

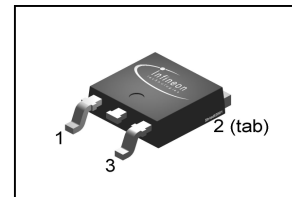
**OptiMOS<sup>®</sup> -T Power-Transistor**

**Features**

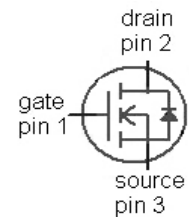
- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

**Product Summary**

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | 100 | V  |
| $R_{DS(on),max}$ | 26  | mΩ |
| $I_D$            | 35  | A  |

**PG-TO252-3-11**


| Type           | Package       | Marking |
|----------------|---------------|---------|
| IPD35N10S3L-26 | PG-TO252-3-11 | 3N10L26 |


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

| Parameter                                    | Symbol         | Conditions                                  | Value        | Unit |
|--|----------------|---|--------------|------|
| Continuous drain current                     | $I_D$          | $T_C=25\text{ °C}, V_{GS}=10\text{V}$       | 35           | A    |
|  |                | $T_C=100\text{ °C}, V_{GS}=10\text{V}^{1)}$ | 25           |      |
| Pulsed drain current <sup>1)</sup>           | $I_{D,pulse}$  | $T_C=25\text{ °C}$                          | 140          |      |
| Avalanche energy, single pulse <sup>1)</sup> | $E_{AS}$       | $I_D=17\text{A}$                            | 175          | mJ   |
| Avalanche current, single pulse              | $I_{AS}$       |   | 35           | A    |
| Gate source voltage <sup>2)</sup>            | $V_{GS}$       |   | ±20          | V    |
| Power dissipation                            | $P_{tot}$      | $T_C=25\text{ °C}$                          | 71           | W    |
| Operating and storage temperature            | $T_j, T_{stg}$ |   | -55 ... +175 | °C   |
| IEC climatic category; DIN IEC 68-1          |                |   | 55/175/56    |      |

| Parameter                                   | Symbol     | Conditions                                   | Values |      |      | Unit |
|---|------------|--|--------|------|------|------|
|   |            |  | min.   | typ. | max. |      |
| <b>Thermal characteristics<sup>1)</sup></b> |            |  |        |      |      |      |
| Thermal resistance, junction - case         | $R_{thJC}$ |  | -      | -    | 2.1  | K/W  |
| SMD version, device on PCB                  | $R_{thJA}$ | minimal 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

#### Static characteristics

|                                  |               |   |     |      |      |               |
|----------------------------------|---------------|---|-----|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=1\text{mA}$                         | 100 | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=39\mu\text{A}$                  | 1.2 | 1.7  | 2.4  |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=80V, V_{GS}=0V, T_j=25^\circ\text{C}$       | -   | 0.01 | 0.1  | $\mu\text{A}$ |
|                                  |               | $V_{DS}=80V, V_{GS}=0V, T_j=125^\circ\text{C}^{1)}$ | -   | 1    | 10   |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20V, V_{DS}=0V$                             | -   | -    | 100  | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=4.5V, I_D=35\text{A}$                       | -   | 24.5 | 31.9 | m $\Omega$    |
|                                  |               | $V_{GS}=10\text{V}, I_D=35\text{A}$                 | -   | 20.0 | 24.0 |               |

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

**Dynamic characteristics<sup>1)</sup>**

|                              |              |   |   |      |      |    |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0V, V_{DS}=25V,$<br>$f=1MHz$                  | - | 2070 | 2700 | pF |
| Output capacitance           | $C_{oss}$    |   | - | 460  | 600  |    |
| Reverse transfer capacitance | $C_{rss}$    |   | - | 50   | 75   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=20V, V_{GS}=10V,$<br>$I_D=35A, R_G=3.5\Omega$ | - | 6    | -    | ns |
| Rise time                    | $t_r$        |   | - | 4    | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |   | - | 18   | -    |    |
| Fall time                    | $t_f$        |   | - | 3    | -    |    |

**Gate Charge Characteristics<sup>1)</sup>**

|                       |               |   |   |     |    |    |
|-----------------------|---------------|---|---|-----|----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=80V, I_D=35A,$<br>$V_{GS}=0$ to 10V | - | 8   | 10 | nC |
| Gate to drain charge  | $Q_{gd}$      |   | - | 5   | 8  |    |
| Gate charge total     | $Q_g$         |   | - | 30  | 39 |    |
| Gate plateau voltage  | $V_{plateau}$ |   | - | 3.7 | -  | V  |

**Reverse Diode**

|  |               |   |     |     |     |    |
|--|---------------|---|-----|-----|-----|----|
| Diode continuous forward current <sup>1)</sup> | $I_S$         | $T_C=25^\circ C$                            | -   | -   | 35  | A  |
| Diode pulse current <sup>1)</sup>              | $I_{S,pulse}$ |   | -   | -   | 140 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0V, I_F=35A,$<br>$T_j=25^\circ C$   | 0.6 | 1   | 1.2 | V  |
| Reverse recovery time <sup>1)</sup>            | $t_{rr}$      | $V_R=50V, I_F=I_S,$<br>$di_F/dt=100A/\mu s$ | -   | 79  | -   | ns |
| Reverse recovery charge <sup>1)</sup>          | $Q_{rr}$      |   | -   | 150 | -   | nC |

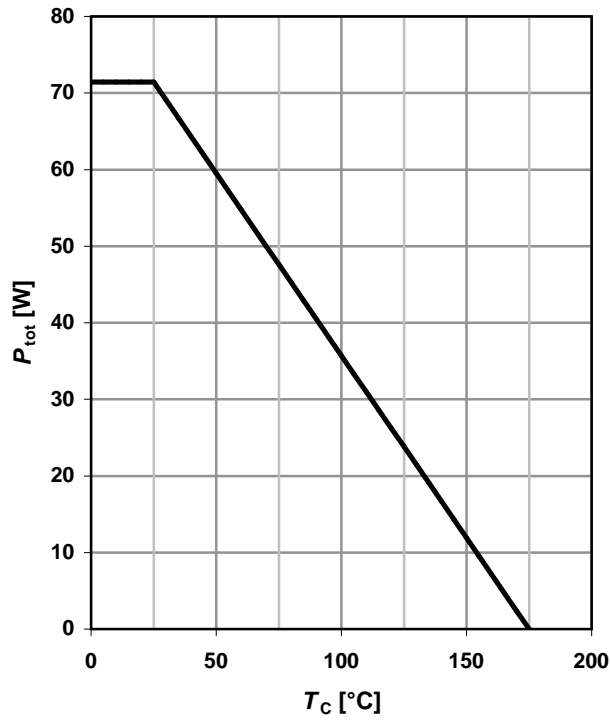
<sup>1)</sup> Defined by design. Not subject to production test.

<sup>2)</sup> Qualified with  $V_{GS} = +20/-5V$ .

<sup>3)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection. PCB is vertical in still air.

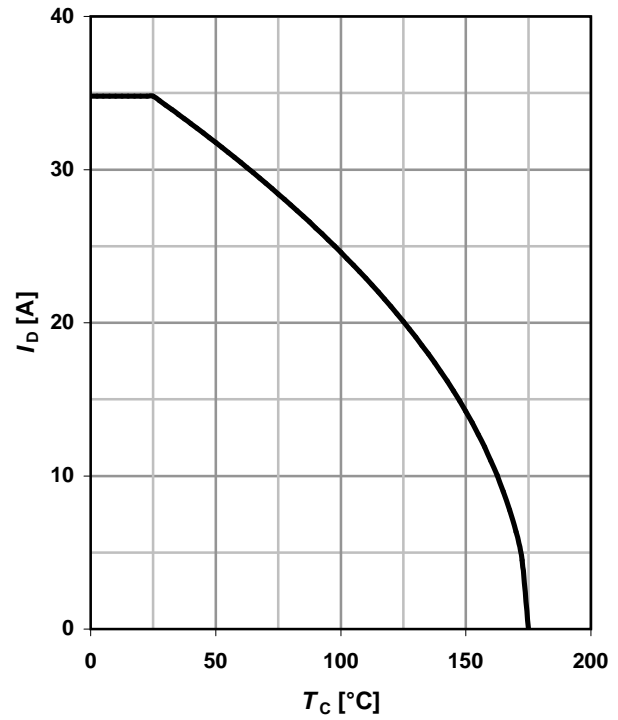
**1 Power dissipation**

$P_{tot} = f(T_C); V_{GS} \geq 6 \text{ V}$



**2 Drain current**

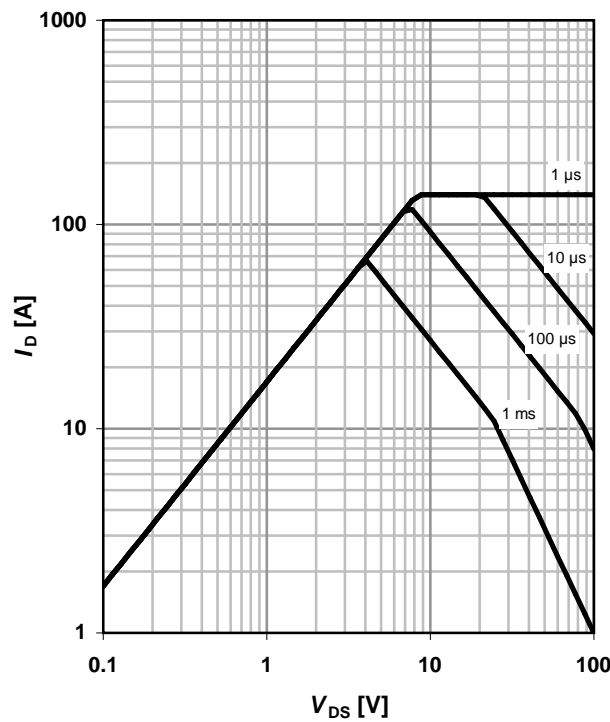
$I_D = f(T_C); V_{GS} \geq 6 \text{ V}$



**3 Safe operating area**

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

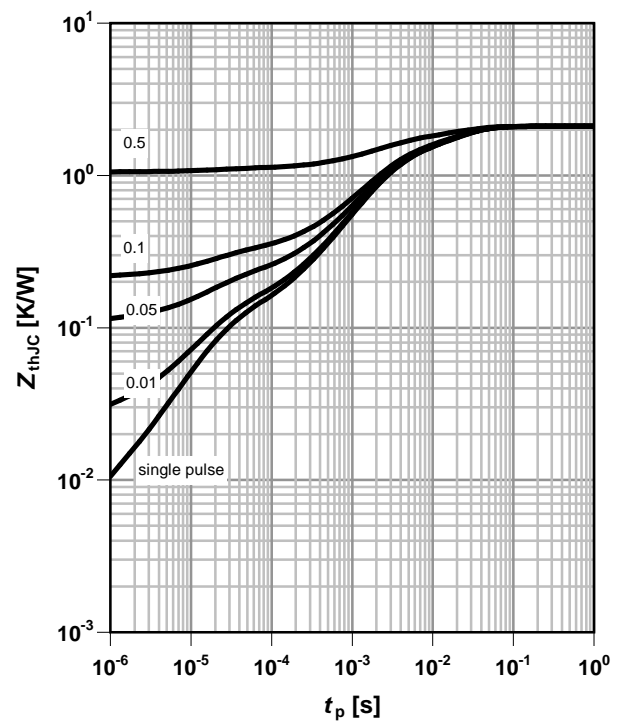
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

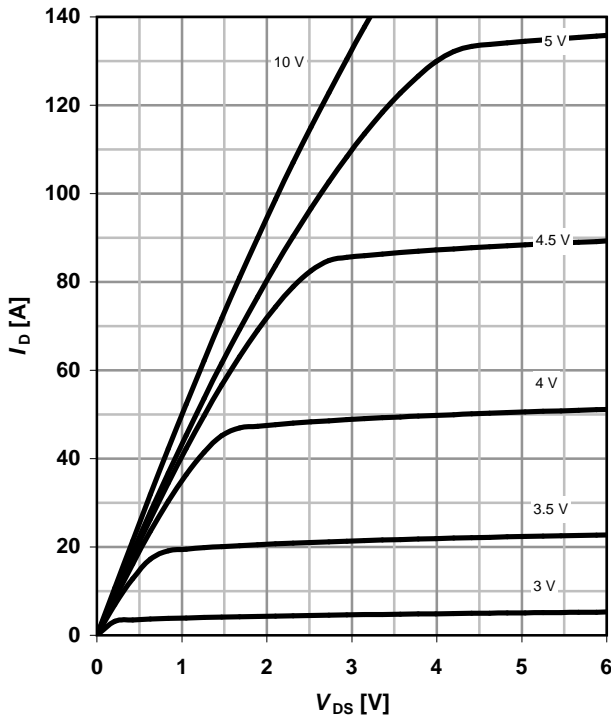
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

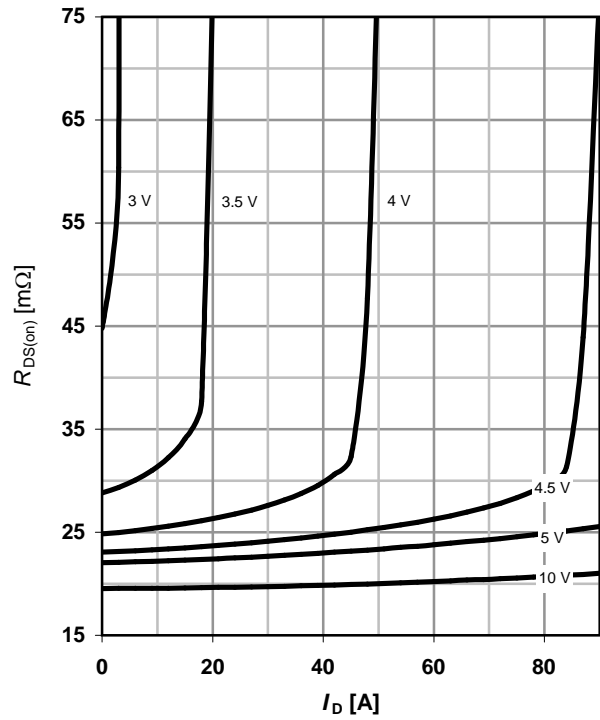
parameter:  $V_{GS}$



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

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

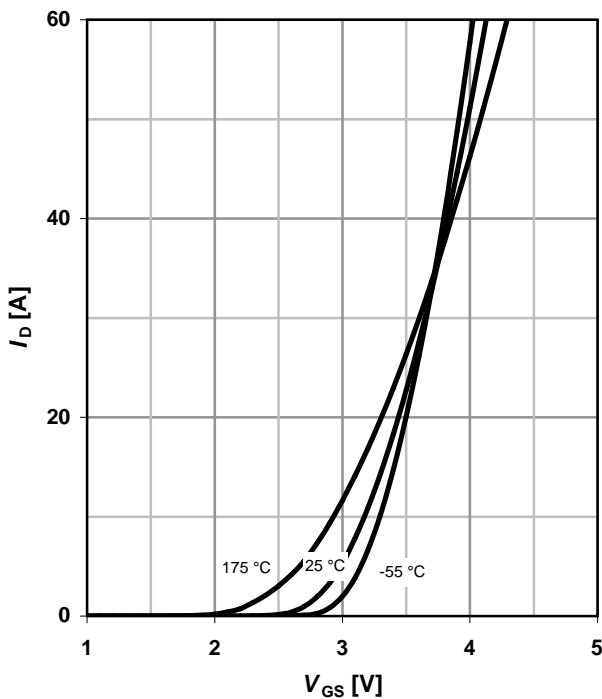
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

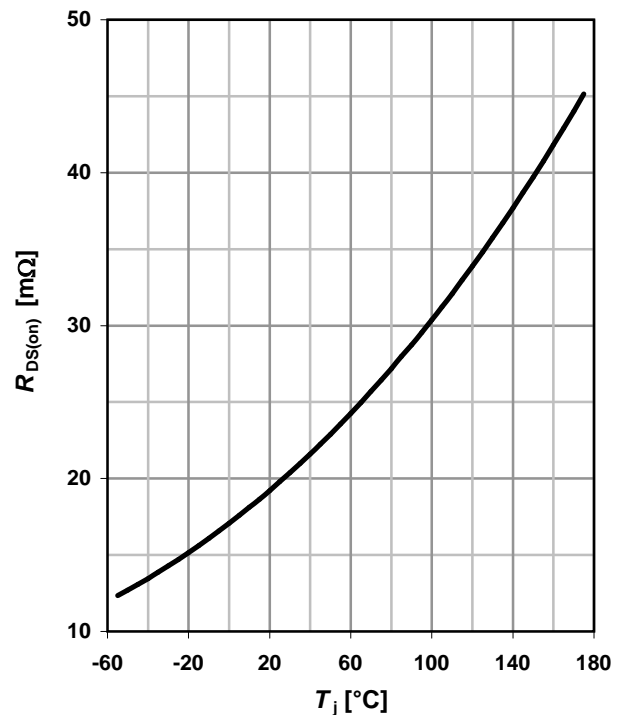
$I_D = f(V_{GS}); V_{DS} = 6V$

parameter:  $T_j$



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

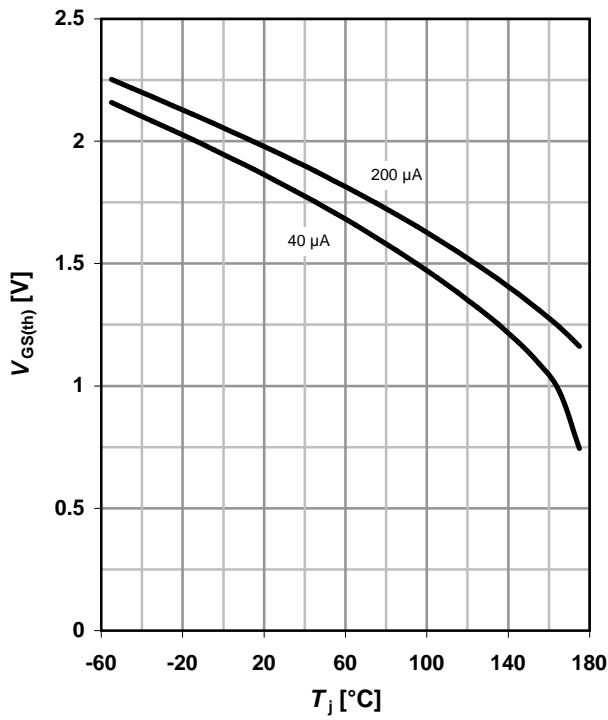
$R_{DS(on)} = f(T_j); I_D = 30\text{ A}; V_{GS} = 10\text{ V}$



**9 Typ. gate threshold voltage**

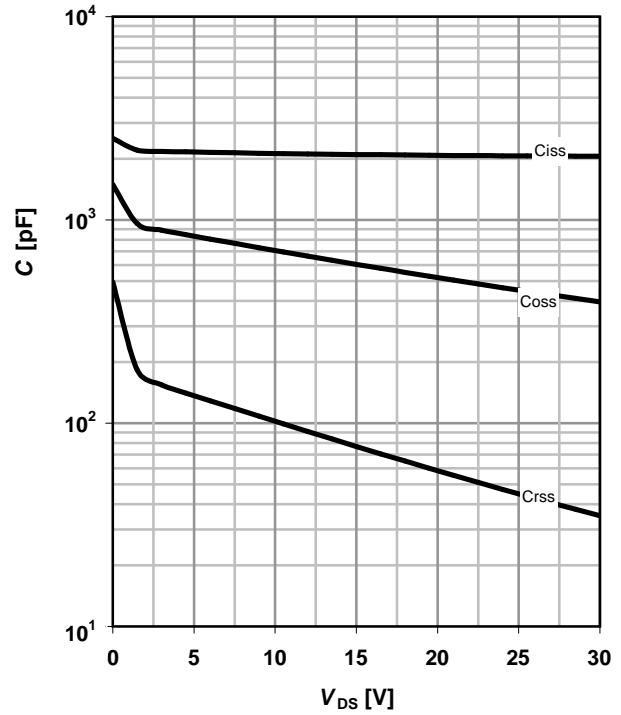
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**10 Typ. capacitances**

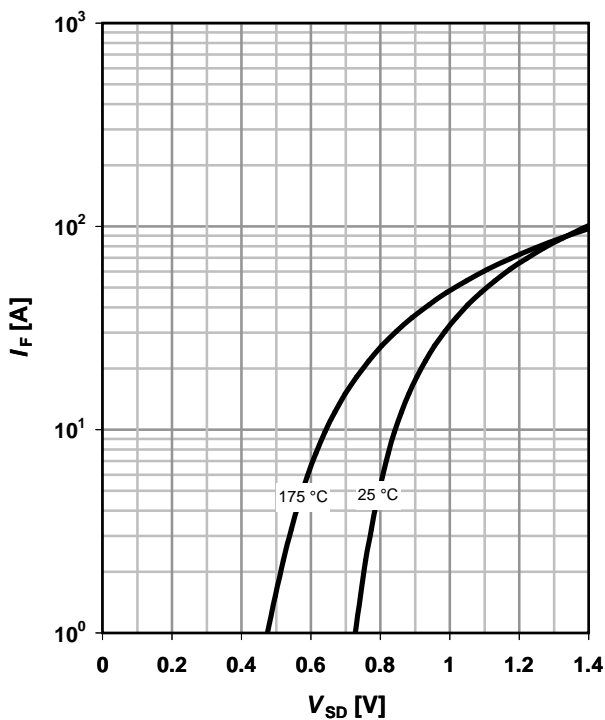
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$



**11 Typical forward diode characteristics**

$I_F = f(V_{SD})$

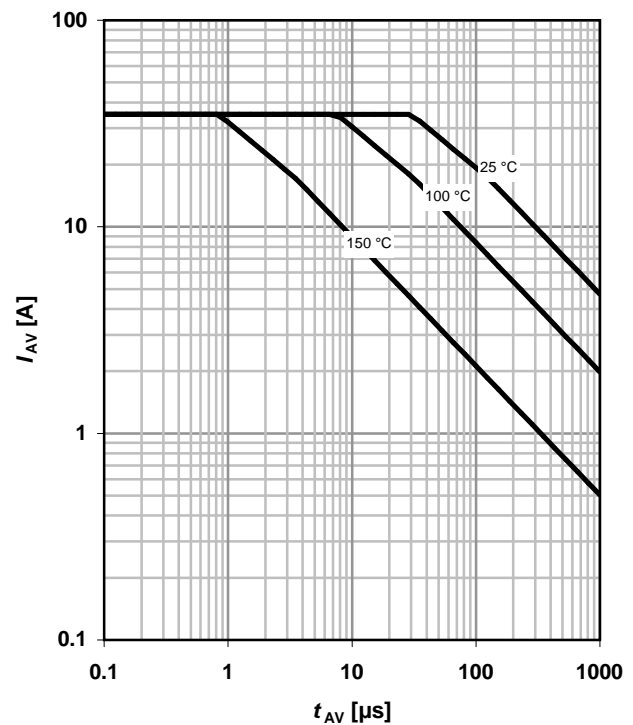
parameter:  $T_j$



**12 Typ. avalanche characteristics**

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

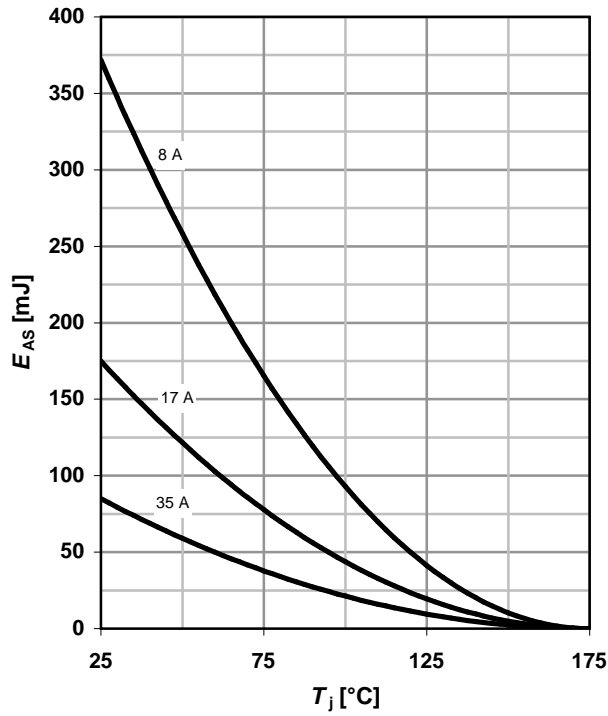
parameter:  $T_{j(start)}$



**13 Typical avalanche energy**

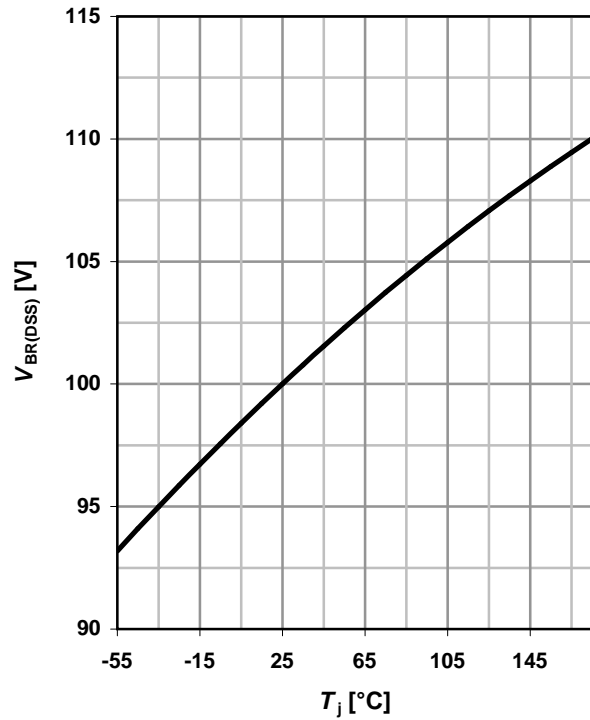
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



**14 Typ. drain-source breakdown voltage**

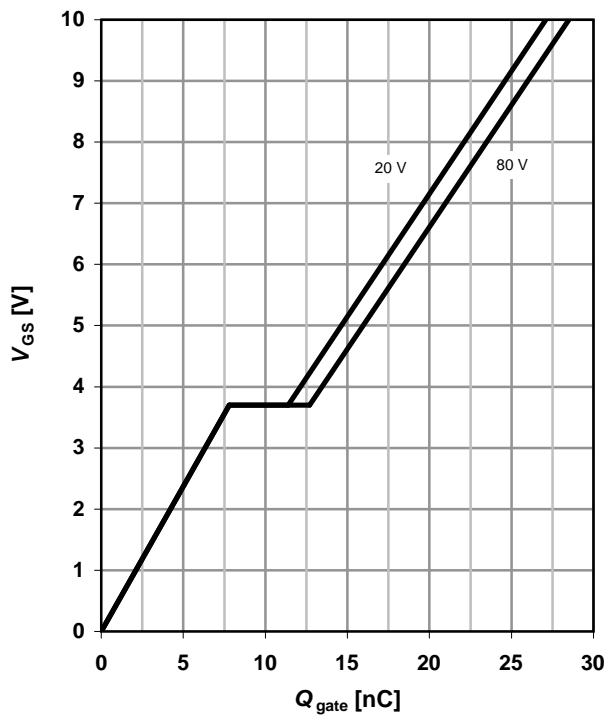
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



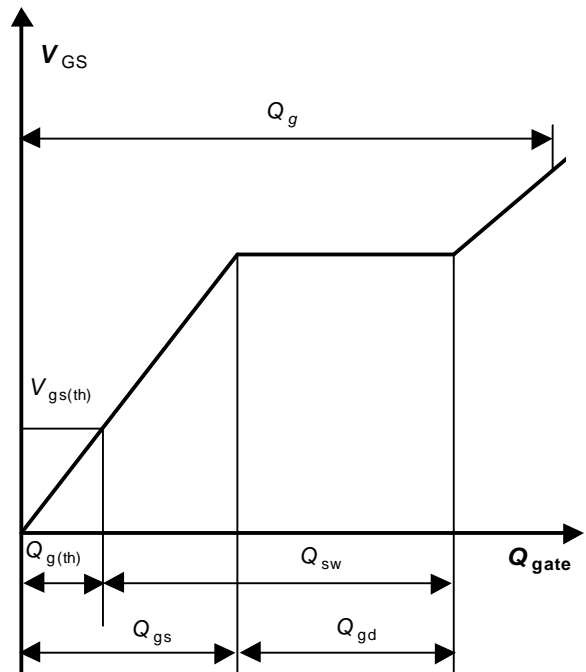
**15 Typ. gate charge**

$$V_{GS} = f(Q_{gate}); I_D = 35 \text{ A pulsed}$$

parameter:  $V_{DD}$



**16 Gate charge waveforms**



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## Revision History

| Version | Date       | Changes                 |
|---------|------------|-------------------------|
| Rev 1.0 | 21.04.2008 | final data sheet        |
| Rev 1.1 | 17.05.2011 | $I_{D,pulse}$ corrected |
|         |            |                         |
|         |            |                         |
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