Hex Schmitt-Trigger Inverter

High-Performance Silicon-Gate CMOS

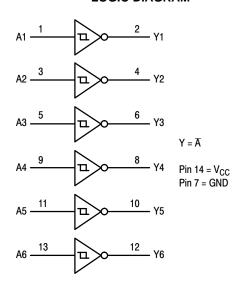
The MC74HC14A is identical in pinout to the LS14, LS04 and the HC04. The device inputs are compatible with Standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

The HC14A is useful to "square up" slow input rise and fall times. Due to hysteresis voltage of the Schmitt trigger, the HC14A finds applications in noisy environments.

Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0 μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7.0 A Requirements
- Chip Complexity: 60 FETs or 15 Equivalent Gates
- 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, Halogen Free/BFR Free and are RoHS Compliant

LOGIC DIAGRAM





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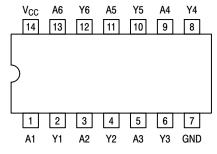
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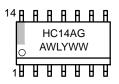
SOIC-14 NB D SUFFIX CASE 751A TSSOP-14 DT SUFFIX CASE 948G

PIN ASSIGNMENT



14-Lead (Top View)

MARKING DIAGRAMS





SOIC-14 NB

1330F-1

A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week

G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

Inputs	Outputs
Α	Υ
L	Н
н	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V _{in}	DC Input Voltage (Referenced to GND)	-0.5 to V _{CC} + 0.5	V
V _{out}	DC Output Voltage (Referenced to GND)	-0.5 to V _{CC} + 0.5	V
l _{in}	DC Input Current, per Pin	±20	mA
I _{out}	DC Output Current, per Pin	±25	mA
Icc	DC Supply Current, V _{CC} and GND Pins	±50	mA
P _D	Power Dissipation in Still Air, SOIC Package† TSSOP Package†	500 450	mW
T _{stg}	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature, 1 mm from Case for 10 Seconds Plastic DIP, SOIC or TSSOP Package	260	°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 GND \leq (V_{in} or V_{out}) \leq V_{CC} .

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

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.

†Derating: ŚOIC Package: -7 mW/°C from 65° to 125°C TSSOP Package: -6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V _{CC}	V
T _A	Operating Temperature Range, All Package Types	- 55	+125	°C
t _r , t _f	Input Rise/Fall Time $V_{CC} = 2.0$ (Figure 1) $V_{CC} = 4.5$ $V_{CC} = 6.0$	/ 0	No Limit* No Limit* No Limit*	ns

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.

^{*}When $V_{in} = 50\% V_{CC}$, $I_{CC} > 1mA$

DC CHARACTERISTICS (Voltages Referenced to GND)

			V _{CC}	Guara	nteed Lin	nit		
Symbol	Parameter	Condition	on	V	–55 to 25°C	≤ 85 °C	≤125°C	Unit
V _{T+} max	Maximum Positive-Going Input	$V_{out} = 0.1V$		2.0	1.50	1.50	1.50	V
	Threshold Voltage	$ I_{out} \le 20\mu A$		3.0	2.15	2.15	2.15	
	(Figure 3)			4.5	3.15	3.15	3.15	
				6.0	4.20	4.20	4.20	
V _{T+} min	Minimum Positive-Going Input	$V_{out} = 0.1V$		2.0	1.0	0.95	0.95	V
	Threshold Voltage	$ I_{out} \le 20\mu A$		3.0	1.5	1.45	1.45	
	(Figure 3)			4.5	2.3	2.25	2.25	
				6.0	3.0	2.95	2.95	
V _T max	Maximum Negative-Going Input	$V_{out} = V_{CC} - 0.1V$		2.0	0.9	0.95	0.95	V
	Threshold Voltage	$ I_{out} \le 20\mu A$		3.0	1.4	1.45	1.45	
	(Figure 3)			4.5	2.0	2.05	2.05	
				6.0	2.6	2.65	2.65	
V _T min	Minimum Negative-Going Input	$V_{out} = V_{CC} - 0.1V$		2.0	0.3	0.3	0.3	V
	Threshold Voltage	$ I_{out} \le 20\mu A$		3.0	0.5	0.5	0.5	
	(Figure 3)			4.5	0.9	0.9	0.9	
				6.0	1.2	1.2	1.2	
V _H max	Maximum Hysteresis Voltage	$V_{out} = 0.1V \text{ or } V_{CC}$	– 0.1V	2.0	1.20	1.20	1.20	V
(Note 1)	(Figure 3)	$ I_{out} \le 20\mu A$		3.0	1.65	1.65	1.65	
				4.5	2.25	2.25	2.25	
				6.0	3.00	3.00	3.00	
V_H min	Minimum Hysteresis Voltage	$V_{out} = 0.1V \text{ or } V_{CC}$	– 0.1V	2.0	0.20	0.20	0.20	V
(Note 1)	(Figure 3)	$ I_{out} \le 20\mu A$		3.0	0.25	0.25	0.25	
				4.5	0.40	0.40	0.40	
				6.0	0.50	0.50	0.50	
V _{OH}	Minimum High-Level Output	$V_{in} \le V_{T-} \min$		2.0	1.9	1.9	1.9	V
	Voltage	$ I_{out} \le 20\mu A$		4.5	4.4	4.4	4.4	
				6.0	5.9	5.9	5.9	
		$V_{in} \le V_{T-} \min$	$ I_{out} \le 2.4 \text{mA}$	3.0	2.48	2.34	2.20	
			$ I_{out} \le 4.0 \text{mA}$	4.5	3.98	3.84	3.70	
			$ I_{out} \le 5.2 mA$	6.0	5.48	5.34	5.20	
V _{OL}	Maximum Low-Level Output	$V_{in} \ge V_{T+} \max$		2.0	0.1	0.1	0.1	V
	Voltage	$ I_{out} \le 20\mu A$		4.5	0.1	0.1	0.1	
				6.0	0.1	0.1	0.1	
		$V_{in} \ge V_{T+} \max$	$ I_{out} \le 2.4 \text{mA}$	3.0	0.26	0.33	0.40	
			$ I_{out} \le 4.0 \text{mA}$	4.5	0.26	0.33	0.40	
			$ I_{out} \le 5.2 \text{mA}$	6.0	0.26	0.33	0.40	
I _{in}	Maximum Input Leakage Current	$V_{in} = V_{CC}$ or GND		6.0	±0.1	±1.0	±1.0	μΑ
I _{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC}$ or GND $I_{out} = 0\mu A$		6.0	1.0	10	40	μΑ

^{1.} $V_H min > (V_{T+} min) - (V_{T-} max); V_H max = (V_{T+} max) - (V_{T-} min).$

$\textbf{AC CHARACTERISTICS} \; (C_L = 50 \text{pF, Input} \; t_f = t_f = 6 \text{ns})$

		V _{CC}	Gu	aranteed Lin	nit	
Symbol	Parameter	v	–55 to 25°C	≤85°C	≤125°C	Unit
t _{PLH} ,	Maximum Propagation Delay, Input A or B to Output Y	2.0	75	95	110	ns
t _{PHL}	(Figures 1 and 2)	3.0	30	40	55	
		4.5	15	19	22	
		6.0	13	16	19	
t _{TLH} ,	Maximum Output Transition Time, Any Output	2.0	75	95	110	ns
t _{THL}	(Figures 1 and 2)	3.0	27	32	36	
		4.5	15	19	22	
		6.0	13	16	19	
C _{in}	Maximum Input Capacitance		10	10	10	pF
			Typical @ 25	5°C, V _{CC} = 5.0	0 V	
C _{PD}	Power Dissipation Capacitance (Per Inverter)*			22		pF

^{*} Used to determine the no–load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

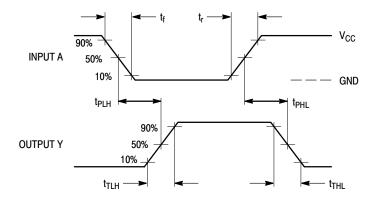
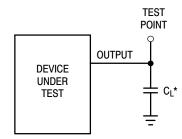


Figure 1. Switching Waveforms



*Includes all probe and jig capacitance

Figure 2. Test Circuit

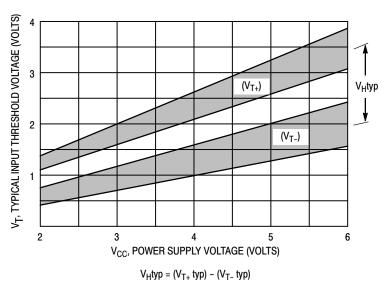
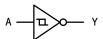
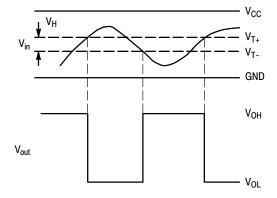


Figure 3. Typical Input Threshold, V_{T+} , V_{T-} versus Power Supply Voltage



(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times



(b) A Schmitt-Trigger Offers Maximum Noise Immunity

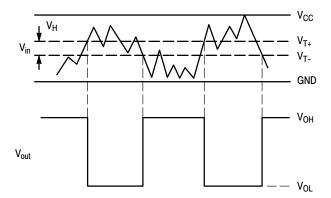


Figure 4. Typical Schmitt-Trigger Applications

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HC14ADG	SOIC-14 NB (Pb-Free)	55 Units / Rail
MC74HC14ADR2G	SOIC-14 NB (Pb-Free)	2500 / Tape & Reel
MC74HC14ADTG	TSSOP-14 (Pb-Free)	96 Units / Rail
MC74HC14ADTR2G	TSSOP-14 (Pb-Free)	2500 / Tape & Reel
NLV74HC14ADG*	SOIC-14 NB (Pb-Free)	55 Units / Rail
NLV74HC14ADR2G*	SOIC-14 NB (Pb-Free)	2500 / Tape & Reel
NLV74HC14ADTG*	TSSOP-14 (Pb-Free)	96 Units / Rail
NLV74HC14ADTR2G*	TSSOP-14 (Pb-Free)	2500 / 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.

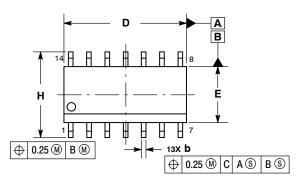
^{*}NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

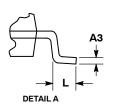


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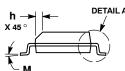
SOIC-14 NB CASE 751A-03 ISSUE L

DATE 03 FEB 2016





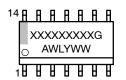




- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
 - ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS.
 - DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT
- MAXIMUM MATERIAL CONDITION.
 DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
- 5.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

	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
АЗ	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
Е	3.80	4.00	0.150	0.157
e	1.27	BSC	0.050	BSC
Н	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
М	0 °	7°	0 °	7 °

GENERIC MARKING DIAGRAM*

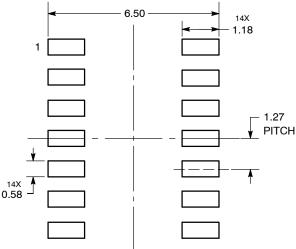


XXXXX = Specific Device Code Α = Assembly Location

WL = Wafer Lot Υ = Year WW = Work Week G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator. "G" or microdot " ■". may or may not be present.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

C SEATING PLANE

STYLES ON PAGE 2

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

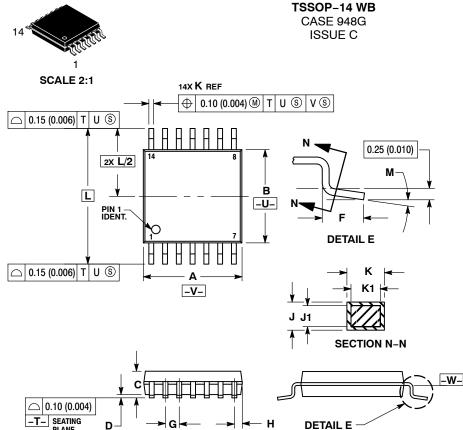
SOIC-14 CASE 751A-03 ISSUE L

DATE 03 FEB 2016

STYLE 1: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. NO CONNECTION 7. ANODE/CATHODE 8. ANODE/CATHODE 9. ANODE/CATHODE 10. NO CONNECTION 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 2: CANCELLED	STYLE 3: PIN 1. NO CONNECTION 2. ANODE 3. ANODE 4. NO CONNECTION 5. ANODE 6. NO CONNECTION 7. ANODE 8. ANODE 9. ANODE 10. NO CONNECTION 11. ANODE 12. ANODE 13. NO CONNECTION 14. COMMON CATHODE	STYLE 4: PIN 1. NO CONNECTION 2. CATHODE 3. CATHODE 4. NO CONNECTION 5. CATHODE 6. NO CONNECTION 7. CATHODE 8. CATHODE 9. CATHODE 10. NO CONNECTION 11. CATHODE 12. CATHODE 13. NO CONNECTION 14. COMMON ANODE
STYLE 5: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 6. NO CONNECTION 7. COMMON ANODE 8. COMMON CATHODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 6: PIN 1. CATHODE 2. CATHODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE 7. CATHODE 8. ANODE 9. ANODE 10. ANODE 11. ANODE 12. ANODE 13. ANODE 14. ANODE	STYLE 7: PIN 1. ANODE/CATHODE 2. COMMON ANODE 3. COMMON CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 6. ANODE/CATHODE 7. ANODE/CATHODE 8. ANODE/CATHODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. COMMON CATHODE 12. COMMON ANODE 13. ANODE/CATHODE 14. ANODE/CATHODE	STYLE 8: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. ANODE/CATHODE 7. COMMON ANODE 8. COMMON ANODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. NO CONNECTION 12. ANODE/CATHODE 13. ANODE/CATHODE 14. COMMON CATHODE

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DATE 17 FEB 2016

- 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.
 DIMENSION B DOES NOT INCLUDE
- INTERLEAD FLASH OR PROTRUSION.
 INTERLEAD FLASH OR PROTRUSION SHALL
- 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 DEFERENCE ONLY.
- REFERENCE ONLY.
 DIMENSION A AND B ARE TO BE
- DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	4.90	5.10	0.193	0.200
В	4.30	4.50	0.169	0.177
С		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	
Н	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
М	0°	8 °	0 °	8 °

GENERIC MARKING DIAGRAM*



= Assembly Location

= Wafer Lot ٧ = Year

W = Work Week

= Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot " ■", may or may not be present.

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	0.65
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MC74HC14AN MC74HC14ANG NLJ74HC14ADTR2G NLV74HC14ADG NLV74HC14ADR2G NLV74HC14ADTR2G

NLV74HC14ADTG