

## NC7WZ00

### TinyLogic® UHS Dual 2-Input NAND Gate

#### Features

- Space saving US8 surface mount package
- MicroPak™ leadless package
- Ultra High Speed;  $t_{PD}$  2.4ns typ. into 50pF at 5V  $V_{CC}$
- High Output Drive;  $\pm 24mA$  at 3V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range; 1.65V–5.5V
- Matches the performance of LCX when operated at 3.3V  $V_{CC}$
- Power down high impedance inputs/output
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Proprietary noise/EMI reduction circuitry implemented


#### General Description

The NC7WZ00 is a dual 2-Input NAND 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 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.

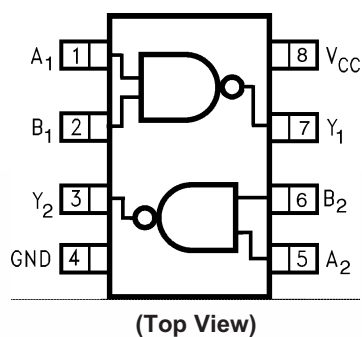
#### Ordering Information

| Order Number | Package Number | Product Code Top Mark | Package Description                               | Supplied As               |
|--------------|----------------|-----------------------|---|---------------------------|
| NC7WZ00K8X   | MAB08A         | WZ00                  | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7WZ00L8X   | MAC08A         | N6                    | 8-Lead MicroPak, 1.6 mm Wide                      | 5k Units on Tape and Reel |

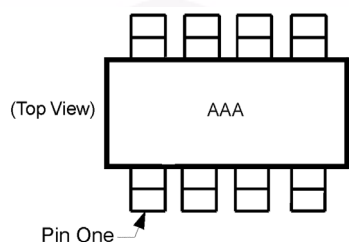
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

## Connection Diagram



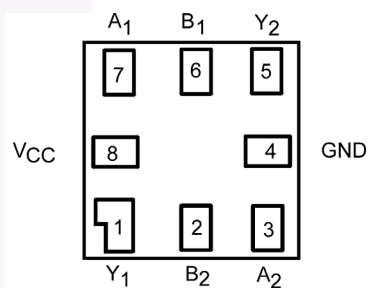
## Pin One Orientation Diagram



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).

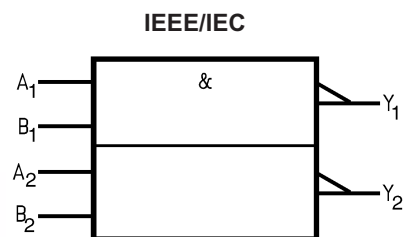
## Pad Assignments for MicroPak



## Pin Description

| Pin Names  | Description |
|------------|-------------|
| $A_n, B_n$ | Inputs      |
| $Y_n$      | Output      |

## Logic Symbol



## Function Table

$$Y = \overline{AB}$$

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | H      |
| L      | H | H      |
| H      | L | H      |
| 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   | Rating          |
|------------------|---|-----------------|
| $V_{CC}$         | Supply Voltage                                    | −0.5V to +7V    |
| $V_{IN}$         | DC Input Voltage                                  | −0.5V to +7V    |
| $V_{OUT}$        | DC Output Voltage                                 | −0.5V to +7V    |
| $I_{IK}$         | DC Input Diode Current @ $V_{IN} < -0.5V$         | −50mA           |
| $I_{OK}$         | DC Output Diode Current @ $V_{OUT} < -0.5V$       | −50mA           |
| $I_{OUT}$        | DC Output Current                                 | ±50mA           |
| $I_{CC}/I_{GND}$ | DC $V_{CC}/GND$ Current                           | ±100mA          |
| $T_{STG}$        | Storage Temperature                               | −65°C to +150°C |
| $T_J$            | Junction Temperature Under Bias                   | 150°C           |
| $T_L$            | Junction Lead Temperature (Soldering, 10 seconds) | 260°C           |
| $P_D$            | Power Dissipation @ +85°C                         | 250mW           |

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

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   | Rating          |
|---------------|---|-----------------|
| $V_{CC}$      | Supply Voltage Operating  | 1.65V to 5.5V   |
|               | Supply Voltage Data Retention   | 1.5V to 5.5V    |
| $V_{IN}$      | Input Voltage   | 0V to 5.5V      |
| $V_{OUT}$     | Output Voltage  | 0V to $V_{CC}$  |
| $T_A$         | Operating Temperature   | −40°C to +85°C  |
| $t_r, t_f$    | Input Rise and Fall Time<br>$V_{CC} = 1.65V \pm 0.15V, 2.5V \pm 0.2V$ | 0ns/V to 20ns/V |
|               | $V_{CC} = 3.3V \pm 0.3V$  | 0ns/V to 10ns/V |
|               | $V_{CC} = 5.0V \pm 0.5V$  | 0ns/V to 5ns/V  |
| $\theta_{JA}$ | Thermal Resistance  | 250°C/W         |

### Note:

1. 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°C to +85°C |                        | Units |
|------------------|---------------------------|---------------------|--|--------------------------|------|------------------------|---------------------------------|------------------------|-------|
|                  |                           |                     |  | Min.                     | Typ. | Max.                   | Min.                            | Max.                   |       |
| V <sub>IH</sub>  | HIGH Level Input Voltage  | 1.65–1.95           |  | 0.75 x V <sub>CC</sub>   |      |                        | 0.75 x V <sub>CC</sub>          |                        | V     |
|                  |                           | 2.3–5.5             |  | 0.70 x V <sub>CC</sub>   |      |                        | 0.70 x V <sub>CC</sub>          |                        |       |
| V <sub>IL</sub>  | LOW Level Input Voltage   | 1.65–1.95           |  |                          |      | 0.25 x V <sub>CC</sub> |                                 | 0.25 x V <sub>CC</sub> | V     |
|                  |                           | 2.3–5.5             |  |                          |      | 0.30 x V <sub>CC</sub> |                                 | 0.30 x V <sub>CC</sub> |       |
| V <sub>OH</sub>  | HIGH Level Output Voltage | 1.65                | V <sub>IN</sub> = V <sub>IL</sub>          | I <sub>OH</sub> = -100μA | 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                    |       |
|                  |                           | 1.65                |  | I <sub>OH</sub> = -4mA   | 1.29 | 1.52                   |                                 | 1.69                   |       |
|                  |                           | 2.3                 |  | I <sub>OH</sub> = -8mA   | 1.9  | 2.15                   |                                 | 1.9                    |       |
|                  |                           | 3.0                 |  | I <sub>OH</sub> = -16mA  | 2.4  | 2.80                   |                                 | 2.4                    |       |
|                  |                           | 3.0                 |  | I <sub>OH</sub> = -24mA  | 2.3  | 2.68                   |                                 | 2.3                    |       |
|                  |                           | 4.5                 |  | I <sub>OH</sub> = -32mA  | 3.8  | 4.20                   |                                 | 3.8                    |       |
|                  |                           |                     |  |                          |      |                        |                                 |                        |       |
| V <sub>OL</sub>  | LOW Level Output Voltage  | 1.65                | V <sub>IN</sub> = V <sub>IH</sub>          | I <sub>OL</sub> = 100μA  |      | 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                    |       |
|                  |                           | 1.65                |  | I <sub>OL</sub> = 4mA    |      | 0.08                   | 0.24                            | 0.24                   |       |
|                  |                           | 2.3                 |  | I <sub>OL</sub> = 8mA    |      | 0.10                   | 0.3                             | 0.3                    |       |
|                  |                           | 3.0                 |  | I <sub>OL</sub> = 16mA   |      | 0.15                   | 0.4                             | 0.4                    |       |
|                  |                           | 3.0                 |  | I <sub>OL</sub> = 24mA   |      | 0.22                   | 0.55                            | 0.55                   |       |
|                  |                           | 4.5                 |  | I <sub>OL</sub> = 32mA   |      | 0.22                   | 0.55                            | 0.55                   |       |
|                  |                           |                     |  |                          |      |                        |                                 |                        |       |
| I <sub>IN</sub>  | Input Leakage Current     | 0–5.5               | V <sub>IN</sub> = 5.5V, GND                |                          |      |                        | ±0.1                            | ±1                     | μA    |
| I <sub>OFF</sub> | Power Off Leakage Current | 0.0                 | V <sub>IN</sub> or V <sub>OUT</sub> = 5.5V |                          |      |                        | 1                               | 10                     | μA    |
| I <sub>CC</sub>  | Quiescent Supply Current  | 1.65–5.5            | V <sub>IN</sub> = 5.5V, GND                |                          |      |                        | 1                               | 10                     | μA    |

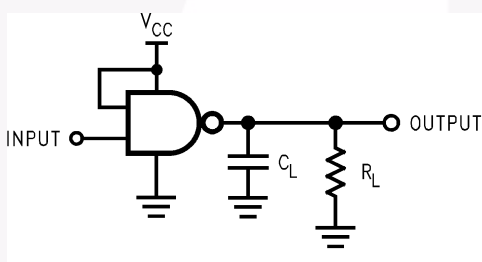
## AC Electrical Characteristics

| Symbol                              | Parameter                     | V <sub>CC</sub> (V) | Conditions                                      | T <sub>A</sub> = +25°C |      |      | T <sub>A</sub> = -40°C to +85°C |      | Units | Figure Number        |
|-------------------------------------|-------------------------------|---------------------|---|------------------------|------|------|---------------------------------|------|-------|----------------------|
|                                     |                               |                     |   | Min.                   | Typ. | Max. | Min.                            | Max. |       |                      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay             | 1.8 ± 0.15          | C <sub>L</sub> = 15pF,<br>R <sub>L</sub> = 1MΩ  | 2.0                    | 5.3  | 9.6  | 2.0                             | 9.8  | ns    | Figure 1<br>Figure 3 |
|                                     |                               | 2.5 ± 0.2           |   | 1.2                    | 3.2  | 5.3  | 1.2                             | 5.7  |       |                      |
|                                     |                               | 3.3 ± 0.3           |   | 0.8                    | 2.4  | 3.7  | 0.8                             | 4.0  |       |                      |
|                                     |                               | 5.0 ± 0.5           |   | 0.5                    | 1.9  | 2.9  | 0.5                             | 3.2  |       |                      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay             | 3.3 ± 0.3           | C <sub>L</sub> = 50pF,<br>R <sub>L</sub> = 500Ω | 1.2                    | 3.0  | 4.6  | 1.2                             | 4.9  | ns    | Figure 1<br>Figure 3 |
|                                     |                               | 5.0 ± 0.5           |   | 0.8                    | 2.4  | 3.6  | 0.8                             | 3.9  |       |                      |
| C <sub>IN</sub>                     | Input Capacitance             | 0                   |   |                        | 2.5  |      |                                 |      | pF    |                      |
| C <sub>PD</sub>                     | Power Dissipation Capacitance | 3.3                 | (2)   |                        | 13   |      |                                 |      | pF    | Figure 2             |
|                                     |                               | 5.0                 |   |                        | 17   |      |                                 |      |       |                      |

### Note:

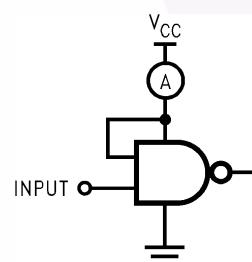
2. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. (See Figure 2.) C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub> = (C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>) + (I<sub>CC</sub>static).

## AC Loading and Waveforms



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

Figure 1. AC Test Circuit



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

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

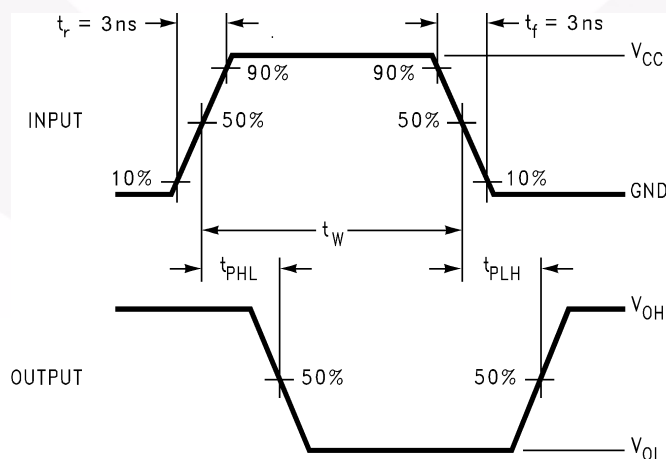


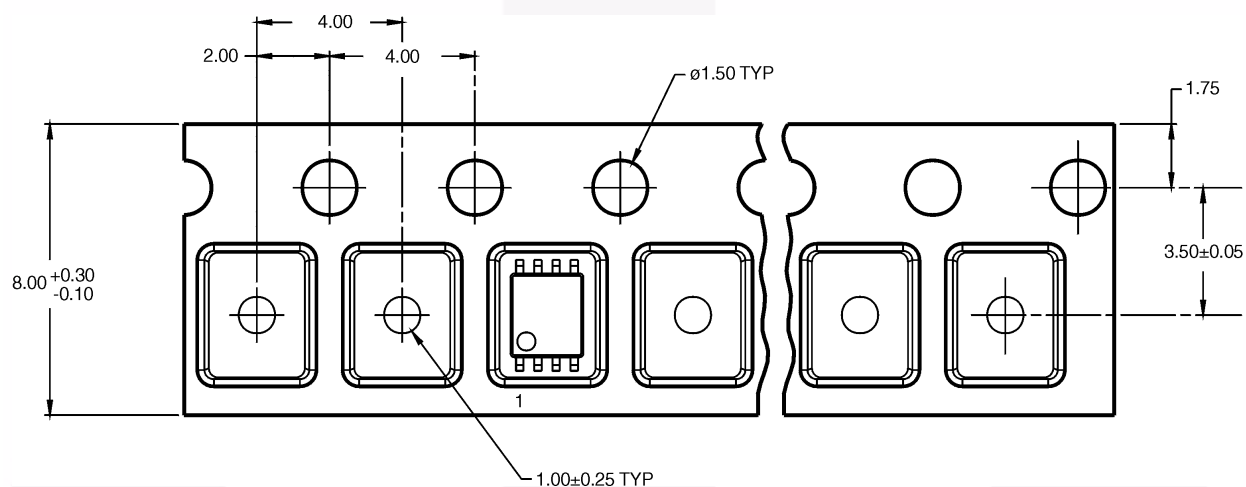
Figure 3. AC Waveforms

## Tape and Reel Specifications

## Tape Format for US8

| Package Designator | Tape Section       | Number of 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            |

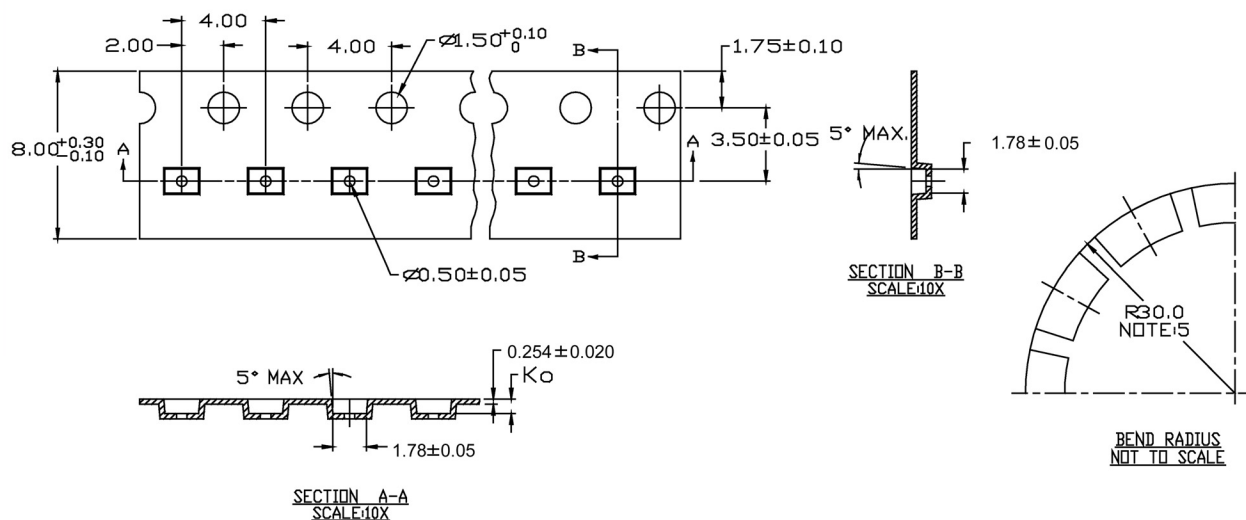
**Tape Dimensions** inches (millimeters)



## Tape Format for MicroPak

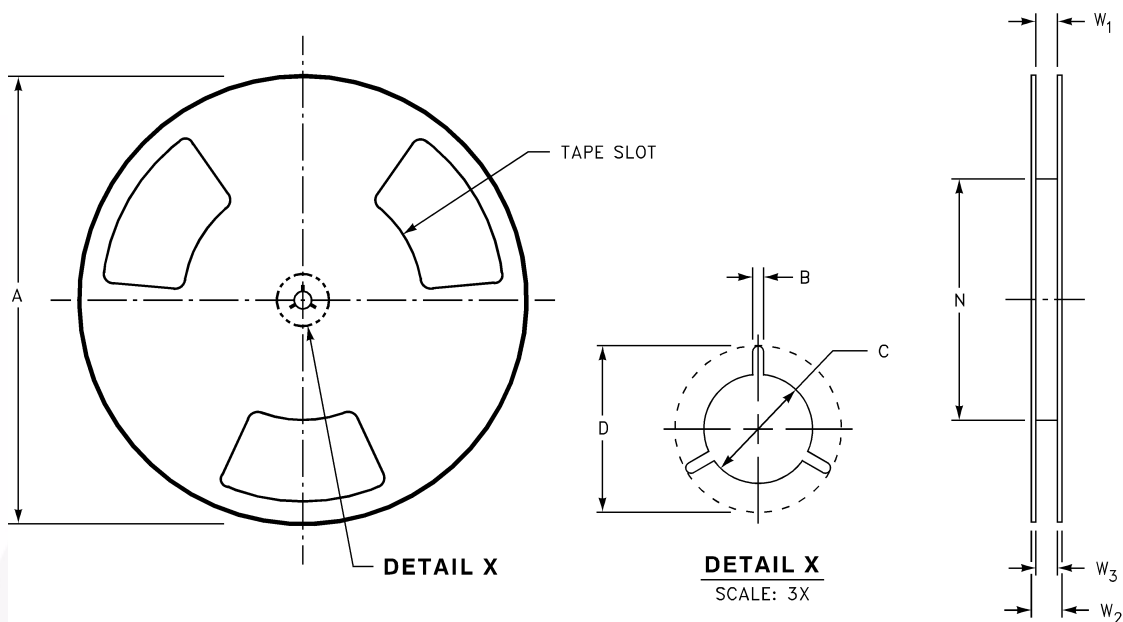
| Package Designator | Tape Section       | Number of Cavities | Cavity Status | Cover Tape Status |
|--------------------|--------------------|--------------------|---------------|-------------------|
| L8X                | Leader (Start End) | 125 (typ.)         | Empty         | Sealed           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

### Tape Dimensions inches (millimeters)



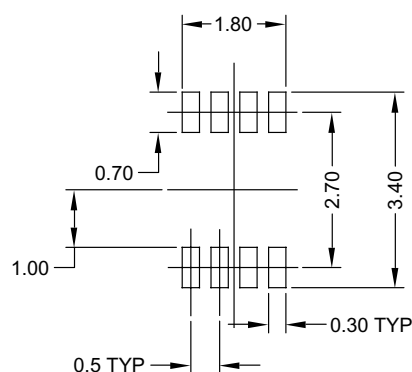
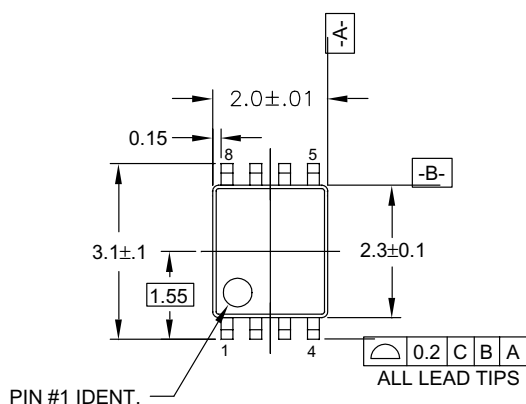
# Tape and Reel Specifications (Continued)

Reel Dimensions inches (millimeters)

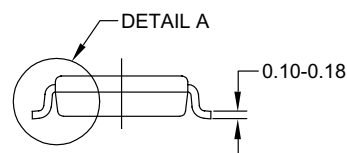
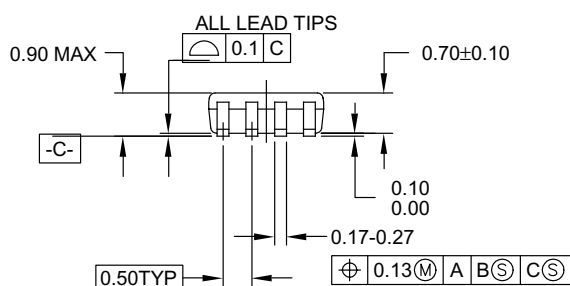


| Tape Size | A              | B               | C                | D                | N                | W1  | W2               | W3                                   |
|-----------|----------------|-----------------|------------------|------------------|------------------|---|------------------|--------------------------------------|
| 8mm       | 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) |

## Physical Dimensions

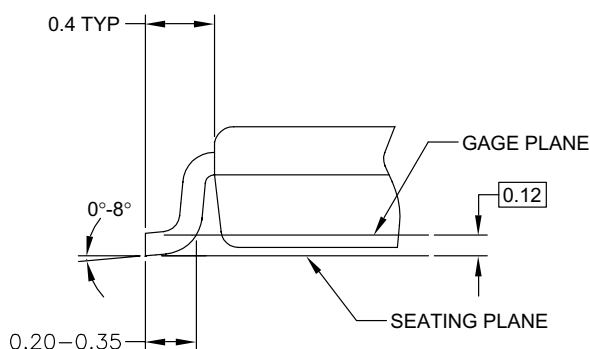


### LAND PATTERN RECOMMENDATION



### NOTES:

- CONFORMS TO JEDEC REGISTRATION MO-187
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.



### DETAIL A

MAB08AREVC

Figure 4. 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide

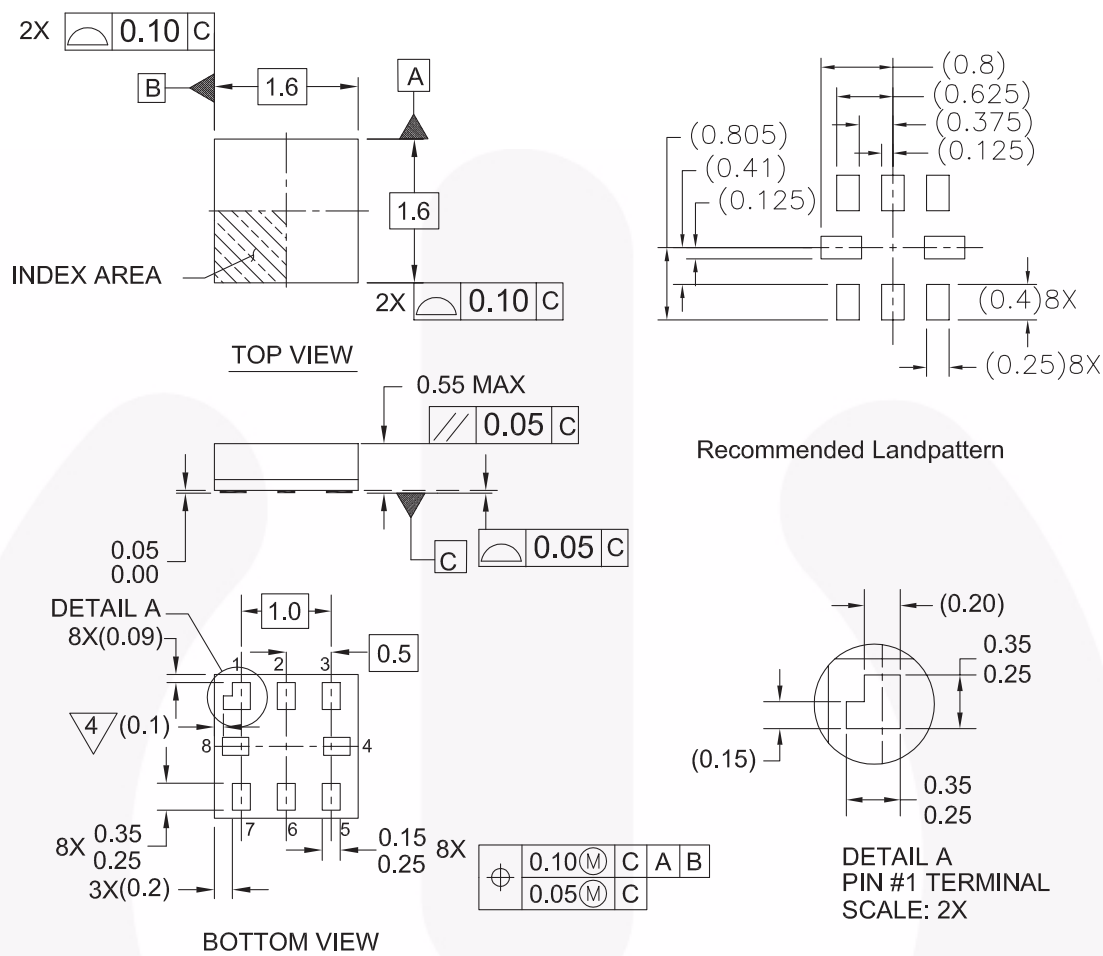
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# Physical Dimensions (Continued)



## 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 5. 8-Lead MicroPak, 1.6 mm Wide**

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

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|  | MegaBuck <sup>™</sup>                        | Quiet Series <sup>™</sup>              | TinyLogic <sup>®</sup>           |
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| FAST <sup>®</sup>   | Motion-SPM <sup>™</sup>                      | SuperFET <sup>™</sup>                  | μSerDes <sup>™</sup>             |
| FastvCore <sup>™</sup>  | OPTOLOGIC <sup>®</sup>                       | SuperSOT <sup>™</sup> 3                | UHC <sup>®</sup>                 |
| FlashWriter <sup>®</sup> *  | OPTOPLANAR <sup>®</sup>                      | SuperSOT <sup>™</sup> 6                | Ultra FRFET <sup>™</sup>         |
|   |  | SuperSOT <sup>™</sup> 8                | UniFET <sup>™</sup>              |
|   |  |  | VCX <sup>™</sup>                 |

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### Definition of Terms

| Datasheet Identification | Product Status         | Definition   |
|--------------------------|------------------------|--|
| Advance Information      | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.   |
| Preliminary              | First Production       | This 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        | This 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      | This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only.                                      |

Rev. I33

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Components Supply Platform

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