



# U74HC14

**CMOS IC**

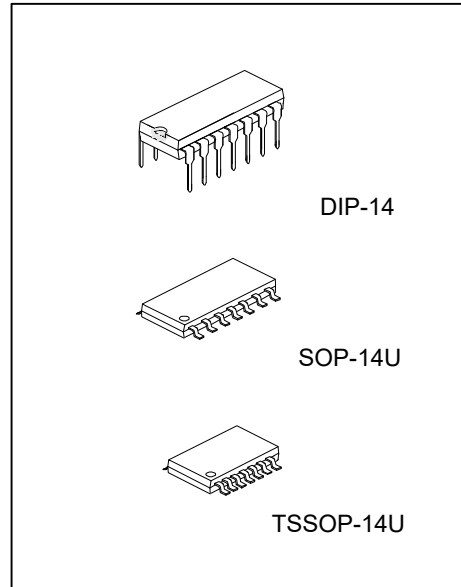
## HIGH-SPEED CMOS LOGIC HEX INVERTING SCHMITT TRIGGER

■ **DESCRIPTION**

The UTC **U74HC14** each contain six inverting Schmitt triggers in one package. Each of them perform the Boolean function  $Y = \overline{A}$

■ **FEATURES**

- \* Widely range of input rise and fall time
- \* high noise immunity
- \* Fan-out parameters(over temperature range) up to 10 LSTTL Loads
- \* Low power consumption
- \* Wide range operation: 2V ~ 6V



■ **ORDERING INFORMATION**

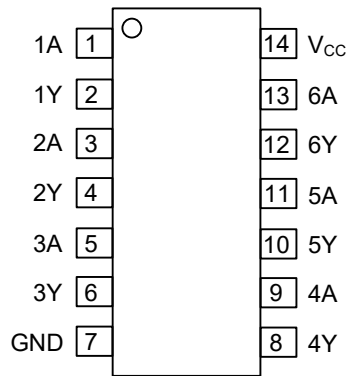
| Ordering Number |                | Package   | Packing   |
|-----------------|----------------|-----------|-----------|
| Lead Free       | Halogen Free   |           |           |
| U74HC14L-D14-T  | U74HC14G-D14-T | DIP-14    | Tube      |
| U74HC14L-UEA-R  | U74HC14G-UEA-R | SOP-14U   | Tape Reel |
| U74HC14L-UEB-R  | U74HC14G-UEB-R | TSSOP-14U | Tape Reel |

|  |  |
|--|--|
| <p>U74HC14G-D14-T</p> <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Green Package</li> </ul> | <p>(1) T: Tube, R: Tape Reel<br/>                 (2) D14: DIP-14, UEA: SOP-14U, UEB: TSSOP-14U<br/>                 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|--|

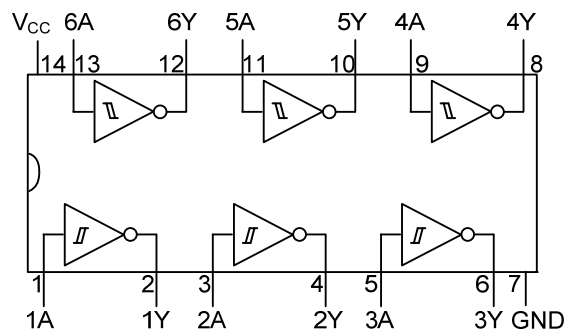
■ **MARKING**

| DIP-14   | SOP-14U / TSSOP-14U  |
|--|--|
|  |  |
| <p>14 13 12 11 10 9 8 → Date Code<br/>                 UTC □□□□<br/>                 L: Lead Free<br/>                 U74HC14 □ → G: Halogen Free<br/>                 □□ → Lot Code<br/>                 1 2 3 4 5 6 7</p> | <p>14 13 12 11 10 9 8 → Date Code<br/>                 UTC □□□□<br/>                 L: Lead Free<br/>                 U74HC14 □ → G: Halogen Free<br/>                 □□ → Lot Code<br/>                 1 2 3 4 5 6 7</p> |

■ PIN CONFIGURATION



■ FUNCTIONAL DIAGRAM

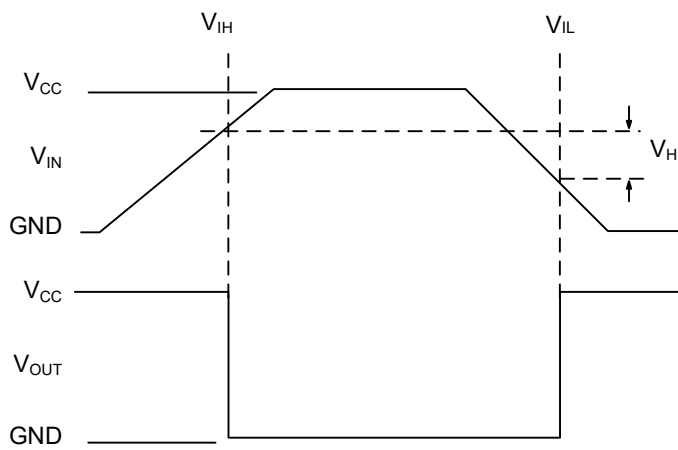
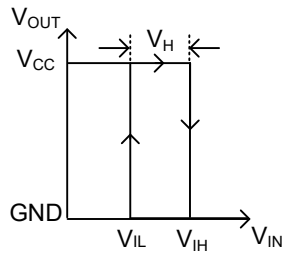
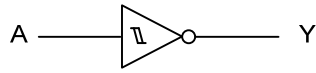


■ TRUTH TABLE

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

H=High level  
L=Low Level

■ LOGIC DIAGRAM



Hysteresis Definition, Characteristic, And Test Setup

## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                  |                                     | SYMBOL    | RATINGS    | UNIT |
|----------------------------|-------------------------------------|-----------|------------|------|
| Supply Voltage             |                                     | $V_{CC}$  | -0.5 ~ 7   | V    |
| Input Clamp Current        | $V_{IN} < 0$ or $V_{IN} > V_{CC}$   | $I_{IK}$  | ±20        | mA   |
| Output Clamp Current       | $V_{OUT} < 0$ or $V_{OUT} > V_{CC}$ | $I_{OK}$  | ±20        | mA   |
| Continuous Output Current  | $V_{OUT} = 0$ to $V_{CC}$           | $I_{OUT}$ | ±25        | mA   |
| $V_{CC}$ or Ground 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

| PARAMETER                     | SYMBOL            | CONDITIONS | MIN | TYP | MAX      | UNIT |
|-------------------------------|-------------------|------------|-----|-----|----------|------|
| Supply Voltage Range HC Types | $V_{CC}$          |            | 2   | 5   | 6        | V    |
| Input or Output Voltage       | $V_{IN}, V_{OUT}$ |            | 0   |     | $V_{CC}$ | V    |
| Operating Temperature         | $T_A$             |            | -40 |     | +125     | °C   |

## ■ THERMAL DATA

| PARAMETER                           |           | SYMBOL        | RATINGS | UNIT |
|-------------------------------------|-----------|---------------|---------|------|
| Thermal Resistance Junction Ambient | DIP-14    | $\theta_{JA}$ | 100     | °C/W |
|                                     | SOP-14U   |               | 125     | °C/W |
|                                     | TSSOP-14U |               | 150     | °C/W |

## ■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

| PARAMETER                            | SYMBOL   | TEST CONDITIONS  | $T_A=25^\circ\text{C}$ |     |      | $T_A=-40^\circ\text{C}\sim+125^\circ\text{C}$ |     |      | UNIT |
|--------------------------------------|----------|--|------------------------|-----|------|---|-----|------|------|
|                                      |          |  | MIN                    | TYP | MAX  | MIN   | TYP | MAX  |      |
| Input Switch Points                  | $V_{IH}$ | $V_{CC}=2\text{V}$   | 0.7                    | 1.2 | 1.5  | 0.7   |     | 1.5  | V    |
|                                      |          | $V_{CC}=4.5\text{V}$   | 1.55                   | 2.5 | 3.15 | 1.55  |     | 3.15 | V    |
|                                      |          | $V_{CC}=6\text{V}$   | 2.1                    | 3.3 | 4.2  | 2.1   |     | 4.2  | V    |
|                                      | $V_{IL}$ | $V_{CC}=2\text{V}$   | 0.3                    | 0.6 | 1    | 0.3   |     | 1    | V    |
|                                      |          | $V_{CC}=4.5\text{V}$   | 0.9                    | 1.6 | 2.45 | 0.9   |     | 2.45 | V    |
|                                      |          | $V_{CC}=6\text{V}$   | 1.2                    | 2   | 3.2  | 1.2   |     | 3.2  | V    |
|                                      | $V_{TH}$ | $V_{CC}=2\text{V}$   | 0.2                    | 0.6 | 1.2  | 0.2   |     | 1.2  | V    |
|                                      |          | $V_{CC}=4.5\text{V}$   | 0.4                    | 0.9 | 2.1  | 0.4   |     | 2.1  | V    |
|                                      |          | $V_{CC}=6\text{V}$   | 0.5                    | 1.3 | 2.5  | 0.5   |     | 2.5  | V    |
| High Level Output Voltage CMOS Loads | $V_{OH}$ | $V_{IN}=V_{IH}$ or $V_{IL}, V_{CC}=2\text{V}, I_{OH}=-0.02\text{mA}$   | 1.9                    |     |      | 1.9   |     |      | V    |
|                                      |          | $V_{IN}=V_{IH}$ or $V_{IL}, V_{CC}=4.5\text{V}, I_{OH}=-0.02\text{mA}$ | 4.4                    |     |      | 4.4   |     |      | V    |
|                                      |          | $V_{IN}=V_{IH}$ or $V_{IL}, V_{CC}=6\text{V}, I_{OH}=-0.02\text{mA}$   | 5.9                    |     |      | 5.9   |     |      | V    |
| High Level Output Voltage TTL Loads  | $V_{OH}$ | $V_{IN}=V_{IH}$ or $V_{IL}, V_{CC}=4.5\text{V}, I_{OH}=-4\text{mA}$    | 3.98                   |     |      | 3.7   |     |      | V    |
|                                      |          | $V_{IN}=V_{IH}$ or $V_{IL}, V_{CC}=6\text{V}, I_{OH}=-5.2\text{mA}$    | 5.48                   |     |      | 5.2   |     |      | V    |

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER                              | SYMBOL          | TEST CONDITIONS   | T <sub>A</sub> =25°C |     |      | T <sub>A</sub> =-40°C~+125°C |     |     | UNIT |
|--|-----------------|---|----------------------|-----|------|------------------------------|-----|-----|------|
|  |                 |   | MIN                  | TYP | MAX  | MIN                          | TYP | MAX |      |
| Low Level Output Voltage<br>CMOS Loads | V <sub>OL</sub> | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> =2V,<br>I <sub>OL</sub> =0.02mA   |                      |     | 0.1  |                              |     | 0.1 | V    |
|  |                 | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> =4.5V,<br>I <sub>OL</sub> =0.02mA |                      |     | 0.1  |                              |     | 0.1 | V    |
|  |                 | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> =6V,<br>I <sub>OL</sub> =0.02mA   |                      |     | 0.1  |                              |     | 0.1 | V    |
| Low Level Output Voltage<br>TTL Loads  | V <sub>OL</sub> | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> =4.5V,<br>I <sub>OL</sub> =4mA    |                      |     | 0.26 |                              |     | 0.4 | V    |
|  |                 | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> =6V,<br>I <sub>OL</sub> =5.2mA    |                      |     | 0.26 |                              |     | 0.4 | V    |
| Input Leakage Current                  | I <sub>IN</sub> | V <sub>IN</sub> =V <sub>CC</sub> and GND, V <sub>CC</sub> =6V   |                      |     | ±0.1 |                              |     | ±1  | µA   |
| Quiescent Device Current               | I <sub>Q</sub>  | V <sub>IN</sub> =V <sub>CC</sub> or GND, V <sub>CC</sub> =6V,<br>I <sub>OUT</sub> =0                    |                      |     | 2    |                              |     | 40  | µA   |

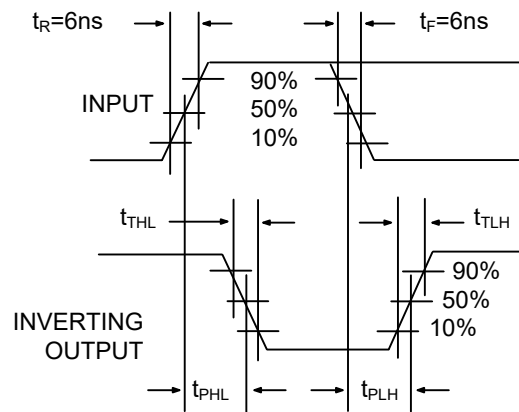
### ■ SWITCHING CHARACTERISTICS (C<sub>L</sub>=50pF, Input t<sub>R</sub>, t<sub>F</sub> = 6ns, unless otherwise specified)

| PARAMETER                    | SYMBOL                              | TEST CONDITIONS       | T <sub>A</sub> =25°C |     |     | T <sub>A</sub> =-40°C~+125°C |     |     | UNIT |
|------------------------------|-------------------------------------|-----------------------|----------------------|-----|-----|------------------------------|-----|-----|------|
|                              |                                     |                       | MIN                  | TYP | MAX | MIN                          | TYP | MAX |      |
| Propagation Delay,<br>A to Y | t <sub>PLH</sub> , t <sub>PHL</sub> | V <sub>CC</sub> =2V   |                      | 55  | 125 |                              |     | 190 | ns   |
|                              |                                     | V <sub>CC</sub> =4.5V |                      | 12  | 25  |                              |     | 38  | ns   |
|                              |                                     | V <sub>CC</sub> =6V   |                      | 11  | 21  |                              |     | 32  | ns   |
| Output Transition Times      | t <sub>TLH</sub> , t <sub>THL</sub> | V <sub>CC</sub> =2V   |                      | 38  | 75  |                              |     | 110 | ns   |
|                              |                                     | V <sub>CC</sub> =4.5V |                      | 11  | 21  |                              |     | 28  | ns   |
|                              |                                     | V <sub>CC</sub> =6V   |                      | 10  | 19  |                              |     | 25  | ns   |

### ■ OPERATING CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

| PARAMETER                     | SYMBOL          | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|-----------------|-----|-----|-----|------|
| Input Capacitance             | C <sub>IN</sub> |                 |     | 3   | 10  | pF   |
| Power Dissipation Capacitance | C <sub>PD</sub> | No load         |     | 20  |     | pF   |

■ TEST CIRCUIT AND WAVEFORMS



Transition Times And Propagation  
Delay Times, Combination Logic

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