

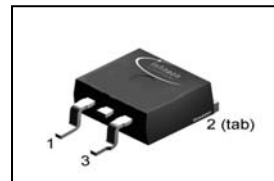
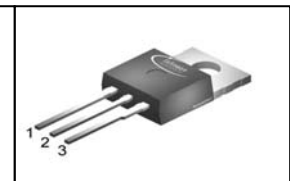
## OptiMOS® Power-Transistor

### Features

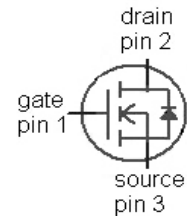
- N-channel Logic Level - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- **Green package (lead free)**
- Ultra low  $R_{DS(on)}$
- 100% Avalanche tested

### Product Summary

|                                |     |    |
|--------------------------------|-----|----|
| $V_{DS}$                       | 55  | V  |
| $R_{DS(on),max}$ (SMD version) | 8.3 | mΩ |
| $I_D$                          | 80  | A  |

**PG-TO263-3-2**

**PG-TO220-3-1**


| Type           | Package      | Ordering Code | Marking |
|----------------|--------------|---------------|---------|
| IPB80N06S2L-09 | PG-TO263-3-2 | SP0002-18743  | 2N06L09 |
| IPP80N06S2L-09 | PG-TO220-3-1 | SP0002-18742  | 2N06L09 |



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

| Parameter                                    | Symbol         | Conditions                                         | Value        | Unit |
|----------------------------------------------|----------------|----------------------------------------------------|--------------|------|
| Continuous drain current <sup>1)</sup>       | $I_D$          | $T_C=25\text{ °C}$ , $V_{GS}=10\text{ V}$          | 80           | A    |
|                                              |                | $T_C=100\text{ °C}$ ,<br>$V_{GS}=10\text{ V}^{2)}$ | 73           |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$  | $T_C=25\text{ °C}$                                 | 320          |      |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$       | $I_D=80\text{ A}$                                  | 370          | mJ   |
| Gate source voltage <sup>4)</sup>            | $V_{GS}$       |                                                    | ±20          | V    |
| Power dissipation                            | $P_{tot}$      | $T_C=25\text{ °C}$                                 | 190          | W    |
| Operating and storage temperature            | $T_j, T_{stg}$ |                                                    | -55 ... +175 | °C   |

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

**Thermal characteristics<sup>2)</sup>**

|                                                |            |                                              |   |   |     |     |
|------------------------------------------------|------------|----------------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case            | $R_{thJC}$ |                                              | - | - | 0.8 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ |                                              | - | - | 62  |     |
| SMD version, device on PCB                     | $R_{thJA}$ | minimal footprint                            | - | - | 62  |     |
|                                                |            | 6 cm <sup>2</sup> cooling area <sup>5)</sup> | - | - | 40  |     |

**Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified**
**Static characteristics**

|                                  |               |                                                                 |     |      |      |               |
|----------------------------------|---------------|-----------------------------------------------------------------|-----|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                            | 55  | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=125\text{ }\mu\text{A}$                     | 1.2 | 1.6  | 2.0  |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$       | -   | 0.01 | 1    | $\mu\text{A}$ |
|                                  |               | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}^{2)}$ | -   | 1    | 100  |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                         | -   | 1    | 100  | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=4.5\text{ V}, I_D=52\text{ A}$                          | -   | 8.4  | 11.3 | m $\Omega$    |
|                                  |               | $V_{GS}=4.5\text{ V}, I_D=52\text{ A},$<br>SMD version          | -   | 8.1  | 11   |               |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=10\text{ V}, I_D=52\text{ A},$                          | -   | 6.9  | 8.5  | m $\Omega$    |
|                                  |               | $V_{GS}=10\text{ V}, I_D=52\text{ A},$<br>SMD version           | -   | 6.6  | 8.2  |               |

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

### Dynamic characteristics<sup>2)</sup>

|                              |              |                                                                                 |   |      |   |    |
|------------------------------|--------------|---------------------------------------------------------------------------------|---|------|---|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$<br>$f=1\text{ MHz}$                    | - | 2620 | - | pF |
| Output capacitance           | $C_{oss}$    |                                                                                 | - | 610  | - |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                 | - | 170  | - |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=80\text{ A}, R_G=2.3\ \Omega$ | - | 10   | - | ns |
| Rise time                    | $t_r$        |                                                                                 | - | 19   | - |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                 | - | 53   | - |    |
| Fall time                    | $t_f$        |                                                                                 | - | 18   | - |    |

### Gate Charge Characteristics<sup>2)</sup>

|                       |               |                                                                            |   |     |     |    |
|-----------------------|---------------|----------------------------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=44\text{ V}, I_D=80\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 9   | 12  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                            | - | 28  | 40  |    |
| Gate charge total     | $Q_g$         |                                                                            | - | 82  | 105 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                            | - | 3.5 | -   | V  |

### Reverse Diode

|                                                |               |                                                                   |   |     |     |    |
|------------------------------------------------|---------------|-------------------------------------------------------------------|---|-----|-----|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25\text{ °C}$                                                | - | -   | 80  | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ |                                                                   | - | -   | 320 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=80\text{ A},$<br>$T_j=25\text{ °C}$       | - | 0.9 | 1.3 | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=30\text{ V}, I_F=I_S,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 57  | 70  | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                                                   | - | 70  | 90  |    |

<sup>1)</sup> Current is limited by bondwire; with an  $R_{thJC} = 0.8\text{ K/W}$  the chip is able to carry 103 A at 25°C. For detailed information see Application Note ANPS071E at [www.infineon.com/optimos](http://www.infineon.com/optimos)

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

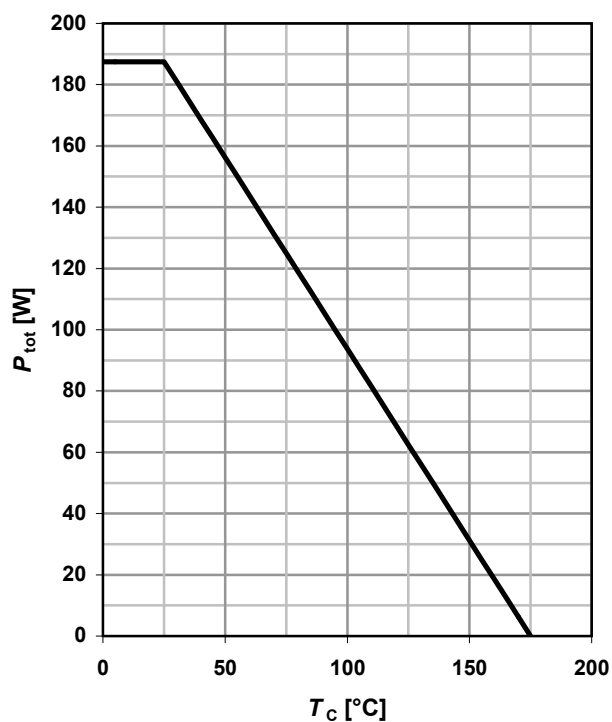
<sup>3)</sup> See diagram 13

<sup>4)</sup> Qualified at -20V and +20V.

<sup>5)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

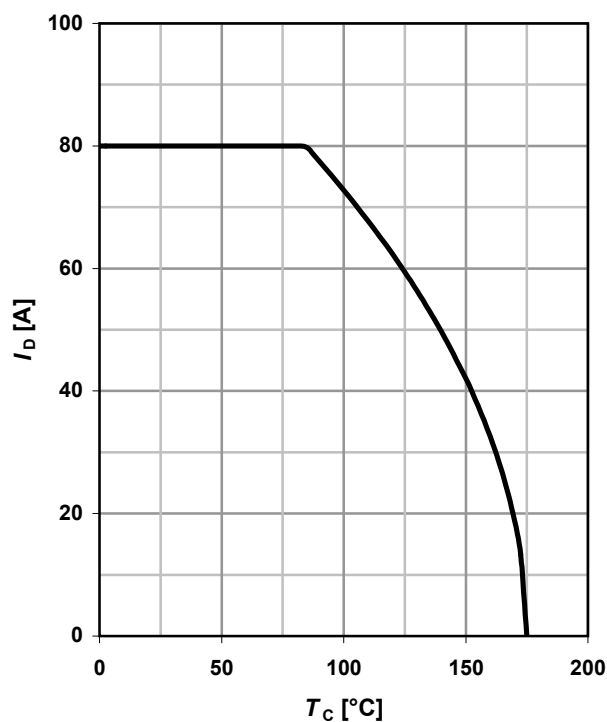
### 1 Power dissipation

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 4 \text{ V}$$



### 2 Drain current

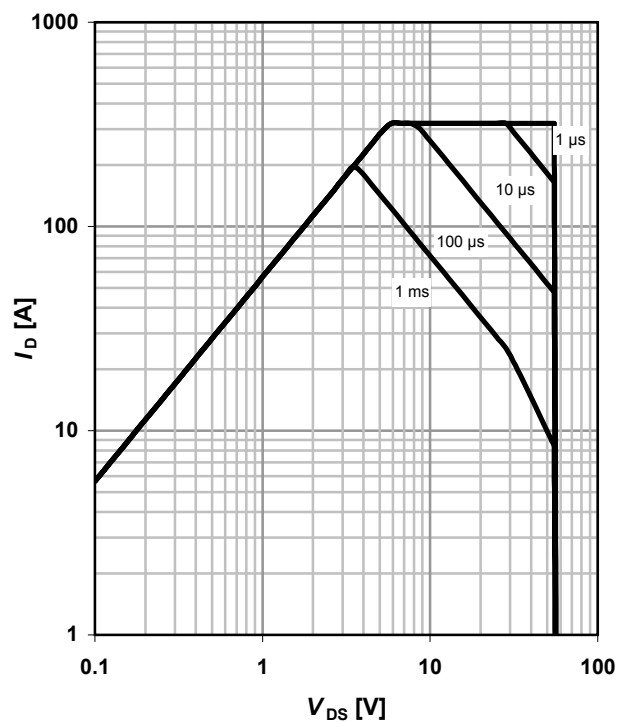
$$I_D = f(T_C); V_{\text{GS}} \geq 10 \text{ V}$$



### 3 Safe operating area

$$I_D = f(V_{\text{DS}}); T_C = 25 \text{ °C}; D = 0$$

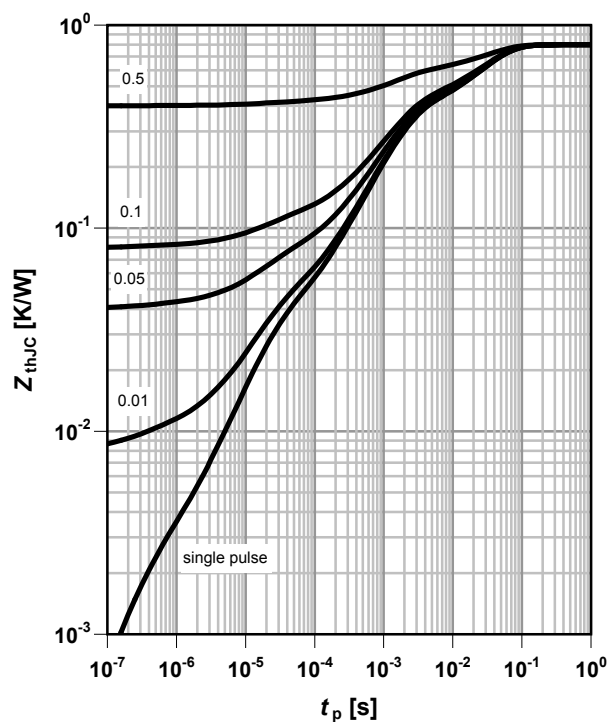
parameter:  $t_p$



### 4 Max. transient thermal impedance

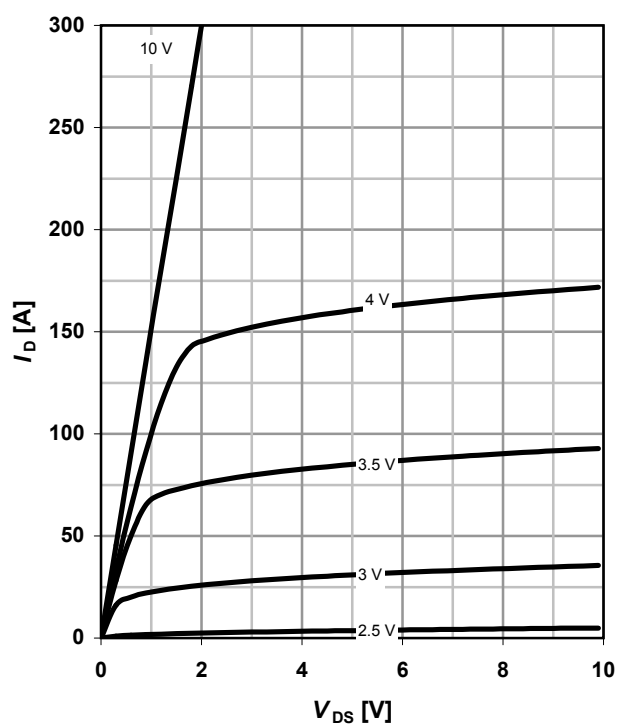
$$Z_{\text{thJC}} = f(t_p)$$

parameter:  $D = t_p/T$



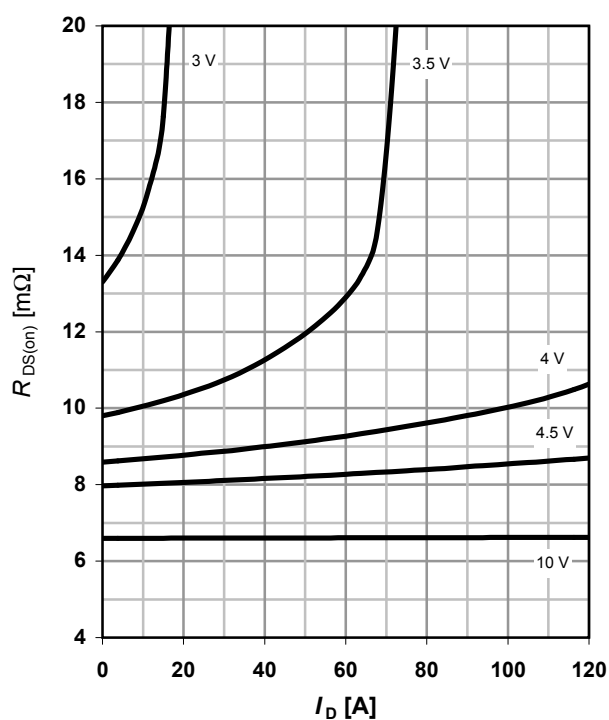
## 5 Typ. output characteristics

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

parameter:  $V_{GS}$ 


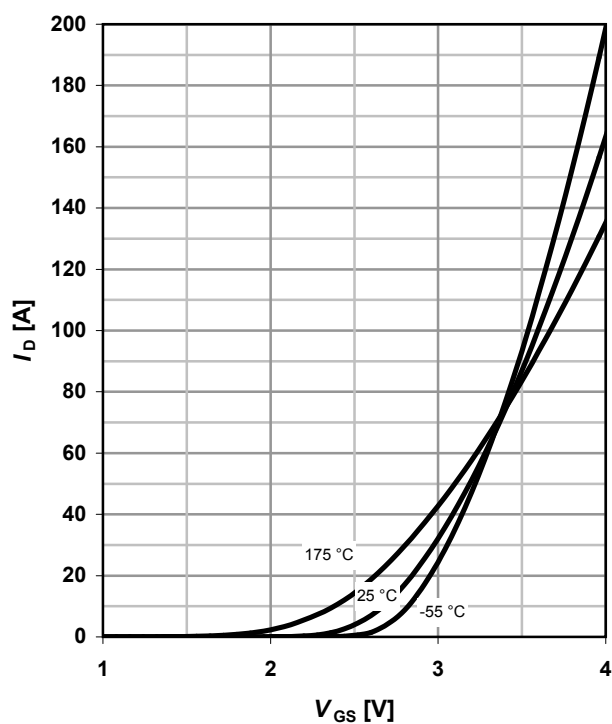
## 6 Typ. drain-source on-state resistance

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

parameter:  $V_{GS}$ 


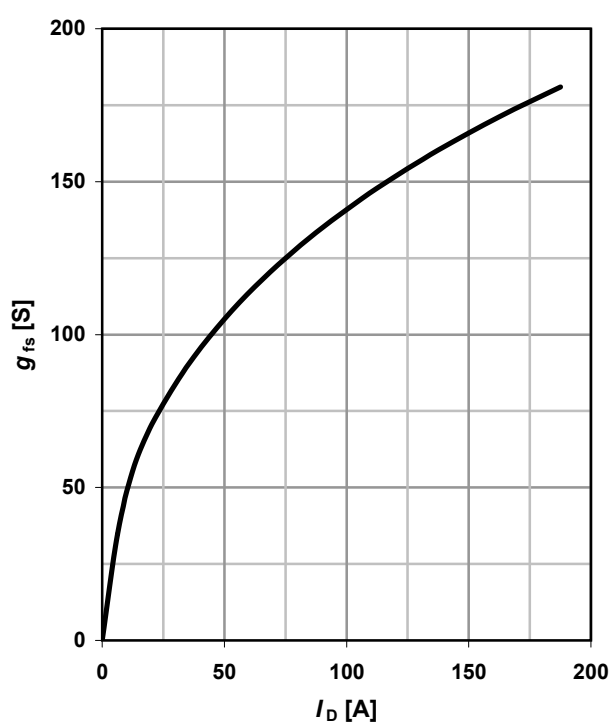
## 7 Typ. transfer characteristics

 $I_D = f(V_{GS}); V_{DS} = 6\text{V}$ 

parameter:  $T_j$ 


## 8 Typ. Forward transconductance

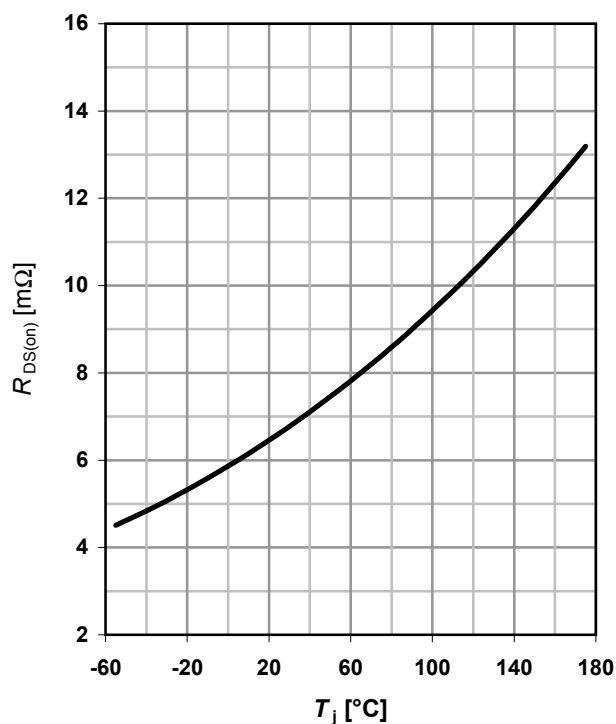
 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$ 

parameter:  $g_{fs}$ 


## 9 Typ. Drain-source on-state resistance

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

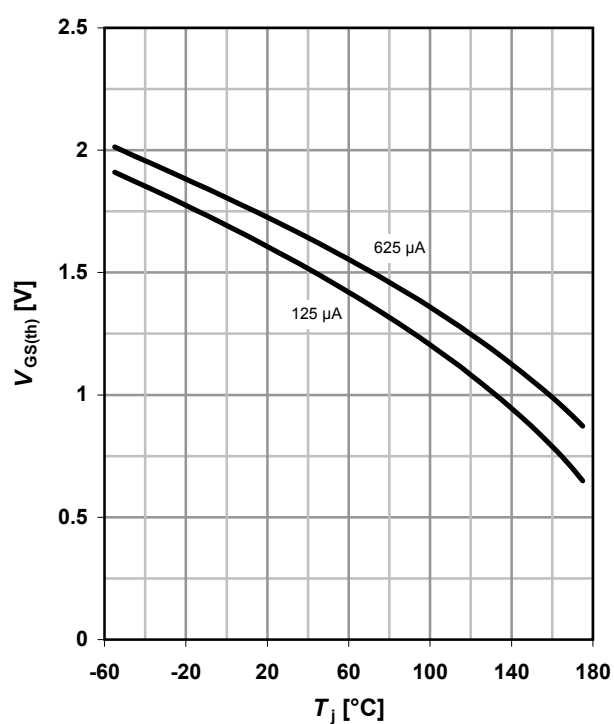
parameter:  $I_D = 80 \text{ A}$ ;  $V_{GS} = 10 \text{ V}$



## 10 Typ. gate threshold voltage

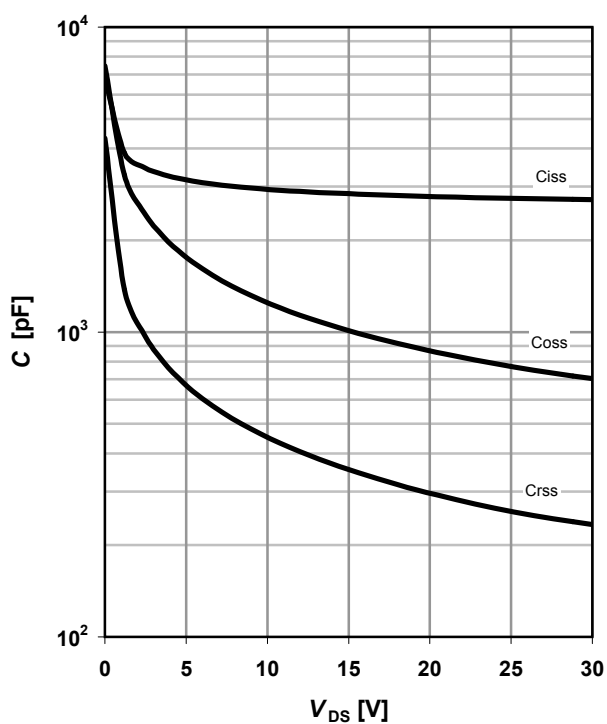
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



## 11 Typ. capacitances

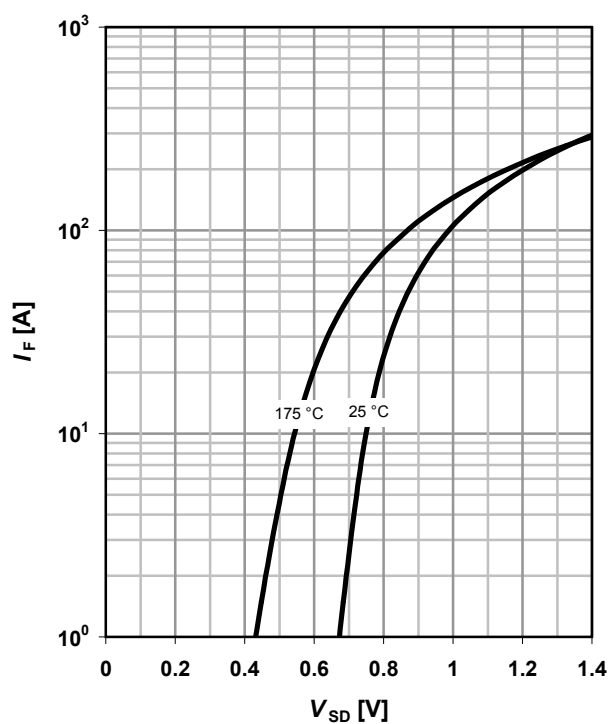
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 12 Typical forward diode characteristics

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

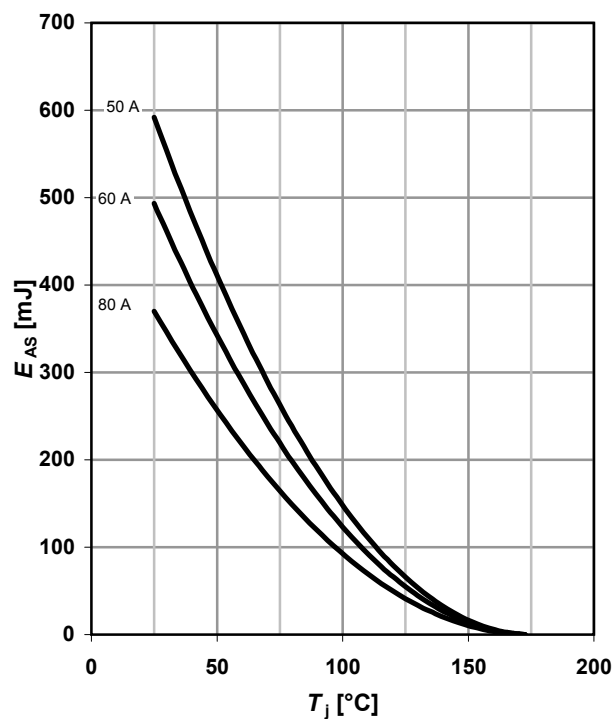
parameter:  $T_j$



### 13 Typical avalanche energy

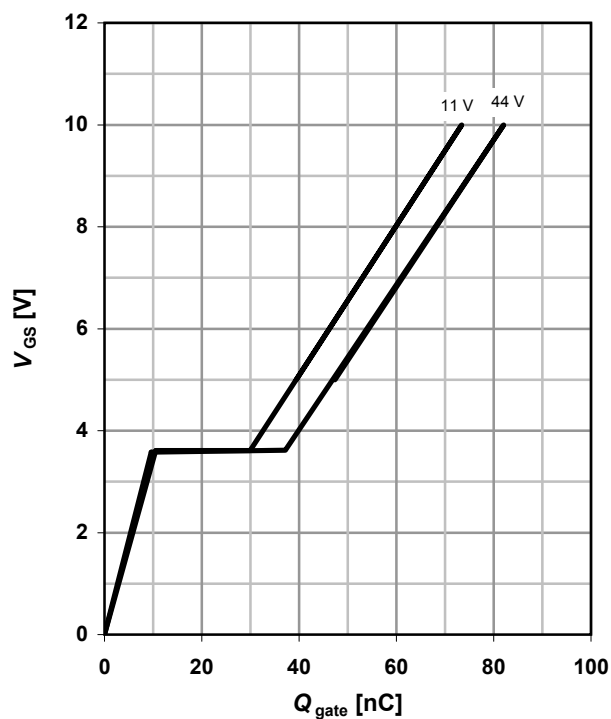
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



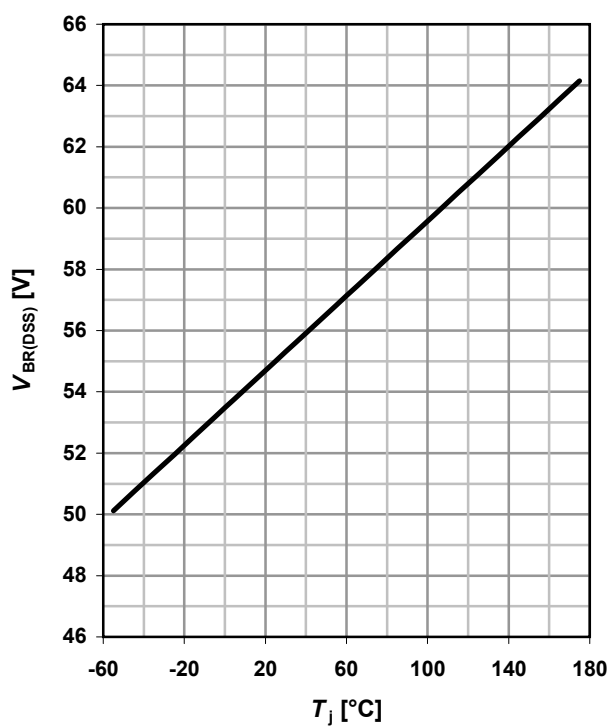
### 14 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 80 \text{ A pulsed}$$

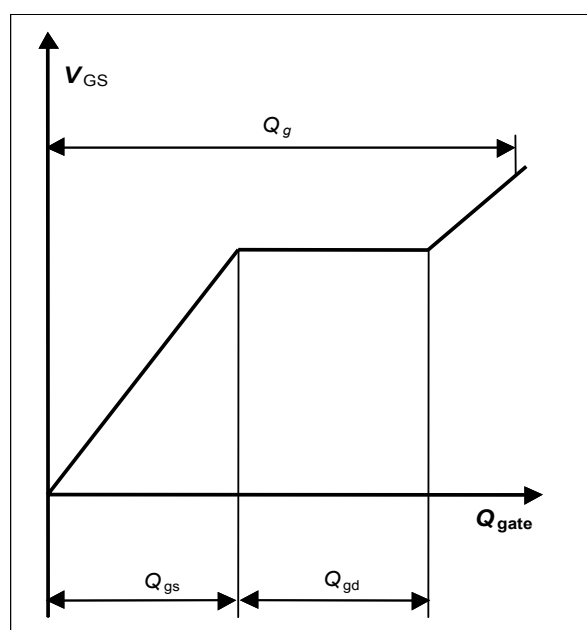


### 15 Typ. drain-source breakdown voltage

$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



### 16 Gate charge waveforms



**Published by**  
**Infineon Technologies AG**  
**St.-Martin-Straße 53**  
**D-81541 München**  
**© Infineon Technologies AG 2004**  
**All Rights Reserved.**

**Attention please!**

The information herein is given to describe certain components and shall not be considered as a guarantee of characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

**Information**

For further information on technology, delivery terms and conditions and prices, please contact your nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com))

**Warnings**

Due to technical requirements, components may contain dangerous substances.

For information on the types in question, please contact your nearest Infineon Technologies Office.

effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.