June 2006

FAIRCHILD
SEMICONDUCTOR®

NC7WV07
TinyLogic® ULP-A Dual Buffer (Open Drain Output)

Features

- 0.9V to 3.6V V_{CC} supply operation
- 3.6V overvoltage 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}
  - 1.2 ns typ for 2.3V to 2.7V V_{CC}
  - 2.0 ns typ for 1.65V to 1.95V V_{CC}
  - 3.2 ns typ for 1.4V to 1.6V V_{CC}
  - 6.0 ns typ for 1.1V to 1.3V V_{CC}
  - 13.0 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 patented Quiet Series™ noise/EMI reduction circuitry
- Ultra small MicroPak™ leadfree package
- Ultra low dynamic power

General Description

The NC7WV07 is a dual buffer with open drain output from Fairchild's Ultra Low Power-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 a 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 NC7WV07 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.

Ordering Information

Order Number	Package Number	Package Code Top Mark	Package Description	Supplied As
NC7WV07P6X	MAA06A	V07	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WV07L6X	MAC06A	BC	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Battery Life vs. V_{CC} Supply Voltage
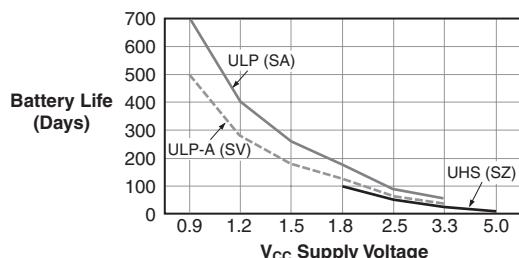
TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.

Battery Life = ($V_{battery}$ • $I_{battery}$ • 0.9) / (P_{device}) / 24hrs/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 = 15pF load.

TinyLogic® is a registered trademark of Fairchild Semiconductor Corporation.
MicroPak™ and Quiet Series™ are trademarks of Fairchild Semiconductor Corporation.

Logic Symbol

IEEE/IEC

A_1 — [1] — Y_1
A_2 — [1] — Y_2
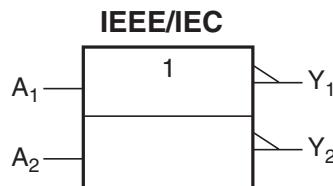
Connection Diagrams

Pin Assignment for SC70

A_1 [1]   [6] Y_1
GND [2]   [5] V_{CC}
A_2 [3]   [4] Y_2

(Top View)
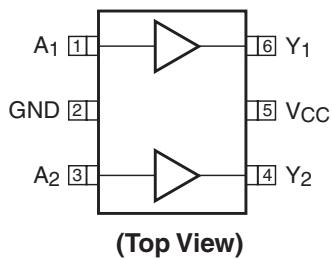
Pin One Orientation Diagram

(Top View)   AAA
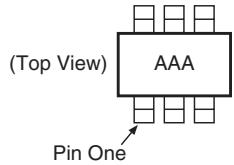
Pin One

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
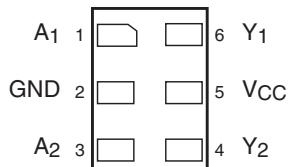
(Top Through View)

Pin Descriptions

Pin Name	Description
A_1, A_2	Data Inputs
Y_1, Y_2	Outputs

Function Table

Y = A

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

H = HIGH Logic Level   L = LOW Logic Level

Absolute Maximum Ratings

The "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.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	−0.5V to +4.6V
V_{IN}	DC Input Voltage	−0.5V to +4.6V

V_{OUT}	DC Output Voltage
	    HIGH or LOW State[1]
	    $V_{CC} = 0V$
		
		 −0.5V to V_{CC} +0.5V
		 −0.5V to +4.6V

I_{IK}	DC Input Diode Current @ $V_{IN} < 0V$	±50mA

I_{OK}	DC Output Diode Current
	    $V_{OUT} < 0V$
	    $V_{OUT} > V_{CC}$
		
		 −50mA
		 +50mA

I_{OH}/I_{OL}	DC Output Source/Sink Current	±50mA
I_{CC} or Ground	DC V_{CC} or Ground Current per Supply Pin	±50mA
T_{STG}	Storage Temperature Range	−65°C to +150°C

Recommended Operating Conditions[2]

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	0.9V to 3.6V
V_{IN}	Input Voltage	0V to 3.6V

V_{OUT}	Output Voltage
	    $V_{CC} = 0.0V$
	    HIGH or LOW State
		
		 0V to 3.6V
		 0V to V_{CC}

I_{OH}/I_{OL}	Output Current in I_{OH}/I_{OL}
	    $V_{CC} = 3.0V$ to 3.6V
	    $V_{CC} = 2.3V$ to 2.7V
	    $V_{CC} = 1.65V$ to 1.95V
	    $V_{CC} = 1.4V$ to 1.6V
	    $V_{CC} = 1.1V$ to 1.3V
	    $V_{CC} = 0.9V$
		
		 ±24mA
		 ±18mA
		 ±6mA
		 ±4mA
		 ±2mA
		 ±0.1mA

T_A	Free Air Operating Temperature	−40°C to +85°C
$\Delta t / \Delta V$	Minimum Input Edge Rate @ $V_{IN} = 0.8V$ to 2.0V, $V_{CC} = 3.0V$	10ns/V

Notes:

1. I_O Absolute Maximum Rating must be observed.
2. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A =$ +25°C Min.	Max.	−40°C to +85°C Min.	Max.	Units
V_{IH}	HIGH Level Input Voltage		0.90	0.65 x V_{CC}	–	0.65 x V_{CC}	–	V
			$1.10 \le V_{CC} \le 1.30$	0.65 x V_{CC}	–	0.65 x V_{CC}	–	
			$1.40 \le V_{CC} \le 1.60$	0.65 x V_{CC}	–	0.65 x V_{CC}	–	
			$1.65 \le V_{CC} \le 1.95$	0.65 x V_{CC}	–	0.65 x V_{CC}	–	
			$2.30 \le V_{CC} < 2.70$	1.6	–	1.6	–	
			$2.70 \le V_{CC} \le 3.60$	2.0	–	2.0	–	
V_{IL}	LOW Level Input Voltage		0.90	–	0.35 x V_{CC}	–	0.35 x V_{CC}	V
			$1.10 \le V_{CC} \le 1.30$	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			$1.40 \le V_{CC} \le 1.60$	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			$1.65 \le V_{CC} \le 1.95$	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			$2.30 \le V_{CC} < 2.70$	–	0.7	–	0.7	
			$2.70 \le V_{CC} \le 3.60$	–	0.8	–	0.8	
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100\mu A$	0.90	–	0.1	–	0.1	V
			$1.10 \le V_{CC} \le 1.30$	–	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	
		$I_{OL} = 2mA$	$1.10 \le V_{CC} \le 1.30$	–	0.25 x V_{CC}	–	0.25 x V_{CC}	
		$I_{OL} = 4mA$	$1.40 \le V_{CC} \le 1.60$	–	0.25 x V_{CC}	–	0.25 x V_{CC}	
		$I_{OL} = 6mA$	$1.65 \le V_{CC} \le 1.95$	–	0.3	–	0.3	
		$I_{OL} = 12mA$	$2.30 \le V_{CC} < 2.70$	–	0.4	–	0.4	
			$2.70 \le V_{CC} \le 3.60$	–	0.4	–	0.4	
		$I_{OL} = 18mA$	$2.30 \le V_{CC} < 2.70$	–	0.6	–	0.6	
			$2.70 \le V_{CC} \le 3.60$	–	0.4	–	0.4	
		$I_{OL} = 24mA$	$2.70 \le V_{CC} \le 3.60$	–	0.55	–	0.55	
I_{IN}	Input Leakage Current	$0 \le V_I \le 3.6V$	0.90 to 3.60	–	±0.1	–	±0.5	µA
I_{OFF}	Power Off Leakage Current	$0 \le (V_I, V_O) \le 3.6V$	0	–	0.5	–	0.5	µA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	0.90 to 3.60	–	0.9	–	0.9	µA
		$V_{CC} \le V_I \le 3.6V$	0.90 to 3.60	–	–	–	±0.9	

www.fairchildsemi.com

AC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	+25°C Min.	+25°C Typ.	+25°C Max.	−40°C to +85°C Min.	−40°C to +85°C Max.	Units	Figure Number
t_{PZL}, t_{PLZ}	Propagation Delay	$C_L = 15pF$, $R_U = R_D$ 1MΩ	0.90		13				ns	Figure 1 Figure 2
		$C_L = 15pF$, $R_U = R_D$ 2kΩ	$1.10 \le V_{CC} \le 1.30$	2.0	6.0	15.0	1.0	18.6		
			$1.40 \le V_{CC} \le 1.60$	1.0	3.2	8.7	1.0	9.7		
		$C_L = 30pF$, $R_U = R_D$ 500Ω	$1.65 \le V_{CC} \le 1.95$	1.0	2.0	6.0	1.0	6.8		
			$2.30 \le V_{CC} < 2.70$	0.7	1.2	3.6	0.6	4.7		
			$2.70 \le V_{CC} \le 3.60$	0.5	1.0	3.3	0.4	4.0		
C_{IN}	Input Capacitance		0	–	2.0	–	–	–	pF	
C_{OUT}	Output Capacitance		0	–	6.5	–	–	–	pF	
C_{PD}	Power Dissipation Capacitance	$V_I = 0V$ or V_{CC}, $f = 10MHz$	0.90 to 3.60	–	10	–	–	–	pF	

AC Loading and Waveforms
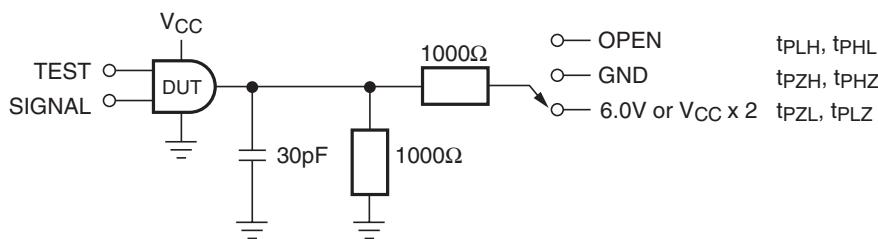
Figure 1. AC Test Circuit

| Test	Switch
t_{PZL}, t_{PLZ}	6V at $V_{CC} = 3.3 \pm 0.3V$; $V_{CC} \times 2$ at $V_{CC} = 0.9V - 2.7V$
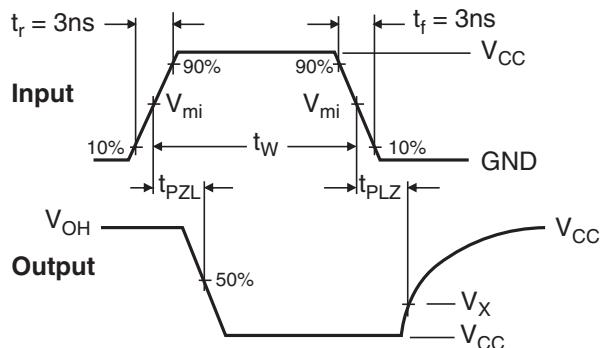
Figure 2. Waveform for Inverting and Non-Inverting Functions

Symbol	V_{CC} 3.3V ± 0.3V	2.5V ± 0.2V	1.8V ± 0.15V	1.5V ± 0.1V	1.2 V ± 0.1V	0.9V
V_{mi}	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
V_X	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$	$V_{OL} + 0.15V$	$V_{OL} + 0.1V$	$V_{OL} + 0.1V$	$V_{OL} + 0.1V$

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 Dimension inches (millimeters)

SECTION B-B

SECTION A-A

BEND RADIUS NOT TO SCALE
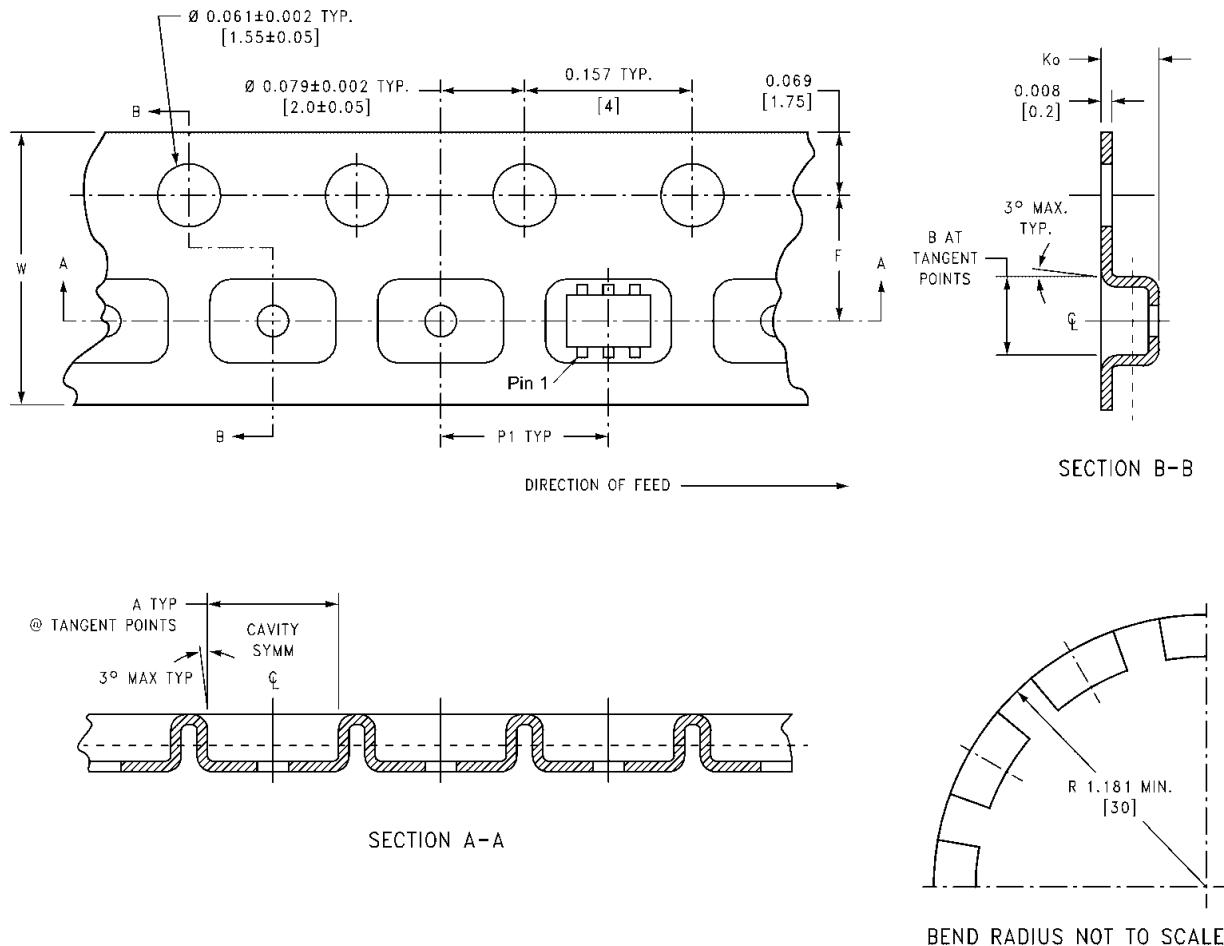
Tape and Reel Specification (Continued)

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

Tape Dimension millimeters

SECTION B-B
SCALE:10X

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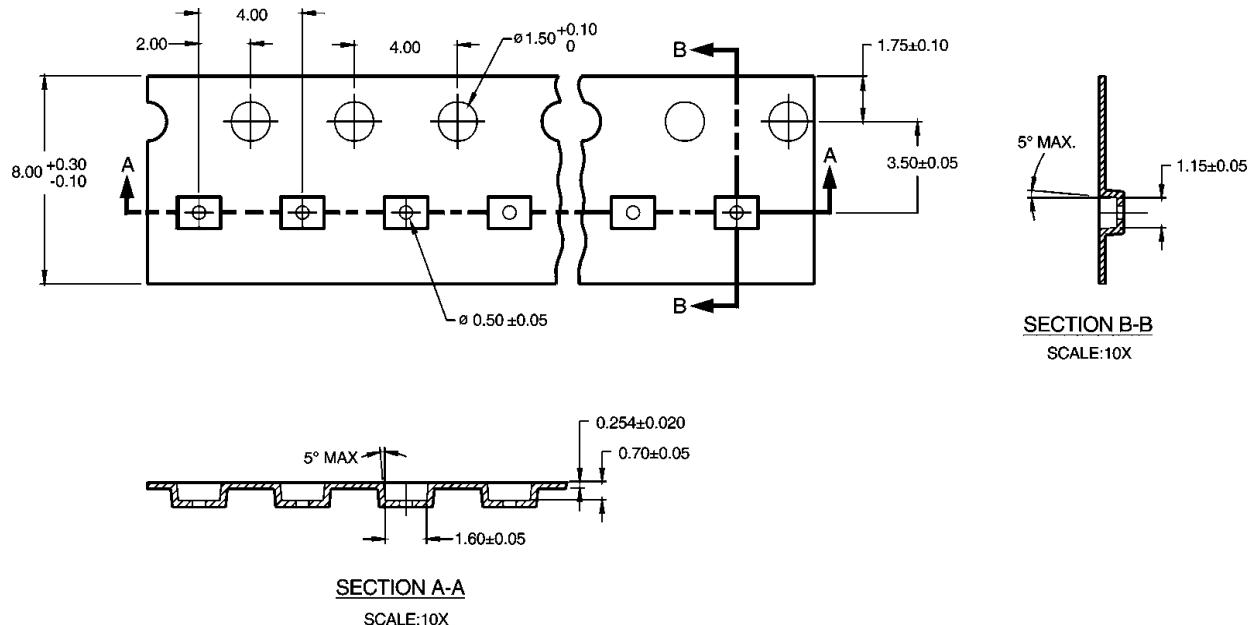
Tape and Reel Specification (Continued)

Reel Dimension for MicroPak inches (millimeters)

DETAIL X

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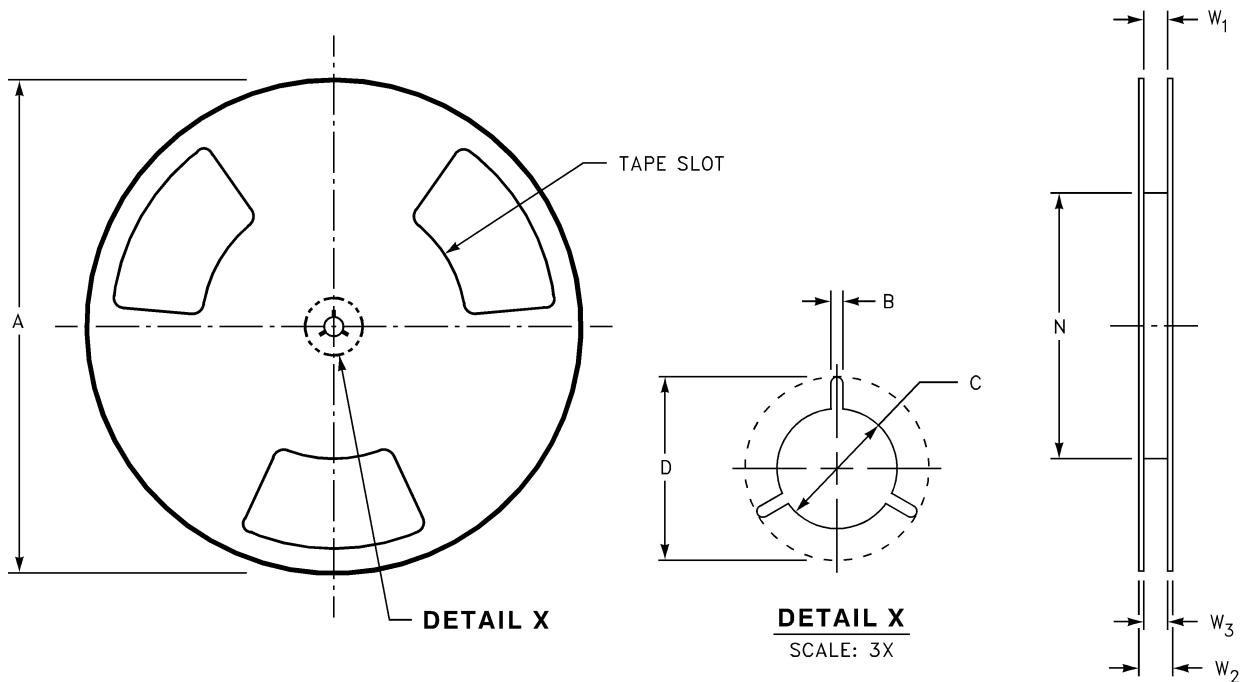
Tape Size	A	B	C	D	N	W1	W2	W3
8mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/−0.000 (8.40 + 1.50/−0.00)	0.567 (14.40)	W1 + 0.078/−0.039 (W1 + 2.00/−1.00)

NC7WV07 TinyLogic® ULP-A Dual Buffer (Open Drain Output)

LAND PATTERN RECOMMENDATION

SEE DETAIL A

GAGE PLANE

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 millimeters unless otherwise noted (Continued)

TOP VIEW

RECOMMENDED
LAND PATTERN

0.55 MAX

BOTTOM VIEW

Detail A

DETAIL A
PIN 1 LEAD

0.075 X 45°
CHAMFER
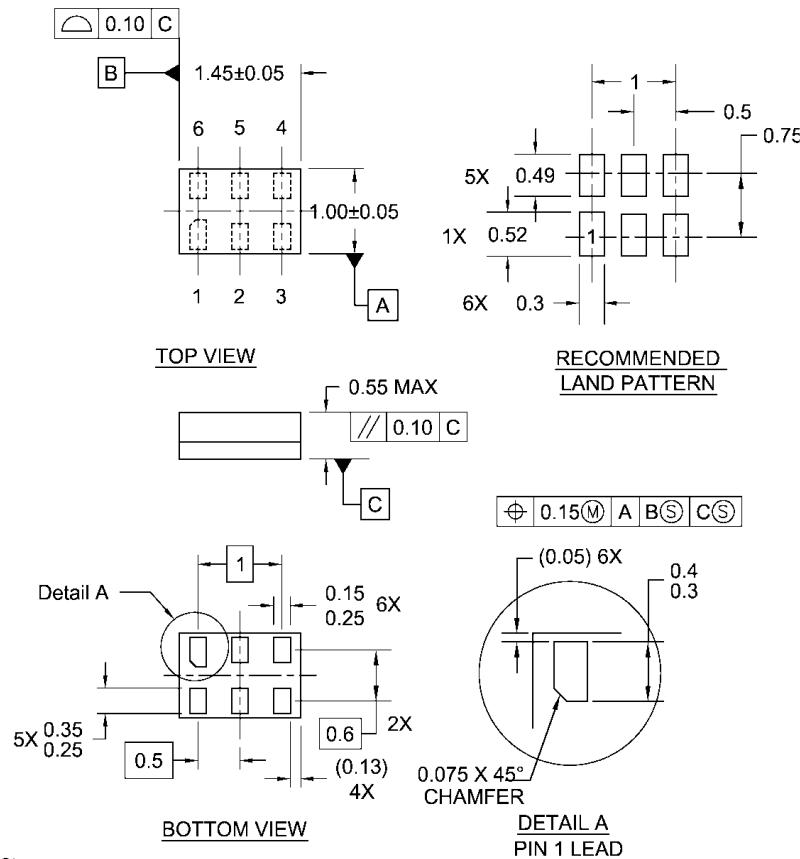
Notes:

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

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	ISOPLANAR™	PowerEdge™	SuperFET™
ActiveArray™	FASTr™	LittleFET™	PowerSaver™	SuperSOT™-3
Bottomless™	FPS™	MICROCOUPLER™	PowerTrench®	SuperSOT™-6
Build it Now™	FRFET™	MicroFET™	QFET®	SuperSOT™-8
CoolFET™	GlobalOptoisolator™	MicroPak™	QS™	SyncFET™
CROSSVOLT™	GTO™	MICROWIRE™	QT Optoelectronics™	TCM™
DOME™	HiSeC™	MSX™	Quiet Series™	TinyLogic®
EcoSPARK™	I²C™	MSXPro™	RapidConfigure™	TINYOPTO™
E²CMOS™	i-Lo™	OCX™	RapidConnect™	TruTranslation™
EnSigna™	ImpliedDisconnect™	OCXPro™	µSerDes™	UHC™
FACT™	IntelliMAX™	OPTOLOGIC®	ScalarPump™	UniFET™
FACT Quiet Series™		OPTOPLANAR™	SILENT SWITCHER®	UltraFET®
Across the board. Around the world.™		PACMAN™	SMART START™	VCX™
The Power Franchise®		POP™	SPM™	Wire™
Programmable Active Droop™		Power247™	Stealth™	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILDíS WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILDíS PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is 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.

PRODUCT STATUS DEFINITIONS
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I19