

## OptiMOS<sup>®</sup>-P Power-Transistor

### Features

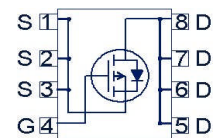
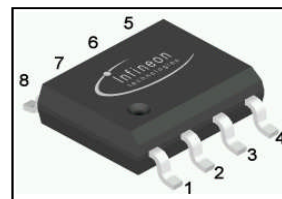
- single P-Channel in SO8
- Enhancement mode
- Logic level
- 150°C operating temperature
- Qualified according JEDEC for trarget applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



### Product Summary

|                  |                        |      |    |
|------------------|------------------------|------|----|
| $V_{DS}$         |                        | -30  | V  |
| $R_{DS(on),max}$ | $V_{GS}=-10\text{ V}$  | 21   | mΩ |
|                  | $V_{GS}=-4.5\text{ V}$ | 31   | mΩ |
| $I_D$            |                        | -9.1 | A  |

### PG-DSO-8



| Type       | Package  | Marking | Lead free | Halogen free | packing |
|------------|----------|---------|-----------|--------------|---------|
| BSO303SP H | PG-DSO-8 | 303SP   | 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> | $I_D$          | $T_A=25\text{ °C}$                        | -9.1             | -7.2         | A    |
|                                        |                | $T_A=70\text{ °C}$                        | -7.1             | -5.8         |      |
|                                        |                | $T_A=25\text{ °C}$                        | -8.9             | -7.2         | A    |
|                                        |                | $T_A=70\text{ °C}$                        | -7.1             | -5.8         |      |
| Pulsed drain current <sup>2)</sup>     | $I_{D,pulse}$  | $T_A=25\text{ °C}^{2)}$                   | -36              |              |      |
| Avalanche energy, single pulse         | $E_{AS}$       | $I_D = -9.1\text{ A}, R_{GS}=25\text{ Ω}$ | 97               |              | mJ   |
| Gate source voltage                    | $V_{GS}$       |                                           | ±20              |              | V    |
| Power dissipation                      | $P_{tot}$      | $T_A=25\text{ °C}^{1)}$                   | 2.50             | 1.56         | 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,<br>junction - soldering point | $R_{thJS}$ |                                                                   | - | - | 35  | K/W |
| Thermal resistance,<br>junction - ambient         | $R_{thJA}$ | minimal footprint,<br>$t_p \leq 10$ s                             | - | - | 110 |     |
|                                                   |            | minimal footprint,<br>steady state                                | - | - | 150 |     |
|                                                   |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> ,<br>$t_p \leq 10$ s | - | - | 50  |     |
|                                                   |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> ,<br>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>$I_D = -100$ $\mu$ 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>$T_j = 150$ °C  | -   | -10  | -100 |            |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS} = -20$ V, $V_{DS} = 0$ V                     | -   | -    | -100 | nA         |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS} = -4.5$ V,<br>$I_D = -7.8$ A                 | -   | 22   | 31   | m $\Omega$ |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS} = -10$ V, $I_D = -9.1$ A                     | -   | 15   | 21   |            |
| Transconductance                 | $g_{fs}$      | $ V_{DS}  > 2 I_D R_{DS(on)max}$ ,<br>$I_D = -7.3$ A | 12  | 19   | -    | 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>$V_{DS}=-25\text{ V}$ , $f=1\text{ MHz}$                         | - | 1750 | 2330 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                           | - | 470  | 625  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                           | - | 390  | 580  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-15\text{ V}$ ,<br>$V_{GS}=-10\text{ V}$ ,<br>$I_D=-1\text{ A}$ , $R_G=6\ \Omega$ | - | 10   | 15   | ns |
| Rise time                    | $t_r$        |                                                                                           | - | 11   | 17   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                           | - | 42   | 63   |    |
| Fall time                    | $t_f$        |                                                                                           | - | 33   | 50   |    |

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

|                          |               |                                                                                   |   |      |      |    |
|--------------------------|---------------|-----------------------------------------------------------------------------------|---|------|------|----|
| Gate to source charge    | $Q_{gs}$      | $V_{DD}=-24\text{ V}$ , $I_D=9.1\text{ A}$ ,<br>$V_{GS}=0\text{ to }-10\text{ V}$ | - | -4.8 | -6.4 | nC |
| Gate charge at threshold | $Q_{g(th)}$   |                                                                                   | - | -2.6 | -3.5 |    |
| Gate to drain charge     | $Q_{gd}$      |                                                                                   | - | -14  | -21  |    |
| Switching charge         | $Q_{sw}$      |                                                                                   | - | -16  | -24  |    |
| Gate charge total        | $Q_g$         |                                                                                   | - | -40  | -54  |    |
| Gate plateau voltage     | $V_{plateau}$ |                                                                                   | - | -2.7 | -    | V  |
| Output charge            | $Q_{oss}$     | $V_{DD}=-15\text{ V}$ , $V_{GS}=0\text{ V}$                                       | - | -14  | -19  |    |

### Reverse Diode

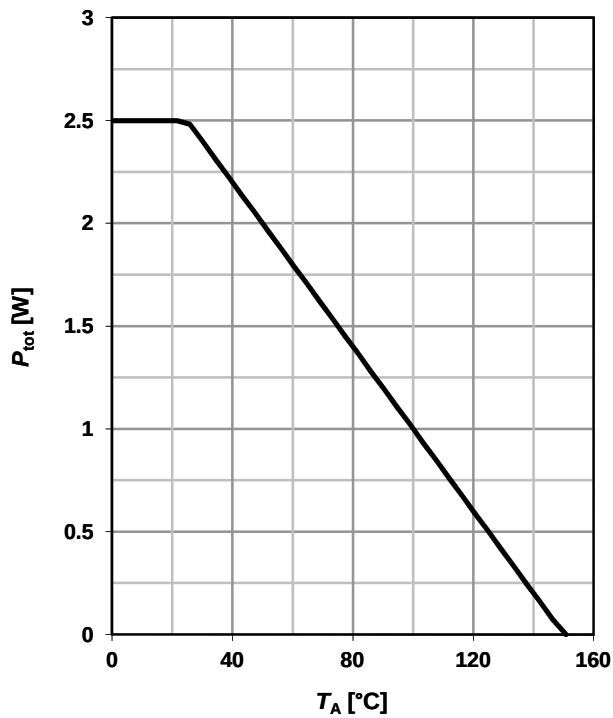
|                                  |               |                                                                                 |   |       |       |    |
|----------------------------------|---------------|---------------------------------------------------------------------------------|---|-------|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                              | - | -     | -2.1  | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                                 | - | -     | -36.5 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}$ , $I_F=-9.1\text{ A}$ ,<br>$T_J=25\text{ °C}$               | - | -0.88 | -1.2  | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=15\text{ V}$ , $I_F=-9.1\text{ A}$ ,<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 19    | 24    | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                                 | - | 9     | 11    | nC |

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

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

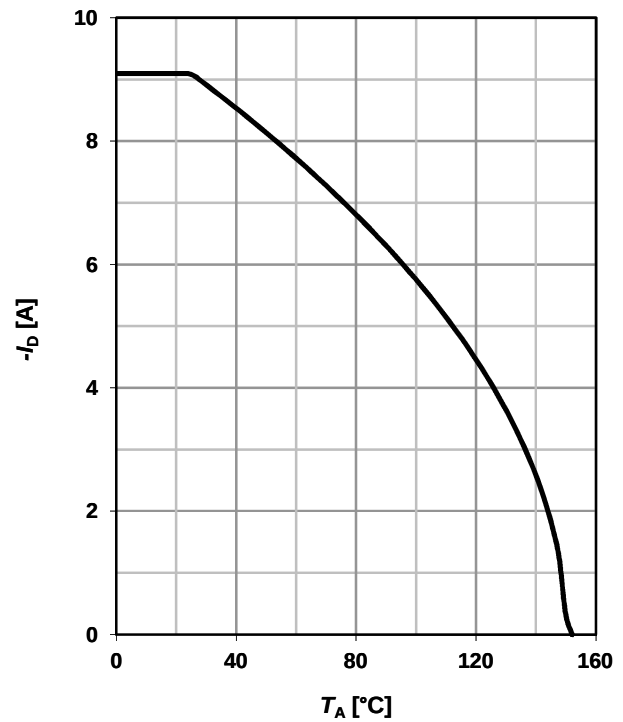
### 1 Power dissipation

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



### 2 Drain current

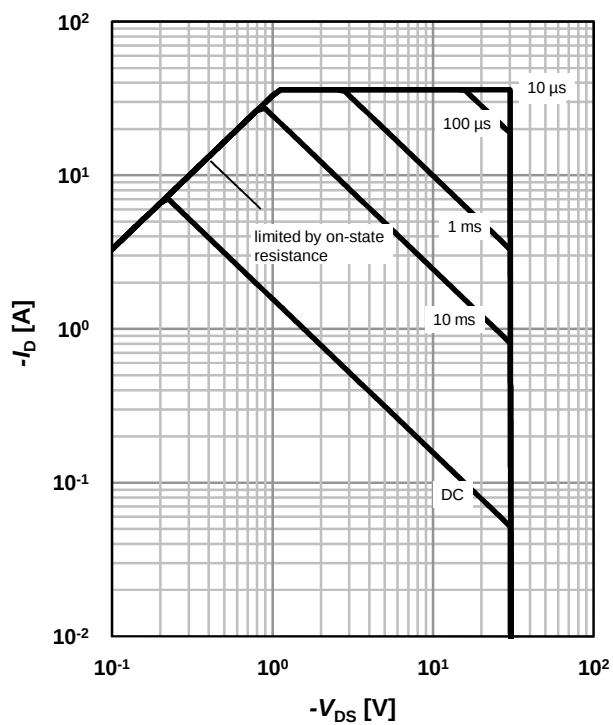
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$$



### 3 Safe operating area

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

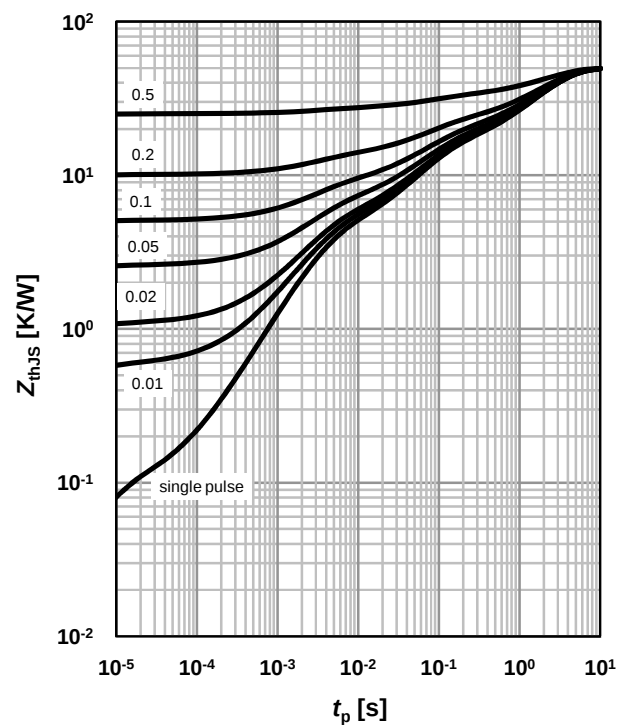
parameter:  $t_p$



### 4 Max. transient thermal impedance

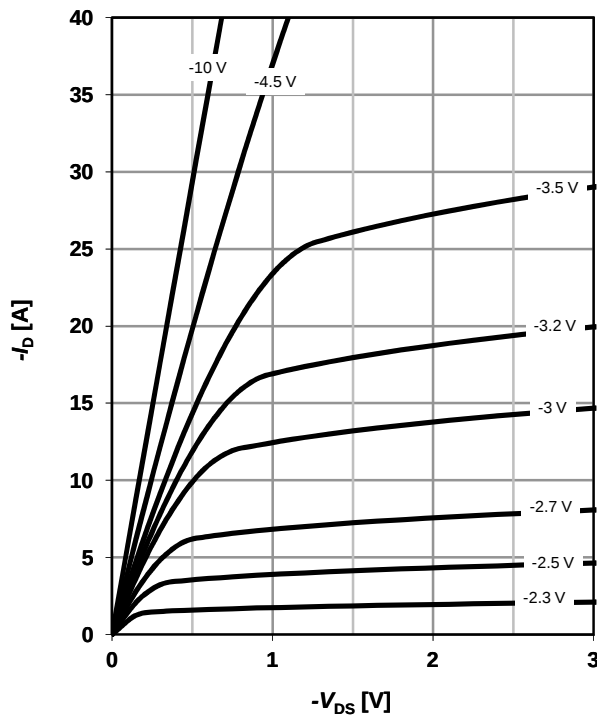
$$Z_{\text{thJS}} = f(t_p)$$

parameter:  $D = t_p/T$



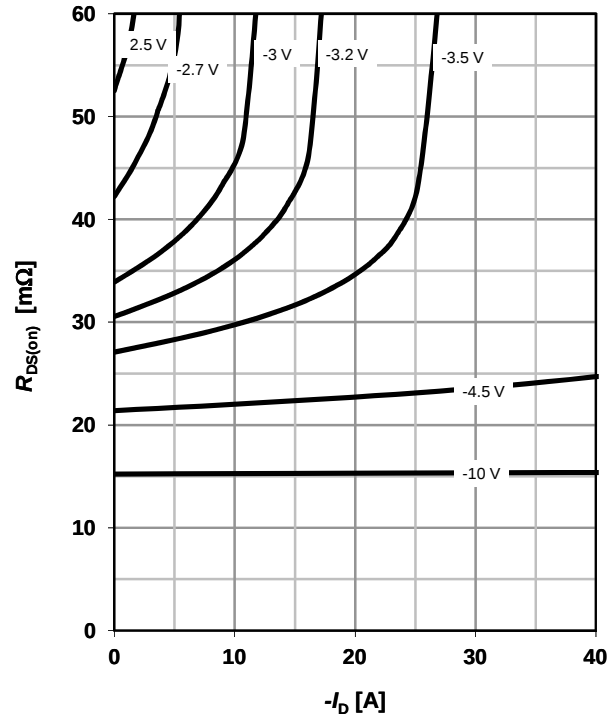
### 5 Typ. output characteristics

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

parameter:  $V_{GS}$ 


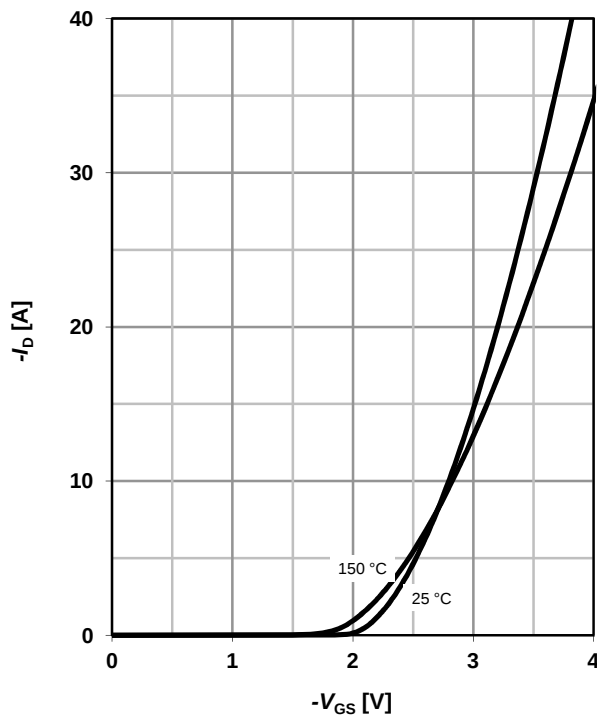
### 6 Typ. drain-source on resistance

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

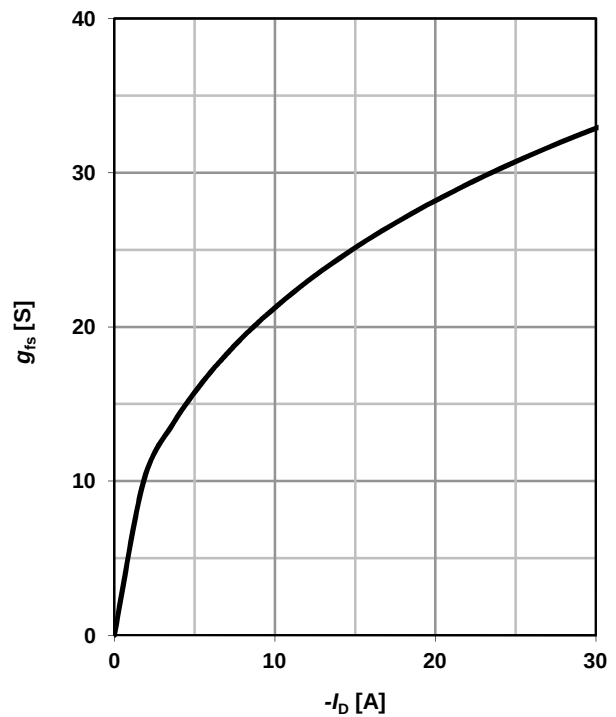
parameter:  $V_{GS}$ 


### 7 Typ. transfer characteristics

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

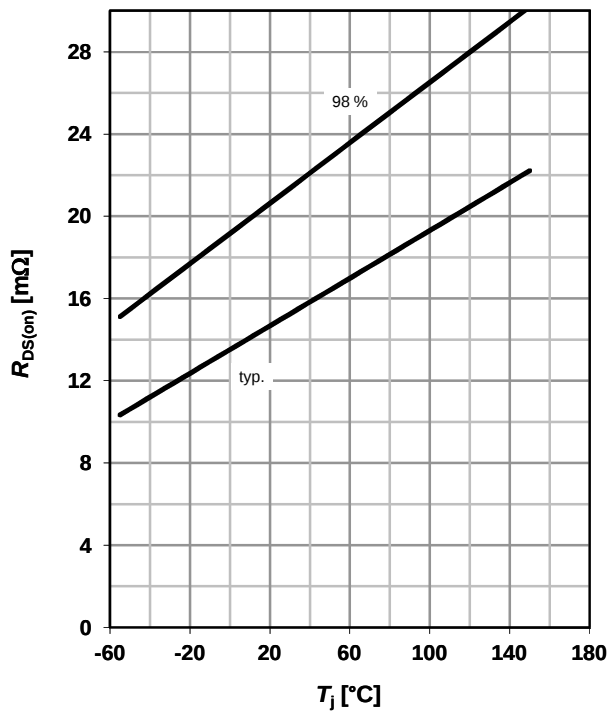
parameter:  $T_j$ 


### 8 Typ. forward transconductance

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


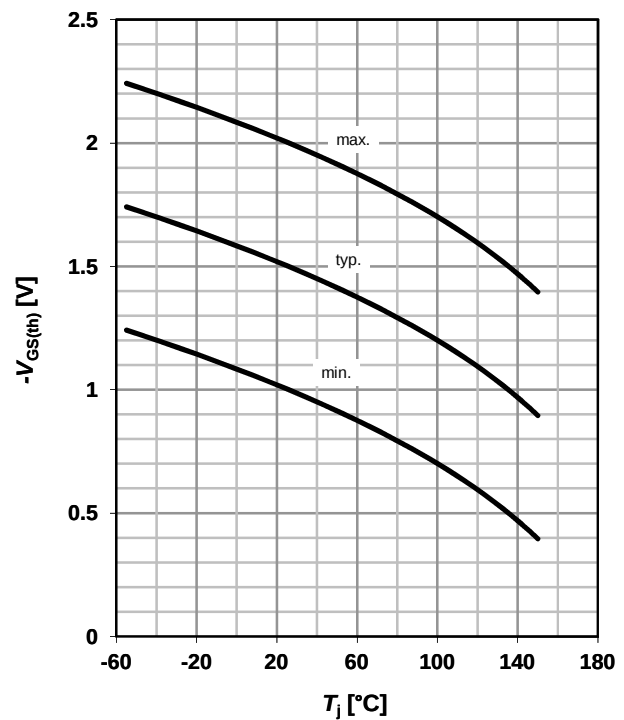
## 9 Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -9.1 \text{ A}; V_{GS} = -10 \text{ V}$$



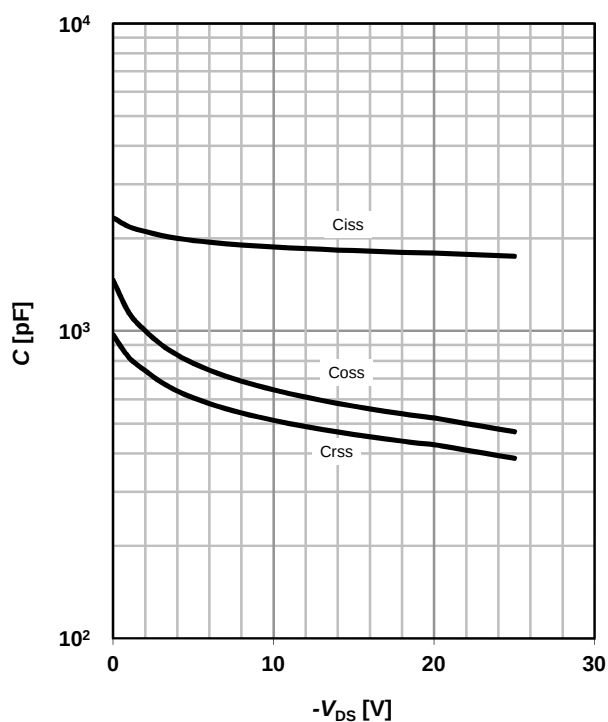
## 10 Typ. gate threshold voltage

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



## 11 Typ. capacitances

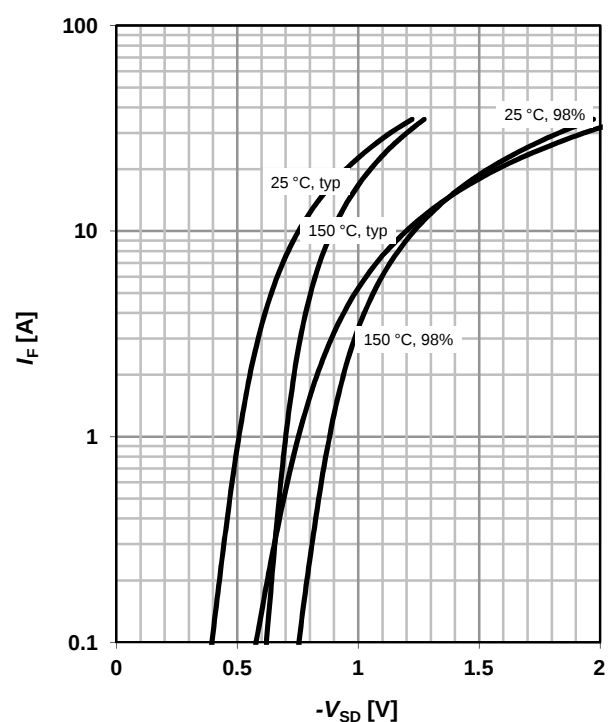
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 12 Forward characteristics of reverse diode

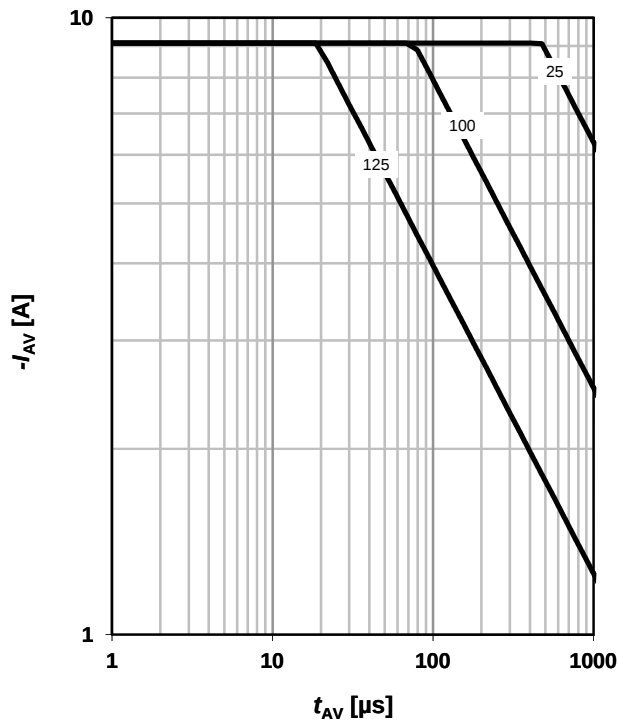
$$I_F = f(V_{SD})$$

parameter:  $T_j$



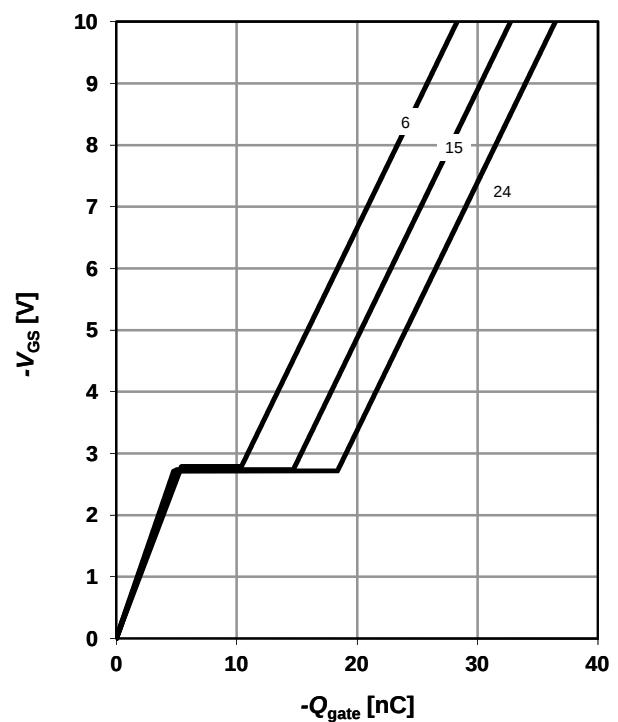
### 13 Avalanche characteristics

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

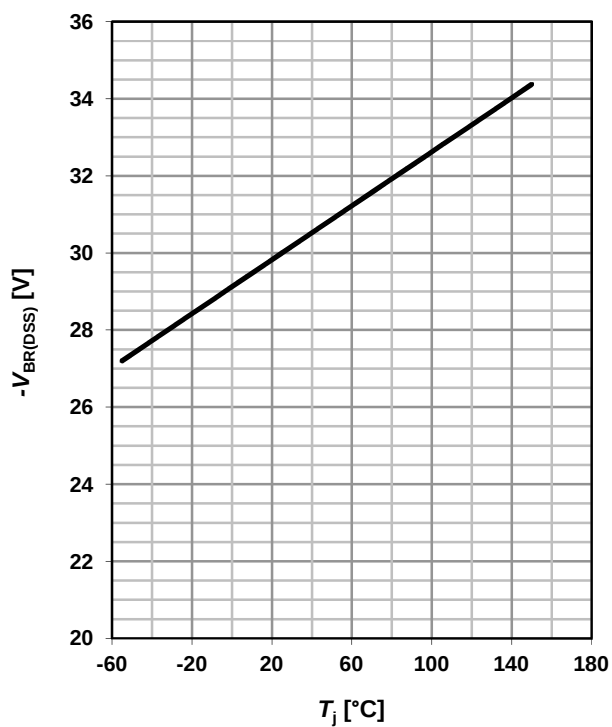
parameter:  $T_{j(\text{start})}$ 


### 14 Typ. gate charge

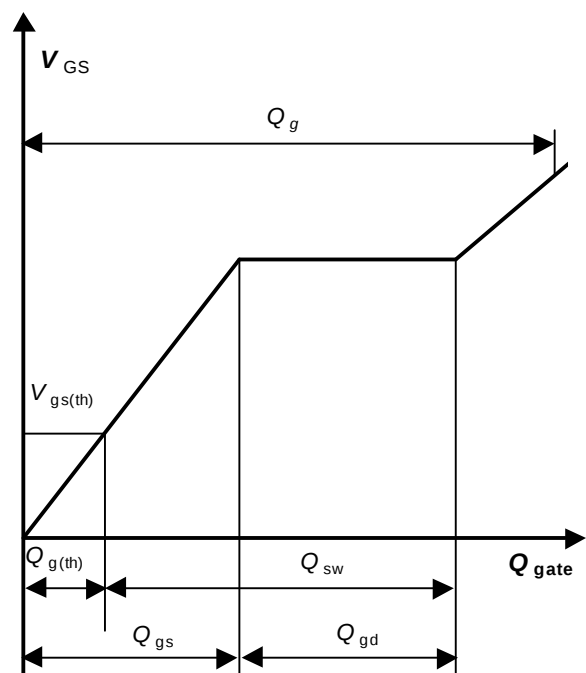
 $V_{GS}=f(Q_{gate}); I_D=-9.1\ \text{A pulsed}$ 

parameter:  $V_{DD}$ 


### 15 Drain-source breakdown voltage

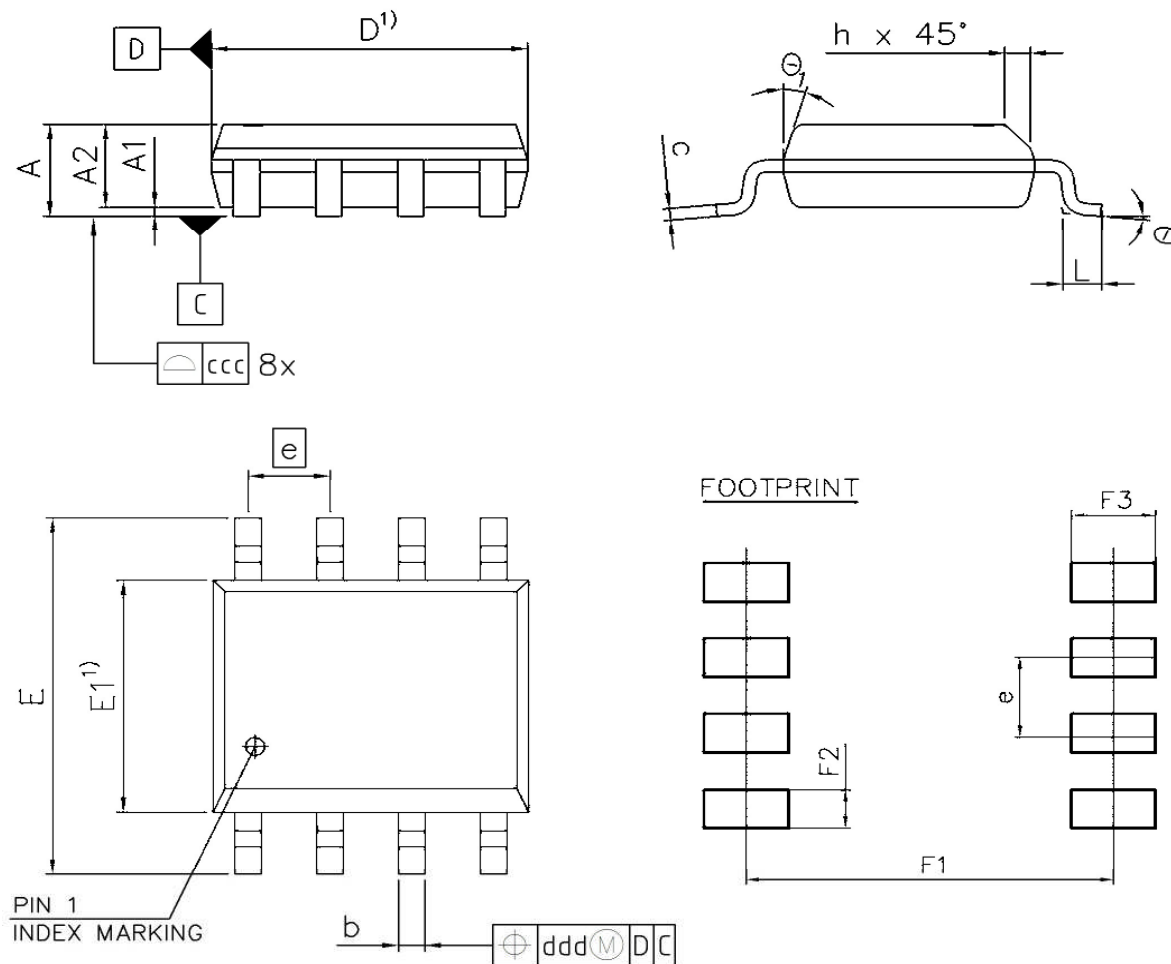
 $V_{BR(DSS)}=f(T_j); I_D=-250\ \mu\text{A}$ 


### 16 Gate charge waveforms



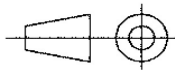
## Package Outline

### 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.<br>Z8B00003333                                                                                  |
| SCALE<br>0 1.0 2mm                                                                                           |
| EUROPEAN PROJECTION<br> |
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