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March 2003 Revised December 2013

## **NC7WV125**

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

### **General Description**

The NC7WV125 is a dual buffer with 3-STATE output from Fairchild's Ultra Low Power-A (ULP-A) Series of TinyLogic®. ULP-A is id eal 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  $V_{\rm CC})$  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 ach ieve high-speed operation while maintaining low CMOS power dissipation.

#### **Features**

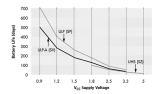
- 0.9V to 3.6V V<sub>CC</sub> supply operation
- 3.6V over-voltage tolerant I/O's at V<sub>CC</sub> from 0.9V to 3.6V
- Extremely High Speed t<sub>PD</sub>
  - 1.0 ns typ for 2.7V to 3.6V  $V_{\rm CC}$
  - 2.0 ns typ for 2.3V to 2.7V  $\rm V_{\rm CC}$
  - 3.0 ns typ for 1.65V to 1.95V  $V_{CC}$
  - 3.5 ns typ for 1.4V to 1.6V  $V_{CC}$
  - 6.0 ns typ for 1.1V to 1.3V  $\ensuremath{V_{CC}}$
  - 13 ns typ for 0.9V  $\rm V_{\rm CC}$
- Power-Off high impedance inputs and outputs
- High Static Drive (I<sub>OH</sub>/I<sub>OL</sub>)
  - ±24 mA @ 3.00V V<sub>CC</sub>
  - ±18 mA @ 2.30V V<sub>CC</sub>
  - $\pm 6$  mA  $\,$  @ 1.65V  $V_{CC}$
- $\pm$ 4 mA @ 1.4V V<sub>CC</sub>
- $\pm 2$  mA @ 1.1V V<sub>CC</sub>
- ±0.1 mA @ 0.9V V<sub>CC</sub>
- Uses proprietary Quiet Series™ noise/EMI reduction circuitry
- Ultra small MicroPak™ Pb-Free package
- Ultra low dynamic power

# **Ordering Code:**

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

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

# Battery Life vs. V<sub>CC</sub> Supply Voltage



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

Battery Life = (V<sub>battery</sub> \*I<sub>battery</sub>\*.9)/(P<sub>device</sub>)/24hrs/day

Where, P<sub>device</sub> =  $(I_{CC} * V_{CC}) + (C_{PD} + C_L) * V_{CC}^2 * f$ 

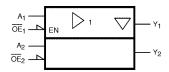
Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAH and derated 90% and device frequency at 10MHz, with  $C_L$  = 15 pF load

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

# **Logic Symbol**

#### IEEE/IEC



# **Pin Descriptions**

Pin Names	Description
ŌE <sub>n</sub>	Enable Inputs for 3-STATE Outputs
A <sub>n</sub>	Input
Y <sub>n</sub>	3-STATE Outputs

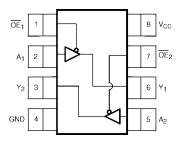
# **Function Table**

Inp	Output	
ŌĒ	A <sub>n</sub>	Y <sub>n</sub>
L	L	L
L	Н	Н
Н	L	Z
Н	Н	Z

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

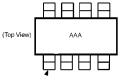
# **Connection Diagrams**

#### Pin Assignments for US8



(Top View)

#### Pin One Orientation Diagram

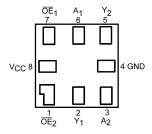


Pin One

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)

±24.0 mA

# **Absolute Maximum Ratings**(Note 1)

# Conditions (Note 3)

-65°C to +150°C

Supply Voltage (V <sub>CC</sub> )	-0.5V to +4.6V	Colluitions (Not
DC Input Voltage (V <sub>IN</sub> )	-0.5V to +4.6V	Supply Voltage
DC Output Voltage (V <sub>OUT</sub> )		Input Voltage (V <sub>IN</sub> )
HIGH or LOW State (Note 2)	–0.5V to $\ensuremath{V_{CC}}$ +0.5V	Output Voltage (V <sub>OUT</sub> )
$V_{CC} = 0V$	-0.5V to $+4.6V$	$V_{CC} = 0.0V$
DC Input Diode Current $(I_{IK}) V_{IN} < 0V$	±50 mA	HIGH or LOW State
DC Output Diode Current (I <sub>OK</sub> )		Output Current in I <sub>OH</sub> /I
V <sub>OUT</sub> < 0V	−50 mA	$V_{CC} = 3.0V \text{ to } 3.6V$
$V_{OUT} > V_{CC}$	+50 mA	$V_{CC} = 2.3V \text{ to } 2.7V$
DC Output Source/Sink Current (I <sub>OH</sub> /I <sub>OL</sub> )	$\pm$ 50 mA	$V_{CC} = 1.65V \text{ to } 1.95V$
DC V <sub>CC</sub> or Ground Current per		$V_{CC} = 1.4V \text{ to } 1.6V$
Supply Pin (I <sub>CC</sub> or Ground)	$\pm$ 50 mA	$V_{CC} = 1.1V \text{ to } 1.3V$

0.9V to 3.6V oltage 0V to 3.6V age (V<sub>IN</sub>)

oltage (V<sub>OUT</sub>) 0V to 3.6V V0.0 or LOW State 0V to  $V_{CC}$ 

**Recommended Operating** 

urrent in I<sub>OH</sub>/I<sub>OL</sub>

2.3V to 2.7V  $\pm 18.0~\text{mA}$ .65V to 1.95V  $\pm 6.0~\text{mA}$ 1.4V to 1.6V ±4.0 mA  $V_{CC} = 1.1V \text{ to } 1.3V$ ±2.0 mA

 $V_{CC} = 0.9V$ ±0.1 mA Free Air Operating Temperature (T<sub>A</sub>) -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

Note 1: 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.

Note 2:  $I_O$  Absolute Maximum Rating must be observed.

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

## **DC Electrical Characteristics**

Storage Temperature Range (T<sub>STG</sub>)

Symbol	Parameter	V <sub>CC</sub>	<b>T</b> <sub>A</sub> = -	+25°C	$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		Units	Conditions
Cyllibol	i arameter	(V)	Min	Max	Min	Max	Onits	Conditions
V <sub>IH</sub>	HIGH Level	0.90	0.65 x V <sub>CC</sub>		0.65 x V <sub>CC</sub>			
	Input Voltage	$1.10 \le V_{CC} \le 1.30$	0.65 x V <sub>CC</sub>		0.65 x V <sub>CC</sub>			
		$1.40 \le V_{CC} \le 1.60$	0.65 x V <sub>CC</sub>		0.65 x V <sub>CC</sub>		V	
		$1.65 \leq V_{CC} \leq 1.95$	0.65 x V <sub>CC</sub>		0.65 x V <sub>CC</sub>		v	
		$2.30 \leq V_{CC} < 2.70$	1.6		1.6			
		$2.70 \leq V_{CC} \leq 3.60$	2.0		2.0			
V <sub>IL</sub>	LOW Level	0.90		0.35 x V <sub>CC</sub>		0.35 x V <sub>CC</sub>		
	Input Voltage	$1.10 \leq V_{CC} \leq 1.30$		$0.35 \times V_{\rm CC}$		$0.35 \times V_{\rm CC}$		
		$1.40 \le V_{CC} \le 1.60$		$0.35 \times V_{\rm CC}$		$0.35 \times V_{\rm CC}$	V	
		$1.65 \leq V_{CC} \leq 1.95$		$0.35 \times V_{\rm CC}$		$0.35 \times V_{\rm CC}$	v	
		$2.30 \leq V_{CC} < 2.70$		0.7		0.7		
		$2.70 \leq V_{CC} \leq 3.60$		8.0		8.0		
V <sub>OH</sub>	HIGH Level	0.90	V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1			
	Output Voltage	$1.10 \leq V_{CC} \leq 1.30$	V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1			
		$1.40 \le V_{CC} \le 1.60$	V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2			$I_{OH} = -100  \mu A$
		$1.65 \le V_{CC} \le 1.95$	V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2			ΙΟΗ = -100 μΑ
		$2.30 \leq V_{CC} < 2.70$	V <sub>CC</sub> - 0.2		$V_{CC} - 0.2$			
		$2.70 \leq V_{CC} \leq 3.60$	V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2			
		$1.10 \le V_{CC} \le 1.30$	0.75 x V <sub>CC</sub>		0.75 x V <sub>CC</sub>			$I_{OH} = -2.0 \text{ mA}$
		$1.40 \le V_{CC} \le 1.60$	0.75 x V <sub>CC</sub>		0.75 x V <sub>CC</sub>		V	$I_{OH} = -4.0 \text{ mA}$
		$1.65 \le V_{CC} \le 1.95$	1.25		1.25			$I_{OH} = -6.0 \text{ mA}$
		$2.30 \le V_{CC} < 2.70$	2.0		2.0			IOH = -0.0 IIIA
		$2.30 \le V_{CC} < 2.70$	1.8		1.8			$I_{OH} = -12.0 \text{ mA}$
		$2.70 \leq V_{CC} \leq 3.60$	2.2		2.2			10H = 12.0111/
		$2.30 \le V_{CC} < 2.70$	1.7		1.7			I <sub>OH</sub> = -18.0 mA
		$2.70 \leq V_{CC} \leq 3.60$	2.4		2.4			
1		$2.70 \le V_{CC} \le 3.60$	2.2		2.2			$I_{OH} = -24.0 \text{ mA}$

# DC Electrical Characteristics (Continued)

Cumbal	Parameter	V <sub>CC</sub>	T <sub>A</sub> =	+25°C	T <sub>A</sub> = -40°	°C to +85°C	Units	Conditions	
Symbol	Parameter	(V)	Min	Max	Min	Max	Units	Conditions	
V <sub>OL</sub>	LOW Level	0.90		0.1		0.1			
	Output Voltage	$1.10 \le V_{CC} \le 1.30$		0.1		0.1			
		$1.40 \le V_{CC} \le 1.60$		0.2		0.2		1 - 100 4	
		$1.65 \le V_{CC} \le 1.95$		0.2		0.2		$I_{OL} = 100  \mu A$	
		$2.30 \le V_{CC} < 2.70$		0.2		0.2			
		$2.70 \leq V_{CC} \leq 3.60$		0.2		0.2			
		$1.10 \le V_{CC} \le 1.30$		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	V	I <sub>OL</sub> = 2.0 mA	
		$1.40 \le V_{CC} \le 1.60$		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	v	I <sub>OL</sub> = 4.0 mA	
		$1.65 \le V_{CC} \le 1.95$		0.3		0.3		I <sub>OL</sub> = 6.0 mA	
		$2.30 \le V_{CC} < 2.70$		0.4		0.4		I <sub>OL</sub> = 12.0 mA	
		$2.70 \leq V_{CC} \leq 3.60$		0.4		0.4		I <sub>OL</sub> = 12.0 IIIA	
		$2.30 \le V_{CC} < 2.70$		0.6		0.6		I <sub>OL</sub> = 18.0 mA	
		$2.70 \leq V_{CC} \leq 3.60$		0.4		0.4		10L = 10.0 111A	
		$2.70 \le V_{CC} \le 3.60$		0.55		0.55		I <sub>OL</sub> = 24.0 mA	
I <sub>IN</sub>	Input Leakage Current	0.90 to 3.60		±0.1		±0.5	μΑ	$0 \le V_I \le 3.6V$	
l <sub>oz</sub>	3-STATE Output Leakage	0.90 to 3.60		±0.5		±0.5	μΑ	$V_I = V_{IH}$ or $V_{IL}$	
								$0 \le V_O \le 3.6V$	
l <sub>OFF</sub>	Power Off Leakage Current	0		0.5		0.5	μΑ	$0 \le (V_I, V_O) \le 3.6$	
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60		0.9		0.9	μА	$V_I = V_{CC}$ or GND	
		0.90 to 3.60				±0.9	μΛ	$V_{CC} \le V_I \le 3.6V$	

# **AC Electrical Characteristics**

Symbol	Parameter	V <sub>cc</sub>		T <sub>A</sub> = +25°0	С	T <sub>A</sub> = -40°0	$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		Conditions	Figure
Syllibol		(V)	Min	Тур	Max	Min	Max	Units	Conditions	Number
t <sub>PHL</sub>	Propagation Delay	0.90		13.0					$C_L = 15 \text{ pF}, R_L = 1 \text{ M}\Omega$	
t <sub>PLH</sub>		$1.10 \le V_{CC} \le 1.30$	3.0	6.0	9.8	1.9	14.9		$C_L = 15 \text{ pF}, R_L = 2 \text{ k}\Omega$	1
		$1.40 \leq V_{CC} \leq 1.60$	1.0	3.5	5.3	0.8	5.7	ns		Figures
		$1.65 \leq V_{CC} \leq 1.95$	0.9	3.0	4.6	0.8	4.9	115	C <sub>L</sub> = 30 pF	1, 2
		$2.30 \leq V_{CC} < 2.70$	8.0	2.0	3.3	0.7	3.5		$R_L = 500\Omega$	
		$2.70 \leq V_{CC} \leq 3.60$	0.5	1.0	3.1	0.5	3.3			
t <sub>PZH</sub>	Output	0.90		14.0					C <sub>L</sub> = 30 pF	
$t_{PZL}$	Enable Time	$1.10 \le V_{CC} \le 1.30$	3.0	6.0	9.7	2.0	16.4		$R_U = 1k\Omega$	
		$1.40 \leq V_{CC} \leq 1.60$	1.2	4.0	6.0	1.0	7.5	ns	$R_D = 1k\Omega$	Figures
		$1.65 \leq V_{CC} \leq 1.95$	1.0	3.0	4.7	0.9	5.2	115	$S_1 = GND \text{ for } t_{PZH}$	1, 2
		$2.30 \le V_{CC} < 2.70$	8.0	2.0	3.5	0.7	3.7		$S_1 = V_I$ for $t_{PZL}$	
		$2.70 \leq V_{CC} \leq 3.60$	0.5	1.2	3.1	0.4	3.4		$V_I = 2 \times V_{CC}$	
t <sub>PHZ</sub>	Output	0.90		14.0					C <sub>L</sub> = 30 pF	
$t_{PLZ}$	Disable Time	$1.10 \le V_{CC} \le 1.30$	2.0	5.0	9.5	2.0	14.0		$R_U = 1k\Omega$	
		$1.40 \leq V_{CC} \leq 1.60$	1.2	3.0	5.9	1.1	7.1	ns	$R_D = 1k\Omega$	Figures
		$1.65 \le V_{CC} \le 1.95$	1.0	2.0	6.3	0.8	6.5	113	$S_1 = GND \text{ for } t_{PHZ}$	1, 2
		$2.30 \le V_{CC} < 2.70$	8.0	1.5	5.3	0.5	5.5		$S_1 = V_I \text{ for } t_{PLZ}$	
		$2.70 \leq V_{CC} \leq 3.60$	0.5	1.0	5.0	0.4	5.2		$V_I = 2 \times V_{CC}$	
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**

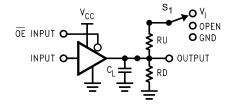
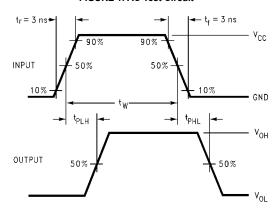


FIGURE 1. AC Test Circuit



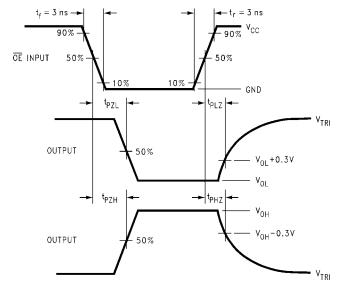
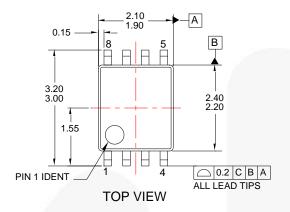
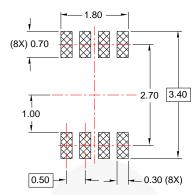


FIGURE 2. AC Waveforms

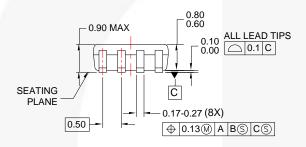
Symbol			V	CC		
<b> </b>	$3.3V \pm 0.3V$	$\textbf{2.5V} \pm \textbf{0.2V}$	$\textbf{1.8V} \pm \textbf{0.15V}$	1.5V ± 0.10V	1.2V ± 0.10V	0.9V
V <sub>mi</sub>	1.5V	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2
V <sub>mo</sub>	1.5V	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2

# **Physical Dimensions**





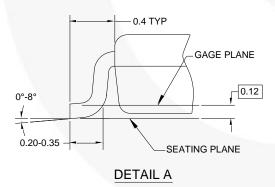




SIDE VIEW

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



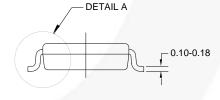


Figure 6. 8-Lead, US8, JEDEC MO-187, 2.3 mm Wide

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Definition of Terms		
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