## Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain source voltage | $V_{DS}$ | 49 | V |
| Drain-gate voltage, $R_{GS}$ = 20 kΩ | $V_{DGR}$ | 49 | |
| Gate source voltage | $V_{GS}$ | ±20 | |
| Nominal load current (ISO 10483)<br>$V_{GS}$ = 4.5 V, $V_{DS} \leq$ 0.5 V, $T_C$ = 85 °C<br>$V_{GS}$ = 10 V, $V_{DS} \leq$ 0.5 V, $T_C$ = 85 °C | $I_{D(ISO)}$ | <br>36<br>52 | A |
| Continuous drain current [1)]<br>$T_C$ = 100 °C, $V_{GS}$ = 4.5V | $I_D$ | 80 | |
| Pulsed drain current | $I_{D\ puls}$ | 320 | |
| Avalanche energy, single pulse<br>$I_D$ = 36 A, $R_{GS}$ = 25 Ω | $E_{AS}$ | 2 | J |
| Power dissipation<br>$T_C$ = 25 °C | $P_{tot}$ | 300 | W |
| Operating temperature [2)] | $T_j$ | -40 ...+175 | °C |
| Peak temperature ( single event ) | $T_{jpeak}$ | 200 | |
| Storage temperature | $T_{stg}$ | -55 ... +150 | |
| DIN humidity category, DIN 40 040 | | E | |
| IEC climatic category; DIN IEC 68-1 | | 40/150/56 | |

[1]current limited by bond wire

[2]Note: Thermal trip temperature of temperature sensor is below 175°C

## Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Characteristics** | | | | | |
| junction - case: | $R_{thJC}$ | - | - | 0.5 | K/W |
| Thermal resistance @ min. footprint | $R_{th(JA)}$ | - | - | 62 | |
| Thermal resistance @ 6 $cm^2$ cooling area [1)] | $R_{th(JA)}$ | - | 33 | 40 | |

## Electrical Characteristics

| Parameter<br>at $T_j$ = 25°C, unless otherwise specified | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain-source breakdown voltage<br>$V_{GS}$ = 0 V, $I_D$ = 0.25 mA | $V_{(BR)DSS}$ | 49 | - | - | V |
| Gate threshold voltage, $V_{GS}$ = $V_{DS}$<br>$I_D$ = 240 µA | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current<br>$V_{DS}$ = 45 V, $V_{GS}$ = 0 V, $T_j$ = -40 °C<br>$V_{DS}$ = 45 V, $V_{GS}$ = 0 V, $T_j$ = 25 °C<br>$V_{DS}$ = 45 V, $V_{GS}$ = 0 V, $T_j$ = 150 °C | $I_{DSS}$ | <br>-<br>-<br>- | <br>-<br>0.1<br>- | <br>0.1<br>1<br>100 | µA |
| Gate-source leakage current<br>$V_{GS}$ = 20 V, $V_{DS}$ = 0 V, $T_j$ = 25 °C<br>$V_{GS}$ = 20 V, $V_{DS}$ = 0 V, $T_j$ = 150 °C | $I_{GSS}$ | <br>-<br>- | <br>10<br>20 | <br>100<br>100 | nA |
| Drain-Source on-state resistance<br>$V_{GS}$ = 4.5 V, $I_D$ = 36 A<br>$V_{GS}$ = 10 V, $I_D$ = 36 A | $R_{DS(on)}$ | <br>-<br>- | <br>8.2<br>5.8 | <br>9.5<br>6.5 | mΩ |

[1] Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6$cm^2$ (one layer, 70µm thick) copper area for drain connection. PCB mounted vertical without blown air.

## Electrical Characteristics

| Parameter<br>at $T_j$ = 25°C, unless otherwise specified | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | |
| Forward transconductance<br>$V_{DS}$>2*$I_D$*$R_{DS(on)max}$ , $I_D$ = 80 A | $g_{fs}$ | 30 | 70 | - | S |
| Input capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{iss}$ | - | 3850 | 4800 | pF |
| Output capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{oss}$ | - | 1090 | 1357 | |
| Reverse transfer capacitance<br>$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, $f$ = 1 MHz | $C_{rss}$ | - | 570 | 715 | |
| Turn-on delay time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 4.5 V, $I_D$ = 80 A,<br>$R_G$ = 1.3 Ω | $t_{d(on)}$ | - | 30 | 45 | ns |
| Rise time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 4.5 V, $I_D$ = 80 A,<br>$R_G$ = 1.3 Ω | $t_r$ | - | 37 | 56 | |
| Turn-off delay time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 4.5 V, $I_D$ = 80 A,<br>$R_G$ = 1.3 Ω | $t_{d(off)}$ | - | 70 | 105 | |
| Fall time<br>$V_{DD}$ = 30 V, $V_{GS}$ = 4.5 V, $I_D$ = 80 A,<br>$R_G$ = 1.3 Ω | $t_f$ | - | 36 | 55 | |

### Gate Charge Characteristics

| | | | | | |
|---|---|---|---|---|---|
| Gate charge at threshold<br>$V_{DD}$ = 40 V, ID ≥0,1 A , $V_{GS}$ = 0 to 1 V | $Q_{g(th)}$ | - | 3.8 | 5.7 | nC |
| Gate charge at 5.0 V<br>$V_{DD}$ = 40 V, $I_D$ = 80 A, $V_{GS}$ = 0 to 5 V | $Q_{g(5)}$ | - | 92 | 138 | |
| Gate charge total<br>$V_{DD}$ = 40 V, $I_D$ = 80 A, $V_{GS}$ = 0 to 10 V | $Q_{g(total)}$ | - | 155 | 232 | |
| Gate plateau voltage<br>$V_{DD}$ = 40 V, $I_D$ = 80 A | $V_{(plateau)}$ | - | 3.4 | - | V |

## Electrical Characteristics

| Parameter<br>at $T_j$ = 25°C, unless otherwise specified | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Reverse Diode** | | | | | |
| Inverse diode continuous forward current<br>$T_C$ = 25 °C | $I_S$ | 80 | - | - | A |
| Inverse diode direct current,pulsed<br>$T_C$ = 25 °C | $I_{FM}$ | 320 | - | - | |
| Inverse diode forward voltage<br>$V_{GS}$ = 0 V, $I_F$ = 95 A | $V_{SD}$ | - | 1.25 | 1.6 | V |
| Reverse recovery time<br>$V_R$ = 30 V, $I_F$=$I_S$, d$i_F$/d$t$ = 100 A/µs | $t_{rr}$ | - | 105 | 157 | ns |
| Reverse recovery charge<br>$V_R$ = 30 V, $I_F$=$I_S$, d$i_F$/d$t$ = 100 A/µs | $Q_{rr}$ | - | 0.31 | 0.47 | µC |

### Sensor Characteristics

For temperature sensing, i.e. temperature protection, please consider application note "Temperature sense concept - Speed TEMPFET".

For short circuit protection please consider application note "Short circuit behaviour of the Speed TEMPFET family".

All application notes are available at **http://www.infineon.com/tempfet/**

| | | | | | |
|---|---|---|---|---|---|
| Forward voltage<br>$I_{AK(on)}$ = 5 mA, $T_j$ = -40...+150 °C<br>$I_{AK(on)}$ = 1.5 mA, $T_j$ = 150 °C | $V_{AK(on)}$ | <br>-<br>- | <br>1.3<br>- | <br>1.4<br>0.9 | V |
| Sensor override<br>$t_P$ = 100 µs, $T_j$ = -40...+150 °C | | - | - | 10 | |
| Forward current<br>$T_j$ = -40...+150 °C | $I_{AK(on)}$ | - | - | 5 | mA |
| Sensor override<br>$t_P$ = 100 µs, $T_j$ = -40...+150 °C | | - | - | 600 | |

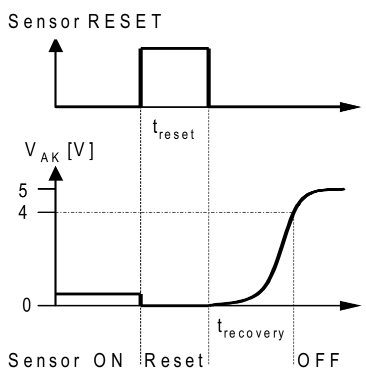
## Electrical Characteristics

| Parameter<br>at $T_j$ = 25°C, unless otherwise specified | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Sensor Characteristics** | | | | | |
| Temperature sensor leakage current<br>$T_j$ = 150 °C | $I_{AK(off)}$ | - | - | 4 | µA |
| Min. reset pulse duration [1]<br>$T_j$ = -40...+150 °C, $I_{AK(on)}$ = 0.3 mA,<br>$V_{AK(Reset)}$<0.5V | $t_{reset}$ | 100 | - | - | µs |
| $V_{AK}$ Recovery time[1][2]<br>$T_j$ = -40...+150 °C, $I_{AK(on)}$ = 0.3 mA | $t_{recovery}$ | - | - | 150 | |

## Characteristics

| | | | | | |
|---|---|---|---|---|---|
| Holding current, $V_{AK(off)}$ = 5V<br>$T_j$ = 25 °C<br>$T_j$ = 150 °C | $I_{AK(hold)}$ | <br>0.05<br>0.05 | <br>-<br>- | <br>0.5<br>0.3 | mA |
| Thermal trip temperature<br>$V_{TS}$ = 5V | $T_{TS(on)}$ | 150 | 160 | 170 | °C |
| Turn-off time (Pin G+A and K+S connected)<br>$V_{TS}$ = 5V, $I_{TS(on)}$ = 2 mA | $t_{off}$ | 0.5 | - | 2.5 | µs |
| Reset voltage<br>$T_j$ = -40...+150°C | $V_{AK(reset)}$ | 0.5 | - | - | V |

### Sensor recovery behaviour:

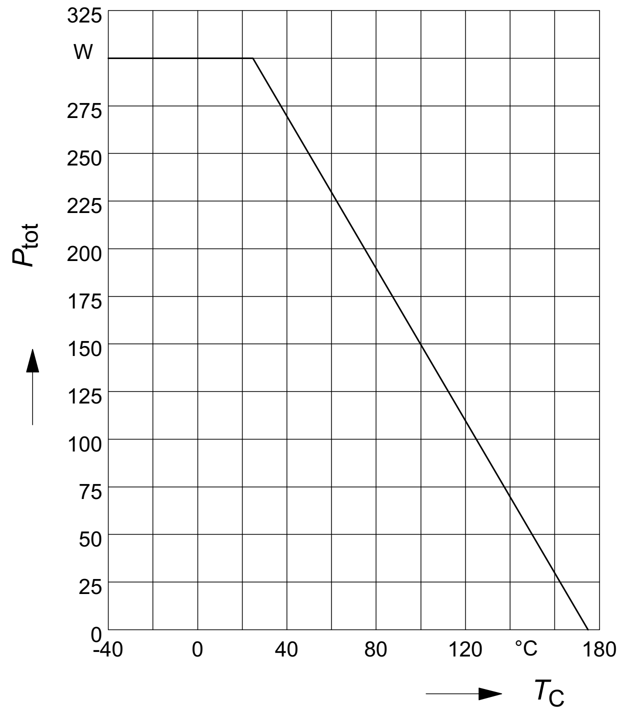



[1] See diagram Sensor recovery behaviour

[2] Time after reset pulse until $V_{AK}$ reaches 4V again

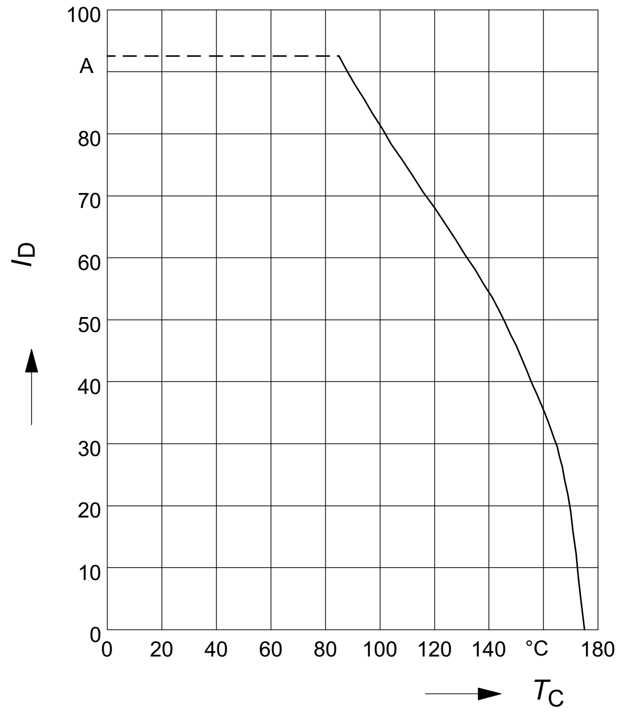
**1 Maximum allowable power dissipation**

$P_{tot} = f(T_C)$




**2 Drain current**

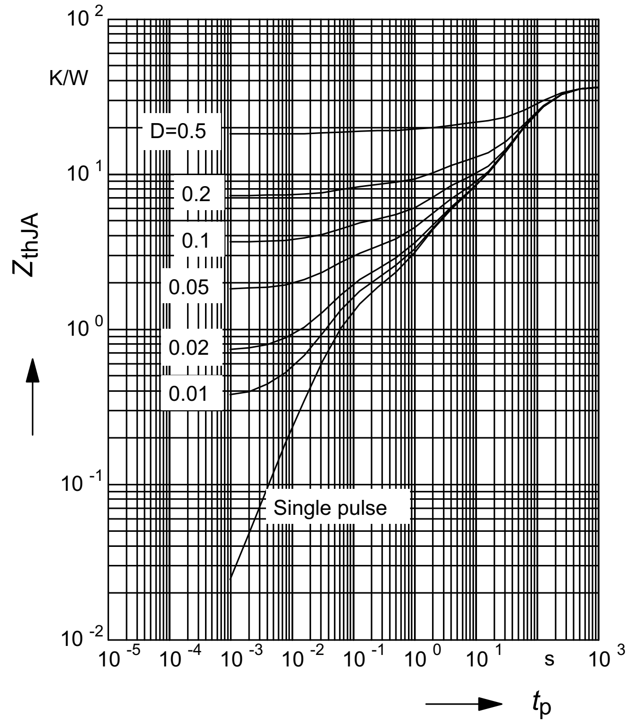
$I_D = f(T_C)$; $V_{GS} \geq 4.5V$




**3 Typ. transient thermal impedance**

**$Z_{thJA}=f(t_p)$ @ 6 cm$^2$ cooling area**

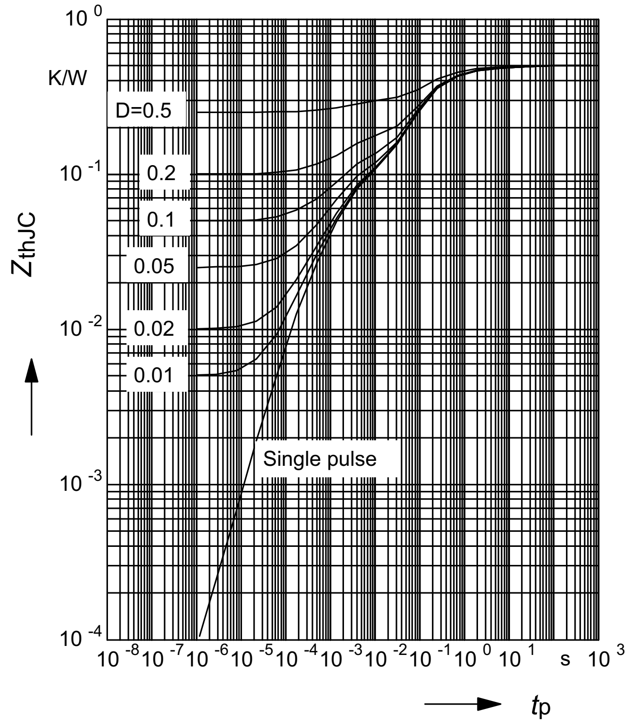
Parameter: $D=t_p/T$




**4 Transient thermal impedance**

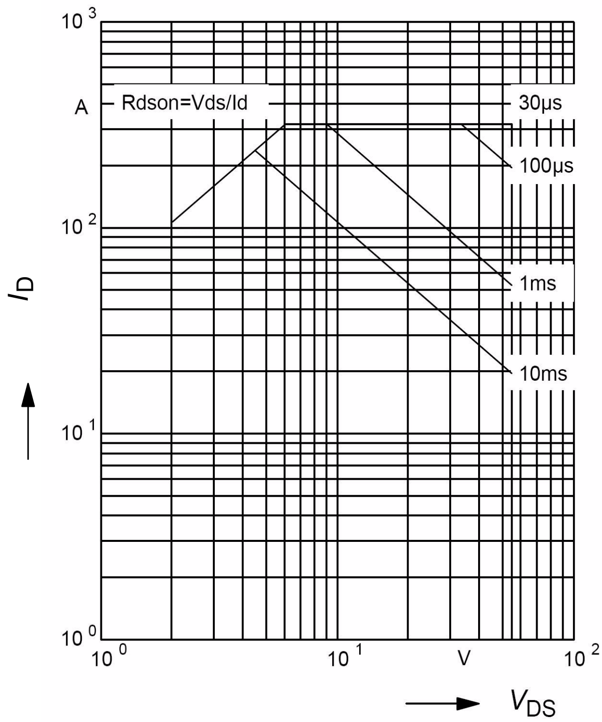
$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$



## 5 Safe operating area

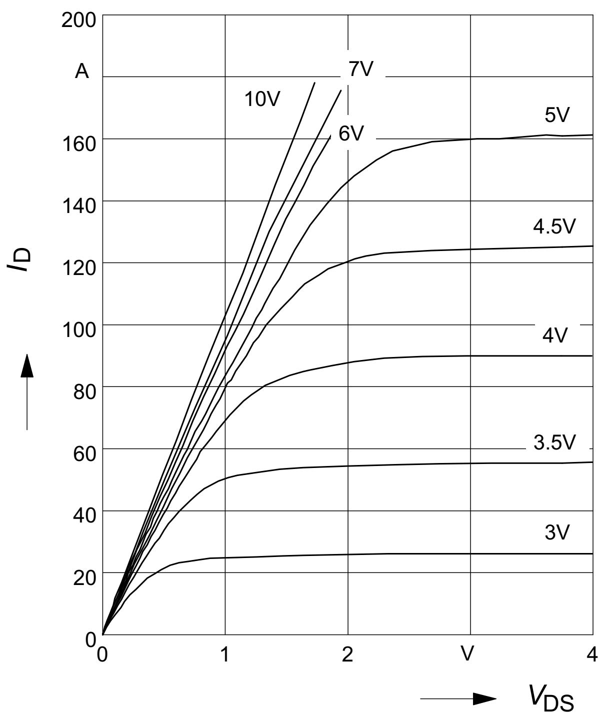
$I_D$=f($V_{DS}$); $D$=0.01; $T_C$=25°C; $V_{GS}$=4.5V




## 6 Typ. output characteristic

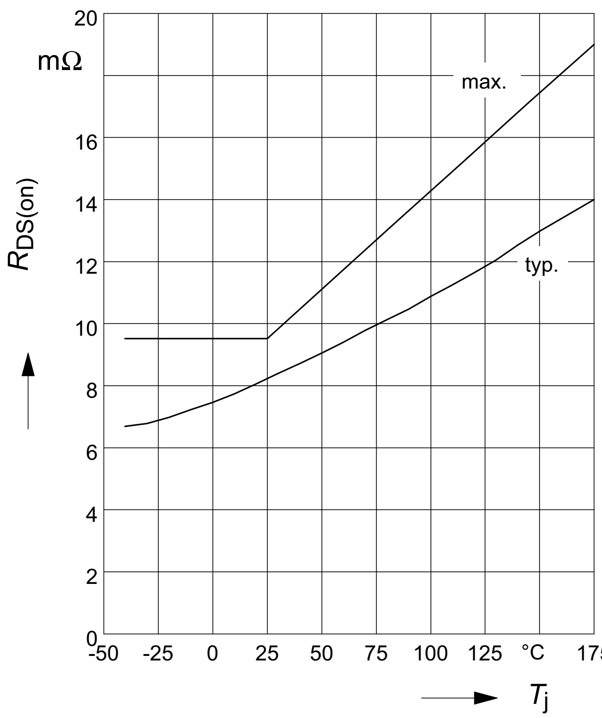
$I_D$ = f($V_{DS}$); $T_j$=25°C

Parameter: $V_{GS}$



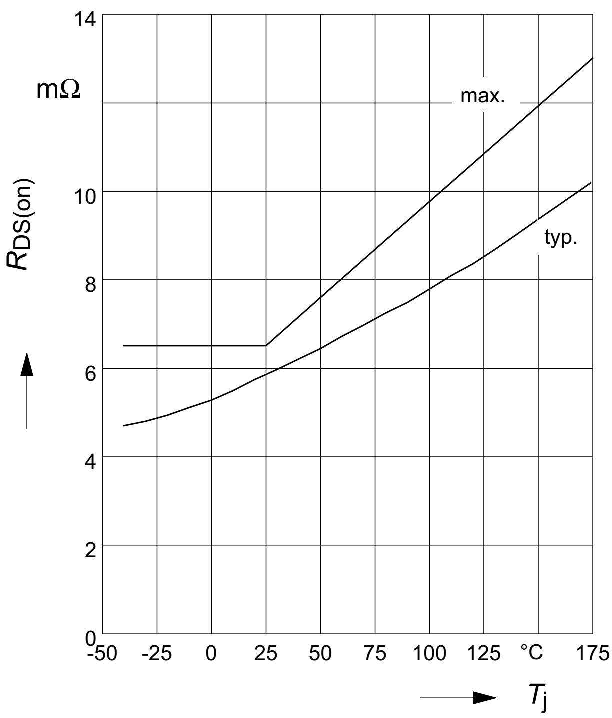

## 7 On-state resistance

$R_{ON}$ = f($T_j$); $I_D$=36A; $V_{GS}$ = 4.5V



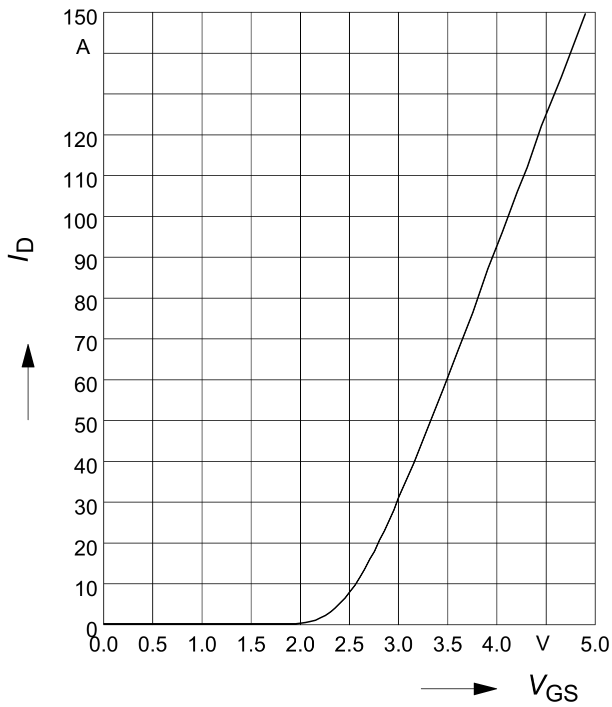

## 8 On-state resistance

$R_{ON}$ = f($T_j$); $I_D$=36A; $V_{GS}$ = 10V



**9 Typ. transfer characteristics**

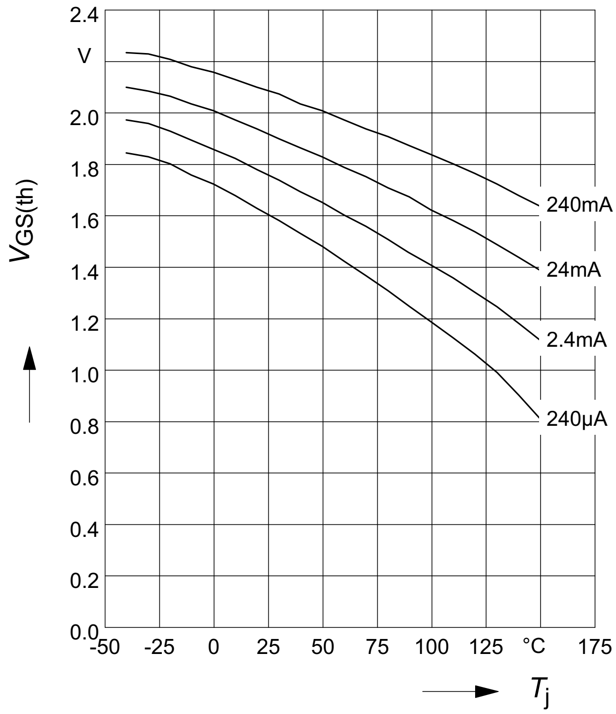
$I_D = f(V_{GS})$; $V_{DS}$ = 12V; $T_j$ = 25°C




**10 Typ. input threshold voltage**

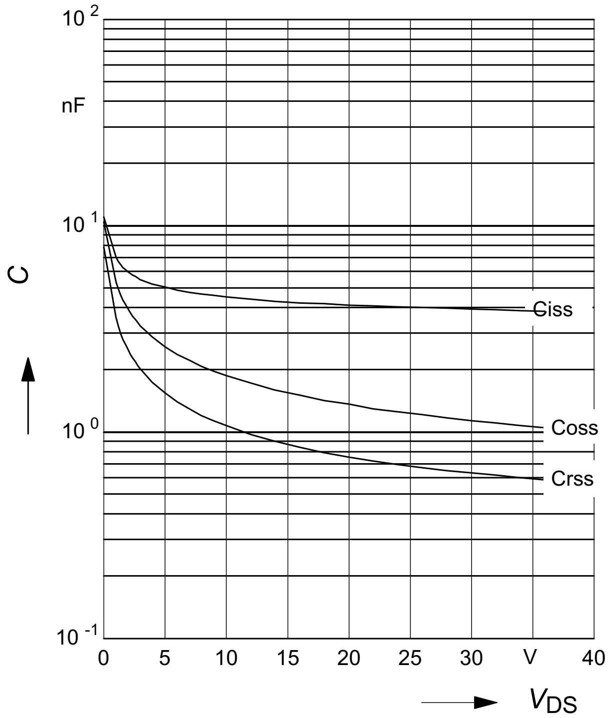
$V_{GS(th)} = f(T_j)$; $V_{DS}=V_{GS}$

Parameter: $I_D$



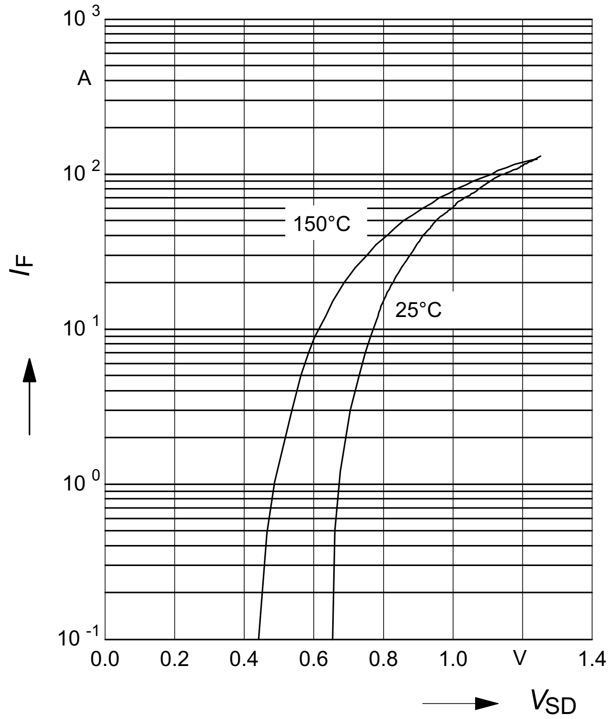

**11 Typ. capacitances**

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




**12 Typ. reverse diode forward charcteristics $I_F = f(V_{SD})$**

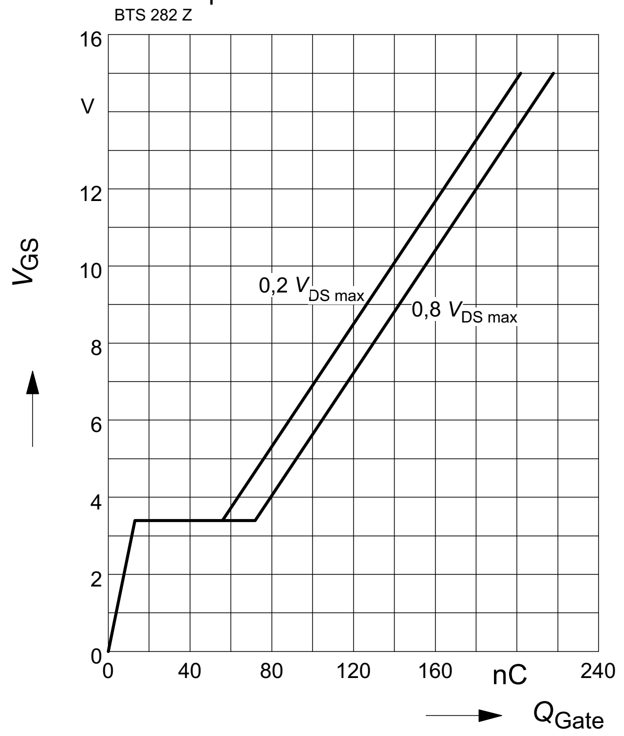
$t_p$ = 80µs (spread); Parameter: $T_j$



### 13 Typ. gate charge

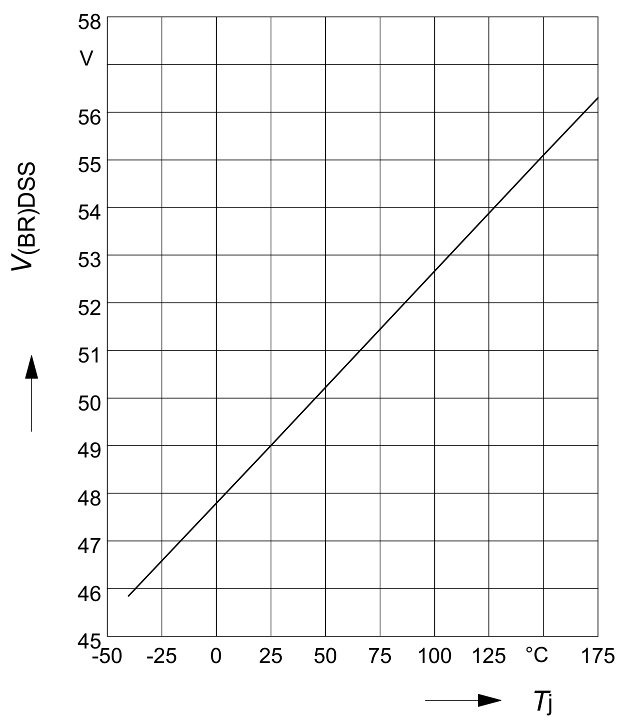
$V_{GS} = f(Q_{Gate})$

Parameter: $I_{D\ puls}$ = 80 A

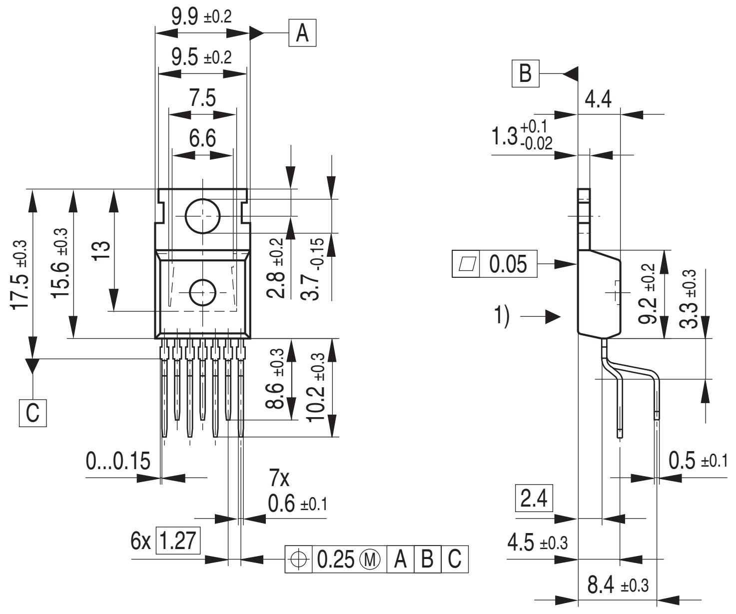



### 14 Drain-source break down voltage

$V_{(BR)DSS} = f(T_j)$

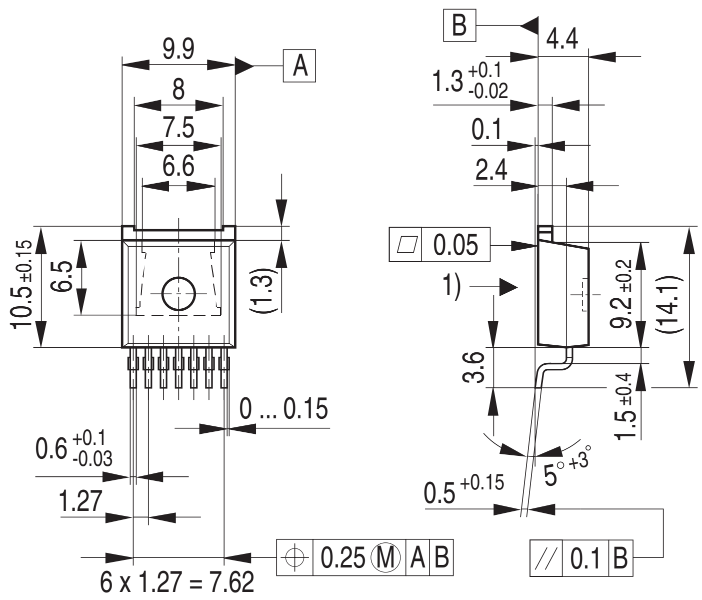


# 1 Package Outlines




1) Shear and punch direction no burrs this surface.
- - - Back side, heatsink contour
All metal surfaces tin plated, except area of cut.

**Figure 1** **PG-TO220-7-3** (Please Insert Package Long Name!)




1) Shear and punch direction no burrs this surface
- - - Back side, heatsink contour
All metal surfaces tin plated, except area of cut

**Figure 2** **PG-TO220-7-180**

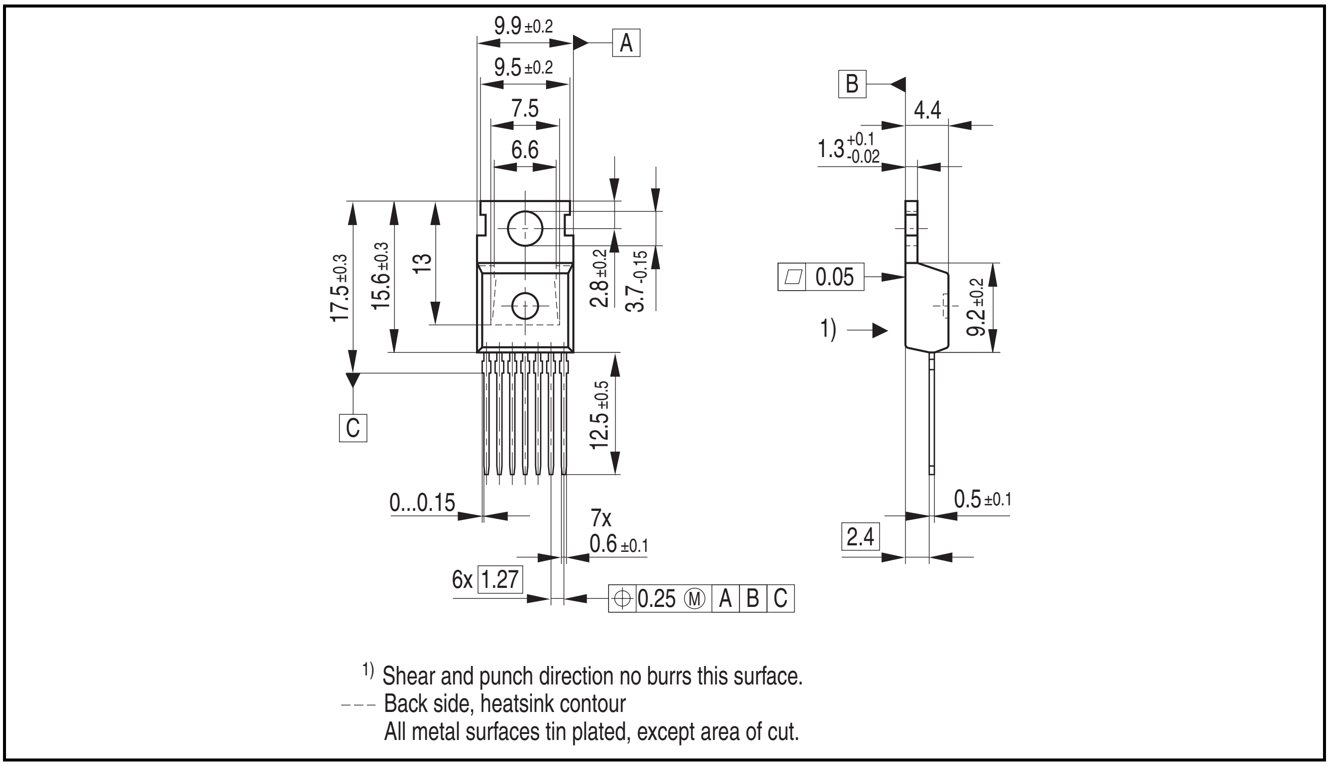



**Figure 3 PG-TO220-7-230**

### Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

For further information on alternative packages, please visit our website:
**http://www.infineon.com/packages**.

Dimensions in mm

## 2 Revision History

| Revision | Date | Changes |
|---|---|---|
| 1.2 | 2009-07-31 | removed 100ms and DC line in SOA diagram |
| 1.1 | 2008-10-21 | all pages:<br>added new Infineon logo Creation of the green datasheet.<br>Initial version of RoHS-compliant derivate of the BTS282Z<br>Page 1 and 12: added RoHS compliance statement and Green product feature<br>Page 1, 11 and 12: Package changed to RoHS compliant version<br>page 13: added Revision history<br>page 14: added Disclaimer |

**Edition 2009-07-31**

**Published by**
**Infineon Technologies AG**
**81726 Munich, Germany**



### Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

### Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

### Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or 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.