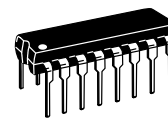


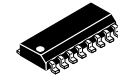


MC74AC4040

12-STAGE BINARY RIPPLE COUNTER



**N SUFFIX
CASE 648-08
PLASTIC**



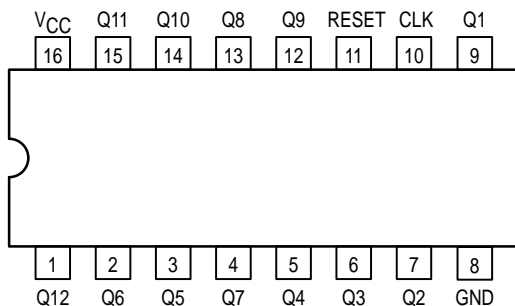
**D SUFFIX
CASE 751B-05
PLASTIC**

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.

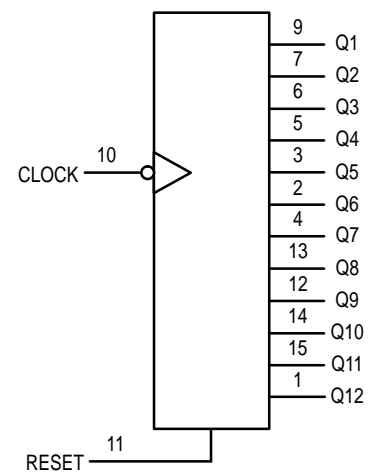
- 140 MHz Typ. Clock
- Outputs Source/Sink 24 mA
- Operating Voltage Range: 2.0 to 6.0 V
- High Noise Immunity



FUNCTION TABLE

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

LOGIC DIAGRAM



PIN 16 = VCC
PIN 8 = GND

MC74AC4040

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	0	150	ns/V
	V _{CC} = 4.5 V	0	40	
	V _{CC} = 5.5 V	0	25	

MC74AC4040

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		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.

MC74AC4040

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	110 130	120 140		100 120		MHz	
t _{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.

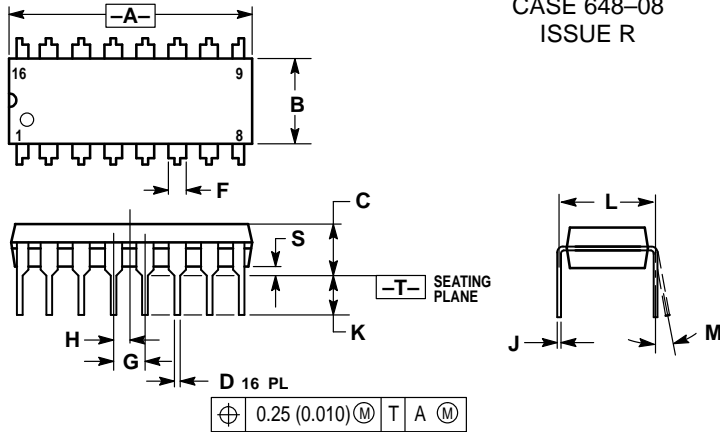
CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
CPD	Power Dissipation Capacitance	50	pF	V _{CC} = 5.0 V

MC74AC4040

OUTLINE DIMENSIONS

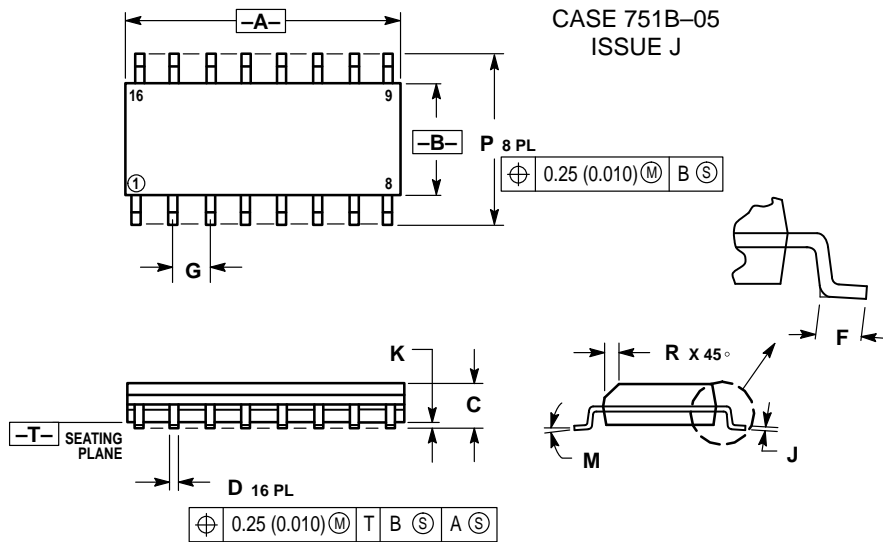
N SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola 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 consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola 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 Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA/EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com -TOUCHTONE (602) 244-6609
INTERNET: http://Design-NET.com

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

