

## OptiMOS®-P Small-Signal-Transistor

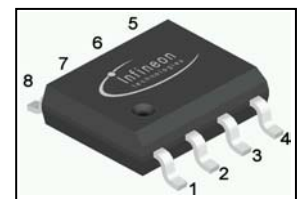
### Features

- P-Channel
- Enhancement mode
- Logic level
- 150°C operating temperature
- Avalanche rated
- dv/dt rated
- Ideal for fast switching buck converter

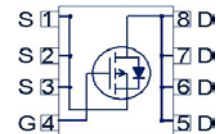
### Product Summary

|                  |      |    |
|------------------|------|----|
| $V_{DS}$         | -30  | V  |
| $R_{DS(on),max}$ | 20   | mΩ |
| $I_D$            | -9.1 | A  |

P-DSO-8



| Type       | Package | Ordering Code | Marking |
|------------|---------|---------------|---------|
| BSO200P03S | P-DSO-8 | Q67042-S4234  | 200P03S |



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

| Parameter                           | Symbol            | Conditions                                                                                              | Value       |              | Unit  |
|-------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------|-------------|--------------|-------|
|                                     |                   |                                                                                                         | ≤10 secs    | steady state |       |
| Continuous drain current            | $I_D$             | $T_A=25\text{ °C}^{(1)}$                                                                                | -9.1        | -7.4         | A     |
|                                     |                   | $T_A=70\text{ °C}^{(1)}$                                                                                | -7.3        | -5.9         |       |
| Pulsed drain current                | $I_{D,pulse}$     | $T_A=25\text{ °C}^{(2)}$                                                                                | -37         |              |       |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=-9.1\text{ A}$ , $R_{GS}=25\text{ Ω}$                                                              | 98          |              | mJ    |
| Reverse diode dv/dt                 | dv/dt             | $I_D=-9.1\text{ A}$ , $V_{DS}=20\text{ V}$ ,<br>$di/dt=-200\text{ A/μs}$ ,<br>$T_{j,max}=150\text{ °C}$ | -6          |              | kV/μs |
| Gate source voltage                 | $V_{GS}$          |                                                                                                         | ±25         |              | V     |
| Power dissipation                   | $P_{tot}$         | $T_A=25\text{ °C}^{(1)}$                                                                                | 2.36        | 1.56         | W     |
| Operating and storage temperature   | $T_J$ , $T_{stg}$ |                                                                                                         | -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,<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 | - | - | 53  |     |
|                                                   |            | 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 |      |         |
| 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      | $I_{GSS}$     | $V_{GS} = -25$ V, $V_{DS} = 0$ V                     | -   | -10  | -100 | nA      |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS} = -10$ V,<br>$I_D = -9.1$ A                  | -   | 16.7 | 20.0 |         |
| Transconductance                 | $g_{fs}$      | $ V_{DS}  > 2 I_D R_{DS(on)max}$ ,<br>$I_D = -7.3$ A | 11  | 21   | -    | 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   | 53   | 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  |      |    |
| 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**

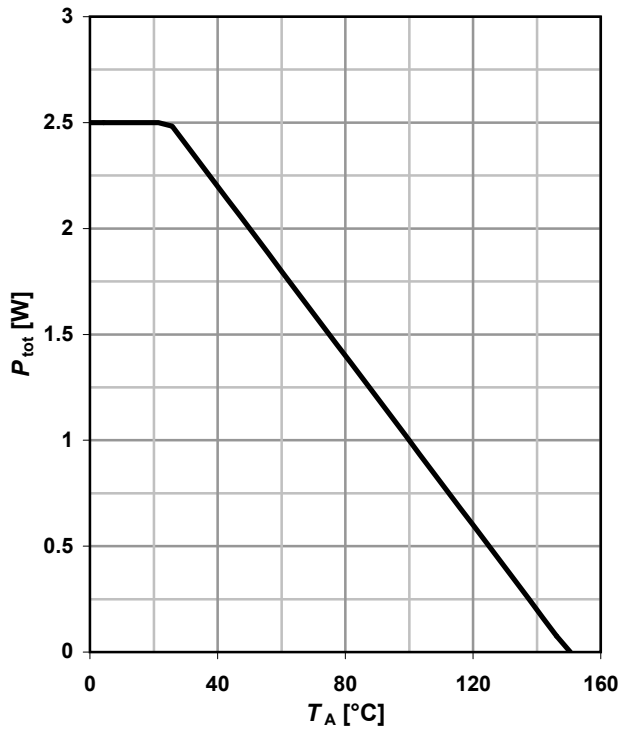
|                                  |               |                                                                                 |   |       |       |    |
|----------------------------------|---------------|---------------------------------------------------------------------------------|---|-------|-------|----|
| 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

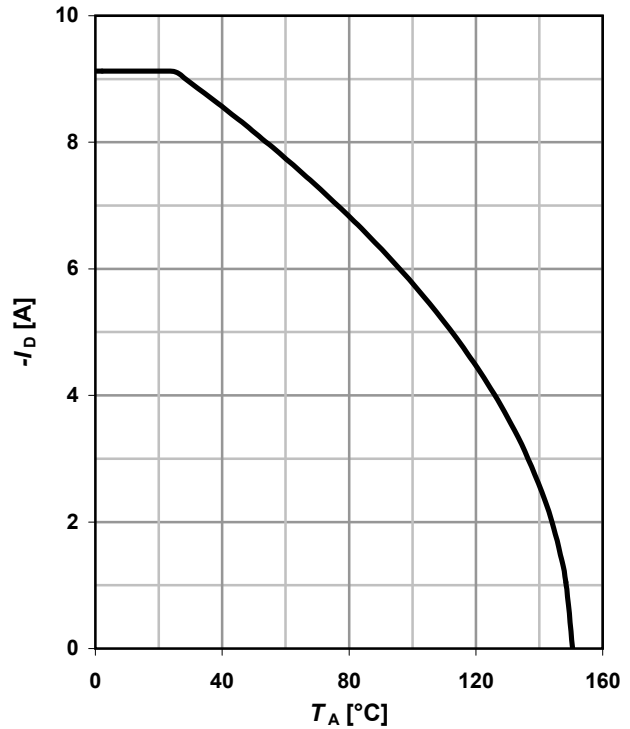
### 1 Power dissipation

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



### 2 Drain current

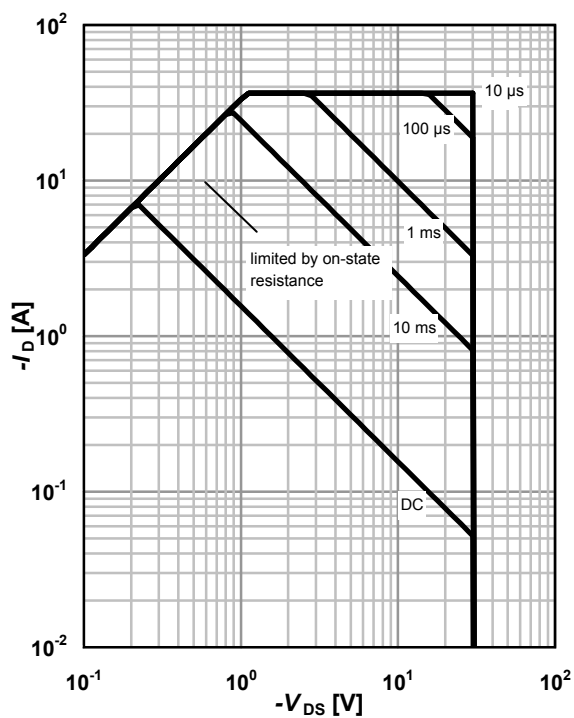
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$$



### 3 Safe operation area

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

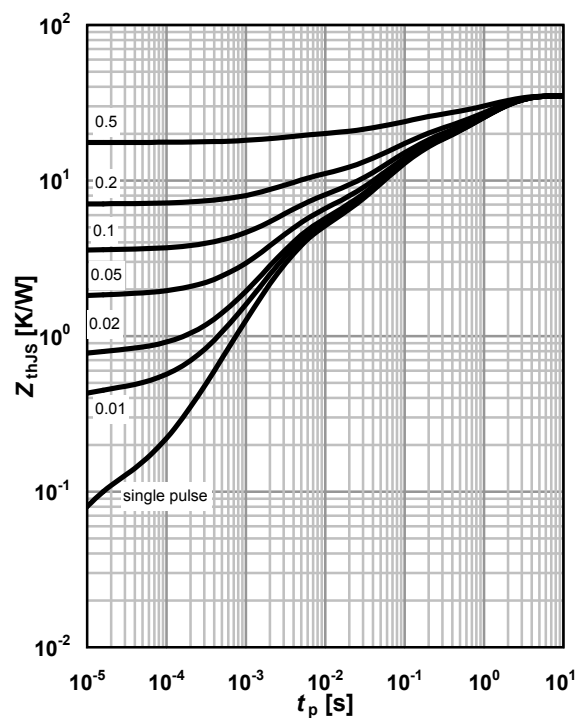
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

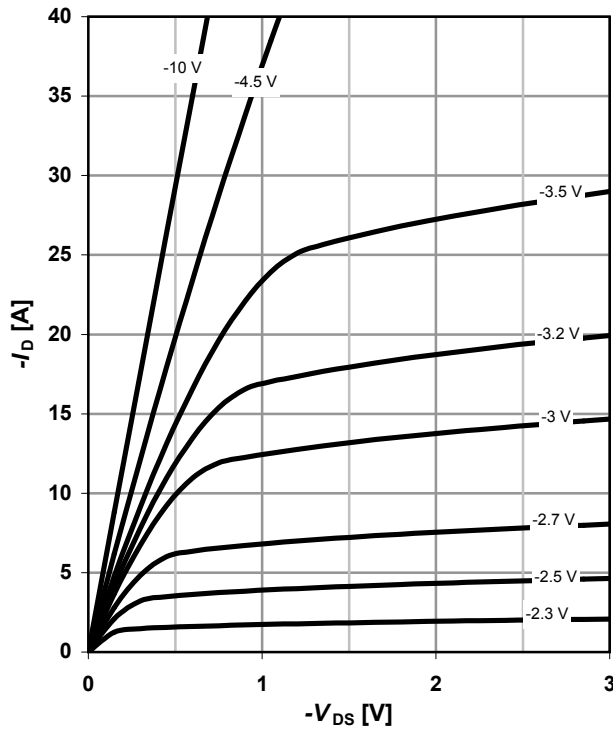
parameter:  $D = t_p / T$



### 5 Typ. output characteristics

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

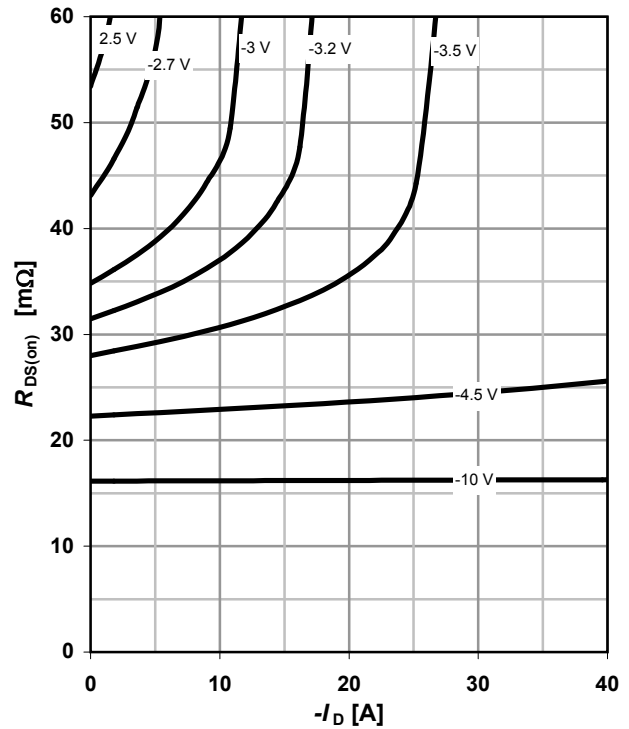
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

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

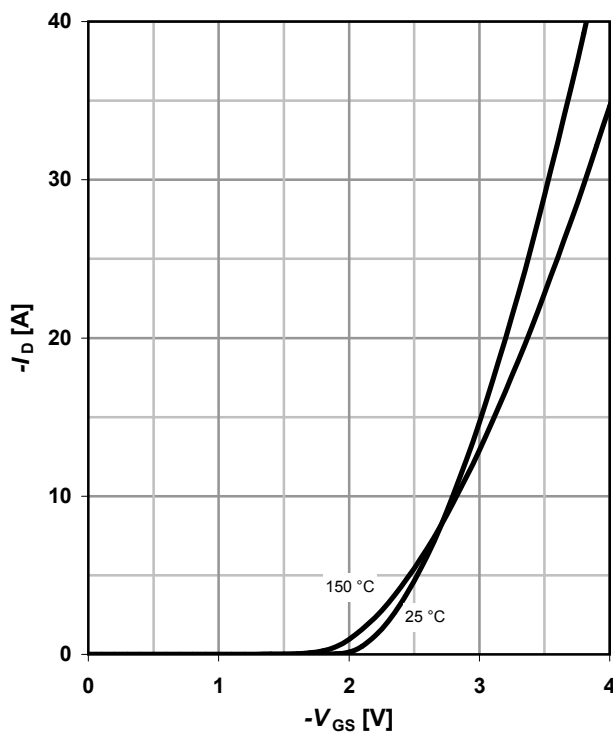
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

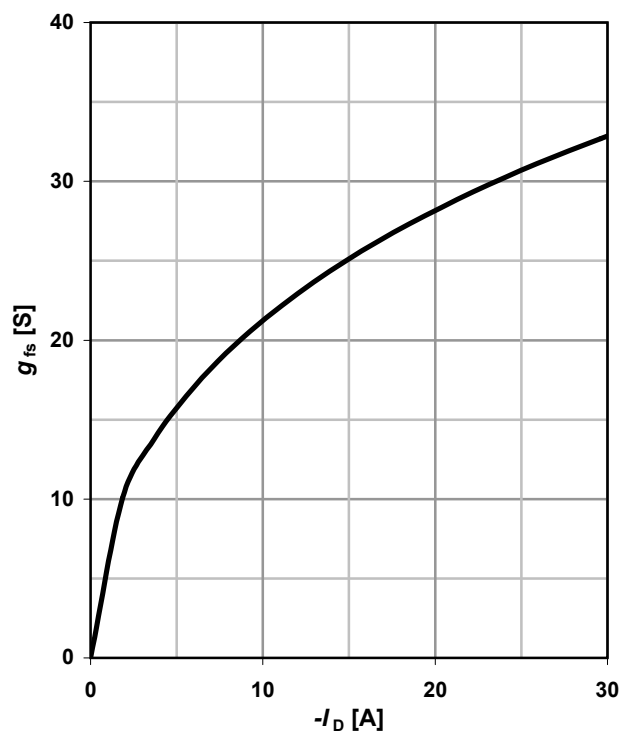
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



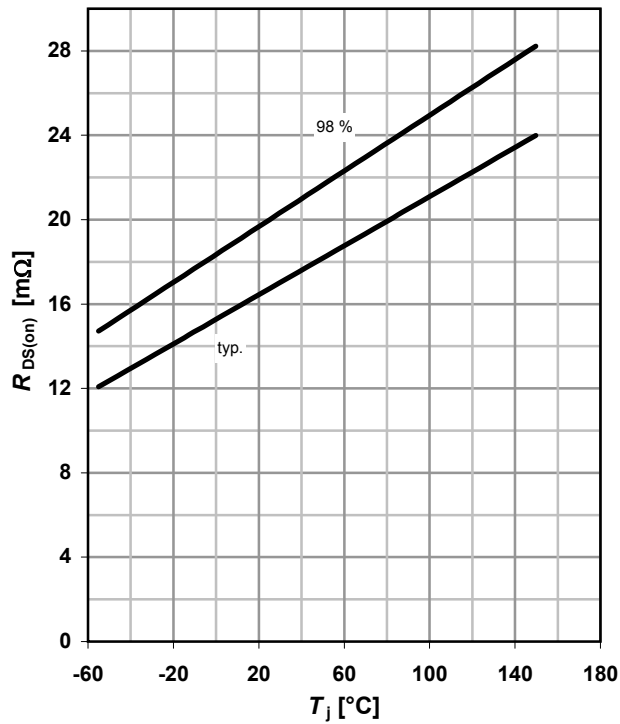
### 8 Typ. forward transconductance

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

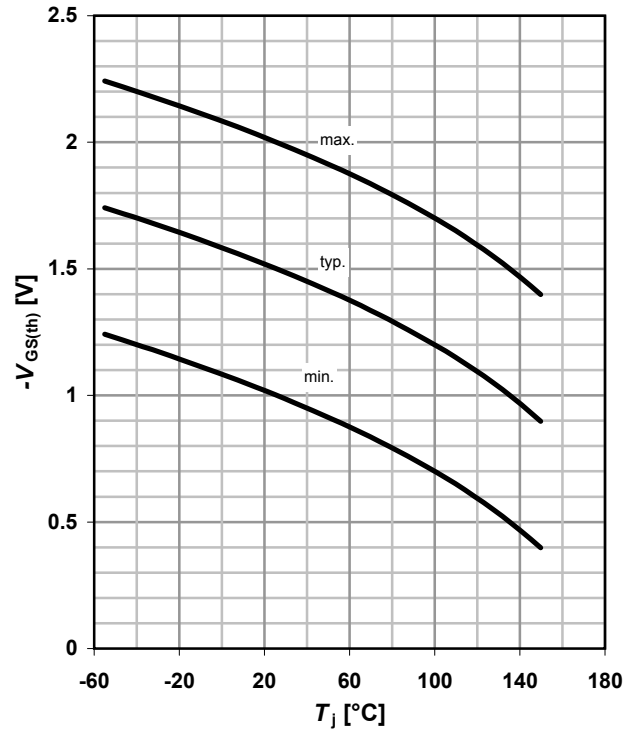


**9 Drain-source on-state resistance**

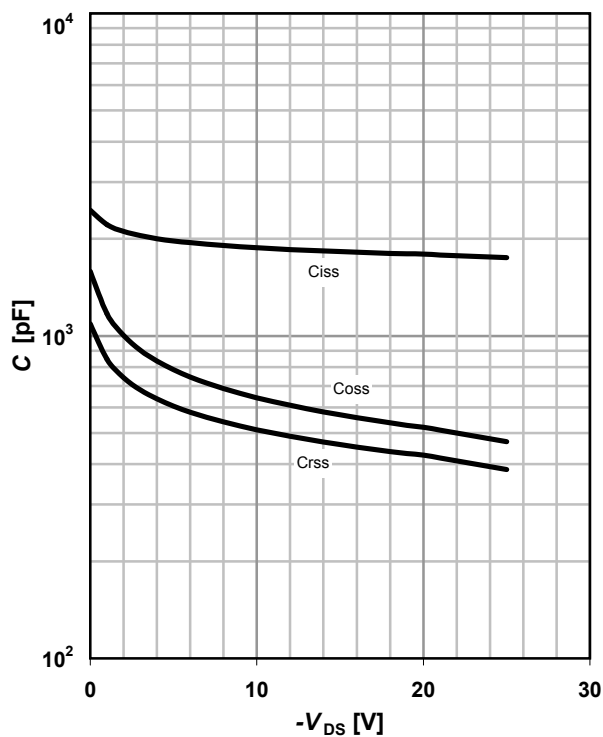
$$R_{DS(on)} = f(T_j); I_D = -9.1 \text{ A}; V_{GS} = -10 \text{ V}$$


**10 Typ. gate threshold voltage**

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

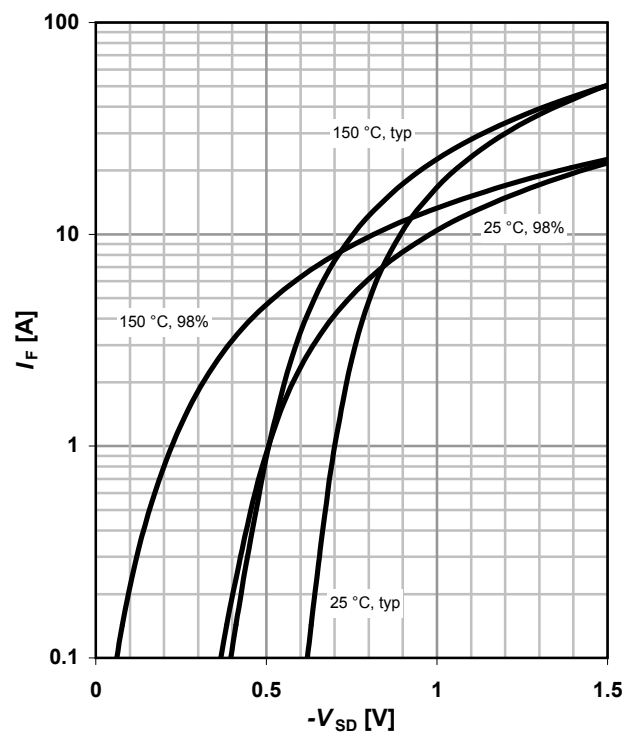

**11 Typ. capacitances**

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


**12 Forward characteristics of reverse diode**

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

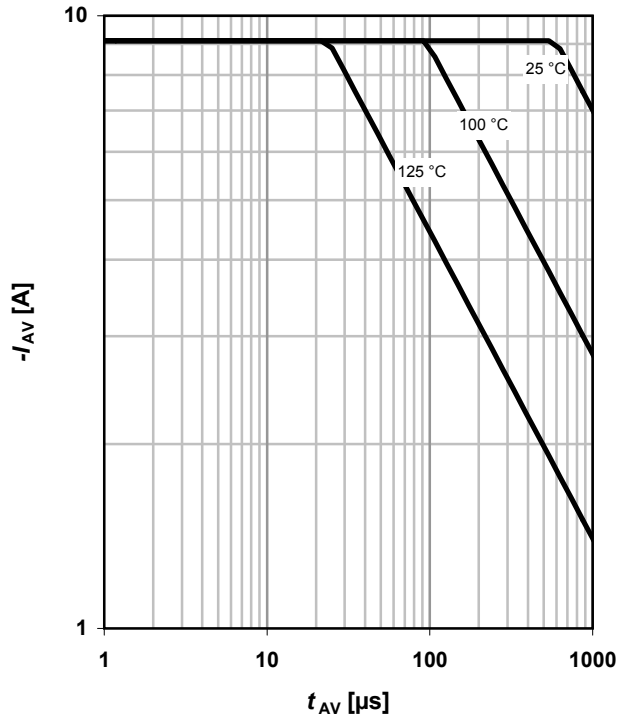
parameter:  $T_j$



### 13 Avalanche characteristics

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

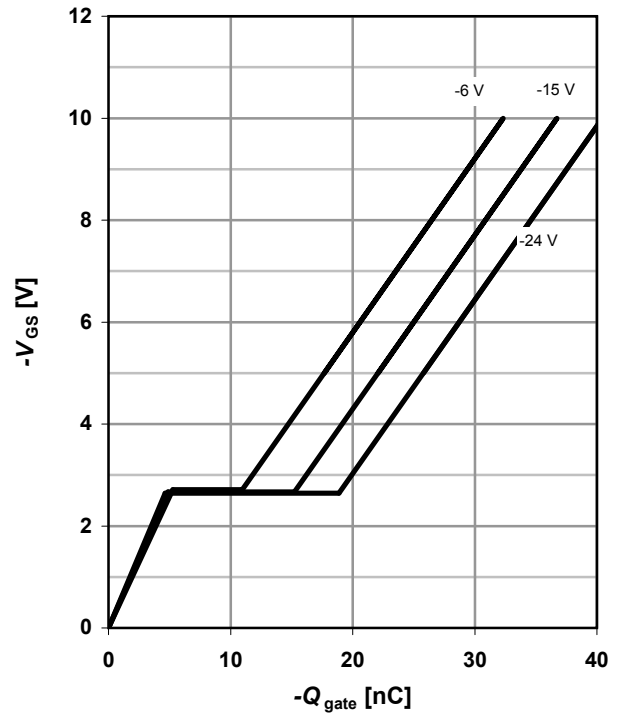
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

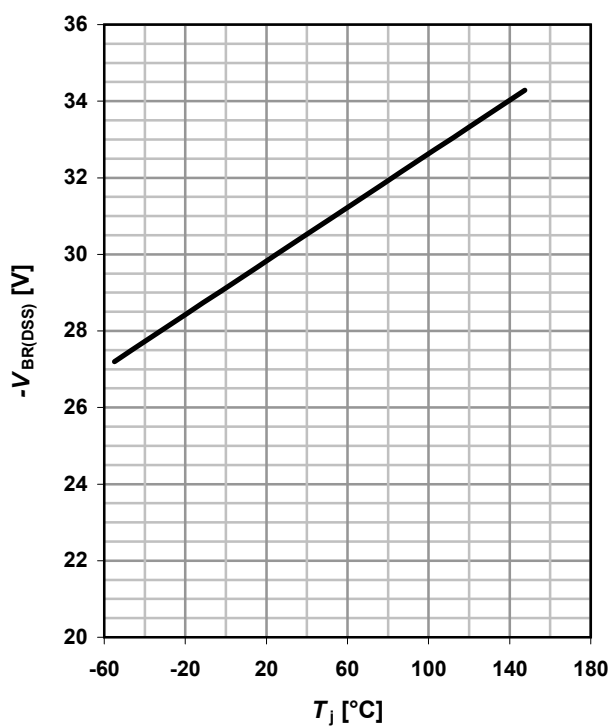
$$V_{GS}=f(Q_{\text{gate}}); I_D=-4.5\ \text{A pulsed}$$

parameter:  $V_{DD}$

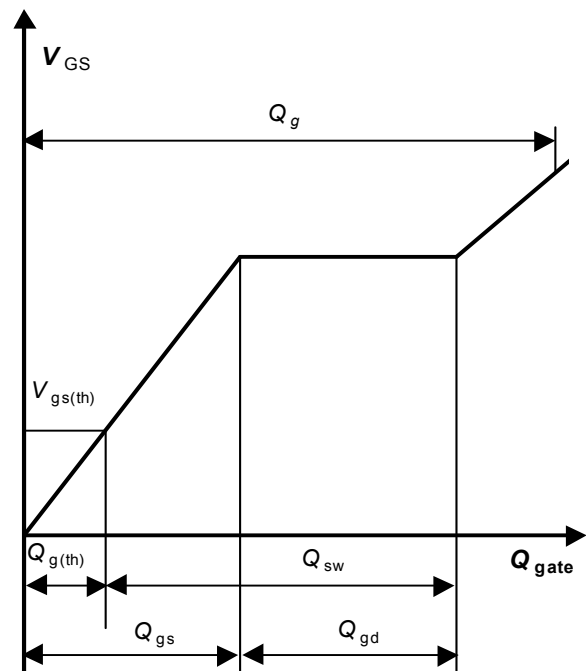


### 15 Drain-source breakdown voltage

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

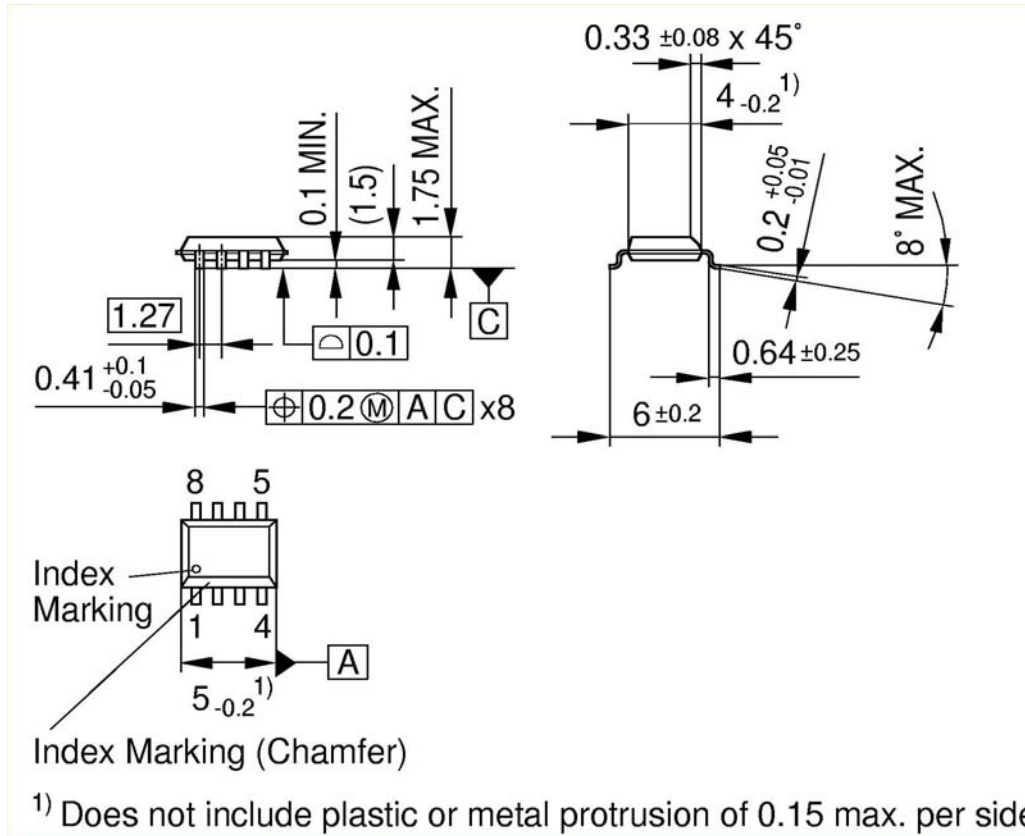


### 16 Gate charge waveforms



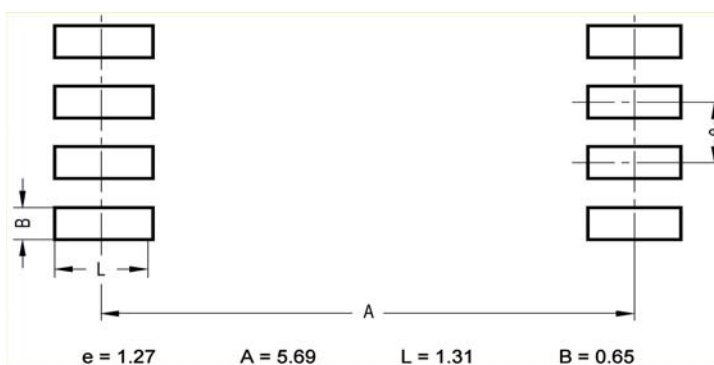
## Package Outline

### P-DSO-8: Outline

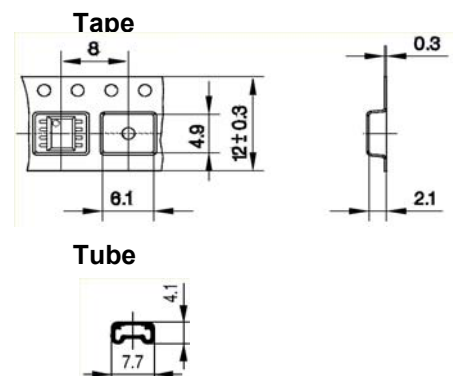


53

### Footprint



### Packaging



Dimensions in mm

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53

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