

NC7ST04

TinyLogic HST Inverter

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 SC70 5-lead Package
- High Speed; $t_{PD} < 7$ ns typ, $V_{CC} = 5$ V, $C_L = 15$ pF
- Low Quiescent Power; $I_{CC} < 1$ μ A typ, $V_{CC} = 5.5$ V
- Balanced Output Drive; 2 mA I_{OL} , -2 mA I_{OH}
- TTL-compatible Inputs
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

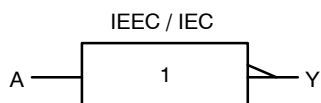


Figure 1. Logic Symbol

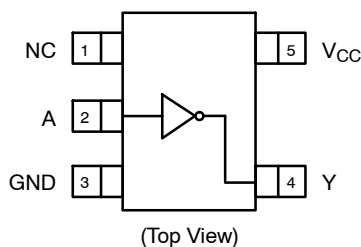
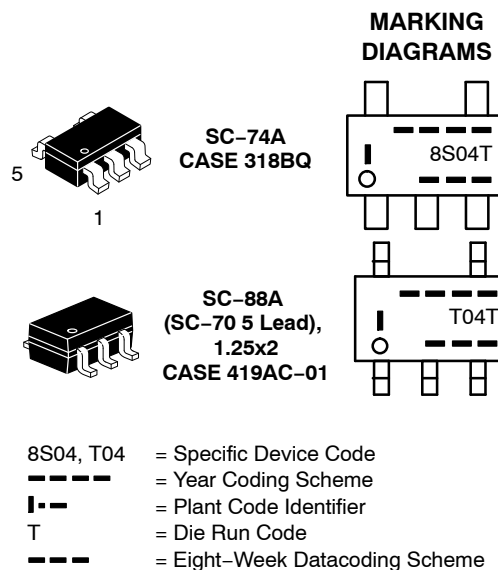


Figure 2. Connection Diagram



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PIN ASSIGNMENT

Pin Name	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

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 3 of this data sheet.

NC7ST04

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage		-0.5	6.5	V
I_{IK}	DC Input Diode Current	$V_{IN} < -0.5\text{ V}$	-	-20	mA
		$V_{IN} \geq V_{CC} + 0.5\text{ V}$	-	+20	
V_{IN}	DC Input Voltage		-0.5	$V_{CC} + 0.5\text{ V}$	V
I_{OK}	DC Output Diode Current	$V_{OUT} < -0.5\text{ V}$	-	-20	mA
		$V_{OUT} > V_{CC} + 0.5\text{ V}$	-	+20	
V_{OUT}	DC Output Voltage		-0.5	$V_{CC} + 0.5\text{ V}$	V
I_{OUT}	DC Output Source or Sink Current		-	± 12.5	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Supply Pin		-	± 25	mA
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Junction Temperature		-	150	°C
	DC V_{CC} or Ground Current per (Soldering, 10 Seconds)		-	+260	°C
P_D	Power Dissipation at +85°C	SC-74A	-	225	mW
		SC-70-5	-	190	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage		4.5	5.5	V
V_{IN}	Input Voltage		0	V_{CC}	V
V_{OUT}	Output Voltage		0	V_{CC}	V
T_A	Operating Temperature		-40	+85	°C
t_r, t_f	Input Rise and Fall Times	$V_{CC} = 5.0\text{ V}$	0	500	ns/V
θ_{JA}	Thermal Resistance	SC-74A	-	555	°C/W
		SC-70-5	-	425	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. Unused inputs must be held HIGH or LOW. They may not float.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	Conditions	$T_A = +25^\circ\text{C}$			$T_A = -40\text{ to }+85^\circ\text{C}$		Unit
				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	$I_{OH} = -20\text{ }\mu\text{A}, V_{IN} = V_{IL},$ $I_{OH} = -2\text{ mA}$	4.4	4.5	-	4.4	-	V
		4.5		4.18	4.35	-	4.13	-	
V_{OL}	LOW Level Output Voltage	4.5	$I_{OL} = 20\text{ }\mu\text{A}, V_{IN} = V_{IN},$ $I_{OL} = 2\text{ mA}$	-	0	0.1	-	0.1	V
		4.5		-	0.10	0.26	-	0.33	
I_{IN}	Input Leakage Current	5.5	$0 \leq V_{IN} \leq 5.5\text{ V}$	-	-	± 0.1	-	± 1.0	μA
I_{CC}	Quiescent Supply Current	5.5	$V_{IN} = V_{CC}$ or GND	-	-	1.0	-	10.0	μA
I_{CCT}	I_{CC} per Input	5.5	Input $V_{IN} = 0.5\text{ V}$ or 2.4 V	-	-	2.0	-	2.9	mA

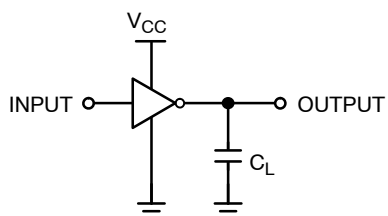
AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = 25°C			T _A = -40 to 85°C		Unit
				Min	Typ	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay (Figure 3, 5)	5.0	C _L = 15 pF	–	3.5	12	–	–	ns
				–	6.0	17	–	–	
		4.5	C _L = 50 pF	–	6.2	16	–	20	
				–	11.4	27	–	31	
				–	4.3	14	–	18	
t _{TLH} , t _{THL}	Output Transition Time (Figure 3, 5)	5.0	C _L = 15 pF	–	4	10	–	–	ns
		4.5	C _L = 50 pF	–	11	25	–	31	
		5.5		–	10	21	–	26	
C _{IN}	Input Capacitance	Open		–	2	10	–	–	pF
C _{PD}	Power Dissipation Capacitance (Figure 4)	5.00	(Note 2)	–	6	–	–	–	pF

2. 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. C_{PD} is related to I_{CCD} dynamic operating current by the expression:

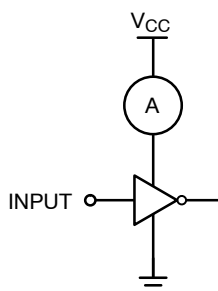
$$I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic})$$

AC Loading and Waveforms



C_L includes load and stray capacitance; inputs PRR = 1.0 MHz, t_W = 500 ns.

Figure 3. AC Test Circuit



Input = AC Waveform; PRR = Variable; Duty Cycle = 50%.

Figure 4. I_{CCD} Test Circuit

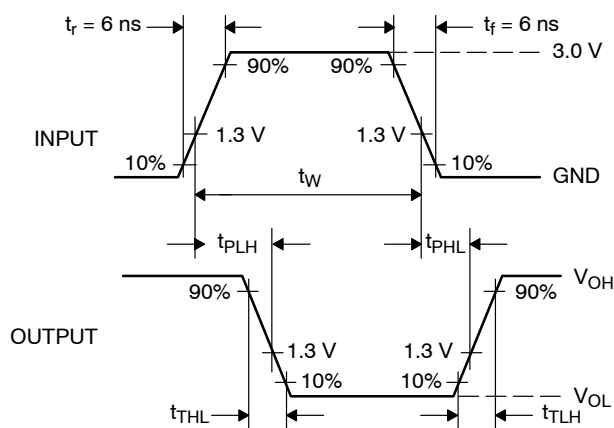


Figure 5. AC Waveforms

DEVICE ORDERING INFORMATION

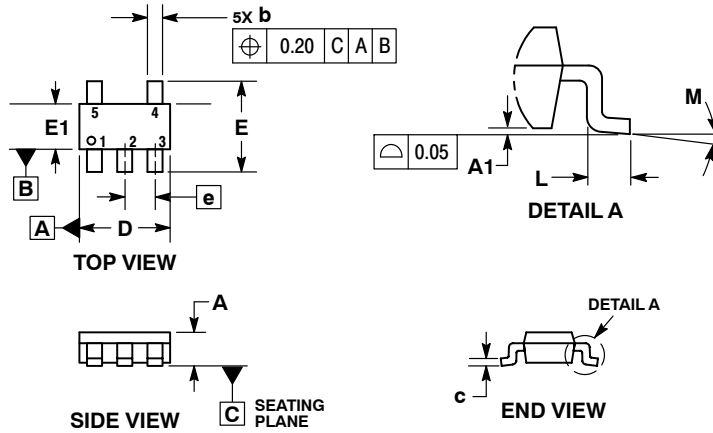
Device	Top Mark	Packages	Shipping†
NC7ST04M5X	8S04	5-Lead SC-74A, 1.6 mm	3000 / Tape & Reel
NC7ST04P5X	T04	5-Lead SC-70, EIAJ SC-88a, 1.25mm Wide	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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PACKAGE DIMENSIONS

SC-74A
CASE 318BQ
ISSUE B

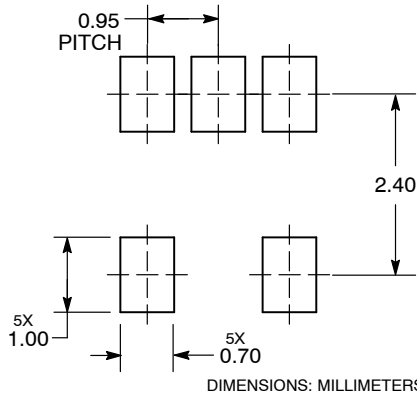


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

MILLIMETERS		
DIM	MIN	MAX
A	0.90	1.10
A1	0.01	0.10
b	0.25	0.50
c	0.10	0.26
D	2.85	3.15
E	2.50	3.00
E1	1.35	1.65
e	0.95 BSC	
L	0.20	0.60
M	0°	10°

RECOMMENDED SOLDERING FOOTPRINT*

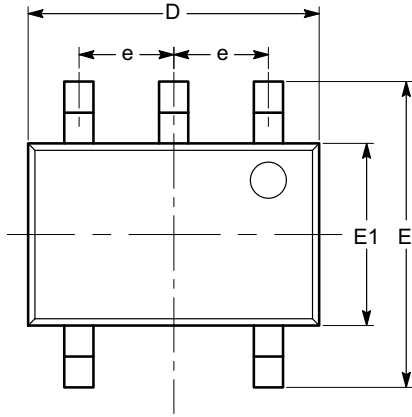


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

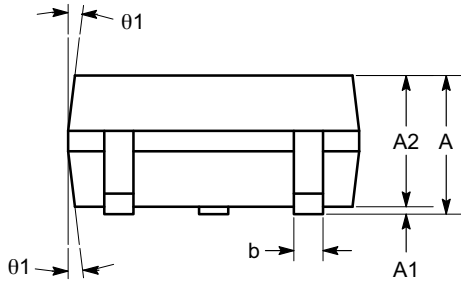
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PACKAGE DIMENSIONS

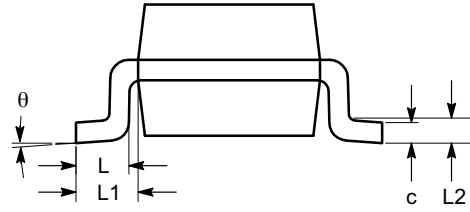
SC-88A (SC-70 5 Lead), 1.25x2
CASE 419AC-01
ISSUE A



TOP VIEW



SIDE VIEW



END VIEW

SYMBOL	MIN	NOM	MAX
A	0.80		1.10
A1	0.00		0.10
A2	0.80		1.00
b	0.15		0.30
c	0.10		0.18
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.26	0.36	0.46
L1	0.42 REF		
L2	0.15 BSC		
θ	0°		8°
θ1	4°		10°

Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

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