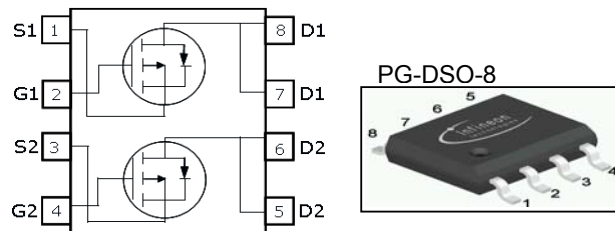


**OptiMOS® P-Power-Transistor**
**Features**

- dual P-Channel in SO8
- Qualified according JEDEC for target applications
- 150°C operating temperature
- Super Logic Level (2.5V rated)
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21


**Product Summary**

|                  |                       |     |    |
|------------------|-----------------------|-----|----|
| $V_{DS}$         |                       | -20 | V  |
| $R_{DS(on),max}$ | $V_{GS}=4.5\text{ V}$ | 67  | mΩ |
|                  | $V_{GS}=2.5\text{ V}$ | 110 |    |
| $I_D$            |                       | 4.6 | A  |



| Type      | Package  | Marking | Lead free | Halogen free | Packing |
|-----------|----------|---------|-----------|--------------|---------|
| BSO211P H | PG-DSO-8 | 211P    | Yes       | Yes          | dry     |

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

| Parameter                              | Symbol         | Conditions                              | Value       |              | Unit |
|--|----------------|---|-------------|--------------|------|
|  |                |   | 10 secs     | steady state |      |
| Continuous drain current <sup>1)</sup> | $I_D$          | $V_{GS}=4.5\text{ V}, T_A=25\text{ °C}$ | -4.6        | -4.0         | A    |
|  |                | $V_{GS}=4.5\text{ V}, T_A=70\text{ °C}$ | -3.7        | -3.2         |      |
|  |                | $V_{GS}=2.5\text{ V}, T_A=25\text{ °C}$ | -3.6        | -3.2         |      |
|  |                | $V_{GS}=2.5\text{ V}, T_A=70\text{ °C}$ | -2.9        | -2.5         |      |
| Pulsed drain current <sup>2)</sup>     | $I_{D,pulse}$  | $T_A=25\text{ °C}$                      | -18.4       |              |      |
| Avalanche energy, single pulse         | $E_{AS}$       | $I_D=-4.6\text{ A}, R_{GS}=25\text{ Ω}$ | 28          |              | mJ   |
| Gate source voltage                    | $V_{GS}$       |   | ±12         |              | V    |
| Power dissipation <sup>1)</sup>        | $P_{tot}$      | $T_A=25\text{ °C}$                      | 2.0         | 1.6          | W    |
| Operating and storage temperature      | $T_j, T_{stg}$ |   | -55 ... 150 |              | °C   |
| ESD class                              |                | JESD22-A114 HBM                         | 0 (0-250V)  |              |      |
| Soldering temperature                  |                |   | 260         |              | °C   |
| IEC climatic category; DIN IEC 68-1    |                |   | 55/150/56   |              |      |

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

**Thermal characteristics**

|  |            |  |   |   |      |     |
|--|------------|--|---|---|------|-----|
| Thermal resistance, junction - soldering point | $R_{thJS}$ |  | - | - | 35   | K/W |
| Thermal resistance, junction - ambient         | $R_{thJA}$ | minimal footprint, $t_p \leq 10$ s                             | - | - | 110  |     |
|  |            | minimal footprint, steady state                                | - | - | 150  |     |
|  |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> , $t_p \leq 10$ s | - | - | 62.5 |     |
|  |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> , steady state    | - | - | 80   |     |

**Electrical characteristics, at  $T_j=25$  °C, unless otherwise specified**
**Static characteristics**

|                                  |               |   |      |      |      |            |
|----------------------------------|---------------|---|------|------|------|------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0$ V, $I_D=-0.25$ mA                    | -20  | -    | -    | V          |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=-25$ $\mu$ A             | -0.6 | -0.9 | -1.2 |            |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-20$ V, $V_{GS}=0$ V, $T_j=25$ °C       | -    | -    | -1   | $\mu$ A    |
|                                  |               | $V_{DS}=-20$ V, $V_{GS}=0$ V, $T_j=150$ °C      | -    | -    | -100 |            |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=12$ V, $V_{DS}=0$ V                     | -    | -    | -100 | nA         |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=2.5$ V, $I_D=-3.6$ A                    | -    | 74   | 110  | m $\Omega$ |
|                                  |               | $V_{GS}=4.5$ V, $I_D=-4.6$ A                    | -    | 54   | 67   |            |
| Gate resistance                  | $R_G$         |   | -    | 7.6  | -    | $\Omega$   |
| Transconductance                 | $g_{fs}$      | $ V_{DS}  > 2 I_D R_{DS(on)max}$ , $I_D=-4.6$ A | 8    | 13   | -    | S          |

<sup>1)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu$ m thick) copper area for drain connection. PCB is vertical in still air.

<sup>2)</sup> See figure 3 for more detailed information

<sup>3)</sup> See figure 13 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>$f=1\text{ MHz}$                       | - | 730 | 1095 | pF |
| Output capacitance           | $C_{oss}$    |  | - | 240 | 360  |    |
| Reverse transfer capacitance | $C_{rss}$    |  | - | 200 | 300  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=15\text{ V}, V_{GS}=4.5\text{ V},$<br>$I_D=-4.6\text{ A}, R_G=1.6\ \Omega$ | - | 9   | 12   | ns |
| Rise time                    | $t_r$        |  | - | 13  | 20   |    |
| Turn-off delay time          | $t_{d(off)}$ |  | - | 23  | 35   |    |
| Fall time                    | $t_f$        |  | - | 27  | 41   |    |

**Gate Charge Characteristics<sup>4)</sup>**

|                          |               |   |   |      |     |    |
|--------------------------|---------------|---|---|------|-----|----|
| Gate to source charge    | $Q_{gs}$      | $V_{DD}=10\text{ V}, I_D=-4.6\text{ A},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$ | - | -1   | -2  | nC |
| Gate charge at threshold | $Q_{g(th)}$   |   | - | -1   | -2  |    |
| Gate to drain charge     | $Q_{gd}$      |   | - | -3   | -4  |    |
| Switching charge         | $Q_{sw}$      |   | - | -3   | -4  |    |
| Gate charge total        | $Q_g$         |   | - | -8   | -10 |    |
| Gate plateau voltage     | $V_{plateau}$ |   | - | -1.8 | -   | V  |
| Output charge            | $Q_{oss}$     | $V_{DD}=10\text{ V}, V_{GS}=0\text{ V}$                                       | - | 5    | 6   | nC |

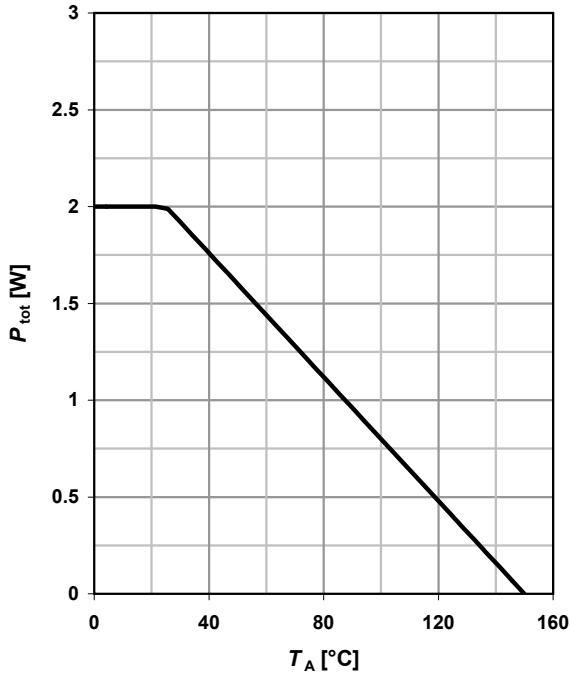
**Reverse Diode**

|                                  |               |   |   |   |       |    |
|----------------------------------|---------------|---|---|---|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ }^\circ\text{C}$  | - | - | -2    | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | - | -18.4 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-4.6\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$ | - | - | -1.4  | V  |
| Reverse recovery charge          | $Q_{rr}$      | $V_R=10\text{ V}, I_F=I_D,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$         | - | 8 | 12    | nC |

<sup>4)</sup> See figure 16 for gate charge parameter definition

**1 Power dissipation**

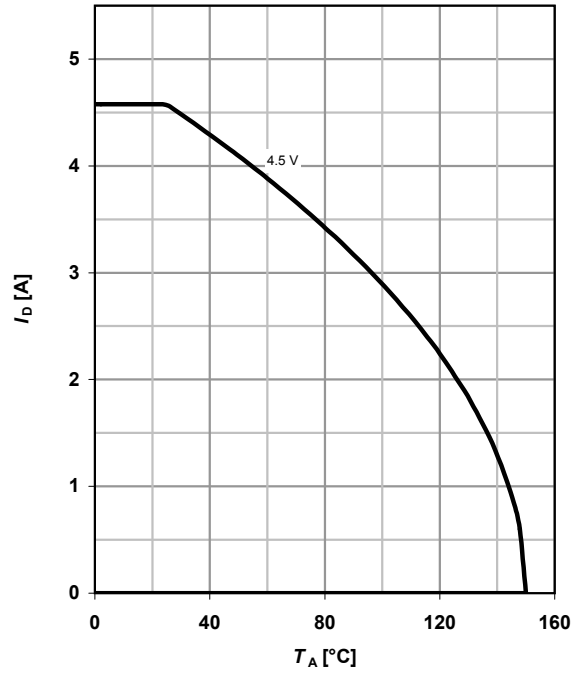
$P_{tot} = f(T_A); t_p \leq 10 \text{ s}$



**2 Drain current**

$I_D = f(T_A); t_p \leq 10 \text{ s}$

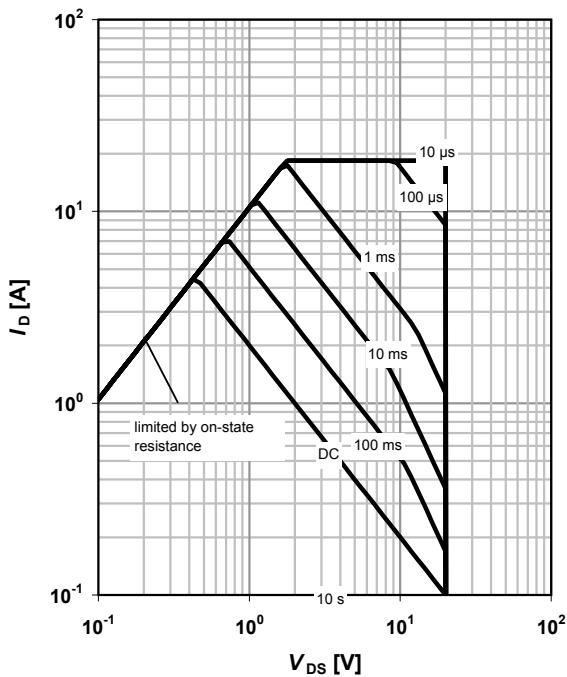
parameter:  $V_{GS}$



**3 Safe operating area**

$I_D = f(V_{DS}); T_A = 25 \text{ °C}^2; D = 0$

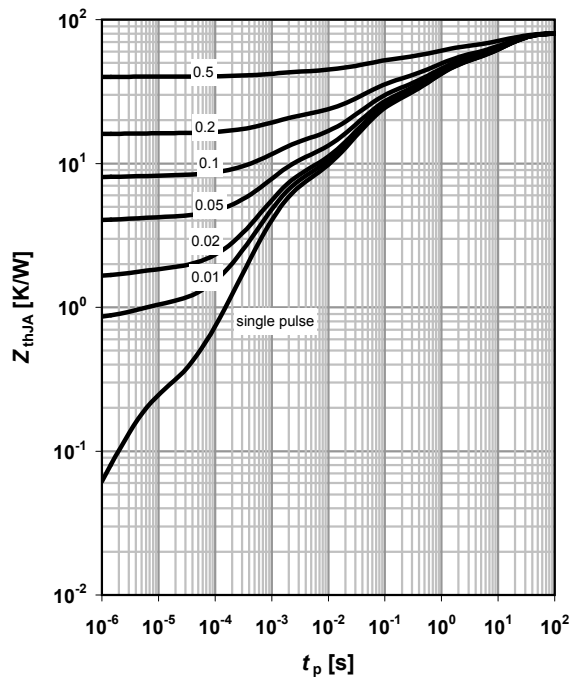
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJA} = f(t_p^2)$

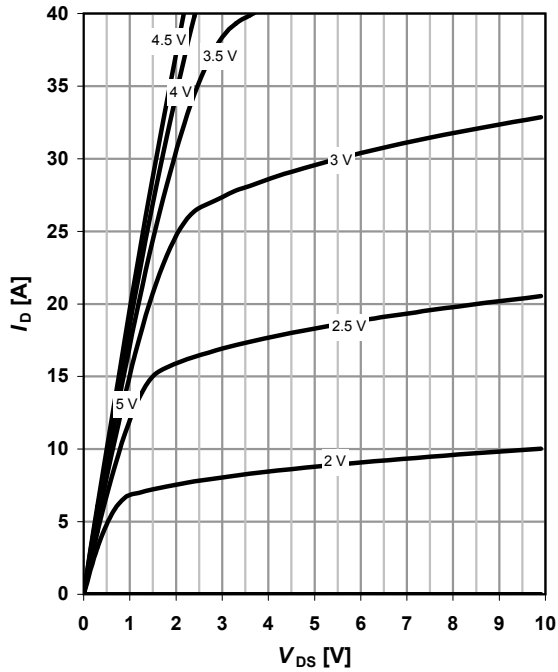
parameter:  $D = t_p / T$



**5 Typ. output characteristics**

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

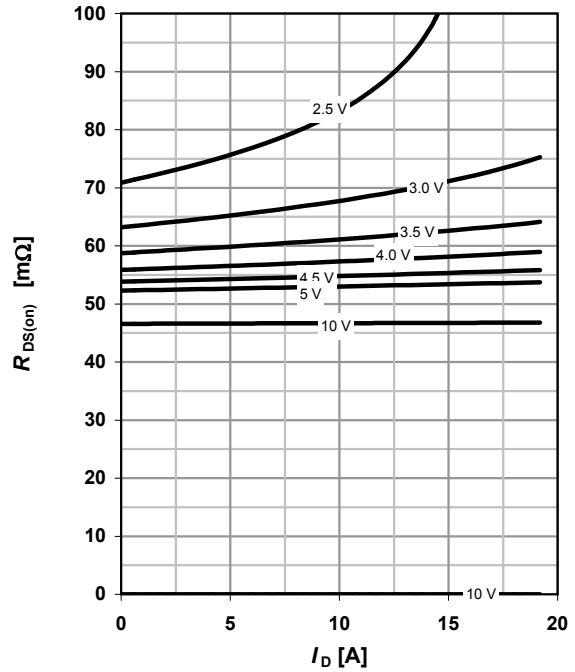
parameter:  $V_{GS}$



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

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

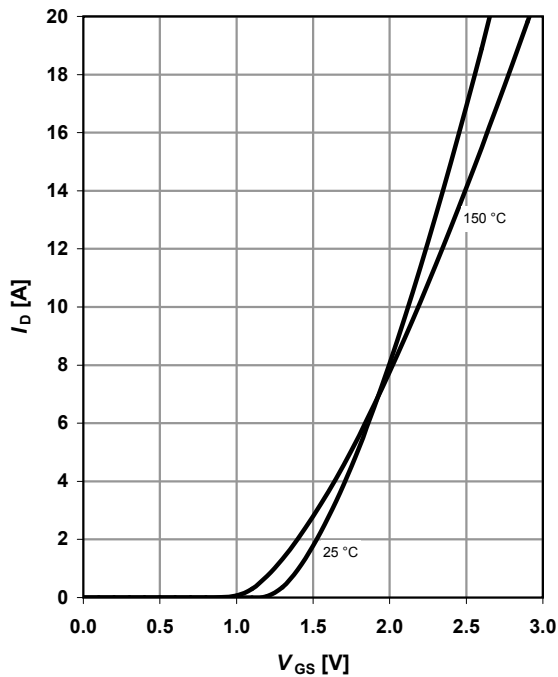
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

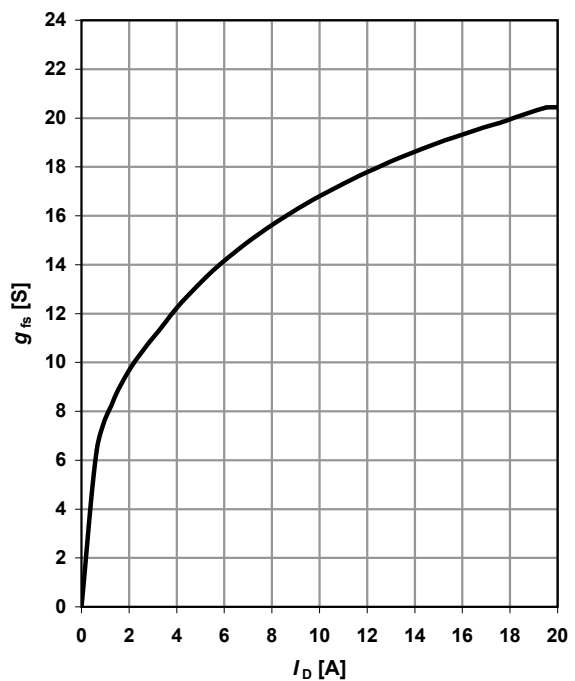
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



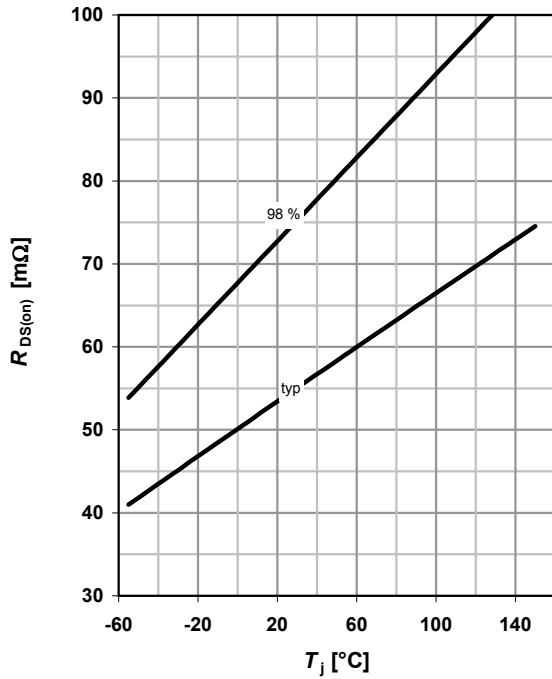
**8 Typ. forward transconductance**

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



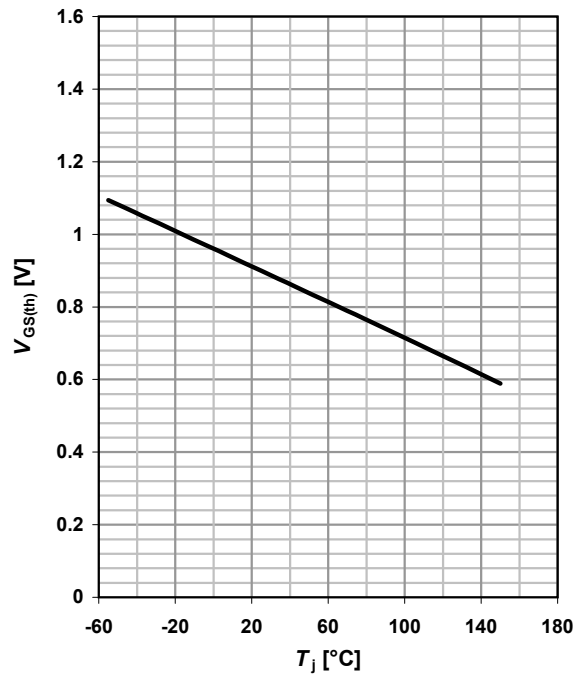
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = -4.6 \text{ A}; V_{GS} = -4.5 \text{ V}$



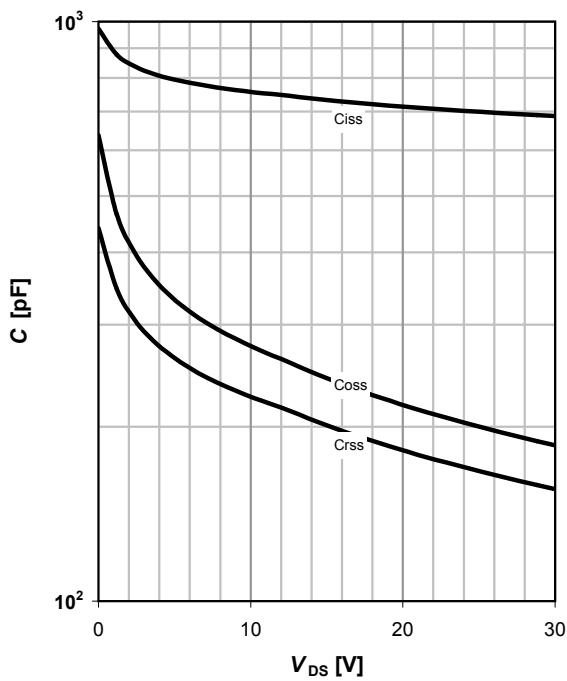
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -25 \mu\text{A}$



**11 Typ. capacitances**

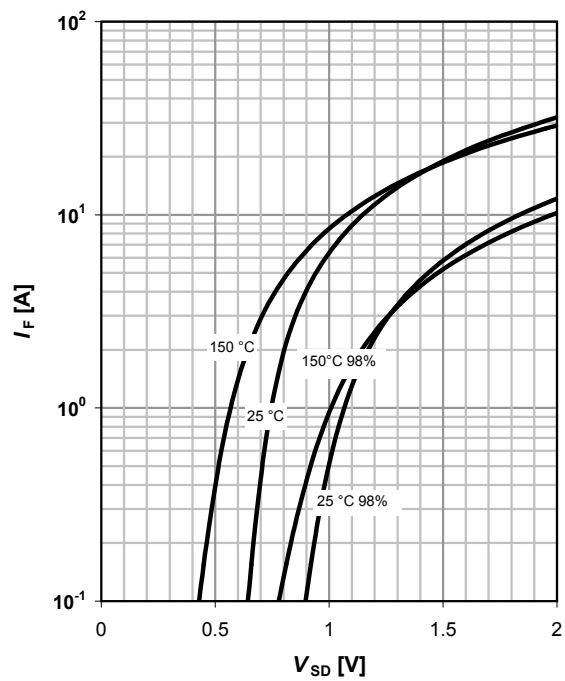
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

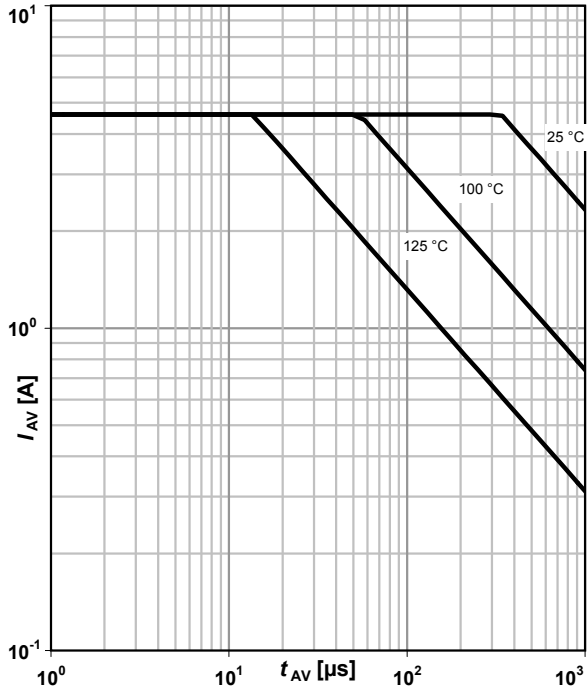
parameter:  $T_j$



**13 Avalanche characteristics**

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

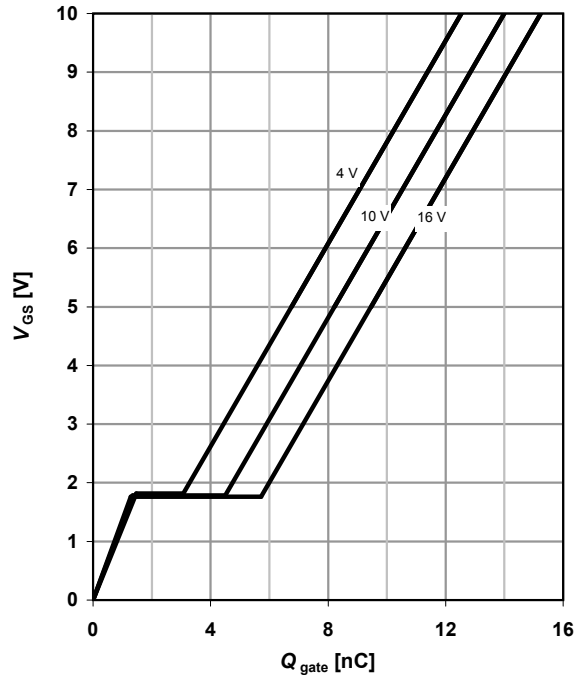
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

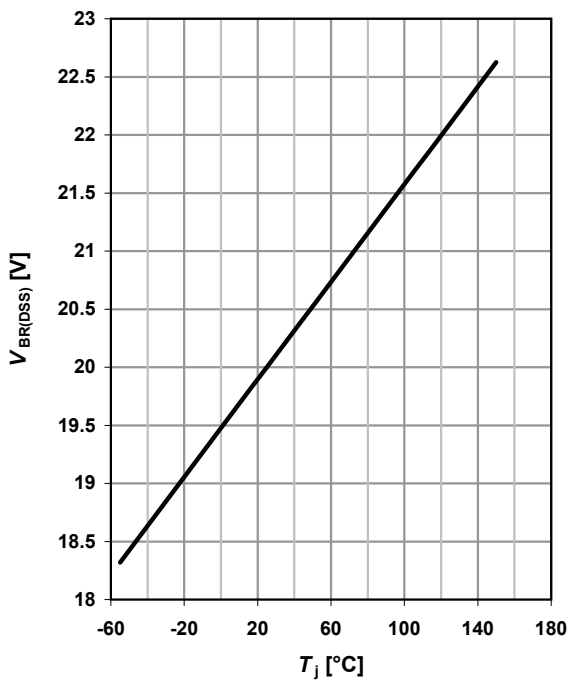
$V_{GS}=f(Q_{gate}); I_D=-4.6 \text{ A pulsed}$

parameter:  $V_{DD}$



**15 Drain-source breakdown voltage**

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

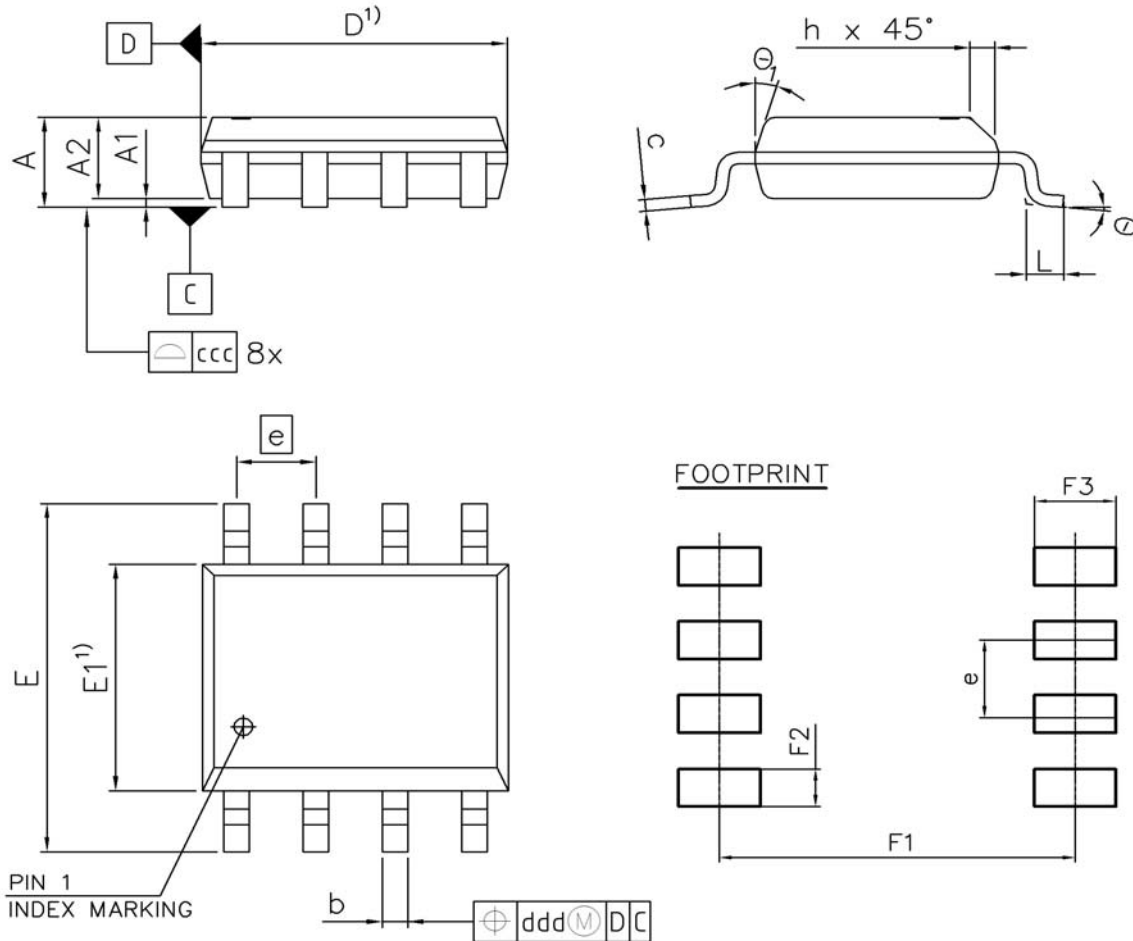


**16 Gate charge waveforms**



Package Outline

PG-DSO-8: Outline



1) DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

| DIM        | MILLIMETERS |      | INCHES |       |
|------------|-------------|------|--------|-------|
|            | MIN         | MAX  | MIN    | MAX   |
| A          | -           | 1.75 | -      | 0.069 |
| A1         | 0.10        | -    | 0.004  | -     |
| A2         | 1.25        | 1.65 | 0.049  | 0.065 |
| b          | 0.35        | 0.51 | 0.014  | 0.020 |
| c          | 0.17        | 0.25 | 0.007  | 0.010 |
| D          | 4.80        | 5.00 | 0.189  | 0.197 |
| E          | 5.80        | 6.20 | 0.228  | 0.244 |
| E1         | 3.80        | 4.00 | 0.150  | 0.157 |
| e          | 1.27        |      | 0.050  |       |
| N          | 8           |      | 8      |       |
| L          | 0.39        | 0.89 | 0.015  | 0.035 |
| h          | 0.23        | 0.50 | 0.009  | 0.020 |
| $\theta$   | 0°          | 8°   | 0°     | 8°    |
| $\theta_1$ | -           | 19°  | -      | 19°   |
| ccc        | 0.10        |      | 0.004  |       |
| ddd        | 0.25        |      | 0.010  |       |
| F1         | 5.59        | 5.79 | 0.220  | 0.228 |
| F2         | 0.55        | 0.75 | 0.022  | 0.030 |
| F3         | 1.21        | 1.41 | 0.048  | 0.056 |

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