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Single Inverter with Schmitt Trigger

The NL17SZ14 is a single inverter with Schmitt trigger in three tiny footprint packages. The device performs much as LCX multi-gate products in speed and drive.

Features

- Tiny SOT-353, SOT-553 and SOT-953 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
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

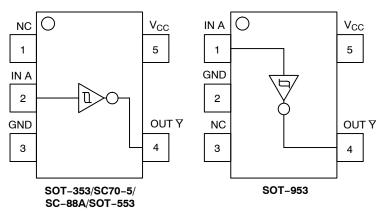


Figure 1. Pinout

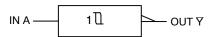


Figure 2. Logic Symbol



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MARKING DIAGRAMS



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





SOT-553 XV5 SUFFIX CASE 463B



LA = 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.



SOT-953 CASE 527AE



2 = Specific Device CodeM = Month Code

ORDERING INFORMATION

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

PIN ASSIGNMENT (SOT-353/SC70-5/SC-88A/SOT-553)

Pin	Function
1	NC
2	IN A
3	GND
4	OUT ₹
5	V _{CC}

PIN ASSIGNMENT (SOT-953)

Pin	Function
1	IN A
2	GND
3	NC
4	OUT ₹
5	V _{CC}

FUNCTION TABLE

Input	Output
Α	Y
L	Н
Н	L

MAXIMUM RATINGS

Symbol	Cha	aracteristics	Value	Units
V _{CC}	DC Supply Voltage		-0.5 to +7.0	V
VI	DC Input Voltage		$-0.5 \leq V_I \leq +7.0$	V
Vo	DC Output Voltage (SOT-353/SC70-5/SC-88A/SOT-	Output in High or LOW State (Note 1) 553 Packages)	-0.5 to V _{CC} + 0.5	V
Vo	DC Output Voltage (SOT-953 Package)	Output in High or LOW State (Note 1) Power-Down Mode (V _{CC} = 0 V)	-0.5 to V _{CC} + 0.5 -0.5 to + 0.5	V
I _{IK}	DC Input Diode Current	V _I < GND	-50	mA
lok	DC Output Diode Current (SOT-353/SC70-5/SC-88A/SOT-	V _O < GND, V _O > V _{CC} 553 Packages)	±50	mA
l _{ok}	DC Output Diode Current (SOT-95	-50	mA	
Io	DC Output Sink Current	±50	mA	
I _{CC}	DC Supply Current per Supply Pin	±100	mA	
I _{GND}	DC Ground Current per Ground Pir	1	±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 Cas	e for 10 Seconds	260	°C
TJ	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	
I _{LATCHUP}	Latchup Performance Above V _{CC} a	nd 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.

- Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
 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.
- Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Units	
V _{CC}	Supply Voltage	Operating Data Retention Only	1.65 1.5	5.5 5.5	V
VI	Input Voltage	0	5.5	V	
V _O	Output Voltage (SOT-353/SC70-5/SC-88A/SOT-553 Packages)	(High or LOW State)	0	5.5	V
Vo	Output Voltage (SOT-953 Package)	0	V _{CC}	V	
T _A	Operating Free-Air Temperature		-55	+125	°C
Δt/ΔV	Input Transition Rise or Fall Rate	$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$ $V_{CC} = 3.0 \text{ V} \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	0 0 0	No Limit No Limit No Limit	ns/V

DC ELECTRICAL CHARACTERISTICS

			V _{CC}	T _A	= 25°C		-55°C ≤ T _A	≤ 125°C	
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Units
V _T +	Positive Input		1.65	0.6	1.0	1.4	0.6	1.4	V
	Threshold Voltage		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		1.65	0.2	0.5	0.8	0.2	0.8	V
	Threshold Voltage		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		1.65	0.1	0.48	0.9	0.1	0.9	V
	Voltage		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	I _{OH} = -100 μA	1.65 to 5.5	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V
	Voltage V _{IN} = V _{IH} or V _{IL}	I _{OH} = -3 mA	1.65	1.29	1.52		1.29		
	"1" "1"	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	I _{OL} = 100 μA	1.65 to 5.5		0.0	0.1		0.1	V
	Voltage V _{IN} = V _{IH} or V _{IL}	I _{OL} = 3 mA	1.65	1	0.08	0.24	1	0.24	
	111 12	I _{OL} = 8 mA	2.3	1	0.2	0.3	1	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	1	0.38	0.55	1	0.55	
		I _{OL} = 32 mA	4.5	1	0.42	0.55	1	0.55	
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μΑ
I _{OFF}	Power Off Leakage Current (SOT-353/ SC70-5/SC-88A/ SOT-553 Packages)	V _{IN} = 5.5 V or V _{OUT} = 5.5 V	0			1		10	μΑ
I _{CC}	Quiescent Supply Current	V _{IN} = 5.5 V or GND	5.5			1		10	μΑ

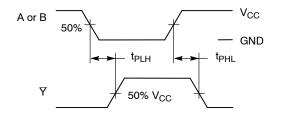
AC ELECTRICAL CHARACTERISTICS t_R = t_F = 3.0 ns

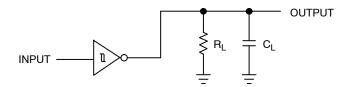
			V _{cc}	-	T _A = 25°C		$-55^{\circ}\text{C} \leq \text{T}_{\text{A}} \leq 125^{\circ}\text{C}$		
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Units
t _{PLH} t _{PHL}	Propagation Delay (Figure 3 and 4)	$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	$\begin{array}{c} 1.65 \\ 1.8 \\ 2.5 \pm 0.2 \\ 3.3 \pm 0.3 \\ 5.0 \pm 0.5 \end{array}$	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
		$R_L = 500 \ \Omega, C_L = 50 \ pF$	$3.3 \pm 0.3 \\ 5.0 \pm 0.5$	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	Units
C _{IN}	Input Capacitance	$V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	>4.0	pF
C _{PD}	Power Dissipation Capacitance (Note 6)	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

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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.





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

Figure 3. Switching Waveform

Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

Device Order Number	Package Type	Tape and Reel Size [†]
NL17SZ14DFT2G	SC-88A/SC-70-5/SOT-353 (Pb-Free)	3000 / Tape & Reel
NLV17SZ14DFT2G*	SC-88A/SC-70-5/SOT-353 (Pb-Free)	3000 / Tape & Reel
NL17SZ14XV5T2G	SOT-553 (Pb-Free)	4000 / Tape & Reel
NL17SZ14P5T5G	SOT-953 (Pb-Free)	8000 / Tape & Reel

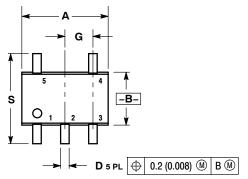
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

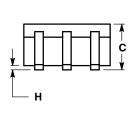
^{*}NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

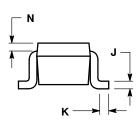
PACKAGE DIMENSIONS

SC-88A (SC-70-5/SOT-353)

CASE 419A-02 ISSUE L







- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

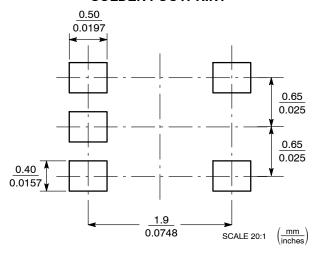
 2. CONTROLLING DIMENSION: INCH.

 3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.

 4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.071	0.087	1.80	2.20
В	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
Н		0.004		0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.004 0.012		0.30
N	0.008 REF		0.20	REF
S	0.079	0.087	2 00	2 20

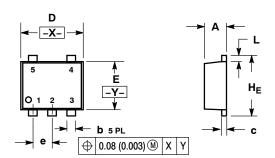
SOLDER FOOTPRINT*



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

PACKAGE DIMENSIONS

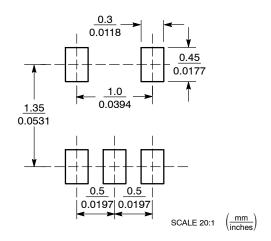
SOT-553 **XV5 SUFFIX** CASE 463B **ISSUE B**



- 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.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	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
С	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
Е	1.10	1.20	1.30	0.043	0.047	0.051
е	0.50 BSC				0.020 BSC	
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.50	1.60	1.70	0.059	0.063	0.067

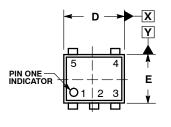
SOLDERING FOOTPRINT*



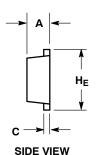
^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

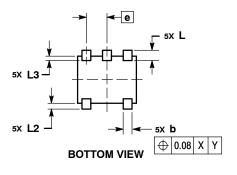
PACKAGE DIMENSIONS

SOT-953 CASE 527AE ISSUE E



TOP VIEW



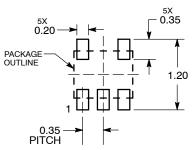


NOTES

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

	MILLIMETERS					
DIM	MIN	NOM	MAX			
Α	0.34	0.37	0.40			
b	0.10	0.15	0.20			
С	0.07	0.12	0.17			
D	0.95	1.00	1.05			
E	0.75	0.80	0.85			
е		0.35 BS	С			
HE	0.95	1.00	1.05			
L	-	0.175 REF				
L2	0.05	0.10	0.15			
L3			0.15			

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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