



# NC7WZ16

## TinyLogic® UHS Dual Buffer


### Features

- Ultra-High Speed:  $t_{PD}$  2.4ns (Typical) into 50pF at 5V  $V_{CC}$
- High Output Drive:  $\pm 24$ 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 Package

### Description

The NC7WZ16 is a dual buffer 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 inputs and outputs are high impedance when  $V_{CC}$  is 0V. Inputs tolerate voltages up to 7V independent of  $V_{CC}$  operating voltage.

### Ordering Information

| Part Number              | Top Mark |  Eco Status | Package                                    | Packing Method            |
|--------------------------|----------|--|--|---------------------------|
| NC7WZ16P6X               | Z16      | RoHS   | 6-Lead SC70, EIAJ SC-88a, 1.25mm Wide      | 3000 Units on Tape & Reel |
| NC7WZ16L6X               | C7       | RoHS   | 6-Lead MicroPak™, 1.00mm Wide              | 5000 Units on Tape & Reel |
| NC7WZ16FHX (Preliminary) | C7       | 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](http://www.fairchildsemi.com/company/green/rohs_green.html).

## Connection Diagrams

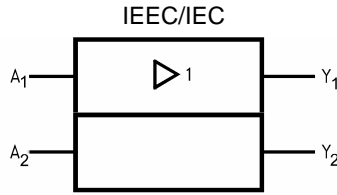


Figure 1. Logic Symbol

## Pin Configurations

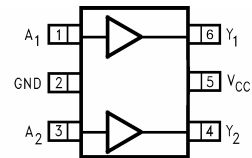


Figure 2. SC70 (Top View)

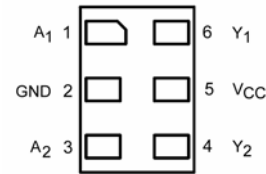
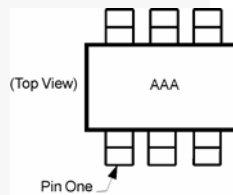


Figure 3. MicroPak (Top Through View)



### 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. Pin 1 Orientation

## Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name            | Description    |
|------------|----------------|-----------------|----------------|
| 1          | 1              | A <sub>1</sub>  | Input          |
| 2          | 2              | GND             | Ground         |
| 3          | 3              | A <sub>2</sub>  | Input          |
| 4          | 4              | Y <sub>2</sub>  | Output         |
| 5          | 5              | V <sub>CC</sub> | Supply Voltage |
| 6          | 6              | Y <sub>1</sub>  | Output         |

## Function Table

Y = A

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

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 <sub>CC</sub>                     | Supply Voltage                                    |                       | -0.5 | 7.0  | V    |
| V <sub>IN</sub>                     | DC Input Voltage                                  |                       | -0.5 | 7.0  | V    |
| V <sub>OUT</sub>                    | DC Output Voltage                                 |                       | -0.5 | 7.0  | V    |
| I <sub>IK</sub>                     | DC Input Diode Current                            | V <sub>IN</sub> < 0V  |      | -50  | mA   |
| I <sub>OK</sub>                     | DC Output Diode Current                           | V <sub>OUT</sub> < 0V |      | -50  | mA   |
| I <sub>OUT</sub>                    | DC Output Source / Sink Current                   |                       |      | ±50  | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current              |                       |      | ±100 | mA   |
| T <sub>STG</sub>                    | Storage Temperature Range                         |                       | -65  | +150 | °C   |
| T <sub>J</sub>                      | Junction Temperature Under Bias                   |                       |      | +150 | °C   |
| T <sub>L</sub>                      | Junction Lead Temperature (Soldering, 10 Seconds) |                       |      | +260 | °C   |
| P <sub>D</sub>                      | Power Dissipation                                 | 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 <sub>CC</sub>                 | Supply Voltage Operating      |                                   | 1.65 | 5.50            | V    |
|                                 | Supply Voltage Data Retention |                                   | 1.50 | 5.50            |      |
| V <sub>IN</sub>                 | Input Voltage                 |                                   | 0    | 5.5             | V    |
| V <sub>OUT</sub>                | Output Voltage                |                                   | 0    | V <sub>CC</sub> | V    |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Times     | V <sub>CC</sub> =1.8V, 2.5V ±0.2V | 0    | 20              | ns/V |
|                                 |                               | V <sub>CC</sub> =3.3V ±0.3V       | 0    | 10              |      |
|                                 |                               | V <sub>CC</sub> =5.5V ±0.5V       | 0    | 5               |      |
| T <sub>A</sub>                  | Operating Temperature         |                                   | -40  | +125            | °C   |
| θ <sub>JA</sub>                 | Thermal Resistance            | SC70-6                            |      | 425             | °C/W |
|                                 |                               | MicroPak-6                        |      | 500             |      |
|                                 |                               | MicroPak2-6                       |      | 560             |      |

**Note:**

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

### DC Electrical Characteristics

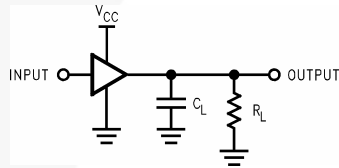
| Symbol           | Parameter                        | V <sub>CC</sub> (V) | Conditions                                | T <sub>A</sub> =25°C    |                       |                        | T <sub>A</sub> =-40 to +85°C |                        | Units |   |      |      |      |
|------------------|----------------------------------|---------------------|---|-------------------------|-----------------------|------------------------|------------------------------|------------------------|-------|---|------|------|------|
|                  |                                  |                     |   | Min.                    | Typ.                  | Max.                   | Min.                         | Max.                   |       |   |      |      |      |
| V <sub>IH</sub>  | HIGH Level Control Input Voltage | 1.65 to 1.95        |   | 0.75V <sub>CC</sub>     |                       |                        | 0.75V <sub>CC</sub>          |                        | V     |   |      |      |      |
|                  |                                  | 2.3 to 5.5          |   | 0.70V <sub>CC</sub>     |                       |                        | 0.70 V <sub>CC</sub>         |                        |       |   |      |      |      |
| V <sub>IL</sub>  | LOW Level Control Input Voltage  | 1.65 to 1.95        |   |                         |                       | 0.25V <sub>CC</sub>    |                              | 0.25V <sub>CC</sub>    | V     |   |      |      |      |
|                  |                                  | 2.3 to 5.5          |   |                         |                       | 0.30V <sub>CC</sub>    |                              | 0.30V <sub>CC</sub>    |       |   |      |      |      |
| V <sub>OH</sub>  | HIGH Level Output Voltage        | 1.65                | V <sub>IN</sub> =V <sub>IH</sub>          | I <sub>OH</sub> =-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 <sub>OH</sub> =-4mA   | 1.29                  | 1.52                   |                              | 1.21                   |       |   |      |      |      |
|                  |                                  | 2.30                |   |                         | I <sub>OH</sub> =-8mA | 1.90                   | 2.14                         |                        | 1.90  |   |      |      |      |
|                  |                                  | 3.00                |   |                         |                       | I <sub>OH</sub> =-16mA | 2.40                         | 2.75                   |       |   | 2.40 |      |      |
|                  |                                  | 3.00                |   |                         |                       |                        | I <sub>OH</sub> =-24mA       | 2.30                   | 2.62  |   |      | 2.30 |      |
|                  |                                  | 4.50                |   |                         |                       |                        |                              | I <sub>OH</sub> =-32mA | 3.80  |   | 4.13 |      | 3.80 |
| V <sub>OL</sub>  | LOW Level Output Voltage         | 1.65                | V <sub>IN</sub> =V <sub>IL</sub>          | I <sub>OL</sub> =100μA  |                       | 0.00                   | 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 <sub>OL</sub> =4mA    |                       | 0.08                   | 0.24                         |                        | 0.24  |   |      |      |      |
|                  |                                  | 2.30                |   |                         | I <sub>OL</sub> =8mA  |                        | 0.10                         | 0.30                   |       |   | 0.30 |      |      |
|                  |                                  | 3.00                |   |                         |                       | I <sub>OL</sub> =16mA  |                              | 0.16                   | 0.40  |   |      | 0.40 |      |
|                  |                                  | 3.00                |   |                         |                       |                        | I <sub>OL</sub> =24mA        |                        | 0.24  |   | 0.55 |      | 0.55 |
|                  |                                  | 4.50                |   |                         |                       |                        |                              | I <sub>OL</sub> =32mA  |       |   | 0.25 | 0.55 |      |
| I <sub>IN</sub>  | Input Leakage Current            | 0 to 5.5            | 0 ≥ V <sub>IN</sub> ≥ 5.5V                |                         |                       | ±0.1                   |                              | ±1.0                   | μA    |   |      |      |      |
| I <sub>OFF</sub> | Power Off Leakage Current        | 0                   | V <sub>IN</sub> or V <sub>OUT</sub> =5.5V |                         |                       | 1.0                    |                              | 10                     | μA    |   |      |      |      |
| I <sub>CC</sub>  | Quiescent Supply Current         | 1.65 to 5.50        | V <sub>IN</sub> =5.5V, GND                |                         |                       | 1.0                    |                              | 10                     | μA    |   |      |      |      |

## AC Electrical Characteristics

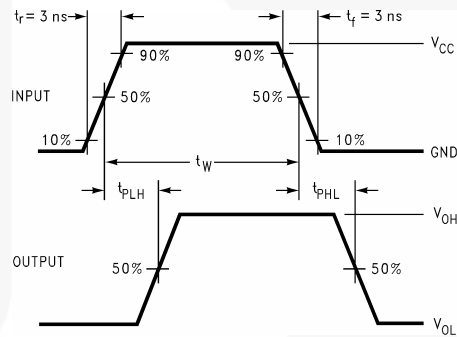
| Symbol                              | Parameter                                    | V <sub>CC</sub> (V) | Conditions                                   | T <sub>A</sub> =25°C                          |      |      | T <sub>A</sub> =-40 to +85°C |      | Units | Figure               |
|-------------------------------------|--|---------------------|--|---|------|------|------------------------------|------|-------|----------------------|
|                                     |  |                     |  | Min.  | Typ. | Max. | Min.                         | Max. |       |                      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay                            | 1.65                | C <sub>L</sub> =15pF,<br>R <sub>L</sub> =1MΩ | 1.8   | 5.5  | 9.6  | 1.8                          | 10.6 | ns    | Figure 5<br>Figure 6 |
|                                     |  | 1.80                |  | 1.8   | 4.6  | 8.0  | 1.8                          | 8.8  |       |                      |
|                                     |  | 2.50 ± 0.20         |  | 1.0   | 3.0  | 5.2  | 1.0                          | 5.8  |       |                      |
|                                     |  | 3.30 ± 0.30         |  | 0.8   | 2.3  | 3.6  | 0.8                          | 4.0  |       |                      |
|                                     |  | 5.00 ± 0.50         |  | 0.5   | 1.8  | 2.9  | 0.5                          | 3.2  |       |                      |
|                                     |  | 3.30 ± 0.30         |  | C <sub>L</sub> =50pF,<br>R <sub>L</sub> =500Ω | 1.2  | 3.0  | 4.6                          | 1.2  |       |                      |
| 5.00 ± 0.50                         | 0.8  | 2.4                 | 3.8  |   | 0.8  | 4.2  |                              |      |       |                      |
| C <sub>IN</sub>                     | Input Capacitance                            | 0.00                |  |   | 2.5  |      |                              |      | pF    |                      |
| C <sub>PD</sub>                     | Power Dissipation Capacitance <sup>(4)</sup> | 3.30                |  |   | 10   |      |                              |      | pF    | Figure 7             |
|                                     |  | 5.00                |  |   | 12   |      |                              |      |       |                      |

**Note:**

4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub>=(C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>)+(I<sub>CCStatic</sub>).



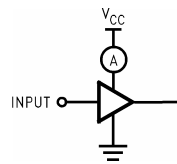
**Figure 5. AC Test Circuit**



**Figure 6. AC Waveforms**

**Note:**

5. C<sub>L</sub> includes load and stray capacitance; Input PRR=1.0MHz; t<sub>W</sub>=500ns

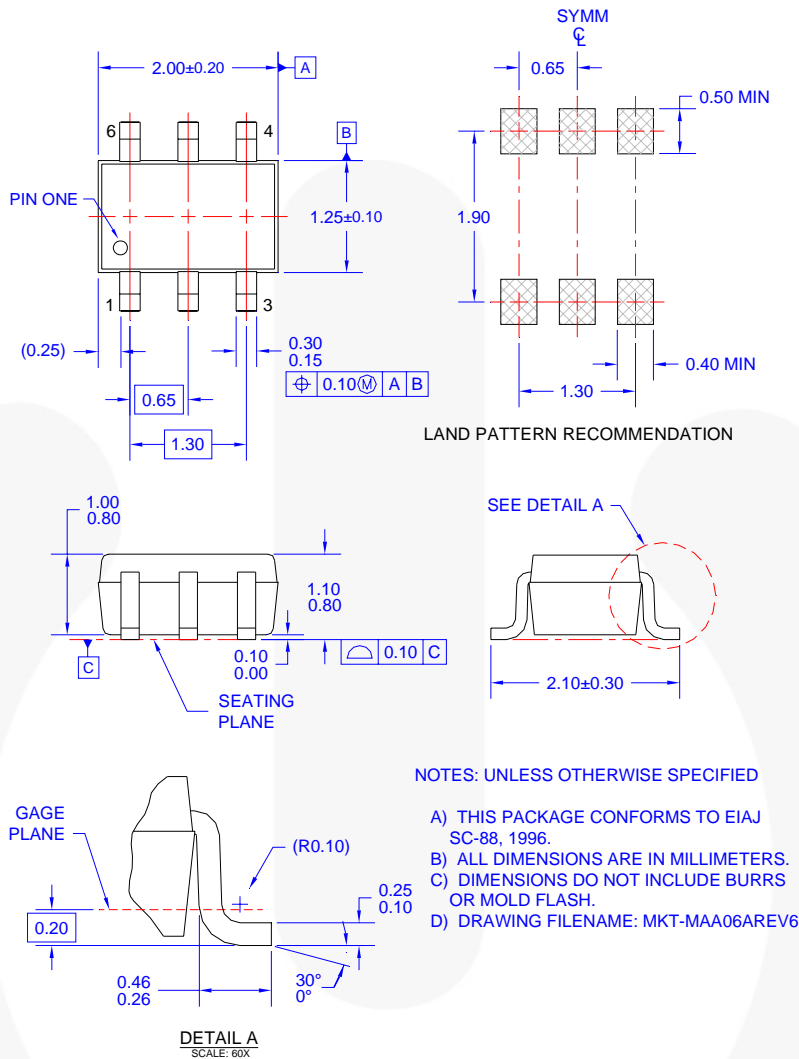


**Note:**

6. Input=AC Waveform; t<sub>r</sub>=t<sub>f</sub>=1.8ns; PRR=10 MHz Duty Cycle=50%.

**Figure 7. I<sub>CCD</sub> Test Circuit**

## Physical Dimensions



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

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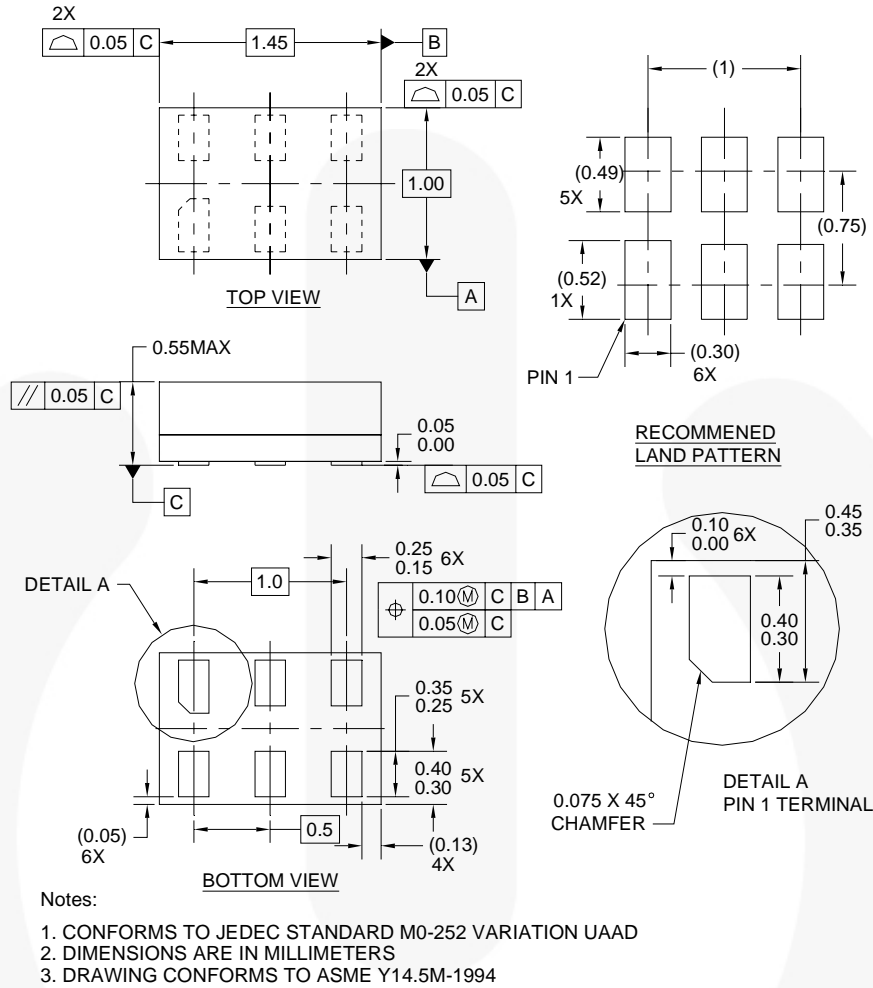
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Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
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| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| P6X                | Leader (Start End) | 125 (Typical) | Empty         | Sealed            |
|                    | Carrier            | 3000          | Filled        | Sealed            |
|                    | Trailer (Hub End)  | 75 (Typical)  | Empty         | Sealed            |

## Physical Dimensions



MAC06AREVC

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

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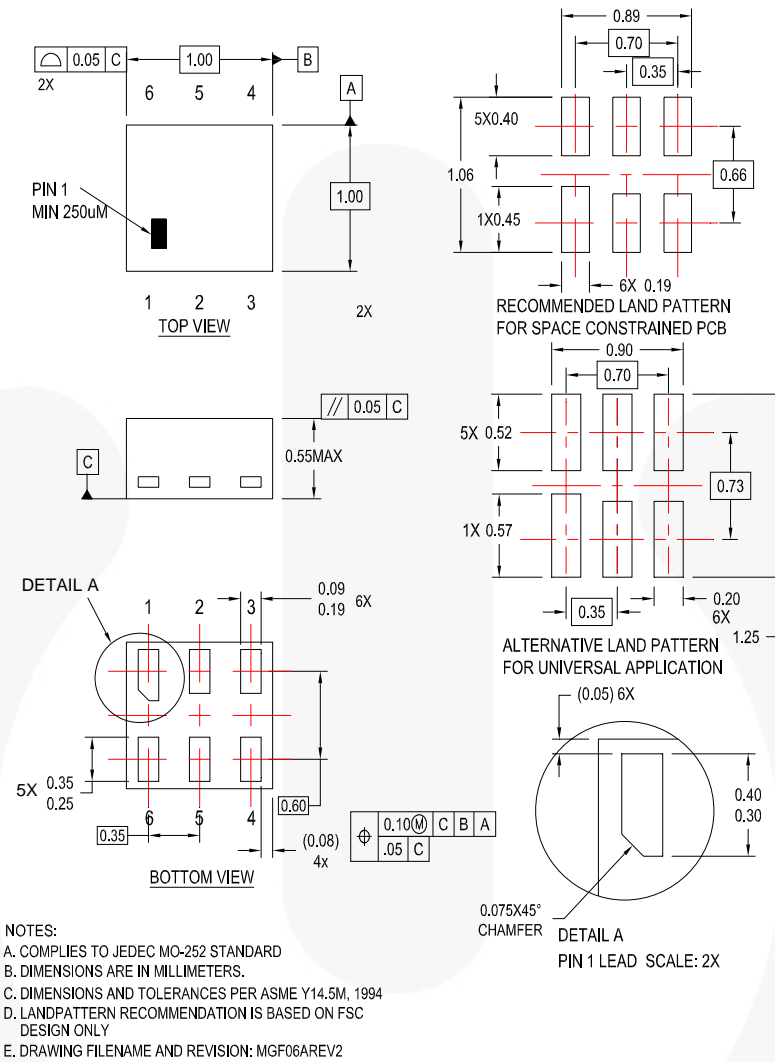
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| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| L6X                | Leader (Start End) | 125 (Typical) | 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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



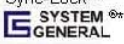
| Package Designator | Tape Section       | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| FHX                | Leader (Start End) | 125 (Typical) | Empty         | Sealed            |
|           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





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| EcoSPARK®   | IntelliMAX™   | Saving our world, 1mW/W/kW at a time™   | TinyPWM™  |
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**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

| 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. |
| No Identification Needed | Full Production       | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.   |
| Obsolete                 | Not In Production     | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.  |

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