

# SIPMOS® Small-Signal-Transistor

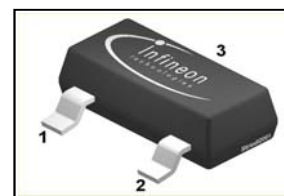
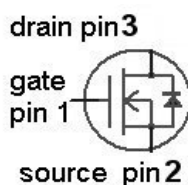
## Features

- N-channel
- Depletion mode
- $dv/dt$  rated
- Available with  $V_{GS(th)}$  indicator on reel
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

## Product Summary

|                  |       |          |
|------------------|-------|----------|
| $V_{DS}$         | 600   | V        |
| $R_{DS(on),max}$ | 700   | $\Omega$ |
| $I_{DSS,min}$    | 0.007 | A        |

## PG-SOT-23



Halogen-Free

| Type   | Package   | Pb-free | Tape and Reel Information                                       | Marking |
|--------|-----------|---------|-----------------------------------------------------------------|---------|
| BSS126 | PG-SOT-23 | Yes     | H6327: 3000 pcs/reel                                            | SHs     |
| BSS126 | PG-SOT-23 | Yes     | H6906: 3000 pcs/reel sorted in $V_{GS(th)}$ bands <sup>1)</sup> | SHs     |

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

| Parameter                                | Symbol         | Conditions                                                                                                          | Value              | Unit              |
|------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|
| Continuous drain current                 | $I_D$          | $T_A=25\text{ °C}$                                                                                                  | 0.021              | A                 |
|                                          |                | $T_A=70\text{ °C}$                                                                                                  | 0.017              |                   |
| Pulsed drain current                     | $I_{D,pulse}$  | $T_A=25\text{ °C}$                                                                                                  | 0.085              |                   |
| Reverse diode $dv/dt$                    | $dv/dt$        | $I_D=0.016\text{ A}$ ,<br>$V_{DS}=20\text{ V}$ ,<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                 |
| ESD sensitivity (HBM) as per JESD22-A114 |                |                                                                                                                     | Class 0 (0 >250 V) |                   |
| Power dissipation                        | $P_{tot}$      | $T_A=25\text{ °C}$                                                                                                  | 0.50               | W                 |
| Operating and storage temperature        | $T_j, T_{stg}$ |                                                                                                                     | -55 ... 150        | °C                |
| IEC climatic category; DIN IEC 68-1      |                |                                                                                                                     | 55/150/56          |                   |

<sup>1)</sup> see table on next page and diagram 11

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

**Thermal characteristics**

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

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

|                                  |               |                                                                   |       |       |      |               |
|----------------------------------|---------------|-------------------------------------------------------------------|-------|-------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=-5\text{ V}, I_D=250\text{ }\mu\text{A}$                  | 600   | -     | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=3\text{ V}, I_D=8\text{ }\mu\text{A}$                     | -2.7  | -2.0  | -1.6 |               |
| Drain-source cutoff current      | $I_{D(off)}$  | $V_{DS}=600\text{ V},$<br>$V_{GS}=-5\text{ V}, T_j=25\text{ °C}$  | -     | -     | 0.1  | $\mu\text{A}$ |
|                                  |               | $V_{DS}=600\text{ V},$<br>$V_{GS}=-5\text{ V}, T_j=125\text{ °C}$ | -     | -     | 10   |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                           | -     | -     | 100  | nA            |
| On-state drain current           | $I_{DSS}$     | $V_{GS}=0\text{ V}, V_{DS}=25\text{ V}$                           | 7     | -     | -    | mA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=0\text{ V}, I_D=3\text{ mA}$                              | -     | 320   | 700  | $\Omega$      |
|                                  |               | $V_{GS}=10\text{ V}, I_D=16\text{ mA}$                            | -     | 280   | 500  |               |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max},$<br>$I_D=0.01\text{ A}$            | 0.008 | 0.017 | -    | S             |

**Threshold voltage  $V_{GS(th)}$  sorted in bands<sup>2)</sup>**

|   |              |                                               |       |   |       |   |
|---|--------------|-----------------------------------------------|-------|---|-------|---|
| J | $V_{GS(th)}$ | $V_{DS}=3\text{ V}, I_D=8\text{ }\mu\text{A}$ | -1.8  | - | -1.6  | V |
| K |              |                                               | -1.95 | - | -1.75 |   |
| L |              |                                               | -2.1  | - | -1.9  |   |
| M |              |                                               | -2.25 | - | -2.05 |   |
| N |              |                                               | -2.4  | - | -2.2  |   |

<sup>2)</sup> Each reel contains transistors out of one band whose identifying letter is printed on the reel label. A specific band cannot be ordered separately.

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

**Dynamic characteristics**

|                                                      |              |                                                                                           |   |     |      |    |
|------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------|---|-----|------|----|
| $I_D=f(V_{GS}); V_{DS}=3\text{ V}; T_j=25\text{ °C}$ | $C_{iss}$    | $V_{GS}=-5\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$                                  | - | 21  | 28   | pF |
| Output capacitance                                   | $C_{oss}$    |                                                                                           | - | 2.4 | 3.2  |    |
| Reverse transfer capacitance                         | $C_{rss}$    |                                                                                           | - | 1.0 | 1.5  |    |
| Turn-on delay time                                   | $t_{d(on)}$  | $V_{DD}=300\text{ V}, V_{GS}=-3\ldots-7\text{ V}, I_D=0.01\text{ A}, R_G=6\text{ }\Omega$ | - | 6.1 | 9.2  | ns |
| Rise time                                            | $t_r$        |                                                                                           | - | 9.7 | 14.5 |    |
| Turn-off delay time                                  | $t_{d(off)}$ |                                                                                           | - | 14  | 21   |    |
| Fall time                                            | $t_f$        |                                                                                           | - | 115 | 170  |    |

**Gate Charge Characteristics**

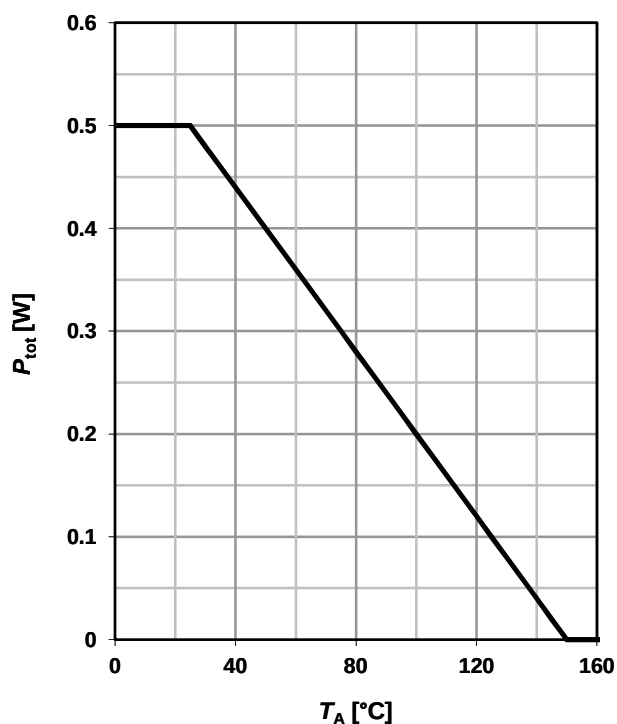
|                       |               |                                                                         |   |      |      |    |
|-----------------------|---------------|-------------------------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=400\text{ V}, I_D=10\text{ mA}, V_{GS}=-3\text{ to }5\text{ V}$ | - | 0.05 | 0.08 | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                         | - | 1.2  | 1.8  |    |
| Gate charge total     | $Q_g$         |                                                                         | - | 1.4  | 2.1  |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                         | - | 0.10 | -    | V  |

**Reverse Diode**

|                                  |               |                                                                         |   |      |       |    |
|----------------------------------|---------------|-------------------------------------------------------------------------|---|------|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                      | - | -    | 0.016 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                         | - | -    | 0.064 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=-5\text{ V}, I_F=16\text{ mA}, T_j=25\text{ °C}$                | - | 0.81 | 1.2   | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=300\text{ V}, I_F=0.01\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$ | - | 160  | 240   | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                         | - | 13.2 | 19.8  | nC |

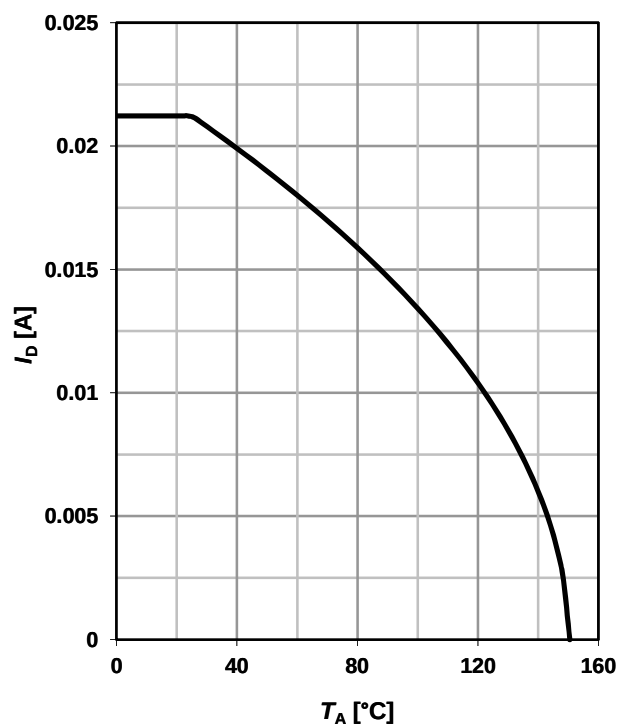
### 1 Power dissipation

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



### 2 Drain current

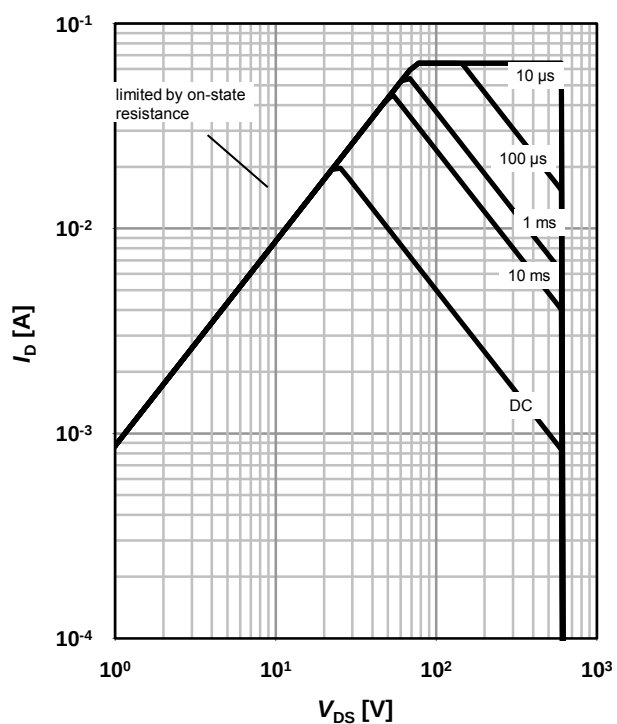
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

$$I_D = f(V_{GS}); V_{DS} = 3 \text{ V}; T_j = 25 \text{ °C}$$

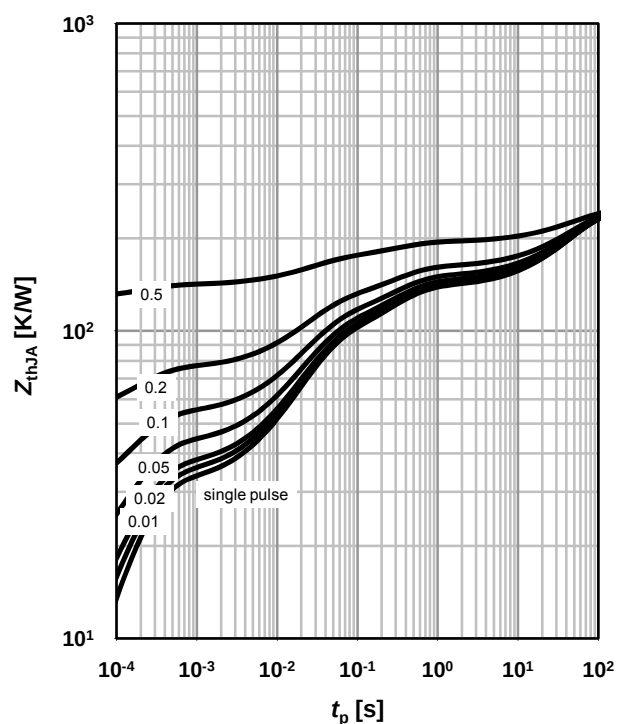
parameter:  $t_p$



### 4 Max. transient thermal impedance

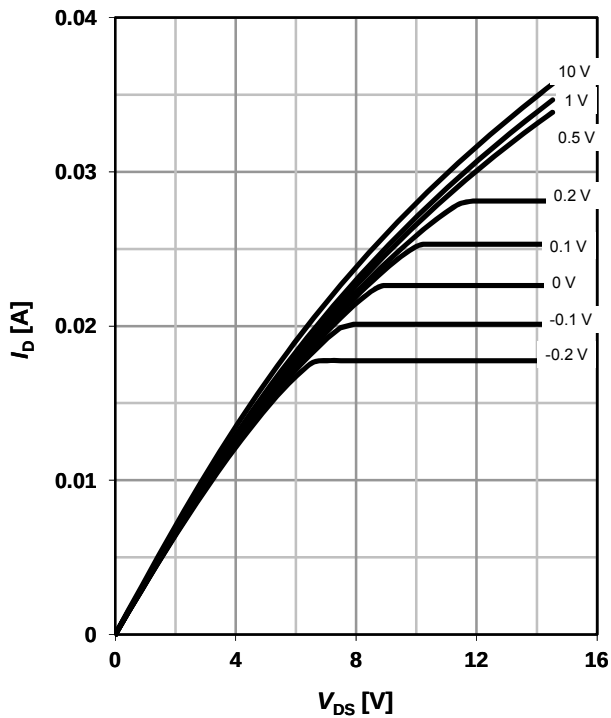
$$Z_{thJA} = f(t_p)$$

parameter:  $D = t_p / T$



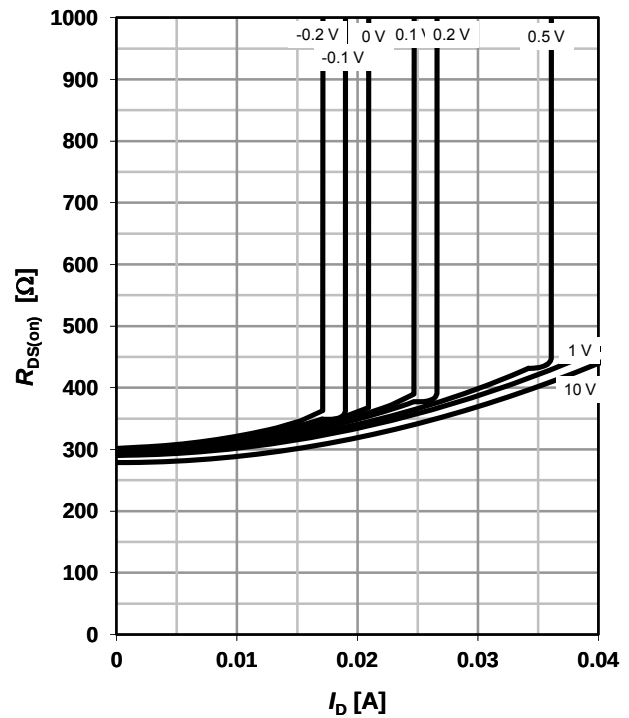
### 5 Typ. output characteristics

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

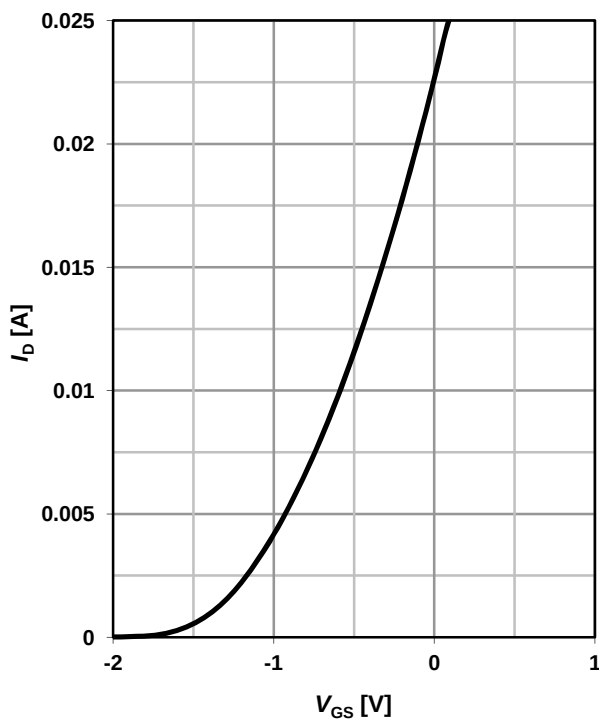
parameter:  $V_{GS}$ 


### 6 Typ. drain-source on resistance

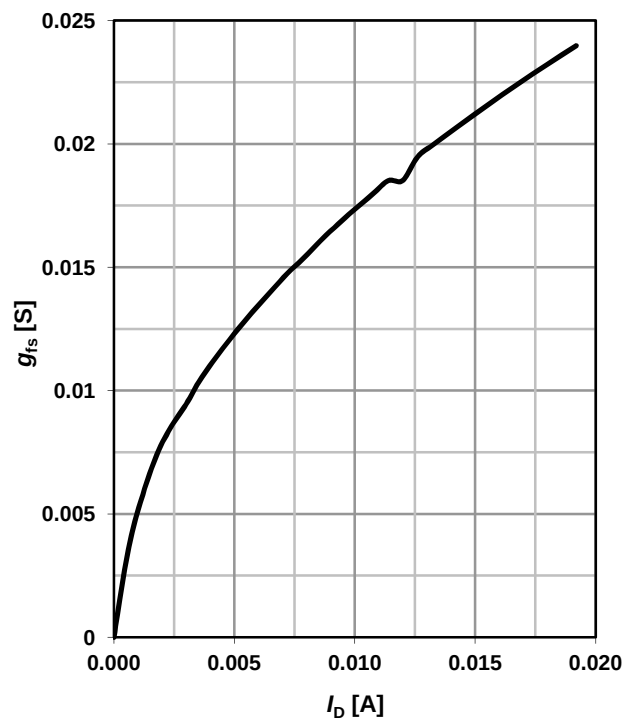
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$ 

parameter:  $V_{GS}$ 


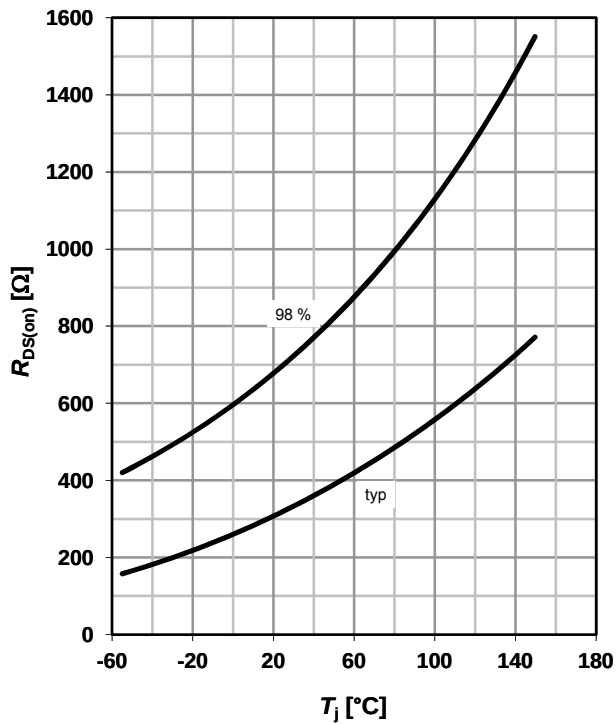
### 7 Typ. transfer characteristics

 $I_D = f(V_{GS}); V_{DS} = 3\text{ V}; T_j = 25^\circ\text{C}$ 


### 8 Typ. forward transconductance

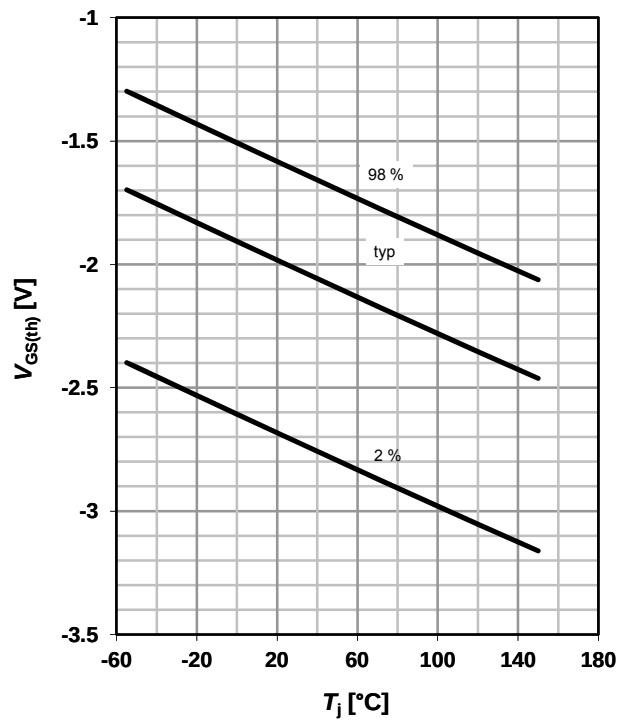
 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$ 


## 9 Drain-source on-state resistance

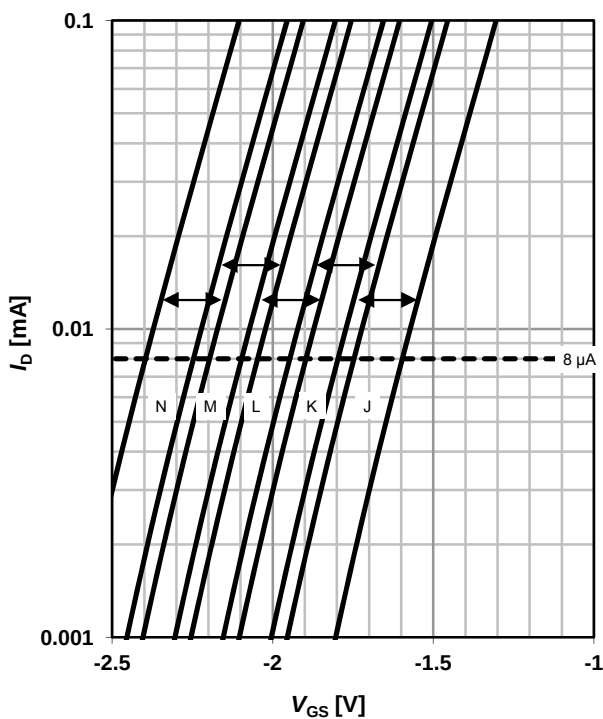
 $R_{DS(on)} = f(T_j); I_D = 0.016 \text{ mA}; V_{GS} = 0 \text{ V}$ 


## 10 Typ. gate threshold voltage

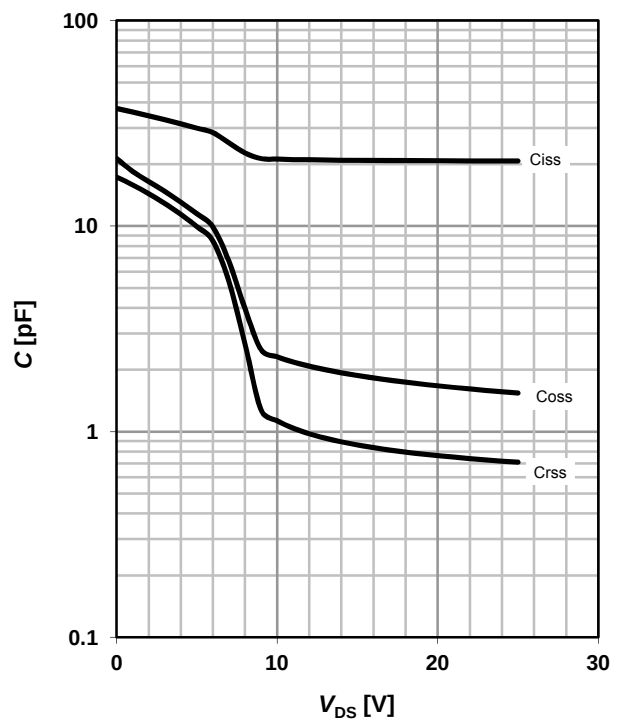
 $V_{GS(th)} = f(T_j); V_{DS} = 3 \text{ V}; I_D = 8 \text{ μA}$ 

parameter:  $I_D$ 


## 11 Threshold voltage bands

 $I_D = f(V_{GS}); V_{DS} = 3 \text{ V}; T_j = 25 \text{ °C}$ 


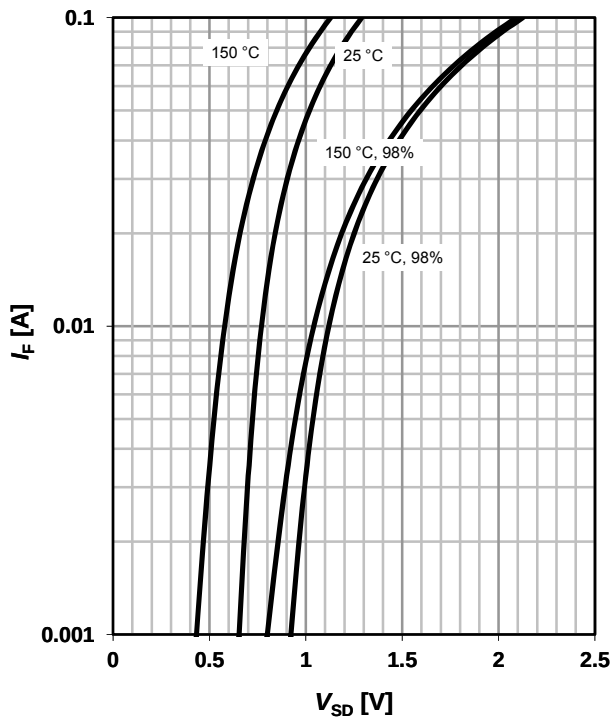
## 12 Typ. capacitances

 $C = f(V_{DS}); V_{GS} = -3 \text{ V}; f = 1 \text{ MHz}$ 


### 13 Forward characteristics of reverse diode

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

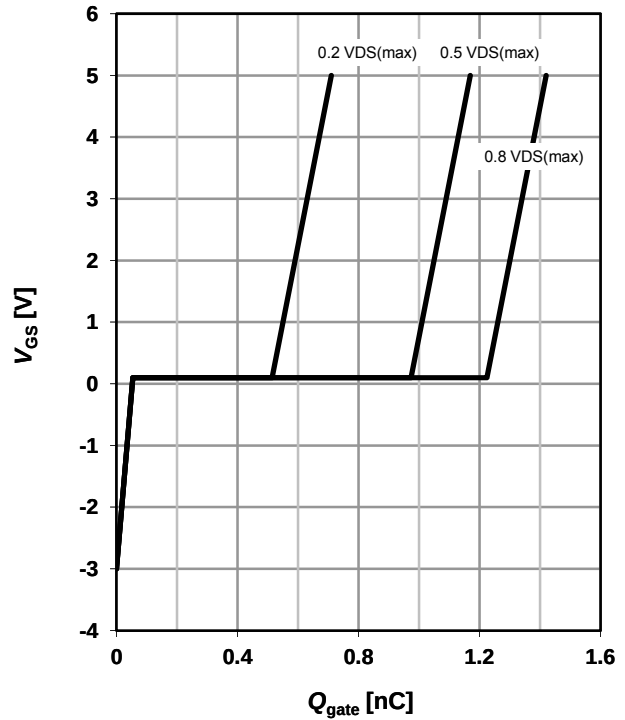
parameter:  $T_j$



### 15 Typ. gate charge

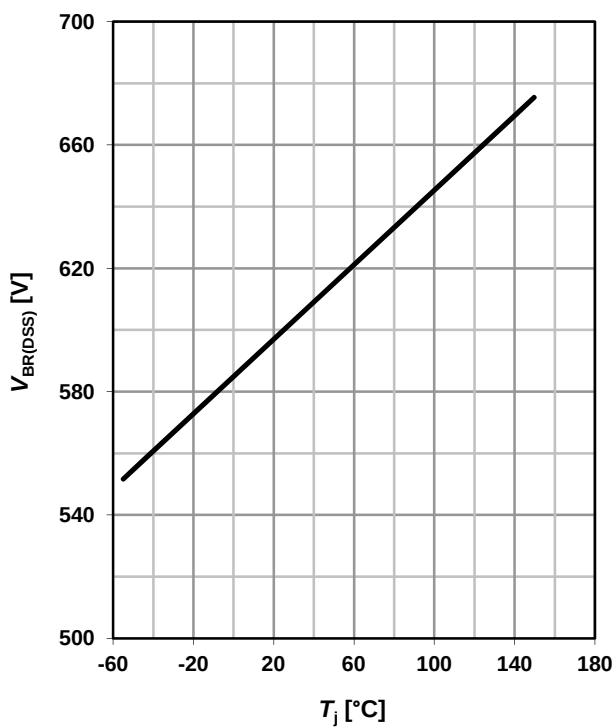
$$V_{GS} = f(Q_{\text{gate}}); I_D = 0.1\text{ A pulsed}$$

parameter:  $V_{DD}$

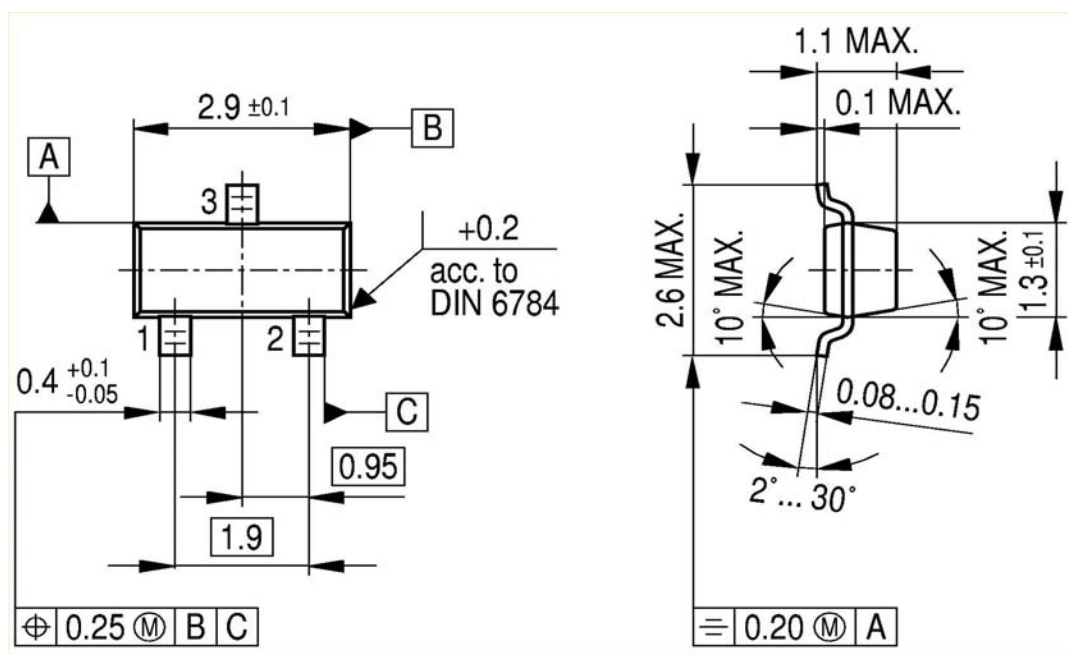


### 16 Drain-source breakdown voltage

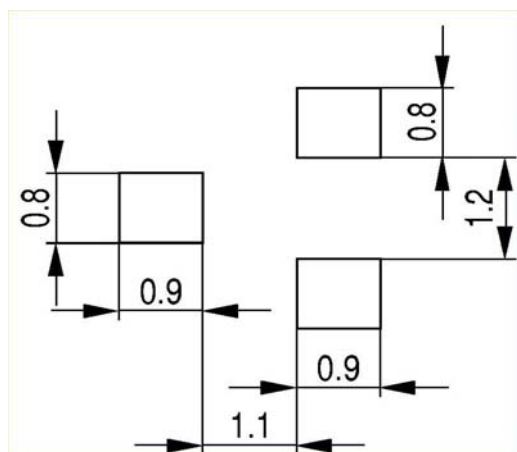
$$I_D = f(V_{GS}); V_{DS} = 3\text{ V}; T_j = 25\text{ }^{\circ}\text{C}$$



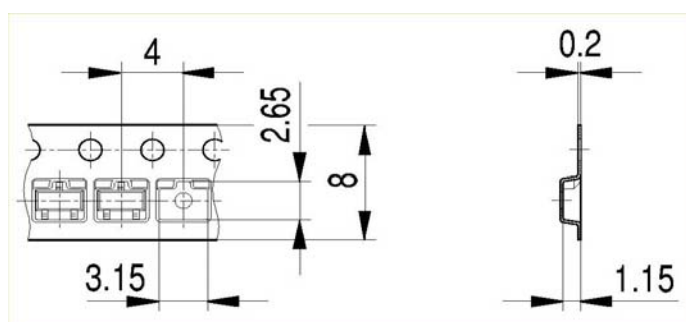
Package Outline:



Footprint:



Packaging:



Dimensions in mm



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