

## OptiMOS® Power-Transistor

### Feature

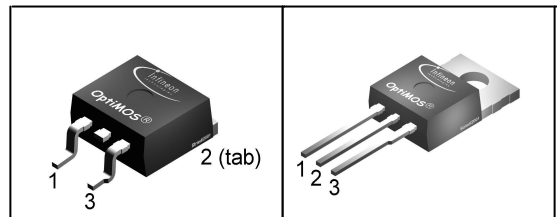
- N-Channel
- Enhancement mode
- Logic Level
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

### Product Summary

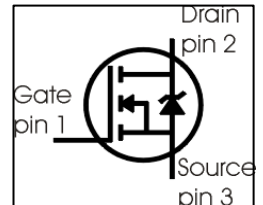
|                               |     |    |
|-------------------------------|-----|----|
| $V_{DS}$                      | 55  | V  |
| $R_{DS(on)}$ max. SMD version | 4.4 | mΩ |
| $I_D$                         | 100 | A  |

P- TO263 -3-2

P- TO220 -3-1



| Type            | Package       | Ordering Code | Marking |
|-----------------|---------------|---------------|---------|
| SPP100N06S2L-05 | P- TO220 -3-1 | Q67060-S6043  | PN06L05 |
| SPB100N06S2L-05 | P- TO263 -3-2 | Q67060-S6042  | PN06L05 |



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

| Parameter                                                                                                                              | Symbol                | Value       | Unit              |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|-------------------|
| Continuous drain current 1)<br>$T_C=25^\circ\text{C}$                                                                                  | $I_D$                 | 100<br>100  | A                 |
| Pulsed drain current<br>$T_C=25^\circ\text{C}$                                                                                         | $I_{D \text{ puls}}$  | 400         |                   |
| Avalanche energy, single pulse<br>$I_D=80\text{A}$ , $V_{DD}=25\text{V}$ , $R_{GS}=25\Omega$                                           | $E_{AS}$              | 810         | mJ                |
| Repetitive avalanche energy, limited by $T_{j\text{max}}^{2)}$                                                                         | $E_{AR}$              | 30          |                   |
| Reverse diode dv/dt<br>$I_S=100\text{A}$ , $V_{DS}=44\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{j\text{max}}=175^\circ\text{C}$ | dv/dt                 | 6           | kV/ $\mu\text{s}$ |
| Gate source voltage                                                                                                                    | $V_{GS}$              | $\pm 20$    | V                 |
| Power dissipation<br>$T_C=25^\circ\text{C}$                                                                                            | $P_{\text{tot}}$      | 300         | W                 |
| Operating and storage temperature                                                                                                      | $T_j, T_{\text{stg}}$ | -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            | $R_{thJC}$ | -      | 0.3  | 0.5  | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 62   |      |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 62   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>3)</sup> |            | -      | -    | 40   |      |

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

| Parameter                                                                                                                | Symbol        | Values |            |            | Unit       |
|--------------------------------------------------------------------------------------------------------------------------|---------------|--------|------------|------------|------------|
|                                                                                                                          |               | min.   | typ.       | max.       |            |
| Static Characteristics                                                                                                   |               |        |            |            |            |
| Drain-source breakdown voltage<br>$V_{GS}=0V, I_D=1mA$                                                                   | $V_{(BR)DSS}$ | 55     | -          | -          | V          |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D = 250\mu A$                                                            | $V_{GS(th)}$  | 1.2    | 1.6        | 2          |            |
| Zero gate voltage drain current<br>$V_{DS}=55V, V_{GS}=0V, T_j=25^{\circ}C$<br>$V_{DS}=55V, V_{GS}=0V, T_j=125^{\circ}C$ | $I_{DSS}$     | -<br>- | 0.01<br>1  | 1<br>100   | $\mu A$    |
| Gate-source leakage current<br>$V_{GS}=20V, V_{DS}=0V$                                                                   | $I_{GSS}$     | -      | 1          | 100        | nA         |
| Drain-source on-state resistance<br>$V_{GS}=4.5V, I_D=80A$<br>$V_{GS}=4.5V, I_D=80A, SMD\ version$                       | $R_{DS(on)}$  | -<br>- | 4.3<br>4   | 5.9<br>5.6 | m $\Omega$ |
| Drain-source on-state resistance<br>$V_{GS}=10V, I_D=80A$<br>$V_{GS}=10V, I_D=80A, SMD\ version$                         | $R_{DS(on)}$  | -<br>- | 3.5<br>3.2 | 4.7<br>4.4 |            |

<sup>1</sup>Current limited by bondwire ; with an  $R_{thJC} = 0.5K/W$  the chip is able to carry  $I_D = 175A$  at  $25^\circ\text{C}$ , for detailed information see app.-note ANPS071E available at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>2</sup>Defined by design. Not subject to production test.

<sup>3</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics**

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

**Dynamic Characteristics**

|                              |              |                                                                           |    |      |      |    |
|------------------------------|--------------|---------------------------------------------------------------------------|----|------|------|----|
| Transconductance             | $g_{fs}$     | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ ,<br>$I_D = 100A$           | 88 | 176  | -    | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0V$ , $V_{DS} = 25V$ ,<br>$f = 1MHz$                            | -  | 5660 | 7530 | pF |
| Output capacitance           | $C_{oss}$    |                                                                           | -  | 1330 | 1760 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                           | -  | 360  | 540  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = 30V$ , $V_{GS} = 4.5V$ ,<br>$I_D = 100A$ ,<br>$R_G = 1.3\Omega$ | -  | 18   | 27   | ns |
| Rise time                    | $t_r$        |                                                                           | -  | 25   | 38   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                           | -  | 98   | 150  |    |
| Fall time                    | $t_f$        |                                                                           | -  | 24   | 36   |    |

**Gate Charge Characteristics**

|                       |                 |                                                          |   |     |     |    |
|-----------------------|-----------------|----------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 44V$ , $I_D = 100A$                            | - | 19  | 25  | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                          | - | 57  | 90  |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 44V$ , $I_D = 100A$ ,<br>$V_{GS} = 0$ to $10V$ | - | 170 | 230 |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = 44V$ , $I_D = 100A$                            | - | 3.3 | -   | V  |

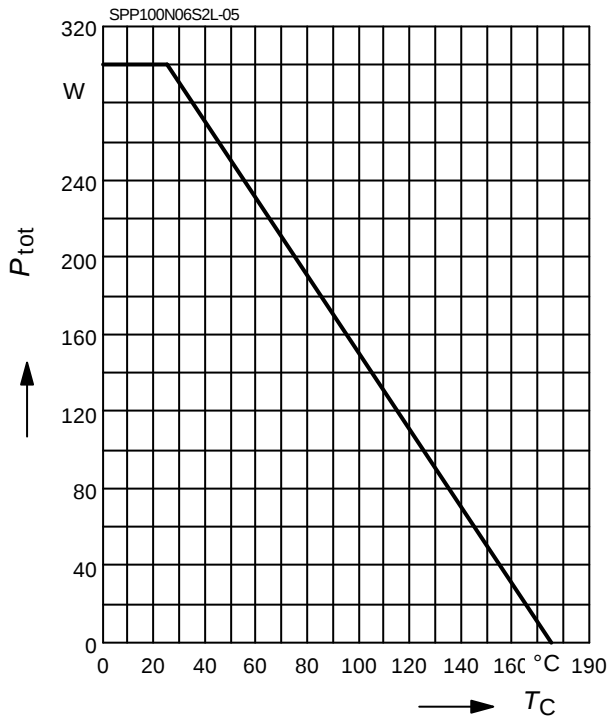
**Reverse Diode**

|                                          |          |                                                       |   |     |     |    |
|------------------------------------------|----------|-------------------------------------------------------|---|-----|-----|----|
| Inverse diode continuous forward current | $I_S$    | $T_C = 25^\circ C$                                    | - | -   | 100 | A  |
| Inv. diode direct current, pulsed        | $I_{SM}$ |                                                       | - | -   | 400 |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS} = 0V$ , $I_F = 80A$                           | - | 0.9 | 1.3 | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R = 30V$ , $I_F = I_S$ ,<br>$di_F/dt = 100A/\mu s$ | - | 65  | 80  | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                       | - | 125 | 160 | nC |

### 1 Power dissipation

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

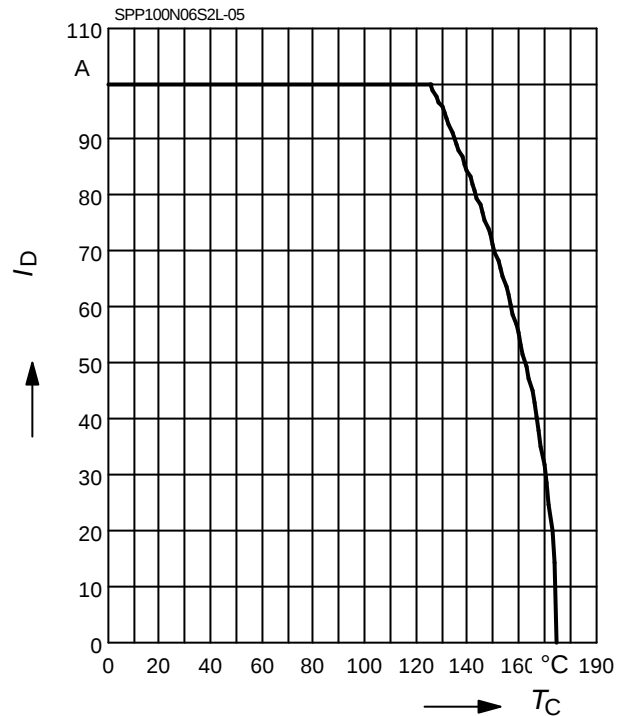
parameter:  $V_{GS} \geq 4 \text{ V}$



### 2 Drain current

$$I_D = f(T_C)$$

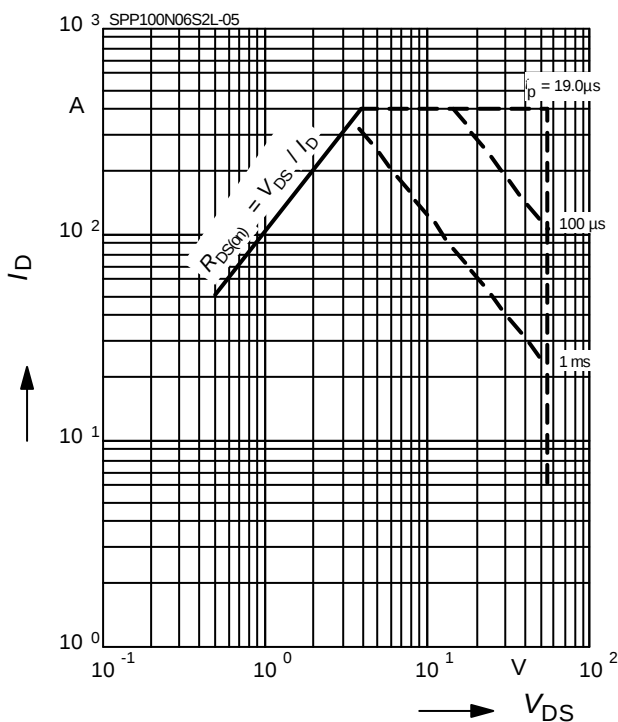
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

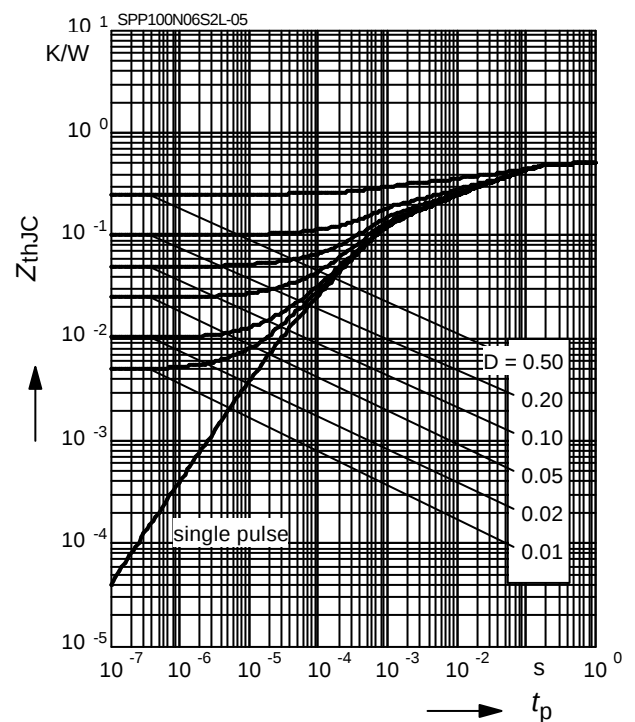
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### 4 Max. transient thermal impedance

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

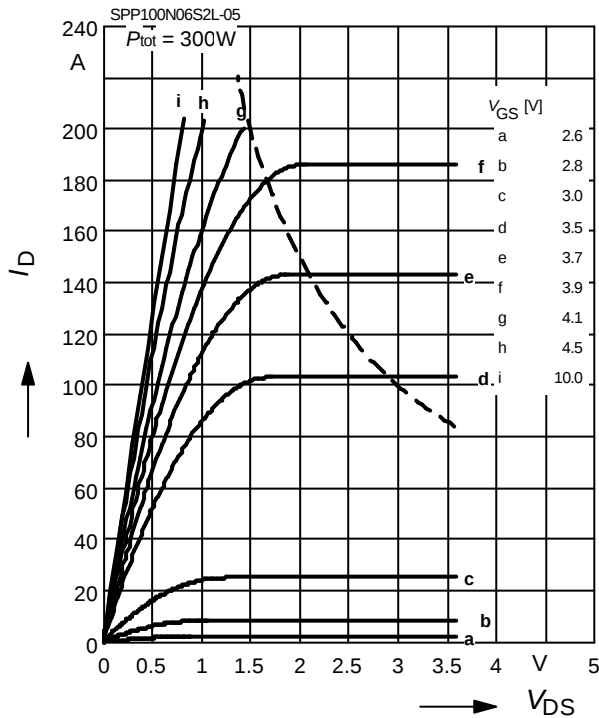
parameter:  $D = t_p/T$



### 5 Typ. output characteristic

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

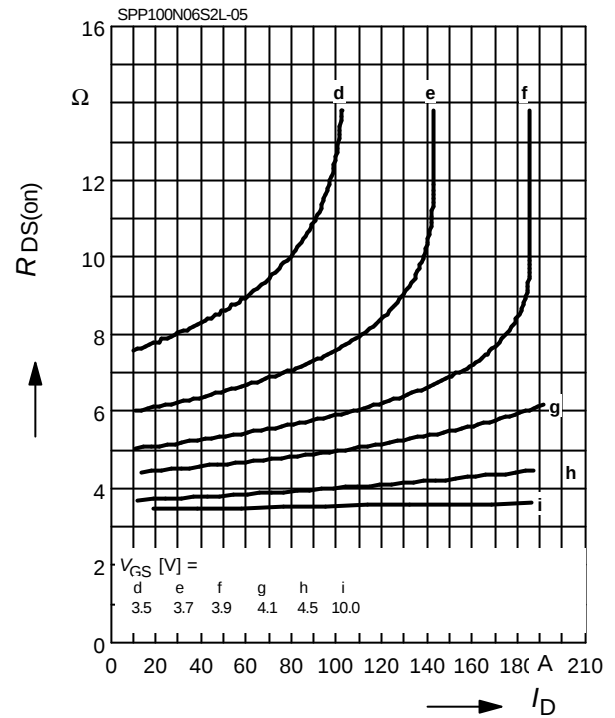
parameter:  $t_p = 80 \mu\text{s}$



### 6 Typ. drain-source on resistance

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

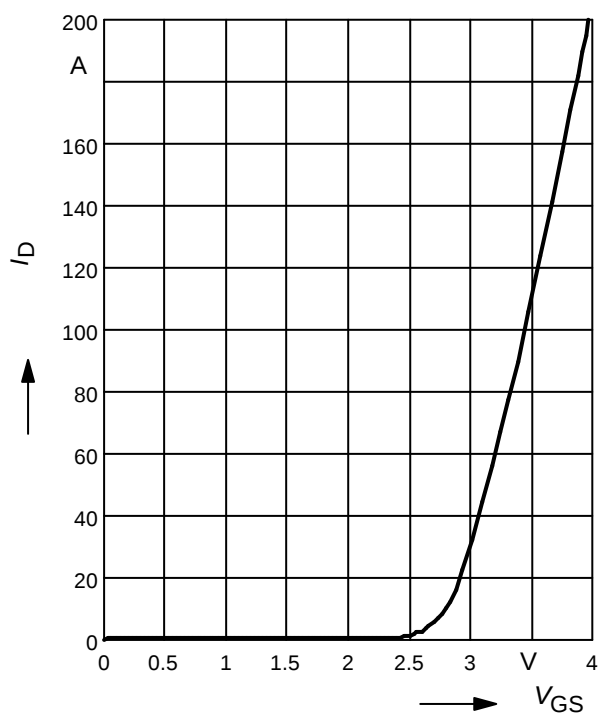
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

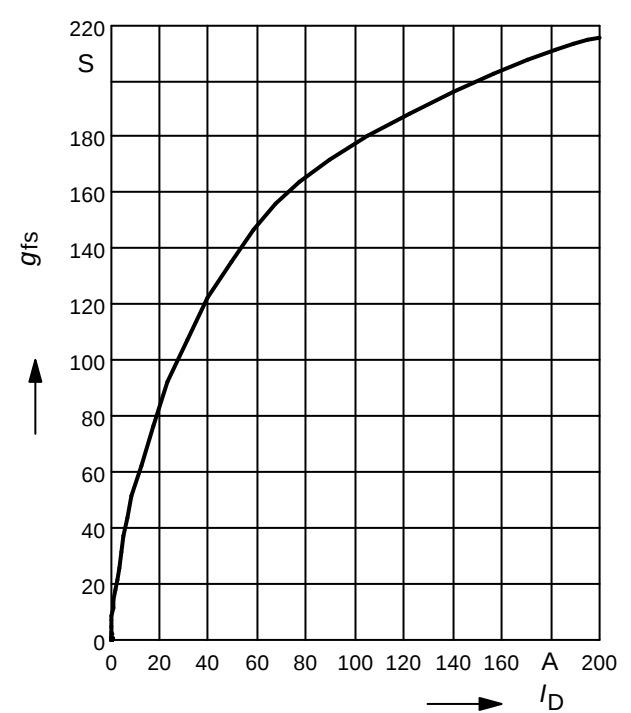
parameter:  $t_p = 80 \mu\text{s}$



### 8 Typ. forward transconductance

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

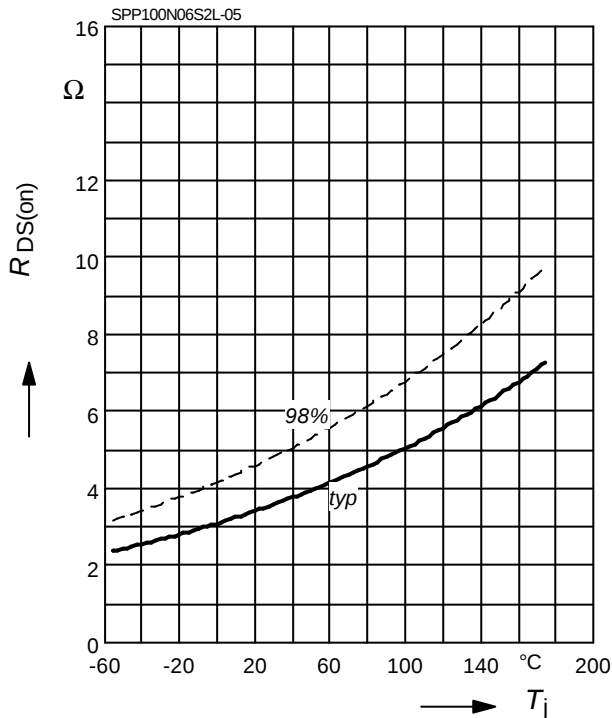
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

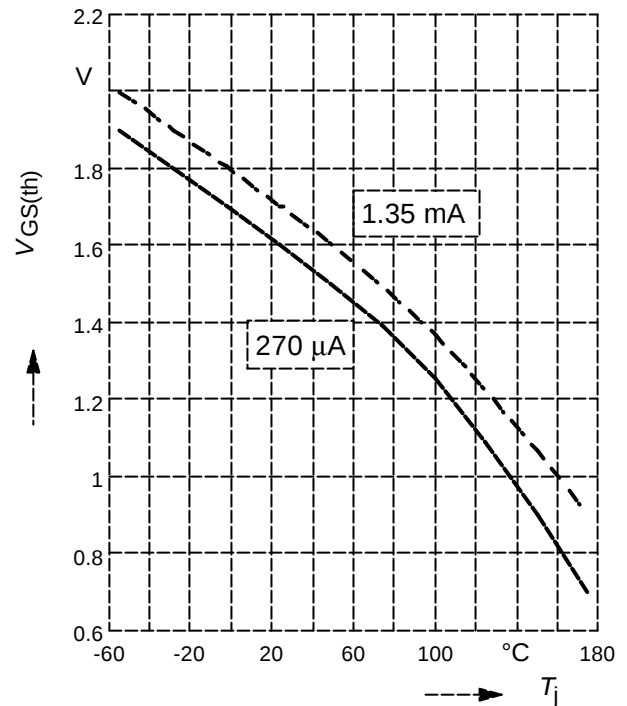
parameter :  $I_D = 80 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



### 10 Typ. gate threshold voltage

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

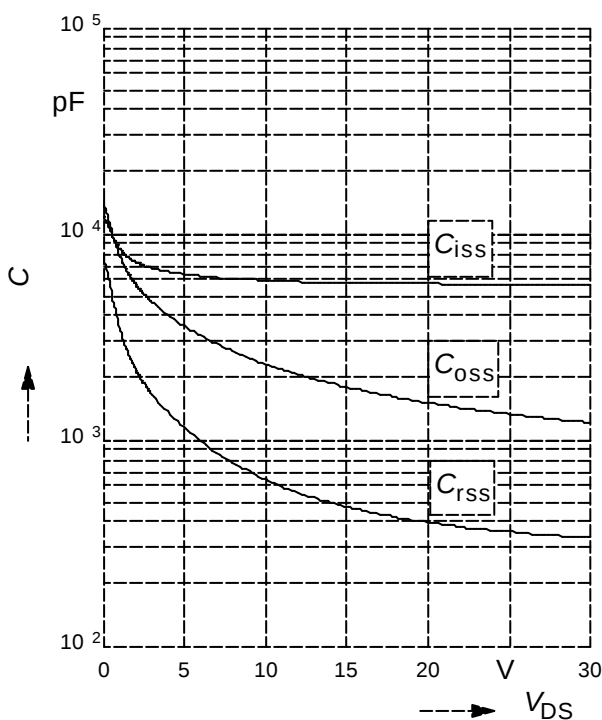
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

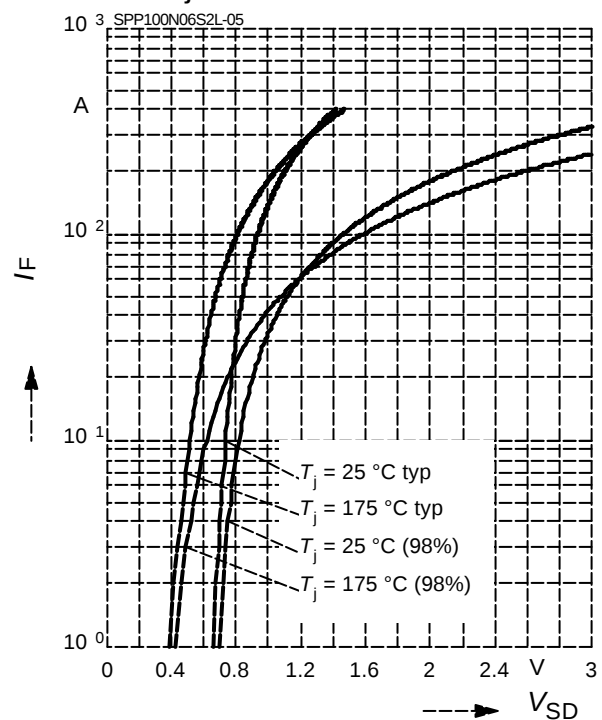
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### 12 Forward character. of reverse diode

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

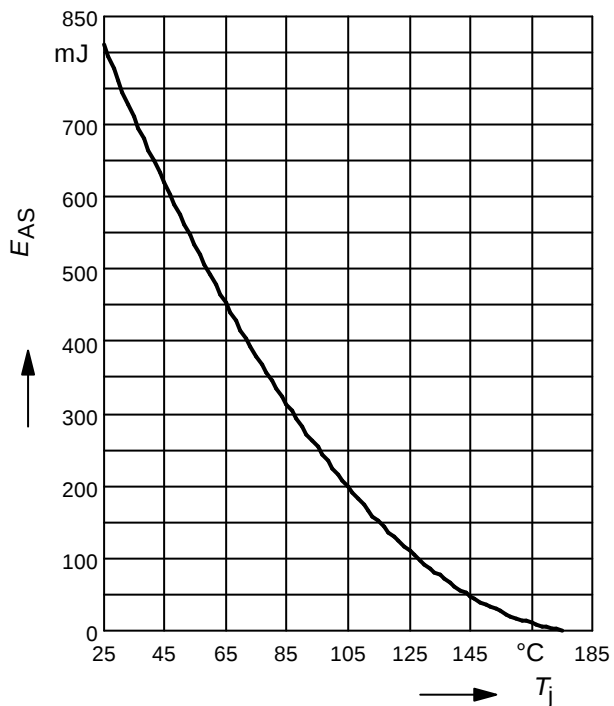
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



### 13 Typ. avalanche energy

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

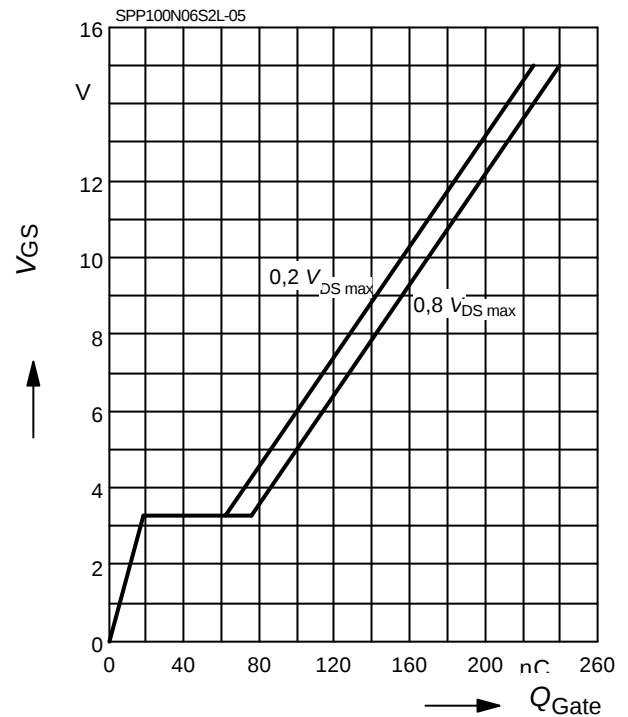
par.:  $I_D = 80\text{ A}$ ,  $V_{DD} = 25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



### 14 Typ. gate charge

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

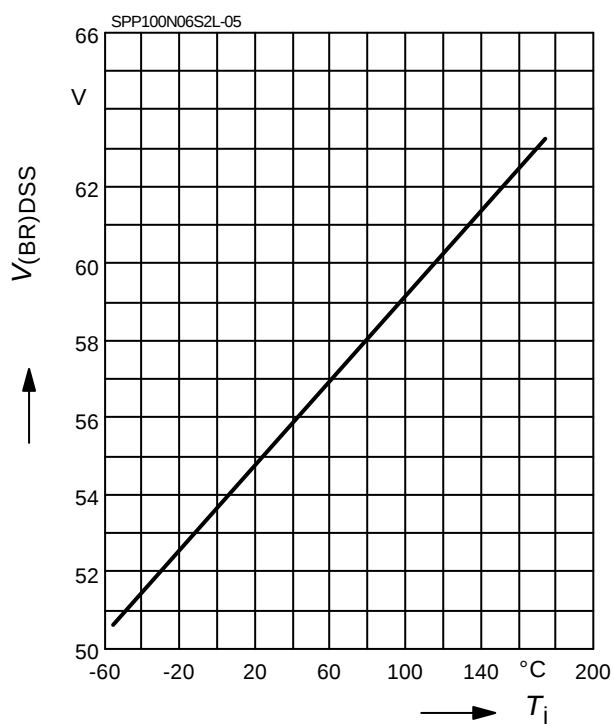
parameter:  $I_D = 100\text{ A}$  pulsed



### 15 Drain-source breakdown voltage

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

parameter:  $I_D = 10\text{ mA}$



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**Further information**

Please notice that the part number is **BSPP100N06S2L-05** and **BSPB100N06S2L-05**, for simplicity the device is referred to by the term **SPP100N06S2L-05** and **SPB100N06S2L-05** throughout this documentation.