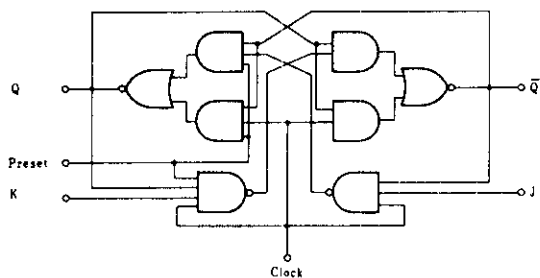
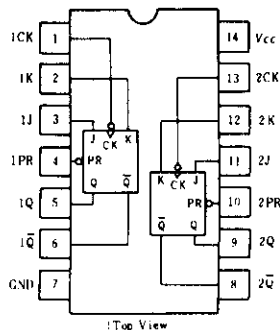


# HD74LS113 ● Dual J-K Negative-edge-triggered Flip-Flops (with Preset)

## ■ BLOCK DIAGRAM (1/2)



## ■ PIN ARRANGEMENT



## ■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Clock frequency	$f_{clock}$	0	—	30	MHz
Pulse width	CK	20	—	—	ns
	PR	25	—	—	
Setup time	"H" level	20↓	—	—	ns
	"L" level	20↓	—	—	
Hold time	$t_h$	0↓	—	—	ns

Note) ↓; The arrow indicates the falling edge.

## ■ FUNCTION TABLE

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

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 ↓.

## ■ 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
	$V_{OL}$	$V_{CC}=4.75\text{V}, V_{IL}=0.8\text{V}, I_{OL}=4\text{mA}$ $V_{IH}=2\text{V}, I_{OL}=8\text{mA}$	—	—	0.4 0.5	V
Input current	J, K	$V_{CC}=5.25\text{V}, V_I=2.7\text{V}$	—	—	20	$\mu\text{A}$
	Preset		—	—	60	
	Clock		—	—	80	
	J, K	$V_{CC}=5.25\text{V}, V_I=0.4\text{V}$	—	—	-0.4	mA
	Preset		—	—	-0.8	
	Clock		—	—	-0.8	
J, K	$V_{CC}=5.25\text{V}, V_I=7\text{V}$	—	—	0.1	mA	
Preset		—	—	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	8	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.

# HD74LS113

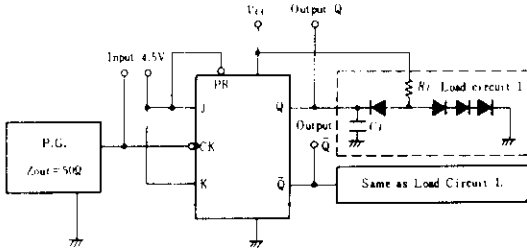
## SWITCHING CHARACTERISTICS ( $V_{CC}=5V$ , $T_a=25^\circ C$ )

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

## TESTING METHOD

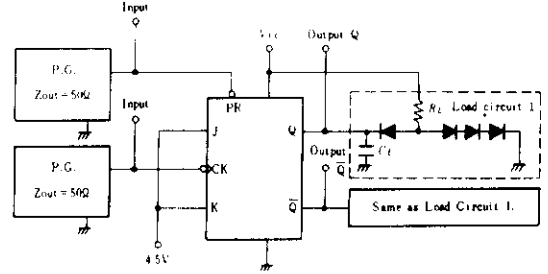
### 1.1) Test Circuit

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



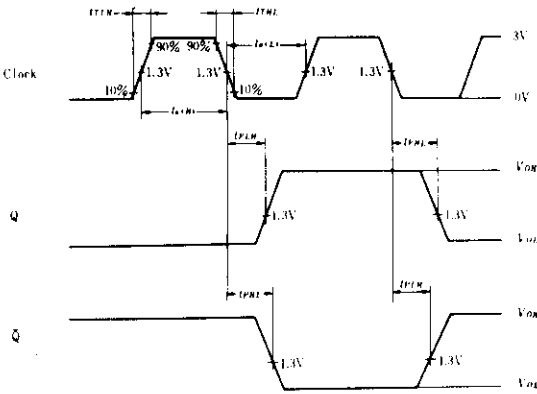
- Notes) 1. Test is put into the each flip-flop.  
 2. All diodes are 1S2074  $\oplus$ .  
 3.  $C_L$  includes probe and jig capacitance.

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

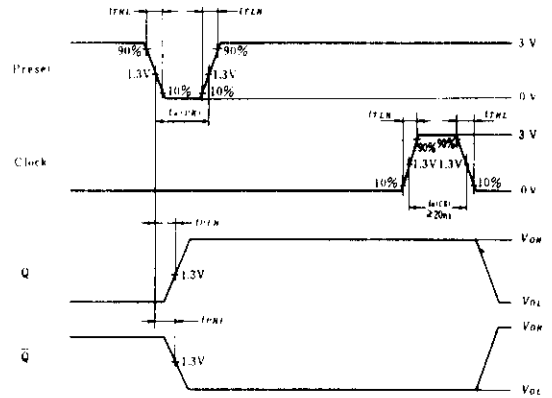


- Notes) 1. Test is put into the each flip-flop.  
 2. All diodes are 1S2074  $\oplus$ .  
 3.  $C_L$  includes probe and jig capacitance.

## Waveform



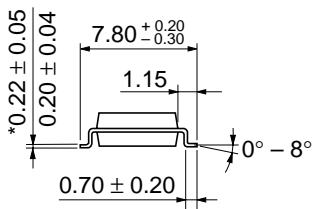
Note) Clock input pulse;  $t_{TLH} \leq 15ns$ ,  $t_{THL} \leq 6ns$ ,  $PRR=1MHz$ , duty cycle=50% and; for  $f_{max}$ ,  $t_{TLH}=t_{THL} \leq 2.5ns$ .



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



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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