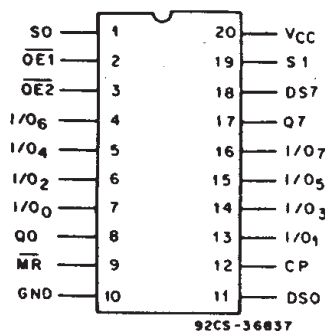


CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323



92CS-36837
TERMINAL ASSIGNMENT

8-Input Universal Shift/Storage Register with Common Parallel I/O Pins

CD54/74AC/ACT299 - Asynchronous Reset
CD54/74AC/ACT323 - Synchronous Reset

Type Features:

- Buffered inputs
- Typical propagation delay:
6 ns @ $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$

The RCA CD54/74AC299 and CD54/74AC323 and the CD54/74ACT299 and CD54/74ACT323 are 3-state, 8-input universal shift/storage registers with common parallel I/O pins. These devices use the RCA ADVANCED CMOS technology. These registers have four synchronous-operating modes controlled by the two select inputs as shown in the Mode Select (S0, S1) table. The Mode Select, the Serial Data (DS0, DS7), and the Parallel Data (I/O₀ - I/O₇) respond only to the LOW-TO-HIGH transition of the clock (CP) pulse. S0, S1 and Data inputs must be present one setup time prior to the positive transition of the clock.

With the CD54/74AC/ACT299, the Master Reset ($\overline{\text{MR}}$) is an asynchronous active-LOW input. When $\overline{\text{MR}}$ is LOW, the register is cleared regardless of the status of all other inputs. With the CD54/74AC/ACT323, the Master Reset ($\overline{\text{MR}}$) clears the register in sync with the clock input. The register can be expanded by cascading same units by tying the serial output (Q0) to the serial data (DS7) input of the preceding register, and tying the serial output (Q7) to the serial data (DS0) input of the following register. Recirculating the (n x 8) bits is accomplished by tying the Q7 of the last stage to the DSO of the first stage.

The 3-state input/output (I/O) port has three modes of operation:

1. Both Output Enable ($\overline{\text{OE1}}$ and $\overline{\text{OE2}}$) inputs are LOW and S0 or S1 or both are LOW; the data in the register is present at the eight outputs.
2. When both S0 and S1 are HIGH, I/O terminals are in the high-impedance state but being input ports, ready for parallel data to be loaded into eight registers with one clock transition regardless of the status of $\overline{\text{OE1}}$ and $\overline{\text{OE2}}$.

Family Features:

- Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
- SCR-Latchup-resistant CMOS process and circuit design
- Speed of bipolar FAST*/AS/S with significantly reduced power consumption
- Balanced propagation delays
- AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply
- $\pm 24\text{-mA}$ output drive current
 - Fanout to 15 FAST* ICs
 - Drives 50-ohm transmission lines

*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

3. Either one of the two Output Enable inputs being HIGH will force I/O terminals to be in the off state. It is noted that each I/O terminal is a 3-state output and a CMOS buffer input.

The CD74AC/ACT299 and CD74AC/ACT323 are supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC/ACT299 and CD54AC/ACT323, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

9

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

MODE SELECT — FUNCTION TABLE REGISTER OPERATING MODES

| FUNCTION | INPUTS | | | | | | | REGISTER OUTPUTS | | | | |
|-------------------|--------|----|----|----|-----|-----|------------------|------------------|----------------|-----|----------------|----------------|
| | MR | CP | S0 | S1 | DS0 | DS7 | I/O _n | Q0 | Q1 | ... | Q6 | Q7 |
| Reset (Clear) | L | X* | X | X | X | X | X | L | L | ... | L | L |
| Shift Right | H | | h | l | l | X | X | L | q ₀ | ... | q ₅ | q ₆ |
| | H | | h | l | h | X | X | H | q ₀ | ... | q ₅ | q ₆ |
| Shift Left | H | | l | h | X | l | X | q ₁ | q ₂ | ... | q ₇ | L |
| | H | | l | h | X | h | X | q ₁ | q ₂ | ... | q ₇ | H |
| Hold (do nothing) | H | | l | l | X | X | X | q ₀ | q ₁ | ... | q ₆ | q ₇ |
| Parallel Load | H | | h | h | X | X | l | L | L | ... | L | L |
| | H | | h | h | X | X | h | H | H | ... | H | H |

*On CD54/74AC/ACT323, CP must be in transition from the LOW-to-HIGH state to Reset (Clear).

MODE SELECT — FUNCTION TABLE 3-STATE I/O PORT OPERATING MODE

| FUNCTION | INPUTS | | | | | Q _n (Register) | INPUTS/OUTPUTS I/O ₀ ... I/O ₇ |
|---------------|--------|-----|----|----|--|-----------------------------------|---|
| | OE1 | OE2 | S0 | S1 | | | |
| Read Register | L | L | L | X | | L | L |
| | L | L | L | X | | H | H |
| | L | L | X | L | | L | L |
| | L | L | X | L | | H | H |
| Load Register | X | X | H | H | | Q _n = I/O _n | I/O _n = Inputs |
| Disable I/O | H | X | X | X | | X | (Z) |
| | X | H | X | X | | X | (Z) |

- H = Input voltage high level.
- h = Input voltage high one set-up time prior clock transition.
- L = Input voltage low level.
- l = Input voltage low one set-up time prior clock transition.
- q_n = Lower case letters indicate the state of the referenced output one set-up time prior clock transition.
- X = Voltage level on logic status don't care.
- Z = Output in high-impedance state.
- = Low-to-high clock transition.

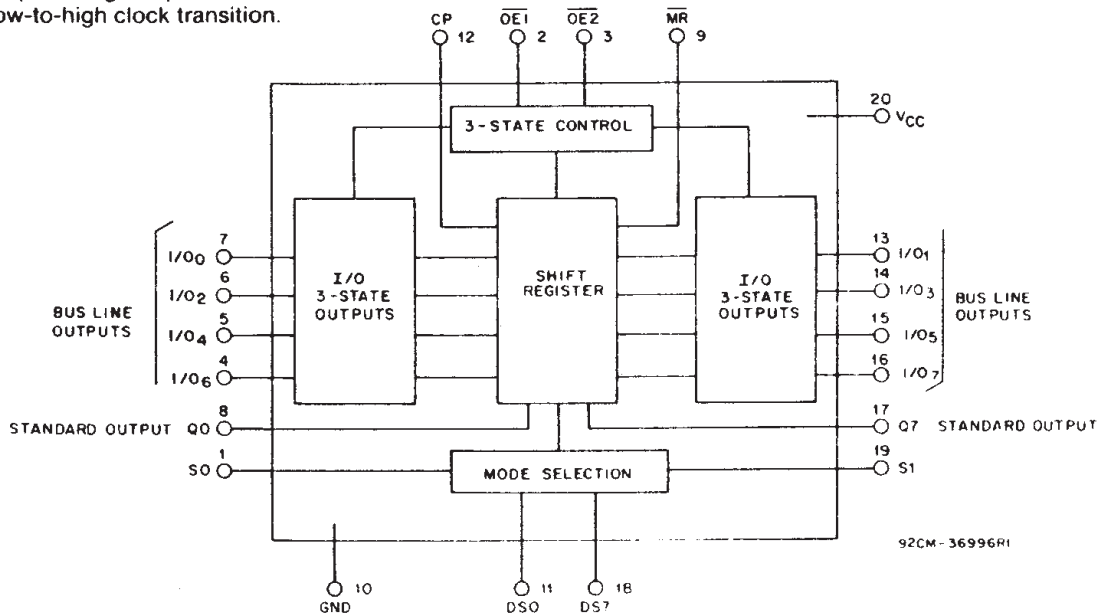


Fig. 1 - Functional diagram.

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

MAXIMUM RATINGS, Absolute-Maximum Values:

| | |
|--|---|
| DC SUPPLY-VOLTAGE (V_{CC}) | -0.5 to 6 V |
| DC INPUT DIODE CURRENT, I_{IK} (for $V_i < -0.5$ V or $V_i > V_{CC} + 0.5$ V) | ± 20 mA |
| DC OUTPUT DIODE CURRENT, I_{OK} (for $V_o < -0.5$ V or $V_o > V_{CC} + 0.5$ V) | ± 50 mA |
| DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, I_o (for $V_o > -0.5$ V or $V_o < V_{CC} + 0.5$ V) | ± 50 mA |
| DC V_{CC} or GROUND CURRENT (I_{CC} or I_{GND}) | ± 100 mA* |
| POWER DISSIPATION PER PACKAGE (P_D): | |
| For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E) | 500 mW |
| For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E) | Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW |
| For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M) | 400 mW |
| For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M) | Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW |
| OPERATING-TEMPERATURE RANGE (T_A) | -55 to $+125^\circ\text{C}$ |
| STORAGE TEMPERATURE (T_{stg}) | -65 to $+150^\circ\text{C}$ |
| LEAD TEMPERATURE (DURING SOLDERING): | |
| At distance $1/16 \pm 1/32$ in. (1.59 ± 0.79 mm) from case for 10 s maximum | $+265^\circ\text{C}$ |
| Unit inserted into PC board min. thickness $1/16$ in. (1.59 mm) with solder contacting lead tips only | $+300^\circ\text{C}$ |

*For up to 4 outputs per device; add ± 25 mA for each additional output.

RECOMMENDED OPERATING CONDITIONS:

For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTICS | LIMITS | | UNITS |
|---|-------------|----------------|----------------------|
| | MIN. | MAX. | |
| Supply-Voltage Range, V_{CC} *: (For $T_A =$ Full Package-Temperature Range) AC Types ACT Types | 1.5 4.5 | 5.5 5.5 | V V |
| DC Input or Output Voltage, V_i, V_o | 0 | V_{CC} | V |
| Operating Temperature, T_A | -55 | $+125$ | $^\circ\text{C}$ |
| Input Rise and Fall Slew Rate, dt/dv at 1.5 V to 3 V (AC Types) at 3.6 V to 5.5 V (AC Types) at 4.5 V to 5.5 V (ACT Types) | 0 0 0 | 50 20 10 | ns/V ns/V ns/V |

*Unless otherwise specified, all voltages are referenced to ground.

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

STATIC ELECTRICAL CHARACTERISTICS: AC Series

| CHARACTERISTICS | TEST CONDITIONS | | V _{CC} (V) | AMBIENT TEMPERATURE (T _A) - °C | | | | | | UNITS |
|--|--|------------------------|------------------------|--|------|------------|------|-------------|------|-------|
| | | | | +25 | | -40 to +85 | | -55 to +125 | | |
| | V _I (V) | I _O (mA) | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| High-Level Input Voltage V _{IH} | | | 1.5 | 1.2 | — | 1.2 | — | 1.2 | — | V |
| | | | 3 | 2.1 | — | 2.1 | — | 2.1 | — | |
| | | | 5.5 | 3.85 | — | 3.85 | — | 3.85 | — | |
| Low-Level Input Voltage V _{IL} | | | 1.5 | — | 0.3 | — | 0.3 | — | 0.3 | V |
| | | | 3 | — | 0.9 | — | 0.9 | — | 0.9 | |
| | | | 5.5 | — | 1.65 | — | 1.65 | — | 1.65 | |
| High-Level Output Voltage V _{OH} | V _{IH} or V _{IL} | -0.05 | 1.5 | 1.4 | — | 1.4 | — | 1.4 | — | V |
| | | -0.05 | 3 | 2.9 | — | 2.9 | — | 2.9 | — | |
| | | -0.05 | 4.5 | 4.4 | — | 4.4 | — | 4.4 | — | |
| | | -4 | 3 | 2.58 | — | 2.48 | — | 2.4 | — | |
| | | -24 | 4.5 | 3.94 | — | 3.8 | — | 3.7 | — | |
| | #, * | -75 | 5.5 | — | — | 3.85 | — | — | — | |
| | | -50 | 5.5 | — | — | — | — | 3.85 | — | |
| Low-Level Output Voltage V _{OL} | V _{IH} or V _{IL} | 0.05 | 1.5 | — | 0.1 | — | 0.1 | — | 0.1 | V |
| | | 0.05 | 3 | — | 0.1 | — | 0.1 | — | 0.1 | |
| | | 0.05 | 4.5 | — | 0.1 | — | 0.1 | — | 0.1 | |
| | | 12 | 3 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | | 24 | 4.5 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | #, * | 75 | 5.5 | — | — | — | 1.65 | — | — | |
| | | 50 | 5.5 | — | — | — | — | — | 1.65 | |
| Input Leakage Current I _I | V _{CC} or GND | | 5.5 | — | ±0.1 | — | ±1 | — | ±1 | μA |
| 3-Stage Leakage Current I _{OZ} | V _{IH} or V _{IL} V _O = V _{CC} or GND | | 5.5 | — | ±0.5 | — | ±5 | — | ±10 | μA |
| Quiescent Supply Current, MSI I _{CC} | V _{CC} or GND | 0 | 5.5 | — | 8 | — | 80 | — | 160 | μA |

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

| CHARACTERISTICS | TEST CONDITIONS | V _{CC} (V) | AMBIENT TEMPERATURE (T _A) - °C | | | | | | UNITS | | |
|---|------------------|--|--|------|------------|------|-------------|------|-------|------|----|
| | | | +25 | | -40 to +85 | | -55 to +125 | | | | |
| | | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | | | |
| High-Level Input Voltage | V _{IH} | | 4.5 to 5.5 | 2 | — | 2 | — | 2 | — | V | |
| Low-Level Input Voltage | V _{IL} | | 4.5 to 5.5 | — | 0.8 | — | 0.8 | — | 0.8 | V | |
| High-Level Output Voltage | V _{OIH} | V _{IH} or V _{IL} #, * | -0.05 | 4.5 | 4.4 | — | 4.4 | — | 4.4 | — | V |
| | | | -24 | 4.5 | 3.94 | — | 3.8 | — | 3.7 | — | |
| | | | -75 | 5.5 | — | — | 3.85 | — | — | — | |
| | | | -50 | 5.5 | — | — | — | — | 3.85 | — | |
| Low-Level Output Voltage | V _{OOL} | V _{IH} or V _{IL} #, * | 0.05 | 4.5 | — | 0.1 | — | 0.1 | — | 0.1 | V |
| | | | 24 | 4.5 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | | | 75 | 5.5 | — | — | — | 1.65 | — | — | |
| | | | 50 | 5.5 | — | — | — | — | — | 1.65 | |
| Input Leakage Current | I _I | V _{CC} or GND | 5.5 | — | ±0.1 | — | ±1 | — | ±1 | μA | |
| 3-State Leakage Current | I _{OZ} | V _{IH} or V _{IL} or V _O or V _{CC} or GND | 5.5 | — | ±0.5 | — | ±5 | — | ±10 | μA | |
| Quiescent Supply Current, MSI | I _{CC} | V _{CC} or GND | 0 | 5.5 | — | 8 | — | 80 | — | 160 | μA |
| Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load | ΔI _{CC} | V _{CC} -2.1 | 4.5 to 5.5 | — | 2.4 | — | 2.8 | — | 3 | mA | |

9

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

ACT INPUT LOADING TABLE

| INPUT | UNIT LOADS* | |
|--|-------------|------|
| | 299 | 323 |
| S1, S0, $\overline{OE1}$, $\overline{OE2}$ | 0.83 | 0.83 |
| I/O ₀ - I/O ₇ , CP, DS0, DS7 | 0.67 | 0.67 |
| \overline{MR} | 1.33 | 0.67 |

*Unit load is ΔI_{CC} limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

Technical Data

CD54/74AC299, CD54/74AC323
CD54/74ACT299, CD54/74ACT323

PREREQUISITE FOR SWITCHING: AC Series

| CHARACTERISTICS | SYMBOL | V _{CC} (V) | AMBIENT TEMPERATURE (T _A) - °C | | | | UNITS |
|---|------------------|------------------------|--|------|-------------|------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Setup Time S1, S0, to CP | t _{su} | 1.5 | 99 | — | 113 | — | ns |
| | | 3.3* | 11.1 | — | 12.6 | — | |
| | | 5† | 7.9 | — | 9 | — | |
| Hold Time S1, S0 to CP | t _h | 1.5 | 0 | — | 0 | — | ns |
| | | 3.3 | 0 | — | 0 | — | |
| | | 5 | 0 | — | 0 | — | |
| Setup Time (I/O)n, DS0, DS7 to CP | t _{su} | 1.5 | 49 | — | 56 | — | ns |
| | | 3.3 | 5.5 | — | 6.3 | — | |
| | | 5 | 3.9 | — | 4.5 | — | |
| Hold Time (I/O)n, DS0, DS7 to CP | t _{su} | 1.5 | 0 | — | 0 | — | ns |
| | | 3.3 | 0 | — | 0 | — | |
| | | 5 | 0 | — | 0 | — | |
| Setup Time MR to CP (323) | t _{su} | 1.5 | 61 | — | 69 | — | ns |
| | | 3.3 | 6.8 | — | 7.8 | — | |
| | | 5 | 4.8 | — | 5.5 | — | |
| Hold Time MR to CP (323) | t _h | 1.5 | 0 | — | 0 | — | ns |
| | | 3.3 | 0 | — | 0 | — | |
| | | 5 | 0 | — | 0 | — | |
| Maximum CP Frequency | f _{MAX} | 1.5 | 9 | — | 8 | — | MHz |
| | | 3.3 | 78 | — | 68 | — | |
| | | 5 | 108 | — | 95 | — | |
| CP Pulse Width | t _w | 1.5 | 57 | — | 65 | — | ns |
| | | 3.3 | 6.4 | — | 7.3 | — | |
| | | 5 | 4.6 | — | 5.2 | — | |
| MR Pulse Width | t _w | 1.5 | 55 | — | 63 | — | ns |
| | | 3.3 | 6.1 | — | 7 | — | |
| | | 5 | 4.4 | — | 5 | — | |
| Recovery Time MR to CP 299 | t _{REC} | 1.5 | 55 | — | 63 | — | ns |
| | | 3.3 | 6.1 | — | 7 | — | |
| | | 5 | 4.4 | — | 5 | — | |

*3.3 V: min. is @ 3 V

†5 V: min is @ 4.5 V

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

SWITCHING CHARACTERISTICS: AC Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

| CHARACTERISTICS | SYMBOL | V_{CC} (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
|-------------------------------------|------------|-----------------|------------------------------------|------|-------------|------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Propagation Delays: CP to Q0, Q7 | t_{PLH} | 1.5 | — | 147 | — | 162 | ns |
| | t_{PHL} | 3.3* | 4.7 | 16.5 | 4.5 | 18.1 | |
| | | 5† | 3.3 | 11.7 | 3.2 | 12.9 | |
| CP to (I/O)n | t_{PLH} | 1.5 | — | 154 | — | 169 | ns |
| | t_{PHL} | 3.3 | 4.9 | 17.2 | 4.7 | 18.9 | |
| | | 5 | 3.5 | 12.3 | 3.4 | 13.5 | |
| MR to Q0, Q7 (299 only) | t_{PLH} | 1.5 | — | 127 | — | 140 | ns |
| | t_{PHL} | 3.3 | 4 | 14.3 | 3.9 | 15.7 | |
| | | 5 | 2.9 | 10.2 | 2.8 | 11.2 | |
| MR to (I/O)n | t_{PLH} | 1.5 | — | 158 | — | 174 | ns |
| | t_{PHL} | 3.3 | 5 | 17.7 | 4.9 | 19.5 | |
| | | 5 | 3.6 | 12.6 | 3.5 | 13.9 | |
| Enable and Disable Times | t_{PZL} | 1.5 | — | 169 | — | 186 | ns |
| | t_{PZH} | 3.3 | 5.8 | 20.4 | 5.6 | 22.4 | |
| | t_{PLZ} | 5 | 3.8 | 13.5 | 3.7 | 14.9 | |
| | t_{PHZ} | | | | | | |
| Power Dissipation Capacitance | $C_{PD}\S$ | — | 280 Typ. | | 280 Typ. | | pF |
| Input Capacitance | C_i | — | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | C_o | — | — | 15 | — | 15 | pF |

*3.3 V: min. is @ 3.6 V
max. is @ 3 V

†5 V: min. is @ 5.5 V
max. is @ 4.5 V

§ C_{PD} is used to determine the dynamic power consumption, per function.

$$P_D = C_{PD}V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o) \text{ where } f_i = \text{input frequency}$$

$$f_o = \text{output frequency}$$

$$C_L = \text{output load capacitance}$$

$$V_{CC} = \text{supply voltage.}$$

PREREQUISITE FOR SWITCHING: ACT Series

| CHARACTERISTICS | SYMBOL | V_{CC} (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
|---|-----------|-----------------|------------------------------------|------|-------------|------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Setup Time S1, S0 to CP | t_{su} | 5* | 7.9 | — | 9 | — | ns |
| Hold Time S1, S0 to CP | t_H | 5 | 0 | — | 0 | — | ns |
| Setup Time (I/O)n, DS0, DS7 to CP | t_{su} | 5 | 3.9 | — | 4.5 | — | ns |
| Hold Time (I/O)n, DS0, DS7 to CP | t_H | 5 | 0 | — | 0 | — | ns |
| Setup Time MR to CP (323) | t_{su} | 5* | 4.8 | — | 5.5 | — | ns |
| Hold Time MR to CP (323) | t_H | 5 | 0 | — | 0 | — | ns |
| Maximum CP Frequency | f_{max} | 5 | 103 | — | 90 | — | MHz |
| CP Pulse Width | t_w | 5 | 4.8 | — | 5.5 | — | ns |
| MR Pulse Width | t_w | 5 | 4.4 | — | 5 | — | ns |
| Recovery Time MR to CP (299) | t_{rec} | 5 | 4.4 | — | 5 | — | ns |

*5 V: min. is @ 4.5 V

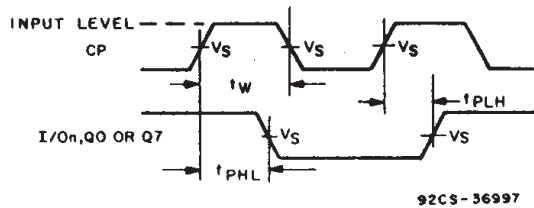
CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

SWITCHING CHARACTERISTICS: ACT Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

| CHARACTERISTICS | SYMBOL | V_{CC} (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
|---|--|-----------------|------------------------------------|------|-------------|------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Propagation Delays: CP to Q0, Q7 | t_{PLH} t_{PHL} | 5* | 3.3 | 11.7 | 3.2 | 12.9 | ns |
| CP to (I/O)n | t_{PLH} t_{PHL} | 5 | 3.7 | 13.2 | 3.6 | 14.5 | ns |
| \overline{MR} to Q0, Q7 (299 only) | t_{PLH} t_{PHL} | 5 | 3.1 | 11.1 | 3.1 | 12.2 | ns |
| \overline{MR} to (I/O)n | t_{PLH} t_{PHL} | 5 | 4.8 | 16.9 | 4.7 | 18.6 | ns |
| Enable and Disable Times | t_{PLZ} t_{PHZ} t_{PZL} t_{PZH} | 5 | 3.8 | 13.5 | 3.7 | 14.9 | ns |
| Power Dissipation Capacitance | $C_{PD}\S$ | — | 280 Typ. | | 280 Typ. | | pF |
| Input Capacitance | C_i | — | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | C_o | — | — | 15 | — | 15 | pF |

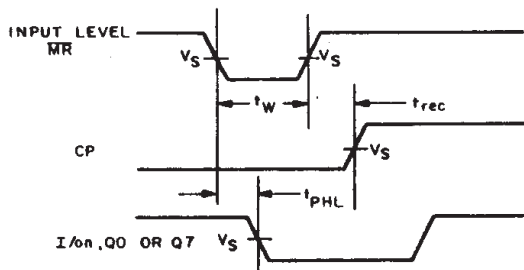
*5 V: min. is @ 5.5 V
max. is @ 4.5 V

$\S C_{PD}$ is used to determine the dynamic power consumption, per function.
 $P_D = C_{PD}V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o) + V_{CC}\Delta I_{CC}$ where f_i = input frequency
 f_o = output frequency
 C_L = output load capacitance
 V_{CC} = supply voltage.



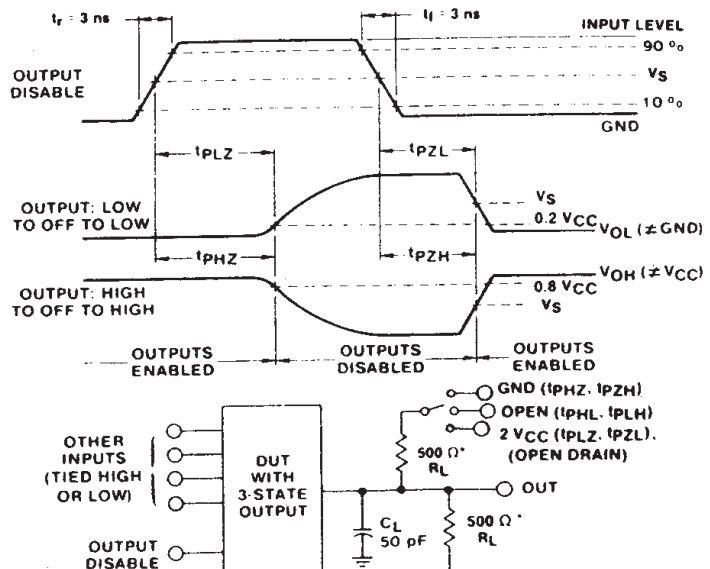
92CS-36997

Fig. 2 - Clock prerequisite and propagation delays.



92CS-36998

Fig. 3 - Master Reset prerequisite and propagation delays.



92CM-42405

*FOR AC SERIES ONLY: WHEN $V_{CC} = 1.5 \text{ V}$, $R_L = 1 \text{ k}\Omega$

Fig. 4 - Three-state propagation delay times and test circuit.

CD54/74AC299, CD54/74AC323 CD54/74ACT299, CD54/74ACT323

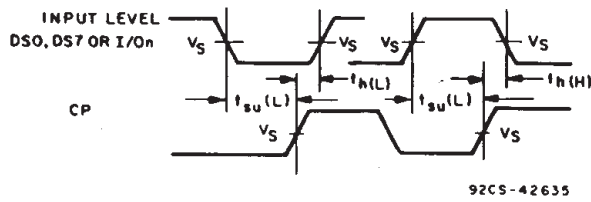


Fig. 5 - Data prerequisite times.

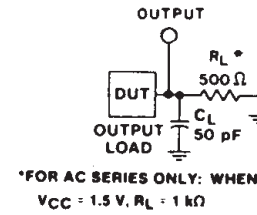


Fig. 6 - Test circuit.

| | CD54/74AC | CD54/74ACT |
|---------------------------------|--------------|--------------|
| Input Level | V_{CC} | 3 V |
| Input Switching Voltage, V_S | 0.5 V_{CC} | 1.5 V |
| Output Switching Voltage, V_S | 0.5 V_{CC} | 0.5 V_{CC} |

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD54AC299F3A | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| CD54ACT299F3A | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| CD54ACT323F3A | NRND | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| CD74AC299M96 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD74AC299M96E4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD74AC323M | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD74ACT299M | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD74ACT299M96 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD74ACT299M96E4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBsolete: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AC.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| Products | | Applications | |
|--------------------|--|---------------------|--|
| Amplifiers | amplifier.ti.com | Audio | www.ti.com/audio |
| Data Converters | dataconverter.ti.com | Automotive | www.ti.com/automotive |
| DSP | dsp.ti.com | Broadband | www.ti.com/broadband |
| Interface | interface.ti.com | Digital Control | www.ti.com/digitalcontrol |
| Logic | logic.ti.com | Military | www.ti.com/military |
| Power Mgmt | power.ti.com | Optical Networking | www.ti.com/opticalnetwork |
| Microcontrollers | microcontroller.ti.com | Security | www.ti.com/security |
| Low Power Wireless | www.ti.com/lpw | Telephony | www.ti.com/telephony |
| | | Video & Imaging | www.ti.com/video |
| | | Wireless | www.ti.com/wireless |

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265