

# HD74LS04 / HD74LS05

## Hex Inverters / Hex Inverters (with Open Collector Outputs)

REJ03D0391-0300  
Rev.3.00  
Jul.13.2005

### Features

- Ordering Information

#### • HD74LS04

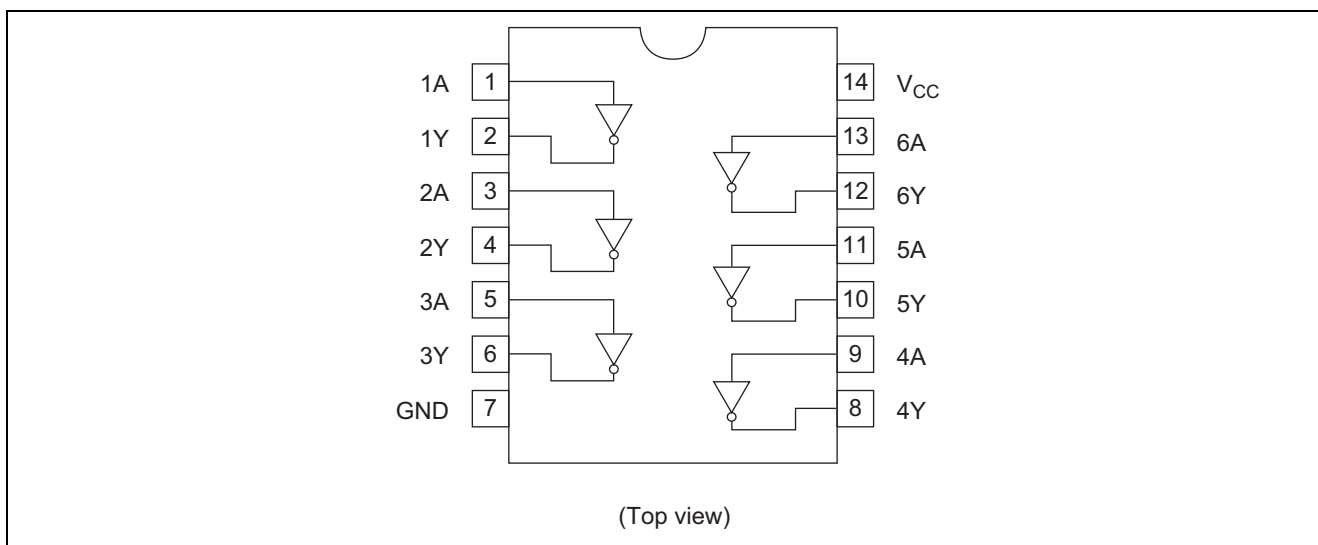
| Part Name    | Package Type       | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|--------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74LS04P    | DILP-14 pin        | PRDP0014AB-B (DP-14AV)       | P                    | —                              |
| HD74LS04FPEL | SOP-14 pin (JEITA) | PRSP0014DF-B (FP-14DAV)      | FP                   | EL (2,000 pcs/reel)            |
| HD74LS04RPEL | SOP-14 pin (JEDEC) | PRSP0014DE-A (FP-14DNV)      | RP                   | EL (2,500 pcs/reel)            |

#### • HD74LS05

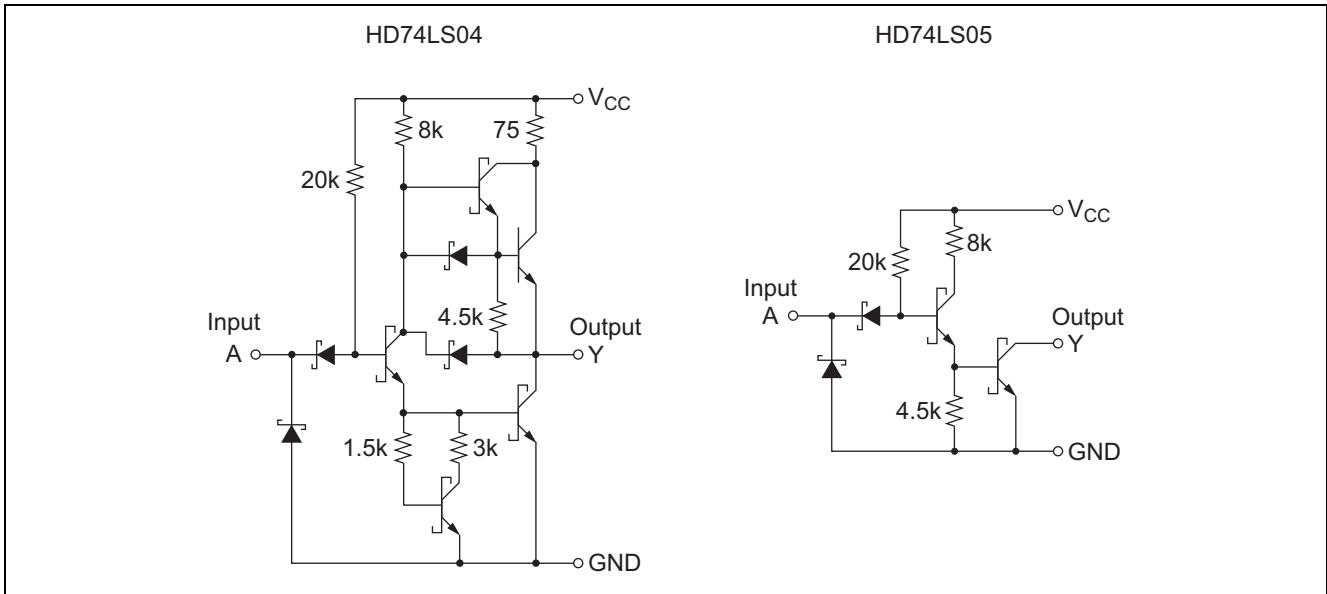
| Part Name    | Package Type       | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|--------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74LS05P    | DILP-14 pin        | PRDP0014AB-B (DP-14AV)       | P                    | —                              |
| HD74LS05FPEL | SOP-14 pin (JEITA) | PRSP0014DF-B (FP-14DAV)      | FP                   | EL (2,000 pcs/reel)            |
| HD74LS05RPEL | SOP-14 pin (JEDEC) | PRSP0014DE-A (FP-14DNV)      | RP                   | EL (2,500 pcs/reel)            |

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

### Pin Arrangement



Circuit Schematic (1/6)



Absolute Maximum Ratings

| Item                | Symbol                   | Ratings     | Unit |
|---------------------|--------------------------|-------------|------|
| Supply voltage      | $V_{CC}$ <sup>Note</sup> | 7           | V    |
| Input voltage       | $V_{IN}$                 | 7           | V    |
| Power dissipation   | $P_T$                    | 400         | mW   |
| Storage temperature | Tstg                     | -65 to +150 | °C   |

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

Recommended Operating Conditions

• HD74LS04

| Item                  | Symbol    | Min  | Typ  | Max  | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage        | $V_{CC}$  | 4.75 | 5.00 | 5.25 | V    |
| Output current        | $I_{OH}$  | —    | —    | -400 | μA   |
|                       | $I_{OL}$  | —    | —    | 8    | mA   |
| Operating temperature | $T_{opr}$ | -20  | 25   | 75   | °C   |

• HD74LS05

| Item                  | Symbol    | Min  | Typ  | Max  | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage        | $V_{CC}$  | 4.75 | 5.00 | 5.25 | V    |
| Output voltage        | $V_{OH}$  | —    | —    | 5.5  | V    |
| Output current        | $I_{OL}$  | —    | —    | 8    | mA   |
| Operating temperature | $T_{opr}$ | -20  | 25   | 75   | °C   |

## Electrical Characteristics

### • HD74LS04

(Ta = -20 to +75 °C)

| Item                         | Symbol           | min. | typ.* | max. | Unit | Condition  |
|------------------------------|------------------|------|-------|------|------|--|
| Input voltage                | V <sub>IH</sub>  | 2.0  | —     | —    | V    |  |
|                              | V <sub>IL</sub>  | —    | —     | 0.8  | V    |  |
| Output voltage               | V <sub>OH</sub>  | 2.7  | —     | —    | V    | V <sub>CC</sub> = 4.75 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -400 μA |
|                              | V <sub>OL</sub>  | —    | —     | 0.5  | V    | V <sub>CC</sub> = 4.75 V, V <sub>IH</sub> = 2 V                              |
| —                            |                  | —    | 0.4   |      |      |  |
| Input current                | I <sub>IH</sub>  | —    | —     | 20   | μA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 2.7 V                             |
|                              | I <sub>IL</sub>  | —    | —     | -0.4 | mA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 0.4 V                             |
|                              | I <sub>I</sub>   | —    | —     | 0.1  | mA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 7 V                               |
| Short-circuit output current | I <sub>OS</sub>  | -20  | —     | -100 | mA   | V <sub>CC</sub> = 5.25 V   |
| Supply current               | I <sub>CCH</sub> | —    | 1.2   | 2.4  | mA   | V <sub>CC</sub> = 5.25 V   |
|                              | I <sub>CCL</sub> | —    | 3.6   | 6.6  | mA   | V <sub>CC</sub> = 5.25 V   |
| Input clamp voltage          | V <sub>IK</sub>  | —    | —     | -1.5 | V    | V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = -18 mA                           |

Note: \* V<sub>CC</sub> = 5 V, Ta = 25°C

### • HD74LS05

(Ta = -20 to +75 °C)

| Item                | Symbol           | min. | typ.* | max. | Unit | Condition  |
|---------------------|------------------|------|-------|------|------|--|
| Input voltage       | V <sub>IH</sub>  | 2.0  | —     | —    | V    |  |
|                     | V <sub>IL</sub>  | —    | —     | 0.8  | V    |  |
| Output voltage      | V <sub>OL</sub>  | —    | —     | 0.5  | V    | V <sub>CC</sub> = 4.75 V, V <sub>IH</sub> = 2 V                            |
|                     |                  | —    | —     | 0.4  |      |  |
| Output current      | I <sub>OH</sub>  | —    | —     | 100  | μA   | V <sub>CC</sub> = 4.75 V, V <sub>IL</sub> = 0.8 V, V <sub>OA</sub> = 5.5 V |
| Input current       | I <sub>IH</sub>  | —    | —     | 20   | μA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 2.7 V                           |
|                     | I <sub>IL</sub>  | —    | —     | -0.4 | mA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 0.4 V                           |
|                     | I <sub>I</sub>   | —    | —     | 0.1  | mA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 7 V                             |
| Supply current      | I <sub>CCH</sub> | —    | 1.2   | 2.4  | mA   | V <sub>CC</sub> = 5.25 V   |
|                     | I <sub>CCL</sub> | —    | 3.6   | 6.6  | mA   | V <sub>CC</sub> = 5.25 V   |
| Input clamp voltage | V <sub>IK</sub>  | —    | —     | -1.5 | V    | V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = -18 mA                         |

Note: \* V<sub>CC</sub> = 5 V, Ta = 25°C

## Switching Characteristics

### • HD74LS04

(V<sub>CC</sub> = 5 V, Ta = 25°C)

| Item                   | Symbol           | min. | typ. | max. | Unit | Condition                                     |
|------------------------|------------------|------|------|------|------|---|
| Propagation delay time | t <sub>PLH</sub> | —    | 9    | 15   | ns   | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ |
|                        | t <sub>PHL</sub> | —    | 10   | 15   | ns   |   |

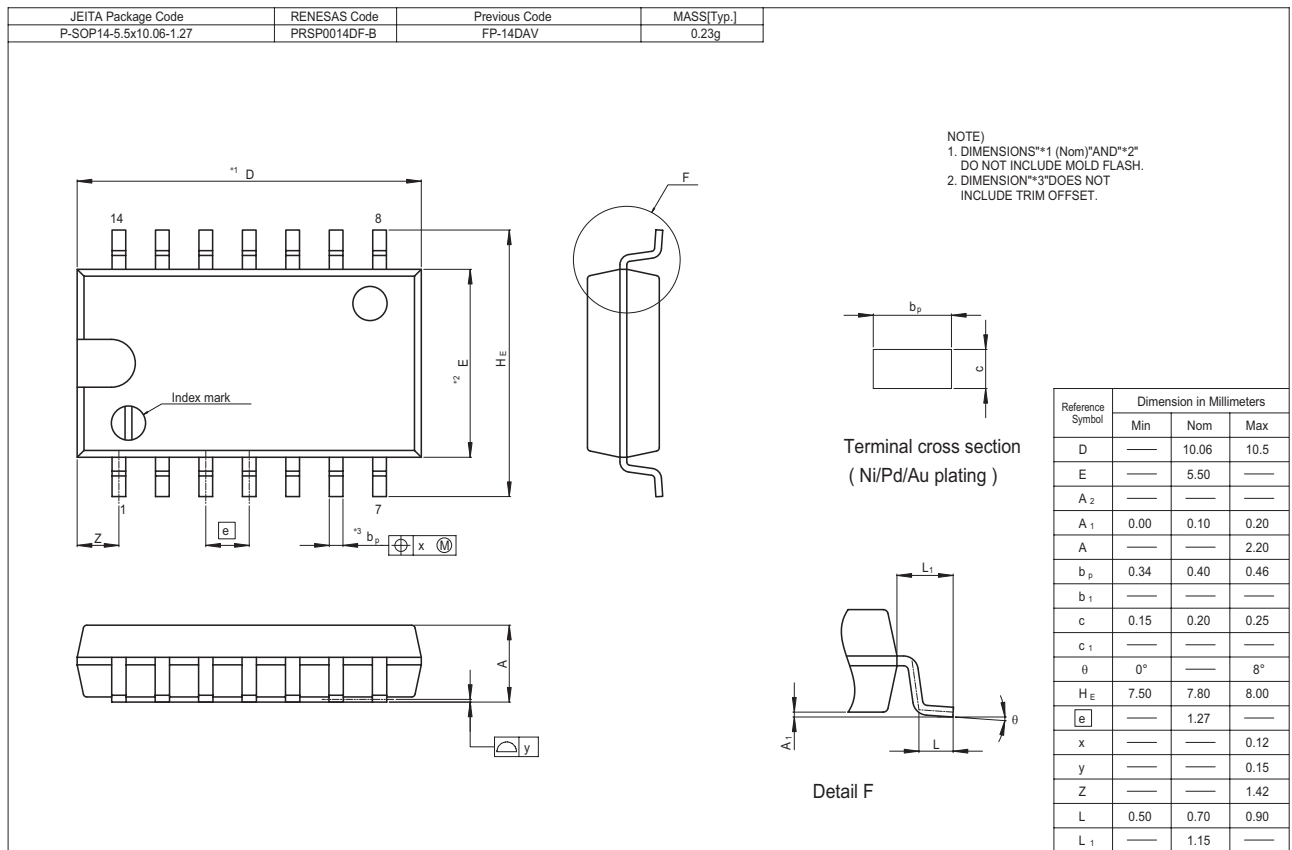
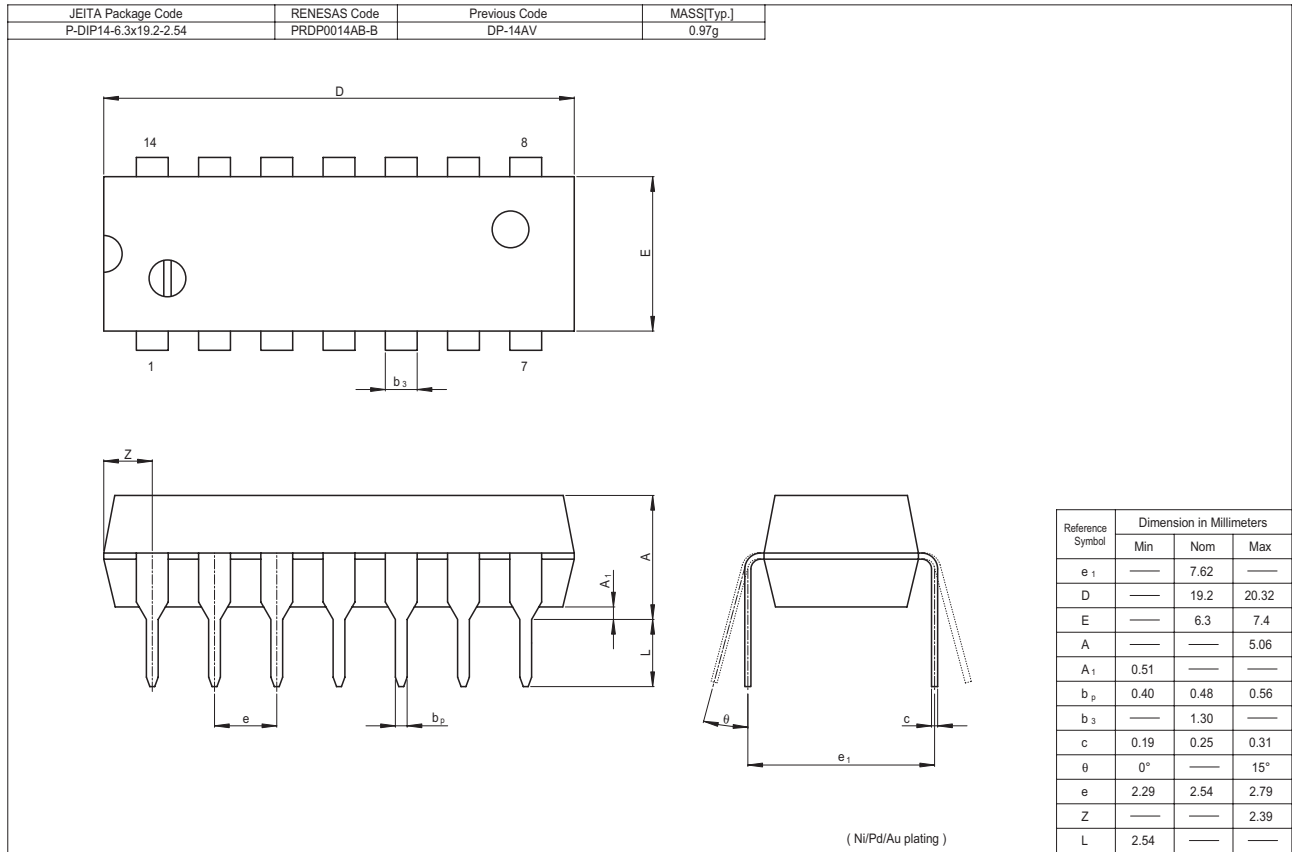
### • HD74LS05

(V<sub>CC</sub> = 5 V, Ta = 25°C)

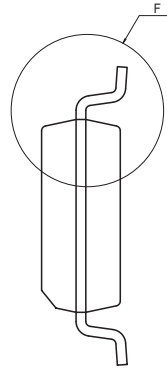
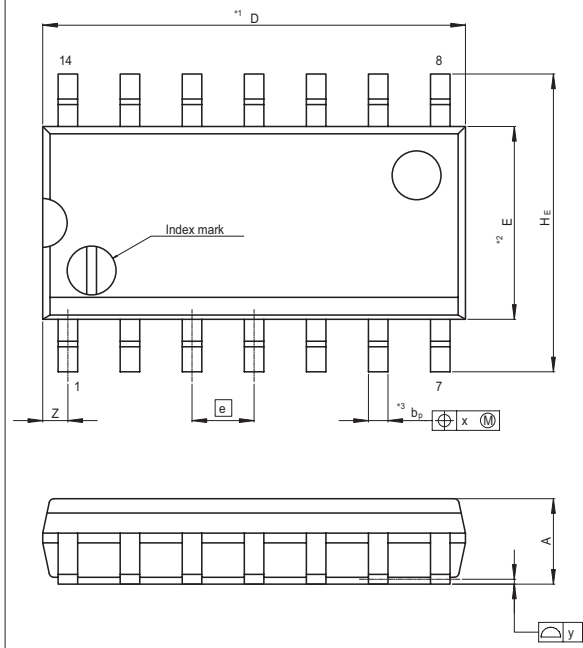
| Item                   | Symbol           | min. | typ. | max. | Unit | Condition                                     |
|------------------------|------------------|------|------|------|------|---|
| Propagation delay time | t <sub>PLH</sub> | —    | 17   | 32   | ns   | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ |
|                        | t <sub>PHL</sub> | —    | 15   | 28   | ns   |   |

Note: Refer to Test Circuit and Waveform of the Common Item "TTL Common Matter (Document No.: REJ27D0005-0100)".

Package Dimensions

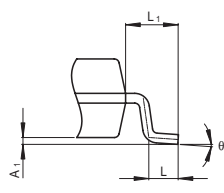


|  |                              |                           |                     |
|--|------------------------------|---------------------------|---------------------|
| JEITA Package Code<br>P-SOP14-3.95x8.65-1.27 | RENESAS Code<br>PRSP0014DE-A | Previous Code<br>FP-14DNV | MASS[Typ.]<br>0.13g |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



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

Terminal cross section  
( Ni/Pd/Au plating )



Detail F

| Reference Symbol | Dimension in Millimeters |      |       |
|------------------|--------------------------|------|-------|
|                  | Min                      | Nom  | Max   |
| D                | —                        | 8.65 | 9.05  |
| E                | —                        | 3.95 | —     |
| A <sub>2</sub>   | —                        | —    | —     |
| A <sub>1</sub>   | 0.10                     | 0.14 | 0.25  |
| A                | —                        | —    | 1.75  |
| b <sub>p</sub>   | 0.34                     | 0.40 | 0.46  |
| b <sub>1</sub>   | —                        | —    | —     |
| c                | 0.15                     | 0.20 | 0.25  |
| c <sub>1</sub>   | —                        | —    | —     |
| $\theta$         | 0°                       | —    | 8°    |
| H <sub>E</sub>   | 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 <sub>1</sub>   | —                        | 1.08 | —     |

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