

## MM74C73

### Dual J-K Flip-Flops with Clear and Preset

#### General Description

The MM74C73 dual J-K flip-flops are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement transistors. Each flip-flop has independent J, K, clock and clear inputs and Q and  $\bar{Q}$  outputs. This flip-flop is edge sensitive to the clock input and change state on the negative going transition of the clock pulse. Clear or preset is independent of the clock and is accomplished by a low level on the respective input.

#### Features

- Supply voltage range: 3V to 15V
- Tenth power TTL compatible: Drive 2 LPTTL loads
- High noise immunity:  $0.45 V_{CC}$  (typ.)
- Low power: 50 nW (typ.)
- Medium speed operation: 10 MHz (typ.)

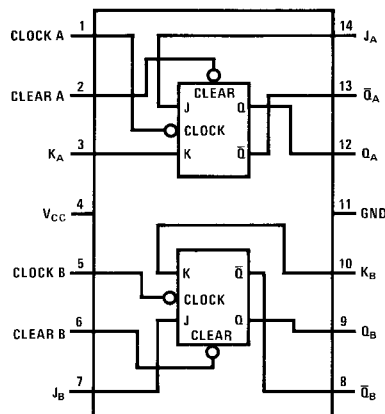
#### Applications

- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm systems
- Industrial electronics
- Remote metering
- Computers

#### Ordering Code:

Order Number	Package Number	Package Description
MM74C73N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

#### Connection Diagram



Note: A logic "0" on clear sets Q to logic "0".

Top View

#### Truth Table

$t_n$		$t_{n+1}$
J	K	Q
0	0	$Q_n$
0	1	0
1	0	1
1	1	$\bar{Q}_n$

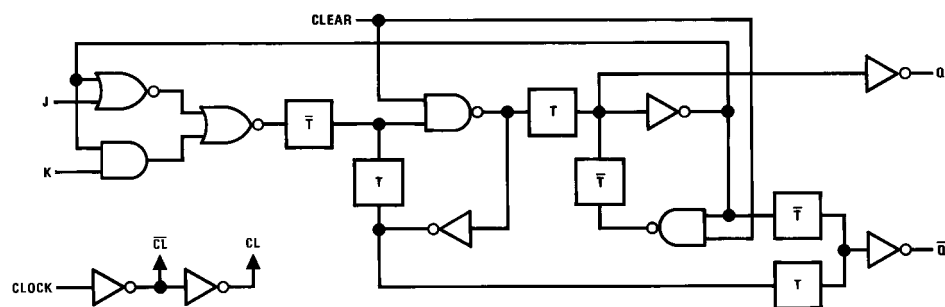
Preset	Clear	$Q_n$	$\bar{Q}_n$
0	0	0	0
0	1	1	0
1	0	0	1
1	1	$Q_n$	$\bar{Q}_n$
		(Note 1)	(Note 1)

$t_n$  = bit time before clock pulse

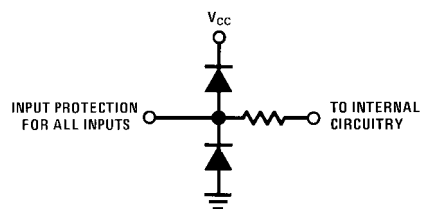
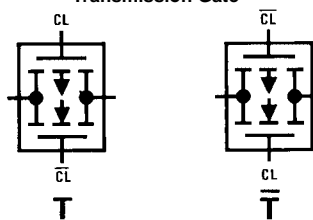
$t_{n+1}$  = bit time after clock pulse

Note 1: No change in output from previous state

## Logic Diagrams



Transmission Gate



**Absolute Maximum Ratings**(Note 2)

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	-55°C to +125°C
Storage Temperature	-65°C to +150°C
Power Dissipation	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature	
(Soldering, 10 seconds)	260°C
Operating $V_{CC}$ Range	+3V to 15V
$V_{CC}$ (Max)	18V

**Note 2:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of Electrical Characteristics provides conditions for actual device operation.

**DC Electrical Characteristics**

Min/Max limits apply across temperature range unless otherwise noted

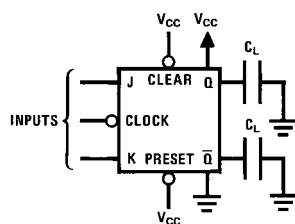
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$	3.5			V
		$V_{CC} = 10V$	8			
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$			1.5	V
		$V_{CC} = 10V$			2	
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V$	4.5			V
		$V_{CC} = 10V$	9			
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V$			0.5	V
		$V_{CC} = 10V$			1	
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V$			1	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V$	-1			$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.050	60	$\mu A$
<b>LOW POWER TTL TO CMOS INTERFACE</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 4.75V, I_O = -360 \mu A$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 4.75V, I_O = 360 \mu A$			0.4	V
<b>OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)</b>						
$I_{SOURCE}$	Output Source Current	$V_{CC} = 5V, V_{IN(0)} = 0V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-1.75			mA
$I_{SOURCE}$	Output Source Current	$V_{CC} = 10V, V_{IN(0)} = 0V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-8			mA
$I_{SINK}$	Output Sink Current	$V_{CC} = 5V, V_{IN(1)} = 5V$ $T_A = 25^\circ C, V_{OUT} = V_{CC}$	1.75			mA
$I_{SINK}$	Output Sink Current	$V_{CC} = 10V, V_{IN(1)} = 10V$ $T_A = 25^\circ C, V_{OUT} = V_{CC}$	8			mA

**AC Electrical Characteristics** (Note 3) $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise noted

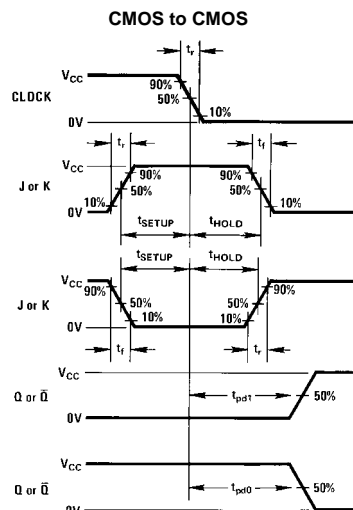
Symbol	Parameter	Conditions	Min	Typ	Max	Units
$C_{IN}$	Input Capacitance	Any Input		5		pF
$t_{pd0}, t_{pd1}$	Propagation Delay Time to a Logical "0" or Logical "1" from Clock to Q or $\bar{Q}$	$V_{CC} = 5V$ $V_{CC} = 10V$		180 70	300 110	ns
$t_{pd0}$	Propagation Delay Time to a Logical "0" from Preset or Clear	$V_{CC} = 5V$ $V_{CC} = 10V$		200 80	300 130	ns
$t_{pd}$	Propagation Delay Time to a Logical "1" from Preset or Clear	$V_{CC} = 5V$ $V_{CC} = 10V$		200 80	300 130	ns
$t_S$	Time Prior to Clock Pulse that Data must be Present	$V_{CC} = 5V$ $V_{CC} = 10V$		110 45	175 70	ns
$t_H$	Time after Clock Pulse that J and K must be Held	$V_{CC} = 5V$ $V_{CC} = 10V$		-40 -20	0 0	ns
$t_{PW}$	Minimum Clock Pulse Width $t_{WL} = t_{WH}$	$V_{CC} = 5V$ $V_{CC} = 10V$		120 50	190 80	ns
$t_{PW}$	Minimum Preset and Clear Pulse Width	$V_{CC} = 5V$ $V_{CC} = 10V$		90 40	130 60	ns
$t_{MAX}$	Maximum Toggle Frequency	$V_{CC} = 5V$ $V_{CC} = 10V$	2.5 7	4 11		MHz
$t_r, t_f$	Clock Pulse Rise and Fall Time	$V_{CC} = 5V$ $V_{CC} = 10V$			15 5	$\mu\text{s}$

**Note 3:** AC Parameters are guaranteed by DC correlated testing.

## AC Test Circuit



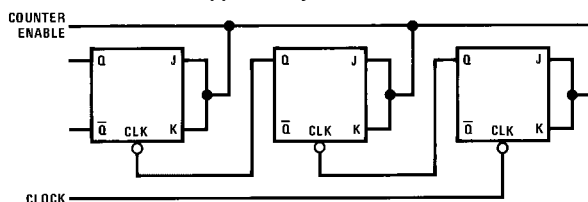
## Switching Time Waveforms



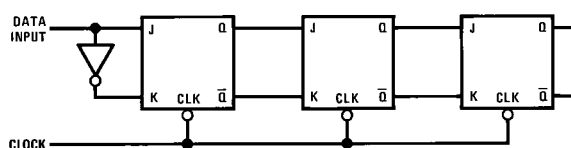
$t_r = t_f = 20 \text{ ns}$

## Typical Applications

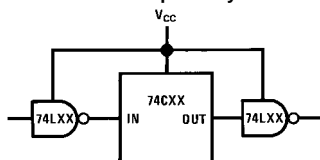
### Ripple Binary Counters



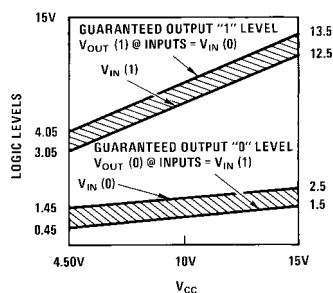
### Shift Registers



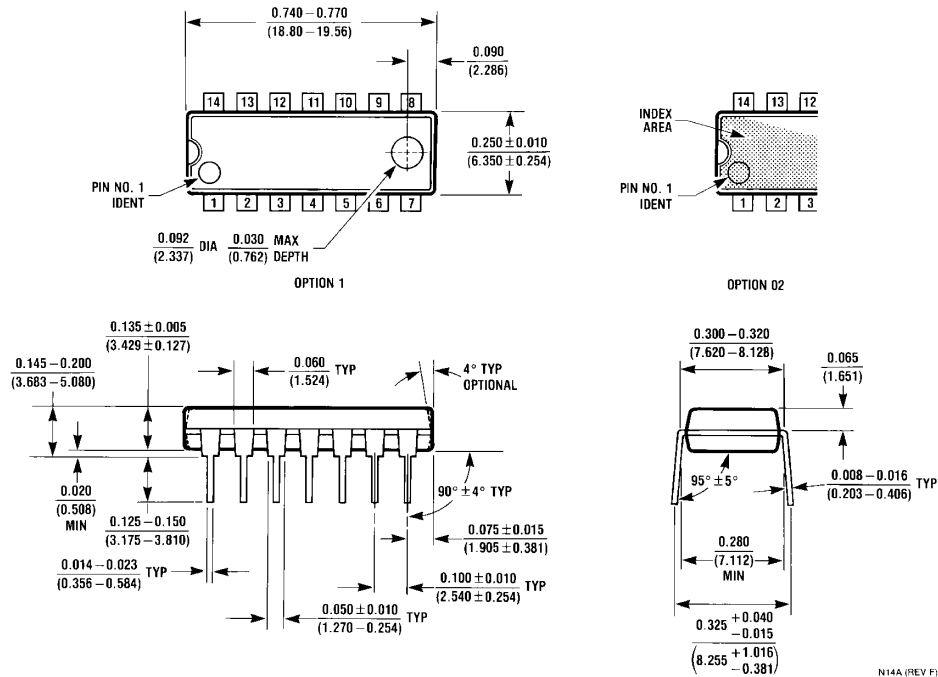
### 74C Compatibility



### Guaranteed Noise Margin as a Function of $V_{CC}$



## Physical Dimensions inches (millimeters) unless otherwise noted



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