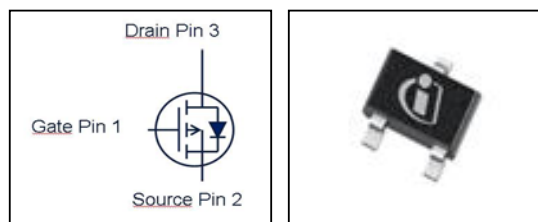


**OptiMOS® -P Small-Signal-Transistor**
**Features**

- P-Channel
- Enhancement mode
- Super Logic level ( 2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- $dv/dt$  rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21


**Product Summary**

|                  |       |            |
|------------------|-------|------------|
| $V_{DS}$         | -20   | V          |
| $R_{DS(on),max}$ | 550   | m $\Omega$ |
| $I_D$            | -0.63 | A          |

**PG-SOT-323**


| Type      | Package | Tape and Reel Information | Marking | Lead free | Packing |
|-----------|---------|---------------------------|---------|-----------|---------|
| BSS 209PW | SOT-323 | H6327: 1000 pcs/reel      | X3s     | Yes       | Non Dry |

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

| Parameter                           | Symbol         | Conditions  | Value                | Unit              |
|-------------------------------------|----------------|---|----------------------|-------------------|
| Continuous drain current            | $I_D$          | $T_C=25\text{ }^\circ\text{C}$  | -0.63                | A                 |
|                                     |                | $T_C=70\text{ }^\circ\text{C}$  | -0.5                 |                   |
| Pulsed drain current                | $I_{D,pulse}$  | $T_C=25\text{ }^\circ\text{C}$  | -2.5                 |                   |
| Avalanche energy, single pulse      | $E_{AS}$       | $I_D = -0.63\text{ A}$ ,<br>$R_{GS} = 25\ \Omega$   | 4.0                  | mJ                |
| Reverse diode $dv/dt$               | $dv/dt$        | $I_D = -0.63\text{ A}$ ,<br>$V_{DS} = -16\text{ V}$ ,<br>$di/dt = -200\text{ A}/\mu\text{s}$ ,<br>$T_{j,max} = 150\text{ }^\circ\text{C}$ | -6                   | kV/ $\mu\text{s}$ |
| Gate source voltage                 | $V_{GS}$       |   | $\pm 12$             | V                 |
| Power dissipation                   | $P_{tot}$      | $T_A = 25\text{ }^\circ\text{C}$  | 0.30                 | W                 |
| Operating and storage temperature   | $T_j, T_{stg}$ |   | -55 ... 150          | $^\circ\text{C}$  |
| ESD class                           |                | JESD22-C101 (HBM)   | 0 (max 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, junction - soldering point | $R_{thJS}$ |  | - | - | 120 | K/W |
| SMD version, device on PCB:                    | $R_{thJA}$ | minimal footprint                            | - | - | 420 |     |
|  |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> | - | - | 350 |     |

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

|                                  |               |   |      |      |      |               |
|----------------------------------|---------------|---|------|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=-250\mu\text{A}$                    | -20  | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=3.5\mu\text{A}$                         | -0.6 | -0.9 | -1.2 |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-20\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$  | -    | -0.1 | -1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=-20\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ °C}$ | -    | -10  | -100 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=12\text{ V}, V_{DS}=0\text{ V}$                     | -    | -10  | -100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=2.5\text{ V}, I_D=0.46\text{ A}$                    | -    | 581  | 900  |               |
|                                  |               | $V_{GS}=4.5\text{ V}, I_D=0.63\text{ A}$                    | -    | 379  | 550  |               |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.46\text{ A}$           | 0.87 | 1.74 | -    | S             |

<sup>1)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air;  $\leq 10\text{ sec}$ .

| 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>$f=1\text{ MHz}$                            | - | 87  | 115  | pF |
| Output capacitance           | $C_{oss}$    |  | - | 35  | 46.7 |    |
| Reverse transfer capacitance | $C_{rss}$    |  | - | 30  | 45   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-10\text{ V}, V_{GS}=-$<br>$4.5\text{ V}, I_D=0.58\text{ A},$<br>$R_G=6\ \Omega$ | - | 2.6 | 4.0  | ns |
| Rise time                    | $t_r$        |  | - | 7   | 11   |    |
| Turn-off delay time          | $t_{d(off)}$ |  | - | 6   | 9    |    |
| Fall time                    | $t_f$        |  | - | 4.6 | 6.9  |    |

**Gate Charge Characteristics<sup>3)</sup>**

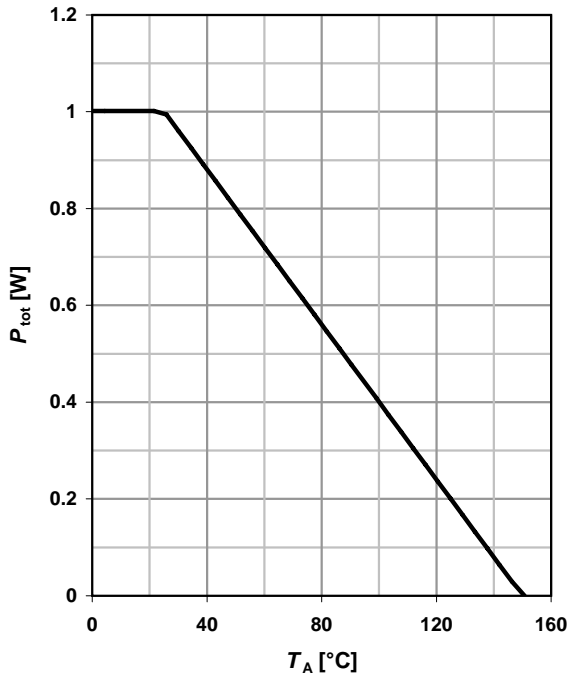
|                       |               |   |   |       |       |    |
|-----------------------|---------------|---|---|-------|-------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=10\text{ V}, I_D=0.58\text{ A},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$ | - | -0.18 | -0.24 | nC |
| Gate to drain charge  | $Q_{gd}$      |   | - | -0.46 | -0.7  |    |
| Gate charge total     | $Q_g$         |   | - | -1.0  | -1.3  |    |
| Gate plateau voltage  | $V_{plateau}$ |   | - | -2.0  | -     | V  |

**Reverse Diode**

|                                  |          |  |   |       |       |    |
|----------------------------------|----------|--|---|-------|-------|----|
| Diode continuous forward current | $I_S$    | $T_C=25\text{ }^\circ\text{C}$   | - | -     | -0.7  | A  |
| Diode direct current, pulsed     | $I_{SM}$ |  | - | -     | -4.0  |    |
| Diode forward voltage            | $V_{SD}$ | $V_{GS}=0\text{ V}, I_F=-0.58\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$ | - | -0.92 | -0.88 | V  |
| Reverse recovery time            | $t_{rr}$ | $V_R=10\text{ V}, I_F= I_S ,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$        | - | 9     | 11.2  | ns |
| Reverse recovery charge          | $Q_{rr}$ |  | - | 1.27  | 1.59  | nC |

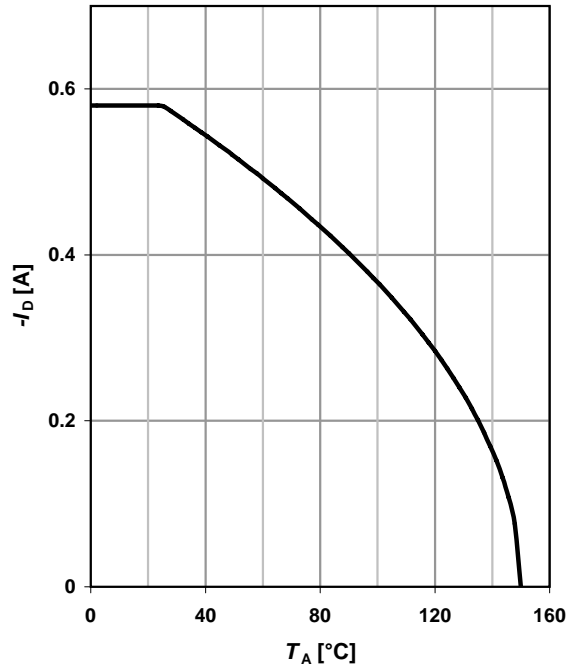
**1 Power dissipation**

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



**2 Drain current**

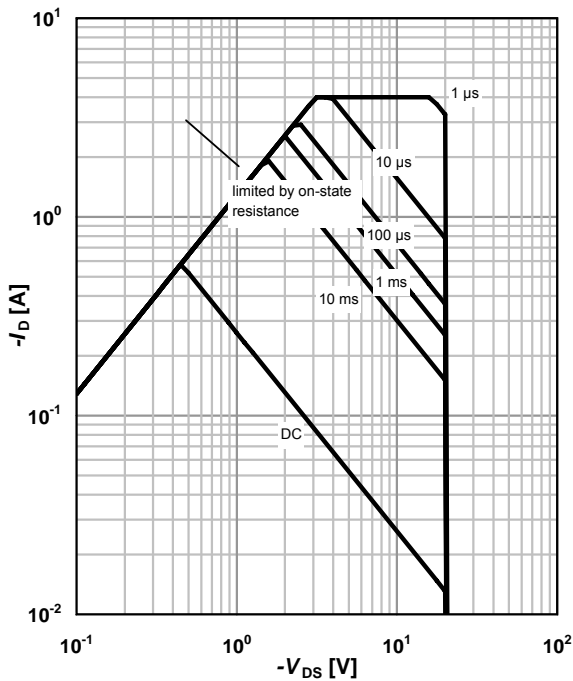
$$I_D = f(T_A); |V_{GS}| \geq 4.5 \text{ V}$$



**3 Safe operating area**

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

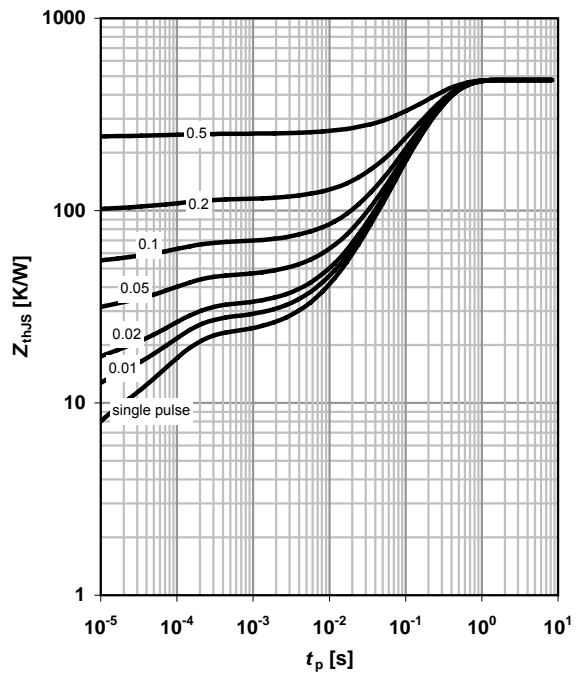
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

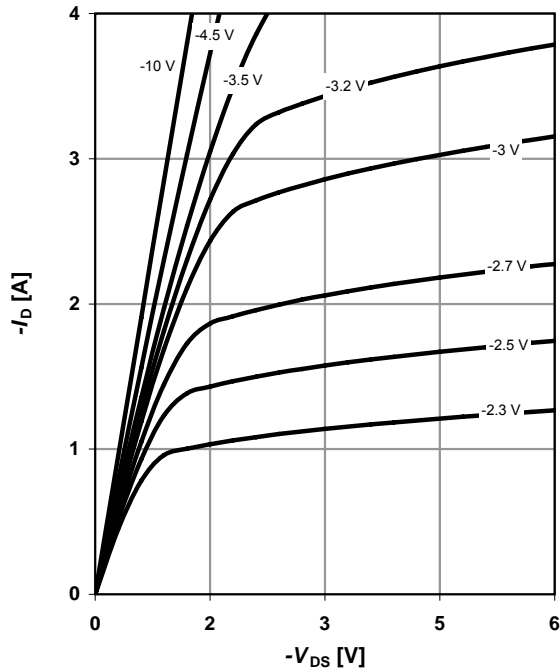
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

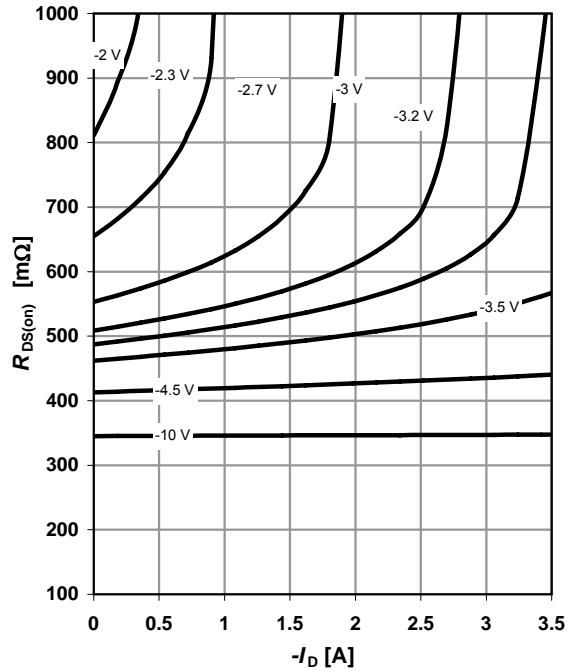
parameter:  $V_{GS}$



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

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

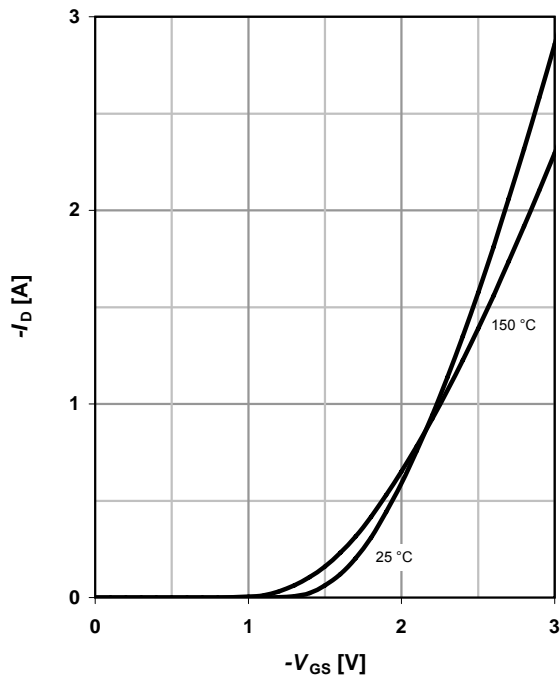
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

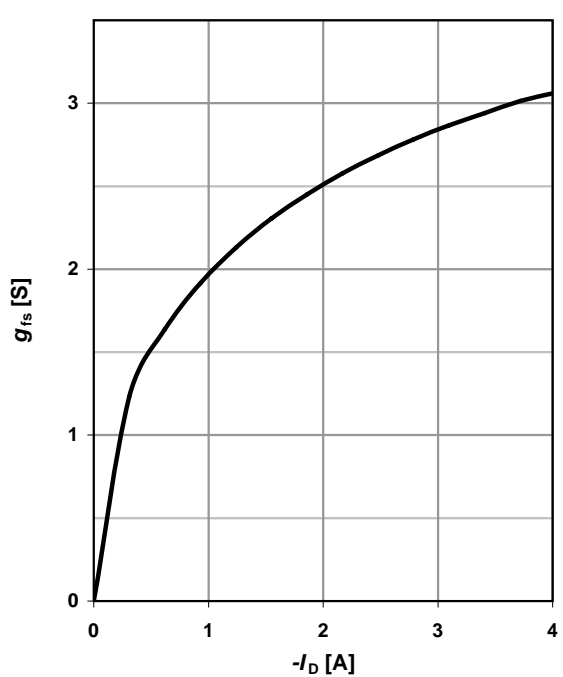
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



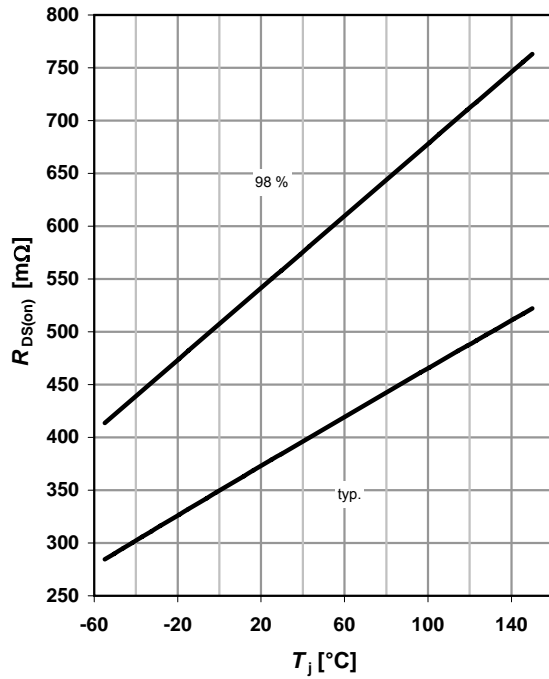
**8 Typ. forward transconductance**

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



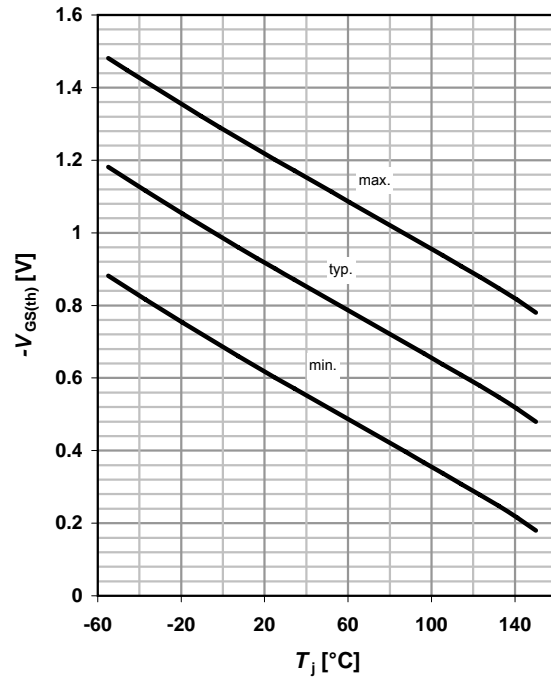
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = -0.58 \text{ A}; V_{GS} = -4.5 \text{ V}$



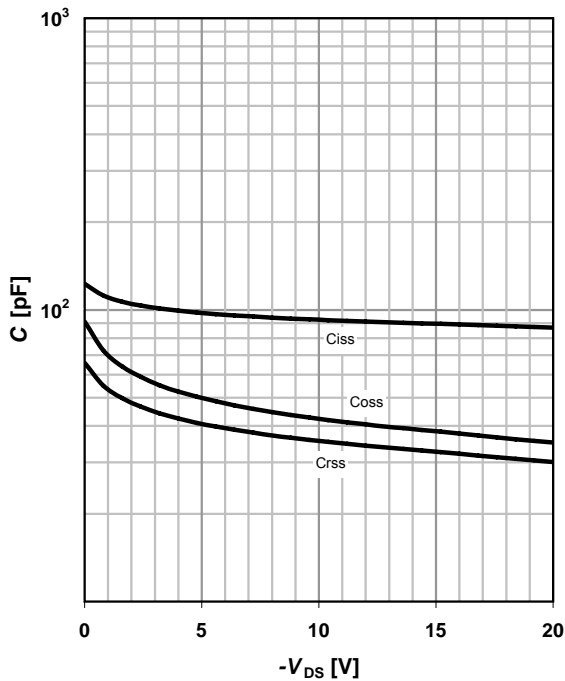
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -3.5 \mu\text{A}$



**11 Typ. capacitances**

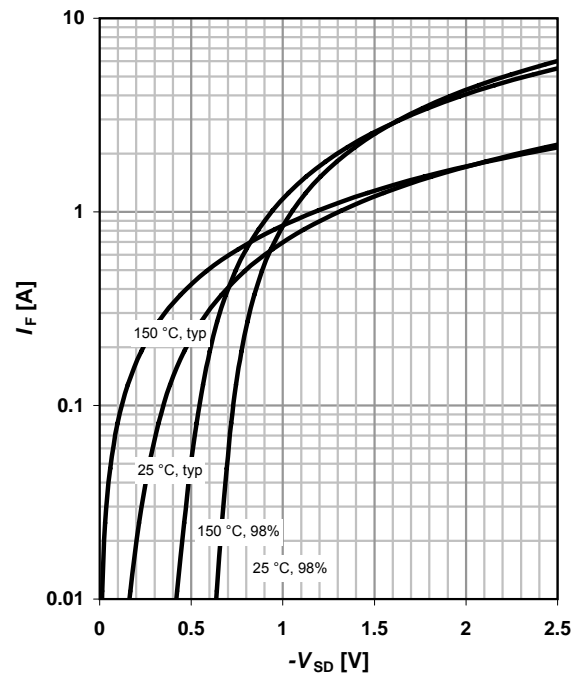
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

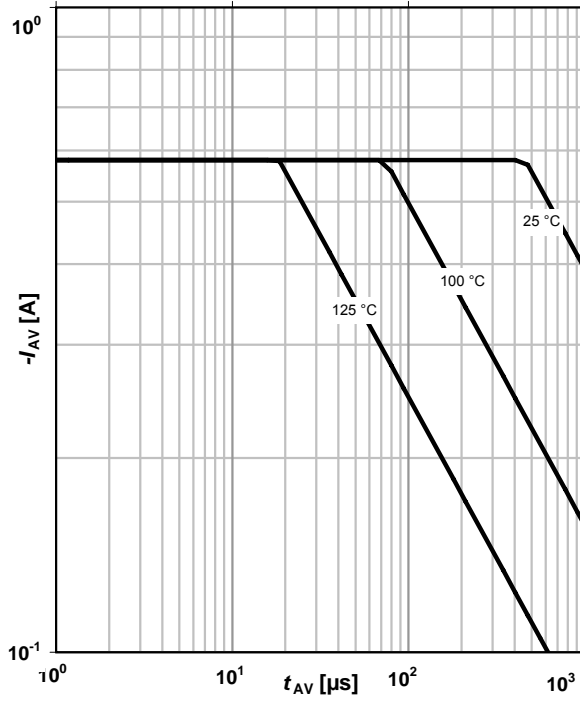
parameter:  $T_j$



**13 Avalanche characteristics**

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

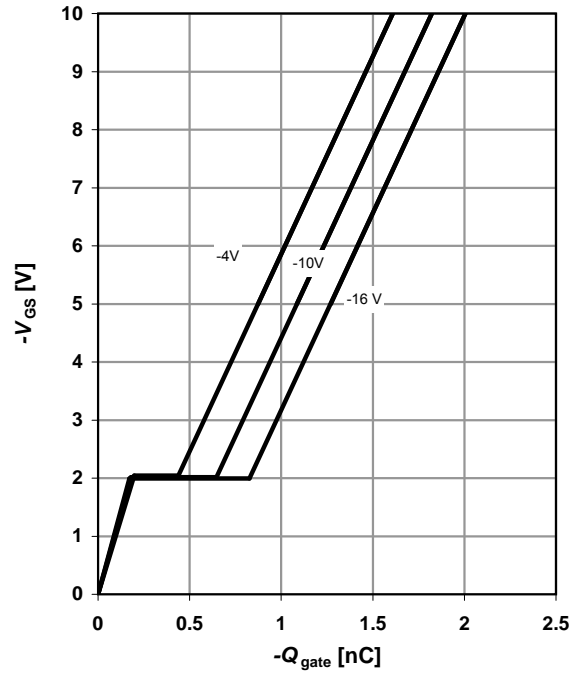
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

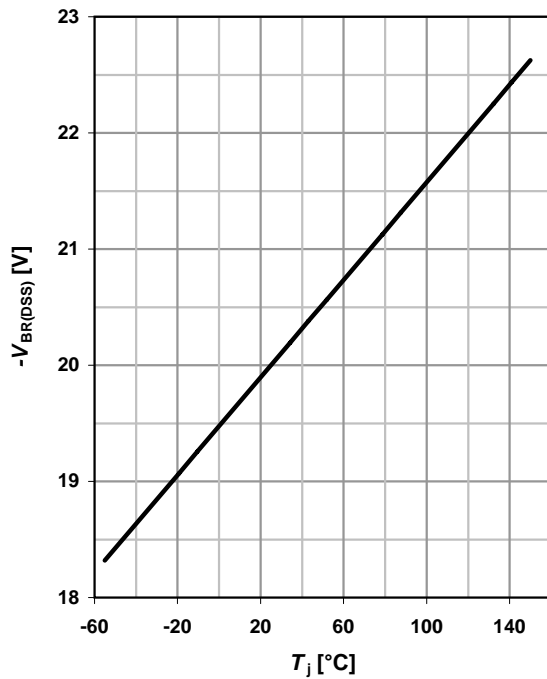
$V_{GS}=f(Q_{gate}); I_D=-0.58\ A\ pulsed$

parameter:  $V_{DD}$

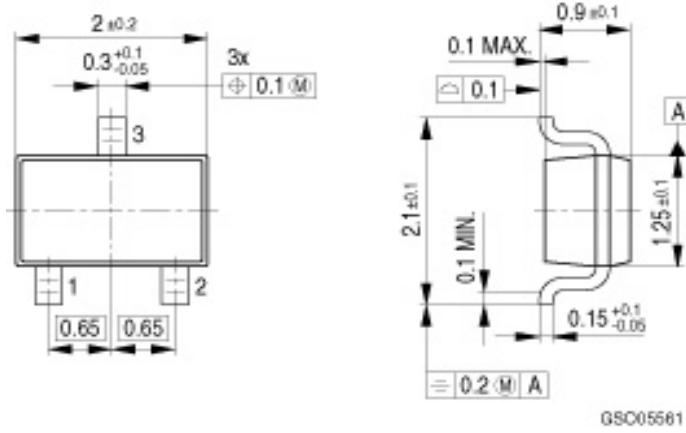


**15 Drain-source breakdown voltage**

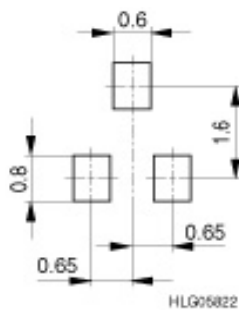
$V_{BR(DSS)}=f(T_j); I_D=-250\ \mu A$



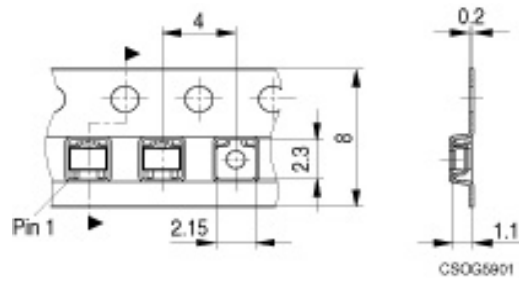
Package Outline:



Footprint:



Packaging:





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