NL17SZ00

Single 2-Input NAND Gate

The NL17SZ00 is a single 2−input NAND Gate 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
- 2.7 ns T_{PD} at 5 V (typ)
- Source/Sink 24 mA at 3.0 V
- Over−Voltage Tolerant Inputs
- Pin For Pin with NC7SZ00P5X, TC7SZ00FU and TC7SZ00AFE
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Pb−Free Packages are Available

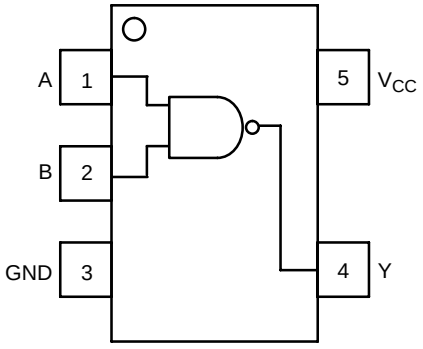


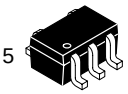
Figure 1. Pinout (Top View)



Figure 2. Logic Symbol

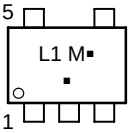
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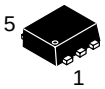


SOT−353/SC70−5/SC−88A
DF SUFFIX
CASE 419A

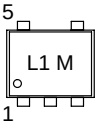
MARKING DIAGRAMS



L1 = Specific Device Marking
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)



SOT−553
XV5 SUFFIX
CASE 463B



L1 = Specific Device Marking
M = Date Code

PIN ASSIGNMENT

Pin	Function
1	A
2	B
3	GND
4	Y
5	V_{CC}

FUNCTION TABLE

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

ORDERING INFORMATION

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

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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		−50	mA
I_{OK}	DC Output Diode Current		−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)	Class Z 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. 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}	DC Supply Voltage		1.65	5.5	V
V_{IN}	DC Input Voltage		0	5.5	V
V_{OUT}	DC Output Voltage		0	V_{CC} + 0.5	V
T_A	Operating Temperature Range		−40	+85	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 3.0 V ±0.3 V V_{CC} = 5.0 V ±0.5 V	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			−40°C ≤ T_A ≤ 85°C		Unit
				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 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 1.55 1.9 2.2 2.4 2.3 3.8	V_{CC} 1.65 2.1 2.4 2.7 2.5 4.0		V_{CC} − 0.1 1.55 1.9 2.2 2.4 2.3 3.8		V
V_{OL}	Low−Level Output Voltage V_{IN} = V_{IH} or V_{OH}	I_{OL} = 100 μA I_{OL} = 3 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 0.20 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} = V_{CC} or GND	0 to 5.5			±0.1		±1.0	μA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND	5.5			1		10	μA

AC ELECTRICAL CHARACTERISTICS $t_R = t_F$ = 3.0 ns

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			−40°C ≤ T_A ≤ 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	5.4	11.4	2.0	12	ns
		R_L = 1 MΩ, C_L = 15 pF	1.8	2.0	4.5	9.5	2.0	10.0	
		R_L = 1 MΩ, C_L = 15 pF	2.5 to 0.2	0.8	3.0	6.5	0.8	7.0	
		R_L = 1 MΩ, C_L = 15 pF	3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
		R_L = 500 Ω, C_L = 50 pF		1.5	2.4	5.0	1.5	5.2	
		R_L = 1 MΩ, C_L = 15 pF	5.0 ± 0.5	0.5	2.0	3.9	0.5	4.1	
		R_L = 500 Ω, C_L = 50 pF		0.8	2.4	4.3	0.8	4.5	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	>4	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	25	pF
		10 MHz, V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	30	

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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

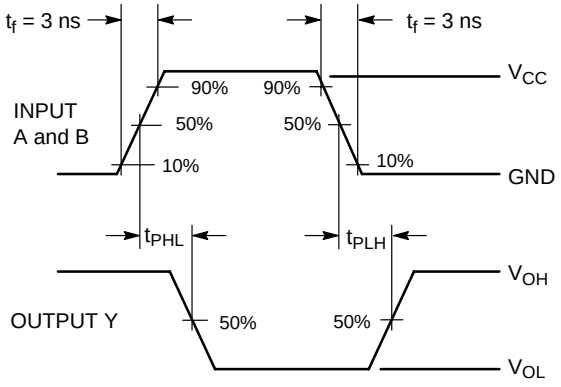
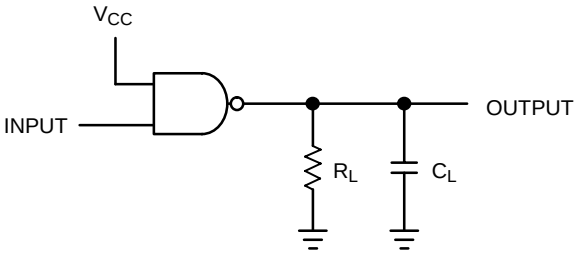


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

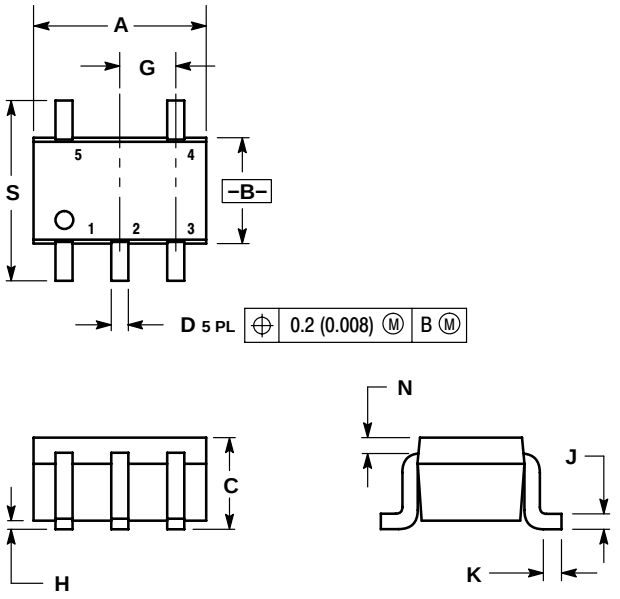
DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type	Tape and Reel Size†
	Logic Circuit Indicator	No. of Gates per Package	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape and Reel Suffix		
NL17SZ00DFT2	NL	1	7	SZ	00	DF	T2	SOT−353	178 mm, 3000 Units
NL17SZ00DFT2G	NL	1	7	SZ	00	DF	T2	SOT−353 (Pb−Free)	178 mm, 3000 Units
NL17SZ00XV5T2	NL	1	7	SZ	00	XV5	T2	SOT−553*	178 mm 4000 units
NL17SZ00XV5T2G	NL	1	7	SZ	00	XV5	T2	SOT−553*	178 mm 4000 units

†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.

PACKAGE DIMENSIONS

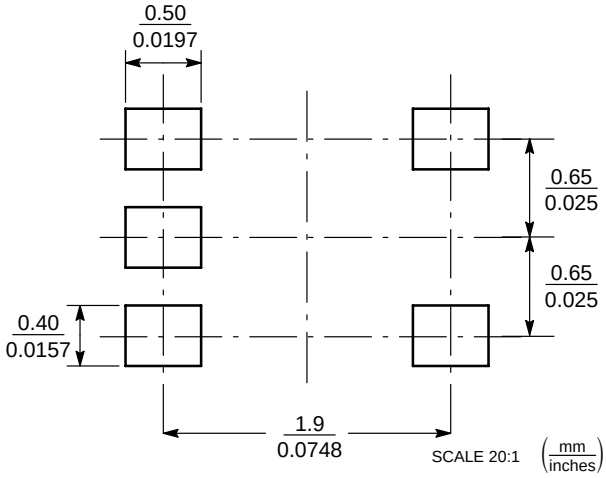
SOT−353
(SC−88A, SC−70)
DF SUFFIX
CASE 419A−02
ISSUE J



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.

	INCHES		MILLIMETERS	
DIM	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

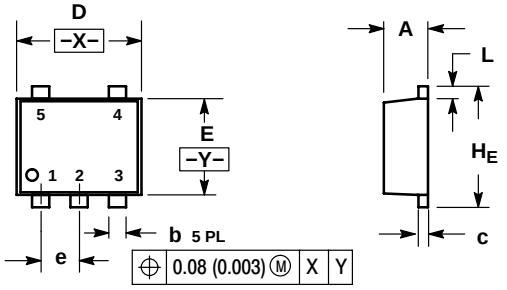
SOLDERING FOOTPRINT*



*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

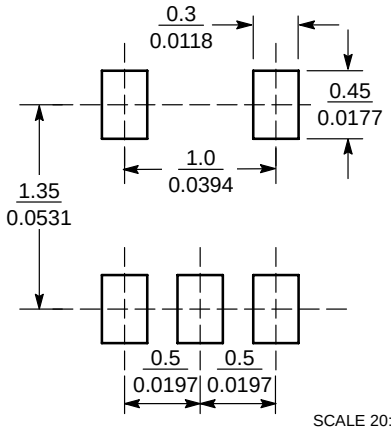
SOT−553
XV5 SUFFIX
CASE 463B−01
ISSUE B



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.

	MILLIMETERS			INCHES		
DIM	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

SOLDERING FOOTPRINT*



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

*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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