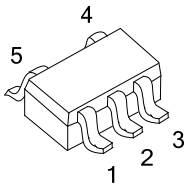
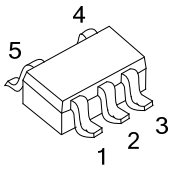
# U74AUP1G14

**CMOS IC**

## LOW-POWER SINGLE SCHMITT-TRIGGER INVERTER




SOT-23-5




SOT-353

### ■ DESCRIPTION

This **U74AUP1G14** functions as an independent gate with Schmitt-trigger inputs, which allows for slow input transition and better switching-noise immunity at the input.

This device ensures a very low static and dynamic power consumption across the entire $V_{CC}$ range from 0.8V to 3.6V.

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
* $I_{OFF}$ supports partial-power-down mode
* Low static power consumption; $I_{CC}$=0.5μA (Max.)
* Optimized for 3.3V Operation

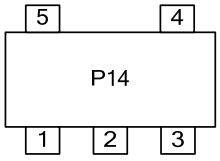
### ■ ORDERING INFORMATION

| Ordering Number | Package | Packing |
|---|---|---|
| U74AUP1G14G-AE5-R | SOT-23-5 | Tape Reel |
| U74AUP1G14G-AL5-R | SOT-353 | Tape Reel |

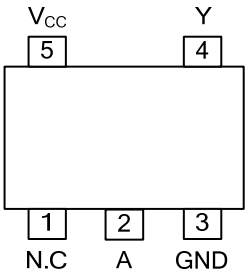
U74AUP1G14G-AE5-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) AE5: SOT-23-5, AL5: SOT-353
(3) G: Halogen Free and Lead Free

### ■ MARKING



## ■ PIN CONFIGURATION

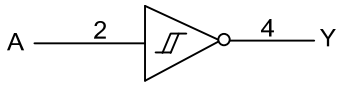



## ■ FUNCTION TABLE (each gate)

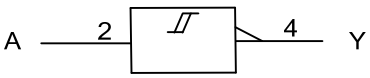
| INPUT (A) | OUTPUT (Y) |
|---|---|
| L | H |
| H | L |

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

## ■ LOGIC DIAGRAM (positive logic)




Logic symbol




IEC logic symbol

## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | SYMBOL | TEST 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 ~ $V_{CC}$ | ±20 | mA |
| Input Clamp Current | $I_{IK}$ | $V_{IN}$<0 | -50 | mA |
| Output Clamp Current | $I_{OK}$ | $V_{OUT}$ >$V_{CC}$ 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 |
| Operating Temperature | $T_A$ | | -40 | | 85 | °C |
| Input Transition Rise or Fall Rate | Δt/Δv | $V_{CC}$=0.8V ~ 3.6V | | | 200 | ns/V |

## ■ ELECTRICAL CHARACTERISTICS ($T_A$ =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Positive-Going Input Threshold Voltage | $V_{T+}$ | $V_{CC}$ =0.8V | | 0.3 | | 0.6 | V |
| | | $V_{CC}$ =1.1V | | 0.53 | | 0.9 | V |
| | | $V_{CC}$ =1.4V | | 0.74 | | 1.11 | V |
| | | $V_{CC}$ =1.65V | | 0.91 | | 1.29 | V |
| | | $V_{CC}$ =2.3V | | 1.37 | | 1.77 | V |
| | | $V_{CC}$ =3V | | 1.88 | | 2.29 | V |
| Negative-Going Input Threshold Voltage | $V_{T-}$ | $V_{CC}$ =0.8V | | 0.1 | | 0.6 | V |
| | | $V_{CC}$ =1.1V | | 0.26 | | 0.65 | V |
| | | $V_{CC}$ =1.4V | | 0.39 | | 0.75 | V |
| | | $V_{CC}$ =1.65V | | 0.47 | | 0.84 | V |
| | | $V_{CC}$ =2.3V | | 0.69 | | 1.04 | V |
| | | $V_{CC}$ =3V | | 0.88 | | 1.24 | V |
| Hysteresis Voltage ($V_{T+}$-$V_{T-}$) | △$V_T$ | $V_{CC}$ =0.8V | | 0.07 | | 0.5 | V |
| | | $V_{CC}$ =1.1V | | 0.08 | | 0.46 | V |
| | | $V_{CC}$ =1.4V | | 0.18 | | 0.56 | V |
| | | $V_{CC}$ =1.65V | | 0.27 | | 0.66 | V |
| | | $V_{CC}$ =2.3V | | 0.53 | | 0.92 | V |
| | | $V_{CC}$ =3V | | 0.79 | | 1.31 | V |
| High-Level Output Voltage | $V_{OH}$ | $V_{CC}$ =0.8V ~ 3.6V, $I_{OH}$=-20μA | | $V_{CC}$-0.1 | | | V |
| | | $V_{CC}$ =1.1V, $I_{OH}$=-1.1mA | | 0.75×$V_{CC}$ | | | 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 |

## ■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Low-Level Output Voltage | $V_{OL}$ | $V_{CC}$=0.8V ~ 3.6V, $I_{OH}$=20μA | | | | 0.1 | V |
| | | $V_{CC}$=1.1V, $I_{OH}$=1.1mA | | | | 0.3×$V_{CC}$ | V |
| | | $V_{CC}$=1.4V, $I_{OH}$=1.7mA | | | | 0.31 | V |
| | | $V_{CC}$=1.65V, $I_{OH}$=1.9mA | | | | 0.31 | V |
| | | $V_{CC}$=2.3V | $I_{OH}$=2.3mA | | | 0.31 | V |
| | | | $I_{OH}$=3.1mA | | | 0.44 | V |
| | | $V_{CC}$=3V | $I_{OH}$=2.7mA | | | 0.31 | V |
| | | | $I_{OH}$=4mA | | | 0.44 | V |
| Input Leakage Current | $I_{I(LEAK)}$ | $V_{CC}$=0V ~ 3.6V, $V_{IN}$=$V_{CC}$ or GND | | | | ±0.1 | μA |
| Power OFF Leakage Current | $I_{OFF}$ | $V_{CC}$=0V, $V_{IN}$ or $V_{CC}$=3.6V | | | | ±0.2 | μA |
| Additional Power OFF Leakage Current | $\Delta I_{off}$ | $V_{CC}$=0V~0.2V, $V_{IN}$ or $V_{OUT}$=0V~3.6V | | | | ±0.2 | μA |
| Quiescent Supply Current | $I_{CC}$ | $V_{CC}$=0.8V ~3.6V, $I_{OUT}$=0 $V_{IN}$=$V_{CC}$ or GND | | | | 0.5 | μA |
| Additional Quiescent Supply Current | $\Delta I_{CC}$ | $V_{CC}$=3.3V, One input at $V_{CC}$-0.6V, other inputs at $V_{CC}$ or GND | | | | 40 | μA |
| 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 | | | 2.5 | | pF |

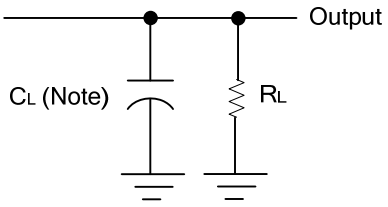
## ■ SWITCHING CHARACTERISTICS ($T_A$ =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Propagation delay from input (A) to output(Y) | $t_{PLH}$/$t_{PHL}$ | $C_L$=5pF, $R_L$=1MΩ | $V_{CC}$=0.8V | | 20.3 | | ns |
| | | | $V_{CC}$=1.2V±0.1V | 3.0 | 6.9 | | ns |
| | | | $V_{CC}$=1.5V±0.1V | 2.6 | 5.2 | | ns |
| | | | $V_{CC}$=1.8V±0.15V | 2.2 | 4.4 | | ns |
| | | | $V_{CC}$=2.5V±0.2V | 2.0 | 3.5 | | ns |
| | | | $V_{CC}$=3.3V±0.3V | 1.9 | 3 | | ns |
| | | $C_L$=10pF, $R_L$=1MΩ | $V_{CC}$=0.8V | | 23.9 | | ns |
| | | | $V_{CC}$=1.2V±0.1V | 3.5 | 7.9 | | ns |
| | | | $V_{CC}$=1.5V±0.1V | 3.0 | 6 | | ns |
| | | | $V_{CC}$=1.8V±0.15V | 2.7 | 5 | | ns |
| | | | $V_{CC}$=2.5V±0.2V | 2.4 | 4 | | ns |
| | | | $V_{CC}$=3.3V±0.3V | 2.4 | 3.5 | | ns |
| | | $C_L$=15pF, $R_L$=1MΩ | $V_{CC}$=0.8V | | 27.3 | | ns |
| | | | $V_{CC}$=1.2V±0.1V | 3.9 | 8.7 | | ns |
| | | | $V_{CC}$=1.5V±0.1V | 3.3 | 6.7 | | ns |
| | | | $V_{CC}$=1.8V±0.15V | 3.0 | 5.6 | | ns |
| | | | $V_{CC}$=2.5V±0.2V | 2.8 | 4.5 | | ns |
| | | | $V_{CC}$=3.3V±0.3V | 2.7 | 3.9 | | ns |
| | | $C_L$=30pF, $R_L$=1MΩ | $V_{CC}$=0.8V | | 25.7 | | ns |
| | | | $V_{CC}$=1.2V±0.1V | 5.1 | 11.2 | | ns |
| | | | $V_{CC}$=1.5V±0.1V | 4.3 | 8.5 | | ns |
| | | | $V_{CC}$=1.8V±0.15V | 3.9 | 7.2 | | ns |
| | | | $V_{CC}$=2.5V±0.2V | 3.6 | 5.7 | | ns |
| | | | $V_{CC}$=3.3V±0.3V | 3.5 | 5 | | ns |

■ OPERATING CHARACTERISTICS (f=10MHz, $T_A$ =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDTIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Power Dissipation Capacitance | $C_{PD}$ | $V_{CC}$=0.8V | | 4 | | pF |
| | | $V_{CC}$=1.2V±0.1V | | 4 | | pF |
| | | $V_{CC}$=1.5V±0.1V | | 4.1 | | pF |
| | | $V_{CC}$=1.8V±0.15V | | 4.1 | | pF |
| | | $V_{CC}$=2.5V±0.2V | | 4.3 | | pF |
| | | $V_{CC}$=3.3V±0.3V | | 4.4 | | pF |

## ■ TEST CIRCUIT AND WAVEFORMS




Note: $C_L$ includes probe and jig capacitance.

| $V_{CC}$ | $V_{IN}$ | $t_R$ / $t_F$ | $V_M$ | $C_L$ | $R_L$ |
|---|---|---|---|---|---|
| 0.8V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |
| 1.2V±0.1V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |
| 1.5V±0.1V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |
| 1.8V±0.15V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |
| 2.5V±0.2V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |
| 3.3V±0.3V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 5,10,15,30pF | 1MΩ |