

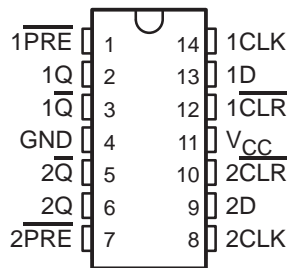
74AC11074

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

SCAS499A – DECEMBER 1986 – REVISED APRIL 1996

- Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- μ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline (D) and Thin Shrink Small-Outline (PW) Packages, and Standard Plastic 300-mil DIPs (N)

D, N, OR PW PACKAGE
(TOP VIEW)



description

This device contains two independent positive-edge-triggered D-type flip-flops. A low level at the preset (\overline{PRE}) or clear (\overline{CLR}) input sets or resets the outputs regardless of the levels of the other inputs. When \overline{PRE} and \overline{CLR} are inactive (high), data at the data (D) input that meets the setup-time requirements are transferred to the outputs on the low-to-high transition of the clock (CLK) 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 may be changed without affecting the levels at the outputs.

The 74AC11074 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE

| INPUTS | | | | OUTPUT | |
|------------------|------------------|-----|---|----------------|------------------|
| \overline{PRE} | \overline{CLR} | CLK | D | Q | \overline{Q} |
| L | H | X | X | H | L |
| H | L | X | X | L | H |
| L | L | X | X | H [†] | H [†] |
| H | H | ↑ | H | H | L |
| H | H | ↑ | L | L | H |
| H | H | L | X | Q_0 | \overline{Q}_0 |

[†] This configuration is nonstable; that is, it does not persist when \overline{PRE} or \overline{CLR} returns to its inactive (high) level.



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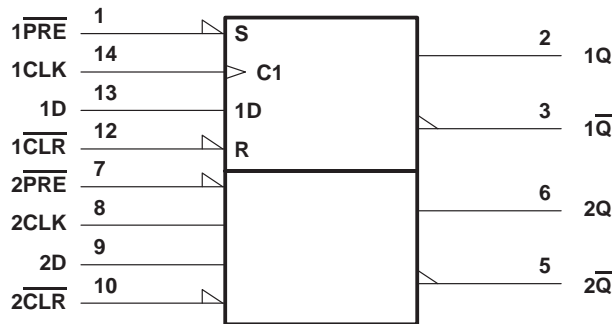
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logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

| | |
|--|--|
| Supply voltage range, V_{CC} | -0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | -0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range, V_O (see Note 1) | -0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) | ± 20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ± 50 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ± 50 mA |
| Continuous current through V_{CC} or GND | ± 100 mA |
| Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): | |
| D package | 1.25 W |
| N package | 1.1 W |
| PW package | 0.5 W |
| Storage temperature range, T_{stg} | -65°C to 150°C |

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

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recommended operating conditions

| | | MIN | NOM | MAX | UNIT |
|-----------------|------------------------------------|-------------------------|-----------------|-----|------|
| V _{CC} | Supply voltage | 3 | 5 | 5.5 | V |
| V _{IH} | High-level input voltage | V _{CC} = 3 V | 2.1 | | V |
| | | V _{CC} = 4.5 V | 3.15 | | |
| | | V _{CC} = 5.5 V | 3.85 | | |
| V _{IL} | Low-level input voltage | V _{CC} = 3 V | 0.9 | | V |
| | | V _{CC} = 4.5 V | 1.35 | | |
| | | V _{CC} = 5.5 V | 1.65 | | |
| V _I | Input voltage | 0 | V _{CC} | | V |
| V _O | Output voltage | 0 | V _{CC} | | V |
| I _{OH} | High-level output current | V _{CC} = 3 V | -4 | | mA |
| | | V _{CC} = 4.5 V | -24 | | |
| | | V _{CC} = 5.5 V | -24 | | |
| I _{OL} | Low-level output current | V _{CC} = 3 V | 12 | | mA |
| | | V _{CC} = 4.5 V | 24 | | |
| | | V _{CC} = 5.5 V | 24 | | |
| Δt/Δv | Input transition rise or fall rate | 0 | 10 | | ns/V |
| T _A | Operating free-air temperature | -40 | 85 | | °C |

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|-----------------|---|-----------------|-----------------------|-----|------|-----|-----|------|
| | | | MIN | TYP | MAX | | | |
| V _{OH} | I _{OH} = -50 μA | 3 V | 2.9 | | 2.9 | | V | |
| | | 4.5 V | 4.4 | | 4.4 | | | |
| | | 5.5 V | 5.4 | | 5.4 | | | |
| | I _{OH} = -4 mA | 3 V | 2.58 | | 2.48 | | | |
| | | 4.5 V | 3.94 | | 3.8 | | | |
| | | 5.5 V | 4.94 | | 4.8 | | | |
| | I _{OH} = -75 mA [†] | 5.5 V | | | 3.85 | | | |
| V _{OL} | I _{OL} = 50 μA | 3 V | | | 0.1 | | V | |
| | | 4.5 V | | | 0.1 | | | |
| | | 5.5 V | | | 0.1 | | | |
| | I _{OL} = 12 mA | 3 V | 0.36 | | 0.44 | | | |
| | | 4.5 V | 0.36 | | 0.44 | | | |
| | | 5.5 V | 0.36 | | 0.44 | | | |
| | I _{OL} = 75 mA [†] | 5.5 V | | | 1.65 | | | |
| I _I | V _I = V _{CC} or GND | 5.5 V | ±0.1 | | ±1 | | μA | |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | 4 | | 40 | | μA | |
| C _i | V _I = V _{CC} or GND | 5 V | 3.5 | | | | pF | |

[†] Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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timing requirements over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (see Figure 1)

| | | $T_A = 25^\circ\text{C}$ | | MIN | MAX | UNIT |
|--------------------|----------------------------------|---|-----|-----|-----|------|
| | | MIN | MAX | | | |
| f_{clock} | Clock frequency | 0 | 100 | 0 | 100 | MHz |
| t_w | Pulse duration | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low | 4 | 4 | | ns |
| | | CLK low or high | 5 | 5 | | |
| t_{su} | Setup time before CLK \uparrow | Data high or low | 5 | 5 | | ns |
| | | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ inactive | 1 | 1 | | |
| t_h | Hold time after CLK \uparrow | 0 | | 0 | | ns |

timing requirements over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (see Figure 1)

| | | $T_A = 25^\circ\text{C}$ | | MIN | MAX | UNIT |
|--------------------|----------------------------------|---|-----|-----|-----|------|
| | | MIN | MAX | | | |
| f_{clock} | Clock frequency | 0 | 125 | 0 | 125 | MHz |
| t_w | Pulse duration | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low | 4 | 4 | | ns |
| | | CLK low or CLK high | 4 | 4 | | |
| t_{su} | Setup time before CLK \uparrow | Data high or low | 3.5 | 3.5 | | ns |
| | | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ inactive | 1 | 1 | | |
| t_h | Hold time after CLK \uparrow | 0 | | 0 | | ns |

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25^\circ\text{C}$ | | | MIN | MAX | UNIT |
|------------------|--|----------------------------|--------------------------|-----|------|-----|------|------|
| | | | MIN | TYP | MAX | | | |
| f_{max} | | | 100 | 125 | | 100 | | MHz |
| t_{PLH} | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ | Q or $\overline{\text{Q}}$ | 1.5 | 5.8 | 9.3 | 1.5 | 10 | ns |
| t_{PHL} | | | 1.5 | 6.5 | 11.4 | 1.5 | 12.2 | |
| t_{PLH} | CLK | Q or $\overline{\text{Q}}$ | 1.5 | 7.7 | 10.5 | 1.5 | 11.3 | ns |
| t_{PHL} | | | 1.5 | 7.3 | 9.7 | 1.5 | 10.6 | |

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25^\circ\text{C}$ | | | MIN | MAX | UNIT |
|------------------|--|----------------------------|--------------------------|-----|-----|-----|-----|------|
| | | | MIN | TYP | MAX | | | |
| f_{max} | | | 125 | 150 | | 125 | | MHz |
| t_{PLH} | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ | Q or $\overline{\text{Q}}$ | 1.5 | 4.2 | 6.6 | 1.5 | 7.1 | ns |
| t_{PHL} | | | 1.5 | 4.7 | 8.2 | 1.5 | 9 | |
| t_{PLH} | CLK | Q or $\overline{\text{Q}}$ | 1.5 | 5.4 | 7.5 | 1.5 | 8.2 | ns |
| t_{PHL} | | | 1.5 | 5 | 6.9 | 1.5 | 7.5 | |

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

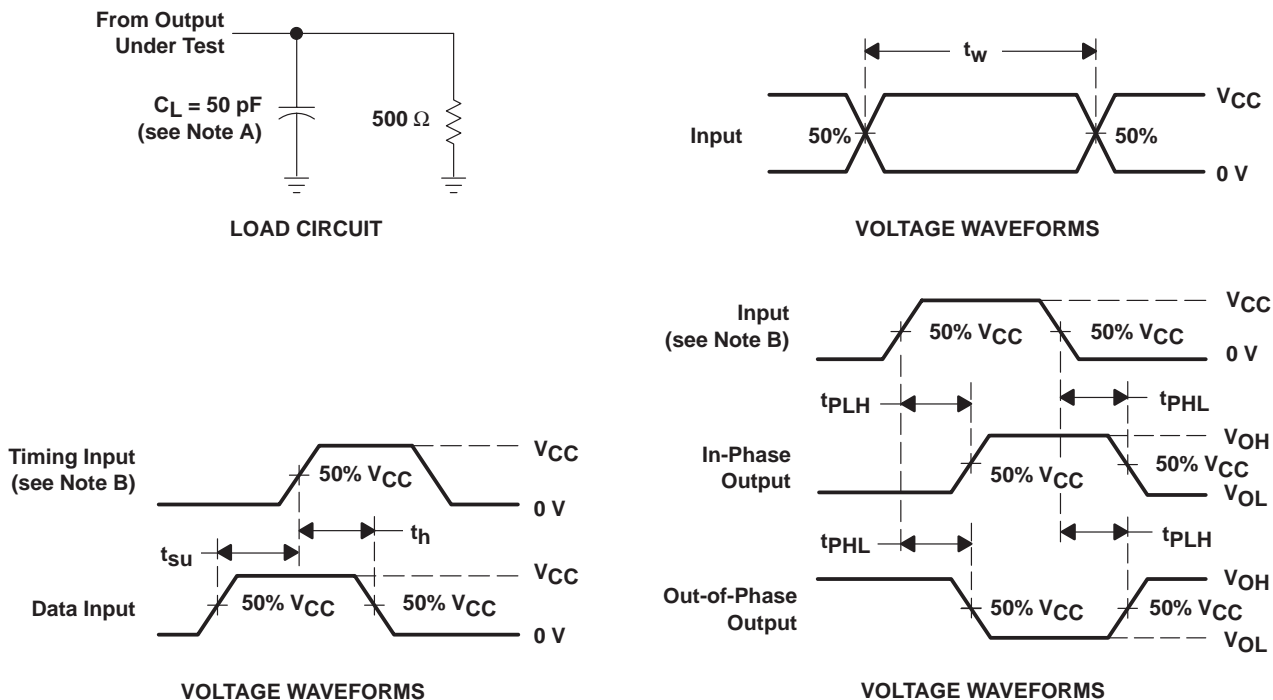
| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|-----------------|-------------------------------|---|-----|------|
| C_{pd} | Power dissipation capacitance | $C_L = 50\text{ pF}$, $f = 1\text{ MHz}$ | 30 | pF |



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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ ns, $t_f = 3$ ns.
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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