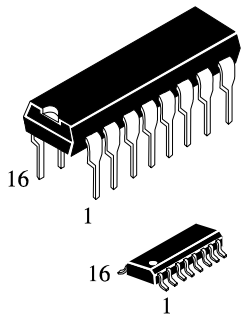
IN74ACT175

Quad D Flip-Flop with Common Clock and Reset

High-Speed Silicon-Gate CMOS



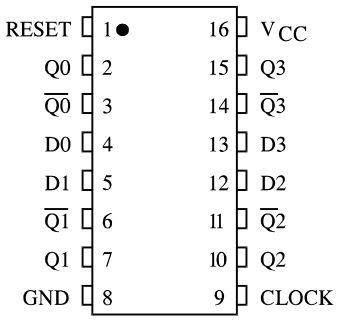
ORDERING INFORMATION
IN74ACT175N Plastic
IN74ACT175D SOIC
T_A = -40° to 85° C for all packages

The IN74ACT175 is identical in pinout to the LS/ALS175, HC/HCT175. The IN74ACT175 may be used as a level converter for interfacing TTL or NMOS outputs to High Speed CMOS inputs.

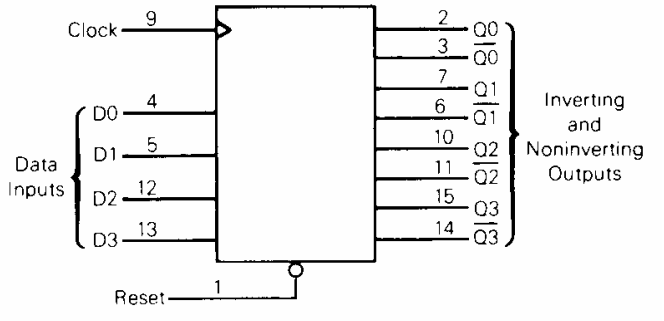
This device consists of four D flip-flops with common Reset and Clock inputs, and separate D inputs. Reset (active-low) is asynchronous and occurs when a low level is applied to the Reset input. Information at a D input is transferred to the corresponding Q output on the next positive-going edge of the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

- TTL/NMOS Compatible Input Levels
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1.0 μA; 0.1 μA @ 25°C
- Outputs Source/Sink 24 mA

PIN ASSIGNMENT



LOGIC DIAGRAM



PIN 16=V_{CC}
PIN 8 = GND

FUNCTION TABLE

Inputs			Outputs	
Reset	Clock	D	Q	$\overline{Q}$
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	no change	

X = Don't care

MAXIMUM RATINGS*

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)	-0.5 to V_{CC} +0.5	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	±50	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±50	mA
P_D	Power Dissipation in Still Air, Plastic DIP+ SOIC Package+	750 500	mW
Tstg	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°C

*Maximum Ratings are those values beyond which damage to the device may occur.
Functional operation should be restricted to the Recommended Operating Conditions.
+Derating - Plastic DIP: - 10 mW/°C from 65° to 125°C
SOIC Package: : - 7 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)		4.5	5.5	V
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage (Referenced to GND)		0	V_{CC}	V
T_J	Junction Temperature (PDIP)			140	°C
T_A	Operating Temperature, All Package Types		-40	+85	°C
I_{OH}	Output Current - High			-24	mA
I_{OL}	Output Current - Low			24	mA
t_r, t_f	Input Rise and Fall Time * (except Schmitt Inputs)	V_{CC} =4.5 V V_{CC} =5.5 V	0 0	10 8.0	ns/V

* V_{IN} from 0.8 V to 2.0 V

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range GND≤(V_{IN} or V_{OUT})≤V_{CC}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limits		Unit
				25 °C	-40°C to 85°C	
V_{IH}	Minimum High-Level Input Voltage	V_{OUT}=0.1 V or V_{CC}-0.1 V	4.5 5.5	2.0 2.0	2.0 2.0	V
V_{IL}	Maximum Low - Level Input Voltage	V_{OUT}=0.1 V or V_{CC}-0.1 V	4.5 5.5	0.8 0.8	0.8 0.8	V
V_{OH}	Minimum High-Level Output Voltage	$I_{OUT} \leq$ -50 μA	4.5 5.5	4.4 5.4	4.4 5.4	V
		*V_{IN}=V_{IH} or V_{IL} I_{OH}=-24 mA I_{OH}=-24 mA	4.5 5.5	3.86 4.86	3.76 4.76	
V_{OL}	Maximum Low-Level Output Voltage	$I_{OUT} \leq$ 50 μA	4.5 5.5	0.1 0.1	0.1 0.1	V
		*V_{IN}=V_{IH} or V_{IL} I_{OL}=24 mA I_{OL}=24 mA	4.5 5.5	0.36 0.36	0.44 0.44	
I_{IN}	Maximum Input Leakage Current	V_{IN}=V_{CC} or GND	5.5	±0.1	±1.0	μA
ΔI_{CCT}	Additional Max. I_{CC}/Input	V_{IN}=V_{CC} - 2.1 V	5.5		1.5	mA
I_{OLD}	+Minimum Dynamic Output Current	V_{OLD}=1.65 V Max	5.5		75	mA
I_{OHD}	+Minimum Dynamic Output Current	V_{OHD}=3.85 V Min	5.5		-75	mA
I_{CC}	Maximum Quiescent Supply Current (per Package)	V_{IN}=V_{CC} or GND	5.5	8.0	80	μA

* All outputs loaded; thresholds on input associated with output under test.
+Maximum test duration 2.0 ms, one output loaded at a time.

AC ELECTRICAL CHARACTERISTICS (V_{CC}=5.0 V ± 10%, C_L=50pF,Input t_r=t_f=3.0 ns)

Symbol	Parameter	Guaranteed Limits				Unit
		25 °C		-40°C to 85°C		
		Min	Max	Min	Max	
f_{max}	Maximum Clock Frequency (Figure 1)	175		145		MHz
t_{PLH}	Propagation Delay, Clock to Q or $\overline{Q}$ (Figure 1)	2.0	10.0	1.5	11.0	ns
t_{PHL}	Propagation Delay, Clock to Q or $\overline{Q}$ (Figure 1)	2.0	11.0	1.5	12.0	ns
t_{PHL}, t_{PLH}	Propagation Delay, Reset to Q or $\overline{Q}$ (Figure 2)	2.0	9.5	1.5	10.5	ns
C_{IN}	Maximum Input Capacitance	4.5		4.5		pF

		Typical @25°C,V_{CC}=5.0 V	
C_{PD}	Power Dissipation Capacitance	45	pF

TIMING REQUIREMENTS(V_{CC}=5.0 V ± 10%, C_L=50pF,Input t_r=t_f=3.0 ns)

Symbol	Parameter	Guaranteed Limits		Unit
		25 °C	-40°C to 85°C	
t_{su} (H) (L)	Minimum Setup Time, Data to Clock (Figure 3)	2.0 2.5	2.0 2.5	ns
t_h	Minimum Hold Time, Clock to Data (Figure 3)	1.0	1.0	ns
t_w	Minimum Pulse Width, Reset (Figure 2)	3.0	4.0	ns
t_w	Minimum Pulse Width, Clock (Figure 1)	3.0	3.5	ns
t_{rec}	Minimum Recovery Time, Reset to Clock (Figure 2)	0	0	ns

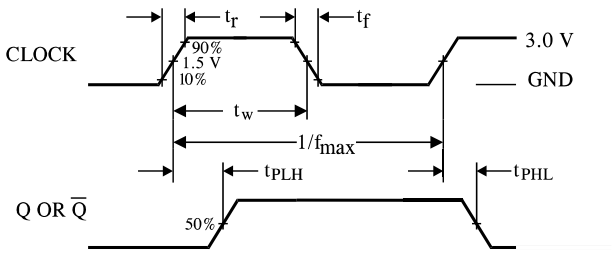


Figure 1. Switching Waveforms

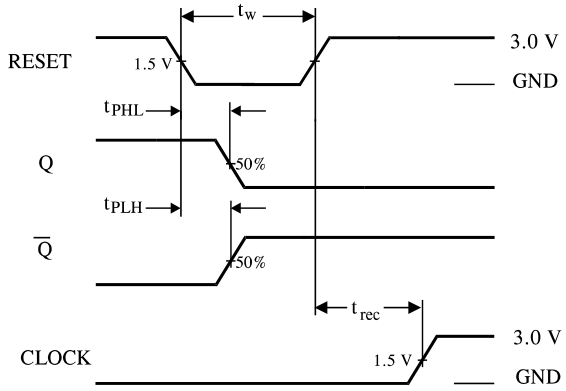


Figure 2. Switching Waveforms

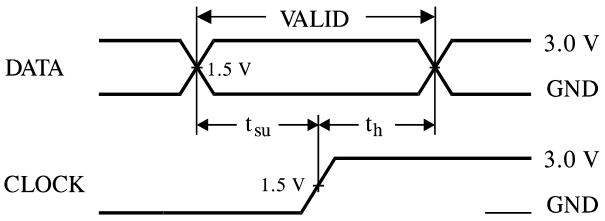
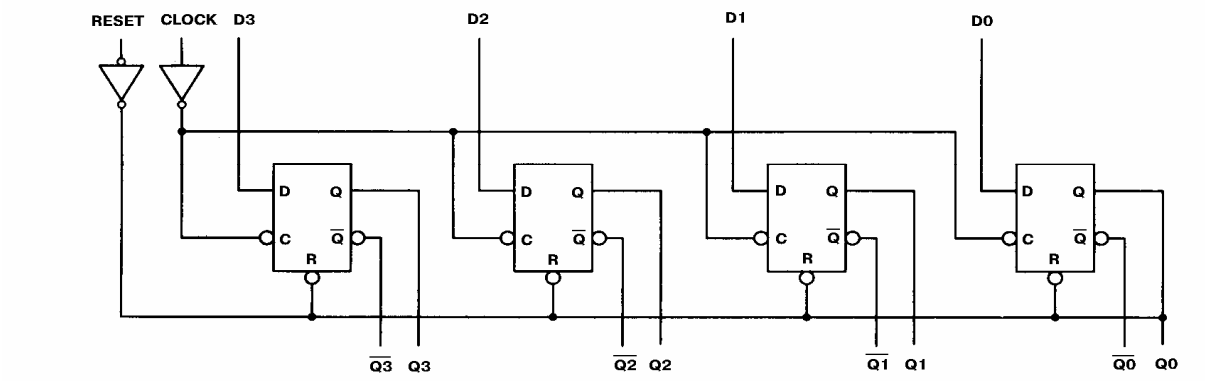
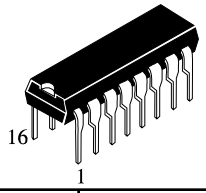


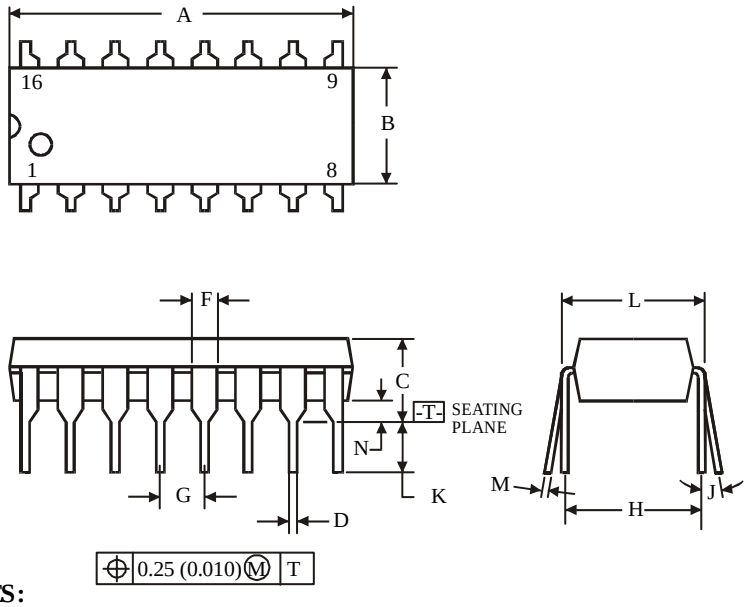
Figure 3. Switching Waveforms

EXPANDED LOGIC DIAGRAM



N SUFFIX PLASTIC DIP
(MS - 001BB)



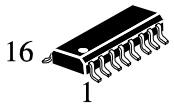


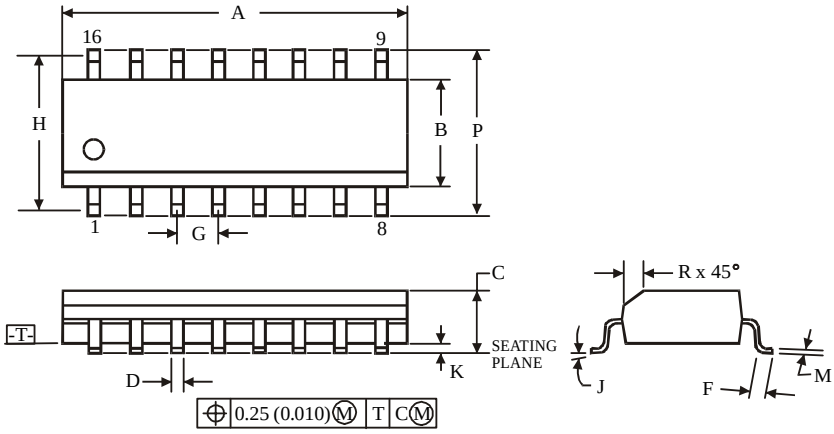
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC
(MS - 012AC)





	Dimension, mm	
Symbol	**MIN**	**MAX**
A	9.8	10
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side
   for A; for B – 0.25 mm (0.010) per side.