

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# HD74HC1G86

## 2-input Exclusive-OR Gate

REJ03D0189-0500Z  
(Previous ADE-205-300C (Z))  
Rev.5.00  
Jan.27.2004

### 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.

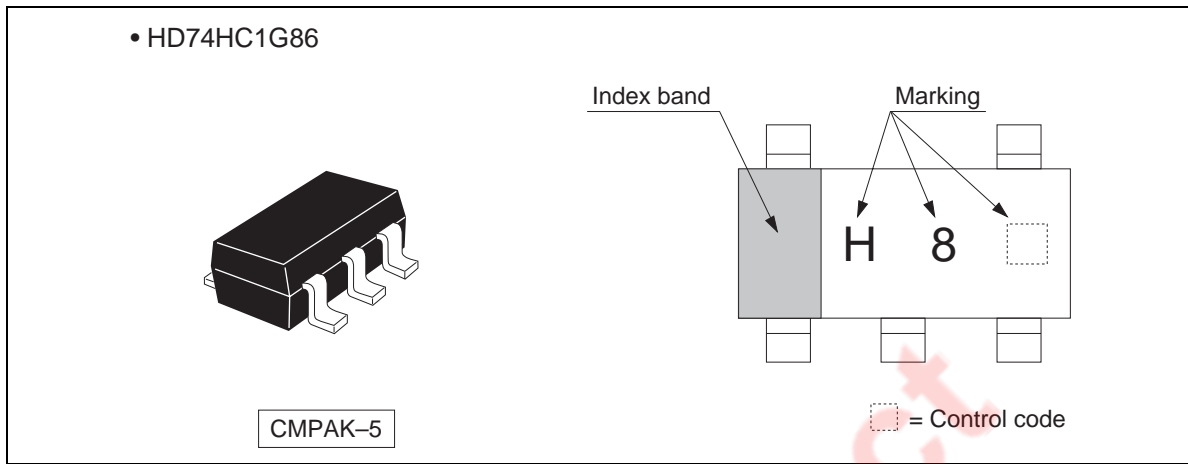
### Features

- The basic gate function is lined up as Renesas 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)

## HD74HC1G86

### Outline and Article Indication



### Function Table

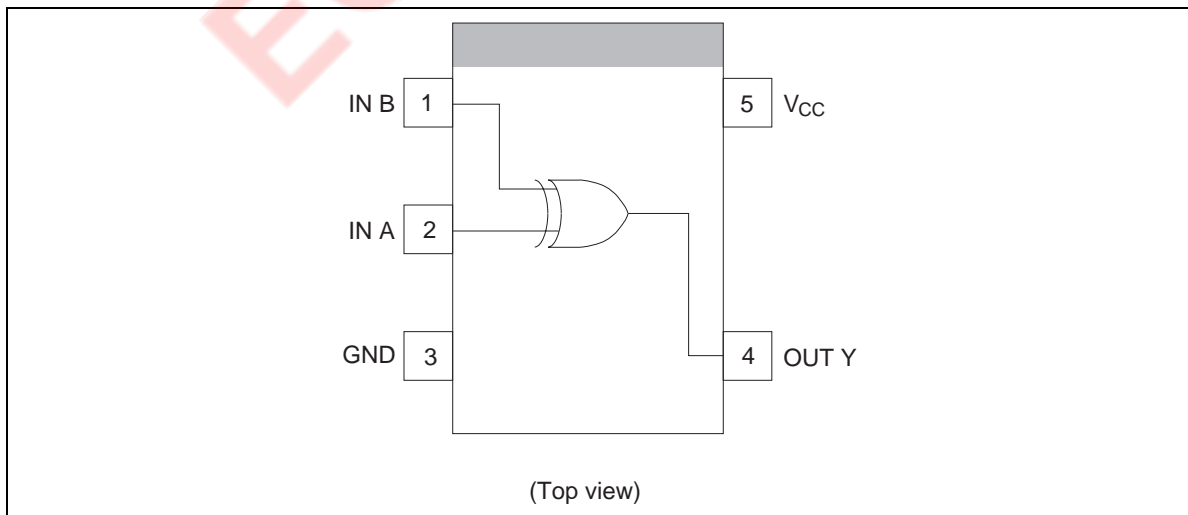
#### Inputs

A	B	Output Y
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 <sup>*1</sup>	$V_I$	-0.5 to $V_{CC} + 0.5$	V	
Output voltage range <sup>*1, 2</sup>	$V_O$	-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) <sup>*3</sup>		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 <sub>CC</sub> (V)	T <sub>a</sub> = 25°C			T <sub>a</sub> = -40 to 85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5			
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -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	—			I <sub>OH</sub> = -2 mA
		6.0	5.68	5.80	—	5.63	—			I <sub>OH</sub> = -2.6 mA
		V <sub>OL</sub>	2.0	—	0.0	0.1	—			0.1
	4.5		—	0.0	0.1	—	0.1			
	6.0		—	0.0	0.1	—	0.1			
	4.5		—	0.17	0.26	—	0.33	I <sub>OL</sub> = 2 mA		
	6.0		—	0.18	0.26	—	0.33	I <sub>OL</sub> = 2.6 mA		
	Input current	I <sub>IN</sub>	6.0	—	—	±0.1	—	±1.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
Operating current	I <sub>CC</sub>	6.0	—	—	1.0	—	10.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	

Switching Characteristics

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

(C<sub>L</sub> = 15 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns, V<sub>CC</sub> = 5 V)

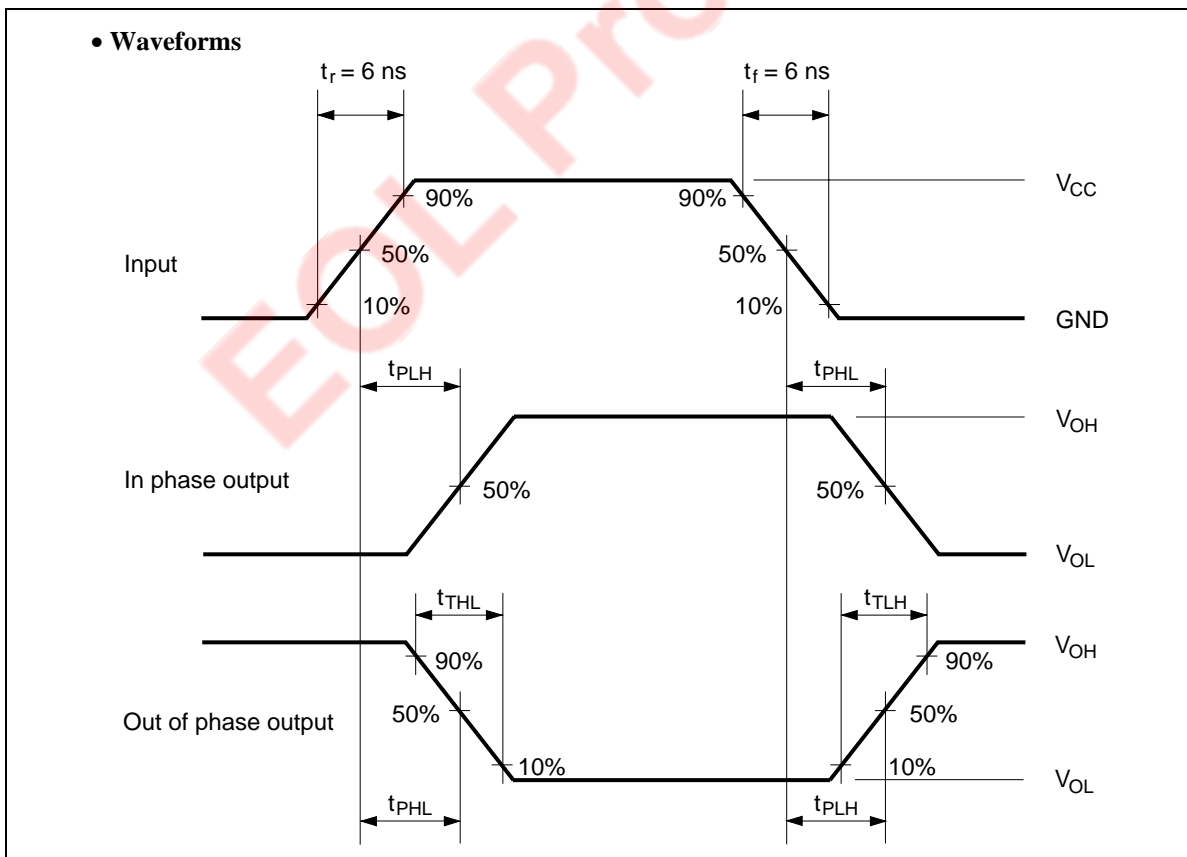
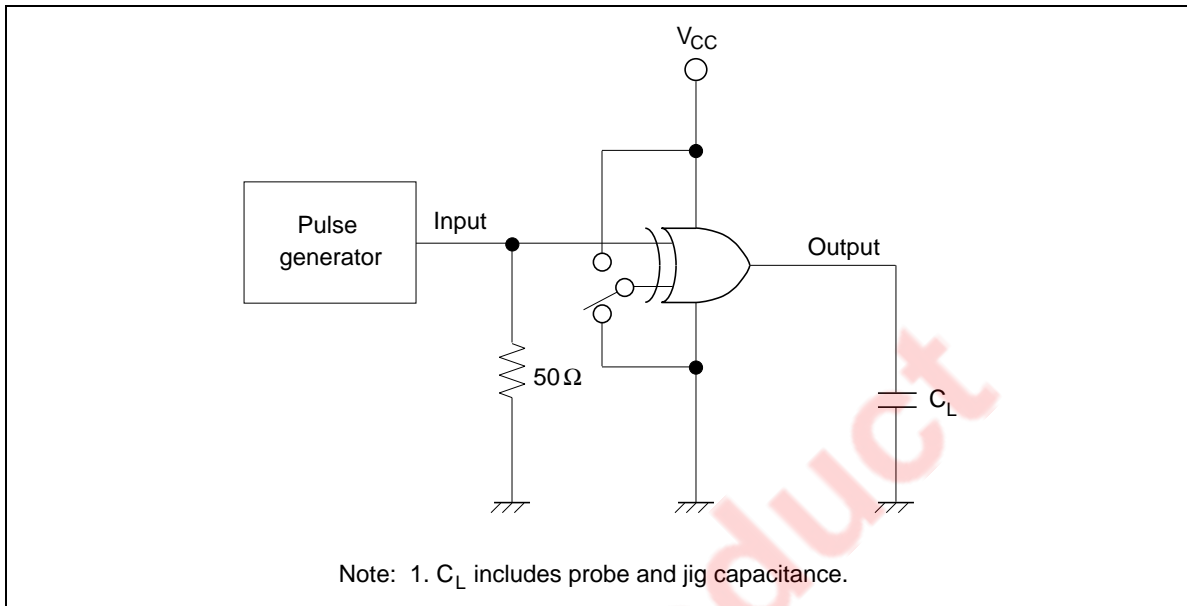
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Output rise / fall time	t <sub>TLH</sub>	2.0	—	50	125	—	155	ns	Test circuit
	t <sub>THL</sub>	4.5	—	14	25	—	31		
		6.0	—	12	21	—	26		
Propagation delay time	t <sub>PLH</sub>	2.0	—	48	100	—	125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

(C<sub>L</sub> = 50 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Note: C<sub>PD</sub> 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.

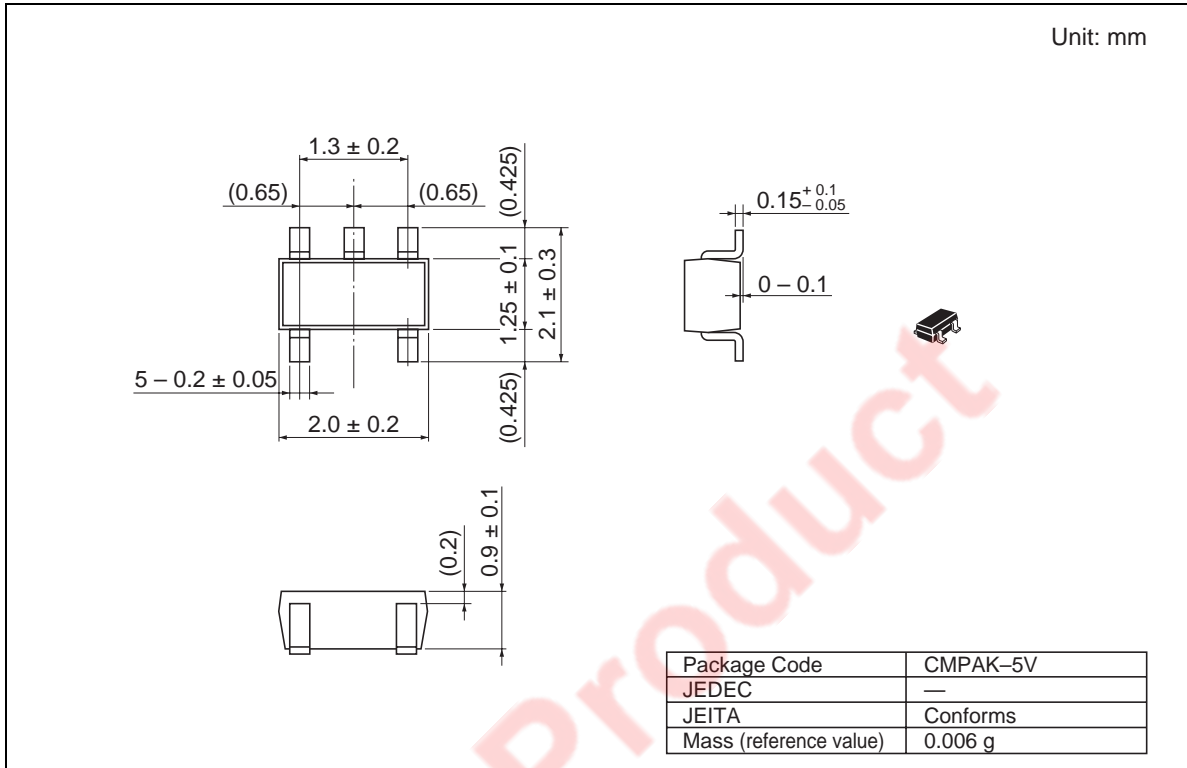
$$I_{CC} (opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit





Package Dimensions



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