To our customers,

# Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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# HD74LV06A

## Hex Inverter Buffers / Drivers with Open Drain Outputs

REJ03D0230–0600
Rev.6.00
Dec 23, 2005

## Description

The HD74LV06A has six inverter 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)
- All outputs $V_O$ (Max.) = 5.5 V (@$V_{CC}$ = 2.0 V to 5.5 V, Output “Z” state)
- Typical $V_{OL}$ ground bounce < 0.8 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)
- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74LV06AFPEL | SOP–14 pin (JEITA) | PRSP0014DF-B (FP–14DAV) | FP | EL (2,000 pcs/reel) |
| HD74LV06ARPEL | SOP–14 pin (JEDEC) | PRSP0014DE-A (FP–14DNV) | RP | EL (2,500 pcs/reel) |
| HD74LV06ATELL | TSSOP–14 pin | PTSP0014JA-B (TTP–14DV) | T | ELL (2,000 pcs/reel) |

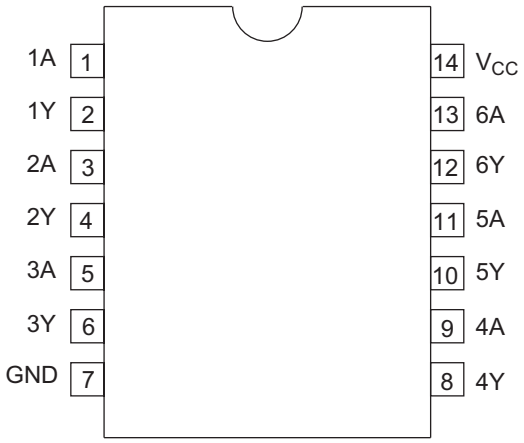
Note: Please consult the sales office for the above package availability.

## Function Table

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

Note: H: High level
L: Low level
Z: High impedance

## Pin Arrangement




(Top view)

## 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: L |
| | | –0.5 to 7.0 | | $V_{CC}$: OFF Output: Z |
| 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.

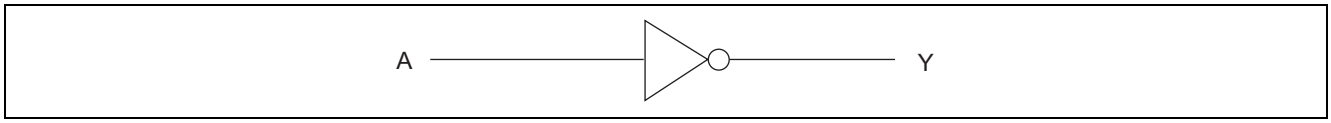
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 7.0 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

## Recommended Operating Conditions

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | 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




## 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 |
| Off state output current | $I_{OZ}$ | Min to Max | — | — | ±2.5 | µA | $V_O$ = 5.5 V |
| 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 | $V_I$ or $V_O$ = 0 to 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.

## Switching Characteristics

$V_{CC}$ = 2.5 ± 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 ± 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 ± 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 | | |

## Operating Characteristics

$C_L$ = 50 pF

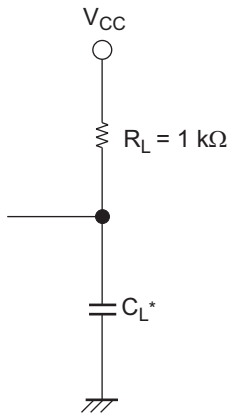
| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | $C_{PD}$ | 3.3 | — | 9.6 | — | pF | f = 10 MHz |
| | | 5.0 | — | 11.4 | — | | |

## Noise Characteristics

$C_L$ = 50 pF

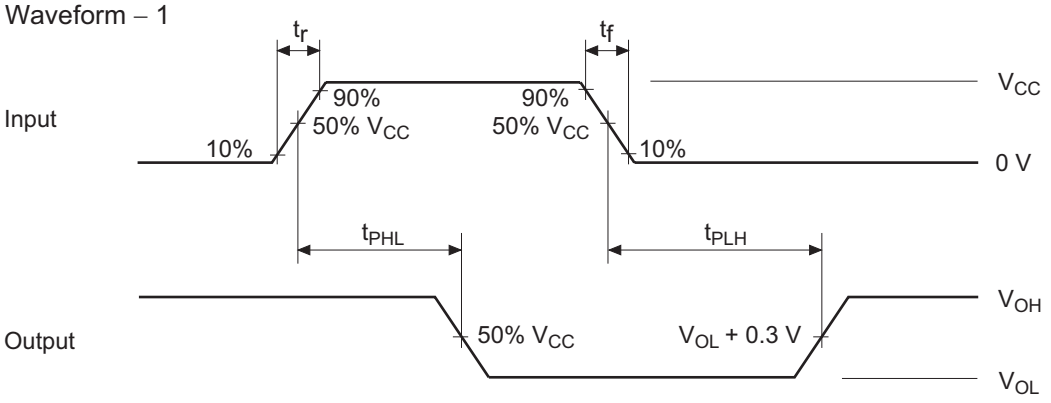
| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Quiet output, maximum dynamic $V_{OL}$ | $V_{OL (P)}$ | 3.3 | — | 0.3 | 0.8 | V | |
| Quiet output, minimum dynamic $V_{OL}$ | $V_{OL (V)}$ | 3.3 | — | –0.1 | –0.8 | V | |
| 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 | V | |

## Test Circuit




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

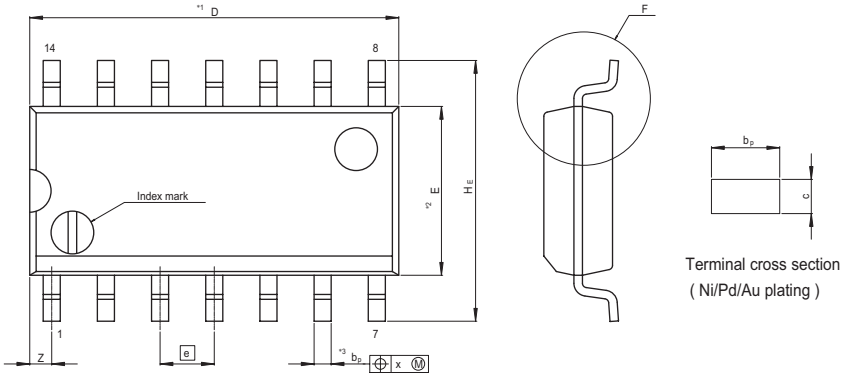
• Waveform – 1




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.

## Package Dimensions

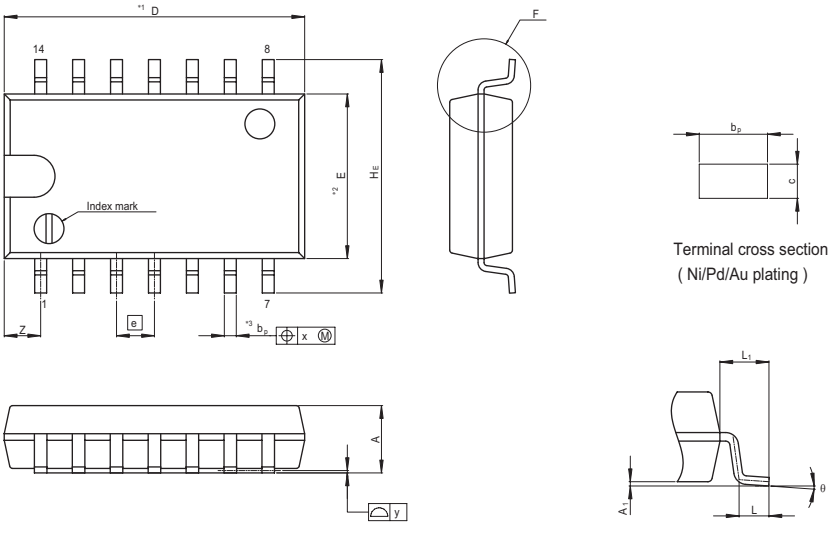
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP14-3.95x8.65-1.27 | PRSP0014DE-A | FP-14DNV | 0.13g |




NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | — | 8.65 | 9.05 |
| E | — | 3.95 | — |
| $A_2$ | — | — | — |
| $A_1$ | 0.10 | 0.14 | 0.25 |
| A | — | — | 1.75 |
| $b_p$ | 0.34 | 0.40 | 0.46 |
| $b_1$ | — | — | — |
| c | 0.15 | 0.20 | 0.25 |
| $c_1$ | — | — | — |
| θ | 0° | — | 8° |
| $H_E$ | 5.80 | 6.10 | 6.20 |
| e | — | 1.27 | — |
| x | — | — | 0.25 |
| y | — | — | 0.15 |
| Z | — | — | 0.635 |
| L | 0.40 | 0.60 | 1.27 |
| $L_1$ | — | 1.08 | — |

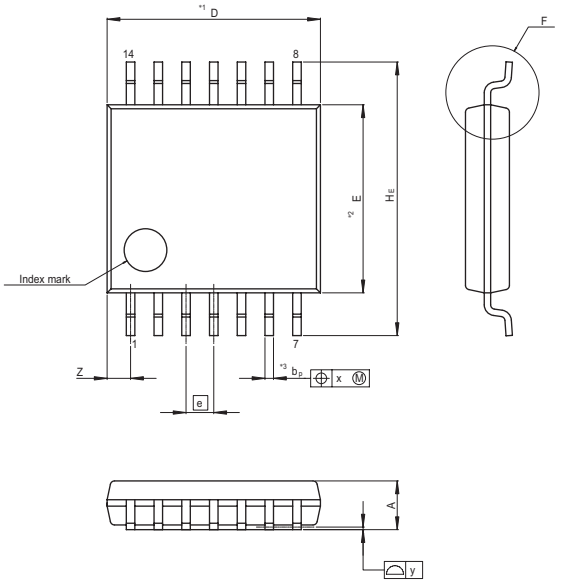
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP14-5.5x10.06-1.27 | PRSP0014DF-B | FP-14DAV | 0.23g |

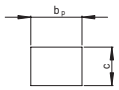



NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

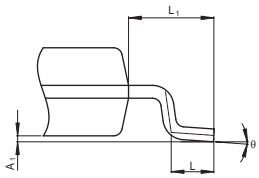
| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | — | 10.06 | 10.5 |
| E | — | 5.50 | — |
| $A_2$ | — | — | — |
| $A_1$ | 0.00 | 0.10 | 0.20 |
| A | — | — | 2.20 |
| $b_p$ | 0.34 | 0.40 | 0.46 |
| $b_1$ | — | — | — |
| c | 0.15 | 0.20 | 0.25 |
| $c_1$ | — | — | — |
| θ | 0° | — | 8° |
| $H_E$ | 7.50 | 7.80 | 8.00 |
| e | — | 1.27 | — |
| x | — | — | 0.12 |
| y | — | — | 0.15 |
| Z | — | — | 1.42 |
| L | 0.50 | 0.70 | 0.90 |
| $L_1$ | — | 1.15 | — |

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-TSSOP14-4.4x5-0.65 | PTSP0014JA-B | TTP-14DV | 0.05g |




Terminal cross section
( Ni/Pd/Au plating )




Detail F

NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2"
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT
INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | — | 5.00 | 5.30 |
| E | — | 4.40 | — |
| $A_2$ | — | — | — |
| $A_1$ | 0.03 | 0.07 | 0.10 |
| A | — | — | 1.10 |
| $b_p$ | 0.15 | 0.20 | 0.25 |
| $b_1$ | — | — | — |
| c | 0.10 | 0.15 | 0.20 |
| $c_1$ | — | — | — |
| θ | 0° | — | 8° |
| $H_E$ | 6.20 | 6.40 | 6.60 |
| e | — | 0.65 | — |
| x | — | — | 0.13 |
| y | — | — | 0.10 |
| Z | — | — | 0.83 |
| L | 0.4 | 0.5 | 0.6 |
| $L_1$ | — | 1.0 | — |

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