



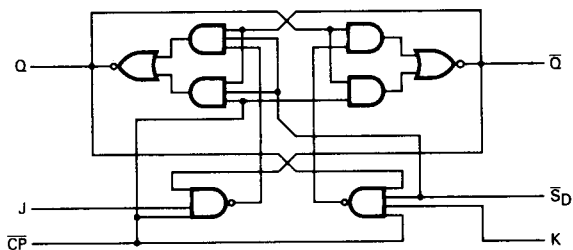
**MOTOROLA**

## Product Preview

### DUAL JK NEGATIVE EDGE-TRIGGERED FLIP-FLOP

**DESCRIPTION** — MC54F/74F113 offers individual J, K, Set and Clock inputs. When the clock goes HIGH the inputs are enabled and data may be entered. The logic level of the J and K inputs may be changed when the clock pulse is in either state and the bistable will perform according to the Truth Table as long as minimum setup and hold times are observed. Input data is transferred to the outputs on the falling edge of the clock pulse.

LOGIC DIAGRAM (one half shown)



TRUTH TABLE

INPUTS		OUTPUT
J	K	Q
L	L	$Q_n$
L	H	L
H	L	H
H	H	$\bar{Q}_n$

Asynchronous Inputs:  
LOW input to  $\bar{S}_D$  sets Q to HIGH level  
Set is independent of clock

$t_n$  = Bit time before clock pulse  
 $t_{n-1}$  = Bit time after clock pulse  
H = HIGH Voltage Level  
L = LOW Voltage Level

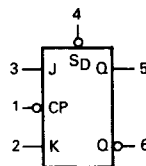
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## MC54F/74F113

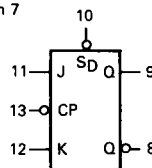
### DUAL JK EDGE-TRIGGERED FLIP-FLOP

FAST™ SCHOTTKY TTL

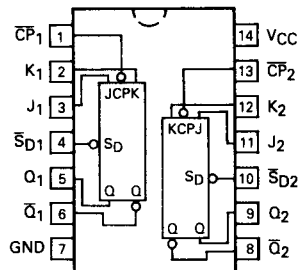
LOGIC SYMBOL



VCC = Pin 14  
GND = Pin 7



CONNECTION DIAGRAM



J Suffix — Case 632-08  
(Ceramic)  
N Suffix — Case 646-06  
(Plastic)  
D Suffix — Case 751A-02  
(SOIC)

# MC54F/74F113

## GUARANTEED OPERATING RANGES

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
V <sub>CC</sub>	Supply Voltage*	54, 74	4.50	5.0	5.50	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

\*74F devices may be operated over the 4.5 to 5.5 V supply range where they will meet the specifications of 54F devices over the 0° to 70°C temperature range.

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

SYMBOL	PARAMETER	LIMITS			UNITS	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> = 4.5 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>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V
				100	μA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V
I <sub>IL</sub>	Input LOW Current (J and K Inputs) ( $\overline{C_P}$ Inputs) ( $\overline{C_D}$ and $\overline{S_D}$ Inputs)			-0.6	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.5 V
				-2.4	mA	
				-3.0	mA	
I <sub>OS</sub>	Output Short Circuit Current (Note 2)	-60		-150	mA	V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0 V
I <sub>CC</sub>	Power Supply Current		12	19	mA	V <sub>CC</sub> = MAX, V <sub>CP</sub> = 0 V

### NOTES:

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

## AC CHARACTERISTICS

SYMBOL	PARAMETER	54/74F		54F		74F		UNITS
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0 V C <sub>L</sub> = 50 pF		T <sub>A</sub> = -55 to +125°C V <sub>CC</sub> = 5.0 V ± 10% C <sub>L</sub> = 50 pF		T <sub>A</sub> = 0 to +70°C V <sub>CC</sub> = 5.0 V ± 10% C <sub>L</sub> = 50 pF		
		MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>	Maximum Clock Frequency	110						MHz
t <sub>PLH</sub>	Propagation Delay $\overline{C_P}$ to Q <sub>n</sub> or $\overline{Q_n}$	2.0	6.0			2.0	7.0	ns
t <sub>PLH</sub>	Propagation Delay $\overline{S_D}$ to Q <sub>n</sub> or $\overline{Q_n}$	2.0	6.5			2.0	7.5	ns
t <sub>PHL</sub>	Propagation Delay $\overline{C_P}$ to Q <sub>n</sub> or $\overline{Q_n}$	2.0	6.0			2.0	7.0	ns
t <sub>PHL</sub>	Propagation Delay $\overline{S_D}$ to Q <sub>n</sub> or $\overline{Q_n}$	2.0	6.5			2.0	7.5	ns

AC OPERATING REQUIREMENTS

SYMBOL	PARAMETER	54/74F			54F		74F		UNITS
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0 V			T <sub>A</sub> = -55 to +125°C V <sub>CC</sub> = 5.0 V ±10%		T <sub>A</sub> = 0 to +70°C V <sub>CC</sub> = 5.0 V ±10%		
		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>s</sub> (H)	Set up Time, HIGH or LOW	4.0					4.0		ns
t <sub>s</sub> (L)	J <sub>n</sub> or K <sub>n</sub> to $\overline{CP}_n$	3.0					3.0		
t <sub>h</sub> (H)	Hold Time, HIGH or LOW	0					0		ns
t <sub>h</sub> (L)	J <sub>n</sub> or K <sub>n</sub> to $\overline{CP}_n$	0					0		
t <sub>w</sub> (H)	$\overline{CP}_n$ Pulse Width, HIGH or LOW	4.5					4.5		ns
t <sub>w</sub> (L)		4.5					4.5		
t <sub>w</sub> (L)	$\overline{SD}_n$ Pulse Width LOW	4.5					4.5		ns
t <sub>rec</sub>	Recovery Time $\overline{SD}_n$ to $\overline{CP}$	4.0					5.0		ns

AC TEST CIRCUIT

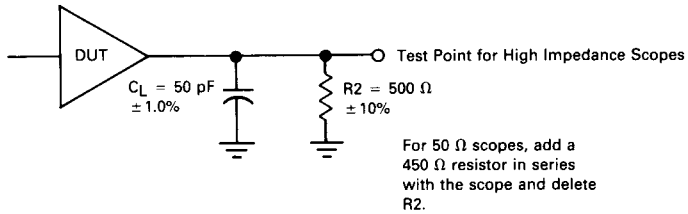


Fig. 1