

MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™

OptiMOS™5 Power-Transistor, 100 V
BSC070N10NS5

Data Sheet

Rev. 2.1
Final

1 Description

Features

- Optimized for high performance SMPS, e.g. sync. rec.
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Qualified according to JEDEC¹⁾ for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

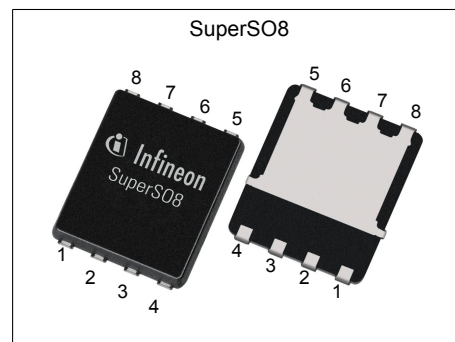
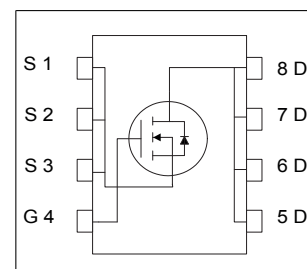


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------|
| V_{DS} | 100 | V |
| $R_{DS(on),max}$ | 7.0 | mΩ |
| I_D | 80 | A |
| Q_{oss} | 41 | nC |
| $Q_G(0V..10V)$ | 30 | nC |



| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|------------|-----------|---------------|
| BSC070N10NS5 | PG-TDSON-8 | 070N10NS5 | - |

¹⁾ J-STD20 and JESD22

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2 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 | - | - | 80 51 14 | A | $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$, $R_{thJA}=50\text{K/W}^1)$ |
| Pulsed drain current ²⁾ | $I_{D,pulse}$ | - | - | 320 | A | $T_C=25\text{ °C}$ |
| Avalanche energy, single pulse ³⁾ | E_{AS} | - | - | 55 | mJ | $I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 83 2.5 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^2)$ |
| Operating and storage temperature | T_j, T_{stg} | -55 | - | 150 | °C | IEC climatic category; 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, bottom | R_{thJC} | - | 0.9 | 1.5 | K/W | - |
| Thermal resistance, junction - case, top | R_{thJC} | - | - | 20 | K/W | - |
| Device on PCB, 6 cm ² cooling area ¹⁾ | R_{thJA} | - | - | 50 | 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 | $V_{(BR)DSS}$ | 100 | - | - | V | $V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.2 | 3.0 | 3.8 | V | $V_{DS}=V_{GS}$, $I_D=50\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | 0.1 10 | 1 100 | μA | $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ }^\circ\text{C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ }^\circ\text{C}$ |
| Gate-source leakage current | I_{GSS} | - | 10 | 100 | nA | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 6.0 7.6 | 7.0 10.2 | m Ω | $V_{GS}=10\text{ V}$, $I_D=40\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=20\text{ A}$ |
| Gate resistance ¹⁾ | R_G | - | 1.0 | 1.5 | Ω | - |
| Transconductance | g_{fs} | 38 | 77 | - | S | $ V_{DS} >2 I_D /R_{DS(on)max}$, $I_D=40\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|--------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Input capacitance ¹⁾ | C_{iss} | - | 2100 | 2700 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance ¹⁾ | C_{oss} | - | 340 | 440 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance ¹⁾ | C_{rss} | - | 16 | 28 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 13 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=40\text{ A}$, $R_{G,ext}=3\text{ }\Omega$ |
| Rise time | t_r | - | 5 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=40\text{ A}$, $R_{G,ext}=3\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 24 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=40\text{ A}$, $R_{G,ext}=3\text{ }\Omega$ |
| Fall time | t_f | - | 6 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=40\text{ A}$, $R_{G,ext}=3\text{ }\Omega$ |

¹⁾ Defined by design. Not Subject to production test.

Table 6 Gate charge characteristics¹⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------------|---------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 10 | - | nC | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 6 | - | nC | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge ²⁾ | Q_{gd} | - | 6 | 10 | nC | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge | Q_{sw} | - | 11 | - | nC | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total ²⁾ | Q_g | - | 30 | 38 | nC | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 4.8 | - | V | $V_{DD}=50\text{ V}$, $I_D=40\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | - | 26 | - | nC | $V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge ²⁾ | Q_{oss} | - | 41 | 55 | nC | $V_{DD}=50\text{ V}$, $V_{GS}=0\text{ V}$ |

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---------------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 76 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 320 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 0.9 | 1.1 | V | $V_{GS}=0\text{ V}$, $I_F=40\text{ A}$, $T_J=25\text{ °C}$ |
| Reverse recovery time ²⁾ | t_{rr} | - | 53 | 106 | ns | $V_R=50\text{ V}$, $I_F=40\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge ²⁾ | Q_{rr} | - | 89 | 179 | nC | $V_R=50\text{ V}$, $I_F=40\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$ |

¹⁾ See "Gate charge waveforms" for parameter definition

²⁾ Defined by design. Not Subject to production test.

5 Electrical characteristics diagrams

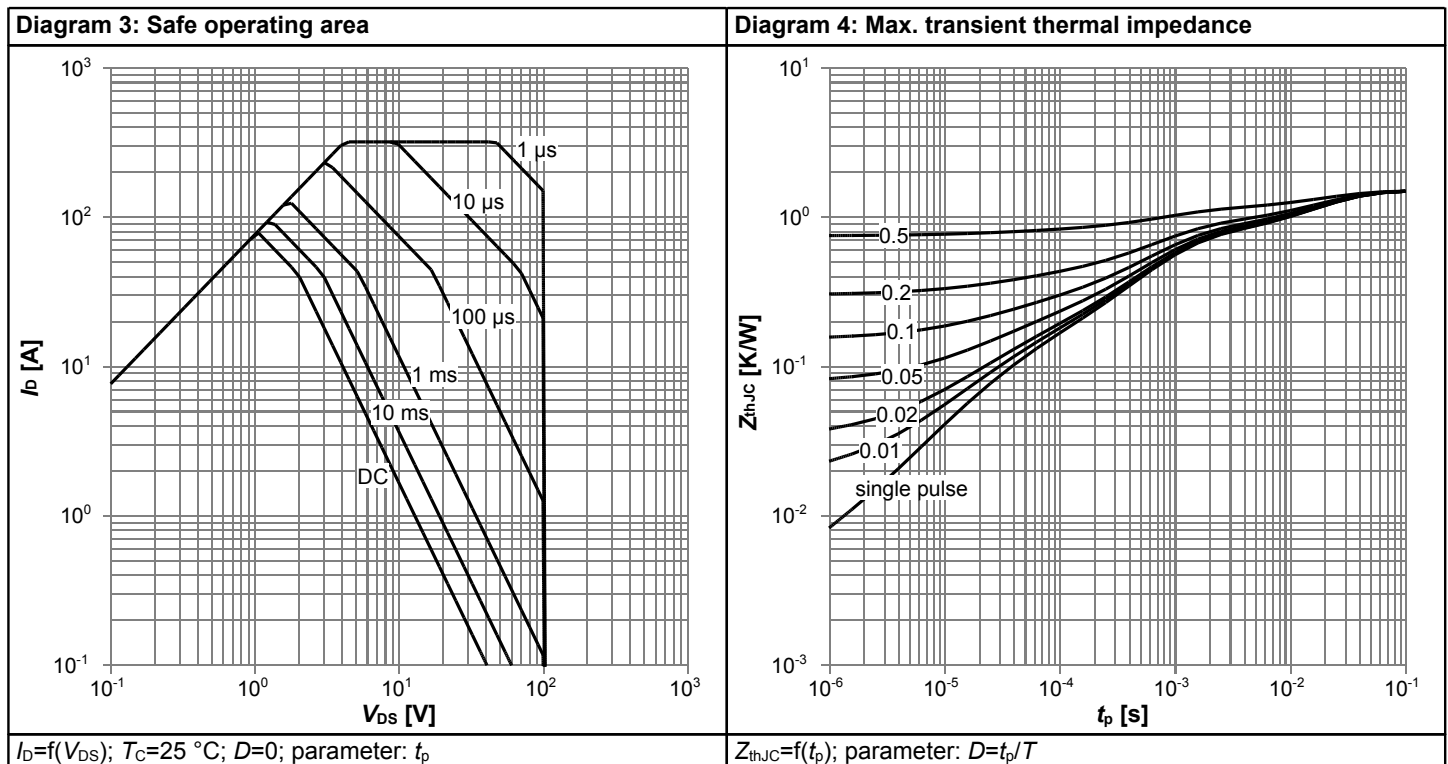
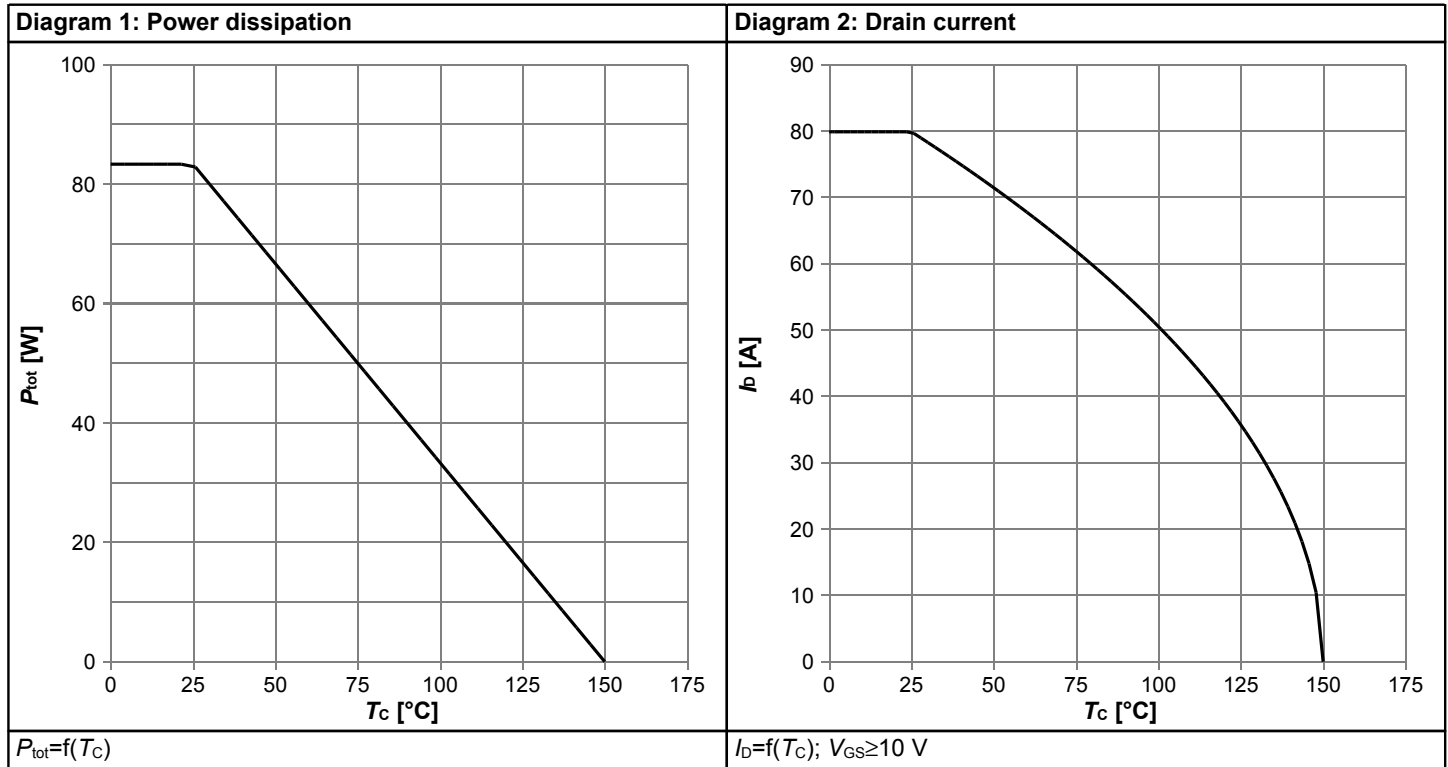
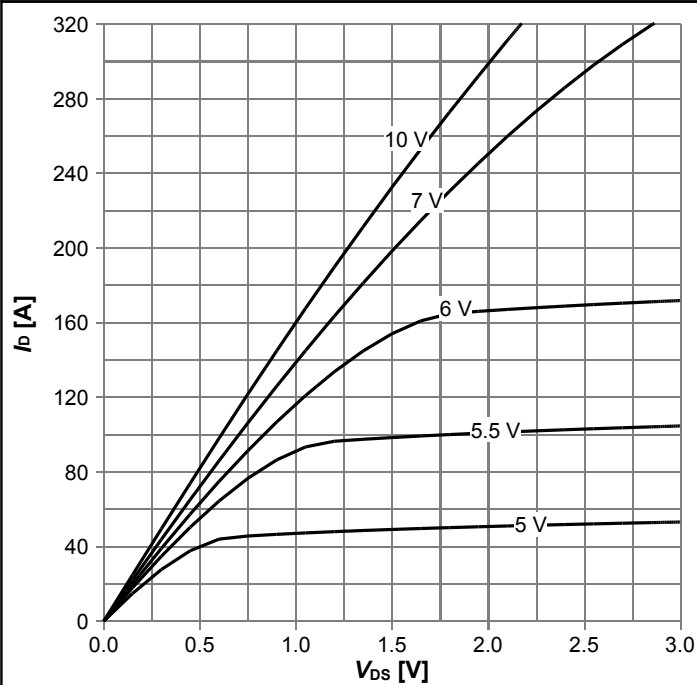
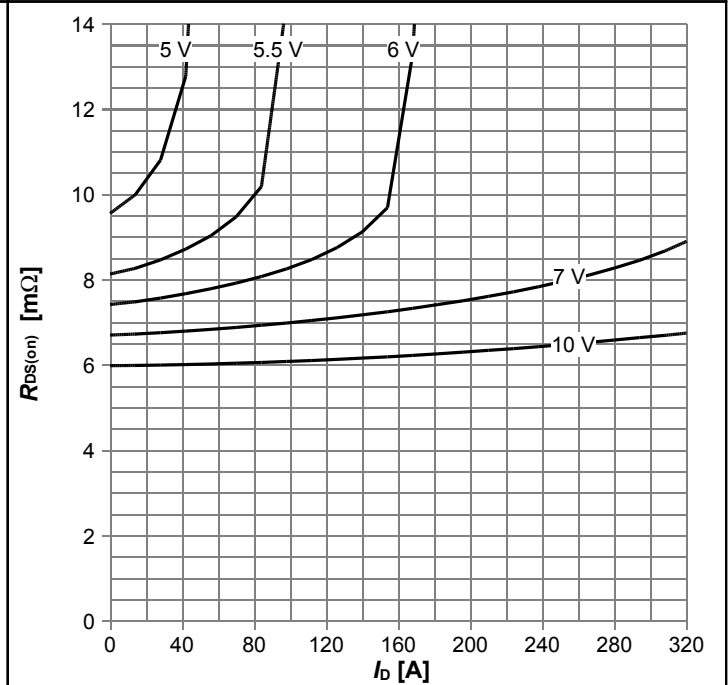


Diagram 5: Typ. output characteristics



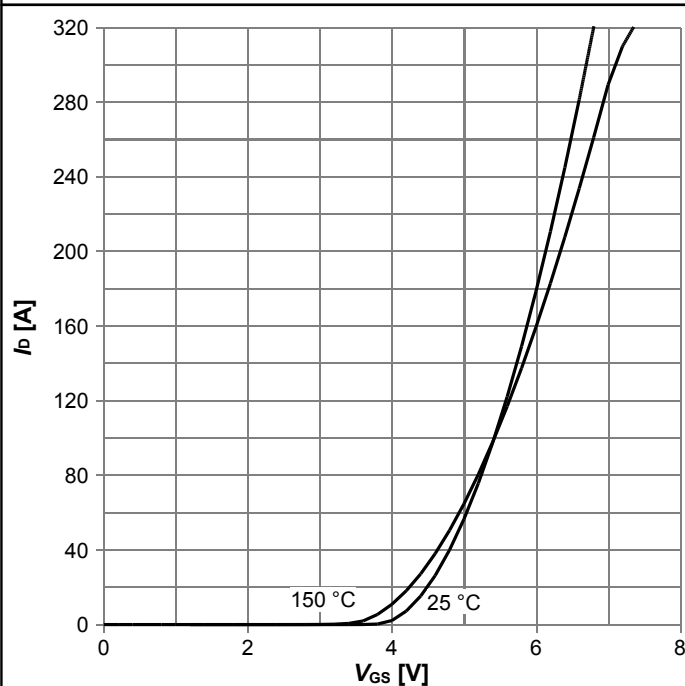
$I_D=f(V_{DS})$; $T_j=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



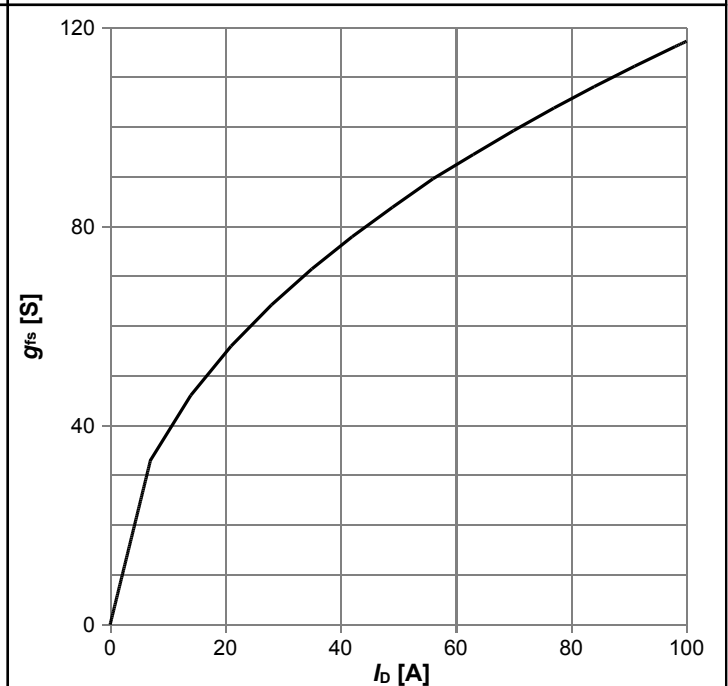
$R_{DS(on)}=f(I_D)$; $T_j=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



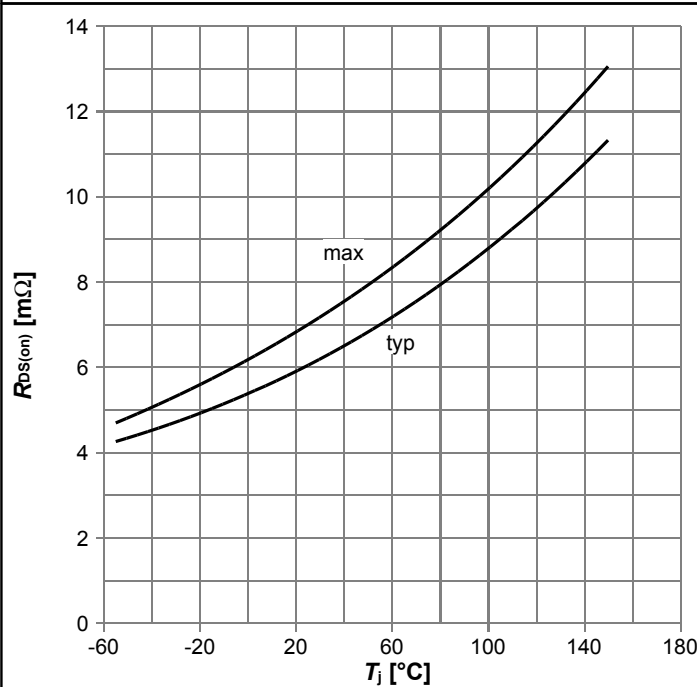
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



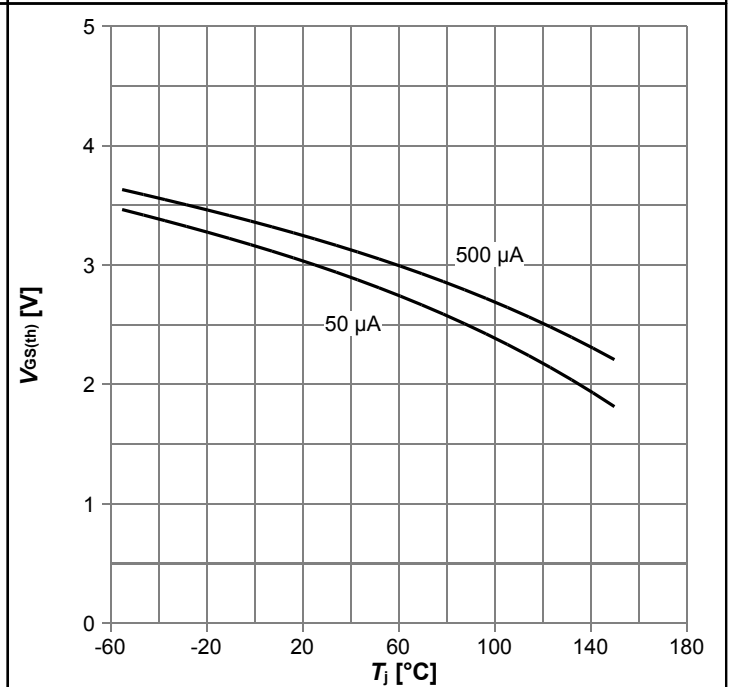
$g_{fs}=f(I_D)$; $T_j=25\text{ }^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



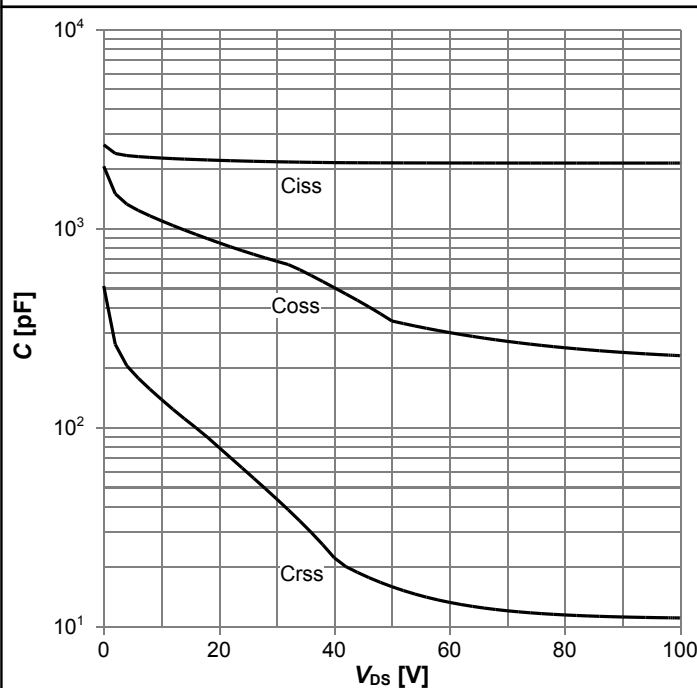
$R_{DS(on)}=f(T_j)$; $I_D=40$ A; $V_{GS}=10$ V

Diagram 10: Typ. gate threshold voltage



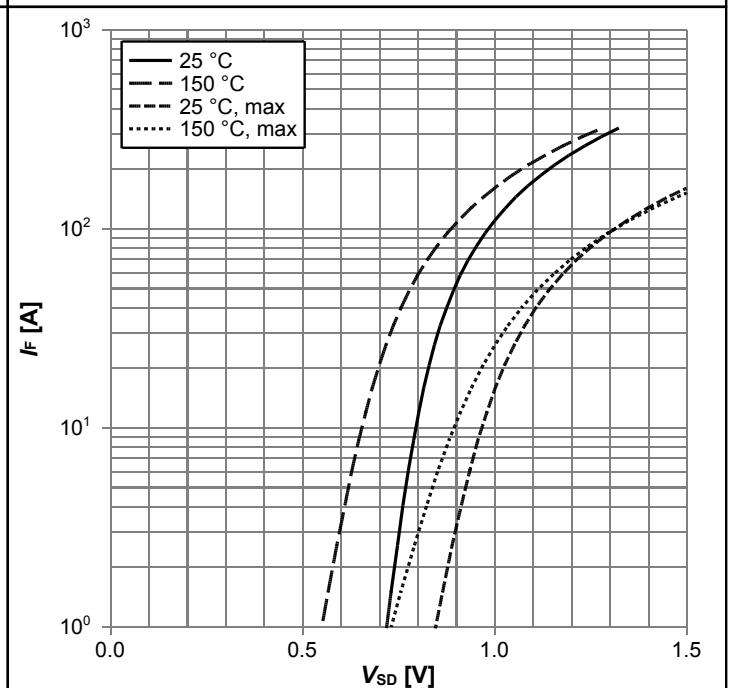
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$

Diagram 11: Typ. capacitances



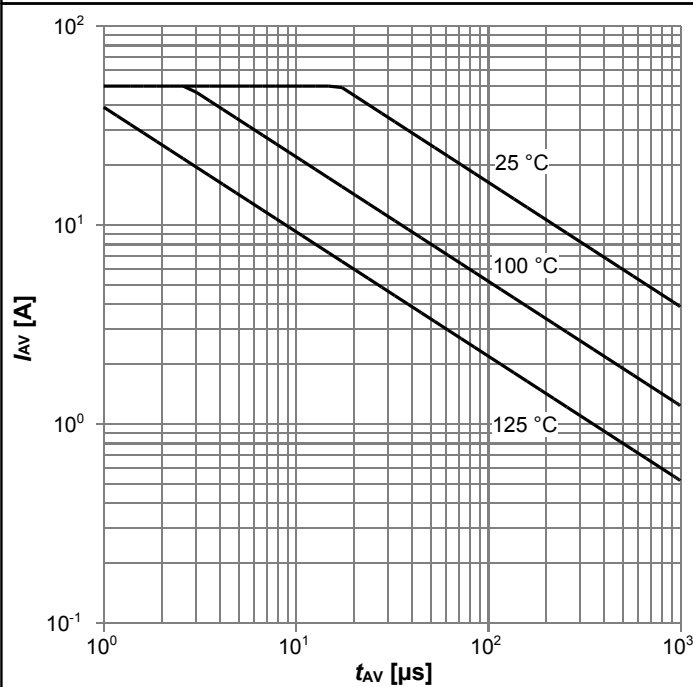
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Forward characteristics of reverse diode



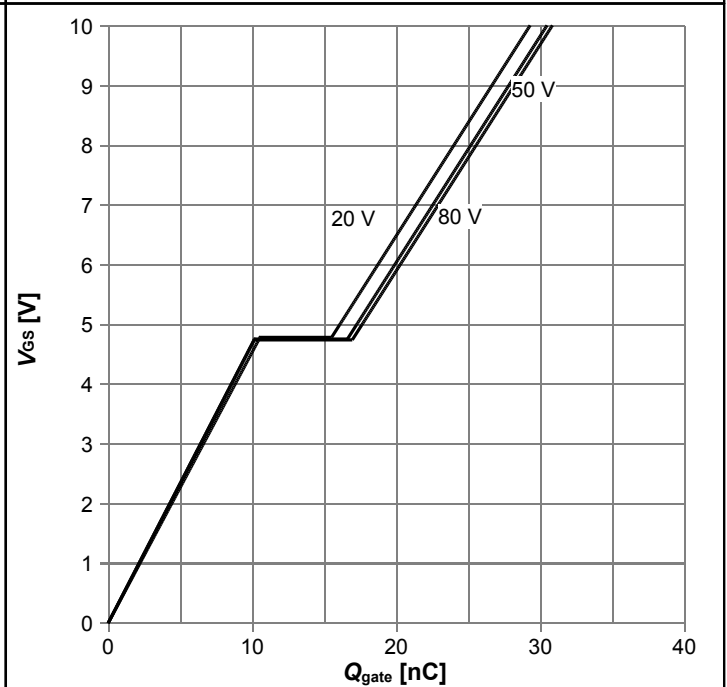
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



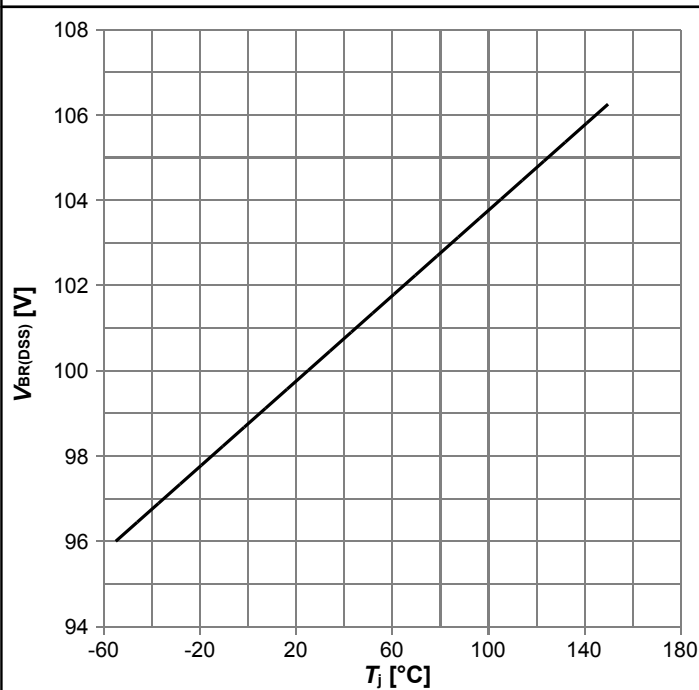
$I_{AS}=f(t_{AV})$; $R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



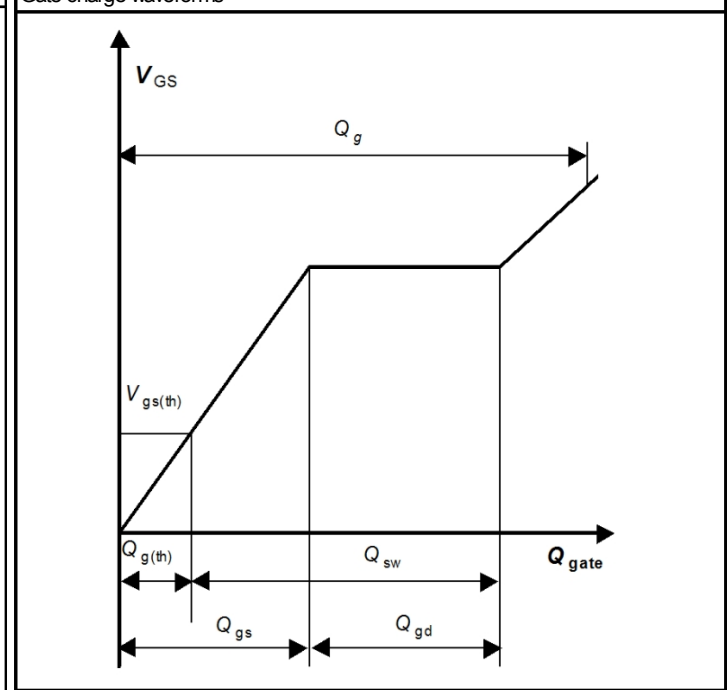
$V_{GS}=f(Q_{gate})$; $I_D=40$ A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

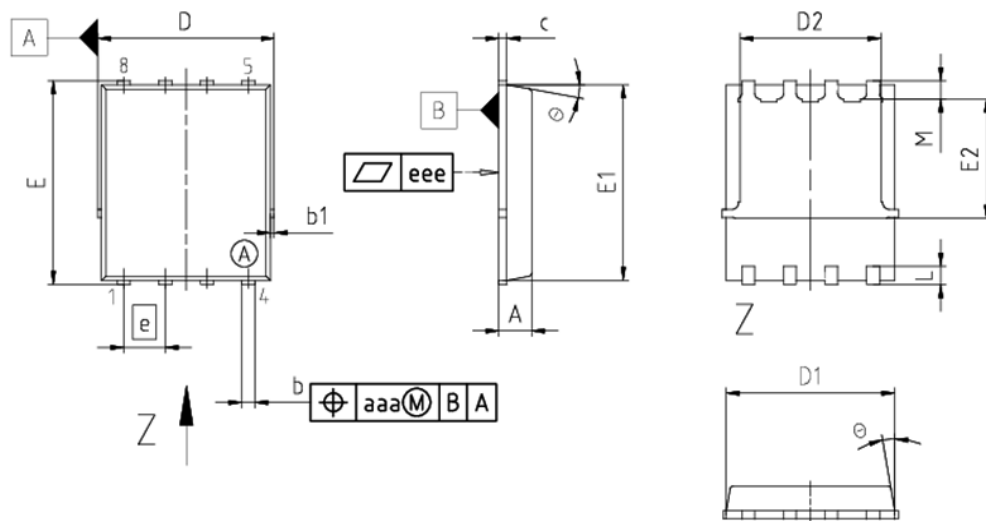


$V_{BR(DSS)}=f(T_j)$; $I_D=1$ mA

Gate charge waveforms



6 Package Outlines



| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN | MAX |
| A | 0.90 | 1.10 |
| b | 0.31 | 0.54 |
| b1 | 0.02 | 0.22 |
| c | 0.15 | 0.35 |
| D | 5.15 | 5.49 |
| D1 | 4.95 | 5.35 |
| D2 | 3.70 | 4.40 |
| E | 5.95 | 6.35 |
| E1 | 5.70 | 6.10 |
| E2 | 3.40 | 3.80 |
| e | 1.27 | |
| N | 8 | |
| L | 0.45 | 0.71 |
| M | 0.45 | 0.75 |
| ø | 8.5° | 12° |
| aaa | 0.25 | |
| eee | 0.08 | |

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SCALE



EUROPEAN PROJECTION



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REVISION
04

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

Revision History

BSC070N10NS5

Revision: 2015-07-13, Rev. 2.1

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0 | 2014-11-26 | Release of final version |
| 2.1 | 2015-07-13 | Update Marking |

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