

## NC7WV125 TinyLogic® ULP-A Buffer with 3-STATE Output

### General Description

The NC7WV125 is a single buffer with 3-STATE output from Fairchild's Ultra Low Power-A (ULP-A) Series of TinyLogic®. ULP-A is ideal for applications that require extreme high speed, high drive and low power. This product is designed for wide low voltage operating range (0.9V to 3.6V  $V_{CC}$ ) and applications that require more drive and speed than the TinyLogic ULP series, but still offer best in class low power operation.

The NC7WV125 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

### Features

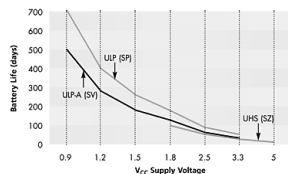
- 0.9V to 3.6V  $V_{CC}$  supply operation
- 3.6V overvoltage tolerant I/O's at  $V_{CC}$  from 0.9V to 3.6V
- Extremely High Speed  $t_{PD}$ 
  - 1.0 ns typ for 2.7V to 3.6V  $V_{CC}$
  - 2.0 ns typ for 2.3V to 2.7V  $V_{CC}$
  - 3.0 ns typ for 1.65V to 1.95V  $V_{CC}$
  - 3.5 ns typ for 1.4V to 1.6V  $V_{CC}$
  - 6.0 ns typ for 1.1V to 1.3V  $V_{CC}$
  - 13 ns typ for 0.9V  $V_{CC}$
- Power-Off high impedance inputs and outputs
- High Static Drive ( $I_{OH}/I_{OL}$ )
  - ±24 mA @ 3.00V  $V_{CC}$
  - ±18 mA @ 2.30V  $V_{CC}$
  - ±6 mA @ 1.65V  $V_{CC}$
  - ±4 mA @ 1.4V  $V_{CC}$
  - ±2 mA @ 1.1V  $V_{CC}$
  - ±0.1 mA @ 0.9V  $V_{CC}$
- Uses patented Quiet Series™ noise/EMI reduction circuitry
- Ultra small MicroPak™ Pb-Free package
- Ultra low dynamic power

### Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WV125K8X	MAB08A	WV25	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide	3k Units on Tape and Reel
NC7WV125L8X	MAC08A	Z5	Pb-Free 8-Lead MicroPak, 1.6 mm Wide	5k Units on Tape and Reel

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

### Battery Life vs. $V_{CC}$ Supply Voltage



TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.

$$\text{Battery Life} = (V_{\text{battery}} * I_{\text{battery}} * 9) / (P_{\text{device}}) / 24 \text{hrs/day}$$

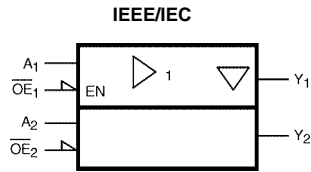
$$\text{Where, } P_{\text{device}} = (I_{CC} * V_{CC}) + (C_{PD} + C_L) * V_{CC}^2 * f$$

Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAh and derated 90% and device frequency at 10MHz, with  $C_L = 15$  pF load

TinyLogic® is a registered trademark of Fairchild Semiconductor Corporation.

MicroPak™ and Quiet Series™ are trademarks of Fairchild Semiconductor Corporation.

**Logic Symbol**



**Pin Descriptions**

Pin Names	Description
$\overline{OE}_n$	Enable Inputs for 3-STATE Outputs
$A_n$	Input
$Y_n$	3-STATE Outputs

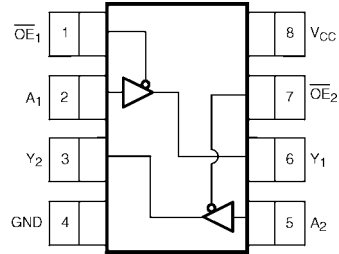
**Function Table**

Inputs		Output
$\overline{OE}$	$A_n$	$Y_n$
L	L	L
L	H	H
H	L	Z
H	H	Z

H = HIGH Logic Level  
 L = LOW Logic Level  
 Z = HIGH Impedance State

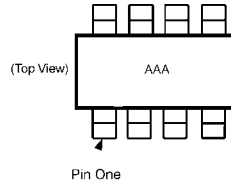
**Connection Diagrams**

**Pin Assignments for US8**



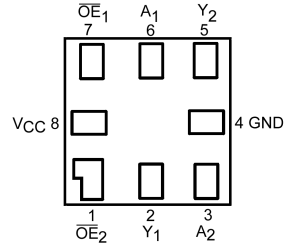
(Top View)

**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)

Absolute Maximum Ratings (Note 1)			Recommended Operating Conditions (Note 3)					
Supply Voltage ( $V_{CC}$ )	-0.5V to +4.6V		Supply Voltage	0.9V to 3.6V				
DC Input Voltage ( $V_{IN}$ )	-0.5V to +4.6V		Input Voltage ( $V_{IN}$ )	0V to 3.6V				
DC Output Voltage ( $V_{OUT}$ )			Output Voltage ( $V_{OUT}$ )					
HIGH or LOW State (Note 2)	-0.5V to $V_{CC} + 0.5V$		$V_{CC} = 0.0V$	0V to 3.6V				
$V_{CC} = 0V$	-0.5V to +4.6V		HIGH or LOW State	0V to $V_{CC}$				
DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$	±50 mA		Output Current in $I_{OH}/I_{OL}$					
DC Output Diode Current ( $I_{OK}$ )			$V_{CC} = 3.0V$ to 3.6V	±24.0 mA				
$V_{OUT} < 0V$	-50 mA		$V_{CC} = 2.3V$ to 2.7V	±18.0 mA				
$V_{OUT} > V_{CC}$	+50 mA		$V_{CC} = 1.65V$ to 1.95V	±6.0 mA				
DC Output Source/Sink Current ( $I_{OH}/I_{OL}$ )	± 50 mA		$V_{CC} = 1.4V$ to 1.6V	±4.0 mA				
DC $V_{CC}$ or Ground Current per			$V_{CC} = 1.1V$ to 1.3V	±2.0 mA				
Supply Pin ( $I_{CC}$ or Ground)	± 50 mA		$V_{CC} = 0.9V$	±0.1 mA				
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C		Free Air Operating Temperature ( $T_A$ )	-40°C to +85°C				
			Minimum Input Edge Rate ( $\Delta t/\Delta V$ )					
			$V_{IN} = 0.8V$ to 2.0V, $V_{CC} = 3.0V$	10 ns/V				
			<p><b>Note 1:</b> 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.</p> <p><b>Note 2:</b> <math>I_O</math> Absolute Maximum Rating must be observed.</p> <p><b>Note 3:</b> Unused inputs must be held HIGH or LOW. They may not float.</p>					
DC Electrical Characteristics								
Symbol	Parameter	$V_{CC}$ (V)	$T_A = +25^\circ C$		$T_A = -40^\circ C$ to $+85^\circ C$		Units	Conditions
			Min	Max	Min	Max		
$V_{IH}$	HIGH Level Input Voltage	0.90	0.65 x $V_{CC}$		0.65 x $V_{CC}$		V	
		$1.10 \leq V_{CC} \leq 1.30$	0.65 x $V_{CC}$		0.65 x $V_{CC}$			
		$1.40 \leq V_{CC} \leq 1.60$	0.65 x $V_{CC}$		0.65 x $V_{CC}$			
		$1.65 \leq V_{CC} \leq 1.95$	0.65 x $V_{CC}$		0.65 x $V_{CC}$			
		$2.30 \leq V_{CC} < 2.70$	1.6		1.6			
	$2.70 \leq V_{CC} \leq 3.60$	2.0		2.0				
$V_{IL}$	LOW Level Input Voltage	0.90		0.35 x $V_{CC}$		0.35 x $V_{CC}$	V	
		$1.10 \leq V_{CC} \leq 1.30$		0.35 x $V_{CC}$		0.35 x $V_{CC}$		
		$1.40 \leq V_{CC} \leq 1.60$		0.35 x $V_{CC}$		0.35 x $V_{CC}$		
		$1.65 \leq V_{CC} \leq 1.95$		0.35 x $V_{CC}$		0.35 x $V_{CC}$		
		$2.30 \leq V_{CC} < 2.70$		0.7		0.7		
	$2.70 \leq V_{CC} \leq 3.60$		0.8		0.8			
$V_{OH}$	HIGH Level Output Voltage	0.90	$V_{CC} - 0.1$		$V_{CC} - 0.1$		V	$I_{OH} = -100 \mu A$
		$1.10 \leq V_{CC} \leq 1.30$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$1.40 \leq V_{CC} \leq 1.60$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$1.65 \leq V_{CC} \leq 1.95$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$2.30 \leq V_{CC} < 2.70$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$2.70 \leq V_{CC} \leq 3.60$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$1.10 \leq V_{CC} \leq 1.30$	0.75 x $V_{CC}$		0.75 x $V_{CC}$			
		$1.40 \leq V_{CC} \leq 1.60$	0.75 x $V_{CC}$		0.75 x $V_{CC}$			
		$1.65 \leq V_{CC} \leq 1.95$	1.25		1.25			
		$2.30 \leq V_{CC} < 2.70$	2.0		2.0			
		$2.30 \leq V_{CC} < 2.70$	1.8		1.8			
		$2.70 \leq V_{CC} \leq 3.60$	2.2		2.2			
	$2.30 \leq V_{CC} < 2.70$	1.7		1.7				
	$2.70 \leq V_{CC} \leq 3.60$	2.4		2.4				
	$2.70 \leq V_{CC} \leq 3.60$	2.2		2.2				
						$I_{OH} = -2.0 mA$		
						$I_{OH} = -4.0 mA$		
						$I_{OH} = -6.0 mA$		
						$I_{OH} = -12.0 mA$		
						$I_{OH} = -18.0 mA$		
						$I_{OH} = -24.0 mA$		

### DC Electrical Characteristics (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units	Conditions
			Min	Max	Min	Max		
V <sub>OL</sub>	LOW Level Output Voltage	0.90		0.1		0.1	V	I <sub>OL</sub> = 100 μA
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		0.1		0.1		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		0.2		0.2		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		0.2		0.2		
		2.30 ≤ V <sub>CC</sub> < 2.70		0.2		0.2		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		0.2		0.2		
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		0.3		0.3		
		2.30 ≤ V <sub>CC</sub> < 2.70		0.4		0.4		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		0.4		0.4		
I <sub>IN</sub>	Input Leakage Current	0.90 to 3.60		±0.1		±0.5	μA	0 ≤ V <sub>I</sub> ≤ 3.6V
I <sub>OZ</sub>	3-STATE Output Leakage	0.90 to 3.60		±0.5		±0.5	μA	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> 0 ≤ V <sub>O</sub> ≤ 3.6V
I <sub>OFF</sub>	Power Off Leakage Current	0		0.5		0.5	μA	0 ≤ (V <sub>I</sub> , V <sub>O</sub> ) ≤ 3.6V
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60		0.9		0.9	μA	V <sub>I</sub> = V <sub>CC</sub> or GND V <sub>CC</sub> ≤ V <sub>I</sub> ≤ 3.6V
		0.90 to 3.60				±0.9		

### AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units	Conditions	Figure Number
			Min	Typ	Max	Min	Max			
t <sub>PHL</sub>	Propagation Delay	0.90		13.0			ns	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	Figures 1, 2	
t <sub>PLH</sub>		1.10 ≤ V <sub>CC</sub> ≤ 1.30	3.0	6.0	9.8	1.9		14.9		C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	1.0	3.5	5.3	0.8		5.7		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	0.9	3.0	4.6	0.8		4.9		
		2.30 ≤ V <sub>CC</sub> < 2.70	0.8	2.0	3.3	0.7		3.5		
	2.70 ≤ V <sub>CC</sub> ≤ 3.60	0.5	1.0	3.1	0.5	3.3	R <sub>L</sub> = 500Ω			
t <sub>PZH</sub>	Output Enable Time	0.90		14.0			ns	C <sub>L</sub> = 30 pF	Figures 1, 2	
t <sub>PZL</sub>		1.10 ≤ V <sub>CC</sub> ≤ 1.30	3.0	6.0	9.7	2.0		16.4		R <sub>U</sub> = 1kΩ
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	1.2	4.0	6.0	1.0		7.5		R <sub>D</sub> = 1kΩ
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	1.0	3.0	4.7	0.9		5.2		S <sub>1</sub> = GND for t <sub>PZH</sub>
		2.30 ≤ V <sub>CC</sub> < 2.70	0.8	2.0	3.5	0.7		3.7		S <sub>1</sub> = V <sub>I</sub> for t <sub>PZL</sub>
	2.70 ≤ V <sub>CC</sub> ≤ 3.60	0.5	1.2	3.1	0.4	3.4	V <sub>I</sub> = 2 x V <sub>CC</sub>			
t <sub>PHZ</sub>	Output Disable Time	0.90		14.0			ns	C <sub>L</sub> = 30 pF	Figures 1, 2	
t <sub>PLZ</sub>		1.10 ≤ V <sub>CC</sub> ≤ 1.30	2.0	5.0	9.5	2.0		14.0		R <sub>U</sub> = 1kΩ
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	1.2	3.0	5.9	1.1		7.1		R <sub>D</sub> = 1kΩ
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	1.0	2.0	6.3	0.8		6.5		S <sub>1</sub> = GND for t <sub>PHZ</sub>
		2.30 ≤ V <sub>CC</sub> < 2.70	0.8	1.5	5.3	0.5		5.5		S <sub>1</sub> = V <sub>I</sub> for t <sub>PLZ</sub>
	2.70 ≤ V <sub>CC</sub> ≤ 3.60	0.5	1.0	5.0	0.4	5.2	V <sub>I</sub> = 2 x V <sub>CC</sub>			
C <sub>IN</sub>	Input Capacitance	0		2.0			pF			
C <sub>OUT</sub>	Output Capacitance	0		4.5			pF			
C <sub>PD</sub>	Power Dissipation Capacitance	0.90 to 3.60		12.0			pF	V <sub>I</sub> = 0V or V <sub>CC</sub> f = 10 MHz		

## AC Loading and Waveforms

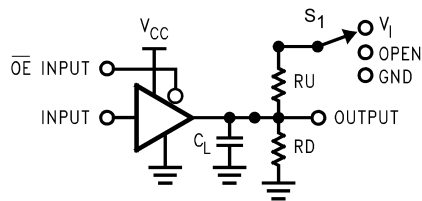


FIGURE 1. AC Test Circuit

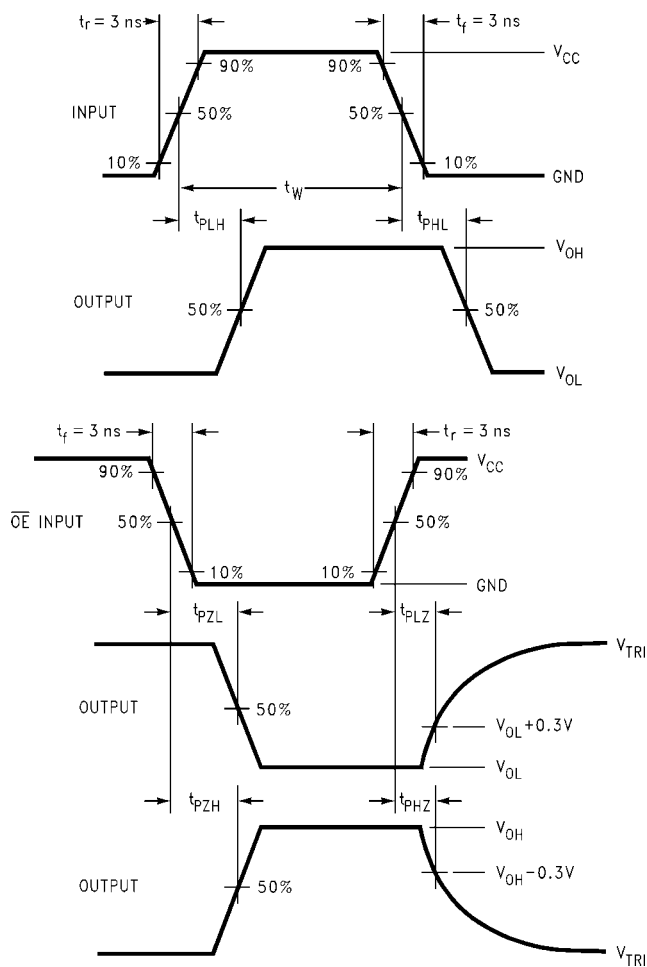


FIGURE 2. AC Waveforms

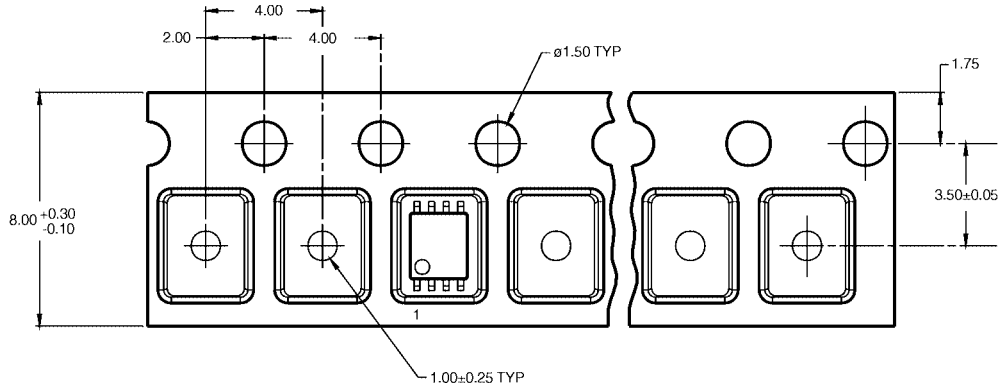
Symbol	$V_{CC}$					
	$3.3V \pm 0.3V$	$2.5V \pm 0.2V$	$1.8V \pm 0.15V$	$1.5V \pm 0.10V$	$1.2V \pm 0.10V$	$0.9V$
$V_{mi}$	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_{mo}$	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

### 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

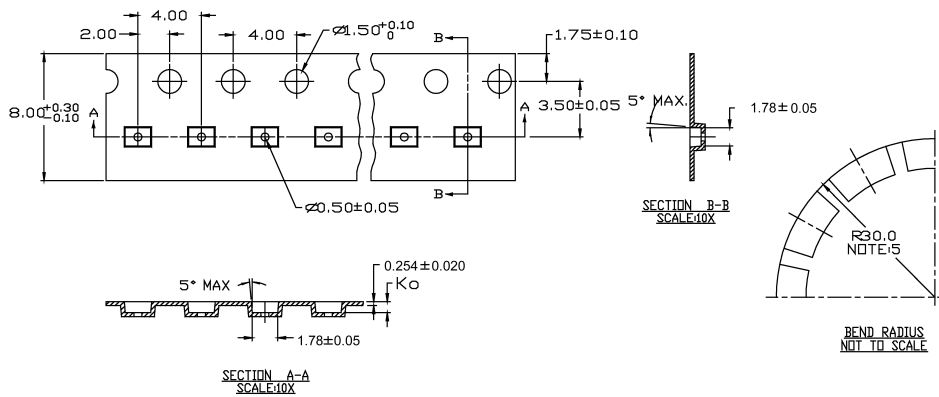
**TAPE DIMENSIONS** inches (millimeters)



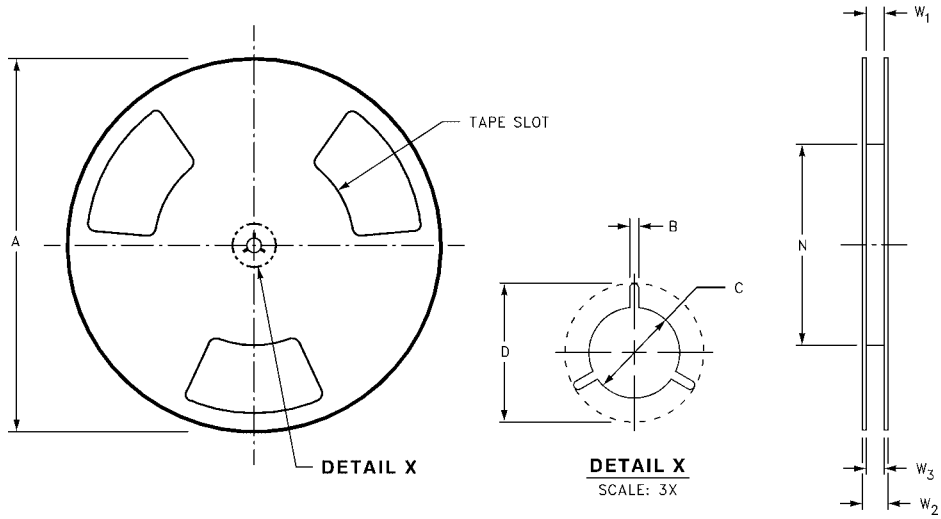
**TAPE FORMAT for MicroPak**

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)

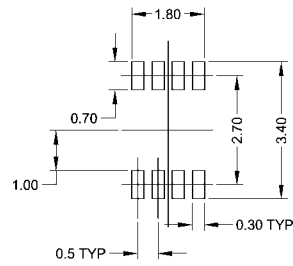
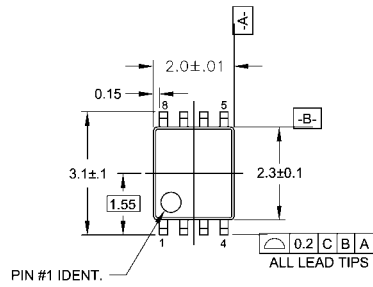


**Tape and Reel Specification** (Continued)  
**REEL DIMENSIONS** inches (millimeters)

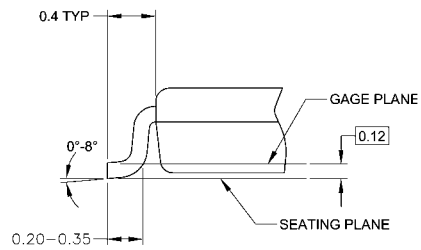
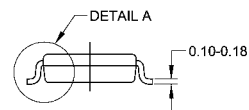
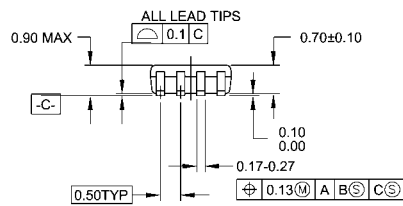


Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/-0.000 (8.40 + 1.50/-0.00)	0.567 (14.40)	W1 + 0.078/-0.039 (W1 + 2.00/-1.00)

**Physical Dimensions** inches (millimeters) unless otherwise noted



**LAND PATTERN RECOMMENDATION**



**DETAIL A**

**NOTES:**

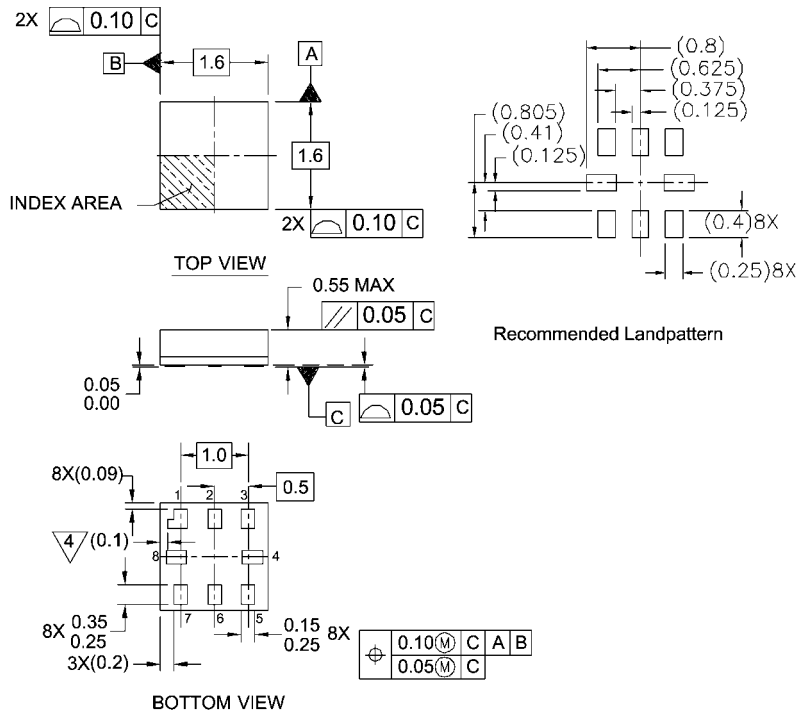
- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

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**

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

[www.fairchildsemi.com](http://www.fairchildsemi.com)