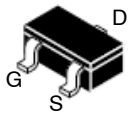
# MOSFET – N-Channel, 2.5 V Specified, POWERTRENCH®

## 20 V, 1.7 A, 100 mΩ

# FDN335N

| $V_{DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 20 V | 0.07 Ω @ 4.5 V | 1.7 A |
| | 0.1 Ω @ 2.5 V | |




**SOT−23/SUPERSOT™ −23, 3 LEAD, 1.4x2.9**
**CASE 527AG**

### General Description

This N−Channel 2.5 V specified MOSFET is produced using **onsemi** advanced POWERTRENCH® process that has been especially tailored to minimize the on−state resistance and yet maintain low gate charge for superior switching performance.

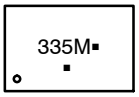
### Features

- 1.7 A, 20 V
  - $R_{DS(ON)}$ = 0.07 Ω @ $V_{GS}$ = 4.5 V
  - $R_{DS(ON)}$ = 0.1 Ω @ $V_{GS}$ = 2.5 V
- Low Gate Charge (3.5 nC typical)
- High Performance Trench Technology for Extremely Low $R_{DS(ON)}$
- High Power and Current Handling Capability
- This Device is Pb−Free and is RoHS Compliant

### Applications

- DC−DC Converter
- Load Switch

### MARKING DIAGRAM

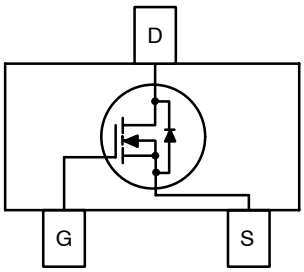



335 = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

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

### PIN ASSIGNMENT




### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C, unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain−Source Voltage | | 20 | V |
| $V_{GSS}$ | Gate−Source Voltage | | ±8 | V |
| $I_D$ | Drain Current | Continuous (Note 1a) | 1.7 | A |
| | | Pulsed | 8 | |
| $P_D$ | Power Dissipation for Single Operation | (Note 1a) | 0.5 | W |
| | | (Note 1b) | 0.46 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | −55 to 150 | °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.

### THERMAL CHARACTERISTICS ($T_A$ = 25°C, unless otherwise noted)

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction−to−Ambient (Note 1a) | 250 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction−to−Case (Note 1) | 75 | °C/W |

© Semiconductor Components Industries, LLC, 1999

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain−Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 20 | – | – | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | – | 14 | – | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 16 V, $V_{GS}$ = 0 V | – | – | 1 | μA |
| $I_{GSSF}$ | Gate to Source Leakage Current, Forward | $V_{GS}$ = 8 V, $V_{DS}$ = 0 V | – | – | 100 | nA |
| $I_{GSSR}$ | Gate to Source Leakage Current, Reverse | $V_{GS}$ = −8 V, $V_{DS}$ = 0 V | – | – | −100 | nA |
| **ON CHARACTERISTICS** (Note 2) | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 0.4 | 0.9 | 1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | – | −3 | – | mV/°C |
| $R_{DS(ON)}$ | Static Drain−Source On−Resistance | $V_{GS}$ = 4.5 V, $I_D$ = 1.7 A | – | 0.055 | 0.07 | Ω |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 1.7 A, $T_J$ = 125°C | – | 0.079 | 0.12 | |
| | | $V_{GS}$ = 2.5 V, $I_D$ = 1.5 A | – | 0.078 | 0.10 | |
| $I_{D(on)}$ | On−State Drain Current | $V_{GS}$ = 4.5 V, $V_{DS}$ = 5 V | 8 | – | – | A |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 1.5 A | – | 7 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 10 V, $V_{GS}$ = 0 V, f = 1 MHz | – | 310 | – | pF |
| $C_{oss}$ | Output Capacitance | | – | 80 | – | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 40 | – | pF |
| **SWITCHING CHARACTERISTICS** (Note 2) | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = 10 V, $I_D$ = 1 A, $V_{GS}$ = 4.5 V, $R_{GEN}$ = 6 Ω | – | 5 | 15 | ns |
| $t_r$ | Turn−On Rise Time | | – | 8.5 | 17 | ns |
| $t_{d(off)}$ | Turn−Off Delay Time | | – | 11 | 20 | ns |
| $t_f$ | Turn−Off Fall Time | | – | 3 | 10 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 10 V, $I_D$ = 1.7 A, $V_{GS}$ = 4.5 V | – | 3.5 | 5 | nC |
| $Q_{gs}$ | Gate−Source Charge | | – | 0.55 | – | nC |
| $Q_{gd}$ | Gate−Drain Charge | | – | 0.95 | – | nC |
| **DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | |
| $I_S$ | Maximum Continuous Drain−Source Diode Forward Current | | – | – | 0.42 | A |
| $V_{SD}$ | Source−Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 0.42 A (Note 2) | – | 0.7 | 1.2 | V |

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.

NOTES:

1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 250°C/W when mounted on a 0.02 $in^2$ pad of 2 oz copper



b) 270°C/W when mounted on a minimum pad

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

## TYPICAL CHARACTERISTICS

($T_J$ = 25°C unless otherwise noted)

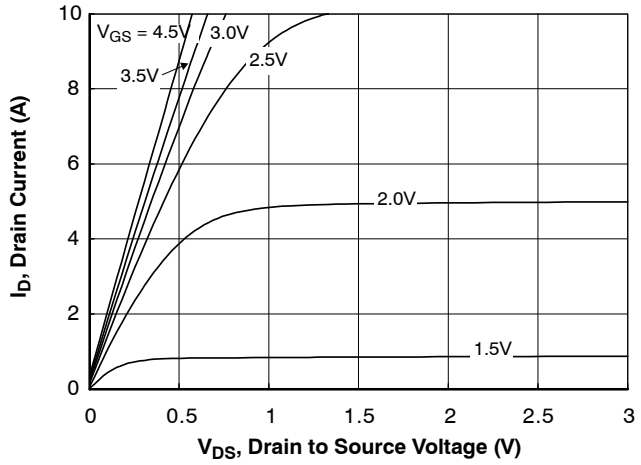



**Figure 1. On Region Characteristics**

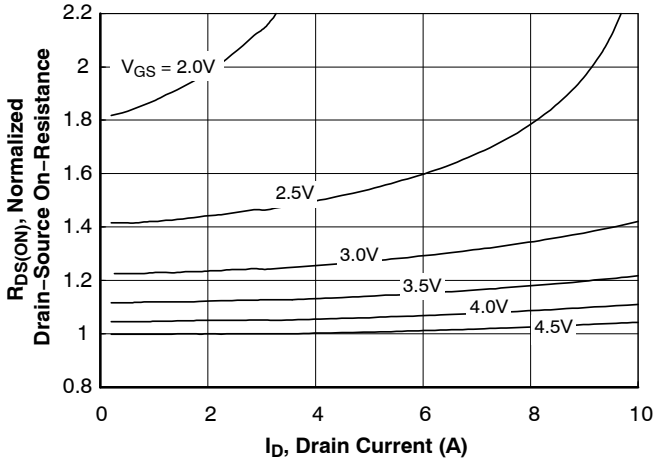



**Figure 2. On−Resistance Variation with Drain Current and Gate Voltage**

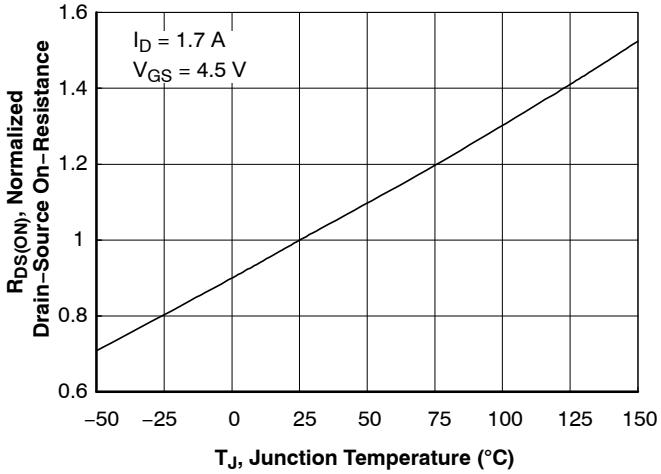



**Figure 3. On−Resistance Variation with Temperature**

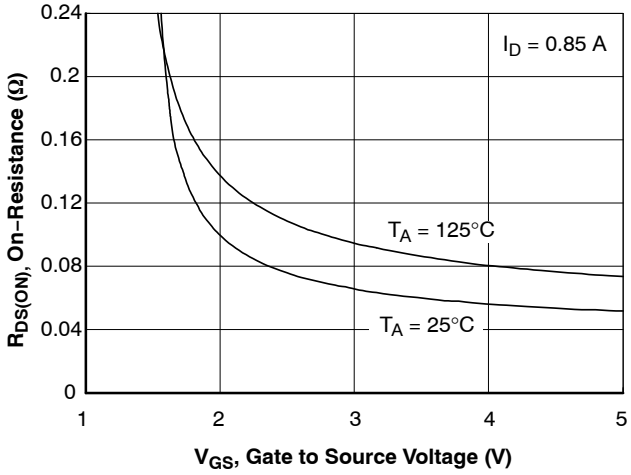



**Figure 4. On−Resistance Variation with Gate to Source Voltage**

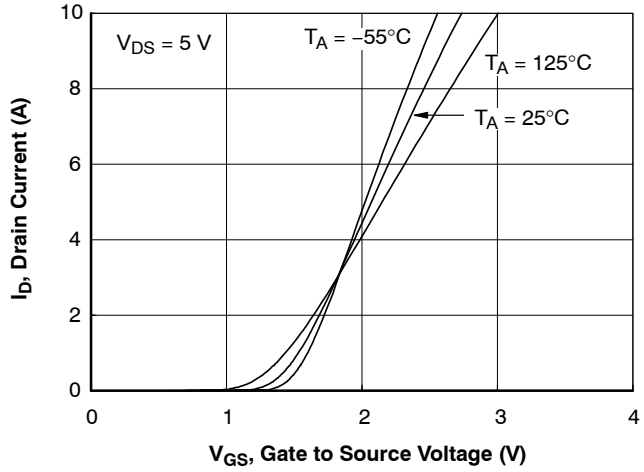



**Figure 5. Transfer Characteristics**

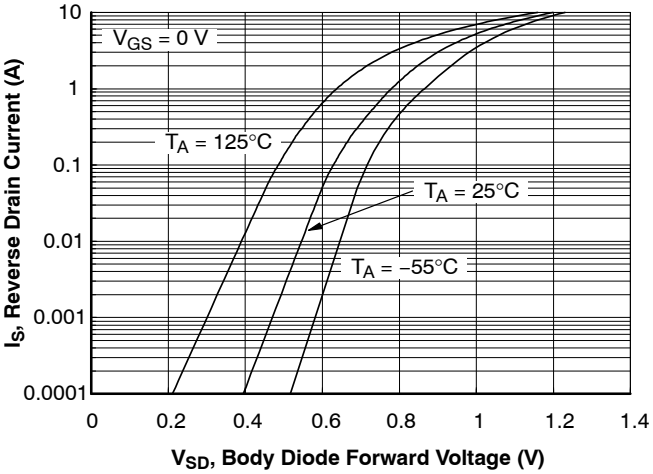



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature**

## TYPICAL CHARACTERISTICS (continued)

($T_J$ = 25°C unless otherwise noted)

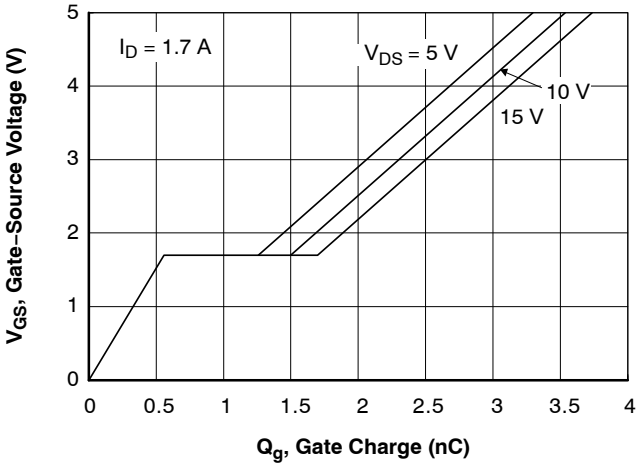



**Figure 7. Gate Charge Characteristics**

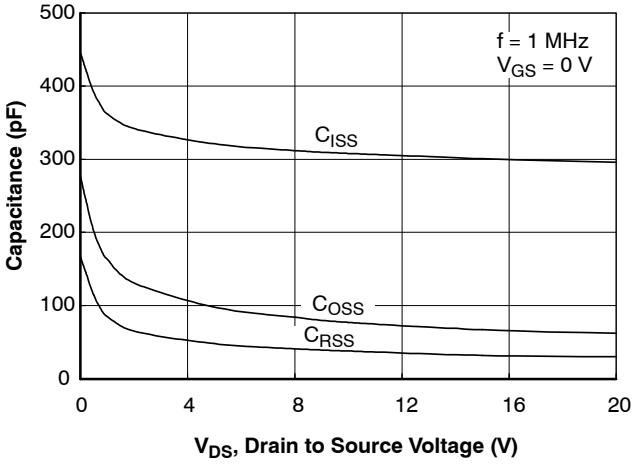



**Figure 8. Capacitance vs Drain to Source Voltage**

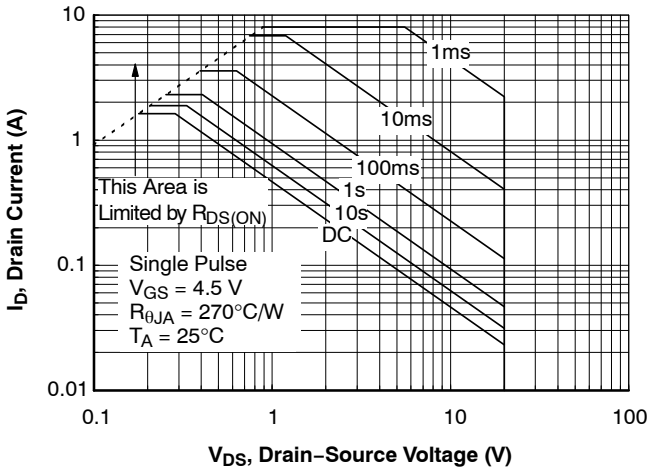



**Figure 9. Maximum Safe Operating Area**

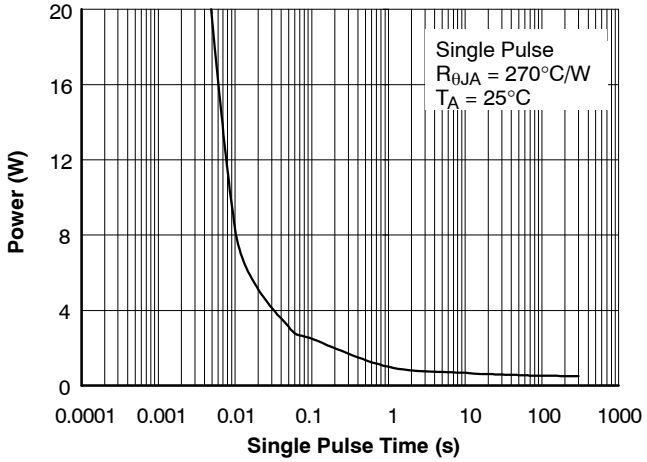



**Figure 10. Single Pulse Maximum Power Dissipation**

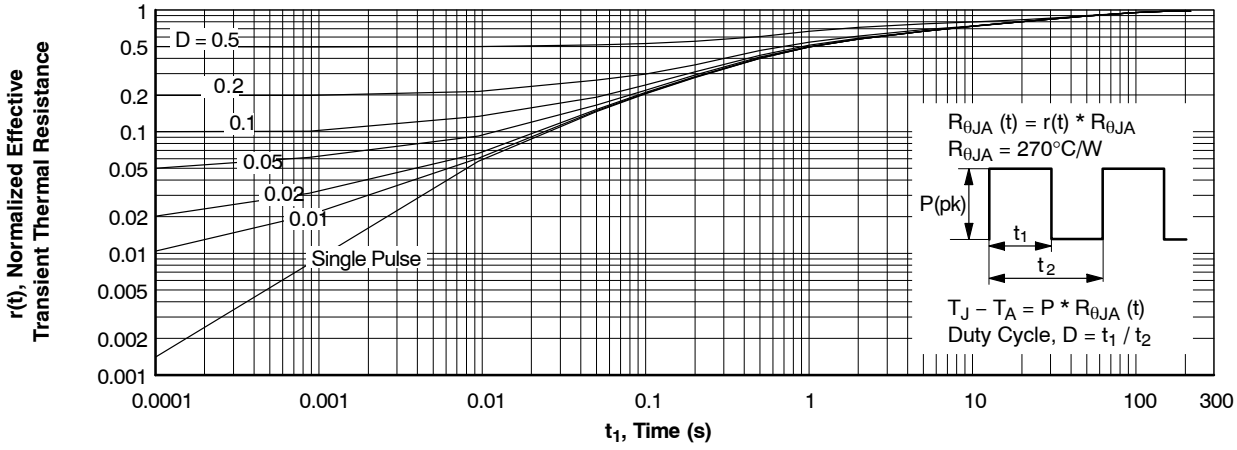



**Figure 11. Transient Thermal Response Curve**

NOTE: Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

## PACKAGE MARKING AND ORDERING INFORMATION

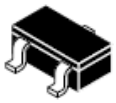
| Device | Device Marking | Package | Shipping† |
|---|---|---|---|
| FDN335N | 335M (see Marking Diagram on the front page) | SOT−23/SUPERSOT−23, 3 LEAD, 1.4x2.9 (Pb−Free, Halide Free) | 3000 / Tape & Reel |

†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.

POWERTRENCH is a registered trademark of Semiconductor Components Industries, LLC dba “**onsemi**” or its affiliates and/or subsidiaries in the United States and/or other countries.
SUPERSOT is a trademark of Semiconductor Components Industries, LLC dba “**onsemi**” or its affiliates and/or subsidiaries in the United States and/or other countries.

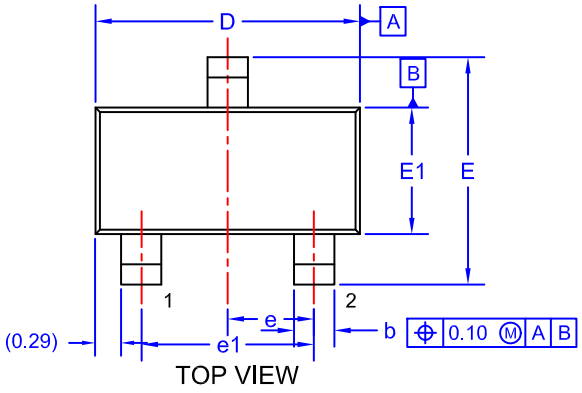
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT−23/SUPERSOT™ −23, 3 LEAD, 1.4x2.9**
CASE 527AG
ISSUE A

DATE 09 DEC 2019

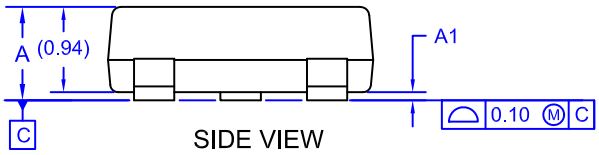


TOP VIEW

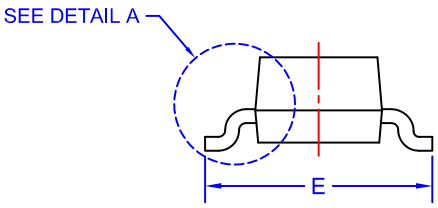
NOTES: UNLESS OTHERWISE SPECIFIED

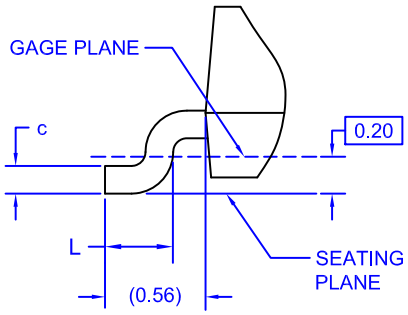
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.

| DIM | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 0.85 | 0.95 | 1.12 |
| A1 | 0.00 | 0.05 | 0.10 |
| b | 0.370 | 0.435 | 0.508 |
| c | 0.085 | 0.150 | 0.180 |
| D | 2.80 | 2.92 | 3.04 |
| E | 2.31 | 2.51 | 2.71 |
| E1 | 1.20 | 1.40 | 1.52 |
| e | | 0.95 BSC | |
| e1 | | 1.90 BSC | |
| L | 0.33 | 0.38 | 0.43 |

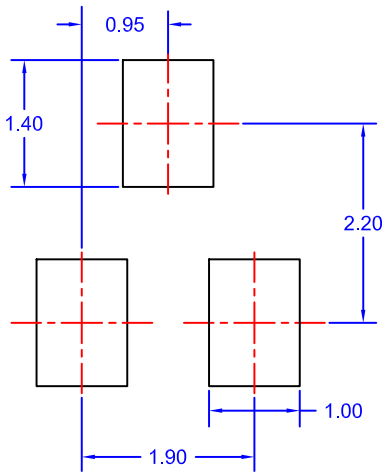


SIDE VIEW



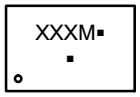
DETAIL A



LAND PATTERN RECOMMENDATION*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**GENERIC MARKING DIAGRAM***




XXX = Specific Device Code
M = Month Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*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.

| | | |
|---|---|---|
| **DOCUMENT NUMBER:** | **98AON34319E** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red. |
| **DESCRIPTION:** | **SOT−23/SUPERSOT−23, 3 LEAD, 1.4X2.9** | **PAGE 1 OF 1** |

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2019

**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. **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.

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
**Email Requests to:** orderlit@onsemi.com

**onsemi Website:** www.onsemi.com

**TECHNICAL SUPPORT**
**North American Technical Support:**
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊