

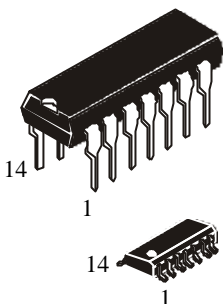
SL74LVU04

Hex Inverter

The 74LVU04 is a low-voltage, Si-gate CMOS device and is pin compatible with the 74HCU04.

The 74LVU04 is a general purpose hex inverter. Each of the six inverters is a single stage with unbuffered outputs.

- Wide Operating Voltage: 1.0÷5.5 V
- Optimized for Low Voltage applications: 1.0÷3.6 V
- Accepts TTL input levels between $V_{CC}=2.7$ V and $V_{CC}=3.6$ V
- Low Input Current



N SUFFIX
PLASTIC

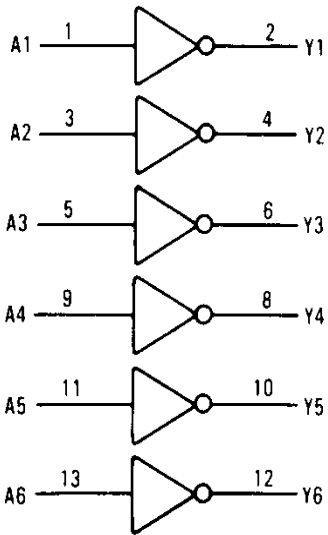
D SUFFIX
SOIC

ORDERING INFORMATION

| | |
|------------|---------|
| SL74LVU04N | Plastic |
| SL74LVU04D | SOIC |
| SL74LVU04 | Chip |

$T_A = -40^{\circ} \div 125^{\circ}$ C for all packages

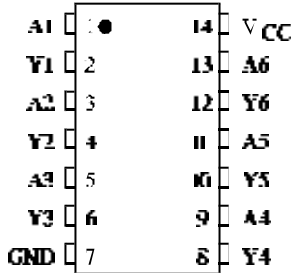
LOGIC DIAGRAM



$Y = \bar{A}$

PIN 14 = V_{CC}
PIN 7 = GND

PIN ASSIGNMENT



FUNCTION TABLE

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

MAXIMUM RATINGS*

| Symbol | Parameter | Value | Unit |
|---------------|--|-------------|------|
| V_{CC} | DC supply voltage (Referenced to GND) | -0.5 ÷ +7.0 | V |
| I_{IK}^{*1} | DC input diode current | ±20 | mA |
| I_{OK}^{*2} | DC output diode current | ±50 | mA |
| I_O^{*3} | DC output source or sink current -bus driver outputs | ±25 | mA |
| I_{CC} | DC V_{CC} current for types with - bus driver outputs | ±50 | mA |
| I_{GND} | DC GND current for types with - bus driver outputs | ±50 | mA |
| P_D | Power dissipation per package, plastic DIP+ SOIC package+ | 750 500 | mW |
| Tstg | Storage temperature | -65 ÷ +150 | °C |
| T_L | Lead temperature, 1.5 mm from Case for 10 seconds (Plastic DIP), 0.3 mm (SOIC Package) | 260 | °C |

*Maximum Ratings are those values beyond which damage to the device may occur.
Functional operation should be restricted to the Recommended Operating Conditions.

+Derating - Plastic DIP: - 12 mW/°C from 70° to 125°C

SOIC Package: : - 8 mW/°C from 70° to 125°C

*¹: $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$

*²: $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$

*³: $-0.5V < V_O < V_{CC} + 0.5V$

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|-------------------|--|-----|----------|------|
| V_{CC} | DC Supply Voltage (Referenced to GND) | 1.0 | 5.5 | V |
| V_{IN}, V_{OUT} | DC Input Voltage, Output Voltage (Referenced to GND) | 0 | V_{CC} | V |
| T_A | Operating Temperature, All Package Types | -40 | +125 | °C |
| t_r, t_f | Input Rise and Fall Time | | | ns |
| | 1.0 V ≤ V_{CC} < 2.0 V | 0 | 500 | |
| | 2.0 V ≤ V_{CC} < 2.7 V | 0 | 200 | |
| | 2.7 V ≤ V_{CC} < 3.6 V | 0 | 100 | |
| | 3.6 V ≤ V_{CC} ≤ 5.5 V | 0 | 50 | |

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range $GND \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

| Symbol | Parameter | Test Conditions | V _{CC} , V | Guaranteed Limit | | | | | | Unit | |
|-----------------|---------------------------------|--|---|------------------|------|--------------|------|---------------|------|------|------|
| | | | | 25°C | | -40°C ÷ 85°C | | -40°C ÷ 125°C | | | |
| | | | | min | max | min | max | min | max | | |
| V _{IH} | High-Level Input Voltage | | 1.2 | 1.0 | | 1.0 | | 1.0 | | V | |
| | | | 2.0 | 1.6 | | 1.6 | | 1.6 | | | |
| | | | 2.7 | 2.4 | | 2.4 | | 2.4 | | | |
| | | | 3.0 | 2.4 | | 2.4 | | 2.4 | | | |
| | | | 3.6 | 2.4 | | 2.4 | | 2.4 | | | |
| | | | 4.5 | 3.6 | | 3.6 | | 3.6 | | | |
| | | | 5.5 | 4.4 | | 4.4 | | 4.4 | | | |
| V _{IL} | Low-Level Input Voltage | | 1.2 | - | 0.2 | - | 0.2 | - | 0.2 | V | |
| | | | 2.0 | - | 0.4 | - | 0.4 | - | 0.4 | | |
| | | | 2.7 | - | 0.5 | - | 0.5 | - | 0.5 | | |
| | | | 3.0 | - | 0.5 | - | 0.5 | - | 0.5 | | |
| | | | 3.6 | - | 0.5 | - | 0.5 | - | 0.5 | | |
| | | | 4.5 | - | 0.9 | - | 0.9 | - | 0.9 | | |
| | | | 5.5 | - | 1.1 | - | 1.1 | - | 1.1 | | |
| V _{OH} | High-Level Output Voltage | V _I = V _{IH} or V _{IL} I ₀ = -100 ÷ A | 1.2 | 1.05 | - | 1.0 | - | 1.0 | - | V | |
| | | | 2.0 | 1.85 | - | 1.8 | - | 1.8 | - | | |
| | | | 2.7 | 2.55 | - | 2.5 | - | 2.5 | - | | |
| | | | 3.0 | 2.85 | - | 2.8 | - | 2.8 | - | | |
| | | | 3.6 | 3.45 | - | 3.4 | - | 3.4 | - | | |
| | | | 4.5 | 4.35 | - | 4.3 | - | 4.3 | - | | |
| | | 5.5 | 5.35 | - | 5.3 | - | 5.3 | - | | | |
| | | | V _I = V _{IH} or V _{IL} I ₀ = -6.0 mA | 3.0 | 2.48 | - | 2.40 | - | 2.20 | | - |
| | | | V _I = V _{IH} or V _{IL} I ₀ = -12 mA | 4.5 | 3.70 | - | 3.60 | - | 3.50 | | - |
| V _{OL} | Low-Level Output Voltage | V _I = V _{IH} or V _{IL} I ₀ = 100 ÷ A | 1.2 | - | 0.15 | - | 0.2 | - | 0.2 | V | |
| | | | 2.0 | - | 0.15 | - | 0.2 | - | 0.2 | | |
| | | | 2.7 | - | 0.15 | - | 0.2 | - | 0.2 | | |
| | | | 3.0 | - | 0.15 | - | 0.2 | - | 0.2 | | |
| | | | 3.6 | - | 0.15 | - | 0.2 | - | 0.2 | | |
| | | | 4.5 | - | 0.15 | - | 0.2 | - | 0.2 | | |
| | | 5.5 | - | 0.15 | - | 0.2 | - | 0.2 | | | |
| | | | V _I = V _{IH} or V _{IL} I ₀ = 6.0 mA | 3.0 | - | 0.33 | - | 0.40 | - | | 0.50 |
| | | | V _I = V _{IH} or V _{IL} I ₀ = 12 mA | 4.5 | - | 0.40 | - | 0.55 | - | | 0.65 |
| I _{IL} | Low-Level Input Leakage Current | V _I = 0 V | 5.5 | - | -0.1 | - | -1.0 | - | -1.0 | ÷ A | |

DC ELECTRICAL CHARACTERISTICS (continuation)

| Symbol | Parameter | Test Conditions | V _{CC} , | Guaranteed Limit | | | Unit |
|--------|-----------|-----------------|-------------------|------------------|--------------|---------------|------|
| | | | | 25°C | -40°C ÷ 85°C | -40°C ÷ 125°C | |

| | | | V | min | max | min | max | min | max | |
|-----------|--|---|------------|--------|------------|--------|------------|--------|--------------|-------------|
| I_{IH} | High-Level Input Leakage Current | $V_I = V_{\tilde{N}}$ | 5.5 | - | 0.1 | - | 1.0 | - | 1.0 | |
| I_{CC} | Quiescent Supply Current (per Package) | $V_I = 0 \hat{A}$ or $V_{\tilde{N}}$ $I_O = 0 \hat{i}$ A | 5.5 | - | 4.0 | - | 20 | - | 40 | \hat{i} A |
| I_{CCI} | Additional Quiescent Supply Current on input | $V_I = V_{\tilde{N}} - 0.6V$ | 2.7 3.6 | - - | 0.2 0.2 | - - | 0.5 0.5 | - - | 0.85 0.85 | mA |

AC ELECTRICAL CHARACTERISTICS ($C_L=50$ pF, $t_{LH}=t_{HL}=2.5$ ns, $R_L=1$ k \hat{U})

| Symbol | Parameter | Test Conditions | V_{CC} V | Guaranteed Limit | | | | | | Unit |
|-------------------------|---|--|---|------------------|-----|--------------|-----|---------------|-----|------|
| | | | | 25°C | | -40°C ÷ 85°C | | -40°C ÷ 125°C | | |
| | | | | Min | max | min | max | min | max | |
| t_{PHL} (t_{PLH}) | Propagation Delay, Input A to Output Y (Figure 1) | $V_I = 0$ V or V_I $t_{LH} = t_{HL} = 2.5$ ns $\tilde{N}_L = 50$ pF $R_L = 1$ k \hat{U} | 1.2 | - | 70 | - | 80 | - | 100 | ns |
| | | | 2.0 | - | 22 | - | 26 | - | 31 | |
| | | | 2.7 | - | 16 | - | 19 | - | 23 | |
| | | | 3.0 | - | 13 | - | 15 | - | 18 | |
| | | | 4.5 | - | 11 | - | 13 | - | 16 | |
| C_I | Input Capacitance | | 5.5 | - | 7.0 | - | - | - | - | pF |
| C_{PD} | Power Dissipation Capacitance (Per Inverter) | | $\hat{O}_A = 25^\circ \tilde{N}$ $V_I = 0V$ or V_{CC} | | | | | | pF | |
| | | | 36 | | | | | | | |

Used to determine the no-load dynamic power consumption:

$$P_D = C_{PD} V_{CC}^2 f_I + (C_L V_{CC}^2 f_O), f_I - \text{input frequency, } f_O - \text{output frequency (MHz)}$$

$(C_L V_{CC}^2 f_O)$ – sum of the outputs

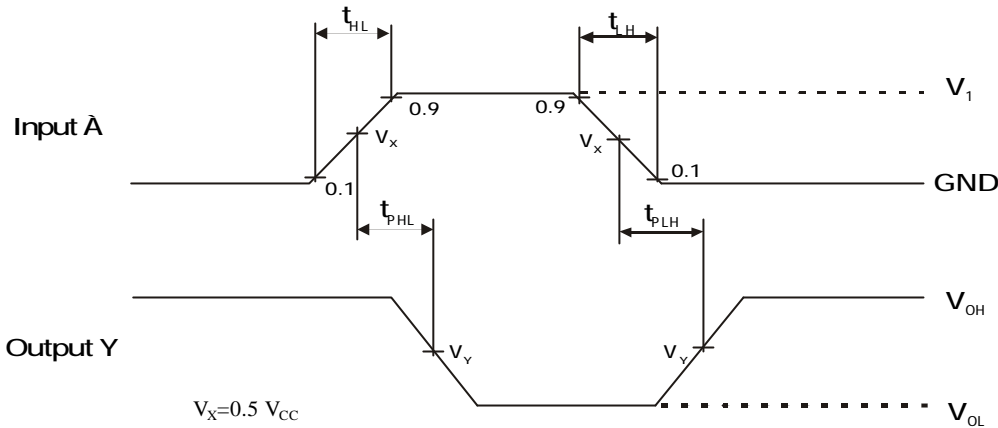


Figure 1. Switching Waveforms

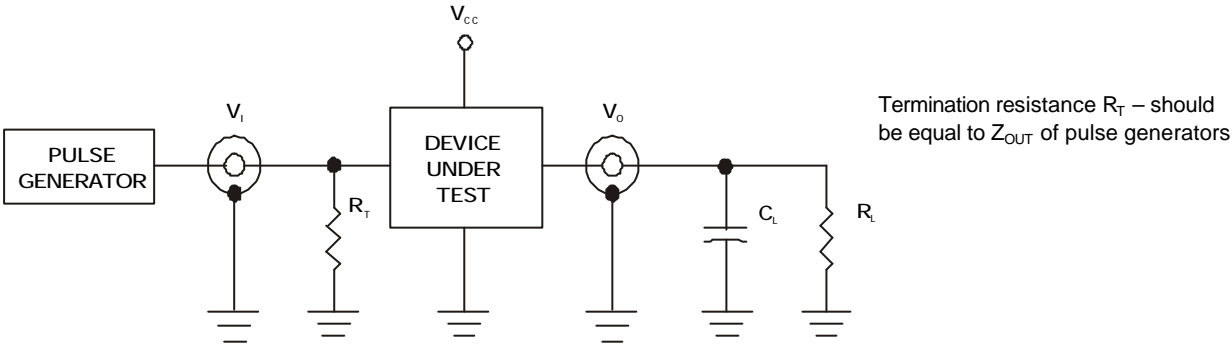
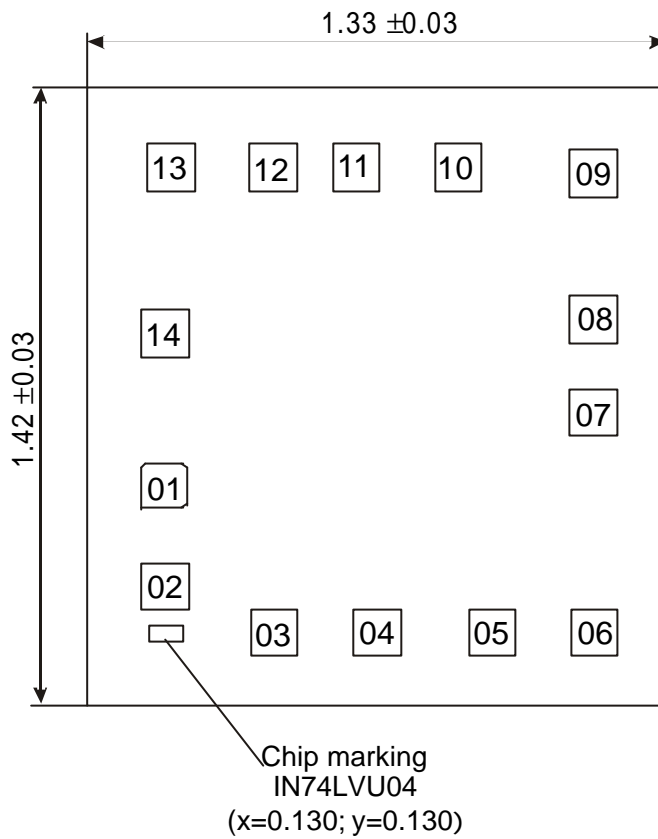


Figure 2. Test circuit

CHIP PAD DIAGRAM SL74LVU04



Pad size 0.108 x 0.108 mm (Pad size is given as per metallization layer)

Thickness of chip 0.46 ± 0.02 mm

PAD LOCATION

| Pad No | Symbol | X | Y |
|--------|-----------------|-------|-------|
| 01 | A1 | 0.130 | 0.463 |
| 02 | Y1 | 0.130 | 0.230 |
| 03 | A2 | 0.381 | 0.126 |
| 04 | Y2 | 0.616 | 0.126 |
| 05 | A3 | 0.881 | 0.126 |
| 06 | Y3 | 1.116 | 0.126 |
| 07 | GND | 1.115 | 0.631 |
| 08 | Y4 | 1.115 | 0.846 |
| 09 | A4 | 1.115 | 1.181 |
| 10 | Y5 | 0.804 | 1.194 |
| 11 | A5 | 0.569 | 1.194 |
| 12 | Y6 | 0.378 | 1.194 |
| 13 | A6 | 0.143 | 1.194 |
| 14 | V _{CC} | 0.130 | 0.813 |