

# NTJS3151P

## Trench Power MOSFET

12 V, 3.3 A, Single P-Channel,  
ESD Protected SC-88



ON Semiconductor®

<http://onsemi.com>

### Features

- Leading Trench Technology for Low  $R_{DS(ON)}$  Extending Battery Life
- SC-88 Small Outline (2x2 mm, SC70-6 Equivalent)
- Gate Diodes for ESD Protection
- Pb-Free Packages are Available

### Applications

- High Side Load Switch
- Cell Phones, Computing, Digital Cameras, MP3s and PDAs

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

Parameter	Symbol	Value	Units
Drain-to-Source Voltage	$V_{DSS}$	-12	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$ -2.7
		$T_A = 85^\circ\text{C}$	-2.0
		$t \leq 5$ s	$T_A = 25^\circ\text{C}$
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$ 0.625
Pulsed Drain Current	$t_p = 10$ $\mu\text{s}$	$I_{DM}$	-8.0 A
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	-0.8	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS (Note 1)

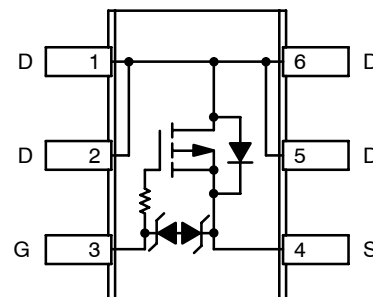
Parameter	Symbol	Max	Units
Junction-to-Ambient - Steady State	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 5$ s	$R_{\theta JA}$	141	
Junction-to-Lead - Steady State	$R_{\theta JL}$	102	

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.

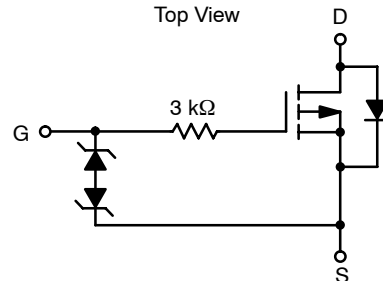
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
-12 V	45 m $\Omega$ @ -4.5 V	-3.3 A
	67 m $\Omega$ @ -2.5 V	
	133 m $\Omega$ @ -1.8 V	

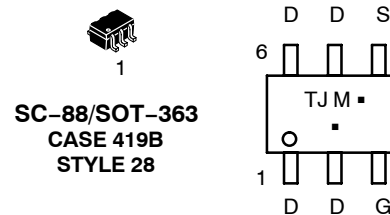
### SC-88 (SOT-363)



Top View



### MARKING DIAGRAM & PIN ASSIGNMENT



SC-88/SOT-363  
CASE 419B  
STYLE 28

TJ = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NTJS3151P

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-12			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			10		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = -9.6 V, V <sub>DS</sub> = 0 V	T <sub>J</sub> = 25°C			μA
			T <sub>J</sub> = 125°C		-2.5	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 V			±1.5	μA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V			±10	mA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 100 μA	-0.40			V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			3.4		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.3 A		45	60	mΩ
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -2.9 A		67	90	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -1.0 A		133	160	
Forward Transconductance	g <sub>FS</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.3 A		15		S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = -12 V		850		pF
Output Capacitance	C <sub>OSS</sub>			170		
Reverse Transfer Capacitance	C <sub>RSS</sub>			110		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -5.0 V, I <sub>D</sub> = -3.3 A		8.6		nC
Gate-to-Source Charge	Q <sub>GS</sub>			1.3		
Gate-to-Drain Charge	Q <sub>GD</sub>			2.2		
Gate Resistance	R <sub>G</sub>			3000		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -6.0 V, I <sub>D</sub> = -1.0 A, R <sub>G</sub> = 6.0 Ω		0.86		μs
Rise Time	t <sub>r</sub>			1.5		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			3.5		
Fall Time	t <sub>f</sub>			3.9		

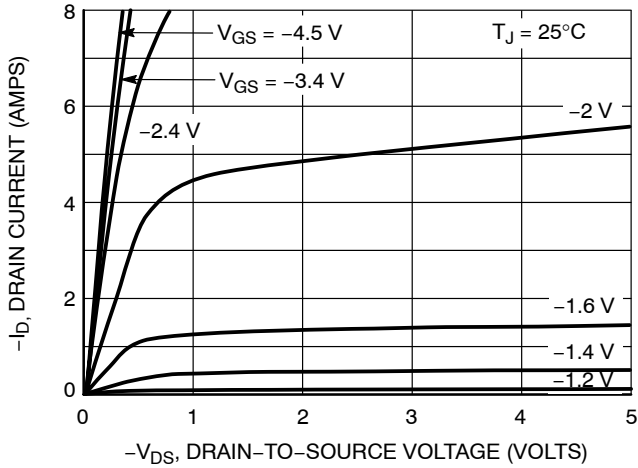
### DRAIN-SOURCE DIODE CHARACTERISTICS (Note 2)

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -3.3 A	T <sub>J</sub> = 25°C	-0.85	-1.2	V
			T <sub>J</sub> = 125°C	-0.7		

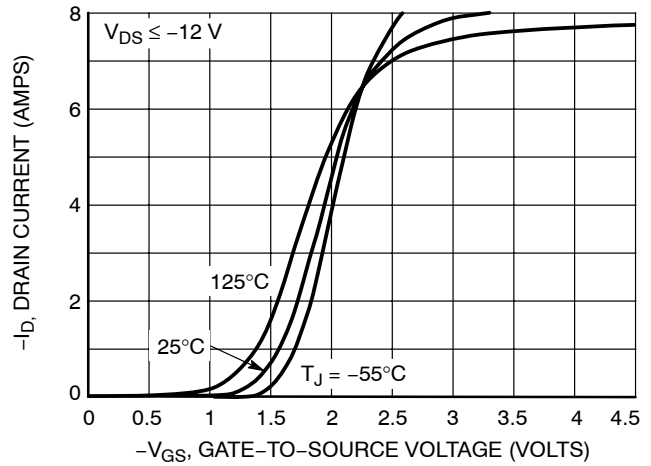
2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

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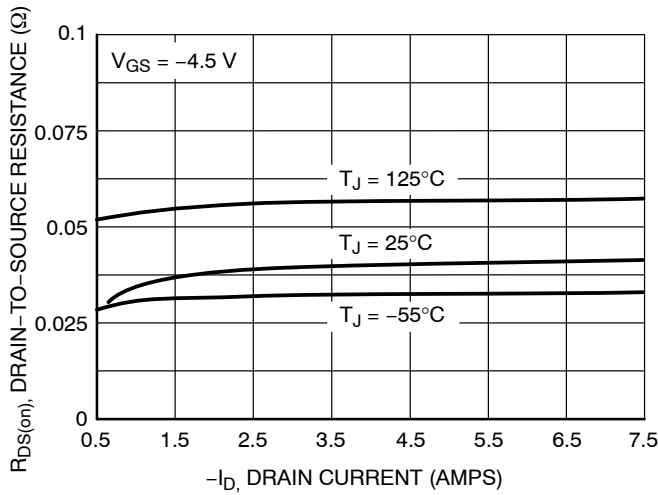
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



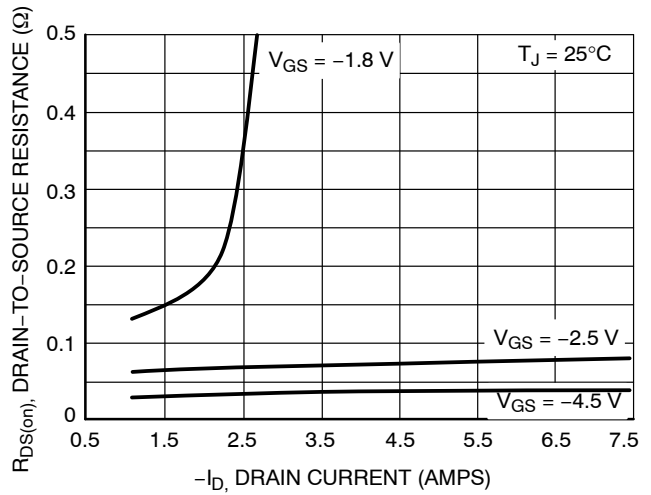
**Figure 1. On-Region Characteristics**



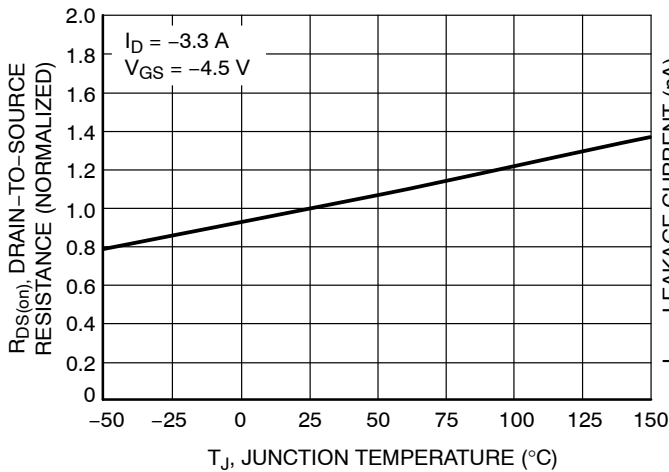
**Figure 2. Transfer Characteristics**



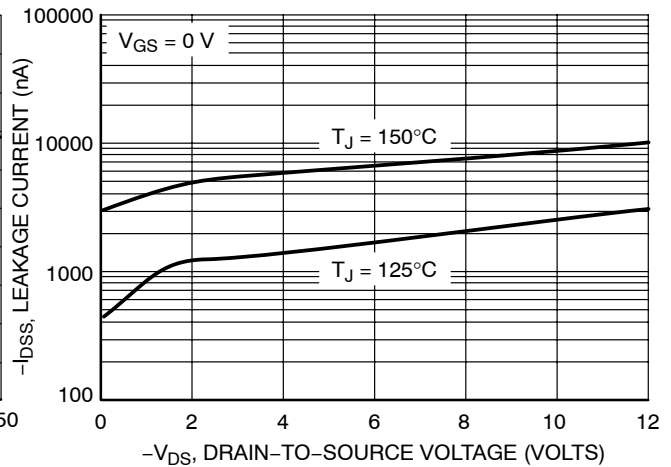
**Figure 3. On-Resistance vs. Drain Current and Temperature**



**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**

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

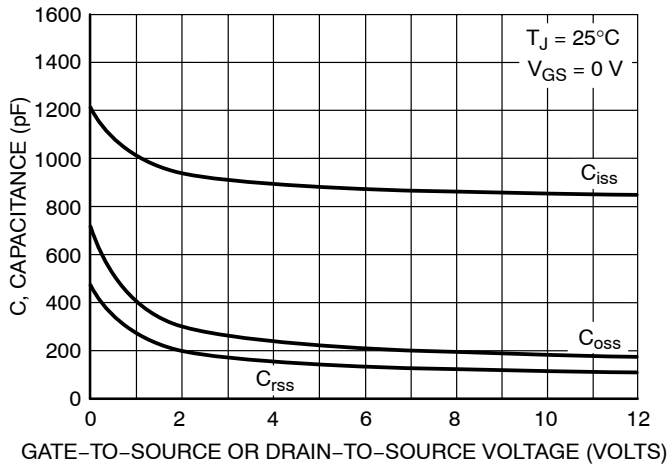


Figure 7. Capacitance Variation

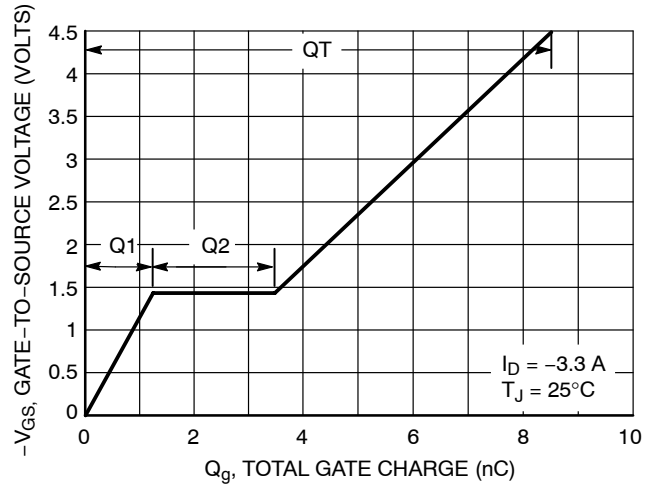


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

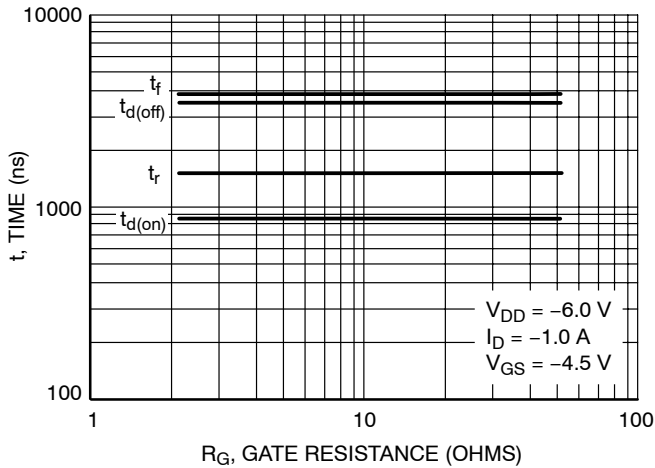


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

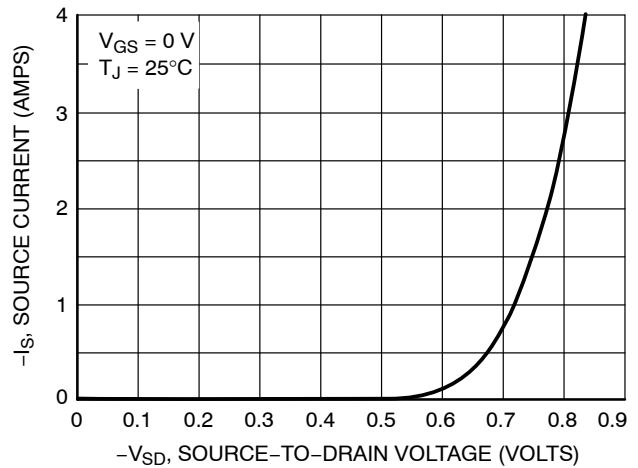


Figure 10. Diode Forward Voltage vs. Current

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## ORDERING INFORMATION

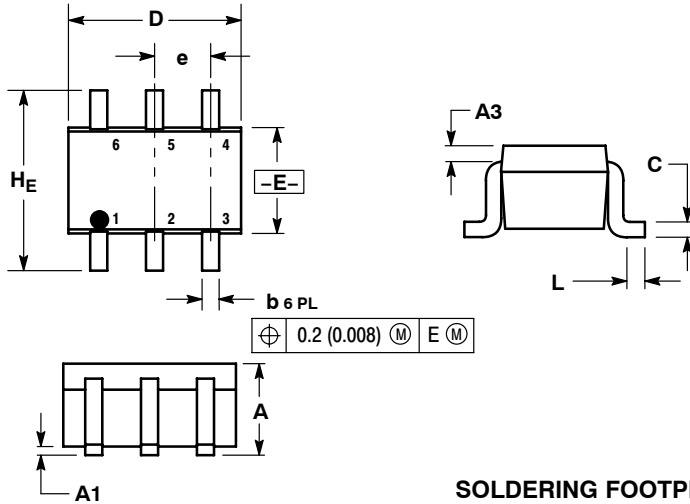
Device	Package	Shipping†
NTJS3151PT1	SC-88	3000 Tape & Reel
NTJS3151PT1G	SC-88 (Pb-Free)	3000 Tape & Reel
NTJS3151PT2	SC-88	3000 Tape & Reel
NTJS3151PT2G	SC-88 (Pb-Free)	3000 Tape & Reel

†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.

# NTJS3151P

## PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE W



**NOTES:**

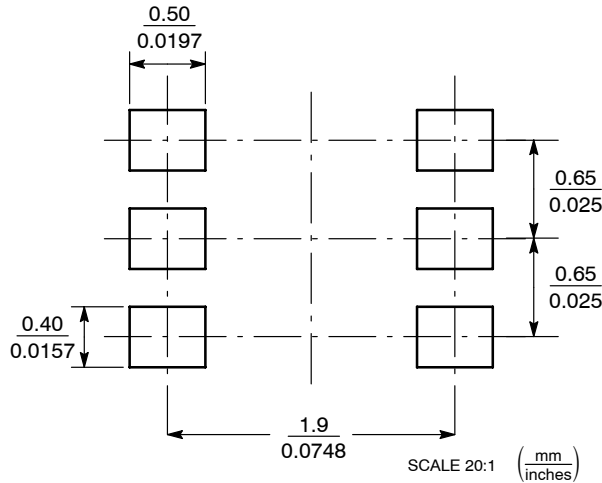
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	2.00	2.10	2.20	0.078	0.082	0.086

**STYLE 28:**

- PIN 1. DRAIN
- 2. DRAIN
- 3. GATE
- 4. SOURCE
- 5. DRAIN
- 6. DRAIN

### 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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