

# TinyLogic ULP-A Triple Buffer

## NC7NP34

The NC7NP34 is a triple buffer in tiny footprint packages. The device is designed to operate for  $V_{CC} = 0.9\text{ V}$  to  $3.6\text{ V}$ .

### Features

- Designed for 0.9 V to 3.6 V  $V_{CC}$  Operation
- 2.7 ns  $t_{PD}$  at 3.3 V (Typ)
- Inputs/Outputs Over-Voltage Tolerant up to 3.6 V
- $I_{OFF}$  Supports Partial Power Down Protection
- Source/Sink 2.6 mA at 3.3 V
- Available in US8 and MicroPak™ Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

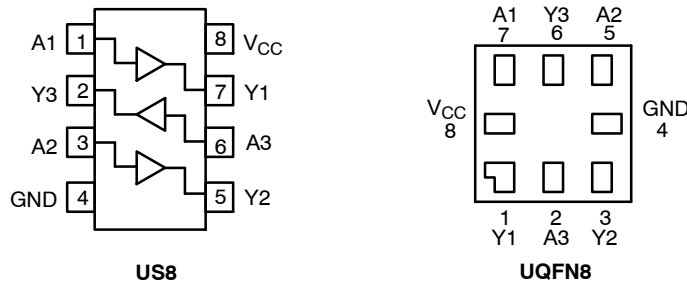


Figure 1. Pinout Diagrams (Top Views)

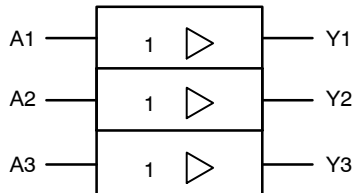


Figure 2. Logic Symbol

### PIN ASSIGNMENT

| Pin | US8      | UQFN8    |
|-----|----------|----------|
| 1   | A1       | Y1       |
| 2   | Y3       | A3       |
| 3   | A2       | Y2       |
| 4   | GND      | GND      |
| 5   | Y2       | A2       |
| 6   | A3       | Y3       |
| 7   | Y1       | A1       |
| 8   | $V_{CC}$ | $V_{CC}$ |

### FUNCTION TABLE

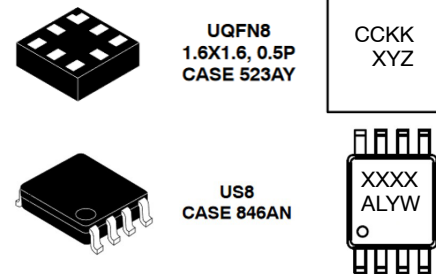
| A Input | Y Output |
|---------|----------|
| L       | L        |
| H       | H        |



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### MARKING DIAGRAMS



CC,XXX = Specific Device Code  
 KK = 2-Digit Date Code Traceability Code  
 XY = 2-Digit Date Code Format  
 Z = Assembly Plant Code  
 A = Assembly Site  
 L = Wafer Lot Number  
 YW = Assembly Start Week

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 6 of this data sheet.

# NC7NP34

## MAXIMUM RATINGS

| Symbol                | Characteristics  | Value  | Unit                        |
|-----------------------|--|--|-----------------------------|
| $V_{CC}$              | DC Supply Voltage  | -0.5 to +4.3   | V                           |
| $V_{IN}$              | DC Input Voltage   | -0.5 to +4.3   | V                           |
| $V_{OUT}$             | DC Output Voltage<br>Active-Mode (High or Low State)<br>Tri-State Mode (Note 1)<br>Power-Down Mode ( $V_{CC} = 0\text{ V}$ ) | -0.5 to $V_{CC} + 0.5$<br>-0.5 to +4.3<br>-0.5 to +4.3 | V                           |
| $I_{IK}$              | DC Input Diode Current<br>$V_{IN} < \text{GND}$  | -50  | mA                          |
| $I_{OK}$              | DC Output Diode Current<br>$V_{OUT} < \text{GND}$  | -50  | mA                          |
| $I_{OUT}$             | DC Output Source/Sink Current  | $\pm 50$   | mA                          |
| $I_{CC}$ or $I_{GND}$ | DC Supply Current per Supply Pin or Ground Pin   | $\pm 50$   | mA                          |
| $T_{STG}$             | Storage Temperature Range  | -65 to +150  | $^{\circ}\text{C}$          |
| $T_L$                 | Lead Temperature, 1 mm from Case for 10 Seconds  | 260  | $^{\circ}\text{C}$          |
| $T_J$                 | Junction Temperature Under Bias  | +150   | $^{\circ}\text{C}$          |
| $\theta_{JA}$         | Thermal Resistance (Note 2)<br>US8<br>MicroPak   | 250<br>210   | $^{\circ}\text{C}/\text{W}$ |
| $P_D$                 | Power Dissipation in Still Air<br>US8<br>MicroPak  | 500<br>595   | 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 (Note 3)<br>Human Body Model<br>Charged Device Model   | 2000<br>1000   | V                           |
| $I_{Latchup}$         | Latchup Performance (Note 4)   | $\pm 100$  | 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. Applicable to devices with outputs that may be tri-stated.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

## RECOMMENDED OPERATING CONDITIONS

| Symbol     | Parameter  | Min         | Max                    | Unit               |
|------------|--|-------------|------------------------|--------------------|
| $V_{CC}$   | Positive DC Supply Voltage   | 0.9         | 3.6                    | V                  |
| $V_{IN}$   | DC Input Voltage   | 0           | 3.6                    | V                  |
| $V_{OUT}$  | DC Output Voltage<br>Active-Mode (High or Low State)<br>Tri-State Mode (Note 1)<br>Power-Down Mode ( $V_{CC} = 0\text{ V}$ ) | 0<br>0<br>0 | $V_{CC}$<br>3.6<br>3.6 | V                  |
| $T_A$      | Operating Temperature Range  | -40         | +85                    | $^{\circ}\text{C}$ |
| $t_r, t_f$ | Input Transition Rise and Fall Time<br>$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  | 0           | 10                     | 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.

# NC7NP34

## DC ELECTRICAL CHARACTERISTICS

| Symbol                    | Parameter                 | Condition   | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C  |                       |                        | T <sub>A</sub> = -40°C to +85°C |                        | Unit |
|---------------------------|---------------------------|---|---------------------|------------------------|-----------------------|------------------------|---------------------------------|------------------------|------|
|                           |                           |   |                     | Min                    | Typ                   | Max                    | Min                             | Max                    |      |
| V <sub>IH</sub>           | High-Level Input Voltage  |   | 0.9                 | -                      | 0.5                   | -                      | -                               | -                      | V    |
|                           |                           |   | 1.1 to 1.3          | 0.65 x V <sub>CC</sub> | -                     | -                      | 0.65 x V <sub>CC</sub>          | -                      |      |
|                           |                           |   | 1.4 to 1.6          | 0.65 x V <sub>CC</sub> | -                     | -                      | 0.65 x V <sub>CC</sub>          | -                      |      |
|                           |                           |   | 1.65 to 1.95        | 0.65 x V <sub>CC</sub> | -                     | -                      | 0.65 x V <sub>CC</sub>          | -                      |      |
|                           |                           |   | 2.3 to 2.7          | 1.6                    | -                     | -                      | 1.6                             | -                      |      |
| 3.0 to 3.6                | 2.1                       | -   | -                   | 2.1                    | -                     |                        |                                 |                        |      |
| V <sub>IL</sub>           | Low-Level Input Voltage   |   | 0.9                 | -                      | 0.5                   | -                      | -                               | -                      | V    |
|                           |                           |   | 1.1 to 1.3          | -                      | -                     | 0.35 x V <sub>CC</sub> | -                               | 0.35 x V <sub>CC</sub> |      |
|                           |                           |   | 1.4 to 1.6          | -                      | -                     | 0.35 x V <sub>CC</sub> | -                               | 0.35 x V <sub>CC</sub> |      |
|                           |                           |   | 1.65 to 1.95        | -                      | -                     | 0.35 x V <sub>CC</sub> | -                               | 0.35 x V <sub>CC</sub> |      |
|                           |                           |   | 2.3 to 2.7          | -                      | -                     | 0.7                    | -                               | 0.7                    |      |
| 3.0 to 3.6                | -                         | -   | 0.9                 | -                      | 0.9                   |                        |                                 |                        |      |
| V <sub>OH</sub>           | High-Level Output Voltage | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>              |                     |                        |                       |                        |                                 |                        | V    |
|                           |                           | I <sub>OH</sub> = -20 μA  | 0.9                 | -                      | V <sub>CC</sub> - 0.1 | -                      | -                               | -                      |      |
|                           |                           |   | 1.1 to 1.3          | V <sub>CC</sub> - 0.1  | -                     | -                      | V <sub>CC</sub> - 0.1           | -                      |      |
|                           |                           |   | 1.4 to 1.6          | V <sub>CC</sub> - 0.1  | -                     | -                      | V <sub>CC</sub> - 0.1           | -                      |      |
|                           |                           |   | 1.65 to 1.95        | V <sub>CC</sub> - 0.1  | -                     | -                      | V <sub>CC</sub> - 0.1           | -                      |      |
|                           |                           |   | 2.3 to 2.7          | V <sub>CC</sub> - 0.1  | -                     | -                      | V <sub>CC</sub> - 0.1           | -                      |      |
|                           |                           |   | 3.0 to 3.6          | V <sub>CC</sub> - 0.1  | -                     | -                      | V <sub>CC</sub> - 0.1           | -                      |      |
|                           |                           | I <sub>OH</sub> = -0.5 mA   | 1.1 to 1.3          | 0.75 x V <sub>CC</sub> | -                     | -                      | 0.70 x V <sub>CC</sub>          | -                      |      |
|                           |                           | I <sub>OH</sub> = -1 mA   | 1.4 to 1.6          | 1.07                   | -                     | -                      | 0.99                            | -                      |      |
|                           |                           | I <sub>OH</sub> = -1.5 mA   | 1.65 to 1.95        | 1.24                   | -                     | -                      | 1.22                            | -                      |      |
| I <sub>OH</sub> = -2.1 mA | 2.3 to 2.7                | 1.95  | -                   | -                      | 1.87                  | -                      |                                 |                        |      |
| I <sub>OH</sub> = -2.6 mA | 3.0 to 3.6                | 2.61  | -                   | -                      | 2.55                  | -                      |                                 |                        |      |
| V <sub>OL</sub>           | Low-Level Output Voltage  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>              |                     |                        |                       |                        |                                 |                        | V    |
|                           |                           | I <sub>OL</sub> = 20 μA   | 0.9                 | -                      | 0.1                   | -                      | -                               | -                      |      |
|                           |                           |   | 1.1 to 1.3          | -                      | -                     | 0.1                    | -                               | 0.1                    |      |
|                           |                           |   | 1.4 to 1.6          | -                      | -                     | 0.1                    | -                               | 0.1                    |      |
|                           |                           |   | 1.65 to 1.95        | -                      | -                     | 0.1                    | -                               | 0.1                    |      |
|                           |                           |   | 2.3 to 2.7          | -                      | -                     | 0.1                    | -                               | 0.1                    |      |
|                           |                           |   | 3.0 to 3.6          | -                      | -                     | 0.1                    | -                               | 0.1                    |      |
|                           |                           | I <sub>OL</sub> = 0.5 mA  | 1.1 to 1.3          | -                      | -                     | 0.3 x V <sub>CC</sub>  | -                               | 0.3 x V <sub>CC</sub>  |      |
|                           |                           | I <sub>OL</sub> = 1 mA  | 1.4 to 1.6          | -                      | -                     | 0.31                   | -                               | 0.37                   |      |
|                           |                           | I <sub>OL</sub> = 1.5 mA  | 1.65 to 1.95        | -                      | -                     | 0.31                   | -                               | 0.35                   |      |
| I <sub>OL</sub> = 2.1 mA  | 2.3 to 2.7                | -   | -                   | 0.31                   | -                     | 0.33                   |                                 |                        |      |
| I <sub>OL</sub> = 2.6 mA  | 3.0 to 3.6                | -   | -                   | 0.31                   | -                     | 0.33                   |                                 |                        |      |
| I <sub>IN</sub>           | Input Leakage Current     | V <sub>IN</sub> = 0 V to 3.6 V                                    | 0.9 to 3.6          | -                      | -                     | ±0.1                   | -                               | ±0.5                   | μA   |
| I <sub>OFF</sub>          | Power Off Leakage Current | V <sub>IN</sub> = 0 V to 3.6 V or V <sub>OUT</sub> = 0 V to 3.6 V | 0                   | -                      | -                     | 0.5                    | -                               | 0.5                    | μA   |
| I <sub>CC</sub>           | Quiescent Supply Current  | V <sub>IN</sub> = V <sub>CC</sub> or GND                          | 0.9 to 3.6          | -                      | -                     | 0.9                    | -                               | 0.9                    | 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.

# NC7NP34

## AC ELECTRICAL CHARACTERISTICS

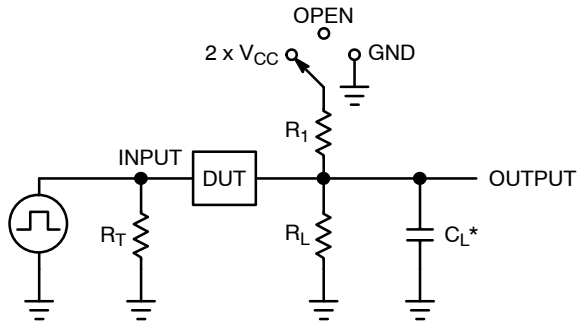
| Symbol                              | Parameter                                   | Condition                                     | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = -40°C to +85°C |      | Unit |
|-------------------------------------|---|---|---------------------|-----------------------|------|------|---------------------------------|------|------|
|                                     |   |   |                     | Min                   | Typ  | Max  | Min                             | Max  |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay, A to Y (Figures 3 and 4) | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 10 pF | 0.9                 | -                     | 45.0 | -    | -                               | -    | ns   |
|                                     |   |   | 1.10 to 1.30        | -                     | 11.9 | 25.9 | -                               | 34.3 |      |
|                                     |   |   | 1.40 to 1.60        | -                     | 6.2  | 14.8 | -                               | 15.0 |      |
|                                     |   |   | 1.65 to 1.95        | -                     | 4.4  | 12.0 | -                               | 12.2 |      |
|                                     |   |   | 2.3 to 2.7          | -                     | 3.3  | 9.4  | -                               | 9.9  |      |
|                                     |   |   | 3.0 to 3.6          | -                     | 2.7  | 8.3  | -                               | 9.0  |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay, A to Y (Figures 3 and 4) | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF | 0.9                 | -                     | 46.6 | -    | -                               | -    | ns   |
|                                     |   |   | 1.10 to 1.30        | -                     | 12.5 | 27.3 | -                               | 37.3 |      |
|                                     |   |   | 1.40 to 1.60        | -                     | 6.7  | 15.5 | -                               | 16.5 |      |
|                                     |   |   | 1.65 to 1.95        | -                     | 4.8  | 12.6 | -                               | 13.6 |      |
|                                     |   |   | 2.3 to 2.7          | -                     | 3.5  | 9.9  | -                               | 10.8 |      |
|                                     |   |   | 3.0 to 3.6          | -                     | 2.9  | 8.7  | -                               | 9.5  |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay, A to Y (Figures 3 and 4) | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 30 pF | 0.9                 | -                     | 51.3 | -    | -                               | -    | ns   |
|                                     |   |   | 1.10 to 1.30        | -                     | 14.5 | 31.6 | -                               | 46.3 |      |
|                                     |   |   | 1.40 to 1.60        | -                     | 8.2  | 17.8 | -                               | 18.2 |      |
|                                     |   |   | 1.65 to 1.95        | -                     | 5.9  | 14.4 | -                               | 15.9 |      |
|                                     |   |   | 2.3 to 2.7          | -                     | 4.2  | 11.3 | -                               | 12.8 |      |
|                                     |   |   | 3.0 to 3.6          | -                     | 3.4  | 9.2  | -                               | 10.7 |      |

## CAPACITIVE CHARACTERISTICS

| Symbol           | Parameter                              | Test Condition   | Typical (T <sub>A</sub> = 25°C) | Unit |
|------------------|--|--|---------------------------------|------|
| C <sub>IN</sub>  | Input Capacitance                      | V <sub>CC</sub> = 0 V  | 2.0                             | pF   |
| C <sub>OUT</sub> | Output Capacitance                     | V <sub>CC</sub> = 0 V  | 4.0                             | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (Note 5) | f = 10 MHz, V <sub>CC</sub> = 0.9 to 3.6 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub> | 6.0                             | pF   |

5. 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>.

# NC7NP34



$C_L$  includes probe and jig capacitance  
 $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )  
 $f = 1$  MHz

| Test                | Switch Position   |
|---------------------|-------------------|
| $t_{PLH} / t_{PHL}$ | Open              |
| $t_{PLZ} / t_{PZL}$ | $2 \times V_{CC}$ |
| $t_{PHZ} / t_{PZH}$ | GND               |

Figure 3. Test Circuit



| $V_{CC}, V$  | $V_{mi}, V$  | $V_{mo}, V$  | $V_Y, V$ |
|--------------|--------------|--------------|----------|
| 0.9          | $V_{CC} / 2$ | $V_{CC} / 2$ | 0.1      |
| 1.1 to 1.3   | $V_{CC} / 2$ | $V_{CC} / 2$ | 0.1      |
| 1.4 to 1.6   | $V_{CC} / 2$ | $V_{CC} / 2$ | 0.1      |
| 1.65 to 1.95 | $V_{CC} / 2$ | $V_{CC} / 2$ | 0.15     |
| 2.3 to 2.7   | $V_{CC} / 2$ | $V_{CC} / 2$ | 0.15     |
| 3.0 to 3.6   | 1.5          | 1.5          | 0.3      |

Figure 4. Switching Waveforms

# NC7NP34

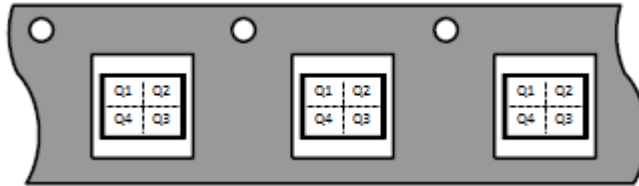
## ORDERING INFORMATION

| Device     | Package         | Marking | Pin 1 Orientation<br>(See below) | Shipping <sup>†</sup> |
|------------|-----------------|---------|----------------------------------|-----------------------|
| NC7NP34K8X | US8             | NP34    | Q4                               | 3000 / Tape & Reel    |
| NC7NP34L8X | MicroPak, UQFN8 | X7      | Q4                               | 5000 / 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.

### Pin 1 Orientation in Tape and Reel

Direction of Feed



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**UQFN8 1.6X1.6, 0.5P**  
CASE 523AY  
ISSUE O

DATE 31 AUG 2016



**RECOMMENDED  
LAND PATTERN**



**SIDE VIEW**



**BOTTOM VIEW**

**NOTES:**

- A. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.



**DETAIL A  
SCALE : 2X**

|                         |                            |  |
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US8  
CASE 846AN  
ISSUE O

DATE 31 DEC 2016



**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1994.



|                         |             |  |
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