

## MM74C174 Hex D-Type Flip-Flop

### General Description

The MM74C174 hex D-type flip-flop is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. All have a direct clear input. Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clear is independent of clock and accomplished by a low level at the clear input. All inputs are protected by diodes to  $V_{CC}$  and GND.

### Features

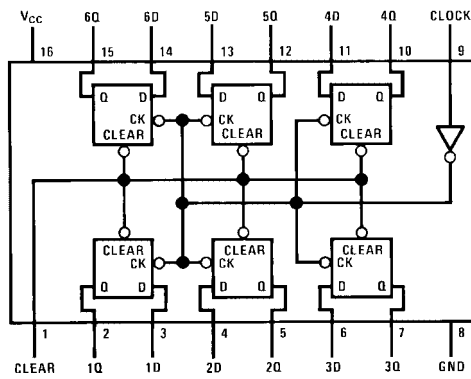
- Wide supply voltage range: 3.0V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity:  $0.45 V_{CC}$  (typ.)
- Low power TTL compatibility:  
Fan out of 2 driving 74L

### Ordering Code:

Order Number	Package Number	Package Description
MM74C174M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
MM74C174N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

### Connection Diagram

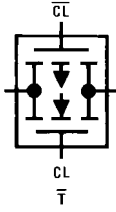
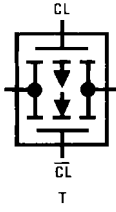
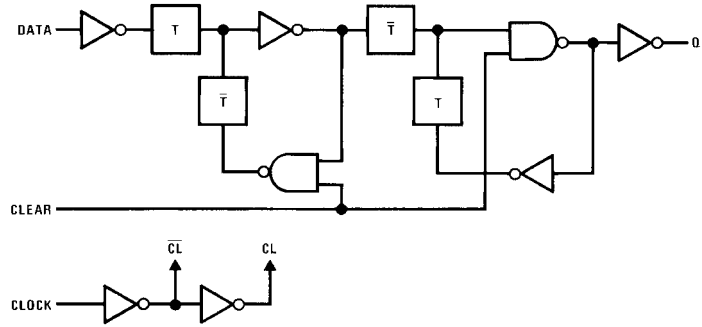


Top View

### Truth Table

Clear	Inputs		Output
	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q

Logic Diagrams



**Absolute Maximum Ratings**(Note 1)

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C
Power Dissipation ( $P_D$ )	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating $V_{CC}$ Range	3.0V to 15V
Absolute Maximum $V_{CC}$	18V
Lead Temperature	
(Soldering, 10 seconds)	260°C

**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 Electrical Characteristics table provides conditions for actual device operation.

**DC Electrical Characteristics**

Min/Max limits apply across temperature range unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$	3.5 8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$			1.5 2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V, I_O = -10 \mu A$ $V_{CC} = 10V, I_O = -10 \mu A$	4.5 9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V, I_O = 10 \mu A$ $V_{CC} = 10V, I_O = 10 \mu A$			0.5 1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V, V_{IN} = 15V$		0.005	1.0	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = 0V$	-1.0	-0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.05	300	$\mu A$
<b>CMOS/LPTTL 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 (P-Channel)	$V_{CC} = 5V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-1.75	-3.3		mA
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 10V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-8.0	-15		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5V$ $T_A = 25^\circ C, V_{OUT} = 0V$	1.75	3.6		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5V$ $T_A = 25^\circ C, V_{OUT} = 0V$	8.0	16		mA

## AC Electrical Characteristics (Note 2)

$T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise noted

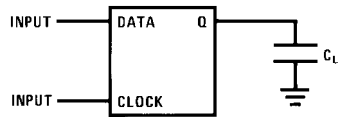
Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd}$	Propagation Delay Time to a Logical "0" or Logical "1" from Clock to Q	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		150 70	300 110	ns
$t_{pd}$	Propagation Delay Time to a Logical "0" from Clear	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		110 50	300 110	ns
$t_{S1}$ , $t_{S0}$	Time Prior to Clock Pulse that Data Must be Present	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	75 25			ns
$t_{H1}$ , $t_{H0}$	Time after Clock Pulse that Data Must be Held	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	0 0	-10 -5.0		ns
$t_W$	Minimum Clock Pulse Width	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		50 35	250 100	ns
$t_W$	Minimum Clear Pulse Width	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		65 35	140 70	ns
$t_r$ , $t_f$	Maximum Clock Rise and Fall Time	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	15 5.0	>1200 >1200		$\mu\text{s}$
$f_{MAX}$	Maximum Clock Frequency	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	2.0 5.0	6.5 12		MHz
$C_{IN}$	Input Capacitance	Clear Input (Note 3) Any Other Input		11 5.0		pF
$C_{PD}$	Power Dissipation Capacitance	Per Package (Note 4)		95		pF

**Note 2:** AC Parameters are guaranteed by DC correlated testing.

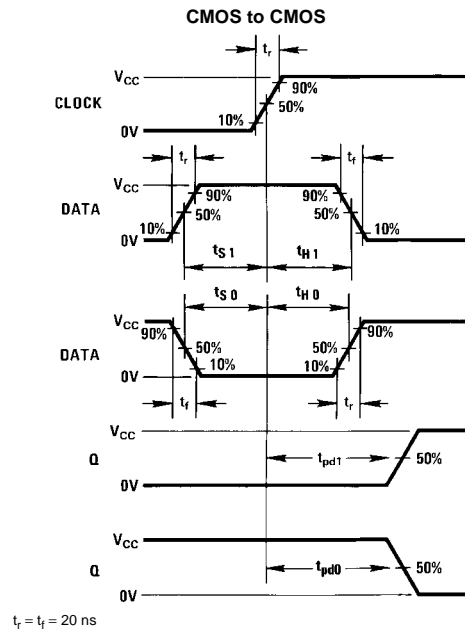
**Note 3:** Capacitance is guaranteed by periodic testing.

**Note 4:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note AN-90.

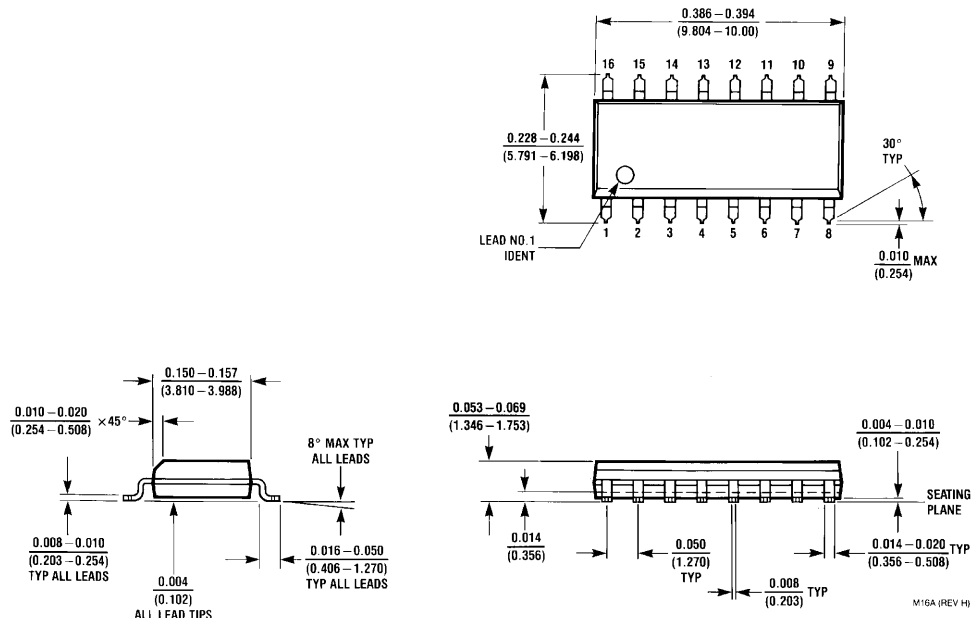
### AC Test Circuit



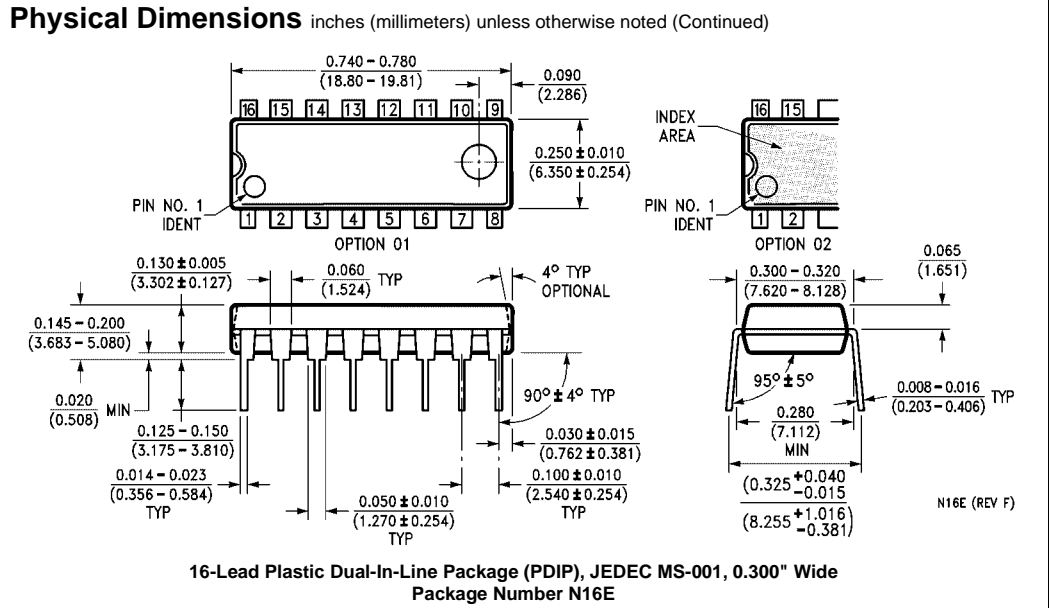
### Switching Time Waveforms



**Physical Dimensions** inches (millimeters) unless otherwise noted



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M16A**



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