February 1988

# MM54C74/MM74C74 Dual D Flip-Flop

### **General Description**

The MM54C74/MM74C74 dual D flip-flop is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. Each flipflop has independent data, preset, clear and clock inputs and Q and  $\overline{\mathbf{Q}}$  outputs. The logic level present at the data input is transferred to the output during the positive going transition of the clock pulse. Preset or clear is independent of the clock and accomplished by a low level at the preset or clear input.

#### **Features**

- Supply voltage range
- Tenth power TTL compatible
- High noise immunity
- Drive 2 LPT<sup>2</sup>L loads  $0.45\ V_{CC}\ (typ.)$

3V to 15V

■ Low power

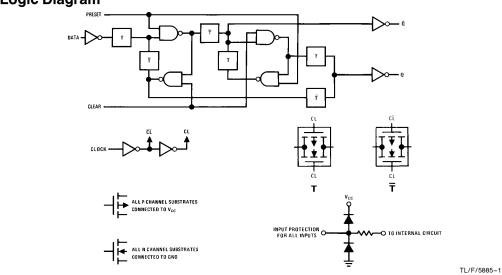
■ Medium speed operation

50 nW (typ.) 10 MHz (typ.) with 10V supply

#### **Applications**

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

#### **Logic Diagram**



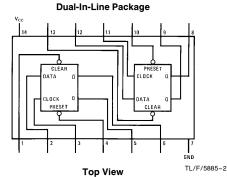
### **Truth Table**

Preset	Clear	Qn	Q <sub>n</sub>
			11
0	0	0	0
0	1	1	0
1	0	0	1
1	1	*Qn	∗Q <sub>n</sub>

\*No change in output from previous state.

Order Number MM54C74 or MM74C74

## **Connection Diagram**



Note: A logic "0" on clear sets Q to logic "0". A logic "0" on preset sets Q to logic "1".

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#### **Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at Any Pin (Note 1)  $$-0.3\mbox{V}$ to \mbox{V}_{\mbox{CC}}$ +0.3\mbox{V}$ 

Operating Temperature Range MM54C74

Storage Temperature Range  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ 

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

## DC Electrical Characteristics Min/Max limits apply across temperature range unless otherwise specified

Symbol	Parameter	Conditions	Min	Тур	Max	Units
CMOS TO CN	108					
V <sub>IN(1)</sub> Logical "1" Inp	Logical "1" Input Voltage	$V_{CC} = 5V$	3.5			V
		V <sub>CC</sub> = 10V	80			V
V <sub>IN(0)</sub> Logical "0" Inp	Logical "0" Input Voltage	V <sub>CC</sub> = 5V			1.5	V
		V <sub>CC</sub> = 10V			2.0	V
V <sub>OUT(1)</sub> Logical "1"	Logical "1" Output Voltage	V <sub>CC</sub> = 5V	4.5			V
		V <sub>CC</sub> = 10V	9.0			V
V <sub>OUT(0)</sub>	Logical "0" Output Voltage	V <sub>CC</sub> = 5V			0.5	V
		V <sub>CC</sub> = 10V			1.0	V
I <sub>IN(1)</sub>	Logical "1" Input Current	V <sub>CC</sub> = 15V			1.0	μΑ
I <sub>IN(0)</sub>	Logical "0" Input Current	V <sub>CC</sub> = 15V	-1.0			μΑ
Icc	Supply Current	V <sub>CC</sub> = 15V		0.05	60	μΑ
MOS/LPTTI	L INTERFACE					
V <sub>IN(1)</sub>	Logical "1" Input Voltage	54C, V <sub>CC</sub> = 4.5V 74C, V <sub>CC</sub> = 4.75V	V <sub>CC</sub> -1.5			
V <sub>IN(0)</sub>	Logical "0" Input Voltage	54C, V <sub>CC</sub> = 4.75V 74C, V <sub>CC</sub> = 4.75V			0.8	V
V <sub>OUT(1)</sub>	Logical "1" Output Voltage	54C, $V_{CC} = 4.5V$ , $I_D = -360 \mu A$ 74C, $V_{CC} = 4.75V$ , $I_D = -360 \mu A$	2.4			V
V <sub>OUT(0)</sub>	Logical "0" Output Voltage	$54$ C, $V_{CC} = 4.5$ V, $I_D = 360$ $\mu$ A $74$ C, $V_{CC} = 4.75$ V, $I_D = 360$ $\mu$ A			0.4	٧
OUTPUT DRI	VE (See 54C/74C Family Chara	cteristics Data Sheet)				
Isource	Output Source Current	$V_{CC} = 5V, V_{IN(0)} = 0V$ $T_A = 25^{\circ}C, V_{OUT} = 0V$	-1.75			mA
Isource	Output Source Current	$V_{CC} = 10V, V_{IN(0)} = 0V$ $T_A = 25^{\circ}C, V_{OUT} = 0V$	-8.0			mA
I <sub>SINK</sub>	Output Sink Current	$V_{CC} = 5V, V_{IN(1)} = 5V$ $T_A = 25^{\circ}C, V_{OUT} = V_{CC}$	1.75			mA
I <sub>SINK</sub>	Output Sink Current	$V_{CC} = 10V, V_{IN(1)} = 10V$ $T_A = 25^{\circ}C, V_{OUT} = V_{CC}$	8.0			mA

Note 1: "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.

Symbol	Parameter	Conditions	Min	Тур	Max	Units
C <sub>IN</sub>	Input Capacitance	Any Input (Note 2)		5.0		pF
t <sub>pd</sub>	Propagation Delay Time to a Logical "0" $t_{pd0}$ or Logical "1" $t_{pd1}$ from Clock to Q or $\overline{Q}$	$V_{CC} = 5V$ $V_{CC} = 10V$		180 70	300 110	ns ns
t <sub>pd</sub>	Propagation Delay Time to a Logical "0" from Preset or Clear	$V_{CC} = 5V$ $V_{CC} = 10V$		180 70	300 110	ns ns
t <sub>pd</sub>	Propagation Delay Time to a Logical "1" from Preset or Clear	$V_{CC} = 5V$ $V_{CC} = 10V$		250 100	400 150	ns ns
t <sub>S0</sub> , t <sub>S1</sub>	Time Prior to Clock Pulse that Data Must be Present t <sub>SETUP</sub>	$V_{CC} = 5V$ $V_{CC} = 10V$	100 40	50 20		ns ns
$t_{H0}$ , $t_{H1}$	Time after Clock Pulse that Data Must be Held	$V_{CC} = 5V$ $V_{CC} = 10V$		-20 -8.0	0 0	ns ns
t <sub>PW1</sub>	Minimum Clock Pulse Width ( $t_{WL} = t_{WH}$ )	$V_{CC} = 5V$ $V_{CC} = 10V$		100 40	250 100	ns ns
t <sub>PW2</sub>	Minimum Preset and Clear Pulse Width	$V_{CC} = 5V$ $V_{CC} = 10V$		100 40	160 70	ns ns
t <sub>r</sub> , t <sub>f</sub>	Maximum Clock Rise and Fall Time	$V_{CC} = 5V$ $V_{CC} = 10V$	15.0 5.0			μs μs
f <sub>MAX</sub>	Maximum Clock Frequency	$V_{CC} = 5V$ $V_{CC} = 10V$	2.0 5.0	3.5 8.0		MHz MHz
C <sub>PD</sub>	Power Dissipation Capacitance	(Note 3)		40		pF

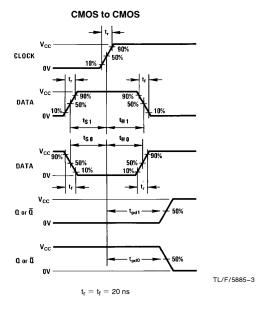
 $<sup>^*\</sup>mbox{AC}$  Parameters are guaranteed by DC correlated testing.

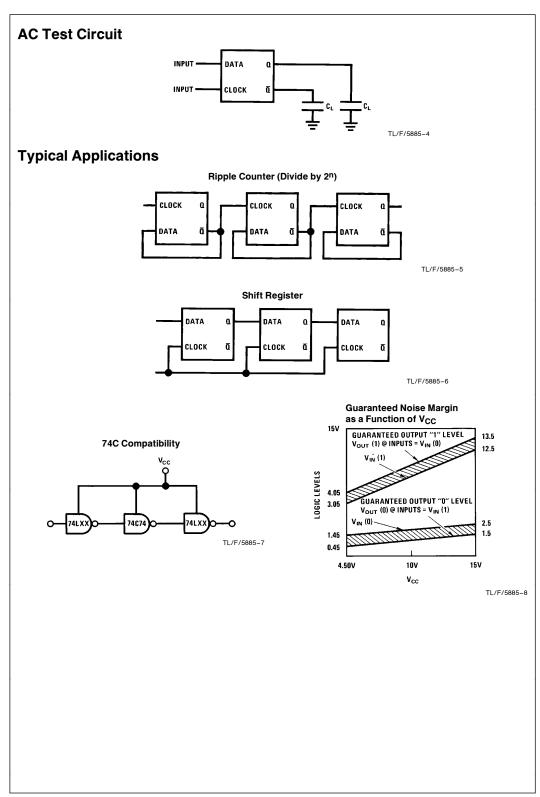
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

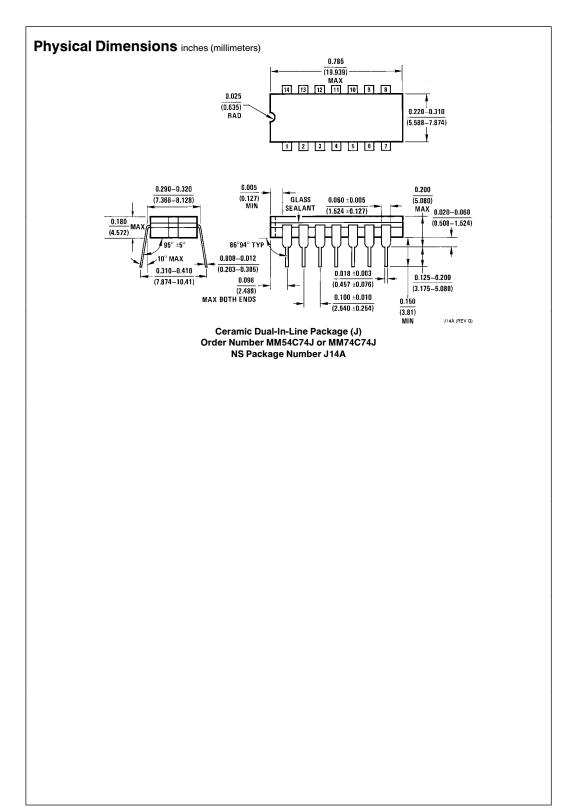
Note 2: Capacitance is guaranteed by periodic testing.

Note 3: C<sub>PD</sub> determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family Characteristics Application Note—AN-90.

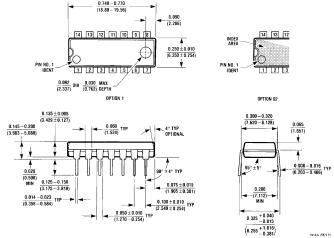
# **Switching Time Waveform**







## Physical Dimensions inches (millimeters) (Continued)



Ceramic Dual-In-Line Package (J) Order Number MM54C74N or MM74C74N NS Package Number N14A

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