FAIRCHILD SEMICONDUCTOR™

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# NC7WZ126
# TinyLogic® UHS Dual Buffer with 3-STATE Outputs

## General Description

The NC7WZ126 is a Dual Non-Inverting Buffer with independent active HIGH enables for the 3-STATE outputs. The Ultra High Speed device is fabricated with advanced CMOS technology to achieve superior switching performance 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 outputs are high impedance when $V_{CC}$ is 0V. Inputs tolerate voltages up to 5.5V independent of $V_{CC}$ operating range. Outputs tolerate voltages above $V_{CC}$ when in the 3-STATE condition.

## Features

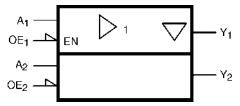
- Space saving US8 surface mount package
- MicroPak™ Pb-Free leadless package
- Ultra High Speed; $t_{PD}$ 2.6 ns Typ into 50 pF at 5V $V_{CC}$
- High Output Drive; ±24 mA at 3V $V_{CC}$
- Broad $V_{CC}$ Operating Range: 1.65V to 5.5V
- Matches the performance of LCX when operated at 3.3V $V_{CC}$
- Power down high impedance inputs/outputs
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Outputs are overvoltage tolerant in 3-STATE mode
- Patented noise/EMI reduction circuitry implemented

## Ordering Code:

| Order Number | Package Number | Product Code Top Mark | Package Description | Supplied As |
|---|---|---|---|---|
| NC7WZ126K8X | MAB08A | WZ26 | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7WZ126L8X | MAC08A | T6 | 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




## Pin Descriptions

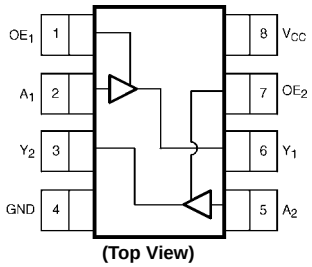
| Pin Names | Description |
|---|---|
| $OE_n$ | Enable Inputs for 3-STATE Outputs |
| $A_n$ | Inputs |
| $Y_n$ | 3-STATE Outputs |

## Function Table

| Inputs | | Output |
|---|---|---|
| OE | $A_n$ | $Y_n$ |
| H | L | L |
| H | H | H |
| L | L | Z |
| L | H | Z |

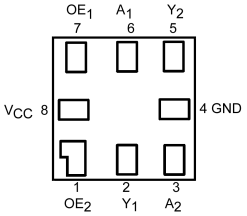
H = HIGH Logic Level  L = LOW Logic Level  Z = 3-STATE

## Connection Diagrams




**(Top View)**

**Pad Assignments for MicroPak**




**(Top Thru View)**

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## Absolute Maximum Ratings (Note 1)

| | |
|---|---|
| Supply Voltage ($V_{CC}$) | −0.5V to +7.0V |
| DC Input Voltage ($V_{IN}$) (Note 2) | −0.5V to +7.0V |
| DC Output Voltage ($V_{OUT}$) | −0.5V to +7.0V |
| DC Input Diode Current ($I_{IK}$) | |
| @$V_{IN}$ < 0V | −50 mA |
| DC Output Diode Current ($I_{OK}$) | |
| @$V_{OUT}$ < 0V | −50 mA |
| DC Output Source/Sink Current ($I_{OUT}$) | ±50 mA |
| DC $V_{CC}$/GND Current ($I_{CC}$/$I_{GND}$) | ±100 mA |
| Storage Temperature Range ($T_{STG}$) | −65°C to +150°C |
| Junction Temperature under Bias ($T_J$) | +150°C |
| Junction Lead Temperature ($T_L$) | |
| (Soldering, 10 seconds) | +260°C |
| Power Dissipation ($P_D$) @+85°C | 250 mW |

## Recommended Operating Conditions (Note 3)

| | |
|---|---|
| Supply Voltage Operating ($V_{CC}$) | 1.65V to 5.5V |
| Supply Voltage Data Retention ($V_{CC}$) | 1.5V to 5.5V |
| Input Voltage ($V_{IN}$) | 0V to 5.5V |
| Output Voltage ($V_{OUT}$) | |
| Active State | 0V to $V_{CC}$ |
| 3-State | 0V to 5.5V |
| Operating Temperature ($T_A$) | −40°C to +85°C |
| Input Rise and Fall Time ($t_r$, $t_f$) | |
| $V_{CC}$ = 1.8V, 0.15V, 2.5V ± 0.2V | 0 ns/V to 20 ns/V |
| $V_{CC}$ = 3.8V ± 0.3V | 0 ns/V to 10 ns/V |
| $V_{CC}$ = 5.0V ± 0.5V | 0 ns/V to 5 ns/V |
| Thermal Resistance ($\theta_{JA}$) | 250°C/W |

**Note 1:** Absolute maximum ratings are DC values beyond which the device may be damaged or have its useful life impaired. The datasheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

**Note 2:** The input and output negative voltage ratings may be exceeded is the input and output diode current ratings are observed.

**Note 3:** Unused inputs must be held HIGH or LOW. They may not float.

## DC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ (V) | $T_A$ = +25°C | | | $T_A$ = −40°C to +85°C | | Unit | Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | | |
| $V_{IH}$ | HIGH Level Input Voltage | 1.65 to 1.95 | 0.75 $V_{CC}$ | | | 0.75 $V_{CC}$ | | V | | |
| | . | 2.3 to 5.5 | 0.7 $V_{CC}$ | | | 0.7 $V_{CC}$ | | | | |
| $V_{IL}$ | LOW Level Input Voltage | 1.65 to 1.95 | | | 0.25 $V_{CC}$ | | 0.25 $V_{CC}$ | V | | |
| | | 2.3 to 5.5 | | | 0.3 $V_{CC}$ | | 0.3 $V_{CC}$ | | | |
| $V_{OH}$ | HIGH Level Output Voltage | 1.65 | 1.55 | 1.65 | | 1.55 | | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = −100 µA |
| | | 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 | 1.29 | 1.52 | | 1.29 | | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = −4 mA |
| | | 2.3 | 1.9 | 2.15 | | 1.9 | | | | $I_{OH}$ = −8 mA |
| | | 3.0 | 2.4 | 2.80 | | 2.4 | | | | $I_{OH}$ = −16 mA |
| | | 3.0 | 2.3 | 2.68 | | 2.3 | | | | $I_{OH}$ = −24 mA |
| | | 4.5 | 3.8 | 4.20 | | 3.8 | | | | $I_{OH}$ = −32 mA |
| $V_{OL}$ | LOW Level Output Voltage | 1.65 | | 0.0 | 0.10 | | 0.10 | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 100 µA |
| | | 2.3 | | 0.0 | 0.10 | | 0.10 | | | |
| | | 3.0 | | 0.0 | 0.10 | | 0.10 | | | |
| | | 4.5 | | 0.0 | 0.10 | | 0.10 | | | |
| | | 1.65 | | 0.08 | 0.24 | | 0.24 | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 4 mA |
| | | 2.3 | | 0.10 | 0.3 | | 0.3 | | | $I_{OL}$ = 8 mA |
| | | 3.0 | | 0.15 | 0.4 | | 0.4 | | | $I_{OL}$ = 16 mA |
| | | 3.0 | | 0.22 | 0.55 | | 0.55 | | | $I_{OL}$ = 24 mA |
| | | 4.5 | | 0.22 | 0.55 | | 0.55 | | | $I_{OL}$ = 32 mA |
| $I_{IN}$ | Input Leakage Current | 0 to 5.5 | | | ±0.1 | | ±1 | µA | $V_{IN}$ = 5.5V, GND | |
| $I_{OZ}$ | 3-STATE Output Leakage | 1.65 to 5.5 | | | ±0.5 | | ±5 | µA | $V_{IN}$ = $V_{IH}$ or $V_{IL}$<br>0 ≤ $V_{OUT}$ ≤ 5.5V | |
| $I_{OFF}$ | Power Off Leakage Current | 0.0 | | | 1 | | 10 | µA | $V_{IN}$ or $V_{OUT}$ = 5.5V | |
| $I_{CC}$ | Quiescent Supply Current | 1.65 to 5.5 | | | 1 | | 10 | µA | $V_{IN}$ = 5.5V, GND | |

## Noise Characteristics

| Symbol | Parameter | $V_{CC}$ (V) | $T_A = +25°C$ | | Units | Conditions |
|---|---|---|---|---|---|---|
| | | | Typ | Max | | |
| $V_{OLP}$ (Note 4) | Quiet Output Maximum Dynamic $V_{OL}$ | 5.0 | | 1.0 | V | $C_L = 50$ pF |
| $V_{OLV}$ (Note 4) | Quiet Output Minimum Dynamic $V_{OL}$ | 5.0 | | 1.0 | V | $C_L = 50$ pF |
| $V_{OHV}$ (Note 4) | Quiet Output Minimum Dynamic $V_{OH}$ | 5.0 | | 4.0 | V | $C_L = 50$ pF |
| $V_{IHD}$ (Note 4) | Minimum HIGH Level Dynamic Input Voltage | 5.0 | | 3.5 | V | $C_L = 50$ pF |
| $V_{ILD}$ (Note 4) | Maximum LOW Level Dynamic Input Voltage | 5.0 | | 1.5 | V | $C_L = 50$ pF |

**Note 4:** Parameter guaranteed by design.

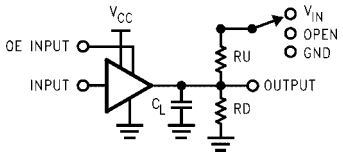
## AC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ (V) | $T_A = +25°C$ | | | $T_A = -40°C$ to $+85°C$ | | Units | Conditions | Figure Number |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | | |
| $t_{PLH}$ | Propagation Delay | $1.8 \pm 0.15$ | 2.0 | | 12.0 | 2.0 | 13.0 | ns | $C_L = 15$ pF | Figures 1, 3 |
| $t_{PHL}$ | $A_n$ to $Y_n$ | $2.5 \pm 0.2$ | 1.0 | | 7.5 | 1.0 | 8.0 | | RD = 1 MΩ | |
| | | $3.3 \pm 0.3$ | 0.8 | | 5.2 | 0.8 | 5.5 | | $S_1$ = OPEN | |
| | | $5.0 \pm 0.5$ | 0.5 | | 4.5 | 0.5 | 4.8 | | | |
| $t_{PLH}$ | Propagation Delay | $3.3 \pm 0.3$ | 1.2 | | 5.7 | 1.2 | 6.0 | ns | $C_L = 50$ pF | Figures 1, 3 |
| $t_{PHL}$ | $A_n$ to $Y_n$ | $5.0 \pm 0.5$ | 0.8 | | 5.0 | 0.8 | 5.3 | | RD = 500Ω | |
| | | | | | | | | | $S_1$ = OPEN | |
| $t_{OSLH}$ | Output to Output Skew | $3.3 \pm 0.3$ | | | 1.0 | | 1.0 | ns | $C_L = 50$ pF | Figures 1, 3 |
| $t_{OSHL}$ | (Note 5) | $5.0 \pm 0.5$ | | | 0.8 | | 0.8 | | RD = 500Ω | |
| | | | | | | | | | $S_1$ = OPEN | |
| $t_{PZL}$ | Output Enable Time | $1.8 \pm 0.15$ | 3.0 | | 14.0 | 3.0 | 15.0 | ns | $C_L = 50$ pF | Figures 1, 3 |
| $t_{PZH}$ | | $2.5 \pm 0.2$ | 1.8 | | 8.5 | 1.8 | 9.0 | | RD, RU = 500Ω | |
| | | $3.3 \pm 0.3$ | 1.2 | | 6.2 | 1.2 | 6.5 | | $S_1$ = GND for $t_{PZH}$ | |
| | | $5.0 \pm 0.5$ | 0.8 | | 5.5 | 0.8 | 5.8 | | $S_1 = V_I$ for $t_{PZL}$ | |
| | | | | | | | | | $V_I = 2 \times V_{CC}$ | |
| $t_{PLZ}$ | Output Disable Time | $1.8 \pm 0.15$ | 2.5 | | 12.0 | 2.5 | 13.0 | ns | $C_L = 50$ pF | Figures 1, 3 |
| $t_{PHZ}$ | | $2.5 \pm 0.2$ | 1.5 | | 8.0 | 1.5 | 8.5 | | RD, RU = 500Ω | |
| | | $3.3 \pm 0.3$ | 0.8 | | 5.7 | 0.8 | 6.0 | | $S_1$ = GND for $t_{PHZ}$ | |
| | | $5.0 \pm 0.5$ | 0.3 | | 4.7 | 0.3 | 5.0 | | $S_1 = V_I$ for $t_{PLZ}$ | |
| | | | | | | | | | $V_I = 2 \times V_{CC}$ | |
| $C_{IN}$ | Input Capacitance | 0 | | 2.5 | | | | pF | | |
| $C_{OUT}$ | Output Capacitance | 5.0 | | 4 | | | | | | |
| $C_{PD}$ | Power Dissipation | 3.3 | | 10 | | | | pF | (Note 6) | Figure 2 |
| | Capacitance | 5.0 | | 12 | | | | | | |

**Note 5:** Parameter guaranteed by design. $t_{OSLH} = | t_{PLHmax} - t_{PLHmin} |$; $t_{OSHL} = | t_{PHLmax} - t_{PHLmin} |$.

**Note 6:** $C_{PD}$ is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption ($I_{CCD}$) at no output loading and operating at 50% duty cycle. (See Figure 2.) $C_{PD}$ is related to $I_{CCD}$ dynamic operating current by the expression:
$I_{CCD} = (CPD)\ (V_{CC})\ (f_{IN}) + (I_{CC}$ static).

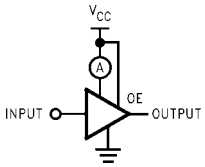
## AC Loading and Waveforms




$C_L$ includes load and stray capacitance

Input PRR = 1.0 MHz, $t_w$ = 500 ns

**FIGURE 1. AC Test Circuit**




Input = AC Waveform; $t_r = t_f = 1.8$ ns;

PRR = 10 MHz; Duty Cycle = 50%

**FIGURE 2. $I_{CCD}$ Test Circuit**

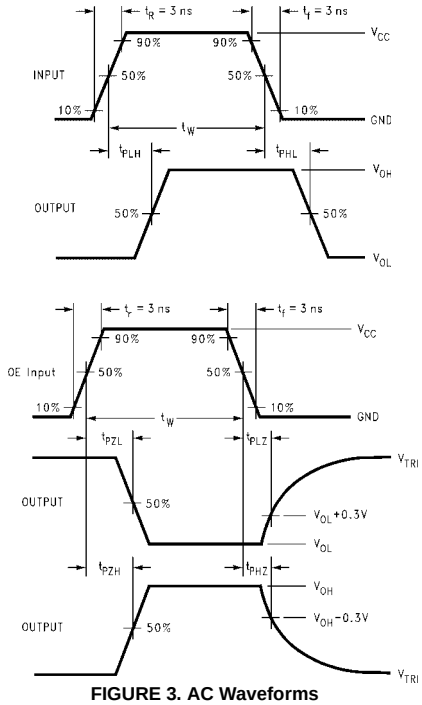


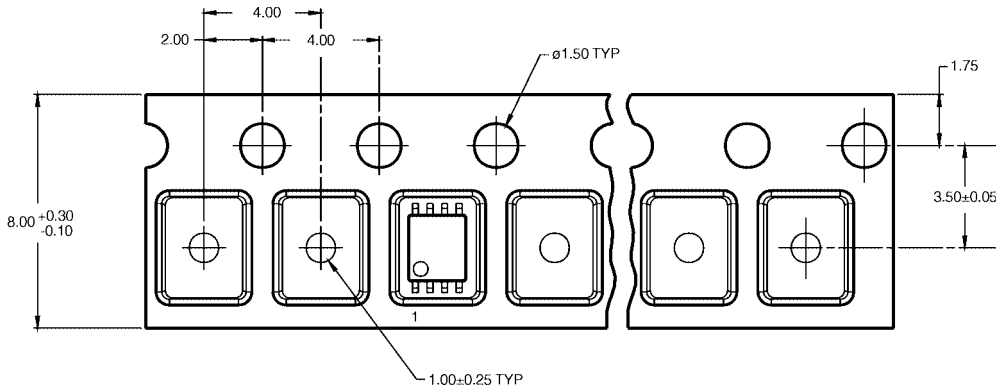

**FIGURE 3. AC Waveforms**

## Tape and Reel Specification

**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 |

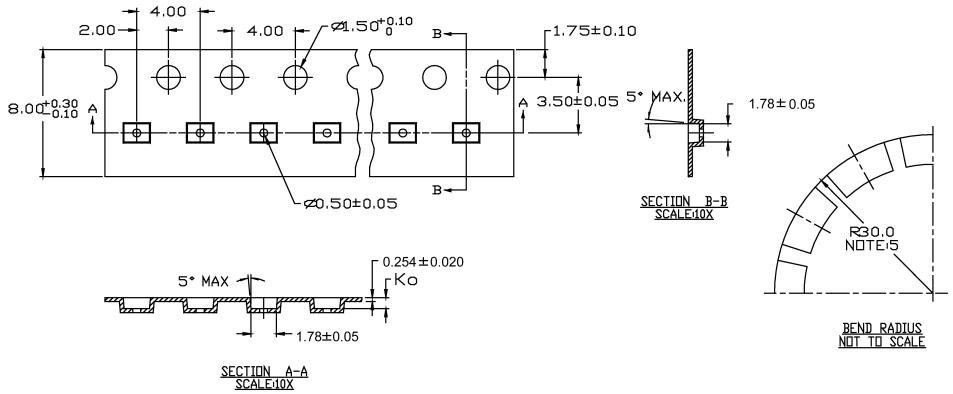
**TAPE DIMENSIONS** inches (millimeters)




**TAPE FORMAT for MicroPak**

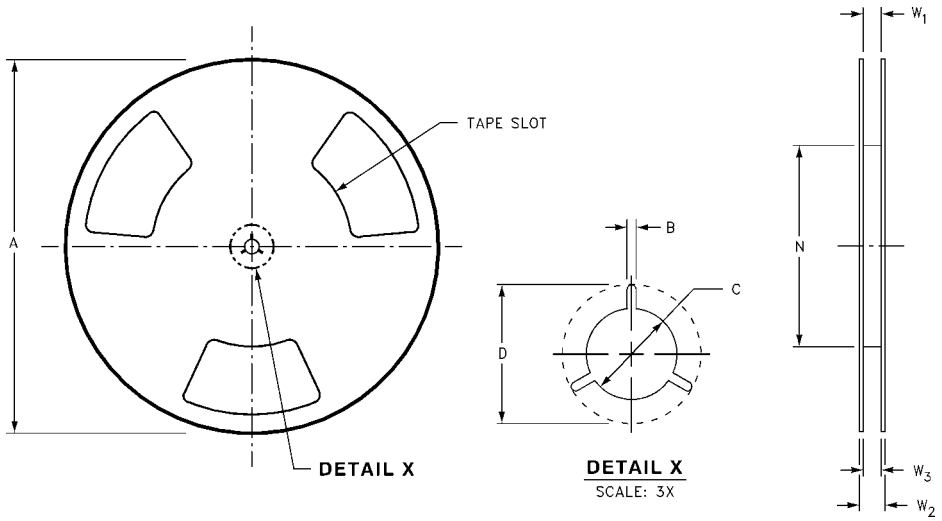
| Package Designator | Tape Section | Number Cavities | Cavity Status | Cover Tape Status |
|---|---|---|---|---|
| L8X | Leader (Start End) | 125 (typ) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (typ) | Empty | Sealed |

**TAPE DIMENSIONS** inches (millimeters)



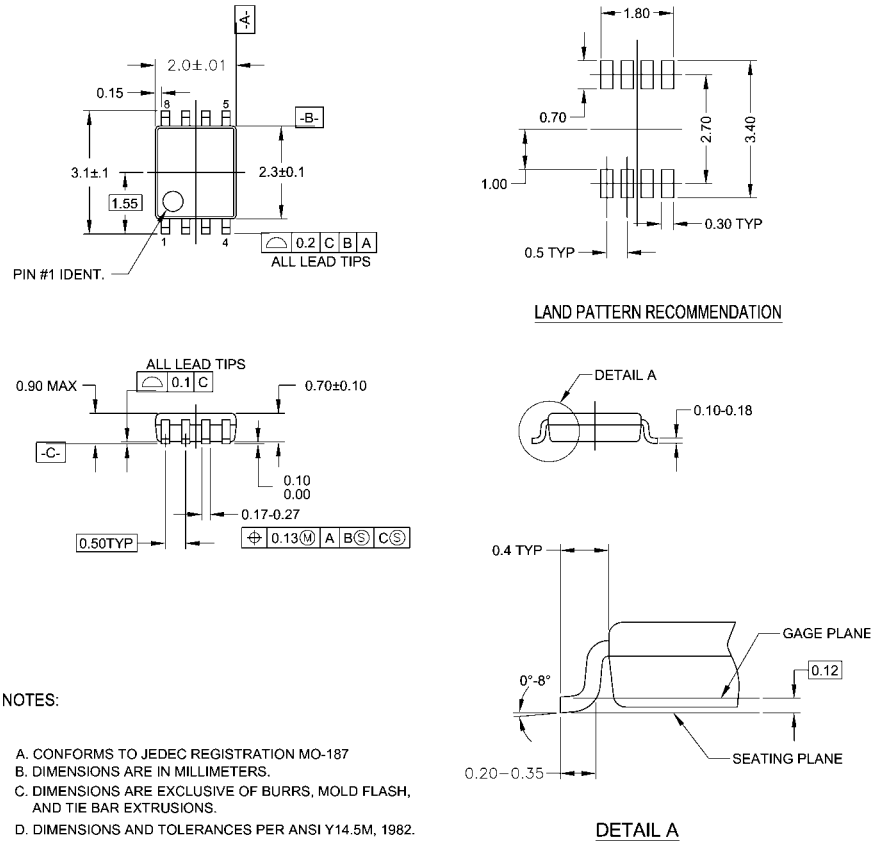
## Tape and Reel Specification (Continued)

**REEL DIMENSIONS** 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) |

## Physical Dimensions inches (millimeters) unless otherwise noted



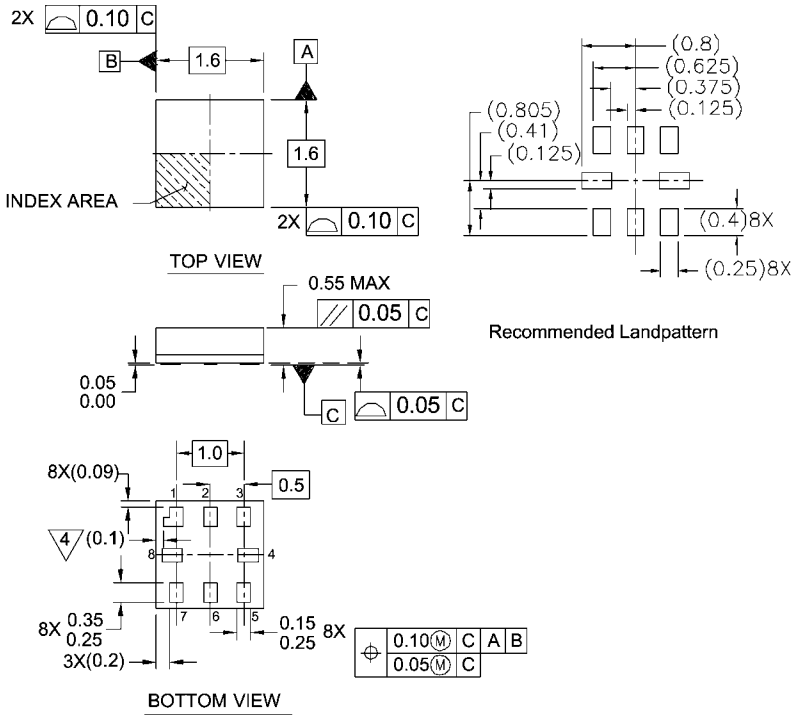

NOTES:

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

**8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide**
**Package Number MAB08A**

## Physical Dimensions inches (millimeters) unless otherwise noted (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.

MAC08AREVC

**Pb-Free 8-Lead MicroPak, 1.6 mm Wide**
**Package Number MAC08A**



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