



## U74AHC20

CMOS IC

### DUAL 4-INPUT NAND GATES

#### DESCRIPTION

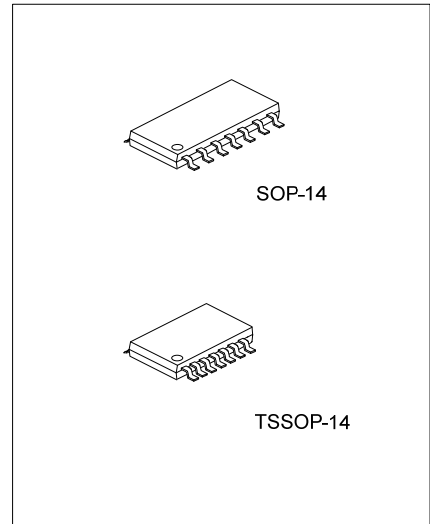
The **U74AHC20** contains two independent 4-input NAND gates.

They perform the Boolean function  $Y=A \cdot B \cdot C \cdot D$  or

$Y=\overline{A+B+C+D}$  in positive logic.

#### FEATURES

- \* Operation voltage range: 2~5.5V
- \* Low power dissipation:  $I_{CC}=2\mu A$  (Max.)
- \*  $\pm 8mA$  output drive at 5V

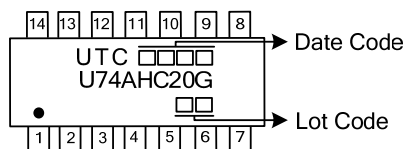


#### ORDERING INFORMATION

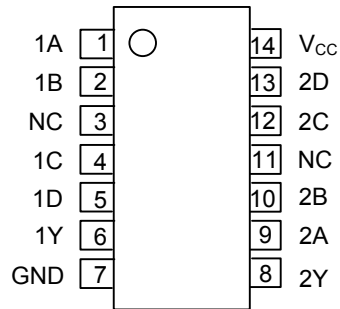
| Ordering Number | Package  | Packing   |
|-----------------|----------|-----------|
| U74AHC20G-S14-R | SOP-14   | Tape Reel |
| U74AHC20G-P14-R | TSSOP-14 | Tape Reel |

|  |   |
|--|---|
| <p>U74AHC20G-S14-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul> | <ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) S14: SOP-14, P14: TSSOP-14</li> <li>(3) G: Halogen Free and Lead Free</li> </ul> |
|--|---|

#### MARKING



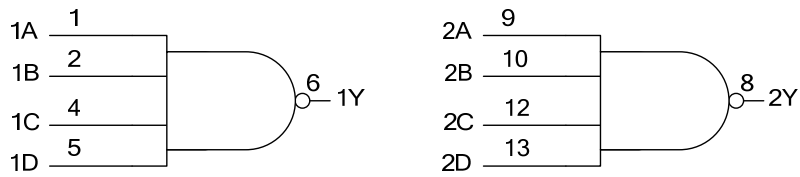
■ PIN CONFIGURATION



■ FUNCTION TABLE (each gate)

| INPUT(A) | INPUT(B) | INPUT(C) | INPUT(D) | OUTPUT(Y) |
|----------|----------|----------|----------|-----------|
| H        | H        | H        | H        | L         |
| L        | X        | X        | X        | H         |
| X        | L        | X        | X        | H         |
| X        | X        | L        | X        | H         |
| X        | X        | X        | L        | H         |

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub> = 25°C, unless otherwise specified)

| PARAMETER   | SYMBOL           | RATINGS    | UNIT |
|---|------------------|------------|------|
| Supply Voltage  | V <sub>CC</sub>  | -0.5~7     | V    |
| Input Clamp Current(V <sub>I</sub> <0)                                      | I <sub>IK</sub>  | -20        | mA   |
| Output Clamp Current(V <sub>O</sub> <0 or V <sub>O</sub> >V <sub>CC</sub> ) | I <sub>OK</sub>  | ±20        | mA   |
| Output Current  | I <sub>OUT</sub> | ±25        | mA   |
| V <sub>CC</sub> or GND Current  | I <sub>CC</sub>  | ±50        | mA   |
| Storage Temperature   | T <sub>STG</sub> | -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 <sub>CC</sub>                 |                          | 2   |     | 5.5             | V    |
| Input Voltage  | V <sub>IN</sub>                 |                          | 0   |     | V <sub>CC</sub> | V    |
| Output Voltage   | V <sub>OUT</sub>                |                          | 0   |     | V <sub>CC</sub> | V    |
| Input Transition Rise or Fall Rate $\Delta t/\Delta V$ | t <sub>R</sub> , t <sub>F</sub> | V <sub>CC</sub> =3V±0.3V |     |     | 100             | ns   |
|  |                                 | V <sub>CC</sub> =5V±0.5V |     |     | 20              | ns   |
| Operating Temperature                                  | T <sub>A</sub>                  |                          | -40 |     | 85              | °C   |

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

| PARAMETER                 | SYMBOL               | TEST CONDITIONS  | MIN  | TYP | MAX  | UNIT |
|---------------------------|----------------------|--|------|-----|------|------|
| High-Level Input Voltage  | V <sub>IH</sub>      | V <sub>CC</sub> = 2 V  | 1.5  |     |      | V    |
|                           |                      | V <sub>CC</sub> = 3V   | 2.1  |     |      | V    |
|                           |                      | V <sub>CC</sub> = 5.5 V  | 3.85 |     |      | V    |
| Low-Level Input Voltage   | V <sub>IL</sub>      | V <sub>CC</sub> = 2 V  |      |     | 0.5  | V    |
|                           |                      | V <sub>CC</sub> = 3V   |      |     | 0.9  | V    |
|                           |                      | V <sub>CC</sub> = 5.5 V  |      |     | 1.65 | V    |
| High-Level Output Voltage | V <sub>OH</sub>      | V <sub>CC</sub> = 2V, I <sub>OH</sub> = 50μA   | 1.9  |     |      | V    |
|                           |                      | V <sub>CC</sub> = 3V, I <sub>OH</sub> = 50μA   | 2.9  |     |      | V    |
|                           |                      | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> =50μA  | 4.4  |     |      | V    |
|                           |                      | V <sub>CC</sub> = 3V, I <sub>OH</sub> = 4mA  | 2.58 |     |      | V    |
|                           |                      | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = 8mA  | 3.94 |     |      | V    |
| Low-Level Output Voltage  | V <sub>OL</sub>      | V <sub>CC</sub> = 2V, I <sub>OH</sub> = 50μA   |      |     | 0.1  | V    |
|                           |                      | V <sub>CC</sub> = 3V, I <sub>OH</sub> = 50μA   |      |     | 0.1  | V    |
|                           |                      | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> =50μA  |      |     | 0.1  | V    |
|                           |                      | V <sub>CC</sub> = 3V, I <sub>OH</sub> = 4mA  |      |     | 0.36 | V    |
|                           |                      | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = 8mA  |      |     | 0.36 | V    |
| Input Leakage Current     | I <sub>I(LEAK)</sub> | V <sub>CC</sub> = 6V, V <sub>IN</sub> = V <sub>CC</sub> or GND                         |      |     | ±0.1 | uA   |
| Quiescent Supply Current  | I <sub>CC</sub>      | V <sub>CC</sub> = 5.5V, V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0 |      |     | 2    | μA   |
| Input Capacitance         | C <sub>IN</sub>      | V <sub>CC</sub> =5V  |      |     | 4    | pF   |

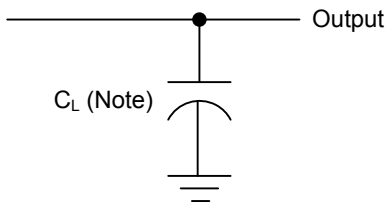
■ DYNAMIC CHARACTERISTICS ( Input: t<sub>R</sub>=t<sub>F</sub>=3ns, 25°C, unless otherwise specified )

| PARAMETER  | SYMBOL           | TEST CONDITION            | MIN                  | TYP | MAX | UNIT |    |
|--|------------------|---------------------------|----------------------|-----|-----|------|----|
| Propagation delay from input (A ,B,C,D) to output(Y) | t <sub>PLH</sub> | V <sub>CC</sub> =3.3±0.3V | C <sub>L</sub> =15pF |     | 6.2 | 8.8  | ns |
|  |                  |                           | C <sub>L</sub> =50pF |     | 8.7 | 12.3 | ns |
|  | t <sub>PHL</sub> | V <sub>CC</sub> =5±0.5V   | C <sub>L</sub> =15pF |     | 4.5 | 5.9  | ns |
|  |                  |                           | C <sub>L</sub> =50pF |     | 5.8 | 7.9  | ns |

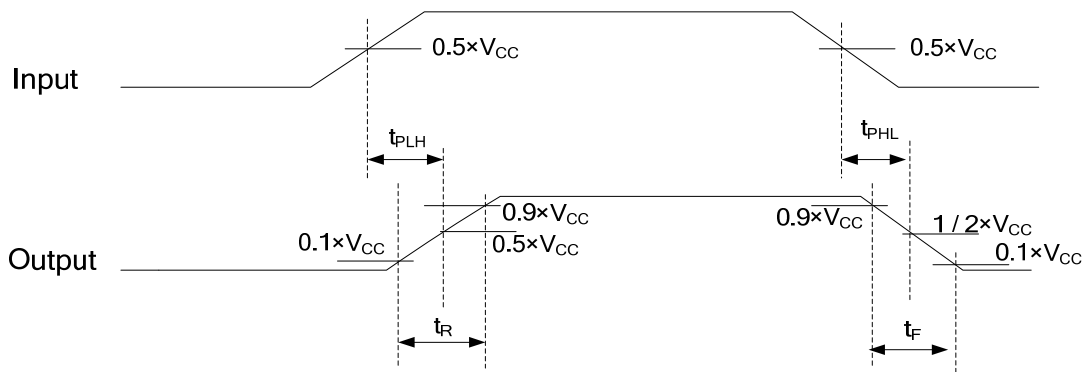
■ OPERATING CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

| PARAMETER                     | SYMBOL          | TEST CONDITION  | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|-----------------|-----|-----|-----|------|
| Power Dissipation Capacitance | C <sub>pd</sub> | No load, f=1MHz |     | 18  |     | pF   |

■ TEST CIRCUIT AND WAVEFORMS



Note : C<sub>L</sub> includes probe and jig capacitance.



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