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# NC7WZ08

## TinyLogic® UHS Dual 2-Input AND Gate

### Features

- Space saving US8 surface mount package
- MicroPak™ leadless package
- Ultra High Speed;  $t_{PD}$  2.5ns Typ. 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 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
- Patented noise/EMI reduction circuitry implemented


### General Description

The NC7WZ08 is a dual 2-Input AND 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  $V_{CC}$  operating range. The device is specified to operate over the 1.65V to 5.5V  $V_{CC}$  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.

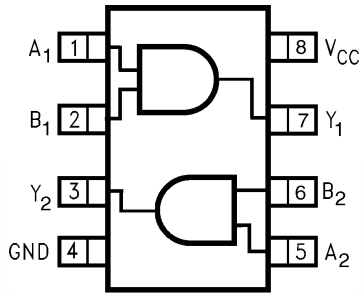
### Ordering Information

| Order Number | Package Number | Product Code Top Mark | Package Description                               | Supplied As               |
|--------------|----------------|-----------------------|---|---------------------------|
| NC7WZ08K8X   | MAB08A         | WZ08                  | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7WZ08L8X   | MAC08A         | X4                    | 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.

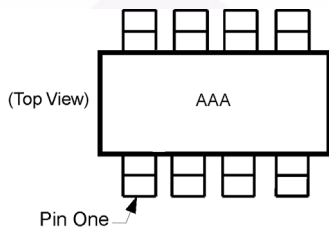
 All packages are lead free per JEDEC: J-STD-020B standard.

### Connection Diagram



(Top View)

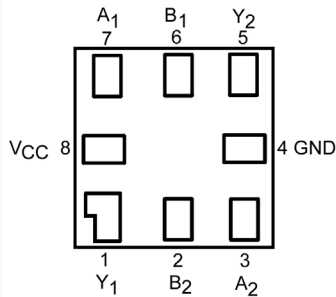
### Pin One Orientation Diagram



AAA represents Product Code Top Mark – see ordering code

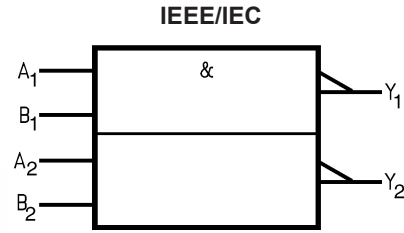
**Note:** Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

### Pad Assignments for MicroPak



(Top Thru View)

### Logic Symbol



### Function Table

$$Y = AB$$

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

H = HIGH Logic Level

L = LOW Logic Level

### Pin Description

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

## 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<br>US8<br>Micropak-8    | 245mW<br>165mW  |

## 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>$V_{CC} = 1.8V \pm 0.15V, 2.5V \pm 0.2V$ | 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<br>US8  | 265°C/W         |
|               | Micropak-8   | 395°C/W         |

**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°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             |  |                          | 0.7 x V <sub>CC</sub>   |      |                        | 0.7 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             |  |                          |                         |      | 0.3 x V <sub>CC</sub>  |                                 | 0.3 x V <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     |      |
|                  |                           | 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 |                        | 1.29                            |                        |       |      |
|                  |                           | 2.3                 |  |                          | I <sub>OH</sub> = -8mA  | 1.9  | 2.15                   |                                 | 1.9                    |       |      |
|                  |                           | 3.0                 |  |                          | I <sub>OH</sub> = -16mA | 2.5  | 2.80                   |                                 | 2.4                    |       |      |
|                  |                           | 3.0                 |  |                          | I <sub>OH</sub> = -24mA | 2.4  | 2.68                   |                                 | 2.3                    |       |      |
|                  |                           | 4.5                 |  |                          | I <sub>OH</sub> = -32mA | 3.9  | 4.20                   |                                 | 3.8                    |       |      |
|                  |                           |                     |  |                          |                         |      |                        |                                 |                        |       |      |
| V <sub>OL</sub>  | LOW Level Output Voltage  | 1.65                | V <sub>IN</sub> = V <sub>IL</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    |      |

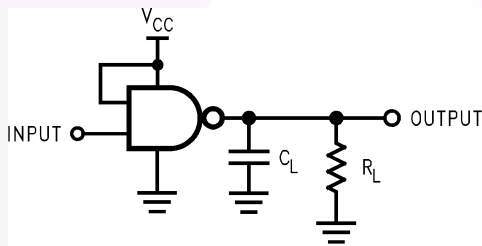
## AC Electrical Characteristics

| 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                    | 5.7  | 10.5 | 2.0                             | 11.0 | ns    | Figure 1<br>Figure 3 |
|                                     |                               | 2.5 ± 0.2           |   | 1.0                    | 3.5  | 5.8  | 1.0                             | 6.2  |       |                      |
|                                     |                               | 3.3 ± 0.3           |   | 0.8                    | 2.6  | 3.9  | 0.8                             | 4.3  |       |                      |
|                                     |                               | 5.0 ± 0.5           |   | 0.5                    | 1.9  | 3.1  | 0.5                             | 3.3  |       |                      |
| 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                    | 3.2  | 4.8  | 1.2                             | 5.2  | ns    | Figure 1<br>Figure 3 |
|                                     |                               | 5.0 ± 0.5           |   | 0.8                    | 2.5  | 3.7  | 0.8                             | 4.0  |       |                      |
| C <sub>IN</sub>                     | Input Capacitance             | 0                   |   |                        | 2.5  |      |                                 |      | pF    |                      |
| C <sub>PD</sub>                     | Power Dissipation Capacitance | 3.3                 | (2)   |                        | 14.5 |      |                                 |      | pF    | Figure 2             |
|                                     |                               | 5.0                 |   |                        | 19.5 |      |                                 |      |       |                      |

**Note:**

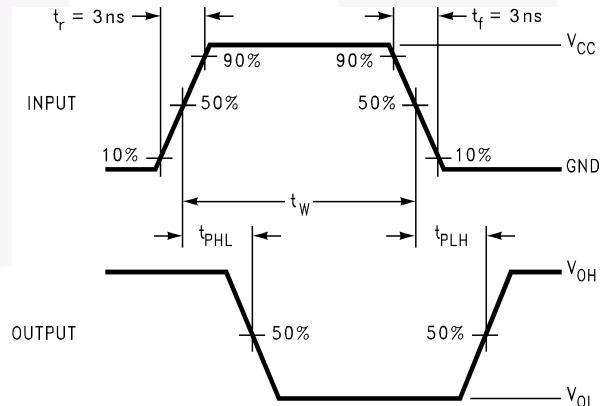
2. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. (See Figure 2.) C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by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

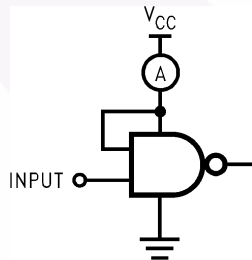


C<sub>L</sub> includes load and stray capacitance  
Input PRR = 1.0MHz, t<sub>w</sub> = 500ns

**Figure 1. AC Test Circuit**



**Figure 3. AC Waveforms**



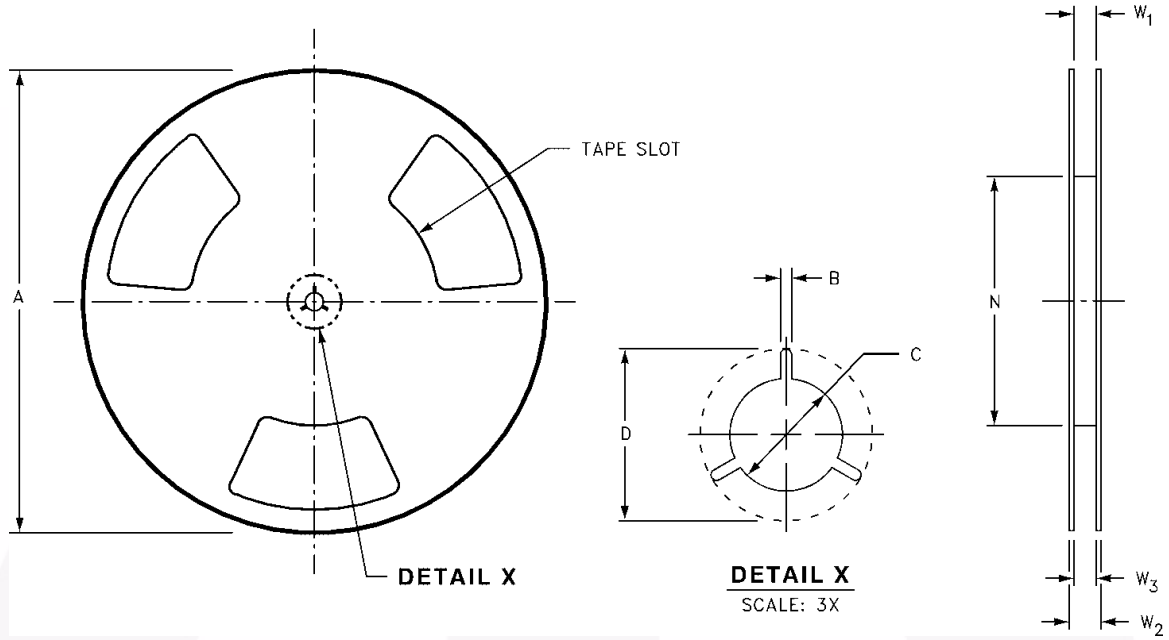
Input = Ac Waveform; t<sub>r</sub> = t<sub>f</sub> = 1.8ns;  
PRR = 10 MHz; Duty Cycle = 50%

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



**Tape and Reel Specifications** (Continued)

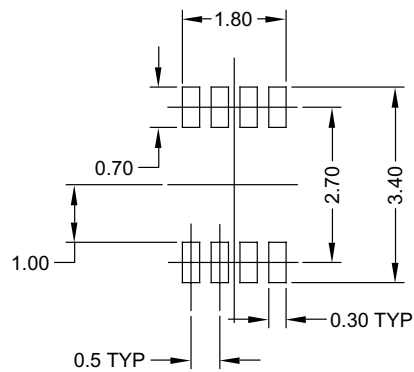
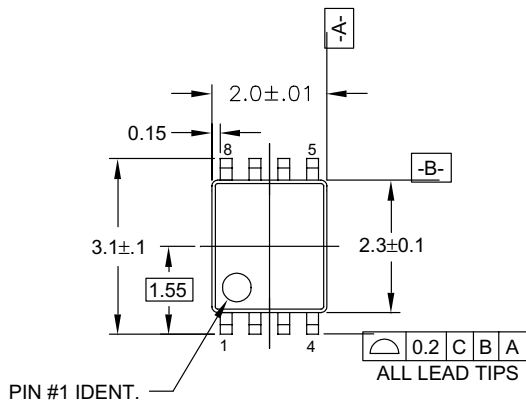
**Reel Dimensions** inches (millimeters)



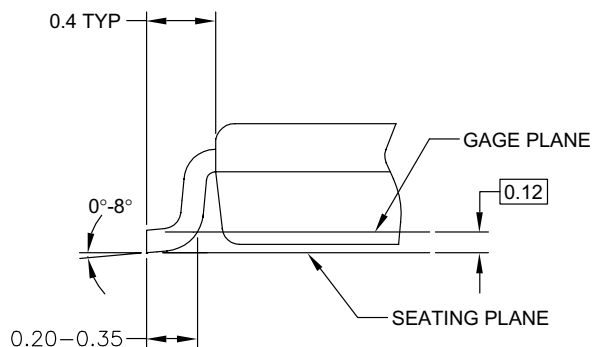
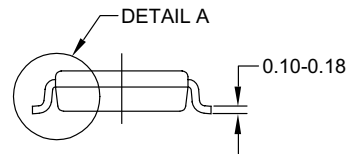
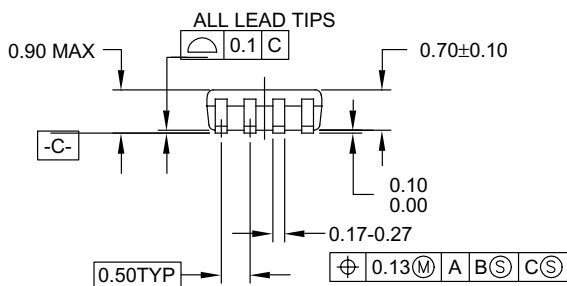
| Tape Size | A              | B               | C                | D                | N                | W1  | W2               | W3                                   |
|-----------|----------------|-----------------|------------------|------------------|------------------|---|------------------|--------------------------------------|
| 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:

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- 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, 1982.

MAB08AREVC

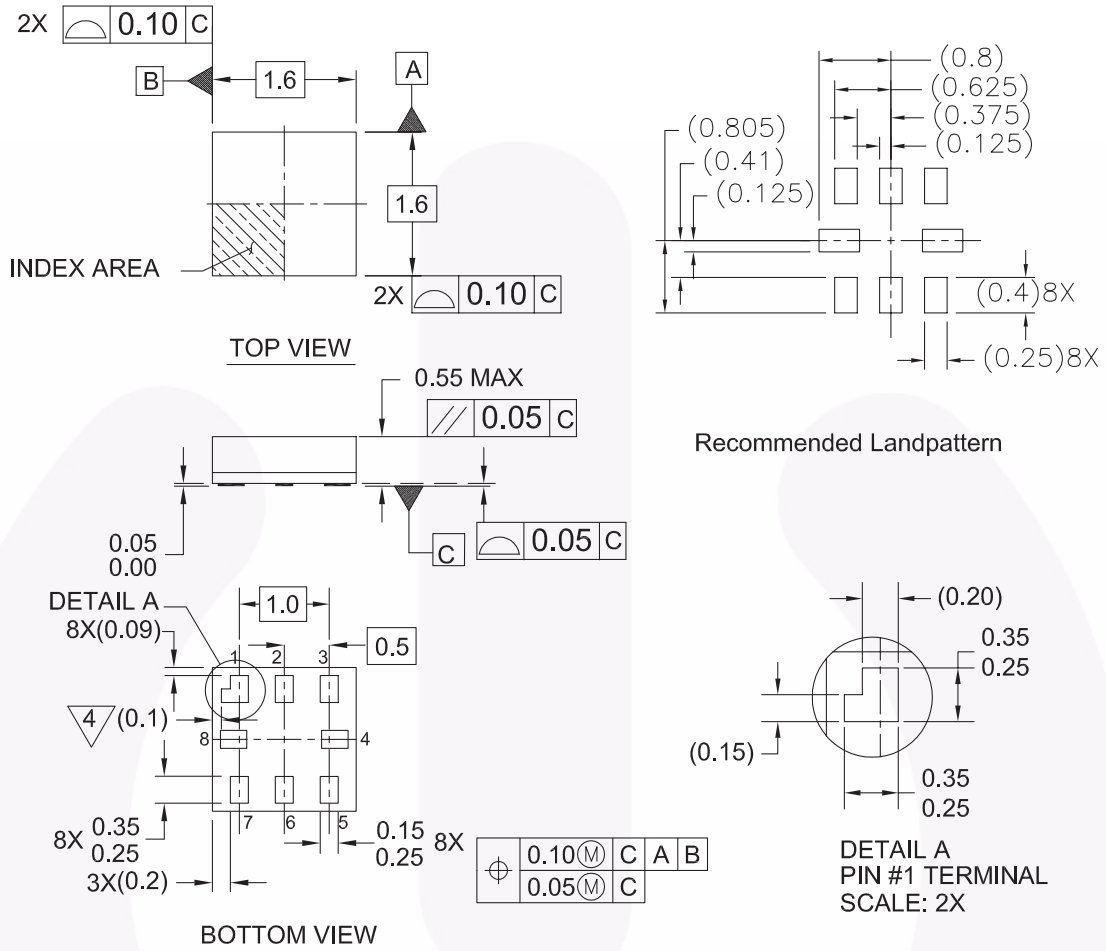
**Figure 4. 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide**

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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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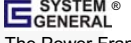
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| CROSSVOLT™  | Green FPS™ e-Series™  | Quiet Series™   | TinyLogic™  |
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| FACT®   | OPTOLOGIC®  | SuperSOT™8  | VisualMax™  |
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| FastvCore™  |  ™ | SyncFET™  |   |
| FlashWriter® *  | PDP SPM™  |  ™ |   |
| FPS™  | Power-SPM™  | The Power Franchise®  |   |
| F-PFS™  | PowerTrench®  |   |   |
|   | PowerXS™  |   |   |

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