

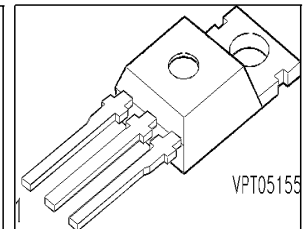
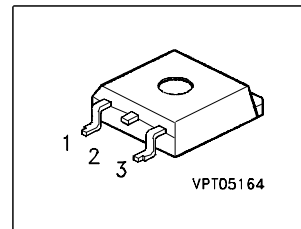
SIPMOS® Power Transistor

Features

- N channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- 175 °C operating temperature

Product Summary

| | | | |
|----------------------------------|--------------|-------|----------|
| Drain source voltage | V_{DS} | 55 | V |
| Drain-Source on-state resistance | $R_{DS(on)}$ | 0.018 | Ω |
| Continuous drain current | I_D | 52 | A |



| Type | Package | Ordering Code | Packaging | Pin 1 | Pin 2 | Pin 3 |
|----------------|-------------|-----------------|---------------|-------|-------|-------|
| BUZ102S | P-TO220-3-1 | Q67040-S4011-A2 | Tube | G | D | S |
| BUZ102S E3045A | P-TO263-3-2 | Q67040-S4011-A6 | Tape and Reel | | | |
| BUZ102S E3045 | P-TO263-3-2 | Q67040-S4011-A5 | Tube | | | |

Maximum Ratings, at $T_j = 25$ °C unless unless specified

| Parameter | Symbol | Value | Unit |
|---|----------------|-------------|-------------|
| Continuous drain current | I_D | | A |
| $T_C = 25$ °C | | 52 | |
| $T_C = 100$ °C | | 37 | |
| Pulsed drain current | I_{Dpulse} | 208 | |
| $T_C = 25$ °C | | | |
| Avalanche energy, single pulse | E_{AS} | 245 | mJ |
| $I_D = 52$ A, $V_{DD} = 25$ V, $R_{GS} = 25$ Ω | | | |
| Avalanche energy, periodic limited by T_{jmax} | E_{AR} | 12 | |
| Reverse diode dv/dt | dv/dt | 6 | kV/ μ s |
| $I_S = 52$ A, $V_{DS} = 40$ V, $di/dt = 200$ A/ μ s, $T_{jmax} = 175$ °C | | | |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation | P_{tot} | 120 | W |
| $T_C = 25$ °C | | | |
| Operating and storage temperature | T_j, T_{stg} | -55... +175 | °C |
| IEC climatic category; DIN IEC 68-1 | | 55/175/56 | |

Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|------------|--------|------|----------|------|
| | | min. | typ. | max. | |
| Characteristics | | | | | |
| Thermal resistance, junction - case | R_{thJC} | - | | 1.25 | K/W |
| Thermal resistance, junction - ambient, leded | R_{thJA} | - | | 62 | |
| SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ¹⁾ | R_{thJA} | - | - | 62 40 | |

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 $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$, $T_j = 25\text{ }^\circ\text{C}$ | $V_{(BR)DSS}$ | 55 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 90\text{ }\mu\text{A}$ | $V_{GS(th)}$ | 2.1 | 3 | 4 | |
| Zero gate voltage drain current $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ | 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-state resistance $V_{GS} = 10\text{ V}$, $I_D = 37\text{ A}$ | $R_{DS(on)}$ | - | 0.0155 | 0.018 | Ω |

¹ Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

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

| Parameter | Symbol | Values | | | Unit |
|---|--------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 37\text{ A}$ | g_{fs} | 10 | 28 | - | S |
| Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{iss} | - | 1220 | 1525 | pF |
| Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{oss} | - | 410 | 515 | |
| Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{rss} | - | 210 | 265 | |
| Turn-on delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 52\text{ A}$, $R_G = 6.8\text{ }\Omega$ | $t_{d(on)}$ | - | 12 | 18 | ns |
| Rise time $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 52\text{ A}$, $R_G = 6.8\text{ }\Omega$ | t_r | - | 22 | 33 | |
| Turn-off delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 52\text{ A}$, $R_G = 6.8\text{ }\Omega$ | $t_{d(off)}$ | - | 30 | 45 | |
| Fall time $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 52\text{ A}$, $R_G = 6.8\text{ }\Omega$ | t_f | - | 25 | 40 | |

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

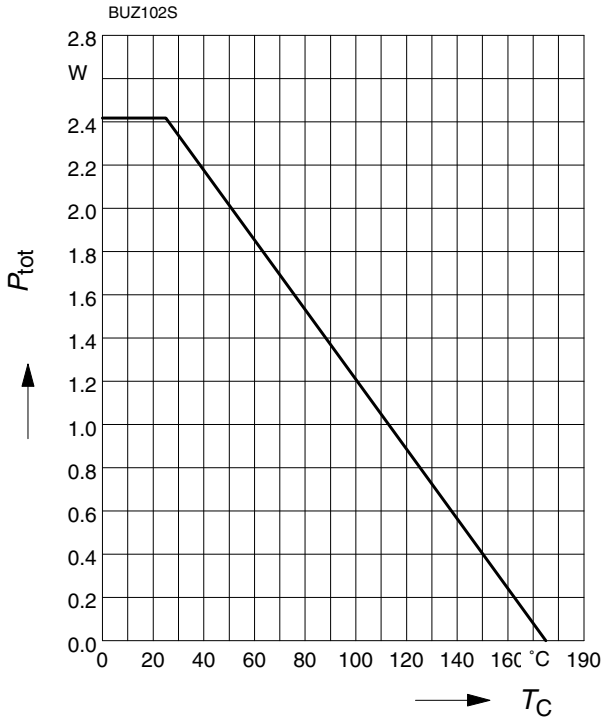
| Parameter | Symbol | Values | | | Unit |
|--|------------------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Gate to source charge $V_{DD} = 40\text{ V}$, $I_D = 52\text{ A}$ | Q_{gs} | - | 8 | 12 | nC |
| Gate to drain charge $V_{DD} = 40\text{ V}$, $I_D = 52\text{ A}$ | Q_{gd} | - | 23 | 34.5 | |
| Gate charge total $V_{DD} = 40\text{ V}$, $I_D = 52\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ | Q_g | - | 45 | 70 | |
| Gate plateau voltage $V_{DD} = 40\text{ V}$, $I_D = 52\text{ A}$ | $V_{(\text{plateau})}$ | - | 5.9 | - | V |

Reverse Diode

| | | | | | |
|---|----------|---|------|------|---------------|
| Inverse diode continuous forward current $T_C = 25\text{ }^\circ\text{C}$ | I_S | - | - | 52 | A |
| Inverse diode direct current,pulsed $T_C = 25\text{ }^\circ\text{C}$ | I_{SM} | - | - | 208 | |
| Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 104\text{ A}$ | V_{SD} | - | 1.2 | 1.7 | V |
| Reverse recovery time $V_R = 30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | t_{rr} | - | 70 | 105 | ns |
| Reverse recovery charge $V_R = 30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | Q_{rr} | - | 0.15 | 0.25 | μC |

Power Dissipation

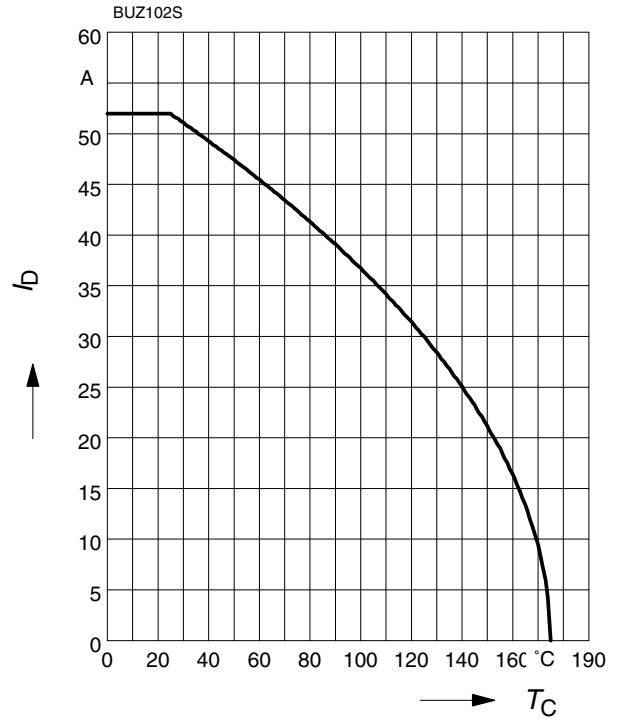
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

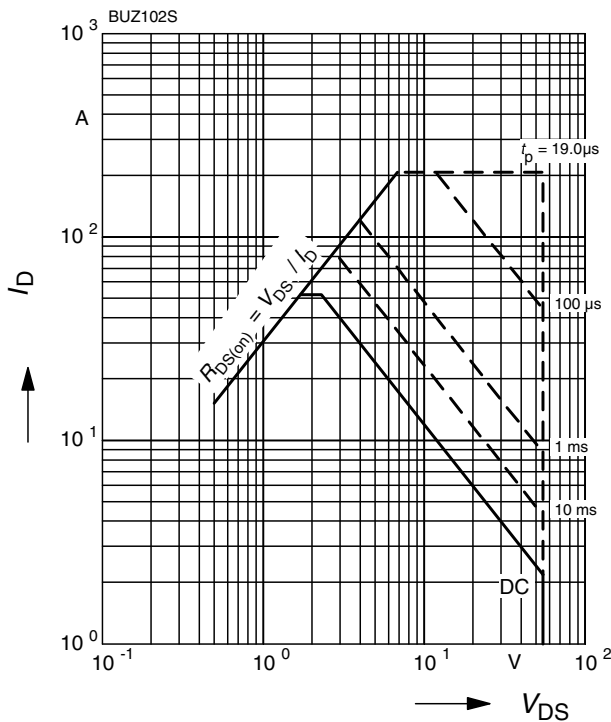
parameter: $V_{GS} \geq 10$ V



Safe operating area

$I_D = f(V_{DS})$

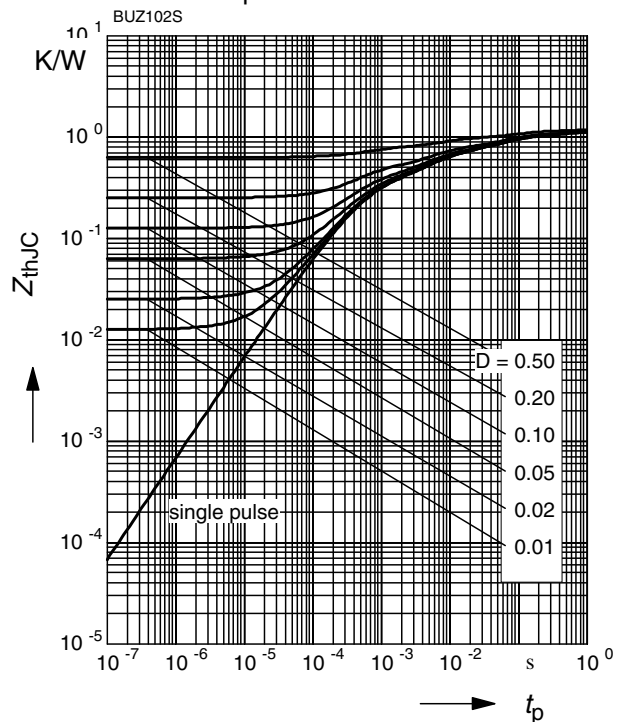
parameter : $D = 0$, $T_C = 25$ °C



Transient thermal impedance

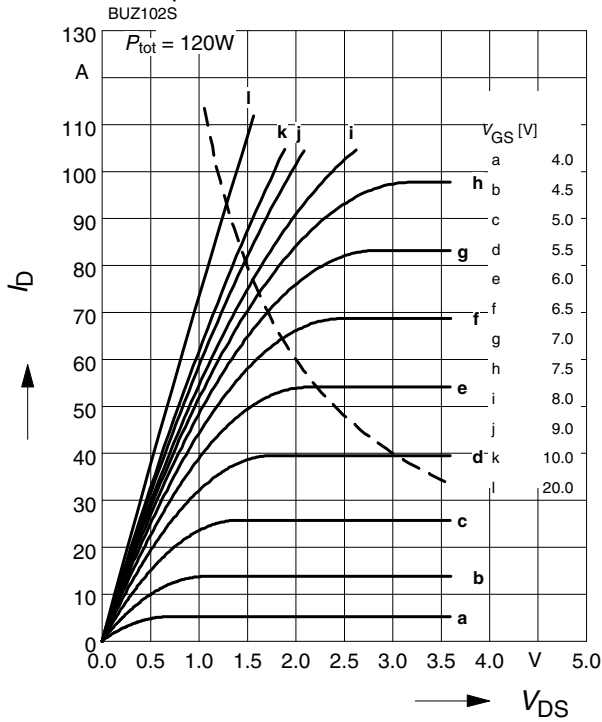
$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$



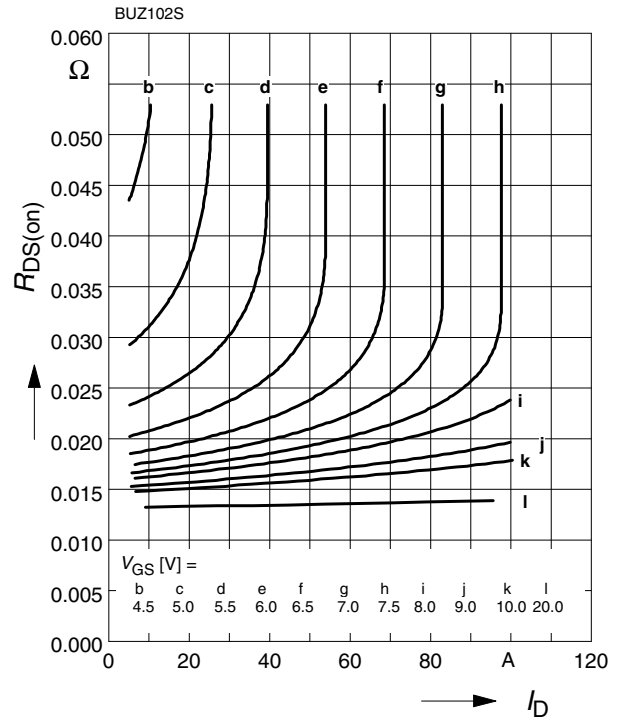
Typ. output characteristics

$I_D = f(V_{DS})$
parameter: $t_p = 80 \mu s$



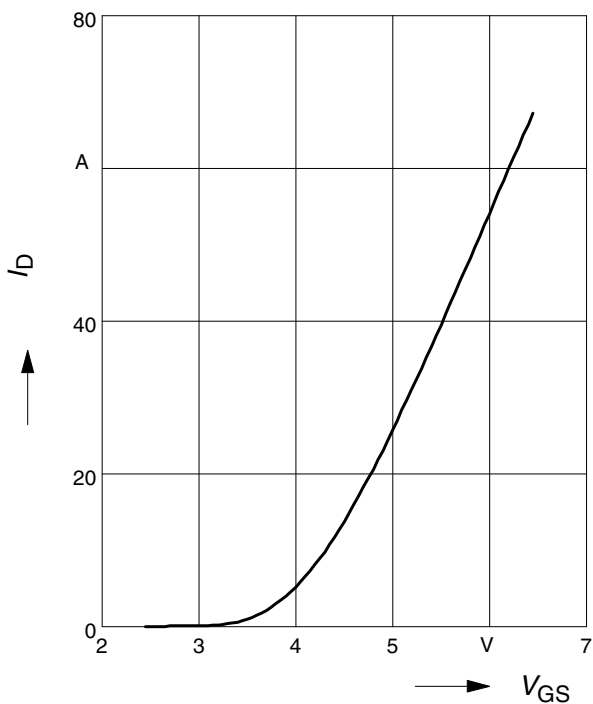
Typ. drain-source-on-resistance

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



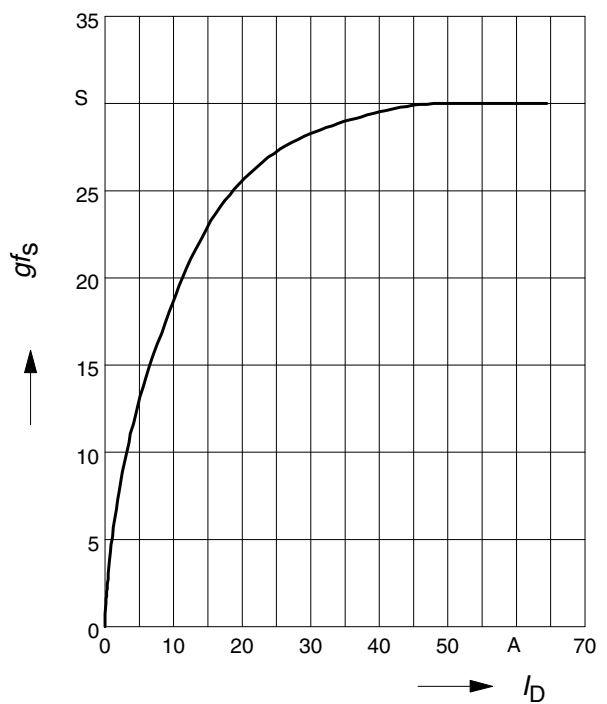
Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: $t_p = 80 \mu s$
 $V_{DS} \geq 2 \times I_D \times R_{DS(on)} \max$



Typ. forward transconductance

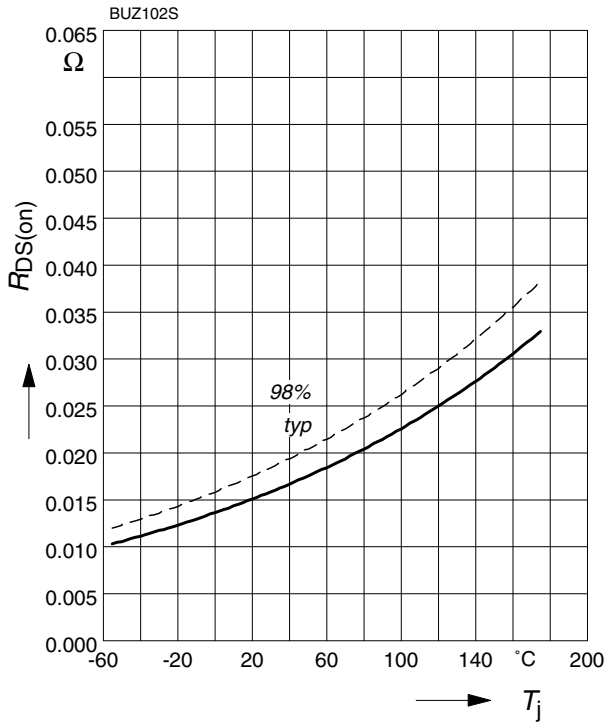
$g_{fs} = f(I_D); T_j = 25^\circ C$
parameter: g_{fs}



Drain-source on-resistance

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

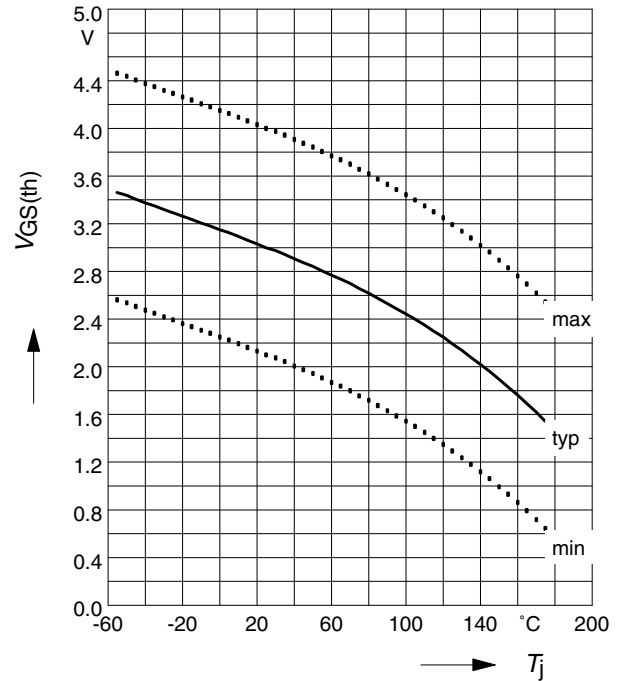
parameter : $I_D = 37 \text{ A}$, $V_{GS} = 10 \text{ V}$



Gate threshold voltage

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

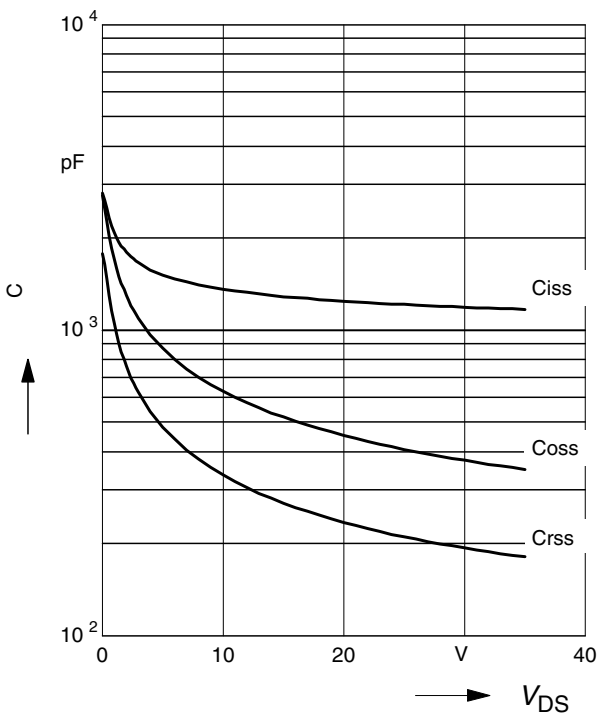
parameter : $V_{GS} = V_{DS}$, $I_D = 90 \mu\text{A}$



Typ. capacitances

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

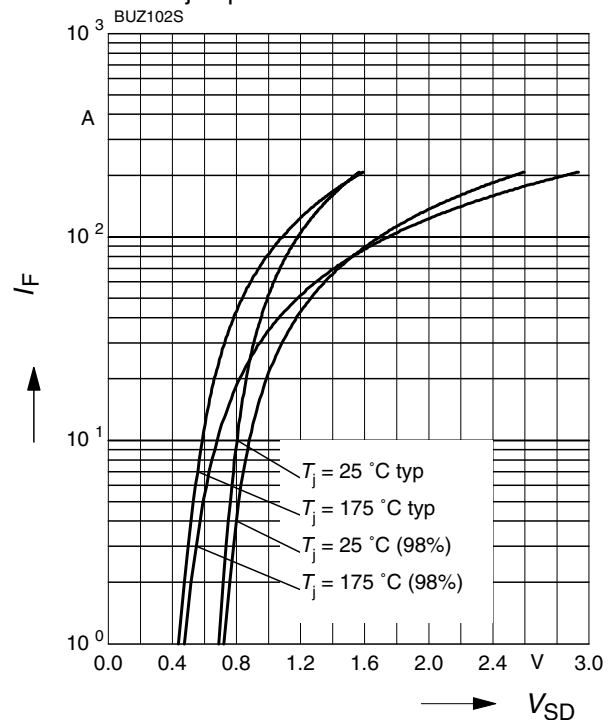
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

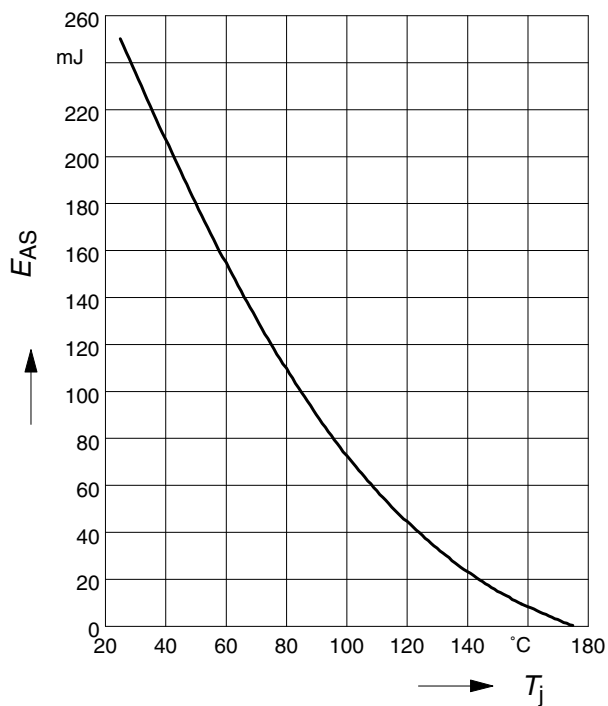
parameter: T_j , $t_p = 80 \mu\text{s}$



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

parameter: $I_D = 52\text{ A}$, $V_{DD} = 25\text{ V}$

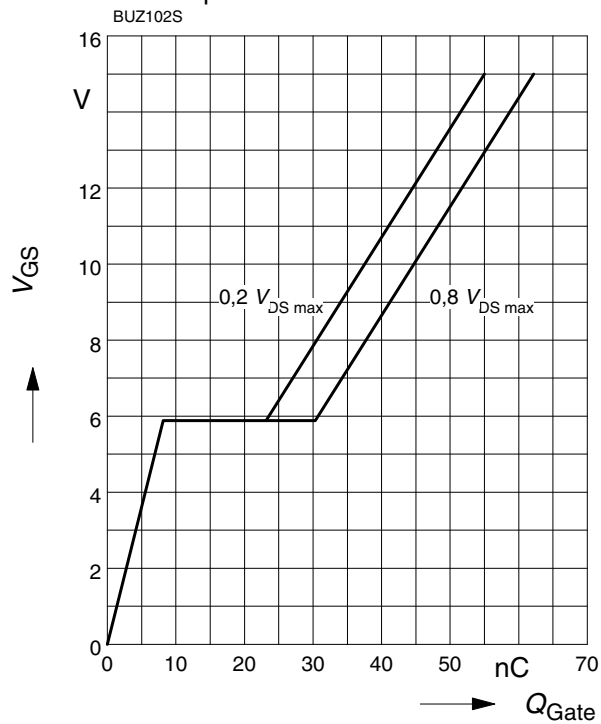
$R_{GS} = 25\ \Omega$



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

parameter: $I_{D\ puls} = 52\text{ A}$

parameter: $I_{D\ puls} = 52\text{ A}$



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

parameter: $V_{GS} = 0\text{ V}$, $I_D = 0\text{ A}$

