

**OptiMOS™ Power-MOSFET**
**Features**

- Optimized for synchronous rectification
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Higher solder joint reliability due to enlarged source interconnection

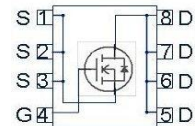
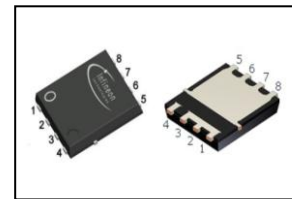


| Type        | Package       | Marking  |
|-------------|---------------|----------|
| BSC016N06NS | PG-TDSON-8 FL | 016N06NS |

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 60  | V          |
| $R_{DS(on),max}$ | 1.6 | m $\Omega$ |
| $I_D$            | 100 | A          |
| $Q_{OSS}$        | 81  | nC         |
| $Q_G(0V..10V)$   | 71  | nC         |

PG-TDSON-8 FL  
enlarged source interconnection



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

| Parameter                                    | Symbol        | Conditions   | Value    | Unit |
|--|---------------|--|----------|------|
| Continuous drain current                     | $I_D$         | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$                                  | 100      | A    |
|  |               | $V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$                                 | 100      |      |
|  |               | $V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ ,<br>$R_{thJA}=50\text{ K/W}^2)$ | 30       |      |
| Pulsed drain current <sup>3)</sup>           | $I_{D,pulse}$ | $T_C=25\text{ °C}$   | 400      |      |
| Avalanche energy, single pulse <sup>4)</sup> | $E_{AS}$      | $I_D=50\text{ A}$ , $R_{GS}=25\text{ }\Omega$                              | 380      | mJ   |
| Gate source voltage                          | $V_{GS}$      |  | $\pm 20$ | V    |

<sup>1)</sup> J-STD20 and JESD22

<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  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

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

<sup>4)</sup> See figure 13 for more detailed information

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

| Parameter                           | Symbol                | Conditions  | Value       | Unit |
|-------------------------------------|-----------------------|---|-------------|------|
| Power dissipation                   | $P_{\text{tot}}$      | $T_C=25\text{ °C}$                                      | 139         | W    |
|                                     |                       | $T_A=25\text{ °C}$ ,<br>$R_{\text{thJA}}=50\text{ K/W}$ | 2.5         |      |
| Operating and storage temperature   | $T_j, T_{\text{stg}}$ |   | -55 ... 150 | °C   |
| IEC climatic category; DIN IEC 68-1 |                       |   | 55/150/56   |      |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Thermal characteristics

|                                     |                   |  |   |   |     |     |
|-------------------------------------|-------------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | $R_{\text{thJC}}$ | bottom                                       | - | - | 0.9 | K/W |
|                                     |                   | top  | - | - | 20  |     |
| Device on PCB                       | $R_{\text{thJA}}$ | 6 cm <sup>2</sup> cooling area <sup>2)</sup> | - | - | 50  |     |

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

### Static characteristics

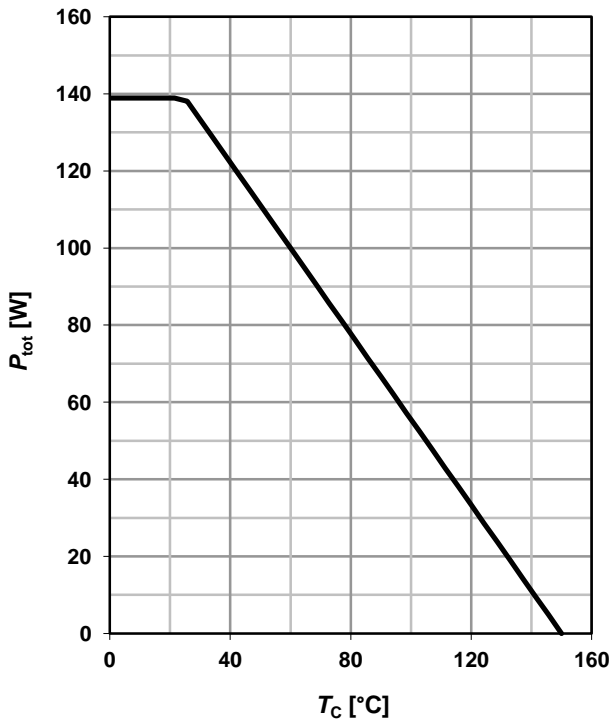
|                                  |                             |   |     |     |     |               |
|----------------------------------|-----------------------------|---|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}$ , $I_{\text{D}}=1\text{ mA}$                               | 60  | -   | -   | V             |
| Gate threshold voltage           | $V_{\text{GS(th)}}$         | $V_{\text{DS}}=V_{\text{GS}}$ , $I_{\text{D}}=95\text{ }\mu\text{A}$                  | 2.1 | 2.8 | 3.3 |               |
| Zero gate voltage drain current  | $I_{\text{DSS}}$            | $V_{\text{DS}}=60\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ ,<br>$T_j=25\text{ °C}$      | -   | 0.5 | 1   | $\mu\text{A}$ |
|                                  |                             | $V_{\text{DS}}=60\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ ,<br>$T_j=125\text{ °C}$     | -   | 10  | 100 |               |
| Gate-source leakage current      | $I_{\text{GSS}}$            | $V_{\text{GS}}=20\text{ V}$ , $V_{\text{DS}}=0\text{ V}$                              | -   | 10  | 100 | nA            |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$         | $V_{\text{GS}}=10\text{ V}$ , $I_{\text{D}}=50\text{ A}$                              | -   | 1.4 | 1.6 | m $\Omega$    |
|                                  |                             | $V_{\text{GS}}=6\text{ V}$ , $I_{\text{D}}=12.5\text{ A}$                             | -   | 1.9 | 2.4 |               |
| Gate resistance                  | $R_{\text{G}}$              |   | -   | 1.9 | 2.9 | $\Omega$      |
| Transconductance                 | $g_{\text{fs}}$             | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$ ,<br>$I_{\text{D}}=50\text{ A}$ | 70  | 140 | -   | S             |

| Parameter                                       | Symbol        | Conditions  | Values |      |      | Unit |
|---|---------------|---|--------|------|------|------|
|   |               |   | min.   | typ. | max. |      |
| <b>Dynamic characteristics</b>                  |               |   |        |      |      |      |
| Input capacitance                               | $C_{iss}$     | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$<br>$f=1\text{ MHz}$                          | 3900   | 5200 | 6500 | pF   |
| Output capacitance                              | $C_{oss}$     |   | 900    | 1200 | 1500 |      |
| Reverse transfer capacitance                    | $C_{rss}$     |   | 14     | 48   | 96   |      |
| Turn-on delay time                              | $t_{d(on)}$   | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=30\text{ A}, R_{G,ext}=1.6\ \Omega$ | -      | 19   | 38   | ns   |
| Rise time                                       | $t_r$         |   | -      | 9    | 18   |      |
| Turn-off delay time                             | $t_{d(off)}$  |   | -      | 35   | 70   |      |
| Fall time                                       | $t_f$         |   | -      | 9    | 18   |      |
| <b>Gate Charge Characteristics<sup>5)</sup></b> |               |   |        |      |      |      |
| Gate to source charge                           | $Q_{gs}$      | $V_{DD}=30\text{ V}, I_D=50\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$            | 16     | 22   | 30   | nC   |
| Gate charge at threshold                        | $Q_{g(th)}$   |   | 10     | 14   | 19   |      |
| Gate to drain charge                            | $Q_{gd}$      |   | 8.8    | 13   | 20   |      |
| Switching charge                                | $Q_{sw}$      |   | 14     | 21   | 30   |      |
| Gate charge total                               | $Q_g$         |   | 58     | 71   | 95   |      |
| Gate plateau voltage                            | $V_{plateau}$ |   | 3.7    | 4.3  | 4.9  | V    |
| Gate charge total, sync. FET                    | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$<br>$V_{GS}=0\text{ to }10\text{ V}$                            | 49     | 62   | 86   | nC   |
| Output charge                                   | $Q_{oss}$     | $V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$   | 60     | 81   | 102  |      |
| <b>Reverse Diode</b>                            |               |   |        |      |      |      |
| Diode continuous forward current                | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | -      | -    | 100  | A    |
| Diode pulse current                             | $I_{S,pulse}$ |   | -      | -    | 400  |      |
| Diode forward voltage                           | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=50\text{ A},$<br>$T_J=25\text{ }^\circ\text{C}$               | -      | 0.9  | 1.2  | V    |
| Reverse recovery time                           | $t_{rr}$      | $V_R=30\text{ V}, I_F=50\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$             | 24     | 61   | 98   | ns   |
| Reverse recovery charge                         | $Q_{rr}$      |   | 39     | 78   | 156  |      |

<sup>5)</sup> See figure 16 for gate charge parameter definition

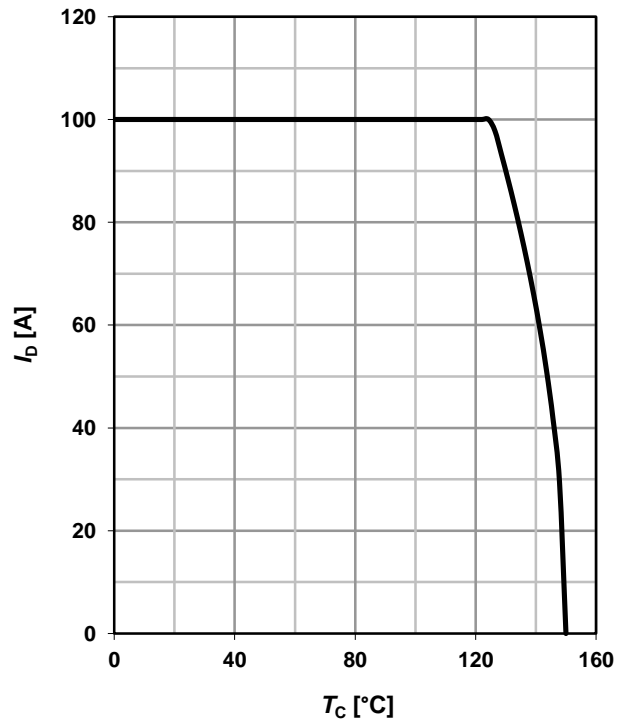
**1 Power dissipation**

$P_{tot}=f(T_C)$



**2 Drain current**

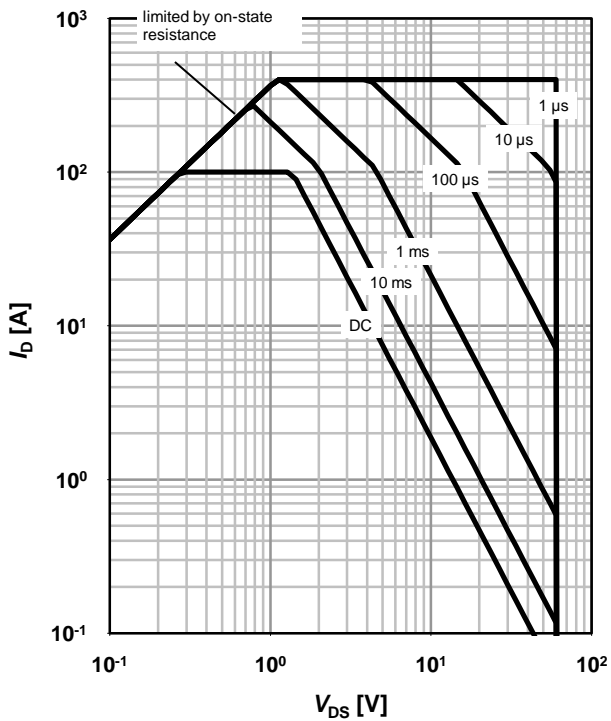
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

$I_D=f(V_{DS}); T_C=25\text{ °C}; D=0$

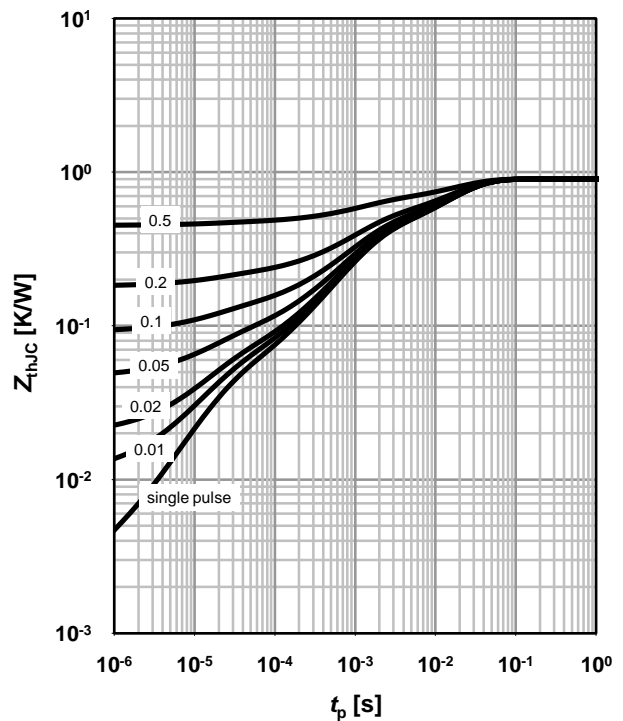
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

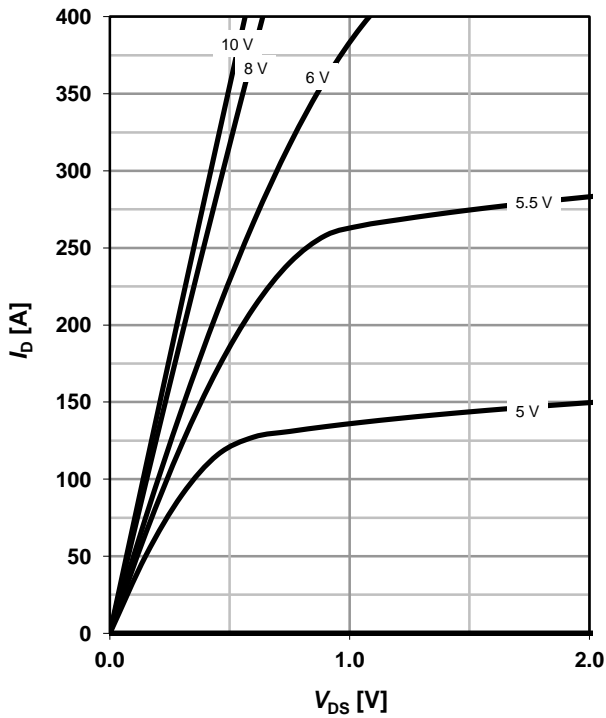
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

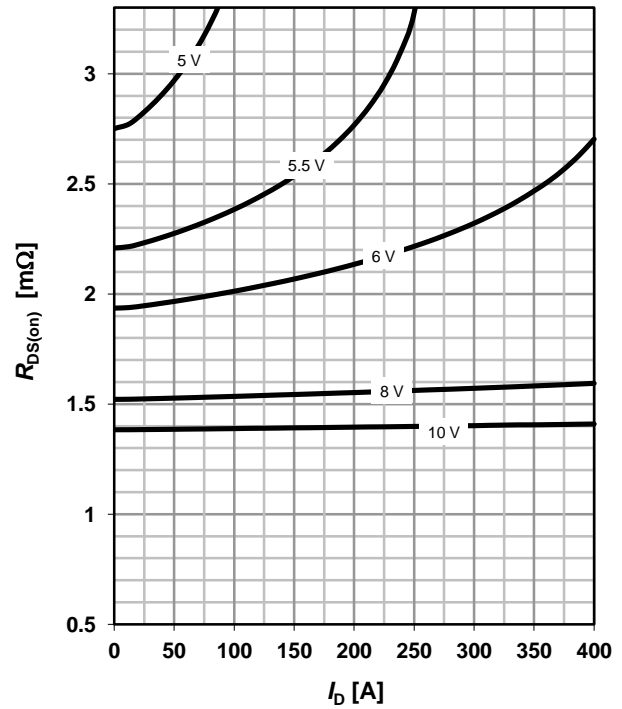
parameter:  $V_{GS}$



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

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

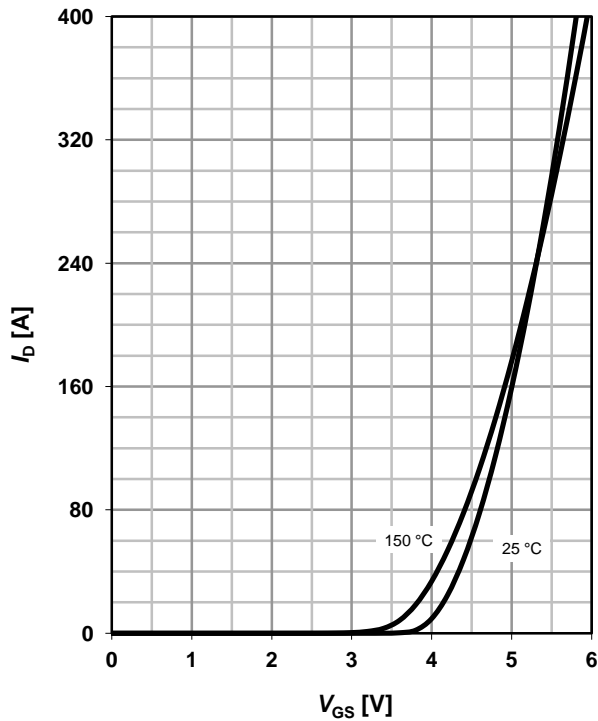
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

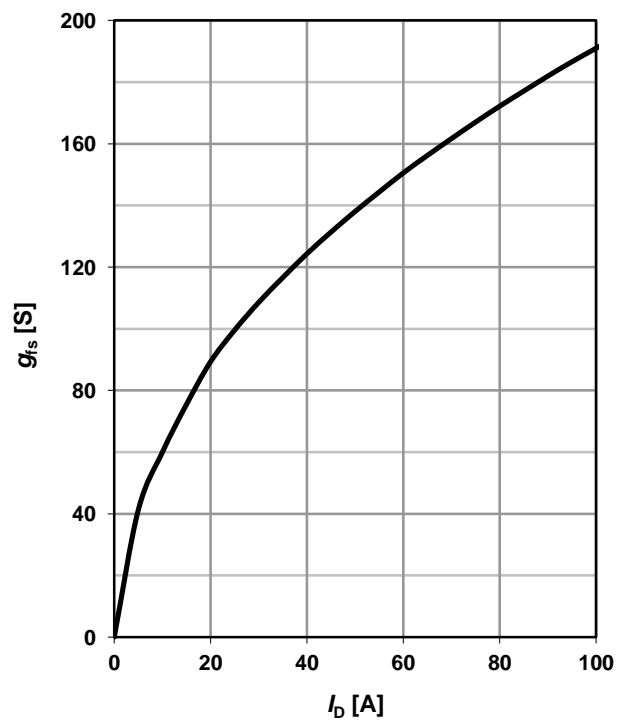
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



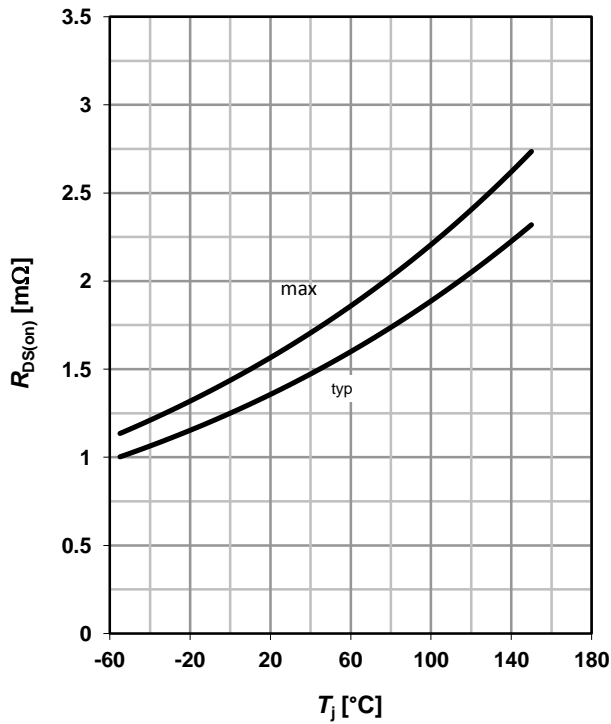
**8 Typ. forward transconductance**

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



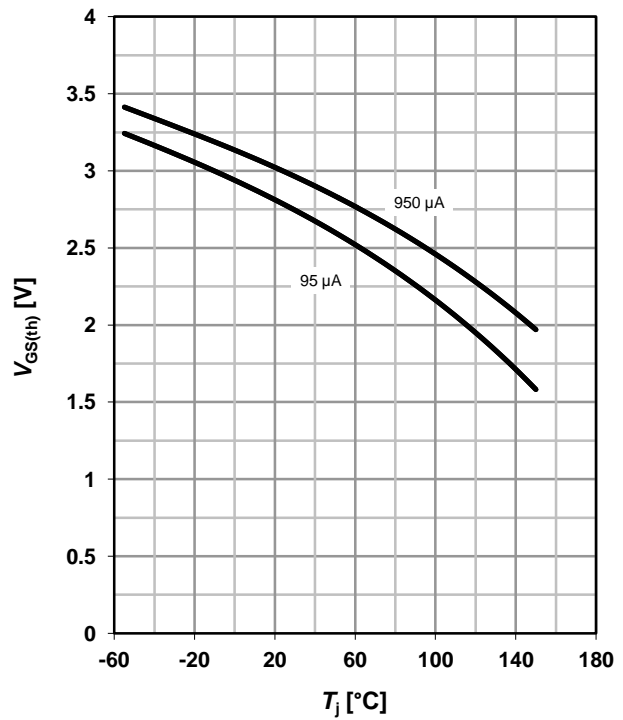
**9 Drain-source on-state resistance**

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



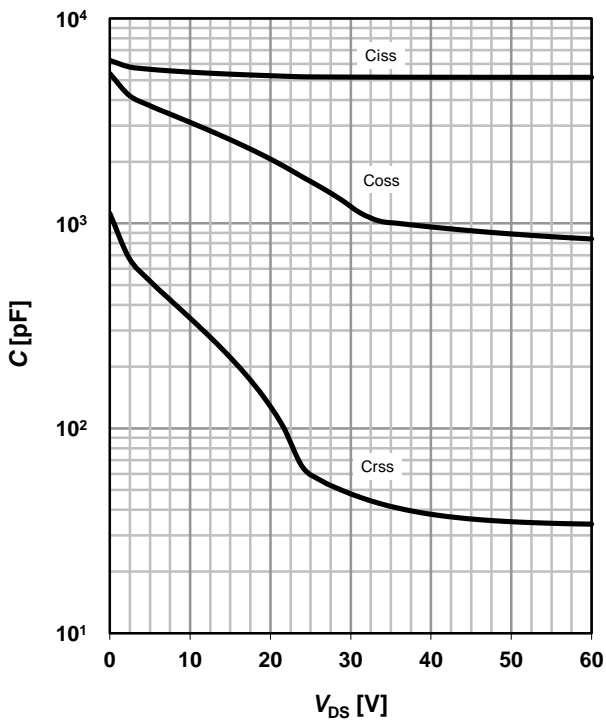
**10 Typ. gate threshold voltage**

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



**11 Typ. capacitances**

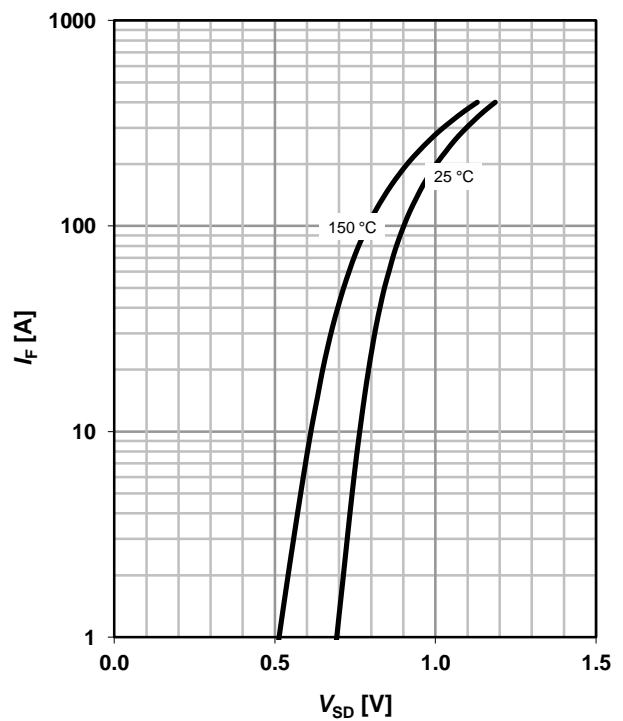
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

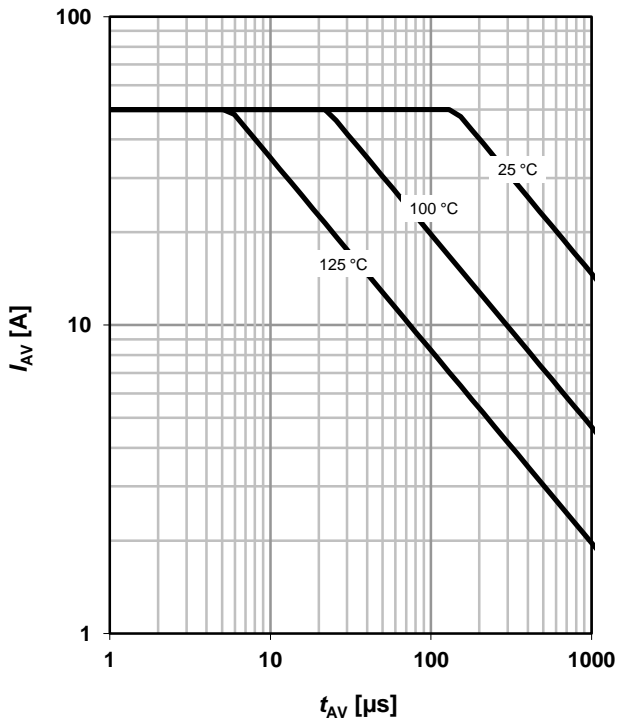
parameter:  $T_j$



**13 Avalanche characteristics**

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

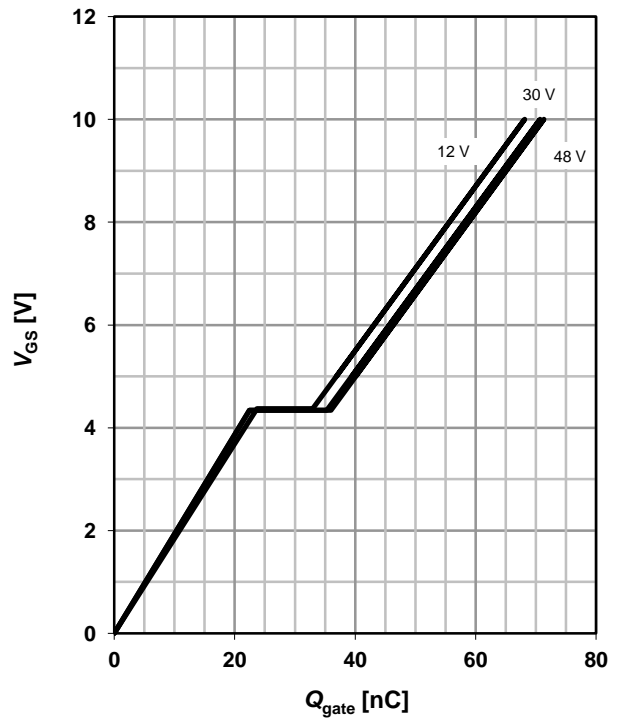
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

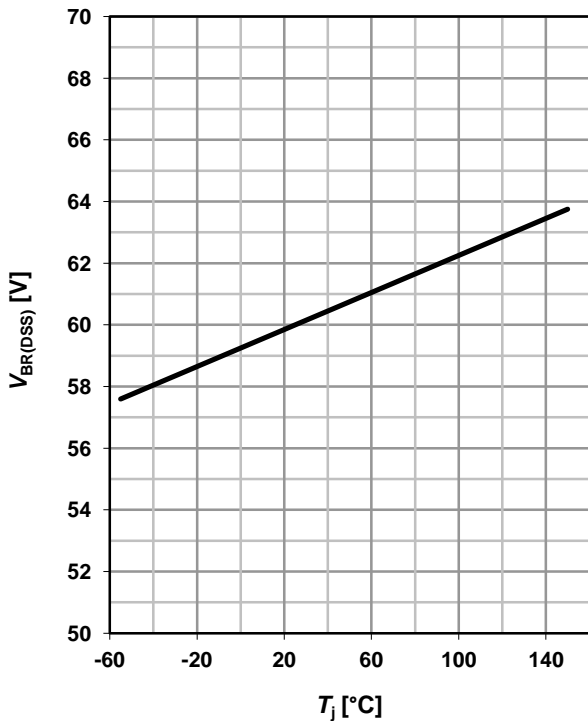
$V_{GS}=f(Q_{gate}); I_D=50 \text{ A pulsed}$

parameter:  $V_{DD}$



**15 Drain-source breakdown voltage**

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



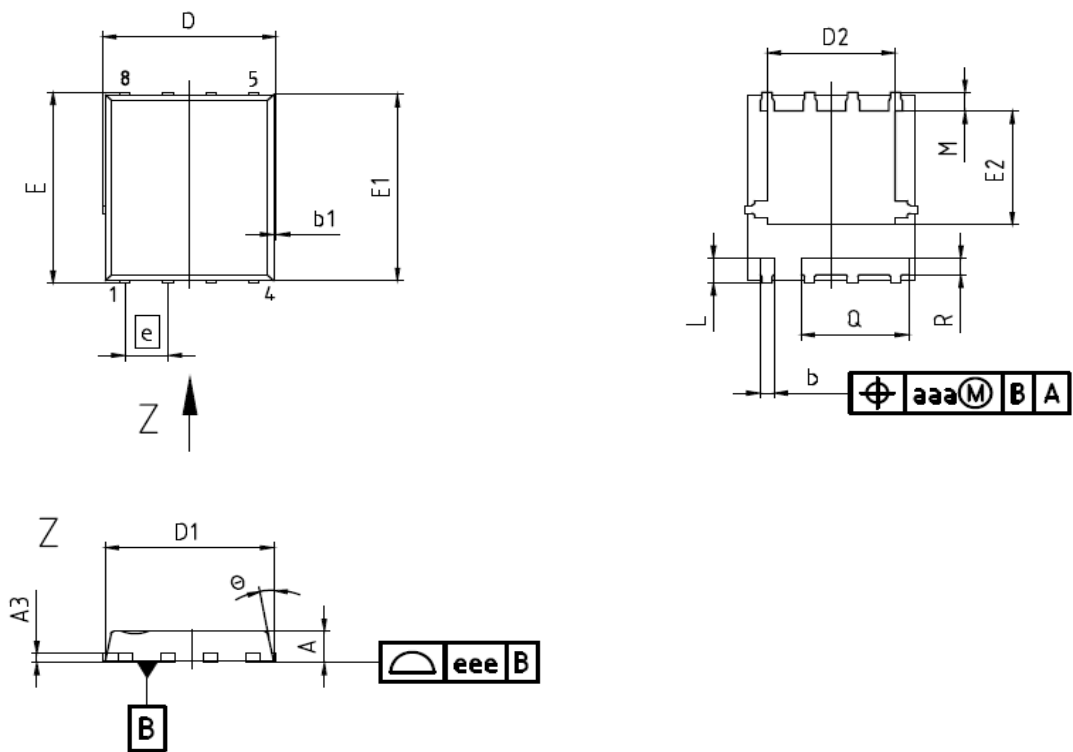
**16 Gate charge waveforms**



Package Outline

PG-TDSON-8 FL

PG-TDSON-8 FL: Outline



| DIM | MILLIMETERS |      | INCHES      |       |
|-----|-------------|------|-------------|-------|
|     | MIN         | MAX  | MIN         | MAX   |
| A   | 0.90        | 1.10 | 0.035       | 0.043 |
| A3  | 0.25 (REF)  |      | 0.011 (REF) |       |
| b   | 0.34        | 0.54 | 0.013       | 0.021 |
| b1  | 0.02        | 0.22 | 0.001       | 0.009 |
| D   | 5.15 (BSC)  |      | 0.203 (BSC) |       |
| D1  | 5.00 (BSC)  |      | 0.197 (BSC) |       |
| D2  | 3.70        | 4.40 | 0.146       | 0.173 |
| E   | 6.15 (BSC)  |      | 0.242 (BSC) |       |
| E1  | 6.00 (BSC)  |      | 0.236 (BSC) |       |
| E2  | 3.40        | 3.80 | 0.134       | 0.150 |
| e   | 1.27 (BSC)  |      | 0.050 (BSC) |       |
| N   | 8           |      | 8           |       |
| L   | 0.74        | 0.84 | 0.029       | 0.033 |
| M   | 0.45        | 0.66 | 0.018       | 0.026 |
| ϕ   | 8.5°        | 12°  | 8.5°        | 12°   |
| Q   | 3.15        | 3.25 | 0.124       | 0.128 |
| R   | 0.48        | 0.58 | 0.019       | 0.023 |
| aaa | 0.25        |      | 0.010       |       |
| eee | 0.08        |      | 0.003       |       |

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SCALE

EUROPEAN PROJECTION

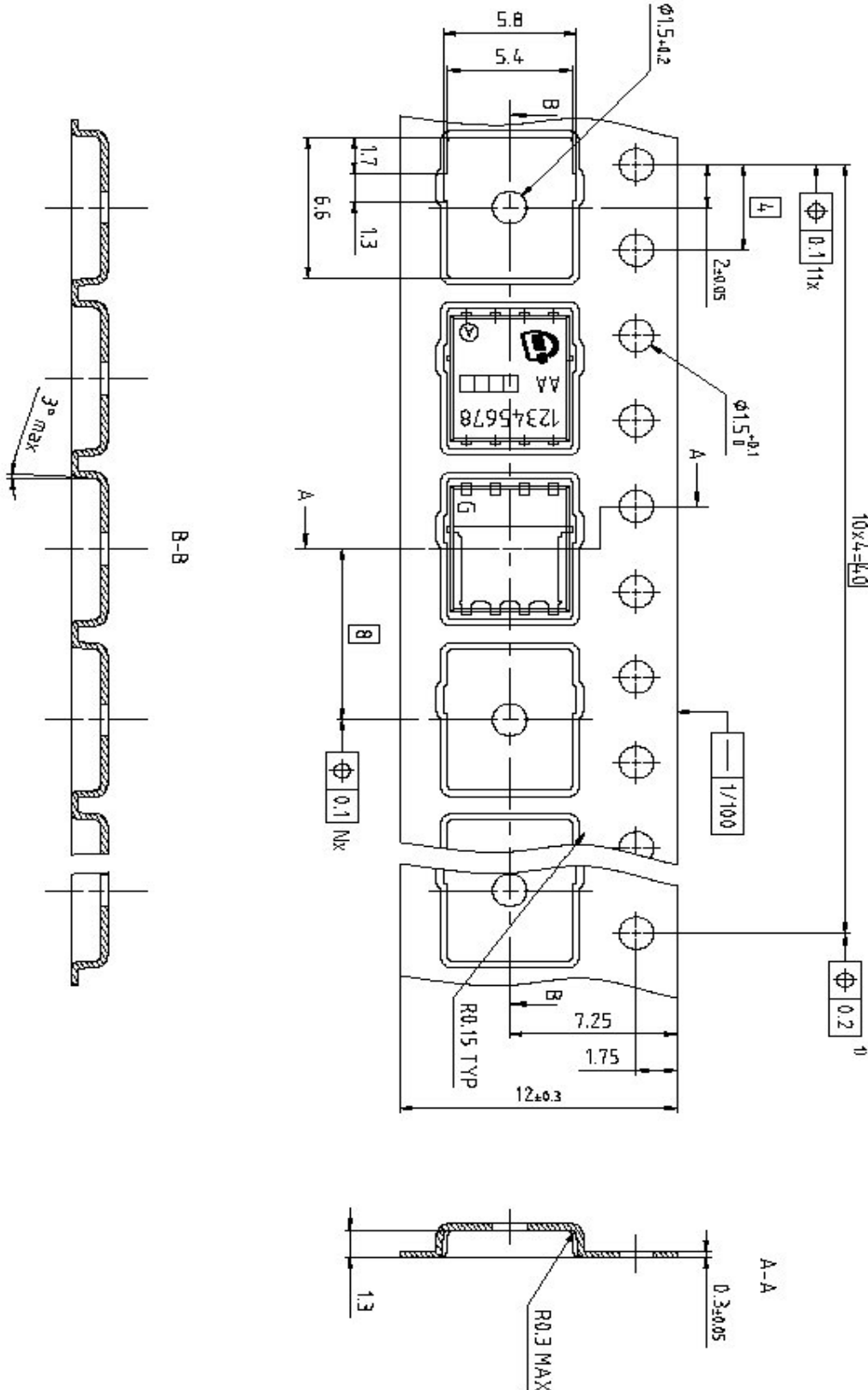
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01



Package Outline

PG-TDSON-8: Tape



Dimensions in mm

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