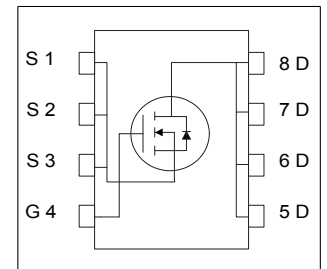
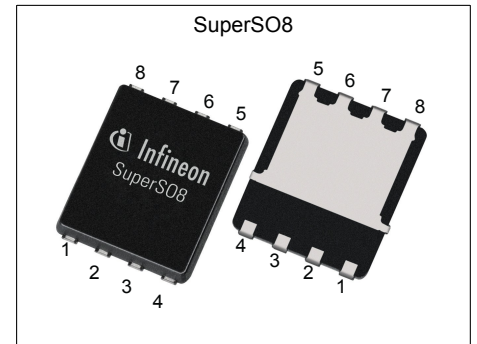


MOSFET

OptiMOS™3 Power-Transistor, 60 V

Features

- Ideal for high frequency switching and sync. rec.
- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- N-channel, logic level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Halogen-free according to IEC61249-2-21



RoHS

Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------------|
| V_{DS} | 60 | V |
| $R_{DS(on),max}$ | 2.8 | m Ω |
| I_D | 174 | A |

| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|------------|----------|---------------|
| BSC028N06LS3 G | PG-TDSON-8 | 028N06LS | - |

¹⁾ J-STD20 and JESD22

Table of Contents

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1 Maximum ratings

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

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|-------------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current ¹⁾ | I_D | - | - | 174 | A | $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^2)$ |
| | | - | - | 110 | | |
| | | - | - | 133 | | |
| | | - | - | 84 | | |
| | | - | - | 23 | | |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | - | - | 696 | A | $T_C=25\text{ °C}$ |
| Avalanche energy, single pulse ⁴⁾ | E_{AS} | - | - | 298 | mJ | $I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 139 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^2)$ |
| | | - | - | 2.5 | | |
| Operating and storage temperature | T_j , T_{stg} | -55 | - | 150 | °C | IEC climatic category; 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} | - | - | 0.9 | K/W | - |
| Device on PCB, minimal footprint | R_{thJA} | - | - | 62 | K/W | - |
| Device on PCB, 6 cm ² cooling area ²⁾ | R_{thJA} | - | - | 50 | K/W | - |

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

²⁾ 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.

³⁾ See Diagram 3 for more detailed information

⁴⁾ See Diagram 13 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 | $V_{(BR)DSS}$ | 60 | - | - | V | $V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 1.2 | 1.7 | 2.2 | V | $V_{DS}=V_{GS}$, $I_D=93\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | 0.1 10 | 1 100 | μA | $V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ |
| Gate-source leakage current | I_{GSS} | - | 10 | 100 | nA | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 3.2 2.3 | 4.8 2.8 | $\text{m}\Omega$ | $V_{GS}=4.5\text{ V}$, $I_D=25\text{ A}$ $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$ |
| Gate resistance | R_G | - | 1.3 | - | Ω | - |
| Transconductance | g_{fs} | 60 | 120 | - | S | $ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=50\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|--------------|--------|-------|-------|------|--|
| | | Min. | Typ. | Max. | | |
| Input capacitance ¹⁾ | C_{iss} | - | 10000 | 13000 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance ¹⁾ | C_{oss} | - | 1700 | 2300 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 70 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 19 | - | ns | $V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=3.3\text{ }\Omega$ |
| Rise time | t_r | - | 17 | - | ns | $V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=3.3\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 77 | - | ns | $V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=3.3\text{ }\Omega$ |
| Fall time | t_f | - | 19 | - | ns | $V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=3.3\text{ }\Omega$ |

Table 6 Gate charge characteristics²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 31 | - | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 17 | - | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate to drain charge | Q_{gd} | - | 10 | - | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Switching charge | Q_{sw} | - | 24 | - | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total ¹⁾ | Q_g | - | 59 | 79 | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 3.1 | - | V | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total ¹⁾ | Q_g | - | 132 | 175 | nC | $V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge ¹⁾ | Q_{oss} | - | 83 | 110 | nC | $V_{DD}=30\text{ V}$, $V_{GS}=0\text{ V}$ |

¹⁾ Defined by design. Not subject to production test

²⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 106 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 696 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 0.8 | 1.2 | V | $V_{GS}=0\text{ V}, I_F=50\text{ A}, T_j=25\text{ °C}$ |
| Reverse recovery time | t_{rr} | - | 47 | - | ns | $V_R=30\text{ V}, I_F=30\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | - | 58 | - | nC | $V_R=30\text{ V}, I_F=30\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ |

4 Electrical characteristics diagrams

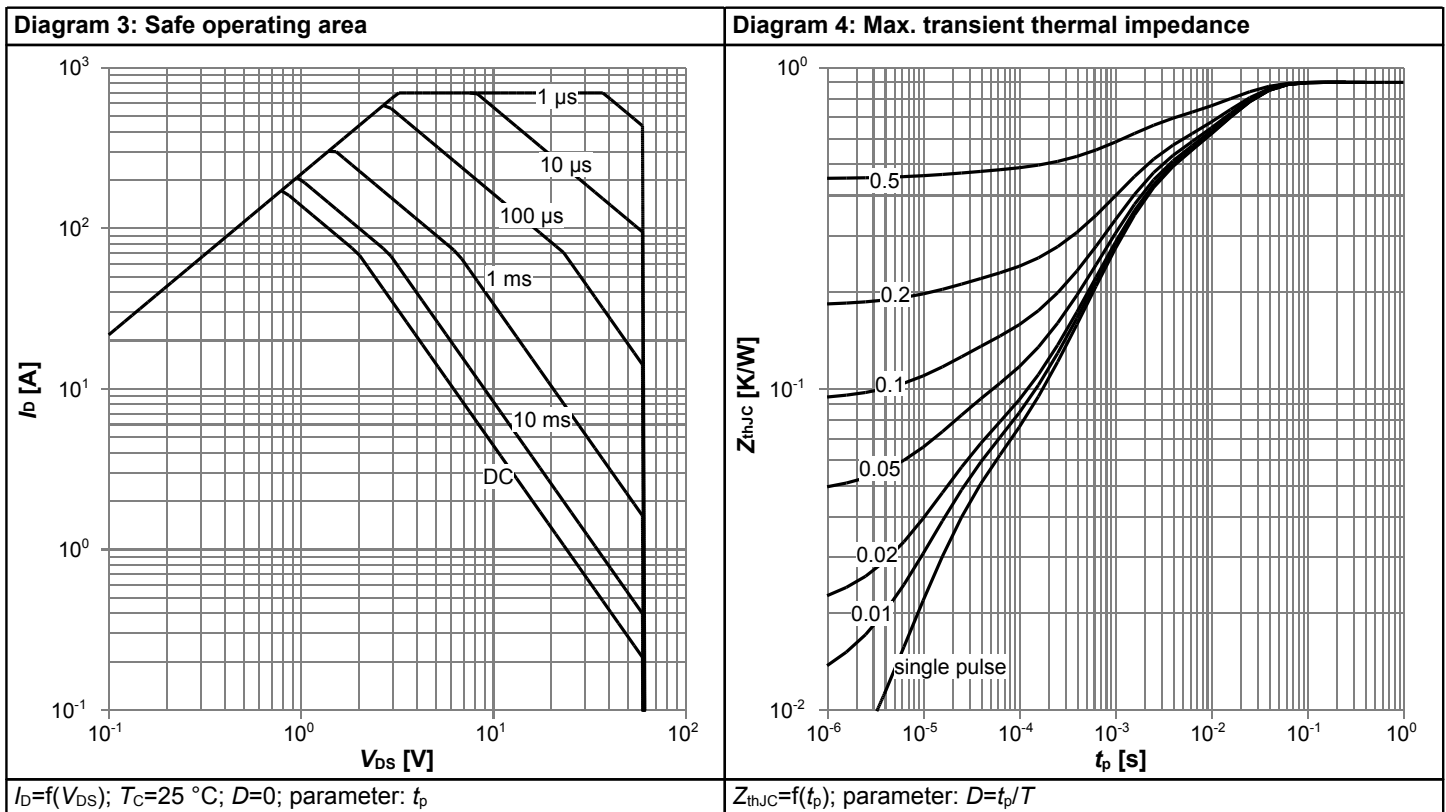
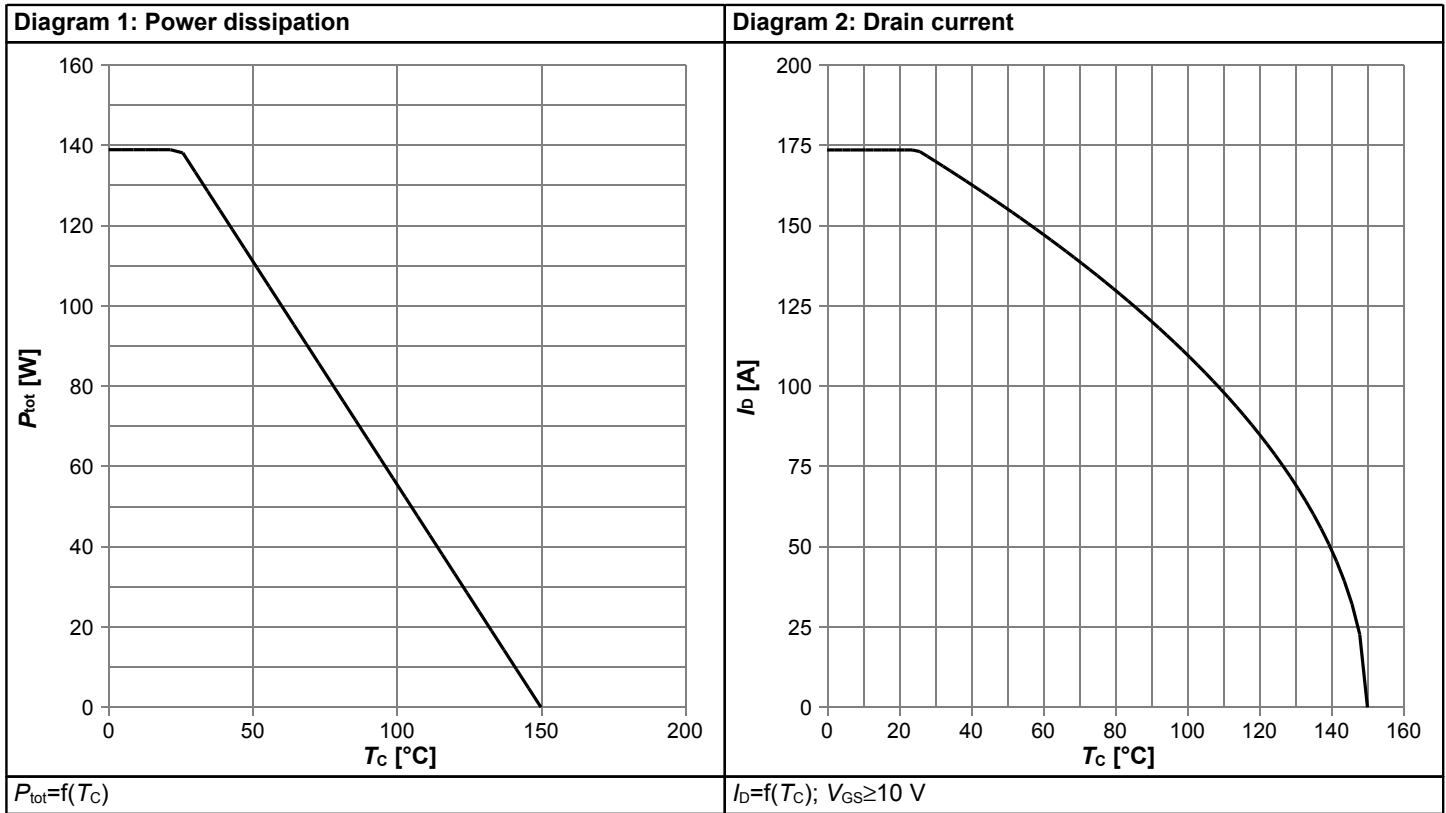
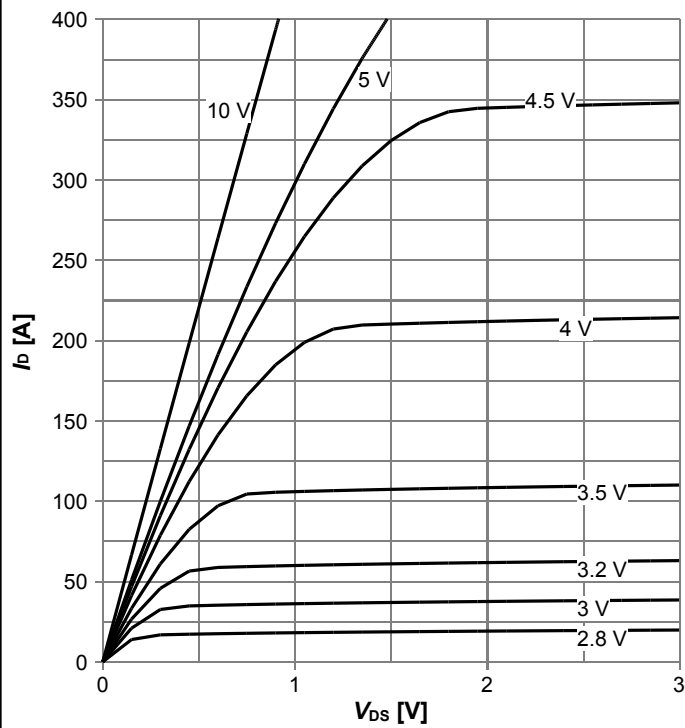
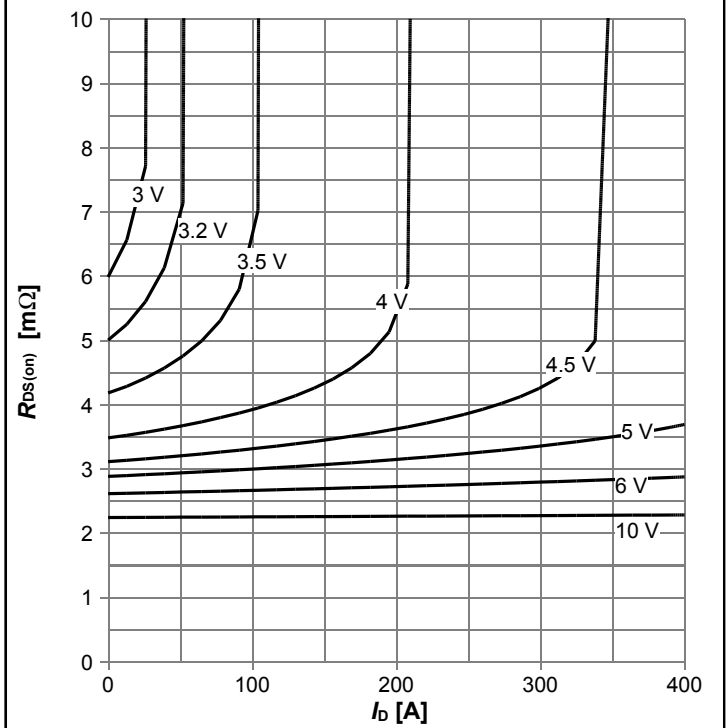


Diagram 5: Typ. output characteristics



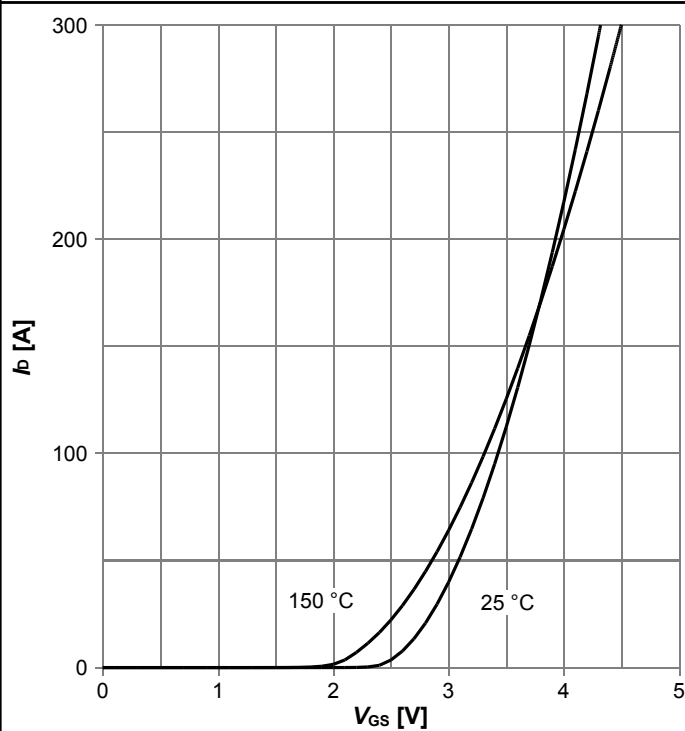
$I_D = f(V_{DS})$; $T_j = 25\text{ °C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



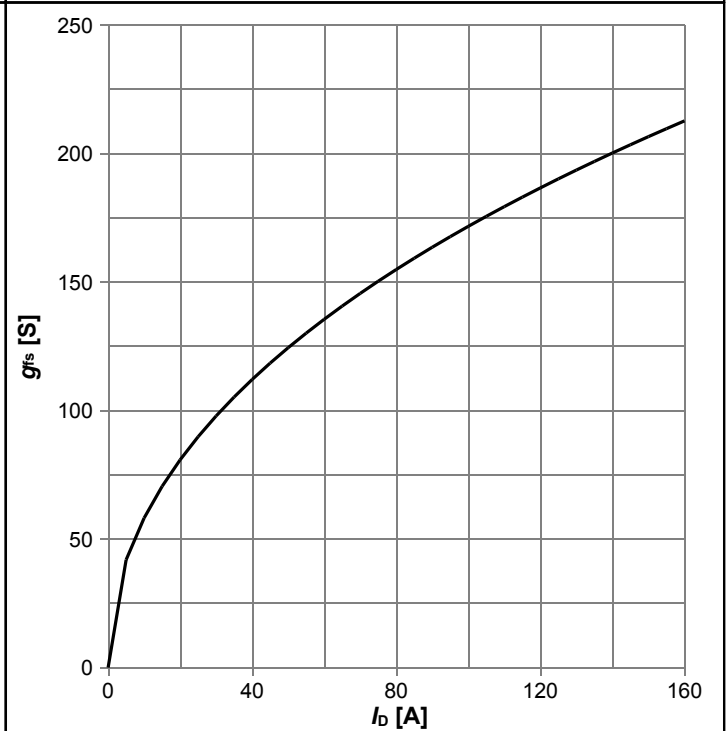
$R_{DS(on)} = f(I_D)$; $T_j = 25\text{ °C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



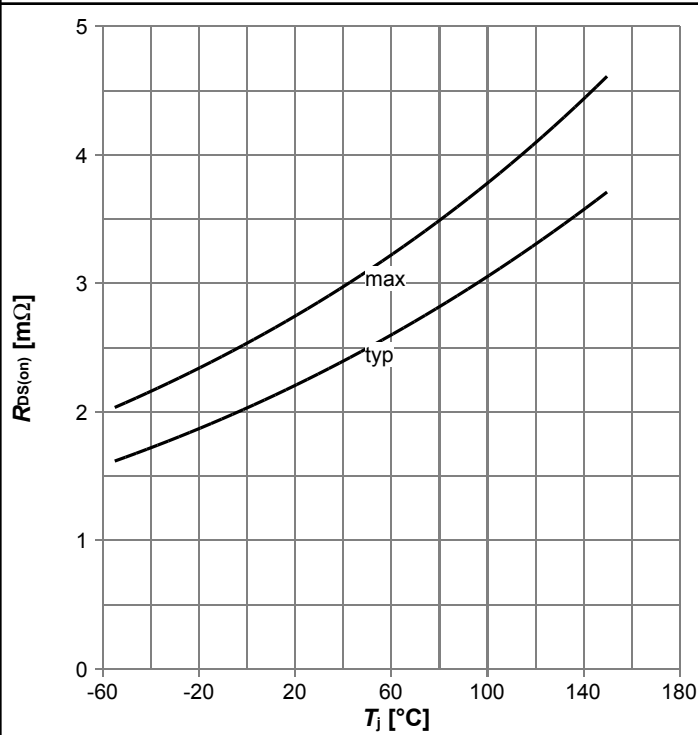
$I_D = f(V_{GS})$; $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



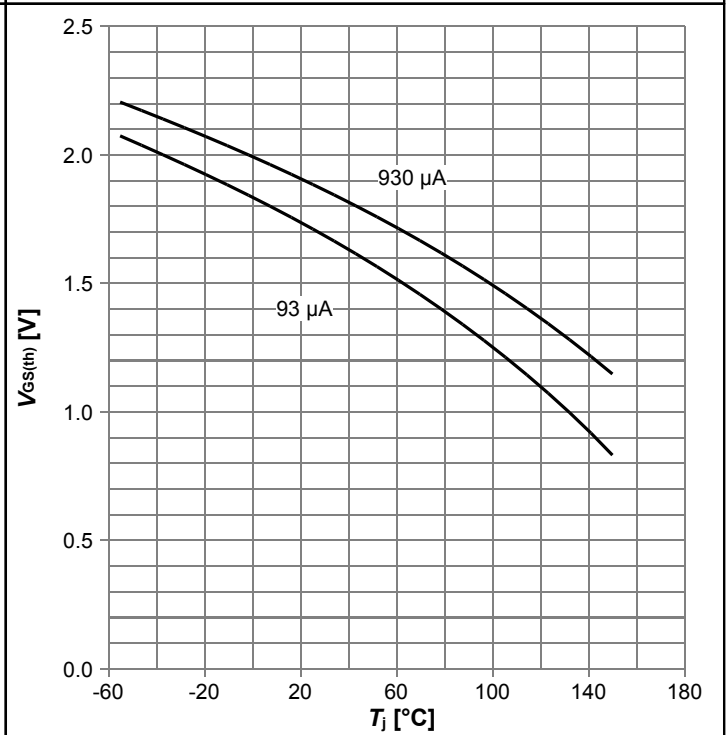
$g_{fs} = f(I_D)$; $T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



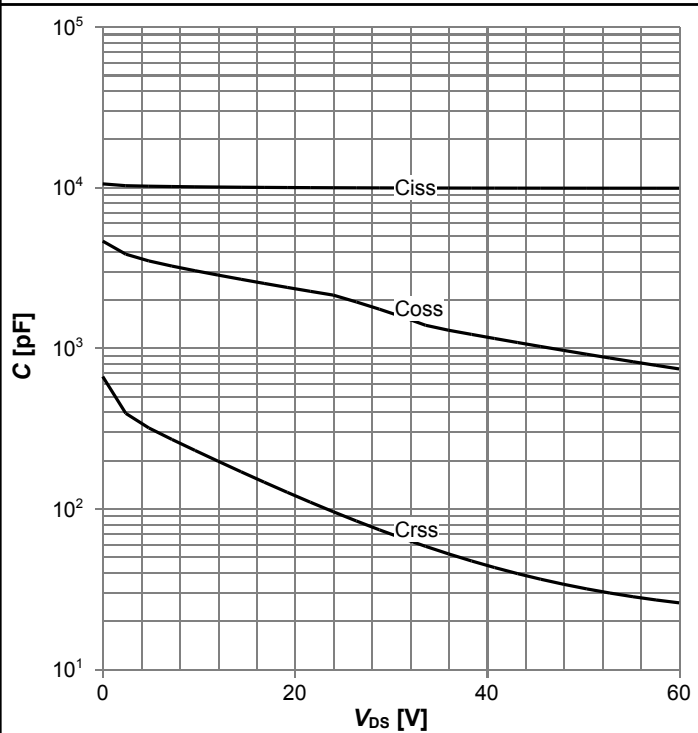
$R_{DS(on)}=f(T_j)$; $I_D=50\text{ A}$; $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



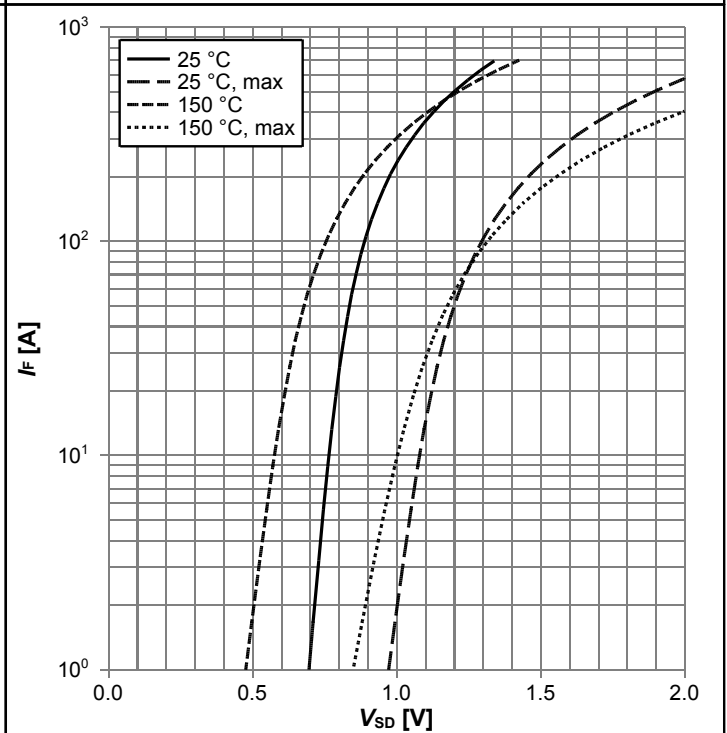
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$

Diagram 11: Typ. capacitances



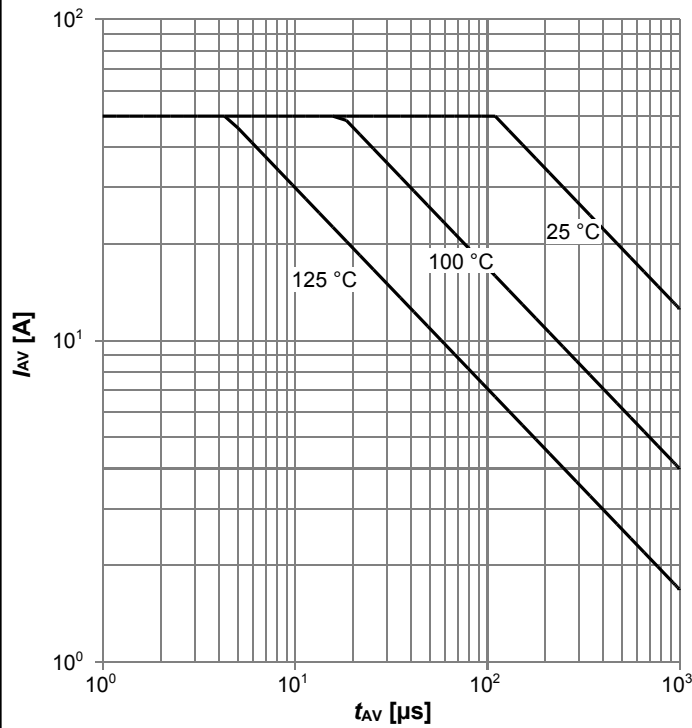
$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



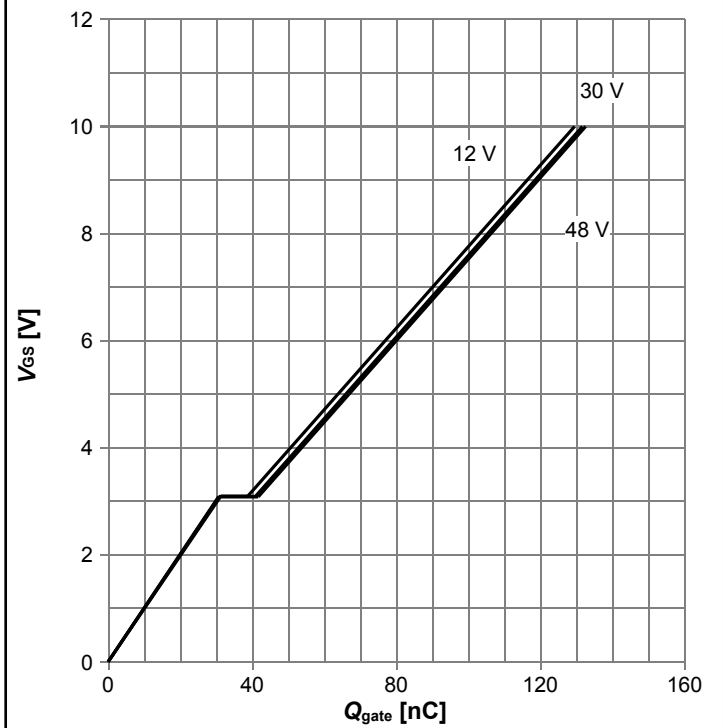
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



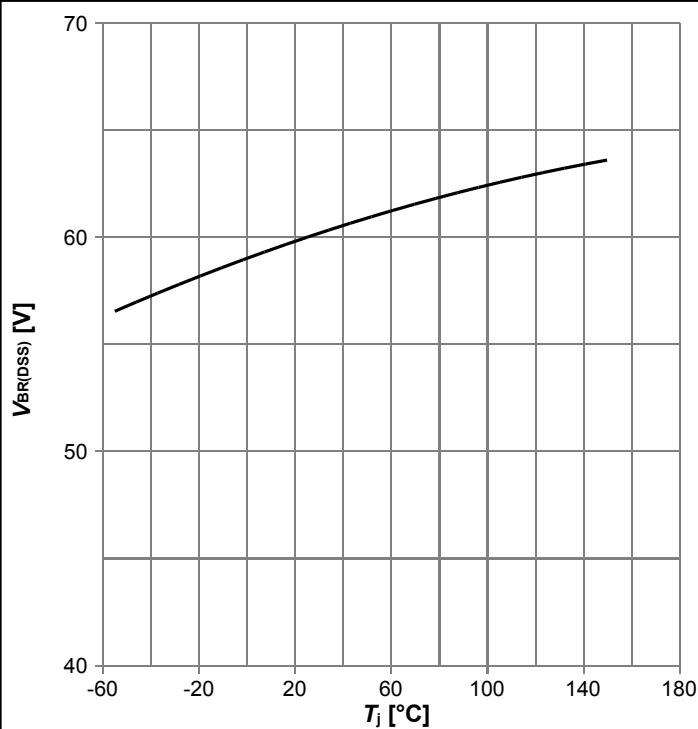
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



$V_{GS}=f(Q_{gate}); I_D=50 \text{ A pulsed}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

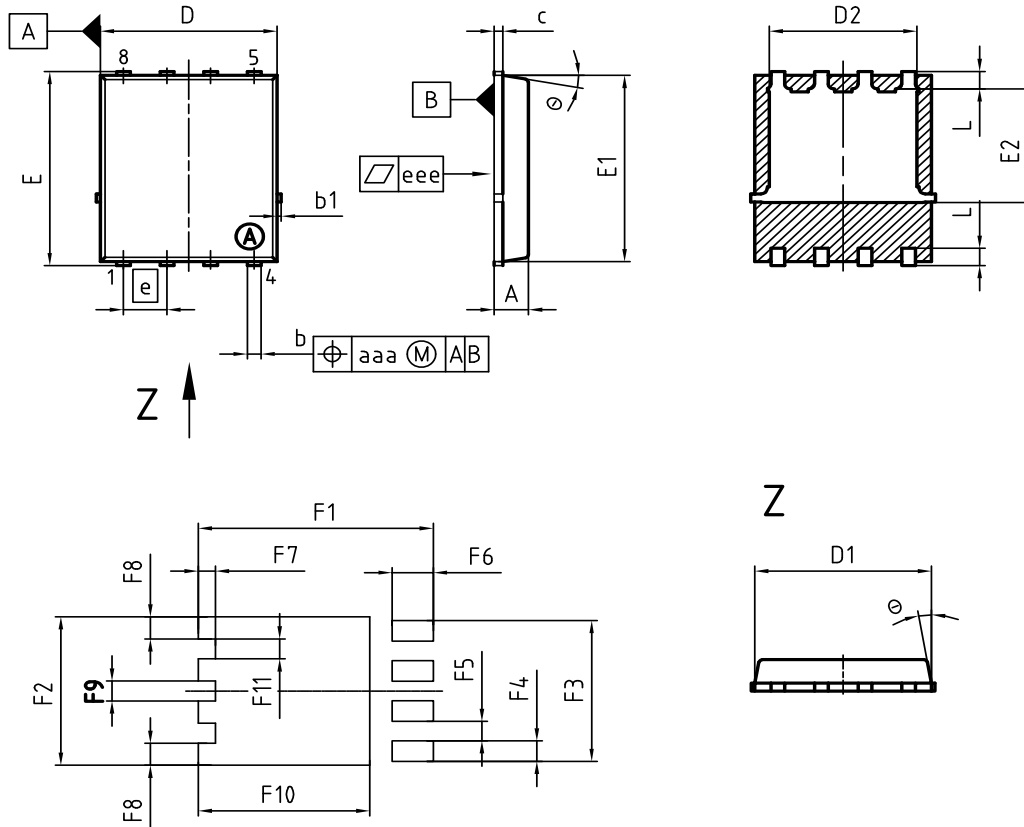


$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Diagram Gate charge waveforms



5 Package Outlines



| DIM | MILLIMETERS | | INCHES | |
|------|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.34 | 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 |
| θ | 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 |

| |
|-----------------------------|
| DOCUMENT NO. Z8B00003332 |
| SCALE 0 2.5 5mm |
| EUROPEAN PROJECTION |
| ISSUE DATE 08-03-2007 |
| REVISION 03 |

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

Revision History

BSC028N06LS3 G

Revision: 2020-09-14, Rev. 2.3

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.3 | 2020-09-14 | Update current rating and footnotes |

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