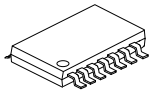
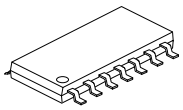
# U74LVC04A

**CMOS IC**

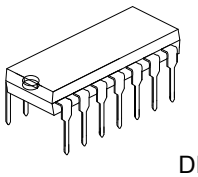
## HEX INVERTERS



TSSOP-14



SOP-14



DIP-14

## ■ DESCRIPTION

The UTC **U74LVC04A** consists of six independent inverters, it provides the function $Y = \overline{A}$ .

Inputs can be driven from either 3.3V or 5V devices, so the device can be used in a mix 3.3V/5V system.

## ■ FEATURES

* Operation Voltage Range: 1.65~3.6V
* Low Power Dissipation
* Input accept voltage to 5.5V

## ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| U74LVC04AL-D14-T | U74LVC04AG-D14-T | DIP-14 | Tube |
| U74LVC04AL-S14-R | U74LVC04AG-S14-R | SOP-14 | Tape Reel |
| U74LVC04AL-P14-R | U74LVC04AG-P14-R | TSSOP-14 | Tape Reel |

U74LVC04AL-D14-T

(1)Packing Type

(2)Package Type

(3)Lead Plating

(1) R: Tape Reel, T: Tube

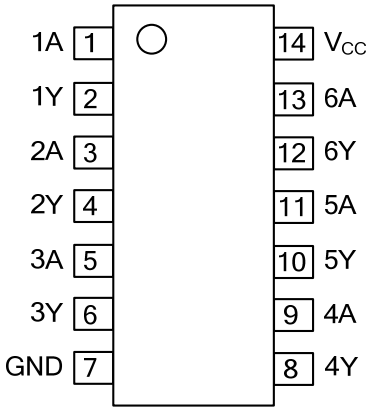
(2) D14: DIP-14, P14: TSSOP-14, S14: SOP-14

(3) G: Halogen Free, L: Lead Free



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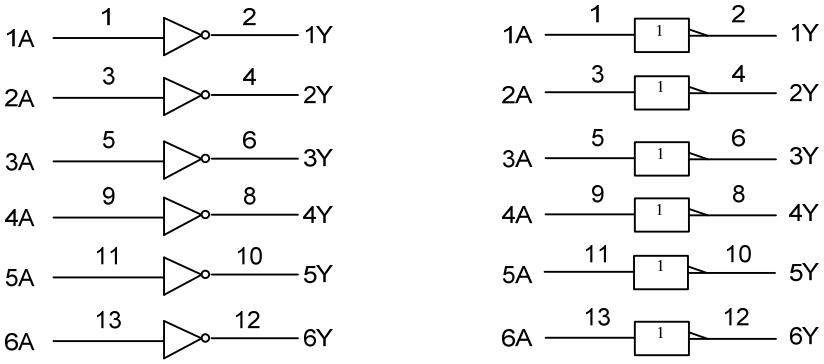
## ■ PIN CONFIGURATION




## ■ FUNCTION TABLE (each gate)

| INPUT | OUTPUT |
|---|---|
| A | Y |
| L | H |
| H | L |

## ■ LOGIC DIAGRAM (positive logic)




IEC logic symbol

## ■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | -0.5~6.5 | V |
| Input Voltage | $V_{IN}$ | -0.5~6.5 | V |
| Output Voltage(active mode) | $V_{OUT}$ | -0.5~$V_{CC}$+0.5 | V |
| Input Clamp Current($V_{IN}$<0) | $I_{IK}$ | -50 | mA |
| Output Clamp Current($V_{OUT}$<0) | $I_{OK}$ | -50 | mA |
| Output Current | $I_{OUT}$ | ±50 | mA |
| $V_{CC}$ or GND Current | $I_{CC}$ | ±100 | mA |
| Power Dissipation | $P_D$ | 500 | mW |
| Derated Above 60°C | | 5.5 | mW/°C |
| Storage Temperature | $T_{STG}$ | -65 ~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Operating | 1.65 | | 3.6 | V |
| | | Data retention only | 1.5 | | | V |
| Input Voltage | $V_{IN}$ | | 0 | | 5.5 | V |
| Output Voltage | $V_{OUT}$ | | 0 | | $V_{CC}$ | V |
| Operating Temperature | $T_A$ | | -40 | | 125 | °C |

## ■ STATIC CHARACTERISTICS (Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| High-Level Input Voltage | $V_{IH}$ | $V_{CC}$= 1.65V~1.95V | 0.65 × $V_{CC}$ | | | V |
| | | $V_{CC}$=2.3V~2.7V | 1.7 | | | V |
| | | $V_{CC}$= 2.7V~3.6V | 2 | | | V |
| Low-Level Input Voltage | $V_{IL}$ | $V_{CC}$= 1.65V~1.95V | | | 0.35 ×$V_{CC}$ | V |
| | | $V_{CC}$=2.3V~2.7V | | | 0.7 | V |
| | | $V_{CC}$= 2.7V~3.6V | | | 0.8 | V |
| High-Level Output Voltage | $V_{OH}$ | $V_{CC}$= 1.65V~3.6V, $I_{OH}$=-100μA | $V_{CC}$ -0.2 | | | V |
| | | $V_{CC}$= 1.65V, $I_{OH}$=-4mA | 1.29 | | | V |
| | | $V_{CC}$= 2.3V, $I_{OH}$=-8mA | 1.9 | | | V |
| | | $V_{CC}$= 2.7V, $I_{OH}$=-12mA | 2.2 | | | V |
| | | $V_{CC}$= 3V, $I_{OH}$=-12mA | 2.4 | | | V |
| | | $V_{CC}$= 3V, $I_{OH}$=-24mA | 2.3 | | | V |
| Low-Level Output Voltage | $V_{OL}$ | $V_{CC}$= 1.65V~3.6V, $I_{OL}$=100μA | | | 0.1 | V |
| | | $V_{CC}$= 1.65V, $I_{OL}$=4mA | | | 0.24 | V |
| | | $V_{CC}$= 2.3V, $I_{OL}$=8mA | | | 0.3 | V |
| | | $V_{CC}$= 2.7V, $I_{OL}$=12mA | | | 0.4 | V |
| | | $V_{CC}$= 3V, $I_{OL}$=24mA | | | 0.55 | V |
| Input Leakage Current | $I_{I(LEAK)}$ | $V_{CC}$= 3.6V, $V_{IN}$=5.5V or GND | | | ±1 | μA |
| Quiescent Supply Current | $I_Q$ | $V_{CC}$= 3.6V, $V_{IN}$=$V_{CC}$ or GND, $I_{OUT}$=0 | | | 1 | μA |
| Additional quiescent Supply Current | Δ $I_Q$ | $V_{CC}$= 2.7V ~ 3.6V<br>One input at $V_{CC}$- 0.6V,<br>other inputs at $V_{CC}$ or GND | | | 500 | μA |
| Input Capacitance | $C_{IN}$ | $V_{CC}$= 3.3V, $V_{IN}$=$V_{CC}$ or GND | | 5 | | pF |

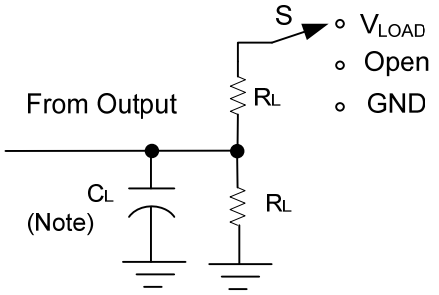
## ■ DYNAMIC CHARACTERISTICS (Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Propagation Delay From Input (A) to Output(Y) | $t_{PLH}/t_{PHL}$ | $V_{CC}$=1.8V±0.15V | 1 | 4.1 | 7.5 | ns |
| | | $V_{CC}$=2.5V±0.2V | 1 | 3.6 | 7 | ns |
| | | $V_{CC}$=2.7V | 1 | 3 | 5.3 | ns |
| | | $V_{CC}$=3.3V±0.3V | 1 | 2.5 | 4.3 | ns |

## ■ OPERATING CHARACTERISTICS (Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Power Dissipation Capacitance | Cpd | $V_{CC}$=1.8V, f=10MHz | | 6 | | pF |
| | | $V_{CC}$=2.5V, f=10MHz | | 7 | | pF |
| | | $V_{CC}$=3.3V, f=10MHz | | 8 | | pF |

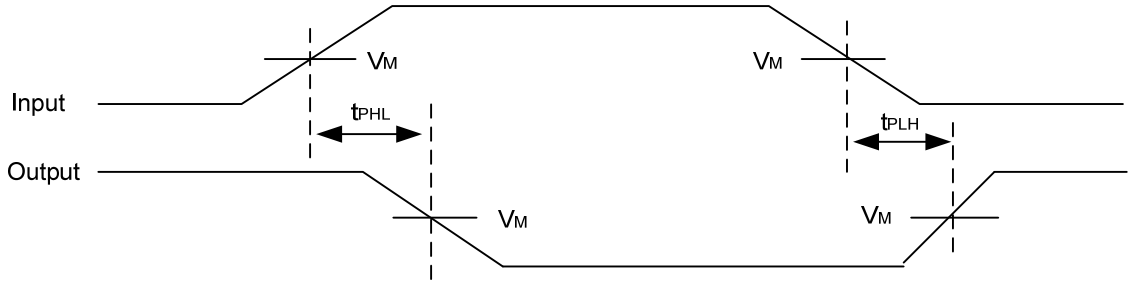
## ■ TEST CIRCUIT AND WAVEFORMS




| TEST | S |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PHZ}/t_{PZH}$ | GND |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |

Note: $C_L$ includes probe and jig capacitance.

| $V_{CC}$ | $V_{IN}$ | $t_R,t_F$ | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V_\triangle$ |
|---|---|---|---|---|---|---|---|
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | $2\times V_{CC}$ | 30pF | 1KΩ | 0.15V |
| 2.5V±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | $2\times V_{CC}$ | 30pF | 500Ω | 0.15V |
| 2.7V | 2.7V | ≤2.5ns | 1.5V | 6V | 50pF | 500Ω | 0.3V |
| 3.3V±0.3V | 2.7 V | ≤2.5ns | 1.5V | 6V | 50pF | 500Ω | 0.3V |




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