

## OptiMOS® -T2 Power-Transistor



### Product Summary

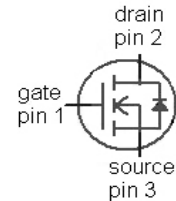
|                                |     |            |
|--------------------------------|-----|------------|
| $V_{DS}$                       | 55  | V          |
| $R_{DS(on),max}$ (SMD version) | 5.6 | m $\Omega$ |
| $I_D$                          | 80  | A          |

### Features

- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested



| Type           | Package      | Marking |
|----------------|--------------|---------|
| IPB80N06S3L-06 | PG-TO263-3-2 | 3N06L06 |
| IPI80N06S3L-06 | PG-TO262-3-1 | 3N06L06 |
| IPP80N06S3L-06 | PG-TO220-3-1 | 3N06L06 |



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

| Parameter                                    | Symbol            | Conditions   | Value        | Unit             |
|--|-------------------|--|--------------|------------------|
| Continuous drain current <sup>1)</sup>       | $I_D$             | $T_C=25\text{ }^\circ\text{C}$ , $V_{GS}=10\text{ V}$        | 80           | A                |
|  |                   | $T_C=100\text{ }^\circ\text{C}$ ,<br>$V_{GS}=10\text{ V}^2)$ | 80           |                  |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$     | $T_C=25\text{ }^\circ\text{C}$                               | 320          |                  |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$          | $I_D=40\text{ A}$  | 455          | mJ               |
| Avalanche current, single pulse              | $I_{AS}$          |  | 80           | A                |
| Gate source voltage <sup>3)</sup>            | $V_{GS}$          |  | $\pm 16$     | V                |
| Power dissipation                            | $P_{tot}$         | $T_C=25\text{ }^\circ\text{C}$                               | 136          | W                |
| Operating and storage temperature            | $T_j$ , $T_{stg}$ |  | -55 ... +175 | $^\circ\text{C}$ |
| IEC climatic category; DIN IEC 68-1          |                   |  | 55/175/56    |                  |

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

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

|  |            |  |   |   |     |     |
|--|------------|--|---|---|-----|-----|
| Thermal resistance, junction - case            | $R_{thJC}$ |  | - | - | 1.1 | 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>4)</sup> | - | - | 40  |     |

**Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , 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           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=80\text{ }\mu\text{A}$                                  | 1.2 | 1.7  | 2.2  |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$       | -   | 0.01 | 1    | $\mu\text{A}$ |
|                                  |               | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}^{2)}$ | -   | 1    | 100  |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=16\text{ V}, V_{DS}=0\text{ V}$                                     | -   | 1    | 100  | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=5\text{ V}, I_D=38\text{ A}$  | -   | 8.3  | 10.4 | m $\Omega$    |
|                                  |               | $V_{GS}=5\text{ V}, I_D=38\text{ A},$<br>SMD version                        | -   | 8.0  | 10.1 |               |
|                                  |               | $V_{GS}=10\text{ V}, I_D=56\text{ A}$                                       | -   | 4.9  | 5.9  |               |
|                                  |               | $V_{GS}=10\text{ V}, I_D=56\text{ A},$<br>SMD version                       | -   | 4.6  | 5.6  |               |

| 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>$f=1\text{ MHz}$                           | - | 9417 | - | pF |
| Output capacitance           | $C_{oss}$    |  | - | 1181 | - |    |
| Reverse transfer capacitance | $C_{rss}$    |  | - | 1127 | - |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=27.5\text{ V},$<br>$V_{GS}=10\text{ V}, I_D=80\text{ A},$<br>$R_G=3.5\ \Omega$ | - | 20   | - | ns |
| Rise time                    | $t_r$        |  | - | 43   | - |    |
| Turn-off delay time          | $t_{d(off)}$ |  | - | 55   | - |    |
| Fall time                    | $t_f$        |  | - | 39   | - |    |

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

|                       |               |  |   |     |     |    |
|-----------------------|---------------|--|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=11\text{ V}, I_D=80\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 44  | -   | nC |
| Gate to drain charge  | $Q_{gd}$      |  | - | 24  | -   |    |
| Gate charge total     | $Q_g$         |  | - | 131 | 196 |    |
| Gate plateau voltage  | $V_{plateau}$ |  | - | 4.4 | -   | V  |

**Reverse Diode**

|  |               |   |     |     |     |    |
|--|---------------|---|-----|-----|-----|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | -   | -   | 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>$T_j=25\text{ }^\circ\text{C}$ | 0.6 | 0.9 | 1.3 | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=27.5\text{ V}, I_F=I_S,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$     | -   | 55  | -   | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |   | -   | 70  | -   |    |

<sup>1)</sup> Current is limited by bondwire; with an  $R_{thJC} = 1.1\text{ K/W}$  the chip is able to carry 114 A at 25°C. For detailed information see Application Note ANPS071E

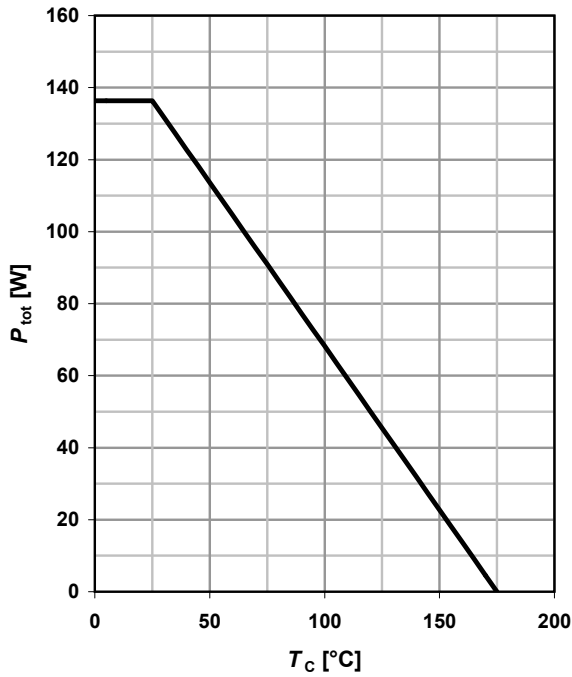
<sup>2)</sup> Defined by design. Not subject to production test.

<sup>3)</sup> Qualified at -5V and +16V.

<sup>4)</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.

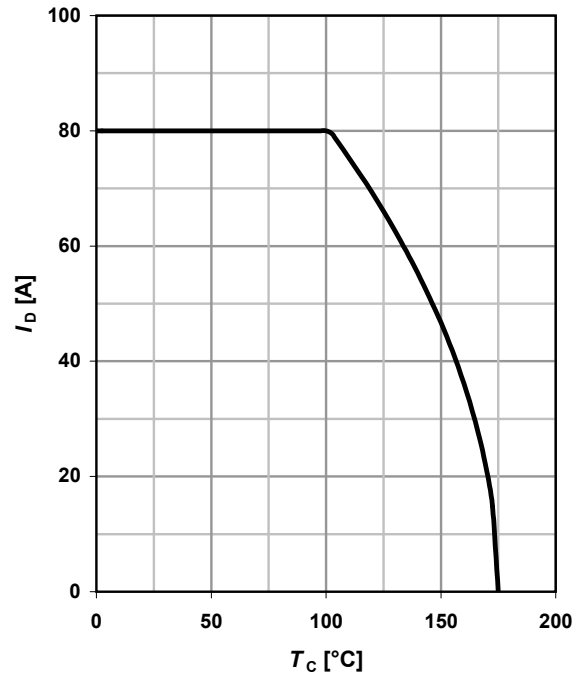
### 1 Power dissipation

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



### 2 Drain current

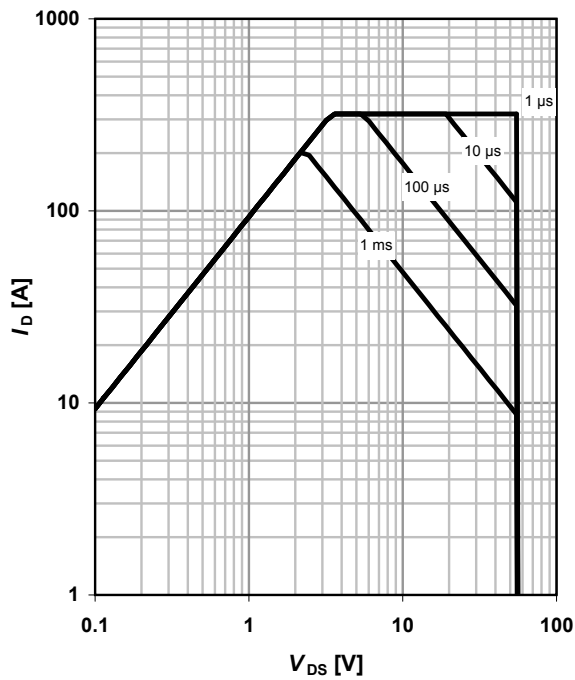
$$I_D = f(T_C); V_{\text{GS}} \geq 4 \text{ V}$$



### 3 Safe operating area

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

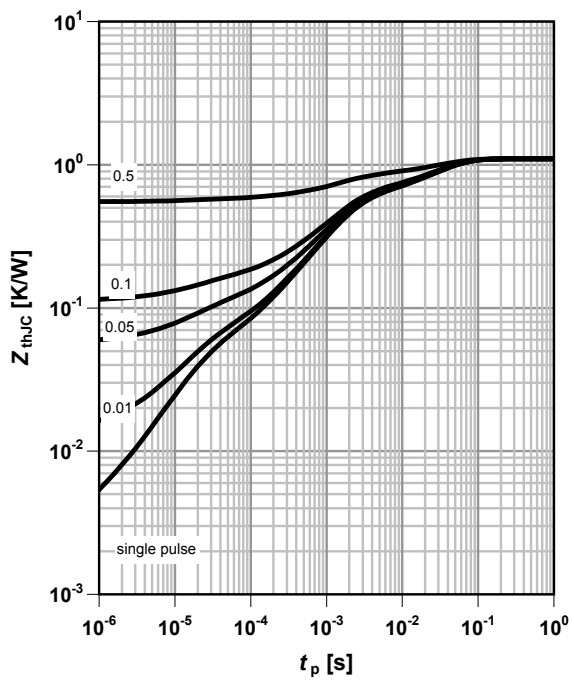
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

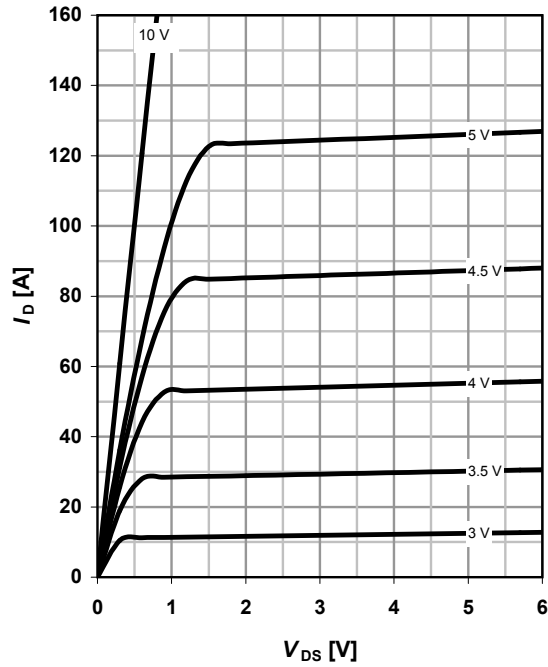
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

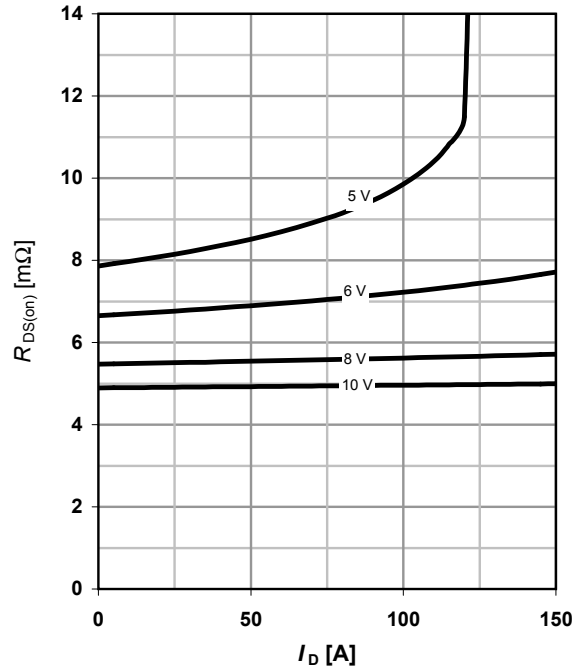
parameter:  $V_{GS}$



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

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

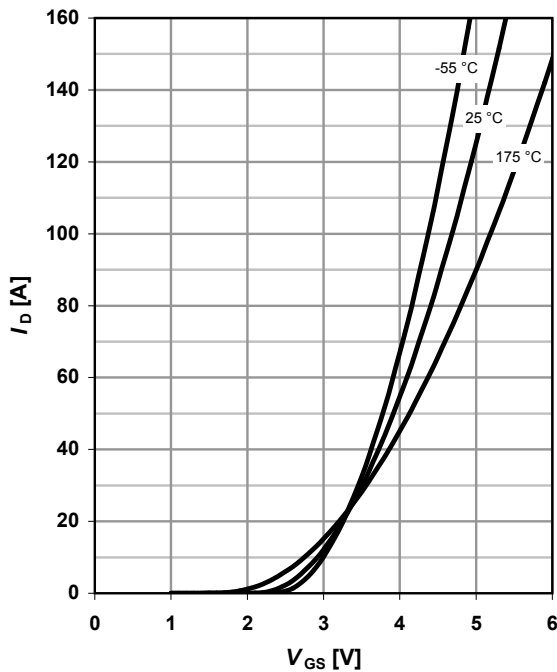
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

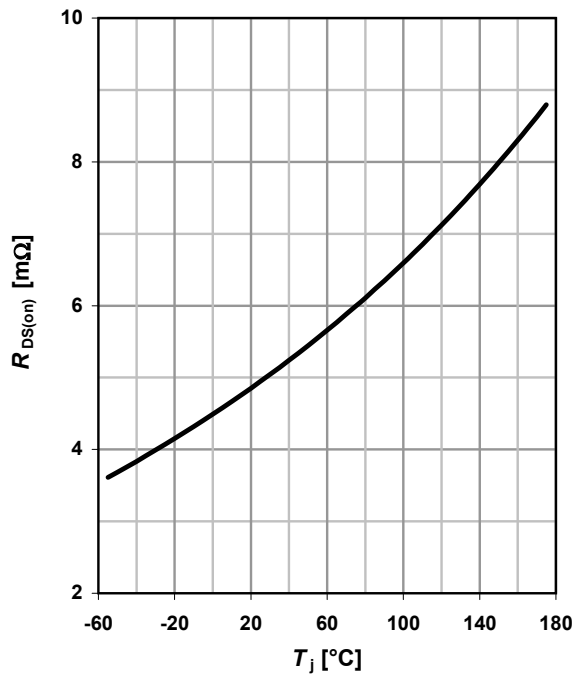
$I_D = f(V_{GS}); V_{DS} = 4\text{ V}$

parameter:  $T_j$



**8 Typ. drain-source on-state resistance**

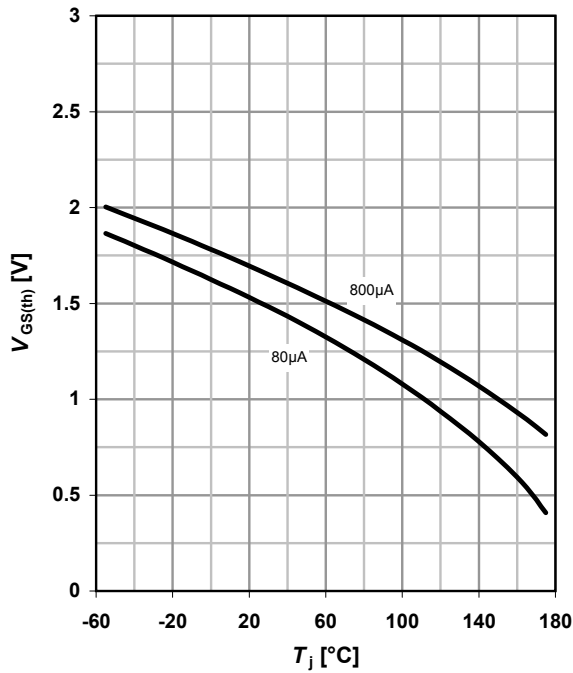
$R_{DS(on)} = f(T_j); I_D = 80\text{ A}; V_{GS} = 10\text{ V}$



**9 Typ. gate threshold voltage**

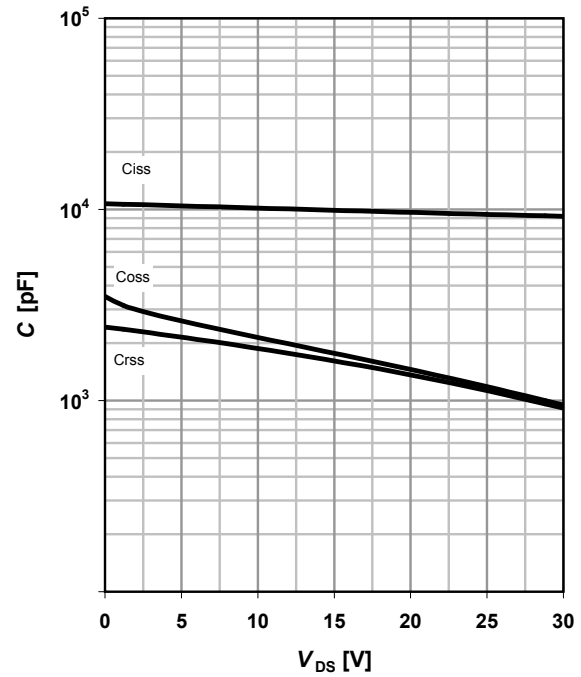
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



**10 Typ. capacitances**

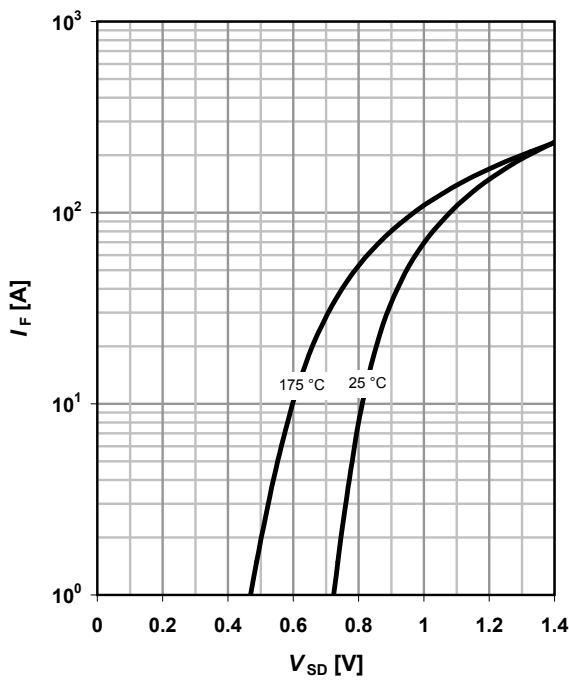
$$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$$



**11 Typical forward diode characteristics**

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

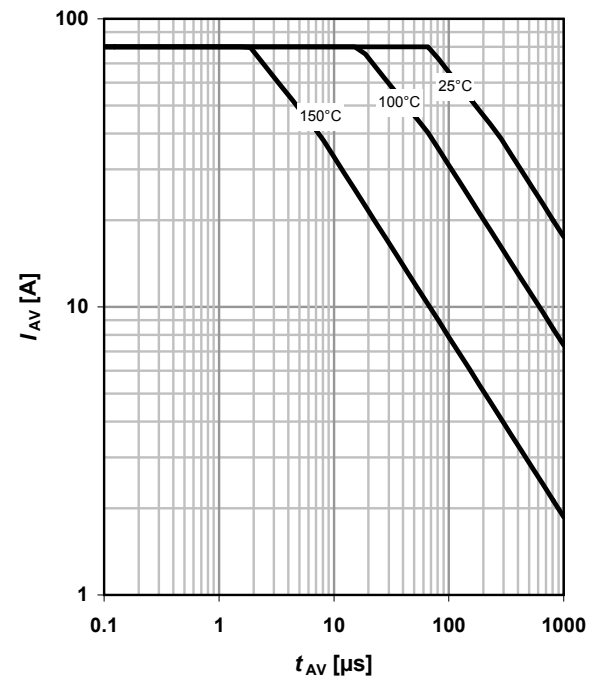
parameter:  $T_j$



**12 Typ. avalanche characteristics**

$$I_{AV} = f(t_{AV})$$

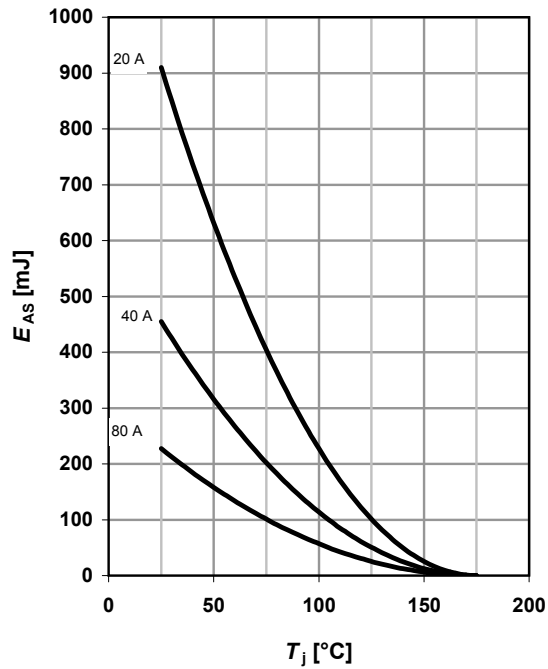
parameter:  $T_{j(start)}$



### 13 Typical avalanche Energy

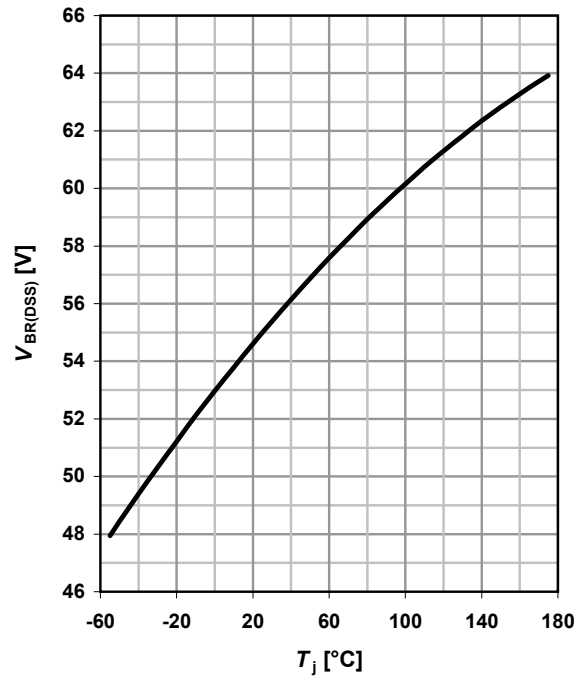
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



### 14 Drain-source breakdown voltage

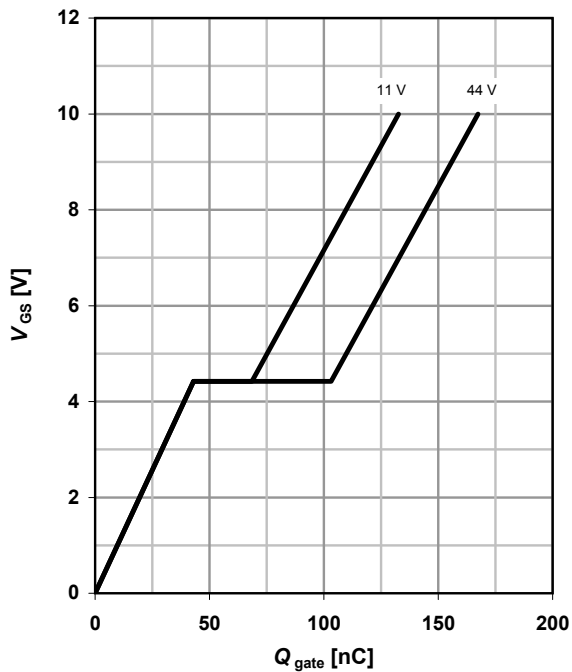
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



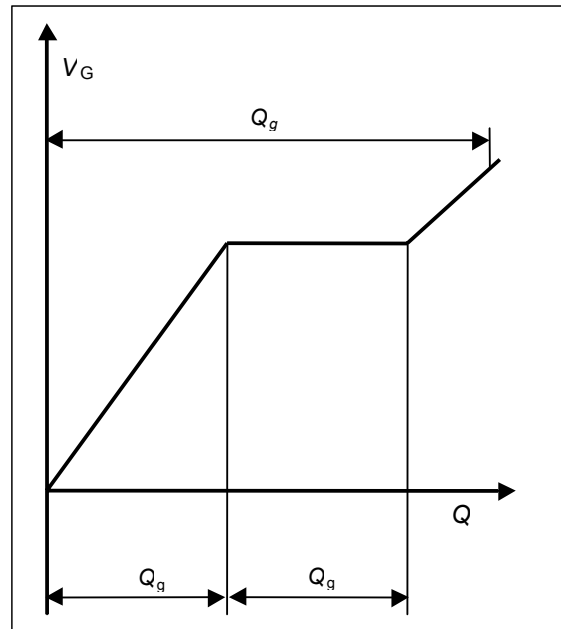
### 15 Typ. gate charge

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

parameter:  $V_{DD}$



### 16 Gate charge waveforms



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Revision History

| Version        | Date       | Changes   |
|----------------|------------|---|
| Data Sheet 2.1 | 15.12.2006 | Removal of ordering code                                    |
| Data Sheet 2.1 | 15.12.2006 | Update of Infineon Logo                                     |
| Data Sheet 2.1 | 15.12.2006 | Implementation of avalanche current single pulse            |
| Data Sheet 2.1 | 15.12.2006 | Removal of ESD class  |
| Data Sheet 2.1 | 15.12.2006 | Update of Infineon address                                  |
| Data Sheet 2.1 | 15.12.2006 | Removal of foot note 3, avalanche diagrams                  |
| Data Sheet 2.1 | 15.12.2006 | Update of Qrr and trr typ                                   |
| Data Sheet 2.1 | 15.12.2006 | Update of disclaimer  |
| Data Sheet 2.1 | 15.12.2006 | Implementation of RoHS and AEC logo, update of feature list |
| Data Sheet 1.1 | 07.11.2007 | Update of data sheet layout                                 |
| Data Sheet 1.1 | 07.11.2007 | Adaptation of Ias   |
| Data Sheet 1.1 | 07.11.2007 | implementation of footnote 2 for Eas specification          |
| Data Sheet 1.1 | 07.11.2007 | removal of Vdg specification from data sheet                |