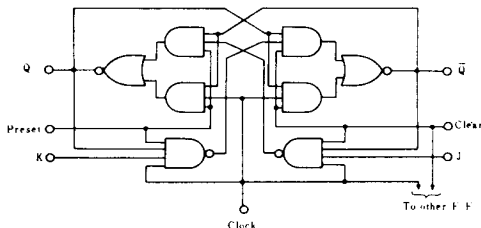
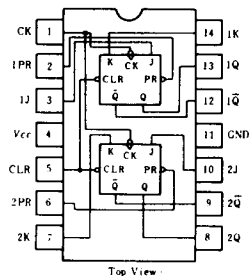


HD74LS78A ●Dual J-K Flip-Flops (with Preset, Common Clear, and Common Clock)

■BLOCK DIAGRAM(1/2)



■PIN ARRANGEMENT

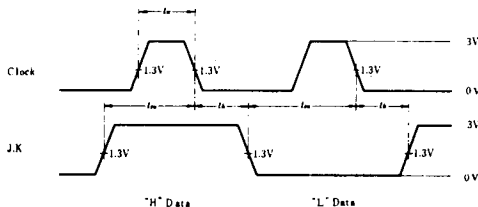


■RECOMMENDED OPERATING CONDITIONS

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

Note) ↓: The arrow indicates the falling edge.

■TIMING METHOD



■FUNCTION TABLE

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

*; This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

■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}	$V_{CC} = 4.75\text{V}, V_{IH} = 2.7\text{V}, V_{IL} = 0.8\text{V}, I_{OH} = -400\mu\text{A}$	2.7	—	—	V
	V_{OL}	$V_{CC} = 4.75\text{V}, V_{IH} = 2\text{V}, V_{IL} = 0.8\text{V}, I_{OL} = 8\text{mA}$	—	—	0.5	V
Input current	J, K		—	—	20	μA
	Clear		—	—	120	
	Preset		—	—	60	
	Clock		—	—	160	
	J, K		—	—	-0.4	mA
	Clear		—	—	-1.6	
	Preset		—	—	-0.8	
	Clock		—	—	-1.6	
	J, K		—	—	0.1	mA
	Clear		—	—	0.6	
	Preset		—	—	0.3	
	Clock		—	—	0.8	
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

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

** I_{IL} should not be measured when preset and clear inputs are low at same time.

*** With all outputs open, I_{CC} is measured with the Q and Q̄ outputs high in turn.

At the time of measurement, the clock input is grounded.



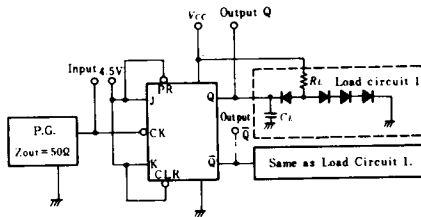
■ SWITCHING CHARACTERISTICS ($V_{CC}=5V$, $T_a=25^\circ C$)

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

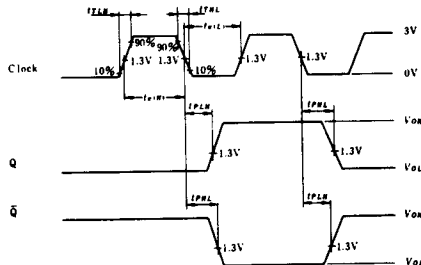
■ TESTING METHOD

1) Test Circuit

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

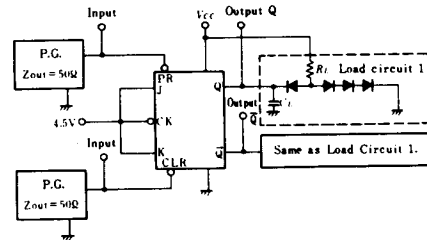


- Notes) 1. Test is put into the each flip-flop
2. All diodes are 1S2074 ④.
3. C_L includes probe and jig capacitance.

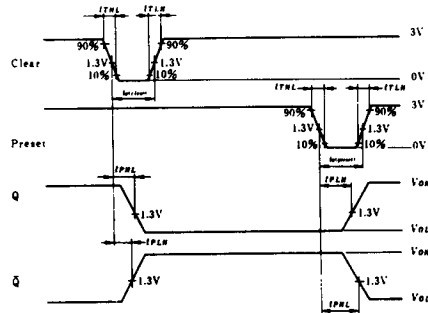


Note) Clock input pulse; $t_{TLH} \leq 15ns$, $t_{THL} \leq 6ns$,
 $PRR=1MHz$, duty cycle=30% and: for f_{max} ,
 $t_{TLH}=t_{THL} \leq 2.5ns$.

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



- Notes) 1. Test is put into the each flip-flop
2. All diodes are 1S2074 ④.
3. C_L includes probe and jig capacitance.



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



Hitachi America Ltd. • 2210 O'Toole Ave. • San Jose, CA 95131 • (408) 435-8300