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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_{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

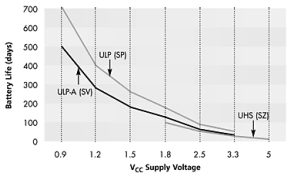
- 0.9V to 3.6V V_{CC} supply operation
- 3.6V over-voltage tolerant I/O's at V_{CC} from 0.9V to 3.6V
- Extremely High Speed t_{PD}
  - 1.0 ns typ for 2.7V to 3.6V V_{CC}
  - 2.0 ns typ for 2.3V to 2.7V V_{CC}
  - 3.0 ns typ for 1.65V to 1.95V V_{CC}
  - 3.5 ns typ for 1.4V to 1.6V V_{CC}
  - 6.0 ns 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 proprietary 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

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

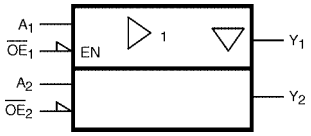
Battery Life vs. V_{CC} Supply Voltage



TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.
Battery Life = $(V_{battery} * I_{battery} * .9)/(P_{device})/24$hrs/day
Where, $P_{device} = (I_{CC} * V_{CC}) + (C_{PD} + C_L) * V_{CC}^2 * f$
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

Logic Symbol

IEEE/IEC



Pin Descriptions

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

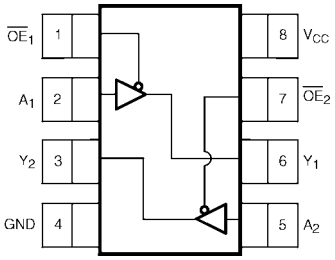
Function Table

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

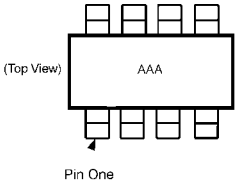
Connection Diagrams

Pin Assignments for US8



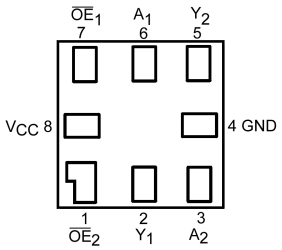
(Top View)

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)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_{IN})	−0.5V to +4.6V
DC Output Voltage (V_{OUT})	
HIGH or LOW State (Note 2)	−0.5V to V_{CC} +0.5V
V_{CC} = 0V	−0.5V to +4.6V
DC Input Diode Current (I_{IK}) V_{IN} < 0V	±50 mA
DC Output Diode Current (I_{OK})	
V_{OUT} < 0V	−50 mA
V_{OUT} > V_{CC}	+50 mA
DC Output Source/Sink Current (I_{OH}/I_{OL})	± 50 mA
DC V_{CC} or Ground Current per	
Supply Pin (I_{CC} or Ground)	± 50 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C

Recommended Operating Conditions (Note 3)

Supply Voltage	0.9V to 3.6V
Input Voltage (V_{IN})	0V to 3.6V
Output Voltage (V_{OUT})	
V_{CC} = 0.0V	0V to 3.6V
HIGH or LOW State	0V to V_{CC}
Output Current in I_{OH}/I_{OL}	
V_{CC} = 3.0V to 3.6V	±24.0 mA
V_{CC} = 2.3V to 2.7V	±18.0 mA
V_{CC} = 1.65V to 1.95V	±6.0 mA
V_{CC} = 1.4V to 1.6V	±4.0 mA
V_{CC} = 1.1V to 1.3V	±2.0 mA
V_{CC} = 0.9V	±0.1 mA
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

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

Symbol	Parameter	V_{CC} (V)	T_A = +25°C Min	T_A = +25°C Max	T_A = −40°C to +85°C Min	T_A = −40°C to +85°C Max	Units	Conditions
V_{IH}	HIGH Level Input Voltage	0.90	0.65 x V_{CC}		0.65 x V_{CC}		V	
		1.10 ≤ V_{CC} ≤ 1.30	0.65 x V_{CC}		0.65 x V_{CC}			
		1.40 ≤ V_{CC} ≤ 1.60	0.65 x V_{CC}		0.65 x V_{CC}			
		1.65 ≤ V_{CC} ≤ 1.95	0.65 x V_{CC}		0.65 x V_{CC}			
		2.30 ≤ V_{CC} < 2.70	1.6		1.6			
		2.70 ≤ V_{CC} ≤ 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 ≤ V_{CC} ≤ 1.30		0.35 x V_{CC}		0.35 x V_{CC}		
		1.40 ≤ V_{CC} ≤ 1.60		0.35 x V_{CC}		0.35 x V_{CC}		
		1.65 ≤ V_{CC} ≤ 1.95		0.35 x V_{CC}		0.35 x V_{CC}		
		2.30 ≤ V_{CC} < 2.70		0.7		0.7		
		2.70 ≤ V_{CC} ≤ 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 μA
		1.10 ≤ V_{CC} ≤ 1.30	V_{CC} − 0.1		V_{CC} − 0.1			
		1.40 ≤ V_{CC} ≤ 1.60	V_{CC} − 0.2		V_{CC} − 0.2			
		1.65 ≤ V_{CC} ≤ 1.95	V_{CC} − 0.2		V_{CC} − 0.2			
		2.30 ≤ V_{CC} < 2.70	V_{CC} − 0.2		V_{CC} − 0.2			
		2.70 ≤ V_{CC} ≤ 3.60	V_{CC} − 0.2		V_{CC} − 0.2			
		1.10 ≤ V_{CC} ≤ 1.30	0.75 x V_{CC}		0.75 x V_{CC}			I_{OH} = −2.0 mA
		1.40 ≤ V_{CC} ≤ 1.60	0.75 x V_{CC}		0.75 x V_{CC}			I_{OH} = −4.0 mA
		1.65 ≤ V_{CC} ≤ 1.95	1.25		1.25			I_{OH} = −6.0 mA
		2.30 ≤ V_{CC} < 2.70	2.0		2.0			
		2.30 ≤ V_{CC} < 2.70	1.8		1.8			I_{OH} = −12.0 mA
		2.70 ≤ V_{CC} ≤ 3.60	2.2		2.2			
		2.30 ≤ V_{CC} < 2.70	1.7		1.7			I_{OH} = −18.0 mA
		2.70 ≤ V_{CC} ≤ 3.60	2.4		2.4			
		2.70 ≤ V_{CC} ≤ 3.60	2.2		2.2			I_{OH} = −24.0 mA

DC Electrical Characteristics (Continued)

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$		$T_A = -40°C$ to $+85°C$		Units	Conditions
			Min	Max	Min	Max		
V_{OL}	LOW Level Output Voltage	0.90		0.1		0.1	V	I_{OL} = 100 μA
		$1.10 \le V_{CC} \le 1.30$		0.1		0.1		
		$1.40 \le V_{CC} \le 1.60$		0.2		0.2		
		$1.65 \le V_{CC} \le 1.95$		0.2		0.2		
		$2.30 \le V_{CC} < 2.70$		0.2		0.2		
		$2.70 \le V_{CC} \le 3.60$		0.2		0.2		
		$1.10 \le V_{CC} \le 1.30$		0.25 x V_{CC}		0.25 x V_{CC}		I_{OL} = 2.0 mA
		$1.40 \le V_{CC} \le 1.60$		0.25 x V_{CC}		0.25 x V_{CC}		I_{OL} = 4.0 mA
		$1.65 \le V_{CC} \le 1.95$		0.3		0.3		I_{OL} = 6.0 mA
		$2.30 \le V_{CC} < 2.70$		0.4		0.4		I_{OL} = 12.0 mA
		$2.70 \le V_{CC} \le 3.60$		0.4		0.4		
		$2.30 \le V_{CC} < 2.70$		0.6		0.6		I_{OL} = 18.0 mA
		$2.70 \le V_{CC} \le 3.60$		0.4		0.4		
		$2.70 \le V_{CC} \le 3.60$		0.55		0.55		I_{OL} = 24.0 mA
I_{IN}	Input Leakage Current	0.90 to 3.60		±0.1		±0.5	μA	$0 \le V_I \le 3.6V$
I_{OZ}	3-STATE Output Leakage	0.90 to 3.60		±0.5		±0.5	μA	$V_I = V_{IH}$ or V_{IL} $0 \le V_O \le 3.6V$
I_{OFF}	Power Off Leakage Current	0		0.5		0.5	μA	$0 \le (V_I, V_O) \le 3.6V$
I_{CC}	Quiescent Supply Current	0.90 to 3.60		0.9		0.9	μA	$V_I = V_{CC}$ or GND
		0.90 to 3.60				±0.9		$V_{CC} \le V_I \le 3.6V$

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_{PHL}	Propagation Delay	0.90		13.0				ns	C_L = 15 pF, R_L = 1 MΩ	Figures 1, 2
t_{PLH}		$1.10 \le V_{CC} \le 1.30$	3.0	6.0	9.8	1.9	14.9		C_L = 15 pF, R_L = 2 kΩ	
		$1.40 \le V_{CC} \le 1.60$	1.0	3.5	5.3	0.8	5.7			
		$1.65 \le V_{CC} \le 1.95$	0.9	3.0	4.6	0.8	4.9		C_L = 30 pF	
		$2.30 \le V_{CC} < 2.70$	0.8	2.0	3.3	0.7	3.5		R_L = 500Ω	
		$2.70 \le V_{CC} \le 3.60$	0.5	1.0	3.1	0.5	3.3			
t_{PZH}	Output	0.90		14.0				ns	C_L = 30 pF	Figures 1, 2
t_{PZL}	Enable Time	$1.10 \le V_{CC} \le 1.30$	3.0	6.0	9.7	2.0	16.4		R_U = 1kΩ	
		$1.40 \le V_{CC} \le 1.60$	1.2	4.0	6.0	1.0	7.5		R_D = 1kΩ	
		$1.65 \le V_{CC} \le 1.95$	1.0	3.0	4.7	0.9	5.2		S_1 = GND for t_{PZH}	
		$2.30 \le V_{CC} < 2.70$	0.8	2.0	3.5	0.7	3.7		$S_1 = V_I$ for t_{PZL}	
		$2.70 \le V_{CC} \le 3.60$	0.5	1.2	3.1	0.4	3.4		V_I = 2 x V_{CC}	
t_{PHZ}	Output	0.90		14.0				ns	C_L = 30 pF	Figures 1, 2
t_{PLZ}	Disable Time	$1.10 \le V_{CC} \le 1.30$	2.0	5.0	9.5	2.0	14.0		R_U = 1kΩ	
		$1.40 \le V_{CC} \le 1.60$	1.2	3.0	5.9	1.1	7.1		R_D = 1kΩ	
		$1.65 \le V_{CC} \le 1.95$	1.0	2.0	6.3	0.8	6.5		S_1 = GND for t_{PHZ}	
		$2.30 \le V_{CC} < 2.70$	0.8	1.5	5.3	0.5	5.5		$S_1 = V_I$ for t_{PLZ}	
		$2.70 \le V_{CC} \le 3.60$	0.5	1.0	5.0	0.4	5.2		V_I = 2 x V_{CC}	
C_{IN}	Input Capacitance	0		2.0				pF		
C_{OUT}	Output Capacitance	0		4.5				pF		
C_{PD}	Power Dissipation Capacitance	0.90 to 3.60		12.0				pF	V_I = 0V or V_{CC} f = 10 MHz	

AC Loading and Waveforms

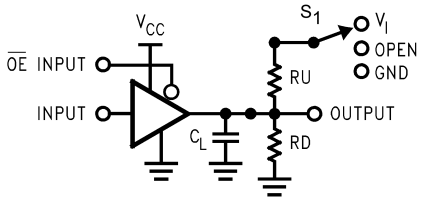


FIGURE 1. AC Test Circuit

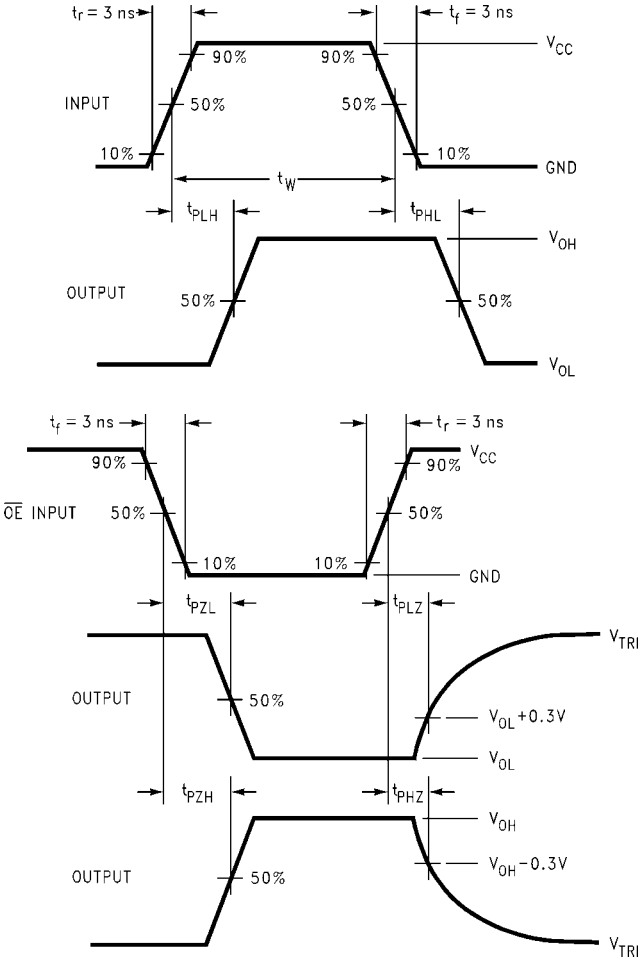
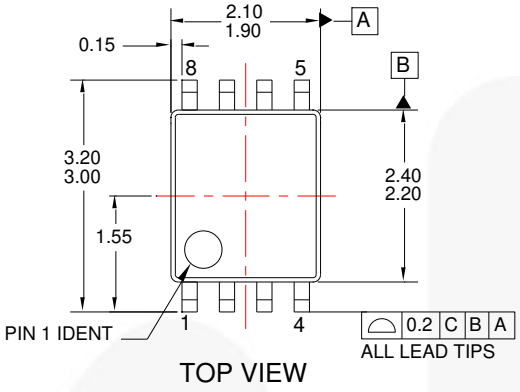


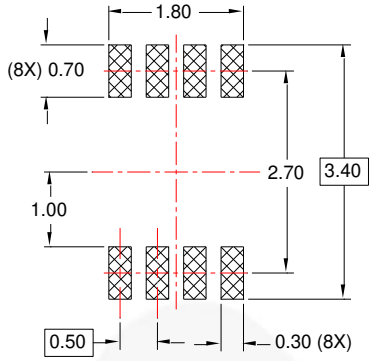
FIGURE 2. AC Waveforms

Symbol	V_{CC}					
	3.3V ± 0.3V	**2.5V ± 0.2V**	**1.8V ± 0.15V**	**1.5V ± 0.10V**	**1.2V ± 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	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

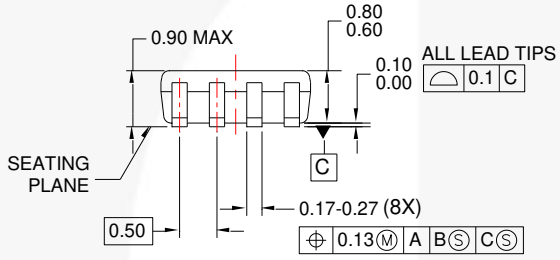
Physical Dimensions



TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW

NOTES:

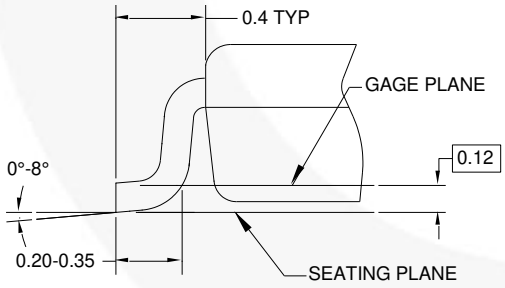
A. CONFORMS TO JEDEC REGISTRATION MO-187

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



DETAIL A

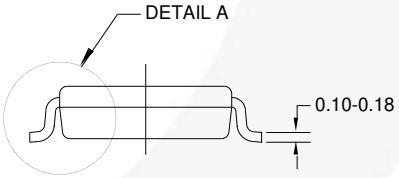


Figure 6. 8-Lead, US8, JEDEC MO-187, 2.3 mm Wide

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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.

ANTI-COUNTERFEITING POLICY

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Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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

Rev. I66

PUBLICATION ORDERING INFORMATION

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For additional information, please contact your local Sales Representative