

# MOSFET

## SIPMOS® Small-Signal-Transistor

### Features

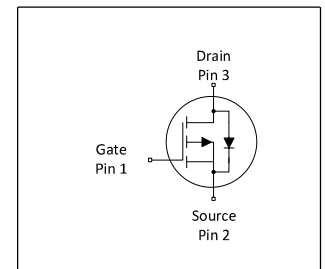
- P-Channel
- Enhancement mode / Logic level
- Avalanche rated
- Pb-free lead plating; RoHS compliant
- Footprint compatible to SOT23
- Halogen free according to IEC61249-2-21

### Product validation

Qualified according to AEC Q101

**Table 1 Key Performance Parameters**

| Parameter        | Value | Unit     |
|------------------|-------|----------|
| $V_{DS}$         | -100  | V        |
| $R_{DS(on),max}$ | 1.8   | $\Omega$ |
| $I_D$            | -0.36 | A        |



| Type / Ordering Code | Package   | Marking | Related Links |
|----------------------|-----------|---------|---------------|
| BSR316P              | PG-SC59-3 | LC      | -             |

## Table of Contents

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

**Table 2 Maximum ratings**

| Parameter                         | Symbol         | Values |                            |                | Unit | Note / Test Condition                             |
|-----------------------------------|----------------|--------|----------------------------|----------------|------|---|
|                                   |                | Min.   | Typ.                       | Max.           |      |   |
| Continuous drain current          | $I_D$          | -      | -                          | -0.36<br>-0.29 | A    | $T_A=25\text{ °C}$<br>$T_A=70\text{ °C}$          |
| Pulsed drain current              | $I_{D,pulse}$  | -      | -                          | -1.44          | A    | $T_A=25\text{ °C}$                                |
| Avalanche energy, single pulse    | $E_{AS}$       | -      | -                          | 25             | mJ   | $I_D=-0.36\text{ A}$ , $R_{GS}=25\text{ }\Omega$  |
| Gate source voltage               | $V_{GS}$       | -20    | -                          | 20             | V    | -   |
| Power dissipation                 | $P_{tot}$      | -      | -                          | 0.5            | W    | $T_C=25\text{ °C}$                                |
| Operating and storage temperature | $T_j, T_{stg}$ | -55    | -                          | 150            | °C   | IEC climatic category;<br>DIN IEC 68-1: 55/150/56 |
| ESD class                         | -              | -      | 1A<br>(250V<br>to<br>500V) | -              | -    | JESD22-A114-HBM                                   |
| Soldering temperature             | -              | -      | 260 °C                     | -              | -    | -   |

**2 Thermal characteristics**

**Table 3 Thermal characteristics**

| Parameter   | Symbol     | Values |      |      | Unit | Note / Test Condition |
|---|------------|--------|------|------|------|-----------------------|
|   |            | Min.   | Typ. | Max. |      |                       |
| Thermal resistance, junction - ambient, minimal footprint, steady state | $R_{thJA}$ | -      | -    | 250  | K/W  | -                     |

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

**Table 4 Static characteristics**

| Parameter                        | Symbol        | Values |             |            | Unit          | Note / Test Condition   |
|----------------------------------|---------------|--------|-------------|------------|---------------|---|
|                                  |               | Min.   | Typ.        | Max.       |               |   |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | -100   | -           | -          | V             | $V_{GS}=0\text{ V}$ , $I_D=-250\text{ }\mu\text{A}$   |
| Gate threshold voltage           | $V_{GS(th)}$  | -2     | -1.5        | -1         | V             | $V_{DS}=V_{GS}$ , $I_D=-170\text{ }\mu\text{A}$   |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | -0.1<br>-10 | -1<br>-100 | $\mu\text{A}$ | $V_{DS}=-100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{DS}=-100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=150\text{ °C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | -10         | -100       | nA            | $V_{GS}=-20\text{ V}$ , $V_{DS}=0\text{ V}$   |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 1.8<br>1.3  | 2.2<br>1.8 | $\Omega$      | $V_{GS}=-4.5\text{ V}$ , $I_D=-0.33\text{ A}$<br>$V_{GS}=-10\text{ V}$ , $I_D=-0.36\text{ A}$   |
| Transconductance                 | $g_{fs}$      | 0.3    | 0.5         | -          | S             | $ V_{DS} >2 I_D R_{DS(on)max}$ , $I_D=-0.29\text{ A}$   |

**Table 5 Dynamic characteristics<sup>1)</sup>**

| Parameter                    | Symbol       | Values |      |      | Unit | Note / Test Condition  |
|------------------------------|--------------|--------|------|------|------|--|
|                              |              | Min.   | Typ. | Max. |      |  |
| Input capacitance            | $C_{iss}$    | -      | 124  | 165  | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=-25\text{ V}$ , $f=1\text{ MHz}$                               |
| Output capacitance           | $C_{oss}$    | -      | 25   | 33   | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=-25\text{ V}$ , $f=1\text{ MHz}$                               |
| Reverse transfer capacitance | $C_{rss}$    | -      | 13   | 20   | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=-25\text{ V}$ , $f=1\text{ MHz}$                               |
| Turn-on delay time           | $t_{d(on)}$  | -      | 5    | 8    | ns   | $V_{DD}=-50\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-0.36\text{ A}$ , $R_{G,ext}=6\ \Omega$ |
| Rise time                    | $t_r$        | -      | 6    | 9    | ns   | $V_{DD}=-50\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-0.36\text{ A}$ , $R_{G,ext}=6\ \Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 71   | 106  | ns   | $V_{DD}=-50\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-0.36\text{ A}$ , $R_{G,ext}=6\ \Omega$ |
| Fall time                    | $t_f$        | -      | 26   | 39   | ns   | $V_{DD}=-50\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-0.36\text{ A}$ , $R_{G,ext}=6\ \Omega$ |

**Table 6 Gate charge characteristics**

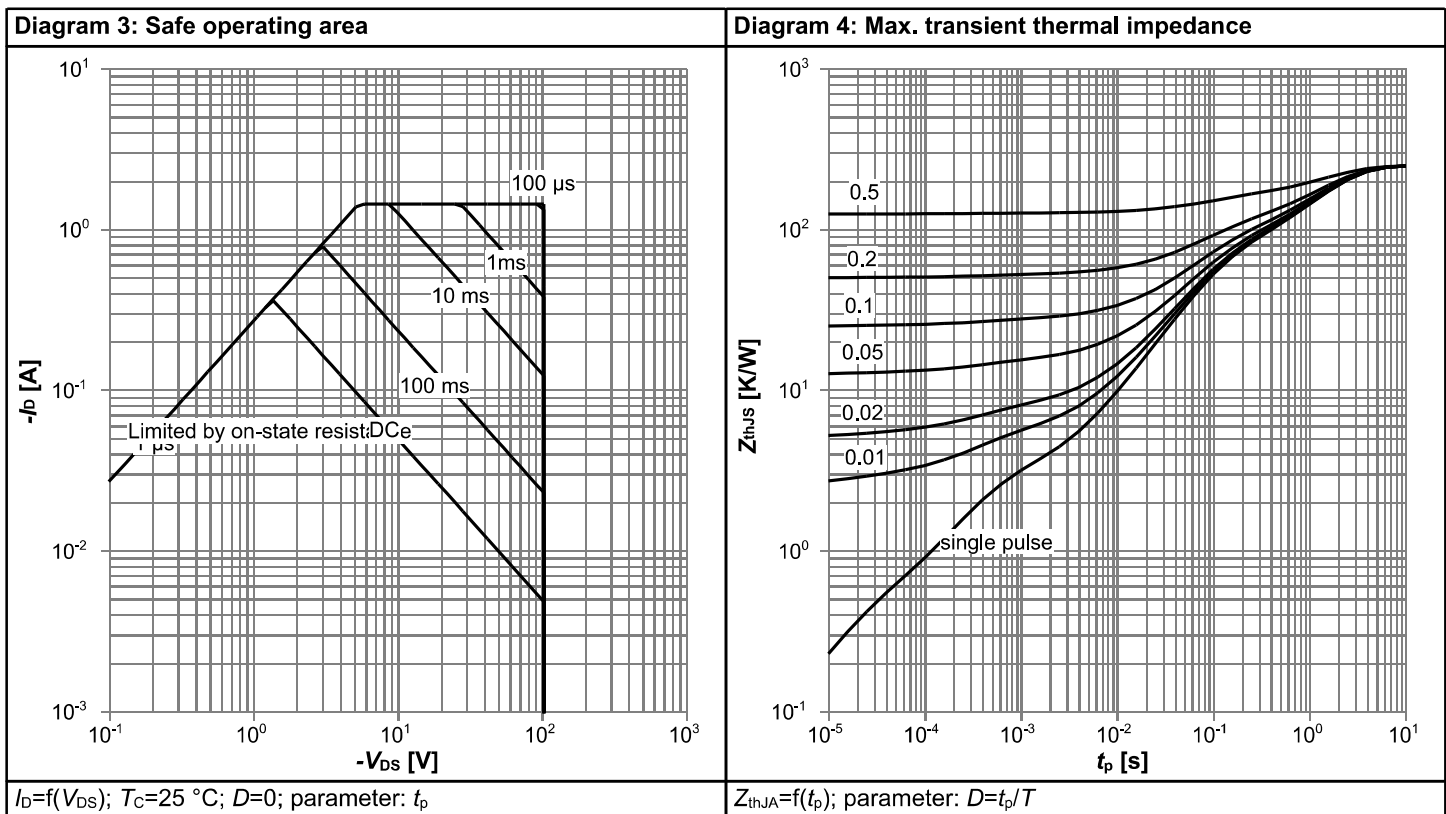
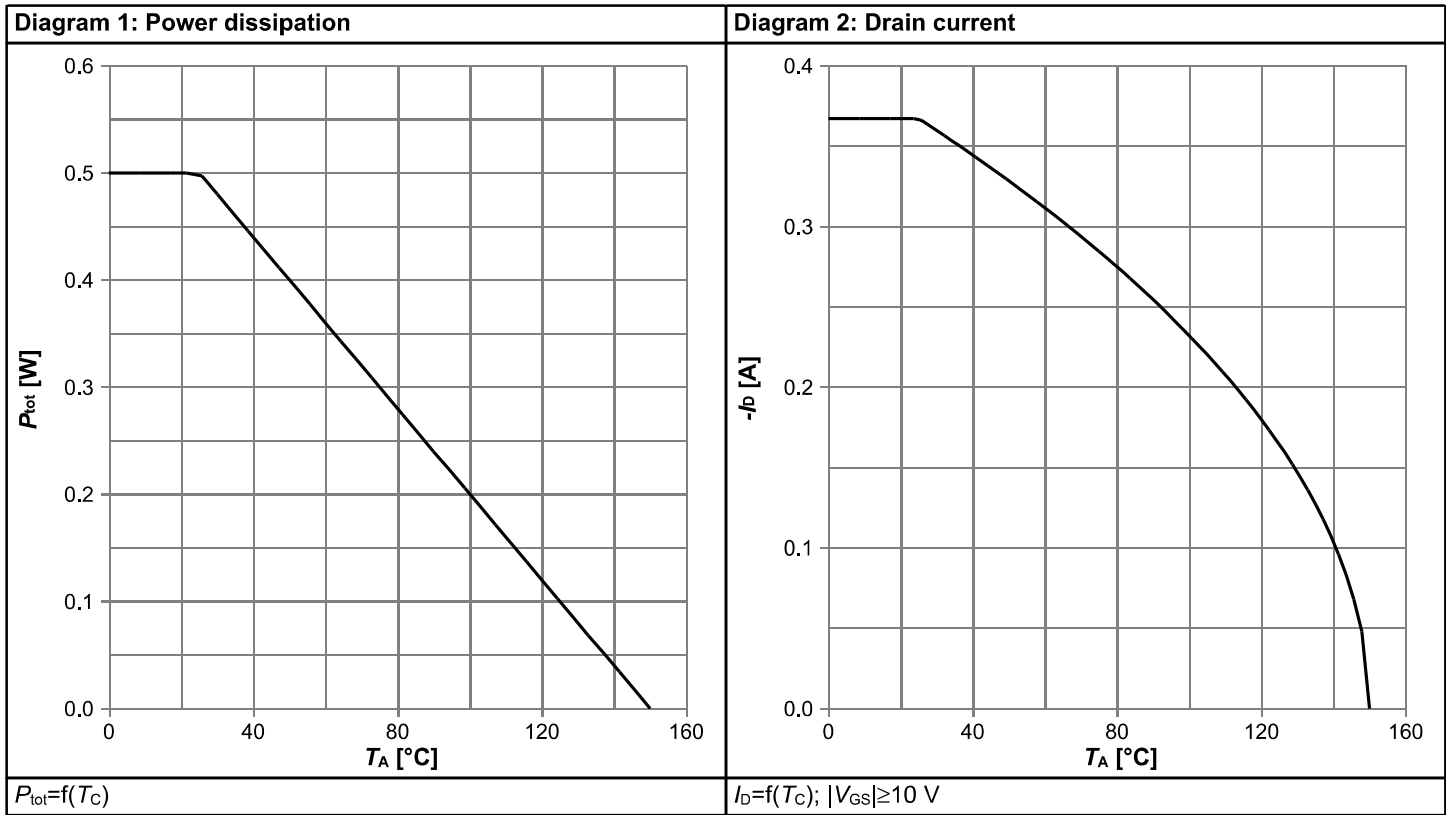
| Parameter             | Symbol        | Values |      |      | Unit | Note / Test Condition  |
|-----------------------|---------------|--------|------|------|------|--|
|                       |               | Min.   | Typ. | Max. |      |  |
| Gate to source charge | $Q_{gs}$      | -      | 0.3  | 0.4  | nC   | $V_{DD}=-80\text{ V}$ , $I_D=-0.36\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate to drain charge  | $Q_{gd}$      | -      | 1.6  | 2.4  | nC   | $V_{DD}=-80\text{ V}$ , $I_D=-0.36\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate charge total     | $Q_g$         | -      | 5.3  | 7.0  | nC   | $V_{DD}=-80\text{ V}$ , $I_D=-0.36\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate plateau voltage  | $V_{plateau}$ | -      | -2.7 | -    | V    | $V_{DD}=-80\text{ V}$ , $I_D=-0.36\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$ |

**Table 7 Reverse diode**

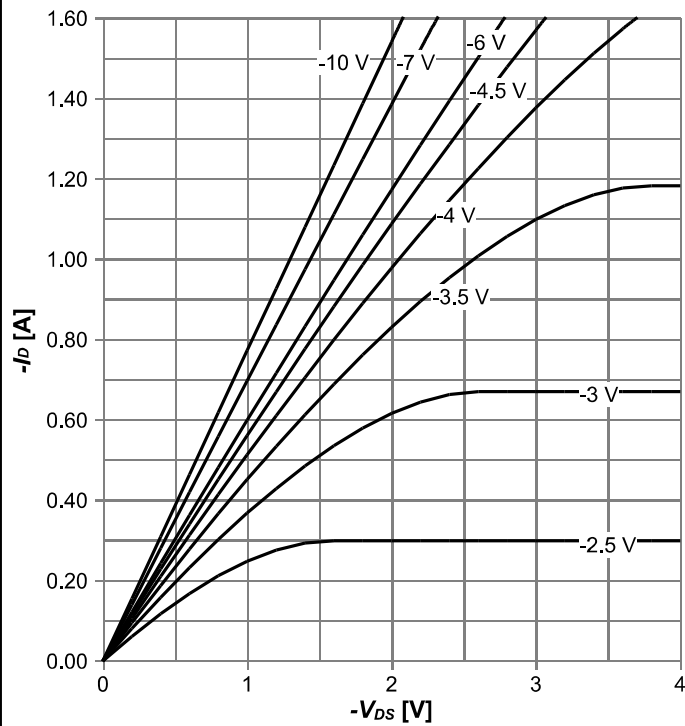
| Parameter                        | Symbol        | Values |      |       | Unit | Note / Test Condition   |
|----------------------------------|---------------|--------|------|-------|------|---|
|                                  |               | Min.   | Typ. | Max.  |      |   |
| Diode continuous forward current | $I_S$         | -      | -    | -0.36 | A    | $T_C=25\text{ °C}$  |
| Diode pulse current              | $I_{S,pulse}$ | -      | -    | -1.44 | A    | $T_C=25\text{ °C}$  |
| Diode forward voltage            | $V_{SD}$      | -      | -0.8 | -1.1  | V    | $V_{GS}=0\text{ V}$ , $I_F=0.36\text{ A}$ , $T_J=25\text{ °C}$        |
| Reverse recovery time            | $t_{rr}$      | -      | 40.6 | -     | ns   | $V_R=-50\text{ V}$ , $I_F= I_S $ , $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge          | $Q_{rr}$      | -      | 46.4 | -     | nC   | $V_R=-50\text{ V}$ , $I_F= I_S $ , $di_F/dt=100\text{ A}/\mu\text{s}$ |

<sup>1)</sup> >Defined by design. Not subjected to production test

### 4 Electrical characteristics diagrams

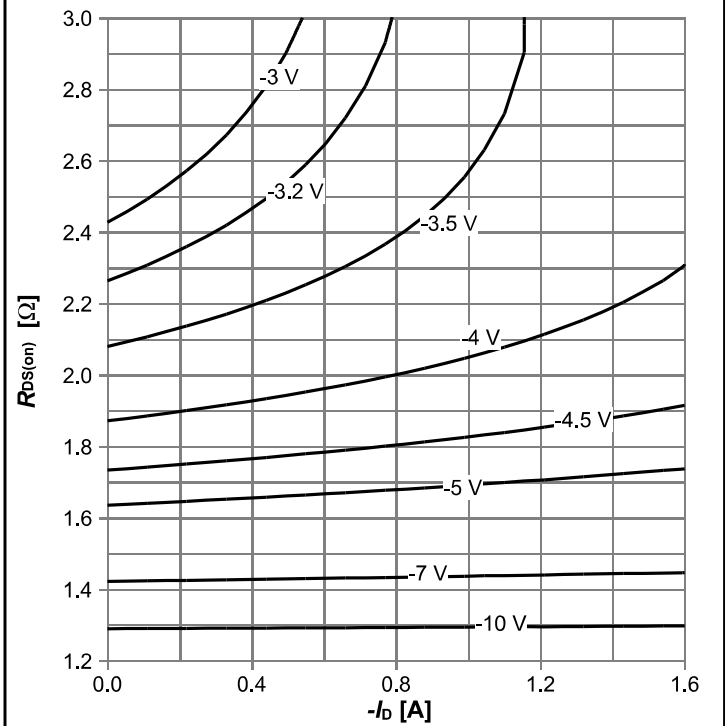


**Diagram 5: Typ. output characteristics**



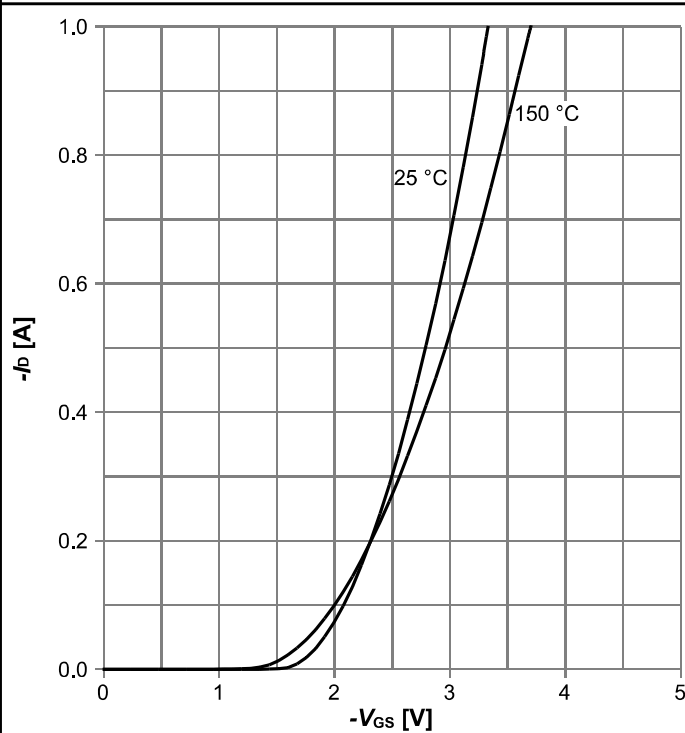
$I_D=f(V_{DS}); T_J=25\text{ }^\circ\text{C};$  parameter:  $V_{GS}$

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



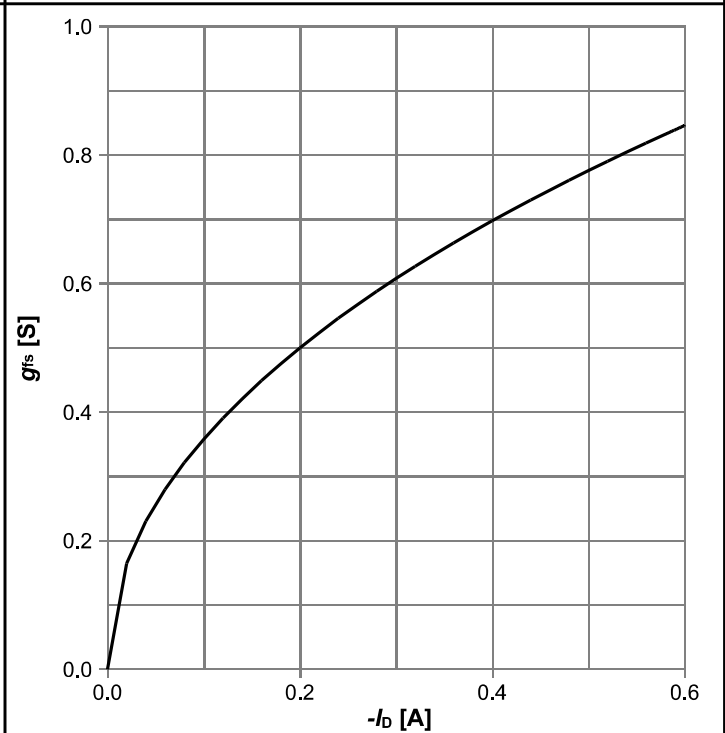
$R_{DS(on)}=f(I_D); T_J=25\text{ }^\circ\text{C};$  parameter:  $V_{GS}$

**Diagram 7: Typ. transfer characteristics**



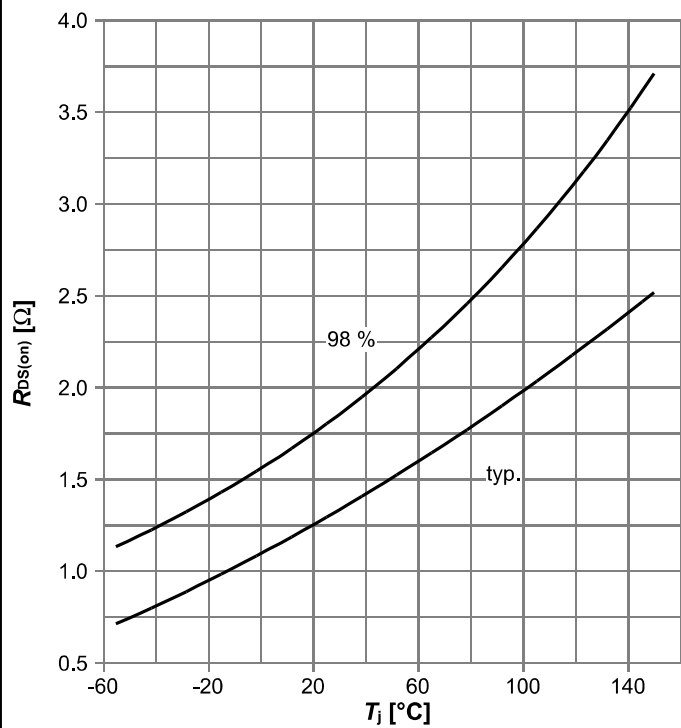
$I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max};$  parameter:  $T_J$

**Diagram 8: Typ. forward transconductance**



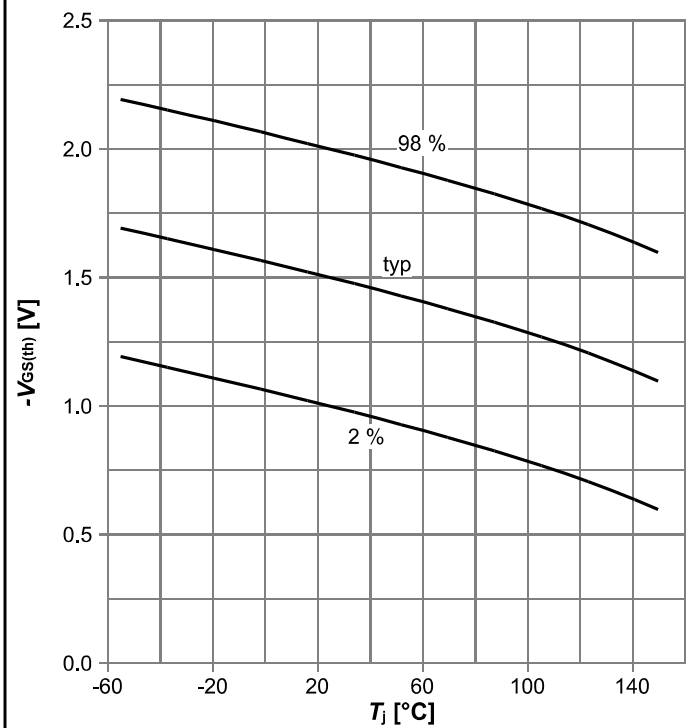
$g_{fs}=f(I_D); T_J=25\text{ }^\circ\text{C}$

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



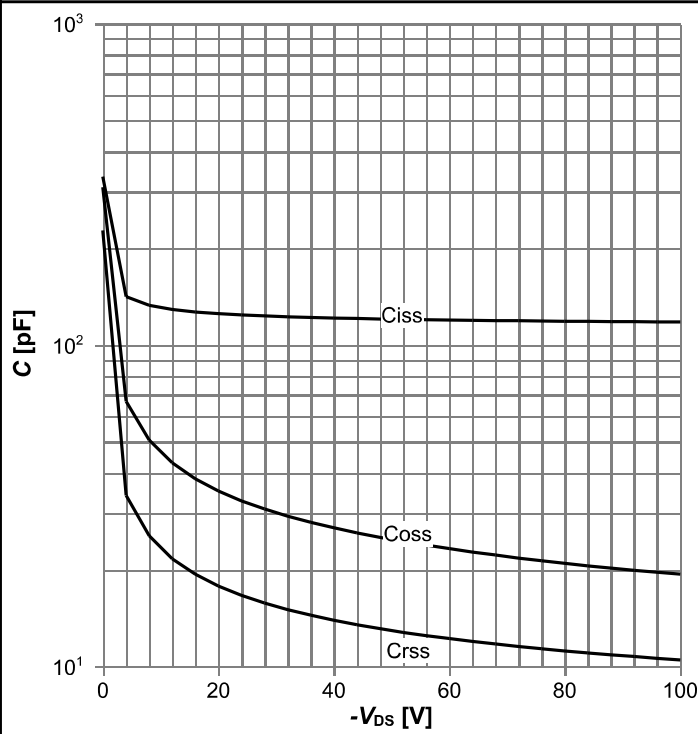
$R_{DS(on)}=f(T_j)$ ;  $I_D=-0.36$  A;  $V_{GS}=-10$  V

**Diagram 10: Typ. gate threshold voltage**



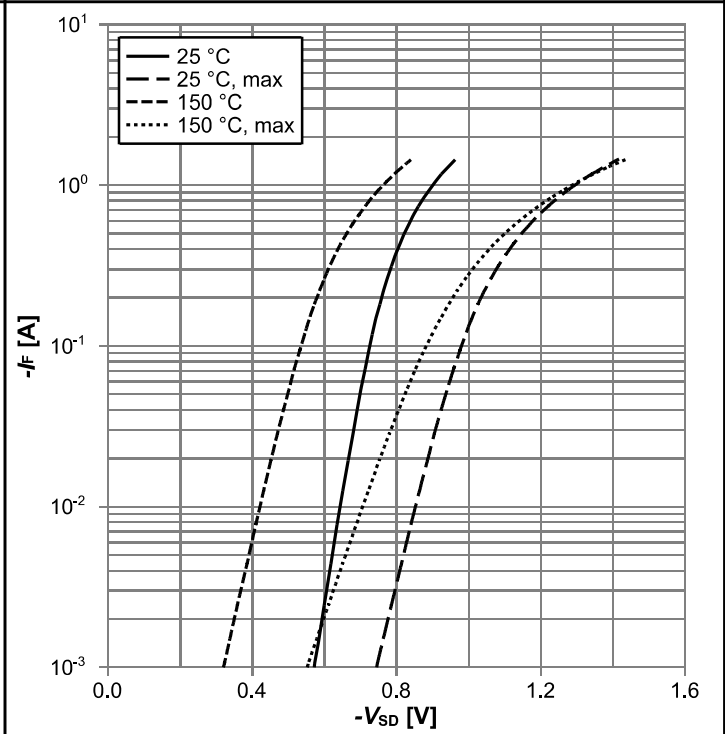
$V_{GS(th)}=f(T_j)$ ;  $V_{GS}=V_{DS}$ ;  $I_D=-170$   $\mu$ A

**Diagram 11: Typ. capacitances**



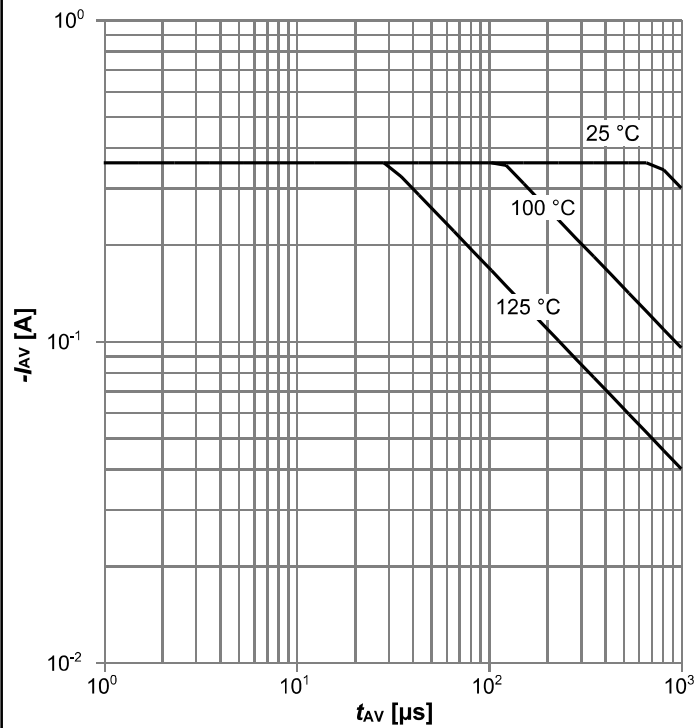
$C=f(V_{DS})$ ;  $V_{GS}=0$  V;  $f=1$  MHz

**Diagram 12: Forward characteristics of reverse diode**



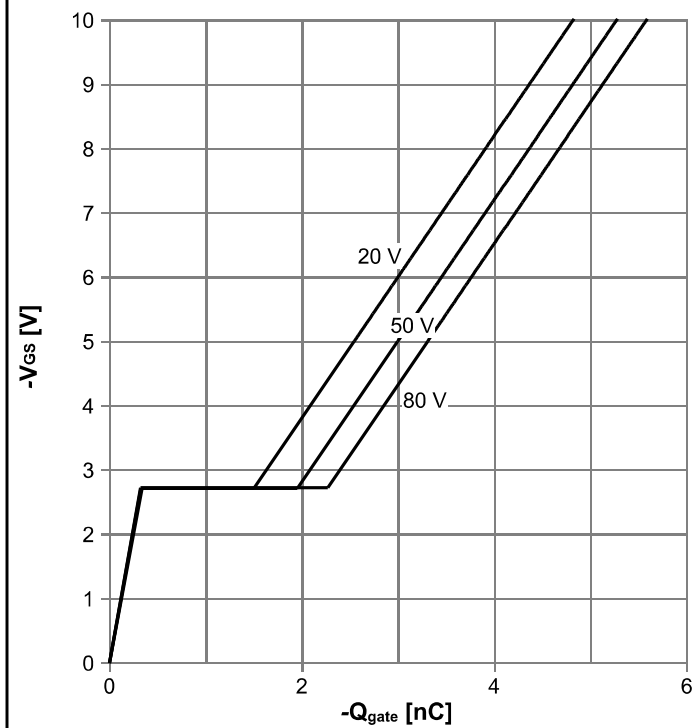
$I_F=f(V_{SD})$ ; parameter:  $T_j$

**Diagram 13: Avalanche characteristics**



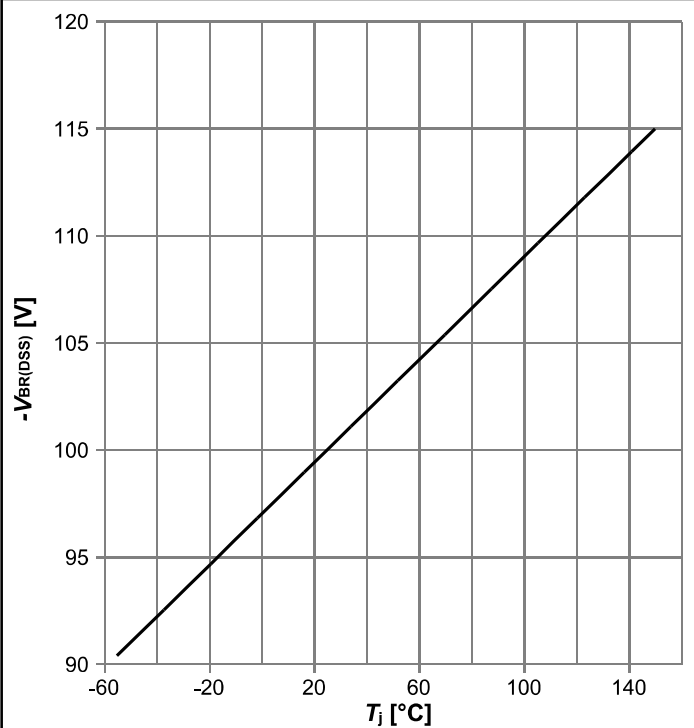
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$ ; parameter:  $T_{j(start)}$

**Diagram 14: Typ. gate charge**



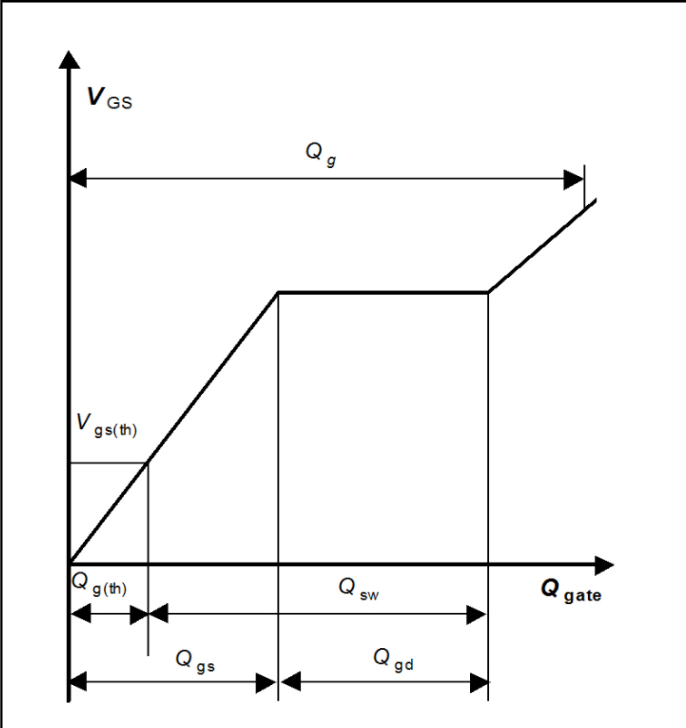
$V_{GS}=f(Q_{gate}); I_D=-0.36$  A pulsed; parameter:  $V_{DD}$

**Diagram 15: Drain-source breakdown voltage**



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

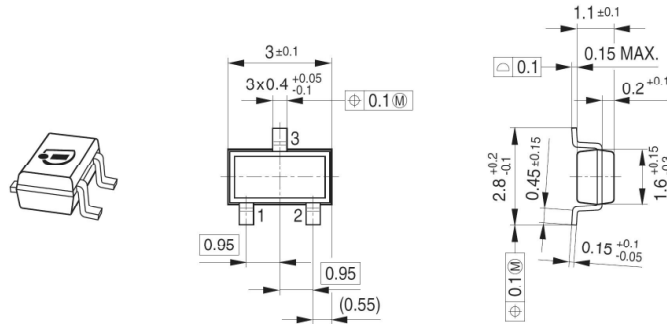
**Diagram Gate charge waveforms**





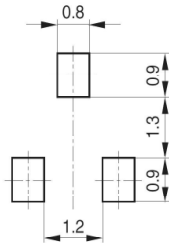
## 5 Package Outlines

### Package Outline

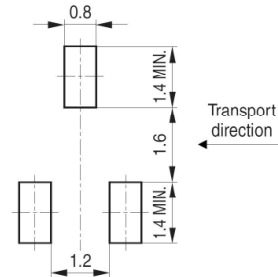


### Foot Print

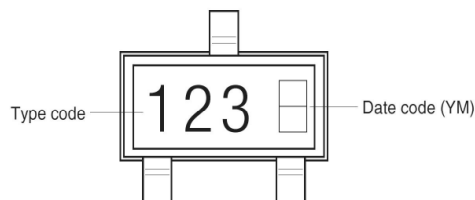
Soldering Type: Reflow Soldering



Soldering Type: Wave Soldering



### Marking Layout



### Tape and Reel

Reel  $\phi$  180 mm: 3.000 Pieces/Reel  
Reels/Box: 1 x 3.000 = 3.000

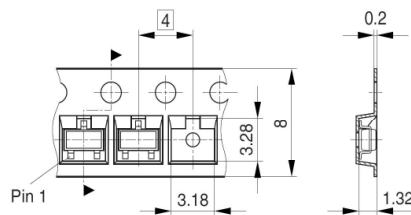


Figure 1 Outline PG-SC59-3, dimensions in mm/inches

## Revision History

BSR316P

**Revision: 2021-05-27, Rev. 2.1**

Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0      | 2020-11-10 | Breakdown voltage max to min                 |
| 2.1      | 2021-05-27 | Update schematic and legend Diagram 4        |

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