

TinyLogic UHS Dual Inverting Buffer with 3-STATE Outputs

NC7WZ240

Description

The NC7WZ240 is a Dual Inverting Buffer with independent active LOW enables for the 3-STATE outputs. The Ultra High Speed device is fabricated with advanced CMOS technology to achieve superior switching performance with high output drive while maintaining low static power dissipation over a broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} operating range. The inputs and outputs are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 5.5 V independent of V_{CC} operating range. Outputs tolerate voltages above V_{CC} when in the 3-STATE condition.

Features

- Space Saving US8 Surface Mount Package
- MicroPak™ Pb-Free Leadless Package
- Ultra High Speed: $t_{PD} = 2.3$ ns Typ. into 50 pF at 5 V V_{CC}
- High Output Drive: ± 24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Matches the Performance of LCX when Operated at 3.3 V V_{CC}
- Power Down High Impedance Inputs / Outputs
- Overvoltage Tolerant Inputs Facilitate 5 V to 3 V Translation
- Outputs are Overvoltage Tolerant in 3-STATE Mode
- Proprietary Noise / EMI Reduction Circuitry Implemented
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

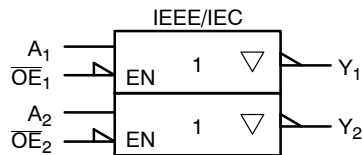


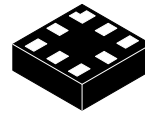
Figure 1. Logic Symbol



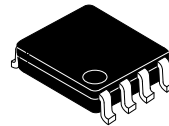
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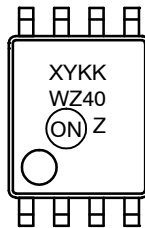
MARKING DIAGRAMS



UQFN8
1.6X1.6, 0.5P
CASE 523AY



US8
CASE 846AN



U7, WZ40 = Specific Device Code
KK = 2-Digit Lot Run Traceability Code
XY = 2-Digit Date Code Format
Z = Assembly Plant Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

Connection Diagrams

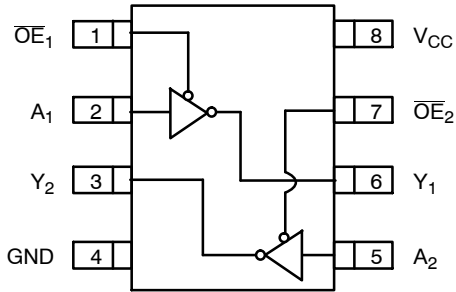


Figure 2. Pin Assignments for US8 (Top View)

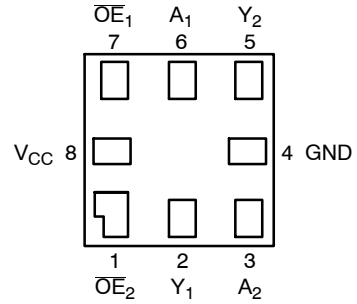
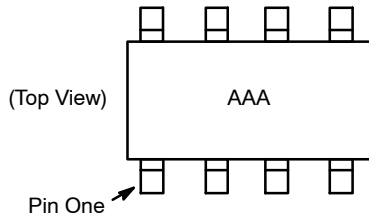


Figure 4. Pad Assignments for MicroPak (Top Thru View)



AAA represents Product Code Top Mark – see ordering code
 NOTE: Orientation of Top Mark determines Pin One location.
 Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Figure 3. Pin One Orientation Diagram

PIN DESCRIPTIONS

| Pin Names | Description |
|-------------------|-----------------------------------|
| \overline{OE}_n | Enable Inputs for 3-STATE Outputs |
| A_n | Inputs |
| Y_n | 3-STATE Outputs |

FUNCTION TABLE

| Inputs | | Output |
|-----------------|-------|--------|
| \overline{OE} | A_n | Y_n |
| L | L | H |
| L | H | L |
| H | L | Z |
| H | H | Z |

H = HIGH Logic Level
 L = LOW Logic Level
 Z = 3-STATE

NC7WZ240

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | | Min | Max | Unit |
|------------------------------------|---|------------------------|------|------|------|
| V _{CC} | Supply Voltage | | -0.5 | 6.5 | V |
| V _{IN} | DC Input Voltage (Note 1) | | -0.5 | 6.5 | V |
| V _{OUT} | DC Output Voltage | | -0.5 | 6.5 | V |
| I _{IK} | DC Input Diode Current | V _{IN} < 0 V | - | -50 | mA |
| I _{OK} | DC Output Diode Current | V _{OUT} < 0 V | - | -50 | mA |
| I _{OUT} | DC Output Source / Sink Current | | - | ±50 | mA |
| I _{CC} / I _{GND} | DC V _{CC} / Ground Current | | - | ±50 | mA |
| T _{STG} | Storage Temperature Range | | -65 | +150 | °C |
| T _J | Junction Lead Temperature under Bias | | - | +150 | °C |
| T _L | Junction Lead Temperature (Soldering, 10 Seconds) | | - | +260 | °C |
| P _D | Power Dissipation in Still Air | US8 | - | 500 | mW |
| | | MicroPak-8 | - | 539 | |

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. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | | Min | Max | Unit |
|---------------------------------|-------------------------------|---|------|-----------------|------|
| V _{CC} | Supply Voltage Operating | | 1.65 | 5.5 | V |
| | Supply Voltage Data Retention | | 1.5 | 5.5 | |
| V _{IN} | Input Voltage | | 0 | 5.5 | V |
| V _{OUT} | Output Voltage | Active State | 0 | V _{CC} | V |
| | | 3-STATE | 0 | 5.5 | V |
| T _A | Operating Temperature | | -40 | +85 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} @ 1.8 V ±0.15 V, 2.5 V ±0.2 V | 0 | 20 | ns/V |
| | | V _{CC} @ 3.3 V ±0.3 V | 0 | 10 | |
| | | V _{CC} @ 5.0 V ±0.5 V | 0 | 5 | |
| θ _{JA} | Thermal Resistance | US8 | - | 250 | °C/W |
| | | MicroPak-8 | - | 232 | |

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.

2. Unused inputs must be held HIGH or LOW. They may not float.

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = +25°C | | | T _A = -40 to +85°C | | Unit | |
|--------------------------|---------------------------|--|---------------------------|------------------------|------|----------------------|-------------------------------|----------------------|------|---|
| | | | | Min | Typ | Max | Min | Max | | |
| V _{IH} | HIGH Level Input Voltage | | 1.65 to 1.95 | 0.65 V _{CC} | - | - | 0.65 V _{CC} | - | V | |
| | | | 2.3 to 5.5 | 0.7 V _{CC} | - | - | 0.7 V _{CC} | - | | |
| V _{IL} | LOW Level Input Voltage | | 1.65 to 1.95 | - | - | 0.35 V _{CC} | - | 0.35 V _{CC} | V | |
| | | | 2.3 to 5.5 | - | - | 0.3 V _{CC} | - | 0.3 V _{CC} | | |
| V _{OH} | HIGH Level Output Voltage | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -100 μA | 1.65 | 1.55 | 1.65 | - | 1.55 | - | V |
| | | | | 2.3 | 2.2 | 2.3 | - | 2.2 | - | |
| | | | | 3.0 | 2.9 | 3.0 | - | 2.9 | - | |
| | | | | 4.5 | 4.4 | 4.5 | - | 4.4 | - | |
| | | | I _{OH} = -4 mA | 1.65 | 1.29 | 1.52 | - | 1.29 | - | |
| | | | I _{OH} = -8 mA | 2.3 | 1.9 | 2.15 | - | 1.9 | - | |
| | | | I _{OH} = -16 mA | 3.0 | 2.4 | 2.80 | - | 2.4 | - | |
| | | | I _{OH} = -24 mA | 3.0 | 2.3 | 2.68 | - | 2.3 | - | |
| I _{OH} = -32 mA | 4.5 | 3.8 | 4.20 | - | 3.8 | - | | | | |
| V _{OL} | LOW Level Output Voltage | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 100 μA | 1.65 | - | 0.0 | 0.10 | - | 0.10 | V |
| | | | | 2.3 | - | 0.0 | 0.10 | - | 0.10 | |
| | | | | 3.0 | - | 0.0 | 0.10 | - | 0.10 | |
| | | | | 4.5 | - | 0.0 | 0.10 | - | 0.10 | |
| | | | I _{OL} = 4 mA | 1.65 | - | 0.08 | 0.24 | - | 0.24 | |
| | | | I _{OL} = 8 mA | 2.3 | - | 0.10 | 0.3 | - | 0.3 | |
| | | | I _{OL} = 16 mA | 3.0 | - | 0.15 | 0.4 | - | 0.4 | |
| | | | I _{OL} = 24 mA | 3.0 | - | 0.22 | 0.55 | - | 0.55 | |
| I _{OL} = 32 mA | 4.5 | - | 0.22 | 0.55 | - | 0.55 | | | | |
| I _{IN} | Input Leakage Current | V _{IN} = 5.5 V, GND | 1.65 to 5.5 | - | - | ±0.1 | - | ±1 | μA | |
| I _{OZ} | 3-STATE Output Leakage | V _{IN} = V _{IH} or V _{IL} 0 ≤ V _{OUT} ≤ 5.5 V | 1.65 to 5.5 | - | - | ±0.5 | - | ±5 | μA | |
| I _{OFF} | Power Off Leakage Current | V _{IN} or V _{OUT} = 5.5 V | 0.0 | - | - | 1 | - | 10 | μA | |
| I _{CC} | Quiescent Supply Current | V _{IN} = 5.5 V, GND | 1.65 to 5.5 | - | - | 1 | - | 10 | μA | |

NOISE CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = +25°C | | Unit |
|---------------------------|--|------------------------|---------------------|------------------------|-----|------|
| | | | | Typ | Max | |
| V _{OLP} (Note 3) | Quiet Output Maximum Dynamic V _{OL} | C _L = 50 pF | 5.0 | - | 1.0 | V |
| V _{OLV} (Note 3) | Quiet Output Minimum Dynamic V _{OL} | C _L = 50 pF | 5.0 | - | 1.0 | V |
| V _{OHV} (Note 3) | Quiet Output Minimum Dynamic V _{OH} | C _L = 50 pF | 5.0 | - | 4.0 | V |
| V _{IHD} (Note 3) | Minimum HIGH Level Dynamic Input Voltage | C _L = 50 pF | 5.0 | - | 3.5 | V |
| V _{ILD} (Note 3) | Maximum LOW Level Dynamic Input Voltage | C _L = 50 pF | 5.0 | - | 1.5 | V |

3. Parameter guaranteed by design.

NC7WZ240

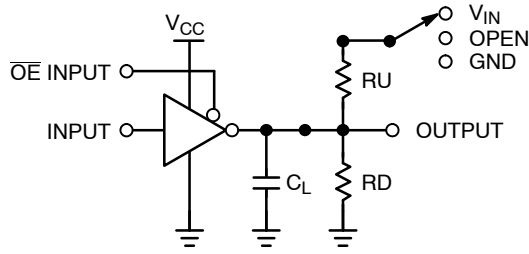
AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = +25°C | | | T _A = -40 to +85°C | | Unit |
|---------------------------------------|--|--|---------------------|------------------------|-----|------|-------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Propagation Delay A _n to Y _n (Figure 5, 7) | C _L = 15 pF R _D = 1 MΩ S1 = Open | 1.8 ±0.15 | - | - | 12.0 | - | 13.0 | ns |
| | | | 2.5 ±0.2 | - | - | 7.5 | - | 8.0 | |
| | | | 3.3 ±0.3 | - | - | 5.2 | - | 5.5 | |
| | | | 5.0 ±0.5 | - | - | 4.5 | - | 4.8 | |
| | | C _L = 50 pF, R _D = 500 Ω S1 = Open | 3.3 ±0.3 | - | - | 5.7 | - | 6.0 | |
| | | | 5.0 ±0.5 | - | - | 5.0 | - | 5.3 | |
| t _{OSLH} , t _{OSSL} | Output to Output Skew (Note 4) (Figure 5, 7) | C _L = 50 pF, R _D = 500 Ω S1 = Open | 3.3 ±0.3 | - | - | 1.0 | - | 1.0 | ns |
| | | | 5.0 ±0.5 | - | - | 0.8 | - | 0.8 | |
| t _{PZL} , t _{PZH} | Output Enable Time (Figure 5, 7) | C _L = 50 pF R _D , R _U = 500 Ω S1 = GND for t _{PZH} S1 = V _I for t _{PZL} V _I = 2 x V _{CC} | 1.8 ±0.15 | - | - | 14.0 | - | 15.0 | ns |
| | | | 2.5 ±0.2 | - | - | 8.5 | - | 9.0 | |
| | | | 3.3 ±0.3 | - | - | 6.2 | - | 6.5 | |
| | | | 5.5 ±0.5 | - | - | 5.5 | - | 5.8 | |
| t _{PLZ} , t _{PHZ} | Output Disable Time (Figure 5, 7) | C _L = 50 pF R _D , R _U = 500 Ω S1 = GND for t _{PZH} S1 = V _I for t _{PZL} V _I = 2 x V _{CC} | 1.8 ±0.15 | - | - | 12.0 | - | 13.0 | ns |
| | | | 2.5 ±0.2 | - | - | 8.0 | - | 8.5 | |
| | | | 3.3 ±0.3 | - | - | 5.7 | - | 6.0 | |
| | | | 5.0 ±0.5 | - | - | 4.7 | - | 5.0 | |
| C _{IN} | Input Capacitance | | 0 | - | 2.5 | - | - | - | pF |
| C _{OUT} | Output Capacitance | | 5.0 | - | 4 | - | - | - | pF |
| C _{PD} | Power Dissipation Capacitance (Figure 6) | (Note 5) | 3.3 | - | 10 | - | - | - | pF |
| | | | 5.0 | - | 12 | - | - | - | |

4. Parameter guaranteed by design. t_{OSLH} = |t_{PLHmax} - t_{PLHmin}|; t_{OSSL} = |t_{PHLmax} - t_{PHLmin}|.

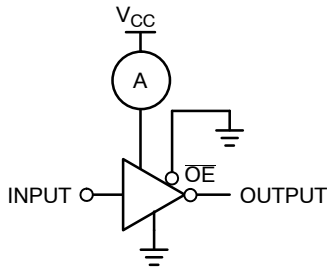
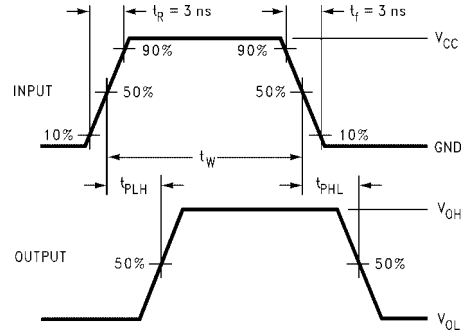
5. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (see Figure 6) C_{PD} is related to I_{CCD} dynamic operating current by the expression:
I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic}).

AC Loading and Waveforms



C_L includes load and stray capacitance
 Input PRR = 1.0 MHz; $t_W = 500$ ns

Figure 5. AC Test Circuit



Input = AC Waveform; $t_r = t_f = 1.8$ ns;
 PRR = 10 MHz; Duty Cycle = 50%.

Figure 6. I_{CCD} Test Circuit

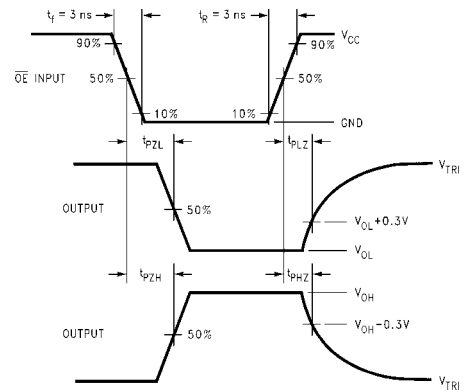


Figure 7. AC Waveforms

ORDERING INFORMATION

| Order Number | Top Mark | Package | Shipping [†] |
|--------------|----------|---|-----------------------|
| NC7WZ240K8X | WZ40 | 8-Lead US8, JEDEC MO-187, Variation CA 3.1 mm Wide | 3000 / Tape & Reel |
| NC7WZ240L8X | U7 | 8-Lead MicroPak, 1.6 mm Wide (Pb-Free) | 5000 / 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.

6. Pb-Free package per JEDEC J-STD-020B.



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

DATE 31 AUG 2016



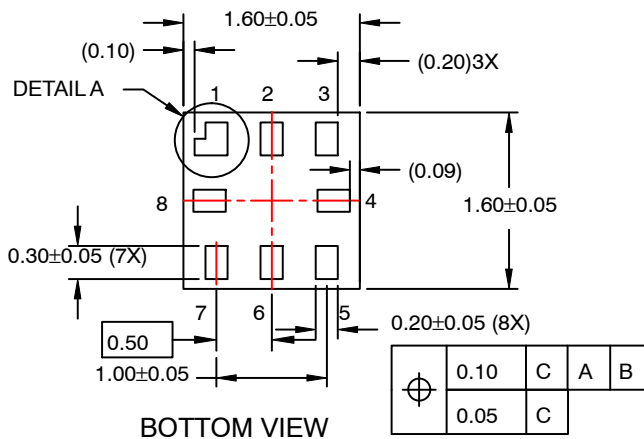
**RECOMMENDED
LAND PATTERN**



SIDE 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.



BOTTOM VIEW



**DETAIL A
SCALE : 2X**

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US8
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DATE 31 DEC 2016



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- 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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