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# 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.

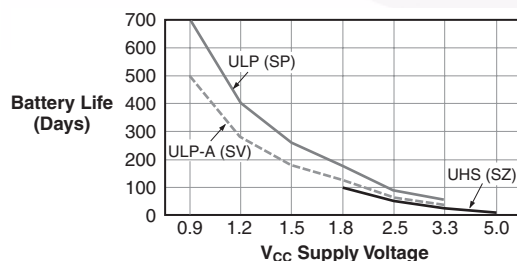
The NC7WV14 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

### 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



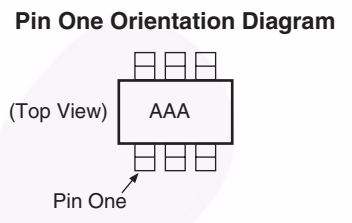
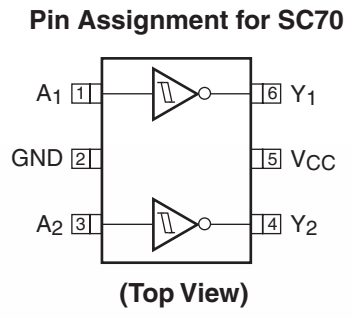
TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.

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

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

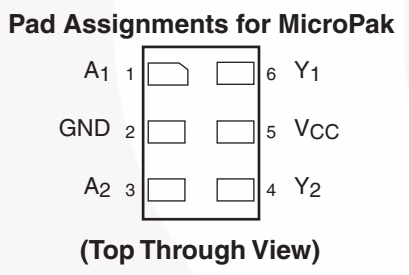
Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAh and derated 90% and device frequency at 10MHz, with  $C_L = 15\text{pF}$  load.

### Connection Diagrams



AAA represents Product Code Top Mark – see ordering code

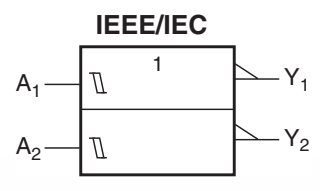
**Note:** Orientation of top mark determines pin one location. Read the top product code mark left to right. Pin one is the lower left pin (see diagram).



### Pin Description

Pin Names	Description
A <sub>1</sub> , A <sub>2</sub>	Data Inputs
Y <sub>1</sub> , Y <sub>2</sub>	Output

### Logic Symbol



### Function Table

$$Y = \bar{A}$$

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 <sup>(1)</sup> $V_{CC} = 0V$	-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<sup>(2)</sup>

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
$\theta_{JA}$	Thermal Resistance SC70-6 Micropak-6	350°C/W 310°C/W

### Notes:

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

## DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units
				Min.	Max.	Min.	Max.	
V <sub>P</sub>	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 <sub>N</sub>	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 <sub>H</sub>	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 <sub>OH</sub>	HIGH Level Output Voltage	0.90	I <sub>OH</sub> = -100μA	V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1		V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2		
		2.30 ≤ V <sub>CC</sub> < 2.70		V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2		
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	I <sub>OH</sub> = -2mA	0.75 x V <sub>CC</sub>		0.75 x V <sub>CC</sub>		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	I <sub>OH</sub> = -4mA	0.75 x V <sub>CC</sub>		0.75 x V <sub>CC</sub>		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	I <sub>OH</sub> = -6mA	1.25		1.25		
		2.30 ≤ V <sub>CC</sub> < 2.70		2.0		2.0		
		2.30 ≤ V <sub>CC</sub> < 2.70	I <sub>OH</sub> = -12mA	1.8		1.8		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		2.2		2.2		
		2.30 ≤ V <sub>CC</sub> < 2.70	I <sub>OH</sub> = -18mA	1.7		1.7		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		2.4		2.4		
2.70 ≤ V <sub>CC</sub> ≤ 3.60	I <sub>OH</sub> = -24mA	2.2		2.2				

### DC Electrical Characteristics (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units
				Min.	Max.	Min.	Max.	
V <sub>OL</sub>	LOW Level Output Voltage	0.90	I <sub>OL</sub> = 100μA		0.1		0.1	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			0.1		0.1	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			0.2		0.2	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			0.2		0.2	
		2.30 ≤ V <sub>CC</sub> < 2.70			0.2		0.2	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.2		0.2	
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	I <sub>OL</sub> = 2mA		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	I <sub>OL</sub> = 4mA		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	I <sub>OL</sub> = 6mA		0.3		0.3	
		2.30 ≤ V <sub>CC</sub> < 2.70	I <sub>OL</sub> = 12mA		0.4		0.4	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.4		0.4	
		2.30 ≤ V <sub>CC</sub> < 2.70	I <sub>OL</sub> = 18mA		0.6		0.6	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.4		0.4	
2.70 ≤ V <sub>CC</sub> ≤ 3.60	I <sub>OL</sub> = 24mA		0.55		0.55			
I <sub>IN</sub>	Input Leakage Current	0.90 to 3.60	0 ≤ V <sub>I</sub> ≤ 3.6V		±0.1		±0.5	μA
I <sub>OFF</sub>	Power Off Leakage Current	0	0 ≤ (V <sub>I</sub> , V <sub>O</sub> ) ≤ 3.6V		0.5		0.5	μA
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60	V <sub>I</sub> = V <sub>CC</sub> or GND		0.9		0.9	μA
			V <sub>CC</sub> ≤ V <sub>I</sub> ≤ 3.6V				±0.9	

### Electrical Characteristics

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

## AC Loading and Waveforms

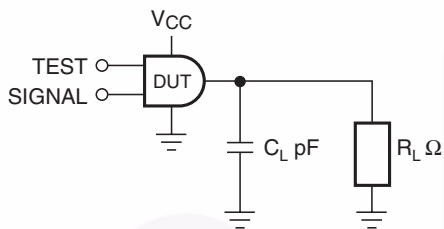


Figure 1. AC Test Circuit

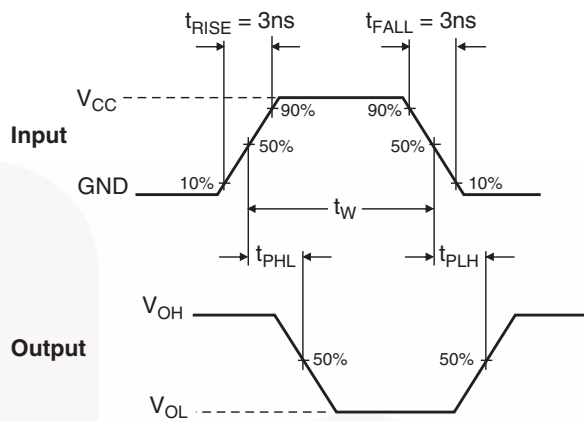


Figure 2. AC Waveforms

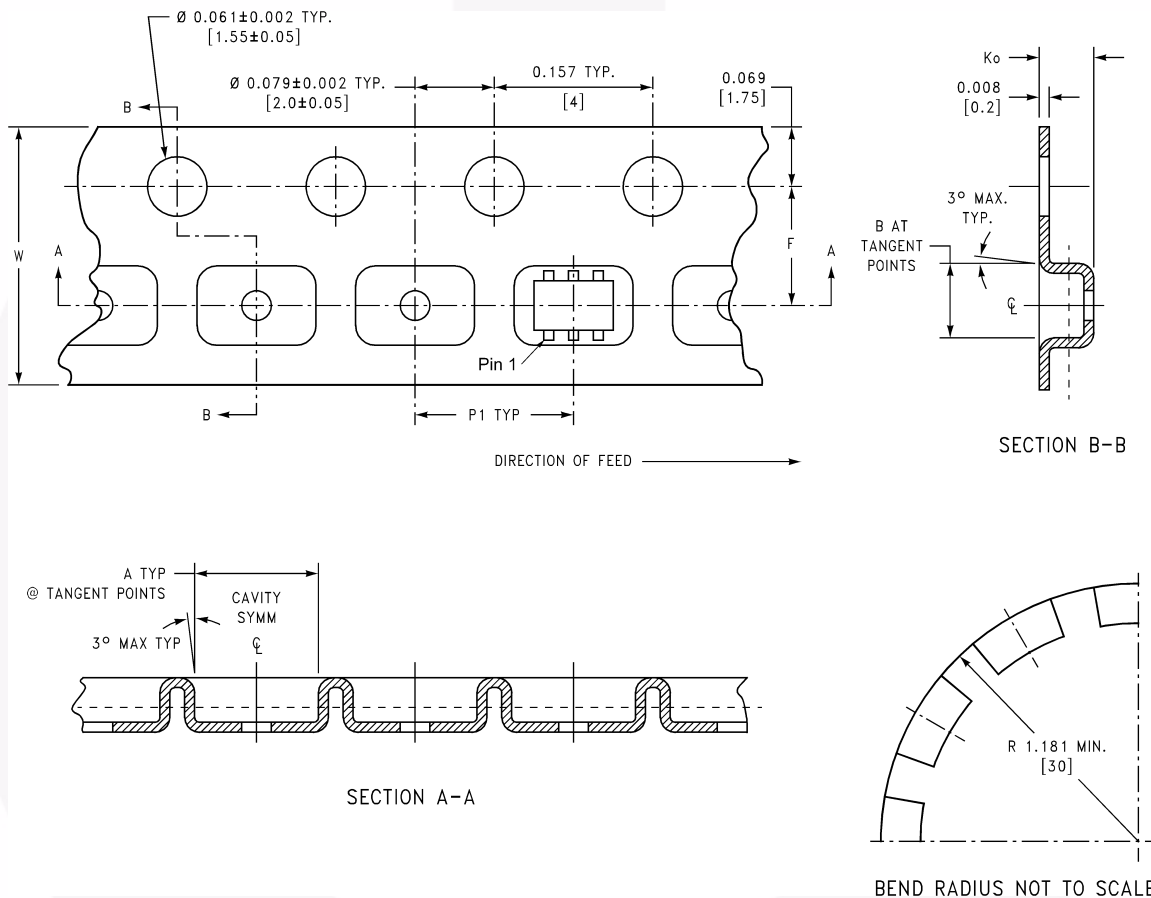
Symbol	$V_{CC}$					
	$3.3V \pm 0.3V$	$2.5V \pm 0.2V$	$1.8V \pm 0.15V$	$1.5V \pm 0.1V$	$1.2V \pm 0.1V$	$0.9V$
$V_{mi}$	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_{mo}$	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

## 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)



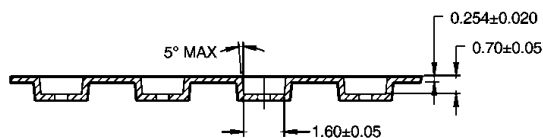
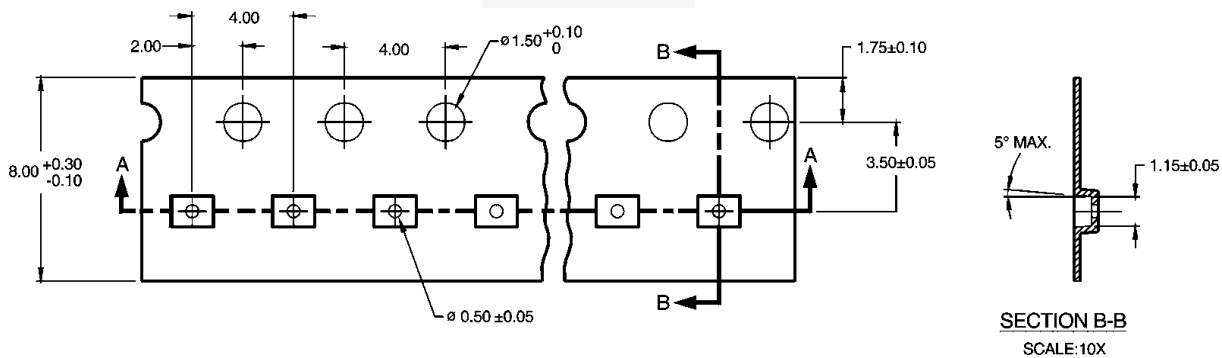
Package	Tape Size	Dim A	Dim B	Dim F	Dim K <sub>O</sub>	Dim P1	Dim W
SC70-6	8mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)

## Tape and Reel Specification (Continued)

### Tape Format for MicroPak

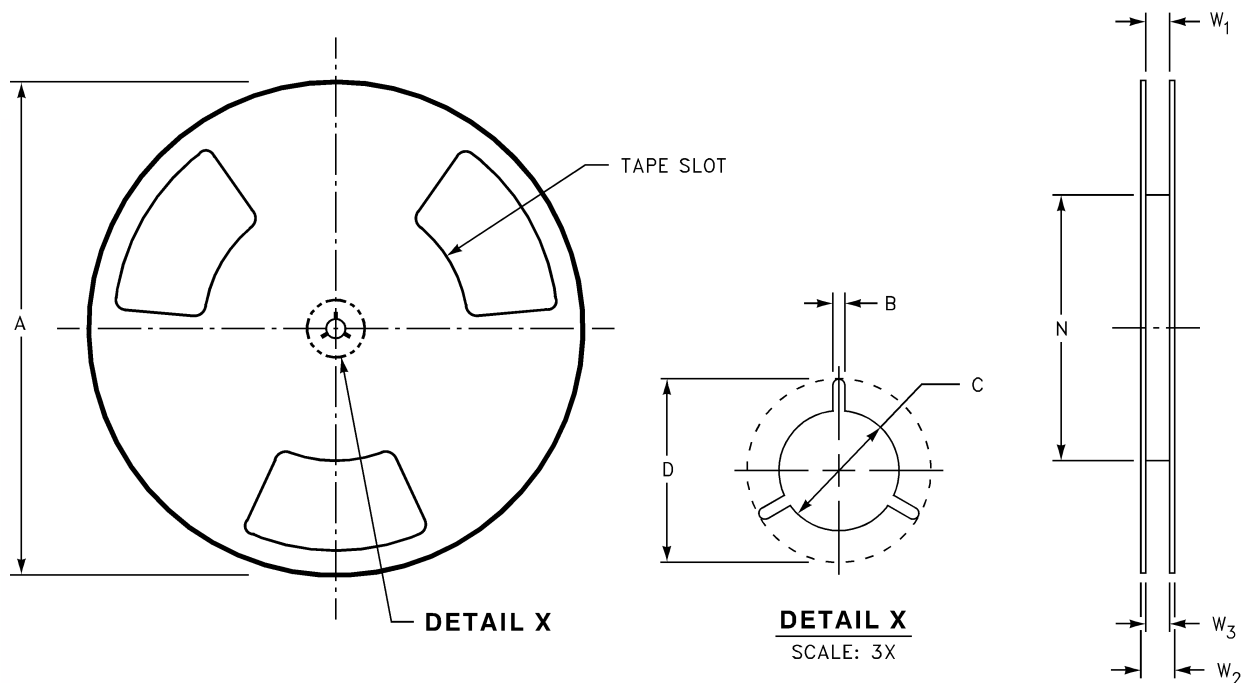
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L6X	Leader (Start End)	125 (typ.)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

### Tape Dimension inches (millimeters)



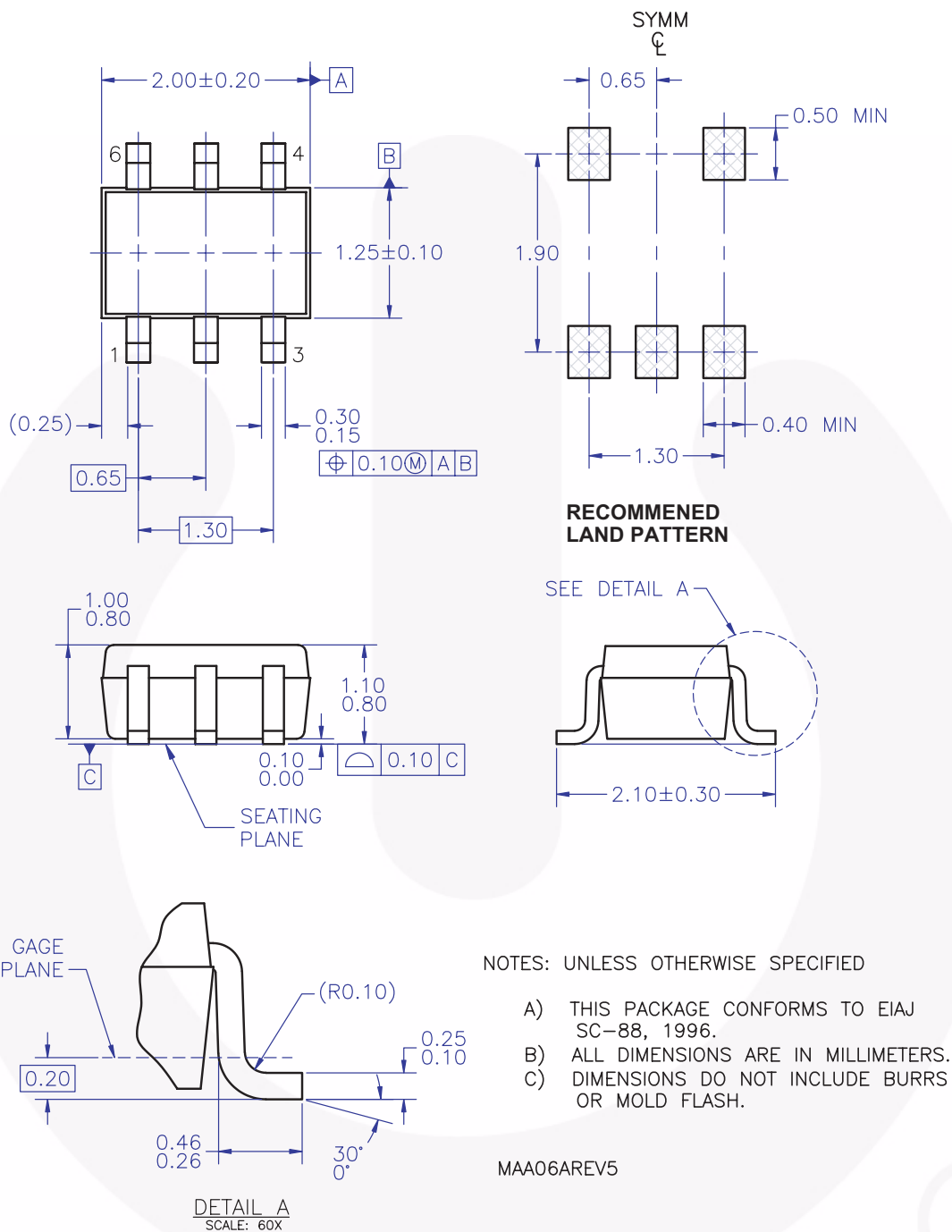
**Tape and Reel Specification** (Continued)

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



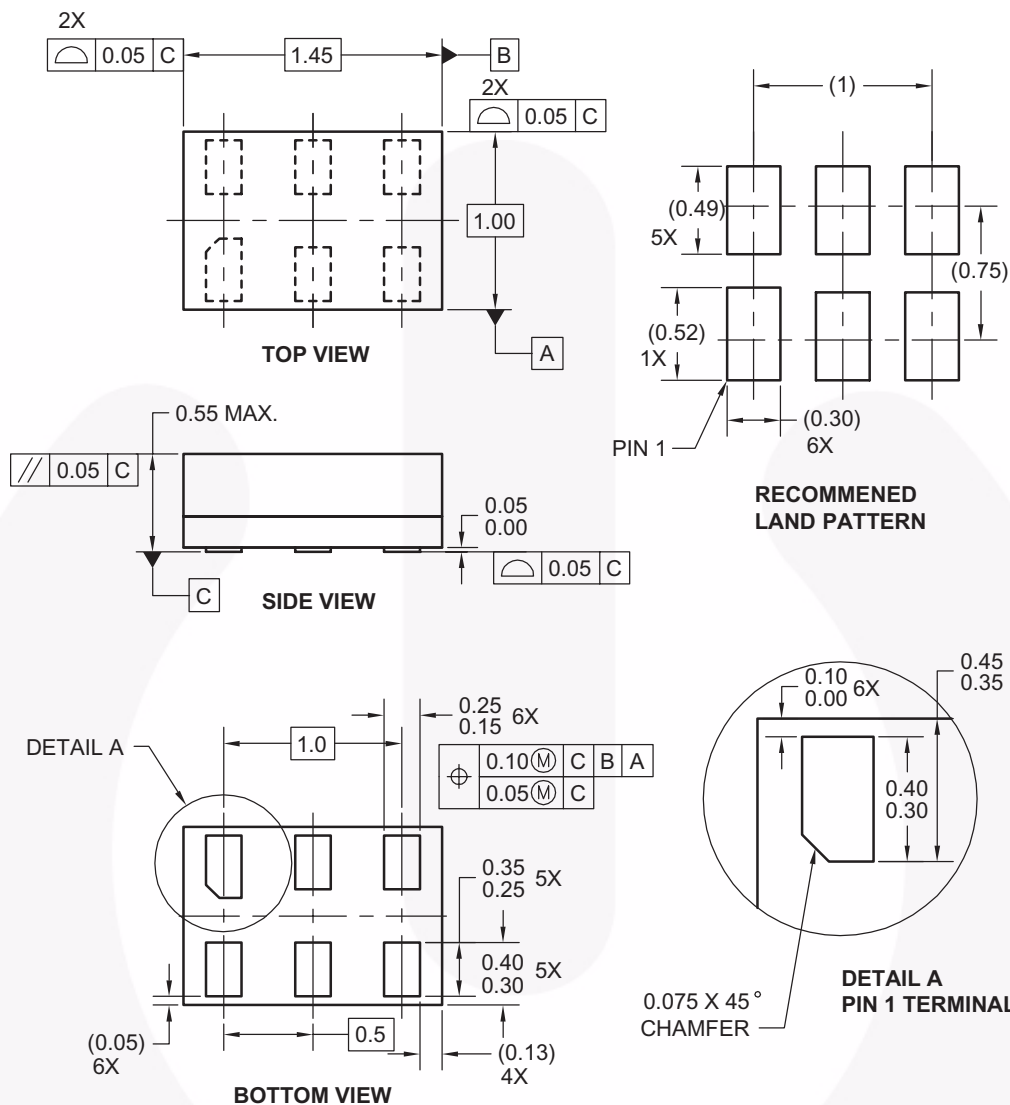
**Figure 3. 6-Lead SC70, EIAJ SC88, 1.25mm Wide**

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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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Current Transfer Logic™	GTO™	Quiet Series™	TinyPower™
EcoSPARK®	IntelliMAX™	RapidConfigure™	TinyPWM™
EfficientMax™	ISOPLANAR™	Saving our world, 1mW at a time™	TinyWire™
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FACT®	Motion-SPM™	SuperSOT™-6	VisualMax™
FAST®	OPTOLOGIC®	SuperSOT™-8	
FastvCore™	OPTOPLANAR®	SupreMOS™	
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Rev. I34

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