

# NTZS3151P

## MOSFET – P-Channel, Small Signal, SOT-563

**-20 V, -950 mA**

### Features

- Low  $R_{DS(on)}$  Improving System Efficiency
- Low Threshold Voltage
- Small Footprint 1.6 x 1.6 mm
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Load/Power Switches
- Battery Management
- Cell Phones, Digital Cameras, PDAs, Pagers, etc.

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	-20	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 8.0$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	-860	mA
		$T_A = 70^\circ\text{C}$	-690	
Power Dissipation (Note 1)	Steady State	$P_D$	170	mW
Continuous Drain Current (Note 1)	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	-950	mA
		$T_A = 70^\circ\text{C}$	-760	
Power Dissipation (Note 1)	$t \leq 5 \text{ s}$	$P_D$	210	mW
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-4.0	A
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	-360		mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260		$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	720	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5 \text{ s}$ (Note 1)	$R_{\theta JA}$	600	

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 1 in. sq. pad size (Cu. area = 1.127 in. sq. [1 oz.] including traces).

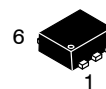
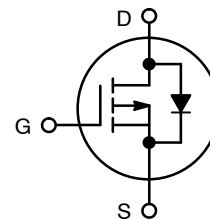


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$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
-20 V	120 m $\Omega$ @ -4.5 V	-950 mA
	144 m $\Omega$ @ -2.5 V	
	195 m $\Omega$ @ -1.8 V	

### P-Channel MOSFET



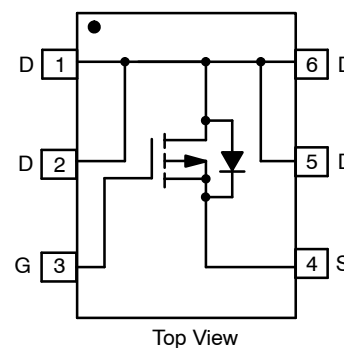
**SOT-563-6  
CASE 463A**

### MARKING DIAGRAM



TX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### PINOUT: SOT-563



### ORDERING INFORMATION

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

# NTZS3151P

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

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
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			-13		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$			-1.0	$\mu\text{A}$
		$V_{DS} = -20\text{ V}, T_J = 125^\circ\text{C}$			-5.0	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$			$\pm 100$	nA

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-0.45		-1.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			2.4		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -950\text{ mA}$		120	150	m $\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -770\text{ mA}$		112	142	
		$V_{GS} = -2.5\text{ V}, I_D = -670\text{ mA}$		144	200	
		$V_{GS} = -1.8\text{ V}, I_D = -200\text{ mA}$		195	240	
Forward Transconductance	$g_{FS}$	$V_{DS} = -10\text{ V}, I_D = -810\text{ mA}$		3.1		S

## CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -16\text{ V}$		458		pF
Output Capacitance	$C_{OSS}$			61		
Reverse Transfer Capacitance	$C_{RSS}$			38		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}; I_D = -770\text{ mA}$		5.6		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.6		
Gate-to-Source Charge	$Q_{GS}$			0.9		
Gate-to-Drain Charge	$Q_{GD}$			1.2		

## SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DD} = -10\text{ V}, I_D = -950\text{ mA}, R_G = 6.0\ \Omega$		5.0		ns
Rise Time	$t_r$			12		
Turn-Off Delay Time	$t_{d(OFF)}$			23.7		
Fall Time	$t_f$			18		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -360\text{ mA}$	$T_J = 25^\circ\text{C}$	-0.64	-0.9	V
			$T_J = 125^\circ\text{C}$	-0.5		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = -360\text{ mA}$		10.5		ns

- Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

# NTZS3151P

## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

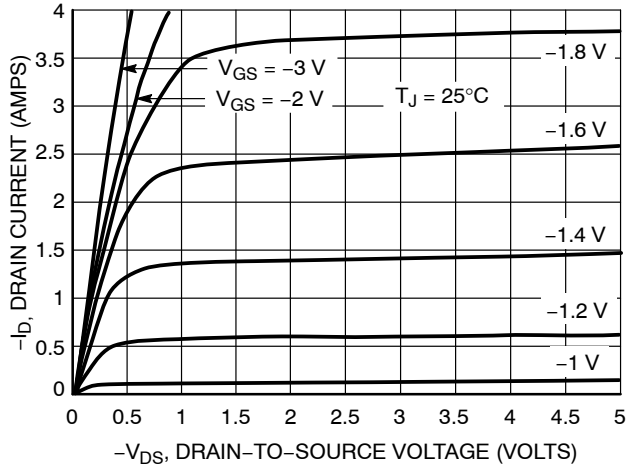


Figure 1. On-Region Characteristics

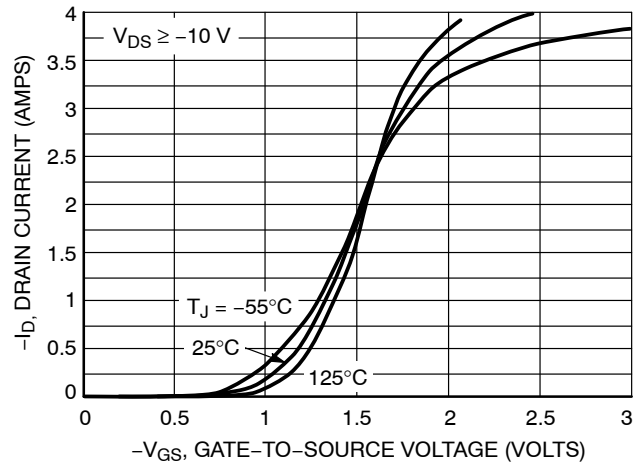


Figure 2. Transfer Characteristics

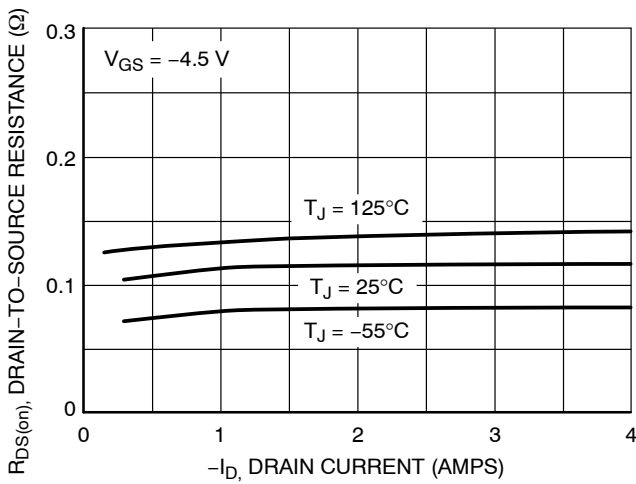


Figure 3. On-Resistance vs. Drain Current and Temperature

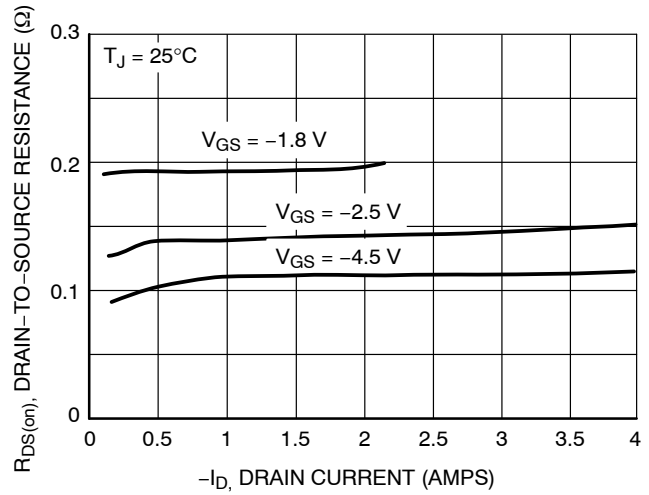


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

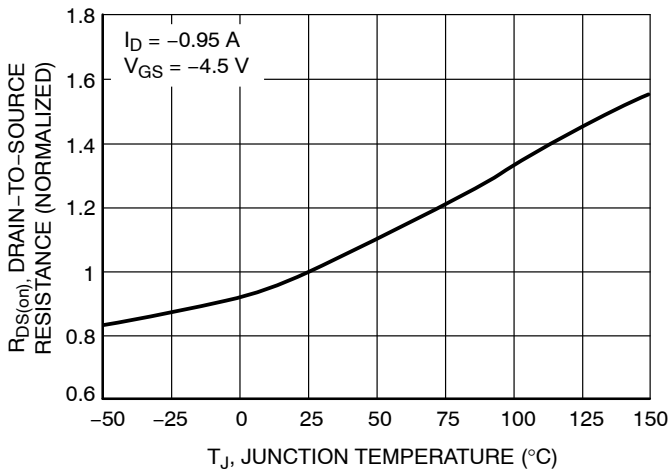


Figure 5. On-Resistance Variation with Temperature

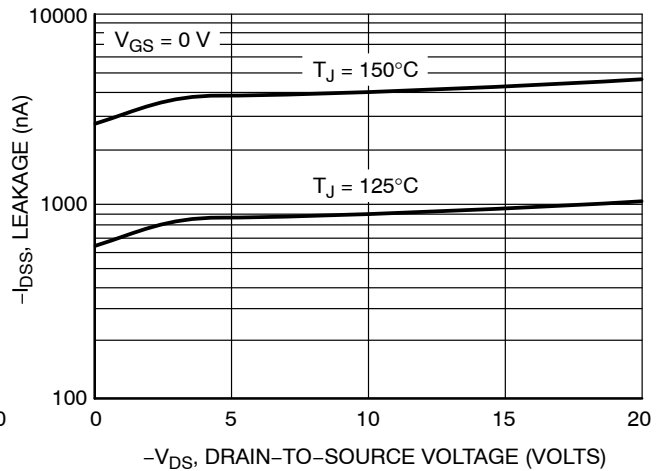
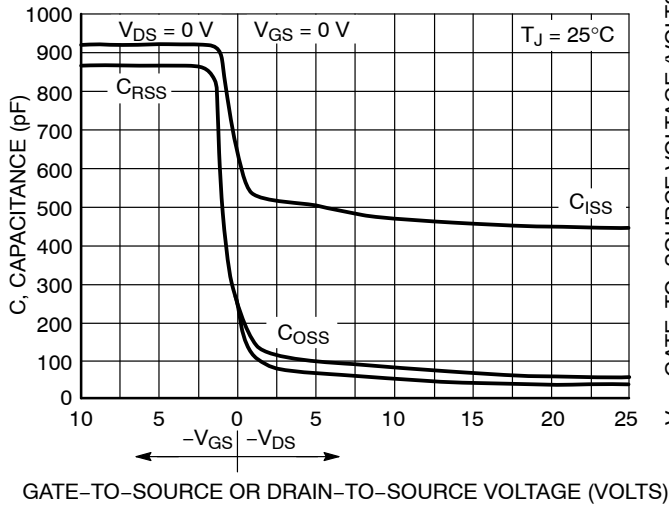


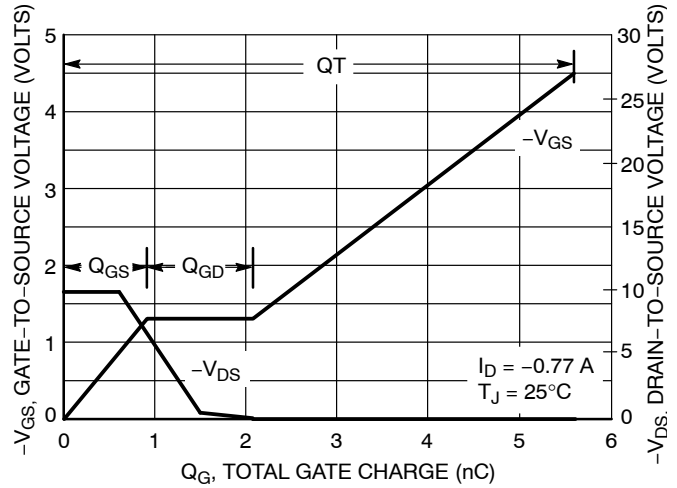
Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTZS3151P

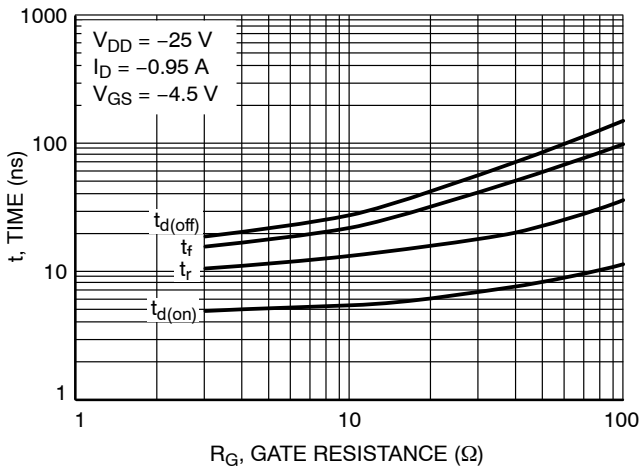
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



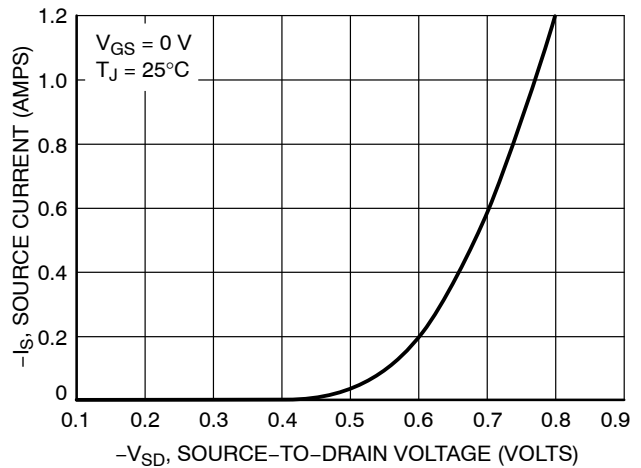
**Figure 7. Capacitance Variation**



**Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**



**Figure 10. Diode Forward Voltage vs. Current**

### ORDERING INFORMATION

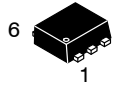
Device	Package	Shipping
NTZS3151PT1G	SOT-563 (Pb-Free)	4000 / Tape & Reel
NTZS3151PT1H	SOT-563 (Pb-Free)	4000 / Tape & Reel
NTZS3151PT5G	SOT-563 (Pb-Free)	8000 / Tape & Reel

†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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

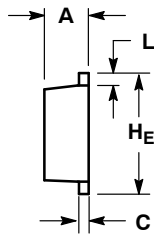
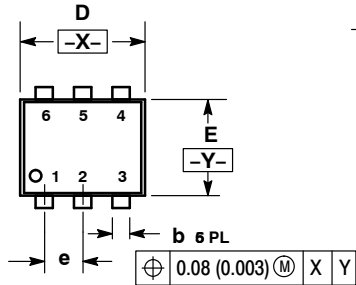
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SCALE 4:1

### SOT-563, 6 LEAD CASE 463A ISSUE G

DATE 23 SEP 2015

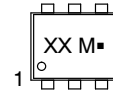


NOTES:

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	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
C	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.5 BSC			0.02 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H <sub>E</sub>	1.50	1.60	1.70	0.059	0.062	0.066

### GENERIC MARKING DIAGRAM\*

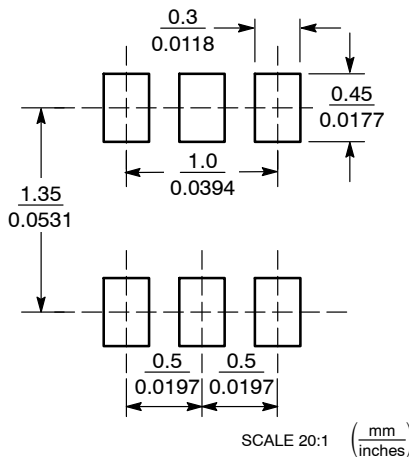


XX = Specific Device Code  
M = Month Code  
■ = Pb-Free Package

\*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.

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

### SOLDERING 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.

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DESCRIPTION:	SOT-563, 6 LEAD	PAGE 1 OF 1

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