

TinyLogic UHS Dual 2-Input NAND Gate

NC7WZ00

Description

The NC7WZ00 is a dual 2-Input NAND Gate from ON Semiconductor's Ultra High Speed Series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra high speed 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 output are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 5.5 V independent of V_{CC} operating voltage.

Features

- Space Saving US8 Surface Mount Package
- MicroPak™ Leadless Package
- Ultra High Speed: t_{PD} 2.4 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 – 5.5 V
- Matches the Performance of LCX when Operated at 3.3 V V_{CC}
- Power Down High Impedance Inputs / Output
- Overvoltage Tolerant Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry Implemented
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

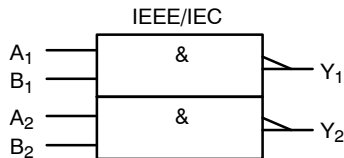


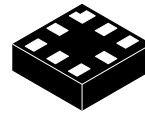
Figure 1. Logic Symbol



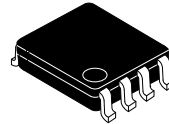
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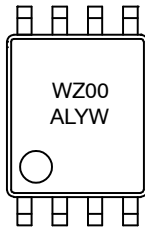
MARKING DIAGRAMS



UQFN8
1.6X1.6, 0.5P
CASE 523AY



US8
CASE 846AN



N6, WZ00 = Specific Device Code
 KK = 2-Digit Lot Run 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 in the package dimensions section on page 6 of this data sheet.

Pin Configurations

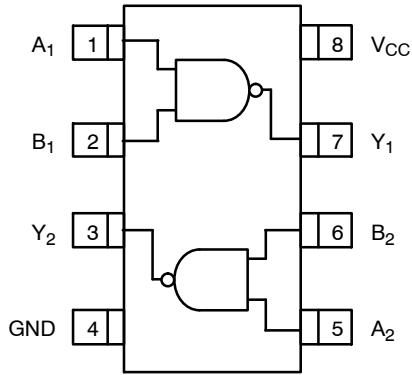


Figure 2. Connection Diagram (Top View)

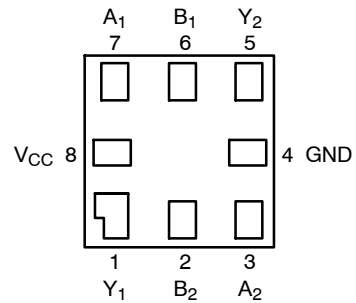
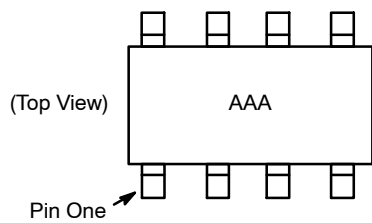


Figure 4. Pad Assignments for MicroPak (Top Thru View)



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 DESCRIPTION

| Pin Names | Description |
|------------|-------------|
| A_n, B_n | Inputs |
| Y_n | Output |

FUNCTION TABLE ($Y = \overline{AB}$)

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

H = HIGH Logic Level
 L = LOW Logic Level

NC7WZ00

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | | Min | Max | Unit |
|------------------------------------|---|------------------------|------------|------|------|
| V _{CC} | Supply Voltage | | -0.5 | 6.5 | V |
| V _{IN} | DC Input Voltage | | -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 Current | | - | ±50 | mA |
| I _{CC} / I _{GND} | DC V _{CC} / GND Current | | - | ±100 | mA |
| T _{STG} | Storage Temperature | | -65 | +150 | °C |
| T _J | Junction 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.

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 | | 0 | V _{CC} | V |
| T _A | Operating Temperature | | -40 | +85 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 1.65 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.

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

NC7WZ00

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | Conditions | T _A = +25°C | | | T _A = -40 to +85°C | | Unit | |
|------------------|---------------------------|---------------------|---|---------------------------|------|----------------------|-------------------------------|----------------------|------|----|
| | | | | Min | Typ | Max | Min | Max | | |
| V _{IH} | HIGH Level Input Voltage | 1.65 – 1.95 | | 0.65 V _{CC} | – | – | 0.65 V _{CC} | – | V | |
| | | 2.3 – 5.5 | | 0.70 V _{CC} | – | – | 0.70 V _{CC} | – | | |
| V _{IL} | LOW Level Input Voltage | 1.65 – 1.95 | | – | – | 0.35 V _{CC} | – | 0.35 V _{CC} | V | |
| | | 2.3 – 5.5 | | – | – | 0.30 V _{CC} | – | 0.30 V _{CC} | | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} = V _{IL} | I _{OH} = -100 μA | 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 | – | |
| | | 1.65 | | I _{OH} = -4 mA | 1.29 | 1.52 | – | 1.69 | – | |
| | | 2.3 | | I _{OH} = -8 mA | 1.9 | 2.15 | – | 1.9 | – | |
| | | 3.0 | | I _{OH} = -16 mA | 2.4 | 2.80 | – | 2.4 | – | |
| | | 3.0 | | I _{OH} = -24 mA | 2.3 | 2.68 | – | 2.3 | – | |
| | | 4.5 | | I _{OH} = -32 mA | 3.8 | 4.20 | – | 3.8 | – | |
| | | | | | | | | | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} = V _{IH} | I _{OL} = 100 μA | – | 0.0 | 0.1 | – | 0.1 | V |
| | | 2.3 | | | – | 0.0 | 0.1 | – | 0.1 | |
| | | 3.0 | | | – | 0.0 | 0.1 | – | 0.1 | |
| | | 4.5 | | | – | 0.0 | 0.1 | – | 0.1 | |
| | | 1.65 | | I _{OL} = 4 mA | – | 0.08 | 0.24 | – | 0.24 | |
| | | 2.3 | | I _{OL} = 8 mA | – | 0.10 | 0.3 | – | 0.3 | |
| | | 3.0 | | I _{OL} = 16 mA | – | 0.15 | 0.4 | – | 0.4 | |
| | | 3.0 | | I _{OL} = 24 mA | – | 0.22 | 0.55 | – | 0.55 | |
| | | 4.5 | | I _{OL} = 32 mA | – | 0.22 | 0.55 | – | 0.55 | |
| | | | | | | | | | | |
| I _{IN} | Input Leakage Current | 1.65 – 5.5 | V _{IN} = 5.5 V, GND | | – | – | ±0.1 | – | ±1 | μA |
| I _{OFF} | Power Off Leakage Current | 0.0 | V _{IN} or V _{OUT} = 5.5 V | | – | – | 1 | – | 10 | μA |
| I _{CC} | Quiescent Supply Current | 1.65 – 5.5 | V _{IN} = 5.5 V, GND | | – | – | 1 | – | 10 | μA |

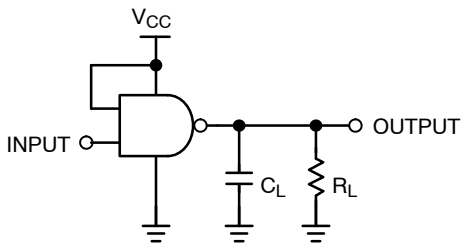
NC7WZ00

AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | Conditions | T _A = +25°C | | | T _A = -40 to +85°C | | Unit |
|-------------------------------------|---|---------------------|---|--|-----|-----|-------------------------------|-----|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Propagation Delay (Figure 5, 7) | 1.8 ± 0.15 | C _L = 15 pF, R _L = 1 MΩ, | - | 5.3 | 9.6 | - | 9.8 | ns |
| | | 2.5 ± 0.2 | | - | 3.2 | 5.3 | - | 5.7 | |
| | | 3.3 ± 0.3 | | - | 2.4 | 3.7 | - | 4.0 | |
| | | 5.0 ± 0.5 | | - | 1.9 | 2.9 | - | 3.2 | |
| | | 3.3 ± 0.3 | | C _L = 50 pF, R _L = 500 Ω, | - | 3.0 | 4.6 | - | |
| | | 5.0 ± 0.5 | - | | 2.4 | 3.6 | - | 3.9 | |
| C _{IN} | Input Capacitance | 0 | | - | 2.5 | - | - | - | pF |
| C _{PD} | Power Dissipation Capacitance (Figure 6) | 3.3 | (Note 2) | - | 13 | - | - | - | pF |
| | | 5.0 | | - | 17 | - | - | - | |

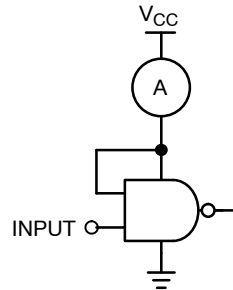
2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (see Figure 6) C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD} = (C_{PD})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

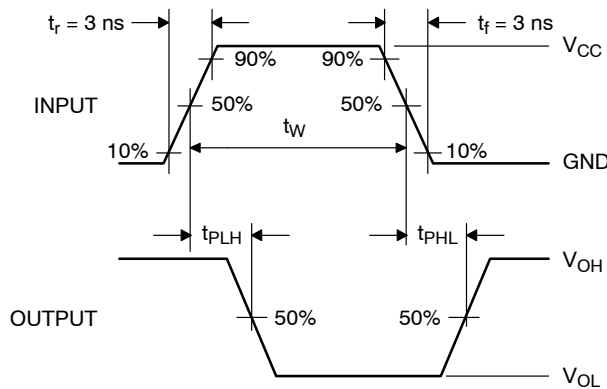


Figure 7. AC Waveforms

NC7WZ00

ORDERING INFORMATION

| Order Number | Top Mark | Package | Shipping† |
|--------------|----------|---|--------------------|
| NC7WZ00K8X | WZ00 | 8-Lead US8, JEDEC MO-187, Variation CA 3.1 mm Wide | 3000 / Tape & Reel |
| NC7WZ00L8X | N6 | 8-Lead MicroPak, 1.6 mm Wide | 5000 / Tape & Reel |

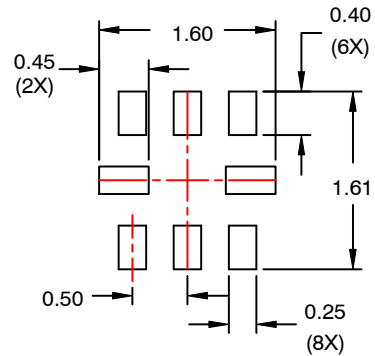
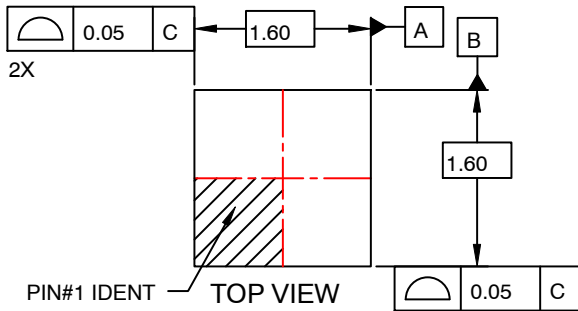
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

3. All packages are lead free per JEDEC: J-STD-020B standard.

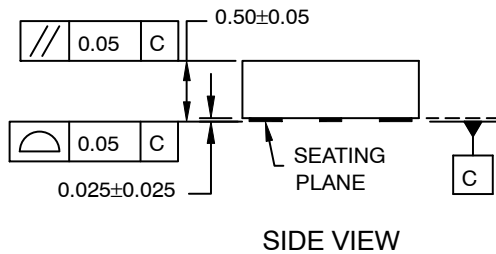
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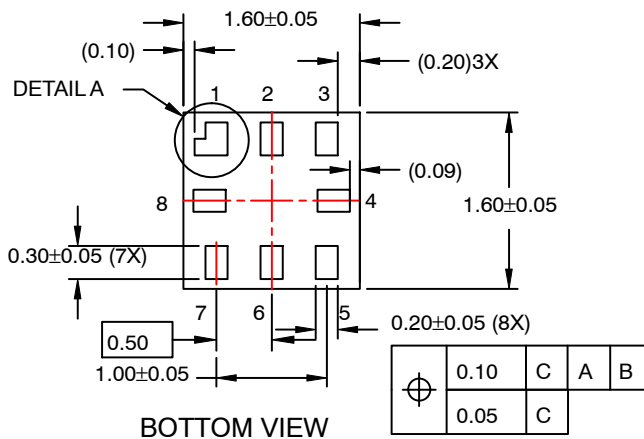
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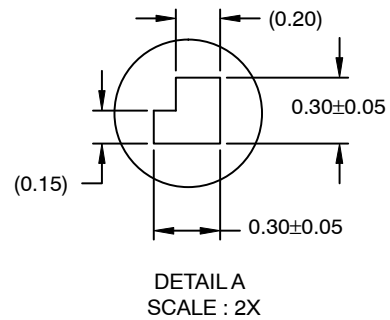
SIDE VIEW

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- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.



BOTTOM VIEW



**DETAIL A
SCALE : 2X**

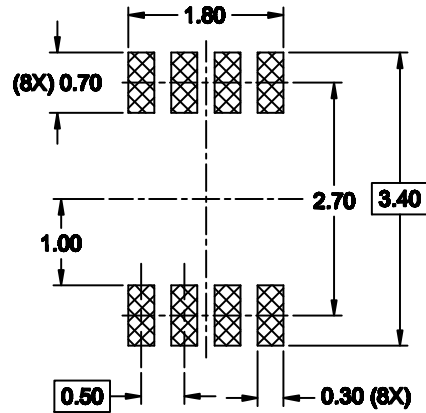
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