

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 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

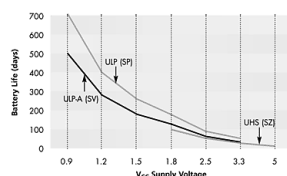
- 0.9V to 3.6V V_{CC} supply operation
- 3.6V over-voltage tolerant I/O's at V_{CC} from 0.9V to 3.6V
- Extremely High Speed t_{PD}
 - 1.0 ns typ for 2.7V to 3.6V V_{CC}
 - 2.0 ns typ for 2.3V to 2.7V V_{CC}
 - 3.0 ns typ for 1.65V to 1.95V V_{CC}
 - 3.5 ns typ for 1.4V to 1.6V V_{CC}
 - 6.0 ns typ for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

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

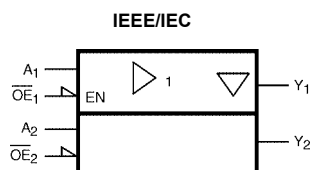
$$\text{Where, } P_{\text{device}} = (I_{CC} \cdot V_{CC}) + (C_{PD} + C_L) \cdot V_{CC}^2 \cdot f$$

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

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Logic Symbol



Pin Descriptions

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

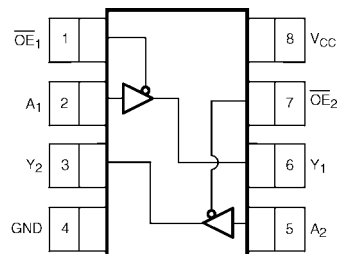
Function Table

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

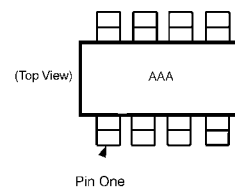
Connection Diagrams

Pin Assignments for US8



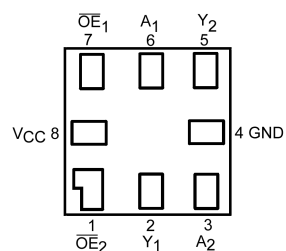
(Top View)

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)

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)	$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		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	$I_{OH} = -100 \mu\text{A}$
		$1.10 \leq V_{CC} \leq 1.30$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$1.40 \leq V_{CC} \leq 1.60$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$1.65 \leq V_{CC} \leq 1.95$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$2.30 \leq V_{CC} < 2.70$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$2.70 \leq V_{CC} \leq 3.60$	$V_{CC} - 0.2$		$V_{CC} - 0.2$			
		$1.10 \leq V_{CC} \leq 1.30$	0.75 x V_{CC}		0.75 x V_{CC}			$I_{OH} = -2.0$ mA
		$1.40 \leq V_{CC} \leq 1.60$	0.75 x V_{CC}		0.75 x V_{CC}			$I_{OH} = -4.0$ mA
		$1.65 \leq V_{CC} \leq 1.95$	1.25		1.25			$I_{OH} = -6.0$ mA
		$2.30 \leq V_{CC} < 2.70$	2.0		2.0			
		$2.30 \leq V_{CC} < 2.70$	1.8		1.8			$I_{OH} = -12.0$ mA
		$2.70 \leq V_{CC} \leq 3.60$	2.2		2.2			
		$2.30 \leq V_{CC} < 2.70$	1.7		1.7			$I_{OH} = -18.0$ mA
		$2.70 \leq V_{CC} \leq 3.60$	2.4		2.4			
		$2.70 \leq V_{CC} \leq 3.60$	2.2		2.2			$I_{OH} = -24.0$ 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 ≤ V _{CC} ≤ 1.30		0.1		0.1		
		1.40 ≤ V _{CC} ≤ 1.60		0.2		0.2		
		1.65 ≤ V _{CC} ≤ 1.95		0.2		0.2		
		2.30 ≤ V _{CC} < 2.70		0.2		0.2		
		2.70 ≤ V _{CC} ≤ 3.60		0.2		0.2		
		1.10 ≤ V _{CC} ≤ 1.30	0.25 x V _{CC}		0.25 x V _{CC}			I _{OL} = 2.0 mA
		1.40 ≤ V _{CC} ≤ 1.60	0.25 x V _{CC}		0.25 x V _{CC}			I _{OL} = 4.0 mA
		1.65 ≤ V _{CC} ≤ 1.95	0.3		0.3			I _{OL} = 6.0 mA
		2.30 ≤ V _{CC} < 2.70	0.4		0.4			I _{OL} = 12.0 mA
		2.70 ≤ V _{CC} ≤ 3.60	0.4		0.4			
		2.30 ≤ V _{CC} < 2.70	0.6		0.6			I _{OL} = 18.0 mA
2.70 ≤ V _{CC} ≤ 3.60	0.4		0.4					
		2.70 ≤ V _{CC} ≤ 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 ≤ V _I ≤ 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 ≤ V _O ≤ 3.6V
I _{OFF}	Power Off Leakage Current	0		0.5		0.5	μA	0 ≤ (V _I , V _O) ≤ 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} ≤ V _I ≤ 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 ≤ V _{CC} ≤ 1.30	3.0	6.0	9.8	1.9	14.9		C _L = 15 pF, R _L = 2 kΩ	
		1.40 ≤ V _{CC} ≤ 1.60	1.0	3.5	5.3	0.8	5.7			
		1.65 ≤ V _{CC} ≤ 1.95	0.9	3.0	4.6	0.8	4.9		C _L = 30 pF	
		2.30 ≤ V _{CC} < 2.70	0.8	2.0	3.3	0.7	3.5		R _L = 500Ω	
		2.70 ≤ V _{CC} ≤ 3.60	0.5	1.0	3.1	0.5	3.3			
t _{PZH}	Output Enable Time	0.90	14.0					ns	C _L = 30 pF	Figures 1, 2
t _{PZL}		1.10 ≤ V _{CC} ≤ 1.30	3.0	6.0	9.7	2.0	16.4		R _U = 1kΩ	
		1.40 ≤ V _{CC} ≤ 1.60	1.2	4.0	6.0	1.0	7.5		R _D = 1kΩ	
		1.65 ≤ V _{CC} ≤ 1.95	1.0	3.0	4.7	0.9	5.2		S ₁ = GND for t _{PZH}	
		2.30 ≤ V _{CC} < 2.70	0.8	2.0	3.5	0.7	3.7		S ₁ = V _I for t _{PZL}	
		2.70 ≤ V _{CC} ≤ 3.60	0.5	1.2	3.1	0.4	3.4		V _I = 2 x V _{CC}	
t _{PHZ}	Output Disable Time	0.90	14.0					ns	C _L = 30 pF	Figures 1, 2
t _{PLZ}		1.10 ≤ V _{CC} ≤ 1.30	2.0	5.0	9.5	2.0	14.0		R _U = 1kΩ	
		1.40 ≤ V _{CC} ≤ 1.60	1.2	3.0	5.9	1.1	7.1		R _D = 1kΩ	
		1.65 ≤ V _{CC} ≤ 1.95	1.0	2.0	6.3	0.8	6.5		S ₁ = GND for t _{PHZ}	
		2.30 ≤ V _{CC} < 2.70	0.8	1.5	5.3	0.5	5.5		S ₁ = V _I for t _{PLZ}	
		2.70 ≤ V _{CC} ≤ 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

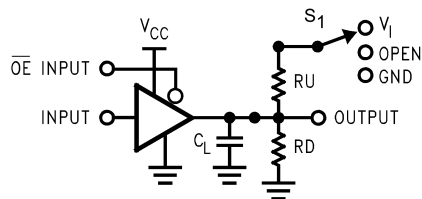


FIGURE 1. AC Test Circuit

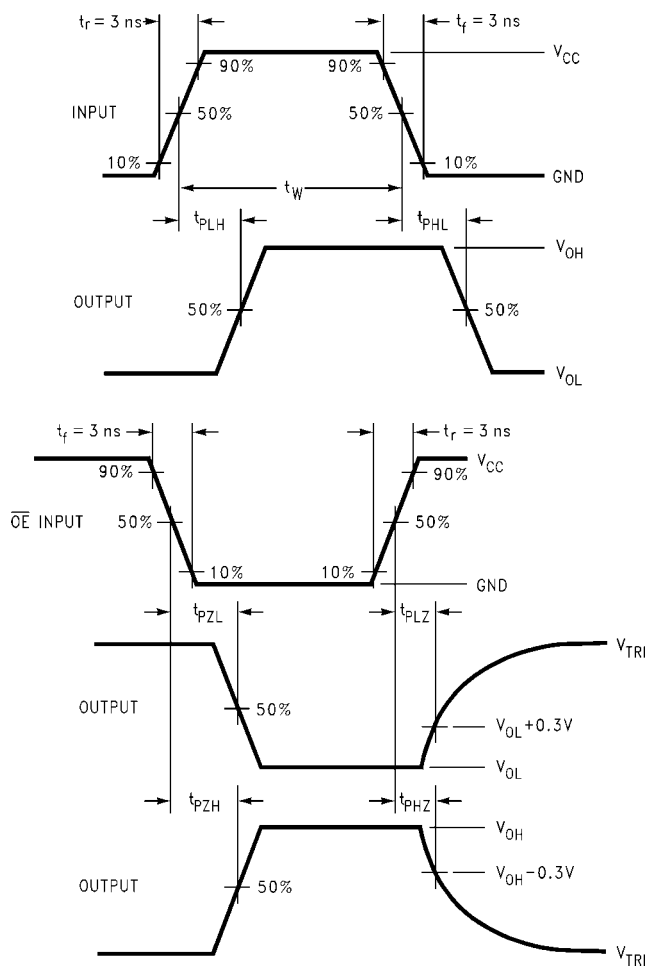


FIGURE 2. AC Waveforms

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



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