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January 1997 Revised August 2004

## NC7ST08

## TinyLogic® HST 2-Input AND Gate

## **General Description**

The NC7ST08 is a single 2-Input high performance CMOS AND Gate, with TTL-compatible inputs. Advanced Silicon Gate CMOS fabrication assures high speed and low power circuit operation. ESD protection diodes inherently guard both inputs and output with respect to the  $V_{\rm CC}$  and GND rails. High gain circuitry offers high noise immunity and reduced sensitivity to input edge rate. The TTL-compatible inputs facilitate TTL to NM OS/CMOS interfacing. Device performance is similar to MM74HCT but with 1/2 the output current drive of HC/HCT.

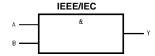
## **Features**

- Space saving SOT23 or SC70 5-lead package
- Ultra small MicroPak™ leadless package
- High Speed:  $t_{PD}$  6 ns (typ),  $V_{CC}$  = 5V,  $C_L$  = 15 pF,  $T_A$  = 25°C
- $\blacksquare$  Low Quiescent Power,  $I_{CC} < 1~\mu\text{A},~V_{CC} = 5.5 V$
- $\blacksquare$  Balanced Output Drive; 2 mA I\_OL, -2 mA I\_OH
- TTL-compatible inputs

## **Ordering Code:**

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7ST08M5X	MA05B	8808	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7ST08P5X	MAA05A	T08	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7ST08L6X	MAC06A	NN	6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

## **Logic Symbol**



## **Pin Descriptions**

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

## **Function Table**

Y = AB

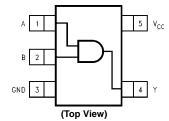
Inp	Output	
Α	В	Y
L	L	L
L	Н	L
Н	L	L
Н	Н	Н

H = HIGH Logic Level

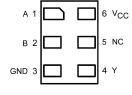
c Level L = LOW Logic Level

## **Connection Diagrams**

## Pin Assignments for SC70 and SOT23



#### Pad Assignment for MicroPak



(Top Thru View)

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## **Absolute Maximum Ratings**(Note 1)

# Recommended Operating Conditions (Note 2)

Supply Voltage (V $_{\rm CC}$ )  $$-0.5{\rm V}$  to +7.0V DC Input Diode Current (I $_{\rm IK}$ )

DC Input Voltage ( $V_{IN}$ ) -0.5V to  $V_{CC} + 0.5V$ 

DC Output Diode Current (I<sub>OK</sub>)

 $\begin{aligned} &V_{OUT} < -0.5V & -20 \text{ mA} \\ &V_{OUT} > V_{CC} + 0.5V & +20 \text{ mA} \end{aligned}$ 

Output Voltage ( $V_{OUT}$ ) -0.5V to  $V_{CC} + 0.5V$ 

DC Output Source or Sink Current

 $(I_{OUT})$  ±12.5 mA

DC V<sub>CC</sub> or Ground Current per

Supply Pin ( $I_{CC}$  or  $I_{GND}$ )  $\pm 25$  mA Storage Temperature ( $T_{STG}$ )  $-65^{\circ}$ C to  $+150^{\circ}$ C Junction Temperature ( $T_{J}$ )  $150^{\circ}$ C

Lead Temperature (T<sub>L</sub>);

(Soldering, 10 seconds) 260°C

Power Dissipation (P<sub>D</sub>) @+85°C

SOT23-5 200 mW SC70-5 150 mW

Input Rise and Fall Time  $(t_r, t_f)$ 

 $V_{CC} = 5.0V$  0 ns to 500 ns

Thermal Resistance ( $\theta_{JA}$ )

SOT23-5 300°C/W

SC70-5 425°C/W

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**

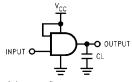
Symbol	Parameter	v <sub>cc</sub>	$T_A = +25^{\circ}C$			$T_A = 40^{\circ}C \text{ to } +85^{\circ}C$		Units	Conditions	
Symbol		(V)	Min	Тур	Max	Min	Max	Offics	Conditions	
V <sub>IH</sub>	HIGH Level Input Voltage	4.5–5.5	2.0			2.0		V		
V <sub>IL</sub>	LOW Level Input Voltage	4.5–5.5			8.0		0.8	V		
V <sub>OH</sub>	HIGH Level Output Voltage	4.5	4.4	4.5		4.4			$I_{OH} = -20 \mu A$	
		4.5	4.18	4.35		4.13		V	$I_{OH} = -2 \text{ mA}$	
									$V_{IN} = V_{IH}$	
V <sub>OL</sub>	LOW Level Output Voltage	4.5		0	0.1		0.1		$I_{OL} = 20 \mu A$	
		4.5		0.10	0.26		0.33	V	$I_{OL} = 2 \text{ mA}$	
									$V_{IN} = V_{IL}$	
I <sub>IN</sub>	Input Leakage Current	5.5			±0.1		±1.0	μΑ	$0 \le V_{IN} \le 5.5V$	
I <sub>CC</sub>	Quiescent Supply Current	5.5			1.0		10.0	μΑ	$V_{IN} = V_{CC}$ or GND	
I <sub>CCT</sub>	I <sub>CC</sub> per Input	5.5			2.0		2.9	mA	One Input $V_{IN} = 0.5V$ or 2.4V,	
									Other Input V <sub>CC</sub> or GND	

## **AC Electrical Characteristics**

Symbol	Parameter	Vcc	T <sub>A</sub> = +25°C		$T_A = 40^{\circ}C \text{ to } +85^{\circ}C$		Units	Conditions	Figure	
		(V)	Min	Тур	Max	Min	Max	Oiilla		Number
t <sub>PLH</sub> ,	Propagation Delay	5.0		4	12				C 45 mF	
$t_{PHL}$				6	17			ns	C <sub>L</sub> = 15 pF	
		4.5		6	16		20			Figures
				12	27		31	ns	C <sub>I</sub> = 50 pF	1, 3
		5.5		5	14		18	115	CL = 50 pr	
				11	26		30			
t <sub>TLH</sub> ,	Output Transition Time	5.0		4	10			ns	C <sub>L</sub> = 15 pF	
$t_{THL}$		4.5		11	25		31	ns	C <sub>1</sub> = 50 pF	Figures 1, 3
		5.5		10	21		26	115	OL = 30 pi	1, -
C <sub>IN</sub>	Input Capacitance	Open			10			pF		
C <sub>PD</sub>	Power Dissipation Capacitance	5.0		6				pF	(Note 3)	Figure 2

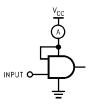
Note 3:  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption ( $I_{CCD}$ ) at no output loading and operating at 50% duty cycle. (See Figure 2.)  $C_{PD}$  is related to  $I_{CCD}$  dynamic operating current by the expression: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

## **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.  $I_{\rm CCD}$  Test Circuit

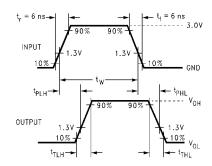
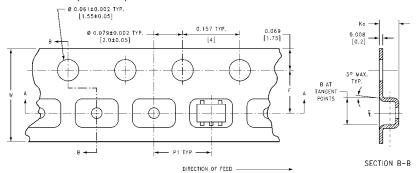


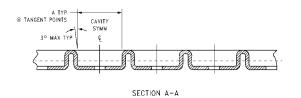
FIGURE 3. AC Waveforms

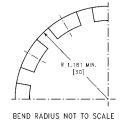
# Tape and Reel Specification TAPE FORMAT for SC70 and SOT23

TALE TO KINATIOLO	TAILET ORMAT TO COTT UTIL COTES							
Package	Таре	Number	Cavity	Cover Tape				
Designator	Section	Cavities	Status	Status				
	Leader (Start End)	125 (typ)	Empty	Sealed				
M5X, P5X	Carrier	3000	Filled	Sealed				
	Trailer (Hub End)	75 (typ)	Empty	Sealed				

## TAPE DIMENSIONS inches (millimeters)

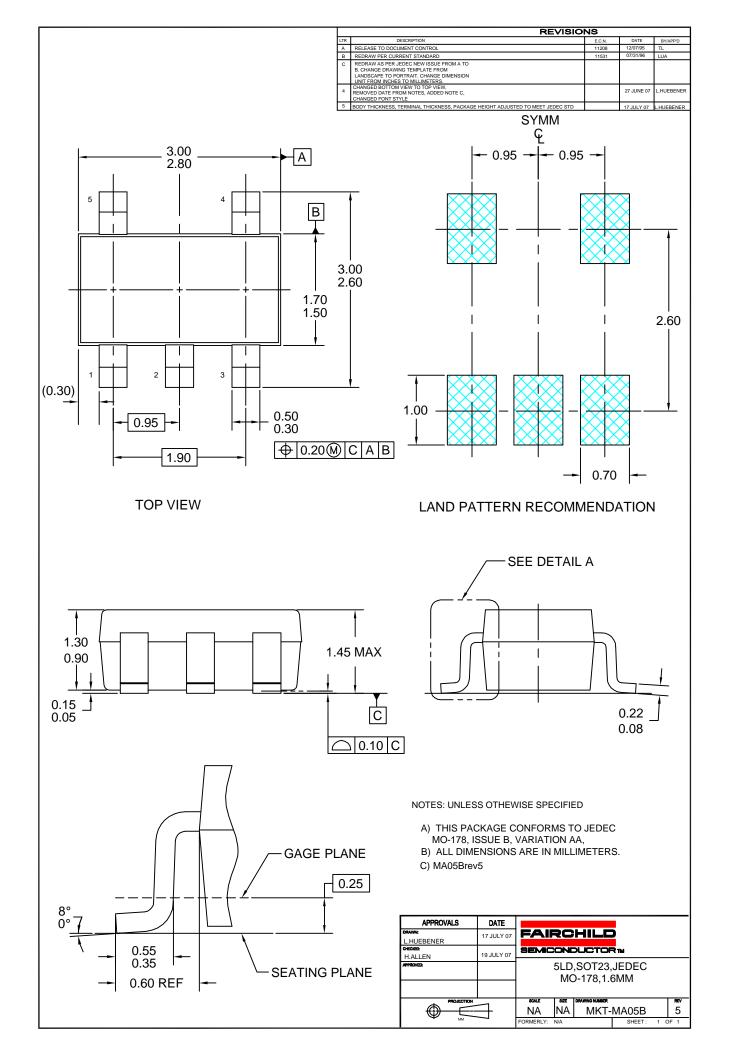


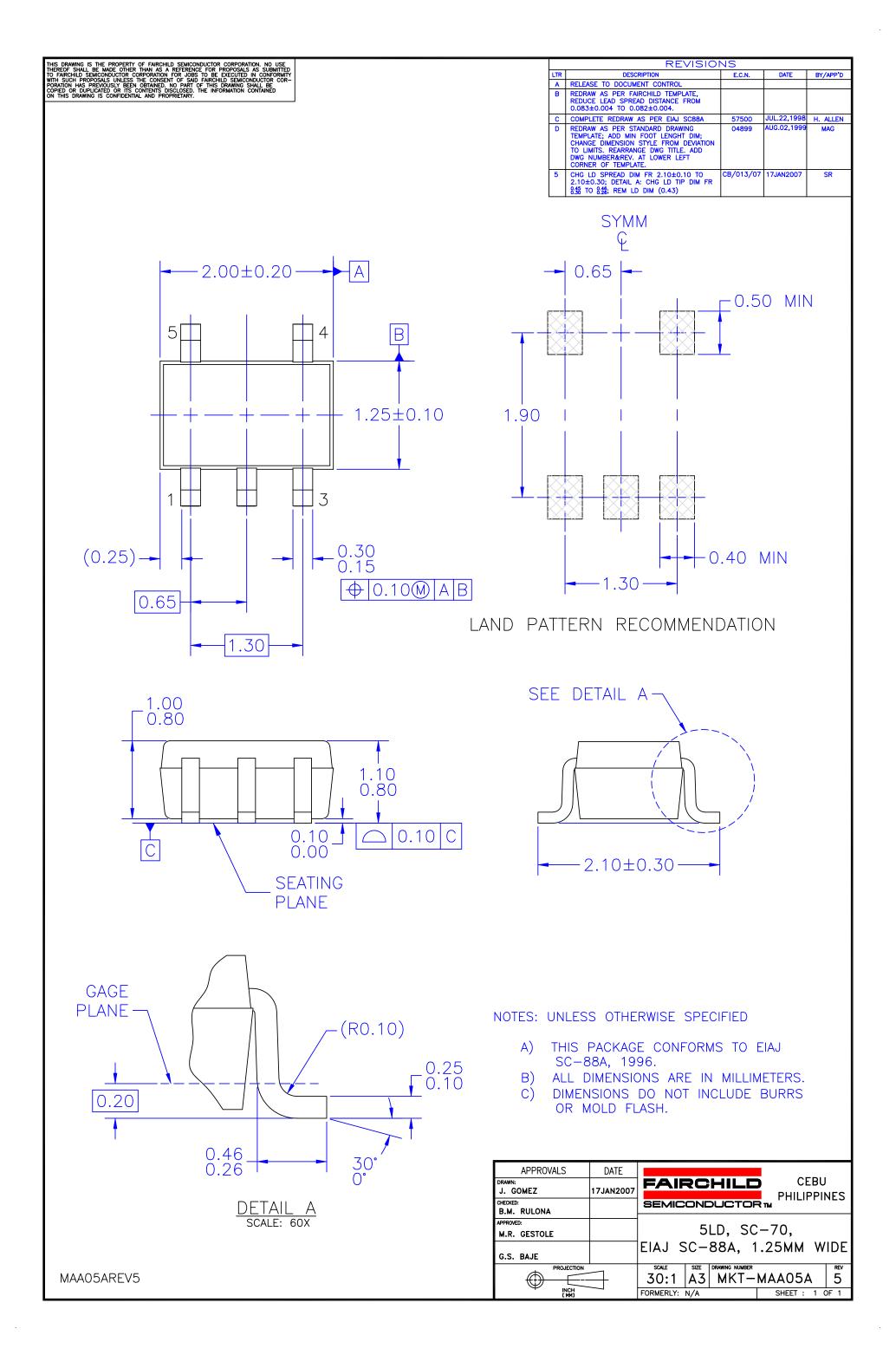


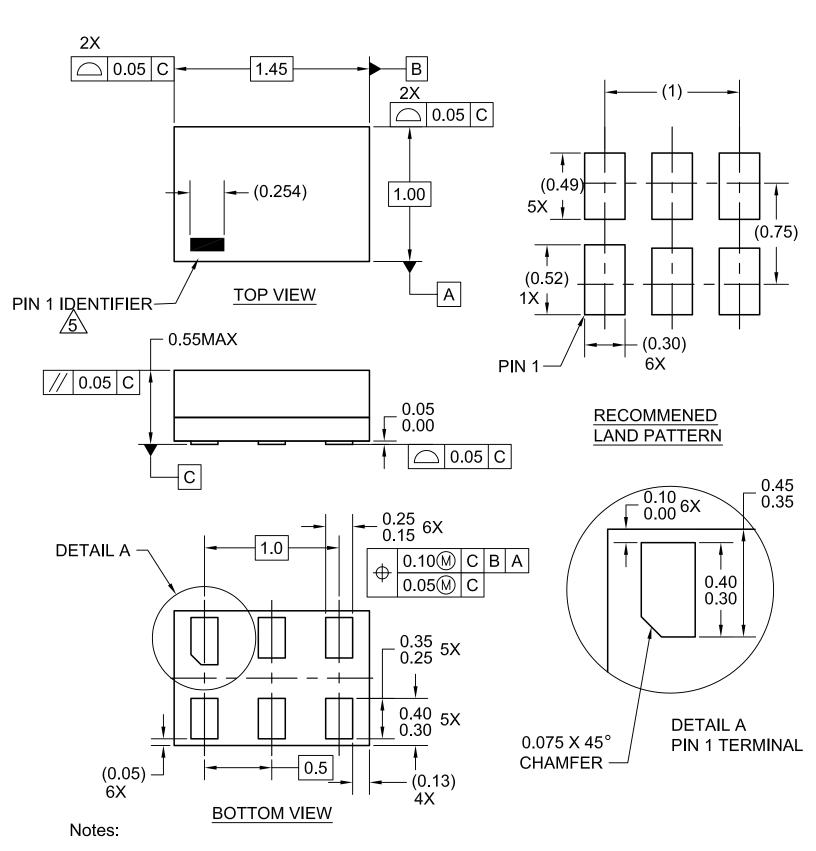


Package	Tape Size	DIM A	DIM B	DIM F	DIM K <sub>o</sub>	DIM P1	DIM W
SC70-5 8 n	8 mm	0.093	0.096	$0.138 \pm 0.004$	$0.053 \pm 0.004$	0.157	$0.315 \pm 0.004$
	0 111111	(2.35)	(2.45)	$(3.5 \pm 0.10)$	$(1.35 \pm 0.10)$	(4)	(8 ± 0.1)
SOT23-5 8 mm	0.130	0.130	$0.138 \pm 0.002$	$0.055 \pm 0.004$	0.157	$0.315 \pm 0.012$	
30123-3	0 111111	(3.3)	(3.3)	$(3.5 \pm 0.05)$	$(1.4 \pm 0.11)$	(4)	$(8 \pm 0.3)$

#### Tape and Reel Specification (Continued) TAPE FORMAT for MircoPak Package Tape Number Cavity Cover Tape Designator Section Cavities Status Status Leader (Start End) 125 (typ) Empty Sealed L6X Carrier 5000 Filled Sealed Trailer (Hub End) 75 (typ) **Empty** Sealed 2.00-1.75±0.10 В 8.00 <sup>+0.30</sup> -0.10 3.50±0.05 1.15±0.05 **-** → В◄ -ø 0.50 ±0.05 SECTION B-B DIRECTION OF FEED SCALE:10X 0.254±0.020 Г 0.70±0.05 SECTION A-A SCALE:10X **REEL DIMENSIONS** inches (millimeters) TAPE SLOT DETAIL X DETAIL X SCALE: 3X W1 W2 W3 Tape В С D Ν Α Size W1 + 0.078/-0.039 0.331 + 0.059/-0.000 7.0 0.567 0.059 0.512 0.795 2.165 8 mm (177.8)(1.50)(13.00)(20.20)(55.00) (8.40 + 1.50 / -0.00)(W1 + 2.00/-1.00)(14.40)







- 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.





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