NLU1GT32

2-Input OR Gate / CMOS Logic Level Shifter

LSTTL-Compatible Inputs

The NLU1GT32 is an advanced CMOS high-speed 2-input 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 NLU1GT32 input and output structures provide protection when voltages up to 7.0 V are applied, irregardless of the supply voltage.

Features

- High Speed: t_{PD} = 3.5 ns (Typ) @ V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 2 μA (Max) at T_A = 25°C
- TTL-Compatible Input: V_{IL} = 0.8 V; V_{IH} = 2.0 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
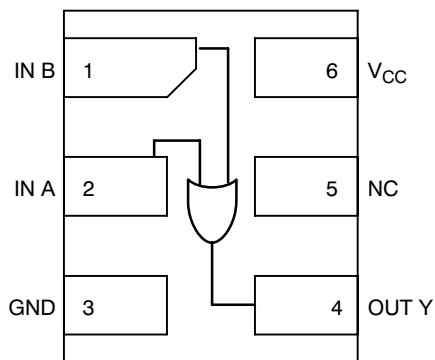- Ultra-Small Pb-Free Package
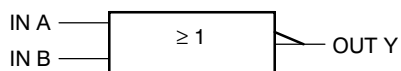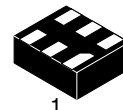- This is a Pb-Free Device

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol

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MARKING DIAGRAM

UDFN6
MU SUFFIX
CASE 517AA

LE, U	= Device Marking
M	= Date Code
■	= Pb-Free Package

PIN ASSIGNMENT

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

FUNCTION TABLE

Input		Output
A	**B**	**Y**
L	L	L
L	H	H
H	L	H
H	H	H

ORDERING INFORMATION

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

Publication Order Number:
NLU1GT32/D

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		TBD	°C
T_J	Junction Temperature Under Bias		TBD	°C
θ_{JA}	Thermal Resistance (Note 1)	UDFN6	TBD	°C/W
P_D	Power Dissipation in Still Air at 85°C	UDFN6	TBD	mW
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 Fail Rate	V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 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		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} or V_{IL} I_{OH} = -50 μA	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} 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	3.0 4.5		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	$0 \leq V_{IN} \leq 5.5$ V	0 to 5.5			±0.1		±1.0		±1.0	μA
I_{CC}	Quiescent Supply Current	$0 \leq V_{IN} \leq V_{CC}$	5.5			2.0		20		40	μA
I_{CCT}	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	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 or B to Y	3.0 to 3.6	C_L = 15 pF		4.8	7.9		9.5		11.5	ns
			C_L = 50 pF		6.1	11.4		13.0		15.5	
		4.5 to 5.5	C_L = 15 pF		3.7	5.5		6.5		8.0	
			C_L = 50 pF		4.4	7.5		8.5		10.0	
C_{IN}	Input Capacitance				5.5	10		10		10.0	pF
C_{PD}	Power Dissipation Capacitance (Note 3)	5.0			11						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: $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.
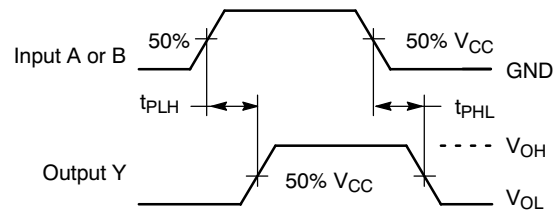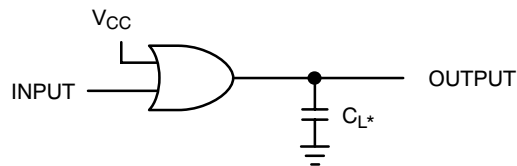
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Figure 3. Switching Waveforms

*Includes all probe and jig capacitance.
A 1- MHz square input wave is recommended
for propagation delay tests.
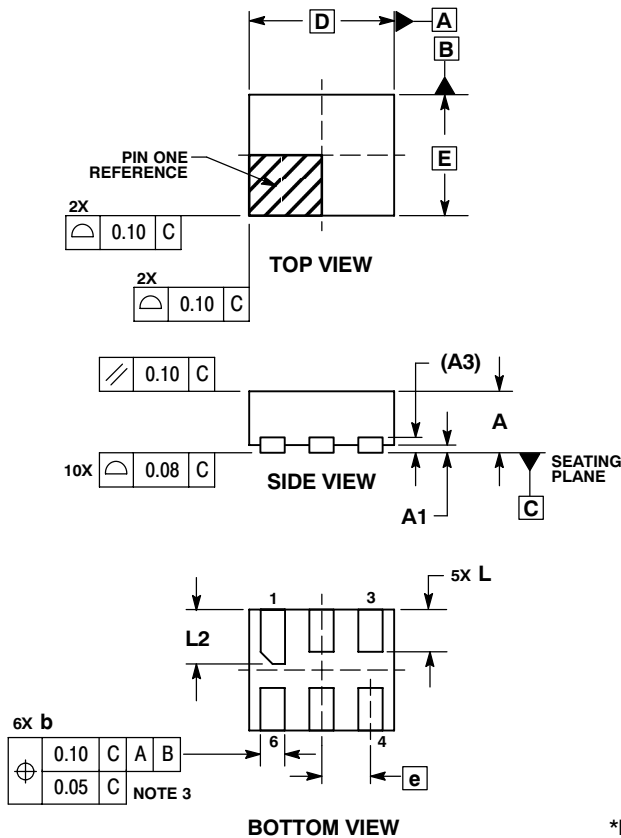
Figure 4. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping[†]
NLU1GT32MUTCG	UDFN6 (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.

NLU1GT32

PACKAGE DIMENSIONS

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

TOP VIEW

PIN ONE REFERENCE

2X 0.10 C

2X 0.10 C

SIDE VIEW

0.10 C

10X 0.08 C

(A3)

A

A1

SEATING PLANE

C

BOTTOM VIEW

5X L

L2

6X b

0.10 C A B

0.05 C NOTE 3

e

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.

DIM	MILLIMETERS	
	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
L2	0.40	0.50

MOUNTING FOOTPRINT*

6X 0.42

6X 0.22

0.40 PITCH

1.07
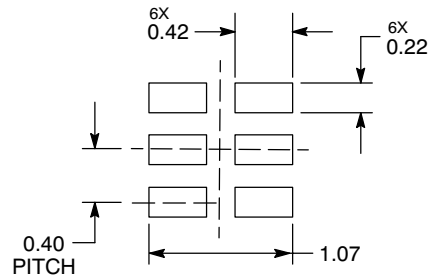
DIMENSIONS: MILLIMETERS

*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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