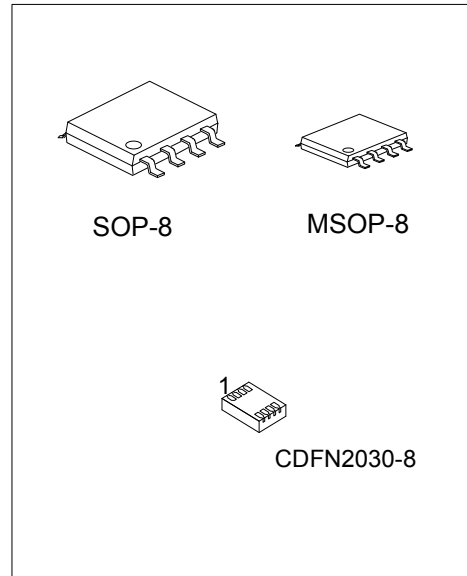




U74AHC1G74

CMOS IC

SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH CLEAR AND PRESET



DESCRIPTION

The **UTC U74AHC1G74** is a single positive-edge-triggered D-type flip-flop.

A low level at the preset ($\overline{\text{PRE}}$) or clear ($\overline{\text{CLR}}$) inputs sets or resets the outputs, regardless of the levels of the other inputs. When $\overline{\text{PRE}}$ and $\overline{\text{CLR}}$ are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

FEATURES

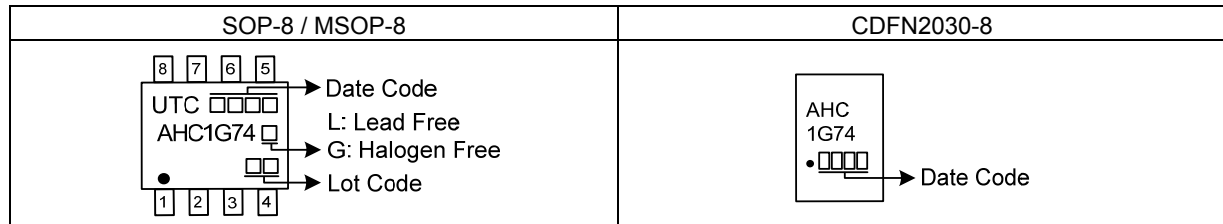
- * Operation voltage range: 2 ~ 5.5V
- * Max t_{PD} of 7.3 ns at 5 V
- * Low static power consumption; $I_{CC}=2\mu\text{A}$ (Max.)
- * $\pm 8\text{mA}$ output drive at 5 V

ORDERING INFORMATION

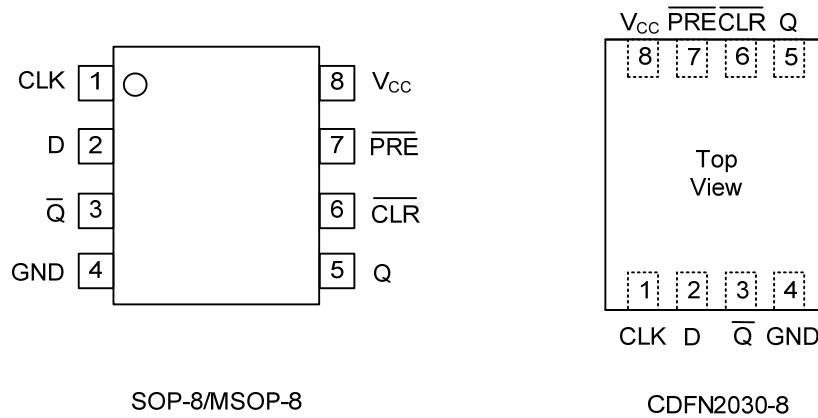
| Ordering Number | | Package | Packing |
|-------------------------|-------------------------|------------|-----------|
| Lead Free | Halogen Free | | |
| U74AHC1G74L-S08-R | U74AHC1G74G-S08-R | SOP-8 | Tape Reel |
| U74AHC1G74L-SM2-R | U74AHC1G74G-SM2-R | MSOP-8 | Tape Reel |
| U74AHC1G74L-CK08-2030-R | U74AHC1G74G-CK08-2030-R | CDFN2030-8 | Tape Reel |

| | |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <p>U74AHC1G74G-S08-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|

■ MARKING



■ PIN CONFIGURATION



■ FUNCTION TABLE (each gate)

| INPUTS | | | | OUTPUTS | |
|--------|-----|-----|---|----------|----------|
| PRE | CLR | CLK | D | Q | Q |
| L | H | X | X | H | L |
| H | L | X | X | L | H |
| L | L | X | X | H (Note) | H (Note) |
| H | H | ↑ | H | H | L |
| H | H | ↑ | L | L | H |
| H | H | L | X | Q0 | Q0 |

Note: This configuration is nonstable; that is, it does not persist when PRE or CLR returns to its inactive (high) level.

■ ABSOLUTE MAXIMUM RATING ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | RATINGS | UNIT |
|------------------------------------|-----------|------------------------------------------------------------------|-----------------------|--------------------|
| Supply Voltage | V_{CC} | | -0.5 ~ +7.0 | V |
| Input Voltage | V_{IN} | | -0.5 ~ +7.0 | V |
| Output Voltage | V_{OUT} | | -0.5 ~ $V_{CC} + 0.5$ | V |
| Continuous V_{CC} or GND Current | I_{CC} | | ± 75 | mA |
| Continuous Output Current | I_{OUT} | $-0.5\text{V} < V_{OUT} < V_{CC} + 0.5\text{V}$ | ± 25 | mA |
| Input Clamp Current | I_{IK} | $V_{IN} < -0.5$ | -20 | mA |
| Output Clamp Current | I_{OK} | $V_{OUT} < -0.5$ or $V_{OUT} > V_{CC} + 0.5\text{V}$ (Note 2) | ± 20 | mA |
| Storage Temperature Range | T_{STG} | | -65 ~ + 150 | $^{\circ}\text{C}$ |

Notes: 1. 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.

2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ RECOMMENDED OPERATING CONDITIONS ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------------------------|---------------------|------------------------------|-----|-----|----------|--------------------|
| Supply Voltage | V_{CC} | Operating | 2.0 | 5.0 | 5.5 | V |
| Input Voltage | V_{IN} | | 0 | | 5.5 | V |
| Output Voltage | V_{OUT} | High or low state | 0 | | V_{CC} | V |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | $V_{CC}=3.3 \pm 0.3\text{V}$ | | | 100 | ns/V |
| | | $V_{CC}=5.0 \pm 0.5\text{V}$ | | | 20 | ns/V |
| Operating Temperature | T_A | | -40 | | +125 | $^{\circ}\text{C}$ |

■ 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} | $V_{CC}=2.0\text{V}$ | 1.5 | | | V |
| | | $V_{CC}=3.0\text{V}$ | 2.1 | | | V |
| | | $V_{CC}=5.5\text{V}$ | 3.85 | | | V |
| Low-level Input Voltage | V_{IL} | $V_{CC}=2.0\text{V}$ | | | 0.5 | V |
| | | $V_{CC}=3.0\text{V}$ | | | 0.9 | V |
| | | $V_{CC}=5.5\text{V}$ | | | 1.65 | V |
| High-level output voltage (all outputs) | V_{OH} | $V_{CC}=2.0\text{V}$ | 1.9 | 2.0 | | V |
| | | $V_{CC}=3.0\text{V}$ | 2.9 | 3.0 | | V |
| | | $V_{CC}=5.5\text{V}$ | 4.4 | 4.5 | | V |
| High-Level Output Voltage | V_{OH} | $V_{CC}=3.0\text{V}$, $V_{IN}=V_{IH}$ or V_{IL} , $I_{OH}=-4.0\text{mA}$ | 2.58 | | | V |
| | | $V_{CC}=4.5\text{V}$, $V_{IN}=V_{IH}$ or V_{IL} , $I_{OH}=-8.0\text{mA}$ | 3.94 | | | V |
| Low-level output voltage (all outputs) | V_{OL} | $V_{CC}=2.0\text{V}$ | | | 0.1 | V |
| | | $V_{CC}=3.0\text{V}$ | | | 0.1 | V |
| | | $V_{CC}=5.5\text{V}$ | | | 0.1 | V |
| Low-Level Output Voltage | V_{OL} | $V_{CC}=3.0\text{V}$, $V_{IN}=V_{IH}$ or V_{IL} , $I_{OL}=4.0\text{mA}$ | | | 0.36 | V |
| | | $V_{CC}=4.5\text{V}$, $V_{IN}=V_{IH}$ or V_{IL} , $I_{OL}=8.0\text{mA}$ | | | 0.36 | V |
| Input Leakage Current | $I_{I(LEAK)}$ | $V_{CC}=5.5\text{V}$, $V_{IN}=V_{CC}$ or GND | | | ± 0.1 | μA |
| Quiescent Supply Current | I_{CC} | $V_{CC}=5.5\text{V}$, $V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$ | | | 2 | μA |
| Input Capacitance | C_{IN} | $V_{IN}=V_{CC}$ or GND | | 2 | 10 | pF |

■ SWITCHING CHARACTERISTICS (GND=0V, $t_r = t_f \leq 3.0\text{ns}$, $T_A=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------|----------------------------------------------|-----|------|------|-----|
| Minimum Frequency Response | f_{Max} | $C_L=15\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | 80 | 125 | | MHz |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | 130 | 170 | | MHz |
| | | $C_L=50\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | 50 | 75 | | MHz |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | 90 | 115 | | MHz |
| Propagation delay from input ($\overline{\text{PRE}}$ or $\overline{\text{CLR}}$) to output (Q or $\overline{\text{Q}}$) | $t_{\text{PLH}} / t_{\text{PHL}}$ | $C_L=15\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | | 7.6 | 12.3 | ns |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | | 4.8 | 7.7 | ns |
| | | $C_L=50\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | | 10.1 | 15.8 | ns |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | | 6.3 | 9.7 | ns |
| Propagation delay from input (CLK) to output(Q or $\overline{\text{Q}}$) | $t_{\text{PLH}} / t_{\text{PHL}}$ | $C_L=15\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | | 6.7 | 11.9 | ns |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | | 4.6 | 7.3 | ns |
| | | $C_L=50\text{pF}$ | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | | 9.2 | 15.4 | ns |
| | | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | | 6.1 | 9.3 | ns |

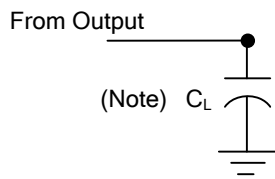
■ TIMING REQUIREMENTS ($T_A=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------|-----|-----|-----|------|
| Pulse duration | t_w | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | 6 | | | ns |
| | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | 5 | | | ns |
| Setup time before CLK \uparrow from Data to $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ inactive | t_{su} | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | 6 | | | ns |
| | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | 5 | | | ns |
| Hold time, data after CLK \uparrow | t_h | $V_{\text{CC}}=3.0\text{V} \sim 3.6\text{V}$ | 0.5 | | | ns |
| | | $V_{\text{CC}}=4.5\text{V} \sim 5.5\text{V}$ | 0.5 | | | ns |

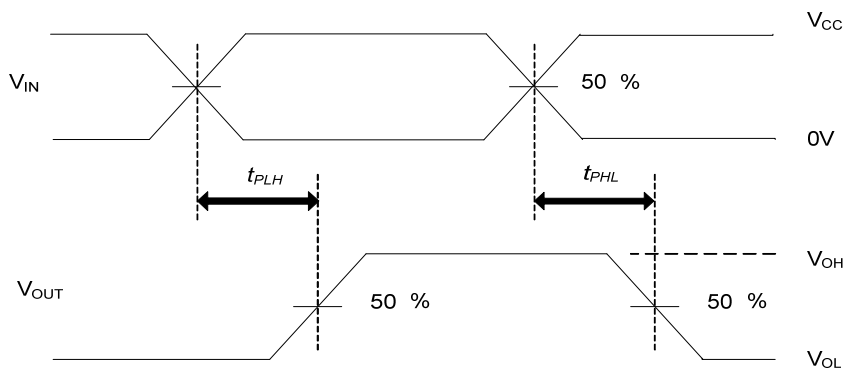
■ OPERATING CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|-------------------------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | C_{PD} | $C_L=50\text{pF}$, $f=1\text{MHz}$ | | 32 | | pF |

■ TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT



PROPAGATION DELAY TIMES

- Notes: 1. C_L includes probe and jig capacitance.
 2. All input pulses are supplied by generators having the following characteristics: PRR $\leq 1\text{MHz}$, $Z_o = 50\Omega$, $t_r \leq 3\text{ns}$, $t_f \leq 3\text{ns}$.

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.