

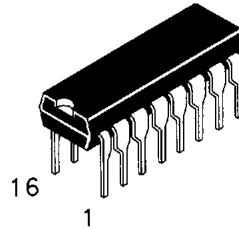
Available Q3, 1995

### Quad D Flip-Flop with Master Reset

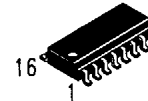
This device consists of four D flip-flops with common Reset and Clock inputs, and separate D inputs. Reset (active-low) is asynchronous and occurs when a low level is applied to the Reset input. Information at D inputs is transferred to the corresponding Q outputs on the next positive-going edge of the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

- Advanced very high speed CMOS
- Outputs source/sink 24 mA
- Transmission line driving 50 ohms
- ACT has TTL compatible inputs
- Operation from 2 to 6 volts guaranteed
- DC & AC Parameters guaranteed over -40 to +85°C

### DV74AC175 DV74ACT175

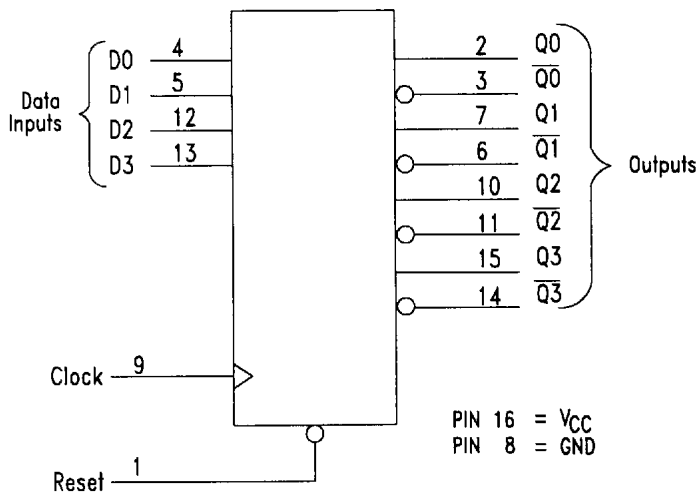


N Suffix  
Plastic DIP  
AVG-003 Case



D Suffix  
Plastic SOP  
AVG-004 Case

#### LOGIC DIAGRAM



#### PIN ASSIGNMENT

Reset	1	16	VCC
Q0	2	15	Q3
Q0-bar	4	14	Q3-bar
D0	5	13	D3
D1	3	12	D2
Q1-bar	6	11	Q2-bar
Q1	7	10	Q2
GND	8	9	Clock

#### TRUTH TABLE

Inputs			Output	
Reset	CP	D	Q <sub>n</sub>	Q <sub>n</sub> -bar
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q <sub>n</sub>	Q <sub>n</sub> -bar

H=HIGH Voltage Level, L=LOW Voltage Level

X=Either Low or High Logic Level

↑=LOW to HIGH transition of Clock

#### ABSOLUTE MAXIMUM RATINGS

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

Symbol	Parameter	AC175, ACT175	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)	-0.5 to V <sub>CC</sub> +0.5	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	± 50	mA
I <sub>CC</sub>	DC V <sub>CC</sub> or GND Current per Output Pin	± 50	mA

## GUARANTEED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V <sub>CC</sub>	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V <sub>IN</sub> , V <sub>OUT</sub>	DC Input Voltage, Output Voltage, (Ref. to GND)	0		V <sub>CC</sub>	V	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 1) <b>AC Devices</b>	V <sub>CC</sub> @ 3.0 V			150	ns/V
		V <sub>CC</sub> @ 4.5 V			40	ns/V
		V <sub>CC</sub> @ 5.5 V			25	ns/V
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 2) <b>ACT Devices</b>	V <sub>CC</sub> @ 4.5 V			10	ns/V
		V <sub>CC</sub> @ 5.5 V			8.0	ns/V
T <sub>A</sub>	Operating Ambient Temperature Range	-40		85	°C	
CPD	Power Dissipation Capacitance	V <sub>CC</sub> = 5.0 V		45	pF	
C <sub>IN</sub>	Input Capacitance V <sub>CC</sub> = 5.0 V	V <sub>CC</sub> = 5.0 V		4.5	pF	

1. V<sub>IN</sub> from 30% to 70% V<sub>CC</sub>

2. V<sub>IN</sub> from 0.8 to 2.0 V

## AC — 175

### DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	AC175			Unit
				T <sub>A</sub> = +25°C		T <sub>A</sub> = -40 to +85°C	
				Typ	Guaranteed Limits		
V <sub>IH</sub>	Minimum High Level Input Voltage	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1 V	3.0	1.5	2.1	2.1	V
			4.5	2.25	3.15	3.15	
			5.5	2.75	3.85	3.85	
V <sub>IL</sub>	Maximum Low Level Input Voltage	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1 V	3.0	1.5	0.9	0.9	V
			4.5	2.25	1.35	1.35	
			5.5	2.75	1.65	1.65	
V <sub>OH</sub>	Minimum High Level Output Voltage	I <sub>OUT</sub> = -50 μA	3.0	2.99	2.9	2.9	V
			4.5	4.49	4.4	4.4	
			5.5	5.49	5.4	5.4	
V <sub>OL</sub>	Maximum Low Level Output Voltage	I <sub>OUT</sub> = 50 μA	3.0	0.002	0.1	0.1	V
			4.5	0.001	0.1	0.1	
			5.5	0.001	0.1	0.1	
V <sub>OL</sub>	Maximum Low Level Output Voltage	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OH</sub> = 12mA 24mA 24 mA	3.0		0.36	0.44	V
			4.5		0.36	0.44	
			5.5		0.36	0.44	
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>I</sub> = V <sub>CC</sub> , GND	5.5		±0.1	±1.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5		8.0	80	μA

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## AC CHARACTERISTICS

Symbol	Parameter ( $C_L = 50 \text{ pF}$ )	$V_{CC}$ $\pm 10\%$ (V)	AC175				Unit
			$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		
			Min	Max	Min	Max	
fmax	Maximum Clock Frequency	3.3 5.0	149 187		139 187		MHz
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub>	3.3 5.0	2.0 1.5	12 9.0	2.0 1.0	13.5 9.5	ns
t <sub>PHL</sub>		3.3 5.0	2.5 1.5	13 9.5	2.0 1.5	14.5 10.5	
t <sub>PLH</sub>	Propagation Delay Reset to Q <sub>n</sub>	3.3 5.0	3.0 2.0	12.5 9.0	2.5 1.5	13.5 10.0	ns
t <sub>PHL</sub>		3.3 5.0	3.0 2.0	11.0 8.5	2.5 1.5	12.5 9.0	

## AC OPERATING REQUIREMENTS

Symbol	Parameter ( $C_L = 50 \text{ pF}$ )	$V_{CC}$ 10% (V)(s)	AC175		Unit		
			$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	
			Typ	Guaranteed Minimum			
t <sub>s</sub>	Setup Time, HIGH or LOW, Dn to CP	3.3 5.0	4.5 3.0	4.5 3.0	ns		
t <sub>h</sub>	Hold Time, HIGH or LOW, Dn to CP	3.3 5.0	1.0 1.0	1.0 1.0	ns		
t <sub>w</sub>	MR Pulse Width, LOW	3.3 5.0	4.5 3.5	4.5 3.5	ns		
t <sub>w</sub>	CP Pulse Width	3.3 5.0	4.5 3.5	5.0 3.5	ns		
t <sub>rec</sub>	Recovery Time, MR to CP	3.3 5.0	0 0	0 0	ns		

# ACT — 175

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	$V_{CC}$ (V)	ACT175		Unit
				$T_A = +25^\circ\text{C}$	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	
				Guaranteed Limits		
V <sub>IH</sub>	Minimum High Level Input Voltage	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1 V	4.5	2.0	2.0	V
			5.5	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	4.5	0.8	0.8	V
			5.5	0.8	0.8	
V <sub>OH</sub>	Minimum High Level Output Voltage	I <sub>OUT</sub> = -50 μA	4.5	4.4	4.4	V
			5.5	5.4	5.4	
		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OH</sub> = -24mA -24 mA	4.5	3.86	3.76	V
			5.5	4.86	4.76	
V <sub>OL</sub>	Maximum Low Level Output Voltage	I <sub>OUT</sub> = 50 μA	4.5	0.1	0.1	V
			5.5	0.1	0.1	
		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OL</sub> = 24mA 24 mA	4.5	0.36	0.44	V
			5.5	0.36	0.44	
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>I</sub> = V <sub>CC</sub> , GND	5.5	±0.1	±1.0	μA

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	ACT175		Unit
				TA = +25°C	TA = -40 to +85°C	
				Guaranteed Limits		
ΔI <sub>CC</sub> T	Additional Max I <sub>CC</sub> /Input	V <sub>I</sub> =V <sub>CC</sub> -2.1 V	5.5		1.5	mA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	8.0	80	μA

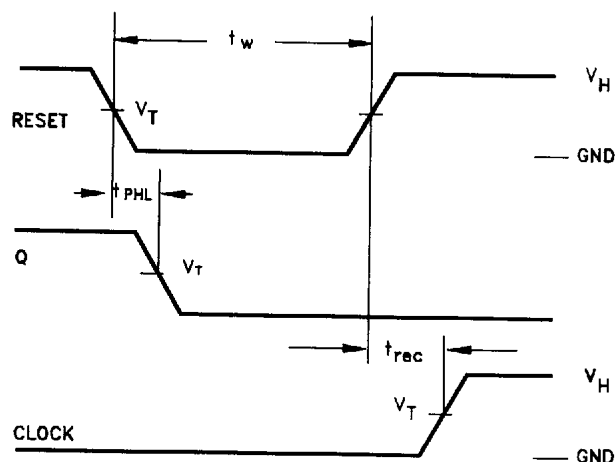
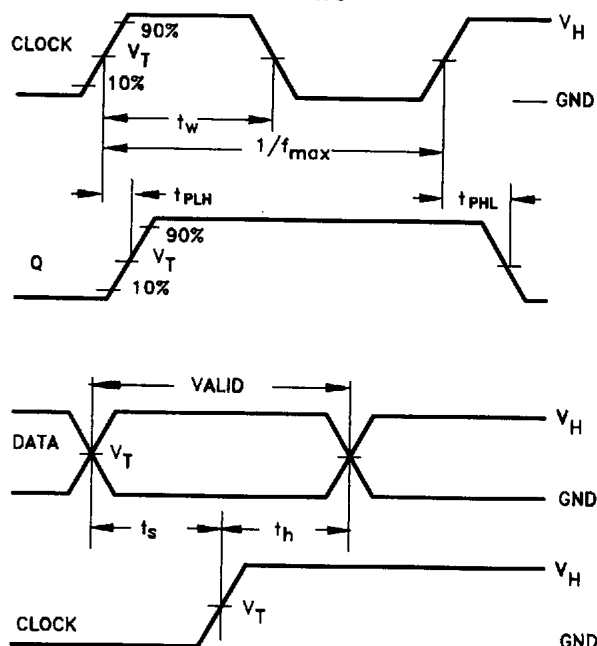
### AC CHARACTERISTICS

Symbol	Parameter (C <sub>L</sub> = 50 pF)	V <sub>CC</sub> ±10% (V)	ACT175				Unit
			TA = +25°C		TA = -40°C to +85°C		
			Min	Max	Min	Max	
f <sub>max</sub>	Maximum Clock Frequency	5.0	175		145		MHz
t <sub>PLH</sub>	Propagation Delay, Clock to Q <sub>n</sub>	5.0	2.0	10.0	1.5	11.0	ns
t <sub>PHL</sub>	Propagation Delay, Clock to Q <sub>n</sub>	5.0	2.0	11.0	1.5	12.0	ns
t <sub>PHL</sub>	Propagation Delay, Master Reset to Q <sub>n</sub>	5.0	2.0	9.5	1.5	10.5	ns

### AC OPERATING REQUIREMENTS

Symbol	Parameter (C <sub>L</sub> = 50 pF)	V <sub>CC</sub> ±10% (V)	ACT175		Unit
			TA = +25°C	TA = -40°C to +85°C	
			Guaranteed Minimum		
t <sub>s</sub>	Setup Time, HIGH or LOW, D <sub>n</sub> to CP (H) (L)	5.0	2.0 2.5	2.0 2.5	ns
t <sub>h</sub>	Hold Time, HIGH or LOW, D <sub>n</sub> to CP	5.0	1.0	1.0	ns
t <sub>w</sub>	MR Pulse Width, LOW	5.0	3.0	4.0	ns
t <sub>w</sub>	CP Pulse Width	5.0	3.0	3.5	ns
t <sub>rec</sub>	Recovery Time, MR to CP	5.0	0	0	ns

### SWITCHING WAVEFORMS



Input and output threshold voltage:  
 VT = 50% V<sub>CC</sub> for AC; 1.5V for ACT  
 VH = V<sub>CC</sub> for AC, 3V for ACT

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