

# NL17SZ125E

## Non-Inverting 3-State Buffer

The NL17SZ125E is a high performance non-inverting buffer operating from a 1.65 V to 5.5 V supply.

### Features

- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- 2.7 ns  $t_{PD}$  at  $V_{CC} = 5$  V (typ)
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- $I_{OFF}$  Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Chip Complexity < 100 FETs
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

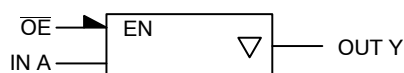


Figure 1. Logic Symbol

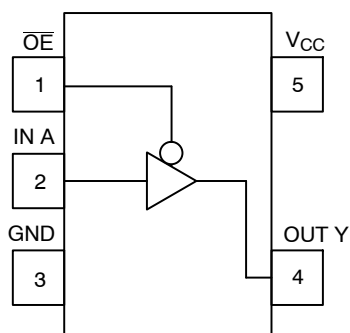


Figure 2. Pinout (Top View)

### PIN ASSIGNMENT

Pin	Function
1	OE
2	IN A
3	GND
4	OUT Y
5	$V_{CC}$

### FUNCTION TABLE

Input		Output
OE	A	Y
L	L	L
L	H	H
H	X	Z

X = Don't Care



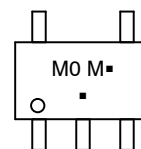
ON Semiconductor®

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### MARKING DIAGRAM



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



M0 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

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

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NL17SZ125E

## DEVICE ORDERING INFORMATION

Device	Package	Shipping†
NL17SZ125EDFT2G	SC-88A (SOT-353) (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.

**Table 1. MAXIMUM RATINGS**

Symbol	Parameter	Value	Units
$V_{CC}$	DC Supply Voltage	-0.5 to +6.5	V
$V_{IN}$	DC Input Voltage	-0.5 to +6.5	V
$V_{OUT}$	DC Output Voltage Active Mode, High or Low State	-0.5 V to $V_{CC} + 0.5$ V	V
	DC Output Voltage Power Down Mode ( $V_{CC} = 0$ V)	-0.5 V to +6.5 V	
$I_{IK}$	DC Input Diode Current	-50	mA
$I_{OK}$	DC Output Diode Current $V_{OUT} < GND$	$\pm 50$	mA
$I_{OUT}$	DC Output Sink Current	$\pm 50$	mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	+150	°C
$\theta_{JA}$	Thermal Resistance (Note 1)	659	°C/W
$P_D$	Power Dissipation in Still Air at 85°C	190	mW
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage Human Body Model (Note 2) Charged Device Model (Note 3)	4000	V
		1000	
$I_{LATCHUP}$	Latchup Performance Above $V_{CC}$ and Below GND at 125°C (Note 4)	$\pm 100$	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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 JESD22-C101-A.
4. Tested to EIA/JESD78.

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**Table 2. RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Units
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	Active Mode, High or Low State	0	V <sub>CC</sub>
	DC Output Voltage	Power Down Mode (V <sub>CC</sub> = 0 V)	0	5.5
T <sub>A</sub>	Operating Temperature Range	-55	+125	°C
t <sub>p</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	ns/V
		0	20	
		0	10	
		0	5.0	
		0	5.0	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

**Table 3. DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Units	Condition
			Min	Typ	Max	Min	Max		
V <sub>IH</sub>	High-Level Input Voltage	1.65 to 1.95 2.3 to 5.5	0.65 V <sub>CC</sub> 0.7 V <sub>CC</sub>			0.65 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			0.35 V <sub>CC</sub> 0.3 V <sub>CC</sub>		0.35 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	1.55	1.65		1.55		V	I <sub>OH</sub> = -100 μA
		1.8	1.7	1.8		1.7			
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>	2.3	2.2	2.3		2.2			
		3.0	2.9	3.0		2.9			
		4.5	4.4	4.5		4.4			
		1.65	1.29	1.52		1.29		V	I <sub>OH</sub> = -4 mA
		2.3	1.9	2.15		1.9			I <sub>OH</sub> = -8 mA
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub>	3.0	2.4	2.80		2.4			I <sub>OL</sub> = -16 mA
		3.0	2.3	2.68		2.3			I <sub>OL</sub> = -24 mA
		4.5	3.8	4.20		3.8			I <sub>OL</sub> = -32 mA
		1.65		0.0	0.1		0.1	V	I <sub>OL</sub> = 100 μA
		1.8		0.0	0.1		0.1		
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub>	2.3		0.0	0.1		0.1		
		3.0		0.0	0.1		0.1		
		4.5		0.0	0.1		0.1		
		1.65		0.08	0.24		0.24	V	I <sub>OL</sub> = 4 mA
		2.3		0.10	0.30		0.30		I <sub>OL</sub> = 8 mA
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub>	3.0		0.15	0.40		0.40		I <sub>OL</sub> = 16 mA
		3.0		0.22	0.55		0.55		I <sub>OL</sub> = 24 mA
		4.5		0.22	0.55		0.55		I <sub>OL</sub> = 32 mA
I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5			±0.1		±1.0	μA	V <sub>IN</sub> = 5.5 V or GND
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			1.0		10	μA	V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V
I <sub>CC</sub>	Quiescent Supply Current	5.5			1.0		10	μA	V <sub>IN</sub> = 5.5 V or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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**Table 4. AC ELECTRICAL CHARACTERISTICS** ( $t_R = t_F = 3.0$  ns)

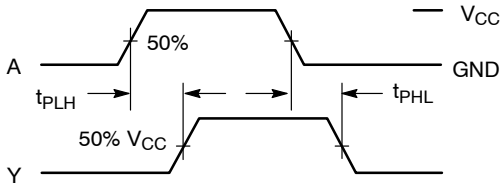
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay AN to YN (Figures 3 and 4, Table 6)	R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF	1.8 ± 0.15		6.0	10		10.5	ns
		R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF	2.5 ± 0.2		3.4	7.5		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		2.5 2.9	5.2 5.7		5.5 6.0	
		R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF	5.0 ± 0.5		2.0 2.3	4.5 5.0		4.8 5.3	
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time (Figures 5, 6 and 7, Table 6)	R <sub>L</sub> = 250 Ω    C <sub>L</sub> = 50 pF	1.8 ± 0.15		6.5	9.5		10	ns
			2.5 ± 0.2		3.6	8.5		9.0	
			3.3 ± 0.3		2.8	6.2		6.5	
			5.0 ± 0.5		2.0	5.5		5.8	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time (Figures 5, 6 and 7, Table 6)	R <sub>L</sub> and R <sub>1</sub> = 500 Ω    C <sub>L</sub> = 50 pF	1.8 ± 0.15		5.0	10		10.5	ns
			2.5 ± 0.2		3.3	8.0		8.5	
			3.3 ± 0.3		2.7	5.7		6.0	
			5.0 ± 0.5		2.6	4.7		5.0	

**Table 5. CAPACITIVE CHARACTERISTICS**

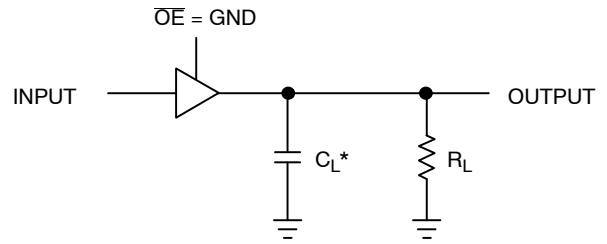
Symbol	Parameter	Condition	Typical	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance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

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>.

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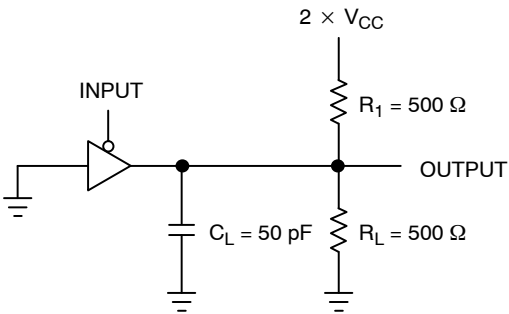


**Figure 3. Switching Waveform**



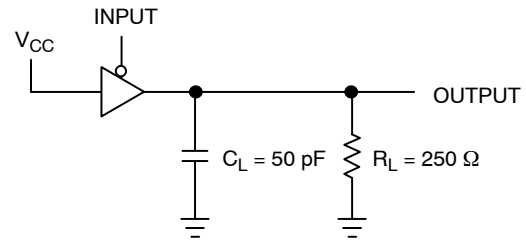
\*Includes all probe and jig capacitance.  
A 1 MHz square input wave is recommended for propagation delay tests.

**Figure 4.  $t_{PLH}$  or  $t_{PHL}$**



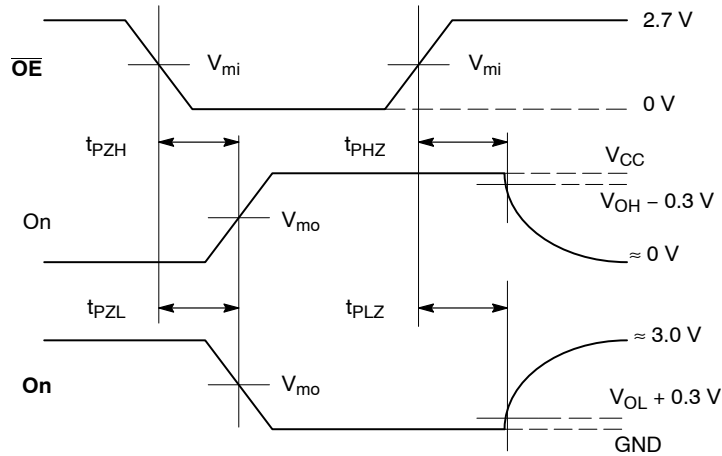
A 1 MHz square input wave is recommended for propagation delay tests.

**Figure 5.  $t_{PZL}$  or  $t_{PLZ}$**



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

**Figure 6.  $t_{PZH}$  or  $t_{PHZ}$**



**Figure 7. AC Output Enable and Disable Waveform**

**Table 6. OUTPUT ENABLE AND DISABLE TIMES**

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

Symbol	$V_{CC}$		
	$3.3\text{ V} \pm 0.3\text{ V}$	$2.7\text{ V}$	$2.5\text{ V} \pm 0.2\text{ V}$
$V_{mi}$	1.5 V	1.5 V	$V_{CC}/2$
$V_{mo}$	1.5 V	1.5 V	$V_{CC}/2$

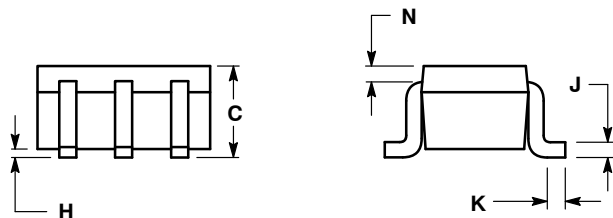
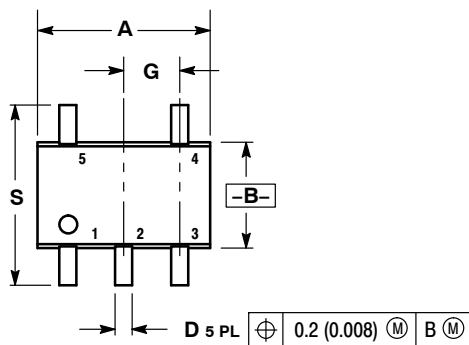
# NL17SZ125E

## PACKAGE DIMENSIONS

SC-88A (SC-70-5/SOT-353)

CASE 419A-02

ISSUE L

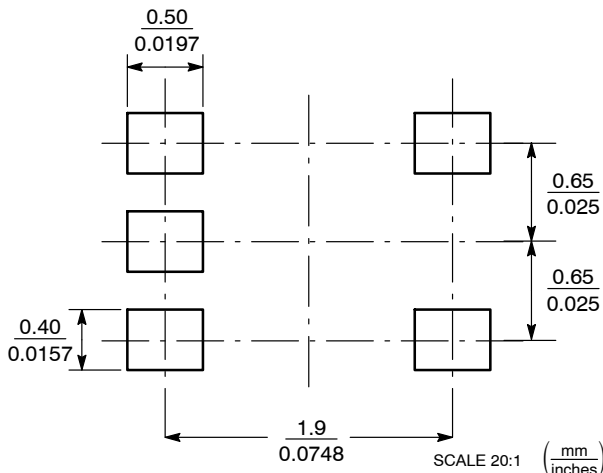


### NOTES:

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

### SOLDER 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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