
HD74HC299

8-bit Universal Shift/Storage Register (with 3-state outputs)

HITACHI






Description


The HD74HC299 features multiplexed inputs/outputs to achieve full 8-bit data handling in a single 20-pin package. Due to the large output drive capability and 3-state feature, this device is ideally suited for interfacing with bus lines in a bus oriented system. Two function select inputs and two output control inputs are used to choose the mode of operation as listed in the function table. Synchronous parallel loading is accomplished by taking both function select lines S_0 and S_1 high. This places the 3-state outputs in a high impedance state, which permits data applied to the input/output lines to be clocked into the register. Reading out of the register can be done while the outputs are enabled in any mode. A direct overriding clear input is provided to clear the register whether the outputs are enabled or disabled.

Features

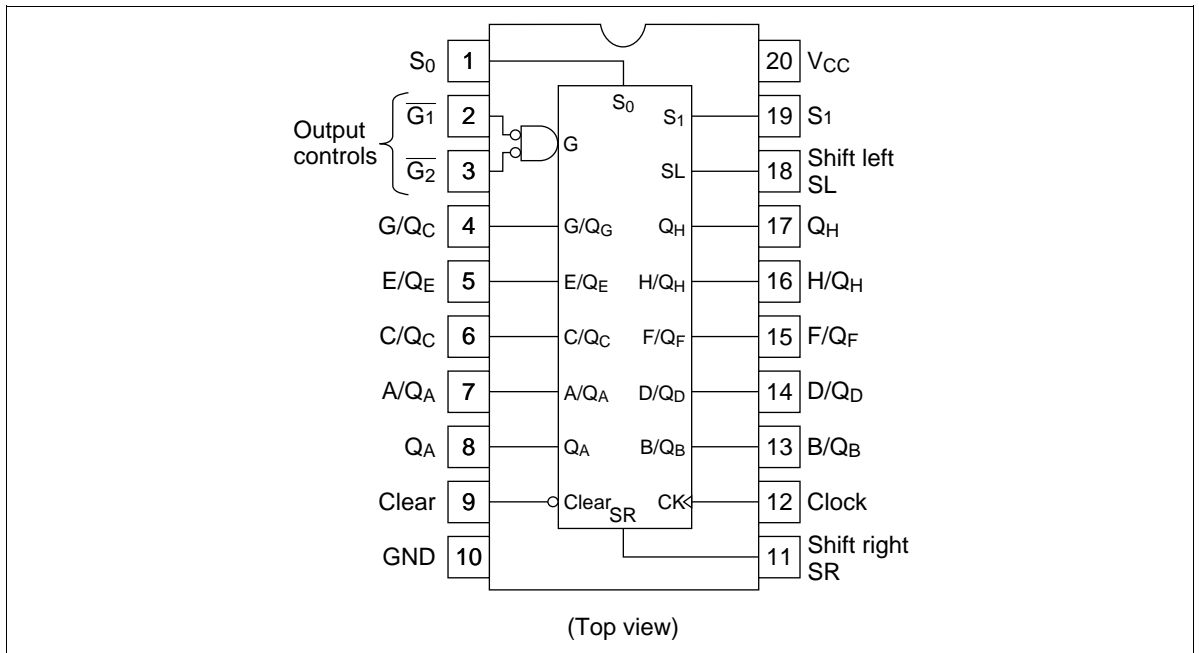
- High Speed Operation
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

Function Table

		Inputs					Serial Inputs/Outputs										Outputs	
		Clear	Function Select		Output Control		S _L	S _R	A/Q _A	B/Q _B	C/Q _C	D/Q _D	E/Q _E	F/Q _F	G/Q _G	H/Q _H	Q _A '	Q _H '
Mode		S ₁	S ₀	$\overline{G}_1 \uparrow$	$\overline{G}_2 \uparrow$	Clock												
Clear	L	X	L	L	L	X	X	X	L	L	L	L	L	L	L	L	L	L
	L	L	X	L	L	X	X	X	L	L	L	L	L	L	L	L	L	L
Hold	H	L	L	L	L	X	X	X	Q _{A0}	Q _{B0}	Q _{C0}	Q _{D0}	Q _{E0}	Q _{F0}	Q _{G0}	Q _{H0}	Q _{A0}	Q _{H0}
	H	X	X	L	L	L	X	X	Q _{A0}	Q _{B0}	Q _{C0}	Q _{D0}	Q _{E0}	Q _{F0}	Q _{G0}	Q _{H0}	Q _{A0}	Q _{H0}
Shift	H	L	H	L	L		X	H	H	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	H	Q _{Gn}
Right	H	L	H	L	L		X	L	L	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	L	Q _{Gn}
Shift	H	H	L	L	L		H	X	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	Q _{Hn}	H	Q _{Bn}	H
Left	H	H	L	L	L		L	X	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	Q _{Hn}	L	Q _{Bn}	L
Load	H	H	H	X	X		X	X	a	b	c	d	e	f	g	h	a	h

- Notes:
1. a to h; the level of steady-state input at inputs A through H, respectively. These data are loaded into the flip-flop outputs are isolated from the input/output terminals.
 2. Q_{A0} to Q_{H0}; the level of Q_A through Q_H, respectively, before the indicated steady-state input conditions were established.
 3. Q_{An} to Q_{Hn}; the level of Q_A through Q_H, respectively, before the most-recent  transition of the clock.
 4. † = ; When one or both output controls are high the eight input/output terminals are disabled to the high-impedance state, however, sequential operation or clearing of the register is not affected.
 5. When clear is low, outputs of Q_A' and Q_H' are low, in spite of other inputs.

Pin Arrangement

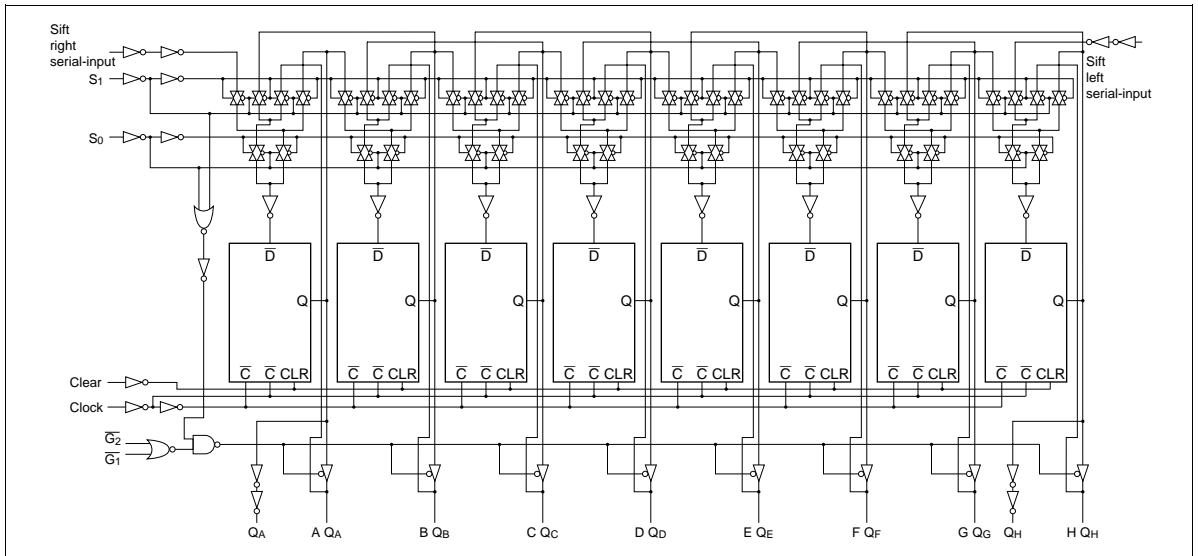


Absolute Maximum Ratings

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}	± 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	T_{stg}	-65 to +150	$^{\circ}C$

HD74HC299

Block Diagram



HITACHI

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	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	—			Q _A ' & Q _H '	I _{OH} = -4 mA
		6.0	5.68	—	—	5.63	—			Outputs	I _{OH} = -5.2 mA
		4.5	4.18	—	—	4.13	—			A/Q _A thru	I _{OH} = -6 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	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			Q _A ' & Q _H '	I _{OH} = 4 mA
		6.0	—	—	0.26	—	0.33			Outputs	I _{OH} = 5.2 mA
		4.5	—	—	0.26	—	0.33			A/Q _A thru	I _{OH} = 6 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		
		6.0	—	—	4.0	—	40			μA	Vin = V _{CC} or GND, Iout = 0 μA
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, Iout = 0 μA		

HD74HC299

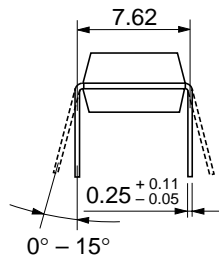
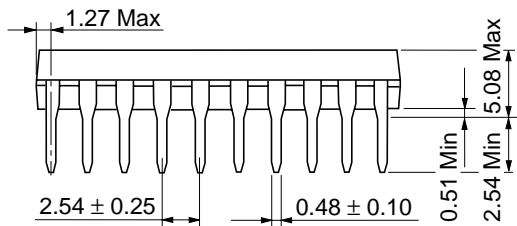
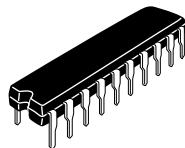
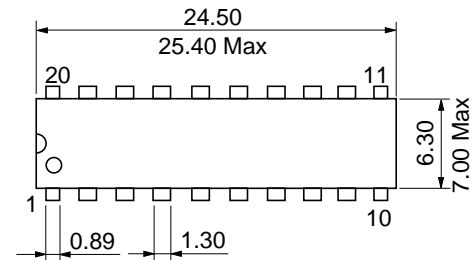
AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

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	—	—	25	—	20		
		6.0	—	—	29	—	23		
Propagation delay time	t_{PLH}	2.0	—	—	190	—	240	ns	Clock to Q_A' or Q_H'
		4.5	—	—	38	—	48		
		6.0	—	—	32	—	41		
	t_{PHL}	2.0	—	—	220	—	275	ns	Clear to Q_A' or Q_H'
		4.5	—	—	44	—	55		
		6.0	—	—	37	—	47		
	t_{PLH}	2.0	—	—	190	—	240	ns	Clock to $Q_A - Q_H$
		4.5	—	—	38	—	48		
		6.0	—	—	32	—	41		
	t_{PHL}	2.0	—	—	220	—	275	ns	Clear to $Q_A - Q_H$
		4.5	—	—	44	—	55		
		6.0	—	—	37	—	47		
Output enable time	t_{ZH}	2.0	—	—	160	—	200	ns	
		4.5	—	—	32	—	40		
		6.0	—	—	27	—	34		
Output disable time	t_{ZL}	2.0	—	—	160	—	200	ns	
		4.5	—	—	32	—	40		
		6.0	—	—	27	—	34		
Setup time	t_{su}	2.0	100	—	—	125	—	ns	Select
		4.5	20	—	—	25	—		
		6.0	17	—	—	21	—		
Hold time	t_h	2.0	5	—	—	5	—	ns	Select
		4.5	5	—	—	5	—		
		6.0	5	—	—	5	—		
Removal time	t_{rem}	2.0	50	—	—	65	—	ns	Clear
		4.5	10	—	—	13	—		
		6.0	9	—	—	11	—		
Pulse width	t_w	2.0	80	—	—	100	—	ns	
		4.5	16	—	—	20	—		
		6.0	14	—	—	17	—		

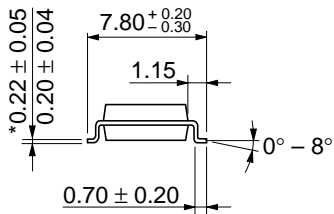
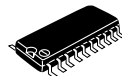
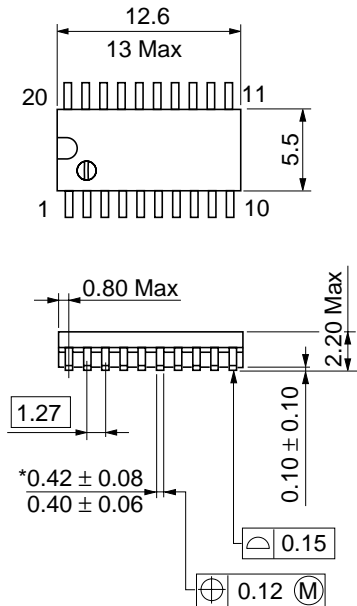
HITACHI

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
Output rise/fall time	t_{TLH}	2.0	—	—	60	—	75	ns	A/Q _A thru H/Q _H outputs
		4.5	—	—	12	—	15		
		6.0	—	—	10	—	13		
	t_{THL}	2.0	—	—	75	—	95	ns	Q _A ' & Q _H ' outputs
		4.5	—	—	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	C _{in}	—	—	5	10	—	10	pF	

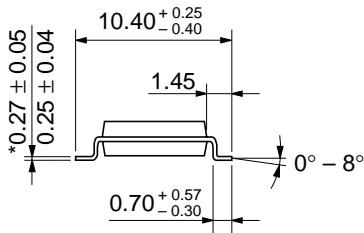
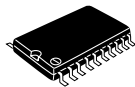
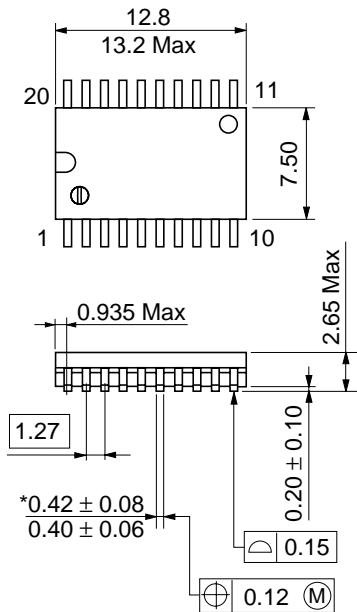


Hitachi Code	DP-20N
JEDEC	—
EIAJ	Conforms
Weight (reference value)	1.26 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-20DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.31 g



Hitachi Code	FP-20DB
JEDEC	Conforms
EIAJ	—
Weight (reference value)	0.52 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, 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
 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