

# NL17SZ86

## Single 2-Input Exclusive-OR Gate

The NL17SZ86 is a high performance single 2-input Exclusive-OR Gate operating from a 2.3 V to 5.5 V supply.

### Features

- Extremely High Speed:  $t_{PD}$  2.4 ns (typical) at  $V_{CC} = 5.0$  V
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Over Voltage Tolerant Inputs
- LV-TTL Compatible – Interface Capability with 5.0 V TTL Logic with  $V_{CC} = 3$  V
- LVC-MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7SZ86
- These Devices are Pb-Free and are RoHS Compliant
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

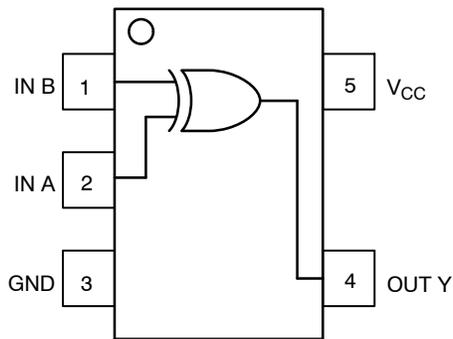


Figure 1. Pinout (Top View)

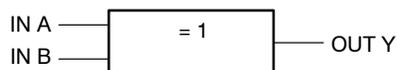


Figure 2. Logic Symbol



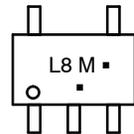
ON Semiconductor®

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

### MARKING DIAGRAM



M = Date Code  
A = Assembly Location  
Y = Year  
W = Work Week  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### PIN ASSIGNMENT

Pin	Assignment
1	IN B
2	IN A
3	GND
4	OUT Y
5	$V_{CC}$

### FUNCTION TABLE

Inputs		Output
A	B	Y
L	L	L
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 <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 V ≤ V <sub>I</sub> ≤ +7.0 V	V
V <sub>O</sub>	DC Output Voltage, Output in High or Low State (Note 1)	-0.5 V to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current V <sub>I</sub> < GND	-50	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>O</sub> < GND	-50	mA
I <sub>O</sub>	DC Output Sink Current	±50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	±100	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T <sub>J</sub>	Junction Temperature under Bias	+150	°C
θ <sub>JA</sub>	Thermal Resistance (Note 2)	350	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 85°C	150	mW
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
I <sub>Latchup</sub>	Latchup Performance Above V <sub>CC</sub> and Below GND @ 85°C (Note 3)	±500	mA
ESD	ESD Classification Human Body Model (Note 4) Machine Model (Note 5) Charge Device Model (Note 6)	Class 1B Class B 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. I<sub>O</sub> absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
3. Tested to EIA/JESD78
4. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
5. Tested to EIA/JESD22-A115-A, rated to EIA/JESD22-A115-B.
6. Tested to JESD22-C101-A.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating Data Retention Only	1.65 1.5	5.5 5.5	V
V <sub>I</sub>	Input Voltage (Note 7)	0	5.5	V
V <sub>O</sub>	Output Voltage (HIGH or LOW State)	0	5.5	V
T <sub>A</sub>	Operating Free-Air Temperature	-55	+125	°C
Δt/ΔV	Input Transition Rise or Fall Rate V <sub>CC</sub> = 2.5 V ± 0.2 V V <sub>CC</sub> = 3.0 V ± 0.3 V V <sub>CC</sub> = 5.0 V ± 0.5 V	0 0 0	20 10 5	ns/V

7. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>			0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>		V
V <sub>IL</sub>	Low-Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25 V <sub>CC</sub> 0.3 V <sub>CC</sub>		0.25 V <sub>CC</sub> 0.3 V <sub>CC</sub>	V
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OH</sub> = 100 μA I <sub>OH</sub> = -3 mA I <sub>OH</sub> = -8 mA I <sub>OH</sub> = -12 mA I <sub>OH</sub> = -16 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -32 mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.5 3.8	V <sub>CC</sub> 1.8 2.1 2.4 2.7 2.5 4.0		V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.3 3.8		V
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 100 μA I <sub>OL</sub> = 3 mA I <sub>OL</sub> = 8 mA I <sub>OL</sub> = 12 mA I <sub>OL</sub> = 16 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 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 <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V	0			1		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 5.5 V or GND	5.5			1		10	μA

## AC ELECTRICAL CHARACTERISTICS t<sub>R</sub> = t<sub>F</sub> = 3.0 ns

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay (Figure 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.65	2.0	6.9	13.8	2.0	14.5	ns
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.8	2.0	5.7	11.5	2.0	12	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.5 ± 0.2	1.2	4.1	7.0	1.2	7.5	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	3.3 ± 0.3	0.8 1.2	3.0 3.8	4.8 5.4	0.8 1.2	5.2 5.9	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	5.0 ± 0.5	0.5 0.8	2.2 2.9	3.5 4.2	0.5 1.0	3.8 4.6	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	7.0	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 8)	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> 10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	9 11	pF

8. C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

# NL17SZ86

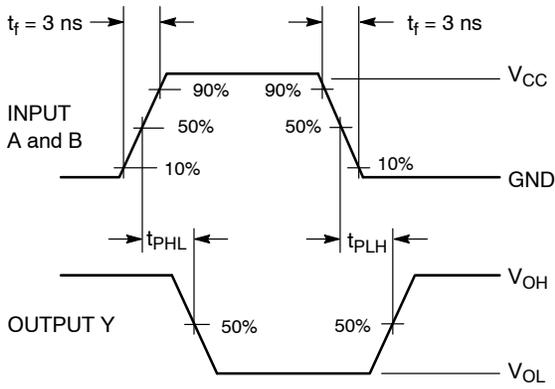
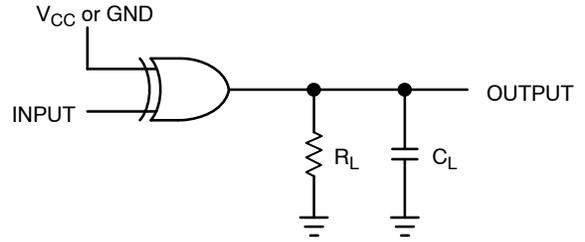


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

## DEVICE ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NL17SZ86DFT2G	SC70-5/SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
NLV17SZ86DFT2G*	SC70-5/SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel

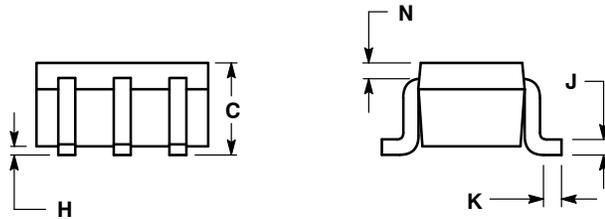
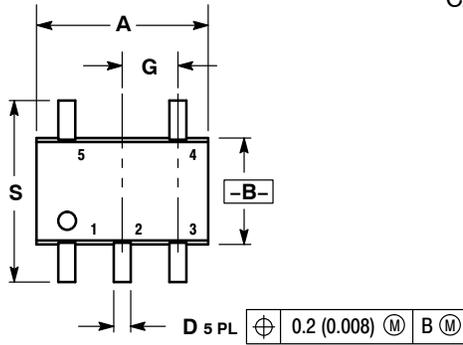
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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## PACKAGE DIMENSIONS

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

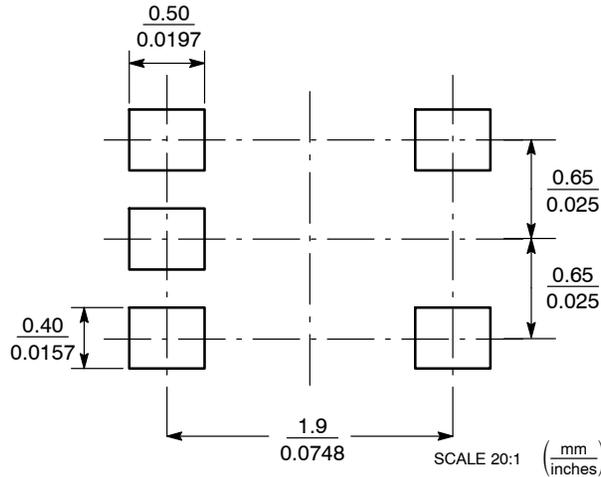


### NOTES:

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\*



\*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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