

SIPMOS® Power-Transistor

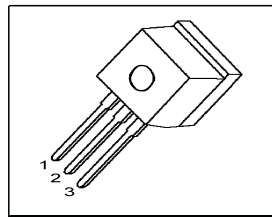
Feature

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

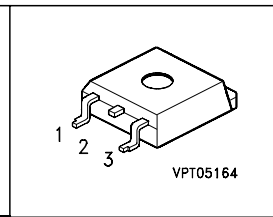
Product Summary

| | | |
|--------------|-----|----|
| V_{DS} | 100 | V |
| $R_{DS(on)}$ | 16 | mΩ |
| I_D | 70 | A |

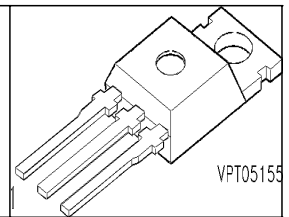
P-TO262-3-1



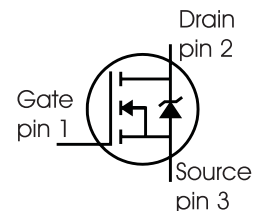
P-TO263-3-2



P-TO220-3-1



| Type | Package | Ordering Code | Marking |
|-----------|-------------|---------------|---------|
| SPP70N10L | P-TO220-3-1 | Q67040-S4175 | 70N10L |
| SPB70N10L | P-TO263-3-2 | Q67040-S4170 | 70N10L |
| SPI70N10L | P-TO262-3-1 | Q67060-S7428 | 70N10L |



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

| Parameter | Symbol | Value | Unit |
|---|--------------------|-------------|-------|
| Continuous drain current | I_D | 70 | A |
| $T_C=25\text{ °C}$ | | 70 | |
| $T_C=100\text{ °C}$ | | 50 | |
| Pulsed drain current | $I_D \text{ puls}$ | 280 | |
| $T_C=25\text{ °C}$ | | | |
| Avalanche energy, single pulse | E_{AS} | 700 | mJ |
| $I_D=70\text{ A}$, $V_{DD}=25\text{ V}$, $R_{GS}=25\text{ Ω}$ | | | |
| Avalanche energy, periodic limited by T_{jmax} | E_{AR} | 25 | |
| Reverse diode dv/dt | dv/dt | 6 | kV/μs |
| $I_S=70\text{ A}$, $V_{DS}=0\text{ V}$, $di/dt=200\text{ A/μs}$ | | | |
| Gate source voltage | V_{GS} | ±20 | V |
| Power dissipation | P_{tot} | 250 | W |
| $T_C=25\text{ °C}$ | | | |
| 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} | - | - | 0.6 | K/W |
| Thermal resistance, junction - ambient, leaded | R_{thJA} | - | - | 62.5 | |
| SMD version, device on PCB: | R_{thJA} | | | | |
| @ min. footprint | | - | - | 62 | |
| @ 6 cm ² cooling area ¹⁾ | | - | - | 40 | |

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

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|------|------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Drain-source breakdown voltage $V_{GS}=0V, I_D=2mA$ | $V_{(BR)DSS}$ | 100 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 2\text{ mA}$ | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current $V_{DS}=100V, V_{GS}=0V, T_j=25^\circ\text{C}$ $V_{DS}=100V, V_{GS}=0V, T_j=150^\circ\text{C}$ | I_{DSS} | - | 0.1 | 1 | μA |
| | | - | - | 100 | |
| Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$ | I_{GSS} | - | 10 | 100 | nA |
| Drain-source on-state resistance $V_{GS}=4.5V, I_D=50A$ | $R_{DS(on)}$ | - | 14 | 25 | m Ω |
| Drain-source on-state resistance $V_{GS}=10V, I_D=50A$ | $R_{DS(on)}$ | - | 10 | 16 | |

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 $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Dynamic Characteristics

| | | | | | | |
|------------------------------|--------------|--|----|------|------|----|
| Transconductance | g_{fs} | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 50\text{A}$ | 30 | 65 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$ | - | 3630 | 4540 | pF |
| Output capacitance | C_{oss} | | - | 640 | 800 | |
| Reverse transfer capacitance | C_{rss} | | - | 345 | 430 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = 50\text{V}$, $V_{GS} = 4.5\text{V}$, $I_D = 70\text{A}$, $R_G = 1.3\Omega$ | - | 70 | 105 | ns |
| Rise time | t_r | | - | 250 | 375 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 250 | 375 | |
| Fall time | t_f | | - | 95 | 145 | |

Gate Charge Characteristics

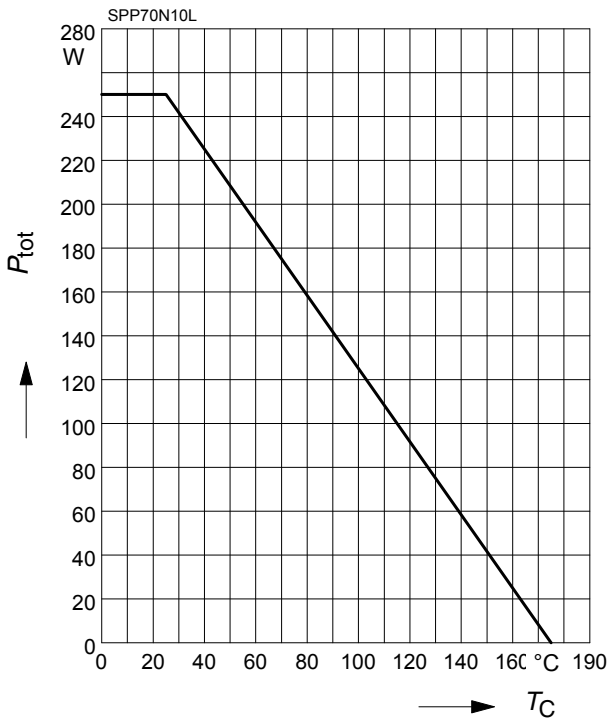
| | | | | | | |
|-----------------------|-----------------|--|---|------|-----|----|
| Gate to source charge | Q_{gs} | $V_{DD} = 80\text{V}$, $I_D = 70\text{A}$ | - | 10 | 15 | nC |
| Gate to drain charge | Q_{gd} | | - | 34 | 51 | |
| Gate charge total | Q_g | $V_{DD} = 80\text{V}$, $I_D = 70\text{A}$, $V_{GS} = 0$ to 10V | - | 160 | 240 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD} = 80\text{V}$, $I_D = 70\text{A}$ | - | 3.22 | - | V |

Reverse Diode

| | | | | | | |
|--|----------|---|---|-----|-----|----|
| Inverse diode continuous forward current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | - | - | 70 | A |
| Inverse diode direct current, pulsed | I_{SM} | | - | - | 280 | |
| Inverse diode forward voltage | V_{SD} | $V_{GS} = 0\text{V}$, $I_F = 140\text{A}$ | - | 1.2 | 1.8 | V |
| Reverse recovery time | t_{rr} | $V_R = 50\text{V}$, $f = 5$, $di_F/dt = 100\text{A}/\mu\text{s}$ | - | 100 | 150 | ns |
| Reverse recovery charge | Q_{rr} | | - | 600 | 900 | |

1 Power dissipation

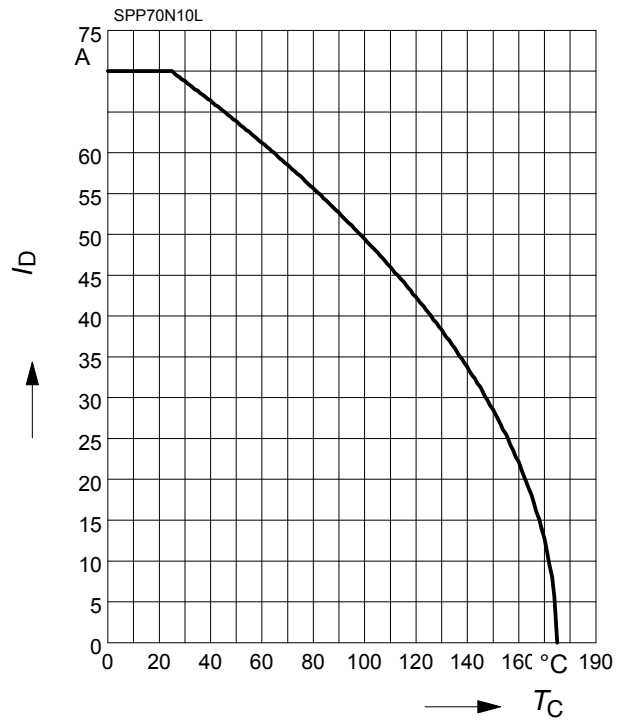
$$P_{tot} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

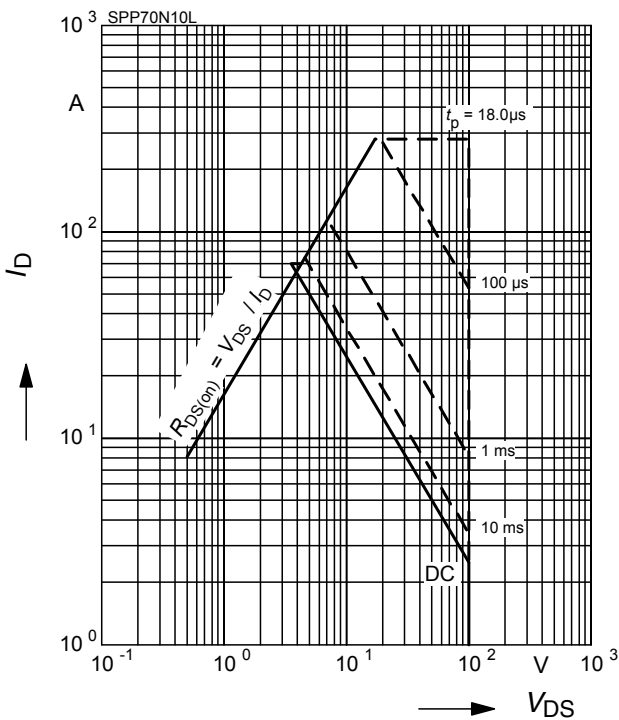
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

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

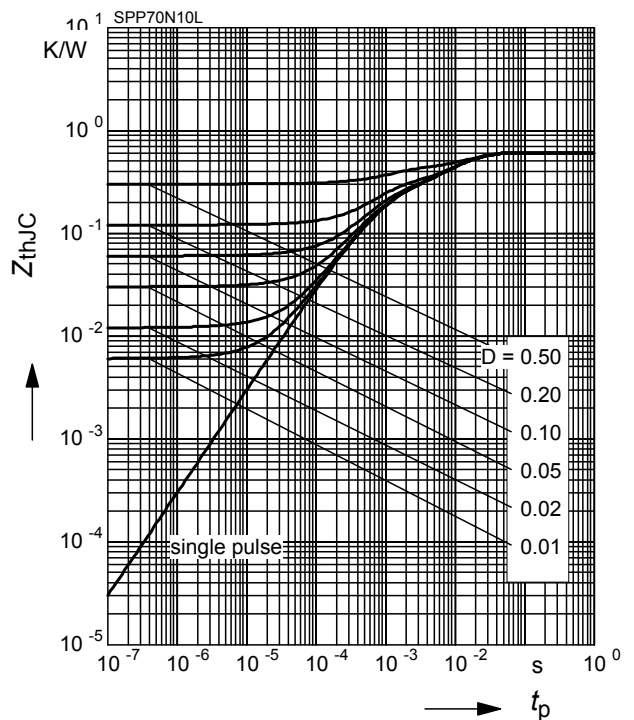
parameter: $D = 0$, $T_C = 25$ °C



4 Transient thermal impedance

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

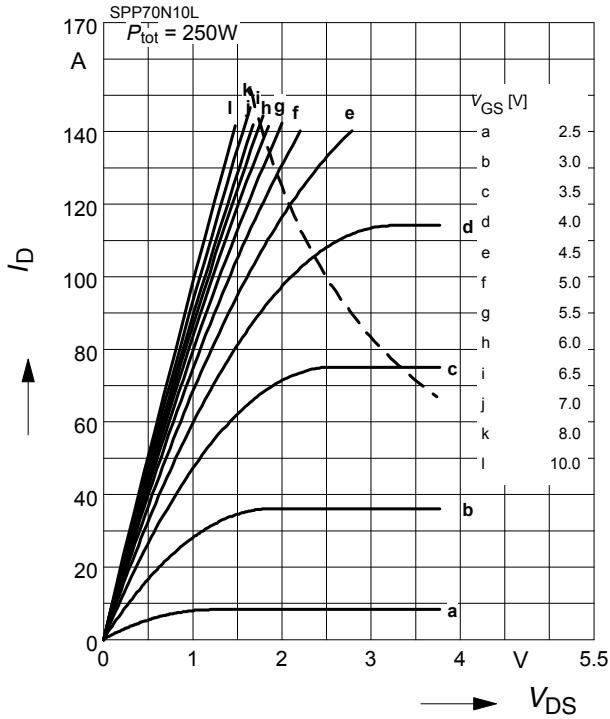
parameter: $D = t_p/T$



5 Typ. output characteristic

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

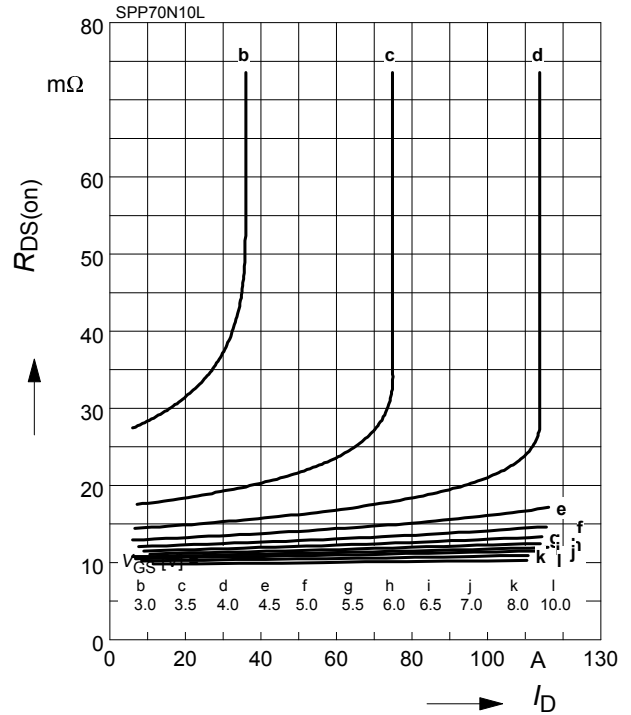
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

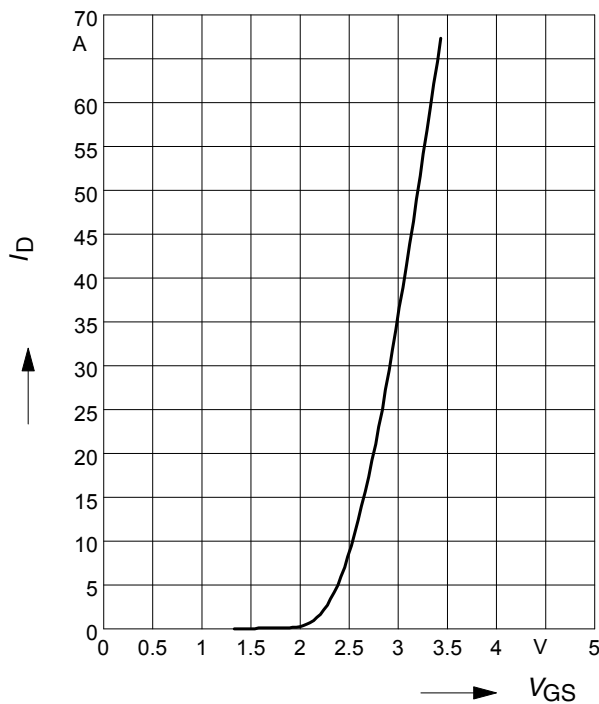
parameter: V_{GS}



7 Typ. transfer characteristics

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

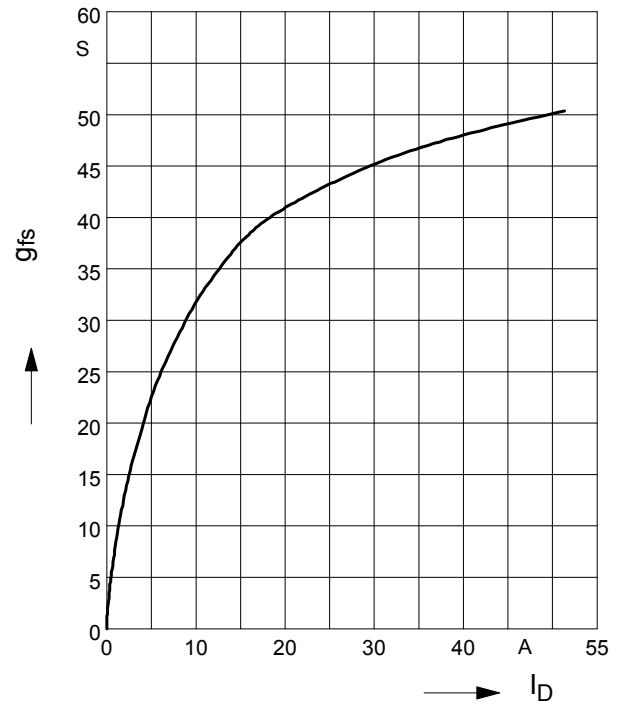
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

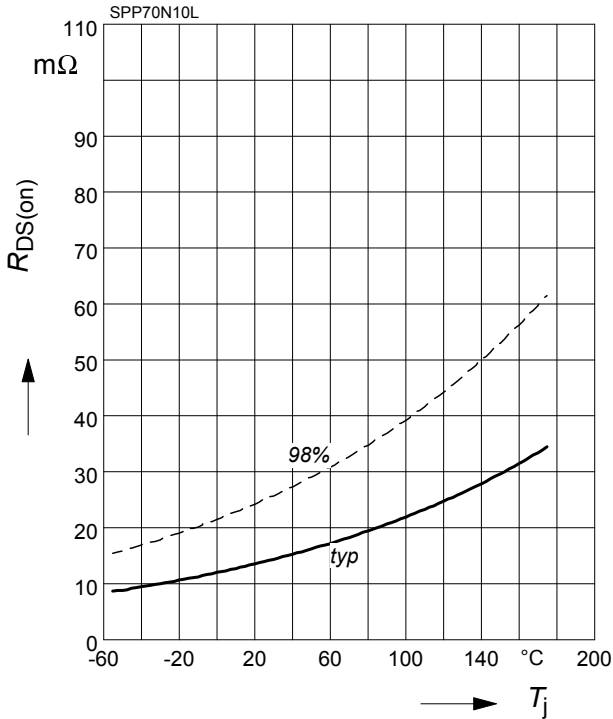
parameter: g_{fs}



9 Drain-source on-state resistance

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

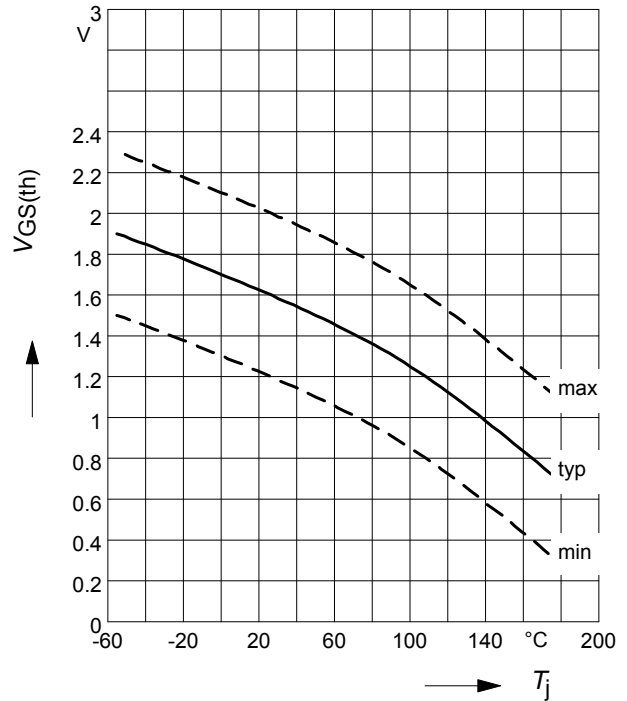
parameter: $I_D = 50\text{ A}$, $V_{GS} = 4.5\text{ V}$



10 Gate threshold voltage

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

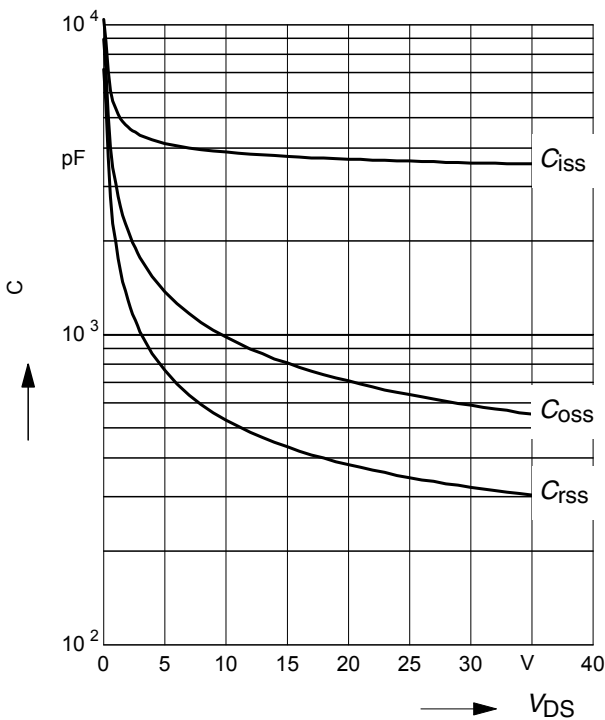
parameter: $V_{GS} = V_{DS}$, $I_D = 2\text{ mA}$



11 Typ. capacitances

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

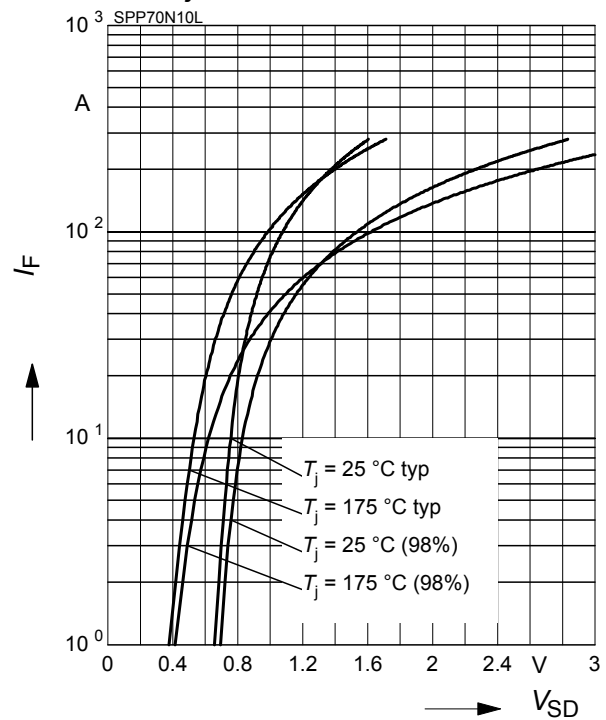
parameter: $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$



12 Forward character. of reverse diode

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

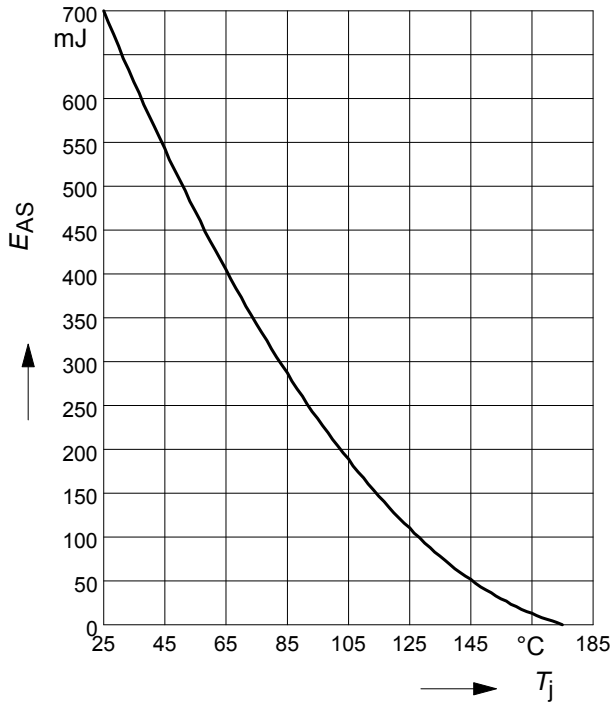
parameter: T_j , $t_p = 80\text{ }\mu\text{s}$



13 Typ. avalanche energy

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

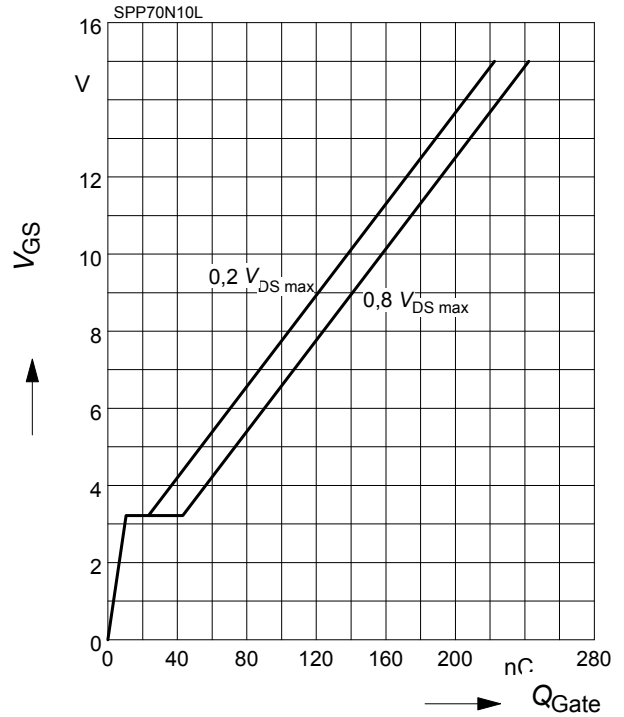
par.: $I_D = 70\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

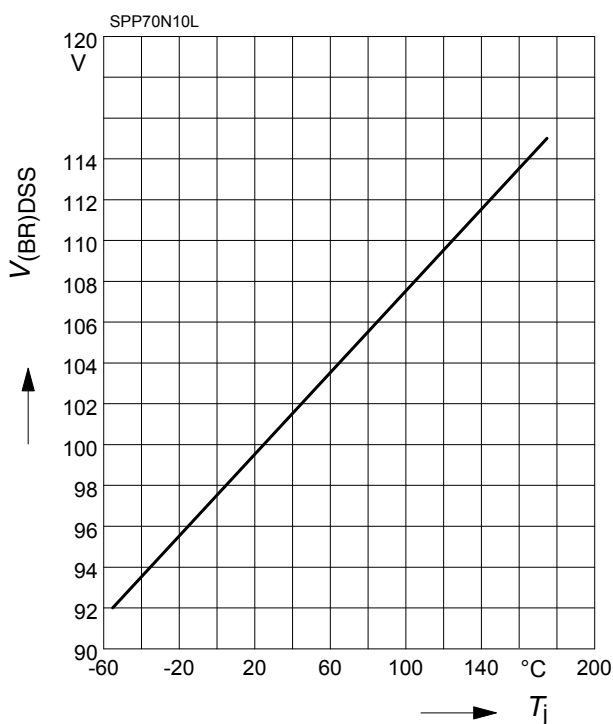
$$V_{GS} = f(Q_{Gate})$$

parameter: $I_D = 70\text{ A}$ pulsed



15 Drain-source breakdown voltage

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



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Further information

Please notice that the part number is BSPP70N10L, BSPB70N10L and BSPI70N10L, for simplicity the device is referred to by the term SPP70N10L, SPB70N10L and SPI70N10L throughout this documentation