

## OptiMOS™ Small-Signal-Transistor

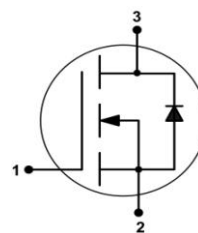
### Features

- N-channel
- Enhancement mode
- Logic level (4.5V rated)
- Avalanche rated
- Qualified according to AEC Q101
- 100% lead-free; RoHS compliant, Halogen free

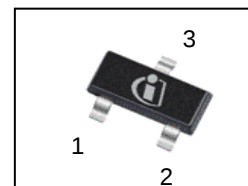


### Product Summary

|                  |                       |            |
|------------------|-----------------------|------------|
| $V_{DS}$         | 100                   | V          |
| $R_{DS(on),max}$ | $V_{GS}=10\text{ V}$  | 6 $\Omega$ |
|                  | $V_{GS}=4.5\text{ V}$ | 10         |
| $I_D$            | 0.19                  | A          |



PG-SOT23



| Type    | Package | Tape and Reel Information | Marking | Halogen Free | Packing |
|---------|---------|---------------------------|---------|--------------|---------|
| BSS123N | SOT23   | H6327: 3000 pcs/ reel     | SAs     | Yes          | Non dry |

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

| Parameter                           | Symbol            | Conditions                                                                                                      | Value                  | Unit               |
|-------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| Continuous drain current            | $I_D$             | $T_A=25\text{ °C}$                                                                                              | 0.19                   | A                  |
|                                     |                   | $T_A=70\text{ °C}$                                                                                              | 0.15                   |                    |
| Pulsed drain current                | $I_{D,pulse}$     | $T_A=25\text{ °C}$                                                                                              | 0.77                   |                    |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=0.19\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                 | 2.0                    | mJ                 |
| Reverse diode $dv/dt$               | $dv/dt$           | $I_D=0.19\text{ A}$ , $V_{DS}=80\text{ V}$ ,<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            | $^{\circ}\text{C}$ |
| ESD Class                           |                   | JESD22-A114 -HBM                                                                                                | 0 (<250V)              |                    |
| Soldering Temperature               |                   |                                                                                                                 | 260 $^{\circ}\text{C}$ |                    |
| IEC climatic category; DIN IEC 68-1 |                   |                                                                                                                 | 55/150/56              |                    |

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

**Thermal characteristics**

|                                           |            |                                 |   |   |     |     |
|-------------------------------------------|------------|---------------------------------|---|---|-----|-----|
| Thermal resistance,<br>junction - 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   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$             | 100 | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=13\text{ }\mu\text{A}$                  | 0.8 | 1.4  | 1.8  |               |
| Drain-source leakage current     | $I_{DSS}$     | $V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$  | -   | -    | 0.01 | $\mu\text{A}$ |
|                                  |               | $V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ °C}$ | -   | -    | 5    |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                     | -   | -    | 10   | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=4.5\text{ V}, I_D=0.15\text{ A}$                    | -   | 2.7  | 10   | $\Omega$      |
|                                  |               | $V_{GS}=10\text{ V}, I_D=0.19\text{ A}$                     | -   | 2.4  | 6    |               |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.15\text{ A}$           |     | 0.41 | -    | S             |

<sup>1)</sup> Performed on 40mm<sup>2</sup> FR4 PCB. The traces are 1mm wide, 70μm 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            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$<br>$f=1\text{ MHz}$                          | - | 15.7 | 20.9 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                       | - | 3.4  | 4.5  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                       | - | 2.1  | 3.1  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=0.19\text{ A}, R_{G,ext}=6\ \Omega$ | - | 2.3  | 3.5  | ns |
| Rise time                    | $t_r$        |                                                                                       | - | 3.2  | 4.6  |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                       | - | 7.4  | 11.1 |    |
| Fall time                    | $t_f$        |                                                                                       | - | 22   | 33   |    |

**Gate Charge Characteristics**

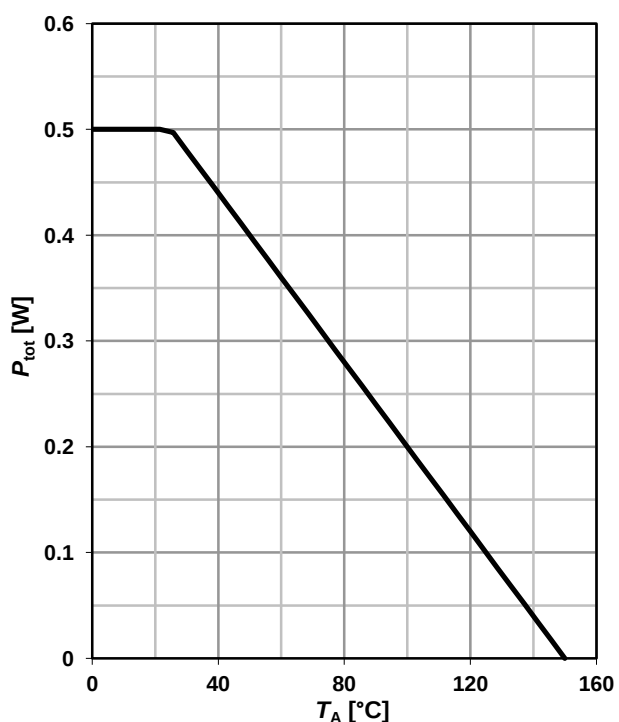
|                       |               |                                                                              |   |      |      |    |
|-----------------------|---------------|------------------------------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=50\text{ V}, I_D=0.19\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 0.04 | 0.06 | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                              | - | 0.23 | 0.35 |    |
| Gate charge total     | $Q_g$         |                                                                              | - | 0.6  | 0.9  |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                              | - | 2.5  | -    | V  |

**Reverse Diode**

|                                  |               |                                                                             |   |     |      |    |
|----------------------------------|---------------|-----------------------------------------------------------------------------|---|-----|------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                          | - | -   | 0.19 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                             | - | -   | 0.77 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=0.19\text{ A},$<br>$T_j=25\text{ °C}$               | - | 0.8 | 1.1  | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=50\text{ V}, I_F=0.19\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 12  | 18   | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                             | - | 4.3 | 6.5  | nC |

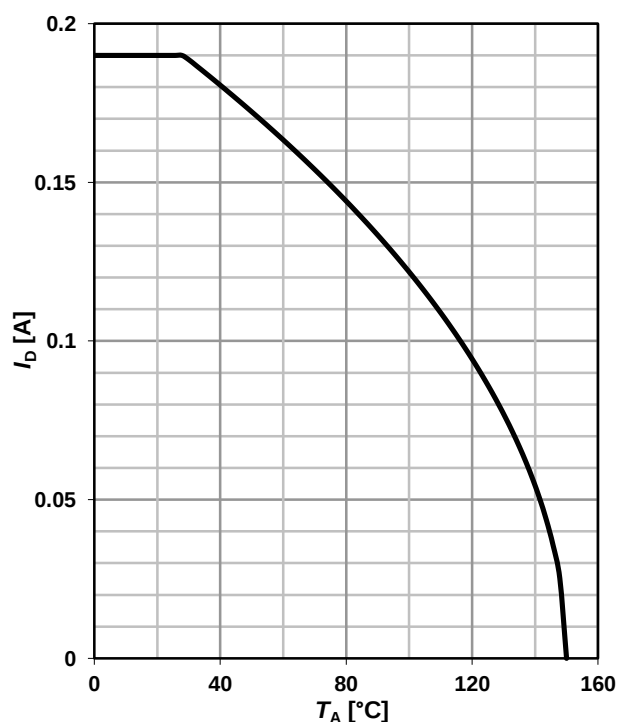
### 1 Power dissipation

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



### 2 Drain current

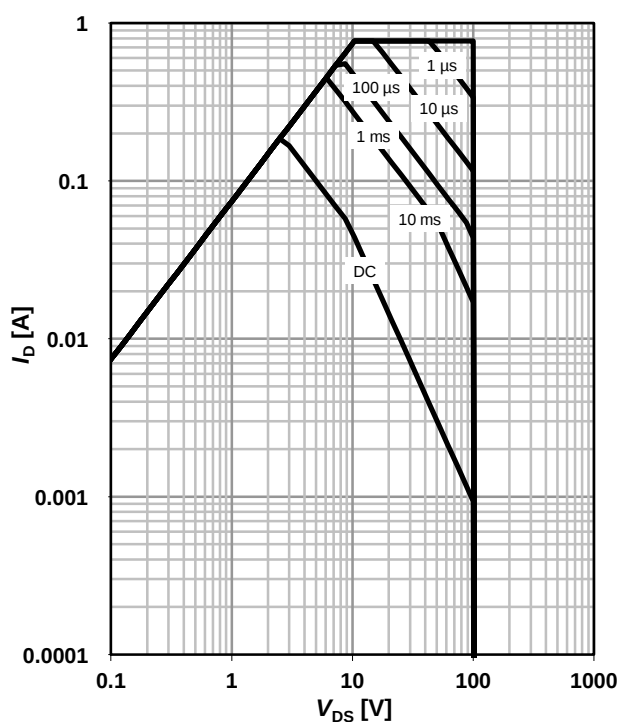
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

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

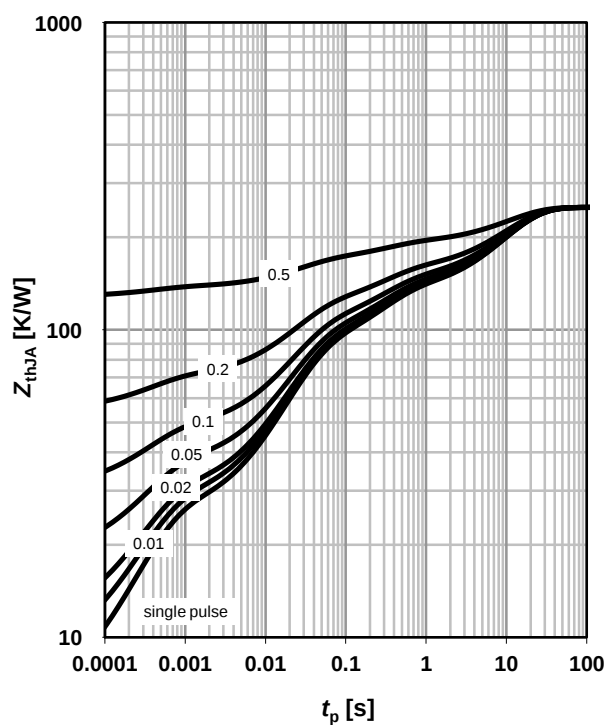
parameter:  $t_p$



### 4 Max. transient thermal impedance

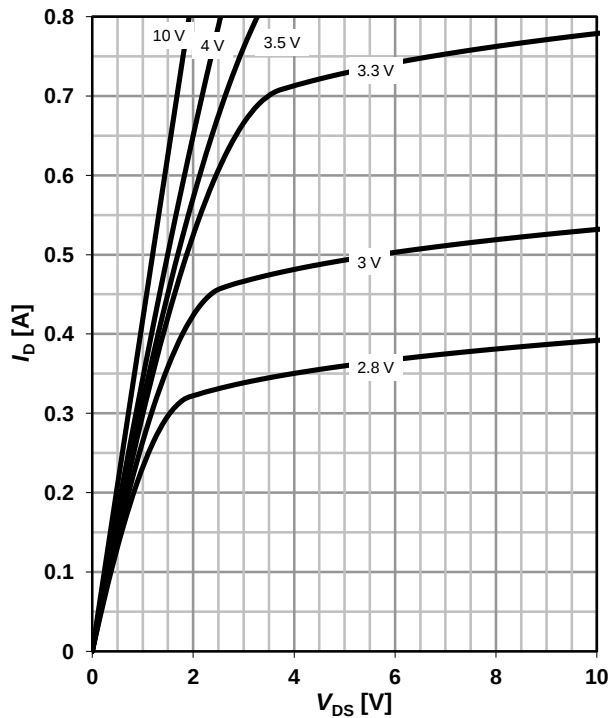
$$Z_{\text{thJA}} = f(t_p)$$

parameter:  $D = t_p/T$



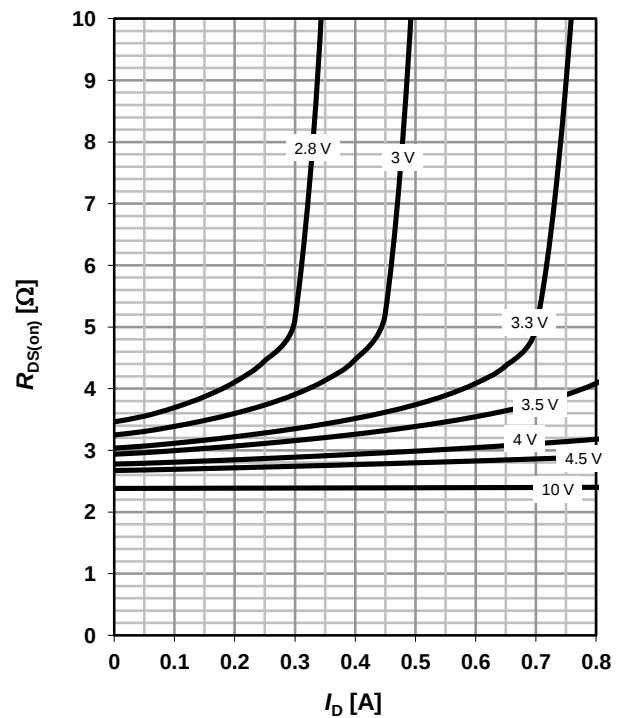
### 5 Typ. output characteristics

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

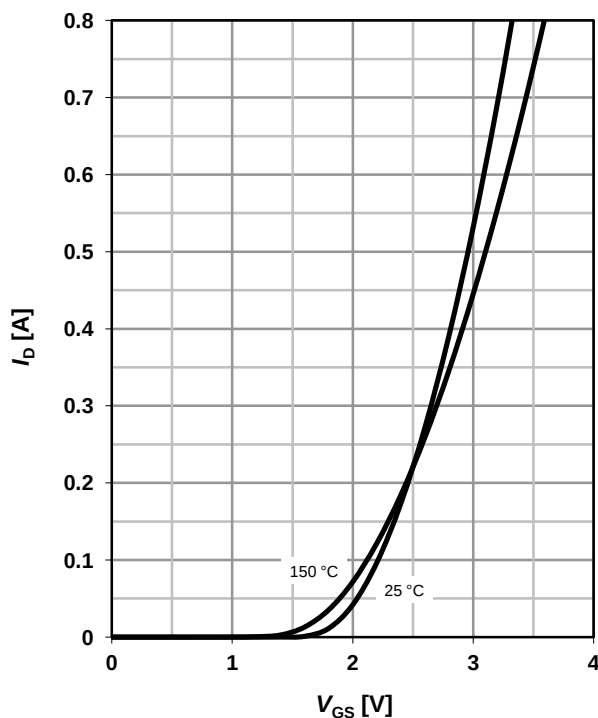
parameter:  $V_{GS}$ 


### 6 Typ. drain-source on resistance

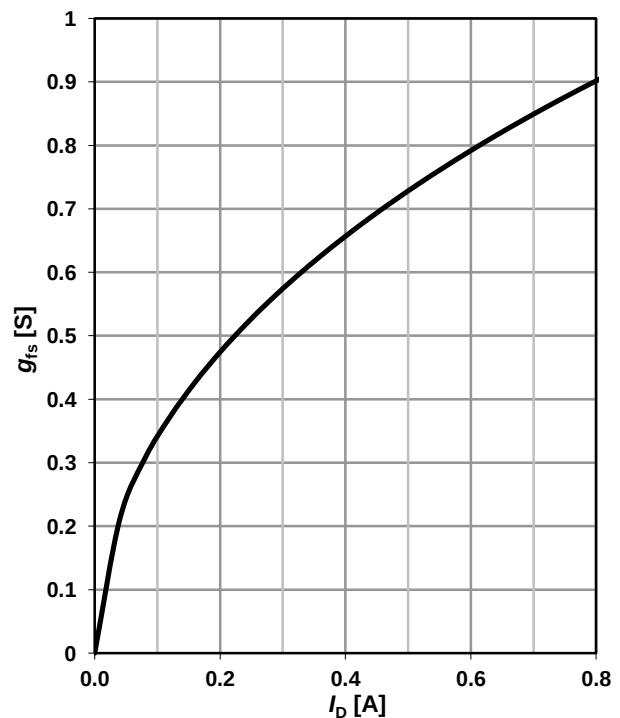
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$ 

parameter:  $V_{GS}$ 


### 7 Typ. transfer characteristics

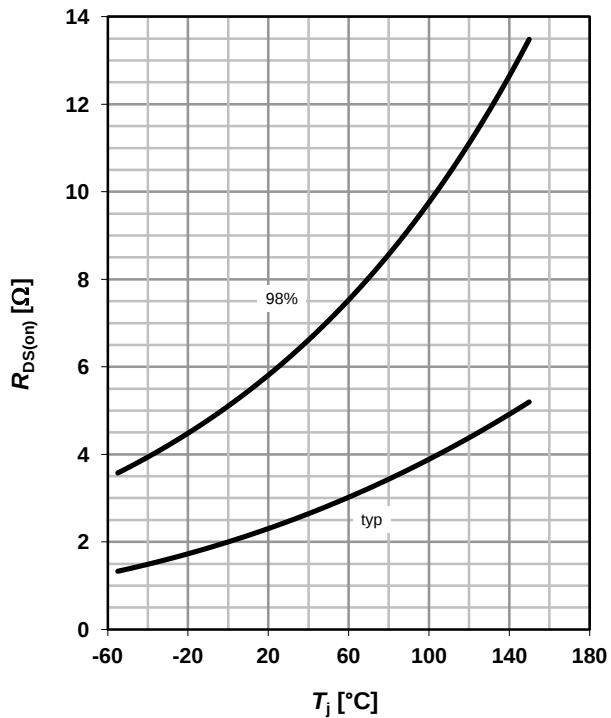
 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$ 


### 8 Typ. forward transconductance

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


### 9 Drain-source on-state resistance

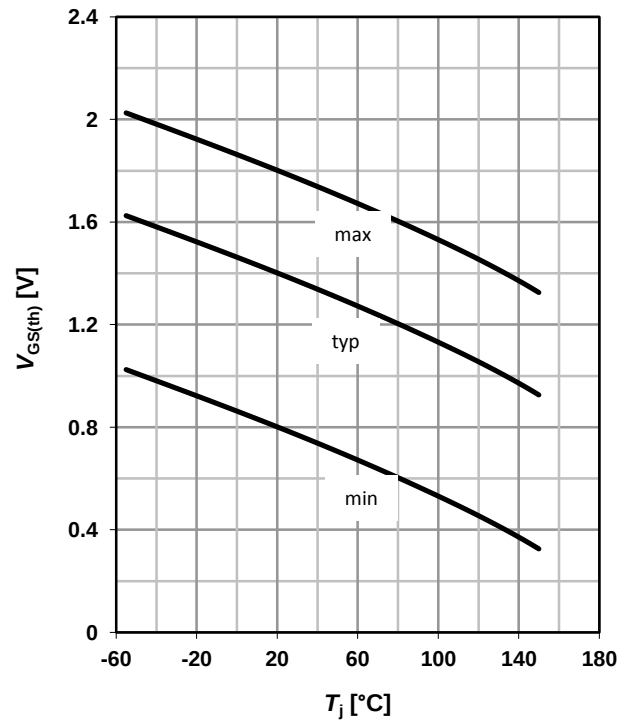
$$R_{DS(on)} = f(T_j); I_D = 0.19 \text{ A}; V_{GS} = 10 \text{ V}$$



### 10 Typ. gate threshold voltage

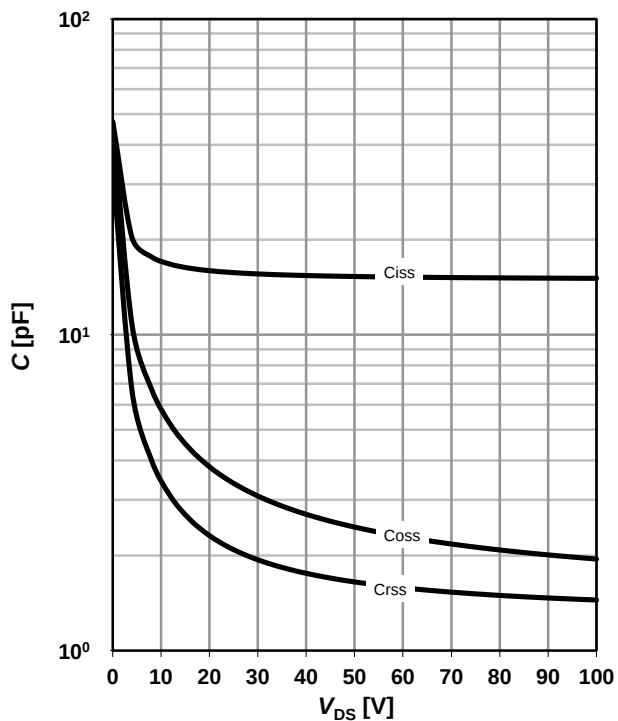
$$V_{GS(th)} = f(T_j); V_{DS} = V_{GS}; I_D = 13 \mu\text{A}$$

parameter:  $I_D$



### 11 Typ. capacitances

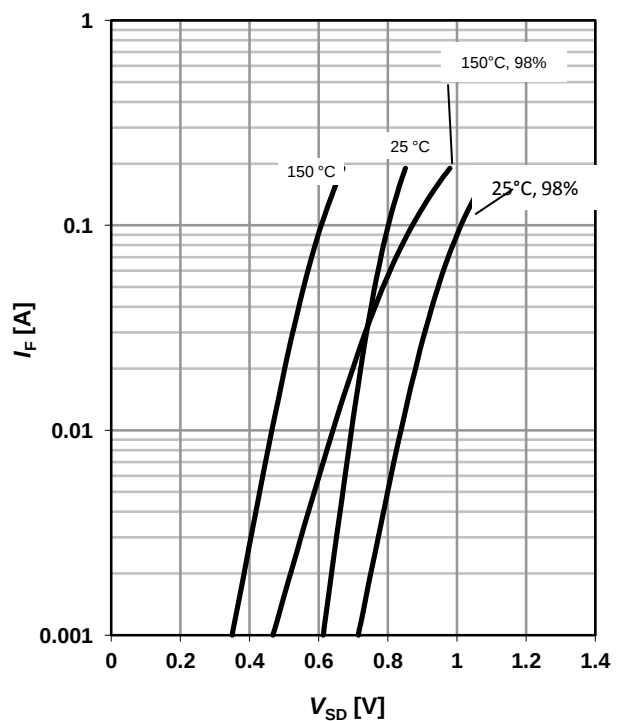
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25^\circ\text{C}$$



### 12 Forward characteristics of reverse diode

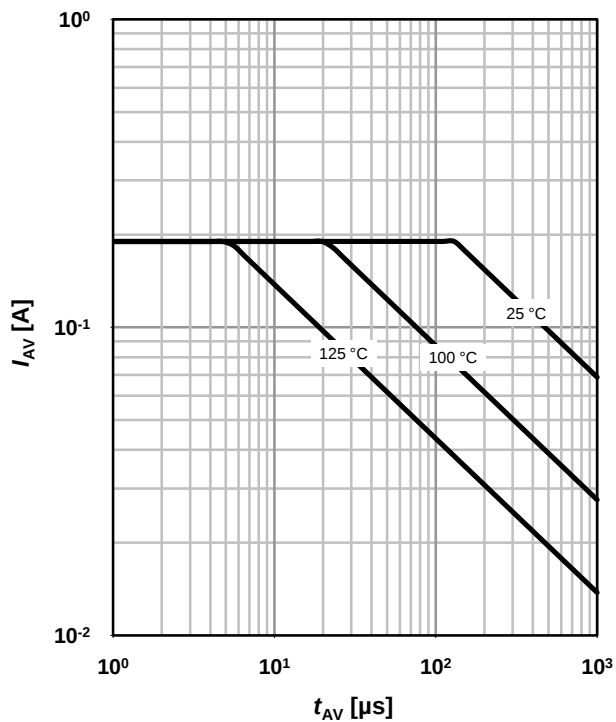
$$I_F = f(V_{SD})$$

parameter:  $T_j$



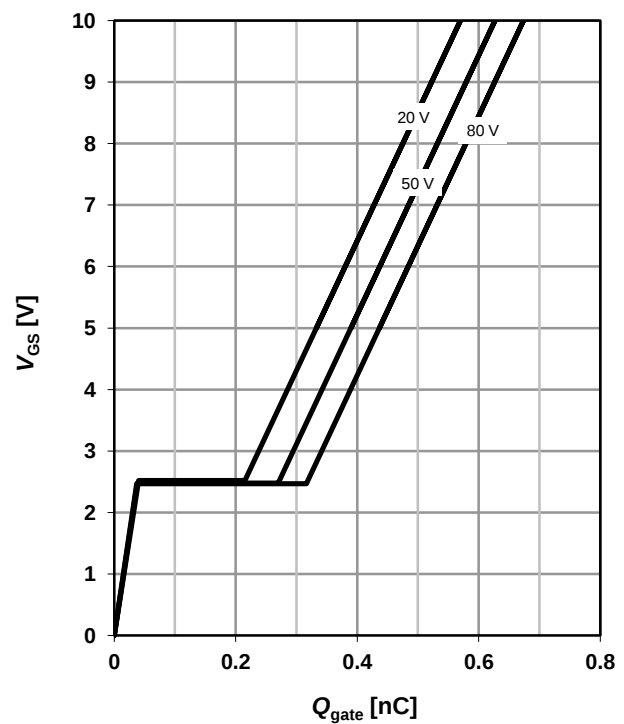
### 13 Avalanche characteristics

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

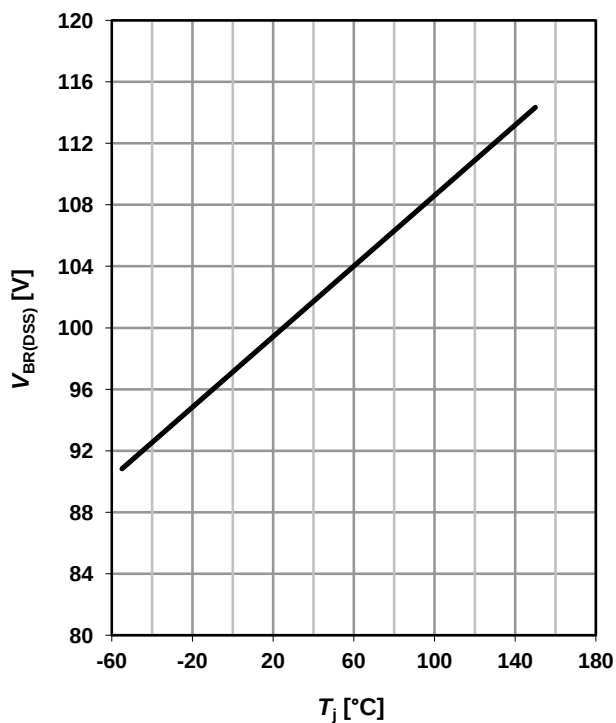
parameter:  $T_{j(\text{start})}$ 


### 14 Typ. gate charge

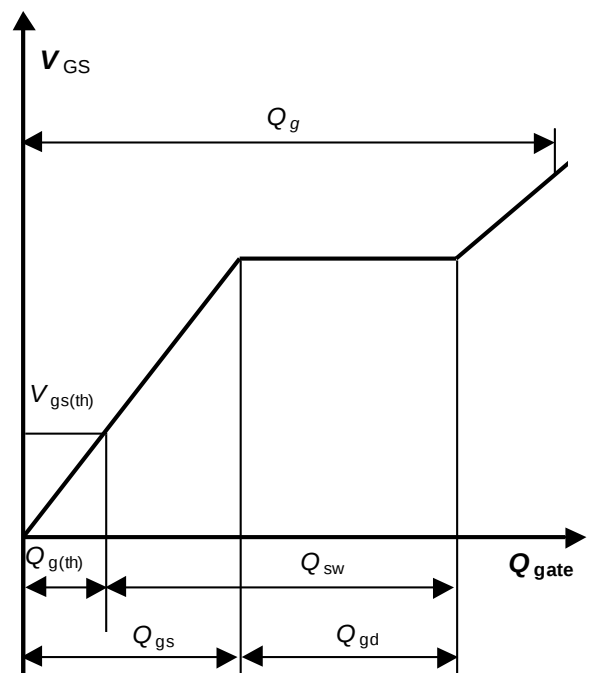
 $V_{GS}=f(Q_{\text{gate}}); I_D=0.19\ \text{A pulsed}$ 

parameter:  $V_{DD}$ 


### 15 Drain-source breakdown voltage

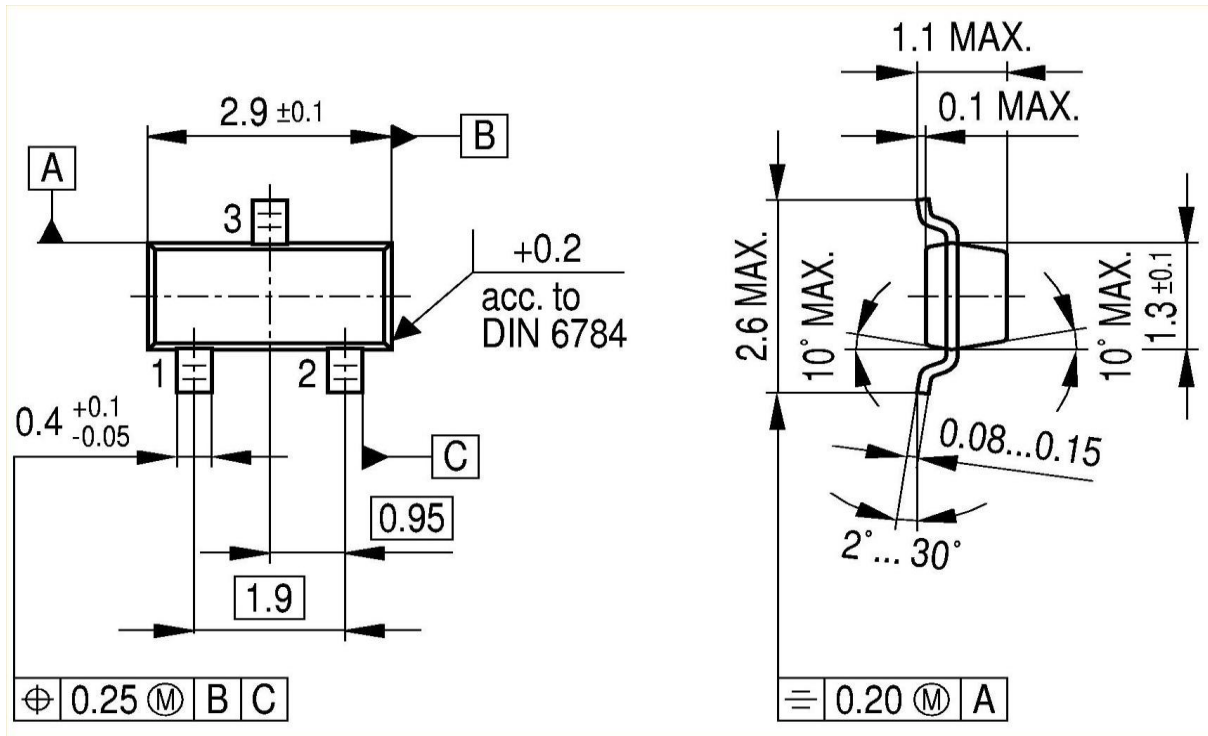
 $V_{BR(DSS)}=f(T_j); I_D=250\ \mu\text{A}$ 


### 16 Gate charge waveforms

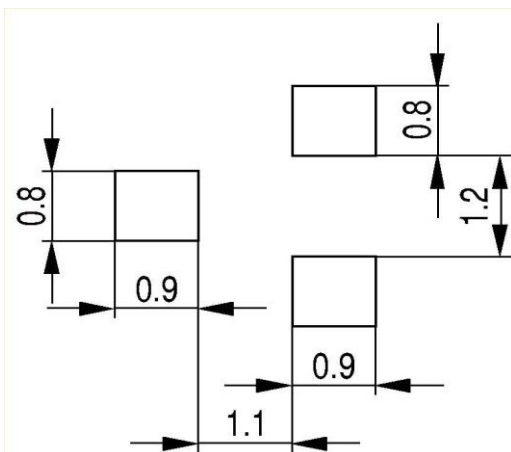


## SOT23

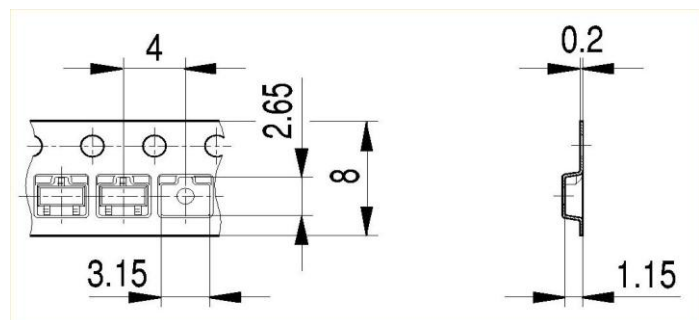
## Package Outline:



## Footprint:



## Packaging:



Dimensions in mm

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