

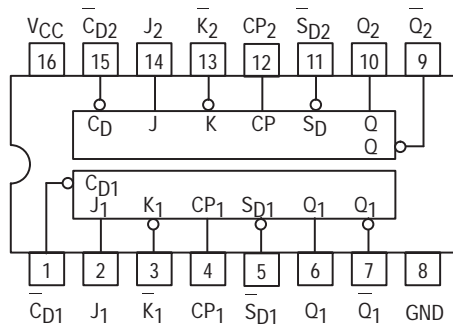


MOTOROLA

DUAL JK POSITIVE EDGE-TRIGGERED FLIP-FLOP

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

CONNECTION DIAGRAM



FUNCTION TABLE (Each Half)

| Input | | Output | |
|------------------|---|----------------------|-----------|
| @ t _n | | @ t _n + 1 | |
| J | K | Q | \bar{Q} |
| 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

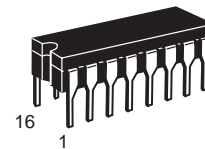
t_n = Bit time before clock pulse

t_n + 1 = Bit time after clock pulse

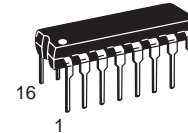
MC54/74F109

**DUAL JK POSITIVE
EDGE-TRIGGERED FLIP-FLOP**

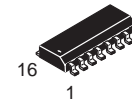
FAST™ SCHOTTKY TTL



J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08

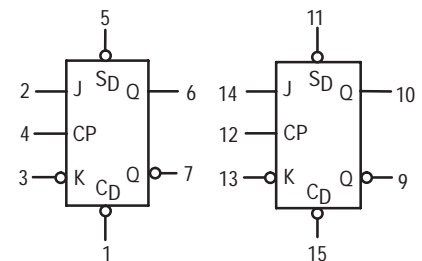


D SUFFIX
SOIC
CASE 751B-03

ORDERING INFORMATION

MC54FXXXJ Ceramic
 MC74FXXXN Plastic
 MC74FXXXD SOIC

LOGIC SYMBOL



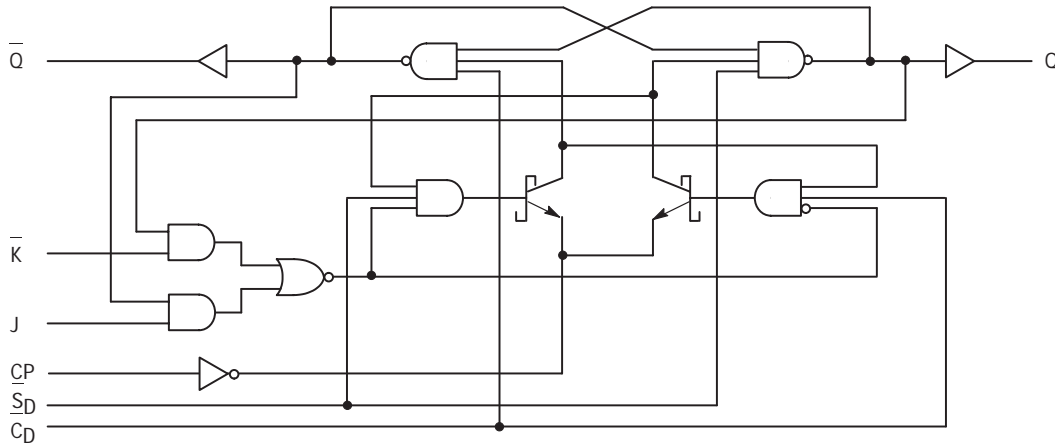
VCC = PIN 16
 GND = PIN 8

LIFETIME BUY

LAST SHIP 30/09/99
 LAST ORDER 31/03/99

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 _{CC} | Supply Voltage | 54, 74 | 4.5 | 5.0 | 5.5 | V |
| T _A | Operating Ambient Temperature Range | 54 | -55 | 25 | 125 | °C |
| | | 54 | 0 | 25 | 70 | |
| I _{OH} | Output Current — High | 54, 74 | | | -1.0 | mA |
| I _{OL} | 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 _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage | |
| V _{IL} | Input LOW Voltage | | | 0.8 | V | Guaranteed Input LOW Voltage | |
| V _{IK} | Input Clamp Diode Voltage | | | -1.2 | V | I _{IN} = -18 mA | V _{CC} = MIN |
| V _{OH} | Output HIGH Voltage | 54, 74 | 2.5 | 3.4 | V | I _{OH} = -1.0 mA | V _{CC} = 4.50 V |
| | | 74 | 2.7 | 3.4 | V | I _{OH} = -1.0 mA | V _{CC} = 4.75 V |
| V _{OL} | Output LOW Voltage | | 0.35 | 0.5 | V | I _{OL} = 20 mA | V _{CC} = MIN |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{IN} = 2.7 V | V _{CC} = MAX |
| | | | | 100 | μA | V _{IN} = 7.0 V | |
| I _{IL} | Input LOW Current (J, K and CP Inputs) (C _D and S _D Inputs) | | | -0.6 | mA | V _{IN} = 0.5 V | V _{CC} = MAX |
| | | | | -1.8 | mA | | |
| I _{OS} | Output Short Circuit Current (Note 2) | -60 | | -150 | mA | V _{OUT} = 0 V | V _{CC} = MAX |
| I _{CC} | Power Supply Current | | 11.7 | 17 | mA | V _{CP} = 0 V | V _{CC} = 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 _A = +25°C V _{CC} = +5.0 V C _L = 50 pF | | | T _A = −55°C to +125°C V _{CC} = 5.0 V ± 10% C _L = 50 pF | | T _A = 0°C to +70°C V _{CC} = 5.0 V ± 10% C _L = 50 pF | | |
| | | Min | Typ | Max | Min | Max | Min | Max | |
| f _{max} | Maximum Clock Frequency | 100 | 125 | | 70 | | 90 | | MHz |
| t _{PLH} | Propagation Delay | 3.8 | 5.3 | 7.0 | 3.8 | 9.0 | 3.8 | 8.0 | ns |
| t _{PHL} | CP _n to Q _n or Q̄ _n | 4.4 | 6.2 | 8.0 | 4.4 | 10.5 | 4.4 | 9.2 | |
| t _{PLH} | Propagation Delay | 2.5 | 5.2 | 7.0 | 2.5 | 9.0 | 2.5 | 8.0 | ns |
| t _{PHL} | C̄D _n or S̄D _n to Q _n or Q̄ _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 _A = +25°C V _{CC} = +5.0 V | | | T _A = −55°C to +125°C V _{CC} = 5.0 V ± 10% | | T _A = 0°C to +70°C V _{CC} = 5.0 V ± 10% | | |
| | | Min | Typ | Max | Min | Max | Min | Max | |
| t _S (H) | Setup Time, HIGH or LOW | 3.0 | | | 3.0 | | 3.0 | | ns |
| t _S (L) | J _N or \overline{K}_N to CP _N | 3.0 | | | 3.0 | | 3.0 | | |
| t _H (H) | Hold Time, HIGH or LOW | 1.0 | | | 1.0 | | 1.0 | | |
| t _H (L) | J _N or \overline{K}_N to CP _N | 1.0 | | | 1.0 | | 1.0 | | |
| t _W (H) | CP _N Pulse Width, HIGH | 4.0 | | | 4.0 | | 4.0 | | ns |
| t _W (L) | or LOW | 5.0 | | | 5.0 | | 5.0 | | |
| t _W (L) | C _{DN} or S _{DN} Pulse Width, LOW | 4.0 | | | 4.0 | | 4.0 | | ns |
| t _{rec} | <u>Recovery</u> Time C _{DN} or S _{DN} to CP | 2.0 | | | 2.0 | | 2.0 | | ns |

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