

HD74LV74

Dual D-type Flip Flops with Preset and Clear

Description

The HD74LV74 has independent data, preset, clear, and clock inputs Q and \bar{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 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 $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V, }T_a = 25^\circ\text{C})$
- Output current $\pm 6\text{ mA} (@V_{CC} = 3.0\text{ V to }3.6\text{ V})$
 $\pm 12\text{ mA} (@V_{CC} = 4.5\text{ V to }5.5\text{ V})$

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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

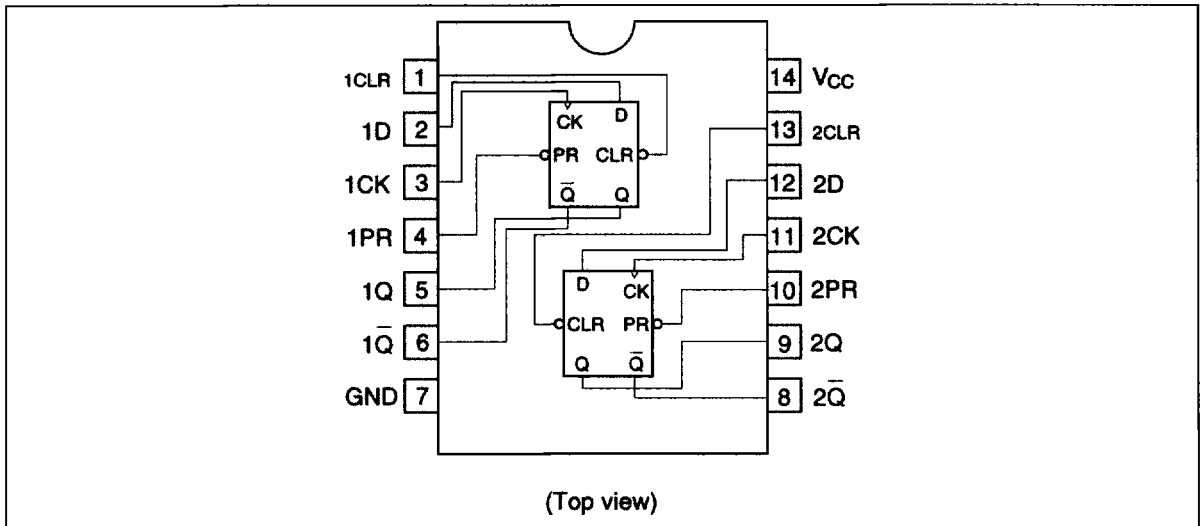
↓: High to low transition

↑: Low to high transition

Q₀: Level of 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 7.0	V	
Input diode current	I_{IK}	-20	mA	$V_I = -0.5$ V
Input voltage	V_I	-0.5 to 7.0	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 current	I_O	± 25	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	50	mA	
Storage temperature	T_{stg}	-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}	2.0 to 5.5	V	
Input / output voltage	V_I	0 to 5.5	V	PR, CLR, CK, D
		0 to V_{CC}	V	Q, \bar{Q}
Operating temperature	T_a	-40 to 85	°C	
Output current	I_{OH}	-6	mA	$V_{CC} = 3.0$ V to 3.6 V
		-12 ²	mA	$V_{CC} = 4.5$ V to 5.5 V
	I_{OL}	6	mA	$V_{CC} = 3.0$ V to 3.6 V
		12 ²	mA	$V_{CC} = 4.5$ V to 5.5 V
Input rise / fall time ¹⁾	t_r, t_f	50	ns/V	$V_{CC} = 5.5$ V
		100	ns/V	$V_{CC} = 3.6$ 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

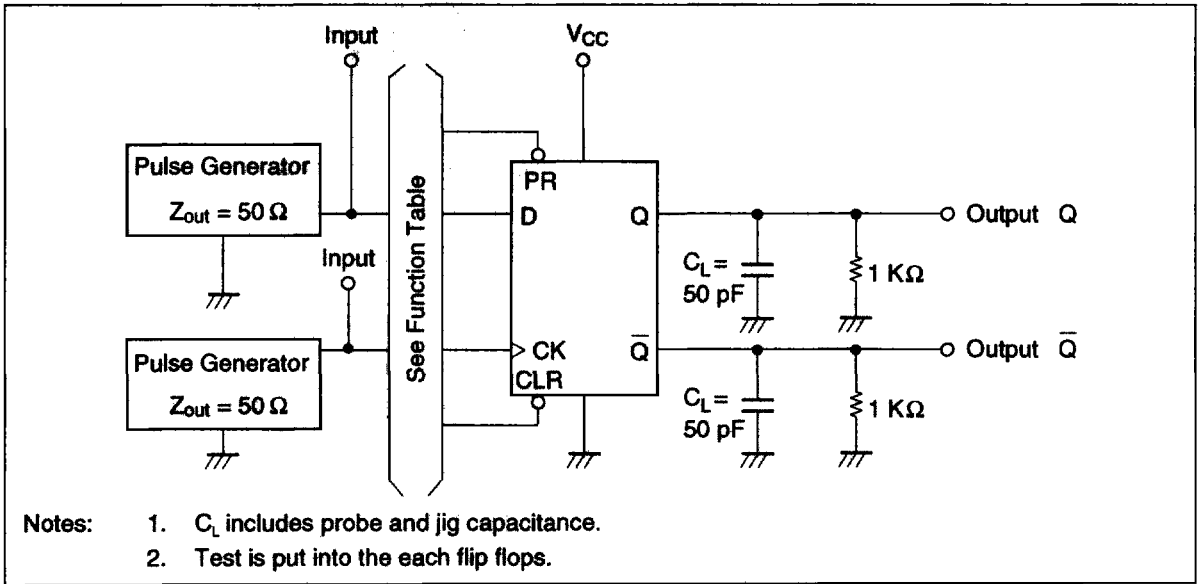
Item	Symbol	V_{CC} (V)	$T_a = -40$ to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	$V_{CC} \times 0.7$	—	V	
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	$V_{CC} \times 0.3$	V	
Output voltage	V_{OH}	2.7 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100 \mu\text{A}$
		3.0	2.4	—	V	$I_{OH} = -6 \text{ mA}$
		4.5	3.6	—	V	$I_{OH} = -12 \text{ mA}$
	V_{OL}	2.7 to 5.5	—	0.2	V	$I_{OL} = 100 \mu\text{A}$
		3.0	—	0.4	V	$I_{OL} = 6 \text{ mA}$
		4.5	—	0.5	V	$I_{OL} = 12 \text{ mA}$
Input current	I_{IN}	0 to 5.5	—	± 1.0	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

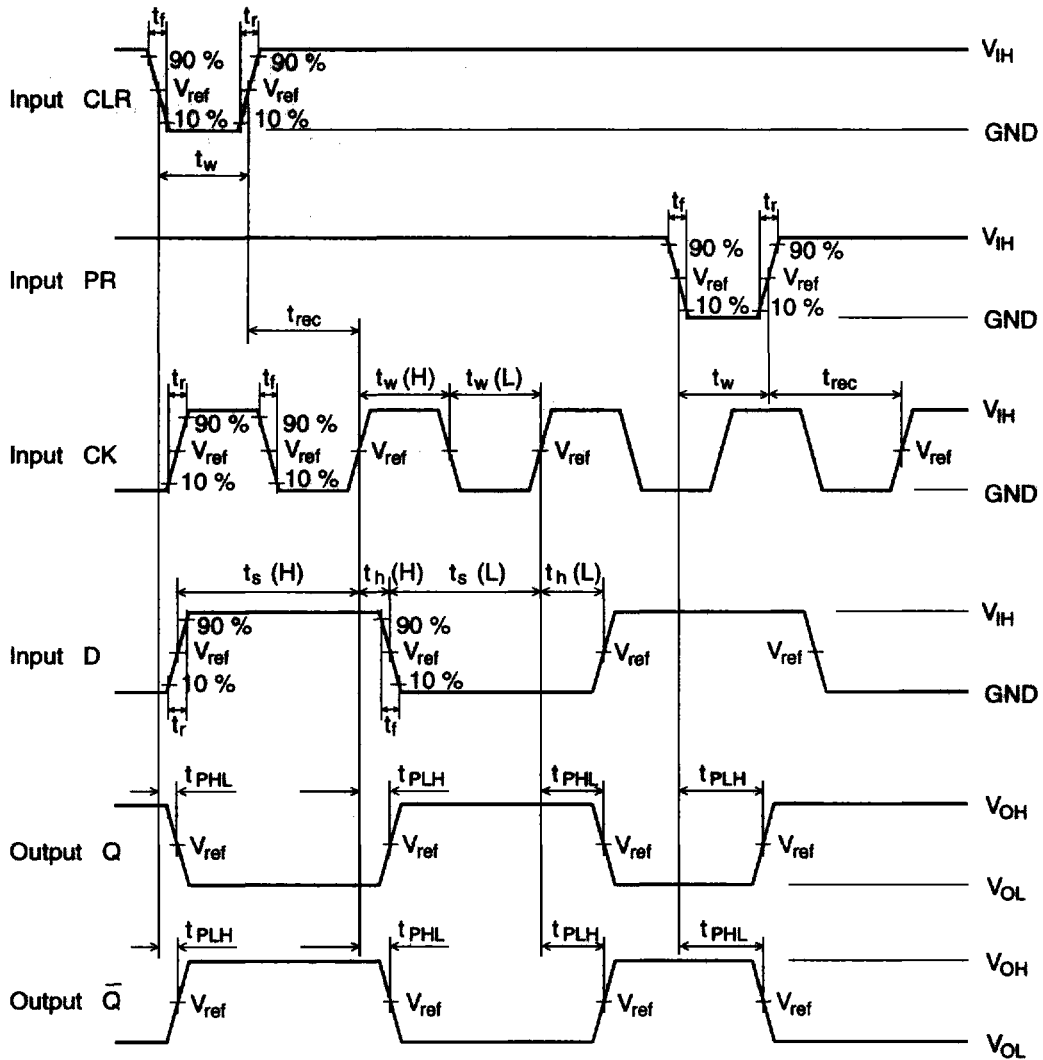
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	From (Input)	To (Output)
			Min	Typ	Max	Min	Typ	Max			
Maximum clock frequency	f_{max}	2.7	40.0	60.0	—	40.0	—	—	MHz		
		3.3 ± 0.3	50.0	75.0	—	50.0	—	—	MHz		
		5.0 ± 0.5	60.0	100.0	—	60.0	—	—	MHz		
Propagation delay time	t_{PLH}	2.7	—	13.5	20.0	1.0	1.0	22.0	ns	CLK	Q or \bar{Q}
		3.3 ± 0.3	—	10.0	18.0	1.0	1.0	19.5	ns		
	t_{PHL}	5.0 ± 0.5	—	8.0	13.5	1.0	1.0	14.5	ns		
		2.7	—	13.0	20.5	1.0	1.0	22.5	ns	PR or CLR	Q or \bar{Q}
		3.3 ± 0.3	—	11.0	18.5	1.0	1.0	20.0	ns		
		5.0 ± 0.5	—	8.0	14.5	1.0	1.0	15.5	ns		
Setup time	t_{su}	2.7	5.0	—	—	5.0	—	—	ns		
		3.3 ± 0.3	4.0	—	—	4.0	—	—	ns		
		5.0 ± 0.5	3.0	—	—	3.0	—	—	ns		
Hold time	t_h	2.7	1.0	—	—	1.0	—	—	ns		
		3.3 ± 0.3	1.0	—	—	1.0	—	—	ns		
		5.0 ± 0.5	1.0	—	—	1.0	—	—	ns		
Pulse width	t_w	2.7	7.0	—	—	7.0	—	—	ns	CLR	
		3.3 ± 0.3	6.0	—	—	6.0	—	—	ns		
		5.0 ± 0.5	5.0	—	—	5.0	—	—	ns		
		2.7	20.0	—	—	20.0	—	—	ns	PR or CLR	
		3.3 ± 0.3	16.0	—	—	16.0	—	—	ns		
		5.0 ± 0.5	12.0	—	—	12.0	—	—	ns		
Recovery time	t_{rec}	2.7	1.0	—	—	1.0	—	—	ns	PR or CLR	
		3.3 ± 0.3	1.0	—	—	1.0	—	—	ns		
		5.0 ± 0.5	1.0	—	—	1.0	—	—	ns		
Input capacitance	C_{IN}	3.3 ± 0.3	—	—	—	—	2.5	—	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, $t_h = 2.5$ ns
 2. Clock pulse input waveform : PRR = 10 MHz, duty cycle 50%
 3. Data input waveform : PRR = 5 MHz, duty cycle 50%