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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

June 2008

NC7WV14
TinyLogic® ULP-A Dual Inverter with Schmitt Trigger Input

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}:
  - 1.5ns typ. for 2.7V to 3.6V V_{CC}
  - 1.8ns typ. for 2.3V to 2.7V V_{CC}
  - 2.0ns typ. for 1.65V to 1.95V V_{CC}
  - 3.2ns typ. for 1.4V to 1.6V V_{CC}
  - 5.9ns typ. for 1.1V to 1.3V V_{CC}
  - 12.0ns typ. for 0.9V V_{CC}
- Power-Off high impedance inputs and outputs
- High Static Drive (I_{OH}/I_{OL}):
  - ±24mA @ 3.00V V_{CC}
  - ±18mA @ 2.30V V_{CC}
  - ±6mA @ 1.65V V_{CC}
  - ±4mA @ 1.4V V_{CC}
  - ±2mA @ 1.1V V_{CC}
  - ±0.1mA @ 0.9V V_{CC}
- Uses patented Quiet Series™ noise/EMI reduction circuitry
- Ultra small MicroPak™ package
- Ultra low dynamic power

General Description

The NC7WV14 is a dual inverter with Schmitt trigger 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 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.

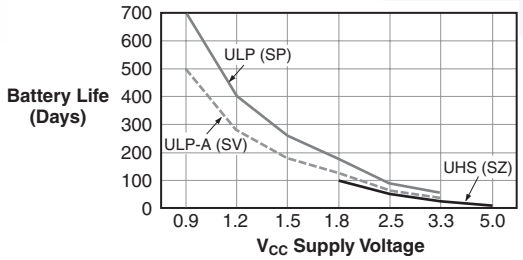
The NC7WV14 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

Ordering Information

Order Number	Package Number	Package Code Top Mark	Package Description	Supplied As
NC7WV14P6X	MAA06A	V14	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WV14L6X	MAC06A	BD	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

All packages are lead free per JEDEC: J-STD-020B standard.

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.

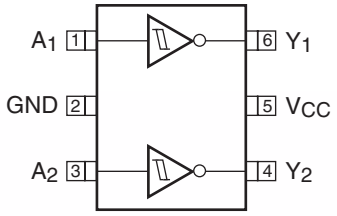
Battery Life = ($V_{battery}$ x $I_{battery}$ x 0.9) / (P_{device}) / 24hrs/day

Where, P_{device} = (I_{CC} x V_{CC}) + (C_{PD} + C_L) x V_{CC}^2 x 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.

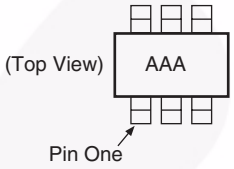
Connection Diagrams

Pin Assignment for SC70



(Top View)

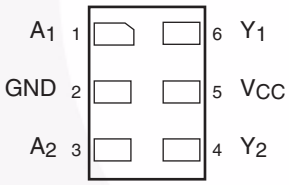
Pin One Orientation Diagram



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 Through View)

Pin Description

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

Logic Symbol

IEEE/IEC

Function Table

$$Y = \overline{A}$$

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level

L = LOW Logic Level

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

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
T_J	Junction Temperature Under Bias	150°C
T_L	Junction Lead Temperature (Soldering, 10 seconds)	260°C
P_D	Power Dissipation @ +85°C SC70-6 Micropak-6	 185mW 210mW

Recommended Operating Conditions(2)

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	0.9V to 3.6V
V_{IN}	Input Voltage	0V to 3.6V
V_{OUT}	Output Voltage HIGH or LOW State V_{CC} = 0V	 0V to V_{CC} 0V to 3.6V
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
θ_{JA}	Thermal Resistance SC70-6 Micropak-6	 350°C/W 310°C/W

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	V_{CC} (V)	Conditions	T_A = +25°C		T_A = –40°C to +85°C		Units
				Min.	Max.	Min.	Max.	
V_P	Positive Threshold Voltage	0.90		0.3	0.7	0.3	0.7	V
		1.10		0.4	1.0	0.4	1.0	
		1.40		0.5	1.4	0.5	1.4	
		1.65		0.7	1.5	0.7	1.5	
		2.30		1.0	1.8	1.0	1.8	
		2.70		1.3	2.2	1.3	2.2	
V_N	Negative Threshold Voltage	0.90		0.10	0.6	0.10	0.6	V
		1.10		0.15	0.7	0.15	0.7	
		1.40		0.20	0.8	0.20	0.8	
		1.65		0.25	0.9	0.25	0.9	
		2.30		0.4	1.15	0.4	1.15	
		2.70		0.6	1.5	0.6	1.5	
V_H	Hysteresis Voltage	0.90		0.07	0.5	0.07	0.5	V
		1.10		0.08	0.6	0.08	0.6	
		1.40		0.10	0.8	0.10	0.8	
		1.65		0.15	1.0	0.15	1.0	
		2.30		0.25	1.1	0.25	1.1	
		2.70		0.40	1.2	0.40	1.2	
V_{OH}	HIGH Level Output Voltage	0.90	I_{OH} = –100µA	V_{CC} – 0.1		V_{CC} – 0.1		V
		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	I_{OH} = –2mA	0.75 x V_{CC}		0.75 x V_{CC}		
		1.40 ≤ V_{CC} ≤ 1.60	I_{OH} = –4mA	0.75 x V_{CC}		0.75 x V_{CC}		
		1.65 ≤ V_{CC} ≤ 1.95	I_{OH} = –6mA	1.25		1.25		
		2.30 ≤ V_{CC} < 2.70		2.0		2.0		
		2.30 ≤ V_{CC} < 2.70	I_{OH} = –12mA	1.8		1.8		
		2.70 ≤ V_{CC} ≤ 3.60		2.2		2.2		
		2.30 ≤ V_{CC} < 2.70	I_{OH} = –18mA	1.7		1.7		
		2.70 ≤ V_{CC} ≤ 3.60		2.4		2.4		
		2.70 ≤ V_{CC} ≤ 3.60	I_{OH} = –24mA	2.2		2.2		

DC Electrical Characteristics (Continued)

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

Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = +25°C			T_A = –40°C to +85°C		Units	Figure Number
				Min.	Typ.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay	0.90	C_L = 15pF, R_L = 1MΩ		12				ns	Figure 1 Figure 2
		1.10 ≤ V_{CC} ≤ 1.30	C_L = 15pF, R_L = 2kΩ	2.0	5.9	11.5	1.0	15.6		
		1.40 ≤ V_{CC} ≤ 1.60		1.0	3.2	6.3	0.9	7.0		
		1.65 ≤ V_{CC} ≤ 1.95	C_L = 30pF,R_L = 500Ω	1.0	2.0	5.2	0.7	6.2		
		2.30 ≤ V_{CC} < 2.70		0.8	1.8	3.7	0.6	4.4		
		2.70 ≤ V_{CC} ≤ 3.60		0.7	1.5	3.3	0.5	3.8		
C_{IN}	Input Capacitance	0			2.0				pF	
C_{PD}	Power Dissipation Capacitance	0.90 to 3.60	V_I = 0V or V_{CC}, f = 10MHz		14				pF	

AC Loading and Waveforms

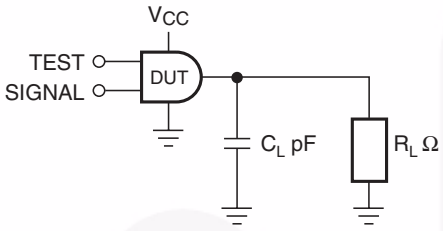


Figure 1. AC Test Circuit

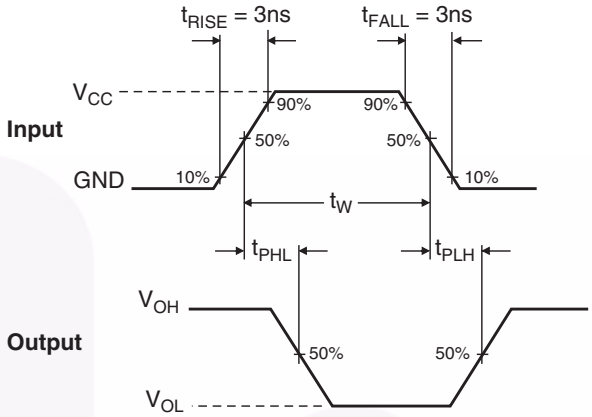


Figure 2. AC Waveforms

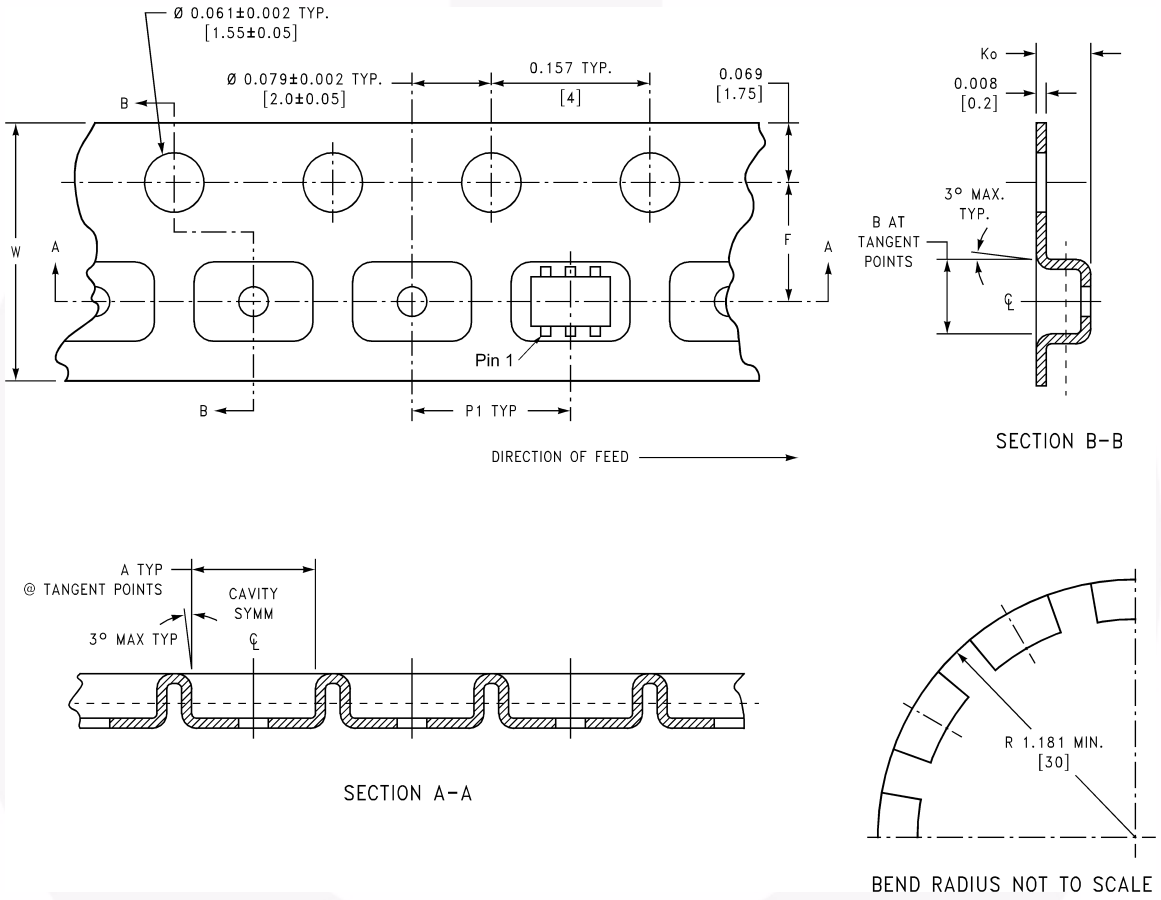
Symbol	V_{CC}					
	3.3V ± 0.3V	**2.5V ± 0.2V**	**1.8V ± 0.15V**	**1.5V ± 0.1V**	**1.2V ± 0.1V**	**0.9V**
V_{mi}	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
V_{mo}	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

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)



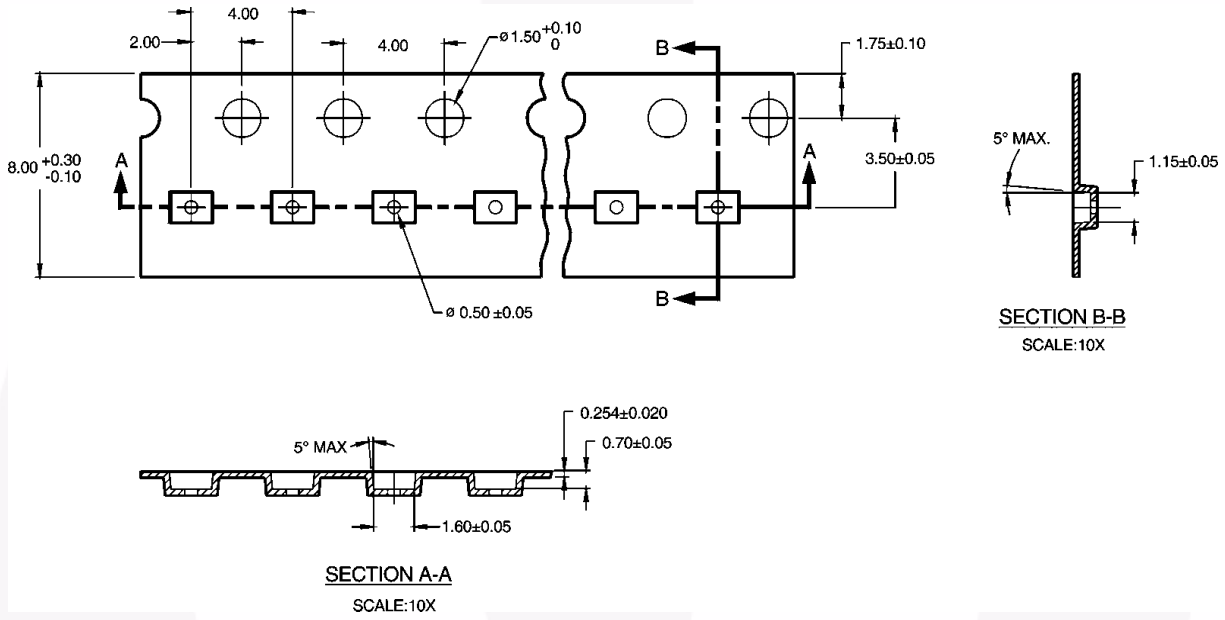
Package	Tape Size	Dim A	Dim B	Dim F	Dim K_O	Dim P1	Dim W
SC70-6	8mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)

Tape and Reel Specification (Continued)

Tape Format for MicroPak

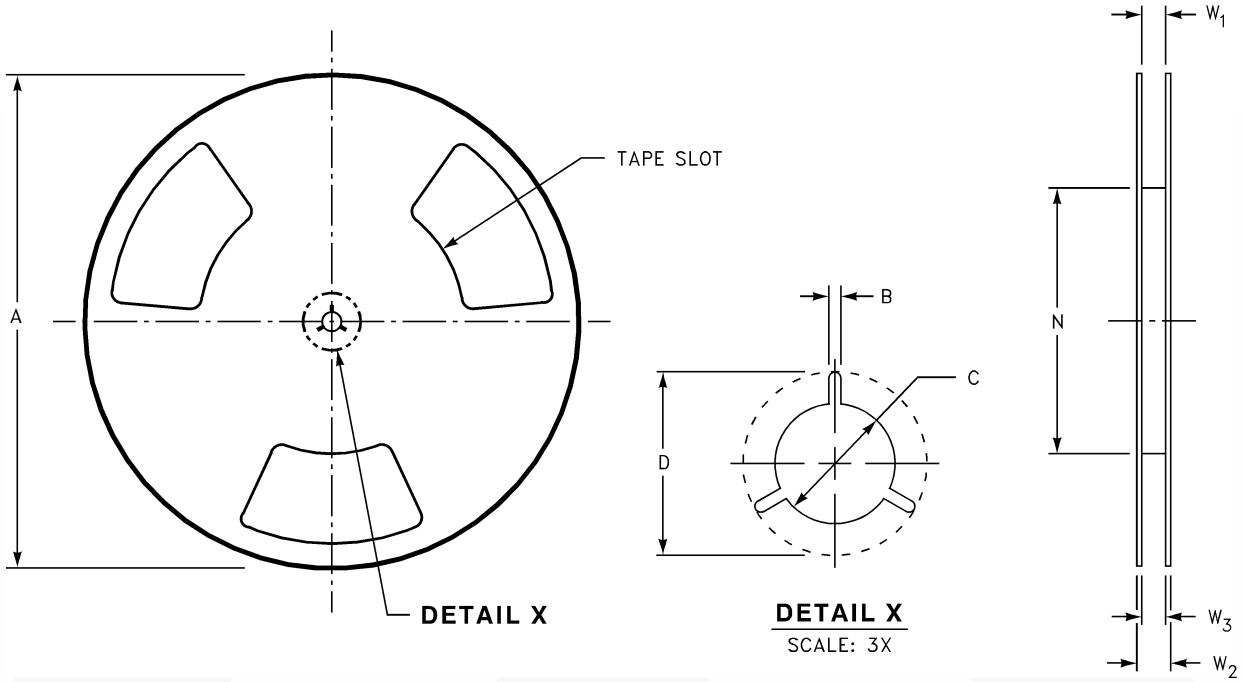
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L6X	Leader (Start End)	125 (typ.)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimension inches (millimeters)



Tape and Reel Specification (Continued)

Reel Dimension for MicroPak inches (millimeters)



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)

Physical Dimensions

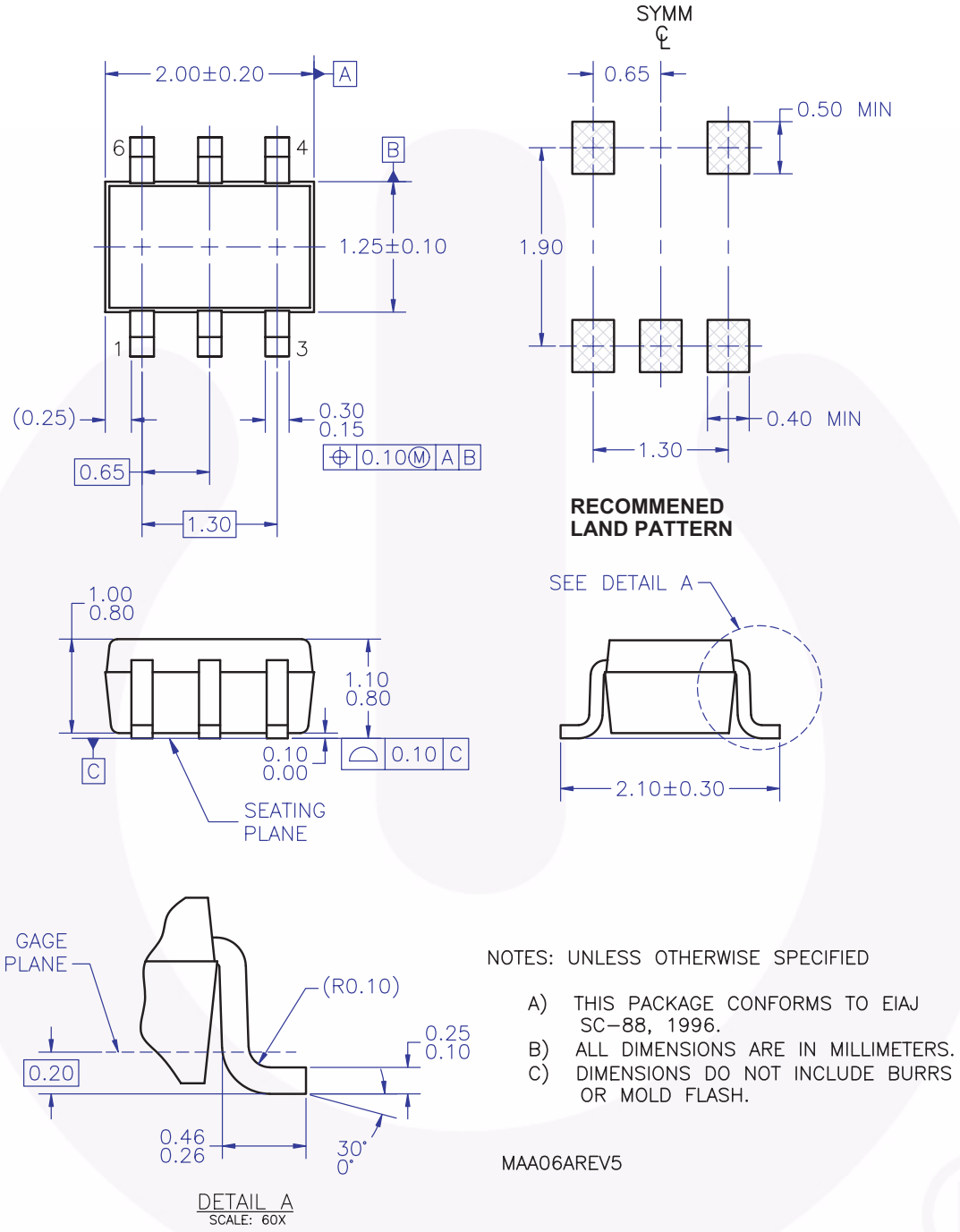


Figure 3. 6-Lead SC70, EIAJ SC88, 1.25mm Wide

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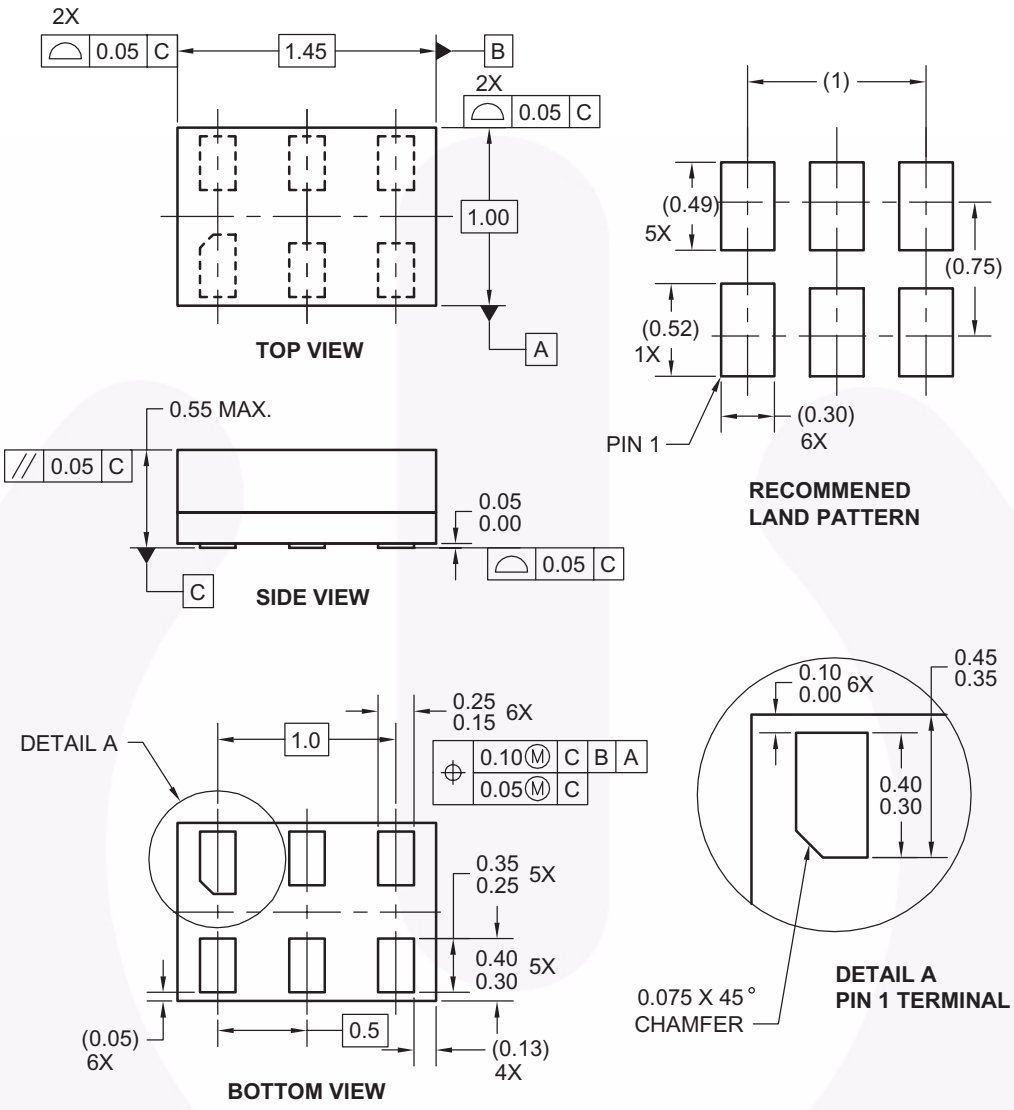
Physical Dimensions (Continued)



Notes:
1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06AREVC

Figure 4. 6-Lead MicroPak, 1.0mm Wide

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F-PFS™
FRFET®
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Green FPS™
Green FPS™ e-Series™
GTO™
IntelliMAX™
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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / 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; 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	This 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	This datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I34

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