# HD74HC1G00

2–input NAND Gate

HITACHI

ADE-205-309B (Z)
3rd. Edition
April 2001

## Description

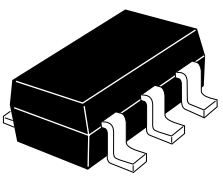
The HD74HC1G00 is high speed CMOS two input NAND gate using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equivalent to LS–TTL series. The internal circuit of three stages construction with buffer provides wide noise margin and stable output.

## Features

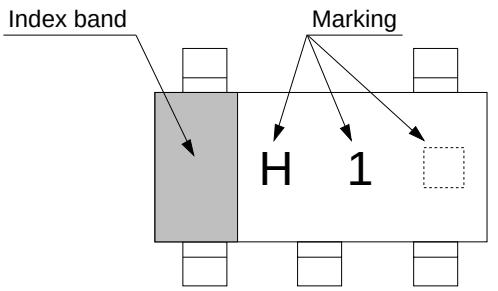
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74HC00
  Supply voltage range : 2 to 6 V
  Operating temperature range : –40 to +85°C
- $|I_{OH}| = I_{OL} = 2$ mA (min)

## Outline and Article Indication

• HD74HC1G00



CMPAK–5




= Control code
( — or blank)

Hitachi semiconductor

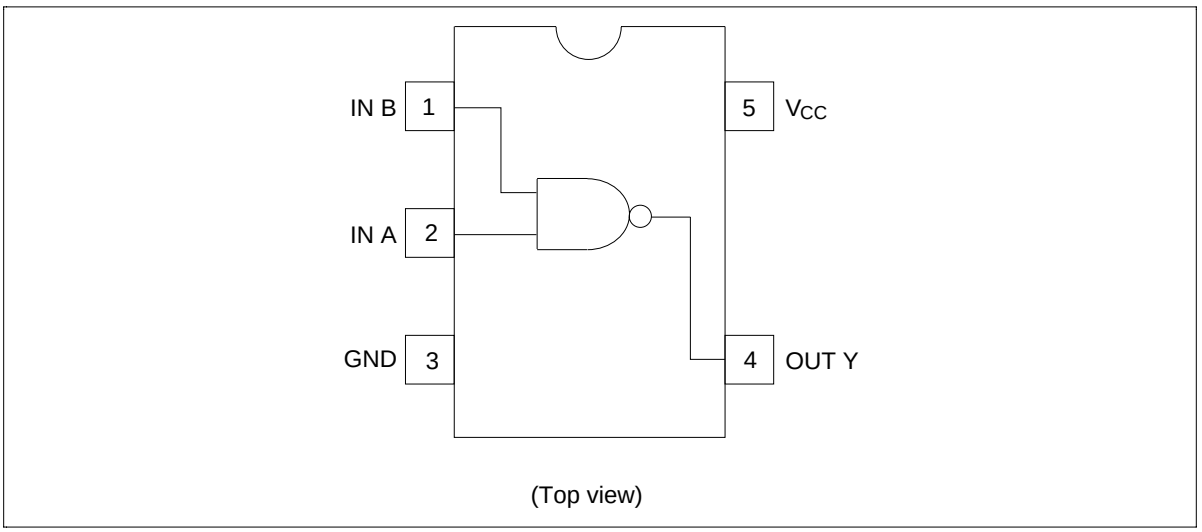
## Function Table

| Inputs | | Output Y |
|---|---|---|
| **A** | **B** | |
| L | L | H |
| 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 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 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 5.5 V maximum.
3. The maximum package power dissipation was caluculated 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 V |
| | | — | 2.6 | | $V_{CC}$ = 6.0 V |
| | $I_{OH}$ | — | –2.0 | mA | $V_{CC}$ = 4.5 V |
| | | — | –2.6 | | $V_{CC}$ = 6.0 V |
| Input rise / fall time | $t_r$, $t_f$ | 0 | 1000 | ns | $V_{CC}$ = 2.0 V |
| (10% to 90%) | | 0 | 500 | | $V_{CC}$ = 4.5 V |
| | | 0 | 400 | | $V_{CC}$ = 6.0 V |
| Operating temperature | Ta | –40 | 85 | °C | |

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

## Electrical Characteristics

| Item | Symbol | $V_{CC}$ | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (V) | 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 | $V_{IN}$ = | $I_{OH}$ = –20 µA |
| | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | | $V_{IH}$ or $V_{IL}$ | |
| | | 6.0 | 5.9 | 6.0 | — | 5.9 | — | | | |
| | | 4.5 | 4.18 | 4.31 | — | 4.13 | — | | | $I_{OH}$ = –2 mA |
| | | 6.0 | 5.68 | 5.80 | — | 5.63 | — | | | $I_{OH}$ = –2.6 mA |
| | $V_{OL}$ | 2.0 | — | 0.0 | 0.1 | — | 0.1 | | | $I_{OL}$ = 20 µA |
| | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | | | |
| | | 6.0 | — | 0.0 | 0.1 | — | 0.1 | | | |
| | | 4.5 | — | 0.17 | 0.26 | — | 0.33 | | | $I_{OL}$ = 2 mA |
| | | 6.0 | — | 0.18 | 0.26 | — | 0.33 | | | $I_{OL}$ = 2.6 mA |
| 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 | $T_a$ = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| Output rise / fall time | $t_{TLH}$<br>$t_{THL}$ | — | 5 | 10 | ns | Test circuit |
| Propagation delay time | $t_{PLH}$<br>$t_{PHL}$ | — | 7 | 15 | ns | Test circuit |

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

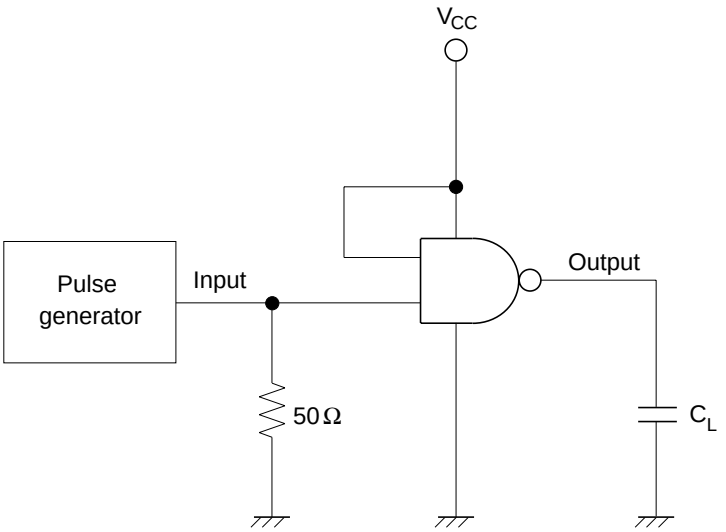
| Item | Symbol | | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ | Min | Typ | Max | Min | Max | | |
| Output rise / fall time | $t_{TLH}$ | 2.0 | — | 50 | 125 | — | 155 | ns | Test circuit |
| | $t_{THL}$ | 4.5 | — | 14 | 25 | — | 31 | | |
| | | 6.0 | — | 12 | 21 | — | 26 | | |
| Propagation delay time | $t_{PLH}$ | 2.0 | — | 48 | 100 | — | 125 | ns | Test circuit |
| | $t_{PHL}$ | 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.

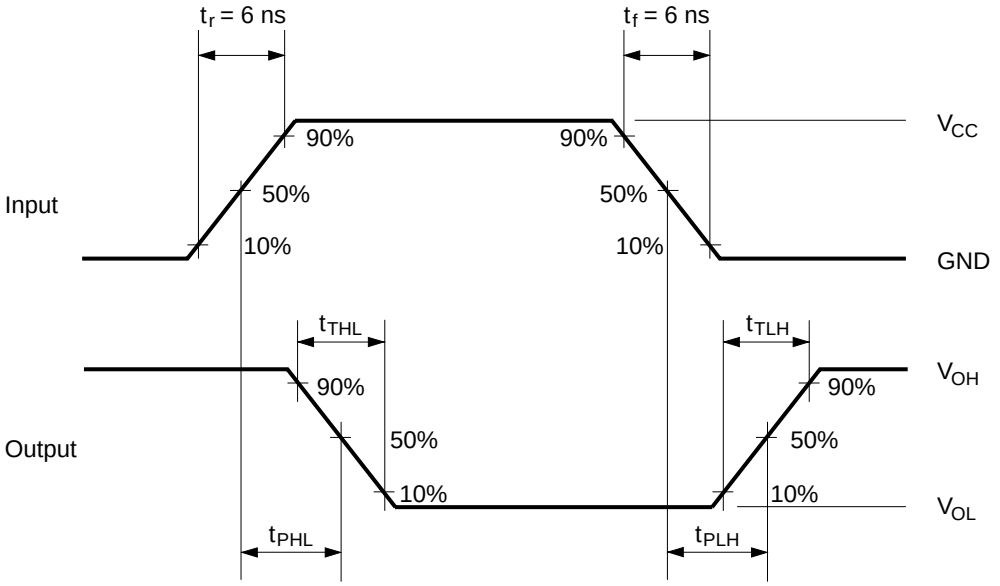
$I_{CC}$ (opr) = $C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

## Test Circuit




Note: 1. $C_L$ includes probe and jig capacitance.

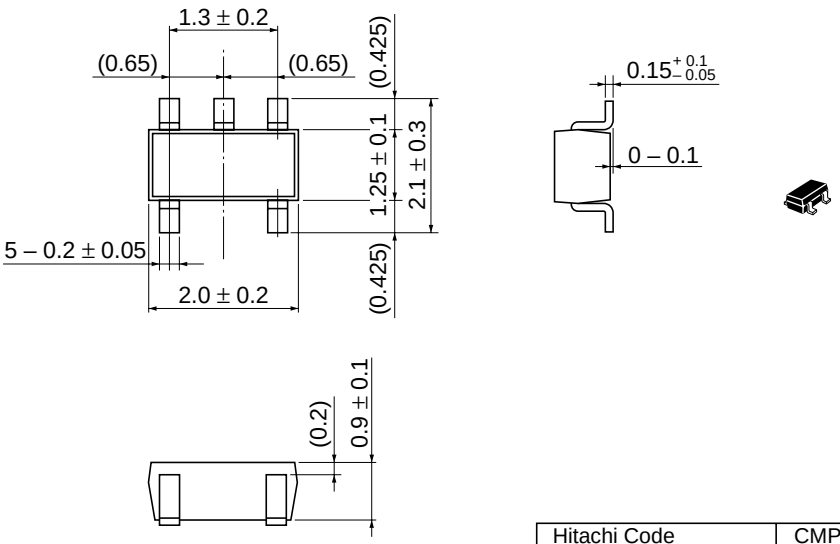
• **Waveforms**



## Package Dimensions

As of January, 2001

Unit: mm




| | |
|---|---|
| Hitachi Code | CMPAK-5 |
| JEDEC | — |
| EIAJ | Conforms |
| Mass (reference value) | 0.006 g |

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