## SIPMOS® Power-Transistor

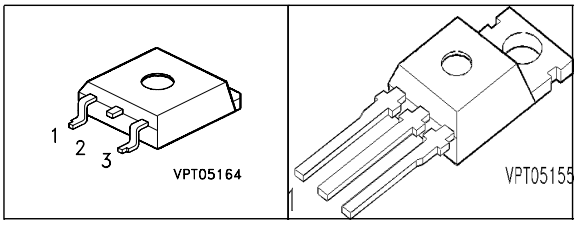
### Features

- P-Channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated
- 175°C operating temperature

RoHS

### Product Summary

| | | | |
|---|---|---|---|
| Drain source voltage | $V_{DS}$ | -60 | V |
| Drain-source on-state resistance | $R_{DS(on)}$ | 0.023 | Ω |
| Continuous drain current | $I_D$ | -80 | A |




| Type | Package | Lead free |
|---|---|---|
| SPP80P06P | P-TO220-3 | No |
| SPB80P06P G | PG-TO263-3 | Yes |

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

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Continuous drain current<br>$T_C$ = 25 °C, [1)]<br>$T_C$ = 100 °C | $I_D$ | <br>-80<br>-64 | A |
| Pulsed drain current<br>$T_C$ = 25 °C | $I_{D\ puls}$ | -320 | |
| Avalanche energy, single pulse<br>$I_D$ = -80 A , $V_{DD}$ = -25 V, $R_{GS}$ = 25 Ω | $E_{AS}$ | 823 | mJ |
| Avalanche energy, periodic limited by $T_{jmax}$ | $E_{AR}$ | 34 | |
| Reverse diode d*v*/d*t*<br>$I_S$ = -80 A, $V_{DS}$ = -48 , d*i*/d*t* = 200 A/µs,<br>$T_{jmax}$ = 175 °C | d*v*/d*t* | 6 | kV/µs |
| Gate source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation<br>$T_C$ = 25 °C | $P_{tot}$ | 340 | W |
| Operating and storage temperature | $T_j$ , $T_{stg}$ | -55...+175 | °C |
| IEC climatic category; DIN IEC 68-1 | | 55/175/56 | |

[1]Current limited by bondwire; with an $R_{thJC}$ = 0.4 K/W the chip is able to carry $I_D$ = -91A

## Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Characteristics** | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 0.4 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | - | - | 62 | |
| SMD version, device on PCB: | $R_{thJA}$ | | | | |
| @ min. footprint | | - | - | 62 | |
| @ 6 cm$^2$ cooling area [1)] | | - | - | 40 | |

**Electrical Characteristics**, at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain- source breakdown voltage<br>$V_{GS}$ = 0 V, $I_D$ = -250 µA | $V_{(BR)DSS}$ | -60 | - | - | V |
| Gate threshold voltage, $V_{GS}$ = $V_{DS}$<br>$I_D$ = -5.5 mA | $V_{GS(th)}$ | -2.1 | -3 | -4 | |
| Zero gate voltage drain current | $I_{DSS}$ | | | | µA |
| $V_{DS}$ = -60 V, $V_{GS}$ = 0 V, $T_j$ = 25 °C | | - | -0.1 | -1 | |
| $V_{DS}$ = -60 V, $V_{GS}$ = 0 V, $T_j$ = 150 °C | | - | -10 | -100 | |
| Gate-source leakage current<br>$V_{GS}$ = -20 V, $V_{DS}$ = 0 V | $I_{GSS}$ | - | -10 | -100 | nA |
| Drain-source on-state resistance<br>$V_{GS}$ = -10 V, $I_D$ = -64 A | $R_{DS(on)}$ | - | 0.021 | 0.023 | Ω |

[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm$^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics,** at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | |
| Transconductance<br>$V_{DS}\geq 2*I_D*R_{DS(on)max}$ , $I_D$ = -64 A | $g_{fs}$ | 18 | 36 | - | S |
| Input capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = -25 V, $f$ = 1 MHz | $C_{iss}$ | - | 4026 | 5033 | pF |
| Output capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = -25 V, $f$ = 1 MHz | $C_{oss}$ | - | 1252 | 1565 | |
| Reverse transfer capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = -25 V, $f$ = 1 MHz | $C_{rss}$ | - | 437 | 546 | |
| Turn-on delay time<br>$V_{DD}$ = -30 V, $V_{GS}$ = -10 V, $I_D$ = -64 A,<br>$R_G$ = 1 Ω | $t_{d(on)}$ | - | 24 | 36 | ns |
| Rise time<br>$V_{DD}$ = -30 V, $V_{GS}$ = -10 V, $I_D$ = -64 A,<br>$R_G$ = 1 Ω | $t_r$ | - | 18 | 27 | |
| Turn-off delay time<br>$V_{DD}$ = -30 V, $V_{GS}$ = -10 V, $I_D$ = -64 A,<br>$R_G$ = 1 Ω | $t_{d(off)}$ | - | 56 | 84 | |
| Fall time<br>$V_{DD}$ = -30 V, $V_{GS}$ = -10 V, $I_D$ = -64 A,<br>$R_G$ = 1 Ω | $t_f$ | - | 30 | 45 | |

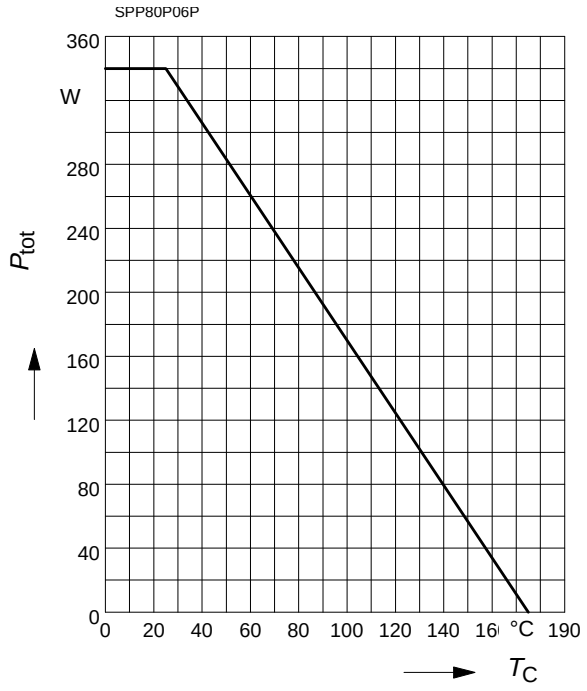
**Electrical Characteristics,** at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | |
| Gate to source charge<br>$V_{DD}$ = -48 V, $I_D$ = -80 A | $Q_{gs}$ | - | 27.4 | 41 | nC |
| Gate to drain charge<br>$V_{DD}$ = -48 V, $I_D$ = -80 A | $Q_{gd}$ | - | 50 | 75 | |
| Gate charge total<br>$V_{DD}$ = -48 V, $I_D$ = -80 A, $V_{GS}$ = 0 to -10 V | $Q_g$ | - | 115 | 173 | |
| Gate plateau voltage<br>$V_{DD}$ = -48 V , $I_D$ = -80 A | $V_{(plateau)}$ | - | -6.2 | - | V |

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Reverse Diode** | | | | | |
| Inverse diode continuous forward current<br>$T_C$ = 25 °C | $I_S$ | - | - | -80 | A |
| Inverse diode direct current,pulsed<br>$T_C$ = 25 °C | $I_{SM}$ | - | - | -320 | |
| Inverse diode forward voltage<br>$V_{GS}$ = 0 V, $I_F$ = -80 A | $V_{SD}$ | - | -1.2 | -1.6 | V |
| Reverse recovery time<br>$V_R$ = -30 V, $I_F$=$I_S$ , d$i_F$/d$t$ = 100 A/µs | $t_{rr}$ | - | 117 | 175 | ns |
| Reverse recovery charge<br>$V_R$ = -30 V, $I_F$=$I_S$ , d$i_F$/d$t$ = 100 A/µs | $Q_{rr}$ | - | 420 | 630 | nC |

## Power dissipation

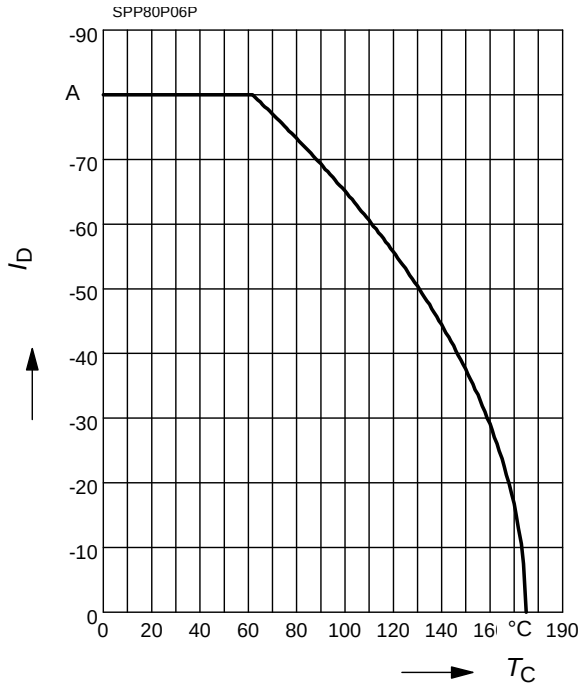
$P_{tot} = f(T_C)$




## Drain current

$I_D = f(T_C)$

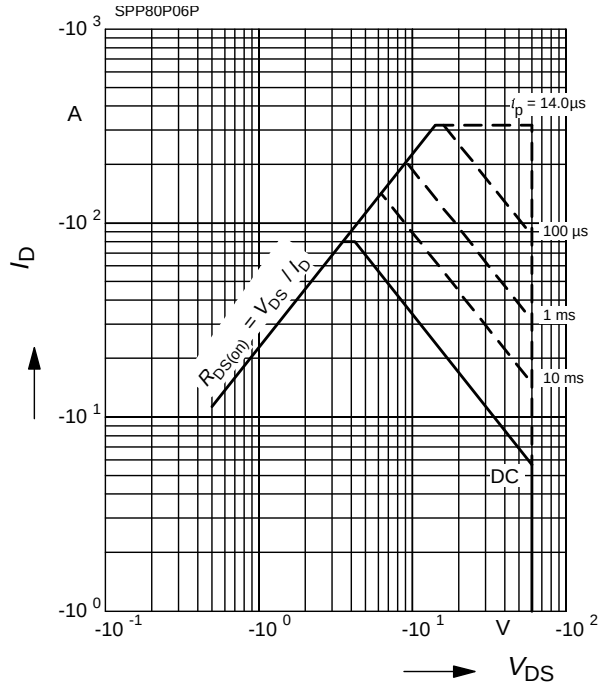
parameter: $V_{GS} \geq 10$ V




## Safe operating area

$I_D = f(V_{DS})$

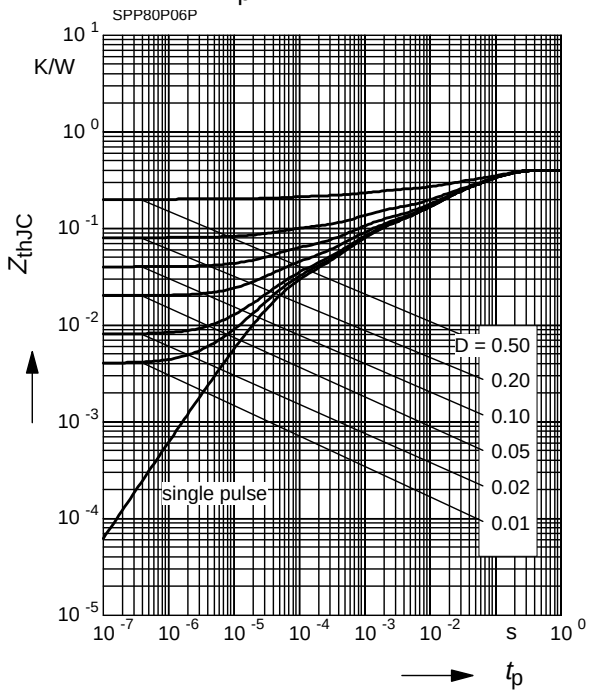
parameter : $D = 0$ , $T_C = 25$ °C




## Transient thermal impedance

$Z_{thJC} = f(t_p)$

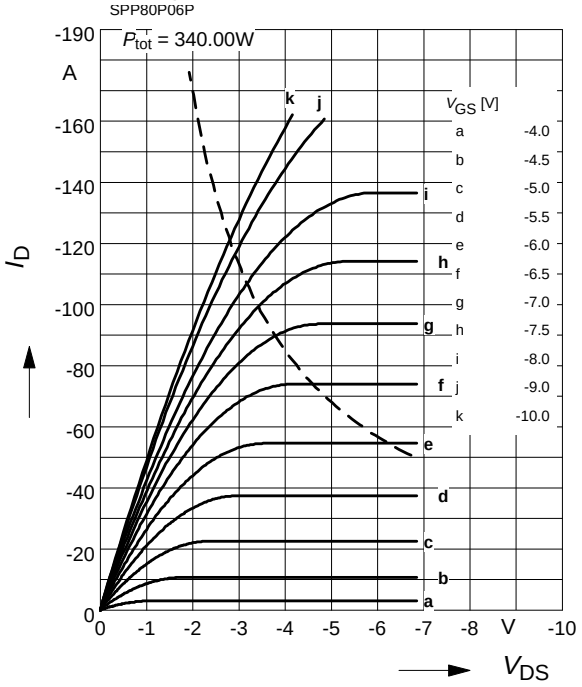
parameter : $D = t_p / T$



## Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=25°C

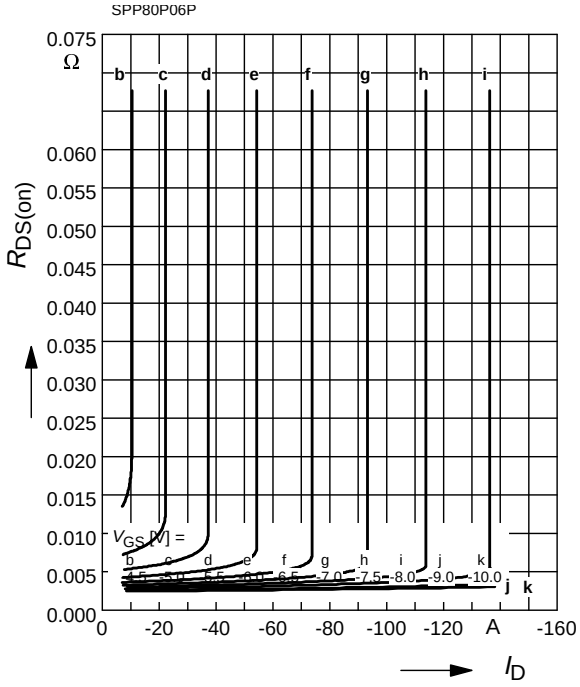
parameter: $t_p$ = 80 µs




## Typ. drain-source-on-resistance

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

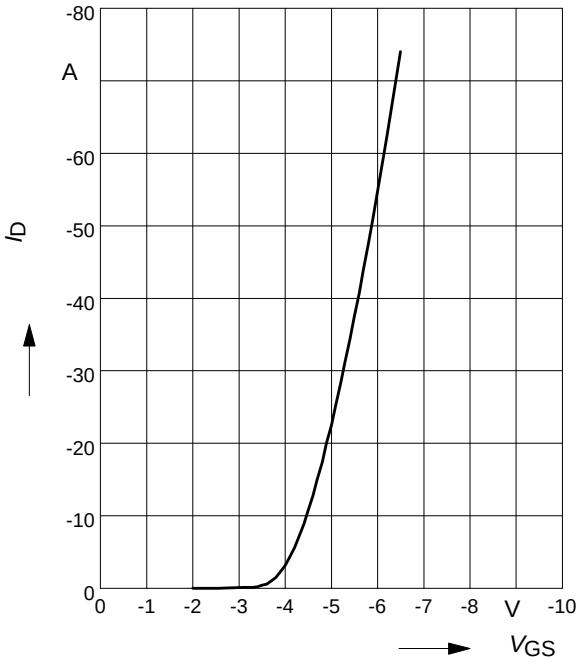
parameter: $V_{GS}$




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

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

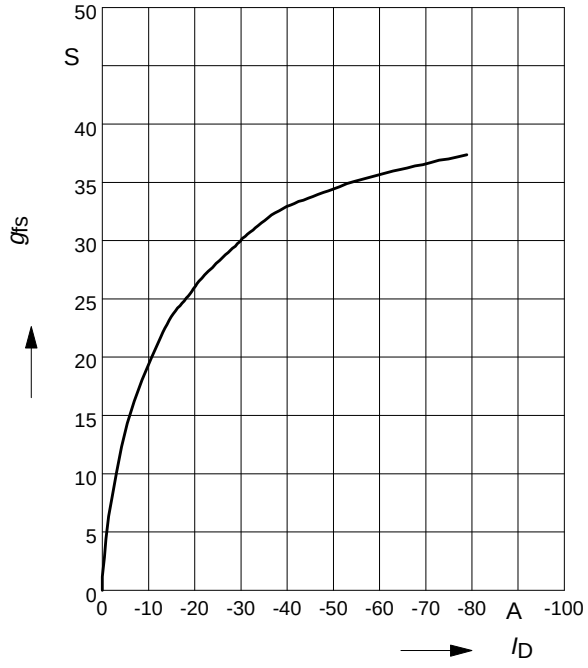
parameter: $t_p$ = 80 µs




## Typ. forward transconductance

$g_{fs}$ = f($I_D$); $T_j$=25°C

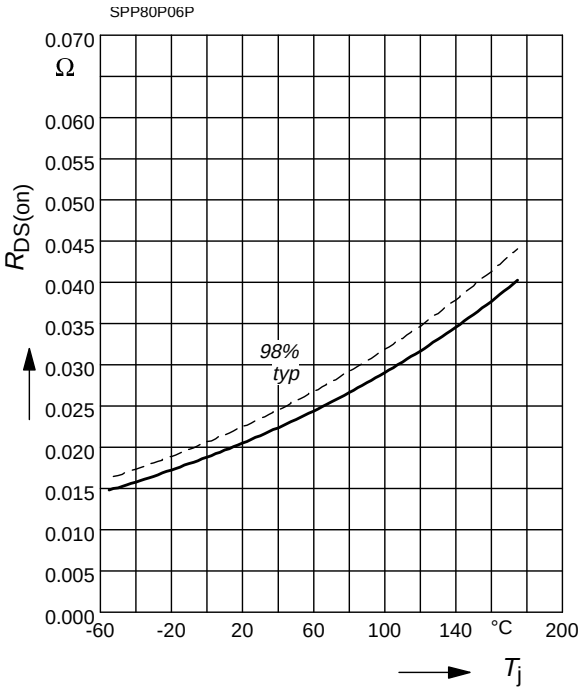
parameter: $g_{fs}$



## Drain-source on-state resistance

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

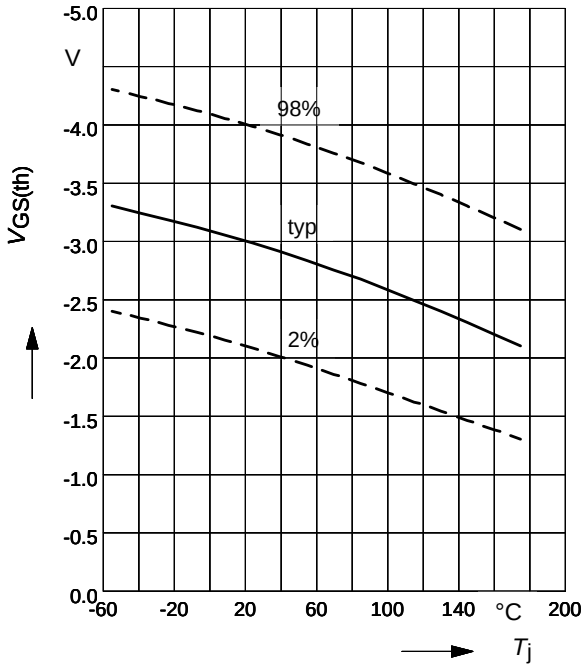
parameter : $I_D$ = -64 A, $V_{GS}$ = -10 V




## Gate threshold voltage

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

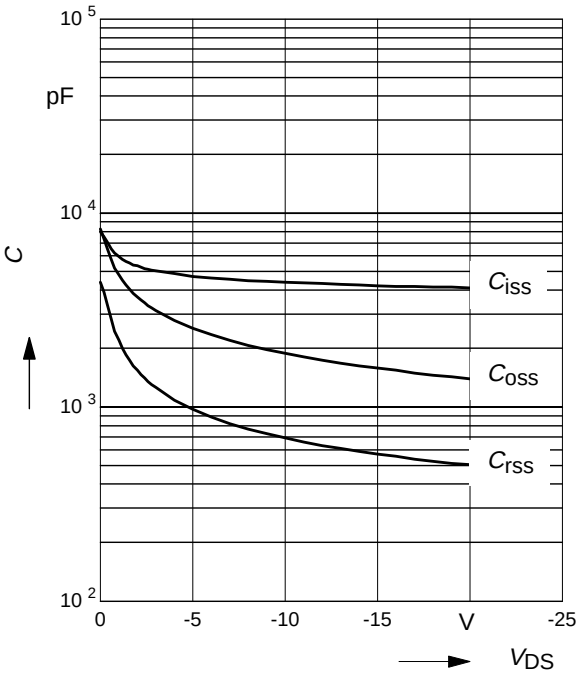
parameter: $V_{GS} = V_{DS}$, $I_D$ = -5.5 mA




## Typ. capacitances

$C = f(V_{DS})$

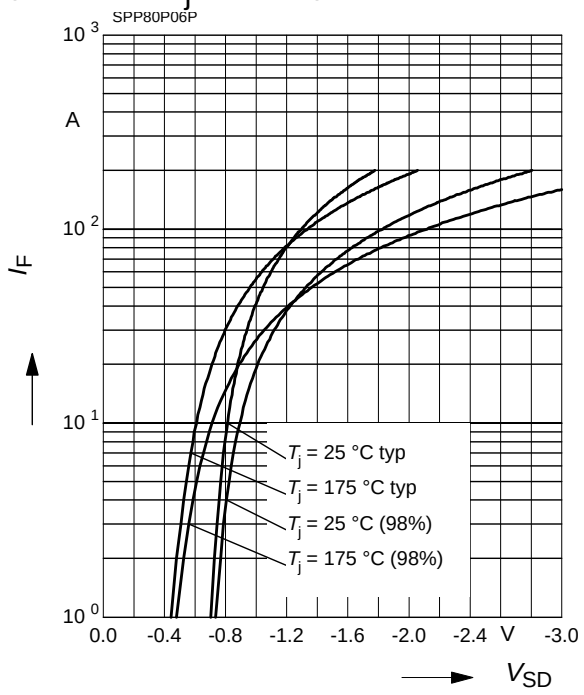
parameter: $V_{GS}$=0V, $f$=1 MHz




## Forward characteristics of reverse diode

$I_F = f(V_{SD})$

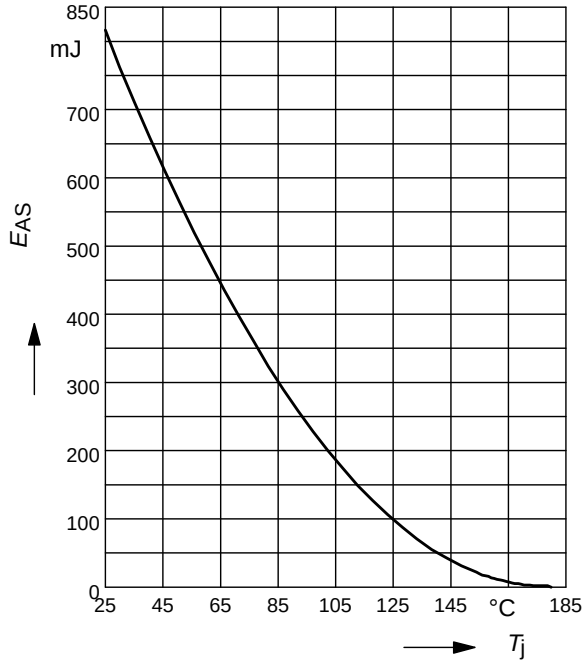
parameter: $T_j$ , tp = 80 µs



## Avalanche energy

$E_{AS} = f(T_j)$

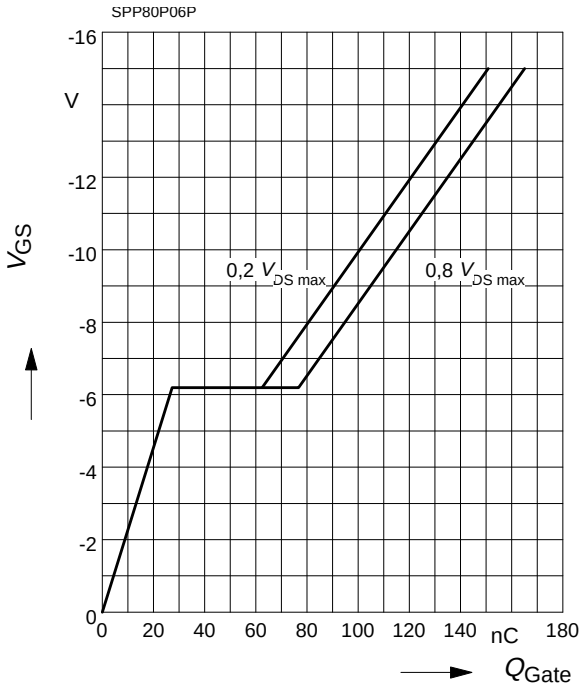
para.: $I_D$ = -80 A , $V_{DD}$ = -25 V, $R_{GS}$ = 25 Ω




## Typ. gate charge

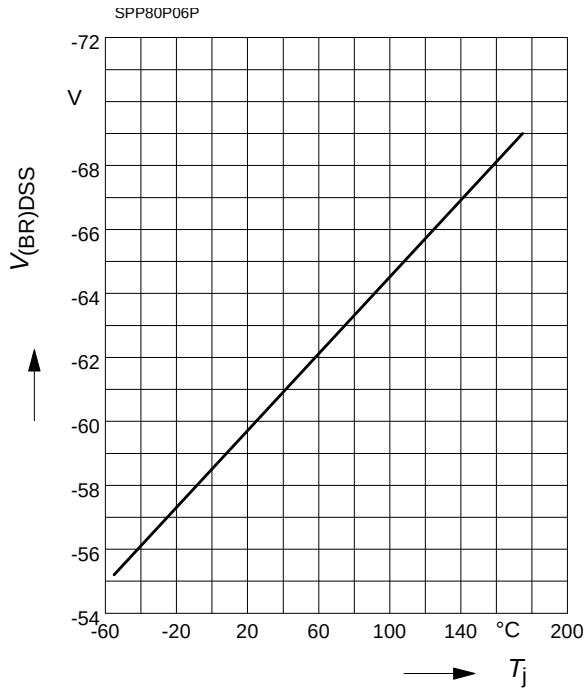
$V_{GS} = f\ (Q_{Gate})$

parameter: $I_D$ = -80 A pulsed




## Drain-source breakdown voltage

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



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