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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

# SIPMOS® Power-Transistor

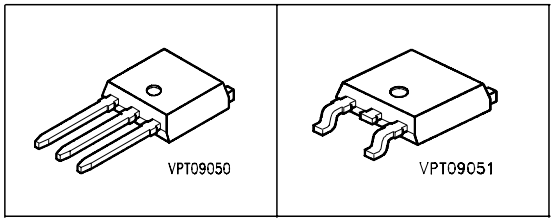
**Feature**

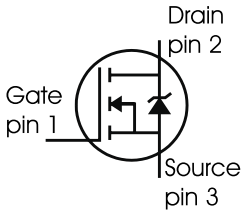
- N-Channel
- Enhancement mode
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated

**Product Summary**

| | | |
|---|---|---|
| $V_{DS}$ | 100 | V |
| $R_{DS(on)}$ | 170 | mΩ |
| $I_D$ | 10.5 | A |

P-TO251 P-TO252




| Type | Package | Ordering Code | Marking |
|---|---|---|---|
| SPD11N10 | P-TO252 | Q67042-S4121 | 11N10 |
| SPU11N10 | P-TO251 | Q67042-S4122 | 11N10 |

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Continuous drain current | $I_D$ | | A |
| $T_C$=25°C | | 10.5 | |
| $T_C$=100°C | | 7.8 | |
| Pulsed drain current | $I_{D\ puls}$ | 41.2 | |
| $T_C$=25°C | | | |
| Avalanche energy, single pulse | $E_{AS}$ | 60 | mJ |
| $I_D$=10.5 A , $V_{DD}$=25V, $R_{GS}$=25Ω | | | |
| Reverse diode d*v*/d*t* | d*v*/d*t* | 6 | kV/µs |
| $I_S$=10.5A, $V_{DS}$=80V, d*i*/d*t*=200A/µs, $T_{jmax}$=175°C | | | |
| Gate source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation | $P_{tot}$ | 50 | W |
| $T_C$=25°C | | | |
| Operating and storage temperature | $T_j$ , $T_{stg}$ | -55... +175 | °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 | $R_{thJC}$ | - | - | 3 | 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 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain-source breakdown voltage<br>$V_{GS}$=0V, $I_D$=1mA | $V_{(BR)DSS}$ | 100 | - | - | V |
| Gate threshold voltage, $V_{GS}$ = $V_{DS}$<br>$I_D$ = 21 µA | $V_{GS(th)}$ | 2.1 | 3 | 4 | |
| Zero gate voltage drain current | $I_{DSS}$ | | | | µA |
| $V_{DS}$=100V, $V_{GS}$=0V, $T_j$=25°C | | - | 0.01 | 1 | |
| $V_{DS}$=100V, $V_{GS}$=0V, $T_j$=125°C | | - | 1 | 100 | |
| Gate-source leakage current<br>$V_{GS}$=20V, $V_{DS}$=0V | $I_{GSS}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance<br>$V_{GS}$=10V, $I_D$=7.8A | $R_{DS(on)}$ | - | 137 | 170 | mΩ |

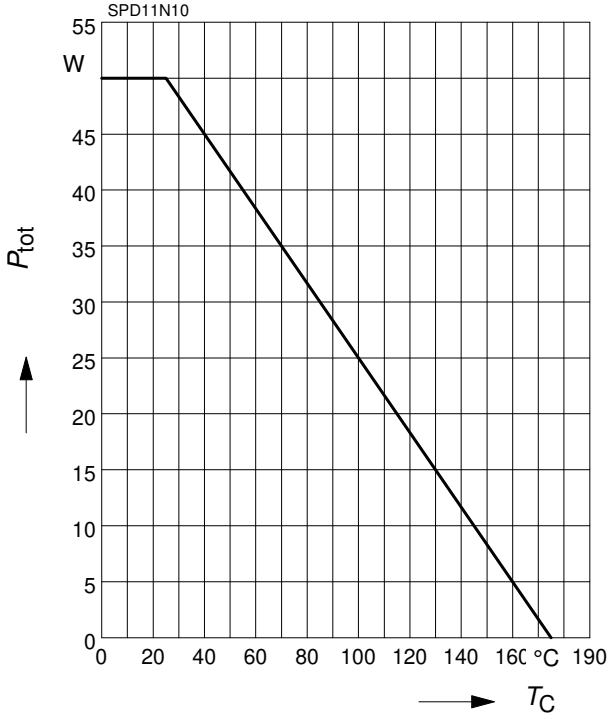
[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | | |
| Transconductance | $g_{fs}$ | $V_{DS}\geq 2*I_D*R_{DS(on)max}$, $I_D$=7.8A | 2.6 | 5.8 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 320 | 400 | pF |
| Output capacitance | $C_{oss}$ | | - | 72 | 90 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 43 | 54 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=50V, $V_{GS}$=10V, $I_D$=10.5A, $R_G$=28Ω | - | 8.2 | 10 | ns |
| Rise time | $t_r$ | | - | 46 | 58 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 29 | 36 | |
| Fall time | $t_f$ | | - | 23 | 29 | |
| **Gate Charge Characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=80V, $I_D$=10.5A | - | 2.3 | 2.9 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 7.8 | 9.8 | |
| Gate charge total | $Q_g$ | $V_{DD}$=80V, $I_D$=10.5A, $V_{GS}$=0 to 10V | - | 14.6 | 18.3 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$=80V, $I_D$=10.5A | - | 6.4 | - | V |
| **Reverse Diode** | | | | | | |
| Inverse diode continuous forward current | $I_S$ | $T_C$=25°C | - | - | 10.5 | A |
| Inverse diode direct current, pulsed | $I_{SM}$ | | - | - | 41.2 | |
| Inverse diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=10.5A | - | 0.93 | 1.25 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=50V, $I_F$=$I_S$, $di_F/dt$=100A/µs | - | 57 | 71 | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 134 | 167 | nC |

## 1 Power dissipation

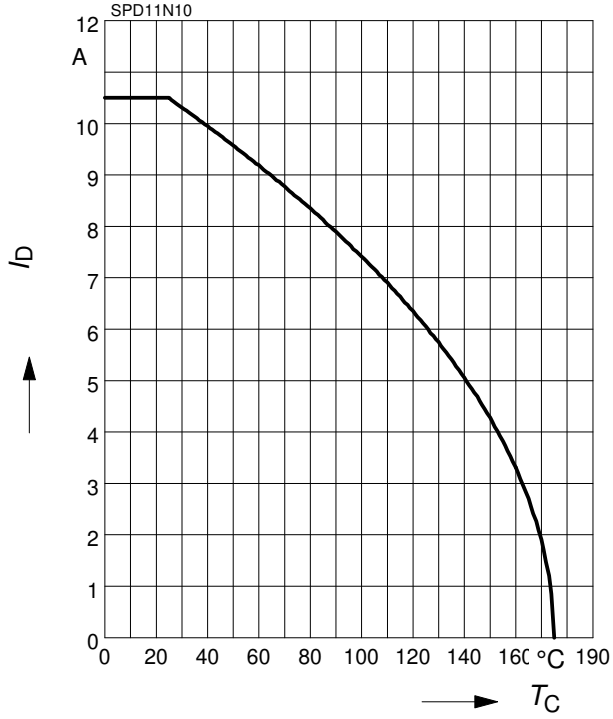
$P_{tot} = f(T_C)$




## 2 Drain current

$I_D = f(T_C)$

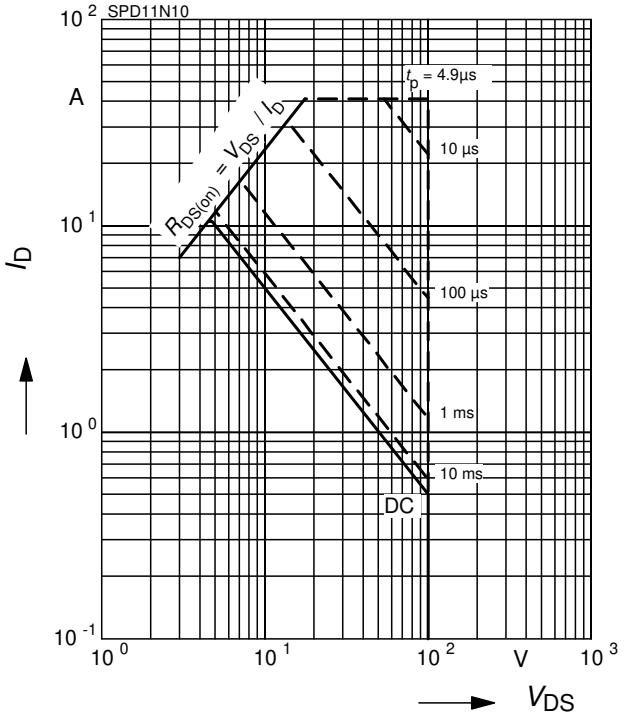
parameter: $V_{GS} \geq 10$ V




## 3 Safe operating area

$I_D = f(V_{DS})$

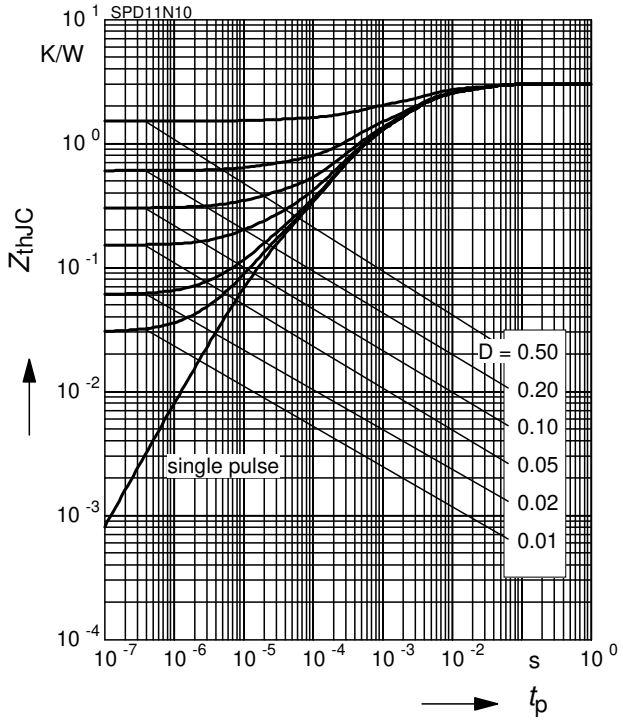
parameter : $D = 0$ , $T_C = 25$ °C




## 4 Transient thermal impedance

$Z_{thJC} = f(t_p)$

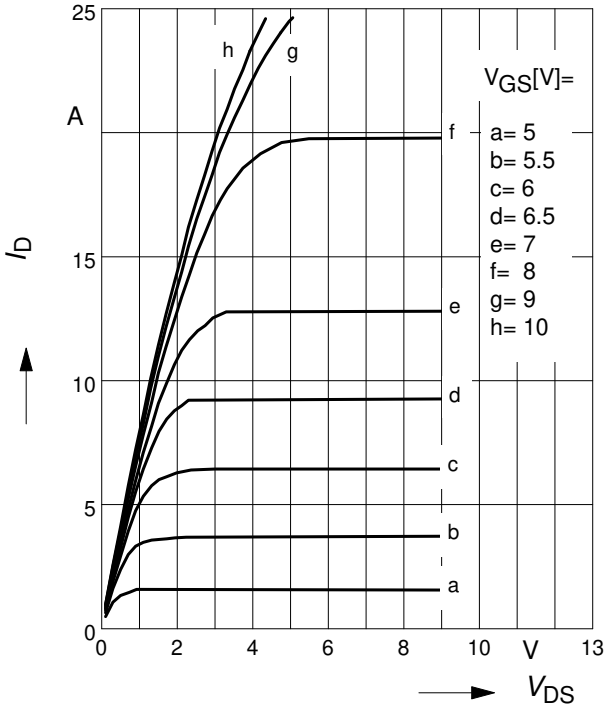
parameter : $D = t_p / T$



### 5 Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=25°C

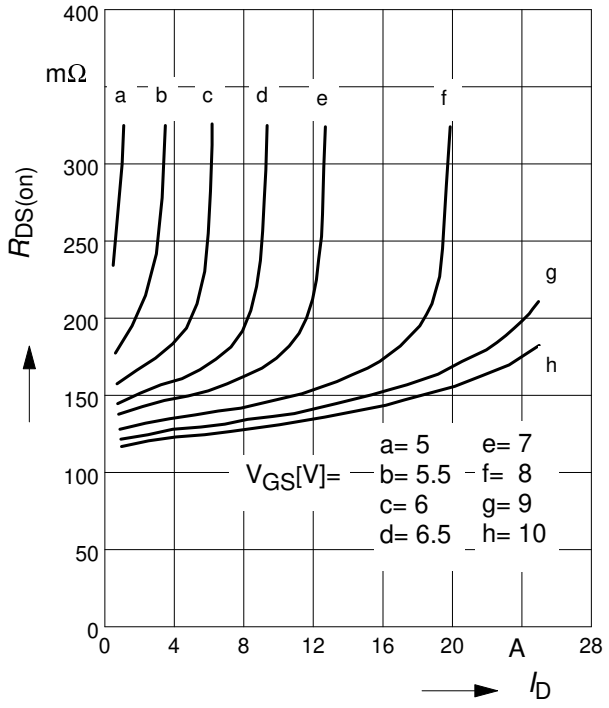
parameter: $t_p$ = 80 µs




### 6 Typ. drain-source on resistance

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

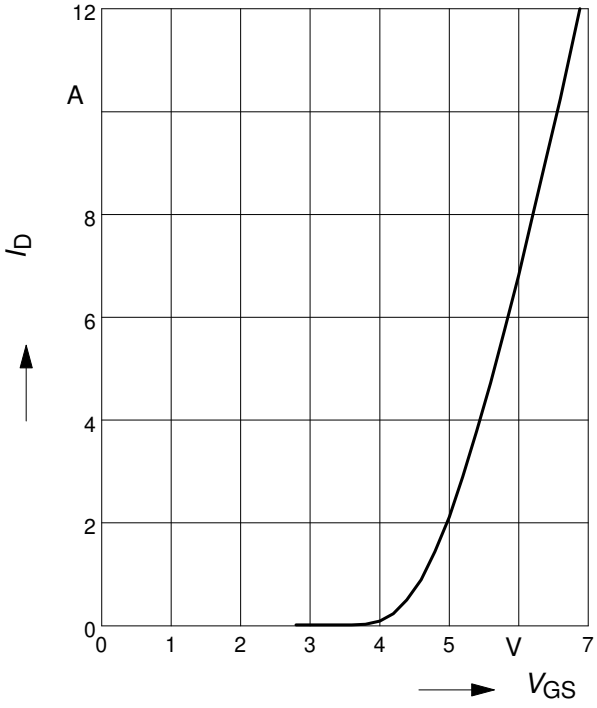
parameter: $V_{GS}$




### 7 Typ. transfer characteristics

$I_D = f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

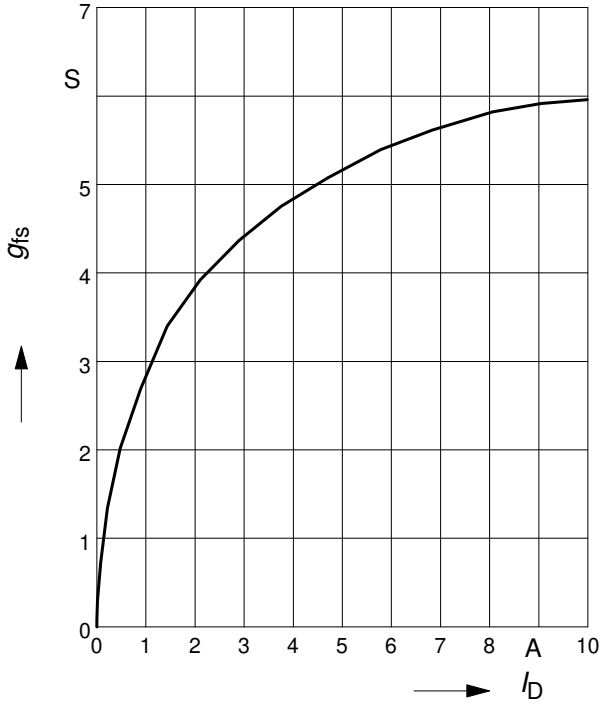
parameter: $t_p$ = 80 µs




### 8 Typ. forward transconductance

$g_{fs}$ = f($I_D$); $T_j$=25°C

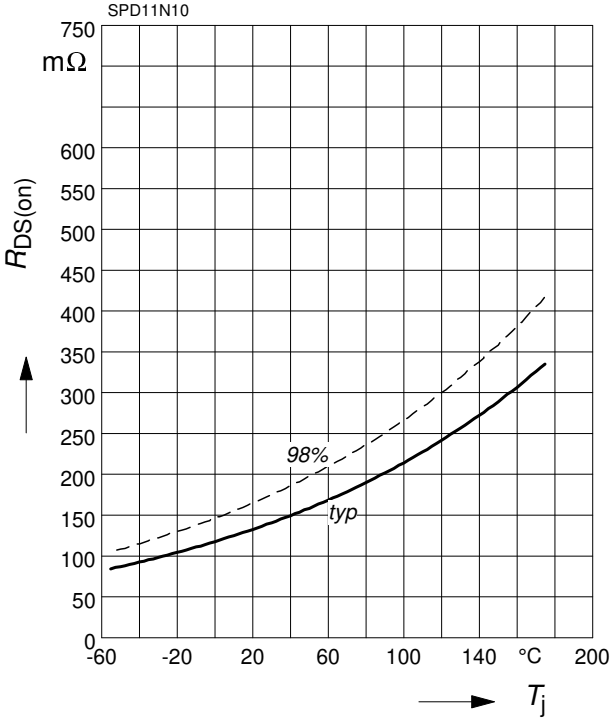
parameter: $g_{fs}$



### 9 Drain-source on-state resistance

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

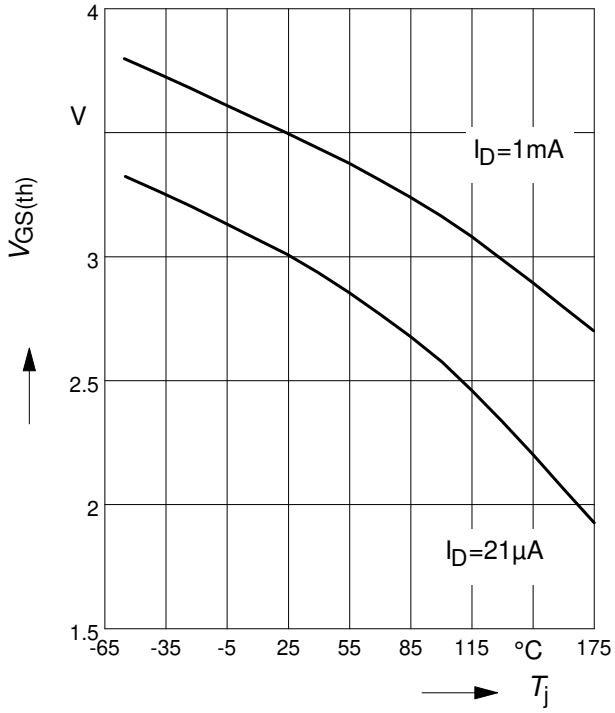
parameter : $I_D$ = 7.8 A, $V_{GS}$ = 10 V




### 10 Typ. gate threshold voltage

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

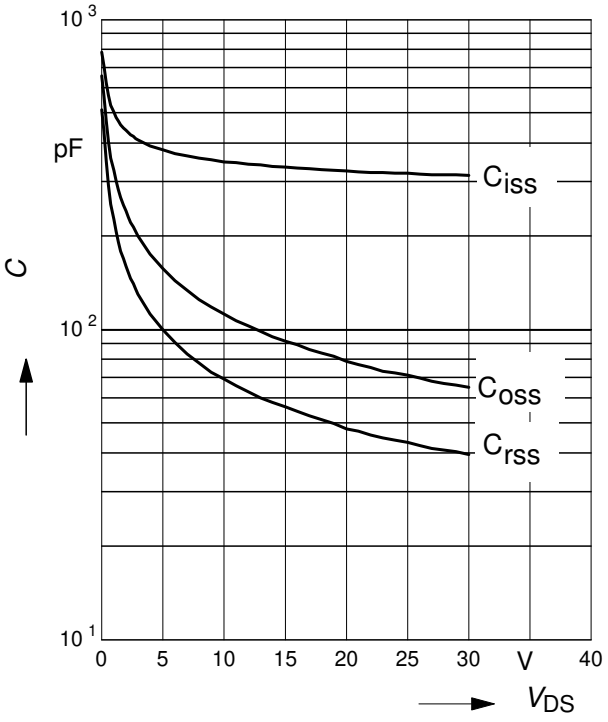
parameter: $V_{GS} = V_{DS}$




### 11 Typ. capacitances

$C = f(V_{DS})$

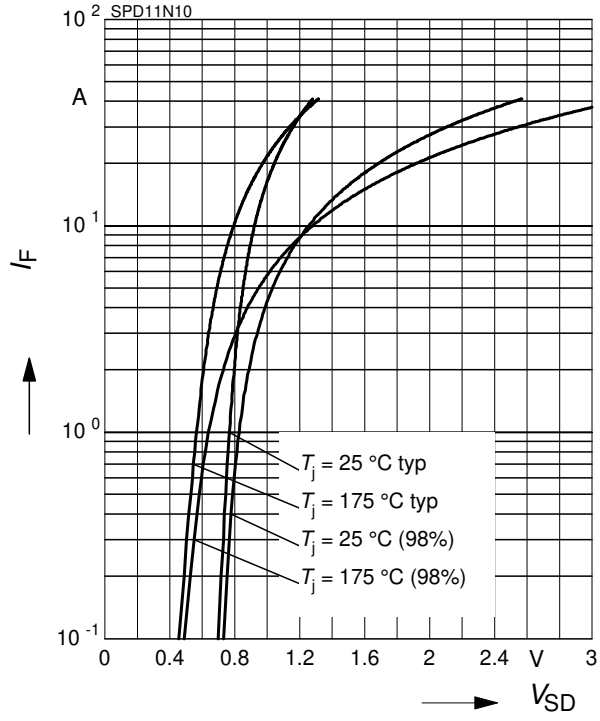
parameter: $V_{GS}$=0V, $f$=1 MHz




### 12 Forward character. of reverse diode

$I_F = f(V_{SD})$

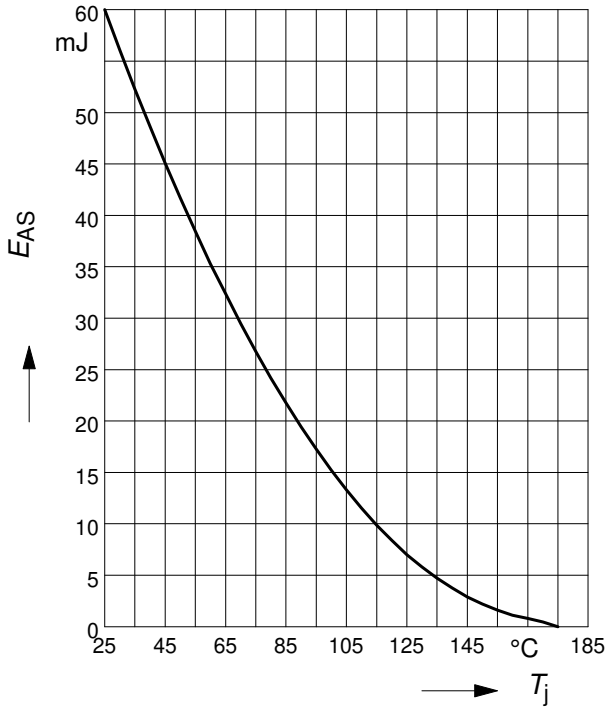
parameter: $T_j$ , tp = 80 µs



### 13 Typ. avalanche energy

$E_{AS} = f(T_j)$

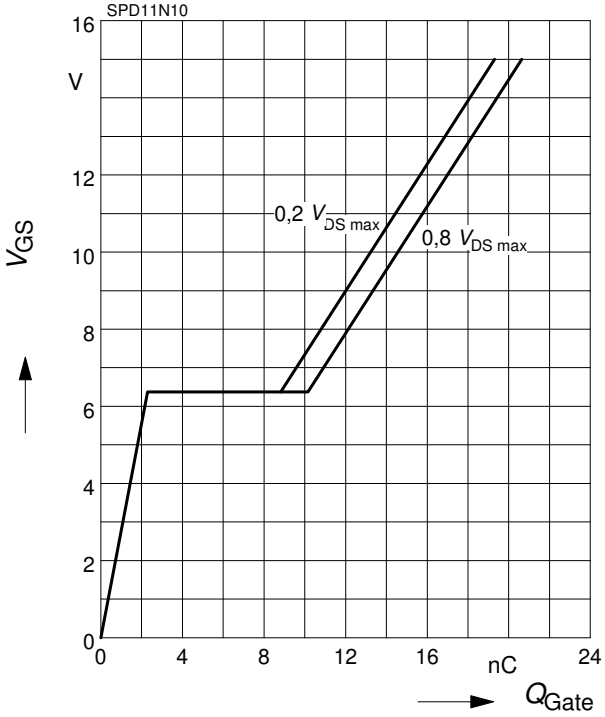
par.: $I_D$ = 10.5 A , $V_{DD}$ = 25 V, $R_{GS}$ = 25 Ω




### 14 Typ. gate charge

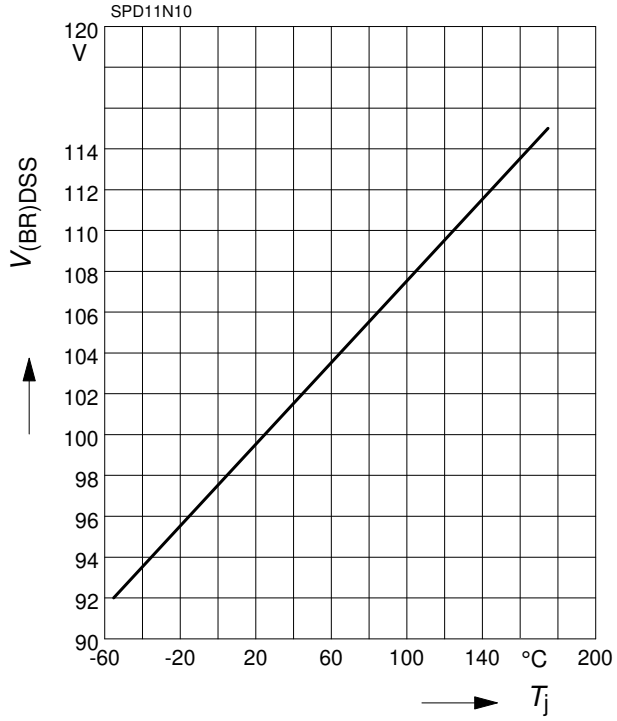
$V_{GS} = f\ (Q_{Gate})$

parameter: $I_D$ = 10.5 A pulsed




### 15 Drain-source breakdown voltage

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



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