

NTJS3157N

Trench Power MOSFET

20 V, 4.0 A, Single N-Channel, SC-88



ON Semiconductor®

<http://onsemi.com>

Features

- Leading Trench Technology for Low $R_{DS(ON)}$ Extending Battery Life
- Fast Switching for Increased Circuit Efficiency
- SC-88 Small Outline (2 x 2 mm) for Maximum Circuit Board Utilization, Same as SC-70-6
- Pb-Free Packages are Available

Applications

- DC-DC Conversion
- Low Side Load Switch
- Cell Phones, Computing, Digital Cameras, MP3s and PDAs

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
20 V	45 mΩ @ 4.5 V	4.0 A
	55 mΩ @ 2.5 V	
	70 mΩ @ 1.8 V	

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}	± 8.0	V	
Continuous Drain Current (Note 1)	I_D	$T_A = 25^\circ\text{C}$ Steady State	3.2	A
		$T_A = 85^\circ\text{C}$	2.3	
		$t \leq 5$ s $T_A = 25^\circ\text{C}$	4.0	
Power Dissipation (Note 1)	P_D	1.0	W	
Pulsed Drain Current	I_{DM}	$t_p = 10$ μs	10	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	1.6	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

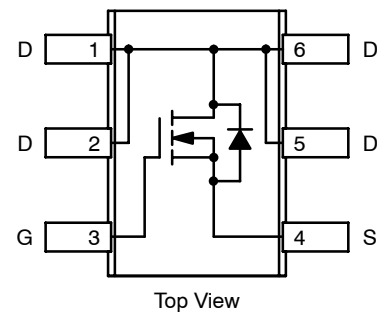
THERMAL RESISTANCE RATINGS (Note 1)

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5$ s	$R_{\theta JA}$	80	
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.

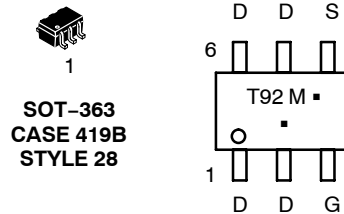
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

SC-88 (SOT-363)



Top View

MARKING DIAGRAM & PIN ASSIGNMENT



SOT-363
CASE 419B
STYLE 28

T92 = 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.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

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	$V_{(BR)DSS}/T_J$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$		12		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 85^\circ\text{C}$		5.0	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$		0.40			V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$		-4.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 4.0\text{ A}$		45	60	mΩ
		$V_{GS} = 2.5\text{ V}, I_D = 3.6\text{ A}$		55	70	
		$V_{GS} = 1.8\text{ V}, I_D = 2.0\text{ A}$		70	85	
Forward Transconductance	g_{FS}	$V_{GS} = 10\text{ V}, I_D = 3.2\text{ A}$		9.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 10\text{ V}$		500		pF
Output Capacitance	C_{OSS}			75		
Reverse Transfer Capacitance	C_{RSS}			60		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.2\text{ A}$		6.9	15	nC
Gate-to-Source Charge	Q_{GS}			1.0		
Gate-to-Drain Charge	Q_{GD}			1.8		

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 10\text{ V}, I_D = 0.5\text{ A}, R_G = 6.0\ \Omega$		6.0	15	ns
Rise Time	t_r			12	25	
Turn-Off Delay Time	$t_{d(off)}$			21	45	
Fall Time	t_f			11	25	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 1.6\text{ A}$	$T_J = 25^\circ\text{C}$		0.7	1.0	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 1.6\text{ A}$			15		ns
Charge Time	T_a				12		
Discharge Time	T_b				3.0		
Reverse Recovery Charge	Q_{RR}				5.0		

2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
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)

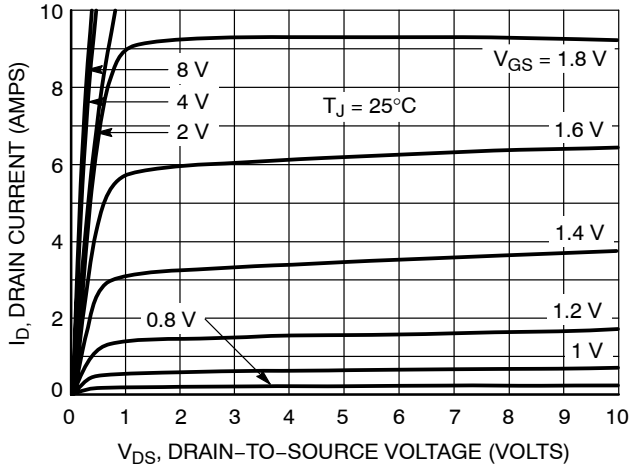


Figure 1. On-Region Characteristics

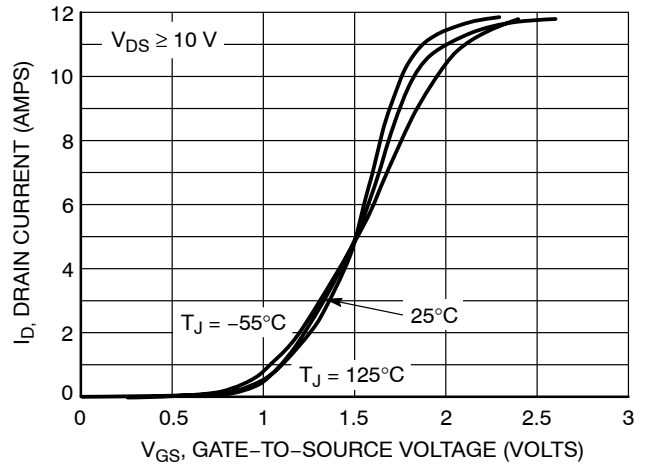


Figure 2. Transfer Characteristics

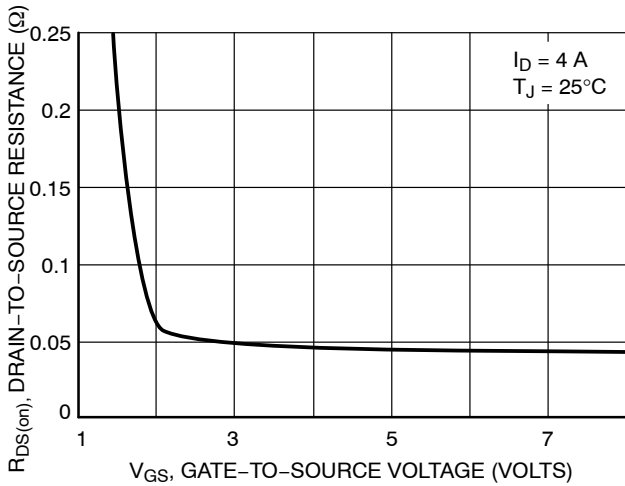


Figure 3. On-Resistance vs. Gate-to-Source Voltage

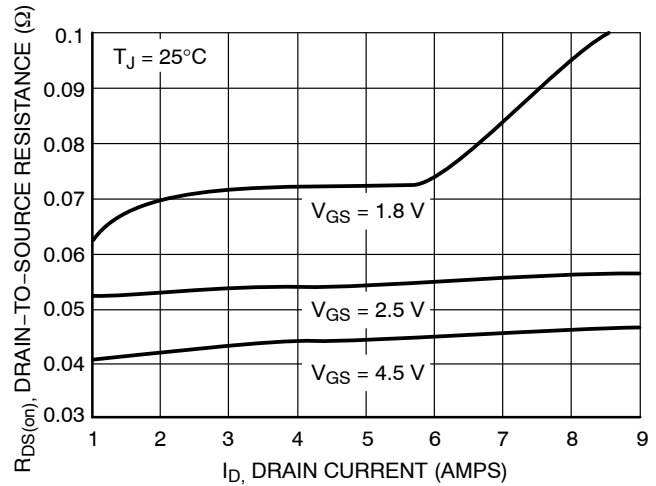


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

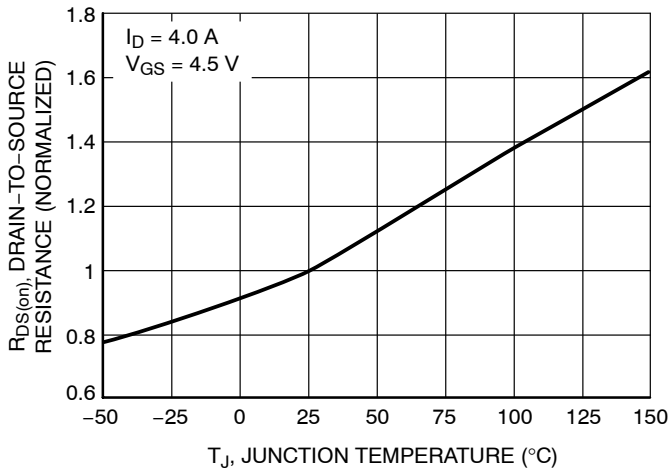


Figure 5. On-Resistance Variation with Temperature

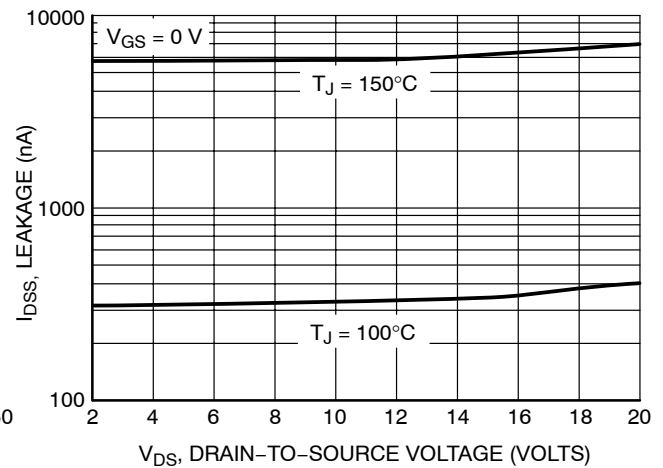


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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

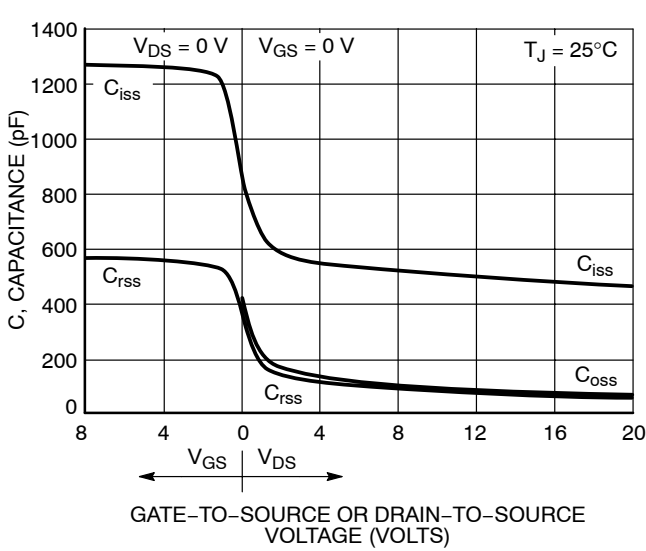


Figure 7. Capacitance Variation

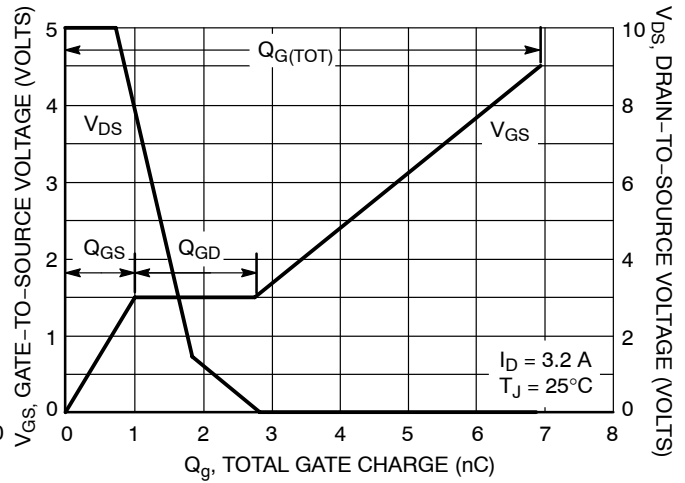


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

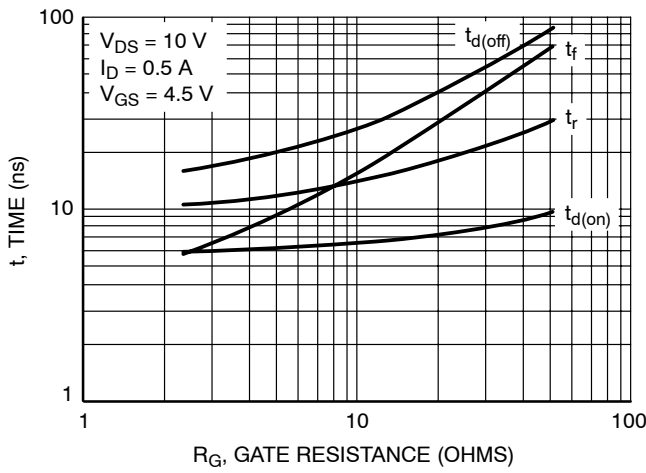


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

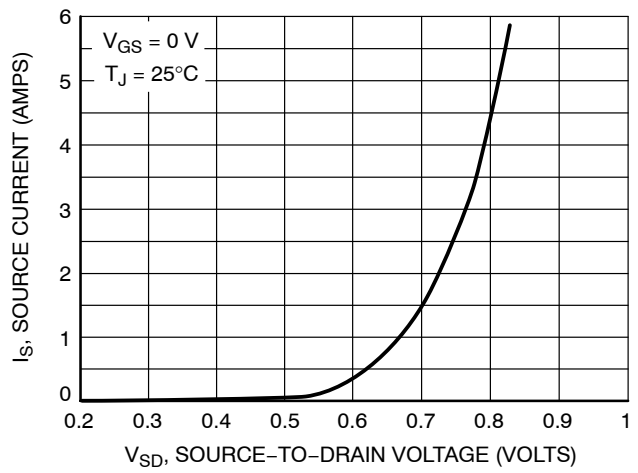


Figure 10. Diode Forward Voltage vs. Current

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ORDERING INFORMATION

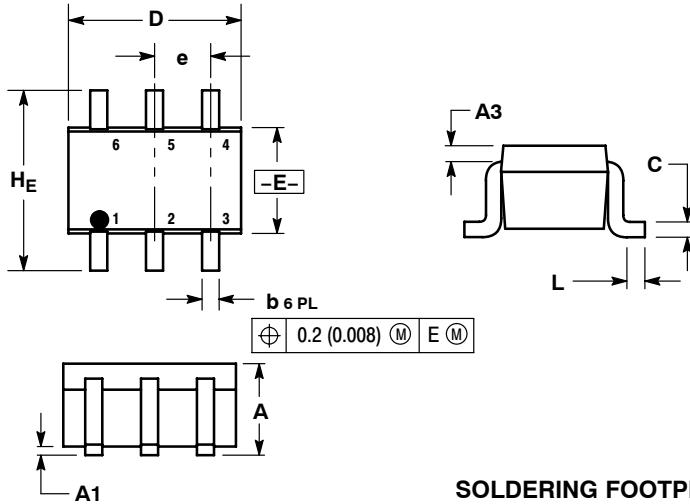
Device	Package	Shipping†
NTJS3157NT1	SC-88	3000 Tape & Reel
NTJS3157NT1G	SC-88 (Pb-Free)	3000 Tape & Reel
NTJS3157NT2	SC-88	3000 Tape & Reel
NTJS3157NT2G	SC-88 (Pb-Free)	3000 Tape & Reel
NTJS3157NT4	SC-88	10,000 Tape & Reel
NTJS3157NT4G	SC-88 (Pb-Free)	10,000 Tape & Reel

†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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PACKAGE DIMENSIONS

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



NOTES:

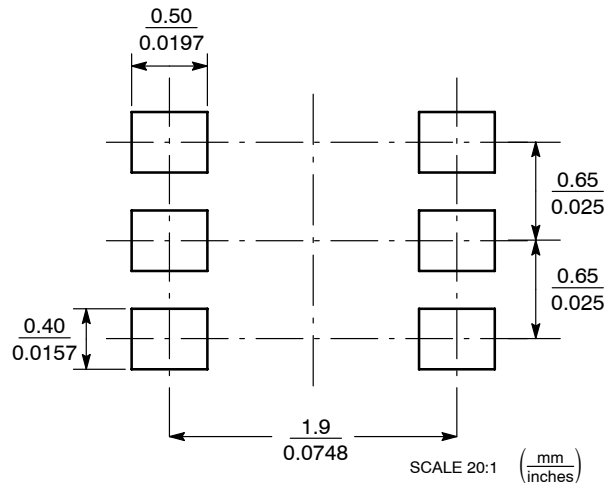
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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
- DRAIN
- GATE
- SOURCE
- DRAIN
- 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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