

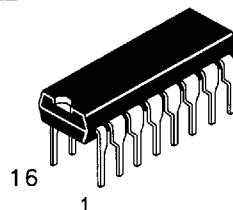
DV74HCT174A Available Q2, 1995

Hex D Flip-Flop with Common Clock and Reset

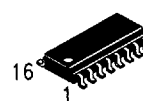
These devices consist of six D flip-flops with the common Clock and Reset inputs. Each flip-flop is data loaded with a low-to-high transition of the Clock input. Reset is asynchronous and active-low.

- **Output Drive Capability:** 10 LSTTL Loads
- **Outputs Directly Interface to CMOS, NMOS, and TTL**
- **Operating Voltage Range:** 2 to 6 V for HC devices
- **Low Input Current:** 1 μ A
- **DC, AC parameters guaranteed from -55°C to 125°C**

DV74HC174A DV74HCT174A



N Suffix
Plastic DIP
AVG-003 Case



D Suffix
Plastic SOP
AVG-004 Case

TRUTH TABLE

Inputs			Outputs
Reset	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	No Change
H	↓	X	No Change

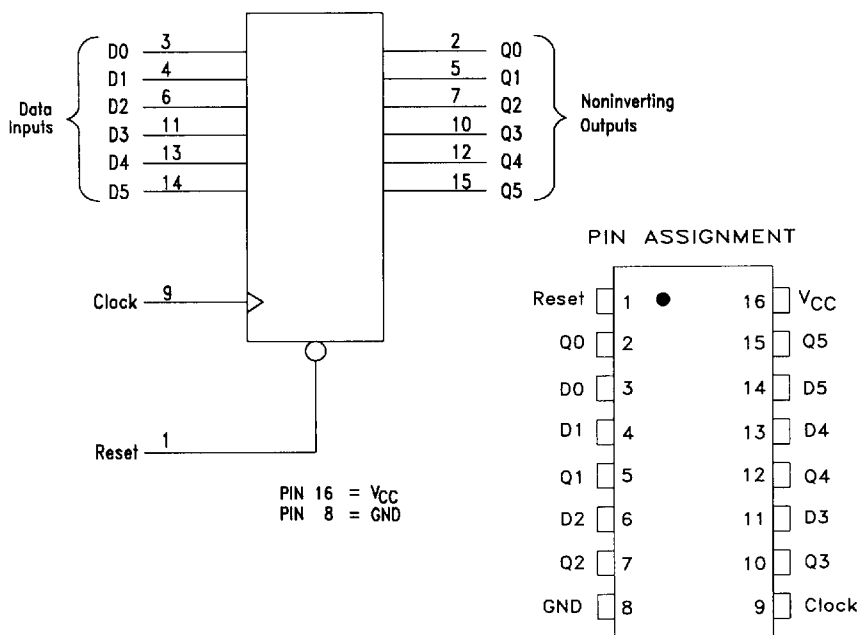
H = High logic Level

L = Low Logic Level

↑ = Low to High Transition

↓ = High to Low Transition

X = Don't Care



ABSOLUTE MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V _{IN}	DC Input Voltage (Referenced to GND)	-1.5 to V _{CC} + 1.5	V
V _{OUT}	DC Output Voltage (Referenced to GND)	-0.5 to V _{CC} + 0.5	V
I _{IN}	DC Input Current, per Pin	± 20	mA
I _{OUT}	DC Output Current, per Pin	± 25	mA
I _{CC}	DC Supply Current, V _{CC} and GND Pins	± 50	mA
P _D	Power Dissipation in Still Air, Plastic DIP SOP Package	750 500	mW
T _{STG}	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature, 1mm from Case for 10 Seconds	260	°C

GUARANTEED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage, HC (HCT), Referenced to GND	2.0 (4.5)	6.0 (5.5)	V
V _{IN} , V _{OUT}	DC Input Voltage, Output Voltage, Referenced to GND	0	V _{CC}	V
T _A	Ambient Temperature	-55	+125	°C
t _r , t _f	Input Rise and Fall Time: HC: V _{CC} =2.0V HCT: V _{CC} =5.5V / HC: V _{CC} =4.5V HC: V _{CC} =6.0V	0 0 0	1000 500 400	ns

HC-174A

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} V	Guaranteed Limits			Unit
				25°C to -55°C	≤85°C	≤125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} = 0.1 V, I _{OUT} ≤ 20 μA or V _{OUT} = V _{CC} - 0.1 V	2.0 4.5 6.0	1.5 3.15 4.2	1.5 3.15 4.2	1.5 3.15 4.2	V
V _{IL}	Maximum Low-Level Input Voltage	V _{OUT} = 0.1 V, I _{OUT} ≤ 20 μA or V _{OUT} = V _{CC} - 0.1 V	2.0 4.5 6.0	0.5 1.35 1.8	0.5 1.35 1.8	0.5 1.35 1.8	V
V _{OH}	Minimum High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5 6.0	3.98 5.48	3.84 5.34	3.7 5.2	
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5 6.0	0.26 0.26	0.33 0.33	0.40 0.40	
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I _{CC}	Maximum Quiescent Supply Current (Per Package)	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	6.0	4.0	40	160	μA

AC ELECTRICAL CHARACTERISTICS over full operating conditions (C_L = 50 pF, Input t_r = t_f = 6 ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			25°C to -55°C	≤85°C	≤125°C	
f _{max}	Maximum Clock Frequency (50% Cycle)	2.0 4.5 6.0	6.0 30 35	4.8 24 28	4.0 20 24	MHz
t _{PLH} , t _{PHL}	Maximum Propagation Delay Time, Clock to Q	2.0 4.5 6.0	110 22 19	140 28 24	165 33 28	ns
t _{PLH} , t _{PHL}	Maximum Propagation Delay Time, Reset to Q	2.0 4.5 6.0	110 21 19	140 28 24	160 32 27	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time any Output	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
C _{IN}	Maximum Input Capacitance	—	10	10	10	pF

CPD	Power Dissipation Capacitance (Per Enabled Output) Used to determine the no-load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$	Typical @ 25°C, $V_{CC} = 5\text{ V}$	pF
		62	

TIMING REQUIREMENTS (Input $t_r=t_f=6\text{ ns}$)

Symbol	Parameter	Vcc	Guaranteed Limit						Unit
			25°C to -55°C		≤85°C		≤125 °C		
			Min	Max	Min	Max	Min	Max	
t _{su}	Minimum Setup Time, Data to Clock	2.0	50		65		75		ns
		4.5	10		13		15		
		6.0	9.0		11		13		
t _h	Minimum Hold Time, Clock to Data	2.0	5		5		5		ns
		4.5	5		5		5		
		6.0	5		5		5		
t _{rec}	Minimum Recovery Time, Reset Inactive to Clock	2.0	5		5		5		ns
		4.5	5		5		5		
		6.0	5		5		5		
t _w	Minimum Pulse Width, Clock	2.0	75		95		110		ns
		4.5	15		19		22		
		6.0	13		16		19		
t _w	Minimum Pulse Width, Reset	2.0	75		95		110		ns
		4.5	15		19		22		
		6.0	13		16		19		

HCT-174A**DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Conditions	V _{CC} V	Guaranteed Limits			Unit
				25°C to -55°C	≤85°C	<125oC	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} =0.1 V, I _{OUT} ≤20μA or V _{OUT} = V _{CC} -0.1V	4.5 5.5	2.0 2.0	2.0 2.0	2.0 2.0	V
V _{IL}	Maximum Low- Level Input Voltage	V _{OUT} =0.1 V, I _{OUT} ≤20μA or V _{OUT} = V _{CC} -0.1V	4.5 5.5	0.8 0.8	0.8 0.8	0.8 0.8	V
V _{OH}	Minimum High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	4.5 5.5	4.4 5.4	4.4 5.4	4.4 5.4	V
		V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 4.0mA	4.5	3.98	3.84	3.7	
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 4.0mA	4.5	0.26	0.33	0.40	V
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	5.5	± 0.1	± 1.0	± 1.0	μA
I _{CC}	Maximum Quiescent Supply Current (Per Package)	V _{IN} = V _{CC} or GND I _{OUT} ≤ 0 μA	5.5	4.0	40	160	μA
ΔI _{CC}	Additional Quiescent Supply Current	V _{IN} =2.4V, Any One Input V _{IN} =V _{CC} or GND, Other Input I _{OUT} =0μA	5.5	≥55°C	25°C to 125°C		mA
				2.9	2.4		

AC ELECTRICAL CHARACTERISTICS over full operating conditions ($C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$)

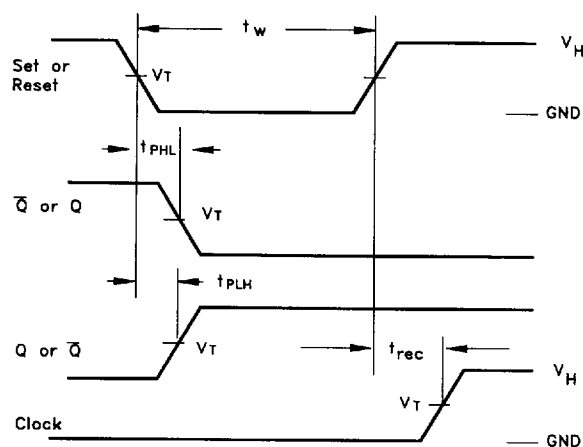
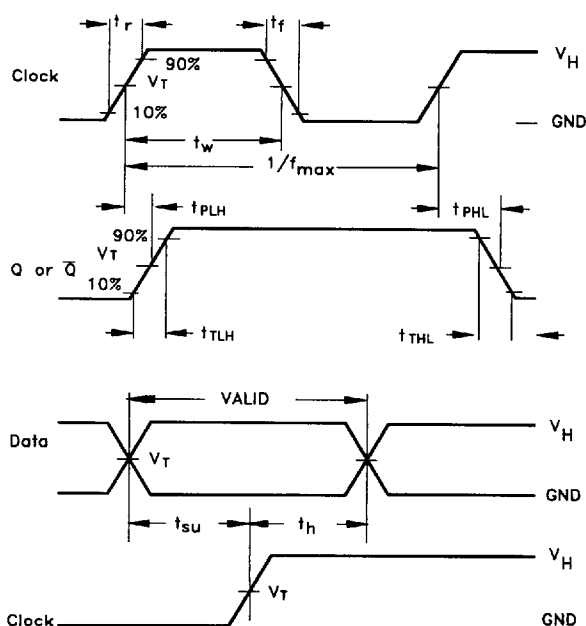
Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			25°C to -55°C	≤85°C	≤125°C	
f_{max}	Maximum Clock Frequency (50% Cycle)	5.0V ±10%	30	24	20	MHz
t_{PLH} , t_{PHL}	Maximum Propagation Delay Time, Clock to Q		24	30	36	ns
t_{PHL}	Maximum Propagation Delay Time, Reset to Q		23	28	35	ns
t_{TLH} , t_{THL}	Maximum Output Transition Time Any Output		15	19	22	ns
C_{IN}	Maximum Input Capacitance	—	10	10	10	pF

Symbol	Parameter	Guaranteed Limit	Unit
C_{PD}	Power Dissipation Capacitance (Per Enabled Output) Used to determine the no-load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$	Typical @ 25°C, $V_{CC} = 5\text{ V}$ 79	pF

TIMING REQUIREMENTS ($V_{CC}=5.0\text{V}$, $C_L = 50\text{ pF}$, Input $t_r=t_f=6\text{ ns}$)

Symbol	Parameter	Guaranteed Limit						Unit
		25°C to -55°C		≤85°C		≤125 °C		
		Min	Max	Min	Max	Min	Max	
t _{su}	Minimum Setup Time, Data to Clock	10		13		15		ns
t _h	Minimum Hold Time, Clock to Data	5.0		6.0		8.0		ns
t _{rec}	Mihimum Recovery Time, Reset Inactive to Clock	5.0		6.0		8.0		ns
t _w	Minimum Pulse Width, Clock	15		19		22		ns
t _w	Minimum Pulse Width, Reset	15		19		22		ns

SWITCHING WAVEFORMS



Input and Output Threshold Voltage: $V_T = 50\% V_{CC}$ for HC, 1.3V for HCT, $V_H = V_{CC}$ for HC, 3V for HCT