

SIPMOS® Power Transistor

- N channel
- Enhancement mode
- Logic Level
- Avalanche-rated
- dv/dt rated
- 175°C operating temperature
- also in SMD available



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

| Type | V _{DS} | I _D | R _{DS(on)} | Package | Ordering Code |
|------------|-----------------|----------------|---------------------|-----------|-----------------|
| BUZ 101 SL | 55 V | 20 A | 0.07 Ω | TO-220 AB | Q67040-S4012-A2 |

Maximum Ratings

| Parameter | Symbol | Values | Unit |
|--|--------------------------|----------|-------|
| Continuous drain current <i>T_C</i> = 25 °C <i>T_C</i> = 100 °C | <i>I_D</i> | 20 14 | A |
| Pulsed drain current <i>T_C</i> = 25 °C | <i>I_{Dpuls}</i> | 80 | |
| Avalanche energy, single pulse <i>I_D</i> = 20 A, <i>V_{DD}</i> = 25 V, <i>R_{GS}</i> = 25 Ω <i>L</i> = 450 μH, <i>T_j</i> = 25 °C | <i>E_{AS}</i> | 90 | mJ |
| Avalanche current, limited by <i>T_{jmax}</i> | <i>I_{AR}</i> | 20 | A |
| Avalanche energy, periodic limited by <i>T_{jmax}</i> | <i>E_{AR}</i> | 5.5 | mJ |
| Reverse diode dv/dt <i>I_S</i> = 20 A, <i>V_{DS}</i> = 40 V, <i>di_F/dt</i> = 200 A/μs <i>T_{jmax}</i> = 175 °C | dv/dt | 6 | kV/μs |
| Gate source voltage | <i>V_{GS}</i> | ± 14 | V |
| Power dissipation <i>T_C</i> = 25 °C | <i>P_{tot}</i> | 55 | W |

Maximum Ratings

| Parameter | Symbol | Values | Unit |
|--|------------|---------------|------|
| Operating temperature | T_j | -55 ... + 175 | °C |
| Storage temperature | T_{stg} | -55 ... + 175 | |
| Thermal resistance, junction - case | R_{thJC} | ≤ 2.7 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | ≤ 62 | |
| IEC climatic category, DIN IEC 68-1 | | 55 / 175 / 56 | |

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 $V_{GS} = 0 \text{ V}$, $I_D = 0.25 \text{ mA}$, $T_j = 25 \text{ }^\circ\text{C}$ | $V_{(BR)DSS}$ | 55 | - | - | V |
| Gate threshold voltage $V_{GS} = V_{DS}$, $I_D = 40 \text{ } \mu\text{A}$ | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current $V_{DS} = 50 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_j = -40 \text{ }^\circ\text{C}$ $V_{DS} = 50 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$ $V_{DS} = 50 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_j = 150 \text{ }^\circ\text{C}$ | I_{DSS} | - | - | 0.1 1 100 | μA |
| Gate-source leakage current $V_{GS} = 20 \text{ V}$, $V_{DS} = 0 \text{ V}$ | I_{GSS} | - | 10 | 100 | nA |
| Drain-Source on-resistance $V_{GS} = 4.5 \text{ V}$, $I_D = 14 \text{ A}$ $V_{GS} = 10 \text{ V}$, $I_D = 14 \text{ A}$ | $R_{DS(on)}$ | - | 0.057 0.034 | 0.07 0.04 | Ω |

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

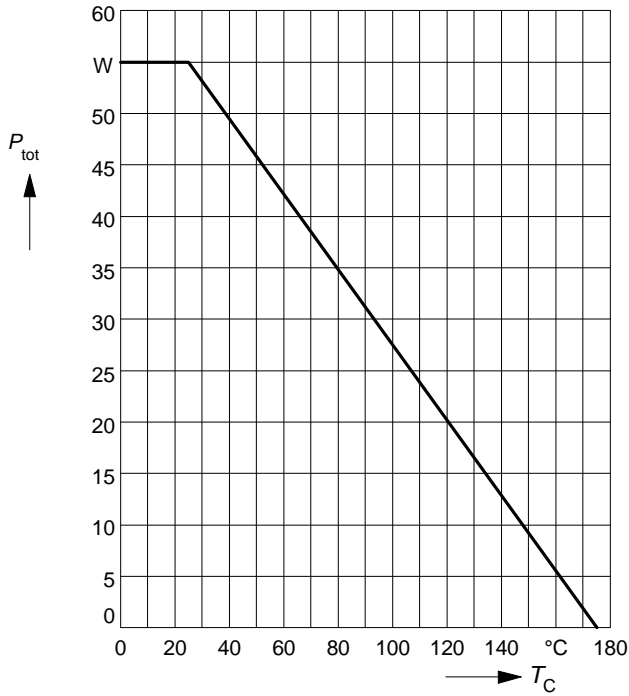
| Parameter | Symbol | Values | | | Unit |
|---|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 14 \text{ A}$ | g_{fs} | 7 | 14 | - | S |
| Input capacitance $V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$ | C_{iss} | - | 560 | 700 | pF |
| Output capacitance $V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$ | C_{oss} | - | 170 | 215 | |
| Reverse transfer capacitance $V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$ | C_{rss} | - | 95 | 120 | |
| Turn-on delay time $V_{DD} = 30 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$ $R_G = 10 \Omega$ | $t_{d(on)}$ | - | 15 | 25 | ns |
| Rise time $V_{DD} = 30 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$ $R_G = 10 \Omega$ | t_r | - | 35 | 55 | |
| Turn-off delay time $V_{DD} = 30 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$ $R_G = 10 \Omega$ | $t_{d(off)}$ | - | 15 | 25 | |
| Fall time $V_{DD} = 30 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$ $R_G = 10 \Omega$ | t_f | - | 15 | 25 | |
| Gate charge at threshold $V_{DD} = 40 \text{ V}$, $I_D \geq 0.1 \text{ A}$, $V_{GS} = 0 \text{ to } 1 \text{ V}$ | $Q_{g(th)}$ | - | 0.8 | 1.2 | nC |
| Gate charge at 5.0 V $V_{DD} = 40 \text{ V}$, $I_D = 20 \text{ A}$, $V_{GS} = 0 \text{ to } 5 \text{ V}$ | $Q_{g(5)}$ | - | 15 | 23 | |
| Gate charge total $V_{DD} = 40 \text{ V}$, $I_D = 20 \text{ A}$, $V_{GS} = 0 \text{ to } 10 \text{ V}$ | $Q_{g(total)}$ | - | 24 | 36 | |
| Gate plateau voltage $V_{DD} = 40 \text{ V}$, $I_D = 20 \text{ A}$ | $V_{(plateau)}$ | - | 4.06 | - | 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 $T_C = 25^\circ\text{C}$ | I_S | - | - | 20 | A |
| Inverse diode direct current, pulsed $T_C = 25^\circ\text{C}$ | I_{SM} | - | - | 80 | |
| Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = 40\text{ A}$ | V_{SD} | - | 1.12 | 1.8 | V |
| Reverse recovery time $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$ | t_{rr} | - | 50 | 75 | ns |
| Reverse recovery charge $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$ | Q_{rr} | - | 0.12 | 0.18 | μC |

Power dissipation

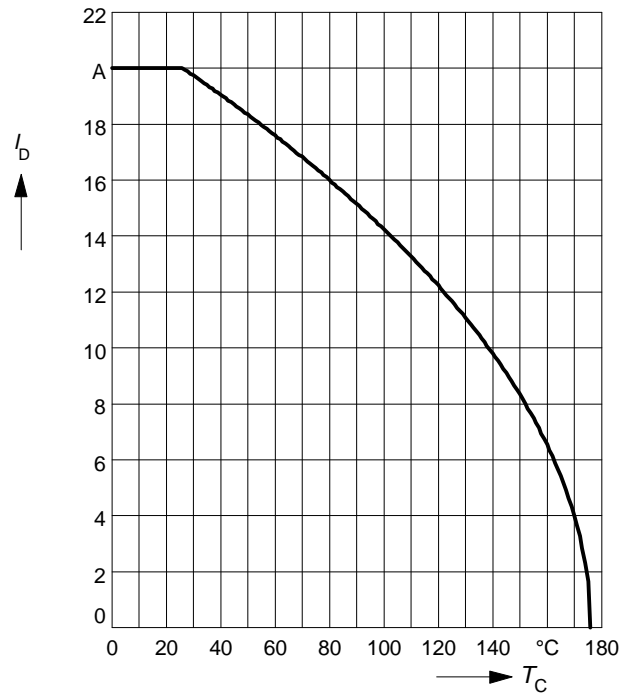
$$P_{\text{tot}} = f(T_C)$$



Drain current

$$I_D = f(T_C)$$

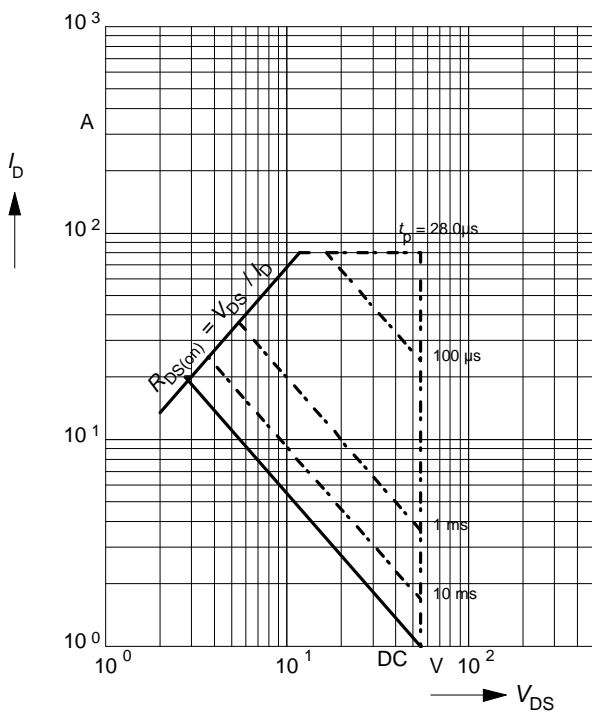
parameter: $V_{GS} \geq 4 \text{ V}$



Safe operating area

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

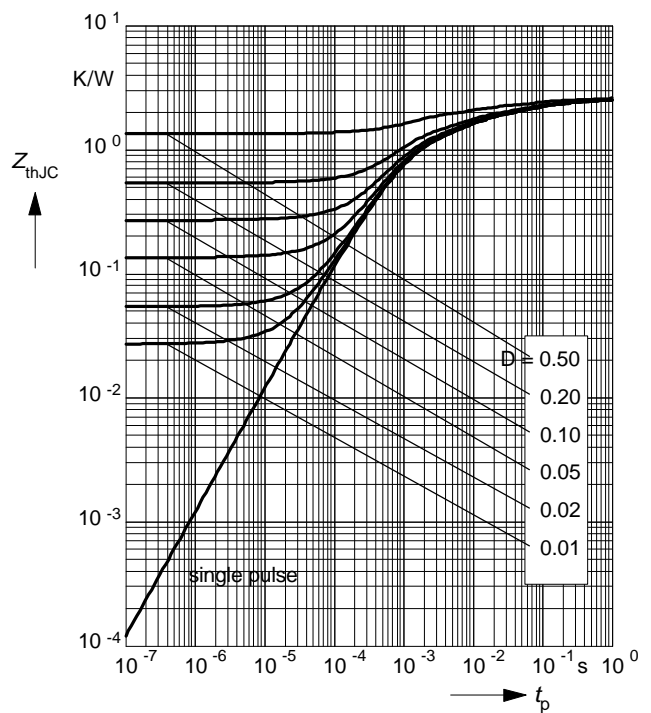
parameter: $D = 0.01, T_C = 25^\circ\text{C}$



Transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

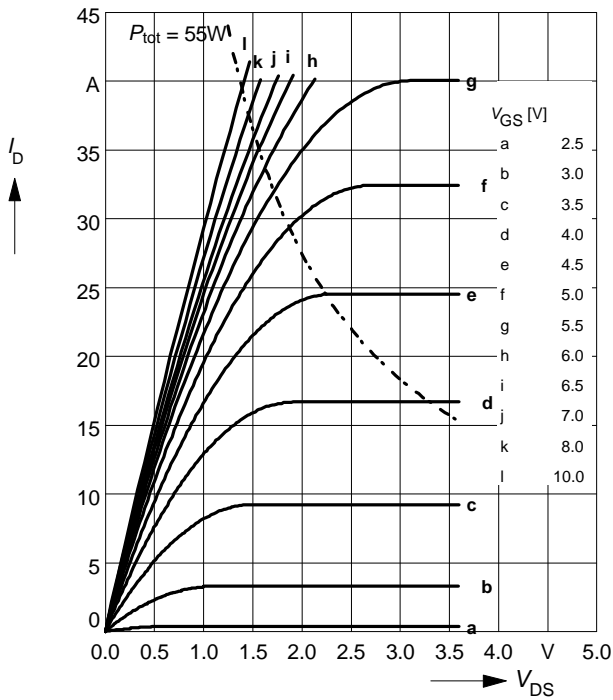
parameter: $D = t_p / T$



Typ. output characteristics

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

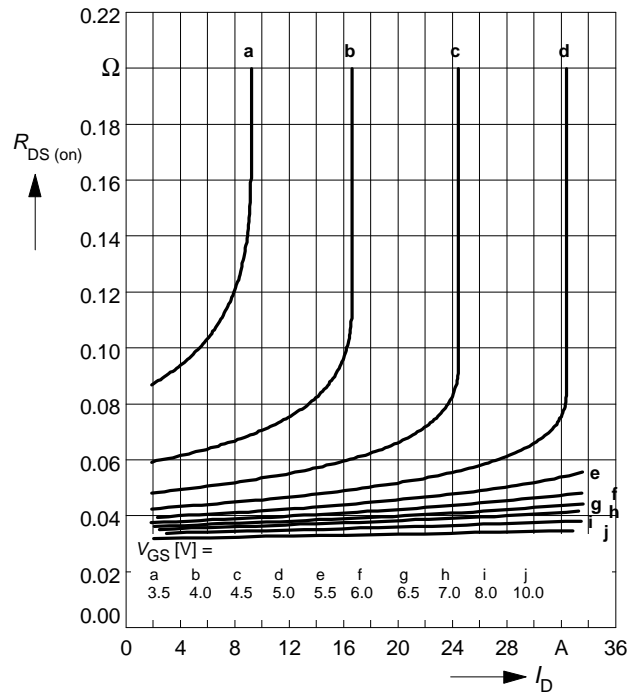
parameter: $t_p = 80 \mu s$, $T_j = 25^\circ C$



Typ. drain-source on-resistance

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

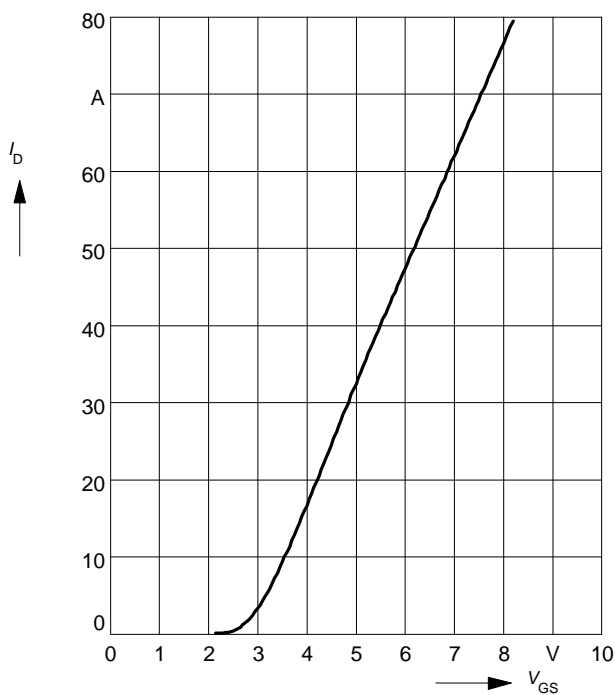
parameter: $t_p = 80 \mu s$, $T_j = 25^\circ C$



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

parameter: $t_p = 80 \mu s$

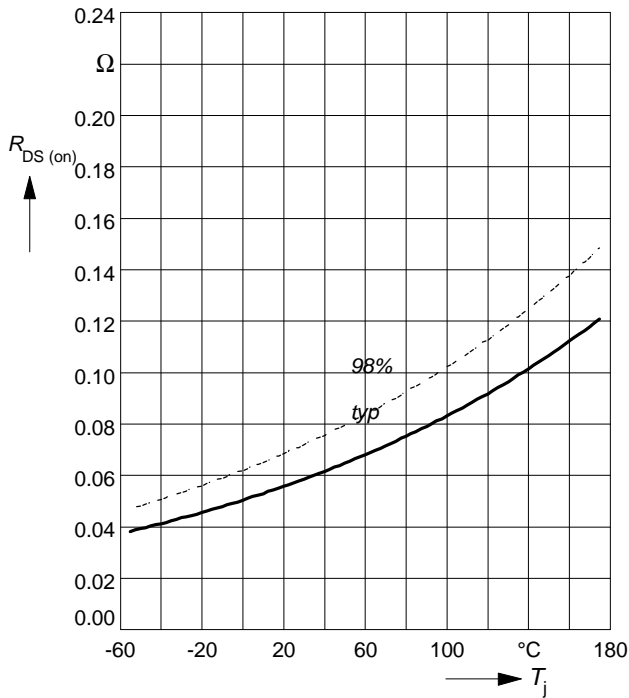
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



Drain-source on-resistance

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

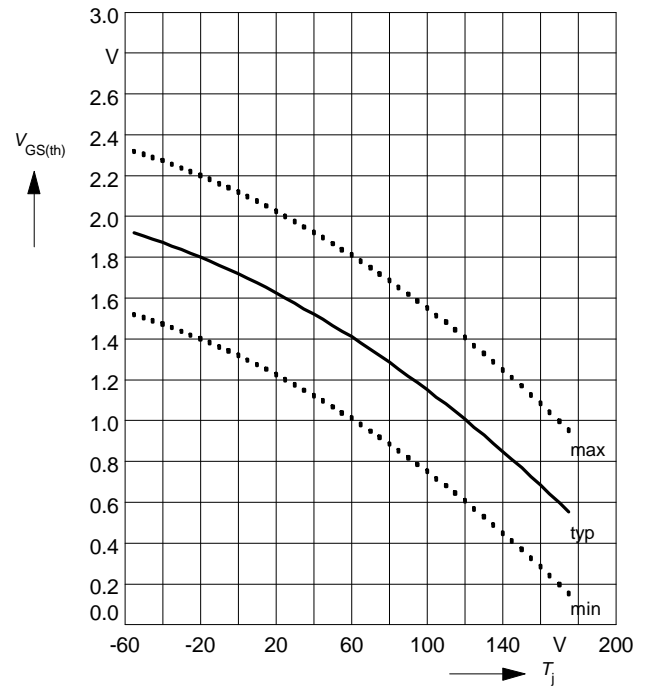
parameter: $I_D = 14 \text{ A}$, $V_{GS} = 4.5 \text{ V}$



Gate threshold voltage

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

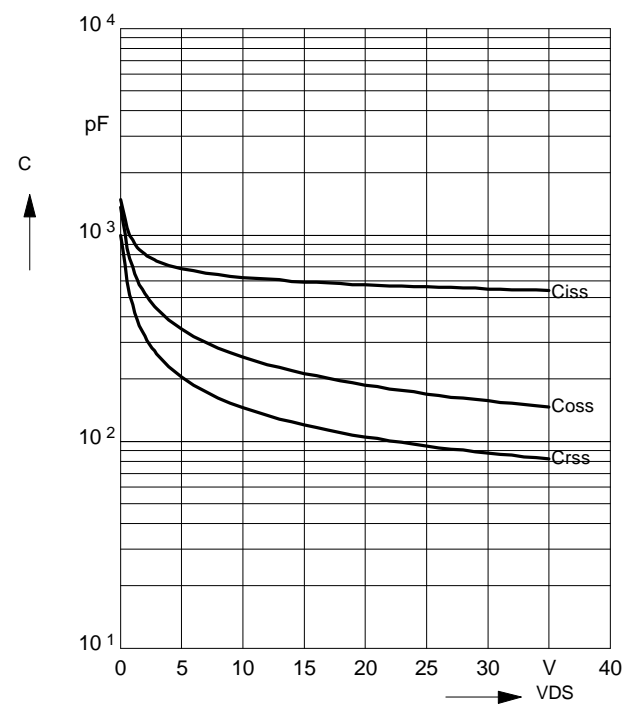
parameter: $V_{GS} = V_{DS}$, $I_D = 40 \mu\text{A}$



Typ. capacitances

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

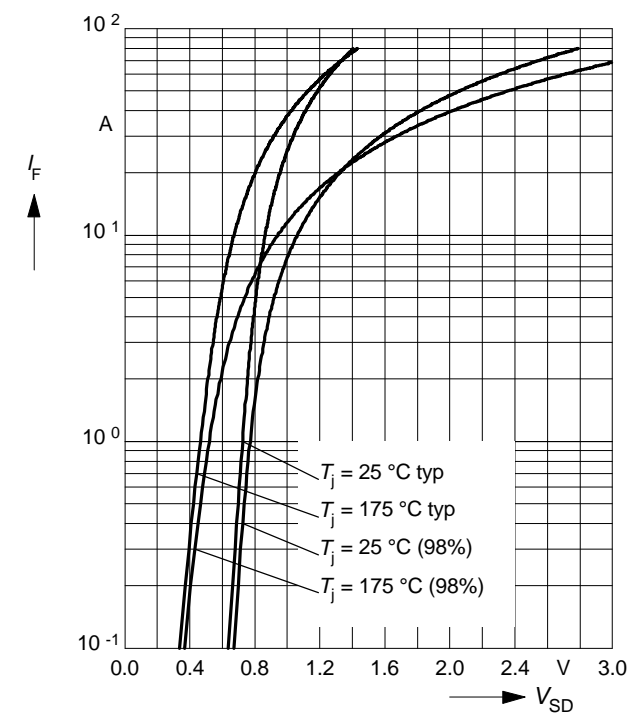
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

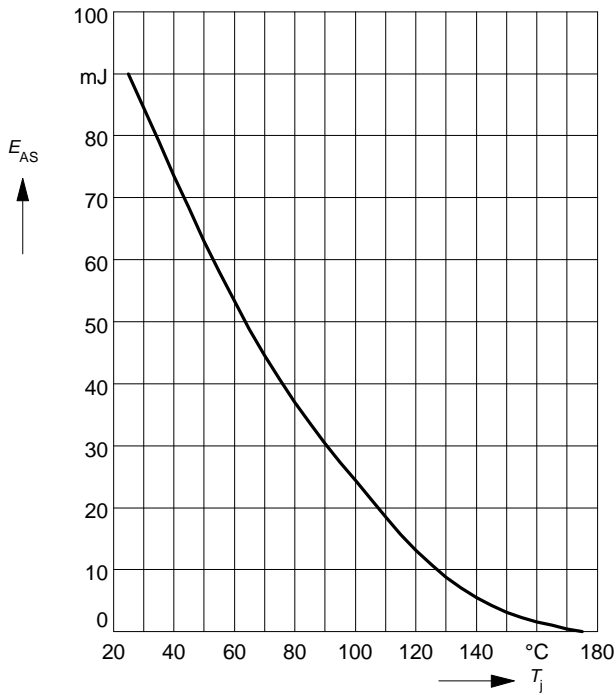
parameter: T_j , $t_p = 80 \mu\text{s}$



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

parameter: $I_D=20A, V_{DD}=25V$

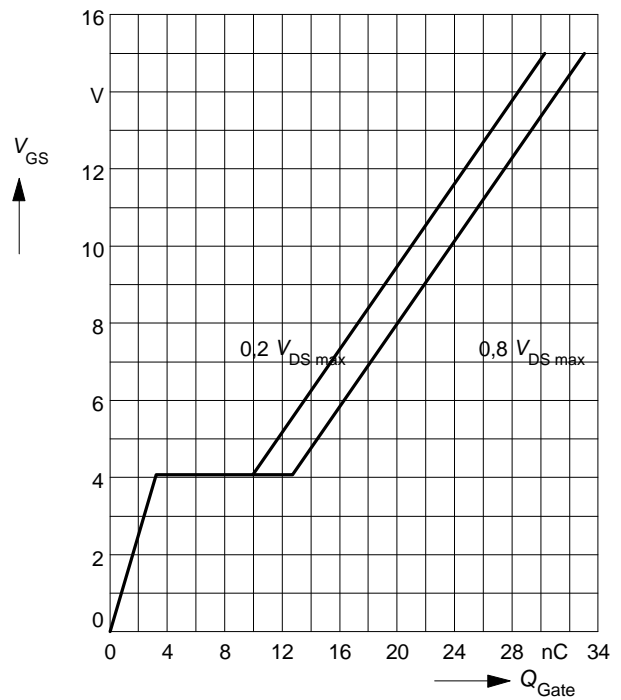
$R_{GS}=25\Omega, L=450\mu H$



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

parameter: $I_{D\ puls}=20A$

parameter: $I_{D\ puls}=20A$



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

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

