

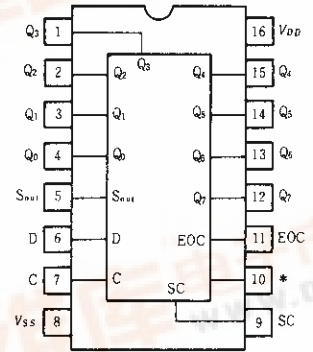
# HD14549B, HD14559B

出货

## Successive Approximation Register

The HD14549B and the HD14559B successive approximation registers are 8-bit registers providing all the digital control and storage necessary for successive approximation analog-to-digital conversion systems. These parts differ in only one control input. The Master Reset (MR) on the HD14549B is required in the cascaded mode when greater than 8 bits are desired. The Feed Forward (FF) of the HD14559B is used for register shortening where End-of-Conversion (EOC) is required after less than eight cycles. Applications for the HD14549B and HD14559B include analog-to-digital conversion, with serial and parallel outputs

### ■ PIN ARRANGEMENT



(Top View)

Note) \* : HD14549B is MR input.  
HD14559B is FF input.

### ■ FEATURES

- Totally Synchronous Operation
- All Outputs Buffered
- Single Supply Operation
- Serial Output
- Retriggerable
- Compatible with a Variety of Digital and Analog Systems such as the HA17408P 8-bit D/A Converter
- All Control Inputs Positive-Edge Triggered
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

### ■ TRUTH TABLE

#### ● HD14549B

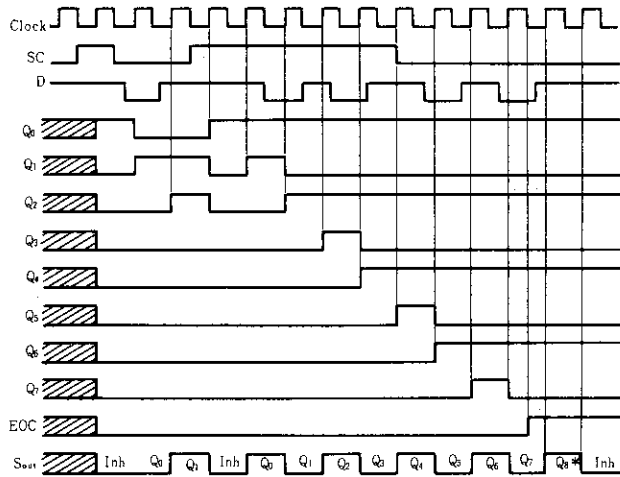
SC	SC <sub>(t-1)</sub>	MR	MR <sub>(t-1)</sub>	Clock	Action
×	×	×	×		
×	×	1	×		Reset
1	0	0	0		Start Conversion
1	×	0	1		Start Conversion
1	1	0	0		Continue Conversion
0	×	0	×		Continue Previous Operation

× = Don't Care  
t-1 = State at Previous Clock

#### ● HD14559B

SC	SC <sub>(t-1)</sub>	EOC	Clock	Action
×	×	×		
1	0	0		Start Conversion
×	1	0		Continue Conversion
0	0	0		Continue Conversion
0	×	1		Retain Conversion Result
1	×	1		Start Conversion

■ TIMING DIAGRAM



Note) : Don't care condition  
 Inh: Indicates Serial Out is inhibited low.  
 \*: Q<sub>8</sub> is ninthbit of serial information available from 8-bit register.  
 Pin 10 = V<sub>SS</sub>

■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V <sub>DD</sub> (V)	Test Conditions	-40°C		25°C			85°C		Unit	
				min	max	min	typ	max	min	max		
Output Voltage	V <sub>OL</sub>	5.0	V <sub>in</sub> = V <sub>DD</sub> 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 <sub>OH</sub>	5.0	V <sub>in</sub> = 0 or V <sub>DD</sub>	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 <sub>IL</sub>	5.0	V <sub>out</sub> = 4.5 or 0.5V	—	1.5	—	2.25	1.5	—	1.5	V	
		10	V <sub>out</sub> = 9.0 or 1.0V	—	3.0	—	4.50	3.0	—	3.0		
		15	V <sub>out</sub> = 13.5 or 1.5V	—	4.0	—	6.75	4.0	—	4.0		
	V <sub>IH</sub>	5.0	V <sub>out</sub> = 0.5 or 4.5V	3.5	—	3.5	2.75	—	3.5	—	V	
		10	V <sub>out</sub> = 1.0 or 9.0V	7.0	—	7.0	5.50	—	7.0	—		
		15	V <sub>out</sub> = 1.5 or 13.5V	11.0	—	11.0	8.25	—	11.0	—		
Output Drive Current	I <sub>OH</sub>	5.0	V <sub>OH</sub> = 2.5V	-1.0	—	-0.8	-1.7	—	-0.6	—	mA	
		5.0	V <sub>OH</sub> = 4.6V	-0.2	—	-0.16	-0.36	—	-0.12	—		
		10	V <sub>OH</sub> = 9.5V	-0.5	—	-0.4	-0.9	—	-0.3	—		
		15	V <sub>OH</sub> = 13.5V	-1.4	—	-1.2	-3.5	—	-1.0	—		
	Q	I <sub>OL</sub>	5.0	V <sub>OL</sub> = 0.4V	1.04	—	0.88	1.76	—	0.72	—	mA
			10	V <sub>OL</sub> = 0.5V	2.6	—	2.2	4.5	—	1.8	—	
			15	V <sub>OL</sub> = 1.5V	7.2	—	6.0	17.6	—	4.8	—	
		Pin 5, 11	5.0	V <sub>OL</sub> = 0.4V	0.52	—	0.44	0.88	—	0.36	—	
			10	V <sub>OL</sub> = 0.5V	1.3	—	1.1	2.25	—	0.9	—	
15			V <sub>OL</sub> = 1.5V	3.6	—	3.0	8.8	—	2.4	—		
Input Current	I <sub>in</sub>	15		—	±0.3	—	±0.0001	±0.3	—	±1.0	μA	
Input Capacitance	C <sub>in</sub>		V <sub>in</sub> = 0	—	—	—	5.0	7.5	—	—	pF	
Quiescent Current	I <sub>DD</sub>	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 <sub>T</sub>	5.0	Dynamic + I <sub>DD</sub> , per Gate	—	—	—	0.8	—	—	—	μA	
		10		—	—	—	1.6	—	—	—		
		15		—	—	—	2.4	—	—	—		

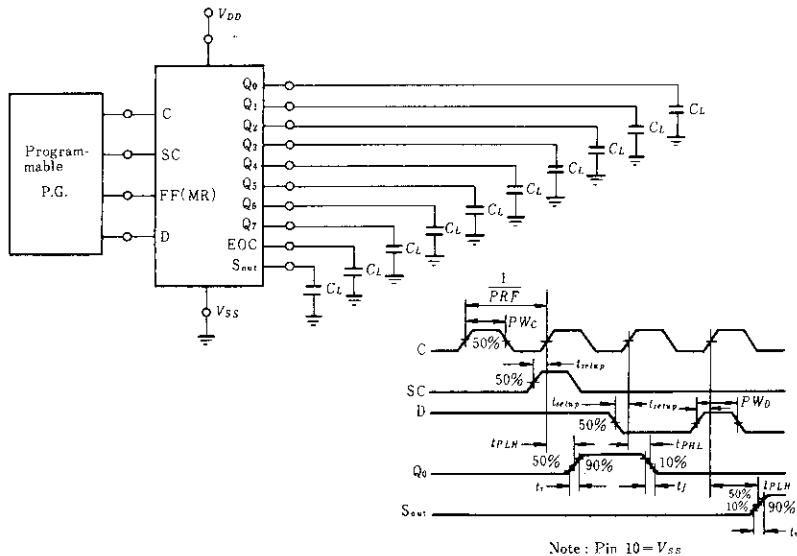
\* To calculate total supply current at frequency other than 1kHz.  
 @V<sub>DD</sub> = 5.0V I<sub>T</sub> = (0.8 μA/kHz)f + I<sub>DD</sub>, @V<sub>DD</sub> = 10V I<sub>T</sub> = (1.6 μA/kHz)f + I<sub>DD</sub>, @V<sub>DD</sub> = 15V I<sub>T</sub> = (2.4 μA/kHz)f + I<sub>DD</sub>

**HD14549B, HD14559B**

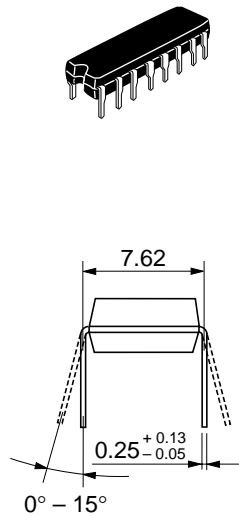
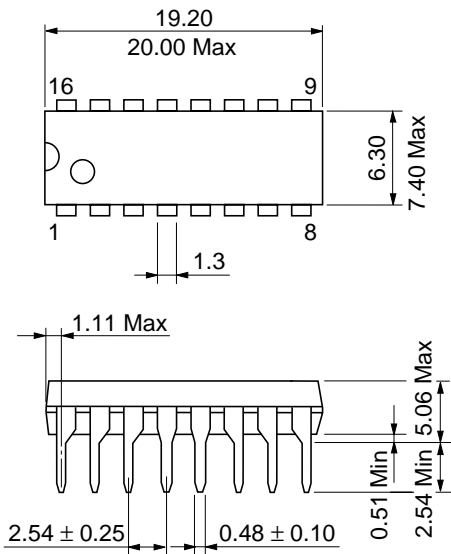
**SWITCHING CHARACTERISTICS** ( $C_L = 50\text{pF}$ ,  $T_a = 25^\circ\text{C}$ )

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	—	120	250	ns
			10	—	60	125	
			15	—	40	100	
Propagation Delay Time	Clock to Q	$t_{PLH}$	5.0	—	500	1200	ns
			10	—	210	500	
			15	—	155	380	
	Clock to Sout	$t_{PHL}$	5.0	—	750	1800	
			10	—	310	750	
			15	—	220	550	
	Clock to EOC		5.0	—	300	750	
			10	—	130	325	
			15	—	100	250	
SC, D, FF, MR Setup Time		$t_{setup}$	5.0	300	125	—	ns
			10	150	50	—	
			15	115	40	—	
Clock Pulse Width		$PW_C$	5.0	600	350	—	ns
			10	300	135	—	
			15	225	100	—	
D, SC, FF, MR Pulse Width		$PW$	5.0	750	250	—	ns
			10	300	100	—	
			15	225	80	—	
Clock Pulse Rise and Fall Time		$t_r, t_f$	5.0	—	—	15	$\mu\text{s}$
			10	—	—	5.0	
			15	—	—	4.0	
Clock Frequency		$PRF$	5.0	—	1.5	0.8	MHz
			10	—	3.0	1.5	
			15	—	4.0	2.0	

**SWITCHING TIME TEST CIRCUIT**







Unit: mm

---

---

## Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

---

---

# 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      NorthAmerica      : <http://semiconductor.hitachi.com/>  
             Europe                 : <http://www.hitachi-eu.com/hel/ecg>  
             Asia (Singapore)        : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>  
             Asia (Taiwan)             : [http://www.hitachi.com.tw/E/Product/SICD\\_Frame.htm](http://www.hitachi.com.tw/E/Product/SICD_Frame.htm)  
             Asia (HongKong)         : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>  
             Japan                        : <http://www.hitachi.co.jp/Sicd/indx.htm>

### 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