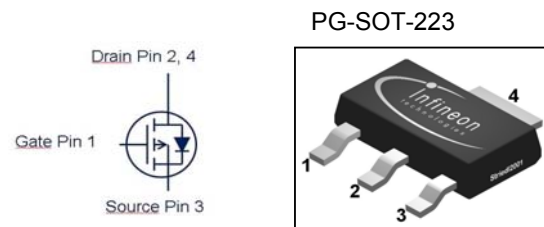


**SIPMOS<sup>®</sup> Small-Signal-Transistor**
**Features**

- P-Channel
- Enhancement mode
- Avalanche rated
- $dv/dt$  rated
- Pb-free lead finishing; RoHS compliant

**Product Summary**

|                  |      |          |
|------------------|------|----------|
| $V_{DS}$         | -60  | V        |
| $R_{DS(on),max}$ | 0.3  | $\Omega$ |
| $I_D$            | -1.9 | A        |



| Type      | Package    | Tape and reel information | Marking | Lead free | Packing |
|-----------|------------|---------------------------|---------|-----------|---------|
| BSP 170 P | PG-SOT-223 | L6327: 1000pcs/reel       | BSP170  | Yes       | Non Dry |

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

| Parameter  | Symbol            | Conditions  | Value                  | Unit               |
|--|-------------------|---|------------------------|--------------------|
|  |                   |   | steady state           |                    |
| Continuous drain current                         | $I_D$             | $T_A=25\text{ °C}$  | -1.9                   | A                  |
|  |                   | $T_A=70\text{ °C}$  | -1.5                   |                    |
| Pulsed drain current                             | $I_{D,pulse}$     | $T_A=25\text{ °C}$  | -7.6                   |                    |
| Avalanche energy, single pulse                   | $E_{AS}$          | $I_D=1.9\text{ A}$ , $R_{GS}=25\ \Omega$  | 70                     | mJ                 |
| Avalanche energy, periodic limited by $T_{jmax}$ | $E_{AR}$          |   | 0.18                   |                    |
| Reverse diode $dv/dt$                            | $dv/dt$           | $I_D=1.9\text{ A}$ , $V_{DS}=48\text{ V}$ ,<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                                | $P_{tot}$         | $T_A=25\text{ °C}$  | 1.8                    | W                  |
| Operating and storage temperature                | $T_j$ , $T_{stg}$ |   | -55 ... 150            | $^{\circ}\text{C}$ |
| ESD class  |                   | JESD22-A114 (HBM)   | 1A (250V to 500V)      |                    |
| 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, junction -soldering point | $R_{thJS}$ |  | - | - | 20  | K/W |
| SMD version, device on PCB:                   | $R_{thJA}$ | minimal footprint                            | - | - | 110 | K/W |
|   |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> | - | - | 70  |     |

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

**Static characteristics**

|                                  |               |   |      |      |      |               |
|----------------------------------|---------------|---|------|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=-250\text{ }\mu\text{A}$                        | -60  | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\text{ }\mu\text{A}$                            | -2.1 | -3   | -4   |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$  | -    | -0.1 | -1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$ | -    | -10  | -100 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$                                | -    | -10  | -100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-10\text{ V}, I_D=-1.9\text{ A}$                                | -    | 239  | 300  | m $\Omega$    |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=-1.9\text{ A}$                       | 1.3  | 2.6  | -    | S             |

<sup>1)</sup> Device on 40mm\*40mm\*1.5 epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

| 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>$f=1\text{ MHz}$                           | - | 328 | 410 | pF |
| Output capacitance           | $C_{oss}$    |   | - | 105 | 135 |    |
| Reverse transfer capacitance | $C_{rss}$    |   | - | 38  | 48  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-30\text{ V}, V_{GS}=-$<br>$10\text{ V}, I_D=-1.9\text{ A},$<br>$R_G=6\ \Omega$ | - | 14  | 21  | ns |
| Rise time                    | $t_r$        |   | - | 28  | 42  |    |
| Turn-off delay time          | $t_{d(off)}$ |   | - | 92  | 138 |    |
| Fall time                    | $t_f$        |   | - | 60  | 90  |    |

**Gate Charge Characteristics**

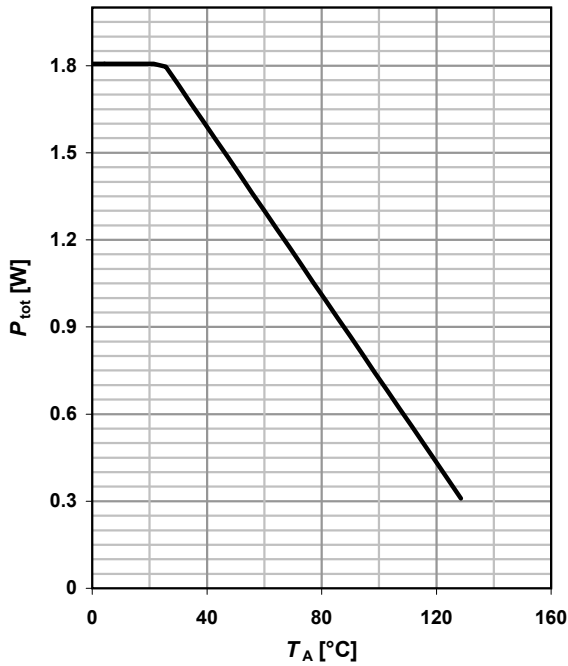
|                       |               |  |   |       |      |    |
|-----------------------|---------------|--|---|-------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=-48\text{ V}, I_D=-1.9\text{ A},$<br>$V_{GS}=0\text{ to }-10\text{ V}$ | - | -1.4  | -1.9 | nC |
| Gate to drain charge  | $Q_{gd}$      |  | - | -4.9  | -7.4 |    |
| Gate charge total     | $Q_g$         |  | - | -10   | -14  |    |
| Gate plateau voltage  | $V_{plateau}$ |  | - | -4.34 | -    | V  |

**Reverse Diode**

|                                  |               |   |   |       |       |    |
|----------------------------------|---------------|---|---|-------|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ }^\circ\text{C}$  | - | -     | -1.98 | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -     | -7.6  |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-1.9\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$ | - | -0.83 | -1.1  | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=30\text{ V}, I_F= I_S ,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$       | - | 36    | 54    | ns |
| Reverse recovery charge          | $Q_{rr}$      |   | - | 41    | 62    |    |

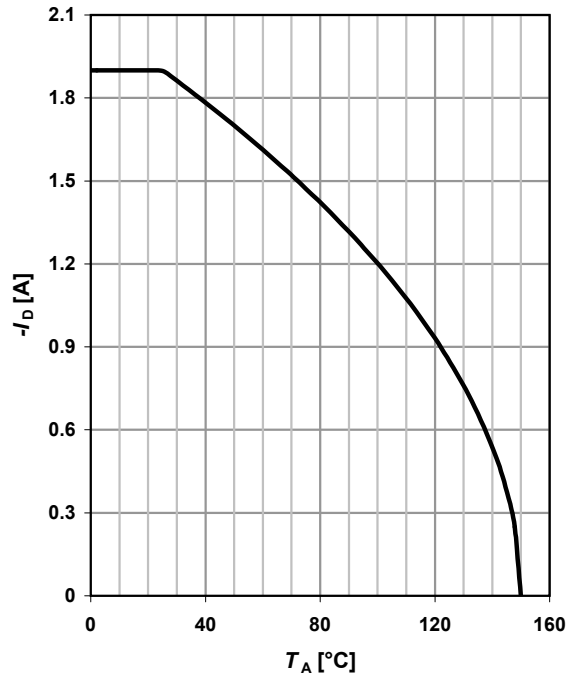
**1 Power dissipation**

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



**2 Drain current**

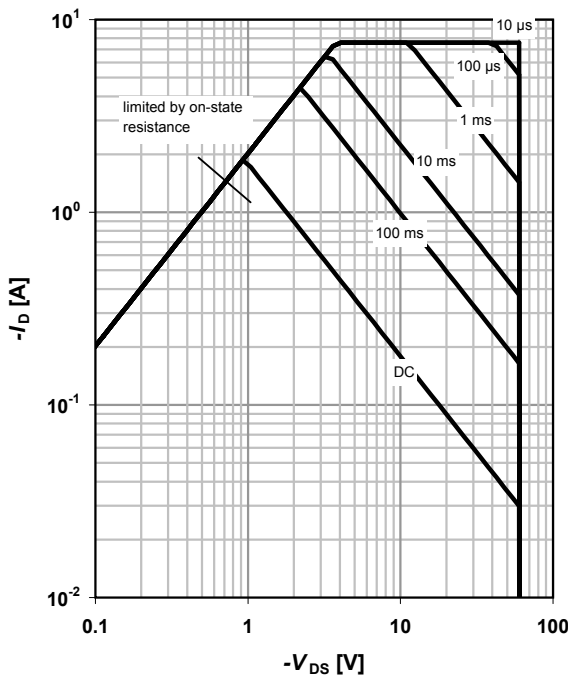
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}$$



**3 Safe operating area**

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

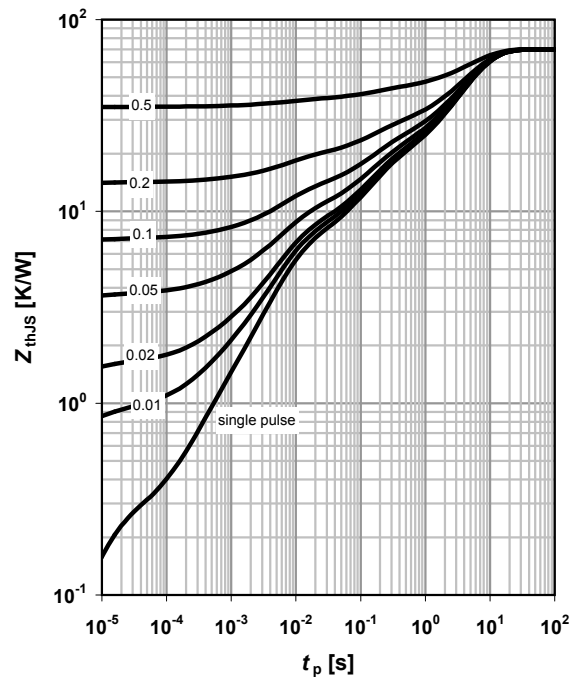
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

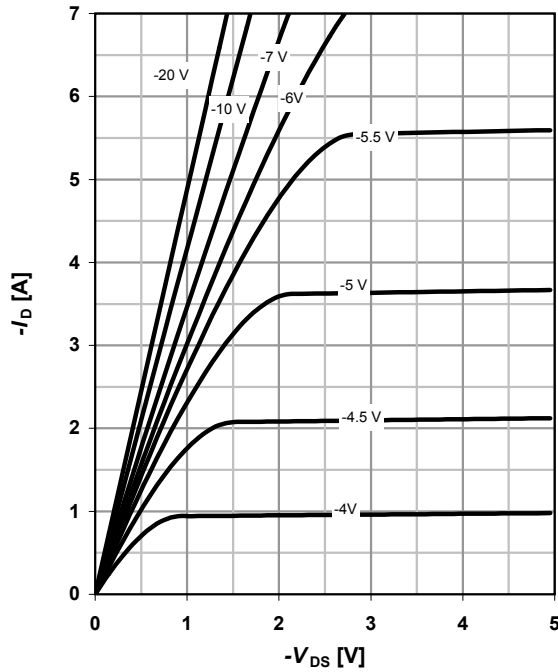
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

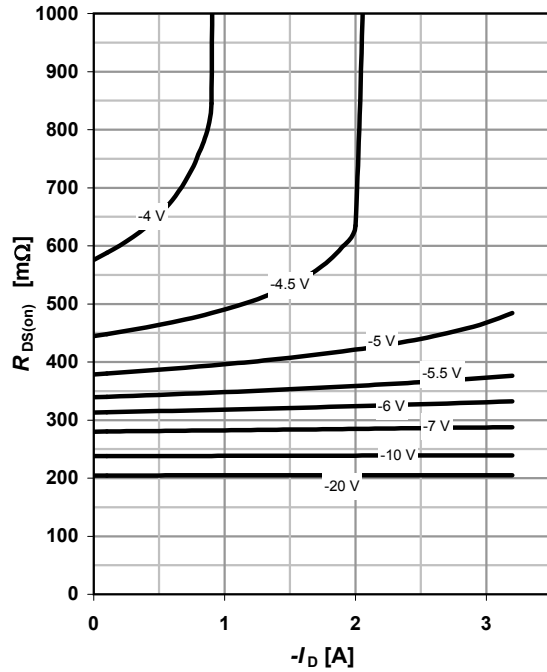
parameter:  $V_{GS}$



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

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

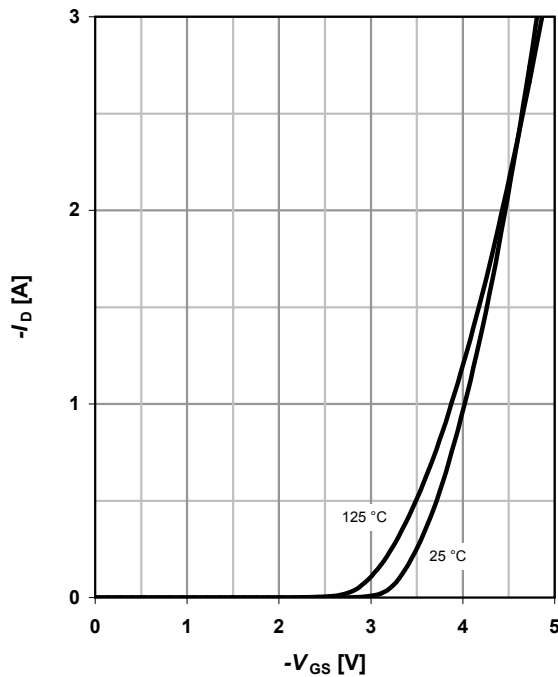
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

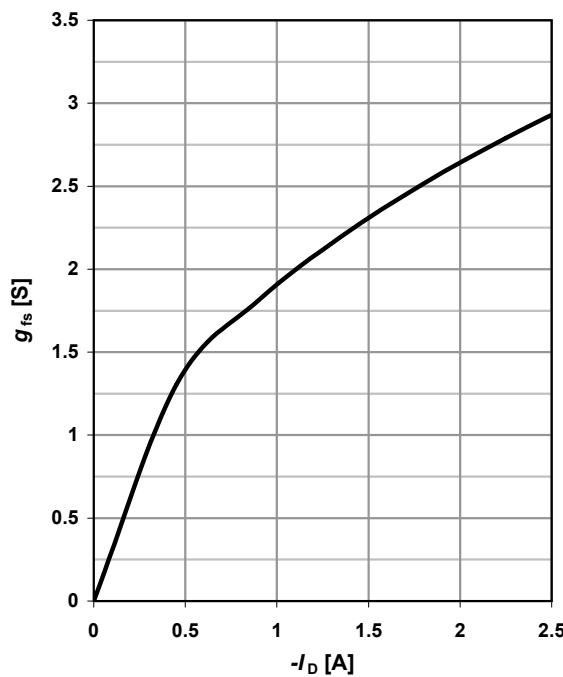
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



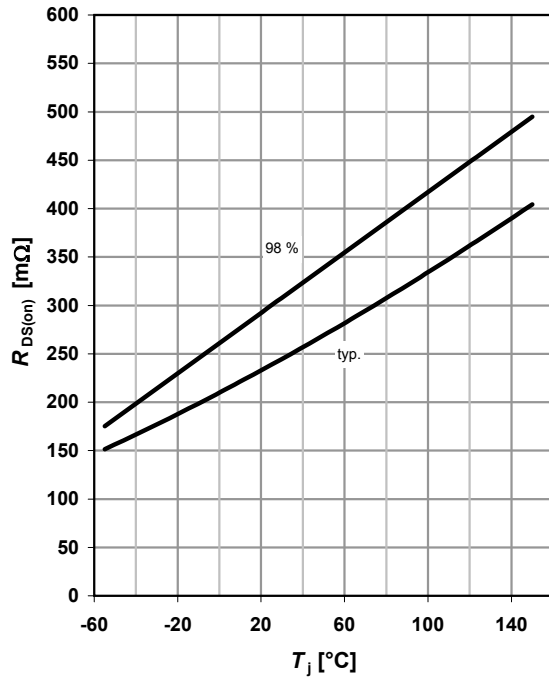
**8 Typ. forward transconductance**

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



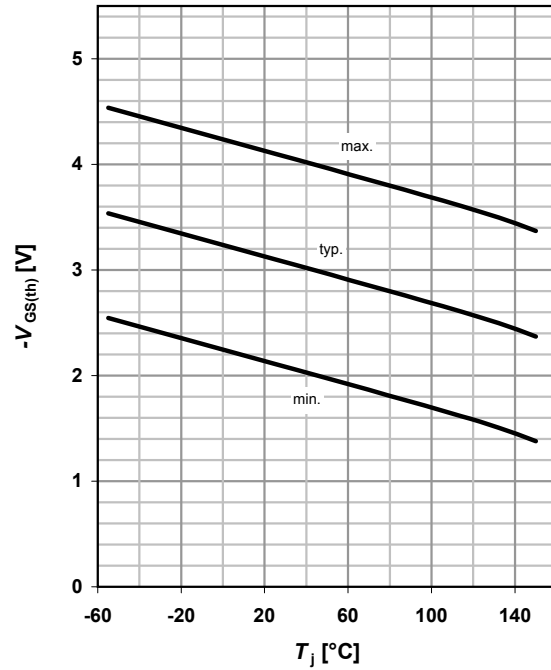
**9 Drain-source on-state resistance**

$$R_{DS(on)} = f(T_j); I_D = -1.9 \text{ A}; V_{GS} = -10 \text{ V}$$



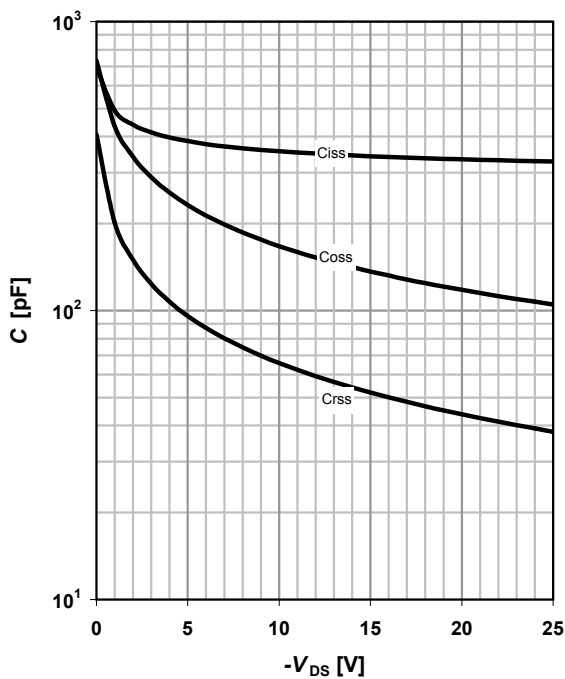
**10 Typ. gate threshold voltage**

$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -250 \mu\text{A}$$



**11 Typ. capacitances**

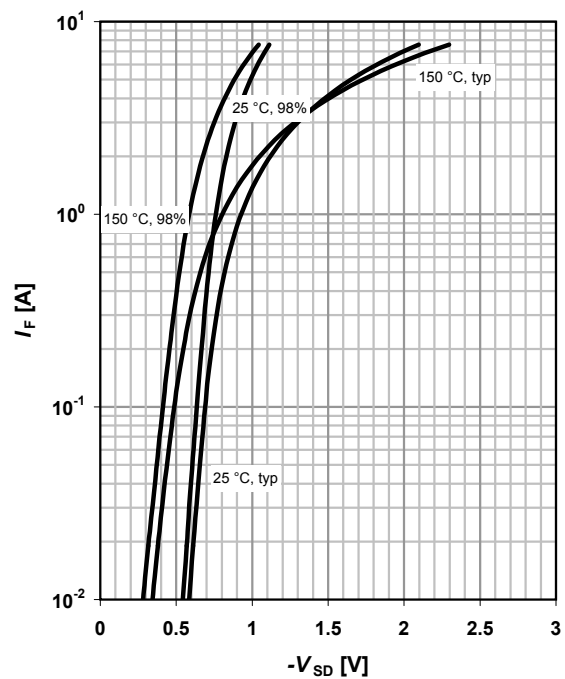
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



**12 Forward characteristics of reverse diode**

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

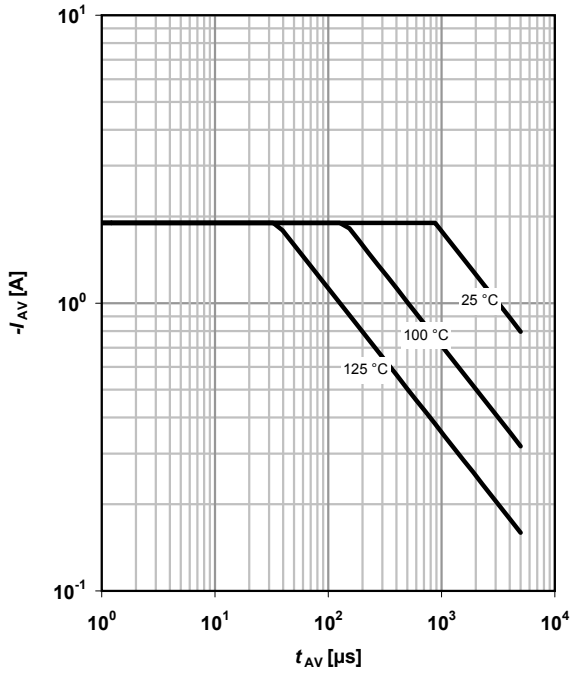
parameter:  $T_j$



**13 Avalanche characteristics**

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

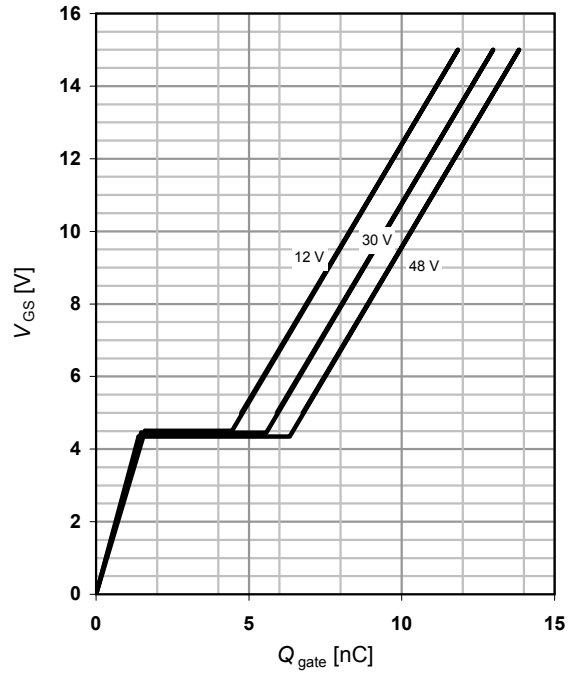
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

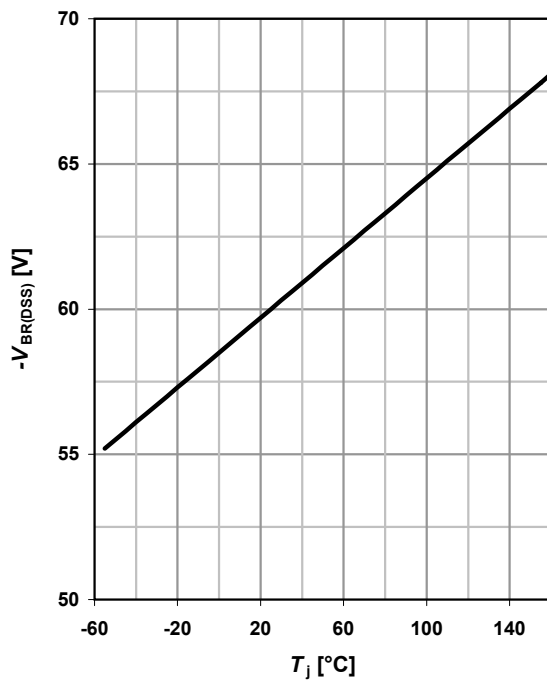
$V_{GS}=f(Q_{gate}); I_D=-1.9 \text{ A pulsed}$

parameter:  $V_{DD}$



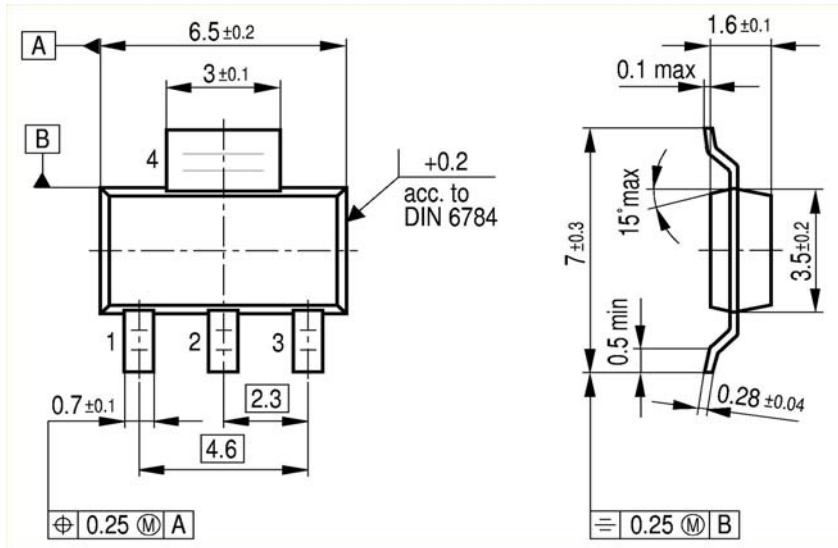
**15 Drain-source breakdown voltage**

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

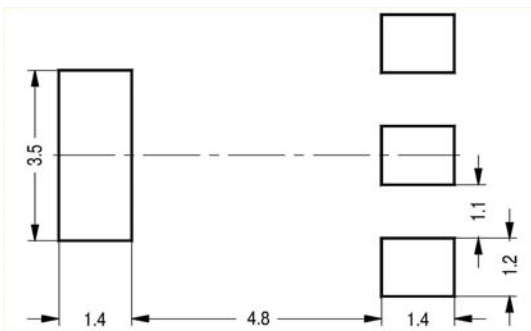


Package Outline

SOT-223: Outline

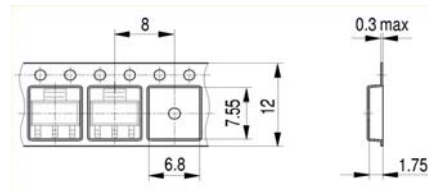


Footprint



Packaging

Tape



Dimensions in mm



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