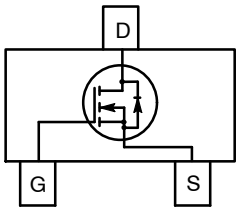
# MOSFET – N-Channel POWERTRENCH®

## 2.5 V Specified

# FDN339AN

SOT−23,
CASE 527AG




### Description

This N−Channel 2.5 V specified MOSFET is produced using **onsemi**'s 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

- 3 A, 20 V
  - $R_{DS(on)}$ = 0.035 Ω @ $V_{GS}$ = 4.5 V
  - $R_{DS(on)}$ = 0.050 Ω @ $V_{GS}$ = 2.5 V
- Low Gate Charge (7 nC Typical)
- High Performance Trench technology for Extremely Low $R_{DS(ON)}$
- High Power and Current Handling Capability

### Typical Applications

- DC−DC Converter
- Load Switch

### MARKING DIAGRAM


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

**ABSOLUTE MAXIMUM RATINGS** $T_A$ = 25°C unless otherwise noted

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | 20 | V |
| $V_{GSS}$ | Gate to Source Voltage | ±8 | V |
| $I_D$ | Drain Current<br>– Continuous (Note 1a)<br>– Pulsed | <br>3<br>20 | A |
| $P_D$ | Power Dissipation for Single Operation (Note 1a)<br>(Note 1b) | <br>0.5<br>0.46 | W |
| $T_J$, $T_{stg}$ | 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.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| FDN339AN | SOT−23<br>(Pb−Free) | 3000 /<br>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.

## THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | 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 |

## ELECTRICAL CHARACTERISTICS $T_A$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to 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−Body Leakage Current, Forward | $V_{GS}$ = 8 V, $V_{DS}$ = 0 V | – | – | 100 | nA |
| $I_{GSSR}$ | Gate−Body 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 | 0.85 | 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, $I_D$ = 3 A<br>$V_{GS}$ = 4.5 V, $I_D$ = 3 A $T_J$ = 125°C<br>$V_{GS}$ = 2.5 V, $I_D$ = 2.4 A | – | 0.029<br>0.040<br>0.039 | 0.035<br>0.061<br>0.050 | Ω |
| $I_{D(on)}$ | On−State Drain Current | $V_{GS}$ = 4.5 V, $V_{DS}$ = 5 V | 10 | | – | A |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 3 A | | 11 | – | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 10 V, $V_{GS}$ = 0 V, f = 1.0 MHz | – | 700 | – | pF |
| $C_{oss}$ | Output Capacitance | | – | 175 | – | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 85 | – | pF |
| **Switching Characteristics** (Note 2) | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = 10 V, $I_D$ = 1 A,<br>$V_{GS}$ = 4.5 V, $R_{GEN}$ = 6 Ω | – | 8 | 16 | ns |
| $t_r$ | Turn−On Rise Time | | – | 10 | 18 | ns |
| $t_{d(off)}$ | Turn−Off Delay Time | | – | 18 | 29 | ns |
| $t_f$ | Turn−Off Fall Time | | – | 5 | 10 | ns |
| $Q_g$ | Total Gate Change | $V_{DS}$ = 10 V, $I_D$ = 3 A,<br>$V_{GS}$ = 4.5 V | – | 7 | 10 | nC |
| $Q_{gs}$ | Gate−Source Change | | – | 1.2 | – | nC |
| $Q_{gd}$ | Gate−Drain Change | | – | 1.9 | – | nC |
| **Drain−Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain−Source Diode Forward Current | | – | – | 0.42 | A |
| $V_{SD}$ | Drain−Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 0.42 A (Note 2) | – | 0.65 | 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 in² Pad of 2 oz. Cu.

b) 270°C/W on a minimum mounting pad of 2 oz. Cu.

Scale 1 : 1 on letter size paper

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

## TYPICAL CHARACTERISTICS

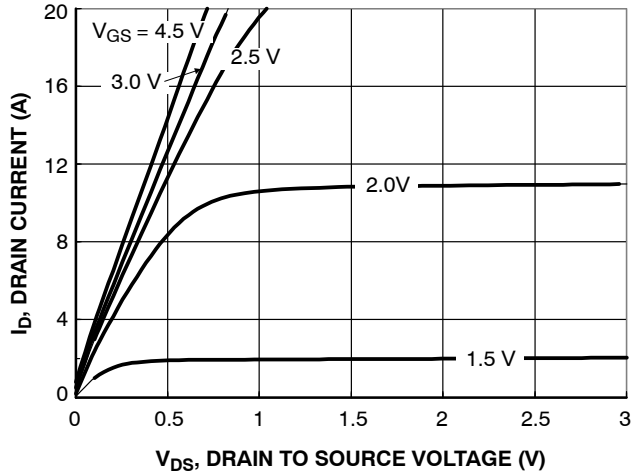



Figure 1. On−Region Characteristics

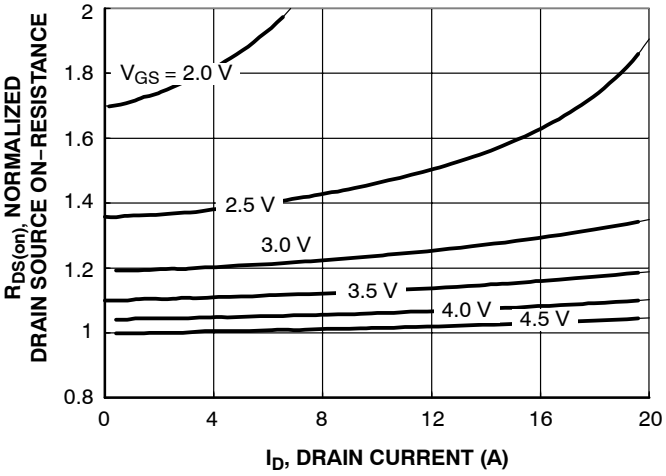



Figure 2. On−Resistance Variation With Drain Current and Gate Voltage

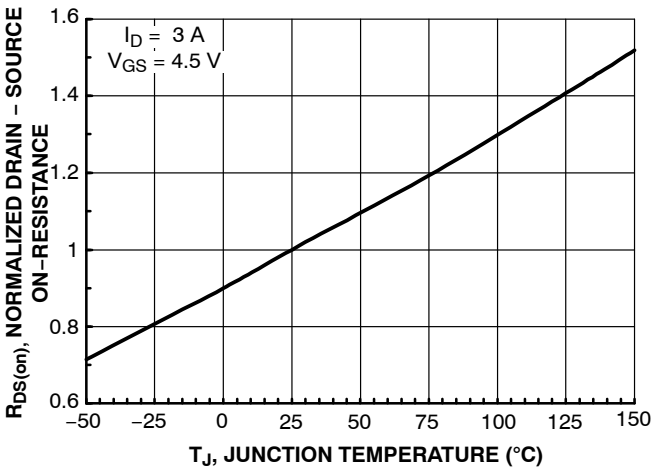



Figure 3. On−Resistance Variation with Temperature

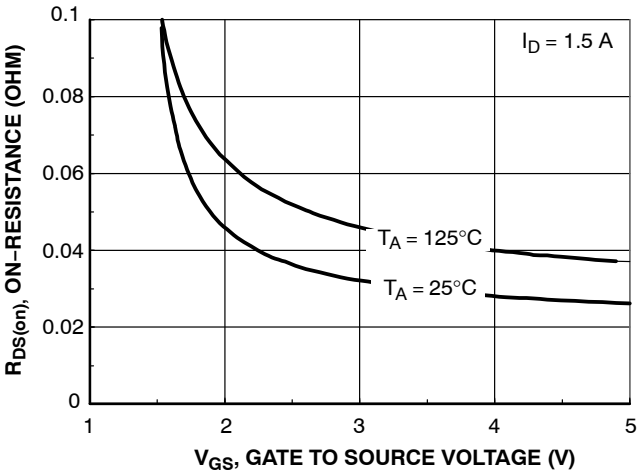



Figure 4. On−Resistance Variation with Gate−to−Source Voltage

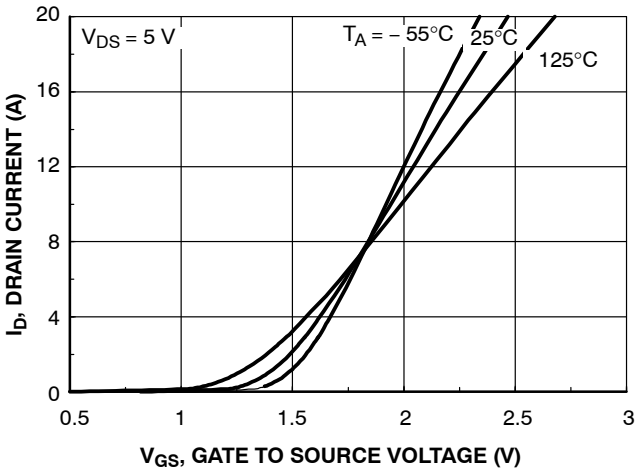



Figure 5. Transfer Characteristics

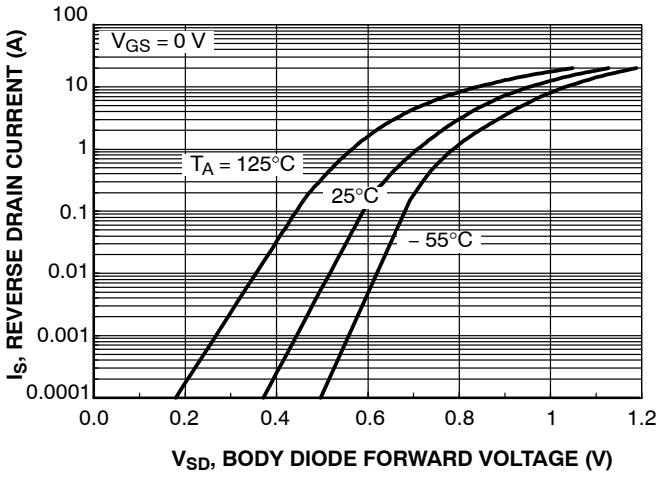



Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

## TYPICAL CHARACTERISTICS (CONTINUED)

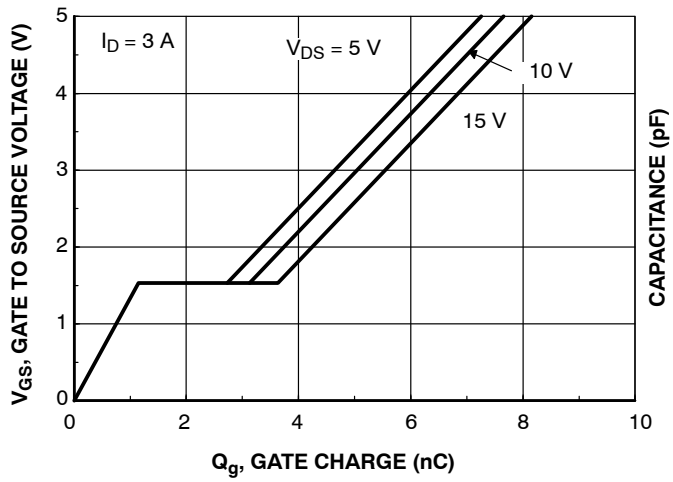



Figure 7. Gate Charge Characteristics

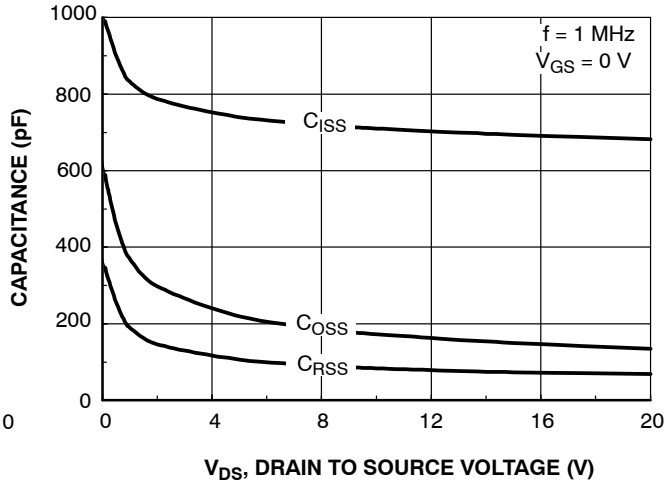



Figure 8. Capacitance Characteristics

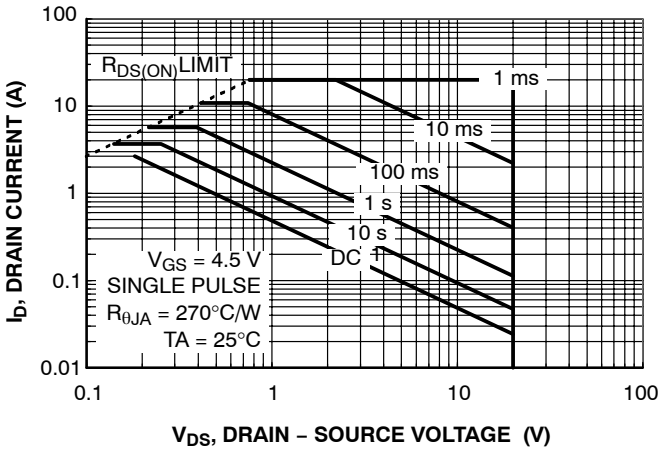



Figure 9. Maximum Safe Operating Area

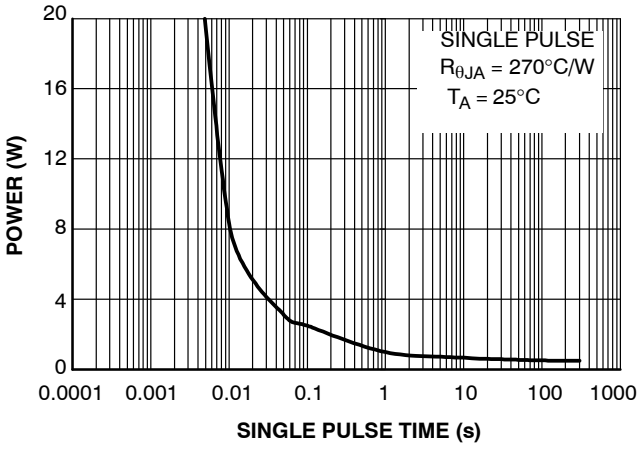



Figure 10. Single Pulse Maximum Power Dissipation

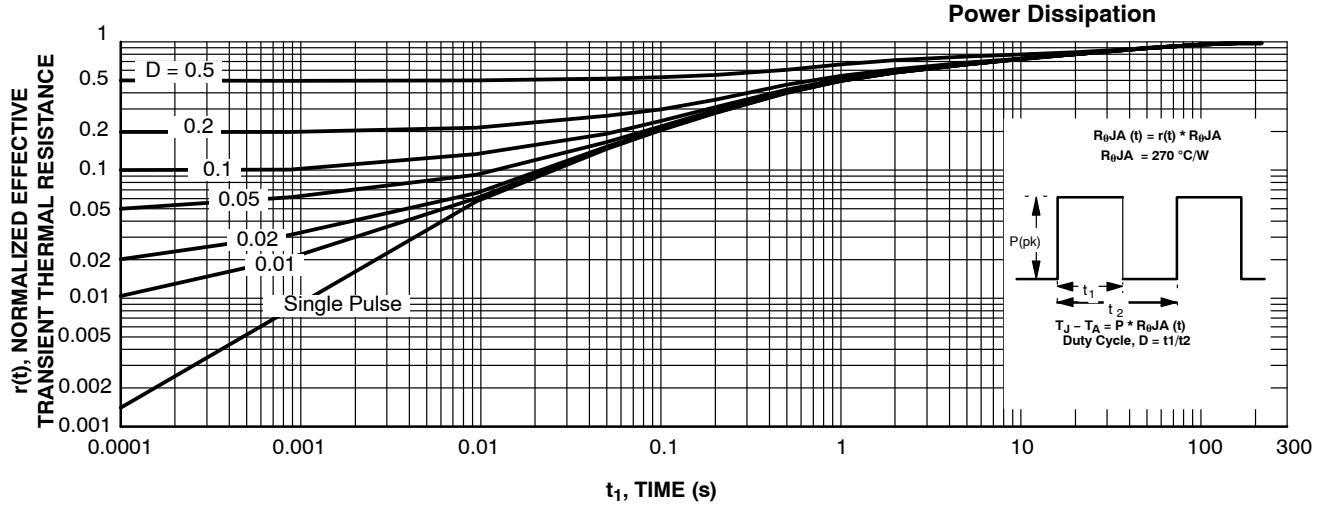
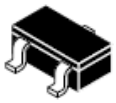


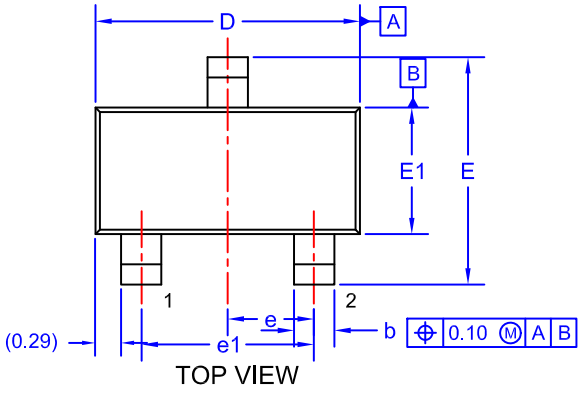

Figure 11. Transient Thermal Response Curve

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



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

DATE 09 DEC 2019

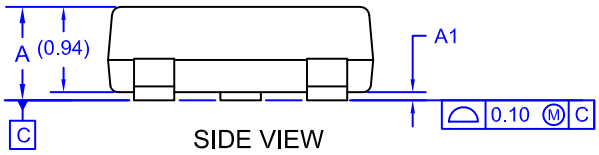



TOP VIEW

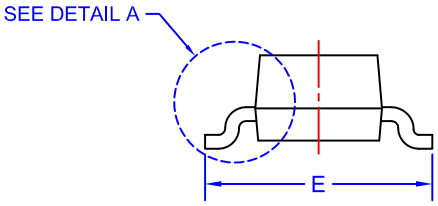
NOTES: UNLESS OTHERWISE SPECIFIED

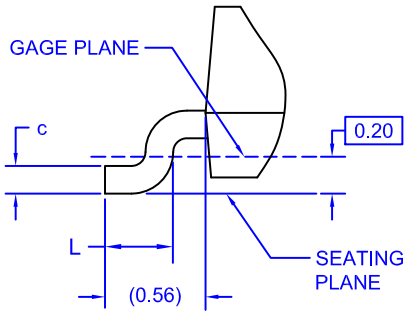
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.

| 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 |

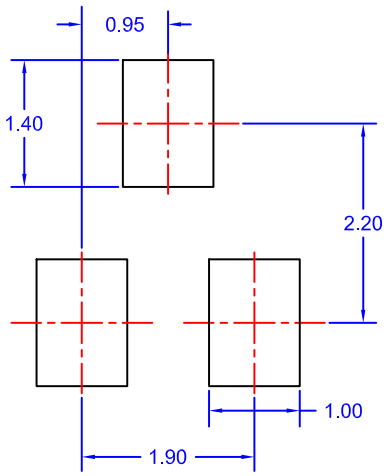



SIDE VIEW



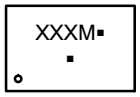

DETAIL A




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** |

## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales

◊