

NLU3G16

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

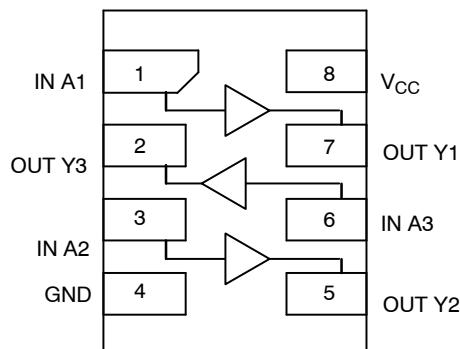


Figure 1. Pinout (Top View)

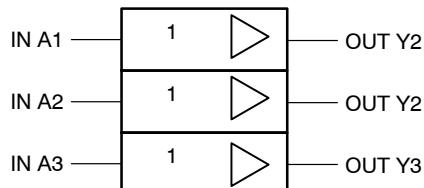


Figure 2. Logic Symbol

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}



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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

A	Y
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
I_O	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
T_L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T_J	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
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25 °C			T _A = +85°C		T _A = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
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} or V _{IL} I _{OH} = -50 μA	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 _{OL}	Low-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA	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 ≤ V _{IN} ≤ 5.5 V	0 to 5.5			±0.1		±1.0		±1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5			1.0		10		40	μA

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0 ns)

Symbol	Parameter	V _{CC} (V)	Test Condition	T _A = 25 °C			T _A = +85°C		T _A = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, Input A to Output Y	3.0 to 3.6	C _L = 15 pF		4.5	7.1		8.5		10	ns
			C _L = 50 pF		6.4	10.6		12		14.5	
		4.5 to 5.5	C _L = 15 pF		3.5	5.5		6.5		8.0	
			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} • 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}.

NLU3G16

SWITCHING WAVEFORMS

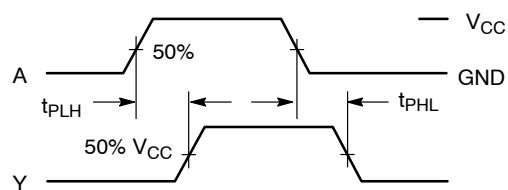
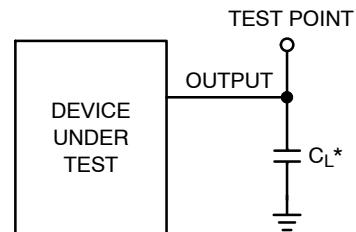


Figure 3. Switching Waveforms



*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

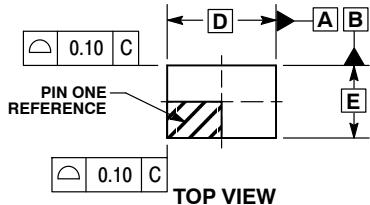
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

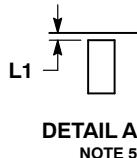
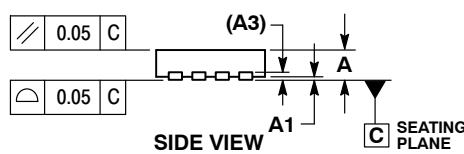
UDFN8 1.8x1.2, 0.4P

CASE 517AJ

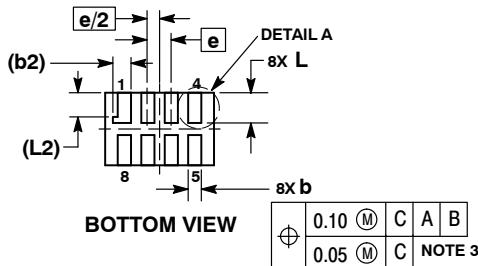
ISSUE O



TOP VIEW

DETAIL A
NOTE 5

SIDE VIEW A1 C SEATING PLANE

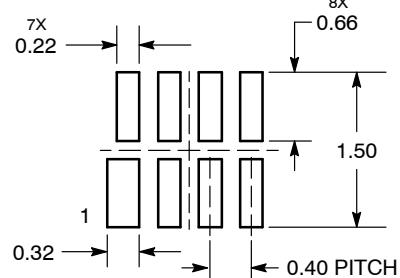


BOTTOM VIEW

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 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
A	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	
e	0.40 BSC	
L	0.45	0.55
L1	0.00	0.03
L2	0.40 REF	

MOUNTING FOOTPRINT
SOLDERMASK DEFINED

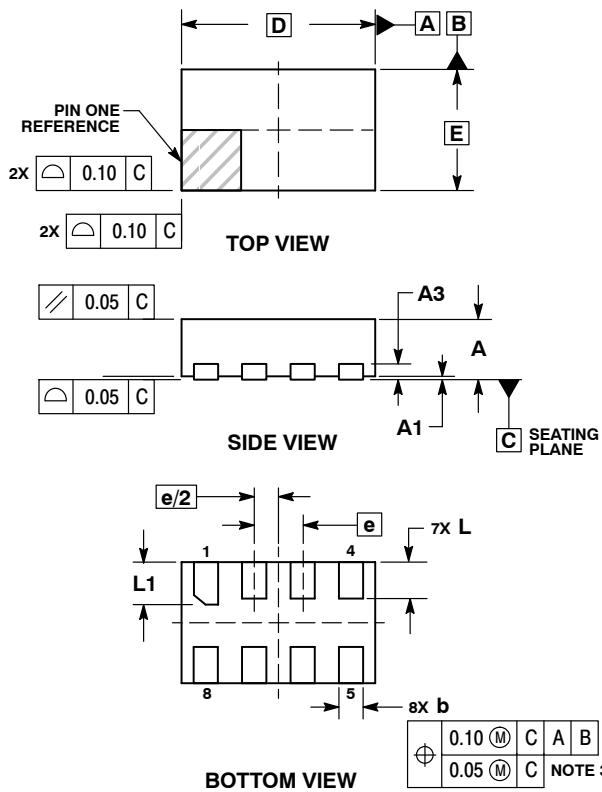
DIMENSIONS: MILLIMETERS

PACKAGE DIMENSIONS

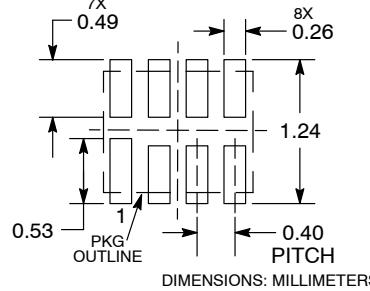
UDFN8, 1.6x1, 0.4P

CASE 517BY

ISSUE O



DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
<i>b</i>	0.15	0.25
D	1.60 BSC	
E	1.00 BSC	
<i>e</i>	0.40 BSC	
L	0.25	0.35
L1	0.30	0.40

RECOMMENDED
SOLDERING FOOTPRINT*

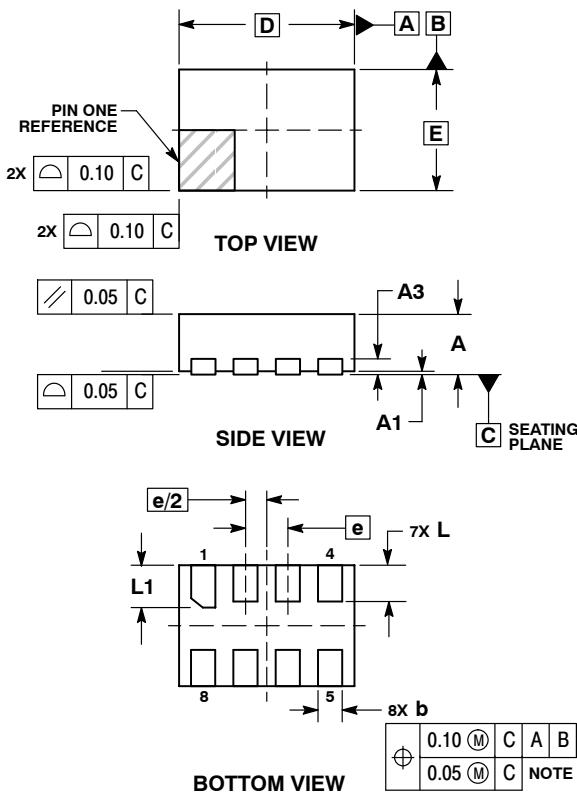
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

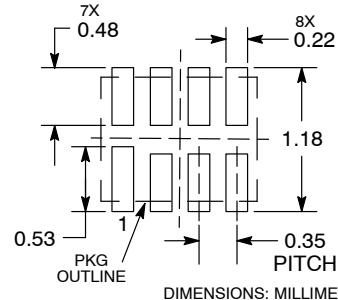
UDFN8, 1.45x1, 0.35P

CASE 517BZ

ISSUE O



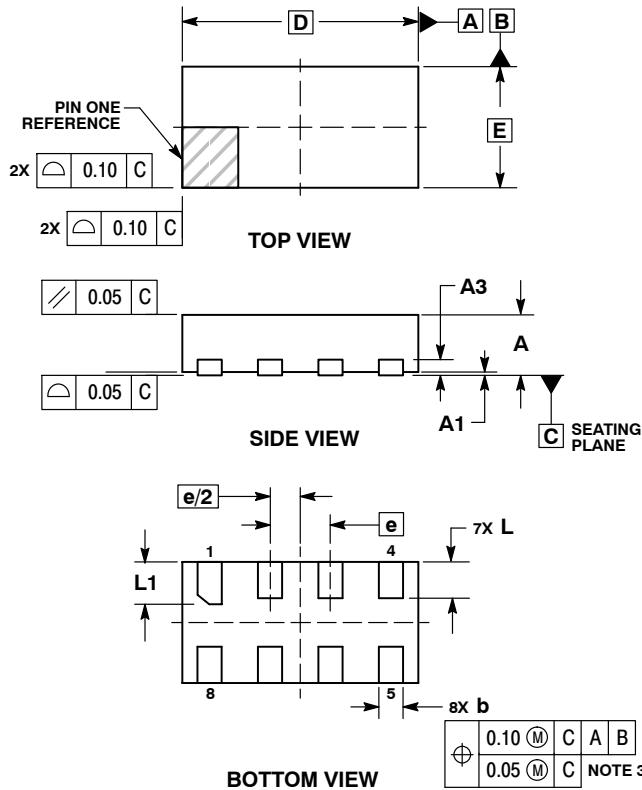
DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13	REF
b	0.15	0.25
D	1.45	BSC
E	1.00	BSC
e	0.35	BSC
L	0.25	0.35
L1	0.30	0.40

RECOMMENDED
SOLDERING FOOTPRINT*

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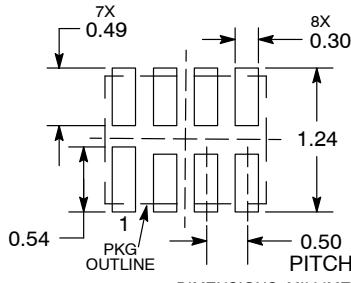
PACKAGE DIMENSIONS

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



	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***



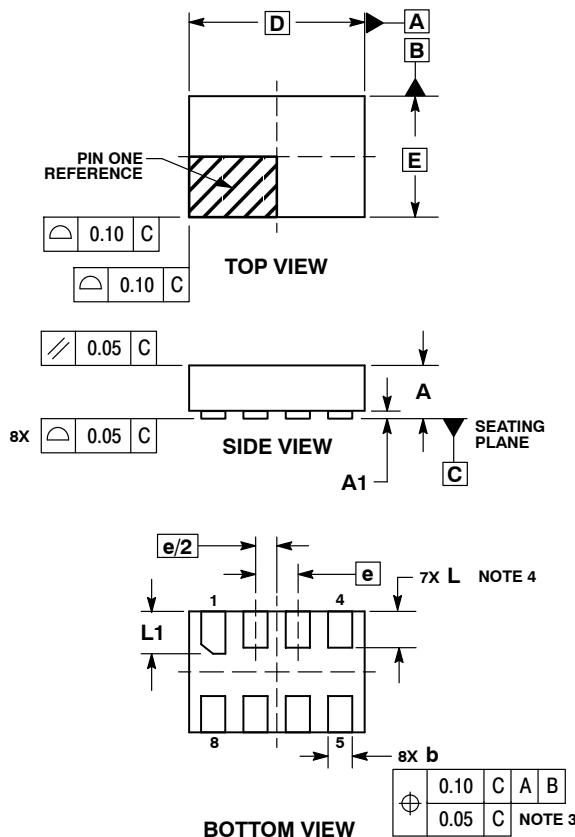
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PACKAGE DIMENSIONS

ULLGA8 1.45x1.0, 0.35P

CASE 613AA

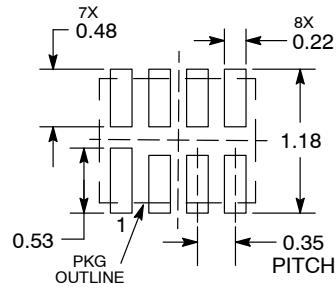
ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION **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	1.45 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

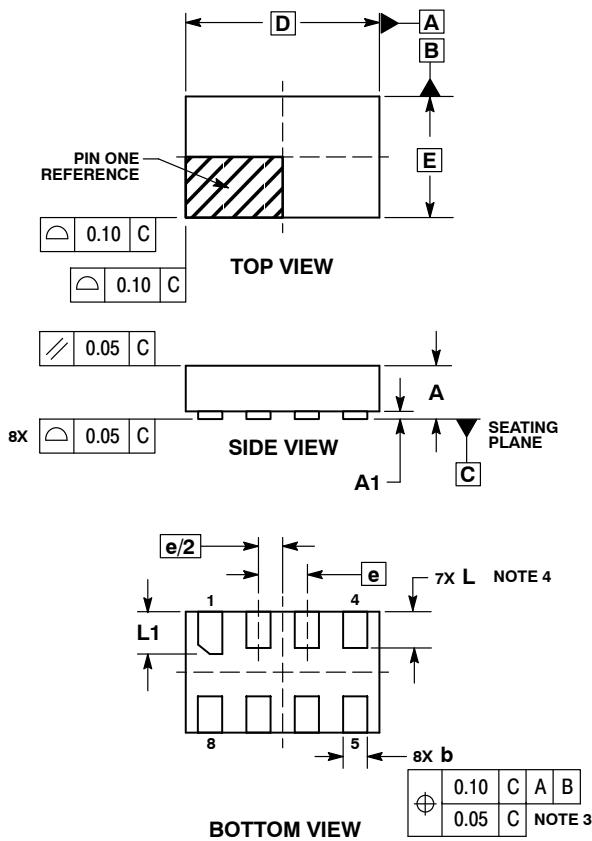
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PACKAGE DIMENSIONS

ULLGA8 1.6x1.0, 0.4P

CASE 613AB

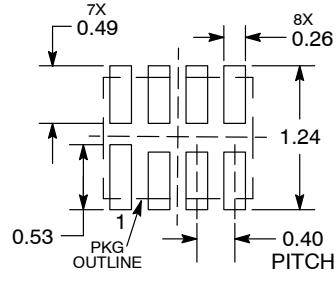
ISSUE A



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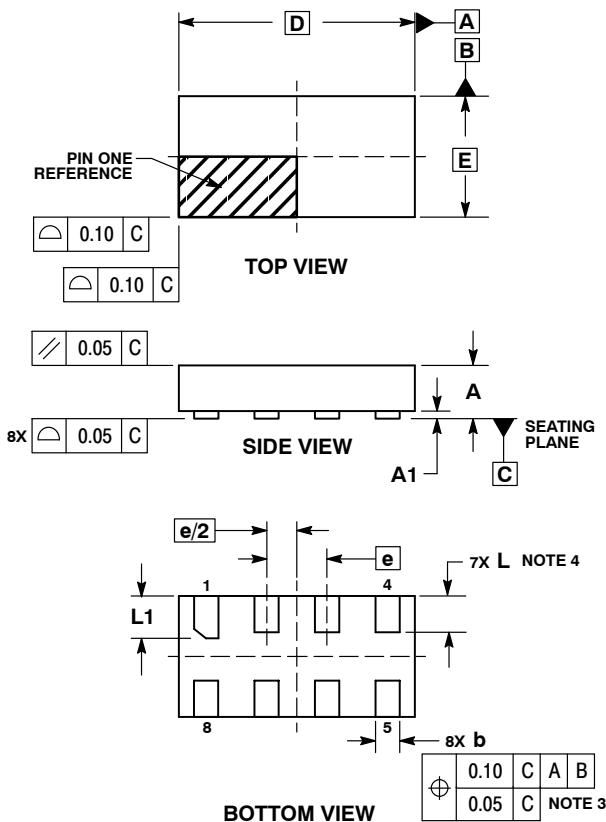
MILLIMETERS		
DIM	MIN	MAX
A	---	0.40
A1	0.00	0.05
b	0.15	0.25
D	1.60 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.25	0.35
L1	0.30	0.40

MOUNTING FOOTPRINT
SOLDERMASK DEFINED*

DIMENSIONS: MILLIMETERS

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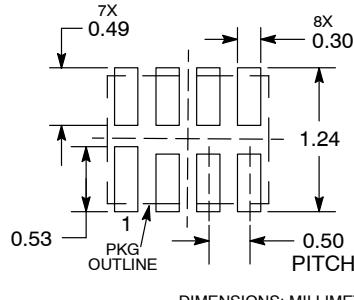
PACKAGE DIMENSIONS

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

NOTES:

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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	1.95 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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