

TC40175BP/TC40175BF QUAD D-TYPE FLIP-FLOP

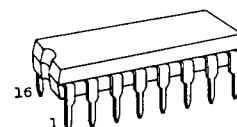
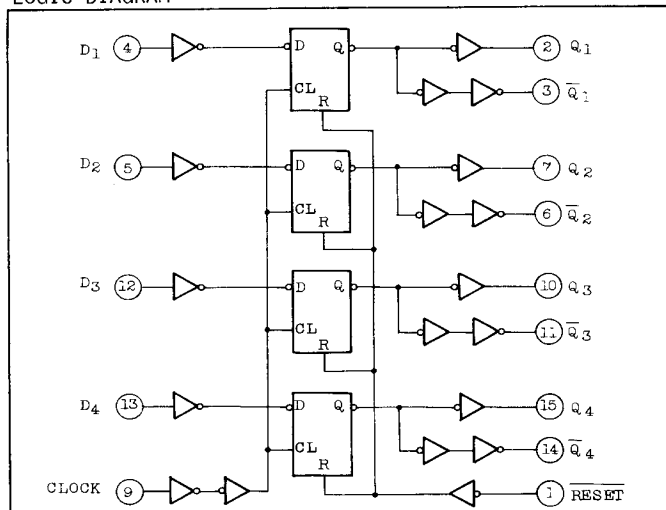
TC40175BP/TC40175BF contains four circuits of D type flip-flop having common clock terminal and clear terminal. The logical input applied to D_n input is transferred to Q_n output by the rising edge of CLOCK input.

RESET input is active with "L" level. This has the same functions as TTL 54175/74175 and the pin assignment is also same.

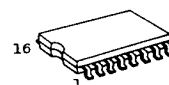
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V _{DD}	V _{SS} -0.5 ~ V _{SS} +20	V
Input Voltage	V _{IN}	V _{SS} -0.5 ~ V _{DD} +0.5	V
Output Voltage	V _{OUT}	V _{SS} -0.5 ~ V _{DD} +0.5	V
DC Input Current	I _{IN}	±10	mA
Power Dissipation	P _D	300(DIP)/180(MFP)	mW
Operating Temperature Range	T _A	-40 ~ 85	°C
Storage Temperature Range	T _{stg}	-65 ~ 150	°C
Lead Temp./Time	T _{sol}	260°C • 10sec	

LOGIC DIAGRAM

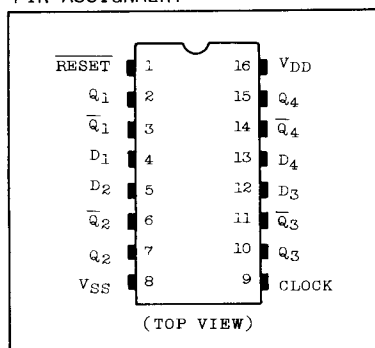


DIP 16(3D16A-P)



MFP 16(F16GC-P)

PIN ASSIGNMENT



TRUTH TABLE

INPUTS			OUTPUTS	
CLOCK Δ	D _n	RESET	Q _{n+1}	Q _{n+1}
↓	H	H	H	L
↓	L	H	L	H
↓	*	H	Q _n	Q _n
*	*	L	L	H

Δ : Level change

· : No change

* : Don't care

RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V _{DD}		3	-	18	V
Input Voltage	V _{IN}		0	-	V _{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V _{DD} (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Output Voltage	V _{OH}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	4.95	-	4.95	5.00	-	4.95	-	V
			10	9.95	-	9.95	10.00	-	9.95	-	
			15	14.95	-	14.95	15.00	-	14.95	-	
Low-Level Output Voltage	V _{OL}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	-	0.05	-	0.00	0.05	-	0.05	V
			10	-	0.05	-	0.00	0.05	-	0.05	
			15	-	0.05	-	0.00	0.05	-	0.05	
Output High Current	I _{OH}	V _{OH} =4.6V	5	-0.61	-	-0.51	-1.0	-	-0.42	-	mA
		V _{OH} =2.5V	5	-2.5	-	-2.1	-4.0	-	-1.7	-	
		V _{OH} =9.5V	10	-1.5	-	-1.3	-2.2	-	-1.1	-	
		V _{OH} =13.5V	15	-4.0	-	-3.4	-9.0	-	-2.8	-	
		V _{IN} =V _{SS} , V _{DD}									
Output Low Current	I _{OL}	V _{OL} =0.4V	5	0.61	-	0.51	1.5	-	0.42	-	mA
		V _{OL} =0.5V	10	1.5	-	1.3	3.8	-	1.1	-	
		V _{OL} =1.5V	15	4.0	-	3.4	15.0	-	2.8	-	
		V _{IN} =V _{SS} , V _{DD}									
Input High Voltage	V _{IH}	V _{OUT} =0.5V, 4.5V	5	3.5	-	3.5	2.75	-	3.5	-	V
		V _{OUT} =1.0V, 9.0V	10	7.0	-	7.0	5.5	-	7.0	-	
		V _{OUT} =1.5V, 13.5V	15	11.0	-	11.0	8.25	-	11.0	-	
		I _{OUT} < 1μA									
Input Low Voltage	V _{IL}	V _{OUT} =0.5V, 4.5V	5	-	1.5	-	2.25	1.5	-	1.5	V
		V _{OUT} =1.0V, 9.0V	10	-	3.0	-	4.5	3.0	-	3.0	
		V _{OUT} =1.5V, 13.5V	15	-	4.0	-	6.75	4.0	-	4.0	
		I _{OUT} < 1μA									
Input Current	"H" Level	I _{IH} V _{IH} =18V	18	-	0.1	-	10 ⁻⁵	0.1	-	1.0	μA
	"L" Level	I _{IL} V _{IL} =0V	18	-	-0.1	-	-10 ⁻⁵	-0.1	-	-1.0	

STATIC ELECTRICAL CHARACTERISTICS ($V_{SS}=0V$)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V_{DD} (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
Quiescent Device Current	I_{DD}	$V_{IN}=V_{SS}, V_{DD}$ *	5	-	1	-	0.005	1	-	30	A
			10	-	2	-	0.010	2	-	60	
			15	-	4	-	0.015	4	-	120	

* All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_a=25^\circ C$, $V_{SS}=0V$, $C_L=50pF$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Output Transition Time (High to Low)	t_{THL}		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Propagation Delay Time (CLOCK - Q, $\bar{Q}$)	t_{pLH} t_{pHL}		5	-	170	340	ns
			10	-	70	140	
			15	-	50	100	
Propagation Delay Time ($\overline{RESET}$ - Q, $\bar{Q}$)	t_{pLH} t_{pHL}		5	-	190	380	ns
			10	-	80	160	
			15	-	55	110	
Min. Clock Pulse Width	t_w		5	-	55	130	ns
			10	-	20	60	
			15	-	15	40	
Min. Pulse Width ($\overline{RESET}$)	t_{WL}		5	-	40	100	ns
			10	-	20	50	
			15	-	15	40	
Max. Clock Frequency	f_{CL}		5	3.5	9	-	MHz
			10	6	25	-	
			15	8	34	-	
Max. Clock Input Rise Time. Max. Clock Input Fall Time.	t_{rCL} t_{fCL}		5	20	-	-	μs
			10	15	-	-	
			15	15	-	-	

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, V_{SS}=0V, C_L=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Min. Set-up Time (DATA - CLOCK)	t _{SU}		5	-	30	60	ns
			10	-	15	30	
			15	-	10	20	
Min. Hold Time (DATA - CLOCK)	t _H		5	-	-5	80	ns
			10	-	0	40	
			15	-	3	30	
Min. Removal Time (RESET - CLOCK)	t _{rem}		5	-	7	40	ns
			10	-	4	20	
			15	-	3	15	
Input Capacitance	C _{IN}			-	5	7.5	pF

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

