NL17SZ14

Single Inverter with Schmitt Trigger

The NL17SZ14 is a single inverter with Schmitt trigger 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 V
- Over−Voltage Tolerant Inputs and Outputs
- Pin For Pin with NC7SZ14
- Designed for 1.65 V to 5.5 V V_{CC} Operation
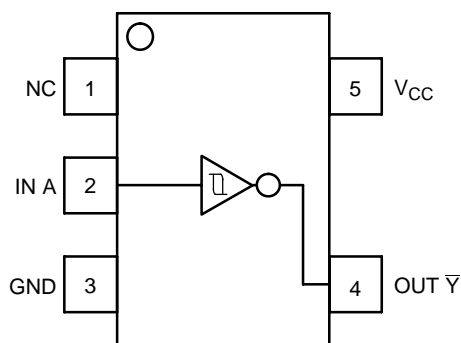- Chip Complexity: FET = 20
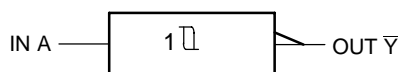- Pb−Free Packages are Available

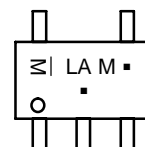**Figure 1. Pinout**

Figure 2. Logic Symbol

MARKING DIAGRAMS

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

SOT−553
XV5 SUFFIX
CASE 463B

LA	= Device Code
M	= Date Code*
A	= Assembly Location
Y	= Year
W	= Work Week
▪	= Pb−Free Package

(Note: Microdot may be in either location)

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

PIN ASSIGNMENT	
1	NC
2	IN A
3	GND
4	OUT $\overline{Y}$
5	V_{CC}

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

ORDERING INFORMATION

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

Publication Order Number:
NL17SZ14/D

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MAXIMUM RATINGS

Symbol	Characteristics		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
P_D	Power Dissipation in Still Air	SOT−353 SOT−553	186 135	mW
θ_{JA}	Thermal Resistance	SOT−353 SOT−553	350 496	°C/W
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	
ESD	ESD Classification	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	Class 2 Class C 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. 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_{CC}	Supply Voltage	Operating Data Retention Only	1.65 1.5	5.5 5.5	V
V_I	Input Voltage		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 ± 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

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$ Min	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	$-40°C \leq T_A \leq 85°C$ Min	$-40°C \leq T_A \leq 85°C$ Max	Unit
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}	$I_{OH} = -100 \mu A$	1.65 to 5.5	$V_{CC} - 0.1$	V_{CC}		$V_{CC} - 0.1$		V
		$I_{OH} = -3$ mA	1.65	1.29	1.52		1.29		
		$I_{OH} = -8$ mA	2.3	1.9	2.1		1.9		
		$I_{OH} = -12$ mA	2.7	2.2	2.4		2.2		
		$I_{OH} = -16$ mA	3.0	2.4	2.7		2.4		
		$I_{OH} = -24$ mA	3.0	2.3	2.5		2.3		
		$I_{OH} = -32$ mA	4.5	3.8	4.0		3.8		
V_{OL}	Low–Level Output Voltage $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 100 \mu A$	1.65 to 5.5		0.0	0.1		0.1	V
		$I_{OL} = 4$ mA	1.65		0.08	0.24		0.24	
		$I_{OL} = 8$ mA	2.3		0.2	0.3		0.3	
		$I_{OL} = 12$ mA	2.7		0.22	0.4		0.4	
		$I_{OL} = 16$ mA	3.0		0.28	0.4		0.4	
		$I_{OL} = 24$ mA	3.0		0.38	0.55		0.55	
		$I_{OL} = 32$ mA	4.5		0.42	0.55		0.55	
I_{IN}	Input Leakage Current	$V_{IN} = V_{CC}$ 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		10	μA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5			1		10	μA

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AC ELECTRICAL CHARACTERISTICS $t_R = t_F = 3.0$ ns

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$			$-40°C \leq T_A \leq 85°C$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay (Figure 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}	> 4.0	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	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}	25 30	pF

5. 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.
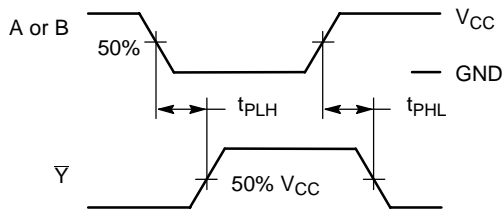
Figure 3. Switching Waveform
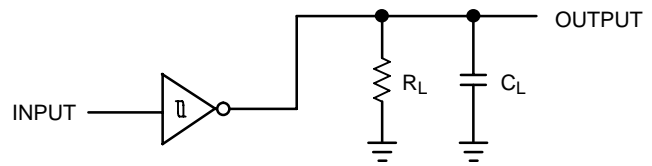
A 1–MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

| Device Order Number	Package Type	Tape and Reel Size†
NL17SZ14DFT2	SOT−353/SC70−5/SC−88A	3000 / Tape & Reel
NL17SZ14DFT2G	SOT−353/SC70−5/SC−88A (Pb−Free)	3000 / Tape & Reel
NL17SZ14XV5T2	SOT−553*	3000 / Tape & Reel
NL17SZ14XV5T2G	SOT−553*	3000 / 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.
*All Devices in Package SOT553 are Inherently Pb−Free.

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PACKAGE DIMENSIONS

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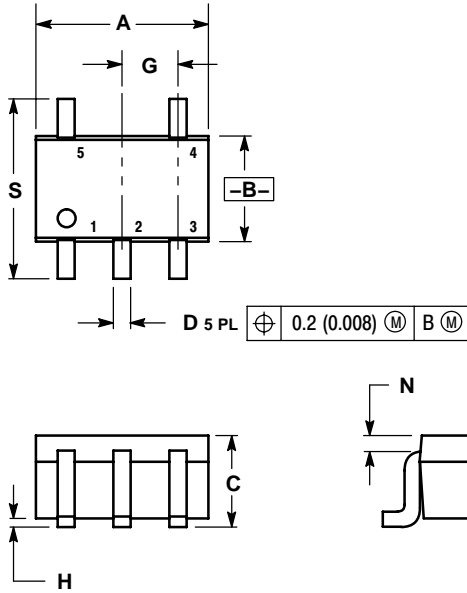
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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

SOLDERING FOOTPRINT*
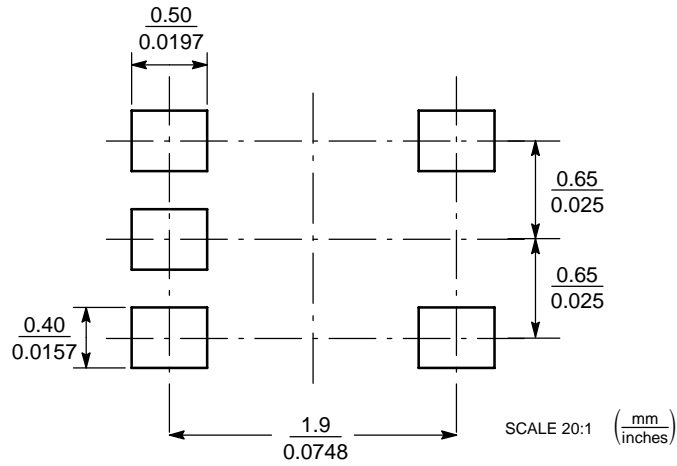
SCALE 20:1 $\left(\frac{mm}{inches}\right)$

*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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PACKAGE DIMENSIONS

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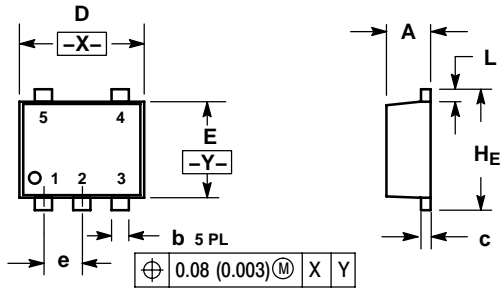
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

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*

$\frac{0.3}{0.0118}$

$\frac{0.45}{0.0177}$

$\frac{1.0}{0.0394}$

$\frac{1.35}{0.0531}$

$\frac{0.5}{0.0197}$ $\frac{0.5}{0.0197}$

SCALE 20:1 $\left(\dfrac{mm}{inches}\right)$

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