

# NC7S14

## TinyLogic™ HS Inverter with Schmitt Trigger Input

### General Description

The NC7S14 is a single high performance CMOS Inverter with Schmitt Trigger input. The circuit design provides hysteresis between the positive-going and negative going input thresholds thereby improving noise margins.

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 input and output with respect to the  $V_{CC}$  and GND rails.

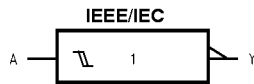
### Features

- Space saving SOT23 or SC70 5-lead package
- Schmitt input hysteresis: > 1V typ
- High speed:  $t_{PD}$  4.5 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

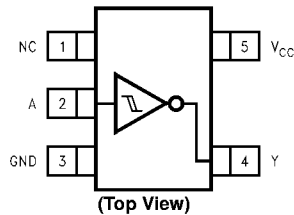
### Ordering Code:

Order Number	Package Number	Package Top Mark	Package Description	Supplied As
NC7S14M5	MA05B	7S14	5-Lead, SOT23, JEDEC MO-178, 1.6mm	250 Units on Tape and Reel
NC7S14M5X	MA05B	7S14	5-Lead, SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7S14P5	MAA05A	S14	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	250 Units on Tape and Reel
NC7S14P5X	MAA05A	S14	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel

### Logic Symbol



### Connection Diagram



### Pin Descriptions

Pin Names	Description
A	Input
Y	Output
NC	No Connect

### Function Table

$Y = \bar{A}$

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level  
L = LOW Logic Level

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<b>Absolute Maximum Ratings</b> (Note 1)		Power Dissipation ( $P_D$ ) @ +85°C	
Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V	SOT23-5	200 mW
DC Input Diode Current ( $I_{IK}$ )		SC70-5	150 mW
@ $V_{IN} \leq -0.5V$	-20 mA	<b>Recommended Operating Conditions</b>	
@ $V_{IN} \geq V_{CC} + 0.5V$	+20 mA	Supply Voltage ( $V_{CC}$ )	2.0V to 6.0V
DC Input Voltage ( $V_{IN}$ )	-0.5V to $V_{CC} + 0.5V$	Input Voltage ( $V_{IN}$ )	0V to $V_{CC}$
DC Output Diode Current ( $I_{OK}$ )		Output Voltage ( $V_{OUT}$ )	0V to $V_{CC}$
@ $V_{OUT} < -0.5V$	-20 mA	Operating Temperature ( $T_A$ )	-40°C to +85°C
@ $V_{OUT} > V_{CC} + 0.5V$	+20 mA	Thermal Resistance ( $\theta_{JA}$ )	
DC Output Voltage ( $V_{OUT}$ )	-0.5V to $V_{CC} + 0.5V$	SOT23-5	300°C/W
DC Output Source or Sink Current ( $I_{OUT}$ )	$\pm 12.5$ mA	SC70-5	425°C/W
DC $V_{CC}$ or Ground Current per Output Pin ( $I_{CC}$ or $I_{GND}$ )	$\pm 25$ mA	<b>Note 1:</b> 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.	
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C		
Junction Temperature ( $T_J$ )	150°C		
Lead Temperature ( $T_L$ ) (Soldering, 10 seconds)	260°C		

**DC Electrical Characteristics**

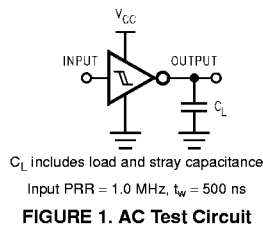
Symbol	Parameter	$V_{CC}$ (V)	$T_A = +25^\circ C$			$T_A = -40^\circ C$ to $+85^\circ C$		Units	Conditions		
			Min	Typ	Max	Min	Max				
$V_P$	Positive Threshold Voltage	2.0	1.0	1.29	1.5	1.0	1.6	V			
		3.0	1.5	1.90	2.2	1.5	2.2				
		4.5	2.3	2.73	3.15	2.3	3.15				
		6.0	3.0	3.56	4.2	3.0	4.2				
$V_N$	Negative Threshold Voltage	2.0	0.3	0.70	0.9	0.3	0.9	V			
		3.0	0.6	1.05	1.35	0.6	1.35				
		4.5	1.13	1.66	2.0	1.13	2.0				
		6.0	1.5	2.24	2.6	1.5	2.6				
$V_H$	Hysteresis Voltage	2.0	0.3	0.59	1.0	0.3	1.0	V			
		3.0	0.4	0.85	1.3	0.4	1.3				
		4.5	0.6	1.08	1.4	0.6	1.4				
		6.0	0.8	1.31	1.7	0.8	1.7				
$V_{OH}$	HIGH Level Output Voltage	2.0	1.90	2.0		1.90		V	$I_{OH} = -20 \mu A$ $V_{IN} = V_{IL}$		
		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	2.68	2.87		2.63	V	$V_{IN} = V_{IL}$ $I_{OH} = -1.3 mA$ $I_{OH} = -2 mA$ $I_{OH} = -2.6 mA$	
				4.5	4.18	4.37		4.13			
				6.0	5.68	5.86		5.63			
$V_{OL}$	LOW Level Output Voltage	2.0		0.0	0.10		0.10	V	$I_{OH} = 20 \mu A$ $V_{IN} = V_{IH}$		
		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		0.1	0.26		0.33	V	$V_{IN} = V_{IH}$ $I_{OL} = 1.3 mA$ $I_{OL} = 2 mA$ $I_{OL} = 2.6 mA$
				4.5		0.1	0.26		0.33		
				6.0		0.1	0.26		0.33		
$I_{IN}$	Input Leakage Current	6.0			$\pm 0.1$		$\pm 1.0$	$\mu A$	$V_{IN} = V_{CC}, GND$		
$I_{CC}$	Quiescent Supply Current	6.0			1.0		10.0	$\mu A$	$V_{IN} = V_{CC}, GND$		

## AC Electrical Characteristics

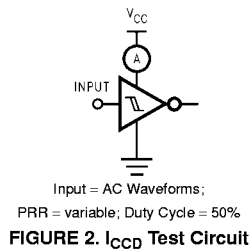
Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units	Conditions	Fig. No.
			Min	Typ	Max	Min	Max			
t <sub>PLH</sub>	Propagation Delay	5.0		4.5	21			ns	C <sub>L</sub> = 15 pF	Figure 1
t <sub>PHL</sub>		2.0		20	100		125		C <sub>L</sub> = 50 pF	Figure 3
		3.0		12	27		35	ns		
		4.5		8.5	20		25			
		6.0		7.5	17		21			
t <sub>TLH</sub>	Output Transition Time	5.0		3	8			ns	C <sub>L</sub> = 15 pF	Figure 1
t <sub>THL</sub>		2.0		25	125		145		C <sub>L</sub> = 50 pF	Figure 3
		3.0		16	35		45	ns		
		4.5		11	25		30			
		6.0		9	21		24			
C <sub>IN</sub>	Input Capacitance	Open		2	10		10	pF		
C <sub>PD</sub>	Power Dissipation Capacitance	5.0		7				pF	(Note 2)	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:  
 $I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CCstatic})$ .

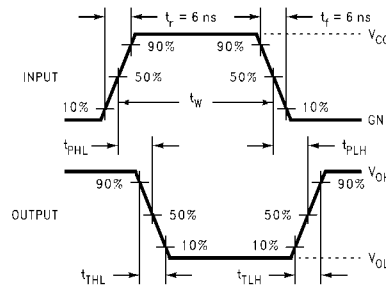
## AC Loading and Waveforms



**FIGURE 1. AC Test Circuit**



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

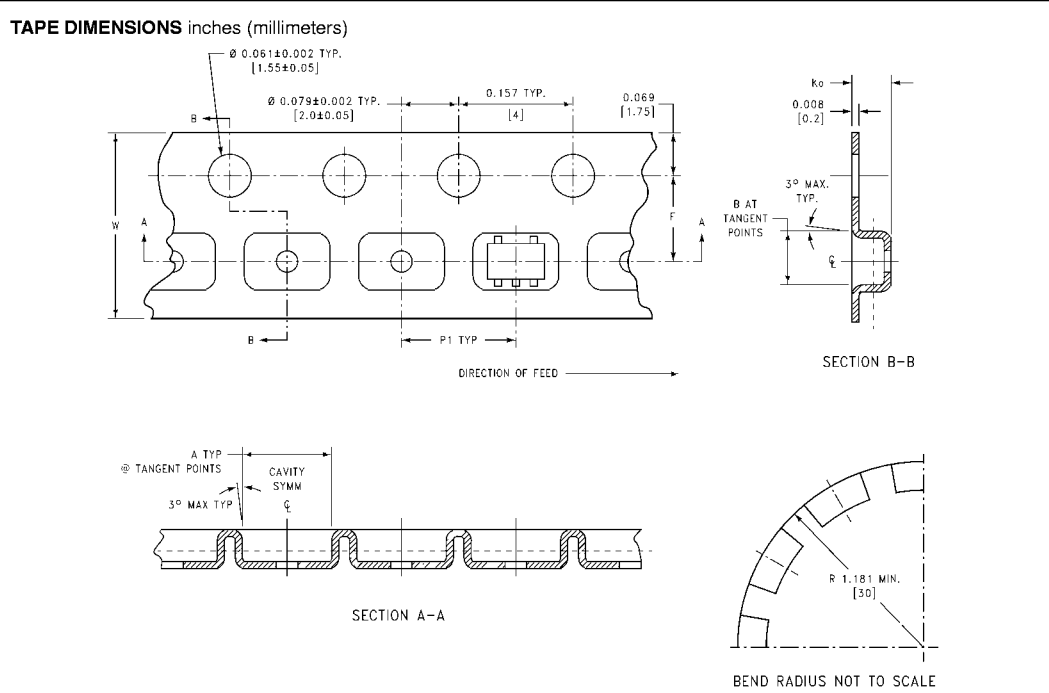


**FIGURE 3. AC Waveforms**

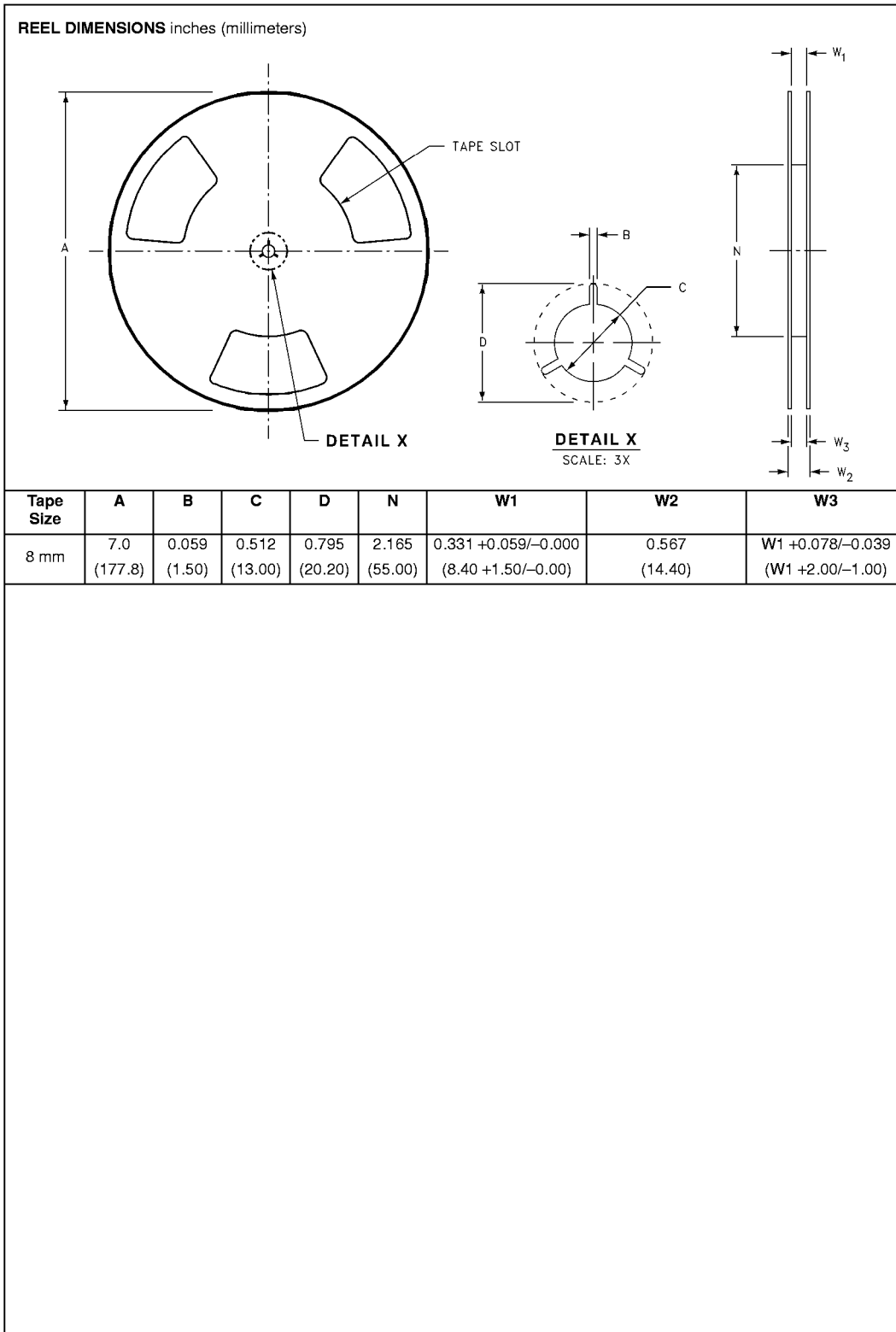
### Tape and Reel Specification

**TAPE FORMAT**

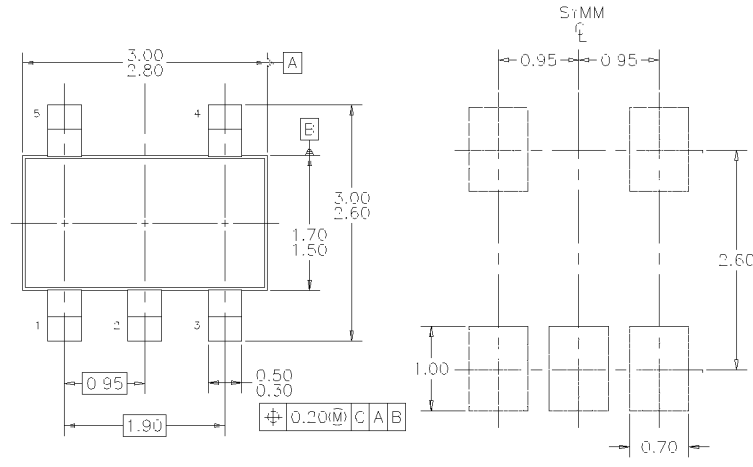
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5, P5	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	250	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed



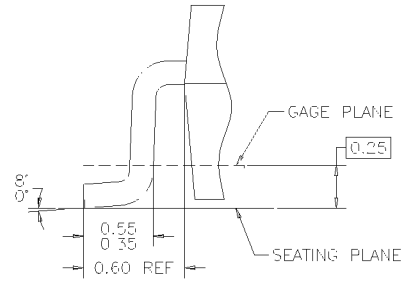
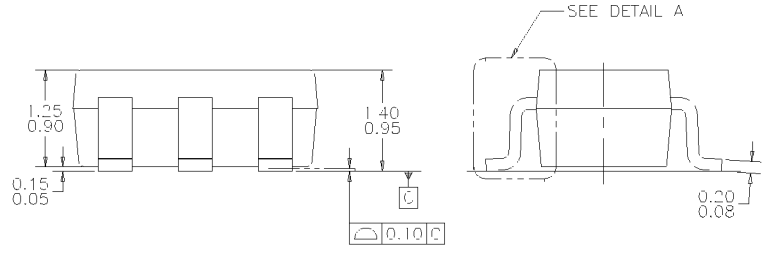
Package	Tape Size	DIM A	DIM B	DIM F	DIM K <sub>0</sub>	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ±0.004 (3.5 ±0.10)	0.053 ±0.004 (1.35 ±0.10)	0.157 (4)	0.315 ±0.004 (8 ±0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ±0.002 (3.5 ±0.05)	0.055 ±0.004 (1.4 ±0.11)	0.157 (4)	0.315 ±0.012 (8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



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



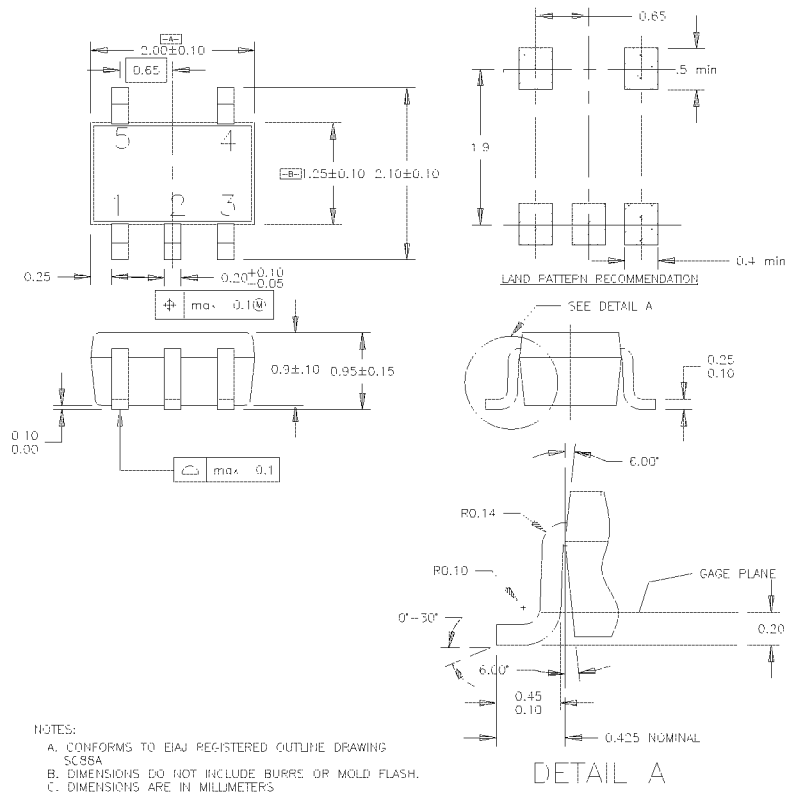
LAND PATTERN RECOMMENDATION



- 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.

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

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



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

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