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# NC7WZ02

## TinyLogic® UHS Dual 2-Input NOR Gate

### General Description

The NC7WZ02 is a dual 2-Input NOR Gate 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<sub>CC</sub> operating range. The device is specified to operate over the 1.65V to 5.5V V<sub>CC</sub> range. The inputs and output are high impedance when V<sub>CC</sub> is 0V. Inputs tolerate voltages up to 7V independent of V<sub>CC</sub> operating voltage.

### Features

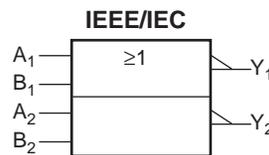
- Space saving US8 surface mount package
- MicroPak™ Pb-Free leadless package
- Ultra High Speed: t<sub>PD</sub> 2.4ns typ into 50pF at 5V V<sub>CC</sub>
- High Output Drive: ±24mA at 3V V<sub>CC</sub>
- Broad V<sub>CC</sub> Operating Range: 1.65V to 5.5V
- Matches the performance of LCX when operated at 3.3V V<sub>CC</sub>
- Power down high impedance inputs/output
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Proprietary noise/EMI reduction circuitry implemented

### Ordering Information

| Order Number | Package Number | Package Code Top Mark | Package Description                               | Supplied As               |
|--------------|----------------|-----------------------|---|---------------------------|
| NC7WZ02K8X   | MAB08A         | WZ02                  | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7WZ02L8X   | MAC08A         | P5                    | Pb-Free 8-Lead MicroPak, 1.6 mm Wide              | 5k Units on Tape and Reel |

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

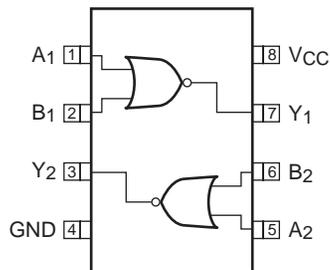
### Logic Symbol



TinyLogic® is a registered trademark of Fairchild Semiconductor Corporation. MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

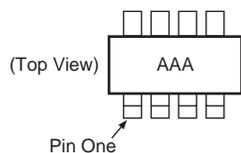
## Connection Diagrams

### Pin Assignment for US8



(Top View)

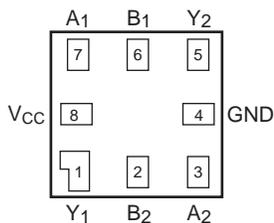
### US8 Pin One Orientation Diagram



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 Assignments for MicroPak



(Top Through View)

## Pin Descriptions

| Pin Name   | Description |
|------------|-------------|
| $A_n, B_n$ | Inputs      |
| $Y_n$      | Outputs     |

## Function Table

$$Y = \overline{A + B}$$

| Inputs |   | Outputs |
|--------|---|---------|
| A      | B | Y       |
| L      | L | H       |
| L      | H | L       |
| H      | L | L       |
| H      | H | L       |

H = HIGH Logic Level    L = LOW Logic Level

## Absolute Maximum Ratings

(The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.)

| Symbol                            | Parameter  | Rating          |
|-----------------------------------|--|-----------------|
| V <sub>CC</sub>                   | Supply Voltage                                     | -0.5V to +7V    |
| V <sub>IN</sub>                   | DC Input Voltage                                   | -0.5V to +7V    |
| V <sub>OUT</sub>                  | DC Output Voltage                                  | -0.5V to +7V    |
| I <sub>IK</sub>                   | DC Input Diode Current @ V <sub>IN</sub> ≤ -0.5V   | -50mA           |
| I <sub>OK</sub>                   | DC Output Diode Current @ V <sub>OUT</sub> ≤ -0.5V | -50mA           |
| I <sub>OUT</sub>                  | DC Output Current                                  | ±50mA           |
| I <sub>CC</sub> /I <sub>GND</sub> | DC V <sub>CC</sub> /GND Current                    | ±100mA          |
| T <sub>STG</sub>                  | Storage Temperature                                | -65°C to +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 @ +85°C                          | 250mW           |

## Recommended Operating Conditions<sup>1</sup>

| Symbol                          | Parameter   | Rating   |
|---------------------------------|---|--|
| V <sub>CC</sub>                 | Supply Voltage Operating  | 1.65V to 5.5V  |
| V <sub>CC</sub>                 | Supply Voltage Data Retention   | 1.5V to 5.5V   |
| V <sub>IN</sub>                 | Input Voltage   | 0V to 5.5V   |
| V <sub>OUT</sub>                | Output Voltage  | 0V to V <sub>CC</sub>                                |
| T <sub>A</sub>                  | Operating Temperature   | -40°C to +85°C                                       |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time<br>V <sub>CC</sub> @ 1.8V±0.15V, 2.5V±0.2V<br>V <sub>CC</sub> @ 3.3V±0.3V<br>V <sub>CC</sub> @ 5.0V±0.5V | 0ns/V to 20ns/V<br>0ns/V to 10ns/V<br>0ns/V to 5ns/V |
| θ <sub>JA</sub>                 | Thermal Resistance  | 250°C/W  |

### Notes:

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

### DC Electrical Characteristics

| Symbol           | Parameter                 | Conditions  | V <sub>CC</sub> (V) | T <sub>A</sub> =     |      |                      |                      |                      | Units |
|------------------|---------------------------|---|---------------------|----------------------|------|----------------------|----------------------|----------------------|-------|
|                  |                           |   |                     | 25°C                 |      |                      | -40°C to +85°C       |                      |       |
|                  |                           |   |                     | Min                  | Typ  | Max                  | Min                  | Max                  |       |
| V <sub>IH</sub>  | HIGH Level Input Voltage  |   | 1.65 to 1.95        | 0.75 V <sub>CC</sub> |      |                      | 0.75 V <sub>CC</sub> |                      | V     |
|                  |                           |   | 2.3 to 5.5          | 0.7 V <sub>CC</sub>  |      |                      | 0.7 V <sub>CC</sub>  |                      |       |
| V <sub>IL</sub>  | LOW Level Input Voltage   |   | 1.65 to 1.95        |                      |      | 0.25 V <sub>CC</sub> |                      | 0.25 V <sub>CC</sub> | V     |
|                  |                           |   | 2.3 to 5.5          |                      |      | 0.3 V <sub>CC</sub>  |                      | 0.3 V <sub>CC</sub>  |       |
| V <sub>OH</sub>  | High Level Output Voltage | V <sub>IN</sub> = V <sub>IL</sub> ,<br>I <sub>OH</sub> = -100μA | 1.65                | 1.55                 | 1.65 |                      | 1.55                 |                      | V     |
|                  |                           |   | 2.3                 | 2.2                  | 2.3  |                      | 2.2                  |                      |       |
|                  |                           |   | 3.0                 | 2.9                  | 3.0  |                      | 2.9                  |                      |       |
|                  |                           |   | 4.5                 | 4.4                  | 4.5  |                      | 4.4                  |                      |       |
|                  |                           | I <sub>OH</sub> = -4mA  | 1.65                | 1.29                 | 1.52 |                      | 1.29                 |                      |       |
|                  |                           | I <sub>OH</sub> = -8mA  | 2.3                 | 1.9                  | 2.15 |                      | 1.9                  |                      |       |
|                  |                           | I <sub>OH</sub> = -16mA   | 3.0                 | 2.4                  | 2.80 |                      | 2.4                  |                      |       |
|                  |                           | I <sub>OH</sub> = -24mA   | 3.0                 | 2.3                  | 2.68 |                      | 2.3                  |                      |       |
| V <sub>OL</sub>  | Low Level Output Voltage  | V <sub>IN</sub> = V <sub>IH</sub> ,<br>I <sub>OL</sub> = 100μA  | 1.65                |                      | 0.0  | 0.1                  |                      | 0.1                  | V     |
|                  |                           |   | 2.3                 |                      | 0.0  | 0.1                  |                      | 0.1                  |       |
|                  |                           |   | 3.0                 |                      | 0.0  | 0.1                  |                      | 0.1                  |       |
|                  |                           |   | 4.5                 |                      | 0.0  | 0.1                  |                      | 0.1                  |       |
|                  |                           | I <sub>OL</sub> = 4mA   | 1.65                |                      | 0.08 | 0.24                 |                      | 0.24                 |       |
|                  |                           | I <sub>OL</sub> = 8mA   | 2.3                 |                      | 0.10 | 0.3                  |                      | 0.3                  |       |
|                  |                           | I <sub>OL</sub> = 16mA  | 3.0                 |                      | 0.15 | 0.4                  |                      | 0.4                  |       |
|                  |                           | I <sub>OL</sub> = 24mA  | 3.0                 |                      | 0.22 | 0.55                 |                      | 0.55                 |       |
| I <sub>IN</sub>  | Input Leakage Current     | V <sub>IN</sub> = 5.5V, GND                                     | 0 to 5.5            |                      |      | ±0.1                 |                      | ±1.0                 | μA    |
|                  |                           |   |                     |                      |      |                      |                      |                      |       |
| I <sub>OFF</sub> | Power OFF Leakage Current | V <sub>IN</sub> or V <sub>OUT</sub> = 5.5V                      | 0.0                 |                      |      | 1                    |                      | 10                   | μA    |
| I <sub>CC</sub>  | Quiescent Supply Current  | V <sub>IN</sub> = 5.5V, GND                                     | 1.65 to 5.5         |                      |      | 1                    |                      | 10                   | μA    |

## AC Electrical Characteristics

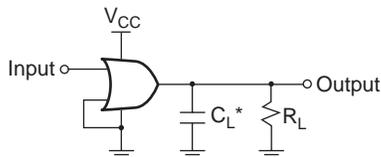
| Symbol                              | Parameter                     | Conditions                                      | V <sub>CC</sub> (V) | T <sub>A</sub> = |      |     |                |     | Units | Figure Number        |
|-------------------------------------|-------------------------------|---|---------------------|------------------|------|-----|----------------|-----|-------|----------------------|
|                                     |                               |   |                     | +25°C            |      |     | -40°C to +85°C |     |       |                      |
|                                     |                               |   |                     | Min              | Typ  | Max | Min            | Max |       |                      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay             | R <sub>L</sub> = 1MΩ,<br>C <sub>L</sub> = 15pF  | 1.8 ± 0.15          | 2.0              | 5.4  | 9.8 | 2.0            | 10  | ns    | Figure 1<br>Figure 3 |
|                                     |                               |   | 2.5 ± 0.2           | 1.2              | 3.3  | 5.4 | 1.2            | 5.8 |       |                      |
|                                     |                               |   | 3.3 ± 0.3           | 0.8              | 2.5  | 3.8 | 0.8            | 4.1 |       |                      |
|                                     |                               |   | 5.0 ± 0.5           | 0.5              | 2.0  | 3.0 | 0.5            | 3.3 |       |                      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay             | R <sub>L</sub> = 500Ω,<br>C <sub>L</sub> = 50pF | 3.3 ± 0.3           | 1.2              | 3.1  | 4.6 | 1.2            | 5.0 | ns    | Figure 1<br>Figure 3 |
|                                     |                               |   | 5.0 ± 0.5           | 0.8              | 2.4  | 3.7 | 0.8            | 4.0 |       |                      |
| C <sub>IN</sub>                     | Input Capacitance             |   | 0                   |                  | 2.5  |     |                |     | pF    |                      |
| C <sub>PD</sub>                     | Power Dissipation Capacitance | Note 2  | 3.3                 |                  | 13.5 |     |                |     | pF    | Figure 2             |
|                                     |                               |   | 5.0                 |                  | 17.5 |     |                |     |       |                      |

### Notes:

2. 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. (See Figure 2.) C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:

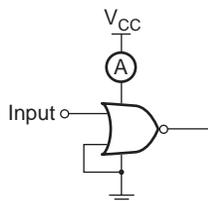
$$C_{PD} = I_{CCD} / (V_{CC}) (F).$$

## AC Loading and Waveforms



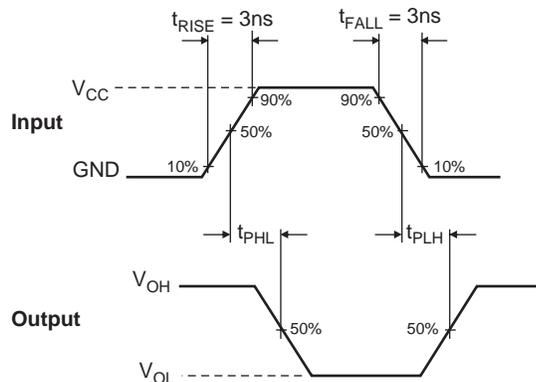
\*C<sub>L</sub> includes load and stray capacitance.  
Input PRR = 1.0MHz; t<sub>W</sub> = 500ns

**Figure 1. AC Test Circuit**



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

**Figure 2. I<sub>CCD</sub> Test Circuit**



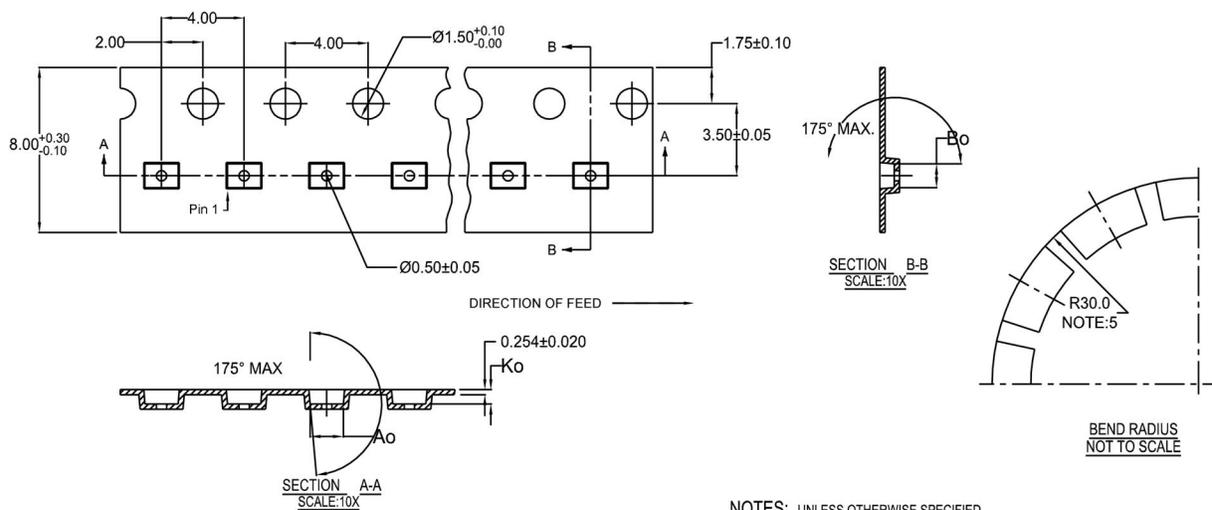
**Figure 3. AC Waveforms**

## Tape and Reel Specification

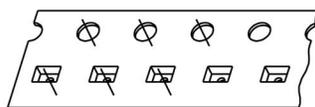
### Tape Format for MircoPak

| 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 Dimension inches (millimeters)



|    |        |             |             |             |
|----|--------|-------------|-------------|-------------|
| 10 | 300056 | 2.30 ± 0.05 | 1.78 ± 0.05 | 0.68 ± 0.05 |
| 8  | 300038 | 1.78 ± 0.05 | 1.78 ± 0.05 | 0.68 ± 0.05 |
| 6  | 300033 | 1.60 ± 0.05 | 1.15 ± 0.05 | 0.70 ± 0.05 |

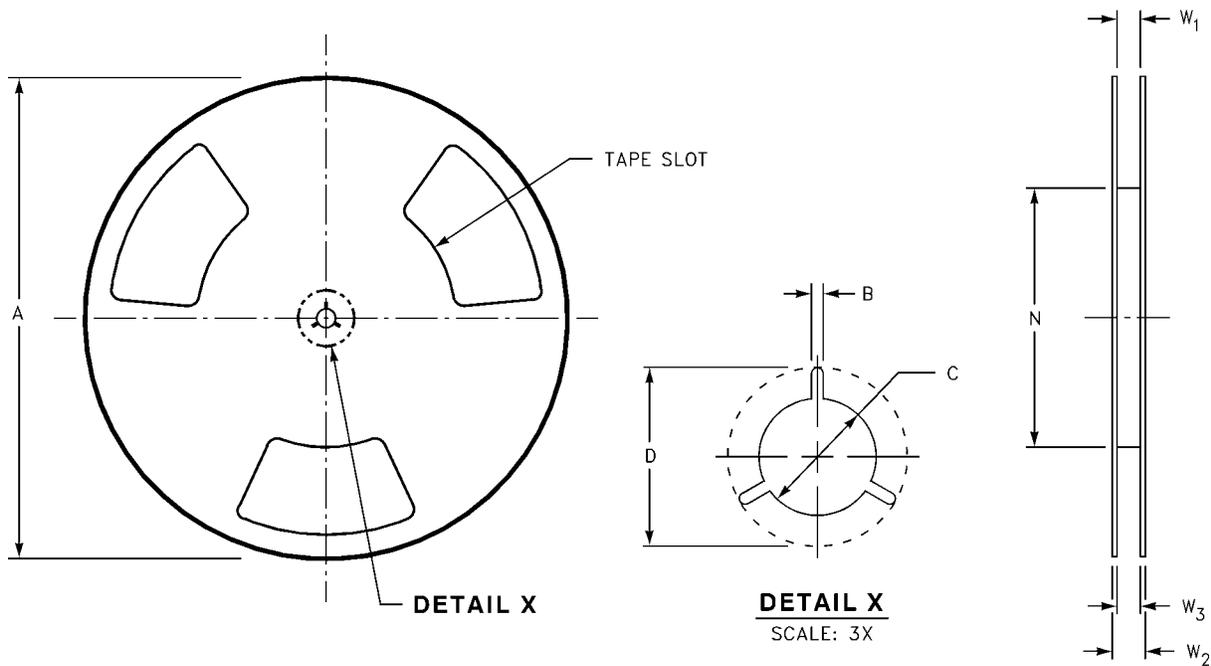


SCALE: 6X

#### NOTES: UNLESS OTHERWISE SPECIFIED

1. ACCUMULATED 50 SPROCKETS, SPROCKET HOLE PITCH IS 200.00 ± 0.30MM
2. NO INDICATED CORNER RADIUS IS 0.127MM
3. CAMBER NOT TO EXCEED 1MM IN 100MM
4. SMALLEST ALLOWABLE BENDING RADIUS
5. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

**Reel Dimension for MircoPak inches (millimeters)**

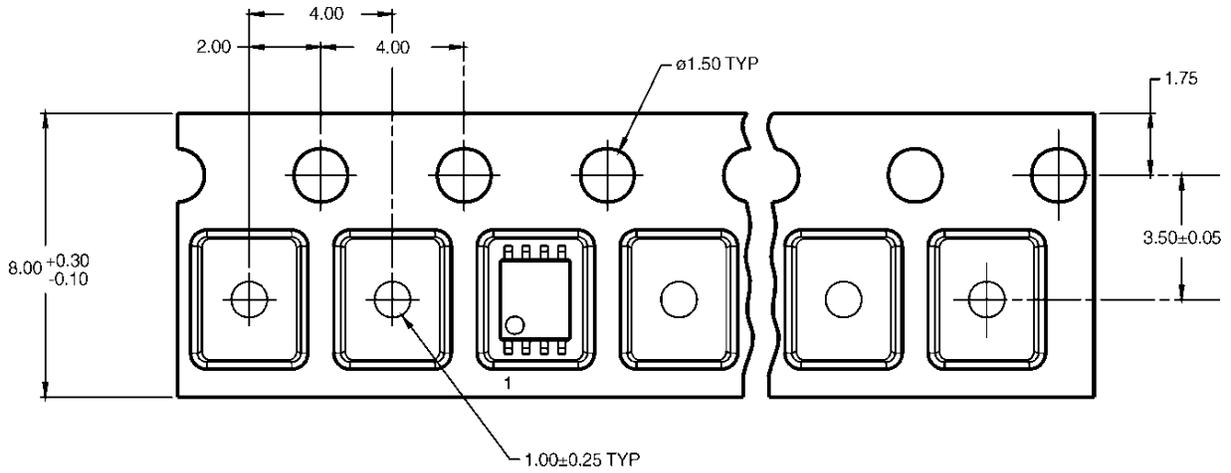


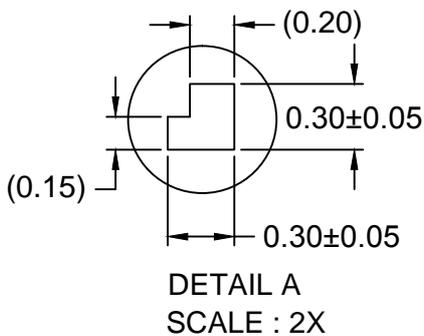
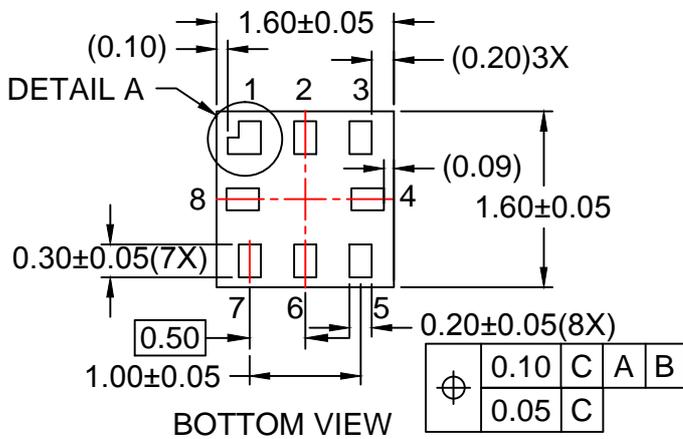
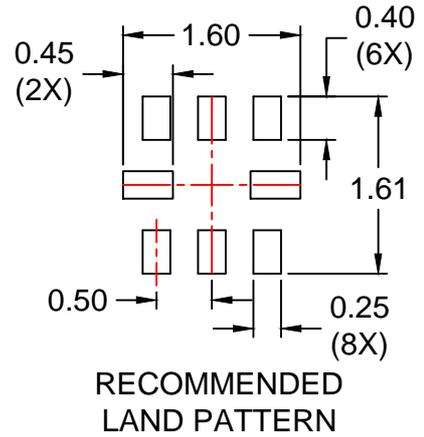
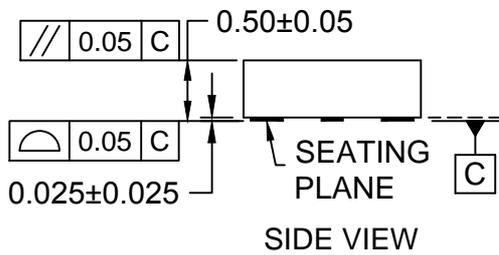
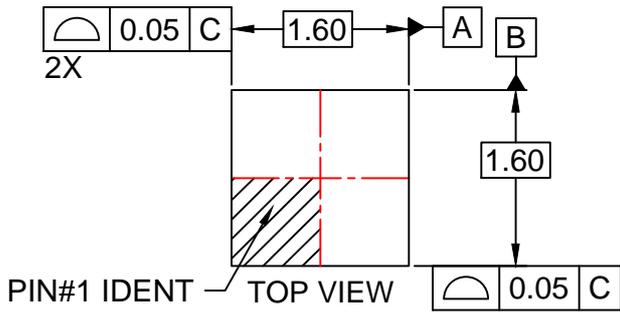
| Tape Size | A              | B               | C                | D                | N                | W1  | W2               | W3                                     |
|-----------|----------------|-----------------|------------------|------------------|------------------|---|------------------|--|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

**Tape Format for US8**

| 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 Dimension** inches (millimeters)

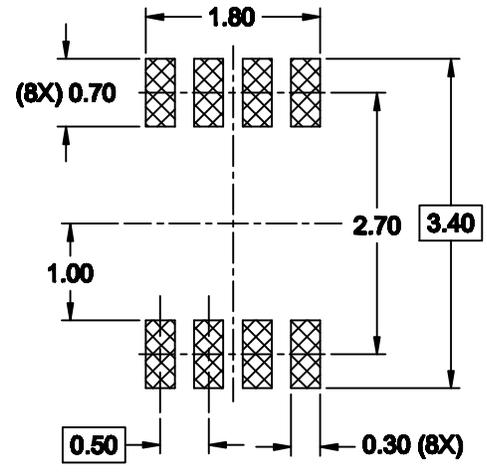
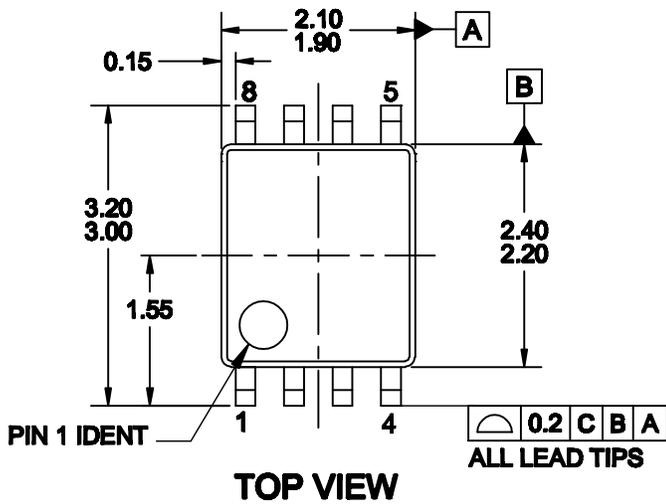




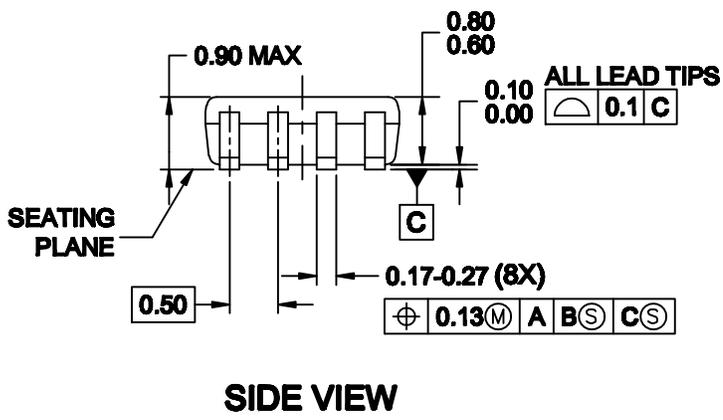
## NOTES:

- A. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
- E. DRAWING FILENAME: MKT-MAC08Arev5.



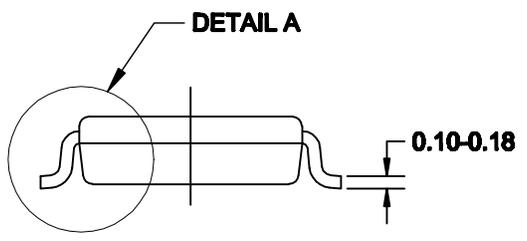
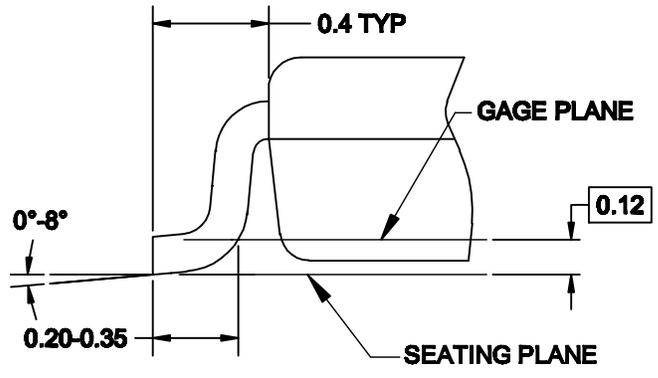


**RECOMMENDED LAND PATTERN**



**NOTES:**

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- 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, 1994.
- E. FILE DRAWING NAME : MKT-MAB08Arev4



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- SuperSOT™-3
- SuperSOT™-6
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**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. |
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