

# HD14024B

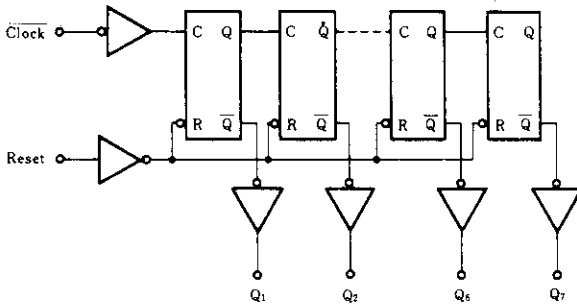
## Seven Stage Ripple Counter

The HD14024B is a seven stage ripple counter with short propagation delays and high maximum clock rates. The Reset input has standard noise immunity (typically 45% of  $V_{DD}$ ), however the Clock input has increased noise immunity due to Hysteresis, with no maximum Clock input rise or fall time. The Output of each counter stage is buffered.

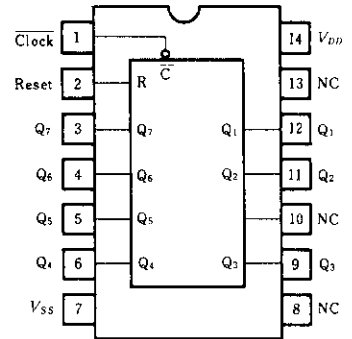
### FEATURES

- Quiescent Current  $\dot{I} = 5nA/pkg$  typ. @5V
- 8-MHz Operation @10V typ.
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4024B and MC14024B

### LOGIC DIAGRAM



### PIN ARRANGEMENT



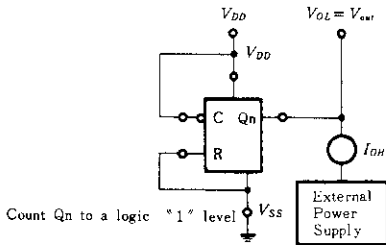
(Top View)

### TRUTH TABLE

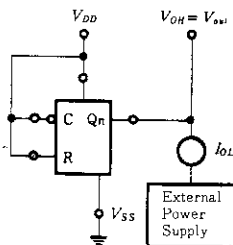
Clock	Reset	Outputs State
L	L	No Change
L	H	All Outputs are low
H	L	No Change
H	H	All Outputs are low
↗	L	No Change
↘	H	All Outputs are low
↖	L	Advance to next state
↗	H	All Outputs are low

### DC CHARACTERISTIC TEST CIRCUIT

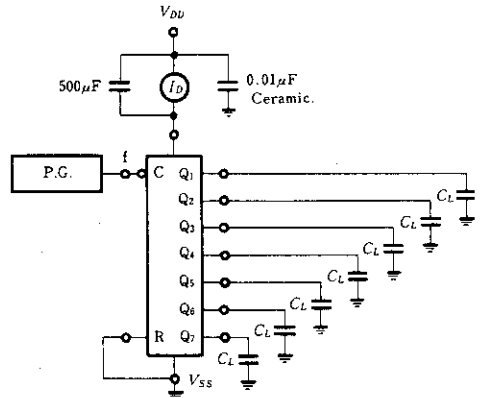
•  $I_{OH}$



•  $I_{OL}$



### POWER DISSIPATION TEST CIRCUIT



## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	$V_{DD}(V)$	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	$V_{OL}$	5.0	$V_{in} = V_{DD}$ or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	$V_{OH}$	5.0	$V_{in} = 0$ or $V_{DD}$	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	$V_{IL}$	5.0	$V_{out} = 4.5$ or $0.5V$	—	1.5	—	2.25	1.5	—	1.5	V
		10	$V_{out} = 9.0$ or $1.0V$	—	3.0	—	4.50	3.0	—	3.0	
		15	$V_{out} = 13.5$ or $1.5V$	—	4.0	—	6.75	4.0	—	4.0	
	$V_{IH}$	5.0	$V_{out} = 0.5$ or $4.5V$	3.5	—	3.5	2.75	—	3.5	—	V
		10	$V_{out} = 1.0$ or $9.0V$	7.0	—	7.0	5.50	—	7.0	—	
		15	$V_{out} = 1.5$ or $13.5V$	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current	$I_{OH}$	5.0	$V_{OH} = 2.5V$	-1.0	—	-0.8	-1.7	—	-0.6	—	mA
		5.0	$V_{OH} = 4.6V$	-0.2	—	-0.16	-0.36	—	-0.12	—	
		10	$V_{OH} = 9.5V$	-0.5	—	-0.4	-0.9	—	-0.3	—	
	$I_{OL}$	5.0	$V_{OL} = 0.4V$	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL} = 0.5V$	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL} = 1.5V$	3.6	—	3.0	8.8	—	2.4	—	
Input Current	$I_{in}$	15		—	$\pm 0.3$	—	$\pm 0.00001$	$\pm 0.3$	—	$\pm 1.0$	$\mu A$
Input Capacitance	$C_{in}$		$V_{in} = 0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	$I_{DD}$	5.0	Zero Signal, per Package	—	20	—	0.005	20	—	150	$\mu A$
		10		—	40	—	0.010	40	—	300	
		15		—	80	—	0.015	80	—	600	
Total Supply Current*	$I_T$	5.0	Dynamic + $I_{DD}$ ,	—	—	—	0.31	—	—	—	$\mu A$
		10	Per Gate	—	—	—	0.60	—	—	—	
		15	$C_L = 50pF, f = 1kHz$	—	—	—	0.89	—	—	—	

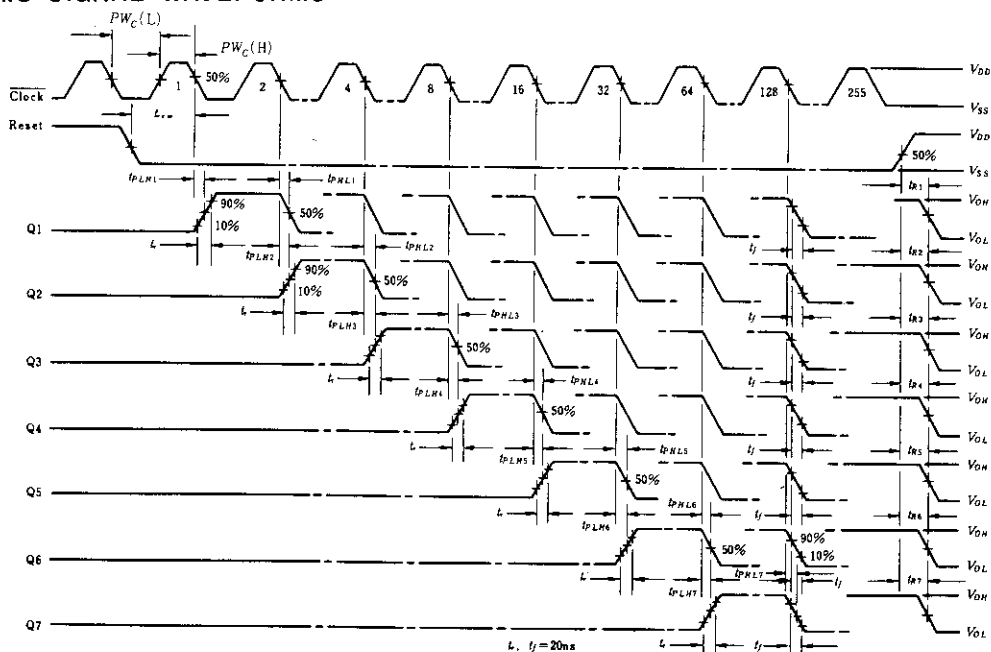
\* To calculate total supply current at frequency other than 1kHz.

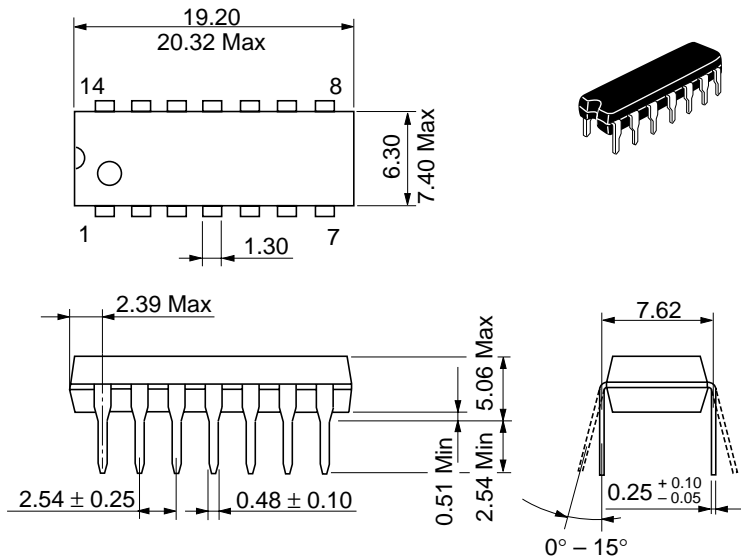
@  $V_{DD} = 5.0V$   $I_T = (0.31\mu A/kHz)f + I_{DD}$ . @  $V_{DD} = 10V$   $I_T = (0.60\mu A/kHz)f + I_{DD}$ . @  $V_{DD} = 15V$   $I_T = (0.89\mu A/kHz)f + I_{DD}$

■ SWITCHING CHARACTERISTICS ( $C_L=50\text{pF}$ ,  $T_a=25^\circ\text{C}$ )

Characteristic		Symbol	$V_{DD}(\text{V})$	min	typ	max	Unit
Output Rise Time		$t_r$	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		$t_f$	5.0	—	100	250	ns
			10	—	50	150	
			15	—	37	100	
Propagation Delay Time	Clock to $Q_1$	$t_{PLH}$ $t_{PHL}$	5.0	—	380	600	ns
			10	—	150	230	
			15	—	110	175	
	Clock to $Q_7$		5.0	—	1,000	3,000	
			10	—	400	750	
			15	—	300	565	
	Reset to $Q_n$		5.0	—	500	800	
			10	—	250	400	
			15	—	180	300	
Clock Pulse Width	$PW_C$	5.0	500	200	—	ns	
		10	165	60	—		
		15	125	40	—		
Reset Pulse Width	$PW_R$	5.0	600	375	—	ns	
		10	350	200	—		
		15	260	150	—		
Reset Removal Time	$t_{rem}$	5.0	625	250	—	ns	
		10	190	75	—		
		15	145	50	—		
Clock Pulse Rise and Fall Time	$t_r, t_f$	5.0	No Limit				
		10					
		15					
Clock Frequency	$f_{max}$	5.0	—	2.5	1.0	MHz	
		10	—	8.0	3.0		
		15	—	12	4.0		

■ DYNAMIC SIGNAL WAVEFORMS





Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g

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# HITACHI

## Hitachi, Ltd.

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      North America      : <http://semiconductor.hitachi.com/>  
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## For further information write to:

Hitachi Semiconductor  
(America) Inc.  
179 East Tasman Drive,  
San Jose, CA 95134  
Tel: <1> (408) 433-1990  
Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
Electronic components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
Electronic Components Group.  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.  
16 Collyer Quay #20-00  
Hitachi Tower  
Singapore 049318  
Tel: 535-2100  
Fax: 535-1533

Hitachi Asia Ltd.  
Taipei Branch Office  
3F, Hung Kuo Building, No.167,  
Tun-Hwa North Road, Taipei (105)  
Tel: <886> (2) 2718-3666  
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon, Hong Kong  
Tel: <852> (2) 735 9218  
Fax: <852> (2) 730 0281  
Telex: 40815 HITEC HX

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