

MC74AC4040

12-Stage Binary Ripple Counter

The MC74AC4040 consists of 12 master-slave flip-flops. The output of each flip-flop feeds the next and the frequency at each output is half that of the preceding one. The state of the counter advances on the negative-going edge of the Clock input. Reset is asynchronous and active-high.

State changes of the Q outputs do not occur simultaneously because of internal ripple delays. Therefore, decoded output signals are subject to decoding spikes and may have to be gated with the Clock of the MC74AC4040 for some designs.

- 140 MHz Typ. Clock
- Outputs Source/Sink 24 mA
- Operating Voltage Range: 2.0 to 6.0 V
- High Noise Immunity

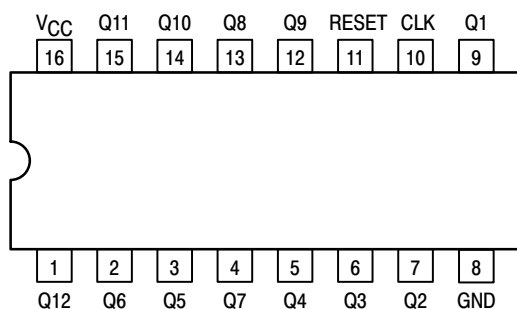


Figure 1. Pinout: 16-Lead Packages Conductors (Top View)

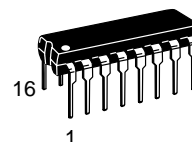
FUNCTION TABLE

Clock	Reset	Output State
	L	No Change
	L	Advance to next state
X	H	All Outputs are low

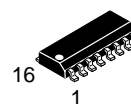


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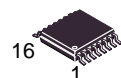
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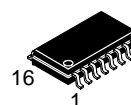
DIP-16
N SUFFIX
CASE 648



SO-16
D SUFFIX
CASE 751B



TSSOP-16
DT SUFFIX
CASE 948F



EIAJ-16
M SUFFIX
CASE 966

ORDERING INFORMATION

Device	Package	Shipping
MC74AC4040N	PDIP-16	25 Units/Rail
MC74AC4040D	SOIC-16	48 Units/Rail
MC74AC4040DR2	SOIC-16	2500 Tape & Reel
MC74AC4040DT	TSSOP-16	96 Units/Rail
MC74AC4040DTR2	TSSOP-16	2500 Tape & Reel
MC74AC4040M	EIAJ-16	50 Units/Rail

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 297 of this data sheet.

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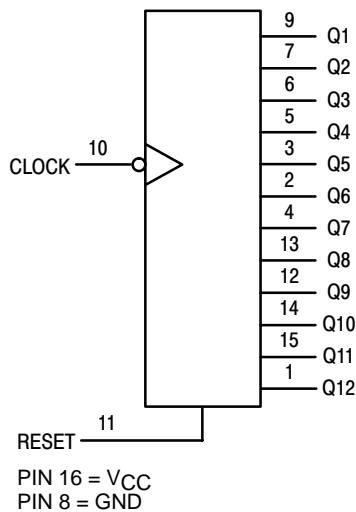


Figure 2. Logic Diagram

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 Current, per Pin	±50	mA
I _{CC}	DC V _{CC} or GND Current per Output Pin	±50	mA
P _D	Power Dissipation in Still Air Plastic† SOIC Package†	750 500	mW
T _{stg}	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.

†Derating: Plastic DIP: - 10mW/°C from 65°C to 125°C SOIC Package: -7.0 mW/°C from 65°C to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V _{IN} /V _{OUT}	Input Voltage, Output Voltage (Ref. to GND)	0	V _{CC}	-
T _A	Operating Temperature, All Package Types	-40	+85	°C
t _r /t _f	Input Rise/Fall Time (Figure 1)	V _{CC} = 3.0 V V _{CC} = 4.5 V V _{CC} = 5.5 V	0 150 40 25	ns/V

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DC CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	Value	Unit	
I _{CC}	Maximum Quiescent Supply Voltage	80	μA	V _{in} = V _{CC} or GND V _{CC} = 5.5 V, T _A = Worst Case
I _{CC}	Maximum Quiescent Supply Current	8.0	μA	V _{in} = V _{CC} or GND V _{CC} = 5.5 V, T _A = 25°C

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	–	2.1	2.1	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
		4.5	–	3.15	3.15		
		5.5	–	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	–	0.9	0.9	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
		4.5	–	1.35	1.35		
		5.5	–	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

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

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

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AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

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	110 130	120 140	– –	100 120	– –	MHz	–
n _{CP} to Q1	Propagation Delay n _{CP} to Q1	3.3 5.0	2.0 2.0	– –	11 8.0	2.0 2.0	14 10	ns	–
Q _n to Q _{n+1}	Propagation Delay Q _n to Q _{n+1}	3.3 5.0	0 0	– –	5.5 3.5	0 0	6.5 4.5	ns	–
MR to Q t _{HL}	Propagation Delay MR to Q	3.3 5.0	3.0 3.0	– –	12 10	3.0 3.0	15 12	ns	–
t _{rec} n _{CP} to MR	Recovery Time	3.3 5.0	0 0	-2.5 -1.5	– –	0 0	– –	ns	–
t _w n _{CP}	Minimum Pulse Width Clock Pin	3.3 5.0	4.0 3.0	3.5 2.5	– –	4.5 3.5	– –	ns	–
t _w MR	Minimum Pulse Width Master Reset	3.3 3.0	4.0 3.0	3.5 2.5	– –	4.5 3.5	– –	ns	–

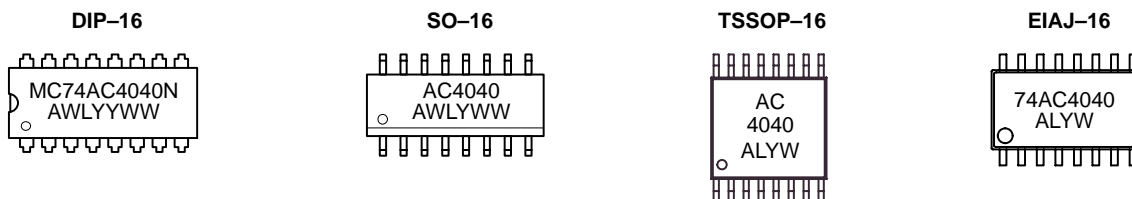
*Voltage Range 3.3 V is 3.3 V ±0.3 V.

*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	50	pF	V _{CC} = 5.0 V

MARKING DIAGRAMS



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