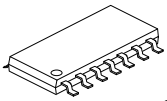
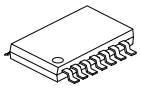
# U74AHC04

**CMOS IC**

## HEX INVERTER



SOP-14U



TSSOP-14U

## ■ DESCRIPTION

The **U74AHC04** is six independent inverters and each inverter provides the Function Y= $\overline{A}$ .

## ■ FEATURES

* Operation Voltage Range: 2V~5.5V
* High Noise Immunity
* Low Power Dissipation
* Balanced Propagation Delays

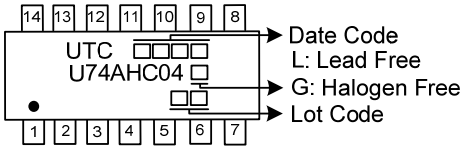
## ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| U74AHC04L-UEA-R | U74AHC04G-UEA-R | SOP-14U | Tape Reel |
| U74AHC04L-UEB-R | U74AHC04G-UEB-R | TSSOP-14U | Tape Reel |

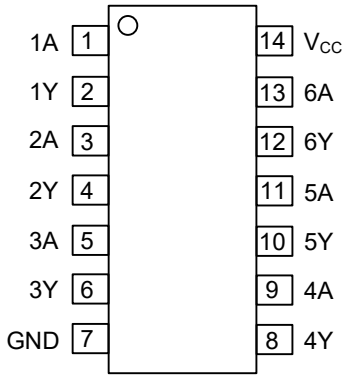
U74AHC04G-UEA-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) UEA: SOP-14U, UEB: TSSOP-14U
(3) G: Halogen Free and Lead Free, L: Lead Free

## ■ MARKING



## ■ PIN CONFIGURATION

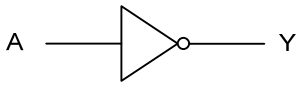



## ■ FUNCTION TABLE (Each Gate)

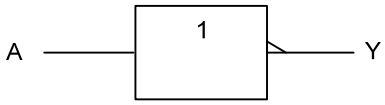
| INPUT A | OUTPUT Y |
|---|---|
| H | L |
| L | H |

Note: H: HIGH voltage level; L: LOW voltage level.

## ■ LOGIC DIAGRAM (Each Gate)




Logic Symbol




IEC Logic Symbol

## ■ ABSOLUTE MAXIMUM RATING (Unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | -0.5 ~ +7.0 | V |
| Input Voltage | $V_{IN}$ | -0.5 ~ +7.0 | V |
| Output Voltage | $V_{OUT}$ | -0.5 ~ $V_{CC}$+0.5 | V |
| Input Clamp Current | $I_{IK}$ | -20 | mA |
| Output Clamp Current | $I_{OK}$ | ±20 | mA |
| Output Current | $I_{OUT}$ | ±25 | mA |
| $V_{CC}$ or GND Current | $I_{CC}$ | ±50 | mA |
| 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 (Unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 2.0 | | 5.5 | V |
| Input Voltage | $V_{IN}$ | | 0 | | 5.5 | V |
| Output Voltage | $V_{OUT}$ | | 0 | | $V_{CC}$ | V |
| High-Level Input Voltage | $V_{IH}$ | $V_{CC}$ =2.0V | 1.5 | | | V |
| | | $V_{CC}$ =3.0V | 2.1 | | | |
| | | $V_{CC}$ =5.5V | 3.85 | | | |
| Low-Level Input Voltage | $V_{IL}$ | $V_{CC}$ =2.0V | | | 0.5 | V |
| | | $V_{CC}$ =3.0V | | | 0.9 | |
| | | $V_{CC}$ =5.5V | | | 1.65 | |
| High-Level Output Current | $I_{OH}$ | $V_{CC}$ =2.0V | | | -50 | μA |
| | | $V_{CC}$ =3.3V±0.3V | | | -4 | mA |
| | | $V_{CC}$ =5V±0.5V | | | -8 | |
| Low-Level Output Current | $I_{OL}$ | $V_{CC}$ =2.0V | | | 50 | μA |
| | | $V_{CC}$ =3.3V±0.3V | | | 4 | mA |
| | | $V_{CC}$ =5V±0.5V | | | 8 | |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | $V_{CC}$ =3.3V±0.3V | | | 100 | ns/V |
| | | $V_{CC}$ =5V±0.5V | | | 20 | ns/V |
| Operating Temperature | $T_A$ | | -40 | | +125 | °C |

## ■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | SOP-14U | $\theta_{JA}$ | 125 | °C/W |
| | TSSOP-14U | | 150 | °C/W |

## ■ STATIC CHARACTERISTICS (Unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| High-Level Output Voltage | $V_{OH}$ | $V_{CC}$=2.0V | $I_{OH}$=-50μA | 1.9 | 2.0 | | V |
| | | $V_{CC}$=3.0V | | 2.9 | 3.0 | | |
| | | $V_{CC}$=4.5V | | 4.4 | 4.5 | | |
| | | $V_{CC}$=3.0V, $I_{OH}$=-4mA | | 2.58 | | | |
| | | $V_{CC}$=4.5V, $I_{OH}$=-8mA | | 3.94 | | | |
| Low-Level Output Voltage | $V_{OL}$ | $V_{CC}$=2.0V | $I_{OL}$=50μA | | | 0.1 | V |
| | | $V_{CC}$=3.0V | | | | 0.1 | |
| | | $V_{CC}$=4.5V | | | | 0.1 | |
| | | $V_{CC}$=3.0V, $I_{OL}$=4mA | | | | 0.36 | |
| | | $V_{CC}$=4.5V, $I_{OL}$=8mA | | | | 0.36 | |
| Input Leakage Current | $I_{I(LEAK)}$ | $V_{IN}$=5.5V or GND,$V_{CC}$ =0V to 5.5V | | | | 0.1 | μA |
| Quiescent Supply Current | $I_Q$ | $V_{IN}$=$V_{CC}$ or GND, $I_{OUT}$=0, $V_{CC}$=5.5V | | | | 2 | μA |
| Input Capacitance | $C_{IN}$ | $V_{IN}$=$V_{CC}$ or GND, $V_{CC}$=5V | | | 2 | 10 | pF |

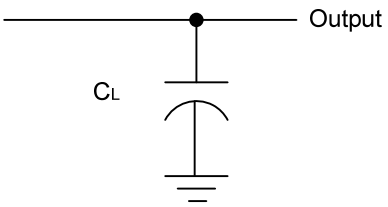
## ■ SWITCHING CHARACTERISTICS (Unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Propagation Delay, From Input(A) To Output(Y) | $t_{PHL}$ / $t_{PLH}$ | $V_{CC}$=3.3±0.3V | $C_L$=15 pF | | 5 | 8.9 | ns |
| | | | $C_L$=50 pF | | 7.5 | 11.4 | ns |
| Propagation Delay, From Input(A) To Output(Y) | $t_{PHL}$ / $t_{PLH}$ | $V_{CC}$=5±0.5V | $C_L$=15 pF | | 3.8 | 5.5 | ns |
| | | | $C_L$=50 pF | | 5.3 | 7.5 | ns |

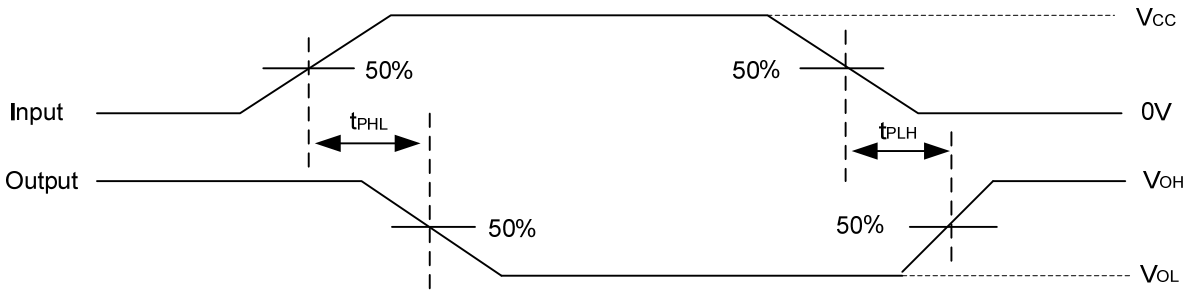
## ■ OPERATING CHARACTERISTICS ($V_{CC}$=5V, unless otherwise specified))

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Power Dissipation Capacitance | $C_{PD}$ | No Load, f=1MHz | | 12 | | pF |

## ■ TEST CIRCUIT AND WAVEFORMS




Test circuit for measuring propagation delay




Waveforms showing the Input(A) to Output(Y) propagation delays.

Note: $C_L$ includes probe and jig capacitance.
All input pulses are supplied by generators having the following characteristics: PRR ≤1MHz, Zo = 50Ω, $t_R$ ⩽3ns, $t_F$ ⩽3ns.