

NC7NZ14 TinyLogic® UHS Inverter with Schmitt Trigger Input

General Description

The NC7NZ14 is a triple Inverter with Schmitt Trigger input from Fairchild'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 very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The input and output are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

Features

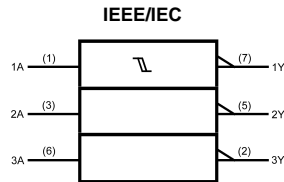
- Space saving US8 surface mount package
- MicroPak™ Pb-Free leadless package
- Ultra High Speed; t_{PD} 3.7 ns Typ into 50 pF at 5V V_{CC}
- High Output Drive; ±24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range; 1.65V to 5.5V
- Power down high impedance inputs/output
- Overvoltage Tolerant inputs facilitate 5V to 3V translation
- Patented noise/EMI reduction circuitry implemented

Ordering Code:

| Order Number | Package Number | Product Code Top Mark | Package Description | Supplied As |
|--------------|----------------|-----------------------|---|---------------------------|
| NC7NZ14K8X | MAB08A | 7NZ14 | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7NZ14L8X | MAC08A | P6 | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5k Units on Tape and Reel |

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

Logic Symbol



Pin Descriptions

| Pin Names | Description |
|-----------|-------------|
| A | Input |
| Y | Output |

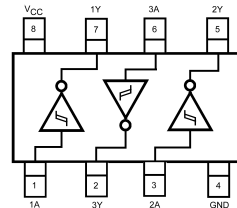
Function Table

$Y = \bar{A}$

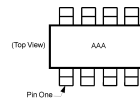
| Input | Output |
|-------|--------|
| A | Y |
| L | H |
| H | L |

H = HIGH Logic Level L = LOW Logic Level

Connection Diagrams



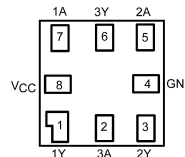
(Top View)



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).

Pad Assignment for MicroPak



(Top Thru View)

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Absolute Maximum Ratings (Note 1)

| | |
|---|-----------------|
| Supply Voltage (V_{CC}) | -0.5V to +7V |
| DC Input Voltage (V_{IN}) | -0.5V to +7V |
| DC Output Voltage (V_{OUT}) | -0.5V to +7V |
| DC Input Diode Current (I_{IK}) | |
| @ $V_{IN} < -0.5V$ | -50 mA |
| @ $V_{IN} > 6V$ | +20 mA |
| DC Output Diode Current (I_{OK}) | |
| @ $V_{OUT} < -0.5V$ | -50 mA |
| @ $V_{OUT} > 6V, V_{CC} = GND$ | +20 mA |
| DC Output Current (I_{OUT}) | ±50 mA |
| DC V_{CC}/GND Current (I_{CC}/I_{GND}) | ±50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Junction Temperature under Bias (T_J) | 150°C |
| Junction Lead Temperature (T_1); (Soldering, 10 seconds) | 260°C |
| Power Dissipation (P_D) @ +85°C | 250 mW |

Recommended Operating Conditions (Note 2)

| | |
|--|----------------|
| Supply Voltage Operating (V_{CC}) | 1.65V to 5.5V |
| Supply Voltage Data Retention (V_{CC}) | 1.5V to 5.5V |
| Input Voltage (V_{IN}) | 0V to 5.5V |
| Output Voltage (V_{OUT}) | 0V to V_{CC} |
| Operating Temperature (T_A) | -40°C to +85°C |
| Thermal Resistance (θ_{JA}) | 250°C/W |

Note 1: Absolute maximum ratings are DC values beyond which the device may be damaged or have its useful life impaired. The datasheet specification should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

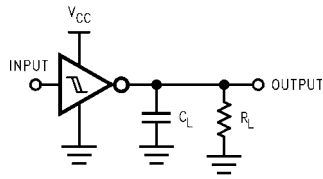
Note 2: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

| Symbol | Parameter | V_{CC} (V) | $T_A = +25^\circ C$ | | | $T_A = -40^\circ C$ to $+85^\circ C$ | | Unit | Conditions | |
|----------|----------------------------|-----------------|---------------------|------|------|--------------------------------------|------|---------------------------|-------------------|-----------------------|
| | | | Min | Typ | Max | Min | Max | | | |
| V_P | Positive Threshold Voltage | 1.65 | 0.7 | 1.1 | 1.5 | 0.7 | 1.5 | V | | |
| | | 2.3 | 1.0 | 1.4 | 1.8 | 1.0 | 1.8 | | | |
| | | 3.0 | 1.3 | 1.75 | 2.2 | 1.3 | 2.2 | | | |
| | | 4.5 | 1.9 | 2.45 | 3.1 | 1.9 | 3.1 | | | |
| | | 5.5 | 2.2 | 2.9 | 3.6 | 2.2 | 3.6 | | | |
| V_N | Negative Threshold Voltage | 1.65 | 0.25 | 0.55 | 0.9 | 0.25 | 0.9 | V | | |
| | | 2.3 | 0.40 | 0.75 | 1.15 | 0.40 | 1.15 | | | |
| | | 3.0 | 0.6 | 1.0 | 1.5 | 0.6 | 1.5 | | | |
| | | 4.5 | 1.0 | 1.43 | 2.0 | 1.0 | 2.0 | | | |
| | | 5.5 | 1.2 | 1.70 | 2.3 | 1.2 | 2.3 | | | |
| V_H | Hysteresis Voltage | 1.65 | 0.15 | 0.54 | 1.0 | 0.15 | 1.0 | V | | |
| | | 2.3 | 0.25 | 0.65 | 1.1 | 0.25 | 1.1 | | | |
| | | 3.0 | 0.4 | 0.77 | 1.2 | 0.4 | 1.2 | | | |
| | | 4.5 | 0.6 | 1.01 | 1.5 | 0.6 | 1.5 | | | |
| | | 5.5 | 0.7 | 1.18 | 1.7 | 0.7 | 1.7 | | | |
| V_{OH} | HIGH Level Output Voltage | 1.65 | 1.55 | 1.65 | | 1.55 | | V | $V_{IN} = V_{IL}$ | $I_{OH} = -100 \mu A$ |
| | | 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 | 1.29 | 1.52 | | 1.29 | | | | |
| | | 2.3 | 1.9 | 2.15 | | 1.9 | | | | |
| | | 3.0 | 2.4 | 2.80 | | 2.4 | | | | |
| | | 3.0 | 2.3 | 2.68 | | 2.3 | | | | |
| | | 4.5 | 3.8 | 4.20 | | 3.8 | | | | |
| | | | | | | | | | | |
| | | | | | | | | $I_{OH} = -8 \text{ mA}$ | | |
| | | | | | | | | $I_{OH} = -16 \text{ mA}$ | | |
| | | | | | | | | $I_{OH} = -24 \text{ mA}$ | | |
| | | | | | | | | $I_{OH} = -32 \text{ mA}$ | | |

| DC Electrical Characteristics (Continued) | | | | | | | | | | |
|---|---|---|------------------------|-----------------------|------|---------------------------------|------|-----------------------------------|--|------------------|
| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | | T _A = -40°C to +85°C | | Unit | Conditions | |
| | | | Min | Typ | Max | Min | Max | | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | 0.0 | 0.1 | | 0.1 | V | V _{IN} = V _{IH} | I _{OL} = 100 μA | |
| | | 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 | 0.08 | 0.24 | | 0.24 | | | | |
| | | 2.3 | 0.10 | 0.3 | | 0.3 | | | | |
| 3.0 | 0.15 | 0.4 | | 0.4 | | | | | | |
| | | 3.0 | 0.22 | 0.55 | | 0.55 | | | I _{OL} = 4 mA | |
| | | 3.0 | 0.22 | 0.55 | | 0.55 | | | I _{OL} = 8 mA | |
| | | 3.0 | 0.22 | 0.55 | | 0.55 | | | I _{OL} = 16 mA | |
| | | 3.0 | 0.22 | 0.55 | | 0.55 | | | I _{OL} = 24 mA | |
| | | 3.0 | 0.22 | 0.55 | | 0.55 | | | I _{OL} = 32 mA | |
| I _{IN} | Input Leakage Current | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA | V _{IN} = 5.5V, GND | |
| I _{OFF} | Power Off Leakage Current | 0.0 | | | 1 | | 10 | μA | V _{IN} or V _{OUT} = 5.5V | |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.5 | | | 1 | | 10 | μA | V _{IN} = 5.5V, GND | |
| AC Electrical Characteristics | | | | | | | | | | |
| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | | T _A = -40°C to +85°C | | Unit | Conditions | Figure Number |
| | | | Min | Typ | Max | Min | Max | | | |
| t _{PLH} | Propagation Delay | 1.8 ± 0.15 | 2.0 | 7.6 | 12.5 | 2.0 | 13 | ns | C _L = 15 pF, R _L = 1 MΩ | Figures 1, 3 |
| t _{PHL} | | 2.5 ± 0.2 | 1.0 | 5.0 | 9.0 | 1.0 | 9.5 | | | |
| | | 3.3 ± 0.3 | 1.0 | 3.7 | 6.3 | 1.0 | 6.5 | | | |
| | | 5.0 ± 0.5 | 0.5 | 3.1 | 5.2 | 0.5 | 5.5 | | | |
| t _{PLH} | Propagation Delay | 3.3 ± 0.3 | 1.5 | 4.4 | 7.2 | 1.5 | 7.5 | ns | C _L = 50 pF, R _L = 500Ω | Figures 1, 3 |
| t _{PHL} | | 5.0 ± 0.5 | 0.8 | 3.7 | 5.9 | 0.8 | 6.2 | | | |
| C _{IN} | Input Capacitance | 0 | | 2.5 | | | | pF | | |
| C _{PD} | Power Dissipation Capacitance | 3.3 5.0 | | 9 11 | | | | pF | (Note 3) | Figure 2 |
| <p>Note 3: 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 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CC} static).</p> | | | | | | | | | | |
| Dynamic Switching Characteristics | | | | | | | | | | |
| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = 25°C | | Unit | | | | |
| | | | | Typical | | | | | | |
| V _{OLP} | Quiet Output Dynamic Peak V _{OL} | C _L = 50pF, V _{IH} = 5.0V, V _{IL} = 0V | 5.0 | 0.8 | | V | | | | |
| V _{OLV} | Quiet Output Dynamic Valley V _{OL} | C _L = 50pF, V _{IH} = 5.0V, V _{IL} = 0V | 5.0 | -0.8 | | V | | | | |

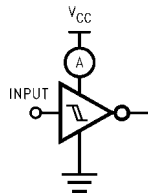
AC Loading and Waveforms



C_L includes load and stray capacitance

Input PRR = 1.0 MHz; $t_w = 500$ ns

FIGURE 1. AC Test Circuit



Input = AC Waveform; $t_r = t_f = 1.8$ ns

PRR = 10 MHz; Duty Cycle = 50%

FIGURE 2. I_{CCD} Test Circuit

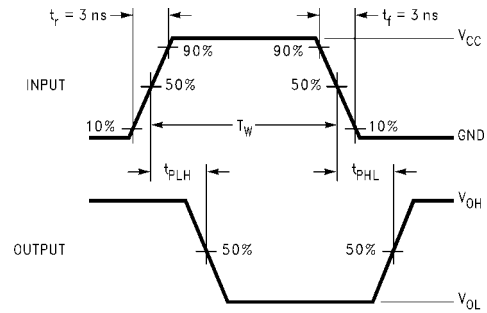


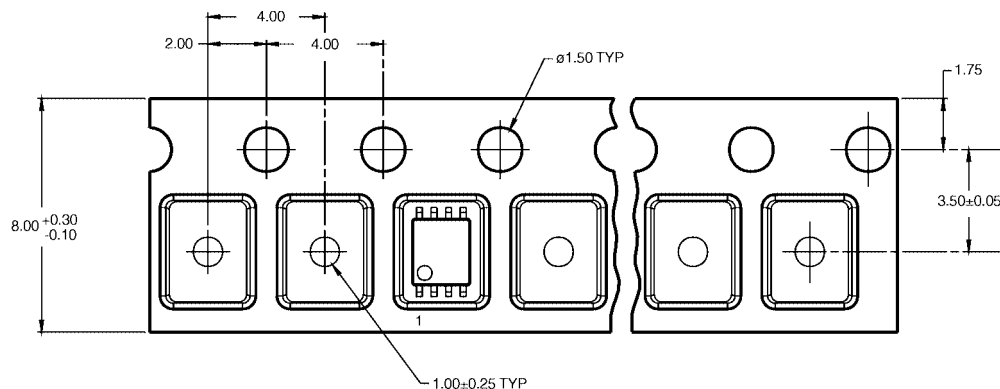
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT

| Package Designator | Tape Section | Number Cavities | Cavity Status | Cover Tape Status |
|--------------------|--------------------|-----------------|---------------|-------------------|
| K8X | Leader (Start End) | 125 (typ) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (typ) | Empty | Sealed |

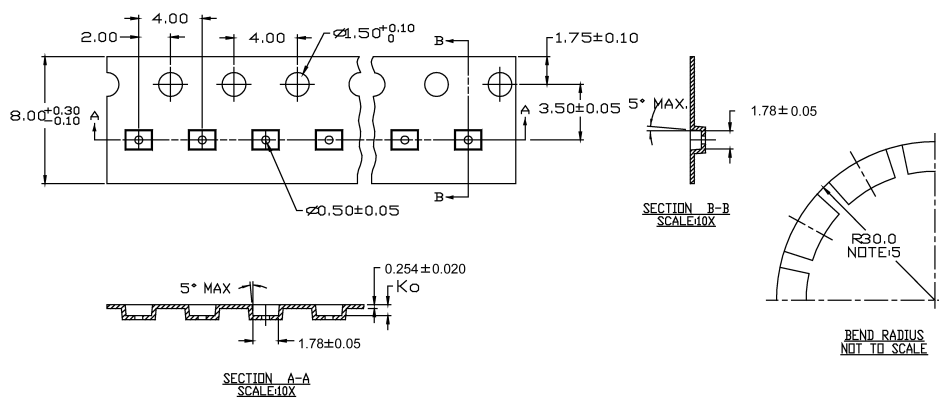
TAPE DIMENSIONS inches (millimeters)



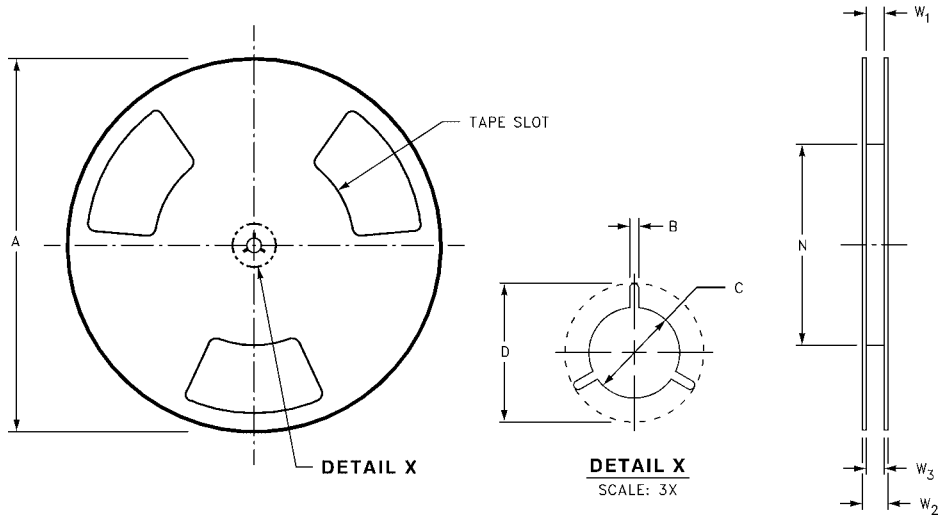
TAPE FORMAT for MicroPak

| Package Designator | Tape Section | Number Cavities | Cavity Status | Cover Tape Status |
|--------------------|--------------------|-----------------|---------------|-------------------|
| L8X | Leader (Start End) | 125 (typ) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (typ) | Empty | Sealed |

TAPE DIMENSIONS inches (millimeters)

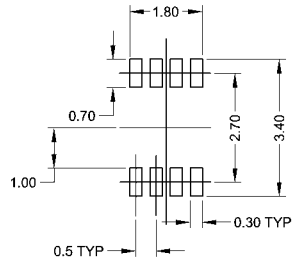
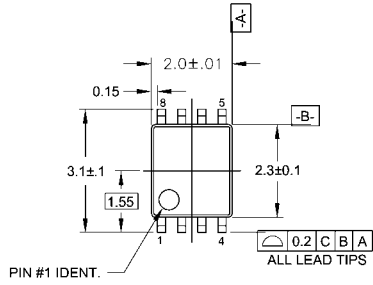


Tape and Reel Specification (Continued)
REEL DIMENSIONS inches (millimeters)

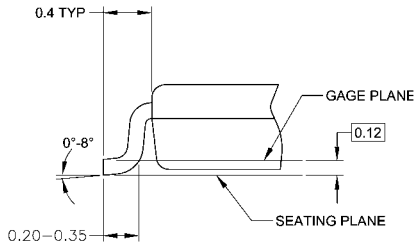
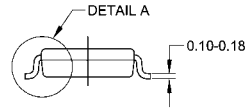
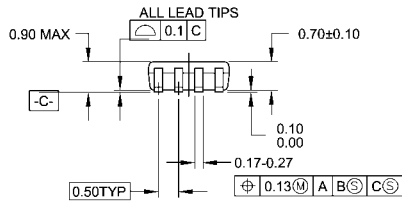


| Tape Size | A | B | C | D | N | W1 | W2 | W3 |
|-----------|----------------|-----------------|------------------|------------------|------------------|--|------------------|--|
| 8 mm | 7.0 (177.8) | 0.059 (1.50) | 0.512 (13.00) | 0.795 (20.20) | 2.165 (55.00) | 0.331 +0.059/-0.000 (8.40 + 1.50/-0.00) | 0.567 (14.40) | W1 + 0.078/-0.039 (W1 + 2.00/-1.00) |

Physical Dimensions inches (millimeters) unless otherwise noted



LAND PATTERN RECOMMENDATION



DETAIL A

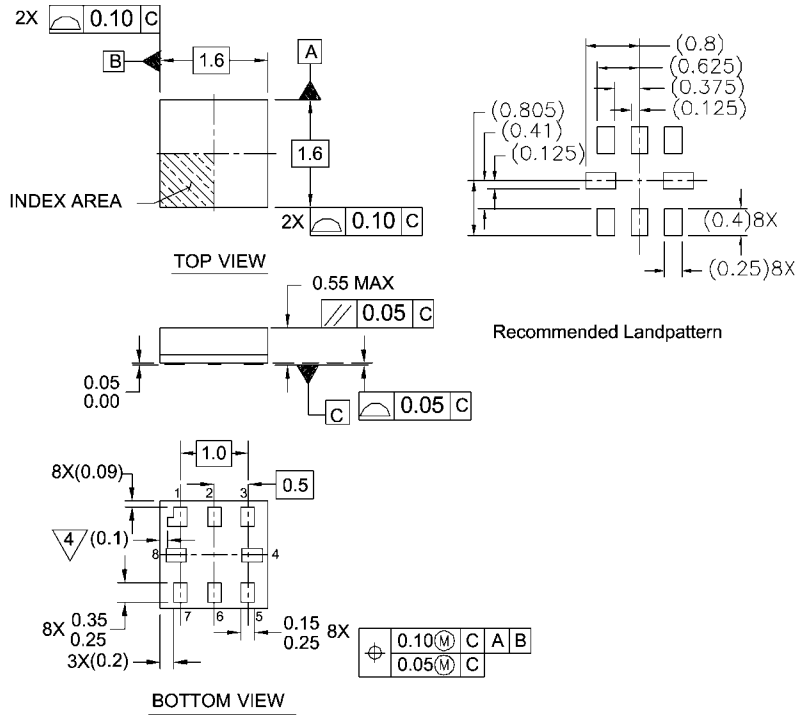
NOTES:

- 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, 1982.

MAB08AREVC

**8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide
Package Number MAB08A**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Notes:

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
- 4 PIN 1 FLAG, END OF PACKAGE OFFSET.

MAC08AREVC

**Pb-Free 8-Lead MicroPak, 1.6 mm Wide
Package Number MAC08A**

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