# HD74LV1GT125A

## Bus Buffer Gate with 3–state Output / CMOS Logic Level Shifter

REJ03D0123–0800Z
(Previous ADE-205-332F (Z))
Rev.8.00
Sep.24.2003

## Description

The HD74LV1GT125A has a bus buffer gate with 3–state output in a 5 pin package. Output is disabled when the associated output enable ($\overline{OE}$) input is high. To ensure the high impedance state during power up or power down, $\overline{OE}$ should be connected to $V_{CC}$ through a pull-down resistor; the minimum value of the resistor is determined by the current souring capability of the driver. The input protection circuitry on this device allows over voltage tolerance on the input, allowing the device to be used as a logic–level translator from 3.0 V CMOS Logic to 5.0 V CMOS Logic or from 1.8 V CMOS logic to 3.0 V CMOS Logic while operating at the high-voltage power supply. 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.

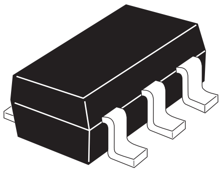
## Features

- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- TTL compatible input level.
  Supply voltage range : 3.0 to 5.5 V
  Operating temperature range : –40 to +85°C
- Logic-level translate function
  3.0 V CMOS logic $\rightarrow$ 5.0 V CMOS logic (@$V_{CC}$ = 5.0 V)
  1.8 V or 2.5 V CMOS logic $\rightarrow$ 3.3 V CMOS logic (@$V_{CC}$ = 3.3 V)
- All inputs $V_{IH}$ (Max.) = 5.5 V (@$V_{CC}$ = 0 V to 5.5 V)
  All outputs $V_O$ (Max.) = 5.5 V (@$V_{CC}$ = 0 V, Output : Z)
- Output current ±6 mA (@$V_{CC}$ = 3.0 V to 3.6 V), ±12 mA (@$V_{CC}$ = 4.5 V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.
- Ordering Information

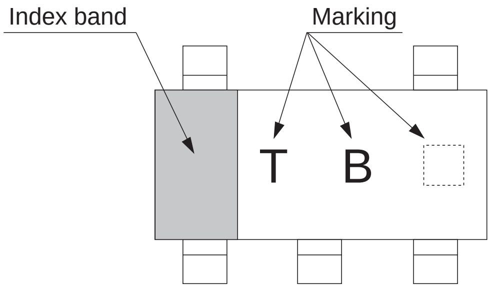
| **Part Name** | **Package Type** | **Package Code** | **Package Abbreviation** | **Taping Abbreviation (Quantity)** |
|---|---|---|---|---|
| HD74LV1GT125ACME | CMPAK-5 pin | CMPAK-5V | CM | E (3,000 pcs/reel) |
| | | CMPAK-5V(O) | | |
| HD74LV1GT125AVSE | VSON-5 pin | TNP-5DV | VS | |

## Outline and Article Indication

- HD74LV1GT125A

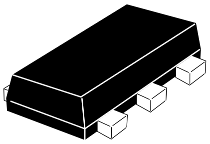


CMPAK–5

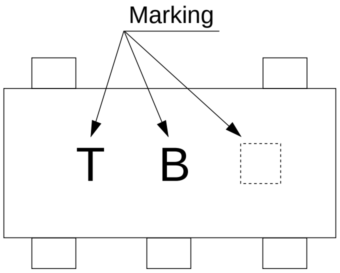


☐ = Control code

- HD74LV1GT125A



VSON–5



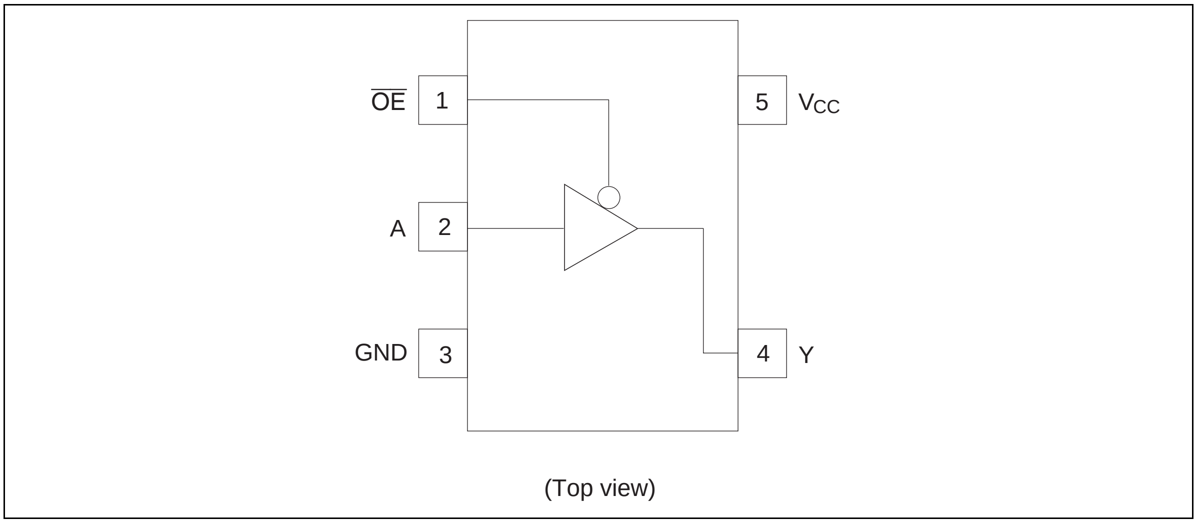
☐ = Control code

## Function Table

| **Inputs** | | **Output Y** |
|---|---|---|
| $\overline{\text{OE}}$ | **A** | |
| L | H | H |
| L | L | L |
| H | X | Z |

H : High level
L : Low level
X : Immaterial
Z : High impedance

## 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 7.0 | V | |
| Output voltage range [*1, 2] | $V_O$ | –0.5 to $V_{CC}$ + 0.5 | V | Output : H or L |
| | | –0.5 to 7.0 | | $V_{CC}$ : OFF or Output : Z |
| Input clamp current | $I_{IK}$ | –20 | mA | $V_I < 0$ |
| Output clamp current | $I_{OK}$ | ±50 | 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 $I_{GND}$ | ±50 | 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 calculated using a junction temperature of 150°C.

## Recommended Operating Conditions

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | 3.0 | 5.5 | V | |
| Input voltage range | $V_I$ | 0 | 5.5 | V | |
| Output voltage range | $V_O$ | 0 | $V_{CC}$ | V | |
| | | 0 | 5.5 | | Output : Z |
| Output current | $I_{OH}$ | — | 6 | mA | $V_{CC}$ = 3.0 to 3.6 V |
| | | — | 12 | | $V_{CC}$ = 4.5 to 5.5 V |
| | $I_{OL}$ | — | –6 | mA | $V_{CC}$ = 3.0 to 3.6 V |
| | | — | –12 | | $V_{CC}$ = 4.5 to 5.5 V |
| Input transition rise or fall rate | $\Delta t / \Delta v$ | 0 | 100 | ns / V | $V_{CC}$ = 3.0 to 3.6 V |
| | | 0 | 20 | | $V_{CC}$ = 4.5 to 5.5 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 | $V_{CC}$ (V) * | Min | Typ | Max | Unit | Test condition |
|---|---|---|---|---|---|---|---|
| Input voltage | $V_{IH}$ | 3.0 to 3.6 | 1.5 | — | — | V | |
| | | 4.5 to 5.5 | 2.0 | — | — | | |
| | $V_{IL}$ | 3.0 to 3.6 | — | — | 0.6 | | |
| | | 4.5 to 5.5 | — | — | 0.8 | | |
| Hysteresis voltage | $V_H$ | 3.3 | — | 0.10 | — | V | $V_T^+ - V_T^-$ |
| | | 5.0 | — | 0.15 | — | | |
| Output voltage | $V_{OH}$ | Min to Max | $V_{CC}$–0.1 | — | — | V | $I_{OH}$ = –50 µA |
| | | 3.0 | 2.48 | — | — | | $I_{OH}$ = –6 mA |
| | | 4.5 | 3.8 | — | — | | $I_{OH}$ = –12 mA |
| | $V_{OL}$ | Min to Max | — | — | 0.1 | | $I_{OL}$ = 50 µA |
| | | 3.0 | — | — | 0.44 | | $I_{OL}$ = 6 mA |
| | | 4.5 | — | — | 0.55 | | $I_{OL}$ = 12 mA |
| Input current | $I_{IN}$ | 0 to 5.5 | — | — | ±1 | µA | $V_{IN}$ = 5.5 V or GND |
| Off state output current | $I_{OZ}$ | Min to Max | — | — | ±5 | µA | $V_O$ = 5.5 V or GND |
| Quiescent supply current | $I_{CC}$ | 5.5 | — | — | 10 | µA | $V_{IN}$ = $V_{CC}$ or GND, $I_O$ = 0 |
| | $\Delta I_{CC}$ | 5.5 | — | — | 1.5 | mA | One input $V_{IN}$ = 3.4 V, other input $V_{CC}$ or GND |
| Output leakage current | $I_{OFF}$ | 0 | — | — | 5 | µA | $V_{IN}$ or $V_O$ = 0 to 5.5 V |
| Input capacitance | $C_{IN}$ | 5.0 | — | 3.0 | — | 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

- $V_{CC}$ = 3.3 ± 0.3 V

| Item | Symbol | Ta = 25°C | | | Ta = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation delay time | $t_{PLH}$ | — | 4.5 | 9.0 | 1.0 | 10.5 | ns | $C_L$ = 15 pF | A | Y |
| | $t_{PHL}$ | — | 6.0 | 11.5 | 1.0 | 13.0 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 4.5 | 9.0 | 1.0 | 10.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 6.0 | 11.5 | 1.0 | 13.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 4.0 | 10.0 | 1.0 | 11.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 5.5 | 13.5 | 1.0 | 15.0 | | $C_L$ = 50 pF | | |

- $V_{CC}$ = 5.0 ± 0.5 V

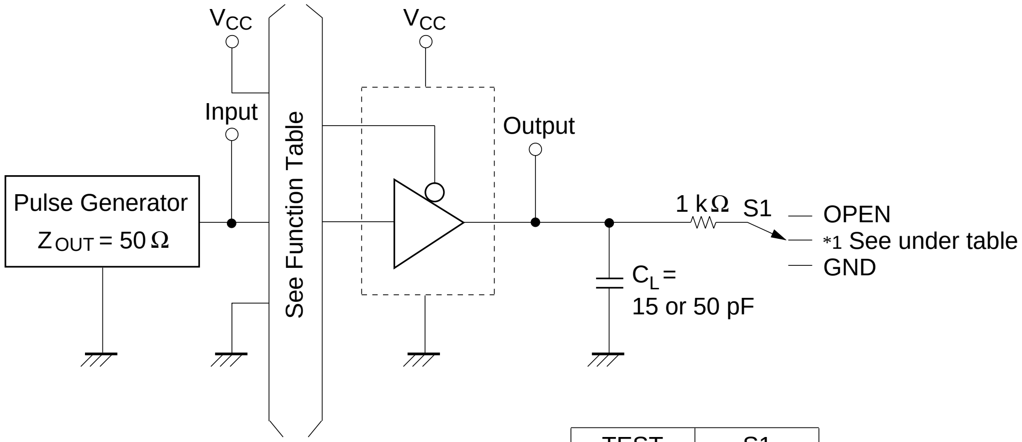
| Item | Symbol | Ta = 25°C | | | Ta = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation delay time | $t_{PLH}$ | — | 3.4 | 5.5 | 1.0 | 6.5 | ns | $C_L$ = 15 pF | A | Y |
| | $t_{PHL}$ | — | 4.3 | 7.5 | 1.0 | 8.5 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 3.4 | 5.1 | 1.0 | 6.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 4.4 | 7.1 | 1.0 | 8.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 3.2 | 6.8 | 1.0 | 8.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 4.0 | 8.8 | 1.0 | 10.0 | | $C_L$ = 50 pF | | |

## Operating Characteristics

- $C_L$ = 50 pF

| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | $C_{PD}$ | 5.0 | — | 11.5 | — | pF | f = 10 MHz |

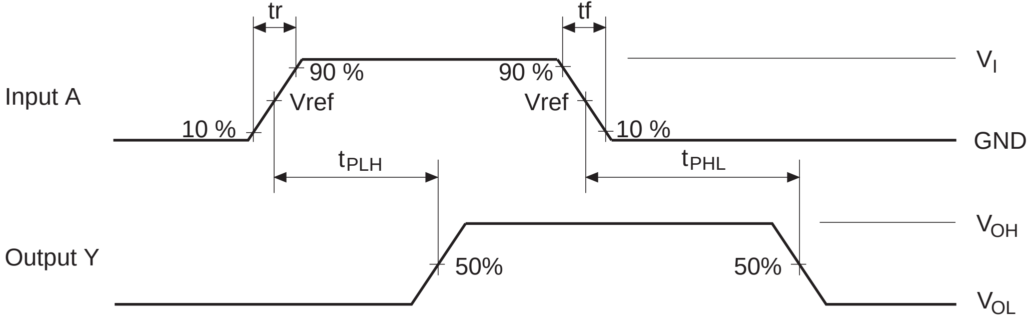
# Test Circuit



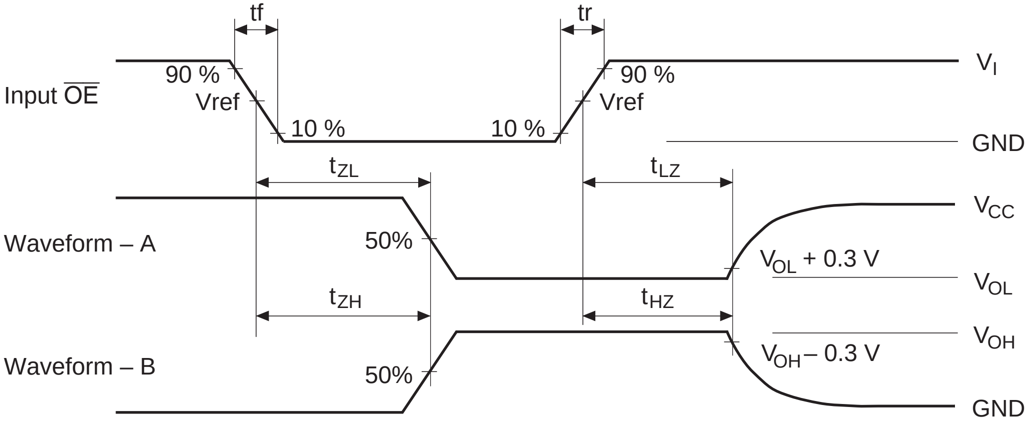
| TEST | S1 |
|---|---|
| $t_{PLH}$ / $t_{PHL}$ | OPEN |
| $t_{ZH}$ / $t_{HZ}$ | GND |
| $t_{ZL}$ / $t_{LZ}$ | $V_{CC}$ |

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

**• Waveforms – 1**



**• Waveforms – 2**

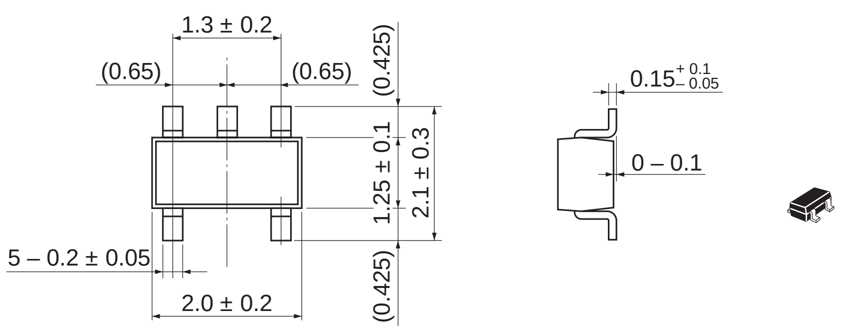


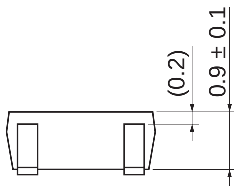
| $V_{CC}$ (V) | INPUTS | | Vref |
|---|---|---|---|
| | $V_I$ | $t_r$ / $t_f$ | |
| 3.3±0.3 | 2.5 V | ≤ 3.0 ns | 50% |
| 5.0±0.5 | 3 V | ≤ 3.0 ns | 1.5 V |

Notes:
1. Input waveform : PRR ≤ 1 MHz, Zo = 50 Ω.
2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform – B is for an output with internal conditions such that the output is high except when disabled by the output control.
4. The output are measured one at a time with one transition per measurement.

# Package Dimensions

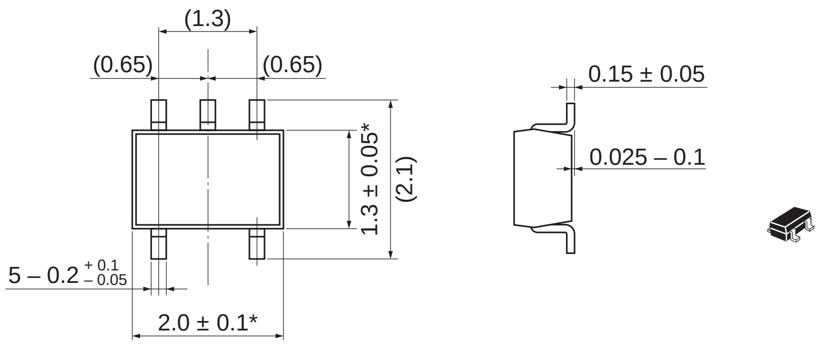
Unit: mm

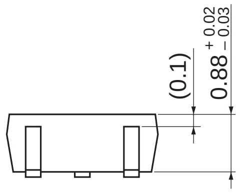




| | |
|---|---|
| Package Code | CMPAK–5V |
| JEDEC | — |
| JEITA | Conforms |
| Mass (reference value) | 0.006 g |

Unit: mm

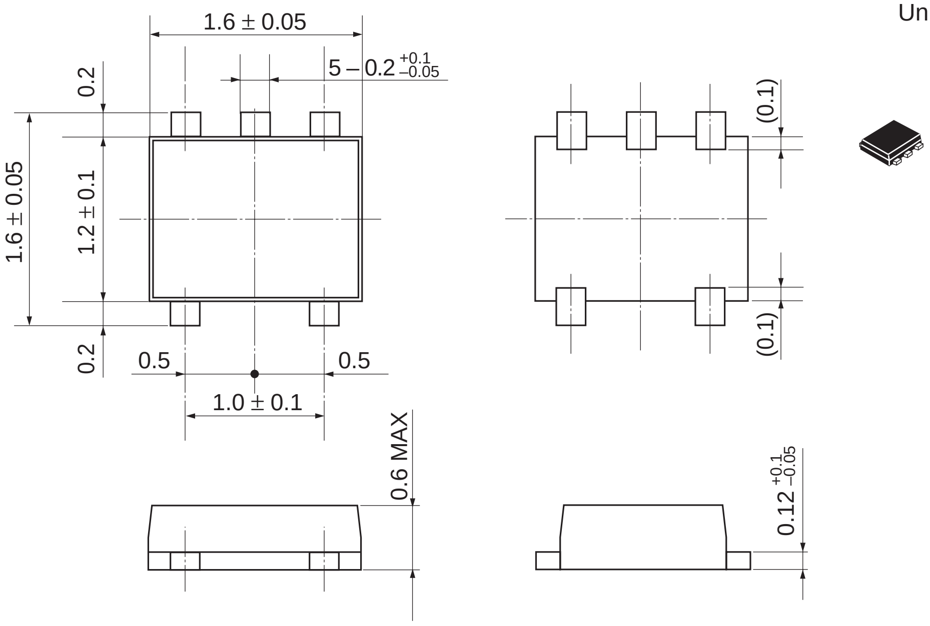




| | |
|---|---|
| Package Code | CMPAK–5V(O) |
| JEDEC | — |
| JEITA | Conforms |
| Mass (reference value) | 0.006 g |

* The value does not include Resin Bar.
(One side: 0.15 mm (max))

Unit: mm



| | |
|---|---|
| Package Code | TNP–5DV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.002 g |

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