

NTMD6N02R2

Power MOSFET 6.0 Amps, 20 Volts

N-Channel Enhancement Mode Dual SO-8 Package

Features

- Ultra Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Miniature Dual SOIC-8 Surface Mount Package
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- SOIC-8 Mounting Information Provided
- Pb-Free Package is Available

Applications

- DC-DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery-Powered Products, for example, Computers, Printers, Cellular and Cordless Telephones and PCMCIA Cards

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|--|-----------------|----------|--------------------|
| Drain-to-Source Voltage | V_{DSS} | 20 | V |
| Drain-to-Gate Voltage ($R_{GS} = 1.0\ \text{M}\Omega$) | V_{DGR} | 20 | V |
| Gate-to-Source Voltage - Continuous | V_{GS} | ± 12 | V |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 2.0 | W |
| Continuous Drain Current @ $T_A = 25^\circ\text{C}$ | I_D | 6.5 | A |
| Continuous Drain Current @ $T_A = 70^\circ\text{C}$ | I_D | 5.5 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | 50 | A |
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 102 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 1.22 | W |
| Continuous Drain Current @ $T_A = 25^\circ\text{C}$ | I_D | 5.07 | A |
| Continuous Drain Current @ $T_A = 70^\circ\text{C}$ | I_D | 4.07 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | 40 | A |
| Thermal Resistance Junction-to-Ambient (Note 3) | $R_{\theta JA}$ | 172 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 0.73 | W |
| Continuous Drain Current @ $T_A = 25^\circ\text{C}$ | I_D | 3.92 | A |
| Continuous Drain Current @ $T_A = 70^\circ\text{C}$ | I_D | 3.14 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | 30 | A |

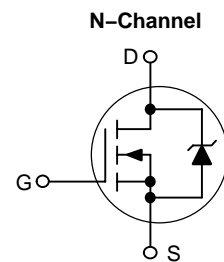
1. Mounted onto a 2 in square FR-4 Board (1 in sq. 2 oz. Cu 0.06 in thick single sided), $t < 10$ seconds.
2. Mounted onto a 2 in square FR-4 Board (1 in sq. 2 oz. Cu 0.06 in thick single sided), $t =$ steady state.
3. Minimum FR-4 or G-10 PCB, $t =$ steady state.
4. Pulse Test: Pulse Width = 10 μs , Duty Cycle = 2%.



ON Semiconductor®

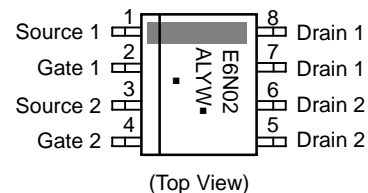
<http://onsemi.com>

| V_{DSS} | $R_{DS(ON)}$ TYP | I_D MAX |
|-----------|----------------------------------|-----------|
| 20 V | 35 m Ω @ $V_{GS} = 4.5$ V | 6.0 A |



SOIC-8
CASE 751
STYLE 11

MARKING DIAGRAM & PIN ASSIGNMENT



E6N02 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|---------------------|------------------|
| NTMD6N02R2 | SOIC-8 | 2500/Tape & Reel |
| NTMD6N02R2G | SOIC-8 (Pb-Free) | 2500/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

NTMD6N02R2

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Rating | Symbol | Value | Unit |
|---|----------------|-------------|------------------|
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 20\text{ Vdc}$, $V_{GS} = 5.0\text{ Vdc}$, Peak $I_L = 6.0\text{ Apk}$, $L = 20\text{ mH}$, $R_G = 25\ \Omega$) | E_{AS} | 360 | mJ |
| Maximum Lead Temperature for Soldering Purposes for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (Note 5)

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

OFF CHARACTERISTICS

| | | | | | |
|--|---------------|---------|-----------|-----------|-----------------------------|
| Drain-to-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\ \mu\text{Adc}$) Temperature Coefficient (Positive) | $V_{(BR)DSS}$ | 20 – | – 19.2 | – – | Vdc mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 25^\circ\text{C}$) ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$) | I_{DSS} | – – | – – | 1.0 10 | μAdc |
| Gate-Body Leakage Current ($V_{GS} = +12\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) | I_{GSS} | – | – | 100 | nAdc |
| Gate-Body Leakage Current ($V_{GS} = -12\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) | I_{GSS} | – | – | -100 | nAdc |

ON CHARACTERISTICS

| | | | | | |
|--|--------------|------------------|----------------------------------|----------------------------------|-----------------------------|
| Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = -250\ \mu\text{Adc}$) Temperature Coefficient (Negative) | $V_{GS(th)}$ | 0.6 – | 0.9 -3.0 | 1.2 – | Vdc mV/ $^\circ\text{C}$ |
| Static Drain-to-Source On-State Resistance ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 6.0\text{ Adc}$) ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 4.0\text{ Adc}$) ($V_{GS} = 2.7\text{ Vdc}$, $I_D = 2.0\text{ Adc}$) ($V_{GS} = 2.5\text{ Vdc}$, $I_D = 3.0\text{ Adc}$) | $R_{DS(on)}$ | – – – – | 0.028 0.028 0.033 0.035 | 0.035 0.043 0.048 0.049 | Ω |
| Forward Transconductance ($V_{DS} = 12\text{ Vdc}$, $I_D = 3.0\text{ Adc}$) | g_{FS} | – | 10 | – | Mhos |

DYNAMIC CHARACTERISTICS

| | | | |
|-------------------|-----------|---|--|
| Input Capacitance | C_{iss} | – | ($V_{DS} = 16\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$) |
|-------------------|-----------|---|--|

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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued) (Note 8)

| Characteristic | Symbol | Min | Typ | Max | Unit | |
|--|----------|-----|-------|-----|---------------|---|
| BODY-DRAIN DIODE RATINGS (Note 9) | | | | | | |
| Diode Forward On-Voltage | V_{SD} | - | 0.83 | 1.1 | Vdc | |
| | | | 0.88 | 1.2 | | |
| | | | 0.75 | - | | |
| Reverse Recovery Time | t_{rr} | - | 30 | - | ns | |
| | | | t_a | - | | - |
| | | | t_b | - | | - |
| Reverse Recovery Stored Charge | Q_{RR} | - | 0.02 | - | μC | |

8. Handling precautions to protect against electrostatic discharge is mandatory.

9. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.

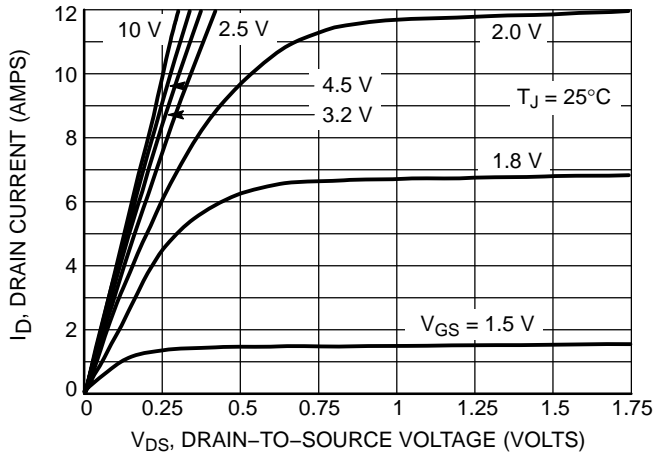


Figure 1. On-Region Characteristics

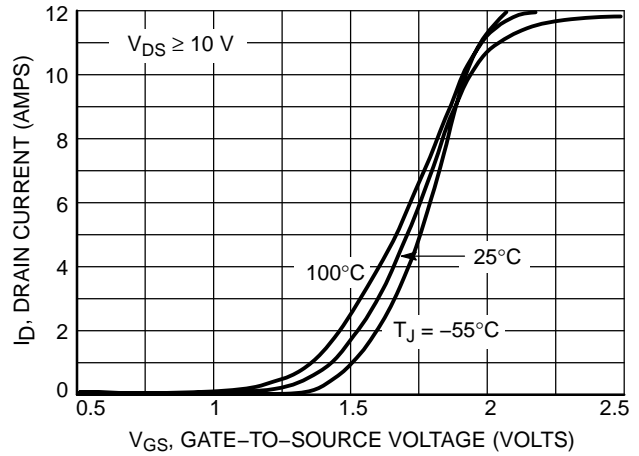


Figure 2. Transfer Characteristics

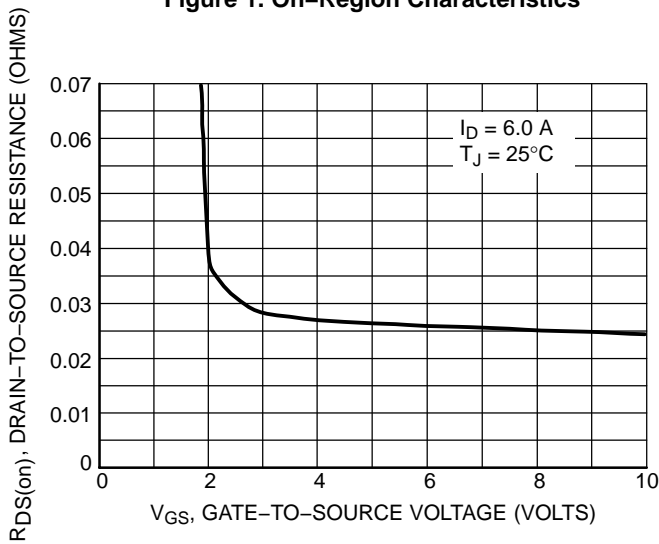


Figure 3. On-Resistance versus Gate-to-Source Voltage

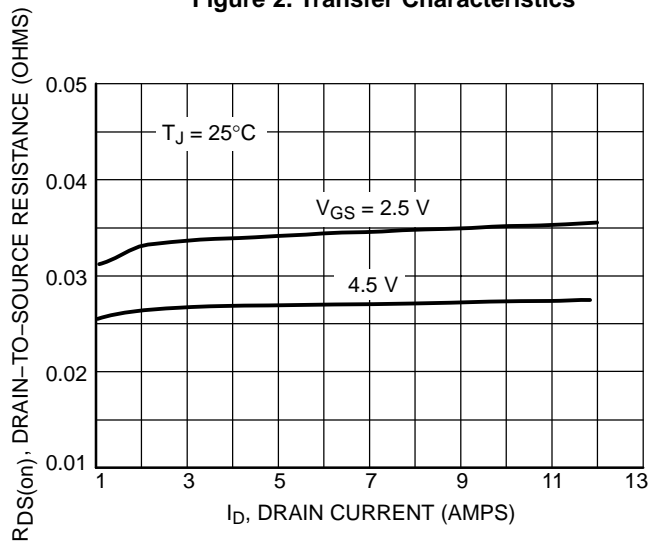


Figure 4. On-Resistance versus Drain Current and Gate Voltage

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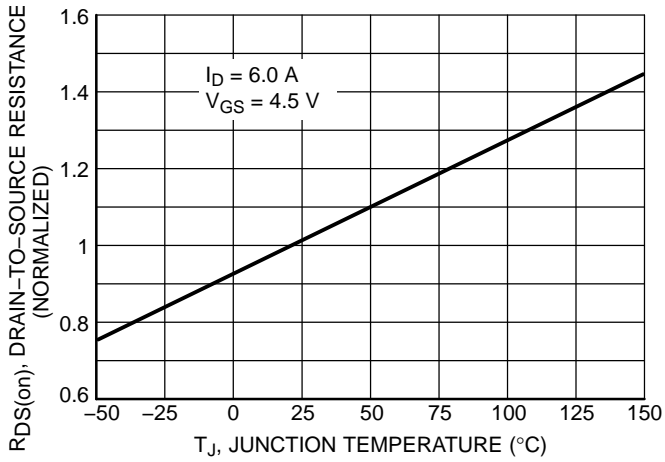


Figure 5. On-Resistance Variation with Temperature

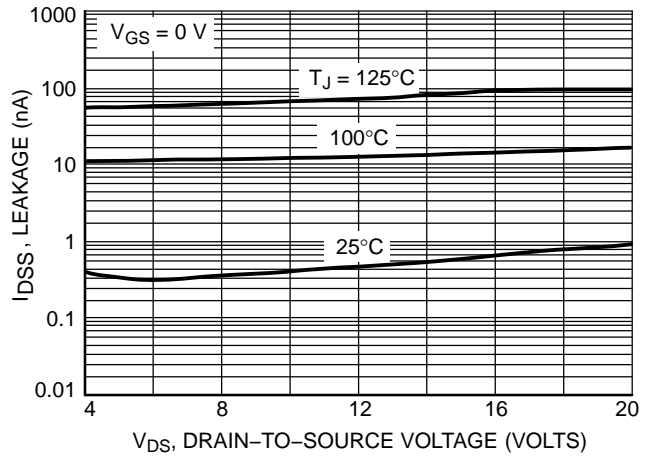


Figure 6. Drain-To-Source Leakage Current versus Voltage

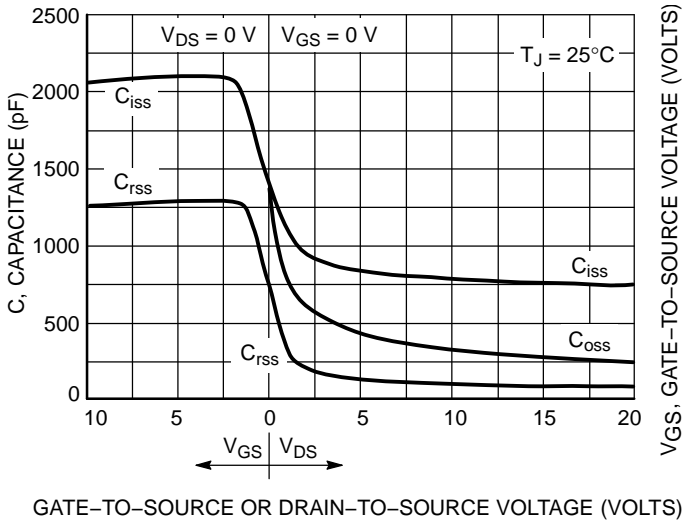


Figure 7. Capacitance Variation

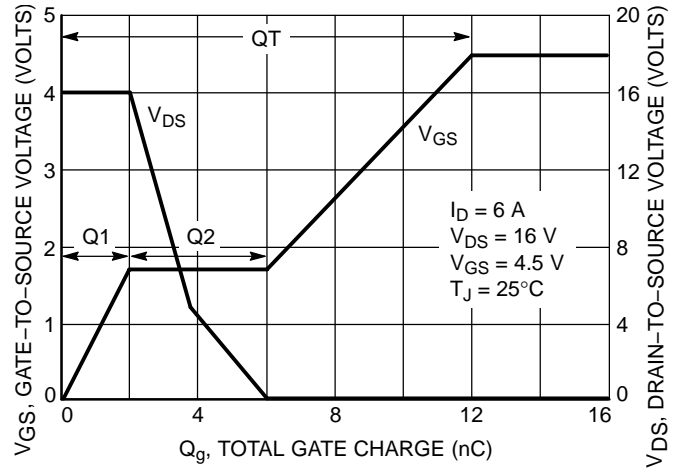


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

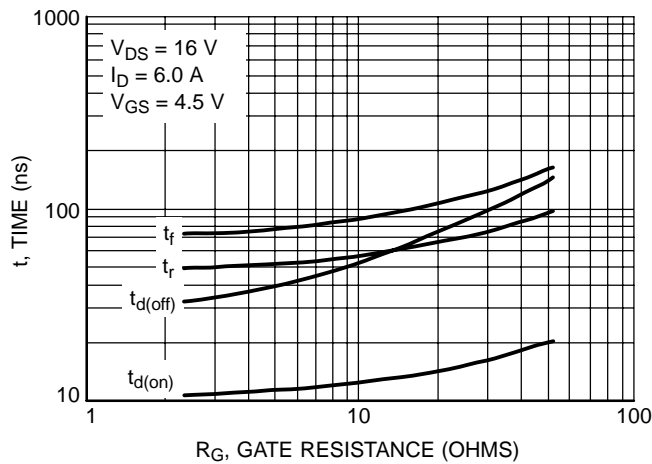


Figure 9. Resistive Switching Time Variation versus Gate Resistance

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DRAIN-TO-SOURCE DIODE CHARACTERISTICS

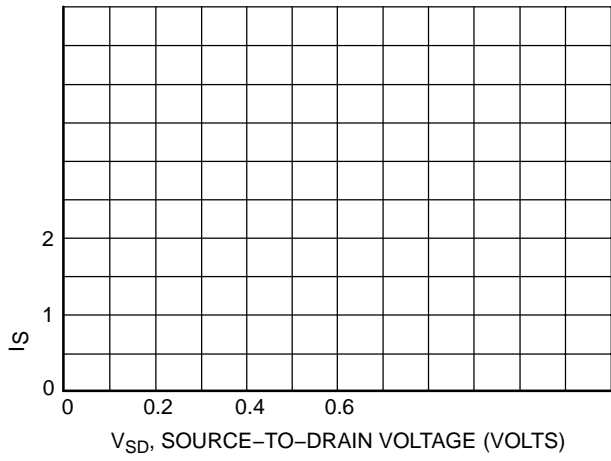
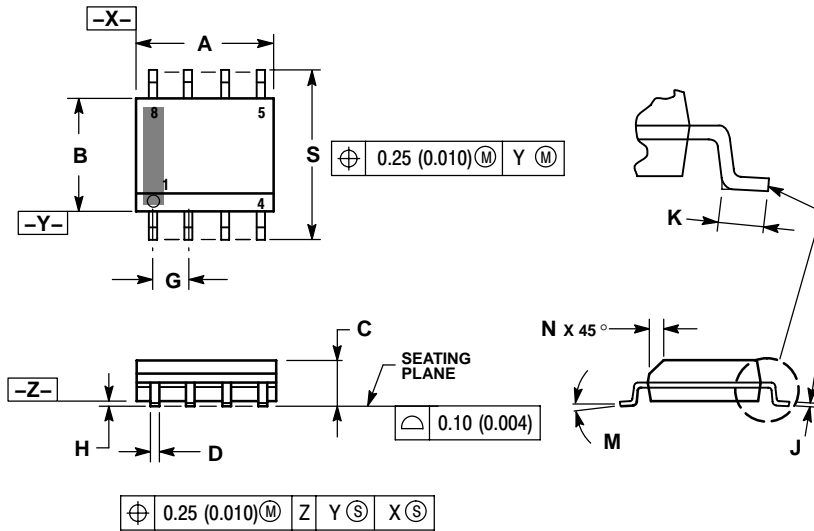


Figure 10. Diode Forward Voltage versus Current

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PACKAGE DIMENSIONS

SOIC-8
CASE 751-07
ISSUE AG



NOTES:

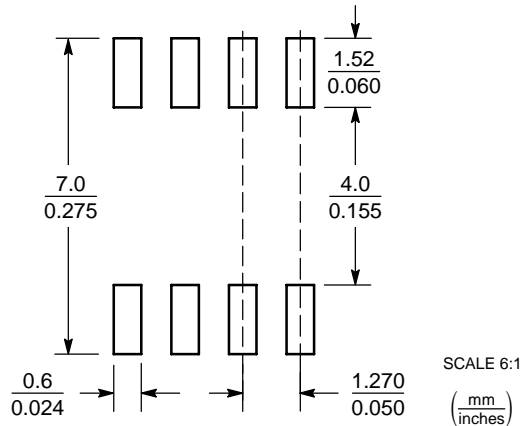
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.80 | 5.00 | 0.189 | 0.197 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.053 | 0.069 |
| D | 0.33 | 0.51 | 0.013 | 0.020 |
| G | 1.27 BSC | | 0.050 BSC | |
| H | 0.10 | 0.25 | 0.004 | 0.010 |
| J | 0.19 | 0.25 | 0.007 | 0.010 |
| K | 0.40 | 1.27 | 0.016 | 0.050 |
| M | 0° | 8° | 0° | 8° |
| N | 0.25 | 0.50 | 0.010 | 0.020 |
| S | 5.80 | 6.20 | 0.228 | 0.244 |

STYLE 11:

1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

SOLDERING FOOTPRINT*



*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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