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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74HC1G86

2-input Exclusive-OR Gate



ADE-205-300C (Z)

4th. Edition
Feb. 2003

Description

The HD74HC1G86 is high speed CMOS two input exclusive-OR gate using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equivalent to LS-TTL series. The internal circuit of three stages construction with buffer provides wide noise margin and stable output.

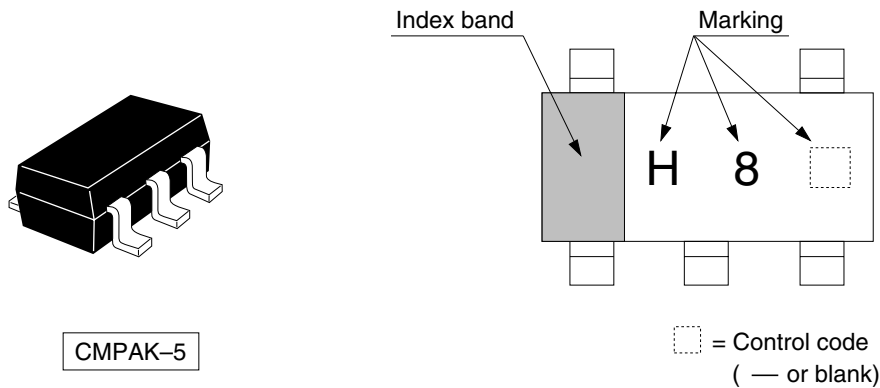
Features

- 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 HD74HC86
 - Supply voltage range : 2 to 6 V
 - Operating temperature range : -40 to +85°C
- $I_{OH} = I_{OL} = 2 \text{ mA (min)}$
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC1G86CME	CMPAK-5 pin	CMPAK-5V	CM	E (3,000 pcs/reel)

Outline and Article Indication

• HD74HC1G86

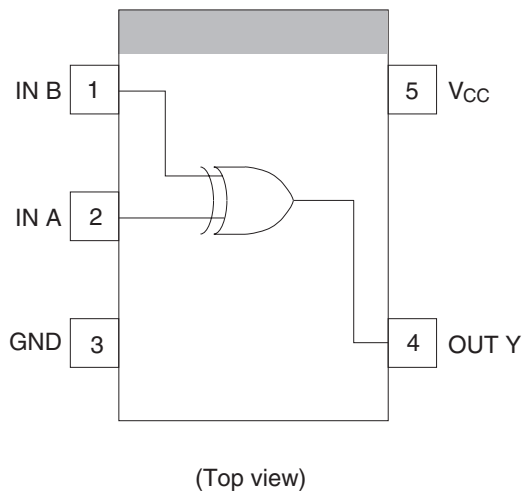


Function Table

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



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	V_{CC}	-0.5 to 7.0	V	
Input voltage range ^{*1}	V_I	-0.5 to $V_{CC} + 0.5$	V	
Output voltage range ^{*1,2}	V_O	-0.5 to $V_{CC} + 0.5$	V	Output : H or L
Input clamp current	I_{IK}	±20	mA	$V_I < 0$ or $V_I > V_{CC}$
Output clamp current	I_{OK}	±20	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	±25	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±25	mA	
Maximum power dissipation P_T at $T_a = 25^\circ\text{C}$ (in still air) ^{*3}		200	mW	
Storage temperature	T_{stg}	-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 5.5 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	Test Conditions
Supply voltage range	V_{CC}	2	6	V	
Input voltage range	V_I	0	V_{CC}	V	
Output voltage range	V_O	0	V_{CC}	V	
Output current	I_{OL}	—	2.0	mA	$V_{CC} = 4.5\text{ V}$
		—	2.6		$V_{CC} = 6.0\text{ V}$
	I_{OH}	—	-2.0	mA	$V_{CC} = 4.5\text{ V}$
		—	-2.6		$V_{CC} = 6.0\text{ V}$
Input rise / fall time (10% to 90%)	t_r, t_f	0	1000	ns	$V_{CC} = 2.0\text{ V}$
		0	500		$V_{CC} = 4.5\text{ V}$
		0	400		$V_{CC} = 6.0\text{ V}$
Operating temperature	T_a	-40	85	°C	

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

Electrical Characteristics

Item	Symbol	V _{CC} (V)	T _a = 25°C			T _a = -40 to 85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5			
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	4.31	—	4.13	—			
		6.0	5.68	5.80	—	5.63	—			
		6.0	—	—	—	—	—			
	V _{OL}	2.0	—	0.0	0.1	—	0.1			I _{OH} = -2 mA
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	0.17	0.26	—	0.33			
		6.0	—	0.18	0.26	—	0.33			
		6.0	—	—	—	—	—			
Input current	I _{IN}	6.0	—	—	±0.1	—	±1.0	μA	V _{IN} = V _{CC} or GND	
Operating current	I _{CC}	6.0	—	—	1.0	—	10.0	μA	V _{IN} = V _{CC} or GND	

Switching Characteristics

Item	Symbol	Ta = 25°C			Unit	Test Conditions
		Min	Typ	Max		
Output rise / fall time	t _{TLH}	—	4	8	ns	Test circuit
	t _{THL}	—	4	8		
Propagation delay time	t _{PLH}	—	10	17	ns	Test circuit
	t _{PHL}	—	10	17		

(C_L = 15 pF, t_r = t_f = 6 ns, V_{CC} = 5 V)

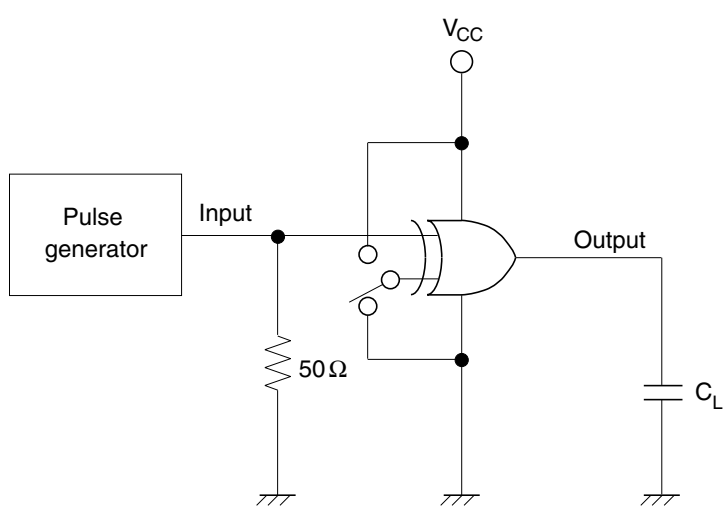
Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions
		V _{CC}	Min	Typ	Max	Min	Max	
Output rise / fall time	t _{TLH}	2.0	—	50	125	—	155	ns
	t _{THL}	4.5	—	14	25	—	31	
		6.0	—	12	21	—	26	
Propagation delay time	t _{PLH}	2.0	—	48	100	—	125	ns
	t _{PHL}	4.5	—	12	20	—	25	
		6.0	—	9	17	—	21	
Input capacitance	C _{IN}	—	—	2.5	5	—	5	pF
Equivalent capacitance	C _{PD}	—	—	10	—	—	—	pF

(C_L = 50 pF, t_r = t_f = 6 ns)

Note: C_{PD} is equivalent capacitance inside of the IC calculated from the operating current without load (see test circuit). The average operating current without load is calculated according to the expression below.

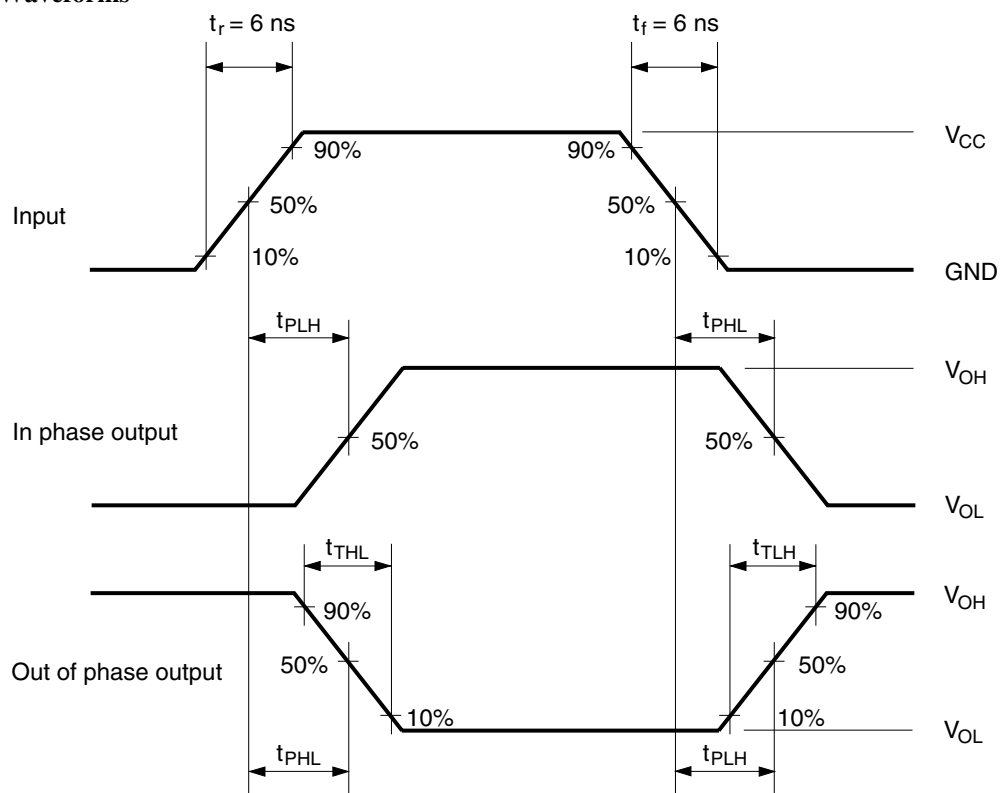
$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit



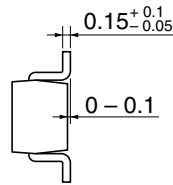
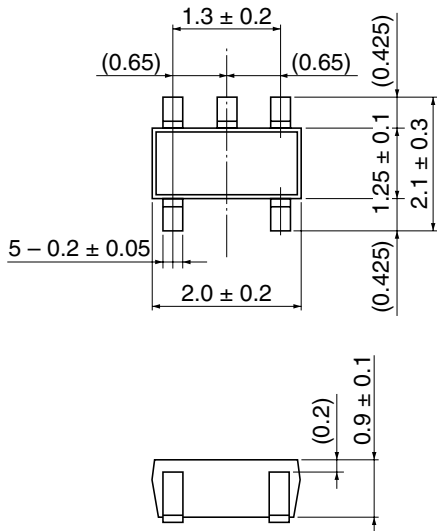
Note: 1. C_L includes probe and jig capacitance.

• Waveforms



Package Dimensions

Unit: mm



*Sn-Bi plating

Hitachi Code	CMPAK-5V
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.006 g

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