



**THE DATASHEET OF  
BSS159N E6327**

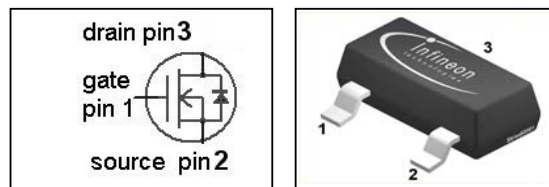


**SIPMOS® Small-Signal-Transistor**
**Features**

- N-channel
- Depletion mode
- $dv/dt$  rated
- Available with  $V_{GS(th)}$  indicator on reel
- Pb-free lead-plating; RoHS compliant

**Product Summary**

|                  |      |          |
|------------------|------|----------|
| $V_{DS}$         | 60   | V        |
| $R_{DS(on),max}$ | 8    | $\Omega$ |
| $I_{DSS,min}$    | 0.13 | A        |

**SOT-23**


| Type   | Package   | Pb-free | Tape and Reel Information                                       | Marking |
|--------|-----------|---------|---|---------|
| BSS159 | PG-SOT-23 | Yes     | L6327: 3000 pcs/reel  | SGs     |
| BSS159 | PG-SOT-23 | Yes     | L6906: 3000 pcs/reel sorted in $V_{GS(th)}$ bands <sup>1)</sup> | SGs     |

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

| Parameter                                | Symbol         | Conditions  | Value       | Unit               |
|--|----------------|---|-------------|--------------------|
| Continuous drain current                 | $I_D$          | $T_A=25\text{ °C}$  | 0.23        | A                  |
|  |                | $T_A=70\text{ °C}$  | 0.18        |                    |
| Pulsed drain current                     | $I_{D,pulse}$  | $T_A=25\text{ °C}$  | 0.92        |                    |
| Reverse diode $dv/dt$                    | $dv/dt$        | $I_D=0.23\text{ A}$ , $V_{DS}=60\text{ V}$ ,<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 MIL-STD 883 |                |   | Class 0     |                    |
| Power dissipation                        | $P_{tot}$      | $T_A=25\text{ °C}$  | 0.36        | W                  |
| Operating and storage temperature        | $T_j, T_{stg}$ |   | -55 ... 150 | $^{\circ}\text{C}$ |
| 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. |      |
| <b>Thermal characteristics</b> |            |                   |        |      |      |      |
| Thermal characteristics        | $R_{thJA}$ | minimal footprint | -      | -    | 350  | K/W  |

Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified

**Static characteristics**

|                                  |               |   |      |      |      |               |
|----------------------------------|---------------|---|------|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=-10\text{ V}, I_D=250\text{ }\mu\text{A}$                             | 60   | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=3\text{ V}, I_D=26\text{ }\mu\text{A}$                                | -3.5 | -2.8 | -2.4 |               |
| Drain-source cutoff current      | $I_{D(off)}$  | $V_{DS}=60\text{ V},$<br>$V_{GS}=-10\text{ V}, T_j=25\text{ }^\circ\text{C}$  | -    | -    | 0.1  | $\mu\text{A}$ |
|                                  |               | $V_{DS}=60\text{ V},$<br>$V_{GS}=-10\text{ V}, T_j=125\text{ }^\circ\text{C}$ | -    | -    | 10   |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                                       | -    | -    | 10   | nA            |
| On-state drain current           | $I_{DSS}$     | $V_{GS}=0\text{ V}, V_{DS}=10\text{ V}$                                       | 130  | -    | -    | mA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=0\text{ V}, I_D=0.07\text{ A}$  | -    | 3.9  | 8    | $\Omega$      |
|                                  |               | $V_{GS}=10\text{ V}, I_D=0.16\text{ A}$                                       | -    | 1.7  | 3.5  |               |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max},$<br>$I_D=0.16\text{ A}$                        | 0.1  | 0.19 | -    | S             |

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

|   |              |  |       |   |       |   |
|---|--------------|--|-------|---|-------|---|
| J | $V_{GS(th)}$ | $V_{DS}=3\text{ V}, I_D=26\text{ }\mu\text{A}$ | -2.6  | - | -2.4  | V |
| K |              |  | -2.75 | - | -2.55 |   |
| L |              |  | -2.9  | - | -2.7  |   |
| M |              |  | -3.05 | - | -2.85 |   |
| N |              |  | -3.2  | - | -3    |   |

<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**

|                                |              |   |   |     |     |    |
|--------------------------------|--------------|---|---|-----|-----|----|
| Input capacitance              | $C_{iss}$    | $V_{GS}=-10\text{ V}, V_{DS}=25\text{ V},$<br>$f=1\text{ MHz}$                              | - | 33  | 44  | pF |
| <b>Dynamic characteristics</b> | $C_{oss}$    |   | - | 8.3 | 11  |    |
| Reverse transfer capacitance   | $C_{rss}$    |   | - | 3.9 | 5.9 |    |
| Turn-on delay time             | $t_{d(on)}$  | $V_{DD}=25\text{ V},$<br>$V_{GS}=-3\dots 7\text{ V},$<br>$I_D=0.16\text{ A}, R_G=6\ \Omega$ | - | 3.1 | 4.7 | ns |
| Rise time                      | $t_r$        |   | - | 2.9 | 4.4 |    |
| Turn-off delay time            | $t_{d(off)}$ |   | - | 9   | 13  |    |
| Fall time                      | $t_f$        |   | - | 9   | 13  |    |

**Gate Charge Characteristics**

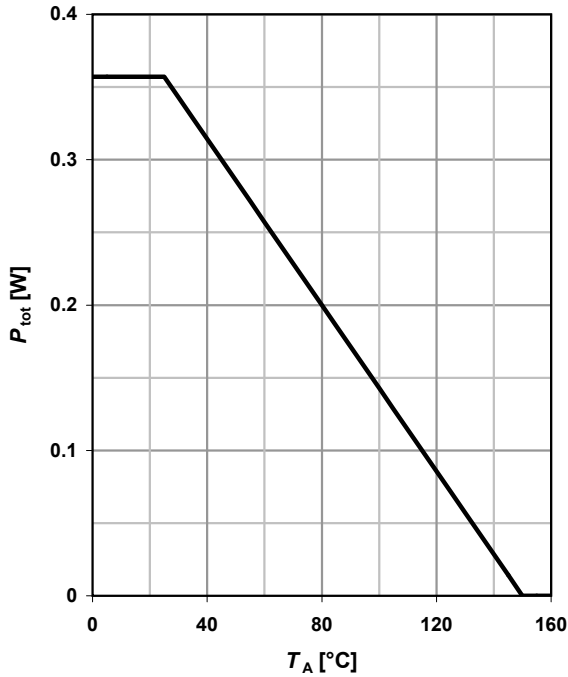
|                       |               |  |   |       |      |    |
|-----------------------|---------------|--|---|-------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=40\text{ V}, I_D=0.16\text{ A},$<br>$V_{GS}=-3\text{ to }5\text{ V}$ | - | 0.14  | 0.21 | nC |
| Gate to drain charge  | $Q_{gd}$      |  | - | 0.7   | 1.1  |    |
| Gate charge total     | $Q_g$         |  | - | 2.2   | 2.9  |    |
| Gate plateau voltage  | $V_{plateau}$ |  | - | -0.14 | -    | V  |

**Reverse Diode**

|                                  |               |   |   |      |      |    |
|----------------------------------|---------------|---|---|------|------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ }^\circ\text{C}$  | - | -    | 0.20 | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -    | 0.81 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=-3\text{ V}, I_F=0.16\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$  | - | 0.79 | 1.2  | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=30\text{ V}, I_F=0.16\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 10.4 | 13   | ns |
| Reverse recovery charge          | $Q_{rr}$      |   | - | 3.3  | 4.1  |    |

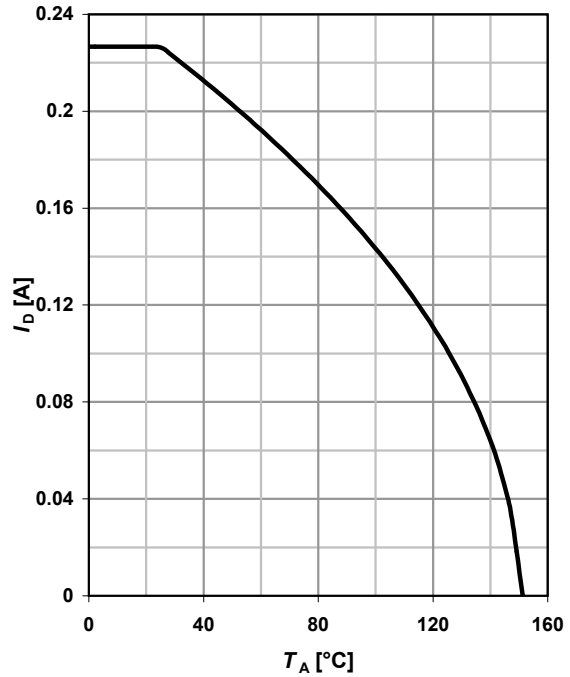
**1 Power dissipation**

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



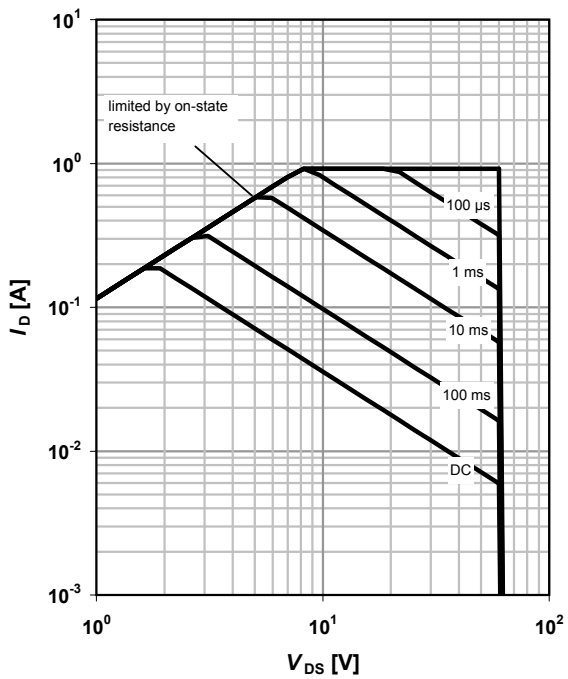
**2 Drain current**

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



**3 Safe operating area**

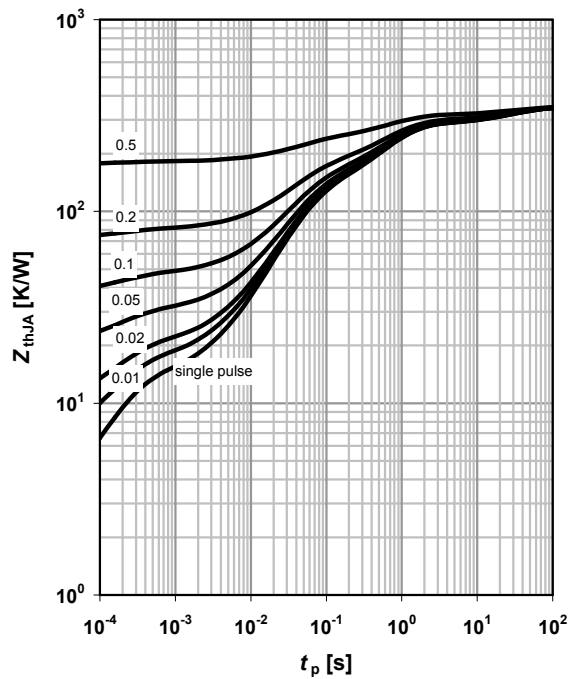
$$I_D = f(V_{DS}); T_A = 25 \text{ °C}; D = 0$$



**4 Max. transient thermal impedance**

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

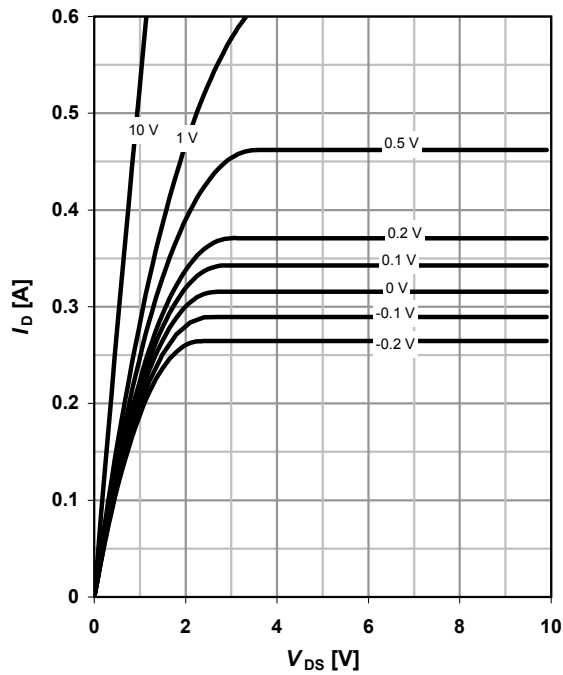
parameter:  $D = t_p / T$



**5 Typ. output characteristics**

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

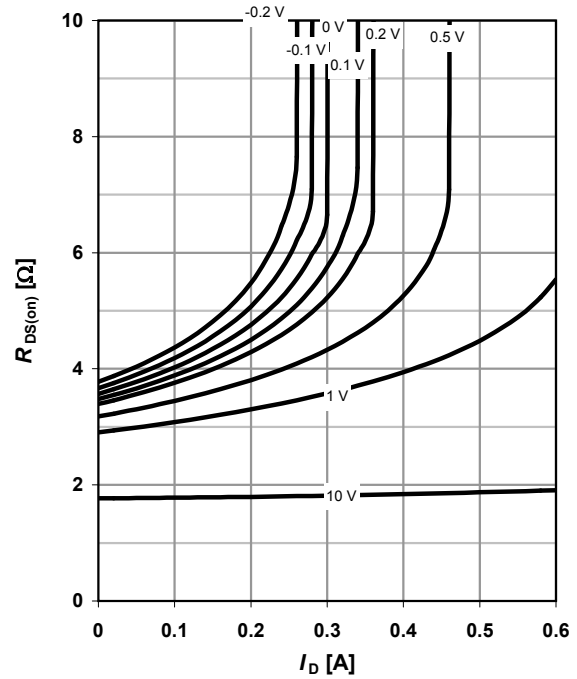
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

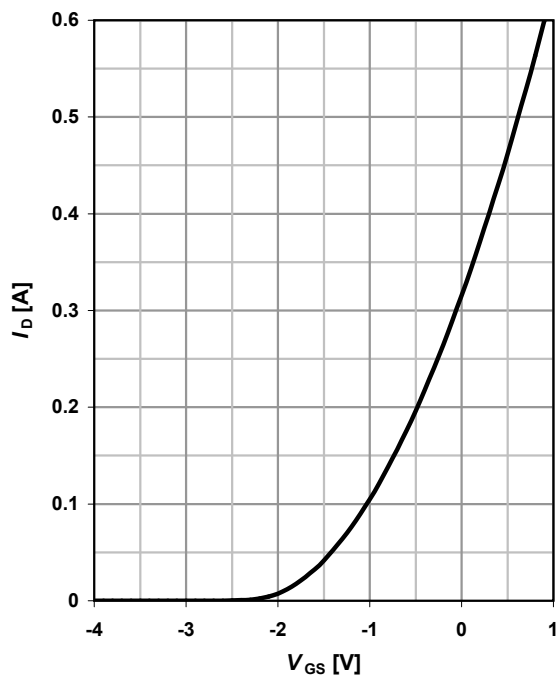
$$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$$

parameter:  $V_{GS}$



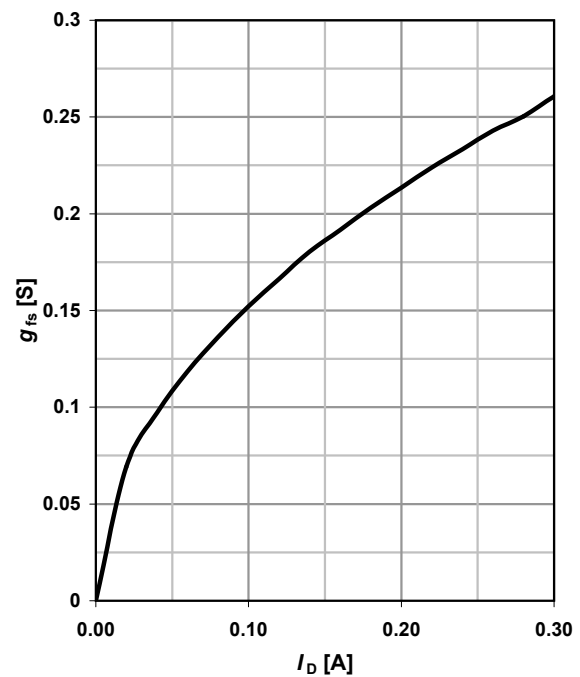
**7 Typ. transfer characteristics**

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



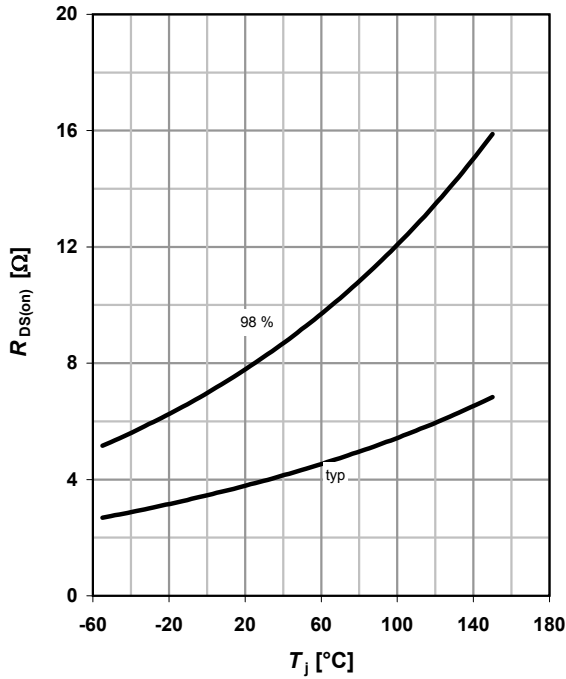
**8 Typ. forward transconductance**

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



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

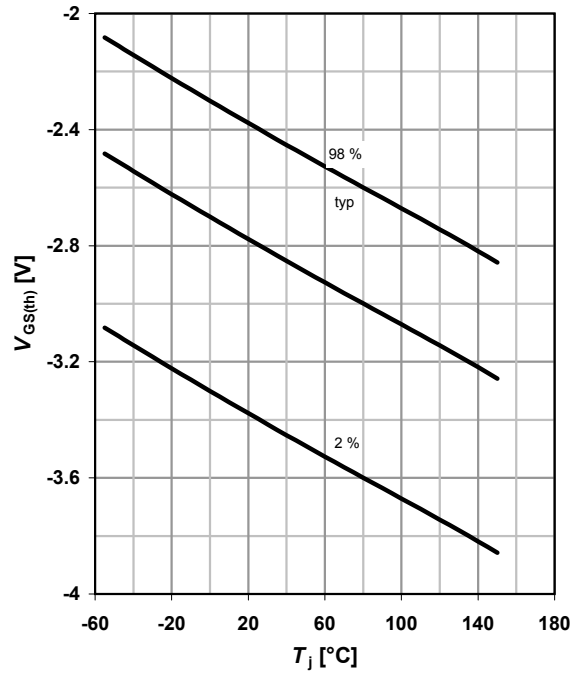
$R_{DS(on)} = f(T_j); I_D = 0.07 \text{ A}; V_{GS} = 0 \text{ V}$



**10 Typ. gate threshold voltage**

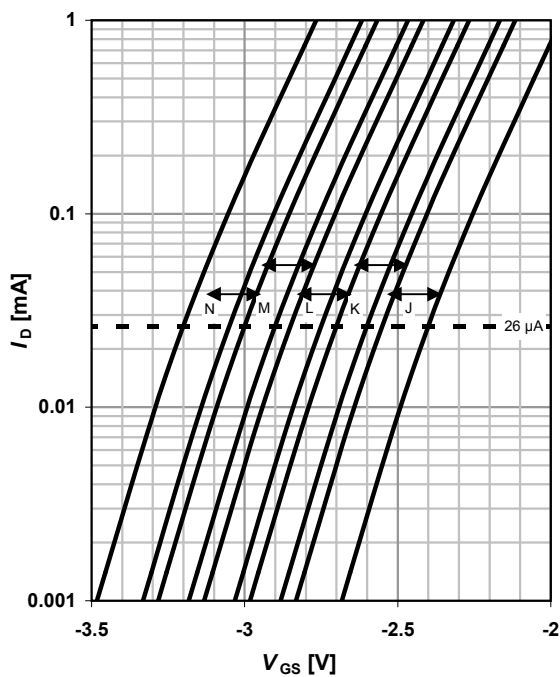
$V_{GS(th)} = f(T_j); V_{DS} = 3 \text{ V}; I_D = 26 \mu\text{A}$

parameter:  $I_D$



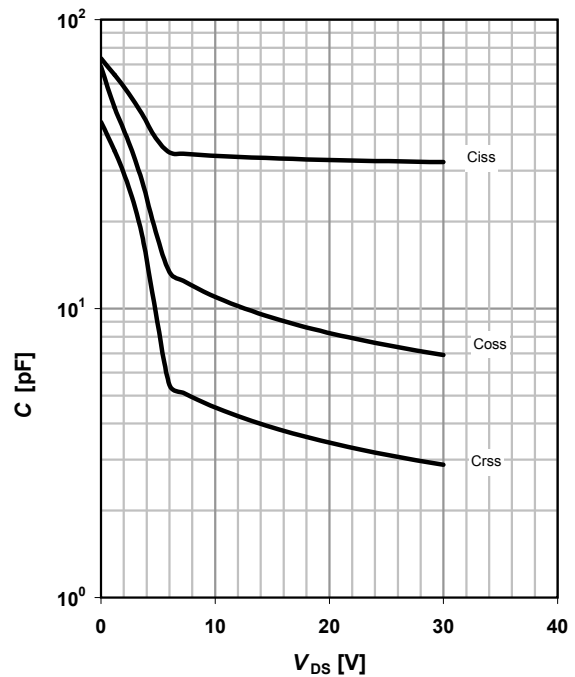
**11 Threshold voltage bands**

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



**12 Typ. capacitances**

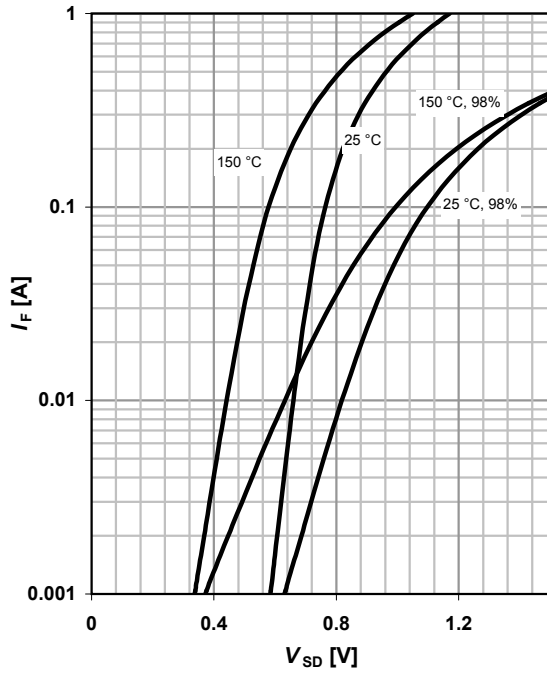
$C = f(V_{DS}); V_{GS} = -10 \text{ V}; f = 1 \text{ MHz}$



**13 Forward characteristics of reverse diode**

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

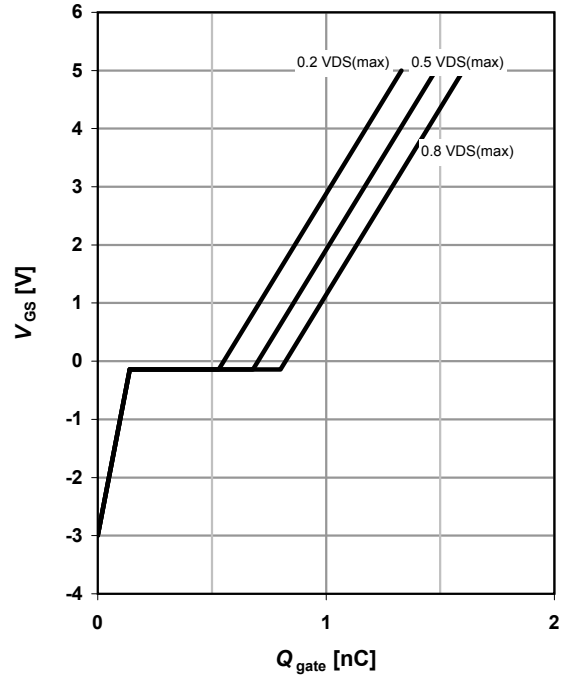
parameter:  $T_j$



**15 Typ. gate charge**

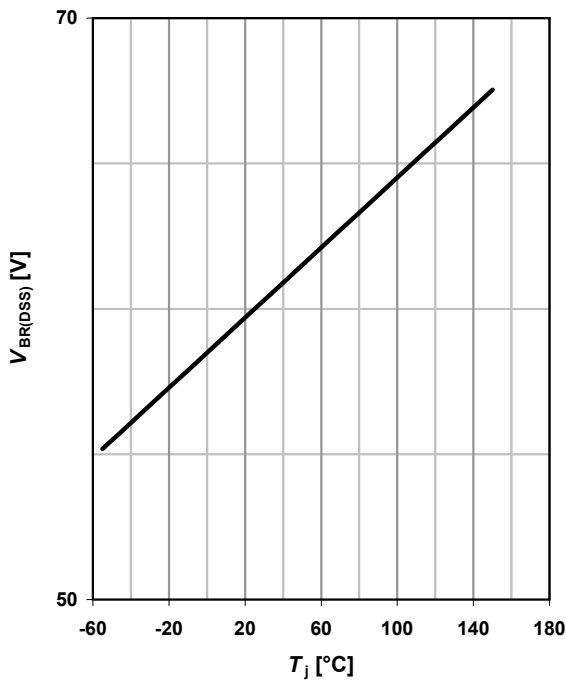
$$V_{GS} = f(Q_{gate}); I_D = 0.16 \text{ A pulsed}$$

parameter:  $V_{DD}$

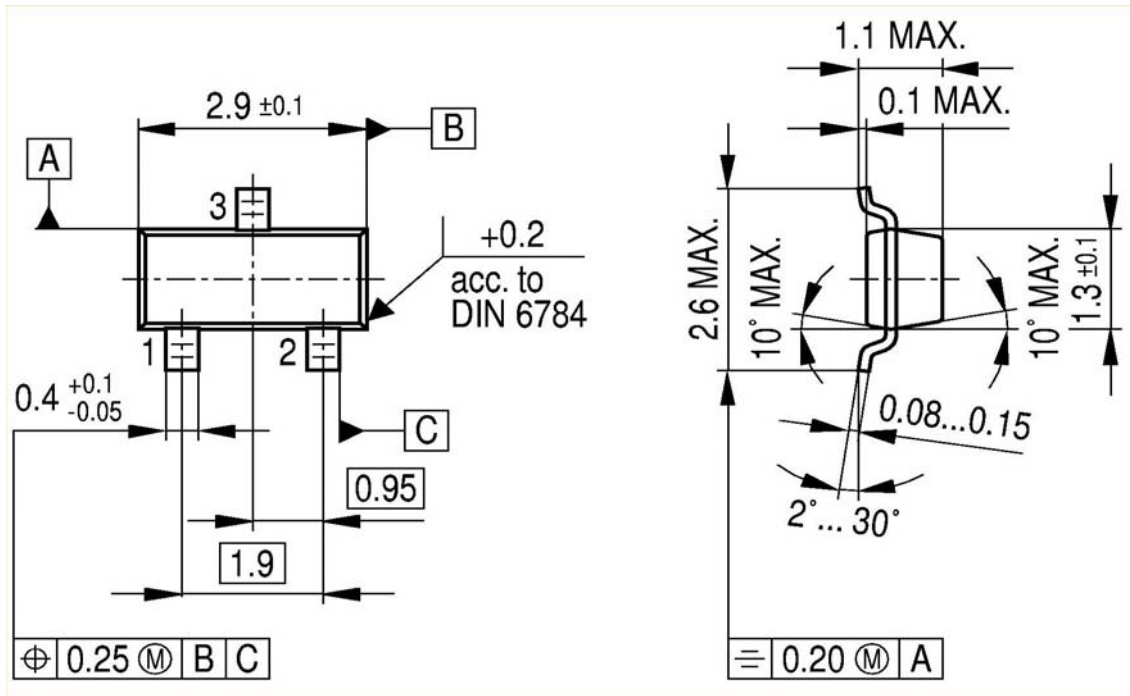


**16 Drain-source breakdown voltage**

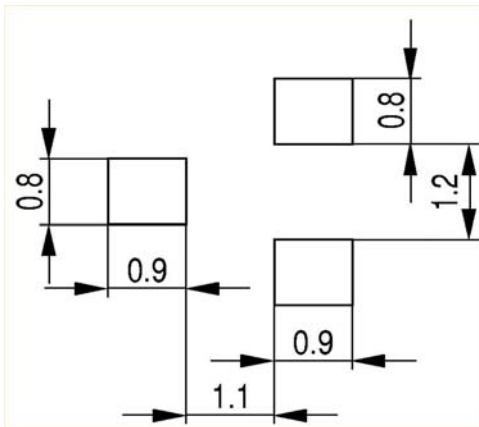
$$V_{BR(DSS)} = f(T_j); I_D = 250 \mu\text{A}$$



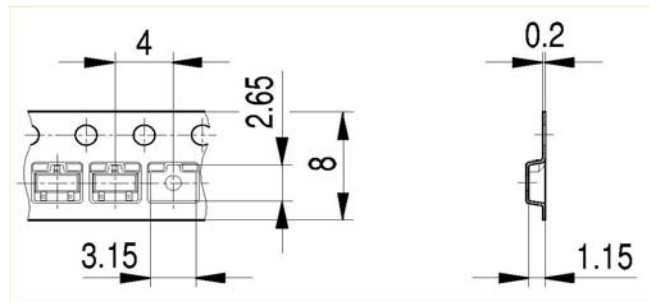
Package Outline:



Footprint:



Packaging:



Dimensions in mm

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