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

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Keep safety first in your circuit designs!

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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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HD74HC490

Dual 4-bit Decade Counters



ADE-205-507 (Z)
1st. Edition
Sep. 2000

Description

This circuit contains eight master-slave flip-flops and additional gating to implement two individual 4-bit decade counters. Each decade counter has individual clock, clear and set-to-9 inputs. BCD count sequences of any length up to divide-by-100 may be implemented with a single HD74HC490. Buffering on each output is provided to ensure that susceptibility to collector communication is reduced significantly. The counters have parallel outputs from each counter state so that submultiples of the input count frequency are available for system timing signals.

Features

- High Speed Operation: t_{pd} (Clock to Q_A) = 13 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

Function Table

Clear/Set-To-9

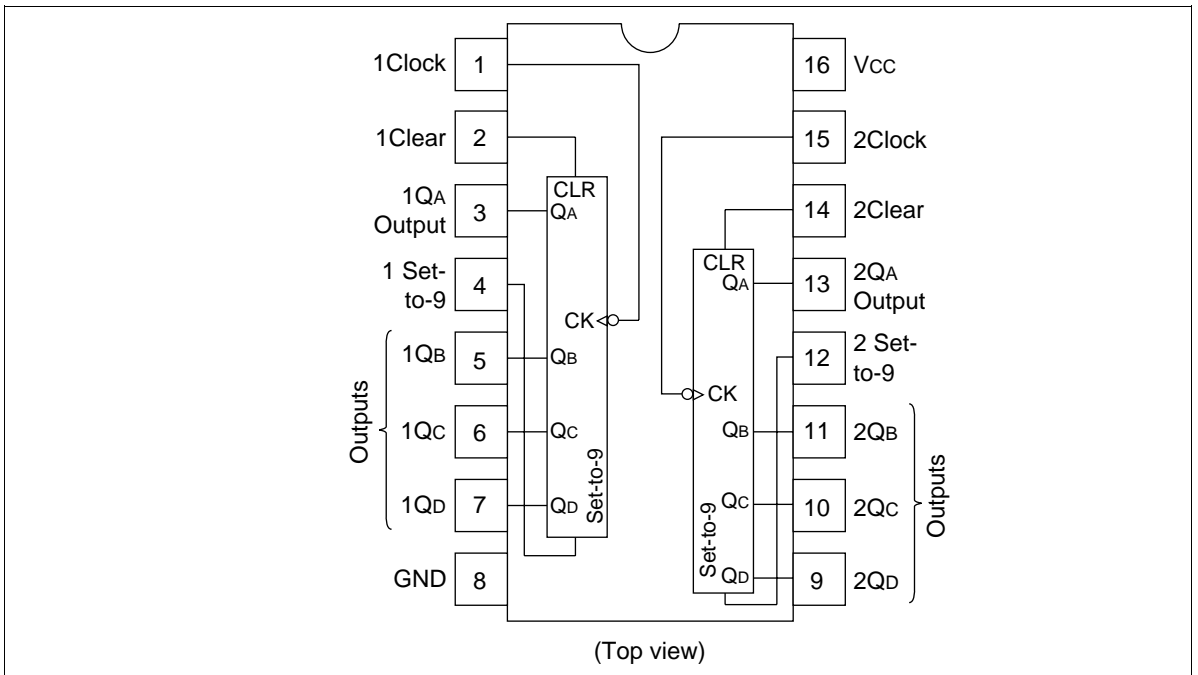
Inputs		Outputs			
Clear	Set-To-9	Q_A	Q_B	Q_C	Q_D
H	L	L	L	L	L
L	H	H	L	L	H
L	L	Count			

HD74HC490

BCD Count Sequence

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

Pin Arrangement



DC Characteristics

Item	Symbol	V _{CC} (V)	Ta = 25°C		Ta = -40 to +85°C		Unit	Test Conditions		
			Min	Typ	Max	Min			Max	
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	Vin = V _{IH} or V _{IL} I _{OH} = -20 μA	
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—			I _{OH} = -4 mA
		6.0	5.68	—	—	5.63	—			I _{OH} = -5.2 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	Vin = V _{IH} or V _{IL} I _{OL} = 20 μA	
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	—	0.26	—	0.33			I _{OL} = 4 mA
		6.0	—	—	0.26	—	0.33			I _{OL} = 5.2 mA
Input current	I _{in}	6.0	—	—	±0.1	—	±1.0	μA	Vin = V _{CC} or GND	
Quiescent supply current	I _{CC}	6.0	—	—	4.0	—	40	μA	Vin = V _{CC} or GND, I _{out} = 0 μA	

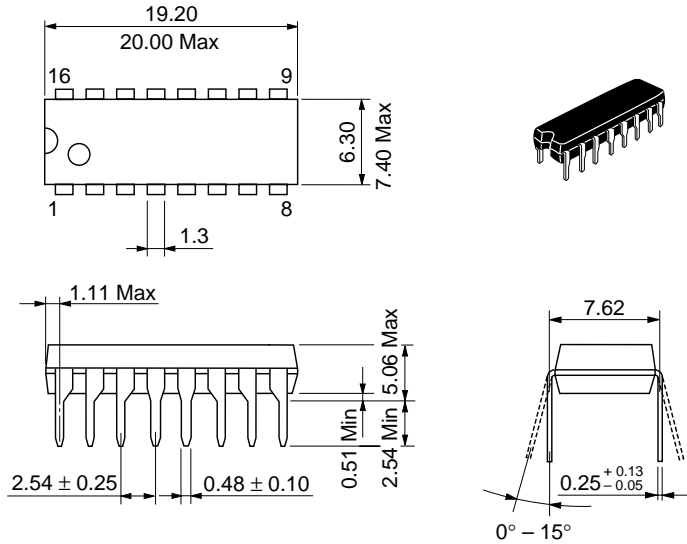
HD74HC490

AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$		$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min			Max
Maximum clock frequency	f_{max}	2.0	—	—	4	—	3	MHz	
		4.5	—	—	20	—	16		
		6.0	—	—	24	—	19		
Propagation delay time	t_{PLH}	2.0	—	—	120	—	150	ns	Clock to Q_A
		4.5	—	13	24	—	30		
		6.0	—	—	20	—	26		
	t_{PHL}	2.0	—	—	205	—	255	ns	Clock to Q_B , Q_C
		4.5	—	21	41	—	51		
		6.0	—	—	35	—	43		
	t_{PLH}	2.0	—	—	280	—	350	ns	Clock to Q_C
		4.5	—	23	56	—	70		
		6.0	—	—	48	—	60		
	t_{PHL}	2.0	—	—	205	—	255	ns	Clear to any output
		4.5	—	18	41	—	51		
		6.0	—	—	35	—	43		
	t_{PLH}	2.0	—	—	205	—	255	ns	Set-to-9 to Q_A , Q_D
		4.5	—	13	41	—	51		
		6.0	—	—	35	—	43		
	t_{PHL}	2.0	—	—	190	—	240	ns	Set-to-9 to Q_B , Q_C
		4.5	—	17	38	—	48		
		6.0	—	—	32	—	41		
Pulse width	t_w	2.0	80	—	—	100	—	ns	
		4.5	16	6	—	20	—		
		6.0	14	—	—	17	—		
Setup time	t_{su}	2.0	100	—	—	125	—	ns	
		4.5	20	1	—	25	—		
		6.0	17	—	—	21	—		
Output rise/fall time	t_{TLH}	2.0	—	—	75	—	95	ns	
	t_{THL}	4.5	—	5	15	—	19		
	t_{THL}	6.0	—	—	13	—	16		
Input capacitance	C_{in}	—	—	5	10	—	10	pF	

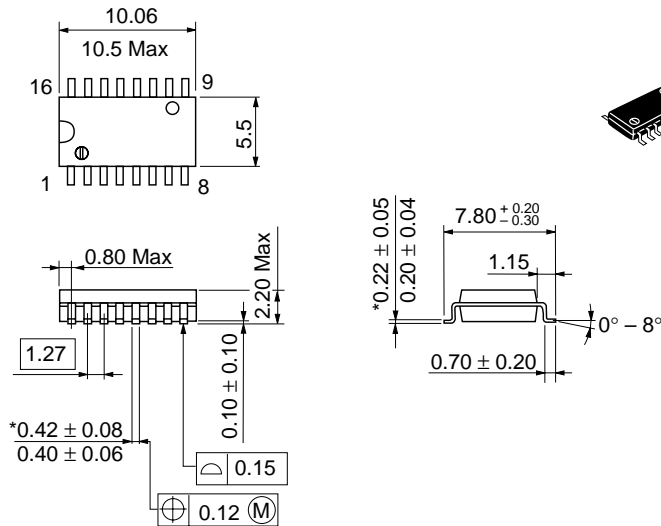
Package Dimensions

Unit: mm



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

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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