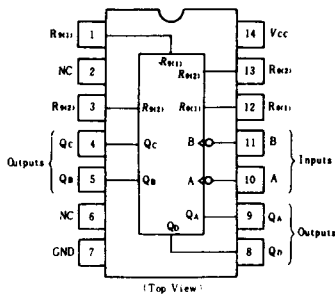


HD74LS290 • Decade Counters

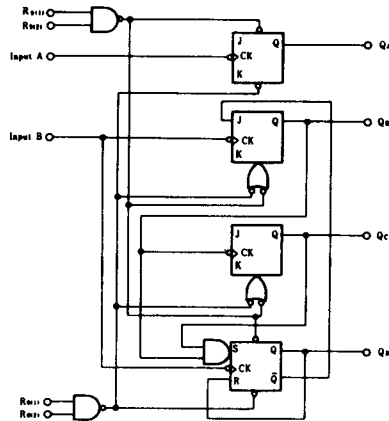
This counter contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and divide-by-five counter.

The HD74LS290 also has gated set-to-nine inputs for use in BCD nine's complement applications. To use the maximum count length of this counter, the B input is connected to the Q_A output. The input count pulses are applied to input A and the outputs are as described in the appropriate function table. A symmetrical divide-by-ten count can be obtained from the HD74LS290 counter by connecting the Q_D output to the A input and applying the input count to the B input which gives a divide-by-ten square wave at output Q_A .

■ PIN ARRANGEMENT



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rated	Unit
Supply voltage	V_{CC}	7.0	V
Input voltage	R Inputs	7.0	V
	A, B Inputs	5.5	V
Operating temperature range	T_{op}	-20 ~ +75	°C
Storage temperature range	T_{stg}	-65 ~ +150	°C

■ FUNCTION TABLE

● Reset/Count

Reset Inputs				Outputs			
$R_{0(1)}$	$R_{0(2)}$	$R_{9(1)}$	$R_{9(2)}$	Q_D	Q_C	Q_B	Q_A
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L	Count			
L	X	L	X	Count			
L	X	X	L	Count			
X	L	L	X	Count			

● 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 Count Sequence (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

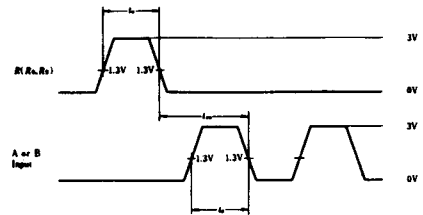
- Notes) 1. Output Q_A is connected to input B for BCD count.
 2. Output Q_D is connected to input A for bi-quinary count.
 3. H: high level, L: low level, X: irrelevant

HD74LS290

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Count frequency	A input	0	—	32	MHz
	B input	0	—	16	
Pulse width	A input	15	—	—	ns
	B input	30	—	—	
	Reset inputs	15	—	—	
Setup time	t_{su}	25	—	—	ns

TIMING DEFINITION



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		
		$I_{OL}=4\text{mA}^{**}$	—	—	0.5			
Input current	Any Reset	I_{IL}	$V_{CC}=5.25\text{V}$, $V_I=0.4\text{V}$	—	—	-0.4	mA	
	A input			—	—	-2.4		
	B input			—	—	-3.2		
	Any Reset	I_{IH}	$V_{CC}=5.25\text{V}$, $V_I=2.7\text{V}$	—	—	20	μA	
	A input			—	—	40		
	B input			—	—	80		
	Any Reset	I_I	$V_{CC}=5.25\text{V}$	$V_I=7\text{V}$	—	—	0.1	mA
	A input			$V_I=5.5\text{V}$	—	—	0.2	
B input	—			—	—	0.4		
Short-circuit output current	I_{OS}	$V_{CC}=5.25\text{V}$	-20	—	-100	mA		
Supply current ***	I_{CC}	$V_{CC}=5.25\text{V}$	—	9	15	mA		
Input clamp voltage	V_{IK}	$V_{CC}=4.75\text{V}$, $I_{IH}=-18\text{mA}$	—	—	-1.5	V		

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

** Q_A output is tested at specified I_{OL} plus the limit value of I_{IL} for the B input. This permits driving the B input while maintaining full fan-out capability.

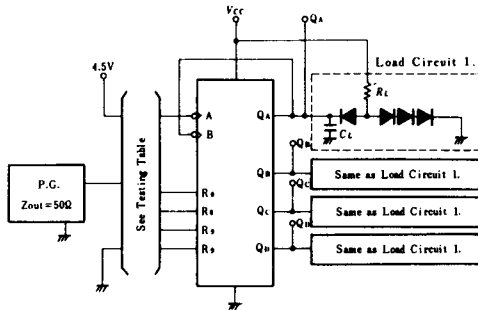
*** I_{CC} is measured with all outputs open, both R_n inputs grounded following momentary connection to 4.5V, and all other inputs grounded.

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	$C_L=15\text{pF}$, $R_L=2\text{k}\Omega$	32	42	—	MHz	
		B	Q_B		16	—	—		
Propagation delay time	t_{PLH}	A	Q_A		—	10	16	ns	
			Q_D		—	12	18		
	t_{PHL}	A	Q_A		—	32	48	ns	
			Q_D		—	34	50		
	t_{PLH}	B	Q_B		—	10	16	ns	
			Q_C		—	14	21		
	t_{PHL}	B	Q_B		—	21	32	ns	
			Q_C		—	23	35		
	t_{PLH}	B	Q_D		Q_D	—	21	32	ns
					Q_C	—	23	35	
	t_{PHL}	Set-to-0	$Q_A \sim Q_D$		$Q_A \sim Q_D$	—	26	40	ns
					Q_B, Q_C	—	20	30	
	t_{PHL}	Set-to-9	Q_B, Q_C	Q_B, Q_C	—	26	40	ns	

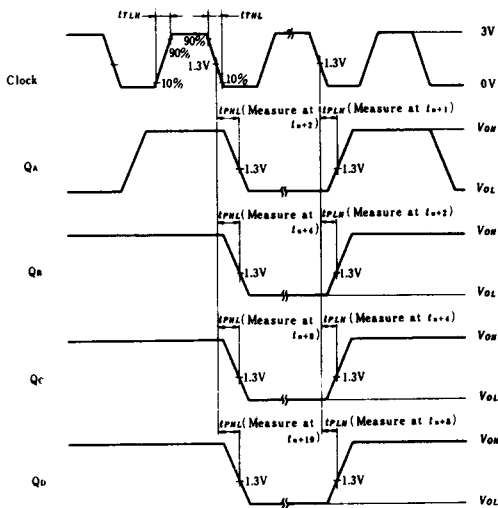
■ TESTING METHOD

1) Test Circuit



- Notes) 1. C_L includes probe and jig capacitance.
2. All diodes are 1S2074 $\text{\textcircled{H}}$.

Waveform 1. f_{max} , t_{PLH} , t_{PHL} (Clock \rightarrow Q)



- Notes) 1. Input pulse: $t_{TLH} \leq 15\text{ns}$, $t_{THL} \leq 5\text{ns}$, $PRR = 1\text{MHz}$, duty cycle = 50% and: for f_{max} , $t_{TLH} = t_{THL} \leq 2.5\text{ns}$.
2. t_n is reference bit time when all outputs are low.

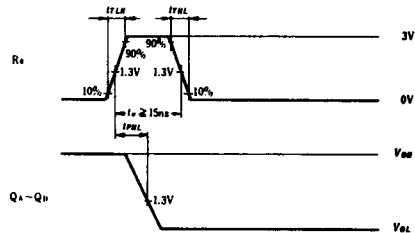
2) Testing Table

Item	From input to output	Inputs				Outputs			
		A	B	R ₀	R ₁	Q _A	Q _B	Q _C	Q _D
f_{max}	A \rightarrow Q	IN	to Q _A	GND	GND	OUT	OUT	OUT	OUT
	B \rightarrow Q	4.5V	IN	GND	GND	—	OUT	OUT	OUT
t_{PLH}	A \rightarrow Q _A	IN	to Q _A	GND	GND	OUT	—	—	—
	B \rightarrow Q _B	4.5V	IN	GND	GND	—	OUT	—	—
t_{PHL}	B \rightarrow Q _C	4.5V	IN	GND	GND	—	—	OUT	—
	B \rightarrow Q _D	4.5V	IN	GND	GND	—	—	—	OUT
	R ₀ \rightarrow Q**	IN*	to Q _A	IN	GND	OUT	OUT	OUT	OUT
	R ₁ \rightarrow Q**	IN*	to Q _A	GND	IN	OUT	OUT	OUT	OUT

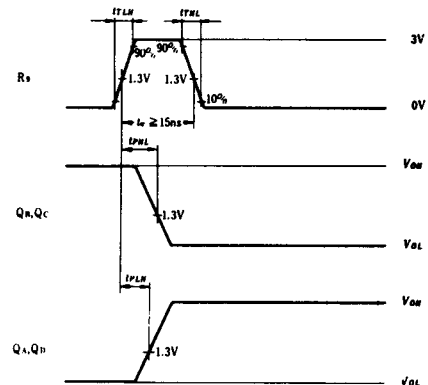
* For initialized

** Measured with each input and unused inputs at 4.5V.

Waveform 2. t_{PHL} (R₀ \rightarrow Q)



Waveform 3. t_{PLH} , t_{PHL} (R₀ \rightarrow Q)

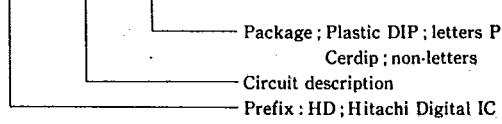


PACKAGING INFORMATIONS

T-90-20

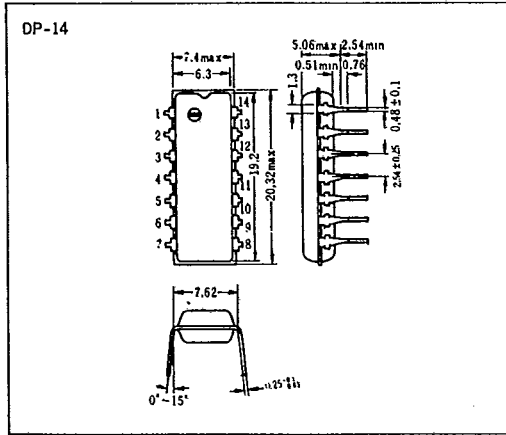
Factory orders for circuits described in this databook should include a three-part type number as explained in the following example.

HD 74LS00 P

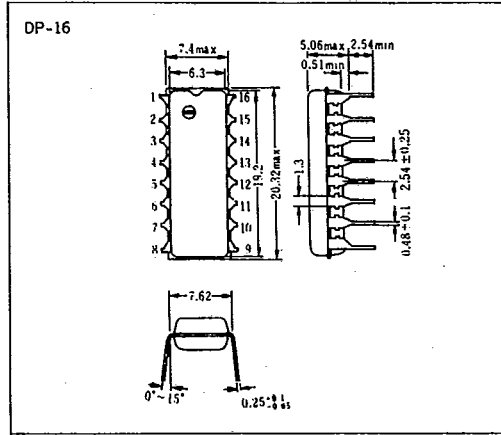


■ Plastic DIP

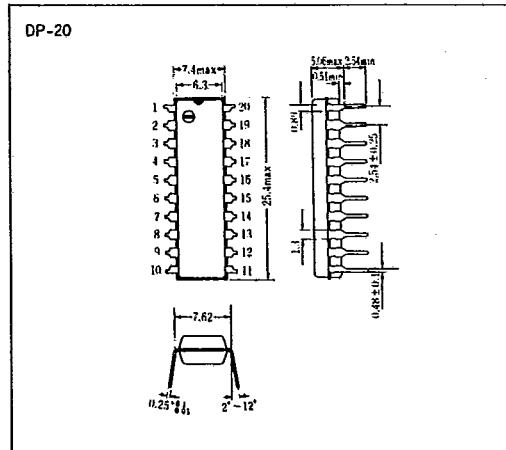
● 14 Pin



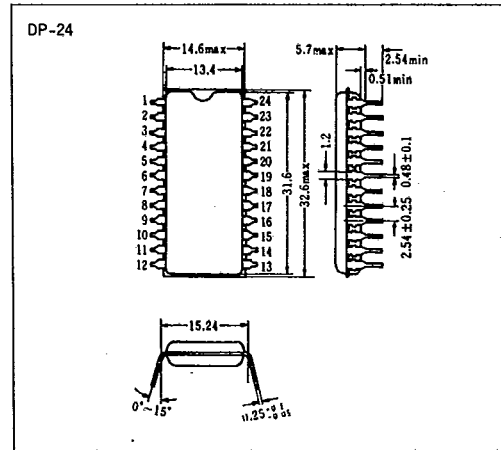
● 16 Pin



● 20 Pin



● 24 Pin

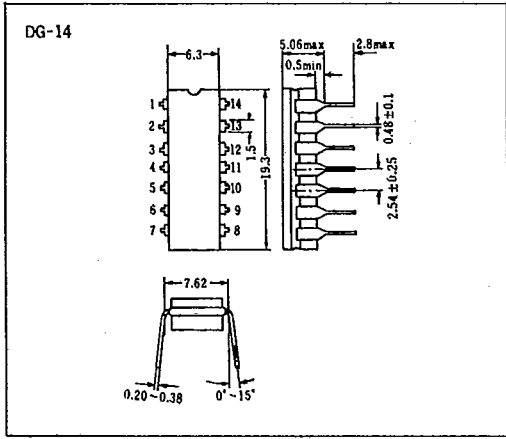


T-90-20

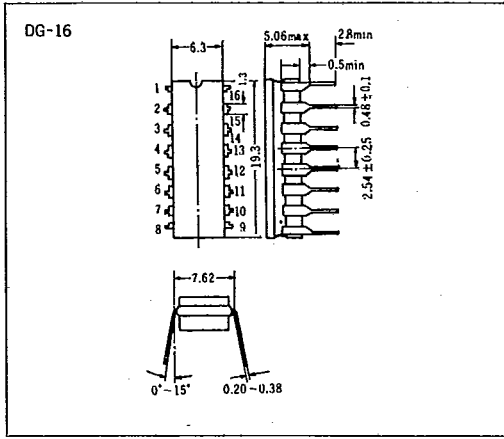
PACKAGING INFORMATIONS

■ Cerdip

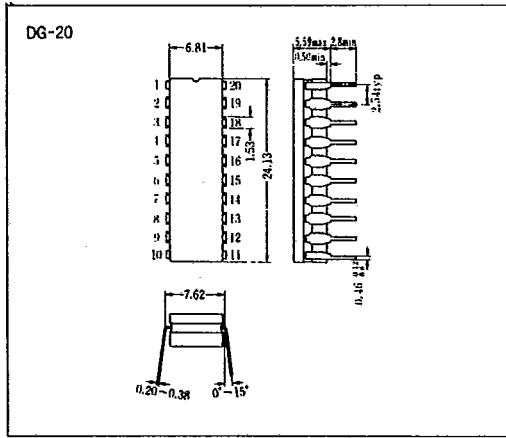
● 14 Pin



● 16 Pin



● 20 Pin



● 24 Pin

