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## NC7SVL04 TinyLogic® Low-I<sub>CC</sub>T Inverter

### Features

- 0.9V to 3.6V V<sub>CC</sub> Supply Operation
- 3.6V Over-Voltage Tolerant I/Os at V<sub>CC</sub> from 0.9V to 3.6V
- Power-Off High Impedance Inputs and Outputs
- Proprietary Quiet Series™ Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Package
- Ultra-Low Dynamic Power

### Description

The NC7SVL04 is a single inverter with a low-I<sub>CC</sub>T input design from Fairchild's Ultra-Low Power (ULP-A) series of TinyLogic®. The NC7SVL04 features very low quiescent current, even when the input voltage is lower than the V<sub>CC</sub> supply. This feature services mobile handset applications very well, allowing for direct interface with baseband processor general-purpose I/Os. Since mobile devices rely on a battery supply, the NC7SVL04 facilitates lower power consumption in mixed-voltage rail environments.

This product is designed on an advanced CMOS technology for a wide low-voltage operating range (0.9V to 3.6V V<sub>CC</sub>), high drive needs (up to 24mA), and speed (maximum propagation delay of 3.5ns, V<sub>CC</sub>=3.3V). It achieves this performance while maintaining low CMOS power dissipation.

### Ordering Information

Part Number	Top Mark	Package	Packing Method
NC7SVL04P5X	L04	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SVL04L6X	CD	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SVL04FHX	CD	6-Lead, MicroPak2™, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

## Connection Diagram



Figure 1. Logic Symbol

## Pin Configurations

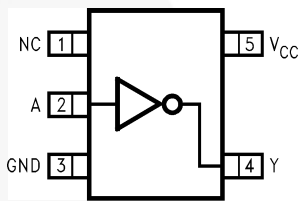


Figure 2. SC70 (Top View)

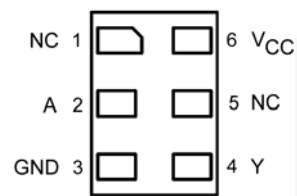


Figure 3. MicroPak™ (Top Through View)

## Pin Definitions

Pin # SC70	Pin # MicroPak™	Name	Description
1	1	NC	No Connect
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

Y =  $\bar{A}$

Inputs	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	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage	-0.5	4.6	V
V <sub>IN</sub>	DC Input Voltage	-0.5	4.6	V
V <sub>OUT</sub>	DC Output Voltage	HIGH or LOW State <sup>(1)</sup>	V <sub>CC</sub> + 0.5	V
		V <sub>CC</sub> =0V	4.6	
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < 0V	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < 0V	-50	mA
		V <sub>OUT</sub> > V <sub>CC</sub>	+50	
I <sub>OH</sub> /I <sub>OL</sub>	DC Output Source/Sink Current		±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current per Supply Pin		±50	mA
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias		+150	°C
T <sub>L</sub>	Junction Lead Temperature, Soldering 10 Seconds		+260	°C
P <sub>D</sub>	Power Dissipation at +85°C	SC70-5	150	mW
		MicroPak™-6	130	
		MicroPak2™-6	120	
ESD	Human Body Model, JEDEC:JESD22-A114		4000	V
	Charge Device Model, JEDEC:JESD22-C101		2000	

**Note:**

- I<sub>O</sub> absolute maximum ratings must be observed.

## 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 <sub>CC</sub>	Supply Voltage		0.9	3.6	V
V <sub>IN</sub>	Input Voltage		0	3.6	V
V <sub>OUT</sub>	Output Voltage	V <sub>CC</sub> =0V	0	3.6	V
		HIGH or LOW State	0	V <sub>CC</sub>	
I <sub>OH</sub> /I <sub>OL</sub>	Output Current in I <sub>OH</sub> /I <sub>OL</sub>	V <sub>CC</sub> =3.0V to 3.6V		±24.0	mA
		V <sub>CC</sub> =2.3V to 2.7V		±18.0	
		V <sub>CC</sub> =1.65V to 1.95V		±6.0	
		V <sub>CC</sub> =1.4V to 1.6V		±4.0	
		V <sub>CC</sub> =1.1V to 1.3V		±2.0	
		V <sub>CC</sub> =0.9V		±0.1	
T <sub>A</sub>	Operating Temperature, Free Air		-40	+85	°C
Δt/ΔV	Minimum Input Edge Rate	V <sub>IN</sub> =0.8V to 2.0V, V <sub>CC</sub> =3.0V		10	ns/V
θ <sub>JA</sub>	Thermal Resistance	SC70-5		425	°C/W
		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.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Input Voltage	0.90		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		0.90		.0.90		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		1.50		1.50		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		1.50		1.50		
V <sub>IL</sub>	LOW Level Input Voltage	0.90			.25 x V <sub>CC</sub>		.25 x V <sub>CC</sub>	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			.25 x V <sub>CC</sub>		.25 x V <sub>CC</sub>	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			.25 x V <sub>CC</sub>		.25 x V <sub>CC</sub>	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			.25 x V <sub>CC</sub>		.25 x V <sub>CC</sub>	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70			0.70		0.70	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.80		0.80	
V <sub>OH</sub>	HIGH Level Output Voltage	0.90	I <sub>OH</sub> =-100μA	V <sub>CC</sub> -0.10		V <sub>CC</sub> -0.10		V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		V <sub>CC</sub> -0.10		V <sub>CC</sub> -0.10		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		V <sub>CC</sub> -0.20		V <sub>CC</sub> -0.20		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		V <sub>CC</sub> -0.20		V <sub>CC</sub> -0.20		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		V <sub>CC</sub> -0.20		V <sub>CC</sub> -0.20		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		V <sub>CC</sub> -0.20		V <sub>CC</sub> -0.20		
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	I <sub>OH</sub> =-2mA	.75 x V <sub>CC</sub>		.75 x V <sub>CC</sub>		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	I <sub>OH</sub> =-4mA	.75 x V <sub>CC</sub>		.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		2.00		2.00		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OH</sub> =-12mA	1.80		1.80		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		2.20		2.20		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OH</sub> =-18mA	1.70		1.70		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		2.40		2.40		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		I <sub>OH</sub> =-24mA	2.20		2.20	

Continued on the following page...

### DC Electrical Characteristics (Continued)

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =25°C		T <sub>A</sub> =-40 to 85°C		Units
				Min.	Max.	Min.	Max.	
V <sub>OL</sub>	LOW Level Output Voltage	0.90	I <sub>OL</sub> =100μA		0.10		0.10	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			0.10		0.10	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			0.20		0.20	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			0.20		0.20	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70			0.20		0.20	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.20		0.20	
		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		0.30		0.30	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OL</sub> =12mA		0.40		0.40	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.40		0.40	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OL</sub> =18mA		0.60		0.60	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.40		0.40	
		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>IN</sub> ≤ 3.60V		±0.1		±0.5	μA
I <sub>OFF</sub>	Power Off Leakage Current	0	0 ≤ (V <sub>IN</sub> , V <sub>O</sub> ) ≤ 3.60V		0.5		0.5	μA
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60	V <sub>IN</sub> =V <sub>CC</sub> or GND		0.9		0.9	μA
			V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.60V				±0.9	
I <sub>CCCT</sub>	Increase in I <sub>CC</sub> per Input	1.95	V <sub>IN</sub> =0.9V		6		8	μA
		3.60	V <sub>IN</sub> =1.5V		6		8	

### 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>PHL</sub> , t <sub>PLH</sub>	Propagation Delay	0.90	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ		34.0				ns	Figure 4 Figure 5
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	C <sub>L</sub> =15pF, R <sub>L</sub> =2kΩ	3.5	8.1	16.5	3.0	27.8		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		1.5	3.7	7.0	1.5	7.5		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	C <sub>L</sub> =30pF, R <sub>L</sub> =500Ω	1.1	2.8	5.8	1.0	6.3		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		0.6	2.0	4.0	0.6	4.5		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		0.5	1.5	3.5	0.5	4.0		
C <sub>IN</sub>	Input Capacitance	0			3			pF		
C <sub>PD</sub>	Power Dissipation Capacitance	0.90 to 3.60	V <sub>IN</sub> =0V or V <sub>CC</sub> , f=10MHz		5			pF		

## AC Loadings and Waveforms

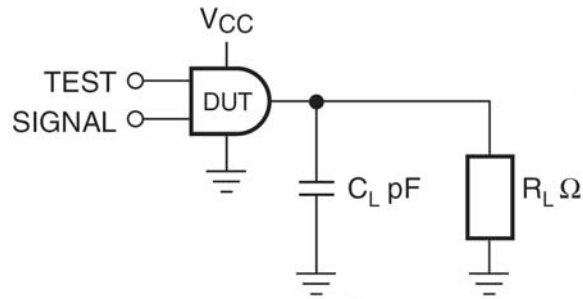


Figure 4. AC Test Circuit

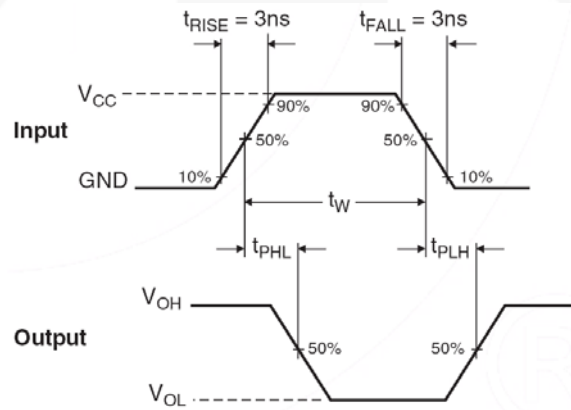
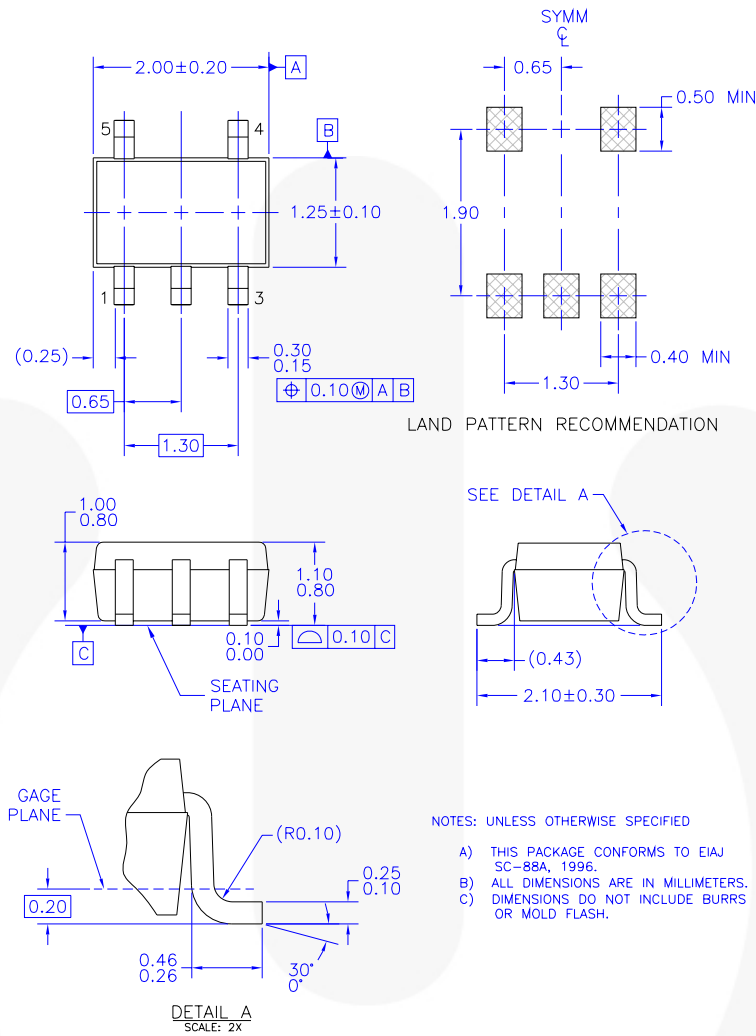


Figure 5. AC Waveforms

Symbol	V <sub>CC</sub>					
	3.3V ± 0.3V	2.5V ± 0.2V	1.8V ± 0.15V	1.5V ± 0.1V	1.2V ± 0.1V	0.9V
V <sub>mi</sub>	1.5V	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2
V <sub>mo</sub>	1.5V	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2

## Physical Dimensions



MAA05AREV5

**Figure 6. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide**

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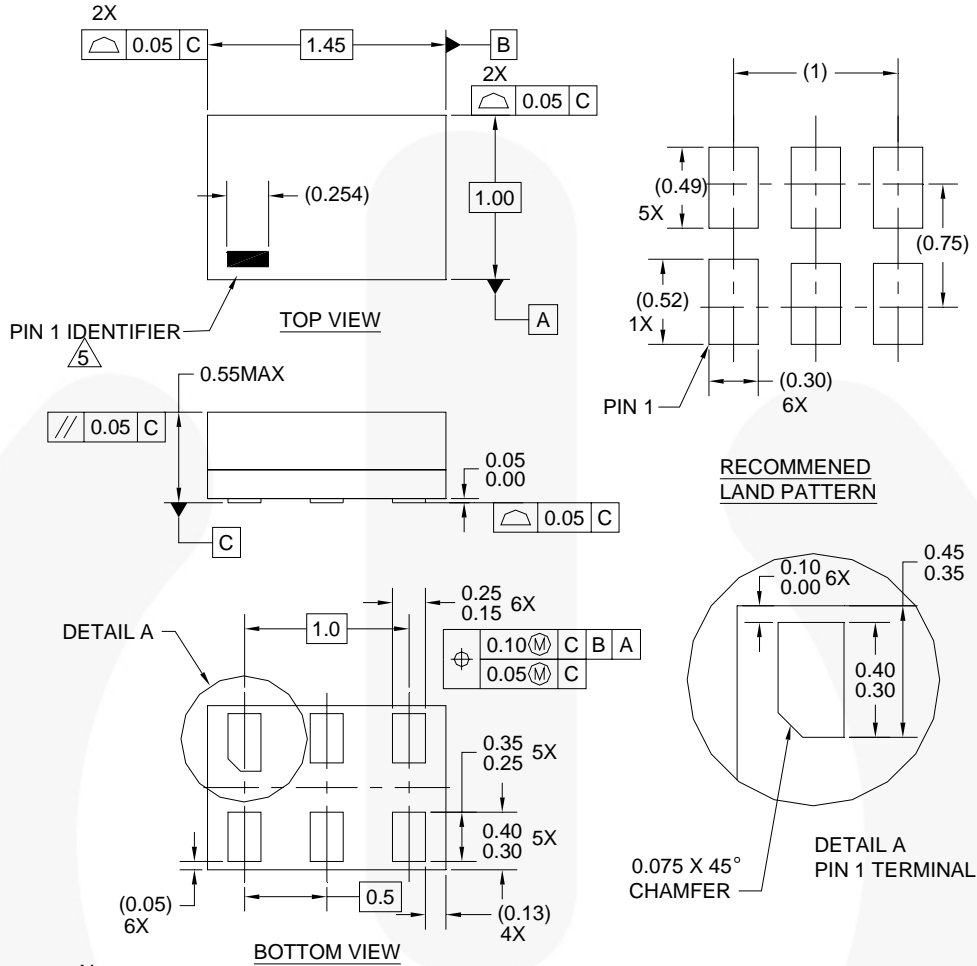
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[http://www.fairchildsemi.com/products/analog/pdf/sc70-5\\_tr.pdf](http://www.fairchildsemi.com/products/analog/pdf/sc70-5_tr.pdf)

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



**Notes:**

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994
4. FILENAME AND REVISION: MAC06AREV4
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

**Figure 7. 6-Lead, MicroPak™, 1.0mm Wide**

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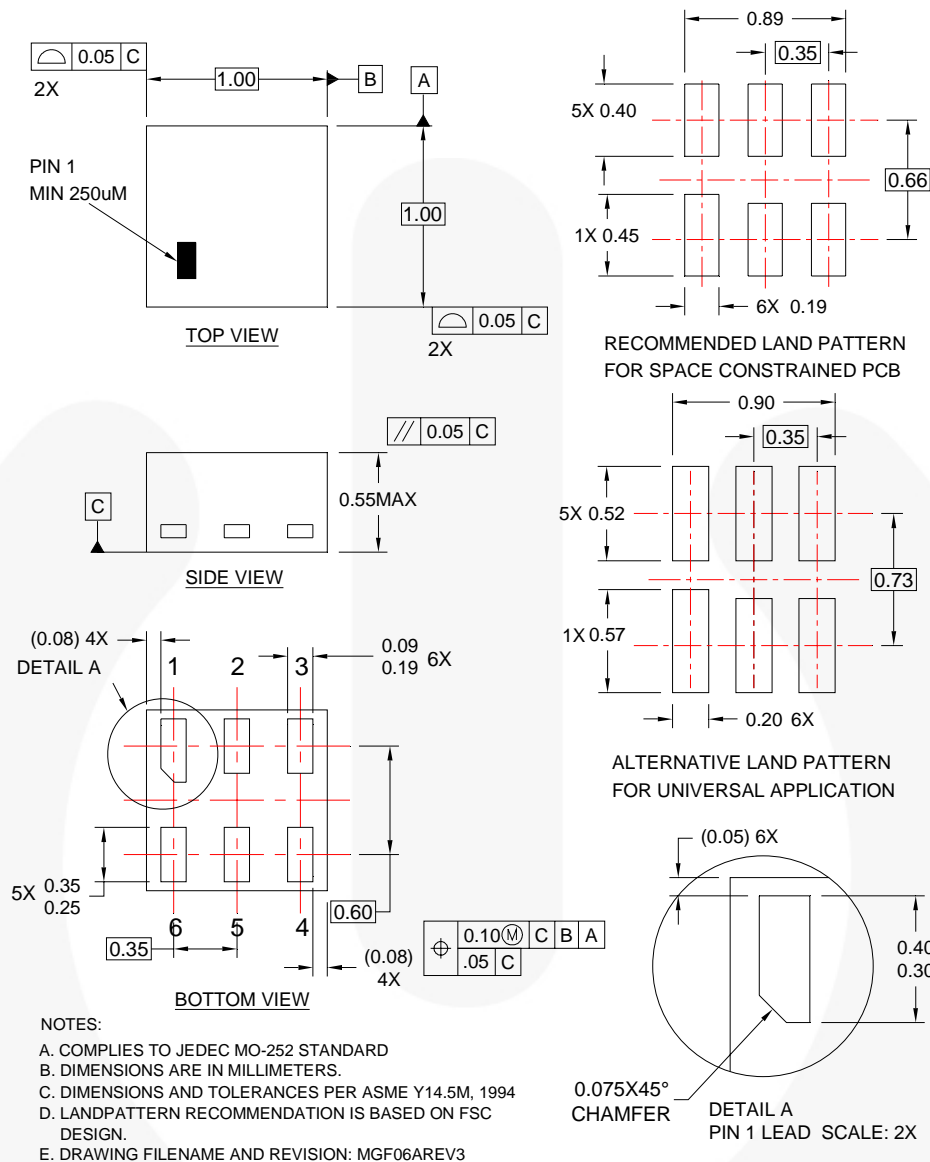
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## Tape and Reel Specifications

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/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 8. 6-Lead, MicroPak2™, 1x1mm Body, .35mm Pitch**

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## Tape and Reel Specifications



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[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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| Auto-SPM™                | FRFET®  | PowerXST™   | The Right Technology for Your Success™   |
| Build it Now™            | Global Power Resource™  | Programmable Active Droop™  | <b>the power franchise</b>   |
| CorePLUS™                | Green FPS™  | QFET®   | TinyBoost™   |
| CorePOWER™               | Green FPS™ e-Series™  | QST™  | TinyBuck™  |
| CROSSVOL™                | Gmax™   | Quiet Series™   | TinyCalc™  |
| CTL™                     | GTO™  | RapidConfigure™   | TinyLogic®   |
| Current Transfer Logic™  | IntelliMAX™   |  ™               | TINYOPTO™  |
| DEUXPEED®                | ISOPLANAR™  | Saving our world, 1mW/Wk/W at a time™   | TinyPower™   |
| Dual Cool™               | MegaBuck™   | SignalWise™   | TinyPVM™   |
| EcoSPARK®                | MICROCOUPLER™   | SmartMax™   | TinyWire™  |
| EfficientMax™            | MicroFET™   | SMART START™  | TriFault Detect™   |
| ESBC™                    | MicroPak™   | SPM®  | TRUECURRENT™   |
| <b>F</b> ®               | MicroPak2™  | STEALTH™  | µSerDes™   |
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| Fairchild Semiconductor® | MotionMax™  | SuperSOT™-3   | UHC®   |
| FACT Quiet Series™       | Motion-SPM™   | SuperSOT™-6   | Ultra FRFET™   |
| FACT®                    | OptoHIT™  | SuperSOT™-8   | UniFET™  |
| FAST®                    | OPTOLOGIC®  | SupreMOS®   | VCT™   |
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| FETBench™                |  ™ | Sync-Lock™  | XS™  |
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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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**Definition of Terms**

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