HD74ALVC2G74

Single D-type Flip Flops with Preset and Clear

HITACHI

ADE-205-639 (Z)

Preliminary
Rev. 0
July. 2001

Description

The HD74ALVC2G74 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

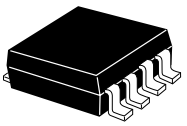
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Supply voltage range : 1.2 to 3.6 V
  Operating temperature range : –40 to +85°C
- All inputs V_{IH} (Max.) = 3.6 V (@V_{CC} = 0 V to 3.6 V)
  All outputs V_O (Max.) = 3.6 V (@V_{CC} = 0 V)
- Output current ±2 mA (@V_{CC} = 1.2)
  ±4 mA (@V_{CC} = 1.4 V to 1.6 V)
  ±6 mA (@V_{CC} = 1.65 V to 1.95 V)
  ±18 mA (@V_{CC} = 2.3 V to 2.7 V)
  ±24 mA (@V_{CC} = 3.0 V to 3.6 V)
- Package type

Package type	Package code	Package suffix	Taping code
SSOP-8 pin	TTP-8DB	US	E (3,000 pcs / Reel)

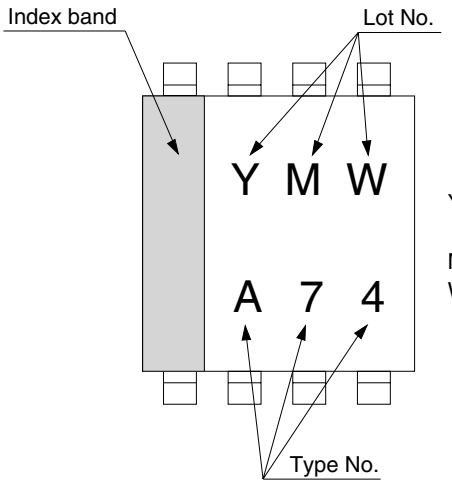
Hitachi semiconductor

Outline and Article Indication

• HD74ALVC2G74



SSOP-8



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

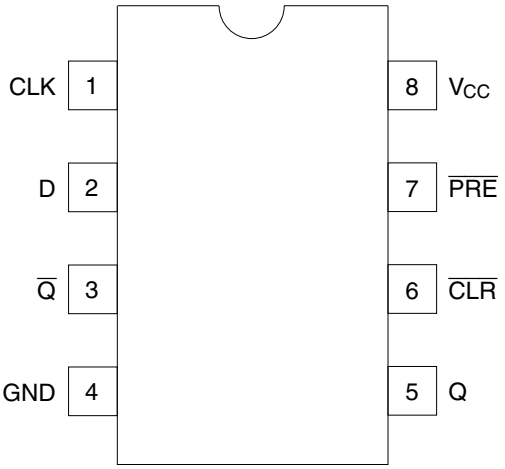
↑ : Low to high transition

↓ : 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	Conditions
Supply voltage range	V_{CC}	–0.5 to 4.6	V	
Input voltage range [*1]	V_I	–0.5 to 4.6	V	
Output voltage range [*1, 2]	V_O	–0.5 to V_{CC}+0.5	V	Output : H or L
		–0.5 to 4.6		V_{CC} : OFF
Input clamp current	I_{IK}	–50	mA	$V_I < 0$
Output clamp current	I_{OK}	±50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	±50	mA	V_O = 0 to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±100	mA	
Maximum power dissipation at Ta = 25°C (in still air) [*3]	P_T	200	mW	
Storage temperature	Tstg	–65 to 150	°C	

Notes: 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.

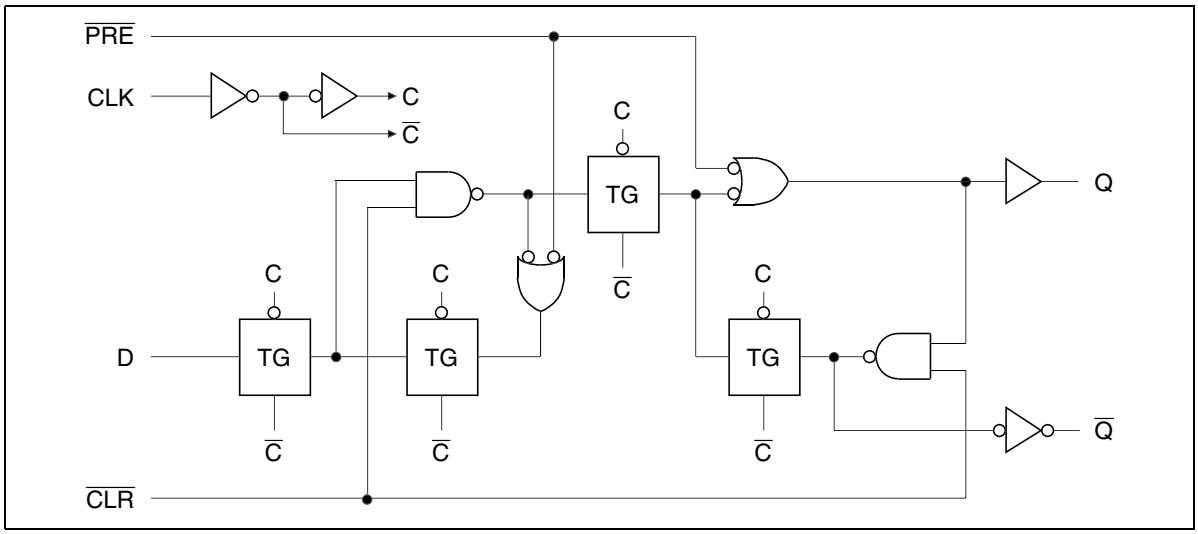
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 4.6 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	1.2	3.6	V	
Input voltage range	V_I	0	3.6	V	
Output voltage range	V_O	0	V_{CC}	V	
Output current	I_{OH}	—	–2	mA	V_{CC} = 1.2 V
		—	–4		V_{CC} = 1.4 V
		—	–6		V_{CC} = 1.65 V
		—	–18		V_{CC} = 2.3 V
		—	–24		V_{CC} = 3.0 V
	I_{OL}	—	2		V_{CC} = 1.2 V
		—	4		V_{CC} = 1.4 V
		—	6		V_{CC} = 1.65 V
		—	18		V_{CC} = 2.3 V
		—	24		V_{CC} = 3.0 V
Input transition rise or fall rate	$\Delta t / \Delta v$	0	20	ns / V	V_{CC} = 1.2 to 2.7 V
		0	10		V_{CC} = 3.3±0.3 V
Operating free-air temperature	Ta	–40	85	°C	

Note: Unused or floating inputs must be held high or low.

Logic Diagram



Electrical Characteristics

(Ta = −40 to 85°C)

Item	Symbol	V_{CC} (V)*	Min	Typ	Max	Unit	Test conditions
Input voltage	V_{IH}	1.2	V_{CC}×0.75	—	—	V	
		1.4 to 1.6	V_{CC}×0.7	—	—		
		1.65 to 1.95	V_{CC}×0.7	—	—		
		2.3 to 2.7	1.7	—	—		
		3.0 to 3.6	2.0	—	—		
	V_{IL}	1.2	—	—	V_{CC}×0.25		
		1.4 to 1.6	—	—	V_{CC}×0.3		
		1.65 to 1.95	—	—	V_{CC}×0.3		
		2.3 to 2.7	—	—	0.7		
		3.0 to 3.6	—	—	0.8		
Output voltage	V_{OH}	Min to Max	V_{CC}–0.2	—	—	V	I_{OH} = –100 µA
		1.2	0.9	—	—		I_{OH} = –2 mA
		1.4	1.1	—	—		I_{OH} = –4 mA
		1.65	1.2	—	—		I_{OH} = –6 mA
		2.3	1.7	—	—		I_{OH} = –18 mA
		3.0	2.2	—	—		I_{OH} = –24 mA
	V_{OL}	Min to Max	—	—	0.2		I_{OL} = 100 µA
		1.2	—	—	0.3		I_{OL} = 2 mA
		1.4	—	—	0.3		I_{OL} = 4 mA
		1.65	—	—	0.3		I_{OL} = 6 mA
		2.3	—	—	0.55		I_{OL} = 18 mA
		3.0	—	—	0.55		I_{OL} = 24 mA
Input current	I_{IN}	3.6	—	—	±5	µA	V_{IN} = 3.6 V or GND
Quiescent supply current	I_{CC}	3.6	—	—	10	µA	V_{IN} = V_{CC} or GND, I_O = 0
Output leakage current	I_{OFF}	0	—	—	5	µA	V_{IN} or V_O = 0 to 3.6 V
Input capacitance	C_{IN}	3.3	—	TBD	—	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

(Ta = −40 to 85°C)

- V_{CC} = 1.2 V

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Maximum clock frequency	f_{max}	—	TBD	—	MHz	C_L = 15 pF		
Propagation	t_{PLH}	—	TBD	—	ns	C_L = 15 pF	$\overline{PRE}/\overline{CLR}$	Q or $\overline{Q}$
delay time	t_{PHL}	—	TBD	—			CLK	
Setup time	t_{su}	—	TBD	—	ns		D	
		—	TBD	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	—	TBD	—	ns			
Pulse width	t_w	—	TBD	—	ns		$\overline{PRE}$ or $\overline{CLR}$ “L”	
		—	TBD	—			CLK “H” or “L”	

- V_{CC} = 1.5±0.1 V

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Maximum clock frequency	f_{max}	TBD	TBD	—	MHz	C_L = 15 pF		
Propagation	t_{PLH}	2.0	—	11.0	ns	C_L = 15 pF	$\overline{PRE}/\overline{CLR}$	Q or $\overline{Q}$
delay time	t_{PHL}	2.0	—	11.0			CLK	
Setup time	t_{su}	6.0	—	—	ns		D	
		5.0	—	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.0	—	—	ns			
Pulse width	t_w	7.0	—	—	ns		$\overline{PRE}$ or $\overline{CLR}$ “L”	
		7.0	—	—			CLK “H” or “L”	

- V_{CC} = 1.8±0.15 V

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Maximum clock frequency	f_{max}	TBD	TBD	—	MHz	C_L = 30 pF		
Propagation	t_{PLH}	1.5	—	8.0	ns	C_L = 30 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
delay time	t_{PHL}	1.5	—	8.0			CLK	
Setup time	t_{su}	5.0	—	—	ns		D	
		3.0	—	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.0	—	—	ns			
Pulse width	t_w	5.0	—	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		5.0	—	—			CLK "H" or "L"	

- V_{CC} = 2.5±0.2 V

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Maximum clock frequency	f_{max}	TBD	TBD	—	MHz	C_L = 30 pF		
Propagation	t_{PLH}	1.0	—	5.0	ns	C_L = 30 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
delay time	t_{PHL}	1.0	—	5.0			CLK	
Setup time	t_{su}	3.0	—	—	ns		D	
		2.0	—	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.0	—	—	ns			
Pulse width	t_w	3.3	—	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		3.3	—	—			CLK "H" or "L"	

- V_{CC} = 3.3±0.3 V

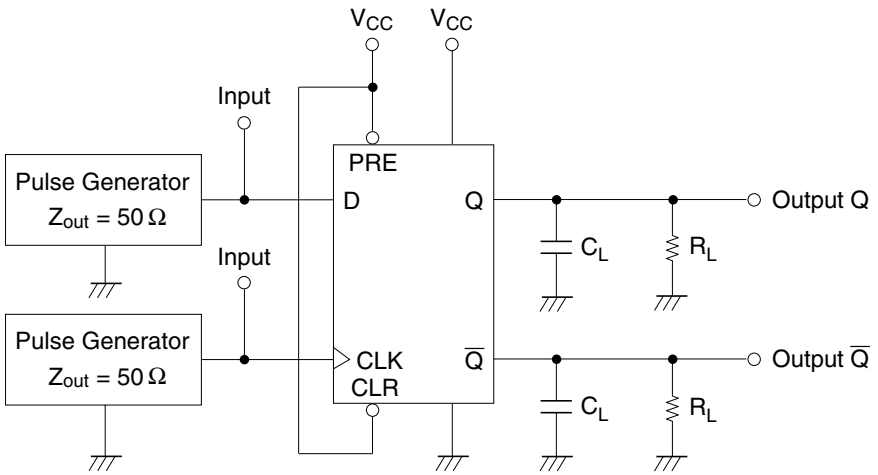
Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Maximum clock frequency	f_{max}	TBD	TBD	—	MHz	C_L = 30 pF		
Propagation	t_{PLH}	1.0	—	3.5	ns	C_L = 30 pF	$\overline{PRE}$/$\overline{CLR}$	Q or $\overline{Q}$
delay time	t_{PHL}	1.0	—	3.5			CLK	
Setup time	t_{su}	3.0	—	—	ns		D	
		2.0	—	—			$\overline{PRE}$ or $\overline{CLR}$ inactive	
Hold time	t_h	0.0	—	—	ns			
Pulse width	t_w	3.3	—	—	ns		$\overline{PRE}$ or $\overline{CLR}$ "L"	
		3.3	—	—			CLK "H" or "L"	

Operating Characteristics

(Ta = 25°C)

Item	Symbol	V_{cc} (V)	Min	Typ	Max	Unit	Test conditions
Power dissipation capacitance	C_{PD}	1.5	—	TBD	—	pF	f = 10 MHz
		1.8	—	TBD	—		
		2.5	—	TBD	—		
		3.3	—	TBD	—		

Test Circuit

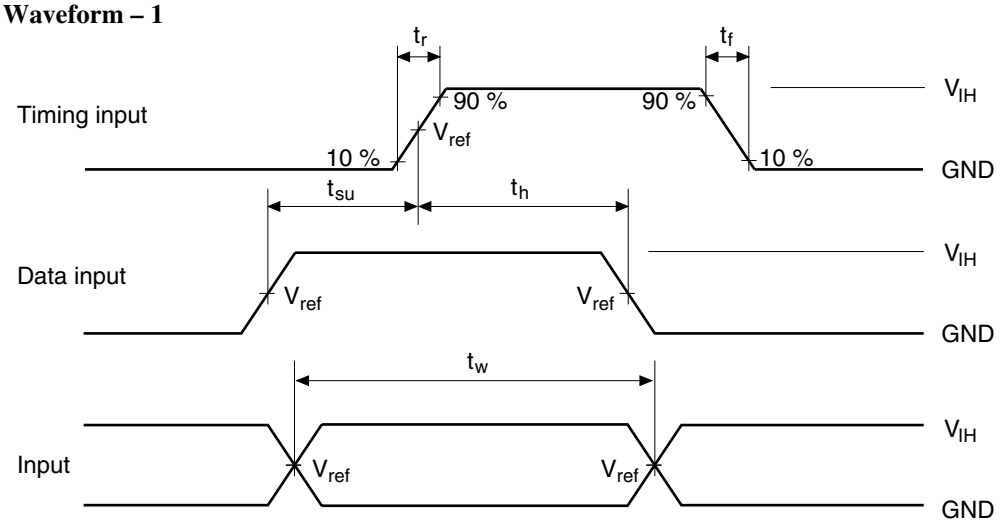


Symbol	V_{CC} = 1.2 V, 1.5±0.1 V	V_{CC} = 1.8±0.15 V	V_{CC} = 2.5±0.2 V, 3.3±0.3 V
R_L	2.0 kΩ	1.0 kΩ	500 Ω
C_L	15 pF	30 pF	30 pF

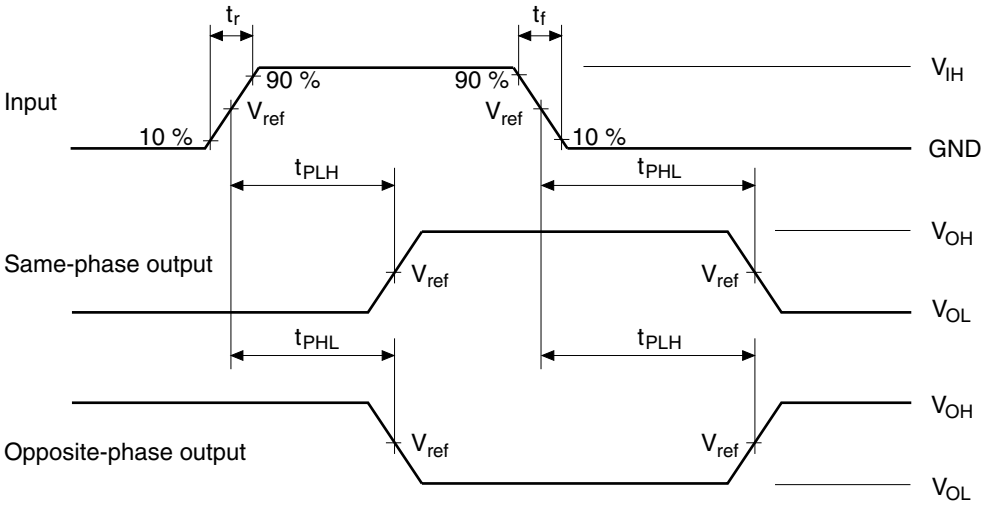
Notes: 1. C_L includes probe and jig capacitance.
2. Test is put into the each flip flops.

Waveforms

• **Waveform – 1**



• **Waveform – 2**



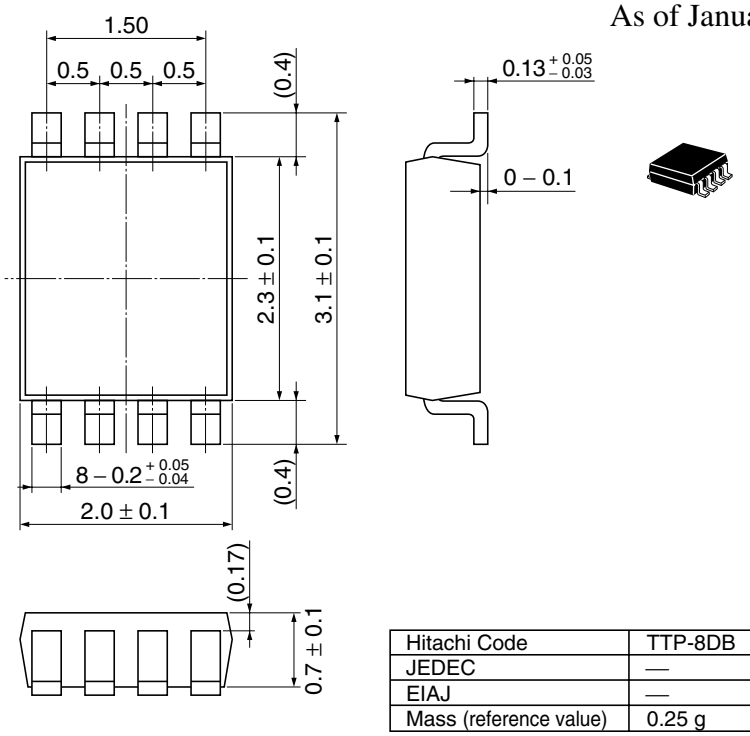
Symbol	V_{CC} = 1.2 V, 1.5±0.1 V, 1.8±0.15 V	V_{CC} = 2.5±0.2 V	V_{CC} = 3.3±0.3 V
t_r / t_f	2.0 ns	2.5 ns	2.5 ns
V_{IH}	V_{CC}	V_{CC}	2.7 V
V_{ref}	50%	50%	1.5 V

Note: Input waveform : PRR = 10 MHz, duty cycle 50%

Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	TTP-8DB
JEDEC	—
EIAJ	—
Mass (reference value)	0.25 g

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