To all our customers

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

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# HD74LV2G241A

## Dual Bus Buffer Noninverted with 3–state Output

ADE-205-350D (Z)

Rev.4
Feb. 2003

## Description

The HD74LV2G241A has dual bus buffer noninverted with 3–state output in an 8 pin package. Two noninverters are included in one circuit. Each circuit can be independently controlled by the enable signal $\overline{OE}$ or OE, which enables outputs when receiving a low or high level signal, respectively. 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.

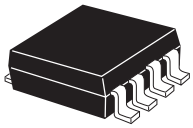
## Features

- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Supply voltage range : 1.65 to 5.5 V
  Operating temperature range : –40 to +85°C
- 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

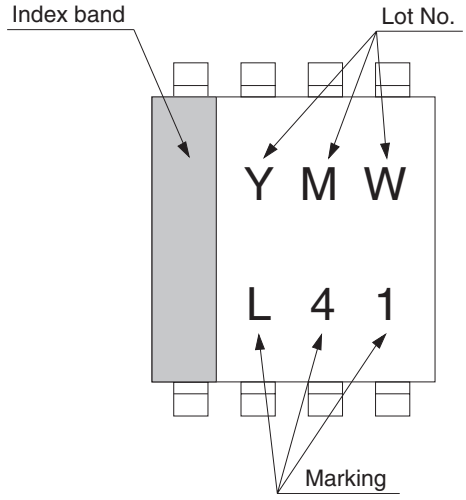
| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74LV2G241AUSE | SSOP-8 pin | TTP-8DBV | US | E (3,000 pcs/reel) |

## Outline and Article Indication

• HD74LV2G241A



SSOP–8




Y : Year code
(the last digit of year)
M : Month code
W : Week code

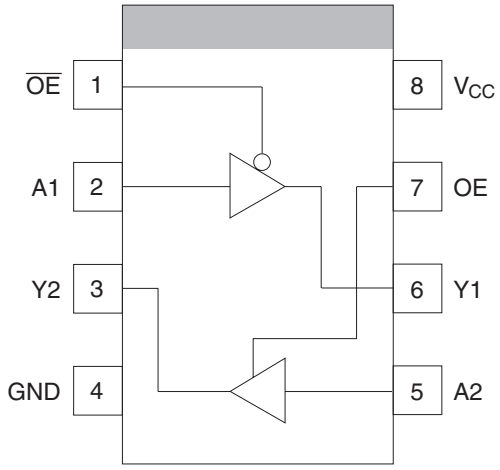
## Function Table

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

| Inputs | | Output Y |
|---|---|---|
| OE | A | |
| H | L | L |
| H | H | H |
| L | X | Z |

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

## 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 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 | $V_{CC}$ | 1.65 | 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 | $I_{OL}$ | — | 1 | mA | $V_{CC}$ = 1.65 to 1.95 V |
| | | — | 2 | | $V_{CC}$ = 2.3 to 2.7 V |
| | | — | 6 | | $V_{CC}$ = 3.0 to 3.6 V |
| | | — | 12 | | $V_{CC}$ = 4.5 to 5.5 V |
| | $I_{OH}$ | — | –1 | | $V_{CC}$ = 1.65 to 1.95 V |
| | | — | –2 | | $V_{CC}$ = 2.3 to 2.7 V |
| | | — | –6 | | $V_{CC}$ = 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 | 300 | ns / V | $V_{CC}$ = 1.65 to 1.95 V |
| | | 0 | 200 | | $V_{CC}$ = 2.3 to 2.7 V |
| | | 0 | 100 | | $V_{CC}$ = 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 | $V_{IH}$ | 1.65 to 1.95 | $V_{CC}$×0.75 | — | — | V | |
| | | 2.3 to 2.7 | $V_{CC}$×0.7 | — | — | | |
| | | 3.0 to 3.6 | $V_{CC}$×0.7 | — | — | | |
| | | 4.5 to 5.5 | $V_{CC}$×0.7 | — | — | | |
| | $V_{IL}$ | 1.65 to 1.95 | — | — | $V_{CC}$×0.25 | | |
| | | 2.3 to 2.7 | — | — | $V_{CC}$×0.3 | | |
| | | 3.0 to 3.6 | — | — | $V_{CC}$×0.3 | | |
| | | 4.5 to 5.5 | — | — | $V_{CC}$×0.3 | | |
| Hysteresis voltage | $V_H$ | 1.8 | — | 0.25 | — | V | $V_T^+ - V_T^-$ |
| | | 2.5 | — | 0.30 | — | | |
| | | 3.3 | — | 0.35 | — | | |
| | | 5.0 | — | 0.45 | — | | |
| Output voltage | $V_{OH}$ | Min to Max | $V_{CC}$–0.1 | — | — | V | $I_{OH}$ = –50 µA |
| | | 1.65 | 1.4 | — | — | | $I_{OH}$ = –1 mA |
| | | 2.3 | 2.0 | — | — | | $I_{OH}$ = –2 mA |
| | | 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 |
| | | 1.65 | — | — | 0.3 | | $I_{OL}$ = 1 mA |
| | | 2.3 | — | — | 0.4 | | $I_{OL}$ = 2 mA |
| | | 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 |
| Output leakage current | $I_{OFF}$ | 0 | — | — | 5 | µA | $V_{IN}$ or $V_O$ = 0 to 5.5 V |
| Input capacitance | $C_{IN}$ | 3.3 | — | 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

- $V_{CC}$ = 1.8 ± 0.15 V

| Item | Symbol | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test | FROM | TO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | Conditions | (Input) | (Output) |
| Propagation | $t_{PLH}$ | — | 13.5 | 23.5 | 1.0 | 26.0 | ns | $C_L$ = 15 pF | A | Y |
| delay time | $t_{PHL}$ | — | 19.0 | 33.0 | 1.0 | 36.0 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 13.7 | 26.5 | 1.0 | 29.0 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 20.5 | 36.0 | 1.0 | 38.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 8.3 | 20.0 | 1.0 | 22.5 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 13.0 | 29.5 | 1.0 | 32.0 | | $C_L$ = 50 pF | | |

- $V_{CC}$ = 2.5 ± 0.2 V

| Item | Symbol | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test | FROM | TO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | Conditions | (Input) | (Output) |
| Propagation | $t_{PLH}$ | — | 6.3 | 11.6 | 1.0 | 14.0 | ns | $C_L$ = 15 pF | A | Y |
| delay time | $t_{PHL}$ | — | 8.2 | 14.4 | 1.0 | 17.0 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 7.4 | 13.0 | 1.0 | 15.5 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 9.5 | 16.5 | 1.0 | 18.5 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 5.7 | 14.7 | 1.0 | 17.0 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 8.1 | 18.2 | 1.0 | 20.5 | | $C_L$ = 50 pF | | |

- $V_{CC}$ = 3.3 ± 0.3 V

| Item | Symbol | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test | FROM | TO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | Conditions | (Input) | (Output) |
| Propagation | $t_{PLH}$ | — | 4.6 | 7.5 | 1.0 | 9.0 | ns | $C_L$ = 15 pF | A | Y |
| delay time | $t_{PHL}$ | — | 5.9 | 11.0 | 1.0 | 12.5 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 5.1 | 8.0 | 1.0 | 9.5 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 6.6 | 11.5 | 1.0 | 13.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 4.4 | 9.7 | 1.0 | 11.5 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 6.1 | 13.2 | 1.0 | 15.0 | | $C_L$ = 50 pF | | |

## Switching Characteristics (cont)

- $V_{CC}$ = 5.0 ± 0.5 V

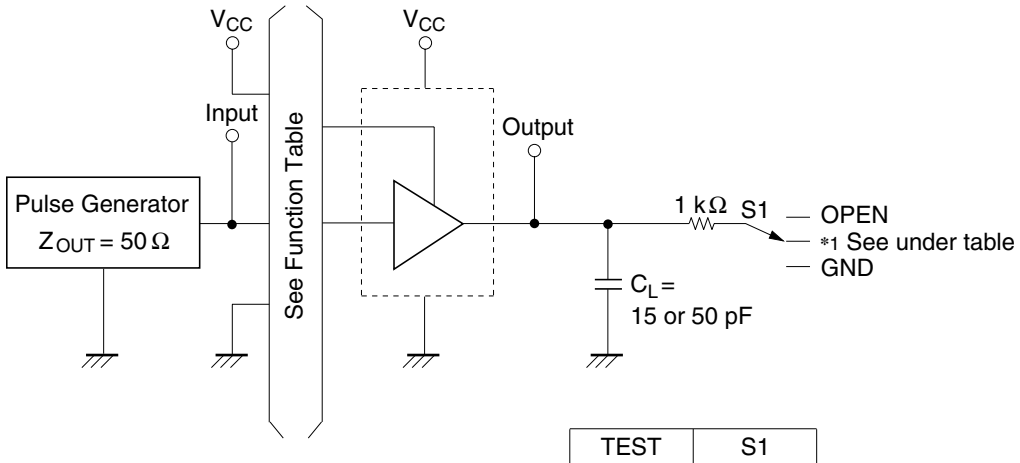
| Item | Symbol | $T_a$ = 25°C | | | $T_a$ = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation | $t_{PLH}$ | — | 3.4 | 5.5 | 1.0 | 6.5 | ns | $C_L$ = 15 pF | A | Y |
| delay time | $t_{PHL}$ | — | 4.4 | 7.5 | 1.0 | 8.5 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 3.6 | 5.1 | 1.0 | 6.0 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 4.6 | 7.1 | 1.0 | 8.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 3.3 | 6.8 | 1.0 | 8.0 | ns | $C_L$ = 15 pF | OE, $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 4.3 | 8.8 | 1.0 | 10.0 | | $C_L$ = 50 pF | | |

## Operating Characteristics

- $C_L$ = 50 pF

| Item | Symbol | $V_{cc}$ (V) | $T_a$ = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Power dissipation | $C_{PD}$ | 3.3 | — | 10.5 | — | pF | f = 10 MHz |
| capacitance | | 5.0 | — | 11.5 | — | | |

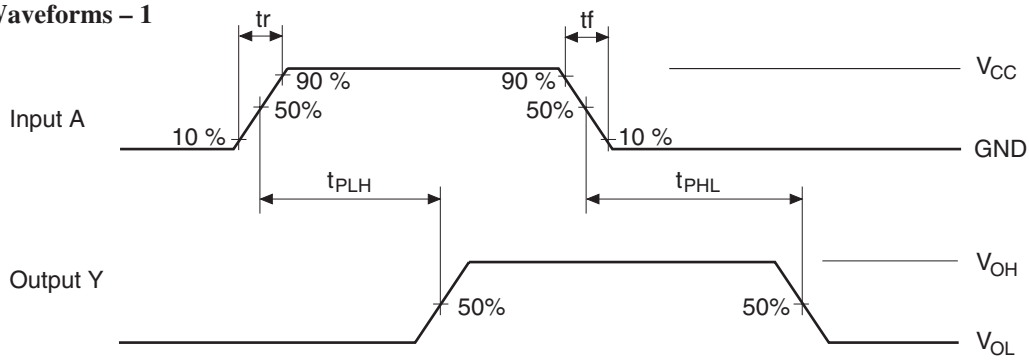
## Test Circuit



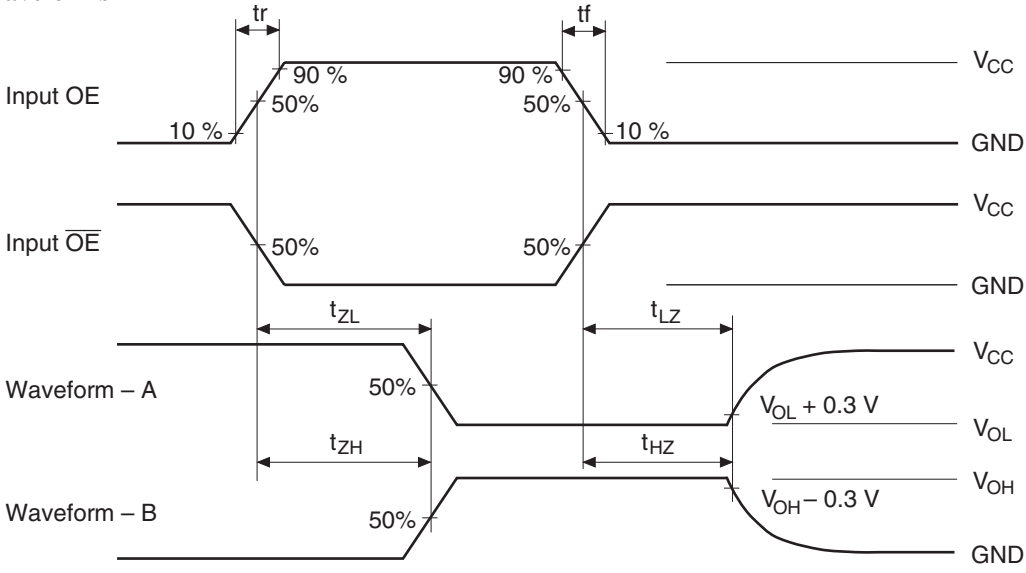

| TEST | S1 |
|---|---|
| $t_{PLH}$/ $t_{PHL}$ | OPEN |
| $t_{ZH}$/ $t_{HZ}$ | GND |
| $t_{ZL}$/ $t_{LZ}$ | $V_{CC}$ |

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

• **Waveforms – 1**



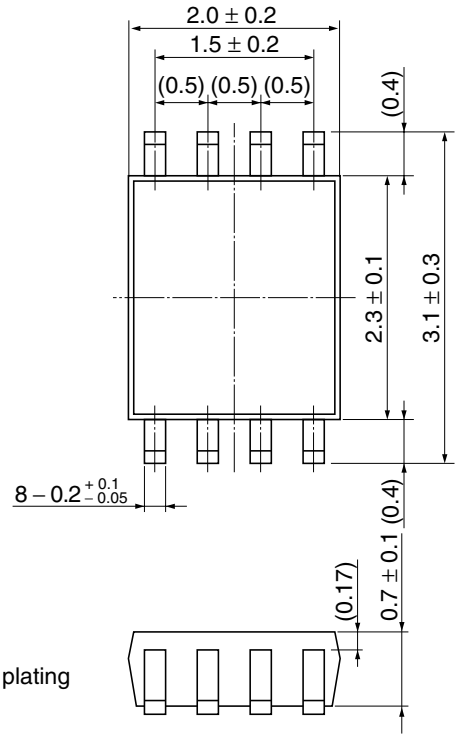

• **Waveforms – 2**

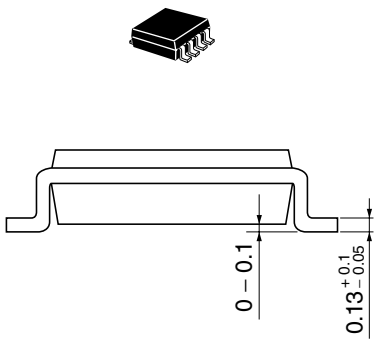



Notes: 1. Input waveform : PRR ≤ 1 MHz, Zo = 50 Ω, $t_r$ ≤ 3 ns, $t_f$ ≤ 3 ns.
2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform – B is for an output with internal conditions such that the output is high except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

## Package Dimensions

Unit: mm




| | |
|---|---|
| Hitachi Code | TTP-8DBV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.010 g |

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Colophon 7.0



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