# OptiMOS™ P3 Power-Transistor

## Features

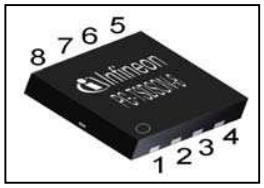
- single P-Channel in S3O8
- Qualified according JEDEC[1] for target applications
- 150 °C operating temperature
- $V_{GS}$=25 V, specially suited for notebook applications
- Pb-free; RoHS compliant
- applications: battery management, load switching
- Halogen-free according to IEC61249-2-21

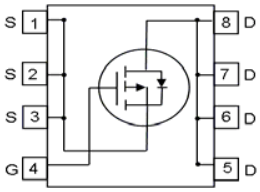
RoHS Halogen-Free

## Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | -30 | V |
| $R_{DS(on),max}$ | 18 | mΩ |
| $I_D$ | -39.6 | A |

PG-TSDSON-8




| Type | Package | Marking | Lead free | Halogen free | Packing |
|---|---|---|---|---|---|
| BSZ180P03NS3 G | PG-TSDSON-8 | 180P3N | Yes | Yes | non-dry |

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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current | $I_D$ | $T_C$=25 °C | 39.6 | A |
| | | $T_C$=70 °C | 32.0 | |
| | | $T_A$=25 °C[2] | -9.0 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C$=25 °C[3] | -158 | |
| Avalanche energy, single pulse | $E_{AS}$ | $I_D$=-20 A, $R_{GS}$=25 Ω | 48 | mJ |
| Gate source voltage | $V_{GS}$ | | ±25 | V |
| Power dissipation | $P_{tot}$ | $T_A$=25 °C | 40 | W |
| | | $T_A$=25 °C[2] | 2.1 | |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -55 … 150 | °C |
| ESD class | | JESD22-A114 HBM | class 1A (250V - 500V) | |
| Soldering temperature | | | 260 | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

[1] J-STD20 and JESD22

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Thermal characteristics** | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | | - | - | 3.1 | K/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | 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, $I_D$=-250µA | -30 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-48 µA | -3.1 | -2.5 | -1.9 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=-30 V, $V_{GS}$=0 V, $T_j$=25 °C | - | - | -1 | µA |
| | | $V_{DS}$=-30 V, $V_{GS}$=0 V, $T_j$=125 °C | - | - | -100 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=-25 V, $V_{DS}$=0 V | - | - | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=-6 V, $I_D$=-13 A | - | 18.4 | 30.0 | mΩ |
| | | $V_{GS}$=-10 V, $I_D$=-20 A | - | 13.5 | 18.0 | |
| Gate resistance | $R_G$ | | - | 3.1 | - | Ω |
| Transconductance | $g_{fs}$ | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=-20 A | 18 | 29 | - | S |

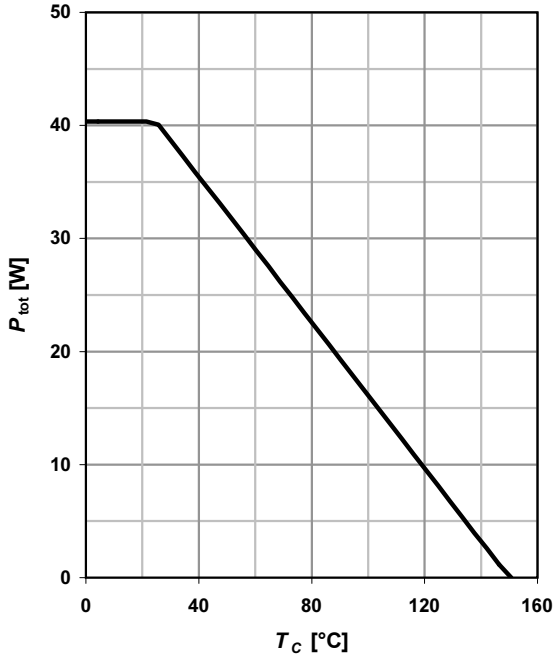
[2)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm$^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

[3)] See Fig. 3 for more detailed information

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0 V, $V_{DS}$=-15 V, $f$=1 MHz | - | 1480 | 2220 | pF |
| Output capacitance | $C_{oss}$ | | - | 744 | 1116 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 49 | 73.5 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=-15 V, $V_{GS}$=-10 V, $I_D$=-20 A, $R_G$=6 Ω | - | 11 | 17 | ns |
| Rise time | $t_r$ | | - | 11 | 16.5 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 20 | 30 | |
| Fall time | $t_f$ | | - | 3 | 5 | |
| Gate Charge Characteristics[3)] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=-15 V, $I_D$=20 A, $V_{GS}$=0 to -10 V | - | 8 | 12 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 2 | 3 | |
| Gate to drain charge | $Q_{gd}$ | | - | 4 | 5 | |
| Switching charge | $Q_{sw}$ | | - | 9 | 13 | |
| Gate charge total | $Q_g$ | | - | 20 | 30 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.0 | - | V |
| Output charge | $Q_{oss}$ | $V_{DD}$=-15 V, $V_{GS}$=0 V | - | 17 | 26 | nC |
| **Reverse Diode** | | | | | | |
| Diode continous 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 | - | - | -1.1 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=15 V, $I_F$=$\|I_S\|$, d$i_F$/d$t$=100 A/µs | - | 41 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 41 | - | nC |

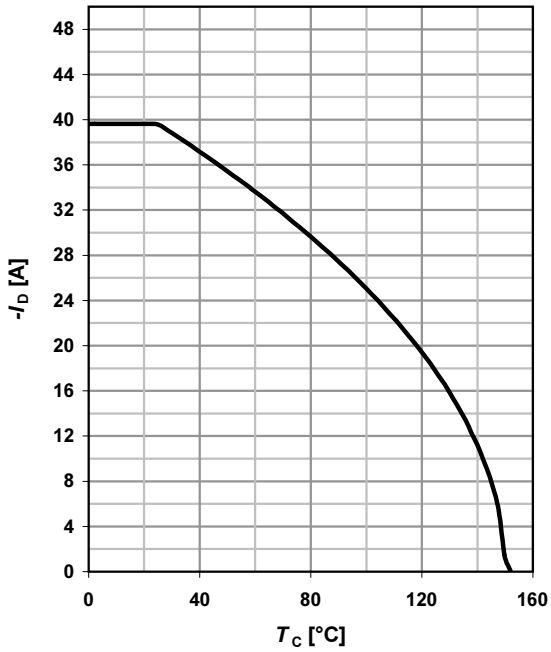
## 1 Power dissipation

$P_{tot}$=f($T_C$); $t_p$≤10 s




## 2 Drain current

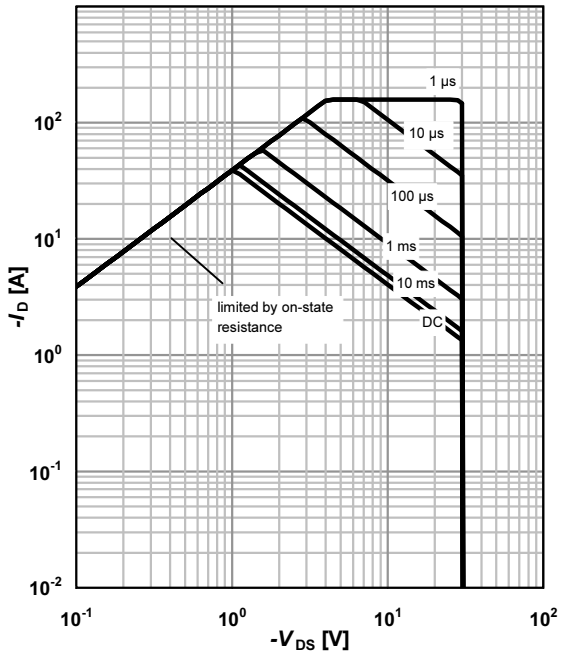
$I_D$=f($T_C$); |$V_{GS}$|≥10 V; $t_p$≤10 s




## 3 Safe operating area

$I_D$=f($V_{DS}$); $T_C$=25 °C[1]; $D$=0

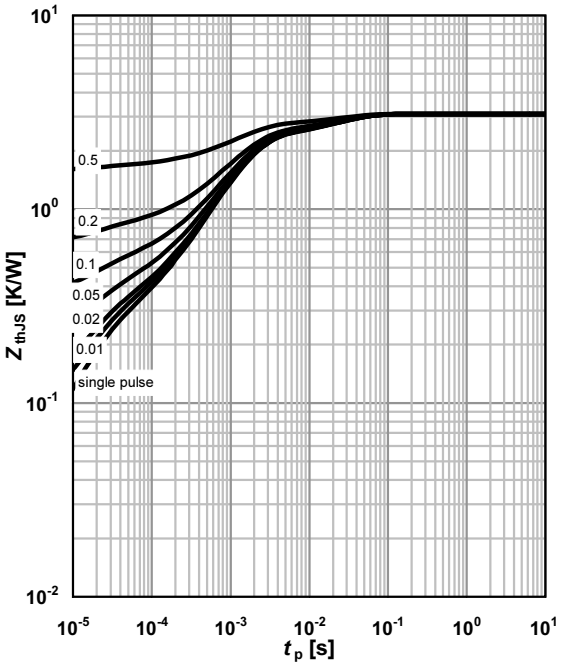
parameter: $t_p$




## 4 Max. transient thermal impedance

$Z_{thJS}$=f($t_p$)

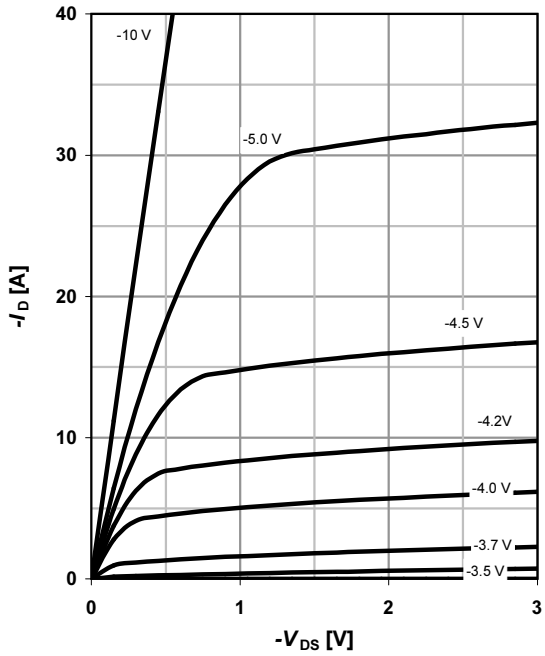
parameter: $D=t_p/T$



### 5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j$=25 °C

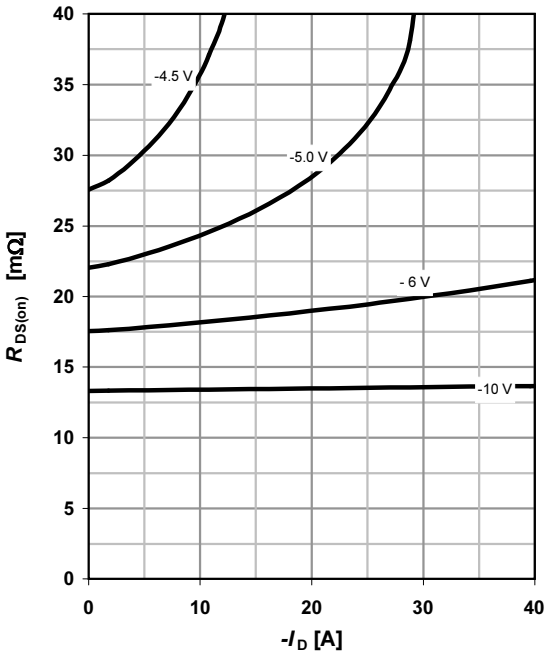
parameter: $V_{GS}$




### 6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j$=25 °C

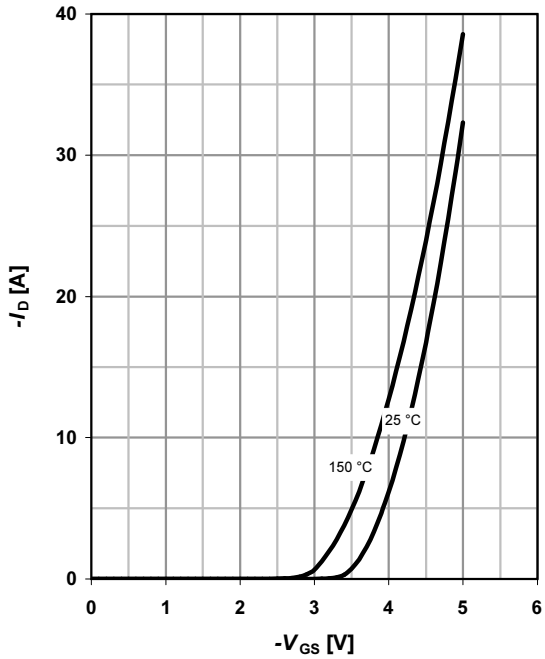
parameter: $V_{GS}$




### 7 Typ. transfer characteristics

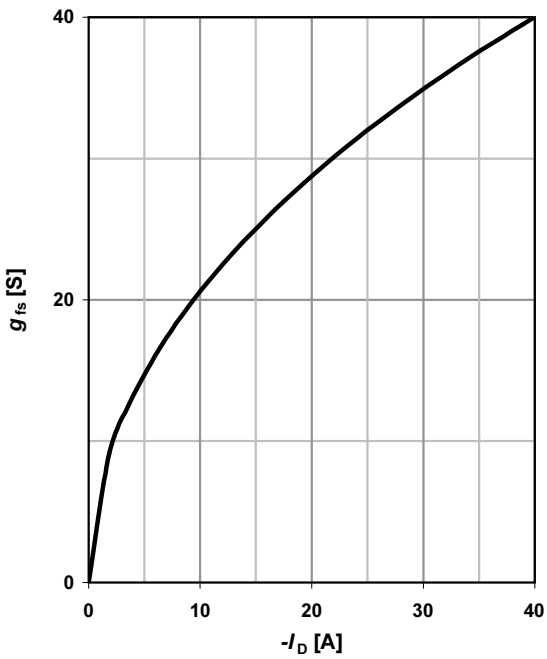
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: $T_j$



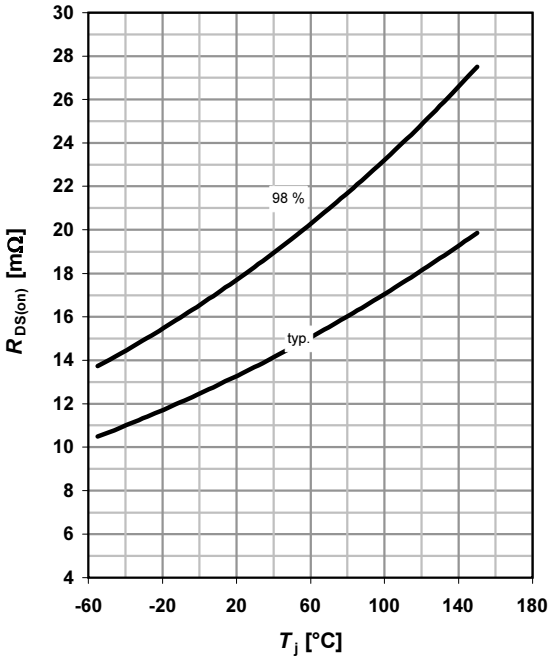

### 8 Typ. forward transconductance

$g_{fs}=f(I_D)$; $T_j$=25 °C



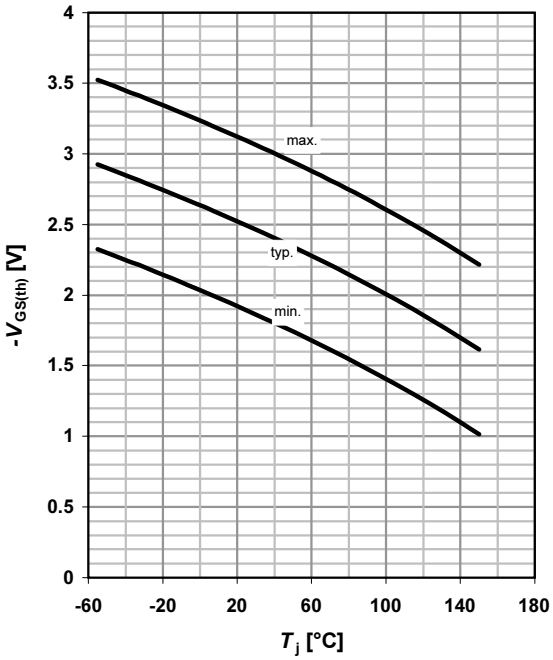
### 9 Drain-source on-state resistance

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



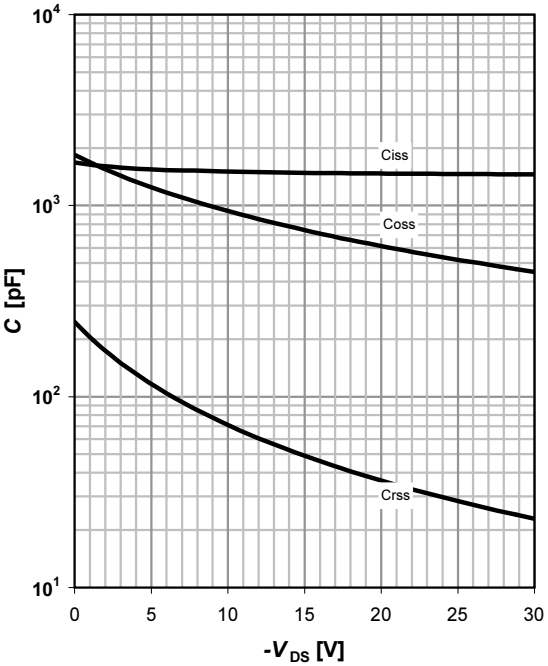

### 10 Typ. gate threshold voltage

$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_D$=-48 µA




### 11 Typ. capacitances

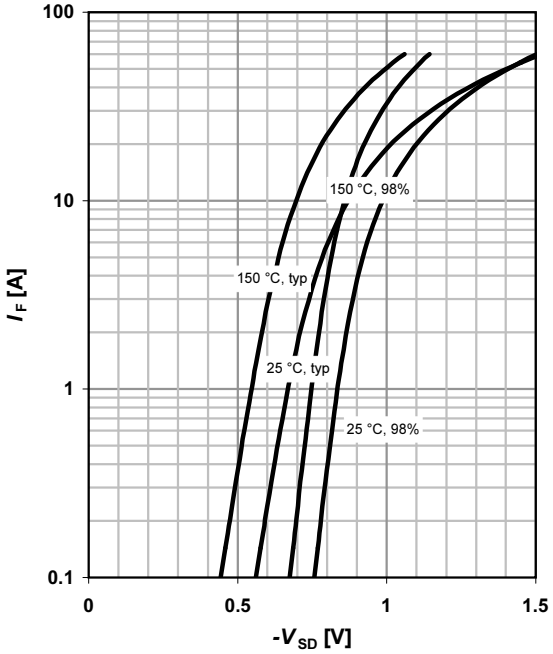
$C=f(V_{DS})$; $V_{GS}$=0 V; $f$=1 MHz




### 12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

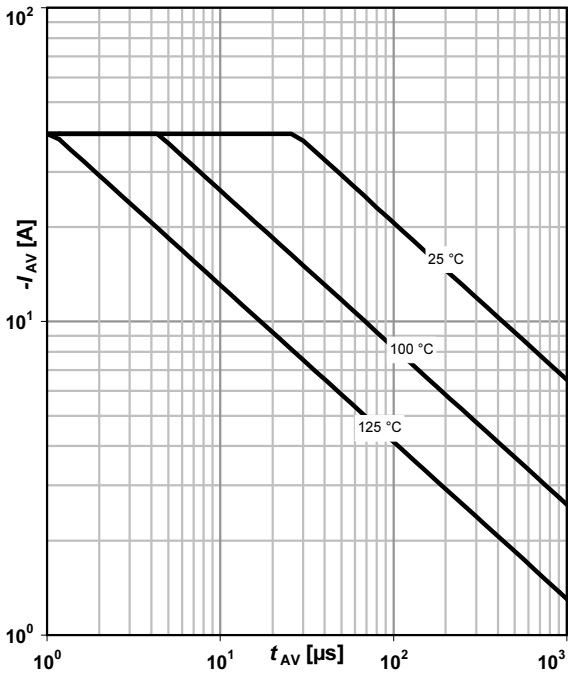
parameter: $T_j$



### 13 Avalanche characteristics

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω

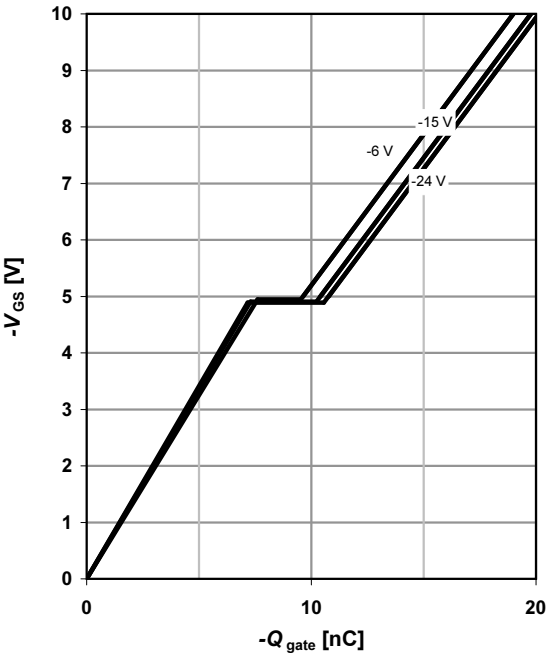
parameter: $T_{j(start)}$




### 14 Typ. gate charge

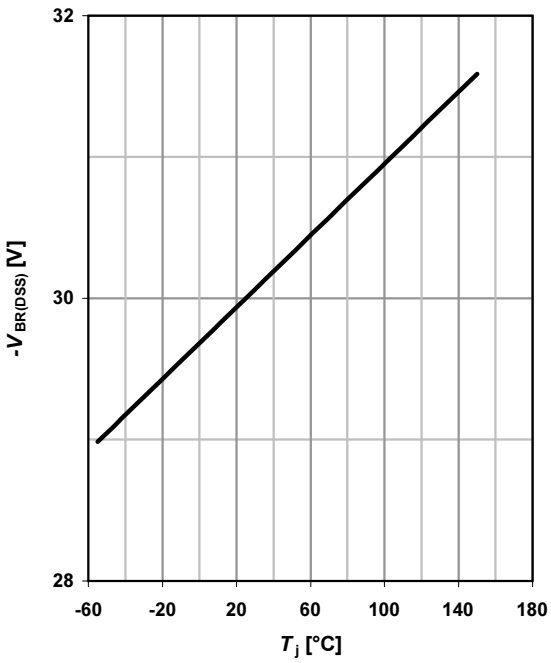
$V_{GS}$=f($Q_{gate}$); $I_D$=-20 A pulsed

parameter: $V_{DD}$

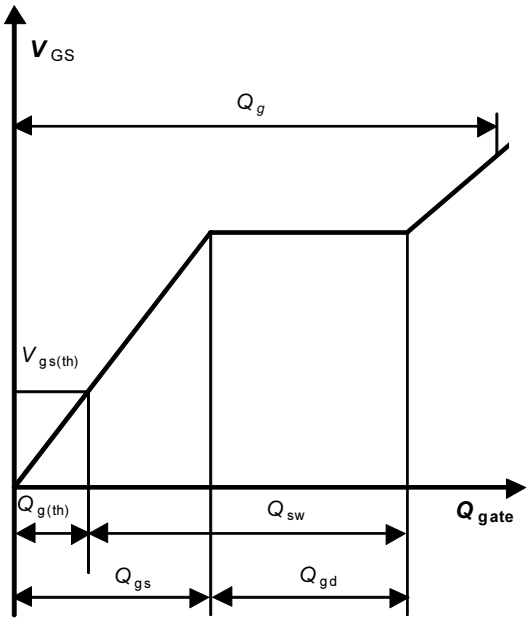



### 15 Drain-source breakdown voltage

$V_{BR(DSS)}$=f($T_j$); $I_D$=-250 µA

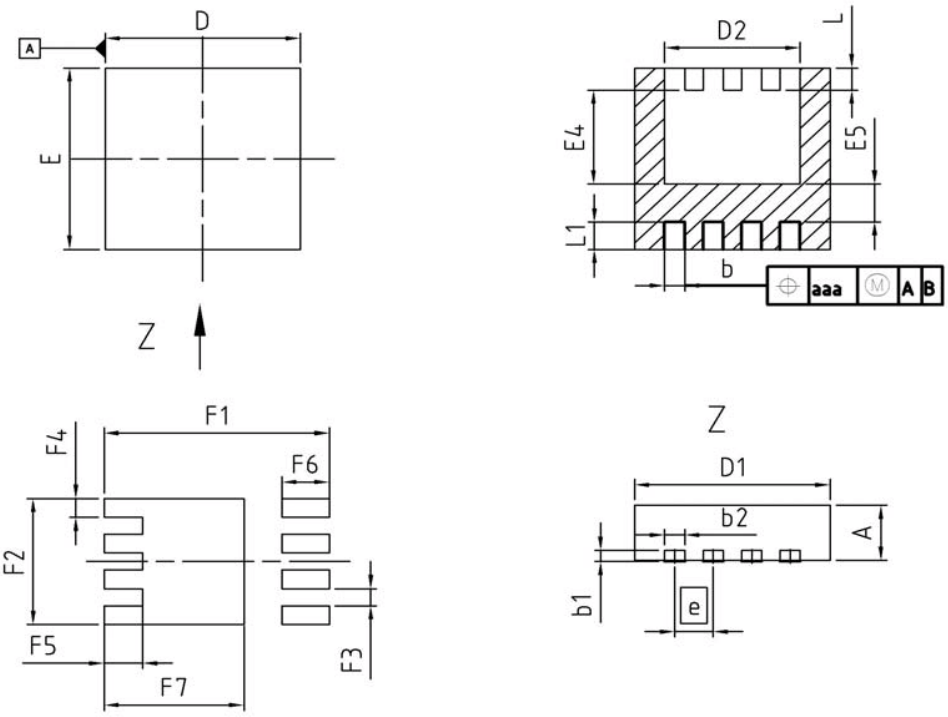



### 16 Gate charge waveforms



**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 | |

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SCALE 0 2.5 0 2.5 5mm

EUROPEAN PROJECTION

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REVISION
02

Dimensions in mm

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