

# MOSFET – Power, N-Channel, SOT-23 200 mA, 50 V

## BSS138L, BVSS138L

Typical applications are DC–DC converters, power management in portable and battery–powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

### Features

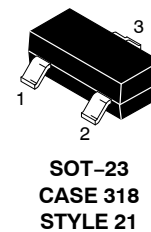
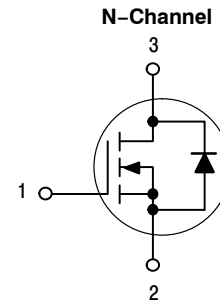
- Low Threshold Voltage ( $V_{GS(th)}$ : 0.85 V–1.5 V) Makes it Ideal for Low Voltage Applications
- Miniature SOT–23 Surface Mount Package Saves Board Space
- HBM Class 0A, MM Class M1A, CDM Class IV (Note 3)
- BVSS Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

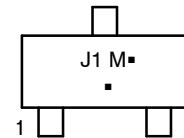
| Rating  | Symbol          | Value       | Unit                      |
|---|-----------------|-------------|---------------------------|
| Drain–to–Source Voltage   | $V_{DS}$        | 50          | Vdc                       |
| Gate–to–Source Voltage – Continuous                             | $V_{GS}$        | $\pm 20$    | Vdc                       |
| Drain Current   | $I_D$           | 200         | mA                        |
| – Continuous @ $T_A = 25^\circ\text{C}$                         | $I_{DM}$        | 800         |                           |
| – Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ )            |                 |             |                           |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$              | $P_D$           | 225         | mW                        |
| Operating and Storage Temperature Range                         | $T_J, T_{stg}$  | – 55 to 150 | $^\circ\text{C}$          |
| Thermal Resistance, Junction–to–Ambient                         | $R_{\theta JA}$ | 556         | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, for 10 seconds | $T_L$           | 260         | $^\circ\text{C}$          |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

200 mA, 50 V  
 $R_{DS(on)} = 3.5 \Omega$



### MARKING DIAGRAM



J1 = Device Code  
M = Date Code\*  
▪ = Pb–Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device                  | Package          | Shipping†            |
|-------------------------|------------------|----------------------|
| BSS138LT1G, BVSS138LT1G | SOT-23 (Pb–Free) | 3,000 / Tape & Reel  |
| BSS138LT7G              | SOT-23 (Pb–Free) | 3,500 / Tape & Reel  |
| BSS138LT3G, BVSS138LT3G | SOT-23 (Pb–Free) | 10,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# BSS138L, BVSS138L

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |               |             |             |                   |                 |
|---|---------------|-------------|-------------|-------------------|-----------------|
| Drain-to-Source Breakdown Voltage<br>( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\text{ }\mu\text{Adc}$ )   | $V_{(BR)DSS}$ | 50          | –           | –                 | Vdc             |
| Zero Gate Voltage Drain Current<br>( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $25^\circ\text{C}$ )<br>( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $25^\circ\text{C}$ )<br>( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $150^\circ\text{C}$ ) | $I_{DSS}$     | –<br>–<br>– | –<br>–<br>– | 0.1<br>0.5<br>5.0 | $\mu\text{Adc}$ |
| Gate-Source Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )  | $I_{GSS}$     | –           | –           | $\pm 0.1$         | $\mu\text{Adc}$ |

### ON CHARACTERISTICS (Note 1)

|  |              |        |          |           |          |
|--|--------------|--------|----------|-----------|----------|
| Gate-Source Threshold Voltage<br>( $V_{DS} = V_{GS}$ , $I_D = 1.0\text{ mAdc}$ )   | $V_{GS(th)}$ | 0.85   | –        | 1.5       | Vdc      |
| Static Drain-to-Source On-Resistance<br>( $V_{GS} = 2.75\text{ Vdc}$ , $I_D < 200\text{ mAdc}$ , $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ )<br>( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 200\text{ mAdc}$ ) | $r_{DS(on)}$ | –<br>– | 5.6<br>– | 10<br>3.5 | $\Omega$ |
| Forward Transconductance<br>( $V_{DS} = 25\text{ Vdc}$ , $I_D = 200\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )  | $g_{fs}$     | 100    | –        | –         | mmhos    |

### DYNAMIC CHARACTERISTICS

|                      |  |           |   |     |     |    |
|----------------------|--|-----------|---|-----|-----|----|
| Input Capacitance    | ( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ ) | $C_{iss}$ | – | 40  | 50  | pF |
| Output Capacitance   | ( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ ) | $C_{oss}$ | – | 12  | 25  |    |
| Transfer Capacitance | ( $V_{DG} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ ) | $C_{rss}$ | – | 3.5 | 5.0 |    |

### SWITCHING CHARACTERISTICS (Note 2)

|                     |   |              |   |   |    |    |
|---------------------|---|--------------|---|---|----|----|
| Turn-On Delay Time  | (V <sub>DD</sub> = 30 Vdc, I <sub>D</sub> = 0.2 Adc.) | $t_{d(on)}$  | – | – | 20 | ns |
| Turn-Off Delay Time |   | $t_{d(off)}$ | – | – | 20 |    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
2. Switching characteristics are independent of operating junction temperature.
3. ESD between the gate and source serves only, no gate overvoltage rating is implied.

TYPICAL ELECTRICAL CHARACTERISTICS

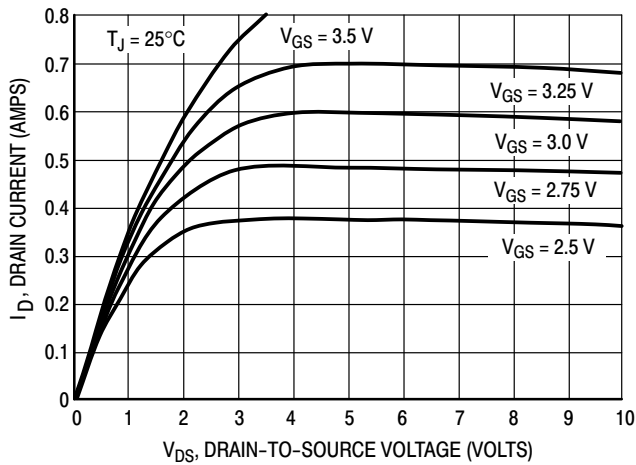


Figure 1. On-Region Characteristics

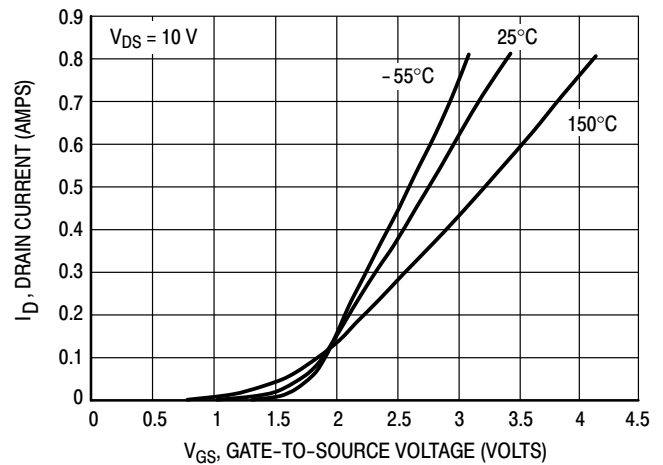


Figure 2. Transfer Characteristics

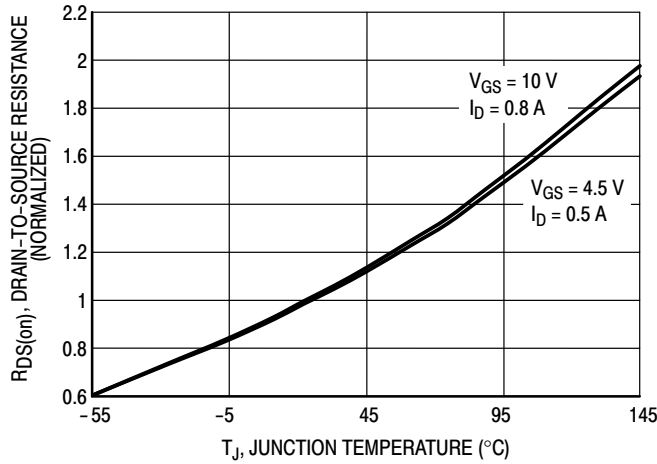


Figure 3. On-Resistance Variation with Temperature

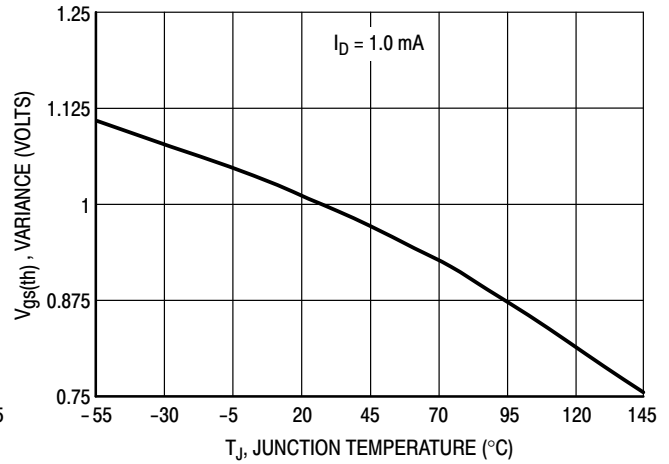


Figure 4. Threshold Voltage Variation with Temperature

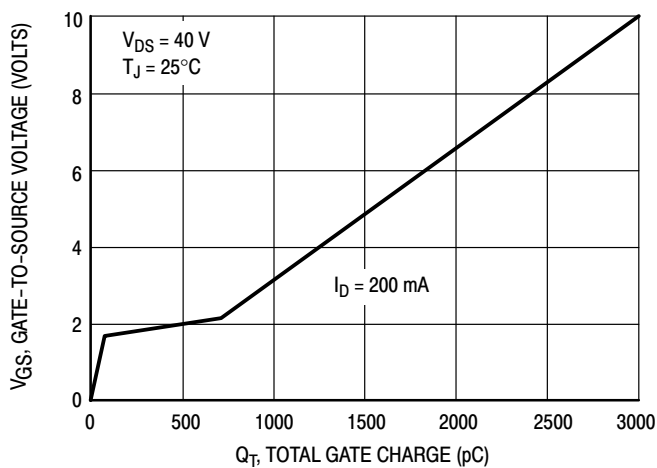


Figure 5. Gate Charge

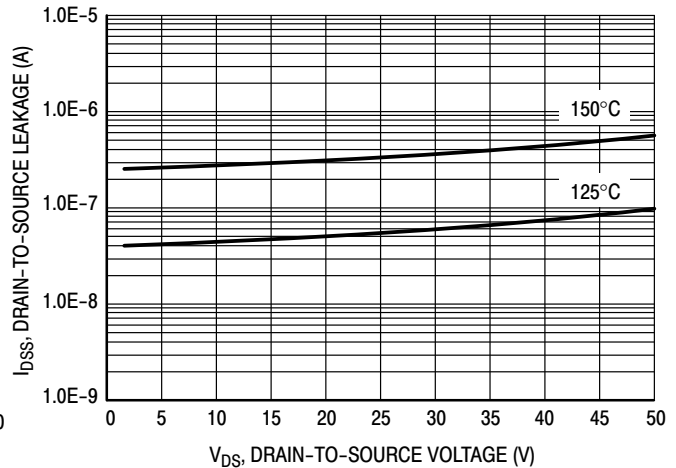


Figure 6. IDSS

TYPICAL ELECTRICAL CHARACTERISTICS

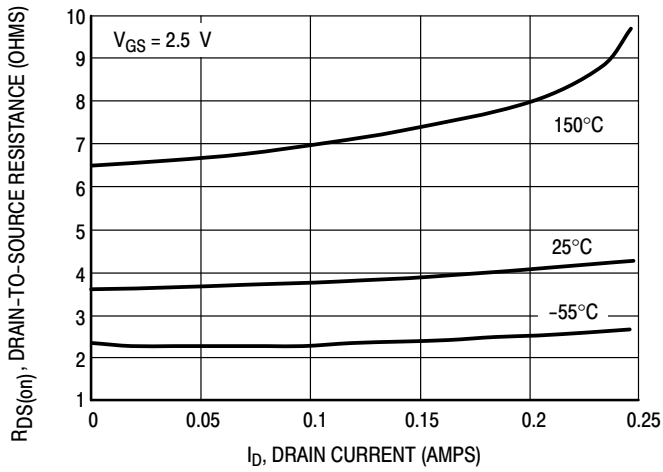


Figure 7. On-Resistance versus Drain Current

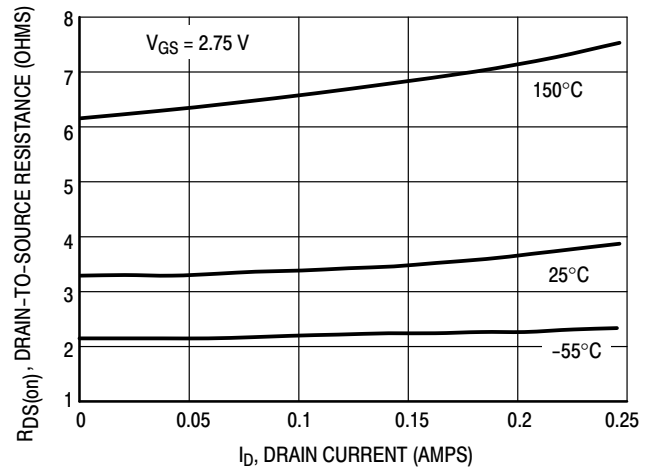


Figure 8. On-Resistance versus Drain Current

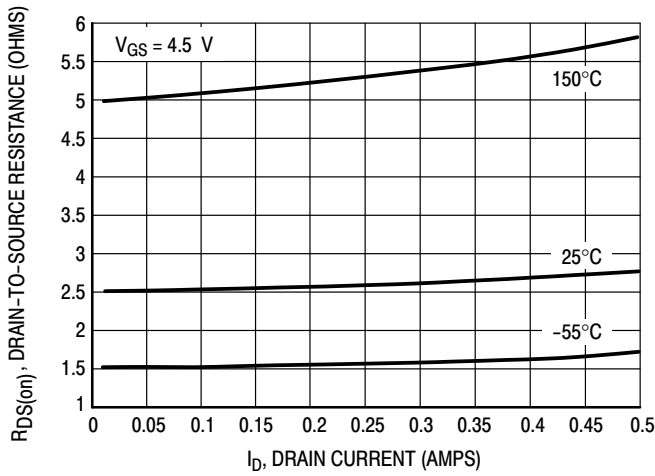


Figure 9. On-Resistance versus Drain Current

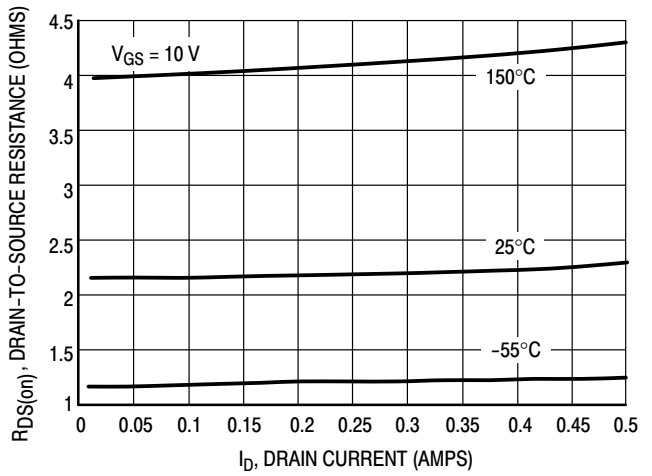


Figure 10. On-Resistance versus Drain Current

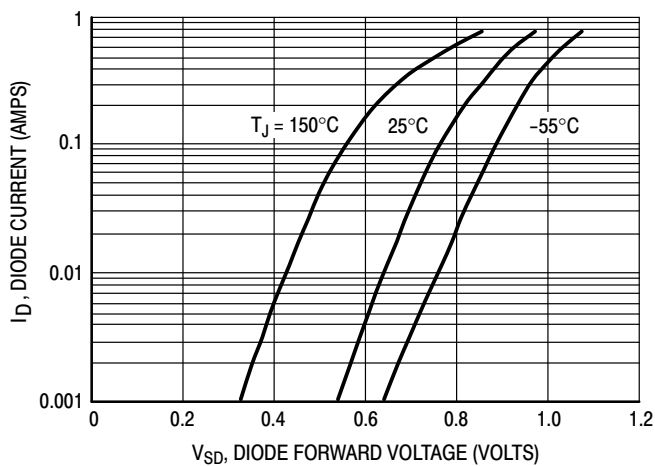


Figure 11. Body Diode Forward Voltage

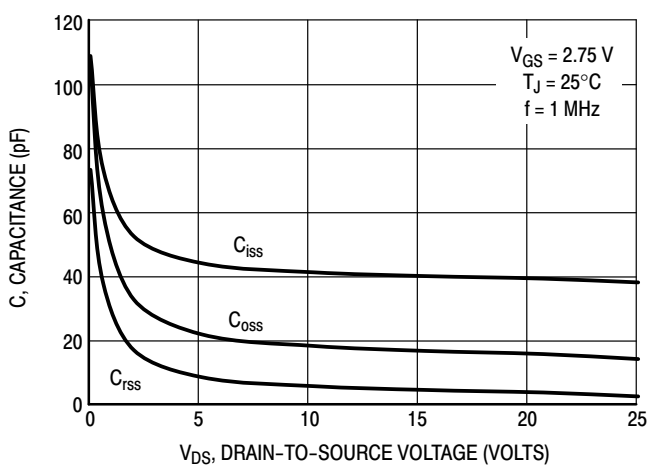


Figure 12. Capacitance

# BSS138L, BVSS138L

## TYPICAL ELECTRICAL CHARACTERISTICS

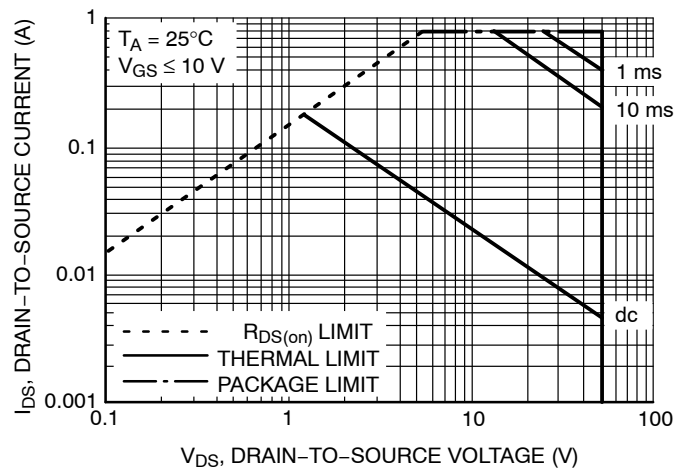
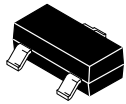


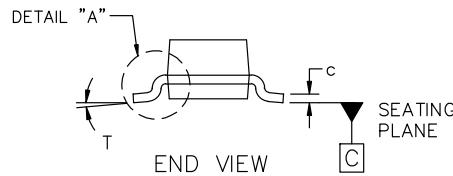
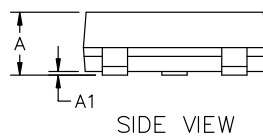
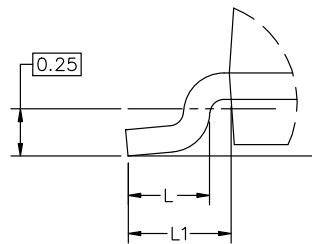
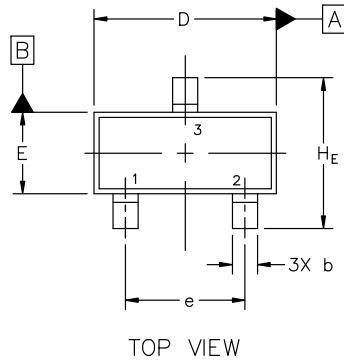
Figure 13. Safe Operating Area



SCALE 4:1

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P  
CASE 318  
ISSUE AU

DATE 14 AUG 2024

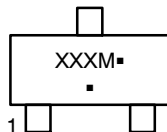


| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 1.20 | 1.30 | 1.40 |
| e           | 1.78 | 1.90 | 2.04 |
| L           | 0.30 | 0.43 | 0.55 |
| L1          | 0.35 | 0.54 | 0.69 |
| HE          | 2.10 | 2.40 | 2.64 |
| T           | 0°   | ---  | 10°  |

NOTES:

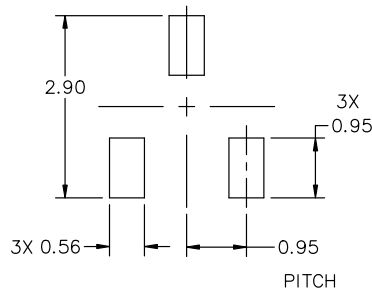
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

GENERIC  
MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED  
MOUNTING FOOTPRINT

\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

STYLES ON PAGE 2

|                  |                                      |   |
|------------------|--------------------------------------|---|
| DOCUMENT NUMBER: | 98ASB42226B                          | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | SOT-23 (TO-236) 2.90x1.30x1.00 1.90P | PAGE 1 OF 2   |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |   |   |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |   |   |   |   |

|                  |                                      |   |
|------------------|--------------------------------------|---|
| DOCUMENT NUMBER: | 98ASB42226B                          | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | SOT-23 (TO-236) 2.90x1.30x1.00 1.90P | PAGE 2 OF 2   |

**onsemi** and **onsemi** are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)



# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[onsemi:](#)

[BSS138LT1G](#) [BSS138LT3G](#) [BVSS138LT1G](#) [BSS138LT7G](#)