

NLU2G16

Dual Non-Inverting Buffer

The NLU2G16 MiniGate™ is an advanced high-speed CMOS dual non-inverting buffer in ultra-small footprint.

The NLU2G16 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: $t_{PD} = 3.5 \text{ ns}$ (Typ) @ $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1 \mu\text{A}$ (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

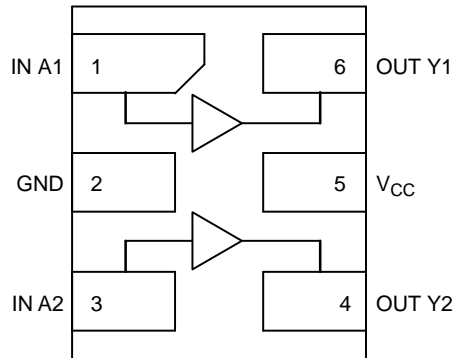


Figure 1. Pinout (Top View)

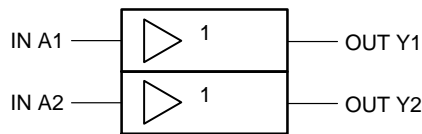


Figure 2. Logic Symbol

PIN ASSIGNMENT

| | |
|---|----------|
| 1 | IN A1 |
| 2 | GND |
| 3 | IN A2 |
| 4 | OUT Y2 |
| 5 | V_{CC} |
| 6 | OUT Y1 |

FUNCTION TABLE

| A | Y |
|---|---|
| L | L |
| H | H |



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MARKING DIAGRAMS



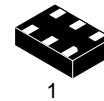
1

UDFN6
1.0 x 1.0
CASE 517BX



1

UDFN6
1.2 x 1.0
CASE 517AA



1

UDFN6
1.45 x 1.0
CASE 517AQ



C, 4, R, E = 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.

NLU2G16

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 |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate $V_{CC} = 3.3 V \pm 0.3 V$ $V_{CC} = 5.0 V \pm 0.5 V$ | 0 0 | 100 20 | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

NLU2G16

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 |
| 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} = 5.5 V or GND | 5.5 | | | 1.0 | | 10 | | 40 | μA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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}.

NLU2G16

SWITCHING WAVEFORMS

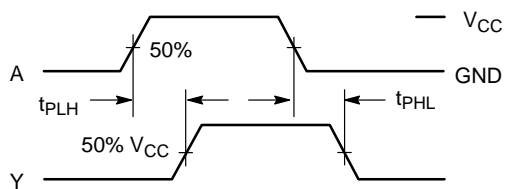
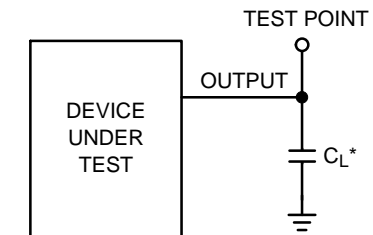


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

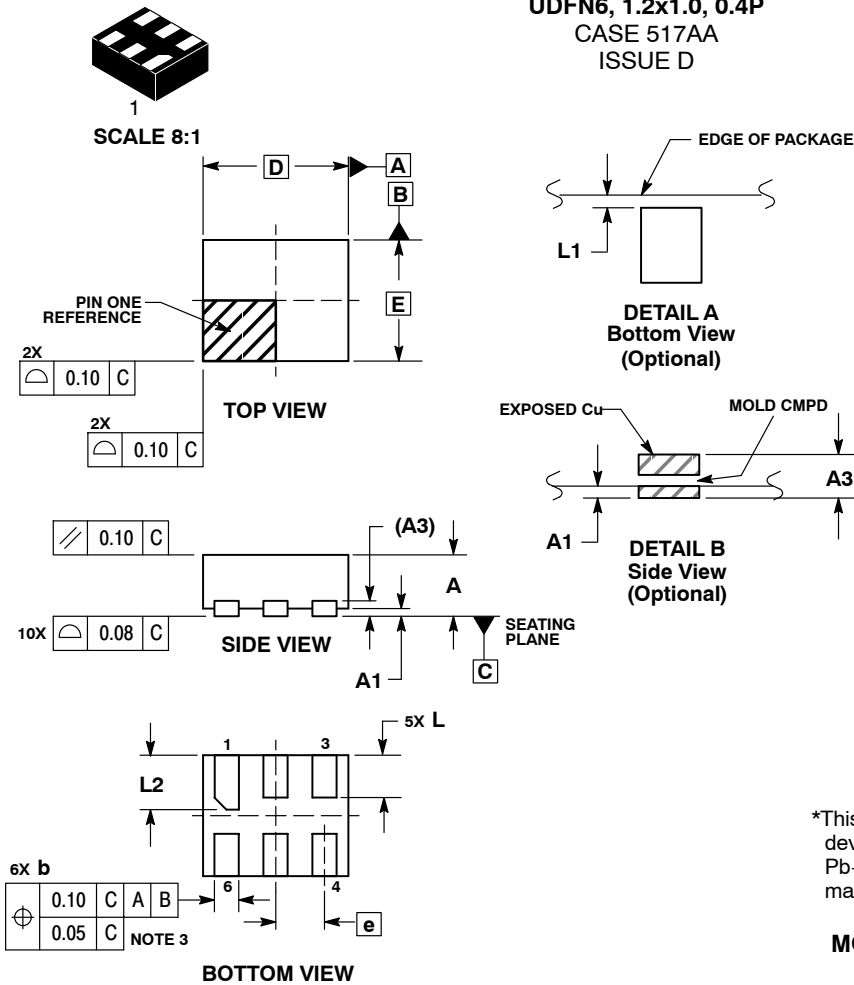
ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|--------------------------------------|--------------------|
| NLU2G16MUTCG | UDFN6, 1.2 x 1.0, 0.4P (Pb-Free) | 3000 / Tape & Reel |
| NLU2G16AMUTCG | UDFN6, 1.45 x 1.0, 0.5P (Pb-Free) | 3000 / Tape & Reel |
| NLU2G16CMUTCG | 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.

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

DATE 03 SEP 2010



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.

| MILLIMETERS | | |
|-------------|----------|------|
| DIM | 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 |

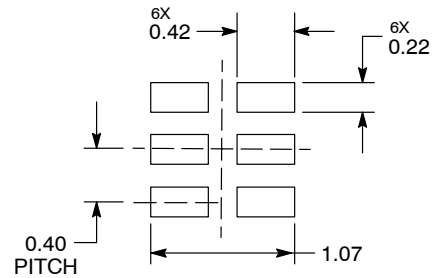
GENERIC MARKING DIAGRAM*



X = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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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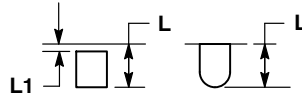
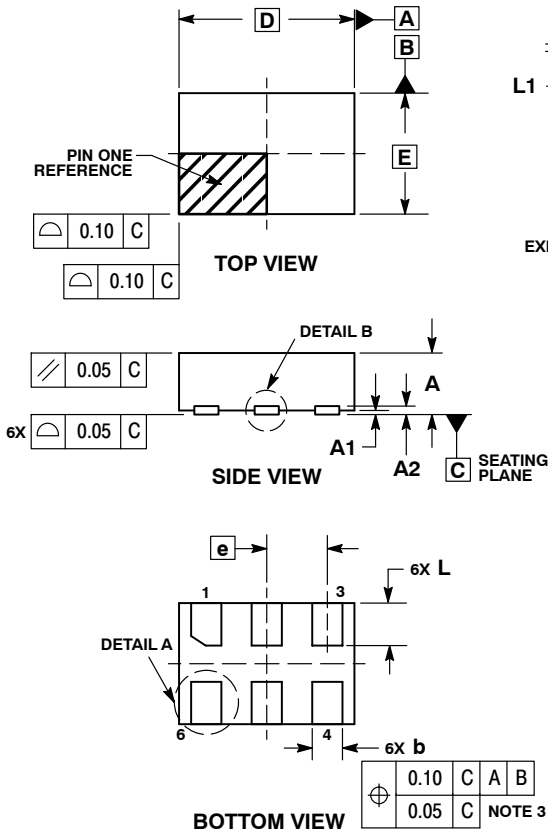
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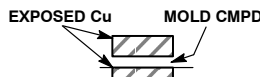
SCALE 4:1

UDFN6, 1.45x1.0, 0.5P
CASE 517AQ
ISSUE O

DATE 15 MAY 2008



DETAIL A
OPTIONAL
CONSTRUCTIONS



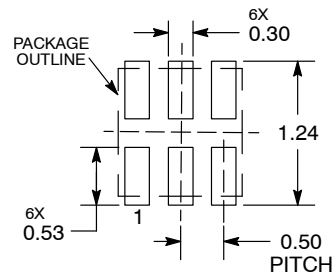
DETAIL B
OPTIONAL
CONSTRUCTIONS

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.

| MILLIMETERS | | |
|-------------|------|------|
| DIM | 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 |

MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

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

GENERIC
MARKING DIAGRAM*



X = Specific Device
Code

M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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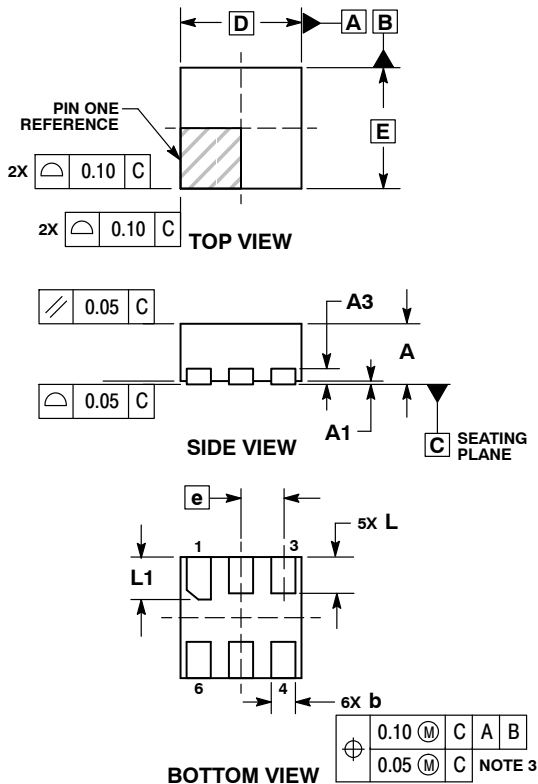
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UDFN6, 1x1, 0.35P
CASE 517BX
ISSUE O

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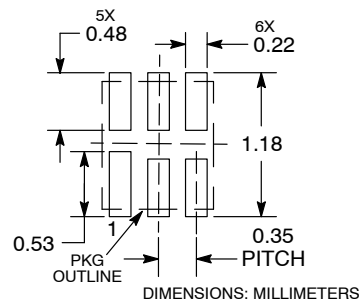
DATE 18 MAY 2011



- 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.

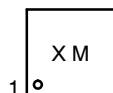
| MILLIMETERS | | |
|-------------|------|------|
| DIM | MIN | MAX |
| A | 0.45 | 0.55 |
| A1 | 0.00 | 0.05 |
| A3 | 0.13 | REF |
| b | 0.12 | 0.22 |
| D | 1.00 | BSC |
| E | 1.00 | BSC |
| e | 0.35 | BSC |
| L | 0.25 | 0.35 |
| L1 | 0.30 | 0.40 |

RECOMMENDED
SOLDERING FOOTPRINT*



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

GENERIC
MARKING DIAGRAM*



X = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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