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# HD74ALVC1G86

2-input Exclusive-OR Gate

## HITACHI

ADE-205-608A (Z)  
2nd. Edition  
March 2001

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### Description

The HD74ALVC1G86 performs the Boolean functions  $Y = A \oplus B$  or  $Y = \overline{A}B + A\overline{B}$  in positive logic. A common application is as a true / complement element. If one of the inputs is low, the other input will be reproduced in true form at the output. If one of the inputs is high, the signal on the other input will be reproduced inverted form at the output. 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.

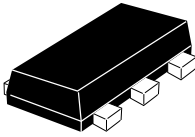
### Features

- 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  $\pm 2$  mA (@  $V_{CC} = 1.2$  V)
  - $\pm 4$  mA (@  $V_{CC} = 1.4$  V to 1.6 V)
  - $\pm 6$  mA (@  $V_{CC} = 1.65$  V to 1.95 V)
  - $\pm 18$  mA (@  $V_{CC} = 2.3$  V to 2.7 V)
  - $\pm 24$  mA (@  $V_{CC} = 3.0$  V to 3.6 V)

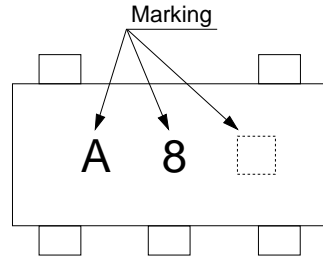
# HD74ALVC1G86

## Outline and Article Indication

• HD74ALVC1G86



VSON-5



□ = Control code

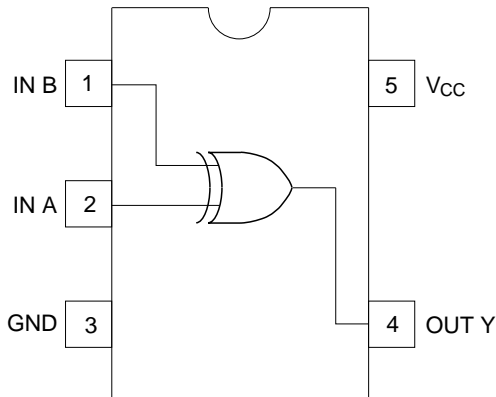
## Function Table

Inputs		Output Y
A	B	
L	L	L
L	H	H
H	L	H
H	H	L

H : High level

L : Low level

## Pin Arrangement



(Top view)

**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	$V_{CC}$	-0.5 to 4.6	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to 4.6	V	
Output voltage range <sup>*1,2</sup>	$V_O$	-0.5 to $V_{CC} + 0.5$ -0.5 to 4.6	V	Output : H or L $V_{CC}$ : OFF
Input clamp current	$I_{IK}$	-50	mA	$V_I < 0$
Output clamp current	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 50$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 100$	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>*3</sup>	$P_T$	200	mW	
Storage temperature	Tstg	-65 to 150	$^\circ\text{C}$	

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  $150^\circ\text{C}$ .

**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	$V_{CC} = 1.2\text{ V}$
		—	-4		$V_{CC} = 1.4\text{ V}$
		—	-6		$V_{CC} = 1.65\text{ V}$
		—	-18		$V_{CC} = 2.3\text{ V}$
		—	-24		$V_{CC} = 3.0\text{ V}$
	$I_{OL}$	—	2	$V_{CC} = 1.2\text{ V}$	
		—	4	$V_{CC} = 1.4\text{ V}$	
		—	6	$V_{CC} = 1.65\text{ V}$	
		—	18	$V_{CC} = 2.3\text{ V}$	
		—	24	$V_{CC} = 3.0\text{ V}$	
Input transition rise or fall rate	$\Delta t / \Delta v$	0	20	ns / V	$V_{CC} = 1.2\text{ to }2.7\text{ V}$
		0	10		$V_{CC} = 3.3 \pm 0.3\text{ V}$
Operating free-air temperature	$T_a$	-40	85	°C	

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

**Electrical Characteristic**

- Ta = -40 to 85°C

Item	Symbol	V <sub>CC</sub> (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	V <sub>IH</sub>	1.2	V <sub>CC</sub> ×0.75	—	—	V	
		1.4 to 1.6	V <sub>CC</sub> ×0.7	—	—		
		1.65 to 1.95	V <sub>CC</sub> ×0.7	—	—		
		2.3 to 2.7	1.7	—	—		
		3.0 to 3.6	2.0	—	—		
	V <sub>IL</sub>	1.2	—	—	V <sub>CC</sub> ×0.25		
		1.4 to 1.6	—	—	V <sub>CC</sub> ×0.3		
		1.65 to 1.95	—	—	V <sub>CC</sub> ×0.3		
		2.3 to 2.7	—	—	0.7		
		3.0 to 3.6	—	—	0.8		
Output voltage	V <sub>OH</sub>	Min to Max	V <sub>CC</sub> -0.2	—	—	V	I <sub>OH</sub> = -100 μA
		1.2	0.9	—	—		I <sub>OH</sub> = -2 mA
		1.4	1.1	—	—		I <sub>OH</sub> = -4 mA
		1.65	1.2	—	—		I <sub>OH</sub> = -6 mA
		2.3	1.7	—	—		I <sub>OH</sub> = -18 mA
		3.0	2.2	—	—		I <sub>OH</sub> = -24 mA
	V <sub>OL</sub>	Min to Max	—	—	0.2	I <sub>OL</sub> = 100 μA	
		1.2	—	—	0.3	I <sub>OL</sub> = 2 mA	
		1.4	—	—	0.3	I <sub>OL</sub> = 4 mA	
		1.65	—	—	0.3	I <sub>OL</sub> = 6 mA	
		2.3	—	—	0.55	I <sub>OL</sub> = 18 mA	
		3.0	—	—	0.55	I <sub>OL</sub> = 24 mA	
Input current	I <sub>IN</sub>	3.6	—	—	±5	μA	V <sub>IN</sub> = 3.6 V or GND
Quiescent supply current	I <sub>CC</sub>	3.6	—	—	10	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0
Output leakage current	I <sub>OFF</sub>	0	—	—	5	μA	V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V
Input capacitance	C <sub>IN</sub>	3.3	—	2.5	—	pF	V <sub>IN</sub> = V <sub>CC</sub> or GND

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

**Switching Characteristics**

- $V_{CC} = 1.2 \text{ V}$

Item	Symbol	$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	—	7.5	—	ns	$C_L = 15 \text{ pF}$	A or B	Y

- $V_{CC} = 1.5 \pm 0.1 \text{ V}$

Item	Symbol	$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	2.0	—	8.0	ns	$C_L = 15 \text{ pF}$	A or B	Y

- $V_{CC} = 1.8 \pm 0.15 \text{ V}$

Item	Symbol	$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.5	—	6.0	ns	$C_L = 30 \text{ pF}$	A or B	Y

- $V_{CC} = 2.5 \pm 0.2 \text{ V}$

Item	Symbol	$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.0	—	4.0	ns	$C_L = 30 \text{ pF}$	A or B	Y

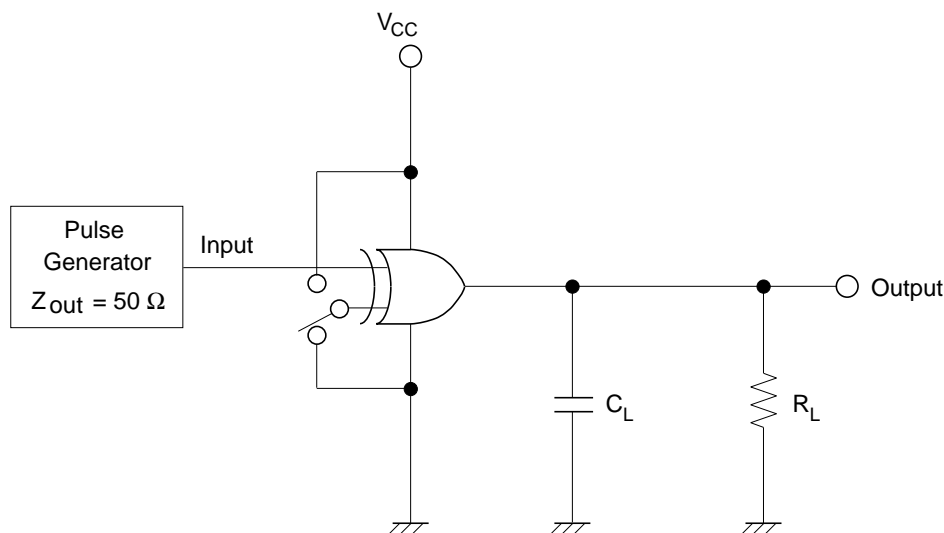
- $V_{CC} = 3.3 \pm 0.3 \text{ V}$

Item	Symbol	$T_a = -40 \text{ to } 85^\circ\text{C}$			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.0	—	3.0	ns	$C_L = 30 \text{ pF}$	A or B	Y

Operating Characteristics

Item	Symbol	V <sub>CC</sub> (V)	T <sub>a</sub> = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C <sub>PD</sub>	1.5	—	10.5	—	pF	f = 10 MHz
		1.8	—	10.5	—		
		2.5	—	10.5	—		
		3.3	—	11.5	—		

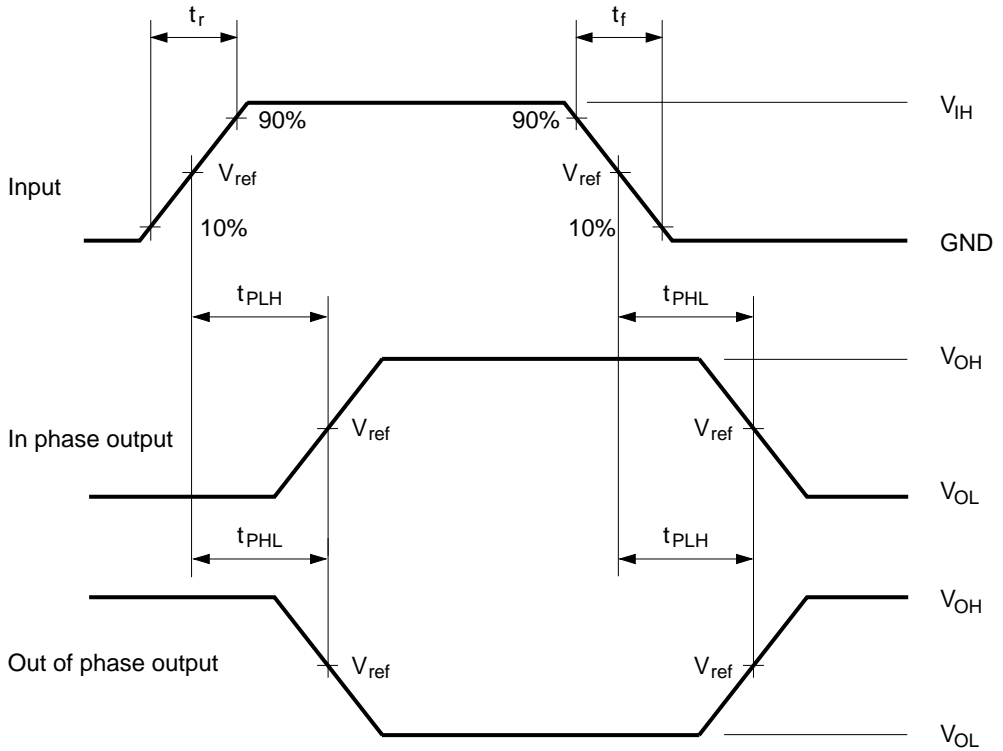
Test Circuit



Symbol	V <sub>CC</sub> = 1.2 V, 1.5±0.1 V	V <sub>CC</sub> = 1.8±0.15 V	V <sub>CC</sub> = 2.5±0.2 V, 3.3±0.3 V
R <sub>L</sub>	2.0 kΩ	1.0 kΩ	500 Ω
C <sub>L</sub>	15 pF	30 pF	30 pF

Note: C<sub>L</sub> includes probe and jig capacitance.

• Waveforms



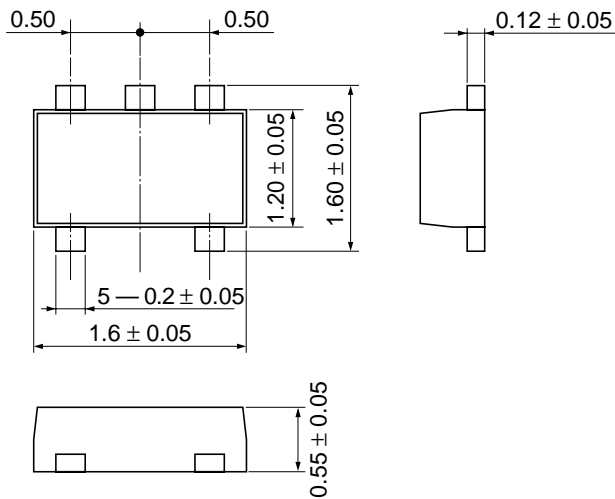
Symbol	$V_{CC} = 1.2 V,$ $1.5 \pm 0.1 V,$ $1.8 \pm 0.15 V$	$V_{CC} = 2.5 \pm 0.2 V$	$V_{CC} = 3.3 \pm 0.3 V$
$t_r / t_f$	2.0 ns	2.5 ns	2.5 ns
$V_{IH}$	$V_{CC}$	$V_{CC}$	2.7 V
$V_{ref}$	50%	50%	1.5 V

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



Package Dimensions

As of January, 2001  
Unit: mm



Hitachi Code	TNP-5D
JEDEC	—
EIAJ	—
Mass (reference value)	—

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