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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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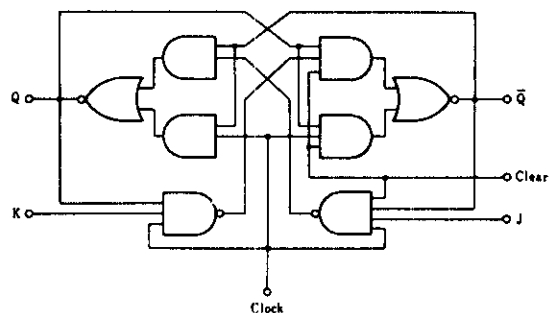
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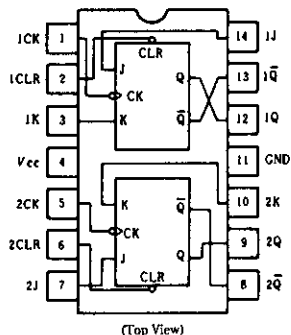
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HD74LS73A • Dual J-K Flip-Flops (with Clear)

■ BLOCK DIAGRAM (1/2)



■ PIN ARRANGEMENT



■ FUNCTION TABLE

Inputs				Outputs	
Clear	Clock	J	K	Q	Q̄
L	X	X	X	L	H
H	↓	L	L	Q ₀	Q̄ ₀
H	↓	H	L	H	L
H	↓	L	H	L	H
H	↓	H	H	Toggle	
H	H	X	X	Q ₀	Q̄ ₀

Notes) H; high level, L; low level, X; irrelevant

↓; transition from high to low level

Q₀; level of Q before the indicated steady-state input conditions were established.

Q̄₀; complement of Q₀ or level of Q before the indicated steady-state input conditions were established.

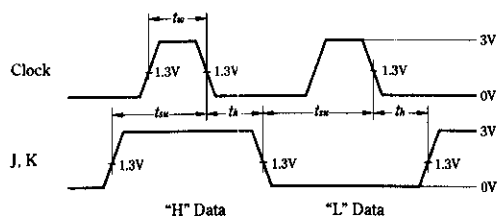
Toggle; each output changes to the complement of its previous level on each active transition indicated by ↓.

■ RECOMMENDED OPERATING CONDITION

Item	Symbol	min	typ	max	Unit
Clock frequency	f_{clock}	0	—	30	MHz
Pulse width	Clock High	20	—	—	ns
	Clear Low	25	—	—	
Setup time	"H" Data	20↓	—	—	ns
	"L" Data	20↓	—	—	
Hold time	t_h	0↓	—	—	ns

Note) ↓; The arrow indicates the falling edge.

■ 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}	$V_{CC}=4.75\text{V}$, $V_{IH}=2\text{V}$	—	—	0.5	V
		$V_{IL}=0.8\text{V}$	—	—	0.4	V
Input current	J, K	I_{IH}	$V_{CC}=5.25\text{V}$, $V_I=2.7\text{V}$	—	20	μA
	Clear			—	60	
	Clock			—	80	
	J, K	I_{IL}	$V_{CC}=5.25\text{V}$, $V_I=0.4\text{V}$	—	-0.4	mA
	Clear			—	0.8	
	Clock			—	-0.8	
	J, K	I_I	$V_{CC}=5.25\text{V}$, $V_I=7\text{V}$	—	0.1	mA
	Clear			—	0.3	
	Clock			—	0.4	
Short-circuit output current	I_{OS}	$V_{CC}=5.25\text{V}$	-20	—	-100	mA
Supply current **	I_{CC}	$V_{CC}=5.25\text{V}$	—	4	6	mA
Input clamp voltage	V_{IK}	$V_{CC}=4.75\text{V}$, $I_{IN}=-18\text{mA}$	—	—	-1.5	V

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

** With all outputs open, I_{CC} is measured with the Q and $\bar{Q}$ outputs high in turn. At the time of measurement, the clock input is grounded.

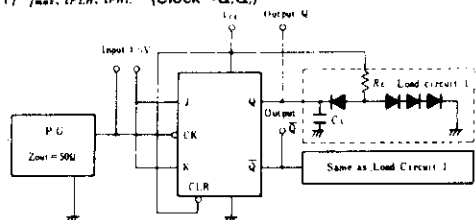
SWITCHING CHARACTERISTICS ($V_{CC}=5\text{V}$, $T_a=25^\circ\text{C}$)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum clock frequency	f_{max}				30	45	—	MHz
Propagation delay time	t_{PLH}	Clear	Q, $\bar{Q}$	$C_L=15\text{pF}$, $R_L=2\text{k}\Omega$	—	15	20	ns
	t_{PHL}	Clock			—	15	20	ns

TESTING METHOD

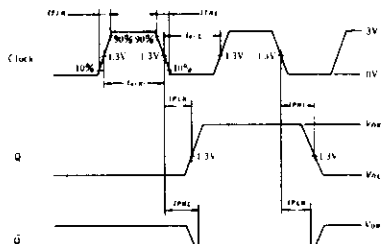
1) Test Circuit

1.1) f_{max} , t_{PLH} , t_{PHL} (Clock $\rightarrow$ Q, $\bar{Q}$)



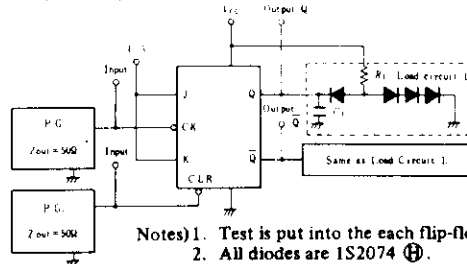
- Notes) 1. Test is put into the each flip flop
2. All diodes are 1S2074 $\oplus$.
3. C_L includes probe and jig capacitance.

Waveform



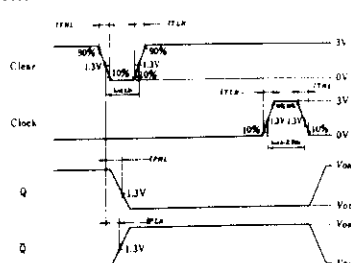
Note) Clock input pulse; $t_{THL} \leq 15\text{ns}$,
 $t_{THL} \leq 6\text{ns}$, $PRR=1\text{MHz}$, duty
cycle=50% and; for f_{max} ,
 $t_{THL}=t_{THL} \leq 2.5\text{ns}$.

1.2) t_{PHL} (Clear $\rightarrow$ Q), t_{PLH} (Clear $\rightarrow$ $\bar{Q}$)

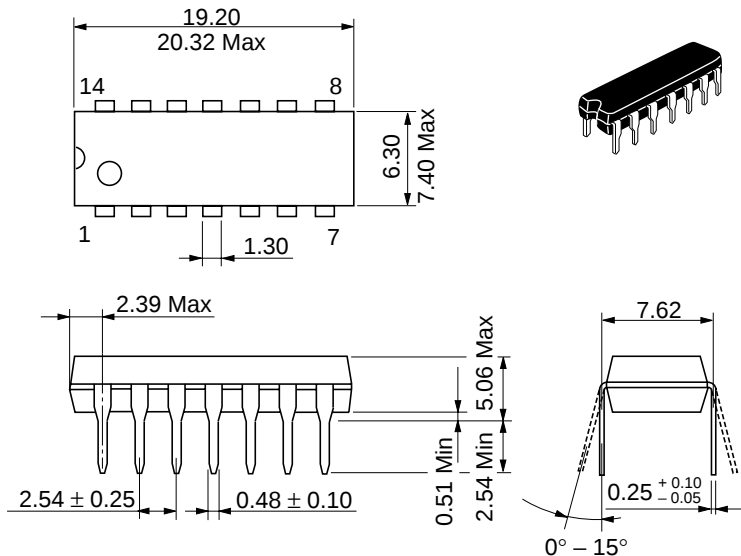


- Notes) 1. Test is put into the each flip-flop
2. All diodes are 1S2074 $\oplus$.
3. C_L includes probe and jig capacitance.

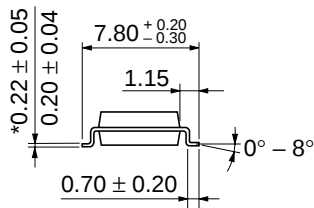
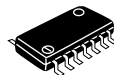
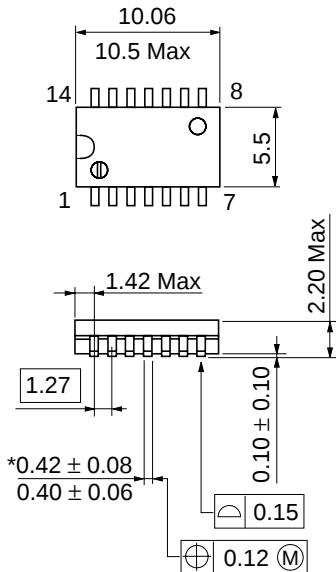
Waveform



Note) Clear and clock input pulse;
 $t_{THL} \leq 15\text{ns}$, $t_{THL} \leq 6\text{ns}$,
 $PRR=1\text{MHz}$

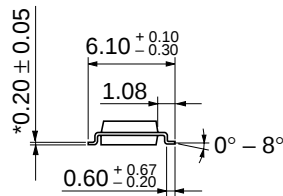
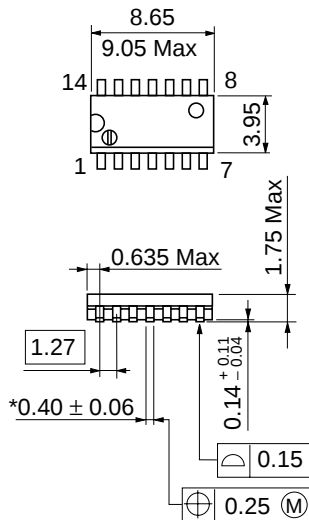


Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g



Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

*Dimension including the plating thickness
Base material dimension



Hitachi Code	FP-14DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.13 g

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