

# NLX2G02

## Dual 2-Input NOR Gate

The NLX2G02 is an advanced high-speed dual 2-input CMOS NOR gate in ultra-small footprint.

The NLX2G02 input structures provide protection when voltages up to 7.0 volts are applied, regardless of the supply voltage.

### Features

- High Speed:  $t_{PD}$  2.5 ns (typical) at  $V_{CC} = 5.0$  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 Sink and Source Capability
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input Pins
- This is a Pb-Free Device

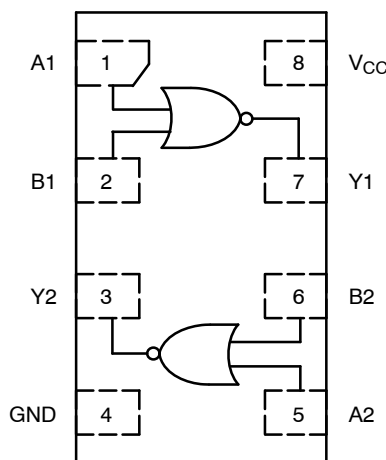


Figure 1. Pinout

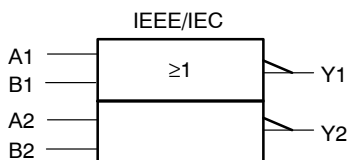


Figure 2. Logic Symbol

### PIN ASSIGNMENT

Pin	Function
1	A1
2	B1
3	Y2
4	GND
5	A2
6	B2
7	Y1
8	$V_{CC}$

### FUNCTION TABLE

$$Y = A + B$$

Inputs		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = HIGH Logic Level  
L = LOW Logic Level



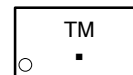
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### MARKING DIAGRAMS



ULLGA8  
1.45 x 1.0  
CASE 613AA



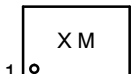
ULLGA8  
1.6 x 1.0  
CASE 613AB



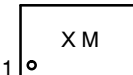
ULLGA8  
1.95 x 1.0  
CASE 613AC



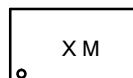
UDFN8  
1.45 x 1.0  
CASE 517BZ



UDFN8  
1.6 x 1.0  
CASE 517BY



UDFN8  
1.95 x 1.0  
CASE 517CA



XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

### ORDERING INFORMATION

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

# NLX2G02

## 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 $V_{CC} + 7.0$	V
$I_{IK}$	DC Input Diode Current $V_{IN} < GND$	− 50	mA
$I_{OK}$	DC Output Diode Current $V_{OUT} < GND$	− 50	mA
$I_O$	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
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	150	°C
$\theta_{JA}$	Thermal Resistance (Note 1)	N/A	°C/W
$P_D$	Power Dissipation in Still Air at 85°C	N/A	mW
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	2000 > 200 N/A	V
$I_{Latchup}$	Latchup Performance Above $V_{CC}$ 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 with 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
$V_{CC}$	Power DC Supply Voltage Operating Data Retention Only	1.65 1.5	5.5 5.5	V
$V_{IN}$	Digital Input Voltage (Note 6)	0	5.5	V
$V_{OUT}$	Output Voltage	0	$V_{CC}$	V
$T_A$	Operating Free-Air Temperature	−55	+125	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$	0 0 0 0	20 20 10 5	ns/V

6. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

# NLX2G02

## DC ELECTRICAL CHARACTERISTICS

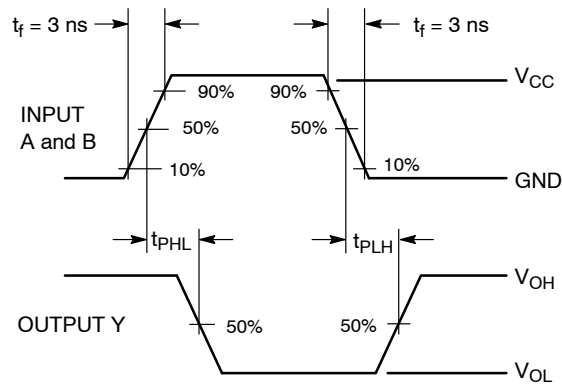
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> ≤ 85°C		T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 2.3 to 5.5	0.75 x V <sub>CC</sub> 0.7 x V <sub>CC</sub>			0.75 x V <sub>CC</sub> 0.7 x V <sub>CC</sub>		0.75 x V <sub>CC</sub> 0.7 x V <sub>CC</sub>		V
V <sub>IL</sub>	Low-Level Input Voltage		1.65 2.3 to 5.5			0.25 x V <sub>CC</sub> 0.3 x V <sub>CC</sub>		0.25 x V <sub>CC</sub> 0.3 x V <sub>CC</sub>		0.25 x V <sub>CC</sub> 0.3 x V <sub>CC</sub>	V
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 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>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -4 mA	1.65	1.29	1.5		1.29		1.29		
		I <sub>OH</sub> = -8 mA	2.3	1.9	2.1		1.9		1.9		
		I <sub>OH</sub> = -12 mA	2.7	2.2	2.4		2.2		2.2		
		I <sub>OH</sub> = -16 mA	3.0	2.4	2.7		2.4		2.4		
		I <sub>OH</sub> = -24 mA	3.0	2.3	2.5		2.3		2.3		
		I <sub>OH</sub> = -32 mA	4.5	3.8	4.0		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 to 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		0.20	0.3		0.3		0.3	
		I <sub>OL</sub> = 12 mA	2.7		0.22	0.4		0.4		0.4	
		I <sub>OL</sub> = 16 mA	3.0		0.28	0.4		0.4		0.4	
		I <sub>OL</sub> = 24 mA	3.0		0.38	0.55		0.55		0.55	
		I <sub>OL</sub> = 32 mA	4.5		0.42	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 Input Leakage Current	V <sub>IN</sub> = 5.5 V	0			1.0		10		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			1.0		10		10	μA

## AC ELECTRICAL CHARACTERISTICS t<sub>R</sub> = t<sub>F</sub> = 2.5 ns

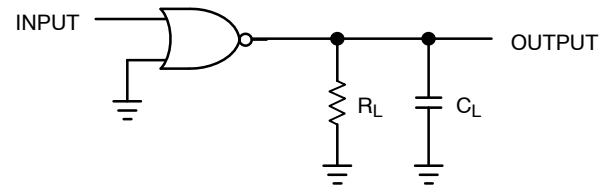
Symbol	Parameter	V <sub>CC</sub> (V)	Test Condition	T <sub>A</sub> = 25°C			T <sub>A</sub> ≤ 85°C		T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input A to Output	1.65 to 1.95	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.0	7.4	9.5	2.0	9.7			ns
		2.3 to 2.7	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.2	3.3	5.4	1.2	5.8			
		3.0 to 3.6	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	0.8	2.6	3.9	0.8	4.3			
			R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	1.2	3.2	4.8	1.2	5.2			
		4.5 to 5.5	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	0.5	1.9	3.1	0.5	3.3			
			R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF	0.8	2.5	3.7	0.8	4.0			
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 7)	3.3 5.5	10 MHz, V <sub>IN</sub> = 0V or V <sub>CC</sub>		9 11						pF

7. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the 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>.

## NLX2G02



**Figure 3. Switching Waveform**



A 1-MHz square input wave is recommended for propagation delay tests.

**Figure 4. Test Circuit**

### ORDERING INFORMATION

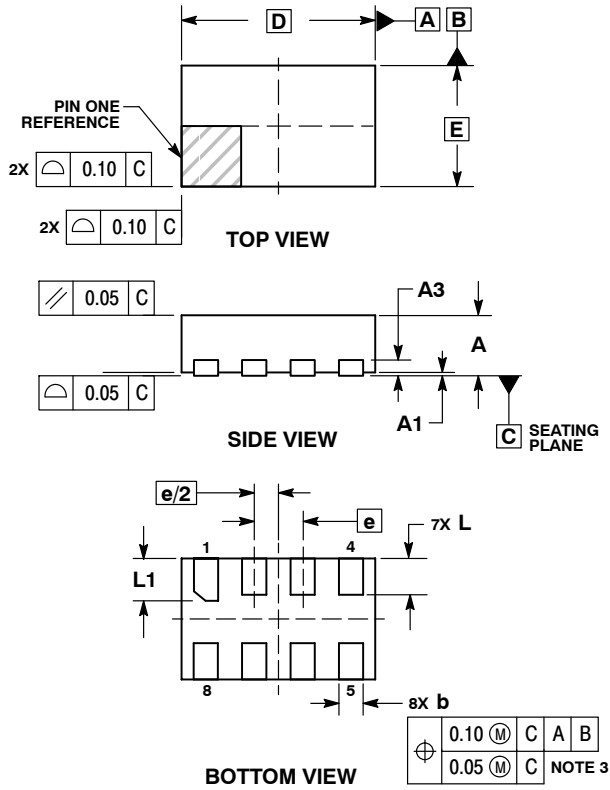
Device	Package	Shipping†
NLX2G02AMX1TCG	ULLGA8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX2G02BMX1TCG	ULLGA8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX2G02CMX1TCG	ULLGA8, 1.45 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel
NLX2G02DMUTCG	UDFN8, 1.95 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLX2G02EMUTCG	UDFN8, 1.6 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLX2G02FMUTCG	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.

# NLX2G02

## PACKAGE DIMENSIONS

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

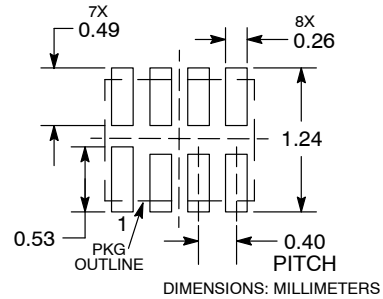


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION 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.

DIM	MILLIMETERS	
	MIN	MAX
A	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	
e	0.40 BSC	
L	0.25	0.35
L1	0.30	0.40

### RECOMMENDED SOLDERING FOOTPRINT\*

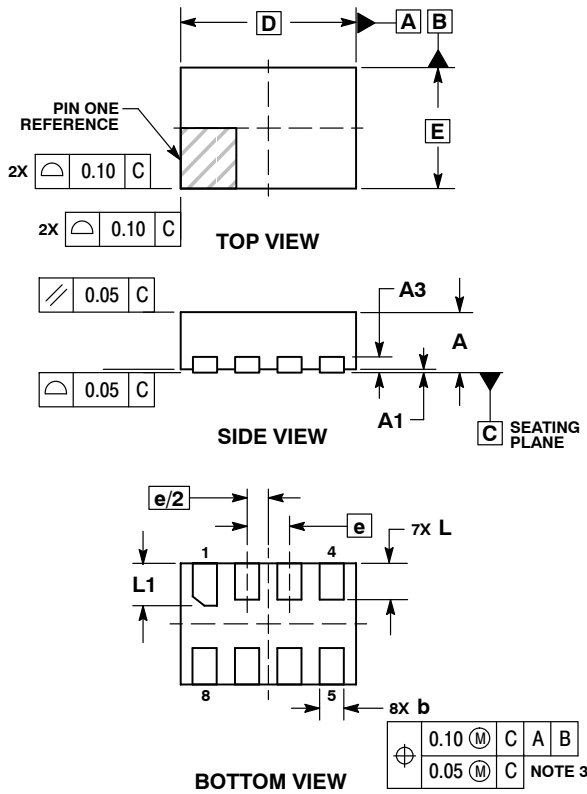


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# NLX2G02

## PACKAGE DIMENSIONS

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

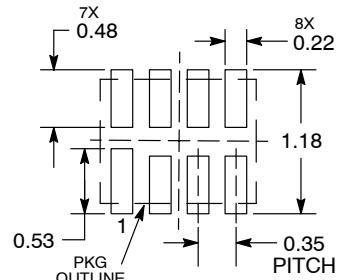


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2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

DIM	MILLIMETERS	
	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

### RECOMMENDED SOLDERING FOOTPRINT\*



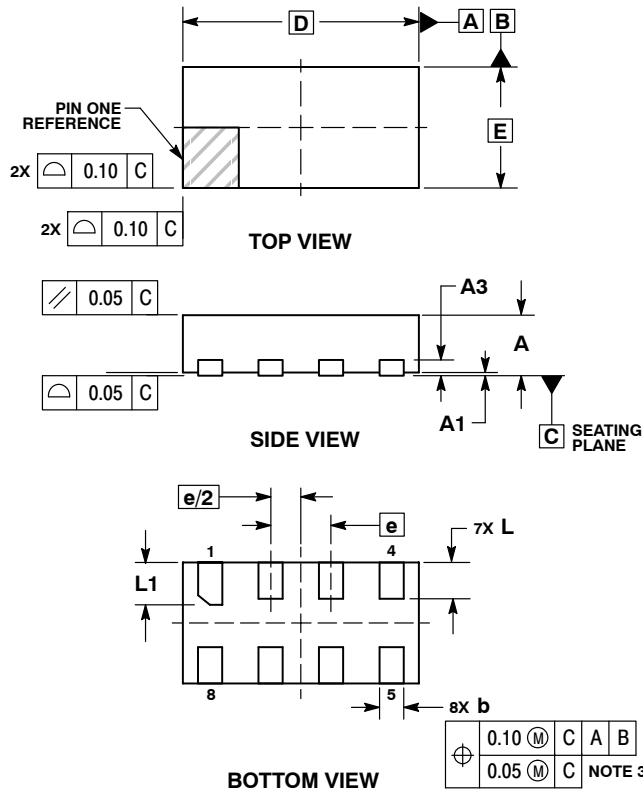
DIMENSIONS: MILLIMETERS

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# NLX2G02

## PACKAGE DIMENSIONS

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

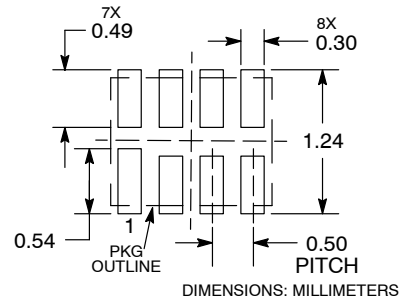


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4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	1.95 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.25	0.35
L1	0.30	0.40

### RECOMMENDED SOLDERING FOOTPRINT\*



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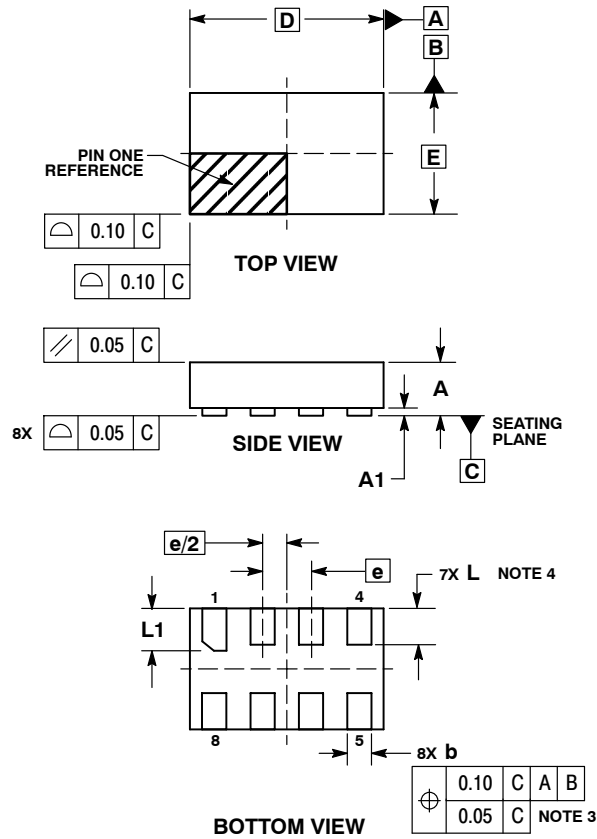




# NLX2G02

## PACKAGE DIMENSIONS

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

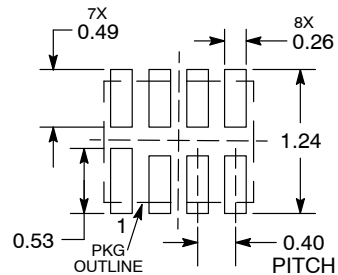


### NOTES:

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.

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

### MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



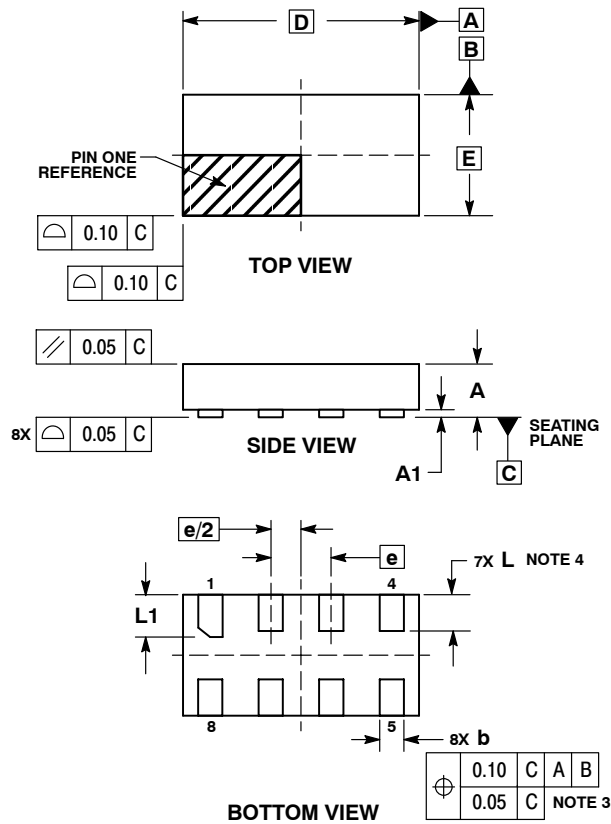
DIMENSIONS: MILLIMETERS

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# NLX2G02

## PACKAGE DIMENSIONS

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

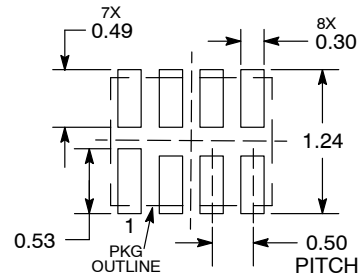


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MILLIMETERS		
DIM	MIN	MAX
A	---	0.40
A1	0.00	0.05
b	0.15	0.25
D	1.95	BSC
E	1.00	BSC
e	0.50	BSC
L	0.25	0.35
L1	0.30	0.40

### MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



DIMENSIONS: MILLIMETERS

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