

**OptiMOS™3 Power-Transistor**
**Features**

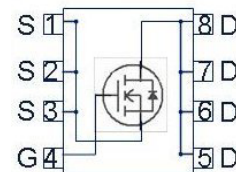
- Ideal for high frequency switching
- Optimized technology for DC/DC converters
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Halogen-free according to IEC61249-2-21



| Type           | Package     | Marking |
|----------------|-------------|---------|
| BSZ160N10NS3 G | PG-TSDSON-8 | 160N10N |

**Product Summary**

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | 100 | V  |
| $R_{DS(on),max}$ | 16  | mΩ |
| $I_D$            | 40  | A  |

**PG-TSDSON-8**

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

| Parameter                                    | Symbol        | Conditions   | Value | Unit |
|--|---------------|--|-------|------|
| Continuous drain current                     | $I_D$         | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$                                    | 40    | A    |
|  |               | $V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$                                   | 28    |      |
|  |               | $V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ ,<br>$R_{thJA}=60\text{ K/W}^{2)}$ | 8     |      |
| Pulsed drain current <sup>3)</sup>           | $I_{D,pulse}$ | $T_C=25\text{ °C}$   | 160   |      |
| Avalanche energy, single pulse <sup>4)</sup> | $E_{AS}$      | $I_D=20\text{ A}$ , $R_{GS}=25\text{ Ω}$                                     | 80    | mJ   |
| Gate source voltage                          | $V_{GS}$      |  | ±20   | V    |

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</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.

<sup>3)</sup> See figure 3 for more detailed information

<sup>4)</sup> See figure 13 for more detailed information

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

| Parameter                           | Symbol                | Conditions   | Value       | Unit |
|-------------------------------------|-----------------------|--|-------------|------|
| Power dissipation                   | $P_{\text{tot}}$      | $T_C=25\text{ °C}$   | 63          | W    |
|                                     |                       | $T_A=25\text{ °C}$ ,<br>$R_{\text{thJA}}=60\text{ K/W}^2)$ | 2.1         |      |
| Operating and storage temperature   | $T_j, T_{\text{stg}}$ |  | -55 ... 150 | °C   |
| IEC climatic category; DIN IEC 68-1 |                       |  | 55/150/56   |      |

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

**Thermal characteristics**

|                                     |                   |  |   |   |     |     |
|-------------------------------------|-------------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | $R_{\text{thJC}}$ |  | - | - | 2.1 | K/W |
| Device on PCB                       | $R_{\text{thJA}}$ | minimal footprint                            | - | - | 62  |     |
|                                     |                   | 6 cm <sup>2</sup> cooling area <sup>2)</sup> | - | - | 60  |     |

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

|                                  |                             |   |     |     |     |               |
|----------------------------------|-----------------------------|---|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}, I_{\text{D}}=1\text{ mA}$                            | 100 | -   | -   | V             |
| Gate threshold voltage           | $V_{\text{GS(th)}}$         | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=12\text{ }\mu\text{A}$               | 2   | 2.8 | 3.5 |               |
| Zero gate voltage drain current  | $I_{\text{DSS}}$            | $V_{\text{DS}}=100\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=25\text{ °C}$        | -   | 0.1 | 1   | $\mu\text{A}$ |
|                                  |                             | $V_{\text{DS}}=100\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=125\text{ °C}$       | -   | 10  | 100 |               |
| Gate-source leakage current      | $I_{\text{GSS}}$            | $V_{\text{GS}}=20\text{ V}, V_{\text{DS}}=0\text{ V}$                           | -   | 10  | 100 | nA            |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$         | $V_{\text{GS}}=10\text{ V}, I_{\text{D}}=20\text{ A}$                           | -   | 14  | 16  | m $\Omega$    |
|                                  |                             | $V_{\text{GS}}=6\text{ V}, I_{\text{D}}=10\text{ A}$                            | -   | 18  | 33  |               |
| Gate resistance                  | $R_{\text{G}}$              |   | -   | 1.4 | -   | $\Omega$      |
| Transconductance                 | $g_{\text{fs}}$             | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}, I_{\text{D}}=20\text{ A}$ | 16  | 33  | -   | S             |

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

**Dynamic characteristics**

|                              |              |   |   |      |      |    |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=50\text{ V},$<br>$f=1\text{ MHz}$                    | - | 1300 | 1700 | pF |
| Output capacitance           | $C_{oss}$    |   | - | 240  | 320  |    |
| Reverse transfer capacitance | $C_{rss}$    |   | - | 11   | -    |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=10\text{ A}, R_G=1.6\ \Omega$ | - | 13.0 | -    | ns |
| Rise time                    | $t_r$        |   | - | 10.0 | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |   | - | 22.0 | -    |    |
| Fall time                    | $t_f$        |   | - | 5.0  | -    |    |

**Gate Charge Characteristics<sup>5)</sup>**

|                          |               |  |   |     |    |    |
|--------------------------|---------------|--|---|-----|----|----|
| Gate to source charge    | $Q_{gs}$      | $V_{DD}=50\text{ V}, I_D=10\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 5.7 | -  | nC |
| Gate charge at threshold | $Q_{g(th)}$   |  | - | 3.8 | -  |    |
| Gate to drain charge     | $Q_{gd}$      |  | - | 3.4 | -  |    |
| Switching charge         | $Q_{sw}$      |  | - | 5.3 | -  |    |
| Gate charge total        | $Q_g$         |  | - | 19  | 25 |    |
| Gate plateau voltage     | $V_{plateau}$ |  | - | 4.2 | -  | V  |
| Output charge            | $Q_{oss}$     | $V_{DD}=40\text{ V}, V_{GS}=0\text{ V}$                                    | - | 25  | 33 | nC |

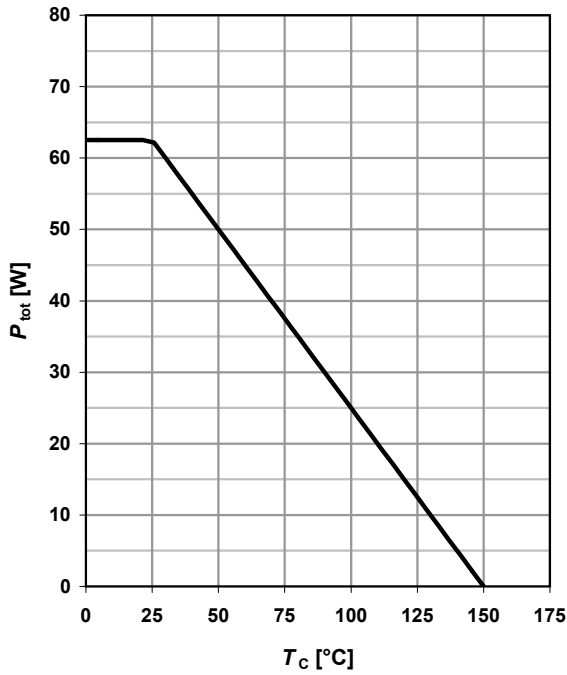
**Reverse Diode**

|                                  |               |   |   |     |     |    |
|----------------------------------|---------------|---|---|-----|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | - | -   | 40  | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -   | 160 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=20\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$   | - | 0.9 | 1.2 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=50\text{ V}, I_F=10\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 73  | -   | ns |
| Reverse recovery charge          | $Q_{rr}$      |   | - | 52  | -   | nC |

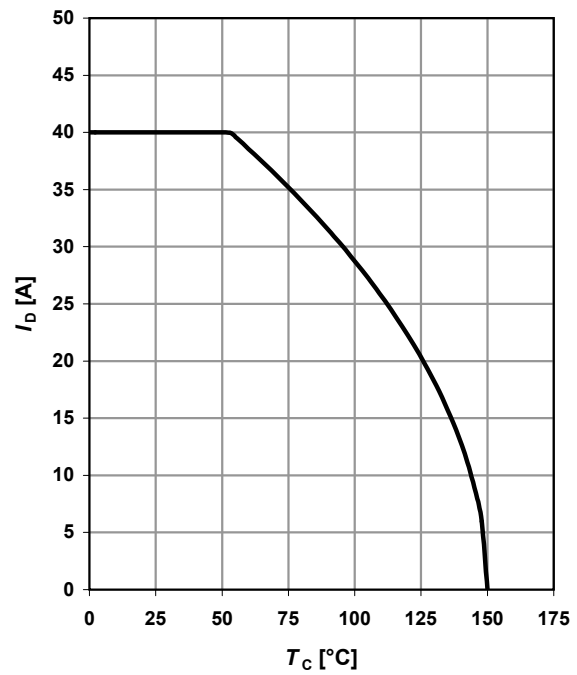
<sup>5)</sup> See figure 16 for gate charge parameter definition

**1 Power dissipation**

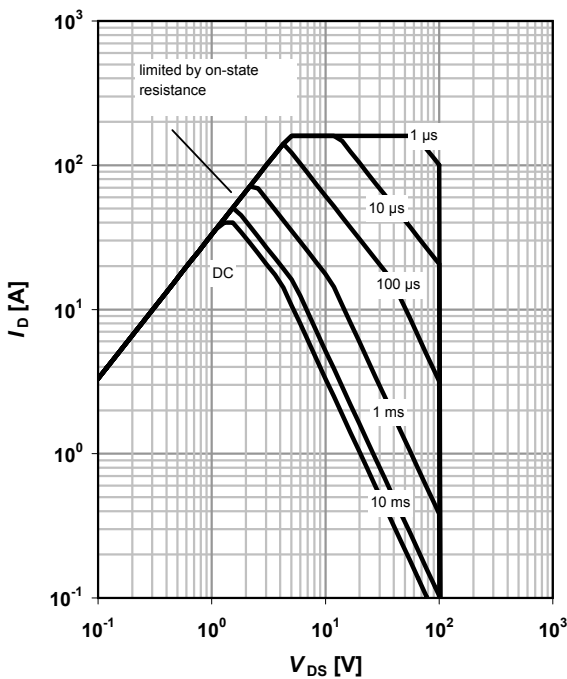
$$P_{\text{tot}} = f(T_C)$$


**2 Drain current**

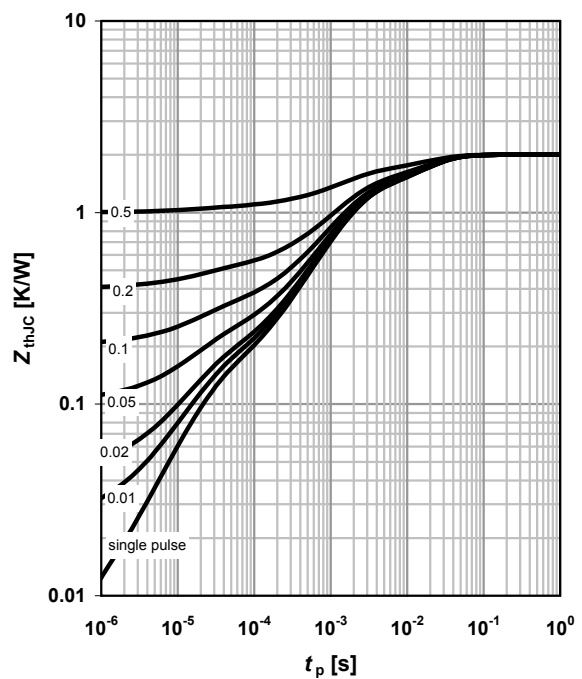
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$


**3 Safe operating area**

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

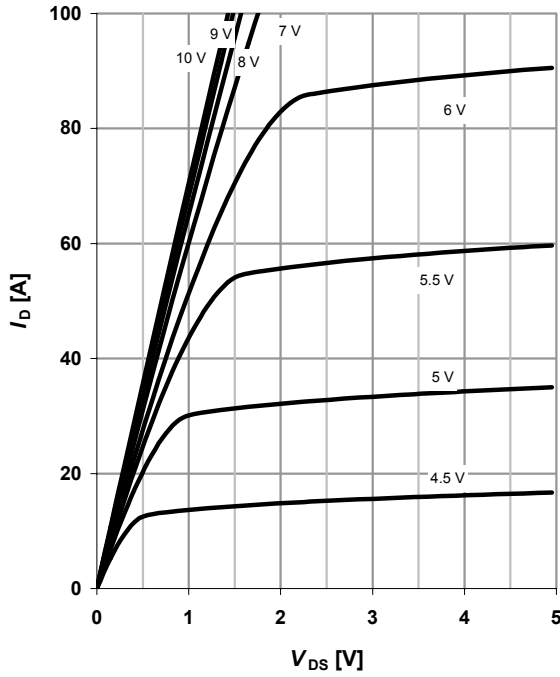
 parameter:  $t_p$ 

**4 Max. transient thermal impedance**

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

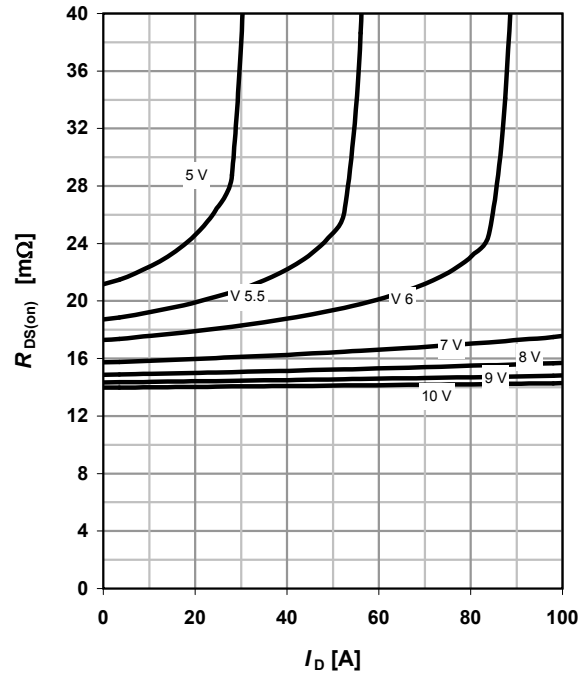
 parameter:  $D = t_p / T$ 


**5 Typ. output characteristics**

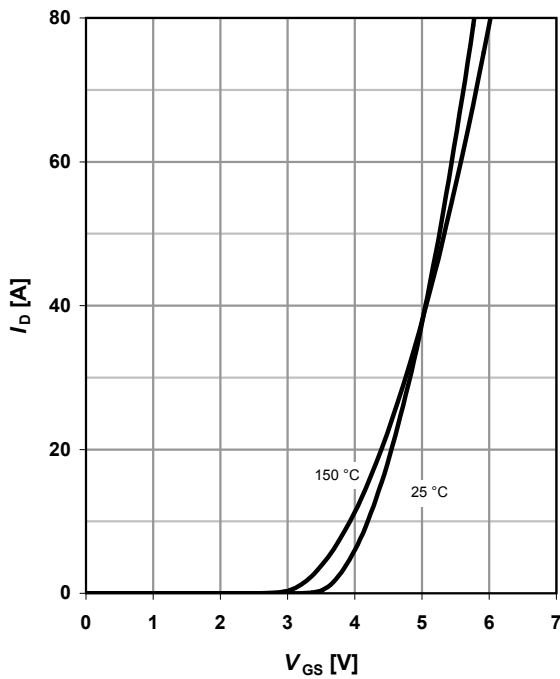
$$I_D = f(V_{DS}); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

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

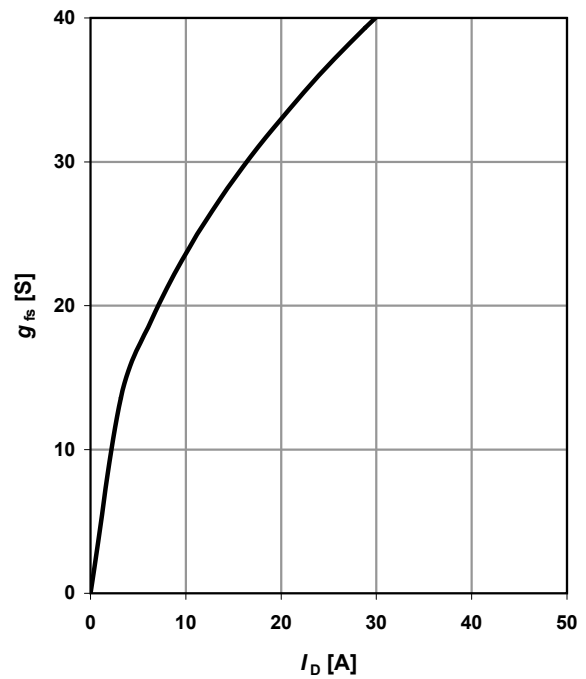
$$R_{DS(on)} = f(I_D); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

**7 Typ. transfer characteristics**

$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

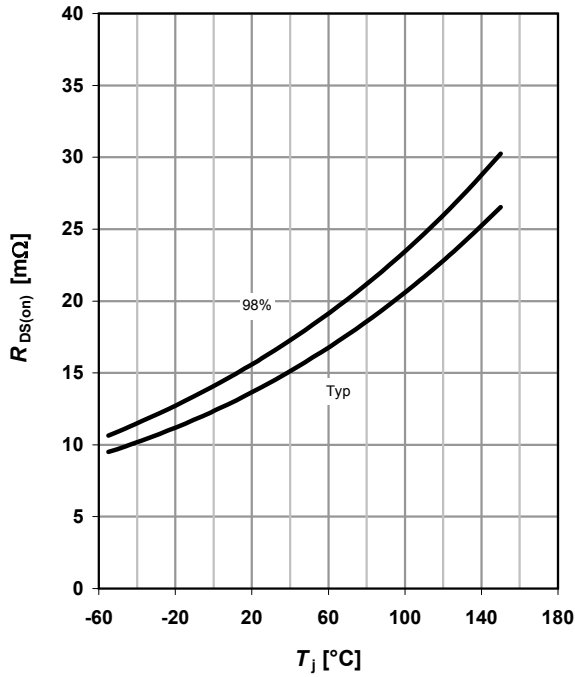
 parameter:  $T_j$ 

**8 Typ. forward transconductance**

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

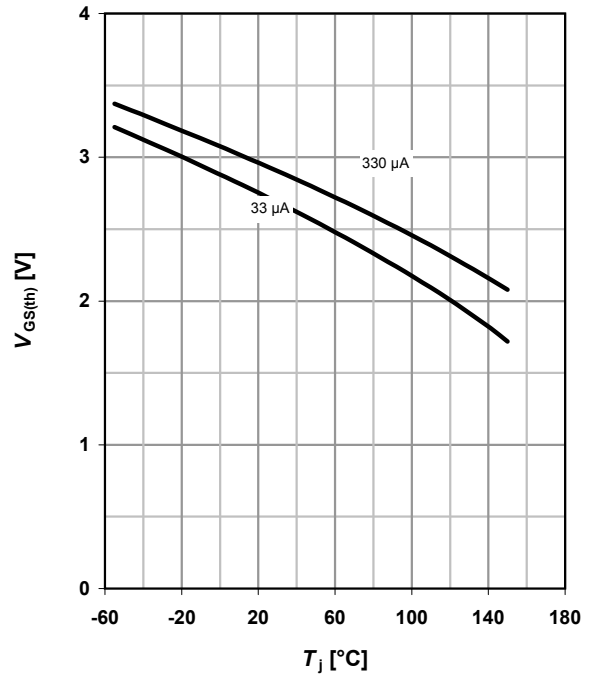


**9 Drain-source on-state resistance**

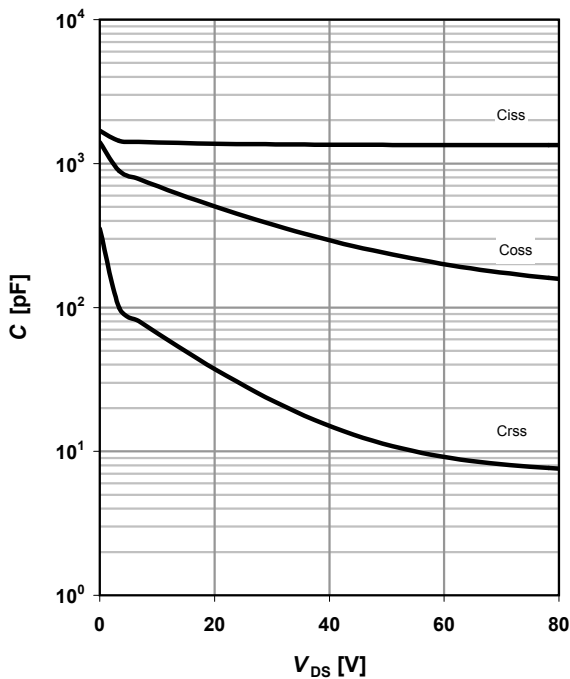
$$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$$


**10 Typ. gate threshold voltage**

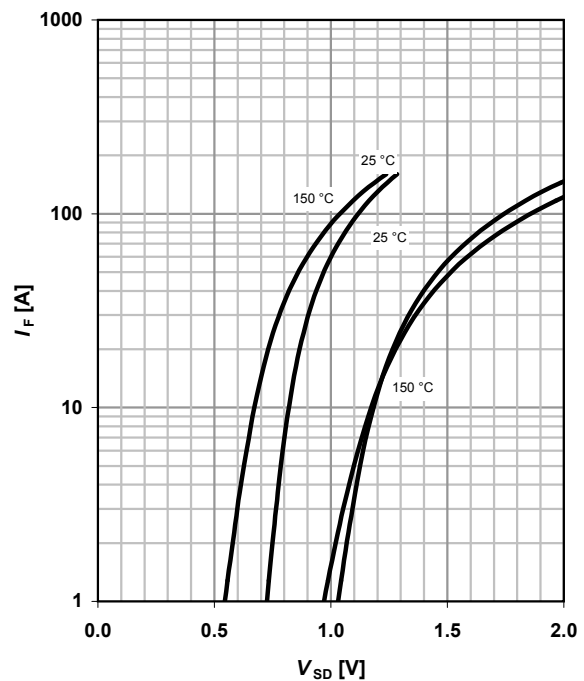
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$


**11 Typ. capacitances**

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

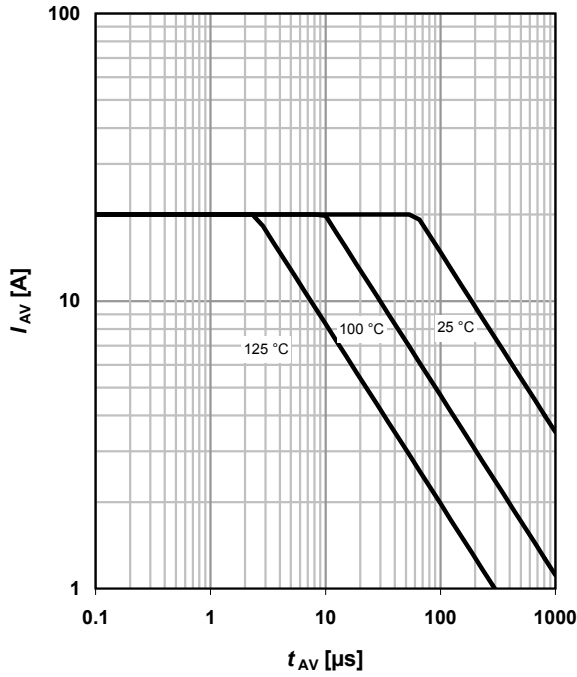

**12 Forward characteristics of reverse diode**

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

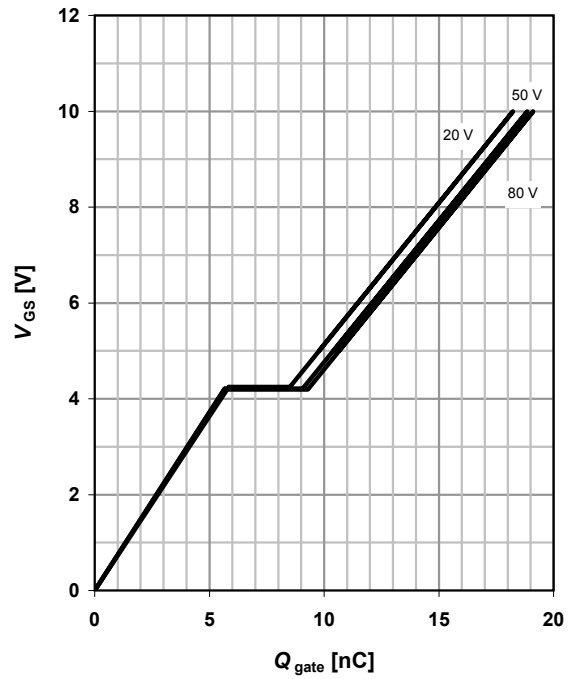
 parameter:  $T_j$ 


**13 Avalanche characteristics**

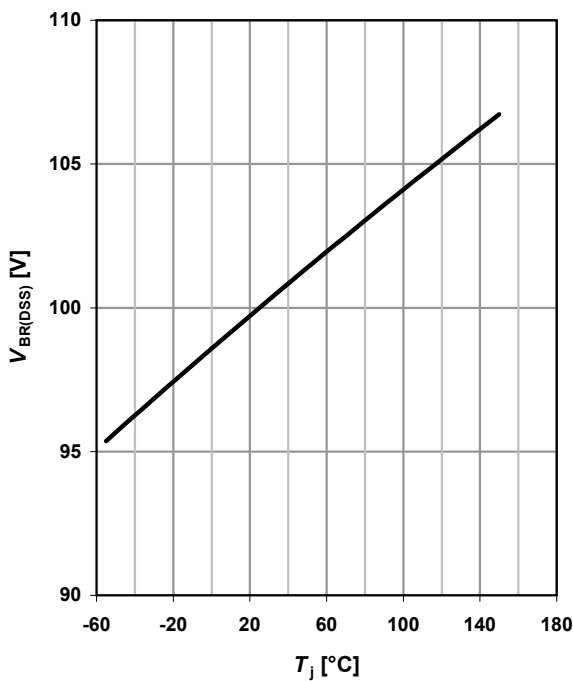
$$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$$

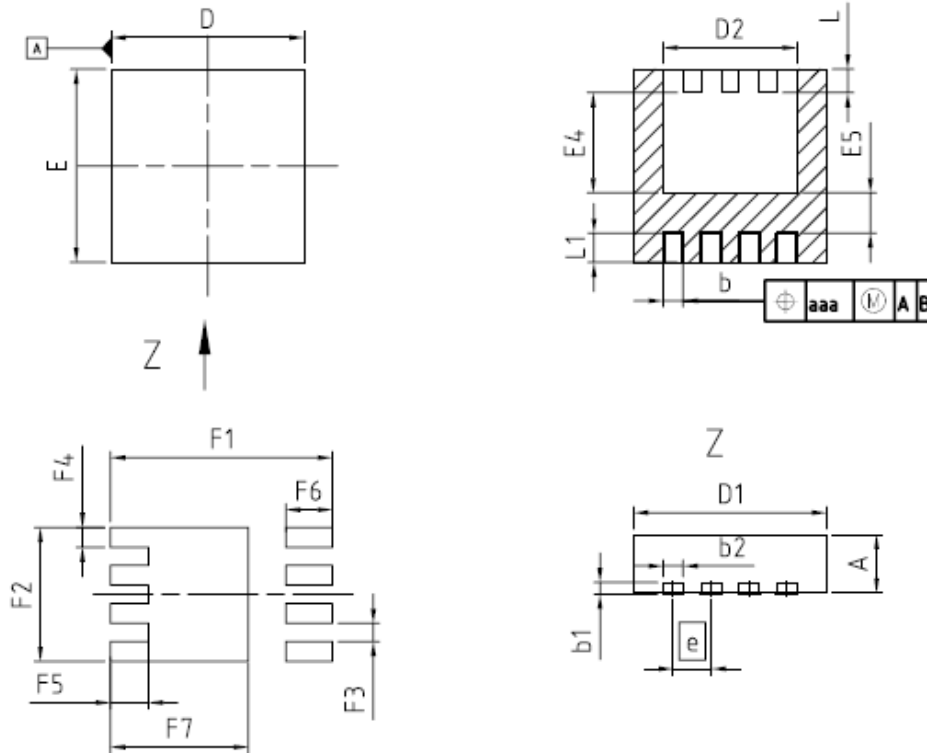
 parameter:  $T_{j(\text{start})}$ 

**14 Typ. gate charge**

$$V_{GS}=f(Q_{\text{gate}}); I_D=10 \text{ A pulsed}$$

 parameter:  $V_{DD}$ 

**15 Drain-source breakdown voltage**

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


**16 Gate charge waveforms**


**Package Outline: PG-TSDSON-8**


| DIM  | MILLIMETERS |      | INCHES |       |
|------|-------------|------|--------|-------|
|      | MIN         | MAX  | MIN    | MAX   |
| A    | 0,90        | 1,10 | 0,035  | 0,043 |
| b    | 0,24        | 0,44 | 0,009  | 0,017 |
| b1   | 0,10        | 0,30 | 0,004  | 0,012 |
| b2   | 0,20        | 0,44 | 0,008  | 0,017 |
| D=D1 | 3,20        | 3,40 | 0,126  | 0,134 |
| D2   | 2,15        | 2,45 | 0,085  | 0,096 |
| E    | 3,20        | 3,40 | 0,126  | 0,134 |
| E4   | 1,60        | 1,81 | 0,063  | 0,071 |
| E5   | 0,59        | 0,86 | 0,023  | 0,034 |
| e    | 0,65        |      | 0,026  |       |
| N    | 8           |      | 8      |       |
| L    | 0,30        | 0,56 | 0,012  | 0,022 |
| L1   | 0,33        | 0,60 | 0,013  | 0,024 |
| aaa  | 0,25        |      | 0,010  |       |
| F1   | 3,80        |      | 0,150  |       |
| F2   | 2,29        |      | 0,090  |       |
| F3   | 0,31        |      | 0,012  |       |
| F4   | 0,34        |      | 0,013  |       |
| F5   | 0,65        |      | 0,026  |       |
| F6   | 0,80        |      | 0,031  |       |
| F7   | 2,36        |      | 0,093  |       |

|                             |
|-----------------------------|
| DOCUMENT NO.<br>Z8B00131645 |
| SCALE<br>                   |
| EUROPEAN PROJECTION<br>     |
| ISSUE DATE<br>17-09-2008    |
| REVISION<br>02              |

**Footprint**  
Dimensions in mm



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