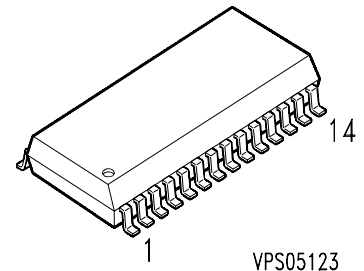
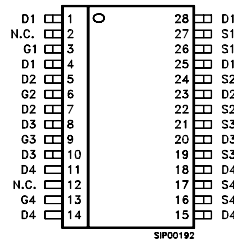


## SIPMOS<sup>®</sup> Power Transistor

- Quad-channel
- Enhancement mode
- Logic level
- Avalanche-rated
- $dv/dt$  rated



VPS05123

| Type        | $V_{DS}$ | $I_D$ | $R_{DS(on)}$   | Package  | Ordering Code         |
|-------------|----------|-------|----------------|----------|-----------------------|
| BUZ 103SL-4 | 55 V     | 4.8 A | 0.055 $\Omega$ | P-DSO-28 | C67078-S. . . . - . . |

## Maximum Ratings

| Parameter                                                                                                                                                              | Symbol      | Values        | Unit              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|-------------------|
| Continuous drain current <i>one channel active</i><br>$T_A = 25\text{ }^\circ\text{C}$                                                                                 | $I_D$       | 4.8           | A                 |
| Pulsed drain current <i>one channel active</i><br>$T_A = 25\text{ }^\circ\text{C}$                                                                                     | $I_{Dpuls}$ | 19.2          |                   |
| Avalanche energy, single pulse<br>$I_D = 4.8\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$<br>$L = 12\text{ mH}$ , $T_j = 25\text{ }^\circ\text{C}$ | $E_{AS}$    | 140           | mJ                |
| Reverse diode $dv/dt$<br>$I_S = 4.8\text{ A}$ , $V_{DS} = 40\text{ V}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$<br>$T_{jmax} = 175\text{ }^\circ\text{C}$                | $dv/dt$     | 6             | kV/ $\mu\text{s}$ |
| Gate source voltage                                                                                                                                                    | $V_{GS}$    | $\pm 14$      | V                 |
| Power dissipation , <i>one channel active</i><br>$T_A = 25\text{ }^\circ\text{C}$                                                                                      | $P_{tot}$   | 2.4           | W                 |
| Operating temperature                                                                                                                                                  | $T_j$       | -55 ... + 175 | $^\circ\text{C}$  |
| Storage temperature                                                                                                                                                    | $T_{stg}$   | -55 ... + 175 |                   |
| IEC climatic category, DIN IEC 68-1                                                                                                                                    |             | 55 / 175 / 56 |                   |

### Thermal Characteristics

| Parameter                                                    | Symbol     | Values |      |      | Unit |
|--------------------------------------------------------------|------------|--------|------|------|------|
|                                                              |            | min.   | typ. | max. |      |
| Thermal resistance, junction - soldering point <sup>1)</sup> | $R_{thJS}$ | -      | tbd  | -    | K/W  |
| Thermal resistance, junction - ambient <sup>2)</sup>         | $R_{thJA}$ | -      | 62.5 | -    |      |

1) Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70μm thick) copper area for Drain connection. PCB is vertical without blown air.

2) one channel active

### 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>$V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$ , $T_j = 25^\circ\text{C}$                                                                                                                                                             | $V_{(BR)DSS}$ | 55          | -             | -               | V             |
| Gate threshold voltage<br>$V_{GS}=V_{DS}$ , $I_D = 50\text{ }\mu\text{A}$                                                                                                                                                                                                | $V_{GS(th)}$  | 1.2         | 1.6           | 2               |               |
| Zero gate voltage drain current<br>$V_{DS} = 55\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = -40^\circ\text{C}$<br>$V_{DS} = 55\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25^\circ\text{C}$<br>$V_{DS} = 55\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150^\circ\text{C}$ | $I_{DSS}$     | -<br>-<br>- | -<br>0.1<br>- | 0.1<br>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             |               |
| Drain-Source on-resistance<br>$V_{GS} = 5\text{ V}$ , $I_D = 4.8\text{ A}$                                                                                                                                                                                               | $R_{DS(on)}$  | -           | 0.0403        | 0.055           | $\Omega$      |

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

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

### Dynamic Characteristics

|                                                                                             |                 |     |      |     |    |
|---------------------------------------------------------------------------------------------|-----------------|-----|------|-----|----|
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(on)max}$ , $I_D = 0$ A                     | $g_{fs}$        | tbd | -    | -   | S  |
| Input capacitance<br>$V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz                           | $C_{iss}$       | -   | 770  | 960 | pF |
| Output capacitance<br>$V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz                          | $C_{oss}$       | -   | 230  | 290 |    |
| Reverse transfer capacitance<br>$V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz                | $C_{rss}$       | -   | 130  | 165 |    |
| Turn-on delay time<br>$V_{DD} = 30$ V, $V_{GS} = 5$ V, $I_D = 4.8$ A<br>$R_G = 6.5 \Omega$  | $t_{d(on)}$     | -   | 50   | 75  | ns |
| Rise time<br>$V_{DD} = 30$ V, $V_{GS} = 5$ V, $I_D = 4.8$ A<br>$R_G = 6.5 \Omega$           | $t_r$           | -   | 30   | 45  |    |
| Turn-off delay time<br>$V_{DD} = 30$ V, $V_{GS} = 5$ V, $I_D = 4.8$ A<br>$R_G = 6.5 \Omega$ | $t_{d(off)}$    | -   | 20   | 30  |    |
| Fall time<br>$V_{DD} = 30$ V, $V_{GS} = 5$ V, $I_D = 4.8$ A<br>$R_G = 6.5 \Omega$           | $t_f$           | -   | 40   | 60  |    |
| Gate charge at threshold<br>$V_{DD} = 40$ V, $I_D \geq 0.1$ A, $V_{GS} = 0$ to 1 V          | $Q_{g(th)}$     | -   | 1.33 | 2   | nC |
| Gate charge at 5.0 V<br>$V_{DD} = 40$ V, $I_D = 4.8$ A, $V_{GS} = 0$ to 5 V                 | $Q_{g(5)}$      | -   | 20   | 30  |    |
| Gate charge total<br>$V_{DD} = 40$ V, $I_D = 4.8$ A, $V_{GS} = 0$ to 10 V                   | $Q_{g(total)}$  | -   | 32.6 | 50  |    |
| Gate plateau voltage<br>$V_{DD} = 40$ V, $I_D = 28$ A                                       | $V_{(plateau)}$ | -   | 2.94 | -   | V  |

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

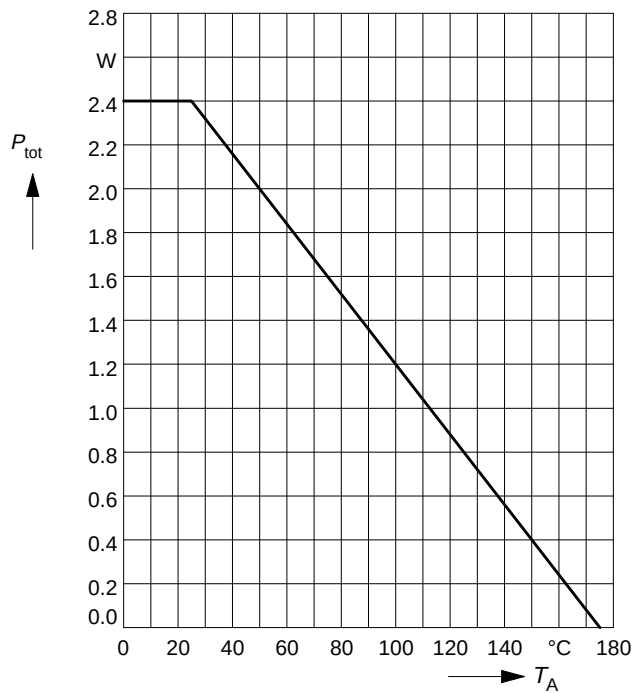
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

### Reverse Diode

|                                                                                                     |          |   |     |      |    |
|-----------------------------------------------------------------------------------------------------|----------|---|-----|------|----|
| Inverse diode continuous forward current<br>$T_A = 25^\circ\text{C}$                                | $I_S$    | - | -   | 4.8  | A  |
| Inverse diode direct current, pulsed<br>$T_A = 25^\circ\text{C}$                                    | $I_{SM}$ | - | -   | 19.2 |    |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = 9.6\text{ A}$                       | $V_{SD}$ | - | 0.9 | 1.6  | V  |
| Reverse recovery time<br>$V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$   | $t_{rr}$ | - | 55  | 85   | ns |
| Reverse recovery charge<br>$V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ | $Q_{rr}$ | - | 93  | 140  | nC |

### Power dissipation

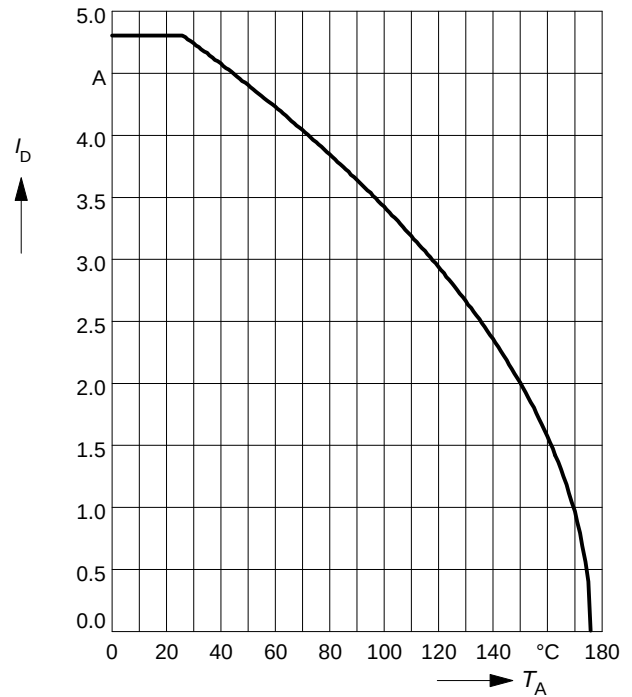
$$P_{\text{tot}} = f(T_A)$$



### Drain current

$$I_D = f(T_A)$$

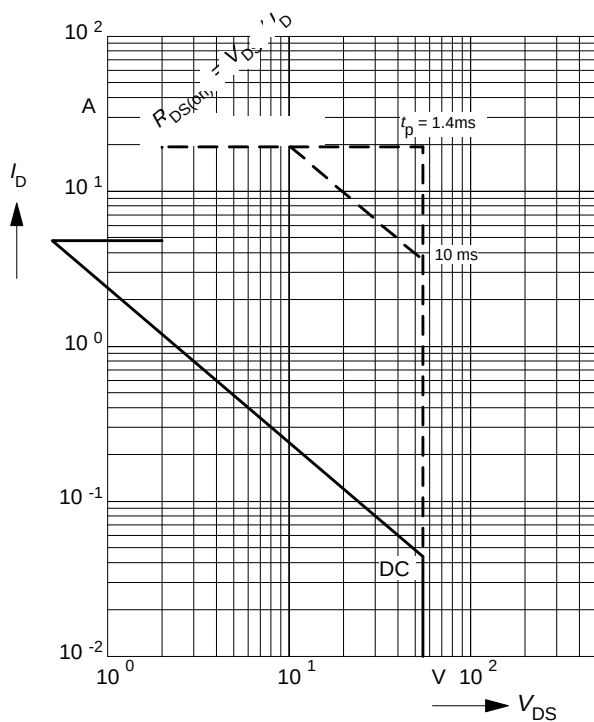
parameter:  $V_{GS} \geq 5 \text{ V}$



### Safe operating area

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

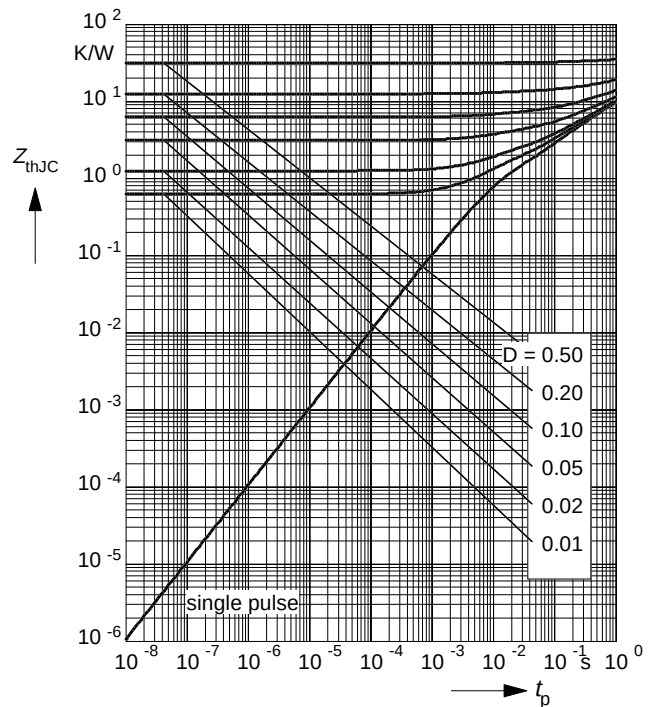
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### Transient thermal impedance

$$Z_{\text{th JA}} = f(t_p)$$

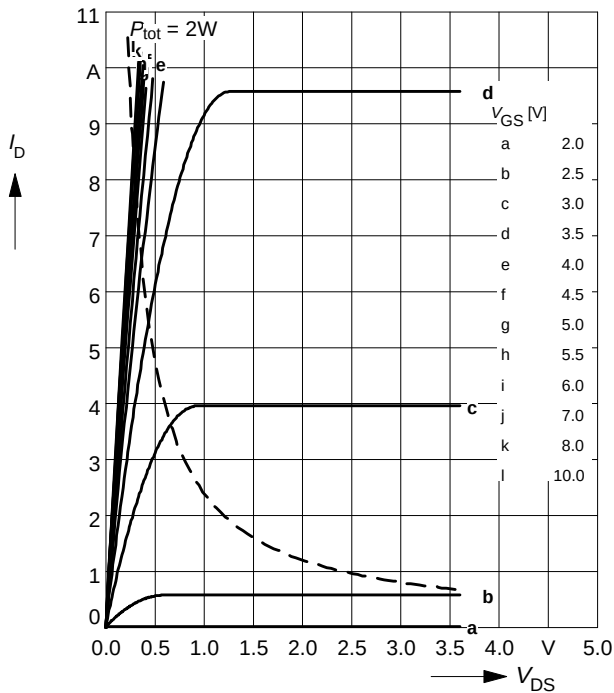
parameter:  $D = t_p / T$



### Typ. output characteristics

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

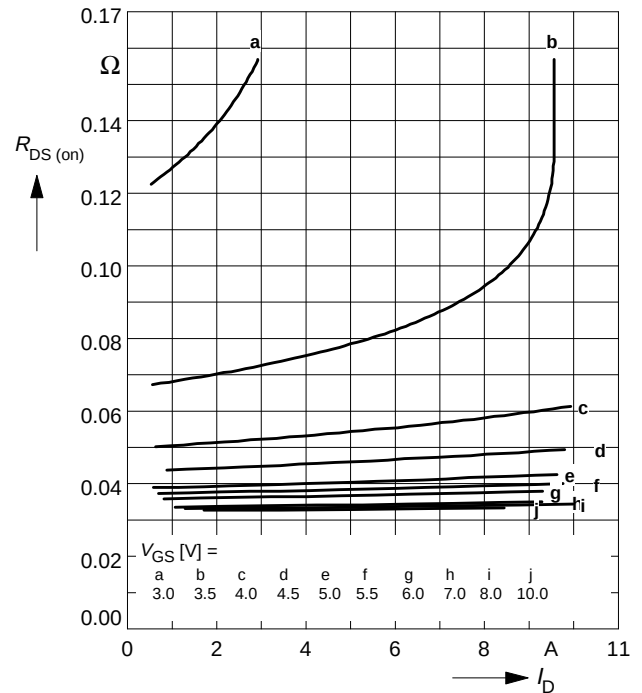
parameter:  $t_p = 80 \mu s$



### Typ. drain-source on-resistance

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

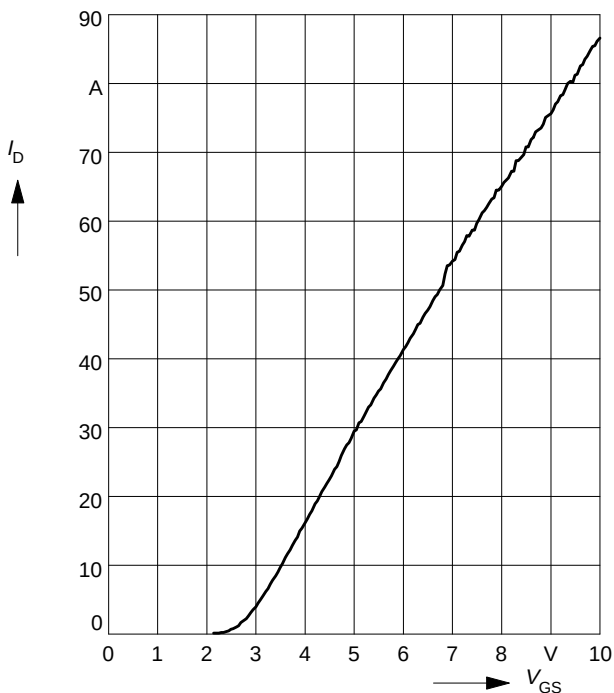
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



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

parameter:  $t_p = 80 \mu s$

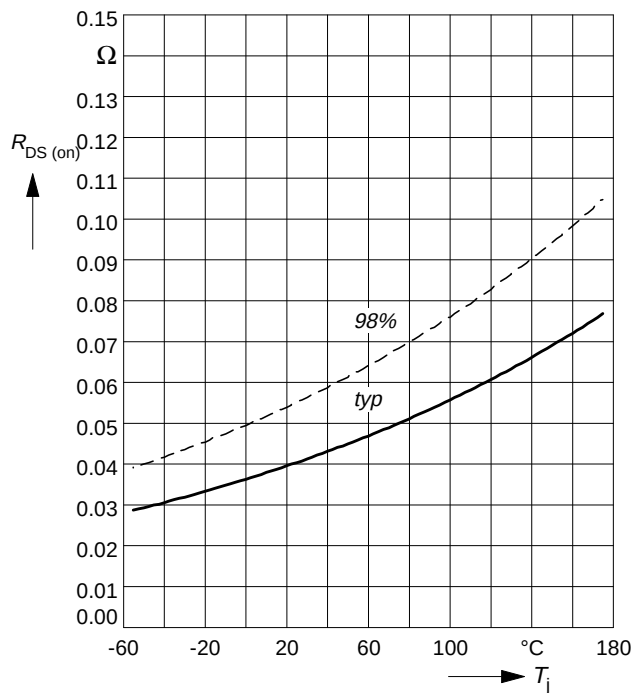
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



### Drain-source on-resistance

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

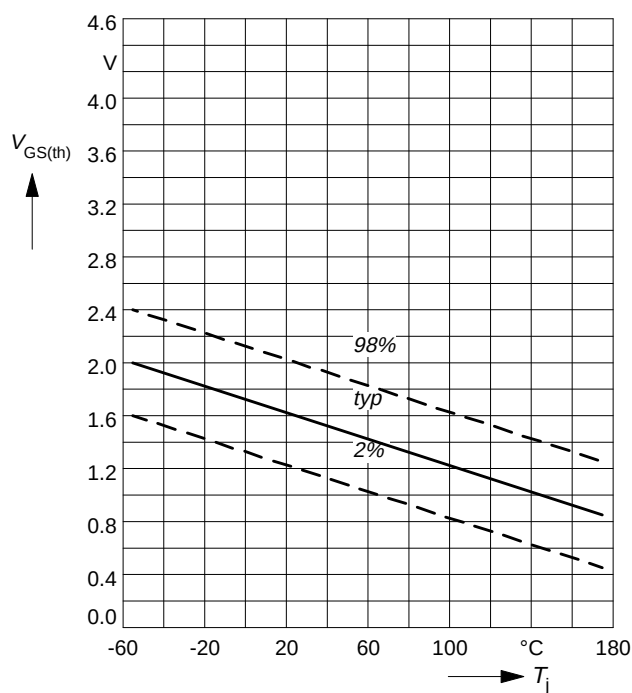
parameter:  $I_D = 4.8 \text{ A}$ ,  $V_{GS} = 5 \text{ V}$



### Gate threshold voltage

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

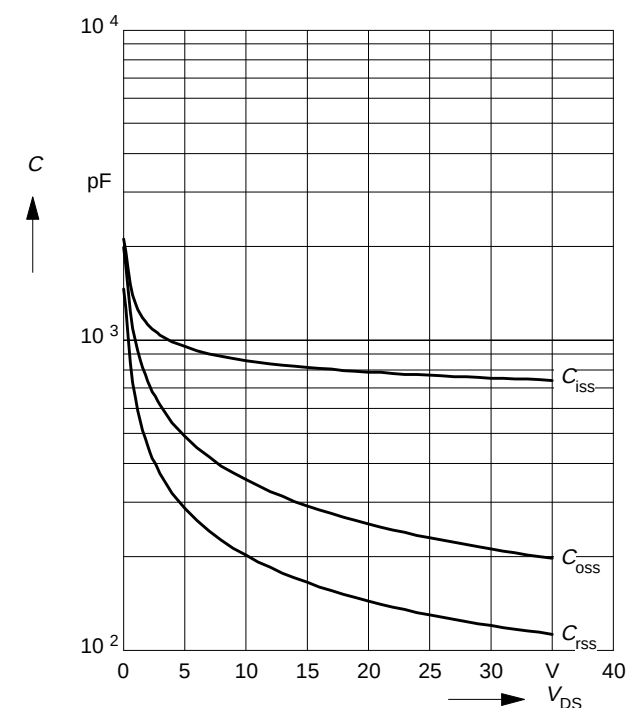
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 50 \mu\text{A}$



### Typ. capacitances

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

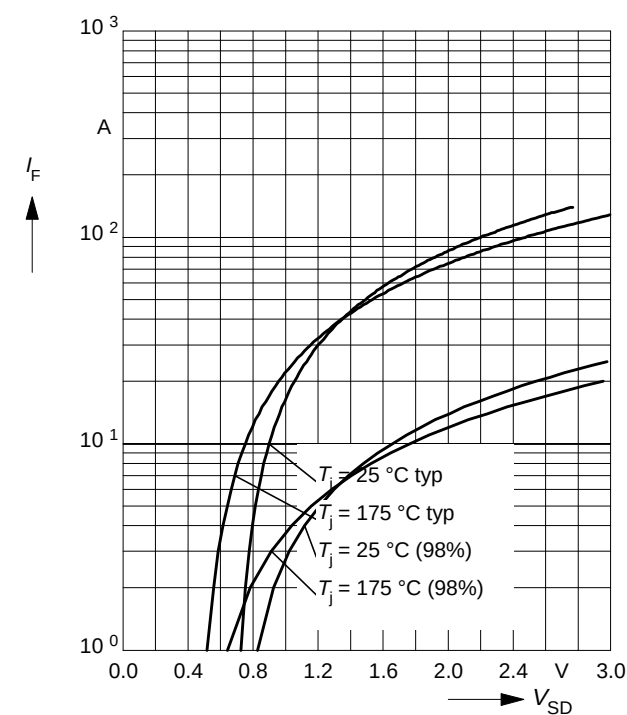
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

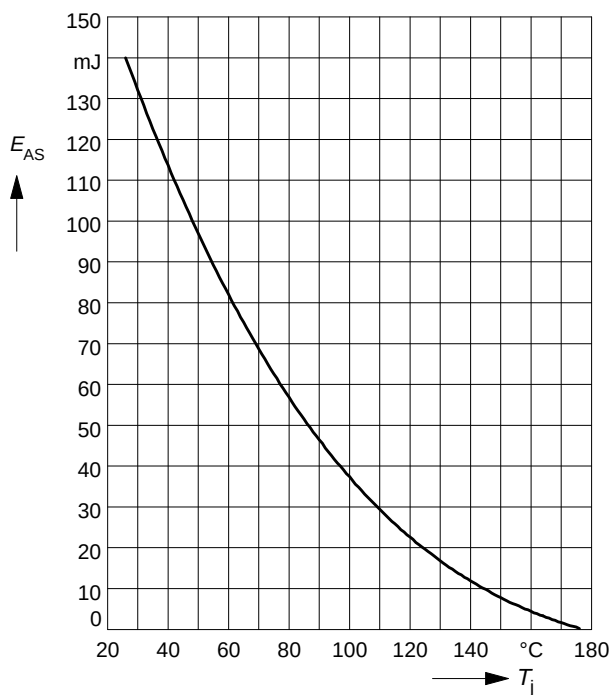
$$I_F = f(V_{SD})$$

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



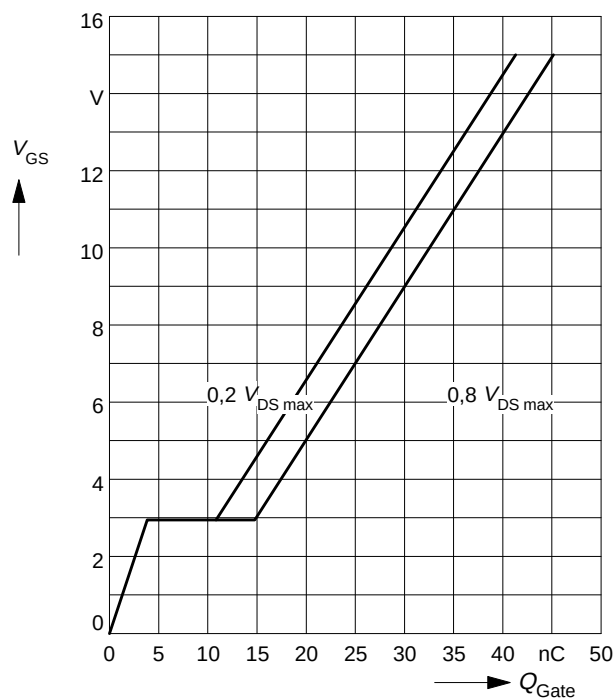
### Avalanche energy $E_{AS} = f(T_j)$

parameter:  $I_D = 4.8 \text{ A}$ ,  $V_{DD} = 25 \text{ V}$   
 $R_{GS} = 25 \Omega$ ,  $L = 12 \text{ mH}$



### Typ. gate charge $V_{GS} = f(Q_{Gate})$

parameter:  $I_{D \text{ puls}} = 5 \text{ A}$



### Drain-source breakdown voltage $V_{(BR)DSS} = f(T_j)$

