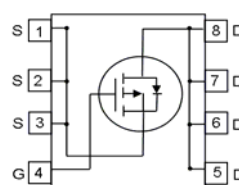


**OptiMOS® P-Power-Transistor**
**Features**

- single 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  |
| $R_{DS(on),max}$ | $V_{GS}=4.5\text{ V}$ | 21   | mΩ |
|                  | $V_{GS}=2.5\text{ V}$ | 34   |    |
| $I_D$            |                       | -8.9 | A  |



| Type       | Package  | Marking | Lead free | Halogen free | Packing |
|------------|----------|---------|-----------|--------------|---------|
| BSO203SP H | PG-DSO-8 | 203SP   | 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> | $I_D$          | $V_{GS} = -4.5\text{ V}$ ,<br>$T_A = 25\text{ °C}$ | -8.9             | -7.0         | A    |
|                                        |                | $V_{GS} = -4.5\text{ V}$ ,<br>$T_A = 70\text{ °C}$ | -7.1             | -5.8         |      |
|                                        |                | $V_{GS} = -2.5\text{ V}$ ,<br>$T_A = 25\text{ °C}$ | -7.0             | -5.7         |      |
|                                        |                | $V_{GS} = -2.5\text{ V}$ ,<br>$T_A = 70\text{ °C}$ | -5.6             | -4.5         |      |
| Pulsed drain current <sup>2)</sup>     | $I_{D,pulse}$  | $T_A = 25\text{ °C}$                               | -35.6            |              |      |
| Avalanche energy, single pulse         | $E_{AS}$       | $I_D = -8.9\text{ A}$ , $R_{GS} = 25\text{ Ω}$     | 97               |              | mJ   |
| Gate source voltage                    | $V_{GS}$       |                                                    | ±12              |              | V    |
| Power dissipation <sup>1)</sup>        | $P_{tot}$      | $T_A = 25\text{ °C}$                               | 2.5              | 1.6          | W    |
| Operating and storage temperature      | $T_j, T_{stg}$ |                                                    | -55 ... 150      |              | °C   |
| ESD class                              |                | JESD22-A114 HBM                                    | 1B (500V - 1 kV) |              |      |
| 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 | - | - | 53  |     |
|                                                |            | 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           | $V_{GS(th)}$  | $V_{DS} = V_{GS}$ , $I_D = -100$ $\mu$ 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, $I_D = -7$ A                    | -    | 22   | 34   | m $\Omega$ |
|                                  |               | $V_{GS} = 4.5$ V, $I_D = -8.9$ A                  | -    | 15   | 21   |            |
| Gate resistance                  | $R_G$         |                                                   | -    | 3.3  | -    | $\Omega$   |
| Transconductance                 | $g_{fs}$      | $ V_{DS}  > 2 I_D R_{DS(on)max}$ , $I_D = -7.1$ A | 18   | 33   | -    | 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>$f=1\text{ MHz}$                              | - | 2500 | 3750 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                           | - | 820  | 1230 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                           | - | 680  | 1020 |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-10\text{ V}, V_{GS}=-$<br>$4.5\text{ V}, I_D=-8.9\text{ A}, R_G=$<br>$6\ \Omega$ | - | 16   | 24   | ns |
| Rise time                    | $t_r$        |                                                                                           | - | 55   | 83   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                           | - | 45   | 68   |    |
| Fall time                    | $t_f$        |                                                                                           | - | 74   | 111  |    |

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

|                          |               |                                                                                |   |      |     |    |
|--------------------------|---------------|--------------------------------------------------------------------------------|---|------|-----|----|
| Gate to source charge    | $Q_{gs}$      | $V_{DD}=-10\text{ V}, I_D=-8.9\text{ A},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$ | - | -4   | -6  | nC |
| Gate charge at threshold | $Q_{g(th)}$   |                                                                                | - | -4   | -6  |    |
| Gate to drain charge     | $Q_{gd}$      |                                                                                | - | -11  | -17 |    |
| Switching charge         | $Q_{sw}$      |                                                                                | - | -12  | -18 |    |
| Gate charge total        | $Q_g$         |                                                                                | - | -26  | -39 |    |
| Gate plateau voltage     | $V_{plateau}$ |                                                                                | - | -1.6 | -   | V  |
| Output charge            | $Q_{oss}$     | $V_{DD}=-10\text{ V}, V_{GS}=0\text{ V}$                                       | - | 16   | 21  | nC |

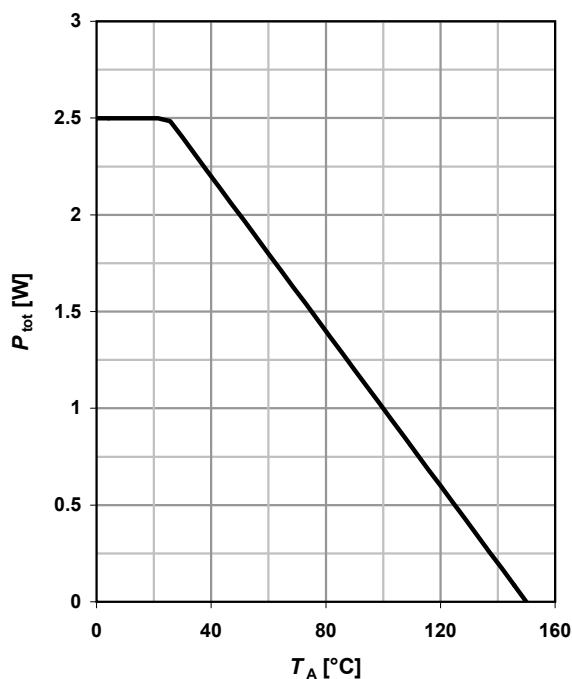
#### Reverse Diode

|                                  |               |                                                                   |   |    |       |    |
|----------------------------------|---------------|-------------------------------------------------------------------|---|----|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                | - | -  | -3    | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                   | - | -  | -35.6 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-8.9\text{ A},$<br>$T_j=25\text{ °C}$     | - | -  | 1.1   | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=10\text{ V}, I_F=I_S,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 26 | 39    | ns |
| Reverse recovery charge          | $Q_{rr}$      | $V_R=10\text{ V}, I_F=I_D,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 14 | 21    | nC |

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

### 1 Power dissipation

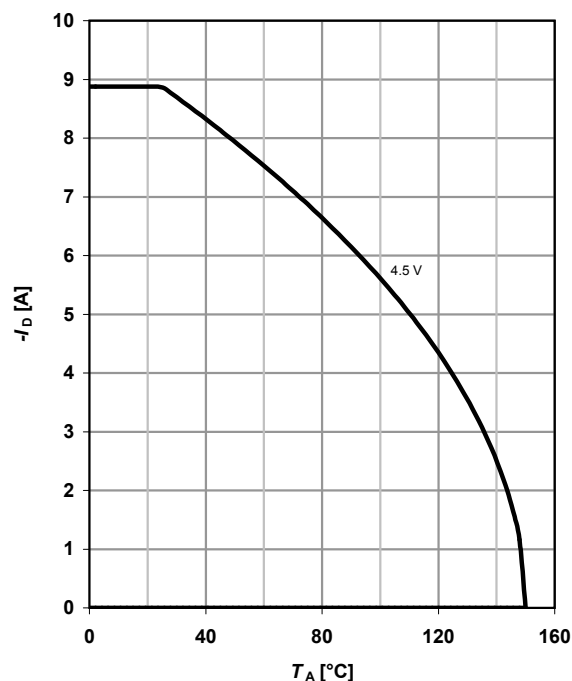
$$P_{\text{tot}} = f(T_A); t_p \leq 10 \text{ s}$$



### 2 Drain current

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

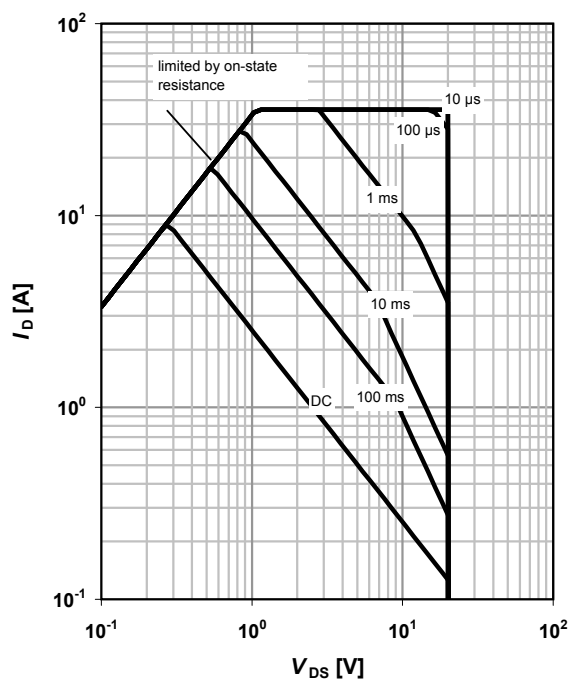
parameter:  $V_{GS}$



### 3 Safe operating area

$$I_D = f(V_{DS}); T_A = 25^\circ\text{C}^{(1)}; D = 0$$

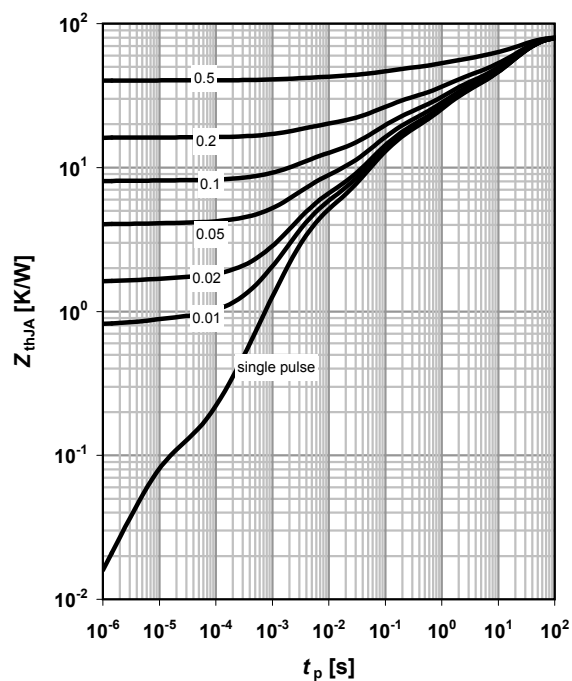
parameter:  $t_p$



### 4 Max. transient thermal impedance

$$Z_{\text{thJA}} = f(t_p)^{(1)}$$

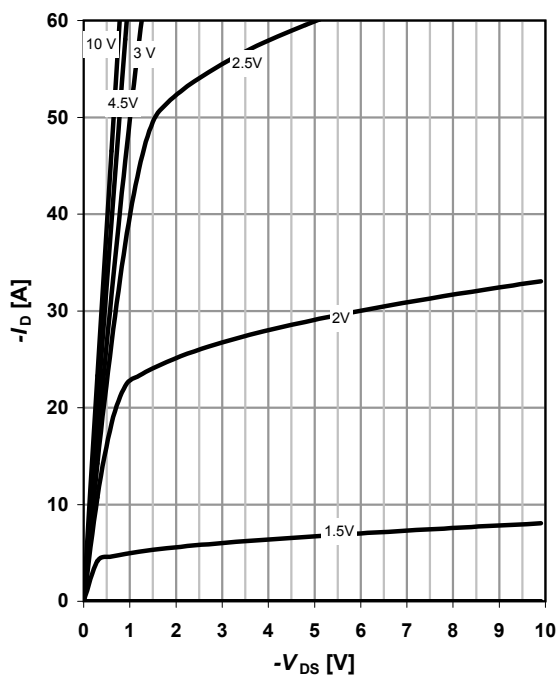
parameter:  $D = t_p / T$



### 5 Typ. output characteristics

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

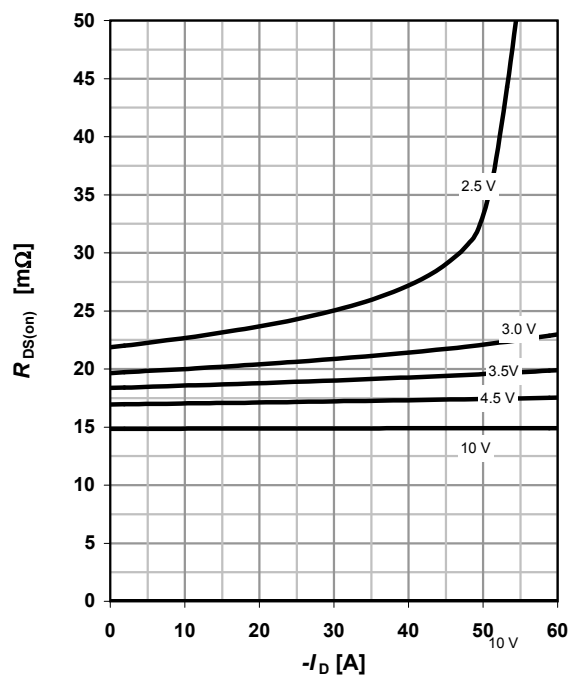
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

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

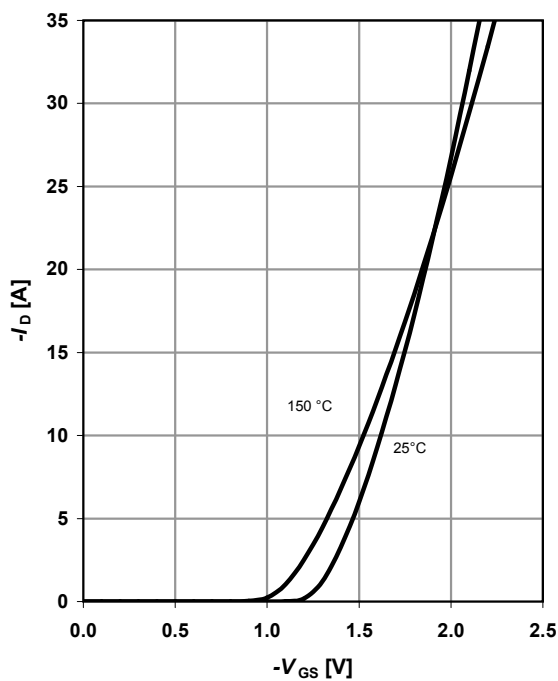
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

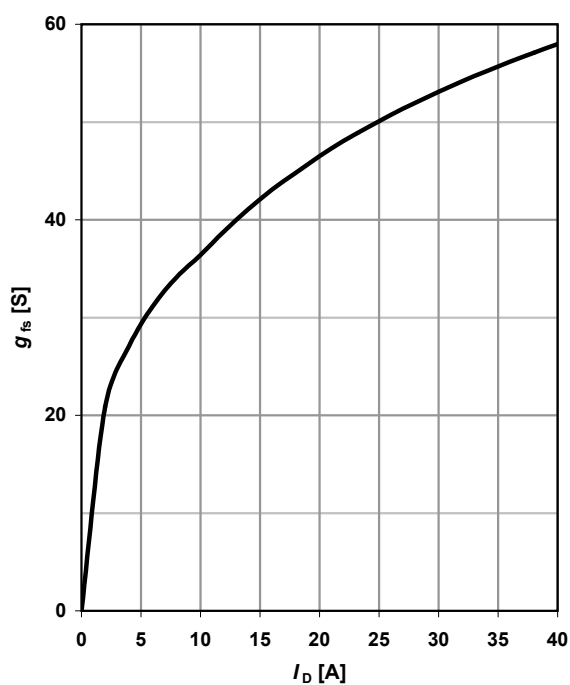
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



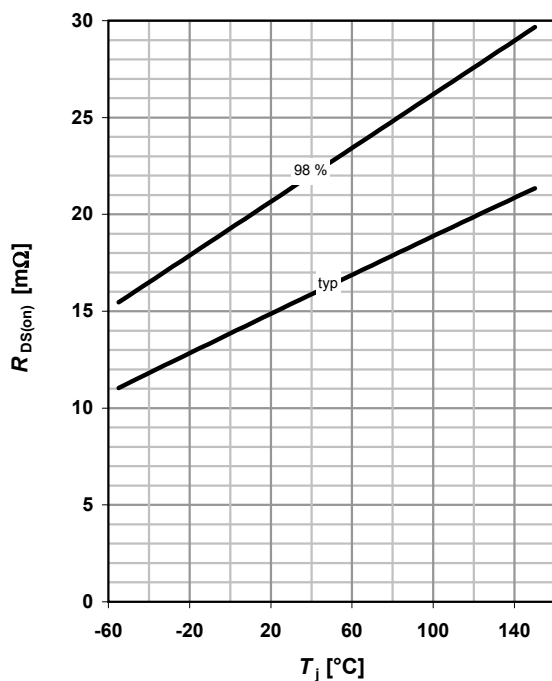
### 8 Typ. forward transconductance

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



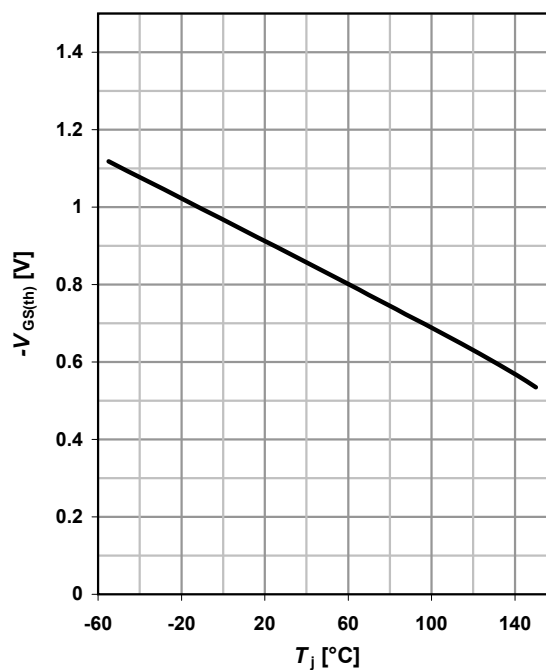
### 9 Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -8.9 \text{ A}; V_{GS} = -4.5 \text{ V}$$



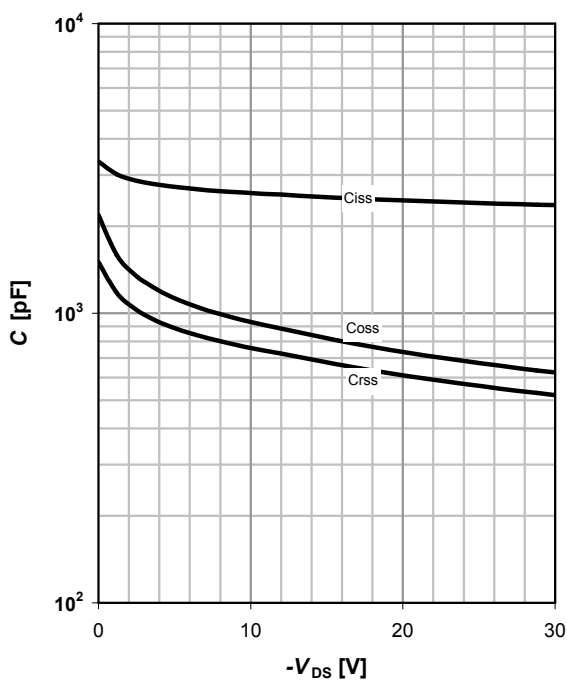
### 10 Typ. gate threshold voltage

$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -100 \mu\text{A}$$



### 11 Typ. capacitances

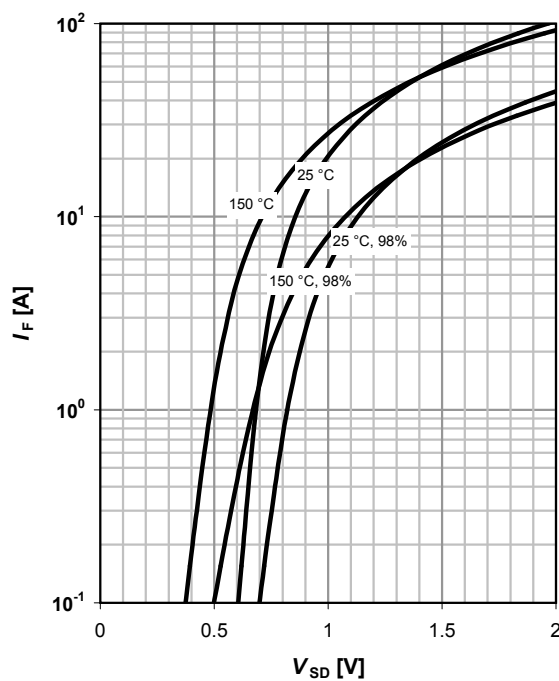
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



### 12 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

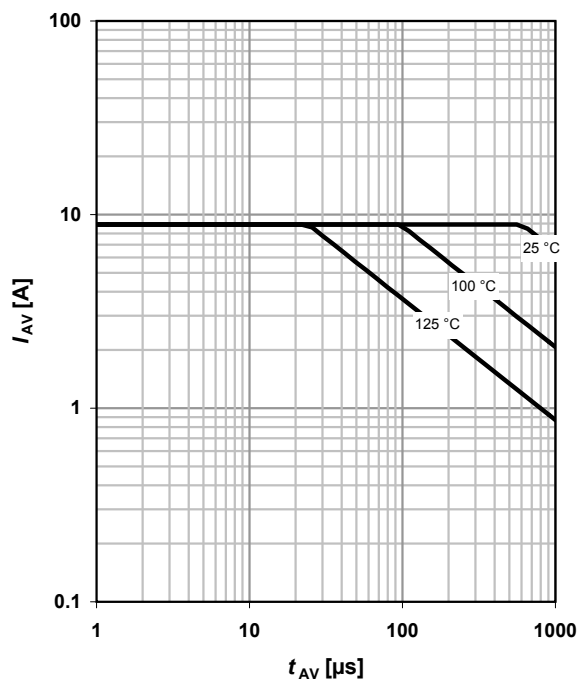
parameter:  $T_j$



### 13 Avalanche characteristics

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

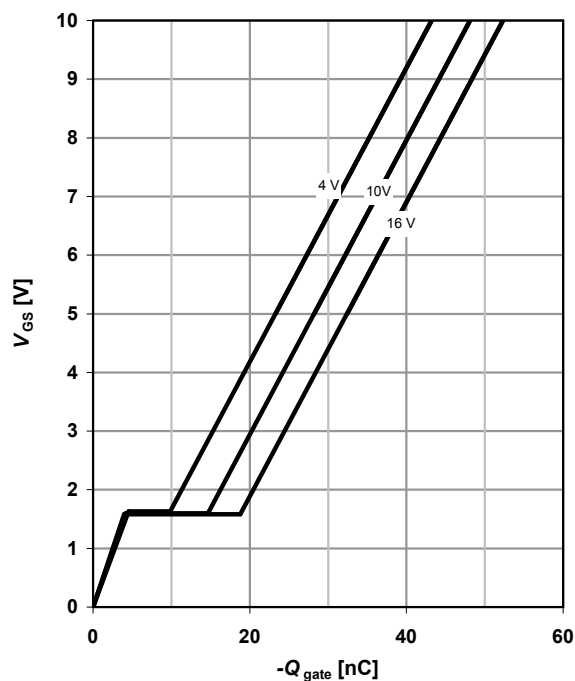
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

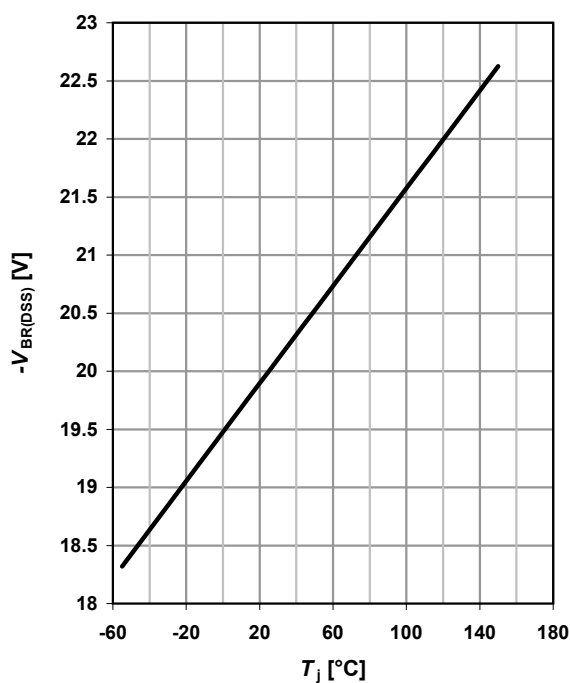
$$V_{GS}=f(Q_{\text{gate}}); I_D=-8.9\ \text{A pulsed}$$

parameter:  $V_{DD}$

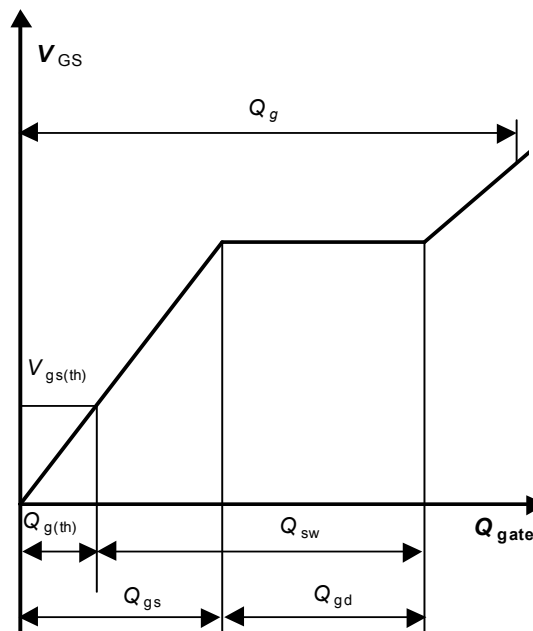


### 15 Drain-source breakdown voltage

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



### 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 |
| Θ              | 0°          | 8°   | 0°     | 8°    |
| Θ <sub>1</sub> | -           | 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 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| DOCUMENT NO.<br>Z8B00003333                                                                                  |
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| EUROPEAN PROJECTION<br> |
| ISSUE DATE<br>09.01.2008                                                                                     |
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