

CD74AC14 Hex Schmitt-Trigger Inverter

1 Features

- 1.5-V to 5.5-V Operation and Balanced Noise Immunity at 30% of the Supply Voltage
- Speed of Bipolar F, AS, and S, With Significantly Reduced Power Consumption
- Greater Noise Immunity Than Standard Inverters
- Operates With Much Slower Than Standard Input Rise and Fall Slew Rates
- Balanced Propagation Delays
- ± 24 -mA Output Drive Current – Fanout to 15 F Devices
- SCR Latchup-Resistant CMOS Process and Circuit Design

2 Description

The CD74AC14 contains six independent inverters.

Package Information

PART NUMBER	PACKAGE ¹	BODY SIZE (NOM)
CD74AC14	D (SOIC, 14)	9.9 mm x 3.9 mm
	N (PDIP, 14)	20.32 mm x 12.7 mm

1. For all available packages, see the orderable addendum at the end of the data sheet.



Simplified Schematic



Table of Contents

1 Features	1	5.4 Electrical Characteristics.....	5
2 Description	1	5.5 Switching Characteristics.....	5
3 Revision History	2	5.6 Operating Characteristics.....	5
4 Pin Configuration and Functions	3	6 Parameter Measurement Information	6
5 Specifications	4	7 Detailed Description	7
5.1 Absolute Maximum Ratings.....	4	7.1 Overview.....	7
5.2 Recommended Operating Conditions.....	4	7.2 Functional Block Diagram.....	7
5.3 Thermal Information.....	4	7.3 Device Functional Modes.....	7

3 Revision History

Changes from Revision B (March 2004) to Revision C (May 2023)	Page
• Added <i>Package Information</i> table, <i>Pin Functions</i> table, and <i>Thermal Information</i> table.....	1

4 Pin Configuration and Functions

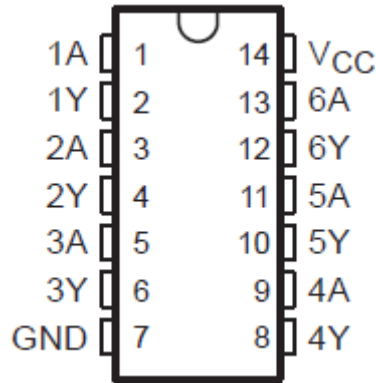


Figure 4-1. E or M Package Top View

Table 4-1. Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
1A	1	Input	Channel 1, Input A
1Y	2	Output	Channel 1, Output Y
2A	3	Input	Channel 2, Input A
2Y	4	Output	Channel 2, Output Y
3A	5	Input	Channel 3, Input A
3Y	6	Output	Channel 3, Output Y
GND	7	—	Ground
4Y	8	Output	Channel 4, Output Y
4A	9	Input	Channel 4, Input A
5Y	10	Output	Channel 5, Output Y
5A	11	Input	Channel 5, Input A
6Y	12	Output	Channel 6, Output Y
6A	13	Input	Channel 6, Input A
V _{CC}	14	—	Positive Supply

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	6	V
I _{IK}	Input clamp current	(V _I < 0 or V _I > V _{CC}) ¹		±20 mA
I _{OK}	Output clamp current	(V _O < 0 or V _O > V _{CC}) ¹		±50 mA
	Continuous output current	(V _O = 0 to V _{CC})		±50 mA
	Continuous current through V _{CC} or GND			±100 mA
T _{stg}	Storage temperature range	-65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5.2 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		T _A = 25°C		- 55°C to 125°C		- 40°C to 85°C		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage	1.5	5.5	1.5	5.5	1.5	5.5	V
V _I	Input voltage	0	V _{CC}	0	V _{CC}	0	V _{CC}	V
V _O	Output voltage	0	V _{CC}	0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 4.5 V to 5.5 V		- 24		- 24		mA
I _{OL}	Low-level output current	V _{CC} = 4.5 V to 5.5 V		24		24		mA

5.3 Thermal Information

THERMAL METRIC ⁽¹⁾		CD74AC14		UNIT
		E	M	
		14 PINS	14 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	80	86	°C/W

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report (SPRA953).

5.4 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	TA = 25°C		– 55°C to 125°C		– 40°C to 85°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
V _{T+} Positive-going threshold		5 V	2.6	3.4	2.6	3.4	2.6	3.4	V
V _{T-} Negative-going threshold		5 V	1.6	2.4	1.6	2.4	1.6	2.4	V
ΔVT Hysteresis (V _{T+} – V _{T-})		5 V	0.5		0.5		0.5		V
V _{OH}	V _I = V _{T+}	I _{OH} = –50 μA	1.5 V	1.4	1.4	1.4			V
			3 V	2.9	2.9	2.9			
			4.5 V	4.4	4.4	4.4			
		I _{OH} = –4 mA	3 V	2.58	2.4	2.48			
		I _{OH} = –24 mA	4.5 V	3.94	3.7	3.8			
		I _{OH} = –50 mA ¹	5.5 V		3.85				
		I _{OH} = –75 mA ¹	5.5 V			3.85			
V _{OL}	V _I = V _{T-}	I _{OL} = 50 μA	1.5 V	0.1	0.1	0.1		V	
			3 V	0.1	0.1	0.1			
			4.5 V	0.1	0.1	0.1			
		I _{OL} = 12 mA	3 V	0.36	0.5	0.44			
		I _{OL} = 24 mA	4.5 V	0.36	0.5	0.44			
		I _{OL} = 50 mA ¹	5.5 V		1.65				
		I _{OL} = 75 mA ¹	5.5 V						
I _I	V _I = V _{CC} or GND	5.5 V	± 0.1		± 0.1		± 0.1		μA
I _{CC}	V _I = V _{CC} or GND I _O = 0	5.5 V	4		80		40		μA
C _i			10		10		10		pF

1. Test one output at a time, not exceeding 1-second duration. Measurement is made by forcing indicated current and measuring voltage to minimize power dissipation. Test verifies a minimum 50-Ω transmission-line drive capability at 85°C and 75-Ω transmission-line drive capability at 125°C.

5.5 Switching Characteristics

over operating free-air temperature range V_{CC} = 5 V ± 0.5 V, C_L = 50 pF (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	– 55°C TO 125°C		– 40°C TO 85°C		UNIT
			MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	2.6	10.5	2.7	9.5	ns
t _{PHL}			2.6	10.5	2.7	9.5	

5.6 Operating Characteristics

V_{CC} = 5 V, T_A = 25°C

PARAMETER	TYP	UNIT
C _{pd} Power dissipation capacitance	45	pF

6 Parameter Measurement Information

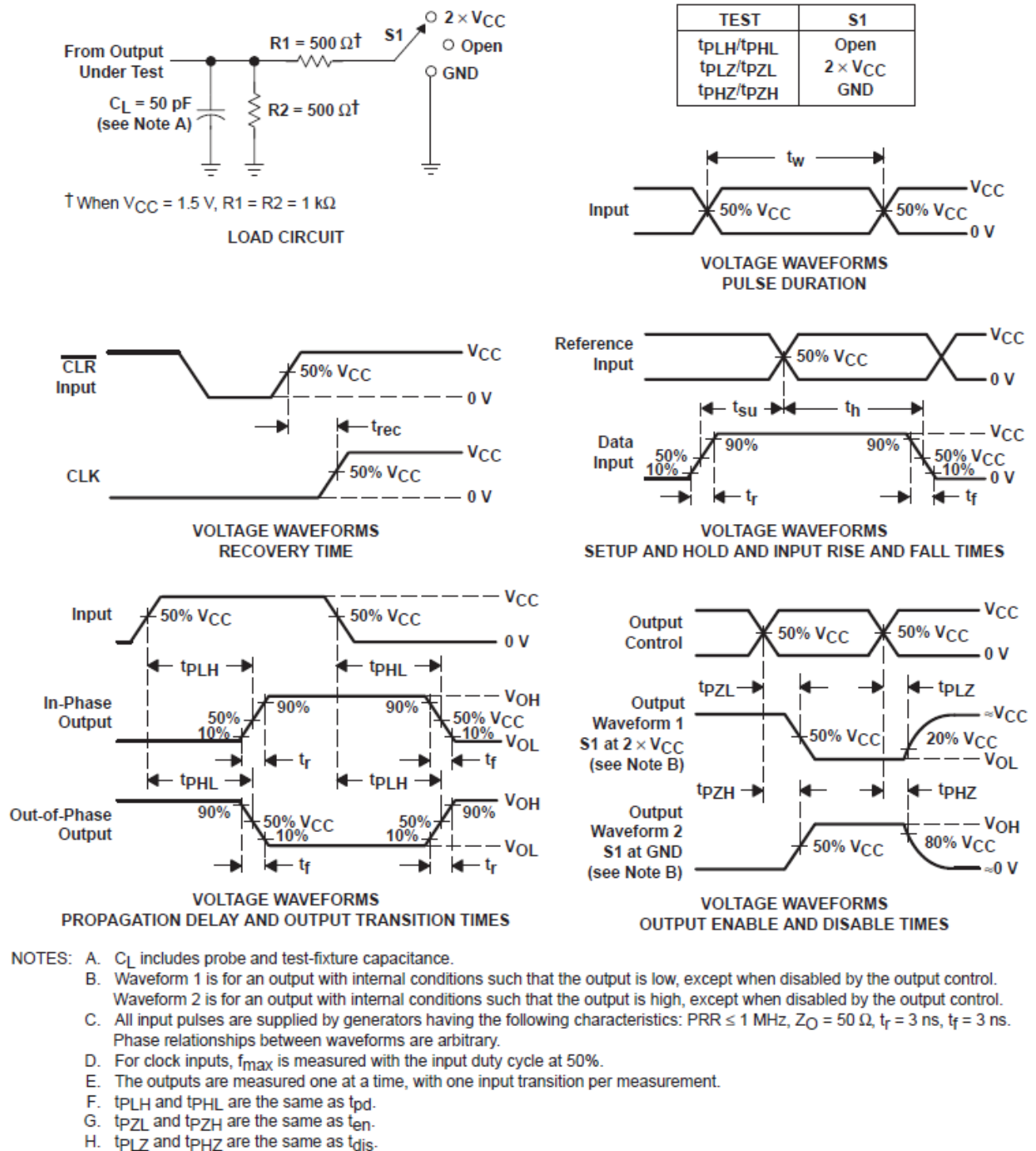


Figure 6-1.

7 Detailed Description

7.1 Overview

The CD74AC14 device performs the Boolean function $Y = \bar{A}$. Each circuit functions as an independent inverter, but because of the Schmitt action, the inverters have different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals.

7.2 Functional Block Diagram



Figure 7-1. Logic Diagram, Each Inverter (Positive Logic)

7.3 Device Functional Modes

Table 7-1. Function Table (Each Inverter)

INPUT	OUTPUT
A	Y
H	L
L	H

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CD74AC14E	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74AC14E	Samples
CD74AC14EE4	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74AC14E	Samples
CD74AC14M96	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC14M	Samples
CD74AC14M96E4	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC14M	Samples
CD74AC14M96G4	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC14M	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74AC14M96	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74AC14M96	SOIC	D	14	2500	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
CD74AC14E	N	PDIP	14	25	506	13.97	11230	4.32
CD74AC14E	N	PDIP	14	25	506	13.97	11230	4.32
CD74AC14EE4	N	PDIP	14	25	506	13.97	11230	4.32
CD74AC14EE4	N	PDIP	14	25	506	13.97	11230	4.32

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 -  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2023, Texas Instruments Incorporated