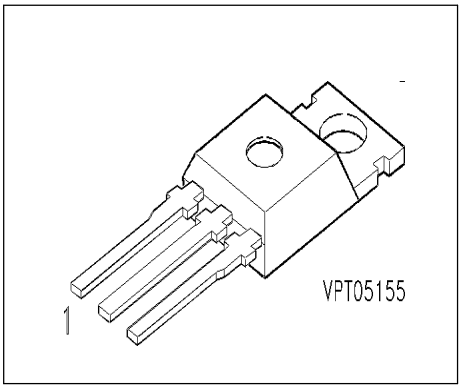
**SIPMOS ® Power Transistor**

- N channel
- Enhancement mode
- Avalanche-rated
- Logic Level




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

| Type | $V_{DS}$ | $I_D$ | $R_{DS(on)}$ | Package | Ordering Code |
|---|---|---|---|---|---|
| BUZ 31 L | 200 V | 13.5 A | 0.2 Ω | TO-220 AB | C67078-S1322-A2 |

**Maximum Ratings**

| Parameter | Symbol | Values | Unit |
|---|---|---|---|
| Continuous drain current<br>$T_C$ = 28 °C | $I_D$ | 13.5 | A |
| Pulsed drain current<br>$T_C$ = 25 °C | $I_{Dpuls}$ | 54 | |
| Avalanche current,limited by $T_{jmax}$ | $I_{AR}$ | 13.5 | |
| Avalanche energy,periodic limited by $T_{jmax}$ | $E_{AR}$ | 9 | mJ |
| Avalanche energy, single pulse<br>$I_D$ = 13.5 A, $V_{DD}$ = 50 V, $R_{GS}$ = 25 Ω<br>$L$ = 1.65 mH, $T_j$ = 25 °C | $E_{AS}$ | 200 | |
| Gate source voltage | $V_{GS}$ | ± 14 | V |
| Gate-source peak voltage,aperiodic | $V_{gs}$ | ± 20 | |
| Power dissipation<br>$T_C$ = 25 °C | $P_{tot}$ | 75 | W |
| Operating temperature | $T_j$ | -55 ... + 150 | °C |
| Storage temperature | $T_{stg}$ | -55 ... + 150 | |
| Thermal resistance, chip case | $R_{thJC}$ | ≤ 1.67 | K/W |
| Thermal resistance, chip to ambient | $R_{thJA}$ | 75 | |
| DIN humidity category, DIN 40 040 | | E | |
| IEC climatic category, DIN IEC 68-1 | | 55 / 150 / 56 | |

**Electrical Characteristics,** at $T_j$ = 25°C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain- source breakdown voltage<br>$V_{GS}$ = 0 V, $I_D$ = 0.25 mA, $T_j$ = 25 °C | $V_{(BR)DSS}$ | 200 | - | - | V |
| Gate threshold voltage<br>$V_{GS}$=$V_{DS}$, $I_D$ = 1 mA | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current<br>$V_{DS}$ = 200 V, $V_{GS}$ = 0 V, $T_j$ = 25 °C<br>$V_{DS}$ = 200 V, $V_{GS}$ = 0 V, $T_j$ = 125 °C | $I_{DSS}$ | -<br>- | 0.1<br>10 | 1<br>100 | µA |
| Gate-source leakage current<br>$V_{GS}$ = 20 V, $V_{DS}$ = 0 V | $I_{GSS}$ | - | 10 | 100 | nA |
| Drain-Source on-resistance<br>$V_{GS}$ = 5 V, $I_D$ = 7 A | $R_{DS(on)}$ | - | 0.16 | 0.2 | Ω |

**Electrical Characteristics,** at $T_j$ = 25°C, unless otherwise specified

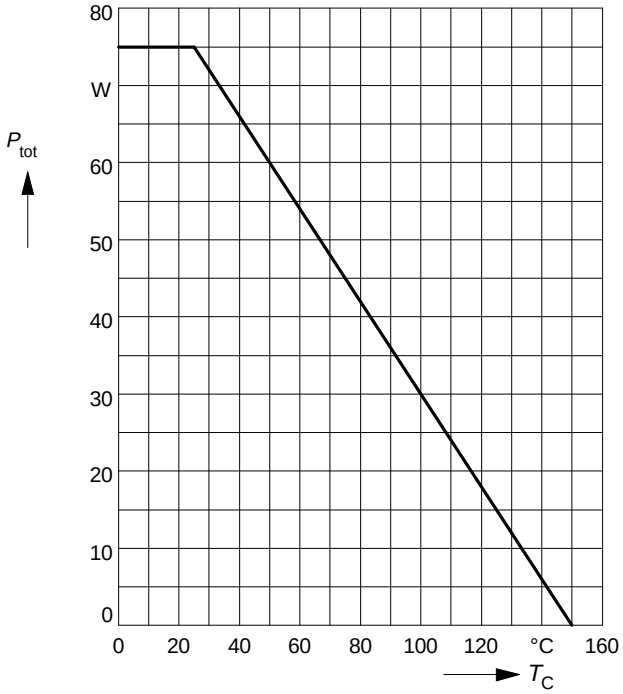
| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | |
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(on)max}$, $I_D$ = 7 A | $g_{fs}$ | 5 | 12 | - | S |
| Input capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{iss}$ | - | 1200 | 1600 | pF |
| Output capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{oss}$ | - | 200 | 300 | |
| Reverse transfer capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{rss}$ | - | 100 | 150 | |
| Turn-on delay time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 5 V, $I_D$ = 3 A<br>$R_{GS}$ = 50 Ω | $t_{d(on)}$ | - | 25 | 40 | ns |
| Rise time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 5 V, $I_D$ = 3 A<br>$R_{GS}$ = 50 Ω | $t_r$ | - | 80 | 120 | |
| Turn-off delay time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 5 V, $I_D$ = 3 A<br>$R_{GS}$ = 50 Ω | $t_{d(off)}$ | - | 210 | 270 | |
| Fall time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 5 V, $I_D$ = 3 A<br>$R_{GS}$ = 50 Ω | $t_f$ | - | 65 | 85 | |

**Electrical Characteristics,** at $T_j$ = 25°C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Reverse Diode** | | | | | |
| Inverse diode continuous forward current<br>$T_C$ = 25 °C | $I_S$ | - | - | 13.5 | A |
| Inverse diode direct current,pulsed<br>$T_C$ = 25 °C | $I_{SM}$ | - | - | 54 | |
| Inverse diode forward voltage<br>$V_{GS}$ = 0 V, $I_F$ = 27 A | $V_{SD}$ | - | 1.2 | 1.6 | V |
| Reverse recovery time<br>$V_R$ = 100 V, $I_F$=$I_S$, d$i_F$/d$t$ = 100 A/µs | $t_{rr}$ | - | 180 | - | ns |
| Reverse recovery charge<br>$V_R$ = 100 V, $I_F$=$I_S$, d$i_F$/d$t$ = 100 A/µs | $Q_{rr}$ | - | 1.2 | - | µC |

**Power dissipation**

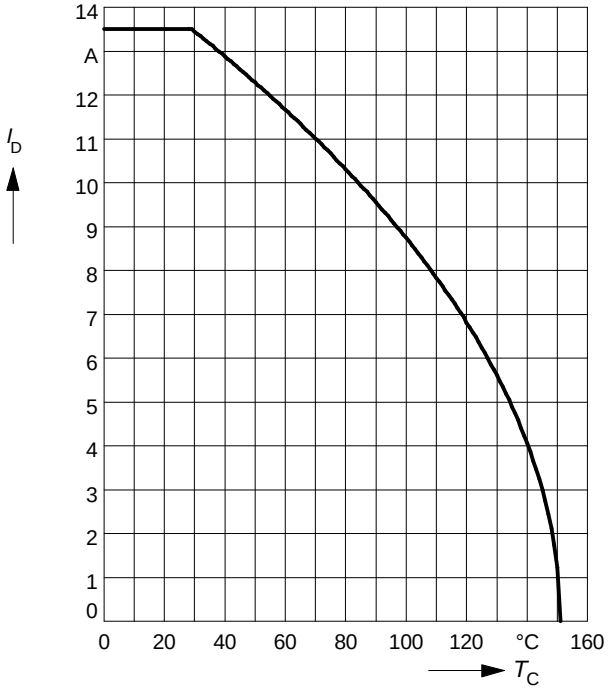
$P_{tot} = f(T_C)$




**Drain current**

$I_D = f(T_C)$

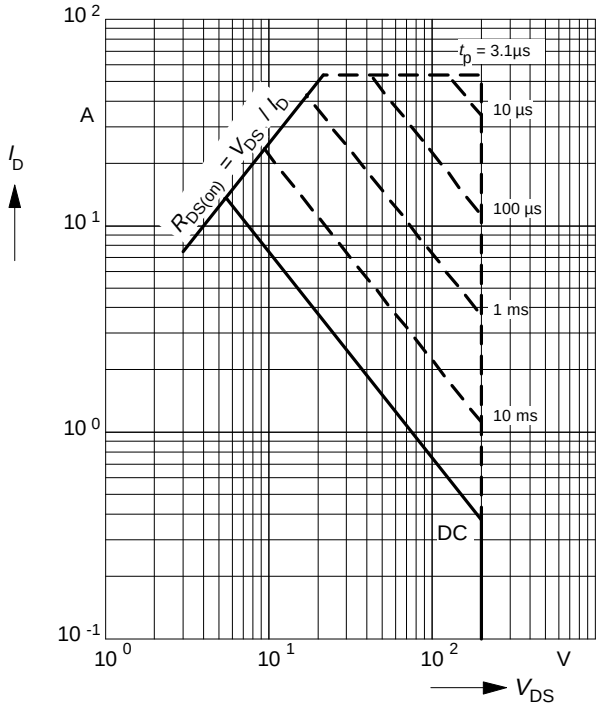
parameter: $V_{GS} \geq 5$ V




**Safe operating area**

$I_D = f(V_{DS})$

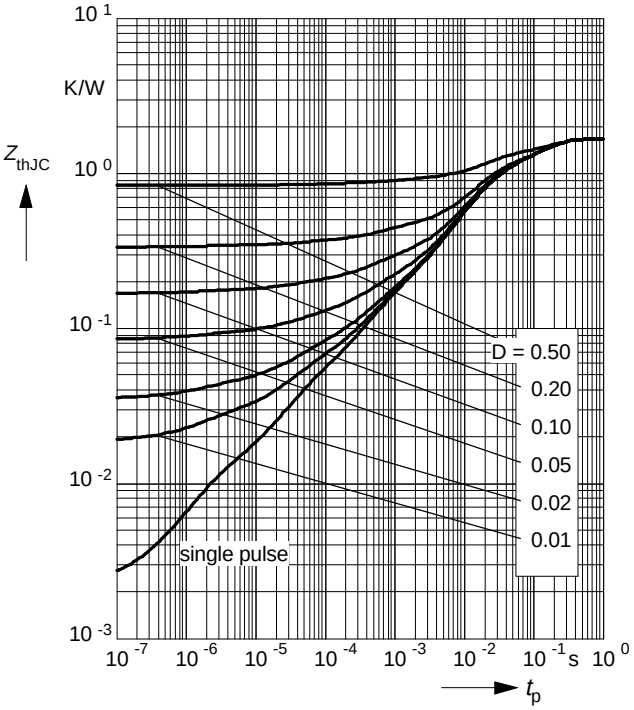
parameter: $D = 0.01$, $T_C = 25$°C



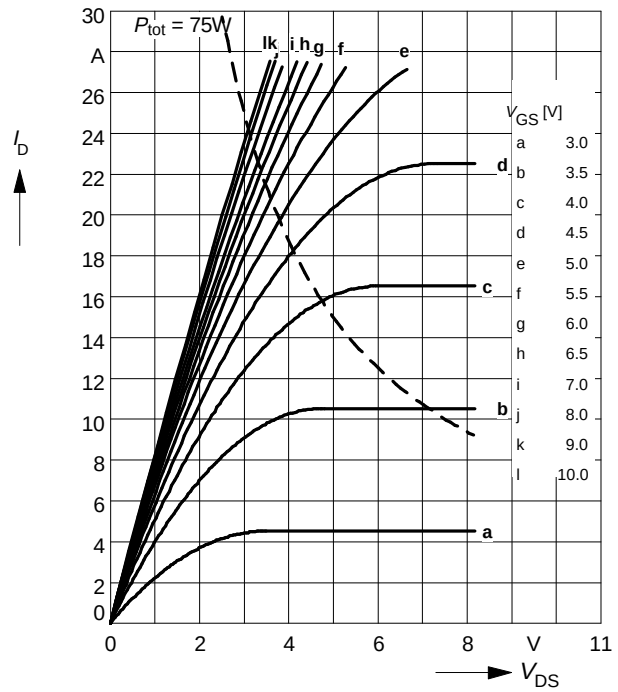

**Transient thermal impedance**

$Z_{th\,JC} = f(t_p)$

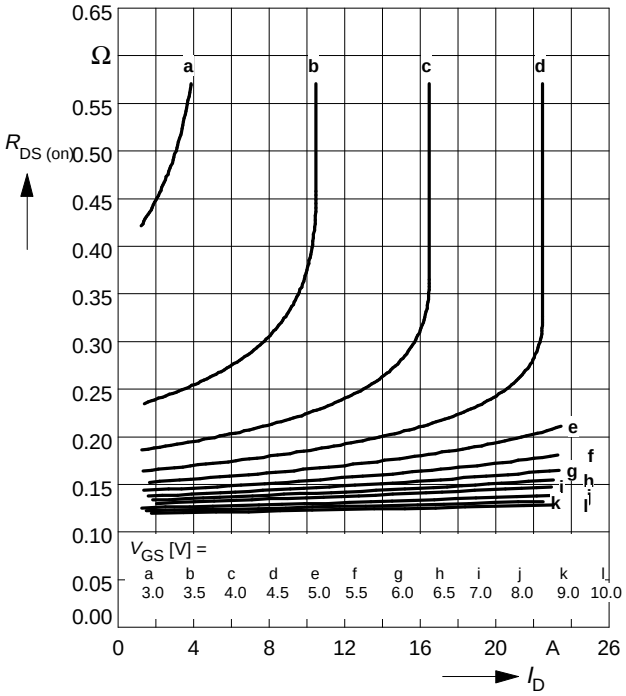
parameter: $D = t_p / T$



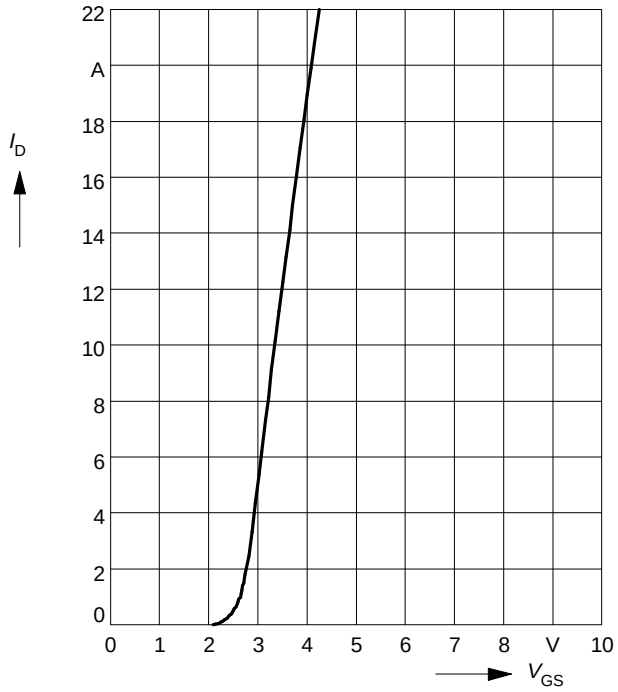
**Typ. output characteristics**
$I_D = f(V_{DS})$
parameter: $t_p$ = 80 µs



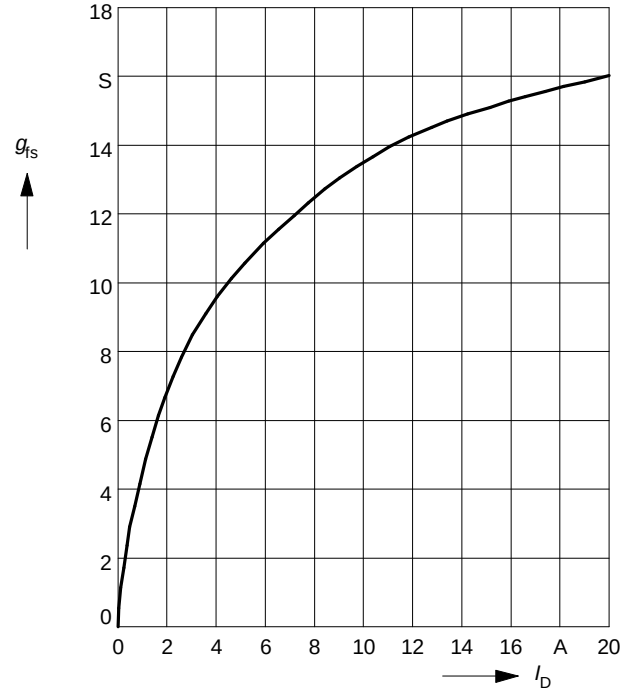

**Typ. drain-source on-resistance**
$R_{DS\ (on)} = f(I_D)$
parameter: $V_{GS}$




**Typ. transfer characteristics** $I_D = f(V_{GS})$
parameter: $t_p$ = 80 µs
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



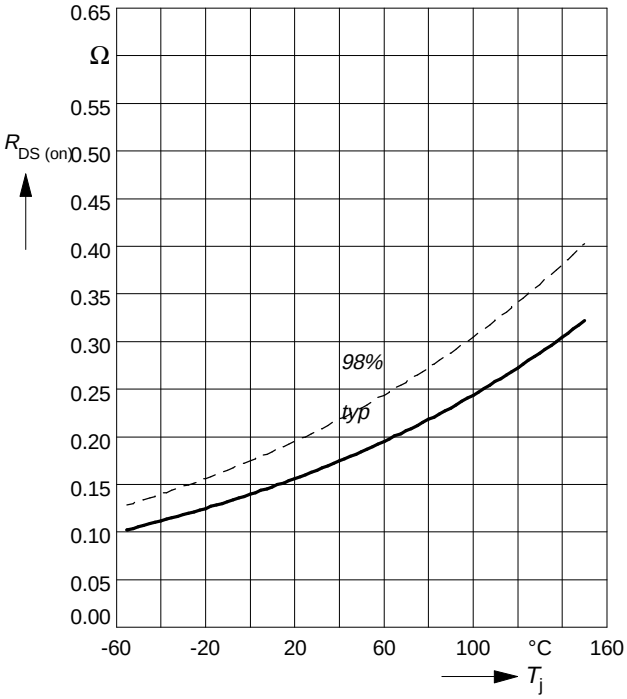

**Typ. forward transconductance** $g_{fs} = f(I_D)$
parameter: $t_p$ = 80 µs,
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Drain-source on-resistance**

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

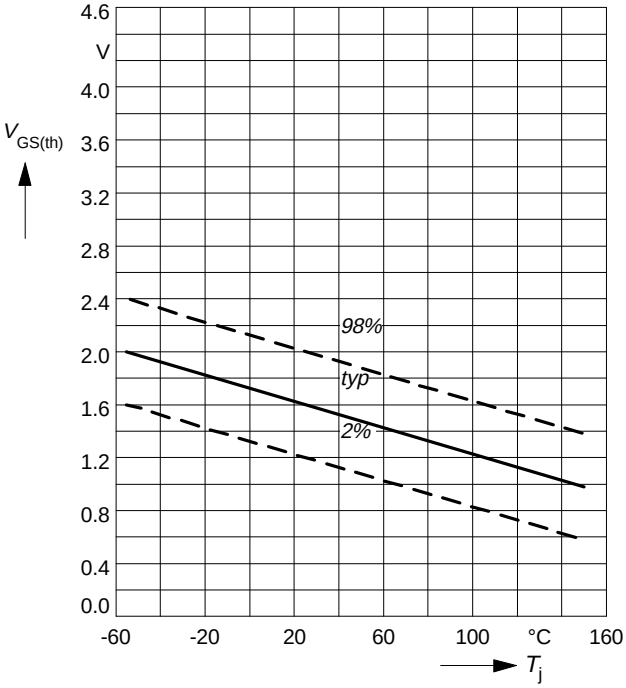
parameter: $I_D$ = 7 A, $V_{GS}$ = 5 V




**Gate threshold voltage**

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

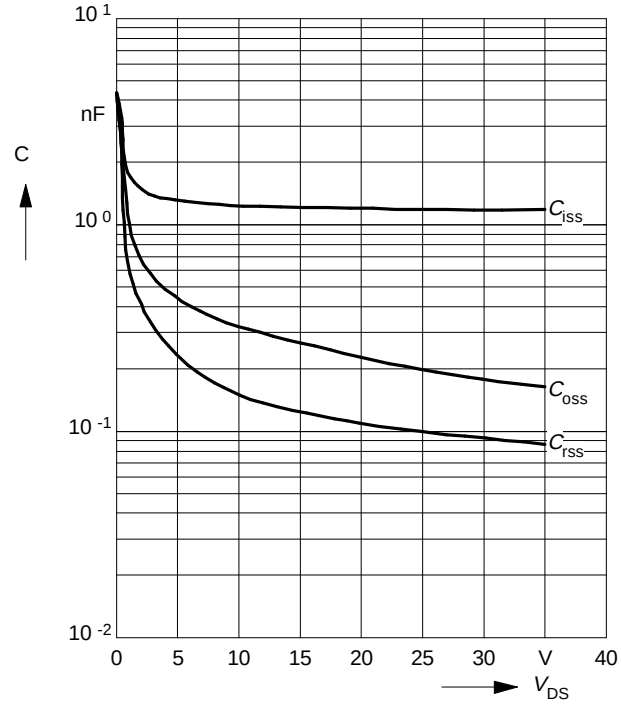
parameter: $V_{GS} = V_{DS}$, $I_D$ = 1 mA




**Typ. capacitances**

$C = f(V_{DS})$

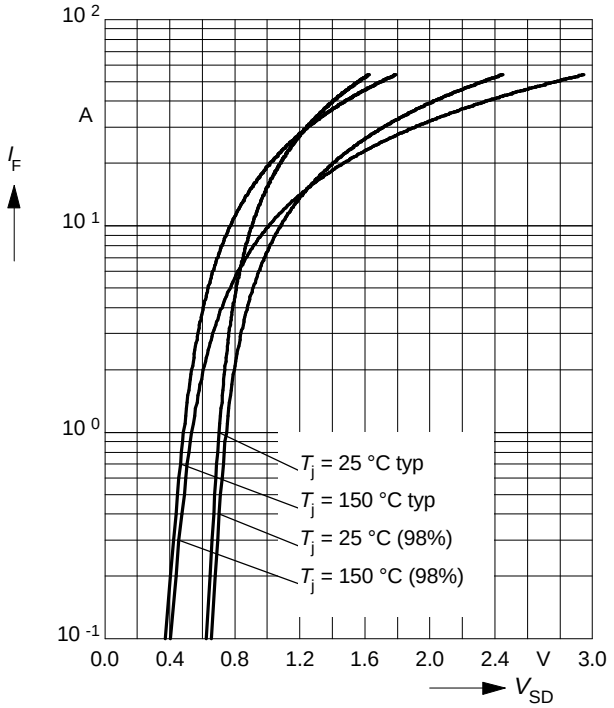
parameter: $V_{GS}$ = 0V, $f$ = 1MHz



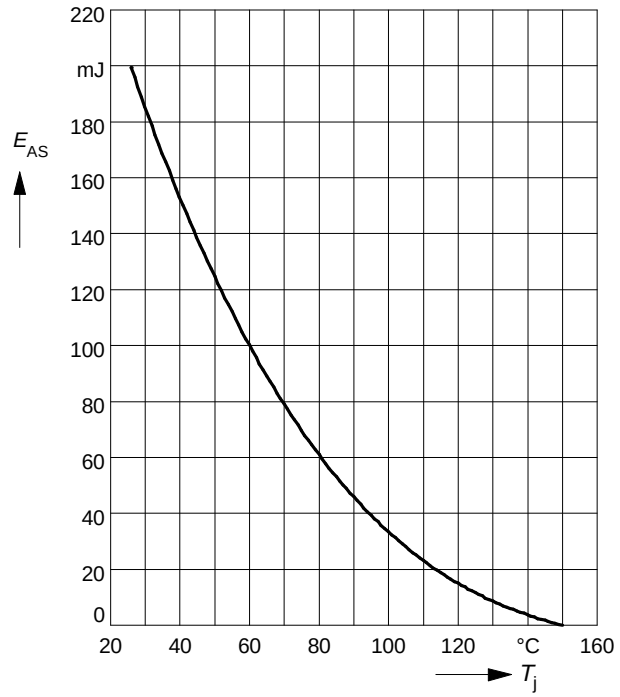

**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

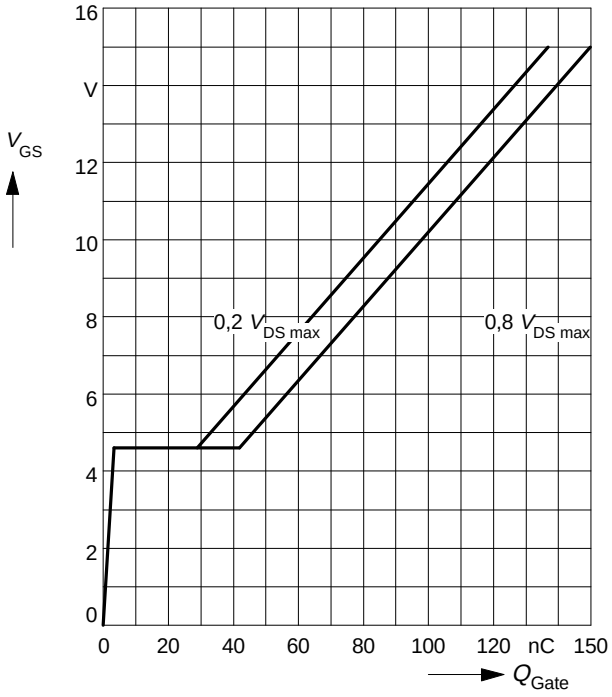
parameter: $T_j$, $t_p$ = 80 µs



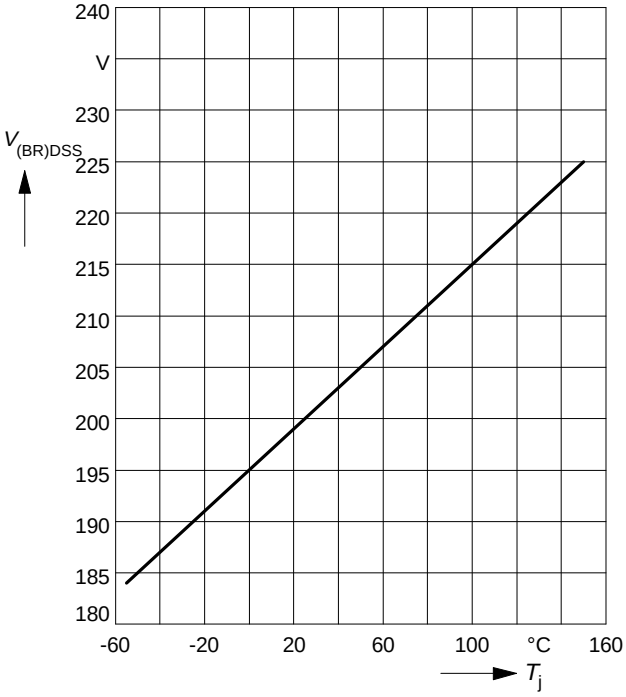
**Avalanche energy** $E_{AS} = f(T_j)$
parameter: $I_D$ = 13.5 A, $V_{DD}$ = 50 V
$R_{GS}$ = 25 Ω, $L$ = 1.65 mH




**Typ. gate charge**
$V_{GS} = f(Q_{Gate})$
parameter: $I_{D\ puls}$ = 21 A



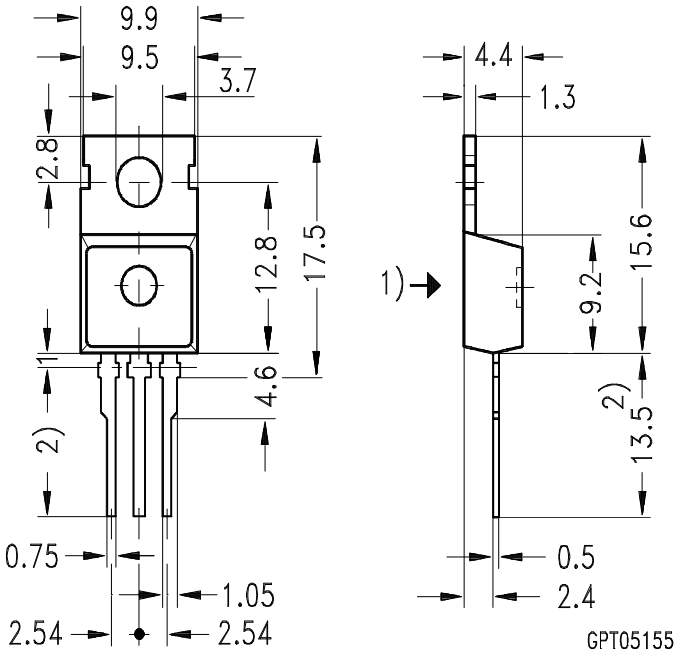

**Drain-source breakdown voltage**
$V_{(BR)DSS} = f(T_j)$



**Package Outlines**

TO-220 AB

Dimension in mm




1) punch direction, burr max. 0.04
2) dip tinning
3) max. 14.5 by dip tinning press burr max. 0.05