

To all our customers

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

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Keep safety first in your circuit designs!

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# HD74HC04

## Hex Inverters

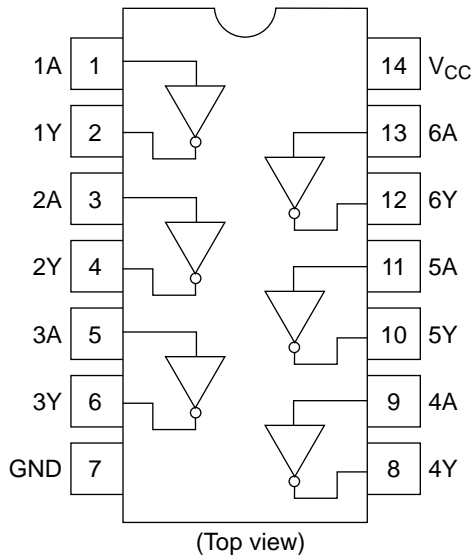
**RENESAS**

ADE-205-406 (Z)  
1st. Edition  
Sep. 2000

### 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  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 1  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )

### Pin Arrangement



## DC Characteristics

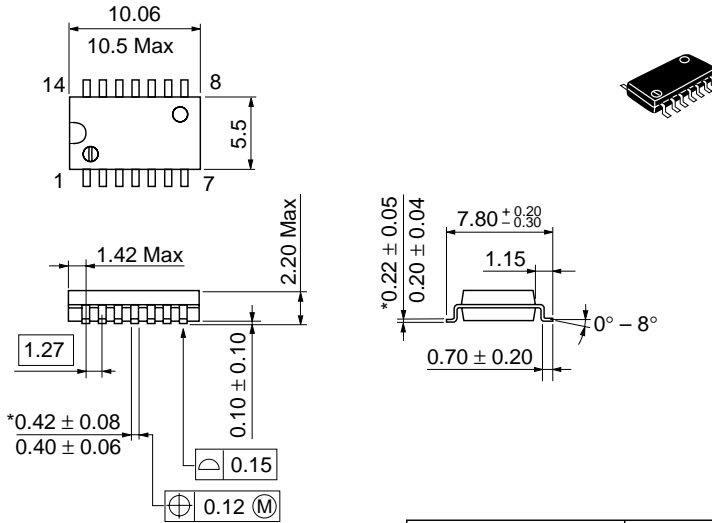
| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     | Ta = -40 to +85°C |      | Unit | Test Conditions |   |                           |
|--------------------------|-----------------|---------------------|-----------|-----|-------------------|------|------|-----------------|---|---------------------------|
|                          |                 |                     | Min       | Typ | Max               | Min  |      |                 | Max   |                           |
| Input voltage            | V <sub>IH</sub> | 2.0                 | 1.5       | —   | —                 | 1.5  | —    | V               |   |                           |
|                          |                 | 4.5                 | 3.15      | —   | —                 | 3.15 | —    |                 |   |                           |
|                          |                 | 6.0                 | 4.2       | —   | —                 | 4.2  | —    |                 |   |                           |
|                          | V <sub>IL</sub> | 2.0                 | —         | —   | 0.5               | —    | 0.5  | V               |   |                           |
|                          |                 | 4.5                 | —         | —   | 1.35              | —    | 1.35 |                 |   |                           |
|                          |                 | 6.0                 | —         | —   | 1.8               | —    | 1.8  |                 |   |                           |
| Output voltage           | V <sub>OH</sub> | 2.0                 | 1.9       | 2.0 | —                 | 1.9  | —    | V               | Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -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 <sub>OH</sub> = -4 mA   |
|                          |                 | 6.0                 | 5.68      | —   | —                 | 5.63 | —    |                 |   | I <sub>OH</sub> = -5.2 mA |
|                          | V <sub>OL</sub> | 2.0                 | —         | 0.0 | 0.1               | —    | 0.1  | V               | Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 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 <sub>OL</sub> = 4 mA    |
|                          |                 | 6.0                 | —         | —   | 0.26              | —    | 0.33 |                 |   | I <sub>OL</sub> = 5.2 mA  |
| Input current            | I <sub>in</sub> | 6.0                 | —         | —   | ±0.1              | —    | ±1.0 | μA              | Vin = V <sub>CC</sub> or GND                                      |                           |
| Quiescent supply current | I <sub>CC</sub> | 6.0                 | —         | —   | 1.0               | —    | 10   | μA              | Vin = V <sub>CC</sub> or GND, I <sub>out</sub> = 0 μA             |                           |

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

| Item                   | Symbol    | $V_{CC}$ (V) | $T_a = 25^\circ\text{C}$ |     | $T_a = -40$ to $+85^\circ\text{C}$ |     | Unit | Test Conditions |
|------------------------|-----------|--------------|--------------------------|-----|------------------------------------|-----|------|-----------------|
|                        |           |              | Min                      | Typ | Max                                | Min |      |                 |
| 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      | $C_{in}$  | —            | —                        | 5   | 10                                 | —   | 10   | pF              |

## Package Dimensions

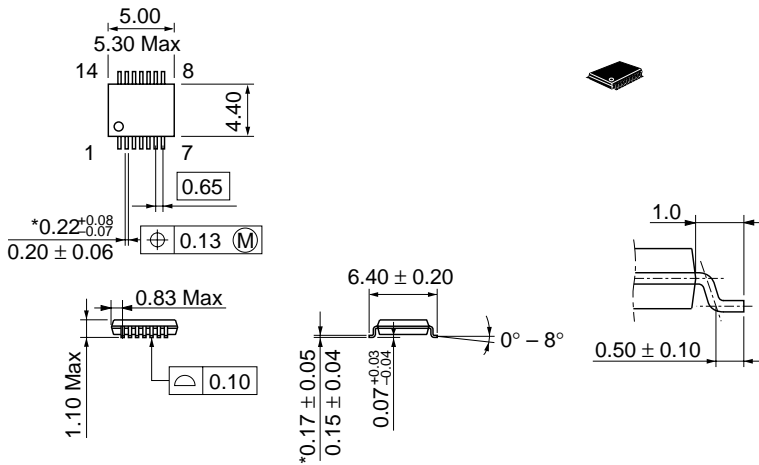
Unit: mm



\*Dimension including the plating thickness  
Base material dimension

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

Unit: mm



\*Dimension including the plating thickness  
Base material dimension

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

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