

OptiMOS[®]-P Small-Signal-Transistor Feature

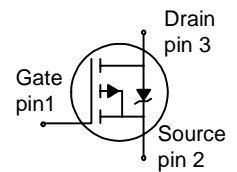
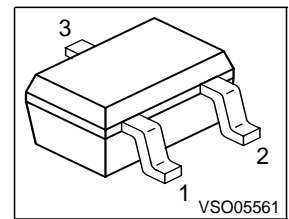
- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21



Product Summary

| | | |
|--------------|-------|----------|
| V_{DS} | -20 | V |
| $R_{DS(on)}$ | 1.2 | Ω |
| I_D | -0.39 | A |

PG-SOT-323



| Type | Package | Tape and Reel | Marking |
|-----------|------------|------------------|---------|
| BSS 223PW | PG-SOT-323 | H6327:3000pcs/r. | X4s |

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/ μs |
| $I_S=-0.39\text{ A}$, $V_{DS}=-16\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j\text{max}}=150\text{ }^\circ\text{C}$ | | | |
| Gate source voltage | V_{GS} | ± 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. | |
| Characteristics | | | | | |
| Thermal resistance, junction - soldering point | R_{thJS} | - | - | 180 | K/W |
| Thermal resistance, junction - ambient, leaded | R_{thJA} | - | - | 500 | |

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

| Parameter | Symbol | Values | | | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|-------------|------------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Drain-source breakdown voltage $V_{GS}=0, I_D=-250\mu\text{A}$ | $V_{(BR)DSS}$ | -20 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.5\mu\text{A}$ | $V_{GS(th)}$ | -0.6 | -0.9 | -1.2 | |
| Zero gate voltage drain current $V_{DS}=-20\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=-20\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$ | I_{DSS} | - | -0.1 -10 | -1 -100 | μA |
| Gate-source leakage current $V_{GS}=-12\text{V}, V_{DS}=0$ | I_{GSS} | - | -10 | -100 | |
| Drain-source on-state resistance $V_{GS}=-2.5\text{V}, I_D=-0.29\text{A}$ | $R_{DS(on)}$ | - | 1.27 | 2.1 | Ω |
| Drain-source on-state resistance $V_{GS}=-4.5, I_D=-0.39\text{A}$ | $R_{DS(on)}$ | - | 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}$ $I_D = -0.31\text{A}$ | 0.35 | 0.7 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0, V_{DS} = -15\text{V},$ $f = 1\text{MHz}$ | - | 45 | 56 | pF |
| Output capacitance | C_{oss} | | - | 21 | 26 | |
| Reverse transfer capacitance | C_{rss} | | - | 17 | 22 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = -10\text{V}, V_{GS} = -4.5\text{V},$ $I_D = -0.39\text{A}, R_G = 6\Omega$ | - | 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

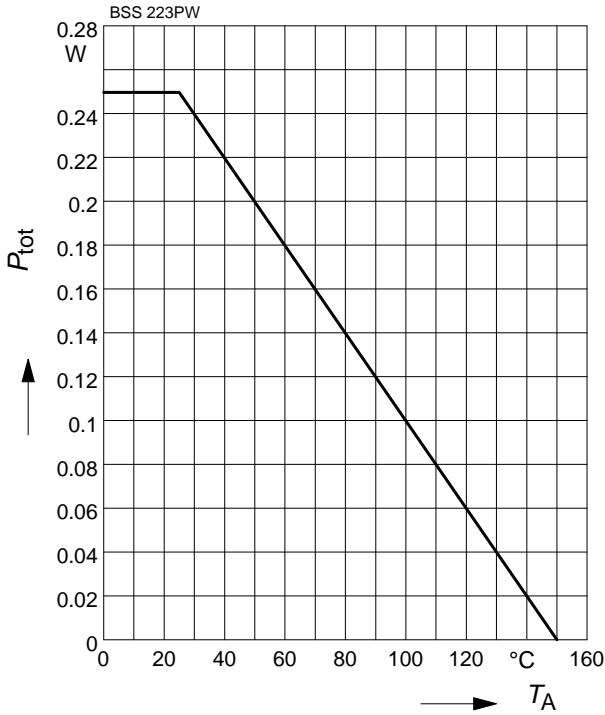
| | | | | | | |
|-----------------------|-----------------|---------------------------------------------------------------------------------------|---|-------|-------|----|
| Gate to source charge | Q_{gs} | $V_{DD} = -10\text{V}, I_D = -0.39\text{A}$ | - | -0.04 | -0.05 | nC |
| Gate to drain charge | Q_{gd} | | - | -0.4 | -0.5 | |
| Gate charge total | Q_g | $V_{DD} = -10\text{V}, I_D = -0.39\text{A},$ $V_{GS} = 0 \text{ to } -4.5\text{V}$ | - | -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} | $V_R = -10\text{V}, I_F = I_D ,$ $di_F/dt = 100\text{A}/\mu\text{s}$ | - | 7.6 | 9.5 | ns |
| Reverse recovery charge | Q_{rr} | | - | 1.1 | 1.4 | |

1 Power dissipation

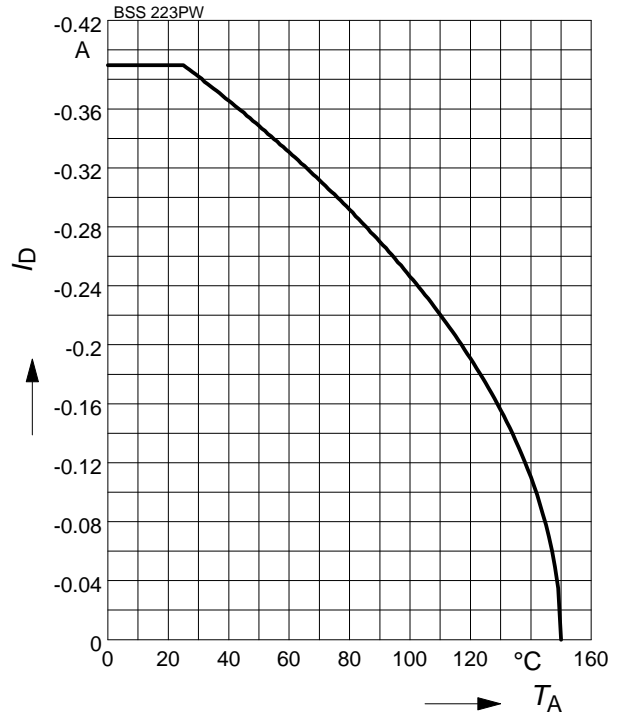
$P_{tot} = f(T_A)$



2 Drain current

$I_D = f(T_A)$

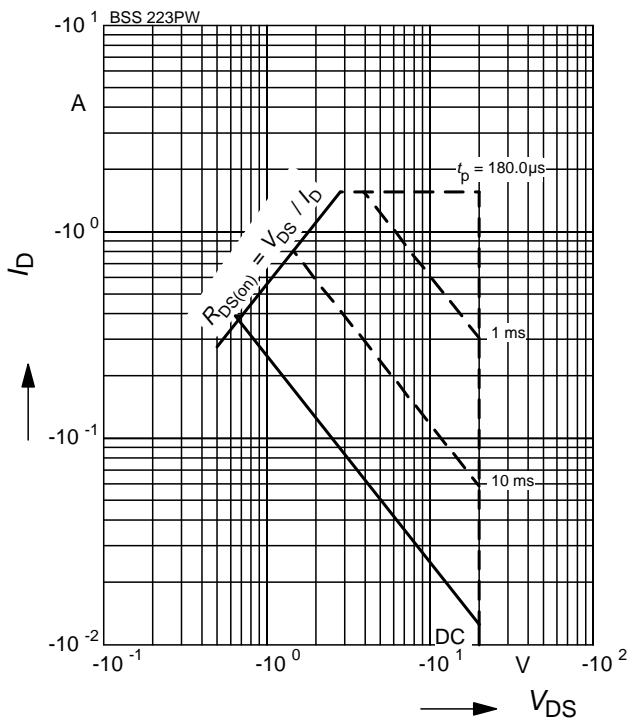
parameter: $|V_{GS}| \geq 4.5 \text{ V}$



3 Safe operating area

$I_D = f(V_{DS})$

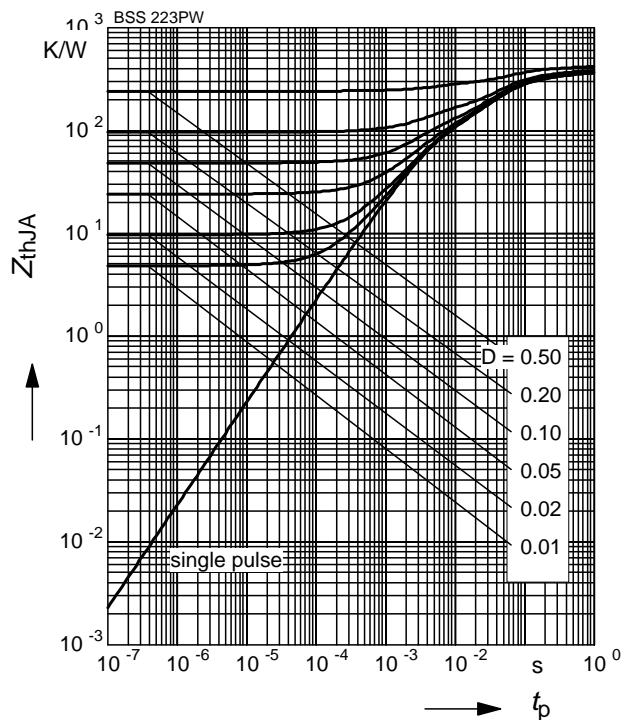
parameter: $D = 0, T_A = 25 \text{ °C}$



4 Transient thermal impedance

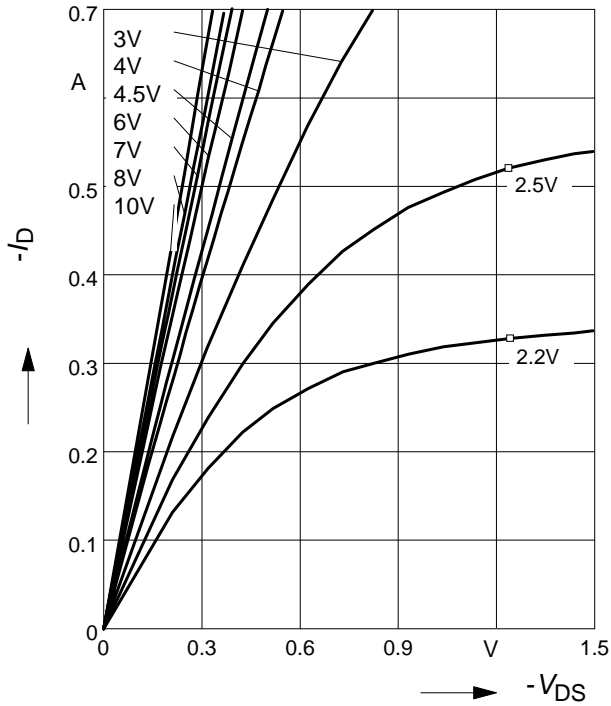
$Z_{thJA} = f(t_p)$

parameter: $D = t_p/T$



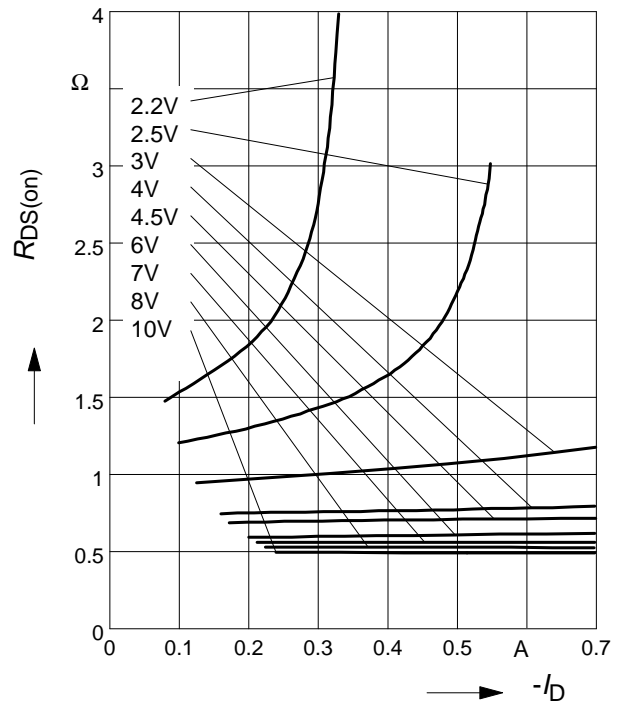
5 Typ. output characteristic

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



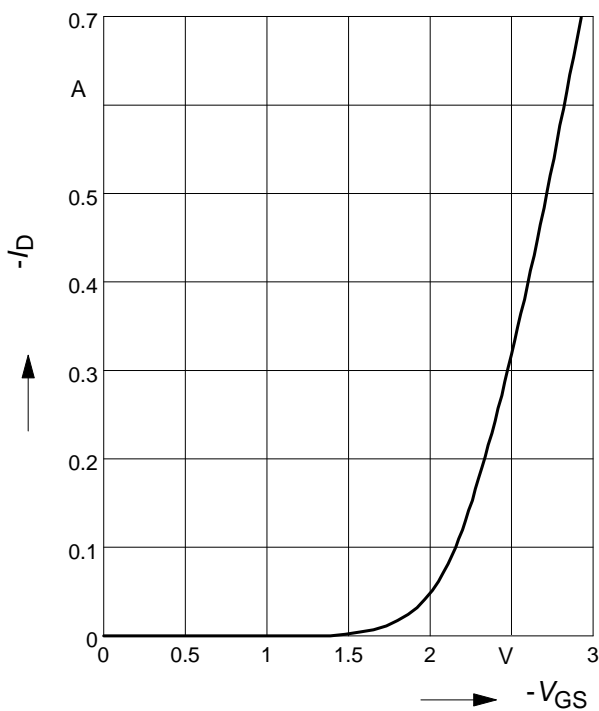
6 Typ. drain-source on resistance

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



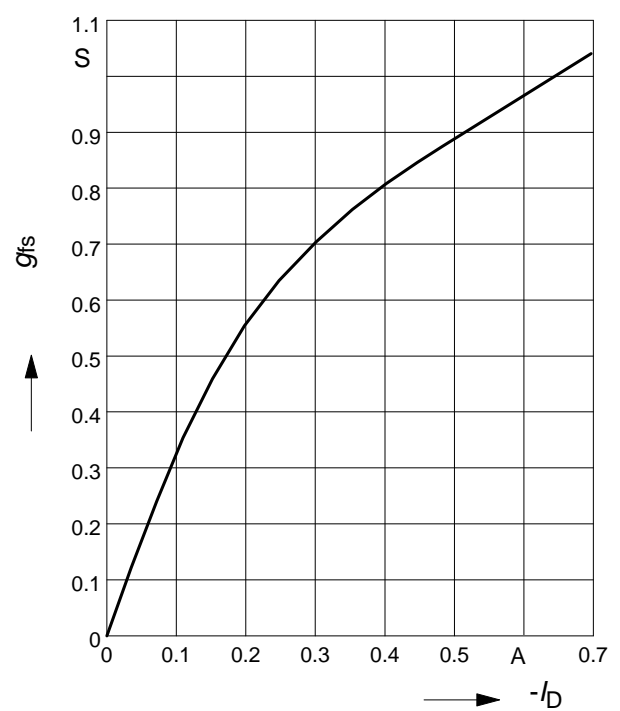
7 Typ. transfer characteristics

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



8 Typ. forward transconductance

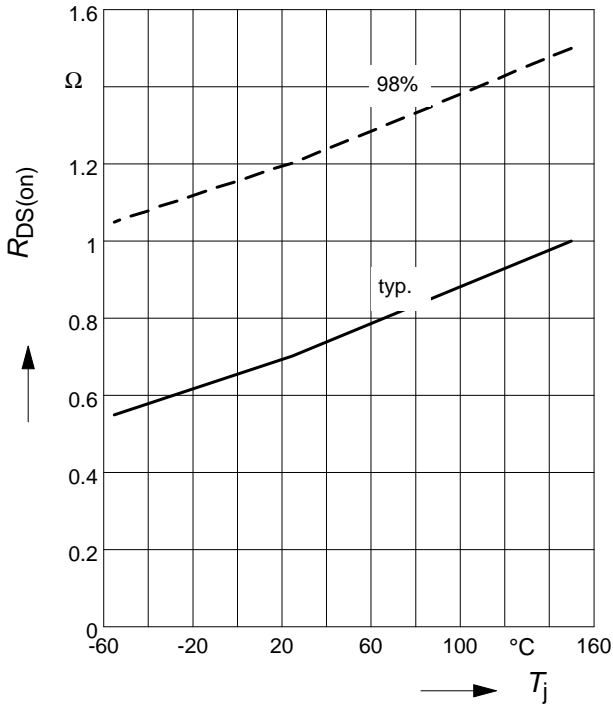
$g_{fs} = f(I_D)$
parameter: $T_j = 25^\circ\text{C}$



9 Drain-source on-resistance

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

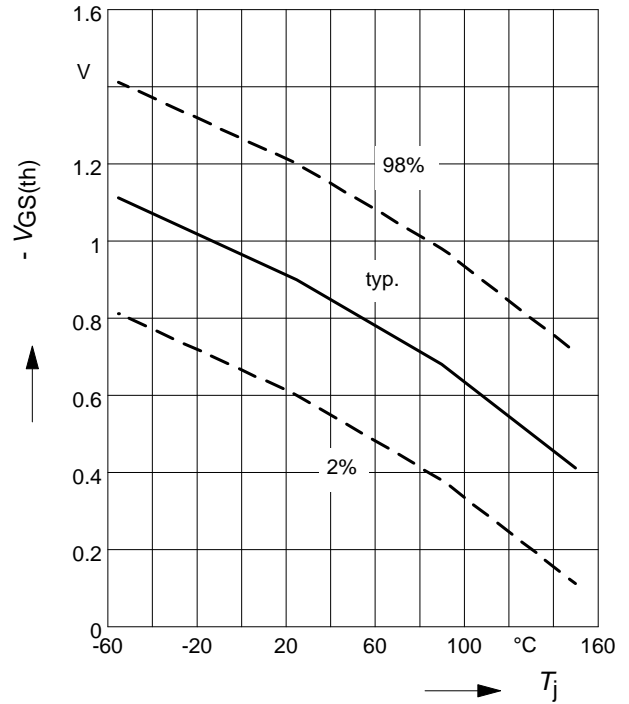
parameter: $I_D = -0.39 \text{ A}$, $V_{GS} = -4.5 \text{ V}$



10 Typ. gate threshold voltage

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

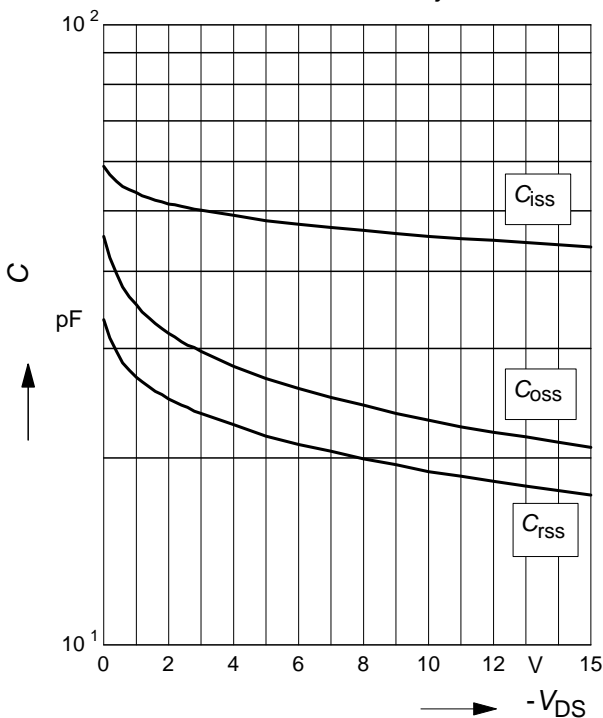
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

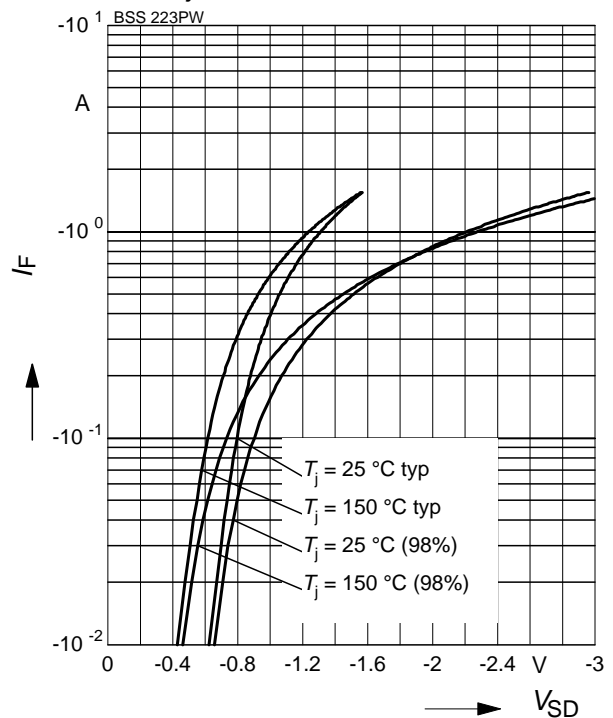
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$



12 Forward character. of reverse diode

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

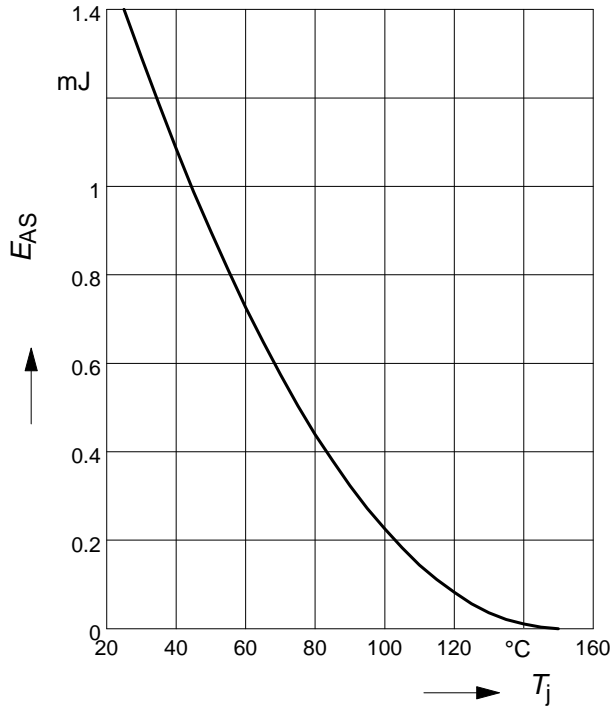
parameter: T_j



13 Typ. avalanche energy

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

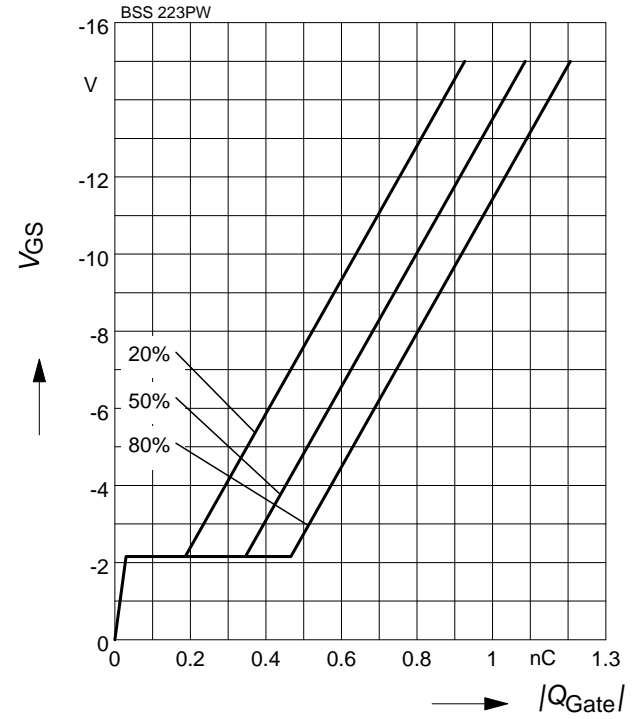
$V_{DD} = -10$ V, $R_{GS} = 25$ Ω



14 Typ. gate charge

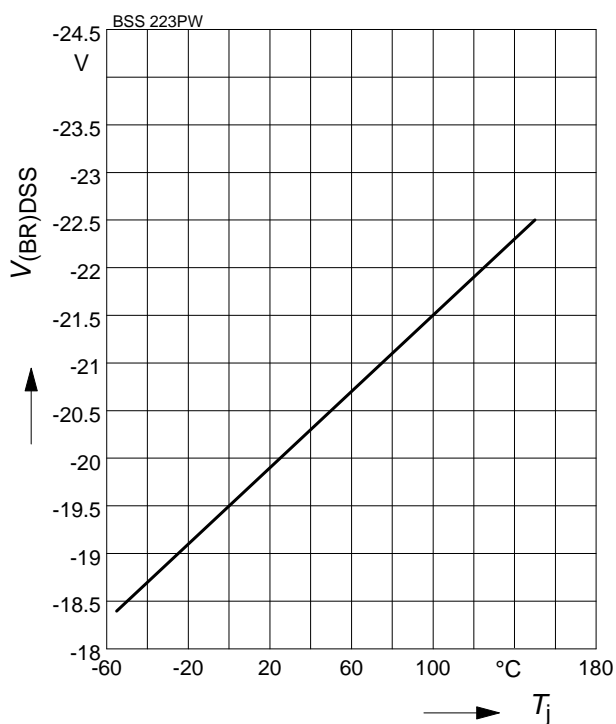
$V_{GS} = f(Q_{Gate})$

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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