# General Purpose Transistor

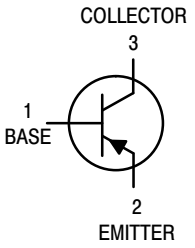
## PNP Silicon

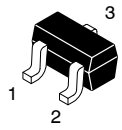
# MMBT2907AWT1G, NSVMMBT2907AWT1G

These transistors are designed for general purpose amplifier applications. They are housed in the SC−70/SOT−323 package which is designed for low power surface mount applications.

### Features

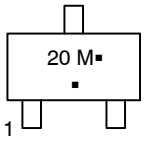
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant




**SC−70/SOT−323**
**CASE 419−04**
**STYLE 3**

### MARKING DIAGRAM




20 = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector − Emitter Voltage | $V_{CEO}$ | −60 | Vdc |
| Collector − Base Voltage | $V_{CBO}$ | −60 | Vdc |
| Emitter − Base Voltage | $V_{EBO}$ | −5.0 | Vdc |
| Collector Current − Continuous | $I_C$ | −600 | mAdc |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Total Device Dissipation FR−5 Board (Note 1) $T_A$ = 25°C | $P_D$ | 150 | mW |
| Thermal Resistance Junction−to−Ambient | $R_{\theta JA}$ | 833 | °C/W |
| Junction and Storage Temperature | $T_J$, $T_{stg}$ | −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.
1. FR−5 = 1.0 x 0.75 x 0.062 in.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MMBT2907AWT1G | SC−70 (Pb−Free) | 3000 Tape & Reel |
| NSVMMBT2907AWT1G | SC−70 (Pb−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.

© Semiconductor Components Industries, LLC, 2016

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector – Emitter Breakdown Voltage (Note 2) ($I_C$ = −10 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | −60 | – | Vdc |
| Collector – Base Breakdown Voltage ($I_C$ = −10 μAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | −60 | – | Vdc |
| Emitter – Base Breakdown Voltage ($I_E$ = −10 μAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | −5.0 | – | Vdc |
| Base Cutoff Current ($V_{CE}$ = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc) | $I_{BL}$ | – | −50 | nAdc |
| Collector Cutoff Current ($V_{CE}$ = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc) | $I_{CEX}$ | – | −50 | nAdc |
| **ON CHARACTERISTICS**[3] | | | | |
| DC Current Gain (Note 2)<br>($I_C$ = −0.1 mAdc, $V_{CE}$ = −10 Vdc)<br>($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc)<br>($I_C$ = −10 mAdc, $V_{CE}$ = −10 Vdc)<br>($I_C$ = −150 mAdc, $V_{CE}$ = −10 Vdc)<br>($I_C$ = −500 mAdc, $V_{CE}$ = −10 Vdc) | $H_{FE}$ | <br>75<br>100<br>100<br>100<br>50 | <br>–<br>–<br>–<br>340<br>– | – |
| Collector – Emitter Saturation Voltage (Note 2)<br>($I_C$ = −150 mAdc, $I_B$ = −15 mAdc)<br>($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) | $V_{CE(sat)}$ | <br>–<br>– | <br>−0.4<br>−1.6 | Vdc |
| Base – Emitter Saturation Voltage (Note 2)<br>($I_C$ = −150 mAdc, $I_B$ = −15 mAdc)<br>($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) | $V_{BE(sat)}$ | <br>–<br>– | <br>−1.3<br>−2.6 | Vdc |
| **SMALL– SIGNAL CHARACTERISTICS** | | | | |
| Current – Gain – Bandwidth Product ($I_C$ = −50 mAdc, $V_{CE}$ = 20 Vdc, f = 100 MHz) | $f_T$ | 200 | – | MHz |
| Output Capacitance ($V_{CB}$ = −10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{obo}$ | – | 8.0 | pF |
| Input Capacitance ($V_{EB}$ = −2.0 Vdc, $I_C$ = 0, f = 1.0 MHz) | $C_{ibo}$ | – | 30 | pF |
| **SWITCHING CHARACTERISTICS** | | | | |
| Turn–On Time | ($V_{CC}$ = −30 Vdc, $I_C$ = −150 mAdc, $I_{B1}$ = −15 mAdc) | $t_{on}$ | – | 45 | ns |
| Delay Time | | $t_d$ | – | 10 | |
| Rise Time | | $t_r$ | – | 40 | |
| Storage Time | ($V_{CC}$ = −6.0 Vdc, $I_C$ = −150 mAdc, $I_{B1}$ = $I_{B2}$ = 15 mAdc) | $t_s$ | – | 80 | |
| Fall Time | | $t_f$ | – | 30 | |
| Turn–Off Time | | $t_{off}$ | – | 100 | |

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.

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

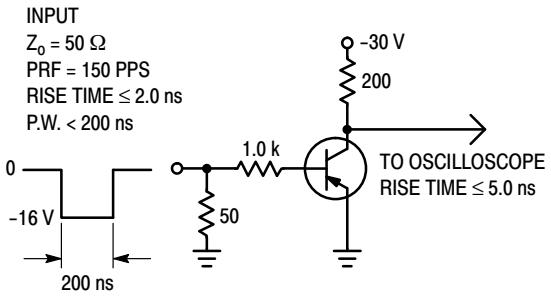



**Figure 1. Delay and Rise Time Test Circuit**

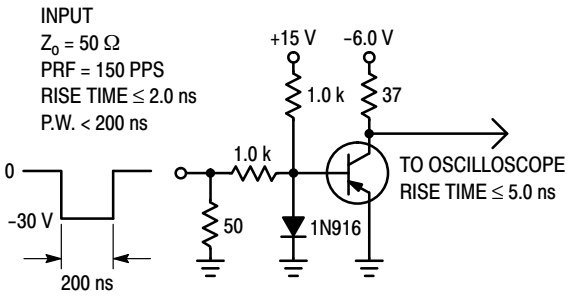



**Figure 2. Storage and Fall Time Test Circuit**

## TYPICAL CHARACTERISTICS

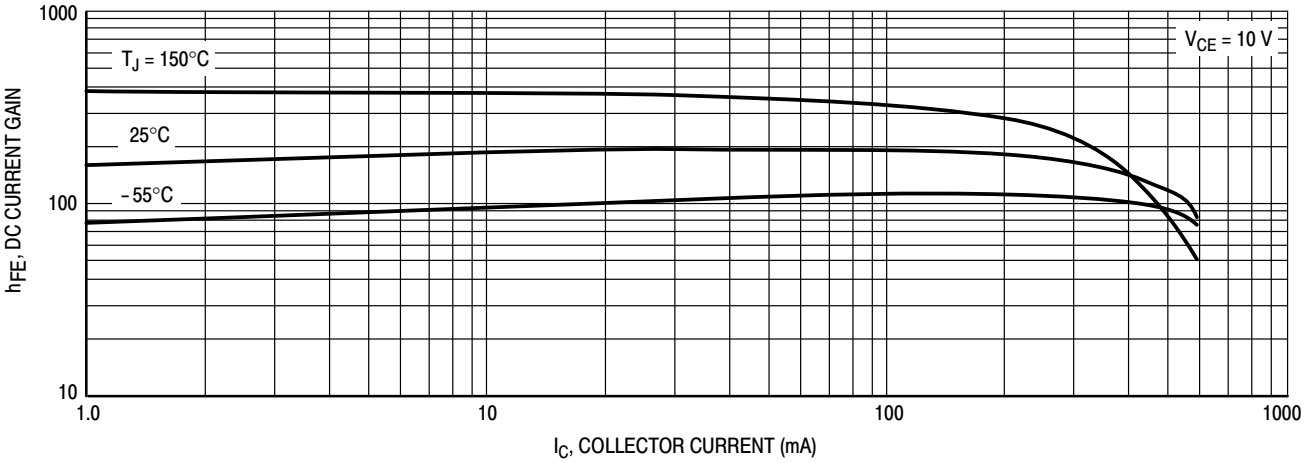



**Figure 3. DC Current Gain**

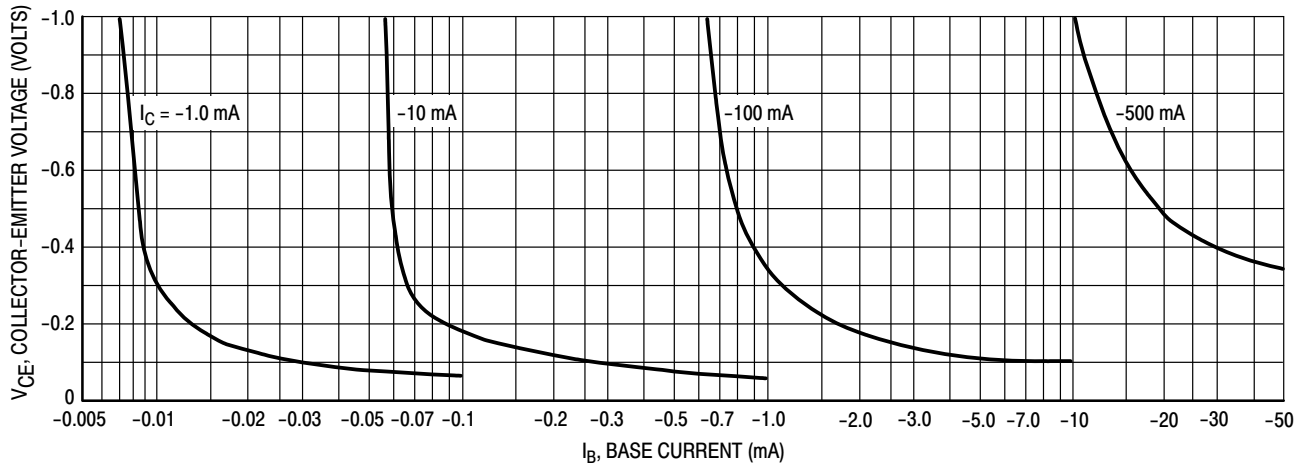



**Figure 4. Collector Saturation Region**

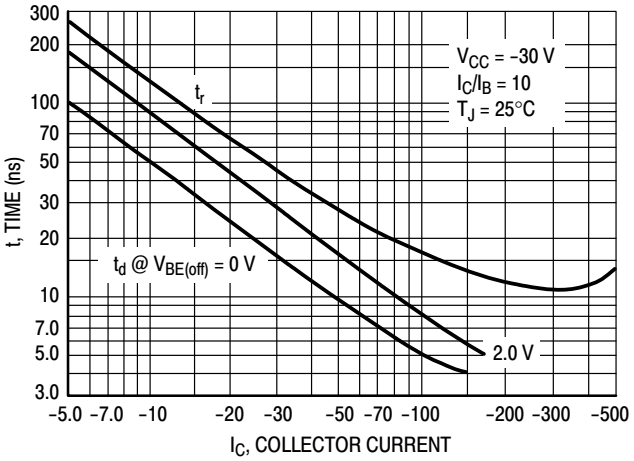



**Figure 5. Turn−On Time**

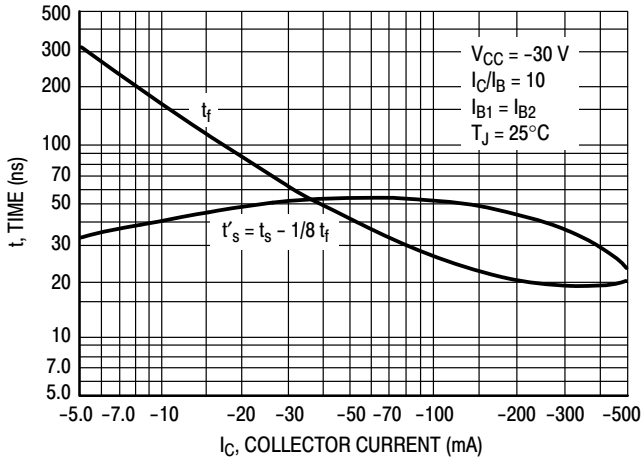



**Figure 6. Turn−Off Time**

## TYPICAL SMALL−SIGNAL Characteristics

### NOISE FIGURE

$V_{CE}$ = 10 Vdc, $T_A$ = 25°C

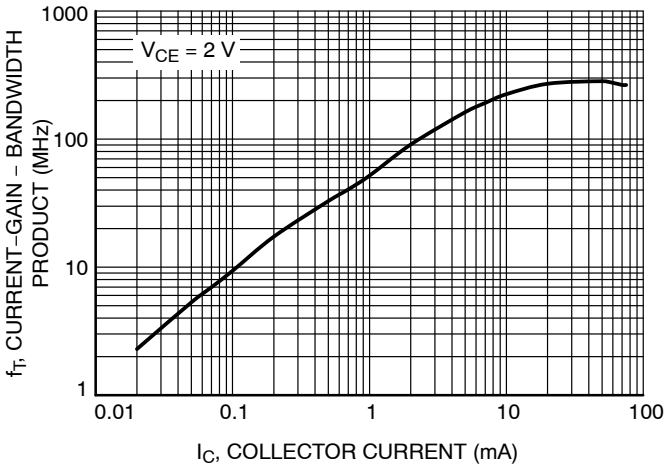



**Figure 7. Current−Gain − Bandwidth Product**

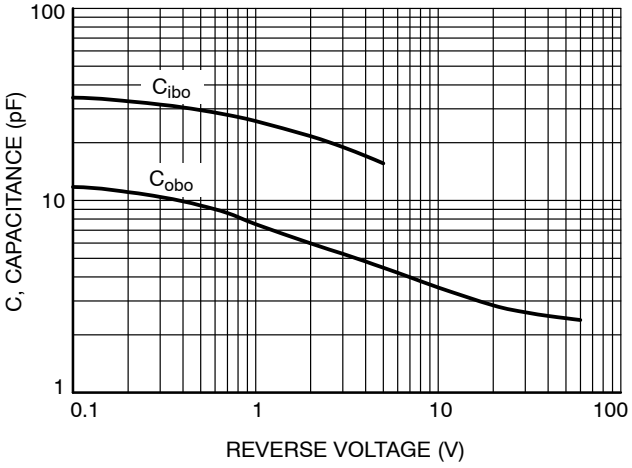



**Figure 8. Capacitances**

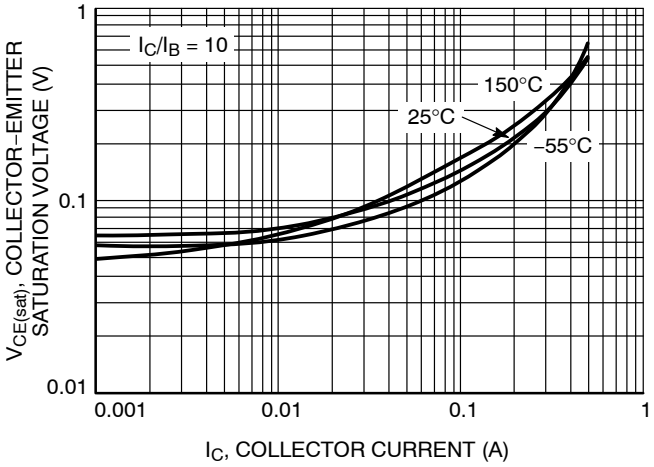



**Figure 9. Collector Emitter Saturation Voltage vs. Collector Current**

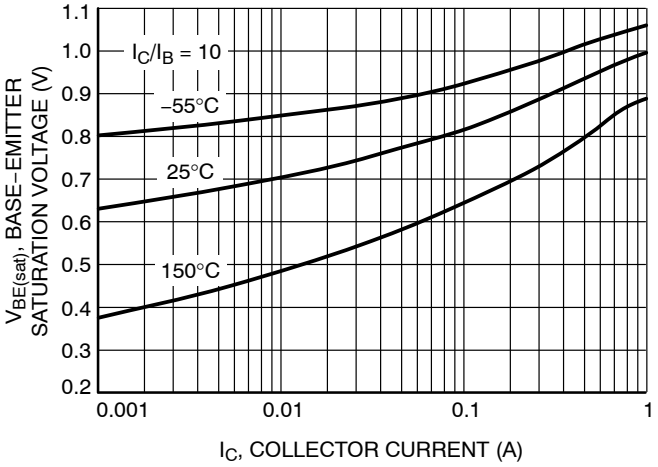



**Figure 10. Base Emitter Saturation Voltage vs. Collector Current**

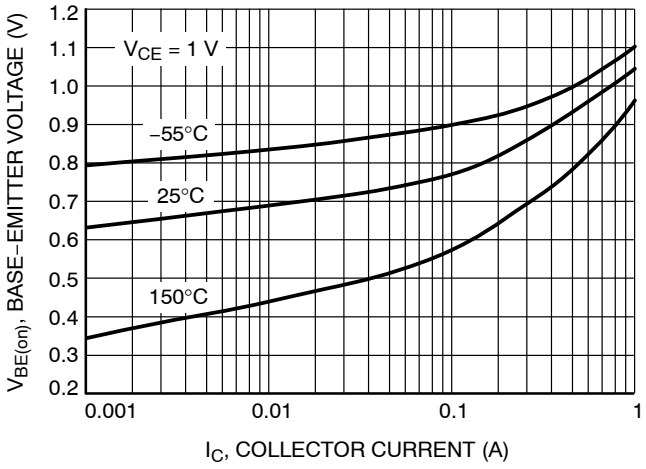
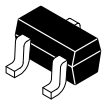


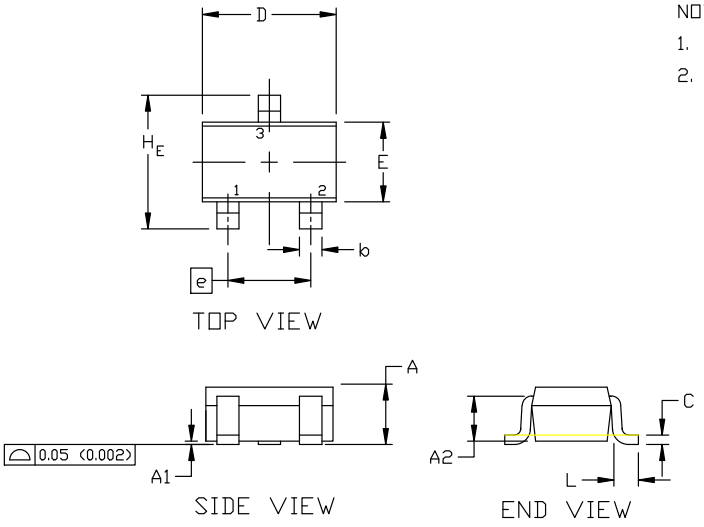

**Figure 11. Base Emitter Voltage vs. Collector Current**



**SCALE 4:1**

**SC−70 (SOT−323)**
CASE 419
ISSUE R

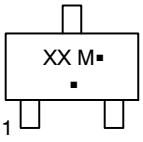
DATE 11 OCT 2022




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

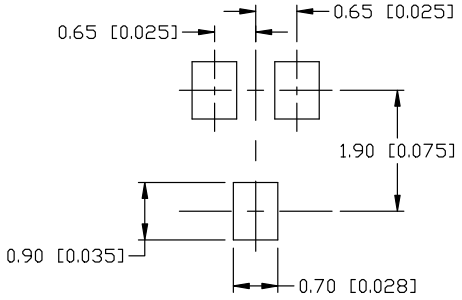
| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.80 | 0.90 | 1.00 | 0.032 | 0.035 | 0.040 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A2 | 0.70 REF | | | 0.028 BSC | | |
| b | 0.30 | 0.35 | 0.40 | 0.012 | 0.014 | 0.016 |
| c | 0.10 | 0.18 | 0.25 | 0.004 | 0.007 | 0.010 |
| D | 1.80 | 2.00 | 2.20 | 0.071 | 0.080 | 0.087 |
| E | 1.15 | 1.24 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e1 | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.20 | 0.38 | 0.56 | 0.008 | 0.015 | 0.022 |
| $H_E$ | 2.00 | 2.10 | 2.40 | 0.079 | 0.083 | 0.095 |

## GENERIC MARKING DIAGRAM




XX = 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.




* For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SOLDERING FOOTPRINT

STYLE 1:
CANCELLED

STYLE 2:
PIN 1. ANODE
2. N.C.
3. CATHODE

STYLE 3:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 5:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 6:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 7:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 8:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 10:
PIN 1. CATHODE
2. ANODE
3. ANODE−CATHODE

STYLE 11:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

| | | |
|---|---|---|
| **DOCUMENT NUMBER:** | **98ASB42819B** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red. |
| **DESCRIPTION:** | **SC−70 (SOT−323)** | **PAGE 1 OF 1** |

**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**, , 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.

## 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