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NLU2G14

Dual Schmitt-Trigger Inverter

The NLU2G14 MiniGate™ is an advanced high−speed CMOS dual Schmitt−trigger inverter in ultra−small footprint.

The NLU2G14 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

The NLU2G14 can be used to enhance noise immunity or to square up slowly changing waveforms.

Features

- High Speed: t_{PD} = 4.0 ns (Typ) @ V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 1 μA (Max) at T_A = 25°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
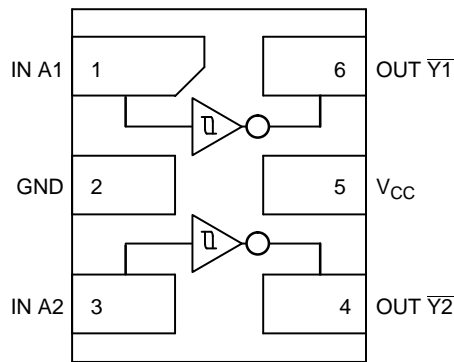
Figure 1. Pinout (Top View)
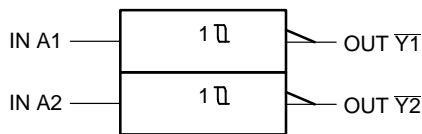
Figure 2. Logic Symbol

PIN ASSIGNMENT

1	IN A1
2	GND
3	IN A2
4	OUT $\overline{Y2}$
5	V_{CC}
6	OUT $\overline{Y1}$

FUNCTION TABLE

A	$\overline{Y}$
L	H
H	L

ON Semiconductor®

MARKING DIAGRAMS

UDFN6
1.0 x 1.0
CASE 517BX

X M
•

UDFN6
1.2 x 1.0
CASE 517AA

DM
•

UDFN6
1.45 x 1.0
CASE 517AQ

X M
○

D = 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.

NLU2G14

MAXIMUM RATINGS

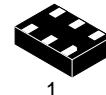| Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_{IN}	DC Input Voltage		−0.5 to +7.0	V
V_{OUT}	DC Output Voltage		−0.5 to +7.0	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−20	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	±20	mA
I_O	DC Output Source/Sink Current		±12.5	mA
I_{CC}	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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
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
Δt/ΔV	Input Transition Rise or Fall Rate	V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 V	0 0	No Limit No Limit	ns/V

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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$_{T+}$	Positive Threshold Voltage		3.0 4.5 5.5	1.85 2.86 3.50	2.0 3.0 3.6	2.2 3.15 3.85		2.2 3.15 3.85		2.2 3.15 3.85	V
V$_{T−}$	Negative Threshold Voltage		3.0 4.5 5.5	0.9 1.35 1.65	1.5 2.3 2.9	1.65 2.46 3.05	0.9 1.35 1.65		0.9 1.35 1.65		V
V$_H$	Hysteresis Voltage		3.0 4.5 5.5	0.30 0.40 0.50	0.57 0.67 0.74	1.20 1.40 1.60	0.30 0.40 0.50	1.20 1.40 1.60	0.30 0.40 0.50	1.20 1.40 1.60	V
V$_{OH}$	Minimum High−Level Output Voltage	V$_{IN}$ ≤ V$_{T−MIN}$ 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$_{T−MIN}$ 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$_{OL}$	Maximum Low−Level Output Voltage	V$_{IN}$ ≥ V$_{T+MAX}$ 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$_{T+MAX}$ 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	0 ≤ V$_{IN}$ ≤ V$_{CC}$	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		7.0	12.8	1.0	15	1.0	17	ns
			C$_L$ = 50 pF		8.5	16.3	1.0	18.5	1.0	20.5	
		4.5 to 5.5	C$_L$ = 15 pF		4.0	8.6	1.0	10	1.0	11.5	
			C$_L$ = 50 pF		5.5	10.6	1.0	12	1.0	13.5	
C$_{IN}$	Input Capacitance				5.0	10		10		10	pF
C$_{PD}$	Power Dissipation Capacitance (Note 3)	5.0			7.0						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$_{CC}$.
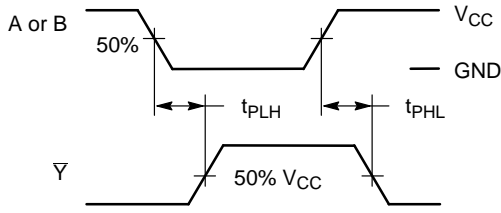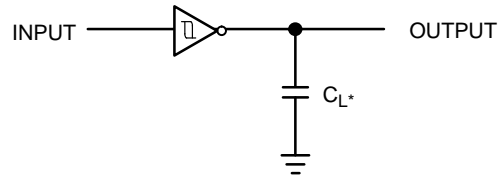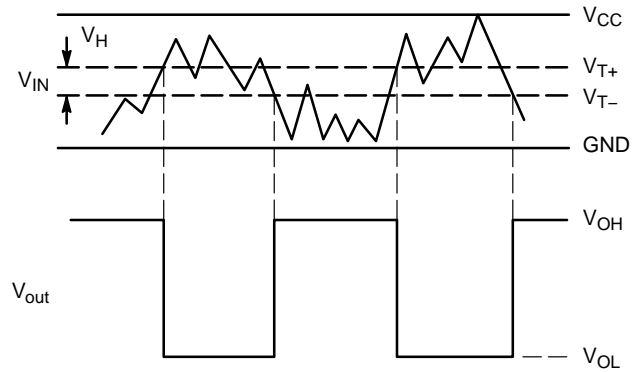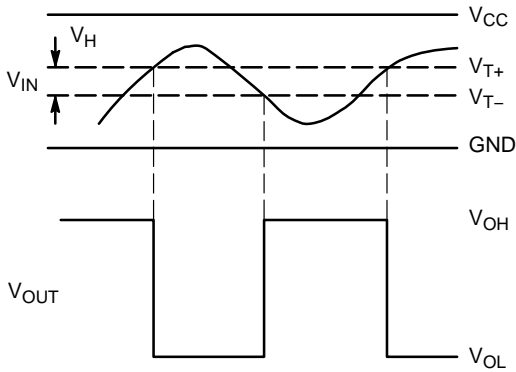
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Figure 3. Switching Waveforms

*Includes all probe and jig capacitance.
A 1−MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

(a) A Schmitt−Trigger Squares Up Inputs With Slow Rise and Fall Times

(b) A Schmitt−Trigger Offers Maximum Noise Immunity

Figure 5. Typical Schmitt−Trigger Applications
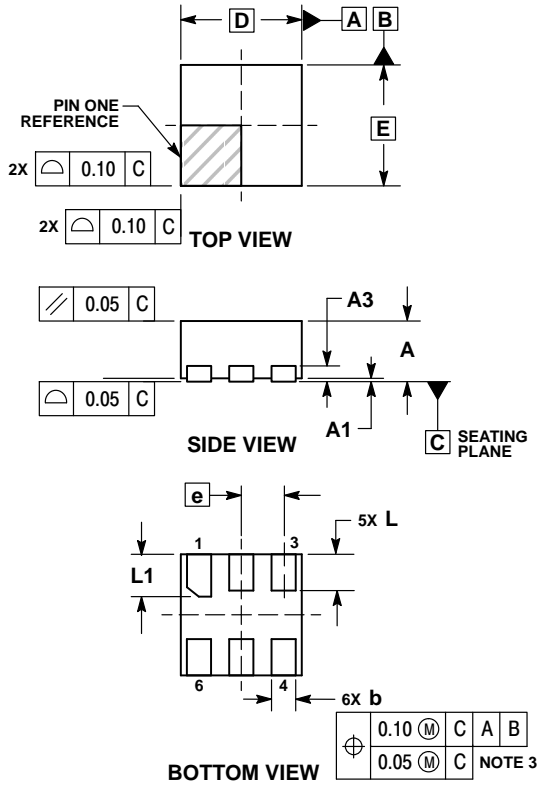
ORDERING INFORMATION

Device	Package	Shipping†
NLU2G14MUTCG	UDFN6, 1.2 x 1.0, 0.4P (Pb−Free)	3000 / Tape & Reel
NLU2G14AMUTCG (In Development)	UDFN6, 1.45 x 1.0, 0.5P (Pb−Free)	3000 / Tape & Reel
NLU2G14CMUTCG (In Development)	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.

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PACKAGE DIMENSIONS

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

TOP VIEW

2X △ | 0.10 | C

2X △ | 0.10 | C

PIN ONE REFERENCE

SIDE VIEW

∠ | 0.05 | C

△ | 0.05 | C

C SEATING PLANE

A3, A, A1

BOTTOM VIEW

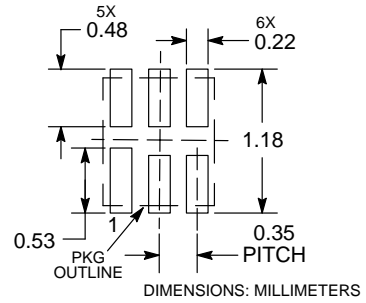e, 5X L, L1, 6X b

⊕ | 0.10 Ⓜ | C | A | B
  | 0.05 Ⓜ | C | NOTE 3

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	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

RECOMMENDED SOLDERING FOOTPRINT*

5X 0.48, 6X 0.22, 1.18, 0.53, 1 PKG OUTLINE, 0.35 PITCH

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.
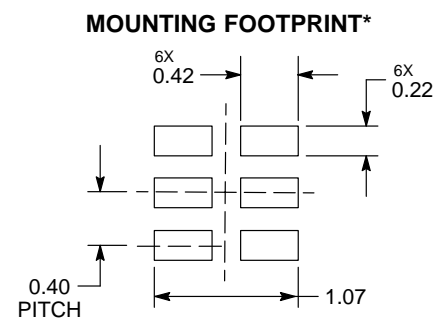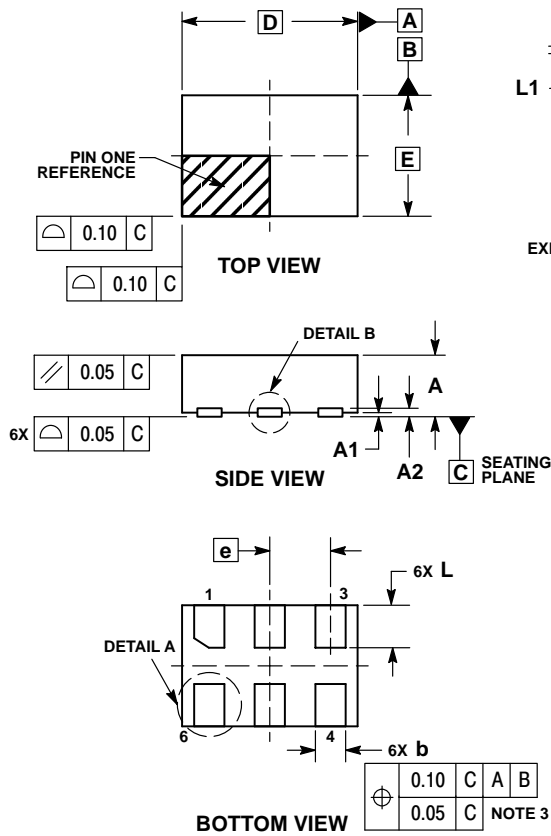
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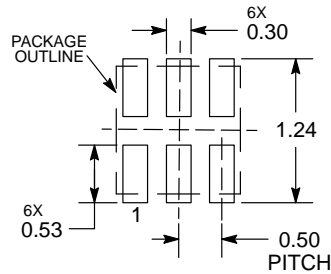## PACKAGE DIMENSIONS

UDFN6, 1.2x1.0, 0.4P
CASE 517AA
ISSUE C
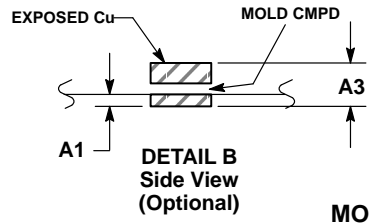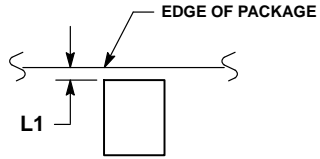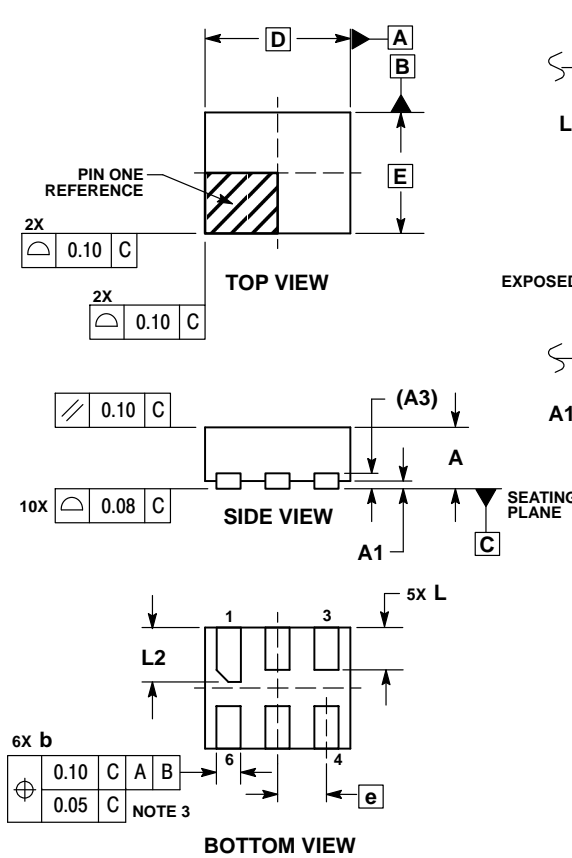
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| 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
L1	0.00	0.15
L2	0.40	0.50

TOP VIEW

DETAIL A
Bottom View
(Optional)

DETAIL B
Side View
(Optional)

SIDE VIEW

BOTTOM VIEW

MOUNTING FOOTPRINT*

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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PACKAGE DIMENSIONS

UDFN6 1.45x1.0, 0.5P
CASE 517AQ
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 0.30 mm FROM THE TERMINAL TIP.

| DIM | MILLIMETERS | |
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	–––	0.15

TOP VIEW

PIN ONE REFERENCE

DETAIL A
OPTIONAL CONSTRUCTIONS

EXPOSED Cu   MOLD CMPD

DETAIL B
OPTIONAL CONSTRUCTIONS

SIDE VIEW

DETAIL B

SEATING PLANE

BOTTOM VIEW

DETAIL A

NOTE 3

MOUNTING FOOTPRINT

PACKAGE OUTLINE

6X 0.30

1.24

6X 0.53

0.50 PITCH

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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