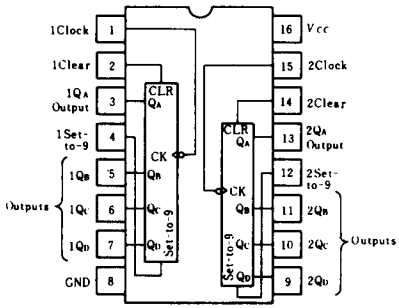
HD74LS490 ●Dual 4-bit Decade Counters

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 HD74LS490. Buffering on each output is provided to ensure that susceptibility to collector communication is reduced significantly. All inputs are diode-clamped to reduce the effects of line ringing. The counters have parallel outputs from each counter stage so that submultiples of the input count frequency are available for system timing signals.

■PIN ARRANGEMENT



(Top View)

■RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Output current	I_{OH}	—	—	−400	μA
Output current	I_{OL}	—	—	8	mA
Count frequency	f_{count}	0	—	25	MHz
Pulse width	t_W	20	—	—	ns
Setup time	t_{su}	25↓	—	—	ns

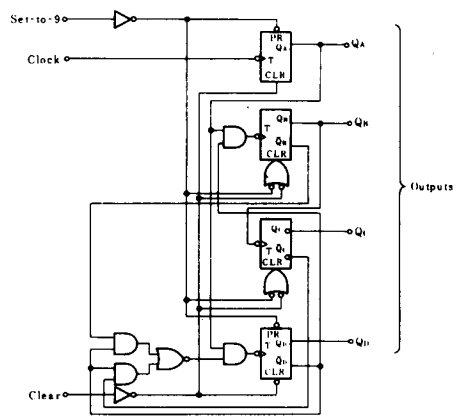
↓; The arrows indicates the falling edge from clock transition.

■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			

■BLOCK DIAGRAM (1/2)



■ABSOLUTE MAXIMUM RATINGS

Item		Symbol	Ratings	Unit
Supply voltage		V_{CC}	7.0	V
Input voltage	CLOCK	V_{IN}	5.5	V
	CLEAR, SET-TO-9		7.0	
Operating temperature range		T_{opr}	−20～+75	°C
Storage temperature range		T_{stg}	−65～+125	°C

●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

HITACHI

■ELECTRICAL CHARACTERISTICS (Ta=−20～+75°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}=4.75V, V_{IH}=2V, V_{IL}=0.8V, I_{OH}=400μA		2.7	—	—	V
		V_{OL}	V_{CC}=4.75V, V_{IH}=2V, V_{IL}=0.8V	I_{OL}=4mA	—	—	0.4	
				I_{OL}=8mA	—	—	0.5	
Input current	Clear	I_{IH}	V_{CC}=5.25V, V_I=2.7V		—	—	20	μA
	Set-to-9							
	Clock				—	—	100	
	Clear	I_{IL}	V_{CC}=5.25V, V_I=0.4V		—	—	−0.4	mA
	Set-to-9							
	Clock				—	—	−1.6	
	Clear	I_I	V_{CC}=5.25V	V_I=7V	—	—	0.1	mA
	Set-to-9							
	Clock			V_I=5.5V	—	—	0.2	
Short-circuit output current		I_{OS}	V_{CC}=5.25V		−20	—	−100	mA
Supply current		I_{CC}**	V_{CC}=5.25V		—	15	26	mA
Input clamp voltage		V_{IK}	V_{CC}=4.75V, I_{IN}=−18mA		—	—	−1.5	V

* V_{CC}=5V, Ta=25°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}=5V, Ta=25°C)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum count frequency	f_{max}	Clock	Q_A	C_L=15pF, R_L=2kΩ	25	35	—	MHz
Propagation delay time	t_{PLH}	Clock	Q_A		—	12	20	ns
	t_{PHL}				—	13	20	
	t_{PLH}	Clock	Q_B, Q_D		—	24	39	
	t_{PHL}				—	26	39	
	t_{PLH}	Clock	Q_C		—	32	54	
	t_{PHL}				—	36	54	
	t_{PHL}	Clear	Any		—	24	39	
	t_{PLH}	Set-to-9	Q_A, Q_D		—	24	39	
	t_{PHL}		Q_B, Q_C		—	20	36	