

HD74LV05A

Hex Inverters with Open Drain Outputs

REJ03D0229-0700

Rev.7.00

Dec 23, 2005

Description

The HD74LV05A has six inverters 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

- $V_{CC} = 2.0\text{ V}$ 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 (@ $V_{CC} = 0\text{ V}$)
- All outputs V_O (Max.) = 5.5 V (@ $V_{CC} = 2.0\text{ V}$ to 5.5 V , Output “Z” state)
- Typical V_{OL} ground bounce < 0.8 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 (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|---------------|-------------------|------------------------------|----------------------|--------------------------------|
| HD74LV05AFPEL | SOP-14 pin(JEITA) | PRSP0014DF-B (FP-14DAV) | FP | EL (2,000 pcs/reel) |
| HD74LV05ARPEL | SOP-14 pin(JEDEC) | PRSP0014DE-A (FP-14DNV) | RP | EL (2,500 pcs/reel) |
| HD74LV05ATELL | TSSOP-14 pin | PTSP0014JA-B (TTP-14DV) | T | ELL (2,000 pcs/reel) |

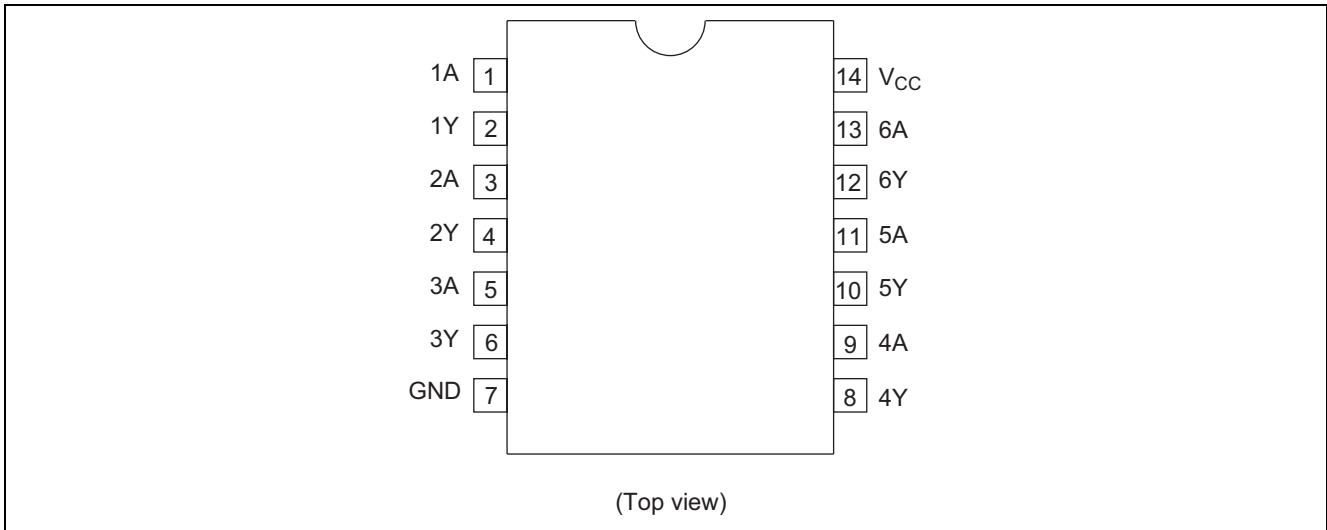
Note: Please consult the sales office for the above package availability.

Function Table

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

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

Pin Arrangement



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 or 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 | ± 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 | mW | SOP |
| | | 500 | | 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.

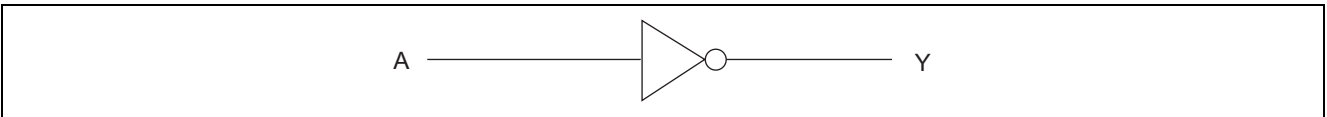
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 7.0 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

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 | $V_{CC} = 2.3 \text{ to } 2.7 V$ |
| | | — | 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

$T_a = -40 \text{ to } 85^{\circ}C$

| 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 | $I_{OL} = 50 \mu A$ |
| | | 2.3 | — | — | 0.4 | | $I_{OL} = 2 \text{ mA}$ |
| | | 3.0 | — | — | 0.44 | | $I_{OL} = 6 \text{ mA}$ |
| | | 4.5 | — | — | 0.55 | | $I_{OL} = 12 \text{ mA}$ |
| Input current | I_{IN} | 0 to 5.5 | — | — | ± 1 | μA | $V_{IN} = 5.5 V \text{ or } GND$ |
| 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 | $V_{IN} = V_{CC} \text{ or } GND, I_o = 0$ |
| Output leakage current | I_{OFF} | 0 | — | — | 5 | μA | $V_I \text{ or } V_O = 0 \text{ to } 5.5 V$ |
| Input capacitance | C_{IN} | 3.3 | — | 2.3 | — | pF | $V_I = V_{CC} \text{ or } GND$ |

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

$V_{CC} = 2.5 \pm 0.2 \text{ V}$

| 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 | | |

$V_{CC} = 3.3 \pm 0.3 \text{ V}$

| 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 | | |

$V_{CC} = 5.0 \pm 0.5 \text{ V}$

| 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

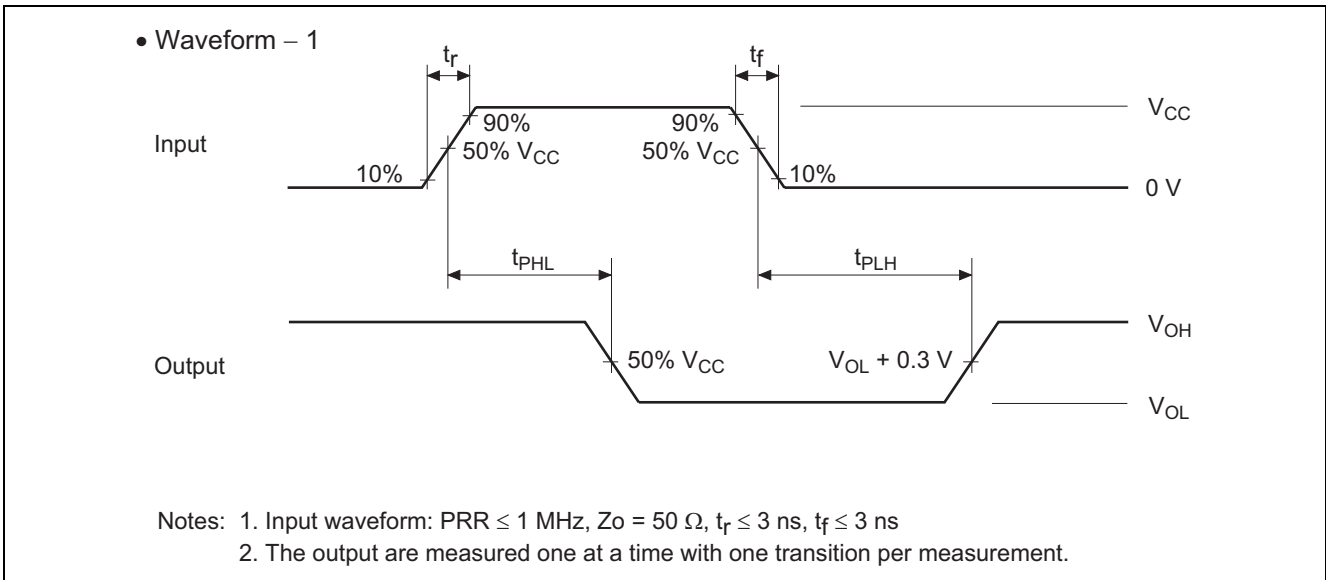
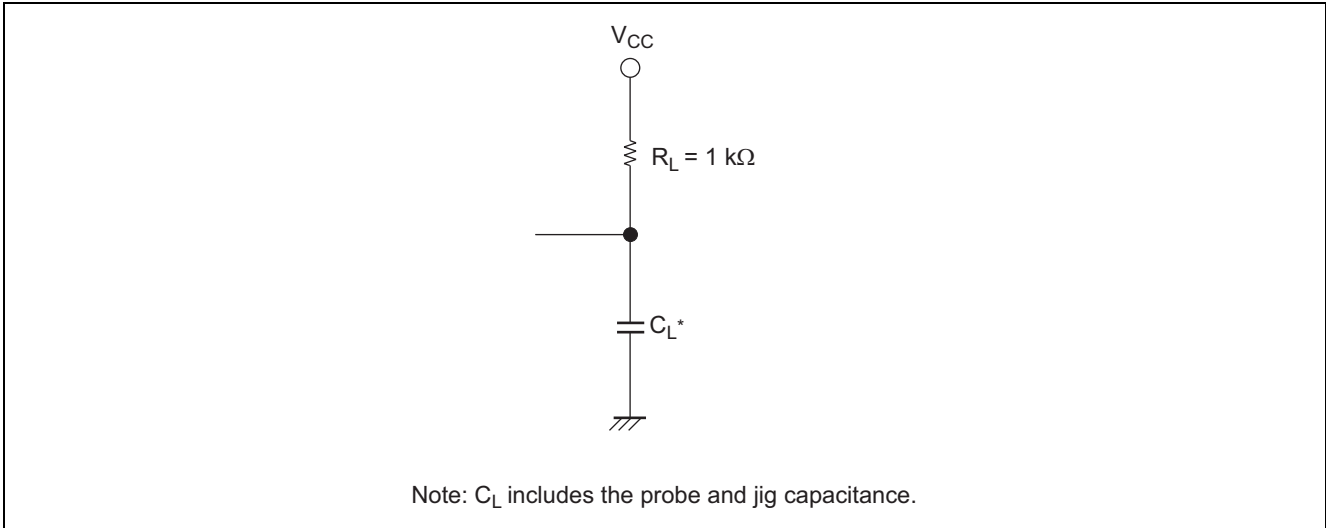
| Item | Symbol | V _{CC} (V) | Ta = 25°C | | | Unit | Test Conditions |
|-------------------------------|-----------------|---------------------|-----------|-----|-----|------|-----------------|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | C _{PD} | 3.3 | — | 2.5 | — | pF | f = 10 MHz |
| | | 5.0 | — | 3.0 | — | | |

Noise Characteristics

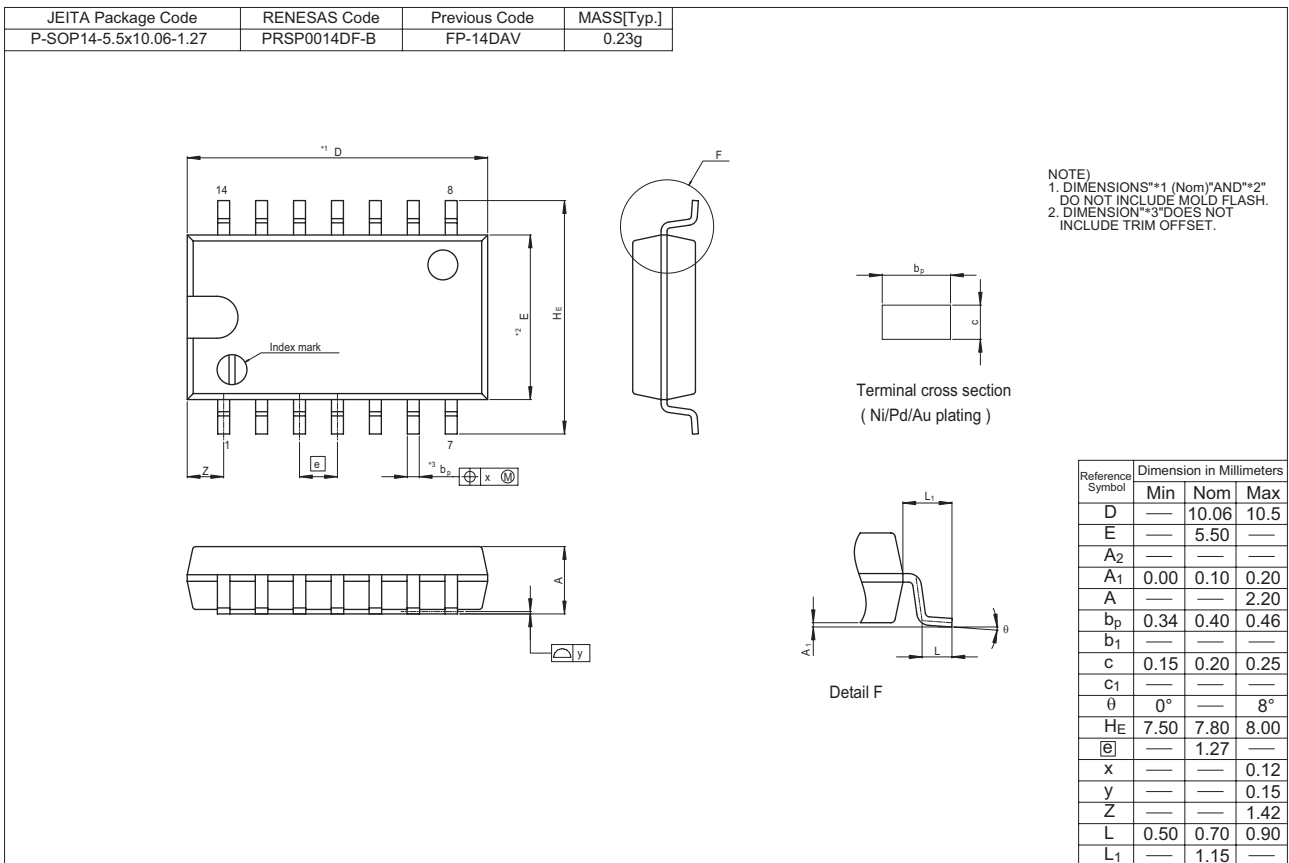
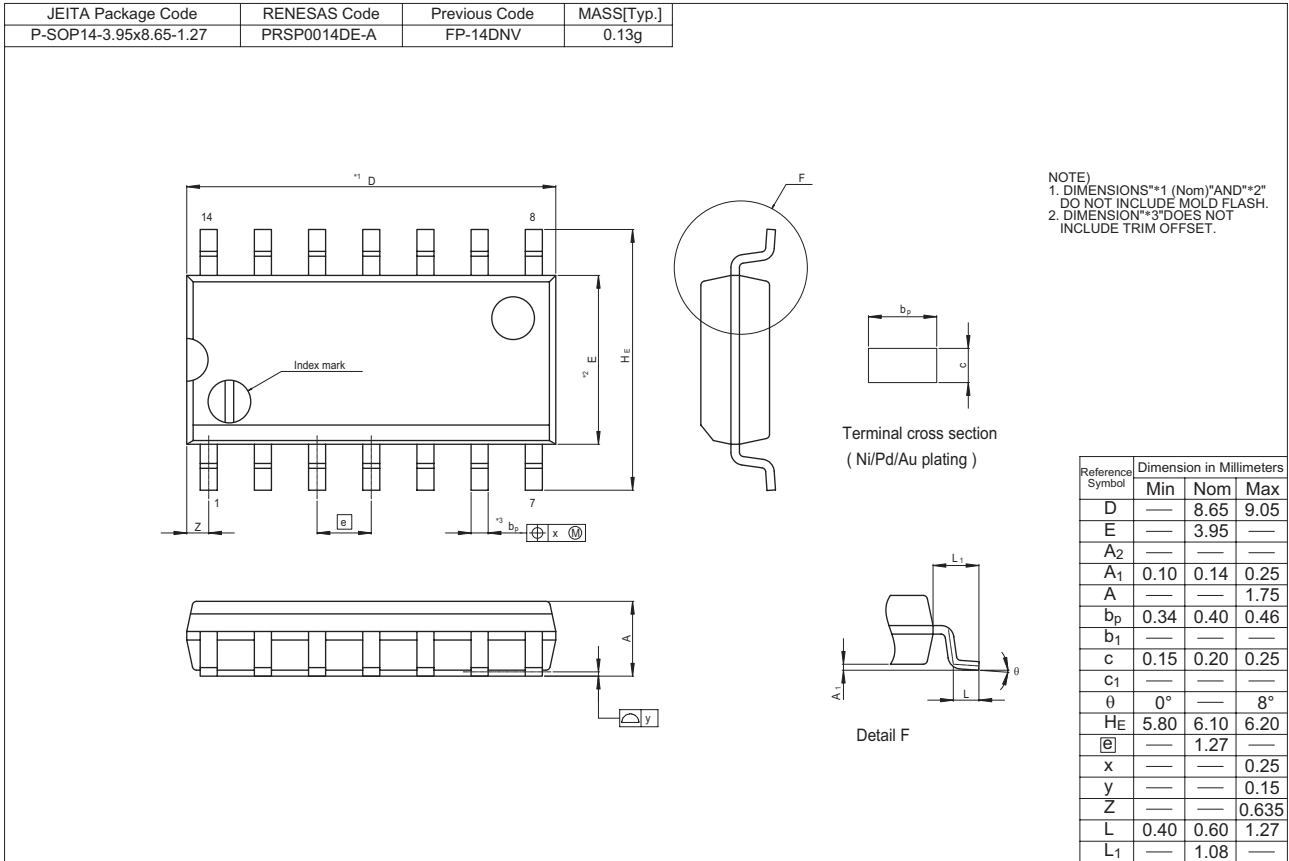
C_L = 50 pF

| 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

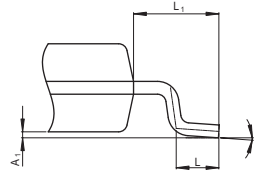
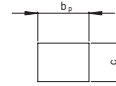
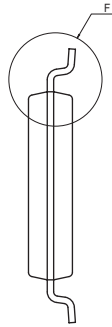
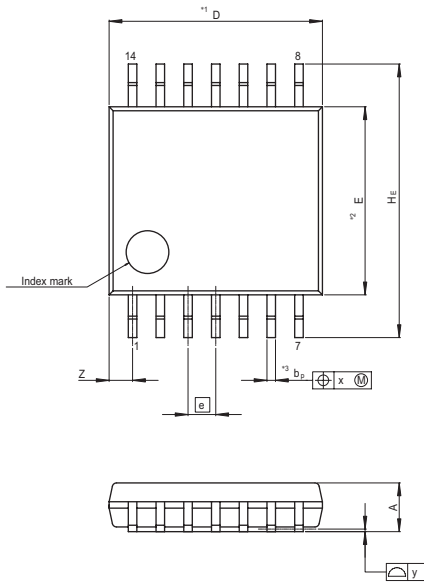


Package Dimensions



HD74LV05A

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



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° |
| HE | 6.20 | 6.40 | 6.60 |
| ⓪ | — | 0.65 | — |
| x | — | — | 0.13 |
| y | — | — | 0.10 |
| Z | — | — | 0.83 |
| L | 0.4 | 0.5 | 0.6 |
| L ₁ | — | 1.0 | — |

Keep safety first in your circuit designs!

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