

# NTJD5121N

## Power MOSFET

60 V, 295 mA, Dual N-Channel with ESD Protection, SC-88

### Features

- Low  $R_{DS(on)}$
- Low Gate Threshold
- Low Input Capacitance
- ESD Protected Gate
- This is a Pb-Free Device

### Applications

- Low Side Load Switch
- DC-DC Converters (Buck and Boost Circuits)

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

Parameter		Symbol	Value	Units
Drain-to-Source Voltage		$V_{DSS}$	60	V
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	295	mA
		$T_A = 85^\circ\text{C}$	212	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	304	
		$T_A = 85^\circ\text{C}$	219	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	250	mW
		$t \leq 5$ s	266	
Pulsed Drain Current	$t_p = 10$ $\mu\text{s}$	$I_{DM}$	900	mA
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)		$I_S$	210	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$
Gate-Source ESD Rating (HBM, Method 3015)		ESD	1400	V

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.

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Units
Junction-to-Ambient – Steady State	$R_{\theta JA}$	500	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5$ s	$R_{\theta JA}$	470	

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).

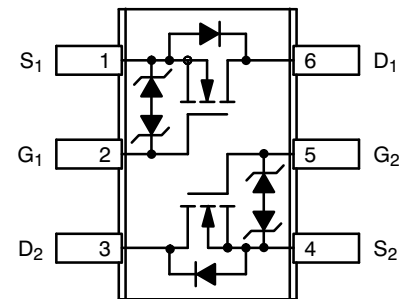


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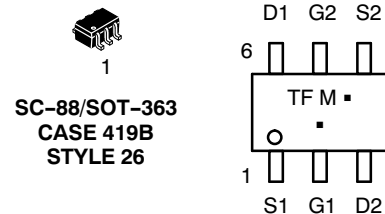
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ Max
60 V	1.6 $\Omega$ @ 10 V	295 mA
	2.5 $\Omega$ @ 4.5 V	

### SC-88 (SOT-363)



Top View

### MARKING DIAGRAM & PIN ASSIGNMENT



SC-88/SOT-363  
CASE 419B  
STYLE 26

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

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTJD5121NT1G	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 Specification Brochure, BRD8011/D.

# NTJD5121N

## 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	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA, ref to 25°C		92		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 60 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 125°C		500	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±10	μA

### 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	1.0	1.7	2.5	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> = 10 V, I <sub>D</sub> = 500 mA		1.0	1.6	Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 200 mA		1.2	2.5	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 200 mA		80		S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 20 V		26		pF
Output Capacitance	C <sub>OSS</sub>			4.4		
Reverse Transfer Capacitance	C <sub>RSS</sub>			2.5		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 25 V, I <sub>D</sub> = 200 mA		0.9		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.2		
Gate-to-Source Charge	Q <sub>GS</sub>			0.3		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.28		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 45 V, V <sub>DD</sub> = 25 V, I <sub>D</sub> = 200 mA, R <sub>G</sub> = 25 Ω		22		ns
Rise Time	t <sub>r</sub>			34		
Turn-Off Delay Time	t <sub>d(off)</sub>			34		
Fall Time	t <sub>f</sub>			32		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 200 mA	T <sub>J</sub> = 25°C		0.8	1.2	V
			T <sub>J</sub> = 85°C		0.7		

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

# NTJD5121N

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

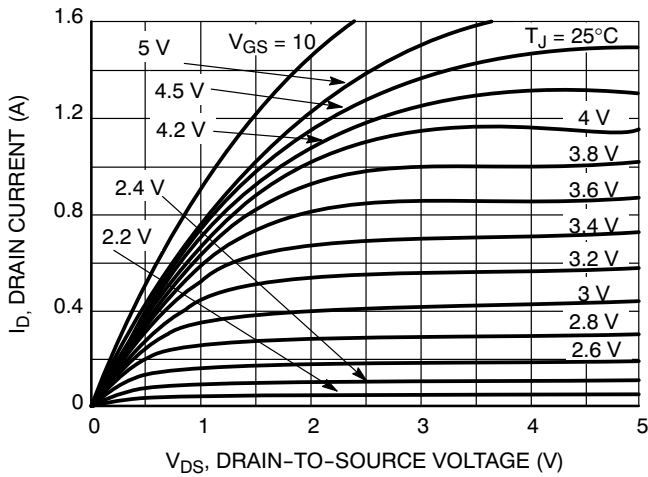


Figure 1. On-Region Characteristics

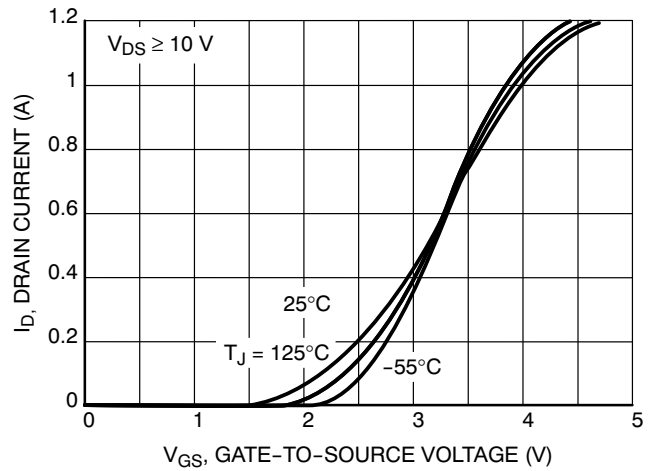


Figure 2. Transfer Characteristics

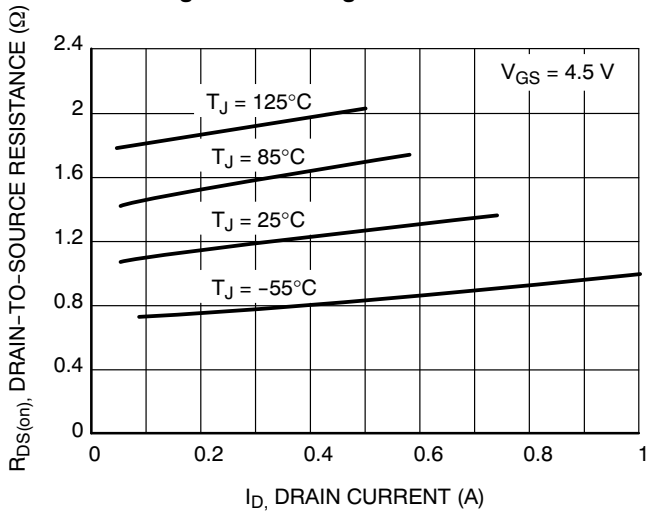


Figure 3. On-Resistance vs. Drain Current and Temperature

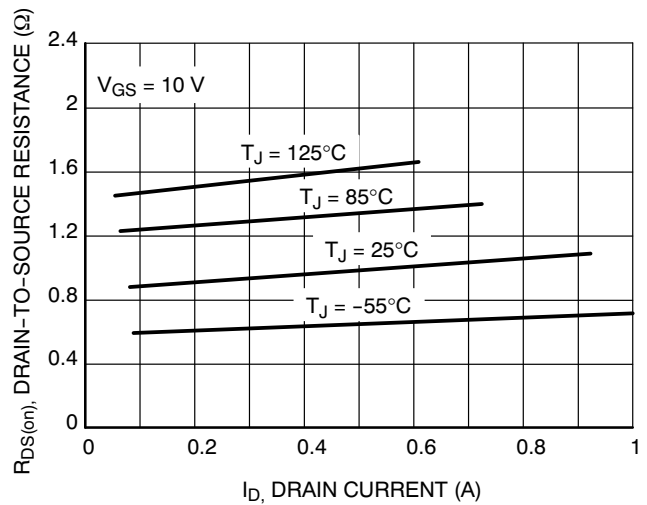


Figure 4. On-Resistance vs. Drain Current and Temperature

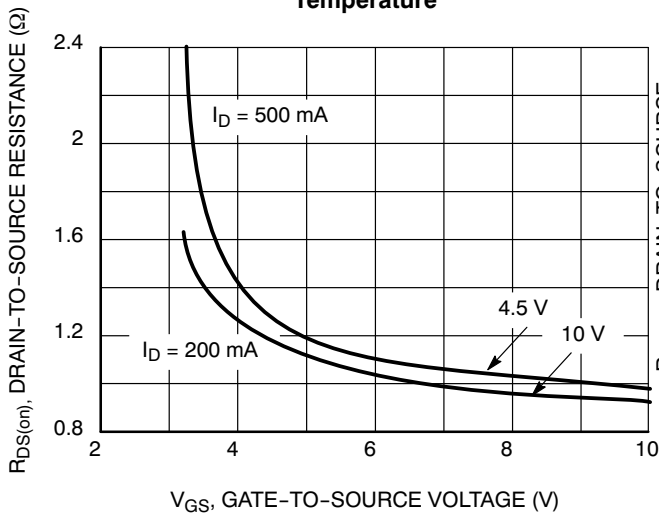


Figure 5. On-Resistance versus Gate-to-Source Voltage

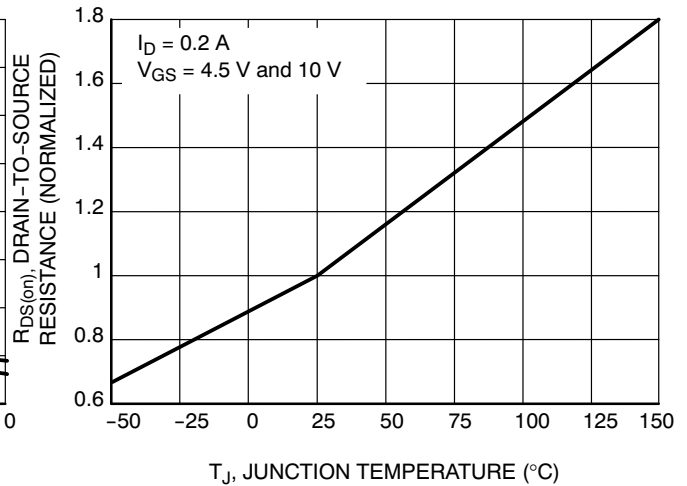


Figure 6. On-Resistance Variation with Temperature

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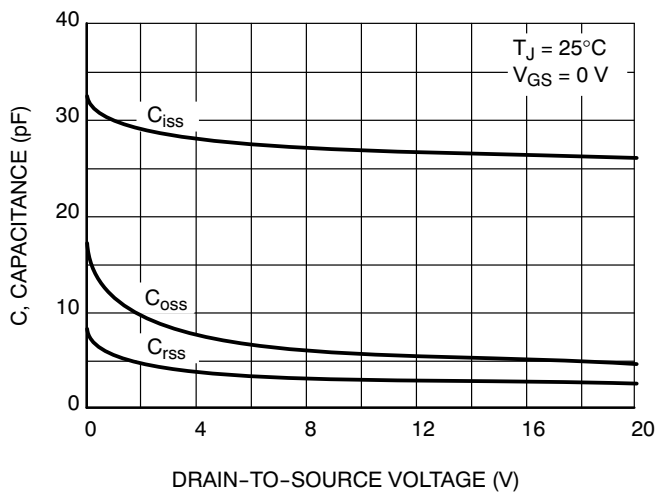


Figure 7. Capacitance Variation

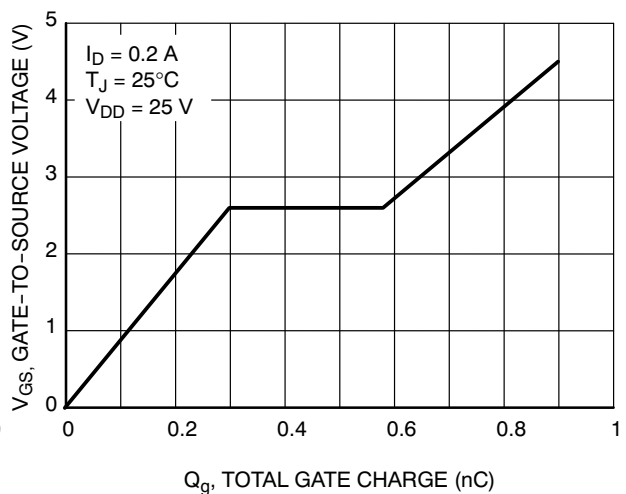


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

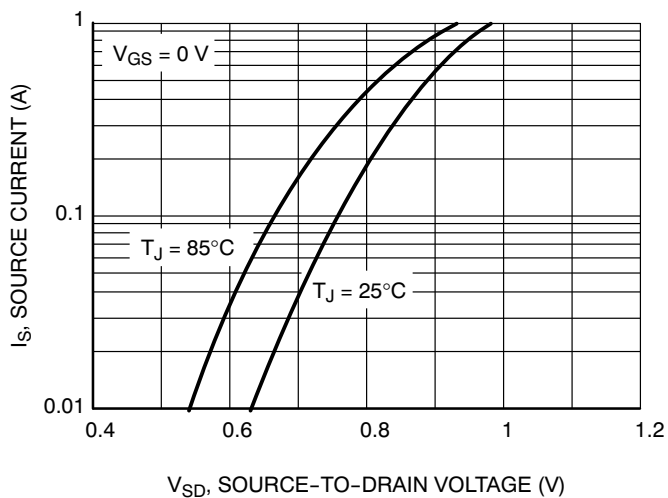
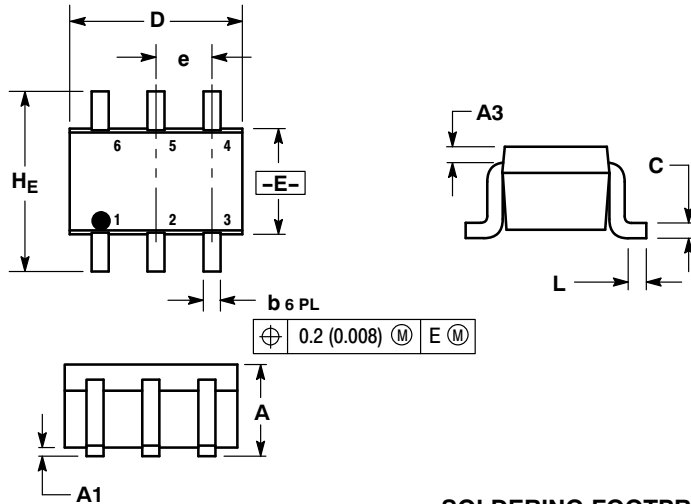


Figure 9. Diode Forward Voltage vs. Current

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## PACKAGE DIMENSIONS

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



NOTES:

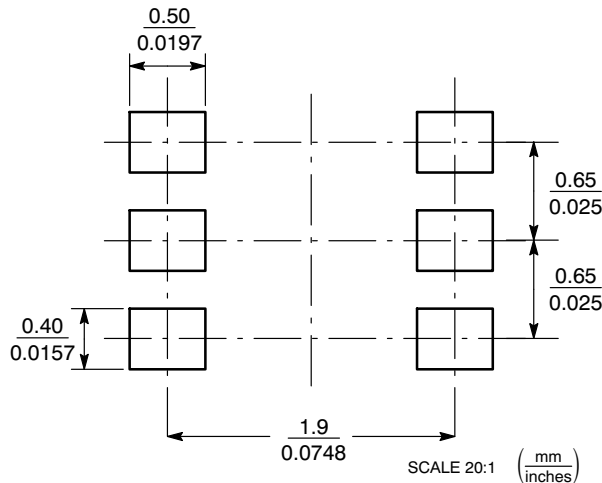
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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

STYLE 26:

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

### 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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