
HD74AC74

Dual D-Type Positive Edge-Triggered Flip-Flop

HITACHI

ADE-205-361 (Z)
1st. Edition
Sep. 2000

Description

The HD74AC74 is a dual D-type flip-flop with Asynchronous Clear and Set inputs and complementary (Q, $\bar{Q}$) outputs. Information at the input is transferred to the outputs on the positive edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive-going pulse. After the Clock Pulse input threshold voltage has been passed, the Data input is locked out and information present will not be transferred to the outputs until the next rising edge of the Clock Pulse input.

Features

Asynchronous Inputs:

Low input to $\bar{S}_D$ (Set) sets Q to High level

Low input to $\bar{C}_D$ (Clear) sets Q to Low level

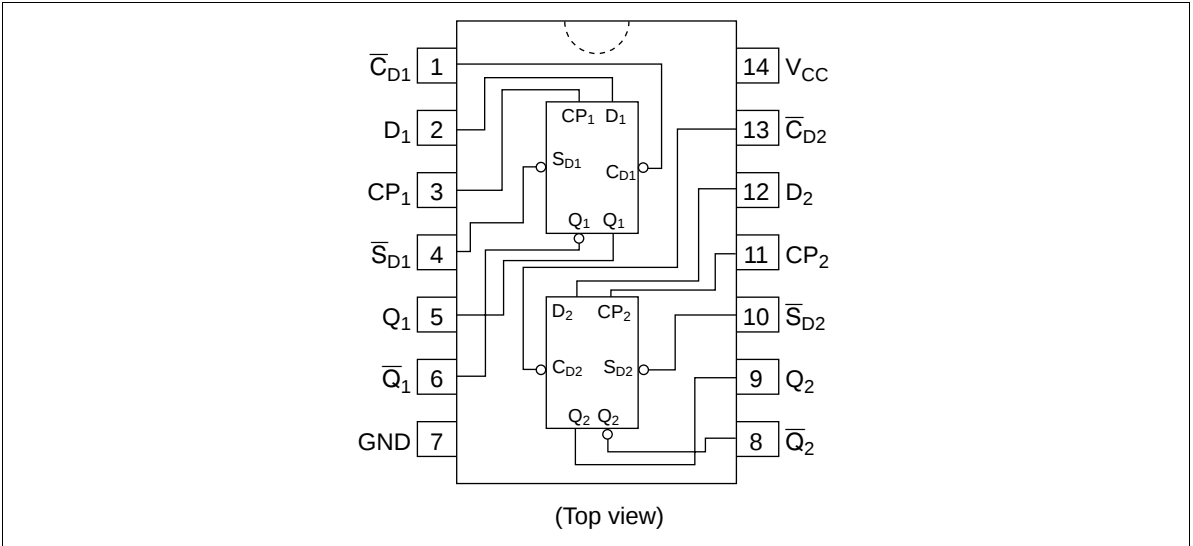
Clear and Set are independent of clock

Simultaneous Low on $\bar{C}_D$ and $\bar{S}_D$ makes both Q and $\bar{Q}$ High

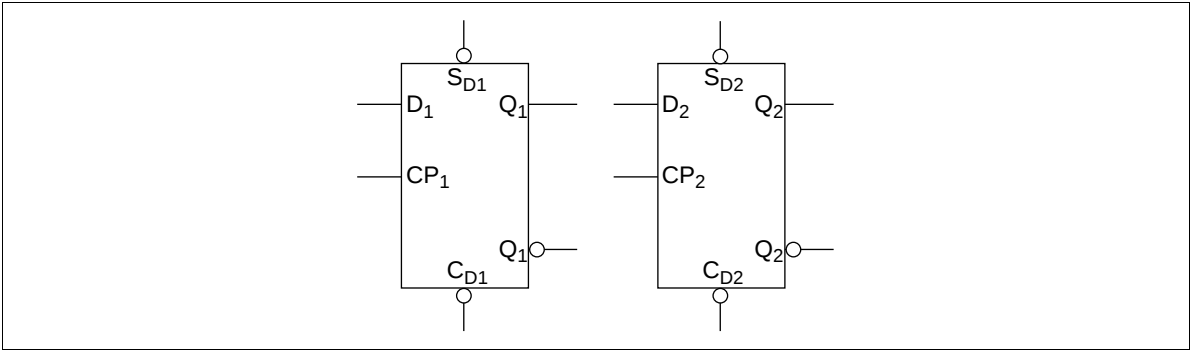
- Outputs Source/Sink 24 mA

HD74AC74

Pin Arrangement



Logic Symbol



Pin Names

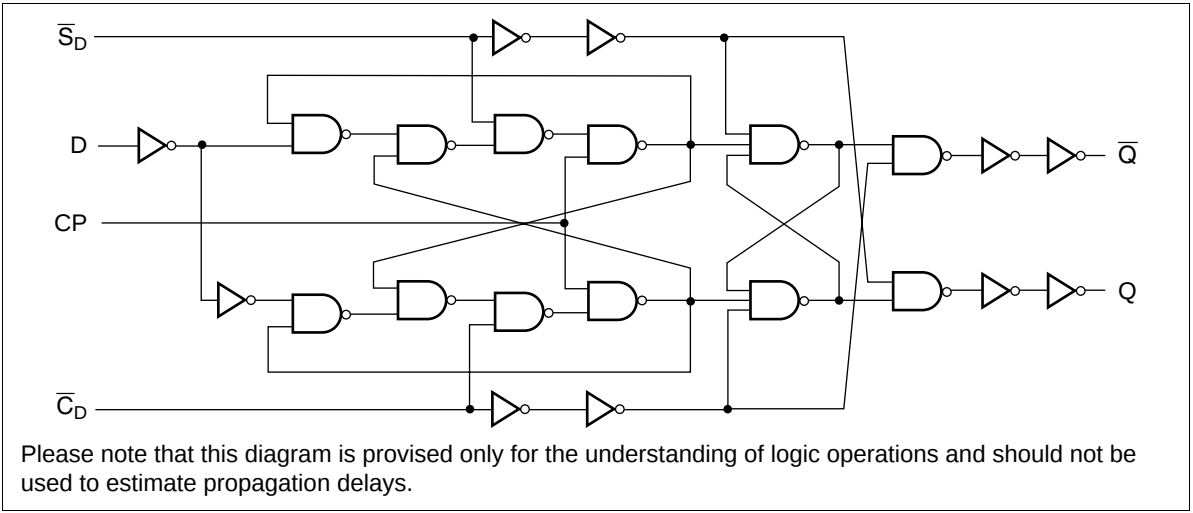
D_1, D_2	Data Inputs
CP_1, CP_2	Clock Pulse Inputs
$\overline{C}_{D1}, \overline{C}_{D2}$	Direct Clear Inputs
$\overline{S}_{D1}, \overline{S}_{D2}$	Direct Set Inputs
$Q_1, \overline{Q}_1, Q_2, \overline{Q}_2$	Outputs

Truth Table (Each Half)

Inputs				Outputs	
$\overline{S}_D$	$\overline{C}_D$	CP	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	$\lceil$	H	H	L
H	H	$\lceil$	L	L	H
H	H	L	X	Q_0	$\overline{Q}_0$

- H : High Voltage Level
- L : Low Voltage Level
- X : Immaterial
- $\lceil$: Low-to-High Clock Transition
- Q_0 ($\overline{Q}_0$) : Previous Q ($\overline{Q}$) before Low-to-High Transition of Clock

Logic Diagram



DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	I_{CC}	40	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = \text{Worst case}$
Maximum quiescent supply current	I_{CC}	4.0	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = 25^{\circ}C$

AC Characteristics

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF			Ta = −40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Maximum clock frequency	f _{max}	3.3	100	125	—	95	—	MHz
		5.0	140	160	—	125	—	
Propagation delay C _{Dn} or S _{Dn} to Q _n or Q _n	t _{PLH}	3.3	1.0	8.0	12.0	1.0	13.0	ns
		5.0	1.0	6.0	9.0	1.0	10.0	
Propagation delay C _{Dn} or S _{Dn} to Q _n or Q _n	t _{PHL}	3.3	1.0	10.5	12.0	1.0	13.5	ns
		5.0	1.0	8.0	9.5	1.0	10.5	
Propagation delay CP _n to Q _n or Q _n	t _{PLH}	3.3	1.0	8.0	13.5	1.0	16.0	ns
		5.0	1.0	6.0	10.0	1.0	10.5	
Propagation delay CP _n to Q _n or Q _n	t _{PHL}	3.3	1.0	8.0	14.0	1.0	14.5	ns
		5.0	1.0	6.0	10.0	1.0	10.5	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Operating Requirements: HD74AC74

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF		Ta = −40°C to +85°C C _L = 50 pF		Unit
			Typ	Guaranteed Minimum			
Set-up time, HIGH or LOW D _n to CP _n	t _{SU}	3.3	1.5	4.0	4.5		ns
		5.0	1.0	3.0	3.0		
Hold time, HIGH or LOW D _n to CP _n	t _H	3.3	−2.0	0	0		ns
		5.0	−1.5	0	0		
CP _n or C _{Dn} or S _{Dn} Pulse width	t _w	3.3	3.0	5.5	7.0		ns
		5.0	2.5	4.5	5.0		
Recovery time C _{Dn} or S _{Dn} to CP	t _{rec}	3.3	−2.5	0	0		ns
		5.0	−2.0	0	0		

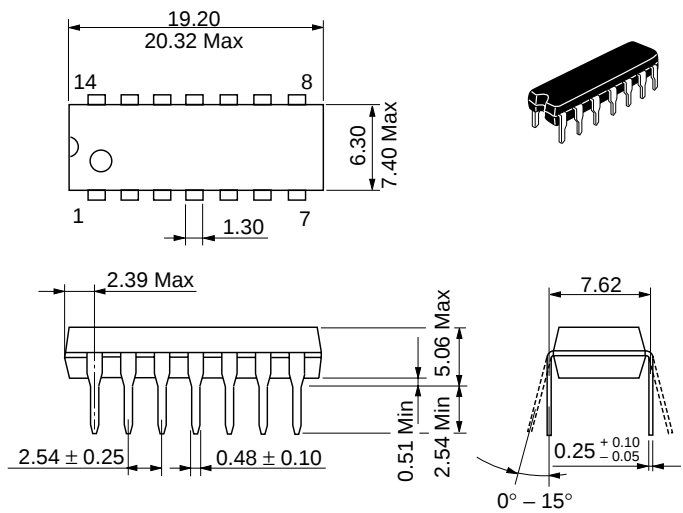
Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C _{IN}	4.5	pF	V _{CC} = 5.5 V
Power dissipation capacitance	C _{PD}	35.0	pF	V _{CC} = 5.0 V

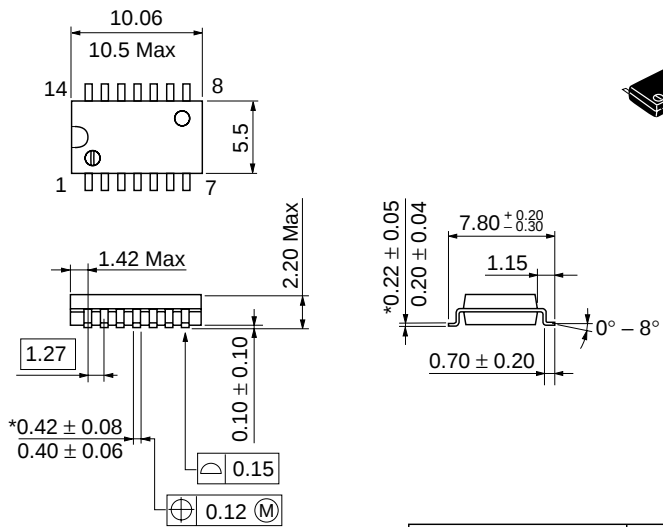
Package Dimensions

Unit: mm



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.97 g

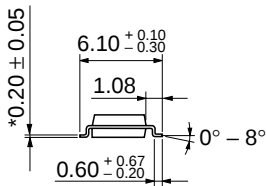
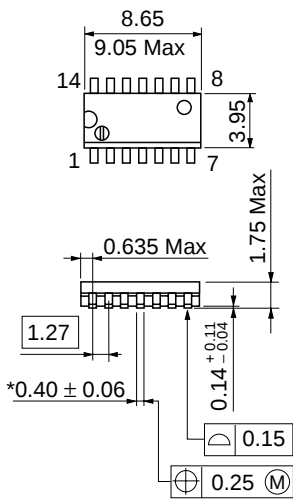
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.23 g

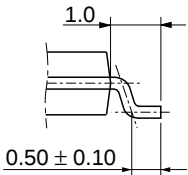
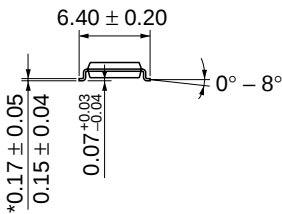
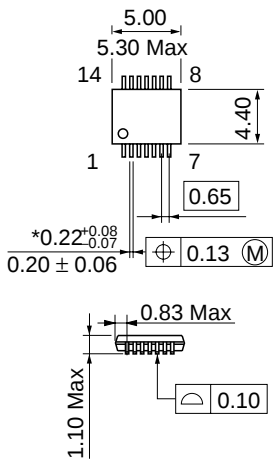
Unit: mm



*Pd plating

Hitachi Code	FP-14DN
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.13 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-14D
JEDEC	—
EIAJ	—
Mass (reference value)	0.05 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.

2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.

3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.

4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.

5. This product is not designed to be radiation resistant.

6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.

7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	NorthAmerica	:	http://semiconductor.hitachi.com/
	Europe	:	http://www.hitachi-eu.com/hel/ecg
	Asia	:	http://sicapac.hitachi-asia.com
	Japan	:	http://www.hitachi.co.jp/Sicd/indx.htm

For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive, San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1> (408) 433-0223	Hitachi Europe GmbH Electronic Components Group Dornacher StraÙe 3 D-85622 Feldkirchen, Munich Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00 Hitachi Europe Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 585160
--	---

Hitachi Asia Ltd. Hitachi Tower 16 Collyer Quay #20-00, Singapore 049318 Tel: <65>-538-6533/538-8577 Fax: <65>-538-6933/538-3877 URL: http://www.hitachi.com.sg Hitachi Asia Ltd. (Taipei Branch Office) 4/F, No. 167, Tun Hwa North Road, Hung-Kuo Building, Taipei (105), Taiwan Tel: <886>-(2)-2718-3666 Fax: <886>-(2)-2718-8180 Telex: 23222 HAS-TP URL: http://www.hitachi.com.tw
--

Hitachi Asia (Hong Kong) Ltd. Group III (Electronic Components) 7/F., North Tower, World Finance Centre, Harbour City, Canton Road Tsim Sha Tsui, Kowloon, Hong Kong Tel: <852>-(2)-735-9218 Fax: <852>-(2)-730-0281 URL: http://www.hitachi.com.hk
--

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.
Colophon 2.0