# Non-Inverting 3-State Buffer, TTL Level

# LSTTL-Compatible Inputs

The NLU1GT125 MiniGate<sup>™</sup> is an advanced CMOS high-speed non-inverting buffer in ultra-small footprint.

The NLU1GT125 requires the 3-state control input  $\overline{OE}$  to be set High to place the output in the high impedance state.

The device input is compatible with TTL-type input thresholds and the output has a full 5.0 V CMOS level output swing.

The NLU1GT125 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

#### Features

- High Speed:  $t_{PD} = 3.8 \text{ ns} (Typ) @ V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 1 \ \mu A$  (Max) at  $T_A = 25^{\circ}C$
- TTL-Compatible Input:  $V_{IL} = 0.8 \text{ V}; V_{IH} = 2.0 \text{ V}$
- CMOS-Compatible Output: V<sub>OH</sub> > 0.8 V<sub>CC</sub>; V<sub>OL</sub> < 0.1 V<sub>CC</sub> @ Load
- Power Down Protection Provided on inputs
- Balanced Propagation Delays
- Ultra-Small Packages
- These are Pb-Free Devices

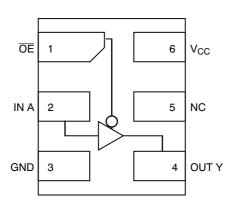


Figure 1. Pinout (Top View)

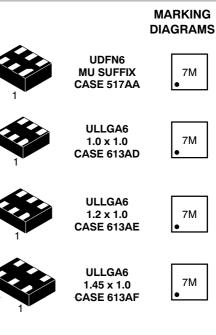


Figure 2. Logic Symbol



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7 = Device Marking M = Date Code

#### **PIN ASSIGNMENT**

1	ŌĒ
2	IN A
3	GND
4	OUT Y
5	NC
6	V <sub>CC</sub>

#### **FUNCTION TABLE**

Inp	out	Output
Α	ŌĒ	Y
L	L	L
Н	L	н
х	Н	Z

#### **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 <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	-20	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < GND	±20	mA
Ι <sub>Ο</sub>	DC Output Source/Sink Current		±12.5	mA
I <sub>CC</sub>	DC Supply Current Per Supply Pin		±25	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin		±25	mA
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C
ΤL	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
Τ <sub>J</sub>	Junction Temperature Under Bias		150	°C
MSL	Moisture Sensitivity	Level 1		
F <sub>R</sub>	Flammability Rating Oxyge	n Index: 28 to 34	UL 94 V-0 @ 0.125 in	
I <sub>LATCHUP</sub>	Latchup Performance Above $V_{CC}$ and Below GND at 1	25°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.
 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 / 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
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate V <sub>C</sub> V <sub>C</sub>		0 0	100 20	ns/V

### DC ELECTRICAL CHARACTERISTICS

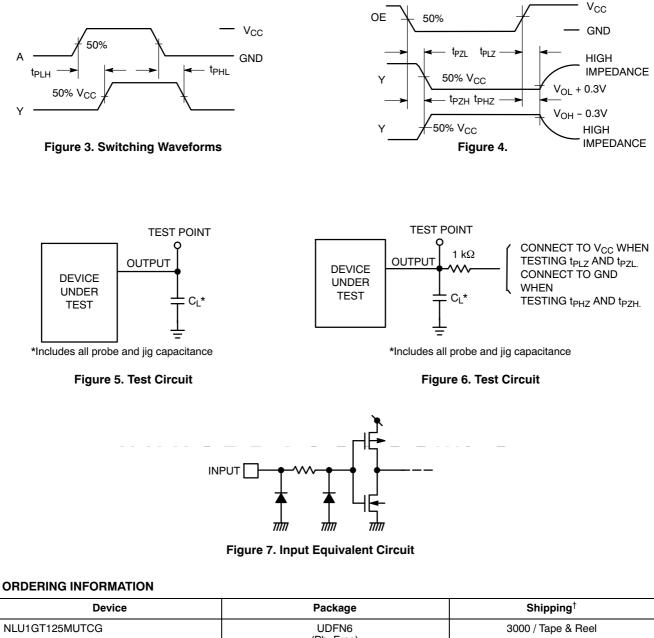
			T <sub>A</sub>			T <sub>A</sub> = 25 °C		T <sub>A</sub> = 25 °C T,	<sub>A</sub> = 25 °C T <sub>A</sub> = +8		T <sub>A</sub> = −55°C +85°C to +125°C			
Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	Min	Тур	Max	Min	Max	Min	Max	Unit			
V <sub>IH</sub>	Low-Level Input Voltage		3.0 4.5 to 5.5	1.4 2.0			1.4 2.0		1.4 2.0		V			
VIL	Low-Level Input Voltage		3.0 4.5 to 5.5			0.53 0.8		0.53 0.8		0.53 0.8	V			
V <sub>OH</sub>	High-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -50 \ \mu A$	3.0 4.5	2.9 4.4	3.0 4.5		2.9 4.4		2.9 4.4		V			
		$\label{eq:VIN} \begin{array}{l} V_{IN} = V_{IH} \mbox{ or } V_{IL} \\ I_{OH} = -4 \mbox{ mA} \\ I_{OH} = -8 \mbox{ mA} \end{array}$	3.0 4.5	2.58 3.94			2.48 3.80		2.34 3.66					
V <sub>OL</sub>	Low-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 50 \ \mu\text{A}$	3.0 4.5		0 0	0.1 0.1		0.1 0.1		0.1 0.1	V			
		$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$	3.0 4.5			0.36 0.36		0.44 0.44		0.52 0.52				
I <sub>IN</sub>	Input Leakage Current	$0 \le V_{IN} \le 5.5 V$	0 to 5.5			±0.1		±1.0		±1.0	μA			
I <sub>CC</sub>	Quiescent Supply Current	$0 \le V_{IN} \le V_{CC}$	5.5			1.0		20		40	μΑ			
ICCT	Quiescent Supply Current	V <sub>IN</sub> = 3.4 V Other Input: V <sub>CC</sub> or GND	5.5			1.35		1.50		1.65	mA			
I <sub>OPD</sub>	Output Leakage Current	V <sub>OUT</sub> = 5.5 V	0.0			0.5		5.0		10	μA			
I <sub>OZ</sub>	3-State Leakage Current	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or}$ GND	0.0		_	±0.25		±2.5		±2.5	μA			

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

		v <sub>cc</sub>	Test	т	_ <sub>A</sub> = 25 °	°C	T <sub>A</sub> =	+85°C		-55°C 25°C	
Symbol	Parameter	(V)	Condition	Min	Тур	Max	Min	Мах	Min	Мах	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, A to <b>Y</b> (Figures 3 and 5)	3.0 to 3.6	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		5.6 8.1	8.0 11.5	1.0 1.0	9.5 13.0		12.0 16.0	ns
		4.5 to 5.5	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		3.8 5.3	5.5 7.5	1.0 1.0	6.5 8.5		8.5 10.5	
t <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable Time, $\overline{OE}$ to Y (Figures 4 and 6)	3.0 to 3.6	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		5.4 7.9	8.0 11.5	1.0 1.0	9.5 13.0		11.5 15.0	ns
		4.5 to 5.5	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		3.6 5.1	5.1 7.1	1.0 1.0	6.0 8.0		7.5 9.5	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Output Disable Time, $\overline{OE}$ to Y (Figures 4 and 6)	3.0 to 3.6	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		6.5 8.0	9.7 13.2	1.0 1.0	11.5 15.0		14.5 18.5	ns
		4.5 to 5.5	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		4.8 7.0	6.8 8.8	1.0 1.0	8.0 10.0		10.0 12.0	
C <sub>IN</sub>	Input Capacitance				4	10		10		10.0	pF
C <sub>OUT</sub>	3-State Output Capacitance (Output in High Impedance State)				6						pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 3)	5.0			14						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

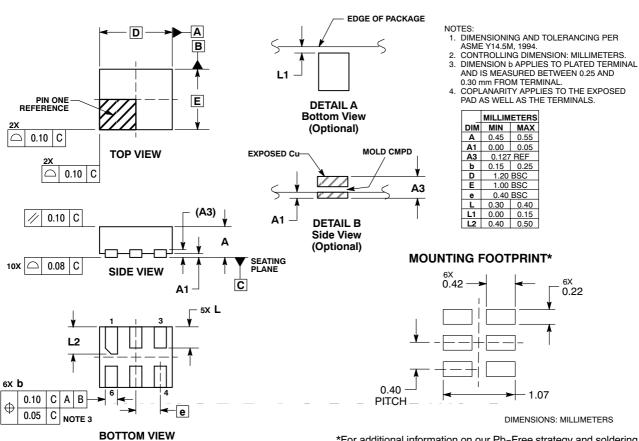


NLU1GT125MUTCG	UDFN6 (Pb-Free)	3000 / Tape & Reel
NLU1GT125AMX1TCG	ULLGA6, 1.45 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLU1GT125BMX1TCG	ULLGA6, 1.2 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLU1GT125CMX1TCG	ULLGA6, 1.0 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>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

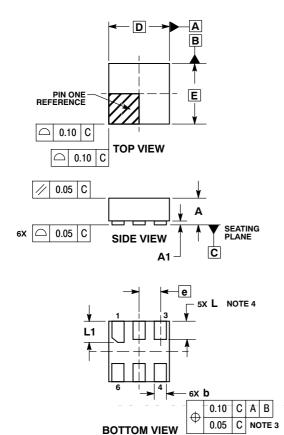
UDFN6, 1.2x1.0, 0.4P CASE 517AA-01 ISSUE C



\*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

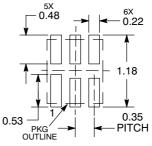
ULLGA6 1.0x1.0, 0.35P CASE 613AD-01 ISSUE A



- 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. 4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

PACKAGE IS ALLOWE							
	MILLIM	MILLIMETERS					
DIM	MIN MAX						
Α		0.40					
A1	0.00	0.05					
b	0.12	0.22					
D	1.00	BSC					
Е	1.00	BSC					
е	0.35	BSC					
L	0.25 0.35						
L1	0.30	0.40					

**MOUNTING FOOTPRINT** SOLDERMASK DEFINED\*

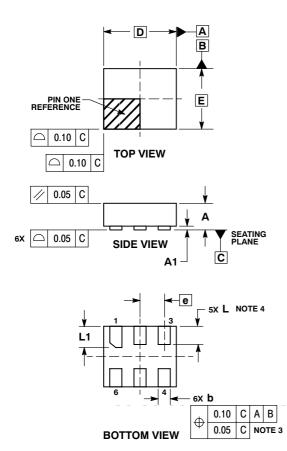


DIMENSIONS: MILLIMETERS

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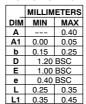
### PACKAGE DIMENSIONS

ULLGA6 1.2x1.0, 0.4P CASE 613AE-01 ISSUE A

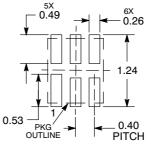


NOTES:

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- 0.30 mm FROM THE TERMINAL TIP. A MAXIMUM OF 0.05 PULL BACK OF THE 4. PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.



#### **MOUNTING FOOTPRINT** SOLDERMASK DEFINED\*

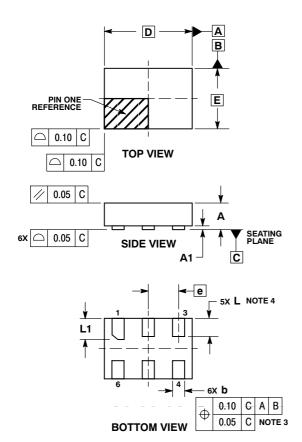


DIMENSIONS: MILLIMETERS

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#### PACKAGE DIMENSIONS

ULLGA6 1.45x1.0, 0.5P CASE 613AF-01 ISSUE A

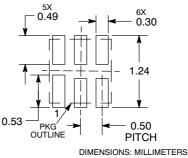


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- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
   CONTROLLING DIMENSION: MILLIMETERS.
- CONTROLLING DIMENSION: MILLIMETERS.
  DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
- A MAXIMUM 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	1.45	BSC				
Е	1.00	BSC				
е	0.50	BSC				
L	0.25	0.35				
L1	0.30	0.40				

MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



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