

NC7S08

TinyLogic® HS 2-Input AND Gate

Features

- Space saving SOT23 or SC70 5-lead package
- Ultra small MicroPak™ Pb-Free leadless package
- High Speed; t_{PD} 3.5ns typ
- Low Quiescent Power; $I_{CC} < 1\mu A$
- Balanced Output Drive; 2mA I_{OL} , -2mA I_{OH}
- Broad V_{CC} Operating Range; 2V–6V
- Balanced Propagation Delays
- Specified for 3V operation

General Description

The NC7S08 is a single 2-Input high performance CMOS AND Gate. Advanced Silicon Gate CMOS fabrication assures high speed and low power circuit operation over a broad V_{CC} range. ESD protection diodes inherently guard both inputs and output with respect to the V_{CC} and GND rails. Three stages of gain between inputs and outputs assures high noise immunity and reduced sensitivity to input edge rate.

Ordering Information

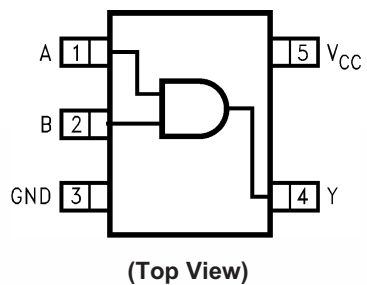
Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7S08M5X	MA05B	7S08	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7S08P5X	MAA05A	S08	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7S08L6X	MAC06A	PP	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

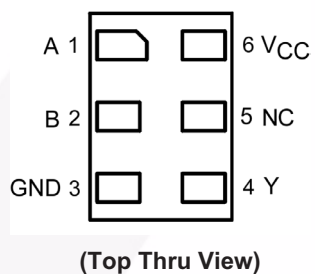
 All packages are lead free per JEDEC: J-STD-020B standard.

Connection Diagram

Pin Assignments for SC70 and SOT23



Pad Assignments for MicroPak



Pin Description

Pin Names	Description
A, B	Inputs
Y	Output
NC	No Connect

Logic Symbol



Function Table

$$Y = AB$$

Inputs		Output
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

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	Rating
V_{CC}	Supply Voltage	-0.5V to +7.0V
I_{IK}	DC Input Diode Current @ $V_{IN} \leq -0.5V$ @ $V_{IN} \geq V_{CC} + 0.5V$	-20mA +20mA
V_{IN}	DC Input Voltage	-0.5V to $V_{CC} + 0.5V$
I_{OK}	DC Output Diode Current @ $V_{OUT} < -0.5V$ @ $V_{OUT} > V_{CC} + 0.5V$	-20mA +20mA
V_{OUT}	DC Output Voltage	-0.5V to $V_{CC} + 0.5V$
I_{OUT}	DC Output Source or Sink Current	$\pm 12.5mA$
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Output Pin	$\pm 25mA$
T_{STG}	Storage Temperature	-65°C to +150°C
T_J	Junction Temperature	150°C
T_L	Lead Temperature (Soldering, 10 seconds)	260°C
P_D	Power Dissipation @ +85°C SOT23-5 SC70-5	200mW 150mW

Recommended Operating Conditions⁽¹⁾

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	Rating
V_{CC}	Supply Voltage	2.0V to 6.0V
V_{IN}	Input Voltage	0V to V_{CC}
V_{OUT}	Output Voltage	0V to V_{CC}
T_A	Operating Temperature	-40°C to +85°C
t_r, t_f	Input Rise and Fall Time V_{CC} @ 2.0V V_{CC} @ 3.0V V_{CC} @ 4.5V V_{CC} @ 6.0V	0ns to 1000ns 0ns to 750ns 0ns to 500ns 0ns to 400ns
θ_{JA}	Thermal Resistance SOT23-5 SC70-5	300°C/W 425°C/W

Notes:

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

DC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40°C to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V _{IH}	HIGH Level Input Voltage	2.0		1.50			1.50		V
		3.0-6.0		0.7 x V _{CC}			0.7 x V _{CC}		
V _{IL}	LOW Level Input Voltage	2.0				0.50		0.50	V
		3.0-6.0				0.3 x V _{CC}		0.3 x V _{CC}	
V _{OH}	HIGH Level Output Voltage	2.0	I _{OH} = -20μA, V _{IN} = V _{IH}	1.90	2.0		1.90		V
		3.0		2.90	3.0		2.90		
		4.5		4.40	4.5		4.40		
		6.0		5.90	6.0		5.90		
		3.0	V _{IN} = V _{IH} , I _{OH} = -1.3mA	2.68	2.85		2.63		
		4.5	V _{IN} = V _{IH} , I _{OH} = -2mA	4.18	4.35		4.13		
		6.0	V _{IN} = V _{IH} , I _{OH} = -2.6mA	5.68	5.85		5.63		
V _{OL}	LOW Level Output Voltage	2.0	I _{OL} = 20μA V _{IN} = V _{IL}		0.0	0.10		0.10	V
		3.0			0.0	0.10		0.10	
		4.5			0.0	0.10		0.10	
		6.0			0.0	0.10		0.10	
		3.0	V _{IN} = V _{IH} or V _{IL} , I _{OH} = 1.3mA		0.1	0.26		0.33	
		4.5	V _{IN} = V _{IH} or V _{IL} , I _{OL} = 2mA		0.1	0.26		0.33	
		6.0	V _{IN} = V _{IH} or V _{IL} , I _{OL} = 2.6mA		0.1	0.26		0.33	
I _{IN}	Input Leakage Current	6.0	V _{IN} = V _{CC} , GND			±0.1		±1.0	μA
I _{CC}	Quiescent Supply Current	6.0	V _{IN} = V _{CC} , GND			1.0		10.0	μA

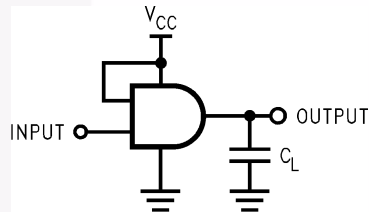
AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40°C to +85°C		Units	Figure Number
				Min.	Typ.	Max.	Min.	Max.		
t _{PLH} , t _{PHL}	Propagation Delay	5.0	C _L = 15pF		3.5	15			ns	Figure 1 Figure 3
		2.0	C _L = 50pF		20	100		125		
		3.0			11	27		35		
		4.5			8	20		25		
		6.0			7	17		21		
t _{TLH} , t _{THL}	Output Transition Time	5.0	C _L = 15pF		3.0	10			ns	Figure 1 Figure 3
		2.0	C _L = 50pF		25	125		155		
		3.0			16	35		45		
		4.5			11	25		31		
		6.0			9	21		26		
C _{IN}	Input Capacitance	Open			2	10		10	pF	
C _{PD}	Power Dissipation Capacitance	5.0	(2)		6				pF	Figure 2

Note:

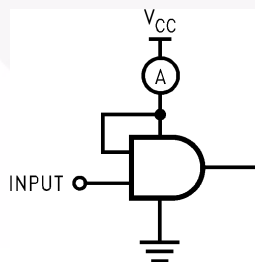
2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC}static).

AC Loading and Waveforms



C_L includes load and stray capacitance
Input PRR = 1.0 MHz; t_W = 500 ns

Figure 1. AC Test Circuit



Input = AC Waveform;
PRR = variable; Duty Cycle = 50%

Figure 2. I_{CCD} Test Circuit

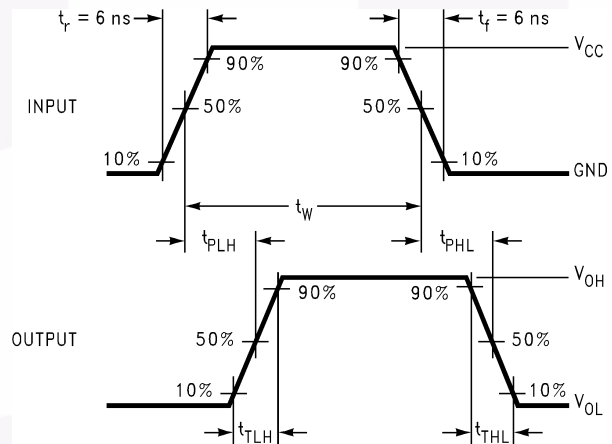


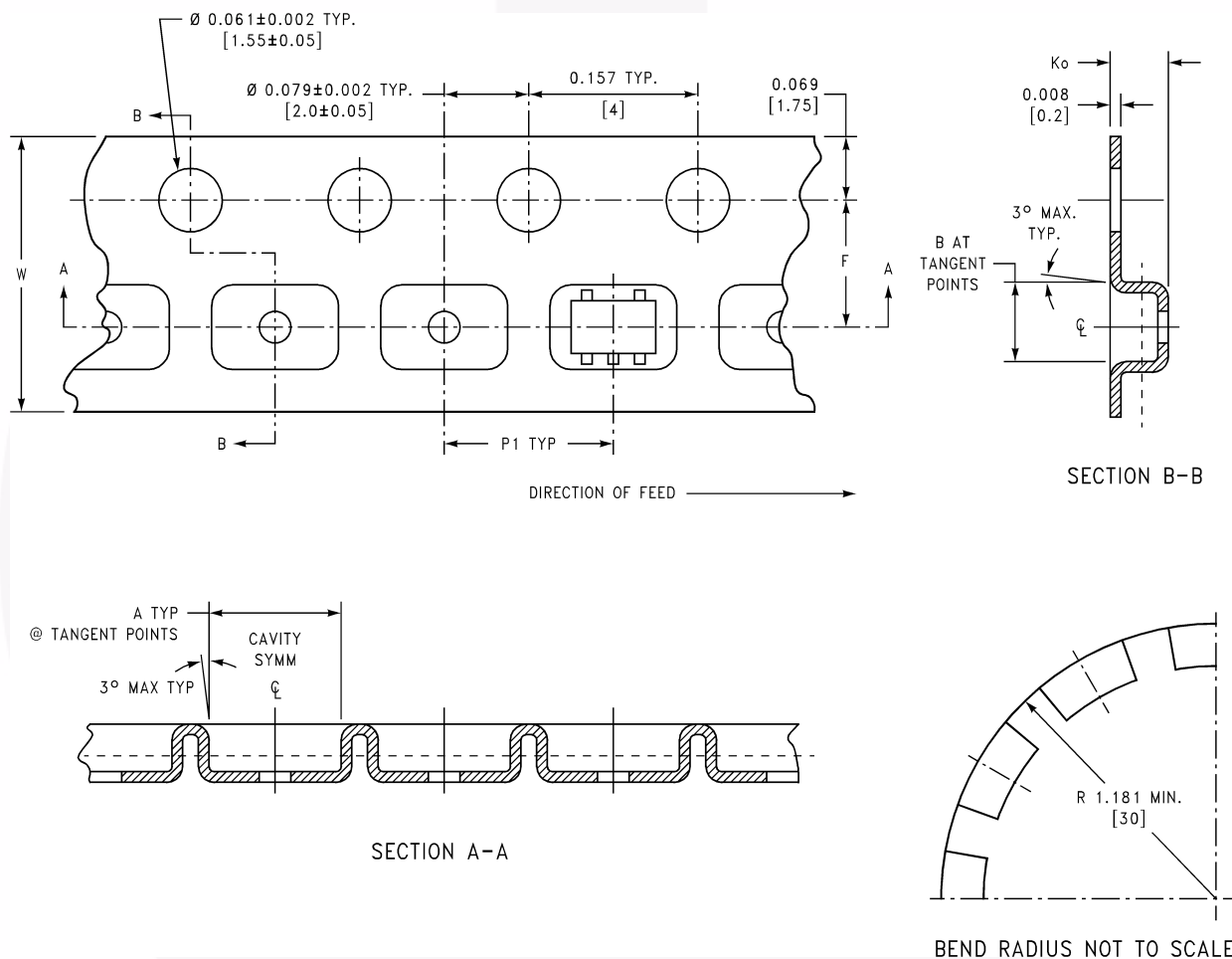
Figure 3. AC Waveforms

Tape and Reel Specifications

Tape Format for SC70 and SOT23

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5X, P5X	Leader (Start End)	125 (typ.)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ.)	Empty	Sealed

Tape Dimensions inches (millimeters)

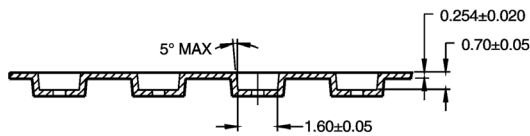
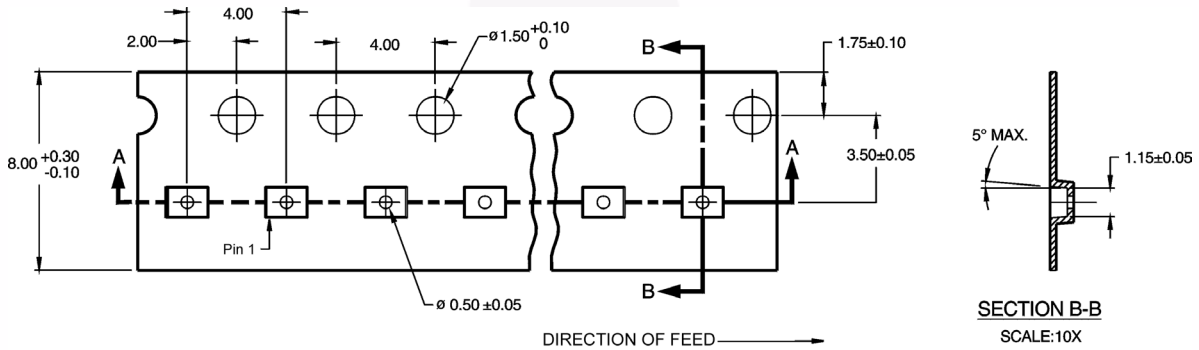


Package	Tape Size	Dim A	Dim B	Dim F	Dim K _o	Dim P1	Dim W
SC70-5	8mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)
SOT23-5	8mm	0.130 (3.3)	0.130 (3.3)	0.138 ± 0.002 (3.5 ± 0.05)	0.055 ± 0.004 (1.4 ± 0.11)	0.157 (4)	0.315 ± 0.012 (8 ± 0.3)

Tape and Reel Specifications (Continued)

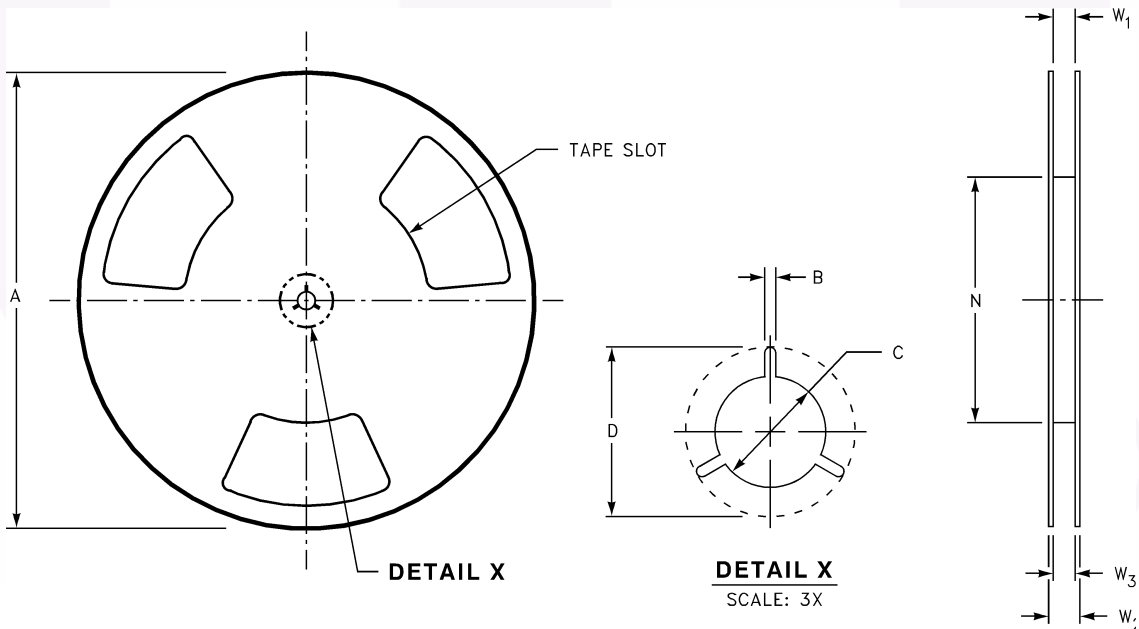
Tape Format for MicroPak

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



SECTION A-A
SCALE:10X

Reel Dimensions inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2	W3
8mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/-0.000 (8.40 + 1.50/-0.00)	0.567 (14.40)	W1 + 0.078/-0.039 (W1 + 2.00/-1.00)

Physical Dimensions

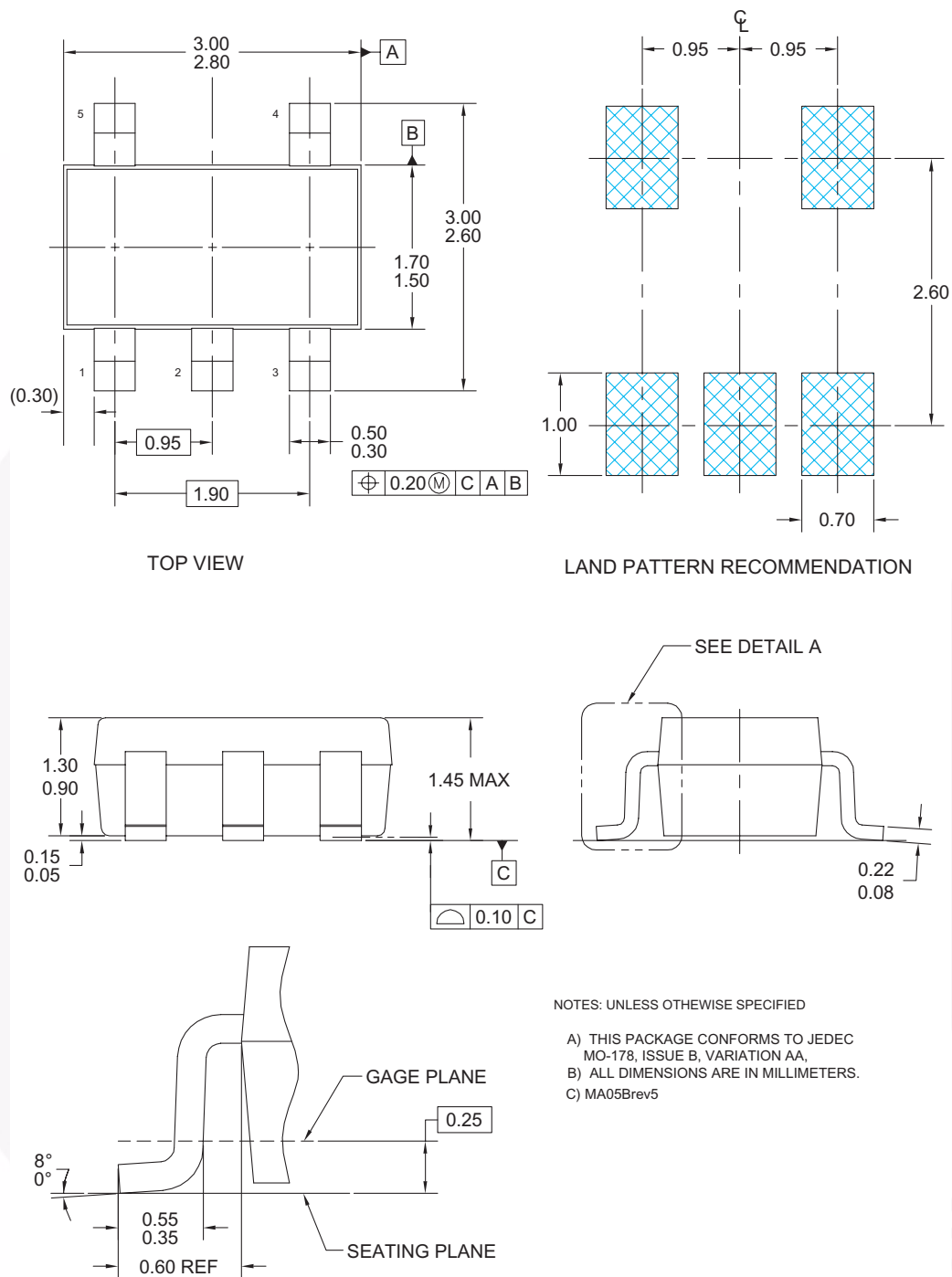


Figure 4. 5-Lead SOT23, JEDEC MO-178, 1.6mm

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/packaging/>

Physical Dimensions (Continued)

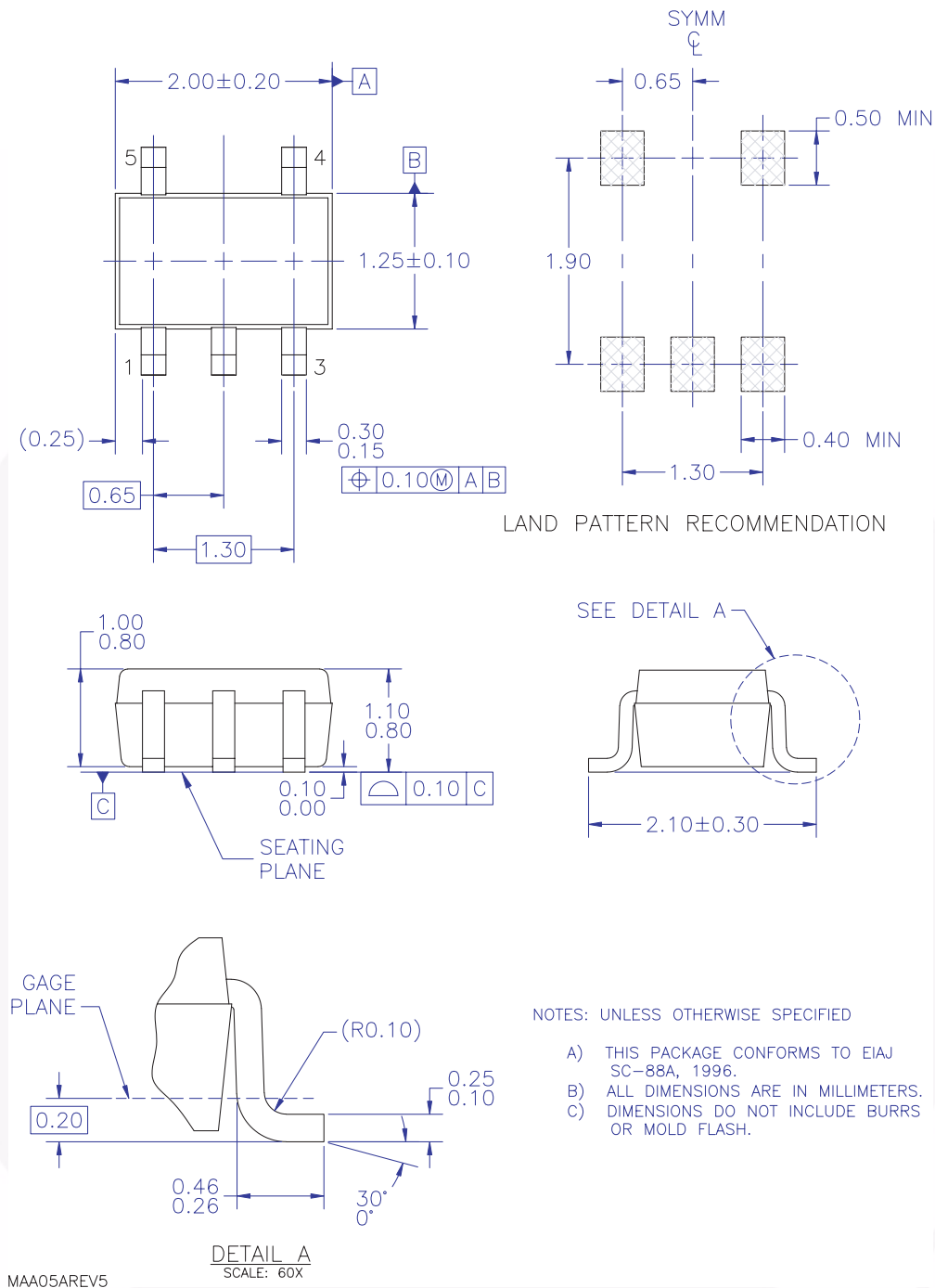
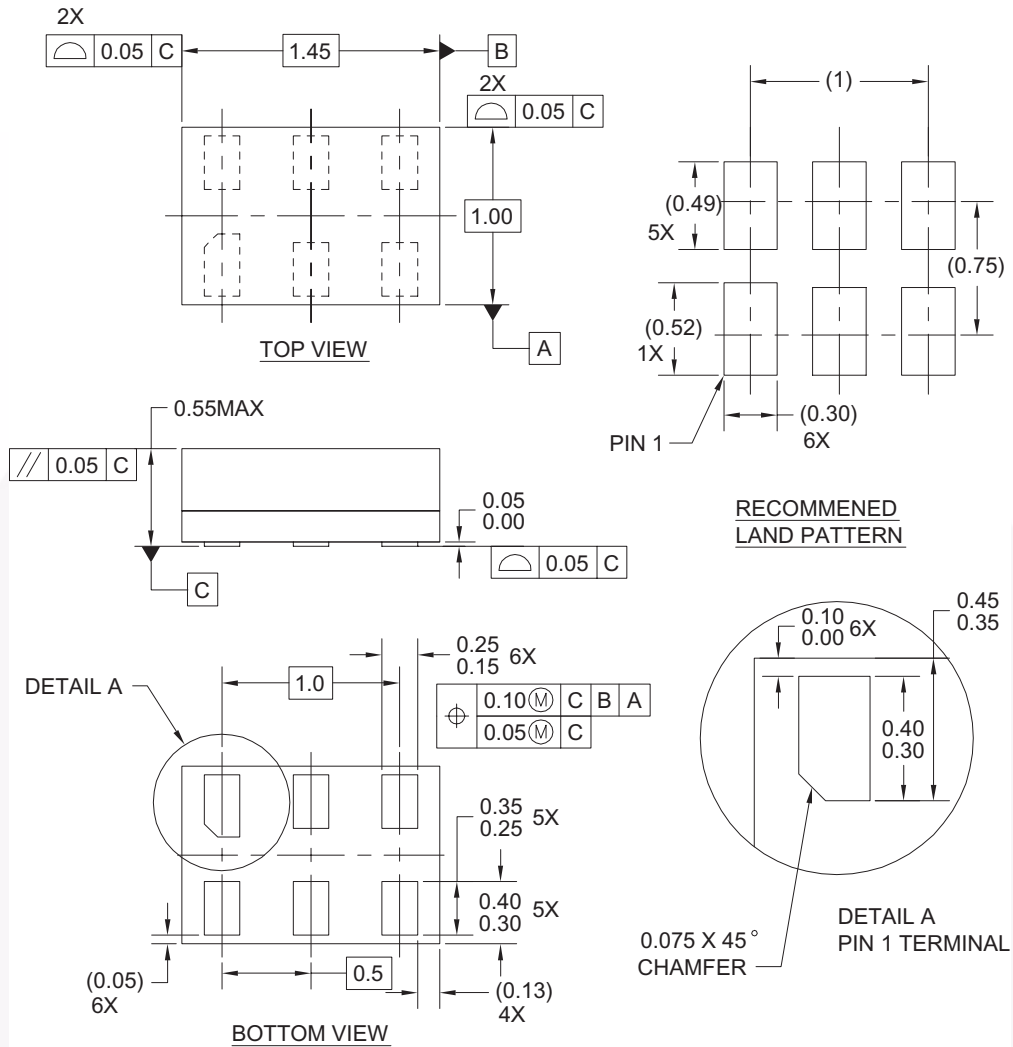


Figure 5. 5-Lead SC70, EIAJ SC-88a, 1.25mm Wide

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/packaging/>

Physical Dimensions (Continued)



Notes:

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06AREVC

Figure 6. 6-Lead MicroPak, 1.0mm Wide

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.



Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/packaging/>



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|---|-------------------------------------|----------------------------|--------------------------------|
| ACEx® | FPS™ | PDP-SPM™ | SupreMOS™ |
| Build it Now™ | FRFET® | Power220® | SyncFET™ |
| CorePLUS™ | Global Power Resource SM | POWEREDGE® | SYSTEM GENERAL® |
| CROSSVOLT™ | Green FPS™ | Power-SPM™ | The Power Franchise® |
| CTL™ | Green FPS™ e-Series™ | PowerTrench® | power ^{the} franchise |
| Current Transfer Logic™ | GTO™ | Programmable Active Droop™ | TinyBoost™ |
| EcoSPARK® | i-Lo™ | QFET® | TinyBuck™ |
| EZSWITCH™ * | IntelliMAX™ | QS™ | TinyLogic® |
|  ™ | ISOPLANAR™ | QT Optoelectronics™ | TINYOPTO™ |
|  ™ | MegaBuck™ | Quiet Series™ | TinyPower™ |
| Fairchild® | MICROCOUPLER™ | RapidConfigure™ | TinyPVM™ |
| Fairchild Semiconductor® | MicroFET™ | SMART START™ | TinyWire™ |
| FACT Quiet Series™ | MicroPak™ | SPM® | µSerDes™ |
| FACT® | MillerDrive™ | STEALTH™ | UHC® |
| FAST® | Motion-SPM™ | SuperFET™ | Ultra FRFET™ |
| FastvCore™ * | OPTOLOGIC® | SuperSOT™.3 | UniFET™ |
| FlashWriter® * | OPTOPLANAR® | SuperSOT™.6 | VCX™ |
| | | SuperSOT™.8 | |

* EZSWITCH™ and FlashWriter® are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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

Rev. I33