
HD74LVC74

Dual D-type Flip Flops with Preset and Clear

HITACHI

ADE-205-066C(Z)

Rev.3

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Description

The HD74LVC74 has independent data, preset, clear, and clock inputs Q and Q outputs in a 14 pin package. The logic level present at the data input is transferred to the output during the positive going transition of the clock pulse. Preset and clear are independent of the clock and accomplished by a low level at the appropriate input. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V to }5.5\text{ V})$
- Typical V_{OL} ground bounce $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V}, T_a = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V}, T_a = 25^\circ\text{C})$
- High output current $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$

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Function Table

Inputs				Outputs	
PR	CLR	CK	D	Q	\bar{Q}
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H ¹	H ¹
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q ₀	\bar{Q} ₀
H	H	H	X	Q ₀	\bar{Q} ₀
H	H	↓	X	Q ₀	\bar{Q} ₀

H : High level

L : Low level

X : Immaterial

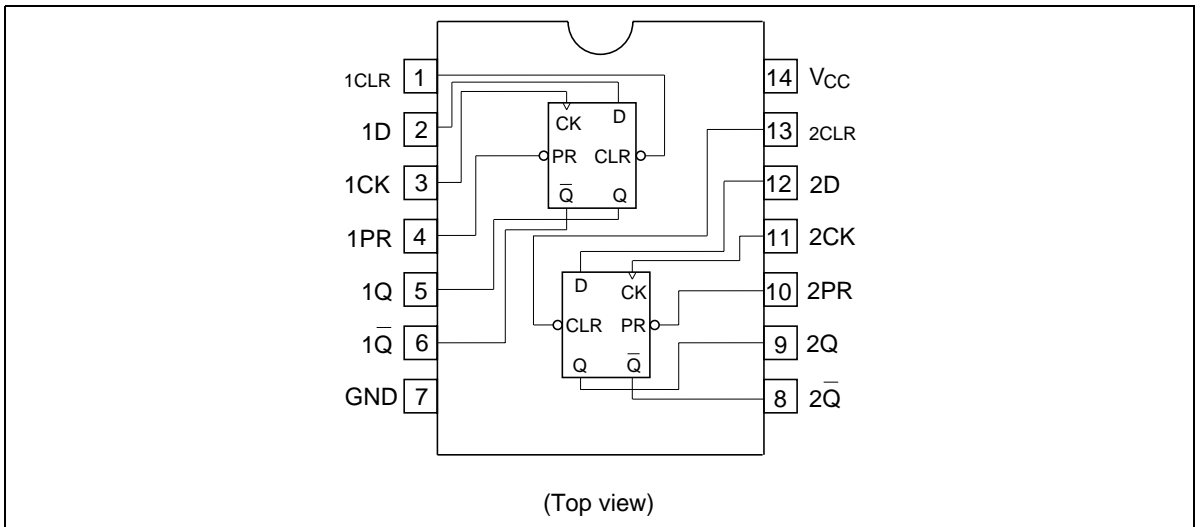
↓ : High to Low transition

↑ : Low to high transition

Q₀: Level to Q before the indicated steady input conditions were established.

Note: 1. Q and \bar{Q} will remain high as long as preset and clear are low, but Q and \bar{Q} are unpredictable, if preset and clear go high simultaneously.

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	-0.5 to 6.0	V	
Input diode current	I_{IK}	-50	mA	$V_I = -0.5\text{ V}$
Input voltage	V_I	-0.5 to 6.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5\text{ V}$
		50	mA	$V_O = V_{CC} + 0.5\text{ V}$
Output voltage	V_O	-0.5 to V_{CC} +0.5	V	
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	T_{stg}	-65 to +150	$^{\circ}\text{C}$	

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	1.5 to 5.5	V	Data retention
		2.0 to 5.5	V	At operation
Input / output voltage	V_I	0 to 5.5	V	PR, CLR, CK, D
	V_O	0 to V_{CC}	V	Q, \bar{Q}
Operating temperature	T_a	-40 to 85	$^{\circ}\text{C}$	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 ^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	I_{OL}	12	mA	$V_{CC} = 2.7\text{ V}$
		24 ^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
Input rise / fall time ^{*1}	t_r, t_f	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle $\leq 50\%$

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Electrical Characteristics

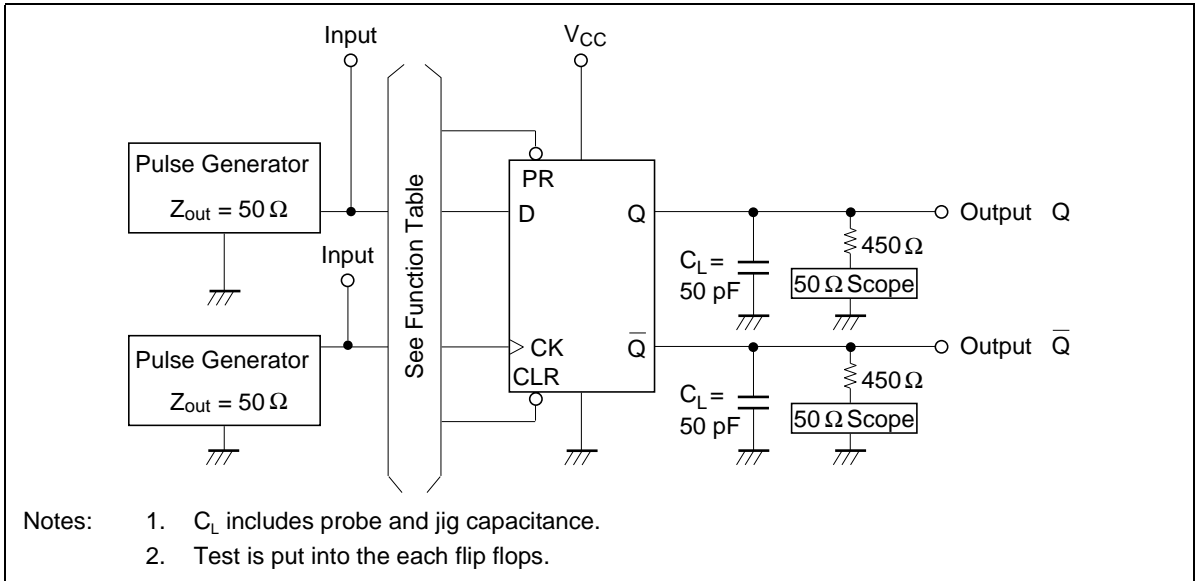
Item	Symbol	V_{CC} (V)	$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	Test Conditions
			Min	Max		
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	$V_{CC} \times 0.7$	—	V	
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	$V_{CC} \times 0.3$	V	
Output voltage	V_{OH}	2.7 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100 \mu\text{A}$
		2.7	2.2	—	V	$I_{OH} = -12 \text{ mA}$
		3.0	2.4	—	V	
		3.0	2.0	—	V	$I_{OH} = -24 \text{ mA}$
	V_{OL}	4.5	3.8	—	V	
		2.7 to 5.5	—	0.2	V	$I_{OL} = 100 \mu\text{A}$
		2.7	—	0.4	V	$I_{OL} = 12 \text{ mA}$
		3.0	—	0.55	V	$I_{OL} = 24 \text{ mA}$
	4.5	—	0.55	V		
Input current	I_{IN}	0 to 5.5	—	± 5.0	μA	$V_{IN} = 5.5 \text{ V or GND}$
Quiescent supply current	I_{CC}	5.5	—	20	μA	$V_{IN} = V_{CC} \text{ or GND}$
	ΔI_{CC}	3.0 to 3.6	—	500	μA	$V_{IN} = \text{one input at } (V_{CC} - 0.6)\text{V},$ other inputs at $V_{CC} \text{ or GND}$

Switching Characteristics

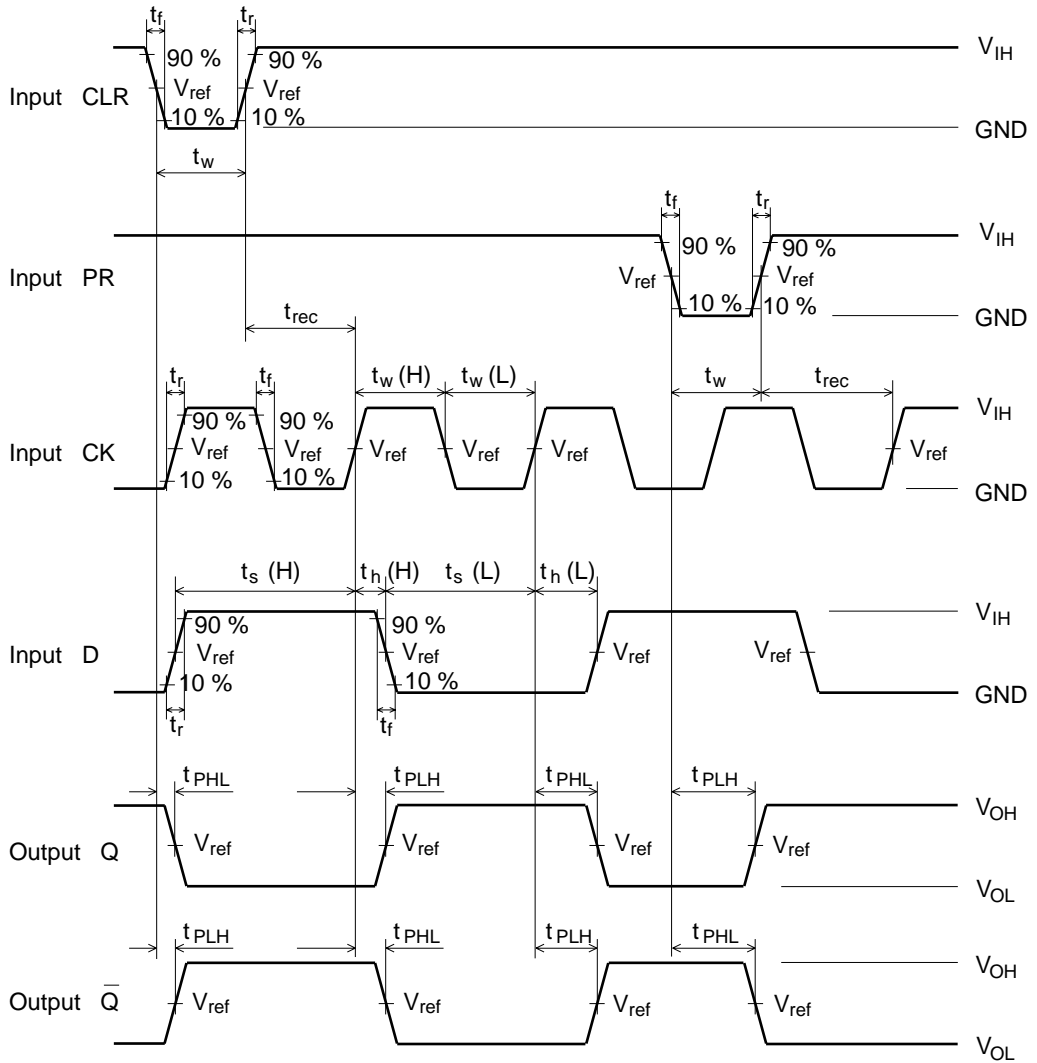
Item	Symbol	V_{CC} (V)	$T_a = -40$ to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Maximum clock frequency	f_{\max}	2.7	150.0	—	—	MHz		
		3.3 ± 0.3	150.0	—	—	MHz		
		5.0 ± 0.5	150.0	—	—	MHz		
Propagation delay time	t_{PLH}	2.7	—	6.0	9.0	ns	CLK	Q, \bar{Q}
		3.3 ± 0.3	1.5	5.0	8.0	ns		
		5.0 ± 0.5	—	4.0	6.5	ns		
	t_{PHL}	2.7	—	6.5	9.0	ns	PR or CLR	Q, \bar{Q}
		3.3 ± 0.3	1.5	5.0	8.0	ns		
		5.0 ± 0.5	—	4.0	6.5	ns		
Setup time	t_{su}	2.7	4.0	—	—	ns		
		3.3 ± 0.3	3.0	—	—	ns		
		5.0 ± 0.5	3.0	—	—	ns		
Hold time	t_h	2.7	2.0	—	—	ns		
		3.3 ± 0.3	2.0	—	—	ns		
		5.0 ± 0.5	2.0	—	—	ns		
Pulse width	t_w	2.7	4.0	—	—	ns	CK	
		3.3 ± 0.3	4.0	—	—	ns		
		5.0 ± 0.5	4.0	—	—	ns		
		2.7	6.0	—	—	ns	PR or CLR	
		3.3 ± 0.3	5.0	—	—	ns		
		5.0 ± 0.5	4.0	—	—	ns		
Recovery time	t_{rec}	2.7	3.0	—	—	ns		
		3.3 ± 0.3	2.0	—	—	ns		
		5.0 ± 0.5	2.0	—	—	ns		
Input capacitance	C_{IN}	2.7	—	3.0	—	pF		
Output capacitance	C_O	2.7	—	15.0	—	pF		

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Test Circuit



Waveforms



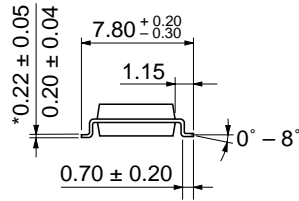
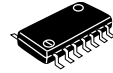
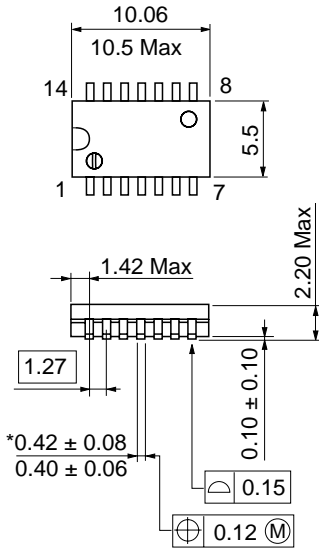
Symbol	V _{CC} = 2.7 V, 3.3±0.3 V	V _{CC} = 5.0±0.5 V
V _{IH}	2.7 V	V _{CC}
V _{ref}	1.5 V	50%V _{CC}

- Notes:
1. t_r = 2.5 ns, t_f = 2.5 ns
 2. Clock pulse input waveform : PRR = 10 MHz, duty cycle 50%
 3. Data input waveform : PRR = 5 MHz, duty cycle 50%

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Package Dimensions

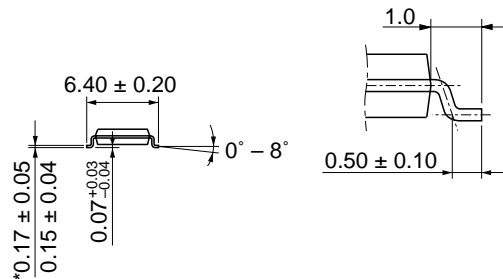
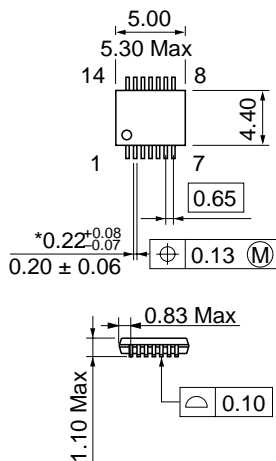
Unit: mm



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

*Dimension including the plating thickness
Base material dimension

Unit: mm



Hitachi Code	TTP-14D
JEDEC	—
EIAJ	—
Mass (reference value)	0.05 g

*Dimension including the plating thickness
Base material dimension

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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

URL NorthAmerica : <http://semiconductor.hitachi.com/>
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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) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : <http://www.hitachi.com.sg>

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
Telex : 23222 HAS-TP
URL : <http://www.hitachi.com.tw>

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
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