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# HD74HC323

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

# HITACHI

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## Description

This eight-bit universal register features multiplexed I/O ports to achieve full eight bit data handling in a single 20-pin package. HD74HC323 applications are as stacked or push-down registers, buffer storage, and accumulator registers.

Two function-select inputs and two output control inputs can be used to choose the modes of operation 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 three-state outputs in a high-impedance state, which permits data that is applied on the I/O ports to be clocked into the register. Reading out of this register can be accomplished while the outputs are enabled in any mode. The clear function is synchronous, and a low level at the clear input clears the register on the next low-to-high transition of the clock.

## Features

- High Speed Operation:  $t_{pd}$  (Clock to Q) = 20 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 ( $T_a = 25^\circ\text{C}$ )

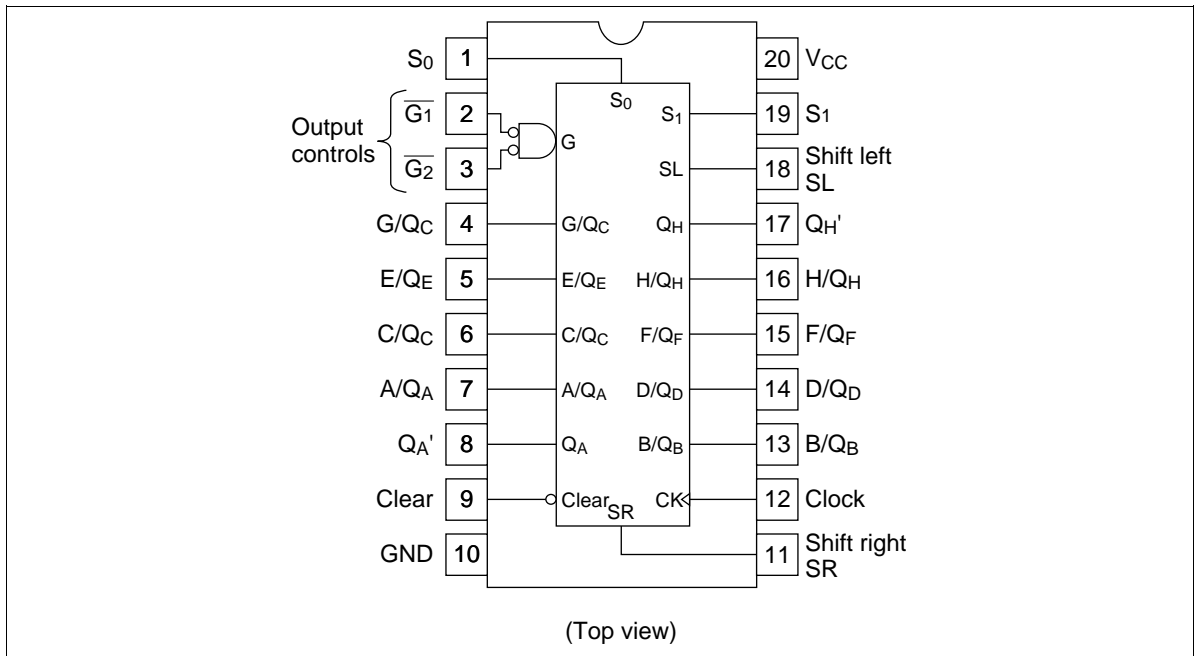
# HD74HC323

## Function Table

Mode	Inputs						Serial Inputs/Outputs										Outputs	
	Clear	Function Select		Output Control		Clock	S <sub>L</sub>	S <sub>R</sub>	A/Q <sub>A</sub>	B/Q <sub>B</sub>	C/Q <sub>C</sub>	D/Q <sub>D</sub>	E/Q <sub>E</sub>	F/Q <sub>F</sub>	G/Q <sub>G</sub>	H/Q <sub>H</sub>	Q <sub>A</sub> '	Q <sub>H</sub> '
Clear	L	X	L	L	L		X	X	L	L	L	L	L	L	L	L	L	L
	L	L	X	L	L		X	X	L	L	L	L	L	L	L	L	L	L
Hold	H	L	L	L	L	X	X	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>E0</sub>	Q <sub>F0</sub>	Q <sub>G0</sub>	Q <sub>H0</sub>	Q <sub>A0</sub>	Q <sub>H0</sub>
	H	X	X	L	L	L	X	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>E0</sub>	Q <sub>F0</sub>	Q <sub>G0</sub>	Q <sub>H0</sub>	Q <sub>A0</sub>	Q <sub>H0</sub>
Shift	H	L	H	L	L		X	H	H	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>	Q <sub>En</sub>	Q <sub>Fn</sub>	Q <sub>Gn</sub>	H	Q <sub>Gn</sub>
Right	H	L	H	L	L		X	L	L	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>	Q <sub>En</sub>	Q <sub>Fn</sub>	Q <sub>Gn</sub>	L	Q <sub>Gn</sub>
Shift	H	H	L	L	L		H	X	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>	Q <sub>En</sub>	Q <sub>Fn</sub>	Q <sub>Gn</sub>	Q <sub>Hn</sub>	H	Q <sub>Bn</sub>	H
Left	H	H	L	L	L		L	X	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>	Q <sub>En</sub>	Q <sub>Fn</sub>	Q <sub>Gn</sub>	Q <sub>Hn</sub>	L	Q <sub>Bn</sub>	L
Load	H	H	H	X	X		X	X	a	b	c	d	e	f	g	h	a	h

a ... h = the level of the steady-state input at A through H, respectively. These data are loaded into the flip-flops while the flip-flop outputs are isolated from the input/output terminals.

## Pin Arrangement

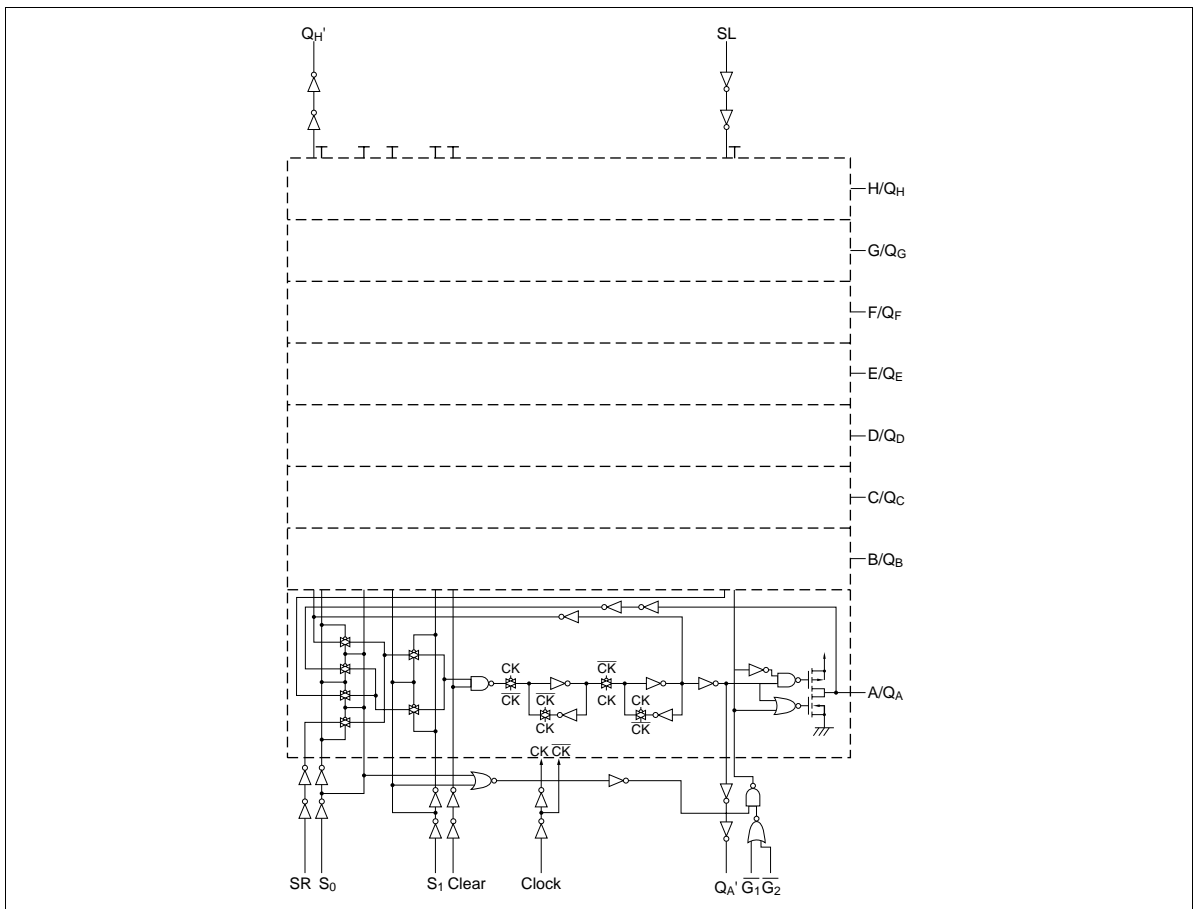


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**Absolute Maximum Ratings**

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**

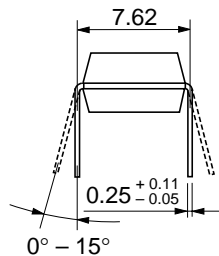
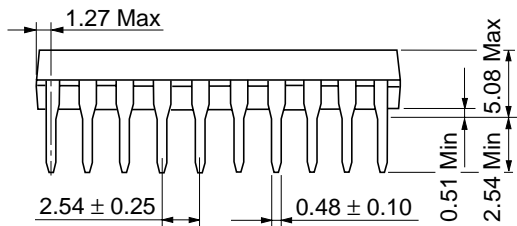
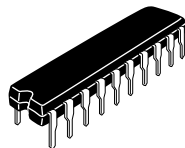
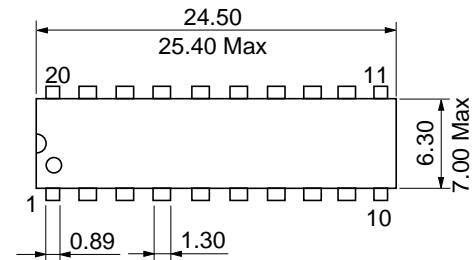


## DC Characteristics

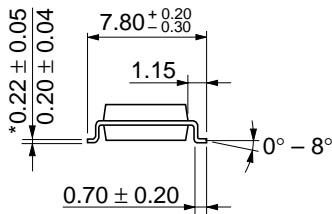
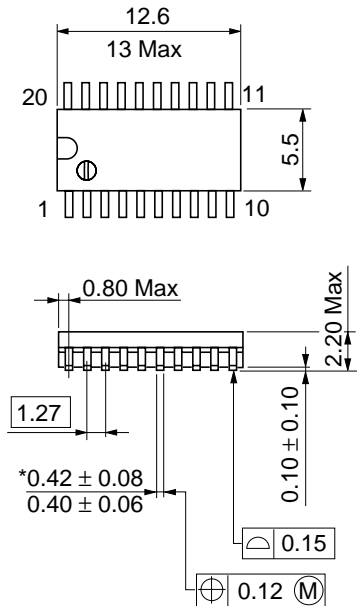
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C		Ta = -40 to +85°C		Unit	Test Conditions				
			Min	Typ	Max	Min			Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V				
		4.5	3.15	—	—	3.15	—					
		6.0	4.2	—	—	4.2	—					
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5		V			
		4.5	—	—	1.35	—	1.35					
		6.0	—	—	1.8	—	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	—		Q <sub>A</sub> to Q <sub>H</sub>			I <sub>OH</sub> = -6 mA
		6.0	5.68	—	—	5.63	—					
		4.5	4.18	—	—	4.13	—		Q <sub>A</sub> ' , Q <sub>H</sub> '			I <sub>OH</sub> = -4 mA
	6.0	5.68	—	—	5.63	—	I <sub>OH</sub> = -5.2 mA					
	V <sub>OL</sub>	2.0	—	0.0	0.1	—	0.1	V	Vin = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 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 <sub>A</sub> to Q <sub>H</sub>	I <sub>OH</sub> = 6 mA
		6.0	—	—	0.26	—	0.33					
4.5		—	—	0.26	—	0.33	Q <sub>A</sub> ' , Q <sub>H</sub> '				I <sub>OH</sub> = 4 mA	
6.0	—	—	0.26	—	0.33	I <sub>OH</sub> = 5.2 mA						
Off-state output current	I <sub>OZ</sub>	6.0	—	—	±0.5	—	±5.0	μA	Vin = V <sub>IH</sub> or V <sub>IL</sub> , Vout = V <sub>CC</sub> or GND			
Input current	I <sub>in</sub>	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	—	—	31	—	24		
Propagation delay time	$t_{PLH}$	2.0	—	—	150	—	190	ns	Clock to $Q_A'$ or $Q_H'$
		4.5	—	18	30	—	38		
		6.0	—	—	26	—	33		
	$t_{PHL}$	2.0	—	—	175	—	220	ns	Clock to Q
		4.5	—	20	35	—	44		
		6.0	—	—	30	—	37		
Output enable time	$t_{ZH}$	2.0	—	—	150	—	190	ns	
		4.5	—	14	30	—	38		
		6.0	—	—	26	—	33		
Output disable time	$t_{ZL}$	2.0	—	—	150	—	190	ns	
		4.5	—	15	30	—	38		
		6.0	—	—	26	—	33		
Output rise/fall time	$t_{TLH}$	2.0	—	—	75	—	95	ns	$Q_A', Q_H'$
		4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
	$t_{THL}$	2.0	—	—	60	—	75	ns	Q
		4.5	—	4	12	—	15		
		6.0	—	—	10	—	13		
Input capacitance	$C_{in}$	—	—	5	10	—	10	pF	

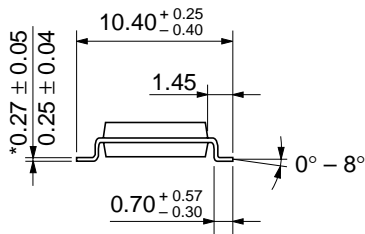
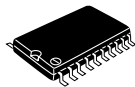
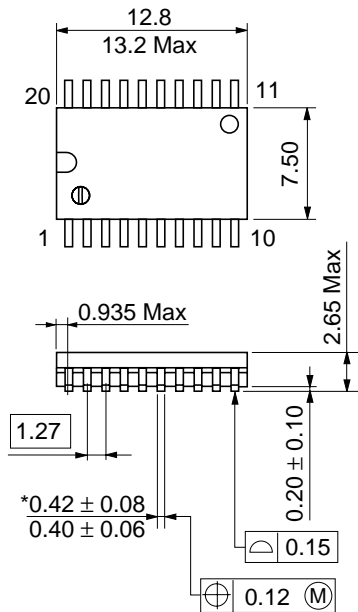


Hitachi Code	DP-20N
JEDEC	—
EIAJ	Conforms
Weight (reference value)	1.26 g



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

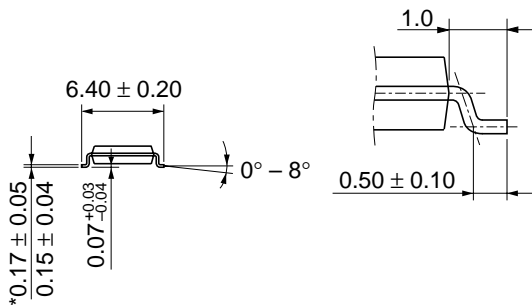
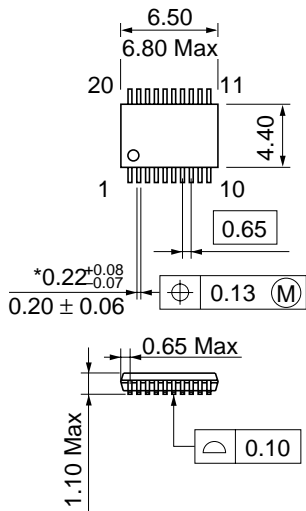
\*Dimension including the plating thickness  
Base material dimension



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

\*Dimension including the plating thickness  
Base material dimension





Hitachi Code	TTP-20DA
JEDEC	—
EIAJ	—
Weight (reference value)	0.07 g

\*Dimension including the plating thickness  
Base material dimension

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