

SIPMOS® Power Transistor

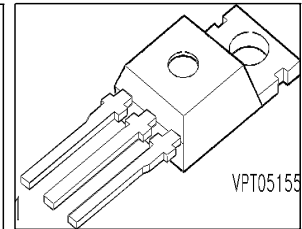
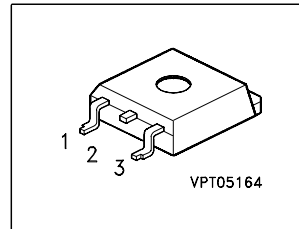
BUZ 111SL

Features

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

Product Summary

| | | | |
|----------------------------------|--------------|-------|----------|
| Drain source voltage | V_{DS} | 55 | V |
| Drain-Source on-state resistance | $R_{DS(on)}$ | 0.007 | Ω |
| Continuous drain current | I_D | 80 | A |



| Type | Package | Ordering Code | Packaging |
|-----------------|-------------|-----------------|---------------|
| BUZ111SL | P-TO220-3-1 | Q67040-S4002-A2 | Tube |
| BUZ111SL E3045A | P-TO263-3-2 | Q67040-S4002-A6 | Tape and Reel |
| BUZ111SL E3045 | P-TO263-3-2 | Q67040-S4002-A5 | Tube |

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

Maximum Ratings, at $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Value | Unit |
|--|----------------|-------------|--------------------|
| Continuous drain current $T_C = 25\text{ °C}$, 1) $T_C = 100\text{ °C}$ | I_D | 80 80 | A |
| Pulsed drain current $T_C = 25\text{ °C}$ | I_{Dpulse} | 320 | |
| Avalanche energy, single pulse $I_D = 80\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$ | E_{AS} | 700 | mJ |
| Avalanche energy, periodic limited by T_{jmax} | E_{AR} | 30 | |
| Reverse diode dv/dt $I_S = 80\text{ A}$, $V_{DS} = 40\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 175\text{ °C}$ | dv/dt | 6 | kV/ μs |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation $T_C = 25\text{ °C}$ | P_{tot} | 300 | W |
| Operating and storage temperature | T_j, T_{stg} | -55... +175 | $^{\circ}\text{C}$ |
| 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} | - | - | 0.5 | K/W |
| Thermal resistance, junction - ambient, leded | R_{thJA} | - | - | 62 | |
| SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ²⁾ | 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 $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$ | $V_{(BR)DSS}$ | 55 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 240\text{ }\mu\text{A}$ | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ | I_{DSS} | - | 0.1 | 1 | μA |
| Gate-source leakage current $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$ | I_{GSS} | - | 10 | 100 | |
| Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$, $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 80\text{ A}$ | $R_{DS(on)}$ | - | 0.0085 | 0.01 | Ω |
| | | - | 0.0055 | 0.007 | |

¹current limited by bond wire

² 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 $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 80\text{ A}$ | g_{fs} | 30 | 95 | - | S |
| Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{iss} | - | 3850 | 4800 | pF |
| Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{oss} | - | 1090 | 1357 | |
| Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{rss} | - | 570 | 715 | |
| Turn-on delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 80\text{ A}$, $R_G = 1.3\text{ }\Omega$ | $t_{d(on)}$ | - | 30 | 45 | ns |
| Rise time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 80\text{ A}$, $R_G = 1.3\text{ }\Omega$ | t_r | - | 37 | 56 | |
| Turn-off delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 80\text{ A}$, $R_G = 1.3\text{ }\Omega$ | $t_{d(off)}$ | - | 70 | 105 | |
| Fall time $V_{DD} = 30\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 80\text{ A}$, $R_G = 1.3\text{ }\Omega$ | t_f | - | 36 | 55 | |

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

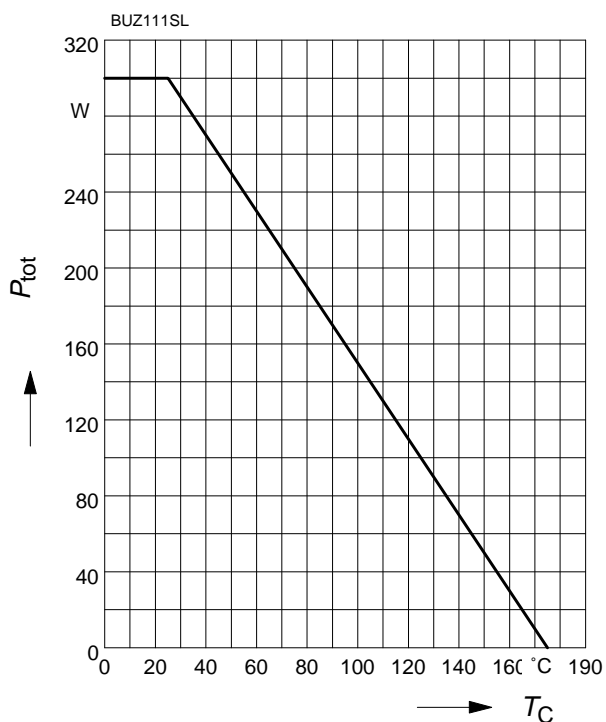
| Parameter | Symbol | Values | | | Unit |
|--|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Gate to source charge $V_{DD} = 40\text{ V}$, $I_D = 80\text{ A}$ | Q_{gs} | - | 12 | 18 | nC |
| Gate to drain charge $V_{DD} = 40\text{ V}$, $I_D = 80\text{ A}$ | Q_{gd} | - | 61 | 91.5 | |
| Gate charge total $V_{DD} = 40\text{ V}$, $I_D = 80\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ | Q_g | - | 155 | 232 | |
| Gate plateau voltage $V_{DD} = 40\text{ V}$, $I_D = 80\text{ A}$ | $V_{(plateau)}$ | - | 3.4 | - | V |

Reverse Diode

| | | | | | |
|---|----------|---|------|------|---------------|
| Inverse diode continuous forward current $T_C = 25\text{ °C}$ | I_S | - | - | 80 | A |
| Inverse diode direct current,pulsed $T_C = 25\text{ °C}$ | I_{SM} | - | - | 320 | |
| Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 160\text{ A}$ | V_{SD} | - | 1.25 | 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} | - | 105 | 157 | ns |
| Reverse recovery charge $V_R = 30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | Q_{rr} | - | 0.31 | 0.47 | μC |

Power Dissipation

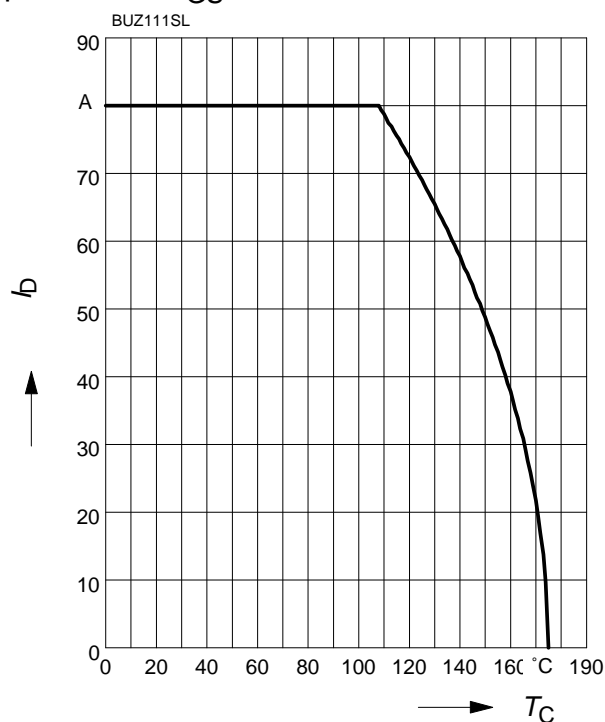
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

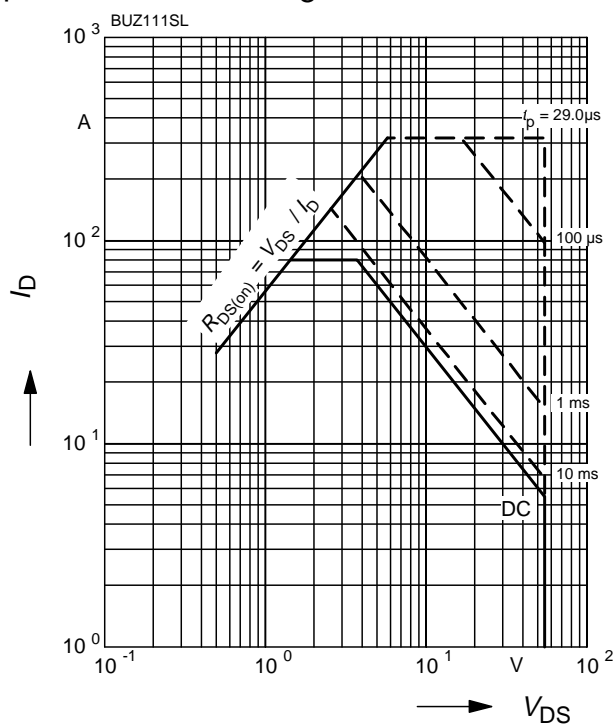
parameter: $V_{GS} \geq 10\text{ V}$



Safe operating area

$I_D = f(V_{DS})$

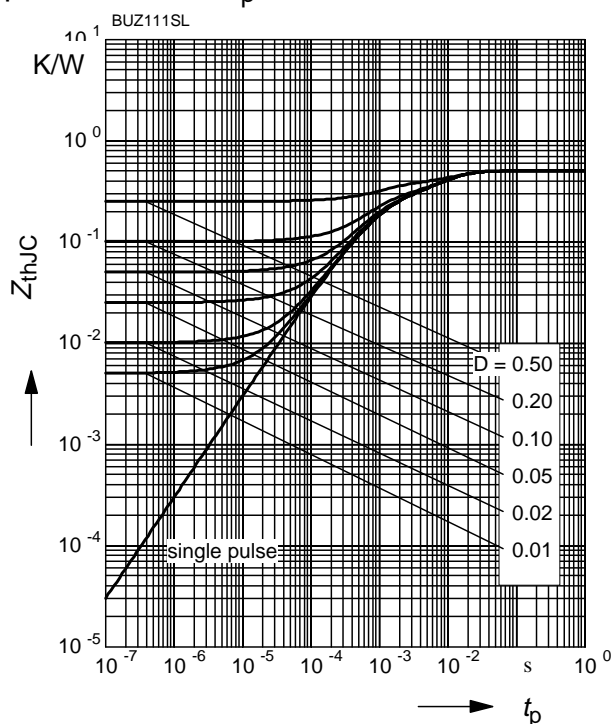
parameter : $D = 0, T_C = 25\text{ °C}$



Transient thermal impedance

$Z_{thJC} = f(t_p)$

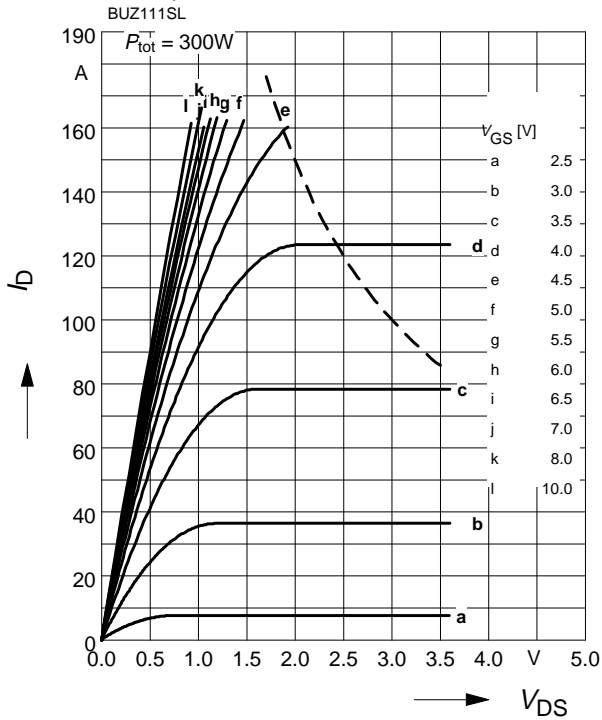
parameter : $D = t_p/T$



Typ. output characteristics

$I_D = f(V_{DS})$

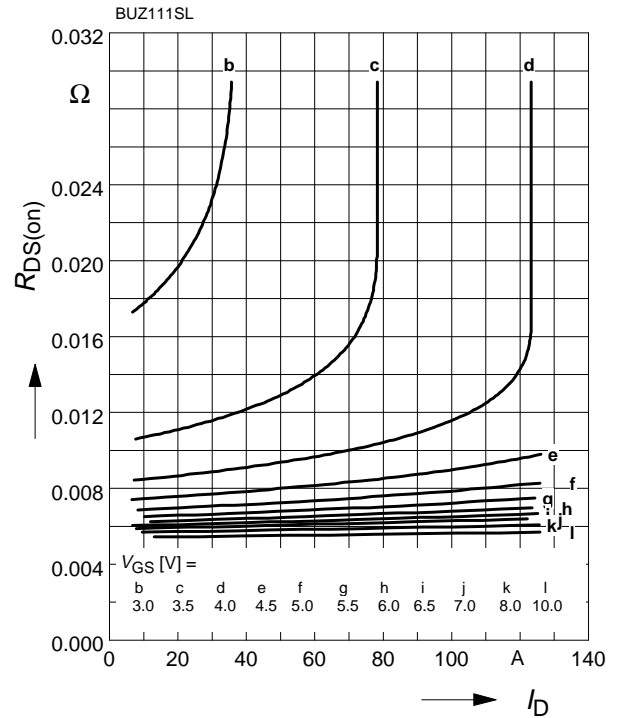
parameter: $t_p = 80 \mu s$



Typ. drain-source-on-resistance

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

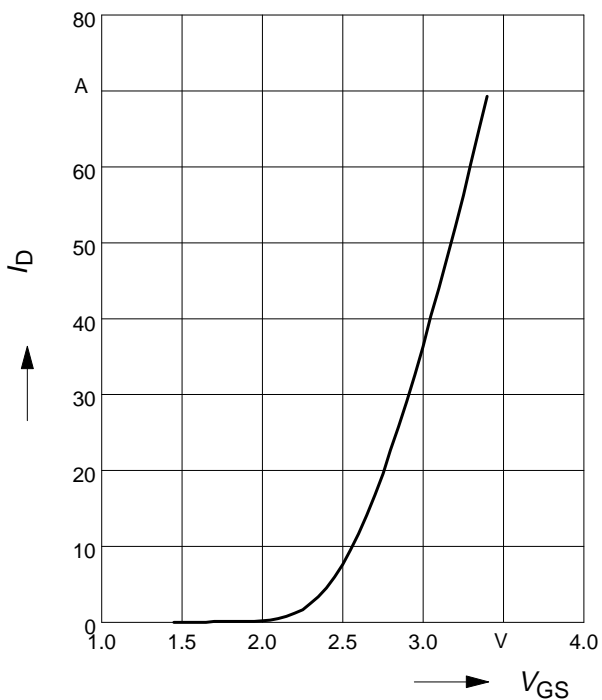
parameter: V_{GS}



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

parameter: $t_p = 80 \mu s$

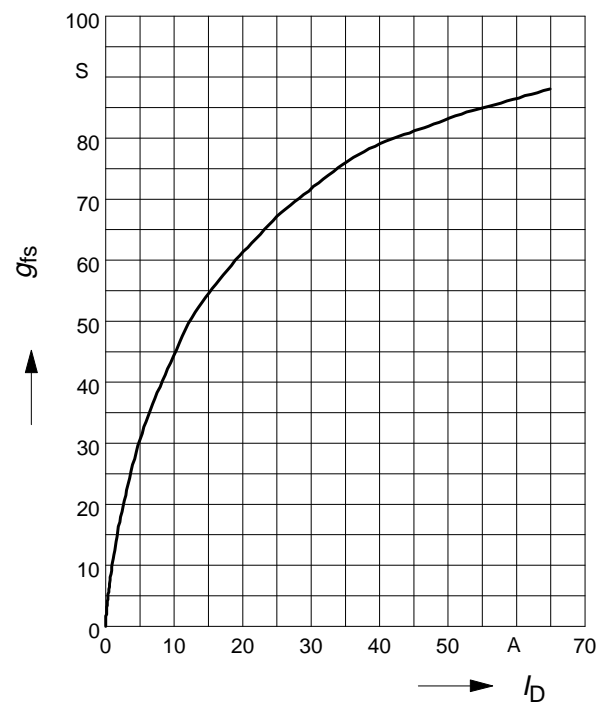
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Typ. forward transconductance

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

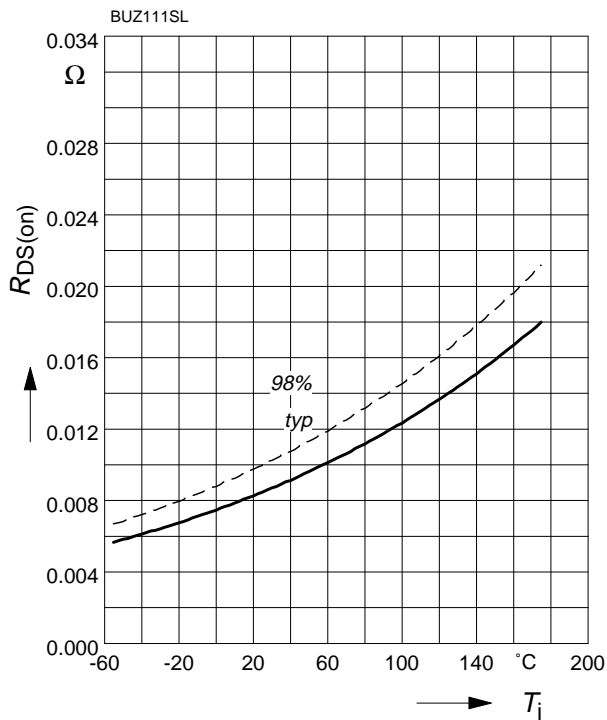
Parameter: g_{fs}



Drain-source on-resistance

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

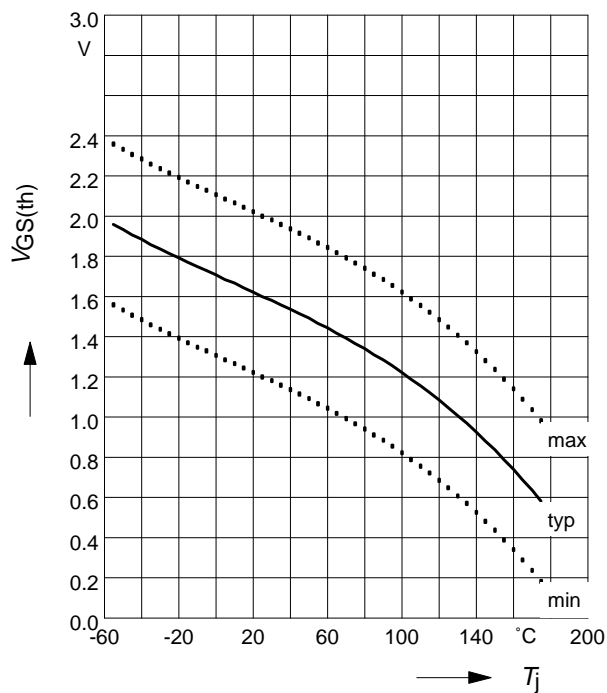
parameter : $I_D = 80 \text{ A}$, $V_{GS} = 4.5 \text{ V}$



Gate threshold voltage

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

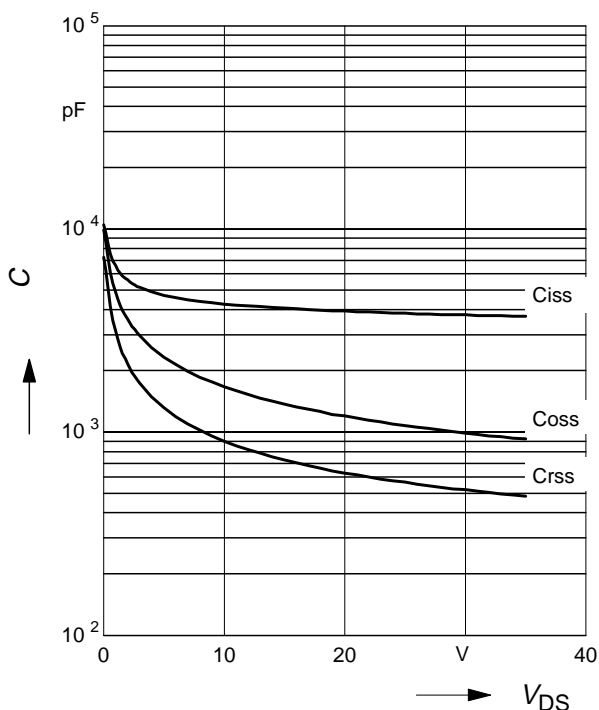
parameter : $V_{GS} = V_{DS}$, $I_D = 240 \mu\text{A}$



Typ. capacitances

$C = f(V_{DS})$

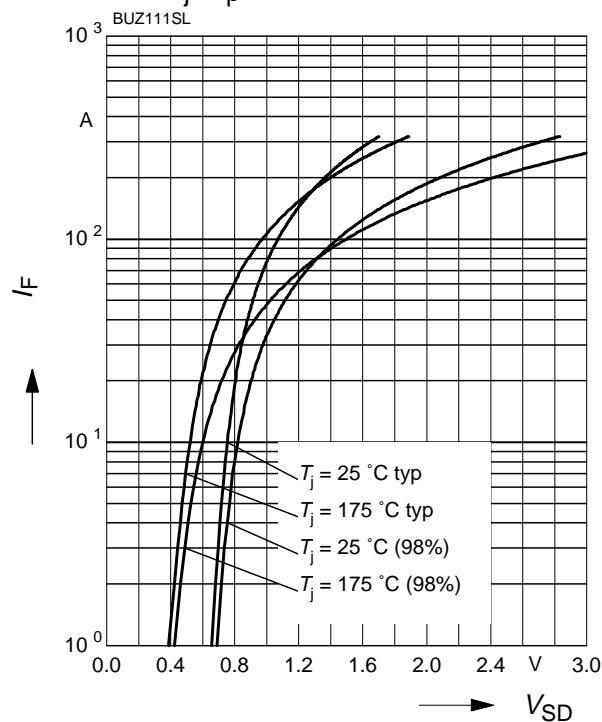
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

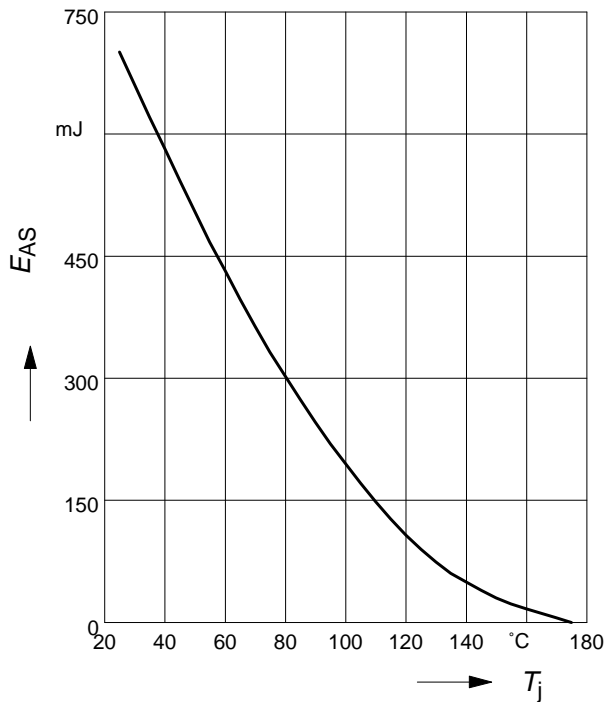
parameter: T_j , $t_p = 80 \mu\text{s}$



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

parameter: $I_D = 80\text{ A}$, $V_{DD} = 25\text{ V}$

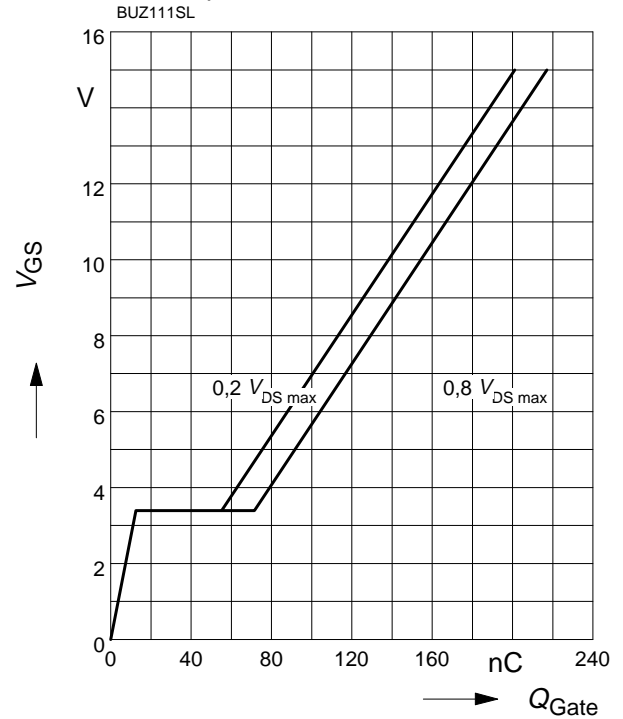
$R_{GS} = 25\ \Omega$



Typ. gate charge

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

parameter: $I_{D\ puls} = 80\text{ A}$



Drain-source breakdown voltage

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

