

# NTUD3171PZ

## Small Signal MOSFET

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



ON Semiconductor®

<http://onsemi.com>

### 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)

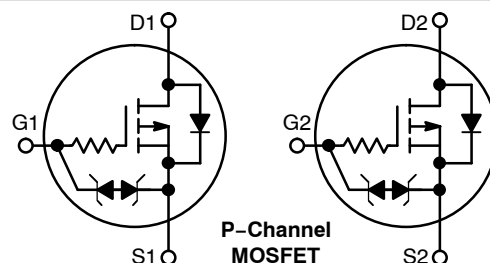
| Parameter   |              | Symbol                   | Value                    | Unit             |
|---|--------------|--------------------------|--------------------------|------------------|
| Drain-to-Source Voltage   |              | $V_{DSS}$                | -20                      | V                |
| Gate-to-Source Voltage  |              | $V_{GS}$                 | $\pm 8$                  | V                |
| Continuous Drain Current (Note 1)                                 | Steady State | $T_A = 25^\circ\text{C}$ | -200                     | mA               |
|   |              |                          | $T_A = 85^\circ\text{C}$ |                  |
|   | $t \leq 5$ s | $T_A = 25^\circ\text{C}$ | -250                     |                  |
| Power Dissipation (Note 1)  | Steady State | $T_A = 25^\circ\text{C}$ | -125                     | mW               |
|   | $t \leq 5$ 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.

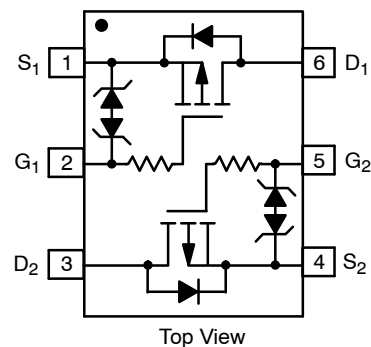
1. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz Cu.

2. Pulse Test: pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX      | $I_D$ 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

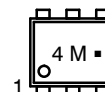


Top View



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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$                           | -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        | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$     | -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>$I_D = -200\text{ mA}, R_G = 2.0\ \Omega$ |  | 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

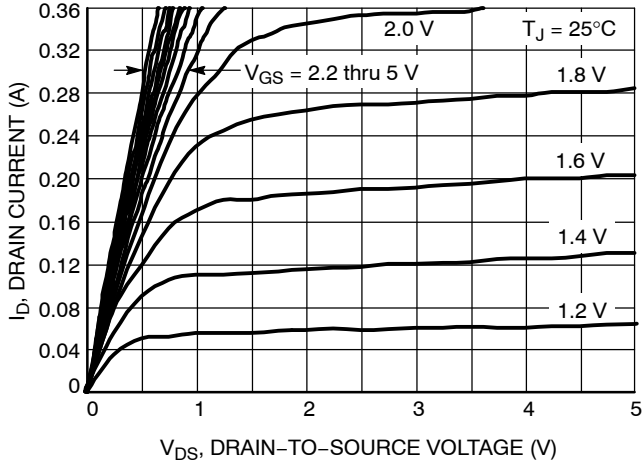


Figure 1. On-Region Characteristics

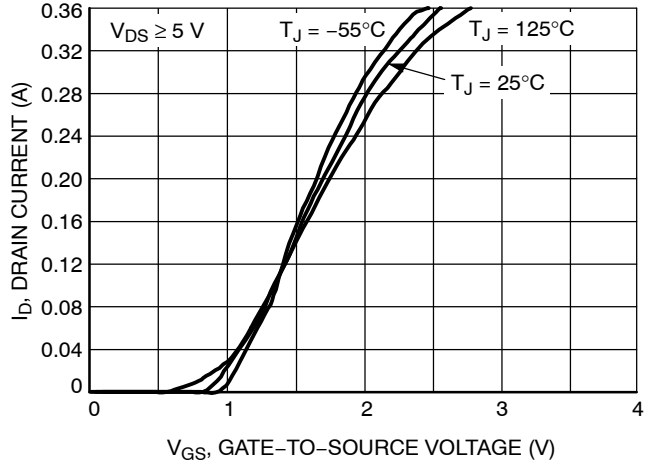


Figure 2. Transfer Characteristics

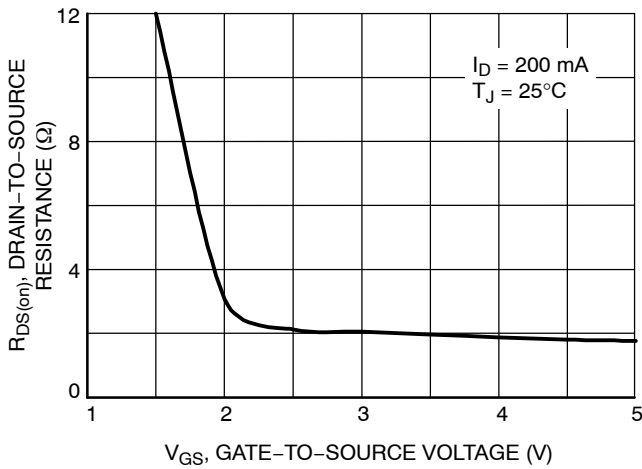


Figure 3. On-Resistance vs. Gate Voltage

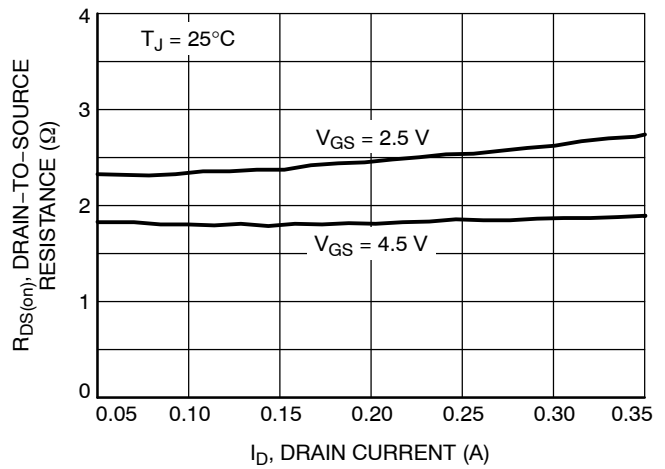


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

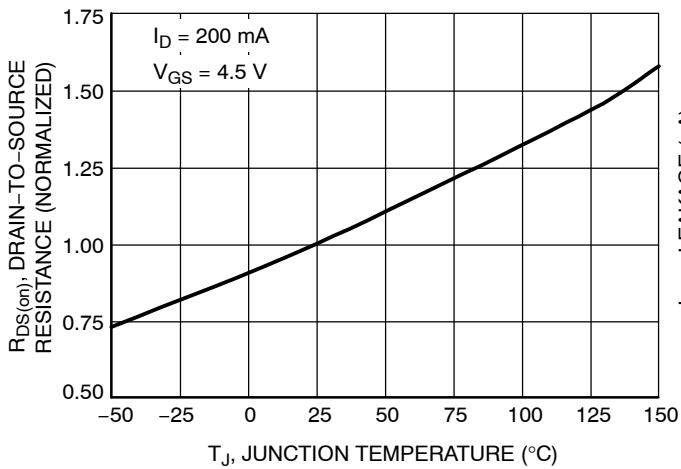


Figure 5. On-Resistance Variation with Temperature

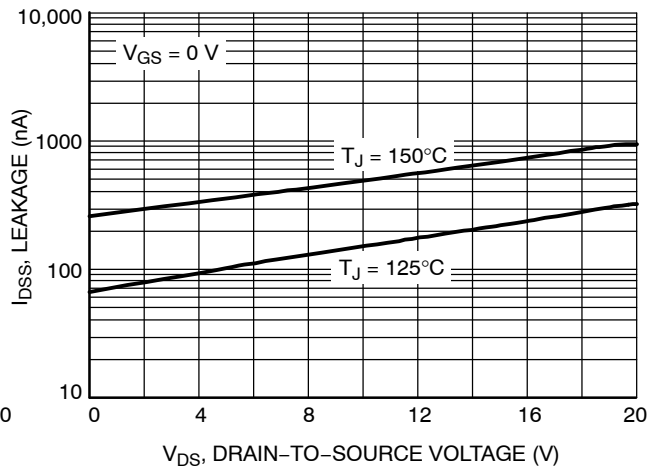


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTUD3171PZ

## TYPICAL CHARACTERISTICS

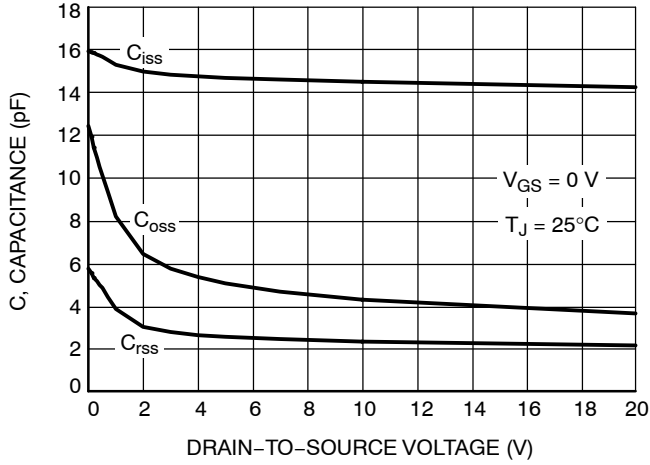


Figure 7. Capacitance Variation

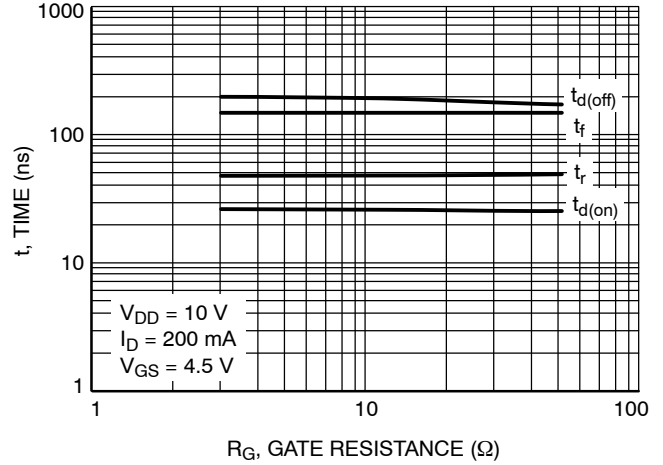


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

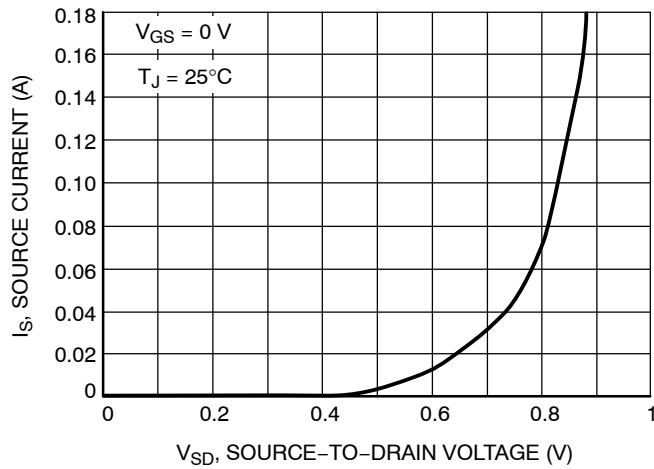


Figure 9. Diode Forward Voltage vs. Current

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 4:1

**SOT-963**  
CASE 527AD-01  
ISSUE E

DATE 09 FEB 2010

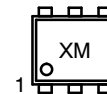


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
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.

| MILLIMETERS    |          |      |      |
|----------------|----------|------|------|
| DIM            | 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 <sub>E</sub> | 0.95     | 1.00 | 1.05 |
| L              | 0.19 REF |      |      |
| L2             | 0.05     | 0.10 | 0.15 |

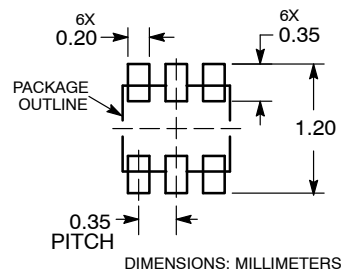
**GENERIC MARKING DIAGRAM\***



X = 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.

**RECOMMENDED MOUNTING FOOTPRINT**



- 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. SOURCE3  
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

|                         |                            |   |
|-------------------------|----------------------------|---|
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