

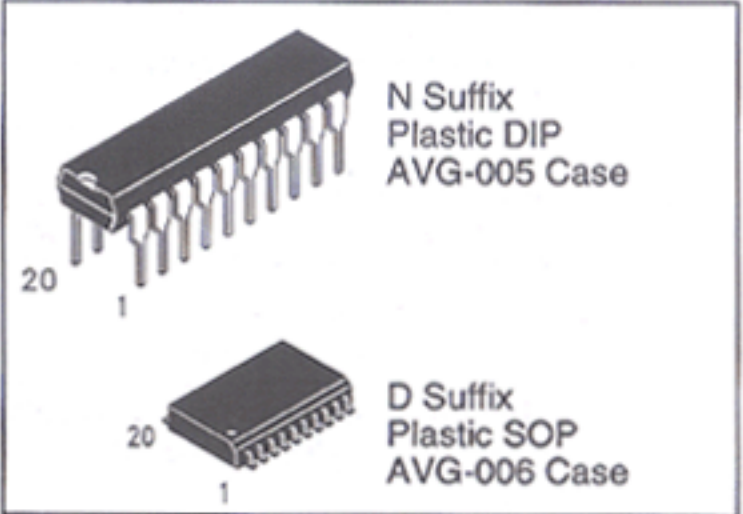
### Octal 3-State Noninverting D-Type Flip-Flop

Pinouts for the 'HC574A and 'HCT574A are identical to the LS574. The 'HC 574A Inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs. The 'HCT574A 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 'HC374/'HCT374 but have the flip-flop inputs on the opposite side of the package from the outputs to facilitate PC board layout.

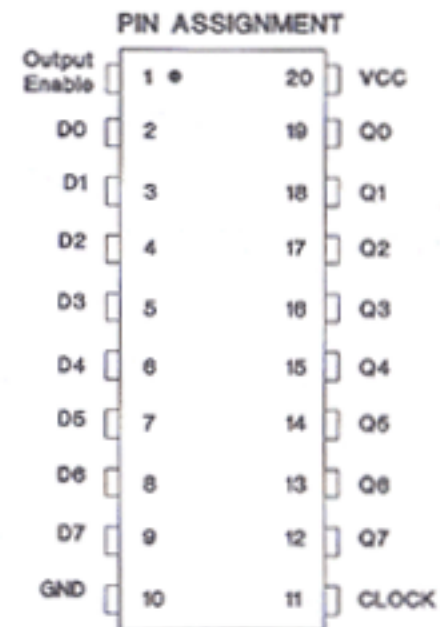
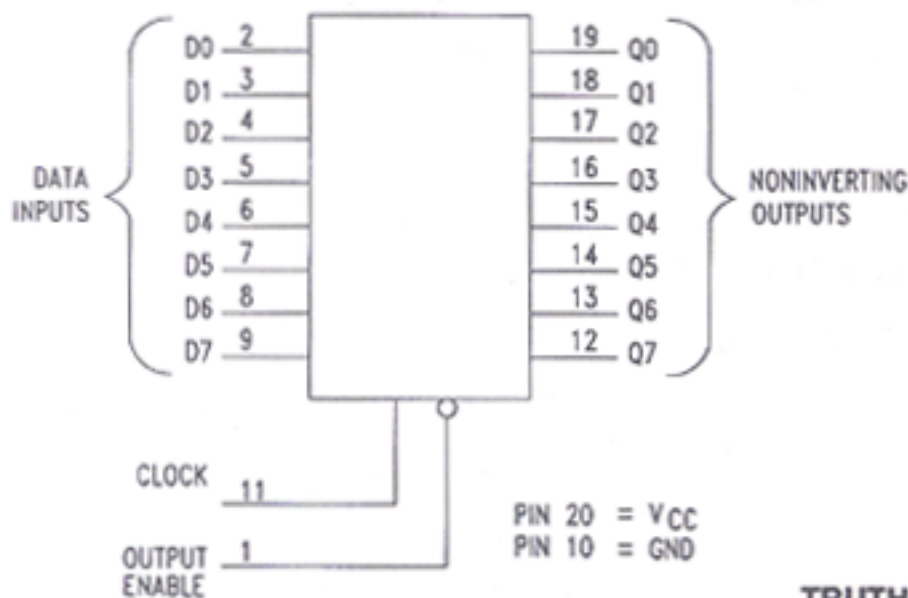
Data meeting the setup time is clocked to the outputs with the rising edge of the Clock. The Output Enable input does not affect the states of the flip-flops, but when the Output Enable is high, the outputs are forced to the high impedance state, thus, data may be stored even when the outputs are not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

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1  $\mu$ A
- DC, AC parameters guaranteed from -55°C to 125°C

**DV74HC574A**  
**DV74HCT574A**



574A



TRUTH TABLE  
(Each Flip-Flop)

Inputs		Output	
Output Enable	Clock	D	Q
L	↑	H	H
L	↑	L	L
L	L,H,↓	X	no change
H	X	X	Z

↑ = Low to High Edge Transition  
↓ = High to Low Edge Transition  
Z = High Impedance  
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 <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	- 0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage (Referenced to GND)	- 1.5 to V <sub>CC</sub> +1.5	V
V <sub>OUT</sub>	DC Output Voltage (Referenced to GND)	- 0.5 to V <sub>CC</sub> +0.5	V
I <sub>IN</sub>	DC Input Current, per Pin	± 20	mA
I <sub>OUT</sub>	DC Output Sink/Source Current, per Pin	± 35	mA
I <sub>CC</sub>	DC V <sub>CC</sub> or GND Current Pin	± 75	mA
P <sub>D</sub>	Power Dissipation in Still Air Plastic DIP SOP Package	750 500	mW
T <sub>stg</sub>	Storage Temperature	- 65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C

## GUARANTEED OPERATING CONDITIONS

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

## HC — 574A

## ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	Guaranteed Limits			Unit
				25°C to -55°C	≤ 85°C	≤ 125°C	
V <sub>IH</sub>	Minimum High Level Input Voltage	V <sub>OUT</sub> = V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.50	1.50	1.50	V
			4.5	3.15	3.15	3.15	
			6.0	4.20	4.20	4.20	
V <sub>IL</sub>	Maximum Low Level Input Voltage	V <sub>OUT</sub> = 0.1V  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.50	0.50	0.50	V
			4.5	1.35	1.35	1.35	
			6.0	1.80	1.80	1.80	
V <sub>OH</sub>	Minimum High Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.90	1.90	1.90	V
			4.5	4.40	4.40	4.40	
		V <sub>IN</sub> = V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 6.0 mA  I <sub>OUT</sub>   ≤ 7.8 mA	4.5	3.98	3.84	3.70	V
			6.0	5.48	5.34	5.20	
V <sub>OL</sub>	Maximum Low Level Output Voltage	V <sub>IN</sub> = V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.10	0.10	0.10	V
			4.5	0.10	0.10	0.10	
		V <sub>IN</sub> = V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 6.0 mA  I <sub>OUT</sub>   ≤ 7.8 mA	4.5	0.26	0.33	0.40	V
			6.0	0.26	0.33	0.40	
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	±0.1	±1.00	±1.00	μA
I <sub>OZ</sub>	Maximum 3-State Current (Output in High Impedance State)	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	6.0	±0.5	±5.0	±10.0	mA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0 μA	6.0	4	40	160	μA



**AC CHARACTERISTICS** over full operating conditions (CL = 50 pF, Input tr = tf = 6 ns)

Symbol	Parameter	Vcc (V)	Guaranteed Limits			Unit
			+25°C to -55°C	≤ 85°C	≤ 125°C	
f <sub>MAX</sub>	Maximum Clock Frequency (50% Duty Cycle)	2.0	6.0	4.8	4.0	MHz
		4.5	30	24	20	
		6.0	35	28	24	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay Clock to Q	2.0	160	200	240	ns
		4.5	32	40	48	
		6.0	27	34	41	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay Time, Output Disable to Q	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay Time, Output Enable to Q	2.0	140	175	210	ns
		4.5	28	35	42	
		6.0	24	30	36	
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, any Output	2.0	60	75	90	ns
		4.5	12	15	18	
		6.0	10	13	15	
C <sub>IN</sub>	Maximum Input Capacitance	—	10	10	10	pF
C <sub>OUT</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)	—	15	15	15	pF

C <sub>PD</sub>	Power Dissipation Capacitance (Per Buffer) Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^{2f} + I_{CC} V_{CC}$	Typical @ 25°C, V <sub>CC</sub> = 5.0 V			pF
		24			

**TIMING REQUIREMENTS** (C<sub>L</sub> = 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	
t <sub>su</sub>	Minimum Setup Time, Data to Clock	2.0	50		65		75		ns
		4.5	10		13		15		
		6.0	9		11		13		
t <sub>h</sub>	Minimum Hold Time, Clock to Data	2.0	5		5		5		ns
		4.5	5		5		5		
		6.0	5		5		5		
t <sub>w</sub>	Minimum Pulse Width, Clock	2.0	75		95		110		ns
		4.5	15		19		22		
		6.0	13		16		19		

**HCT — 574 A**
**DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Conditions	Vcc (V)	Guaranteed Limits			Unit
				+25°C to -55°C	< 85°C	≤ 125°C	
V <sub>IH</sub>	Minimum High Level Input Voltage	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1  I <sub>OUT</sub>   ≤ 20 μA	4.5	2.0	2.0	2.0	V
			5.5	2.0	2.0	2.0	
V <sub>IL</sub>	Maximum Low Level Input Voltage	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	4.5	0.8	0.8	0.8	V
			5.5	0.8	0.8	0.8	
V <sub>OH</sub>	Minimum High Level Output Voltage	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 20 μA	4.5	4.4	4.4	4.4	V
			5.5	5.4	5.4	5.4	
		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 6 mA	4.5	3.98	3.84	3.7	V

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	Guaranteed Limits			Unit
				+25°C to -55°C	< 85°C	≤ 125°C	
V <sub>OL</sub>	Maximum Low Level Output Voltage	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 20 μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>  I <sub>OUT</sub>   ≤ 6 mA	4.5	0.26	0.33	0.4	V
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>IN</sub> =V <sub>CC</sub> or GND	5.5	±0.1	±1.0	±1.0	μA
I <sub>OZ</sub>	Maximum 3-State Current (Output in High Impedance State)	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub> V <sub>OUT</sub> =V <sub>CC</sub> or GND	5.5	-0.5	-5.0	-10.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUTI</sub> = 0 μA	5.5	4.0	40.0	160	μA
ΔI <sub>CC</sub>	Additional Quiescent Supply Current (per Package) V <sub>IN</sub> =2.4 V, Any One Input; V <sub>IN</sub> = V <sub>CC</sub> or GND, Other Inputs; I <sub>OUTI</sub> = 0 μA		5.5	> - 55°C	25°C to 125°C		mA
				2.9	2.4		

**AC CHARACTERISTICS** over full operating conditions (V<sub>CC</sub> = 5.0 V ±10%, Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

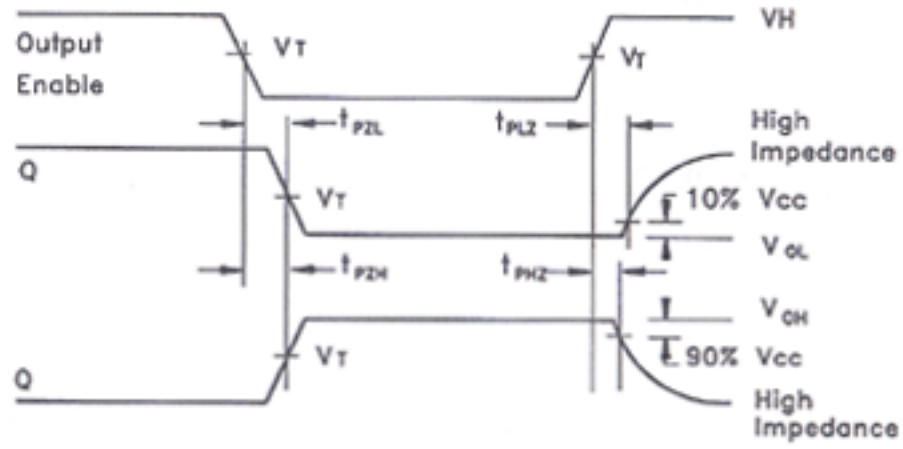
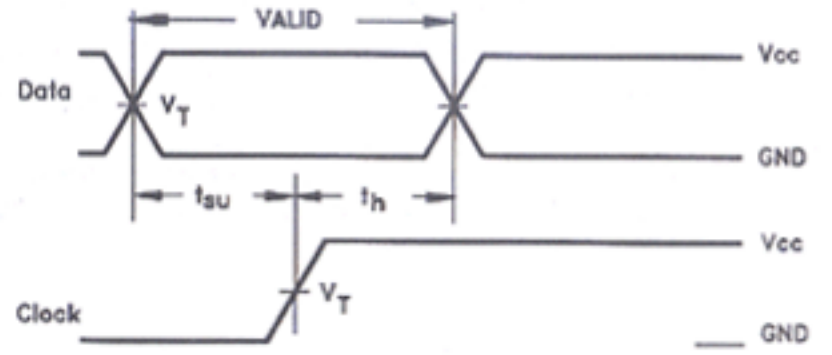
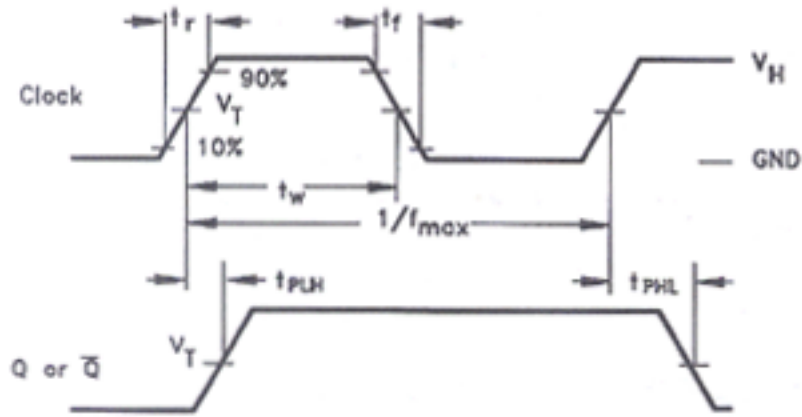
Symbol	Parameter	Guaranteed Limits			Unit
		25°C to -55°C	≤ 85°C	≤ 125°C	
f <sub>MAX</sub>	Maximum Clock Frequency (50% Duty Cycle)	30	24	20	MHz
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay Clock to Q	30	38	45	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay Time, Output Enable to Q	28	35	42	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	Maximum Propagation Delay Time, Output Enable to Q	28	35	42	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, any Output	12	15	18	ns
C <sub>IN</sub>	Maximum Input Capacitance	10	10	10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Per Buffer) Used to determine the no-load dynamic power consumption: P <sub>D</sub> = C <sub>PD</sub> V <sub>CC</sub> <sup>2f</sup> + I <sub>CC</sub> V <sub>CC</sub>	Typical @ 25°C, V <sub>CC</sub> = 5.0 V			pF
		58			

**TIMING REQUIREMENTS** (V<sub>CC</sub> = 5.0 V ±10%, Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns.)

Symbol	Parameter	Guaranteed Limits						Unit
		25°C to -55°C		≤ 85°C		≤ 125°C		
		Min	Max	Min	Max	Min	Max	
t <sub>SU</sub>	Minimum Setup Time, Data to Clock	10.0		13.0		15.0		ns
t <sub>H</sub>	Minimum Hold Time, Clock to Data	5.0		5.0		5.0		ns
t <sub>W</sub>	Minimum Pulse Width, Clock	15.0		19.0		22.0		ns



SWITCHING WAVE FORMS



574A