
HD74LVC16374A

16-bit D-type Flip Flops with 3-state Outputs

HITACHI

ADE-205-122B(Z)
3rd Edition
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Description

The HD74LVC16374A has sixteen edge trigger D type flip flops with three state outputs in a 48 pin package. Data at the D inputs meeting set up requirements, are transferred to the Q outputs on positive going transitions of the clock input. When the latch enable goes low, data at the D inputs will be retained at the outputs until latch enable returns high again. When a high logic level is applied to the output control input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements. 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 $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- All outputs $V_{OUT} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V or output off state})$
- 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			Output Q
\bar{G}	CK	D	
H	X	X	Z
L	↑	L	L
L	↑	H	H
L	L	X	Q ₀

H: High level

L: Low level

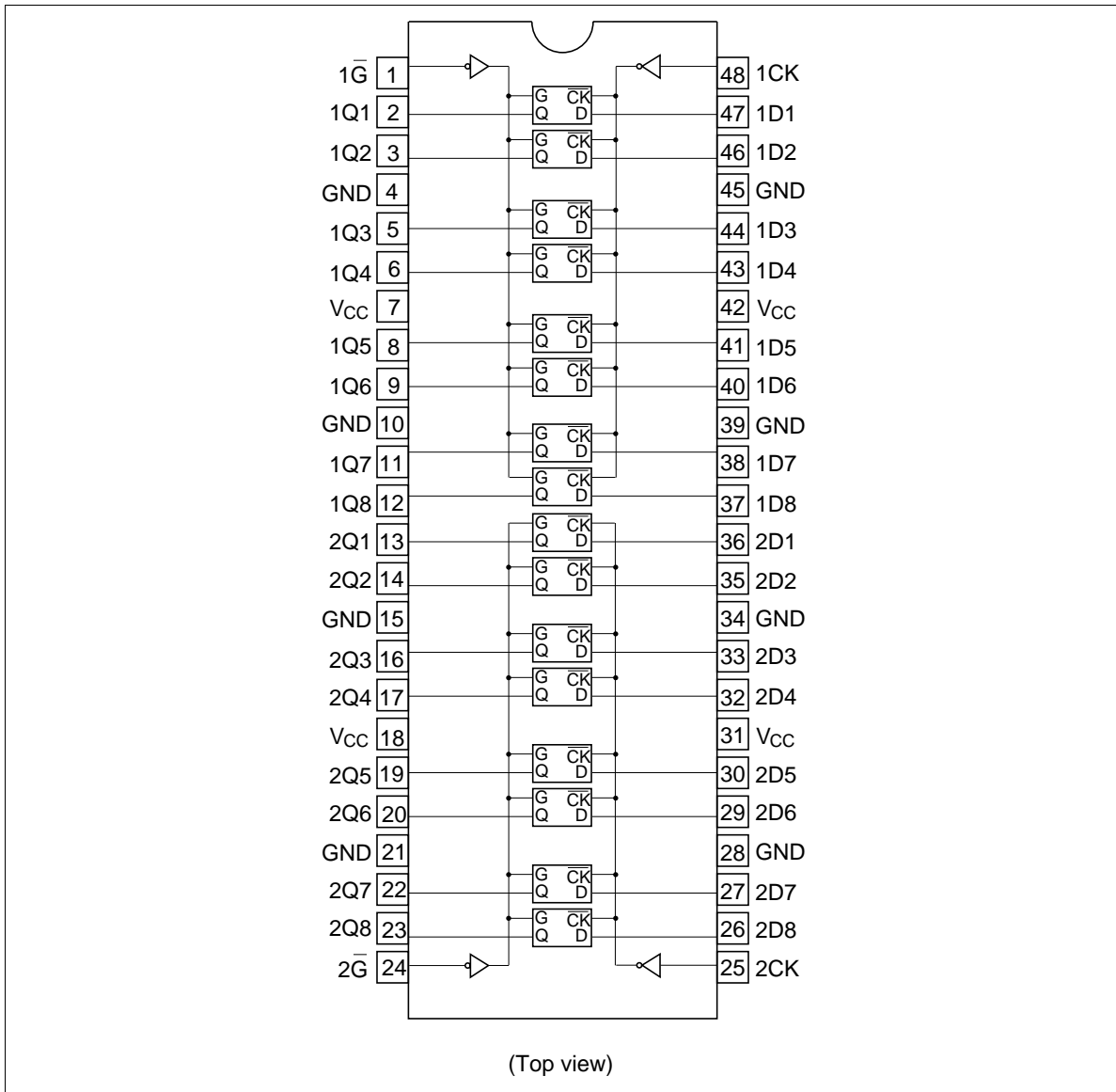
X: Immaterial

Z: High impedance

↑: Low to high transition

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

Pin Arrangement



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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	$V_I = -0.5$ V
Input voltage	V_I	-0.5 to 6.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5$ V
		50	mA	$V_O = V_{CC} + 0.5$ V
Output voltage	V_O	-0.5 to $V_{CC} + 0.5$	V	Output "H" or "L"
		-0.5 to 6.0	V	Output "Z" or V_{CC} :OFF
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	Tstg	-65 to +150	°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 hold
		2.0 to 5.5	V	At operation
Input / output voltage	V_I	0 to 5.5	V	\bar{G} , CK, D
		0 to V_{CC}	V	Output "H" or "L"
			V	Output "Z" or V_{CC} :OFF
Operating temperature	Ta	-40 to 85	°C	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7$ V
		-24 ²	mA	$V_{CC} = 3.0$ V to 5.5 V
	I_{OL}	12	mA	$V_{CC} = 2.7$ V
		24 ²	mA	$V_{CC} = 3.0$ V to 5.5 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 $\leq 50\%$

Electrical Characteristics

Item	Symbol	V _{CC} (V)	Ta = -40 to 85°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} ×0.7	—	V	
	V _{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V _{CC} ×0.3	V	
Output voltage	V _{OH}	2.7 to 5.5	V _{CC} -0.2	—	V	I _{OH} = -100 μA
		2.7	2.2	—	V	I _{OH} = -12 mA
		3.0	2.4	—	V	
		3.0	2.2	—	V	I _{OH} = -24 mA
		4.5	3.8	—	V	
	V _{OL}	2.7 to 5.5	—	0.2	V	I _{OL} = 100 μA
		2.7	—	0.4	V	I _{OL} = 12 mA
		3.0	—	0.55	V	I _{OL} = 24 mA
		4.5	—	0.55	V	
	Input current	I _{IN}	0 to 5.5	—	±5.0	μA
Off state output current	I _{OZ}	2.7 to 5.5	—	±5.0	μA	V _{IN} = V _{CC} , GND V _{OUT} = 5.5 V or GND
Output leak current	I _{OFF}	0	—	20	μA	V _{IN} / V _{OUT} = 5.5 V
Quiescent supply current	I _{CC}	2.7 to 3.6	—	±20	μA	V _{IN} / V _{OUT} = 3.6 to 5.5 V
		2.7 to 5.5	—	20	μA	V _{IN} = V _{CC} or GND
	ΔI _{CC}	3.0 to 3.6	—	500	μA	V _{IN} = one input at (V _{CC} -0.6)V, other inputs at V _{CC} or GND

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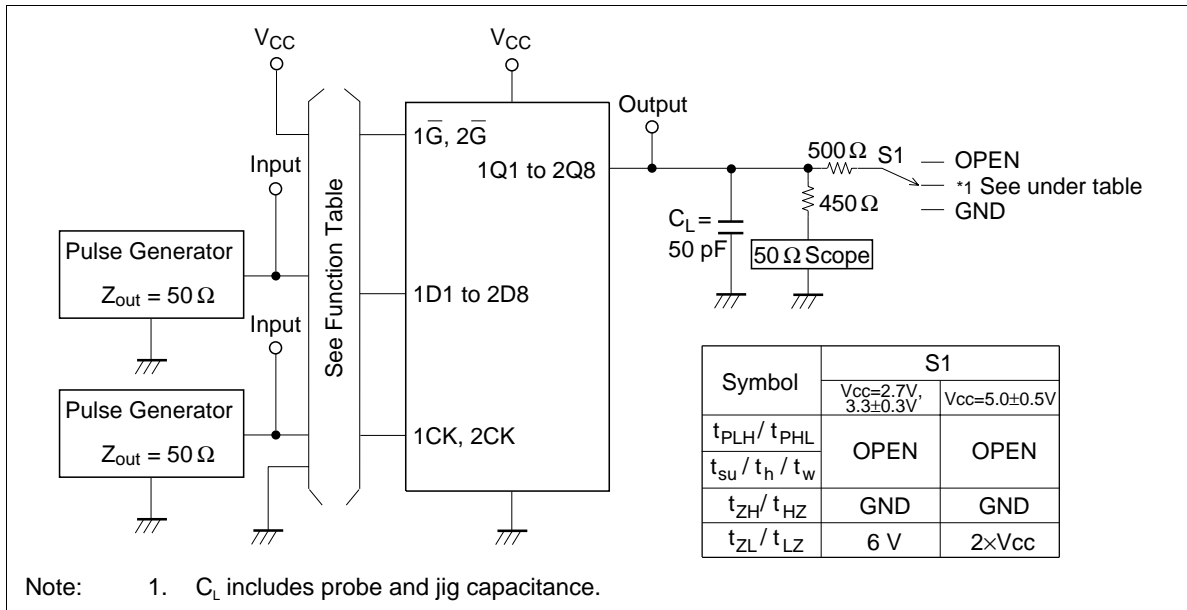
Switching Characteristics

Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Maximum clock frequency	f _{max}	2.7	80.0	—	—	MHz		
		3.3±0.3	100.0	150.0	—	MHz		
		5.0±0.5	125.0	—	—	MHz		
Propagation delay time	t _{PLH}	2.7	—	—	7.7	ns	CK	Q
		3.3±0.3	1.5	—	7.0	ns		
		5.0±0.5	—	—	5.5	ns		
Output enable time	t _{ZH}	2.7	—	—	8.0	ns	\overline{G}	Q
		3.3±0.3	1.5	—	7.0	ns		
		5.0±0.5	—	—	6.0	ns		
Output disable time	t _{LZ}	2.7	—	—	8.0	ns	\overline{G}	Q
		3.3±0.3	1.5	—	7.0	ns		
		5.0±0.5	—	—	6.0	ns		
Setup time	t _{su}	2.7	2.0	—	—	ns		
		3.3±0.3	2.0	—	—	ns		
		5.0±0.5	2.0	—	—	ns		
Hold time	t _h	2.7	1.5	—	—	ns		
		3.3±0.3	1.5	—	—	ns		
		5.0±0.5	1.5	—	—	ns		
Pulse width	t _w	2.7	3.0	—	—	ns		
		3.3±0.3	3.0	—	—	ns		
		5.0±0.5	3.0	—	—	ns		
Between output pins skew ^{*1}	t _{OSLH}	2.7	—	—	—	ns		
		3.3±0.3	—	—	1.0	ns		
		5.0±0.5	—	—	1.0	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0	—	pF		

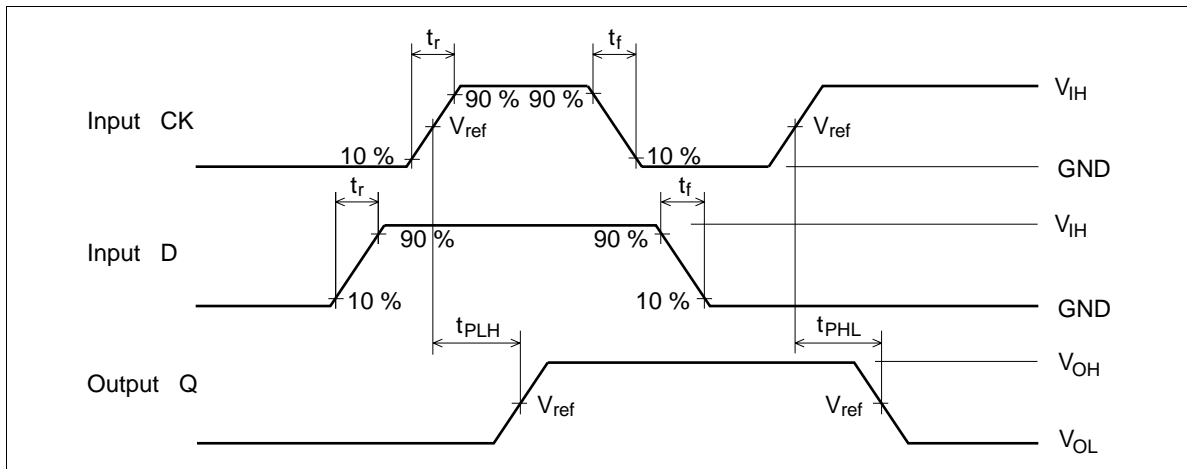
Note: 1. This parameter is characterized but not tested.

$$tos_{LH} = |t_{PLHm} - t_{PLHn}|, tos_{HL} = |t_{PHLm} - t_{PHLn}|$$

Test Circuit

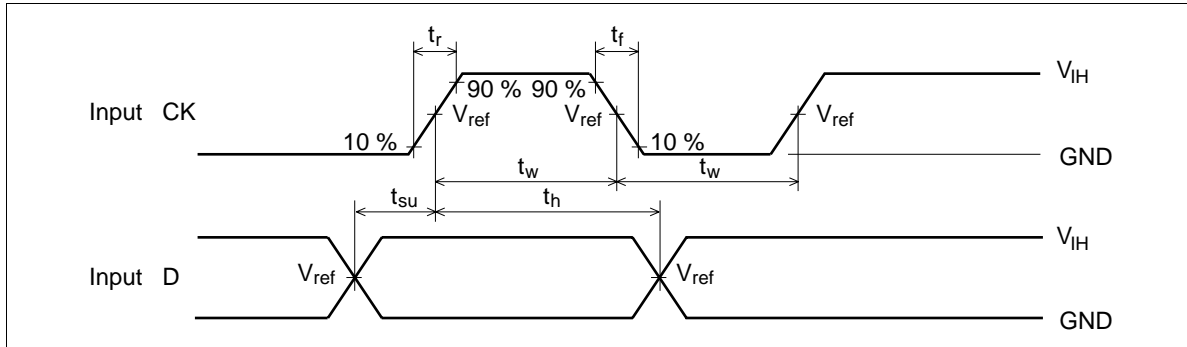


Waveforms - 1

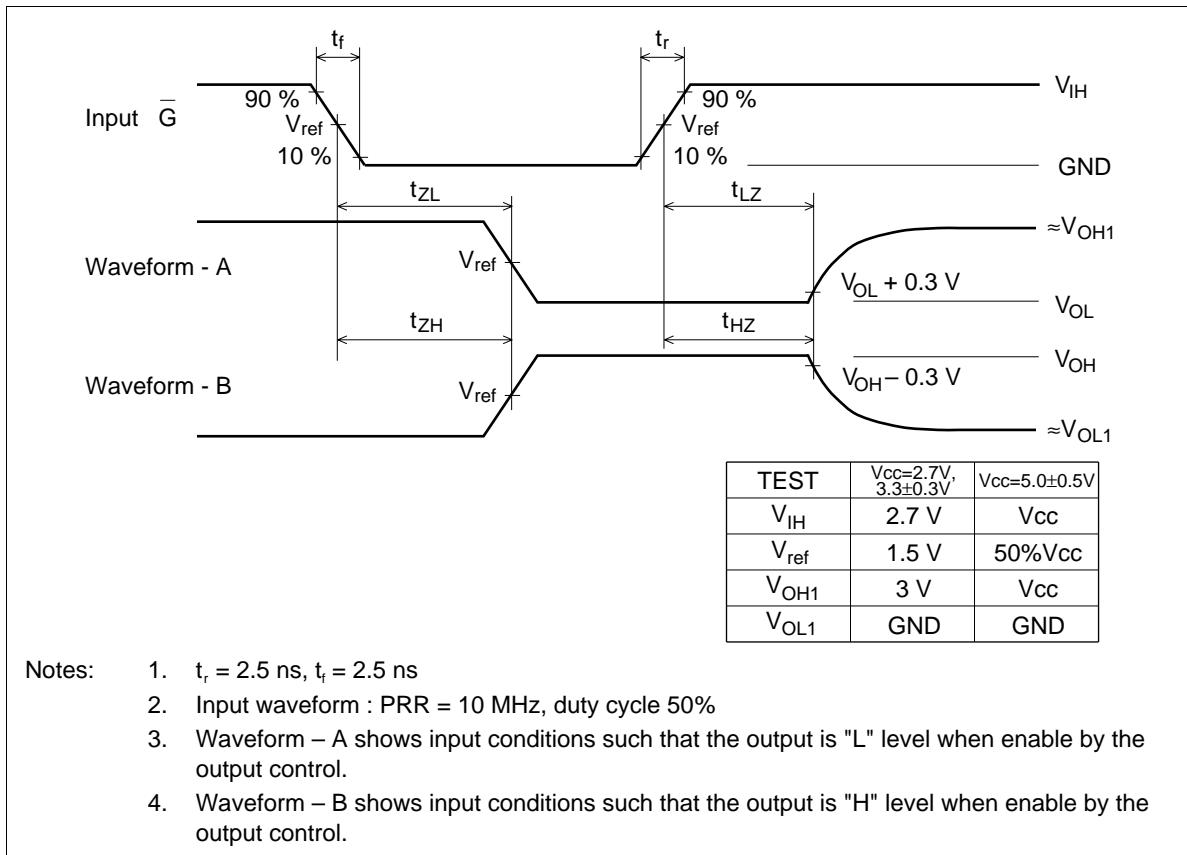


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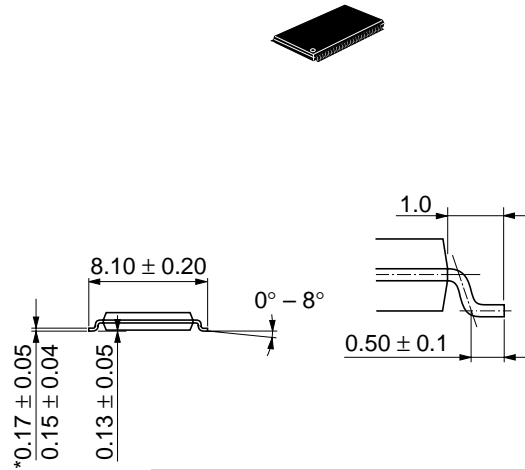
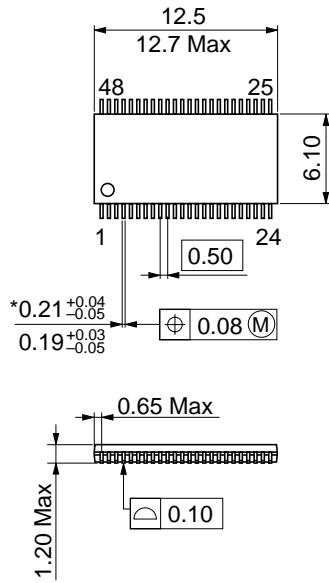
Waveforms – 2



Waveforms – 3



Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-48DB
JEDEC	—
EIAJ	—
Weight (reference value)	0.20 g

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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 StraÙe 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

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