NTUD3129P

Small Signal MOSFET

-20 V, -180 mA, Dual P-Channel, 1.0 x 1.0 mm SOT-963 Package

ON Semiconductor®

Features

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

Applications

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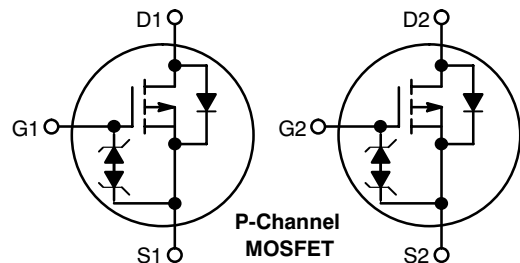- Optimized for Power Management in Ultra Portable Equipment

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D Max
-20 V	5.0 Ω @ -4.5 V	-0.18 A
	7.0 Ω @ -2.5 V	
	10 Ω @ -1.8 V	
	14 Ω @ -1.5 V	

P-Channel MOSFET

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

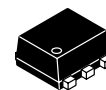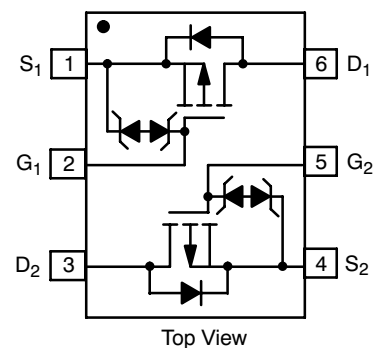| Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	-20	V
Gate-to-Source Voltage			V_{GS}	±8	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25°C$	I_D	-140	mA
		$T_A = 85°C$		-100	
	$t \leq 5$ s	$T_A = 25°C$		-180	
Power Dissipation (Note 1)	Steady State	$T_A = 25°C$	P_D	-125	mW
	$t \leq 5$ 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 527AA

MARKING DIAGRAM
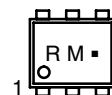
R	= Specific Device Code
M	= Date Code
▪	= Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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
			T_J = 85°C			-200	
		V_{GS} = 0 V, V_{DS} = -16 V	T_J = 25°C			-100	
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			4.0	5.0	Ω
		V_{GS} = -2.5 V, I_D = -50 mA			5.0	7.0	
		V_{GS} = -1.8 V, I_D = -20 mA			6.5	10	
		V_{GS} = -1.5 V, I_D = -10 mA			7.5	14	
		V_{GS} = -1.2 V, I_D = -1.0 mA			11.5		
Forward Transconductance	g_{FS}	V_{DS} = -5.0 V, I_D = -125 mA			0.26		S
Source-Drain Diode Voltage	V_{SD}	V_{GS} = 0 V, I_D = -10 mA			-0.65	-1.0	V
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	f = 1 MHz, V_{GS} = 0 V V_{DS} = -15 V			12		pF
Output Capacitance	C_{OSS}				2.7		
Reverse Transfer Capacitance	C_{RSS}				1.0		
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, I_D = -180 mA, R_G = 2.0 Ω			20		ns
Rise Time	t_r				37		
Turn-Off Delay Time	$t_{d(OFF)}$				112		
Fall Time	t_f				97		

4. Switching characteristics are independent of operating junction temperatures
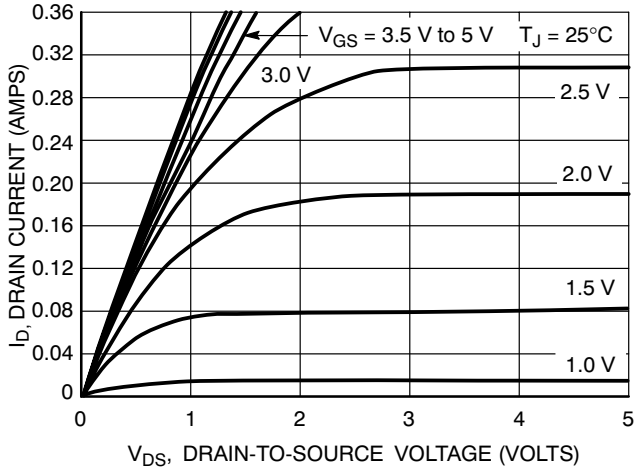
NTUD3129P

TYPICAL PERFORMANCE CURVES

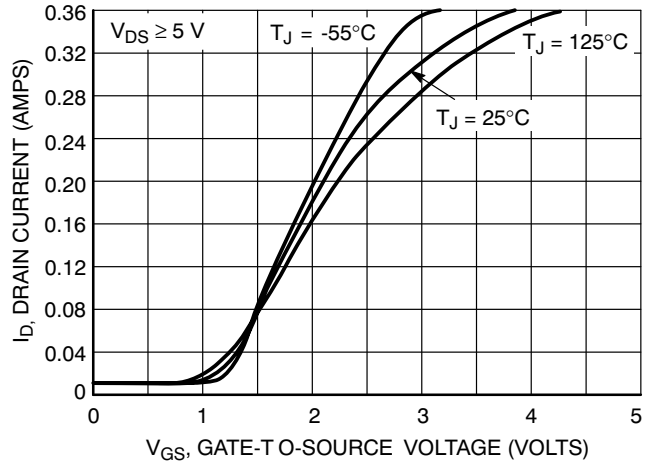**Figure 1. On-Region Characteristics**
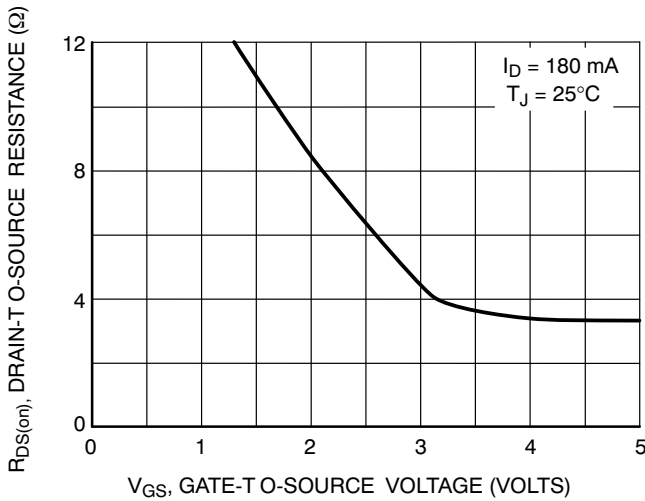
Figure 2. Transfer Characteristics

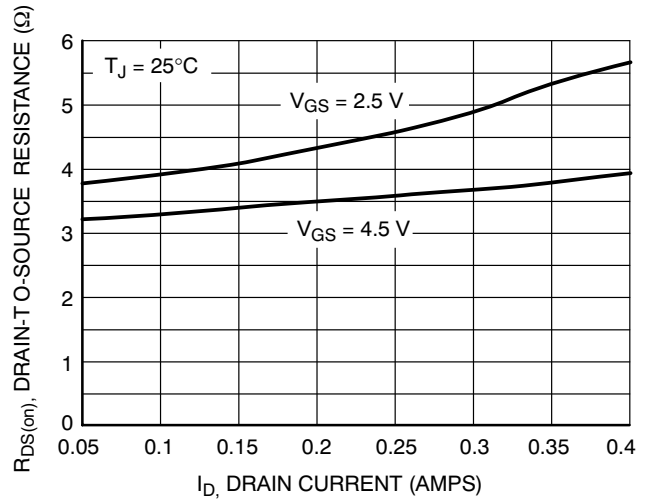**Figure 3. On-Resistance vs. Gate Voltage**

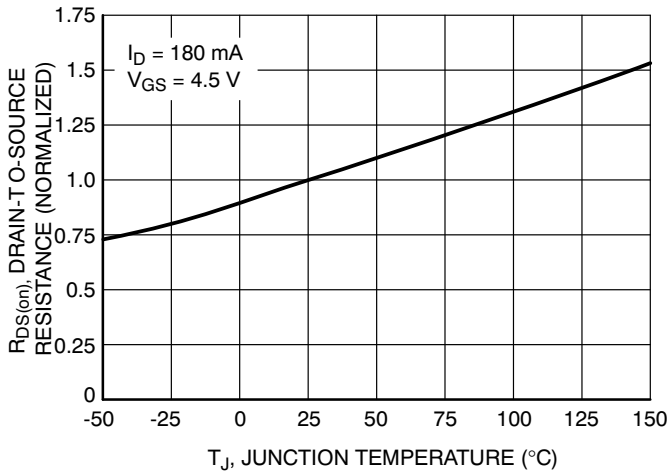**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**
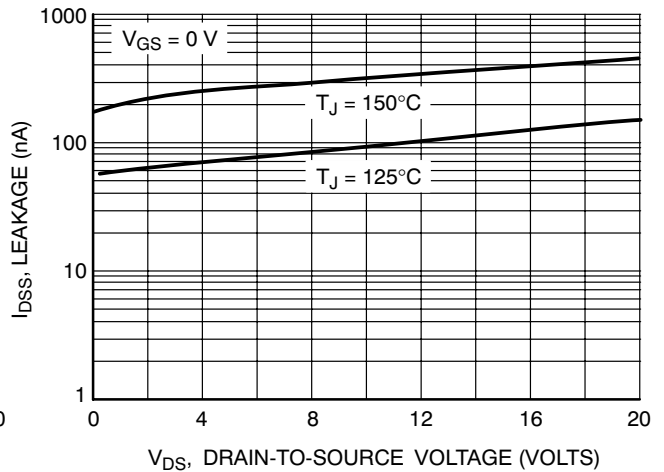
Figure 5. On-Resistance Variation with Temperature

Figure 6. Drain-to-Source Leakage Current vs. Voltage
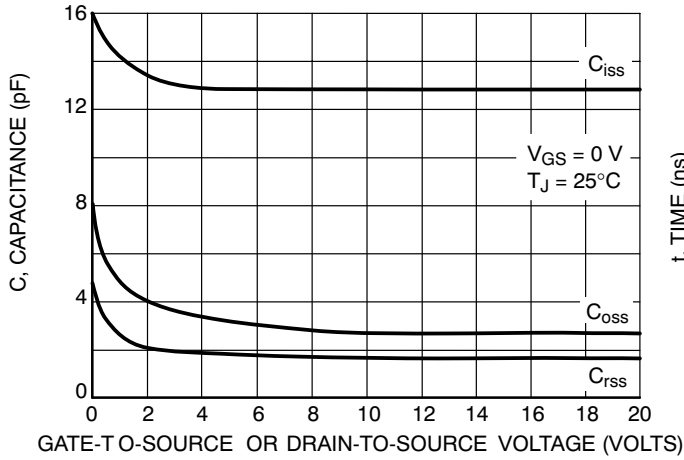
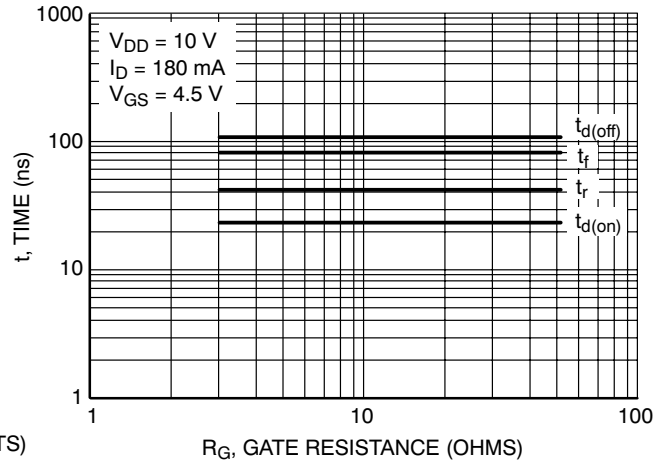## TYPICAL PERFORMANCE CURVES

Figure 7. Capacitance Variation
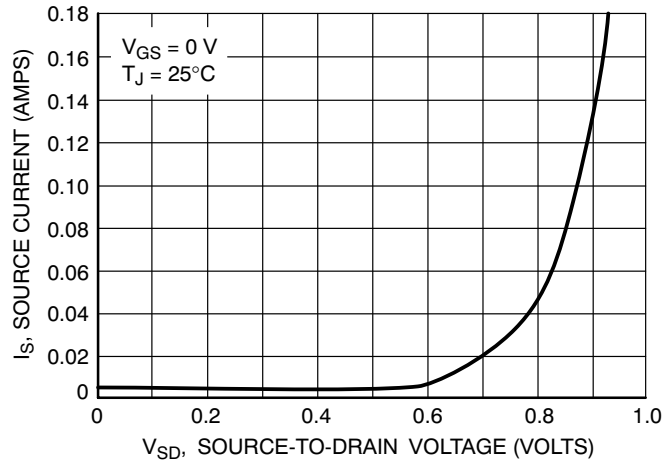
Figure 8. Resistive Switching Time Variation vs. Gate Resistance

Figure 9. Diode Forward Voltage vs. Current

ORDERING INFORMATION

Device	Package	Shipping[†]
NTUD3129PT5G	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.

SOT−963
CASE 527AA−01
ISSUE D

SCALE 4:1

DATE 30 JUL 2008
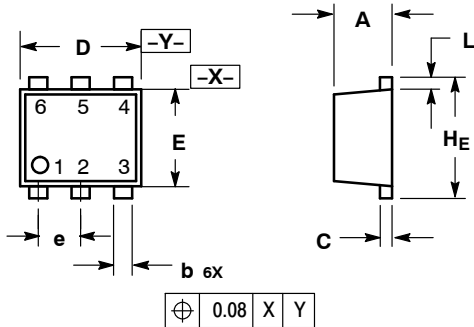
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.40	0.45	0.50	0.016	0.018	0.020
b	0.10	0.15	0.20	0.004	0.006	0.008
C	0.05	0.10	0.15	0.002	0.004	0.006
D	0.95	1.00	1.05	0.037	0.039	0.041
E	0.75	0.80	0.85	0.03	0.032	0.034
e	0.35 BSC			0.014 BSC		
L	0.05	0.10	0.15	0.002	0.004	0.006
H$_E$	0.95	1.00	1.05	0.037	0.039	0.041

⊕ | 0.08 | X | Y

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*

XM
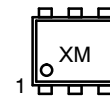
X = Specific Device Code
M = Month Code

*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.

SOLDERING FOOTPRINT*

0.35 / 0.014   0.35 / 0.014

0.90 / 0.0354

0.20 / 0.008

0.20 / 0.008

SCALE 20:1 (mm / inches)
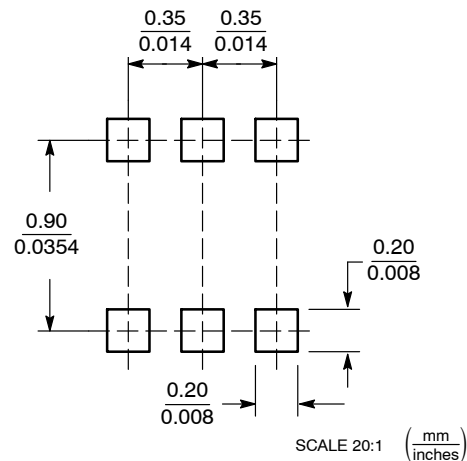
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ADDITIONAL INFORMATION

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