

MOSFET

OptiMOS™ P3 Power-Transistor, -30 V

Features

- single P-Channel in S308
- Qualified according JEDEC¹⁾ for target applications
- 150 °C operating temperature
- $V_{GS}=25\text{ V}$, specially suited for notebook applications
- Pb-free; RoHS compliant
- applications: battery management, load switching
- Halogen-free according to IEC61249-2-21

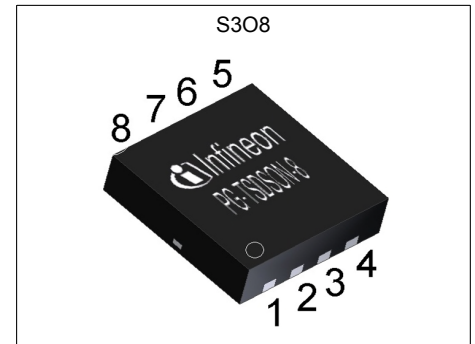
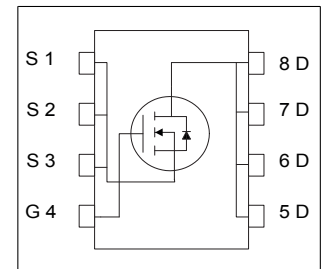


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------------|
| V_{DS} | -30 | V |
| $R_{DS(on),max}$ | 8.6 | m Ω |
| I_D | -40 | A |



| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|-------------|---------|---------------|
| BSZ086P03NS3 G | PG-TSDSON-8 | 086P3N | - |

¹⁾ J-STD20 and JESD22

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1 Maximum ratings

at $T_j=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-----------------------------------|----------------|--------|------|---------------------|------|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current | I_D | - | - | -40 -40 -13.5 | A | $T_C=25\text{ °C}$ $T_C=70\text{ °C}$ $T_A=25\text{ °C}^{1)}$ |
| Pulsed drain current | $I_{D,pulse}$ | - | - | -160 | A | $T_C=25\text{ °C}^{2)}$ |
| Avalanche energy, single pulse | E_{AS} | - | - | 105 | mJ | $I_D=-20\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -25 | - | 25 | V | - |
| Power dissipation | P_{tot} | - | - | 69 2.1 | - | $T_A=25\text{ °C}$ $T_A=25\text{ °C}^{1)}$ |
| Operating and storage temperature | T_j, T_{stg} | -55 | - | 150 | °C | IEC climatic category; DIN IEC 68-1: 55/150/56 |
| ESD class | - | - | 1C | - | - | (1kV-2kV), JESD22-A114 HBM |
| Soldering temperature | - | - | 260 | - | °C | - |

2 Thermal characteristics

Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 1.8 | K/W | - |
| Thermal resistance, junction - ambient, 6 cm ² 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 Fig. 3 for more detailed information

3 Electrical characteristics

at $T_j=25\text{ °C}$, unless otherwise specified

Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------------|-------------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | -30 | - | - | V | $V_{GS}=0\text{ V}$, $I_D=-250\text{ A}$ |
| Gate threshold voltage | $V_{GS(th)}$ | -3.1 | -2.5 | -1.9 | V | $V_{DS}=V_{GS}$, $I_D=-105\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | - | -1 -10 | μA | $V_{DS}=-30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=-30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ |
| Gate-source leakage current | I_{GSS} | - | - | -100 | nA | $V_{GS}=-25\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 6.5 8.7 | 8.6 13.4 | m Ω | $V_{GS}=-10\text{ V}$, $I_D=-20\text{ A}$ $V_{GS}=-6\text{ V}$, $I_D=-20\text{ A}$ |
| Gate resistance | R_G | - | 2.2 | - | Ω | - |
| Transconductance | g_{fs} | 30 | 43 | - | S | $ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=-20\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | C_{iss} | - | 3190 | 4785 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-15\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance | C_{oss} | - | 1520 | 2280 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-15\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 110 | 165 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-15\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 16 | 24 | ns | $V_{DD}=-15\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-20\text{ A}$, $R_{G,ext}=6\text{ }\Omega$ |
| Rise time | t_r | - | 46 | 69 | ns | $V_{DD}=-15\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-20\text{ A}$, $R_{G,ext}=6\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 35 | 53 | ns | $V_{DD}=-15\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-20\text{ A}$, $R_{G,ext}=6\text{ }\Omega$ |
| Fall time | t_f | - | 8 | 12 | ns | $V_{DD}=-15\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-20\text{ A}$, $R_{G,ext}=6\text{ }\Omega$ |

Table 6 Gate charge characteristics¹⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 16.1 | 21.4 | nC | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 5.0 | 6.7 | nC | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate to drain charge | Q_{gd} | - | 7.4 | 11.1 | nC | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Switching charge | Q_{sw} | - | 18.4 | 25.7 | nC | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate charge total | Q_g | - | 43.2 | 57.5 | nC | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | -4.5 | - | V | $V_{DD}=-15\text{ V}$, $I_D=-20\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Output charge | Q_{oss} | - | 34.9 | 46.4 | nC | $V_{DD}=-15\text{ V}$, $V_{GS}=0\text{ V}$ |

¹⁾ See Fig. 3 for more detailed information

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | -40 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | -160 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | - | -1.1 | V | $V_{GS}=0\text{ V}, I_F=-40\text{ A}, T_j=25\text{ °C}$ |
| Reverse recovery time | t_{rr} | - | 39 | - | ns | $V_R=15\text{ V}, I_F= I_S , di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | - | 34 | - | nC | $V_R=15\text{ V}, I_F= I_S , di_F/dt=100\text{ A}/\mu\text{s}$ |

4 Electrical characteristics diagrams

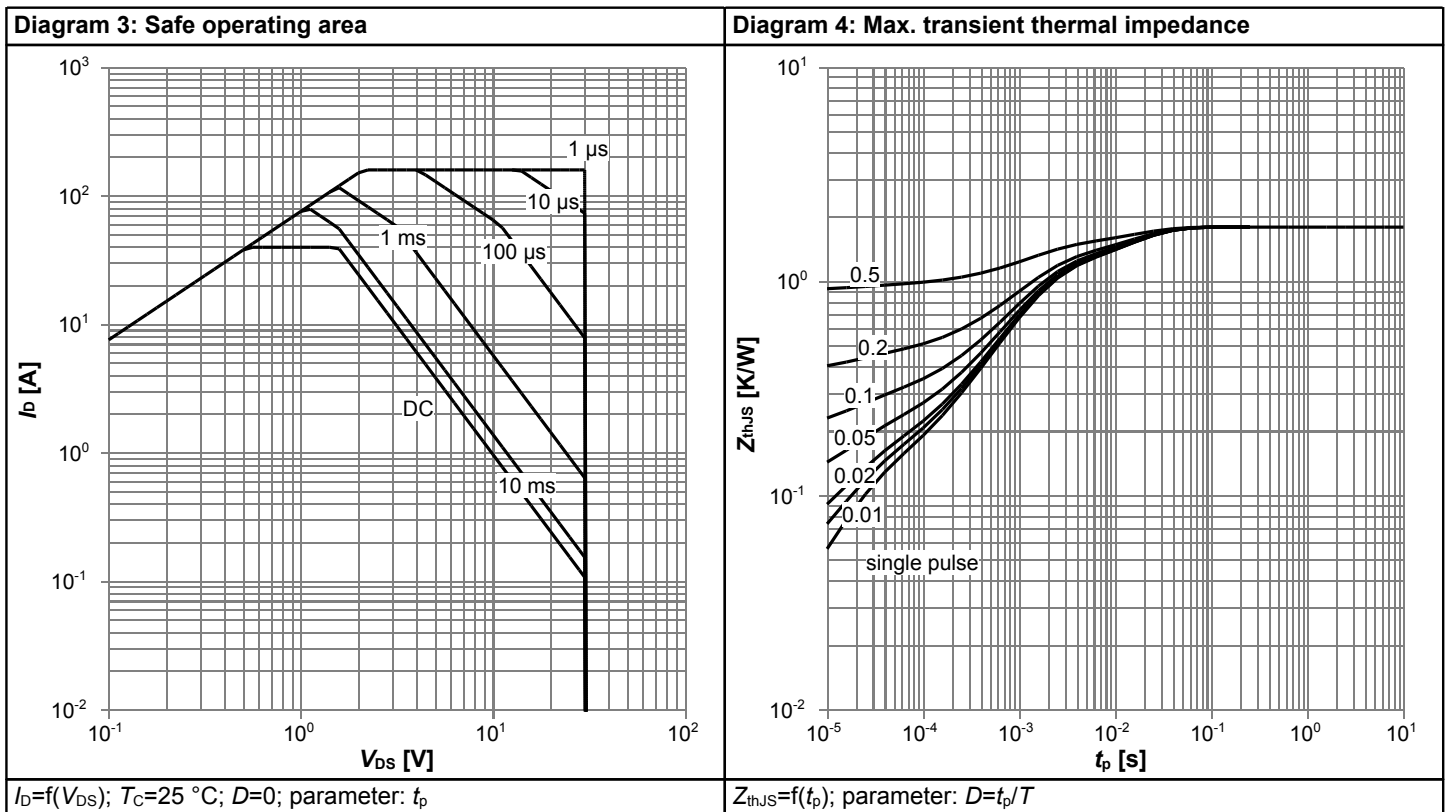
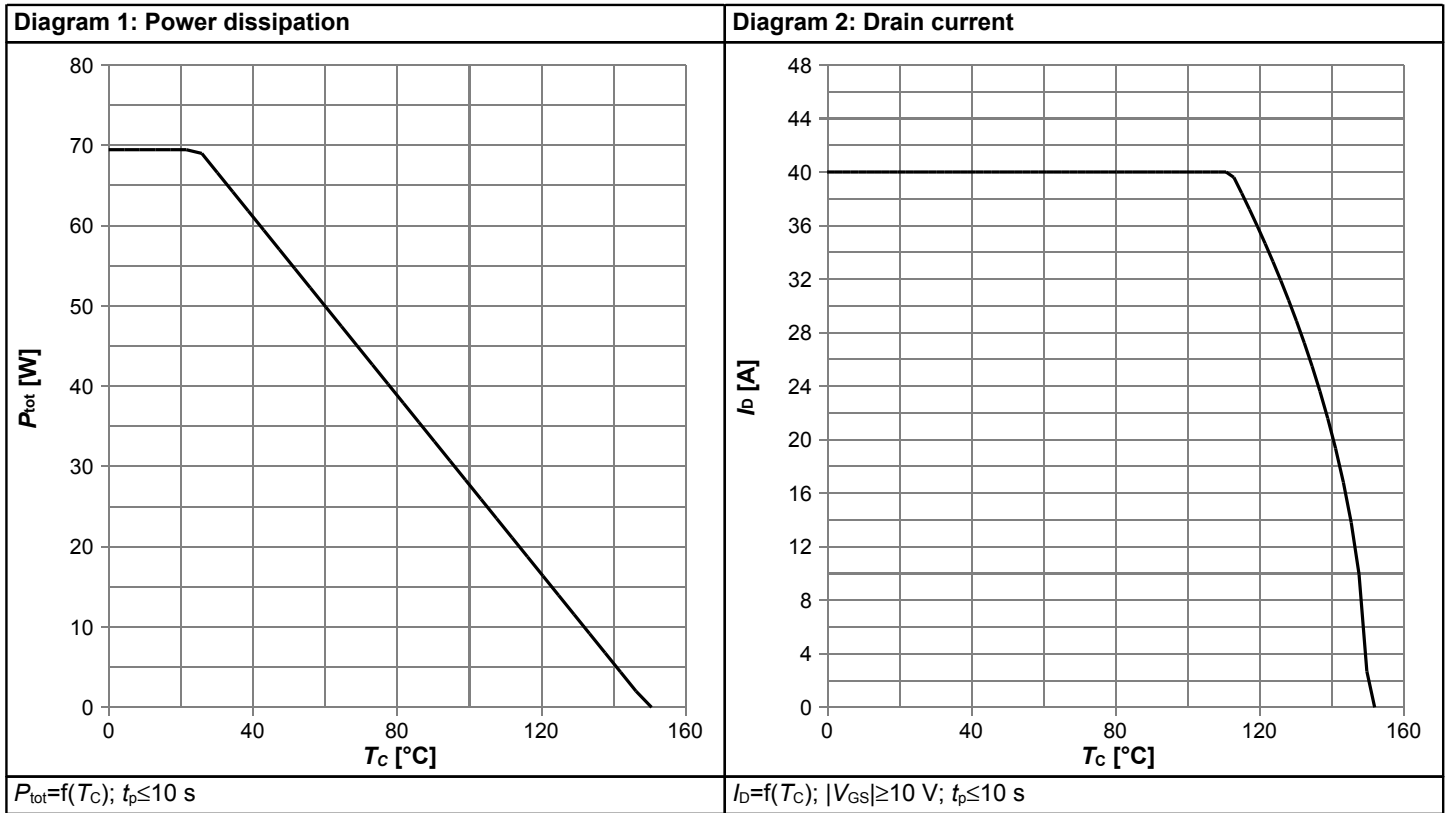
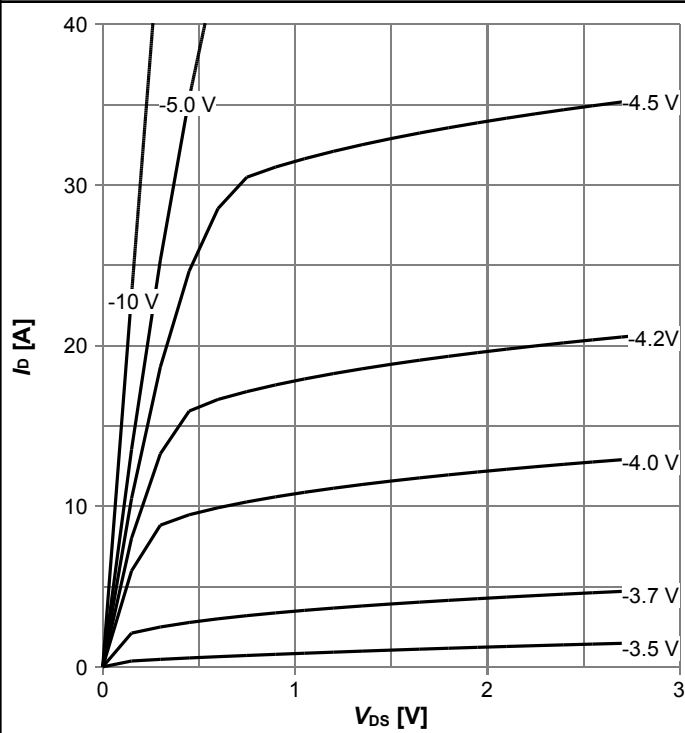
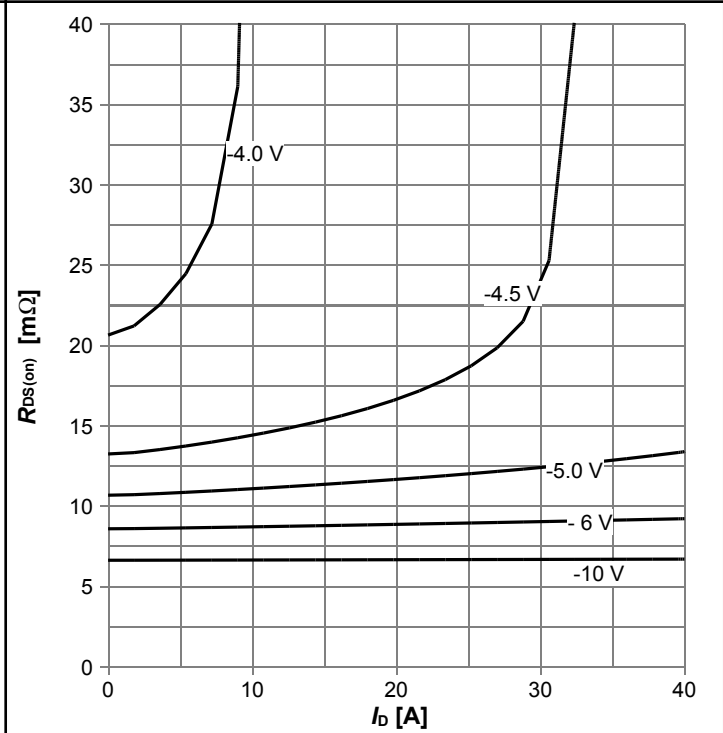


Diagram 5: Typ. output characteristics



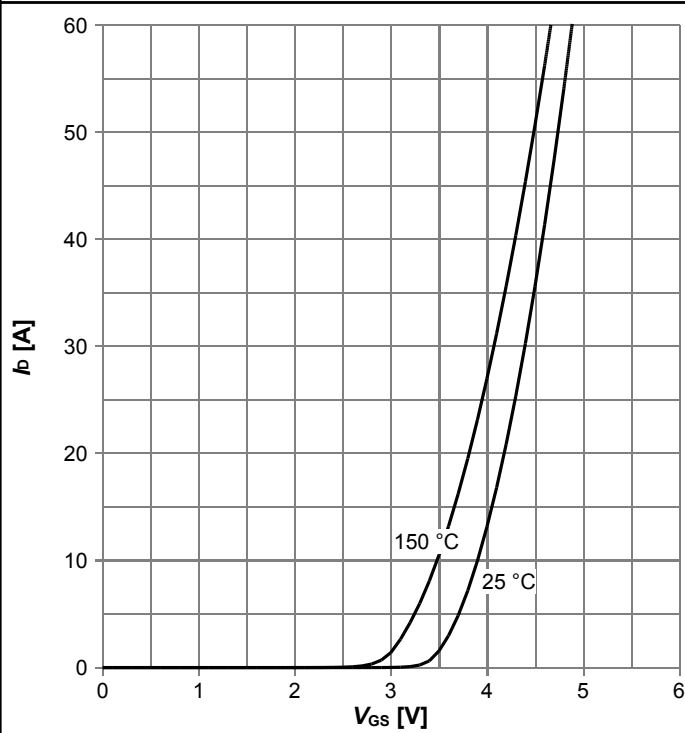
$I_D = f(V_{DS}); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



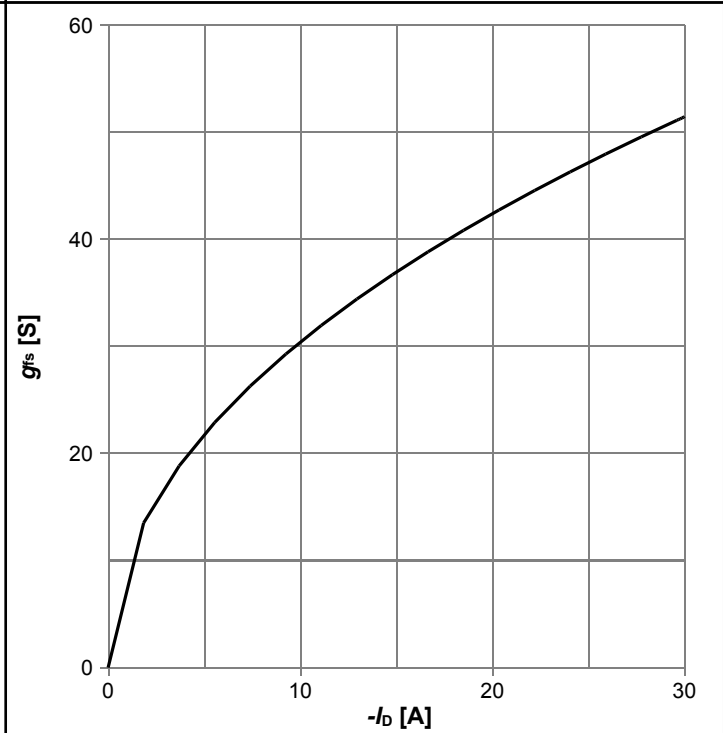
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



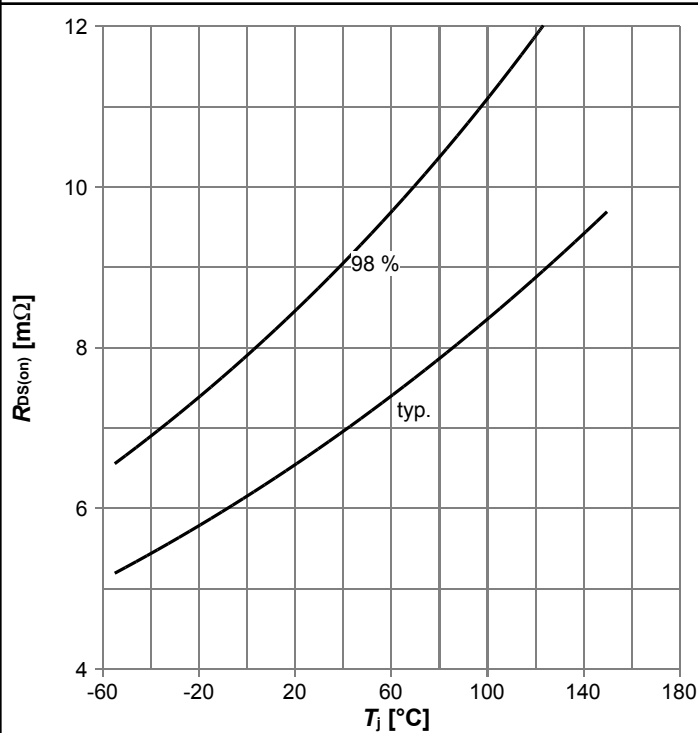
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. forward transconductance



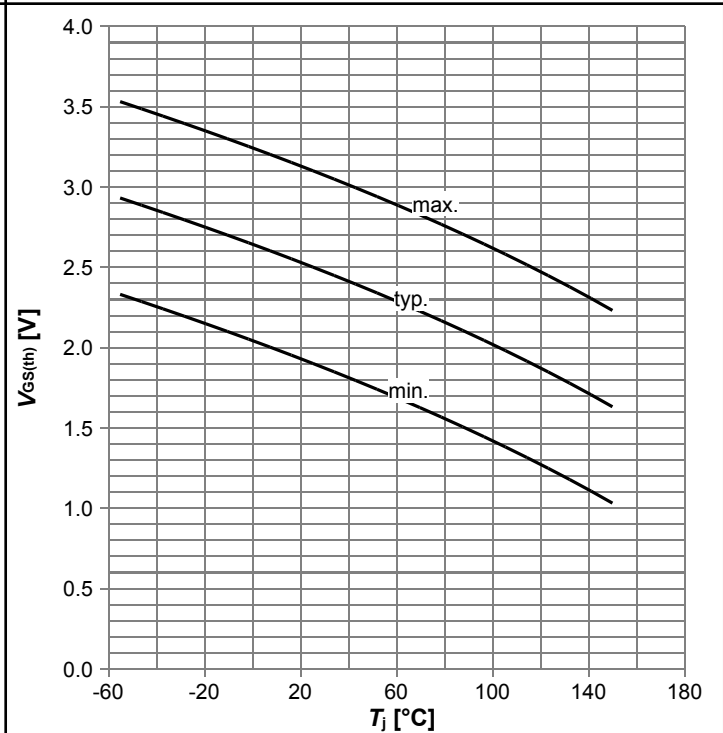
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



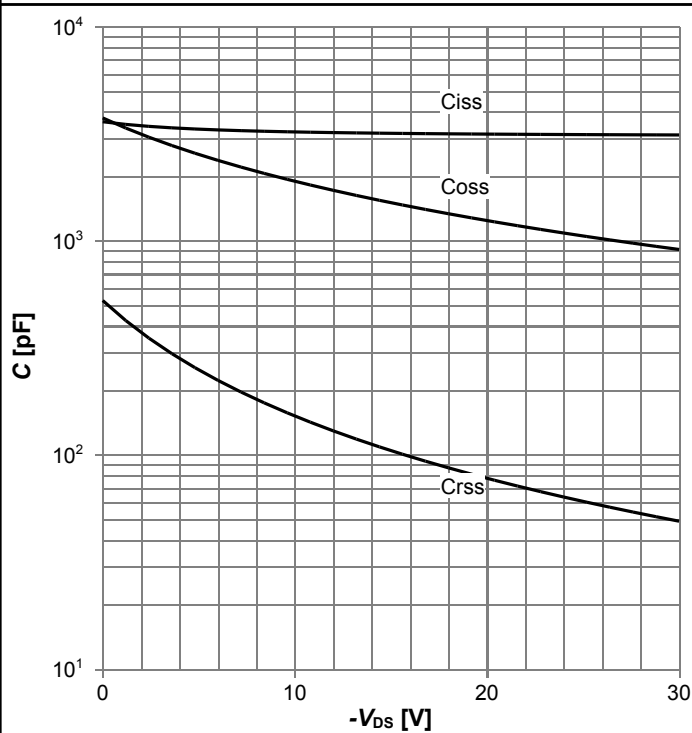
$R_{DS(on)}=f(T_j)$; $I_D=-20$ A; $V_{GS}=-10$ V

Diagram 10: Typ. gate threshold voltage



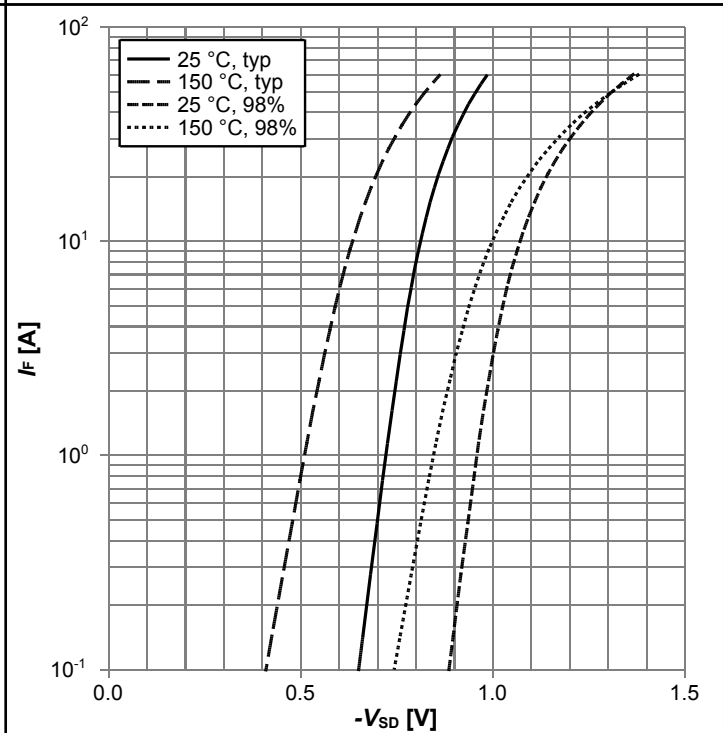
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_D=-105$ μ A

Diagram 11: Typ. capacitances



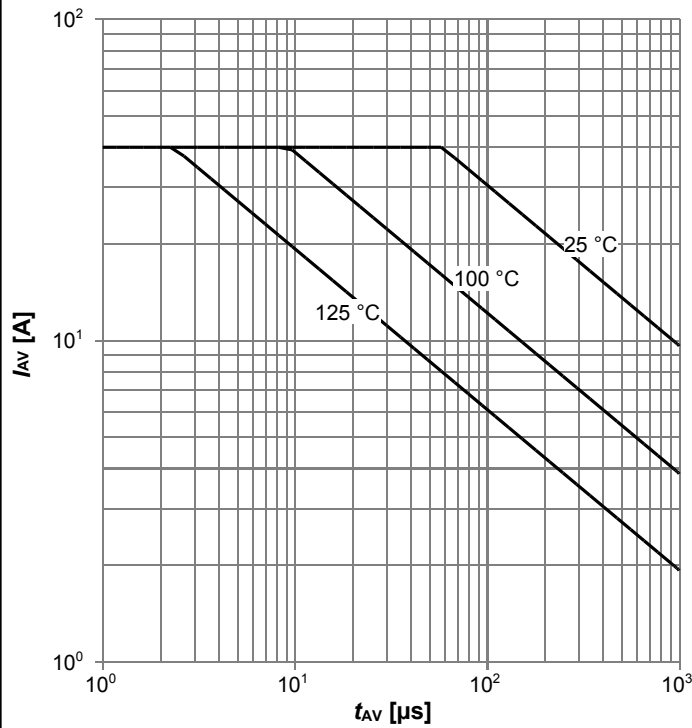
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Forward characteristics of reverse diode



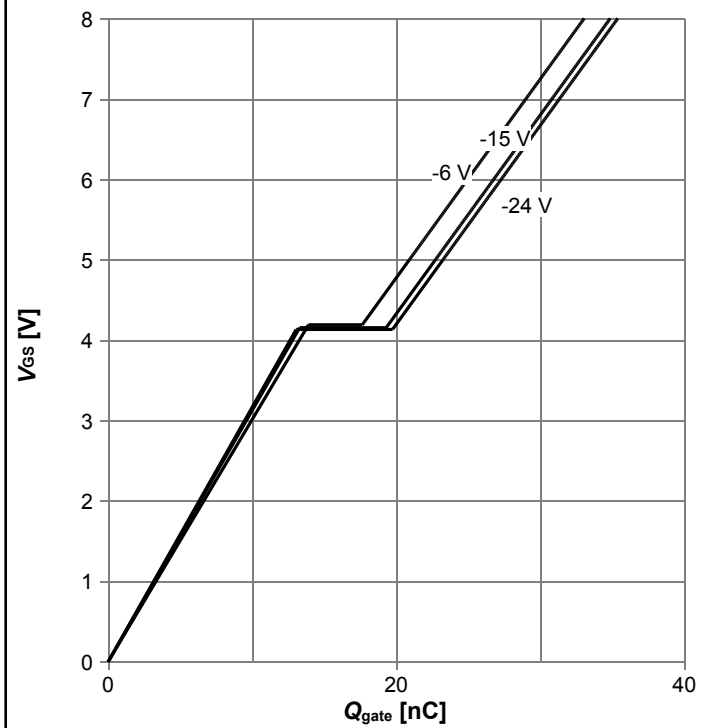
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



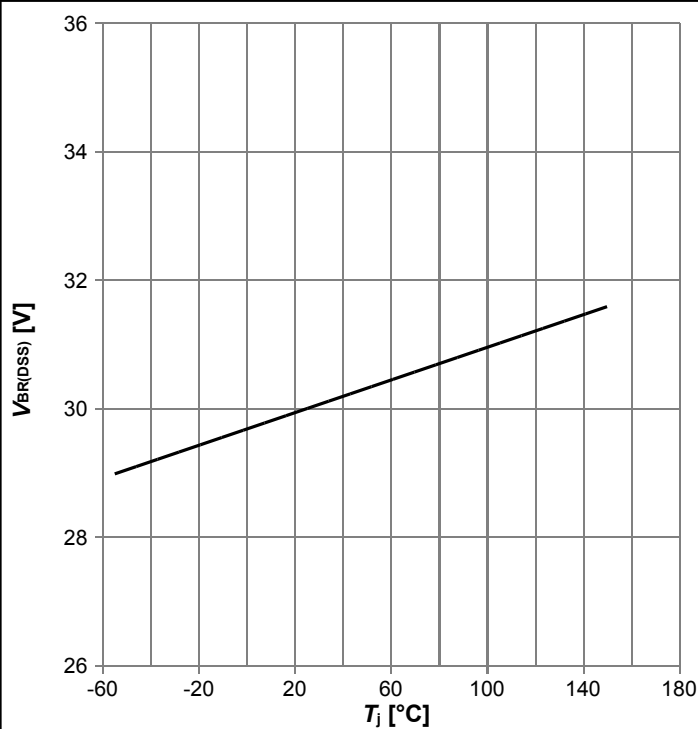
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



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

Diagram 15: Drain-source breakdown voltage

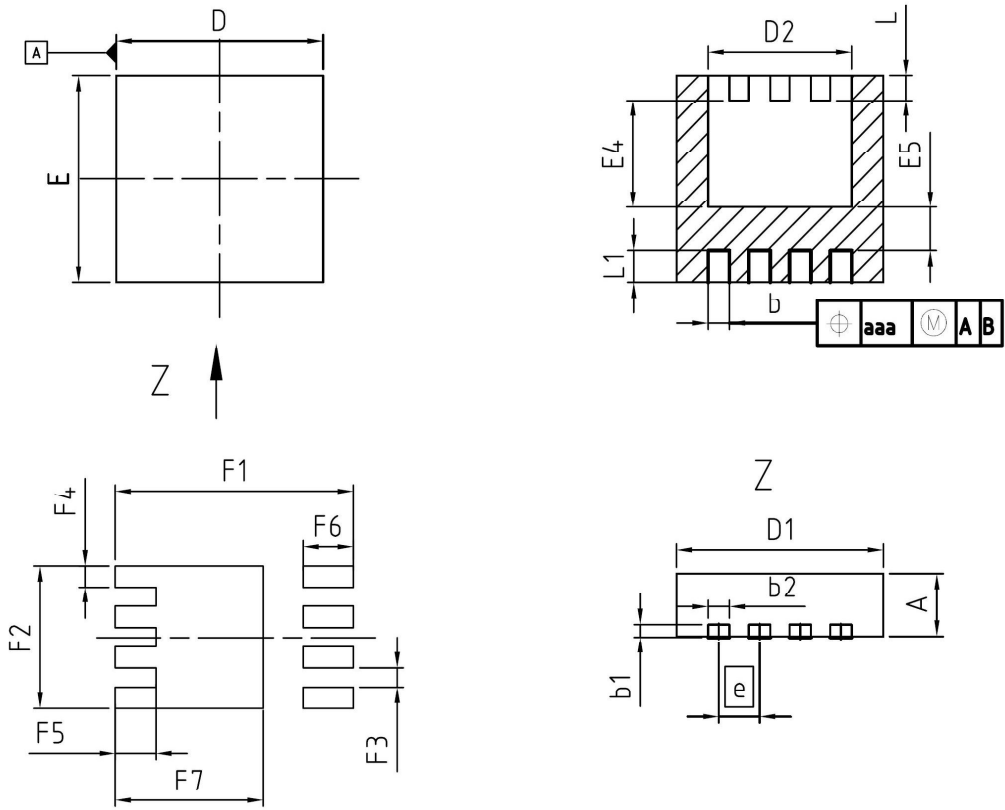


$V_{BR(DSS)}=f(T_j); I_D=-250 \mu A$

Diagram Gate charge waveforms



5 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 | 0.20 | 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 | |

DOCUMENT NO.
Z8B00131645

SCALE

EUROPEAN PROJECTION

ISSUE DATE
17-09-2008

REVISION
02

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

Revision History

BSZ086P03NS3 G

Revision: 2019-12-03, Rev. 2.4

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.4 | 2019-12-03 | Update SOA Diagram |

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