

# MM74C175 Quad D-Type Flip-Flop

## General Description

The MM74C175 consists of four positive-edge triggered D-type flip-flops implemented with monolithic CMOS technology. Both true and complemented outputs from each flip-flop are externally available. All four flip-flops are controlled by a common clock and a common clear. Information at the D-type inputs meeting the set-up time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. The clearing operation, enabled by a negative pulse at Clear input, clears all four Q outputs to logical "0" and Q's to logical "1".

All inputs are protected from static discharge by diode clamps to  $V_{CC}$  and GND.

## Features

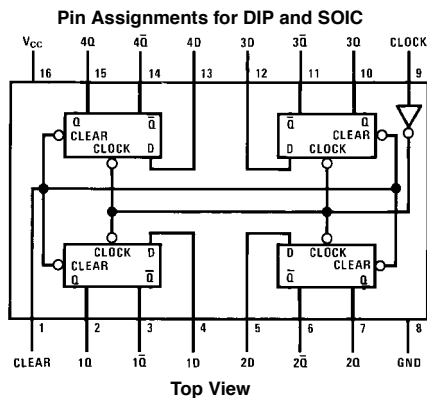
- Wide supply voltage range: 3V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity:  $0.45 V_{CC}$  (typ.)
- Low power TTL compatibility: Fan out of 2 driving 74L

## Ordering Code:

Order Number	Package Number	Package Description
MM74C175M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
MM74C175N	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



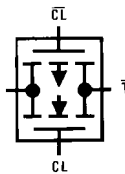
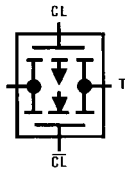
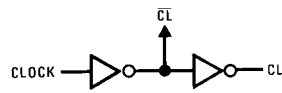
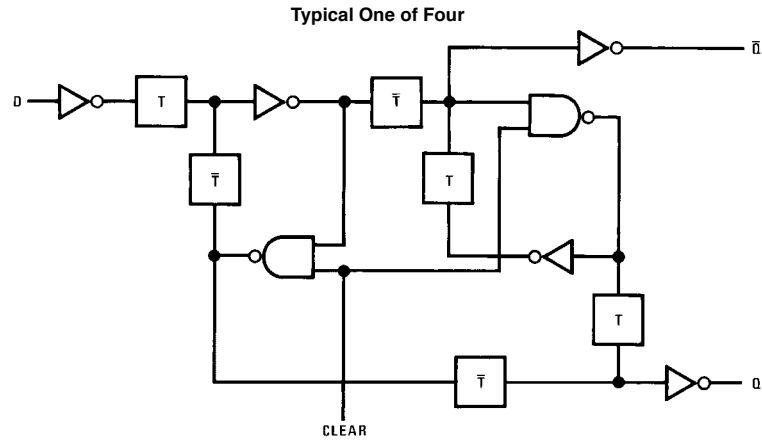
## Truth Table

Each Flip-Flop

Inputs			Outputs	
Clear	Clock	D	Q	$\bar{Q}$
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	H	X	NC	NC
H	L	X	NC	NC

H = HIGH Level  
L = LOW Level  
X = Irrelevant  
↑ = Transition from LOW-to-HIGH level  
NC = No Change

Block Diagrams



<b>Absolute Maximum Ratings</b> (Note 1)		Absolute Maximum $V_{CC}$	18V
Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$	Lead Temperature	
Operating Temperature Range	-40°C to +85°C	(Soldering, 10 seconds)	260°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	3V to 15V		

**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

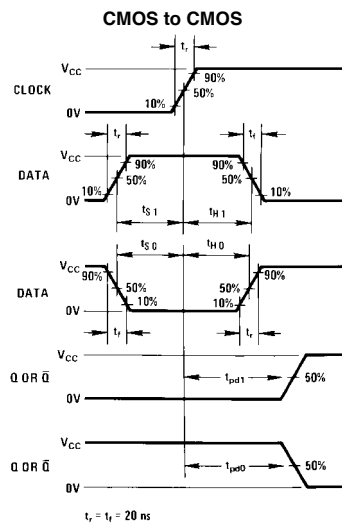
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$	3.5			V
		$V_{CC} = 10V$	8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$			1.5	V
		$V_{CC} = 10V$			2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V, I_O = -10 \mu A$	4.5			V
		$V_{CC} = 10V, I_O = -10 \mu A$	9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V, I_O = 10 \mu A$			0.5	V
		$V_{CC} = 10V, I_O = 10 \mu A$			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	74C, $V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	74C, $V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	74C, $V_{CC} = 4.75V, I_O = -360 \mu A$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	74C, $V_{CC} = 4.75V, I_O = 360 \mu A$			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)	$V_{CC} = 5V, T_A = 25^\circ C, V_{OUT} = V_{CC}$	1.75	3.6		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, T_A = 25^\circ C, V_{OUT} = V_{CC}$	8.0	16		mA

**AC Electrical Characteristics** (Note 2)  
 $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise noted

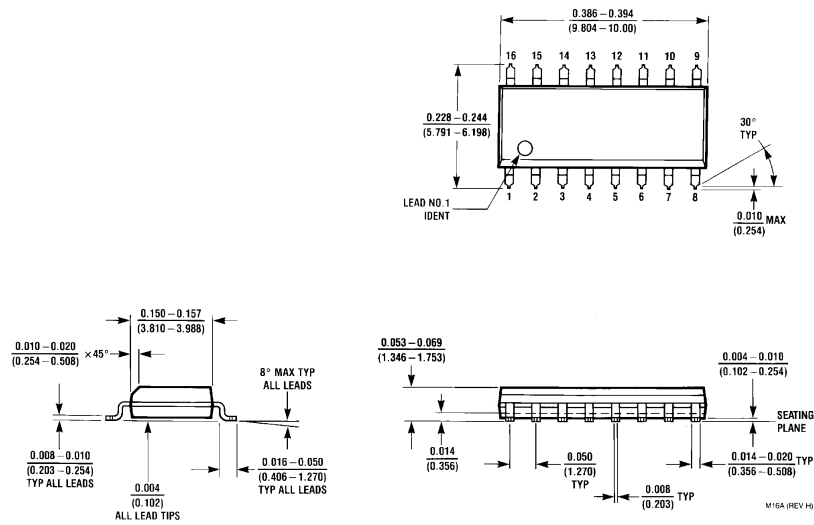
Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd}$	Propagation Delay Time to a Logical "0" or Logical "1" from Clock to Q or $\bar{Q}$	$V_{CC} = 5\text{V}$		190	300	ns
		$V_{CC} = 10\text{V}$		75	110	ns
$t_{pd}$	Propagation Delay Time to a Logical "0" from Clear to Q	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		180 70	300 110	ns ns
$t_{pd}$	Propagation Delay Time to a Logical "1" from Clear to Q	$V_{CC} = 5\text{V}$		230	400	ns
		$V_{CC} = 10\text{V}$		90	150	ns
$t_S$	Time Prior to Clock Pulse that Data Must be Present	$V_{CC} = 5\text{V}$	100	45		ns
		$V_{CC} = 10\text{V}$	40	16		ns
$t_H$	Time After Clock Pulse that Data Must be Held	$V_{CC} = 5\text{V}$	0	-11		ns
		$V_{CC} = 10\text{V}$	0	-4		ns
$t_W$	Minimum Clock Pulse Width	$V_{CC} = 5.0\text{V}$		130	250	ns
		$V_{CC} = 10\text{V}$		45	100	ns
$t_W$	Minimum Clear Pulse Width	$V_{CC} = 5.0\text{V}$		120	250	ns
		$V_{CC} = 10\text{V}$		45	100	ns
$t_r$	Maximum Clock Rise Time	$V_{CC} = 5\text{V}$	15	450		$\mu\text{s}$
		$V_{CC} = 10\text{V}$	5.0	125		$\mu\text{s}$
$t_f$	Maximum Clock Fall Time	$V_{CC} = 5\text{V}$	15	50		$\mu\text{s}$
		$V_{CC} = 10\text{V}$	5.0	50		$\mu\text{s}$
$f_{MAX}$	Maximum Clock Frequency	$V_{CC} = 5\text{V}$	2.0	3.5		MHz
		$V_{CC} = 10\text{V}$	5.0	10		MHz
$C_{IN}$	Input Capacitance	Clear Input (Note 3) Any Other Input		10 5.0		pF pF
$C_{PD}$	Power Dissipation Capacitance	Per Package (Note 4)		130		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.

**Switching Time Waveforms**

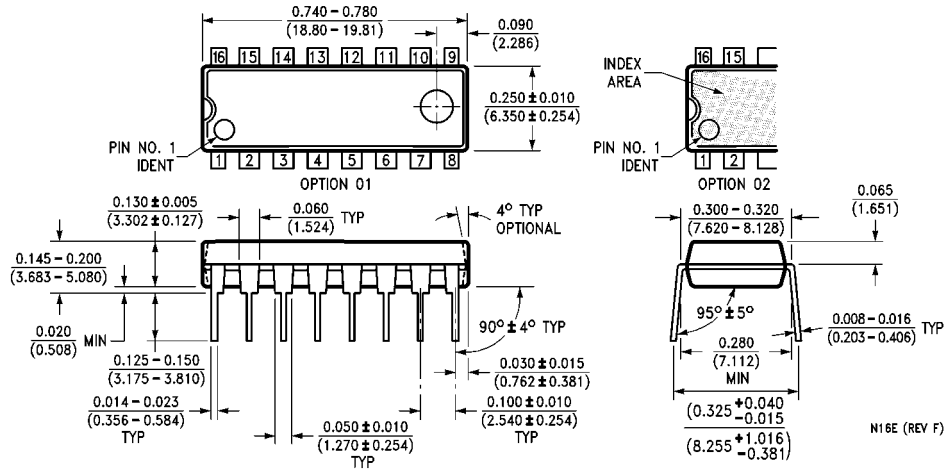


**Physical Dimensions** inches (millimeters) unless otherwise noted



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

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



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N16E**

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