

NC7WZU04 TinyLogic® UHS Dual Unbuffered Inverter

General Description

The NC7WZU04 is a dual unbuffered inverter from Fairchild's Ultra High Speed Series of TinyLogic® in the space saving SC70 6-lead package. The special purpose unbuffered circuit design is intended for crystal oscillator or analog applications. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

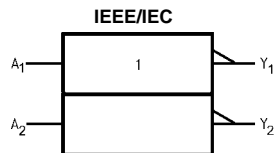
Features

- Space saving SC70 6-lead package
- Ultra small MicroPak™ leadless package
- Unbuffered for crystal oscillator and analog applications
- Balanced Output Drive: ±8 mA at 4.5V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Low Quiescent Power: I_{CC} < 1 μA at 5V V_{CC}, T_A = 25°C

Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WZU04P6X	MAA06A	ZU4	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WZU04L6X	MAC06A	B5	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Logic Symbol



Pin Descriptions

Pin Names	Description
A ₁ , A ₂	Data Inputs
Y ₁ , Y ₂	Output

Function Table

$$Y = \bar{A}$$

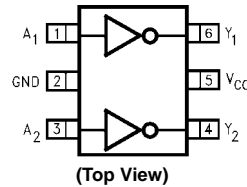
Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level
L = LOW Logic Level

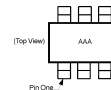
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Connection Diagrams

Pin Assignments for SC70



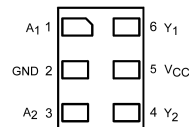
Pin One Orientation Diagram



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



NC7WZU04

Connection Diagrams (Continued)
(Top Thru View)

Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	-0.5V to +7V
DC Input Voltage (V_{IN})	-0.5V to +7V
DC Output Voltage (V_{OUT})	-0.5V to +7V
DC Input Diode Current (I_{IK})	
$V_{IN} < -0.5V$	-50 mA
DC Output Diode Current (I_{OK})	
$V_{OUT} < -0.5V$	-50 mA
$V_{OUT} > 0.5V, V_{CC} = GND$	+50 mA
DC Output Current (I_{OUT})	±50 mA
DC V_{CC}/GND Current (I_{CC}/I_{GND})	±100 mA
Storage Temperature (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	180 mW

Recommended Operating Conditions (Note 2)

Supply Voltage Operating (V_{CC})	1.8V 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})	0V to V_{CC}
Operating Temperature (T_A)	-40°C to +85°C
Thermal Resistance (θ_{JA})	350°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: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

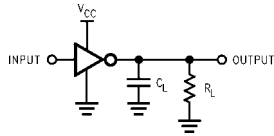
Symbol	Parameter	V_{CC} (V)	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions		
			Min	Typ	Max	Min	Max				
V_{IH}	HIGH Level Input Voltage	1.8 to 2.7	0.85 V_{CC}			0.85 V_{CC}		V			
		3.0 to 5.5	0.8 V_{CC}			0.8 V_{CC}					
V_{IL}	LOW Level Input Voltage	1.8 to 2.7	0.15 V_{CC}			0.15 V_{CC}		V			
		3.0 to 5.5	0.2 V_{CC}			0.2 V_{CC}					
V_{OH}	HIGH Level Output Voltage	1.65	1.55	1.65	1.55		V	$V_{IN} = V_{IL}$	$I_{OH} = -100 \mu\text{A}$		
		1.8	1.6	1.79	1.6						
		2.3	2.1	2.29	2.1						
		3.0	2.7	2.99	2.7						
		4.5	4.0	4.48	4.0						
			1.65	1.26	1.52	1.29		V	$V_{IN} = GND$	$I_{OH} = -2 \text{ mA}$ $I_{OH} = -2 \text{ mA}$ $I_{OH} = -4 \text{ mA}$ $I_{OH} = -6 \text{ mA}$ $I_{OH} = -8 \text{ mA}$	
			2.3	1.9	2.19	1.9					
			3.0	2.4	2.82	2.4					
			3.0	2.3	2.73	2.3					
			4.5	3.8	4.24	3.8					
V_{OL}	LOW Level Output Voltage	1.65	0.01			0.2		V	$V_{IN} = V_{IH}$	$I_{OL} = 100 \mu\text{A}$	
		1.8	0.01			0.2					
		2.3	0.01			0.2					
		3.0	0.01			0.3					
		4.5	0.01			0.5					
			1.65	0.10			0.24		V	$V_{IN} = V_{CC}$	$I_{OL} = 2 \text{ mA}$ $I_{OL} = 2 \text{ mA}$ $I_{OL} = 4 \text{ mA}$ $I_{OL} = 6 \text{ mA}$ $I_{OL} = 8 \text{ mA}$
			2.3	0.12			0.3				
			3.0	0.19			0.4				
			3.0	0.29			0.55				
			4.5	0.29			0.55				
I_{IN}	Input Leakage Current	0 to 5.5	±0.1			±1.0		μA	$V_{IN} = 5.5V, GND$		
I_{CC}	Quiescent Supply Current	1.65 to 5.5	1.0			10		μA	$V_{IN} = 5.5V, GND$		
I_{CCPEAK}	Peak Supply Current in Analog Operation	1.8	0.2					mA	$V_{OUT} = \text{Open}$ $V_{IN} = \text{Adjust for Peak } I_{CC} \text{ Current}$		
		2.5	2								
		3.3	5								
		5.0	15								

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	1.65	1.5	5.5	9.8	1.5	11.0	ns	C _L = 15 pF, R _L = 1 MΩ	Figures 1, 3
t _{PHL}		1.8	1.5	4.6	8.1	1.5	8.9			
		2.5 ± 0.2	1.2	3.3	5.7	1.2	6.3			
		3.3 ± 0.3	0.8	2.7	4.1	0.8	4.5			
		5.0 ± 0.5	0.5	2.2	3.3	0.5	3.6			
t _{PLH}	Propagation Delay	3.3 ± 0.3	1.2	4.0	6.4	1.2	7.0	ns	C _L = 50 pF, R _L = 500Ω	Figures 1, 3
t _{PHL}		5.0 ± 0.5	0.8	3.4	5.6	0.8	6.2			
C _{IN}	Input Capacitance	0	3					pF		
C _{PD}	Power Dissipation Capacitance	3.3	3.5					pF	(Note 3)	Figure 2
		5.0	5.5							

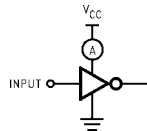
Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression:
 $I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CCstatic})$.

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



Application Note: When operating the NC7WZU04's unbuffered output stage in its linear range, as in oscillator applications, care must be taken to observe maximum power rating for the device and package. The high drive nature of the design of the output stage will result in substantial simultaneous conduction currents when the stage is in the linear region. See the I_{CCPEAK} specification on page 2.

Input = AC Waveform; t_r = t_f = 1.8 ns;
 PRR = variable; Duty Cycle = 50%

FIGURE 2. I_{CCD} Test Circuit

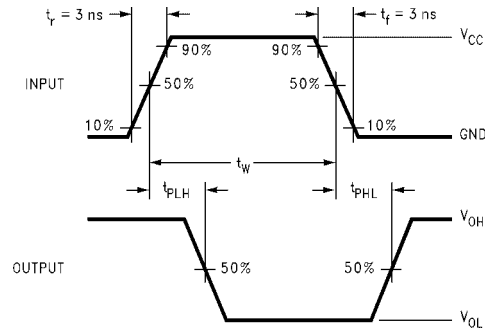


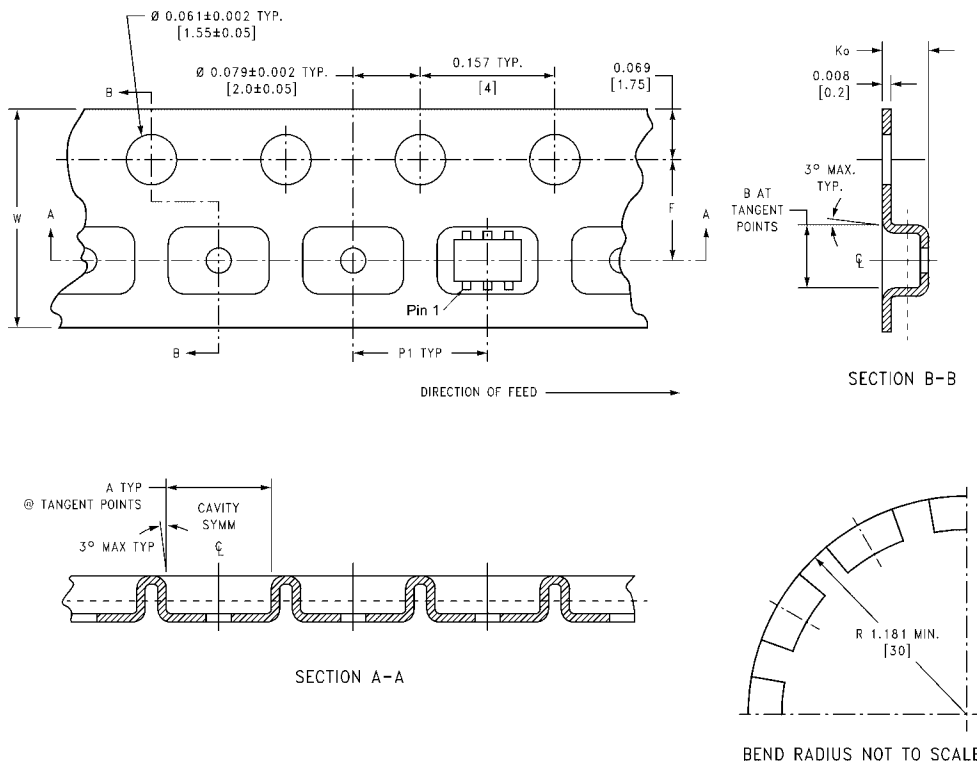
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT for SC70

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
P6X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)



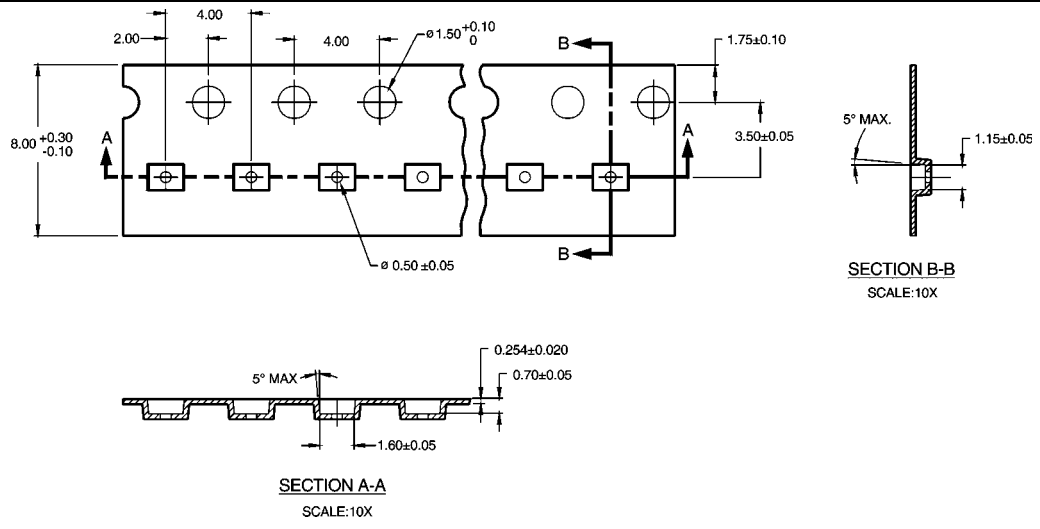
Package	Tape Size	DIM A	DIM B	DIM F	DIM K ₀	DIM P1	DIM W
SC70-6	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)

NC7WZU04

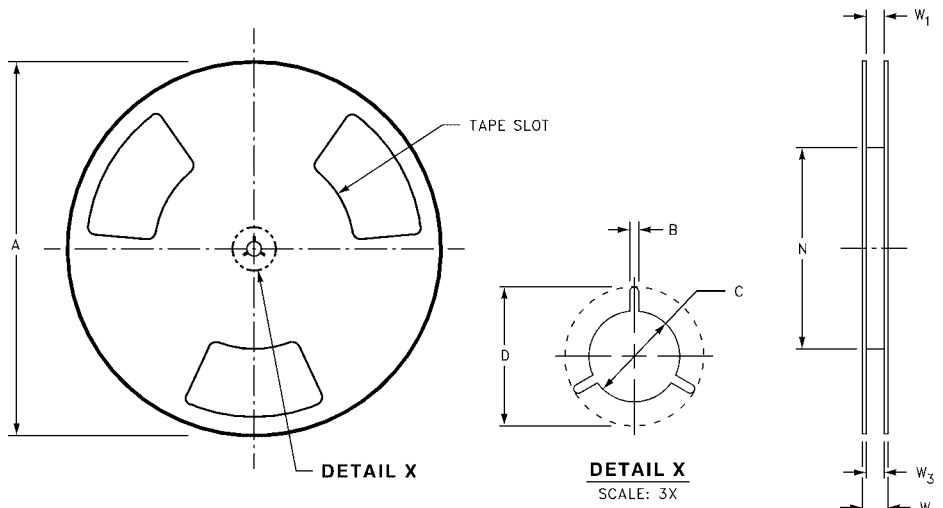
Tape and Reel Specification (Continued)

TAPE FORMAT for MicroPak

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L6X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

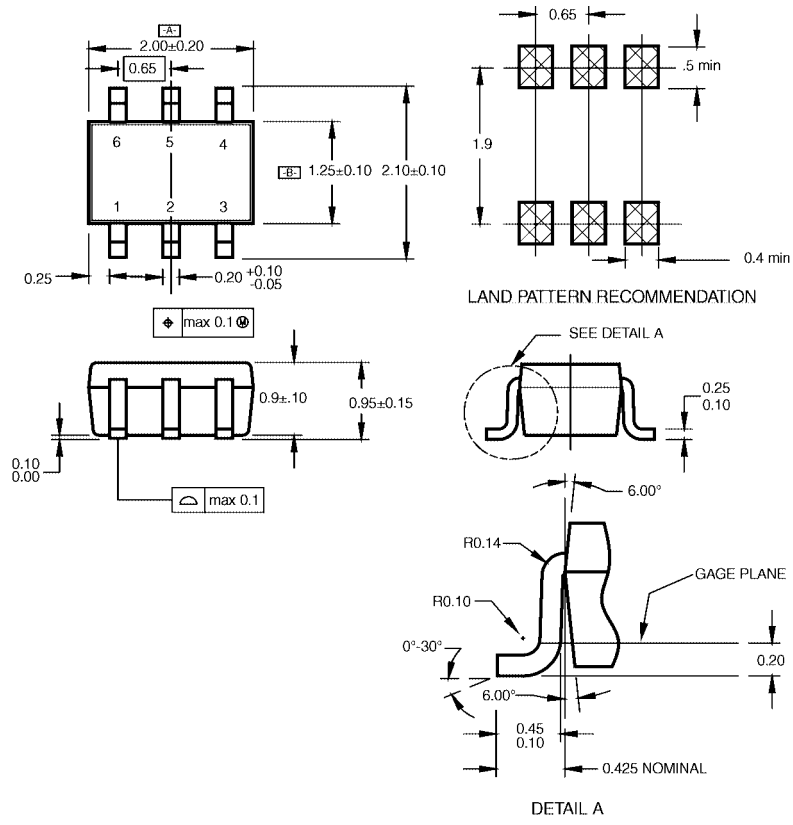


REEL DIMENSIONS inches (millimeters)



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



- NOTES:
- A. CONFORMS TO EIAJ REGISTERED OUTLINE DRAWING SC88.
 - B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
 - C. DIMENSIONS ARE IN MILLIMETERS.

MAA06ARevC

**6-Lead SC70, EIAJ SC88, 1.25mm Wide
Package Number MAA06A**

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



Notes:

1. JEDEC PACKAGE REGISTRATION IS ANTICIPATED
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06ARevB

**6-Lead MicroPak, 1.0mm Wide
Package Number MAC06A**

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