FAIRCHILD
SEMICONDUCTOR ™

March 1999
Revised April 2002

NC7WZ04
TinyLogic™ UHS Dual Inverter

General Description

The NC7WZ04 is a dual inverter from Fairchild's Ultra High Speed Series of TinyLogic™ in the space saving SC70 6-lead package. 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 tolerate voltages up to 7V independent of V_{CC} operating voltage.

Features

■ Space saving SC70 6-lead package
■ Ultra small MicroPak™ leadless package
■ Ultra High Speed: t_{PD} 2.3 ns Typ into 50 pF at 5V V_{CC}
■ High Output Drive: ±24 mA at 3V V_{CC}
■ Broad V_{CC} Operating Range; 1.65V to 5.5V
■ Matches the performance of LCX when operated at 3.3V V_{CC}
■ Power down high impedance inputs/outputs
■ Overvoltage tolerant inputs facilitate 5V to 3V translation
■ Patented noise/EMI reduction circuitry implemented

Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WZ04P6X	MAA06A	Z04	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WZ04L6X	MAC06A	A7	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

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Logic Symbol

IEEE/IEC

A_1 — | 1 | — Y_1

A_2 — | | — Y_2
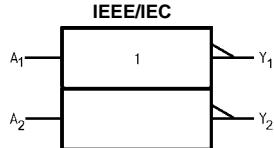
Pin Descriptions

Pin Names	Description
A_1, A_2	Data Inputs
Y_1, Y_2	Output

Function Table

$$Y = \overline{A}$$

Input	Output
A	**Y**
L	H
H	L

H = HIGH Logic Level   L = LOW Logic Level

Connection Diagrams

Pin Assignments for SC70

A_1 [1]   [6] Y_1

GND [2]   [5] V_{CC}

A_2 [3]   [4] Y_2
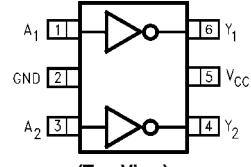
(Top View)

Pin One Orientation Diagram

(Top View)   AAA
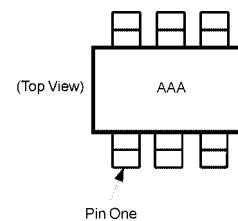
Pin One

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

A_1 1   6 Y_1

GND 2   5 V_{CC}

A_2 3   4 Y_2
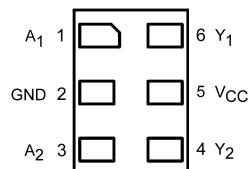
(Top Thru View)

Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Voltage (V_{IN})	−0.5V to +7.0V
DC Output Voltage (V_{OUT})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
$V_{IN} < 0V$	−50 mA
DC Output Diode Current (I_{OK})	
$V_{OUT} < 0V$	−50 mA
DC Output Source/Sink 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})	1.65V to 5.5V
Data Retention	1.5V to 5.5V
Input Voltage (V_{IN})	0V to 5.5V
Output Voltage (V_{OUT})	0V to V_{CC}
Input Rise and Fall time (t_r, t_f)	
V_{CC} = 1.8V, 2.5V ± 0.2V	0 to 20 ns/V
V_{CC} = 3.3V ± 0.3V	0 to 10 ns/V
V_{CC} = 5.5V ± 0.5V	0 to 5 ns/V
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°C			T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Control	1.65 to 1.95	0.75 V_{CC}			0.75 V_{CC}		V		
	Input Voltage	2.3 to 5.5	0.7 V_{CC}			0.7 V_{CC}				
V_{IL}	LOW Level Control	1.65 to 1.95			0.25 V_{CC}		0.25 V_{CC}	V		
	Input Voltage	2.3 to 5.5			0.3 V_{CC}		0.3 V_{CC}			
V_{OH}	HIGH Level Control	1.65	1.55	1.65		1.55				
	Output Voltage	1.8	1.7	1.8		1.7				
		2.3	2.2	2.3		2.2				$I_{OH} = -100$ μA
		3.0	2.9	3.0		2.9				
		4.5	4.4	4.5		4.4		V	$V_{IN} = V_{IL}$	
		1.65	1.29	1.52		1.29				$I_{OH} = -4$ mA
		2.3	1.9	2.14		1.9				$I_{OH} = -8$ mA
		3.0	2.4	2.75		2.4				$I_{OH} = -16$ mA
		3.0	2.3	2.62		2.3				$I_{OH} = -24$ mA
		4.5	3.8	4.13		3.8				$I_{OH} = -32$ mA
V_{OL}	LOW Level Control	1.65		0.1	0.1		0.1			
	Output Voltage	1.8		0.0	0.1		0.1			
		2.3		0.0	0.1		0.1			$I_{OL} = 100$ μA
		3.0		0.0	0.1		0.1			
		4.5		0.0	0.1		0.1	V	$V_{IN} = V_{IH}$	
		1.65		0.08	0.24		0.24			$I_{OL} = 4$ mA
		2.3		0.10	0.3		0.3			$I_{OL} = 8$ mA
		3.0		0.16	0.4		0.4			$I_{OL} = 16$ mA
		3.0		0.24	0.55		0.55			$I_{OL} = 24$ mA
		4.5		0.25	0.55		0.55			$I_{OL} = 32$ mA
I_{IN}	Input Leakage Current	0 to 5.5			±0.1		±1.0	μA	$0 \leq V_{IN} \leq 5.5V$	
I_{OFF}	Power Off Leakage Current	0.0			1.0		10	μA	V_{IN} or V_{OUT} = 5.5V	
I_{CC}	Quiescent Supply Current	1.65 to 5.5			1.0		10	μA	V_{IN} = 5.5V, GND	

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	1.8	5.3	9.2	1.8	11.0	ns	C$_L$ = 15 pF, R$_L$ = 1 MΩ	Figures 1, 3
t$_{PHL}$		1.8	1.8	4.4	7.6	1.8	8.4			
		2.5 ± 0.2	1.2	3.0	5.1	1.2	5.6			
		3.3 ± 0.3	0.8	2.2	3.4	0.8	3.8			
		5.0 ± 0.5	0.5	1.8	2.8	0.5	3.1			
t$_{PLH}$	Propagation Delay	3.3 ± 0.3	1.2	2.9	4.5	1.2	5.0	ns	C$_L$ = 50 pF, R$_L$ = 500Ω	Figures 1, 3
t$_{PHL}$		5.0 ± 0.5	0.8	2.3	3.6	0.8	4.0			
C$_{IN}$	Input Capacitance	0		2.5				pF		
C$_{PD}$	Power Dissipation Capacitance	3.3		9				pF	(Note 3)	Figure 2
		5.0		11						

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$_{CC}$static).

AC Loading and Waveforms
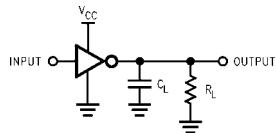
C$_L$ includes load and stray capacitance
Input PRR = 1.0 MHz; t$_W$ = 500 ns

FIGURE 1. AC Test Circuit
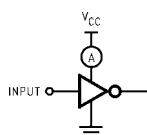
Input = AC Waveform; t$_r$ = t$_f$ = 1.8 ns;
PRR = variable; Duty Cycle = 50%

FIGURE 2. I$_{CCD}$ Test Circuit
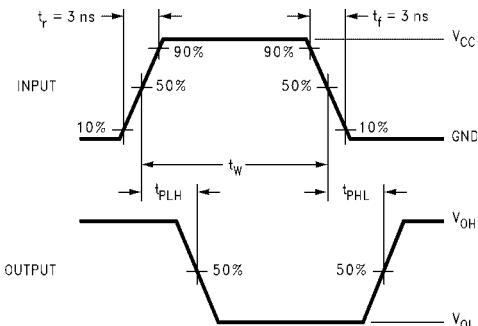
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT for SC70

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

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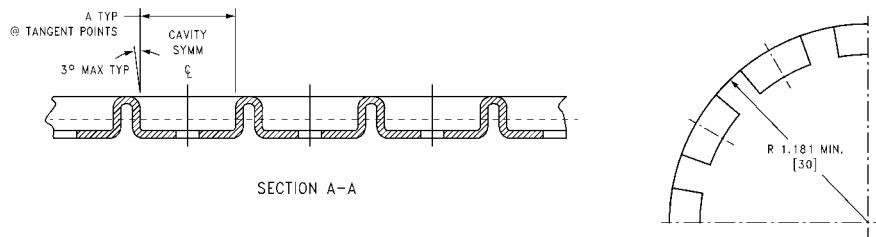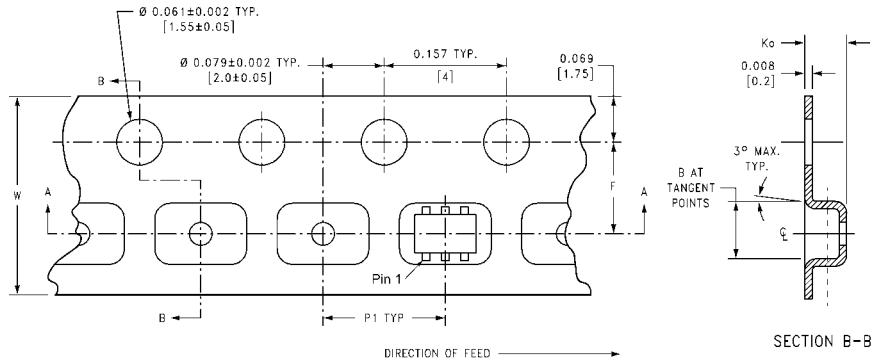
| Package	Tape Size	DIM A	DIM B	DIM F	DIM K$_o$	DIM P1	DIM W
SC70-6	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)

Tape and Reel Specification (Continued)

TAPE FORMAT for MicroPak

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

SECTION B-B
SCALE:10X

SECTION A-A
SCALE:10X
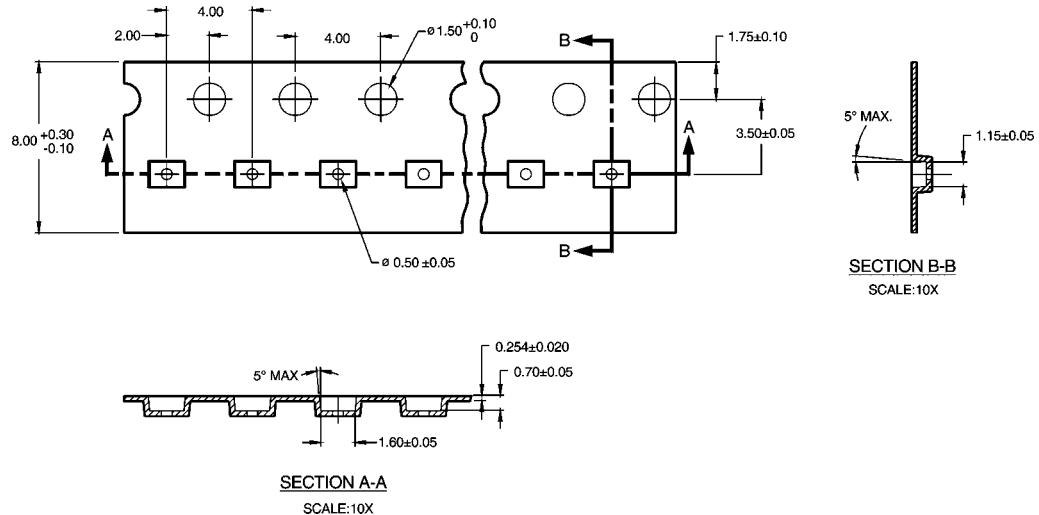
Tape and Reel Specification (Continued)

REEL DIMENSIONS inches (millimeters)

TAPE SLOT

DETAIL X

DETAIL X
SCALE: 3X
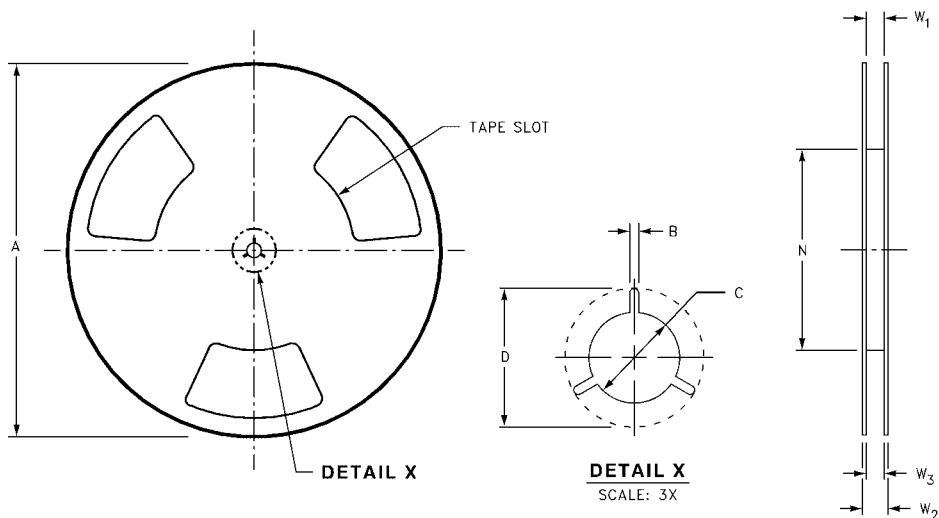
Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/–0.000 (8.40 + 1.50/–0.00)	0.567 (14.40)	W1 + 0.078/–0.039 (W1 + 2.00/–1.00)

Physical Dimensions inches (millimeters) unless otherwise noted

-A-
2.00±0.20
0.65

6 5 4

1 2 3

-B- 1.25±0.10   2.10±0.10

0.25   0.20 +0.10 -0.05

⊕ max 0.1 ⊕

0.9±.10   0.95±0.15

0.10 0.00

⌒ max 0.1

0.65

1.9

.5 min

0.4 min

LAND PATTERN RECOMMENDATION

SEE DETAIL A

0.25 0.10

6.00°

R0.14

R0.10

GAGE PLANE

0°-30°

0.20

6.00°

0.45 0.10

0.425 NOMINAL

DETAIL A
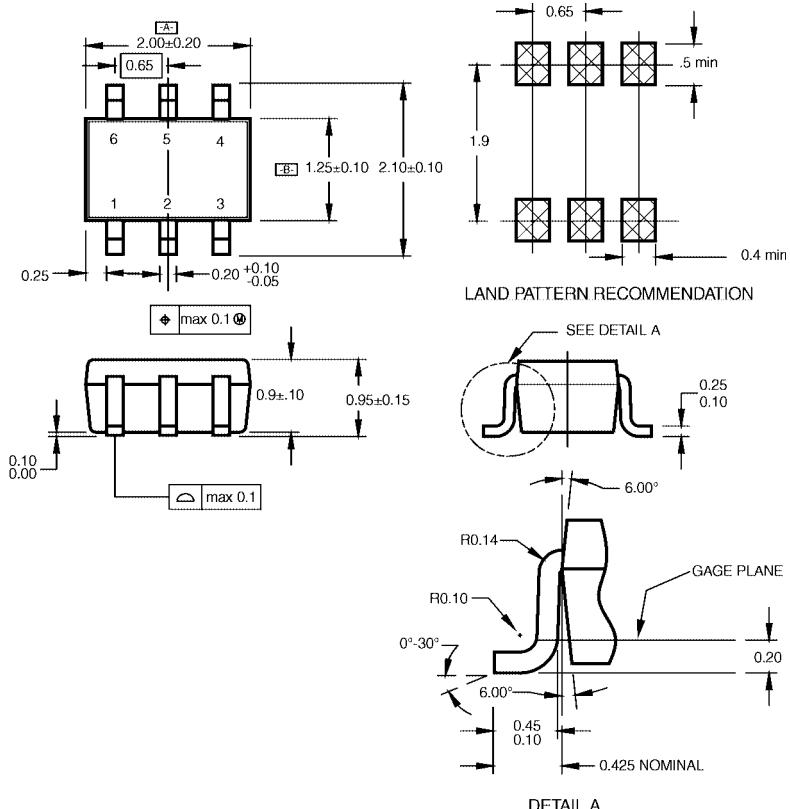
MAA06ARevC

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

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

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

TOP VIEW

RECOMMENDED
LAND PATTERN

BOTTOM VIEW

Detail A

DETAIL A
PIN 1 LEAD

0.075 X 45°
CHAMFER
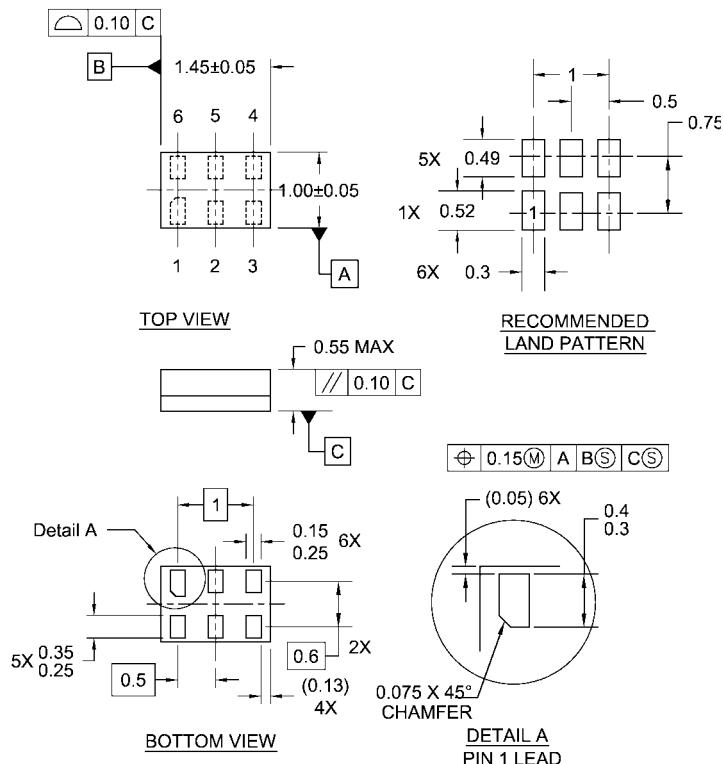
Notes:
1. JEDEC PACKAGE REGISTRATION IS ANTICIPATED
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06ARevB

6-Lead MicroPak, 1.0mm Wide
Package Number MAC06A

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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.

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