

# NTUD3171PZ

## Small Signal MOSFET

-20 V, -200 mA, Dual P-Channel,  
1.0 x 1.0 mm SOT-963 Package

### Features

- Dual P-Channel MOSFET
- Offers a Low  $R_{DS(on)}$  Solution in the Ultra Small 1.0 x 1.0 mm Package
- 1.5 V Gate Voltage Rating
- Ultra Thin Profile (< 0.5 mm) Allows It to Fit Easily into Extremely Thin Environments such as Portable Electronics.
- This is a Pb-Free Device

### Applications

- High Side Switch
- High Speed Interfacing
- Optimized for Power Management in Ultra Portable Equipment

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

| Parameter                                                         |                      |                          | Symbol         | Value      | Unit             |
|-------------------------------------------------------------------|----------------------|--------------------------|----------------|------------|------------------|
| Drain-to-Source Voltage                                           |                      |                          | $V_{DS}$       | -20        | V                |
| Gate-to-Source Voltage                                            |                      |                          | $V_{GS}$       | $\pm 8$    | V                |
| Continuous Drain Current (Note 1)                                 | Steady State         | $T_A = 25^\circ\text{C}$ | $I_D$          | -200       | mA               |
|                                                                   |                      | $T_A = 85^\circ\text{C}$ |                | -140       |                  |
|                                                                   | $t \leq 5 \text{ s}$ | $T_A = 25^\circ\text{C}$ |                | -250       |                  |
| Power Dissipation (Note 1)                                        | Steady State         | $T_A = 25^\circ\text{C}$ | $P_D$          | -125       | mW               |
|                                                                   | $t \leq 5 \text{ s}$ |                          |                | -200       |                  |
| Pulsed Drain Current                                              |                      | $t_p = 10 \mu\text{s}$   | $I_{DM}$       | -600       | mA               |
| Operating Junction and Storage Temperature                        |                      |                          | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |
| Source Current (Body Diode) (Note 2)                              |                      |                          | $I_S$          | -200       | mA               |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |                      |                          | $T_L$          | 260        | $^\circ\text{C}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

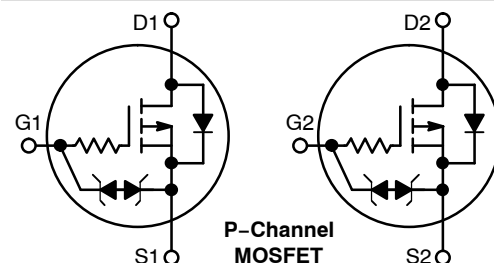
1. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz Cu.
2. Pulse Test: pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$



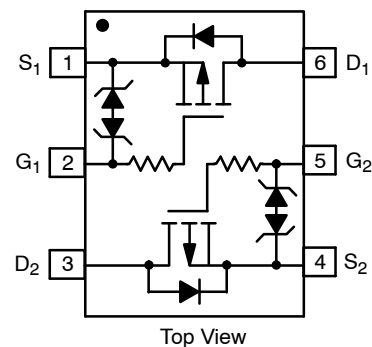
ON Semiconductor®

<http://onsemi.com>

| $V_{(BR)DS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ Max}$ |
|--------------|--------------------------|-------------------|
| -20 V        | 5.0 $\Omega$ @ -4.5 V    | -0.2 A            |
|              | 6.0 $\Omega$ @ -2.5 V    |                   |
|              | 7.0 $\Omega$ @ -1.8 V    |                   |
|              | 10 $\Omega$ @ -1.5 V     |                   |



### PINOUT: SOT-963

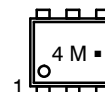


Top View



SOT-963  
CASE 527AD

### MARKING DIAGRAM



- 4 = Specific Device Code
- M = Date Code
- = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NTUD3171PZ

## THERMAL RESISTANCE RATINGS

| Parameter                                   | Symbol          | Max  | Unit |
|---------------------------------------------|-----------------|------|------|
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 1000 | °C/W |
| Junction-to-Ambient – $t = 5$ s (Note 3)    |                 | 600  |      |

3. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz Cu.

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

| Parameter                         | Symbol        | Test Condition                                                        | Min | Typ | Max       | Unit |
|-----------------------------------|---------------|-----------------------------------------------------------------------|-----|-----|-----------|------|
| <b>OFF CHARACTERISTICS</b>        |               |                                                                       |     |     |           |      |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$                  | -20 |     |           | V    |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS} = 0\text{ V}, V_{DS} = -5.0\text{ V}, T_J = 25^\circ\text{C}$ |     |     | -50       | nA   |
|                                   |               | $V_{GS} = 0\text{ V}, V_{DS} = -5.0\text{ V}, T_J = 85^\circ\text{C}$ |     |     | -100      |      |
|                                   |               | $V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}, T_J = 25^\circ\text{C}$  |     |     | -200      |      |
| Gate-to-Source Leakage Current    | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 5.0\text{ V}$                      |     |     | $\pm 100$ | nA   |

## ON CHARACTERISTICS (Note 4)

|                               |              |                                                  |      |      |      |          |
|-------------------------------|--------------|--------------------------------------------------|------|------|------|----------|
| Gate Threshold Voltage        | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$ | -0.4 |      | -1.0 | V        |
| Drain-to-Source On Resistance | $R_{DS(ON)}$ | $V_{GS} = -4.5\text{ V}, I_D = -100\text{ mA}$   |      | 2.0  | 5.0  | $\Omega$ |
|                               |              | $V_{GS} = -2.5\text{ V}, I_D = -50\text{ mA}$    |      | 2.6  | 6.0  |          |
|                               |              | $V_{GS} = -1.8\text{ V}, I_D = -20\text{ mA}$    |      | 3.4  | 7.0  |          |
|                               |              | $V_{GS} = -1.5\text{ V}, I_D = -10\text{ mA}$    |      | 4.0  | 10   |          |
|                               |              | $V_{GS} = -1.2\text{ V}, I_D = -1.0\text{ mA}$   |      | 6.0  |      |          |
| Forward Transconductance      | $g_{FS}$     | $V_{DS} = -5.0\text{ V}, I_D = -125\text{ mA}$   |      | 0.35 |      | S        |
| Source-Drain Diode Voltage    | $V_{SD}$     | $V_{GS} = 0\text{ V}, I_S = -10\text{ mA}$       |      | -0.6 | -1.0 | V        |

## CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |           |                                                                    |  |      |  |    |
|------------------------------|-----------|--------------------------------------------------------------------|--|------|--|----|
| Input Capacitance            | $C_{ISS}$ | $f = 1\text{ MHz}, V_{GS} = 0\text{ V}$<br>$V_{DS} = -15\text{ V}$ |  | 13.5 |  | pF |
| Output Capacitance           | $C_{OSS}$ |                                                                    |  | 3.8  |  |    |
| Reverse Transfer Capacitance | $C_{RSS}$ |                                                                    |  | 2.0  |  |    |

## SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 4)

|                     |              |                                                                                                     |  |     |  |    |
|---------------------|--------------|-----------------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = -4.5\text{ V}, V_{DD} = -15\text{ V},$<br>$I_D = -200\text{ mA}, R_G = 2.0\text{ }\Omega$ |  | 26  |  | ns |
| Rise Time           | $t_r$        |                                                                                                     |  | 46  |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                                     |  | 196 |  |    |
| Fall Time           | $t_f$        |                                                                                                     |  | 145 |  |    |

4. Switching characteristics are independent of operating junction temperatures

## ORDERING INFORMATION

| Device        | Package              | Shipping <sup>†</sup> |
|---------------|----------------------|-----------------------|
| NTUD3171PZT5G | SOT-963<br>(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.

TYPICAL CHARACTERISTICS

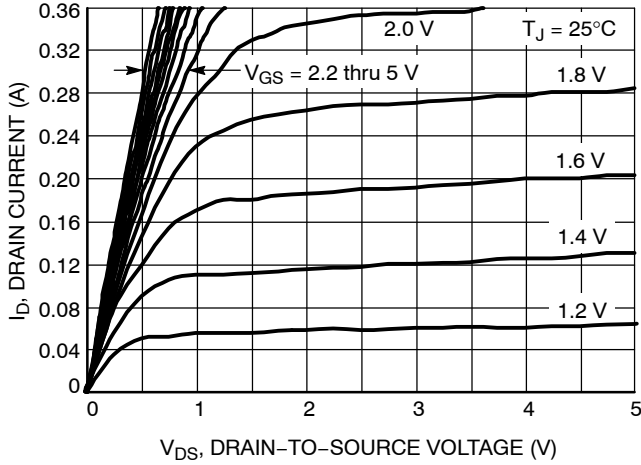


Figure 1. On-Region Characteristics

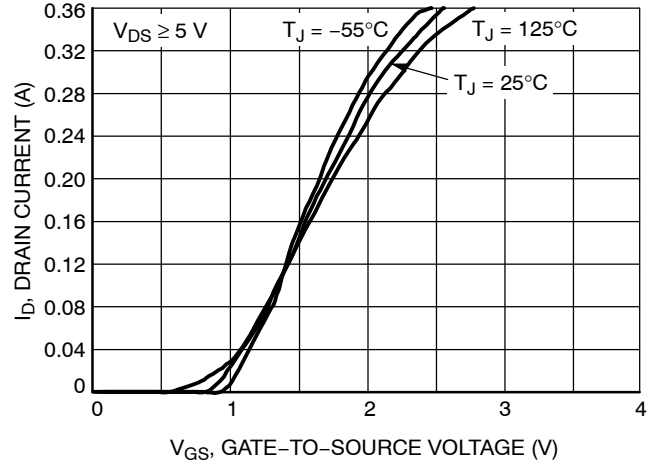


Figure 2. Transfer Characteristics

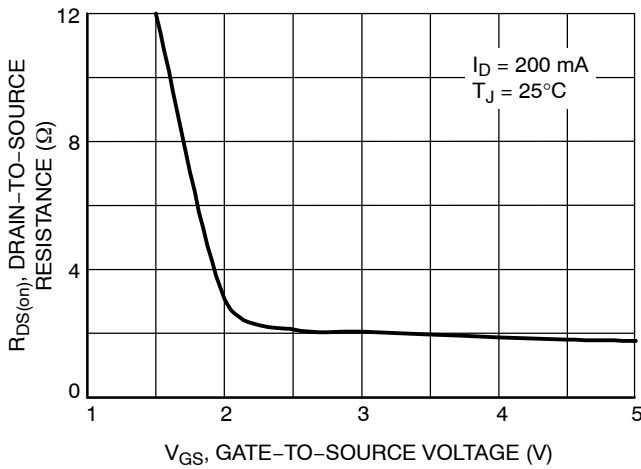


Figure 3. On-Resistance vs. Gate Voltage

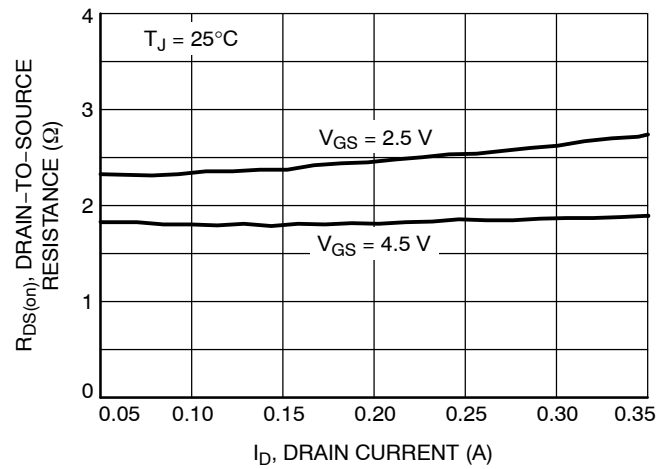


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

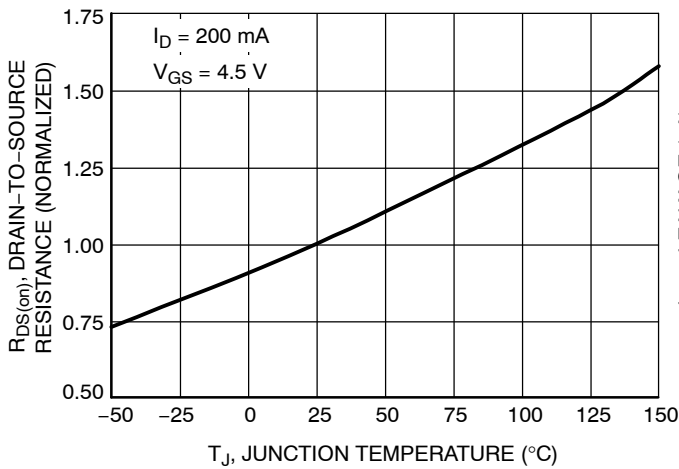


Figure 5. On-Resistance Variation with Temperature

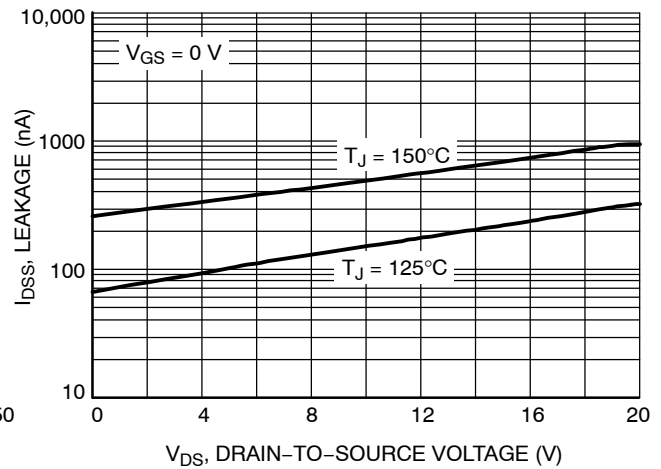


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

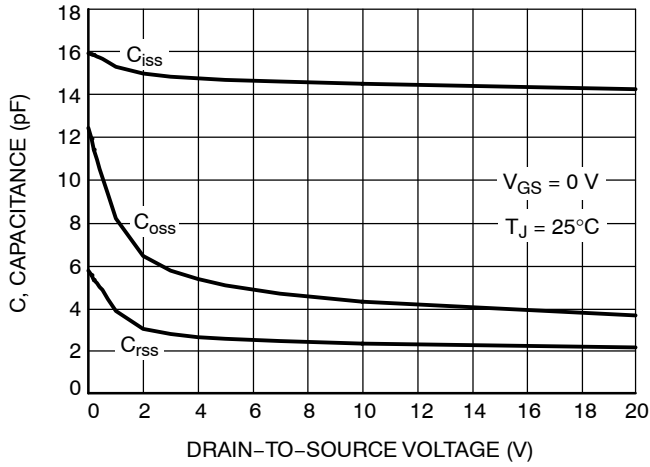


Figure 7. Capacitance Variation

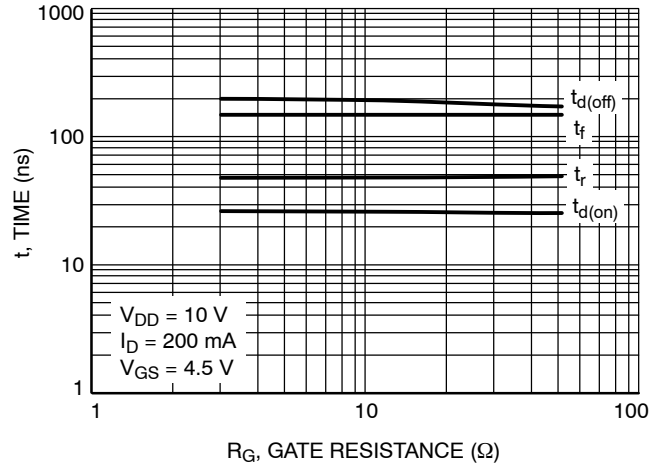


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

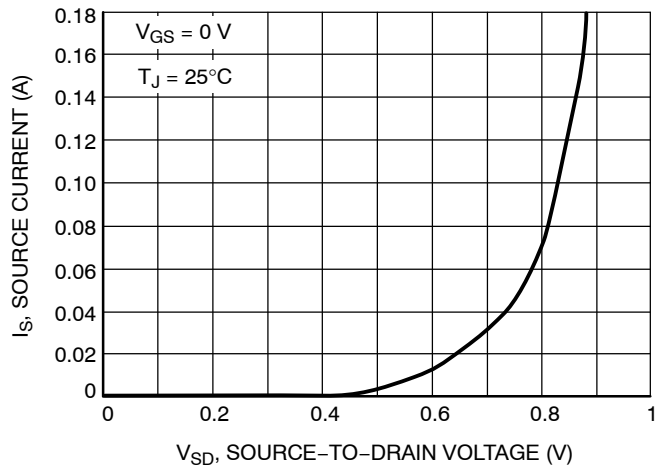
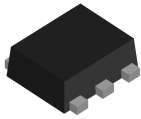


Figure 9. Diode Forward Voltage vs. Current

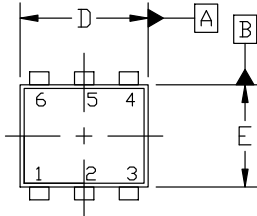


**SOT-963 1.00x1.00x0.37, 0.35P**  
**CASE 527AD**  
**ISSUE F**

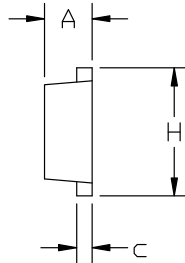
DATE 20 FEB 2024

NOTES:

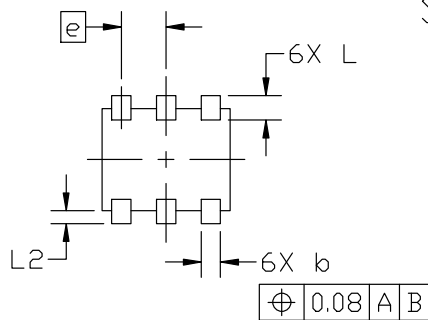
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



TOP VIEW

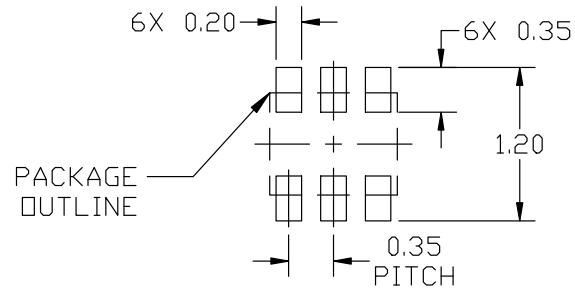


SIDE VIEW



BOTTOM VIEW

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.34        | 0.37 | 0.40 |
| b   | 0.10        | 0.15 | 0.20 |
| c   | 0.07        | 0.12 | 0.17 |
| D   | 0.95        | 1.00 | 1.05 |
| E   | 0.75        | 0.80 | 0.85 |
| e   | 0.35 BSC    |      |      |
| H   | 0.95        | 1.00 | 1.05 |
| L   | 0.19 REF    |      |      |
| L2  | 0.05        | 0.10 | 0.15 |



RECOMMENDED MOUNTING  
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.

STYLE 1:

- PIN 1. EMITTER 1  
2. BASE 1  
3. COLLECTOR 2  
4. EMITTER 2  
5. BASE 2  
6. COLLECTOR 1

STYLE 2:

- PIN 1. EMITTER 1  
2. EMITTER2  
3. BASE 2  
4. COLLECTOR 2  
5. BASE 1  
6. COLLECTOR 1

STYLE 3:

- PIN 1. CATHODE 1  
2. CATHODE 1  
3. ANODE/ANODE 2  
4. CATHODE 2  
5. CATHODE 2  
6. ANODE/ANODE 1

STYLE 4:

- PIN 1. COLLECTOR  
2. COLLECTOR  
3. BASE  
4. EMITTER  
5. COLLECTOR  
6. COLLECTOR

STYLE 5:

- PIN 1. CATHODE  
2. CATHODE  
3. ANODE  
4. ANODE  
5. CATHODE  
6. CATHODE

STYLE 6:

- PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. CATHODE  
5. CATHODE  
6. CATHODE

STYLE 7:

- PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. CATHODE  
5. ANODE  
6. CATHODE

STYLE 8:

- PIN 1. DRAIN  
2. DRAIN  
3. GATE  
4. SOURCE  
5. DRAIN  
6. DRAIN

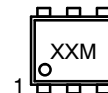
STYLE 9:

- PIN 1. SOURCE 1  
2. GATE 1  
3. DRAIN 2  
4. SOURCE 2  
5. GATE 2  
6. DRAIN 1

STYLE 10:

- PIN 1. CATHODE 1  
2. N/C  
3. CATHODE 2  
4. ANODE 2  
5. N/C  
6. ANODE 1

**GENERIC  
MARKING DIAGRAM\***



XX = Specific Device Code  
M = Month 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.

|                         |                                      |                                                                                                                                                                                  |
|-------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON26456D</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-963 1.00x1.00x0.37, 0.35P</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)