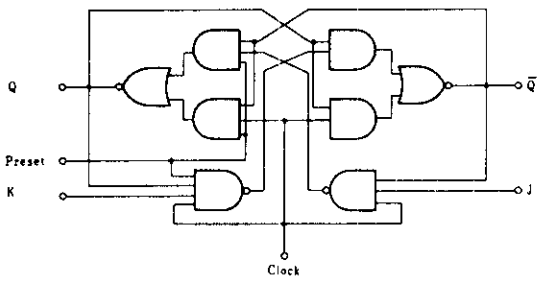
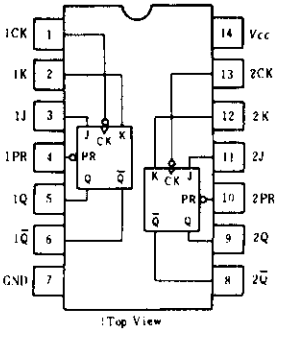
HD74LS113 ● Dual J-K Negative-edge-triggered Flip-Flops (with Preset)

■BLOCK DIAGRAM(½)



■PIN ARRANGEMENT



■RECOMMENDED OPERATING CONDITIONS

Item		Symbol	min	typ	max	Unit
Clock frequency		f_{clock}	0	–	30	MHz
Pulse width	CK	t_w	20	–	–	ns
	PR		25	–	–	
Setup time	"H"level	t_{su}	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	×	×	×	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	×	×	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 ($Ta=-20\sim+75°C$)

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}	$V_{CC}=4.75V$, $V_{IL}=0.8V$,	$I_{OL}=4mA$	–	–	0.4	V
			$V_{IH}=2V$	$I_{OL}=8mA$	–	–	0.5	
Input current	J, K	I_{IH}	$V_{CC}=5.25V$, $V_I=2.7V$		–	–	20	μA
	Preset				–	–	60	
	Clock				–	–	80	
	J, K	I_{IL}	$V_{CC}=5.25V$, $V_I=0.4V$		–	–	−0.4	mA
	Preset				–	–	−0.8	
	Clock				–	–	−0.8	
	J, K	I_I	$V_{CC}=5.25V$, $V_I=7V$		–	–	0.1	mA
	Preset				–	–	0.3	
	Clock				–	–	0.4	
Short-circuit output current		I_{OS}	$V_{CC}=5.25V$		−20	–	−100	mA
Supply current **		I_{CC}	$V_{CC}=5.25V$		–	4	8	mA
Input clamp voltage		V_{IK}	$V_{CC}=4.75V$, $I_{IN}=-18mA$		–	–	−1.5	V

* $V_{CC}=5V$, $Ta=25°C$
** 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.

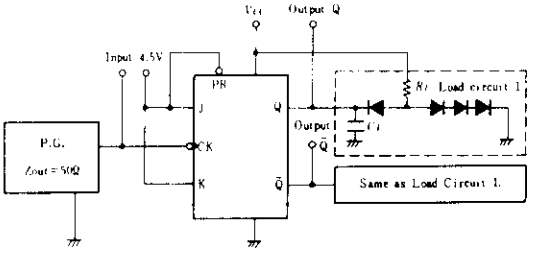
■SWITCHING CHARACTERISTICS (V_{CC}=5V, Ta=25℃)

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

■TESTING METHOD

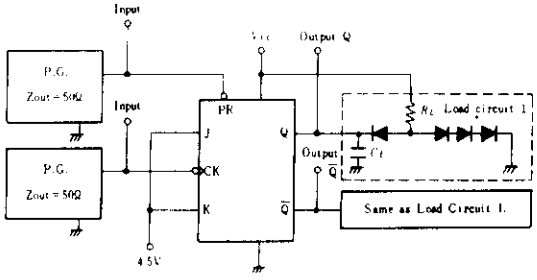
1.1) Test Circuit

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



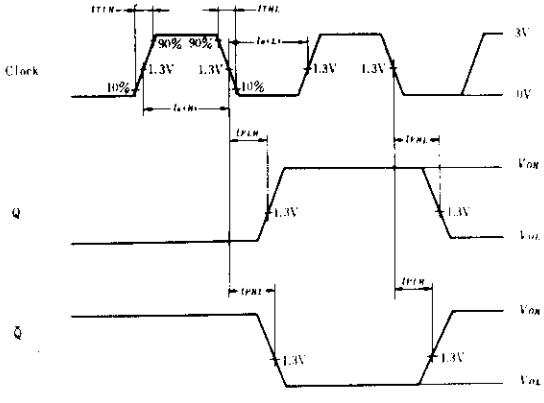
Notes) 1. Test is put into the each flip-flop.
2. All diodes are 1S2074 Ⓗ.
3. C_L includes probe and jig capacitance.

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

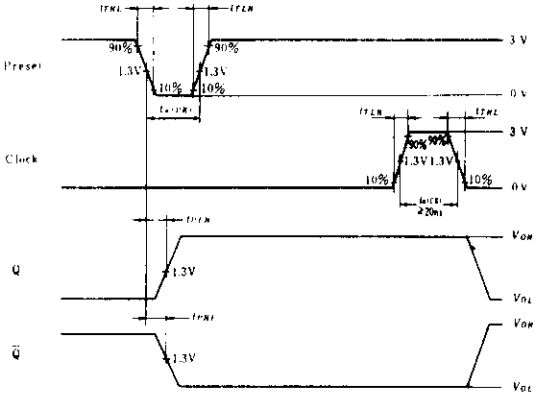


Notes) 1. Test is put into the each flip-flop.
2. All diodes are 1S2074 Ⓗ.
3. C_L includes probe and jig capacitance.

Waveform

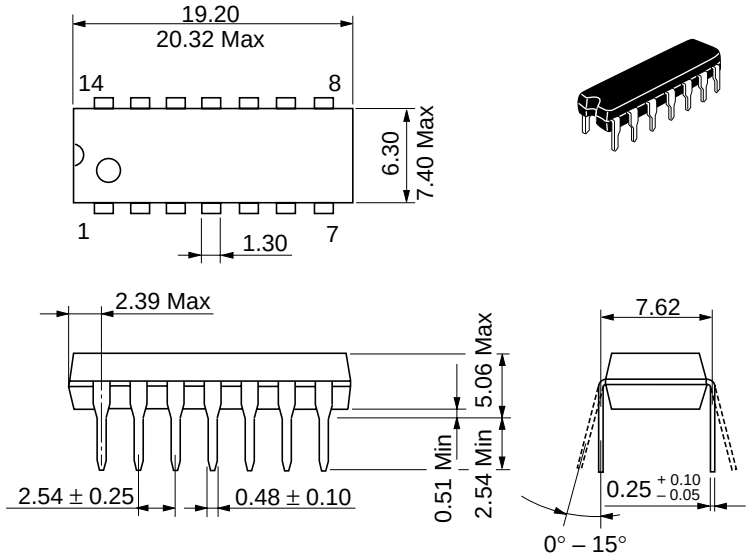


Note) Clock input pulse; t_{TLH}≦15ns, t_{THL}≦6ns, PRR=1MHz, duty cycle=50% and: for f_{max}, t_{TLH}=t_{THL}≦2.5ns.



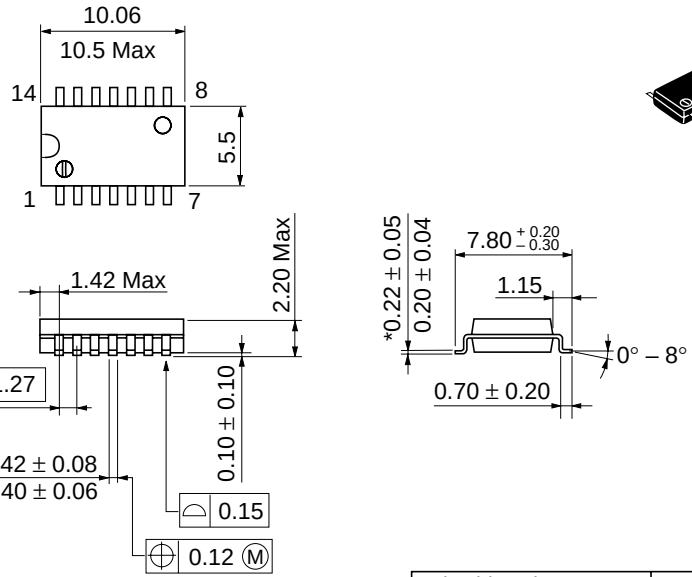
Note) Preset and clock input pulse: t_{TLH}≦15ns, t_{THL}≦6ns, PRR=1MHz

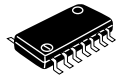
Unit: mm



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

Unit: mm

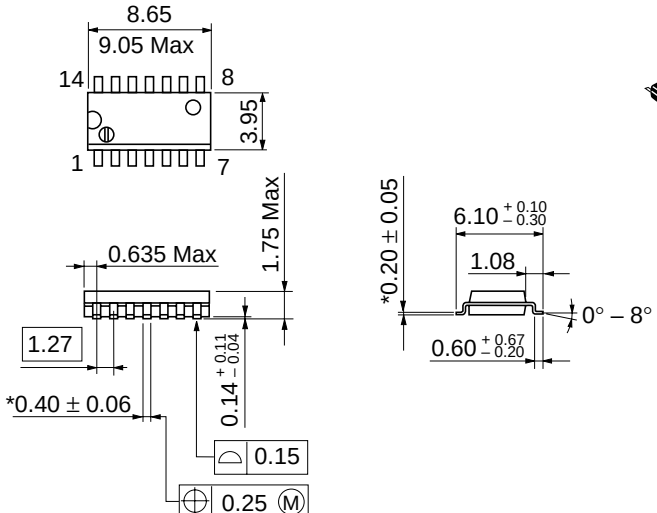




Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

*Dimension including the plating thickness
Base material dimension

Unit: mm



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

*Pd plating

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HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building. No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX