

**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

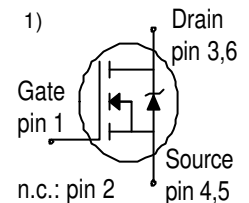
**Product Summary**

|              |     |    |
|--------------|-----|----|
| $V_{DS}$     | 30  | V  |
| $R_{DS(on)}$ | 4.2 | mΩ |
| $I_D$        | 100 | A  |

P-TO252-5-1

**Titel:**  
**C:\ARJ\VF**  
**Erstellt von**

| Type            | Package     | Ordering Code | Marking |
|-----------------|-------------|---------------|---------|
| SPD100N03S2L-04 | P-TO252-5-1 | Q67042-S4128  | PN03L04 |


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

| Parameter                                                                                                                      | Symbol                | Value       | Unit  |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|-------|
| Continuous drain current <sup>2)</sup><br>$T_C=100\text{ °C}$                                                                  | $I_D$                 | 100<br>100  | A     |
| Pulsed drain current<br>$T_C=25\text{ °C}$                                                                                     | $I_{D\text{ puls}}$   | 400         |       |
| Avalanche energy, single pulse<br>$I_D=80\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$                              | $E_{AS}$              | 325         | mJ    |
| Repetitive avalanche energy, limited by $T_{j\text{max}}^{3)}$                                                                 | $E_{AR}$              | 15          |       |
| Reverse diode $dv/dt$<br>$I_S=100\text{ A}$ , $V_{DS}=24\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{j\text{max}}=175\text{ °C}$ | $dv/dt$               | 6           | kV/μs |
| Gate source voltage                                                                                                            | $V_{GS}$              | ±20         | V     |
| Power dissipation<br>$T_C=25\text{ °C}$                                                                                        | $P_{\text{tot}}$      | 150         | W     |
| Operating and storage temperature                                                                                              | $T_j, T_{\text{sta}}$ | -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            | $R_{thJC}$ | -      | 0.7  | 1    | K/W  |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 75   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>4)</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>$I_D = 100 \mu A$                                                           | $V_{GS(th)}$  | 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>$V_{GS}=4.5V, I_D=50A$                                                               | $R_{DS(on)}$  | -      | 5          | 6.3      | m $\Omega$ |
| Drain-source on-state resistance<br>$V_{GS}=10V, I_D=50A$                                                                | $R_{DS(on)}$  | -      | 3.4        | 4.2      |            |

<sup>1</sup>pin 1 and 2 have to be connected together on the PCB as well as pin 4 and 5.

<sup>2</sup>Current limited by bondwire ; with an  $R_{thJC} = 1\text{K/W}$  the chip is able to carry  $I_D = 307\text{A}$  at  $25^\circ\text{C}$ , for detailed information see app.-note ANPS071E available at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>3</sup>Defined by design. Not subject to production test.

<sup>4</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  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>$I_D = 100A$         | 59 | 118  | -    | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0V$ , $V_{DS} = 25V$ ,<br>$f = 1MHz$                          | -  | 2500 | 3320 | pF |
| Output capacitance           | $C_{oss}$    |                                                                         | -  | 980  | 1300 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                         | -  | 230  | 350  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = 15V$ , $V_{GS} = 10V$ ,<br>$I_D = 50A$ ,<br>$R_G = 2.7\Omega$ | -  | 12   | 18   | ns |
| Rise time                    | $t_r$        |                                                                         | -  | 17   | 26   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                         | -  | 45   | 67   |    |
| Fall time                    | $t_f$        |                                                                         | -  | 24   | 36   |    |

**Gate Charge Characteristics**

|                       |                 |                                                          |   |      |      |    |
|-----------------------|-----------------|----------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 24V$ , $I_D = 100A$                            | - | 7.9  | 10.5 | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                          | - | 23.3 | 35   |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 24V$ , $I_D = 100A$ ,<br>$V_{GS} = 0$ to $10V$ | - | 67.5 | 89.7 |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = 24V$ , $I_D = 100A$                            | - | 3.6  | -    | V  |

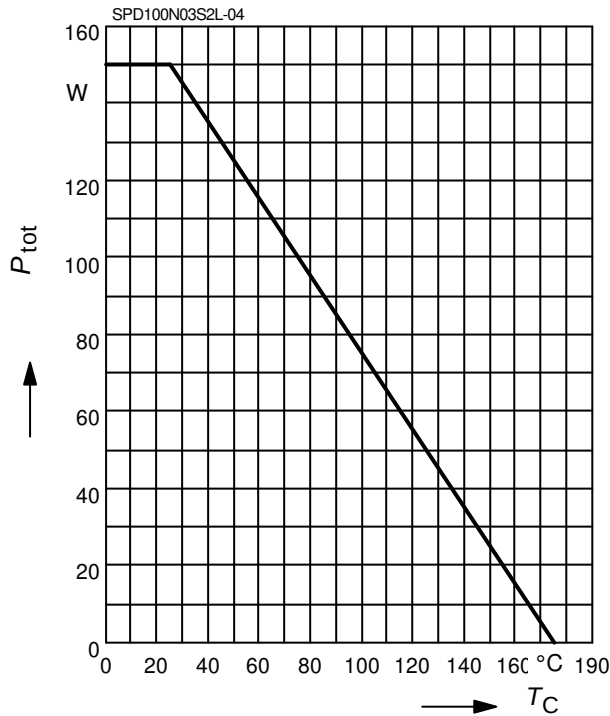
**Reverse Diode**

|                                          |          |                                                       |   |     |     |    |
|------------------------------------------|----------|-------------------------------------------------------|---|-----|-----|----|
| 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                    | $t_{rr}$ | $V_R = 15V$ , $I_F = I_S$ ,<br>$di_F/dt = 200A/\mu s$ | - | 46  | 58  | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                       | - | 56  | 69  | nC |

### 1 Power dissipation

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

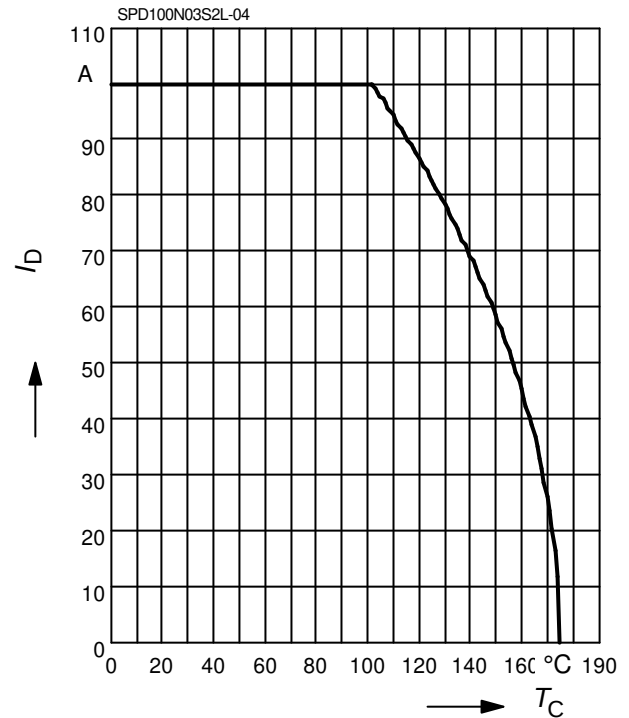
parameter:  $V_{GS} \geq 4 \text{ V}$



### 2 Drain current

$$I_D = f(T_C)$$

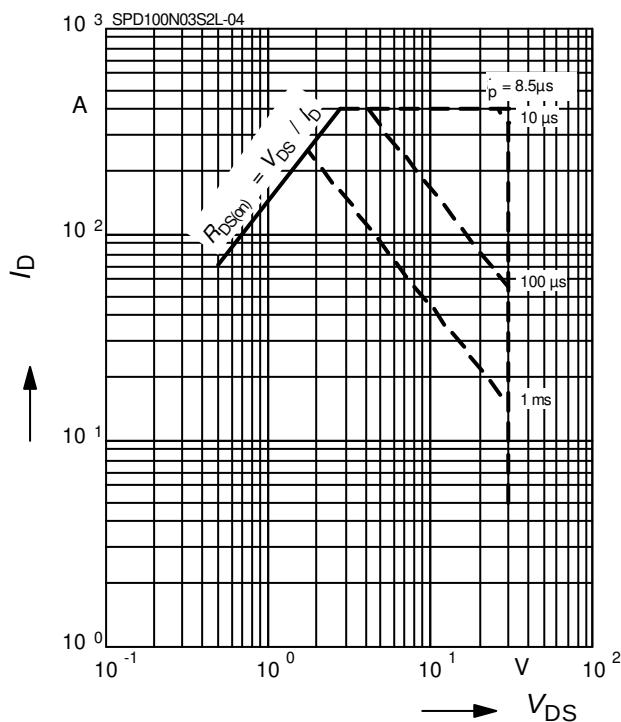
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

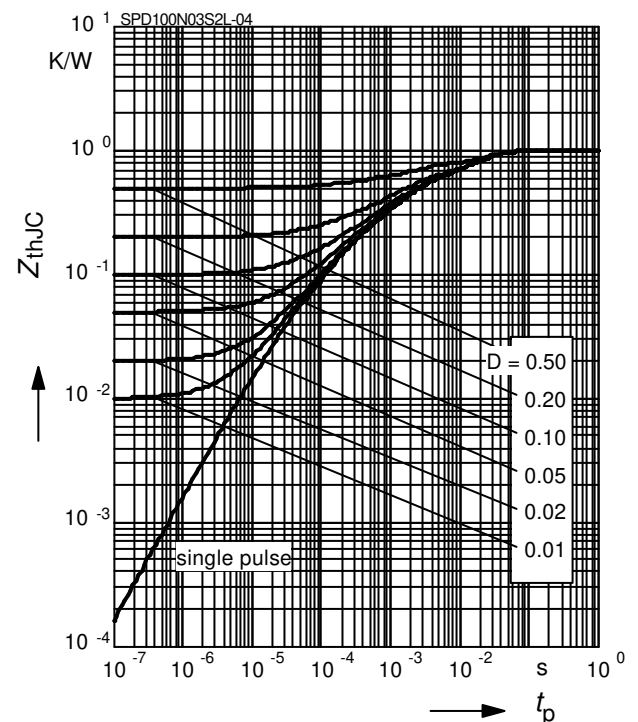
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### 4 Max. transient thermal impedance

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

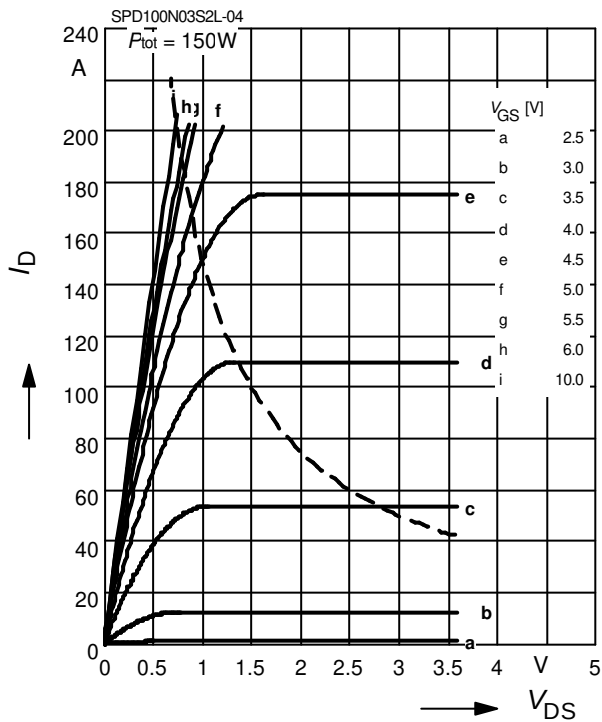
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

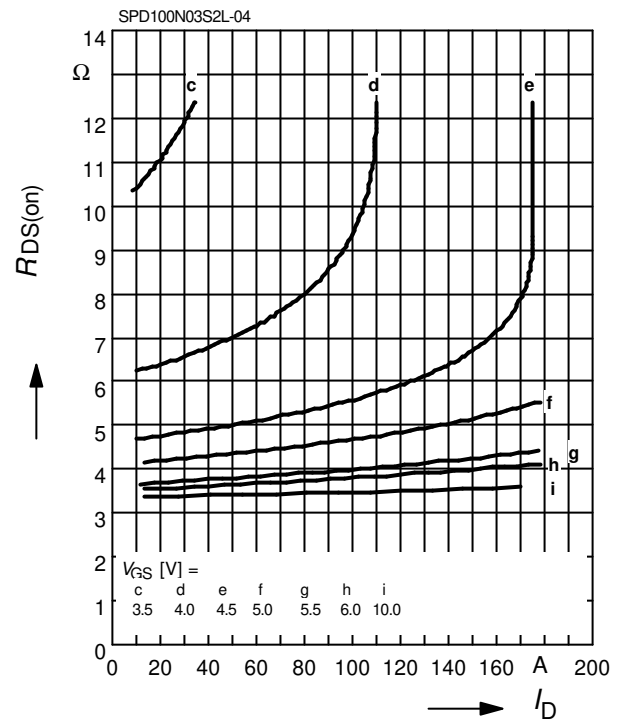
$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

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


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

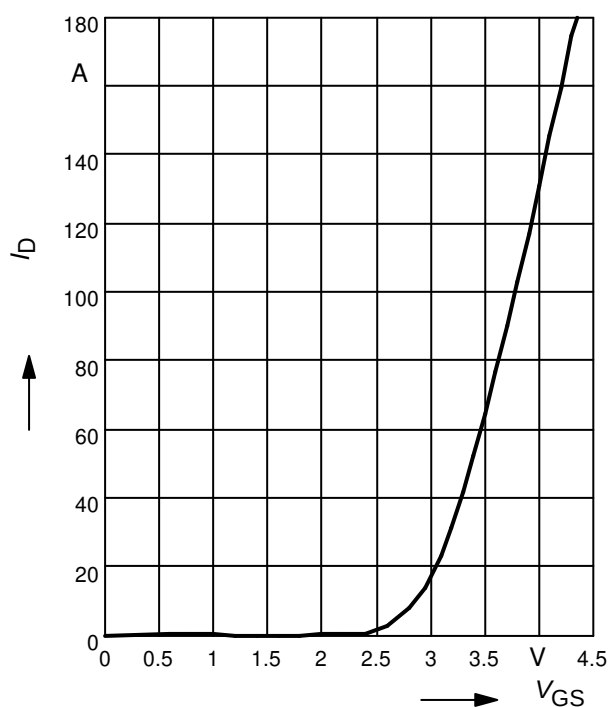
$$R_{DS(on)} = f(I_D)$$

parameter:  $V_{GS}$


**7 Typ. transfer characteristics**

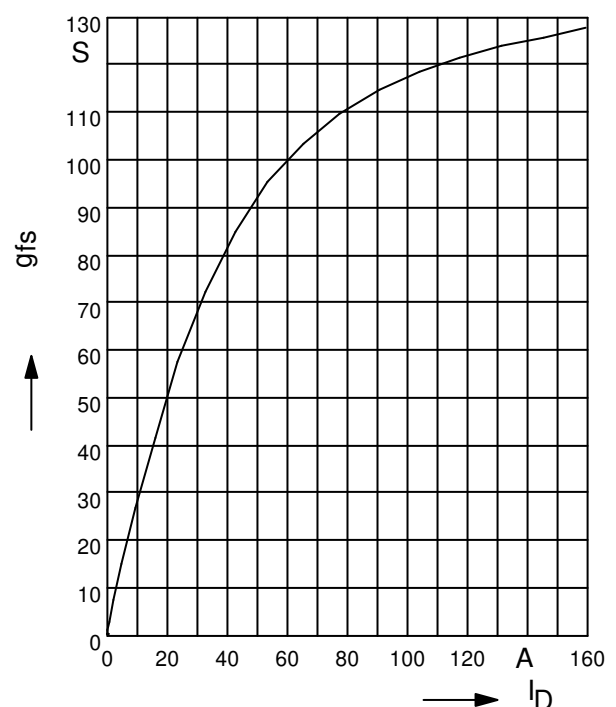
$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

parameter:  $t_p = 20 \mu\text{s}$


**8 Typ. forward transconductance**

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

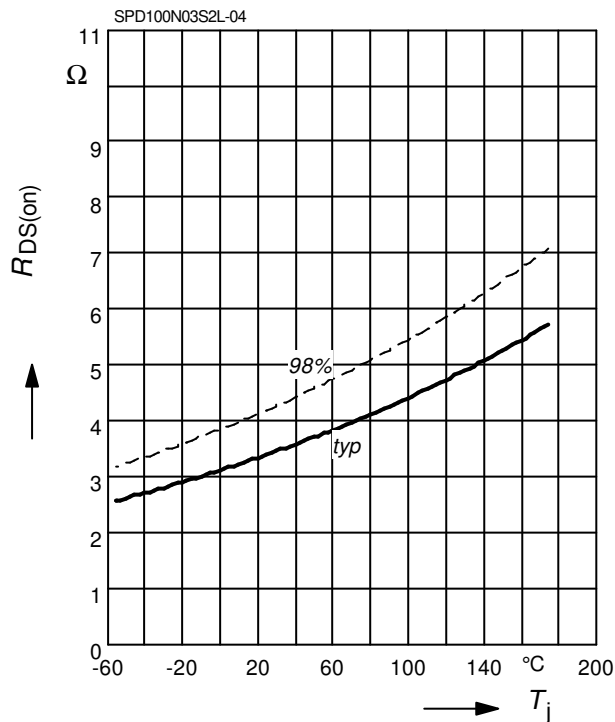
parameter:  $g_{fs}$



## 9 Drain-source on-state resistance

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

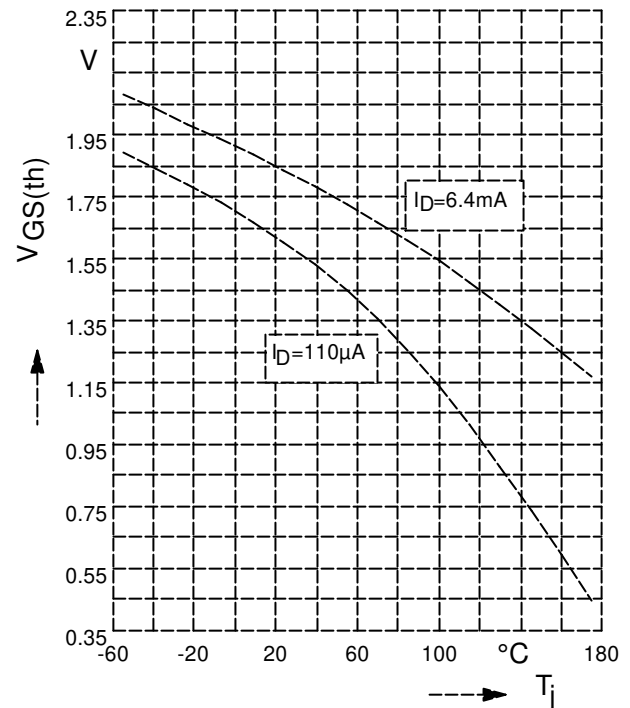
parameter:  $I_D = 50 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



## 10 Typ. gate threshold voltage

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

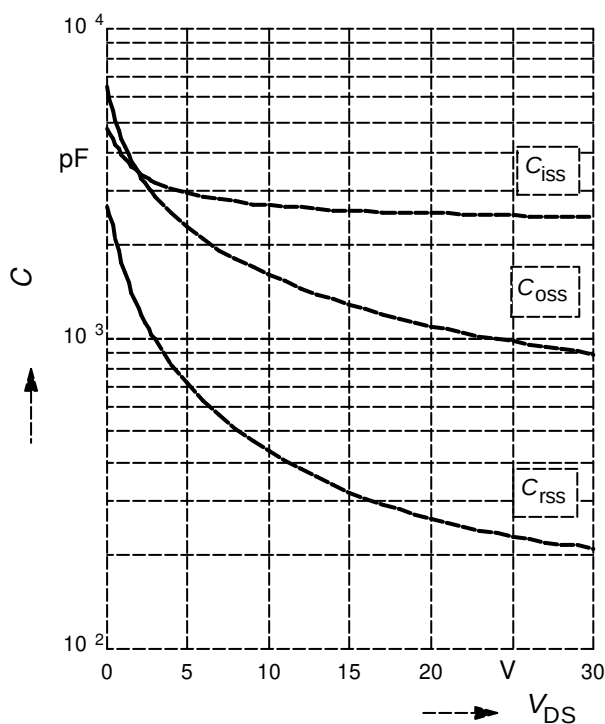
parameter:  $V_{GS} = V_{DS}$



## 11 Typ. capacitances

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

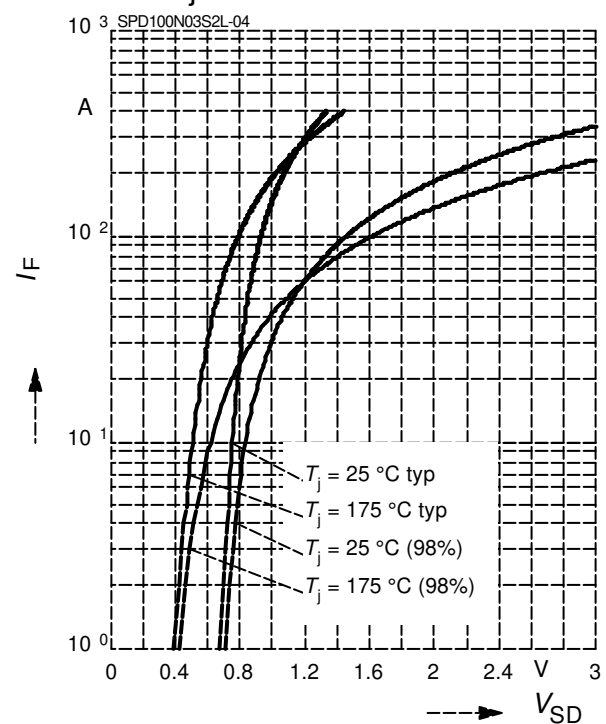
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



## 12 Forward character. of reverse diode

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

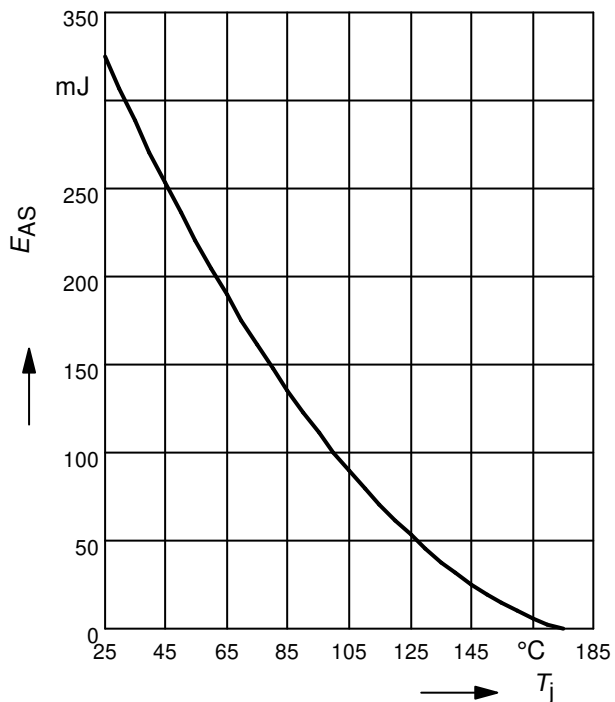
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

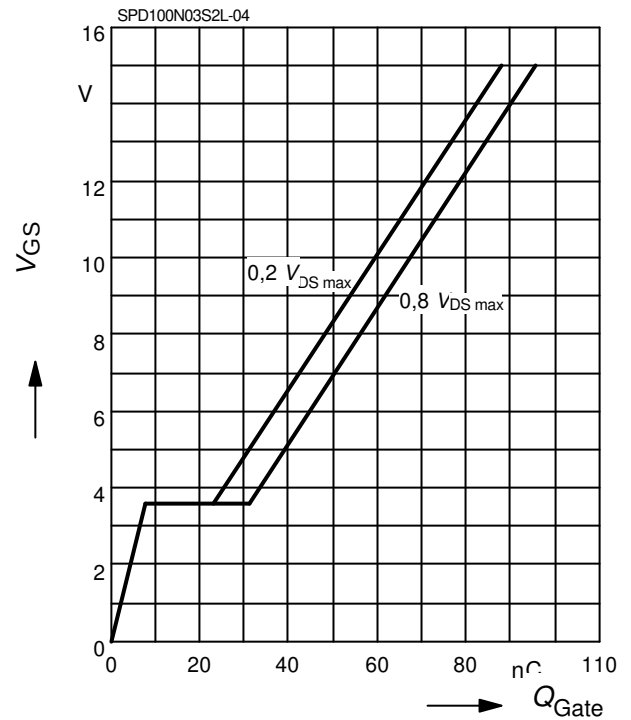
$$E_{AS} = f(T_j)$$

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


**14 Typ. gate charge**

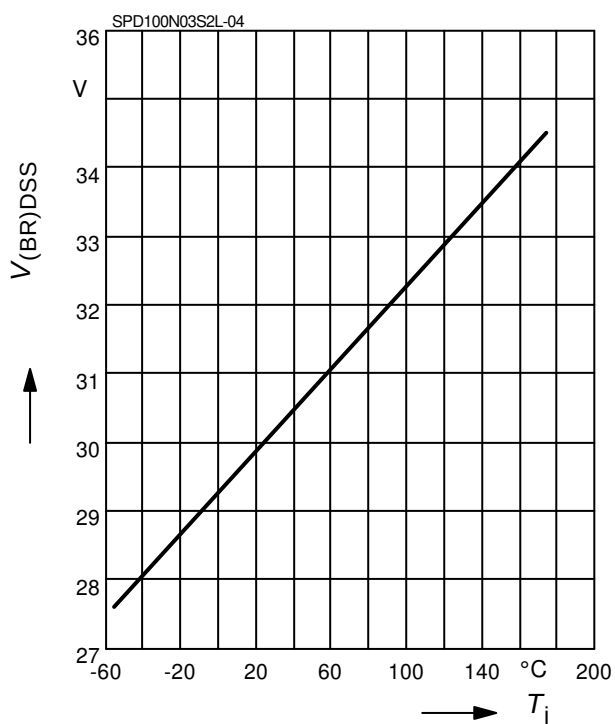
$$V_{GS} = f(Q_{Gate})$$

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 BSPD100N03S2L-04, for simplicity the device is referred to by the term SPD100N03S2L-04 throughout this documentation.