

# NTUD3170NZ

## MOSFET – Dual, N-Channel, Small Signal, SOT-963, 1.0 mm x 1.0 mm

20 V, 220 mA



ON Semiconductor®

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### Features

- Dual N-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

- General Purpose Interfacing Switch
- Optimized for Power Management in Ultra Portable Equipment
- Analog Switch

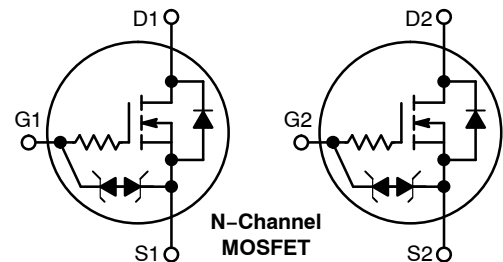
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

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	$T_A = 25^\circ\text{C}$	$I_D$	220	mA
		$T_A = 85^\circ\text{C}$		160	
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$		280	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	125	mW
				$t \leq 5 \text{ s}$	
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	$I_{DM}$	800	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	$^\circ\text{C}$

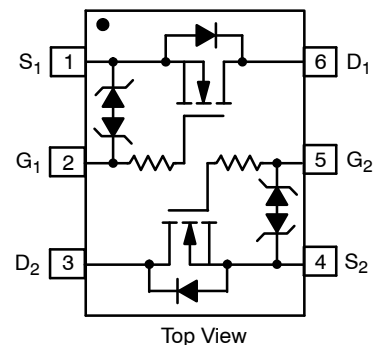
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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	1.5 $\Omega$ @ 4.5 V	0.22 A
	2.0 $\Omega$ @ 2.5 V	
	3.0 $\Omega$ @ 1.8 V	
	4.5 $\Omega$ @ 1.5 V	



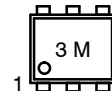
### PINOUT: SOT-963



### MARKING DIAGRAM



SOT-963  
CASE 527AD



3 = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

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

# NTUD3170NZ

## 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	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = 5$ V	$T_J = 25^\circ\text{C}$		50	nA
			$T_J = 85^\circ\text{C}$		200	nA
		$V_{GS} = 0$ V, $V_{DS} = 16$ V	$T_J = 25^\circ\text{C}$		100	nA
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 5.0$ V			$\pm 100$	nA

## ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = 250$ $\mu$ A	0.4		1.0	V
Drain-to-Source On Resistance	$R_{DS(ON)}$	$V_{GS} = 4.5$ V, $I_D = 100$ mA		0.75	1.5	$\Omega$
		$V_{GS} = 2.5$ V, $I_D = 50$ mA		1.0	2.0	
		$V_{GS} = 1.8$ V, $I_D = 20$ mA		1.4	3.0	
		$V_{GS} = 1.5$ V, $I_D = 10$ mA		1.8	4.5	
		$V_{GS} = 1.2$ V, $I_D = 1.0$ mA		2.8		
Forward Transconductance	$g_{FS}$	$V_{DS} = 5.0$ V, $I_D = 125$ mA		0.48		S
Source-Drain Diode Voltage	$V_{SD}$	$V_{GS} = 0$ V, $I_S = 10$ mA		0.6	1.0	V

## CAPACITANCES

Input Capacitance	$C_{ISS}$	$f = 1.0$ MHz, $V_{GS} = 0$ V $V_{DS} = 15$ V		12.5		pF
Output Capacitance	$C_{OSS}$			3.6		
Reverse Transfer Capacitance	$C_{RSS}$			2.6		

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

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DD} = 10$ V, $I_D = 200$ mA, $R_G = 2.0$ $\Omega$		16.5		ns
Rise Time	$t_r$			25.5		
Turn-Off Delay Time	$t_{d(OFF)}$			142		
Fall Time	$t_f$			80		

4. Switching characteristics are independent of operating junction temperatures.

## ORDERING INFORMATION

Device	Package	Shipping†
NTUD3170NZT5G	SOT-963 (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

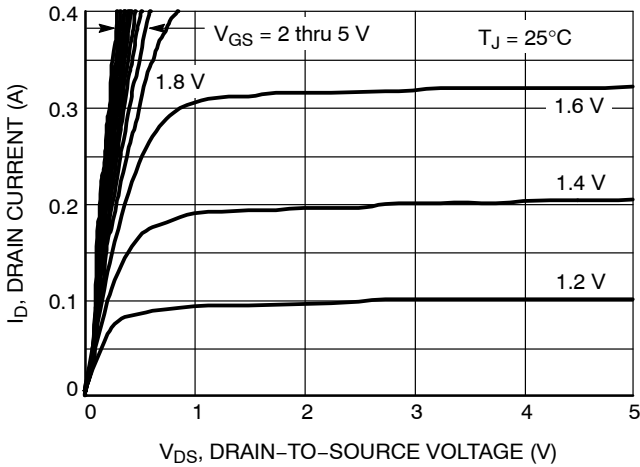


Figure 1. On-Region Characteristics

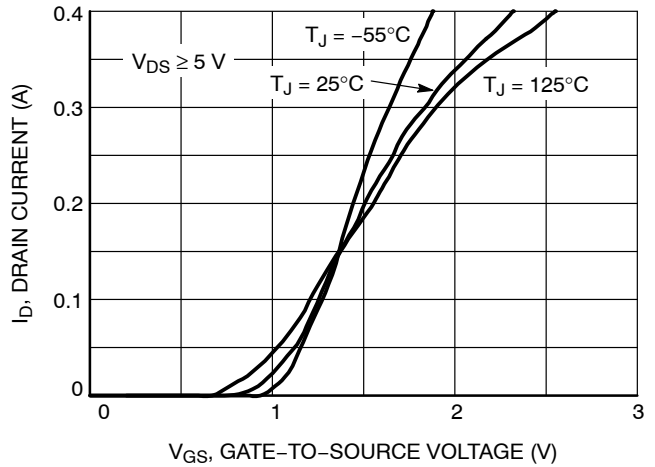


Figure 2. Transfer Characteristics

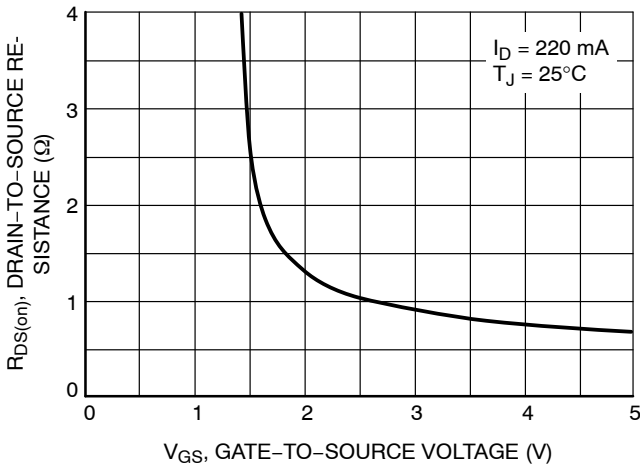


Figure 3. On-Resistance vs. Gate Voltage

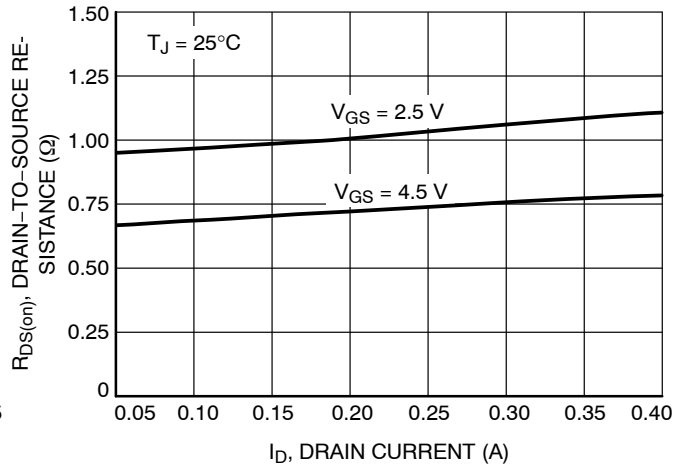


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

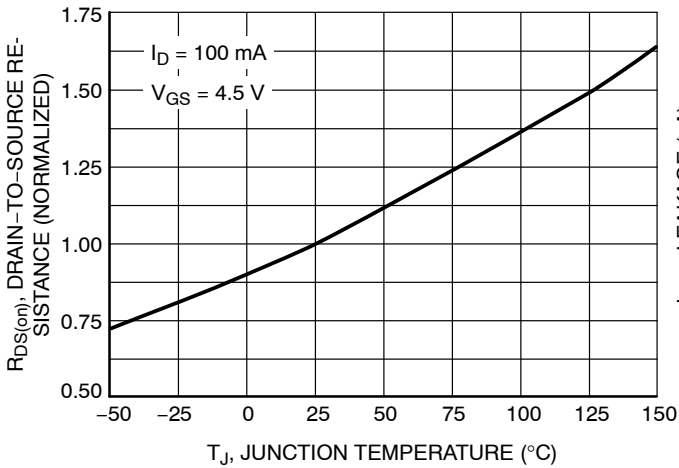


Figure 5. On-Resistance Variation with Temperature

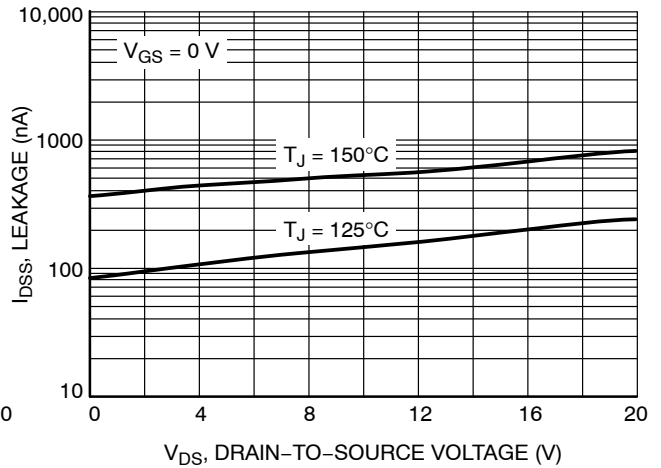


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTUD3170NZ

## TYPICAL CHARACTERISTICS

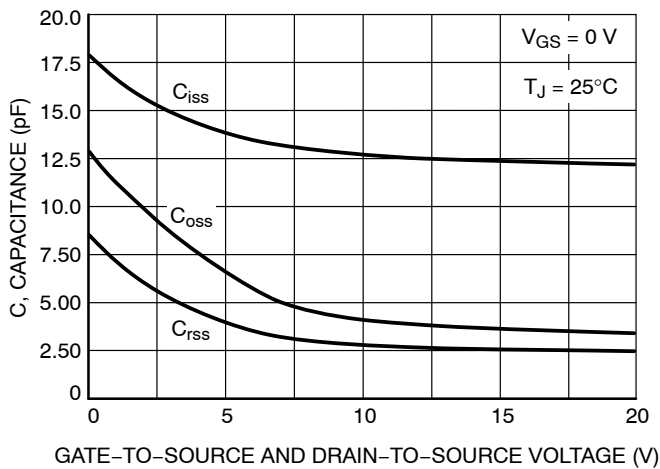


Figure 7. Capacitance Variation

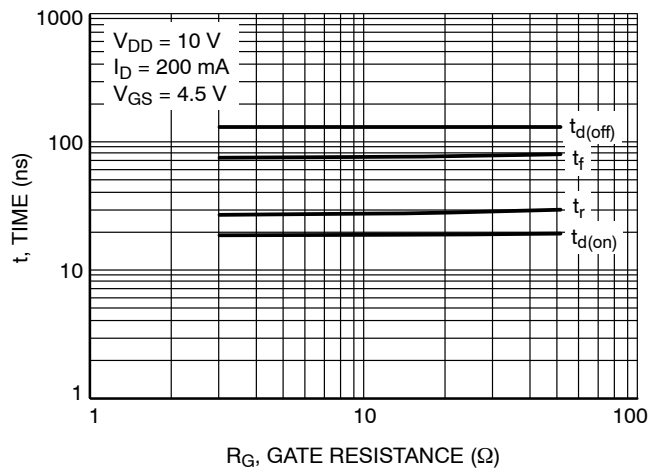


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

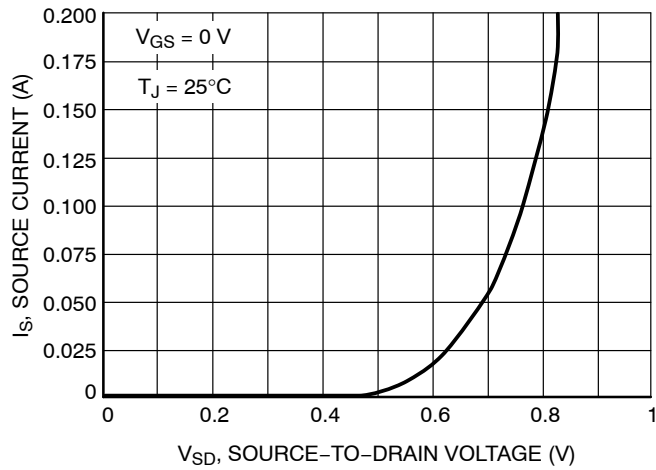
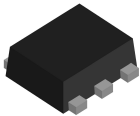


Figure 9. Diode Forward Voltage vs. Current

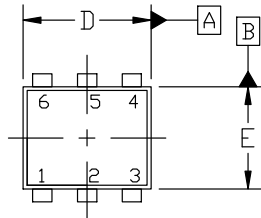


**SOT-963 1.00x1.00x0.37, 0.35P**  
**CASE 527AD**  
**ISSUE F**

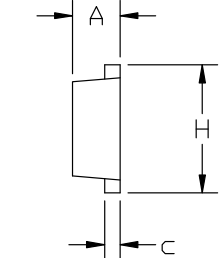
DATE 20 FEB 2024

NOTES:

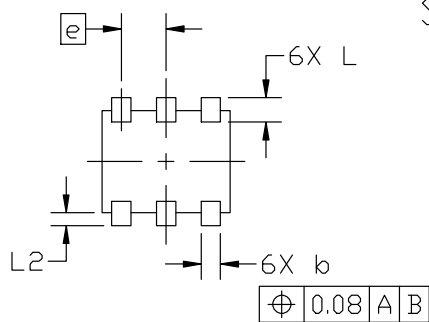
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



TOP VIEW

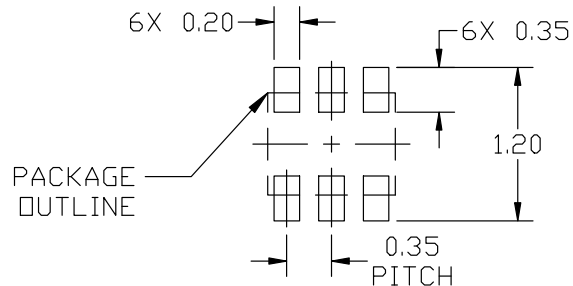


SIDE VIEW



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

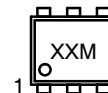


RECOMMENDED MOUNTING FOOTPRINT

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

- |  |   |  |
|--|---|--|
| <p><b>STYLE 1:</b><br/>PIN 1. EMITTER 1<br/>2. BASE 1<br/>3. COLLECTOR 2<br/>4. EMITTER 2<br/>5. BASE 2<br/>6. COLLECTOR 1</p> | <p><b>STYLE 2:</b><br/>PIN 1. EMITTER 1<br/>2. EMITTER2<br/>3. BASE 2<br/>4. COLLECTOR 2<br/>5. BASE 1<br/>6. COLLECTOR 1</p> | <p><b>STYLE 3:</b><br/>PIN 1. CATHODE 1<br/>2. CATHODE 1<br/>3. ANODE/ANODE 2<br/>4. CATHODE 2<br/>5. CATHODE 2<br/>6. ANODE/ANODE 1</p> |
| <p><b>STYLE 4:</b><br/>PIN 1. COLLECTOR<br/>2. COLLECTOR<br/>3. BASE<br/>4. EMITTER<br/>5. COLLECTOR<br/>6. COLLECTOR</p>      | <p><b>STYLE 5:</b><br/>PIN 1. CATHODE<br/>2. CATHODE<br/>3. ANODE<br/>4. ANODE<br/>5. CATHODE<br/>6. CATHODE</p>              | <p><b>STYLE 6:</b><br/>PIN 1. CATHODE<br/>2. ANODE<br/>3. CATHODE<br/>4. CATHODE<br/>5. CATHODE<br/>6. CATHODE</p>                       |
| <p><b>STYLE 7:</b><br/>PIN 1. CATHODE<br/>2. ANODE<br/>3. CATHODE<br/>4. CATHODE<br/>5. ANODE<br/>6. CATHODE</p>               | <p><b>STYLE 8:</b><br/>PIN 1. DRAIN<br/>2. DRAIN<br/>3. GATE<br/>4. SOURCE<br/>5. DRAIN<br/>6. DRAIN</p>                      | <p><b>STYLE 9:</b><br/>PIN 1. SOURCE 1<br/>2. GATE 1<br/>3. DRAIN 2<br/>4. SOURCE 2<br/>5. GATE 2<br/>6. DRAIN 1</p>                     |
| <p><b>STYLE 10:</b><br/>PIN 1. CATHODE 1<br/>2. N/C<br/>3. CATHODE 2<br/>4. ANODE 2<br/>5. N/C<br/>6. ANODE 1</p>              |   |  |

**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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<b>DESCRIPTION:</b>	<b>SOT-963 1.00x1.00x0.37, 0.35P</b>	<b>PAGE 1 OF 1</b>

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