



54AC/74AC273 Octal D Flip-Flop

General Description

The 'AC273 has eight edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) and Master Reset ($\overline{MR}$) input load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's Q output.

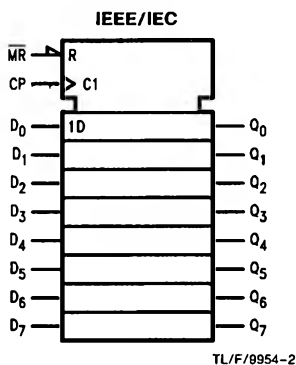
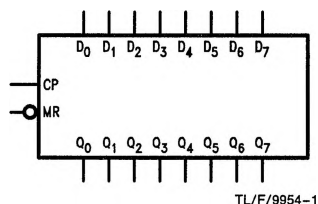
All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the $\overline{MR}$ input. The device is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

Features

- Ideal buffer for MOS microprocessor or memory
- Eight edge-triggered D flip-flops
- Buffered common clock
- Buffered, asynchronous master reset
- See '377 for clock enable version
- See '373 for transparent latch version
- See '374 for TRI-STATE version
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
 - 'AC273: 5962-87756

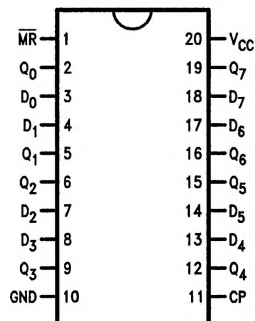
Ordering Code: See Section 8

Logic Symbols

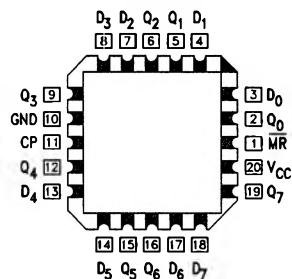


Connection Diagrams

**Pin Assignment
for DIP, Flatpak and SOIC**



**Pin Assignment
for LCC**



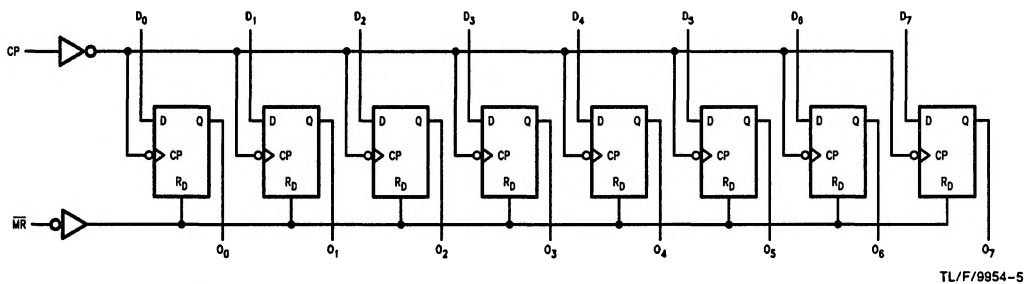
Pin Names	Description
D ₀ –D ₇	Data Inputs
$\overline{MR}$	Master Reset
CP	Clock Pulse Input
Q ₀ –Q ₇	Data Outputs

Mode Select-Function Table

Operating Mode	Inputs			Outputs
	$\overline{MR}$	CP	D_n	Q_n
Reset (Clear)	L	X	X	L
Load '1'	H		H	H
Load '0'	H		L	L

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 = LOW-to-HIGH Transition

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Rating (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	–0.5V to +7.0V
DC Input Diode Current (I_{IK})	
$V_I = -0.5V$	–20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage (V_I)	–0.5V to $V_{CC} + 0.5V$
DC Output Diode Current (I_{OK})	
$V_O = -0.5V$	–20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage (V_O)	–0.5V to $V_{CC} + 0.5V$
DC Output Source or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	–65°C to +150°C
Junction Temperature (T_J)	
CDIP	175°C
PDIP	140°C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (V_{CC})	2.0V to 6.0V
'AC	4.5 to 5.5V
'ACT	0V to V_{CC}
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
74AC/ACT	–40°C to +85°C
54AC/ACT	–55°C to +125°C
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'AC Devices	
V_{IN} from 30% to 70% of V_{CC}	
V_{CC} @ 3.3V, 4.5V, 5.5V	125 mV/ns
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

DC Characteristics for 'AC Family Devices

Symbol	Parameter	V _{CC} (V)	74AC		54AC	74AC	Units	Conditions
			T _A = +25°C		T _A = −55°C to +125°C	T _A = −40°C to +85°C		
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	2.1	V	V _{OUT} = 0.1V or V _{CC} − 0.1V
		4.5	2.25	3.15	3.15	3.15		
		5.5	2.75	3.85	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	0.9	V	V _{OUT} = 0.1V or V _{CC} − 0.1V
		4.5	2.25	1.35	1.35	1.35		
		5.5	2.75	1.65	1.65	1.65		
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	2.9	V	I _{OUT} = −50 μA
		4.5	4.49	4.4	4.4	4.4		
		5.5	5.49	5.4	5.4	5.4		
		3.0		2.56	2.4	2.46	V	*V _{IN} = V _{IL} or V _{IH} −12 mA I _{OH} −24 mA −24 mA
		4.5		3.86	3.7	3.76		
		5.5		4.86	4.7	4.76		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	0.1	V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1	0.1		
		5.5	0.001	0.1	0.1	0.1		
		3.0		0.36	0.50	0.44	V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
		4.5		0.36	0.50	0.44		
		5.5		0.36	0.50	0.44		
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	±1.0	μA	V _I = V _{CC} , GND

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	74AC		54AC		74AC		Units	Conditions
			T _A = +25°C		T _A = −55°C to +125°C		T _A = −40°C to +85°C			
			Typ	Guaranteed Limits						
I _{OLD}	†Minimum Dynamic Output Current	5.5			50		75		mA	V _{OLD} = 1.65V Max
I _{OHD}		5.5			−50		−75		mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	160.0		80.0		μA	V _{IN} = V _{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

AC Electrical Characteristics: See Section 2 for waveforms

Symbol	Parameter	V _{CC} * (V)	74AC			54AC		74AC		Units	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = −55°C to +125°C C _L = 50 pF		T _A = −40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max	Min	Max		
t _{max}	Maximum Clock Frequency	3.3 5.0	90 140	125 175		75 90		75 125		MHz	
t _{PLH}	Propagation Delay Clock to Output	3.3 5.0	4.0 3.0	7.0 5.5	12.5 9.0	1.0 1.0	15.0 11.0	3.0 2.5	14.0 10.0	ns	2-3, 4
t _{PHL}	Propagation Delay Clock to Output	3.3 5.0	4.0 3.0	7.0 5.0	13.0 10.0	1.0 1.0	16.0 11.5	3.5 2.5	14.5 11.0	ns	2-3, 4
t _{PHL}	Propagation Delay MR to Output	3.3 5.0	4.0 3.0	7.0 5.0	13.0 10.0	1.0 1.0	16.0 11.5	3.5 2.5	14.0 10.5	ns	2-3, 4

*Voltage Range 3.3 is 3.3V ±0.3V

Voltage Range 5.0 is 5.0V ±0.5V

AC Operating Requirements: See Section 2 for waveforms

Symbol	Parameter	V _{CC} * (V)	74AC		54AC	74AC	Units	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = −55°C to +125°C C _L = 50 pF	T _A = −40°C to +85°C C _L = 50 pF		
			Typ	Guaranteed Minimum				
t _s	Setup Time, HIGH or LOW Data to CP	3.3 5.0	3.5 2.5	5.5 4.0	8.0 5.0	6.0 4.5	ns	2-7
t _h	Hold Time, HIGH or LOW Data to CP	3.3 5.0	−2.0 −1.0	0 1.0	0 1.0	0 1.0	ns	2-7
t _w	Clock Pulse Width HIGH or LOW	3.3 5.0	3.5 2.5	5.5 4.0	6.5 5.0	6.0 4.5	ns	2-3
t _w	MR Pulse Width HIGH or LOW	3.3 5.0	2.0 1.5	5.5 4.0	10.0 6.5	6.0 4.5	ns	2-3
t _{rec}	Recovery Time MR to CP	3.3 5.0	1.5 1.0	3.5 2.0	6.0 4.0	4.5 3.0	ns	2-3, 7

*Voltage Range 3.3 is 3.3V ±0.3V

Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	$V_{CC} = 5.0V$
C_{PD}	Power Dissipation Capacitance	50.0	pF	$V_{CC} = 5.0V$