

# NL17SZ00

## Single 2-Input NAND Gate

The NL17SZ00 is a single 2-input NAND Gate in two tiny footprint packages. The device performs much as LCX multi-gate products in speed and drive.

### Features

- Tiny SOT-353 and SOT-553 Packages
- 2.7 ns  $T_{PD}$  at 5 V (typ)
- Source/Sink 24 mA at 3.0 V
- Over-Voltage Tolerant Inputs
- Pin For Pin with NC7SZ00P5X, TC7SZ00FU and TC7SZ00AFE
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- These Devices are Pb-Free and are RoHS Compliant

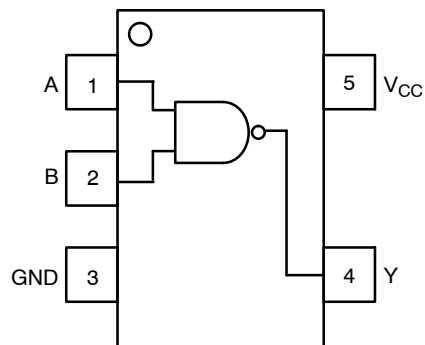


Figure 1. Pinout (Top View)

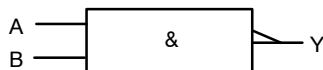
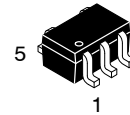


Figure 2. Logic Symbol



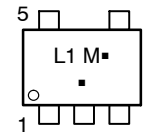
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SOT-353/SC70-5/SC-88A  
DF SUFFIX  
CASE 419A

### MARKING DIAGRAMS



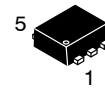
L1 = Specific Device Marking

M = Date Code\*

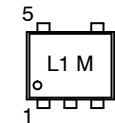
■ = Pb-Free Package

(Note: Microdot may be in either location)

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



SOT-553  
XV5 SUFFIX  
CASE 463B



L1 = Specific Device Marking

M = Date Code

### PIN ASSIGNMENT

Pin	Function
1	A
2	B
3	GND
4	Y
5	$V_{CC}$

### FUNCTION TABLE

Input		Output $Y = AB$
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# NL17SZ00

## 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 to V <sub>CC</sub> + 0.5	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 + 50	°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	SOT-353 (Note 1) SOT-553 350 496	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 85°C	SOT-353 SOT-553 186 135	mW
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in	
ESD	ESD Classification	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) Class Z Class A N/A	

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.

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, rated to EIA/JESD22-A114-B.
3. Tested to EIA/JESD22-A115-A, rated 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	-55	+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time			
	V <sub>CC</sub> = 3.0 V ± 0.3 V	0	100	ns/V
	V <sub>CC</sub> = 5.0 V ± 0.5 V	0	20	

# NL17SZ00

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				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>IL</sub> or V <sub>IH</sub>	I <sub>OH</sub> = 100 μA I <sub>OH</sub> = -3 mA I <sub>OH</sub> = -8 mA I <sub>OH</sub> = -12 mA I <sub>OH</sub> = -16 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -32 mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.7 2.3 3.8	V <sub>CC</sub> 1.4 2.1 2.4 2.7 2.5 4.0		V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.3 3.8		V
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>OH</sub>	I <sub>OL</sub> = 100 μA I <sub>OL</sub> = 3 mA I <sub>OL</sub> = 8 mA I <sub>OL</sub> = 12 mA I <sub>OL</sub> = 16 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 32 mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5		0.08 0.20 0.22 0.28 0.38 0.42	0.1 0.24 0.3 0.4 0.4 0.55 0.55		0.1 0.24 0.3 0.4 0.4 0.55 0.55	V
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V	0			1		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 5.5 V or GND	5.5			1		10	μA

## AC ELECTRICAL CHARACTERISTICS 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			-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay (Figure 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.65	2.0	5.4	11.4	2.0	12	ns
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.8	2.0	4.5	9.5	2.0	10.0	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.5 to 0.2	0.8	3.0	6.5	0.8	7.0	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		1.5	2.4	5.0	1.5	5.2	
		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	2.0	3.9	0.5	4.1	
				0.8	2.4	4.3	0.8	4.5	

## 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>	> 4	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>	25	pF
		10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	30	

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>.

# NL17SZ00

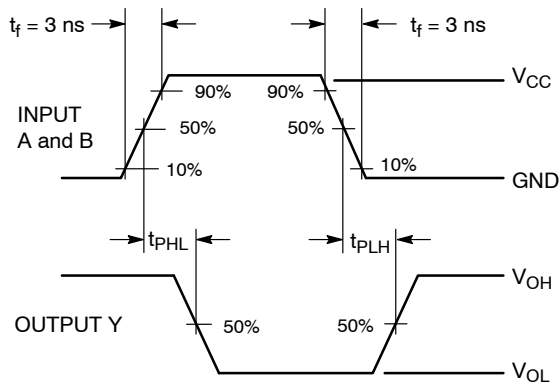
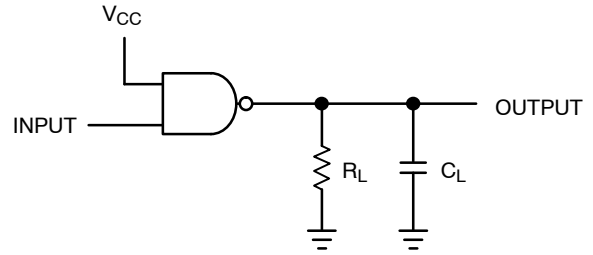


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

## DEVICE ORDERING INFORMATION

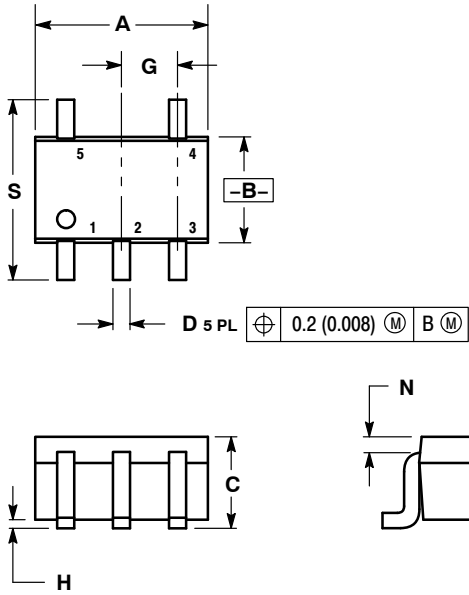
Device Order Number	Package Type	Shipping†
NL17SZ00DFT2G	SOT-353 (Pb-Free)	3000 / Tape & Reel
NL17SZ00XV5T2G	SOT-553 (Pb-Free)	4000 / Tape & Reel

†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.

# NL17SZ00

## PACKAGE DIMENSIONS

SC-88A  
(SC-70-5/SOT-353)  
DF SUFFIX  
CASE 419A-02  
ISSUE K



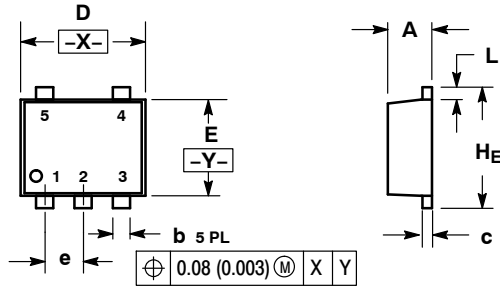
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
  4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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

# NL17SZ00

## PACKAGE DIMENSIONS

**SOT-553**  
**XV5 SUFFIX**  
**CASE 463B**  
**ISSUE B**

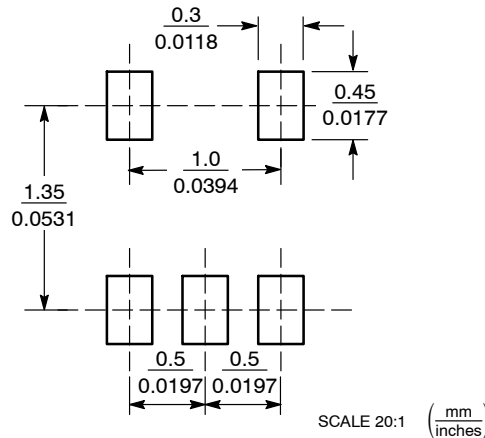


**NOTES:**

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
<b>A</b>	0.50	0.55	0.60	0.020	0.022	0.024
<b>b</b>	0.17	0.22	0.27	0.007	0.009	0.011
<b>c</b>	0.08	0.13	0.18	0.003	0.005	0.007
<b>D</b>	1.50	1.60	1.70	0.059	0.063	0.067
<b>E</b>	1.10	1.20	1.30	0.043	0.047	0.051
<b>e</b>	0.50 BSC			0.020 BSC		
<b>L</b>	0.10	0.20	0.30	0.004	0.008	0.012
<b>H<sub>E</sub></b>	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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