



# NC7SZ125 TinyLogic® UHS Buffer with Three-State Output


## Features

- Ultra-High Speed:  $t_{PD}$  2.6ns (Typical) into 50pF at 5V  $V_{CC}$
- High Output Drive:  $\pm 24mA$  at 3V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V  $V_{CC}$
- Power Down High-Impedance Inputs/Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SOT23 and SC70 Packages

## Description

The NC7SZ125 is a single buffer with three-state output from Fairchild's Ultra-High Speed (UHS) of TinyLogic®. 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 range. The inputs and output are high impedance above ground when  $V_{CC}$  is 0V. Inputs tolerate voltages up to 6V independent of  $V_{CC}$  operating voltage. The output tolerates voltages above  $V_{CC}$  when in the 3-STATE condition.

## Ordering Information

Part Number	Top Mark	 Eco Status	Package	Packing Method
NC7SZ125M5X	7Z25	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZ125P5X	Z25	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZ125L6X	DD	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZ125FHX	DD	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

 For Fairchild's definition of Eco Status, please visit: [http://www.fairchildsemi.com/company/green/rohs\\_green.html](http://www.fairchildsemi.com/company/green/rohs_green.html).

## Connection Diagrams

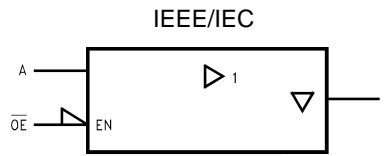


Figure 1. Logic Symbol

## Pin Configurations

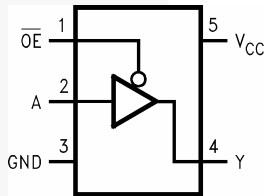


Figure 2. SC70 and SOT23 (Top View)

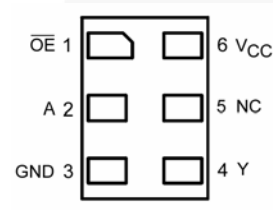


Figure 3. MicroPak™ (Top Through View)

## Pin Definitions

Pin # SC70 / SOT23	Pin # MicroPak	Name	Description
1	1	OE	Input
2	2	A	Input
3	3	GND	Ground
4	4	Y	Output
5	6	V <sub>CC</sub>	Supply Voltage
	5	NC	No Connect

## Function Table

Inputs		Output
/OE	In A	Out Y
L	L	L
L	H	H
H	X	Z

H = HIGH Logic Level

L = LOW Logic Level

X = HIGH or LOW Logic Level

Z = HIGH Impedance State

## 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	Min.	Max.	Unit	
$V_{CC}$	Supply Voltage	-0.5	6.0	V	
$V_{IN}$	DC Input Voltage	-0.5	6.0	V	
$V_{OUT}$	DC Output Voltage	-0.5	6.0	V	
$I_{IK}$	DC Input Diode Current	$V_{IN} < -0.5V$		-50	mA
		$V_{IN} > 6.0V$		+20	
$I_{OK}$	DC Output Diode Current	$V_{OUT} < -0.5V$		-50	mA
		$V_{OUT} > 6V, V_{CC}=GND$		+20	
$I_{OUT}$	DC Output Current		±50	mA	
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current		±50	mA	
$T_{STG}$	Storage Temperature Range	-65	+150	°C	
$T_J$	Junction Temperature Under Bias		+150	°C	
$T_L$	Junction Lead Temperature (Soldering, 10 Seconds)		+260	°C	
$P_D$	Power Dissipation at +85°C	SOT-23		200	mW
		SC70-5		150	
		MicroPak-6		130	
		MicroPak2-6		120	
ESD	Human Body Model, JESD22-A114		4000	V	
	Charged Device Model, JESD22-C101		2000		

## Recommended Operating Conditions

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	Conditions	Min.	Max.	Unit
$V_{CC}$	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.50	5.50	
$V_{IN}$	Input Voltage		0	5.5	V
$V_{OUT}$	Output Voltage	Active State	0	$V_{CC}$	V
		Three-State	0	5.5	
$T_A$	Operating Temperature		-40	+85	°C
$t_r, t_f$	Input Rise and Fall Times	$V_{CC}$ at 1.8V, 2.5V ± 0.2V	0	20	ns/V
		$V_{CC}$ at 3.3V ± 0.3V	0	10	
		$V_{CC}$ at 5.0V ± 0.5V	0	5	
$\theta_{JA}$	Thermal Resistance	SOT-23		300	°C/W
		SC70-5		425	
		MicroPak-6		500	
		MicroPak2-6		560	

### Note:

- Unused inputs must be held HIGH or LOW. They may not float.

### DC Electrical Characteristics

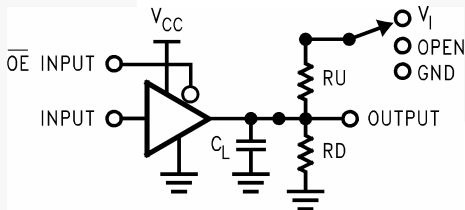
Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Input Voltage	1.65 to 1.95		0.75V <sub>CC</sub>			0.75V <sub>CC</sub>		V
		2.30 to 5.50		0.70V <sub>CC</sub>			0.70V <sub>CC</sub>		
V <sub>IL</sub>	LOW Level Input Voltage	1.65 to 1.95				0.25V <sub>CC</sub>		0.25V <sub>CC</sub>	V
		2.30 to 5.50				0.30V <sub>CC</sub>		0.30V <sub>CC</sub>	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OH</sub> =-100μA	1.55	1.65		1.55		V
		1.80		1.70	1.80		1.70		
		2.30		2.20	2.30		2.20		
		3.00		2.90	3.00		2.90		
		4.50		4.40	4.50		4.40		
		1.65	I <sub>OH</sub> =-4mA	1.29	1.52		1.29		
		2.30	I <sub>OH</sub> =-8mA	1.90	2.15		1.90		
		3.00	I <sub>OH</sub> =-16mA	2.40	2.80		2.40		
		3.00	I <sub>OH</sub> =-24mA	2.30	2.68		2.30		
		4.50	I <sub>OH</sub> =-32mA	3.80	4.20		3.80		
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> =V <sub>IL</sub> , I <sub>OL</sub> =100μA		0.00	0.10		0.00	V
		1.80			0.00	0.10		0.10	
		2.30			0.00	0.10		0.10	
		3.00			0.00	0.10		0.10	
		4.50			0.00	0.10		0.10	
		1.65	I <sub>OL</sub> =4mA		0.80	0.24		0.24	
		2.30	I <sub>OL</sub> =8mA		0.10	0.30		0.30	
		3.00	I <sub>OL</sub> =16mA		0.15	0.40		0.40	
		3.00	I <sub>OL</sub> =24mA		0.22	0.55		0.55	
		4.50	I <sub>OL</sub> =32mA		0.22	0.55		0.55	
I <sub>IN</sub>	Input Leakage Current	0 to 5.5	0 ≥ V <sub>IN</sub> ≥ 5.5V			±1		±10	μA
I <sub>oZ</sub>	3-STATE Output Leakage	0 to 5.5	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> 0 ≥ V <sub>O</sub> ≥ 5.5V			±1		±10	μA
I <sub>OFF</sub>	Power Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> =5.5V			1		10	μA
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.50	V <sub>IN</sub> =5.5V, GND			2		20	μA

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay	1.65	C <sub>L</sub> =15pF, R <sub>D</sub> =1MΩ S <sub>1</sub> =OPEN	2.0	6.4	13.2	2.0	13.8	ns	Figure 4 Figure 6
		1.80		2.0	5.3	11.0	2.0	11.5		
		2.50 ± 0.20		0.8	3.4	7.5	0.8	8.0		
		3.30 ± 0.30		0.5	2.5	5.2	0.5	5.5		
		5.00 ± 0.50		0.5	2.1	4.5	0.5	4.8		
		3.30 ± 0.30		1.5	3.2	5.7	1.5	6.0		
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time	1.65	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω R <sub>U</sub> =500Ω S <sub>1</sub> =GND for t <sub>PZH</sub> S <sub>1</sub> =V <sub>IN</sub> for t <sub>PZL</sub> V <sub>IN</sub> =2•V <sub>CC</sub>	2.0	8.4	15.0	2.0	15.6	ns	Figure 4 Figure 6
		1.80		2.0	7.0	12.5	2.0	13.0		
		2.50 ± 0.20		1.5	4.6	8.5	1.5	9.0		
		3.30 ± 0.30		1.5	3.5	6.2	1.5	6.5		
		5.00 ± 0.50		0.8	2.8	5.5	0.8	5.8		
		3.30 ± 0.30		0.8	2.8	5.5	0.8	5.8		
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Disable Time	1.65	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω R <sub>U</sub> =500Ω S <sub>1</sub> =GND for t <sub>PHZ</sub> S <sub>1</sub> =V <sub>IN</sub> for t <sub>PLZ</sub> V <sub>IN</sub> =2•V <sub>CC</sub>	2.0	6.5	13.2	2.0	14.5	ns	Figure 4 Figure 6
		1.80		2.0	5.4	11.0	2.0	12.0		
		2.50 ± 0.20		1.5	3.5	8.0	1.5	8.5		
		3.30 ± 0.30		1.0	2.8	5.7	1.0	6.0		
		5.00 ± 0.50		0.5	2.1	4.7	0.5	5.0		
		3.30 ± 0.30		0.5	2.1	4.7	0.5	5.0		
C <sub>IN</sub>	Input Capacitance	0.00			4			pF		
C <sub>OUT</sub>	Output Capacitance	0.00			8			pF		
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(2)</sup>	3.30			17			pF	Figure 5	
		5.00			24					

**Note:**

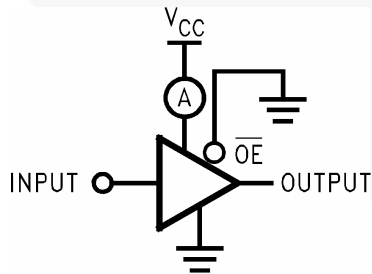
- C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub>=(C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>)+(I<sub>CC</sub>Static).



**Note:**

- C<sub>L</sub> includes load and stray capacitance. Input PRR=1.0MHz, t<sub>W</sub>=500ns.

Figure 4. AC Test Circuit



**Note:**

- Input=AC Waveform; t<sub>r</sub>=t<sub>f</sub>=1.8ns; PRR=10MHz; Duty Cycle=50%.

Figure 5. I<sub>CCD</sub> Test Circuit

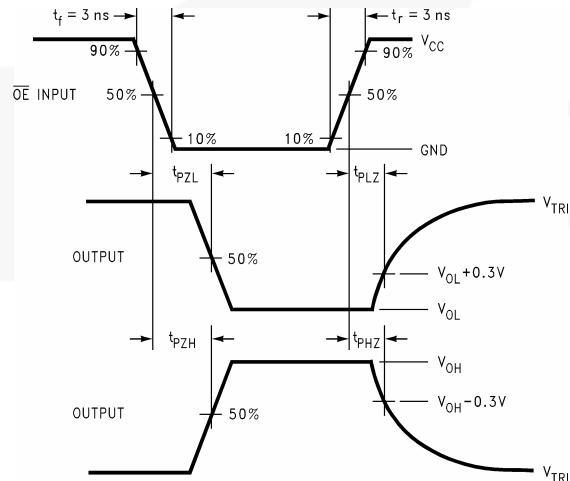
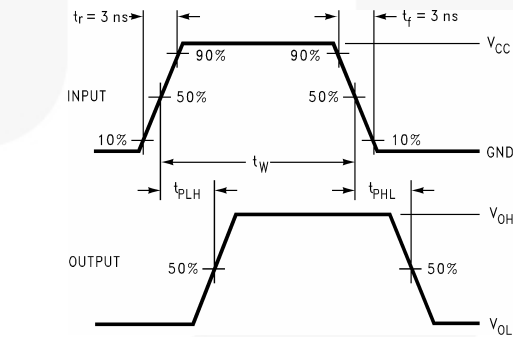
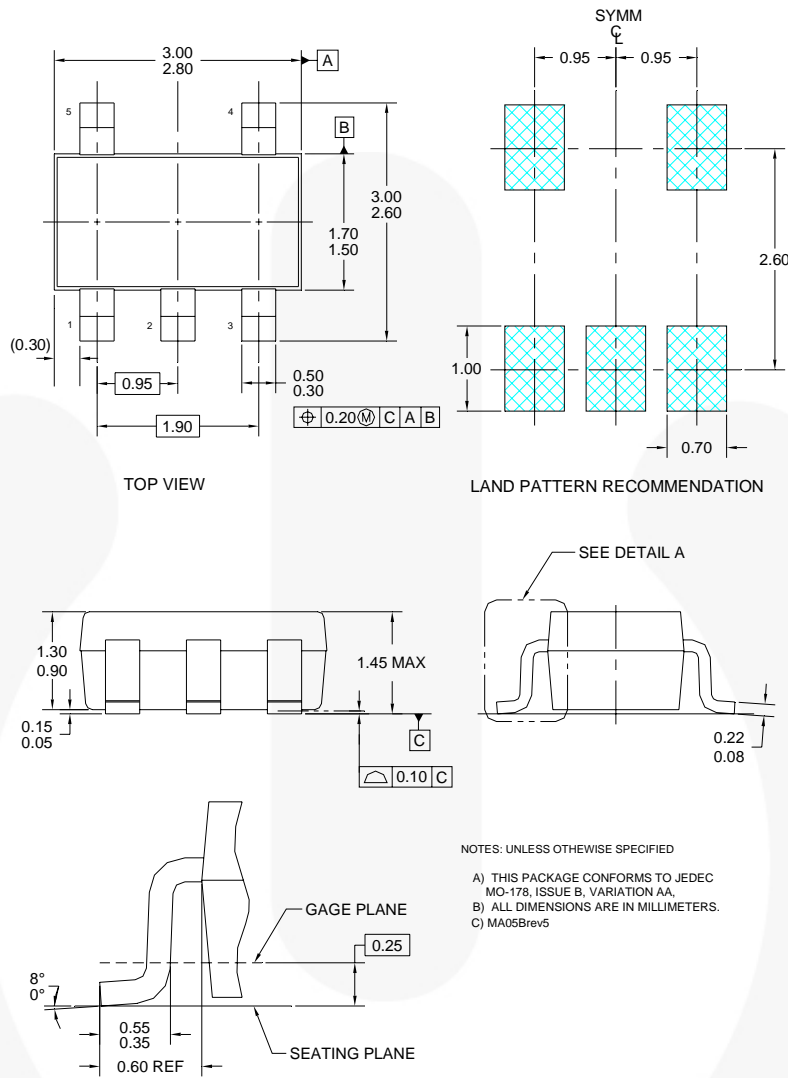


Figure 6. AC Waveforms

## Physical Dimensions



**Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6mm**

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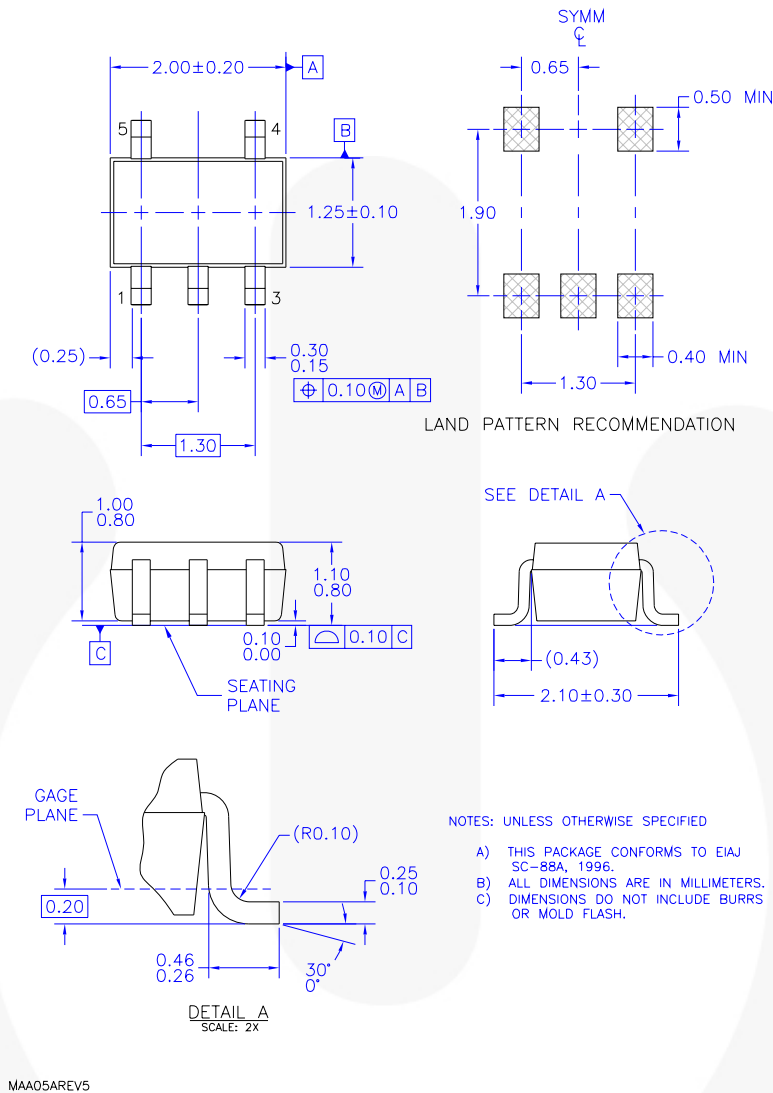
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## Tape and Reel Specifications

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[http://www.fairchildsemi.com/packaging/SOT23-5L\\_tr.pdf](http://www.fairchildsemi.com/packaging/SOT23-5L_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
M5X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

## Physical Dimensions



**Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide**

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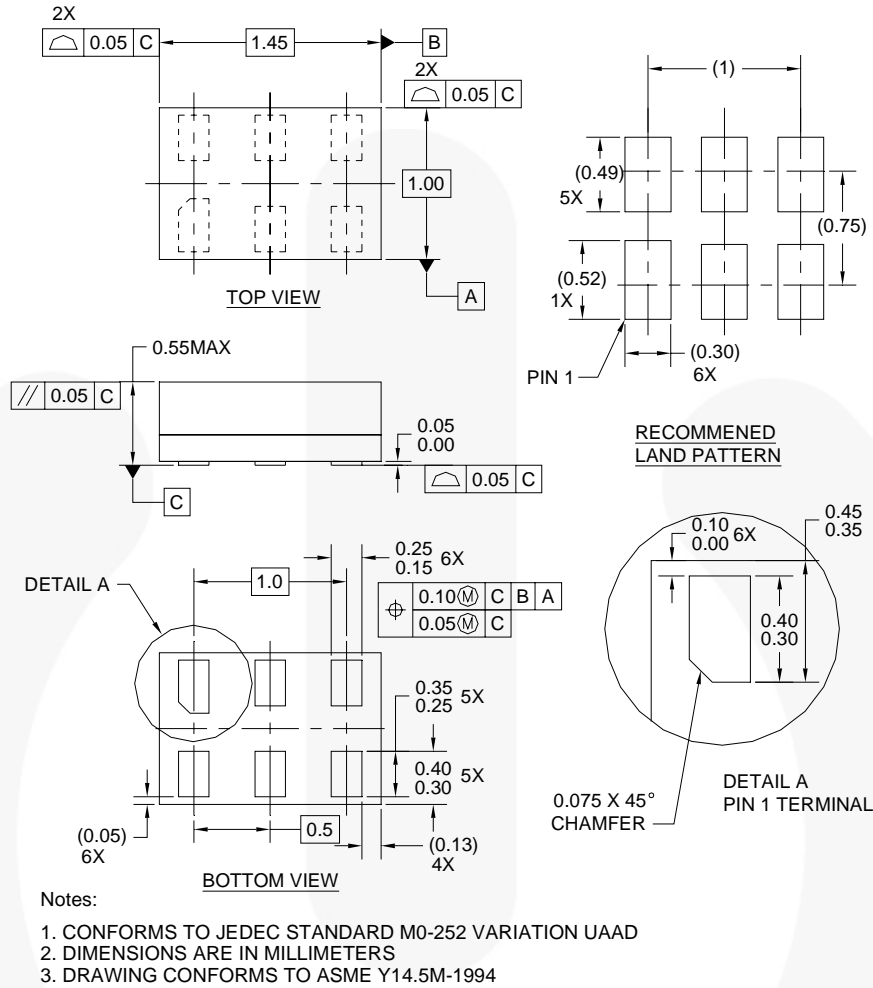
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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
P5X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

## Physical Dimensions



MAC06AREVC

**Figure 9. 6-Lead, MicroPak™, 1.0mm Wide**

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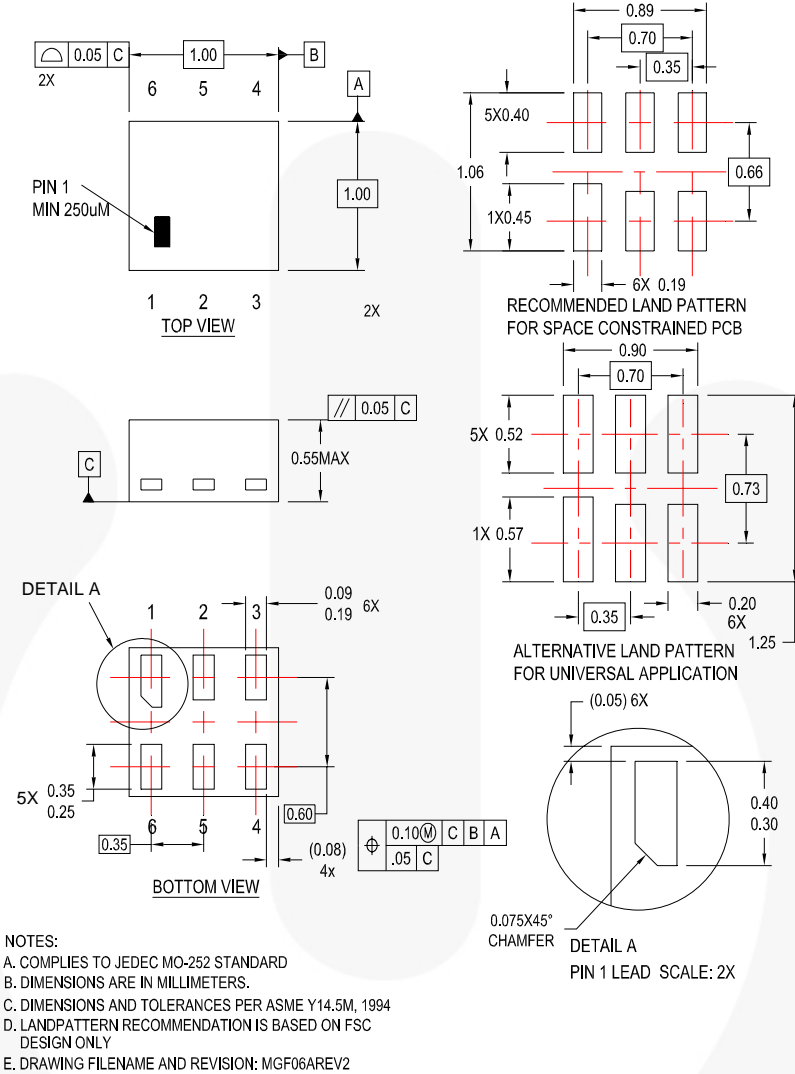
## Tape and Reel Specifications

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[http://www.fairchildsemi.com/products/logic/pdf/micropak\\_tr.pdf](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf)

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



## Physical Dimensions



**Figure 10. 6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch**

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## Tape and Reel Specifications






Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/packaging/MicroPAK2\\_6L\\_tr.pdf](http://www.fairchildsemi.com/packaging/MicroPAK2_6L_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
FHX	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



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