

FAIRCHILD
SEMICONDUCTOR™October 1987
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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 are 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

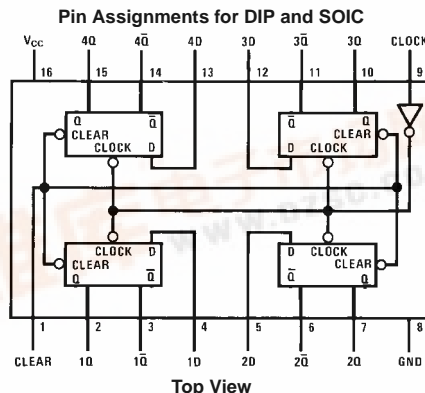
- Wide supply voltage range: 3V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity: $0.45 V_{CC}$ (typ.)
- Low power TTL compatibility: Fan out of 2 driving 74L

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



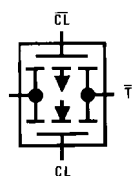
Truth Table

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





Absolute Maximum Ratings(Note 1)

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$	Absolute Maximum V_{CC}	18V
Operating Temperature Range	-40°C to +85°C	Lead Temperature	
Storage Temperature Range	-65°C to +150°C	(Soldering, 10 seconds)	260°C
Power Dissipation (P_D)		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.	
Dual-In-Line	700 mW		
Small Outline	500 mW		
Operating V_{CC} Range	3V to 15V		

DC Electrical Characteristics

Min/Max limits apply across temperature range unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CMOS TO CMOS						
$V_{IN(1)}$	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	μA
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = 0V$	-1.0	-0.005		μA
I_{CC}	Supply Current	$V_{CC} = 15V$		0.05	300	μA
CMOS/LPTTL INTERFACE						
$V_{IN(1)}$	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
OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)						
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

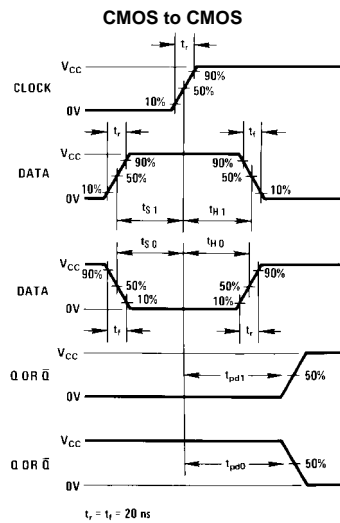
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd}	Propagation Delay Time to a Logical "0" or Logical "1" from Clock to Q or \bar{Q}	$V_{CC} = 5\text{V}$		190	300	ns
		$V_{CC} = 10\text{V}$		75	110	ns
t_{pd}	Propagation Delay Time to a Logical "0" from Clear to Q	$V_{CC} = 5\text{V}$		180	300	ns
		$V_{CC} = 10\text{V}$		70	110	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		μs
		$V_{CC} = 10\text{V}$	5.0	125		μs
t_f	Maximum Clock Fall Time	$V_{CC} = 5\text{V}$	15	50		μs
		$V_{CC} = 10\text{V}$	5.0	50		μs
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)		10		pF
		Any Other Input		5.0		pF
C_{PD}	Power Dissipation Capacitance	Per Package (Note 4)		130		pF

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

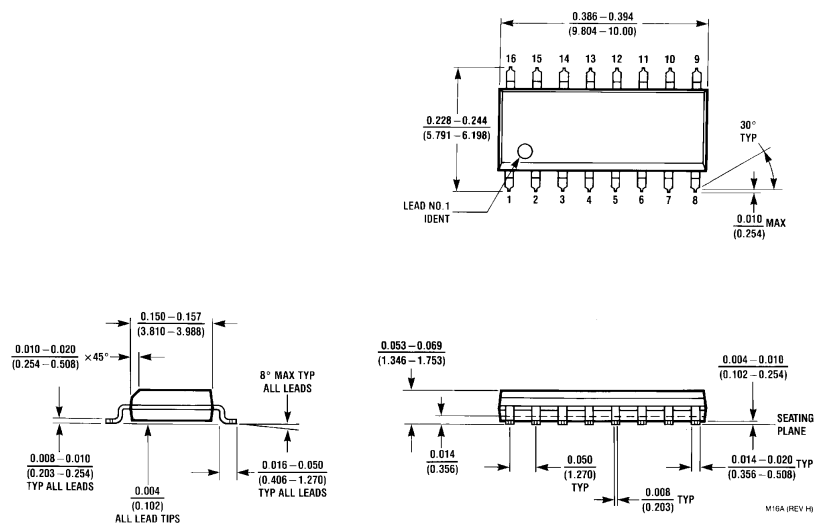
Note 3: Capacitance is guaranteed by periodic testing.

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

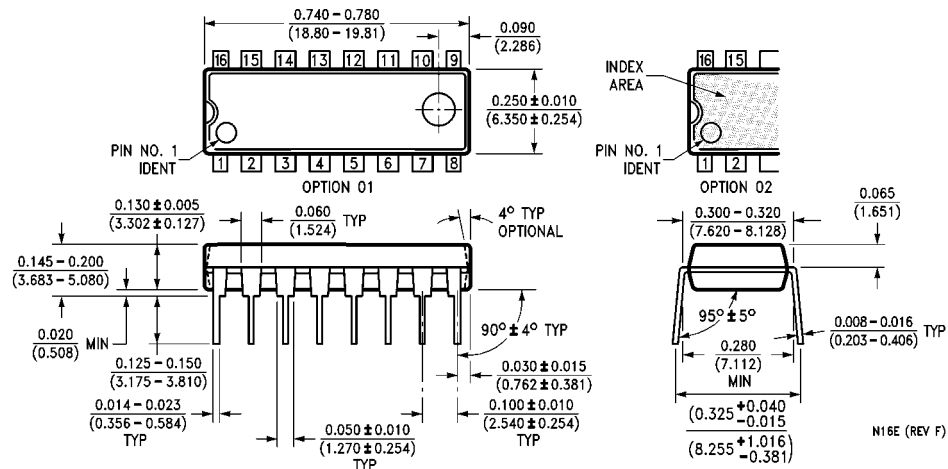


Physical Dimensions inches (millimeters) unless otherwise noted



**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

N16E (REV F)

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