Triple Non-Inverting Buffer

The NLU3G16 MiniGate[™] is an advanced high-speed CMOS triple non-inverting buffer in ultra-small footprint.

The NLU3G16 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: $t_{PD} = 3.5 \text{ ns}$ (Typ) @ $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1 \mu A$ (Max) at $T_A = 25^{\circ}C$
- Power Down Protection Provided on inputs
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- These are Pb-Free Devices

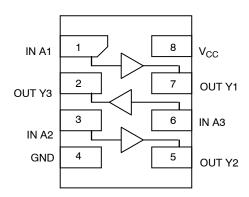


Figure 1. Pinout (Top View)

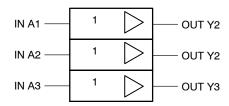


Figure 2. Logic Symbol

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}



ON Semiconductor®

http://onsemi.com

MARKING DIAGRAMS



UDFN8 1.8 x 1.2 CASE 517AJ





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 1.45x1, 0.35P CASE 517BZ





UDFN8 1.6x1, 0.4P CASE 517BY





UDFN8 1.95x1, 0.5P CASE 517CA



UY, R or LR = Specific Device Code

M = Date Code

= Pb-Free Package

FUNCTION TABLE

Α	Υ
L	L
H	H

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0	V
V _{IN}	DC Input Voltage	-0.5 to +7.0	V
V _{OUT}	DC Output Voltage	−0.5 to +7.0	V
I _{IK}	DC Input Diode Current $V_{IN} < GND$	-20	mA
I _{OK}	DC Output Diode Current V _{OUT} < GND	±20	mA
Ιο	DC Output Source/Sink Current	±12.5	mA
I _{CC}	DC Supply Current Per Supply Pin	±25	mA
I _{GND}	DC Ground Current per Ground Pin	±25	mA
T _{STG}	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature, 1 mm from Case for 10 Seconds	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 GND at 125°C (Note 2)	±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 / 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} = 3.3 \ V \pm 0.3 \ V \\ V_{CC} = 5.0 \ V \pm 0.5 \ V \\ \end{array} $	0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

			V _{CC}	T,	_A = 25 °	С	T _A = -	+85°C		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	0.75 x V _{CC}			0.75 x V _{CC}				V
			2.3 to 5.5	0.70 x V _{CC}			0.70 x V _{CC}				
V _{IL}	Low-Level Input Voltage		1.65			0.25 x V _{CC}		0.25 x V _{CC}		0.25 x V _{CC}	V
			2.3 to 5.5			0.30 x V _{CC}		0.30 x V _{CC}		0.30 x V _{CC}	
V _{OH}	High-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -50 \mu A$	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 2.9 4.4		1.9 2.9 4.4		V
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -4$ mA $I_{OH} = -8$ mA	3.0 4.5	2.58 3.94			2.48 3.80		2.34 3.66		V
V _{OL}	Low-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 50 \mu\text{A}$	2.0 3.0 4.5		0 0 0	0.1 0.1 0.1		0.1 0.1 0.1		0.1 0.1 0.1	V
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 4$ mA $I_{OL} = 8$ mA	3.0 4.5			0.36 0.36		0.44 0.44		0.52 0.52	
I _{IN}	Input Leakage Current	$0 \le V_{IN} \le 5.5 V$	0 to 5.5			±0.1		±1.0		±1.0	μΑ
Icc	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5			1.0		10		40	μΑ

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

		V _{CC}	Test	т,	_A = 25 °	С	T _A = 4	-85°C	T _A = -5 +12	5°C to 5°C	
Symbol	Parameter	(V)	Condition	Min	Тур	Max	Min	Max	Min	Max	Unit
t _{PLH} ,	Propagation Delay,	3.0 to	C _L = 15 pF		4.5	7.1		8.5		10	ns
t _{PHL}	Input A to Output ₹	3.6	C _L = 50 pF		6.4	10.6		12		14.5	
		4.5 to	C _L = 15 pF		3.5	5.5		6.5		8.0	
		5.5	C _L = 50 pF		4.5	7.5		8.5		10	
C _{IN}	Input Capacitance				4.0	10		10		10	pF
C _{PD}	Power Dissipation Capacitance (Note 3)	5.0			8.0						pF

^{3.} 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 $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption: $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

SWITCHING WAVEFORMS

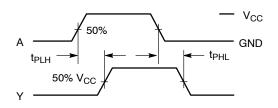
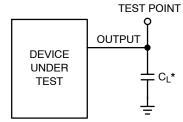


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

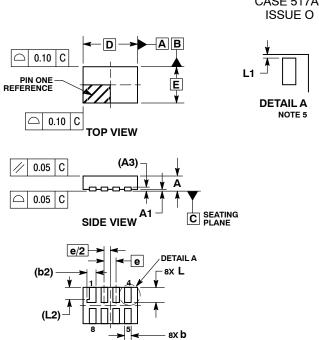
ORDERING INFORMATION

Device	Package	Shipping [†]
NLU3G16MUTAG	UDFN8 (Pb-Free)	3000 / Tape & Reel
NLU3G16AMX1TCG	ULLGA8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLU3G16BMX1TCG	ULLGA8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLU3G16CMX1TCG	ULLGA8, 1.45 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel
NLU3G16DMUTCG	UDFN8, 1.95 x 1 (Pb-Free)	3000 / Tape & Reel
NLU3G16EMUTCG	UDFN8, 1.6 x 1 (Pb-Free)	3000 / Tape & Reel
NLU3G16FMUTCG	UDFN8, 1.45 x 1 (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

UDFN8 1.8x1.2, 0.4P CASE 517AJ



BOTTOM VIEW

0.10 M C A B

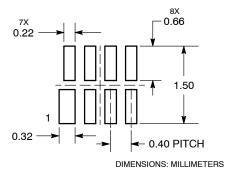
0.05 M

C NOTE 3

- 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 0.30 mm FROM TERMINAL TIP.
 4. MOLD FLASH ALLOWED ON TERMINALS ALONG EDGE OF PACKAGE. FLASH MAY NOT EXCEED 0.03 ONTO BOTTOM SURFACE OF TERMINALS.
 5. DETAIL A SHOWS OPTIONAL CONSTRUCTION FOR TERMINALS.

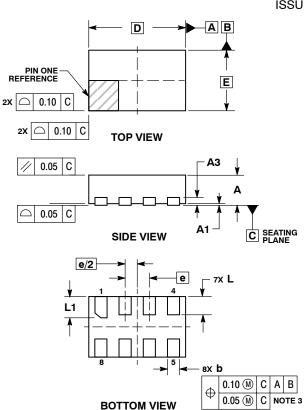
	MILLIMETERS					
DIM	MIN	MAX				
Α	0.45	0.55				
A1	0.00	0.05				
A3	0.127 REF					
b	0.15	0.25				
b2	0.30 REF					
D	1.80	BSC				
E	1.20	BSC				
е	0.40 BSC					
L	0.45	0.55				
L1	0.00	0.03				
L2	0.40 REF					

MOUNTING FOOTPRINT SOLDERMASK DEFINED



PACKAGE DIMENSIONS

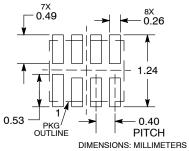
UDFN8, 1.6x1, 0.4P CASE 517BY ISSUE O



- 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				
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				

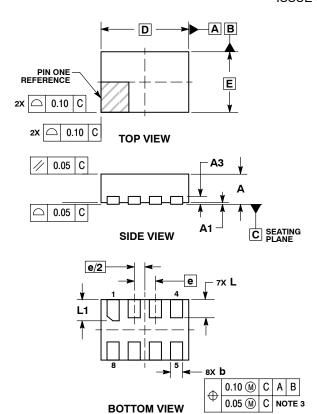
RECOMMENDED SOLDERING FOOTPRINT*



*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, 0.35P CASE 517BZ ISSUE O

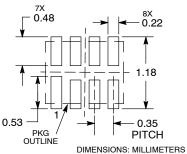


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
 4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

	MILLIMETERS				
DIM	MIN	MAX			
Α	0.45	0.55			
A1	0.00	0.05			
А3	0.13 REF				
b	0.15	0.25			
D	1.45	BSC			
Е	1.00 BSC				
е	0.35 BSC				
	0.25 0.35				

L1 0.30 0.40

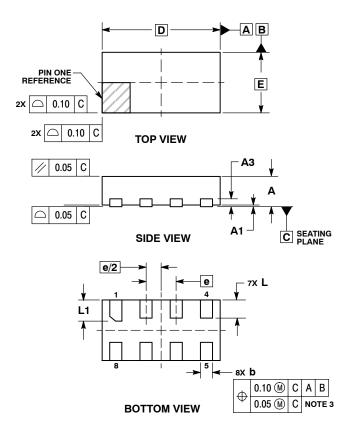
RECOMMENDED SOLDERING FOOTPRINT*



*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, 0.5P CASE 517CA ISSUE O



- NOTES:

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

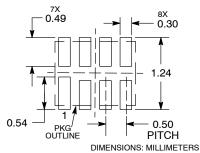
 2. CONTROLLING DIMENSION: MILLIMETERS.

 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				
АЗ	0.13 REF					
b	0.15	0.25				
D	1.95	BSC				
E	1.00 BSC					
е	0.50 BSC					
L	0.25	0.35				
L1	0.30	0.40				

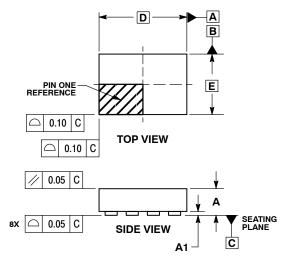
RECOMMENDED SOLDERING FOOTPRINT*

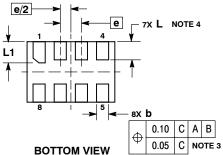


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

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



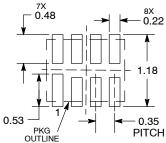


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
 ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION & APPLIES TO PLATED TERMINAL
 AND IS MEASURED BETWEEN 0.15 AND
 0.30 mm FROM THE TERMINAL TIP.
- 0.30 mm FROM THE TERMINAL TIP.

 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*

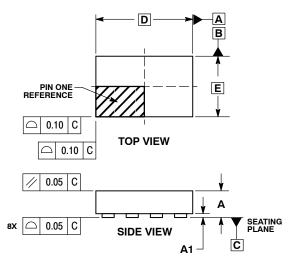


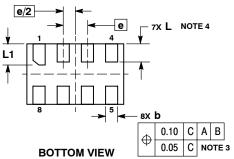
DIMENSIONS: MILLIMETERS

^{*}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**

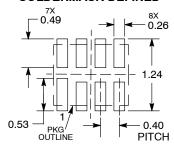




- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS.
 DIMENSION & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
 A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE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

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

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

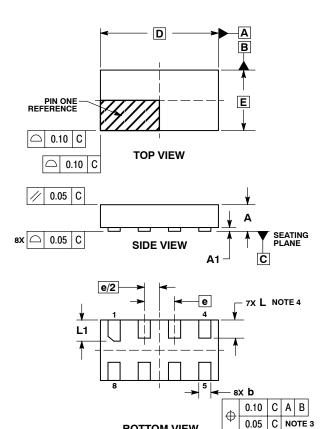


DIMENSIONS: MILLIMETERS

^{*}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**



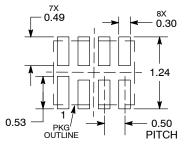
BOTTOM VIEW

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
- 0.30 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	
E	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.

MiniGate is a trademark of Semiconductor Components Industries, LLC (SCILLC).

are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT

Literature Distribution Center for ON Semiconductor P.O. Box 5163, Denver, Colorado 80217 USA Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada

Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910

Japan Customer Focus Center Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative