

Quad 2-Input "NAND" Schmitt Trigger

The HT4093A Schmitt trigger is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These devices find primary use where low power dissipation and/or high noise immunity is desired. The HT4093A may be used in place of the HT4011A quad 2-input NAND gate for enhanced noise immunity or to "square up" slowly changing

Features

- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Triple Diode Protection on All Inputs
- Pin-for-Pin Compatible with CD4093
- Can be Used to Replace HT4011A
- Independent Schmitt-Trigger at each Input
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

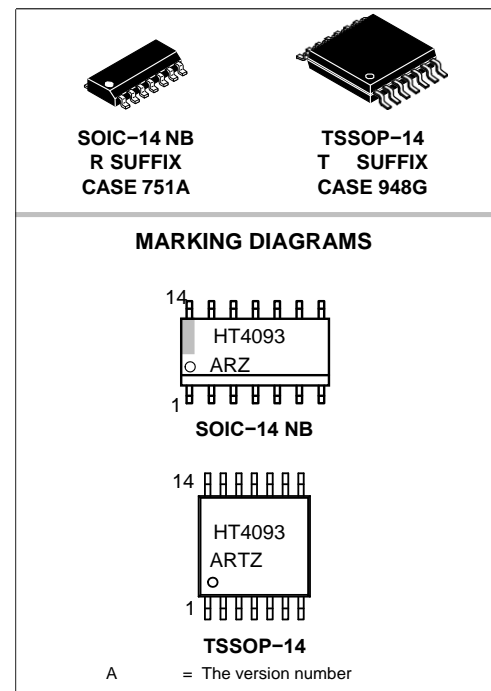
Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage Range	- 0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage Range (DC or Transient)	- 0.5 to $V_{DD} + 0.5$	V
I_{in}, I_{out}	Input or Output Current (DC or Transient) per Pin	± 10	mA
P_D	Power Dissipation, per Package (Note 1)	500	mW
T_A	Ambient Temperature Range	- 55 to +125	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	- 65 to +150	$^{\circ}\text{C}$
T_L	Lead Temperature (8-Second Soldering)	260	$^{\circ}\text{C}$

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.

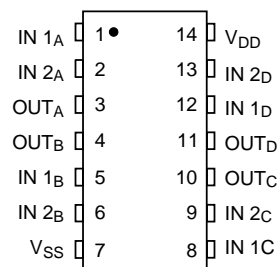
1 Temperature Derating: "D/DW" Packages: -7.0mW/ $^{\circ}\text{C}$ From 65 $^{\circ}\text{C}$ To 125 $^{\circ}\text{C}$

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

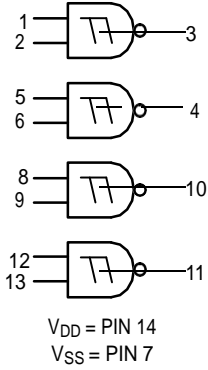
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.



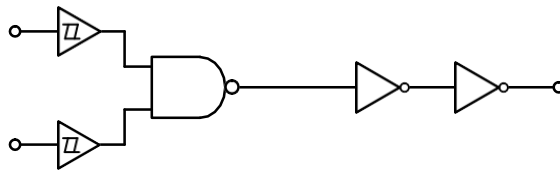
PIN ASSIGNMENT



LOGIC DIAGRAM



EQUIVALENT CIRCUIT SCHEMATIC
(1/4 OF CIRCUIT SHOWN)



ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	-55. C		25. C			125. C		Unit
			Min	Max	Min	Typ (Note 2)	Max	Min	Max	
Output Voltage $V_{in} = V_{DD}$ or 0 $V_{in} = 0$ or V_{DD}	"0" Level V_{OL}	5.0	-	0.05	-	0	0.05	-	0.05	Vdc
		10	-	0.05	-	0	0.05	-	0.05	
		15	-	0.05	-	0	0.05	-	0.05	
	"1" Level V_{OH}	5.0	4.95	-	4.95	5.0	-	4.95	-	Vdc
		10	9.95	-	9.95	10	-	9.95	-	
		15	14.95	-	14.95	15	-	14.95	-	
Output Drive Current ($V_{OH} = 2.5$ Vdc) ($V_{OH} = 4.6$ Vdc) ($V_{OH} = 9.5$ Vdc) ($V_{OH} = 13.5$ Vdc) ($V_{OL} = 0.4$ Vdc) ($V_{OL} = 0.5$ Vdc) ($V_{OL} = 1.5$ Vdc)	Source I_{OH}	5.0	-3.0	-	-2.4	-4.2	-	-1.7	-	mAdc
		5.0	-0.64	-	-0.51	-0.88	-	-0.36	-	
		10	-1.6	-	-1.3	-2.25	-	-0.9	-	
		15	-4.2	-	-3.4	-8.8	-	-2.4	-	
	Sink I_{OL}	5.0	0.64	-	0.51	0.88	-	0.36	-	mAdc
		10	1.6	-	1.3	2.25	-	0.9	-	
15		4.2	-	3.4	8.8	-	2.4	-		
Input Current	I_{in}	15	-	± 0.1	-	± 0.00001	± 0.1	-	± 1.0	μ Adc
Input Capacitance ($V_{in} = 0$)	C_{in}	-	-	-	-	5.0	7.5	-	-	pF
Quiescent Current (Per Package)	I_{DD}	5.0	-	0.25	-	0.0005	0.25	-	7.5	μ Adc
		10	-	0.5	-	0.0010	0.5	-	15	
		15	-	1.0	-	0.0015	1.0	-	30	
Total Supply Current (Notes 3 & 4) (Dynamic plus Quiescent, Per Package) ($C_L = 50$ pF on all outputs, all buffers switching)	I_T	5.0	$I_T = (1.2 \mu\text{A/kHz}) f + I_{DD}$ $I_T = (2.4 \mu\text{A/kHz}) f + I_{DD}$ $I_T = (3.6 \mu\text{A/kHz}) f + I_{DD}$							μ Adc
		10								
		15								
Hysteresis Voltage	V_{HT}	5.0	0.3	2.0	0.3	1.1	2.0	0.3	2.0	Vdc
		10	1.2	3.4	1.2	1.7	3.4	1.2	3.4	
		15	1.6	5.0	1.6	2.1	5.0	1.6	5.0	
Threshold Voltage Positive-Going Negative-Going	V_{T+}	5.0	2.2	3.6	2.2	2.9	3.6	2.2	3.6	Vdc
		10	4.6	7.1	4.6	5.9	7.1	4.6	7.1	
		15	6.8	10.8	6.8	8.8	10.8	6.8	10.8	
	V_{T-}	5.0	0.9	2.8	0.9	1.9	2.8	0.9	2.8	Vdc
		10	2.5	5.2	2.5	3.9	5.2	2.5	5.2	
		15	4.0	7.4	4.0	5.8	7.4	4.0	7.4	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2 Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3 The formulas given are for the typical characteristics only at 25. C.

4 To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) Vfk$$

where: I_T is in μ A (per package), C_L in pF, $V = (V_{DD} - V_{SS})$ in volts, f in kHz is input frequency, and $k = 0.004$.

SWITCHING CHARACTERISTICS ($C_L = 50 \text{ pF}$, $T_A = 25^\circ \text{ C}$)

Characteristic	Symbol	V_{DD} Vdc	Min	Typ (Note 5)	Max	Unit
Output Rise Time	t_{TLH}	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Output Fall Time	t_{THL}	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Propagation Delay Time	t_{PLH} , t_{PHL}	5.0	–	125	250	ns
		10	–	50	100	
		15	–	40	80	

5 Data labeled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

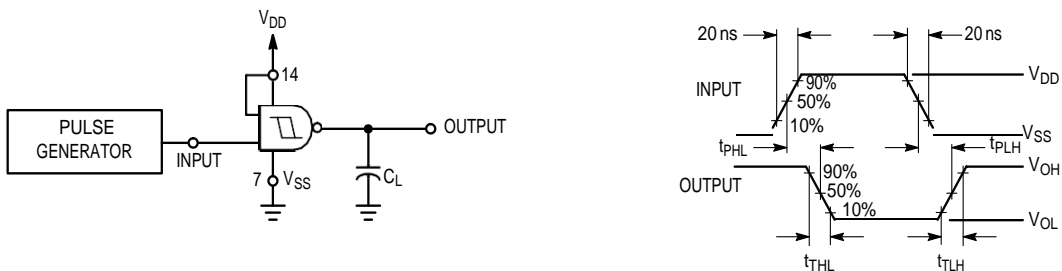


Figure 1. Switching Time Test Circuit and Waveforms

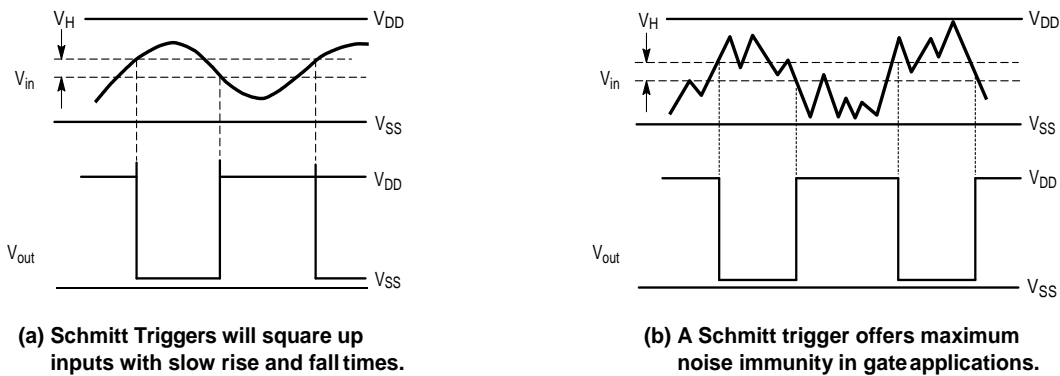


Figure 2. Typical Schmitt Trigger Applications

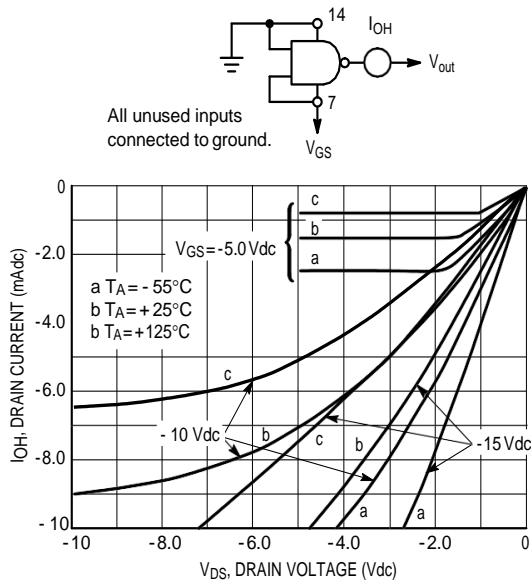


Figure 3. Typical Output Source Characteristics Test Circuit

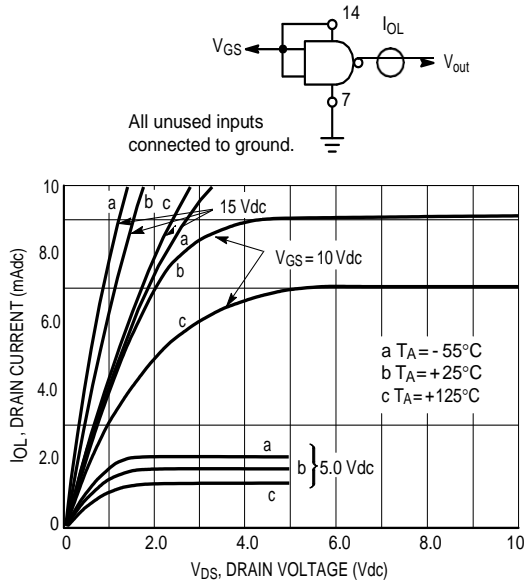


Figure 4. Typical Output Sink Characteristics Test Circuit

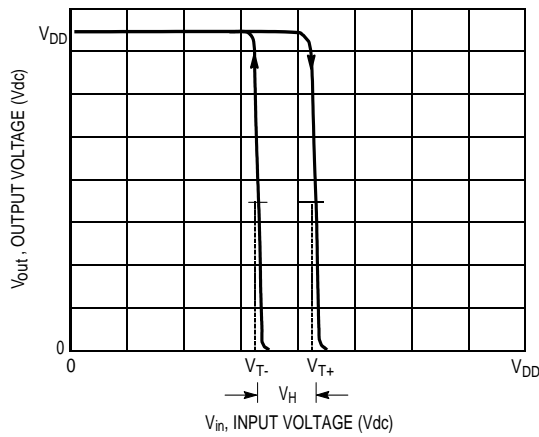
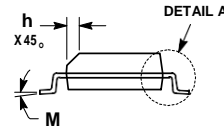
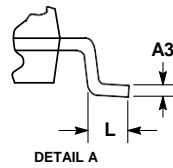
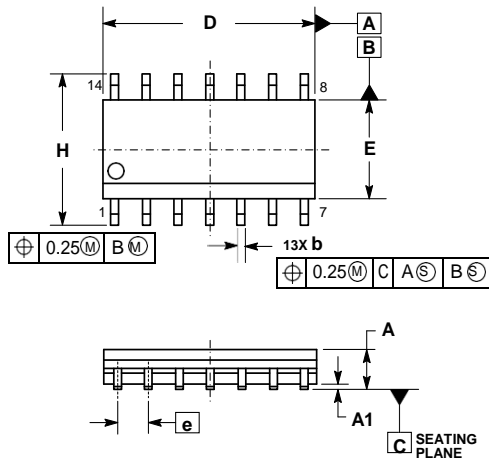


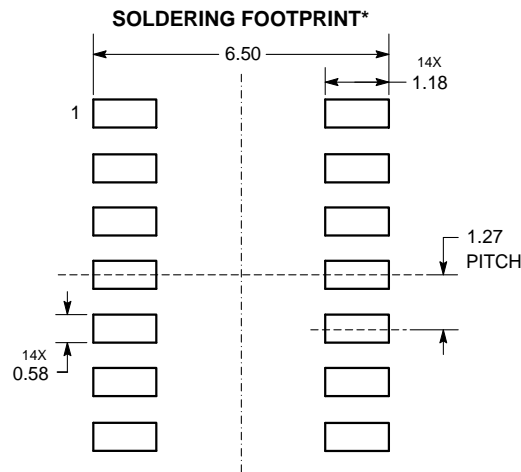
Figure 5. Typical Transfer Characteristics

SOIC-14 NB
CASE 751A-03
ISSUE K



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
 5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

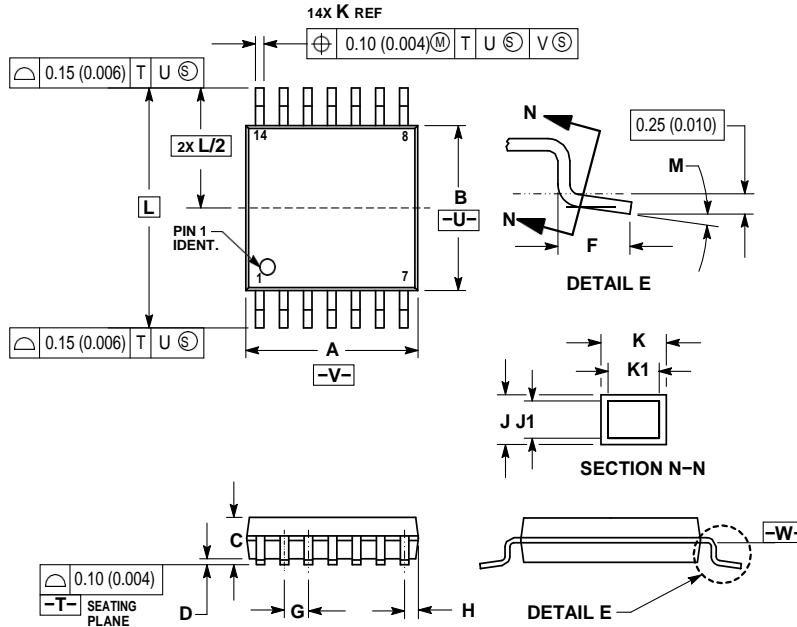
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0.2	0.7	0.008	0.028



DIMENSIONS: MILLIMETERS

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

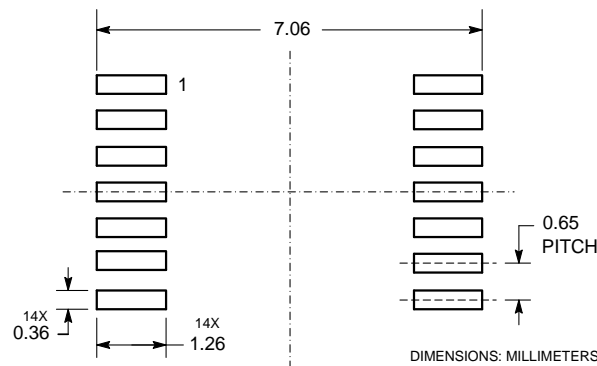
TSSOP-14
CASE 948G
ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM:	MILLIMETER		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 _s	8 _s	0 _s	8 _s

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.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Flip-Flops category](#):

Click to view products by [HTCSEMI manufacturer](#):

Other Similar products are found below :

[74F574SC](#) [TC7W74FUTE12LF](#) [NLV14013BDR2G](#) [NLV74HC74ADR2G](#) [MC10EP131MNG](#) [MC74AC74DTR2](#) [CD4013BMT/TR](#)
[74VHC574FT\(BJ\)](#) [U74AHC14G-P14-R](#) [U74HC14G-S14-R](#) [CD40106BE](#) [HT4093ARZ](#) [74LVC1G80GW-Q100,1](#) [MC74HC73ADG](#)
[MC74HC73ADR2G](#) [74LCX16374MTDX](#) [74LVT74D,118](#) [74VHCT9273FT\(BJ\)](#) [JM38510/37202BEA](#) [MM74HC374WM](#)
[74ALVCH162374PAG](#) [74LVC1G175GS,132](#) [74LVX74MTCX](#) [TC7WZ74FK,LJ\(CT\)](#) [JM38510/30106BEA](#) [JM38510/00204BEA](#)
[MM74HCT273WM](#) [SN74LVC74AD](#) [MC74HC73ADTR2G](#) [SN74HC273DWR](#) [M74HC374RM13TR](#) [M74HC175B1R](#) [M74HC174RM13TR](#)
[74ALVTH32374ZKER](#) [74AUP1G74DC,125](#) [74VHC374FT\(BJ\)](#) [74VHCV374FT\(BJ\)](#) [74VHCV574FT\(BJ\)](#) [SN74LVC74ADR](#)
[SN74HC574PWR](#) [SN74HC374AN](#) [SN74AS574DWR](#) [SN74ALS175NSR](#) [SN74HC175D](#) [SN74AC74D](#) [74AHC1G79GV.125](#)
[74AUP1G74DC.125](#) [74HCT173D.652](#) [74AHC1G79GW.125](#) [74AHC574D.118](#)