



## U74AC00

CMOS IC

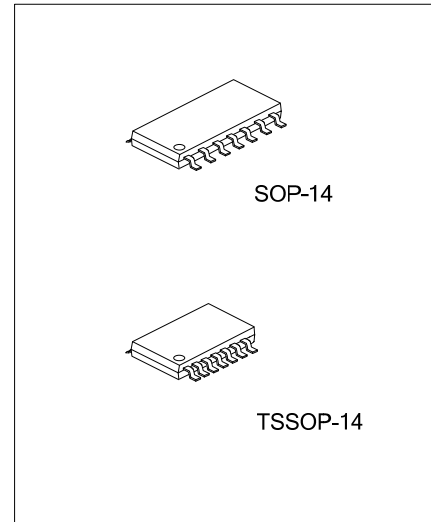
### QUADRUPLE 2-INPUT POSITIVE-NAND GATES

#### DESCRIPTION

The UTC **U74AC00** contains four independent 2-input NAND gates, and those gates perform the Boolean function of  $Y = \overline{A \times B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

#### FEATURES

- \* Operation voltage range: 2V ~ 6V
- \* Low power dissipation:  $I_{CC} = 2\mu A$  (Max)
- \* High speed:  $t_{pd} = 7ns$  (Typ.) @ 5V
- \* Low input current:  $0.1\mu A$  (Max) @ 25°C

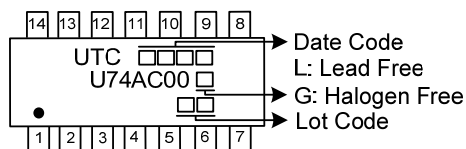


#### ORDERING INFORMATION

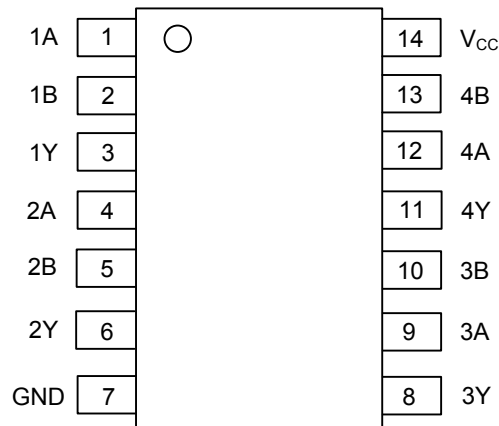
| Ordering Number |                | Package  | Packing   |
|-----------------|----------------|----------|-----------|
| Lead Free       | Halogen Free   |          |           |
| U74AC00L-S14-R  | U74AC00G-S14-R | SOP-14   | Tape Reel |
| U74AC00L-P14-R  | U74AC00G-P14-R | TSSOP-14 | Tape Reel |

|                |                                                        |                                                                                                       |
|----------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| U74AC00G-S14-R | (1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) R: Tape Reel<br>(2) S14: SOP-14, P14: TSSOP-14<br>(3) G: Halogen Free and Lead Free, L: Lead Free |
|----------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------|

#### MARKING



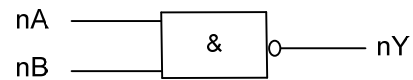
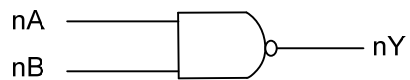
## ■ PIN CONFIGURATION



## ■ FUNCTION TABLE (each gate)

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

## ■ LOGIC DIAGRAM (positive logic)



# ■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

| PARAMETER               | SYMBOL    | RATINGS             | UNIT |
|-------------------------|-----------|---------------------|------|
| Supply Voltage          | $V_{CC}$  | -0.5~7              | V    |
| Input Voltage           | $V_{IN}$  | -0.5 ~ $V_{CC}+0.5$ | 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          | $I_{OUT}$ | ±50                 | mA   |
| $V_{CC}$ or GND Current | $I_{CC}$  | ±200                | 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     | MIN | TYP | MAX      | UNIT |
|------------------------------------|------------|-----|-----|----------|------|
| Supply Voltage                     | $V_{CC}$   | 2   |     | 6        | V    |
| Input Voltage                      | $V_{IN}$   | 0   |     | $V_{CC}$ | V    |
| Output Voltage                     | $V_{OUT}$  | 0   |     | $V_{CC}$ | V    |
| Input Transition Rise or Fall Rate | $t_R, t_F$ |     |     | 8        | ns/V |
| Operating Temperature              | $T_A$      | -40 |     | 85       | °C   |

# ■ THERMAL DATA

| PARAMETER        | SYMBOL   | RATINGS | UNIT |
|------------------|----------|---------|------|
| Junction to Case | SOP-14   | 76      | °C/W |
|                  | TSSOP-14 | 113     | °C/W |

# ■ STATIC CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

| PARAMETER                 | SYMBOL        | TEST CONDITIONS                                                | MIN  | TYP   | MAX  | UNIT          |
|---------------------------|---------------|----------------------------------------------------------------|------|-------|------|---------------|
| High-Level Input Voltage  | $V_{IH}$      | $V_{CC} = 3\text{ V}$                                          | 2.1  |       |      | V             |
|                           |               | $V_{CC} = 4.5\text{ V}$                                        | 3.15 |       |      | V             |
|                           |               | $V_{CC} = 5.5\text{ V}$                                        | 3.85 |       |      | V             |
| Low-Level Input Voltage   | $V_{IL}$      | $V_{CC} = 3\text{ V}$                                          |      |       | 0.9  | V             |
|                           |               | $V_{CC} = 4.5\text{ V}$                                        |      |       | 1.35 | V             |
|                           |               | $V_{CC} = 5.5\text{ V}$                                        |      |       | 1.65 | V             |
| High-Level Output Voltage | $V_{OH}$      | $V_{CC} = 3\text{ V}, I_{OH} = -50\mu\text{A}$                 | 2.9  |       |      | V             |
|                           |               | $V_{CC} = 4.5\text{ V}, I_{OH} = -50\mu\text{A}$               | 4.4  |       |      | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OH} = -50\mu\text{A}$               | 5.4  |       |      | V             |
|                           |               | $V_{CC} = 3\text{ V}, I_{OH} = -12\text{ mA}$                  | 2.56 |       |      | V             |
|                           |               | $V_{CC} = 4.5\text{ V}, I_{OH} = -24\text{ mA}$                | 3.86 |       |      | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OH} = -24\text{ mA}$                | 4.86 |       |      | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OH} = -75\text{ mA (Note)}$         | 3.85 |       |      | V             |
| Low-Level Output Voltage  | $V_{OL}$      | $V_{CC} = 3\text{ V}, I_{OL} = 50\mu\text{A}$                  |      | 0.002 | 0.1  | V             |
|                           |               | $V_{CC} = 4.5\text{ V}, I_{OL} = 50\mu\text{A}$                |      | 0.001 | 0.1  | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OL} = 50\mu\text{A}$                |      | 0.001 | 0.1  | V             |
|                           |               | $V_{CC} = 3\text{ V}, I_{OL} = 12\text{ mA}$                   |      |       | 0.36 | V             |
|                           |               | $V_{CC} = 4.5\text{ V}, I_{OL} = 24\text{ mA}$                 |      |       | 0.36 | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OL} = 24\text{ mA}$                 |      |       | 0.36 | V             |
|                           |               | $V_{CC} = 5.5\text{ V}, I_{OL} = 75\text{ mA (Note)}$          |      |       | 1.65 | V             |
| Input Leakage Current     | $I_{I(LEAK)}$ | $V_{CC} = 5.5\text{ V}, V_{IN} = V_{CC}$ or GND                |      |       | 0.1  | $\mu\text{A}$ |
| Quiescent Supply Current  | $I_Q$         | $V_{CC} = 5.5\text{ V}, V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$ |      |       | 2    | $\mu\text{A}$ |
| Input Capacitance         | $C_{IN}$      | $V_{CC} = 5\text{ V}, V_{IN} = V_{CC}$ or GND                  |      | 2.6   |      | pF            |

Note: Not more than one output should be tested at a time, and the duration of the test should not exceed 2 ms.

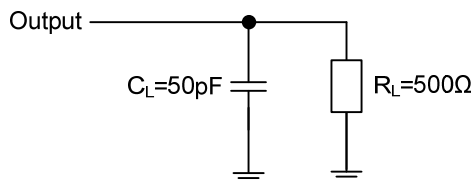
■ **DYNAMIC CHARACTERISTICS** (Ta=25°C, Input:  $t_R=t_F=2.5\text{ns}$ , unless otherwise specified )

| PARAMETER                                         | SYMBOL    | TEST CONDITIONS                                            | MIN | TYP | MAX | UNIT |
|---------------------------------------------------|-----------|------------------------------------------------------------|-----|-----|-----|------|
| Propagation delay from Input(A or B) to Output(Y) | $t_{PLH}$ | $V_{CC}=3.3V\pm0.3V$ , $C_L=50\text{pf}$ , $R_L=500\Omega$ | 2   | 7   | 9.5 | ns   |
|                                                   |           | $V_{CC}=5V\pm0.5V$ , $C_L=50\text{pF}$ , $R_L=500\Omega$   | 1.5 | 6   | 8   | ns   |
|                                                   | $t_{PHL}$ | $V_{CC}=3.3V\pm0.3V$ , $C_L=50\text{pf}$ , $R_L=500\Omega$ | 1.5 | 5.5 | 8   | ns   |
|                                                   |           | $V_{CC}=5V\pm0.5V$ , $C_L=50\text{pF}$ , $R_L=500\Omega$   | 1.5 | 4.5 | 6.5 | ns   |

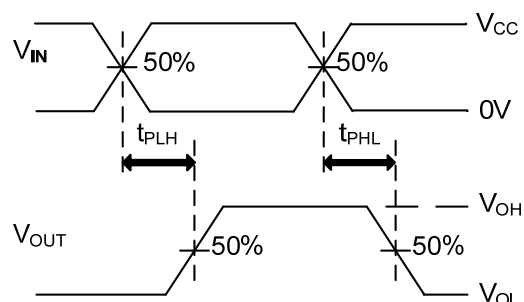
■ **OPERATING CHARACTERISTICS** (Ta=25°C, unless otherwise specified)

| PARAMETER                     | SYMBOL | TEST CONDITION                      | MIN | TYP | MAX | UNIT |
|-------------------------------|--------|-------------------------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | Cpd    | $C_L=50\text{pF}$ , $f=1\text{MHz}$ |     | 40  |     | pF   |

## ■ TEST CIRCUIT AND WAVEFORMS



Definitions for test circuit



Propagation Delay Times

Note:  $C_L$  includes probe and jig capacitance.

$PRR \leq 1\text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_r \leq 2.5\text{ns}$ ,  $t_f \leq 2.5\text{ns}$ .

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