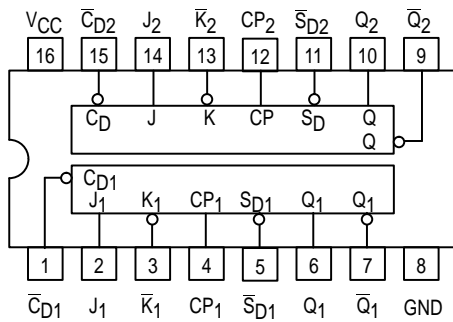




# DUAL JK̄ POSITIVE EDGE-TRIGGERED FLIP-FLOP

The MC54/74F109 consists of two high-speed, completely independent transition clocked JK̄ flip-flops. The clocking operation is independent of rise and fall times of the clock waveform. The JK̄ design allows operation as a D flip-flop (refer to F74 data sheet) by connecting the J and K̄ inputs together.

## CONNECTION DIAGRAM



## FUNCTION TABLE (Each Half)

| Input   |    | Output      |    |
|---------|----|-------------|----|
| @ $t_n$ |    | @ $t_n + 1$ |    |
| J       | K̄ | Q           | Q̄ |
| L       | H  | No Change   |    |
| L       | L  | L           | H  |
| H       | H  | H           | L  |
| H       | L  | Toggles     |    |

Asynchronous Inputs:

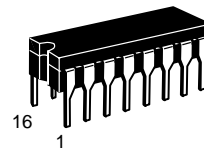
- LOW Input to  $\bar{S}_D$  sets Q to HIGH level
- LOW Input to  $\bar{C}_D$  sets Q to LOW level
- Clear and Set are independent of clock
- Simultaneous LOW on  $\bar{C}_D$  and  $\bar{S}_D$  makes both Q and  $\bar{Q}$  HIGH

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 $t_n$  = Bit time before clock pulse  
 $t_n + 1$  = Bit time after clock pulse

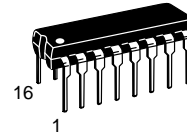
## MC54/74F109

### DUAL JK̄ POSITIVE EDGE-TRIGGERED FLIP-FLOP

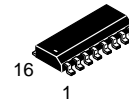
FAST™ SCHOTTKY TTL



**J SUFFIX**  
 CERAMIC  
 CASE 620-09



**N SUFFIX**  
 PLASTIC  
 CASE 648-08

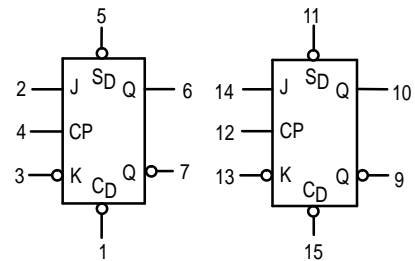


**D SUFFIX**  
 SOIC  
 CASE 751B-03

## ORDERING INFORMATION

MC54FXXXJ Ceramic  
 MC74FXXXN Plastic  
 MC74FXXXD SOIC

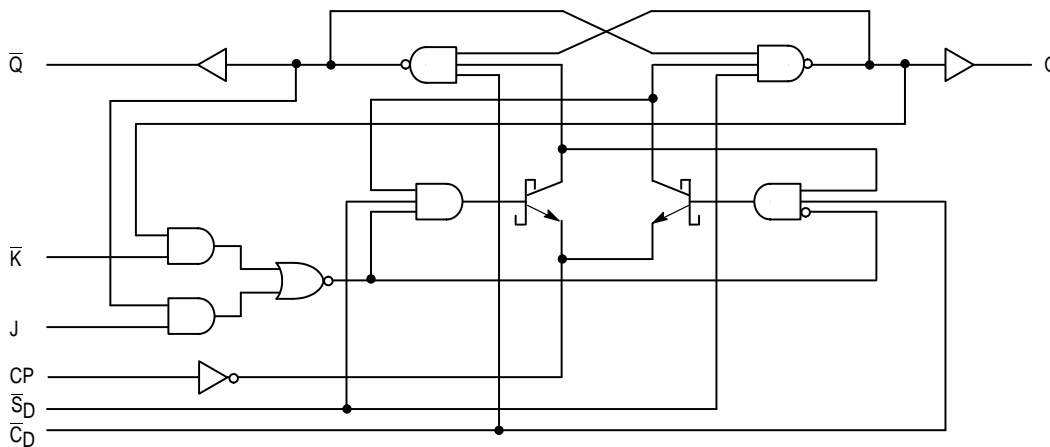
## LOGIC SYMBOL



VCC = PIN 16  
 GND = PIN 8

# MC54/74F109

LOGIC DIAGRAM (one half shown)



NOTE:  
This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## GUARANTEED OPERATING RANGES

| Symbol          | Parameter                           |        | Min | Typ | Max  | Unit |
|-----------------|-------------------------------------|--------|-----|-----|------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54, 74 | 4.5 | 5.0 | 5.5  | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54     | -55 | 25  | 125  | °C   |
|                 |                                     | 74     | 0   | 25  | 70   |      |
| I <sub>OH</sub> | Output Current — High               | 54, 74 |     |     | -1.0 | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54, 74 |     |     | 20   | mA   |

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol          | Parameter   | Limits |      |      | Unit | Test Conditions               |                          |
|-----------------|---|--------|------|------|------|-------------------------------|--------------------------|
|                 |   | Min    | Typ  | Max  |      |                               |                          |
| V <sub>IH</sub> | Input HIGH Voltage  | 2.0    |      |      | V    | Guaranteed Input HIGH Voltage |                          |
| V <sub>IL</sub> | Input LOW Voltage   |        |      | 0.8  | V    | Guaranteed Input LOW Voltage  |                          |
| V <sub>IK</sub> | Input Clamp Diode Voltage   |        |      | -1.2 | V    | I <sub>IN</sub> = -18 mA      | V <sub>CC</sub> = MIN    |
| V <sub>OH</sub> | Output HIGH Voltage   | 54, 74 | 2.5  | 3.4  | V    | I <sub>OH</sub> = -1.0 mA     | V <sub>CC</sub> = 4.50 V |
|                 |   | 74     | 2.7  | 3.4  | V    | I <sub>OH</sub> = -1.0 mA     | V <sub>CC</sub> = 4.75 V |
| V <sub>OL</sub> | Output LOW Voltage  |        | 0.35 | 0.5  | V    | I <sub>OL</sub> = 20 mA       | V <sub>CC</sub> = MIN    |
| I <sub>IH</sub> | Input HIGH Current  |        |      | 20   | μA   | V <sub>IN</sub> = 2.7 V       | V <sub>CC</sub> = MAX    |
|                 |   |        |      | 100  | μA   | V <sub>IN</sub> = 7.0 V       |                          |
| I <sub>IL</sub> | Input LOW Current<br>(J, K and CP Inputs)<br>(C <sub>D</sub> and S <sub>D</sub> Inputs) |        |      | -0.6 | mA   | V <sub>IN</sub> = 0.5 V       | V <sub>CC</sub> = MAX    |
|                 |   |        |      | -1.8 | mA   |                               |                          |
| I <sub>OS</sub> | Output Short Circuit Current (Note 2)   | -60    |      | -150 | mA   | V <sub>OUT</sub> = 0 V        | V <sub>CC</sub> = MAX    |
| I <sub>CC</sub> | Power Supply Current  |        | 11.7 | 17   | mA   | V <sub>CP</sub> = 0 V         | V <sub>CC</sub> = MAX    |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.
- Not more than one output should be shorted at a time, nor for more than 1 second.

# MC54/74F109

## AC CHARACTERISTICS

| Symbol           | Parameter   | 54/74F   |     |     | 54F   |      | 74F  |      | Unit |
|------------------|---|--|-----|-----|---|------|--|------|------|
|                  |   | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0 V<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = 5.0 V ± 10%<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = 5.0 V ± 10%<br>C <sub>L</sub> = 50 pF |      |      |
|                  |   | Min  | Typ | Max | Min   | Max  | Min  | Max  |      |
| f <sub>max</sub> | Maximum Clock Frequency   | 100  | 125 |     | 70  |      | 90   |      | MHz  |
| t <sub>PLH</sub> | Propagation Delay   | 3.8  | 5.3 | 7.0 | 3.8   | 9.0  | 3.8  | 8.0  | ns   |
| t <sub>PHL</sub> | CP <sub>n</sub> to Q <sub>n</sub> or $\bar{Q}_n$                  | 4.4  | 6.2 | 8.0 | 4.4   | 10.5 | 4.4  | 9.2  |      |
| t <sub>PLH</sub> | Propagation Delay   | 2.5  | 5.2 | 7.0 | 2.5   | 9.0  | 2.5  | 8.0  | ns   |
| t <sub>PHL</sub> | $\bar{C}_{Dn}$ or $\bar{S}_{Dn}$ to Q <sub>n</sub> or $\bar{Q}_n$ | 3.5  | 7.0 | 9.0 | 3.5   | 11.5 | 3.5  | 10.5 |      |

## AC OPERATING REQUIREMENTS

| Symbol             | Parameter   | 54/74F   |     |     | 54F   |     | 74F  |     | Unit |
|--------------------|---|--|-----|-----|---|-----|--|-----|------|
|                    |   | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0 V |     |     | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = 5.0 V ± 10% |     | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = 5.0 V ± 10% |     |      |
|                    |   | Min  | Typ | Max | Min   | Max | Min  | Max |      |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW                                 | 3.0  |     |     | 3.0   |     | 3.0  |     | ns   |
| t <sub>S</sub> (L) | J <sub>n</sub> or $\bar{K}_n$ to CP <sub>n</sub>        | 3.0  |     |     | 3.0   |     | 3.0  |     |      |
| t <sub>H</sub> (H) | Hold Time, HIGH or LOW                                  | 1.0  |     |     | 1.0   |     | 1.0  |     |      |
| t <sub>H</sub> (L) | J <sub>n</sub> or $\bar{K}_n$ to CP <sub>n</sub>        | 1.0  |     |     | 1.0   |     | 1.0  |     | ns   |
| t <sub>w</sub> (H) | CP <sub>n</sub> Pulse Width, HIGH                       | 4.0  |     |     | 4.0   |     | 4.0  |     |      |
| t <sub>w</sub> (L) | or LOW  | 5.0  |     |     | 5.0   |     | 5.0  |     |      |
| t <sub>w</sub> (L) | $\bar{C}_{Dn}$ or $\bar{S}_{Dn}$ Pulse Width, LOW       | 4.0  |     |     | 4.0   |     | 4.0  |     | ns   |
| t <sub>rec</sub>   | Recovery Time<br>$\bar{C}_{Dn}$ or $\bar{S}_{Dn}$ to CP | 2.0  |     |     | 2.0   |     | 2.0  |     | ns   |