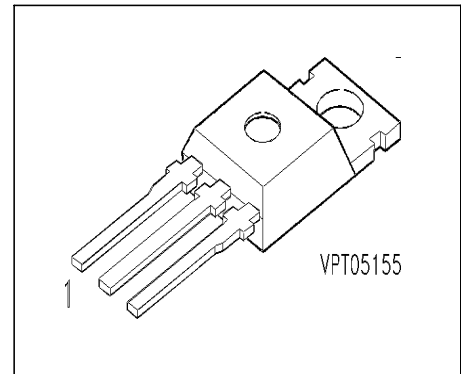


**SIPMOS® Power Transistor**

**BUZ 21**

- N channel
- Enhancement mode
- Avalanche-rated



| Pin 1 | Pin 2 | Pin 3 |
|-------|-------|-------|
| G     | D     | S     |

| Type   | V <sub>DS</sub> | I <sub>D</sub> | R <sub>DS(on)</sub> | Package   | Ordering Code   |
|--------|-----------------|----------------|---------------------|-----------|-----------------|
| BUZ 21 | 100 V           | 21 A           | 0.085 Ω             | TO-220 AB | C67078-S1308-A2 |

**Maximum Ratings**

| Parameter   | Symbol                 | Values        | Unit |
|---|------------------------|---------------|------|
| Continuous drain current<br><i>T<sub>C</sub></i> = 25 °C  | I <sub>D</sub>         | 21            | A    |
| Pulsed drain current<br><i>T<sub>C</sub></i> = 25 °C  | I <sub>Dpuls</sub>     | 84            |      |
| Avalanche current, limited by <i>T<sub>jmax</sub></i>   | I <sub>AR</sub>        | 21            |      |
| Avalanche energy, periodic limited by <i>T<sub>jmax</sub></i>   | E <sub>AR</sub>        | 11            | mJ   |
| Avalanche energy, single pulse<br>I <sub>D</sub> = 21 A, V <sub>DD</sub> = 25 V, R <sub>GS</sub> = 25 Ω<br>L = 340 μH, <i>T<sub>j</sub></i> = 25 °C | E <sub>AS</sub>        | 100           |      |
| Gate source voltage   | V <sub>GS</sub>        | ± 20          | V    |
| Power dissipation<br><i>T<sub>C</sub></i> = 25 °C   | P <sub>tot</sub>       | 75            | W    |
| Operating temperature   | <i>T<sub>j</sub></i>   | -55 ... + 150 | °C   |
| Storage temperature   | <i>T<sub>stg</sub></i> | -55 ... + 150 |      |
| Thermal resistance, chip case   | R <sub>thJC</sub>      | ≤ 1.67        | K/W  |
| Thermal resistance, chip to ambient   | R <sub>thJA</sub>      | 75            |      |
| DIN humidity category, DIN 40 040   |                        | E             |      |
| IEC climatic category, DIN IEC 68-1   |                        | 55 / 150 / 56 |      |

**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>$V_{GS} = 0\text{ V}, I_D = 0.25\text{ mA}, T_j = 25^\circ\text{C}$   | $V_{(BR)DSS}$ | 100    | -         | -        | V             |
| Gate threshold voltage<br>$V_{GS} = V_{DS}, I_D = 1\text{ mA}$   | $V_{GS(th)}$  | 2.1    | 3         | 4        |               |
| Zero gate voltage drain current<br>$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_j = 25^\circ\text{C}$<br>$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_j = 125^\circ\text{C}$ | $I_{DSS}$     | -      | 0.1<br>10 | 1<br>100 | $\mu\text{A}$ |
| Gate-source leakage current<br>$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$   | $I_{GSS}$     | -      | 10        | 100      | nA            |
| Drain-Source on-resistance<br>$V_{GS} = 10\text{ V}, I_D = 13\text{ A}$  | $R_{DS(on)}$  | -      | 0.065     | 0.085    | $\Omega$      |

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

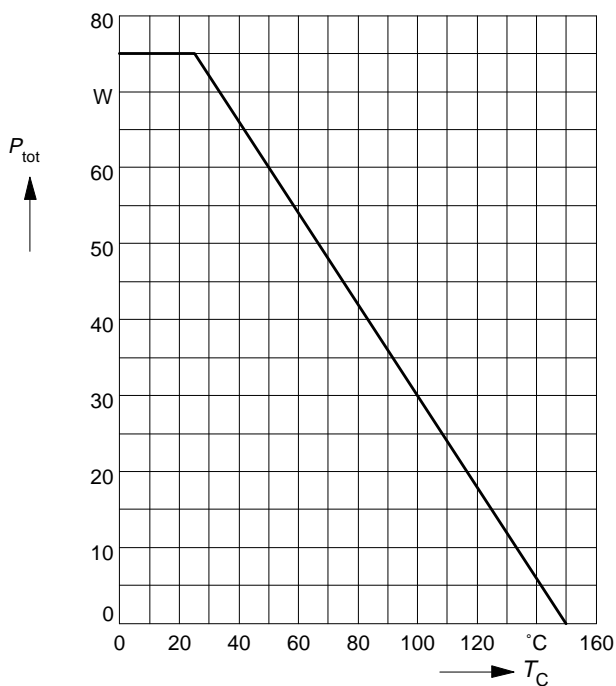
| Parameter  | Symbol       | Values |      |      | Unit |
|--|--------------|--------|------|------|------|
|  |              | min.   | typ. | max. |      |
| <b>Dynamic Characteristics</b>   |              |        |      |      |      |
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(on)max}$ , $I_D = 13 \text{ A}$                                       | $g_{fs}$     | 8      | 11   | -    | S    |
| Input capacitance<br>$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$                            | $C_{iss}$    | -      | 1000 | 1300 | pF   |
| Output capacitance<br>$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$                           | $C_{oss}$    | -      | 300  | 530  |      |
| Reverse transfer capacitance<br>$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$                 | $C_{rss}$    | -      | 150  | 240  |      |
| Turn-on delay time<br>$V_{DD} = 30 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$<br>$R_{GS} = 50 \Omega$  | $t_{d(on)}$  | -      | 25   | 40   | ns   |
| Rise time<br>$V_{DD} = 30 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_r$        | -      | 50   | 75   |      |
| Turn-off delay time<br>$V_{DD} = 30 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$<br>$R_{GS} = 50 \Omega$ | $t_{d(off)}$ | -      | 160  | 210  |      |
| Fall time<br>$V_{DD} = 30 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_f$        | -      | 80   | 110  |      |

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

| Parameter   | Symbol   | Values |      |      | Unit          |
|---|----------|--------|------|------|---------------|
|   |          | min.   | typ. | max. |               |
| <b>Reverse Diode</b>  |          |        |      |      |               |
| Inverse diode continuous forward current<br>$T_C = 25^\circ\text{C}$                          | $I_S$    | -      | -    | 21   | A             |
| Inverse diode direct current, pulsed<br>$T_C = 25^\circ\text{C}$                              | $I_{SM}$ | -      | -    | 84   |               |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}, I_F = 42\text{ A}$                     | $V_{SD}$ | -      | 1.3  | 1.7  | V             |
| Reverse recovery time<br>$V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$   | $t_{rr}$ | -      | 150  | -    | ns            |
| Reverse recovery charge<br>$V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$ | $Q_{rr}$ | -      | 0.48 | -    | $\mu\text{C}$ |

**Power dissipation**

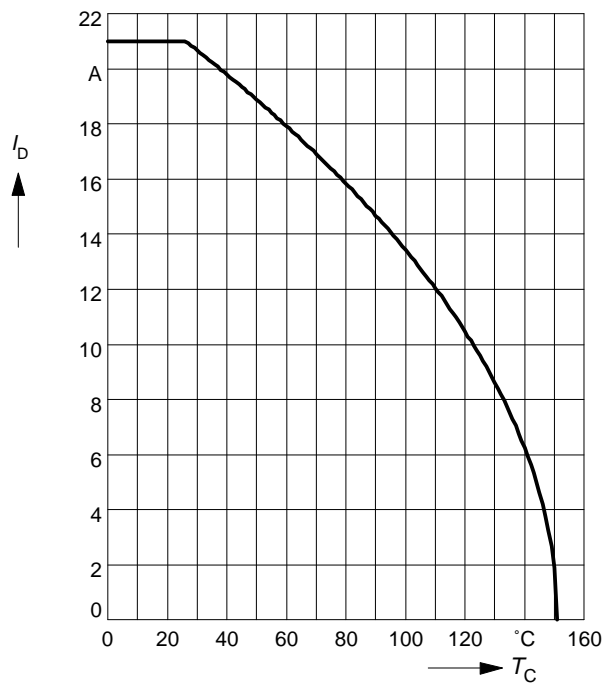
$P_{tot} = f(T_C)$



**Drain current**

$I_D = f(T_C)$

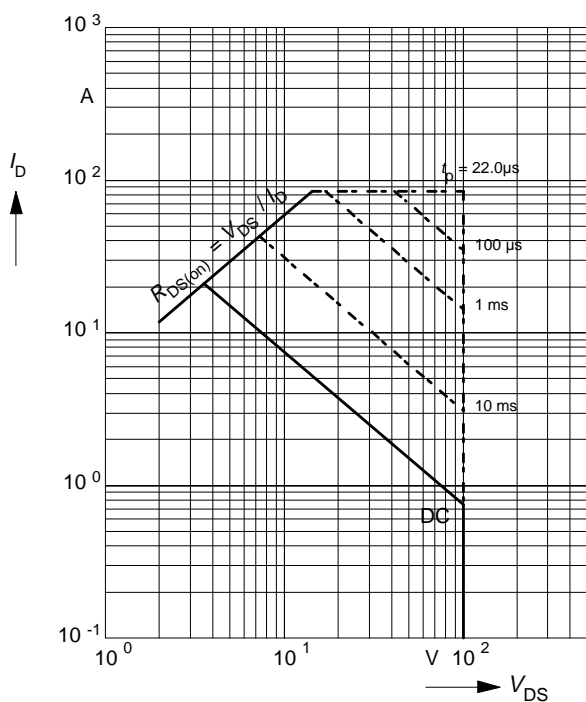
parameter:  $V_{GS} \geq 10\text{ V}$



**Safe operating area**

$I_D = f(V_{DS})$

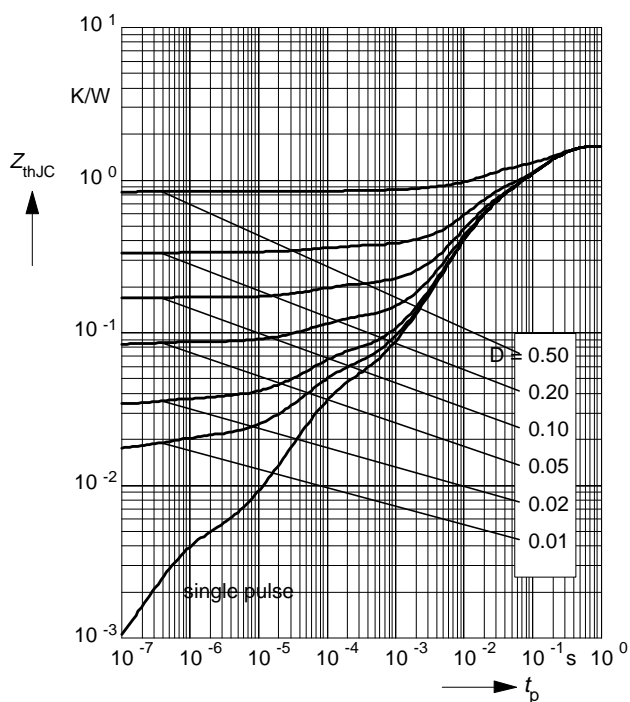
parameter:  $D = 0.01, T_C = 25^\circ\text{C}$



**Transient thermal impedance**

$Z_{thJC} = f(t_p)$

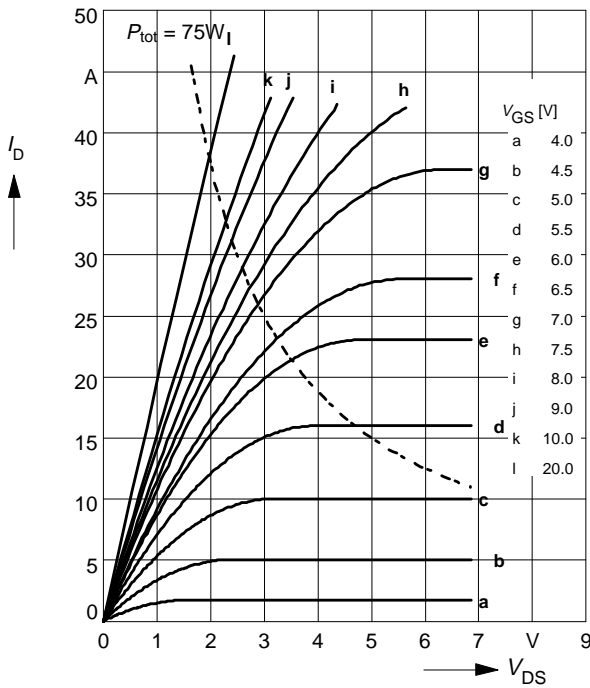
parameter:  $D = t_p / T$



**Typ. output characteristics**

$I_D = f(V_{DS})$

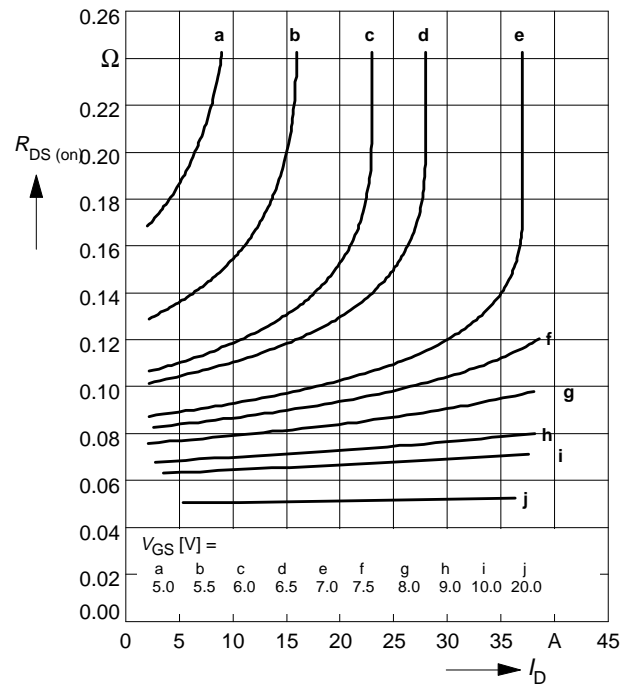
parameter:  $t_p = 80 \mu s$



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

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

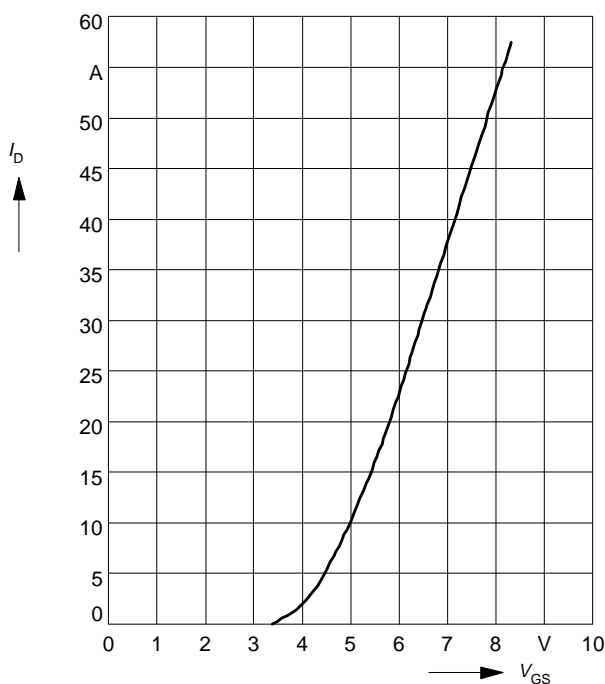
parameter:  $t_p = 80 \mu s, T_j = 25^\circ C$



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

parameter:  $t_p = 80 \mu s$

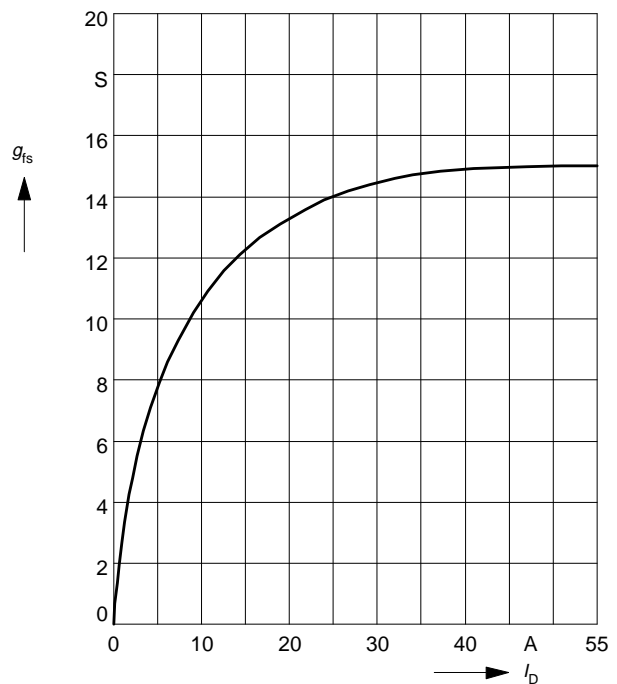
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Typ. forward transconductance**  $g_{fs} = f(I_D)$

parameter:  $t_p = 80 \mu s,$

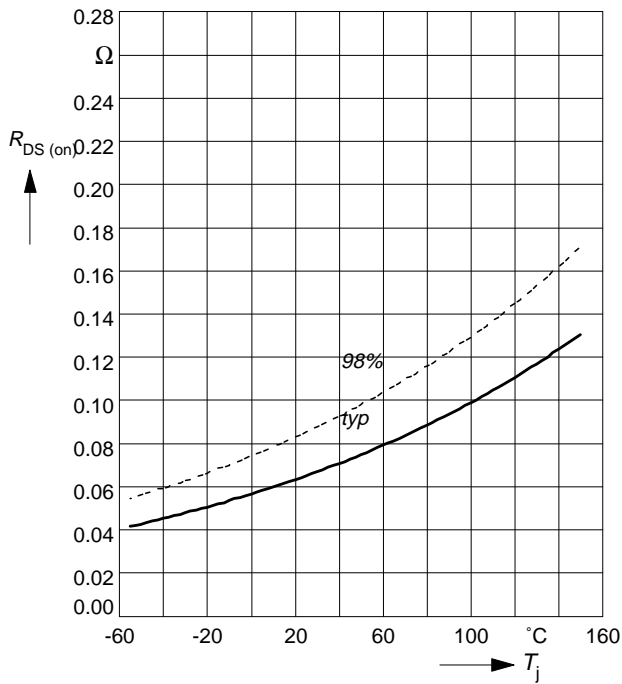
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Drain-source on-resistance**

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

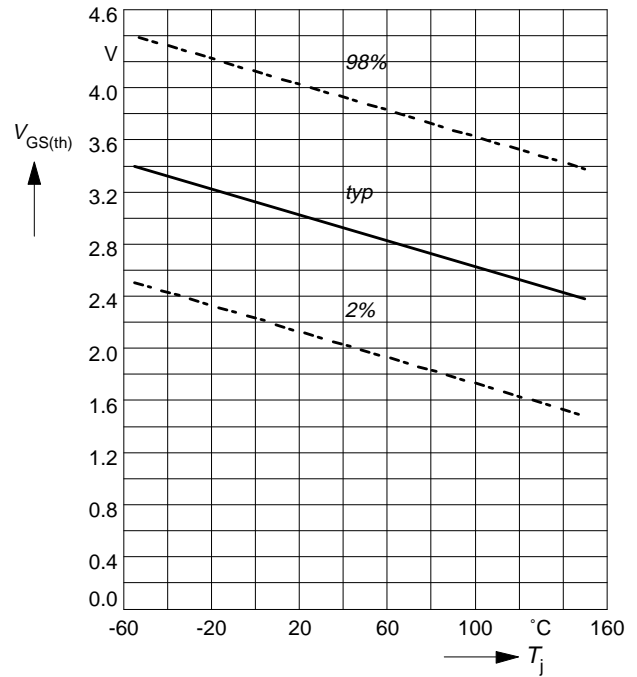
parameter:  $I_D = 13\text{ A}$ ,  $V_{GS} = 10\text{ V}$



**Gate threshold voltage**

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

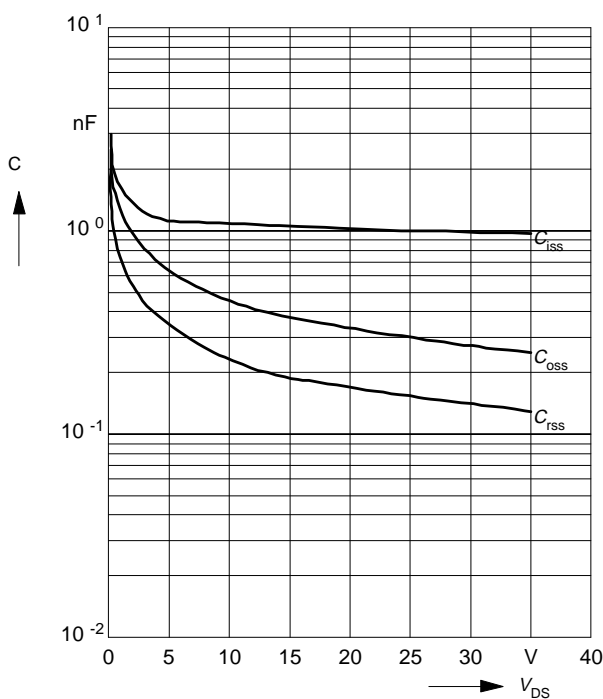
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 1\text{ mA}$



**Typ. capacitances**

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

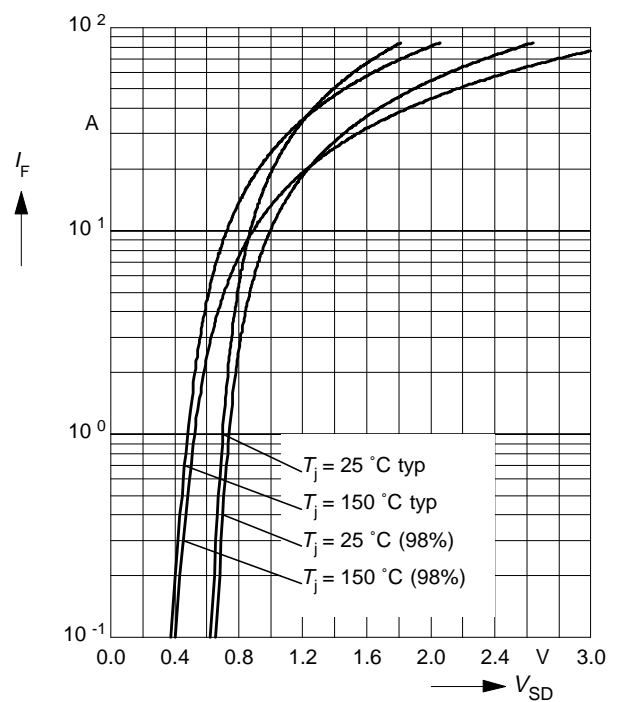
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



**Forward characteristics of reverse diode**

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

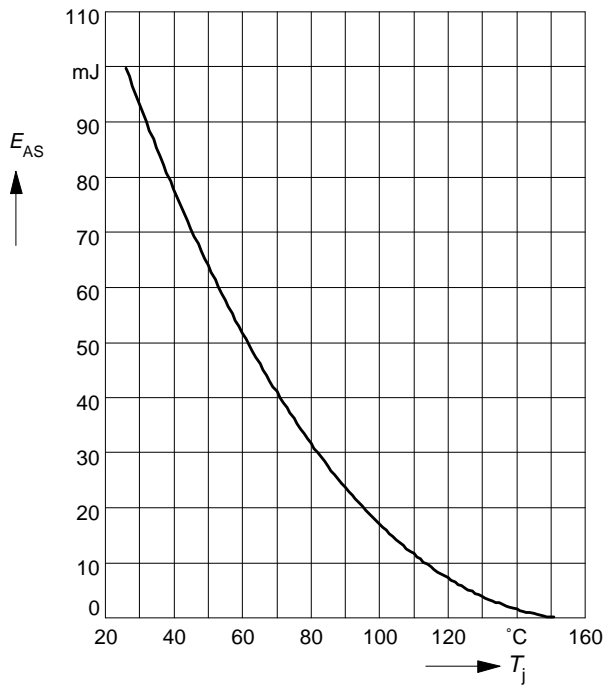
parameter:  $T_j$ ,  $t_p = 80\text{ }\mu\text{s}$



**Avalanche energy**  $E_{AS} = f(T_j)$

parameter:  $I_D = 21\text{ A}$ ,  $V_{DD} = 25\text{ V}$

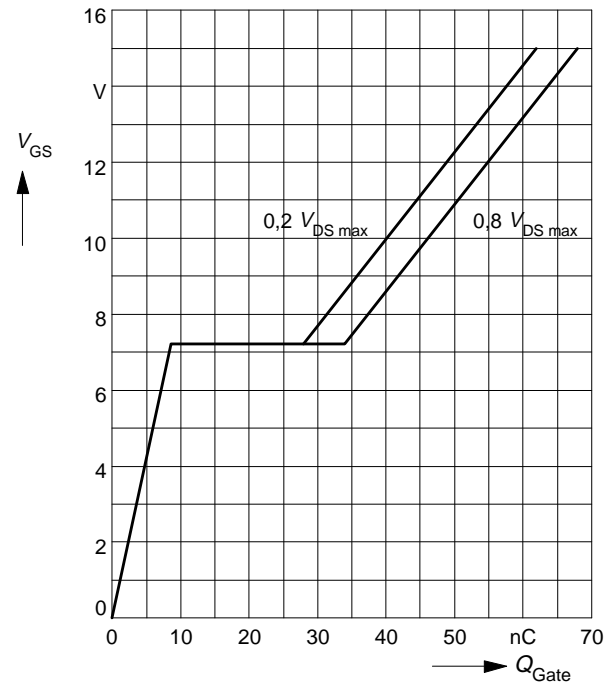
$R_{GS} = 25\ \Omega$ ,  $L = 340\ \mu\text{H}$



**Typ. gate charge**

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

parameter:  $I_{D\text{ puls}} = 36\text{ A}$



**Drain-source breakdown voltage**

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

