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FAIRCHILD SEMICONDUCTOR®

March 2011

FXLP34
Single Bit Uni-Directional Translator

Features

- 1.0V to 3.6V V_{CC} Supply Voltage
- Converts Any Voltage (1.0V to 3.6V) to (1.0V to 3.6V)
- 4.6V Tolerant Inputs and Outputs
- t_{PD}:
  - 4ns Typical for 3.0V to 3.6V V_{CC}
- Power-Off High Impedance Inputs and Outputs
- Static Drive (I_{OH}/I_{OL}):
  - ±2.6mA at 3.00V V_{CC}
- Uses Proprietary Quiet Series™ Noise / EMI Reduction Circuitry
- Ultra-Small Micropak™ Leadless Packages
- Ultra-Low Dynamic Power

Description

The FXLP34 is a single translator with two separate supply voltages: V_{CC1} for input translation voltages and V_{CC} for output translation voltages. The FXLP34 is part of Fairchild's Ultra Low Power (ULP) series of products. This device operates with VCC values from 1.0V to 3.6V, and is intended for use in portable applications that require ultra low power consumption.

The internal circuit is composed of a minimum of buffer stages, to enable ultra low dynamic power.

The FXLP34 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

Part Number	Top Mark	Package	Packing Method
FXLP34P5X	X34	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
FXLP34L6X	X3	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
FXLP34FHX	X3	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

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Pin Configuration

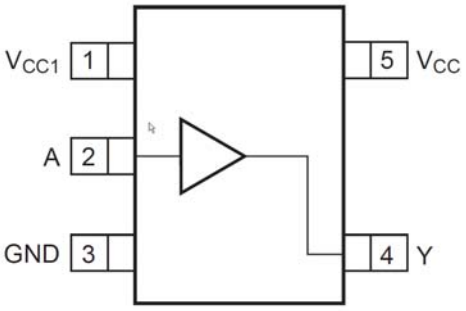

Figure 1. SC70 (Top View)

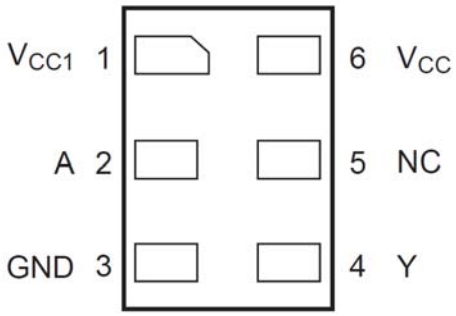

Figure 2. MicroPak™ (Top Through View)

Pin Definitions

Pin # SC70	Pin # MicroPak™	Name	Description
1	1	V_{CC1}	Input Translation Voltage
2	2	A	Input
3	3	GND	Ground
4	4	Y	Output
	5	NC	No Connect
5	6	V_{CC}	Output Translation Voltage

Truth Table

Inputs	Outputs
A	**Y**
L	L
H	H

H = Logic Level HIGH

L = Logic Level Low

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}, V_{CC1}	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} +0.5V	V
		V_{CC}=0V	-0.5	+4.6	
I_{IK}	DC Input Diode Current	V_{IN} < 0		-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			±100	mA
T_{STG}	Storage Temperature Range		-65	150	°C
P_D	Power Dissipation at +85°C	SC70-6		180	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 Rating 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}, V_{CC1}	Supply Voltage		1.0	3.6	V
V_{IN}	Input Voltage		0	3.6	V
V_{OUT}	Output Voltage	HIGH or LOW State	0	V_{CC}	V
		V_{CC}=0V	0	3.6	
I_{OH}/I_{OL}	Output Current in I_{OH}/I_{OL}	V_{CC}=3.0 to 3.6V		±2.6	mA
		V_{CC}=2.3 to 2.7V		±2.1	
		V_{CC}=1.65 to 1.95V		±1.5	
		V_{CC}=1.40 to 1.60V		±1.0	
		V_{CC}=1.10 to 1.30V		±0.5	
		V_{CC}=1.0V		±20	µA
T_A	Operating Temperature, Free Air		-40	+85	°C
θ_{JA}	Thermal Resistance	SC70-6		425	°C/W
		MicroPak™-6		500	
		MicroPak2™-6		560	

Note:

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

Electrical Characteristics

Symbol	Parameter	Condition	V_{CC} (V)	V_{CC1} (V)	T_A=+25°C		T_A=-40 to +85°C		Unit
					Min.	Max.	Min.	Max.	
V_{IH}	HIGH Level Input (V_{CC1})		1.0 to 3.6	1.0	0.65 x V_{CCI}		0.65 x V_{CCI}		V
				1.10≤V_{CC1}≤1.30	0.65 x V_{CCI}		0.65 x V_{CCI}		
				1.40≤V_{CC1}≤1.60	0.65 x V_{CCI}		0.65 x V_{CCI}		
				1.65≤V_{CC1}≤1.95	0.65 x V_{CCI}		0.65 x V_{CCI}		
				2.30≤V_{CC1}≤2.70	1.6		1.6		
				3.00≤V_{CC1}≤3.60	2.1		2.1		
V_{IL}	LOW Level Input		1.0 to 3.6	1.0		0.35 x V_{CCI}		0.35 x V_{CCI}	V
				1.10≤V_{CC1}≤1.30		0.35 x V_{CCI}		0.35 x V_{CCI}	
				1.40≤V_{CC1}≤1.60		0.35 x V_{CCI}		0.35 x V_{CCI}	
				1.65≤V_{CC1}≤1.95		0.35 x V_{CCI}		0.35 x V_{CCI}	
				2.30≤V_{CC1}≤2.70		0.7		0.7	
				3.00≤V_{CC1}≤3.60		0.9		0.9	
V_{OH}	HIGH Level Output (V_{CC})	I_{OH}=-20µA	1.0	1.0 to 3.6	V_{CC}-0.1		V_{CC}-0.1		V
			1.10≤V_{CC1}≤1.30		V_{CC}-0.1		V_{CC}-0.1		
			1.40≤V_{CC1}≤1.60		V_{CC}-0.1		V_{CC}-0.1		
			1.65≤V_{CC1}≤1.95		V_{CC}-0.1		V_{CC}-0.1		
			2.30≤V_{CC1}≤2.70		V_{CC}-0.1		V_{CC}-0.1		
			3.00≤V_{CC1}≤3.60		V_{CC}-0.1		V_{CC}-0.1		
		I_{OH}=-0.5mA	1.10≤V_{CC1}≤1.30	1.0 to 3.6	0.75 x V_{CC}		0.70 x V_{CC}		
		I_{OH}=-1.0mA	1.40≤V_{CC1}≤1.60		1.07		0.99		
		I_{OH}=-1.5mA	1.65≤V_{CC1}≤1.95		1.24		1.22		
		I_{OH}=-2.1mA	2.30≤V_{CC1}≤2.70		1.95		1.87		
		I_{OH}=-2.6mA	3.00≤V_{CC1}≤3.60		2.61		2.55		
V_{OL}	LOW Level Output	I_{OL}=20µA	1.0	1.0 to 3.6		0.1		0.1	V
			1.10≤V_{CC1}≤1.30			0.1		0.1	
			1.40≤V_{CC1}≤1.60			0.1		0.1	
			1.65≤V_{CC1}≤1.95			0.1		0.1	
			2.30≤V_{CC1}≤2.70			0.1		0.1	
		I_{OL}=0.5mA	1.10≤V_{CC1}≤1.30	1.0 to 3.6		0.30 x V_{CC}		0.30 x V_{CC}	
		I_{OL}=1.0mA	1.40≤V_{CC1}≤1.60			0.31		0.37	
		I_{OL}=1.5mA	1.65≤V_{CC1} ≤ 1.95			0.31		0.35	
		I_{OL}=2.1mA	2.30≤V_{CC1}≤2.70			0.31		0.33	
		I_{OL}=2.6mA	3.00≤V_{CC1}≤3.60			0.31		0.33	
I_{IN}	Input Leakage Current	0 ≤ V_{IN} ≤ 3.60		1.0 to 3.6		±0.1		±1.0	µA
I_{OFF}	Power Off Leakage Current	0 ≤ (V_{IN}, V_O) ≤ 3.60	0	0		1.0		5.0	µA
I_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND	1.0 to 3.6	1.0 to 3.6		0.9		5.0	µA

Continued on the following page…

AC Electrical Characteristics

Symbol	Parameter	Condition	V_{CC1} (V)	T_A=+25°C			T_A=-40 to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.0	C_L=10pF, R_L=1MΩ	1.0		26.0				ns	Figure 3, Figure 4
			1.10 to 1.30	15.0	25.0	38.1	12.0	43.3		
			1.40 to 1.60	14.0	24.0	36.7	11.0	42.0		
			1.65 to 1.95	13.0	23.0	36.0	10.0	41.4		
			2.30 to 2.70	12.0	22.0	35.5	9.0	40.9		
			3.00 to 3.60	11.0	21.0	35.5	8.0	40.6		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.2	C_L=10pF, R_L=1MΩ	1.0		18.0				ns	Figure 3, Figure 4
			1.10 to 1.30	8.0	15.0	23.2	6.0	41.0		
			1.40 to 1.60	7.5	14.0	21.7	5.5	39.1		
			1.65 to 1.95	7.0	13.0	20.9	5.0	32.3		
			2.30 to 2.70	6.5	12.0	20.4	4.5	29.6		
			3.00 to 3.60	6.0	12.0	20.2	4.0	29.4		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.5	C_L=10pF, R_L=1MΩ	1.0		14.0				ns	Figure 3, Figure 4
			1.10 to 1.30	5.0	11.0	16.3	4.0	20.6		
			1.40 to 1.60	4.8	10.0	14.8	3.5	19.3		
			1.65 to 1.95	4.5	9.0	14.1	3.0	18.7		
			2.30 to 2.70	4.0	8.0	13.5	2.5	18.0		
			3.00 to 3.60	3.5	8.0	13.3	2.0	17.8		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.8	C_L=10pF, R_L=1MΩ	1.0		13.0				ns	Figure 3, Figure 4
			1.10 to 1.30	4.0	9.0	13.5	3.0	17.5		
			1.40 to 1.60	3.5	8.0	12.0	2.5	16.3		
			1.65 to 1.95	3.0	7.0	11.3	2.0	15.6		
			2.30 to 2.70	2.5	6.0	10.7	1.5	15.0		
			3.00 to 3.60	2.5	6.0	10.5	1.0	14.7		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=2.5	C_L=10pF, R_L=1MΩ	1.0		12.0				ns	Figure 3, Figure 4
			1.10 to 1.30	3.0	7.0	10.9	2.5	14.3		
			1.40 to 1.60	2.5	6.0	9.4	2.0	13.1		
			1.65 to 1.95	2.0	5.0	8.6	1.5	11.4		
			2.30 to 2.70	1.5	4.0	8.0	1.0	10.8		
			3.00 to 3.60	1.5	4.0	7.8	1.0	10.5		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=3.3	C_L=10pF, R_L=1MΩ	1.0		11.0				ns	Figure 3, Figure 4
			1.10 to 1.30	3.0	6.0	10.1	2.0	13.8		
			1.40 to 1.60	2.5	5.0	8.2	1.5	10.5		
			1.65 to 1.95	2.0	4.0	7.4	1.0	9.9		
			2.30 to 2.70	1.0	3.0	6.8	1.0	9.2		
			3.00 to 3.60	1.0	3.0	6.6	1.0	9.0		

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AC Electrical Characteristics (Continued)

Symbol	Parameter	Condition	V_{CC1} (V)	T_A=+25°C			T_A=-40 to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.0	C_L=15pF, R_L=1MΩ	1.0		28.0				ns	Figure 3, Figure 4
			1.10 to 1.30	16.0	27.0	43.0	12.0	44.8		
			1.40 to 1.60	15.0	26.0	41.6	11.0	43.6		
			1.65 to 1.95	14.0	25.0	40.9	10.0	47.9		
			2.30 to 2.70	13.0	24.0	40.5	9.0	47.5		
			3.00 to 3.60	12.0	23.0	40.4	8.0	41.4		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.2	C_L=15pF, R_L=1MΩ	1.0		19.0				ns	Figure 3, Figure 4
			1.10 to 1.30	9.0	16.0	24.6	8.0	43.1		
			1.40 to 1.60	8.5	15.0	23.1	7.5	42.2		
			1.65 to 1.95	8.0	14.0	22.4	7.0	31.4		
			2.30 to 2.70	7.5	13.0	21.8	6.5	30.7		
			3.00 to 3.60	7.0	13.0	21.6	6.0	30.5		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.5	C_L=15pF, R_L=1MΩ	1.0		15.0				ns	Figure 3, Figure 4
			1.10 to 1.30	6.0	12.0	17.2	5.5	21.5		
			1.40 to 1.60	5.8	11.0	15.7	5.0	20.3		
			1.65 to 1.95	5.5	10.0	14.9	4.5	19.6		
			2.30 to 2.70	5.0	9.0	14.3	4.0	18.9		
			3.00 to 3.60	4.5	.0	14.2	3.5	18.7		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.8	C_L=15pF, R_L=1MΩ	1.0		14.0				ns	Figure 3, Figure 4
			1.10 to 1.30	5.0	8.0	14.2	5.5	18.2		
			1.40 to 1.60	4.5	7.0	12.7	4.0	17.0		
			1.65 to 1.95	4.0	6.0	11.9	3.5	16.3		
			2.30 to 2.70	3.5	5.0	11.3	3.0	15.7		
			3.00 to 3.60	3.5	5.0	11.2	2.5	14.4		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=2.5	C_L=15pF, R_L=1MΩ	1.0		12.0				ns	Figure 3, Figure 4
			1.10 to 1.30	4.0	7.0	11.3	3.5	14.9		
			1.40 to 1.60	3.5	6.0	9.8	3.0	13.6		
			1.65 to 1.95	3.0	5.0	9.1	2.5	12.0		
			2.30 to 2.70	2.5	4.0	8.5	2.0	11.3		
			3.00 to 3.60	2.5	4.0	8.3	2.0	11.1		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=3.3	C_L=15pF, R_L=1MΩ	1.0		11.0				ns	Figure 3, Figure 4
			1.10 to 1.30	3.0	6.0	10.5	2.0	14.2		
			1.40 to 1.60	2.5	5.0	8.6	1.5	11.0		
			1.65 to 1.95	2.0	4.0	7.8	1.0	10.3		
			2.30 to 2.70	1.5	3.0	7.2	1.0	9.7		
			3.00 to 3.60	1.5	3.0	7.0	1.0	9.4		

Continued on the following page…

AC Electrical Characteristics (Continued)

Symbol	Parameter	Condition	V_{CC1} (V)	T_A=+25°C			T_A=-40 to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.0	C_L=30pF, R_L=1MΩ	1.0		34.0				ns	Figure 3, Figure 4
			1.10 to 1.30	19.0	32.0	48.6	15.0	55.5		
			1.40 to 1.60	18.0	31.0	47.1	14.0	52.3		
			1.65 to 1.95	17.0	30.0	46.4	13.0	50.6		
			2.30 to 2.70	16.0	29.0	45.9	12.0	49.2		
			3.00 to 3.60	15.0	28.0	45.8	10.0	49.1		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.2	C_L=30pF, R_L=1MΩ	1.0		22.0				ns	Figure 3, Figure 4
			1.10 to 1.30	11.0	19.0	29.0	10.0	46.5		
			1.40 to 1.60	10.0	18.0	27.5	9.0	42.6		
			1.65 to 1.95	9.0	17.0	26.7	8.0	36.7		
			2.30 to 2.70	8.5	16.0	26.1	7.0	36.0		
			3.00 to 3.60	8.0	16.0	26.0	6.0	35.9		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.5	C_L=30pF, R_L=1MΩ	1.0		16.0				ns	Figure 3, Figure 4
			1.10 to 1.30	6.0	13.0	19.8	5.5	25.3		
			1.40 to 1.60	5.8	12.0	18.3	5.0	23.0		
			1.65 to 1.95	5.5	11.0	17.6	4.5	22.4		
			2.30 to 2.70	5.0	10.0	17.0	4.0	21.7		
			3.00 to 3.60	4.5	9.0	16.8	3.5	21.5		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=1.8	C_L=30pF, R_L=1MΩ	1.0		15.0				ns	Figure 3, Figure 4
			1.10 to 1.30	5.0	11.0	16.2	5.5	20.4		
			1.40 to 1.60	4.5	10.0	14.7	4.0	19.2		
			1.65 to 1.95	4.0	9.0	13.9	3.5	18.5		
			2.30 to 2.70	3.5	8.0	13.3	3.0	17.9		
			3.00 to 3.60	3.5	8.0	13.1	2.5	17.6		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=2.5	C_L=30pF, R_L=1MΩ	1.0		13.0				ns	Figure 3, Figure 4
			1.10 to 1.30	4.0	8.0	12.7	3.5	15.9		
			1.40 to 1.60	3.5	7.0	11.2	3.0	14.3		
			1.65 to 1.95	3.0	6.0	10.5	2.5	13.6		
			2.30 to 2.70	2.5	5.0	9.9	2.0	12.8		
			3.00 to 3.60	2.5	5.0	9.7	2.0	12.5		
t_{PHL}, t_{PLH}	Propagation Delay Output Translation V_{CC}(V)=3.3	C_L=30pF, R_L=1MΩ	1.0		12.0				ns	Figure 3, Figure 4
			1.10 to 1.30	3.0	8.0	11.7	2.0	15.0		
			1.40 to 1.60	2.5	7.0	9.8	1.5	12.2		
			1.65 to 1.95	2.0	6.0	8.9	1.0	11.5		
			2.30 to 2.70	1.5	5.0	8.3	1.0	10.7		
			3.00 to 3.60	1.5	5.0	8.1	1.0	10.4		

Capacitance

Symbol	Parameter	Conditions	V_{CC} / V_{CC1} (V)	T_A=+25°C	Units
				Typical	
C_{IN}	Input Capacitance			2	pF
$C_{I/O}$	Input/Output Capacitance			4	pF
C_{PD}	Power Dissipation Capacitance	V_I=0V or V_{CC1}, f=10MHz, V_{CC} / V_{CC1}=3.6V	1.0 to 3.60	8	pF

Translator Power-up Sequence Recommendations

To ensure that the system does not experience unnecessary I_{CC} current draw, bus contention, or oscillations during power-up; adhere to the following guidelines. This device is designed with the output pin(s) supplied by V_{CC} and the input pin(s) supplied by V_{CC1}. The first recommendation is to begin by powering up the input side of the device with V_{CC1}. The Input pin(s) should be ramped with or ahead of V_{CC1} or held LOW. This guards against bus contentions and oscillations as all inputs and the input V_{CC1} are powered at the same time. The output V_{CC} can then be powered to the target voltage level to which the device will translate. The output pin(s) then translate to logic levels dictated by the output V_{CC} levels.

Upon completion of these steps, the device can be configured for the desired operation. Following these steps helps prevent possible damage to the translator device as well as other system components.

AC Loadings and Waveforms

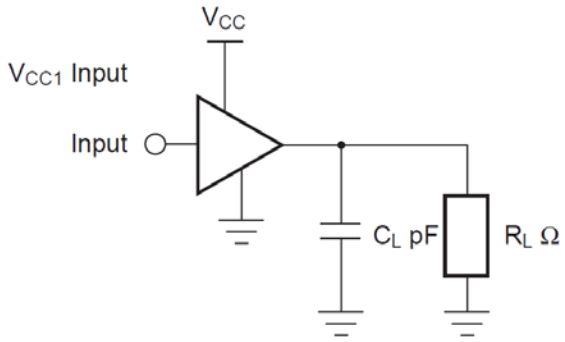

Figure 3. AC Test Circuit

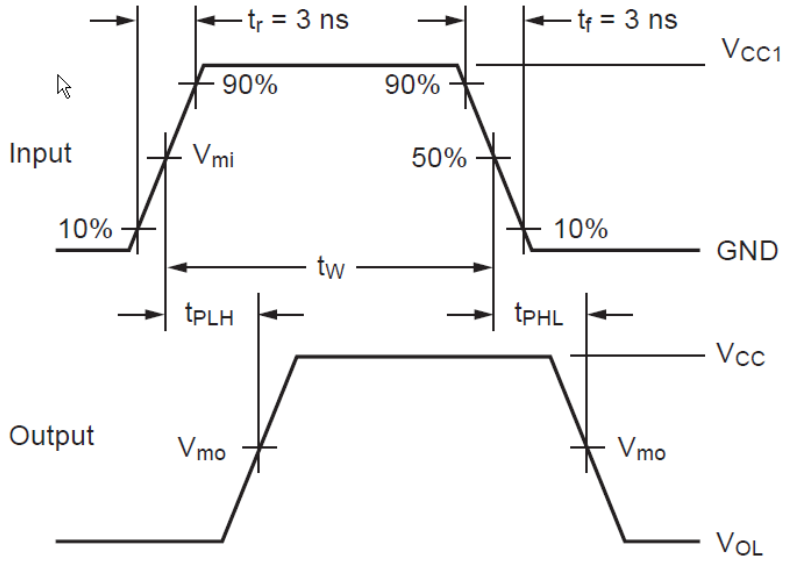

Figure 4. Waveform for Inverting and Non-Inverting Functions

Table 1. AC Load Table

Symbol	V_{CC}					
	3.3V ±0.3V	2.5V ±0.2V	1.8V ±0.15V	1.5V ±0.10V	1.2V ±0.10V	1.0V
V_{mi}	1.5V	$V_{CC1}/2$	$V_{CC1}/2$	$V_{CC1}/2$	$V_{CC1}/2$	$V_{CC1}/2$
V_{mo}	1.5V	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_CC/2$	$V_{CC}/2$

Physical Dimensions

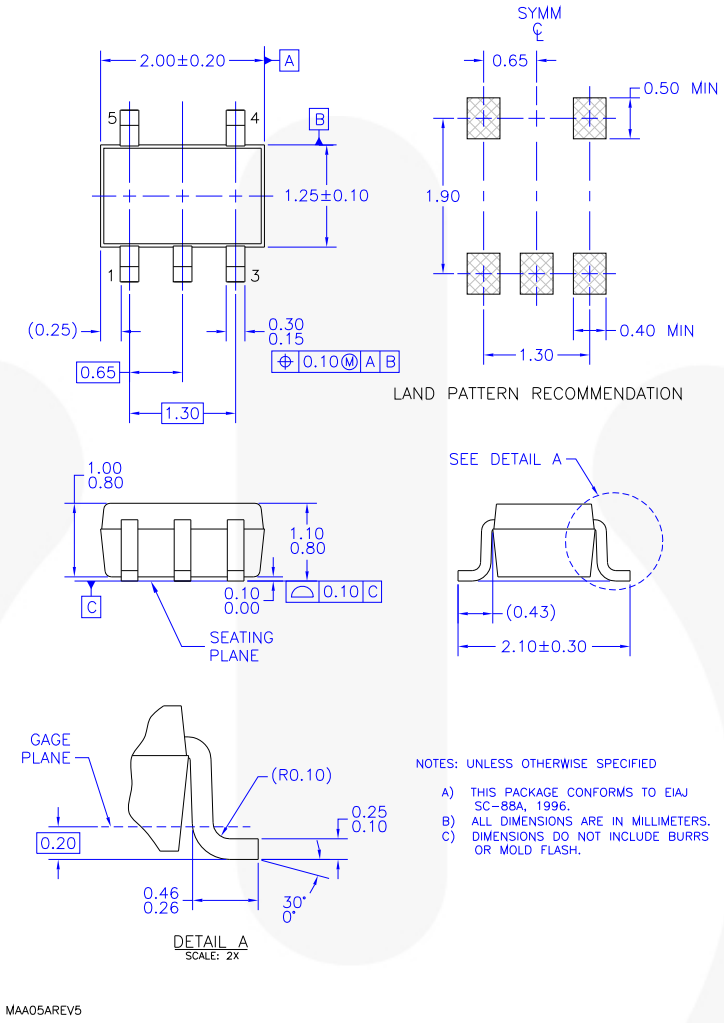

Figure 5. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

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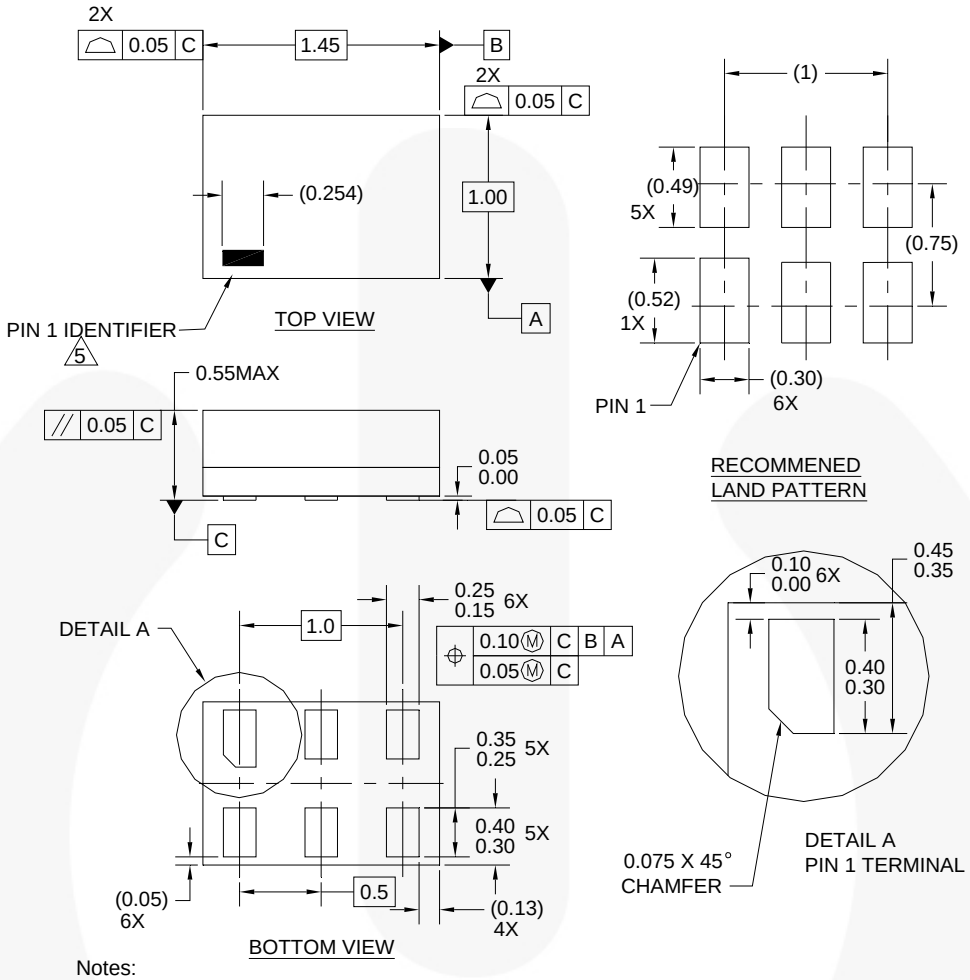
Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
P5X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Physical Dimensions



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 6. 6-Lead, MicroPak™, 1.0mm Wide

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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

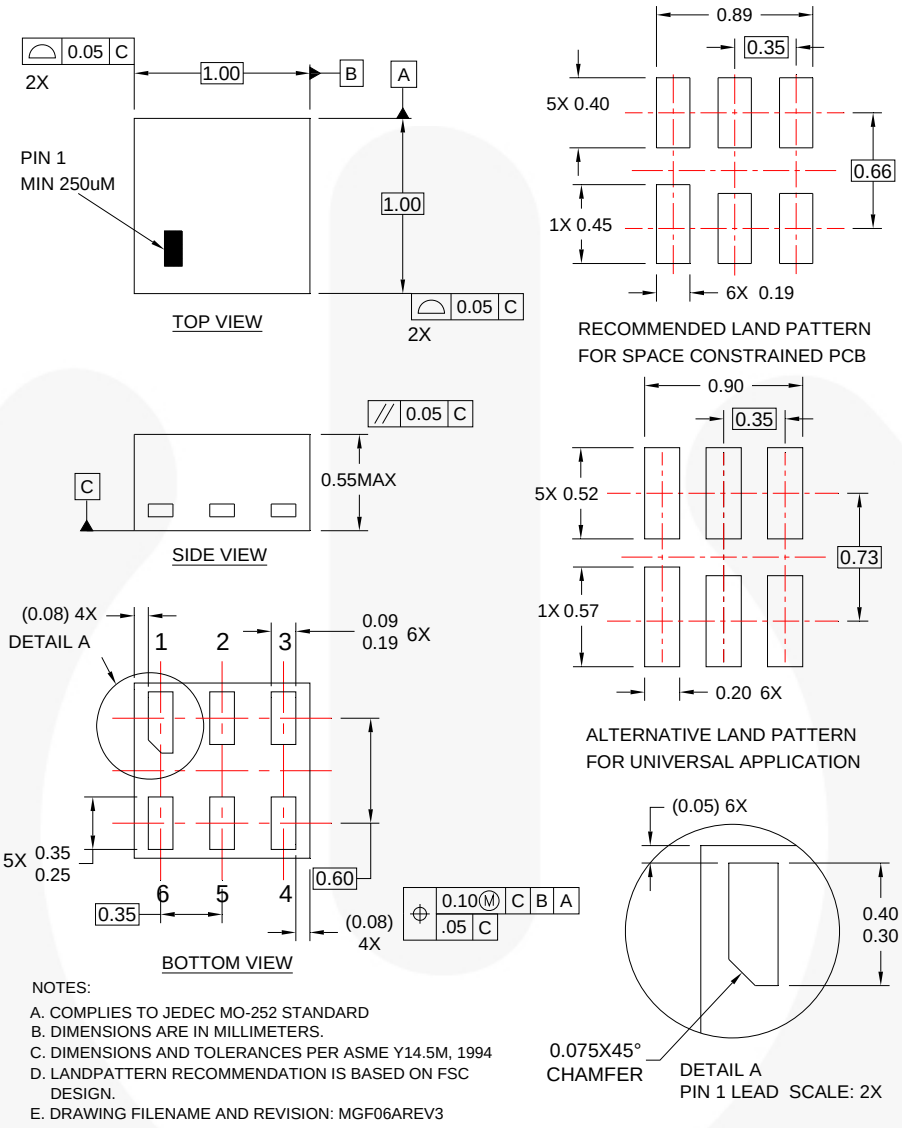

Figure 7. 6-Lead, MicroPak2™, 1x1mm Body, .35mm Pitch

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Tape and Reel Specification

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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