Single 2-Input Exclusive-OR Gate

NL17SZ86

The NL17SZ86 is a high performance single 2–input Exclusive–OR Gate in tiny footprint packages.

Features

- $\bullet\,$ Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.9 ns t_{PD} at $V_{CC} = 5 V (typ)$
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- IOFF Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in SC-88A, SC-74A, SOT-553, SOT-953 and UDFN6 Packages
- Chip Complexity < 100 FETs
- 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, Halogen Free/BFR Free and are RoHS Compliant

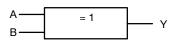


Figure 1. Logic Symbol



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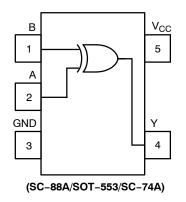
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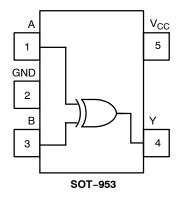
		MARKING DIAGRAMS
Sign .	SC-88A DF SUFFIX CASE 419A	□ □ ×× м• ○ •
	SC-74A DBV SUFFIX CASE 318BQ	
a see	SOT-553 XV5 SUFFIX CASE 463B	XX M•
	SOT-953 P5 SUFFIX CASE 527AE	1
1	UDFN6 1.45 x 1.0 CASE 517AQ	● XM
Ŷ	UDFN6 1.0 x 1.0 CASE 517BX	1 • X M
XX M	= Specific Devi = Date Code* = Pb-Free Pac	
	Microdot may be in eil	
*Date Co vary de	ode orientation and/o pending upon manufa	or position may cturing location.

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet.

NL17SZ86





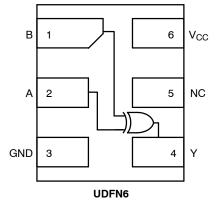


Figure 2. Pinout (Top View)

PIN ASSIGNMENT

(SC-88A/SOT-553/SC-74A)

Pin	Function		
1	В		
2	A		
3	GND		
4	Y		
5	V _{CC}		

PIN ASSIGNMENT (SOT-953)

Pin	Function
1	А
2	GND
3	В
4	Y
5	V _{CC}

PIN ASSIGNMENT (UDFN)

Pin	Function
1	В
2	A
3	GND
4	Y
5	NC
6	V _{CC}

FUNCTION TABLE

Inp	Output	
Α	В	Y
L	L	L
L	Н	Н
Н	L	Н
Н	Н	L

MAXIMUM RATINGS

Symbol	Characteristics	3	Value	Unit
V_{CC}	DC Supply Voltage SC-74A, SC-88	SC-88A (NLV) 3A, SOT-953, SOT-553, UDFN6	-0.5 to +7.0 -0.5 to +6.5	V
V _{IN}	DC Input Voltage SC-74A, SC-88	SC-88A (NLV) 3A, SOT-953, SOT-553, UDFN6	-0.5 to +7.0 -0.5 to +6.5	V
V _{OUT}	DC Output Voltage // SC–88A (NLV)	Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode (V _{CC} = 0 V)	-0.5 to V _{CC} + 0.5 -0.5 to +7.0 -0.5 to +7.0	V
	DC Output Voltage SC-74A, SC-88A, SOT-953, SOT-553, UDFN	Active-Mode (High or Low State) 6 Tri-State Mode (Note 1) Power-Down Mode (V _{CC} = 0 V)	-0.5 to V _{CC} + 0.5 -0.5 to +6.5 -0.5 to +6.5	V
I _{IK}	DC Input Diode Current			
I _{OK}	DC Output Diode Current	-50	mA	
I _{OUT}	DC Output Source/Sink Current	±50	mA	
I _{CC} or I _{GND}	DC Supply Current per Supply Pin or Ground Pi	±100	mA	
T _{STG}	Storage Temperature Range		-65 to +150	°C
ΤL	Lead Temperature, 1 mm from Case for 10 secs	3	260	°C
TJ	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 2)	SC-88A SC-74A SOT-553 SOT-953 UDFN6	377 320 324 254 154	°C/W
P _D	Power Dissipation in Still Air SC-74A SOT-553 SOT-953 UDFN6		332 390 386 491 812	mW
MSL	Moisture Sensitivity		Level 1	-
F _R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
V_{ESD}	ESD Withstand Voltage (Note 3)	Vithstand Voltage (Note 3) Human Body Model Charged Device Model		
I _{Latchup}	Latchup Performance (Note 4)		±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.
Applicable to devices with outputs that may be tri-stated.
Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V _{CC}	Positive DC Supply Voltage	1.65	5.5	V	
V _{IN}	DC Input Voltage		0	5.5	V
V _{OUT}		ve–Mode (High or Low State) Tri–State Mode (Note 1) wer–Down Mode (V _{CC} = 0 V)	0 0 0	V _{CC} 5.5 5.5	
T _A	Operating Temperature Range		-55	+125	°C
t _r , t _f	Input Rise and Fall Time SC-88A (NLV)	V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 V	0 0	100 20	ns/V
	Input Rise and Fall Time (SC-74A, SC-88A, SOT-953, SOT-553, UDFN6)	$\begin{array}{l} V_{CC} = 1.65 \ V \ to \ 1.95 \ V \\ V_{CC} = 2.3 \ V \ to \ 2.7 \ V \\ V_{CC} = 3.0 \ V \ to \ 3.6 \ V \\ V_{CC} = 4.5 \ V \ to \ 5.5 \ V \end{array}$	0 0 0 0	20 20 10 5	

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

			Vcc	Т,	T _A = 25°C		–55°C ≤ T	A ≤ 125°C	
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Units
V _{IH}	High-Level Input		1.65 to 1.95	0.65 V _{CC}	-	-	0.65 V _{CC}	_	V
	Voltage		2.3 to 5.5	0.70 V _{CC}	-	-	0.70 V _{CC}	-	
V _{IL}	Low-Level Input		1.65 to 1.95	-	-	$0.35 V_{CC}$	-	$0.35 V_{CC}$	V
	Voltage		2.3 to 5.5	-	-	$0.30 V_{CC}$	-	0.30 V _{CC}	
V _{OH}	High-Level Output Voltage	$ \begin{array}{l} V_{IN} = V_{IH} \mbox{ or } V_{IL} \\ I_{OH} = -100 \ \mu A \\ I_{OH} = -4 \ m A \\ I_{OH} = -8 \ m A \\ I_{OH} = -12 \ m A \\ I_{OH} = -16 \ m A \\ I_{OH} = -24 \ m A \\ I_{OH} = -32 \ m A \end{array} $	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	V _{CC} - 0.1 1.29 1.9 2.2 2.4 2.3 3.8	V _{CC} 1.4 2.1 2.4 2.7 2.5 4.0		V _{CC} - 0.1 1.29 1.9 2.2 2.4 2.3 3.8		V
V _{OL}	Low-Level Output Voltage		1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5		- 0.08 0.2 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	$V_{IN} = 5.5 \text{ V or GND}$	1.65 to 5.5	-	-	±0.1	-	±1.0	μΑ
I _{OFF}	Power Off Leakage Current	V _{IN} = 5.5 V or V _{OUT} = 5.5 V	0	-	-	1.0	_	10	μΑ
I _{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5	-	_	1.0	-	10	μΑ

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.

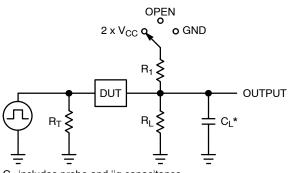
AC ELECTRICAL CHARACTERISTICS

			V _{cc}	T _A = 25°C		–55°C ≤ T			
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Мах	Units
t _{PLH,}	Propagation Delay,	R_L = 1 M Ω , C_L = 15 pF	1.65 to 1.95	-	6.9	13.8	-	14.5	ns
t _{PHL}	(A or B) to Y (Figures 3 and 4)	R_L = 1 M Ω , C_L = 15 pF	2.3 to 2.7	-	4.1	7.0	-	7.5	
		R_L = 1 M Ω , C_L = 15 pF	3.0 to 3.6	-	3.0	4.8	-	5.2	
		$R_L = 500 \ \Omega$, $C_L = 50 \ pF$		-	3.8	5.4	-	5.9	
		R_L = 1 MΩ, C_L = 15 pF	4.5 to 5.5	-	2.2	3.5	-	3.8	
		$R_L = 500 \ \Omega$, $C_L = 50 \ pF$		-	2.9	4.2	-	4.6	

CAPACITIVE CHARACTERISTICS

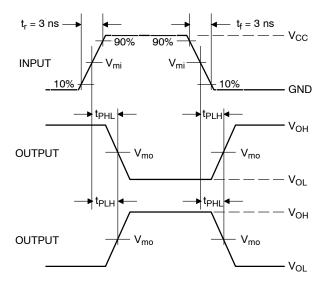
Symbol	Parameter	Condition	Typical	Units
C _{IN}	Input Capacitance	V_{CC} = 5.5 V, V_{IN} = 0 V or V_{CC}	2.5	pF
C _{OUT}	Output Capacitance	V_{CC} = 5.5 V, V_{IN} = 0 V or V_{CC}	2.5	pF
C _{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, V _{CC} = 3.3 V, V _{IN} = 0 V or V _{CC} 10 MHz, V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC}	9 11	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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.



 C_L includes probe and jig capacitance R_T is Z_{OUT} of pulse generator (typically 50 $\Omega)$ f = 1 MHz

Figure 3. Test Circuit



Test	Switch Position	C _L , pF	R_{L}, Ω	R ₁ , Ω	
t _{PLH} / t _{PHL}	Open	See AC Characteristics Table			
t _{PLZ} / t _{PZL}	$2 \times V_{CC}$	50	500	500	
t _{PHZ} / t _{PZH}	GND	50	500	500	

X = Don't Care

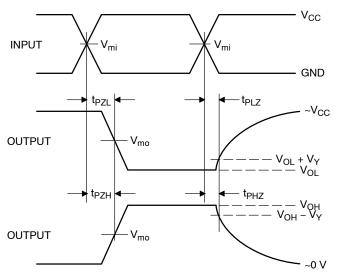


Figure 4. Switching Waveforms

		Vm		
V _{CC} , V	V _{mi} , V	t _{PLH} , t _{PHL}	t _{PZL} , t _{PLZ} , t _{PZH} , t _{PHZ}	V _Y , V
1.65 to 1.95	V _{CC} /2	V _{CC} /2	V _{CC} /2	0.15
2.3 to 2.7	V _{CC} /2	V _{CC} /2	V _{CC} /2	0.15
3.0 to 3.6	V _{CC} /2	V _{CC} /2	V _{CC} /2	0.3
4.5 to 5.5	V _{CC} /2	V _{CC} /2	V _{CC} /2	0.3

DEVICE ORDERING INFORMATION

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
NL17SZ86DFT2G	SC-88A	L8	Q4	3000 / Tape & Reel
NLV17SZ86DFT2G	SC-88A	L8	Q4	3000 / Tape & Reel
NL17SZ86DBVT1G	SC-74A	AQ	Q4	3000 / Tape & Reel
NL17SZ86XV5T2G (In Development)	SOT-553	TBD	Q4	4000 / Tape & Reel
NL17SZ86P5T5G	SOT-953	P (Rotated 180° CW)	Q2	8000 / Tape & Reel
NL17SZ86MU1TCG (In Development)	UDFN6, 1.45 x 1.0, 0.5P	TBD	Q4	3000 / Tape & Reel
NL17SZ86MU3TCG (In Development)	UDFN6, 1.0 x 1.0, 0.35P	TBD	Q4	3000 / Tape & Reel

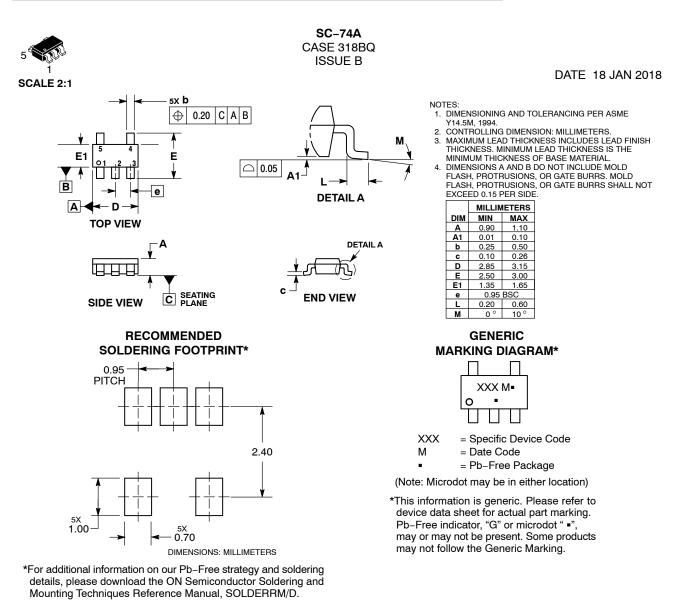
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D. *NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP

Capable.

Pin 1 Orientation in Tape and Reel

Direction of Feed 0 0 Ο Q1 Q2 Q1 Q2 01 02 Q4 Q3 04 Q3 04 03





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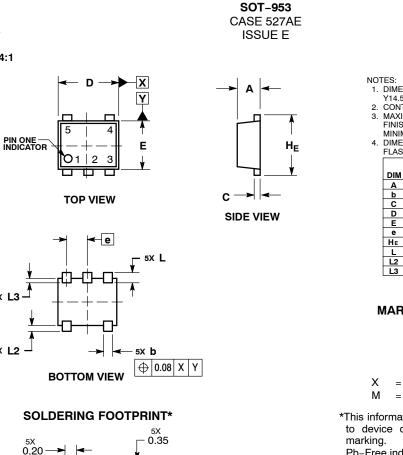
5X L3

5X L2

PACKAGE OUTLINE

0.35 PITCH





DATE 02 AUG 2011

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.

	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 BSC		
ΗE	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3			0.15

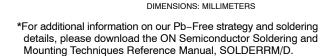
GENERIC **MARKING DIAGRAM***

= Specific Device Code

= Month Code

*This information is generic. Please refer to device data sheet for actual part

Pb-Free indicator, "G" or microdot " .", may or may not be present.



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