

NC7S00

TinyLogic® HS 2-Input NAND Gate

General Description

The NC7S00 is a single 2-Input high performance CMOS NAND 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 output assures high noise immunity and reduced sensitivity to input edge rate.

Features

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

Ordering Code:

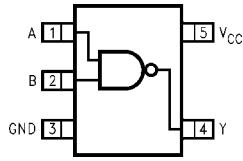
Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7S00M5X	MA05B	7S00	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7S00P5X	MAA05A	S00	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7S00L6X	MAC06A	A3	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Logic Symbol

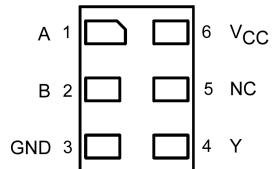


Connection Diagrams

Pin Assignments for SC70 and SOT23



Pad Assignments for MicroPak



Pin Descriptions

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

Function Table

$$Y = \overline{AB}$$

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

H = HIGH Logic Level

L = LOW Logic Level

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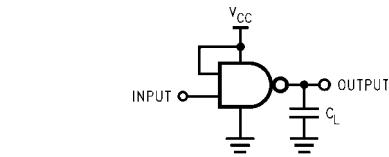
Absolute Maximum Ratings ^(Note 1)							Recommended Operating Conditions ^(Note 2)			
Supply Voltage (V_{CC})			-0.5V to +7.0V				Supply Voltage (V_{CC})	2.0V–6.0V		
DC Input Diode Current (I_{IK})			-20 mA				Input Voltage (V_{IN})	0V– V_{CC}		
@ $V_{IN} \leq -0.5V$			-20 mA				Output Voltage (V_{OUT})	0V– V_{CC}		
@ $V_{IN} \geq V_{CC} + 0.5V$			+20 mA				Operating Temperature (T_A)	-40°C to +85°C		
DC Input Voltage (V_{IN})			-0.5V to $V_{CC} + 0.5V$				Input Rise and Fall Time (t_r, t_f)			
DC Output Diode Current (I_{OK})			-20 mA				$V_{CC} @ 2.0V$	0–1000 ns		
@ $V_{OUT} < -0.5V$			-20 mA				$V_{CC} @ 3.0V$	0–750 ns		
@ $V_{OUT} > V_{CC} + 0.5V$			+20 mA				$V_{CC} @ 4.5V$	0–500 ns		
DC Output Voltage (V_{OUT})			-0.5V to $V_{CC} + 0.5V$				$V_{CC} @ 6.0V$	0–400 ns		
DC Output Source or Sink Current (I_{OUT})			± 12.5 mA				Thermal Resistance (θ_{JA})			
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})			± 25 mA				SOT23-5	300°C/W		
Storage Temperature (T_{STG})			-65°C to +150°C				SC70-5	425°C/W		
Junction Temperature (T_J)			150°C							
Lead Temperature (T_L); (Soldering, 10 seconds)			260°C							
Power Dissipation (P_D) @ +85°C			200 mW							
SOT23-5			150 mW							
SC70-5										
Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of circuits outside the databook specifications.										
Note 2: Unused inputs must be held HIGH or LOW. They may not float.										
DC Electrical Characteristics										
Symbol	Parameter	V_{CC} (V)	$T_A = +25^\circ C$		$T_A = -40^\circ C$ to $+85^\circ C$		Units	Conditions		
			Min	Typ	Max	Min			Max	
V_{IH}	HIGH Level Input Voltage	2.0 3.0 - 6.0	1.50 0.7 V_{CC}		1.50 0.7 V_{CC}		V			
V_{IL}	LOW Level Input Voltage	2.0 3.0 - 6.0		0.50 0.3 V_{CC}		0.50 0.3 V_{CC}	V			
V_{OH}	HIGH Level Output Voltage	2.0 3.0 4.5 6.0	1.90 2.90 4.40 5.90	2.0 3.0 4.5 6.0	1.90 2.90 4.40 5.90		V	$I_{OH} = -20 \mu A$ $V_{IN} = V_{IL}$		
		3.0 4.5 6.0	2.68 4.18 5.68	2.85 4.35 5.85	2.63 4.13 5.63		V	$V_{IN} = V_{IL}$ $I_{OH} = -1.3 mA$ $I_{OH} = -2 mA$ $I_{OH} = -2.6 mA$		
		2.0 3.0 4.5 6.0	0.0 0.0 0.0 0.0	0.10 0.10 0.10 0.10	0.10 0.10 0.10 0.10		V	$I_{OL} = 20 \mu A$ $V_{IN} = V_{IH}$		
		3.0 4.5 6.0	0.1 0.1 0.1	0.26 0.26 0.26	0.33 0.33 0.33		V	$V_{IN} = V_{IH}$ $I_{OL} = 1.3 mA$ $I_{OL} = 2 mA$ $I_{OL} = 2.6 mA$		
I_{IN}	Input Leakage Current	6.0		± 0.1		± 1.0	μA	$V_{IN} = V_{CC}, GND$		
I_{CC}	Quiescent Supply Current	6.0		1.0		10.0	μA	$V_{IN} = V_{CC}, GND$		

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	T _A = +25°C			Units	Conditions	Figure Number
			Min	Typ	Max			
t _{PLH} , t _{PHL}	Propagation Delay	5.0	3.5	15		ns	C _L = 15 pF	Figures 1, 3
		2.0	19	100	125			
		3.0	10.5	27	35	ns	C _L = 50 pF	
		4.5	7.5	20	25			
		6.0	6.5	17	21			
t _{TLH} , t _{THL}	Output Transition Time	5.0	3.0	10		ns	C _L = 15 pF	Figures 1, 3
		2.0	25	125	155			
		3.0	16	35	45	ns	C _L = 50 pF	
		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	6			pF	(Note 3)	Figure 2

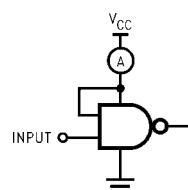
Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression:
 $I_{CCD} = (C_{PD}) / (V_{CC}) (f_{IN}) + (I_{CCstatic})$.

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

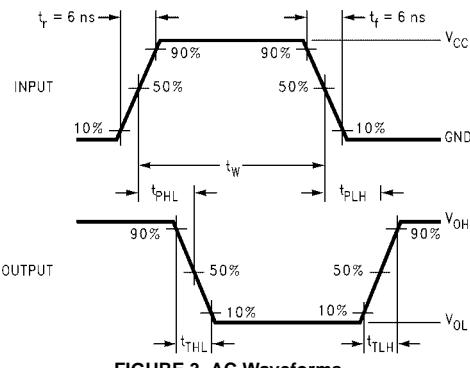


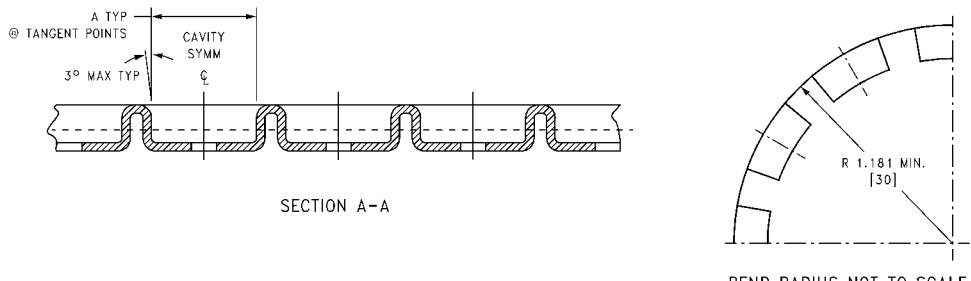
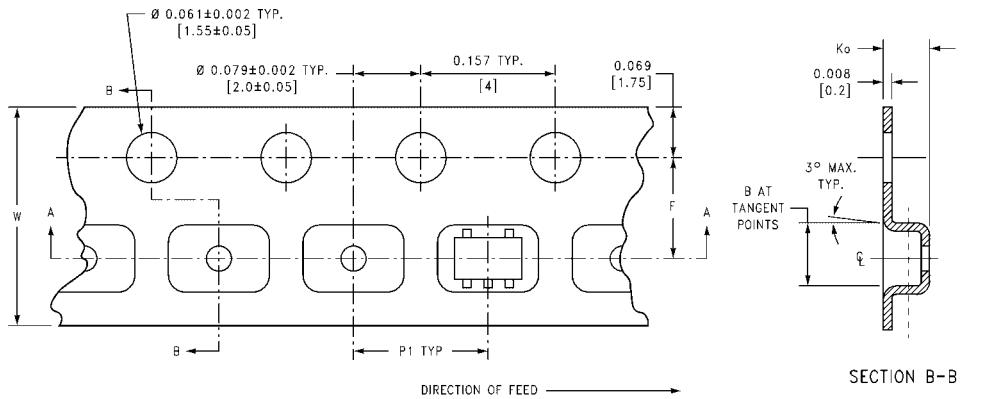
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT for SC70 and SOT23

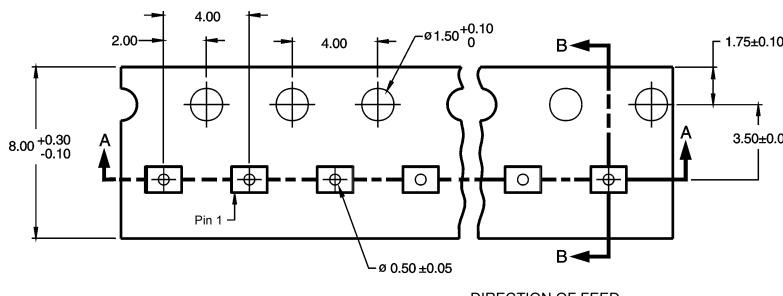
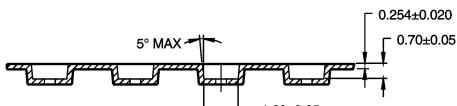
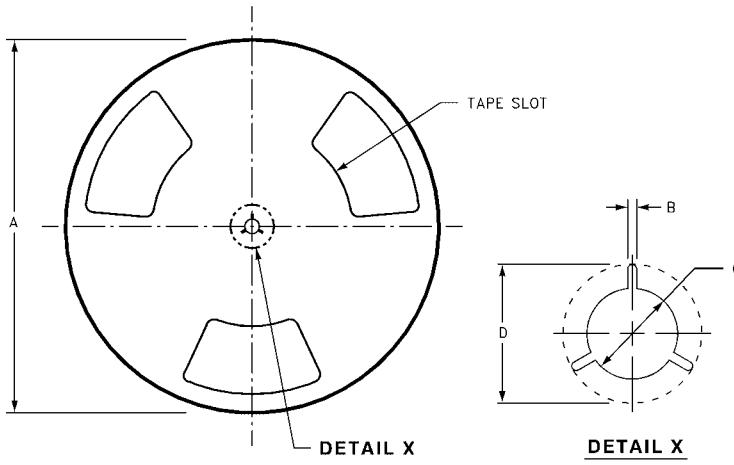
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)



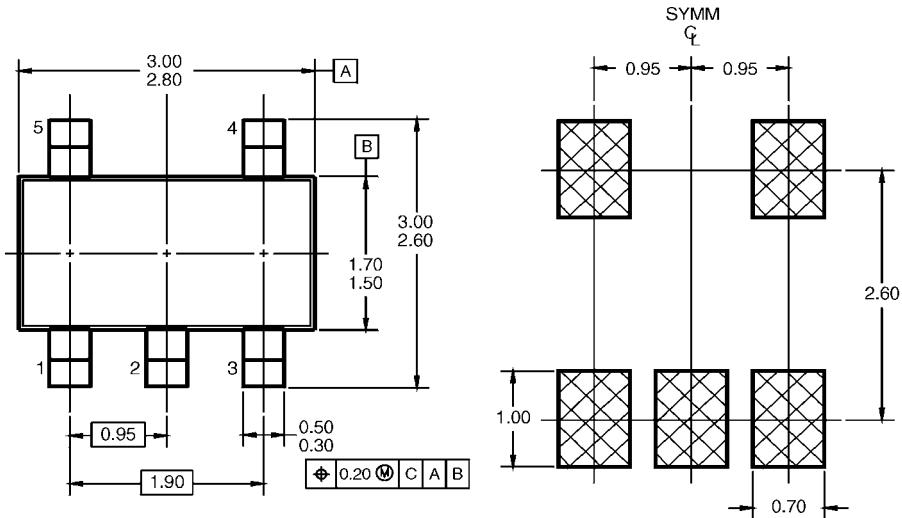
Package	Tape Size	DIM A	DIM B	DIM F	DIM K _o	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138±0.004 (3.5±0.10)	0.053±0.004 (1.35±0.10)	0.157 (4)	0.315±0.004 (8±0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138±0.002 (3.5±0.05)	0.055±0.004 (1.4±0.11)	0.157 (4)	0.315±0.012 (8±0.3)

Tape and Reel Specification (Continued)
TAPE FORMAT for MicroPak

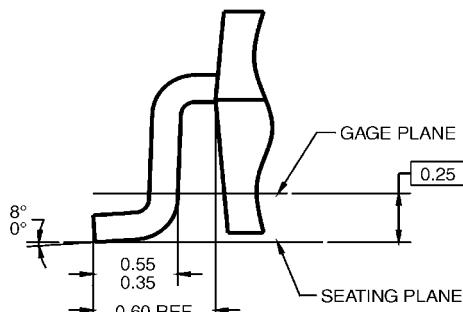
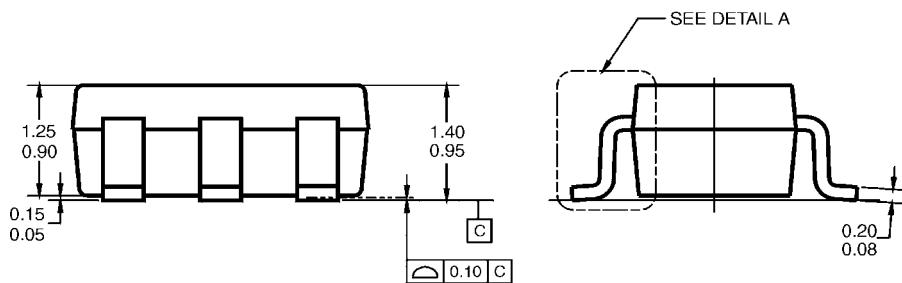
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status				
L6X	Leader (Start End) Carrier Trailer (Hub End)	125 (typ) 5000 75 (typ)	Empty Filled Empty	Sealed Sealed Sealed				
 <p>8.00^{+0.30}_{-0.10} ← 2.00 ← 4.00 ← 4.00 ← Ø1.50^{+0.10}₀ ← Pin 1 ← Ø 0.50 ± 0.05 ← B ← 1.75 ± 0.10 ← 3.50 ± 0.05 ← B ← DIRECTION OF FEED → SECTION B-B SCALE:10X</p>								
 <p>5° MAX. ← 0.254 ± 0.020 ← 0.70 ± 0.05 ← -1.60 ± 0.05 ← SECTION A-A SCALE:10X</p>								
<p>REEL DIMENSIONS inches (millimeters)</p>  <p>A ← TAPE SLOT ← B ← C ← D ← N ← W₁ ← W₂ ← W₃ ← DETAIL X DETAIL X SCALE: 3X</p>								
Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	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)

NC7S00

Physical Dimensions inches (millimeters) unless otherwise noted



LAND PATTERN RECOMMENDATION



NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC
MO-178, ISSUE B, VARIATION AA,
DATED JANUARY 1999.
B) ALL DIMENSIONS ARE IN MILLIMETERS.

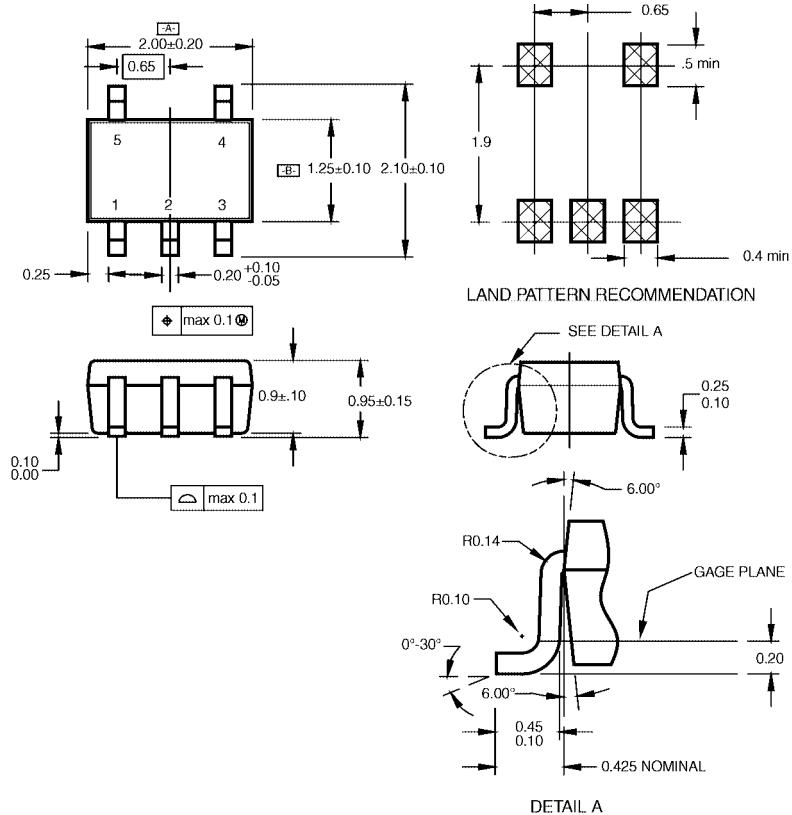
MA05BRevC

DETAIL A

5-Lead SOT23, JEDEC MO-178, 1.6mm
Package Number MA05B

Physical Dimensions

inches (millimeters) unless otherwise noted (Continued)

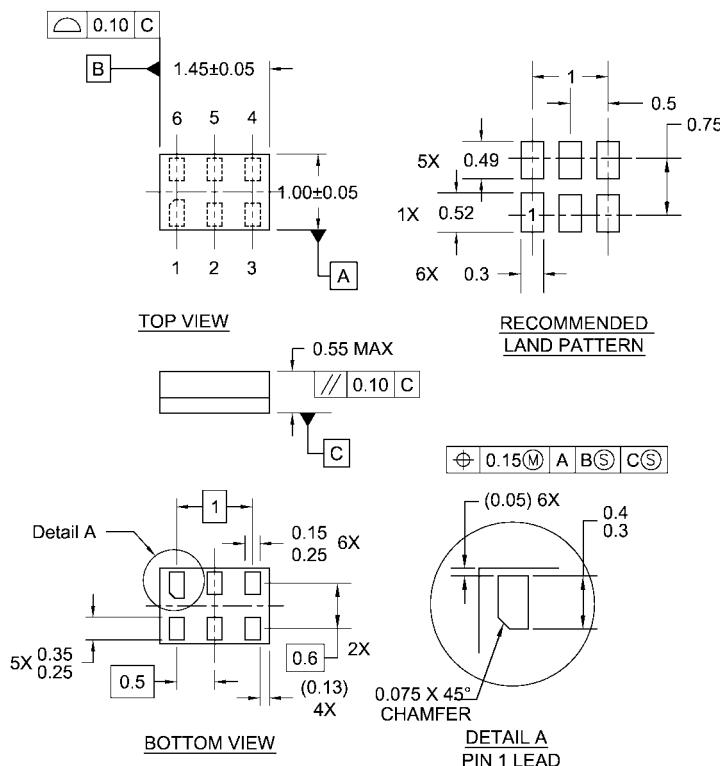


NOTES:

- A. CONFORMS TO EIAJ REGISTERED OUTLINE DRAWING SC88A.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
- C. DIMENSIONS ARE IN MILLIMETERS.

MAA05ARevC

5-Lead SC70, EIAJ SC-88a, 1.25mm Wide
Package Number MAA05A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

Notes:

1. JEDEC PACKAGE REGISTRATION IS ANTICIPATED
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06ARevB

6-Lead MicroPak, 1.0mm Wide
Package Number MAC06A

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