

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.

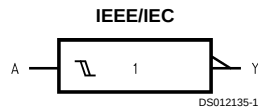
Features

- Space saving SOT23 or SC70 5-lead surface mount 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:

Product	Package	Package Drawing	Package Top Mark	Supplied As
NC7S14M5	SOT23-5	MA05B	7S14	250 Units on Tape and Reel
NC7S14M5X	SOT23-5	MA05B	7S14	3k Units on Tape and Reel
NC7S14P5	SC70-5	MAA05A	S14	250 Units on Tape and Reel
NC7S14P5X	SC70-5	MAA05A	S14	3k Units on Tape and Reel

Logic Symbol

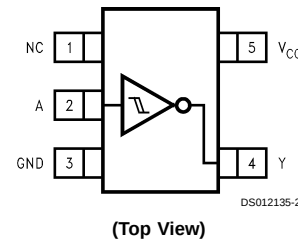


Pin Descriptions

Pin Names	Description
A	Input
Y	Output
NC	No Connect

Connection Diagram

Pin Assignment for 5-lead Packages



Function Table

$$Y = \overline{A}$$

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level
L = LOW Logic Level

Absolute Maximum Ratings (Note 1)

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

ESD Tolerance (Human Body Model)

MIL-STD-883D Method 3015.7	2000V
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DC Latchup Tolerance

Source Current (JEDEC Method 17)	± 500 mA
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Recommended Operating Conditions

Supply Voltage (V_{CC})	2.0V to 6.0V
Input Voltage (V_{IN})	0V to V_{CC}
Output Voltage (V_{OUT})	0V to V_{CC}
Operating Temperature (T_A)	-40°C to +85°C
Thermal Resistance (θ_{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.

DC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	NC7S14			NC7S14		Units	Conditions
			T _A = +25°C			T _A = −40°C to +85°C			
			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 μA 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			

DC Electrical Characteristics (Continued)

Symbol	Parameter	V _{CC} (V)	NC7S14			NC7S14		Units	Conditions
			T _A = +25°C			T _A = −40°C to +85°C			
			Min	Typ	Max	Min	Max		
V _{OL}	Low Level Output Voltage	2.0	0.0	0.10	0.10		V	I _{OH} = 20 μA 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				
		6.0							
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	

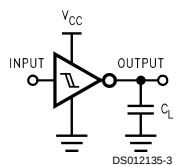
AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	NC7S14			NC7S14		Units	Conditions
			T _A = +25°C			T _A = −40°C to +85°C			
			Min	Typ	Max	Min	Max		
t _{PLH} , t _{PHL}	Propagation Delay	5.0	4.5 21				ns	C _L = 15 pF	
		2.0	20 100		125		ns	C _L = 50 pF	
		3.0	12 27		35				
		4.5	8.5 20		25				
		6.0	7.5 17		21				
t _{TLH} , t _{THL}	Output Transition Time	5.0	3 8				ns	C _L = 15 pF	
		2.0	25 125		145		ns	C _L = 50 pF	
		3.0	16 35		45				
		4.5	11 25		30				
		6.0	9 21		24				
C _{IN}	Input Capacitance (Note 2)	Open	2 10		10		pF		
C _{PD}	Power Dissipation Capacitance	5.0	7				pF	(Note 3)	

Note 2: Parameter guaranteed by design. Not tested.

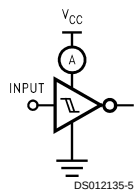
Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD} =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

AC Electrical Characteristics (Continued)



C_L includes load and stray capacitance
Input PRR = 1.0 MHz, $t_w = 500$ ns

FIGURE 1. AC Test Circuit



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

FIGURE 2. I_{CCD} Test Circuit

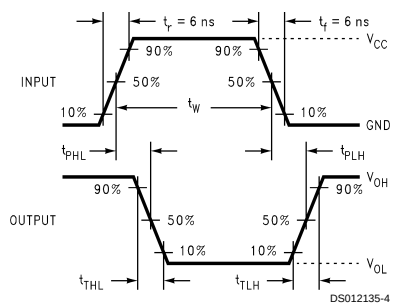
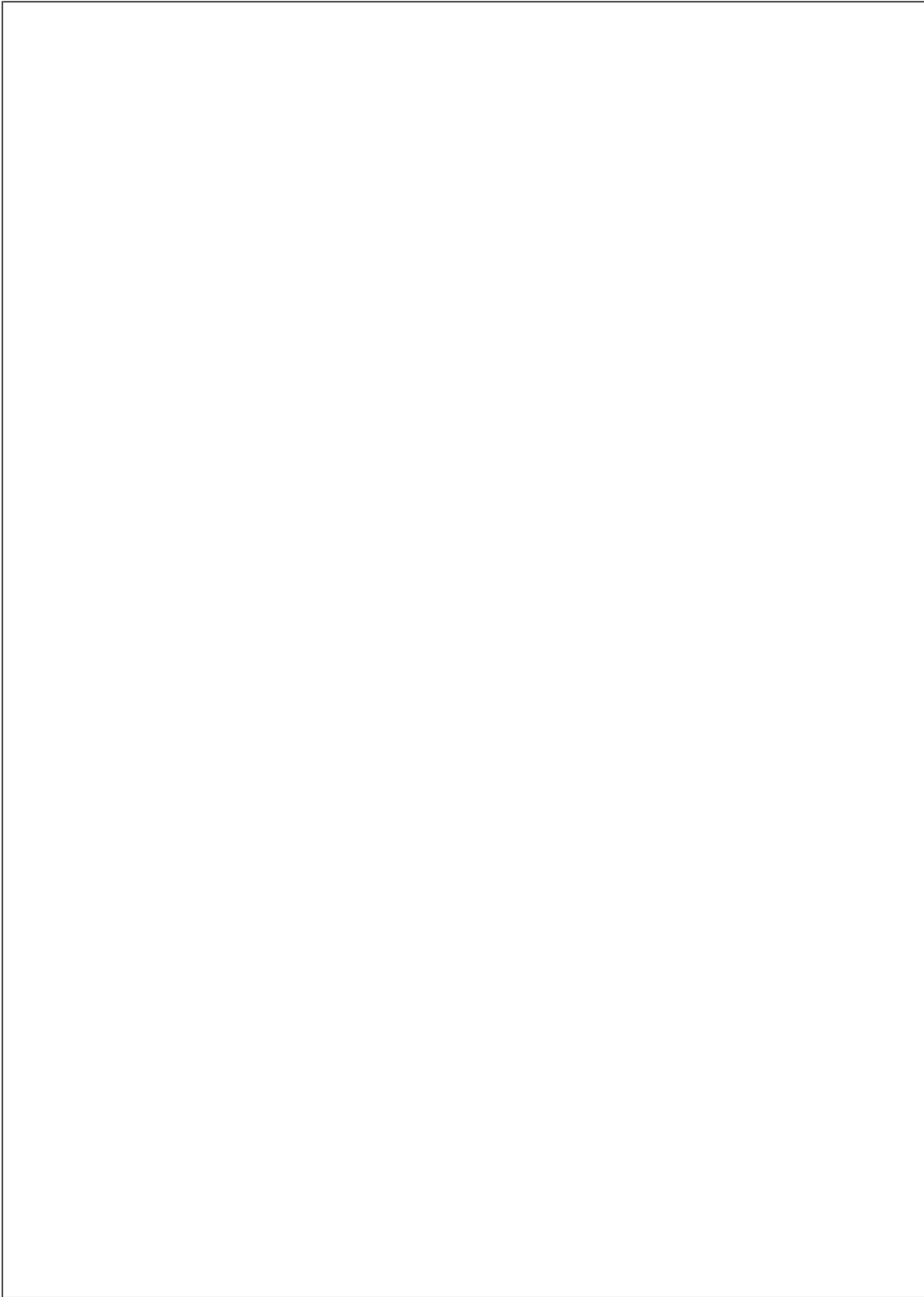
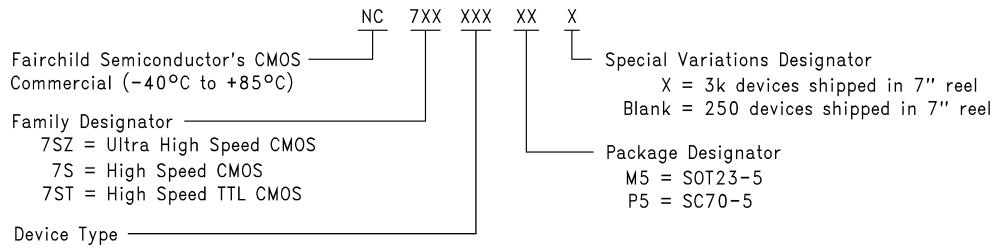


FIGURE 3. AC Waveforms



Ordering Information

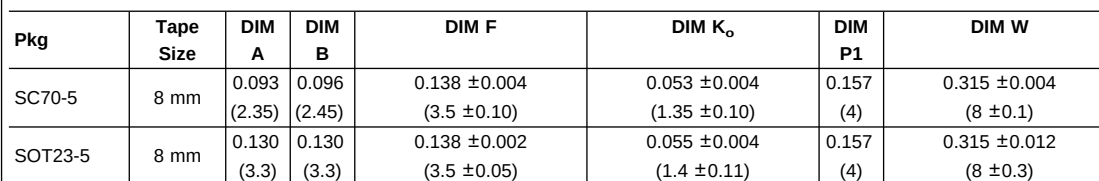
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



DS012135-6

TAPE FORMAT

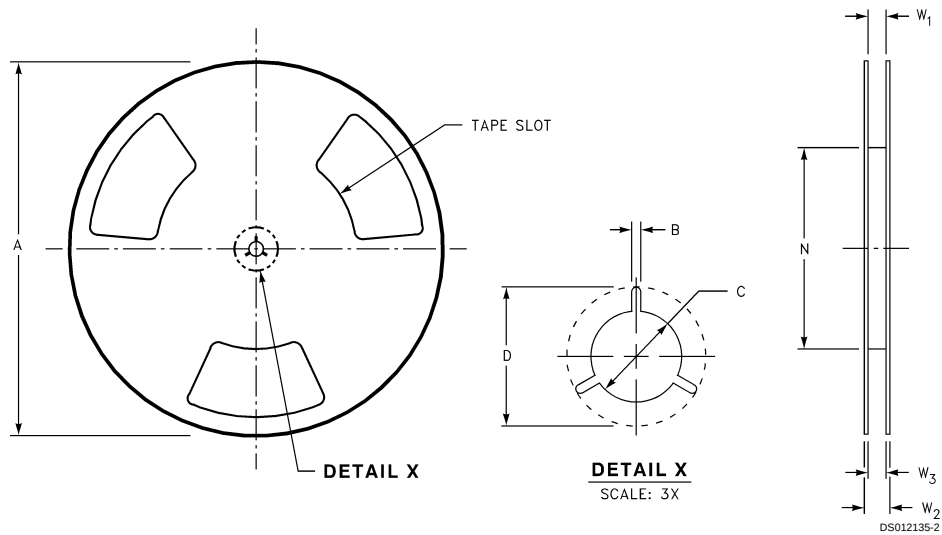
TAPE DIMENSIONS inches (millimeters)



Tape and Reel Specification

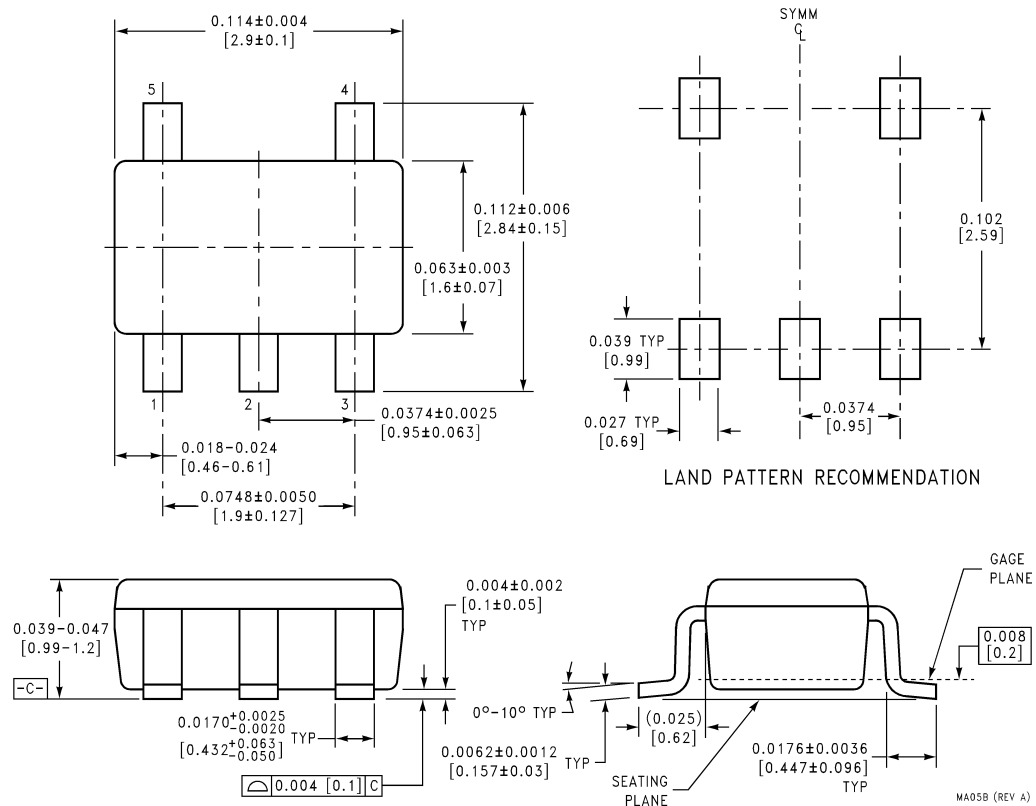
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REEL DIMENSIONS inches (millimeters)



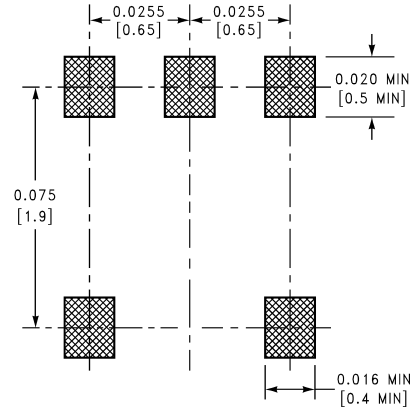
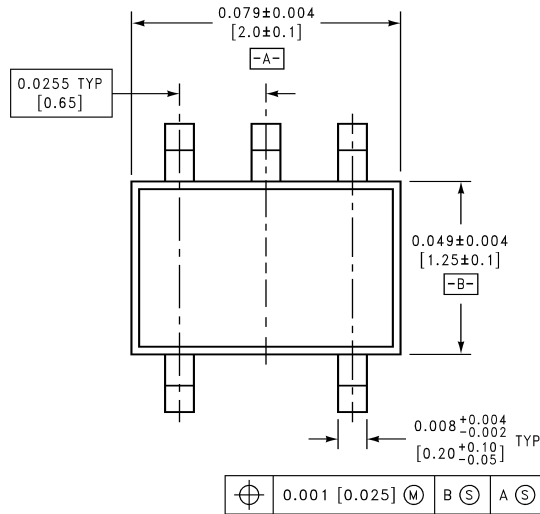
Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 +0.059/-0.000 (8.40 +1.50/-0.00)	0.567 (14.40)	W1 +0.078/-0.039 (W1 +2.00/-1.00)

Physical Dimensions inches (millimeters) unless otherwise noted

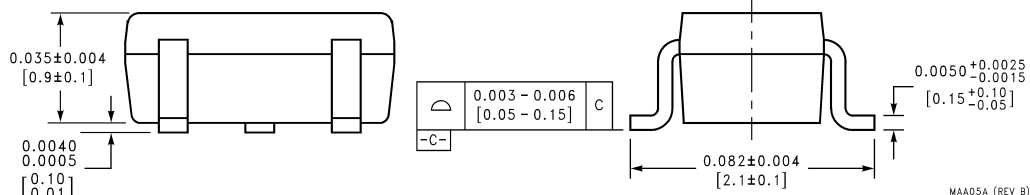


**5-Lead Molded SOT23, Enhanced Thermal
Package Number MA05B**

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



LAND PATTERN RECOMMENDATION



MAA05A (REV B)

5-Lead Molded SC70, Enhanced Thermal
Package Number MAA05A

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Fairchild Semiconductor
Corporation
Americas
Customer Response Center
Tel: 1-888-522-5372

Fairchild Semiconductor
Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 8 141-35-0
English Tel: +44 (0) 1 793-85-68-56
Italy Tel: +39 (0) 2 57 5631

Fairchild Semiconductor
Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: +852 2737-7200
Fax: +852 2314-0061

National Semiconductor
Japan Ltd.
Tel: 81-3-5620-6175
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