

# HD74HC589

## 8-bit Serial of Parallel-input/Serial-output Shift Register (with 3-state outputs)

# HITACHI

### Description






The HD74HC589 is similar in function to the HD74HC597, which is not a 3-state device.

This device consists of an 8-bit storage latch which feeds parallel data to an 8-bit shift register. Data can also be loaded serially (see Function Table). The shift register output,  $O_H$ , is a three-state output, allowing this device to be used in bus-oriented systems.

### Features

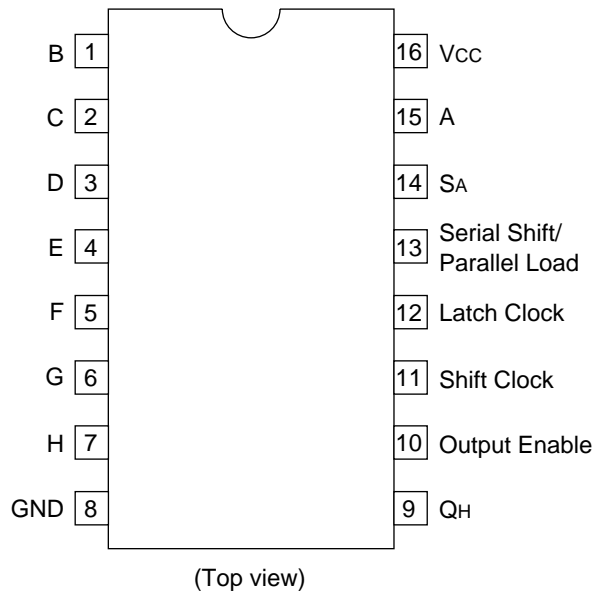
- High Speed Operation:  $t_{pd}$  (Shift Clock to  $Q_H$ ) = 15 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$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

### Function Table

Latch Clock LCK	Shift Clock SCK	Serial Shift/ Parallel Load	Output Enable OE	Function
	X	X	X	Data are loaded into input latches
	X	L	L	Data are loaded from input into shift registers
X	X	L	L	Data are transferred from input latches to shift registers
L, H, 	L, H, 	X	H	Outputs are disabled
X		H	L	Serial shift $Q_n = Q_{n-1}$ , $Q_0 = \text{SER}$

# HD74HC589

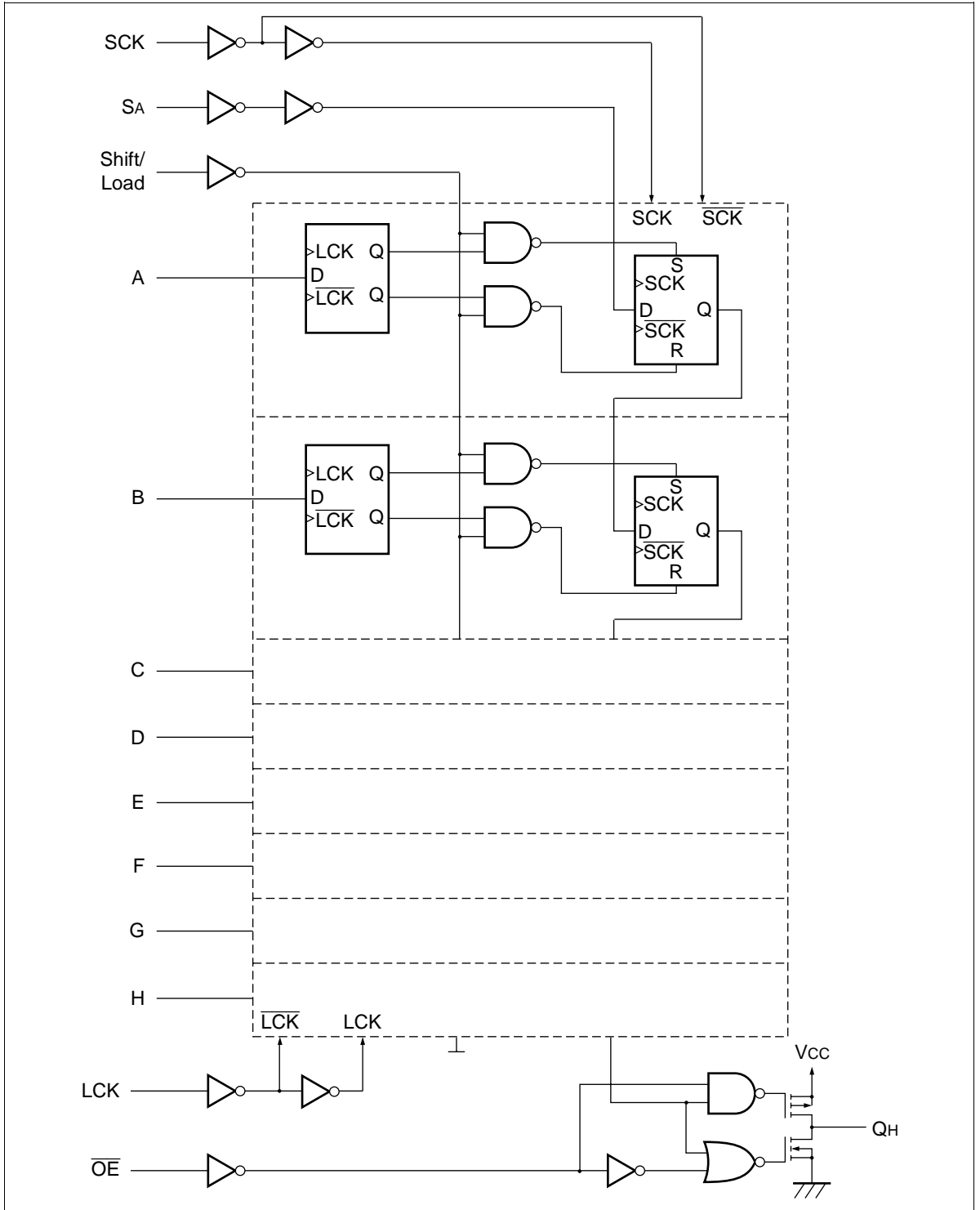
## Pin Arrangement



## 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	$I_{OUT}$	$\pm 35$	mA
DC current drain per $V_{CC}$ , GND	$I_{CC}$ , $I_{GND}$	$\pm 75$	mA
DC input diode current	$I_{IK}$	$\pm 20$	mA
DC output diode current	$I_{OK}$	$\pm 20$	mA
Power Dissipation per package	$P_T$	500	mW
Storage temperature	$T_{stg}$	-65 to +150	$^{\circ}C$

Logic Diagram



# HD74HC589

## DC Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions		
			Min	Typ	Max	Min	Max				
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V			
		4.5	3.15	—	—	3.15	—				
		6.0	4.2	—	—	4.2	—				
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5	V			
		4.5	—	—	1.35	—	1.35				
		6.0	—	—	1.8	—	1.8				
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -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 <sub>OH</sub> = -6 mA	
		6.0	5.68	—	—	5.63	—			I <sub>OH</sub> = -7.8 mA	
		6.0	—	0.0	0.1	—	0.1			V	Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 20 μA
	V <sub>OL</sub>	4.5	—	0.0	0.1	—	0.1	V	I <sub>OL</sub> = 20 μA		
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33			I <sub>OL</sub> = 6 mA	
		6.0	—	—	0.26	—	0.33			I <sub>OL</sub> = 7.8 mA	
		6.0	—	—	±0.5	—	±5.0			μA	Vin = V <sub>IH</sub> or V <sub>IL</sub> , Vout = V <sub>CC</sub> or GND
		6.0	—	—	±0.1	—	±1.0			μA	Vin = V <sub>CC</sub> or GND
Quiescent supply current	I <sub>CC</sub>	6.0	—	—	4.0	—	40	μA	Vin = V <sub>CC</sub> or GND, Iout = 0 μA		

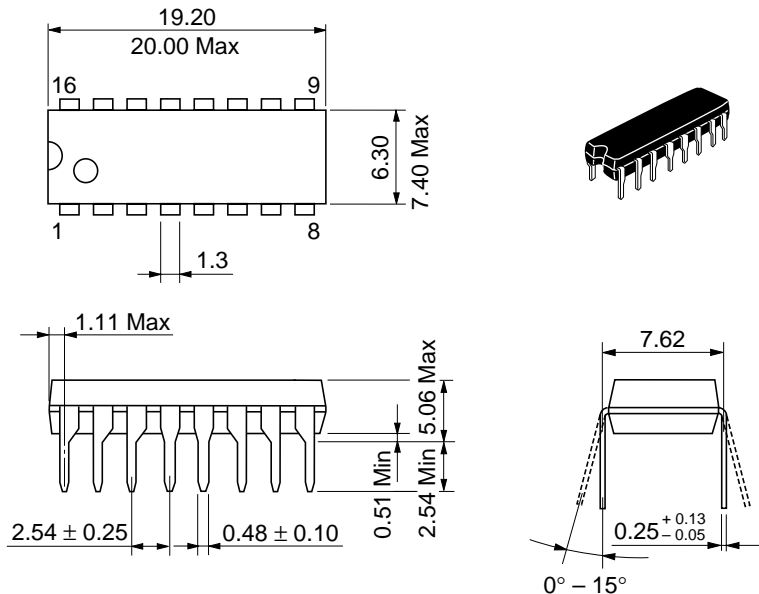
AC Characteristics ( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	$f_{max}$	2.0	—	—	5	—	4	MHz	
		4.5	—	—	27	—	21		
		6.0	—	—	32	—	25		
Propagation delay time	$t_{PLH}$	2.0	—	—	200	—	250	ns	Latch clock to $Q_H$
		4.5	—	20	40	—	50		
		6.0	—	—	34	—	43		
	$t_{PHL}$	2.0	—	—	175	—	220	ns	Shift clock to $Q_H$
		4.5	—	15	35	—	44		
		6.0	—	—	30	—	37		
$t_{PLH}$	2.0	—	—	175	—	220	ns	Serial shift/prallel load to $Q_H$	
	4.5	—	16	35	—	44			
	6.0	—	—	30	—	37			
Output enable time	$t_{ZL}$	2.0	—	—	150	—	190	ns	
		4.5	—	9	30	—	38		
		6.0	—	—	26	—	33		
Output disable time	$t_{LZ}$	2.0	—	—	150	—	190	ns	
		4.5	—	14	30	—	38		
		6.0	—	—	26	—	33		
Pulse width	$t_w$	2.0	80	—	—	100	—	ns	
		4.5	16	8	—	20	—		
		6.0	14	—	—	17	—		
Setup time	$t_{su}$	2.0	100	—	—	125	—	ns	Data to latch clock
		4.5	20	1	—	25	—		
		6.0	17	—	—	21	—		
	$t_{su}$	2.0	100	—	—	125	—	ns	$S_A$ to shift clock
		4.5	20	—	—	25	—		
		6.0	17	—	—	21	—		
	$t_{su}$	2.0	100	—	—	125	—	ns	Serial shift/parallel load to shift clock
		4.5	20	—	—	25	—		
		6.0	17	—	—	21	—		

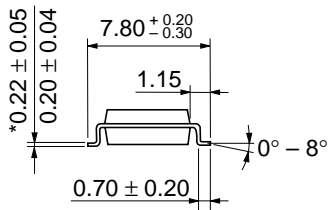
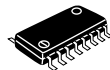
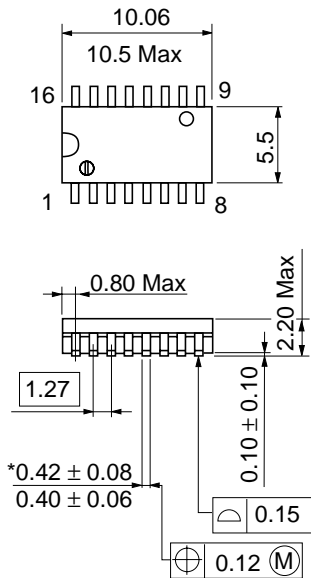
# HD74HC589

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

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$		$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions		
			Min	Typ	Max	Min			Max	
Hold time	$t_h$	2.0	5	—	—	5	—	ns	Latch clock to data	
		4.5	5	0	—	5	—			
		6.0	5	—	—	5	—			
	$t_h$	$t_h$	2.0	5	—	—	5	—	ns	Shift clock to $S_A$
			4.5	5	—	—	5	—		
			6.0	5	—	—	5	—		
	$t_h$	$t_h$	2.0	5	—	—	5	—	ns	Shift clock to serial shift/ parallel load
			4.5	5	—	—	5	—		
			6.0	5	—	—	5	—		
Output rise/fall time	$t_{TLH}$	2.0	—	—	75	—	95	ns		
	$t_{THL}$	4.5	—	5	15	—	19			
	$t_{THL}$	6.0	—	—	13	—	16			
Input capacitance	$C_{in}$	—	—	5	10	—	10	pF		



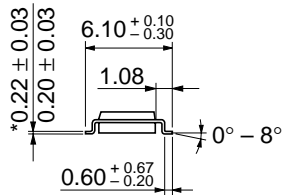
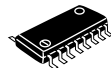
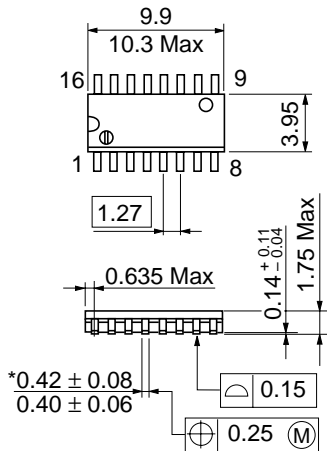
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



\*Dimension including the plating thickness  
Base material dimension

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





\*Dimension including the plating thickness  
 Base material dimension

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

## 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 North America : <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 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

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.

## HITACHI