

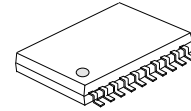
**U74AHC374****CMOS IC****OCTAL EDGE-TRIGGERED  
D-TYPE FLIP-FLOPS WITH  
3-STATE OUTPUTS****DESCRIPTION**

The **U74AHC374** is a octal edge-triggered D-type flip-flops with 3-state outputs and it has 8 channels.

When the  $\overline{OE}$  input is low, on the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels of the data (D) inputs.

When the  $\overline{OE}$  input is high, the outputs are in the high-impedance.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.



TSSOP-20U

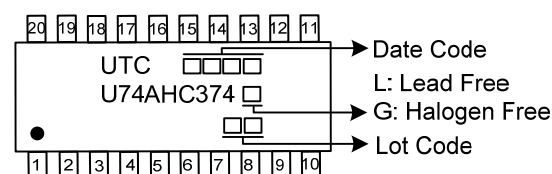
**FEATURES**

- \* Operate from 2V to 5.5V
- \* Max  $t_{PD}$  of 12.7ns at  $V_{CC}=3.3V$ ,  $C_L=15pF$
- \* Max  $I_{CC}$  of 4 $\mu A$
- \* Typ  $V_{OL} < 0.36V$  at  $V_{CC}=4.5V$ ,  $I_O=8mA$ ,  $T_A=25^\circ C$
- \* Typ  $V_{OH} > 3.94V$  at  $V_{CC}=4.5V$ ,  $I_O=-8mA$ ,  $T_A=25^\circ C$

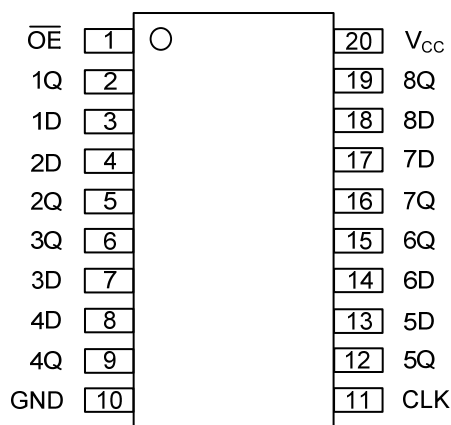
**ORDERING INFORMATION**

| Ordering Number  |                  | Package   | Packing   |
|------------------|------------------|-----------|-----------|
| Lead Free        | Halogen Free     |           |           |
| U74AHC374L-ULA-R | U74AHC374G-ULA-R | TSSOP-20U | Tape Reel |

|                                                                                         |                                                                                                    |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <p>U74AHC374G-ULA-R</p> <p>(1)Packing Type<br/>(2)Package Type<br/>(3)Green Package</p> | <p>(1) R: Tape Reel<br/>(2) ULA: TSSOP-20U<br/>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|

**MARKING**

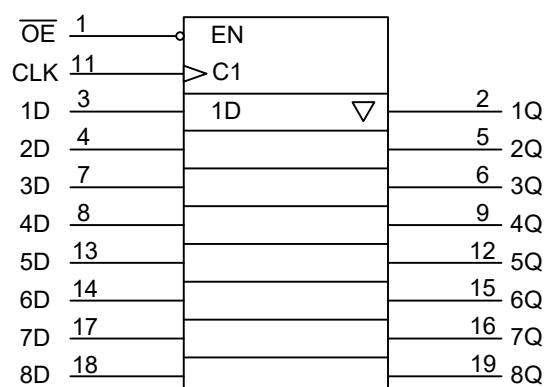
## PIN CONFIGURATION



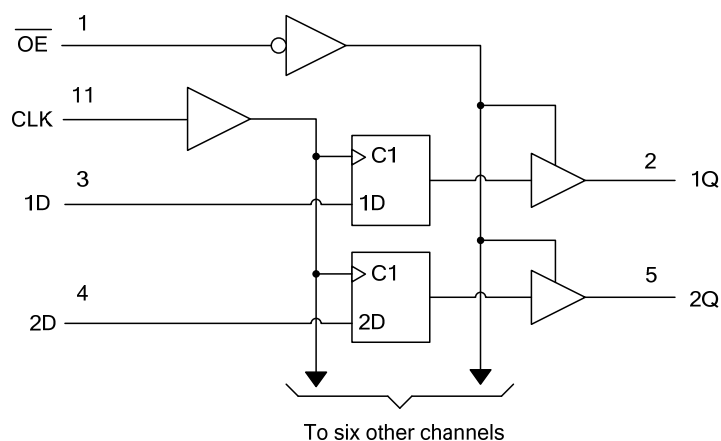
## FUNCTION TABLE

| INPUTS( $\overline{OE}$ ) | INPUTS(CLK) | INPUTS(D) | OUTPUT(Q) |
|---------------------------|-------------|-----------|-----------|
| L                         | $\uparrow$  | H         | H         |
| L                         | $\uparrow$  | L         | L         |
| L                         | H or L      | X         | Q0        |
| H                         | X           | X         | Z         |

## LOGIC SYMBOL



## LOGIC DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING (Unless otherwise specified)

| PARAMETER               | SYMBOL    | RATINGS               | UNIT |
|-------------------------|-----------|-----------------------|------|
| Supply Voltage          | $V_{CC}$  | -0.5 ~ 7              | V    |
| Input Voltage           | $V_{IN}$  | -0.5 ~ 7              | V    |
| Output Voltage          | $V_{OUT}$ | -0.5 ~ $V_{CC} + 0.5$ | V    |
| $V_{CC}$ or GND Current | $I_{CC}$  | ±75                   | mA   |
| Output Current          | $I_{OUT}$ | ±25                   | mA   |
| Input Clamp Current     | $I_{IK}$  | -20                   | mA   |
| Output Clamp Current    | $I_{OK}$  | ±20                   | 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 (Unless otherwise specified)

| PARAMETER                      | SYMBOL              | TEST CONDITIONS            | MIN  | TYP | MAX      | UNIT |
|--------------------------------|---------------------|----------------------------|------|-----|----------|------|
| Supply Voltage                 | $V_{CC}$            |                            | 2    |     | 5.5      | V    |
| High-level Input Voltage       | $V_{IH}$            | $V_{CC}=2V$                | 1.5  |     |          | V    |
|                                |                     | $V_{CC}=3V$                | 2.1  |     |          |      |
|                                |                     | $V_{CC}=5.5V$              | 3.85 |     |          |      |
| Low-level Input Voltage        | $V_{IL}$            | $V_{CC}=2V$                |      |     | 0.5      | V    |
|                                |                     | $V_{CC}=3V$                |      |     | 0.9      |      |
|                                |                     | $V_{CC}=5.5V$              |      |     | 1.65     |      |
| Input Voltage                  | $V_{IN}$            |                            | 0    |     | $V_{CC}$ | V    |
| Output Voltage                 | $V_{OUT}$           | High or low state          | 0    |     | $V_{CC}$ | V    |
| High-level Output Current      | $I_{OH}$            | $V_{CC} = 2 V$             |      |     | -50      | μA   |
|                                |                     | $V_{CC} = 3.3 V \pm 0.3 V$ |      |     | -4       | mA   |
|                                |                     | $V_{CC} = 5 V \pm 0.5 V$   |      |     | -8       |      |
| Low-level Output Current       | $I_{OL}$            | $V_{CC} = 2 V$             |      |     | 50       | μA   |
|                                |                     | $V_{CC} = 3.3 V \pm 0.3 V$ |      |     | 4        | mA   |
|                                |                     | $V_{CC} = 5 V \pm 0.5 V$   |      |     | 8        |      |
| Input Rise or Fall Times       | $\Delta t/\Delta v$ | $V_{CC} = 3.3 V \pm 0.3 V$ |      |     | 100      | ns   |
|                                |                     | $V_{CC} = 5 V \pm 0.5 V$   |      |     | 20       |      |
| Operating Free-air Temperature | $T_A$               |                            | -40  |     | +125     | °C   |

### ■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

| PARAMETER                 | SYMBOL        | TEST CONDITIONS                                          | MIN  | TYP | MAX   | UNIT |
|---------------------------|---------------|----------------------------------------------------------|------|-----|-------|------|
| Output Voltage High-Level | $V_{OH}$      | $V_{CC}=2V, I_{OH}=-50\mu A$                             | 1.9  | 2   |       | V    |
|                           |               | $V_{CC}=3V, I_{OH}=-50\mu A$                             | 2.9  | 3   |       |      |
|                           |               | $V_{CC}=4.5V, I_{OH}=-50\mu A$                           | 4.4  | 4.5 |       |      |
|                           |               | $V_{CC}=3V, I_{OH}=-4mA$                                 | 2.58 |     |       |      |
|                           |               | $V_{CC}=4.5V, I_{OH}=-8mA$                               | 3.94 |     |       |      |
| Output Voltage Low-Level  | $V_{OL}$      | $V_{CC}=2V, I_{OL}=50\mu A$                              |      |     | 0.1   | V    |
|                           |               | $V_{CC}=3V, I_{OL}=50\mu A$                              |      |     | 0.1   |      |
|                           |               | $V_{CC}=4.5V, I_{OL}=50\mu A$                            |      |     | 0.1   |      |
|                           |               | $V_{CC}=3V, I_{OL}=4mA$                                  |      |     | 0.36  |      |
|                           |               | $V_{CC}=4.5V, I_{OL}=8mA$                                |      |     | 0.36  |      |
| Input Leakage Current     | $I_{I(LEAK)}$ | $V_{CC}= 0 \text{ to } 5.5V, V_{IN}=5.5V \text{ or GND}$ |      |     | ±0.1  | μA   |
| 3-state Leakage Current   | $I_{OZ}$      | $V_{CC}=5.5V, V_{OUT}= V_{CC} \text{ or GND}$            |      |     | ±0.25 | μA   |
| Quiescent Supply Current  | $I_{CC}$      | $V_{CC}=5.5V, V_{IN}=V_{CC} \text{ or GND}, I_{OUT}=0$   |      |     | 4     | μA   |
| Input Capacitance         | $C_I$         | $V_{CC}=5V, V_{IN}=V_{CC} \text{ or GND}$                |      | 4   | 10    | pF   |
| Output Capacitance        | $C_O$         | $V_{CC}=5V, V_{OUT}=V_{CC} \text{ or GND}$               |      | 6   |       | pF   |

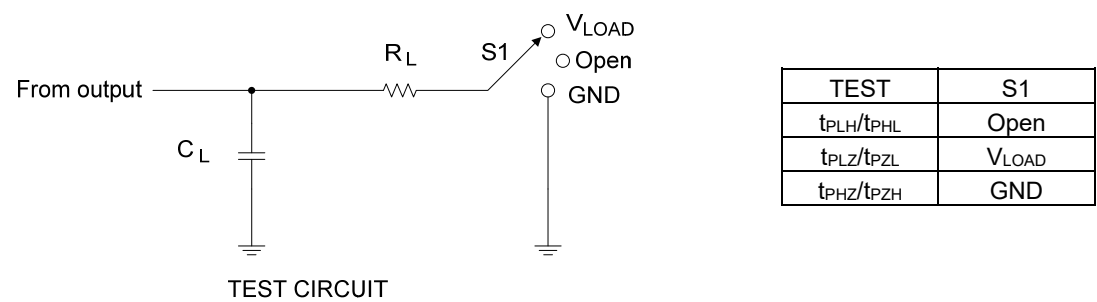
■ **SWITCHING CHARACTERISTICS** (See TEST CIRCUIT AND WAVEFORMS)

| PARAMETER                 | SYMBOL            | TEST CONDITIONS          |              | MIN | TYP  | MAX  | UNIT |
|---------------------------|-------------------|--------------------------|--------------|-----|------|------|------|
| From CLK to Q             | $t_{PLH}/t_{PHL}$ | $V_{CC} = 3.3V \pm 0.3V$ | $C_L = 15pF$ |     | 8.1  | 12.7 | ns   |
|                           |                   |                          | $C_L = 50pF$ |     | 10.6 | 16.2 |      |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   | $C_L = 15pF$ |     | 5.4  | 8.1  |      |
|                           |                   |                          | $C_L = 50pF$ |     | 6.9  | 10.1 |      |
| From $\overline{OE}$ to Q | $t_{PZL}/t_{PZH}$ | $V_{CC} = 3.3V \pm 0.3V$ | $C_L = 15pF$ |     | 7.1  | 11   | ns   |
|                           |                   |                          | $C_L = 50pF$ |     | 9.6  | 14.5 |      |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   | $C_L = 15pF$ |     | 5.1  | 7.6  |      |
|                           |                   |                          | $C_L = 50pF$ |     | 6.6  | 9.6  |      |
| From $\overline{OE}$ to Q | $t_{PLZ}/t_{PHZ}$ | $V_{CC} = 3.3V \pm 0.3V$ | $C_L = 15pF$ |     | 7.5  | 10.5 | ns   |
|                           |                   |                          | $C_L = 50pF$ |     | 10.2 | 14   |      |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   | $C_L = 15pF$ |     | 4.6  | 6.8  |      |
|                           |                   |                          | $C_L = 50pF$ |     | 6.1  | 8.8  |      |
| Maximum Clock Frequency   | $f_{MAX}$         | $V_{CC} = 3.3V \pm 0.3V$ | $C_L = 15pF$ | 80  | 130  |      | MHz  |
|                           |                   |                          | $C_L = 50pF$ | 55  | 85   |      |      |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   | $C_L = 15pF$ | 130 | 185  |      |      |
|                           |                   |                          | $C_L = 50pF$ | 85  | 120  |      |      |
| Pulse Width               | $t_W$             | $V_{CC} = 3.3V \pm 0.3V$ |              | 5   |      |      | ns   |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   |              | 5   |      |      |      |
| Setup Time                | $t_{SU}$          | $V_{CC} = 3.3V \pm 0.3V$ |              | 4.5 |      |      | ns   |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   |              | 3   |      |      |      |
| Hold Time                 | $t_H$             | $V_{CC} = 3.3V \pm 0.3V$ |              | 2   |      |      | ns   |
|                           |                   | $V_{CC} = 5V \pm 0.5V$   |              | 2   |      |      |      |

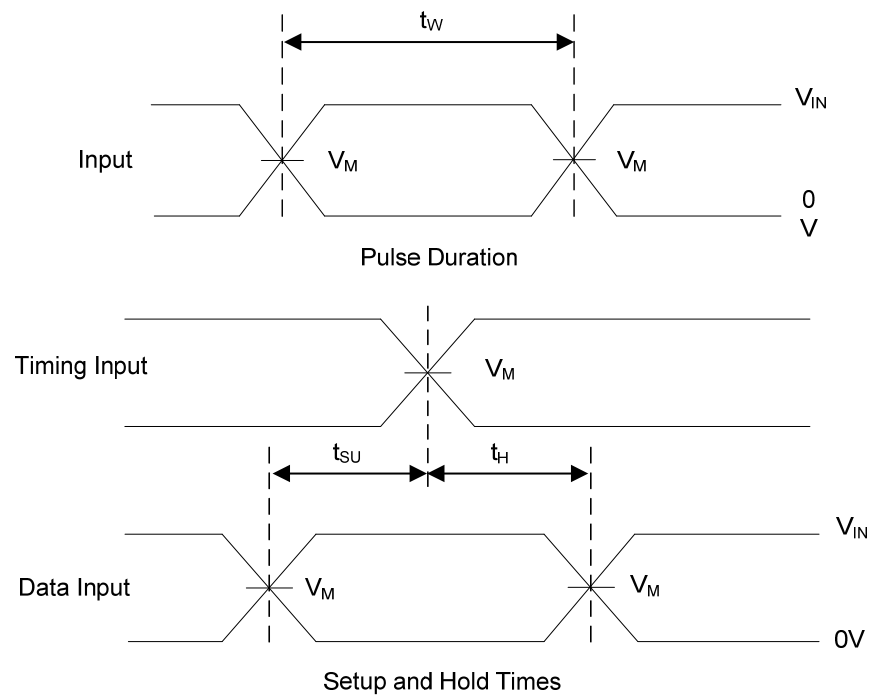
■ **OPERATING CHARACTERISTICS** (Unless otherwise specified)

| PARAMETER                     | SYMBOL   | TEST CONDITIONS                   | RATINGS | UNIT |
|-------------------------------|----------|-----------------------------------|---------|------|
| Power Dissipation Capacitance | $C_{PD}$ | No load, $V_{CC} = 5V$ , $f=1MHz$ | 32      | pF   |

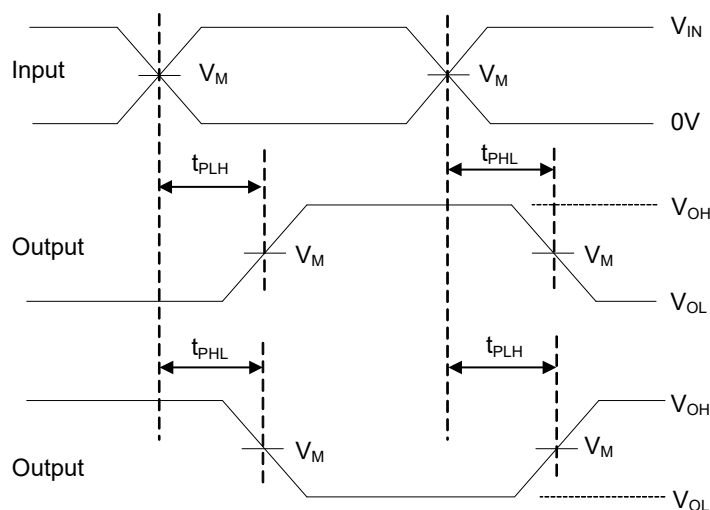
■ TEST CIRCUIT AND WAVEFORMS



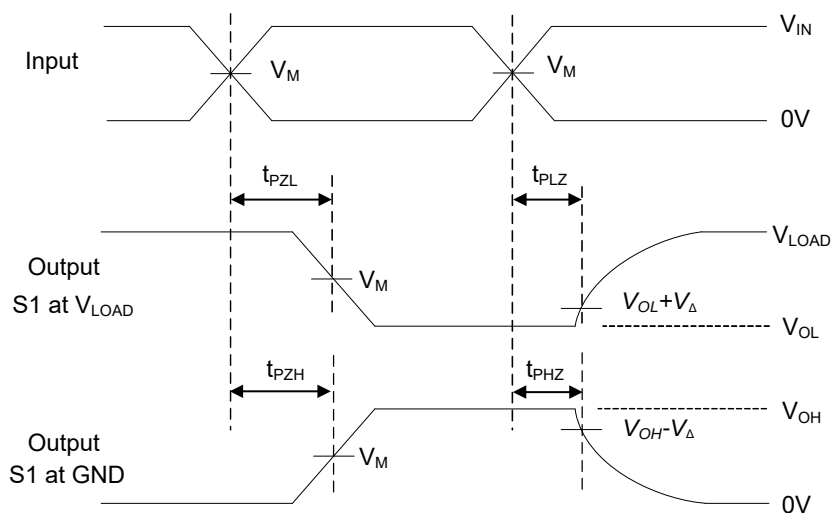
| $V_{CC}$        | Input    |            | $V_M$      | $V_{LOAD}$ | $C_L$ | $R_L$ | $V_{\Delta}$ |
|-----------------|----------|------------|------------|------------|-------|-------|--------------|
|                 | $V_{IN}$ | $t_R, t_F$ |            |            |       |       |              |
| $3.3V \pm 0.3V$ | $V_{CC}$ | $\leq 3ns$ | $V_{CC}/2$ | $V_{CC}$   | 15pF  | 1kΩ   | 0.3V         |
|                 |          |            |            |            | 50pF  |       |              |
| $5V \pm 0.5V$   | $V_{CC}$ | $\leq 3ns$ | $V_{CC}/2$ | $V_{CC}$   | 15pF  | 1kΩ   | 0.5V         |
|                 |          |            |            |            | 50pF  |       |              |



## ■ TEST CIRCUIT AND WAVEFORMS (Cont.)



**VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES**



**VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES**

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

2. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_r = 3\text{ns}$ ,  $t_f = 3\text{ns}$ .

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