

# NL17SZ125

## Non-Inverting 3-State Buffer

The NL17SZ125 is a high performance non-inverting buffer operating from a 1.65 V to 5.5 V supply.

- Extremely High Speed:  $t_{PD}$  2.6 ns (typical) at  $V_{CC} = 5.0$  V
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Overvoltage Tolerant Inputs and Outputs
- LVTTTL Compatible – Interface Capability With 5.0 V TTL Logic with  $V_{CC} = 3.0$  V
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- 3-State OE Input is Active-Low
- Replacement for NC7SZ125
- Chip Complexity = 36 FETs
- Pb-Free Packages are Available

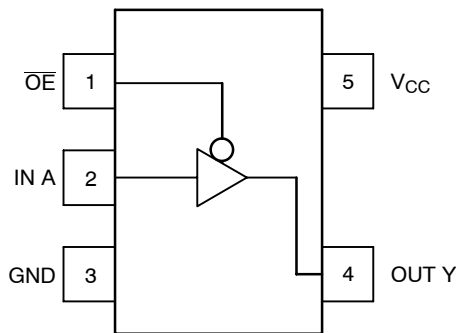


Figure 1. Pinout (Top View)

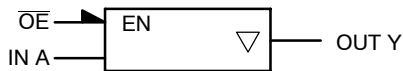


Figure 2. Logic Symbol



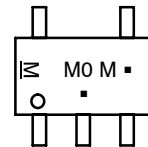
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### MARKING DIAGRAM



SC-88A (SOT-353)  
DF SUFFIX  
CASE 419A



SOT-553  
XV5 SUFFIX  
CASE 463B



M0 = Specific Device Code

D = Date Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### PIN ASSIGNMENT

PIN ASSIGNMENT	
1	$\overline{OE}$
2	IN A
3	GND
4	OUT Y
5	$V_{CC}$

### FUNCTION TABLE

$\overline{OE}$ Input	A Input	Y Output
L	L	L
L	H	H
H	X	Z

X = Don't Care

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

**MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>OUT</sub>	DC Output Voltage	-0.5 to +7.0	V
I <sub>IK</sub>	DC Input Diode Current	-50	mA
I <sub>OK</sub>	DC Output Diode Current	-50	mA
I <sub>OUT</sub>	DC Output Sink Current	± 50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	± 100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T <sub>J</sub>	Junction Temperature Under Bias	+ 150	°C
θ <sub>JA</sub>	Thermal Resistance (Note 1)	350	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 85°C	150	mW
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 N/A

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. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage	1.65	5.5	V
V <sub>IN</sub>	DC Input Voltage	0	5.5	V
V <sub>OUT</sub>	DC Output Voltage	0	5.5	V
T <sub>A</sub>	Operating Temperature Range	-40	+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> = 1.8 V ± 0.15 V V <sub>CC</sub> = 2.5 V ± 0.2 V V <sub>CC</sub> = 3.0 V ± 0.3 V V <sub>CC</sub> = 5.0 V ± 0.5 V	0 20 10 5.0	ns/V

**DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES**

Junction Temperature °C	Time, Hours	Time, Years
80	1,032,200	117.8
90	419,300	47.9
100	178,700	20.4
110	79,600	9.4
120	37,000	4.2
130	17,800	2.0
140	8,900	1.0

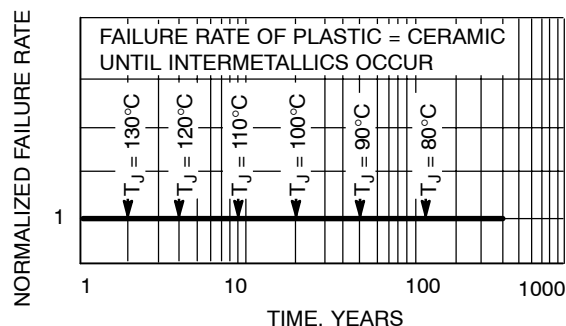


Figure 3. Failure Rate vs. Time Junction Temperature

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 125°C		Unit	Condition
			Min	Typ	Max	Min	Max		
V <sub>IH</sub>	High-Level Input Voltage	1.65 to 1.95 2.3 to 5.5	0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>			0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>		V	
V <sub>IL</sub>	Low-Level Input Voltage	1.65 to 1.95 2.3 to 5.5			0.25 V <sub>CC</sub> 0.3 V <sub>CC</sub>		0.25 V <sub>CC</sub> 0.3 V <sub>CC</sub>	V	
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>	1.65 1.8 2.3 3.0 4.5	1.55 1.7 2.2 2.9 4.4	1.65 1.8 2.3 3.0 4.5		1.55 1.7 2.2 2.9 4.4		V	I <sub>OH</sub> = -100 μA
		1.65 2.3 3.0 3.0 4.5	1.29 1.9 2.4 2.3 3.8	1.52 2.15 2.80 2.68 4.20		1.29 1.9 2.4 2.3 3.8		V	I <sub>OH</sub> = -4 mA I <sub>OH</sub> = -8 mA I <sub>OH</sub> = -16 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -32 mA
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub>	1.65 1.8 2.3 3.0 4.5		0.0 0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1 0.1		0.1 0.1 0.1 0.1 0.1	V	I <sub>OL</sub> = 100 μA
		1.65 2.3 3.0 3.0 4.5		0.08 0.10 0.15 0.22 0.22	0.24 0.30 0.40 0.55 0.55		0.24 0.30 0.40 0.55 0.55	V	I <sub>OL</sub> = 4 mA I <sub>OL</sub> = 8 mA I <sub>OL</sub> = 16 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 32 mA
I <sub>IN</sub>	Input Leakage Current	0 to 5.5			±1.0		±1.0	μA	0 V ≤ V <sub>IN</sub> ≤ 5.5 V
I <sub>OZ</sub>	3-State Output Leakage	1.65 to 5.5			±0.5		±5.0	μA	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> 0 V ≤ V <sub>OUT</sub> ≤ 5.5 V
I <sub>OFF</sub>	Power Off Leakage Current	0.0			1.0		10	μA	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.5			1.0		10	μA	V <sub>IN</sub> = 5.5 V, GND

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## AC ELECTRICAL CHARACTERISTICS ( $t_R = t_F = 3.0$ ns)

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay AN to YN (Figures 4 and 5, Table 1)	R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF	1.8 ± 0.15	2.0	9.0	10	2.0	10.5	ns
		R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF	2.5 ± 0.2	1.0		7.5	1.0	8.0	
		R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF	3.3 ± 0.3	0.8		5.2	0.8	5.5	
		R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF	5.0 ± 0.5	0.5		4.5	0.5	4.8	
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time (Figures 6, 7 and 8, Table 1)	R <sub>L</sub> = 250 Ω    C <sub>L</sub> = 50 pF	1.8 ± 0.15	2.0	7.6	9.5	2.0	10	ns
			2.5 ± 0.2	1.8		8.5	1.8	9.0	
			3.3 ± 0.3	1.2		6.2	1.2	6.5	
			5.0 ± 0.5	0.8		5.5	0.8	5.8	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time (Figures 6, 7 and 8, Table 1)	R <sub>L</sub> and R <sub>1</sub> = 500 Ω    C <sub>L</sub> = 50 pF	1.8 ± 0.15	2.0	8.0	10	2.0	10.5	ns
			2.5 ± 0.2	1.5		8.0	1.5	8.5	
			3.3 ± 0.3	0.8		5.7	0.8	6.0	
			5.0 ± 0.5	0.3		4.7	0.3	5.0	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> 10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	9 11	pF

5. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

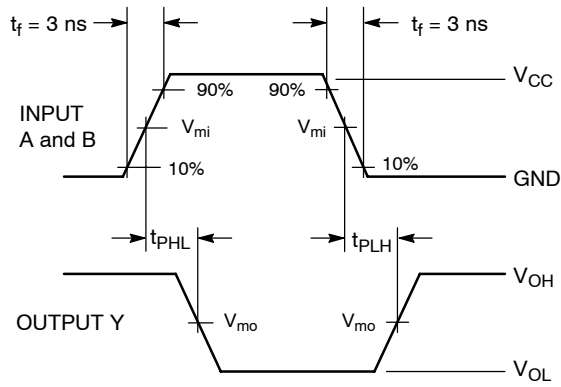
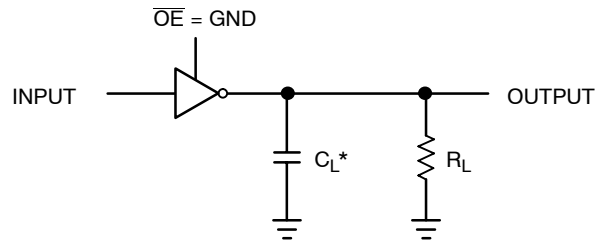
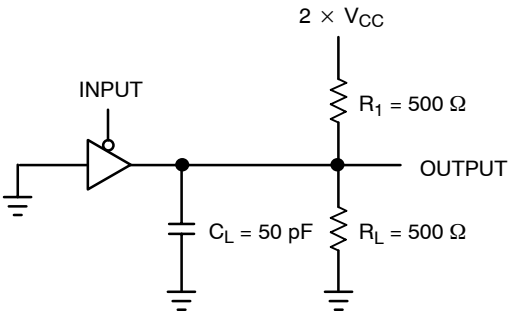


Figure 4. Switching Waveform



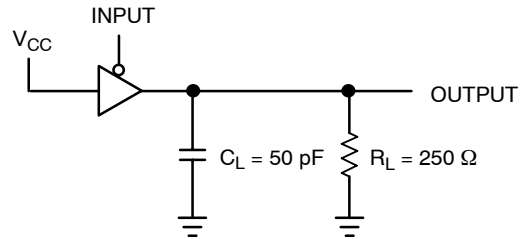
\*Includes all probe and jig capacitance.  
A 1 MHz square input wave is recommended for propagation delay tests.

Figure 5. T<sub>PLH</sub> or T<sub>PHL</sub>



A 1 MHz square input wave is recommended for propagation delay tests.

Figure 6. T<sub>PZL</sub> or T<sub>PL</sub>



A 1 MHz square input wave is recommended for propagation delay tests.

Figure 7. T<sub>PZH</sub> or T<sub>PHZ</sub>

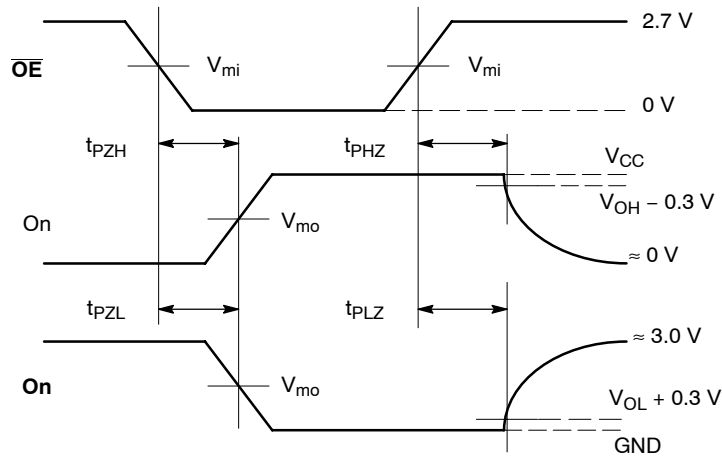


Figure 8. AC Output Enable and Disable Waveform

Table 1. Output Enable and Disable Times

$t_R = t_F = 2.5$  ns, 10% to 90%;  $f = 1$  MHz;  $t_W = 500$  ns

Symbol	V <sub>CC</sub>		
	3.3 V ± 0.3 V	2.7 V	2.5 V ± 0.2 V
V <sub>mi</sub>	1.5 V	1.5 V	V <sub>CC</sub> /2
V <sub>mo</sub>	1.5 V	1.5 V	V <sub>CC</sub> /2

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## DEVICE ORDERING INFORMATION

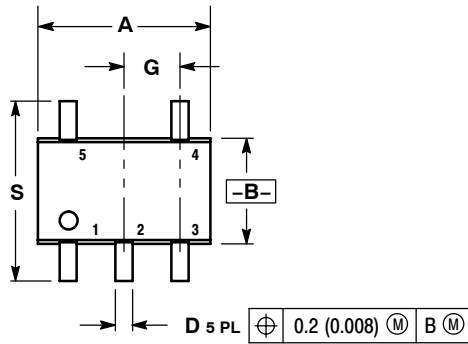
Device	Package	Shipping†
NL17SZ125DFT2	SC-88A (SOT-353)	3000 / Tape & Reel
NL17SZ125DFT2G	SC-88A (SOT-353) (Pb-Free)	3000 / Tape & Reel
NL17SZ125XV5T2G	SOT-553 (Pb-Free)	4000 / Tape & Reel

†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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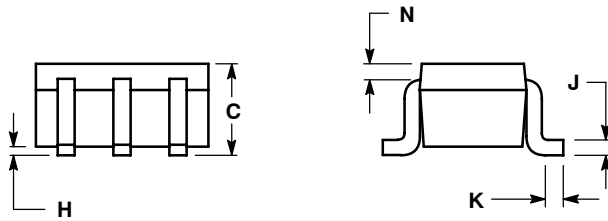
## PACKAGE DIMENSIONS

SC-88A, SOT-353, SC-70  
CASE 419A-02  
ISSUE J

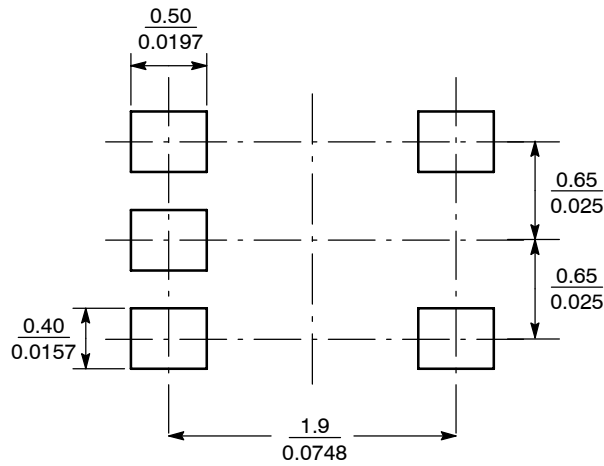


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
  4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20



### SOLDERING FOOTPRINT\*

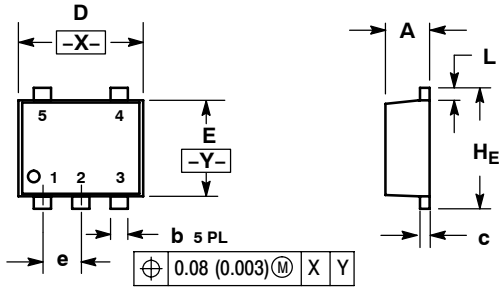


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

SOT-553, 5 LEAD  
CASE 463B-01  
ISSUE B

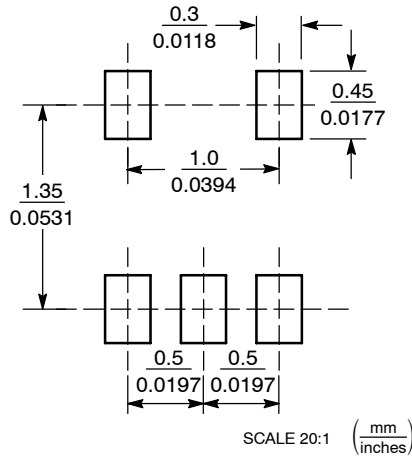


NOTES:

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	0.022	0.024
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.08	0.13	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.063	0.067
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.50 BSC			0.020 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.50	1.60	1.70	0.059	0.063	0.067

### 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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