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NC7WZ04 TinyLogic® UHS Dual Inverter

Features

- Ultra-High Speed: t_{PD} 2.3ns (Typical) into 50pF at 5V V_{CC}
- High Output Drive: ± 24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Matches Performance of LCX when Operated at 3.3V V_{CC}
- Power Down High Impedance Inputs/Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC70 6-Lead Package


Description

The NC7WZ04 is a dual 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 a very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

Related Resources

- [MS-503 — Family Characteristics TinyLogic® HS/HST and UHS Series](#)

Ordering Information

| Part Number | Top Mark |  Eco Status | Package | Packing Method |
|-------------|----------|--|---|---------------------------|
| NC7WZ04P6X | Z04 | RoHS | 6-Lead SC70, EIAJ SC88 1.25mm Wide | 3000 Units on Tape & Reel |
| NC7WZ04L6X | A7 | RoHS | 6-Lead MicroPak™, 1.00mm Wide | 5000 Units on Tape & Reel |
| NC7WZ04FHX | A7 | Green | 6-Lead, MicroPak2™, 1x1mm Body, .35mm Pitch | 5000 Units on Tape & Reel |

 For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Connection Diagrams

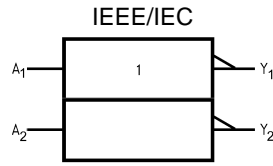


Figure 1. Logic Symbol

Pin Configurations

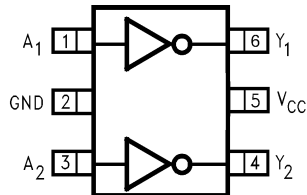


Figure 2. SC70 (Top View)

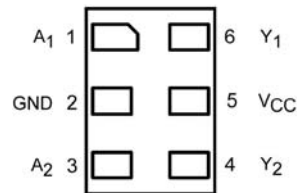


Figure 3. MicroPak (Top Through View)

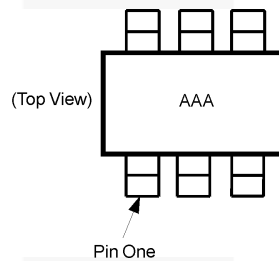


Figure 4. Pin 1 Orientation

Notes:

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

Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|------------|----------------|-----------------|----------------|
| 1 | 1 | A | Input |
| 2 | 2 | GND | Ground |
| 3 | 3 | A | Input |
| 4 | 4 | Y | Output |
| 5 | 5 | V _{CC} | Supply Voltage |
| 6 | 6 | Y | Output |

Function Table

Y = /A

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

H = HIGH Logic Level

L = LOW Logic Level

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} < -0V | | -50 | mA |
| I _{OK} | DC Output Diode Current | V _{OUT} < 0V | | -50 | mA |
| I _{OUT} | DC Output Source / Sink Current | | | ±50 | mA |
| I _{CC} or I _{GND} | DC V _{CC} or Ground Current | | | ±100 | mA |
| T _{STG} | Storage Temperature Range | | -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 at +85°C | SC70-6 | | 180 | mW |
| | | MicroPak-6 | | 130 | |
| | | MicroPak2-6 | | 120 | |
| 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 _r , t _f | Input Rise and Fall Times | V _{CC} at 1.8V, 2.5V ±0.2V | 0 | 20 | ns/V |
| | | V _{CC} at 3.3V ± 0.3V | 0 | 10 | |
| | | V _{CC} at 5.0V ± 0.5V | 0 | 5 | |
| T _A | Operating Temperature | | -40 | +85 | °C |
| θ _{JA} | Thermal Resistance | SC70-6 | | 350 | °C/W |
| | | MicroPak-6 | | 500 | |
| | | MicroPak2-6 | | 560 | |

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 | 1.65 to 1.95 | | 0.75V _{CC} | | | 0.75V _{CC} | | V |
| | | 2.30 to 5.50 | | 0.70V _{CC} | | | 0.70V _{CC} | | |
| V _{IL} | LOW Level Input Voltage | 1.65 to 1.95 | | | | 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 |
| | | 1.80 | | 1.70 | 1.80 | | 1.70 | | |
| | | 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 | 2.14 | | 1.90 | | |
| | | 3.00 | I _{OH} =-16mA | 2.40 | 2.75 | | 2.40 | | |
| | | 3.00 | I _{OH} =-24mA | 2.30 | 2.62 | | 2.30 | | |
| | | 4.50 | I _{OH} =-32mA | 3.80 | 4.13 | | 3.80 | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} =V _{IH} , I _{OL} =100μA | | 0.10 | 0.10 | | 0.10 | V |
| | | 1.80 | | | 0.00 | 0.10 | | 0.10 | |
| | | 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 | | 0.16 | 0.40 | | 0.40 | |
| | | 3.00 | I _{OL} =24mA | | 0.24 | 0.55 | | 0.55 | |
| | | 4.50 | I _{OL} =32mA | | 0.25 | 0.55 | | 0.55 | |
| I _{IN} | Input Leakage Current | 0 to 5.5 | 0 ≤ V _{IN} ≤ 5.5V | | | ±1 | | ±1.0 | 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 | 1.65 | C _L =15pF, R _L =1MΩ | 1.8 | 5.3 | 9.2 | 1.8 | 11.0 | ns | Figure 5 Figure 6 |
| | | 1.80 | | 1.8 | 4.4 | 7.6 | 1.8 | 8.4 | | |
| | | 2.50 ± 0.20 | | 1.2 | 3.0 | 5.1 | 1.2 | 5.6 | | |
| | | 3.30 ± 0.30 | | 0.8 | 2.2 | 3.4 | 0.8 | 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 | | |
| 5.00 ± 0.50 | 0.8 | 2.3 | 3.6 | | 0.8 | 4.0 | | | | |
| C _{IN} | Input Capacitance | 0.00 | | | 2.5 | | | | pF | |
| C _{PD} | Power Dissipation Capacitance ⁽⁵⁾ | 3.30 | | | 9 | | | | pF | Figure 7 |
| | | 5.00 | | | 11 | | | | | |

Note:

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

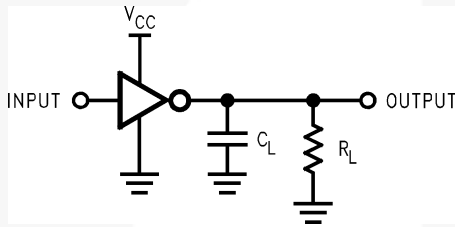


Figure 5. AC Test Circuit

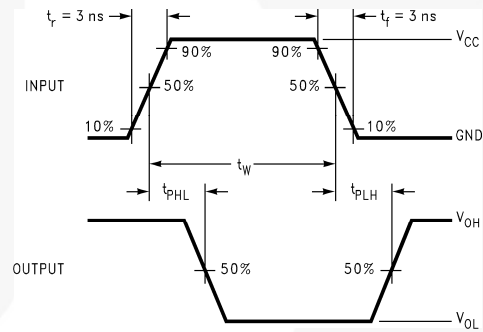


Figure 6. AC Waveforms

Notes:

6. C_L includes load and stray capacitance.
7. Input PRR = 1.0MHz, tw = 500ns.

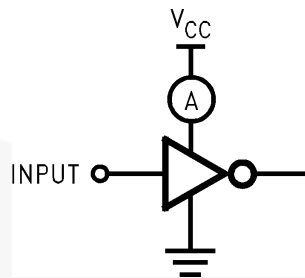


Figure 7. I_{CCD} Test Circuit

Note:

8. Input=AC Waveform; tr=tr=1.8ns.
9. PRR=Variable; Duty Cycle=50%.

Physical Dimensions

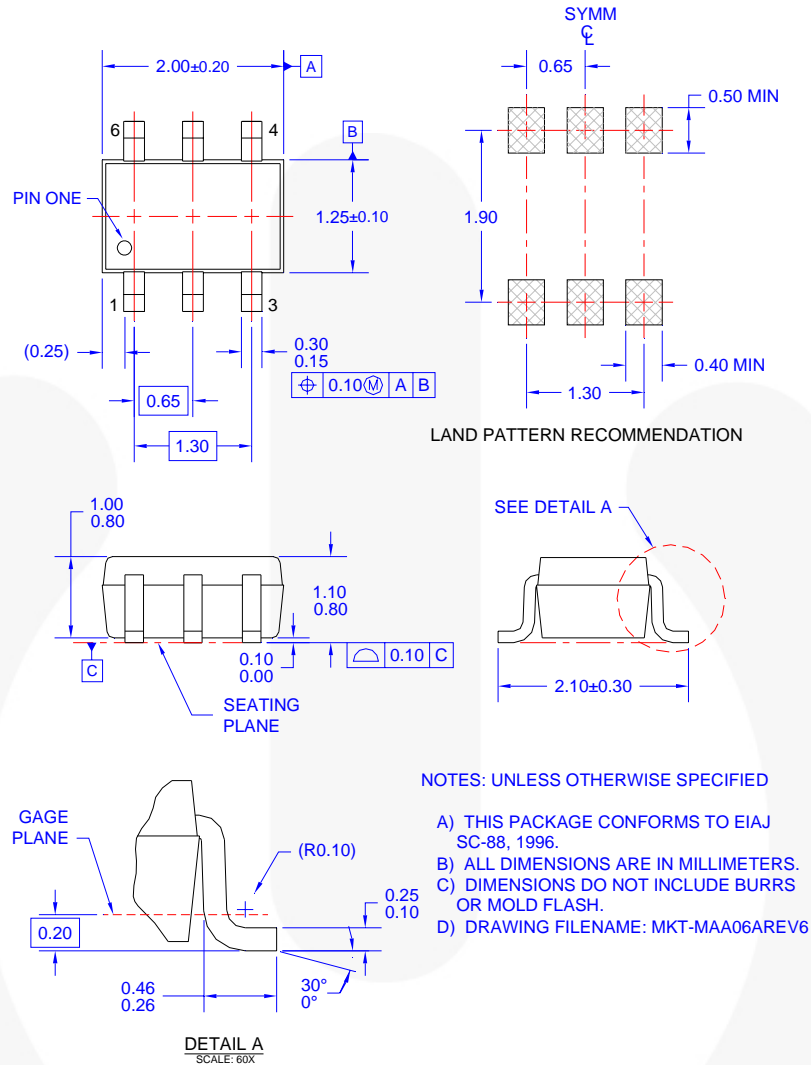


Figure 8. 6-Lead, SC70, EIAJ SC88, 1.25mm Wide

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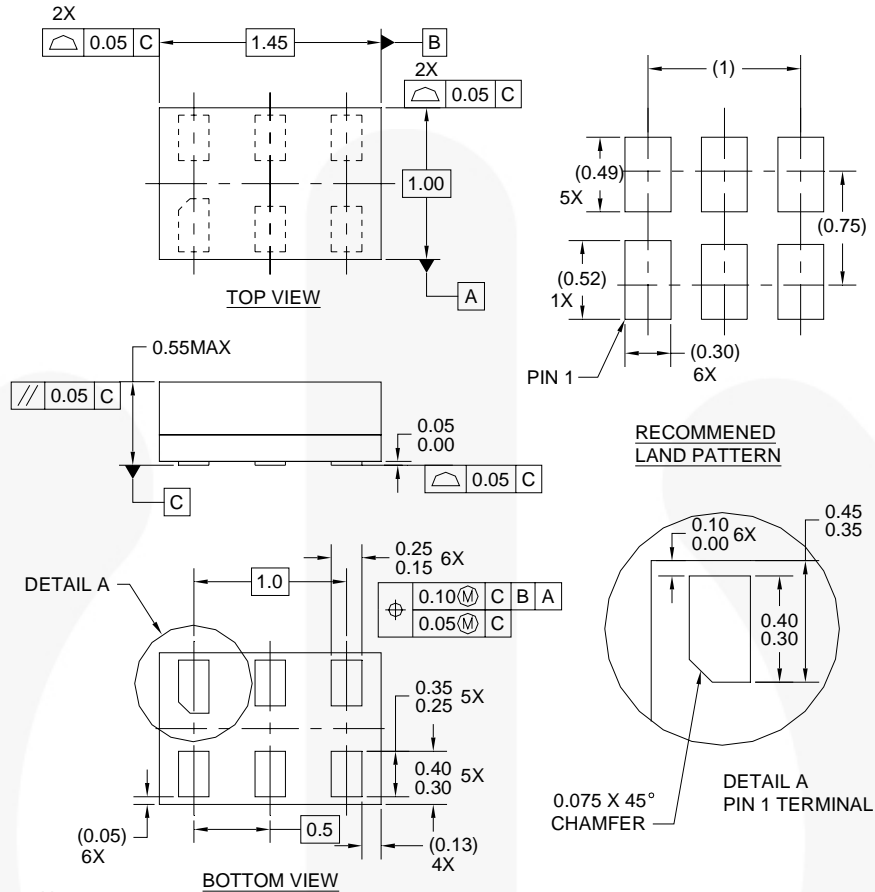
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Tape and Reel Specification

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:
http://www.fairchildsemi.com/products/analog/pdf/sc70-6_tr.pdf.

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| P6X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

Physical Dimensions



Notes:

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06AREVC

Figure 9. 6-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 |
|--------------------|--------------------|---------------|---------------|-------------------|
| L6X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 5000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

Physical Dimensions

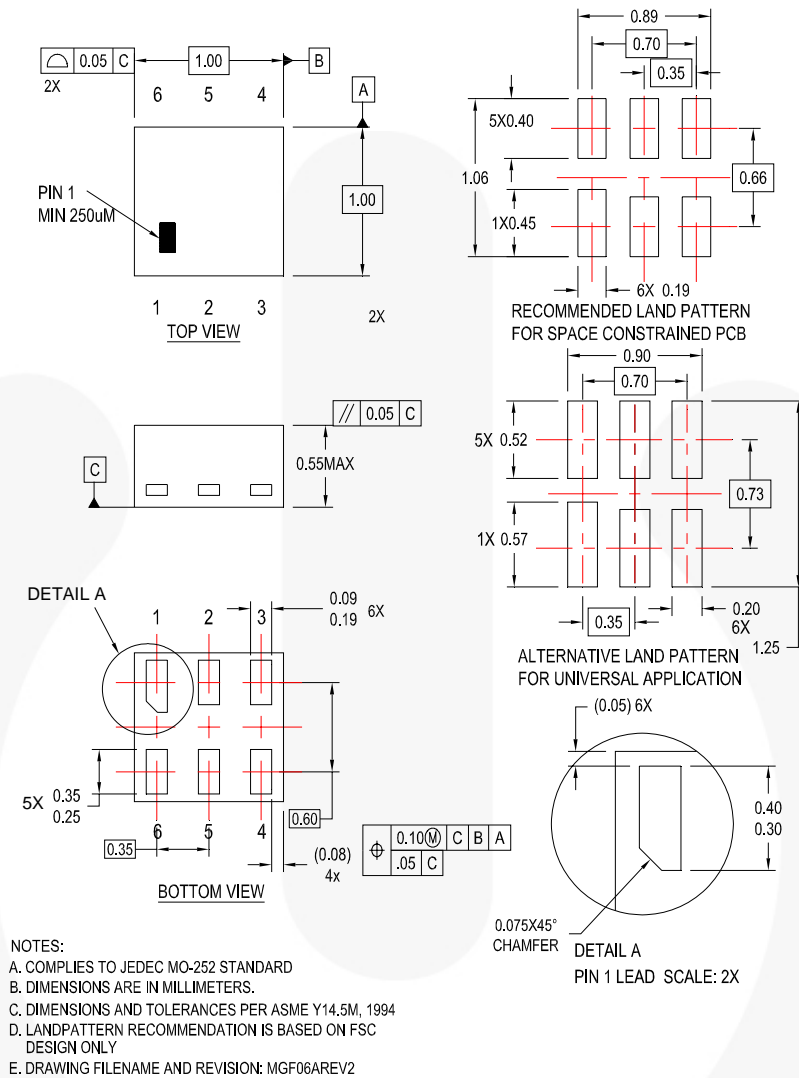


Figure 10. 6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:
http://www.fairchildsemi.com/packaging/MicroPAK2_6L_tr.pdf

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| FHX | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 5000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |



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