

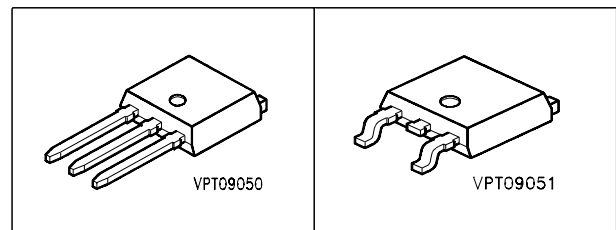
SIPMOS® Power-Transistor

Features

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- 175°C operating temperature

Product Summary

| | | | |
|----------------------------------|--------------|-------|----------|
| Drain source voltage | V_{DS} | -60 | V |
| Drain-source on-state resistance | $R_{DS(on)}$ | 0.075 | Ω |
| Continuous drain current | I_D | -30 | A |



| Type | Package |
|-----------|-----------|
| SPD30P06P | P-TO252-3 |
| SPU30P06P | P-TO251-3 |

| Pin 1 | PIN 2/4 | PIN 3 |
|-------|---------|-------|
| G | D | S |

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

| Parameter | Symbol | Value | Unit |
|--|---------------------|--------------|--------------------|
| Continuous drain current $T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$ | I_D | -30 -21.5 | A |
| Pulsed drain current $T_C = 25\text{ °C}$ | $I_{D\text{ puls}}$ | -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} | 12.5 | |
| Reverse diode dv/dt $I_S = -30\text{ A}$, $V_{DS} = -48\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 175\text{ °C}$ | dv/dt | 6 | kV/ μs |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation $T_C = 25\text{ °C}$ | P_{tot} | 125 | 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} | - | - | 1.2 | K/W |
| Thermal resistance, junction - ambient, leaded | R_{thJA} | - | - | 100 | |
| SMD version, device on PCB: | R_{thJA} | | | | |
| @ min. footprint | | - | - | 75 | |
| @ 6 cm ² cooling area ¹⁾ | | - | - | 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 $V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$ | $V_{(BR)DSS}$ | -60 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = -1.7\text{ mA}$ | $V_{GS(th)}$ | -2.1 | -3 | -4 | |
| Zero gate voltage drain current $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ °C}$ $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ °C}$ | 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 $V_{GS} = -10\text{ V}$, $I_D = -21.5\text{ A}$ | $R_{DS(on)}$ | - | 0.069 | 0.075 | Ω |

¹Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (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 $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = -21.5\text{ A}$ | g_{fs} | 5.2 | 10.4 | - | S |
| Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{iss} | - | 1228 | 1535 | pF |
| Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{oss} | - | 387 | 383 | |
| Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{rss} | - | 142 | 177 | |
| Turn-on delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -21.5\text{ A}$, $R_G = 1.6\text{ }\Omega$ | $t_{d(on)}$ | - | 13 | 19.5 | ns |
| Rise time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -21.5\text{ A}$, $R_G = 1.6\text{ }\Omega$ | t_r | - | 11 | 16.5 | |
| Turn-off delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -21.5\text{ A}$, $R_G = 1.6\text{ }\Omega$ | $t_{d(off)}$ | - | 30 | 45 | |
| Fall time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -21.5\text{ A}$, $R_G = 1.6\text{ }\Omega$ | t_f | - | 20 | 30 | |

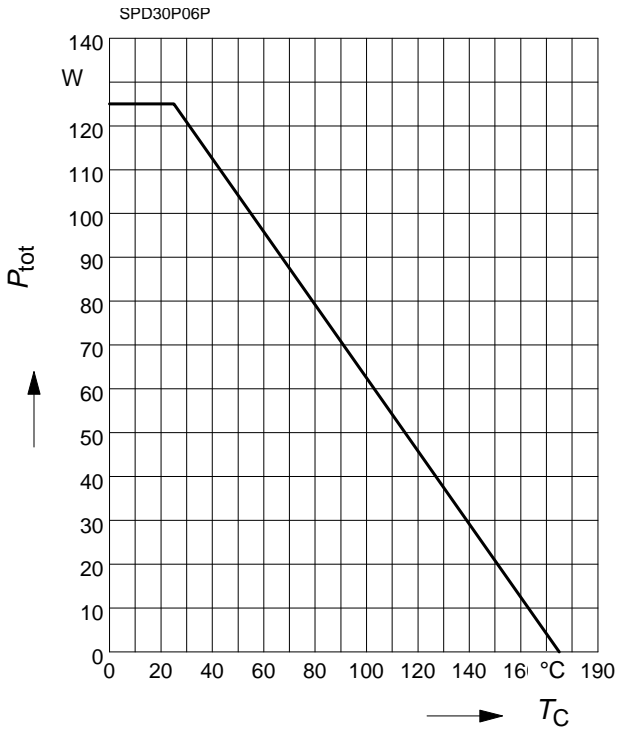
Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Gate to source charge $V_{DD} = -48\text{ V}, I_D = -30\text{ A}$ | Q_{gs} | - | 3.7 | 5.6 | nC |
| Gate to drain charge $V_{DD} = -48\text{ V}, I_D = -30\text{ A}$ | Q_{gd} | - | 13.8 | 20.7 | |
| Gate charge total $V_{DD} = -48\text{ V}, I_D = -30\text{ A}, V_{GS} = 0\text{ to }-10\text{ V}$ | Q_g | - | 32 | 48 | |
| Gate plateau voltage $V_{DD} = -48\text{ V}, I_D = -30\text{ A}$ | $V_{(plateau)}$ | - | -5.2 | - | V |

| Parameter | Symbol | Values | | | Unit |
|--|----------|--------|------|------|------|
| | | min. | typ. | max. | |
| 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 $V_{GS} = 0\text{ V}, I_F = -30$ | V_{SD} | - | -1.3 | -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} | - | 64.6 | 97 | ns |
| Reverse recovery charge $V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$ | Q_{rr} | - | 153 | 230 | nC |

Power dissipation

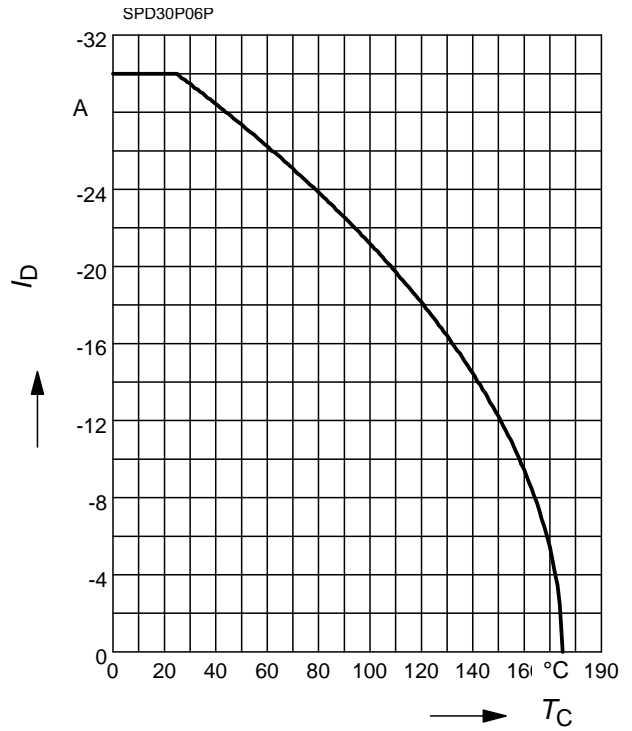
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

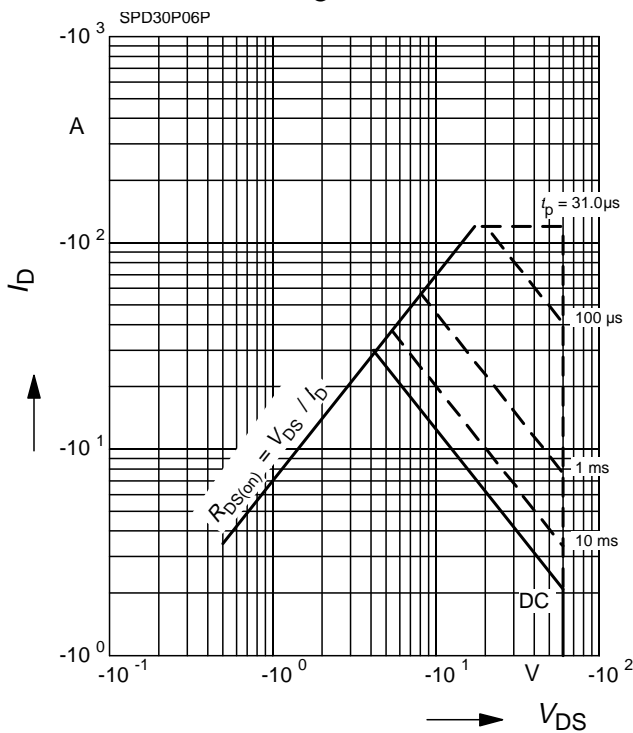
parameter: $V_{GS} \geq 10\text{ V}$



Safe operating area

$I_D = f(V_{DS})$

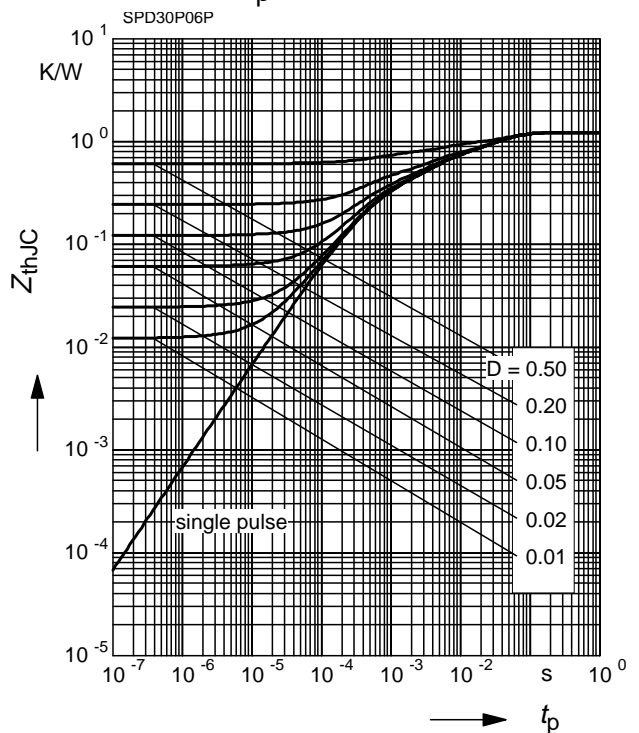
parameter: $D = 0, T_C = 25\text{ °C}$



Transient thermal impedance

$Z_{thJC} = f(t_p)$

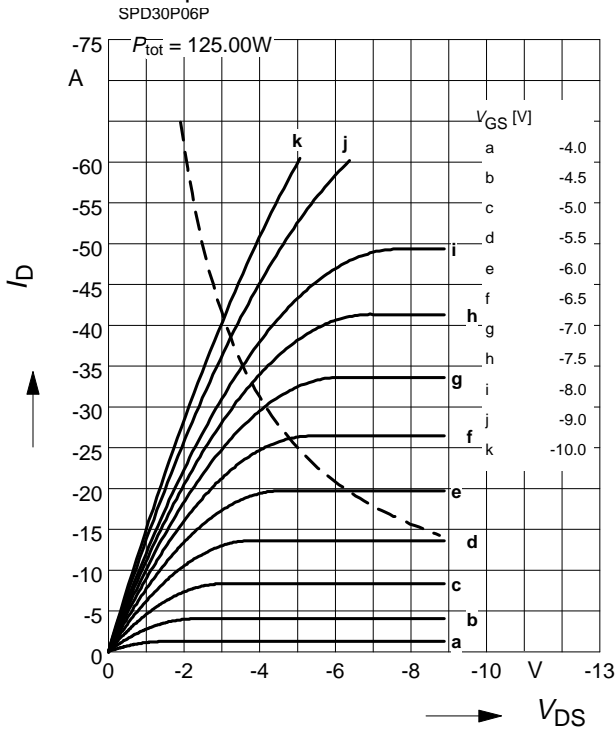
parameter: $D = t_p/T$



Typ. output characteristic

$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

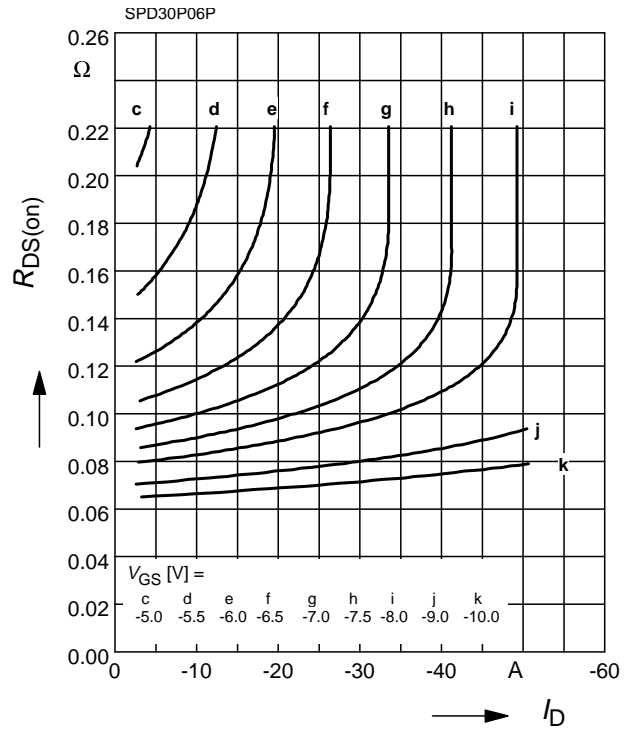
parameter: $t_p = 80 \mu\text{s}$



Typ. drain-source-on-resistance

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

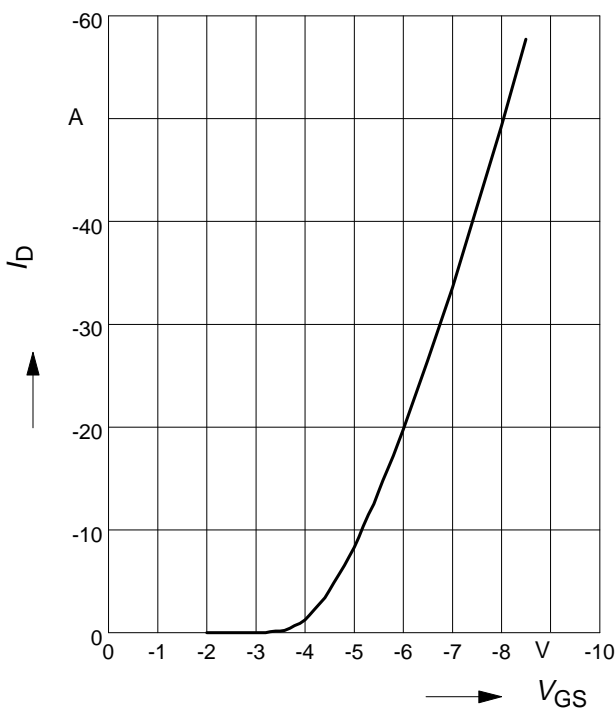
parameter: V_{GS}



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

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

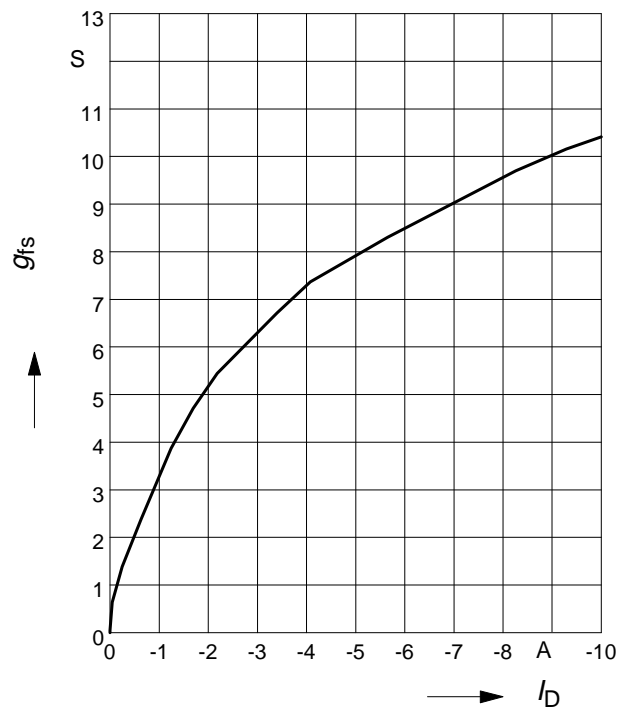
parameter: $t_p = 80 \mu\text{s}$



Typ. forward transconductance

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

parameter: g_{fs}

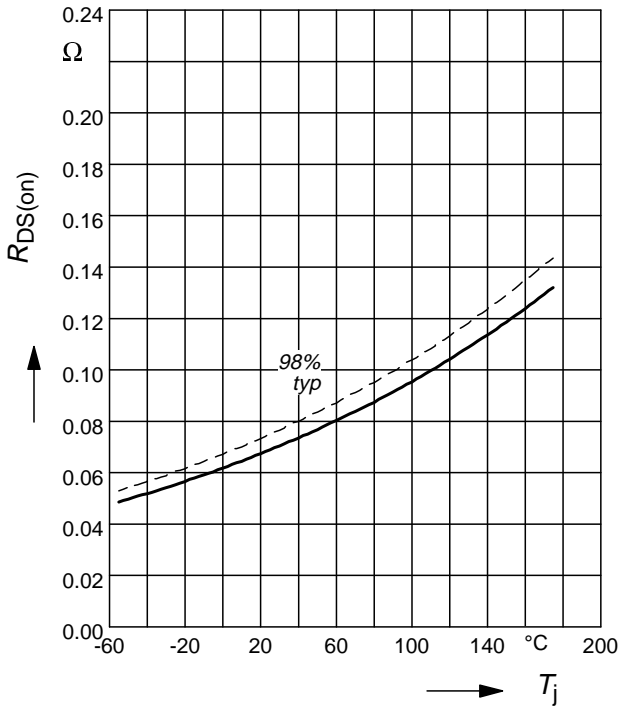


Drain-source on-state resistance

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

parameter: $I_D = -21.5 \text{ A}$, $V_{GS} = -10 \text{ V}$

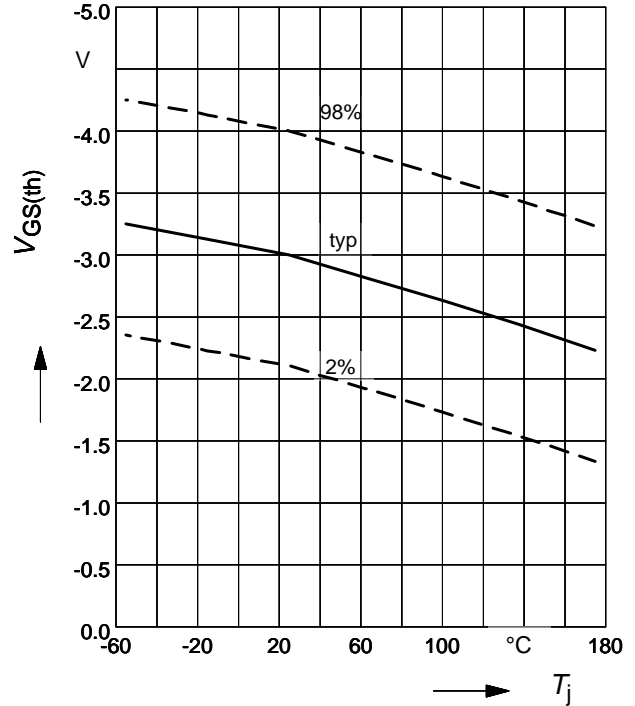
SPD30P06P



Gate threshold voltage

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

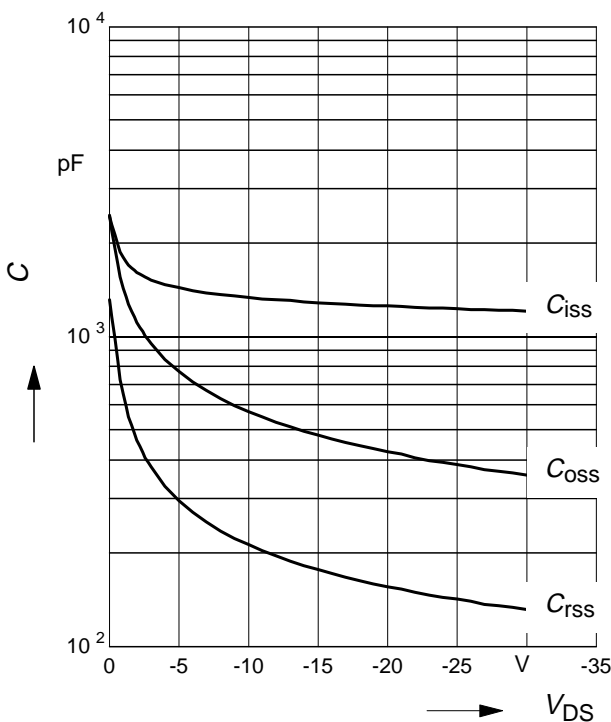
parameter: $V_{GS} = V_{DS}$, $I_D = -1.7 \text{ mA}$



Typ. capacitances

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

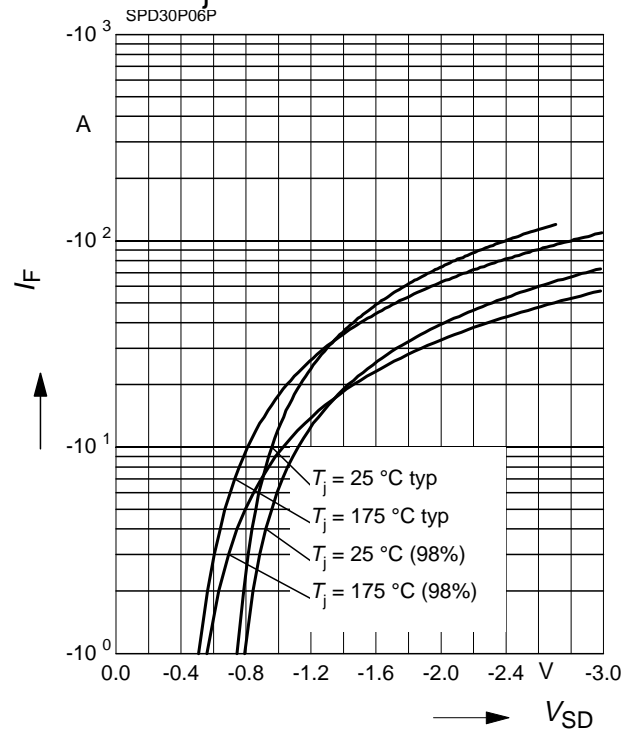
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

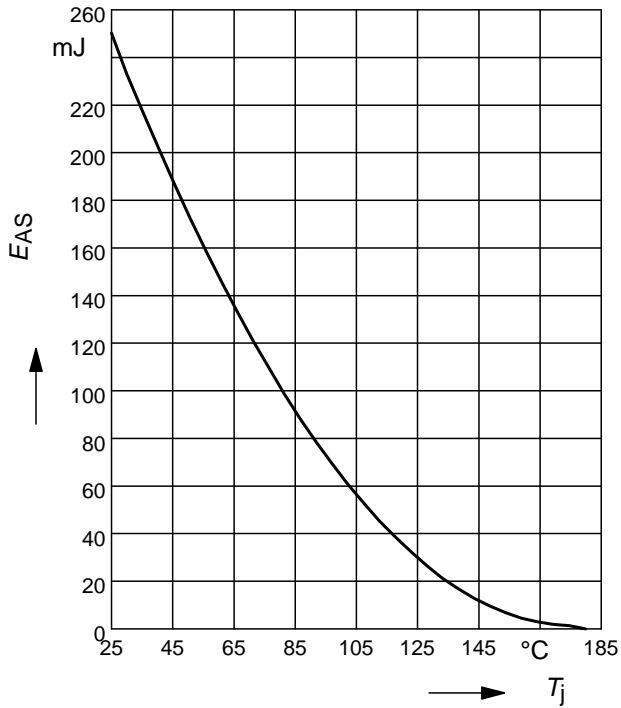
parameter: T_j , $t_p = 80 \mu\text{s}$



Avalanche energy

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

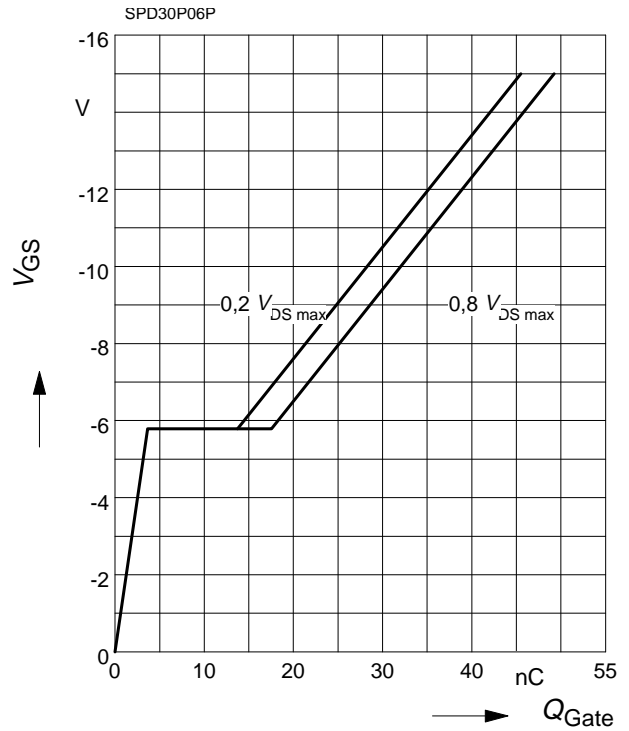
para.: $I_D = -30\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$



Typ. gate charge

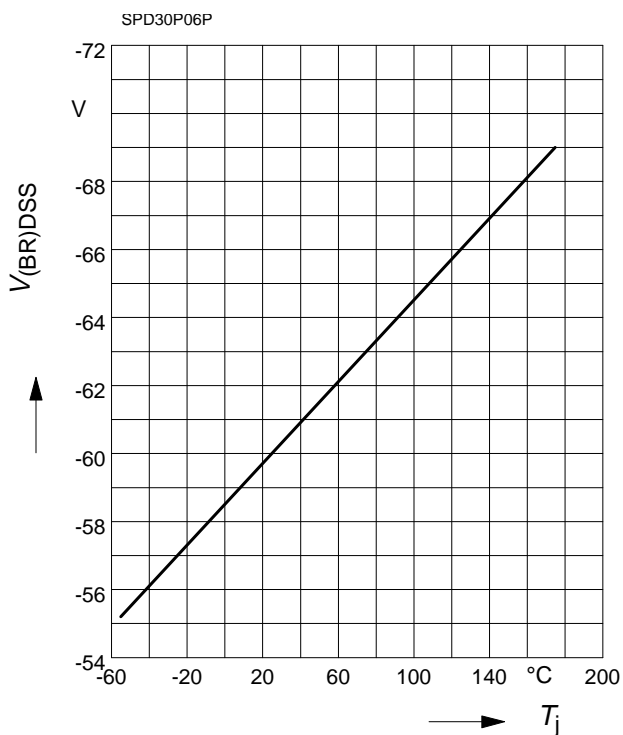
$$V_{GS} = f(Q_{Gate})$$

parameter: $I_D = -30\text{ A}$ pulsed



Drain-source breakdown voltage

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



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