

# NLX3G14

## Triple Schmitt-Trigger Inverter

The NLX3G14 MiniGate™ is an advanced high-speed CMOS triple Schmitt-trigger inverter in ultra-small footprint.

The NLX3G14 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

The NLX3G14 can be used to enhance noise immunity or to square up slowly changing waveforms.

### Features

- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Low Power Dissipation:  $I_{CC} = 1 \mu A$  (Max) at  $T_A = 25^\circ C$
- 24 Balanced Output Source and Sink Capability
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- These are Pb-Free Devices

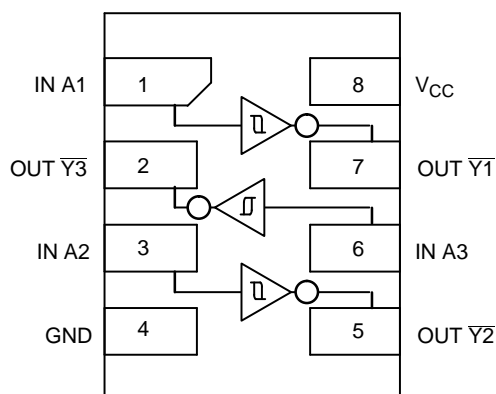


Figure 1. Pinout (Top View)

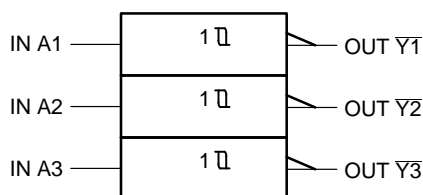


Figure 2. Logic Symbol

### FUNCTION TABLE

A	Y
L	H
H	L

### PIN ASSIGNMENT

1	IN A1
2	OUT $\bar{Y}3$
3	IN A2
4	GND
5	OUT $\bar{Y}2$
6	IN A3
7	OUT $\bar{Y}1$
8	$V_{CC}$



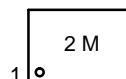
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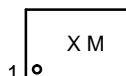
### MARKING DIAGRAMS



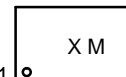
UDFN8  
1.45 x 1.0  
CASE 517BZ



UDFN8  
1.6 x 1.0  
CASE 517BY



UDFN8  
1.95 x 1.0  
CASE 517CA



F, AC, 2 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NLX3G14

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>OUT</sub>	DC Output Voltage	-0.5 to +7.0	V
I <sub>IK</sub>	DC Input Diode Current V <sub>IN</sub> < GND	-50	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>OUT</sub> < GND	±50	mA
I <sub>O</sub>	DC Output Source/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
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 N/A	V
I <sub>LATCHUP</sub>	Latchup Performance Above V <sub>CC</sub> and Below GND at 125°C (Note 5)	±500	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 no air flow.
2. Tested to EIA / JESD22-A114-A.
3. Tested to EIA / JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA / JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Positive DC Supply Voltage	1.65	5.5	V
V <sub>IN</sub>	Digital Input Voltage	0	5.5	V
V <sub>OUT</sub>	Output Voltage	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> = 3.3 V ± 0.3 V V <sub>CC</sub> = 5.0 V ± 0.5 V	0 0 0	No Limit No Limit No Limit	ns/V

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.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25 °C			T <sub>A</sub> = +85°C		T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>T+</sub>	Positive Threshold Voltage		1.65	0.6	1.0	1.4	0.6	1.4	0.6	1.4	V
			2.3	1.0	1.5	1.8	1.0	1.8	1.0	1.8	
			2.7	1.2	1.7	2.0	1.2	2.0	1.2	2.0	
			3.0	1.3	1.9	2.2	1.3	2.2	1.3	2.2	
			3.0	1.9	2.7	3.1	1.9	3.1	1.9	3.1	
4.5	2.2	3.3	3.6	2.2	3.6	2.2	3.6				
V <sub>T-</sub>	Negative Threshold Voltage		1.65	0.2	0.5	0.8	0.2	0.8	0.2	0.8	V
			2.3	0.4	0.75	1.15	0.4	1.15	0.4	1.15	
			2.7	0.5	0.87	1.4	0.5	1.4	0.5	1.4	
			3.0	0.6	1.0	1.5	0.6	1.5	0.6	1.5	
			3.0	1.0	1.5	2.0	1.0	2.0	1.0	2.0	
4.5	1.2	1.9	2.3	1.2	2.3	1.2	2.3				
V <sub>H</sub>	Hysteresis Voltage		1.65	0.1	0.48	0.9	0.1	0.9	0.1	0.9	V
			2.3	0.25	0.75	1.1	0.25	1.1	0.25	1.1	
			2.7	0.3	0.83	1.15	0.3	1.15	0.3	1.15	
			3.0	0.4	0.93	1.2	0.4	1.2	0.4	1.2	
			3.0	0.6	1.2	1.5	0.6	1.5	0.6	1.5	
4.5	0.7	1.4	1.7	0.7	1.7	0.7	1.7				
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>IN</sub> ≤ V <sub>T-MIN</sub> I <sub>OH</sub> = -100 μA	1.65 to 5.5	V <sub>CC</sub> - 0.1	V <sub>CC</sub>		V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1		V
		V <sub>IN</sub> ≤ V <sub>T-MIN</sub> I <sub>OH</sub> = -4 mA	1.65	1.29	1.52		1.29		1.29		
		I <sub>OH</sub> = -8 mA	2.3	1.9	2.1		1.9		1.8		
		I <sub>OH</sub> = -12 mA	2.7	2.2	2.4		2.2		2.1		
		I <sub>OH</sub> = -16 mA	3.0	2.4	2.7		2.4		2.3		
		I <sub>OH</sub> = -24 mA	3.0	2.3	2.5		2.3		2.2		
4.5	3.8	4.0		3.8		3.7					
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>IN</sub> ≥ V <sub>T+MAX</sub> I <sub>OL</sub> = 100 μA	1.65 to 5.5		0	0.1		0.1		0.1	V
		V <sub>IN</sub> ≥ V <sub>T+MAX</sub> I <sub>OH</sub> = 4 mA	1.65		0.08	0.24		0.24		0.24	
		I <sub>OH</sub> = 8 mA	2.3		0.2	0.3		0.3		0.4	
		I <sub>OH</sub> = 12 mA	2.7		0.22	0.4		0.4		0.5	
		I <sub>OH</sub> = 16 mA	3.0		0.28	0.4		0.4		0.5	
		I <sub>OH</sub> = 24 mA	3.0		0.38	0.55		0.55		0.55	
4.5		0.42	0.55		0.55		0.65				
I <sub>IN</sub>	Input Leakage Current	0 ≤ V <sub>IN</sub> ≤ 5.5 V	0 to 5.5			±0.1		±1.0		±1.0	μA
I <sub>OFF</sub>	Power-Off Output Leakage Current	V <sub>OUT</sub> = 5.5 V	0			1.0		10		10	μA
I <sub>CC</sub>	Quiescent Supply Current	0 ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	5.5			1.0		10		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 (Input $t_r = t_f = 3.0$ ns)

Symbol	Parameter	V <sub>CC</sub> (V)	Test Condition	T <sub>A</sub> = 25 °C			T <sub>A</sub> = +85°C		T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, Input A to Output Y	2.3–2.7	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.8	4.3	7.4	1.8	8.1	1.8	9.1	ns
		3.0–3.6	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.5	3.3	5.0	1.5	5.5	1.5	6.5	
				R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	1.8	4.0	6.0	1.8	6.6	1.8	
		4.5–5.5	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.0	2.7	4.1	1.0	4.5	1.0	5.5	
				R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	1.2	3.2	4.9	1.2	5.4	1.2	
C <sub>IN</sub>	Input Capacitance	5.5	V <sub>IN</sub> = 0 V or V <sub>CC</sub>		2.5						pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 6)	3.3 5.5	10 MHz V <sub>IN</sub> = 0 V or V <sub>CC</sub>		11 12.5						pF

6. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation  $I_{CC(OPER)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ . C<sub>PD</sub> is used to determine the no-load dynamic power consumption:  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

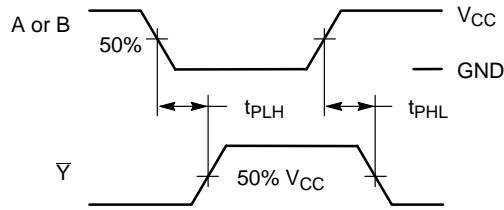
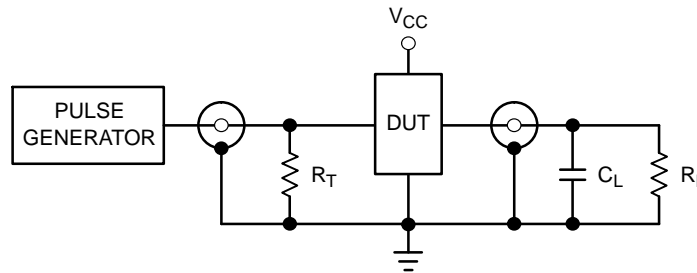


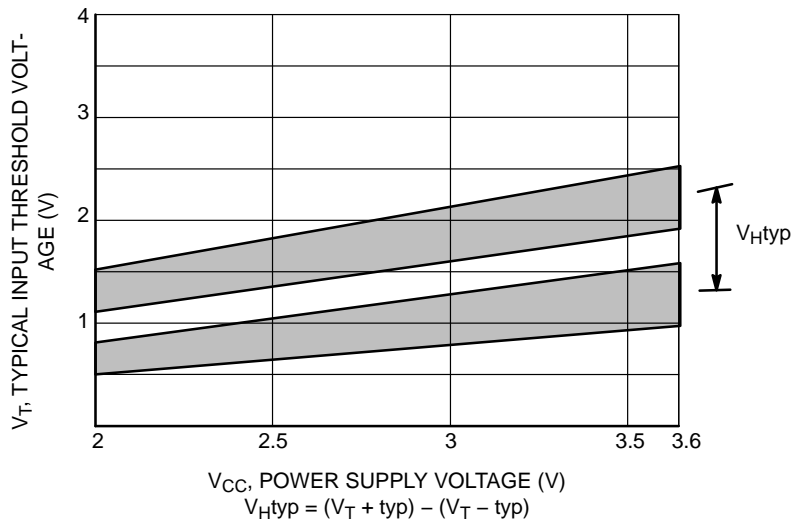
Figure 3. Switching Waveforms



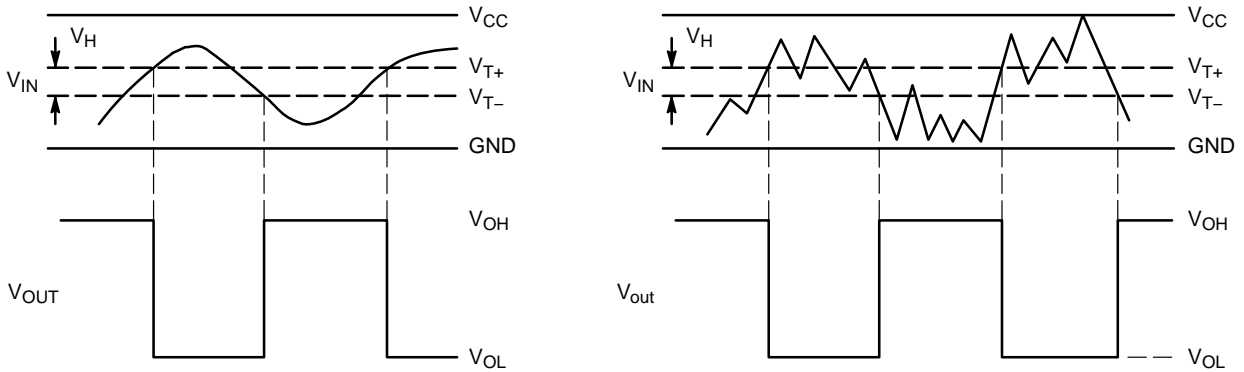
$R_T = Z_{OUT}$  of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

# NLX3G14



**Figure 5. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage**



(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times

(b) A Schmitt-Trigger Offers Maximum Noise Immunity

**Figure 6. Typical Schmitt-Trigger Applications**

## ORDERING INFORMATION

Device	Package	Shipping†
NLX3G14DMUTCG (In Development)	UDFN8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX3G14EMUTCG (In Development)	UDFN8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX3G14FMUTCG	UDFN8, 1.45 x 1.0, 0.35P (Pb-Free)	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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

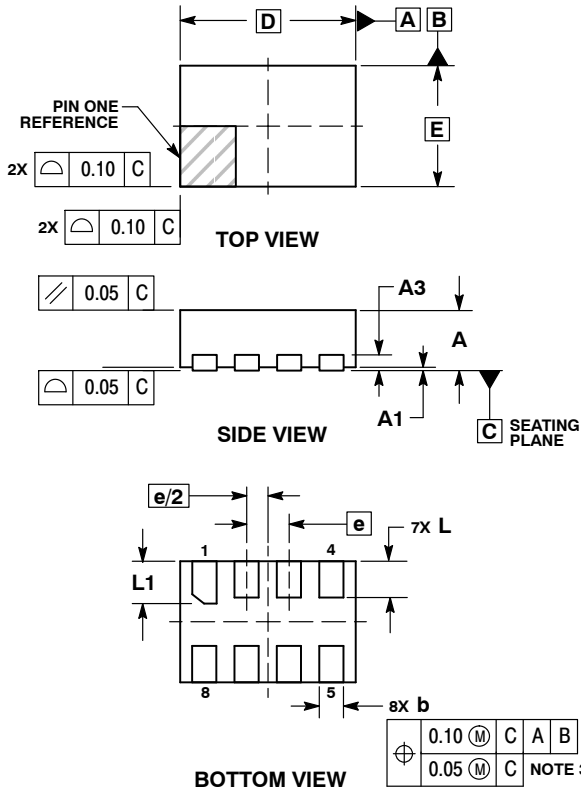
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UDFN8, 1.45x1, 0.35P  
CASE 517BZ-01  
ISSUE O

SCALE 4:1

DATE 18 MAY 2011

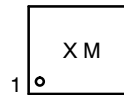


**NOTES:**

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: MILLIMETERS.
- DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
- PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13	REF
b	0.15	0.25
D	1.45	BSC
E	1.00	BSC
e	0.35	BSC
L	0.25	0.35
L1	0.30	0.40

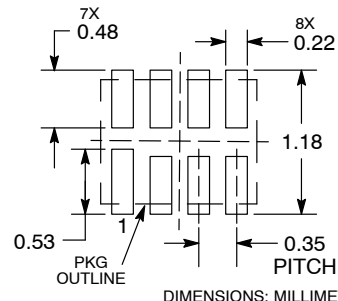
**GENERIC MARKING DIAGRAM\***



X = Specific Device Code  
M = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking.  
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

**RECOMMENDED 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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