HD74AC393

Dual Modulo-16-Counter

HITACHI

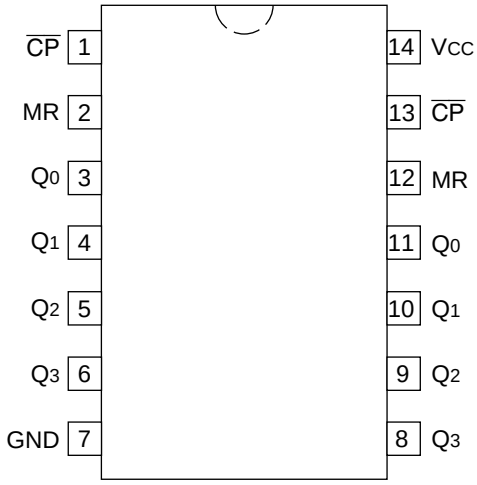
Description

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

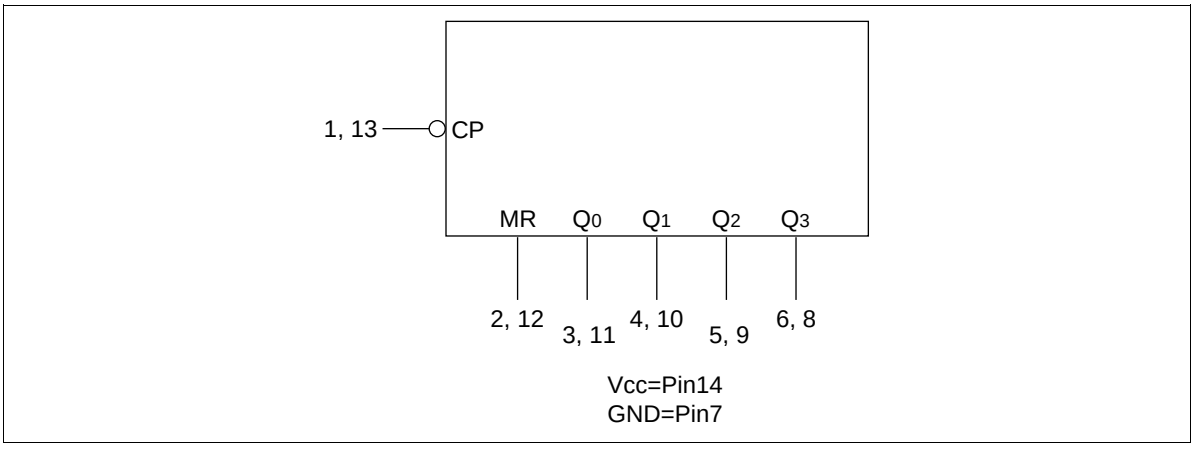
Pin Arrangement



(Top view)

Hitachi semiconductor

Logic Symbol (each half)



Pin Names

$\overline{CP}$	Clock Pulse Input (Active Falling Edge)
MR	Asynchronous Master Reset Input (Active High)
$Q_0 - Q_3$	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.

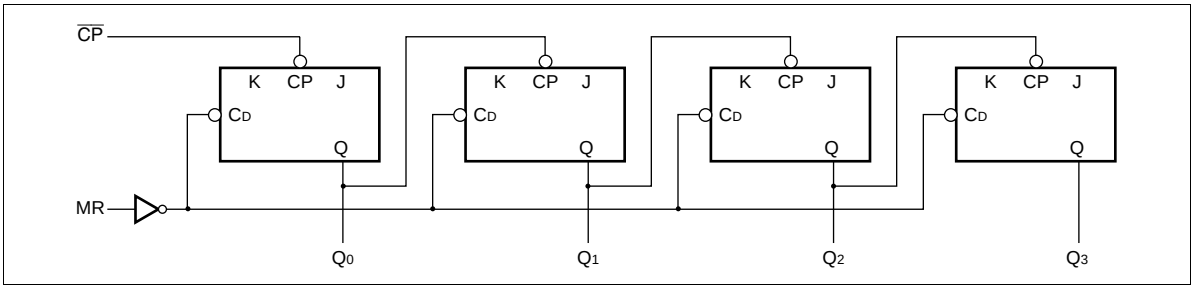
Truth Table

	Outputs			
Count	**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)



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, Ta = Worst case
Maximum quiescent supply current	I_{CC}	8.0	µA	V_{IN} = V_{CC} or ground, V_{CC} = 5.5 V, Ta = 25°C

AC Characteristics: HD74AC393

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

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

AC Operating Requirements: HD74AC393

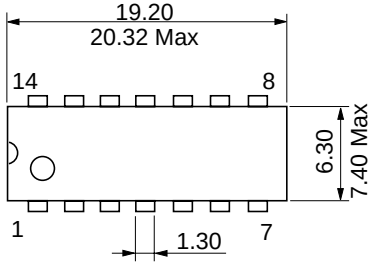
Item	Symbol	V_{CC} (V)*[1]	Ta = +25°C, C_L = 50 pF	Ta = –40°C to +85°C, C_L = 50 pF		Unit
			Typ	Guaranteed Minimum		
Pulse width $\overline{CP}$	t_w	3.3	3.5	5.5	7.0	ns
		5.0	2.5	4.5	5.0	
Recovery time MR to $\overline{CP}$	t_{rec}	3.3	–2.5	0.0	0.0	ns
		5.0	–2.5	0.0	0.0	

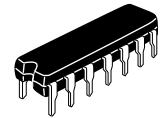
Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

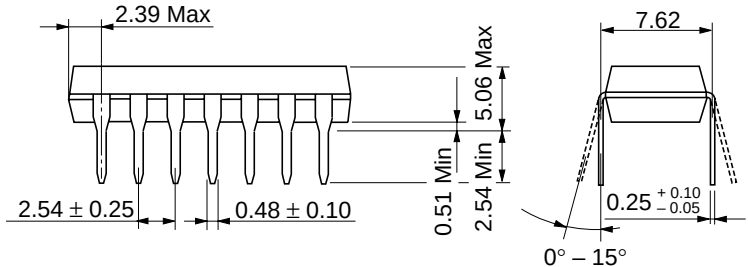
Capacitance

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

Unit: mm

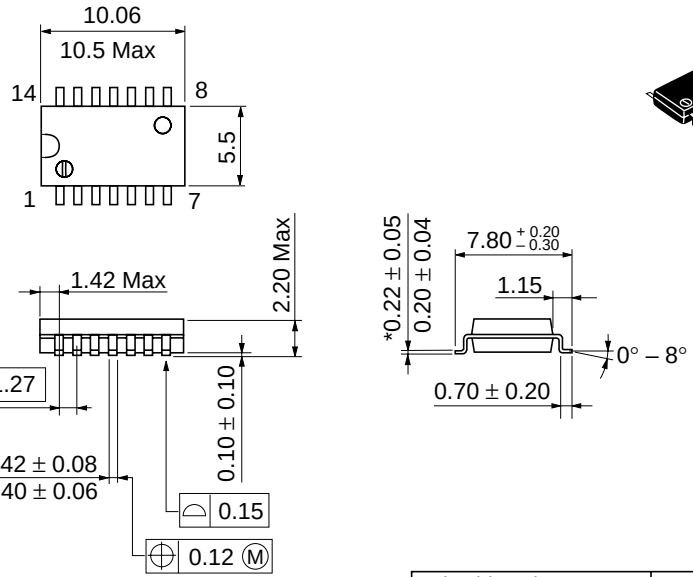


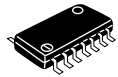




Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g

Unit: mm

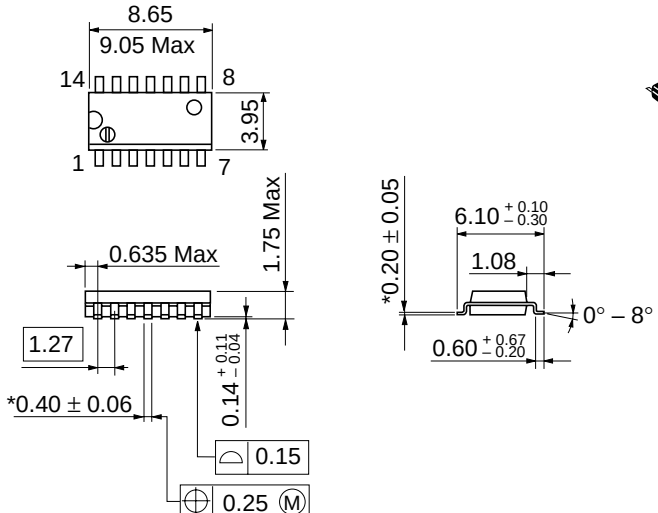




Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

*Dimension including the plating thickness
Base material dimension

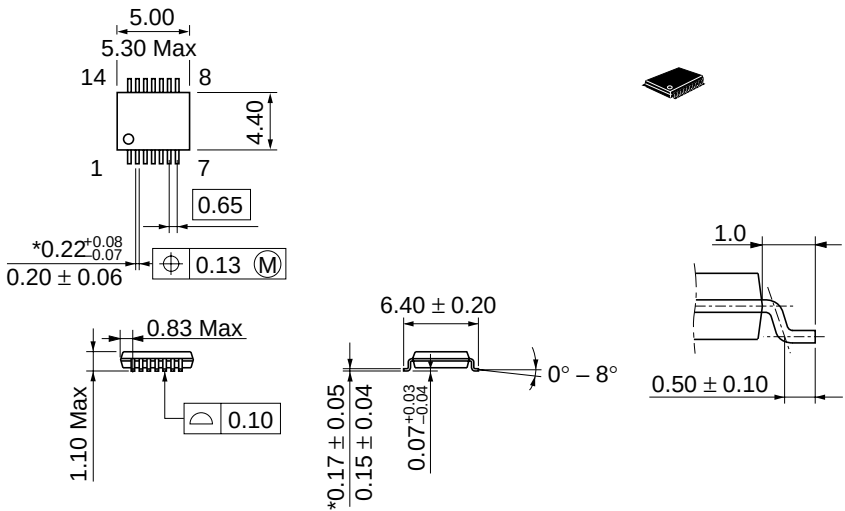
Unit: mm



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

*Pd plating

Unit: mm



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

*Dimension including the plating thickness
Base material dimension

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