# NTUD3171PZ

# Small Signal MOSFET

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

ON Semiconductor®

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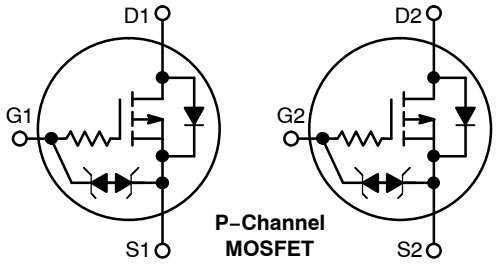
### Features

- 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

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



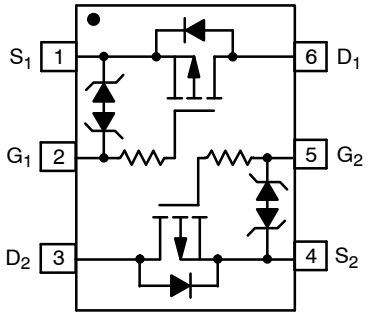

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise specified)

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain−to−Source Voltage | | | $V_{DSS}$ | −20 | V |
| Gate−to−Source Voltage | | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | −200 | mA |
| | | $T_A$ = 85°C | | −140 | |
| | t ≤ 5 s | $T_A$ = 25°C | | −250 | |
| Power Dissipation (Note 1) | Steady State | $T_A$ = 25°C | $P_D$ | −125 | mW |
| | t ≤ 5 s | | | −200 | |
| Pulsed Drain Current | | $t_p$ = 10 μs | $I_{DM}$ | −600 | mA |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{STG}$ | −55 to 150 | °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 | °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 ≤300 μs, duty cycle ≤2%

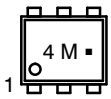
**PINOUT: SOT−963**




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.

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## 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°C unless otherwise specified)

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain−to−Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = −250 μA | | −20 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = −5.0 V | $T_J$ = 25°C | | | −50 | nA |
| | | $V_{GS}$ = 0 V, $V_{DS}$ = −5.0 V | $T_J$ = 85°C | | | −100 | |
| | | $V_{GS}$ = 0 V, $V_{DS}$ = −16 V | $T_J$ = 25°C | | | −200 | |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±5.0 V | | | | ±100 | nA |
| **ON CHARACTERISTICS** (Note 4) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = −250 μA | | −0.4 | | −1.0 | V |
| Drain−to−Source On Resistance | $R_{DS(ON)}$ | $V_{GS}$ = −4.5 V, $I_D$ = −100 mA | | | 2.0 | 5.0 | Ω |
| | | $V_{GS}$ = −2.5 V, $I_D$ = −50 mA | | | 2.6 | 6.0 | |
| | | $V_{GS}$ = −1.8 V, $I_D$ = −20 mA | | | 3.4 | 7.0 | |
| | | $V_{GS}$ = −1.5 V, $I_D$ = −10 mA | | | 4.0 | 10 | |
| | | $V_{GS}$ = −1.2 V, $I_D$ = −1.0 mA | | | 6.0 | | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = −5.0 V, $I_D$ = −125 mA | | | 0.35 | | S |
| Source−Drain Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = −10 mA | | | −0.6 | −1.0 | V |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | f = 1 MHz, $V_{GS}$ = 0 V<br>$V_{DS}$ = −15 V | | | 13.5 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 3.8 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 2.0 | | |
| **SWITCHING CHARACTERISTICS, $V_{GS}$ = 4.5 V** (Note 4) | | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = −4.5 V, $V_{DD}$ = −15 V,<br>$I_D$ = −200 mA, $R_G$ = 2.0 Ω | | | 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† |
|---|---|---|
| NTUD3171PZT5G | SOT−963<br>(Pb−Free) | 8000 / Tape & Reel |

†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

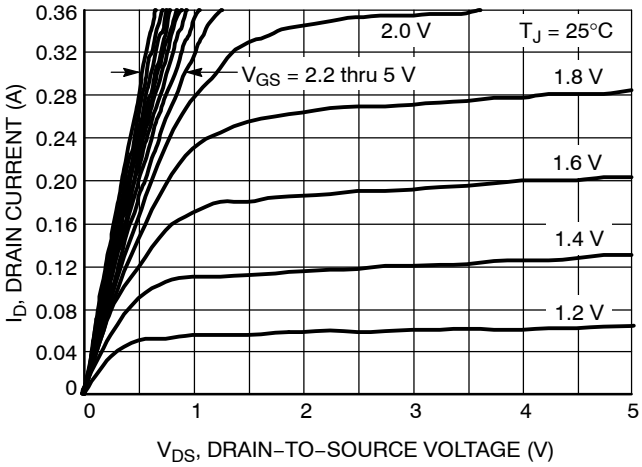



**Figure 1. On−Region Characteristics**

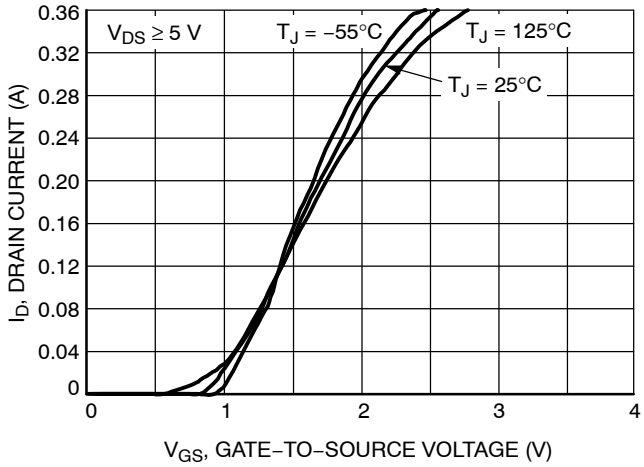



**Figure 2. Transfer Characteristics**

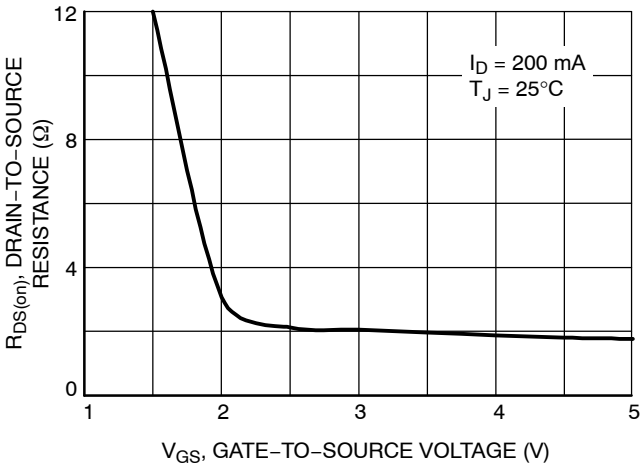



**Figure 3. On−Resistance vs. Gate Voltage**

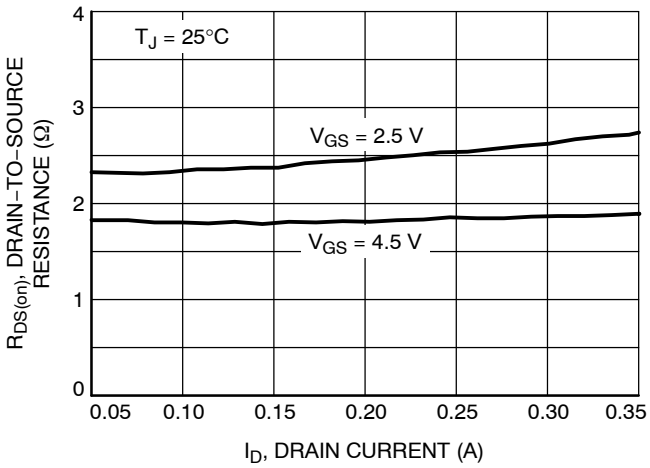



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

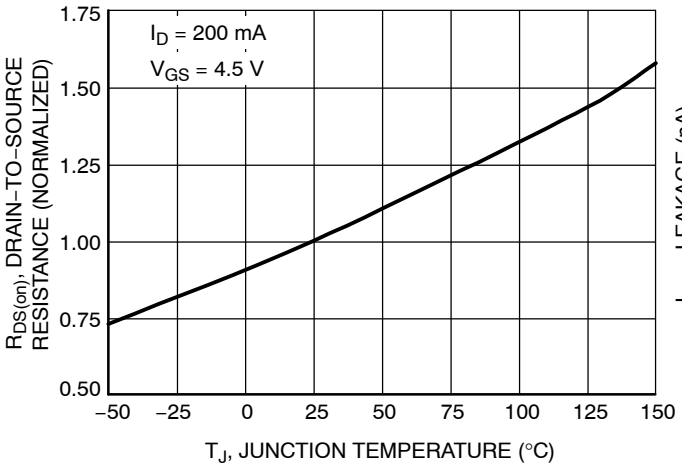



**Figure 5. On−Resistance Variation with Temperature**

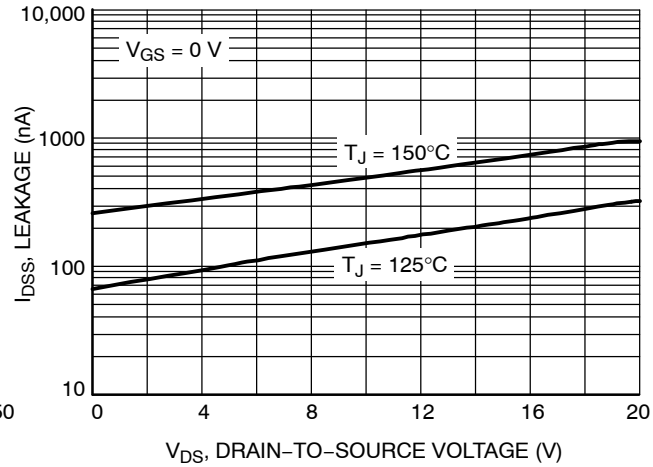



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL CHARACTERISTICS

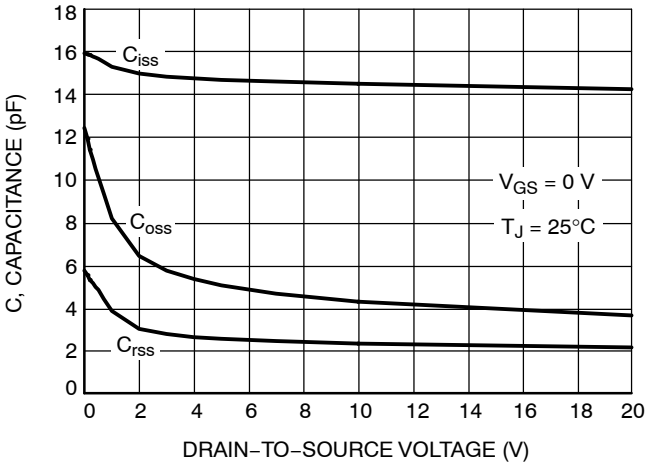



**Figure 7. Capacitance Variation**

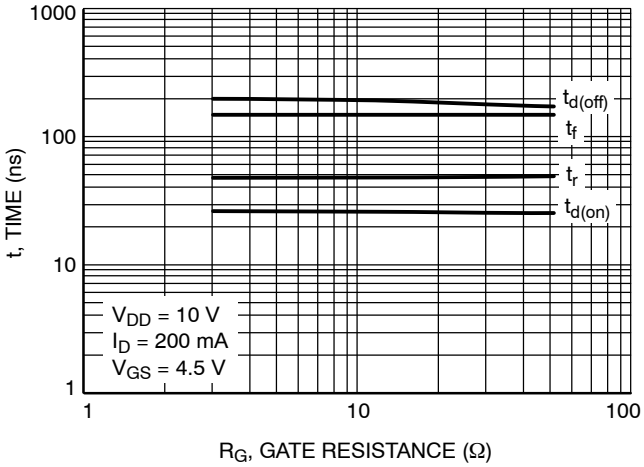



**Figure 8. Resistive Switching Time Variation vs. Gate Resistance**

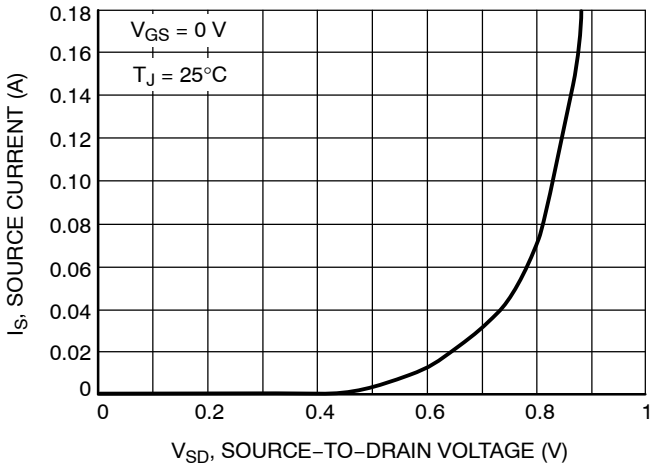
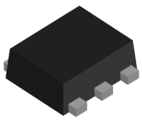



**Figure 9. Diode Forward Voltage vs. Current**

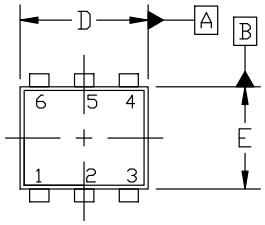


**SOT−963 1.00x1.00x0.37, 0.35P**
CASE 527AD
ISSUE F

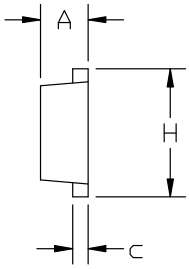
DATE 20 FEB 2024

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.

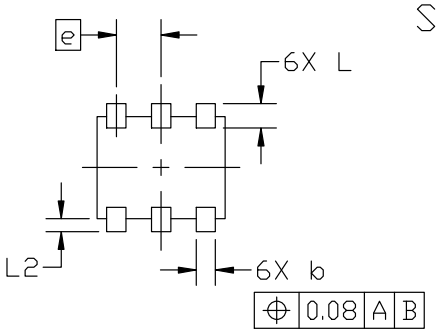
| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.34 | 0.37 | 0.40 |
| b | 0.10 | 0.15 | 0.20 |
| c | 0.07 | 0.12 | 0.17 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.35 BSC | | |
| H | 0.95 | 1.00 | 1.05 |
| L | 0.19 REF | | |
| L2 | 0.05 | 0.10 | 0.15 |



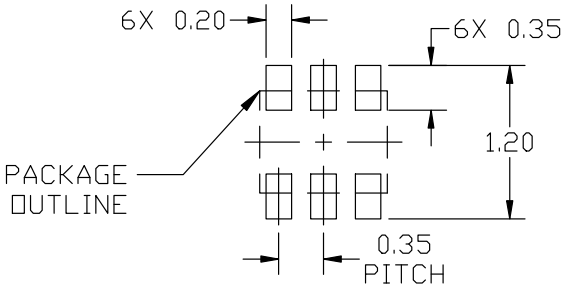

TOP VIEW




SIDE VIEW




BOTTOM VIEW




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

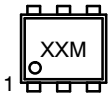
STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

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.

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