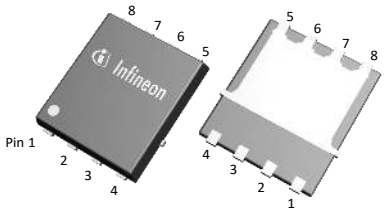
# MOSFET

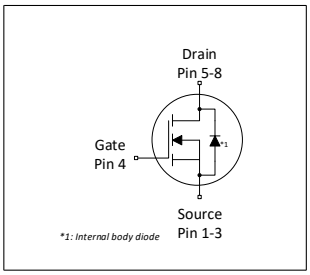
## OptiMOS™ 5 Power-Transistor, 150 V

PG-TDSON-8




### Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC[1] for target application
- Ideal for high-frequency switching and synchronous rectification




### Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 150 | V |
| $R_{DS(on),max}$ | 11 | mΩ |
| $I_D$ | 76 | A |
| $Q_{OSS}$ | 78 | nC |
| $Q_G$ (0V..10V) | 28 | nC |
| $Q_{SW}$ | 11.5 | nC |

| Type / Ordering Code | Package | Marking | Related Links |
|---|---|---|---|
| BSC110N15NS5 | PG-TDSON-8 | 110N15NS | - |

[1] J-STD20 and JESD22

## Table of Contents

# 1 Maximum ratings

at $T_A$=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>- | 76<br>48 | A | $T_C$=25 °C<br>$T_C$=100 °C |
| Pulsed drain current[1] | $I_{D,pulse}$ | - | - | 304 | A | $T_C$=25 °C |
| Avalanche energy, single pulse[2] | $E_{AS}$ | - | - | 100 | mJ | $I_D$=50 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -20 | - | 20 | V | - |
| Power dissipation | $P_{tot}$ | - | - | 125 | W | $T_C$=25 °C |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 150 | °C | IEC climatic category;<br>DIN IEC 68-1: 55/150/56 |

# 2 Thermal characteristics

### Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | 0.6 | 1 | K/W | - |
| Thermal resistance, junction-ambient, 6 cm² cooling area[3] | $R_{thJA}$ | - | - | 50 | K/W | - |

# 3 Electrical characteristics

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

### Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 150 | - | - | V | $V_{GS}$=0 V, $I_D$=1 mA |
| Gate threshold voltage | $V_{GS(th)}$ | 3 | 3.8 | 4.6 | V | $V_{DS}$=$V_{GS}$, $I_D$=91 µA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | 0.1<br>10 | 1<br>100 | µA | $V_{DS}$=120 V, $V_{GS}$=0 V, $T_j$=25 °C<br>$V_{DS}$=120 V, $V_{GS}$=0 V, $T_j$=125 °C |
| Gate-source leakage current | $I_{GSS}$ | - | 1 | 100 | nA | $V_{GS}$=20 V, $V_{DS}$=0 V |
| Drain-source on-state resistance | $R_{DS(on)}$ | -<br>- | 9<br>10 | 11<br>12.7 | mΩ | $V_{GS}$=10 V, $I_D$=38 A,<br>$V_{GS}$=8 V, $I_D$=19 A, |
| Gate resistance[4] | $R_G$ | - | 0.9 | 1.35 | Ω | - |
| Transconductance | $g_{fs}$ | 29 | 58 | - | S | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=38 A |

[1] See Diagram 3 for more detailed information
[2] See Diagram 13 for more detailed information
[3] 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.
[4] Defined by design. Not subject to production test

## Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance[1)] | $C_{iss}$ | - | 2080 | 2770 | pF | $V_{GS}$=0 V, $V_{DS}$=75 V, $f$=1 MHz |
| Output capacitance[1)] | $C_{oss}$ | - | 515 | 685 | pF | $V_{GS}$=0 V, $V_{DS}$=75 V, $f$=1 MHz |
| Reverse transfer capacitance[1)] | $C_{rss}$ | - | 13 | 23 | pF | $V_{GS}$=0 V, $V_{DS}$=75 V, $f$=1 MHz |
| Turn-on delay time | $t_{d(on)}$ | - | 10.3 | - | ns | $V_{DD}$=75 V, $V_{GS}$=10 V, $I_D$=38 A, $R_{G,ext}$=3 Ω |
| Rise time | $t_r$ | - | 3.3 | - | ns | $V_{DD}$=75 V, $V_{GS}$=10 V, $I_D$=38 A, $R_{G,ext}$=3 Ω |
| Turn-off delay time | $t_{d(off)}$ | - | 14.5 | - | ns | $V_{DD}$=75 V, $V_{GS}$=10 V, $I_D$=38 A, $R_{G,ext}$=3 Ω |
| Fall time | $t_f$ | - | 2.9 | - | ns | $V_{DD}$=75 V, $V_{GS}$=10 V, $I_D$=38 A, $R_{G,ext}$=3 Ω |

## Table 6 Gate charge characteristics[2)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | - | 12 | - | nC | $V_{DD}$=75 V, $I_D$=38 A, $V_{GS}$=0 to 10 V |
| Gate to drain charge[1)] | $Q_{gd}$ | - | 5.8 | 9 | nC | $V_{DD}$=75 V, $I_D$=38 A, $V_{GS}$=0 to 10 V |
| Switching charge | $Q_{sw}$ | - | 11.5 | - | nC | $V_{DD}$=75 V, $I_D$=38 A, $V_{GS}$=0 to 10 V |
| Gate charge total[1)] | $Q_g$ | - | 28 | 35 | nC | $V_{DD}$=75 V, $I_D$=38 A, $V_{GS}$=0 to 10 V |
| Gate plateau voltage | $V_{plateau}$ | - | 5.8 | - | V | $V_{DD}$=75 V, $I_D$=38 A, $V_{GS}$=0 to 10 V |
| Output charge[1)] | $Q_{oss}$ | - | 78 | 103 | nC | $V_{DD}$=75 V, $V_{GS}$=0 V |

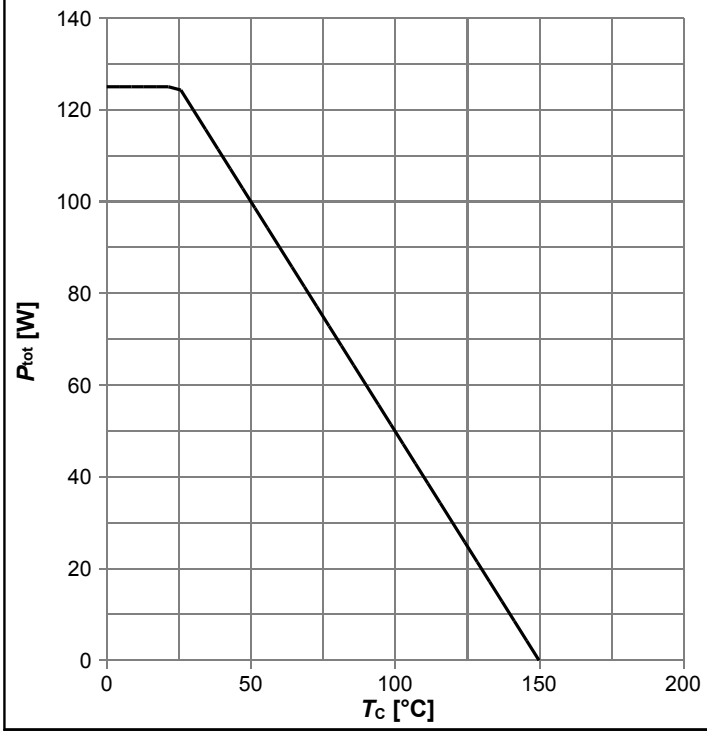
## Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continous forward current | $I_S$ | - | - | 86 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | - | - | 304 | A | $T_C$=25 °C |
| Diode forward voltage | $V_{SD}$ | - | 0.88 | 1.2 | V | $V_{GS}$=0 V, $I_F$=38 A, $T_j$=25 °C |
| Reverse recovery time[1)] | $t_{rr}$ | - | 45 | 90 | ns | $V_R$=75 V, $I_F$=38 A, d$i_F$/d$t$=100 A/µs |
| Reverse recovery charge[1)] | $Q_{rr}$ | - | 46 | 92 | nC | $V_R$=75 V, $I_F$=38 A, d$i_F$/d$t$=100 A/µs |

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

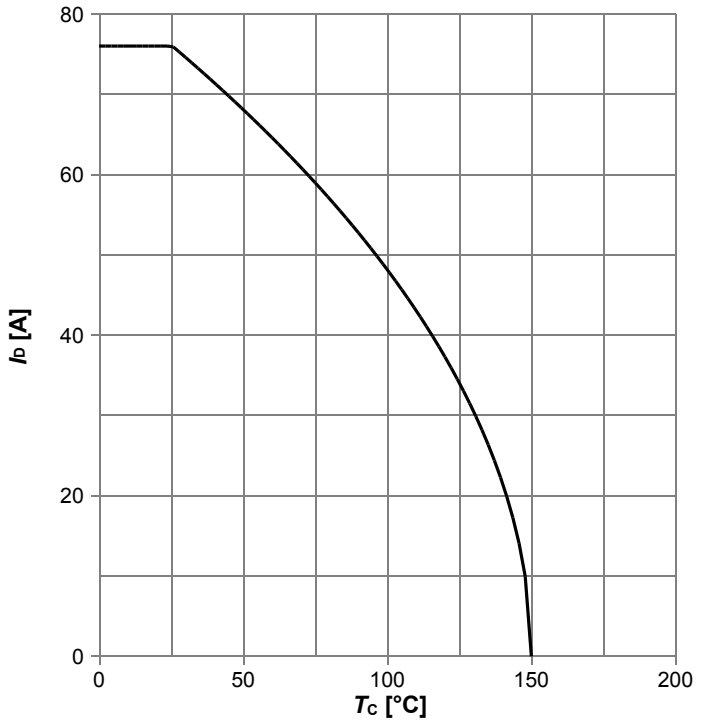
# 4 Electrical characteristics diagrams

**Diagram 1: Power dissipation**



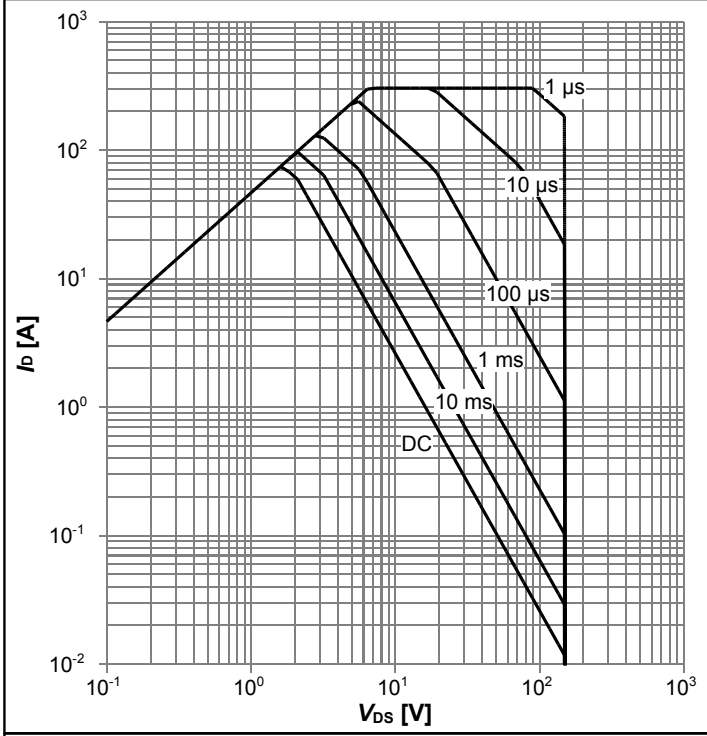

$P_{tot}=f(T_C)$

**Diagram 2: Drain current**



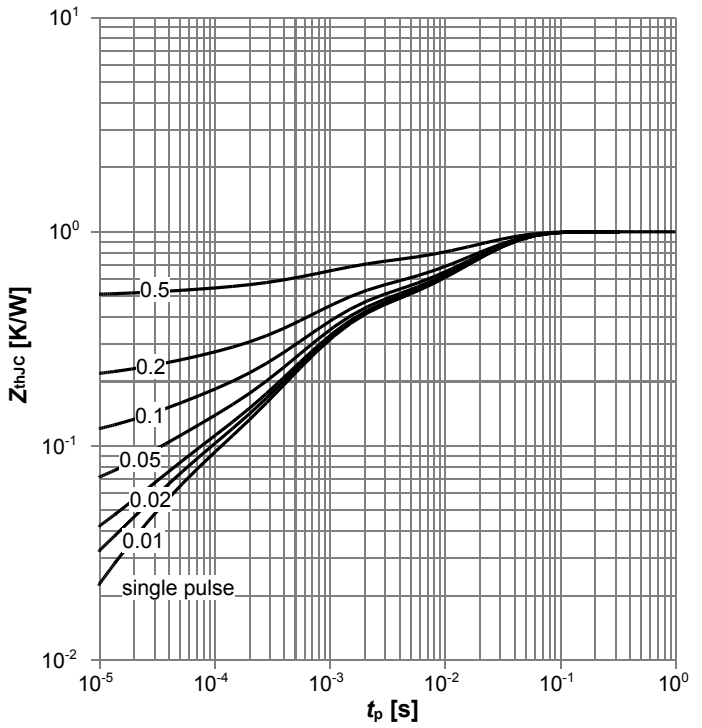

$I_D=f(T_C)$; $V_{GS}\geq 10$ V

**Diagram 3: Safe operating area**



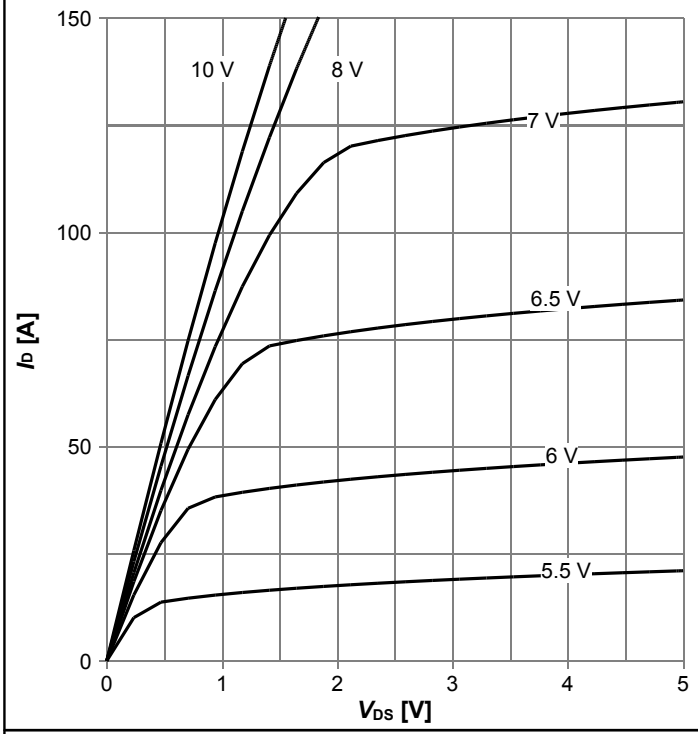

$I_D=f(V_{DS})$; $T_C$=25 °C; $D$=0; parameter: $t_p$

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



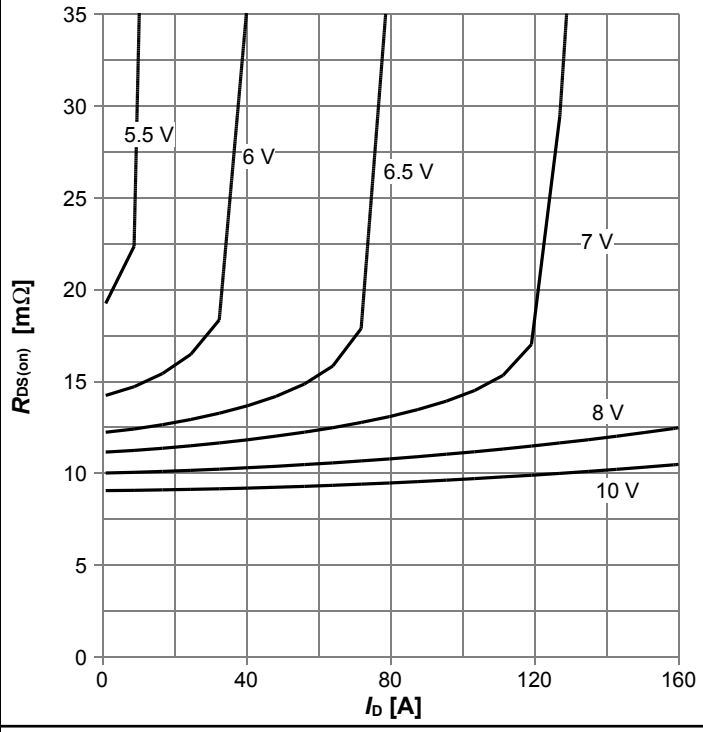

$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

**Diagram 5: Typ. output characteristics**



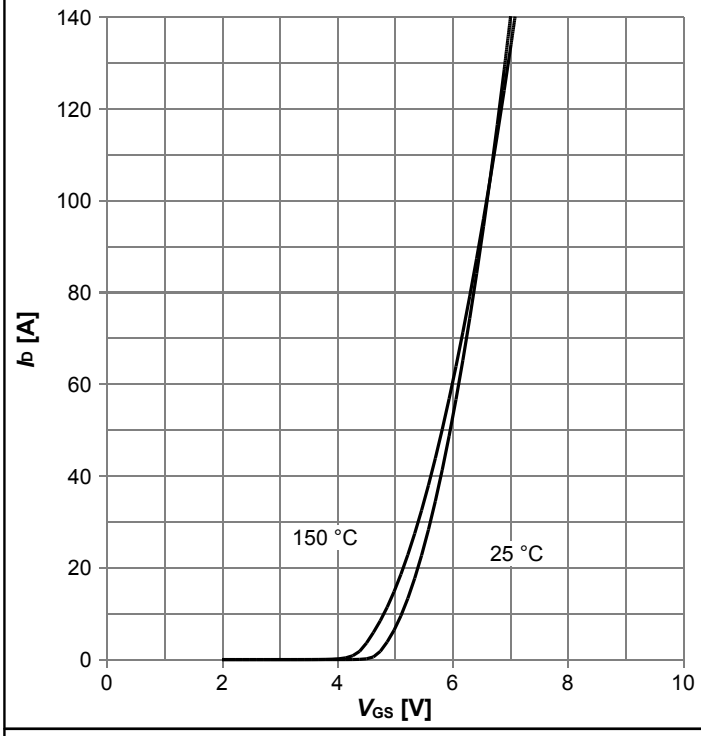

$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: $V_{GS}$

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



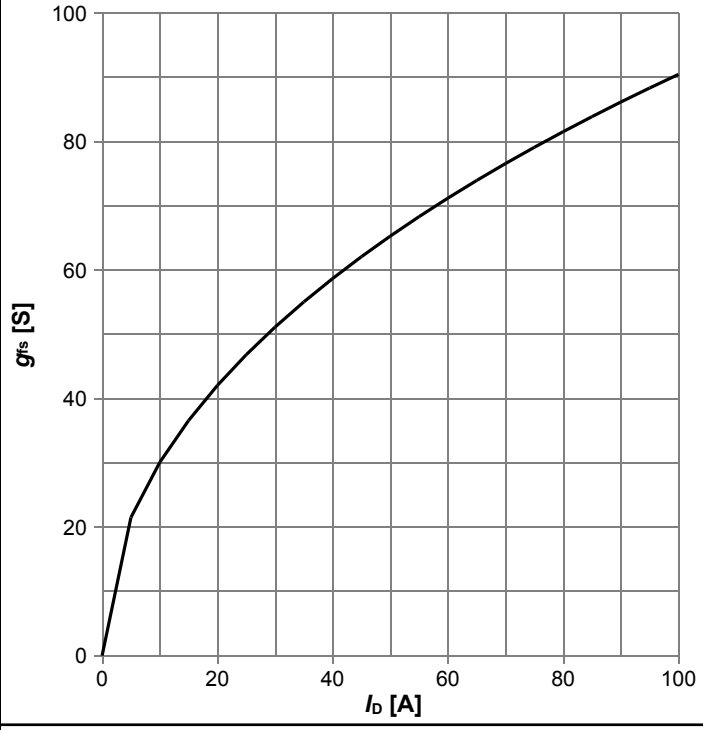

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: $V_{GS}$

**Diagram 7: Typ. transfer characteristics**



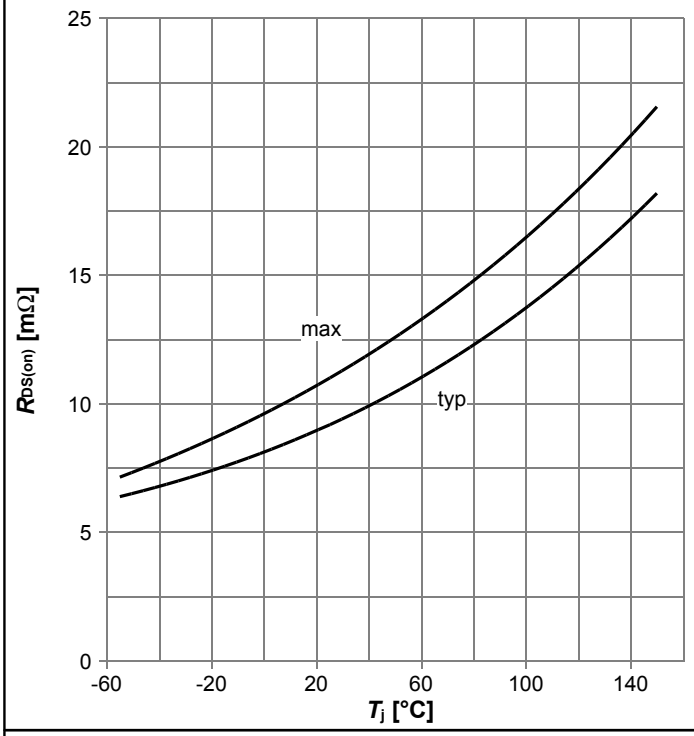

$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: $T_j$

**Diagram 8: Typ. forward transconductance**



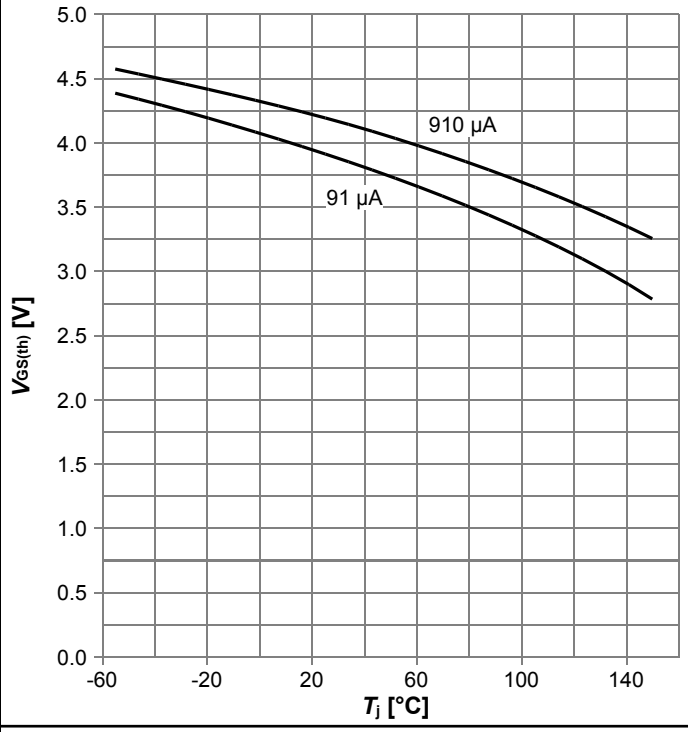

$g_{fs}=f(I_D)$; $T_j=25$ °C

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



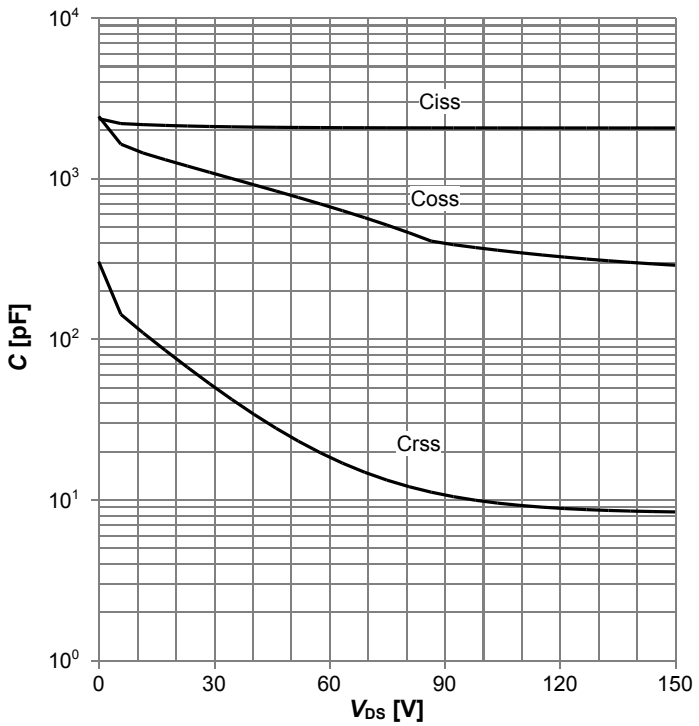

$R_{DS(on)}$=f($T_j$); $I_D$=38 A; $V_{GS}$=10 V

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



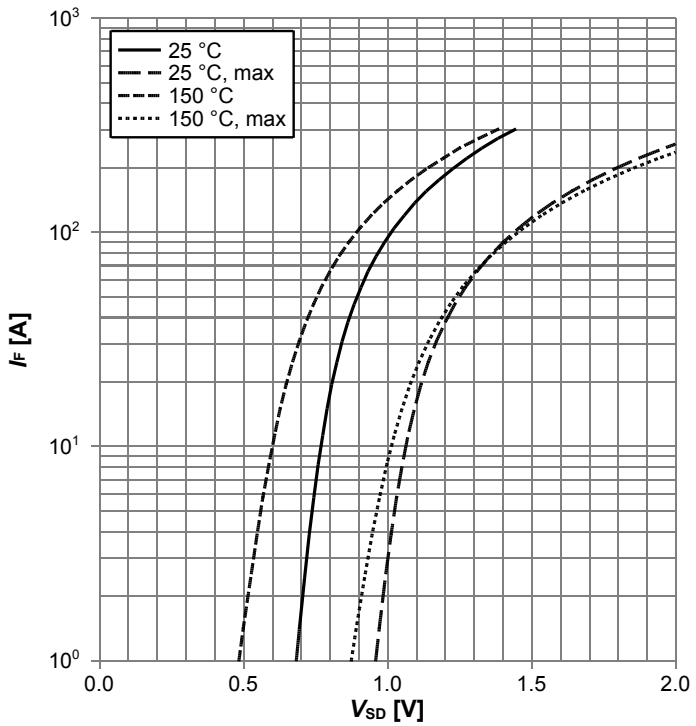

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; parameter: $I_D$

**Diagram 11: Typ. capacitances**



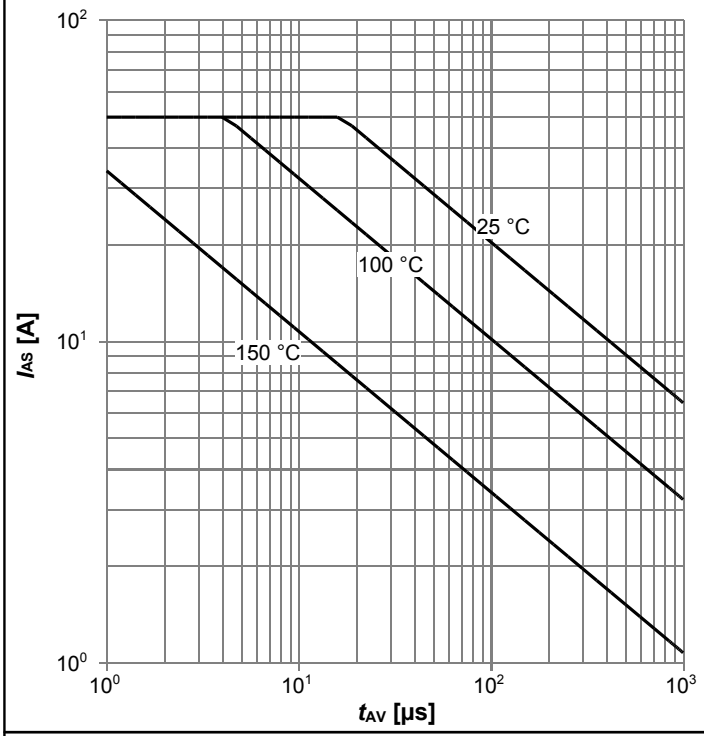

$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz

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



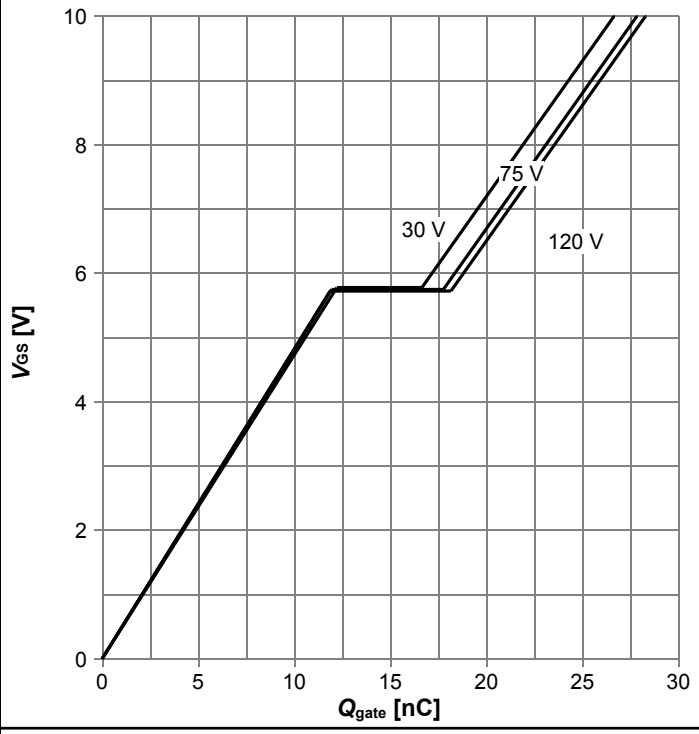

$I_F$=f($V_{SD}$); parameter: $T_j$

**Diagram 13: Avalanche characteristics**



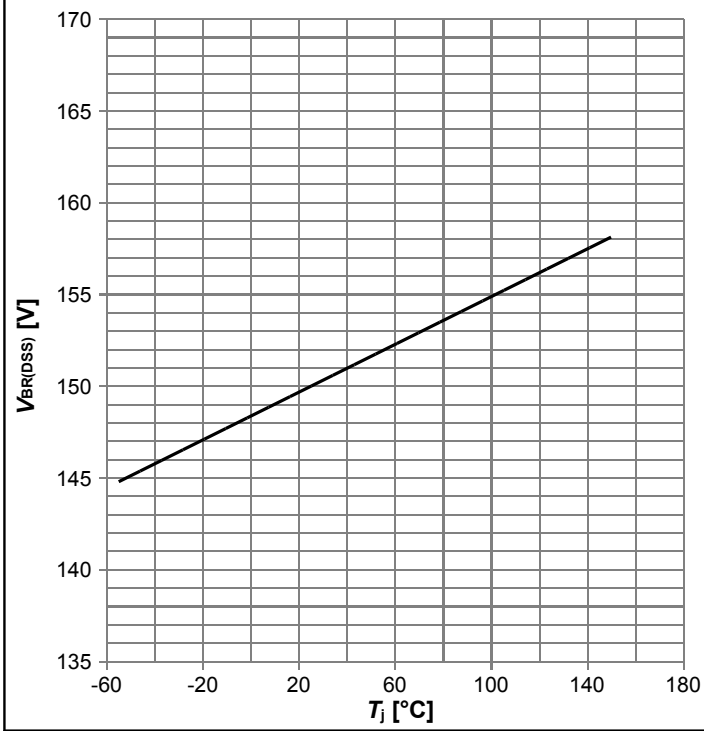

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j(start)}$

**Diagram 14: Typ. gate charge**



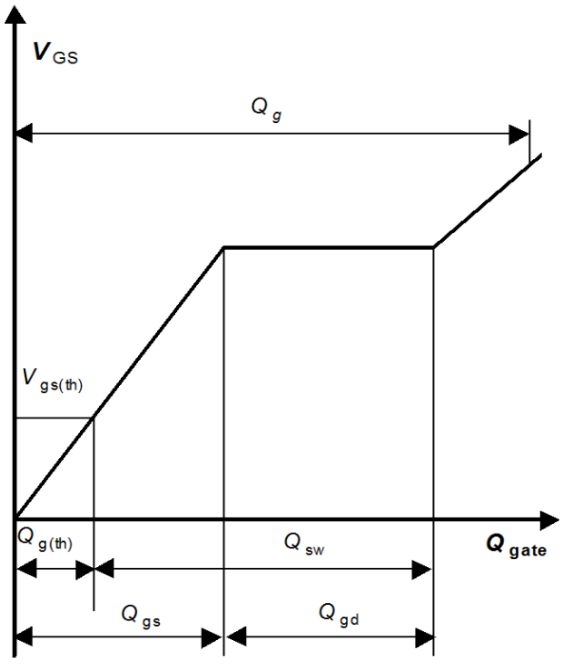

$V_{GS}$=f($Q_{gate}$); $I_D$=38A pulsed; parameter: $V_{DD}$

**Diagram 15: Drain-source breakdown voltage**

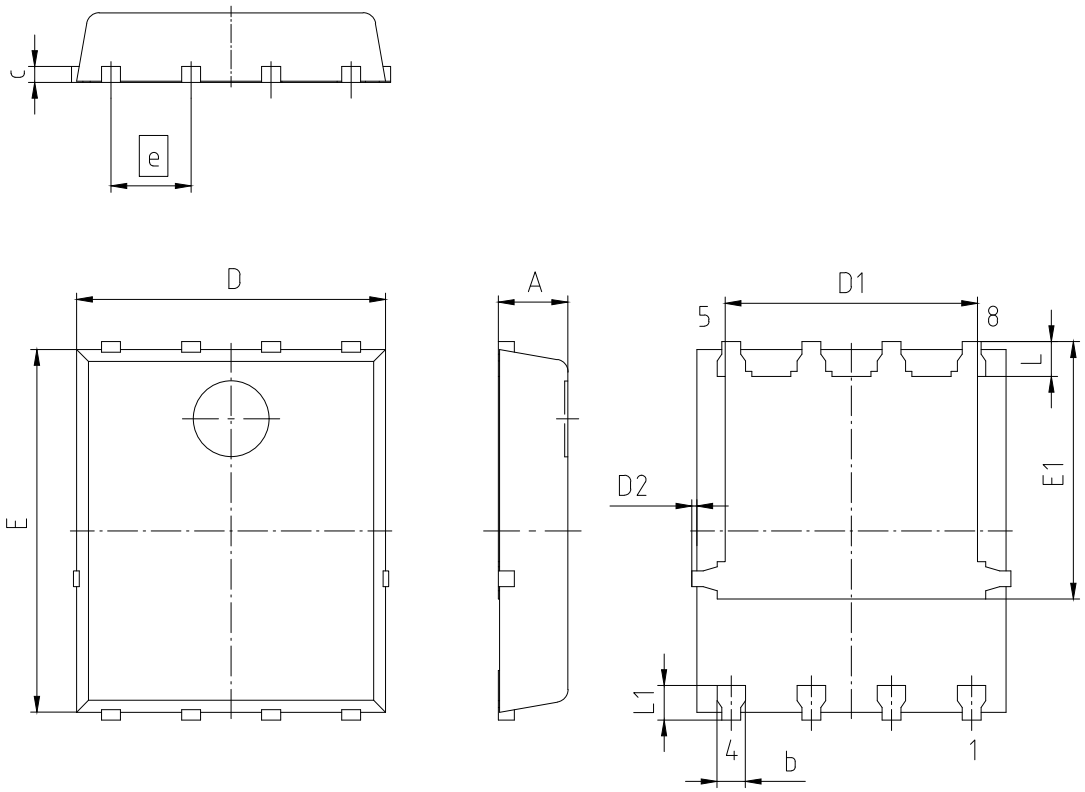



$V_{BR(DSS)}$=f($T_j$); $I_D$=1 mA

**Diagram Gate charge waveforms**



# 5 Package Outlines




| PACKAGE - GROUP NUMBER: | PG-TDSON-8-U08 | |
|---|---|---|
| DIMENSIONS | MILLIMETERS | |
| | MIN. | MAX. |
| A | 0.90 | 1.20 |
| b | 0.34 | 0.54 |
| c | 0.15 | 0.35 |
| D | 4.80 | 5.35 |
| D1 | 3.90 | 4.40 |
| D2 | 0.00 | 0.22 |
| E | 5.70 | 6.10 |
| E1 | 4.05 | 4.25 |
| e | 1.27 | |
| L | 0.45 | 0.65 |
| L1 | 0.45 | 0.65 |

1) EXCLUDING MOLD FLASH
2) REMOVAL ON MOLD GATE
INTRUSION 0.1 MM
PROTRUSION 0.1 MM
3) ALL METAL SURFACES ARE PLATED,
EXCEPT AREA OF CUT

**Figure 1 Outline PG-TDSON-8, dimensions in mm**

## Revision History

BSC110N15NS5

**Revision: 2022-11-07, Rev. 2.6**

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 2.0 | 2015-05-26 | Release of final version |
| 2.1 | 2015-06-09 | Update Avalanche Energy |
| 2.2 | 2017-09-18 | Update Ron max at Vgs=8V |
| 2.3 | 2018-02-21 | Update labels Diagram 9 |
| 2.4 | 2018-05-23 | Update date |
| 2.5 | 2021-05-20 | Update Diagram 11 and forward current |
| 2.6 | 2022-11-07 | Update package outline drawing |



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