# RD74HC04A

## Hex Inverters

R07DS0045EJ0100
Rev.1.00
Jul 20, 2010

### Features

- High Speed Operation: $t_{pd}$ = 7.5 ns typ ($C_L$ = 50 pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC}$ = 2 to 6 V
- Low Input Current: 1 µA max
- Low Quiescent Supply Current: $I_{CC}$ (static) = 1 µA max (Ta = 25°C)
- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) | Surface Treatment |
|---|---|---|---|---|---|
| RD74HC04APT0 | DILP-14 pin | PRDP0014AB-B (DP-14AV) | P | — | 0 (Ni/Pd/Au) |
| RD74HC04AFPH0 | SOP-14 pin (JEITA) | PRSP0014DF-B (FP-14DAV) | FP | H (2,000 pcs/reel) | 0 (Ni/Pd/Au) |
| RD74HC04ARPH0 | SOP-14 pin (JEDEC) | PRSP0014DE-A (FP-14DNV) | RP | H (2,500 pcs/reel) | 0 (Ni/Pd/Au) |

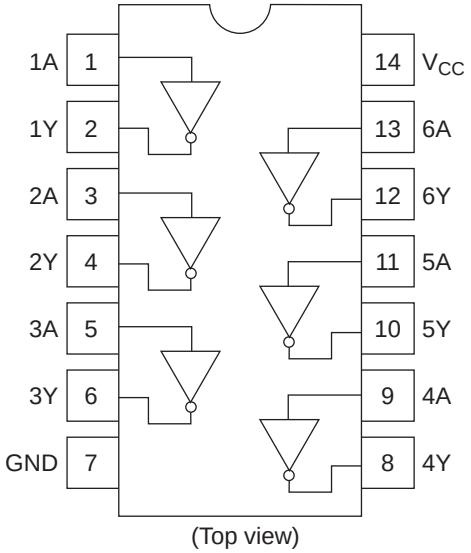
Note: Please consult the sales office for the above package availability.

### Function Table

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

H : High level
L : Low level

### Pin Arrangement




(Top view)

## Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | –0.5 to 7.0 | V | |
| Input / Output voltage | Vin, Vout | –0.5 to $V_{CC}$ +0.5 | V | |
| Input / Output diode current | $I_{IK}$, $I_{OK}$ | ±20 | mA | |
| Output current | $I_O$ | ±25 | mA | |
| $V_{CC}$, GND current | $I_{CC}$ or $I_{GND}$ | ±50 | mA | |
| Power dissipation | $P_T$ | 1185 | mW | DIP |
| | | 785 | mW | SOP |
| | | 500 | mW | TSSOP |
| Storage temperature | Tstg | –65 to +150 | °C | |

Note: 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.

## Recommended Operating Conditions

| Item | Symbol | Ratings | Unit | Conditions |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | 2 to 6 | V | |
| Input / Output voltage | $V_{IN}$, $V_{OUT}$ | 0 to $V_{CC}$ | V | |
| Operating temperature | Ta | –40 to 85 | °C | |
| Input rise / fall time[*1] | $t_r$, $t_f$ | 0 to 1000 | ns | $V_{CC}$ = 2.0 V |
| | | 0 to 500 | | $V_{CC}$ = 4.5 V |
| | | 0 to 400 | | $V_{CC}$ = 6.0 V |

Note: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

## Electrical Characteristics

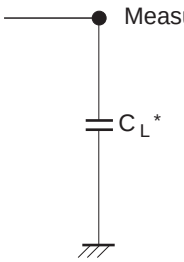
| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Ta = –40 to+85°C | | Unit | Test Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | | |
| Input voltage | $V_{IH}$ | 2.0 | 1.5 | — | — | 1.5 | — | V | | |
| | | 4.5 | 3.15 | — | — | 3.15 | — | | | |
| | | 6.0 | 4.2 | — | — | 4.2 | — | | | |
| | $V_{IL}$ | 2.0 | — | — | 0.5 | — | 0.5 | V | | |
| | | 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 | Vin = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = –20 μA |
| | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | | | |
| | | 6.0 | 5.9 | 6.0 | — | 5.9 | — | | | |
| | | 4.5 | 4.18 | — | — | 4.13 | — | | | $I_{OH}$ = –4 mA |
| | | 6.0 | 5.68 | — | — | 5.63 | — | | | $I_{OH}$ = –5.2 mA |
| | $V_{OL}$ | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V | Vin = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA |
| | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | | | |
| | | 6.0 | — | 0.0 | 0.1 | — | 0.1 | | | |
| | | 4.5 | — | — | 0.26 | — | 0.33 | | | $I_{OL}$ = 4 mA |
| | | 6.0 | — | — | 0.26 | — | 0.33 | | | $I_{OL}$ = 5.2 mA |
| Input current | Iin | 6.0 | — | — | ±0.1 | — | ±1.0 | μA | Vin = $V_{CC}$ or GND | |
| Quiescent supply current | $I_{CC}$ | 6.0 | — | — | 1.0 | — | 10 | μA | Vin = $V_{CC}$ or GND, Iout = 0 μA | |

## Switching Characteristics

($C_L$ = 50 pF, Input $t_r$ = $t_f$ = 6 ns)

| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C | | | Ta = –40 to +85°C | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | |
| Propagation delay time | $t_{PLH}$ | 2.0 | — | — | 90 | — | 115 | ns | |
| | | 4.5 | — | 7 | 18 | — | 23 | | |
| | | 6.0 | — | — | 15 | — | 20 | | |
| | $t_{PHL}$ | 2.0 | — | — | 90 | — | 115 | ns | |
| | | 4.5 | — | 8 | 18 | — | 23 | | |
| | | 6.0 | — | — | 15 | — | 20 | | |
| Output rise time | $t_{TLH}$ | 2.0 | — | — | 75 | — | 95 | ns | |
| | | 4.5 | — | 5 | 15 | — | 19 | | |
| | | 6.0 | — | — | 13 | — | 16 | | |
| Output fall time | $t_{THL}$ | 2.0 | — | — | 75 | — | 95 | ns | |
| | | 4.5 | — | 5 | 15 | — | 19 | | |
| | | 6.0 | — | — | 13 | — | 16 | | |
| Input capacitance | Cin | — | — | 5 | 10 | — | 10 | pF | |

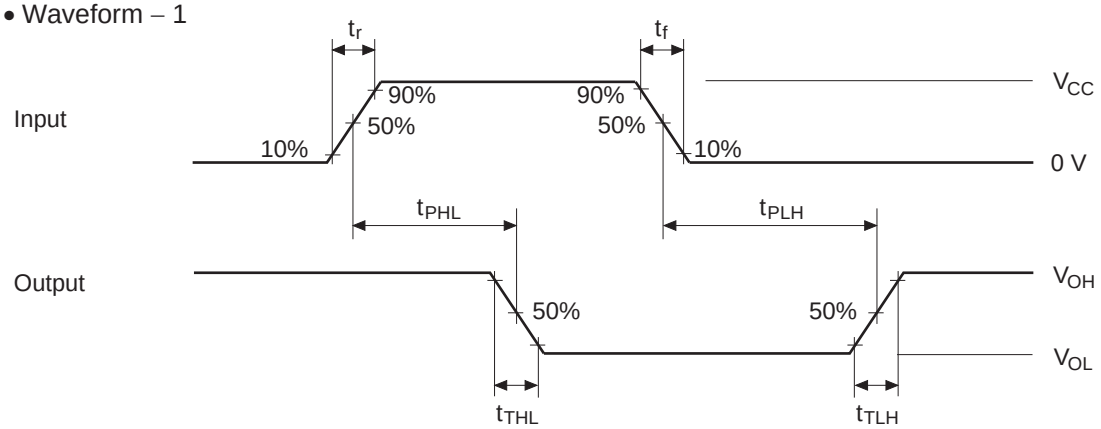
## Test Circuit




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

### Waveforms

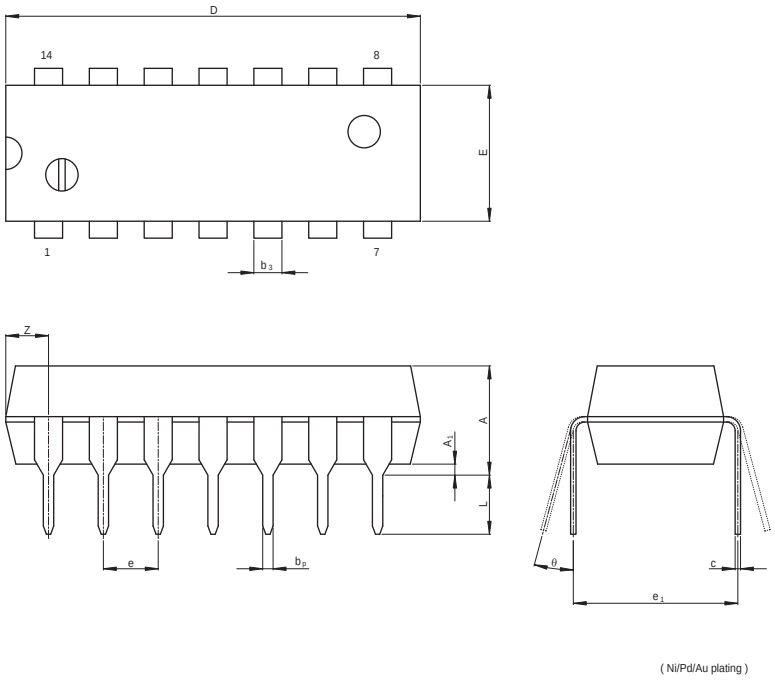
• Waveform – 1




Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, $t_r$ ≤ 6 ns, $t_f$ ≤ 6 ns
2. The output are measured one at a time with one transition per measurement.

## Package Dimensions

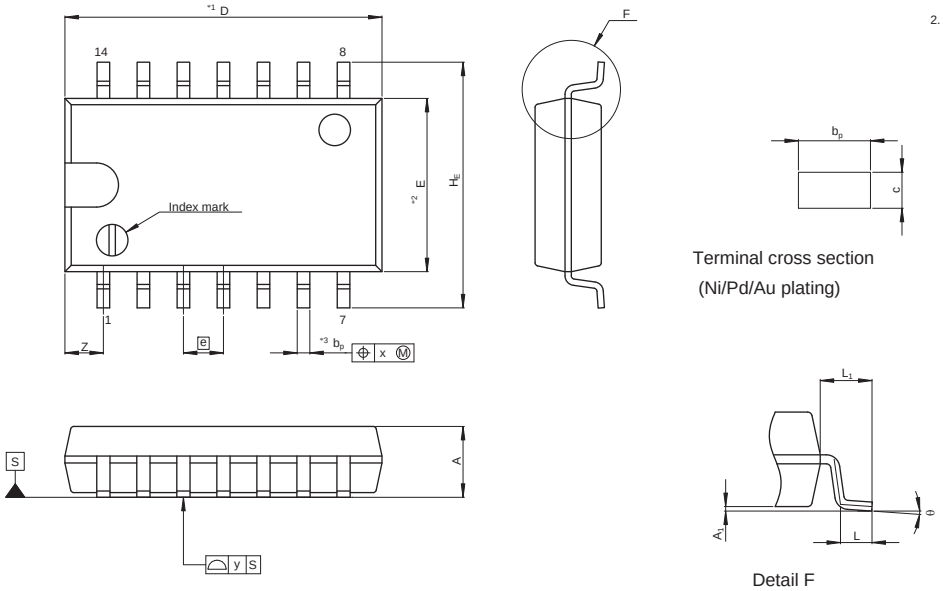
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-DIP14-6.3x19.2-2.54 | PRDP0014AB-B | DP-14AV | 0.97g |




| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| $e_1$ | — | 7.62 | — |
| D | — | 19.2 | 20.32 |
| E | — | 6.3 | 7.4 |
| A | — | — | 5.06 |
| $A_1$ | 0.51 | — | — |
| $b_p$ | 0.40 | 0.48 | 0.56 |
| $b_3$ | — | 1.30 | — |
| c | 0.19 | 0.25 | 0.31 |
| θ | 0° | — | 15° |
| e | 2.29 | 2.54 | 2.79 |
| Z | — | — | 2.39 |
| L | 2.54 | — | — |

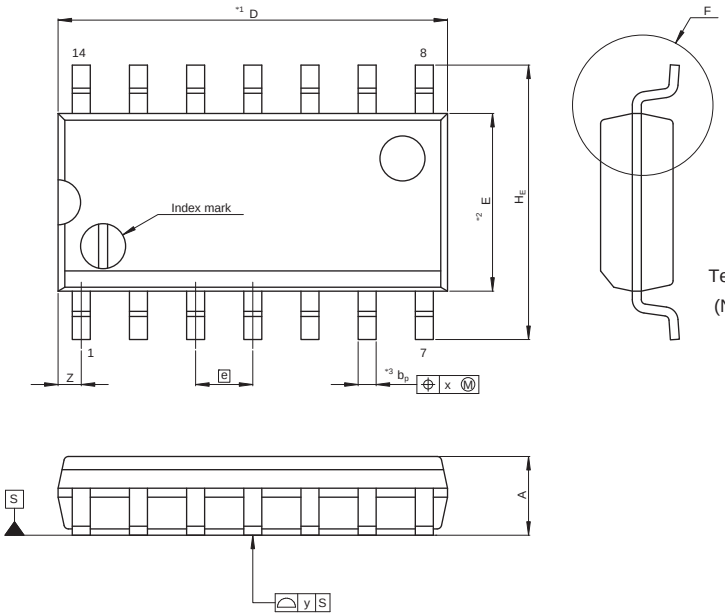
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP14-5.5x10.06-1.27 | PRSP0014DF-B | FP-14DAV | 0.23g |

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



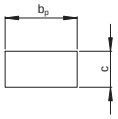

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | — | 10.06 | 10.5 |
| E | — | 5.50 | — |
| $A_2$ | — | — | — |
| $A_1$ | 0.00 | 0.10 | 0.20 |
| A | — | — | 2.20 |
| $b_p$ | 0.34 | 0.40 | 0.46 |
| $b_1$ | — | — | — |
| c | 0.15 | 0.20 | 0.25 |
| $c_1$ | — | — | — |
| 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-SOP14-3.95x8.65-1.27 | PRSP0014DE-A | FP-14DNV | 0.13g |

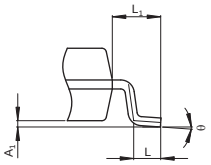









Terminal cross section
(Ni/Pd/Au plating)




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 | — | 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 | — |

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**Renesas Electronics America Inc.**
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

**Renesas Electronics Canada Limited**
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

**Renesas Electronics Europe Limited**
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

**Renesas Electronics Europe GmbH**
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

**Renesas Electronics Hong Kong Limited**
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

**Renesas Electronics Taiwan Co., Ltd.**
7F, No. 363 Fu Shing North Road Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

**Renesas Electronics Singapore Pte. Ltd.**
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

**Renesas Electronics Malaysia Sdn.Bhd.**
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

**Renesas Electronics Korea Co., Ltd.**
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141



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