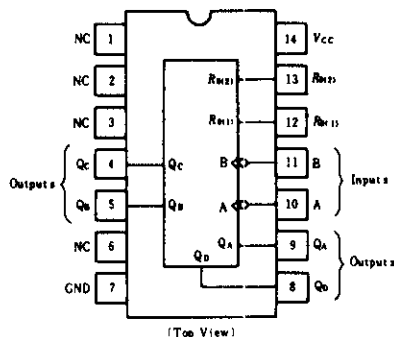


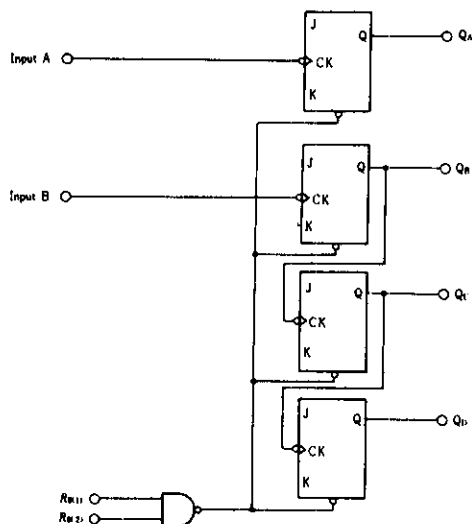
HD74LS293 ● 4-bit Binary Counters

This counter contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and divide-by-eight counter. This counter has a gated zero reset. 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.

■ PIN ARRANGEMENT



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Item		Symbol	Ratings	Unit
Supply voltage		V_{CC}	7.0	V
Input voltage	R_0 Inputs	V_{IN}	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 Input		Outputs			
$R_{0(1)}$	$R_{0(2)}$	Q_D	Q_C	Q_B	Q_A
H	H	L	L	L	L
L	X	Count			
X	L	Count			

● BCD Count Sequence

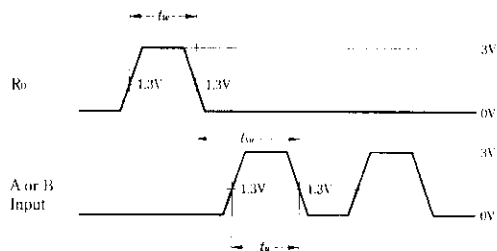
Count	Outputs				Count	Outputs			
	Q_D	Q_C	Q_B	Q_A		Q_D	Q_C	Q_B	Q_A
0	L	L	L	L	8	H	L	L	L
1	L	L	L	H	9	H	L	L	H
2	L	L	H	L	10	H	L	H	L
3	L	L	H	H	11	H	L	H	H
4	L	H	L	L	12	H	H	L	L
5	L	H	L	H	13	H	H	L	H
6	L	H	H	L	14	H	H	H	L
7	L	H	H	H	15	H	H	H	H

- Notes) 1. H; high level, L; low level, X; irrelevant.
2. Output Q_A is connected to input B.

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Output current	I_{OH}	—	—	-400	μA
Output current	I_{OL}	—	—	8	mA
Count frequency	A input	f_{count}	0	—	MHz
	B input		0	—	
Pulse width	A input	t_w	15	—	ns
	B input		30	—	
	Reset inputs		15	—	
Setup time	t_{st}	25	—	—	ns

TIMING DEFINITION



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

Item		Symbol	Test Conditions	min	typ*	max	Unit	
Input voltage		V_{IH}		2.0	—	—	V	
		V_{IL}		—	—	0.8	V	
Output voltage		V_{OH}	$V_{CC}=4.75V, V_{IH}=2V, V_{IL}=0.8V, I_{OH}=-400\mu A$	2.7	—	—	V	
		V_{OL}	$V_{CC}=4.75V, V_{IH}=2V, V_{IL}=0.8V$	$I_{OL}=4mA^{**}$	—	—	0.4	V
				$I_{OL}=8mA^{**}$	—	—	0.5	
Input current	Any Reset	I_{IL}	$V_{CC}=5.25V, V_I=0.4V$	—	—	-0.4	mA	
	A input			—	—	-2.4		
	B input			—	—	-1.6		
	Any Reset	I_{IH}	$V_{CC}=5.25V, V_I=2.7V$	—	—	20	μA	
	A input			—	—	40		
	B input			—	—	40		
	Any Reset	I_I	$V_{CC}=5.25V$	$V_I=7V$	—	—	0.1	mA
	A input			$V_I=5.5V$	—	—	0.2	
	B input				—	—	0.2	
Short-circuit output current		I_{OS}	$V_{CC}=5.25V$	-20	—	-100	mA	
Supply current***		I_{CC}	$V_{CC}=5.25V$	—	9	15	mA	
Input clamp voltage		V_{IK}	$V_{CC}=4.75V, I_{IN}=-18mA$	—	—	-1.5	V	

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

** 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.

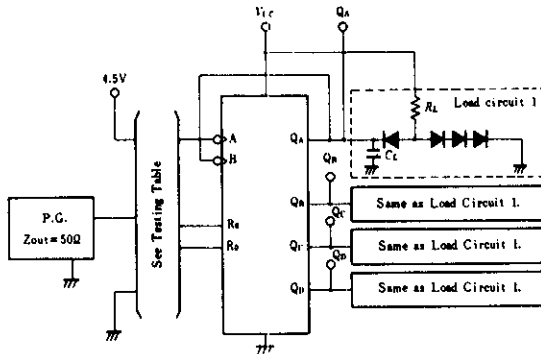
*** I_{CC} is measured with all outputs open, both R_0 inputs grounded following momentary connection to 4.5V, and all other inputs grounded.

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

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum count frequency	f_{max}	A	Q_A	$C_L=15pF, R_L=2k\Omega$	32	42	—	MHz
		B	Q_B		16	—	—	
Propagation delay time	t_{PLH}	A	Q_A		—	10	16	ns
	t_{PHL}				—	12	18	
	t_{PLH}	A	Q_D		—	46	70	ns
	t_{PHL}				—	46	70	
	t_{PLH}	B	Q_B		—	10	16	ns
	t_{PHL}				—	14	21	
	t_{PLH}	B	Q_C		—	21	32	ns
	t_{PHL}				—	23	35	
	t_{PLH}	B	Q_D		—	34	51	ns
	t_{PHL}				—	34	51	
	t_{PHL}	Set-to-0	$Q_A \sim Q_D$		—	26	40	ns

■ TESTING METHOD

1) Test Circuit



- Notes) 1. C_L includes probe and jig capacitance.
2. All diodes are 1S2074 (H).

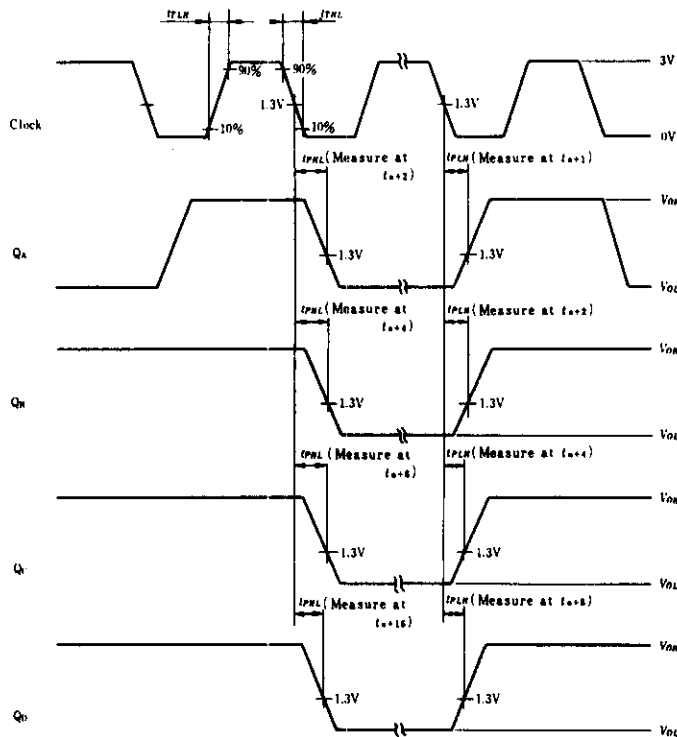
2) Testing Table

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

* For initialized.

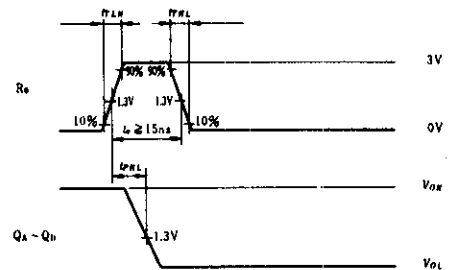
** Measured with each input and unused inputs at 4.5V.

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

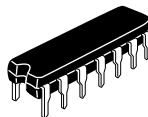
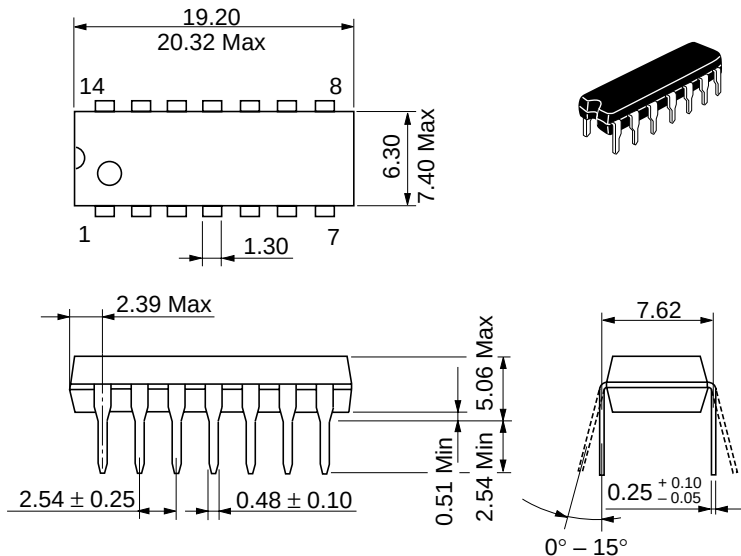


- Notes) 1. Input pulse: $t_{TLH} \leq 15ns$, $t_{THL} \leq 5ns$, $PRR=1MHz$, duty cycle=50% and: for f_{max} , $t_{TLH}=t_{THL} \leq 2.5ns$.
2. t_m is reference bit time when all outputs are low.

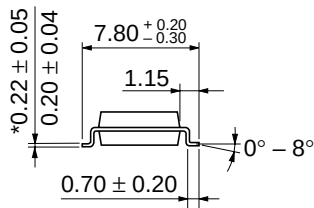
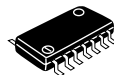
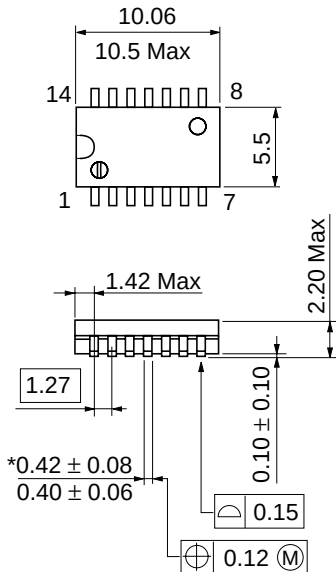
Waveform 2. t_{PHL} (R₀→Q)



Note) $t_{TLH} \leq 15ns$, $t_{THL} \leq 5ns$

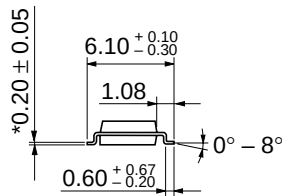
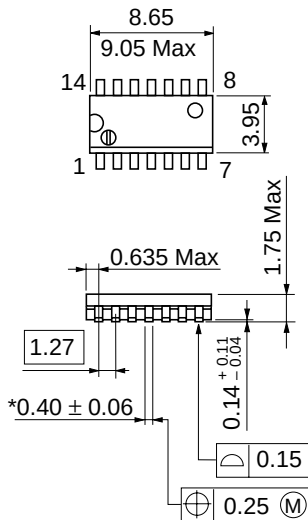


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EIAJ	Conforms
Weight (reference value)	0.97 g



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JEDEC	—
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Weight (reference value)	0.23 g

*Dimension including the plating thickness
Base material dimension



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EIAJ	Conforms
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