

## OptiMOS™-P 3 Small-Signal-Transistor

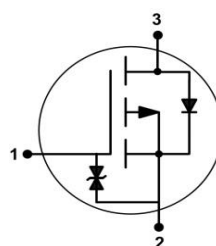
### Features

- P-channel
- Enhancement mode
- Logic level (4.5V rated)
- ESD protected
- Qualified according AEC Q101
- 100% Lead-free; RoHS compliant
- Halogen-free according to IEC61249-2-21

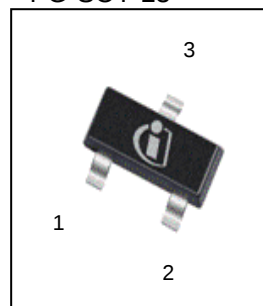


### Product Summary

|                  |                        |     |
|------------------|------------------------|-----|
| $V_{DS}$         | 30                     | V   |
| $R_{DS(on),max}$ | $V_{GS}=-10\text{ V}$  | 140 |
|                  | $V_{GS}=-4.5\text{ V}$ | 230 |
| $I_D$            | -1.5                   | A   |



PG-SOT-23



| Type     | Package  | Tape and Reel Information | Marking | Lead Free | Packing |
|----------|----------|---------------------------|---------|-----------|---------|
| BSS314PE | PG-SOT23 | H6327: 3000 pcs/ reel     | YGs     | Yes       | Non dry |

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

| Parameter                           | Symbol            | Conditions                                                                                                           | Value          | Unit              |
|-------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------|----------------|-------------------|
| Continuous drain current            | $I_D$             | $T_A=25\text{ °C}$                                                                                                   | -1.5           | A                 |
|                                     |                   | $T_A=70\text{ °C}$                                                                                                   | -1.2           |                   |
| Pulsed drain current                | $I_{D,pulse}$     | $T_A=25\text{ °C}$                                                                                                   | -6.1           |                   |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=-1.5\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                      | 6              | mJ                |
| Reverse diode $dv/dt$               | $dv/dt$           | $I_D=-1.5\text{ A}$ ,<br>$V_{DS}=-16\text{ V}$ ,<br>$di/dt=-200\text{ A}/\mu\text{s}$ ,<br>$T_{j,max}=150\text{ °C}$ | 6              | kV/ $\mu\text{s}$ |
| Gate source voltage                 | $V_{GS}$          |                                                                                                                      | $\pm 20$       | V                 |
| Power dissipation <sup>1)</sup>     | $P_{tot}$         | $T_A=25\text{ °C}$                                                                                                   | 0.5            | W                 |
| Operating and storage temperature   | $T_j$ , $T_{stg}$ |                                                                                                                      | -55 ... 150    | °C                |
| ESD Class                           |                   | JESD22-A114 -HBM                                                                                                     | 1000V to 2000V |                   |
| Soldering Temperature               |                   |                                                                                                                      | 260 °C         | °C                |
| IEC climatic category; DIN IEC 68-1 |                   |                                                                                                                      | 55/150/56      | °C                |

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

**Thermal characteristics**

|                                           |            |                                 |   |   |     |     |
|-------------------------------------------|------------|---------------------------------|---|---|-----|-----|
| Thermal resistance,<br>junction - ambient | $R_{thJA}$ | minimal footprint <sup>1)</sup> | - | - | 250 | K/W |
|-------------------------------------------|------------|---------------------------------|---|---|-----|-----|

**Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified**
**Static characteristics**

|                                  |               |                                             |     |      |      |           |
|----------------------------------|---------------|---------------------------------------------|-----|------|------|-----------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$                  | -30 | -    | -    | V         |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-6.3\mu A$              | -1  | -1.5 | -2   |           |
| Drain-source leakage current     | $I_{DSS}$     | $V_{DS}=-30V, V_{GS}=0V, T_j=25\text{ °C}$  | -   | -    | -1   | $\mu A$   |
|                                  |               | $V_{DS}=-30V, V_{GS}=0V, T_j=150\text{ °C}$ | -   | -    | -100 |           |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-20V, V_{DS}=0V$                    | -   | -    | -5   | $\mu A$   |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-4.5V, I_D=-1.2A$                   | -   | 153  | 230  | $m\Omega$ |
|                                  |               | $V_{GS}=-10V, I_D=-1.5A$                    | -   | 107  | 140  |           |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=-1.2A$   |     | 3    | -    | S         |

<sup>1)</sup> Performed on 40mm<sup>2</sup> FR4 PCB. The traces are 1mm wide, 70 $\mu$ m thick and 20mm long; they are present on both sides of the PCB.

| 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>$f=1\text{ MHz}$                          | - | 221  | 294 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                        | - | 126  | 168 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                        | - | 7    | 11  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-15\text{ V},$<br>$V_{GS}=-10\text{ V},$<br>$I_D=-1.5\text{ A}, R_G=6\ \Omega$ | - | 5.1  | -   | ns |
| Rise time                    | $t_r$        |                                                                                        | - | 3.9  | -   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                        | - | 12.4 | -   |    |
| Fall time                    | $t_f$        |                                                                                        | - | 2.8  | -   |    |

**Gate Charge Characteristics**

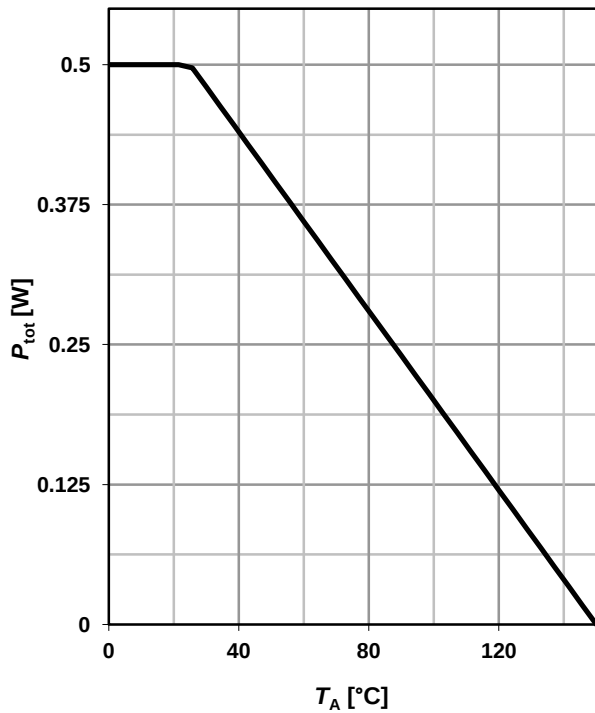
|                       |               |                                                                                     |   |      |   |    |
|-----------------------|---------------|-------------------------------------------------------------------------------------|---|------|---|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=-15\text{ V},$<br>$I_D=-1.5\text{ A},$<br>$V_{GS}=0\text{ to }-10\text{ V}$ | - | -0.7 | - | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                                     | - | -0.3 | - |    |
| Gate charge total     | $Q_g$         |                                                                                     | - | -2.9 | - |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                                     | - | -3.2 | - | V  |

**Reverse Diode**

|                                  |               |                                                                              |   |      |      |    |
|----------------------------------|---------------|------------------------------------------------------------------------------|---|------|------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                           | - | -    | -0.5 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                              | - | -    | -6.1 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-1.5\text{ A},$<br>$T_J=25\text{ °C}$                | - | 0.8  | 1.1  | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=-15\text{ V}, I_F=-1.5\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 12.5 | -    | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                              | - | 4.3  | -    | nC |

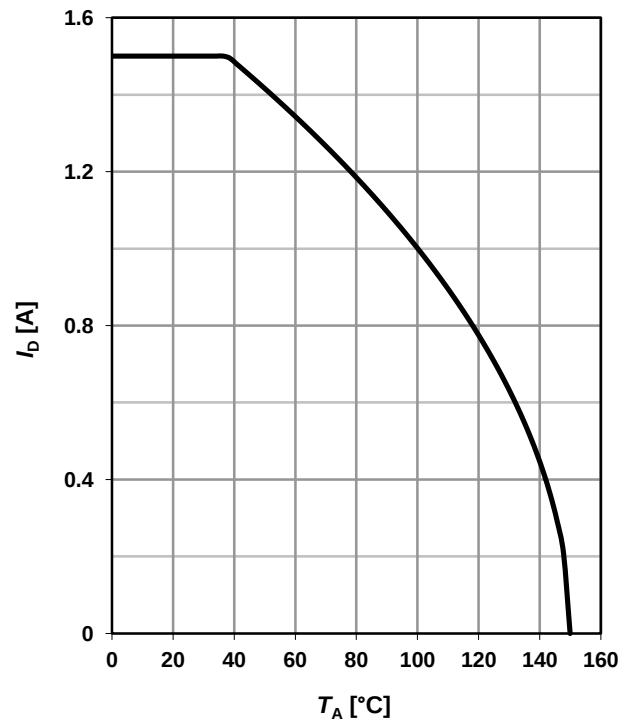
## 1 Power dissipation

$$P_{\text{tot}} = f(T_A)$$



## 2 Drain current

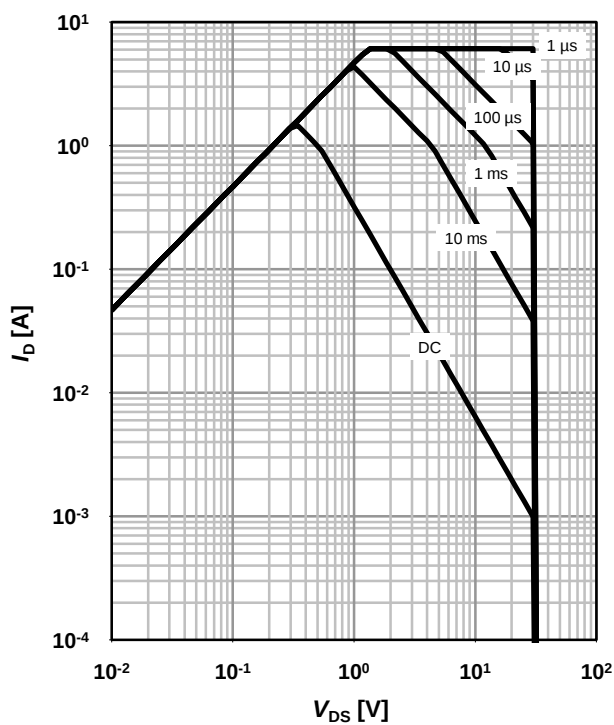
$$I_D = f(T_A); V_{GS} \leq -10 \text{ V}$$



## 3 Safe operating area

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

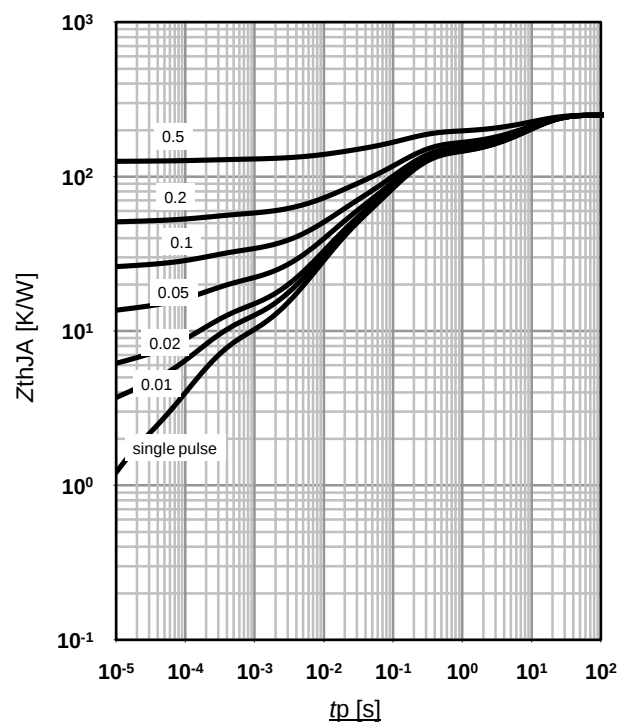
parameter:  $t_p$



## 4 Max. transient thermal impedance

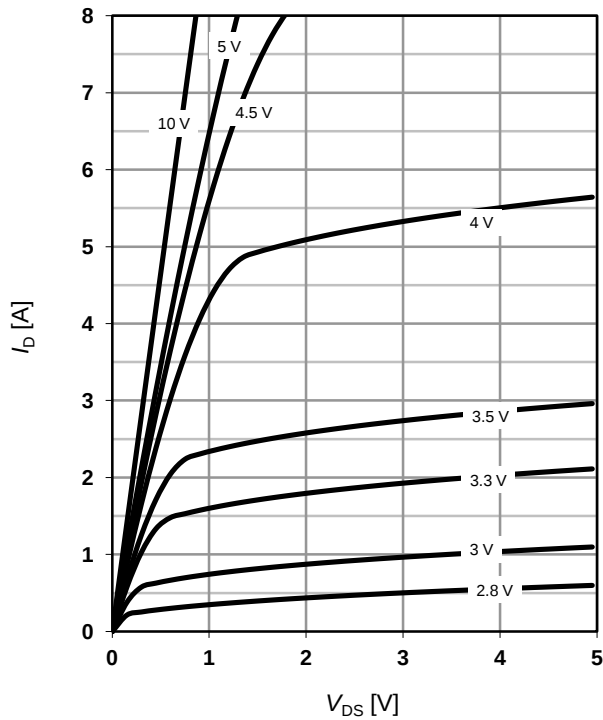
$$Z_{\text{thJA}} = f(t_p)$$

parameter:  $D = t_p/T$



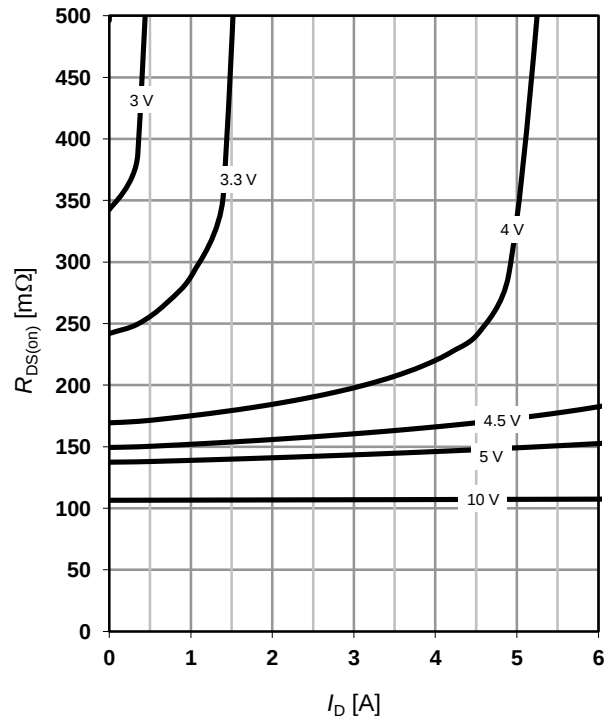
### 5 Typ. output characteristics

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

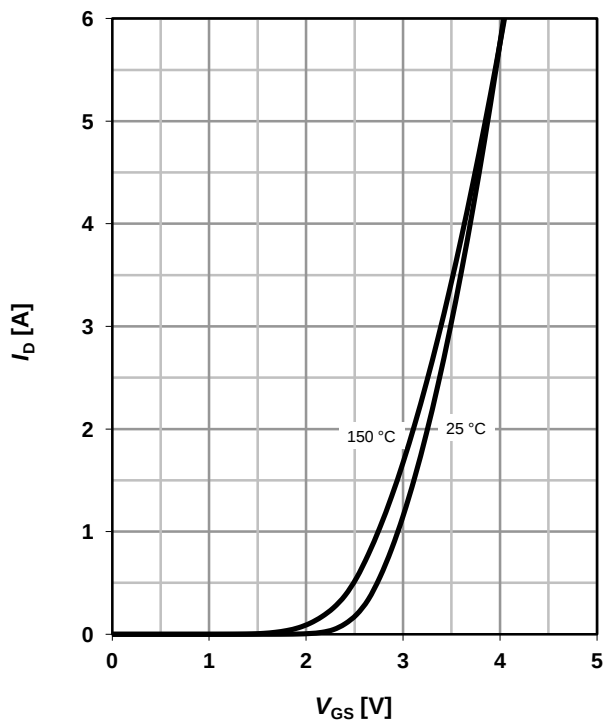
parameter:  $V_{GS}$ 


### 6 Typ. drain-source on resistance

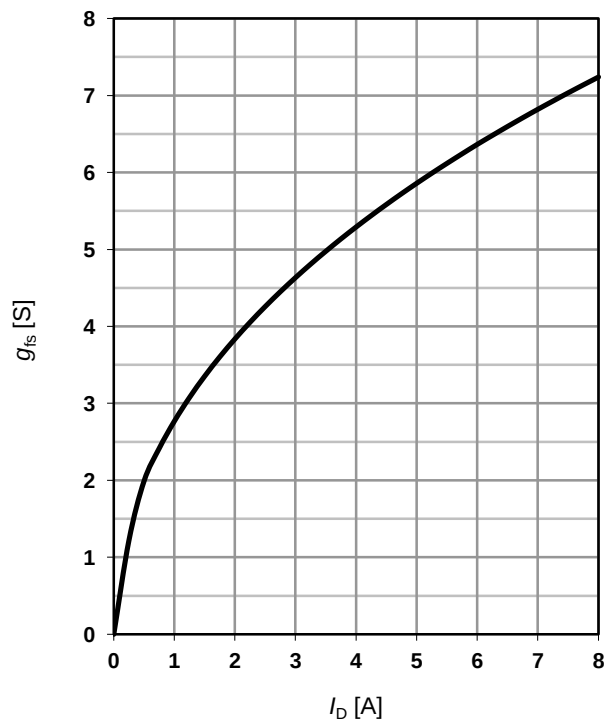
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$ 

parameter:  $V_{GS}$ 


### 7 Typ. transfer characteristics

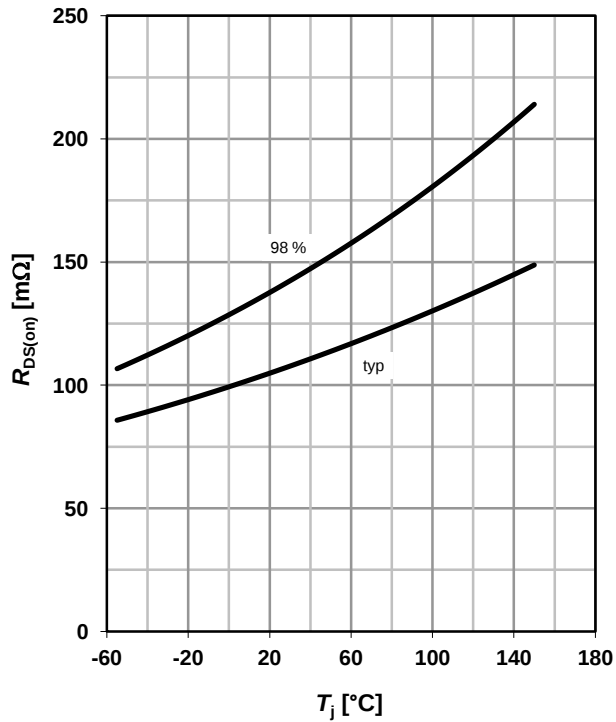
 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$ 


### 8 Typ. forward transconductance

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


## 9 Drain-source on-state resistance

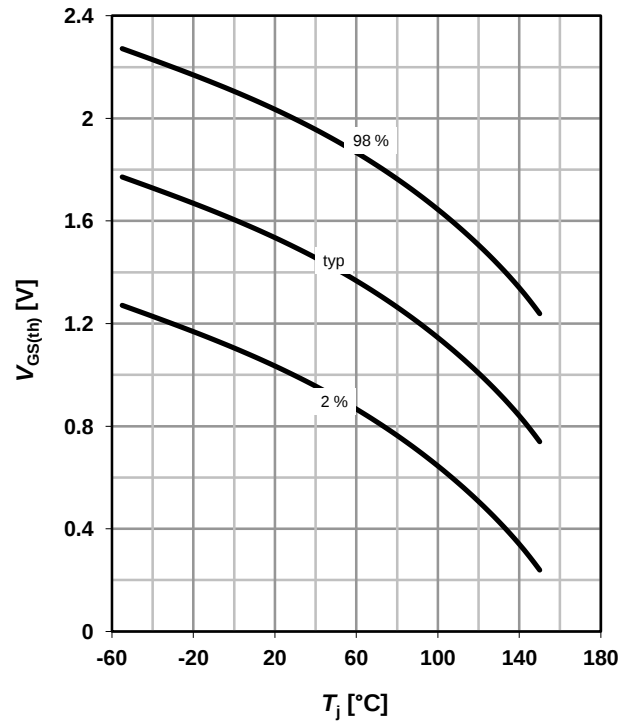
$R_{DS(on)} = f(T_j)$ ;  $I_D = -1.5 \text{ A}$ ;  $V_{GS} = -10 \text{ V}$



## 10 Typ. gate threshold voltage

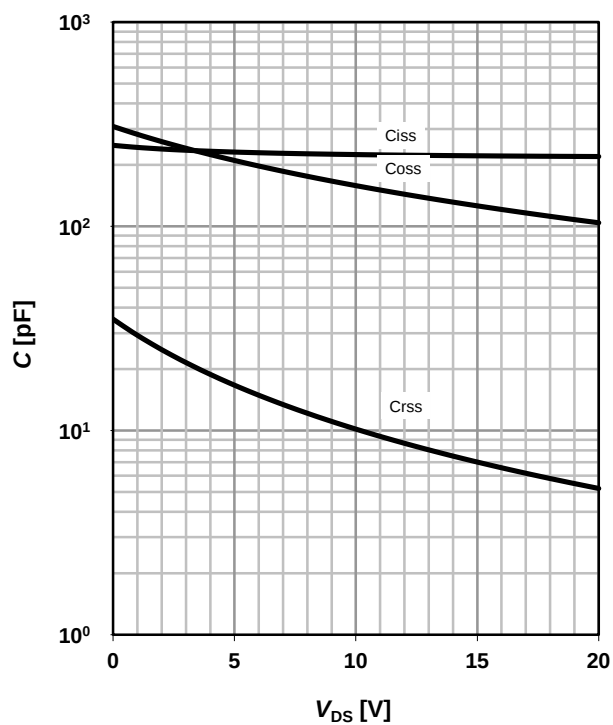
$V_{GS(th)} = f(T_j)$ ;  $V_{DS} = V_{GS}$ ;  $I_D = -6.3 \mu\text{A}$

parameter:  $I_D$



## 11 Typ. capacitances

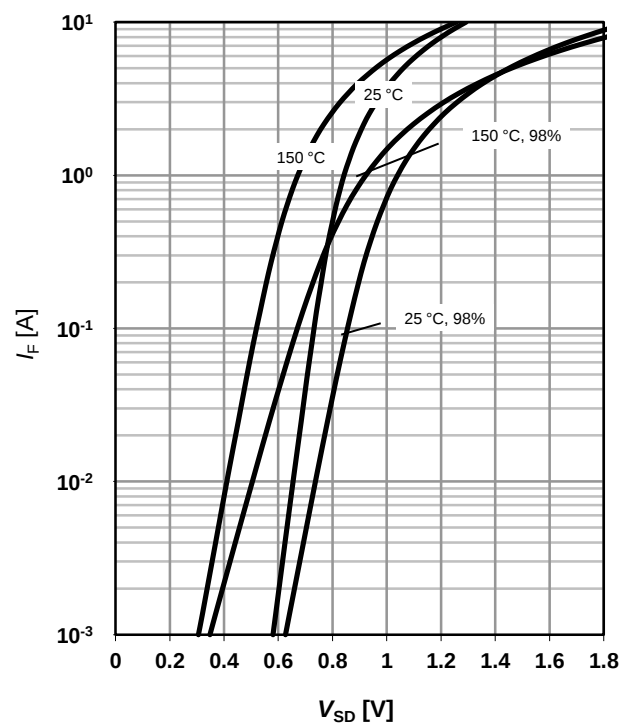
$C = f(V_{DS})$ ;  $V_{GS} = 0 \text{ V}$ ;  $f = 1 \text{ MHz}$ ;  $T_j = 25^\circ\text{C}$



## 12 Forward characteristics of reverse diode

$I_F = f(V_{SD})$

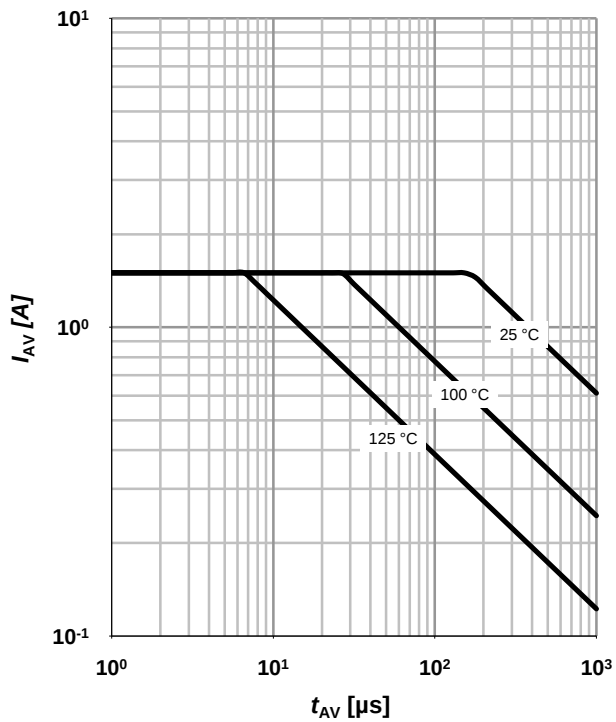
parameter:  $T_j$



### 13 Avalanche characteristics

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

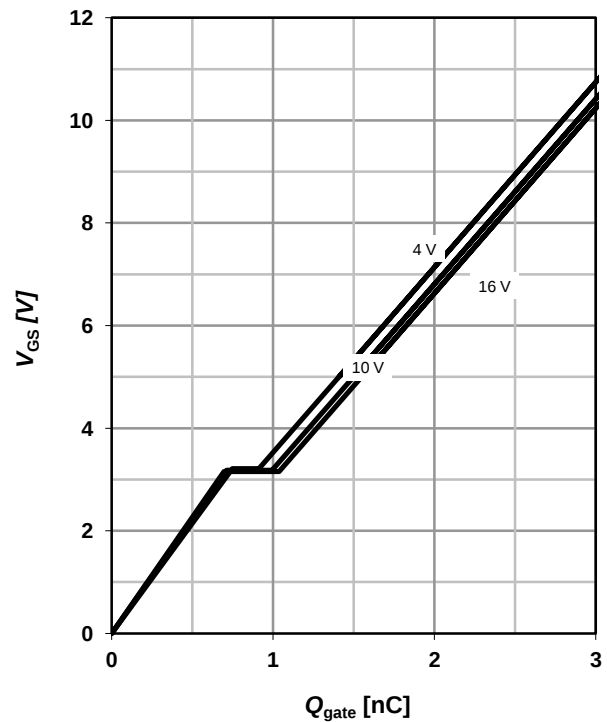
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

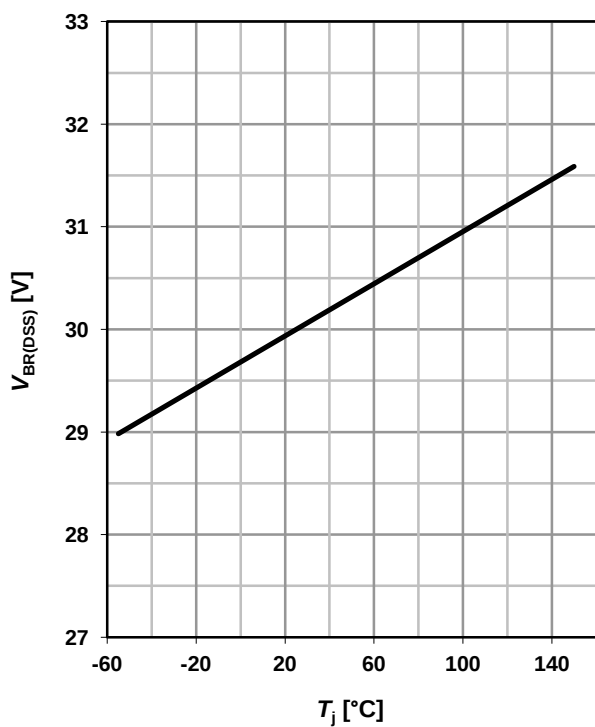
$V_{GS}=f(Q_{\text{gate}}); I_D=-1.5\ \text{A pulsed}$

parameter:  $V_{DD}$

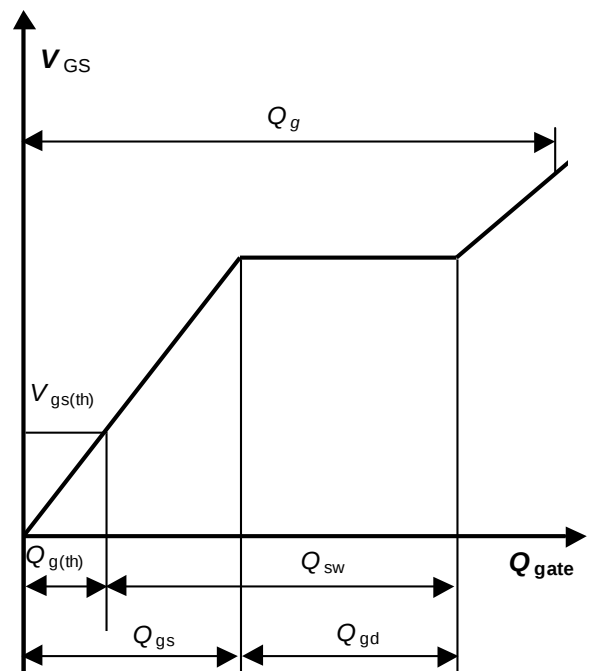


### 15 Drain-source breakdown voltage

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

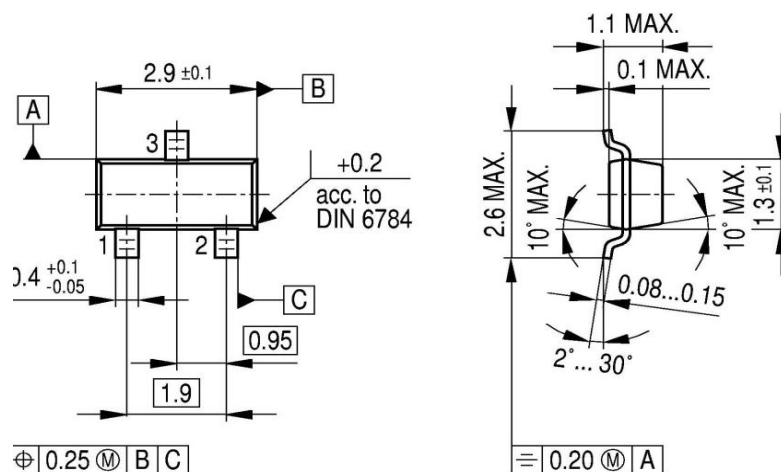


### 16 Gate charge waveforms



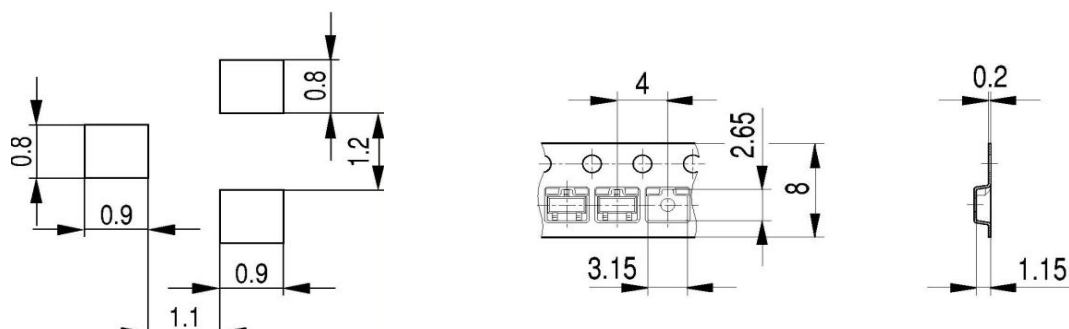
# SOT-23

## Package Outline:



## Footprint:

## Packaging:



Dimensions in mm

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