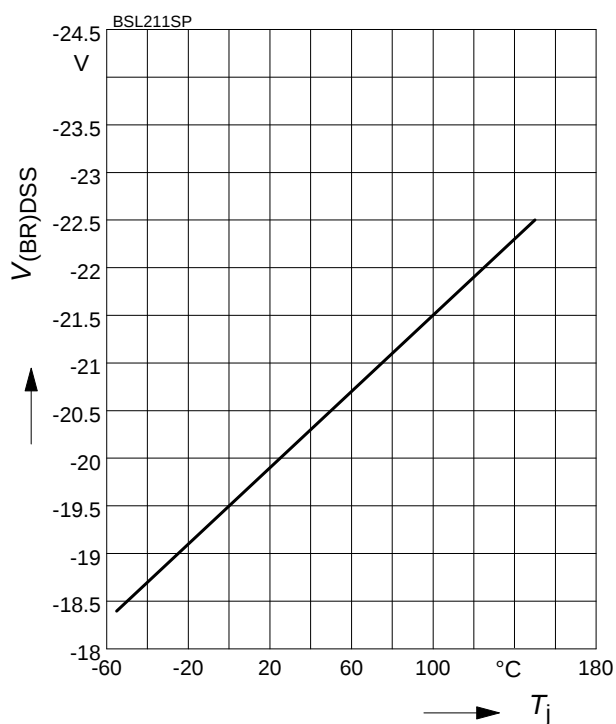
 $E_{AS} = f(T_j)$ , par.:  $I_D = -4.7\text{ A}$ 
 $V_{DD} = -10\text{ V}$ ,  $R_{GS} = 25\ \Omega$ 


### 14 Typ. gate charge

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

parameter:  $I_D = -4.7\text{ A}$  pulsed


### 15 Drain-source breakdown voltage

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


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