

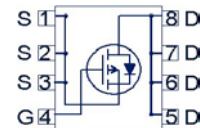
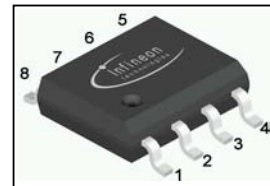
**OptiMOS® -P Power-Transistor**
**Features**

- P-Channel
- Enhancement mode
- Logic level
- 150°C operating temperature
- Avalanche rated
- Qualified according JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

**Product Summary**

|                  |                        |       |    |
|------------------|------------------------|-------|----|
| $V_{DS}$         |                        | -30   | V  |
| $R_{DS(on),max}$ | $V_{GS}= 10\text{ V}$  | 8.0   | mΩ |
|                  | $V_{GS}= 4.5\text{ V}$ | 12.0  | A  |
| $I_D$            |                        | -14.9 | A  |

PG-DSO-8



| Type       | Package  | Marking | Leadfree | Halogen free | packing |
|------------|----------|---------|----------|--------------|---------|
| BSO301SP H | PG-DSO-8 | 301SP   | Yes      | Yes          | non dry |

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

| Parameter                           | Symbol         | Conditions                               | Value          |              | Unit |
|-------------------------------------|----------------|--|----------------|--------------|------|
|                                     |                |  | ≤10 secs       | steady state |      |
| Continuous drain current            | $I_D$          | $T_A=25\text{ °C}^{1)}$                  | -14.9          | -12.6        | A    |
|                                     |                | $T_A=70\text{ °C}^{1)}$                  | -11.9          | -10          |      |
| Pulsed drain current                | $I_{D,pulse}$  | $T_A=25\text{ °C}^{2)}$                  | -60            |              |      |
| Avalanche energy, single pulse      | $E_{AS}$       | $I_D=-14.9\text{ A}, R_{GS}=25\text{ Ω}$ | 248            |              | mJ   |
| Gate source voltage                 | $V_{GS}$       |  | ±20            |              | V    |
| Power dissipation                   | $P_{tot}$      | $T_A=25\text{ °C}^{1)}$                  | 2.5            | 1.79         | W    |
| Operating and storage temperature   | $T_j, T_{stg}$ |  | -55 ... 150    |              | °C   |
| ESD class                           |                | JESD22-A114 HBM                          | 1C (1kV - 2kV) |              |      |
| 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 | - | - | 50  |     |
|  |            | 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, $I_D=-250$ $\mu$ A                     | -30 | -    | -    | V          |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ ,<br>$I_D=-250$ $\mu$ A              | -1  | -1.5 | -2   |            |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-30$ V, $V_{GS}=0$ V,<br>$T_j=25$ °C         | -   | -0.1 | -1   | $\mu$ A    |
|                                  |               | $V_{DS}=-30$ V, $V_{GS}=0$ V,<br>$T_j=125$ °C        | -   | -10  | -100 |            |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-20$ V, $V_{DS}=0$ V                         | -   | -10  | -100 | nA         |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-4.5$ V, $I_D=-12$ A                         | -   | 8.8  | 12   | m $\Omega$ |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-10$ V, $I_D=-14.9$ A                        | -   | 6.3  | 8.0  |            |
| Transconductance                 | $g_{fs}$      | $ V_{DS}  > 2 I_D  R_{DS(on)max}$ ,<br>$I_D=-14.9$ A | 22  | 44   | -    | 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.

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

**Dynamic characteristics**

|                              |              |  |   |      |      |    |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V},$<br>$V_{DS}=-25\text{ V}, f=1\text{ MHz}$                        | - | 4430 | 5890 | pF |
| Output capacitance           | $C_{oss}$    |  | - | 1180 | 1570 |    |
| Reverse transfer capacitance | $C_{rss}$    |  | - | 970  | 1500 |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-15\text{ V},$<br>$V_{GS}=-10\text{ V},$<br>$I_D=-1\text{ A}, R_G=6\ \Omega$ | - | 15   | 23   | ns |
| Rise time                    | $t_r$        |  | - | 22   | 33   |    |
| Turn-off delay time          | $t_{d(off)}$ |  | - | 130  | 195  |    |
| Fall time                    | $t_f$        |  | - | 110  | 165  |    |

**Gate Charge Characteristics<sup>3)</sup>**

|                          |               |  |   |      |      |    |
|--------------------------|---------------|--|---|------|------|----|
| Gate to source charge    | $Q_{gs}$      | $V_{DD}=-24\text{ V},$<br>$I_D=-14.9\text{ A},$<br>$V_{GS}=0\text{ to }-10\text{ V}$ | - | -11  | -15  | nC |
| Gate charge at threshold | $Q_{g(th)}$   |  | - | -7.1 | -9.5 |    |
| Gate to drain charge     | $Q_{gd}$      |  | - | -35  |      |    |
| Switching charge         | $Q_{sw}$      |  | - | -40  | -59  |    |
| Gate charge total        | $Q_g$         |  | - | -102 | -136 |    |
| Gate plateau voltage     | $V_{plateau}$ |  | - | -2.5 | -    | V  |
| Output charge            | $Q_{oss}$     | $V_{DD}=-15\text{ V}, V_{GS}=0\text{ V}$   | - | -36  | -48  |    |

**Reverse Diode**

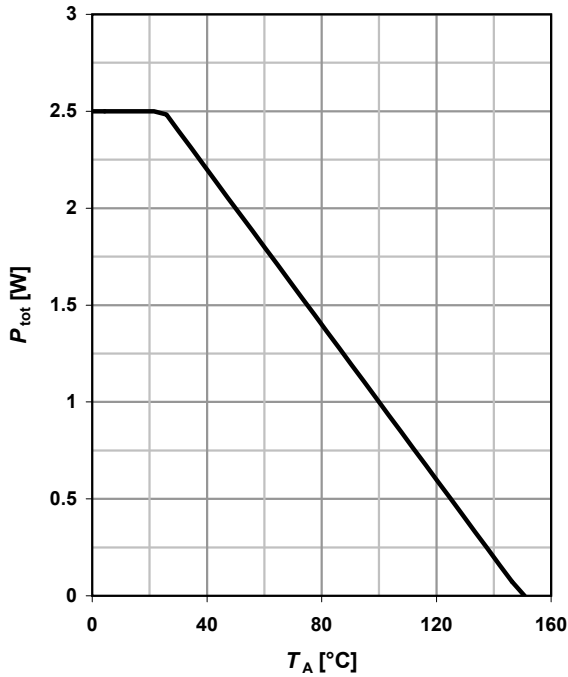
|                                  |               |  |   |       |      |    |
|----------------------------------|---------------|--|---|-------|------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ }^\circ\text{C}$   | - | -     | -2.1 | A  |
| Diode pulse current              | $I_{S,pulse}$ |  | - | -     | -60  |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-14.9\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$   | - | -0.82 | -1.2 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=15\text{ V}, I_F=-14.9\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 32    | 40   | ns |
| Reverse recovery charge          | $Q_{rr}$      |  | - | -20   | -25  | nC |

<sup>2)</sup> See figure 3

<sup>3)</sup> See figure 16 for gate charge parameter definition

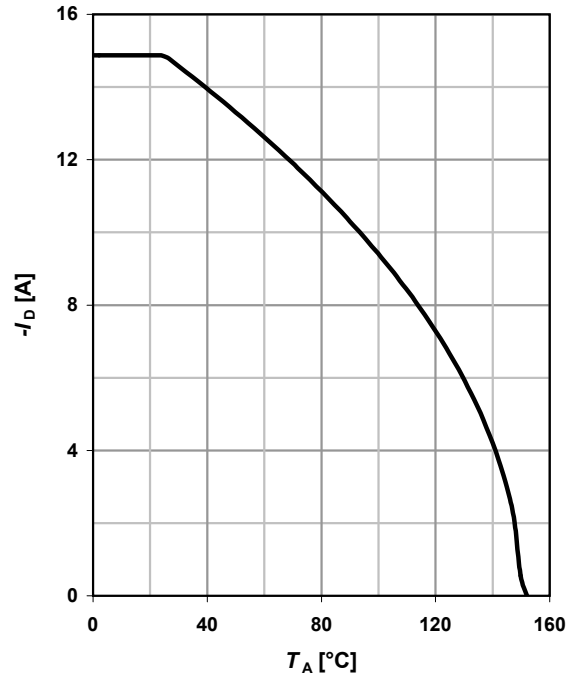
**1 Power dissipation**

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



**2 Drain current**

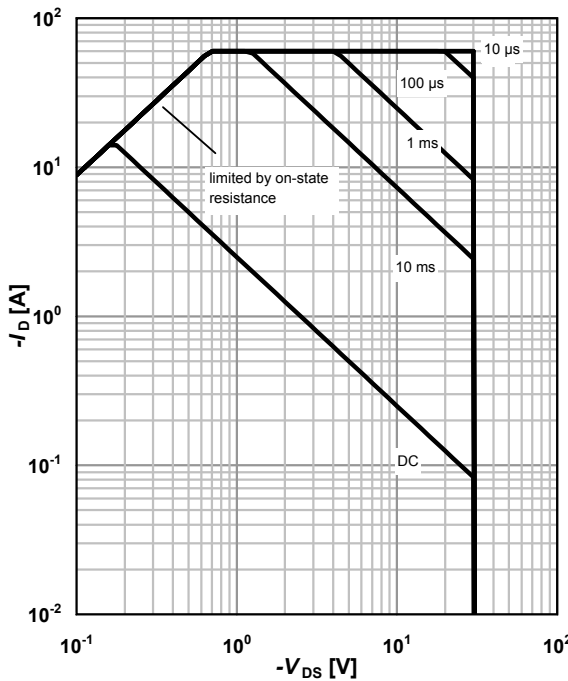
$I_D=f(T_A); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$



**3 Safe operating area**

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

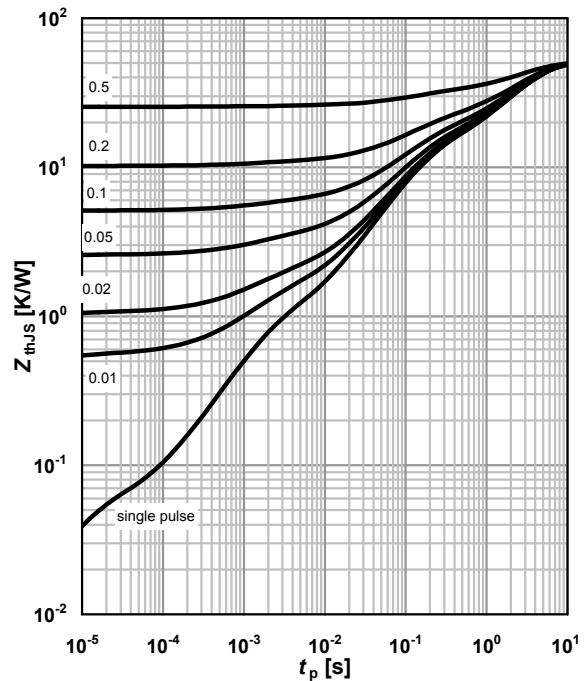
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJS}=f(t_p)$

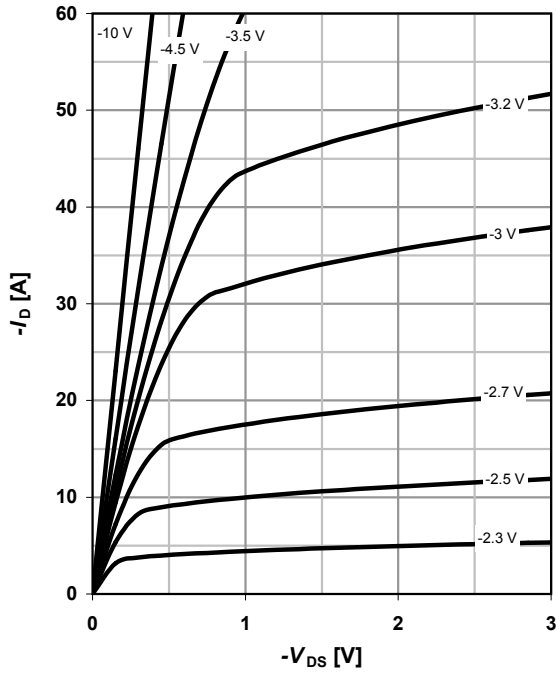
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

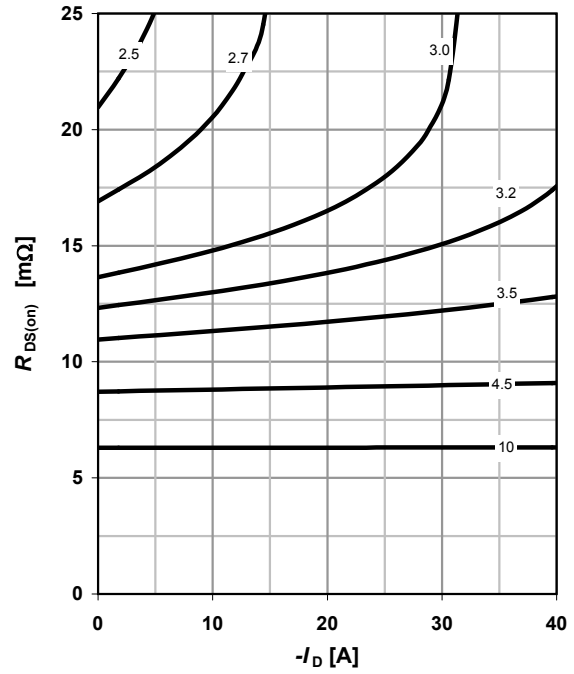
parameter:  $V_{GS}$



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

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

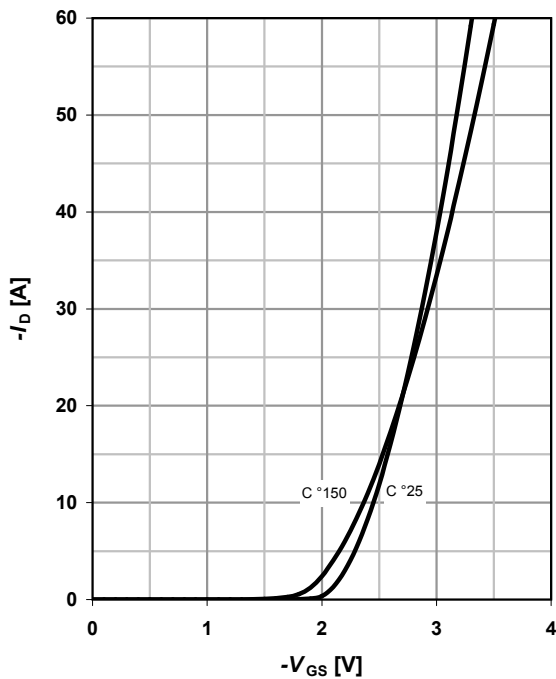
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

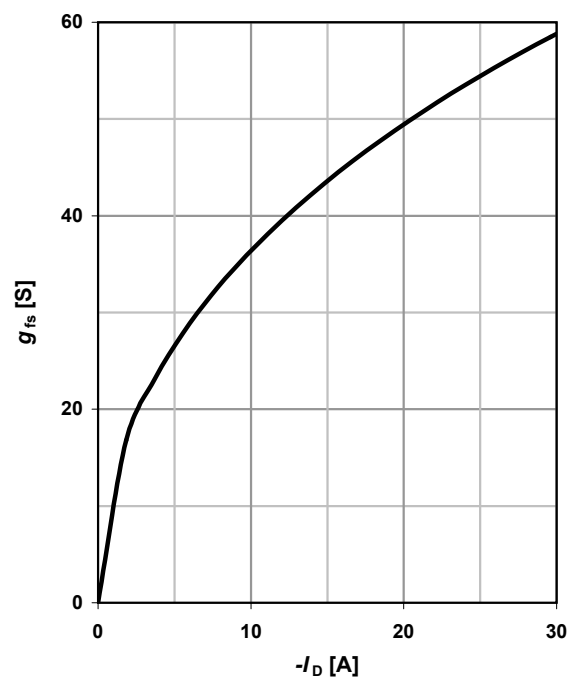
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



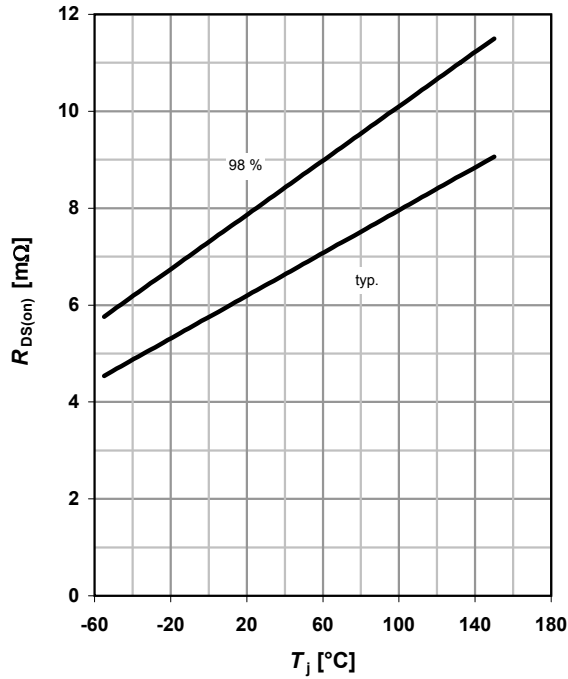
**8 Typ. forward transconductance**

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



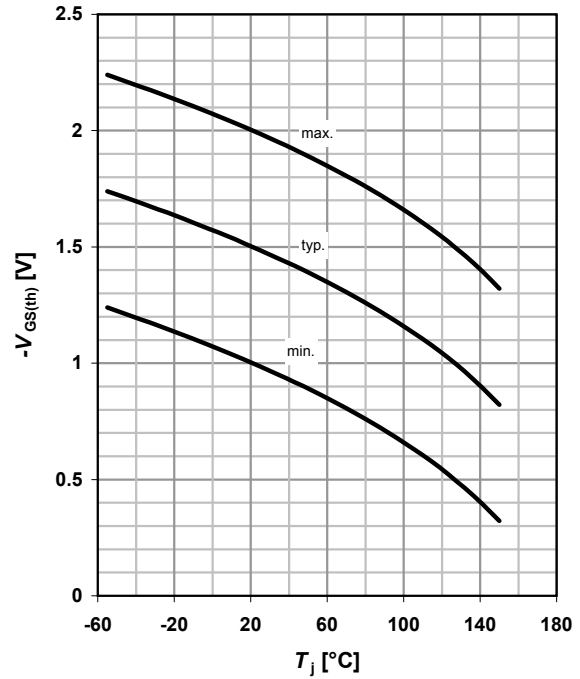
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = -14.9 \text{ A}; V_{GS} = -10 \text{ V}$



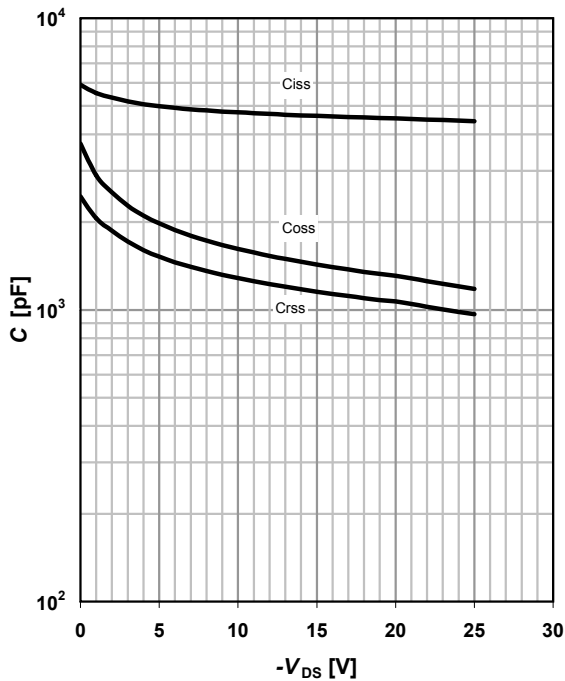
**10 Typ. gate threshold voltage**

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



**11 Typ. capacitances**

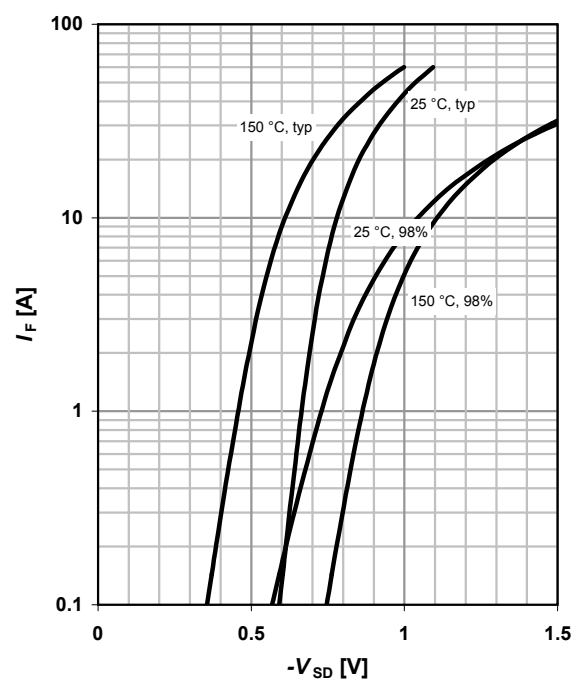
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

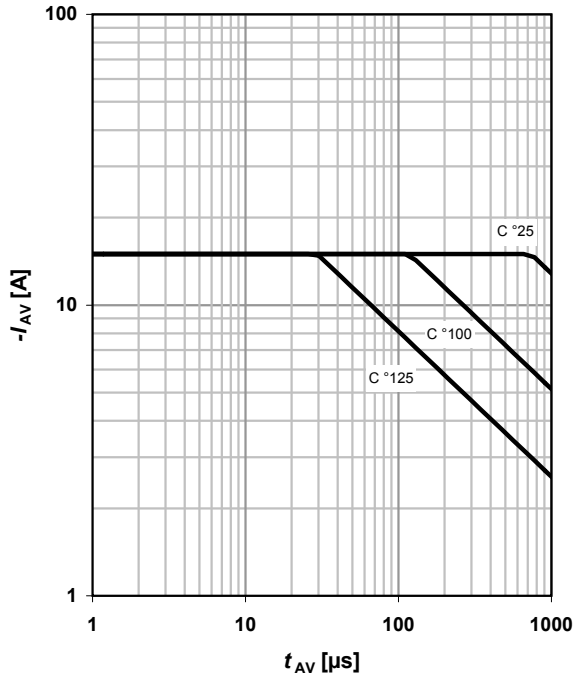
parameter:  $T_j$



**13 Avalanche characteristics**

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

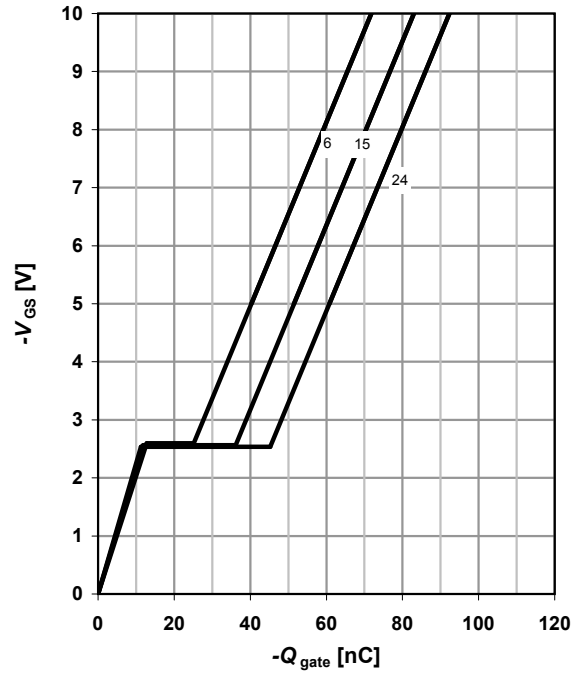
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

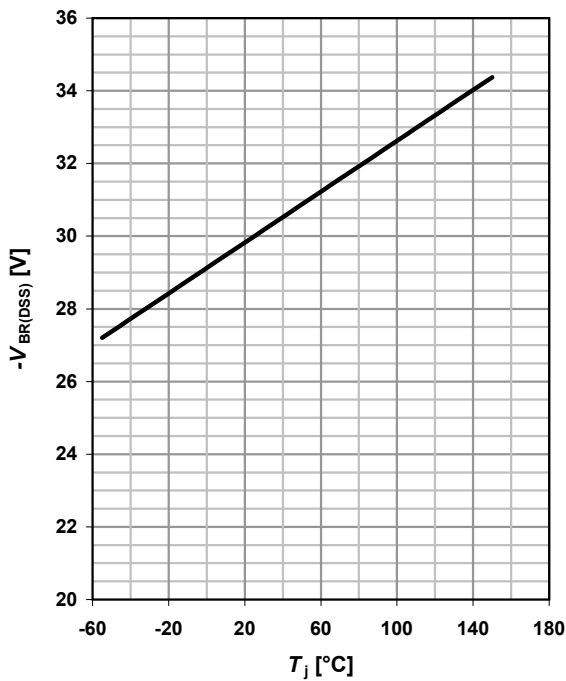
$V_{GS}=f(Q_{gate}); I_D=-14.9$  A pulsed

parameter:  $V_{DD}$

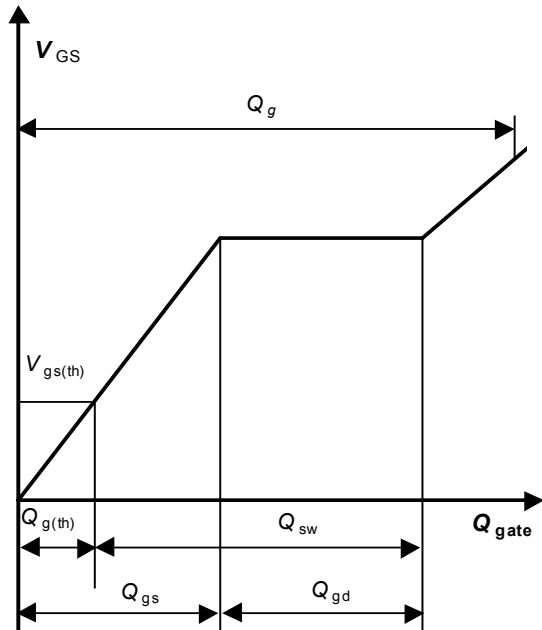


**15 Drain-source breakdown voltage**

$V_{BR(DSS)}=f(T_j); I_D=-250 \mu$ A

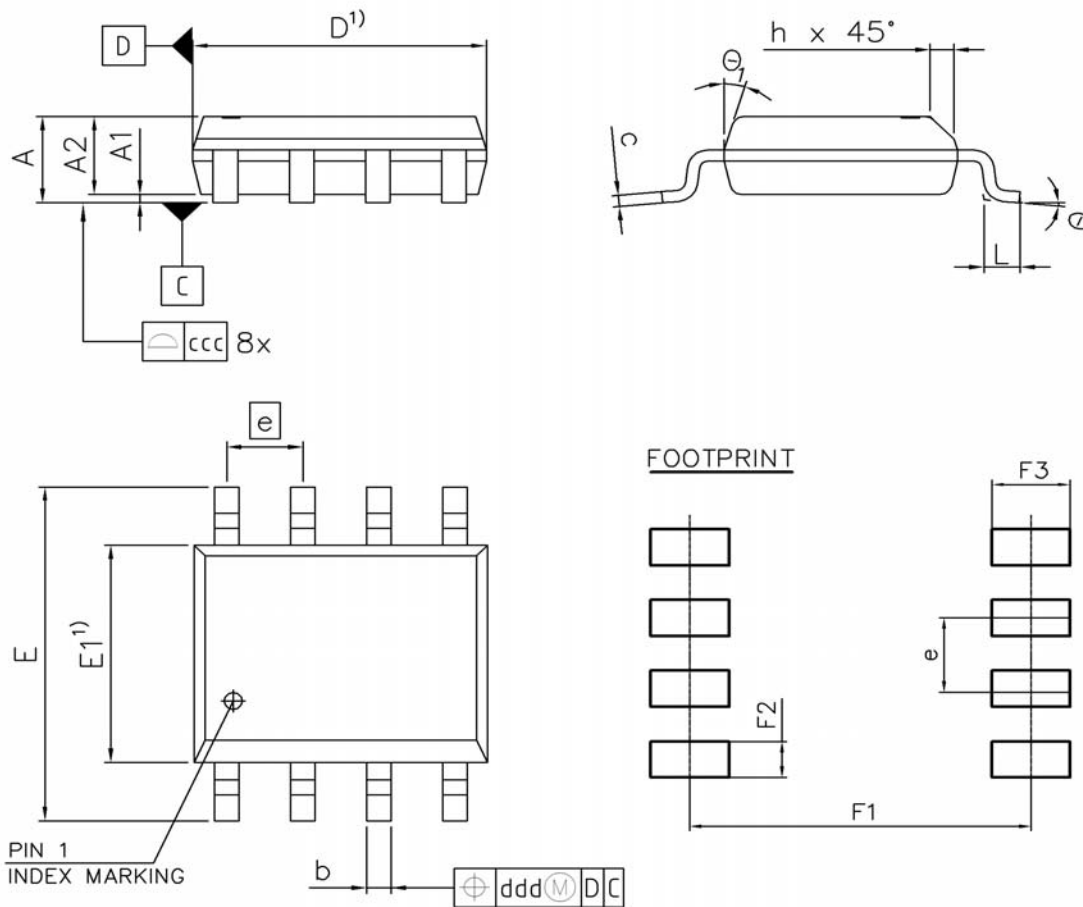


**16 Gate charge waveforms**



Package Outline

P-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.  
Z8B00003333

SCALE

EUROPEAN PROJECTION

ISSUE DATE  
09.01.2008

REVISION  
02



**Published by**  
**Infineon Technologies AG**  
**81726 Munich, Germany**  
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