

CD40174BC • CD40175BC

Hex D-Type Flip-Flop • Quad D-Type Flip-Flop

General Description

The CD40174BC consists of six positive-edge triggered D-type flip-flops; the true outputs from each flip-flop are externally available. The CD40175BC consists of four positive-edge triggered D-type flip-flops; both the true and complement outputs from each flip-flop are externally available.

All flip-flops are controlled by a common clock and a common clear. Information at the D 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 Q outputs to logical "0" and $\bar{Q}$ s (CD40175BC only) to logical "1".

All inputs are protected from static discharge by diode clamps to V_{DD} and V_{SS} .

Features

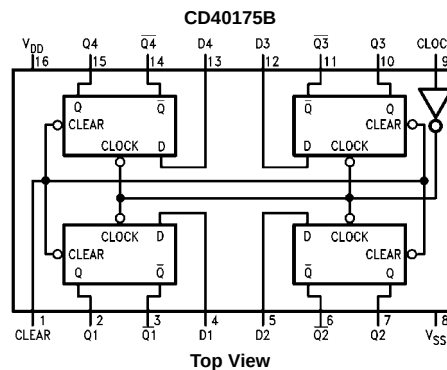
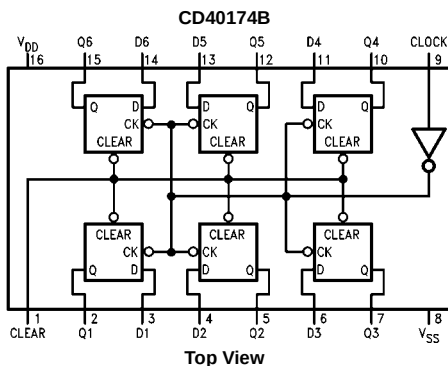
- Wide supply voltage range: 3V to 15V
- High noise immunity: $0.45 V_{DD}$ (typ.)
- Low power TTL compatibility:
fan out of 2 driving 74L or 1 driving 74 LS
- Equivalent to MC14174B, MC14175B
- Equivalent to MM74C174, MM74C175

Ordering Code:

Order Number	Package Number	Package Description
CD40174BCM	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
CD40174BCN	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
CD40175BCM	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
CD40175BCN	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

Connection Diagrams



Truth Table

Inputs			Outputs	
Clear	Clock	D	Q	$\overline{Q}$ (Note 1)
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

Note 1: $\overline{Q}$ for CD40175B only

Absolute Maximum Ratings(Note 2)

(Note 3)

DC Supply Voltage (V_{DD})	−0.5V to +18V
Input Voltage (V_{IN})	−0.5V to $V_{DD} + 0.5 V_{DC}$
Storage Temperature Range (T_S)	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions (Note 3)

DC Supply Voltage (V_{DD})	3V to 15 V_{DC}
Input Voltage (V_{IN})	0V to $V_{DD} V_{DC}$
Operating Temperature Range (T_A)	−55°C to +125°C

Note 2: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

Note 3: $V_{SS} = 0V$ unless otherwise specified.

DC Electrical Characteristics (Note 3)

CD40174BC/CD40175BC

Symbol	Parameter	Conditions	−55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$		1.0			1.0		30	μA
		$V_{DD} = 10V, V_{IN} = V_{DD} \text{ or } V_{SS}$		2.0			2.0		60	
		$V_{DD} = 15V, V_{IN} = V_{DD} \text{ or } V_{SS}$		4.0			4.0		120	
V_{OL}	LOW Level Output Voltage	$V_{DD} = 5V$		0.05			0.05		0.05	V
		$V_{DD} = 10V$		0.05			0.05		0.05	
		$V_{DD} = 15V$		0.05			0.05		0.05	
V_{OH}	HIGH Level Output Voltage	$V_{DD} = 5V$	4.95		4.95	5		4.95		V
		$V_{DD} = 10V$	9.95		9.95	10		9.95		
		$V_{DD} = 15V$	14.95		14.95	15		14.95		
V_{IL}	LOW Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$		1.5			1.5		1.5	V
		$V_{DD} = 10V, V_O = 1V \text{ or } 9V$		3.0			3.0		3.0	
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		4.0			4.0		4.0	
V_{IH}	HIGH Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$	3.5		3.5			3.5		V
		$V_{DD} = 10V, V_O = 1V \text{ or } 9V$	7.0		7.0			7.0		
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	11.0		11.0			11.0		
I_{OL}	LOW Level Output Current (Note 4)	$V_{DD} = 5V, V_O = 0.4V$	0.64		0.51	0.88		0.36		mA
		$V_{DD} = 10V, V_O = 0.5V$	1.6		1.3	2.25		0.9		
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8.8		2.4		
I_{OH}	HIGH Level Output Current (Note 4)	$V_{DD} = 5V, V_O = 4.6V$	−0.64		−0.51	−0.88		−0.36		mA
		$V_{DD} = 10V, V_O = 9.5V$	−1.6		−1.3	−2.25		−0.9		
		$V_{DD} = 15V, V_O = 13.5V$	−4.2		−3.4	−8.8		−2.4		
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$		0.1		-10^{-5}	0.1		−1.0	μA
		$V_{DD} = 15V, V_{IN} = 15V$		−0.1		10^{-5}	−0.1		1.0	

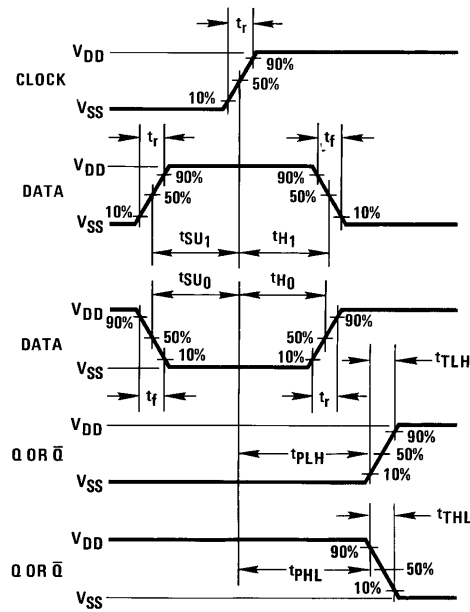
Note 4: I_{OH} and I_{OL} are tested one output at a time.

AC Electrical Characteristics (Note 5) $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}$ and $t_r = t_f = 20\text{ ns}$, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}, t_{PLH}	Propagation Delay Time to a Logical "0" or Logical "1" from Clock to Q or $\bar{Q}$ (CD40175 Only)	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		190 75 60	300 110 90	ns
t_{PHL}	Propagation Delay Time to a Logical "0" from Clear to Q	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		180 70 60	300 110 90	ns
t_{PLH}	Propagation Delay Time to a Logical "1" from Clear to $\bar{Q}$ (CD40175 Only)	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		230 90 75	400 150 120	ns
t_{SU}	Time Prior to Clock Pulse that Data must be Present	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		45 15 13	100 40 35	ns
t_H	Time after Clock Pulse that Data Must be Held	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		-11 -4 -3	0 0 0	ns
t_{THL}, t_{TLH}	Transition Time	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		100 50 40	200 100 80	ns
t_{WH}, t_{WL}	Minimum Clock Pulse Width	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		130 45 40	250 100 80	ns
t_{WL}	Minimum Clear Pulse Width	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		120 45 40	250 100 80	ns
t_{RCL}	Maximum Clock Rise Time	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$	15 5.0 5.0			μs
t_{CL}	Maximum Clock Fall Time	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$	15 5.0 5.0	50 50 50		μs
f_{CL}	Maximum Clock Frequency	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$	2.0 5.0 6.0	3.5 10 12		MHz
C_{IN}	Input Capacitance	Clear Input Other Input		10 5.0	15 7.5	pF
C_{PD}	Power Dissipation	Per Package (Note 6)		130		pF

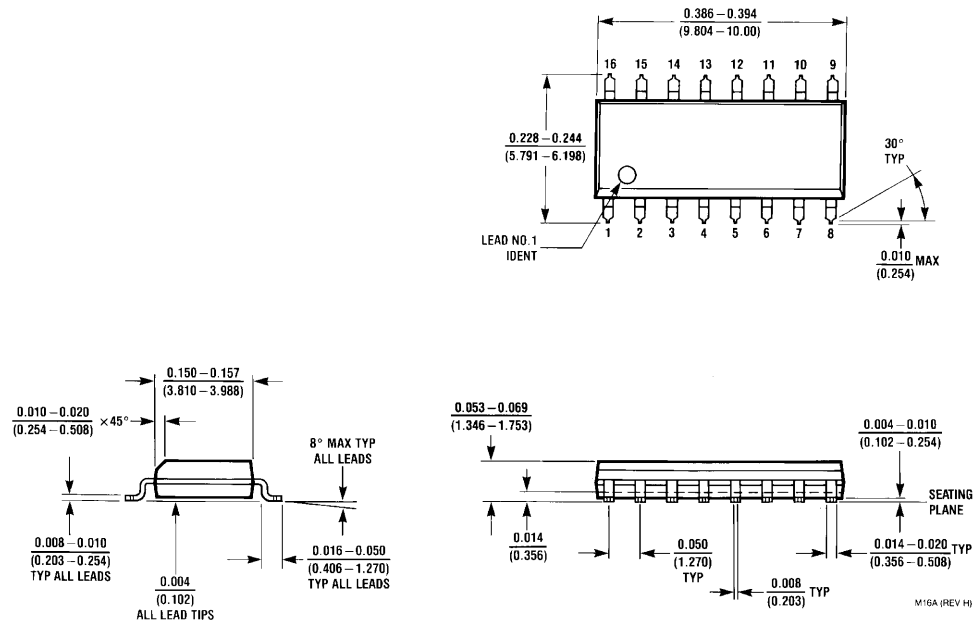
Note 5: AC Parameters are guaranteed by DC correlated testing.**Note 6:** C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation, see 74C Family Characteristics application note, AN-90.

Switching Time Waveforms



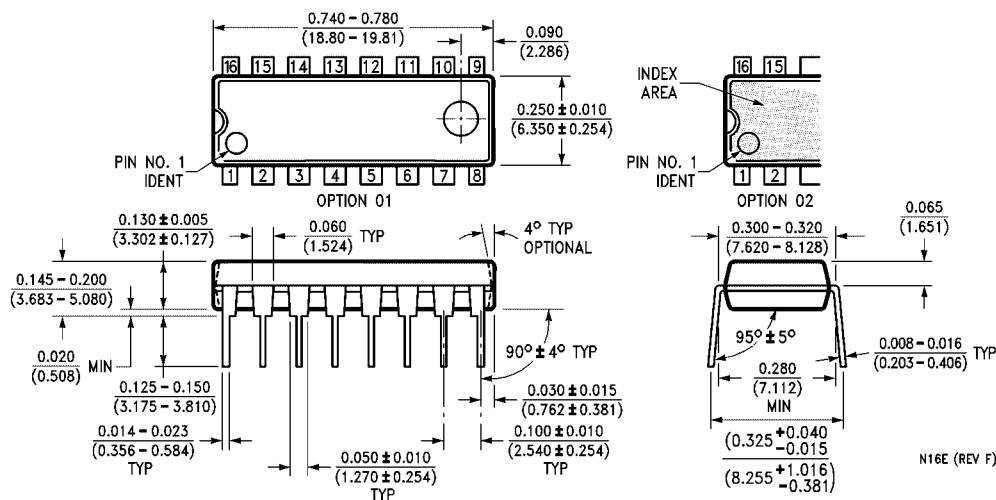
$t_r = t_f = 20 \text{ ns}$

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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