
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

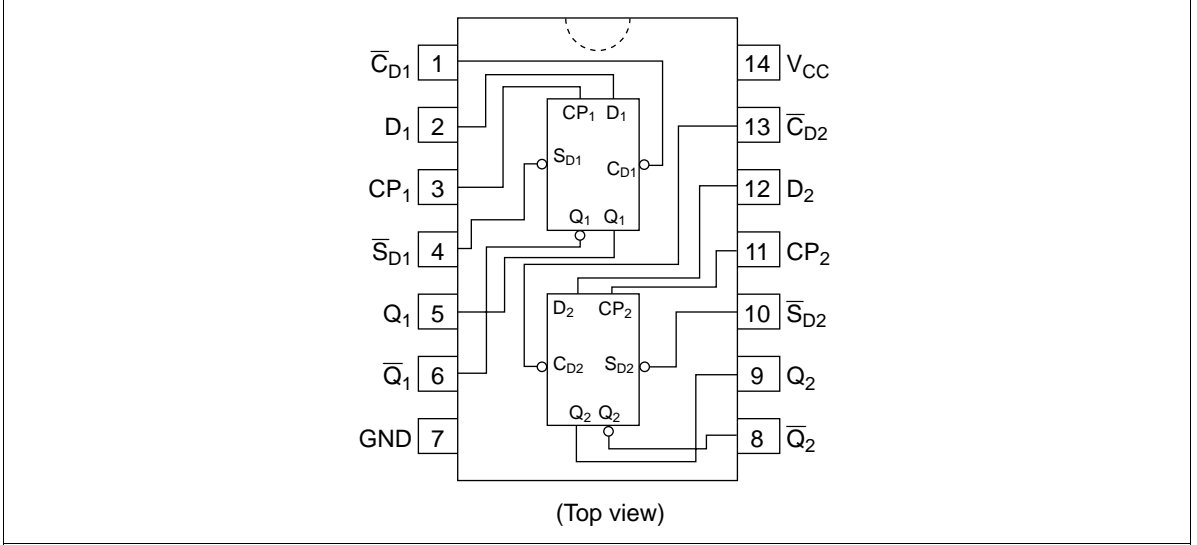
Asynchronous Inputs:

- 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

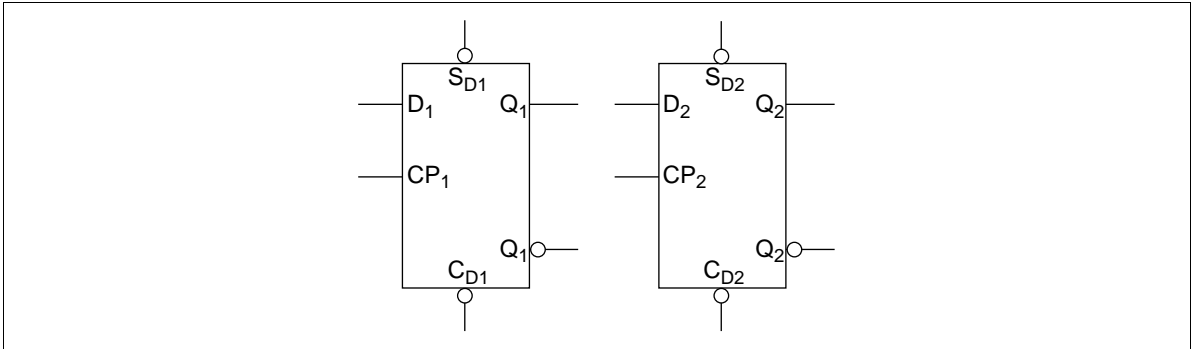
- Outputs Source/Sink 24 mA

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 |

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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	\lrcorner	H	H	L
H	H	\lrcorner	L	L	H
H	H	L	X	Q_0	\overline{Q}_0

H : High Voltage Level

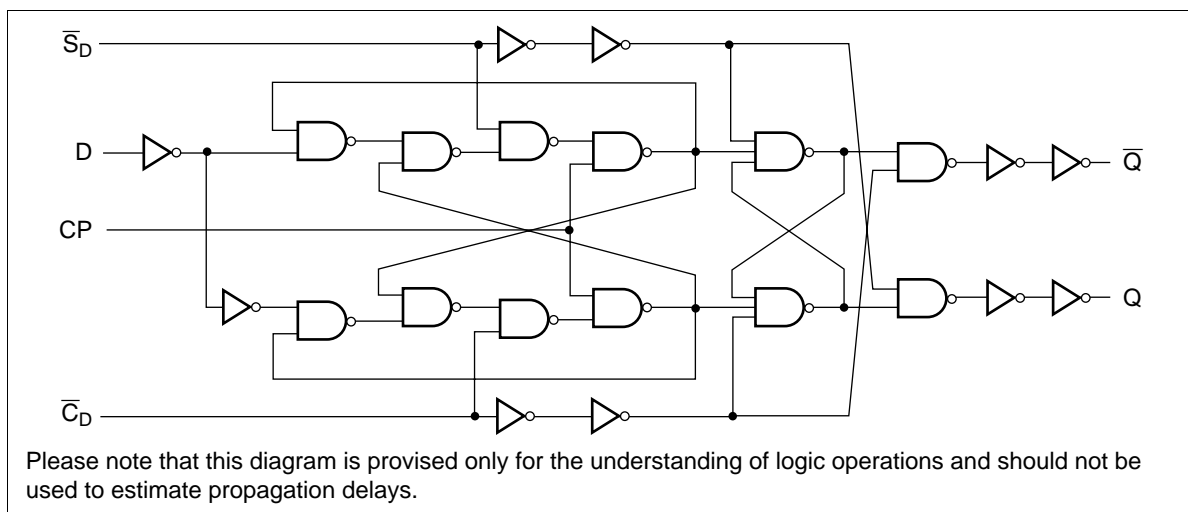
L : Low Voltage Level

X : Immaterial

\lrcorner : 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	Typ	Guaranteed Minimum		Unit
			Ta = +25°C C _L = 50 pF	Ta = -40°C to +85°C C _L = 50 pF	Ta = -40°C to +85°C C _L = 50 pF	
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	
Pulse width CP _n or C _{Dn} or S _{Dn}	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	

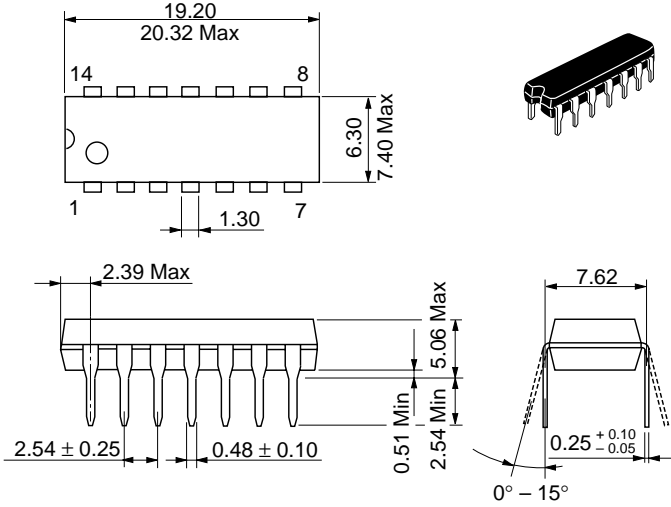
Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C_{IN}	4.5	pF	$V_{CC} = 5.5 \text{ V}$
Power dissipation capacitance	C_{PD}	35.0	pF	$V_{CC} = 5.0 \text{ V}$

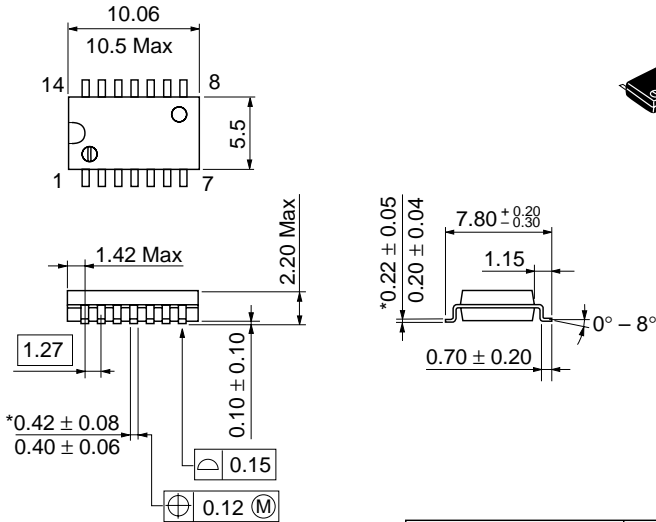
Package Dimensions

Unit: mm



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

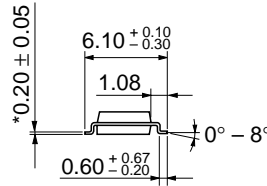
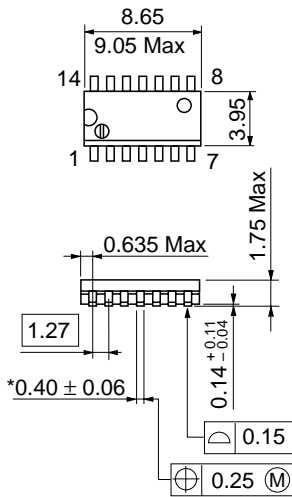
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

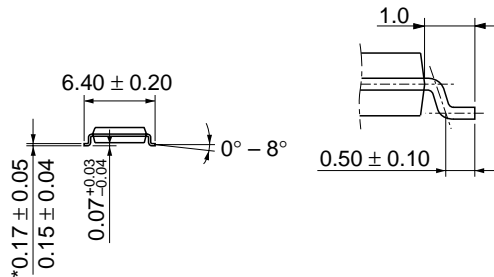
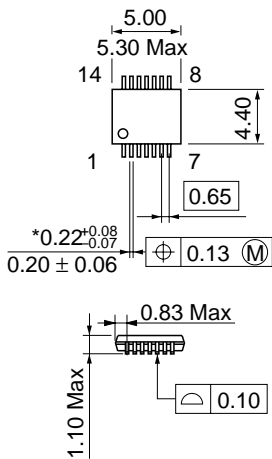
Unit: mm



*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

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