

HD74LV04A

Hex Inverters

REJ03D0227-0300Z
(Previous ADE-205-242A (Z))
Rev.3.00
May 21, 2004

Description

The HD74LV04A has six inverters 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

- $V_{CC} = 2.0\text{ V}$ to 5.5 V operation
- All inputs V_{IH} (Max.) = 5.5 V (@ $V_{CC} = 0\text{ V}$ to 5.5 V)
- All outputs V_O (Max.) = 5.5 V (@ $V_{CC} = 0\text{ V}$)
- Typical V_{OL} ground bounce < 0.8 V (@ $V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot > 2.3 V (@ $V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Output current $\pm 6\text{ mA}$ (@ $V_{CC} = 3.0\text{ V}$ to 3.6 V), $\pm 12\text{ mA}$ (@ $V_{CC} = 4.5\text{ V}$ to 5.5 V)
- Ordering Information

| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|---------------|-------------------|--------------|----------------------|--------------------------------|
| HD74LV04AFPEL | SOP-14 pin(JEITA) | FP-14DAV | FP | EL (2,000 pcs/reel) |
| HD74LV04ARPEL | SOP-14 pin(JEDEC) | FP-14DNV | RP | EL (2,500 pcs/reel) |
| HD74LV04ATELL | TSSOP-14 pin | TTP-14DV | T | ELL (2,000 pcs/reel) |

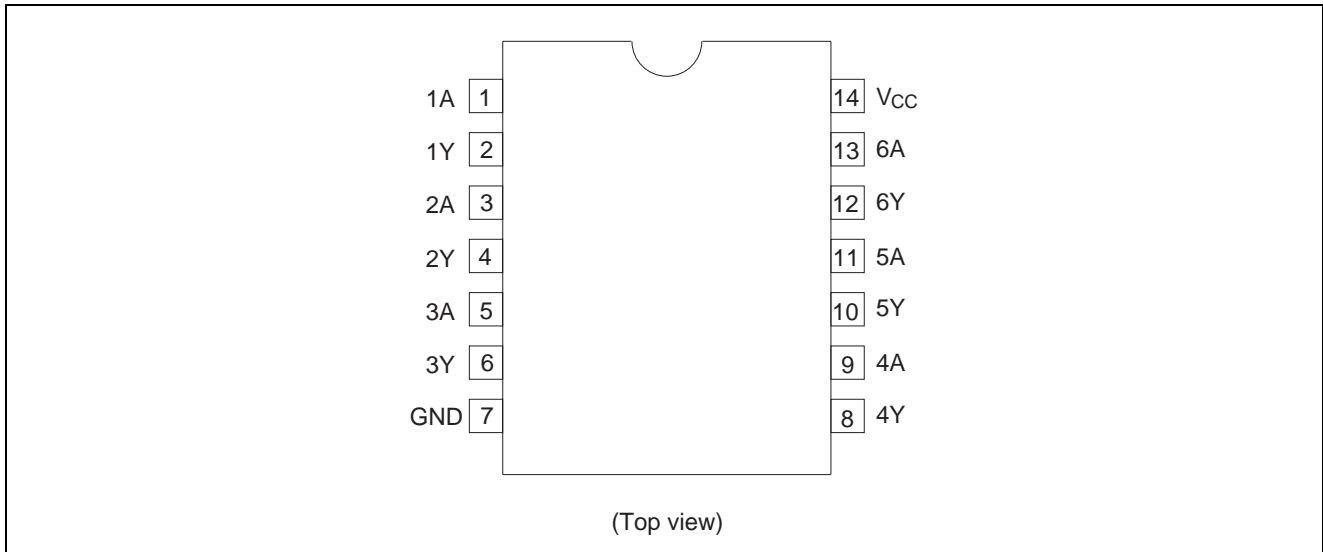
Note: Please consult the sales office for the above package availability.

Function Table

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

Note: H: High level
L: Low level

Pin Arrangement



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 $V_{CC} + 0.5$ -0.5 to 7.0 | V | Output: H or L V_{CC} : OFF |
| Input clamp current | I_{IK} | -20 | mA | $V_I < 0$ |
| Output clamp current | I_{OK} | ± 50 | mA | $V_O < 0$ or $V_O > V_{CC}$ |
| Continuous output current | I_O | ± 25 | 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 $T_a = 25^\circ\text{C}$ (in still air) * ³ | P_T | 785 500 | mW | SOP TSSOP |
| Storage temperature | T_{stg} | -65 to 150 | $^\circ\text{C}$ | |

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.

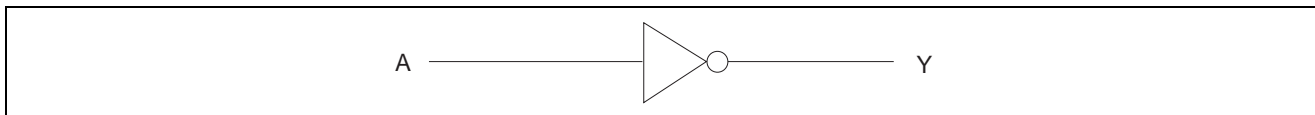
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150 $^\circ\text{C}$.

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 | V_{CC} | V | |
| Output current | I_{OH} | — | -50 | μA | $V_{CC} = 2.0 V$ |
| | | — | -2 | mA | $V_{CC} = 2.3 \text{ to } 2.7 V$ |
| | | — | -6 | | $V_{CC} = 3.0 \text{ to } 3.6 V$ |
| | | — | -12 | | $V_{CC} = 4.5 \text{ to } 5.5 V$ |
| | I_{OL} | — | 50 | μA | $V_{CC} = 2.0 V$ |
| | | — | 2 | mA | $V_{CC} = 2.3 \text{ to } 2.7 V$ |
| | | — | 6 | | $V_{CC} = 3.0 \text{ to } 3.6 V$ |
| | | — | 12 | | $V_{CC} = 4.5 \text{ to } 5.5 V$ |
| Input transition rise or fall rate | $\Delta t/\Delta v$ | 0 | 200 | ns/V | $V_{CC} = 2.3 \text{ to } 2.7 V$ |
| | | 0 | 100 | | $V_{CC} = 3.0 \text{ to } 3.6 V$ |
| | | 0 | 20 | | $V_{CC} = 4.5 \text{ to } 5.5 V$ |
| Operating free-air temperature | T_a | -40 | 85 | $^{\circ}C$ | |

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} × 0.7 | — | — | | |
| | | 3.0 to 3.6 | V _{CC} × 0.7 | — | — | | |
| | | 4.5 to 5.5 | V _{CC} × 0.7 | — | — | | |
| | V _{IL} | 2.0 | — | — | 0.5 | | |
| | | 2.3 to 2.7 | — | — | V _{CC} × 0.3 | | |
| | | 3.0 to 3.6 | — | — | V _{CC} × 0.3 | | |
| | | 4.5 to 5.5 | — | — | V _{CC} × 0.3 | | |
| Output voltage | V _{OH} | Min to Max | V _{CC} - 0.1 | — | — | V | I _{OH} = -50 μA |
| | | 2.3 | 2.0 | — | — | | I _{OH} = -2 mA |
| | | 3.0 | 2.48 | — | — | | I _{OH} = -6 mA |
| | | 4.5 | 3.8 | — | — | | I _{OH} = -12 mA |
| | V _{OL} | Min to Max | — | — | 0.1 | | I _{OL} = 50 μA |
| | | 2.3 | — | — | 0.4 | | I _{OL} = 2 mA |
| | | 3.0 | — | — | 0.44 | | I _{OL} = 6 mA |
| | | 4.5 | — | — | 0.55 | | I _{OL} = 12 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 _I or V _O = 0 V 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} | — | 8.0 | 11.7 | 1.0 | 14.0 | ns | C _L = 15 pF | A | Y |
| | t _{PHL} | — | 11.2 | 15.5 | 1.0 | 18.0 | | | | |

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} | — | 5.6 | 7.1 | 1.0 | 8.5 | ns | C _L = 15 pF | A | Y |
| | t _{PHL} | — | 8.0 | 10.6 | 1.0 | 12.0 | | | | |

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} | — | 3.8 | 5.5 | 1.0 | 6.5 | ns | C _L = 15 pF | A | Y |
| | t _{PHL} | — | 5.5 | 7.5 | 1.0 | 8.5 | | | | |

Operating Characteristics

$C_L = 50 \text{ pF}$

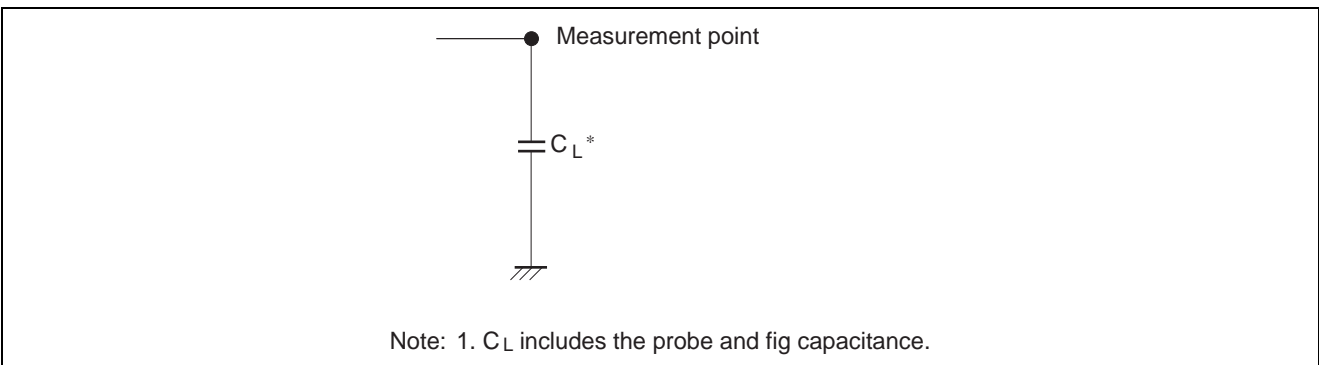
| Item | Symbol | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | Unit | Test Conditions |
|-------------------------------|----------|--------------|--------------------------|------|-----|------|-----------------|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | C_{PD} | 3.3 | — | 9.6 |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

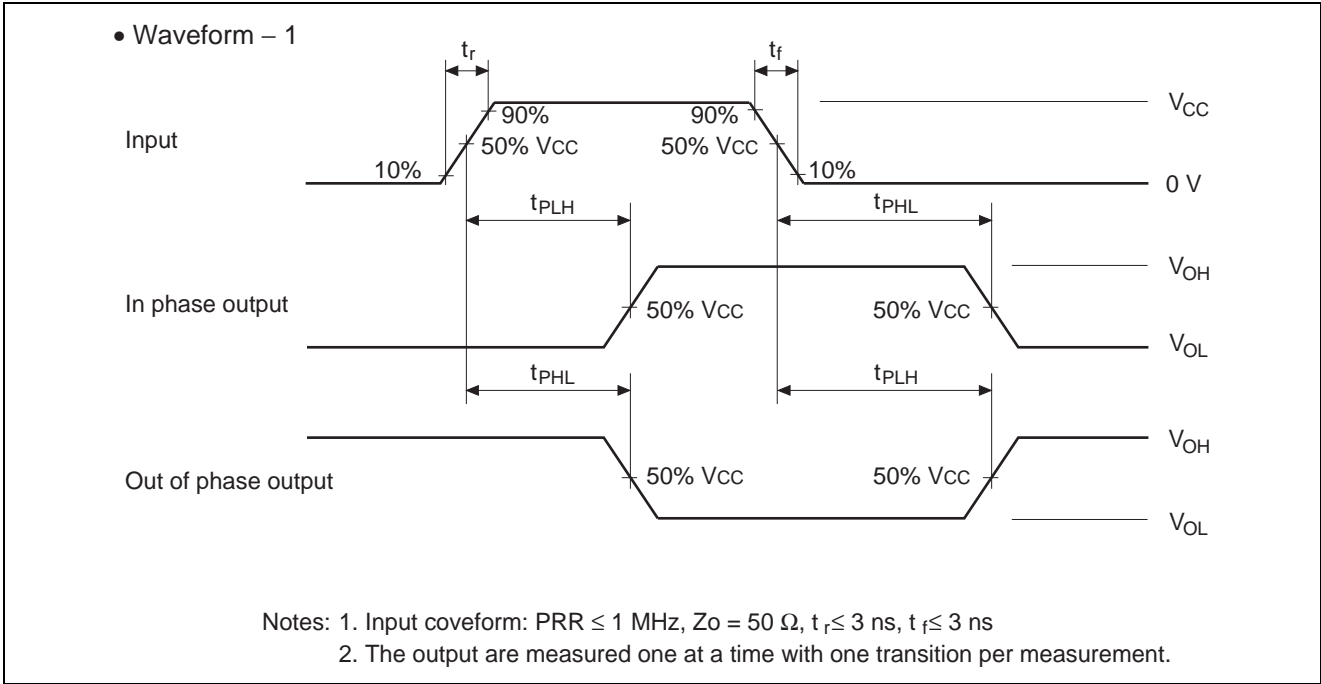
Noise Characteristics

$C_L = 50 \text{ pF}$

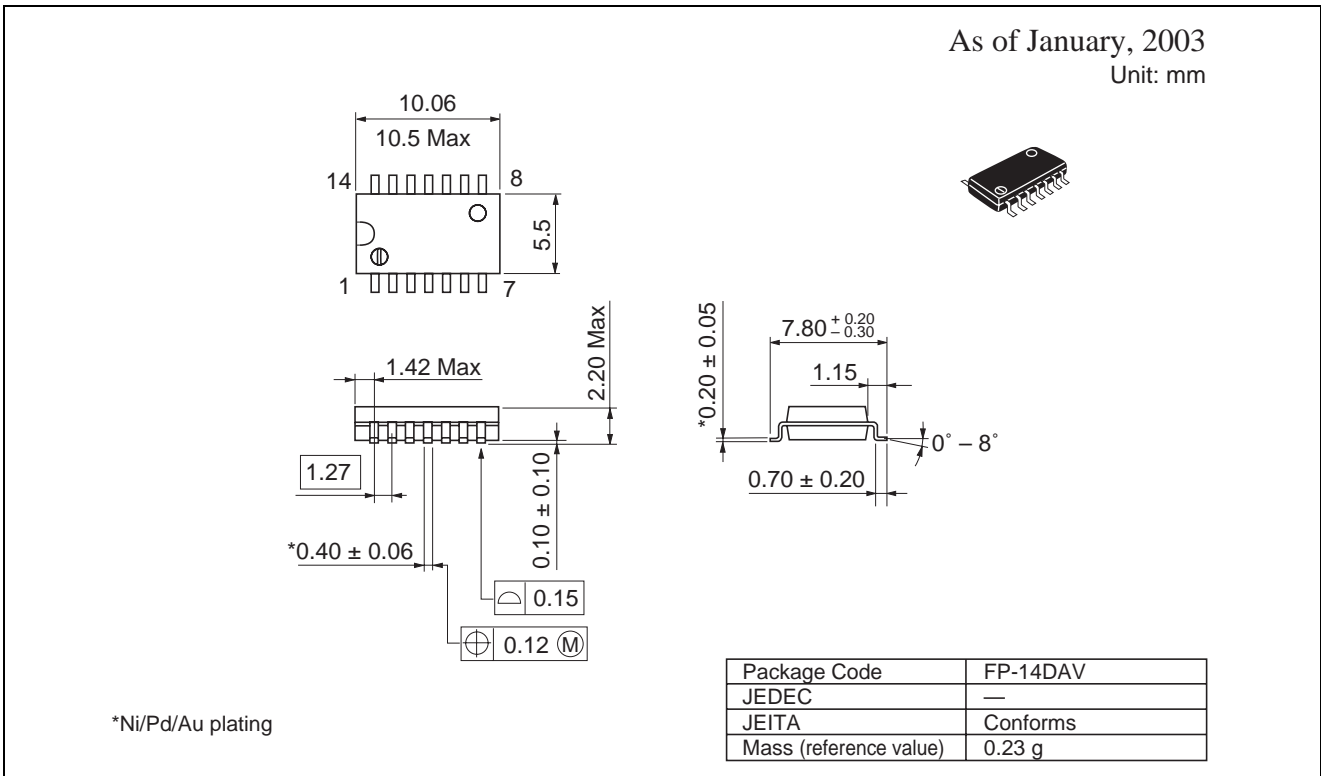
| Item | Symbol | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | Unit | Test Conditions |
|--|-------------|--------------|--------------------------|------|------|------|-----------------|
| | | | Min | Typ | Max | | |
| Quiet output, maximum dynamic V_{OL} | $V_{OL(P)}$ | 3.3 | — | 0.26 | 0.8 | V | |
| Quiet output, minimum dynamic V_{OL} | $V_{OL(V)}$ | 3.3 | — | -0.1 | -0.8 | V | |
| Quiet output, minimum dynamic V_{OH} | $V_{OH(V)}$ | 3.3 | — | 3.1 | — | V | |
| High-level dynamic input voltage | $V_{IH(D)}$ | 3.3 | 2.31 | — | — | V | |
| Low-level dynamic inout voltage | $V_{IL(D)}$ | 3.3 | — | — | 0.99 | V | |

Test Circuit



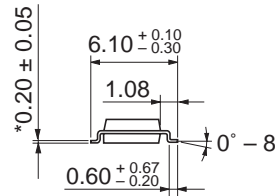
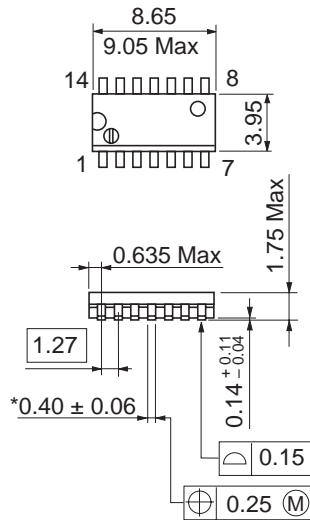


Package Dimensions



As of January, 2003

Unit: mm

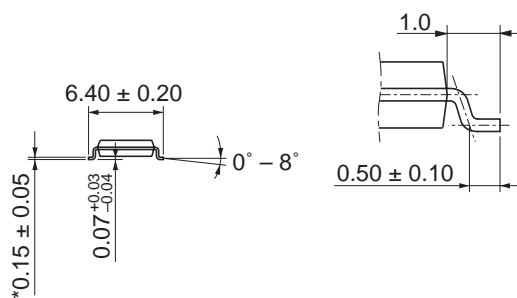
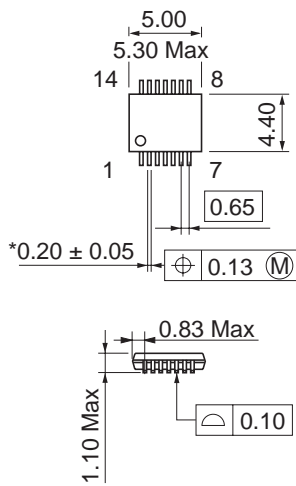


| | |
|------------------------|----------|
| Package Code | FP-14DNV |
| JEDEC | Conforms |
| JEITA | Conforms |
| Mass (reference value) | 0.13 g |

*Ni/Pd/Au plating

As of January, 2003

Unit: mm



| | |
|------------------------|----------|
| Package Code | TTP-14DV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.05 g |

*Ni/Pd/Au plating

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