C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

TC40H174P/F

TC40H174 HEX D-TYPE FLIP-FLOP

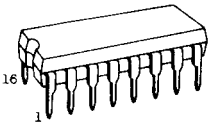
The TC40H174 is a Hex D-type flip flop having common CLOCK and CLEAR terminal.

The logical input applied to input D is transmitted to output Q at the rising edge of CLOCK input.

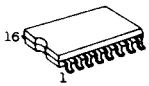
CLEAR input is active at "L" level.

The pin assignment and function of this flip-flop are the same as those of the TTL74LS174.

Further, the same may be said of the TC40174BP.



DIP16(3D16A-P)

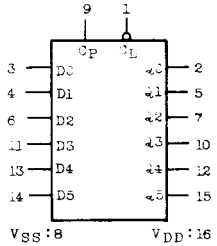


MFP16(F16GC-P)

※ Don't Care

INPUTS			OUTPUTS
CLOCK	D_n	$\overline{CLEAR}$	Q_n
↑	H	H	H
↑	L	H	L
↓	※	H	No Change
※	※	L	L

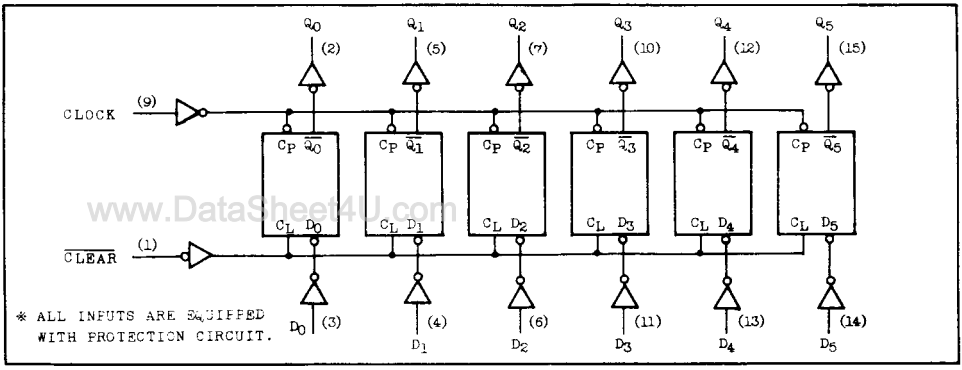
BLOCK DIAGRAM



MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	V_{SS}-0.5 ∿ V_{SS}+10	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
Input Current	I_{IN}	±10	mA
Power Dissipation	P_D	300(DIP)/180(MFP)	mW
Storage Temperature	T_{stg}	-65 ∿ 150	°C
Lead Temp./Time	T_{sol}	260°C • 10 sec	

LOGIC DIAGRAM



TC40H174P/F

RECOMMENDED OPERATING CONDITIONS (V_{SS}=0.0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	-	2.0	-	8.0	V
Input Voltage	V_{IN}	-	0.0	-	V_{DD}	V
Operating Temperature	T_{opr}	-	-40	-	85	°C

ELECTRICAL CHARACTERISTIC (V_{SS}=0.0V)

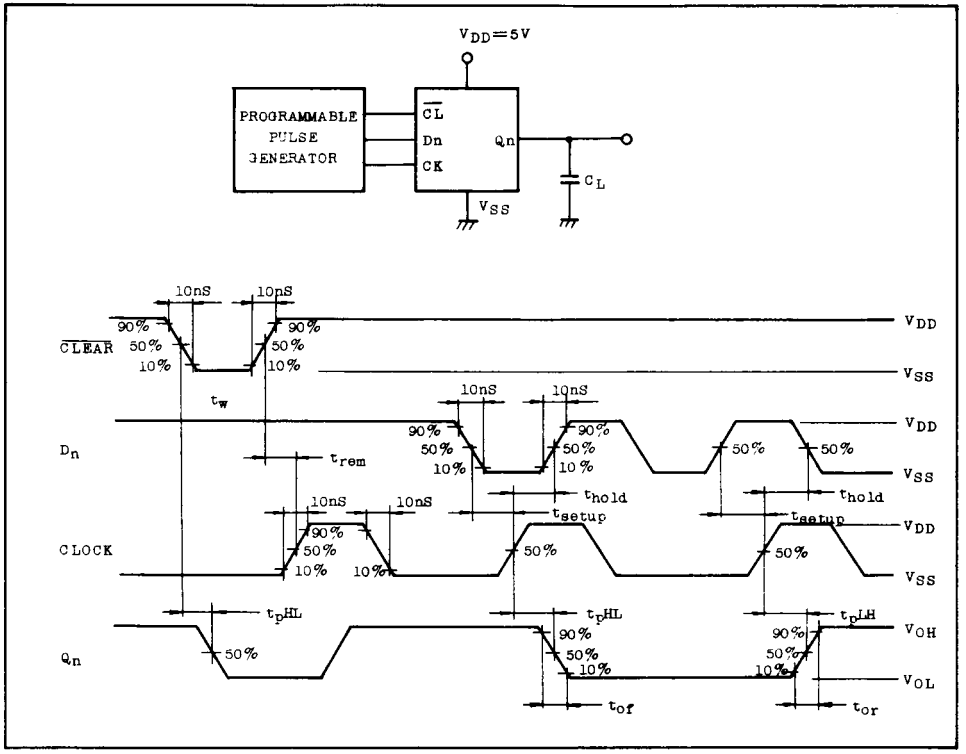
CHARACTERISTIC		SYMBOL	TEST CONDITION	V_{DD} (V)	-40°C		25°C			85°C		UNIT
					MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High Level Output Voltage		V_{OH}	$\|I_{OUT}\|$<1μA $V_{IN}=V_{SS},V_{DD}$	5	4.95	-	4.95	5.0	-	4.95	-	V
Low Level Output Voltage		V_{OL}	$\|I_{OUT}\|$<1μA $V_{IN}=V_{SS},V_{DD}$	5	-	0.05	-	0.0	0.05	-	0.05	V
High Level Output Current		I_{OH}	V_{OH}=4.6V $V_{IN}=V_{SS},V_{DD}$	5	-0.52	-	-0.44	-	-	-0.36	-	mA
Low Level Output Current		I_{OL}	V_{OL}=0.4V $V_{IN}=V_{SS},V_{DD}$	5	1.4	-	1.1	-	-	0.8	-	mA
Input Voltage	"H" Level	V_{IH}	$\|I_{OUT}\|$<1μA V_{OH}=4.5V V_{OL}=0.5V	5	4.0	-	4.0	-	-	4.0	-	V
	"L" Level	V_{IL}		5	-	1.0	-	-	1.0	-	1.0	V
Input Current	"H" Level	I_{IH}	V_{IH}=8.0V	8	-	0.3	-	10^{-5}	0.3	-	1.0	μA
	"L" Level	I_{IL}	V_{IL}=0.0V	8	-	-0.3	-	-10^{-5}	-0.3	-	-1.0	μA
Quiescent Supply Current		I_{DD}	*$V_{IN}=V_{SS},V_{DD}$	5	-	12.5	-	0.005	12.5	-	75	μA

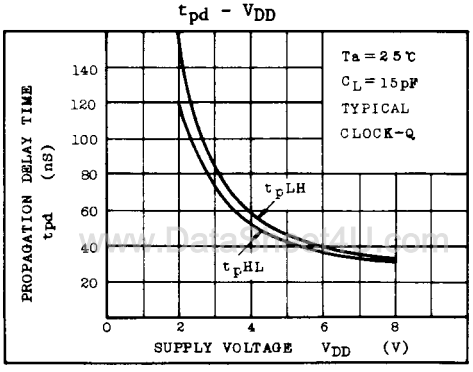
* All valid input combinations.

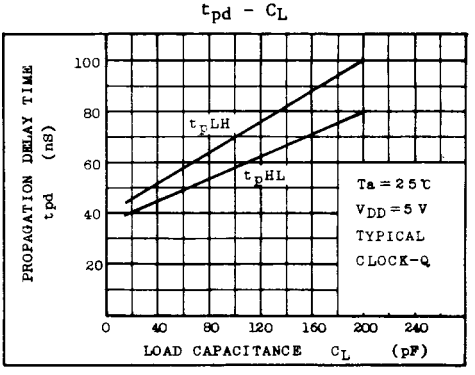
SWITCHING CHARACTERISTICS (Ta=25°C, V_{SS}=0V, C_L=15pF)

CHARACTERISTIC		SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Rise Time		t_{or}	-	5	-	20	35	ns
Output Fall Time		t_{of}	-	5	-	15	30	ns
Propagation Delay Time	(Low-High)	t_{pLH}	CLOCK - Q	5	-	45	68	ns
	(High-Low)	t_{pHL}		5	-	40	60	ns
	(High-Low)	t_{pHL}	$\overline{CLEAR}$ - Q	5	-	48	72	ns
Min. Clear Width of Pulse		t_w	$\overline{CLEAR}$	5	-	25	44	ns
Max. Clock Rise Time / Fall Time		$t_{r\phi}$, $t_{f\phi}$	-	5	1.0	12	-	μs
Min. Data Hold Time		t_{hold}		5	-	-	5	ns
Min. Data Setup Time		t_{set-up}	D_n - CLOCK	5	-	-	25	ns
Max. Clock Frequency		$f_{MAX\phi}$	-	5	10	20	-	MHz
Input Capacitance		C_{IN}	-	5	-	5		pF
Min. Clear Removal Time		t_{rem}		5	-	11	25	ns

SWITCHING TIME TEST CIRCUIT AND WAVEFORM

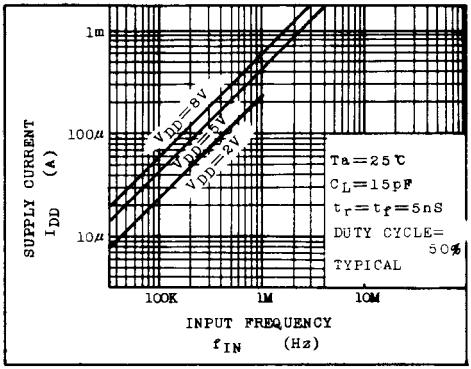




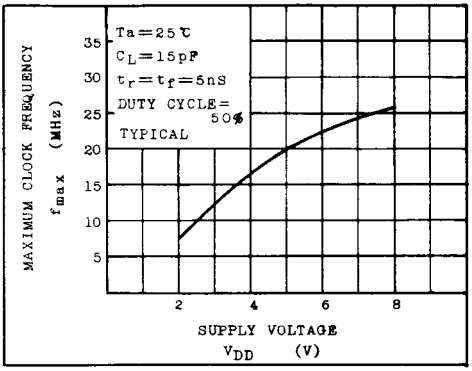


TC40H174P/F

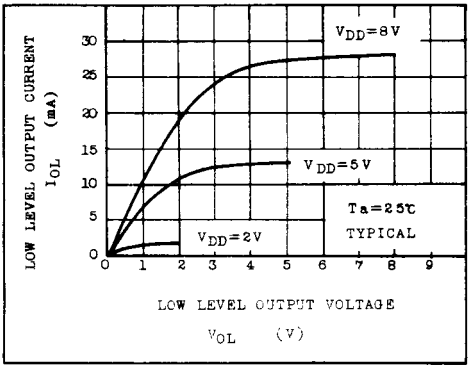
I_{DD} - f_{IN}



$f_{MAX\phi}$ - V_{DD}



I_{OL} - V_{OL}



I_{OH} - (V_{DD} - V_{OH})