



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

# 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

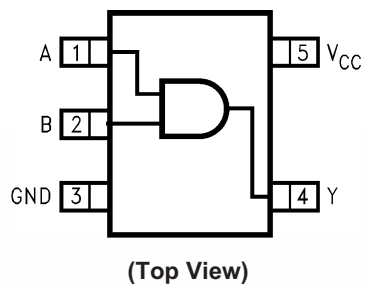
Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7S08M5X	MA05B	7S08	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7S08P5X	MAA05A	S08	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7S08L6X	MAC06A	PP	6-Lead MicroPak, 1.0mm Wide	5k Units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

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

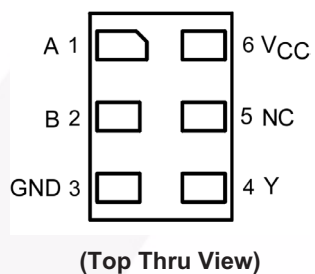
 All packages are lead free per JEDEC: J-STD-020B standard.

## 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<sup>(1)</sup>

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
$\theta_{JA}$	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 <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Input Voltage	2.0		1.50			1.50		V
		3.0-6.0		0.7 x V <sub>CC</sub>			0.7 x V <sub>CC</sub>		
V <sub>IL</sub>	LOW Level Input Voltage	2.0				0.50		0.50	V
		3.0-6.0				0.3 x V <sub>CC</sub>		0.3 x V <sub>CC</sub>	
V <sub>OH</sub>	HIGH Level Output Voltage	2.0	I <sub>OH</sub> = -20μA, V <sub>IN</sub> = V <sub>IH</sub>	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 <sub>IN</sub> = V <sub>IH</sub> , I <sub>OH</sub> = -1.3mA	2.68	2.85		2.63		
		4.5	V <sub>IN</sub> = V <sub>IH</sub> , I <sub>OH</sub> = -2mA	4.18	4.35		4.13		
		6.0	V <sub>IN</sub> = V <sub>IH</sub> , I <sub>OH</sub> = -2.6mA	5.68	5.85		5.63		
V <sub>OL</sub>	LOW Level Output Voltage	2.0	I <sub>OL</sub> = 20μA V <sub>IN</sub> = V <sub>IL</sub>		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 <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OH</sub> = 1.3mA		0.1	0.26		0.33	
		4.5	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 2mA		0.1	0.26		0.33	
		6.0	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 2.6mA		0.1	0.26		0.33	
I <sub>IN</sub>	Input Leakage Current	6.0	V <sub>IN</sub> = V <sub>CC</sub> , GND			±0.1		±1.0	μA
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>IN</sub> = V <sub>CC</sub> , GND			1.0		10.0	μA

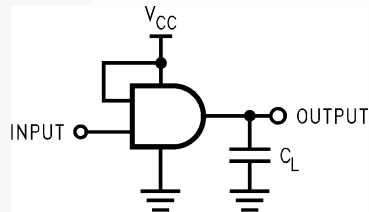
## AC Electrical Characteristics

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

**Note:**

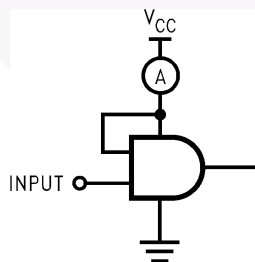
2. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. (See Figure 2.) C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub> = (C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>) + (I<sub>CC</sub>static).

### AC Loading and Waveforms



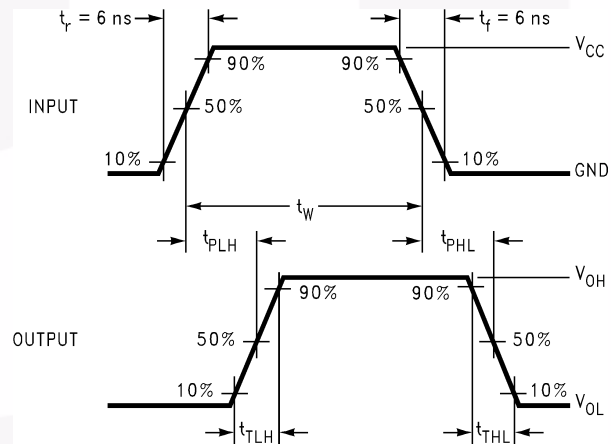
C<sub>L</sub> includes load and stray capacitance  
Input PRR = 1.0 MHz; t<sub>W</sub> = 500 ns

**Figure 1. AC Test Circuit**



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

**Figure 2. I<sub>CCD</sub> Test Circuit**



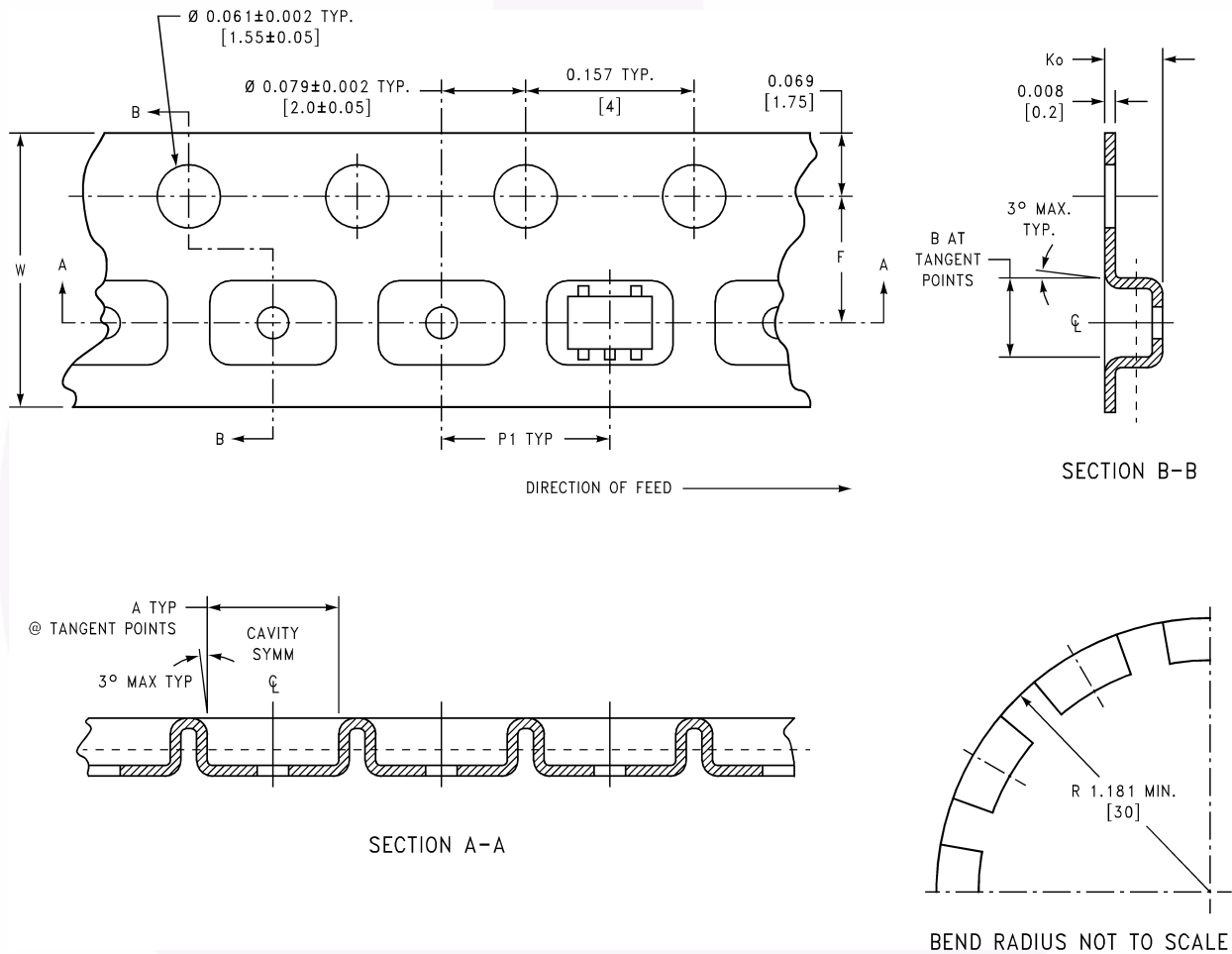
**Figure 3. AC Waveforms**

## 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)

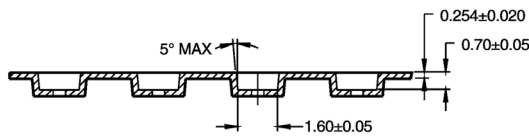
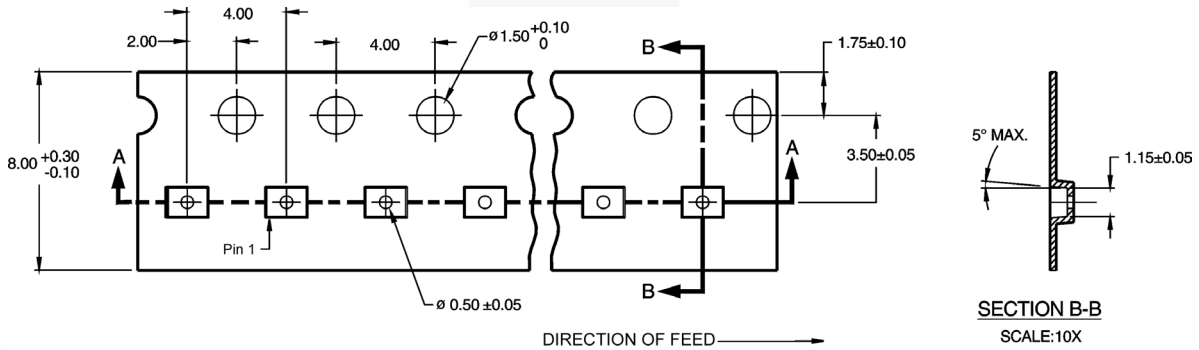


Package	Tape Size	Dim A	Dim B	Dim F	Dim $K_o$	Dim P1	Dim W
SC70-5	8mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)
SOT23-5	8mm	0.130 (3.3)	0.130 (3.3)	0.138 ± 0.002 (3.5 ± 0.05)	0.055 ± 0.004 (1.4 ± 0.11)	0.157 (4)	0.315 ± 0.012 (8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

## Tape and Reel Specifications (Continued)

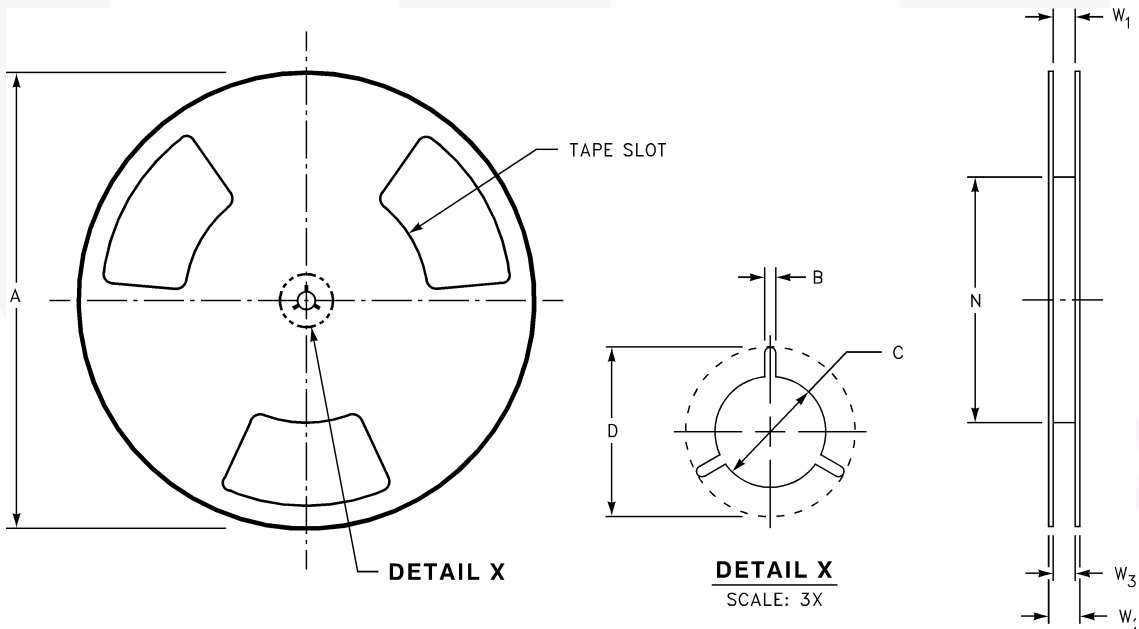
### Tape Format for MicroPak

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

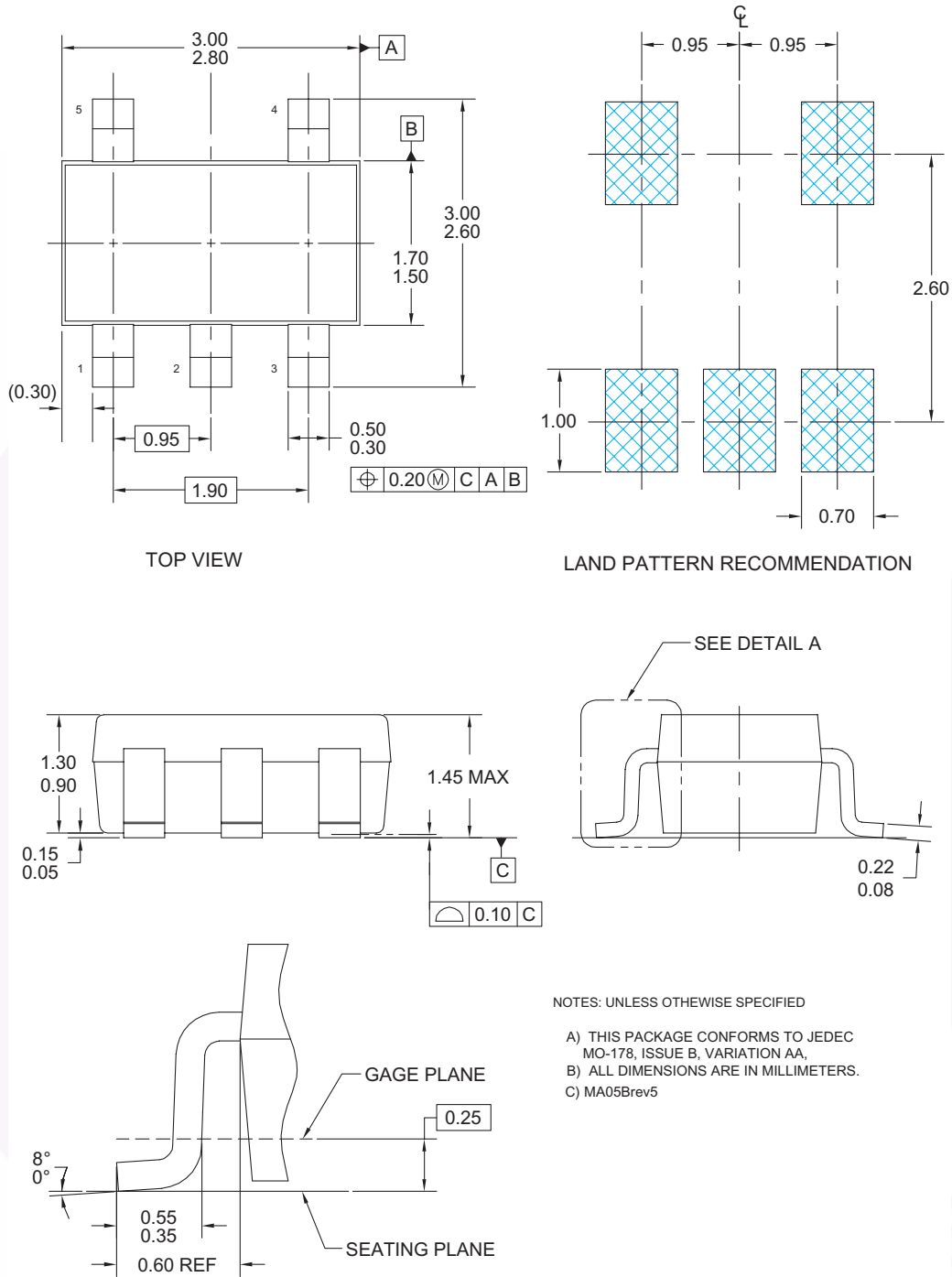
### Reel Dimensions inches (millimeters)



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)

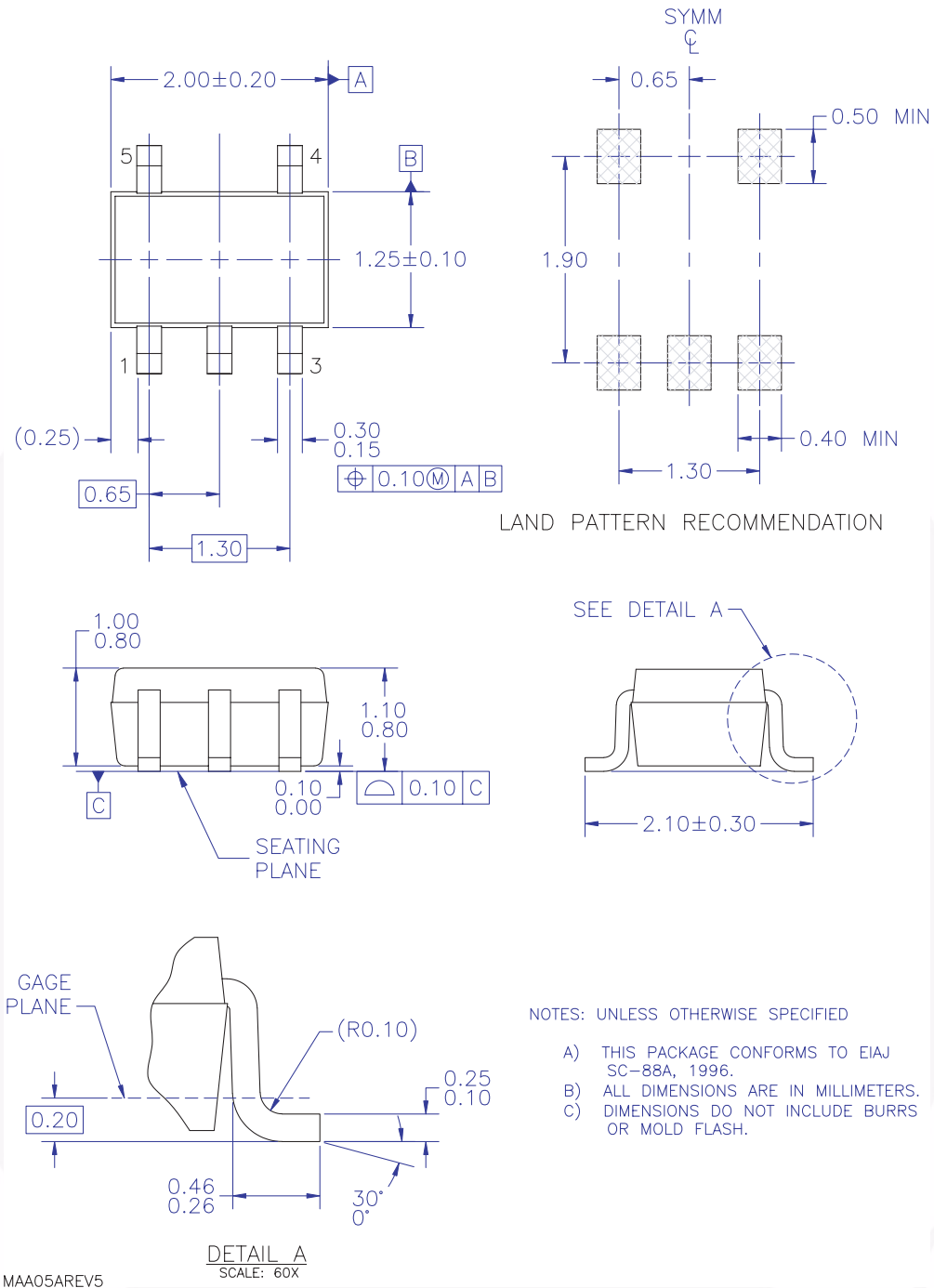
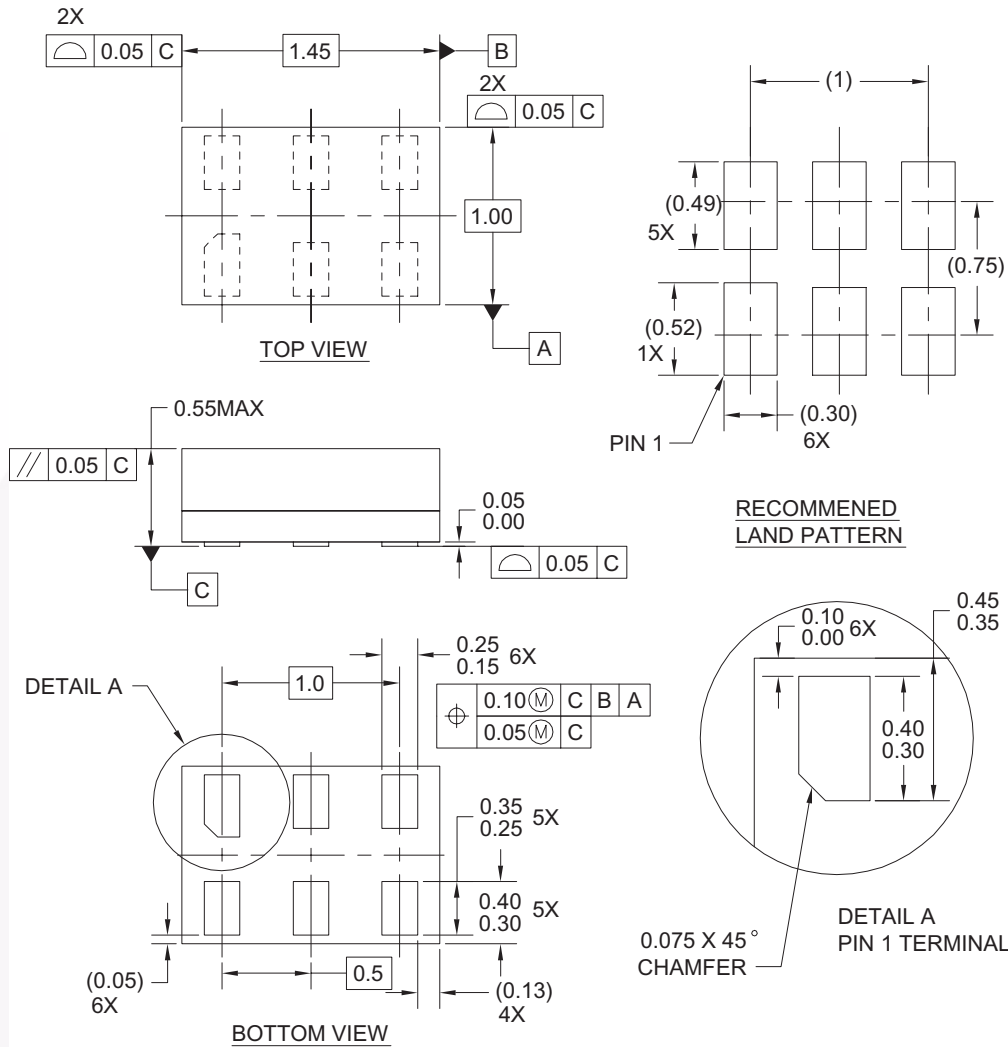


Figure 5. 5-Lead SC70, EIAJ SC-88a, 1.25mm Wide

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)



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™ | POWEREDGE®                 | SYSTEM GENERAL®      |
| CROSSVOLT™  | Green FPS™             | Power-SPM™                 | The Power Franchise® |
| CTL™  | Green FPS™ e-Series™   | PowerTrench®               | power 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

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative