# HD74LV07A

## Hex Buffers / Drivers with Open Drain Outputs

# HITACHI

## Description

The HD74LV07A has six buffers / drivers with open drain outputs in a 14-pin package.
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

- $V_{CC}$ = 2.0 V to 5.5 V operation
- 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)
- Typical $V_{OL}$ ground bounce < 0.8 V (@$V_{CC}$ = 3.3 V, Ta = 25°C)
- Typical $V_{OH}$ undershoot > 2.3 V (@$V_{CC}$ = 3.3 V, Ta = 25°C)
- Output current ±8 mA (@$V_{CC}$ = 3.0 V to 3.6 V), ±16 mA (@$V_{CC}$ = 4.5 V to 5.5 V)

## Function Table

| Input A | Output Y |
| --- | --- |
| L | L |
| H | H |

Note: H: High level
L: Low level

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## Pin Arrangement

| Pin | Signal | | Pin | Signal |
|-----|--------|---|-----|--------|
| 1A | 1 | | 14 | V$_{CC}$ |
| 1Y | 2 | | 13 | 6A |
| 2A | 3 | | 12 | 6Y |
| 2Y | 4 | | 11 | 5A |
| 3A | 5 | | 10 | 5Y |
| 3Y | 6 | | 9 | 4A |
| GND | 7 | | 8 | 4Y |

(Top view)

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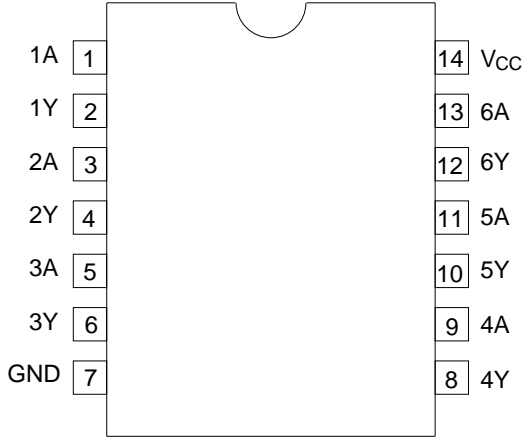
## Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | 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 |
| Input clamp current | $I_{IK}$ | −20 | mA | $V_I < 0$ |
| Output clamp current | $I_{OK}$ | −50 | mA | $V_O < 0$ |
| Continuous output current | $I_O$ | 35 | 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] | $P_T$ | 785 | mW | SOP |
| | | 500 | | TSSOP |
| 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.

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## Recommended Operating Conditions

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | 2.0 | 5.5 | V | |
| Input voltage range | $V_I$ | 0 | 5.5 | V | |
| Output voltage range | $V_O$ | 0 | 5.5 | V | |
| Output current | $I_{OL}$ | — | 50 | µA | $V_{CC} = 2.0$ V |
| | | — | 2 | mA | $V_{CC} = 2.3$ to 2.7 V |
| | | — | 8 | | $V_{CC} = 3.0$ to 3.6 V |
| | | — | 16 | | $V_{CC} = 4.5$ to 5.5 V |
| Input transition rise or fall rate | $\Delta t/\Delta v$ | 0 | 200 | ns/V | $V_{CC} = 2.3$ 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 | Ta | −40 | 85 | °C | |

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

## Logic Diagram

A ————————▷————————— Y
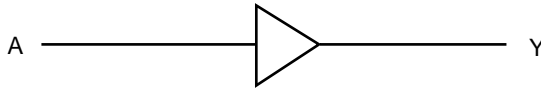
## DC Electrical Characteristics

- **Ta = –40 to 85°C**

| Item | Symbol | $V_{CC}$ (V)* | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| Input voltage | $V_{IH}$ | 2.0 | 1.5 | — | — | V | |
| | | 2.3 to 2.7 | $V_{CC} \times 0.7$ | — | — | | |
| | | 3.0 to 3.6 | $V_{CC} \times 0.7$ | — | — | | |
| | | 4.5 to 5.5 | $V_{CC} \times 0.7$ | — | — | | |
| | $V_{IL}$ | 2.0 | — | — | 0.5 | | |
| | | 2.3 to 2.7 | — | — | $V_{CC} \times 0.3$ | | |
| | | 3.0 to 3.6 | — | — | $V_{CC} \times 0.3$ | | |
| | | 4.5 to 5.5 | — | — | $V_{CC} \times 0.3$ | | |
| Output voltage | $V_{OL}$ | Min to Max | — | — | 0.1 | V | $I_{OL}$ = 50 µA |
| | | 2.3 | — | — | 0.4 | | $I_{OL}$ = 2 mA |
| | | 3.0 | — | — | 0.44 | | $I_{OL}$ = 8 mA |
| | | 4.5 | — | — | 0.55 | | $I_{OL}$ = 16 mA |
| Input current | $I_{IN}$ | 0 to 5.5 | — | — | ±1 | µA | $V_{IN}$ = 5.5 V or GND |
| Quiescent supply current | $I_{CC}$ | 5.5 | — | — | 20 | µA | $V_{IN} = V_{CC}$ or GND, $I_O = 0$ |
| Output leakage current | $I_{OFF}$ | 0 | — | — | 5 | µA | $V_O$ = 5.5 V |
| Input capacitance | $C_{IN}$ | 3.3 | — | 2.3 | — | pF | $V_I = V_{CC}$ or GND |

Note: For conditions shown as Min or Max use the appropriate values under recommended operating conditions.

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## Switching Characteristics

- $V_{CC} = 2.5 \pm 0.2$ 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 | $t_{PLH}$ | — | 4.7 | 10.4 | 1.0 | 13.0 | ns | $C_L$ = 15 pF | A | Y |
| | | — | 9.5 | 15.2 | 1.0 | 18.0 | | $C_L$ = 50 pF | | |
| | $t_{PHL}$ | — | 5.4 | 10.4 | 1.0 | 13.0 | | $C_L$ = 15 pF | | |
| | | — | 7.9 | 15.2 | 1.0 | 18.0 | | $C_L$ = 50 pF | | |

- $V_{CC} = 3.3 \pm 0.3$ 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 | $t_{PLH}$ | — | 4.0 | 7.1 | 1.0 | 8.5 | ns | $C_L$ = 15 pF | A | Y |
| | | — | 7.3 | 10.6 | 1.0 | 12.0 | | $C_L$ = 50 pF | | |
| | $t_{PHL}$ | — | 4.3 | 7.1 | 1.0 | 8.5 | | $C_L$ = 15 pF | | |
| | | — | 5.8 | 10.6 | 1.0 | 12.0 | | $C_L$ = 50 pF | | |

- $V_{CC} = 5.0 \pm 0.5$ 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 | $t_{PLH}$ | — | 3.3 | 5.5 | 1.0 | 6.5 | ns | $C_L$ = 15 pF | A | Y |
| | | — | 5.6 | 7.5 | 1.0 | 8.5 | | $C_L$ = 50 pF | | |
| | $t_{PHL}$ | — | 3.4 | 5.5 | 1.0 | 6.5 | | $C_L$ = 15 pF | | |
| | | — | 4.1 | 7.5 | 1.0 | 8.5 | | $C_L$ = 50 pF | | |

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## Operating Characteristics

- $C_L = 50 \text{ pF}$

| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Unit | Test Conditions |
| | | | Min | Typ | Max | | |
|---|---|---|---|---|---|---|---|
| Power dissipation capacitance | $C_{PD}$ | 3.3 | — | 9.6 | — | pF | f = 10 MHz |
| | | 5.0 | — | 11.4 | — | | |

## Noise Characteristics

- $C_L = 50 \text{ pF}$

| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Unit | Test Conditions |
| | | | Min | Typ | Max | | |
|---|---|---|---|---|---|---|---|
| Quiet output, maximum dynamic $V_{OL}$ | $V_{OL\,(P)}$ | 3.3 | — | 0.3 | 0.8 | V | |
| Quiet output, minimum dynamic $V_{OL}$ | $V_{OL\,(V)}$ | 3.3 | — | −0.1 | −0.8 | | |
| High-level dynamic input voltage | $V_{IH\,(D)}$ | 3.3 | 2.31 | — | — | V | |
| Low-level dynamic input voltage | $V_{IL\,(D)}$ | 3.3 | — | — | 0.99 | | |

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## Test Circuit
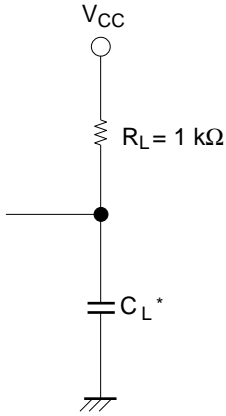


Note: $C_L$ includes the probe and jig capacitance.



• Waveform – 1
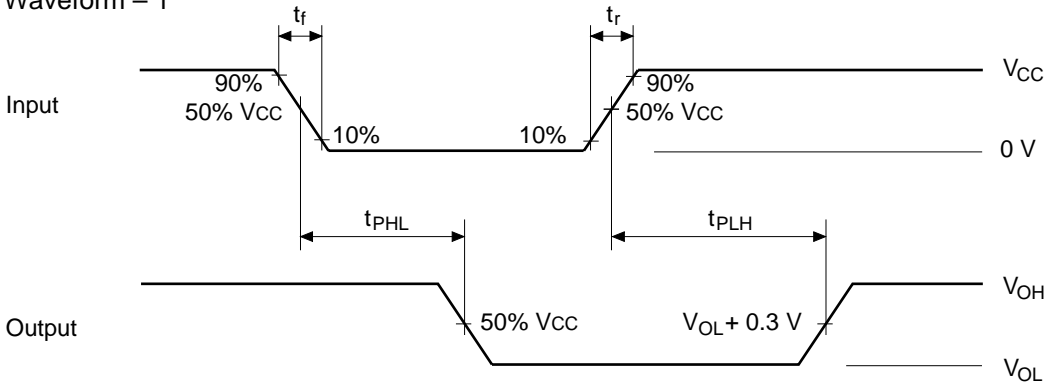
Input

Output

Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, $t_r$ ≤ 3 ns, $t_f$ ≤ 3 ns
2. The output are measured one at a time with one transition per measurement.

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## Package Dimensions

Unit: mm
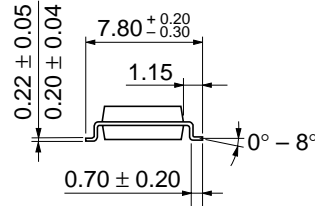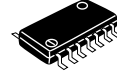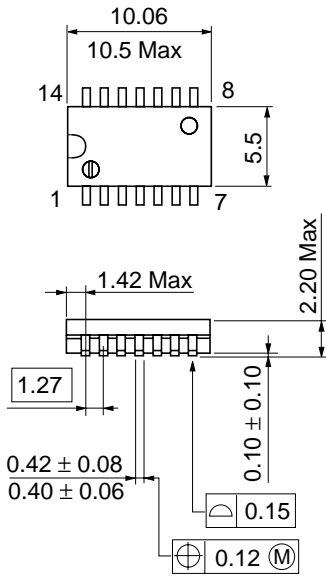


Dimension including the plating thickness
Base material dimension

| Hitachi Code | FP-14DA |
|---|---|
| JEDEC | — |
| EIAJ | Conforms |
| Weight (reference value) | 0.23 g |

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Unit: mm

8.65
9.05 Max

14    8

3.95

1    7

1.75 Max

0.635 Max

1.27

$0.14 ^{+0.11}_{-0.04}$

*$0.42 \pm 0.08$
$0.40 \pm 0.06$

0.15

0.25 Ⓜ

*$0.22 \pm 0.03$
$0.20 \pm 0.03$

$6.10 ^{+0.10}_{-0.30}$

1.08

0° − 8°

$0.60 ^{+0.67}_{-0.20}$
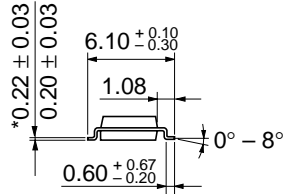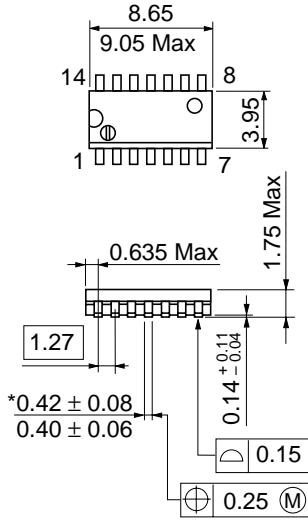
*Dimension including the plating thickness
Base material dimension

| Hitachi Code | FP-14DN |
|---|---|
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 0.13 g |

Unit: mm

5.00
5.30 Max

14    8

4.40

1    7

0.65

$0.22 ^{+0.08}_{-0.07}$
$0.20 \pm 0.06$

0.13 Ⓜ

0.83 Max

1.10 Max

0.10

$6.40 \pm 0.20$

$0.17 \pm 0.05$
$0.15 \pm 0.04$

$0.07 ^{+0.03}_{-0.04}$

0° − 8°

1.0

$0.50 \pm 0.10$
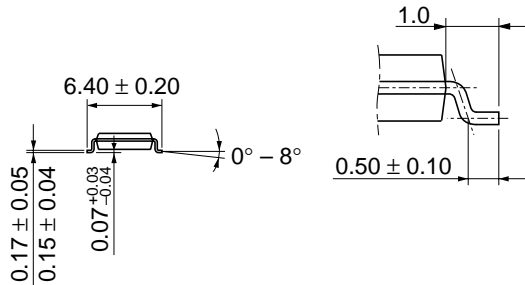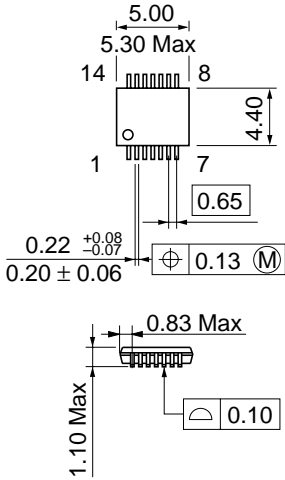
Dimension including the plating thickness
Base material dimension

| Hitachi Code | TTP-14D |
|---|---|
| JEDEC | — |
| EIAJ | — |
| Weight (reference value) | 0.05 g |

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