

MC74AC574, MC74ACT574

Octal D Flip-Flop with 3-State Outputs

The MC74AC574/74ACT574 is a high-speed, low power octal flip-flop with a buffered common Clock (CP) and a buffered common Output Enable (\overline{OE}). The information presented to the D inputs is stored in the flip-flops on the LOW-to-HIGH Clock (CP) transition.

The MC74AC574/74ACT574 is functionally identical to the MC74AC374/74ACT374 except for the pinouts.

- Inputs and Outputs on Opposite Sides of Package Allowing Easy Interface with Microprocessors
- Useful as Input or Output Port for Microprocessors
- Functionally Identical to MC74AC374/74ACT374
- 3-State Outputs for Bus-Oriented Applications
- Outputs Source/Sink 24 mA
- 'ACT574 Has TTL Compatible Inputs

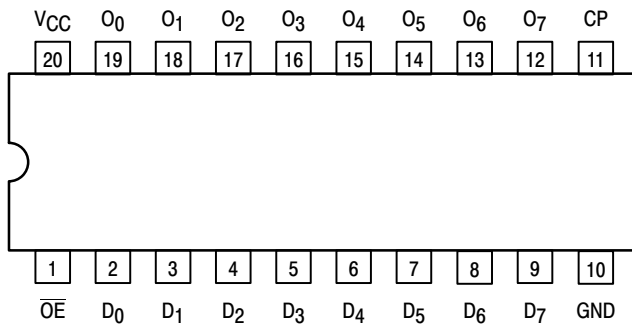


Figure 1. Pinout: 20-Lead Packages Conductors
(Top View)

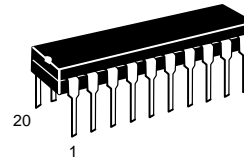
PIN ASSIGNMENT

PIN	FUNCTION
D ₀ -D ₇	Data Inputs
CP	Clock Pulse Input
\overline{OE}	3-State Output Enable Input
O ₀ -O ₇	3-State Outputs

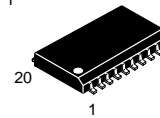


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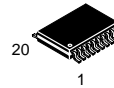
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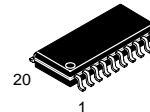
PDIP-20
N SUFFIX
CASE 738



SO-20
DW SUFFIX
CASE 751



TSSOP-20
DT SUFFIX
CASE 948E



EIAJ-20
M SUFFIX
CASE 967

ORDERING INFORMATION

Device	Package	Shipping
MC74AC574N	PDIP-20	18 Units/Rail
MC74ACT574N	PDIP-20	18 Units/Rail
MC74AC574DW	SOIC-20	38 Units/Rail
MC74AC574DWR2	SOIC-20	1000 Tape & Reel
MC74ACT574DW	SOIC-20	38 Units/Rail
MC74ACT574DWR2	SOIC-20	1000 Tape & Reel
MC74AC574DT	TSSOP-20	75 Units/Rail
MC74AC574DTR2	TSSOP-20	2500 Tape & Reel
MC74ACT574DT	TSSOP-20	75 Units/Rail
MC74ACT574DTR2	TSSOP-20	2500 Tape & Reel
MC74AC574M	EIAJ-20	40 Units/Rail
MC74AC574MEL	EIAJ-20	2000 Tape & Reel
MC74ACT574M	EIAJ-20	40 Units/Rail
MC74ACT574MEL	EIAJ-20	2000 Tape & Reel

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 278 of this data sheet.

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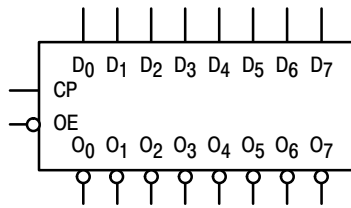


Figure 2. Logic Symbol

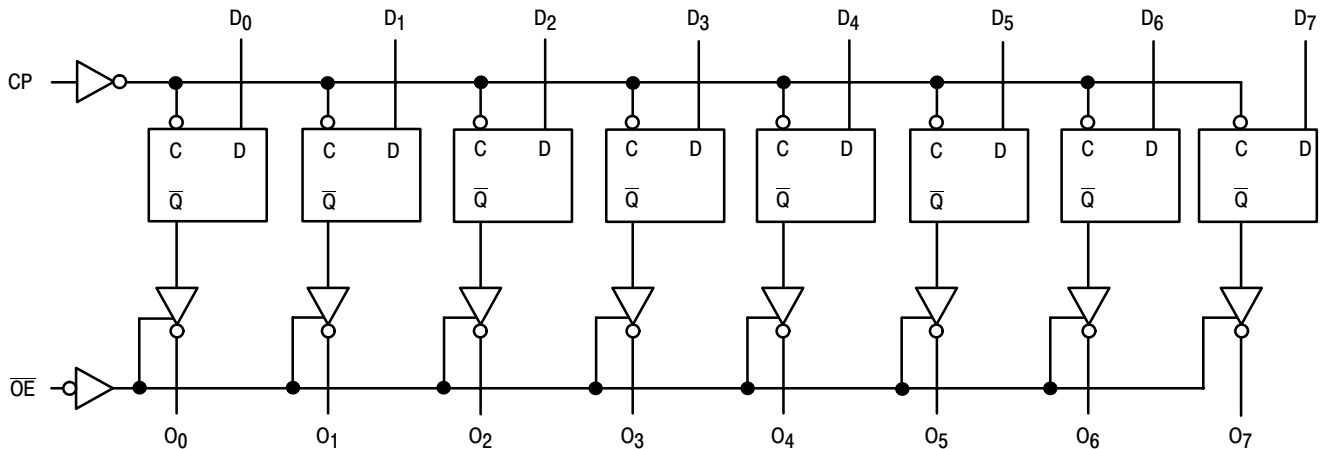
FUNCTIONAL DESCRIPTION

The MC74AC574/74ACT574 consists of eight edge-triggered flip-flops with individual D-type inputs and 3-state true outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. With the Output Enable (\overline{OE}) LOW, the contents of the eight flip-flops are available at the outputs. When \overline{OE} is HIGH, the outputs go to the high impedance state. Operation of the \overline{OE} input does not affect the state of the flip-flops.

FUNCTION TABLE

Inputs			Internal	Outputs	Function
\overline{OE}	CP	D	Q	O_n	
H	H	L	NC	Z	Hold
H	H	H	NC	Z	Hold
H	\lrcorner	L	L	Z	Load
H	\lrcorner	H	H	Z	Load
L	\lrcorner	L	L	L	Data Available
L	\lrcorner	H	H	H	Data Available
L	H	L	NC	NC	No Change in Data
L	H	H	NC	NC	No Change in Data

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance
 \lrcorner = LOW-to-HIGH Clock Transition
 NC = No Change



NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Figure 3. Logic Diagram

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 V_{CC} or GND Current per Output Pin	± 50	mA
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}C$

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V _{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V _{IN} , V _{OUT}	DC Input Voltage, Output Voltage (Ref. to GND)	0	–	V _{CC}	V	
t _r , t _f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V _{CC} @ 3.0 V	–	150	–	ns/V
		V _{CC} @ 4.5 V	–	40	–	
		V _{CC} @ 5.5 V	–	25	–	
t _r , t _f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V _{CC} @ 4.5 V	–	10	–	ns/V
		V _{CC} @ 5.5 V	–	8.0	–	
T _J	Junction Temperature (PDIP)	–	–	140	°C	
T _A	Operating Ambient Temperature Range	–40	25	85	°C	
I _{OH}	Output Current – High	–	–	–24	mA	
I _{OL}	Output Current – Low	–	–	24	mA	

1. V_{IN} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V_{IN} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74AC		74AC	Unit	Conditions
			T _A = +25°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	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = -50 μA
		4.5	4.49	4.4	4.4		
		5.5	5.49	5.4	5.4		
		3.0	-	2.56	2.46	V	*V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA
		4.5	-	3.86	3.76		
		5.5	-	4.86	4.76		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
		3.0	-	0.36	0.44	V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
		4.5	-	0.36	0.44		
		5.5	-	0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V _I = V _{CC} , GND
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	8.0	80	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: Note: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

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AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
f _{max}	Maximum Clock Frequency	3.3 5.0	75 95	— —	— —	60 85	— —	MHz	3-3
t _{PLH}	Propagation Delay CP to O _n	3.3 5.0	3.5 2.0	— —	13.5 9.5	3.5 2.0	15 11	ns	3-6
t _{PHL}	Propagation Delay CP to O _n	3.3 5.0	3.5 2.0	— —	12 8.5	3.5 2.0	13.5 9.5	ns	3-6
t _{PZH}	Output Enable Time	3.3 5.0	2.5 2.0	— —	11 8.5	2.5 2.0	12 9.0	ns	3-7
t _{PZL}	Output Enable Time	3.3 5.0	3.0 1.5	— —	10.5 8.0	3.5 2.0	11.5 9.0	ns	3-8
t _{PHZ}	Output Disable Time	3.3 5.0	4.0 2.0	— —	12 9.5	4.5 2.0	13 10.5	ns	3-7
t _{PLZ}	Output Disable Time	3.3 5.0	2.0 1.5	— —	9.0 7.5	2.5 1.5	10 8.5	ns	3-8

* Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

AC OPERATING REQUIREMENTS

Symbol	Parameter	V _{CC} * (V)	74AC		74AC		Unit	Fig. No.
			T _A = +25°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 D _n to CP	3.3 5.0	— —	2.5 1.5	3.0 2.0		ns	3-9
t _h	Hold Time, HIGH or LOW D _n to CP	3.3 5.0	— —	1.5 1.5	1.5 1.5		ns	3-9
t _w	CP Pulse Width HIGH or LOW	3.3 5.0	— —	6.0 4.0	7.0 5.0		ns	3-6

* Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

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DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74ACT		74ACT		Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C			
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V	
		5.5	1.5	2.0	2.0			
V _{IL}	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V	
		5.5	1.5	0.8	0.8			
V _{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I _{OUT} = -50 μA	
		5.5	5.49	5.4	5.4			
			4.5	-	3.86	3.76	V	*V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA
			5.5	-	4.86	4.76		
V _{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I _{OUT} = 50 μA	
		5.5	0.001	0.1	0.1			
			4.5	-	0.36	0.44	V	*V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA
			5.5	-	0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V _I = V _{CC} , GND	
ΔI _{CC} T	Additional Max. I _{CC} /Input	5.5	0.6		1.5	mA	V _I = V _{CC} - 2.1 V	
I _{OZ}	Maximum 3-State Current	5.5	-	±0.5	±5.0	μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND	
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5	-	8.0	80	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.

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74ACT			74ACT		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
f _{max}	Maximum Clock Frequency	5.0	100	-	-	85	-	ns	3-3
t _{PLH}	Propagation Delay CP to O _n	5.0	2.5	-	11	2.0	12	ns	3-6
t _{PHL}	Propagation Delay CP to O _n	5.0	2.0	-	10	1.5	11	ns	3-6
t _{PZH}	Output Enable Time	5.0	2.0	-	9.5	1.5	10	ns	3-7
t _{PZL}	Output Enable Time	5.0	2.0	-	9.0	1.5	10	ns	3-8
t _{PHZ}	Output Disable Time	5.0	2.0	-	10.5	1.5	11.5	ns	3-7
t _{PLZ}	Output Disable Time	5.0	2.0	-	8.5	1.5	9.0	ns	3-8

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

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AC OPERATING REQUIREMENTS

Symbol	Parameter	V _{CC} * (V)	74ACT		74ACT		Unit	Fig. No.
			T _A = +25°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 D _n to CP	5.0	–	2.5	2.5	ns	3–9	
t _h	Hold Time, HIGH or LOW D _n to CP	5.0	–	1.0	1.0	ns	3–9	
t _w	CP Pulse Width HIGH or LOW	5.0	–	3.0	4.0	ns	3–6	

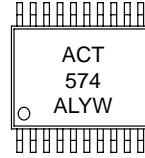
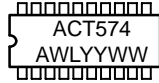
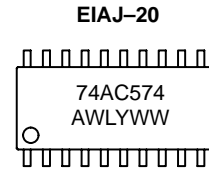
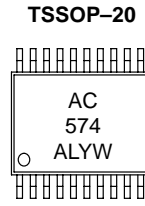
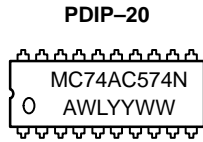
*Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	40	pF	V _{CC} = 5.0 V

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MARKING DIAGRAMS



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week