

NL17SH17

Single Schmitt-Trigger Buffer

The NL17SH17 is a single gate CMOS Schmitt-trigger non-inverting buffer fabricated with silicon gate CMOS technology. The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The NL17SH17 input structure provides protection when voltages up to 7 V are applied, regardless of the supply voltage. This allows the NL17SH17 to be used to interface 5 V circuits to 3 V circuits.

The NL17SH17 can be used to enhance noise immunity or to square up slowly changing waveforms.

Features

- High Speed: $t_{PD} = 4.0 \text{ ns}$ (Typ) at $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1.0 \mu\text{A}$ (Max) at $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 101
- These Devices are Pb-Free and are RoHS Compliant

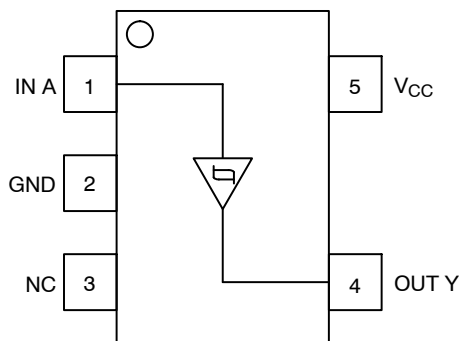


Figure 1. Pinout

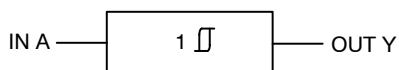


Figure 2. Logic Symbol



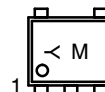
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAM



SOT-953
CASE 527AE



Y = Specific Device Code
(Rotated 90°)
M = Month Code

PIN ASSIGNMENT

1	IN A
2	GND
3	NC
4	OUT Y
5	V _{CC}

FUNCTION TABLE

Input A	Output Y
L	L
H	H

ORDERING INFORMATION

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

NL17SH17

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0	V
V _{IN}	DC Input Voltage	-0.5 to +7.0	V
V _{OUT}	DC Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current V _{IN} < GND	-20	mA
I _{OK}	DC Output Diode Current V _{OUT} < GND, V _{OUT} > V _{CC}	±20	mA
I _{OUT}	DC Output Source/Sink Current	±12.5	mA
I _{CC}	DC Supply Current per Supply Pin	±25	mA
I _{GND}	DC Ground Current per Ground Pin	±25	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
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) Machine Model (Note 3) Charged Device Model (Note 4)	>3000 >200 N/A	V
I _{LATCHUP}	Latchup Performance Above V _{CC} and Below GND at 125°C (Note 5)	±100	mA

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.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
V _{CC}	Positive DC Supply Voltage	1.65	5.5	V
V _{IN}	Digital Input Voltage	0.0	5.5	V
V _{OUT}	Output Voltage	0.0	V _{CC}	V
T _A	Operating Temperature Range	-55	+125	°C
Δt / ΔV	Input Transition Rise or Fall Rate V _{CC} = 3.3 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V	0	No Limit No Limit	ns/V

DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

Junction Temperature °C	Time, Hours	Time, Years
80	1,032,200	117.8
90	419,300	47.9
100	178,700	20.4
110	79,600	9.4
120	37,000	4.2
130	17,800	2.0
140	8,900	1.0



Figure 3. Failure Rate vs. Time Junction Temperature

NL17SH17

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25°C			T _A ≤ 85°C		-55°C to 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{T+}	Positive Threshold Voltage		3.0		2.0	2.2		2.2		2.2	V
			4.5		3.0	3.15		3.15		3.15	
			5.5		3.6	3.85		3.85		3.85	
V _{T-}	Negative Threshold Voltage		3.0	0.9	1.5		0.9		0.9		V
			4.5	1.35	2.3		1.35		1.35		
			5.5	1.65	2.9		1.65		1.65		
V _H	Hysteresis Voltage		3.0	0.3	0.57	1.2	0.3	1.2	0.3	1.2	V
			4.5	0.4	0.67	1.4	0.4	1.4	0.4	1.4	
			5.5	0.5	0.74	1.6	0.5	1.6	0.5	1.6	
V _{OH}	High-Level Output Voltage	V _{IN} ≥ V _{Tmin} I _{OH} = -50 μA	2.0	1.9	2.0		1.9		1.9		V
			3.0	2.9	3.0		2.9		2.9		
		4.5	4.4	4.5		4.4		4.4			
		V _{IN} ≥ V _{Tmin} I _{OH} = -4 mA I _{OH} = -8 mA	3.0	2.58			2.48		2.34		
4.5	3.94			3.80		3.66					
V _{OL}	Low-Level Output Voltage	V _{IN} ≤ V _{Tmax} I _{OL} = 50 μA	2.0		0.0	0.1		0.1		0.1	V
			3.0		0.0	0.1		0.1		0.1	
		4.5		0.0	0.1		0.1		0.1		
		V _{IN} ≤ V _{Tmax} I _{OL} = 4 mA I _{OL} = 8 mA	3.0			0.36		0.44		0.52	
4.5			0.36		0.44		0.52				
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0		±1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5			1.0		20		40	μA

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

Symbol	Parameter	V _{CC} (V)	Test Conditions	T _A = 25°C			T _A ≤ 85°C		-55°C to 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, A to Y	3.0 to 3.6	C _L = 15 pF C _L = 50 pF		7.0	12.8	1.0	15.0	1.0	17.0	ns
					8.5	16.3	1.0	18.5	1.0	20.5	
		4.5 to 5.5	C _L = 15 pF C _L = 50 pF		4.0	8.6	1.0	10.0	1.0	11.5	
					5.5	10.6	1.0	12.0	1.0	13.5	
C _{IN}	Input Capacitance				5.0	10		10		10	pF
C _{PD}	Power Dissipation Capacitance (Note 6)	Typical @ 25°C, V_{CC} = 5.0 V									
		7.0									pF

6. 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}.

NL17SH17

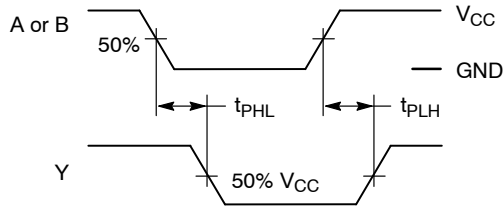
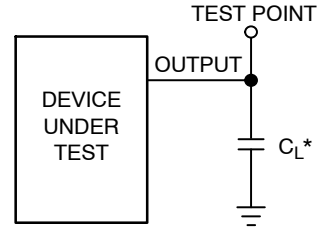


Figure 4. Switching Waveform



*Includes all probe and jig capacitance.

Figure 5. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping†
NL17SH17P5T5G	SOT-953 (Pb-Free)	8000 / 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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



SCALE 4:1

SOT-953 CASE 527AE ISSUE E

DATE 02 AUG 2011



TOP VIEW



SIDE VIEW



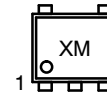
BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H _E	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3	---	---	0.15

GENERIC MARKING DIAGRAM*



- X = Specific Device Code
- M = Month Code

*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

DOCUMENT NUMBER:	98AON26457D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-953	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

