Triple Non-Inverting Buffer

The NLX3G16 MiniGate™ is an advanced high-speed CMOS triple non-inverting buffer in ultra-small footprint.

The NLX3G16 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: $t_{PD} = 1.8 \text{ ns (Typ)} @ V_{CC} = 5.0 \text{ V}$
- 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 mA Balanced Output Source and Sink Capability
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- These are Pb-Free Devices

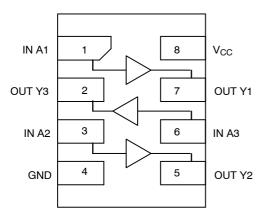


Figure 1. Pinout (Top View)

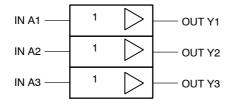


Figure 2. Logic Symbol



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



J or AD = Specific Device Code

M = Date Code

Pb-Free Package

PIN ASSIGNMENT

1	IN A1			
2	OUT Y3			
3	IN A2			
4	GND			
5	OUT Y2			
6	IN A3			
7	OUT Y1			
8	V _{CC}			

FUNCTION TABLE

Α	Υ
L H	L H

ORDERING INFORMATION

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

MAXIMUM RATINGS

Symbol	Paramete	Value	Unit	
V _{CC}	DC Supply Voltage		-0.5 to +7.0	٧
V _{IN}	DC Input Voltage		-0.5 to +7.0	٧
V _{OUT}	DC Output Voltage		-0.5 to +7.0	٧
I _{IK}	DC Input Diode Current	V _{IN} < GND	-50	mA
I _{OK}	DC Output Diode Current	V _{OUT} < GND	-50	mA
ΙO	DC Output Source/Sink Current	±50	mA	
I _{CC}	DC Supply Current Per Supply Pin	±100	mA	
I _{GND}	DC Ground Current per Ground Pin	±100	mA	
T _{STG}	Storage Temperature Range	-65 to +150	°C	
TL	Lead Temperature, 1 mm from Case for 10 Se	conds	260	°C
TJ	Junction Temperature Under Bias	150	°C	
MSL	Moisture Sensitivity		Level 1	
F _R	Flammability Rating Oxygen	Index: 28 to 34	UL 94 V-0 @ 0.125 in	
I _{LATCHUP}	Latchup Performance Above V _{CC} and Below 0	±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.

- Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
 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	Min	Max	Unit
V _{CC}	Positive DC Supply Voltage	1.65	5.5	V
V _{IN}	Digital Input Voltage	0	5.5	V
V _{OUT}	Output Voltage	0	5.5	V
T _A	Operating Free-Air Temperature	-55	+125	°C
Δt/ΔV	Input Transition Rise or Fall Rate $\begin{array}{c} V_{CC} = 1.8 \ V \pm 0.18 \\ V_{CC} = 2.5 \ V \pm 0.2 \ V \\ V_{CC} = 3.3 \ V \pm 0.3 \ V \\ V_{CC} = 5.0 \ V \pm 0.5 \ V \end{array}$	0 0 0 0	20 20 10 5	ns/V

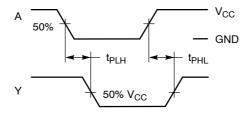
DC ELECTRICAL CHARACTERISTICS

			Vac	V _{CC} T _A = 25 °C		T _A = +	-85°C	T _A = -5 +12	55°C to 5°C		
Symbol	Parameter	Conditions	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
V _{IH}	Low-Level Input Voltage		1.65 to 5.5	0.70 x V _{CC}			0.70 x V _{CC}				V
V _{IL}	Low-Level Input Voltage		1.65 to 5.5			0.30 x V _{CC}		0.30 x V _{CC}		0.30 x V _{CC}	V
V _{OH}	High- Level Output	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -100 \mu A$	1.65 to .5	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V _{CC} - 0.1		V
	Voltage	$\begin{aligned} &V_{\text{IN}} = V_{\text{IH}} \text{ or } V_{\text{IL}} \\ &I_{\text{OH}} = -4 \text{ mA} \\ &I_{\text{OH}} = -8 \text{ mA} \\ &I_{\text{OH}} = -12 \text{ mA} \\ &I_{\text{OH}} = -16 \text{ mA} \\ &I_{\text{OH}} = -24 \text{ mA} \\ &I_{\text{OH}} = -32 \text{ mA} \end{aligned}$	1.65 2.3 2.7 3.0 3.0 4.5	1.4 1.9 2.2 2.4 2.3 3.8	1.50 2.1 2.4 2.7 2.5 4.0		1.4 1.9 2.2 2.4 2.3 3.8		1.4 1.9 2.2 2.4 2.3 3.8		
V _{OL}	Low-Level Output	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 100 \mu A$	1.65 – 5.5			0.1		0.1		0.1	V
	Voltage	$\begin{aligned} &V_{IN} = V_{IH} \text{ or } V_{IL} \\ &I_{OH} = 4 \text{ mA} \\ &I_{OH} = 8 \text{ mA} \\ &I_{OH} = 12 \text{ mA} \\ &I_{OH} = 16 \text{ mA} \\ &I_{OH} = 24 \text{ mA} \\ &I_{OH} = 32 \text{ mA} \end{aligned}$	1.65 2.3 2.7 3.0 3.0 4.5		0.2 0.2 0.22 0.28 0.38 0.42	0.24 0.3 0.4 0.4 0.55 0.55		0.24 0.3 0.4 0.4 0.55 0.55		0.24 0.3 0.4 0.4 0.55 0.55	
I _{IN}	Input Leakage Current	$0 \le V_{IN} \le 5.5 V$	0 to 5.5			±0.1		±1.0		±1.0	μΑ
l _{OFF}	Power-Off Output Leakage Current	V _{IN} or V _{OUT} = 5.5 V	0			1.0		10		10	μΑ
I _{CC}	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 _{cc}	Test	т	' _A = 25 °	С	T _A = -	+85°C		55°C to 5°C	
Symbol	Parameter	(V)	Condition	Min	Тур	Max	Min	Max	Min	Max	Unit
t _{PLH} , t _{PHL}	Propagation Delay Input A to Output	1.65–1.95	$R_L = 1 M\Omega$, $C_L = 15 pF$	1.8	6.0	7.9	1.8	8.8	1.8	12	ns
	Output	2.3-2.7	$R_L = 1 M\Omega$, $C_L = 15 pF$	1.0	3.0	5.2	1.0	5.8	1.0	9.1	
		3.0-3.6	$R_L = 1 M\Omega$, $C_L = 15 pF$	0.8	2.3	3.6	0.8	4.0	0.8	6.5	
			$R_L = 500 \Omega$, $C_L = 50 pF$	1.2	3.0	4.6	1.2	5.1	1.2	7.6	
		4.5–5.5	$R_L = 1 M\Omega$, $C_L = 15 pF$	0.5	1.8	2.9	0.5	3.2	0.5	5.5	
			$R_L = 500 \Omega$, $C_L = 50 pF$	0.8	2.4	3.8	0.8	4.2	0.8	6.4	
C _{IN}	Input Capacitance	5.5	V _{IN} = 0 V or V _{CC}		7.0						pF
C _{PD}	Power Dissipation Capacitance (Note 6)	3.3 5.5	10 MHz V _{IN} = 0 V or V _{CC}		9 11						pF

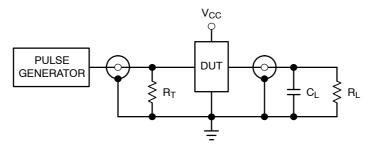
^{6.} C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no–load dynamic power consumption: P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.



PROPAGATION DELAYS

 t_R = t_F = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

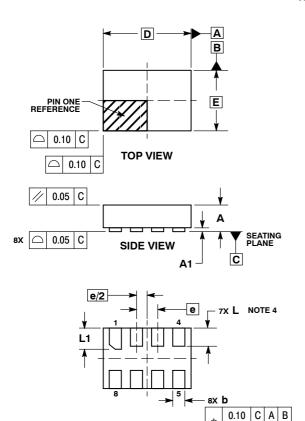
ORDERING INFORMATION

Device	Package	Shipping [†]
NLX3G16AMX1TCG	ULLGA8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX3G16BMX1TCG	ULLGA8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX3G16CMX1TCG	ULLGA8, 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.

PACKAGE DIMENSIONS

ULLGA8 1.45x1.0, 0.35P CASE 613AA-01 ISSUE A



BOTTOM VIEW

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0.05 C NOTE 3

- NOTES:

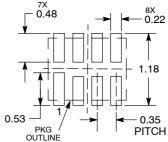
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

 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				
A 1	0.00	0.05				
b	0.15	0.25				
D	1.45 BSC					
Е	1.00 BSC					
e	0.35 BSC					
Ĺ	0.25	0.35				
L1	0.30	0.40				

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

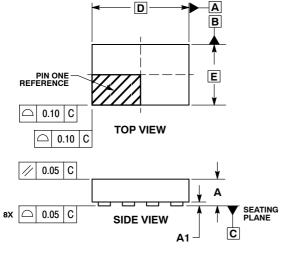


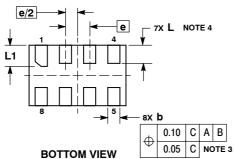
DIMENSIONS: MILLIMETERS

^{*}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 1.6x1.0, 0.4P CASE 613AB-01 **ISSUE A**

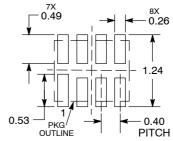




- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
 4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.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

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

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

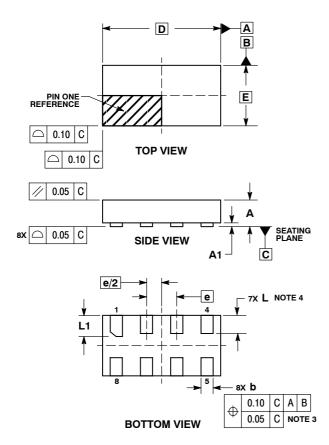


DIMENSIONS: MILLIMETERS

^{*}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

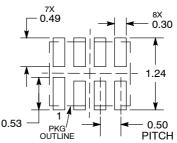
ULLGA8 1.95x1.0, 0.5P CASE 613AC-01 **ISSUE A**



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994.
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	MILLIMETERS						
DIM	MIN	MAX					
Α		0.40					
A1	0.00	0.05					
b	0.15	0.25					
D	1.95	BSC					
Ε	1.00 BSC						
е	0.50 BSC						
L	0.25	0.35					
L1	0.30	0.40					

MOUNTING FOOTPRINT **SOLDERMASK DEFINED***



DIMENSIONS: MILLIMETERS

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