
HD74LVC16374

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

HITACHI

ADE-205-122(Z)

Rev.0

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Description

The HD74LVC16374 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 $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{cc} = 0 \text{ V to } 5.5 \text{ V})$
- 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 $\pm 24 \text{ mA} (@V_{cc} = 3.0 \text{ V to } 5.5 \text{ V})$

Function Table

Inputs			
$\overline{G}$	CK	D	Output Q
H	X	X	Z
L	$\uparrow$	L	L
L	$\uparrow$	H	H
L	L	X	Q_0

H: High level

L: Low level

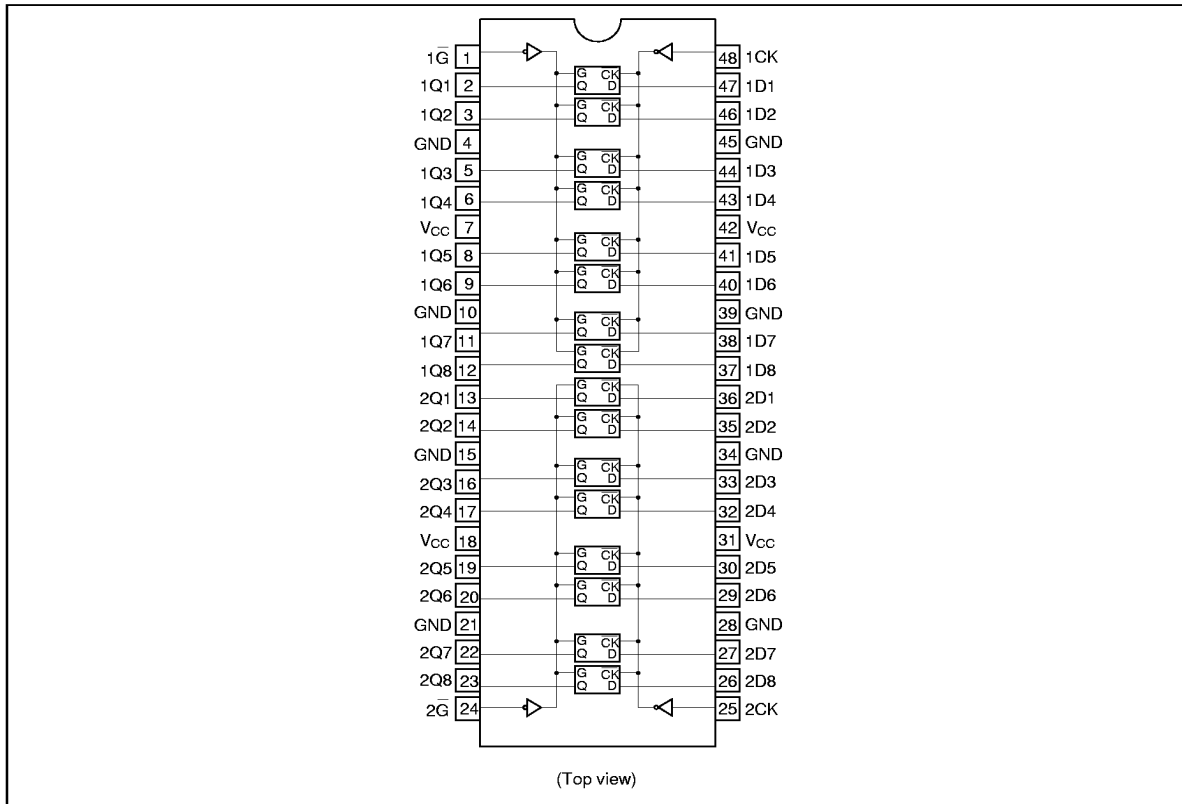
X: Immaterial

Z: High impedance

 $\uparrow$: Low to high transition Q_0 : Level of Q before the indicated steady input conditions were established.

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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	$V_i = -0.5$ 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"
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 retention
		2.0 to 5.5	V	At operation
Input / output voltage	V_i	0 to 5.5	V	$\overline{G}$, CK, D
	V_o	0 to V_{CC}	V	Output "H" or "L"
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 $\leq 50\%$

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Electrical Characteristics

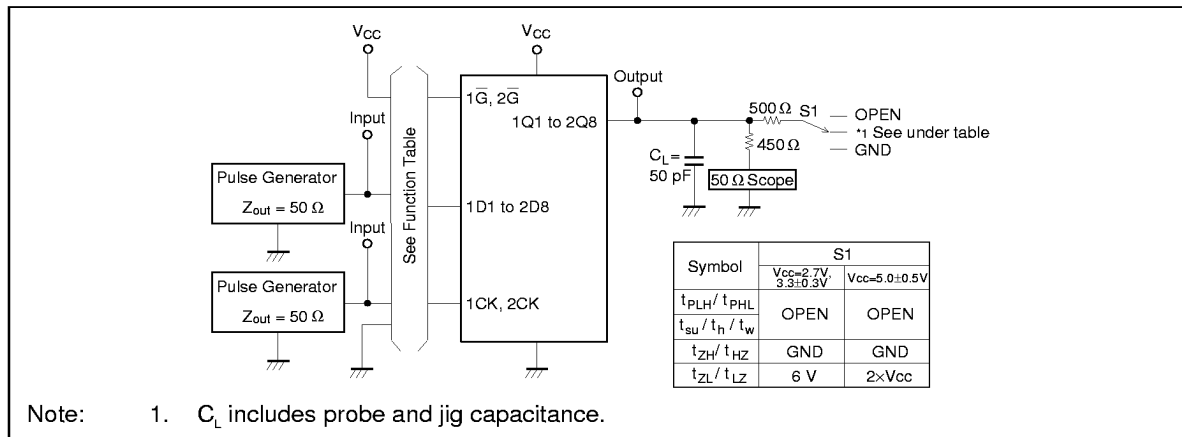
Item	Symbol	V_{CC} (V)	$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	Test Conditions
			Min	Max		
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	$V_{CC} \times 0.7$	—	V	
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	$V_{CC} \times 0.3$	V	
Output voltage	V_{OH}	2.7 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100 \mu\text{A}$
		2.7	2.2	—	V	$I_{OH} = -12 \text{ mA}$
		3.0	2.4	—	V	
		3.0	2.0	—	V	$I_{OH} = -24 \text{ mA}$
		4.5	3.8	—	V	
	V_{OL}	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	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} or GND
Off state output current	I_{OZ}	5.5	—	± 10	μA	$V_{IN} = V_{CC}, \text{ GND}$ $V_{OUT} = V_{CC} \text{ or GND}$
Quiescent supply current	I_{CC}	5.5	—	40	μA	$V_{IN} = V_{CC} \text{ or GND}$

Switching Characteristics

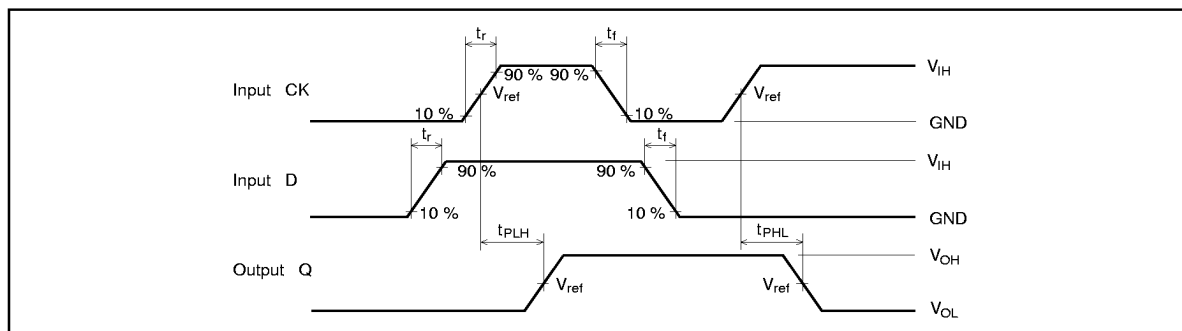
Item	Symbol	V _{cc} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Maximum clock frequency	f _{max}	2.7	80.0	—	—	MHz		
		3.3±0.3	100.0	150.0	—	MHz		
		5.0±0.5	125.0	—	—	MHz		
Propagation delay time	t _{PLH} t _{PHL}	2.7	—	5.0	8.5	ns	CK	Q
		3.3±0.3	1.5	4.0	7.5	ns		
		5.0±0.5	—	3.0	6.0	ns		
Output enable time	t _{ZH} t _{ZL}	2.7	—	5.0	8.5	ns	$\overline{G}$	Q
		3.3±0.3	1.5	4.0	7.5	ns		
		5.0±0.5	—	3.0	6.5	ns		
Output disable time	t _{HZ} t _{LZ}	2.7	—	4.0	8.0	ns	$\overline{G}$	Q
		3.3±0.3	1.5	3.5	7.0	ns		
		5.0±0.5	—	3.0	6.0	ns		
Setup time	t _{su}	2.7	3.0	—	—	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	4.0	—	—	ns		
		3.3±0.3	4.0	—	—	ns		
		5.0±0.5	4.0	—	—	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0	—	pF		

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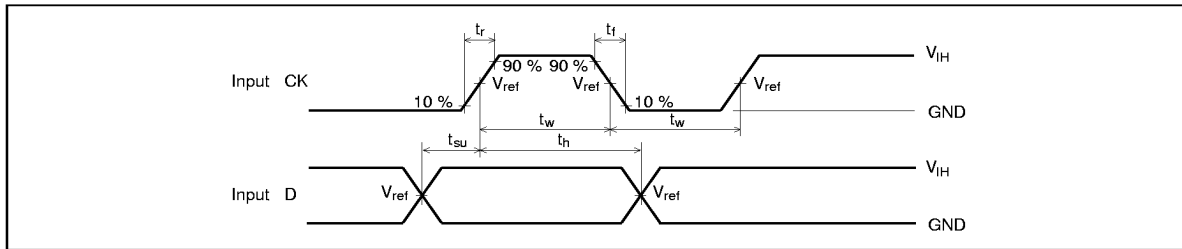
Test Circuit



Waveforms – 1



Waveforms – 2



Waveforms – 3

