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NC7WZ14

TinyLogic® UHS Dual Inverter with Schmitt Trigger Inputs

Features

- Ultra-High Speed: t_{PD} 3.2ns (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
- 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 Package

Description

The NC7WZ14 is a dual inverter with Schmitt trigger input 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 very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs and outputs are high-impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage. Schmitt trigger inputs achieve typically 1V hysteresis between the positive-and negative-going input threshold voltage at 5V.

Ordering Information

| Part Number | Operating Temperature | Top Mark | Package | Packing Method |
|-------------|-----------------------|----------|--|---------------------------|
| NC7WZ14P6X | -40 to +85°C | Z14 | 6-Lead SC70, EIAJ SC-88a, 1.25mm Wide | 3000 Units on Tape & Reel |
| NC7WZ14EP6X | -40 to +125°C | Z14 | 6-Lead SC70, EIAJ SC-88a, 1.25mm Wide | 3000 Units on Tape & Reel |
| NC7WZ14L6X | -40 to +85°C | A9 | 6-Lead MicroPak™, 1.00mm Wide | 5000 Units on Tape & Reel |
| NC7WZ14FHX | -40 to +85°C | A9 | 6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch | 5000 Units on Tape & Reel |

Connection Diagrams

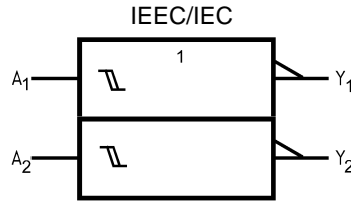


Figure 1. Logic Symbol

Pin Configurations

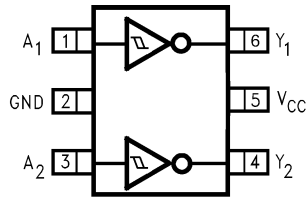


Figure 2. SC70 (Top View)

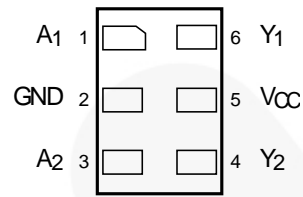
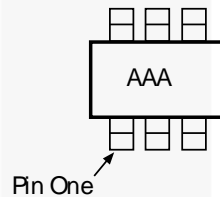


Figure 3. MicroPak (Top Through View)



Notes:

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

Figure 4. SC70 Pin 1 Orientation

Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|------------|----------------|-----------------|----------------|
| 1 | 1 | A ₁ | Input |
| 2 | 2 | GND | Ground |
| 3 | 3 | A ₂ | Input |
| 4 | 4 | Y ₂ | Output |
| 5 | 5 | V _{CC} | Supply Voltage |
| 6 | 6 | Y ₁ | 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 | $V_{IN} < -0.5V$ | | -50 | mA | |
| I_{OK} | DC Output Diode Current | $V_{OUT} < -0.5V$ | | -50 | mA | |
| I_{OUT} | DC Output Current | | | ±100 | mA | |
| I_{CC} or I_{GND} | DC V_{CC} or Ground Current | | | ±50 | 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 | SC70-6 | $T_A=85^\circ C$ | 170 | mW | |
| | | | $T_A=125^\circ C$ | 104 | | |
| | | 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⁽³⁾

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 | SC70-6 | -40 | +125 | °C |
| | | MicroPak-6 | -40 | +85 | |
| | | MicroPak2-6 | -40 | +85 | |
| θ_{JA} | Thermal Resistance | SC70-6 | | 390 | °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} (V) | Conditions | T _A =+25°C | | | T _A =-40 to +85°C | | T _A =-40 to +125°C | | Units |
|------------------|----------------------------|---------------------|---|-----------------------|----------------------------|------|------------------------------|------|-------------------------------|------|-------|
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| V _P | Positive Threshold Voltage | 1.65 | | 0.60 | | 1.40 | 0.60 | 1.40 | 0.60 | 1.40 | V |
| | | 1.80 | | 0.70 | | 1.50 | 0.70 | 1.50 | 0.70 | 1.50 | |
| | | 2.30 | | 1.00 | | 1.80 | 1.00 | 1.80 | 1.00 | 1.80 | |
| | | 3.00 | | 1.30 | | 2.20 | 1.30 | 2.20 | 1.30 | 2.20 | |
| | | 4.50 | | 1.90 | | 3.10 | 1.90 | 3.10 | 2.00 | 3.20 | |
| | | 5.50 | | 2.20 | | 3.60 | 2.20 | 3.60 | 2.30 | 3.70 | |
| V _N | Negative Threshold Voltage | 1.65 | | 0.20 | 0.50 | 0.80 | 0.20 | 0.80 | 0.30 | 0.90 | V |
| | | 1.80 | | 0.25 | 0.56 | 0.90 | 0.25 | 0.90 | 0.35 | 1.00 | |
| | | 2.30 | | 0.40 | 0.75 | 1.15 | 0.40 | 1.15 | 0.50 | 1.20 | |
| | | 3.00 | | 0.60 | 0.98 | 1.50 | 0.60 | 1.50 | 0.70 | 1.60 | |
| | | 4.50 | | 1.00 | 1.42 | 2.00 | 1.00 | 2.00 | 1.10 | 2.20 | |
| | | 5.50 | | 1.20 | 1.68 | 2.30 | 1.20 | 2.30 | 1.40 | 2.50 | |
| V _H | Hysteresis Voltage | 1.65 | | 0.10 | 0.48 | 0.90 | 0.10 | 0.90 | 0.10 | 0.90 | V |
| | | 1.80 | | 0.15 | 0.51 | 1.00 | 0.15 | 1.00 | 0.15 | 1.00 | |
| | | 2.30 | | 0.25 | 0.62 | 1.10 | 0.25 | 1.10 | 0.25 | 1.10 | |
| | | 3.00 | | 0.40 | 0.76 | 1.20 | 0.40 | 1.20 | 0.40 | 1.20 | |
| | | 4.50 | | 0.60 | 1.01 | 1.50 | 0.60 | 1.50 | 0.60 | 1.50 | |
| | | 5.50 | | 0.70 | 1.20 | 1.70 | 0.70 | 1.70 | 0.70 | 1.70 | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} =V _{IL} , I _{OH} =-100μA | 1.55 | 1.65 | | 1.55 | | 1.55 | | V |
| | | 1.80 | | 1.70 | 1.80 | | 1.70 | | 1.70 | | |
| | | 2.30 | | 2.20 | 2.30 | | 2.20 | | 2.20 | | |
| | | 3.00 | | 2.90 | 3.00 | | 2.90 | | 2.90 | | |
| | | 4.50 | | 4.40 | 4.50 | | 4.40 | | 4.40 | | |
| | | 1.65 | I _{OH} =-4mA | 1.29 | 1.52 | | 1.29 | | 1.26 | | |
| | | 2.30 | I _{OH} =-8mA | 1.90 | 2.14 | | 1.90 | | 1.80 | | |
| | | 3.00 | I _{OH} =-16mA | 2.40 | 2.75 | | 2.40 | | 2.30 | | |
| | | 3.00 | I _{OH} =-24mA | 2.30 | 2.62 | | 2.30 | | 2.20 | | |
| | | 4.50 | I _{OH} =-32mA | 3.80 | 4.13 | | 3.80 | | 3.70 | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} =V _{IH} , I _{OL} =100μA | | 0.00 | 0.10 | | 0.10 | | 0.10 | V |
| | | 1.80 | | | 0.00 | 0.10 | | 0.10 | | 0.10 | |
| | | 2.30 | | | 0.00 | 0.10 | | 0.10 | | 0.10 | |
| | | 3.00 | | | 0.00 | 0.10 | | 0.10 | | 0.10 | |
| | | 4.50 | | | 0.00 | 0.10 | | 0.10 | | 0.10 | |
| | | 1.65 | I _{OL} =4mA | | 0.08 | 0.24 | | 0.24 | | 0.26 | |
| | | 2.30 | I _{OL} =8mA | | 0.10 | 0.30 | | 0.30 | | 0.32 | |
| | | 3.00 | I _{OL} =16mA | | 0.16 | 0.40 | | 0.40 | | 0.43 | |
| | | 3.00 | I _{OL} =24mA | | 0.24 | 0.55 | | 0.55 | | 0.60 | |
| | | 4.50 | I _{OL} =32mA | | 0.25 | 0.55 | | 0.55 | | 0.60 | |
| | | I _{IN} | Input Leakage Current | 0 to 5.5 | V _{IN} =5.5V, GND | | | ±0.1 | | ±1.0 | |
| 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 | | | 1.0 | | 10 | | μA | |

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} (V) | Conditions | T _A =+25°C | | | T _A =-40 to +85°C | | T _A =-40 to +125°C | | Units | Figure |
|-------------------------------------|--|---------------------|--|-----------------------|------|------|------------------------------|------|-------------------------------|------|-------|----------------------|
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | | |
| t _{PLH} , t _{PHL} | Propagation Delay | 1.65 | C _L =15pF, R _L =1MΩ | 2.5 | 7.6 | 13.1 | 2.5 | 14.5 | 2.5 | 14.7 | ns | Figure 5 Figure 6 |
| | | 1.80 | | 2.5 | 6.3 | 10.9 | 2.5 | 12.0 | 2.5 | 12.3 | | |
| | | 2.50 ± 0.20 | | 1.8 | 4.3 | 7.4 | 1.8 | 8.1 | 1.8 | 8.4 | | |
| | | 3.30 ± 0.30 | | 1.5 | 3.3 | 5.0 | 1.5 | 5.5 | 1.5 | 5.8 | | |
| | | 5.00 ± 0.50 | | 1.0 | 2.7 | 4.1 | 1.0 | 4.5 | 1.0 | 4.8 | | Figure 5 Figure 6 |
| | | 3.30 ± 0.30 | | 1.8 | 4.0 | 6.0 | 1.8 | 6.6 | 1.8 | 6.9 | | |
| C _{IN} | Input Capacitance | 0.00 | | | 2.5 | | | | | | pF | |
| | | 5.00 ± 0.50 | | | 1.2 | 3.2 | 4.9 | 1.2 | 5.4 | 1.2 | 5.7 | |
| C _{PD} | Power Dissipation Capacitance ⁽⁴⁾ | 3.30 | | | 11.0 | | | | | | pF | Figure 7 |
| | | 5.00 | | | | | | | | | | |

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).

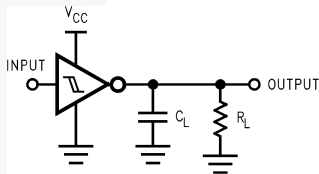


Figure 5. AC Test Circuit

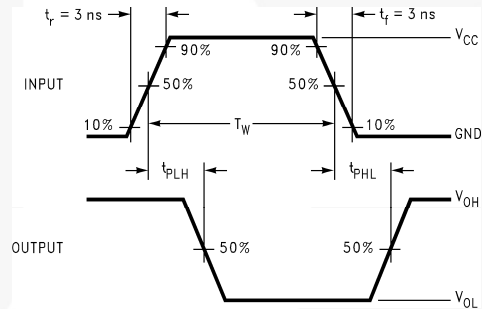


Figure 6. AC Waveforms

Note:

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

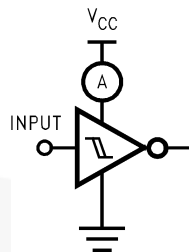


Figure 7. I_{CCD} Test Circuit

Note:

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

Physical Dimensions

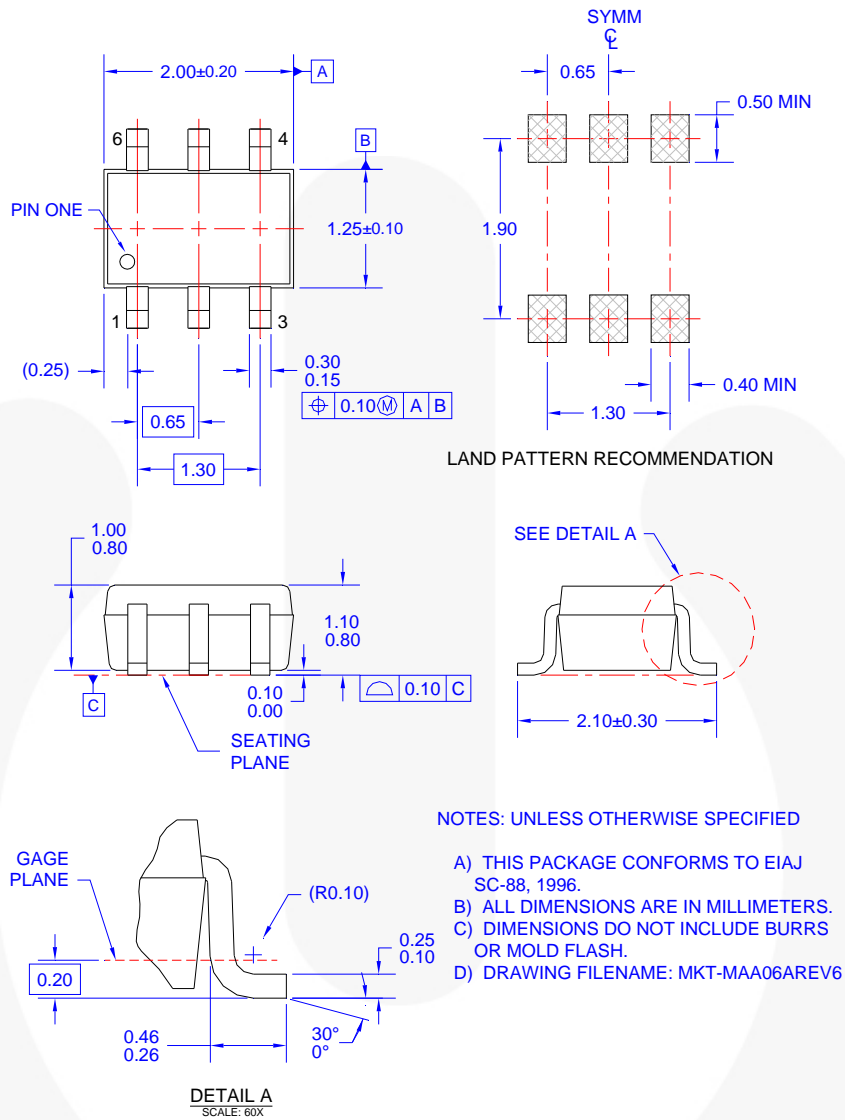


Figure 8. 6-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

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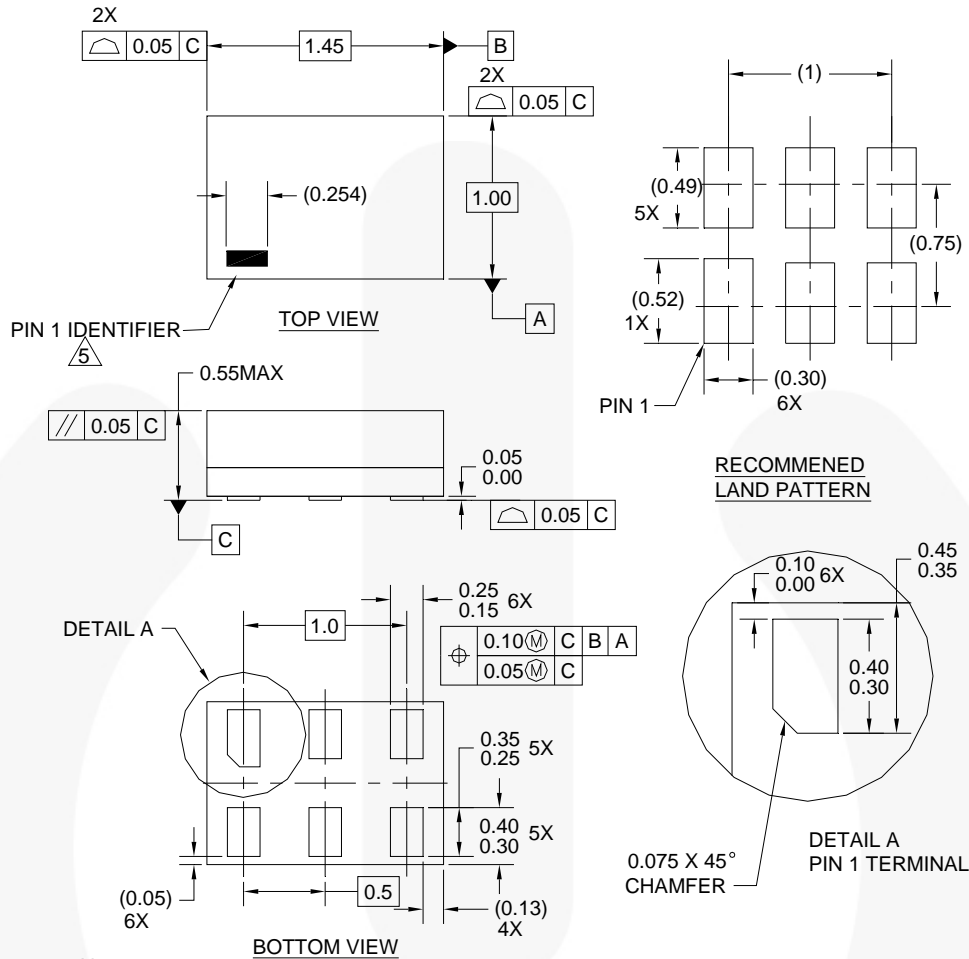
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Tape and Reel Specification

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
4. FILENAME AND REVISION: MAC06AREV4
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

Figure 9. 6-Lead, MicroPak™, 1.0mm Wide

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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/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

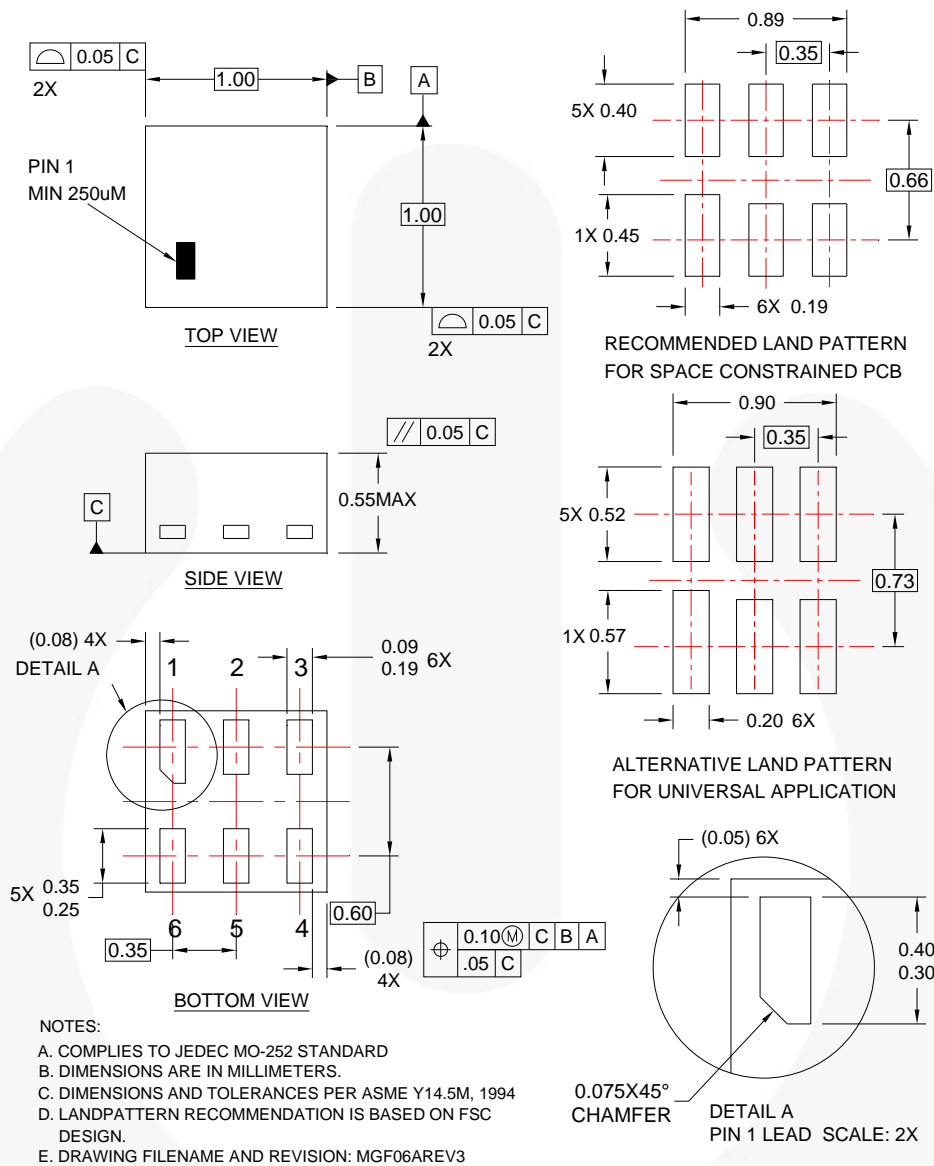


Figure 10. 6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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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/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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| CROSSVOL7™ | GTO™ | RapidConfigure™ | TinyPower™ |
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| Datasheet Identification | Product Status | Definition |
|--------------------------|-----------------------|---|
| Advance Information | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
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