HD74ALVC1G86

2–input Exclusive–OR Gate

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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.

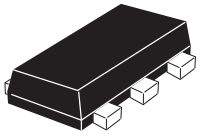
Features

- The basic gate function is lined up as Renesas 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 V)
  ±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)
- Ordering Information

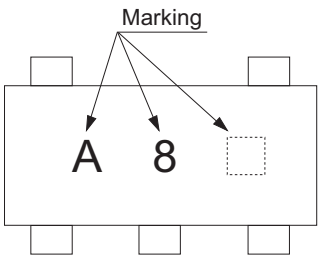
Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74ALVC1G86VSE	VSON-5 pin	PUSN0005KA-A (TNP-5DV)	VS	E (3,000 pcs/reel)

Outline and Article Indication

• HD74ALVC1G86



VSON–5



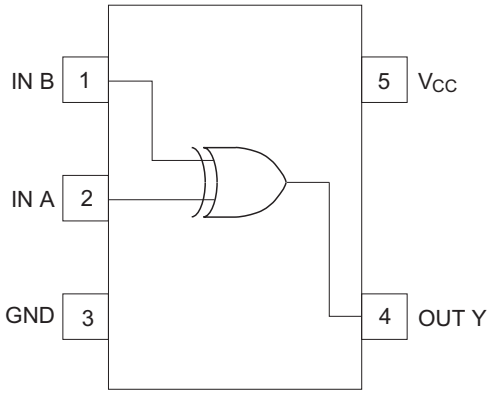
= Control code

Function Table

Inputs		Output
A	B	Y
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 *[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	Δt / Δv	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.

Electrical Characteristics

Ta = –40 to 85°C

Item	Symbol	V_{CC} (V) *	Min	Typ	Max	Unit	Test condition
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_I or V_O = 0 to 3.6 V
Input capacitance	C_{IN}	3.3	—	4.5	—	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} = 1.2 V

Item	Symbol	Ta = –40 to 85°C			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Propagation delay time	t_{PLH} t_{PHL}	—	7.5	—	ns	C_L = 15 pF	A or B	Y

V_{CC} = 1.5 ± 0.1 V

Item	Symbol	Ta = –40 to 85°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 pF	A or B	Y

V_{CC} = 1.8 ± 0.15 V

Item	Symbol	Ta = –40 to 85°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 pF	A or B	Y

V_{CC} = 2.5 ± 0.2 V

Item	Symbol	Ta = –40 to 85°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 pF	A or B	Y

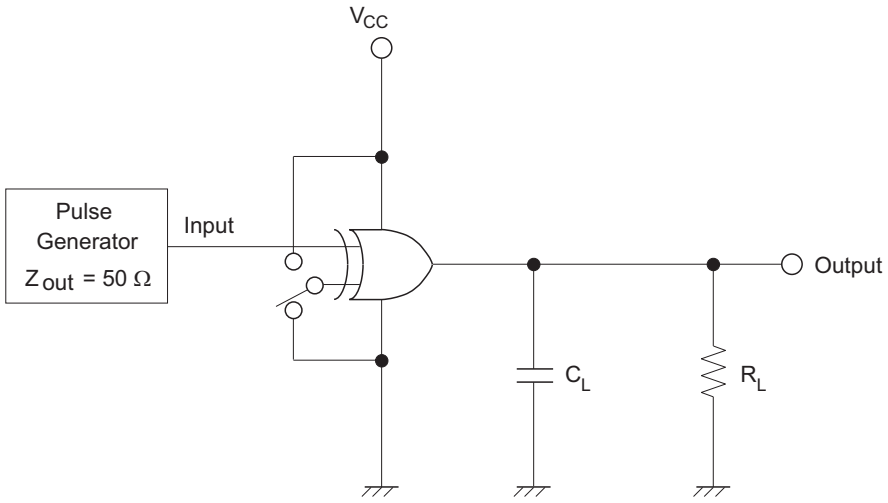
V_{CC} = 3.3 ± 0.3 V

Item	Symbol	Ta = –40 to 85°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 pF	A or B	Y

Operating Characteristics

Item	Symbol	V_{CC} (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	1.5	—	10.5	—	pF	f = 10 MHz
		1.8	—	10.5	—		
		2.5	—	10.5	—		
		3.3	—	11.5	—		

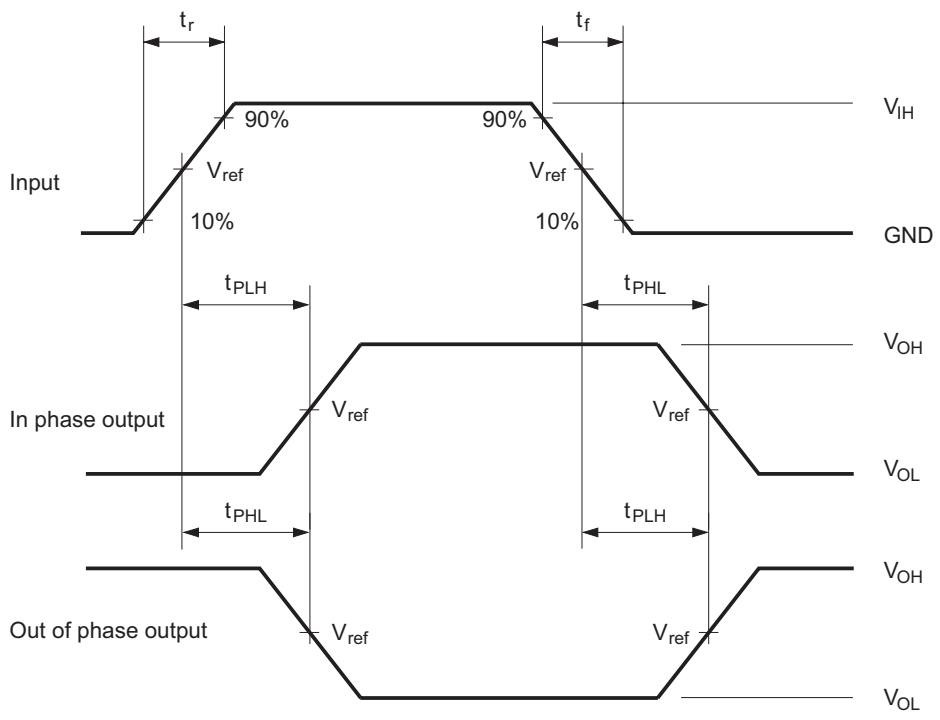
Test Circuit



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

Note: C_L includes probe and jig capacitance.

Waveforms

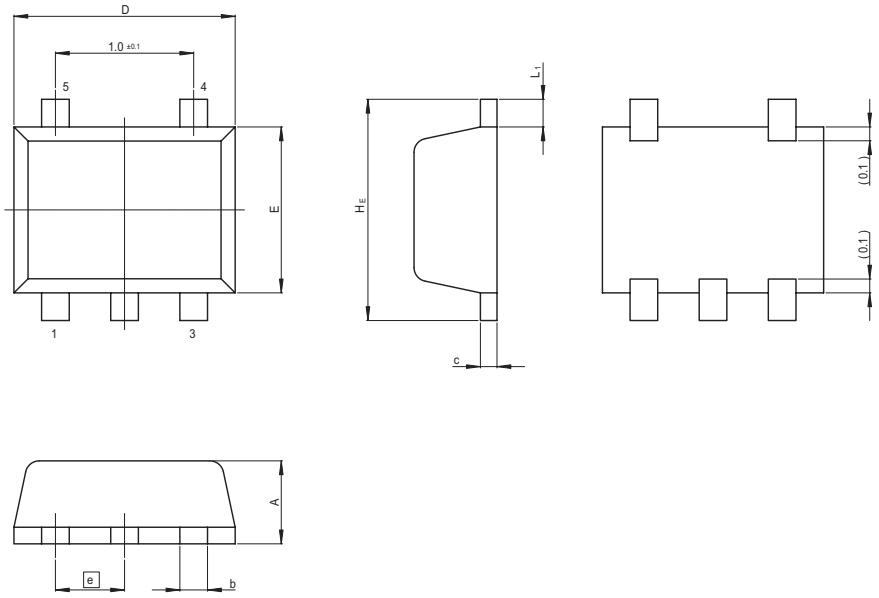


Symbol	V_{CC} = 1.2 V, 1.5±0.1 V, 1.8±0.15 V	V_{CC} = 2.5±0.2 V	V_{CC} = 3.3±0.3 V
t_r / t_f	2.0 ns	2.5 ns	2.5 ns
V_{IH}	V_{CC}	V_{CC}	2.7 V
V_{ref}	50%	50%	1.5 V

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

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-USON5-1.2x1.6-0.50	PUSN0005KA-A	TNP-5D/TNP-5DV	0.002g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	1.55	1.6	1.65
E	1.1	1.2	1.3
A	——	——	0.6
A_1	——	——	——
A_2	——	——	——
b	0.15	0.2	0.3
b_1	——	——	——
e	——	0.5	——
L_p	——	——	——
x	——	——	——
y	——	——	——
Z_D	——	——	——
c	0.07	0.12	0.22
c_1	——	——	——
H_E	1.55	1.6	1.65
L_1	——	0.2	——

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

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Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
Unit2607 Ruijing Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> 2-796-3115, Fax: <82> 2-796-2145

Renesas Technology Malaysia Sdn. Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

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