# MJE15032 (NPN), MJE15033 (PNP)

**Preferred Devices**

# Complementary Silicon Plastic Power Transistors

Designed for use as high−frequency drivers in audio amplifiers.

### Features

- DC Current Gain Specified to 5.0 Amperes
  $h_{FE}$ = 70 (Min) @ $I_C$ = 0.5 Adc
  = 10 (Min) @ $I_C$ = 2.0 Adc
- Collector−Emitter Sustaining Voltage −
  $V_{CEO(sus)}$ = 250 Vdc (Min) − MJE15032, MJE15033
- High Current Gain − Bandwidth Product
  $f_T$ = 30 MHz (Min) @ $I_C$ = 500 mAdc
- TO−220AB Compact Package
- Epoxy Meets UL 94 V−0 @ 0.125 in
- ESD Ratings: Machine Model C
  Human Body Model 3B
- Pb−Free Packages are Available*

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector−Emitter Voltage | $V_{CEO}$ | 250 | Vdc |
| Collector−Base Voltage | $V_{CB}$ | 250 | Vdc |
| Emitter−Base Voltage | $V_{EB}$ | 5.0 | Vdc |
| Collector Current − Continuous<br>− Peak | $I_C$ | 8.0<br>16 | Adc |
| Base Current | $I_B$ | 2.0 | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 50<br>0.40 | W<br>W/°C |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 2.0<br>0.016 | W<br>W/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 2.5 | °C/W |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 62.5 | °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.

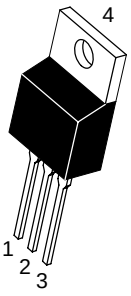
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**ON Semiconductor®**

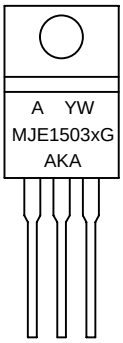
**http://onsemi.com**

## 8.0 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 250 VOLTS, 50 WATTS

**MARKING DIAGRAM**




**TO−220**
**CASE 221A**
**STYLE 1**




MJE1503x = Specific Device Code
x = 2 or 3
A = Assembly Location
Y = Year
W = Work Week
G = Pb−Package

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MJE15032 | TO−220 | 50 Units/Rail |
| MJE15032G | TO−220 (Pb−Free) | 50 Units/Rail |
| MJE15033 | TO−220 | 50 Units/Rail |
| MJE15033G | TO−220 (Pb−Free) | 50 Units/Rail |

†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.

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

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector−Emitter Sustaining Voltage (Note 1)<br>($I_C$ = 10 mAdc, $I_B$ = 0) | $V_{CEO(sus)}$ | 250 | − | Vdc |
| Collector Cutoff Current<br>($V_{CB}$ = 250 Vdc, $I_E$ = 0) | $I_{CBO}$ | − | 10 | μAdc |
| Emitter Cutoff Current<br>($V_{BE}$ = 5.0 Vdc, $I_C$ = 0) | $I_{EBO}$ | − | 10 | μAdc |
| **ON CHARACTERISTICS** (Note 1) | | | | |
| DC Current Gain<br>($I_C$ = 0.5 Adc, $V_{CE}$ = 5.0 Vdc)<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 5.0 Vdc)<br>($I_C$ = 2.0 Adc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | <br>70<br>50<br>10 | <br>−<br>−<br>− | − |
| Collector−Emitter Saturation Voltage<br>($I_C$ = 1.0 Adc, $I_B$ = 0.1 Adc) | $V_{CE(sat)}$ | − | 0.5 | Vdc |
| Base−Emitter On Voltage<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 5.0 Vdc) | $V_{BE(on)}$ | − | 1.0 | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Current Gain − Bandwidth Product (Note 2)<br>($I_C$ = 500 mAdc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1.0 MHz) | $f_T$ | 30 | − | MHz |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
2. $f_T = |h_{fe}| \bullet f_{test}$.

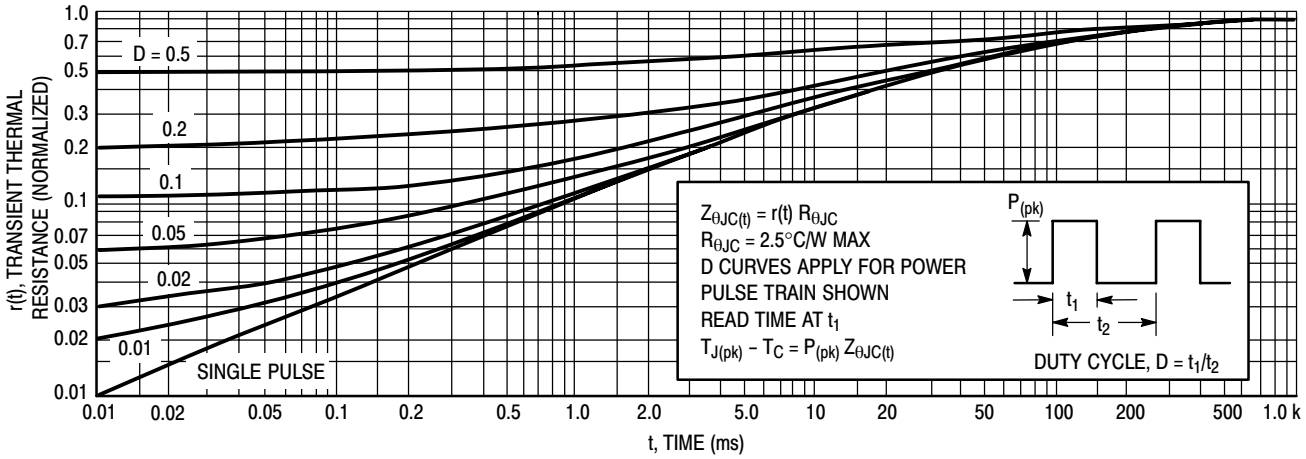



**Figure 1. Thermal Response**

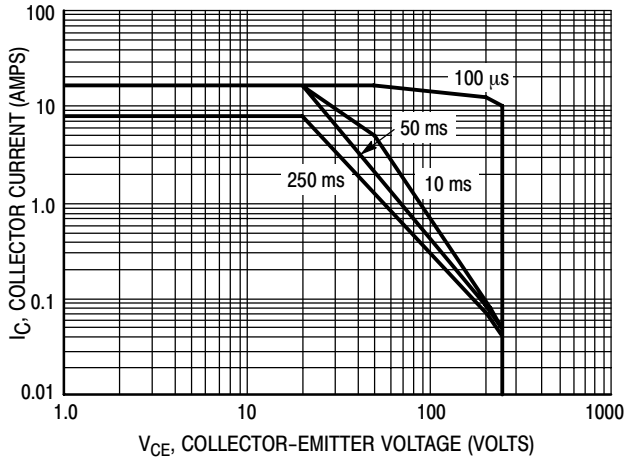



**Figure 2. MJE15032 & MJE15033 Safe Operating Area**

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 then the curves indicate.

The data of Figures 2 and 4 is based on $T_{J(pk)}$ = 150°C; $T_C$ is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)}$ < 150°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.

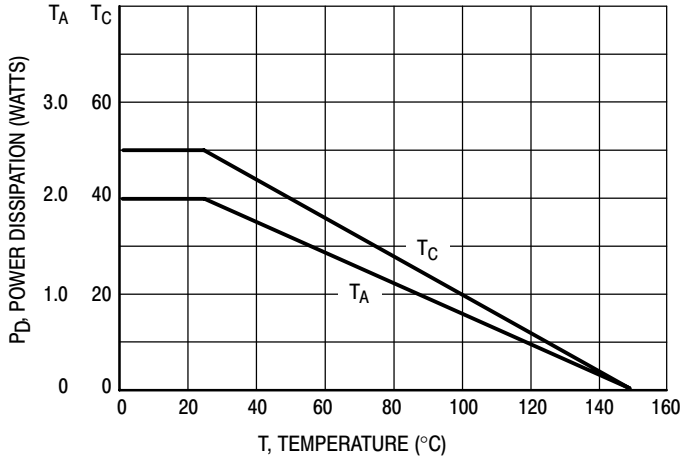



**Figure 3. Power Derating**

**NPN − MJE15032**

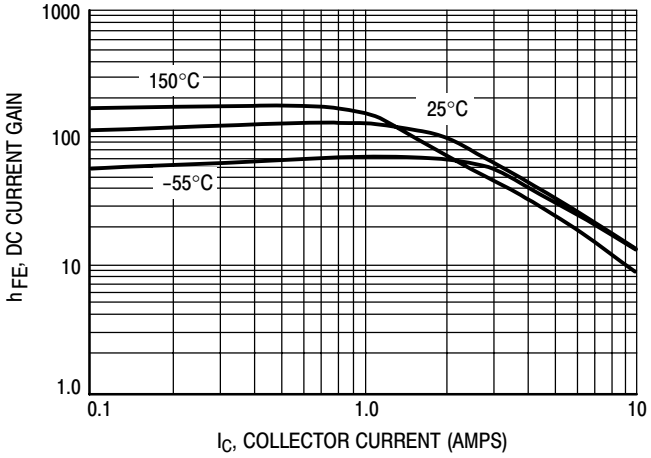



**Figure 4. NPN − MJE15032**
**$V_{CE}$ = 5 V DC Current Gain**

**PNP − MJE15033**

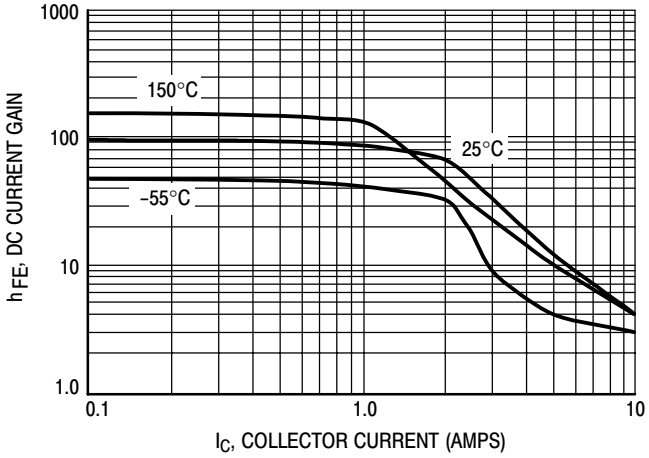



**Figure 5. PNP − MJE15033**
**$V_{CE}$ = 5 V DC Current Gain**

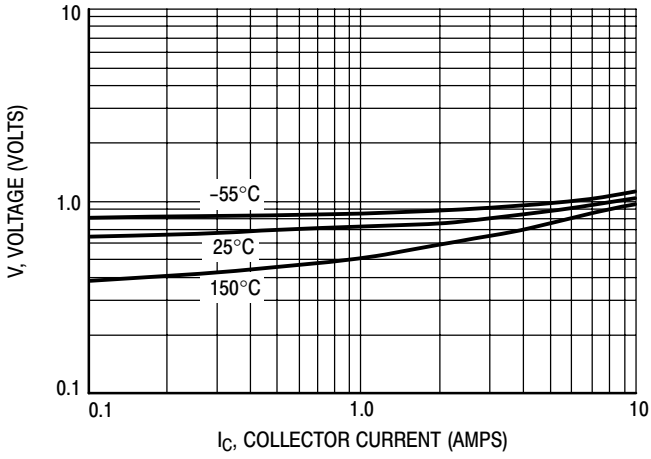



**Figure 6. NPN − MJE15032**
**$V_{CE}$ = 5 V $V_{BE(on)}$ Curve**

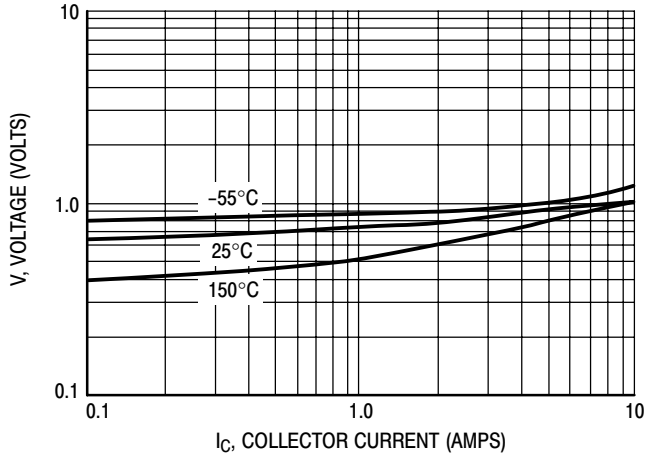



**Figure 7. PNP − MJE15033**
**$V_{CE}$ = 5 V $V_{BE(on)}$ Curve**

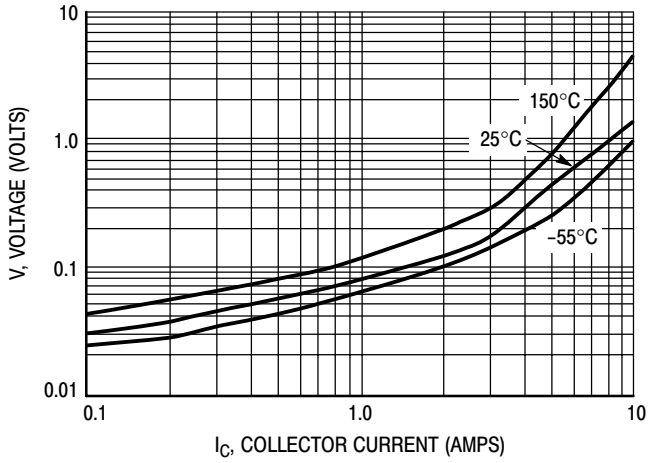



**Figure 8. NPN − MJE15032**
**$V_{CE(sat)}$ $I_C/I_B$ = 10**

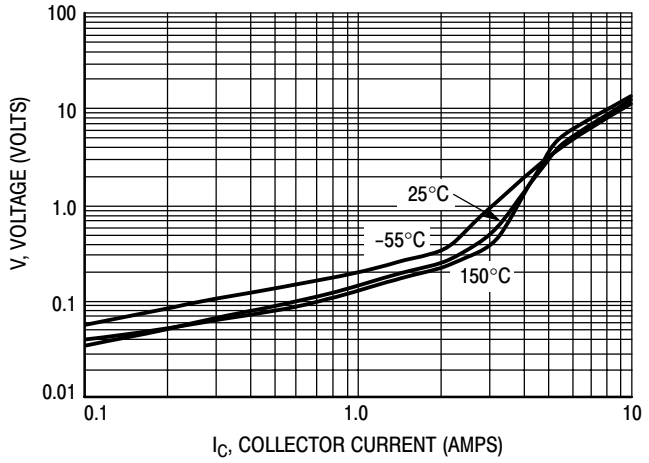



**Figure 9. PNP − MJE15033**
**$V_{CE(sat)}$ $I_C/I_B$ = 10**

**NPN − MJE15032**

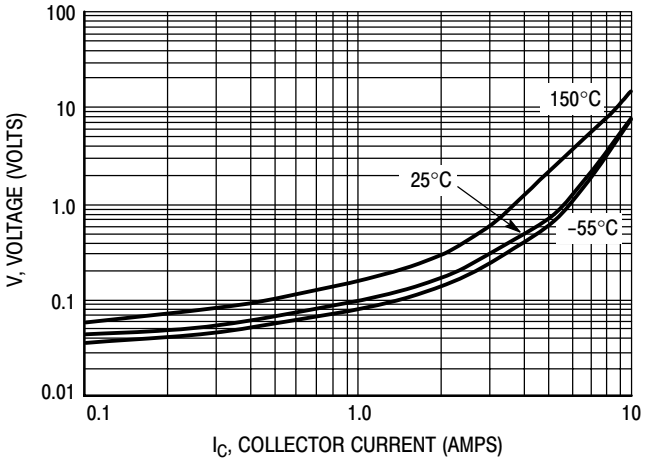



**Figure 10. NPN − MJE15032**
**$V_{CE(sat)}$ $I_C/I_B$ = 20**

**PNP − MJE15033**

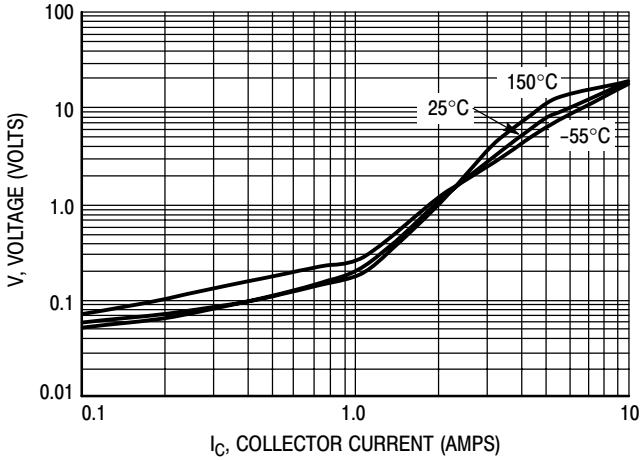



**Figure 11. PNP − MJE15033**
**$V_{CE(sat)}$ $I_C/I_B$ = 20**

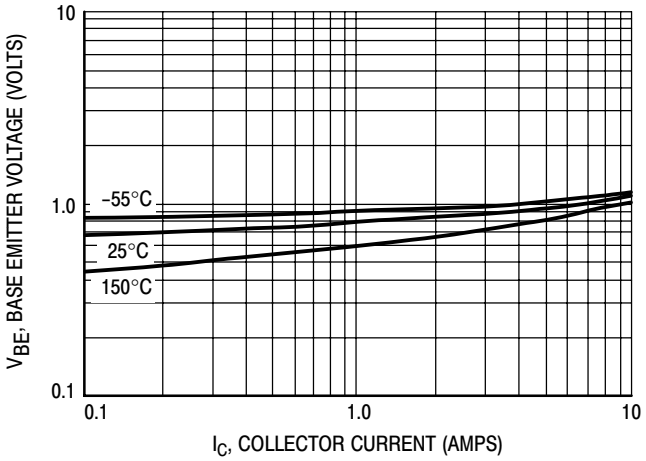



**Figure 12. NPN − MJE15032**
**$V_{BE(sat)}$ $I_C/I_B$ = 10**

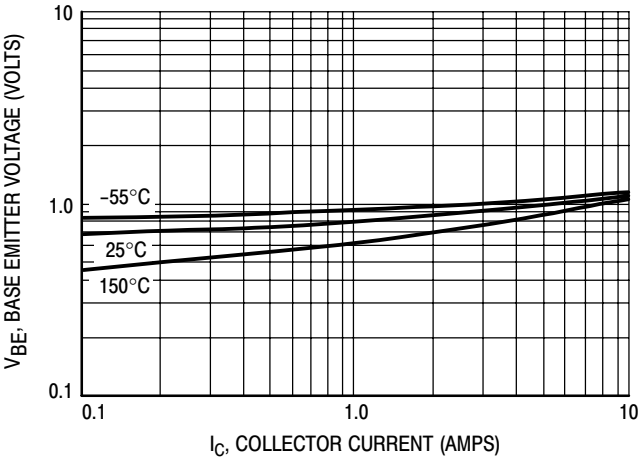
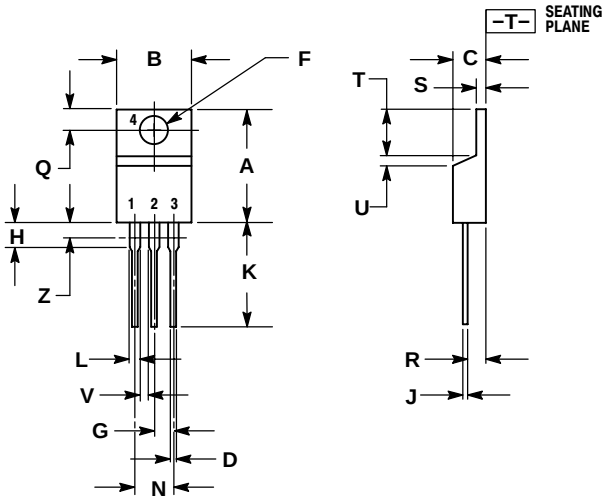



**Figure 13. PNP − MJE15033**
**$V_{BE(sat)}$ $I_C/I_B$ = 10**

## PACKAGE DIMENSIONS

**TO−220**
CASE 221A−09
ISSUE AA




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |

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



## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
**Phone**: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
**Fax**: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada

**Japan**: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
**Phone**: 81−3−5773−3850

**ON Semiconductor Website**: http://onsemi.com

**Order Literature**: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.

**MJE15032/D**