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

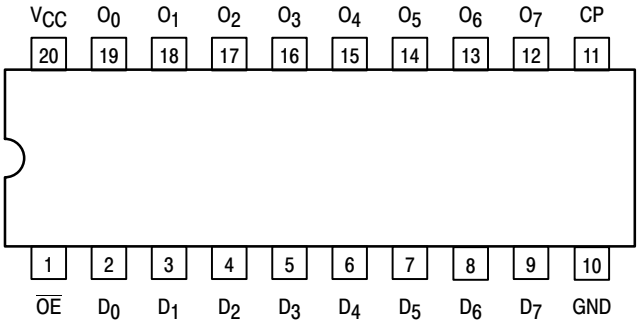

Figure 1. Pinout: 20–Lead Packages Conductors
(Top View)

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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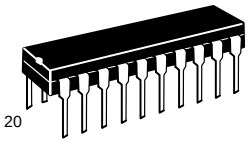
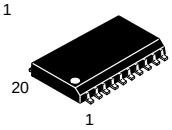
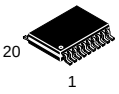


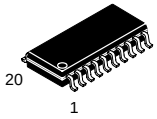
PDIP–20
N SUFFIX
CASE 738



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.

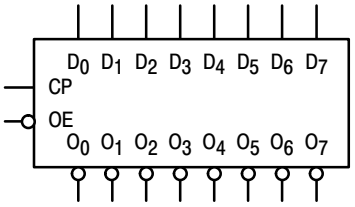


Figure 2. Logic Symbol

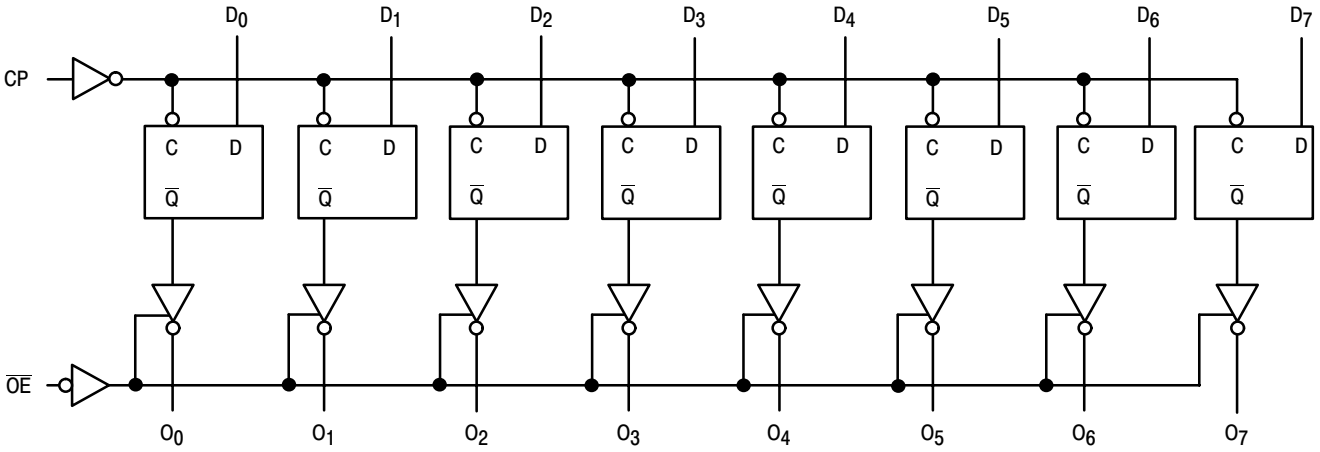
FUNCTIONAL DESCRIPTION

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	⌐¬	L	L	Z	Load
H	⌐¬	H	H	Z	Load
L	⌐¬	L	L	L	Data Available
L	⌐¬	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
⌐¬ = 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	°C

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

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.

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74AC T_A = +25°C		74AC T_A = –40°C to +85°C	Unit	Conditions
			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
		4.5	–	3.86	3.76		I_{OH} –24 mA
		5.5	–	4.86	4.76		–24 mA
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
		4.5	–	0.36	0.44		I_{OL} 24 mA
		5.5	–	0.36	0.44		24 mA
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}.

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

Symbol	Parameter	V_{CC}* (V)	74AC T_A = +25°C, C_L = 50 pF			74AC T_A = –40°C to +85°C, C_L = 50 pF		Unit	Fig. No.
			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 T_A = +25°C, C_L = 50 pF		74AC T_A = –40°C to +85°C, C_L = 50 pF	Unit	Fig. No.
			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.

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 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I_{OUT} = –50 μA
		4.5 5.5	– –	3.86 4.86	3.76 4.76	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} –24 mA I_{OH} –24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I_{OUT} = 50 μA
		4.5 5.5	– –	0.36 0.36	0.44 0.44	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} 24 mA I_{OL} 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	–	±0.1	±1.0	μA	V_I = V_{CC}, GND
ΔI_{CCT}	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.

AC OPERATING REQUIREMENTS

Symbol	Parameter	V_{CC}* (V)	74ACT T_A = +25°C C_L = 50 pF		74ACT T_A = –40°C to +85°C C_L = 50 pF	Unit	Fig. No.
			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

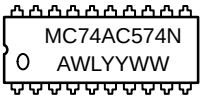
*Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

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

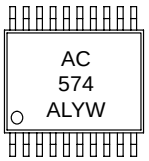
MARKING DIAGRAMS

PDIP–20



SO–20

TSSOP–20



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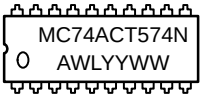

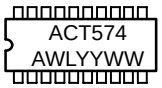

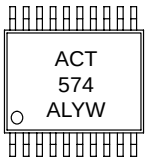

A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week