



## DESCRIPTION

The BSS138L is available in SOT-23 Package

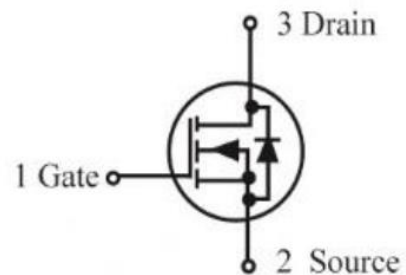
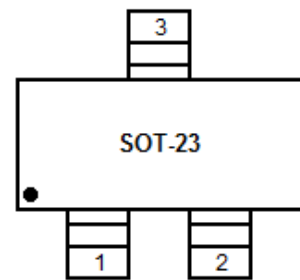
## ORDERING INFORMATION

| Package Type                             | Part Number        |
|--|--------------------|
| SOT-23                                   | BSS138L            |
| Note                                     | SPQ: 3,000pcs/Reel |
| AiT provides all RoHS Compliant Products |                    |

## FEATURES

- Low threshold voltage ( $V_{GS(th)}$ : 0.5V...1.5V) makes it ideal for low voltage applications.
- Available in SOT-23 Package

## PIN DESCRIPTION





## ABSOLUTE MAXIMUM RATINGS

|  |       |
|--|-------|
| V <sub>DSS</sub> , Drain–Source Voltage                          | 50V   |
| V <sub>GS</sub> , Gate–to–Source Voltage – Continuous            | ±20V  |
| I <sub>D</sub> , Drain Current, Continuous T <sub>A</sub> = 25°C | 200mA |
| I <sub>DM</sub> , Drain Current, Pulsed (t <sub>p</sub> ≤10μs)   | 800mA |

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## THERMAL CHARACTERISTICS

| Parameter  | Symbol                            | Limits      | Unit        |
|--|-----------------------------------|-------------|-------------|
| Total Device Dissipation, FR- 5 Board <sup>NOTE1</sup><br>T <sub>A</sub> = 25 °C<br>Derate above 25 °C | P <sub>D</sub>                    | 225<br>1.8  | mW<br>mW/°C |
| Thermal Resistance, Junction–to–Ambient <sup>NOTE1</sup>   | R <sub>θJA</sub>                  | 556         | °C/W        |
| Junction and Storage Temperature   | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C          |
| Maximum Lead Temperature for Soldering Purposes,<br>for 10 seconds                                     | T <sub>L</sub>                    | 260         | °C          |

NOTE1: FR-5 = 1.0 x 0.75 x 0.062 in.



## ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = 25°C

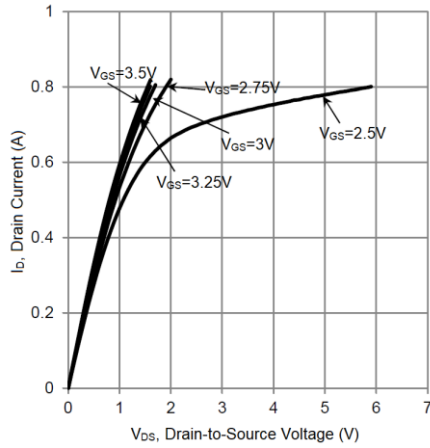
| Parameter                                  | Symbol              | Conditions   | Min. | Typ. | Max. | Unit |
|--|---------------------|--|------|------|------|------|
| <b>OFF CHARACTERISTICS</b>                 |                     |  |      |      |      |      |
| Drain–Source Breakdown Voltage             | V <sub>BRDSS</sub>  | V <sub>GS</sub> = 0, I <sub>D</sub> = 250μAdc  | 50   | -    | -    | Vdc  |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | V <sub>GS</sub> = 0, V <sub>DS</sub> = 25Vdc   | -    | -    | 0.1  | μAdc |
|  |                     | V <sub>GS</sub> = 0, V <sub>DS</sub> = 50Vdc   | -    | -    | 0.5  |      |
| Gate–Body Leakage Current,<br>Forward      | I <sub>GSSF</sub>   | V <sub>GS</sub> = 20Vdc  | -    | -    | 0.1  | μAdc |
| Gate–Body Leakage Current,<br>Reverse      | I <sub>GSSR</sub>   | V <sub>GS</sub> = - 20Vdc  | -    | -    | -0.1 | μAdc |
| <b>ON CHARACTERISTICS<sup>NOTE2</sup></b>  |                     |  |      |      |      |      |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1.0mAdc                             | 0.5  | -    | 1.5  | Vdc  |
| Static Drain–Source On–State<br>Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> = 2.75Vdc, I <sub>D</sub> < 200<br>mAdc, T <sub>A</sub> = -40°C to +85°C | -    | 5.6  | 10   | Ohms |
|  |                     | V <sub>GS</sub> = 5.0Vdc, I <sub>D</sub> = 200mAdc                                       | -    | -    | 3.5  |      |
| Forward Transconductance                   | G <sub>FS</sub>     | V <sub>DS</sub> = 25Vdc, I <sub>D</sub> = 200mAdc,<br>f = 1.0 kHz                        | 100  | -    | -    | mS   |
| <b>DYNAMIC CHARACTERISTICS</b>             |                     |  |      |      |      |      |
| Input Capacitance                          | C <sub>iss</sub>    | V <sub>DS</sub> = 25Vdc, V <sub>GS</sub> = 0,<br>f = 1.0 MHz                             | -    | 40   | 50   | pF   |
| Output Capacitance                         | C <sub>oss</sub>    |  | -    | 12   | 25   |      |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    |  | -    | 3.5  | 5.0  |      |
| <b>SWITCHING CHARACTERISTICS</b>           |                     |  |      |      |      |      |
| Turn-On Delay Time                         | t <sub>d(on)</sub>  | V <sub>DD</sub> = 30Vdc, I <sub>D</sub> = 200mAdc  | -    | -    | 20   | ns   |
| Turn-Off Delay Time                        | t <sub>d(off)</sub> |  | -    | -    | 20   |      |

NOTE2 Pulse Test: Pulse Width ≤300 μs, Duty Cycle ≤2.0%.

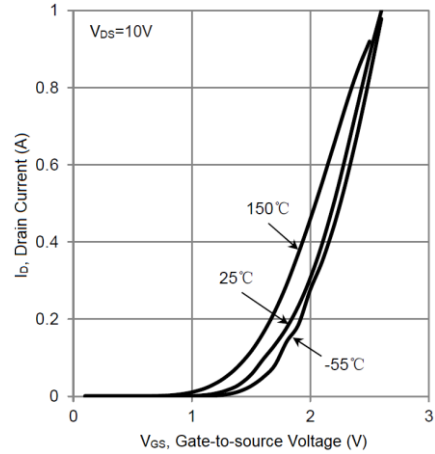


## TYPICAL CHARACTERISTICS

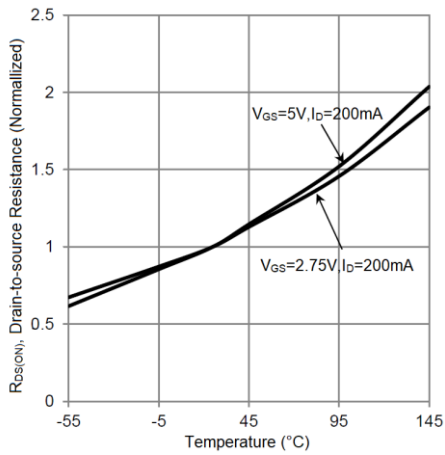
### 1. On-Region Characteristics



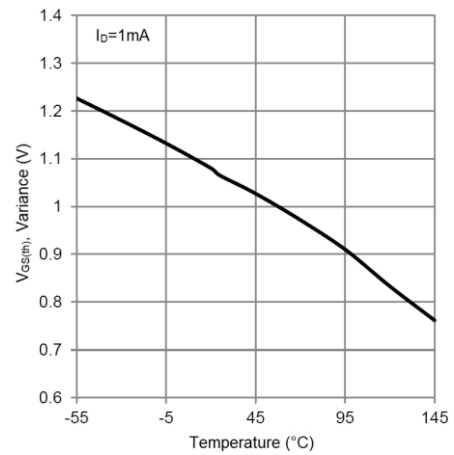
### 2. Transfer Characteristics



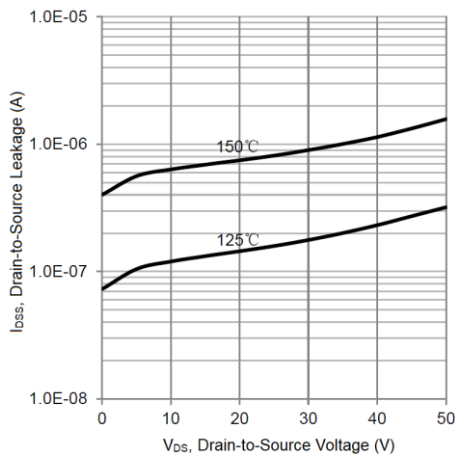
### 3. $R_{DS(ON)}$ vs. Temperature



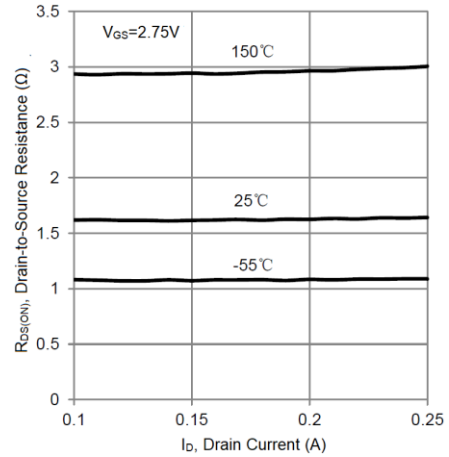
### 4. Threshold Voltage vs. Temperature



### 5. $I_{DSS}$ vs. $V_{DS}$

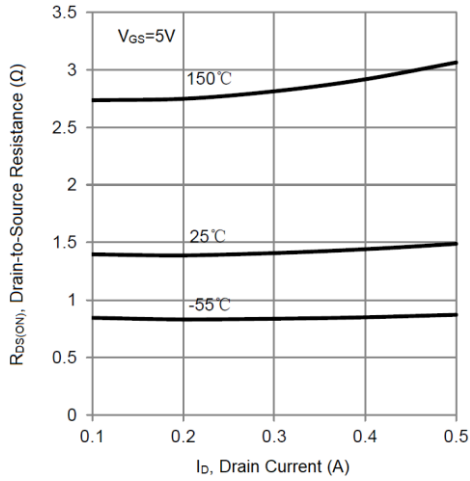


### 6. $R_{DS(ON)}$ vs. $I_D$

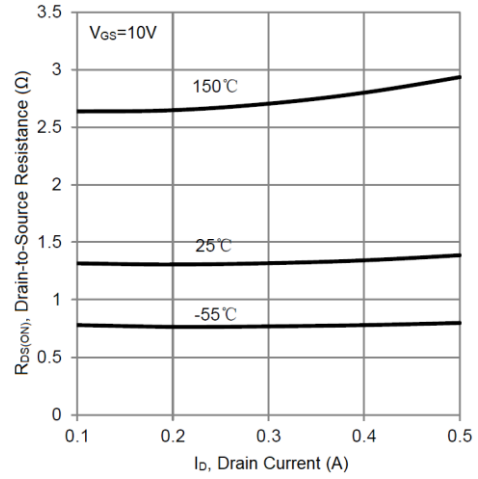




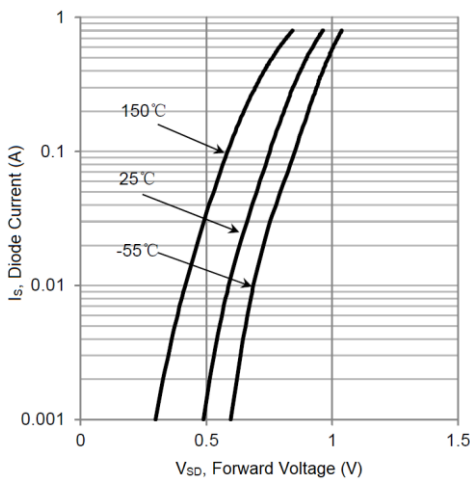
7.  $R_{DS(ON)}$  vs.  $I_D$



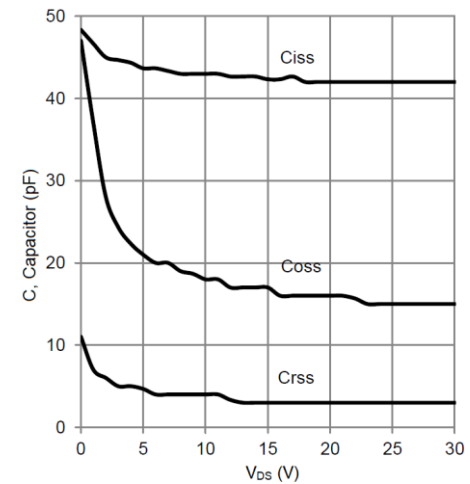
8.  $R_{DS(ON)}$  vs.  $I_D$



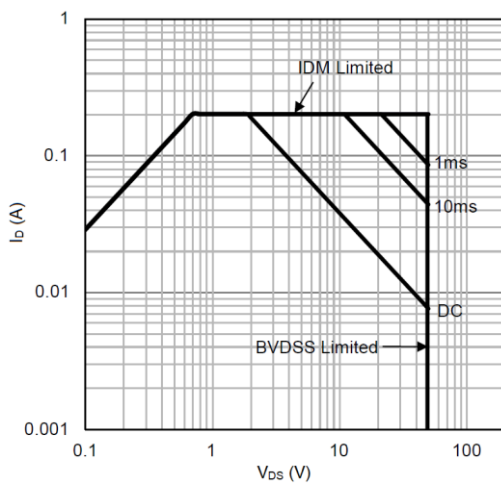
9. Body Diode Forward Voltage



10. Capacitor vs.  $V_{DS}$



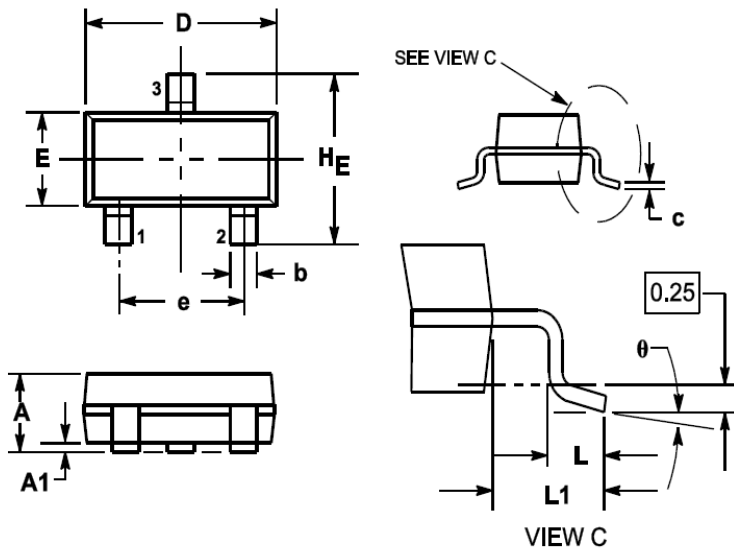
11. Safe Operating Area



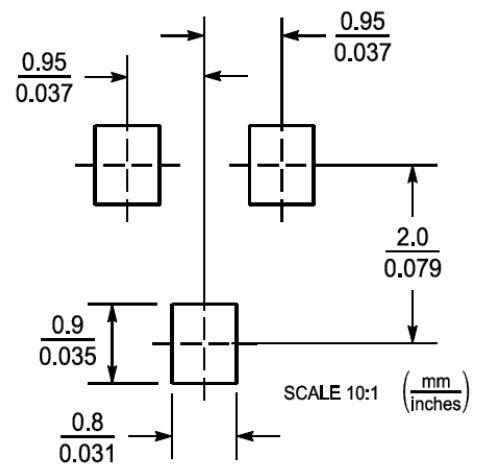


## PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



## SOLDERING FOOTPRINT



| DIM | MILLIMETERS |      | INCHES |       |
|-----|-------------|------|--------|-------|
|     | MIN         | MAX  | MIN    | MAX   |
| A   | 0.89        | 1.11 | 0.035  | 0.044 |
| A1  | 0.01        | 0.10 | 0.001  | 0.004 |
| b   | 0.37        | 0.50 | 0.015  | 0.020 |
| c   | 0.09        | 0.18 | 0.003  | 0.007 |
| D   | 2.80        | 3.04 | 0.110  | 0.120 |
| E   | 1.20        | 1.40 | 0.047  | 0.055 |
| e   | 1.78        | 2.04 | 0.070  | 0.081 |
| L   | 0.10        | 0.30 | 0.004  | 0.012 |
| L1  | 0.35        | 0.69 | 0.014  | 0.029 |
| HE  | 2.10        | 2.64 | 0.083  | 0.104 |
| θ   | 0°          | 10°  | 0°     | 10°   |



## IMPORTANT NOTICE

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