

# NTJS4151P

## Trench Power MOSFET

-20 V, -4.2 A, Single P-Channel, 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) for Maximum Circuit Board Utilization, Same as SC-70-6
- Gate Diodes for ESD Protection
- Pb-Free Package is 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	Unit
Drain-to-Source Voltage			$V_{DSS}$	-20	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 12$	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	-3.3	A
		$T_A = 85^\circ\text{C}$		-2.4	
	$t \leq 5\text{ s}$	$T_A = 25^\circ\text{C}$		-4.2	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	1.0	W
Pulsed Drain Current		$t_p = 10\ \mu\text{s}$	$I_{DM}$	-10	A
Operating Junction and Storage Temperature			$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)			$I_S$	-1.3	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			$T_L$	260	$^\circ\text{C}$
ESD	Human Body Model (HBM)		ESD	4000	V

### THERMAL RESISTANCE RATINGS (Note 1)

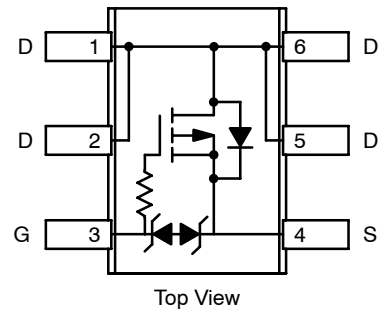
Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State	$R_{\theta JA}$	125	$^\circ\text{C/W}$
Junction-to-Ambient - $t \leq 5\text{ s}$	$R_{\theta JA}$	75	
Junction-to-Lead - Steady State	$R_{\theta JL}$	45	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

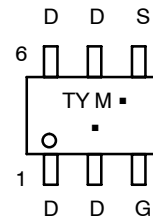
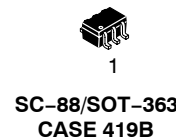
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
-20 V	47 m $\Omega$ @ -4.5 V	-4.2 A
	70 m $\Omega$ @ -2.5 V	
	180 m $\Omega$ @ -1.8 V	

### SC-88 (SOT-363)



### MARKING DIAGRAM & PIN ASSIGNMENT



- TY = Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTJS4151PT1	SC-88	3000 / Tape & Reel
NTJS4151PT1G	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.

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## 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	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			-12		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = -16 V, V <sub>DS</sub> = 0 V	T <sub>J</sub> = 25°C		-1.0	μA
			T <sub>J</sub> = 85°C		-5.0	
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> = -250 μA	-0.40		-1.2	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			4.0		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		47	60	mΩ
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -2.3 A		70	85	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -1.0 A		180	205	
Forward Transconductance	g <sub>FS</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.3 A		12		S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = -10 V		850		pF
Output Capacitance	C <sub>OSS</sub>			160		
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> = -10 V, I <sub>D</sub> = -3.3 A		10		nC
Gate-to-Source Charge	Q <sub>GS</sub>			1.5		
Gate-to-Drain Charge	Q <sub>GD</sub>			2.8		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -10 V, I <sub>D</sub> = -1.0 A, R <sub>G</sub> = 6.0 Ω		0.85		μs
Rise Time	t <sub>r</sub>			1.7		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			2.7		
Fall Time	t <sub>f</sub>			4.2		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -1.3 A, T <sub>J</sub> = 25°C		-0.75	-1.2	V
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = -1.3 A		63		ns
Charge Time	T <sub>a</sub>			9.0		
Discharge Time	T <sub>b</sub>			54		
Reverse Recovery Charge	Q <sub>RR</sub>			0.23		nC

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

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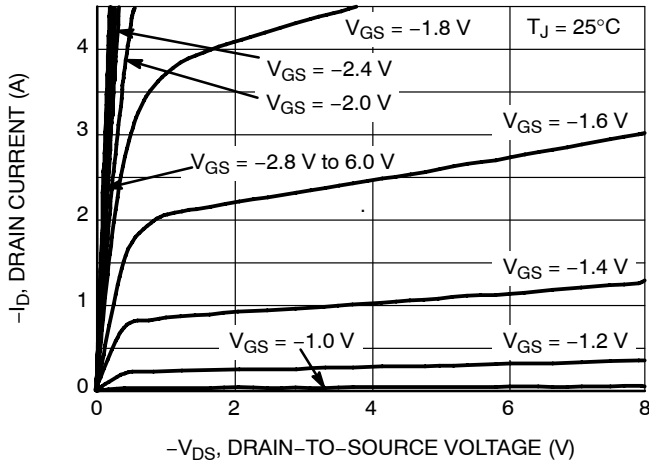


Figure 1. On-Region Characteristics

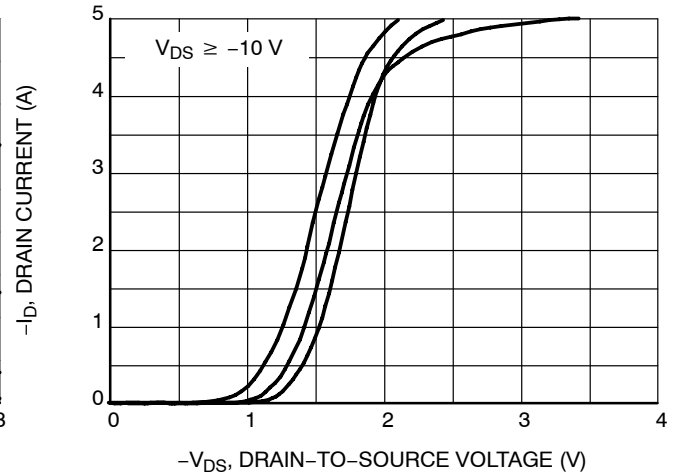


Figure 2. On-Region Characteristics

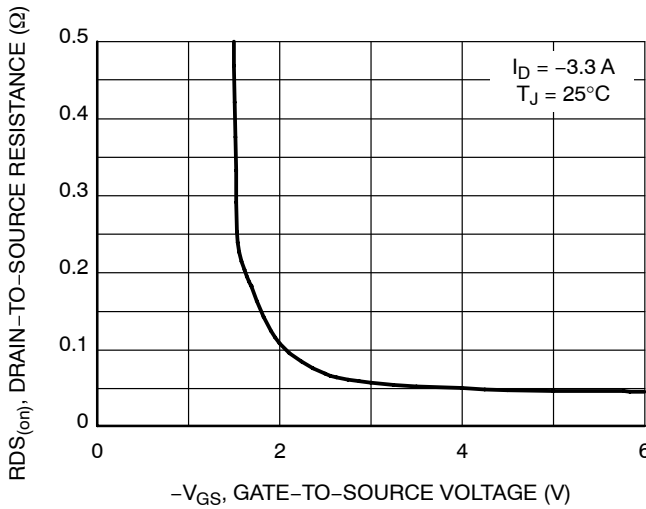


Figure 3. On-Resistance versus Gate-to-Source Voltage

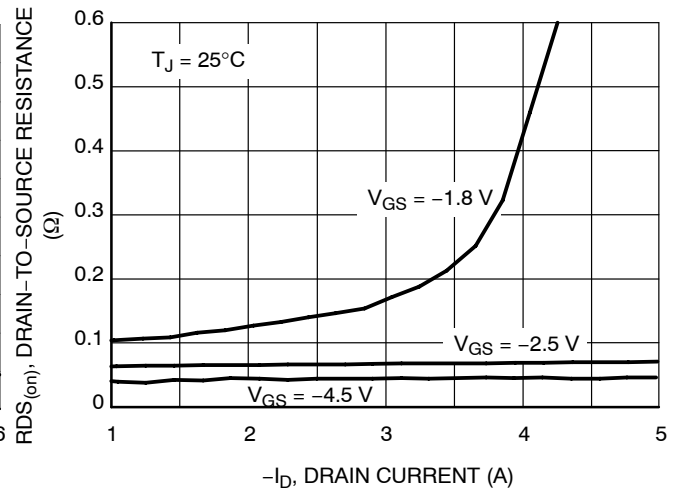


Figure 4. On-Resistance versus Drain Current and Gate Voltage

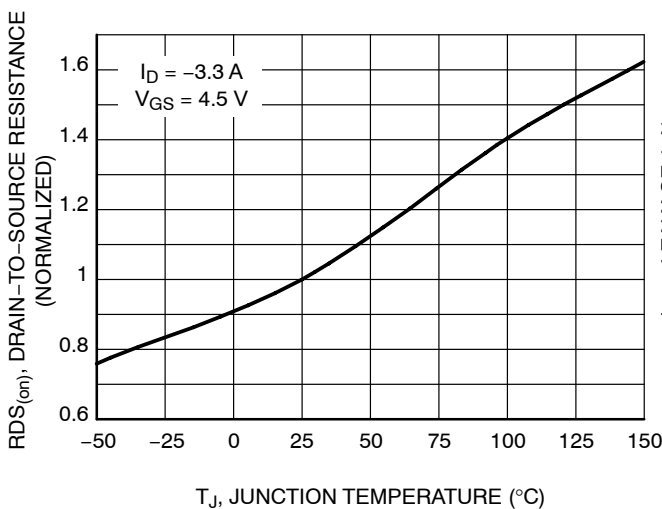


Figure 5. On-Resistance Variation with Temperature

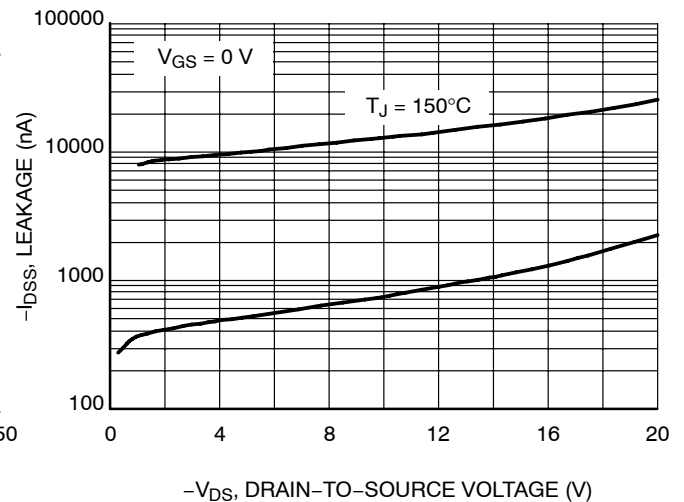


Figure 6. Drain-to-Source Leakage Current versus Voltage

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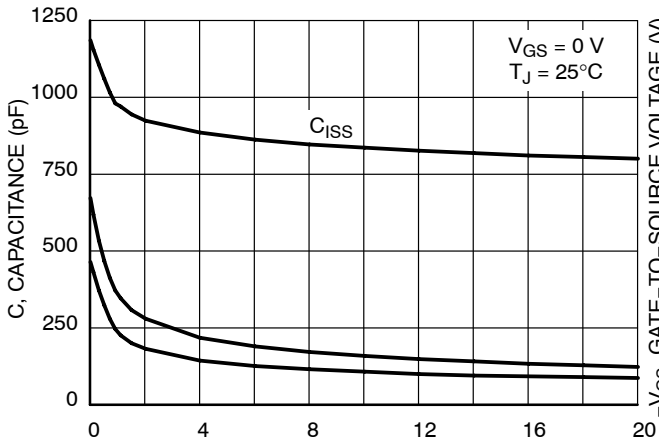


Figure 7. Capacitance Variation

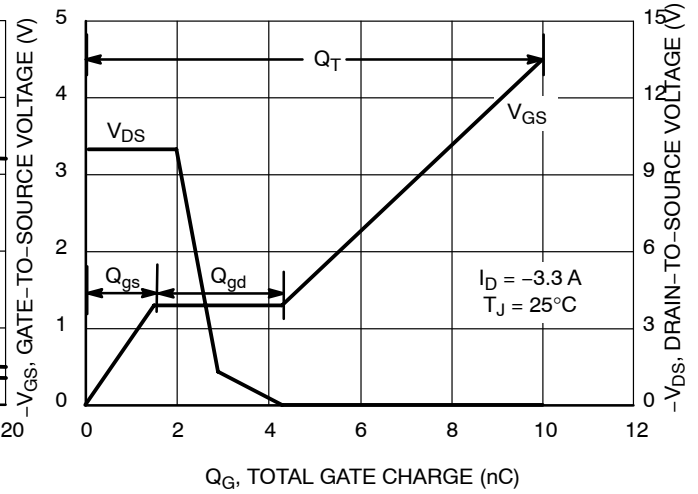


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

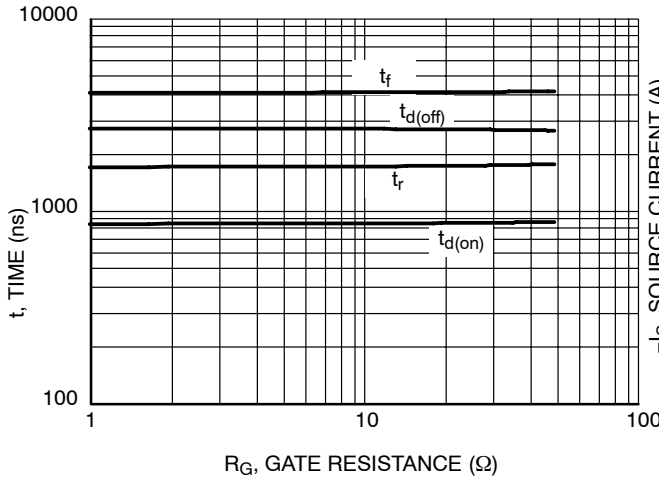


Figure 9. Resistive Switching Time Variation Gate Resistance

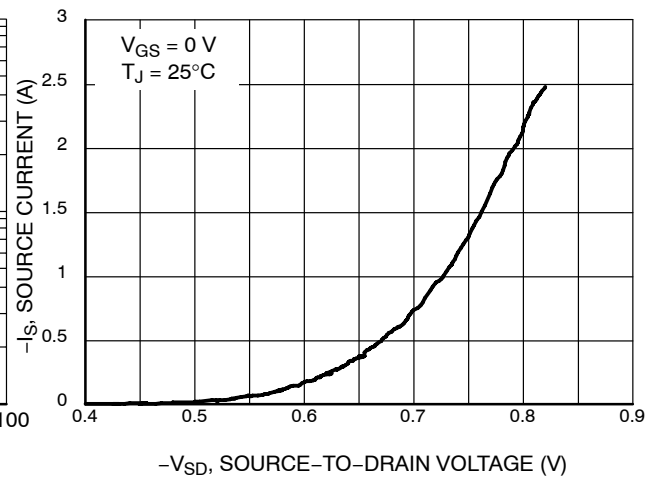
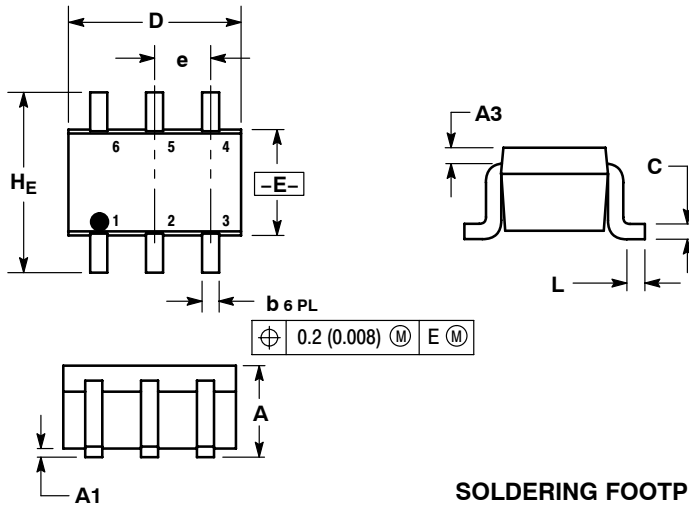


Figure 10. Diode Forward Voltage versus Current

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## PACKAGE DIMENSIONS

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

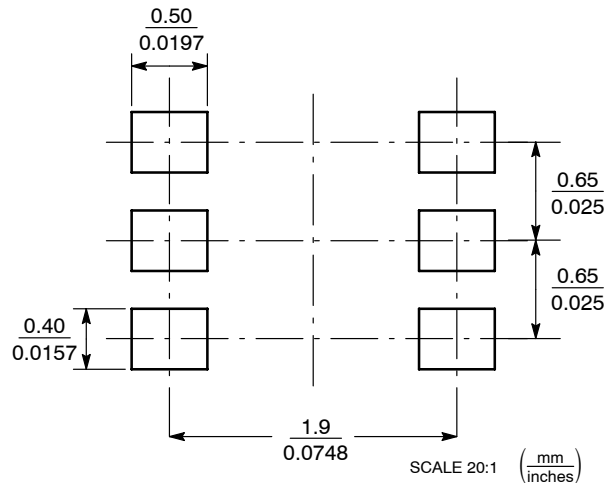


### NOTES:

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

### 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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