

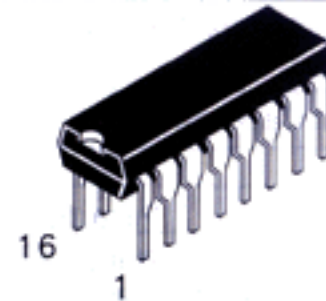
DV74HCT175 Available Q2, 1995

Quad D Flip-Flop with Common Clock and Reset

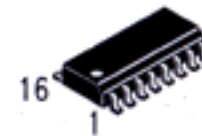
This device consists of four D flip-flops with the common Reset and Clock inputs, and separate D inputs. Reset (active-low) is asynchronous and occurs when a low level is applied to the Reset input. Information at a D is transferred to the corresponding Q output on the next positive-going edge of the Clock input.

- 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

DV74HC175
DV74HCT175

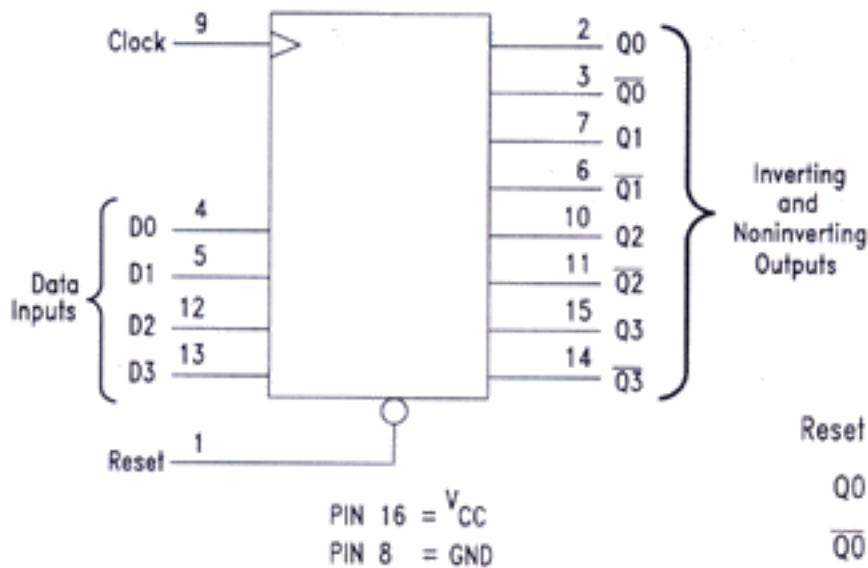


N Suffix
Plastic DIP
AVG-003 Case



D Suffix
Plastic SOP
AVG-004 Case

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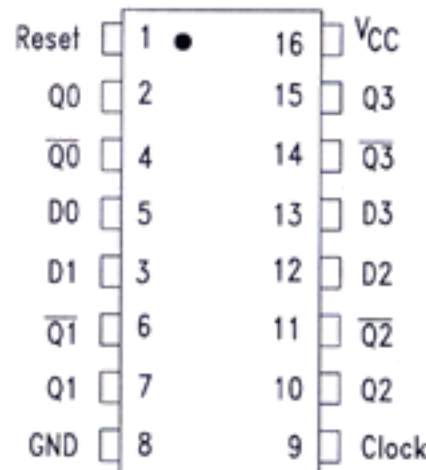


TRUTH TABLE

Input			Outputs	
Reset	Clock	D	Q	Q̄
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	No Change	

H = High Logic Level
L = Low Logic Level
↑ = Low to High Transition
X = Don't Care

PIN ASSIGNMENT



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

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} - 0.1V	2.0	1.5	1.5	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V _{IL}	Maximum Low-Level Input Voltage	V _{OUT} = 0.1 V, I _{OUT} ≤ 20 μA or V _{OUT} = V _{CC} - 0.1V	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V _{OH}	Minimum High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5	3.98	3.84	3.7	
			6.0	5.48	5.34	5.2	
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5	0.26	0.33	0.40	V
			6.0	0.26	0.33	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	V _{IN} = V _{CC} or GND, I _{OUT} = 0 μA (Per Package)	6.0	8.0	80	160	μA

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

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	6.0	4.8	4.0	MHz
		4.5	30	24	20	
		6.0	35	28	24	
t _{PLH} , t _{PHL}	Maximum Propagation Delay Time, Clock to Q or \bar{Q}	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
t _{PHL}	Maximum Propagation Delay Time, Reset to Q or \bar{Q}	2.0	125	155	190	ns
		4.5	25	31	38	
		6.0	21	26	32	
t _{TLH} , t _{THL}	Maximum Output Transition Time Any Output	2.0	75	95	110	ns
		4.5	15	19	22	
		6.0	13	16	19	
C _{IN}	Maximum Input Capacitance	—	10	10	10	pF
C _{PD}	Power Dissipation Capacitance (Per Flip-Flop) 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 V			pF	
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TIMING REQUIREMENTS (Input $t_r=t_f=6$ ns)

Symbol	Parameter	V _{CC}	Guaranteed Limit			Unit
			25°C to -55°C	≤85°C	≤125 °C	
t _{su}	Minimum Setup Time, Data to Clock	2.0	100	125	150	ns
		4.5	20	25	30	
		6.0	17	21	26	
t _h	Minimum Hold Time, Clock to Data	2.0	3	3	3	ns
		4.5	3	3	3	
		6.0	3	3	3	
t _{rec}	Minimum Recovery Time, Reset Inactive to Clock	2.0	100	125	150	ns
		4.5	20	25	30	
		6.0	17	21	26	
t _w	Minimum Pulse Width, Clock	2.0	80	100	120	ns
		4.5	16	20	24	
		6.0	14	17	20	
t _w	Minimum Pulse Width, Reset	2.0	80	100	120	ns
		4.5	16	20	24	
		6.0	14	17	20	

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} V	Guaranteed Limits						Unit
				25°C to -55°C		≤85°C		≤125°C		
				Min	Max	Min	Max	Min	Max	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} -0.1 V I _{OUT} ≤ 20 μA	4.5	2.00		2.00		2.00		V
			5.5	2.00		2.00		2.00		
V _{IL}	Maximum Low- Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	4.5		0.80		0.80		0.80	V
			5.5		0.80		0.80		0.80	
V _{OH}	Minimum High-Level Output Voltage	V _{IN} = V _{IL} or V _{IH} I _{OUT} ≤ 20 μA	4.5	4.40		4.40		4.40		V
			5.5	5.40		5.40		5.40		
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	4.5		0.1		0.1		0.1	V
			5.5		0.1		0.1		0.1	
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	4.5		0.26		0.33		0.40	V
			5.5		± 0.1		± 1.0		± 1.0	
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	5.5		8.0		80		160	μA
Δ I _{CC}	Additional Quiescent Supply Current	V _{IN} =2.4V, Any One Input V _{IN} =V _{CC} or GND, Other Inputs I _{OUT} =0 μA	5.5	≥ -55°C		25°C to 125°C				mA
				2.9		2.4				

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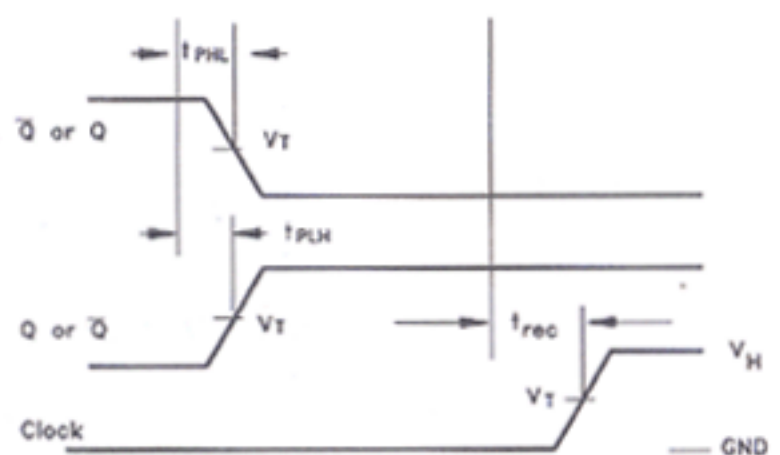
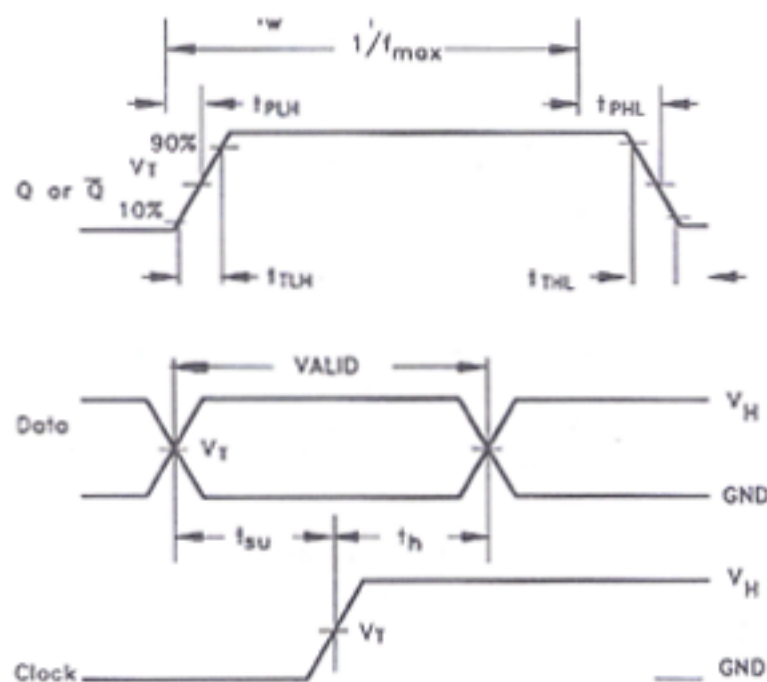
AC ELECTRICAL CHARACTERISTICS over full operating conditions ($C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			25°C to -55°C	≤85°C	≤125°C	
f _{max}	Maximum Clock Frequency (50% Cycle)	5.0 ±10%	30	20	17	MHz
t _{PLH} , t _{PHL}	Maximum Propagation Delay Time, Clock to Q or \bar{Q}	5.0 ±10%	30	41	50	ns
t _{PHL}	Maximum Propagation Delay Time, Reset to Q or \bar{Q}		25	48	57	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time Any Output		15	19	22	ns
C _{IN}	Maximum Input Capacitance	—	10	10	10	pF
C _{PD}	Power Dissipation Capacitance (Per Flip-Flop) 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 V			pF	
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TIMING REQUIREMENTS (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	
t _{su}	Minimum Setup Time, Data to Clock	5 ± 10%	16	20	24	ns
t _h	Minimum Hold Time, Clock to Data		5	5	5	ns
t _{rec}	Minimum Recovery Time, Reset Inactive to Clock		5	5	5	ns
t _w	Minimum Pulse Width, Clock		20	25	30	ns
t _w	Minimum Pulse Width, Reset		20	25	30	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