# MOSFET

Metal Oxide Semiconductor Field Effect Transistor

## OptiMOS™

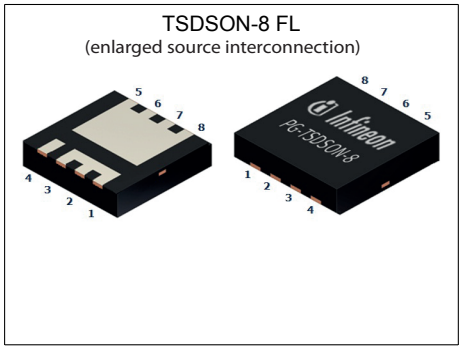
OptiMOS™5 Power-MOSFET, 25 V
BSZ017NE2LS5I

## Data Sheet

Rev. 2.0
Final

Power Management & Multimarket

# 1 Description




## Features

- Optimized for high performance buck converters
- Monolithic integrated Schottky-like diode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}$=4.5 V
- 100% avalanche tested
- N-channel
- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

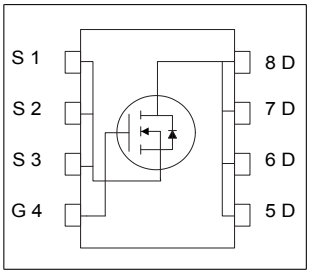



**Table 1 Key Performance Parameters**

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 25 | V |
| $R_{DS(on),max}$ | 1.7 | mΩ |
| $I_D$ | 40 | A |
| $Q_{OSS}$ | 17.5 | nC |
| $Q_G$(0V..4.5V) | 10.5 | nC |

| Type / Ordering Code | Package | Marking | Related Links |
|---|---|---|---|
| BSZ017NE2LS5I | PG-TSDSON-8 FL | 17NE25I | - |

[1] J-STD20 and JESD22

## Table of Contents

## 2 Maximum ratings

at $T_j$ = 25 °C, unless otherwise specified

**Table 2 Maximum ratings**

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current | $I_D$ | -<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>- | 40<br>40<br>40<br>40<br>27 | A | $V_{GS}$=10 V, $T_C$=25 °C<br>$V_{GS}$=10 V, $T_C$=100 °C<br>$V_{GS}$=4.5 V, $T_C$=25 °C<br>$V_{GS}$=4.5 V, $T_C$=100 °C<br>$V_{GS}$=10 V, $T_A$=25 °C, $R_{thJA}$=60 K/W[1)] |
| Pulsed drain current[2)] | $I_{D,pulse}$ | - | - | 160 | A | $T_C$=25 °C |
| Avalanche current, single pulse[3)] | $I_{AS}$ | - | - | 20 | A | $T_C$=25 °C |
| Avalanche energy, single pulse | $E_{AS}$ | - | - | 40 | mJ | $I_D$=20 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -16 | - | 16 | V | - |
| Power dissipation | $P_{tot}$ | -<br>- | -<br>- | 50<br>2.1 | W | $T_C$=25 °C<br>$T_A$=25 °C, $R_{thJA}$=60 K/W[1)] |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 150 | °C | IEC climatic category;<br>DIN IEC 68-1: 55/150/56 |

## 3 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 2.5 | K/W | - |
| Device on PCB,<br>6 cm² cooling area[1)] | $R_{thJA}$ | - | - | 60 | K/W | - |

[1)] 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.
[2)] See Diagram 3 for more detailed information
[3)] See Diagram 13 for more detailed information

# 4 Electrical characteristics

## Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 25 | - | - | V | $V_{GS}$=0 V, $I_D$=10 mA |
| Breakdown voltage temperature coefficient | $dV_{(BR)DSS}/dT_j$ | - | 15 | - | mV/K | $I_D$=10 mA, referenced to 25 °C |
| Gate threshold voltage | $V_{GS(th)}$ | 1.2 | - | 2 | V | $V_{DS}$=$V_{GS}$, $I_D$=250 µA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | -<br>0.5 | 0.5<br>- | mA | $V_{DS}$=20 V, $V_{GS}$=0 V, $T_j$=25 °C<br>$V_{DS}$=20 V, $V_{GS}$=0 V, $T_j$=125 °C |
| Gate-source leakage current | $I_{GSS}$ | - | 10 | 100 | nA | $V_{GS}$=20 V, $V_{DS}$=0 V |
| Drain-source on-state resistance | $R_{DS(on)}$ | -<br>- | 1.9<br>1.45 | 2.3<br>1.7 | mΩ | $V_{GS}$=4.5 V, $I_D$=20 A<br>$V_{GS}$=10 V, $I_D$=20 A |
| Gate resistance | $R_G$ | - | 0.85 | 1.4 | Ω | - |
| Transconductance | $g_{fs}$ | 60 | 120 | - | S | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=20 A |

## Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance[1)] | $C_{iss}$ | - | 1500 | 2000 | pF | $V_{GS}$=0 V, $V_{DS}$=12 V, $f$=1 MHz |
| Output capacitance[1)] | $C_{oss}$ | - | 750 | 1000 | pF | $V_{GS}$=0 V, $V_{DS}$=12 V, $f$=1 MHz |
| Reverse transfer capacitance | $C_{rss}$ | - | 60 | - | pF | $V_{GS}$=0 V, $V_{DS}$=12 V, $f$=1 MHz |
| Turn-on delay time | $t_{d(on)}$ | - | 4 | - | ns | $V_{DD}$=12 V, $V_{GS}$=10 V, $I_D$=30 A, $R_{G,ext}$=1.6 Ω |
| Rise time | $t_r$ | - | 4 | - | ns | $V_{DD}$=12 V, $V_{GS}$=10 V, $I_D$=30 A, $R_{G,ext}$=1.6 Ω |
| Turn-off delay time | $t_{d(off)}$ | - | 20 | - | ns | $V_{DD}$=12 V, $V_{GS}$=10 V, $I_D$=30 A, $R_{G,ext}$=1.6 Ω |
| Fall time | $t_f$ | - | 3 | - | ns | $V_{DD}$=12 V, $V_{GS}$=10 V, $I_D$=30 A, $R_{G,ext}$=1.6 Ω |

[1)] Defined by design. Not subject to production test.

## Table 6 Gate charge characteristics[1)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | - | 3.7 | - | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge at threshold | $Q_{g(th)}$ | - | 2.4 | - | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate to drain charge | $Q_{gd}$ | - | 2.3 | - | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Switching charge | $Q_{sw}$ | - | 3.5 | - | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge total | $Q_g$ | - | 10.5 | 14 | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate plateau voltage | $V_{plateau}$ | - | 2.4 | - | V | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge total[2)] | $Q_g$ | - | 22 | 30 | nC | $V_{DD}$=12 V, $I_D$=30 A, $V_{GS}$=0 to 10 V |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | - | 9.8 | - | nC | $V_{DS}$=0.1 V, $V_{GS}$=0 to 4.5 V |
| Output charge[2)] | $Q_{oss}$ | - | 17.5 | 24 | nC | $V_{DD}$=12 V, $V_{GS}$=0 V |

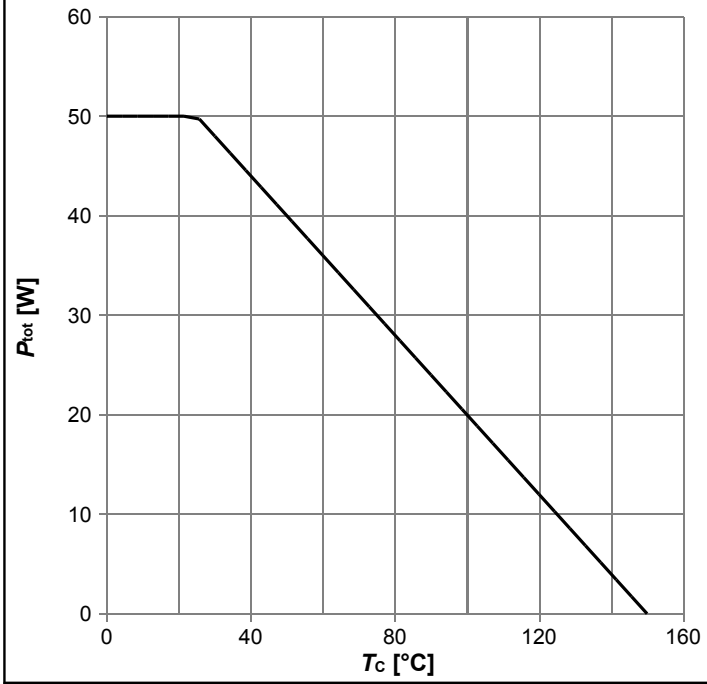
## Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | $I_S$ | - | - | 40 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | - | - | 160 | A | $T_C$=25 °C |
| Diode forward voltage | $V_{SD}$ | - | 0.51 | 0.65 | V | $V_{GS}$=0 V, $I_F$=7 A, $T_j$=25 °C |
| Reverse recovery charge | $Q_{rr}$ | - | 12 | - | nC | $V_R$=12 V, $I_F$=$I_S$, d$i_F$/d$t$=400 A/µs |

[1)] See ″Gate charge waveforms″ for parameter definition
[2)] Defined by design. Not subject to production test.

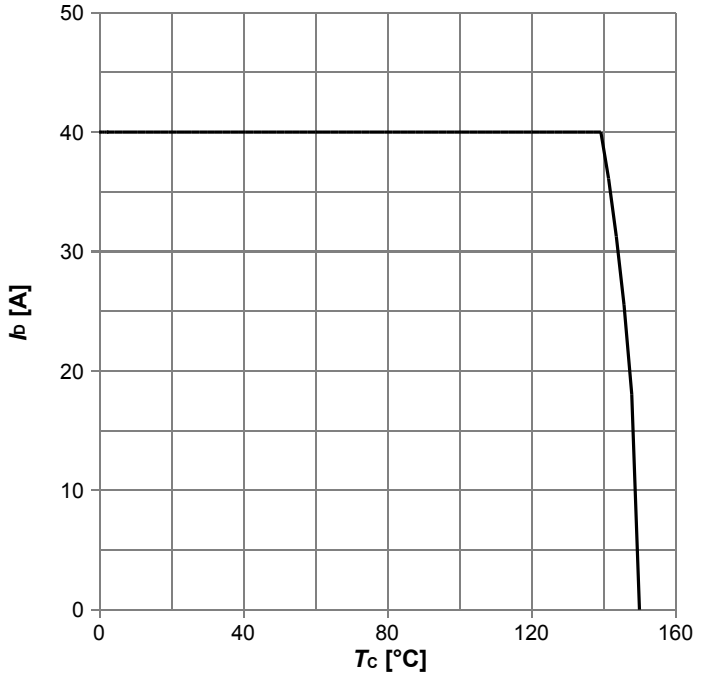
# 5 Electrical characteristics diagrams

**Diagram 1: Power dissipation**



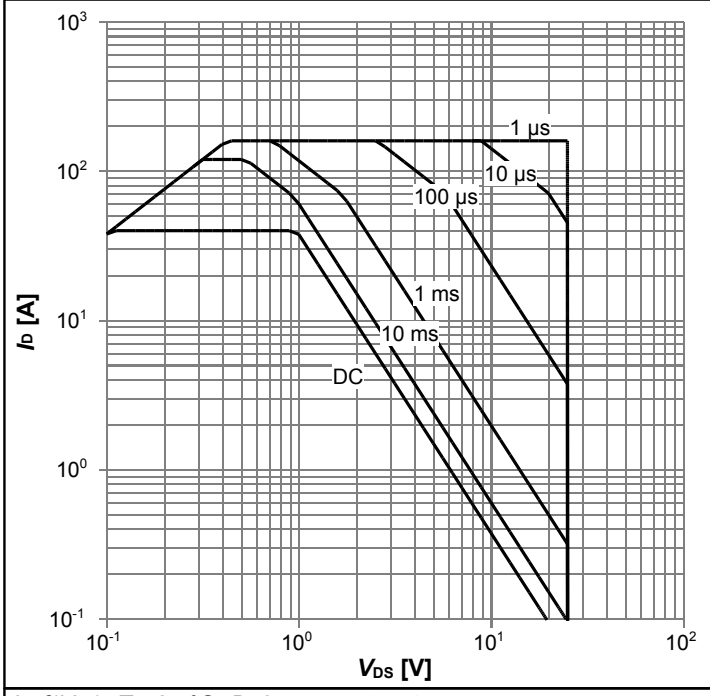

$P_{tot}=f(T_C)$

**Diagram 2: Drain current**



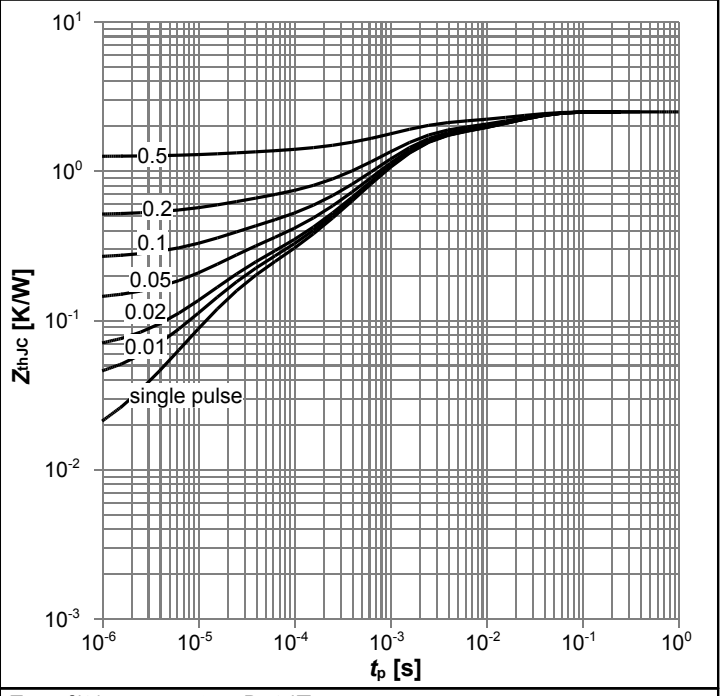

$I_D=f(T_C)$; $V_{GS}\geq 10$ V

**Diagram 3: Safe operating area**



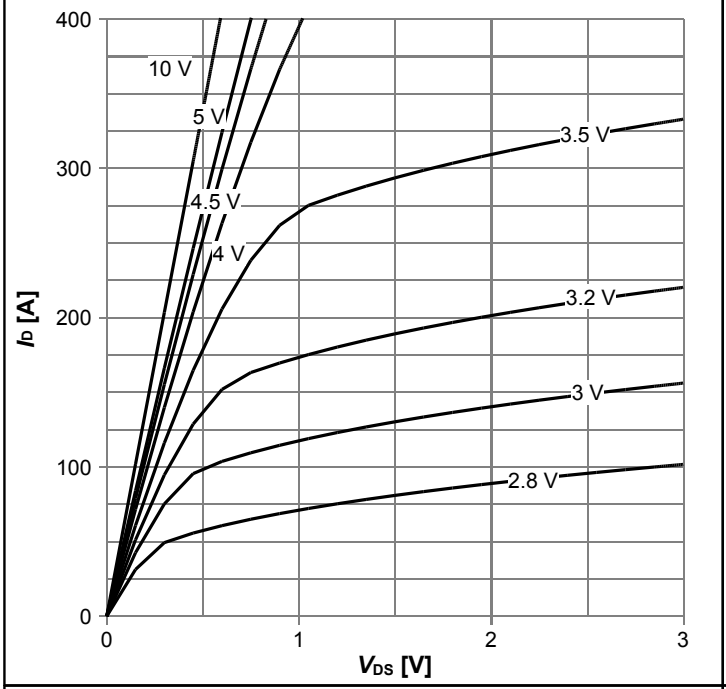

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: $t_p$

**Diagram 4: Max. transient thermal impedance**



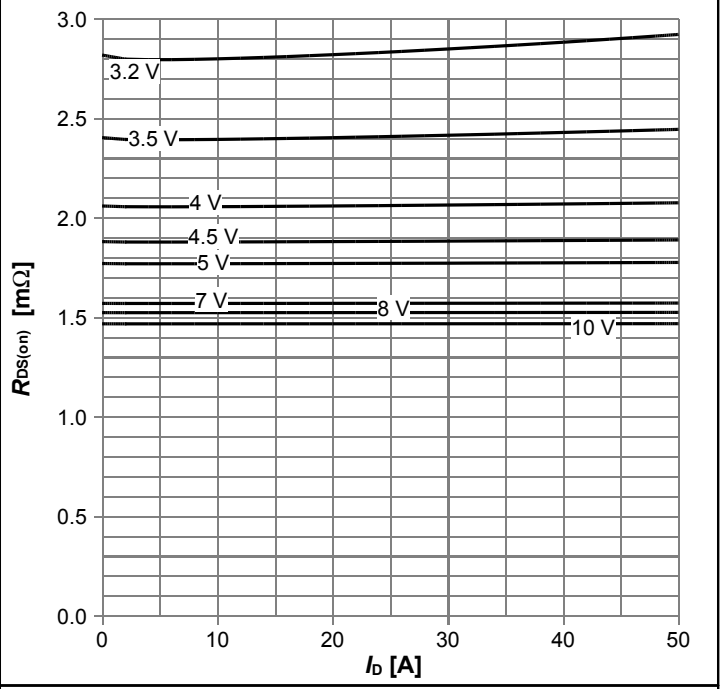

$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

**Diagram 5: Typ. output characteristics**



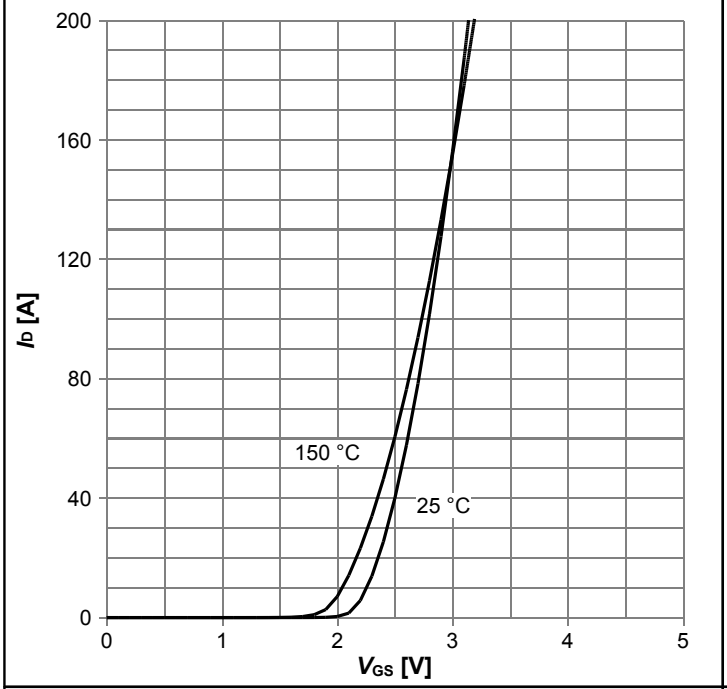

$I_D$=f($V_{DS}$); $T_j$=25 °C; parameter: $V_{GS}$

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



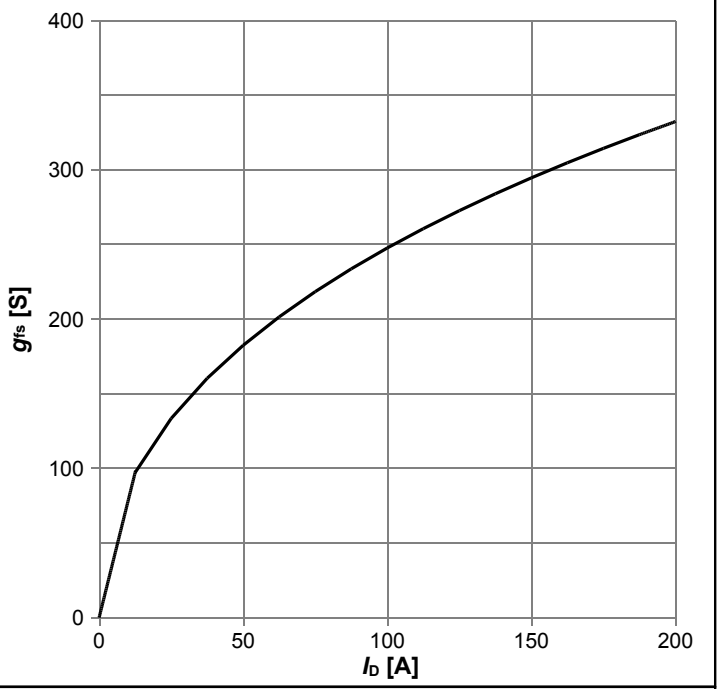

$R_{DS(on)}$=f($I_D$); $T_j$=25 °C; parameter: $V_{GS}$

**Diagram 7: Typ. transfer characteristics**



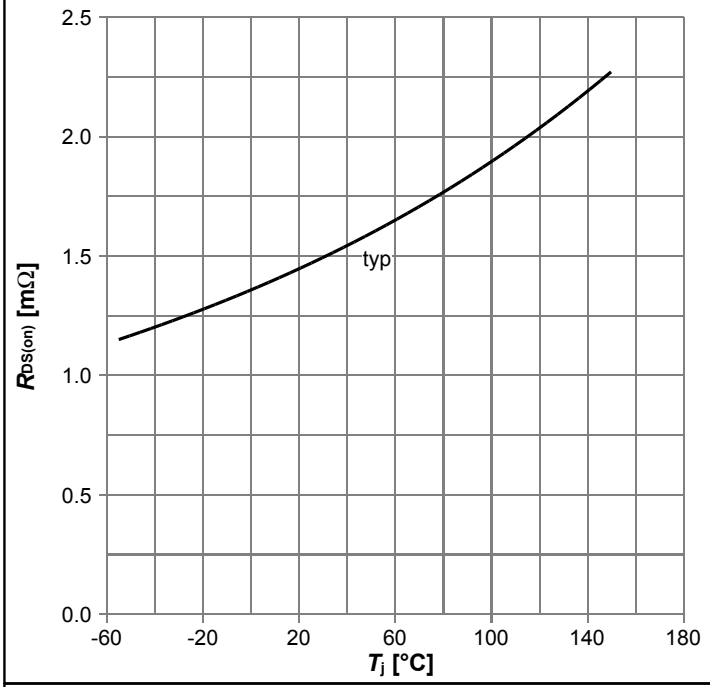

$I_D$=f($V_{GS}$); |$V_{DS}$|>2|$I_D$|$R_{DS(on)max}$; parameter: $T_j$

**Diagram 8: Typ. forward transconductance**



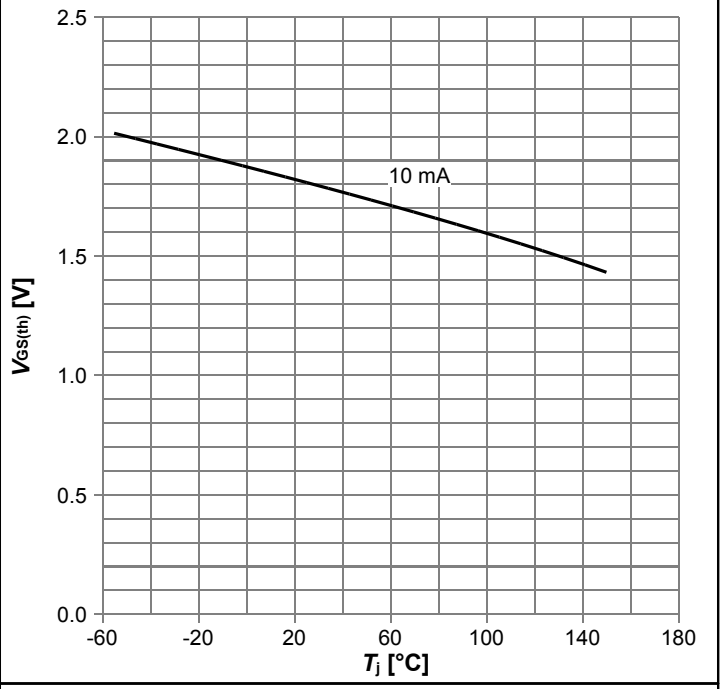

$g_{fs}$=f($I_D$); $T_j$=25 °C

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



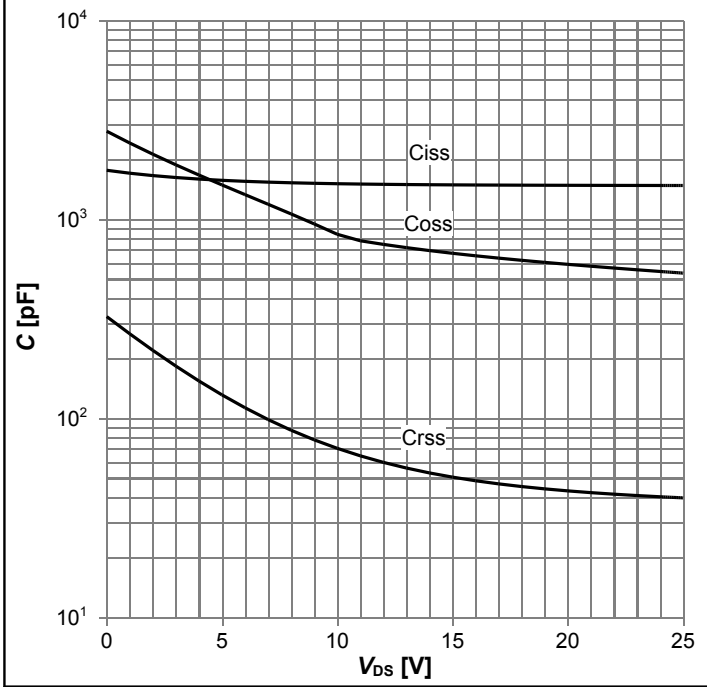

$R_{DS(on)}$=f($T_j$); $I_D$=20 A; $V_{GS}$=10 V

**Diagram 10: Typ. gate threshold voltage**



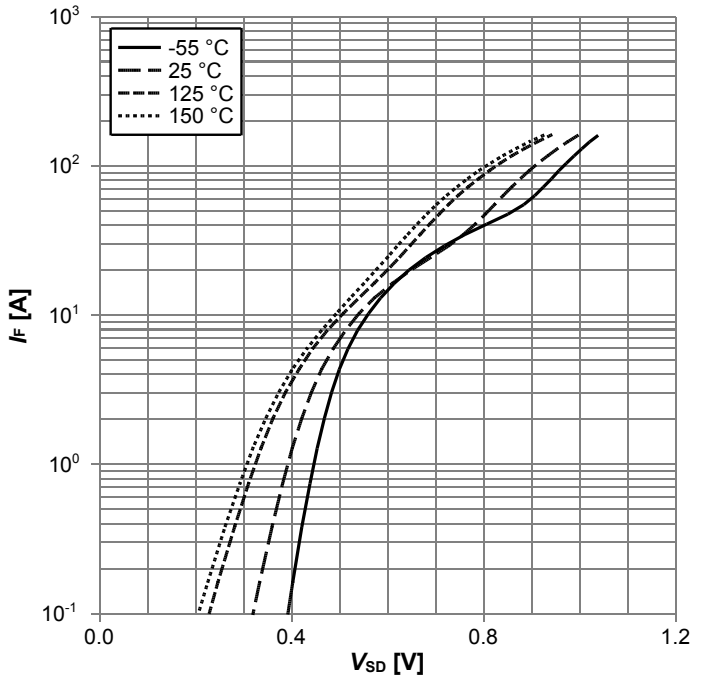

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$

**Diagram 11: Typ. capacitances**



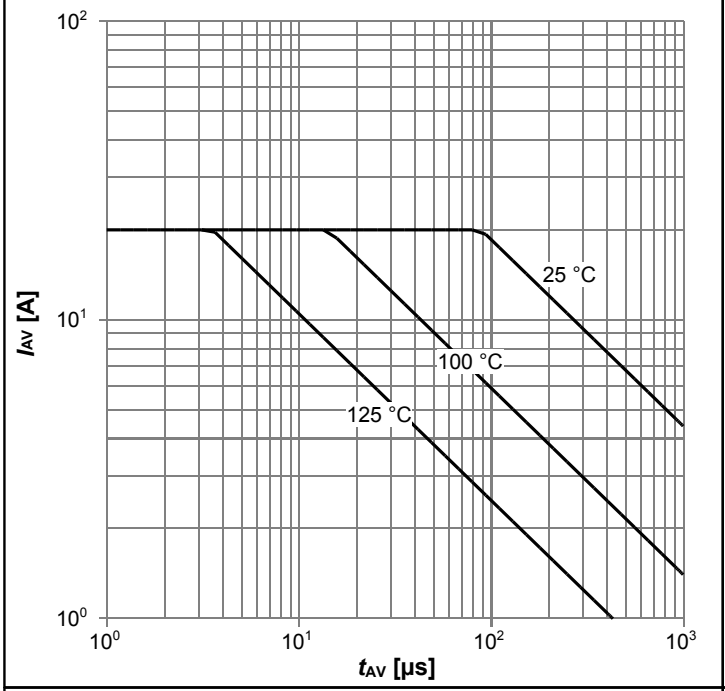

$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz

**Diagram 12: Forward characteristics of reverse diode**



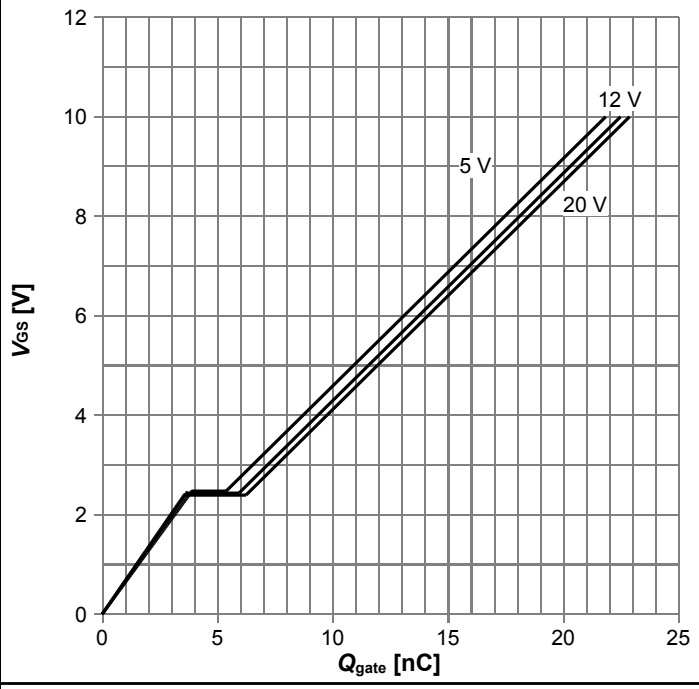

$I_F$=f($V_{SD}$); parameter: $T_j$

**Diagram 13: Avalanche characteristics**



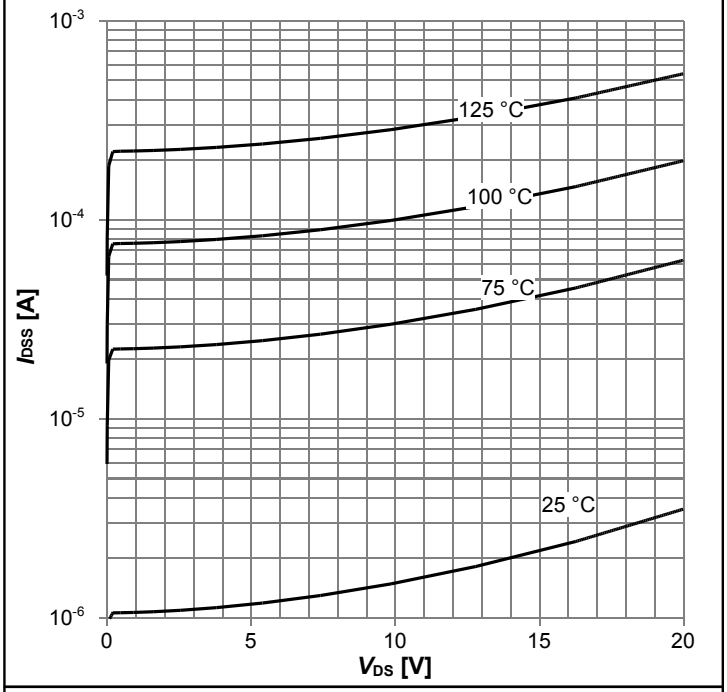

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j(start)}$

**Diagram 14: Typ. gate charge**



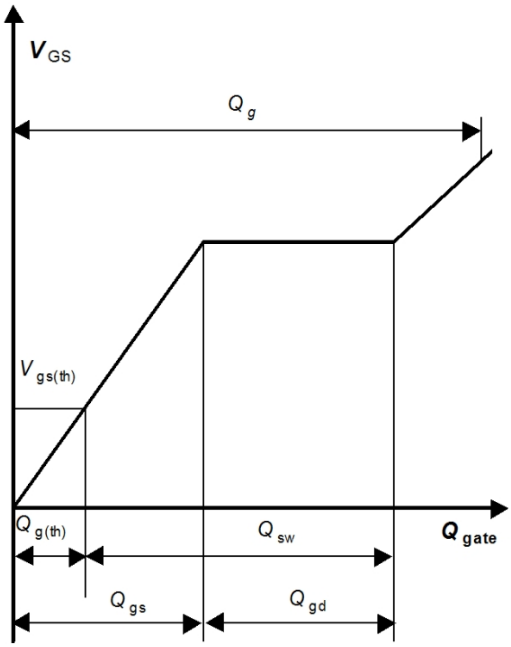

$V_{GS}$=f($Q_{gate}$); $I_D$=30 A pulsed; parameter: $V_{DD}$

**Diagram 15: Typ. drain-source leakage current**

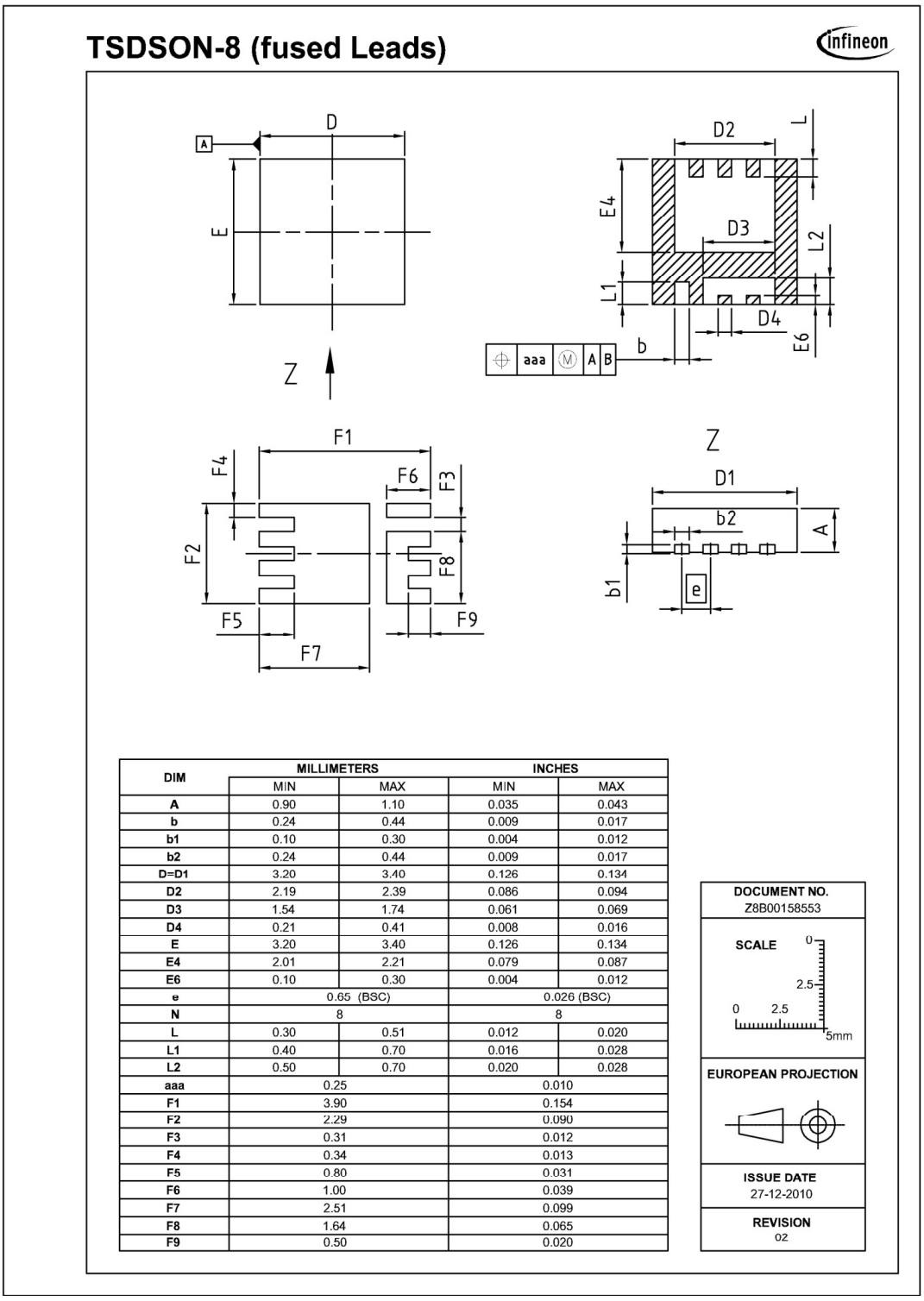



$I_{DSS}$=f($V_{DS}$); $V_{GS}$=0 V; parameter: $T_j$

Gate charge waveforms



# 6 Package Outlines




| 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 | 0.24 | 0.44 | 0.009 | 0.017 |
| D=D1 | 3.20 | 3.40 | 0.126 | 0.134 |
| D2 | 2.19 | 2.39 | 0.086 | 0.094 |
| D3 | 1.54 | 1.74 | 0.061 | 0.069 |
| D4 | 0.21 | 0.41 | 0.008 | 0.016 |
| E | 3.20 | 3.40 | 0.126 | 0.134 |
| E4 | 2.01 | 2.21 | 0.079 | 0.087 |
| E6 | 0.10 | 0.30 | 0.004 | 0.012 |
| e | 0.65 (BSC) | | 0.026 (BSC) | |
| N | 8 | | 8 | |
| L | 0.30 | 0.51 | 0.012 | 0.020 |
| L1 | 0.40 | 0.70 | 0.016 | 0.028 |
| L2 | 0.50 | 0.70 | 0.020 | 0.028 |
| aaa | 0.25 | | 0.010 | |
| F1 | 3.90 | | 0.154 | |
| F2 | 2.29 | | 0.090 | |
| F3 | 0.31 | | 0.012 | |
| F4 | 0.34 | | 0.013 | |
| F5 | 0.80 | | 0.031 | |
| F6 | 1.00 | | 0.039 | |
| F7 | 2.51 | | 0.099 | |
| F8 | 1.64 | | 0.065 | |
| F9 | 0.50 | | 0.020 | |

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SCALE
0 2.5 5mm

EUROPEAN PROJECTION

ISSUE DATE
27-12-2010

REVISION
02

**Figure 1 Outline PG-TSDSON-8 FL, dimensions in mm/inches**

## Revision History

BSZ017NE2LS5I

**Revision: 2015-08-17, Rev. 2.0**

| Previous Revision | | |
|---|---|---|
| Revision | Date | Subjects (major changes since last revision) |
| 2.0 | 2015-08-17 | Release of final version |

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