# OptiMOS™3 Power-Transistor

## Features

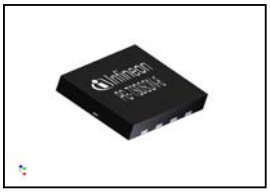
- Ideal for high frequency switching
- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC[1] for target applications
- Halogen-free according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

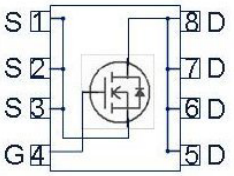
RoHS Halogen-Free

## Product Summary

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

PG-TSDSON-8






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

**Maximum ratings,** at $T_j$=25 °C, unless otherwise specified

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

[1] J-STD20 and JESD22
[2] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.
[3] See figure 3 for more detailed information
[4] See figure 13 for more detailed information

**Maximum ratings,** at $T_j$=25 °C, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Power dissipation | $P_{tot}$ | $T_C$=25 °C | 63 | W |
| | | $T_A$=25 °C, $R_{thJA}$=60 K/W[2)] | 2.1 | |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -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 | $R_{thJC}$ | | - | - | 2.1 | K/W |
| Device on PCB | $R_{thJA}$ | minimal footprint | - | - | 62 | |
| | | 6 cm$^2$ cooling area[2)] | - | - | 60 | |

**Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified

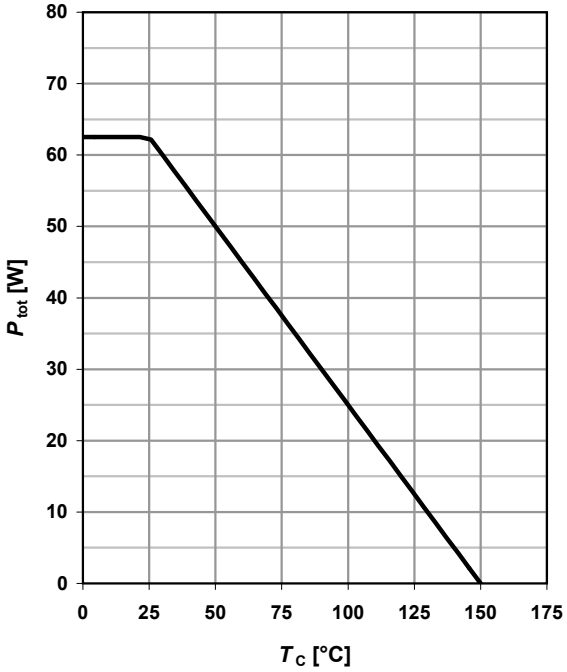
| | | | | | | |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_D$=1 mA | 100 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=12 µA | 2 | 2.8 | 3.5 | |
| Zero gate voltage drain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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0 V, $V_{DS}$=50 V, $f$=1 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 V, $V_{GS}$=10 V, $I_D$=10 A, $R_G$=1.6 Ω | - | 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[5)] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=50 V, $I_D$=10 A, $V_{GS}$=0 to 10 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 V, $V_{GS}$=0 V | - | 25 | 33 | nC |
| **Reverse Diode** | | | | | | |
| Diode continuous forward current | $I_S$ | $T_C$=25 °C | - | - | 40 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 160 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=20 A, $T_j$=25 °C | - | 0.9 | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=50 V, $I_F$=*10A*, d$i_F$/d$t$=100 A/µs | - | 73 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 52 | - | nC |

[5)] See figure 16 for gate charge parameter definition

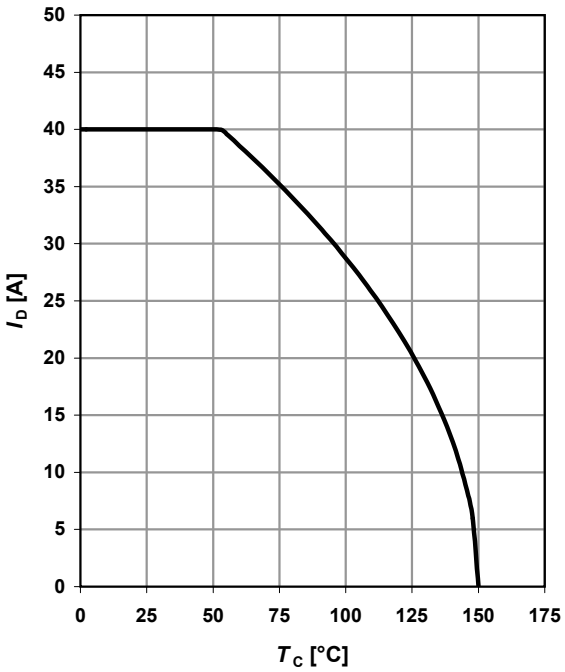
### 1 Power dissipation

$P_{tot}=f(T_C)$




### 2 Drain current

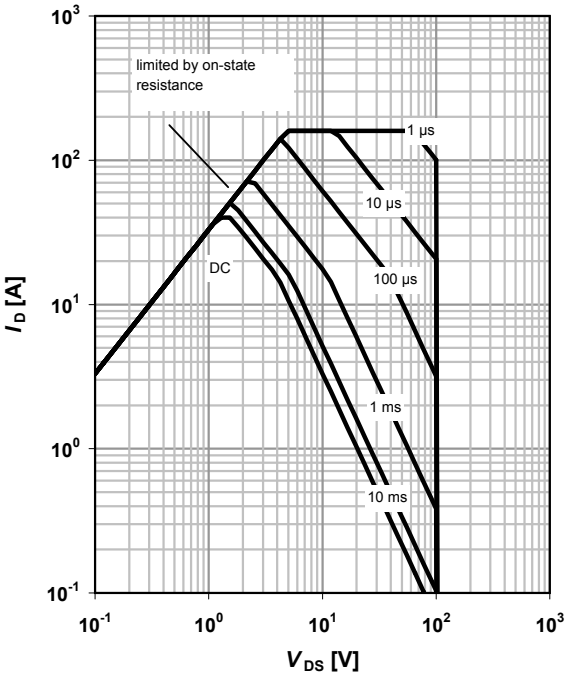
$I_D=f(T_C)$; $V_{GS}\geq 10$ V




### 3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

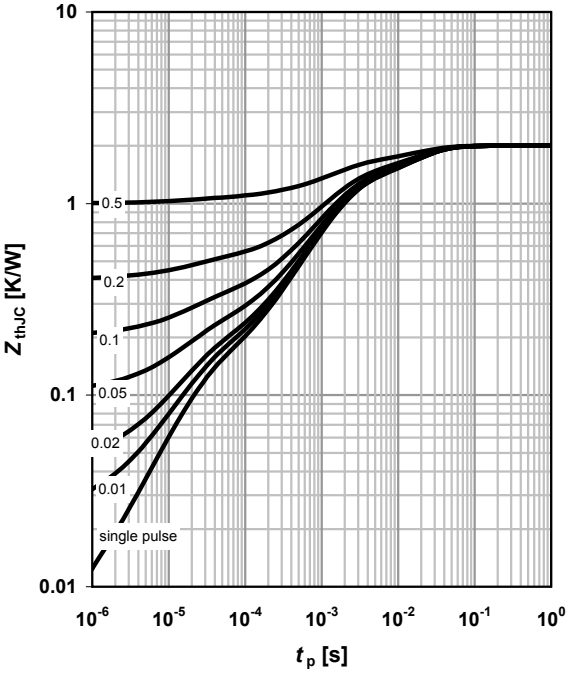
parameter: $t_p$




### 4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

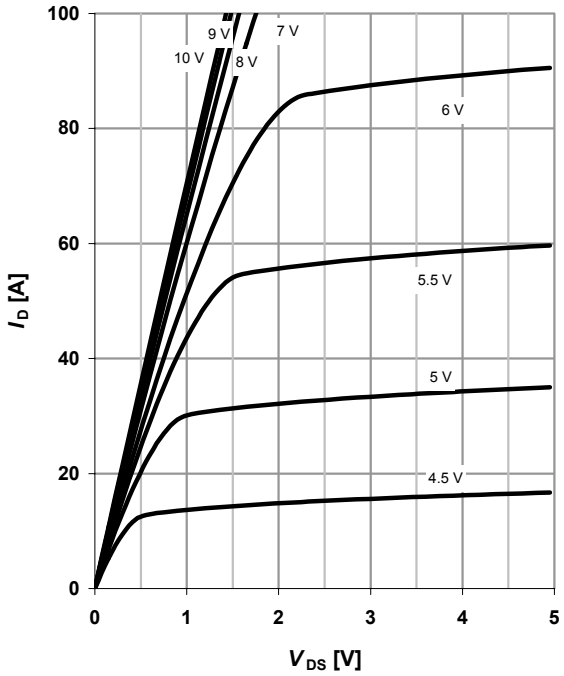
parameter: $D=t_p/T$



### 5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

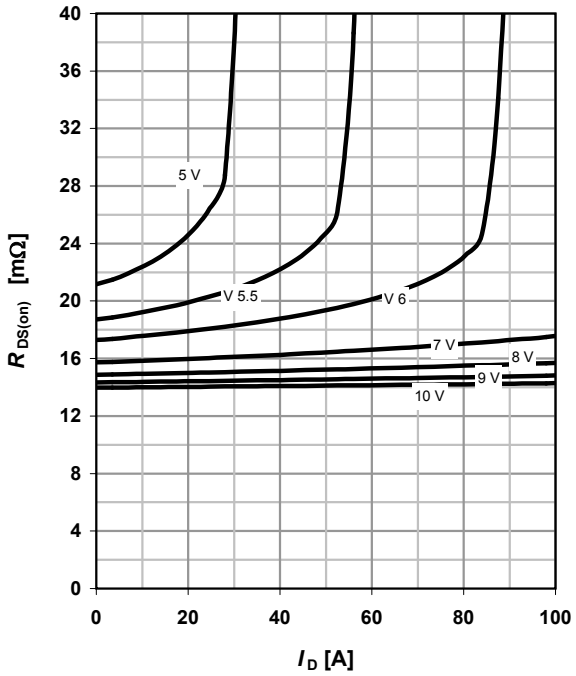
parameter: $V_{GS}$




### 6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C

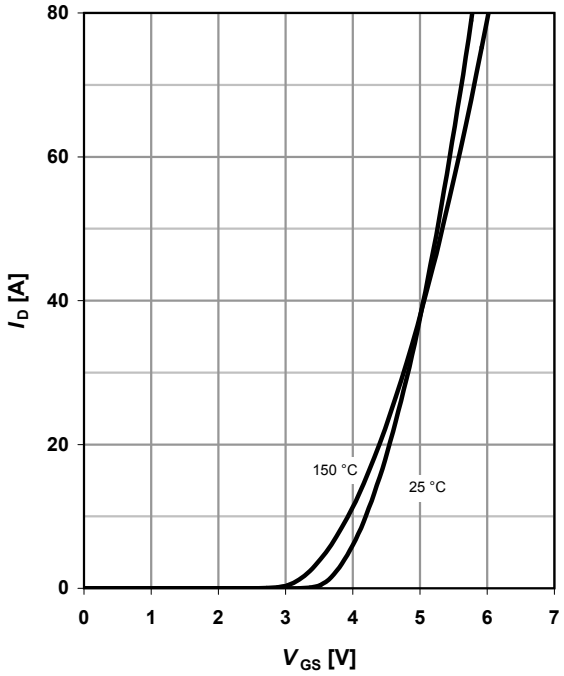
parameter: $V_{GS}$




### 7 Typ. transfer characteristics

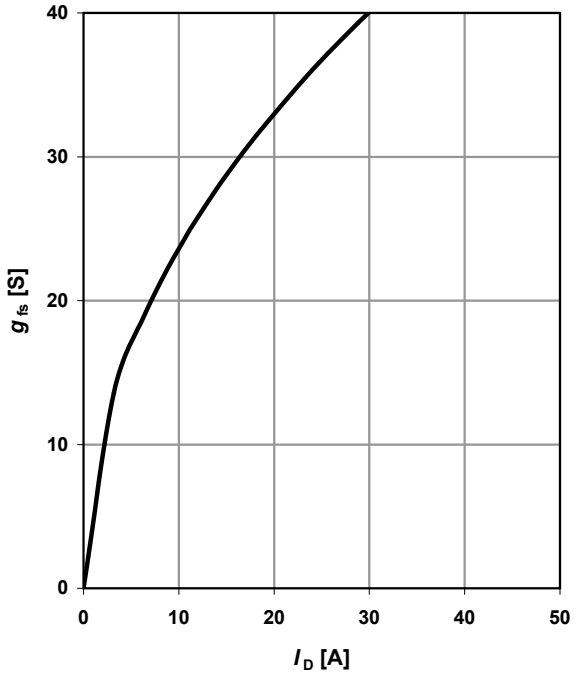
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: $T_j$



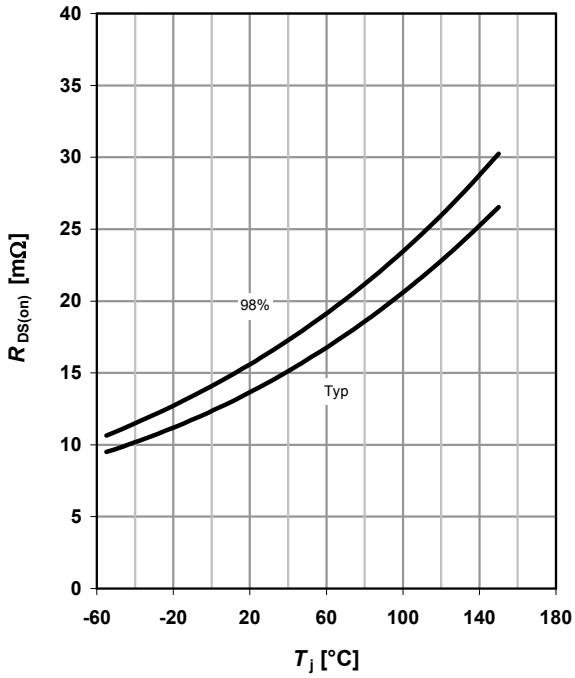

### 8 Typ. forward transconductance

$g_{fs}=f(I_D)$; $T_j=25$ °C



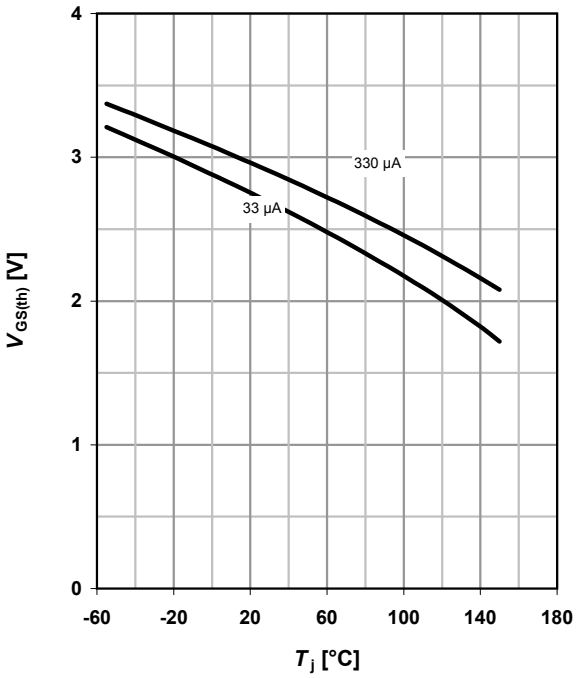
### 9 Drain-source on-state resistance

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



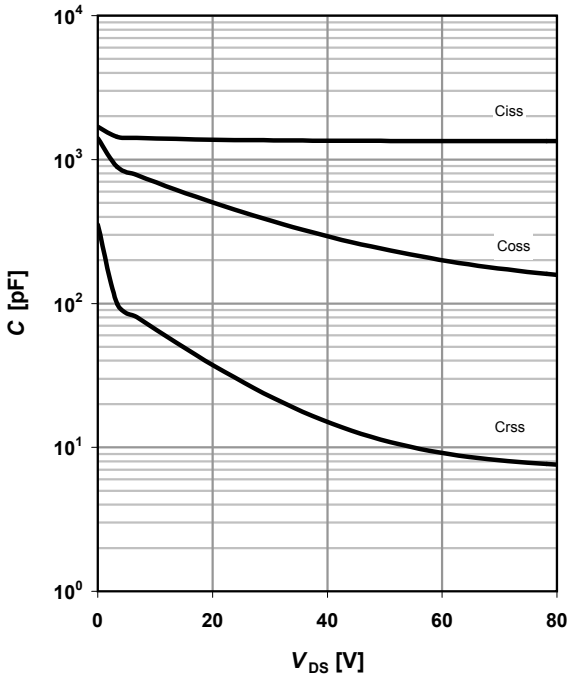

### 10 Typ. gate threshold voltage

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




### 11 Typ. capacitances

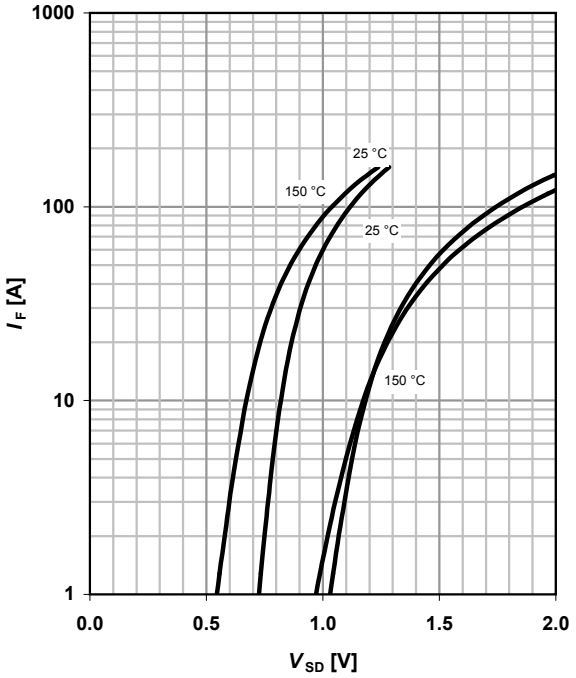
$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz




### 12 Forward characteristics of reverse diode

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

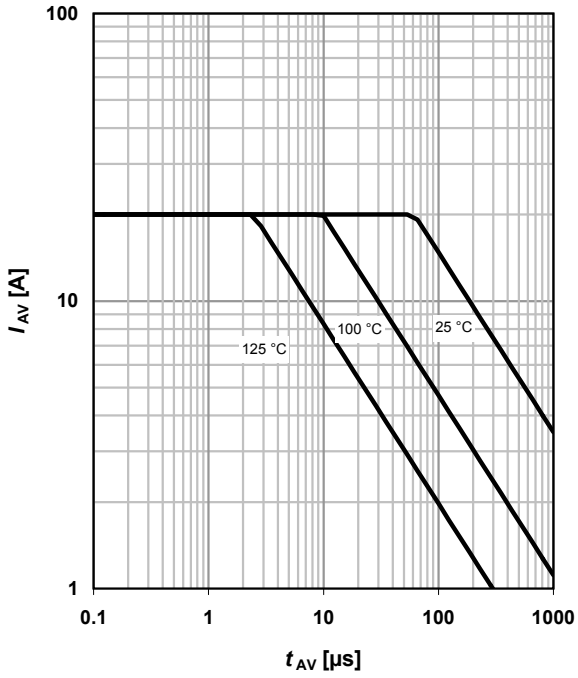
parameter: $T_j$



## 13 Avalanche characteristics

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω

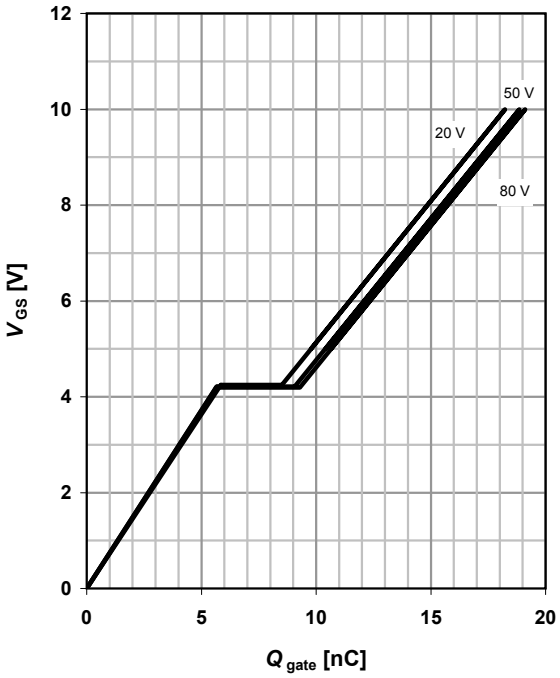
parameter: $T_{j(start)}$




## 14 Typ. gate charge

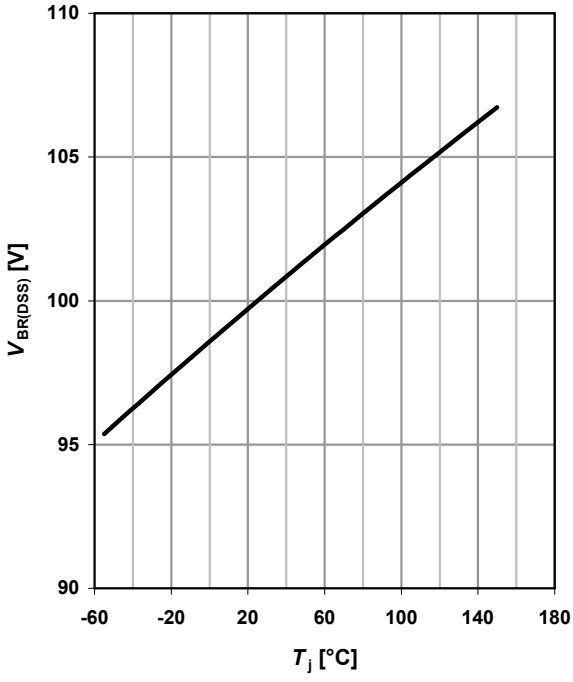
$V_{GS}$=f($Q_{gate}$); $I_D$=10 A pulsed

parameter: $V_{DD}$

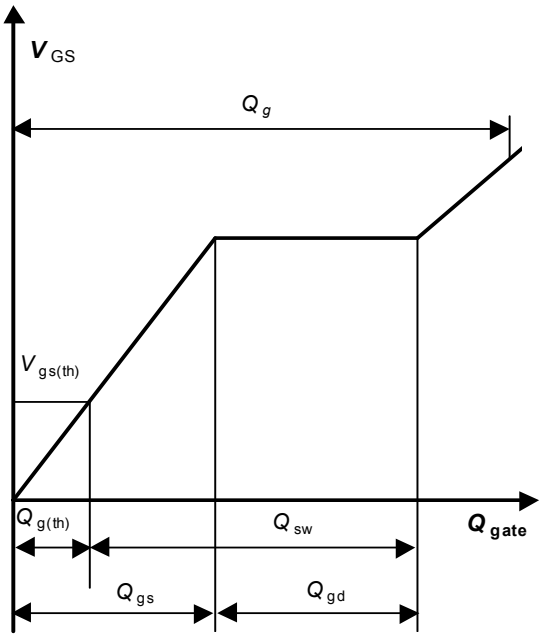



## 15 Drain-source breakdown voltage

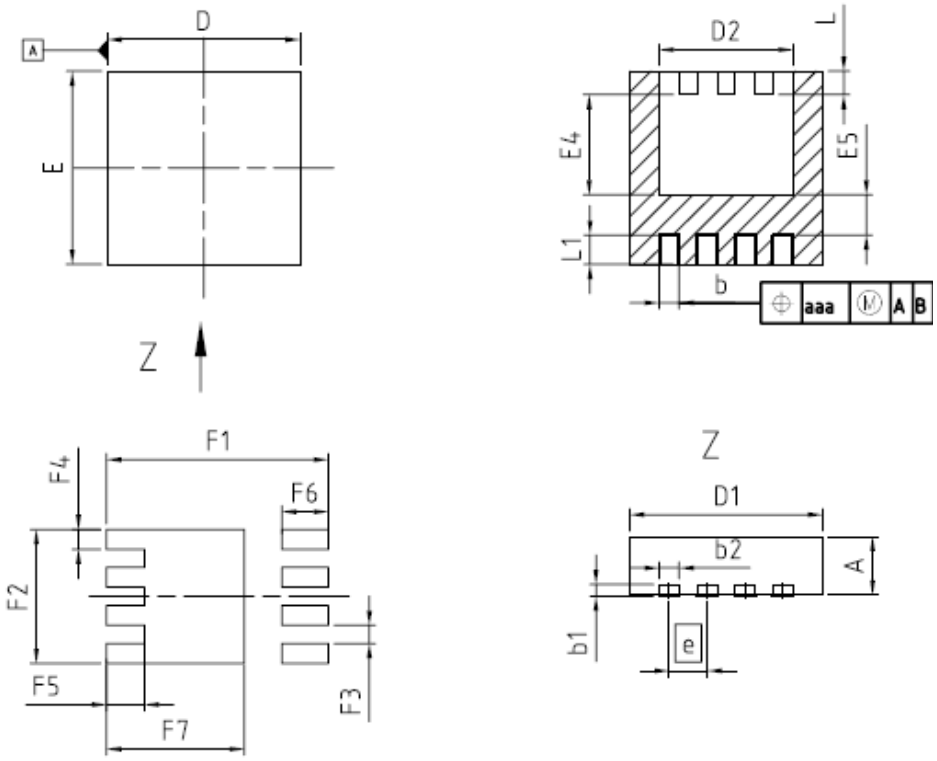
$V_{BR(DSS)}$=f($T_j$); $I_D$=1 mA



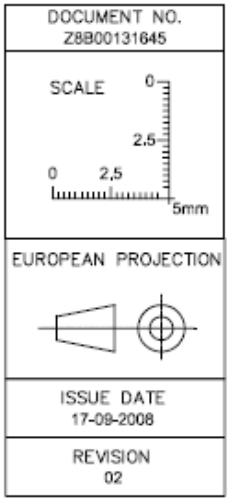

## 16 Gate charge waveforms



**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 | |




**Footprint**

Dimensions in mm

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