
HD74AC393

Dual Modulo-16-Counter

HITACHI

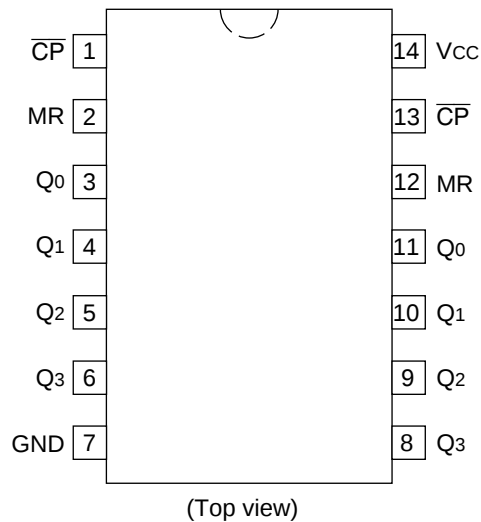
Description

The HD74AC393 contains a pair of high speed 4-stage ripple counters. Each half of the HD74AC393 operates as a modulo-16 binary divider, with the last three stages triggered in a ripple fashion. The flip-flops are triggered by a High-to-Low transition of their $\overline{CP}$ inputs. Each half of each circuit type has a Master Reset input which responds to a High signal by forcing all four outputs to the Low state.

Feature

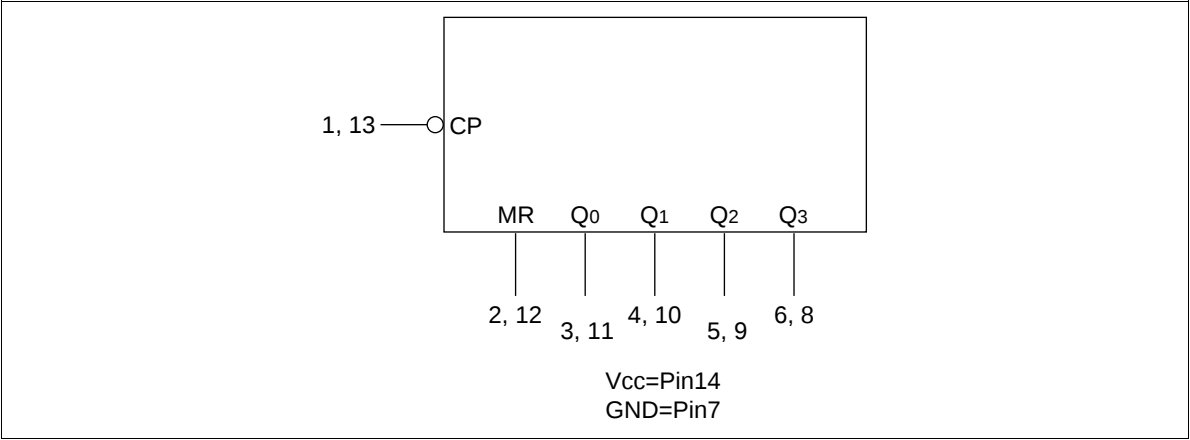
- Outputs Source/Sink 24 mA

Pin Arrangement



HD74AC393

Logic Symbol (each half)



Pin Names

- $\overline{CP}$ Clock Pulse Input (Active Falling Edge)
- MR Asynchronous Master Reset Input (Active High)
- Q₀ – Q₃ Flip-flop Outputs

Functional Description

Each half of the HD74AC393 operates in the modulo-16 binary sequence, as indicated in the + 16 Truth Table. The first flip-flop is triggered by High-to-Low transitions of the $\overline{CP}$ input signal. Each of the other flip-flops is triggered by a High-to-Low transition of the Q output of the preceding flip-flop. Thus state changes of the Q outputs do not occur simultaneously. This means that logic signals derived from combinations of these outputs will be subject to decoding spikes and, therefore, should not be used as clocks for other counters, registers or flip-flops. A High signal on MR forces all outputs to the Low state and prevents counting.

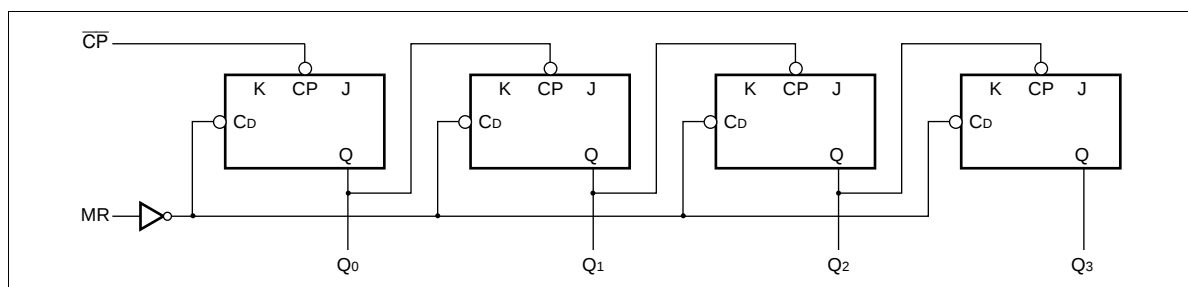
Truth Table

Count	Outputs			
	Q ₃	Q ₂	Q ₁	Q ₀
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H
10	H	L	H	L
11	H	L	H	H
12	H	H	L	L
13	H	H	L	H
14	H	H	H	L
15	H	H	H	H

H : High Voltage Level

L : Low Voltage Level

Logic Diagram (one, half shown)



HD74AC393

DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	I_{CC}	80	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = \text{Worst case}$
Maximum quiescent supply current	I_{CC}	8.0	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = 25^{\circ}C$

AC Characteristics: HD74AC393

Item	Symbol	$V_{CC} (V)^{*1}$	$T_a = +25^{\circ}C$ $C_L = 50 pF$			$T_a = -40^{\circ}C \text{ to } +85^{\circ}C$ $C_L = 50 pF$		Unit
			Min	Typ	Max	Min	Max	
Maximum clock frequency	f_{max}	3.3	125	—	—	100	—	MHz
		5.0	150	—	—	125	—	
Propagation delay $\overline{CP}$ to Q_0	t_{PLH}	3.3	1.0	8.5	12.0	1.0	13.0	ns
		5.0	1.0	6.5	9.0	1.0	10.0	
Propagation delay $\overline{CP}$ to Q_0	t_{PHL}	3.3	1.0	8.0	11.5	1.0	12.5	ns
		5.0	1.0	6.0	8.5	1.0	9.5	
Propagation delay $\overline{CP}$ to Q_1	t_{PLH}	3.3	1.0	12.0	15.0	1.0	16.0	ns
		5.0	1.0	9.5	12.0	1.0	13.0	
Propagation delay $\overline{CP}$ to Q_1	t_{PHL}	3.3	1.0	11.5	14.5	1.0	15.5	ns
		5.0	1.0	9.0	11.5	1.0	12.5	
Propagation delay $\overline{CP}$ to Q_2	t_{PLH}	3.3	1.0	15.0	18.0	1.0	19.5	ns
		5.0	1.0	12.0	14.5	1.0	16.0	
Propagation delay $\overline{CP}$ to Q_2	t_{PHL}	3.3	1.0	14.5	17.5	1.0	19.0	ns
		5.0	1.0	11.5	14.0	1.0	15.5	
Propagation delay $\overline{CP}$ to Q_3	t_{PLH}	3.3	1.0	18.0	20.5	1.0	22.0	ns
		5.0	1.0	14.5	17.0	1.0	18.5	
Propagation delay $\overline{CP}$ to Q_3	t_{PHL}	3.3	1.0	17.5	20.0	1.0	21.5	ns
		5.0	1.0	14.0	16.5	1.0	17.5	
Propagation delay MR to Q_0, Q_1, Q_2 or Q_3	t_{PHL}	3.3	1.0	10.5	14.0	1.0	15.0	ns
		5.0	1.0	8.5	11.0	1.0	12.0	

Note: 1. Voltage Range 3.3 is $3.3 V \pm 0.3 V$
Voltage Range 5.0 is $5.0 V \pm 0.5 V$

AC Operating Requirements: HD74AC393

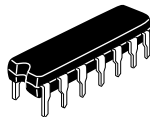
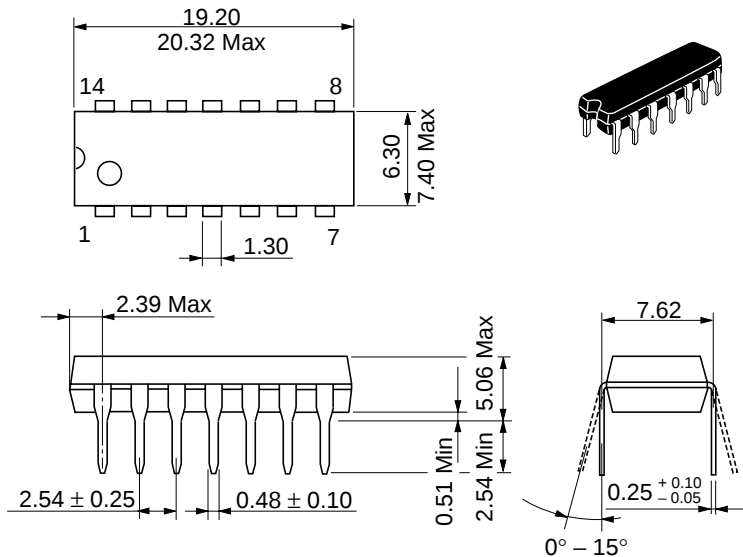
Item	Symbol	V _{CC} (V)*1	Ta = +25°C	Ta = −40°C		Unit
			C _L = 50 pF	to +85°C	C _L = 50 pF	
Pulse width $\overline{CP}$	t _w	3.3	3.5	5.5	7.0	ns
		5.0	2.5	4.5	5.0	
Recovery time MR to $\overline{CP}$	t _{rec}	3.3	−2.5	0.0	0.0	ns
		5.0	−2.5	0.0	0.0	

Note: 1. Voltage Range 3.3 is $3.3\text{ V} \pm 0.3\text{ V}$

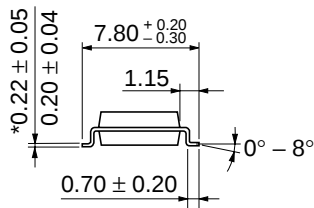
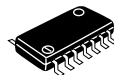
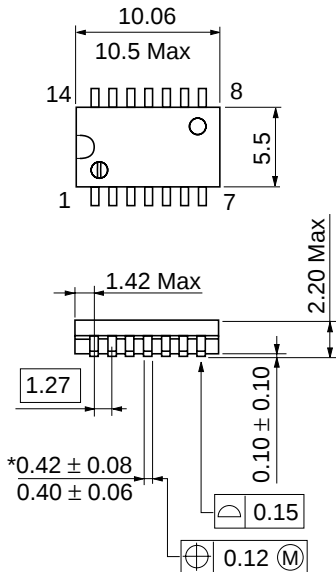
Voltage Range 5.0 is $5.0\text{ V} \pm 0.5\text{ V}$

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C_{IN}	4.5	pF	$V_{CC} = 5.5\text{ V}$
Power dissipation capacitance	C_{PD}	50	pF	$V_{CC} = 5.0\text{ V}$

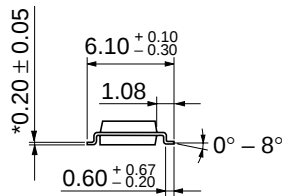
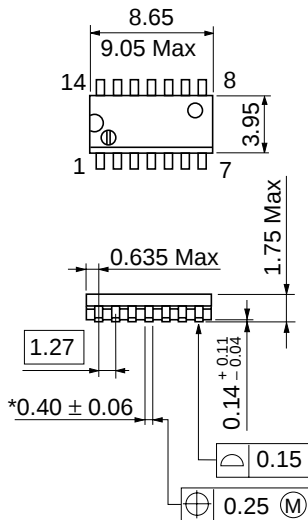


Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g

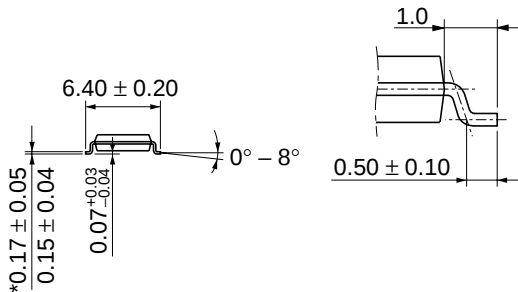
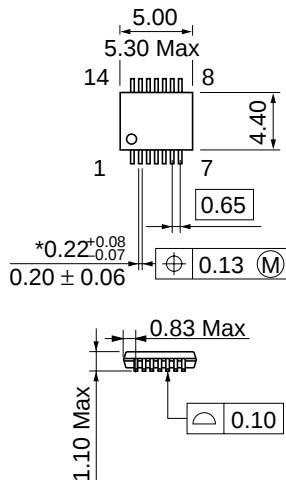


Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

*Dimension including the plating thickness
Base material dimension



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



*Dimension including the plating thickness
Base material dimension

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

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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

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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 Straße 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) 778322
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Hitachi Asia Pte. Ltd. 16 Collyer Quay #20-00 Hitachi Tower Singapore 049318 Tel: 535-2100 Fax: 535-1533 Hitachi Asia Ltd. Taipei Branch Office 3F, Hung Kuo Building, No.167, Tun-Hwa North Road, Taipei (105) Tel: <886> (2) 2718-3666 Fax: <886> (2) 2718-8180
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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 Telex: 40815 HITEC HX
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