January 2016

FSA1156, FSA1157
Low-R_{ON}, Low-Voltage SPST Analog Switch

Features

- Maximum 0.95Ω R_{ON} for 4.5V Supply at 25°C
- 0.3Ω Maximum R_{ON} Flatness at 4.5V Supply
- Broad V_{CC} Operating Range: 1.65V to 5.5v
- Fast Turn-On and Turn-Off Time
- Over-Voltage Tolerant, TTL-Compatible Control Input
- Available in space-saving 6-lead, MicroPak™ and SC70 Packages

Description

The FSA1156 and FSA1157 are high-performance Single-Pole / Single-Throw (SPST) analog switches. The devices feature ultra-low R_{ON} of 0.75 Ω (typical) and operate over a wide V_{CC} range of 1.65 V to 5.5 V. The devices are fabricated with sub-micron CMOS technology to achieve fast switching speeds. The select input is TTL-level compatible. The FSA1156 has normally open operation; the FSA1157 has normally closed operation.

Ordering Information

Part Number	Top Mark	Package Description	Packing Method
FSA1156P6X	156	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3000 Units Tape and Reel
FSA1156L6X	EH	6-Lead MicroPak™, 1.0mm Wide	5000 Units Tape and Reel
FSA1157P6X	157	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3000 Units Tape and Reel
FSA1157L6X	EJ	6-Lead MicroPak™, 1.0mm Wide	5000 Units Tape and Reel

Pin Configurations

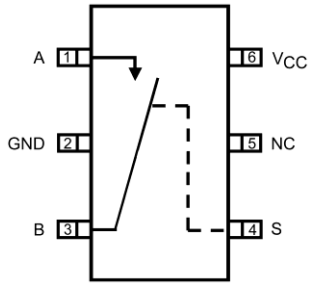


Figure 1. FSA1156 SC70 Top View (Normally Open)

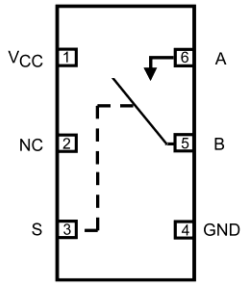


Figure 2. FSA1156 MircroPak™ Top Through View (Normally Open)

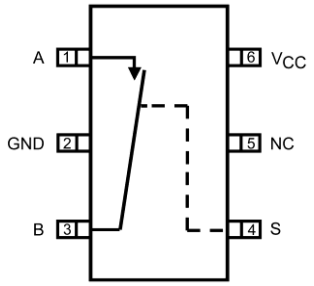


Figure 3. FSA1157 SC70 Top View (Normally Closed)

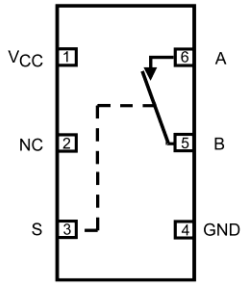


Figure 4. FSA1157 MircroPak™ Top Through View (Normally Closed)

Pin Definitions

Pin# SC70	Pin# Micropak™	Name	Description
1	6	A	Data Ports
2	4	GND	Ground
3	5	B	Data Ports
4	3	S	Control Input
5	2	NC	No Connect
6	1	VCC	Supply Voltage

Truth Table

Control Input (S)	FSA1156	FSA1157
Low	OFF	ON
High	ON	OFF

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_{SW}	Switch Voltage(1)		-0.5	V_{CC} + 0.5	V
V_{IN}	Input Voltage(1)		-0.5	6.0	V
I_{IK}	Input Diode Current			-50	mA
I_{SW}	Switch Current			200	mA
I_{SWPEAK}	Peak Switch Current (Pulse at 1ms Duration, <10% Duty Cycle)			400	mA
P_D	Power Dissipation at 85°C, SC70 Package			180	mW
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Maximum Junction Temperature			+150	°C
T_L	Lead Temperature (Soldering, 10 seconds)			+260	°C
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114		8000	V

Note:
1. Input and output negative ratings may be exceeded if input and output diode current ratings are 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	Min.	Max.	Unit
V_{CC}	Supply Voltage	1.65	5.50	V
V_{CNTRL}	Control Input Voltage(2)	0	V_{CC}	V
V_{SW}	Switch Input Voltage	0	V_{CC}	V
T_A	Operating Temperature	-40	+85	°C
θ_{JA}	Thermal Resistance in Still Air, SC70 Package		350	°C/W

Note:
2. Control input must be held HIGH or LOW and it must not float.

DC Electrical Characteristics

Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC}(V)	Ambient Temperature (T_A)					Units
				+25°C			-40 to +85°C		
				Min.	Typ.	Max.	Min.	Max.	
V_{IH}	Input Voltage High		2.7 to 3.6				2.0		V
			4.5 to 5.5				2.4		
V_{IL}	Input Voltage Low		2.7 to 3.6					0.6	V
			4.5 to 5.5					0.8	
I_{IN}	Control Input Leakage	V_{IN}=0 V to V_{CC}	2.7 to 3.6				-1.0	1.0	µA
			4.5 to 5.5				-1.0	1.0	
$I_{NO(OFF)}$, $I_{NC(OFF)}$	Off Leakage Current	A=1 V, 4.5 V, B=4.5 V, 1 V	5.5	-2		2	20	20	nA
$I_{A(ON)}$	On Leakage Current	A=1 V, 4.5 V, B=1 V, 4.5 V, or Floating	5.5	-4		4	-40	40	nA
R_{ON}	Switch On Resistance[3]	I_{OUT}=100 mA, B=1.5 V	2.7		1.4	2.1		2.5	Ω
		I_{OUT}=100 mA, B=3.5 V	4.5		0.75	0.90		1.00	
$R_{FLAT(ON)}$	On Resistance Flatness[4]	I_{OUT}=100 mA, B_0 =0 V, 0.75 V,1.5 V	2.7		0.6				Ω
		I_{OUT}=100 mA, B_0 =0 V, 1 V, 2 V	4.5		0.1	0.2		0.3	
I_{CC}	Quiescent Supply Current	V_{IN}=0 V or V_{CC}, I_{OUT}=0 V	3.6		0.1	0.5		1.0	µA
			5.5		0.1	0.5		1.0	

Notes:

3. On resistance is determined by the voltage drop between the A an B pins at the indicated current through the switch.
4. Flatness is defined as the difference between the maximum and minimum value of on resistance over the specified range of conditions.

AC Electrical Characteristics

Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC}(V)	Ambient Temperature (T_A)					Units	Figure
				+25°C			-40 to +85°C			
				Min.	Typ.	Max.	Min.	Max.		
t_{ON}	Turn-On Time	B =1.5 V, R_L=50 Ω, C_L=35 pF	2.7 to 3.6		30	40		45	ns	Figure 7
		B=3.0 V, R_L=50 Ω, C_L=35 pF	4.5 to 5.5		15	20		25		
t_{OFF}	Turn-Off Time	B=1.5 V, R_L=50 Ω, C_L=35 pF	2.7 to 3.6		25	35		45	ns	Figure 7
		B=3.0 V, R_L=50 Ω, C_L=35 pF	4.5 to 5.5		22	30		40		
Q	Charge Injection	C_L=1.0 nF, V_{GE}=0 V, R_{GEN}=0Ω	2.7 to 3.6		10				pC	Figure 8
			4.5 to 5.5		20					
OIRR	Off Isolation	f=1 MHz, R_L=50 Ω	2.7 to 3.6		-65				dB	Figure 9
			4.5 to 5.5		-65					
BW	-3db Bandwidth	R_L=50 Ω	2.7 to 3.6		300				MHz	Figure 10
			4.5 to 5.5		300					
THD	Total Harmon Distortion	R_L=600 Ω, V_{IN}=0.5 V_{PP}, f=20 Hz to 20 kHz	2.7 to 3.6		0.001				%	Figure 11
			4.5 to 5.5		0.001					

Capacitance

Symbol	Parameter	Conditions	V_{CC} (V)	Ambient Temperature +25°			Units	Figure
				Min.	Typ.	Max.		
C_{IN}	Control Pin Input Capacitance	f=1 MHz	0.0		3		pF	Figure 12
C_{OFF}	B Port Off Capacitance	f=1 MHz	4.5		20		pF	Figure 12
C_{ON}	On Capacitance	f=1 MHz	4.5		65		pF	Figure 12

Typical Performance Characteristics

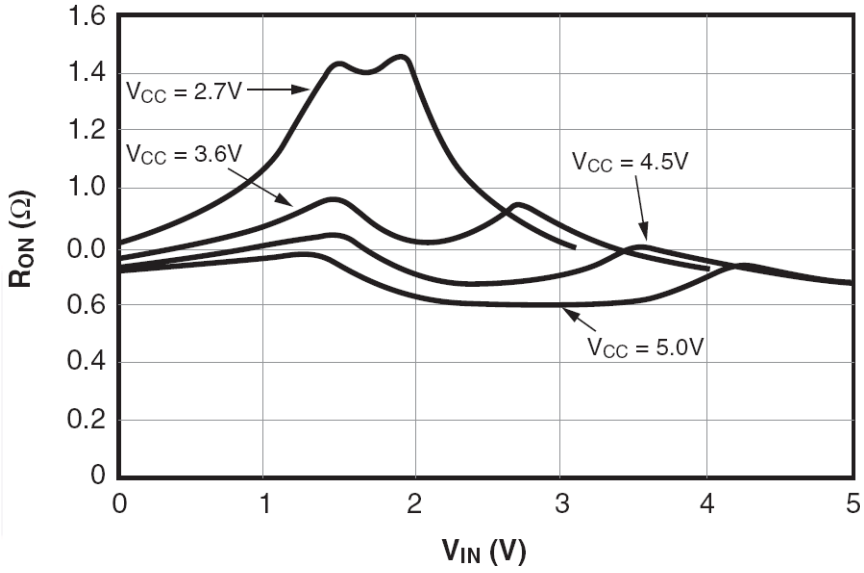


Figure 5. On Resistance vs. Input Voltage, Over Supply Voltage, T_A=25°C

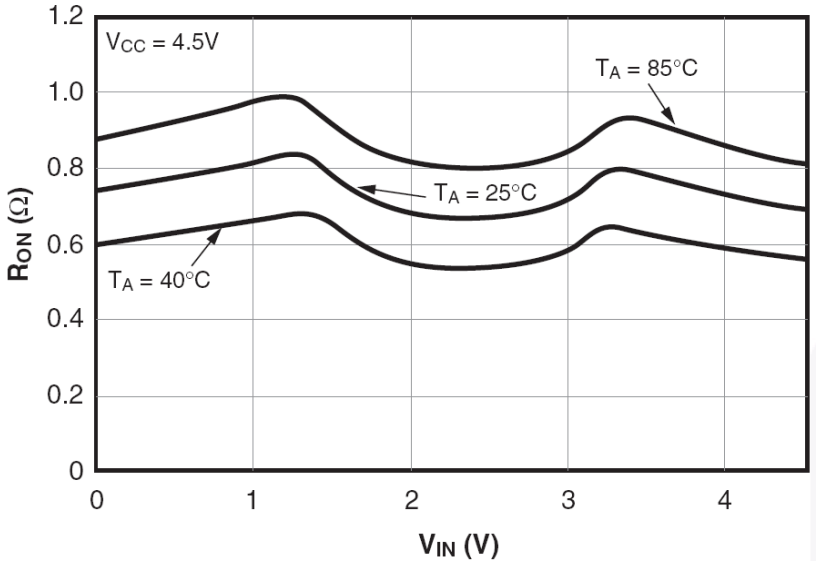
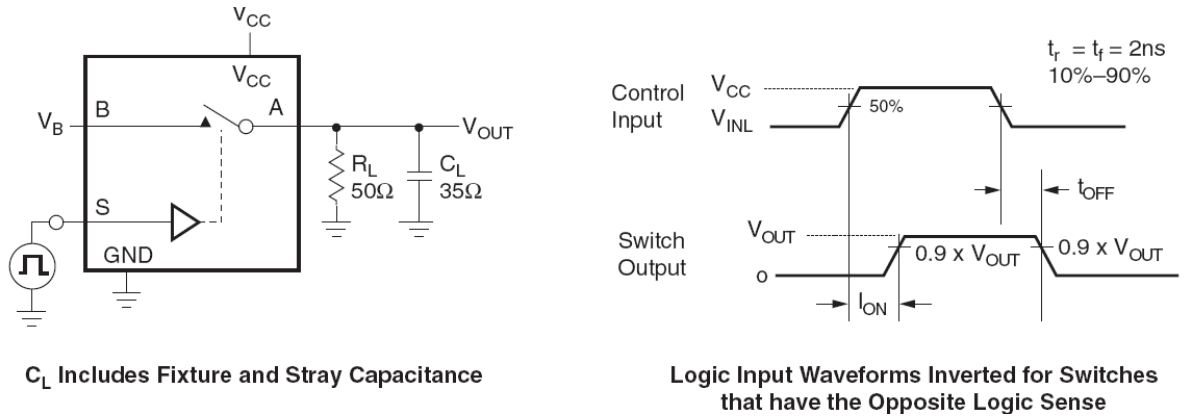


Figure 6. On Resistance vs. Input Voltage, Over Temperature

AC Loadings and Waveforms



C_L Includes Fixture and Stray Capacitance

Logic Input Waveforms Inverted for Switches that have the Opposite Logic Sense

Figure 7. Turn On / Off Timing

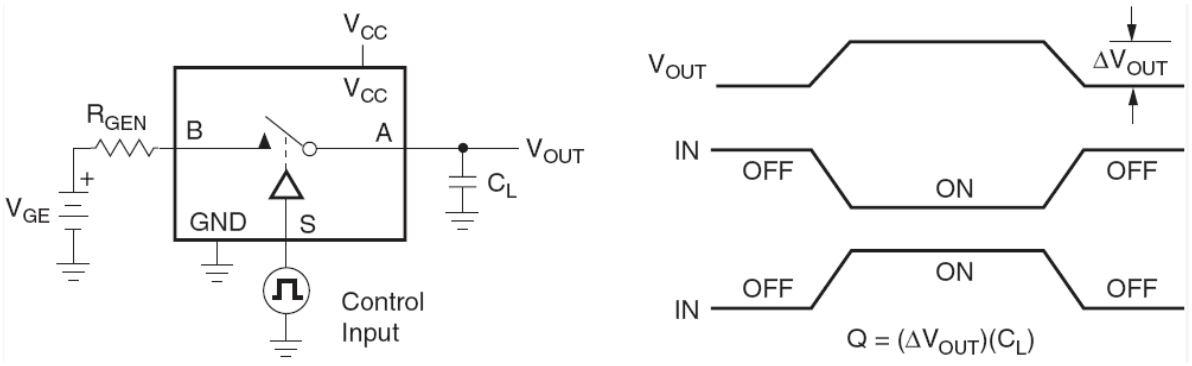


Figure 8. Charge Injection

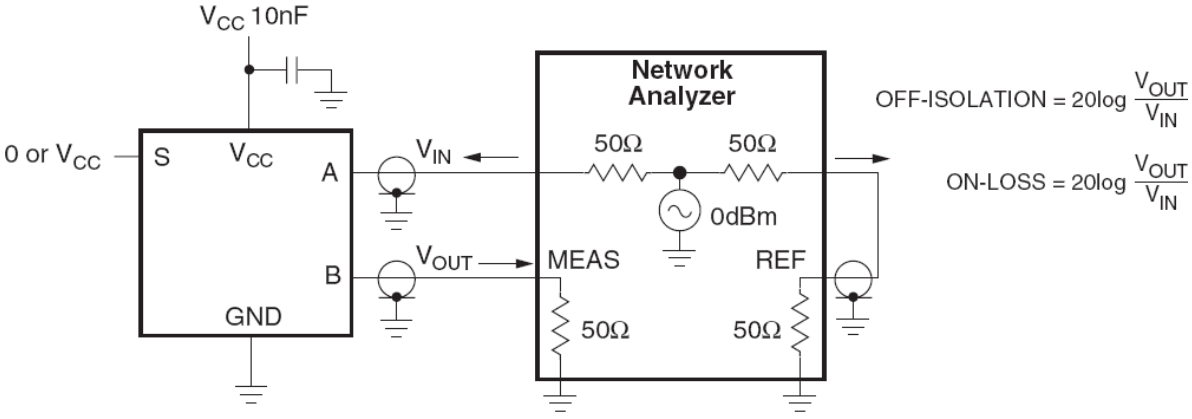


Figure 9. Off Isolation

AC Loadings and Waveforms (Continued)

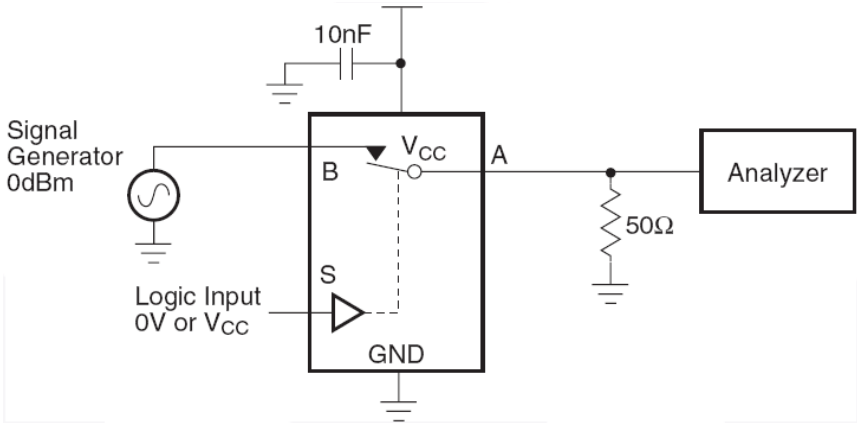


Figure 10. Bandwidth

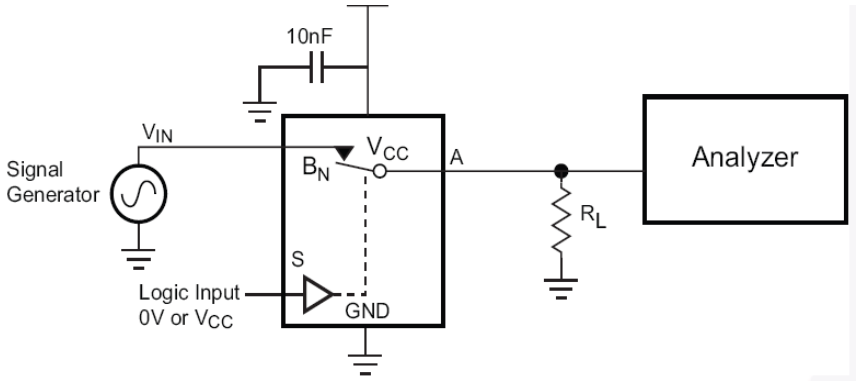


Figure 11. Harmonic Distortion

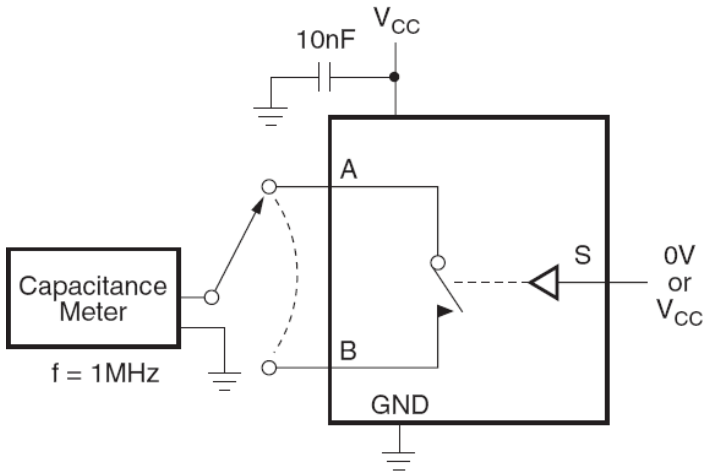


Figure 12. On / Off Capacitance

Physical Dimensions

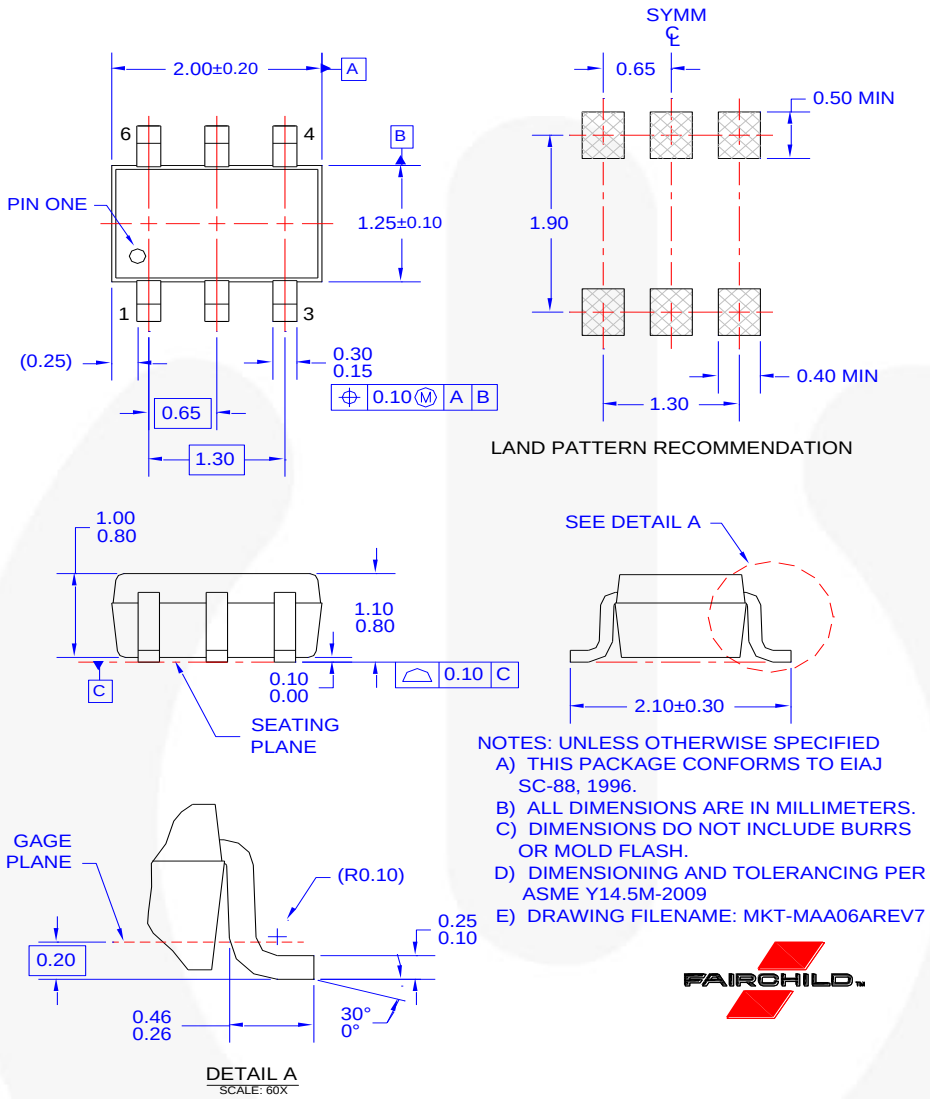


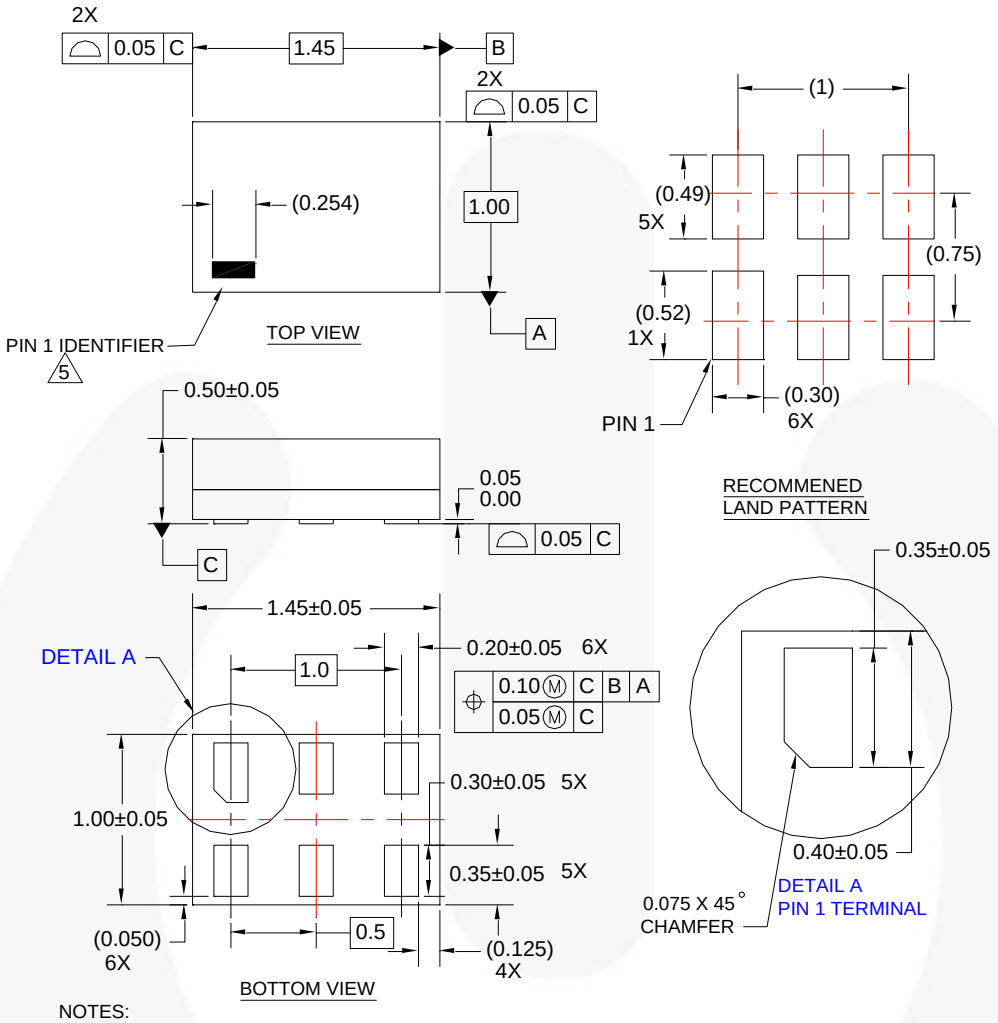
Figure 13. 6-Lead, SC70, EIAJ SC88 1.25mm Wide Package

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/sc70-6_tr.pdf.

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
P6X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Physical Dimensions (Continued)



NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. LANDPATTERN RECOMMENDATION PER FSC
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.
6. FILENAME AND REVISION: MAC06AREV6

Figure 14. 6-Lead, Micropak™ 1.0mm Wide Package

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

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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.

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