

# MJF44H11 (NPN), MJF45H11 (PNP)

Preferred Devices

## Complementary Power Transistors

### For Isolated Package Applications

Complementary power transistors are for general purpose power amplification and switching such as output or driver stages in applications such as switching regulators, converters and power amplifiers.

#### Features

- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 1.0 \text{ V (Max) @ } 8.0 \text{ A}$
- Fast Switching Speeds
- Complementary Pairs Simplifies Designs
- Pb–Free Packages are Available\*

#### MAXIMUM RATINGS

| Rating                                                                                   | Symbol         | Value        | Unit                     |
|------------------------------------------------------------------------------------------|----------------|--------------|--------------------------|
| Collector–Emitter Voltage                                                                | $V_{CEO}$      | 80           | Vdc                      |
| Emitter–Base Voltage                                                                     | $V_{EB}$       | 5            | Vdc                      |
| Collector Current – Continuous<br>– Peak                                                 | $I_C$          | 10<br>20     | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 36<br>0.288  | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 2.0<br>0.016 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                      | $T_J, T_{stg}$ | –55 to 150   | $^\circ\text{C}$         |

#### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max  | Unit               |
|-----------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction–to–Case    | $R_{\theta JC}$ | 3.5  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

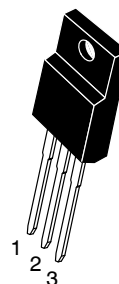
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

<http://onsemi.com>

## SILICON POWER TRANSISTORS 10 AMPERES 80 VOLTS, 36 WATTS



ISOLATED TO–220  
CASE 221D  
STYLE 2

#### MARKING DIAGRAM



F4xH11 = Specific Device Code  
x = 4 or 5  
G = Pb–Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

#### ORDERING INFORMATION

| Device    | Package                      | Shipping      |
|-----------|------------------------------|---------------|
| MJF44H11  | TO–220 FULLPACK              | 50 Units/Rail |
| MJF44H11G | TO–220 FULLPACK<br>(Pb–Free) | 50 Units/Rail |
| MJF45H11  | TO–220 FULLPACK              | 50 Units/Rail |
| MJF45H11G | TO–220 FULLPACK<br>(Pb–Free) | 50 Units/Rail |

Preferred devices are recommended choices for future use and best overall value.

# MJF44H11 (NPN), MJF45H11 (PNP)

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

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

### OFF CHARACTERISTICS

|                                                                                 |                |    |   |     |               |
|---------------------------------------------------------------------------------|----------------|----|---|-----|---------------|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 30\text{ mA}$ , $I_B = 0$ )    | $V_{CEO(sus)}$ | 80 | – | –   | Vdc           |
| Collector Cutoff Current<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{BE} = 0$ ) | $I_{CES}$      | –  | – | 1.0 | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 5\text{ Vdc}$ )                           | $I_{EBO}$      | –  | – | 10  | $\mu\text{A}$ |

### ON CHARACTERISTICS

|                                                                                           |               |    |   |     |     |
|-------------------------------------------------------------------------------------------|---------------|----|---|-----|-----|
| Collector-Emitter Saturation Voltage<br>( $I_C = 8\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ ) | $V_{CE(sat)}$ | –  | – | 1.0 | Vdc |
| Base-Emitter Saturation Voltage<br>( $I_C = 8\text{ Adc}$ , $I_B = 0.8\text{ Adc}$ )      | $V_{BE(sat)}$ | –  | – | 1.5 | Vdc |
| DC Current Gain<br>( $V_{CE} = 1\text{ Vdc}$ , $I_C = 2\text{ Adc}$ )                     | $h_{FE}$      | 60 | – | –   | –   |
| DC Current Gain<br>( $V_{CE} = 1\text{ Vdc}$ , $I_C = 4\text{ Adc}$ )                     |               | 40 | – | –   |     |

### DYNAMIC CHARACTERISTICS

|                                                                                                       |                      |          |        |            |        |               |
|-------------------------------------------------------------------------------------------------------|----------------------|----------|--------|------------|--------|---------------|
| Collector Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )                     | MJF44H11<br>MJF45H11 | $C_{cb}$ | –<br>– | 130<br>230 | –<br>– | $\mu\text{F}$ |
| Gain Bandwidth Product<br>( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 20\text{ MHz}$ ) | MJF44H11<br>MJF45H11 | $f_T$    | –<br>– | 50<br>40   | –<br>– | MHz           |

### SWITCHING TIMES

|                                                                               |                      |             |        |            |        |    |
|-------------------------------------------------------------------------------|----------------------|-------------|--------|------------|--------|----|
| Delay and Rise Times<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = 0.5\text{ Adc}$ )  | MJF44H11<br>MJF45H11 | $t_d + t_r$ | –<br>– | 300<br>135 | –<br>– | ns |
| Storage Time<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ ) | MJF44H11<br>MJF45H11 | $t_s$       | –<br>– | 500<br>500 | –<br>– | ns |
| Fall Time<br>( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )    | MJF44H11<br>MJF45H11 | $t_f$       | –<br>– | 140<br>100 | –<br>– | ns |

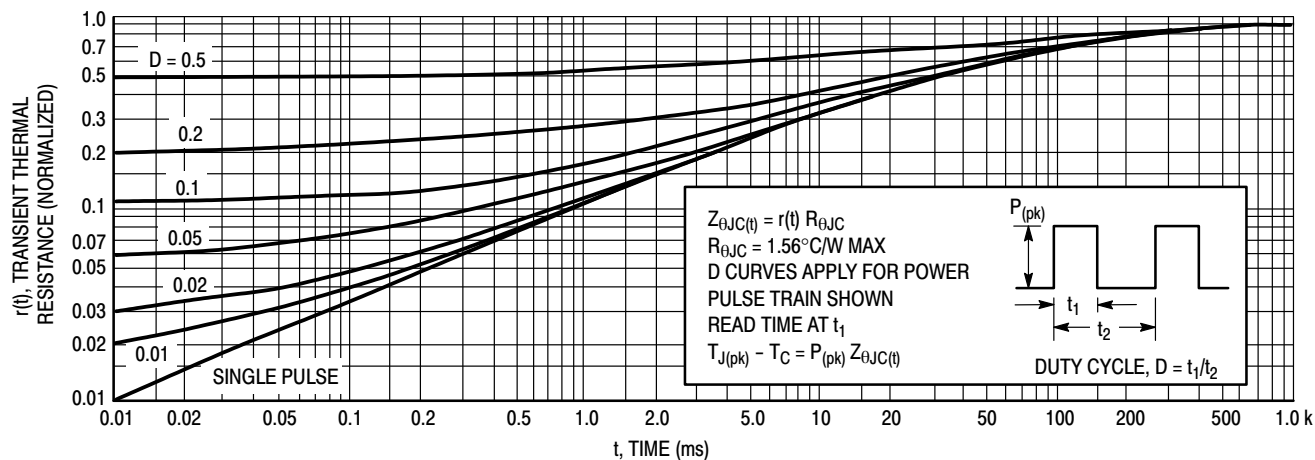
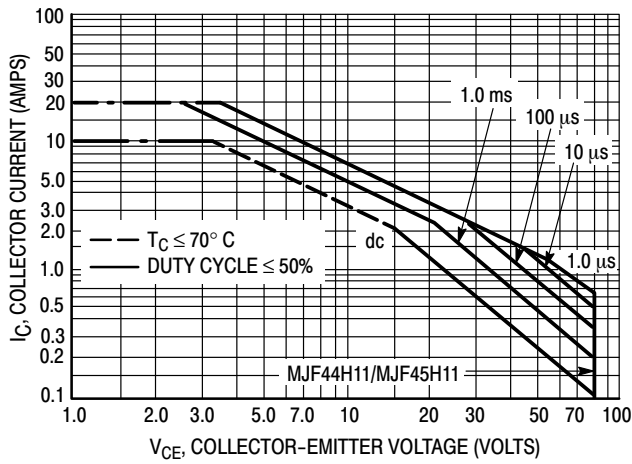


Figure 1. Thermal Response

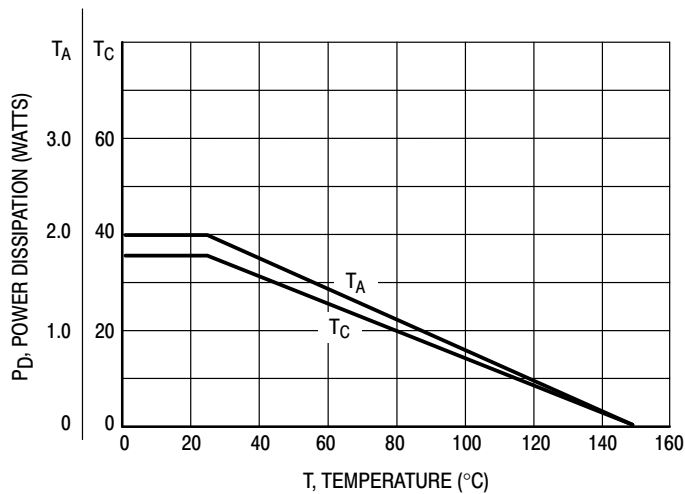
## MJF44H11 (NPN), MJF45H11 (PNP)



**Figure 2. Maximum Rated Forward Bias Safe Operating Area**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 2 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 1. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



**Figure 3. Power Derating**

# MJF44H11 (NPN), MJF45H11 (PNP)

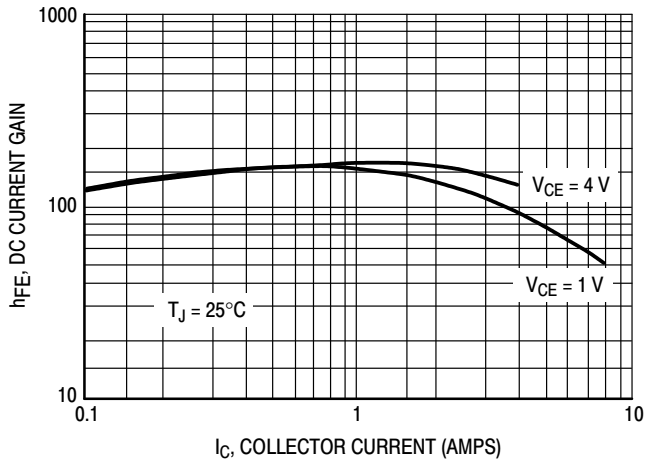


Figure 4. MJF44H11 DC Current Gain

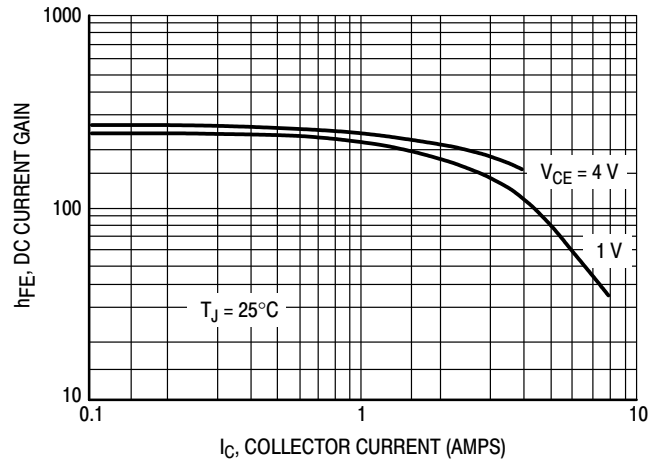


Figure 5. MJF45H11 DC Current Gain

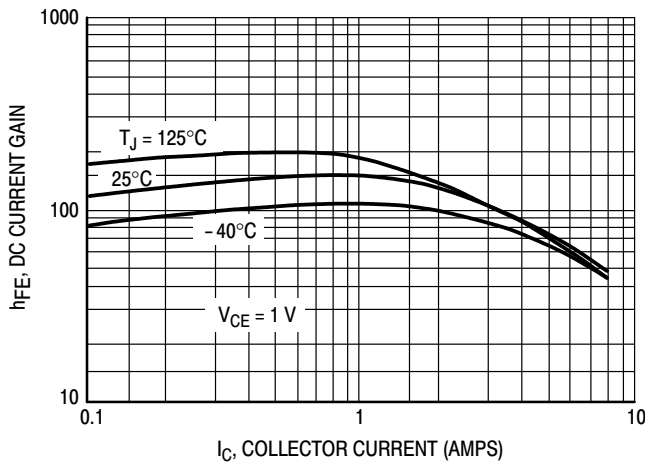


Figure 6. MJF44H11 Current Gain versus Temperature

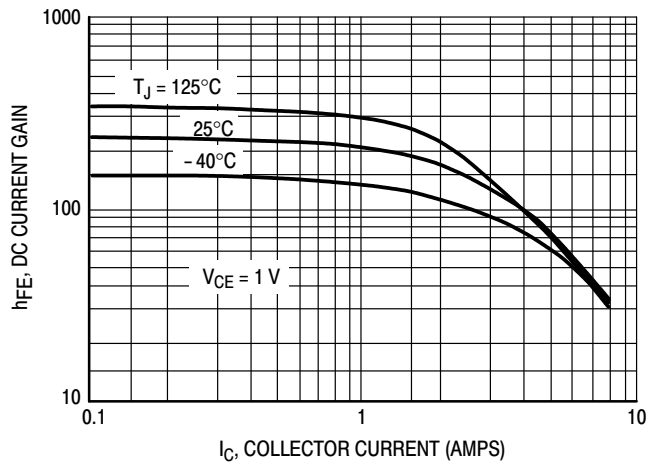


Figure 7. MJF45H11 Current Gain versus Temperature

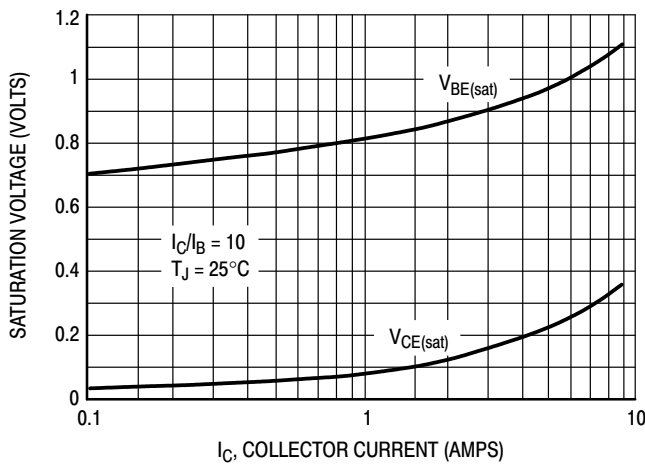


Figure 8. MJF44H11 On-Voltages

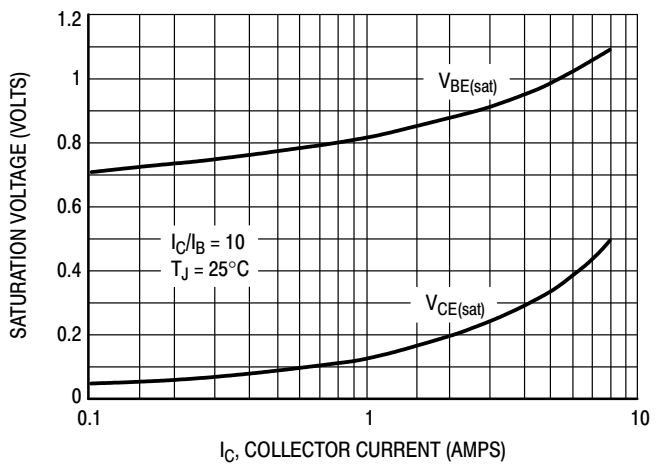
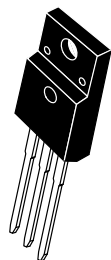


Figure 9. MJF45H11 On-Voltages

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

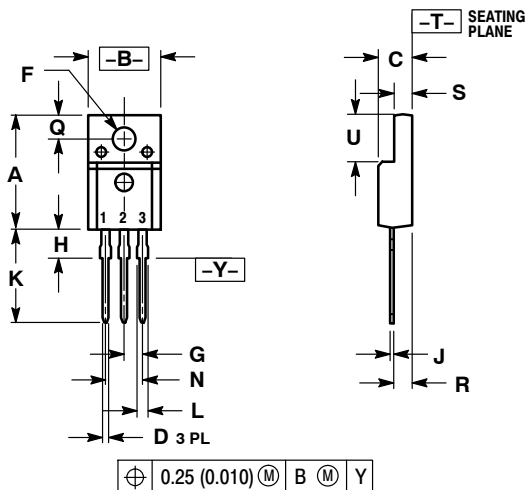
ON Semiconductor®



SCALE 1:1

## TO-220 FULLPAK CASE 221D-03 ISSUE K

DATE 27 FEB 2009

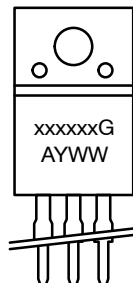


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH
  3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.617     | 0.635 | 15.67       | 16.12 |
| B   | 0.392     | 0.419 | 9.96        | 10.63 |
| C   | 0.177     | 0.193 | 4.50        | 4.90  |
| D   | 0.024     | 0.039 | 0.60        | 1.00  |
| F   | 0.116     | 0.129 | 2.95        | 3.28  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.118     | 0.135 | 3.00        | 3.43  |
| J   | 0.018     | 0.025 | 0.45        | 0.63  |
| K   | 0.503     | 0.541 | 12.78       | 13.73 |
| L   | 0.048     | 0.058 | 1.23        | 1.47  |
| N   | 0.200 BSC |       | 5.08 BSC    |       |
| Q   | 0.122     | 0.138 | 3.10        | 3.50  |
| R   | 0.099     | 0.117 | 2.51        | 2.96  |
| S   | 0.092     | 0.113 | 2.34        | 2.87  |
| U   | 0.239     | 0.271 | 6.06        | 6.88  |

## MARKING DIAGRAMS

- STYLE 1:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE
- STYLE 2:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER
- STYLE 3:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE
- STYLE 4:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE
- STYLE 5:  
PIN 1. CATHODE  
2. ANODE  
3. GATE
- STYLE 6:  
PIN 1. MT 1  
2. MT 2  
3. GATE



Bipolar



Rectifier

xxxxxx = Specific Device Code  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

A = Assembly Location  
Y = Year  
WW = Work Week  
xxxxxx = Device Code  
G = Pb-Free Package  
AKA = Polarity Designator

|                  |                |                                                                                                                                                                                     |
|------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOCUMENT NUMBER: | 98ASB42514B    | 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:     | TO-220 FULLPAK | PAGE 1 OF 1                                                                                                                                                                         |

ON Semiconductor and 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.

**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)