

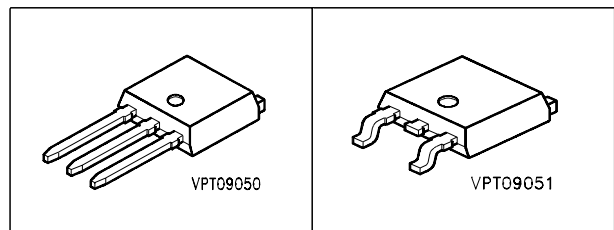
## SIPMOS® Power-Transistor

### 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 | $\Omega$ |
| Continuous drain current         | $I_D$        | -30   | A        |



| Type      | Package | Ordering Code |
|-----------|---------|---------------|
| SPD30P06P | P-TO252 | Q67042-S4018  |
| SPU30P06P | P-TO251 | Q67042-S4019  |

| 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<br>$T_C = 25\text{ °C}$<br>$T_C = 100\text{ °C}$  | $I_D$          | -30<br>-21.5 | A                  |
| Pulsed drain current<br>$T_C = 25\text{ °C}$   | $I_D$ puls     | -120         |                    |
| Avalanche energy, single pulse<br>$I_D = -30\text{ A}$ , $V_{DD} = -25\text{ V}$ , $R_{GS} = 25\ \Omega$                                     | $E_{AS}$       | 250          | mJ                 |
| Avalanche energy, periodic limited by $T_{jmax}$   | $E_{AR}$       | 12.5         |                    |
| Reverse diode $dv/dt$<br>$I_S = -30\text{ A}$ , $V_{DS} = -48\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ ,<br>$T_{jmax} = 175\text{ °C}$ | $dv/dt$        | 6            | kV/ $\mu\text{s}$  |
| Gate source voltage  | $V_{GS}$       | $\pm 20$     | V                  |
| Power dissipation<br>$T_C = 25\text{ °C}$  | $P_{tot}$      | 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. |      |
| <b>Characteristics</b>                         |            |        |      |      |      |
| 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 <sup>2</sup> cooling area <sup>1)</sup> |            | -      | -    | 50   |      |

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

| Parameter  | Symbol        | Values |       |       | Unit          |
|--|---------------|--------|-------|-------|---------------|
|  |               | min.   | typ.  | max.  |               |
| <b>Static Characteristics</b>  |               |        |       |       |               |
| Drain- source breakdown voltage<br>$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$   | $V_{(BR)DSS}$ | -60    | -     | -     | V             |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D = -1.7\text{ mA}$  | $V_{GS(th)}$  | -2.1   | -3    | -4    |               |
| Zero gate voltage drain current<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ °C}$<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ °C}$ | $I_{DSS}$     | -      | -0.1  | -1    | $\mu\text{A}$ |
| Gate-source leakage current<br>$V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$   | $I_{GSS}$     | -      | -10   | -100  |               |
| Drain-source on-state resistance<br>$V_{GS} = -10\text{ V}$ , $I_D = -21.5\text{ A}$   | $R_{DS(on)}$  | -      | 0.069 | 0.075 | $\Omega$      |

<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  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. |      |
| <b>Dynamic Characteristics</b>   |              |        |      |      |      |
| Transconductance<br>$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -21.5\text{ A}$                                 | $g_{fs}$     | 5.2    | 10.4 | -    | S    |
| Input capacitance<br>$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$                                  | $C_{iss}$    | -      | 1228 | 1535 | pF   |
| Output capacitance<br>$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$                                 | $C_{oss}$    | -      | 387  | 383  |      |
| Reverse transfer capacitance<br>$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$                       | $C_{rss}$    | -      | 142  | 177  |      |
| Turn-on delay time<br>$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -21.5\text{ A}$ ,<br>$R_G = 1.6\ \Omega$  | $t_{d(on)}$  | -      | 13   | 19.5 | ns   |
| Rise time<br>$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -21.5\text{ A}$ ,<br>$R_G = 1.6\ \Omega$           | $t_r$        | -      | 11   | 16.5 |      |
| Turn-off delay time<br>$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -21.5\text{ A}$ ,<br>$R_G = 1.6\ \Omega$ | $t_{d(off)}$ | -      | 30   | 45   |      |
| Fall time<br>$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -21.5\text{ A}$ ,<br>$R_G = 1.6\ \Omega$           | $t_f$        | -      | 20   | 30   |      |

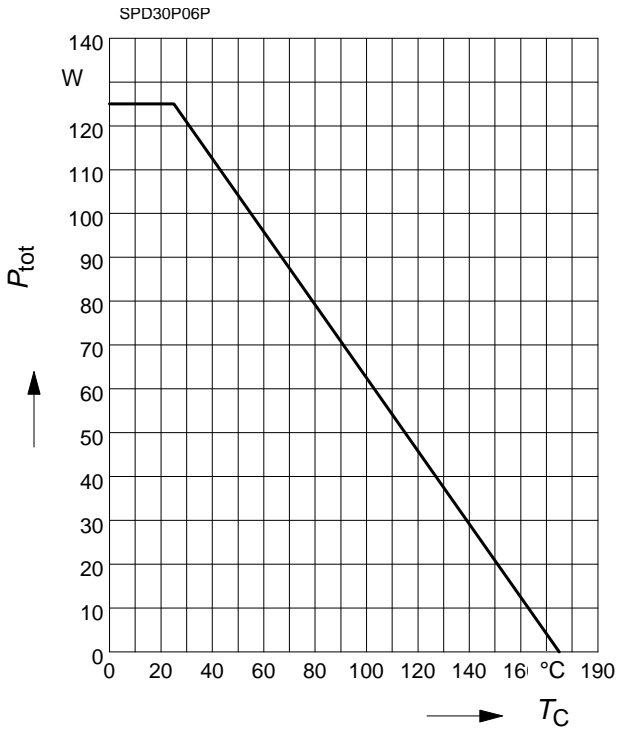
**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

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

| Parameter  | Symbol   | Values |      |      | Unit |
|--|----------|--------|------|------|------|
|  |          | min.   | typ. | max. |      |
| <b>Reverse Diode</b>   |          |        |      |      |      |
| Inverse diode continuous forward current<br>$T_C = 25\text{ °C}$                               | $I_S$    | -      | -    | -30  | A    |
| Inverse diode direct current,pulsed<br>$T_C = 25\text{ °C}$                                    | $I_{SM}$ | -      | -    | -120 |      |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}, I_F = -30$                              | $V_{SD}$ | -      | -1.3 | -1.7 | V    |
| Reverse recovery time<br>$V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$   | $t_{rr}$ | -      | 64.6 | 97   | ns   |
| Reverse recovery charge<br>$V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$ | $Q_{rr}$ | -      | 153  | 230  | nC   |

**Power dissipation**

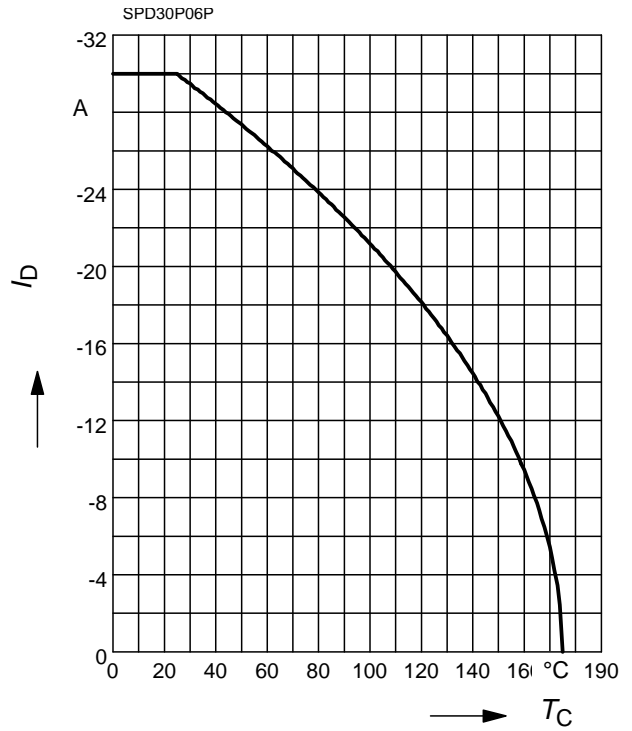
$$P_{tot} = f(T_C)$$



**Drain current**

$$I_D = f(T_C)$$

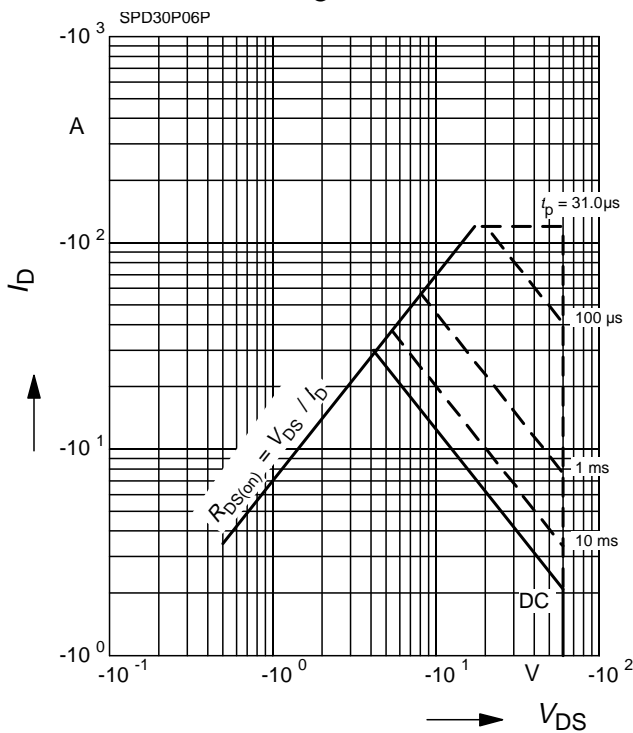
parameter:  $V_{GS} \geq 10 \text{ V}$



**Safe operating area**

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

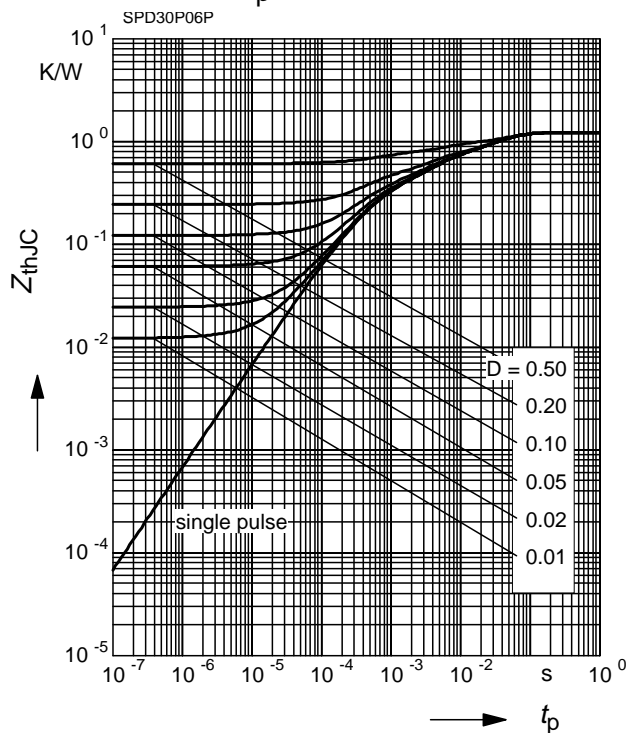
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



**Transient thermal impedance**

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

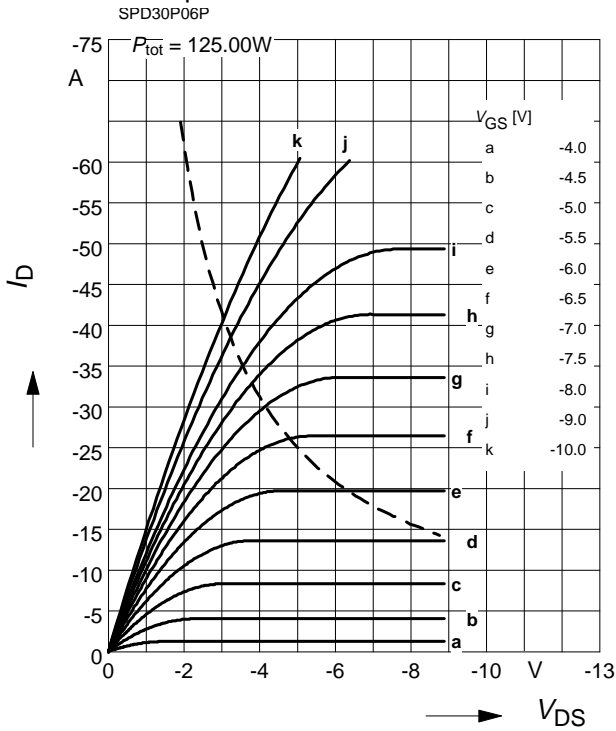
parameter:  $D = t_p/T$



**Typ. output characteristic**

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

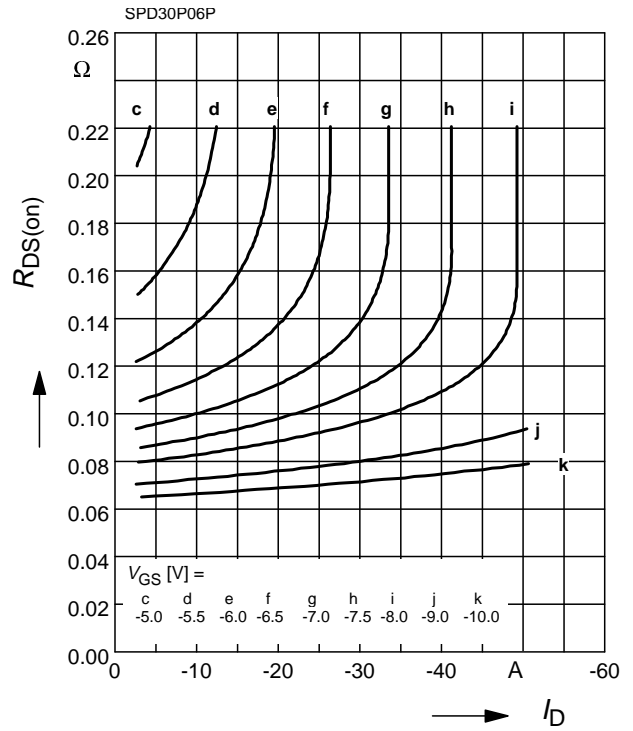
parameter:  $t_p = 80 \mu\text{s}$



**Typ. drain-source-on-resistance**

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

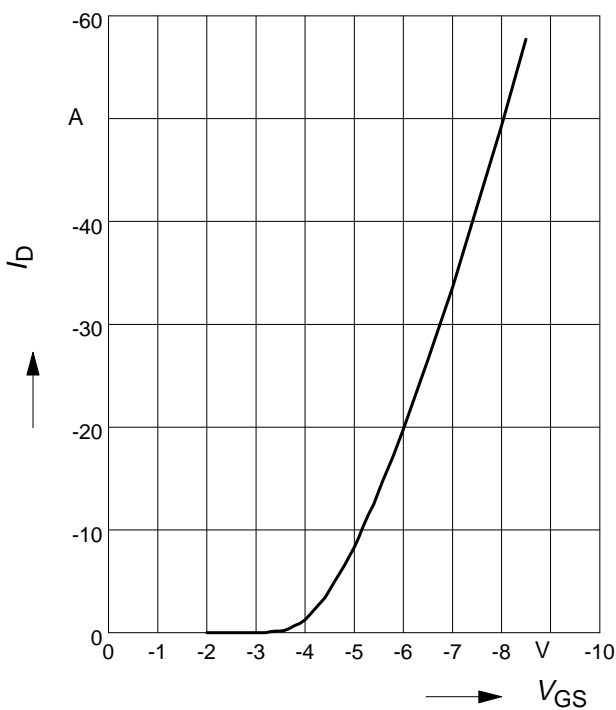
parameter:  $V_{GS}$



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

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

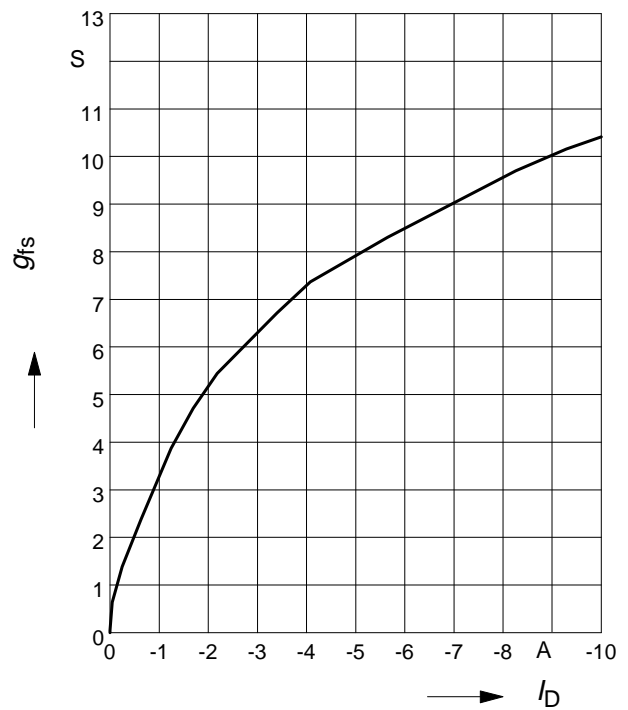
parameter:  $t_p = 80 \mu\text{s}$



**Typ. forward transconductance**

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

parameter:  $g_{fs}$

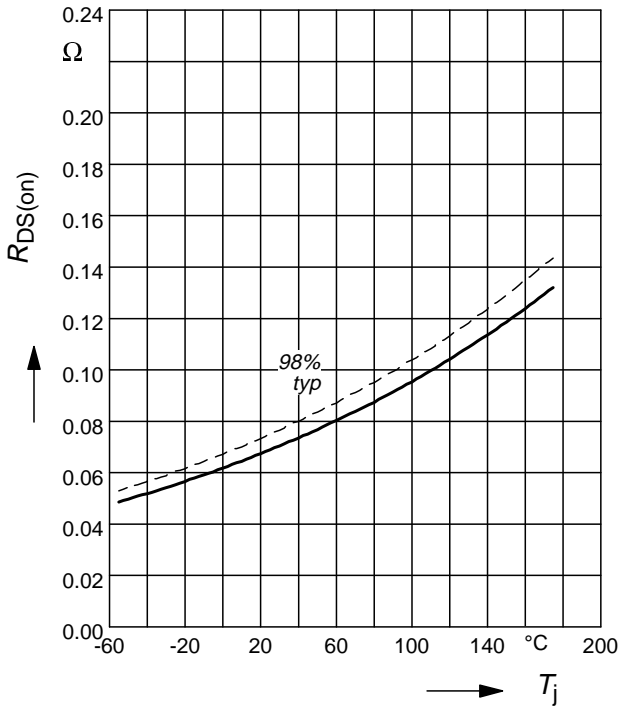


**Drain-source on-state resistance**

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

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

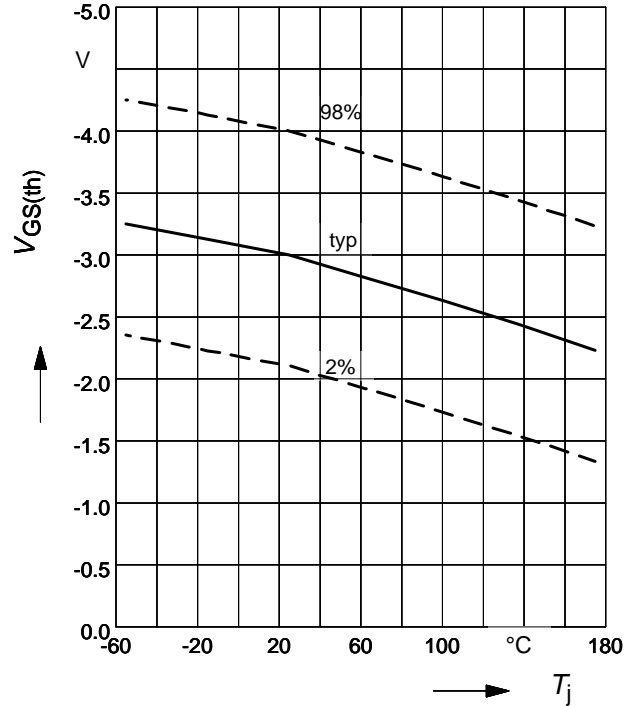
SPD30P06P



**Gate threshold voltage**

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

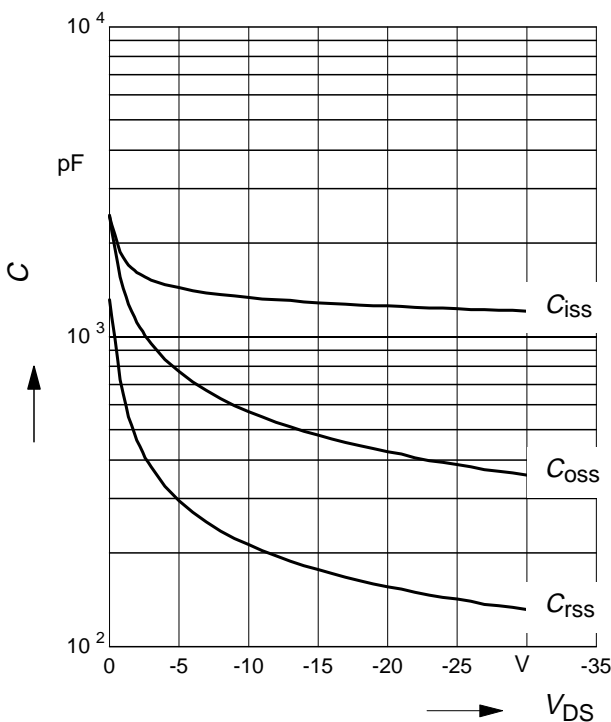
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -1.7 \text{ mA}$



**Typ. capacitances**

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

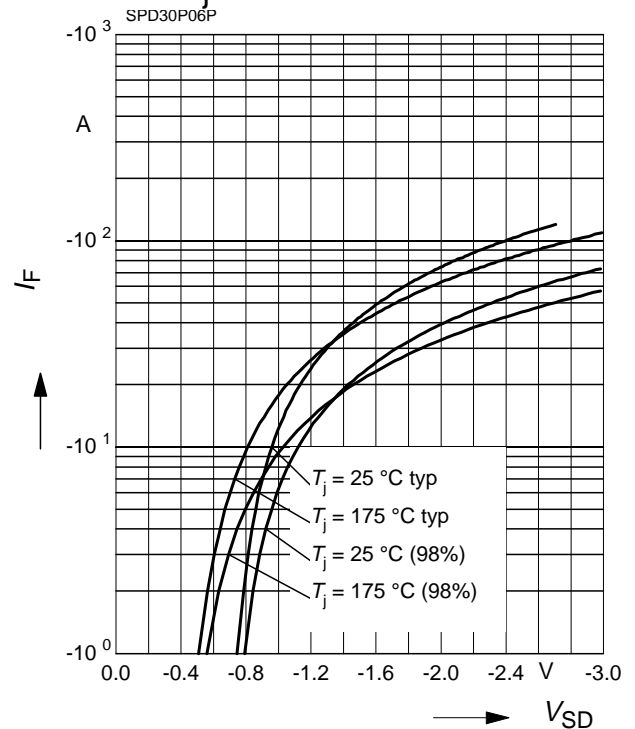
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



**Forward characteristics of reverse diode**

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

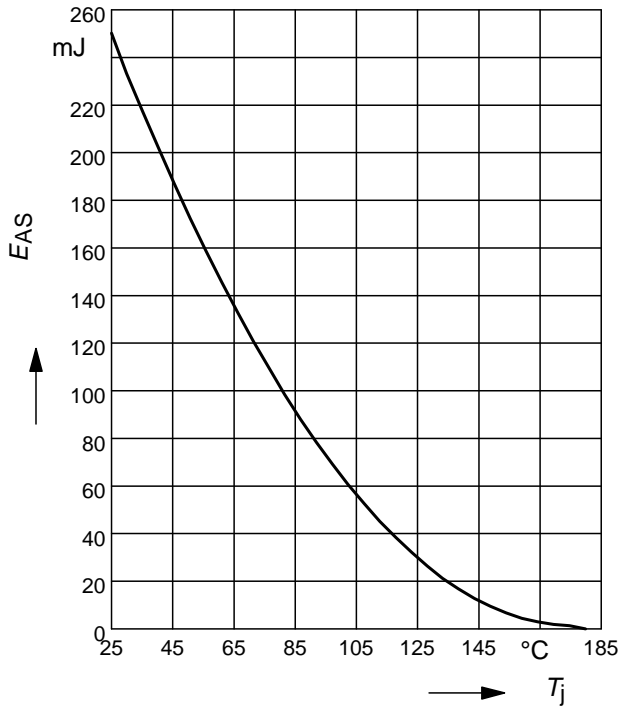
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**Avalanche energy**

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

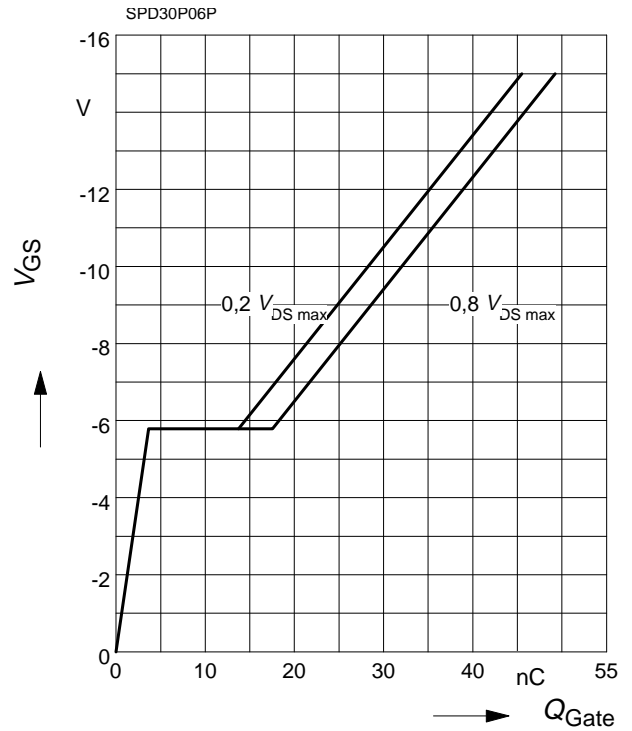
para.:  $I_D = -30\text{ A}$  ,  $V_{DD} = -25\text{ V}$  ,  $R_{GS} = 25\ \Omega$



**Typ. gate charge**

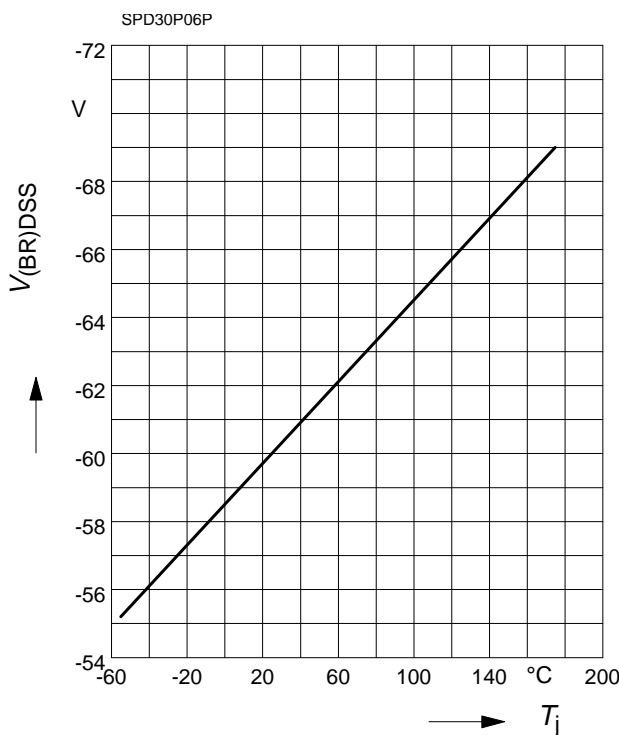
$$V_{GS} = f(Q_{Gate})$$

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



**Drain-source breakdown voltage**

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





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