Single 2-Input Exclusive OR Gate, TTL Level

LSTTL-Compatible Inputs

The NLU1GT86 MiniGate[™] is an advanced CMOS high-speed 2-input Exclusive OR gate in ultra-small footprint.

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

The NLU1GT86 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: $t_{PD} = 3.1 \text{ ns (Typ)} @ V_{CC} = 5.0 \text{ V}$
- 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:

 $V_{OH} > 0.8 V_{CC}$; $V_{OL} < 0.1 V_{CC}$ @ Load

- Power Down Protection Provided on inputs
- Balanced Propagation Delays
- Ultra-Small Packages
- These are Pb-Free Devices

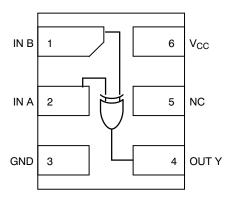


Figure 1. Pinout (Top View)

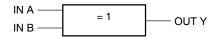


Figure 2. Logic Symbol

FUNCTION TABLE

Inp	Output	
Α	В	Y
L	L	L
L	H	H
Н	L	Н
Н	Н	L

PIN ASSIGNMENT

	_
1	IN B
2	IN A
3	GND
4	OUT Y
5	NC
6	V _{CC}



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MARKING DIAGRAMS



UDFN6 1.2 x 1.0 CASE 517AA





ULLGA6 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 1.45 x 1.0 CASE 517AQ



6 = Device Marking M = Date Code

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
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	
V _{ESD}	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 150 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 no air flow.
- Tested to EIA / JESD22-A114-A.
 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}	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

				т	' _A = 25 °(С	T _A = -	+85°C	T _A = - to +1	-55°C 25°C	
Symbol	Parameter	Conditions	V _{CC} (V)	Min	Тур	Max	Min	Max	Min	Max	Unit
V _{IH}	Low-Level Input Voltage		3.0 4.5 to 5.5	1.4 2.0			1.4 2.0		1.4 2.0		V
V _{IL}	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 _{OH}	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
		$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -4 \text{ mA}$ $I_{OH} = -8 \text{ mA}$	3.0 4.5	2.58 3.94			2.48 3.80		2.34 3.66		
V _{OL}	Low-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 50 \mu\text{A}$	3.0 4.5		0.0 0.0	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
lcc	Quiescent Supply Current	$0 \le V_{IN} \le V_{CC}$	5.5			1.0		20		40	μΑ
Ісст	Quiescent Supply Current	V _{IN} = 3.4 V	5.5			1.35		1.50		1.65	mA
I _{OPD}	Output Leakage Current	V _{OUT} = 5.5 V	0.0			0.5		5.0		10	μΑ

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

		V _{CC}	Test	т	' _A = 25 °(С	T _A = +	⊦85°C	T _A = - to +1	-55°C 25°C	
Symbol	Parameter	(V)	Condition	Min	Тур	Max	Min	Max	Min	Max	Unit
t _{PLH} ,	Propagation Delay, Input A to	3.0 to	C _L = 15 pF		5.0	11.0		13.0		15.5	ns
t _{PHL}	Output Y	3.6	C _L = 50 pF		6.2	14.5		16.5		19.5	
		4.5 to	C _L = 15 pF		3.1	6.8		6.0		10.0	
		5.5	C _L = 50 pF		4.2	8.8		10.0		12.0	
C _{IN}	Input Capacitance				5.5	10		10		10.0	pF
C _{PD}	Power Dissipation Capacitance (Note 6)	5.0			11						pF

^{6.} 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}.

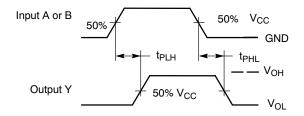
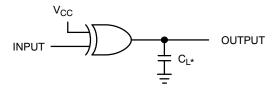


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance.

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

Figure 4. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping [†]
NLU1GT86MUTCG	UDFN6, 1.2 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLU1GT86AMX1TCG	ULLGA6, 1.45 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLU1GT86BMX1TCG	ULLGA6, 1.2 x 1.0, 0.4P (Pb-Free)	3000 / Tape & Reel
NLU1GT86CMX1TCG	ULLGA6, 1.0 x 1.0, 0.35P (Pb-Free)	3000 / Tape & Reel
NLU1GT86AMUTCG	UDFN6, 1.45 x 1.0, 0.5P (Pb-Free)	3000 / Tape & Reel
NLU1GT86CMUTCG	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.

PACKAGE DIMENSIONS

UDFN6 1.45x1.0, 0.5P CASE 517AQ ISSUE O D Α NOTES: NOTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. 2. CONTROLLING DIMENSION: MILLIMETERS. 3. DIMENSION 6 APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP. В **DETAIL A** PIN ONE REFERENCE OPTIONAL CONSTRUCTIONS Е | MILLIMETERS | DIM | MIN | MAX | A | 0.45 | 0.55 | A1 | 0.00 | 0.05 | 0.10 C **EXPOSED Cu** MOLD CMPD A2 0.07 REF **TOP VIEW** b D E 0.20 0.30 □ 0.10 C 1.45 BSC 1.00 BSC е 0.50 BSC DETAIL B **DETAIL B** 0.30 0.40 --- 0.15 OPTIONAL CONSTRUCTIONS 0.05 C **MOUNTING FOOTPRINT** 6X 🗀 0.05 C Α1 C SEATING 6X 0.30 **A2** SIDE VIEW PACKAGE OUTLINE е 6X L 1.24 DETAIL A 6X 0.53 0.50 PITCH DIMENSIONS: MILLIMETERS *For additional information on our Pb-Free strategy and soldering C A B 0.10 details, please download the ON Semiconductor Soldering and

Mounting Techniques Reference Manual, SOLDERRM/D.

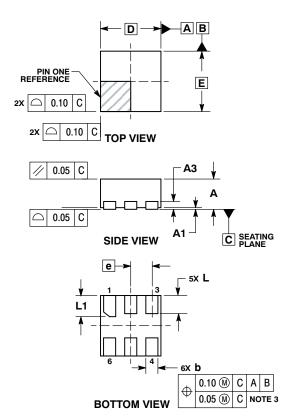
С ноте з

0.05

BOTTOM VIEW

PACKAGE DIMENSIONS

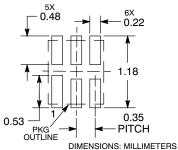
UDFN6 1.0x1.0, 0.35P CASE 517BX ISSUE O



- 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			
A 0.45 0.55 A1 0.00 0.05 A3 0.13 REF b 0.12 0.22		MILLIN	IETERS
A1 0.00 0.05 A3 0.13 REF b 0.12 0.22	DIM	MIN	MAX
A3 0.13 REF b 0.12 0.22	Α	0.45	0.55
b 0.12 0.22	A1	0.00	0.05
	A3	0.13	REF
D 1.00 BSC	b	0.12	0.22
	D	1.00	BSC
E 1.00 BSC	E	1.00	BSC
e 0.35 BSC	е	0.35	BSC
L 0.25 0.35	L	0.25	0.35
L1 0.30 0.40	L1	0.30	0.40

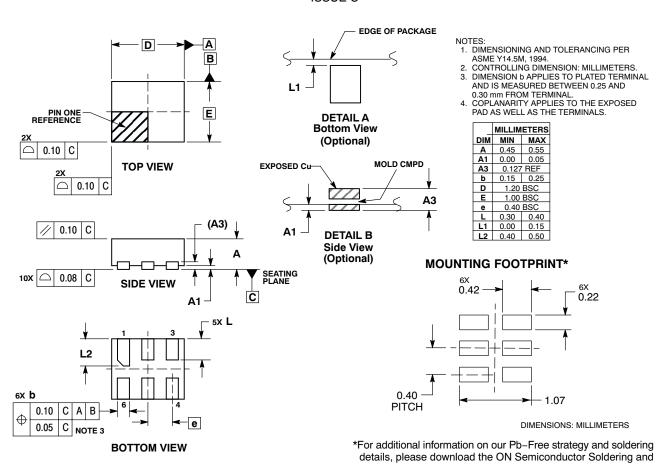
RECOMMENDED SOLDERING FOOTPRINT*



*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

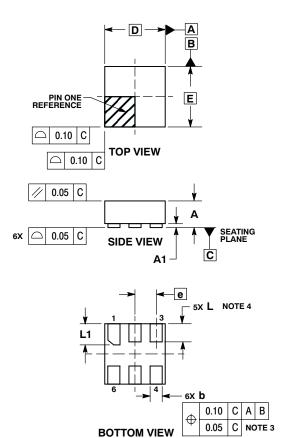
UDFN6, 1.2x1.0, 0.4P CASE 517AA ISSUE C



Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

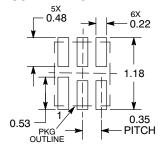
ULLGA6 1.0x1.0, 0.35P CASE 613AD **ISSUE A**



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION & 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			
Α		0.40			
A 1	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*

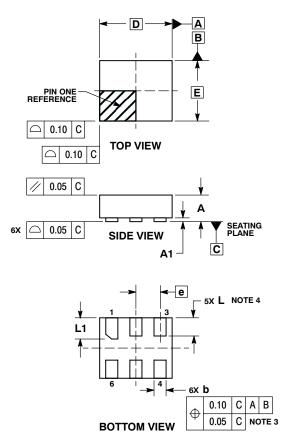


DIMENSIONS: MILLIMETERS

^{*}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

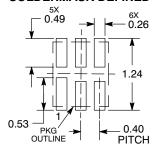
ULLGA6 1.2x1.0, 0.4P CASE 613AE **ISSUE A**



- 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 PACKAGE IS ALLOWED. PACKAGE IS ALLOWED.

MILLIMETERS					
MIN	MAX				
	0.40				
0.00	0.05				
0.15	0.25				
1.20	BSC				
1.00	BSC				
0.40	BSC				
0.25	0.35				
0.35	0.45				
	MIN 0.00 0.15 1.20 1.00 0.40 0.25				

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

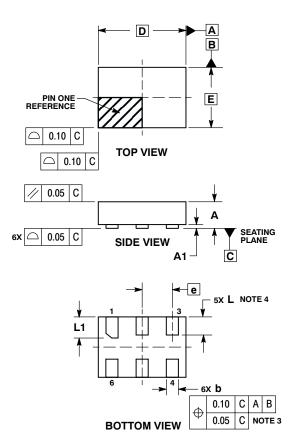


DIMENSIONS: MILLIMETERS

^{*}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

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



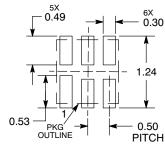
NOTES:

- 1. DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994. 2. CONTROLLING DIMENSION: MILLIMETERS.
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- 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	0.50	BSC			
L	0.25	0.35			
L1	0.30	0.40			

MOUNTING FOOTPRINT SOLDERMASK DEFINED*



DIMENSIONS: MILLIMETERS

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