

12-Stage Binary Ripple Counter

MC74AC4040

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.

Features

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

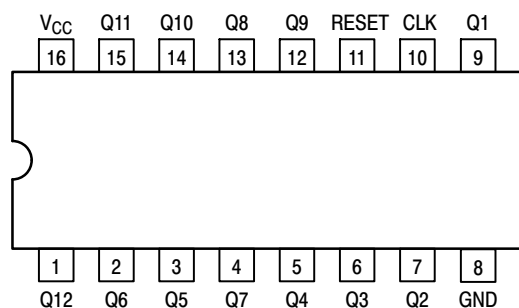


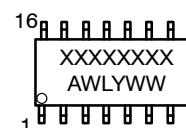
Figure 1. Pinout: 16-Lead Packages Conductors
(Top View)

FUNCTION TABLE

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



MARKING DIAGRAM



XXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

MC74AC4040

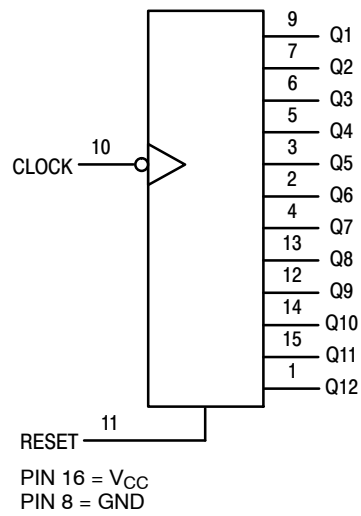


Figure 2. Logic Diagram

MC74AC4040

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage	−0.5 to +6.5	V
V _I	DC Input Voltage	−0.5 ≤ V _{CC} +0.5	V
V _O	DC Output Voltage (Note 1)	−0.5 ≤ V _{CC} +0.5	V
I _{IK}	DC Input Diode Current	±20	mA
I _{OK}	DC Output Diode Current	±50	mA
I _O	DC Output Sink/Source Current	±50	mA
I _{CC}	DC Supply Current per Output Pin	±50	mA
I _{GND}	DC Ground Current per Output Pin	±50	mA
T _{STG}	Storage Temperature Range	−65 to +150	°C
T _L	Lead temperature, 1 mm from Case for 10 Seconds	260	°C
T _J	Junction temperature under Bias	+150	°C
θ _{JA}	Thermal Resistance (Note 2)	126	°C/W
P _D	Power Dissipation in Still Air at 25°C	995	mW
MSL	Moisture Sensitivity	Level 1	
F _R	Flammability Rating	Oxygen Index: 30% – 35% UL 94 V–0 @ 0.125 in	
V _{ESD}	ESD Withstand Voltage (Note 3)	Human Body Model Charged Device Model > 2000 > 1000	V
I _{Latch-Up}	Latch-Up Performance (Note 4)	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. I_O absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD51–7.
3. HBM tested to EIA / JESD22–A114–A. CDM tested to JESD22–C101–A. JEDEC recommends that ESD qualification to EIA/JESD22–A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

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 (Referenced 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 0 0	150 40 25	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

MC74AC4040

DC CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	Conditions	Value	Unit
I_{CC}	Maximum Quiescent Supply Voltage	$V_{in} = V_{CC}$ or GND $V_{CC} = 5.5$ V, $T_A = \text{Worst Case}$	80	μA
I_{CC}	Maximum Quiescent Supply Current	$V_{in} = V_{CC}$ or GND $V_{CC} = 5.5$ V, $T_A = 25^\circ\text{C}$	8.0	μA

DC CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	74AC		74AC		Unit
				T _A = +25°C		T _A = –40°C to +85°C		
				Typ	Guaranteed Limits			
V _{IH}	Minimum High Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	3.0	–	2.1	2.1	V	
			4.5	–	3.15	3.15		
			5.5	–	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	3.0	–	0.9	0.9	V	
			4.5	–	1.35	1.35		
			5.5	–	1.65	1.65		
V _{OH}	Minimum High Level Output Voltage	I _{OUT} = –50 μA	3.0	2.99	2.9	2.9	V	
			4.5	4.49	4.4	4.4		
			5.5	5.49	5.4	5.4		
		*V _{IN} = V _{IL} or V _{IH} –12 mA I _{OH} –24 mA –24 mA	3.0	–	2.56	2.46	V	
			4.5	–	3.86	3.76		
			5.5	–	4.86	4.76		
V _{OL}	Maximum Low Level Output Voltage	I _{OUT} = 50 μA	3.0	0.002	0.1	0.1	V	
			4.5	0.001	0.1	0.1		
			5.5	0.001	0.1	0.1		
		*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA	3.0	–	0.36	0.44	V	
			4.5	–	0.36	0.44		
			5.5	–	0.36	0.44		
I _{IN}	Maximum Input Leakage Current	V _I = V _{CC} , GND	5.5	–	±0.1	±1.0	μA	
I _{OLD}	Minimum Dynamic Output Current†	V _{OLD} = 1.65 V Max	5.5	–	–	75	mA	
I _{OHD}		V _{OHD} = 3.85 V Min	5.5	–	–	–75	mA	

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

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

MC74AC4040

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

Symbol	Parameter	Conditions	V _{CC} * (V)	74AC			74AC		Unit
				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	Conditions	Value Typ	Unit
C _{IN}	Input Capacitance	V _{CC} = 5.0 V	4.5	pF
C _{PD}	Power Dissipation Capacitance	V _{CC} = 5.0 V	50	pF

ORDERING INFORMATION

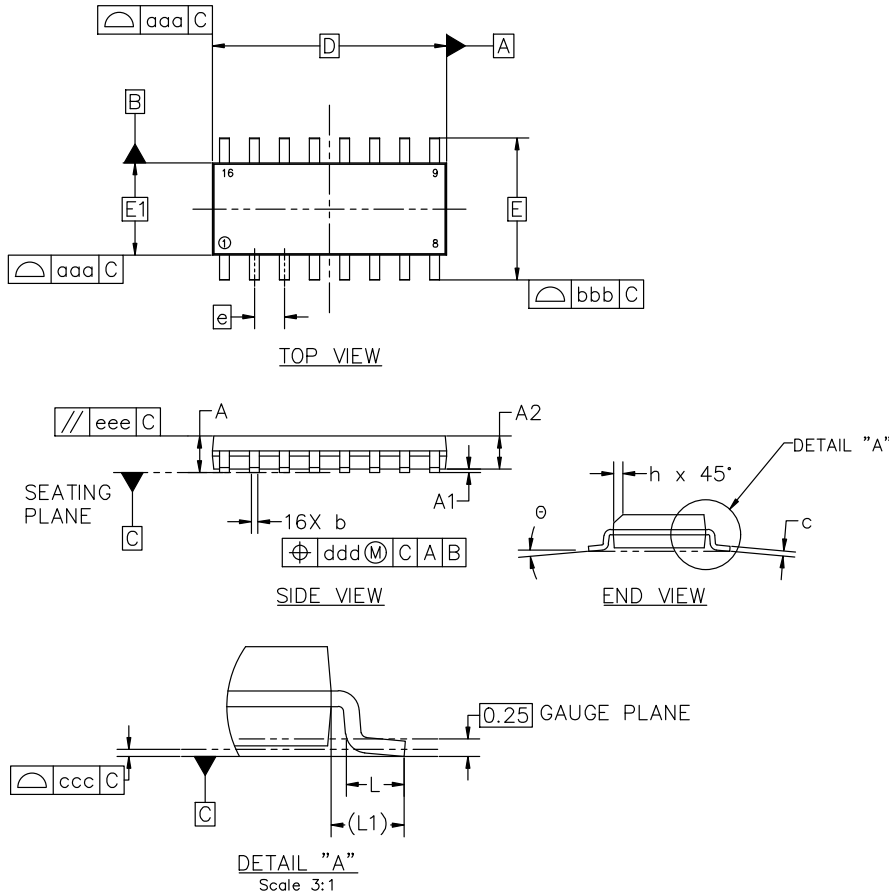
Device	Marking	Package	Shipping†
MC74AC4040DR2G	AC4040G	SOIC–16 (Pb–Free)	2,500 Tape & Reel


SOIC-16 9.90x3.90x1.37 1.27P
CASE 751B
ISSUE M

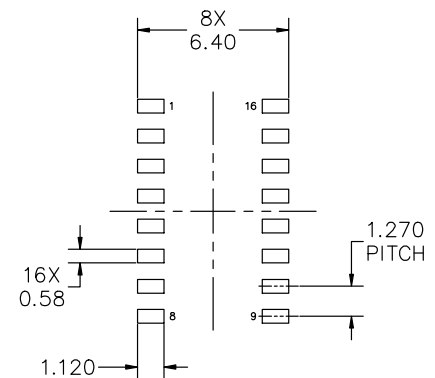
DATE 18 OCT 2024

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.



MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
A2	1.25	1.37	1.50
b	0.35	0.42	0.49
c	0.19	0.22	0.25
D	9.90 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
h	0.25	---	0.50
L	0.40	0.83	1.25
L1	1.05 REF		
θ	0°	---	7°
TOLERANCE OF FORM AND POSITION			
aaa	0.10		
bbb	0.20		
ccc	0.10		
ddd	0.25		
eee	0.10		



*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE onsemi SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D

DOCUMENT NUMBER:	98ASB42566B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOIC-16 9.90X3.90X1.37 1.27P	PAGE 1 OF 2

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

SOIC-16 9.90x3.90x1.37 1.27P
CASE 751B
ISSUE M

DATE 18 OCT 2024

GENERIC
MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1: PIN 1. COLLECTOR 2. BASE 3. EMITTER 4. NO CONNECTION 5. EMITTER 6. BASE 7. COLLECTOR 8. COLLECTOR 9. BASE 10. EMITTER 11. NO CONNECTION 12. EMITTER 13. BASE 14. COLLECTOR 15. EMITTER 16. COLLECTOR	STYLE 2: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION 4. CATHODE 5. CATHODE 6. NO CONNECTION 7. ANODE 8. CATHODE 9. CATHODE 10. ANODE 11. NO CONNECTION 12. CATHODE 13. CATHODE 14. NO CONNECTION 15. ANODE 16. CATHODE	STYLE 3: PIN 1. COLLECTOR, DYE #1 2. BASE, #1 3. EMITTER, #1 4. COLLECTOR, #1 5. COLLECTOR, #2 6. BASE, #2 7. EMITTER, #2 8. COLLECTOR, #2 9. COLLECTOR, #3 10. BASE, #3 11. EMITTER, #3 12. COLLECTOR, #3 13. COLLECTOR, #4 14. BASE, #4 15. EMITTER, #4 16. COLLECTOR, #4	STYLE 4: PIN 1. COLLECTOR, DYE #1 2. COLLECTOR, #1 3. COLLECTOR, #2 4. COLLECTOR, #2 5. COLLECTOR, #3 6. COLLECTOR, #3 7. COLLECTOR, #4 8. COLLECTOR, #4 9. BASE, #4 10. EMITTER, #4 11. BASE, #3 12. EMITTER, #3 13. BASE, #2 14. EMITTER, #2 15. BASE, #1 16. EMITTER, #1
STYLE 5: PIN 1. DRAIN, DYE #1 2. DRAIN, #1 3. DRAIN, #2 4. DRAIN, #2 5. DRAIN, #3 6. DRAIN, #3 7. DRAIN, #4 8. DRAIN, #4 9. GATE, #4 10. SOURCE, #4 11. GATE, #3 12. SOURCE, #3 13. GATE, #2 14. SOURCE, #2 15. GATE, #1 16. SOURCE, #1	STYLE 6: PIN 1. CATHODE 2. CATHODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE 7. CATHODE 8. CATHODE 9. ANODE 10. ANODE 11. ANODE 12. ANODE 13. ANODE 14. ANODE 15. ANODE 16. ANODE	STYLE 7: PIN 1. SOURCE N-CH 2. COMMON DRAIN (OUTPUT) 3. COMMON DRAIN (OUTPUT) 4. GATE P-CH 5. COMMON DRAIN (OUTPUT) 6. COMMON DRAIN (OUTPUT) 7. COMMON DRAIN (OUTPUT) 8. SOURCE P-CH 9. SOURCE P-CH 10. COMMON DRAIN (OUTPUT) 11. COMMON DRAIN (OUTPUT) 12. COMMON DRAIN (OUTPUT) 13. GATE N-CH 14. COMMON DRAIN (OUTPUT) 15. COMMON DRAIN (OUTPUT) 16. SOURCE N-CH	

DOCUMENT NUMBER:	98ASB42566B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOIC-16 9.90X3.90X1.37 1.27P	PAGE 2 OF 2

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales