
HD74HC590

8-bit Binary Counter/Register (with 3-state outputs)

HITACHI

ADE-205-512 (Z)

1st. Edition

Sep. 2000

Description

This device each contains an 8-bit binary counter that feeds an 8-bit storage register. The storage register has parallel outputs. Separate clocks are provided for both the binary counter and storage register. The binary counter features a direct clear input $\overline{\text{CCLR}}$ and a count enable input $\overline{\text{CCKEN}}$. For cascading a ripple carry output $\overline{\text{RCO}}$ is provided. Expansion is easily accomplished by tying $\overline{\text{RCO}}$ of the first stage to $\overline{\text{CCKEN}}$ of the second stage, etc.

Both the counter and register clocks are positive-edge triggered. If the user wishes to connect both clocks together, the counter state will always be one count ahead of the register, Internal circuitry prevents clocking from the clock enable.

Features

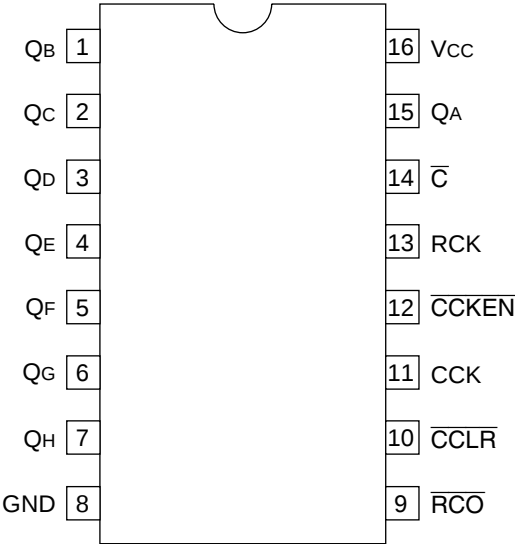
- High Speed Operation: t_{pd} (RCK to Q) = 18.5 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μA max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μA max ($T_a = 25^\circ\text{C}$)

Function Table

Inputs					Function
$\overline{G}$	RCK	$\overline{CCLR}$	$\overline{CCKEN}$	CCK	
H	X	X	X	X	Q output disabled
L	X	X	X	X	Q output enabled
X		X	X	X	Contents of counter stored to register
X		X	X	X	No change in register
X	X	L	X	X	Counter clear
X	X	H	L		Count up
X	X	H	L		No count
X	X	H	H	X	No count

$\overline{RCO} = QA' \cdot QB' \cdot QC' \cdot QD' \cdot QE' \cdot QF' \cdot QG' \cdot QH' \cdot (\overline{CCKEN})$ (QA' to QH': Output of Internal Counter)

Pin Arrangement

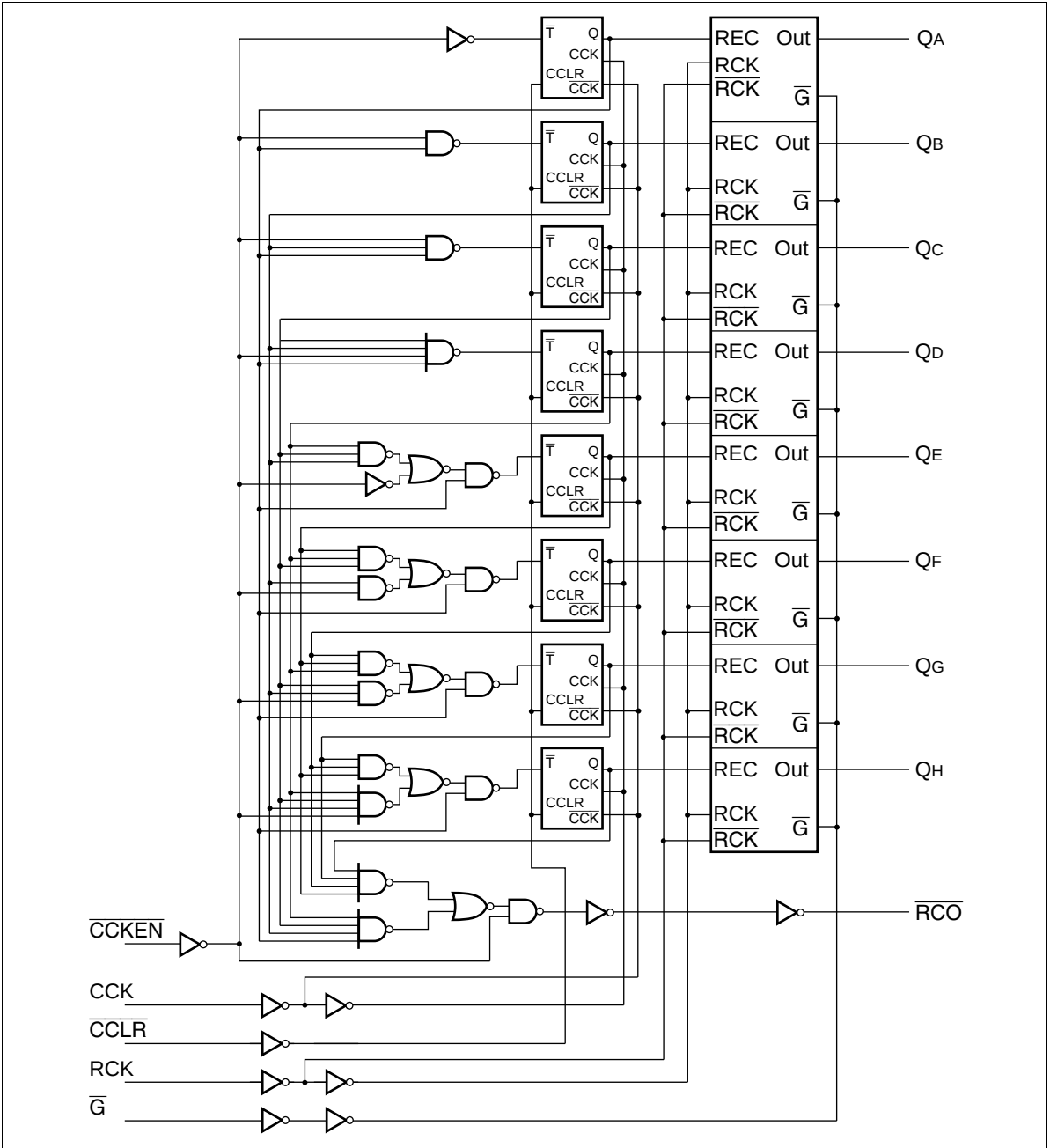


(Top view)

Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to +7.0	V
Input voltage	V_{IN}	−0.5 to $V_{CC} + 0.5$	V
Output voltage	V_{OUT}	−0.5 to $V_{CC} + 0.5$	V
Output current	I_{OUT}	±35	mA
DC current drain per V_{CC} , GND	I_{CC} , I_{GND}	±75	mA
DC input diode current	I_{IK}	±20	mA
DC output diode current	I_{OK}	±20	mA
Power Dissipation per package	P_T	500	mW
Storage temperature	Tstg	−65 to +150	°C

Logic Diagram



DC Characteristics

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions		
			Min	Typ	Max	Min	Max				
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V			
		4.5	3.15	—	—	3.15	—				
		6.0	4.2	—	—	4.2	—				
	V _{IL}	2.0	—	—	0.5	—	0.5	V			
		4.5	—	—	1.35	—	1.35				
		6.0	—	—	1.8	—	1.8				
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	Q _A to Q _H Vin = V _{IH} or V _{IL}	I _{OH} = -20 μA	
		4.5	4.4	4.5	—	4.4	—				
		6.0	5.9	6.0	—	5.9	—				
		4.5	4.18	—	—	4.13	—				I _{OH} = -6 mA
		6.0	5.68	—	—	5.63	—				I _{OH} = -7.8 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	Q _A to Q _H Vin = V _{IH} or V _{IL}	I _{OL} = 20 μA	
		4.5	—	0.0	0.1	—	0.1				
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33				I _{OL} = 6 mA
		6.0	—	—	0.26	—	0.33				I _{OL} = 7.8 mA
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	$\overline{RCO}$ Vin = V _{IH} or V _{IL}	I _{OH} = -20 μA	
		4.5	4.4	4.5	—	4.4	—				
		6.0	5.9	6.0	—	5.9	—				
		4.5	4.18	—	—	4.13	—				I _{OH} = -4 mA
		6.0	5.68	—	—	5.63	—				I _{OH} = -5.2 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	$\overline{RCO}$ Vin = V _{IH} or V _{IL}	I _{OL} = 20 μA	
		4.5	—	0.0	0.1	—	0.1				
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33				I _{OL} = 4 mA
		6.0	—	—	0.26	—	0.33				I _{OL} = 5.2 mA
Off-state output current	I _{OZ}	6.0	—	—	±0.5	—	±5.0	μA	Vin = V _{IH} or V _{IL} , Vout = V _{CC} or GND		
Input current	I _{in}	6.0	—	—	±0.1	—	±1.0	μA	Vin = V _{CC} or GND		
Quiescent supply current	I _{CC}	6.0	—	—	4.0	—	40	μA	Vin = V _{CC} or GND, I _{out} = 0 μA		

AC Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns)

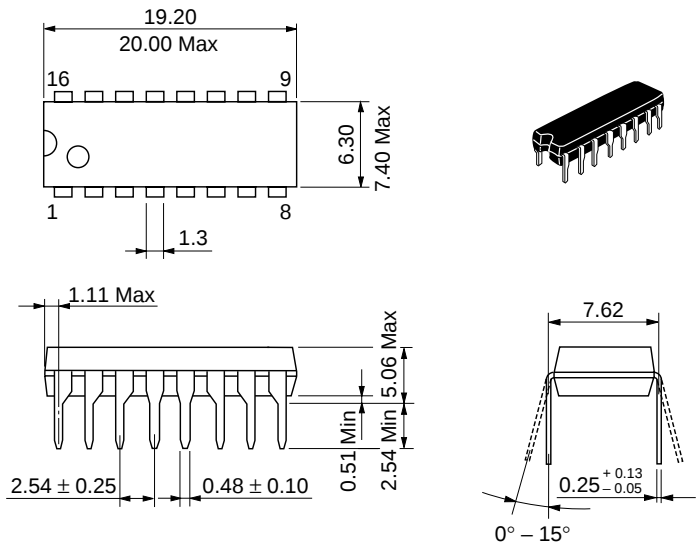
Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	f _{max}	2.0	—	—	5	—	4	MHz	
		4.5	—	—	25	—	20		
		6.0	—	—	29	—	24		
Propagation delay time	t _{PLH}	2.0	—	—	200	—	250	ns	CCK to $\overline{\text{RCO}}$
		4.5	—	18	40	—	50		
		6.0	—	—	34	—	43		
	t _{PLH}	2.0	—	—	250	—	315	ns	$\overline{\text{CCLR}}$ to $\overline{\text{RCO}}$
		4.5	—	17	50	—	63		
		6.0	—	—	43	—	54		
	t _{PLH}	2.0	—	—	200	—	250	ns	RCK to Q
		4.5	—	18	40	—	50		
		6.0	—	—	34	—	43		
Output enable time	t _{ZL}	2.0	—	—	150	—	190	ns	
	t _{ZH}	4.5	—	16	30	—	39		
		6.0	—	—	26	—	33		
Output disable time	t _{LZ}	2.0	—	—	150	—	190	ns	
	t _{HZ}	4.5	—	17	30	—	38		
		6.0	—	—	26	—	33		
Pulse width	t _w	2.0	80	—	—	100	—	ns	
		4.5	16	6	—	20	—		
		6.0	14	—	—	17	—		
Removal time	t _{rem}	2.0	5	—	—	5	—	ns	$\overline{\text{CCLR}}$ to CCK
		4.5	5	—	—	5	—		
		6.0	5	—	—	5	—		
Setup time	t _{su}	2.0	100	—	—	125	—	ns	$\overline{\text{CCKEN}}$ to CCK
		4.5	20	-3	—	25	—		
		6.0	17	—	—	21	—		
		2.0	200	—	—	250	—	ns	CCK to RCK
		4.5	40	10	—	50	—		
		6.0	34	—	—	43	—		

AC Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns) (cont)

Item	Symbol	V _{cc} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Hold time	t _h	2.0	5	—	—	5	—	ns	$\overline{\text{CCKEN}}$ to CCK
		4.5	5	—	—	5	—		CCK to RCK
		6.0	5	—	—	5	—		
Output rise/fall time	t _{TLH}	2.0	—	—	60	—	75	ns	Q
	t _{THL}	4.5	—	4	12	—	15		
		6.0	—	—	10	—	13		
	t _{TLH}	2.0	—	—	75	—	95	ns	$\overline{\text{RCO}}$
	t _{THL}	4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	Cin	—	—	5	10	—	10	pF	

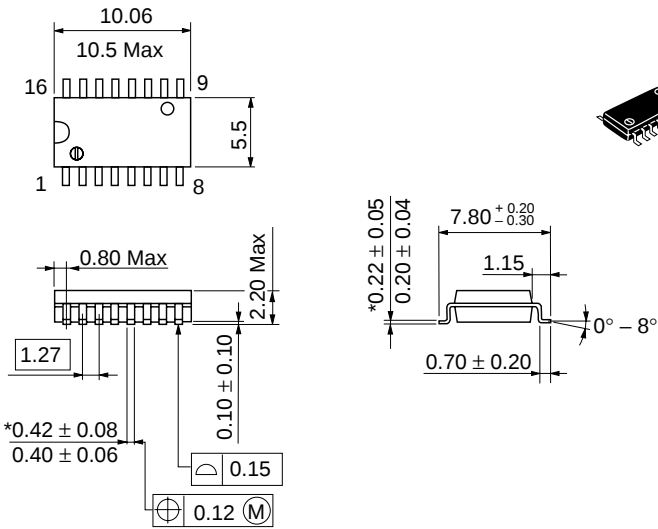
Package Dimensions

Unit: mm



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

Unit: mm



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

*Dimension including the plating thickness
Base material dimension

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, Ohite-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	North America	: http://semiconductor.hitachi.com/
	Europe	: http://www.hitachi-eu.com/hel/ecg
	Asia	: http://sicapac.hitachi-asia.com
	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 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) 585160

Hitachi Asia Ltd. Hitachi Tower 16 Collyer Quay #20-00, Singapore 049318 Tel: <65>-538-6533/538-8577 Fax: <65>-538-6933/538-3877 URL: http://www.hitachi.com.sg	Hitachi Asia Ltd. (Taipei Branch Office) 4/F, No. 167, Tun Hwa North Road, Hung-Kuo Building, Taipei (105), Taiwan Tel: <886>-(2)-2718-3666 Fax: <886>-(2)-2718-8180 Telex: 23222 HAS-TP URL: http://www.hitachi.com.tw
---	---

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
URL: <http://www.hitachi.com.hk>

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.
Colophon 2.0

HITACHI