

# MOSFET

## OptiMOS™ Power-Transistor, 60 V

### Features

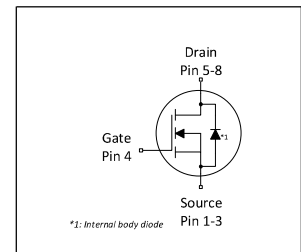
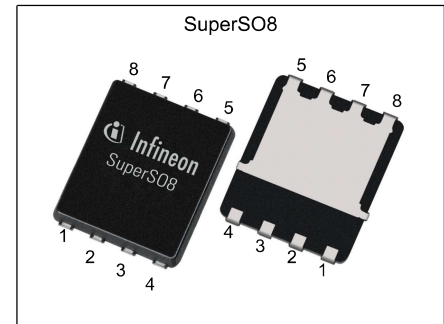
- Ideal for high-frequency switching
- Optimized for chargers
- 100% avalanche tested
- Superior thermal resistance
- N-channel, Logic level
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

### Product validation

Qualified according to JEDEC Standard

**Table 1 Key Performance Parameters**

| Parameter        | Value | Unit       |
|------------------|-------|------------|
| $V_{DS}$         | 60    | V          |
| $R_{DS(on),max}$ | 2.7   | m $\Omega$ |
| $I_D$            | 134   | A          |
| $Q_{oss}$        | 43    | nC         |
| $Q_G(0..4.5V)$   | 24    | nC         |



RoHS

| Type / Ordering Code | Package    | Marking | Related Links |
|----------------------|------------|---------|---------------|
| BSC0702LS            | PG-TDSON-8 | 0702LS  | -             |



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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 <sup>1)</sup>       | $I_D$             | -      | -    | 134<br>84<br>23 | A    | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=50\text{ K/W}^{2)}$ |
| Pulsed drain current <sup>3)</sup>           | $I_{D,pulse}$     | -      | -    | 536             | A    | $T_C=25\text{ °C}$   |
| Avalanche energy, single pulse <sup>4)</sup> | $E_{AS}$          | -      | -    | 100             | mJ   | $I_D=50\text{ A}$ , $R_{GS}=25\text{ }\Omega$  |
| Gate source voltage                          | $V_{GS}$          | -20    | -    | 20              | V    | -  |
| Power dissipation                            | $P_{tot}$         | -      | -    | 83<br>2.5       | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=50\text{ K/W}^{3)}$   |
| 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, bottom                 | $R_{thJC}$ | -      | 0.9  | 1.5  | K/W  | -                     |
| Device on PCB, 6 cm <sup>2</sup> cooling area <sup>2)</sup> | $R_{thJA}$ | -      | -    | 50   | K/W  | -                     |

<sup>1)</sup> Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

<sup>3)</sup> See Diagram 3 for more detailed information

<sup>4)</sup> 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           | $V_{GS(th)}$  | 1.1    | 1.7        | 2.3        | V             | $V_{DS}=V_{GS}$ , $I_D=49\text{ }\mu\text{A}$   |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | 0.5<br>10  | 1.0<br>100 | $\mu\text{A}$ | $V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | 10         | 100        | nA            | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$  |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 2.3<br>3.1 | 2.7<br>3.9 | m $\Omega$    | $V_{GS}=10\text{ V}$ , $I_D=50\text{ A}$<br>$V_{GS}=4.5\text{ V}$ , $I_D=25\text{ A}$   |
| Gate resistance <sup>1)</sup>    | $R_G$         | -      | 1.3        | 1.95       | $\Omega$      | -   |
| Transconductance                 | $g_{fs}$      | 60     | 120        | -          | S             | $ V_{DS} >2 I_D R_{DS(on)max}$ , $I_D=50\text{ A}$  |

**Table 5 Dynamic characteristics<sup>1)</sup>**

| Parameter                    | Symbol       | Values |      |      | Unit | Note / Test Condition  |
|------------------------------|--------------|--------|------|------|------|--|
|                              |              | Min.   | Typ. | Max. |      |  |
| Input capacitance            | $C_{iss}$    | -      | 3300 | 4400 | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                      |
| Output capacitance           | $C_{oss}$    | -      | 670  | 890  | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                      |
| Reverse transfer capacitance | $C_{rss}$    | -      | 33   | 58   | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                      |
| Turn-on delay time           | $t_{d(on)}$  | -      | 7.7  | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=50\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time                    | $t_r$        | -      | 4.8  | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=50\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 25   | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=50\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time                    | $t_f$        | -      | 5.4  | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=50\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |

**Table 6 Gate charge characteristics<sup>2)</sup>**

| Parameter                          | Symbol        | Values |      |      | Unit | Note / Test Condition  |
|------------------------------------|---------------|--------|------|------|------|--|
|                                    |               | Min.   | Typ. | Max. |      |  |
| Gate to source charge              | $Q_{gs}$      | -      | 10   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge at threshold           | $Q_{g(th)}$   | -      | 6    | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate to drain charge <sup>1)</sup> | $Q_{gd}$      | -      | 8    | 11   | nC   | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Switching charge                   | $Q_{sw}$      | -      | 12   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total <sup>1)</sup>    | $Q_g$         | -      | 24   | 30   | nC   | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate plateau voltage               | $V_{plateau}$ | -      | 2.9  | -    | V    | $V_{DD}=30\text{ V}$ , $I_D=50\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total, sync. FET       | $Q_{g(sync)}$ | -      | 43   | -    | nC   | $V_{DS}=0.1\text{ V}$ , $V_{GS}=0\text{ to }10\text{ V}$                     |
| Output charge <sup>1)</sup>        | $Q_{oss}$     | -      | 43   | 58   | nC   | $V_{DD}=30\text{ V}$ , $V_{GS}=0\text{ V}$                                   |

<sup>1)</sup> Defined by design. Not subject to production test

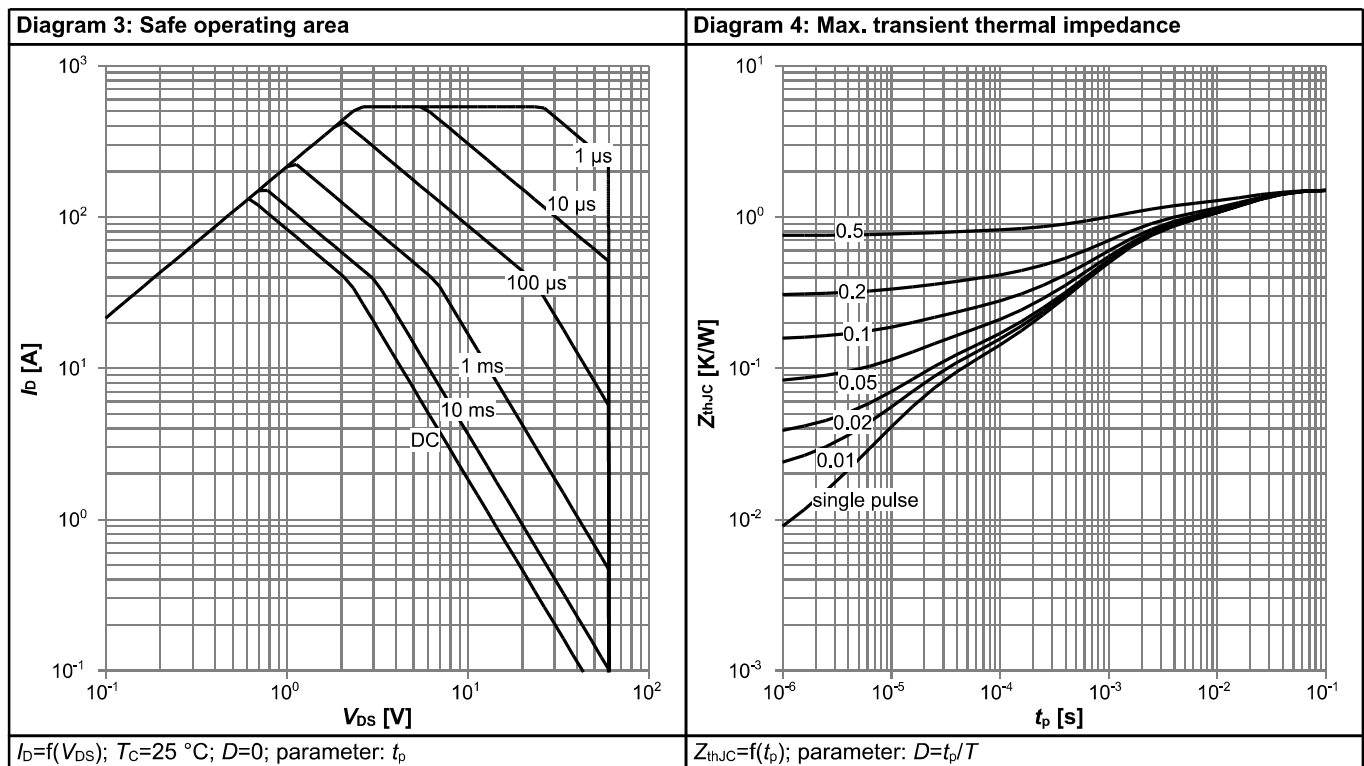
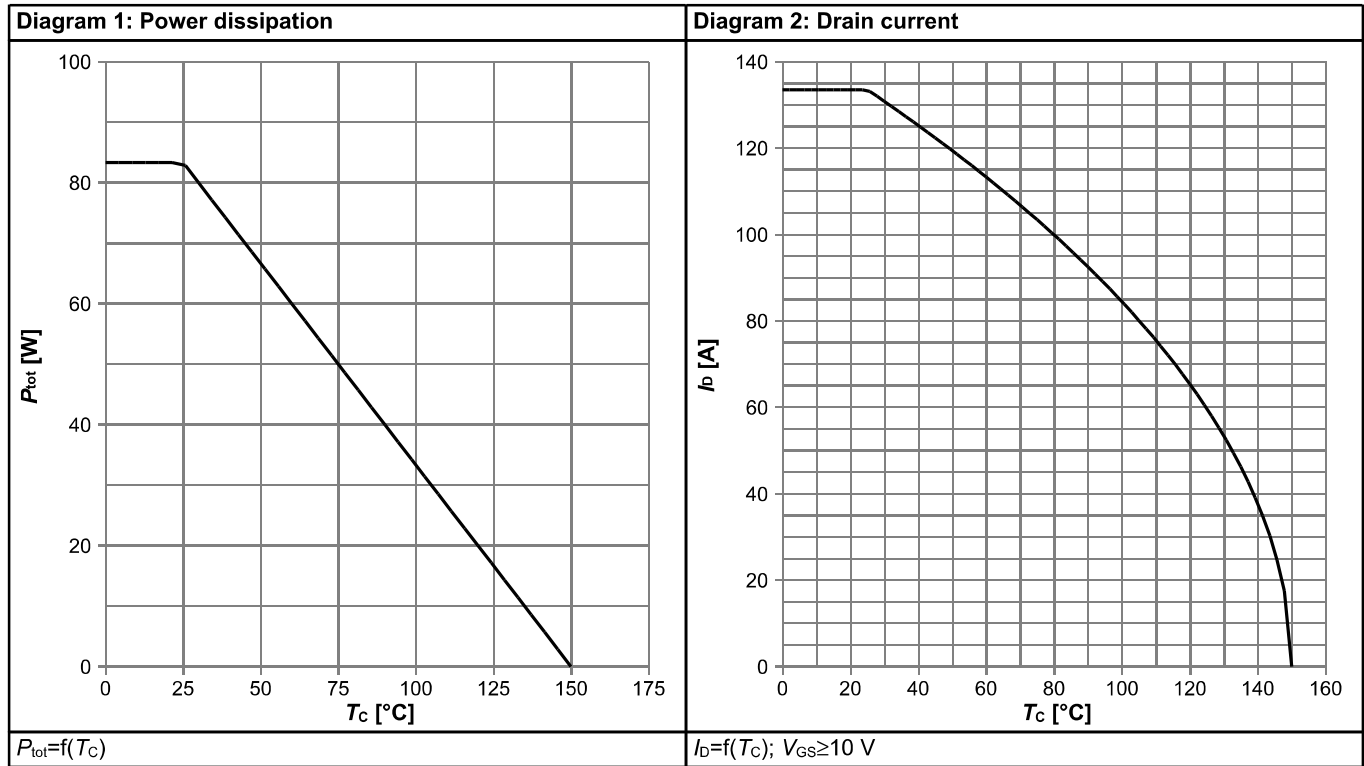
<sup>2)</sup> See "Gate charge waveforms" for parameter definition

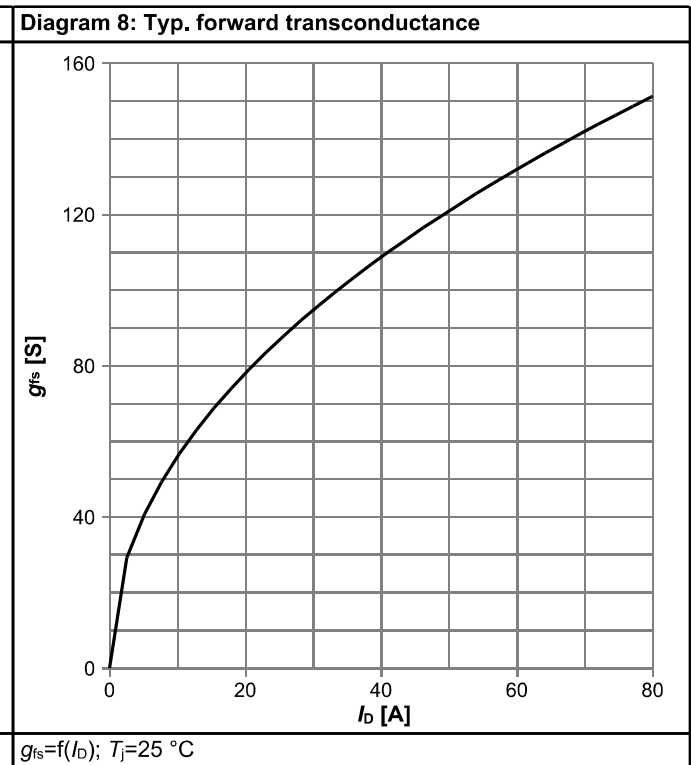
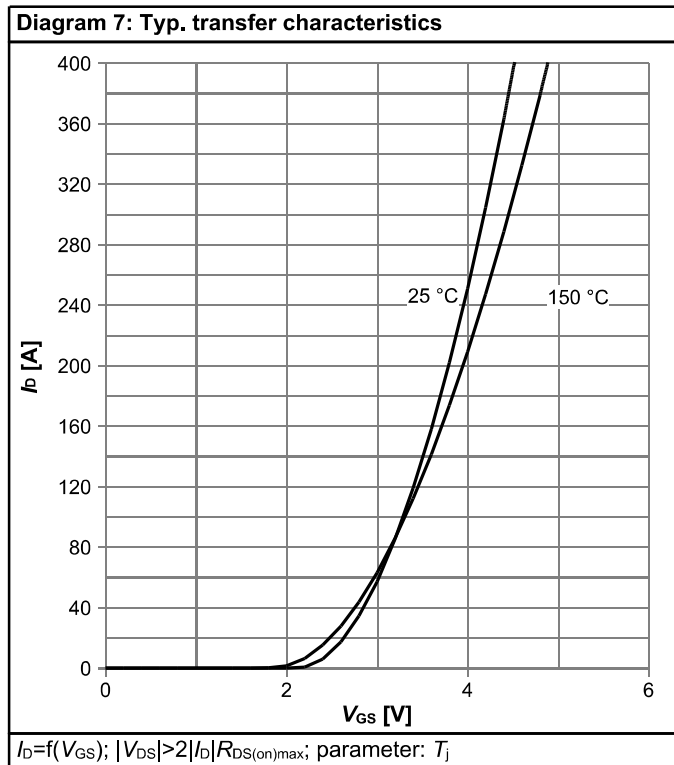
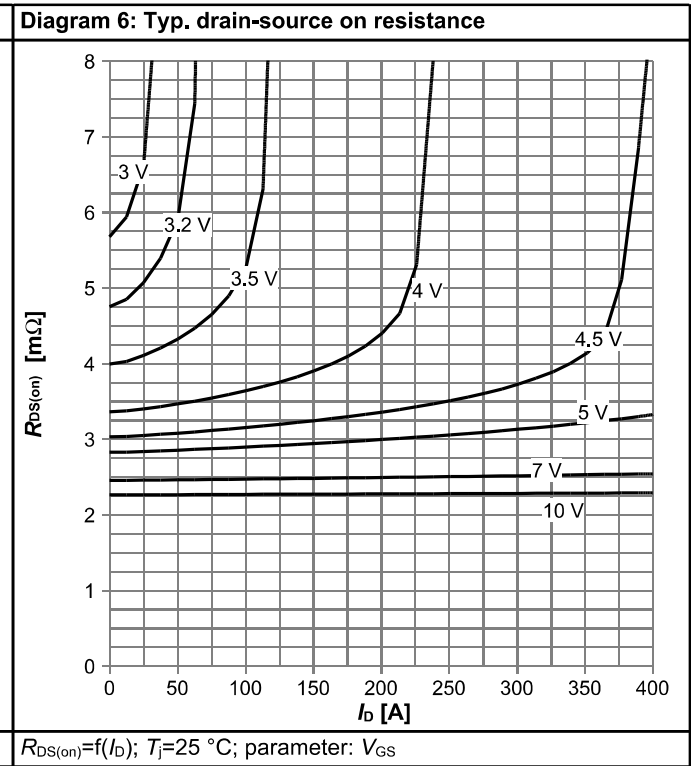
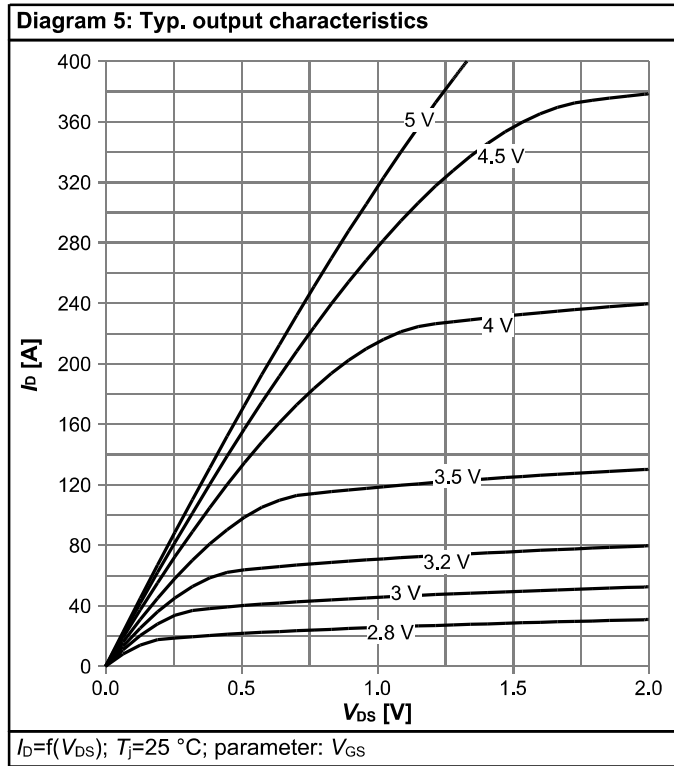
**Table 7 Reverse diode**

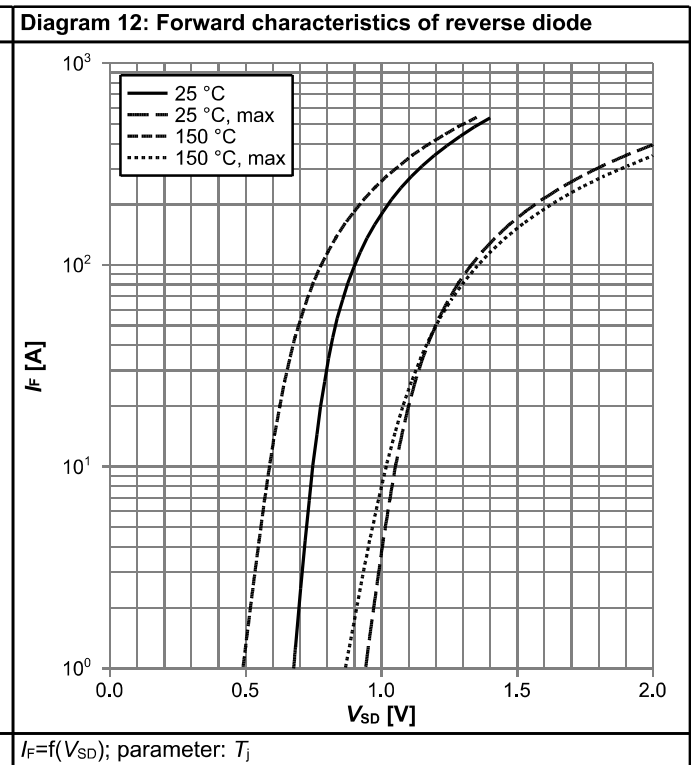
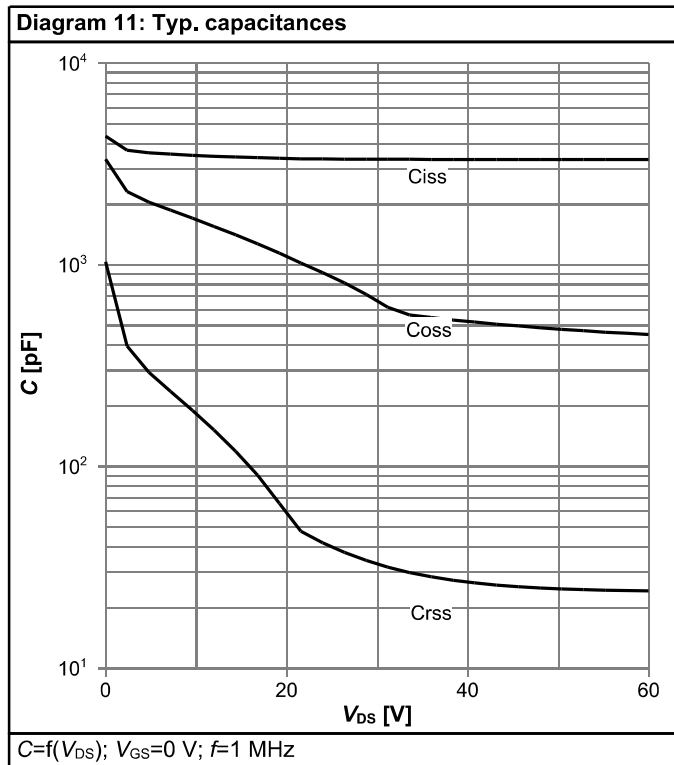
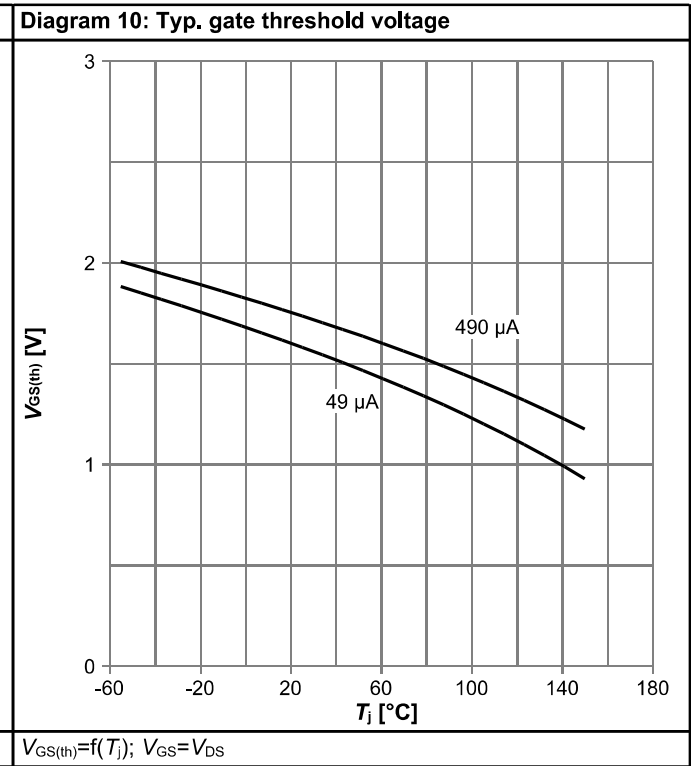
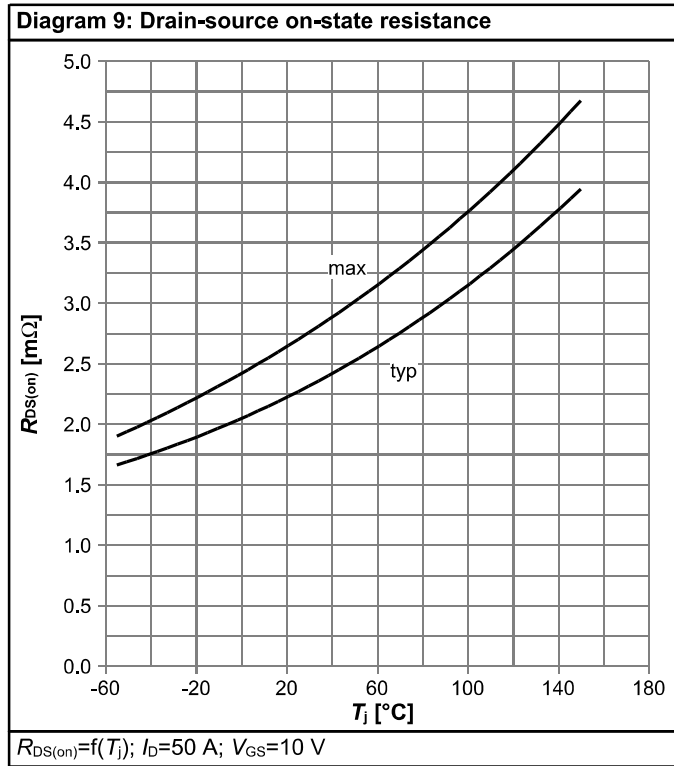
| Parameter                             | Symbol        | Values |      |      | Unit | Note / Test Condition  |
|---------------------------------------|---------------|--------|------|------|------|--|
|                                       |               | Min.   | Typ. | Max. |      |  |
| Diode continuous forward current      | $I_S$         | -      | -    | 69   | A    | $T_C=25\text{ °C}$   |
| Diode pulse current                   | $I_{S,pulse}$ | -      | -    | 536  | A    | $T_C=25\text{ °C}$   |
| Diode forward voltage                 | $V_{SD}$      | -      | 0.84 | 1.2  | V    | $V_{GS}=0\text{ V}, I_F=50\text{ A}, T_j=25\text{ °C}$               |
| Reverse recovery time <sup>1)</sup>   | $t_{rr}$      | -      | 40   | 80   | ns   | $V_R=30\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge <sup>1)</sup> | $Q_{rr}$      | -      | 36   | 72   | nC   | $V_R=30\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ |

<sup>1)</sup> Defined by design. Not subject to production test

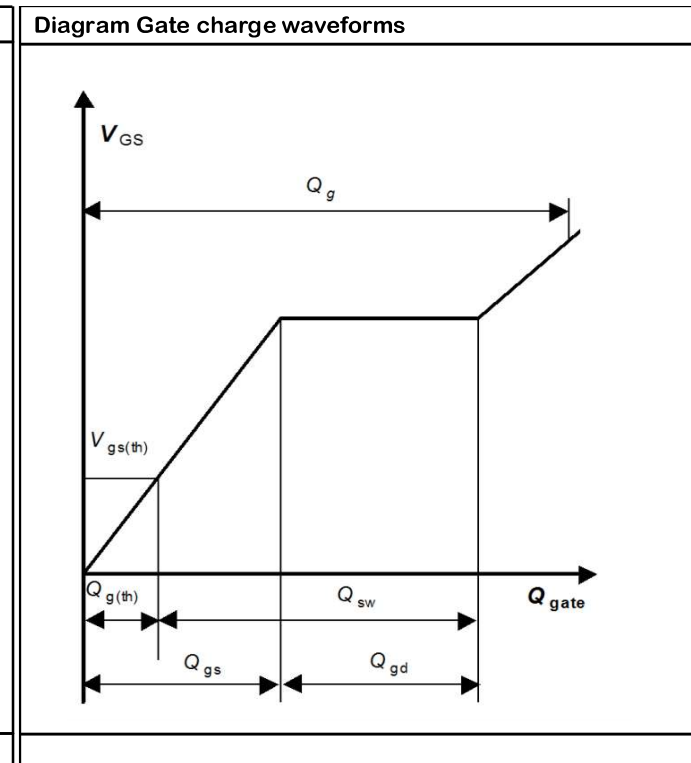
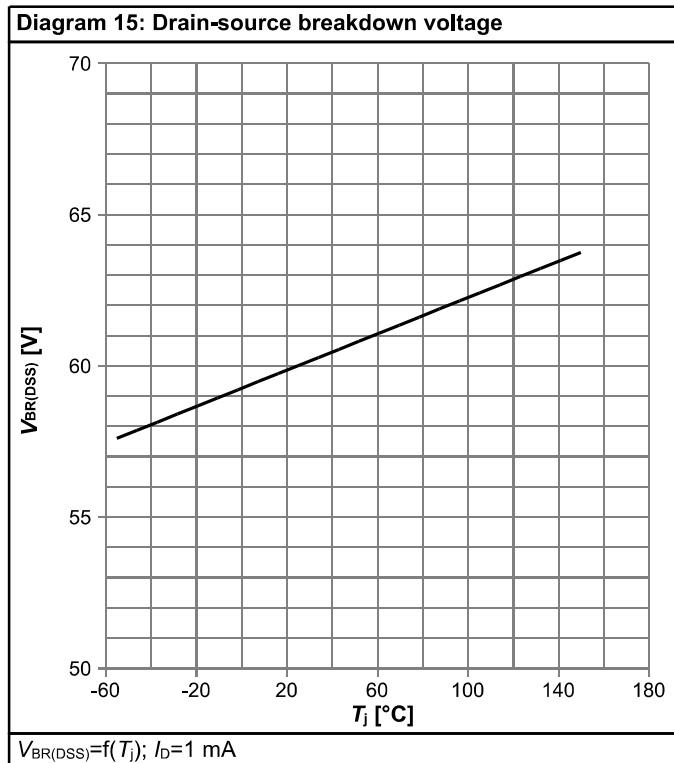
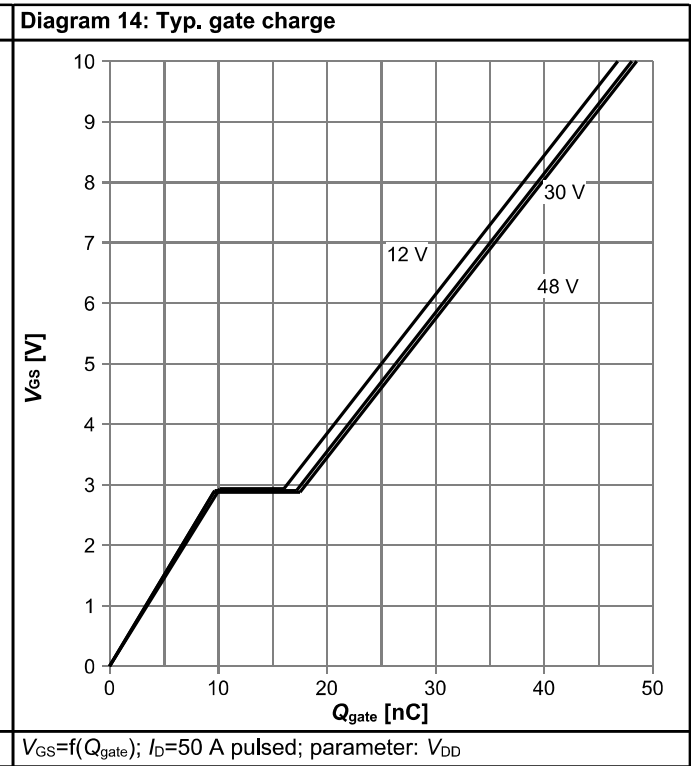
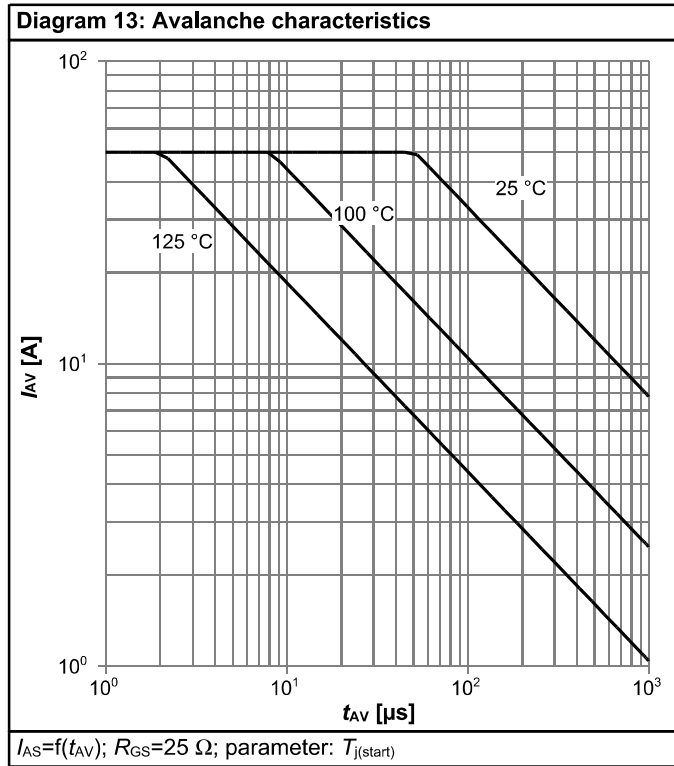
## 4 Electrical characteristics diagrams



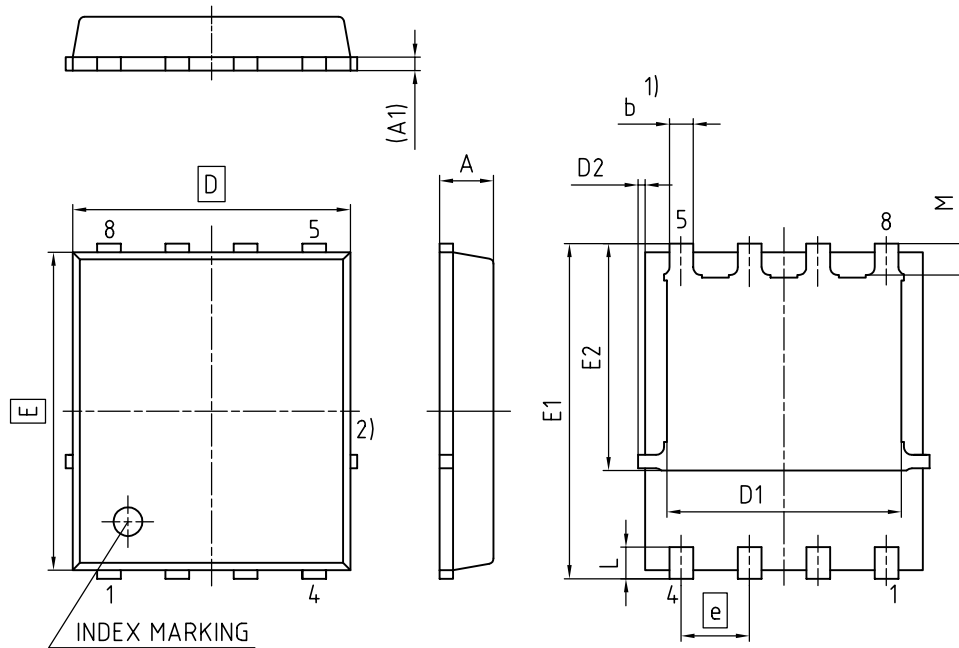








## 5 Package Outlines



1) EXCLUDING MOLD FLASH  
 2) REMOVAL ON MOLD GATE  
 INTRUSION 0.1 MM  
 PROTRUSION 0.1 MM  
 LEAD LENGTH UP TO ANTI FLASH LINE  
 ALL METAL SURFACES ARE PLATED, EXCEPT AREA OF CUT

| DIMENSION | MILLIMETERS |      |
|-----------|-------------|------|
|           | MIN.        | MAX. |
| A         | 0.90        | 1.20 |
| A1        | 0.15        | 0.35 |
| b         | 0.34        | 0.54 |
| D         | 4.80        | 5.35 |
| D1        | 3.90        | 4.40 |
| D2        | 0.03        | 0.23 |
| E         | 5.70        | 6.10 |
| E1        | 5.90        | 6.42 |
| E2        | 3.88        | 4.31 |
| e         | 1.27        |      |
| L         | 0.45        | 0.71 |
| M         | 0.45        | 0.69 |

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

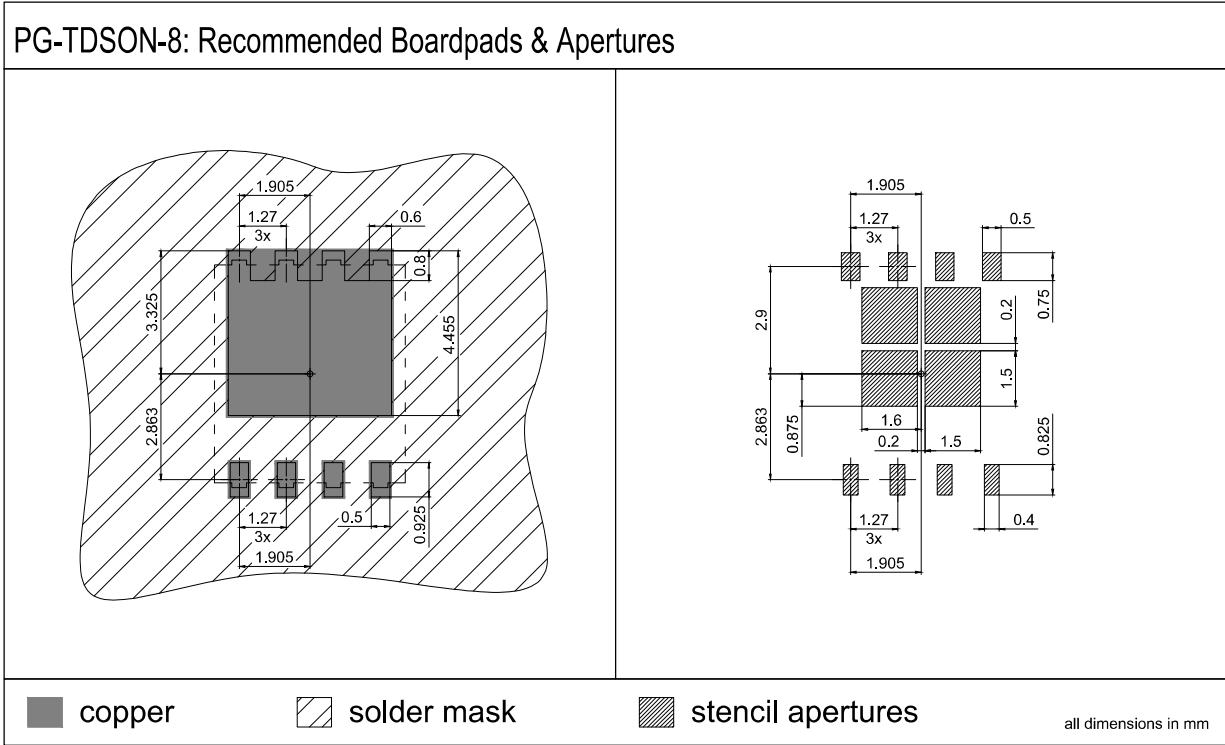
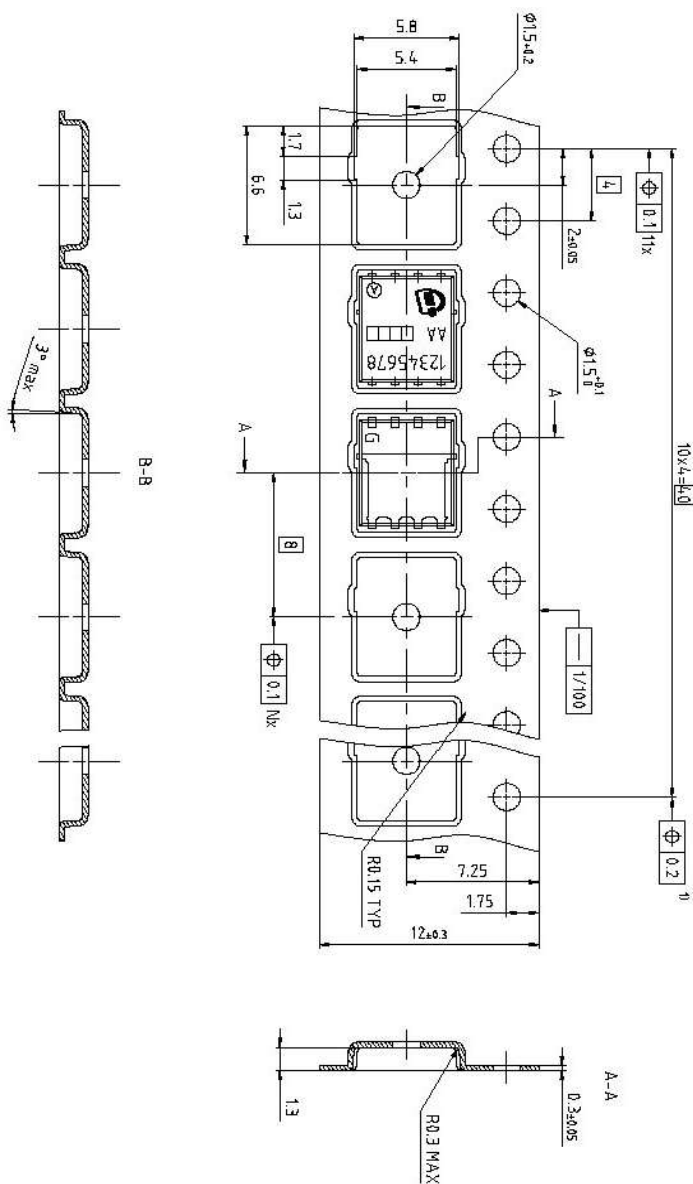


Figure 2 Outline Boardpads (TDSON-8), dimensions in mm



Dimension in mm

Figure 3 Outline Tape (TDSON-8)

## Revision History

BSC0702LS

Revision: 2021-04-06, Rev. 2.5

### Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0      | 2016-06-09 | Release of final version                     |
| 2.1      | 2016-06-13 | Insert Rds(on) max at Vgs 4.5                |
| 2.2      | 2016-06-21 | Delete heading on first page                 |
| 2.3      | 2016-10-25 | Update " Features "                          |
| 2.4      | 2019-11-04 | Update package drawings                      |
| 2.5      | 2021-04-06 | Update current rating                        |

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