# OptiMOS™ P3 Power-Transistor

## Features

- single P-Channel in SuperSO8
- Qualified according JEDEC[1] for target applications
- $V_{GS}$=25 V, specially suited for notebook applications
- Pb-free; RoHS compliant
- ESD > 4 kV
- applications: battery management, load switching
- Halogen-free according to IEC61249-2-21

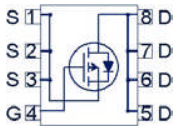
RoHS Halogen-Free

## Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | -30 | V |
| $R_{DS(on),max}$ | 3.0 | mΩ |
| $I_D$ | -100 | A |

PG-TDSON-8




| Type | Package | Marking | Lead free | Halogen free | Packing |
|---|---|---|---|---|---|
| BSC030P03NS3 G | PG-TDSON-8 | 030P3NS | Yes | Yes | 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 | -100 | A |
| | | $T_C$=70 °C | -100 | |
| | | $T_A$=25 °C | -25.4 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C$=25 °C[3] | -200 | |
| Avalanche energy, single pulse | $E_{AS}$ | $I_D$=-100 A, $R_{GS}$=25 Ω | 345 | mJ |
| Gate source voltage | $V_{GS}$ | | ±25 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25 °C | 125 | W |
| | | $T_A$=25 °C[2] | 2.5 | |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -55 ... 150 | °C |
| ESD class | | JESD22-A114 HBM | class 3 (> 4KV) | |
| 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 | $R_{thJC}$ | | - | - | 1.0 | K/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | 6 cm$^2$ cooling area[2)] | - | - | 50 | |
| **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 | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-345 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 | - | - | -10 | |
| 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, $I_D$=-50 A | - | 3.0 | 4.6 | mΩ |
| | | $V_{GS}$=-10 V, $I_D$=-50 A | - | 2.3 | 3.0 | |
| Gate resistance | $R_G$ | | - | 3.1 | - | Ω |
| Transconductance | $g_{fs}$ | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=-30 A | 47 | 93 | - | S |

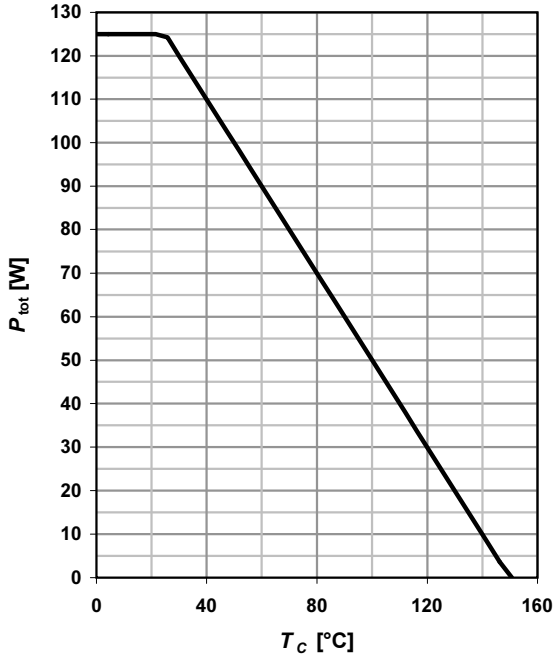
[2)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm$^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

[3)] See Fig. 3

| 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 | - | 10500 | 14000 | pF |
| Output capacitance | $C_{oss}$ | | - | 4690 | 6240 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 350 | 520 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=-15 V, $V_{GS}$=-10 V, $I_D$=-50 A, $R_G$=6 Ω | - | 27 | 41 | ns |
| Rise time | $t_r$ | | - | 105 | 158 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 98 | 147 | |
| Fall time | $t_f$ | | - | 33 | 50 | |
| Gate Charge Characteristics[3)] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=-15 V, $I_D$=-50 A, $V_{GS}$=0 to -10 V | - | 42 | 56 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 17 | 22 | |
| Gate to drain charge | $Q_{gd}$ | | - | 19 | 28 | |
| Switching charge | $Q_{sw}$ | | - | 44 | 62 | |
| Gate charge total | $Q_g$ | | - | 140 | 186 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4.1 | - | V |
| Output charge | $Q_{oss}$ | $V_{DD}$=-15 V, $V_{GS}$=0 V | - | 108 | 144 | |
| **Reverse Diode** | | | | | | |
| Diode continous forward current | $I_S$ | $T_C$=25 °C | - | - | 100 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 200 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=-50 A, $T_j$=25 °C | - | - | -1.1 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=15 V, $I_F$=$\|I_S\|$, $di_F/dt$=100 A/µs | - | 65 | 90 | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 86 | 111 | nC |

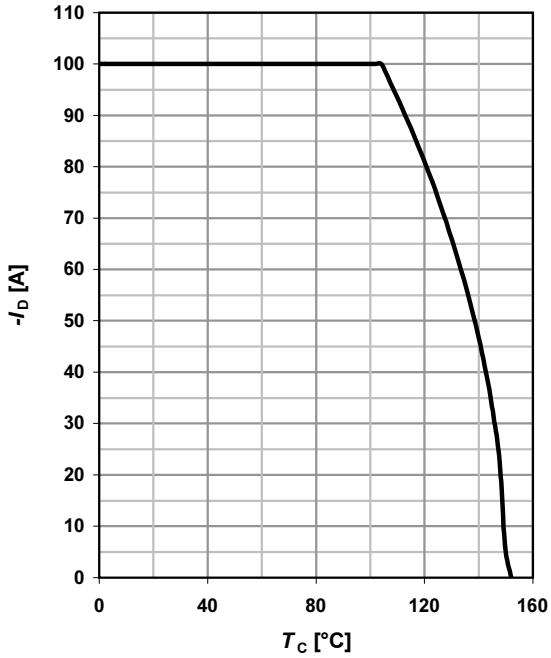
## 1 Power dissipation

$P_{tot}=f(T_C)$; $t_p \leq 10$ s




## 2 Drain current

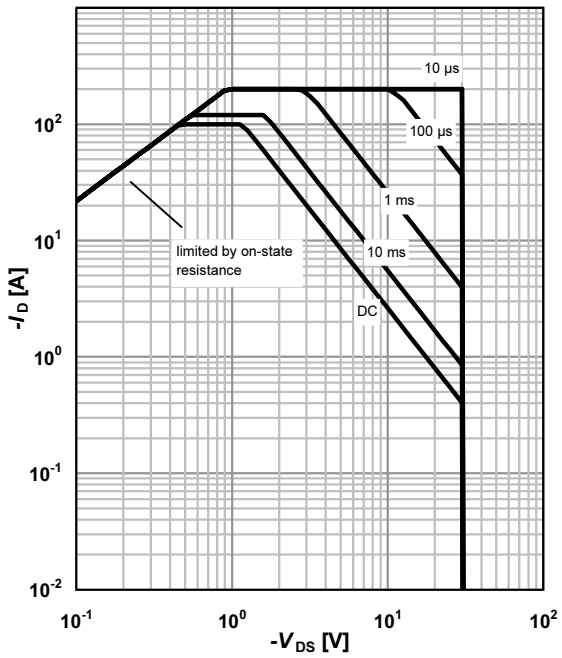
$I_D=f(T_C)$; $|V_{GS}| \geq 10$ V; $t_p \leq 10$ s




## 3 Safe operating area

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

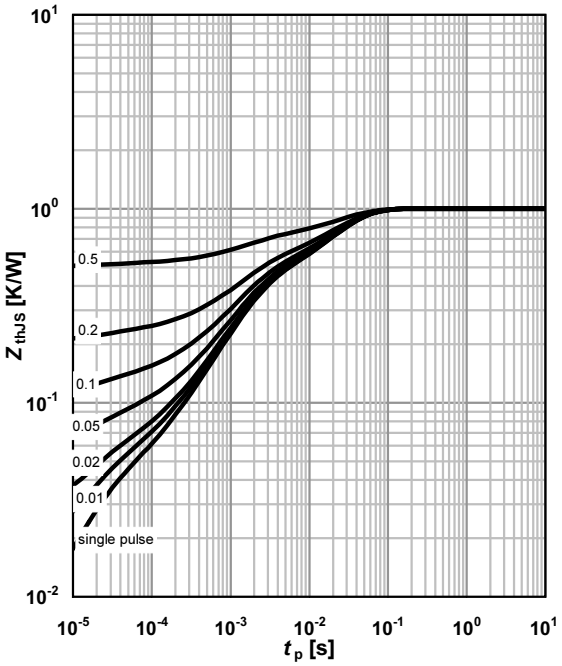
parameter: $t_p$




## 4 Max. transient thermal impedance

$Z_{thJS}=f(t_p)$

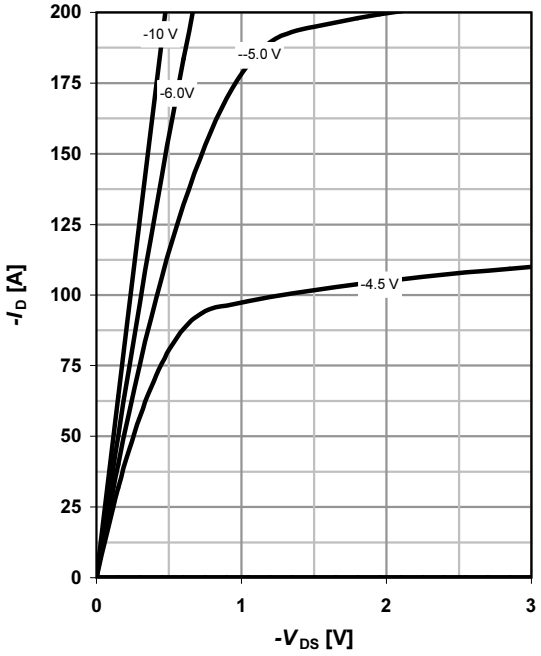
parameter: $D=t_p/T$



### 5 Typ. output characteristics

$I_D$=f($V_{DS}$); $T_j$=25 °C

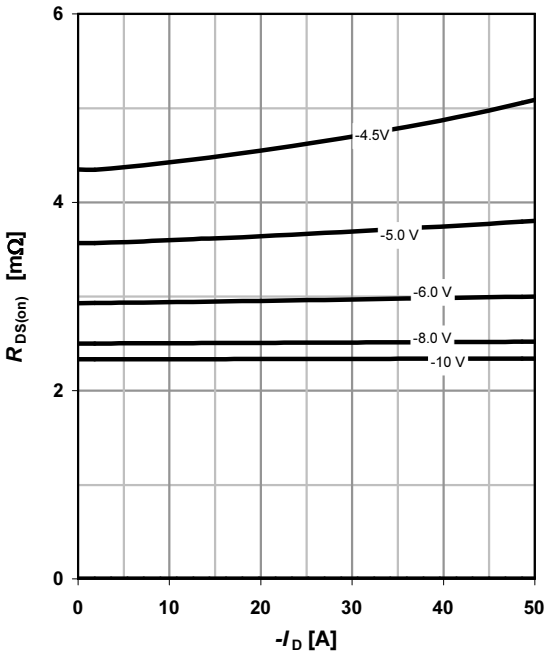
parameter: $V_{GS}$




### 6 Typ. drain-source on resistance

$R_{DS(on)}$=f($I_D$); $T_j$=25 °C

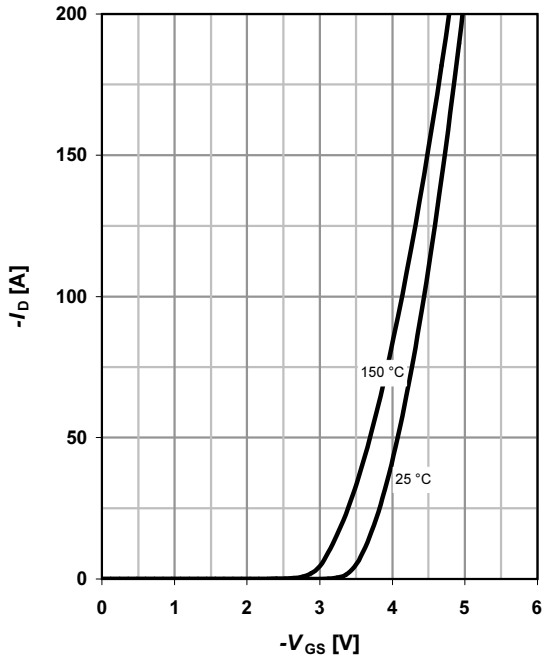
parameter: $V_{GS}$




### 7 Typ. transfer characteristics

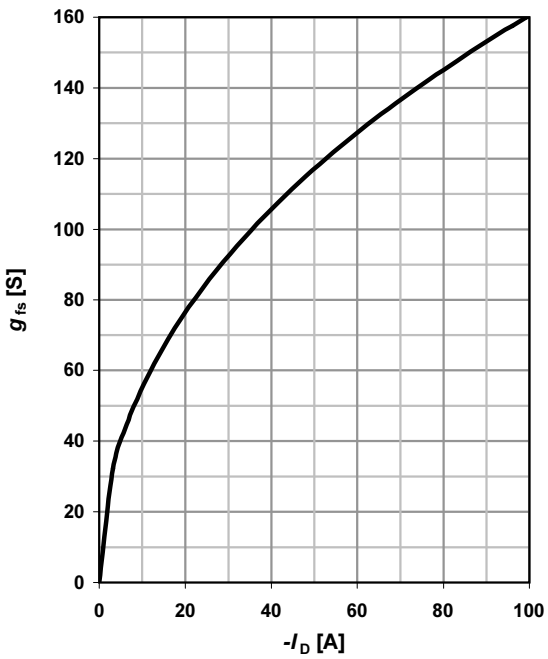
$I_D$=f($V_{GS}$); $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: $T_j$



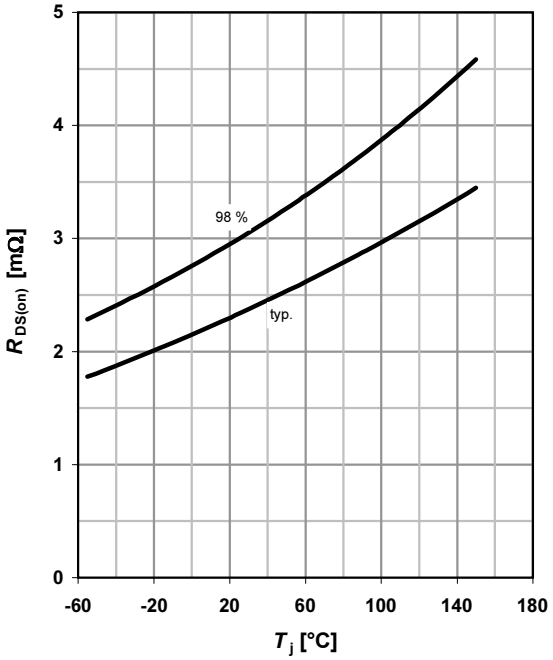

### 8 Typ. forward transconductance

$g_{fs}$=f($I_D$); $T_j$=25 °C



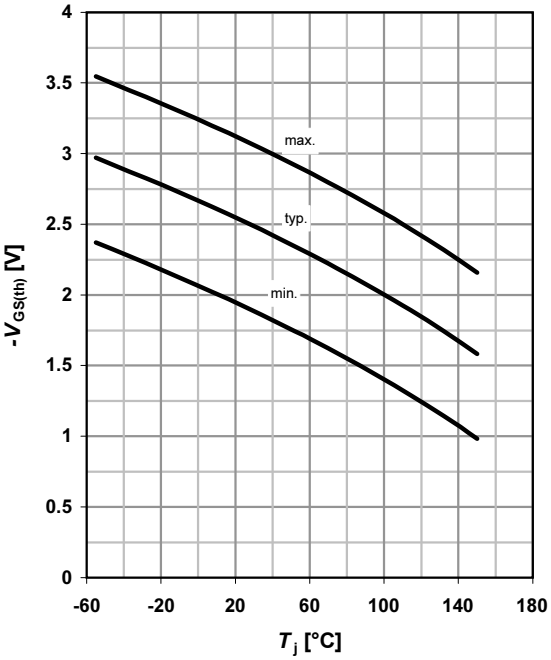
### 9 Drain-source on-state resistance

$R_{DS(on)}$=f($T_j$); $I_D$=-50 A; $V_{GS}$=-10 V



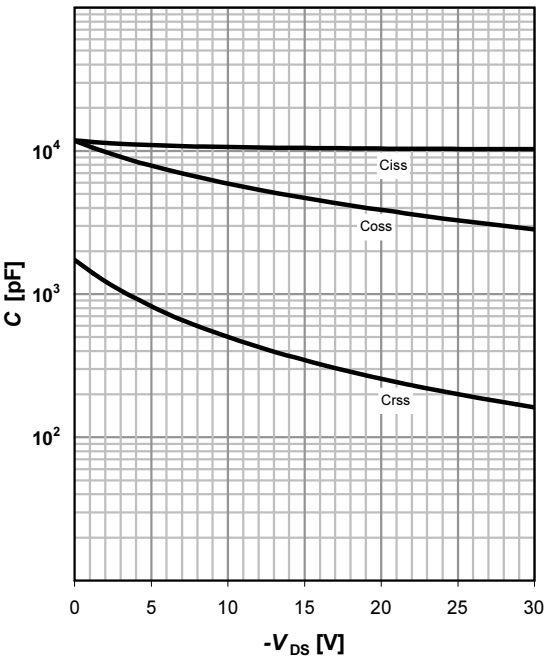

### 10 Typ. gate threshold voltage

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; $I_D$=-345 µA




### 11 Typ. capacitances

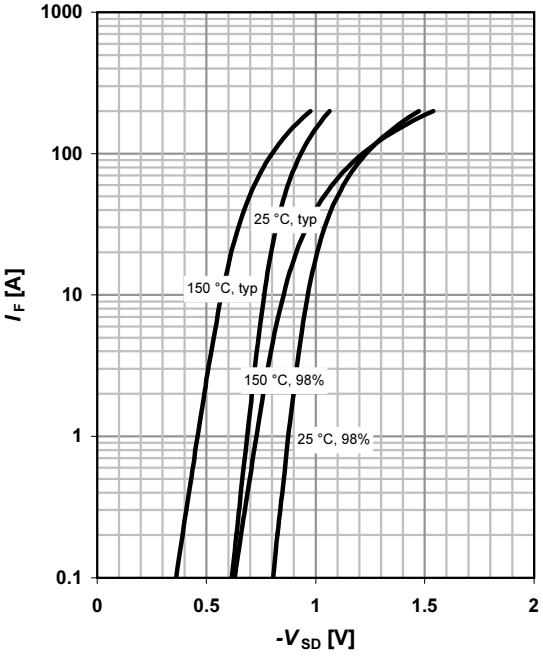
$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz




### 12 Forward characteristics of reverse diode

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

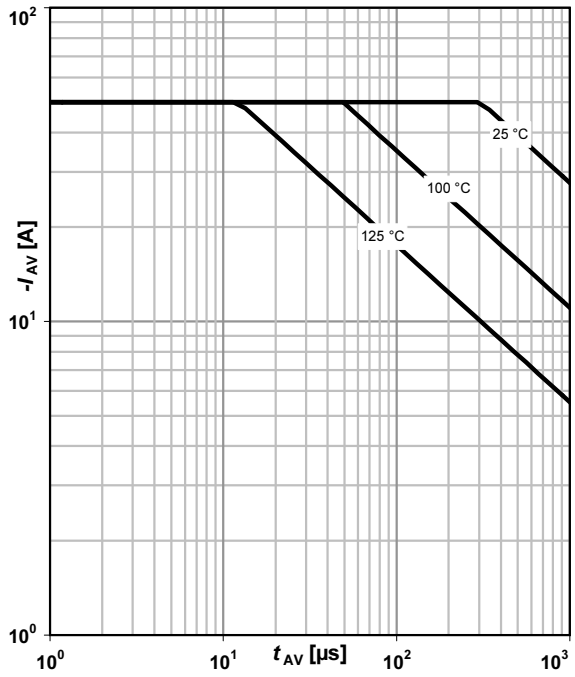
parameter: $T_j$



### 13 Avalanche characteristics

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω

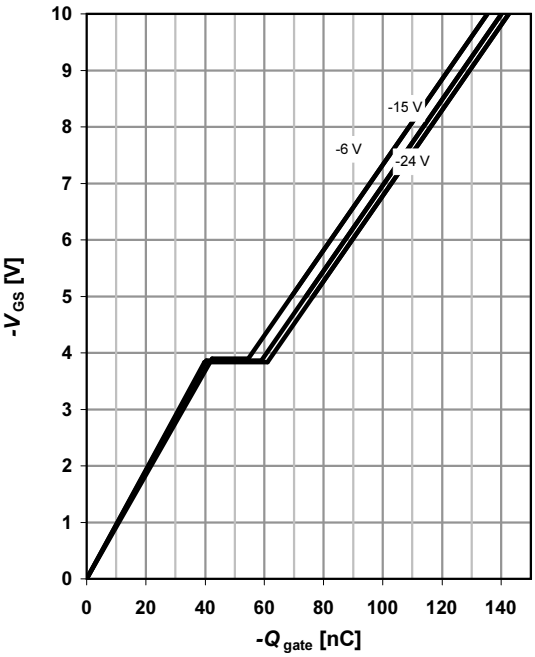
parameter: $T_{j(start)}$




### 14 Typ. gate charge

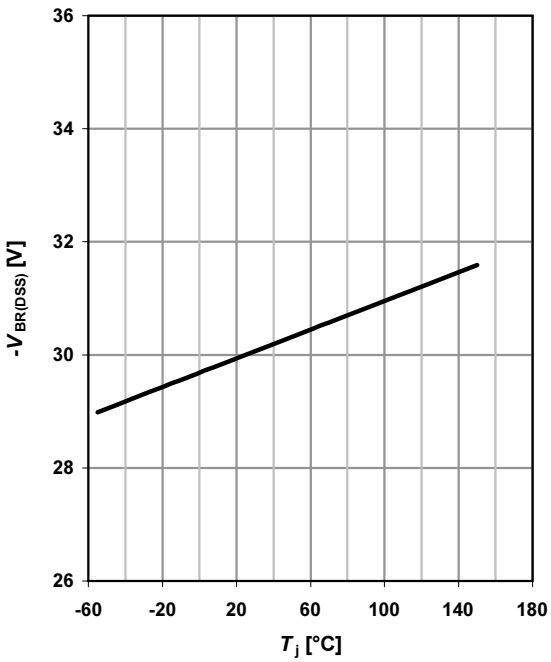
$V_{GS}$=f($Q_{gate}$); $I_D$=-50 A pulsed

parameter: $V_{DD}$

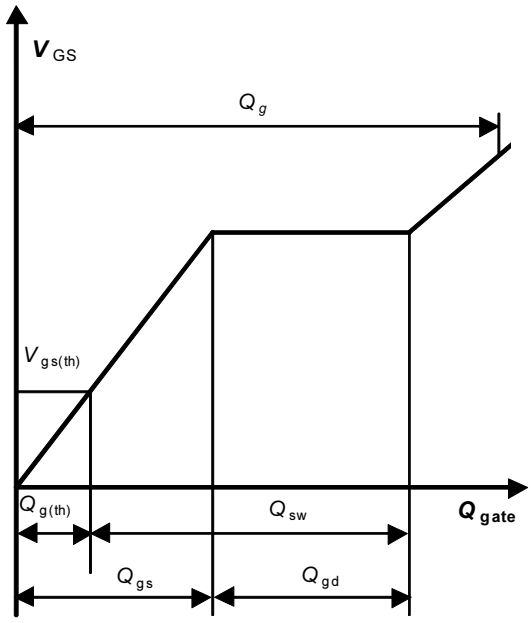



### 15 Drain-source breakdown voltage

$V_{BR(DSS)}$=f($T_j$); $I_D$=-250 µA

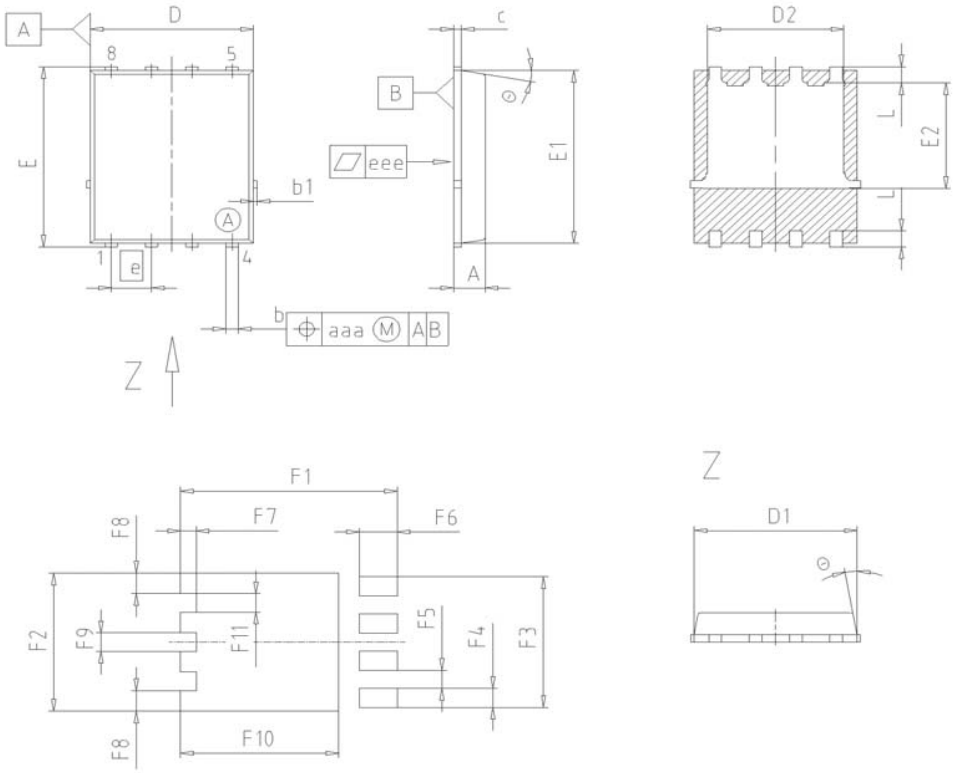



### 16 Gate charge waveforms



**Package Outline**

**PG-TDSON-8**




| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.34 | 0.54 | 0.013 | 0.021 |
| b1 | 0.02 | 0.22 | 0.001 | 0.008 |
| c | 0.15 | 0.35 | 0.006 | 0.014 |
| D=D1 | 4.95 | 5.35 | 0.195 | 0.211 |
| D2 | 4.20 | 4.40 | 0.165 | 0.173 |
| E | 5.95 | 6.35 | 0.234 | 0.250 |
| E1 | 5.70 | 6.10 | 0.224 | 0.240 |
| E2 | 3.40 | 3.80 | 0.134 | 0.150 |
| e | 1.27 | | 0.050 | |
| N | 8 | | 8 | |
| L | 0.45 | 0.65 | 0.018 | 0.026 |
| □ | 8.5° | 11.5° | 8.5° | 11.5° |
| aaa | 0.25 | | 0.010 | |
| eee | 0.05 | | 0.002 | |
| F1 | 6.75 | 6.95 | 0.266 | 0.274 |
| F2 | 4.60 | 4.80 | 0.181 | 0.189 |
| F3 | 4.36 | 4.56 | 0.172 | 0.180 |
| F4 | 0.55 | 0.75 | 0.022 | 0.030 |
| F5 | 0.52 | 0.72 | 0.020 | 0.028 |
| F6 | 1.10 | 1.30 | 0.043 | 0.051 |
| F7 | 0.40 | 0.60 | 0.016 | 0.024 |
| F8 | 0.60 | 0.80 | 0.024 | 0.031 |
| F9 | 0.53 | 0.73 | 0.021 | 0.029 |
| F10 | 4.90 | 5.10 | 0.193 | 0.201 |
| F11 | 0.53 | 0.73 | 0.021 | 0.029 |

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**SCALE**
0 2.5 0 2.5 5mm

**EUROPEAN PROJECTION**

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03

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