HD74LV2G74A

Single D–type Flip Flops with Preset and Clear

HITACHI

ADE-205-346 (Z)
1st. Edition
June 2000

Description

The HD74LV2G74A has independent data, preset, clear, and clock inputs Q and $\overline{Q}$ outputs in a 8 pin package. The input data is transferred to the output at the rising edge of clock pulse CLK. Low voltage and high speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

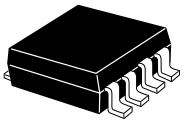
Features

- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74LV74A
  Supply voltage range : 1.65 to 5.5 V
  Operating temperature range : –40 to +85°C
- All inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
  All outputs V_O (Max.) = 5.5 V (@V_{CC} = 0 V)
- Output current ±6 mA (@V_{CC} = 3.0 V to 3.6 V), ±12 mA (@V_{CC} = 4.5 V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.

Hitachi semiconductor

Outline and Article Indication

• HD74LV2G74A



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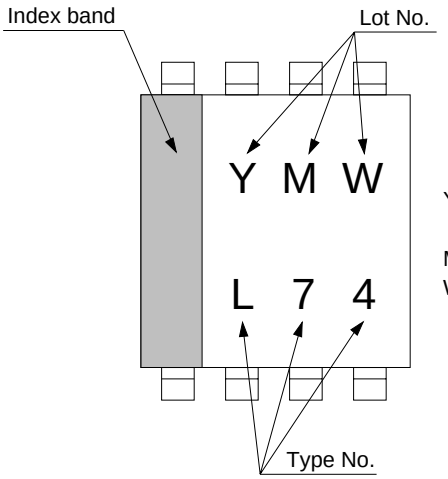


Y : Year code
(the last digit of year)
M : Month code
W : Week code

Function Table

Inputs				Outputs	
$\overline{PRE}$	$\overline{CLR}$	CLK	D	Q	$\overline{Q}$
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	↓	X	Q_0	$\overline{Q}_0$

H : High level

L : Low level

X : Immaterial

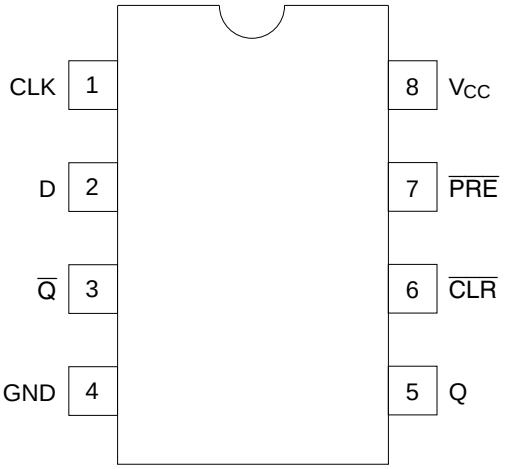
↑ : Low to high transition

↓ : High to low transition

Q_0 : The level of Q immediately before the input conditions shown in the above table are determined.

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

Pin Arrangement



(Top view)

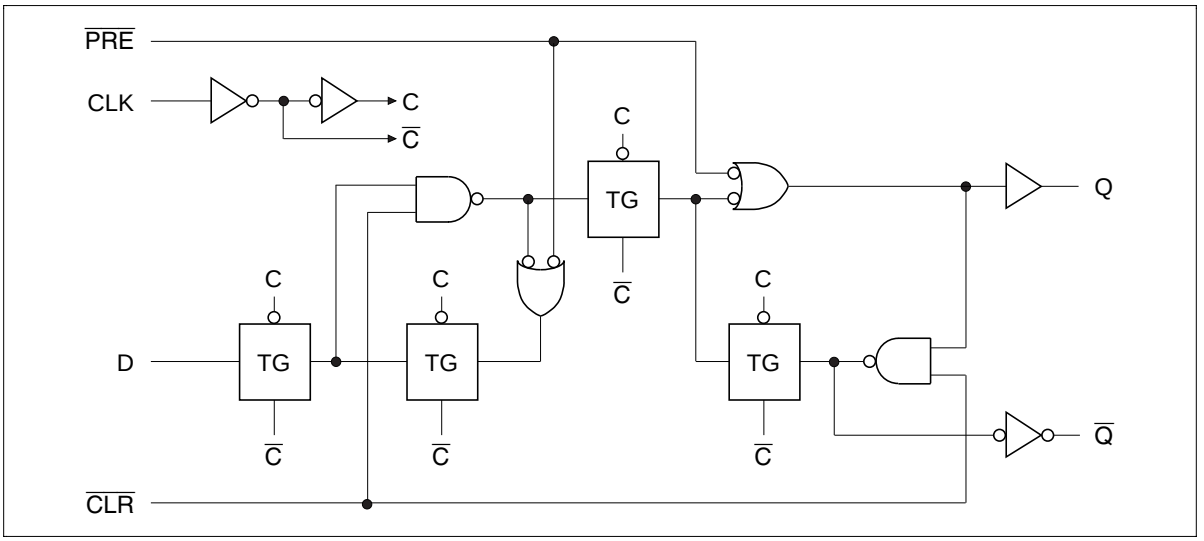
Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage	V_{CC}	–0.5 to 7.0	V	
Input voltage	V_{IN}	–0.5 to 7.0	V	
Output voltage	V_{OUT}	–0.5 to V_{CC} + 0.5	V	Output : H or L
		–0.5 to 7.0		V_{CC} : OFF
Input diode current	I_{IK}	–20	mA	
Output diode current	I_{OK}	±50	mA	
Output current	I_{OUT}	±25	mA	
V_{CC}, GND current	I_{CC} or I_{GND}	±50	mA	
Power dissipation	P_T	200	mW	
Storage temperature	Tstg	–65 to 150	°C	

Recommended Operating Conditions

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	1.65 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	–40 to +85	°C
Input rise / fall time	t_r, t_f	0 to 300 (V_{CC} = 1.65 to 1.95 V)	ns
		0 to 200 (V_{CC} = 2.3 to 2.7 V)	
		0 to 100 (V_{CC} = 3.0 to 3.6 V)	
		0 to 20 (V_{CC} = 4.5 to 5.5 V)	

Logic Diagram



Electrical Characteristic

- **Ta = –40 to 85°C**

Item	Symbol	V_{cc} (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	V_{IH}	1.65 to 1.95	V_{CC}×0.75	—	—	V	
		2.3 to 2.7	V_{CC}×0.7	—	—		
		3.0 to 3.6	V_{CC}×0.7	—	—		
		4.5 to 5.5	V_{CC}×0.7	—	—		
	V_{IL}	1.65 to 1.95	—	—	V_{CC}×0.25		
		2.3 to 2.7	—	—	V_{CC}×0.3		
		3.0 to 3.6	—	—	V_{CC}×0.3		
		4.5 to 5.5	—	—	V_{CC}×0.3		
Hysteresis voltage	V_H	1.8	—	0.25	—	V	$V_T^+ – V_T^-$
		2.5	—	0.30	—		
		3.3	—	0.35	—		
		5.0	—	0.45	—		
Output voltage	V_{OH}	Min to Max	V_{CC}–0.1	—	—	V	I_{OH} = –50 µA
		1.65	1.4	—	—		I_{OH} = –1 mA
		2.3	2.0	—	—		I_{OH} = –2 mA
		3.0	2.48	—	—		I_{OH} = –6 mA
		4.5	3.8	—	—		I_{OH} = –12 mA
	V_{OL}	Min to Max	—	—	0.1		I_{OL} = 50 µA
		1.65	—	—	0.3		I_{OL} = 1 mA
		2.3	—	—	0.4		I_{OL} = 2 mA
		3.0	—	—	0.44		I_{OL} = 6 mA
		4.5	—	—	0.55		I_{OL} = 12 mA
Input current	I_{IN}	0 to 5.5	—	—	±1	µA	V_{IN} = 5.5 V or GND
Quiescent supply current	I_{CC}	5.5	—	—	10	µA	V_{IN} = V_{CC} or GND, I_O = 0
Output leakage current	I_{OFF}	0	—	—	5	µA	V_O = 5.5 V
Input capacitance	C_{IN}	3.3	—	2.5	—	pF	V_{IN} = V_{CC} or GND

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

- V_{CC} = 1.8 ± 0.15 V

Item	Symbol	T_a = 25°C			T_a = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	f_{max}	30	60	—	20	—	MHz	C_L = 15 pF		
		20	40	—	15	—		C_L = 50 pF		
Propagation delay time	t_{PLH}	—	16.3	27.0	1.0	29.0	ns	C_L = 15 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
	t_{PHL}	—	17.9	29.0	1.0	32.0			CLK	
		—	21.6	34.0	1.0	36.5		C_L = 50 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
		—	24.5	39.5	1.0	42.5			CLK	
Setup time	t_{su}	13.0	—	—	14.0	—	ns		D	
		9.0	—	—	9.0	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.5	—	—	0.5	—	ns			
Pulse width	t_w	12.0	—	—	13.0	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		12.0	—	—	13.0	—			CLK "H" or "L"	

- V_{CC} = 2.5 ± 0.2 V

Item	Symbol	T_a = 25°C			T_a = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	f_{max}	50	100	—	40	—	MHz	C_L = 15 pF		
		30	70	—	25	—		C_L = 50 pF		
Propagation delay time	t_{PLH}	—	9.8	14.8	1.0	17.0	ns	C_L = 15 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
	t_{PHL}	—	11.1	16.4	1.0	19.0			CLK	
		—	13.0	17.4	1.0	20.0		C_L = 50 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
		—	14.2	20.0	1.0	23.0			CLK	
Setup time	t_{su}	8.0	—	—	9.0	—	ns		D	
		7.0	—	—	7.0	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.5	—	—	0.5	—	ns			
Pulse width	t_w	8.0	—	—	9.0	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		8.0	—	—	9.0	—			CLK "H" or "L"	

Switching Characteristics (cont)

- **V_{CC} = 3.3 ± 0.3 V**

Item	Symbol	T_a = 25°C			T_a = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	f_{max}	80	140	—	70	—	MHz	C_L = 15 pF		
		50	90	—	45	—		C_L = 50 pF		
Propagation delay time	t_{PLH}	—	6.9	12.3	1.0	14.5	ns	C_L = 15 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
	t_{PHL}	—	7.9	11.9	1.0	14.0			CLK	
		—	9.2	15.8	1.0	18.0		C_L = 50 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
		—	10.2	15.4	1.0	17.5			CLK	
Setup time	t_{su}	6.0	—	—	7.0	—	ns		D	
		5.0	—	—	5.0	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.5	—	—	0.5	—	ns			
Pulse width	t_w	6.0	—	—	7.0	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		6.0	—	—	7.0	—			CLK "H" or "L"	

- **V_{CC} = 5.0 ± 0.5 V**

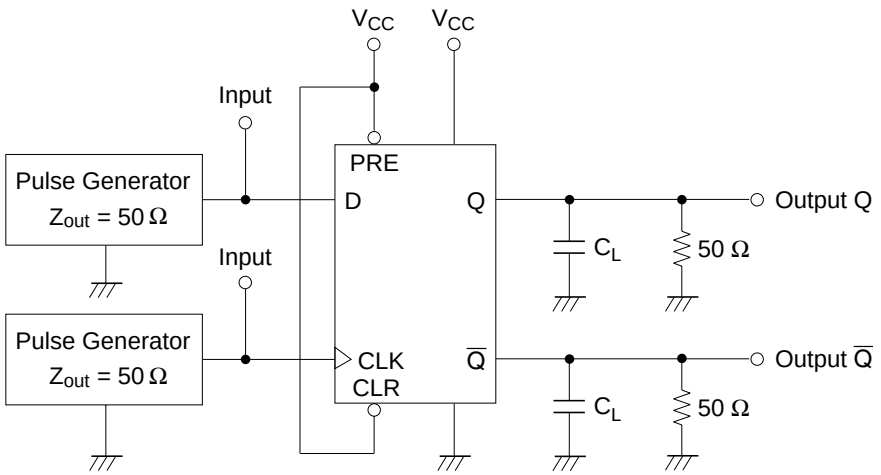
Item	Symbol	T_a = 25°C			T_a = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	f_{max}	130	180	—	110	—	MHz	C_L = 15 pF		
		90	140	—	75	—		C_L = 50 pF		
Propagation delay time	t_{PLH}	—	5.0	7.7	1.0	9.0	ns	C_L = 15 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
	t_{PHL}	—	5.6	7.3	1.0	8.5			CLK	
		—	6.6	9.7	1.0	11.0		C_L = 50 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
		—	7.2	9.3	1.0	10.5			CLK	
Setup time	t_{su}	5.0	—	—	5.0	—	ns		D	
		3.0	—	—	3.0	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.5	—	—	0.5	—	ns			
Pulse width	t_w	5.0	—	—	5.0	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		5.0	—	—	5.0	—			CLK "H" or "L"	

Operating Characteristics

- C_L = 50 pF

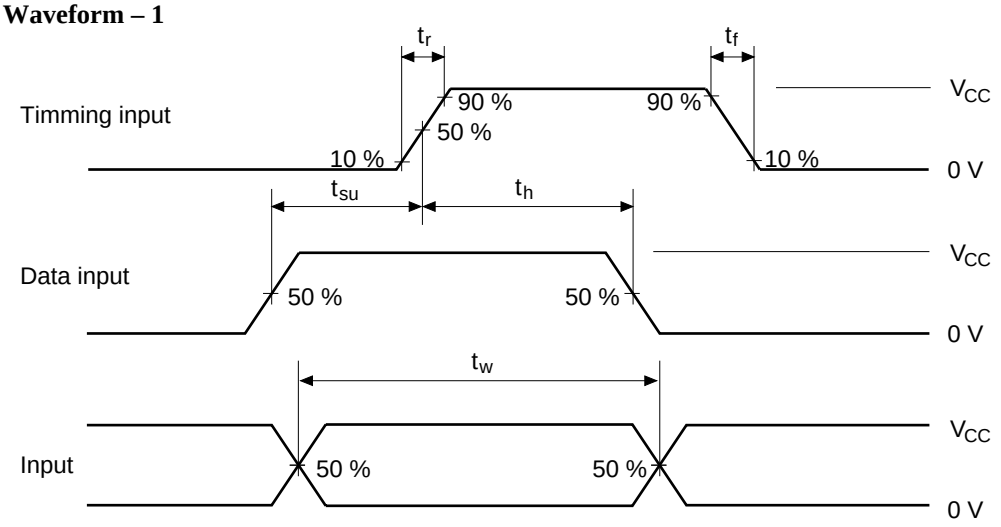
Item	Symbol	V_{CC} (V)	T_a = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	3.3	—	13.0	—	pF	f = 10 MHz
		5.0	—	14.0	—		

Test Circuit

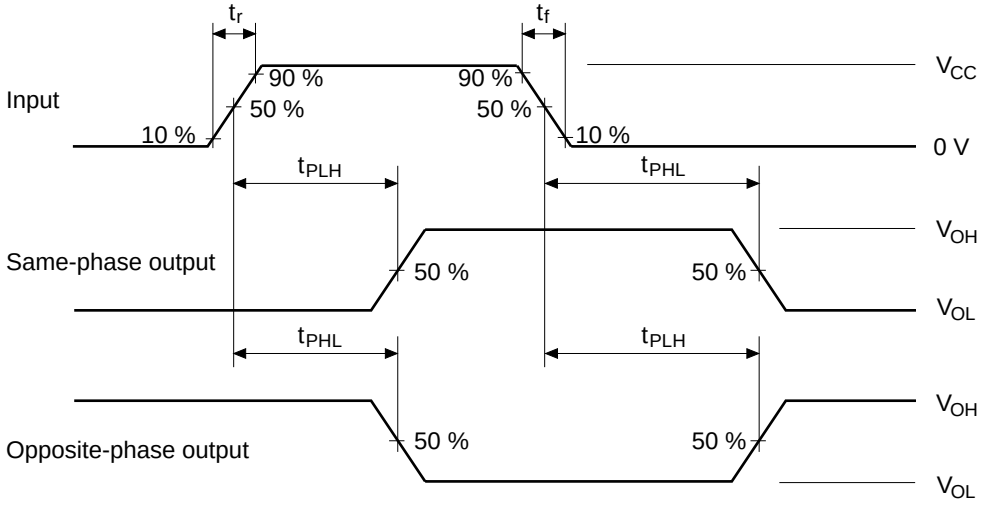


Notes: 1. C_L includes probe and jig capacitance.
2. Test is put into the each flip flops.

• **Waveform – 1**



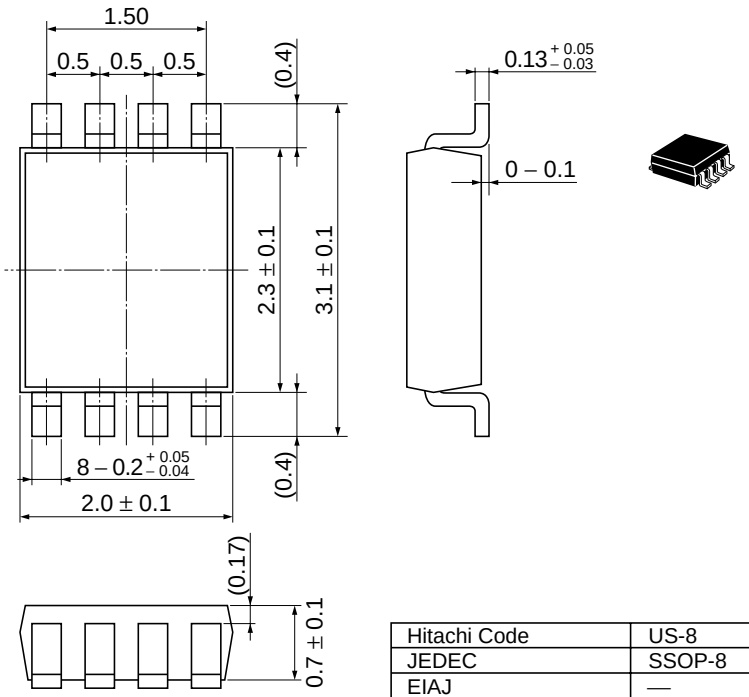
• **Waveform – 2**



Notes: 1. Input waveform : PRR = 1 MHz, Zo = 50 Ω, t_r = 3 ns, t_f = 3 ns
2. The output are measured one at a time with one transition per measurement.

Package Dimensions

Unit : mm



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Mass (reference value)	—

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