

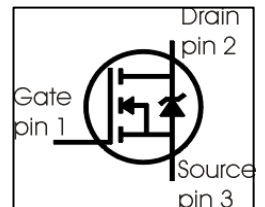
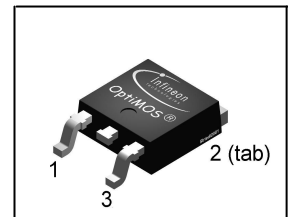
**OptiMOS® Power-Transistor**
**Feature**

- N-Channel
- Enhancement mode
- Logic Level
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

**Product Summary**

|              |    |    |
|--------------|----|----|
| $V_{DS}$     | 30 | V  |
| $R_{DS(on)}$ | 20 | mΩ |
| $I_D$        | 30 | A  |

P- TO252 -3-11



| Type           | Package        | Ordering Code | Marking |
|----------------|----------------|---------------|---------|
| SPD30N03S2L-20 | P- TO252 -3-11 | Q67042-S4077  | 2N03L20 |

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

| Parameter                                                                                                   | Symbol              | Value       | Unit  |
|-------------------------------------------------------------------------------------------------------------|---------------------|-------------|-------|
| Continuous drain current <sup>1)</sup><br>$T_C=25\text{ °C}$                                                | $I_D$               | 30<br>30    | A     |
| Pulsed drain current<br>$T_C=25\text{ °C}$                                                                  | $I_{D\text{ puls}}$ | 120         |       |
| Avalanche energy, single pulse<br>$I_D=30\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$           | $E_{AS}$            | 70          | mJ    |
| Repetitive avalanche energy, limited by $T_{jmax}^{2)}$                                                     | $E_{AR}$            | 6           |       |
| Reverse diode dv/dt<br>$I_S=30\text{ A}$ , $V_{DS}=-V$ , $di/dt=200\text{ A/μs}$ , $T_{jmax}=175\text{ °C}$ | dv/dt               | 6           | kV/μs |
| Gate source voltage                                                                                         | $V_{GS}$            | ±20         | V     |
| Power dissipation<br>$T_C=25\text{ °C}$                                                                     | $P_{tot}$           | 60          | W     |
| 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            | $R_{thJC}$ | -      | 1.7  | 2.5  | 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>3)</sup> |            | -      | -    | 50   |      |

**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>$V_{GS}=0V, I_D=1mA$                                                                   | $V_{(BR)DSS}$ | 30     | -          | -        | V          |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D=23\mu A$                                                               | $V_{GS(th)}$  | 1.2    | 1.6        | 2        |            |
| Zero gate voltage drain current<br>$V_{DS}=30V, V_{GS}=0V, T_j=25^{\circ}C$<br>$V_{DS}=30V, V_{GS}=0V, T_j=125^{\circ}C$ | $I_{DSS}$     | -<br>- | 0.01<br>10 | 1<br>100 | $\mu A$    |
| Gate-source leakage current<br>$V_{GS}=20V, V_{DS}=0V$                                                                   | $I_{GSS}$     | -      | 1          | 100      |            |
| Drain-source on-state resistance<br>$V_{GS}=4.5V, I_D=18A$                                                               | $R_{DS(on)}$  | -      | 22.9       | 31       | m $\Omega$ |
| Drain-source on-state resistance<br>$V_{GS}=10V, I_D=18A$                                                                | $R_{DS(on)}$  | -      | 15.5       | 20       |            |

<sup>1</sup>Current limited by bondwire ; with an  $R_{thJC} = 2.5K/W$  the chip is able to carry  $I_D = 43A$  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>$I_D = 30A$           | 14 | 28  | -   | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0V$ , $V_{DS} = 25V$ ,<br>$f = 1MHz$                           | -  | 530 | 700 | pF |
| Output capacitance           | $C_{oss}$    |                                                                          | -  | 200 | 275 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                          | -  | 60  | 90  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = 15V$ , $V_{GS} = 10V$ ,<br>$I_D = 30A$ ,<br>$R_G = 12.7\Omega$ | -  | 6   | 9   | ns |
| Rise time                    | $t_r$        |                                                                          | -  | 11  | 17  |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                          | -  | 20  | 30  |    |
| Fall time                    | $t_f$        |                                                                          | -  | 17  | 26  |    |

**Gate Charge Characteristics**

|                       |                 |                                                         |   |      |     |    |
|-----------------------|-----------------|---------------------------------------------------------|---|------|-----|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 24V$ , $I_D = 30A$                            | - | 1.7  | 2.2 | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                         | - | 4.9  | 7.4 |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 24V$ , $I_D = 30A$ ,<br>$V_{GS} = 0$ to $10V$ | - | 14.3 | 19  |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = 24V$ , $I_D = 30A$                            | - | 3.2  | -   | V  |

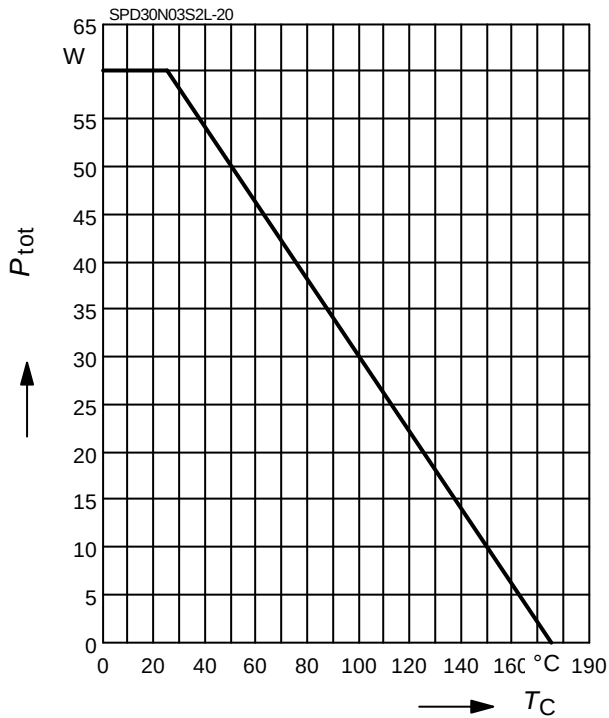
**Reverse Diode**

|                                          |          |                                                      |   |     |     |    |
|------------------------------------------|----------|------------------------------------------------------|---|-----|-----|----|
| Inverse diode continuous forward current | $I_S$    | $T_C = 25^\circ C$                                   | - | -   | 30  | A  |
| Inv. diode direct current, pulsed        | $I_{SM}$ |                                                      | - | -   | 120 |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS} = 0V$ , $I_F = 30A$                          | - | 1.1 | 1.4 | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R = -V$ , $I_F = I_S$ ,<br>$di_F/dt = 100A/\mu s$ | - | 15  | 18  | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                      | - | 2   | 3   | nC |

### 1 Power dissipation

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

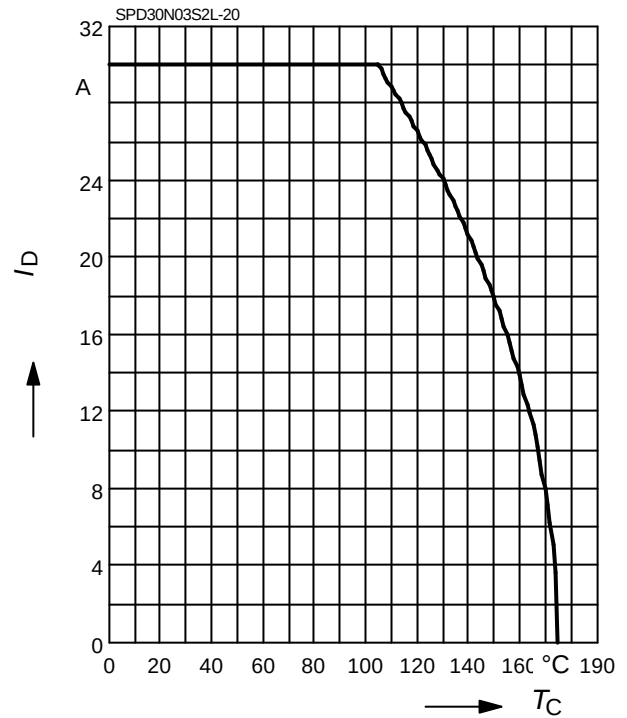
parameter:  $V_{GS} \geq 4 \text{ V}$



### 2 Drain current

$$I_D = f(T_C)$$

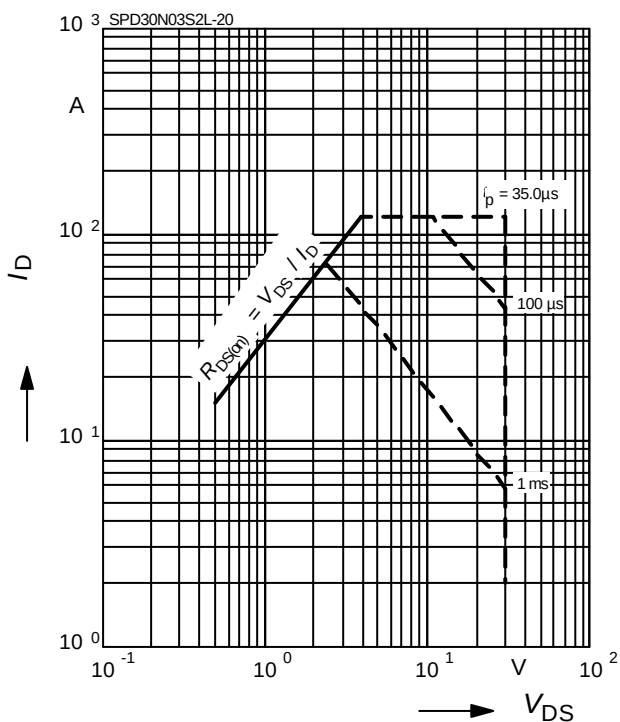
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

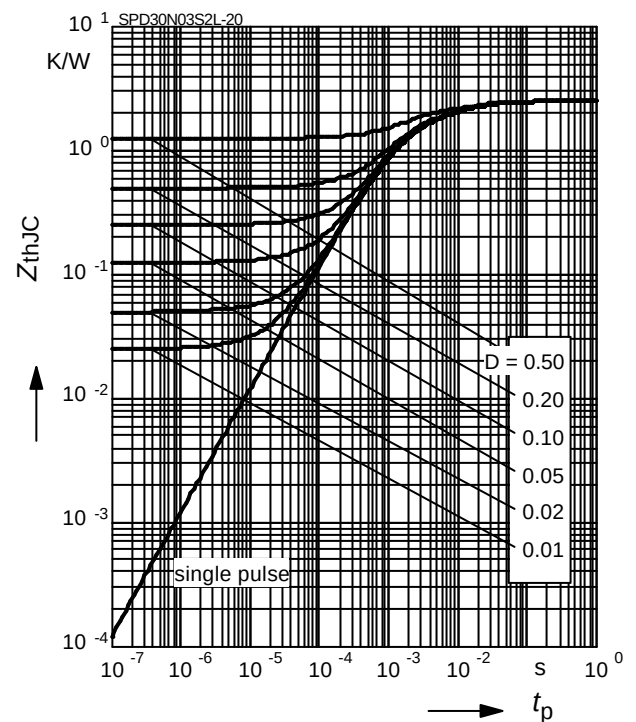
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### 4 Max. transient thermal impedance

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

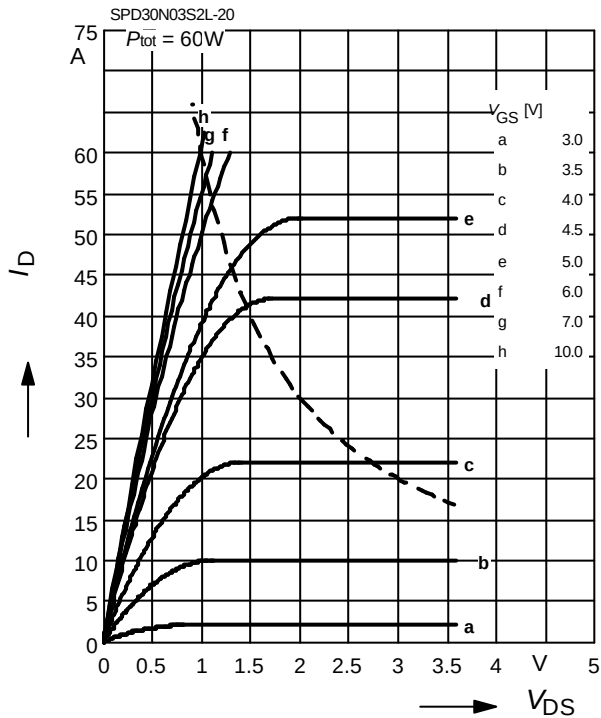
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

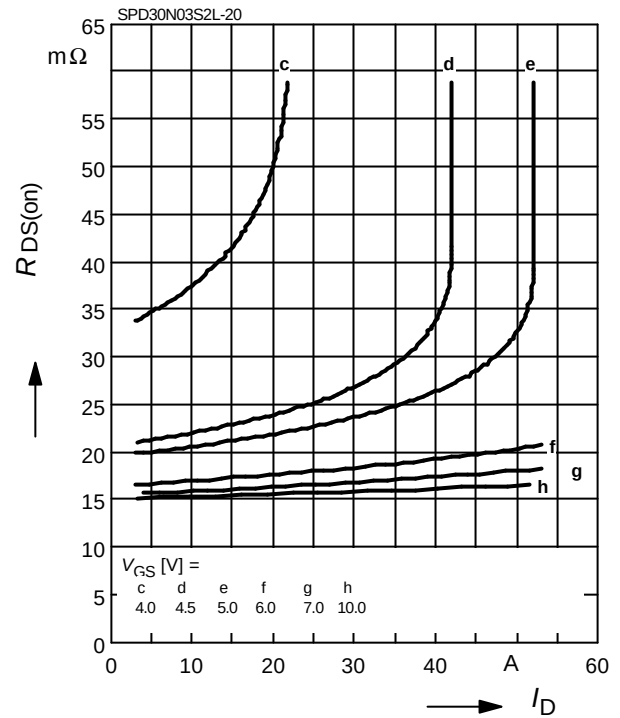
$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

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


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

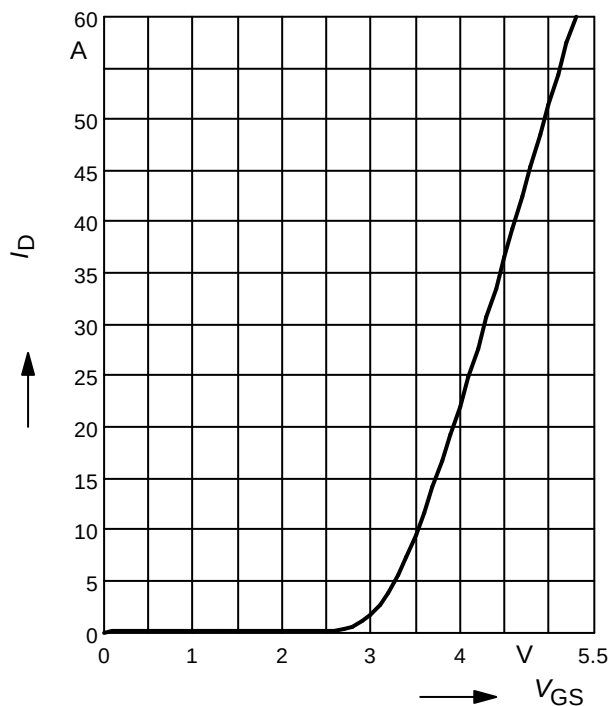
$$R_{DS(on)} = f(I_D)$$

parameter:  $V_{GS}$


**7 Typ. transfer characteristics**

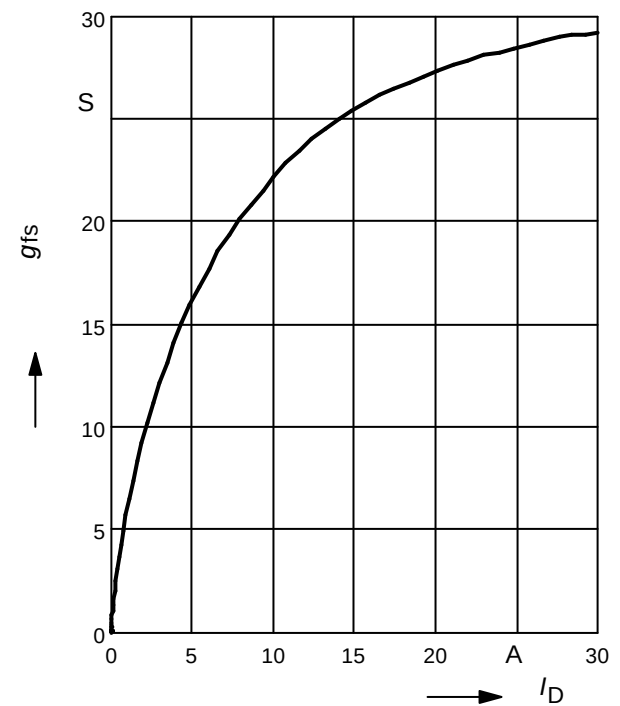
$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

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


**8 Typ. forward transconductance**

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

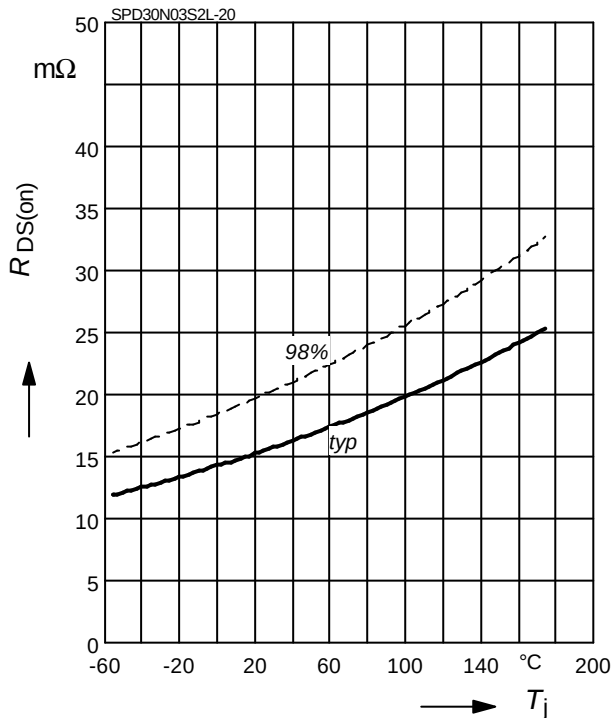
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

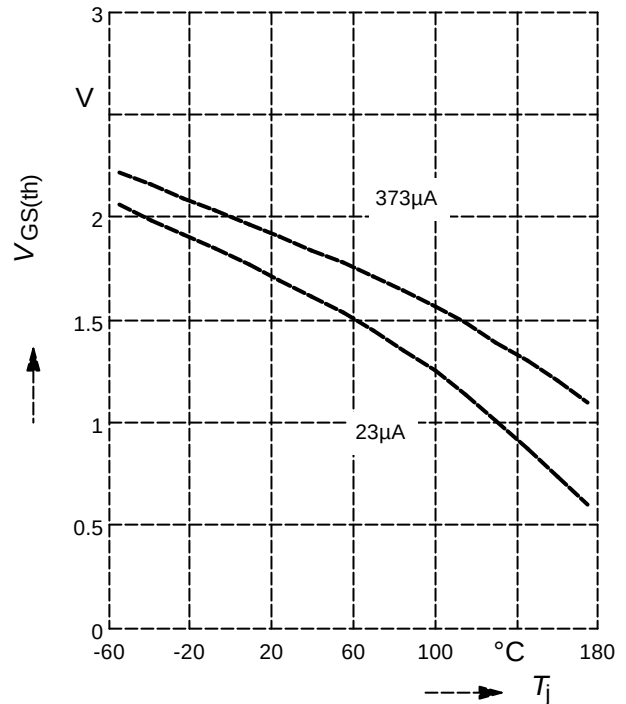
parameter:  $I_D = 18\text{ A}$ ,  $V_{GS} = 10\text{ V}$



### 10 Typ. gate threshold voltage

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

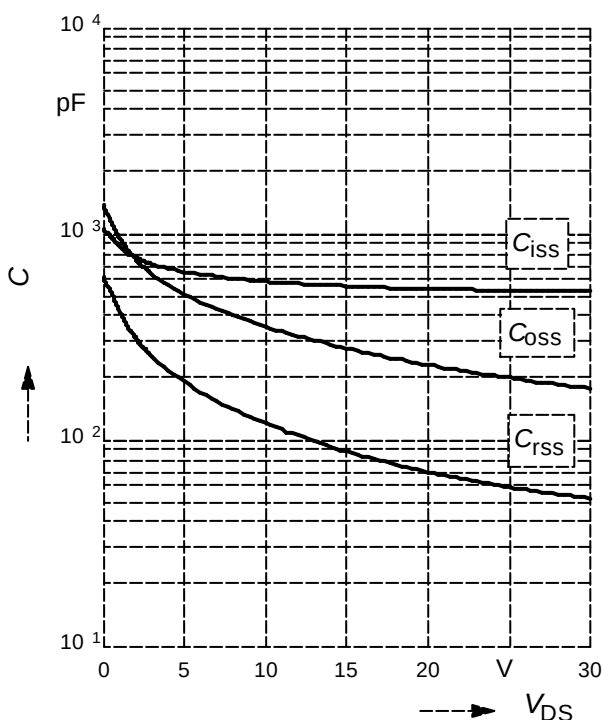
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

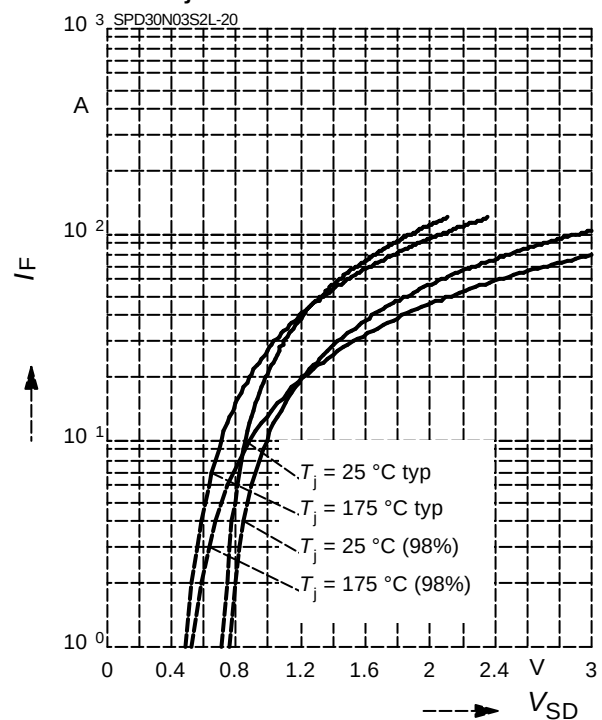
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### 12 Forward character. of reverse diode

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

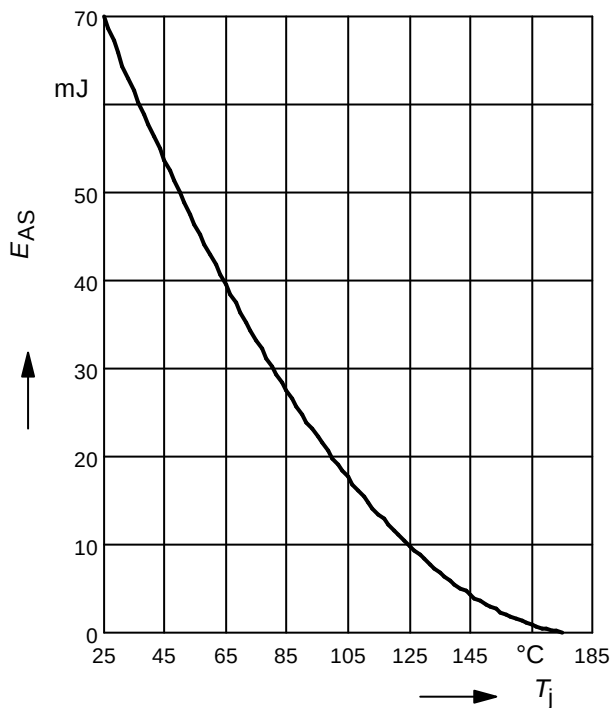
parameter:  $T_j$ ,  $t_p = 80\text{ μs}$



**13 Typ. avalanche energy**

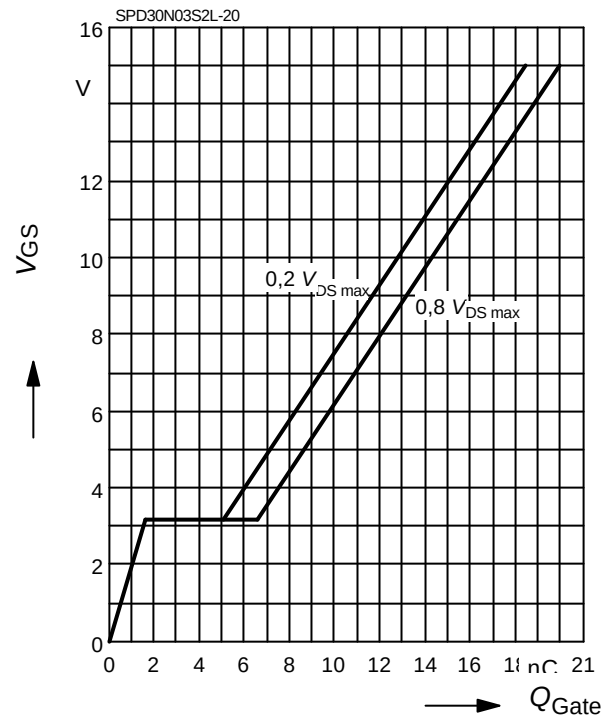
$$E_{AS} = f(T_j)$$

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


**14 Typ. gate charge**

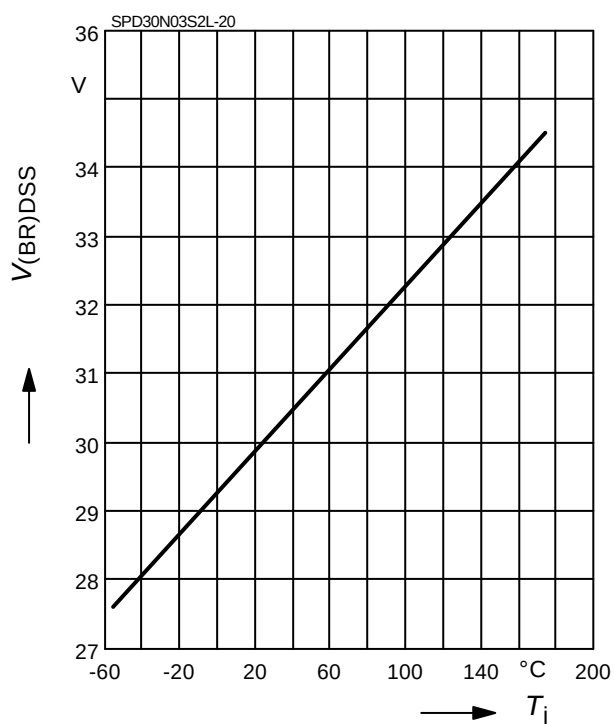
$$V_{GS} = f(Q_{Gate})$$

parameter:  $I_D = 30\text{ A}$  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 BSPD30N03S2L-20, for simplicity the device is referred to by the term SPD30N03S2L-20 throughout this documentation.