

MC74HC10A

Triple 3-Input NAND Gate

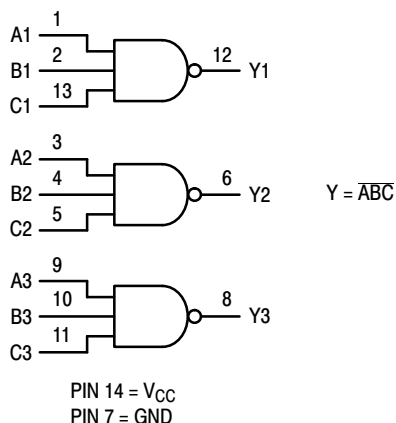
High-Performance Silicon-Gate CMOS

The MC74HC10A is identical in pinout to the LS10. The device inputs are compatible with Standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

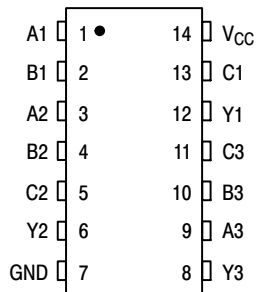
Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the Requirements Defined JEDEC Standard No. 7 A
- Chip Complexity: 36 FETs or 9 Equivalent Gates
- Pb-Free Packages are Available

LOGIC DIAGRAM



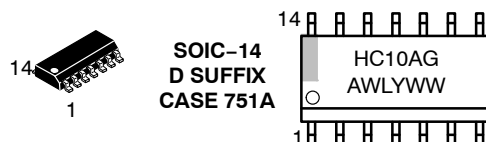
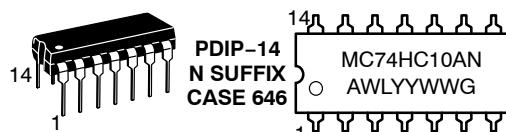
PIN ASSIGNMENT



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MARKING DIAGRAMS



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

MC74HC10A

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
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Current, per Pin	± 25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 50	mA
P_D	Power Dissipation in Still Air Plastic DIP† SOIC Package† TSSOP Package†	750 500 450	mW
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP, SOIC or TSSOP Package)	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

†Derating — Plastic DIP: – 10 mW/°C from 65° to 125°C
SOIC Package: – 7 mW/°C from 65° to 125°C
TSSOP Package: – 6.1 mW/°C from 65° to 125°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 $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. 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.

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, All Package Types	− 55	+ 125	°C	
t _r , t _f	Input Rise and Fall Time (Figure 1)	V _{CC} = 2.0 V V _{CC} = 3.0 V V _{CC} = 4.5 V V _{CC} = 6.0 V	0 0 0 0	1000 600 500 400	ns

MC74HC10A

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				– 55 to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{out} = 0.1 V or V _{CC} – 0.1 V I _{out} ≤ 20 μA	2.0 3.0 4.5 6.0	1.5 2.1 3.15 4.2	1.5 2.1 3.15 4.2	1.5 2.1 3.15 4.2	V
V _{IL}	Maximum Low-Level Input Voltage	V _{out} = 0.1 V or V _{CC} – 0.1 V I _{out} ≤ 20 μA	2.0 3.0 4.5 6.0	0.5 0.9 1.35 1.8	0.5 0.9 1.35 1.8	0.5 0.9 1.35 1.8	V
V _{OH}	Minimum High-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
			3.0 4.5 6.0	2.48 3.98 5.48	2.34 3.84 5.34	2.20 3.70 5.20	
V _{OL}	Maximum Low-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
			3.0 4.5 6.0	0.26 0.26 0.26	0.33 0.33 0.33	0.40 0.40 0.40	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = V _{CC} or GND I _{out} = 0 μA	6.0	1	10	40	μA

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6 ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			– 55 to 25° C	≤ 85° C	≤ 125° C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A, B, or C to Output Y (Figures 1 and 2)	2.0	95	120	145	ns
		3.0	45	60	75	
		4.5	19	24	29	
		6.0	16	20	25	
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 2)	2.0	75	95	110	ns
		3.0	30	40	55	
		4.5	15	19	22	
		6.0	13	16	19	
C _{in}	Maximum Input Capacitance	—	10	10	10	pF
C _{PD}	Power Dissipation Capacitance (Per Gate)*	Typical @ 25°C, V _{CC} = 5.0 V				pF
		25				

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

MC74HC10A

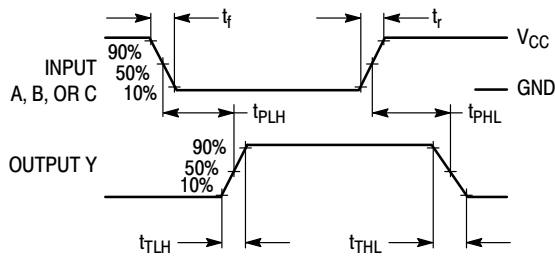


Figure 1. Switching Waveforms

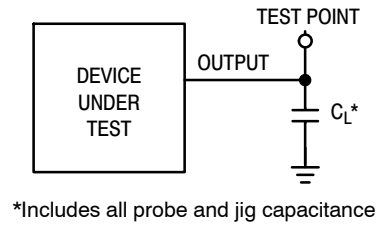
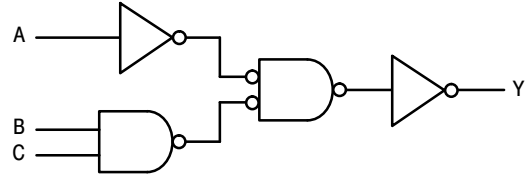


Figure 2. Test Circuit



**EXPANDED LOGIC DIAGRAM
(1/3 OF THE DEVICE)**

ORDERING INFORMATION

Device	Package	Shipping†
MC74HC10ANG	PDIP-14 (Pb-Free)	25 Units/Rail
MC74HC10ADG	SOIC-14 (Pb-Free)	55 Units/Rail
MC74HC10ADR2G	SOIC-14 (Pb-Free)	2500/Tape & Reel
MC74HC10ADTR2G	TSSOP-14*	

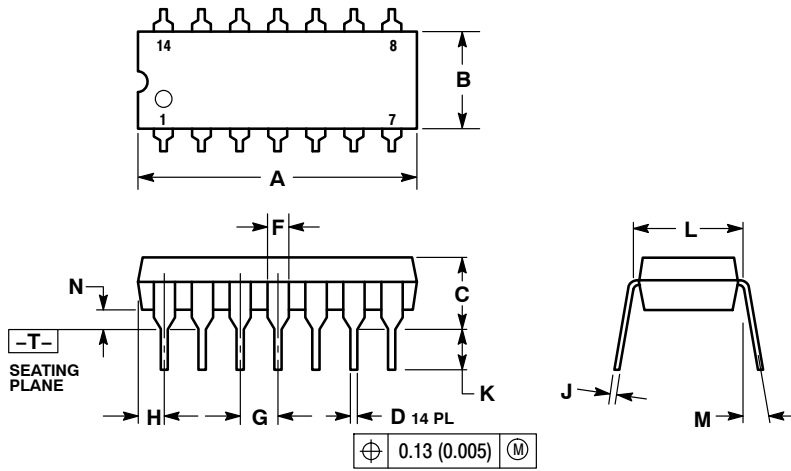
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

MC74HC10A

PACKAGE DIMENSIONS

PDIP-14
CASE 646-06
ISSUE P



NOTES:

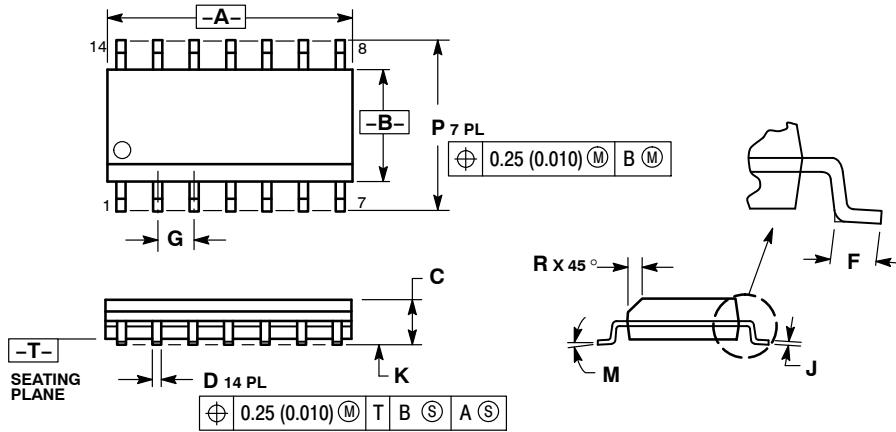
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10 °	---	10 °
N	0.015	0.039	0.38	1.01

MC74HC10A

PACKAGE DIMENSIONS

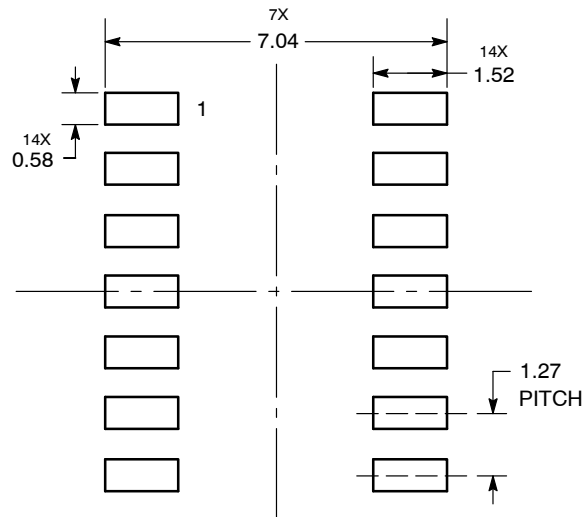
SOIC-14
CASE 751A-03
ISSUE H



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT*



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.

PACKAGE DIMENSIONS

Technical drawing of a 14-pin micro connector. The drawing includes the following views and dimensions:

- Top View:** Shows a rectangular component with 14 pins (7 on each long side). Dimensions include a width of $0.15 (0.006)$ for the pin rows, a total width of $0.10 (0.004)$ with a tolerance of $\textcircled{M}$, and a length of $2X L/2$. A feature is labeled "PIN 1 IDENT." with a circle around pin 1. A section line is labeled $-V-$.
- Side View:** Shows the profile of the component with a height of B and a width of $0.15 (0.006)$ for the pin rows. A feature is labeled $-T-$ with a tolerance of $0.10 (0.004)$. A section line is labeled $-W-$.
- Detail E:** A cross-sectional view of the pin and housing assembly. It shows a pin with a diameter of $0.25 (0.010)$ and a housing with a thickness of F . The pin is labeled N and the housing is labeled M . A section line is labeled $-U-$.
- Section N-N:** A cross-sectional view of the component showing the internal structure. It includes dimensions J , $J1$, K , and $K1$. The section is labeled $-V-$.
- Bottom View:** Shows the component from the bottom with dimensions C , D , G , and H . A feature is labeled $-T-$ with a tolerance of $0.10 (0.004)$. A section line is labeled $-W-$.

- 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.

DIMENSIONS AT DATUM PLANE A			DIMENSIONS AT DATUM PLANE B		
	MILLIMETERS		INCHES		
DIM	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°	8°	0°	8°	

Technical drawing of a 14-pin connector showing dimensions in millimeters. The drawing includes a side view on the left and a front view on the right. The side view shows a 14-pin connector with a total width of 7.06 mm and a pin pitch of 0.65 mm. The front view shows the connector with a total width of 1.26 mm and a pin pitch of 0.36 mm. The drawing is labeled "DIMENSIONS: MILLIMETERS".

7

MC74HC10A

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