

# NHPD660, NRVHPD660

## Switch Mode Power Rectifier

### DPAK Surface Mount Package

These state-of-the-art devices are designed for use in switching power supplies, inverters and as free wheeling diodes.

#### Features

- Ultrafast 30 Nanosecond Recovery Time
- 175°C Operating Junction Temperature
- High Voltage Capability of 600 V
- Low Forward Drop
- Low Leakage Specified @ 125°C Case Temperature
- NRV 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

#### Mechanical Characteristics

- Case: Epoxy, Molded
- Weight: 0.4 Gram (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead and Mounting Surface Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- ESD Ratings:
  - ♦ Machine Model = C (> 400 V)
  - ♦ Human Body Model = 3B (> 8 kV)

#### Applications

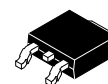
- Boost Rectifier for SMPS PFC Operating in Continuous Conduction Mode (CCM)
- LED Lighting Power Conversion
- Automotive Diesel Piezo Injection
- Thin and Ultra Thin Flat Panel Display
- Output Rectification in High Frequency High Output Voltage Applications



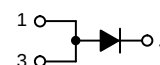
**ON Semiconductor®**

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### PLANAR ULTRAFAST RECTIFIER 6.0 AMPERES, 600 VOLTS



**DPAK  
CASE 369C**



#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

#### ORDERING INFORMATION

| Device       | Package        | Shipping <sup>†</sup>      |
|--------------|----------------|----------------------------|
| NHPD660T4G   | DPAK (Pb-Free) | 2,500/Tape & Reel<br>16 mm |
| NRVHPD660T4G | DPAK (Pb-Free) | 2,500/Tape & Reel<br>16 mm |

<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.

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

# NHPD660, NRVHPD660

## MAXIMUM RATINGS

| Rating                                                                                             | Symbol                          | Value       | Unit             |
|----------------------------------------------------------------------------------------------------|---------------------------------|-------------|------------------|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage             | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 600         | V                |
| Average Rectified Forward Current<br>(Rated $V_R$ , $T_C = 145^\circ\text{C}$ )                    | $I_{F(AV)}$                     | 6.0         | A                |
| Peak Repetitive Forward Current<br>(Rated $V_R$ , Square Wave, 20 kHz, $T_C = 135^\circ\text{C}$ ) | $I_{FRM}$                       | 12.0        | A                |
| Non-Repetitive Peak Surge Current<br>(Surge Applied at Rated Load Conditions Halfwave, 60 Hz)      | $I_{FSM}$                       | 60          | A                |
| Operating Junction and Storage Temperature Range                                                   | $T_J, T_{stg}$                  | -65 to +175 | $^\circ\text{C}$ |

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.

## THERMAL CHARACTERISTICS

| Characteristics                                   | Symbol          | Value | Unit               |
|---------------------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance – Junction-to-Case             | $R_{\theta JC}$ | 4.2   | $^\circ\text{C/W}$ |
| Thermal Resistance – Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 95.7  | $^\circ\text{C/W}$ |

1. Rating applies when surface mounted on the minimum pad sizes recommended.

## ELECTRICAL CHARACTERISTICS

| Characteristic                                                                                             | Test Conditions                                                                                                                                                 | Symbol                                  | Typ                      | Max                | Unit               |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|--------------------|--------------------|
| Instantaneous Forward Voltage<br>(Note 2)                                                                  | ( $I_F = 6\text{ A}$ , $T_C = 125^\circ\text{C}$ )<br>( $I_F = 6\text{ A}$ , $T_C = 25^\circ\text{C}$ )                                                         | $V_F$                                   | 1.45<br>2.4              | 1.8<br>3.0         | V                  |
| Instantaneous Reverse Current<br>(Note 2)                                                                  | (Rated DC Voltage, $T_C = 125^\circ\text{C}$ )<br>(Rated DC Voltage, $T_C = 25^\circ\text{C}$ )                                                                 | $I_R$                                   | 35<br>0.035              | 300<br>30          | $\mu\text{A}$      |
| Reverse Recovery Time                                                                                      | ( $I_F = 0.5\text{ A}$ , $I_{rr} = 0.25\text{ A}$ , $I_R = 1\text{ A}$ )<br>( $I_F = 1\text{ A}$ , $dI_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ ) | $t_{rr}$                                | –<br>–                   | 30<br>50           | ns                 |
| Reverse Recovery Time<br>Peak Reverse Recovery Current<br>Total Reverse Recovery Charge<br>Softness Factor | ( $I_F = 6\text{ A}$ , $dI_F/dt = -200\text{ A}/\mu\text{s}$ , $T_C = 25^\circ\text{C}$ )                                                                       | $t_{rr}$<br>$I_{RM}$<br>$Q_{rr}$<br>$S$ | 30<br>2.3<br>37<br>2     | 50<br>3<br>50<br>– | ns<br>A<br>nC<br>– |
| Reverse Recovery Time<br>Peak Reverse Recovery Current<br>Total Reverse Recovery Charge<br>Softness Factor | ( $I_F = 6\text{ A}$ , $dI_F/dt = -200\text{ A}/\mu\text{s}$ , $T_C = 125^\circ\text{C}$ )                                                                      | $t_{rr}$<br>$I_{RM}$<br>$Q_{rr}$<br>$S$ | 45<br>5.5<br>150<br>0.35 | –<br>–<br>–<br>–   | ns<br>A<br>nC<br>– |
| Forward Recovery Time<br>Forward Voltage Time                                                              | ( $I_F = 6\text{ A}$ , $dI_F/dt = 120\text{ A}/\mu\text{s}$ , $T_C = 25^\circ\text{C}$ )                                                                        | $t_{fr}$<br>$V_{FP}$                    | –<br>–                   | 200<br>6           | ns<br>V            |

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

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.

TYPICAL CHARACTERISTICS

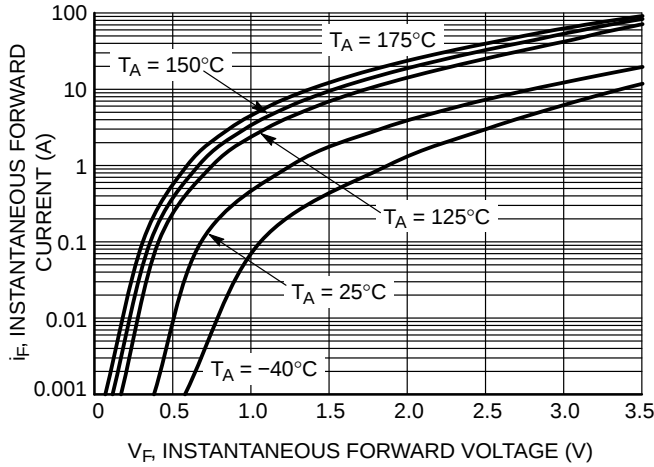


Figure 1. Typical Instantaneous Forward Characteristics

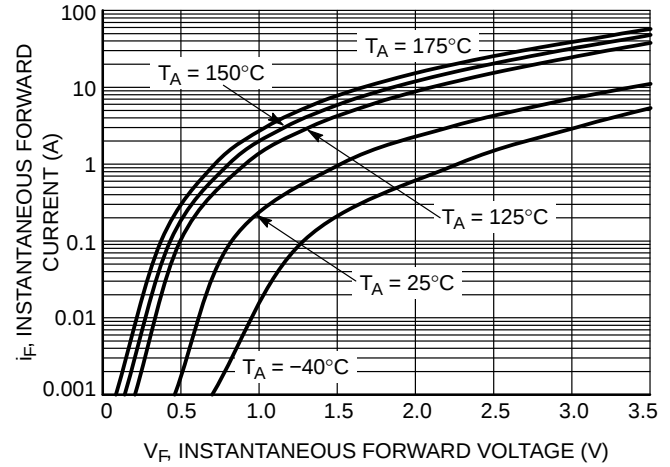


Figure 2. Maximum Instantaneous Forward Characteristics

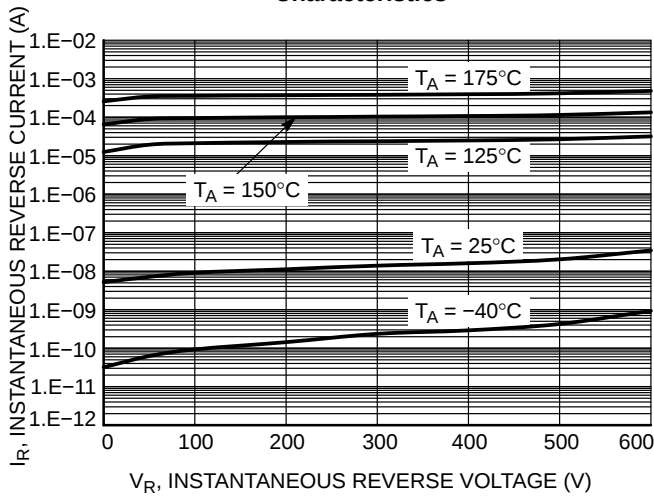


Figure 3. Typical Reverse Characteristics

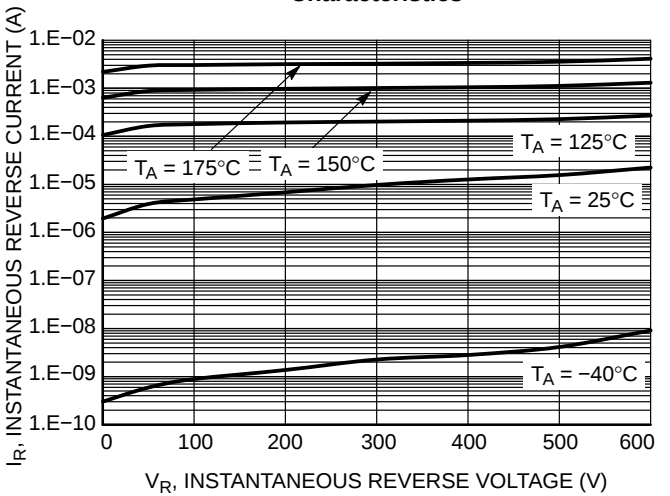


Figure 4. Maximum Reverse Characteristics

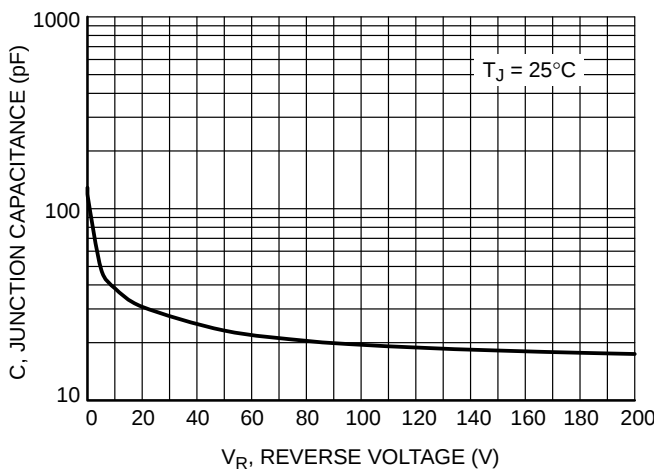


Figure 5. Typical Junction Capacitance

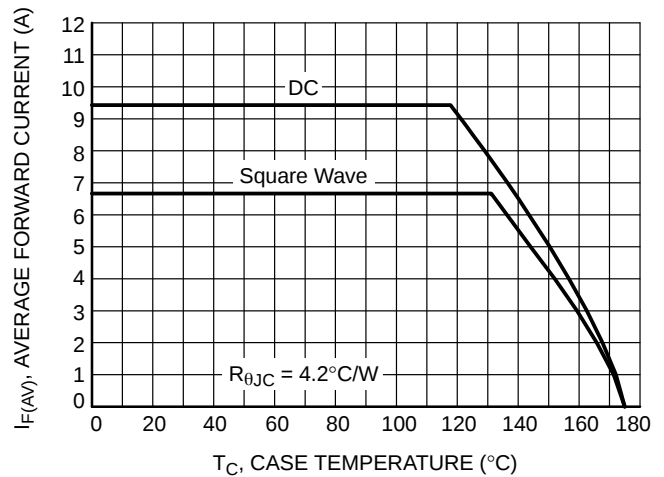


Figure 6. Current Derating

# NHPD660, NRVHPD660

## TYPICAL CHARACTERISTICS

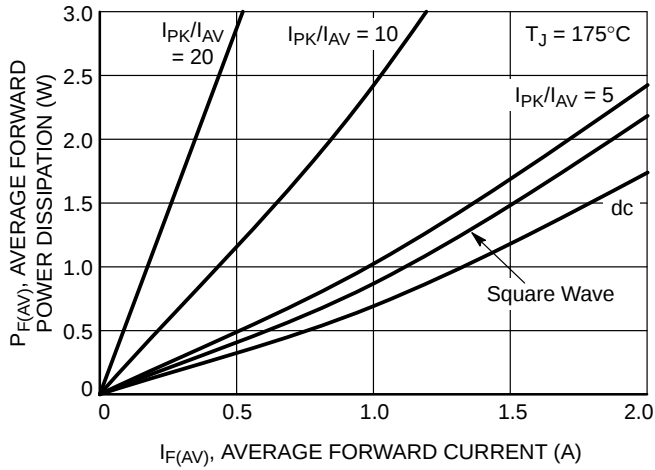


Figure 7. Forward Power Dissipation

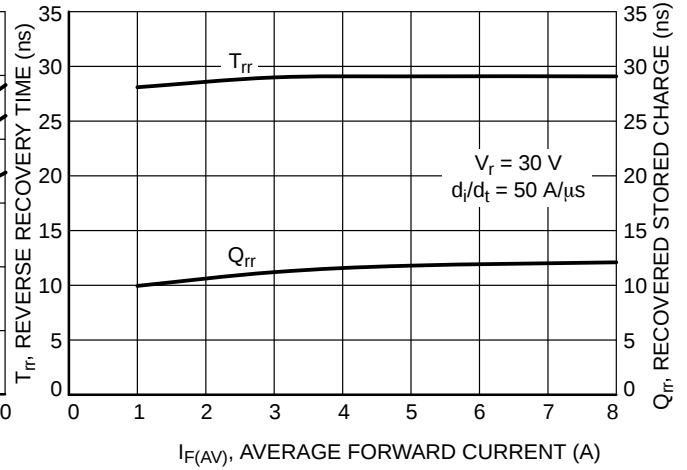


Figure 8. Typical Recovery Characteristics

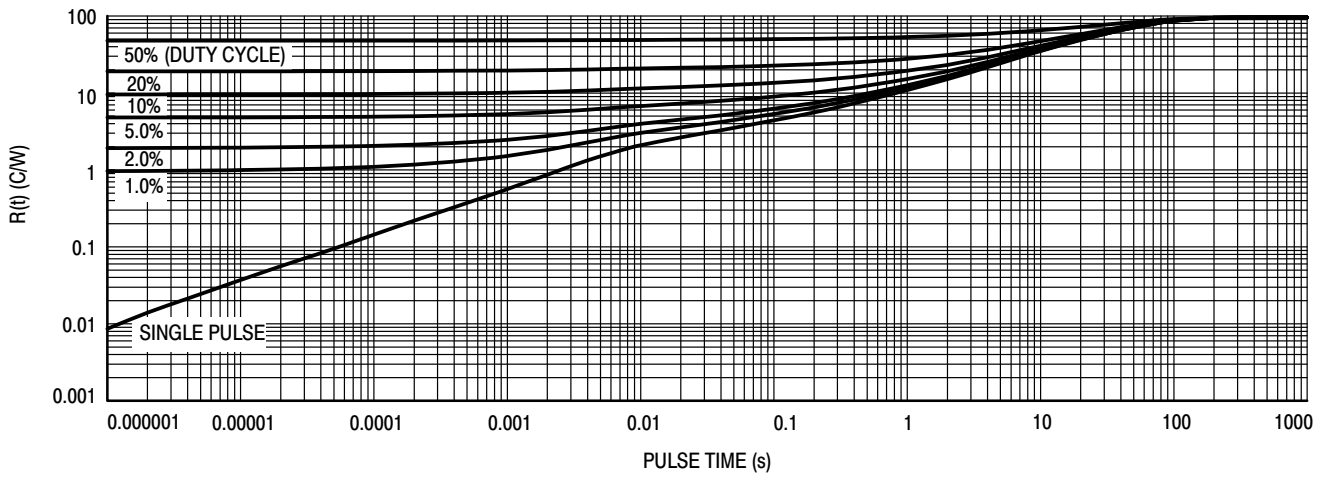
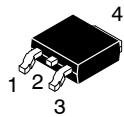


Figure 9. Thermal Response

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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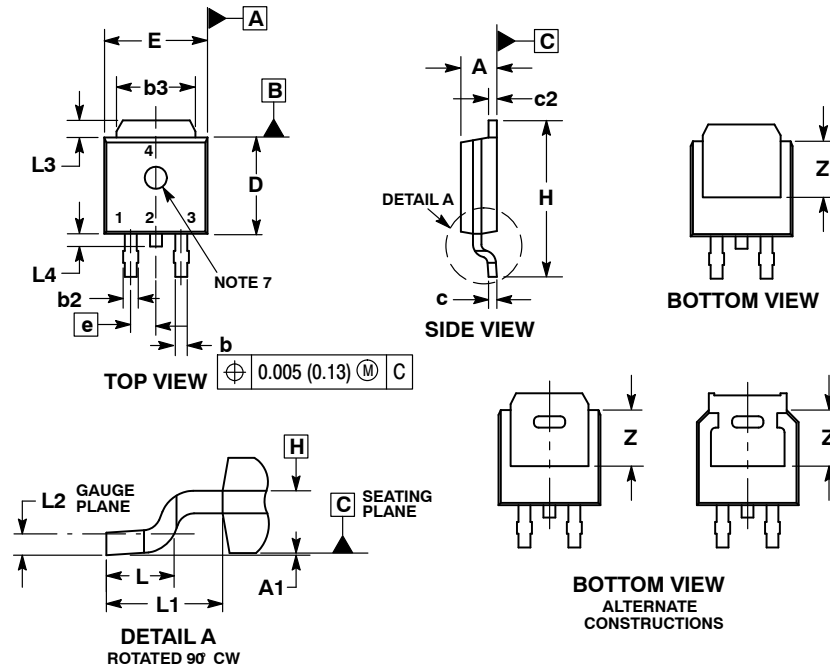
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SCALE 1:1

## DPAK (SINGLE GAUGE) CASE 369C ISSUE F

DATE 21 JUL 2015

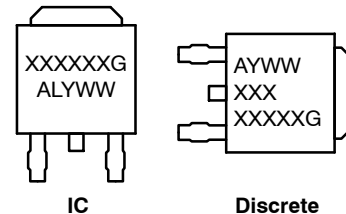


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

| DIM | MIN       | MAX   | MIN      | MAX   |
|-----|-----------|-------|----------|-------|
| A   | 0.086     | 0.094 | 2.18     | 2.38  |
| A1  | 0.000     | 0.005 | 0.00     | 0.13  |
| b   | 0.025     | 0.035 | 0.63     | 0.89  |
| b2  | 0.028     | 0.045 | 0.72     | 1.14  |
| b3  | 0.180     | 0.215 | 4.57     | 5.46  |
| c   | 0.018     | 0.024 | 0.46     | 0.61  |
| c2  | 0.018     | 0.024 | 0.46     | 0.61  |
| D   | 0.235     | 0.245 | 5.97     | 6.22  |
| E   | 0.250     | 0.265 | 6.35     | 6.73  |
| e   | 0.090 BSC |       | 2.29 BSC |       |
| H   | 0.370     | 0.410 | 9.40     | 10.41 |
| L   | 0.055     | 0.070 | 1.40     | 1.78  |
| L1  | 0.114 REF |       | 2.90 REF |       |
| L2  | 0.020 BSC |       | 0.51 BSC |       |
| L3  | 0.035     | 0.050 | 0.89     | 1.27  |
| L4  | ---       | 0.040 | ---      | 1.01  |
| Z   | 0.155     | ---   | 3.93     | ---   |

### GENERIC MARKING DIAGRAM\*

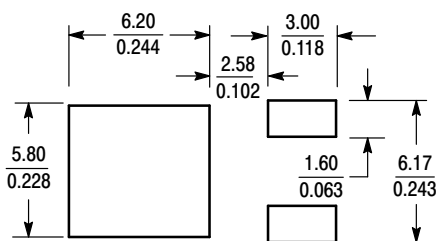


XXXXXX = Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking.

- STYLE 1:**  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 2:**  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN
- STYLE 3:**  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 4:**  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE
- STYLE 5:**  
PIN 1. GATE  
2. ANODE  
3. CATHODE  
4. ANODE
- STYLE 6:**  
PIN 1. MT1  
2. MT2  
3. GATE  
4. MT2
- STYLE 7:**  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 8:**  
PIN 1. N/C  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 9:**  
PIN 1. ANODE  
2. CATHODE  
3. RESISTOR ADJUST  
4. CATHODE
- STYLE 10:**  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

### SOLDERING FOOTPRINT\*



SCALE 3:1 (mm inches)

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

|                         |                            |                                                                                                                                                                                     |
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