

NC7ST04 TinyLogic™ HST Inverter

General Description

The NC7ST04 is a single high performance CMOS Inverter, with TTL-compatible inputs. Advanced Silicon Gate CMOS fabrication assures high speed and low power circuit operation. ESD protection diodes inherently guard both input and output with respect to the V_{CC} and GND rails. High gain circuitry offers high noise immunity and reduced sensitivity to input edge rate. The TTL-compatible input facilitates TTL to NMOS/CMOS interfacing. Device performance is similar to MM74HCT but with $\frac{1}{2}$ the output current drive of HC/HCT.

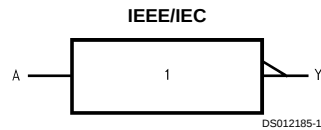
Features

- Space saving SOT23 or SC70 5-lead surface mount package
- High Speed; $T_{PD} < 7$ ns typ, $V_{CC} = 5V$, $C_L = 15$ pF
- Low Quiescent Power; $I_{CC} < 1$ μA typ, $V_{CC} = 5.5V$
- Balanced Output Drive; 2 mA I_{OL} , -2 mA I_{OH}
- TTL-compatible inputs

Ordering Code:

Product Code	Package	Package Drawing	Package Top Mark	Supplied As
NC7ST04M5	SOT23-5	MA05B	8S04	250 Units on Tape and Reel
NC7ST04M5X	SOT23-5	MA05B	8S04	3k Units on Tape and Reel
NC7ST04P5	SC70-5	MAA05A	T04	250 Units on Tape and Reel
NC7ST04P5X	SC70-5	MAA05A	T04	3k Units on Tape and Reel

Logic Symbol

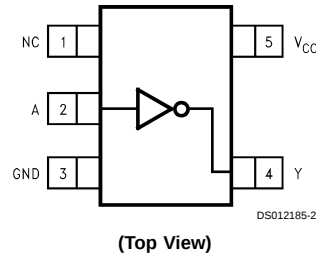


Pin Descriptions

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})	
$V_{IN} < -0.5V$	-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
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 Supply 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

DC Latchup Tolerance

Source Current

(JEDEC Method 17)

± 500 mA

Recommended Operating Conditions

Supply Voltage	4.5V–5.5V
Input Voltage (V_{IN})	0V– V_{CC}
Output Voltage (V_{OUT})	0V– V_{CC}
Operating Temperature (T_A)	-40°C to +85°C
Input Rise and Fall Time (t_r , t_f)	
$V_{CC} = 5.0V$	0–500 ns
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

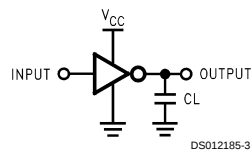
Symbol	Parameter	V _{CC} (V)	NC7ST04			NC7ST04		Units	Conditions
			T _A = +25°C			T _A = -40°C to +85°C			
			Min	Typ	Max	Min	Max		
V _{IH}	High Level Input Voltage	4.5–5.5	2.0			2.0		V	
V _{IL}	Low Level Input Voltage	4.5–5.5			0.8		0.8	V	
V _{OH}	High Level Output Voltage	4.5	4.4	4.5		4.4		V	I _{OH} = -20 μA, V _{IN} = V _{IL} , I _{OH} = -2 mA
		4.5	4.18	4.35		4.13		V	
V _{OL}	Low Level Output Voltage	4.5		0	0.1		0.1	V	I _{OL} = 20 μA, V _{IN} = V _{IH} , I _{OL} = 2 mA
		4.5		0.10	0.26		0.33	V	
I _{IN}	Input Leakage Current	5.5			±0.1		±1.0	μA	0 ≤ V _{IN} ≤ 5.5V
I _{CC}	Quiescent Supply Current	5.5			1.0		10.0	μA	V _{IN} = V _{CC} or GND
I _{CCT}	I _{CC} per Input	5.5			2.0		2.9	mA	Input V _{IN} = 0.5V or 2.4V

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	NC7ST04			NC7ST04		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		3.5	12			ns	C _L = 15 pF
				6.0	17				
		4.5		6.2	16		20	ns	C _L = 50 pF
				11.4	27		31		
		5.5		4.3	14		18		
				11.1	26		30		
t _{TLH} , t _{THL}	Output Transition Time	5.0		4	10			ns	C _L = 15 pF
		4.5		11	25		31	ns	C _L = 50 pF
		5.5		10	21		26		
C _{IN}	Input Capacitance (Note 2)	Open		2	10			pF	
C _{PD}	Power Dissipation Capacitance	5.0		6				pF	(Note 3)

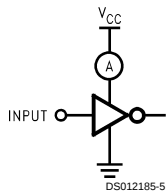
Note 2: Parameter guaranteed by design. Not tested.

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_{CCstatic}).



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

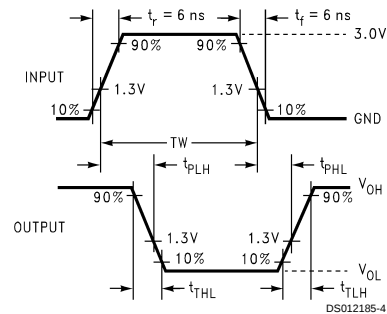
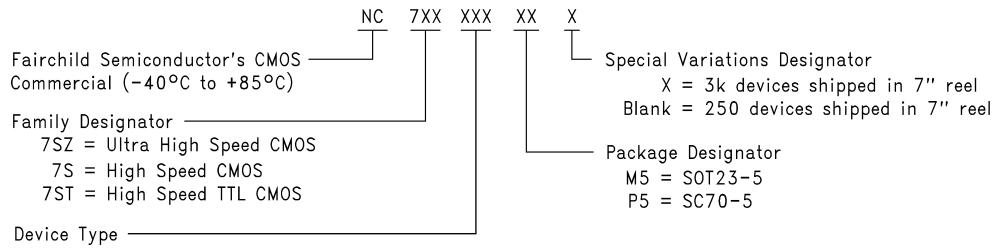


FIGURE 3. AC Waveforms

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:



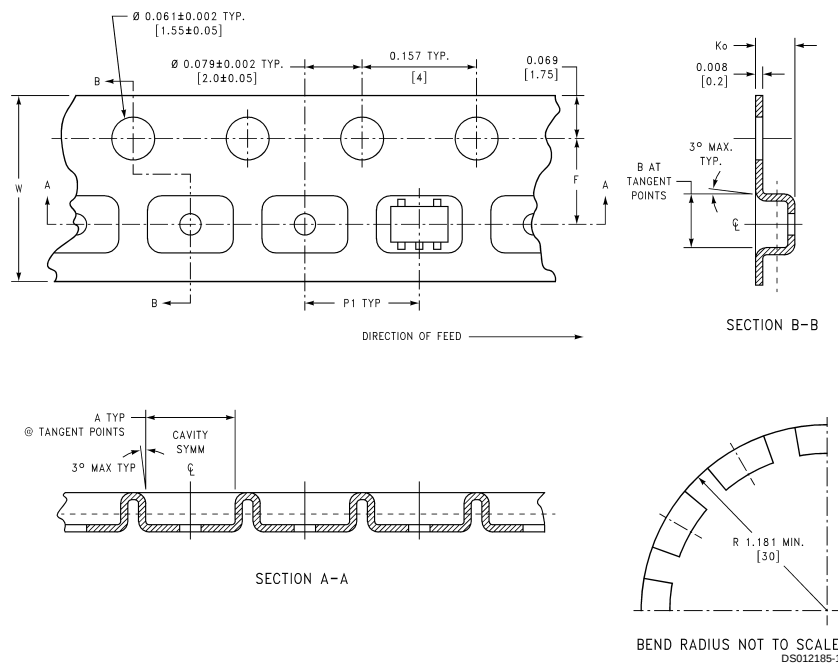
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Tape and Reel Specification

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

TAPE DIMENSIONS inches (millimeters)

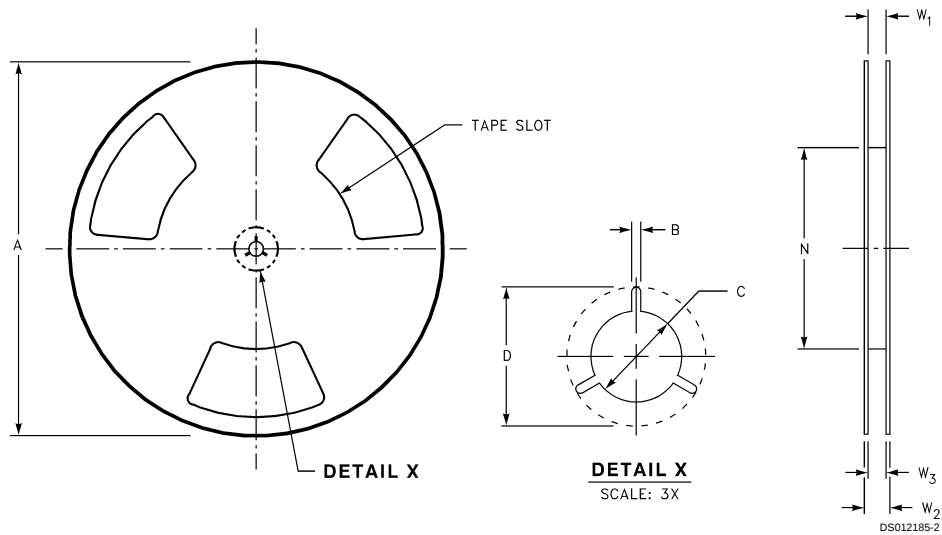


Pkg	Tape Size	DIM A	DIM B	DIM F	DIM K ₀	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ± 0.002 (3.5 ± 0.05)	0.055 ± 0.004 (1.4 ± 0.11)	0.157 (4)	0.315 ± 0.012 (8 ± 0.3)

Tape and Reel Specification

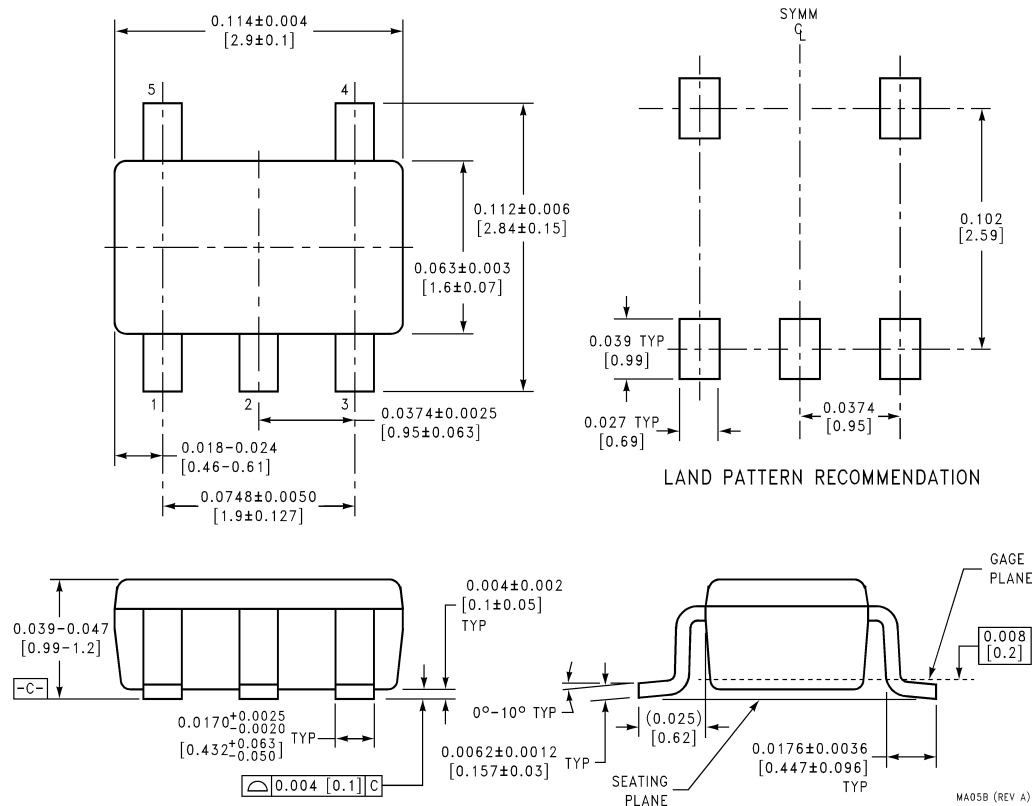
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REEL DIMENSIONS inches (millimeters)



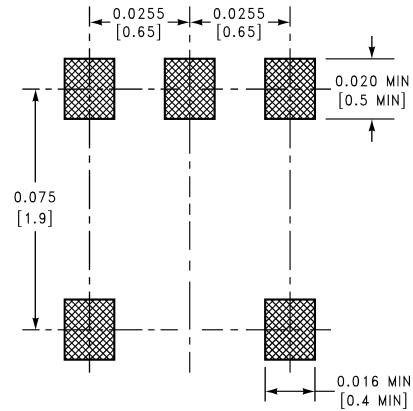
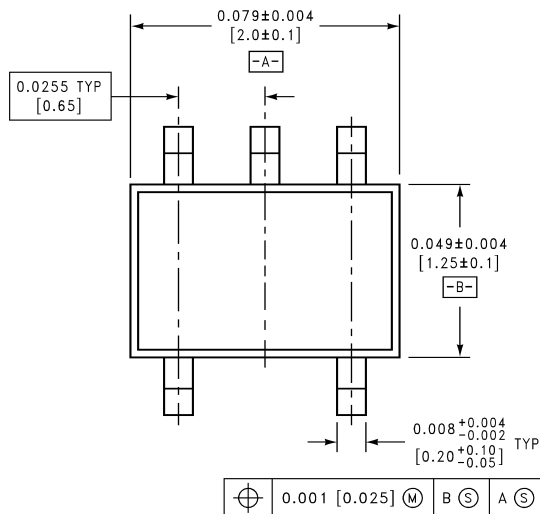
Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 +0.059/-0.000 (8.40 +1.50/-0.00)	0.567 (14.40)	W1 +0.078/-0.039 (W1 +2.00/-1.00)

Physical Dimensions inches (millimeters) unless otherwise noted

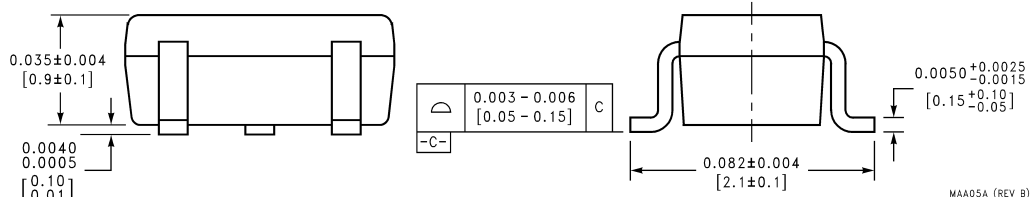


**5-Lead Molded SOT23, Enhanced Thermal
Package Number MA05B**

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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