

# NPN High Voltage Transistor

## MMBT5551M3

The MMBT5551M3 device is a spin-off of our popular SOT-23 three-leaded device. It is designed for general purpose high voltage applications and is housed in the SOT-723 surface mount package. This device is ideal for low-power surface mount applications where board space is at a premium.

### Features

- Reduces Board Space
- 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

### MAXIMUM RATINGS

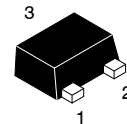
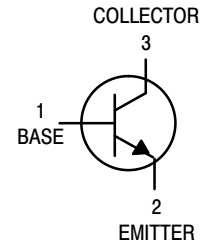
| Rating                         | Symbol    | Value | Unit             |
|--------------------------------|-----------|-------|------------------|
| Collector – Emitter Voltage    | $V_{CEO}$ | 160   | Vdc              |
| Collector – Base Voltage       | $V_{CBO}$ | 180   | Vdc              |
| Emitter – Base Voltage         | $V_{EBO}$ | 6.0   | Vdc              |
| Collector Current – Continuous | $I_C$     | 60    | mA <sub>dc</sub> |

### THERMAL CHARACTERISTICS

| Characteristic                                                                                                      | Symbol          | Max         | Unit                       |
|---------------------------------------------------------------------------------------------------------------------|-----------------|-------------|----------------------------|
| Total Device Dissipation<br>FR-5 Board (Note 1)<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$      | $P_D$           | 265<br>2.1  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient (Note 1)                                                                 | $R_{\theta JA}$ | 470         | $^\circ\text{C}/\text{W}$  |
| Total Device Dissipation<br>Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 640<br>5.1  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient<br>(Note 2)                                                                 | $R_{\theta JA}$ | 195         | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature                                                                                    | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

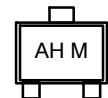
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



SOT-723  
CASE 631AA  
STYLE 1

### MARKING DIAGRAM



AH = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

| Device           | Package           | Shipping <sup>†</sup> |
|------------------|-------------------|-----------------------|
| MMBT5551M3T5G    | SOT-723 (Pb-Free) | 8000 / Tape & Reel    |
| NSVMMBT5551M3T5G | SOT-723 (Pb-Free) | 8000 / Tape & Reel    |

<sup>†</sup>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.

# MMBT5551M3

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

| Characteristic                                                                                                                                                                           | Symbol        | Min            | Max           | Unit                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|-------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                               |               |                |               |                         |
| Collector – Emitter Breakdown Voltage (Note 3)<br>( $I_C = 1.0\text{ mA}$ , $I_B = 0$ )                                                                                                  | $V_{(BR)CEO}$ | 160            | –             | Vdc                     |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{A}$ , $I_E = 0$ )                                                                                                     | $V_{(BR)CBO}$ | 180            | –             | Vdc                     |
| Emitter – Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )                                                                                                        | $V_{(BR)EBO}$ | 6.0            | –             | Vdc                     |
| Collector Cutoff Current<br>( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )                                           | $I_{CBO}$     | –<br>–         | 100<br>100    | nAdc<br>$\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                      | $I_{EBO}$     | –              | 50            | nAdc                    |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                |               |                |               |                         |
| DC Current Gain<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 50\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ ) | $h_{FE}$      | 80<br>80<br>30 | –<br>250<br>– | –                       |
| Collector – Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )                                           | $V_{CE(sat)}$ | –<br>–         | 0.15<br>0.20  | Vdc                     |
| Base – Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )                                                | $V_{BE(sat)}$ | –<br>–         | 1.0<br>1.0    | Vdc                     |
| Collector Emitter Cut-off<br>( $V_{CB} = 10\text{ V}$ )<br>( $V_{CB} = 75\text{ V}$ )                                                                                                    | $I_{CES}$     | –<br>–         | 50<br>100     | nA                      |

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.

3. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

# MMBT5551M3

## TYPICAL CHARACTERISTICS

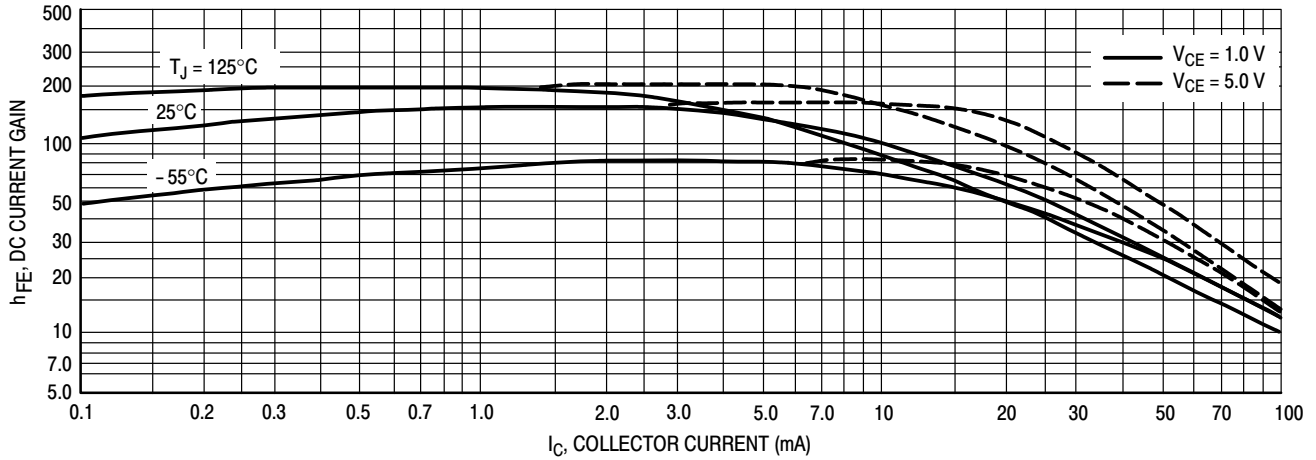


Figure 1. DC Current Gain

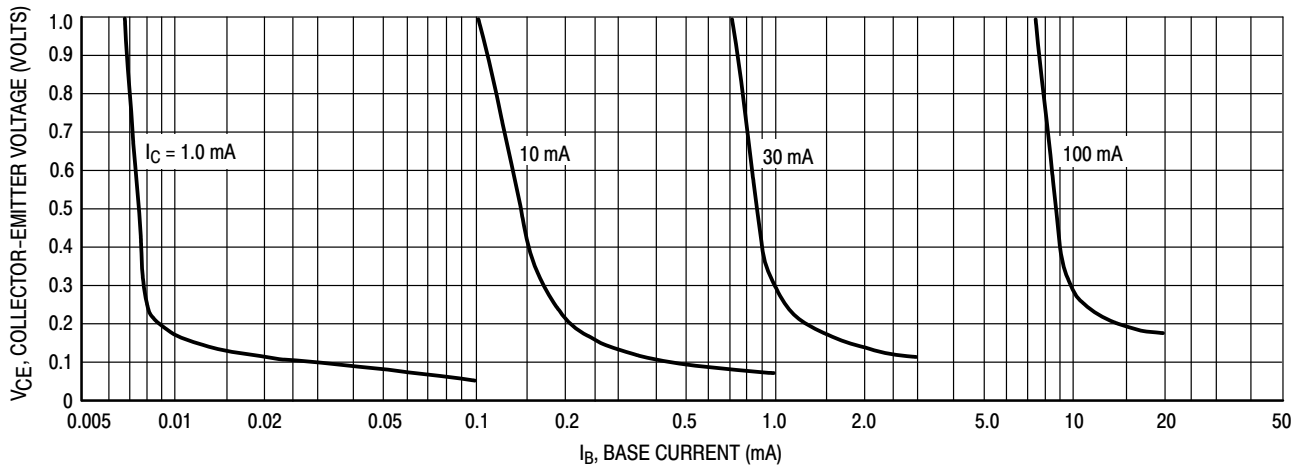


Figure 2. Collector Saturation Region

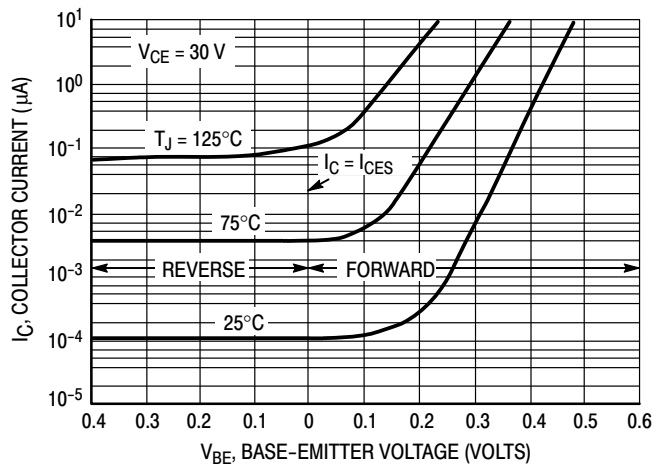


Figure 3. Collector Cut-Off Region

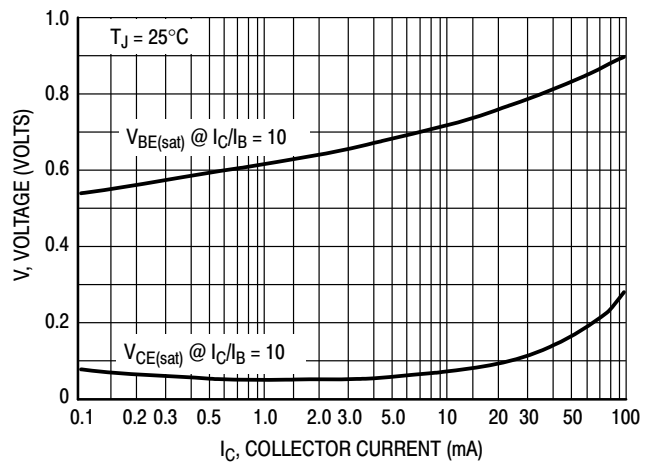


Figure 4. "On" Voltages

TYPICAL CHARACTERISTICS

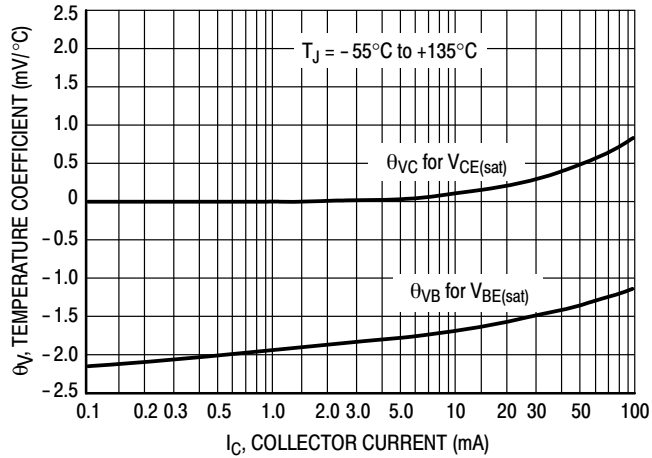
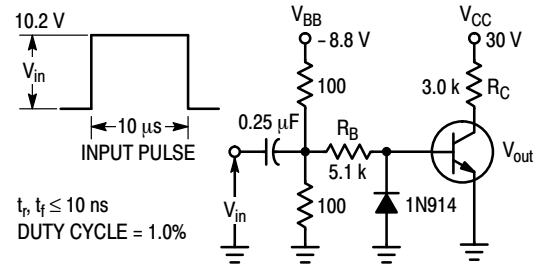


Figure 5. Temperature Coefficients



Values Shown are for  $I_C$  @ 10 mA

Figure 6. Switching Time Test Circuit

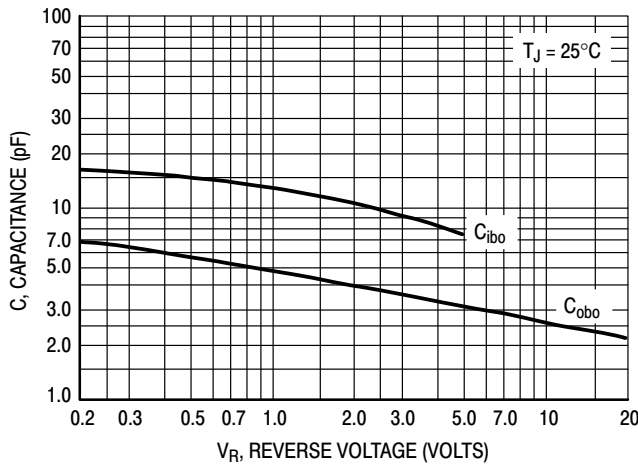


Figure 7. Capacitances

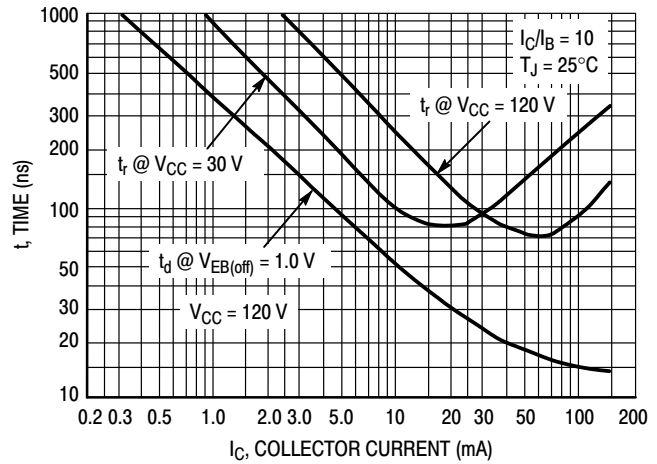


Figure 8. Turn-On Time

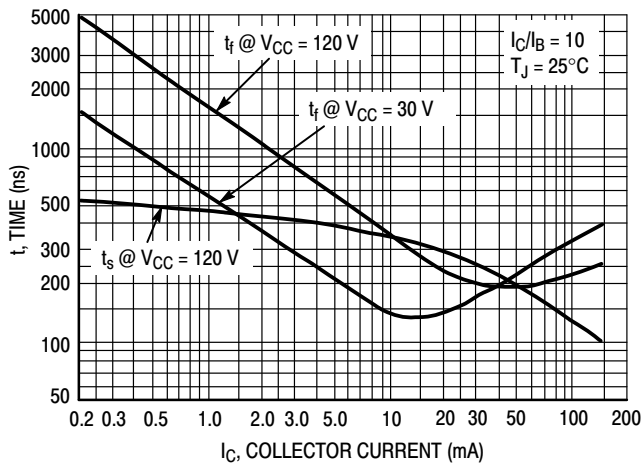


Figure 9. Turn-Off Time

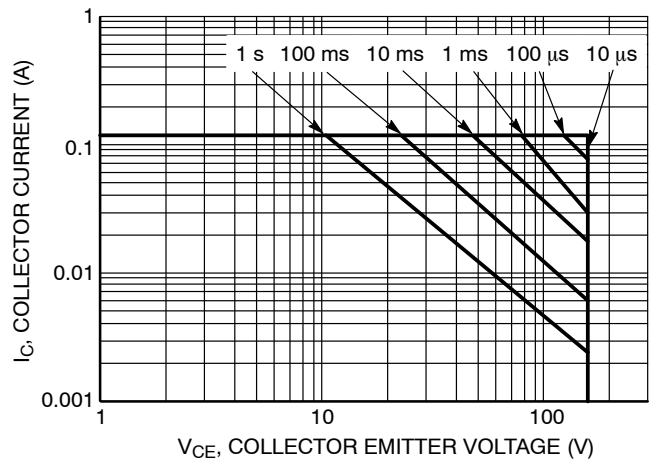
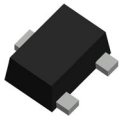


Figure 10. Safe Operating Area

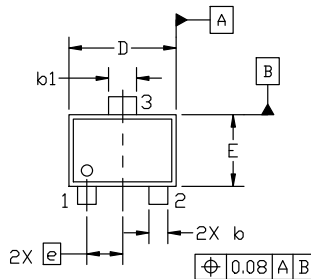


**SOT-723 1.20x0.80x0.50, 0.40P**  
**CASE 631AA**  
**ISSUE E**

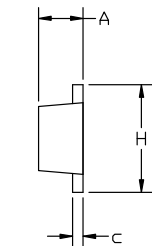
DATE 24 JAN 2024

NOTES:

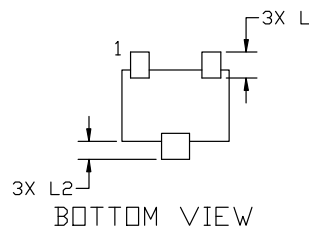
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.



TOP VIEW

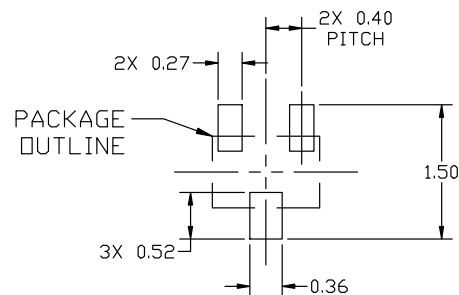


SIDE VIEW



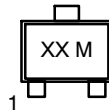
BOTTOM VIEW

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.45        | 0.50 | 0.55 |
| b   | 0.15        | 0.21 | 0.27 |
| b1  | 0.25        | 0.31 | 0.37 |
| c   | 0.07        | 0.12 | 0.17 |
| D   | 1.15        | 1.20 | 1.25 |
| E   | 0.75        | 0.80 | 0.85 |
| e   | 0.40 BSC    |      |      |
| H   | 1.15        | 1.20 | 1.25 |
| L   | 0.29 REF    |      |      |
| L2  | 0.15        | 0.20 | 0.25 |



RECOMMENDED MOUNTING  
FOOTPRINT

**GENERIC  
MARKING DIAGRAM\***



XX = Specific Device Code  
M = Date Code

\*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, SOLDERM/D.

|                                                       |                                                  |                                                    |                                                      |                                                  |
|-------------------------------------------------------|--------------------------------------------------|----------------------------------------------------|------------------------------------------------------|--------------------------------------------------|
| STYLE 1:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 2:<br>PIN 1. ANODE<br>2. N/C<br>3. CATHODE | STYLE 3:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE | STYLE 5:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN |
|-------------------------------------------------------|--------------------------------------------------|----------------------------------------------------|------------------------------------------------------|--------------------------------------------------|

|                         |                                      |                                                                                                                                                                                  |
|-------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON12989D</b>                   | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>SOT-723 1.20x0.80x0.50, 0.40P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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)