

# NLX2G16

## Dual Buffer

The NLX2G16 MiniGate™ is an advanced high-speed CMOS dual non-inverting buffer in ultra-small footprint.

The NLX2G16 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:  $I_{CC} = 1 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- 24 mA Balanced Output Source and Sink Capability
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- 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

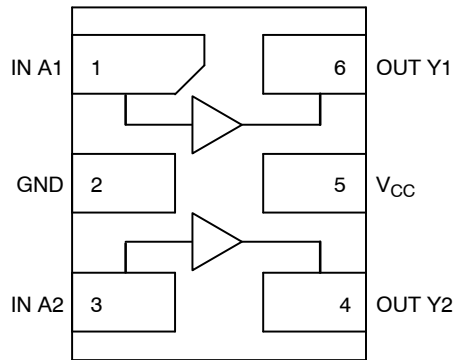


Figure 1. Pinout (Top View)

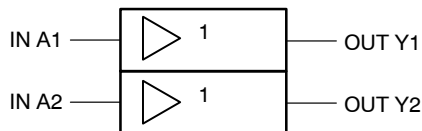


Figure 2. Logic Symbol

### FUNCTION TABLE

A	Y
L	L
H	H

### PIN ASSIGNMENT

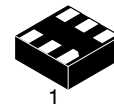
1	IN A1
2	GND
3	IN A2
4	OUT Y2
5	$V_{CC}$
6	OUT Y1



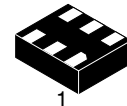
ON Semiconductor®

<http://onsemi.com>

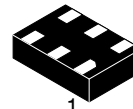
### MARKING DIAGRAMS



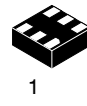
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1.0 x 1.0  
CASE 613AD



ULLGA6  
1.2 x 1.0  
CASE 613AE



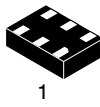
ULLGA6  
1.45 x 1.0  
CASE 613AF



UDFN6  
1.0 x 1.0  
CASE 517BX



UDFN6  
1.2 x 1.0  
CASE 517AA



UDFN6  
1.45 x 1.0  
CASE 517AQ



M = Date Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# NLX2G16

## 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	
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	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> = 1.8 V ± 0.18 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	20	ns/V
		0	20	
		0	10	
		0	5	

# NLX2G16

## 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>IH</sub>	Low-Level Input Voltage		1.65–1.95	0.75 x V <sub>CC</sub>			0.75 x V <sub>CC</sub>		0.75 x V <sub>CC</sub>		V
			2.3 to 5.5	0.70 x V <sub>CC</sub>			0.70 x V <sub>CC</sub>		0.70 x V <sub>CC</sub>		
V <sub>IL</sub>	Low-Level Input Voltage		1.65–1.95			0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	V
			2.3 – 5.5			0.30 x V <sub>CC</sub>		0.30 x V <sub>CC</sub>		0.30 x V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -100 µA	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
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</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	2.15		1.9		1.9		
		I <sub>OH</sub> = -16 mA	3.0	2.4	2.8		2.4		2.4		
		I <sub>OH</sub> = -24 mA	3.0	2.3	2.68		2.3		2.3		
I <sub>OH</sub> = -32 mA	4.5	3.8	4.2		3.8		3.8				
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 100 µA	1.65 – 5.5			0.1		0.1		0.1	V
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 4 mA	1.65		0.08	0.24		0.24		0.24	
		I <sub>OL</sub> = 8 mA	2.3		0.1	0.3		0.3		0.3	
		I <sub>OL</sub> = 16 mA	3.0		0.15	0.4		0.4		0.4	
		I <sub>OL</sub> = 24 mA	3.0		0.22	0.55		0.55		0.55	
I <sub>OL</sub> = 32 mA	4.5		0.22	0.55		0.55		0.55			
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>IN</sub> or V <sub>OUT</sub> = 5.5 V	0			1.0		10		10	µA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 0 V or V <sub>CC</sub>	5.5			1.0		10		10	µA

# NLX2G16

## 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> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Input A to Output	1.65–1.95	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.8	8.0	9.6	1.8	10.2	ns
		2.3–2.7	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.0	3.0	5.2	1.0	5.8	
		3.0–3.6	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	0.8	2.3	3.6	0.8	4.0	
			R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	1.2	3.0	4.6	1.2	5.1	
		4.5–5.5	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	0.5	1.8	2.9	0.5	3.2	
			R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	0.8	2.4	3.8	0.8	4.2	
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 11				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  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ . C<sub>PD</sub> is used to determine the no-load dynamic power consumption:  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

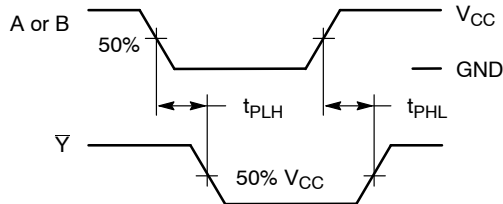
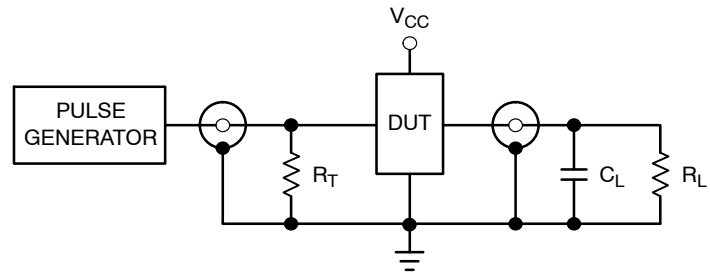


Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

## ORDERING INFORMATION

Device	Package	Shipping†
NLX2G16AMX1TCG	ULLGA6, 1.45 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX2G16BMX1TCG	ULLGA6, 1.2 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX2G16CMX1TCG	ULLGA6, 1.0 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel
NLX2G16MUTCG (In Development)	UDFN6, 1.2 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX2G16AMUTCG, NLVX2G16AMUTCG*	UDFN6, 1.45 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX2G16CMUTCG (In Development)	UDFN6, 1.0 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel

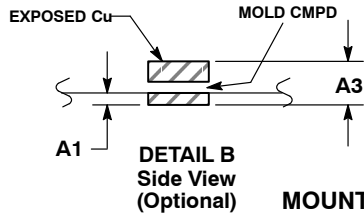
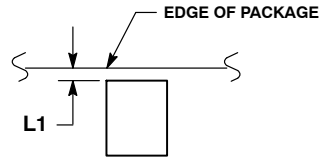
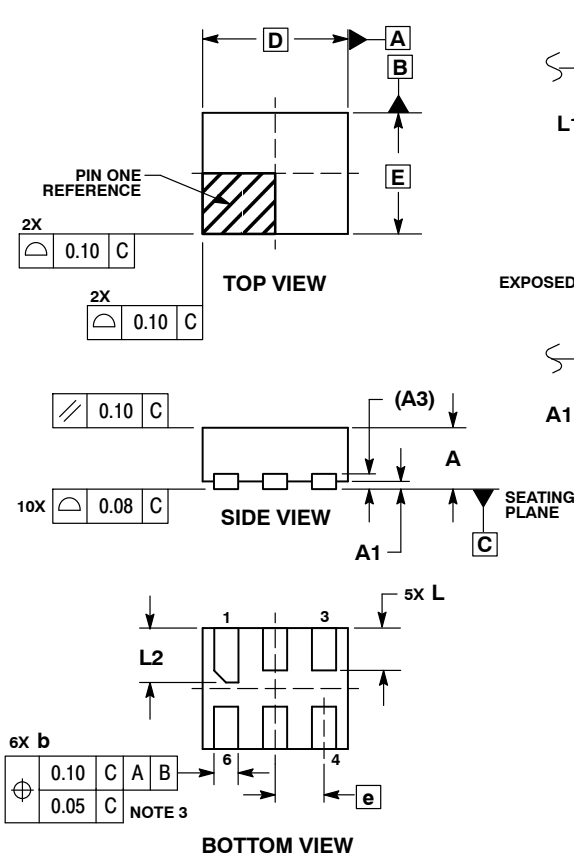
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

# NLX2G16

## PACKAGE DIMENSIONS

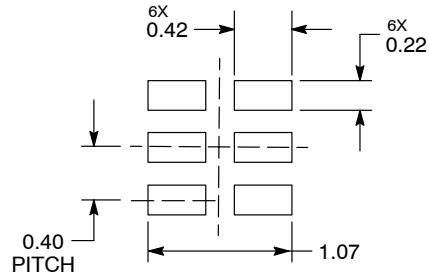
UDFN6, 1.2x1.0, 0.4P  
CASE 517AA  
ISSUE D



- 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 0.25 AND 0.30 mm FROM TERMINAL.
  4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127	REF
b	0.15	0.25
D	1.20	BSC
E	1.00	BSC
e	0.40	BSC
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

### MOUNTING FOOTPRINT\*



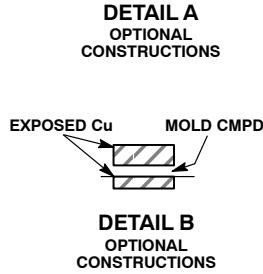
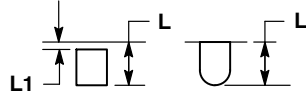
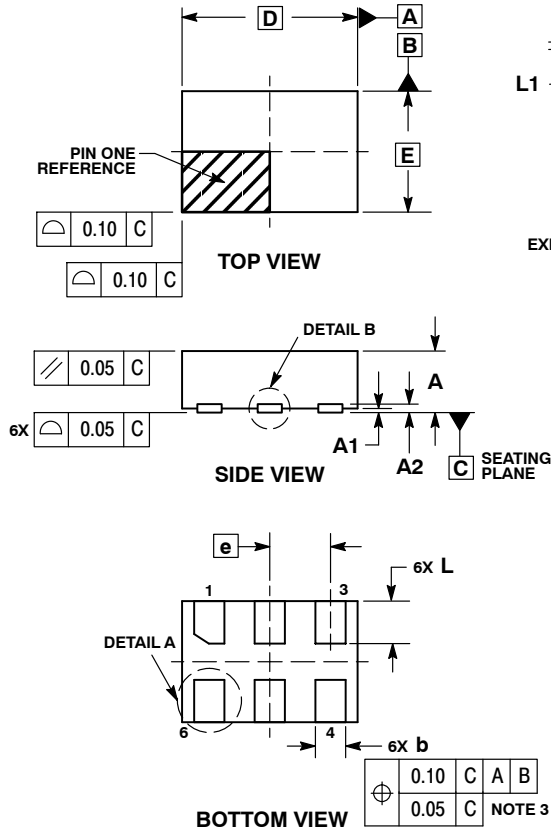
DIMENSIONS: MILLIMETERS

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

# NLX2G16

## PACKAGE DIMENSIONS

UDFN6 1.45x1.0, 0.5P  
CASE 517AQ  
ISSUE O

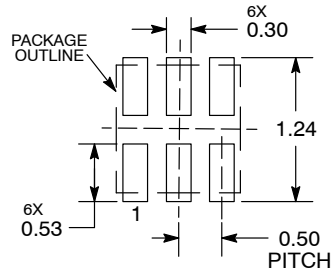


**NOTES:**

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 0.30 mm FROM THE TERMINAL TIP.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	---	0.15

### MOUNTING FOOTPRINT



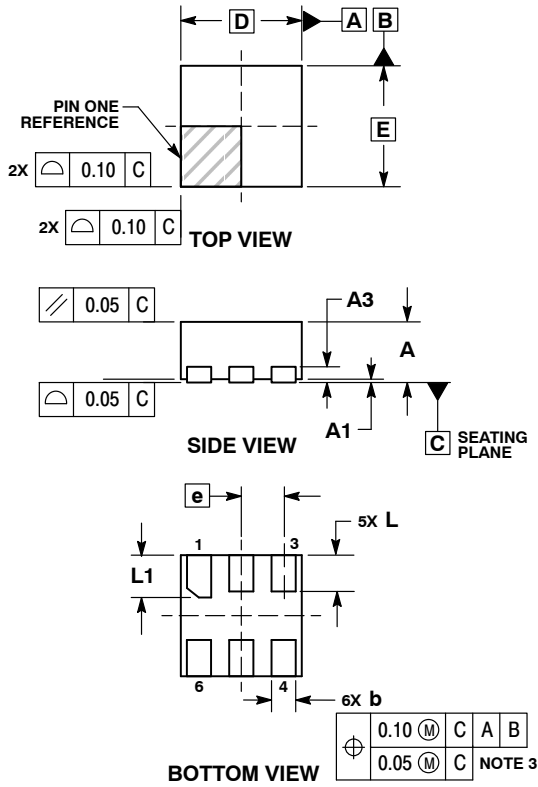
DIMENSIONS: MILLIMETERS

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

# NLX2G16

## PACKAGE DIMENSIONS

UDFN6 1.0x1.0, 0.35P  
CASE 517BX  
ISSUE O

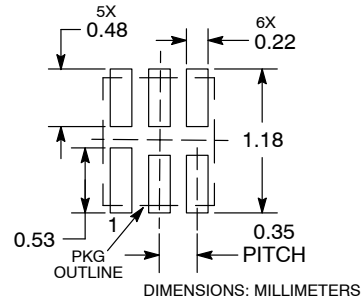


**NOTES:**

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
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

**RECOMMENDED SOLDERING FOOTPRINT\***

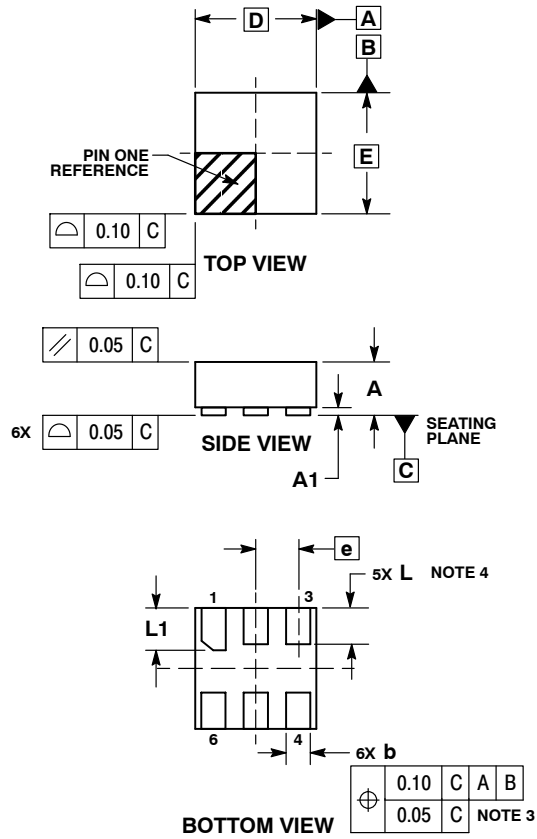


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# NLX2G16

## PACKAGE DIMENSIONS

ULLGA6 1.0x1.0, 0.35P  
CASE 613AD  
ISSUE A

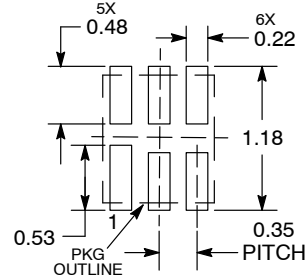


NOTES:

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.

DIM	MILLIMETERS	
	MIN	MAX
A	---	0.40
A1	0.00	0.05
b	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

### MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



DIMENSIONS: MILLIMETERS

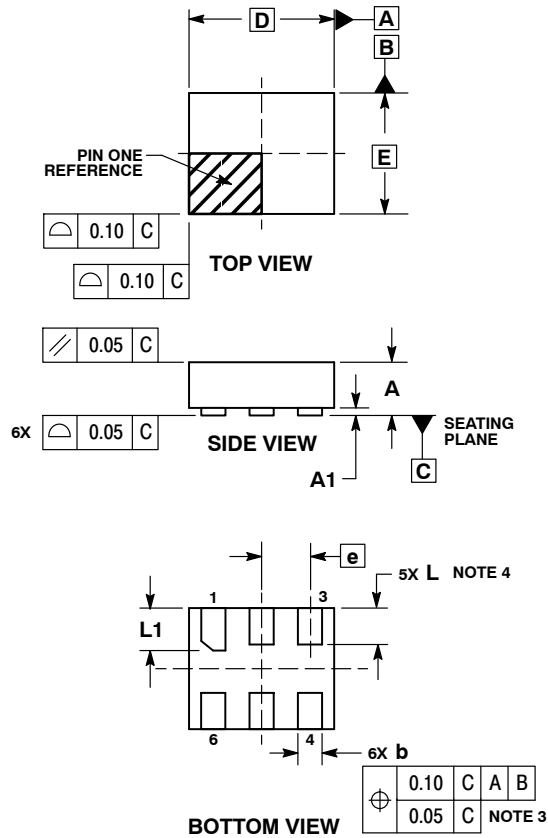
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# NLX2G16

## PACKAGE DIMENSIONS

ULLGA6 1.2x1.0, 0.4P  
CASE 613AE  
ISSUE A

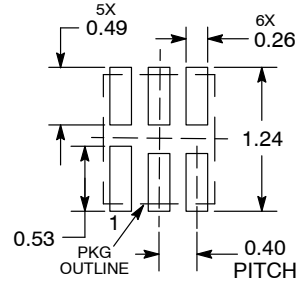


**NOTES:**

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2. CONTROLLING DIMENSION: MILLIMETERS.
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4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

MILLIMETERS		
DIM	MIN	MAX
A	---	0.40
A1	0.00	0.05
b	0.15	0.25
D	1.20 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.25	0.35
L1	0.35	0.45

**MOUNTING FOOTPRINT  
SOLDEMASK DEFINED\***



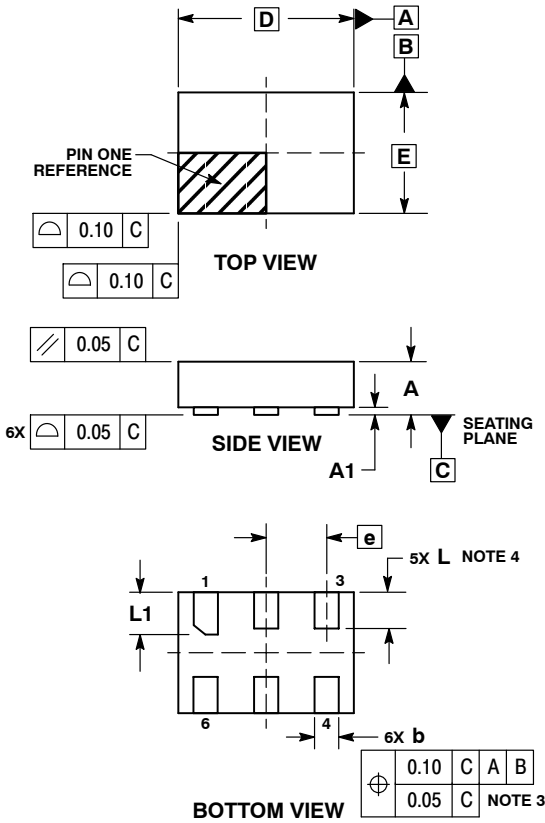
DIMENSIONS: MILLIMETERS

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# NLX2G16

## PACKAGE DIMENSIONS

ULLGA6 1.45x1.0, 0.5P  
CASE 613AF  
ISSUE A

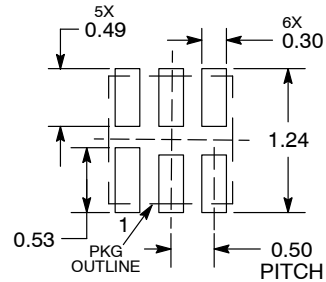


### NOTES:

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.

DIM	MILLIMETERS	
	MIN	MAX
A	---	0.40
A1	0.00	0.05
b	0.15	0.25
D	1.45 BSC	
E	1.00 BSC	
e	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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