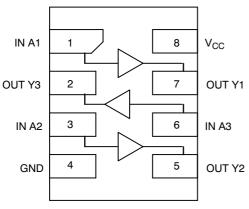
Triple Non-Inverting Buffer

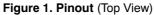
The NLU3G16 MiniGate[™] is an advanced high-speed CMOS triple non-inverting buffer in ultra-small footprint.

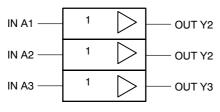
The NLU3G16 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: $t_{PD} = 3.5 \text{ ns} (Typ) @ V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1 \mu A$ (Max) at $T_A = 25^{\circ}C$
- Power Down Protection Provided on inputs
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra-Small Packages
- These are Pb-Free Devices











ON Semiconductor®

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| | | MARKING DIAGRAMS |
|---|---|---------------------|
| | B UDFN8 1.8 x 1.2 CASE 517AJ | UYM O • |
| | ULLGA8 1.45 x 1.0 CASE 613AA | RM O |
| | ULLGA8 1.6 x 1.0 CASE 613AB | LRM ○ ■ |
| 1 | ULLGA8 1.95 x 1.0 CASE 613AC | LRM ○ ■ |
| | UY, R or LR = Specific M = Date Code | c Device Code |

- /I = Date Code
- = Pb-Free Package

PIN ASSIGNMENT

| IN A1 |
|-----------------|
| OUT Y3 |
| IN A2 |
| GND |
| OUT Y2 |
| IN A3 |
| OUT Y1 |
| V _{CC} |
| |

FUNCTION TABLE

| А | Y |
|---|---|
| L | L |
| H | H |

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 |
| Ι _Ο | 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 |
| ΤL | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | °C |
| ТJ | 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 | |
| ILATCHUP | 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.
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 _{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 $ \begin{array}{c} V_{CC} = 3.3 \ V \pm 0.3 \ V \\ V_{CC} = 5.0 \ V \pm 0.5 \ V \end{array} $ | 0 0 | 100 20 | ns/V |

DC ELECTRICAL CHARACTERISTICS

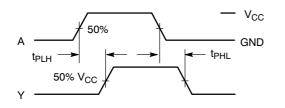
| | | | v _{cc} | т | _A = 25 ° | с | T _A = - | ⊦85°C | | 55°C to 25°C | |
|-----------------|------------------------------|--|-------------------|---------------------------|---------------------|---------------------------|---------------------------|---------------------------|-------------------|---------------------------|------|
| Symbol | Parameter | Conditions | (V) | Min | Тур | Max | Min | Max | Min | Max | Unit |
| 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 | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -50 \ \mu A$ | 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 |
| | | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -4 \text{ mA}$ $I_{OH} = -8 \text{ mA}$ | 3.0 4.5 | 2.58 3.94 | | | 2.48 3.80 | | 2.34 3.66 | | V |
| V _{OL} | Low-Level Output Voltage | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 50 \ \mu \text{A}$ | 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 |
| | | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$ | 3.0 4.5 | | | 0.36 0.36 | | 0.44 0.44 | | 0.52 0.52 | |
| I _{IN} | Input Leakage Current | $0 \le V_{IN} \le 5.5 V$ | 0 to 5.5 | | | ±0.1 | | ±1.0 | | ±1.0 | μΑ |
| ICC | Quiescent Supply Current | $0 \le V_{IN} \le V_{CC}$ | 5.5 | | | 1.0 | | 10 | | 40 | 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 = -5 +12 | | |
|--------------------|--|-----------------|------------------------|-----|----------|------|---------------------------|-------|----------------------------|------|------|
| Symbol | Parameter | (V) | Condition | Min | Тур | Max | Min | Max | Min | Max | Unit |
| t _{PLH} , | Propagation Delay, | 3.0 to | C _L = 15 pF | | 4.5 | 7.1 | | 8.5 | | 10 | ns |
| t _{PHL} | Input A to Output Y | 3.6 | C _L = 50 pF | | 6.4 | 10.6 | | 12 | | 14.5 | |
| | | 4.5 to | C _L = 15 pF | | 3.5 | 5.5 | | 6.5 | | 8.0 | |
| | | 5.5 | 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 $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. 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



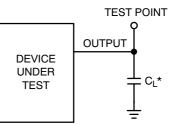


Figure 3. Switching Waveforms

*Includes all probe and jig capacitance

Figure 4. Test Circuit

ORDERING INFORMATION

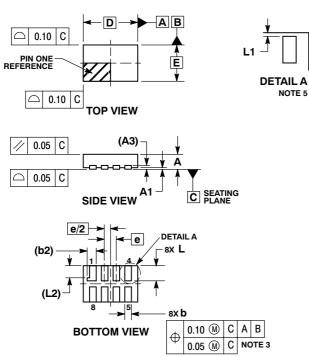
| Device | Package | Shipping [†] |
|----------------|--|-----------------------|
| NLU3G16MUTAG | UDFN8 (Pb-Free) | 3000 / Tape & Reel |
| NLU3G16AMX1TCG | ULLGA8, 1.95 x 1.0, 0.5P (Pb-Free) | 3000 / Tape & Reel |
| NLU3G16BMX1TCG | ULLGA8, 1.6 x 1.0, 0.4P (Pb-Free) | 3000 / Tape & Reel |
| NLU3G16CMX1TCG | ULLGA8, 1.45 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

UDFN8 1.8x1.2, 0.4P CASE 517AJ-01 ISSUE O

NOTE 5

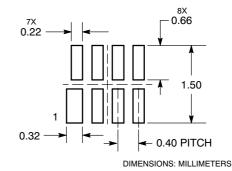


NOTES:

- 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 TERMINAL TIP. 4. MOLD FLASH ALLOWED ON TERMINALS ALONG EDGE OF PACKAGE. FLASH MAY NOT EXCEED 0.30 ONTO BOTTOM SURFACE OF TERMINALS. 5. DETAIL A SHOWS OPTIONAL CONSTRUCTION FOR TERMINALS.

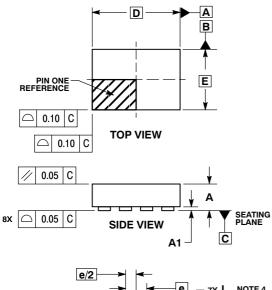
| concritection | | | | | | |
|---------------|-------------|-----------|--|--|--|--|
| | MILLIMETERS | | | | | |
| DIM | MIN MAX | | | | | |
| Α | 0.45 | 0.55 | | | | |
| A1 | 0.00 | 0.05 | | | | |
| A3 | 0.127 | 0.127 REF | | | | |
| b | 0.15 0.25 | | | | | |
| b2 | 0.30 REF | | | | | |
| D | 1.80 | BSC | | | | |
| Е | 1.20 | BSC | | | | |
| е | 0.40 | BSC | | | | |
| L | 0.45 | 0.45 0.55 | | | | |
| L1 | 0.00 | 0.03 | | | | |
| L2 | 0.40 | REF | | | | |

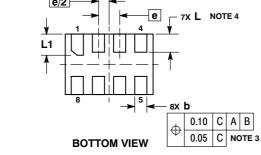
MOUNTING FOOTPRINT SOLDERMASK DEFINED



PACKAGE DIMENSIONS

ULLGA8 1.45x1.0, 0.35P CASE 613AA-01 ISSUE A



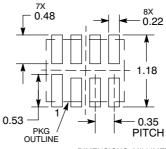


NOTES:

- 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 ALLOW | | | | | |
|------------------|---------|-------------|--|--|--|
| | MILLIM | 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 | 0.35 | BSC | | | |
| L | 0.25 | 0.35 | | | |
| L1 | 0.30 | 0.40 | | | |

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

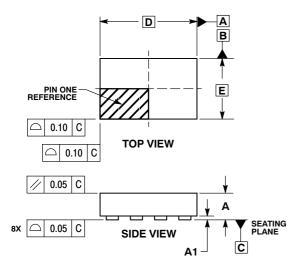


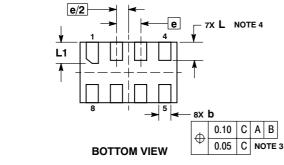
DIMENSIONS: MILLIMETERS

*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

ULLGA8 1.6x1.0, 0.4P CASE 613AB-01 ISSUE A



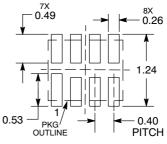


- NOTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. 2. CONTROLLING DIMENSION: MILLIMETERS. 3. DIMENSION & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP. 4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PLATED TERMINAL FROM THE EDGE OF THE PLATED TERMINAL LOWED.

 - PACKAGE IS ALLOWED.

| | MILLIMETERS | | | | |
|-----|-------------|----------|--|--|--|
| DIM | MIN | MAX | | | |
| Α | | 0.40 | | | |
| A1 | 0.00 | 0.05 | | | |
| b | 0.15 | 0.25 | | | |
| D | 1.60 | BSC | | | |
| Е | 1.00 | BSC | | | |
| е | 0.40 | 0.40 BSC | | | |
| L | 0.25 | 0.35 | | | |
| L1 | 0.30 | 0.40 | | | |

MOUNTING FOOTPRINT SOLDERMASK DEFINED*

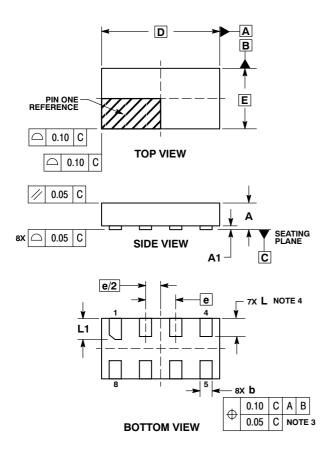


DIMENSIONS: MILLIMETERS

*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

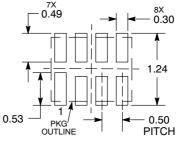
ULLGA8 1.95x1.0, 0.5P CASE 613AC-01 **ISSUE A**



- NOTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. CONTROLLING DIMENSION: MILLIMETERS.
- 2. 3. 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 | 1.95 | BSC | | | |
| Е | 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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