

NL17SZ08

Single 2-Input AND Gate

The NL17SZ08 is a single 2-input AND Gate in three tiny footprint packages. The device performs much as LCX multi-gate products in speed and drive. They should be used wherever the need for higher speed and drive are needed.

Features

- Tiny SOT-353, SOT-553 and SOT-953 Packages
- 2.7 ns T_{PD} at 5.0 V (typ)
- Source/Sink 24 mA at 3.0 V
- Overvoltage Tolerant Inputs
- Pin For Pin with NC7SZ08P5X, TC7SZ08FU and TC7SZ08AFE
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

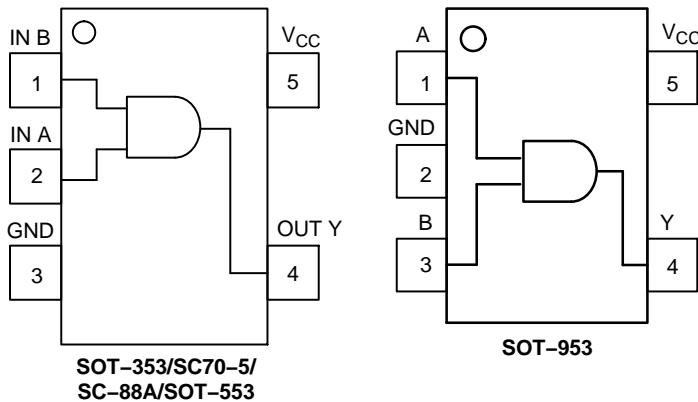


Figure 1. Pinout (Top View)

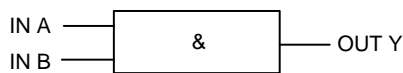
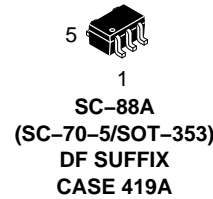


Figure 2. Logic Symbol

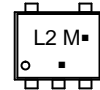
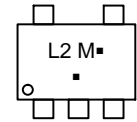


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MARKING DIAGRAMS



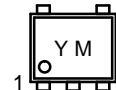
L2 = Specific Device Marking
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

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



SOT-953
CASE 527AE



Y = Specific Device Code
M = Month Code

ORDERING INFORMATION

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

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

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

PIN ASSIGNMENT (SOT-953)

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

FUNCTION TABLE

Input		Output Y = AB
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

MAXIMUM RATINGS

Symbol	Parameter	Value	Units	
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 (SOT-353/SC70-5/SC-88A/SOT-553 Packages)	-0.5 to +7.0	V	
V _{OUT}	DC Output Voltage (SOT-953 Package)	-0.5 to V _{CC} + 0.5	V	
I _{IK}	DC Input Diode Current	-50	mA	
I _{OK}	DC Output Diode Current (SOT-953 Package) V _{OUT} < GND, V _{OUT} > V _{CC}	±50	mA	
I _{OK}	DC Output Diode Current (SOT-353/SC70-5/SC-88A/SOT-553 Packages) V _{OUT} < GND	-50	mA	
I _{OUT}	DC Output Sink Current	±50	mA	
I _{CC}	DC Supply Current per Supply 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 1) 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	
ESD	ESD Classification	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	2000 200 N/A	V
I _{LATCHUP}	Latchup Performance Above V _{CC} and Below GND at 125°C (Note 5)	±100	mA	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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.
5. Tested to EIA/JESD78.

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Units	
V _{CC}	DC Supply Voltage	1.65	5.5	V	
V _{IN}	DC Input Voltage	0	5.5	V	
V _{OUT}	DC Output Voltage (SOT-353/SC70-5/SC-88A/SOT-553 Packages)	0	5.5	V	
V _{OUT}	DC Output Voltage (SOT-953 Package)	0	V _{CC}	V	
T _A	Operating Temperature Range	-55	+125	°C	
t _p , t _f	Input Rise and Fall Time				
		V _{CC} = 3.0 V ±0.3 V	0	100	ns/V
		V _{CC} = 5.0 V ±0.5 V	0	20	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-55°C ≤ T _A ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75 V _{CC} 0.7 V _{CC}			0.75 V _{CC} 0.7 V _{CC}		V
V _{IL}	Low-Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25 V _{CC} 0.3 V _{CC}		0.25 V _{CC} 0.3 V _{CC}	V
V _{OH}	High-Level Output Voltage V _{IN} = V _{IL} or V _{IH}	I _{OH} = -100 μA	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			
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IH} or V _{OH}	I _{OL} = 100 μA	1.65 to 5.5			0.1		0.1	V
		I _{OL} = 3 mA	1.65		0.08	0.24		0.24	
		I _{OL} = 8 mA	2.3		0.20	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 _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} = 5.5 V or GND	5.5			1		10	μA
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	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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AC ELECTRICAL CHARACTERISTICS $t_R = t_F = 3.0 \text{ ns}$

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25^\circ\text{C}$			$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Units
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay (Figure 3 and 4)	$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	1.65	2.0	6.3	12	2.0	12.7	ns
		$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	1.8	2.0	6.2	10	2.0	10.5	
		$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	2.5 ± 0.2	0.8	3.4	7.0	0.8	7.5	
		$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	3.3 ± 0.3	0.5	2.6	4.7	0.5	5.0	
		$R_L = 500 \Omega, C_L = 50 \text{ pF}$		1.5	3.3	5.2	1.5	5.5	
		$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$	5.0 ± 0.5	0.5	2.2	4.1	0.5	4.4	
		$R_L = 500 \Omega, C_L = 50 \text{ pF}$		0.8	2.7	4.5	0.8	4.8	

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, $V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	25	pF
		10 MHz, $V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	30	

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

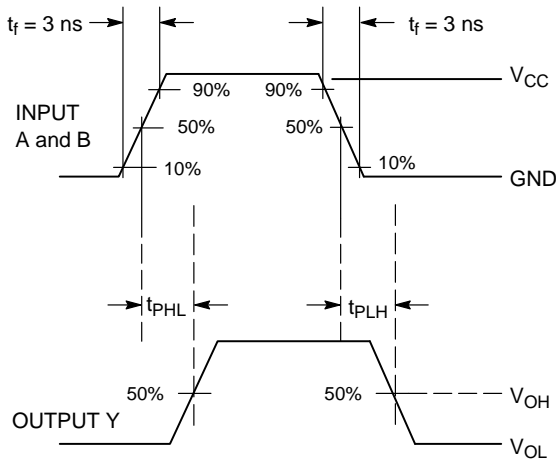
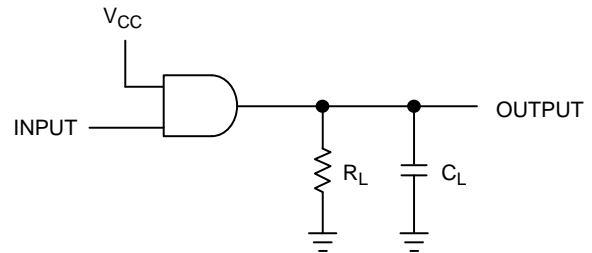


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

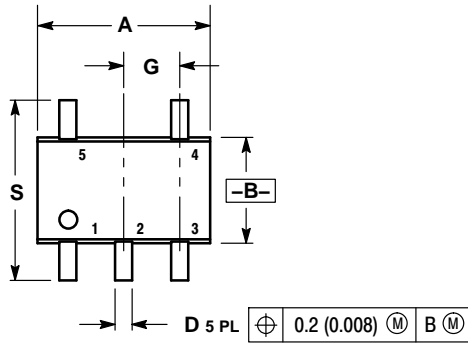
Device Order Number	Package Type	Tape and Reel Size [†]
NL17SZ08DFT2G	SC-88A/SC-70-5/SOT-353 (Pb-Free)	3000 / Tape & Reel
NL17SZ08XV5T2G	SOT-553 (Pb-Free)	4000 / Tape & Reel
NL17SZ08P5T5G	SOT-953 (Pb-Free)	8000 / Tape & Reel

[†]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.

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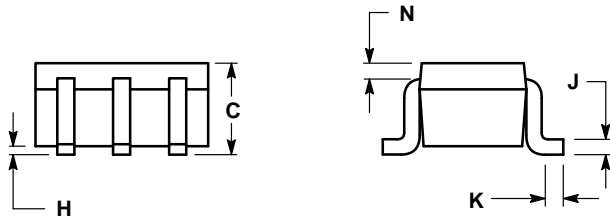
PACKAGE DIMENSIONS

SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE L

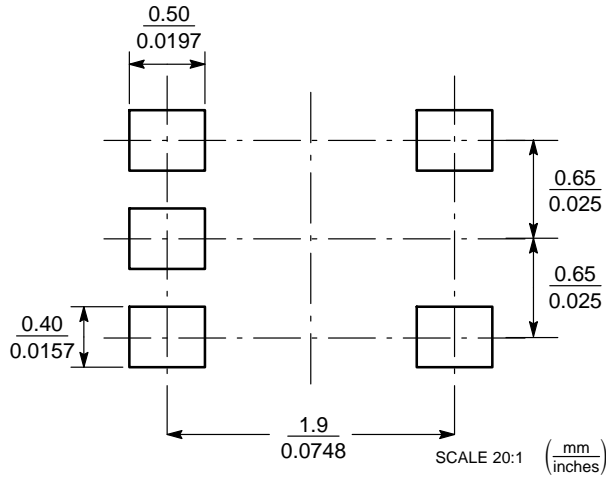


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
 4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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



SOLDER FOOTPRINT*

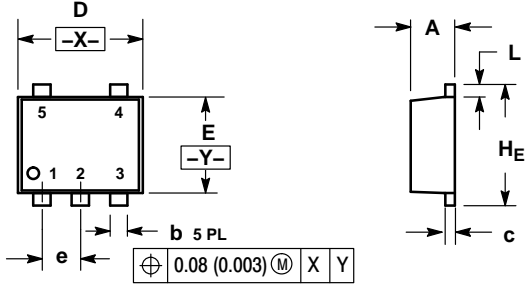


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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PACKAGE DIMENSIONS

SOT-553, 5 LEAD
 XV5 SUFFIX
 CASE 463B
 ISSUE C

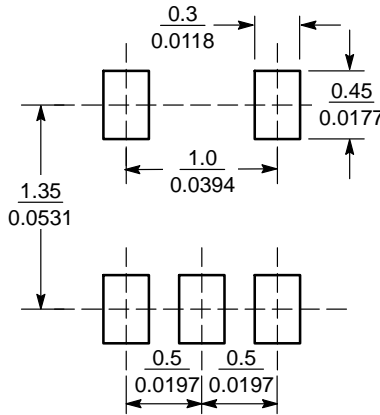


NOTES:

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	1.55	1.60	1.65	0.061	0.063	0.065
E	1.15	1.20	1.25	0.045	0.047	0.049
e	0.50 BSC			0.020 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.55	1.60	1.65	0.061	0.063	0.065

RECOMMENDED SOLDERING FOOTPRINT*



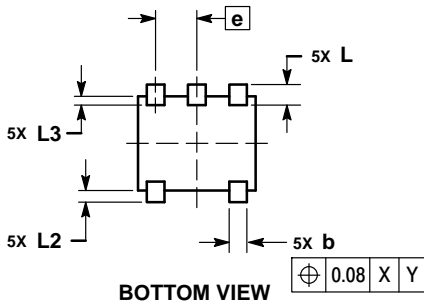
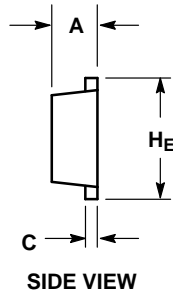
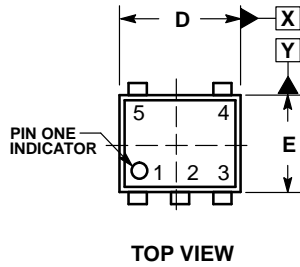
SCALE 20:1 (mm/inches)

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

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PACKAGE DIMENSIONS

SOT-953 CASE 527AE ISSUE E

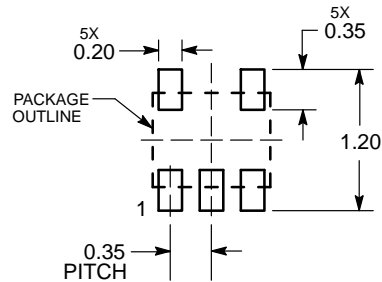


NOTES:

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		
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

*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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