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NC7NZ04 TinyLogic® UHS Inverter

Features

- Ultra-High Speed: t_{PD} 2.4ns (Typical) into 50pF at 5V V_{CC}
- High Output Drive: $\pm 24mA$ at 3V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Power-Down, High-Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Space-Saving MicroPak™ and US8 Surface Mount Packages

Description

The NC7NZ04 is a triple inverter from Fairchild's Ultra-High Speed (UHS) 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 1.65V to 5.5V V_{CC} operating range. The inputs and output are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V, independent of V_{CC} operating voltage.

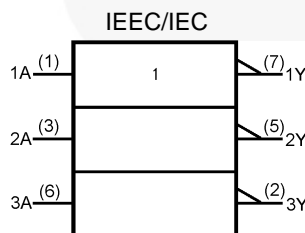


Figure 1. Logic Symbol

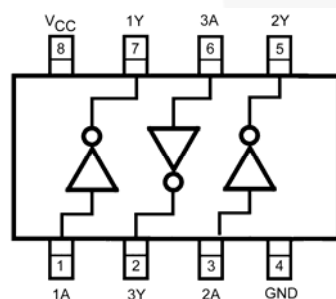


Figure 2. Connection Diagram

Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|---|---------------------------|
| NC7NZ04K8X | NZ04 | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3000 Units on Tape & Reel |
| NC7NZ04L8X | T3 | 8-Lead MicroPak™, 1.6mm Wide | 5000 Units on Tape & Reel |

MicroPak™ is a trademarks of Fairchild Semiconductor Corporation.

Pin Configurations

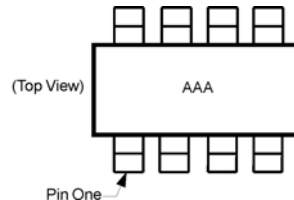


Figure 3. US8

Notes:

1. AAA represents product code top mark (see ordering table).
2. Orientation of top mark determines pin one location. Reading the top product code mark left to right, pin one is the lower left pin.

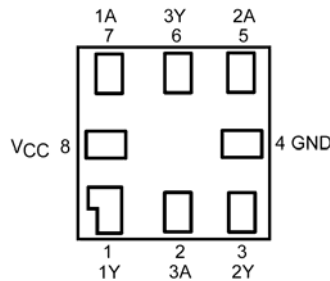


Figure 4. MicroPak™ (Top Through View)

Pin Definitions

| Pin # US8 | Pin # MicroPak™ | Name | Description |
|-----------|-----------------|-----------------|----------------|
| 1 | 7 | 1A | Input |
| 2 | 6 | 3Y | Output |
| 3 | 5 | 2A | Input |
| 4 | 4 | GND | Ground |
| 5 | 3 | 2Y | Output |
| 6 | 2 | 3A | Input |
| 7 | 1 | 1Y | Output |
| 8 | 8 | V _{CC} | Supply Voltage |

Function Table

Y = /A

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

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Min. | Max. | Unit |
|-----------------------|---|----------------------------|----------|-------------|
| V_{CC} | Supply Voltage | -0.5 | 7.0 | V |
| V_{IN} | DC Input Voltage | -0.5 | 7.0 | V |
| V_{OUT} | DC Output Voltage | -0.5 | 7.0 | V |
| I_{IK} | DC Input Diode Current | $V_{IN} < -0.5V$ | -50 | mA |
| | | $V_{IN} > 6.0V$ | +20 | |
| I_{OK} | DC Output Diode Current | $V_{OUT} < -0.5V$ | -50 | mA |
| | | $V_{OUT} > 6V, V_{CC}=GND$ | +20 | |
| I_{OUT} | DC Output Current | | ± 50 | mA |
| I_{CC} or I_{GND} | DC V_{CC} or Ground Current | | ± 50 | mA |
| T_{STG} | Storage Temperature Range | -65 | +150 | $^{\circ}C$ |
| T_J | Junction Temperature Under Bias | | +150 | $^{\circ}C$ |
| T_L | Junction Lead Temperature (Soldering, 10 Seconds) | | +260 | $^{\circ}C$ |
| P_D | Power Dissipation at +85 $^{\circ}C$ | | 250 | mW |
| ESD | Human Body Model, JEDEC:JESD22-A114 | | 4000 | V |
| | Charge Device Model, JEDEC:JESD22-C101 | | 2000 | |

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | Conditions | Min. | Max. | Unit |
|---------------|-------------------------------|-----------------------------------|------|----------|---------------|
| V_{CC} | Supply Voltage Operating | | 1.65 | 5.50 | 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 | $^{\circ}C$ |
| t_r, t_f | Input Rise and Fall Times | V_{CC} at 1.8V, 2.5V \pm 0.2V | 0 | 20 | ns/V |
| | | V_{CC} at 3.3V \pm 0.3V | 0 | 10 | |
| | | V_{CC} at 5.0V \pm 0.5V | 0 | 5 | |
| θ_{JA} | Thermal Resistance | US8 | | 250 | $^{\circ}C/W$ |
| | | MicroPak™ | | 287 | |

Note:

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

DC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to 85°C | | Units |
|------------------|---------------------------|-----------------|--|----------------------|-----------------------|---------------------|-----------------------------|---------------------|-------|
| | | | | Min. | Typ. | Max. | Min. | Max. | |
| V _{IH} | HIGH Level Input Voltage | 1.80 ± 0.15 | | 0.75V _{CC} | | | 0.75V _{CC} | | V |
| | | 2.30 to 5.50 | | 0.70V _{CC} | | | 0.70V _{CC} | | |
| V _{IL} | LOW Level Input Voltage | 1.80 ± 0.15 | | | | 0.25V _{CC} | | 0.25V _{CC} | V |
| | | 2.30 to 5.50 | | | | 0.30V _{CC} | | 0.30V _{CC} | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} =V _{IL} , I _{OH} =-100μA | 1.55 | 1.65 | | 1.55 | | V |
| | | 2.30 | | 2.20 | 2.30 | | 2.20 | | |
| | | 3.00 | | 2.90 | 3.00 | | 2.90 | | |
| | | 4.50 | | 4.40 | 4.50 | | 4.40 | | |
| | | 1.65 | I _{OH} =-4mA | 1.29 | 1.52 | | 1.29 | | |
| | | 2.30 | I _{OH} =-8mA | 1.90 | 2.15 | | 1.90 | | |
| | | 3.00 | I _{OH} =-16mA | 2.40 | 2.80 | | 2.40 | | |
| | | 3.00 | I _{OH} =-24mA | 2.30 | 2.68 | | 2.30 | | |
| | | 4.50 | I _{OH} =-32mA | 3.80 | 4.20 | | 3.80 | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} =V _{IH} , I _{OL} =100μA | | 0.00 | 0.10 | | 0.10 | V |
| | | 2.30 | | | 0.00 | 0.10 | | 0.10 | |
| | | 3.00 | | | 0.00 | 0.10 | | 0.10 | |
| | | 4.50 | | | 0.00 | 0.10 | | 0.10 | |
| | | 1.65 | I _{OL} =4mA | | 0.80 | 0.24 | | 0.24 | |
| | | 2.30 | I _{OL} =8mA | | 0.10 | 0.30 | | 0.30 | |
| | | 3.00 | I _{OL} =16mA | | 0.15 | 0.40 | | 0.40 | |
| | | 3.00 | I _{OL} =24mA | | 0.22 | 0.55 | | 0.55 | |
| | | | | 4.50 | I _{OL} =32mA | | 0.22 | 0.55 | |
| I _{IN} | Input Leakage Current | 0 to 5.5 | 0 ≤ V _{IN} ≤ 5.5V | | | ±1 | | ±1 | μA |
| I _{OFF} | Power-Off Leakage Current | 0 | V _{IN} or V _{OUT} =5.5V | | | 1 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.50 | V _{IN} =5.5V, GND | | | 1 | | 10 | μA |

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to 85°C | | Units | Figure |
|-------------------------------------|--|-----------------|---|----------------------|------|------|-----------------------------|------|-------|----------------------|
| | | | | Min. | Typ. | Max. | Min. | Max. | | |
| t _{PLH} , t _{PHL} | Propagation Delay | 1.80 ± 0.15 | C _L =15pF, R _L =1MΩ | 1.8 | 4.4 | 9.5 | 2.0 | 10.0 | ns | Figure 5 Figure 6 |
| | | 2.50 ± 0.20 | | 0.8 | 2.9 | 5.1 | 0.8 | 5.6 | | |
| | | 3.30 ± 0.30 | | 0.5 | 2.1 | 3.4 | 0.5 | 3.8 | | |
| | | 5.00 ± 0.50 | | 0.5 | 1.8 | 2.8 | 0.5 | 3.1 | | |
| | | 3.30 ± 0.30 | C _L =50pF, R _L =500Ω | 1.2 | 2.9 | 4.5 | 1.2 | 5.0 | | |
| | | 5.00 ± 0.50 | | 0.8 | 2.4 | 3.6 | 0.8 | 4.0 | | |
| C _{IN} | Input Capacitance | 0 | | | 2.5 | | | | pF | |
| C _{PD} | Power Dissipation Capacitance ⁽⁴⁾ | 3.30 | | | 9 | | | | pF | Figure 7 |
| | | 5.00 | | | 11 | | | | | |

Note:

4. 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. C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}static).

Dynamic Switching Characteristics

| Symbol | Parameter | Conditions | V _{CC} | T _A =25°C | Unit |
|------------------|---|--|-----------------|----------------------|------|
| | | | | Typ. | |
| 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} | | 5.0 | -0.8 | V |

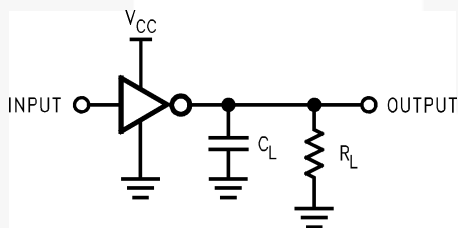


Figure 5. AC Test Circuit

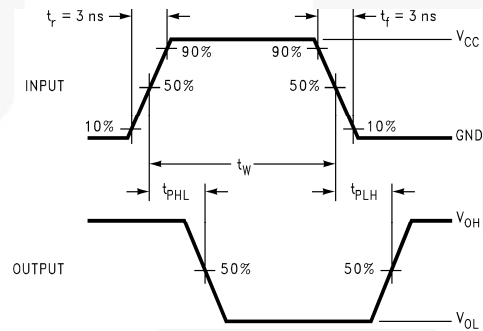


Figure 6. AC Waveforms

Note:

5. C_L includes load and stray capacitance; inputs PRR=1.0MHz, t_w=500ns.

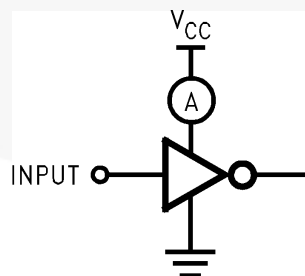


Figure 7. I_{CCD} Test Circuit

Note:

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

Physical Dimensions

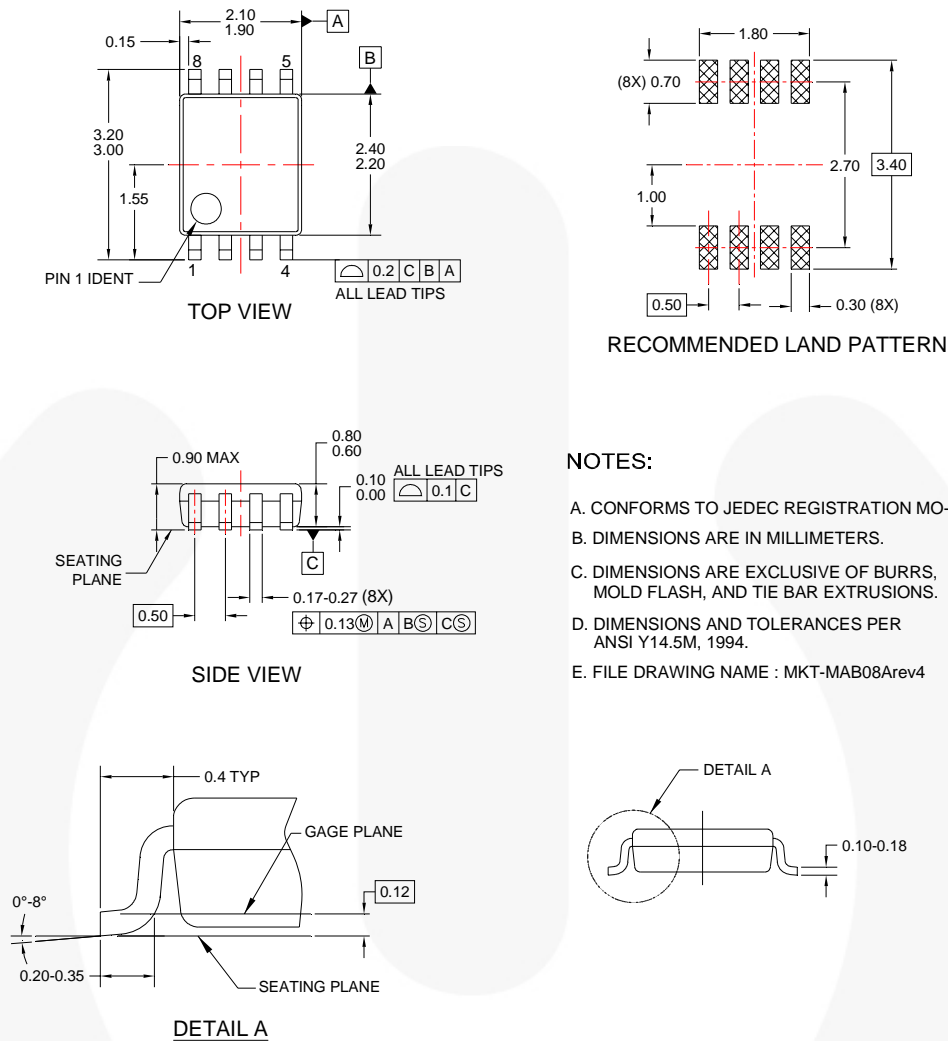


Figure 8. 8-Lead US8, JEDEC MO-187, Variation CA, 3.1mm Wide

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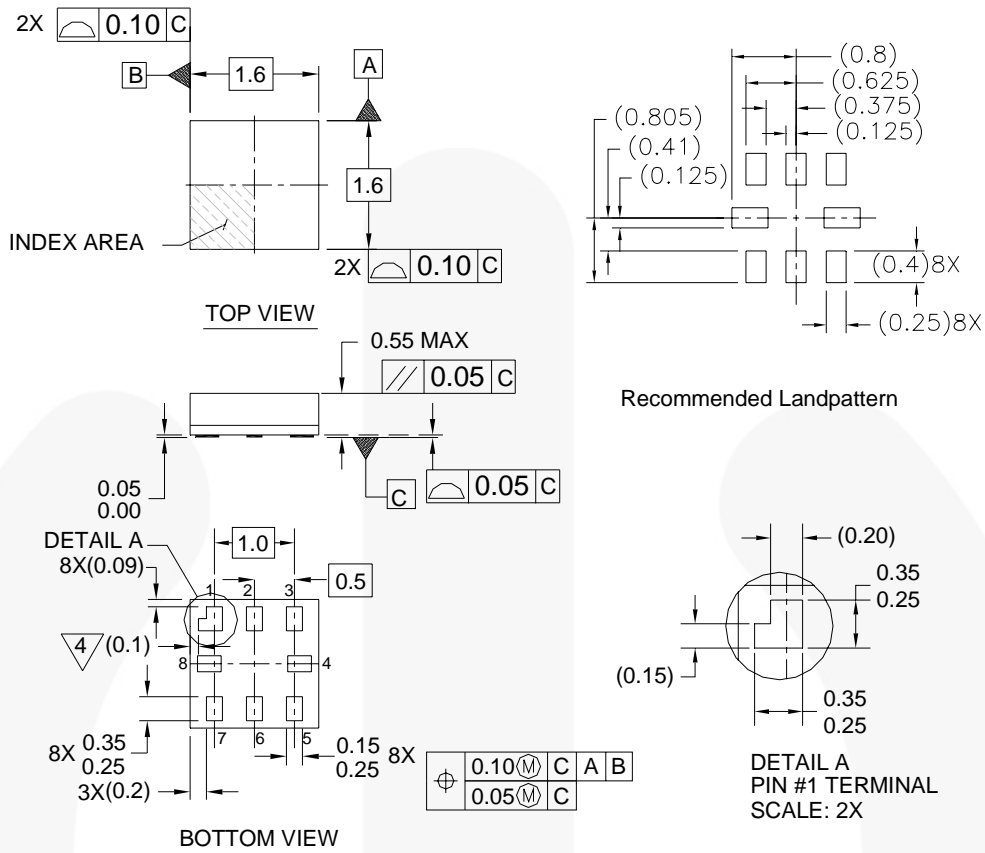
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Tape and Reel Specification

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:
http://www.fairchildsemi.com/packaging/US8_Pack_TNR.pdf

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

Physical Dimensions



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
5. DRAWING FILE NAME: MKT-MAC08AREV4

MAC08AREV4

Figure 9. 8-Lead, MicroPak™, 1.0mm Wide

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Tape and Reel Specification

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http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf

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



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| CorePOWER™ | Green FPS™ e-Series™ | QFET® | |
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