## **Triple Non-Inverting Schmitt-Trigger Buffer**

The NLX3G17 MiniGate<sup>™</sup> is an advanced high-speed CMOS triple non-inverting Schmitt-trigger buffer in ultra-small footprint.

The NLX3G17 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

The NLX3G17 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<sub>CC</sub> Operation
- Low Power Dissipation:  $I_{CC} = 1 \mu A$  (Max) at  $T_A = 25^{\circ}C$
- 24 mA Balanced Output Source and Sink Capability @  $V_{CC} = 3.0 \text{ V}$
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- These are Pb-Free Devices

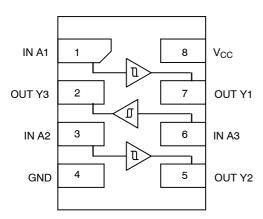


Figure 1. Pinout (Top View)

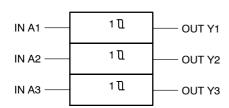


Figure 2. Logic Symbol

# FUNCTION TABLE A Y L L H H

#### **PIN ASSIGNMENT**

1
2
3
4
5
6
7
8
3 4 5 6 7



## ON Semiconductor®

http://onsemi.com

#### MARKING DIAGRAMS



ULLGA8 1.45 x 1.0 CASE 613AA





ULLGA8 1.6 x 1.0 CASE 613AB





ULLGA8 1.95 x 1.0 CASE 613AC





UDFN8 1.45 x 1.0 CASE 517BZ





UDFN8 1.6 x 1.0 CASE 517BY





UDFN8 1.95 x 1.0 CASE 517CA

1 × M

K or AE = 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.

#### **MAXIMUM RATINGS**

Symbol	Parame	eter	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
ΙO	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 S	Seconds	260	°C
$T_J$	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	
I <sub>LATCHUP</sub>	Latchup Performance Above V <sub>CC</sub> and Below	GND at 125 °C (Note 5)	±500	mA

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 no air flow.

2. Tested to EIA/JESD22-A114-A.

- 3. Tested to EIA/UESD22-A115-A.
- 4. Tested to JESD22-C101-A.
- 5. Tested to EIA / JESD78.

#### RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter			Max	Unit
V <sub>CC</sub>	Positive DC Supply Voltage		1.65	5.5	V
V <sub>IN</sub>	Digital Input Voltage			5.5	V
V <sub>OUT</sub>	Output Voltage			5.5	V
T <sub>A</sub>	Operating Free-Air Temperature		-55	+125	°C
Δt/ΔV	Input Transition Rise or Fall Rate	$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$ $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	0 0 0	No Limit No Limit No Limit	ns/V

### DC ELECTRICAL CHARACTERISTICS

			V <sub>CC</sub>	т	A = 25 °(	C	T <sub>A</sub> = 4	-85°C	T <sub>A</sub> = -5 +12		
Symbol	Parameter	Conditions	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
V <sub>T+</sub>	Positive Threshold Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.6 1.0 1.2 1.3 1.9 2.2	1.0 1.5 1.7 1.9 2.7 3.3	1.4 1.8 2.0 2.2 3.1 3.6	0.6 1.0 1.2 1.3 1.9 2.2	1.4 1.8 2.0 2.2 3.1 3.6	0.6 1.0 1.2 1.3 1.9 2.2	1.4 1.8 2.0 2.2 3.1 3.6	>
V <sub>T-</sub>	Negative Threshold Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.2 0.4 0.5 0.6 1.0	0.5 0.75 0.87 1.0 1.5 1.9	0.8 1.15 1.4 1.5 2.0 2.3	0.2 0.4 0.5 0.6 1.0	0.8 1.15 1.4 1.5 2.0 2.3	0.2 0.4 0.5 0.6 1.0	0.8 1.15 1.4 1.5 2.0 2.3	<b>&gt;</b>
V <sub>H</sub>	Low-Level Input Voltage		1.65 2.3 2.7 3.0 4.5 5.5	0.1 0.25 0.3 0.4 0.6 0.7	0.48 0.75 0.83 0.93 1.2 1.4	0.9 1.1 1.15 1.2 1.5 1.7	0.1 0.25 0.3 0.4 0.6 0.7	0.9 1.1 1.15 1.2 1.5 1.7	0.1 0.25 0.3 0.4 0.6 0.7	0.9 1.1 1.15 1.2 1.5	>
V <sub>OH</sub>	High- Level	$V_{IN} \ge V_{T+MAX}$ $I_{OH} = -100 \mu A$	1.65 – 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
	Output Voltage	$\begin{array}{c} V_{IN} \geq V_{T+MAX} \\ I_{OH} = -4 \text{ mA} \\ I_{OH} = -8 \text{ mA} \\ I_{OH} = -12 \text{ mA} \\ I_{OH} = -16 \text{ mA} \\ I_{OH} = -24 \text{ mA} \\ I_{OH} = -32 \text{ mA} \end{array}$	1.65 2.3 2.7 3.0 3.0 4.5	1.29 1.9 2.2 2.4 2.3 3.8	1.52 2.1 2.4 2.7 2.5 4.0		1.29 1.9 2.2 2.4 2.3 3.8		1.29 1.8 2.1 2.3 2.2 3.7		
V <sub>OL</sub>	Low-Level Output Voltage	$V_{IN} \leq V_{T-MIN}$ $I_{OL} = 100 \mu A$	1.65 – 5.5		0	0.1		0.1		0.1	V
	voltage	$\begin{aligned} &V_{IN} \leq V_{T-MIN} \\ &I_{OH} = 4 \text{ mA} \\ &I_{OH} = 8 \text{ mA} \\ &I_{OH} = 12 \text{ mA} \\ &I_{OH} = 16 \text{ mA} \\ &I_{OH} = 24 \text{ mA} \\ &I_{OH} = 32 \text{ mA} \end{aligned}$	1.65 2.3 2.7 3.0 3.0 4.5		0.08 0.2 0.22 0.28 0.38 0.42	0.24 0.3 0.4 0.4 0.55		0.24 0.3 0.4 0.4 0.55 0.55		0.24 0.4 0.5 0.5 0.55	
I <sub>IN</sub>	Input Leakage Current	$0 \le V_{\text{IN}} \le 5.5  \text{V}$	0 to 5.5			±0.1		±1.0		±1.0	μΑ
l <sub>OFF</sub>	Power-Off Output Leakage Current	V <sub>OUT</sub> = 5.5 V	0			1.0		10		10	μΑ
I <sub>CC</sub>	Quiescent Supply Current	$0 \le V_{IN} \le V_{CC}$	5.5			1.0		10		10	μΑ

### AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0 \text{ nS}$ )

		V <sub>CC</sub>	Test	т	A = 25 °C	С	<b>T</b> <sub>A</sub> = -	+85°C	T <sub>A</sub> = -5 +12	55°C to 5°C	
Symbol	Parameter	(V)	Condition	Min	Тур	Max	Min	Max	Min	Max	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Input A to Output	2.3 to 2.7	$R_L = 1 M\Omega$ , $C_L = 15 pF$	1.8	4.3	7.4	1.8	8.1	1.8	9.1	ns
	σαιραί	3.0 to 3.6	$R_L = 1 M\Omega$ , $C_L = 15 pF$	1.5	3.3	5.0	1.5	5.5	1.5	6.5	
			$R_L = 500 \Omega$ , $C_L = 50 pF$	1.8	4.0	5.0	1.8	6.6	1.8	7.6	
		4.5 to 5.5	$R_L = 1 M\Omega$ , $C_L = 15 pF$	1.0	2.7	4.1	1.0	4.5	1.0	5.5	
			$R_L = 500 \Omega$ , $C_L = 50 pF$	1.2	3.2	4.9	1.2	5.4	1.2	6.4	
C <sub>IN</sub>	Input Capacitance	5.5	V <sub>IN</sub> = 0 V or V <sub>CC</sub>		7.0						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>		9.0 11						pF

<sup>6.</sup> 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<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>.

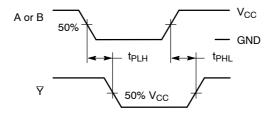
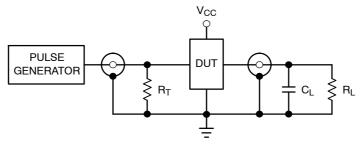


Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

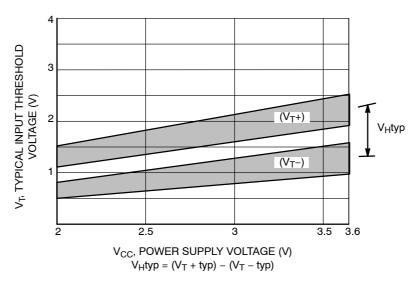
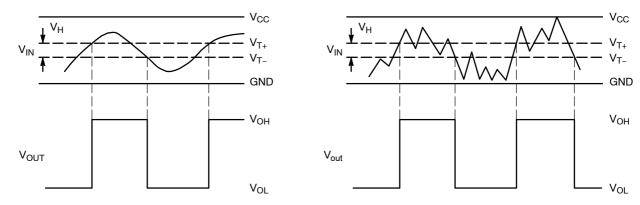


Figure 5. Typical Input Threshold,  $V_{T^+}$ ,  $V_{T^-}$  versus Power Supply Voltage



(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

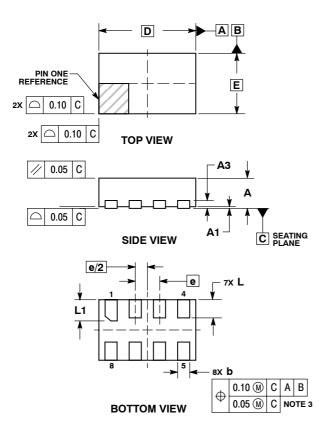
#### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
NLX3G17AMX1TCG	ULLGA8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX3G17BMX1TCG	ULLGA8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX3G17CMX1TCG	ULLGA8, 1.45 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel
NLX3G17DMUTCG	UDFN8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX3G17EMUTCG	UDFN8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX3G17FMUTCG	UDFN8, 1.45 x 1.0, 0.35P (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.

## **PACKAGE DIMENSIONS**

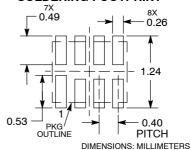
UDFN8 1.6x1.0, 0.4P CASE 517BY ISSUE O



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

	MILLIMETERS					
DIM	MIN	MAX				
Α	0.45	0.55				
A1	0.00	0.05				
A3	0.13 REF					
b	0.15	0.25				
D	1.60	BSC				
E	1.00	BSC				
е	0.40 BSC					
L	0.25	0.35				
L1	0.30	0.40				

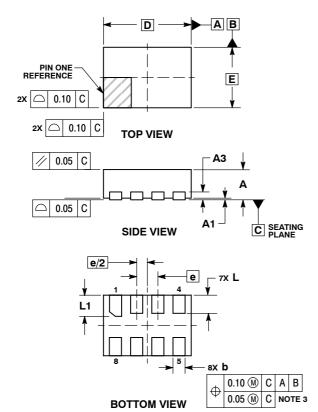
#### **RECOMMENDED SOLDERING FOOTPRINT\***



\*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**

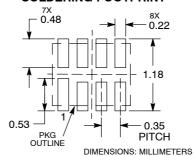
UDFN8 1.45x1.0, 0.35P CASE 517BZ ISSUE O



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION 6 APPLIES TO PLATED TERMINAL AND 1S MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
  - 0.15 AND 0.20 MM FROM TERMINAL TIP. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

	MILLIMETERS				
DIM	MIN	MAX			
Α	0.45	0.55			
A1	0.00	0.05			
А3	0.13 REF				
b	0.15	0.25			
D	1.45 BSC				
E	1.00 BSC				
е	0.35 BSC				
L	0.25	0.35			
L1	0.30	0.40			

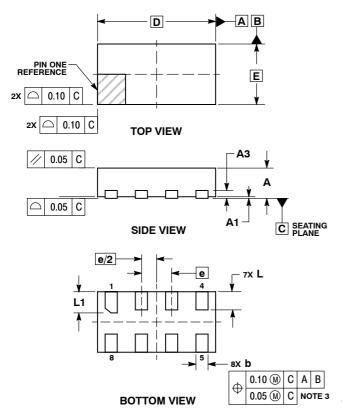
#### **RECOMMENDED SOLDERING FOOTPRINT\***



\*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

UDFN8 1.95x1.0, 0.5P CASE 517CA ISSUE O



#### NOTES:

- NOTES:

  1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

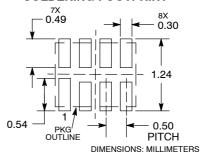
  2. CONTROLLING DIMENSION: MILLIMETERS.

  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.

  4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

	MILLIMETERS			
DIM	MIN MAX			
Α	0.45	0.55		
A1	0.00	0.05		
А3	0.13 REF			
b	0.15	0.25		
D	1.95 BSC			
E	1.00 BSC			
е	0.50 BSC			
Ĺ	0.25	0.35		
L1	0.30	0.40		

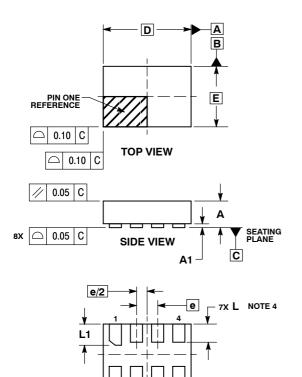
#### **RECOMMENDED SOLDERING FOOTPRINT\***



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#### PACKAGE DIMENSIONS

ULLGA8 1.45x1.0, 0.35P CASE 613AA ISSUE A



**BOTTOM VIEW** 

8X **b** 

 $\oplus$ 

0.10 C A B

0.05 C NOTE 3

- NOTES:

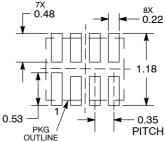
  1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

  2. CONTROLLING DIMENSION: MILLIMETERS.

  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
- 4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

	MILLIMETERS				
DIM	MIN	MAX			
Α		0.40			
A1	0.00	0.05			
b	0.15	0.25			
D	1.45 BSC				
E	1.00 BSC				
е	0.35 BSC				
Ĺ	0.25	0.35			
L1	0.30	0.40			

#### **MOUNTING FOOTPRINT SOLDERMASK DEFINED\***

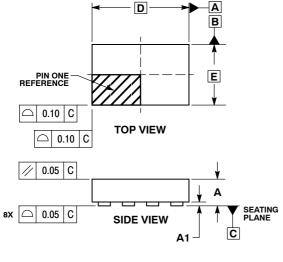


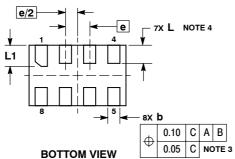
DIMENSIONS: MILLIMETERS

<sup>\*</sup>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

ULLGA8 1.6x1.0, 0.4P CASE 613AB **ISSUE A** 

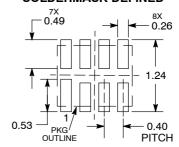




- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
  4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED. PACKAGE IS ALLOWED.

	MILLIMETERS			
DIM	MIN	MAX		
Α		0.40		
A1	0.00	0.05		
b	0.15	0.25		
D	1.60	BSC		
Е	1.00 BSC			
е	0.40 BSC			
L	0.25	0.35		
L1	0.30	0.40		

#### MOUNTING FOOTPRINT **SOLDERMASK DEFINED\***

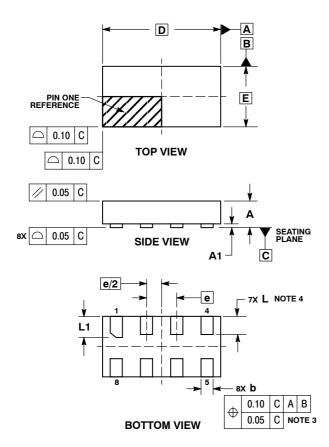


**DIMENSIONS: MILLIMETERS** 

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

#### PACKAGE DIMENSIONS

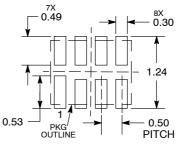
#### ULLGA8 1.95x1.0, 0.5P CASE 613AC **ISSUE A**



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER
  - ASME Y14.5M, 1994.
    CONTROLLING DIMENSION: MILLIMETERS.
- DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
- A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

	MILLIMETERS					
DIM	MIN	MAX				
Α		0.40				
A1	0.00	0.05				
b	0.15	0.25				
D	1.95 BSC					
Е	1.00 BSC					
е	0.50 BSC					
L	0.25	0.35				
L1	0.30	0.40				

#### **MOUNTING FOOTPRINT SOLDERMASK DEFINED\***



**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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