HD14017B

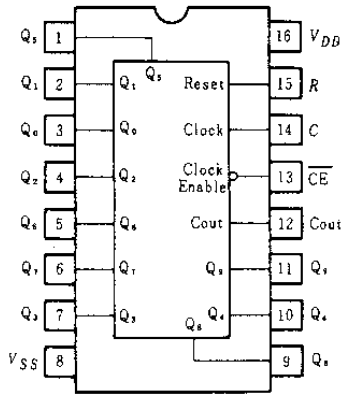
Decade Counter/Divider

The HD14017B is a five-stage Johnson decade counter with built-in code converter. High speed operation and spike free outputs are obtained by use of a Johnson decade counter design. The ten decoded outputs are normally low, and go high only at their appropriate decimal time period. The output changes occur on the positive going edge of the clock pulse. This part can be used in frequency division applications as well as decade counter or decimal decode display applications.

■ FEATURES

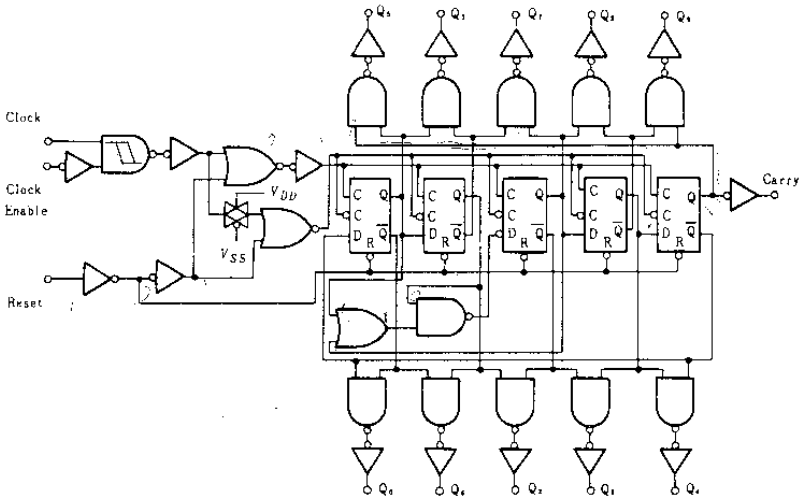
- Carry Output for Cascading 12MHz (typ) Operation @10V
- Divide-by-N Counting
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4017B and MC14017B

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM



■ TRUTH TABLE

C	CE	R	Decode Output=n
0	×	0	n
×	1	0	n
×	×	1	Q0
⌐	0	0	n + 1
¬	×	0	n
×	⌐	0	n
1	¬	0	n + 1

Notes) 1. × : Don't Care.
2. If n<5 Carry="1", Otherwise="0"

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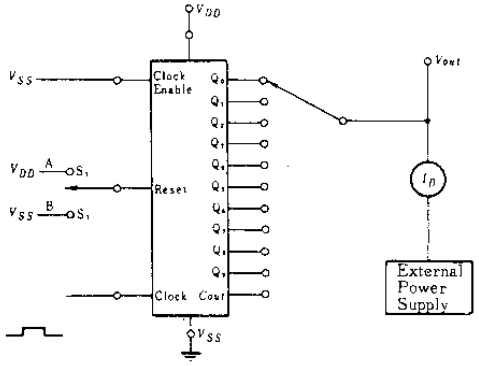
■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
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	−	
		15	V_{OH}=13.5V	−1.4	−	−1.2	−3.5	−	−1.0	−	
	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		−	±0.3	−	±0.00001	±0.3	−	±1.0	μA
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	μA
		10		−	40	−	0.010	40	−	300	
		15		−	80	−	0.015	80	−	600	
Total Supply Current*	I_T	5.0	Dynamic+I_{DD}, C_L=50pF, f= 1 kHz, per Gate	−	−	−	0.27	−	−	−	μA
		10		−	−	−	0.55	−	−	−	
		15		−	−	−	0.83	−	−	−	

* To calculate total supply current at frequency other than 1kHz.
@ V_{DD}=5.0V $I_T=(0.27\mu A/kHz)f+I_{DD}$ @ V_{DD}=10V $I_T=(0.55\mu A/kHz)f+I_{DD}$ @ V_{DD}=15V $I_T=(0.83\mu A/kHz)f+I_{DD}$

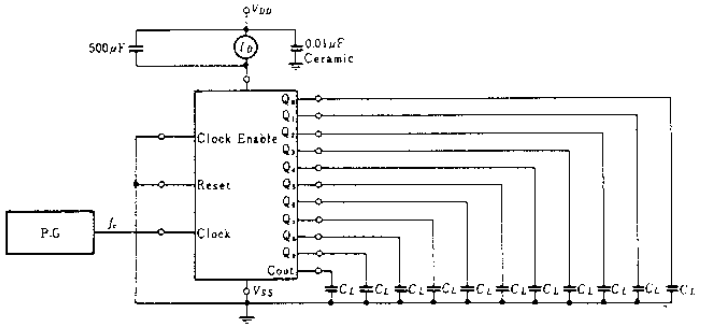
■ DC CHARACTERISTIC TEST CIRCUIT

● Typical Output Source and Output Sink Characteristics Test Circuit



	I_{OL}	I_{OH}
DECODE OUTPUTS	(S1− A)	Clock to desired outputs (S1 to B)
Carry	Clock5~9(S1~B)	S1−A
V_{CS}=	V_{DD}	− V_{DD}
V_{DS}=	V_{out}	$V_{out}-V_{DD}$

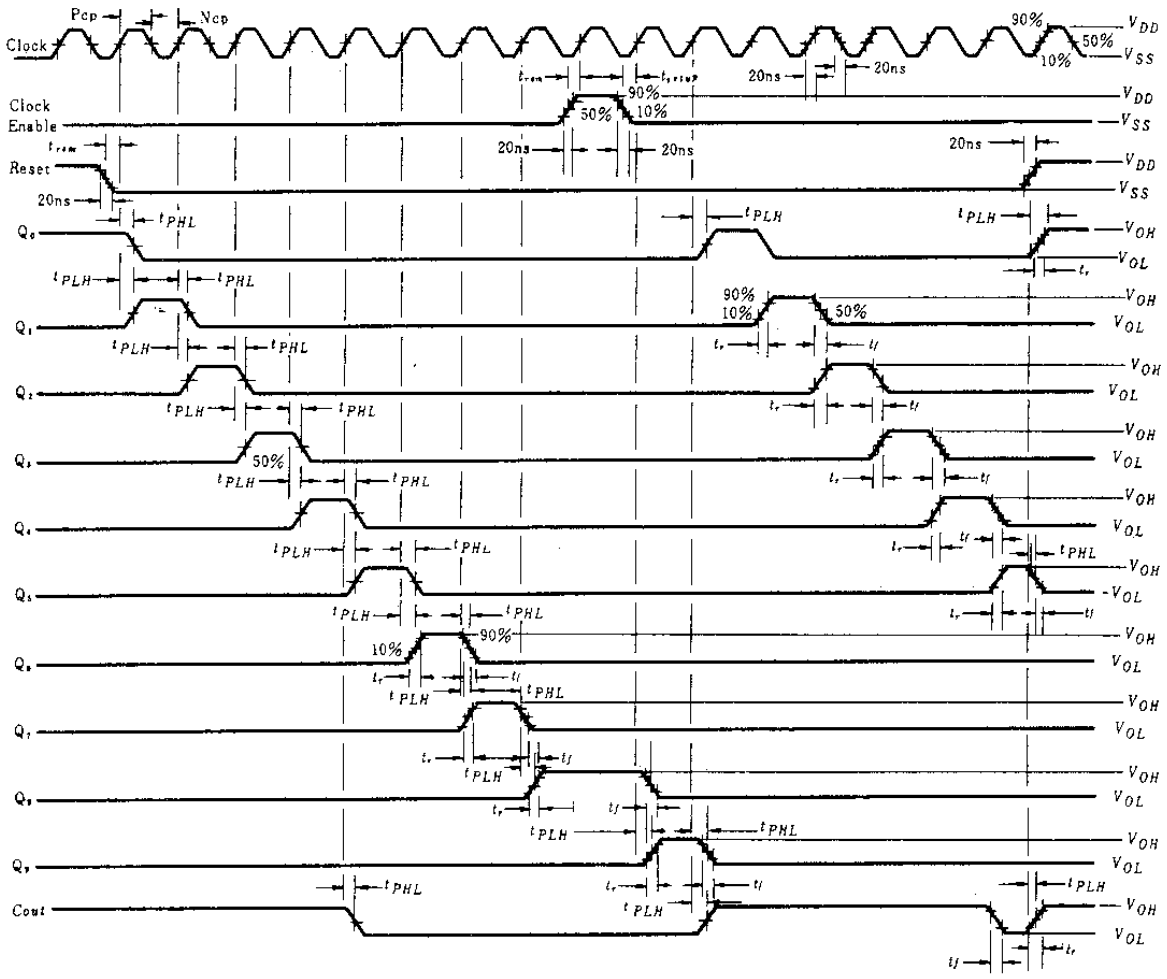
■ POWER DISSIPATION TEST CIRCUIT



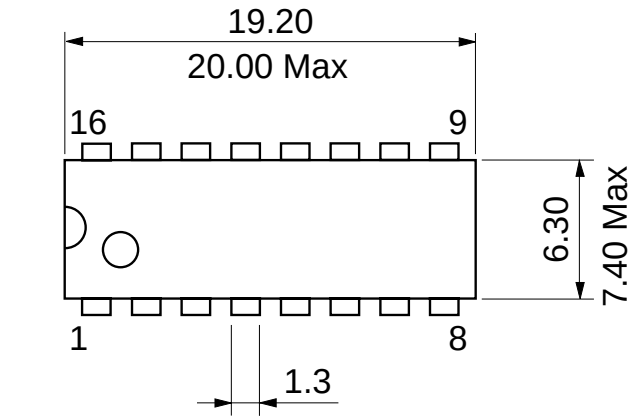
■ SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25°C)

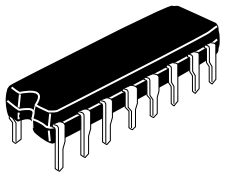
Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	Reset-to-Decode	t_{PLH}, t_{PHL}	5.0	—	500	1000	ns
			10	—	230	460	
			15	—	140	350	
	Clock-to-Cout		5.0	—	400	800	
			10	—	150	350	
			15	—	100	250	
	Clock-to-Decode		5.0	—	500	1000	
			10	—	230	460	
			15	—	140	350	
	Reset-to-Cout	t_{PLH}	5.0	—	400	800	ns
			10	—	150	350	
			15	—	100	250	
Clock Pulse Width		PW_C	5.0	250	100	—	ns
			10	100	42	—	
			15	75	30	—	
Clock Pulse Frequency		PRF	5.0	—	5.0	2.0	MHz
			10	—	12	5.0	
			15	—	16	6.7	
Reset Pulse Width		PW_R	5.0	500	200	—	ns
			10	250	100	—	
			15	190	75	—	
Reset Removal Time		t_{rem}	5.0	750	300	—	ns
			10	275	100	—	
			15	210	80	—	
Clock Pulse Rise and Fall Time		t_r, t_f	5.0	No Limit			
			10				
			15				
Clock Enable Setup Time		t_{setup}	5.0	700	175	—	ns
			10	300	75	—	
			15	225	52	—	
Clock Enable Removal Time		t_{rem}	5.0	700	260	—	ns
			10	300	100	—	
			15	225	70	—	

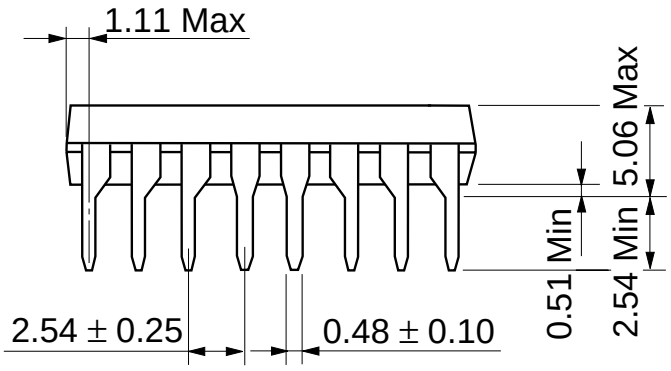
■ DYNAMIC SIGNAL WAVEFORMS

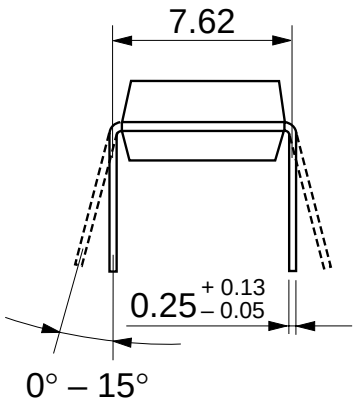


Unit: mm



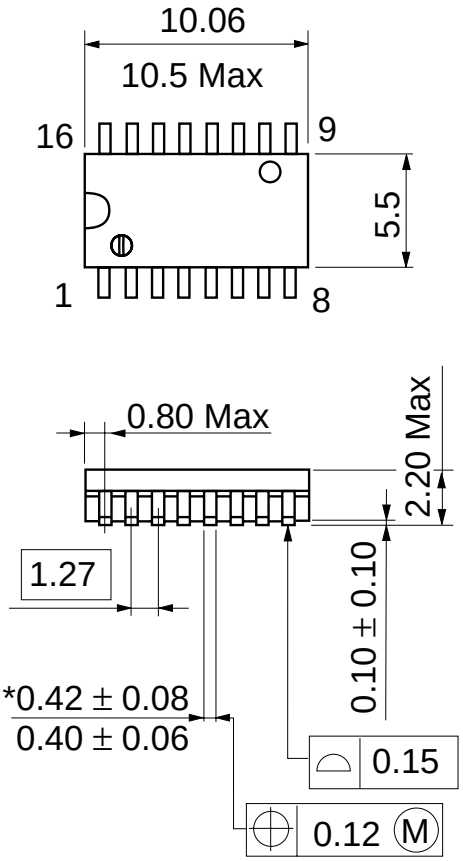


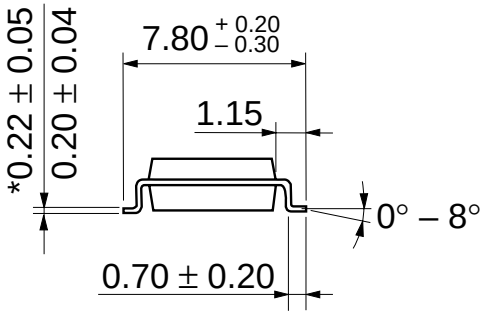


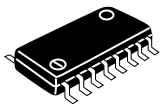


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm



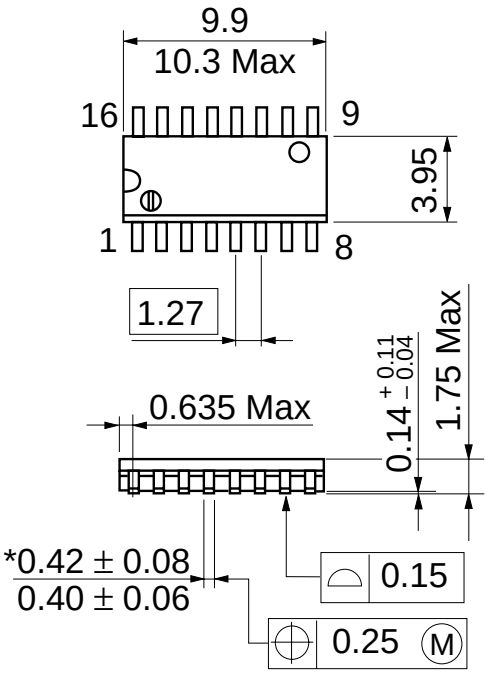


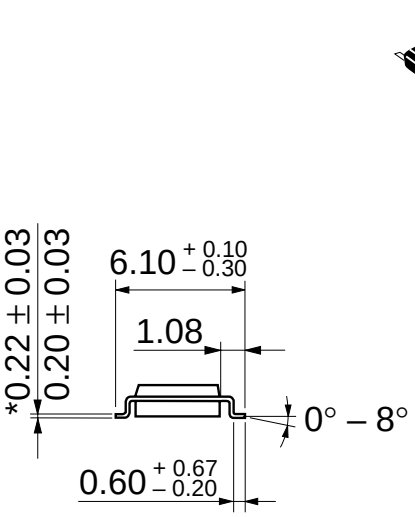


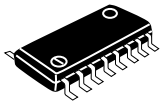
*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

Unit: mm







*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 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 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