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

ON Semiconductor®

http://onsemi.com

MARKING DIAGRAMS

SOT−353
(SC70−5/SC−88A)
DF SUFFIX
CASE 419A
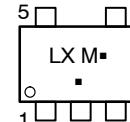
SOT−553
XV5 SUFFIX
CASE 463B
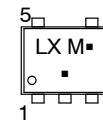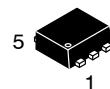
LX = Specific Device Code
M = Date Code*
 ▪ = Pb−Free Package
(Note: Microdot may be in either location)

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

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol

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.

NL17SZ17

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		-0.5 to $+7.0$	V
V_I	DC Input Voltage		$-0.5 \le V_I \le +7.0$	V
V_O	DC Output Voltage	Output in High or LOW State (Note 1)	$-0.5 \le V_O \le 7.0$	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	

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. 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		−55	+125	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	V_{CC} = 2.5 V ± 0.2 V V_{CC} = 3.0 V ± 0.3 V V_{CC} = 5.0 V ± 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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V$_{CC}$ (V)	T$_A$ = 25°C			−55°C ≤ T$_A$ ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V$_T$+	Positive Input Threshold Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.6 1.0 1.2 1.3 1.9 2.2	1.0 1.5 1.7 1.9 2.7 3.3	1.4 1.8 2.0 2.2 3.1 3.6	0.6 1.0 1.2 1.3 1.9 2.2	1.4 1.8 2.0 2.2 3.1 3.6	V
V$_T$−	Negative Input Threshold Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.2 0.4 0.5 0.6 1.0 1.2	0.5 0.75 0.87 1.0 1.5 1.9	0.8 1.15 1.4 1.5 2.0 2.3	0.2 0.4 0.5 0.6 1.0 1.2	0.8 1.15 1.4 1.5 2.0 2.3	V
V$_H$	Input Hysteresis Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.1 0.25 0.3 0.4 0.6 0.7	0.48 0.75 0.83 0.93 1.2 1.4	0.9 1.1 1.15 1.2 1.5 1.7	0.1 0.25 0.3 0.4 0.6 0.7	0.9 1.1 1.15 1.2 1.5 1.7	V
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 1.65 2.3 2.7 3.0 3.0 4.5	V$_{CC}$ − 0.1 1.29 1.9 2.2 2.4 2.3 3.8	V$_{CC}$ 1.52 2.1 2.4 2.7 2.5 4.0		V$_{CC}$ − 0.1 1.29 1.9 2.2 2.4 2.3 3.8		V
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 1.65 2.3 2.7 3.0 3.0 4.5		0.08 0.2 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$_{IN}$	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			−55°C ≤ T$_A$ ≤ 125°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 1.8 2.5 ± 0.2 3.3 ± 0.3 5.0 ± 0.5	2.0 2.0 1.0 1.0 0.5	9.1 7.6 5.0 3.7 3.1	15 12.5 9.0 6.3 5.2	2.0 2.0 1.0 1.0 0.5	15.6 13 9.5 6.5 5.5	ns
		R$_L$ = 500 Ω, C$_L$ = 50 pF	3.3 ± 0.3 5.0 ± 0.5	1.5 0.8	4.4 3.7	7.2 5.9	1.5 0.8	7.5 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$_{CC}$.

NL17SZ17
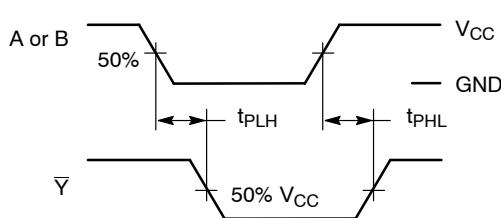
Figure 3. Switching Waveforms
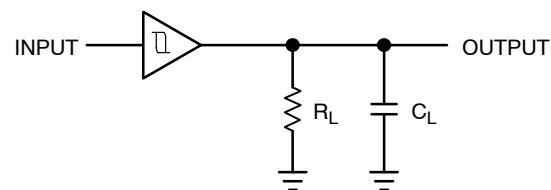
A 1 MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

$V_H$typ = (V_T+ typ) − (V_T- typ)
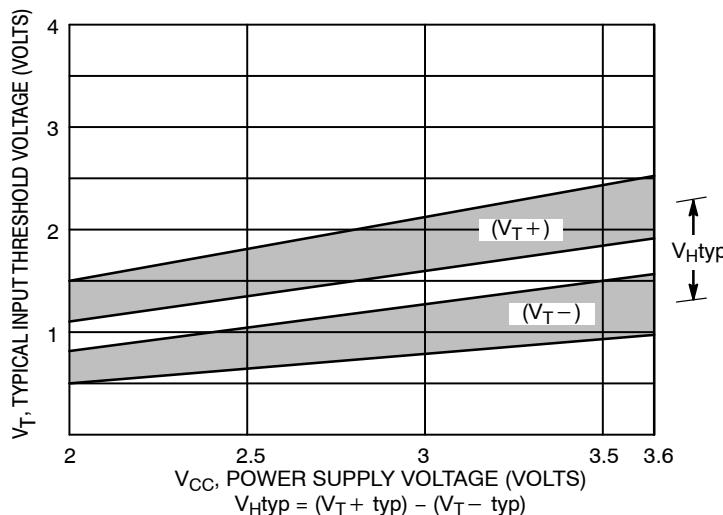
Figure 5. Typical Input Threshold, V_T+, V_T- versus Power Supply Voltage
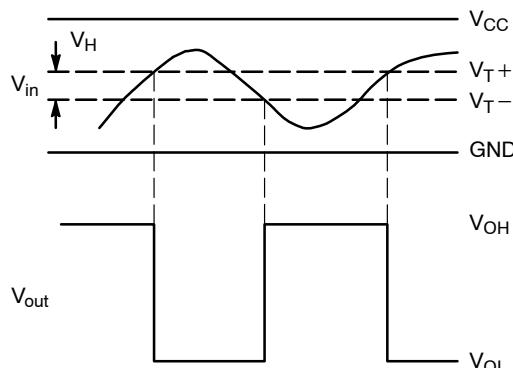
(a) A Schmitt−Trigger Squares Up Inputs With Slow Rise and Fall Times
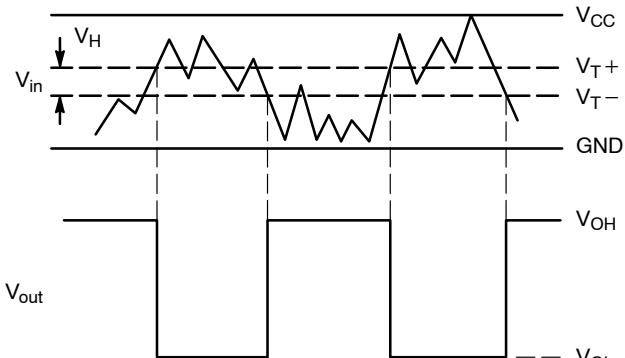
(b) A Schmitt−Trigger Offers Maximum Noise Immunity

Figure 6. Typical Schmitt−Trigger Applications

DEVICE ORDERING INFORMATION

Device Order Number	Package Type	Tape/Reel Size[†]
NL17SZ17DFT2	SOT−353/SC70−5/SC−88A	178 mm, 3000 Units / Tape & Reel
NL17SZ17DFT2G	SOT−353/SC70−5/SC−88A (Pb−Free)	178 mm, 3000 Units / Tape & Reel
NL17SZ17XV5T2	SOT−553*	178 mm, 4000 Units / Tape & Reel
NL17SZ17XV5T2G	SOT−553* (Pb−Free)	178 mm, 4000 Units / 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.
*This package is inherently Pb−Free.

NL17SZ17

SC−88A, SOT−353, SC−70
DF SUFFIX
CASE 419A−02
ISSUE J
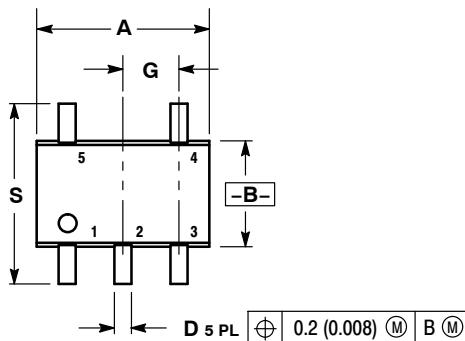
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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
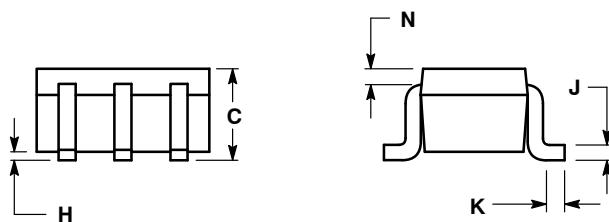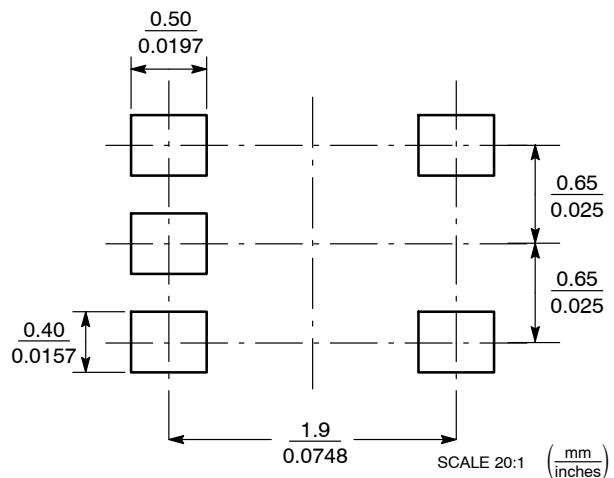
D 5 PL ⊕ 0.2 (0.008) Ⓜ B Ⓜ

SOLDERING FOOTPRINT*

0.50 / 0.0197

0.65 / 0.025

0.65 / 0.025

0.40 / 0.0157

1.9 / 0.0748

SCALE 20:1 (mm / inches)

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

PACKAGE DIMENSIONS

SOT−553
XV5 SUFFIX
CASE 463B−01
ISSUE B
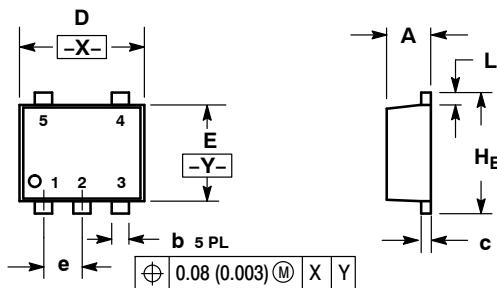
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

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
H_E	1.50	1.60	1.70	0.059	0.063	0.067

⊕ | 0.08 (0.003) Ⓜ | X | Y

SOLDERING FOOTPRINT*

0.3 / 0.0118
0.45 / 0.0177
1.0 / 0.0394
1.35 / 0.0531
0.5 / 0.0197
0.5 / 0.0197

SCALE 20:1 (mm/inches)

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