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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®

November 2010

NC7SVL04
TinyLogic® Low-I_{CCT} Inverter

Features

- 0.9V to 3.6V V_{CC} Supply Operation
- 3.6V Over-Voltage Tolerant I/Os at V_{CC} 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_{CCT} 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_{CC} 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_{CC}), high drive needs (up to 24mA), and speed (maximum propagation delay of 3.5ns, V_{CC}=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

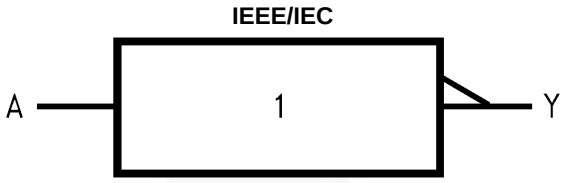

Figure 1. Logic Symbol

Pin Configurations

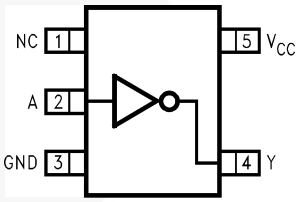

Figure 2. SC70 (Top View)

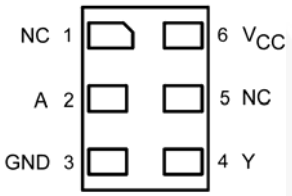

Figure 3. MicroPak™ (Top Through View)

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_{CC}	Supply Voltage
	5	NC	No Connect

Function Table

Y=/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_{CC}	Supply Voltage		-0.5	4.6	V
V_{IN}	DC Input Voltage		-0.5	4.6	V
V_{OUT}	DC Output Voltage	HIGH or LOW State(1)	-0.5	V_{CC} + 0.5	V
		V_{CC}=0V	-0.5	4.6	
I_{IK}	DC Input Diode Current	V_{IN} < 0V		-50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < 0V		-50	mA
		V_{OUT} > V_{CC}		+50	
I_{OH} / I_{OL}	DC Output Source/Sink Current			±50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Supply Pin			±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	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:

1. I_O 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_{CC}	Supply Voltage		0.9	3.6	V
V_{IN}	Input Voltage		0	3.6	V
V_{OUT}	Output Voltage	V_{CC}=0V	0	3.6	V
		HIGH or LOW State	0	V_{CC}	
I_{OH}/I_{OL}	Output Current in I_{OH}/I_{OL}	V_{CC}=3.0V to 3.6V		±24.0	mA
		V_{CC}=2.3V to 2.7V		±18.0	
		V_{CC}=1.65V to 1.95V		±6.0	
		V_{CC}=1.4V to 1.6V		±4.0	
		V_{CC}=1.1V to 1.3V		±2.0	
		V_{CC}=0.9V		±0.1	
T_A	Operating Temperature, Free Air		-40	+85	°C
$\Delta t/\Delta V$	Minimum Input Edge Rate	V_{IN}=0.8V to 2.0V, V_{CC}=3.0V		10	ns/V
θ_{JA}	Thermal Resistance	SC70-5		425	°C/W
		MicroPak™-6		500	
		MicroPak2™-6		560	

Note:

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

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	Conditions	T_A=25°C		T_A=-40 to +85°C		Units
				Min.	Max.	Min.	Max.	
V_{IH}	HIGH Level Input Voltage	0.90		.65 x V_{CC}		.65 x V_{CC}		V
		1.10 ≤ V_{CC} ≤ 1.30		.65 x V_{CC}		.65 x V_{CC}		
		1.40 ≤ V_{CC} ≤ 1.60		.65 x V_{CC}		.65 x V_{CC}		
		1.65 ≤ V_{CC} ≤ 1.95		0.90		.0.90		
		2.30 ≤ V_{CC} ≤ 2.70		1.50		1.50		
		2.70 ≤ V_{CC} ≤ 3.60		1.50		1.50		
V_{IL}	LOW Level Input Voltage	0.90			.25 x V_{CC}		.25 x V_{CC}	V
		1.10 ≤ V_{CC} ≤ 1.30			.25 x V_{CC}		.25 x V_{CC}	
		1.40 ≤ V_{CC} ≤ 1.60			.25 x V_{CC}		.25 x V_{CC}	
		1.65 ≤ V_{CC} ≤ 1.95			.25 x V_{CC}		.25 x V_{CC}	
		2.30 ≤ V_{CC} ≤ 2.70			0.70		0.70	
		2.70 ≤ V_{CC} ≤ 3.60			0.80		0.80	
V_{OH}	HIGH Level Output Voltage	0.90	I_{OH}=-100µA	V_{CC}-0.10		V_{CC}-0.10		V
		1.10 ≤ V_{CC} ≤ 1.30		V_{CC}-0.10		V_{CC}-0.10		
		1.40 ≤ V_{CC} ≤ 1.60		V_{CC}-0.20		V_{CC}-0.20		
		1.65 ≤ V_{CC} ≤ 1.95		V_{CC}-0.20		V_{CC}-0.20		
		2.30 ≤ V_{CC} ≤ 2.70		V_{CC}-0.20		V_{CC}-0.20		
		2.70 ≤ V_{CC} ≤ 3.60		V_{CC}-0.20		V_{CC}-0.20		
		1.10 ≤ V_{CC} ≤ 1.30	I_{OH}=-2mA	.75 x V_{CC}		.75 x V_{CC}		
		1.40 ≤ V_{CC} ≤ 1.60	I_{OH}=-4mA	.75 x V_{CC}		.75 x V_{CC}		
		1.65 ≤ V_{CC} ≤ 1.95	I_{OH}=-6mA	1.25		1.25		
		2.30 ≤ V_{CC} ≤ 2.70		2.00		2.00		
		2.30 ≤ V_{CC} ≤ 2.70	I_{OH}=-12mA	1.80		1.80		
		2.70≤ V_{CC} ≤ 3.60		2.20		2.20		
		2.30 ≤ V_{CC} ≤ 2.70	I_{OH}=-18mA	1.70		1.70		
		2.70 ≤ V_{CC} ≤ 3.60		2.40		2.40		
		2.70 ≤ V_{CC} ≤ 3.60	I_{OH}=-24mA	2.20		2.20		

Continued on the following page…

DC Electrical Characteristics (Continued)

Symbol	Parameter	V_{CC}	Conditions	T_A=25°C		T_A=-40 to 85°C		Units
				Min.	Max.	Min.	Max.	
V_{OL}	LOW Level Output Voltage	0.90	I_{OL}=100µA		0.10		0.10	V
		1.10 ≤ V_{CC} ≤ 1.30			0.10		0.10	
		1.40 ≤ V_{CC} ≤ 1.60			0.20		0.20	
		1.65 ≤ V_{CC} ≤ 1.95			0.20		0.20	
		2.30 ≤ V_{CC} ≤ 2.70			0.20		0.20	
		2.70 ≤ V_{CC} ≤ 3.60			0.20		0.20	
		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		0.30		0.30	
		2.30 ≤ V_{CC} ≤ 2.70	I_{OL}=12mA		0.40		0.40	
		2.70 ≤ V_{CC} ≤ 3.60			0.40		0.40	
		2.30 ≤ V_{CC} ≤ 2.70	I_{OL}=18mA		0.60		0.60	
		2.70 ≤ V_{CC} ≤ 3.60			0.40		0.40	
		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_{IN} ≤ 3.60V		±0.1		±0.5	µA
I_{OFF}	Power Off Leakage Current	0	0 ≤ ($V_{IN,}$ V_O) ≤ 3.60V		0.5		0.5	µA
I_{CC}	Quiescent Supply Current	0.90 to 3.60	V_{IN}=V_{CC} or GND		0.9		0.9	µA
			V_{CC} ≤ V_{IN} ≤ 3.60V				±0.9	
I_{CCT}	Increase in I_{CC} per Input	1.95	V_{IN}=0.9V		6		8	µA
		3.60	V_{IN}=1.5V		6		8	

AC Electrical Characteristics

Symbol	Parameter	V_{CC}	Conditions	T_A=25°C			T_A=-40 to 85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay	0.90	C_L=15pF, R_L=1MΩ		34.0				ns	Figure 4 Figure 5
		1.10 ≤ V_{CC} ≤ 1.30	C_L=15pF, R_L=2kΩ	3.5	8.1	16.5	3.0	27.8		
		1.40 ≤ V_{CC} ≤ 1.60		1.5	3.7	7.0	1.5	7.5		
		1.65 ≤ V_{CC} ≤ 1.95	C_L=30pF, R_L=500Ω	1.1	2.8	5.8	1.0	6.3		
		2.30 ≤ V_{CC} ≤ 2.70		0.6	2.0	4.0	0.6	4.5		
		2.70 ≤ V_{CC} ≤ 3.60		0.5	1.5	3.5	0.5	4.0		
C_{IN}	Input Capacitance	0			3				pF	
C_{PD}	Power Dissipation Capacitance	0.90 to 3.60	V_{IN}=0V or V_{CC}, f=10MHz		5				pF	

AC Loadings and Waveforms

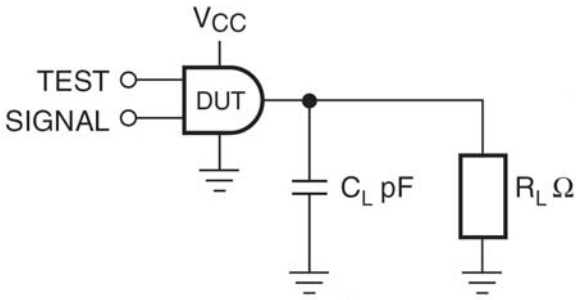

Figure 4. AC Test Circuit

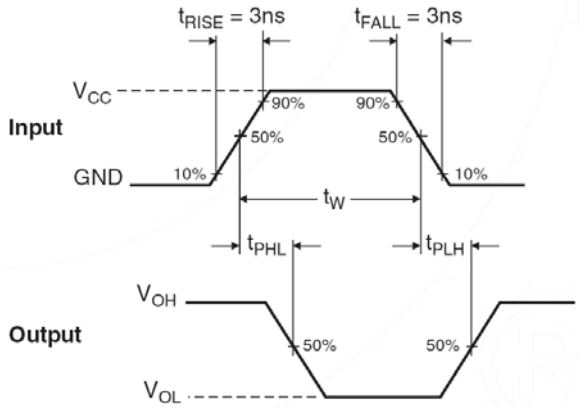

Figure 5. AC Waveforms

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	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

Physical Dimensions

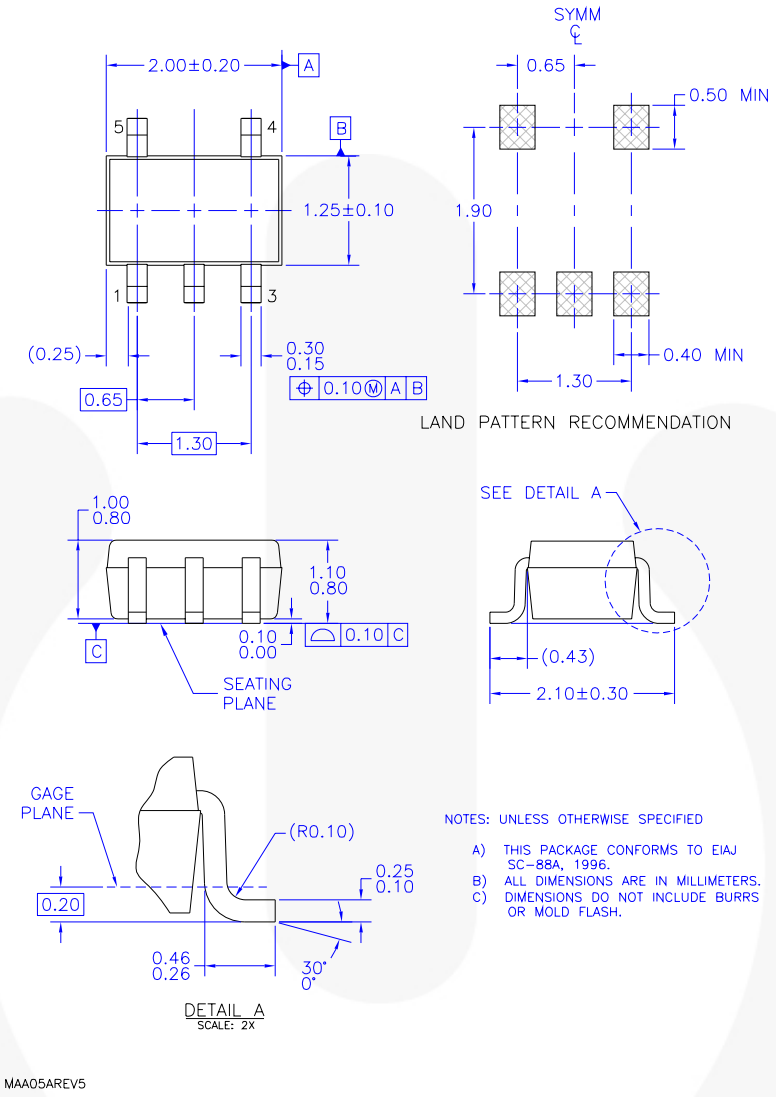

Figure 6. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

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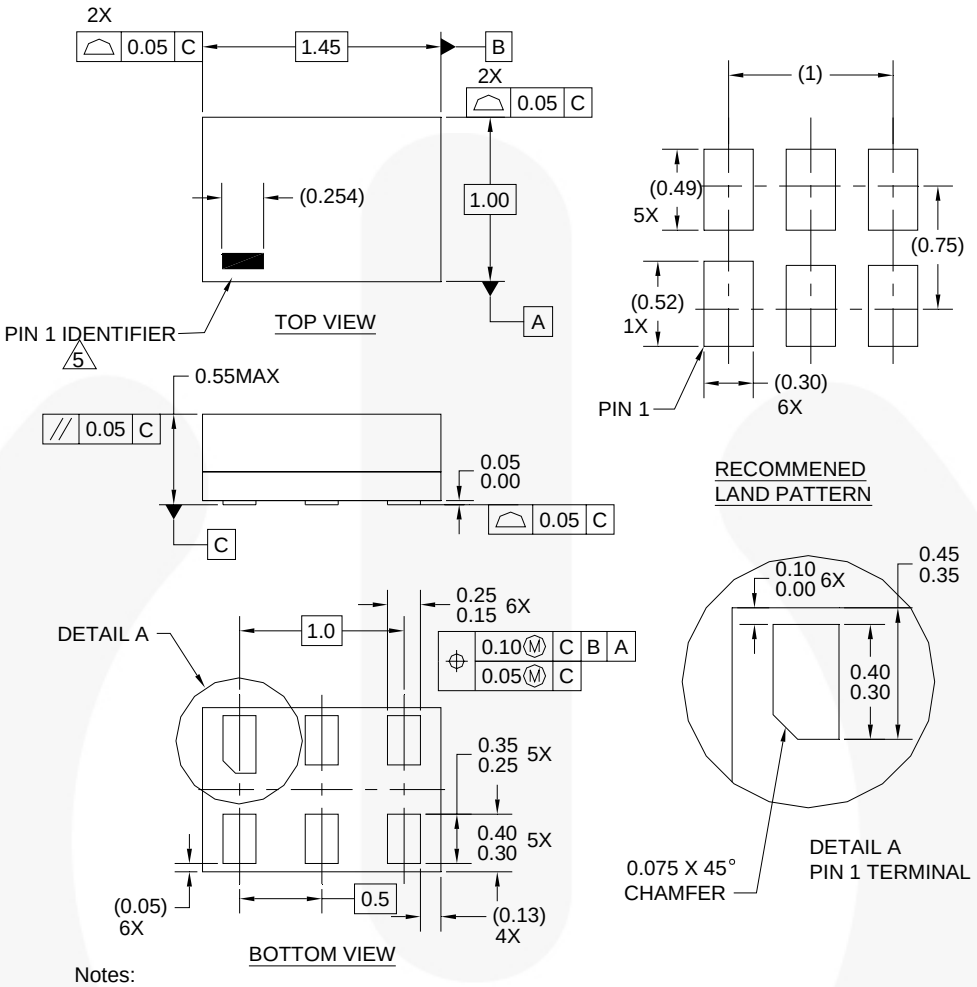
Tape and Reel Specifications

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:
http://www.fairchildsemi.com/products/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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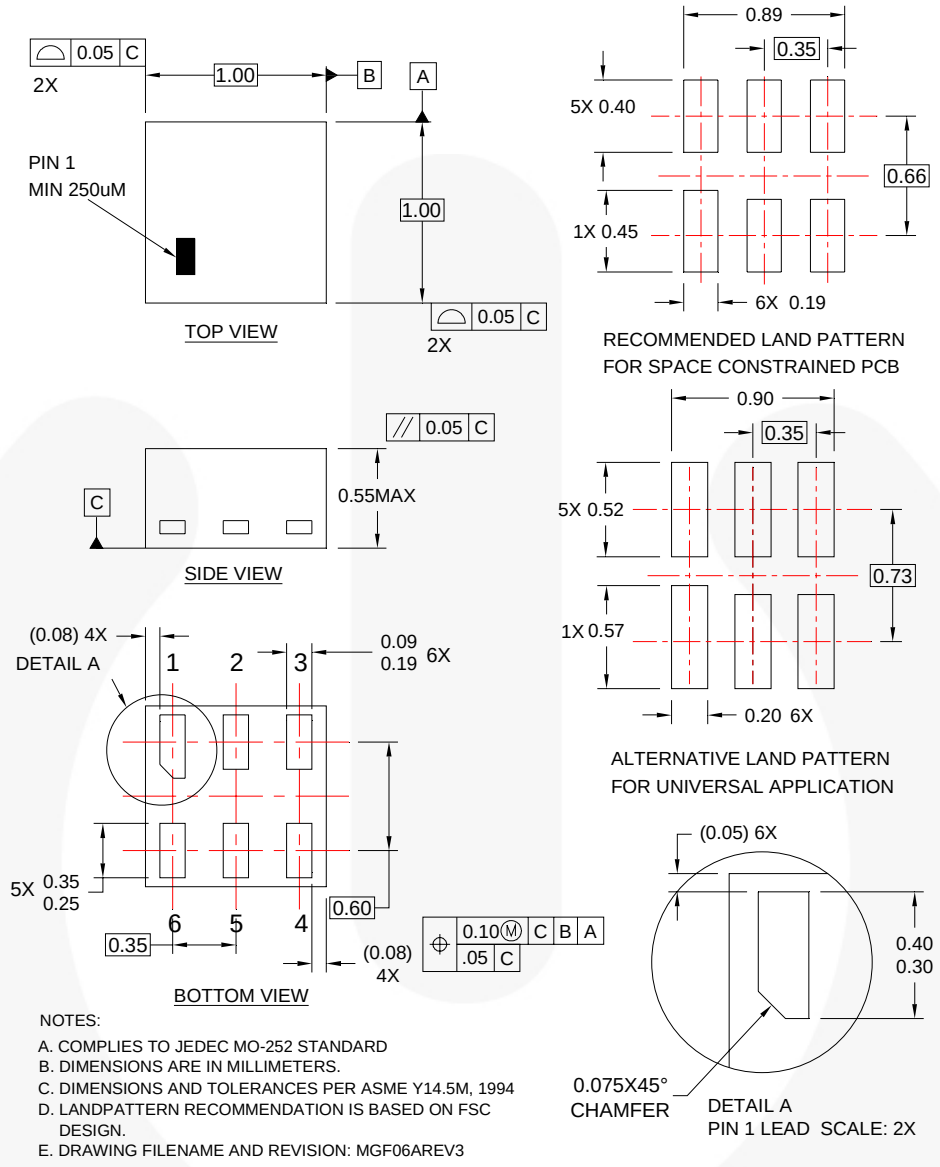
Tape and Reel Specifications

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.

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



NOTES:

A. COMPLIES TO JEDEC MO-252 STANDARD
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
D. LANDPATTERN RECOMMENDATION IS BASED ON FSC DESIGN.
E. DRAWING FILENAME AND REVISION: MGF06AREV3

Figure 8. 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.

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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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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	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	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I51

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