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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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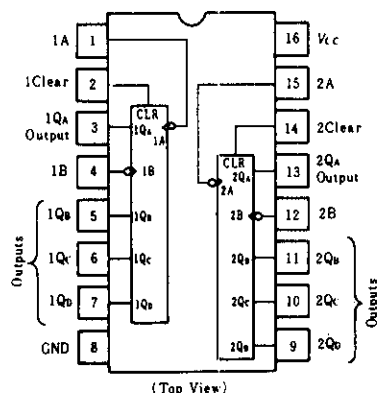
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HD74LS390 ● Dual Decade Counters

This circuit contains eight master-slave flip-flops and additional gating to implement two individual four-bit counters. The HD74LS390 incorporates dual divide-by-two and divide-by-five counters, which can be used to implement cycle lengths equal to any whole and/or cumulative multiples of 2 and/or 5 up to divide-by-100. When connected as a bi-quinary counter, the separate divide-by-two circuit can be used to provide symmetry (a square wave) at the final output stage.

■ PIN ARRANGEMENT



■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Output current	I_{OH}	—	—	-400	μA
Output current	I_{OL}	—	—	8	mA
Count frequency	Input A	f_{count}	0	—	25
	Input B		0	—	20
Pulse width	Input A	t_w	20	—	—
	Input B		25	—	—
	Clear		20	—	—
Setup time	t_{su}	25	—	—	ns

†: The arrow indicates that the falling edge of the clock pulse is used for reference.

■ FUNCTION TABLE

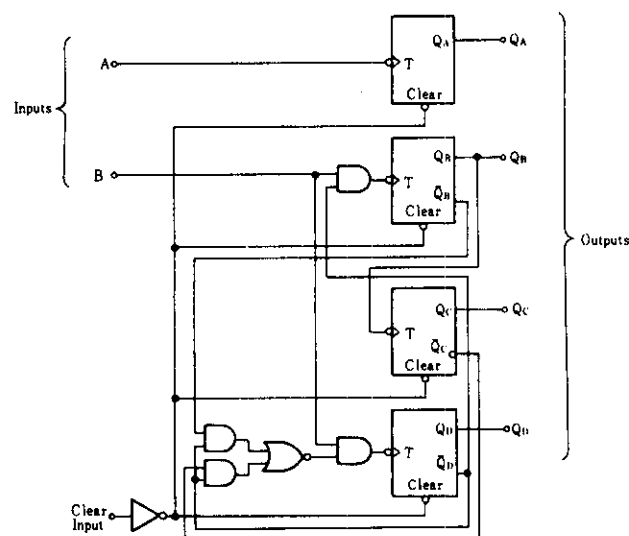
● BCD Count Sequence (Notes 1)

Count	Outputs			
	Q_D	Q_C	Q_B	Q_A
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

● Bi-Quinary (Notes 2)

Count	Outputs			
	Q_A	Q_D	Q_C	Q_B
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	H	L	L	L
6	H	L	L	H
7	H	L	H	L
8	H	L	H	H
9	H	H	L	L

■ BLOCK DIAGRAM (1/2)



■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7	V
Input voltage	Clear	7	V
	A, B	5.5	V
Operating temperature range	T_{op}	-20 ~ +75	°C
Storage temperature range	T_{stg}	-65 ~ +150	°C

Notes)

1. Output Q_A is connected to input B for BCD count.
2. Output Q_D is connected to input A for bi-quinary count.
3. H; high level, L; low level, X; irrelevant

HD74LS390

■ ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$)

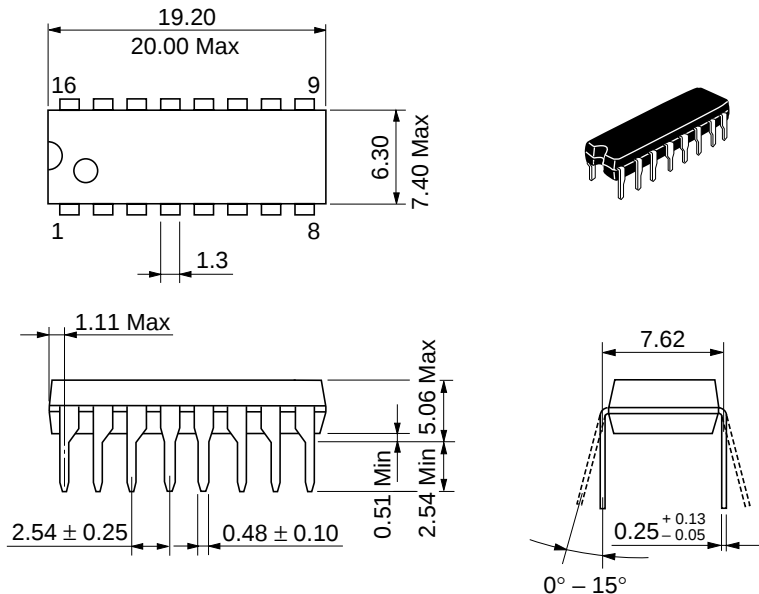
Item		Symbol	Test Conditions	min	typ*	max	Unit
Input voltage		V_{IH}		2.0	—	—	V
		V_{IL}		—	—	0.8	V
Output voltage		V_{OH}	$V_{CC} = 4.75\text{V}$, $V_{IH} = 2\text{V}$, $V_{IL} = 0.8\text{V}$, $I_{OH} = -400\mu\text{A}$	2.7	—	—	V
		V_{OL}	$V_{CC} = 4.75\text{V}$, $V_{IH} = 2\text{V}$, $V_{IL} = 0.8\text{V}$			0.4	V
						0.5	
Input current	Clear	I_i	$V_{CC} = 5.25\text{V}$	$V_i = 7\text{V}$	—	0.1	mA
	Input A			$V_i = 5.5\text{V}$	—	0.2	
	Input B				—	0.4	
	Clear	I_{IH}	$V_{CC} = 5.25\text{V}$, $V_i = 2.7\text{V}$		—	20	μA
	Input A				—	100	
	Input B				—	200	
	Clear	I_{II}	$V_{CC} = 5.25\text{V}$, $V_i = 0.4\text{V}$		—	-0.4	mA
	Input A				—	-1.6	
	Input B				—	-2.4	
Short-circuit output current		I_{OS}	$V_{CC} = 5.25\text{V}$	-20	—	-100	mA
Supply current		I_{CC}^{**}	$V_{CC} = 5.25\text{V}$	—	15	26	mA
Input clamp voltage		V_{IA}	$V_{CC} = 4.75\text{V}$, $I_{IS} = -18\text{mA}$	—	—	-1.5	V

* $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$

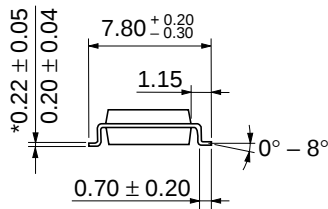
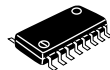
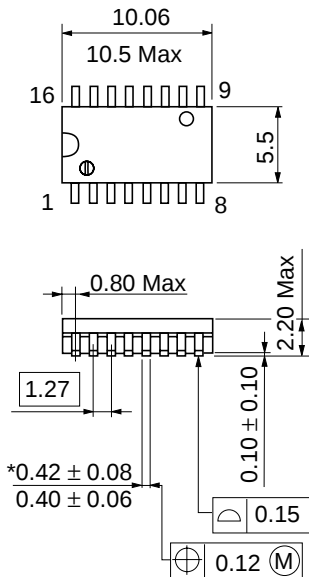
** I_{CC} is measured with all outputs open, both clear inputs grounded following momentary connection to 4.5V, and all other inputs grounded.

■ SWITCHING CHARACTERISTICS ($V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum count frequency	f_{max}	A	Q_A	$C_L=15\text{pF},$ $R_L=2\text{k}\Omega$	25	35	—	MHz
		B	Q_B		20	30	—	
Propagation delay time	t_{PLH}	A	Q_A		—	12	20	ns
	t_{PHL}				—	13	20	
	t_{PLH}	A	Q_C		—	37	60	
	t_{PHL}				—	39	60	
	t_{PLH}	B	Q_B		—	13	21	
	t_{PHL}				—	14	21	
	t_{PLH}	B	Q_C		—	24	39	
	t_{PHL}				—	26	39	
	t_{PLH}	B	Q_D		—	13	21	
	t_{PHL}				—	14	21	
	t_{PHL}	Clear	Any		—	24	39	

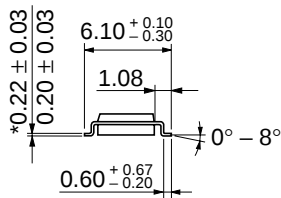
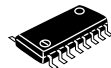
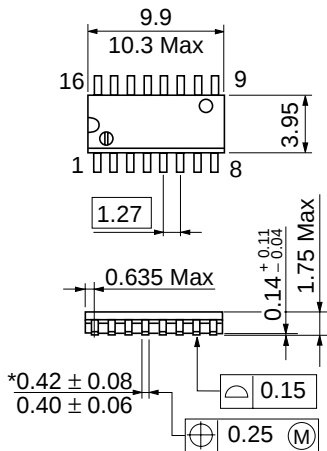


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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