

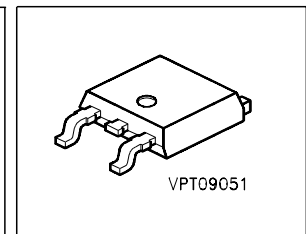
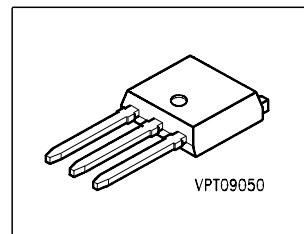
SIPMOS® Power Transistor

Features

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

Product Summary

| | | | |
|----------------------------------|--------------|-------|----------|
| Drain source voltage | V_{DS} | 30 | V |
| Drain-Source on-state resistance | $R_{DS(on)}$ | 0.012 | Ω |
| Continuous drain current | I_D | 30 | A |



| Type | Package | Ordering Code | Packaging |
|-----------|-------------|-----------------|---------------|
| SPD30N03L | P-TO252 | Q67040-S4148-A2 | Tape and Reel |
| SPU30N03L | P-TO251-3-1 | Q67040-S4149-A2 | 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 $T_C = 25\text{ °C}$, limited by bond wire $T_C = 100\text{ °C}$ | I_D | 30 30 | A |
| Pulsed drain current $T_C = 25\text{ °C}$ | I_{Dpulse} | 120 | |
| Avalanche energy, single pulse $I_D = 30\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\text{ }\Omega$ | E_{AS} | 250 | mJ |
| Avalanche energy, periodic limited by T_{jmax} | E_{AR} | 12 | |
| Reverse diode dv/dt $I_S = 46\text{ A}$, $V_{DS} = 24\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 175\text{ °C}$ | dv/dt | 6 | kV/ μs |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation $T_C = 25\text{ °C}$ | P_{tot} | 120 | 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} | - | - | 1.25 | K/W |
| Thermal resistance, junction - ambient, leded | R_{thJA} | - | - | 100 | |
| SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ¹⁾ | R_{thJA} | - | - | 75 50 | |

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

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|-----------------|----------------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Drain- source breakdown voltage $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$ | $V_{(BR)DSS}$ | 30 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 80\text{ }\mu\text{A}$ | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current $V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ °C}$ $V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ °C}$ | 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 | |
| Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 30\text{ A}$ | $R_{DS(on)}$ | - | 0.013 0.0076 | 0.018 0.012 | 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 $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|--|--------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 30\text{ A}$ | g_{fs} | 20 | 45 | - | S |
| Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{iss} | - | 1640 | 2100 | pF |
| Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{oss} | - | 650 | 820 | |
| Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$ | C_{rss} | - | 280 | 350 | |
| Turn-on delay time $V_{DD} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $R_G = 3.6\ \Omega$ | $t_{d(on)}$ | - | 16 | 24 | ns |
| Rise time $V_{DD} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $R_G = 3.6\ \Omega$ | t_r | - | 30 | 45 | |
| Turn-off delay time $V_{DD} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $R_G = 3.6\ \Omega$ | $t_{d(off)}$ | - | 20 | 30 | |
| Fall time $V_{DD} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $R_G = 3.6\ \Omega$ | t_f | - | 25 | 38 | |

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

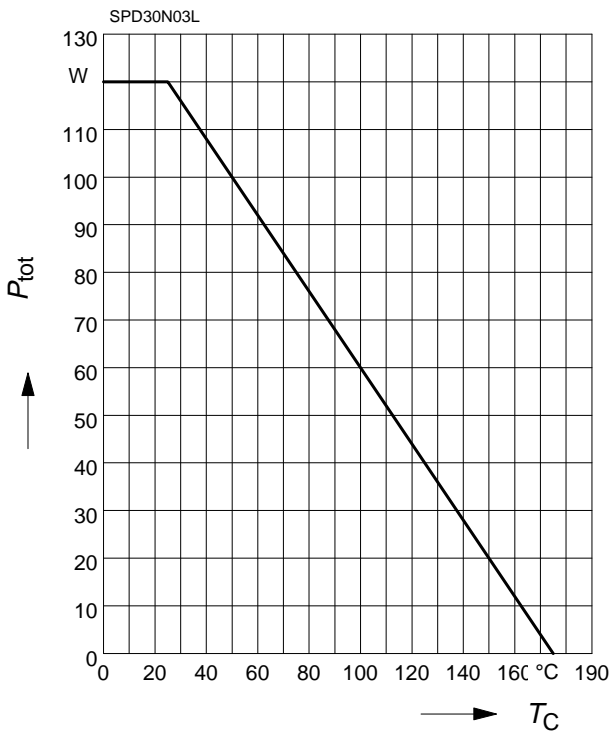
| Parameter | Symbol | Values | | | Unit |
|--|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Gate to source charge $V_{DD} = 24\text{ V}$, $I_D = 30\text{ A}$ | Q_{gs} | - | 4 | 6 | nC |
| Gate to drain charge $V_{DD} = 24\text{ V}$, $I_D = 30\text{ A}$ | Q_{gd} | - | 21 | 31.5 | |
| Gate charge total $V_{DD} = 24\text{ V}$, $I_D = 30\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ | Q_g | - | 54 | 80 | |
| Gate plateau voltage $V_{DD} = 24\text{ V}$, $I_D = 30\text{ A}$ | $V_{(plateau)}$ | - | 3.31 | - | V |

Reverse Diode

| | | | | | |
|---|----------|---|-------|-------|---------------|
| Inverse diode continuous forward current $T_C = 25\text{ °C}$ | I_S | - | - | 30 | A |
| Inverse diode direct current, pulsed $T_C = 25\text{ °C}$ | I_{SM} | - | - | 120 | |
| Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 60\text{ A}$ | V_{SD} | - | 0.97 | 1.7 | V |
| Reverse recovery time $V_R = 15\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | t_{rr} | - | 45 | 68 | ns |
| Reverse recovery charge $V_R = 15\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | Q_{rr} | - | 0.045 | 0.068 | μC |

Power Dissipation

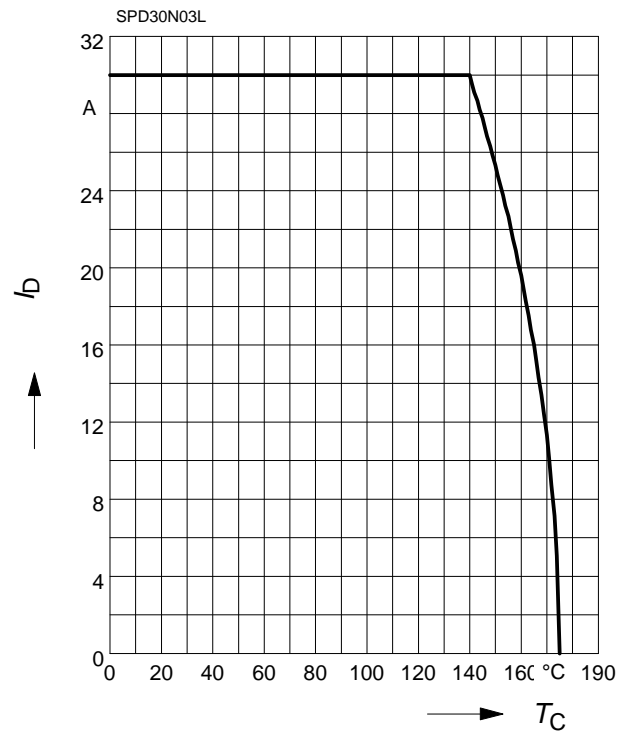
$$P_{\text{tot}} = f(T_C)$$



Drain current

$$I_D = f(T_C)$$

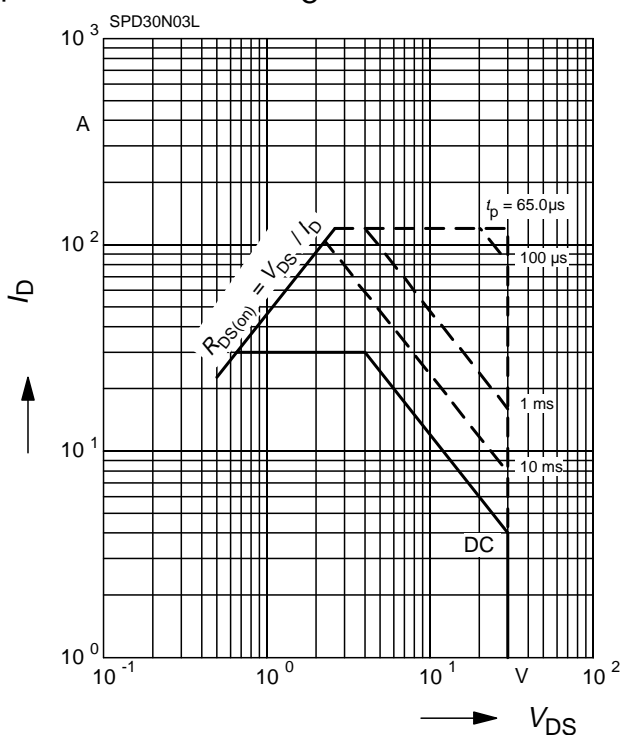
parameter: $V_{GS} \geq 10 \text{ V}$



Safe operating area

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

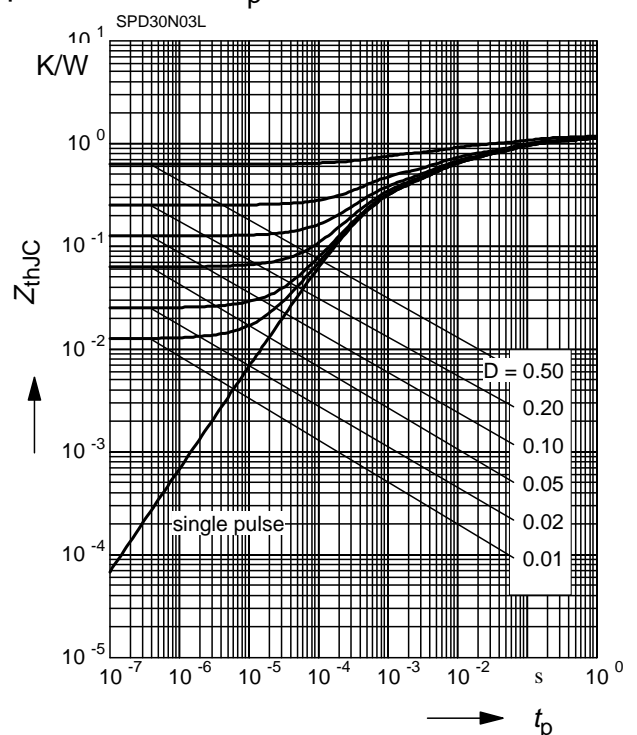
parameter: $D = 0$, $T_C = 25 \text{ }^{\circ}\text{C}$



Transient thermal impedance

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

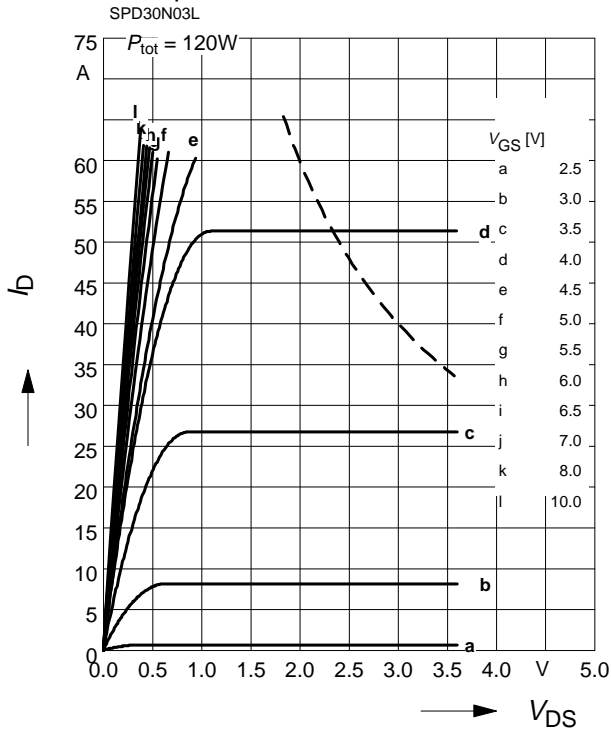
parameter: $D = t_p / T$



Typ. output characteristics

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

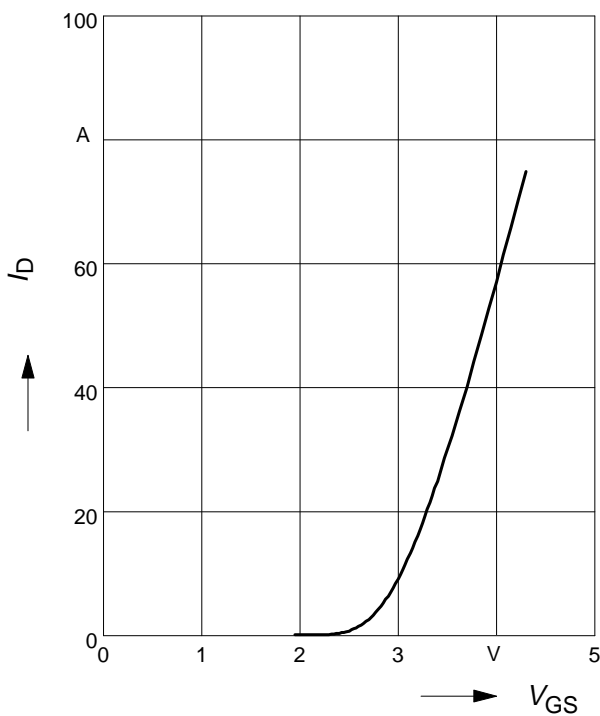
parameter: $t_p = 80 \mu s$



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

parameter: $t_p = 80 \mu s$

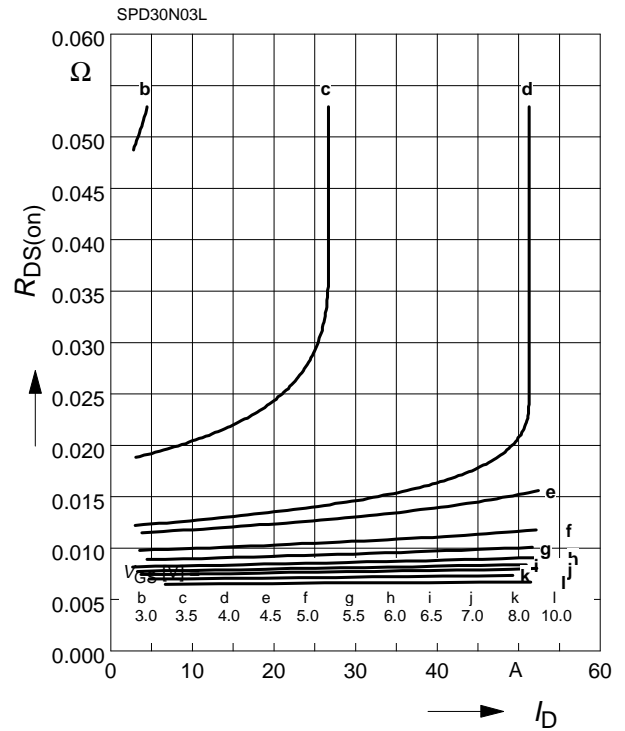
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Typ. drain-source-on-resistance

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

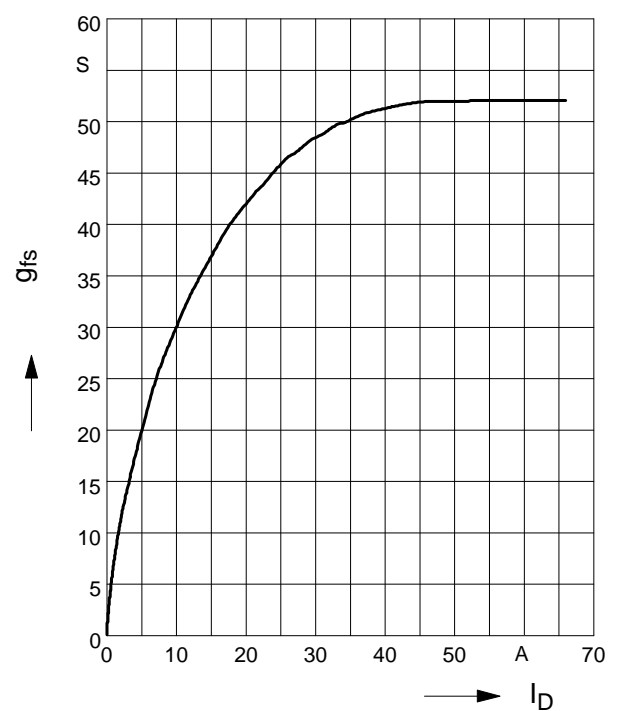
parameter: V_{GS}



Typ. forward transconductance

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

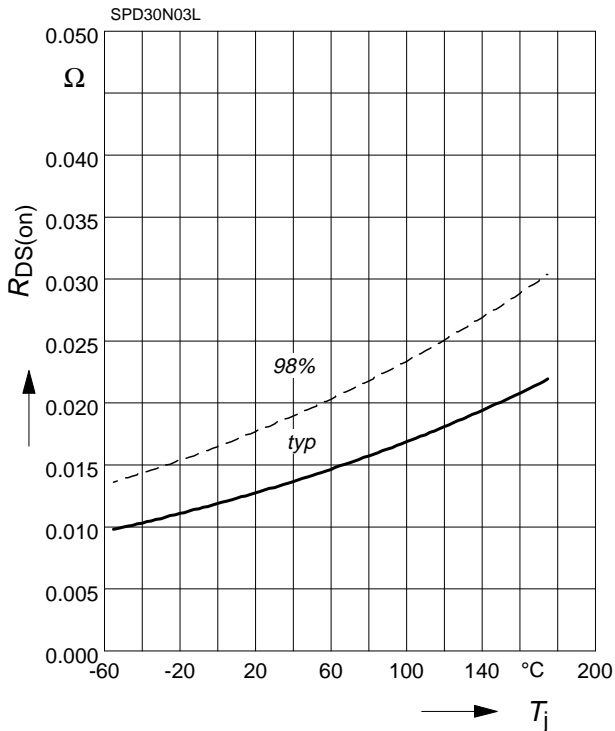
parameter: g_{fs}



Drain-source on-resistance

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

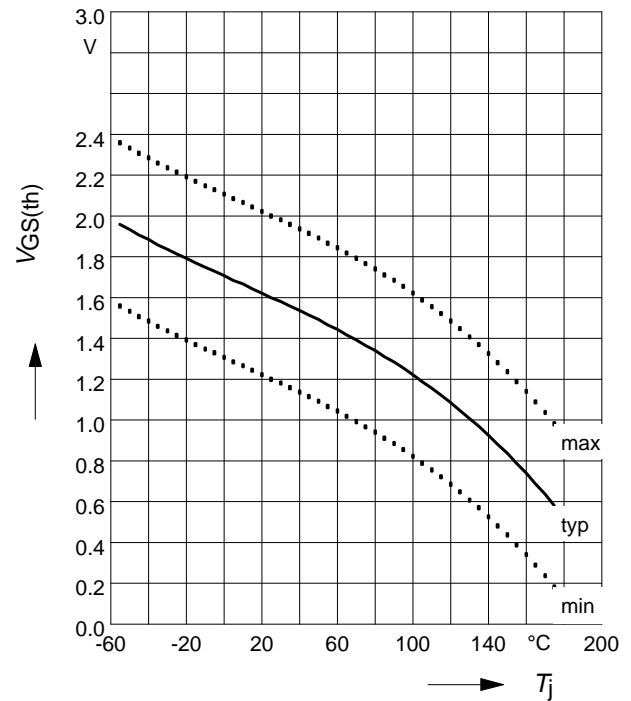
parameter : $I_D = 30 \text{ A}$, $V_{GS} = 4.5 \text{ V}$



Gate threshold voltage

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

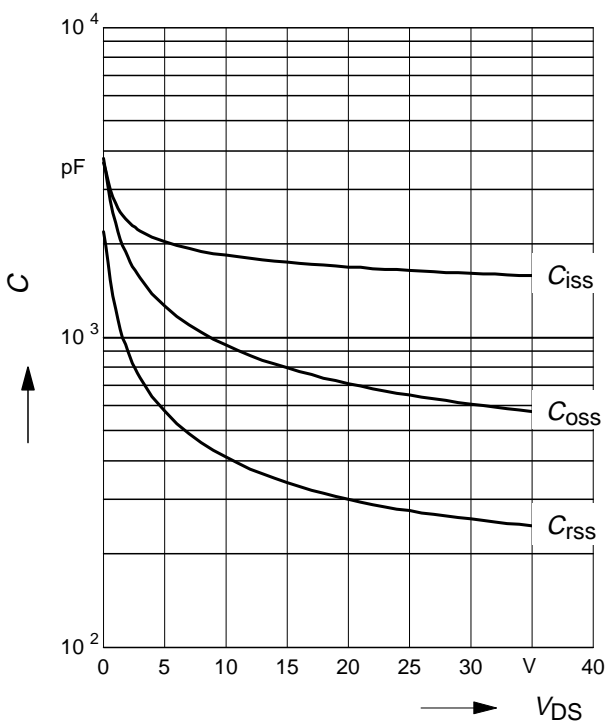
parameter : $V_{GS} = V_{DS}$, $I_D = 80 \mu\text{A}$



Typ. capacitances

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

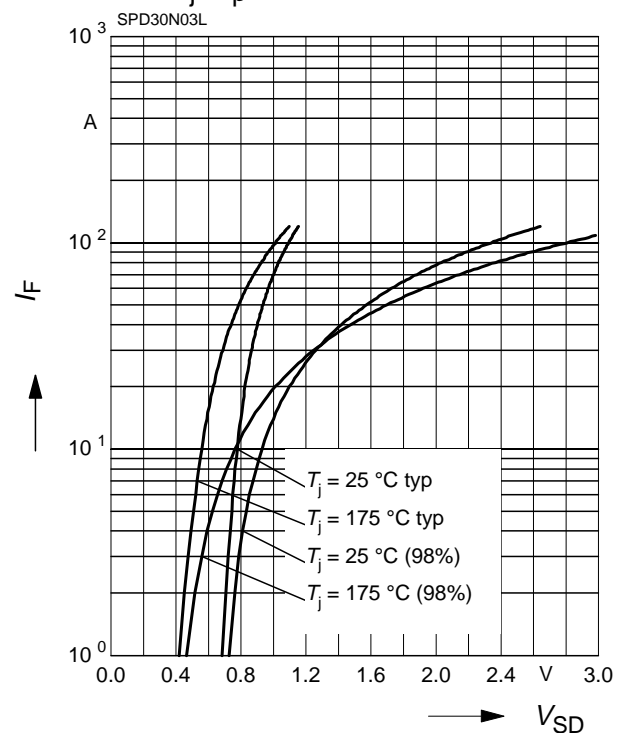
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

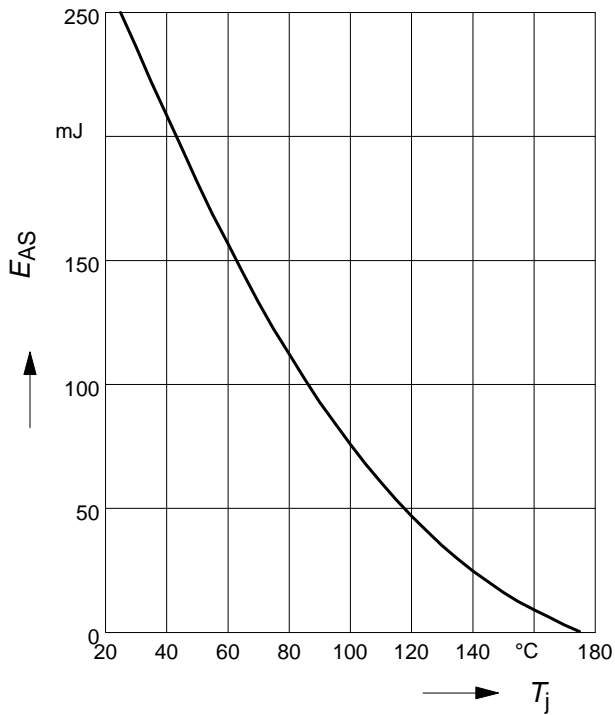
parameter: T_j , $t_p = 80 \mu\text{s}$



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

parameter: $I_D = 30\text{ A}$, $V_{DD} = 25\text{ V}$

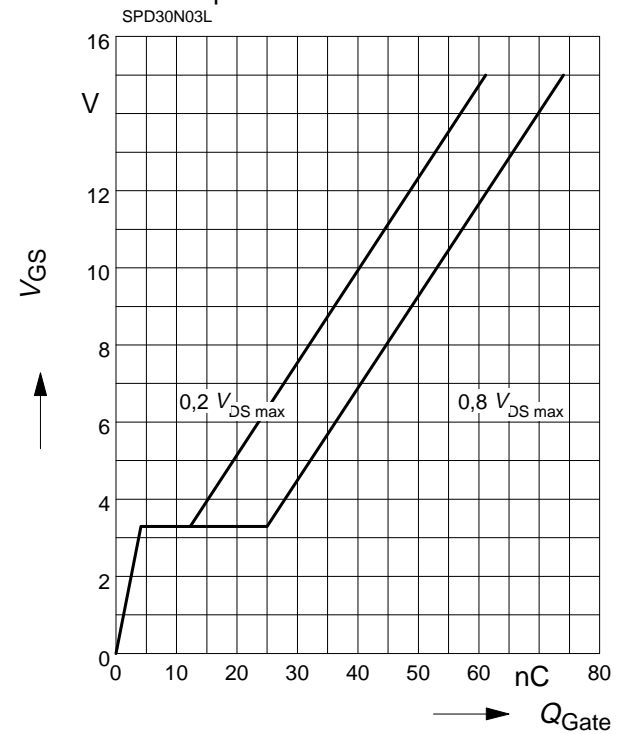
$R_{GS} = 25\ \Omega$



Typ. gate charge

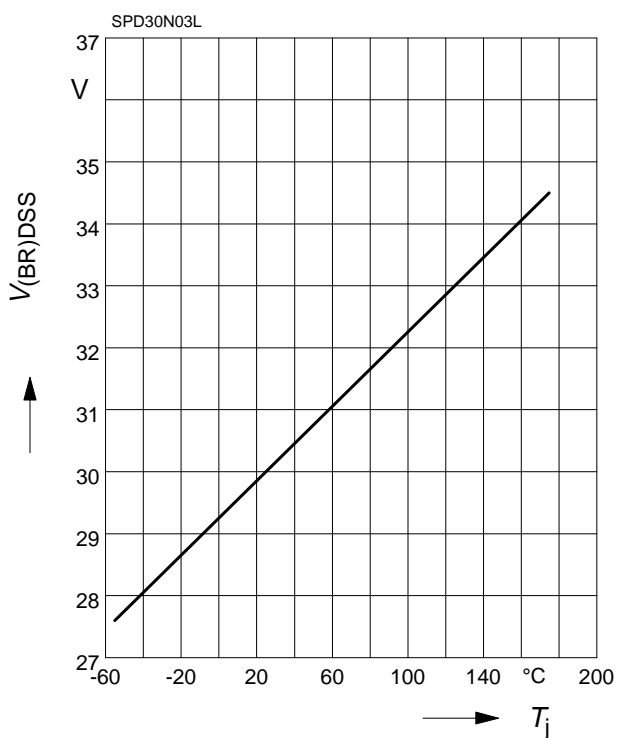
$V_{GS} = f(Q_{Gate})$

parameter: $I_{D\text{ puls}} = 30\text{ A}$



Drain-source breakdown voltage

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



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