



# U74AUP1G04

**CMOS IC**

## SINGLE INVERTER GATE

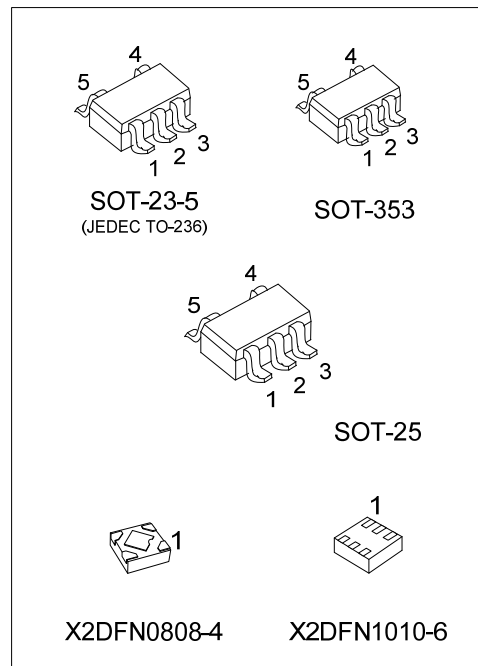
### DESCRIPTION

The UTC **U74AUP1G04** is a single inverter gate, it provides the function  $Y = \bar{A}$ .

This device has power-down protective circuit, preventing device destruction when it is powered down.

### FEATURES

- \* Wide supply voltage range from 0.8V to 3.6V
- \* Inputs accept voltages up to 3.6V
- \* I<sub>OFF</sub> supports partial-power-down mode
- \* Low static power consumption; I<sub>CC</sub>=0.5μA (Max.)
- \* Optimized for 3.3V Operation



### ORDERING INFORMATION

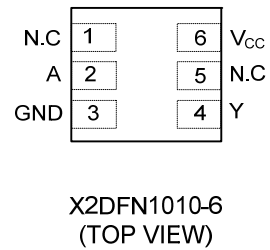
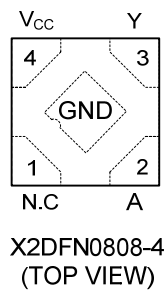
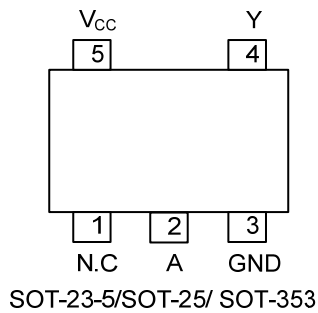
| Ordering Number          |                          | Package     | Packing   |
|--------------------------|--------------------------|-------------|-----------|
| Lead Free                | Halogen Free             |             |           |
| U74AUP1G04L-AE5-R        | U74AUP1G04G-AE5-R        | SOT-23-5    | Tape Reel |
| U74AUP1G04L-AF5-R        | U74AUP1G04G-AF5-R        | SOT-25      | Tape Reel |
| U74AUP1G04L-AL5-R        | U74AUP1G04G-AL5-R        | SOT-353     | Tape Reel |
| U74AUP1G04L-K04-0808X2-R | U74AUP1G04G-K04-0808X2-R | X2DFN0808-4 | Tape Reel |
| U74AUP1G04L-K06-1010X2-R | U74AUP1G04G-K06-1010X2-R | X2DFN1010-6 | Tape Reel |

|   |   |
|---|---|
| <p>U74AUP1G04G-AE5-R</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Green Package</p> | <p>(1) R: Tape Reel<br/>(2) AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353,<br/>K04-0808X2: X2DFN0808-4<br/>K06-1010X2: X2DFN1010-6<br/>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|---|---|

### MARKING

| SOT-23-5 / SOT-25 / SOT-353 | X2DFN0808-4 / X2DFN1010-6 |
|-----------------------------|---------------------------|
|                             |                           |

■ PIN CONFIGURATION



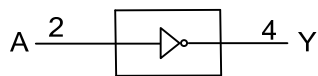
■ FUNCTION TABLE

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

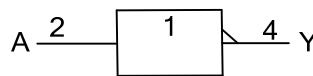
Note: H: HIGH voltage level; L: LOW voltage level.

■ LOGIC DIAGRAM (positive logic)

For SOT-23-5 / SOT-25 / SOT-353

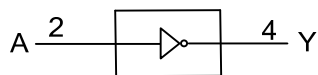


Logic symbol



IEC logic symbol

For X2DFN0808-4 / X2DFN1010-6



Logic symbol



IEC logic symbol

## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER                          | SYMBOL    | CONDITIONS                      | RATINGS               | UNIT |
|------------------------------------|-----------|---------------------------------|-----------------------|------|
| Supply Voltage                     | $V_{CC}$  |                                 | -0.5 ~ +4.6           | V    |
| Input Voltage                      | $V_{IN}$  |                                 | -0.5 ~ +4.6           | V    |
| Output Voltage                     | $V_{OUT}$ | Output in the high or low state | -0.5 ~ $V_{CC} + 0.5$ | V    |
|                                    |           | Output in the power-off state   | -0.5 ~ +4.6           | V    |
| Continuous $V_{CC}$ or GND Current | $I_{CC}$  |                                 | ±50                   | mA   |
| Continuous Output Current          | $I_{OUT}$ | $V_{OUT}=0 \sim V_{CC}$         | ±20                   | mA   |
| Input Clamp Current                | $I_{IK}$  | $V_{IN} < 0$                    | -50                   | mA   |
| Output Clamp Current               | $I_{OK}$  | $V_O > V_{CC}$ or $V_{OUT} < 0$ | -50                   | mA   |
| Storage Temperature Range          | $T_{STG}$ |                                 | -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              | TEST CONDITIONS         | MIN | TYP | MAX      | UNIT |
|------------------------------------|---------------------|-------------------------|-----|-----|----------|------|
| Supply Voltage                     | $V_{CC}$            | Operating               | 0.8 |     | 3.6      | V    |
| Input Voltage                      | $V_{IN}$            |                         | 0   |     | 3.6      | V    |
| Output Voltage                     | $V_{OUT}$           | High or low state       | 0   |     | $V_{CC}$ | V    |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | $V_{CC}=0.8V \sim 3.6V$ |     |     | 200      | ns/V |
| Operating Temperature              | $T_A$               |                         | -40 |     | +125     | °C   |

## ■ ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                 | SYMBOL   | TEST CONDITIONS                         | MIN                  | TYP  | MAX                  | UNIT |   |
|---------------------------|----------|---|----------------------|------|----------------------|------|---|
| High-level Input Voltage  | $V_{IH}$ | $V_{CC}=0.8V$                           | $V_{CC}$             |      |                      | V    |   |
|                           |          | $V_{CC}=1.1V \sim 1.95V$                | $0.65 \times V_{CC}$ |      |                      | V    |   |
|                           |          | $V_{CC}=2.3V \sim 2.7V$                 | 1.6                  |      |                      | V    |   |
|                           |          | $V_{CC}=3V \sim 3.6V$                   | 2                    |      |                      | V    |   |
| Low-level Input Voltage   | $V_{IL}$ | $V_{CC}=0.8V$                           |                      |      | 0                    | V    |   |
|                           |          | $V_{CC}=1.1V \sim 1.95V$                |                      |      | $0.35 \times V_{CC}$ | V    |   |
|                           |          | $V_{CC}=2.3V \sim 2.7V$                 |                      |      | 0.7                  | V    |   |
|                           |          | $V_{CC}=3V \sim 3.6V$                   |                      |      | 0.9                  | V    |   |
| High-Level Output Voltage | $V_{OH}$ | $V_{CC}=0.8 \sim 3.6V, I_{OH}=-20\mu A$ | $V_{CC}-0.1$         |      |                      | V    |   |
|                           |          | $V_{CC}=1.1V, I_{OH}=-1.1mA$            | $0.75 \times V_{CC}$ |      |                      | V    |   |
|                           |          | $V_{CC}=1.4V, I_{OH}=-1.7mA$            | 1.11                 |      |                      | V    |   |
|                           |          | $V_{CC}=1.65V, I_{OH}=-1.9mA$           | 1.32                 |      |                      | V    |   |
|                           |          | $V_{CC}=2.3V$                           | $I_{OH}=-2.3mA$      | 2.05 |                      |      | V |
|                           |          |   | $I_{OH}=-3.1mA$      | 1.9  |                      |      | V |
|                           |          | $V_{CC}=3V$                             | $I_{OH}=-2.7mA$      | 2.72 |                      |      | V |
| $I_{OH}=-4mA$             | 2.6      |   |                      |      | V                    |      |   |
| Low-Level Output Voltage  | $V_{OL}$ | $V_{CC}=0.8 \sim 3.6V, I_{OL}=20\mu A$  |                      |      | 0.1                  | V    |   |
|                           |          | $V_{CC}=1.1V, I_{OL}=1.1mA$             |                      |      | $0.3 \times V_{CC}$  | V    |   |
|                           |          | $V_{CC}=1.4V, I_{OL}=1.7mA$             |                      |      | 0.31                 | V    |   |
|                           |          | $V_{CC}=1.65V, I_{OL}=1.9mA$            |                      |      | 0.31                 | V    |   |
|                           |          | $V_{CC}=2.3V$                           | $I_{OL}=2.3mA$       |      |                      | 0.31 | V |
|                           |          |   | $I_{OL}=3.1mA$       |      |                      | 0.44 | V |
|                           |          | $V_{CC}=3V$                             | $I_{OL}=2.7mA$       |      |                      | 0.31 | V |
| $I_{OL}=4mA$              |          |   |                      | 0.44 | V                    |      |   |

## ■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER   | SYMBOL           | TEST CONDITIONS   | MIN | TYP | MAX       | UNIT    |
|---|------------------|---|-----|-----|-----------|---------|
| Input Leakage Current                             | $I_{I(LEAK)}$    | $V_{CC}=0 \sim 3.6V, V_{IN}=GND \sim 3.6V$                |     |     | $\pm 0.1$ | $\mu A$ |
| Power OFF Leakage Current                         | $I_{off}$        | $V_{CC}=0 V, V_{IN}$ or $V_{OUT}=0 \sim 3.6V$             |     |     | $\pm 0.2$ | $\mu A$ |
| Additional Power OFF Leakage Current              | $\Delta I_{off}$ | $V_{CC}=0 V \sim 0.2V, V_{IN}$ or $V_{OUT}=0 \sim 3.6V$   |     |     | $\pm 0.2$ | $\mu A$ |
| Quiescent Supply Current                          | $I_{CC}$         | $V_{CC}=0.8 \sim 3.6V, V_{IN}=V_{CC}$ or $GND, I_{OUT}=0$ |     |     | 0.5       | $\mu A$ |
| Additional Quiescent Supply Current Per Input Pin | $\Delta I_{CC}$  | $V_{CC}=3.3 V, V_{IN}=V_{CC}-0.6V, I_{OUT}=0$             |     |     | 40        | $\mu A$ |
| Input Capacitance                                 | $C_i$            | $V_{CC}=0V, V_{IN}=V_{CC}$ or $GND$                       |     | 1.5 |           | pF      |
|   |                  | $V_{CC}=3.6V, V_{IN}=V_{CC}$ or $GND$                     |     | 1.5 |           | pF      |
| Output Capacitance                                | $C_{OUT}$        | $V_{CC}=0V, V_{OUT}=GND$                                  |     | 3   |           | pF      |

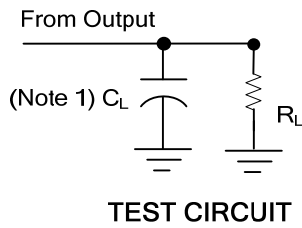
## ■ SWITCHING CHARACTERISTICS ( $T_A=25^\circ C$ , unless otherwise specified)

| PARAMETER  | SYMBOL                | TEST CONDITIONS          | MIN                   | TYP  | MAX  | UNIT |    |
|--|-----------------------|--------------------------|-----------------------|------|------|------|----|
| Propagation delay from input (A or B) to output(Y) | $t_{PLH} / t_{PHL}$   | $C_L=5pF, R_L=1M\Omega$  | $V_{CC}=0.8V$         |      | 15.6 |      | ns |
|  |                       |                          | $V_{CC}=1.2\pm 0.1V$  | 3.3  | 5.9  | 10.8 | ns |
|  |                       |                          | $V_{CC}=1.5\pm 0.1V$  | 2.5  | 4.2  | 7    | ns |
|  |                       |                          | $V_{CC}=1.8\pm 0.15V$ | 2.2  | 3.4  | 5.9  | ns |
|  |                       |                          | $V_{CC}=2.5\pm 0.2V$  | 1.7  | 2.5  | 4    | ns |
|  |                       | $C_L=10pF, R_L=1M\Omega$ | $V_{CC}=3.3\pm 0.3V$  | 1.4  | 2.1  | 3.2  | ns |
|  |                       |                          | $V_{CC}=0.8V$         |      | 17.7 |      | ns |
|  |                       |                          | $V_{CC}=1.2\pm 0.1V$  | 3.9  | 6.9  | 12.2 | ns |
|  |                       |                          | $V_{CC}=1.5\pm 0.1V$  | 3    | 5    | 8.1  | ns |
|  |                       |                          | $V_{CC}=1.8\pm 0.15V$ | 2.6  | 4    | 6.9  | ns |
|  |                       | $C_L=15pF, R_L=1M\Omega$ | $V_{CC}=2.5\pm 0.2V$  | 2.1  | 3    | 4.6  | ns |
|  |                       |                          | $V_{CC}=3.3\pm 0.3V$  | 1.8  | 2.5  | 3.8  | ns |
|  |                       |                          | $V_{CC}=0.8V$         |      | 19.5 |      | ns |
|  |                       |                          | $V_{CC}=1.2\pm 0.1V$  | 4.7  | 7.8  | 13   | ns |
|  |                       |                          | $V_{CC}=1.5\pm 0.1V$  | 3.7  | 5.6  | 8.6  | ns |
|  |                       | $C_L=30pF, R_L=1M\Omega$ | $V_{CC}=1.8\pm 0.15V$ | 3.2  | 4.6  | 7.4  | ns |
|  |                       |                          | $V_{CC}=2.5\pm 0.2V$  | 2.5  | 3.5  | 5.1  | ns |
|  |                       |                          | $V_{CC}=3.3\pm 0.3V$  | 2.2  | 2.9  | 4.2  | ns |
|  |                       |                          | $V_{CC}=0.8V$         |      | 25.4 |      | ns |
|  |                       |                          | $V_{CC}=1.2\pm 0.1V$  | 6.8  | 10.4 | 16   | ns |
|  | $V_{CC}=1.5\pm 0.1V$  | 5.3                      | 7.6                   | 10.8 | ns   |      |    |
|  | $V_{CC}=1.8\pm 0.15V$ | 4.6                      | 6.3                   | 9.2  | ns   |      |    |
|  | $V_{CC}=2.5\pm 0.2V$  | 3.6                      | 4.8                   | 6.5  | ns   |      |    |
|  | $V_{CC}=3.3\pm 0.3V$  | 3.2                      | 4                     | 5.4  | ns   |      |    |

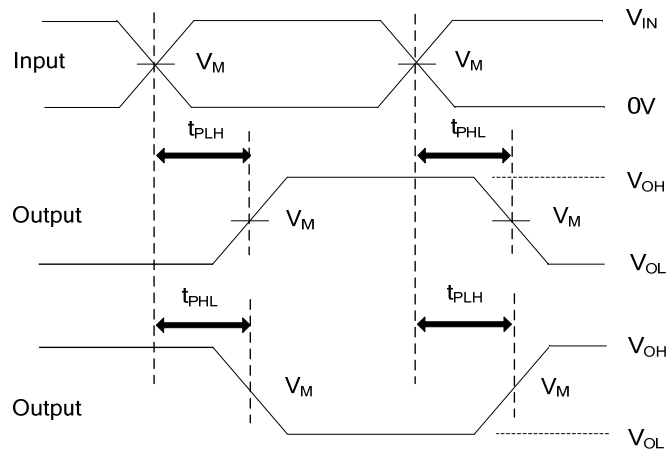
## ■ OPERATING CHARACTERISTICS ( $f=10MHz, T_A=25^\circ C$ , unless otherwise specified)

| PARAMETER                     | SYMBOL   | TEST CONDITIONS       | MIN | TYP | MAX | UNIT |
|-------------------------------|----------|-----------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | $C_{PD}$ | $V_{CC}=0.8V$         |     | 3.9 |     | pF   |
|                               |          | $V_{CC}=1.2\pm 0.1V$  |     | 3.9 |     | pF   |
|                               |          | $V_{CC}=1.5\pm 0.1V$  |     | 3.9 |     | pF   |
|                               |          | $V_{CC}=1.8\pm 0.15V$ |     | 3.9 |     | pF   |
|                               |          | $V_{CC}=2.5\pm 0.2V$  |     | 3.9 |     | pF   |
|                               |          | $V_{CC}=3.3\pm 0.3V$  |     | 4.1 |     | pF   |

## ■ TEST CIRCUIT AND WAVEFORMS



| $V_{CC}$         | $V_{IN}$ | $t_R / t_F$       | $V_M$      | $C_L$           | $R_L$       |
|------------------|----------|-------------------|------------|-----------------|-------------|
| 0.8V             | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.2V $\pm$ 0.1V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.5V $\pm$ 0.1V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.8V $\pm$ 0.15V | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 2.5V $\pm$ 0.2V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 3.3V $\pm$ 0.3V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |



Notes: 1.  $C_L$  includes probe and jig capacitance.

2. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10MHz,  $Z_O = 50\Omega$ .

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