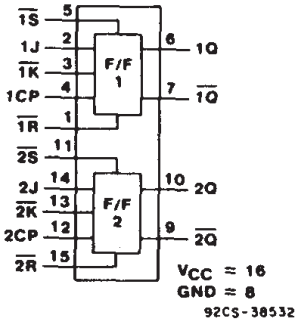




Data sheet acquired from Harris Semiconductor  
SCHS282

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112



**CD54/74AC/ACT109  
FUNCTIONAL DIAGRAM**

## Dual "J-K" Flip-Flop with Set and Reset

CD54/74AC/ACT109 - Positive-Edge-Triggered (J,  $\bar{K}$ )

CD54/74AC/ACT112 - Negative-Edge-Triggered (J, K)

**Type Features:**

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

**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.

The RCA CD54/74AC109 and CD54/74AC112 and the CD54/74ACT109 and CD54/74ACT112 dual "J-K" flip-flops with set and reset use the RCA ADVANCED CMOS technology. These flip-flops have independent J, K (or  $\bar{K}$ ), Set, Reset, and Clock inputs and Q and  $\bar{Q}$  outputs. The CD54/74AC/ACT112 changes state on the negative-going transition of the clock pulse. The CD54/74AC/ACT109 changes state on the positive-going transition of the clock. Set and Reset are accomplished asynchronously by low-level inputs.

The CD74AC/ACT109 and CD74AC/ACT112 are supplied in 16-lead dual-in-line plastic packages (E suffix) and in 16-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/ACT109 and CD54AC/ACT112, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

**CD54/74AC/ACT109 TRUTH TABLE**

| INPUTS    |           |    |   |           | OUTPUTS   |           |
|-----------|-----------|----|---|-----------|-----------|-----------|
| $\bar{S}$ | $\bar{R}$ | CP | J | $\bar{K}$ | Q         | $\bar{Q}$ |
| L         | H         | X  | X | X         | H         | L         |
| H         | L         | X  | X | X         | L         | H         |
| L         | L         | X  | X | X         | H*        | H*        |
| H         | H         |    | L | L         | L         | H         |
| H         | H         |    | H | L         | TOGGLE    |           |
| H         | H         |    | L | H         | NO CHANGE |           |
| H         | H         |    | H | H         | H         | L         |
| H         | H         | L  | X | X         | NO CHANGE |           |

\*Unpredictable and unstable condition if both  $\bar{S}$  and  $\bar{R}$  go high simultaneously.

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This data sheet is applicable to the CD54/74AC109, CD54AC112, CD45ACT109, and CD54ACT112. See SCHS233 for information on the CD74AC112, CD74ACT109, and CD74ACT112.

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

CD54/74AC/ACT112 TRUTH TABLE

| INPUTS    |           |            |   |   | OUTPUTS   |           |
|-----------|-----------|------------|---|---|-----------|-----------|
| $\bar{S}$ | $\bar{R}$ | $\bar{CP}$ | J | K | Q         | $\bar{Q}$ |
| L         | H         | X          | X | X | H         | L         |
| H         | L         | X          | X | X | L         | H         |
| L         | L         | X          | X | X | H*        | H*        |
| H         | H         |            | L | L | NO CHANGE |           |
| H         | H         |            | H | L | H         | L         |
| H         | H         |            | L | H | L         | H         |
| H         | H         |            | H | H | TOGGLE    |           |
| H         | H         | H          | X | X | NO CHANGE |           |

\*Output states unpredictable if  $\bar{S}$  and  $\bar{R}$  go High simultaneously after both being Low at the same time.

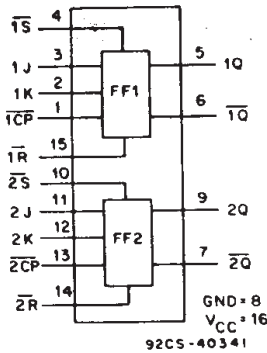
H = High steady state

L = Low steady state

X = Irrelevant

= High-to-Low transition

= Low-to-High transition



CD54/74AC/ACT112  
FUNCTIONAL DIAGRAM

**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)                          | $\pm 20$ mA   |
| DC OUTPUT DIODE CURRENT, $I_{OK}$ (for $V_o < -0.5$ V or $V_o > V_{CC} + 0.5$ V)                         | $\pm 50$ 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)    | $\pm 50$ mA   |
| DC $V_{CC}$ or GROUND CURRENT ( $I_{CC}$ or $I_{GND}$ )  | $\pm 100$ 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. ( $1.59 \pm 0.79$ 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  $\pm 25$  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, $V_{CC}$ *:<br>(For $T_A =$ Full Package-Temperature Range)<br>AC Types<br>ACT Types                            | 1.5<br>4.5  | 5.5<br>5.5     | V<br>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, $dt/dv$<br>at 1.5 V to 3 V (AC Types)<br>at 3.6 V to 5.5 V (AC Types)<br>at 4.5 V to 5.5 V (ACT Types) | 0<br>0<br>0 | 50<br>20<br>10 | ns/V<br>ns/V<br>ns/V |

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

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

## STATIC ELECTRICAL CHARACTERISTICS: AC Series

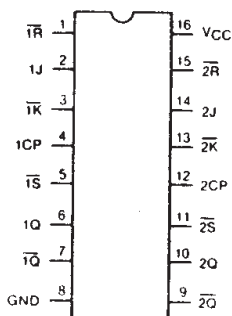
| CHARACTERISTICS              | TEST CONDITIONS |   | V <sub>CC</sub> (V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |                    |                    |                    |                    |                    | UNITS |    |
|------------------------------|-----------------|---|---------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|-------|----|
|                              |                 |   |                     | +25  |                    | -40 to +85         |                    | -55 to +125        |                    |       |    |
|                              |                 |   |                     | MIN.                                       | MAX.               | MIN.               | MAX.               | MIN.               | MAX.               |       |    |
| High-Level Input Voltage     | V <sub>IH</sub> |   | 1.5<br>3<br>5.5     | 1.2<br>2.1<br>3.85                         | —<br>—<br>—        | 1.2<br>2.1<br>3.85 | —<br>—<br>—        | 1.2<br>2.1<br>3.85 | —<br>—<br>—        | V     |    |
| Low-Level Input Voltage      | V <sub>IL</sub> |   | 1.5<br>3<br>5.5     | —<br>—<br>—                                | 0.3<br>0.9<br>1.65 | —<br>—<br>—        | 0.3<br>0.9<br>1.65 | —<br>—<br>—        | 0.3<br>0.9<br>1.65 | V     |    |
| High-Level Output Voltage    | V <sub>OH</sub> | V <sub>IH</sub><br>or<br>V <sub>IL</sub><br>#,* | -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               | —                  | —                  | —     |    |
| Low-Level Output Voltage     | V <sub>OL</sub> | V <sub>IH</sub><br>or<br>V <sub>IL</sub><br>#,* | 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               | —                  | —     |    |
| Input Leakage Current        | I <sub>I</sub>  | V <sub>CC</sub><br>or<br>GND                    | 5.5                 | —  | ±0.1               | —                  | ±1                 | —                  | ±1                 | μA    |    |
| Quiescent Supply Current, FF | I <sub>CC</sub> | V <sub>CC</sub><br>or<br>GND                    | 0                   | 5.5  | —                  | 4                  | —                  | 40                 | —                  | 80    | 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.

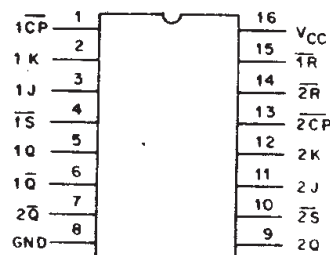
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### TERMINAL ASSIGNMENT DIAGRAMS



12CS 38761

CD54/74AC/ACT109



92CS-40339

CD54/74AC/ACT112

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

| CHARACTERISTICS   | TEST CONDITIONS | $V_{CC}$<br>(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   | $V_{OH}$        | $V_{IH}$ or $V_{IL}$<br>#, * | -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  | $V_{OL}$        | $V_{IH}$ or $V_{IL}$<br>#, * | 0.05                               | 4.5  | —          | 0.10 | —           | 0.10 | —     | 0.10 | V  |
|   |                 |                              | 24                                 | 4.5  | —          | 0.36 | —           | 0.44 | —     | 0.50 |    |
|   |                 |                              | 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   |    |
| Quiescent Supply Current, FF  | $I_{CC}$        | $V_{CC}$ or GND              | 0                                  | 5.5  | —          | 4    | —           | 40   | —     | 80   | µA |
| Additional Supply Current per Input Pin TTL Inputs High 1 Unit Load | $\Delta I_{CC}$ | $V_{CC}-2.1$                 | 4.5 to 5.5                         | —    | 2.4        | —    | 2.8         | —    | 3     | mA   |    |

#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* |      |
|---------------------------------|-------------|------|
|                                 | 109         | 112  |
| J, CP, $\overline{CP}$          | 1           | 1    |
| K                               | —           | 0.53 |
| $\overline{K}$                  | 0.53        | —    |
| $\overline{S}$ , $\overline{R}$ | 0.58        | 0.58 |

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

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

**PREREQUISITE FOR SWITCHING: AC Series**

| CHARACTERISTICS                                  | SYMBOL           | V <sub>CC</sub><br>(V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |             |      | UNITS |
|--|------------------|------------------------|--|------|-------------|------|-------|
|  |                  |                        | -40 to +85                                 |      | -55 to +125 |      |       |
|  |                  |                        | MIN.                                       | MAX. | MIN.        | MAX. |       |
| Maximum CP, ( $\overline{CP}$ ) Frequency<br>109 | f <sub>max</sub> | 1.5                    | 9  | —    | 8           | —    | MHz   |
|  |                  | 3.3*                   | 81   | —    | 71          | —    |       |
|  |                  | 5†                     | 114  | —    | 100         | —    |       |
| 112  | f <sub>max</sub> | 1.5                    | 9  | —    | 8           | —    | MHz   |
|  |                  | 3.3                    | 81   | —    | 71          | —    |       |
|  |                  | 5                      | 114  | —    | 100         | —    |       |
| CP, ( $\overline{CP}$ ) Pulse Width              | t <sub>w</sub>   | 1.5                    | 55   | —    | 63          | —    | ns    |
|  |                  | 3.3                    | 6  | —    | 7           | —    |       |
|  |                  | 5                      | 4.4  | —    | -5          | —    |       |
| R, $\overline{S}$ Pulse Width                    | t <sub>w</sub>   | 1.5                    | 49   | —    | 56          | —    | ns    |
|  |                  | 3.3                    | 5.5  | —    | 6.3         | —    |       |
|  |                  | 5                      | 3.9  | —    | 4.5         | —    |       |
| Setup Time<br>J, $\overline{K}$ to CP<br>109     | t <sub>SU</sub>  | 1.5                    | 61   | —    | 69          | —    | ns    |
|  |                  | 3.3                    | 6.8  | —    | 7.7         | —    |       |
|  |                  | 5                      | 4.8  | —    | 5.5         | —    |       |
| J, K to $\overline{CP}$<br>112                   | t <sub>SU</sub>  | 1.5                    | 44   | —    | 50          | —    | ns    |
|  |                  | 3.3                    | 4.9  | —    | 5.6         | —    |       |
|  |                  | 5                      | 3.5  | —    | 4           | —    |       |
| Hold Time<br>J, $\overline{K}$ to CP<br>109      | t <sub>H</sub>   | 1.5                    | 0  | —    | 0           | —    | ns    |
|  |                  | 3.3                    | 0  | —    | 0           | —    |       |
|  |                  | 5                      | 0  | —    | 0           | —    |       |
| J, K to $\overline{CP}$<br>112                   | t <sub>H</sub>   | 1.5                    | 0  | —    | 0           | —    | ns    |
|  |                  | 3.3                    | 0  | —    | 0           | —    |       |
|  |                  | 5                      | 0  | —    | 0           | —    |       |
| Removal Time<br>R, S to CP, ( $\overline{CP}$ )  | t <sub>REM</sub> | 1.5                    | 27   | —    | 31          | —    | ns    |
|  |                  | 3.1                    | 3.1  | —    | 3.5         | —    |       |
|  |                  | 5                      | 2.2  | —    | 2.5         | —    |       |

\*3.3 V: min. is @ 3 V  
†5 V: min is @ 4.5 V

**SWITCHING CHARACTERISTICS: AC Series; t<sub>r</sub>, t<sub>f</sub> = 3 ns, C<sub>L</sub> = 50 pF**

| CHARACTERISTICS   | SYMBOL                               | V <sub>CC</sub><br>(V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |             |      | UNITS |
|---|--------------------------------------|------------------------|--|------|-------------|------|-------|
|   |                                      |                        | -40 to +85                                 |      | -55 to +125 |      |       |
|   |                                      |                        | MIN.                                       | MAX. | MIN.        | MAX. |       |
| Propagation Delays:<br>CP, ( $\overline{CP}$ ) to Q, $\overline{Q}$ | t <sub>PLH</sub><br>t <sub>PHL</sub> | 1.5                    | —  | 117  | —           | 129  | ns    |
|   |                                      | 3.3*                   | 3.7  | 13.1 | 3.6         | 14.4 |       |
|   |                                      | 5†                     | 2.7  | 9.4  | 2.6         | 10.3 |       |
| $\overline{S}$ , R to Q, $\overline{Q}$                             | t <sub>PLH</sub><br>t <sub>PHL</sub> | 1.5                    | —  | 139  | —           | 153  | ns    |
|   |                                      | 3.3                    | 4.4  | 15.5 | 4.3         | 17.1 |       |
|   |                                      | 5                      | 3.2  | 11.1 | 3.1         | 12.2 |       |
| Power Dissipation Capacitance                                       | C <sub>PD</sub> §                    | —                      | 56 Typ.                                    |      | 56 Typ.     |      | pF    |
| Input Capacitance   | C <sub>I</sub>                       | —                      | —  | 10   | —           | 10   | 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<sub>PD</sub> is used to determine the dynamic power consumption, per flip-flop.  
 $P_D = C_{PD}V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o)$  where f<sub>i</sub> = input frequency  
 f<sub>o</sub> = output frequency  
 C<sub>L</sub> = output load capacitance  
 V<sub>CC</sub> = supply voltage.

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

PREREQUISITE FOR SWITCHING: ACT Series

| CHARACTERISTICS                                  | SYMBOL           | V <sub>CC</sub><br>(V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |             |      | UNITS |
|--|------------------|------------------------|--|------|-------------|------|-------|
|  |                  |                        | -40 to +85                                 |      | -55 to +125 |      |       |
|  |                  |                        | MIN.                                       | MAX. | MIN.        | MAX. |       |
| Maximum CP, ( $\overline{CP}$ ) Frequency<br>109 | f <sub>max</sub> | 5*                     | 114  | —    | 100         | —    | MHz   |
| 112  |                  |                        | 114  | —    | 100         | —    |       |
| CP, ( $\overline{CP}$ ) Pulse Width              | t <sub>w</sub>   | 5                      | 4.4  | —    | 5           | —    | ns    |
| R, S Pulse Width                                 | t <sub>w</sub>   | 5                      | 4.8  | —    | 5.5         | —    | ns    |
| Setup Time<br>J, $\overline{K}$ to CP (109)      | t <sub>su</sub>  | 5                      | 4.8  | —    | 5.5         | —    | ns    |
| J, K to $\overline{CP}$ (112)                    |                  |                        | 3.5  | —    | 4           | —    |       |
| Hold Time<br>J, $\overline{K}$ to CP (109)       | t <sub>h</sub>   | 5                      | 0  | —    | 0           | —    | ns    |
| J, K to $\overline{CP}$ (112)                    |                  |                        | 1  | —    | 1           | —    |       |
| Removal Time<br>R, S to CP, ( $\overline{CP}$ )  | t <sub>rem</sub> | 5                      | 2.2  | —    | 2.5         | —    | ns    |

\*5 V: min. is @ 4.5 V

SWITCHING CHARACTERISTICS: ACT Series; t<sub>r</sub>, t<sub>f</sub> = 3 ns, C<sub>L</sub> = 50 pF

| CHARACTERISTICS  | SYMBOL                               | V <sub>CC</sub><br>(V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |             |      | UNITS |
|--|--------------------------------------|------------------------|--|------|-------------|------|-------|
|  |                                      |                        | -40 to +85                                 |      | -55 to +125 |      |       |
|  |                                      |                        | MIN.                                       | MAX. | MIN.        | MAX. |       |
| Propagation Delays<br>CP, ( $\overline{CP}$ ) to Q, $\overline{Q}$ | t <sub>PLH</sub><br>t <sub>PHL</sub> | 5*                     | 2.7  | 9.4  | 2.6         | 10.3 | ns    |
| S, R, to Q, $\overline{Q}$   | t <sub>PLH</sub><br>t <sub>PHL</sub> | 5                      | 3.2  | 11.1 | 3.1         | 12.2 | ns    |
| Power Dissipation Capacitance                                      | C <sub>PD</sub> §                    | —                      | 56 Typ.                                    |      | 56 Typ.     |      | pF    |
| Input Capacitance  | C <sub>I</sub>                       | —                      | —  | 10   | —           | 10   | pF    |

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

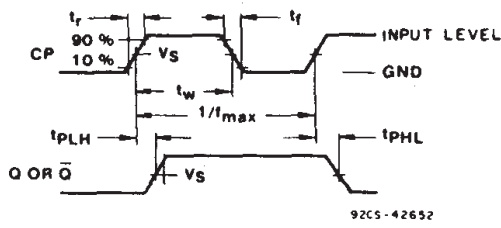
§C<sub>PD</sub> is used to determine the dynamic power consumption, per flip-flop.

$$P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$$

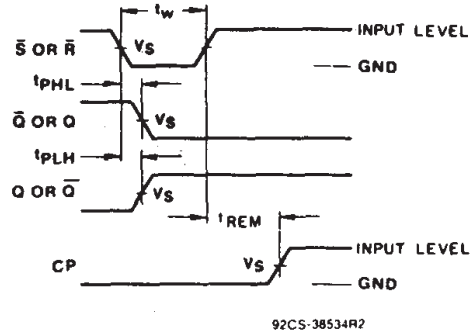
where f<sub>i</sub> = input frequency  
f<sub>o</sub> = output frequency  
C<sub>L</sub> = output load capacitance  
V<sub>CC</sub> = supply voltage.

# CD54/74AC109, CD54/74AC112 CD54/74ACT109, CD54/74ACT112

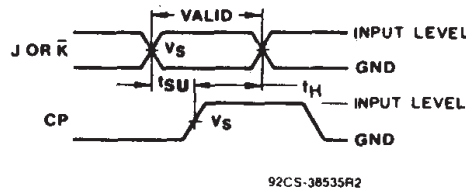
## CD54/74AC/ACT109 Waveforms



Clock to output delays and clock pulse width.

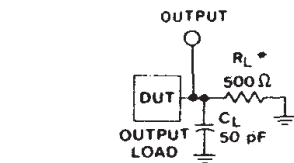
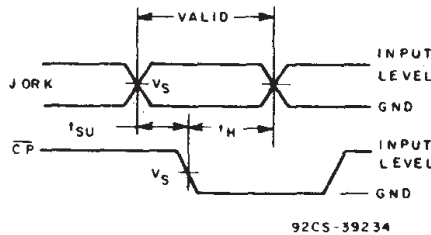
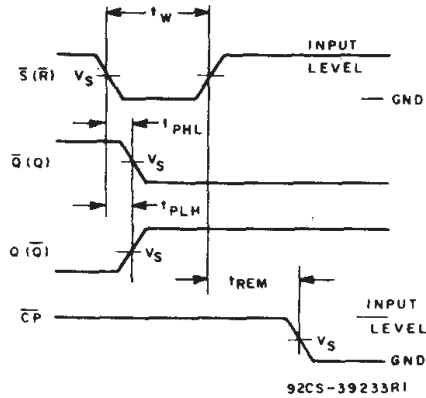
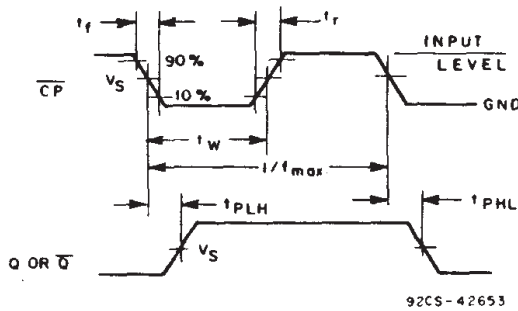


Reset or Set prerequisite and propagation delays.



Data setup and hold times.

## CD54/74/AC/ACT112 Waveforms



\*FOR AC SERIES ONLY: WHEN  
V<sub>CC</sub> = 1.5 V, R<sub>L</sub> = 1 kΩ

92CS-42189

Test circuit.

Propagation delay times, and setup and hold times.

|  | CD54/74AC           | CD54/74ACT          |
|--|---------------------|---------------------|
| Input Level                              | V <sub>CC</sub>     | 3 V                 |
| Input Switching Voltage, V <sub>S</sub>  | 0.5 V <sub>CC</sub> | 1.5 V               |
| Output Switching Voltage, V <sub>S</sub> | 0.5 V <sub>CC</sub> | 0.5 V <sub>CC</sub> |

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