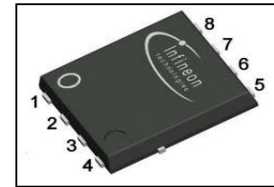


**OptiMOS<sup>®</sup>3 Power-MOSFET**
**Features**

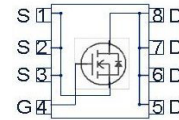
- Fast switching MOSFET for SMPS
- Optimized technology for DC/DC converters
- Qualified according to JEDEC<sup>1)</sup> for target applications
- N-channel
- Logic level
- Excellent gate charge  $\times R_{DS(on)}$  product (FOM)
- Very low on-resistance  $R_{DS(on)}$
- Superior thermal resistance
- Avalanche rated
- Pb-free plating; RoHS compliant

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 30  | V          |
| $R_{DS(on),max}$ | 2   | m $\Omega$ |
| $I_D$            | 100 | A          |

**PG-TDSON-8**


| Type          | Package    | Marking  |
|---------------|------------|----------|
| BSC020N03LS G | PG-TDSON-8 | 020N03LS |


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

| Parameter                                     | Symbol        | Conditions   | Value    | Unit              |
|---|---------------|--|----------|-------------------|
| Continuous drain current                      | $I_D$         | $V_{GS}=10\text{ V}, T_C=25\text{ }^\circ\text{C}$   | 100      | A                 |
|   |               | $V_{GS}=10\text{ V}, T_C=100\text{ }^\circ\text{C}$  | 100      |                   |
|   |               | $V_{GS}=4.5\text{ V}, T_C=25\text{ }^\circ\text{C}$  | 100      |                   |
|   |               | $V_{GS}=4.5\text{ V}, T_C=100\text{ }^\circ\text{C}$   | 93       |                   |
|   |               | $V_{GS}=10\text{ V}, T_A=25\text{ }^\circ\text{C}, R_{thJA}=50\text{ K/W}^2$                               | 28       |                   |
| Pulsed drain current <sup>3)</sup>            | $I_{D,pulse}$ | $T_C=25\text{ }^\circ\text{C}$   | 400      |                   |
| Avalanche current, single pulse <sup>4)</sup> | $I_{AS}$      | $T_C=25\text{ }^\circ\text{C}$   | 50       |                   |
| Avalanche energy, single pulse                | $E_{AS}$      | $I_D=50\text{ A}, R_{GS}=25\text{ }\Omega$   | 180      | mJ                |
| Reverse diode $dv/dt$                         | $dv/dt$       | $I_D=50\text{ A}, V_{DS}=24\text{ V}, di/dt=200\text{ A}/\mu\text{s}, T_{j,max}=150\text{ }^\circ\text{C}$ | 6        | kV/ $\mu\text{s}$ |
| Gate source voltage                           | $V_{GS}$      |  | $\pm 20$ | V                 |

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

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

| Parameter                           | Symbol                | Conditions   | Value       | Unit |
|-------------------------------------|-----------------------|--|-------------|------|
| Power dissipation                   | $P_{\text{tot}}$      | $T_C=25\text{ °C}$   | 96          | W    |
|                                     |                       | $T_A=25\text{ °C}$ ,<br>$R_{\text{thJA}}=50\text{ K/W}^2)$ | 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 | $R_{\text{thJC}}$ |  | - | - | 1.3 | K/W |
| 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   | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}, I_{\text{D}}=1\text{ mA}$                            | 30  | -   | -   | V             |
| Gate threshold voltage           | $V_{\text{GS(th)}}$         | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\text{ }\mu\text{A}$              | 1   | -   | 2.2 |               |
| Zero gate voltage drain current  | $I_{\text{DSS}}$            | $V_{\text{DS}}=30\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=25\text{ °C}$         | -   | 0.1 | 1   | $\mu\text{A}$ |
|                                  |                             | $V_{\text{DS}}=30\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=125\text{ °C}$        | -   | 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 | $R_{\text{DS(on)}}$         | $V_{\text{GS}}=4.5\text{ V}, I_{\text{D}}=30\text{ A}$                          | -   | 2.3 | 2.9 | m $\Omega$    |
|                                  |                             | $V_{\text{GS}}=10\text{ V}, I_{\text{D}}=30\text{ A}$                           | -   | 1.7 | 2   |               |
| Gate resistance                  | $R_{\text{G}}$              |   | 0.9 | 1.9 | 3.3 | $\Omega$      |
| Transconductance                 | $g_{\text{fs}}$             | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}, I_{\text{D}}=30\text{ A}$ | 65  | 130 | -   | S             |

<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

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

**Dynamic characteristics**

|                              |              |   |   |      |      |    |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$<br>$f=1\text{ MHz}$                    | - | 5400 | 7200 | pF |
| Output capacitance           | $C_{oss}$    |   | - | 1900 | 2500 |    |
| Reverse transfer capacitance | $C_{rss}$    |   | - | 110  | -    |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=30\text{ A}, R_G=1.6\ \Omega$ | - | 11   | -    | ns |
| Rise time                    | $t_r$        |   | - | 7.0  | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |   | - | 42   | -    |    |
| Fall time                    | $t_f$        |   | - | 7.0  | -    |    |

**Gate Charge Characteristics<sup>5)</sup>**

|                              |               |   |   |     |    |    |
|------------------------------|---------------|---|---|-----|----|----|
| Gate to source charge        | $Q_{gs}$      | $V_{DD}=15\text{ V}, I_D=30\text{ A},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$ | - | 15  | 20 | nC |
| Gate charge at threshold     | $Q_{g(th)}$   |   | - | 9   | 12 |    |
| Gate to drain charge         | $Q_{gd}$      |   | - | 7   | 12 |    |
| Switching charge             | $Q_{sw}$      |   | - | 14  | 21 |    |
| Gate charge total            | $Q_g$         |   | - | 34  | 45 |    |
| Gate plateau voltage         | $V_{plateau}$ |   | - | 2.8 | -  |    |
| Gate charge total            | $Q_g$         | $V_{DD}=15\text{ V}, I_D=30\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$  | - | 70  | 93 | nC |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$                 | - | 29  | 39 |    |
| Output charge                | $Q_{oss}$     | $V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$                                     | - | 49  | 66 |    |

**Reverse Diode**

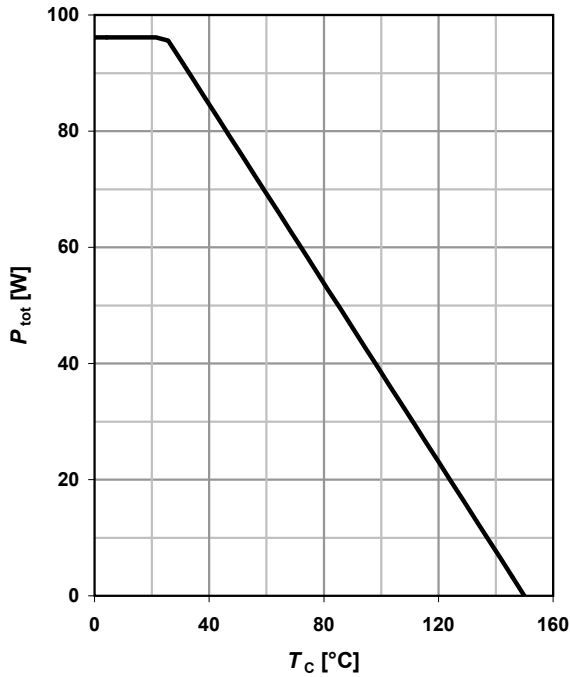
|                                  |               |   |   |     |     |    |
|----------------------------------|---------------|---|---|-----|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | - | -   | 87  | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -   | 400 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=30\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$ | - | 0.8 | 1.1 | V  |
| Reverse recovery charge          | $Q_{rr}$      | $V_R=15\text{ V}, I_F=I_S,$<br>$di_F/dt=400\text{ A}/\mu\text{s}$       | - | -   | 25  | nC |

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

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

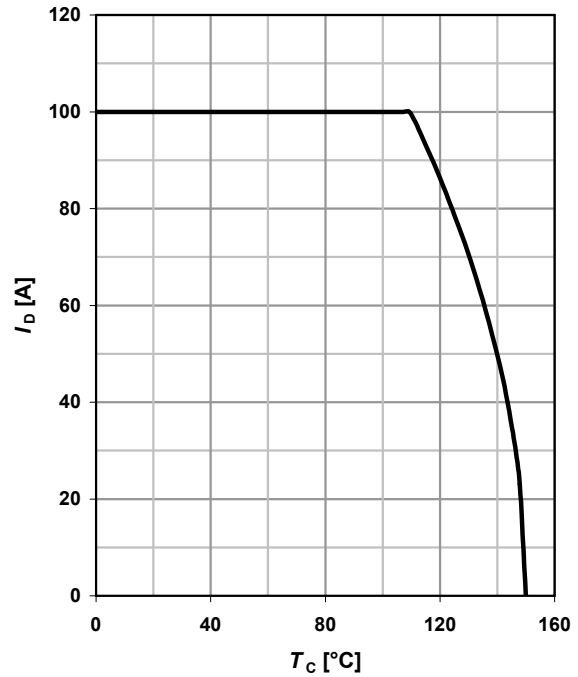
**1 Power dissipation**

$$P_{tot} = f(T_C)$$



**2 Drain current**

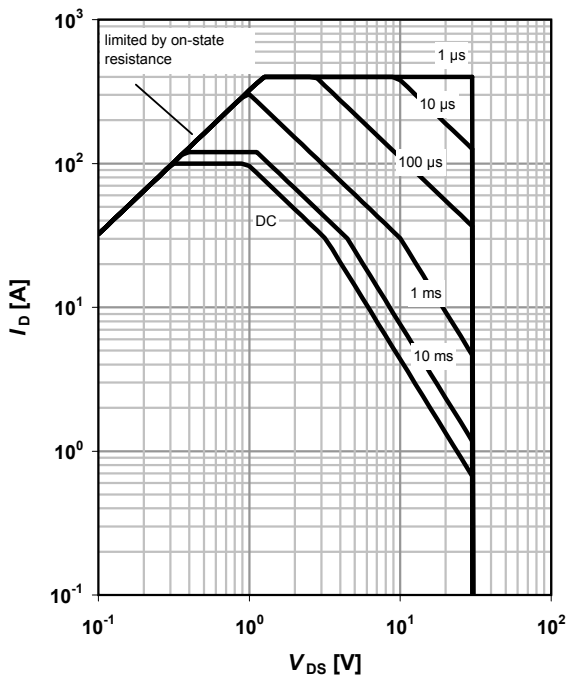
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



**3 Safe operating area**

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

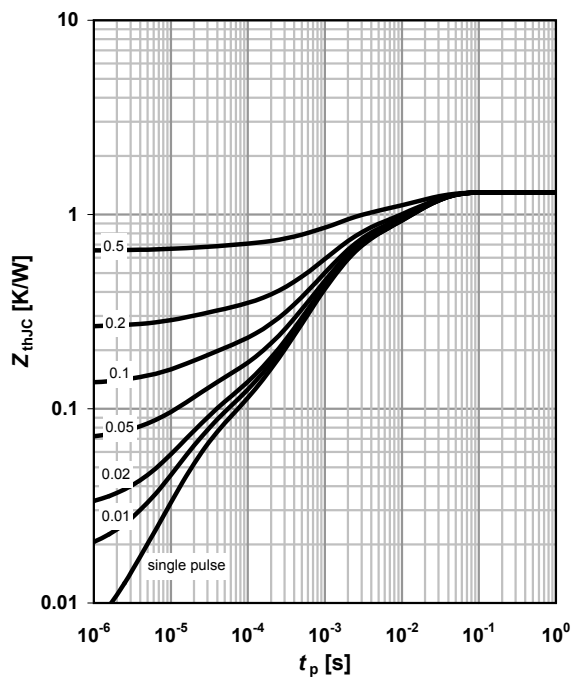
parameter:  $t_p$



**4 Max. transient thermal impedance**

$$Z_{thJC} = f(t_p)$$

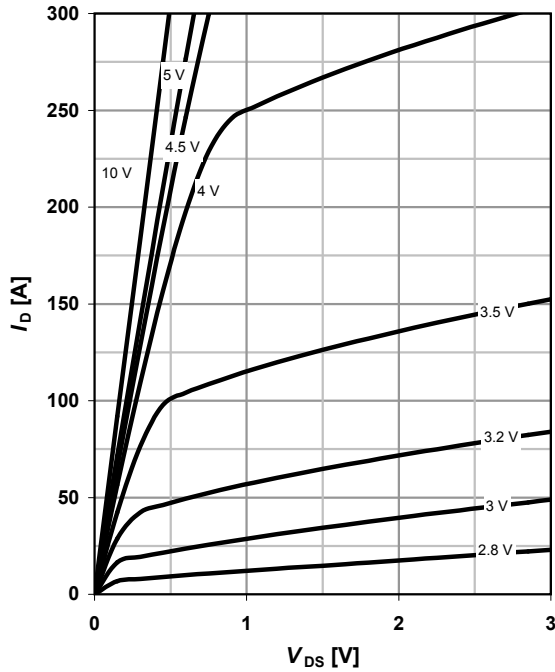
parameter:  $D = t_p / T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

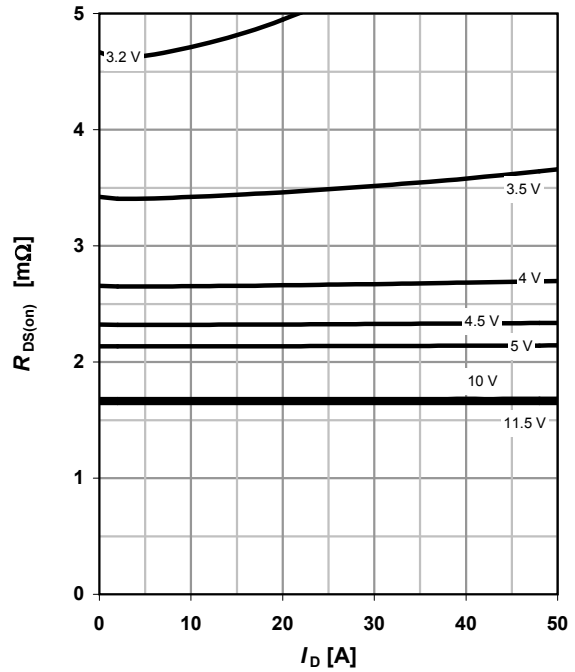
parameter:  $V_{GS}$



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

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

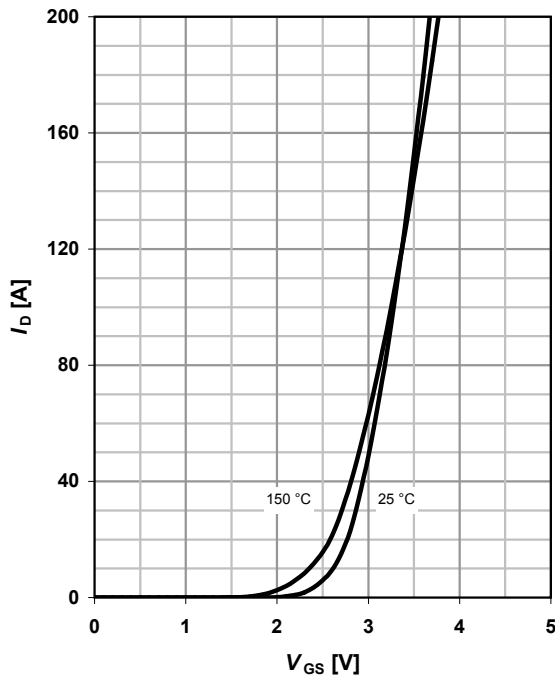
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

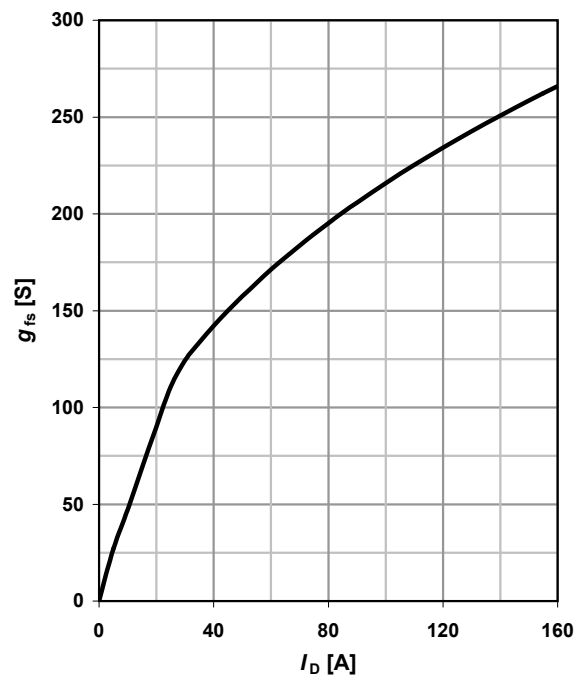
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



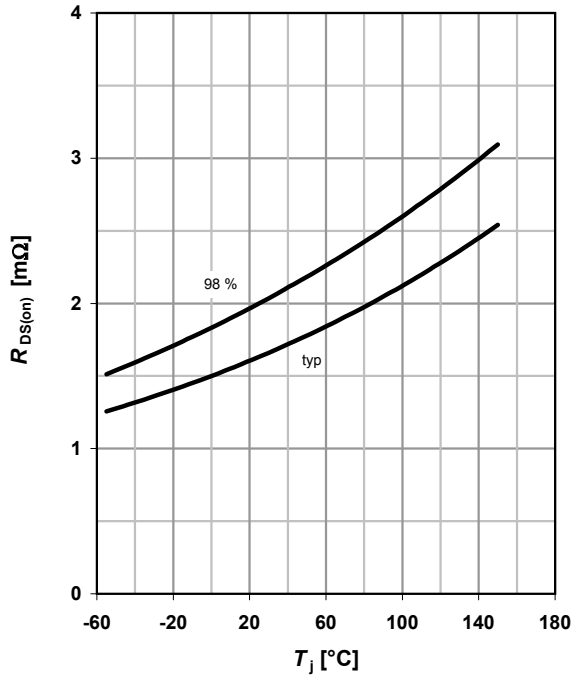
**8 Typ. forward transconductance**

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



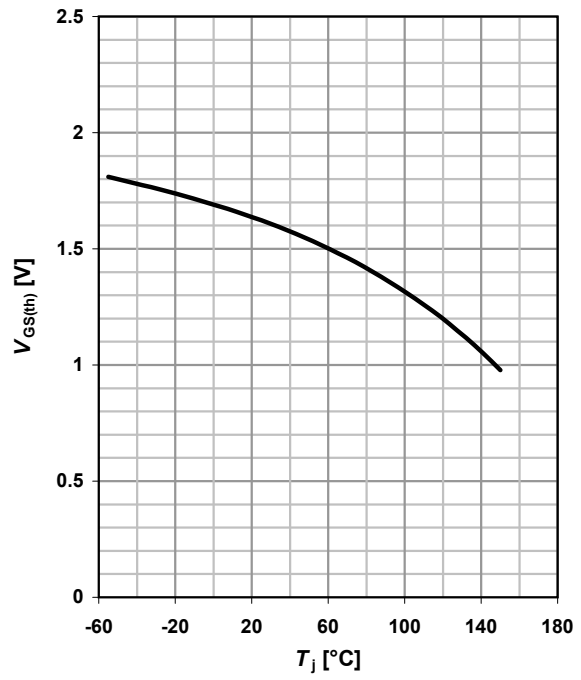
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = 30 \text{ A}; V_{GS} = 10 \text{ V}$



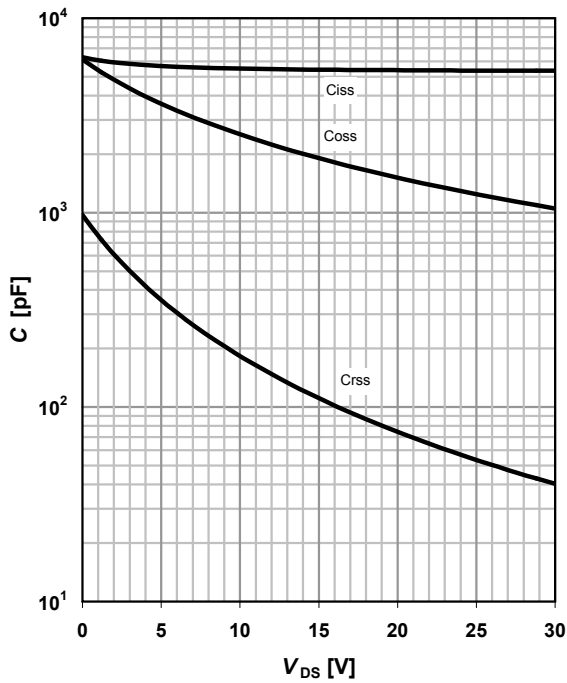
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = 250 \mu\text{A}$



**11 Typ. capacitances**

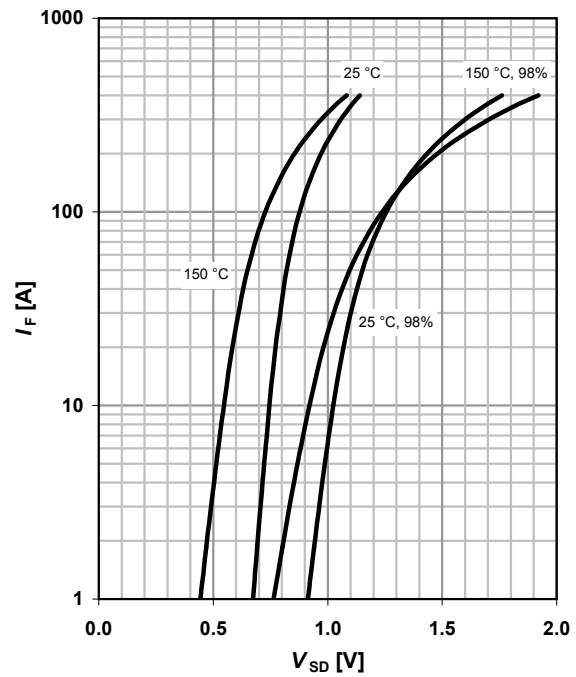
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

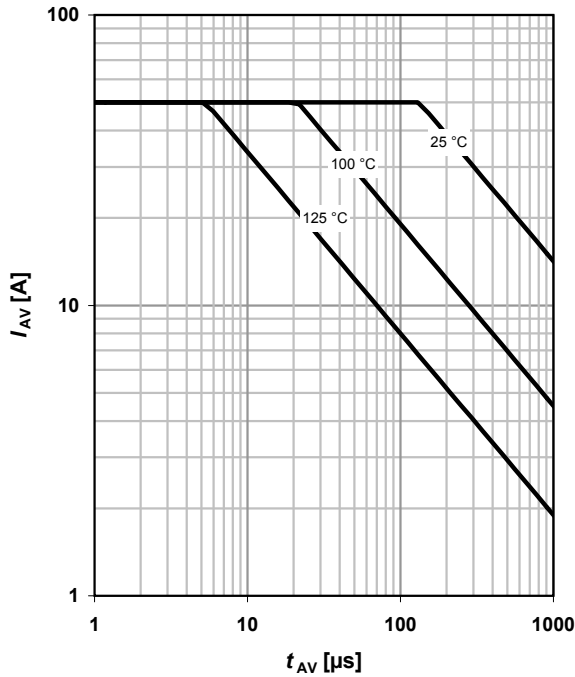
parameter:  $T_j$



**13 Avalanche characteristics**

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

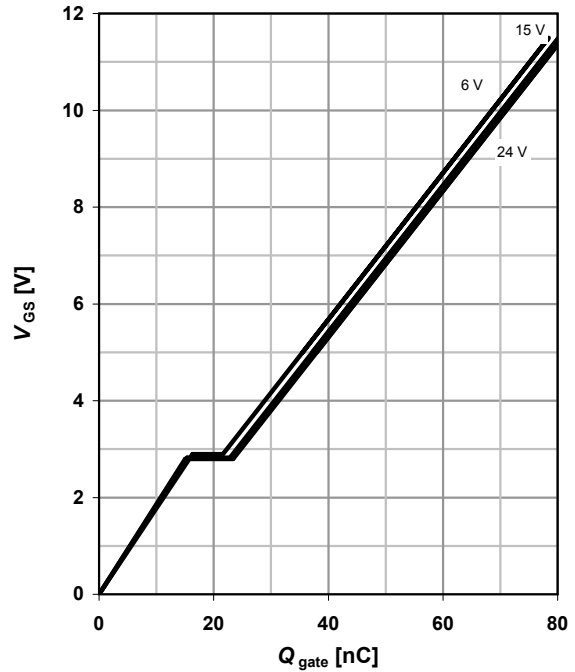
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

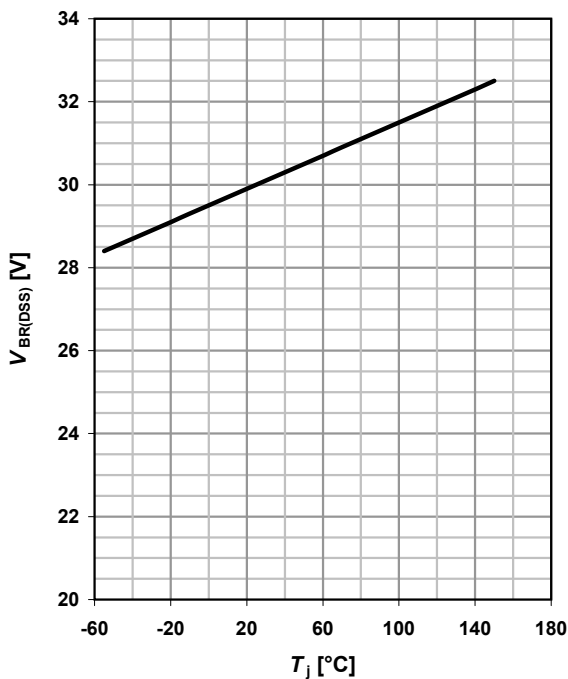
$V_{GS}=f(Q_{gate}); I_D=30 \text{ A pulsed}$

parameter:  $V_{DD}$



**15 Drain-source breakdown voltage**

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

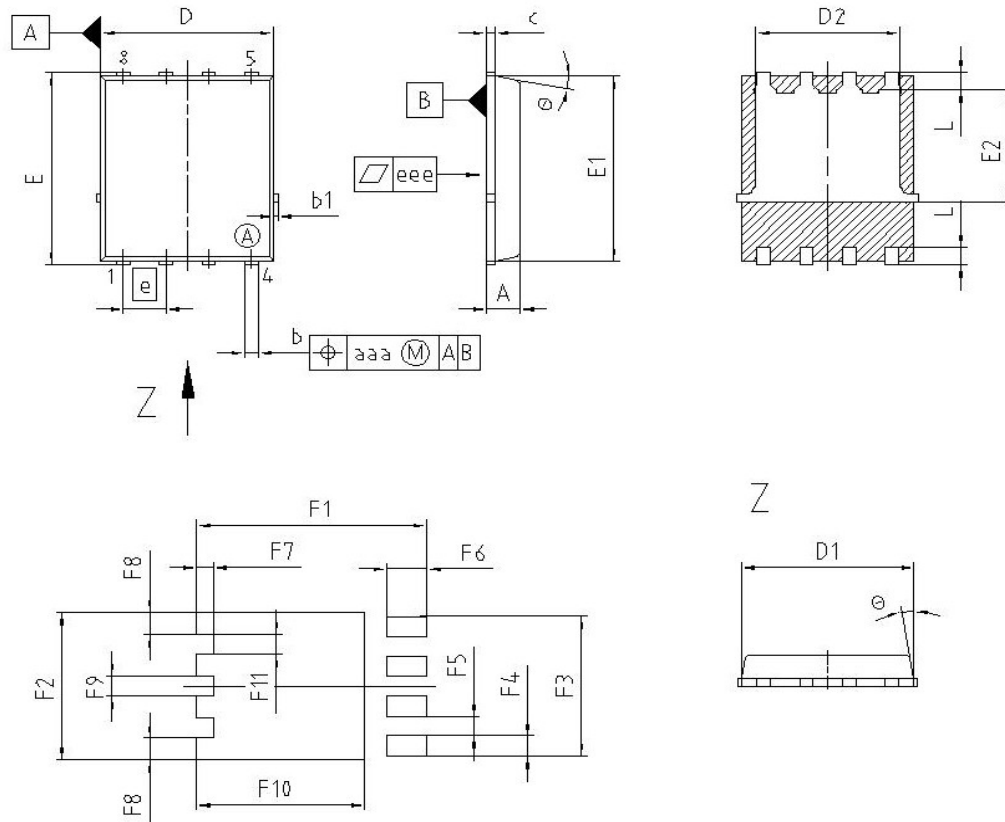


**16 Gate charge waveforms**



Package Outline

PG-TDSON-8



| DIM   | MILLIMETERS |       | INCHES |       |
|-------|-------------|-------|--------|-------|
|       | MIN         | MAX   | MIN    | MAX   |
| A     | 0.900       | 1.100 | 0.035  | 0.043 |
| b     | 0.340       | 0.540 | 0.013  | 0.021 |
| b1    | 0.000       | 0.120 | 0.000  | 0.005 |
| c     | 0.150       | 0.350 | 0.006  | 0.014 |
| D=D1  | 4.950       | 5.350 | 0.195  | 0.211 |
| D2    | 4.200       | 4.400 | 0.165  | 0.173 |
| E     | 5.950       | 6.350 | 0.234  | 0.250 |
| E1    | 5.700       | 6.100 | 0.224  | 0.240 |
| E2    | 3.400       | 3.800 | 0.134  | 0.150 |
| e     | 1.270       |       | 0.050  |       |
| N     | 8           |       | 8      |       |
| L     | 0.450       | 0.650 | 0.018  | 0.026 |
| theta | 9°          | 11°   | 9°     | 11°   |
| aaa   | 0.250       |       | 0.010  |       |
| eee   | 0.050       |       | 0.002  |       |
| F1    | 6.750       | 6.950 | 0.266  | 0.274 |
| F2    | 4.600       | 4.800 | 0.181  | 0.189 |
| F3    | 4.360       | 4.560 | 0.172  | 0.180 |
| F4    | 0.550       | 0.750 | 0.022  | 0.030 |
| F5    | 0.520       | 0.720 | 0.020  | 0.028 |
| F6    | 1.100       | 1.300 | 0.043  | 0.051 |
| F7    | 0.400       | 0.600 | 0.016  | 0.024 |
| F8    | 0.600       | 0.800 | 0.024  | 0.031 |
| F9    | 0.530       | 0.730 | 0.021  | 0.029 |
| F10   | 4.900       | 5.100 | 0.193  | 0.201 |
| F11   | 0.535       | 0.735 | 0.021  | 0.029 |

**REFERENCE**  
JEDEC / MO-240

**SCALE**

**EUROPEAN PROJECTION**

**ISSUE DATE**  
23-08-2006

**FILE**  
TDSON\_1





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