

# NL17SZ17

## Single Non-Inverting Buffer with Schmitt Trigger

The NL17SZ17 is a single Non-inverting Schmitt Trigger Buffer in a tiny footprint package. The SC70-5/SC-88A occupies a very small board area. The device performs much as LCX multi-gate products in speed and drive.

- Tiny SC70-5/SC-88A Package
- Source/Sink 24 mA at 3.0 Volts
- Over-Voltage Tolerant Inputs and Outputs
- Chip Complexity: FETs = TBD
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation

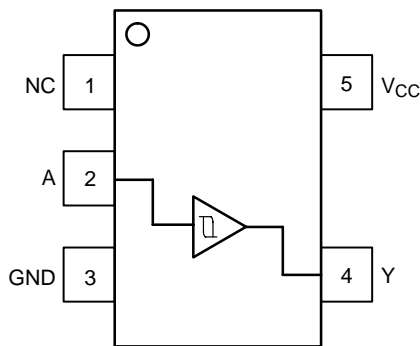


Figure 1. Pinout (Top View)



Figure 2. Logic Symbol



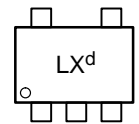
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### MARKING DIAGRAM



SC70-5/SC-88A/SOT-353  
DF SUFFIX  
CASE 419A



d = Date Code

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

### PIN ASSIGNMENT

Pin	Function
1	NC
2	A
3	GND
4	Y
5	V <sub>CC</sub>

### FUNCTION TABLE

A Input	$\bar{Y}$ Output
L	L
H	H

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0	V
$V_I$	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$	V
$V_O$	DC Output Voltage Output in High or LOW State (Note 1)	$-0.5 \leq V_O \leq 7.0$	V
$I_{IK}$	DC Input Diode Current $V_I < \text{GND}$	-50	mA
$I_{OK}$	DC Output Diode Current $V_O < \text{GND}$	-50	mA
$I_O$	DC Output Sink Current	$\pm 50$	mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$	mA
$I_{GND}$	DC Ground Current per Ground 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 2)	333	°C/W
$P_D$	Power Dissipation in Still Air at 85°C	200	mW
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$I_{\text{Latch-Up}}$	Latch-Up Performance Above $V_{CC}$ and Below GND at 85°C (Note 6)	$\pm 500$	mA

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1.  $I_O$  absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
3. Tested to EIA/JESD22-A114-A.
4. Tested to EIA/JESD22-A115-A.
5. Tested to JESD22-C101-A.
6. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Supply Voltage Operating Data Retention Only	1.65 1.5	5.5 5.5	V
$V_I$	Input Voltage (Note 7)	0	5.5	V
$V_O$	Output Voltage (HIGH or LOW State)	0	5.5	V
$T_A$	Operating Free-Air Temperature	-40	+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$ $V_{CC} = 3.0 \text{ V} \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	0 0 0	20 10 5	ns/V

7. Unused inputs may not be left open. All inputs must be tied to a high-logic voltage level or a low-logic input voltage level.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		Unit	
				Min	Typ	Max	Min	Max		
V <sub>T+</sub>	Positive Input Threshold Voltage		1.65	0.6	1.0	1.4	0.6	1.4	V	
			2.3	1.0	1.5	1.8	1.0	1.8		
			2.7	1.2	1.7	2.0	1.2	2.0		
			3.0	1.3	1.9	2.2	1.3	2.2		
			4.5	1.9	2.7	3.1	1.9	3.1		
			5.5	2.2	3.3	3.6	2.2	3.6		
V <sub>T-</sub>	Negative Input Threshold Voltage		1.65	0.2	0.5	0.8	0.2	0.8	V	
			2.3	0.4	0.75	1.15	0.4	1.15		
			2.7	0.5	0.87	1.4	0.5	1.4		
			3.0	0.6	1.0	1.5	0.6	1.5		
			4.5	1.0	1.5	2.0	1.0	2.0		
			5.5	1.2	1.9	2.3	1.2	2.3		
V <sub>H</sub>	Input Hysteresis Voltage		1.65	0.1	0.48	0.9	0.1	0.9	V	
			2.3	0.25	0.75	1.1	1.25	1.1		
			2.7	0.3	0.83	1.15	0.3	1.15		
			3.0	0.4	0.93	1.2	0.4	1.2		
			4.5	0.6	1.2	1.5	0.6	1.5		
			5.5	0.7	1.4	1.7	0.7	1.7		
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	V <sub>IN</sub> = V <sub>IL</sub> or I <sub>OH</sub> = -100 μA	1.65	1.55	1.65	1.55	V <sub>CC</sub> - 0.1	V <sub>CC</sub> - 0.1	V	
			2.3 to 5.5	V <sub>CC</sub> - 0.1	V <sub>CC</sub>	V <sub>CC</sub> - 0.1				
			1.65	1.29	1.52	1.29				
			2.3	1.9	2.1	1.9				
			I <sub>OH</sub> = -8 mA	2.7	2.2	2.4				2.2
			I <sub>OH</sub> = -12 mA	3.0	2.4	2.7				2.4
			I <sub>OH</sub> = -16 mA	3.0	2.3	2.5				2.3
			I <sub>OH</sub> = -32 mA	4.5	3.8	4.0				3.8
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100 μA	1.65		0.0	0.1		0.1	V	
			2.3 to 5.5			0.1		0.1		
			I <sub>OL</sub> = 100 μA	1.65	0.08	0.24		0.24		
			I <sub>OL</sub> = 4 mA	2.3	0.2	0.3		0.3		
			I <sub>OL</sub> = 8 mA	2.7	0.22	0.4		0.4		
			I <sub>OL</sub> = 12 mA	3.0	0.28	0.4		0.4		
			I <sub>OL</sub> = 16 mA	3.0	0.38	0.55		0.55		
			I <sub>OL</sub> = 24 mA	4.5	0.42	0.55		0.55		
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> or V <sub>OUT</sub> = V <sub>CC</sub> or GND	0 to 5.5			±0.1		±1.0	μA	
I <sub>OFF</sub>	Power Off-Output Leakage Current	V <sub>OUT</sub> = 5.5 V	0			1.0		10	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			1.0		10	μA	

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0 ns)

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input A to Y (Figures 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.65	2.0	9.1	15	2.0	15.6	ns
			1.8	2.0	7.6	12.5	2.0	13	
			2.5 ± 0.2	1.0	5.0	9.0	1.0	9.5	
			3.3 ± 0.3	1.0	3.7	6.3	1.0	6.5	
			5.0 ± 0.5	0.5	3.1	5.2	0.5	5.5	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	3.3 ± 0.3	1.5	4.4	7.2	1.5	7.5	
			5.0 ± 0.5	0.8	3.7	5.9	0.8	6.2	

## 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>PD</sub>	Power Dissipation Capacitance (Note 8)	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	

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8.  $C_{PD}$  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:  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ .  $C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

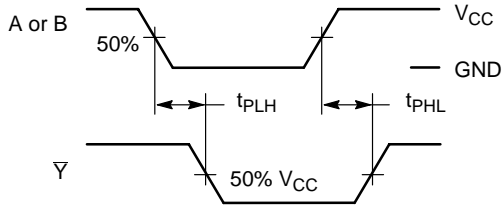
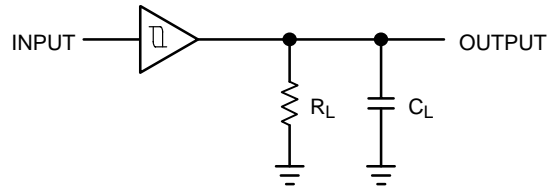


Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

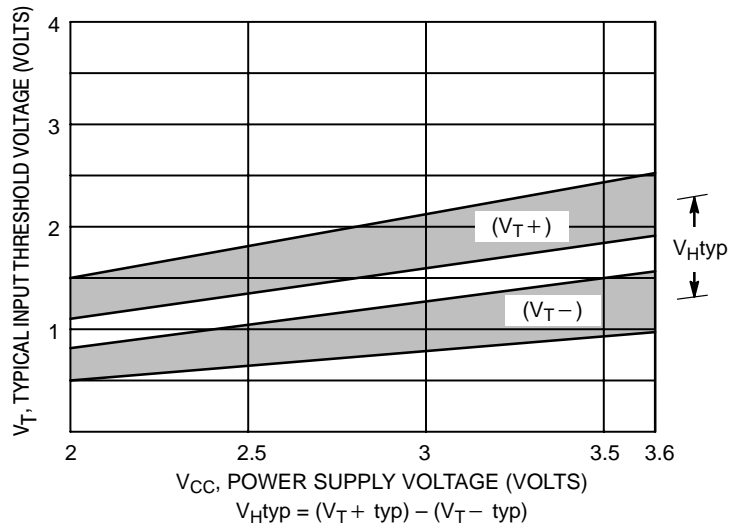
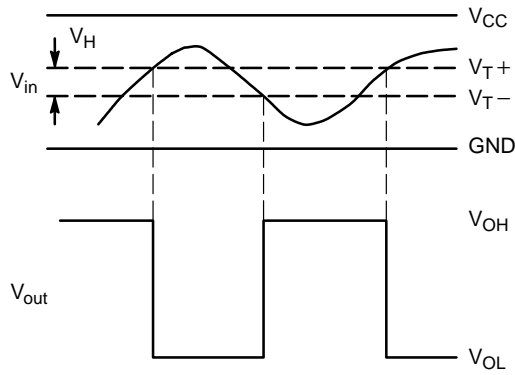
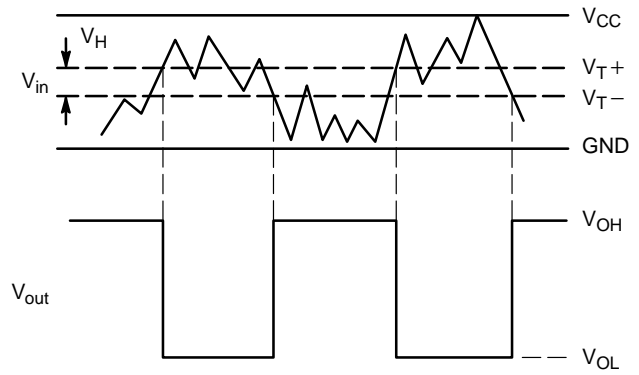


Figure 5. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage

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(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times



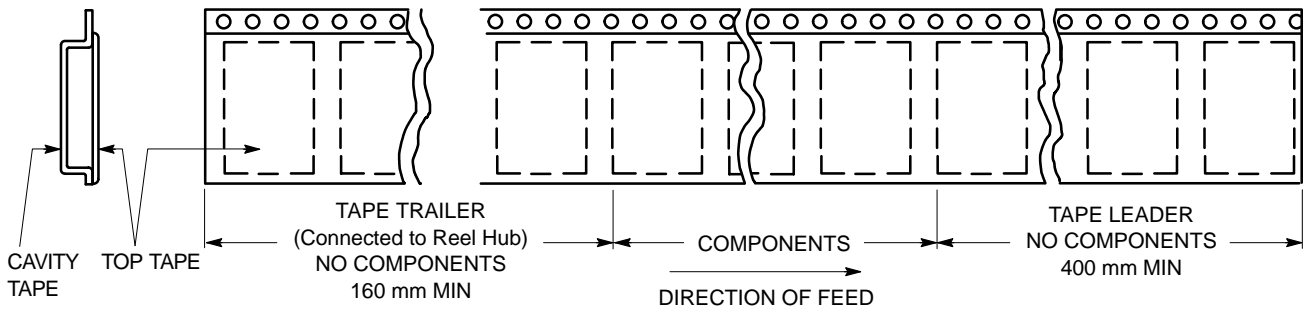
(b) A Schmitt-Trigger Offers Maximum Noise Immunity

**Figure 6. Typical Schmitt-Trigger Applications**

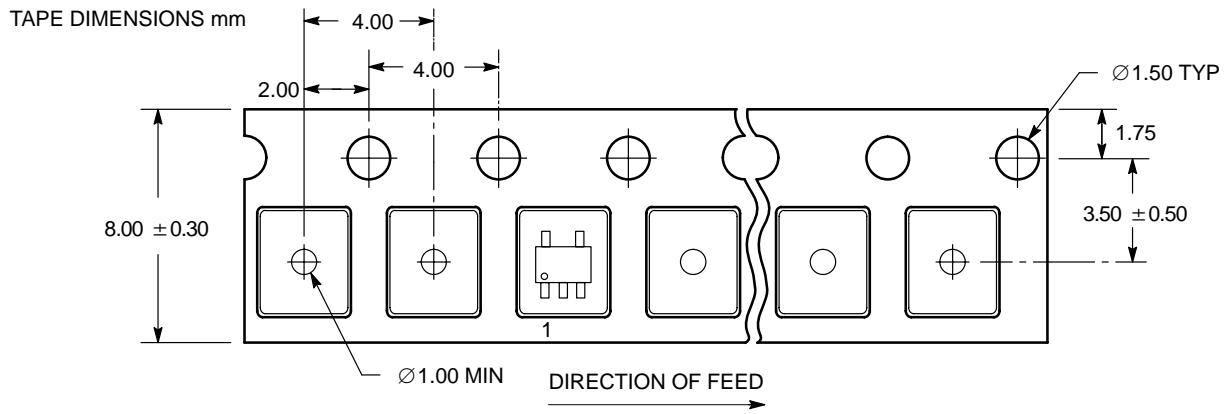
## DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type	Tape and Reel Size
	Logic Circuit Indicator	No. of Gates per Package	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape and Reel Suffix		
NL17SZ17DFT2	NL	1	7	SZ	17	DF	T2	SC70-5/ SC-88A/ SOT-353	178 mm, 3000 Units

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**Figure 7. Tape Ends for Finished Goods**



**Figure 8. SC-70/SC-88A/SOT-353 DFT2 Reel Configuration/Orientation**

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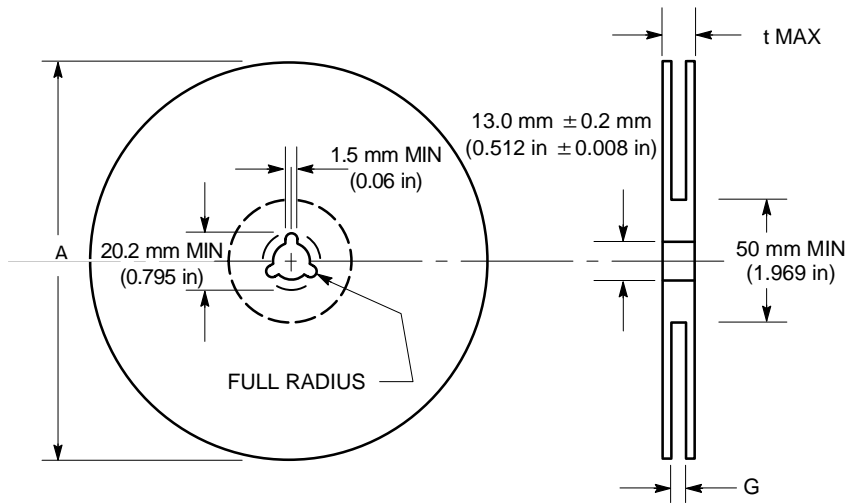


Figure 9. Reel Dimensions

## REEL DIMENSIONS

Tape Size	T and R Suffix	A Max	G	t Max
8 mm	T1, T2	178 mm (7 in)	8.4 mm, + 1.5 mm, -0.0 (0.33 in + 0.059 in, -0.00)	14.4 mm (0.56 in)

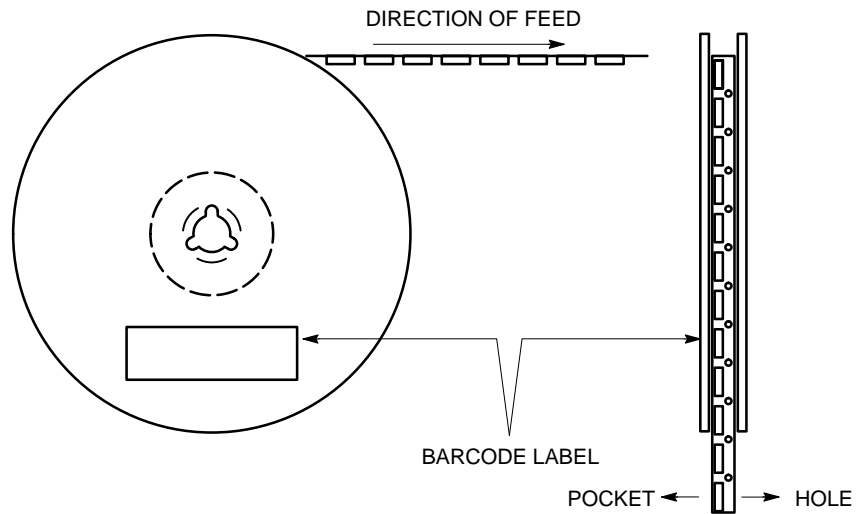
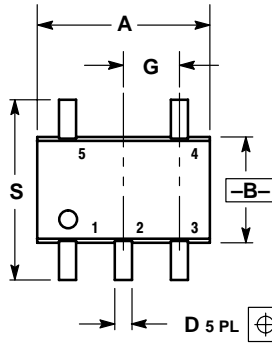


Figure 10. Reel Winding Direction

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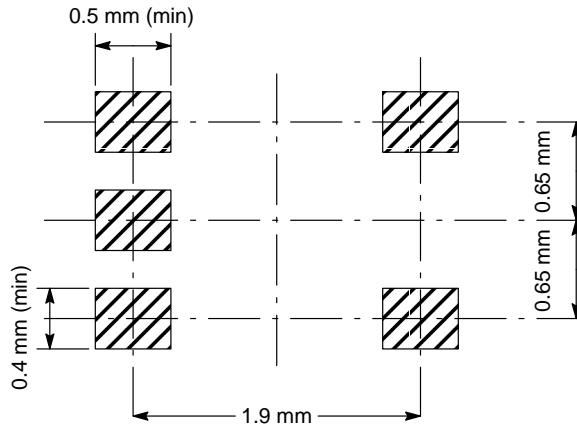
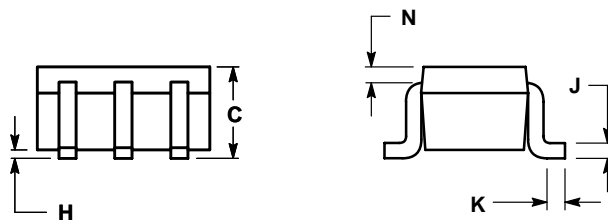
## PACKAGE DIMENSIONS


SC70-5/SC-88A/SOT-353  
 DF SUFFIX  
 5-LEAD PACKAGE  
 CASE 419A-02  
 ISSUE F



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

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



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