

NL17SZ17

Single Non-Inverting Buffer with Schmitt Trigger

The NL17SZ17 is a single Non-inverting Schmitt Trigger Buffer 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
- Source/Sink 24 mA at 3.0 Volts
- Overvoltage Tolerant Inputs and Outputs
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Pb-Free Packages are Available

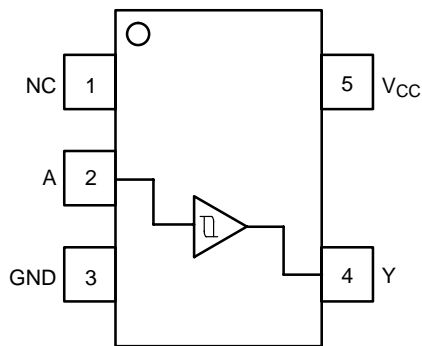


Figure 1. Pinout (Top View)

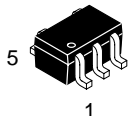


Figure 2. Logic Symbol



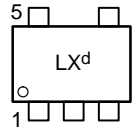
ON Semiconductor®

MARKING DIAGRAMS



5
1

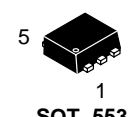
SOT-353/SC70-5/SC-88A
DF SUFFIX
CASE 419A



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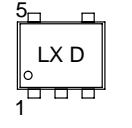
LX^d

d = Date Code



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SOT-553
XV5 SUFFIX
CASE 463B



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LX D

LX = Device Marking
D = One Digit Date Code

PIN ASSIGNMENT

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

FUNCTION TABLE

A Input	Y Output
L	L
H	H

ORDERING INFORMATION

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

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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 $V_I < GND$	-50	mA
I_{OK}	DC Output Diode Current $V_O < GND$	-50	mA
I_O	DC Output Sink Current	± 50	mA
I_{CC}	DC Supply Current per Supply Pin	± 100	mA
I_{GND}	DC Ground Current per Ground Pin	± 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
θ_{JA}	Thermal Resistance SOT-353 (Note 2) SOT-553	350 496	°C/W
P_D	Power Dissipation in Still Air at 85°C SOT-353 SOT-553	186 135	mW
MSL	Moisture Sensitivity	Level 1	
F_R	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$I_{Latchup}$	Latchup Performance Above V_{CC} and Below GND at 85°C (Note 6)	± 500	mA
ESD	ESD Classification Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model	Class IC Class A 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. 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, rated to EIA/JESD22-A114-B.
4. Tested to EIA/JESD22-A115-A, rated 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 $V_{CC} = 2.5 V \pm 0.2 V$ $V_{CC} = 3.0 V \pm 0.3 V$ $V_{CC} = 5.0 V \pm 0.5 V$	0 0 0	No Limit No Limit No Limit	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 _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
V _{T+}	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 _{T-}	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 _H	Input Hysteresis Voltage		1.65	0.1	0.48	0.9	0.1	0.9	V
			2.3	0.25	0.75	1.1	0.25	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 _{OH}	High-Level Output Voltage V _{IN} = V _{IH} or V _{IL}	I _{OH} = -100 μA I _{OH} = -3 mA I _{OH} = -8 mA I _{OH} = -12 mA I _{OH} = -16 mA I _{OH} = -24 mA I _{OH} = -32 mA	1.65 to 5.5	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V
			1.65	1.29	1.52		1.29		
			2.3	1.9	2.1		1.9		
			2.7	2.2	2.4		2.2		
			3.0	2.4	2.7		2.4		
			3.0	2.3	2.5		2.3		
			4.5	3.8	4.0		3.8		
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100 μA I _{OL} = 4 mA I _{OL} = 8 mA I _{OL} = 12 mA I _{OL} = 16 mA I _{OL} = 24 mA I _{OL} = 32 mA	1.65 to 5.5			0.1		0.1	V
			1.65		0.08	0.24		0.24	
			2.3		0.2	0.3		0.3	
			2.7		0.22	0.4		0.4	
			3.0		0.28	0.4		0.4	
			3.0		0.38	0.55		0.55	
			4.5		0.42	0.55		0.55	
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μA
I _{OFF}	Power Off-Output Leakage Current	V _{OUT} = 5.5 V	0			1.0		10	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5			1.0		10	μA

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0 ns)

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation Delay Input A to Y (Figures 3 and 4)	R _L = 1 MΩ, C _L = 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 _L = 500 Ω, C _L = 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 _{IN}	Input Capacitance	V _{CC} = 5.5 V, V _I = 0 V or V _{CC}	>2.5	pF
C _{PD}	Power Dissipation Capacitance (Note 8)	10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC} 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC}	9 11	pF

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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

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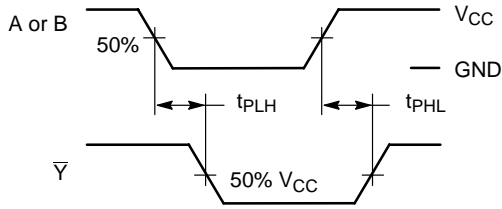
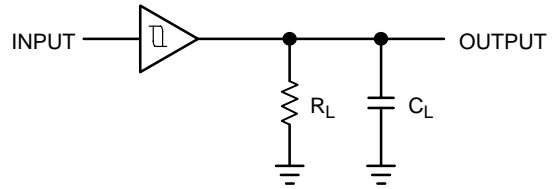


Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

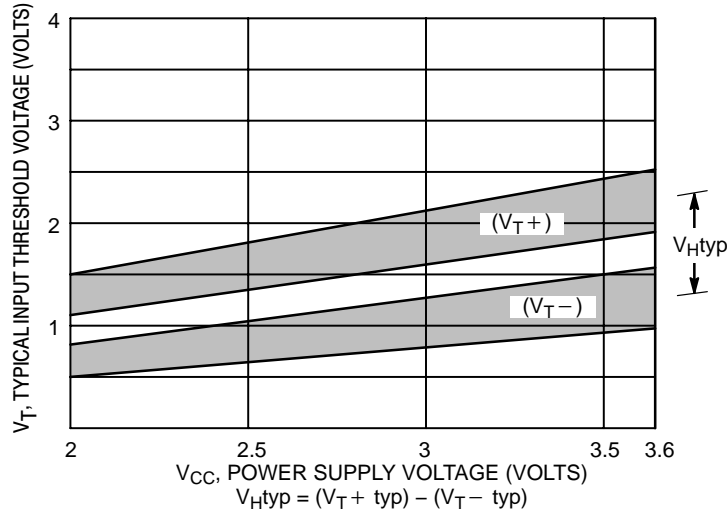


Figure 5. Typical Input Threshold, V_{T+} , V_{T-} versus Power Supply Voltage

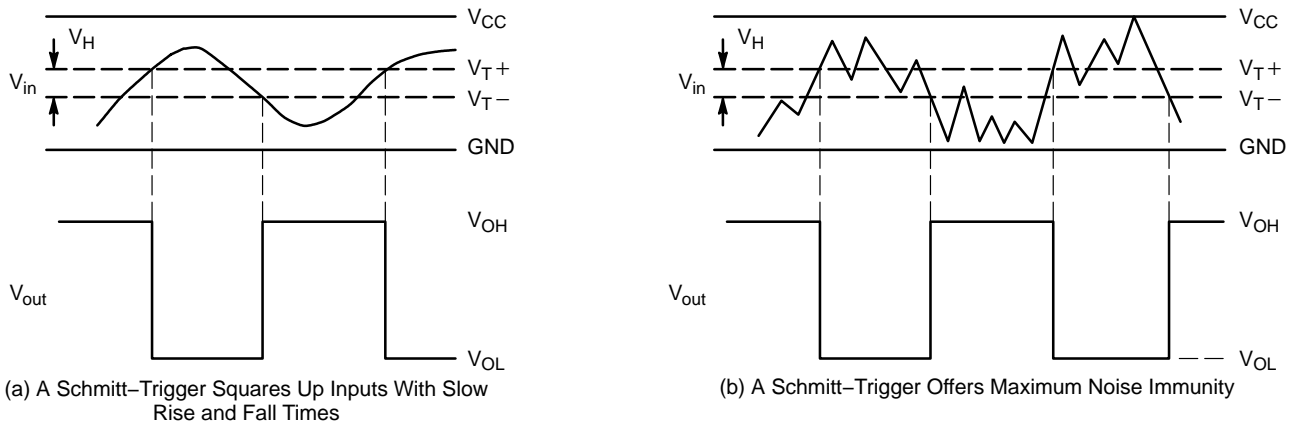


Figure 6. Typical Schmitt-Trigger Applications

DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type	Tape/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	SOT-353/SC70-5/ SC-88A	178 mm, 3000 Units
NL17SZ17DFT2G	NL	1	7	SZ	17	DF	T2	SOT-353/SC70-5/ SC-88A (Pb-Free)	178 mm, 3000 Units
NL17SZ17XV5T2	NL	1	7	SZ	17	XV5	T2	SOT-553* (Pb-Free)	178 mm, 4000 Units

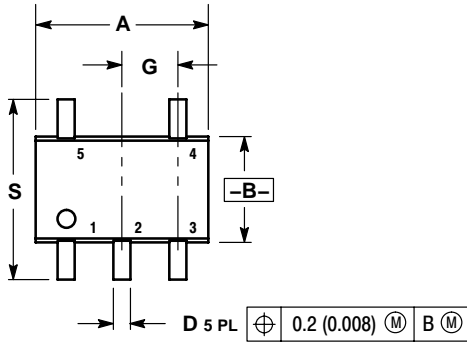
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

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PACKAGE DIMENSIONS

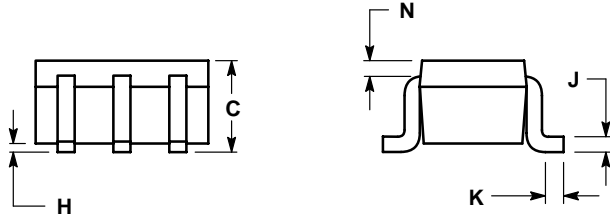
SOT-353
DF SUFFIX
5-LEAD PACKAGE
CASE 419A-02
ISSUE G



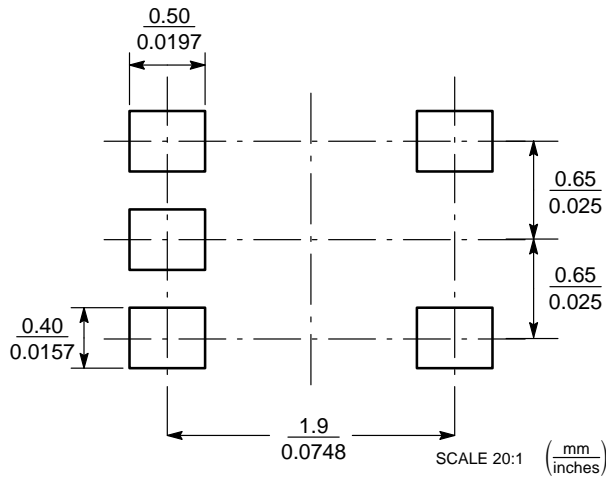
NOTES:

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.