

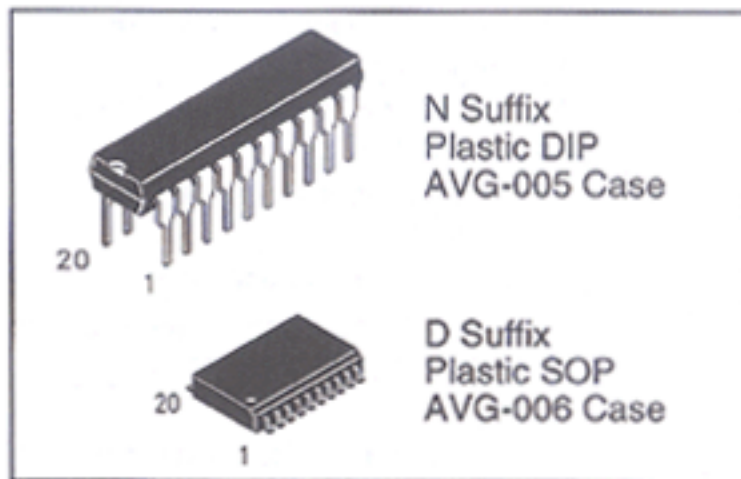
Octal 3-State Noninverting D-Type Flip-Flop

Pinout for the 'HC374A and 'HCT374A is identical to the LS374. The 'HC 374A Inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with TTL Family outputs. The 'HCT374A is particularly suited as a level convertor interfacing TTL or NMOS outputs to High-Speed CMOS inputs. Both devices are similar in function to the 'HC574A which has the input pins on the opposite side of the package from the output.

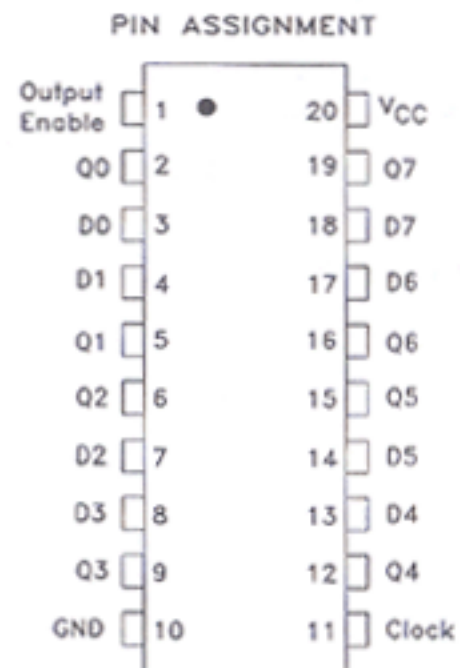
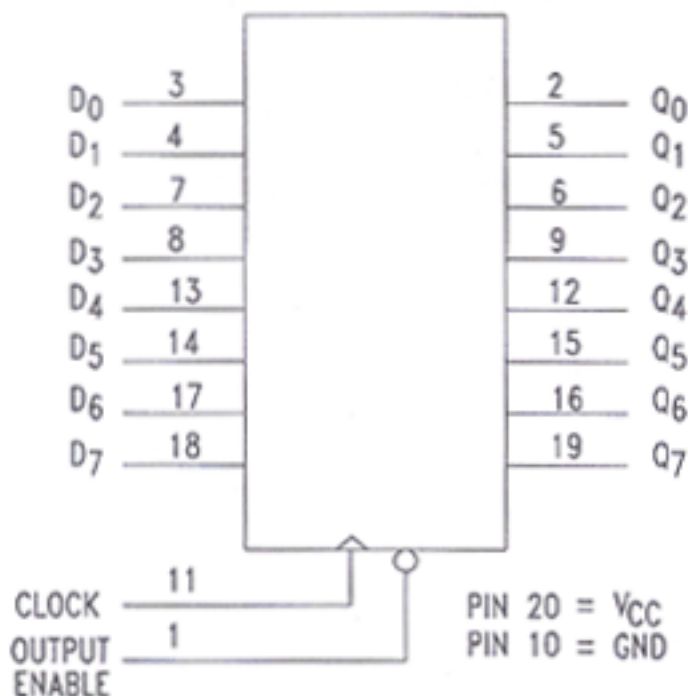
Data meeting the setup time is clocked to the outputs with the rising edge of the clock. The Output Enable input does not affect the states of the flip-flops, but when the Output Enable is high, the outputs are forced to the high-impedence state, thus, data may be stored even when the outputs are not enabled.

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

DV74HC374A
DV74HCT374A



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TRUTH TABLE

Input		Outputs	
Output Enable	Clock	D	Q
L	\uparrow	H	H
L	\uparrow	L	L
L	L, H, \downarrow	X	No Change
H	X	X	Z

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

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 Sink/Source Current, per Pin	± 35	mA
I _{CC}	DC V _{CC} or GND Current Pin	± 75	mA
P _D	Power Dissipation in Still Air Plastic DIP SOP Package Derating: Plastic Dip - 10 mW/°C from 65° to 125°C SOP Package - 7 mW/°C from 65° to 125°C	750 500	mW
T _{stg}	Storage Temperature	- 65 to +150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds Plastic DIP or SOP Package	260	°C

GUARANTEED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	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 — 374A

DC ELECTRICAL CHARACTERISTICS (Voltages referenced to GND)

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} = V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	1.50	1.50	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.20	4.20	4.2	
V _{IL}	Maximum Low Level Input Voltage	V _{OUT} = 0.1V I _{OUT} ≤ 20 μA	2.0	0.50	0.50	0.5	V
			4.5	1.35	1.35	1.35	
			6.0	1.80	1.80	1.8	
V _{OH}	Minimum High Level Output Voltage	V _{IN} = V _{IH} I _{OUT} ≤ 20 μA	2.0	1.90	1.90	1.9	V
			4.5	4.40	4.40	4.4	
		V _{IN} = V _{IH} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 mA	4.5	3.98	3.84	3.70	V
			6.0	5.48	5.34	5.20	
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IL} I _{OUT} ≤ 20 μA	2.0	0.10	0.10	0.1	V
			4.5	0.10	0.10	0.1	
			6.0	0.10	0.10	0.1	
		V _{IN} = V _{IL} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 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	±1.00	±1.00	μA
I _{OZ}	Maximum 3-State Current (Output in High Impedance State)	V _{IN} = V _{IL} or V _{IH} V _{OUT} = V _{CC} or GND	6.0	±0.5	±5.0	±10.0	mA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	6.0	4	40	160	μA

AC CHARACTERISTICS (CL = 50 pF, Input tr = tf = 6 ns)

Symbol	Parameter	Vcc (V)	Guaranteed Limits			Unit
			+25°C to -55°C	≤ 85°C	≤ 125°C	
fMAX	Maximum Clock Frequency (50% Duty Cycle)	2.0	6	5	4	MHz
		4.5	30	24	20	
		6.0	35	28	24	
tPLH, tPHL	Maximum Propagation Delay Clock to Q	2.0	125	155	190	ns
		4.5	25	31	38	
		6.0	21	26	32	
tPLZ, tPHZ	Maximum Propagation Delay Time, Output Disable to Q	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
tPZH, tPZL	Maximum Propagation Delay Time, Output Enable to Q	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
tTLH, tTHL	Maximum Output Transition Time, any Output	2.0	75	95	110	ns
		4.5	15	19	22	
		6.0	13	16	19	
CIN	Maximum Input Capacitance	—	10	10	10	pF
COUT	Maximum Three-State Output Capacitance (Output in High-Impedance State)	—	15	15	15	pF

CPD	Power Dissipation Capacitance (Per Buffer) Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$	Typical @ 25°C, Vcc = 5.0 V			pF
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TIMING REQUIREMENTS (CL = 50 pF, Input tr = tf = 6.0 ns)

Symbol	Parameter	Vcc (V)	Guaranteed Limits						Unit
			25°C to -55°C		≤ 85°C		≤ 125°C		
			Min	Max	Min	Max	Min	Max	
tsu	Minimum Setup Time, Input D to Latch Enable	2.0	50		65		75		ns
		4.5	10		13		15		
		6.0	9		11		13		
th	Minimum Hold Time, Latch Enable to Input D	2.0	5		5		5		ns
		4.5	5		5		5		
		6.0	5		5		5		
tw	Minimum Pulse Width, Latch Enable	2.0	60		75		90		ns
		4.5	12		15		18		
		6.0	10		3		15		

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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	
V _{IH}	Minimum High Level Input Voltage	V _{OUT} = 0.1V or V _{CC} - 0.1 I _{OUT} ≤ 20 μA	4.5 5.5	2.0 2.0	2.0 2.0	2.0 2.0	V
V _{OH}	Minimum High Level Output Voltage	V _{IN} = V _{IL} or V _{IH} I _{OUT} ≤ 20 μA	4.5 5.5	4.4 5.4	4.4 5.4	4.4 5.4	V
		V _{IN} = V _{IL} or V _{IH} I _{OUT} ≤ 6 mA	4.5	3.98	3.84	3.7	V
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IL} or V _{IH} I _{OUT} ≤ 20 μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		V _{IN} = V _{IL} or V _{IH} I _{OUT} ≤ 6 mA	4.5	0.26	0.33	0.4	V
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	5.5	±0.1	±1.0	±1.0	μA
I _{OZ}	Maximum 3-State Current (Output in High Impedance State)	V _{IN} = V _{IL} or V _{IH} V _{OUT} = V _{CC} or GND	5.5	±0.5	±5.0	±10.0	mA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND I _{OUTI} = 0 μA	5.5	4.0	40.0	160	μA
ΔI _{CC}	Additional Quiescent Supply Current (per Package)	V _{IN} = 2.4 V, Any One Input V _{IN} = V _{CC} or GND, Other Inputs I _{OUTI} = 0 μA	V _{CC} (V)	> -55°C		25°C to 125°C	mA
			5.5	2.9		2.4	

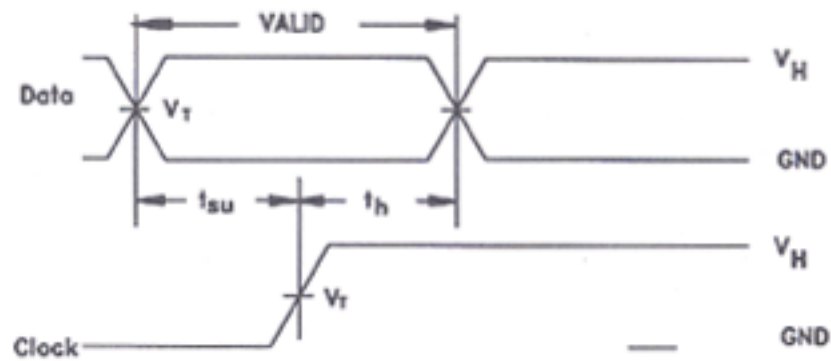
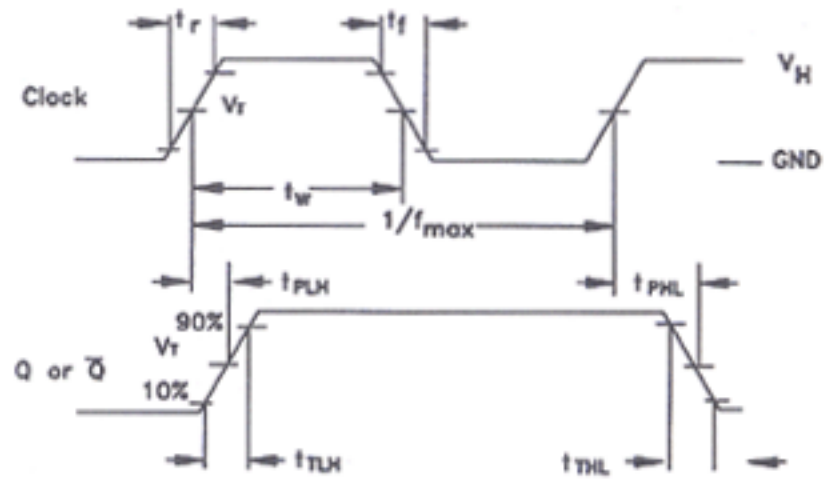
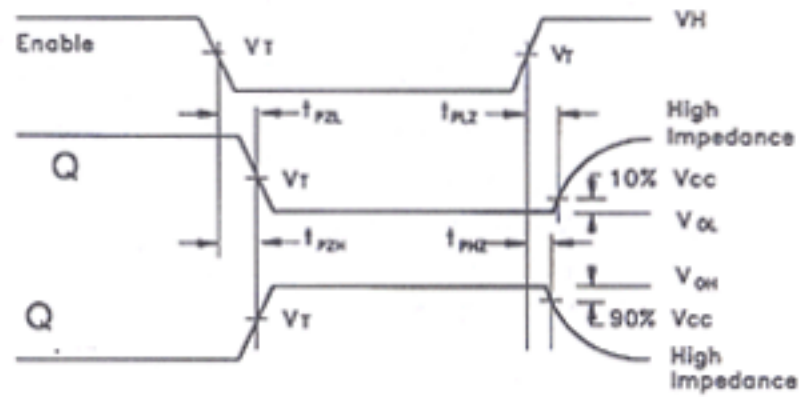
AC CHARACTERISTICS (V_{CC} = 5.0 V ±10%, Input t_r = t_f = 6.0 ns)

Symbol	Parameter	Guaranteed Limits			Unit
		25°C to -55°C	≤ 85°C	≤ 125°C	
f _{MAX}	Maximum Clock Frequency (50% Duty Cycle)	30	24	20	MHz
t _{PLH} , t _{PHL}	Maximum Propagation Delay Clock to Q	31	24	20	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay Time, Output Disble to Q	30	38	45	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay Time, Output Enable to Q	30	38	45	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, any Output	12	15	18	ns
C _{IN}	Maximum Input Capacitance	10	10	10	pF
C _{OUT}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	15	15	15	pF
C _{PD}	Power Dissipation Capacitance (Per Buffer) 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} = 5.0 V			pF
		65			

TIMING REQUIREMENTS ($V_{CC} = 5.0\text{ V} \pm 10\%$, Input $t_r = t_f = 6.0\text{ ns}$)

Symbol	Parameter	Guaranteed Limits			Unit
		25°C to -55°C	≤ 85°C	≤ 125°C	
t_{su}	Minimum Setup Time, Data to Clock	12.0	15.0	18.0	ns
t_h	Minimum Hold Time, Clock to Data	5.0	5.0	5.0	ns
t_w	Minimum Pulse Width, Clock	12.0	15.0	18.0	ns

SWITCHING WAVEFORMS



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