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# NLX2G86

## Dual 2-Input Exclusive-OR Gate

The NLX2G86 is a high performance dual 2-input Exclusive-OR Gate operating from a 1.65 V to 5.5 V supply.

### Features

- Extremely High Speed:  $t_{PD}$  2.4 ns (typical) at  $V_{CC} = 5.0$  V
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible – Interface Capability With 5.0 V TTL Logic with  $V_{CC} = 3.0$  V
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7WZ86
- This is a Pb-Free Device

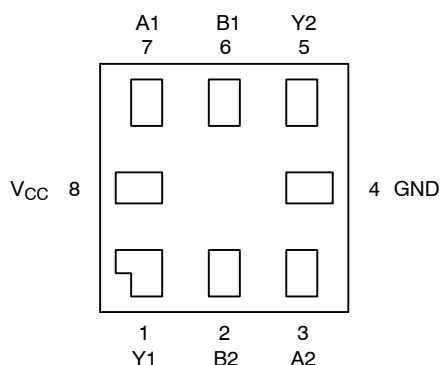


Figure 1. Pinout (Top View)

### PIN ASSIGNMENT

| Pin | Function |
|-----|----------|
| 1   | Y1       |
| 2   | B2       |
| 3   | A2       |
| 4   | GND      |
| 5   | Y2       |
| 6   | B1       |
| 7   | A1       |
| 8   | $V_{CC}$ |



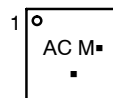
**ON Semiconductor®**

<http://onsemi.com>



**UQFN8**  
**MU SUFFIX**  
**CASE 523AN**

### MARKING DIAGRAM



AC = Device Code  
M = Date Code\*  
■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

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

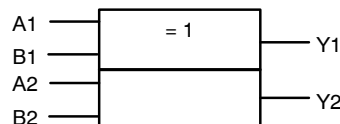


Figure 2. Logic Symbol

### FUNCTION TABLE

| Input |   | Output<br>$Y = A + B$ |
|-------|---|-----------------------|
| A     | B | Y                     |
| L     | L | L                     |
| L     | H | H                     |
| H     | L | H                     |
| H     | H | L                     |

## NLX2G86

### MAXIMUM RATINGS

| Symbol        | Parameter   | Value                  | Unit |
|---------------|---|------------------------|------|
| $V_{CC}$      | DC Supply Voltage   | - 0.5 to + 7.0         | V    |
| $V_I$         | DC Input Voltage  | - 0.5 to + 7.0         | V    |
| $V_O$         | DC Output Voltage   | - 0.5 to + 7.0         | V    |
| $I_{IK}$      | DC Input Diode Current<br>$V_I < GND$   | - 50                   | mA   |
| $I_{OK}$      | DC Output Diode Current<br>$V_O < GND$  | - 50                   | mA   |
| $I_O$         | DC Output Sink Current  | $\pm 50$               | mA   |
| $I_{CC}$      | DC Supply Current per Supply Pin  | $\pm 100$              | mA   |
| $I_{GND}$     | DC Ground Current per Ground Pin  | $\pm 100$              | 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   |
| $\theta_{JA}$ | Thermal Resistance (Note 1)   | TBD                    | °C/W |
| $P_D$         | Power Dissipation in Still Air at 85°C  | TBD                    | mW   |
| MSL           | Moisture Sensitivity  | Level 1                |      |
| $F_R$         | Flammability Rating<br>Oxygen Index: 28 to 34   | UL 94 V-0 @ 0.125 in   |      |
| $V_{ESD}$     | ESD Withstand Voltage<br>Human Body Model (Note 2)<br>Machine Model (Note 3)<br>Charged Device Model (Note 4) | > 2000<br>> 200<br>N/A | V    |

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 with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.

### RECOMMENDED OPERATING CONDITIONS

| Symbol              | Parameter   | Min              | Max                 | Unit |
|---------------------|---|------------------|---------------------|------|
| $V_{CC}$            | Supply Voltage<br>Operating<br>Data Retention Only  | 1.65<br>1.5      | 5.5<br>5.5          | V    |
| $V_I$               | Input Voltage (Note 5)  | 0                | 5.5                 | V    |
| $V_O$               | Output Voltage (HIGH or LOW State)  | 0                | 5.5                 | V    |
| $T_A$               | Operating Free-Air Temperature  | - 40             | + 125               | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate<br>$V_{CC} = 1.8 V \pm 0.15 V$<br>$V_{CC} = 2.5 V \pm 0.2 V$<br>$V_{CC} = 3.0 V \pm 0.3 V$<br>$V_{CC} = 5.0 V \pm 0.5 V$ | 0<br>0<br>0<br>0 | 20<br>20<br>10<br>5 | ns/V |

5. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

## NLX2G86

### DC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter  | V <sub>CC</sub><br>(V)           | T <sub>A</sub> = 25°C                       |                                      |   | -40°C ≤ T <sub>A</sub> ≤ 85°C               |   | Unit | Condition  |
|------------------|--|----------------------------------|---|--------------------------------------|---|---|---|------|--|
|                  |  |                                  | Min   | Typ                                  | Max   | Min   | Max   |      |  |
| V <sub>IH</sub>  | High-Level Input Voltage                                       | 1.65 to 1.95<br>2.3 to 5.5       | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub> |                                      |   | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub> |   | V    |  |
| V <sub>IL</sub>  | Low-Level Input Voltage  | 1.65 to 1.95<br>2.3 to 5.5       |   |                                      | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub> |   | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub> | V    |  |
| V <sub>OH</sub>  | High-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> | 1.65<br>1.8<br>2.3<br>3.0<br>4.5 | 1.55<br>1.7<br>2.2<br>2.9<br>4.4            | 1.65<br>1.8<br>2.3<br>3.0<br>4.5     |   | 1.55<br>1.7<br>2.2<br>2.9<br>4.4            |   | V    | I <sub>OH</sub> = -100 μA  |
|                  |  | 1.65<br>2.3<br>3.0<br>3.0<br>4.5 | 1.29<br>1.9<br>2.4<br>2.3<br>3.8            | 1.52<br>2.15<br>2.80<br>2.68<br>4.20 |   | 1.29<br>1.9<br>2.4<br>2.3<br>3.8            |   | V    | I <sub>OH</sub> = -4 mA<br>I <sub>OH</sub> = -8 mA<br>I <sub>OH</sub> = -16 mA<br>I <sub>OH</sub> = -24 mA<br>I <sub>OH</sub> = -32 mA |
| V <sub>OL</sub>  | Low-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IL</sub>  | 1.65<br>1.8<br>2.3<br>3.0<br>4.5 |   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0      | 0.1<br>0.1<br>0.1<br>0.1<br>0.1             |   | 0.1<br>0.1<br>0.1<br>0.1<br>0.1             | V    | I <sub>OL</sub> = 100 μA   |
|                  |  | 1.65<br>2.3<br>3.0<br>3.0<br>4.5 |   | 0.08<br>0.10<br>0.15<br>0.22<br>0.22 | 0.24<br>0.30<br>0.40<br>0.55<br>0.55        |   | 0.24<br>0.30<br>0.40<br>0.55<br>0.55        | V    | I <sub>OL</sub> = 4 mA<br>I <sub>OL</sub> = 8 mA<br>I <sub>OL</sub> = 16 mA<br>I <sub>OL</sub> = 24 mA<br>I <sub>OL</sub> = 32 mA      |
| I <sub>IN</sub>  | Input Leakage Current  | 0 to 5.5                         |   |                                      | ± 1.0                                       |   | ± 1.0                                       | μA   | 0 V ≤ V <sub>IN</sub> ≤ 5.5 V  |
| I <sub>OFF</sub> | Power Off Leakage Current                                      | 0.0                              |   |                                      | 1.0   |   | 10  | μA   | V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V  |
| I <sub>CC</sub>  | Quiescent Supply Current                                       | 1.65 to 5.5                      |   |                                      | 1.0   |   | 10  | μA   | V <sub>IN</sub> = 5.5 V, GND   |

### AC ELECTRICAL CHARACTERISTICS t<sub>R</sub> = t<sub>F</sub> = 3.0 ns

| Symbol           | Parameter                             | Condition                                      | V <sub>CC</sub><br>(V) | T <sub>A</sub> = 25°C |     |     | -40°C ≤ T <sub>A</sub> ≤ 125°C |      | Unit |
|------------------|---------------------------------------|--|------------------------|-----------------------|-----|-----|--------------------------------|------|------|
|                  |                                       |  |                        | Min                   | Typ | Max | Min                            | Max  |      |
| t <sub>PLH</sub> | Propagation Delay<br>(Figure 3 and 4) | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF  | 1.8 ± 0.15             | 2.0                   | 7.9 | 9.0 | 2.0                            | 10.5 | ns   |
| t <sub>PHL</sub> |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF  | 2.5 ± 0.2              | 1.2                   | 4.1 | 7.0 | 1.2                            | 7.5  |      |
|                  |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF  | 3.3 ± 0.3              | 0.8                   | 3.0 | 4.8 | 0.8                            | 5.2  |      |
|                  |                                       | R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF |                        | 1.2                   | 3.8 | 5.4 | 1.2                            | 5.9  |      |
|                  |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF  | 5.0 ± 0.5              | 0.5                   | 2.2 | 3.5 | 0.5                            | 3.8  |      |
|                  |                                       | R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF |                        | 0.8                   | 2.9 | 4.2 | 1.0                            | 4.6  |      |

### CAPACITIVE CHARACTERISTICS

| Symbol          | Parameter                                 | Condition  | Typical | Unit |
|-----------------|---|--|---------|------|
| C <sub>IN</sub> | Input Capacitance                         | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>         | 2.5     | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance<br>(Note 6) | 10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 9       | pF   |
|                 |   | 10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 11      |      |

6. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

## NLX2G86

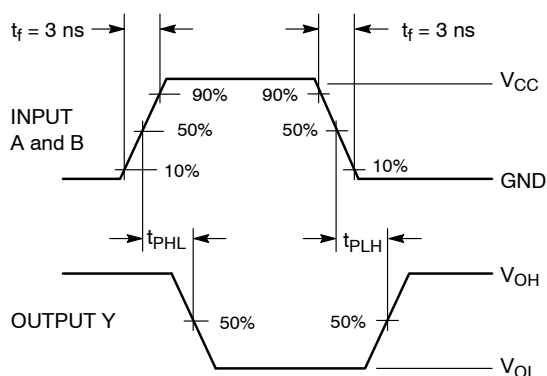
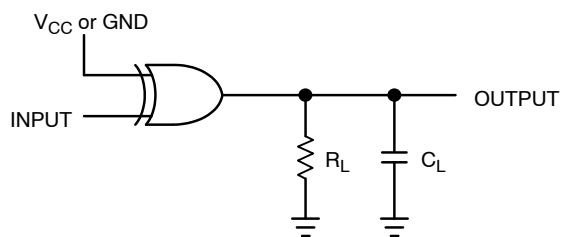


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

### DEVICE ORDERING INFORMATION

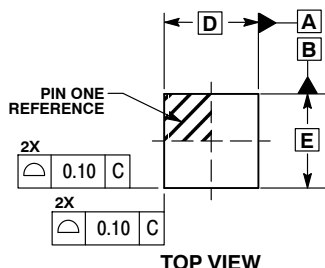
| Device Order Number | Package Type       | Tape and Reel Size <sup>†</sup> |
|---------------------|--------------------|---------------------------------|
| NLX2G86MUTCG        | UQFN8<br>(Pb-Free) | 3000 Units / Tape & Reel        |

<sup>†</sup>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.

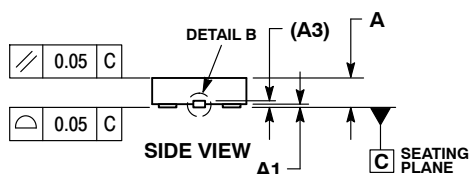
## NLX2G86

### PACKAGE DIMENSIONS

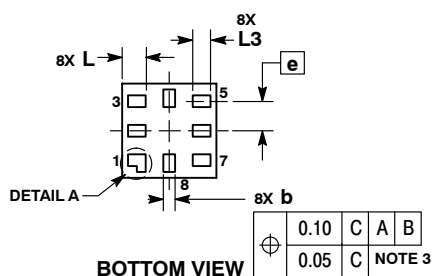
**UQFN8**  
**MU SUFFIX**  
CASE 523AN-01  
ISSUE O



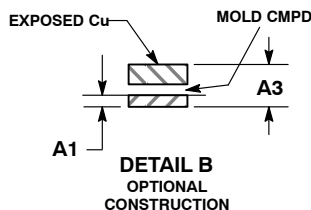
TOP VIEW



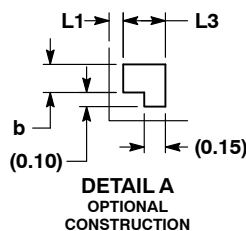
SIDE VIEW



BOTTOM VIEW



DETAIL B  
OPTIONAL  
CONSTRUCTION



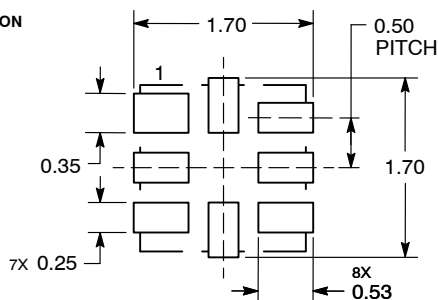
DETAIL A  
OPTIONAL  
CONSTRUCTION

#### 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 | 0.60 |
| A1          | 0.00 | 0.05 |
| A3          | 0.13 | REF  |
| b           | 0.15 | 0.25 |
| D           | 1.60 | BSC  |
| E           | 1.60 | BSC  |
| e           | 0.50 | BSC  |
| L           | 0.35 | 0.45 |
| L1          | ---  | 0.15 |
| L3          | 0.25 | 0.35 |

#### SOLDERING 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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