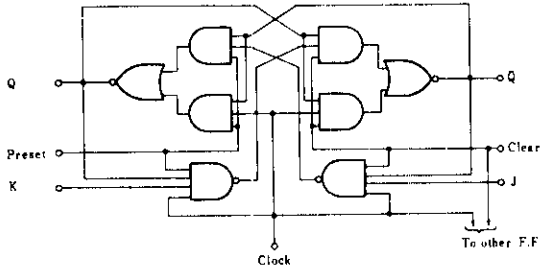
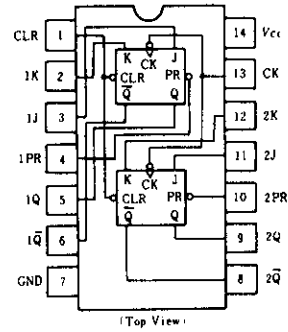


# HD74LS114 • Dual J-K Negative-edge-triggered Flip-Flops (with Preset, Common Clear and Common Clock)

## ■ 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 Clear 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.

## ■ FUNCTION TABLE

Inputs					Outputs	
Preset	Clear	Clock	J	K	Q	$\bar{Q}$
L	H	×	×	×	H	L
H	L	×	×	×	L	H
L	L	×	×	×	H*	H*
H	H	↓	L	L	$Q_0$	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	Toggle	
H	H	H	×	×	$Q_0$	$\bar{Q}_0$

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

↓; transition from high to low level

$Q_0$ ; level of Q before the indicated steady-state input conditions were established.

$\bar{Q}_0$ ; complement of  $Q_0$  or level of  $\bar{Q}$  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 ↓.

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

# HD74LS114

## ■ 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	
	$V_{OL}$	$V_{CC} = 4.75\text{V}$ , $V_{IL} = 0.8\text{V}$ , $I_{OL} = 8\text{mA}$	—	—	0.5	V	
		$V_{IH} = 2\text{V}$ , $I_{OL} = 4\text{mA}$	—	—	0.4		
Input current	J, K	$I_{IH}$	$V_{CC} = 5.25\text{V}$ , $V_i = 2.7\text{V}$	—	—	20	$\mu\text{A}$
	Clear			—	—	120	
	Preset			—	—	60	
	Clock			—	—	160	
	J, K	$I_{IL}^{**}$	$V_{CC} = 5.25\text{V}$ , $V_i = 0.4\text{V}$	—	—	-0.4	mA
	Clear			—	—	-1.6	
	Preset			—	—	-0.8	
	Clock			—	—	-1.6	
	J, K	$I_i$	$V_{CC} = 5.25\text{V}$ , $V_i = 7\text{V}$	—	—	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	8	mA	
Input clamp voltage	$V_{IK}$	$V_{CC} = 4.75\text{V}$ , $I_{IS} = -18\text{mA}$	—	—	-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  $\bar{Q}$  output high in turn. At the time of measurement, the clock input is grounded.

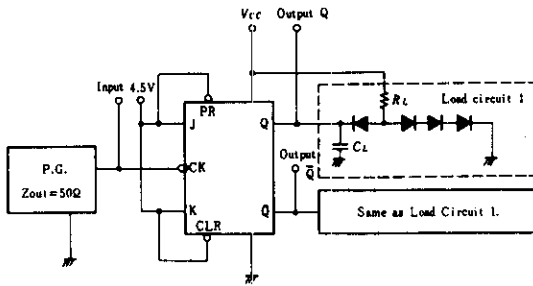
## ■ SWITCHING CHARACTERISTICS ( $V_{CC} = 5\text{V}$ , $T_a = 25^\circ\text{C}$ )

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum clock frequency	$f_{max}$			$C_L = 15\text{pF}$ , $R_L = 2\text{k}\Omega$	30	45	—	MHz
Propagation delay time	$t_{PLH}$	Clear Preset	Q, $\bar{Q}$		—	11	20	ns
	$t_{PHL}$	Clock			—	15	30	ns

## TESTING METHOD

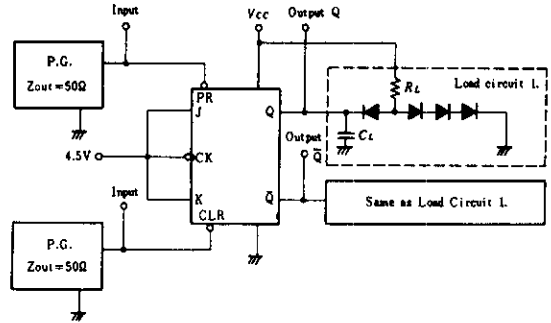
### 1) Test Circuit

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



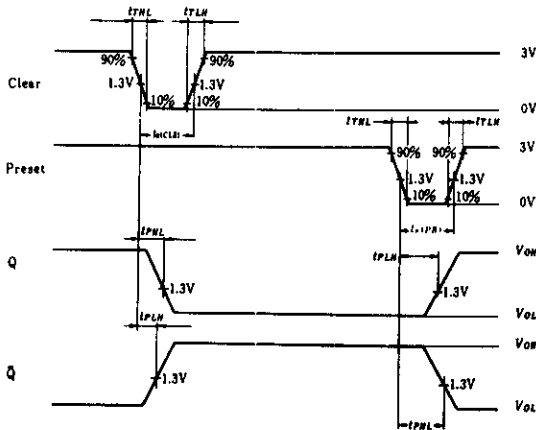
- Notes)
1. Test is put into the each flip-flop.
  2. All diodes are 1S2074 (Ⓜ).
  3.  $C_L$  includes probe and jig capacitance.

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



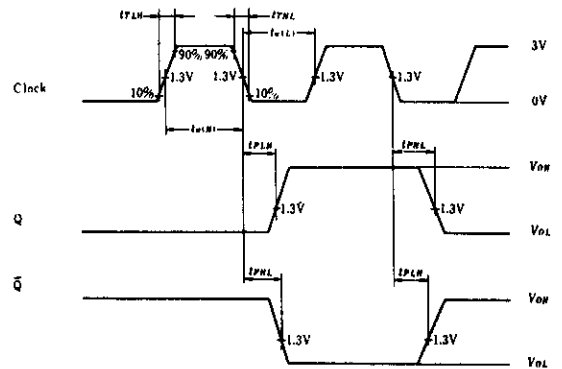
- Notes)
1. Test is put into the each flip-flop.
  2. All diodes are 1S2074 (Ⓜ).
  3.  $C_L$  includes probe and jig capacitance.

### Waveform



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

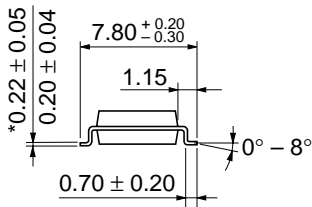
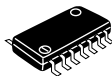
### Waveform



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

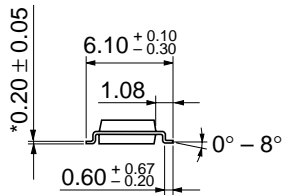


Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g



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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