

HD14160B, HD14161B HD14162B, HD14163B

HD14160B.....Decade Counter with Asynchronous Clear

HD14161B.....4-bit Binary Counter with Asynchronous Clear

HD14162B.....Decade Counter with Synchronous Clear

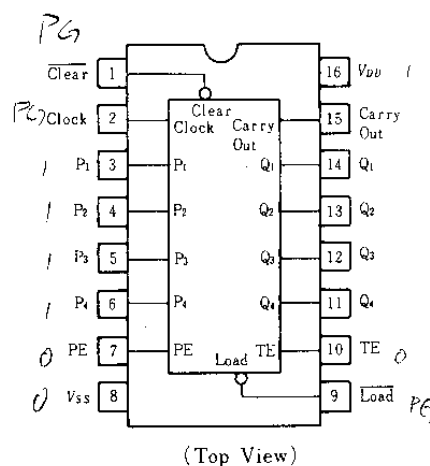
HD14163B.....4-bit Binary Counter with Synchronous Clear

The HD14160B to HD14163B are synchronous programmable counters and functionally equivalent to the 74160 to 74163 TTL counters. Two are synchronous programmable decade counters with asynchronous and synchronous clear inputs respectively (HD14160B, HD14162B). The other two are synchronous programmable 4-bit binary counters with the asynchronous and synchronous clear respectively (HD14161B, HD14163B).

■ FEATURES

- Internal Look-Ahead for Fast Counting
- Carry Output for N-bit Cascading
- Synchronously Programmable
- Synchronous Counting
- Load Control Line
- Synchronous or Asynchronous Clear Positive Edge Clocked

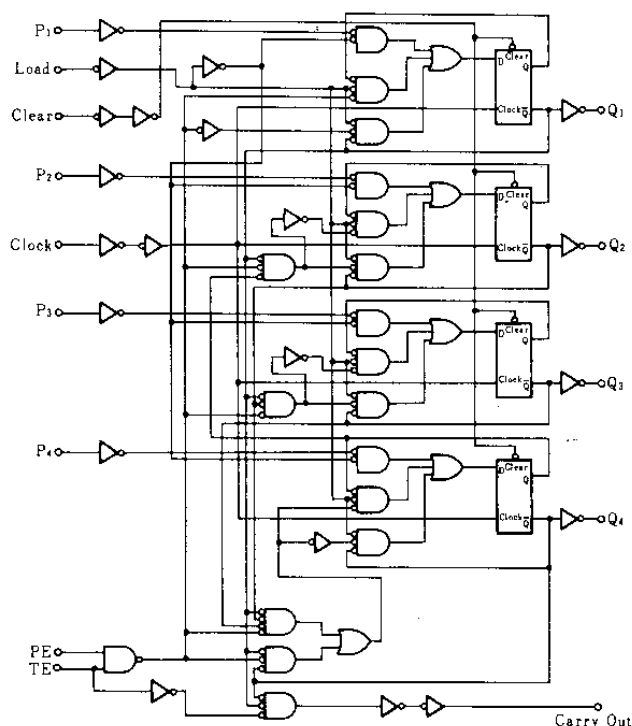
■ PIN ARRANGEMENT



■ LOGIC DIAGRAM

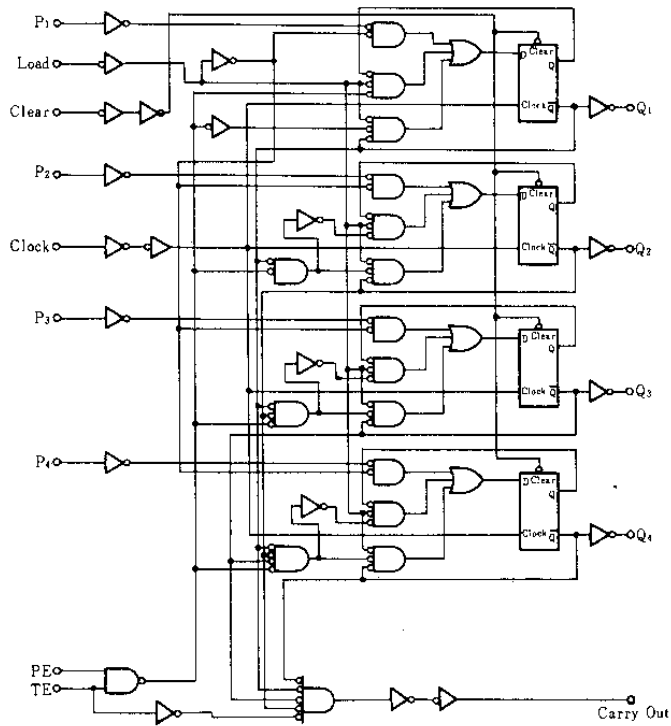
● HD14160B, HD14162B

(Clear is synchronous for HD14162B)



● HD14161B, HD14163B

(Clear is Synchronous for HD14163B)



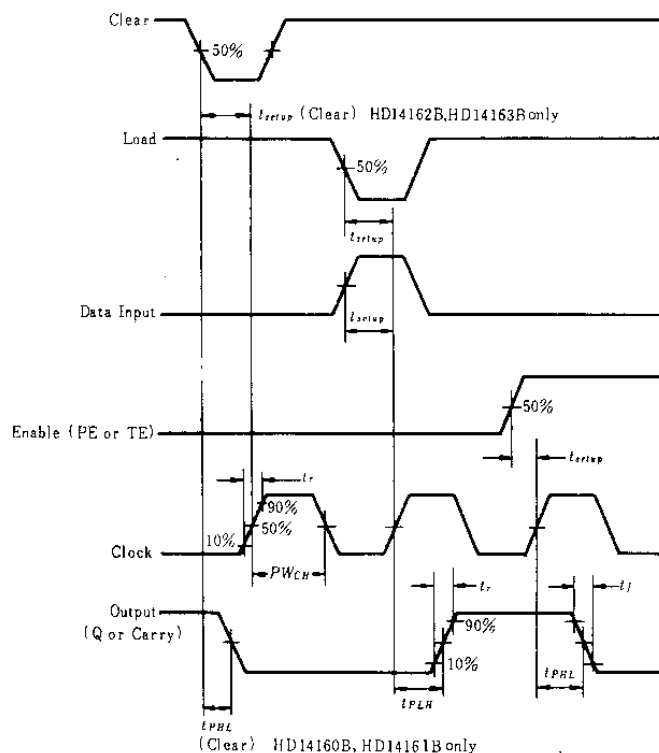
■ ELECTRICAL CHARACTERISTICS

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	$V_{OH}=2.5$ V	-2.5	—	-2.1	-4.2	—	-1.7	—	mA
		5.0	$V_{OH}=4.6$ V	-0.52	—	-0.44	-0.88	—	-0.36	—	
		10	$V_{OH}=9.5$ V	-1.3	—	-1.1	-2.25	—	-0.9	—	
		15	$V_{OH}=13.5$ V	-3.6	—	-3.0	-8.8	—	-2.4	—	
	I_{OL}	5.0	$V_{OL}=0.4$ V	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL}=0.5$ V	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL}=1.5$ V	3.6	—	3.0	8.8	—	2.4	—	
Input Current	I_{in}	15		—	± 0.3	—	± 0.00001	± 0.3	—	± 1.0	μ 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	μ A
		10		—	40	—	0.010	40	—	300	
		15		—	80	—	0.015	80	—	600	
Total Supply Current*	I_T	5.0	Dynamic + I_{DD} ,	—	—	—	0.56	—	—	—	μ A
		10	per Gate, $C_L=50$ pF	—	—	—	1.1	—	—	—	
		15	$f=1$ kHz	—	—	—	1.9	—	—	—	

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

@ $V_{DD}=5.0$ V $I_T=(0.56\mu\text{A}/\text{kHz})f+I_{DD}$, @ $V_{DD}=10$ V $I_T=(1.1\mu\text{A}/\text{kHz})f+I_{DD}$, @ $V_{DD}=15$ V $I_T=(1.9\mu\text{A}/\text{kHz})f+I_{DD}$

■ DYNAMIC SIGNAL WAVEFORMS

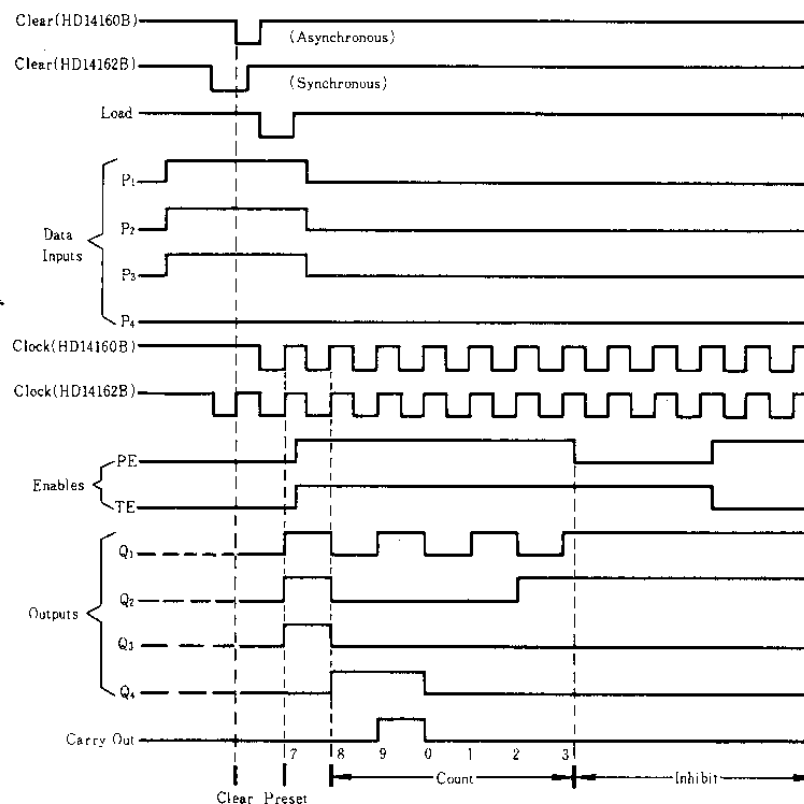


■ SWITCHING CHARACTERISTICS ($C_L=50\text{pF}$, $T_a=25^\circ\text{C}$)

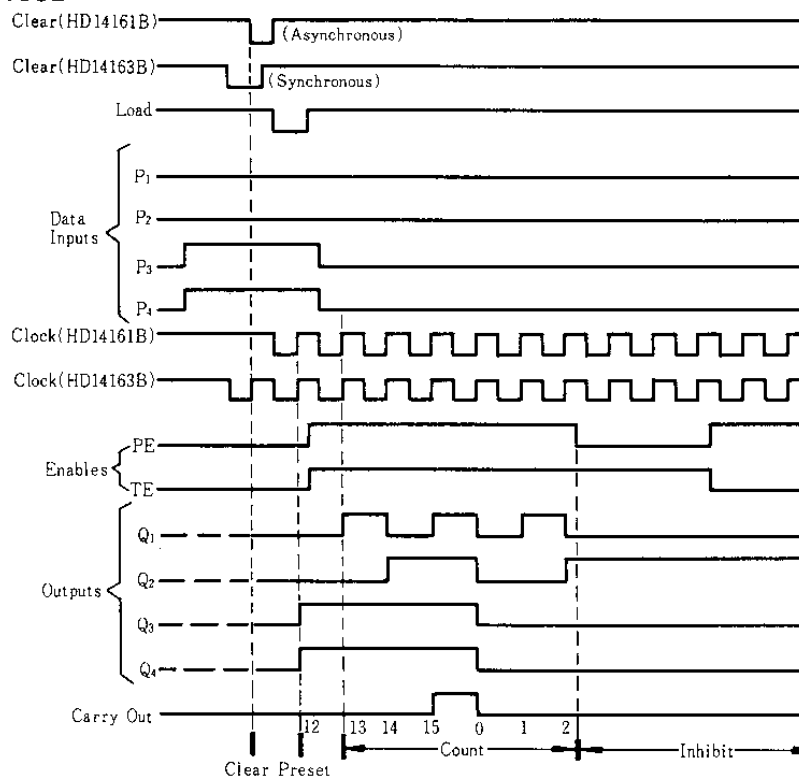
Characteristic		Symbol	$V_{DD}(\text{V})$	min	typ	max	Unit		
Output Rise Time		t_r	5.0	—	100	200	ns		
			10	—	50	100			
			15	—	40	80			
Output Fall Time		t_f	5.0	—	100	200	ns		
			10	—	50	100			
			15	—	40	80			
Propagation Delay Time		$t_{PLH},$ t_{PHL}	5.0	—	350	700	ns		
			10	—	150	300			
			15	—	100	200			
			Clock to Carry Out		5.0	—		440	880
					10	—		185	370
					15	—		125	250
			TE to Carry Out		5.0	—		300	600
					10	—		130	260
					15	—		90	180
			Clear to Q (HD14160B, HD14161B only)		5.0	—		155	310
					10	—		55	110
					15	—		35	70
Setup Time		t_{setup}	5.0	320	160	—	ns		
			10	130	65	—			
			15	90	45	—			
			Load to Clock		5.0	600		300	—
					10	260		130	—
					15	180		90	—
			Enable to Clock (PE or TE)		5.0	420		210	—
					10	170		85	—
					15	120		60	—
			Clear to Clock (HD14162B, HD14163B only)		5.0	310		155	—
					10	110		55	—
					15	70		35	—
Clock Pulse Width		PW_{CH}	5.0	250	125	—	ns		
			10	100	50	—			
			15	70	35	—			
Clock Rise Time		t_r	5.0	—	—	15	μs		
			10	—	—	15			
			15	—	—	15			
Clock Frequency		PRF	5.0	—	2.0	1.0	MHz		
			10	—	5.0	2.5			
			15	—	8.0	4.0			

■ TIMING DIAGRAM

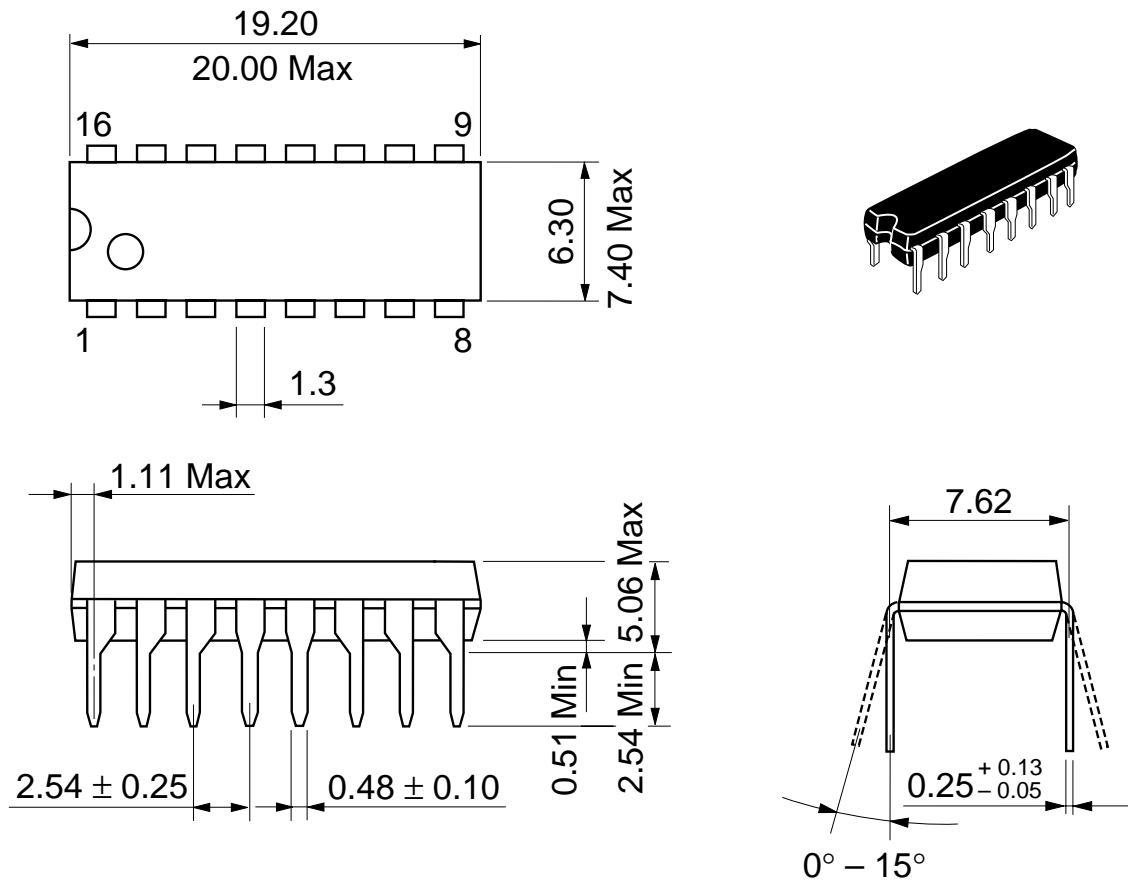
● HD14160B, HD14162B



● HD14161B, HD14163B



Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 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

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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 StraÙe 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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