



# THE DATASHEET OF BSD223P



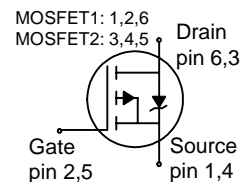
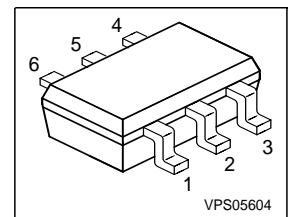
## OptiMOS<sup>®</sup>-P Small-Signal-Transistor Feature

- Dual 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        |
| $R_{DS(on)}$ | 1.2   | $\Omega$ |
| $I_D$        | -0.39 | A        |

**PG-SOT-363**


| Type     | Package    | Tape & Reel      | Marking |
|----------|------------|------------------|---------|
| BSD 223P | PG-SOT-363 | H6327: 3000pcs/r | X1s     |

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

| Parameter  | Symbol             | Value       | Unit              |
|--|--------------------|-------------|-------------------|
| Continuous drain current   | $I_D$              |             | A                 |
| $T_A=25\text{ }^\circ\text{C}$   |                    | -0.39       |                   |
| $T_A=70\text{ }^\circ\text{C}$   |                    | -0.31       |                   |
| Pulsed drain current   | $I_D \text{ puls}$ | -1.56       |                   |
| $T_A=25\text{ }^\circ\text{C}$   |                    |             |                   |
| Avalanche energy, single pulse   | $E_{AS}$           | 1.4         | mJ                |
| $I_D=-0.39\text{ A}$ , $V_{DD}=-10\text{ V}$ , $R_{GS}=25\Omega$   |                    |             |                   |
| Reverse diode dv/dt  | dv/dt              | -6          | kV/ $\mu\text{s}$ |
| $I_S=-0.39\text{ A}$ , $V_{DS}=-16\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{jmax}=150\text{ }^\circ\text{C}$ |                    |             |                   |
| Gate source voltage  | $V_{GS}$           | $\pm 12$    | V                 |
| Power dissipation  | $P_{tot}$          | 0.25        | W                 |
| $T_A=25\text{ }^\circ\text{C}$   |                    |             |                   |
| 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 | $R_{thJS}$ | -      | -    | 180  | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 500  |      |

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

| Parameter  | Symbol        | Values |      |      | Unit          |
|--|---------------|--------|------|------|---------------|
|  |               | min.   | typ. | max. |               |
| <b>Static Characteristics</b>  |               |        |      |      |               |
| Drain-source breakdown voltage<br>$V_{GS}=0, I_D=-250\mu\text{A}$  | $V_{(BR)DSS}$ | -20    | -    | -    | V             |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D=-1.5\mu\text{A}$   | $V_{GS(th)}$  | -0.6   | -0.9 | -1.2 |               |
| Zero gate voltage drain current<br>$V_{DS}=-20\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$<br>$V_{DS}=-20\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$ | $I_{DSS}$     | -      | -0.1 | -1   | $\mu\text{A}$ |
| Gate-source leakage current<br>$V_{GS}=-12\text{V}, V_{DS}=0$  | $I_{GSS}$     | -      | -10  | -100 |               |
| Drain-source on-state resistance<br>$V_{GS}=-2.5\text{V}, I_D=-0.29\text{A}$   | $R_{DS(on)}$  | -      | 1.27 | 2.1  | $\Omega$      |
| Drain-source on-state resistance<br>$V_{GS}=-4.5, I_D=-0.39\text{A}$   | $R_{DS(on)}$  | -      | 0.7  | 1.2  |               |

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

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

**Dynamic Characteristics**

|                              |              |  |      |     |     |    |
|------------------------------|--------------|--|------|-----|-----|----|
| Transconductance             | $g_{fs}$     | $ V_{DS}  \geq 2 *  I_D  * R_{DS(on)max}$<br>$I_D = -0.31\text{A}$                     | 0.35 | 0.7 | -   | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0, V_{DS} = -15\text{V},$<br>$f = 1\text{MHz}$                               | -    | 45  | 56  | pF |
| Output capacitance           | $C_{oss}$    |  | -    | 21  | 26  |    |
| Reverse transfer capacitance | $C_{rss}$    |  | -    | 17  | 22  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = -10\text{V}, V_{GS} = -4.5\text{V},$<br>$I_D = -0.39\text{A}, R_G = 6\Omega$ | -    | 3.8 | 5.7 | ns |
| Rise time                    | $t_r$        |  | -    | 5   | 7.5 |    |
| Turn-off delay time          | $t_{d(off)}$ |  | -    | 5.1 | 7.6 |    |
| Fall time                    | $t_f$        |  | -    | 3.2 | 4.8 |    |

**Gate Charge Characteristics**

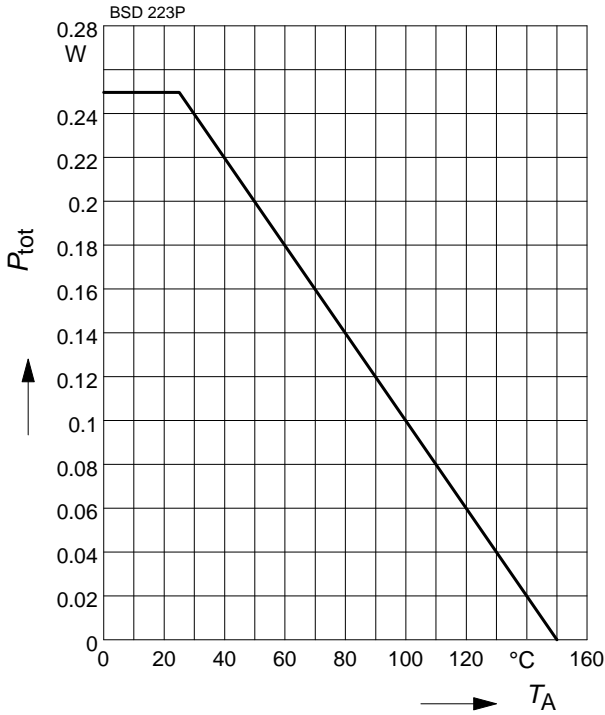
|                       |                 |   |   |       |       |    |
|-----------------------|-----------------|---|---|-------|-------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = -10\text{V}, I_D = -0.39\text{A}$   | - | -0.04 | -0.05 | nC |
| Gate to drain charge  | $Q_{gd}$        |   | - | -0.4  | -0.5  |    |
| Gate charge total     | $Q_g$           | $V_{DD} = -10\text{V}, I_D = -0.39\text{A},$<br>$V_{GS} = 0 \text{ to } -4.5\text{V}$ | - | -0.5  | -0.62 |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = -10\text{V}, I_D = -0.39\text{A}$   | - | -2.2  | -2.7  | V  |

**Reverse Diode**

|  |          |  |   |     |       |    |
|--|----------|--|---|-----|-------|----|
| Inverse diode continuous forward current | $I_S$    | $T_A = 25\text{ }^\circ\text{C}$   | - | -   | -0.39 | A  |
| Inv. diode direct current, pulsed        | $I_{SM}$ |  | - | -   | -1.56 |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS} = 0, I_F = -0.39$  | - | -1  | -1.33 | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R = -10\text{V},  I_F  =  I_D ,$<br>$di_F/dt = 100\text{A}/\mu\text{s}$ | - | 7.6 | 9.5   | ns |
| Reverse recovery charge                  | $Q_{rr}$ |  | - | 1.1 | 1.4   |    |

**1 Power dissipation**

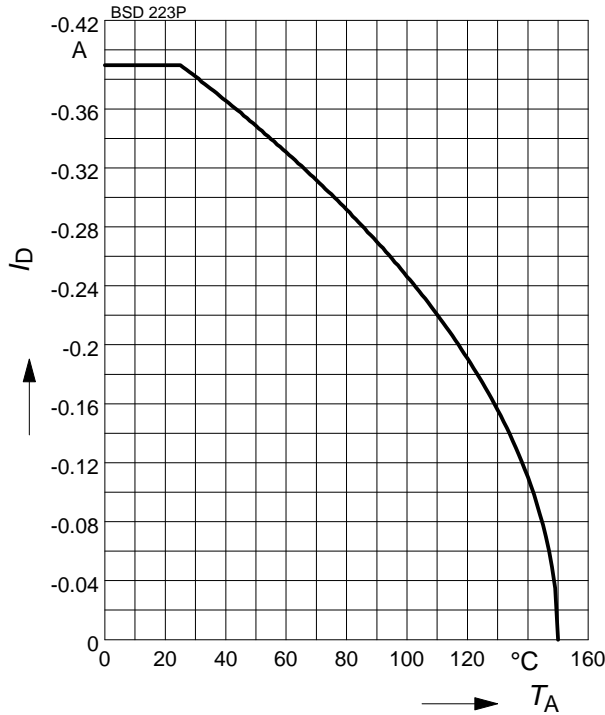
$P_{tot} = f(T_A)$



**2 Drain current**

$I_D = f(T_A)$

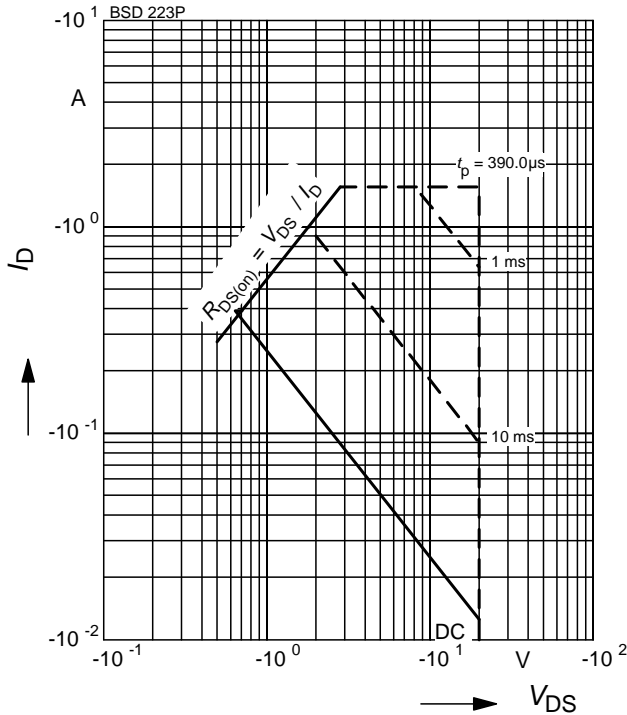
parameter:  $|V_{GS}| \geq 4.5 \text{ V}$



**3 Safe operating area**

$I_D = f(V_{DS})$

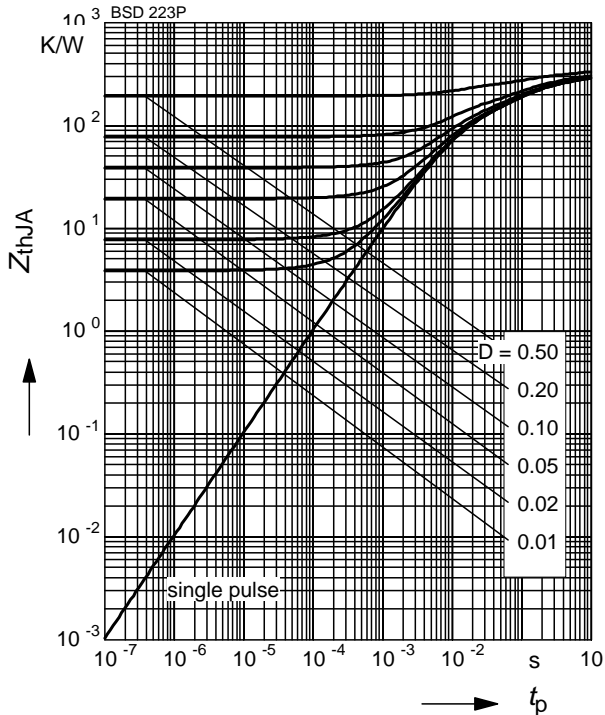
parameter :  $D = 0, T_A = 25 \text{ °C}$



**4 Transient thermal impedance**

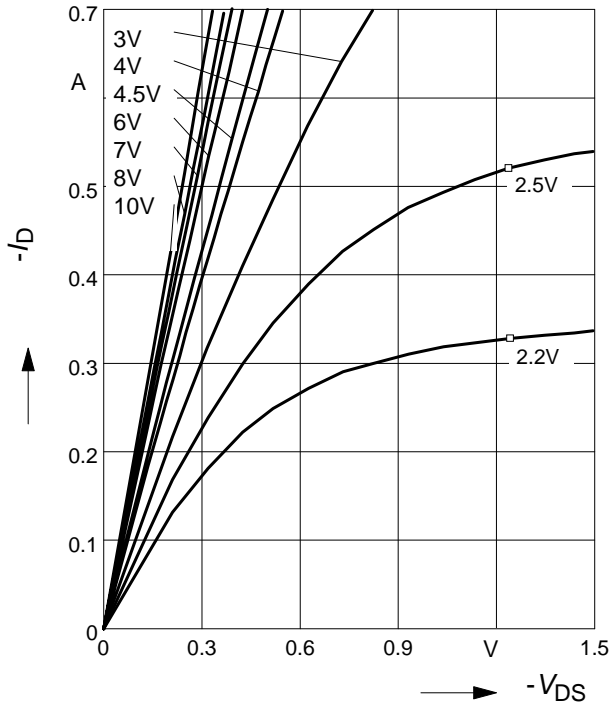
$Z_{thJA} = f(t_p)$

parameter :  $D = t_p/T$



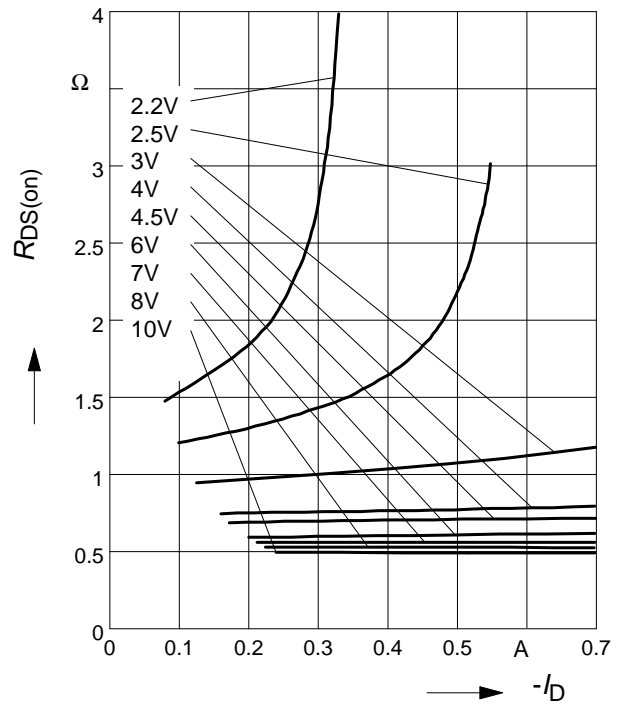
**5 Typ. output characteristic**

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



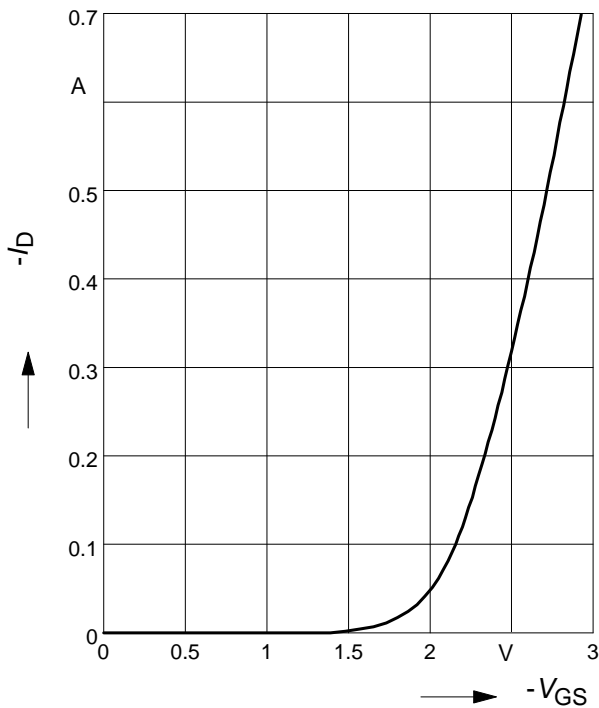
**6 Typ. drain-source on resistance**

$R_{DS(on)} = f(I_D)$   
parameter:  $V_{GS}$



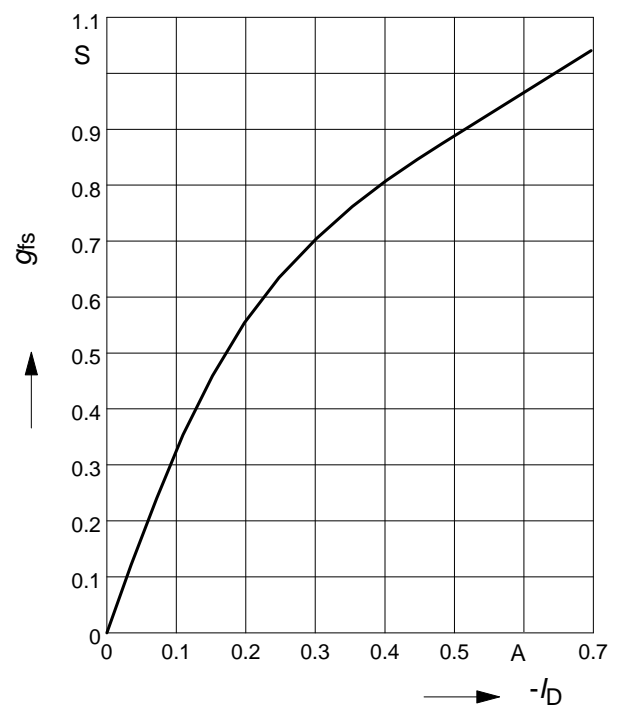
**7 Typ. transfer characteristics**

$I_D = f(V_{GS})$ ;  $|V_{DS}| \geq 2 \times |I_D| \times R_{DS(on)max}$   
parameter:  $T_j = 25^\circ\text{C}$



**8 Typ. forward transconductance**

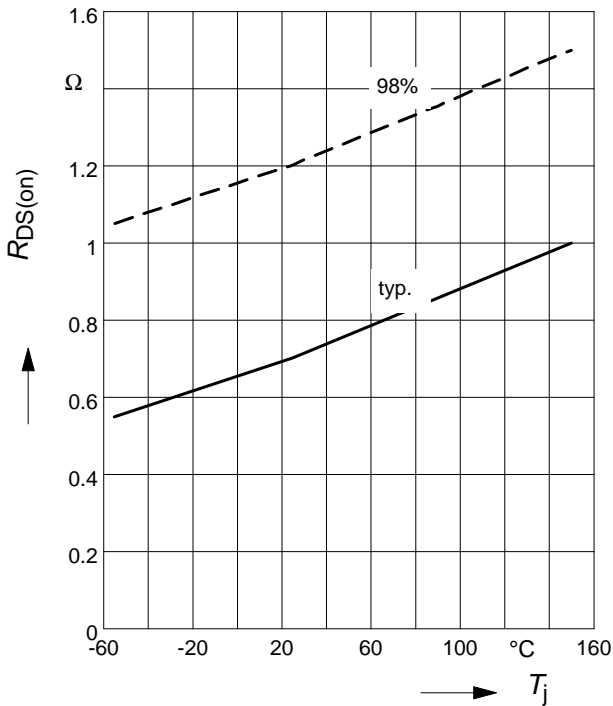
$g_{fs} = f(I_D)$   
parameter:  $T_j = 25^\circ\text{C}$



**9 Drain-source on-resistance**

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

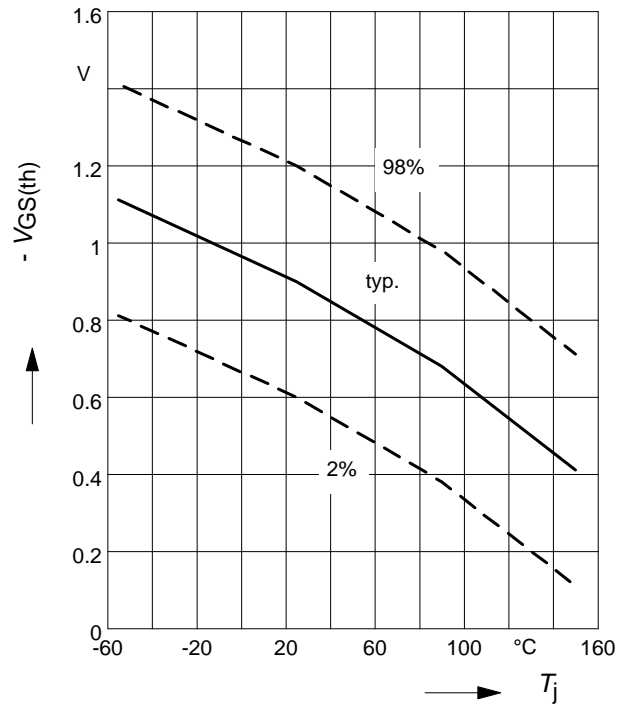
parameter:  $I_D = -0.39\text{ A}$ ,  $V_{GS} = -4.5\text{ V}$



**10 Typ. gate threshold voltage**

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

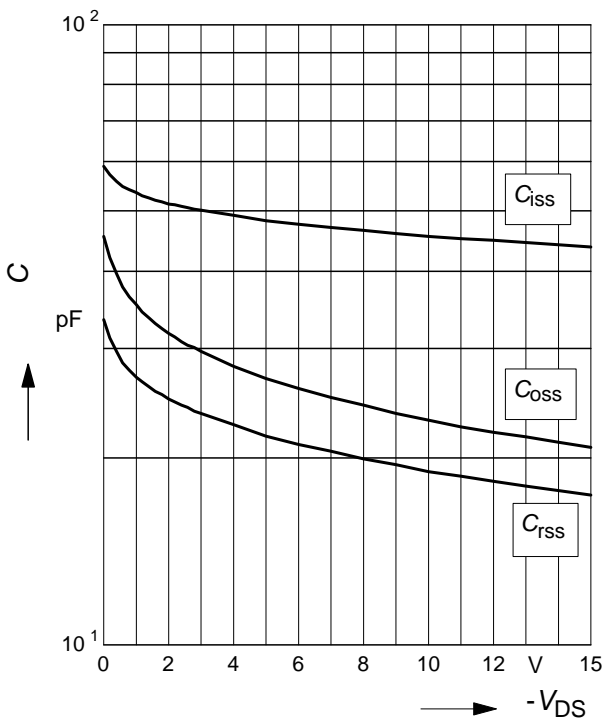
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

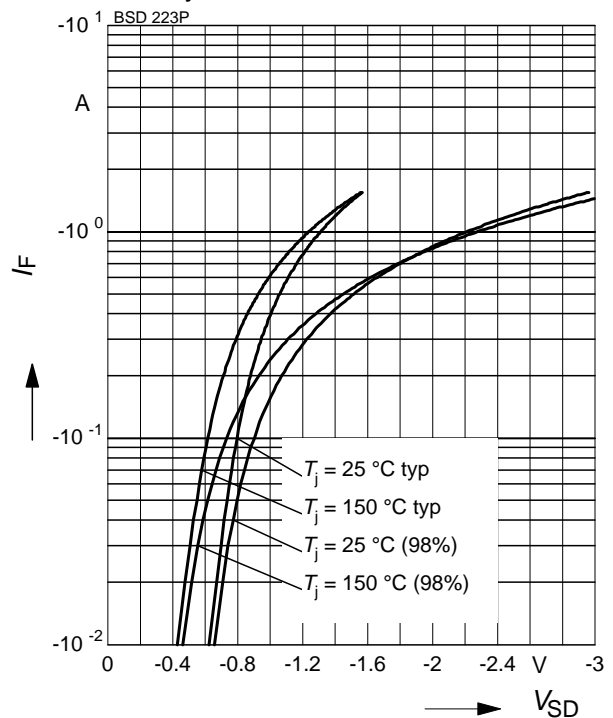
parameter:  $V_{GS}=0$ ,  $f=1\text{ MHz}$



**12 Forward character. of reverse diode**

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

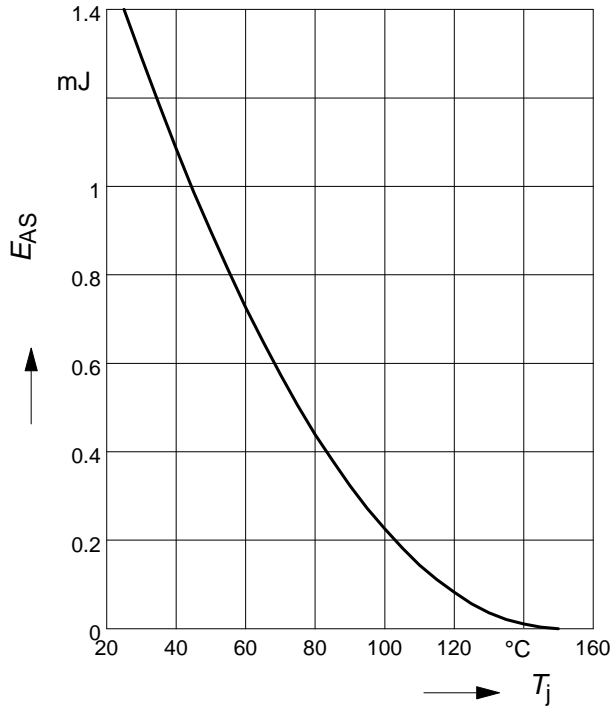
parameter:  $T_j$



**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$ , par.:  $I_D = -0.39$  A

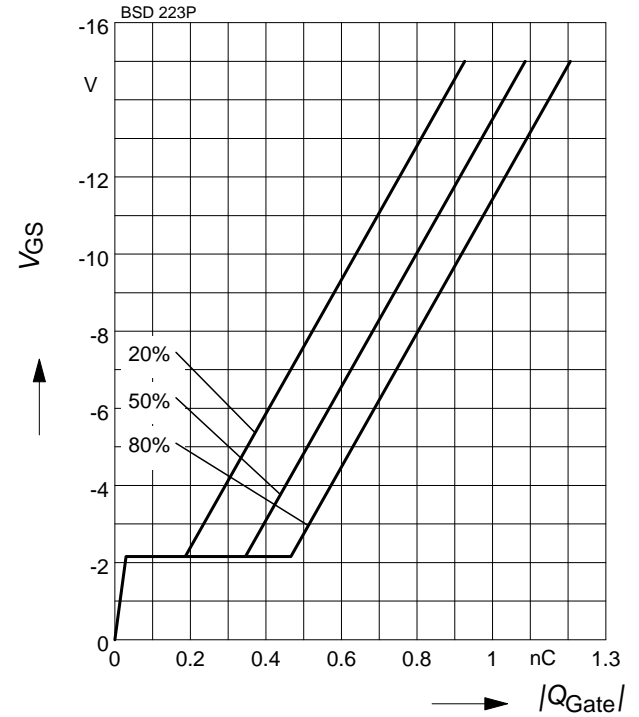
$V_{DD} = -10$  V,  $R_{GS} = 25 \Omega$



**14 Typ. gate charge**

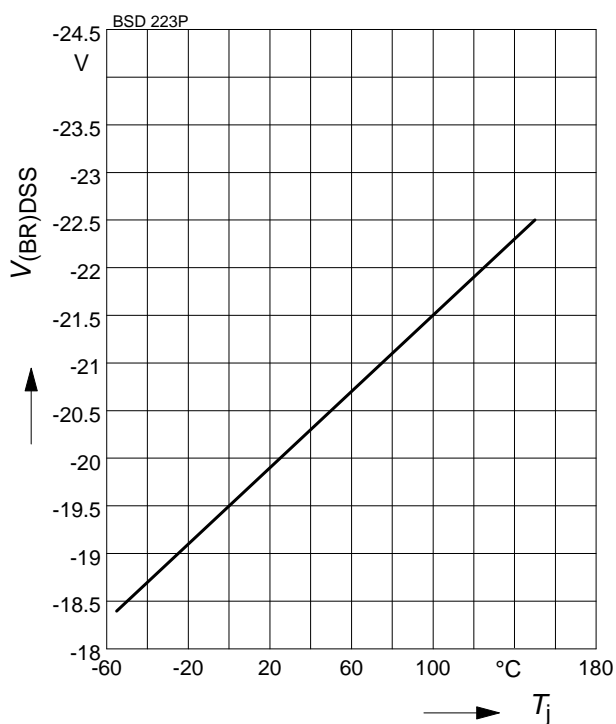
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = -0.39$  A pulsed;  $T_j = 25$  °C



**15 Drain-source breakdown voltage**

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



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