

# HD74HC164

## 8-bit Parallel-out Shift Register

# HITACHI





### Description

This 8-bit shift register has gated serial inputs and clear. Each register bit is a D-type master/slave flip-flop. Inputs A & B permit complete control over the incoming data. A low at either or both inputs inhibits entry of new data and resets the first flip-flop to the low level at the next clock pulse. A high level on the input enables the other input which will then determine the state of the first flip-flop. Data at the serial inputs may be changed while the clock is high or low, but only information meeting the setup and hold time requirements will be entered. Data is serially shifted in and out of the 8-bit register during the positive going transition of the clock pulse. Clear is independent of the clock and accomplished by a low level at the clear input.

### Features

- High Speed Operation:  $t_{pd}$  (Clock to Q) = 14.5 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 10 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

### Function Table

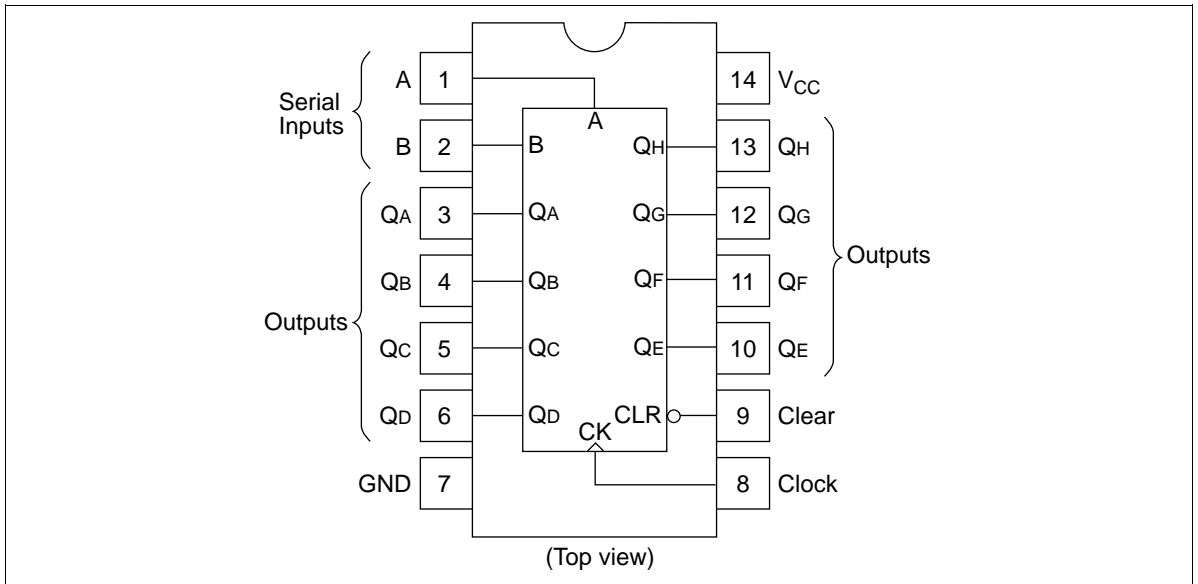
Inputs				Outputs			
Clear	Clock	A	B	$Q_A$	$Q_B$	.....	$Q_H$
L	X	X	X	L	L	.....	L
H		X	X	$Q_{Ao}$	$Q_{Bo}$	.....	$Q_{Ho}$
H		L	X	L	$Q_{An}$	.....	$Q_{Gn}$
H		X	L	L	$Q_{An}$	.....	$Q_{Gn}$
H		H	H	H	$Q_{An}$	.....	$Q_{Gn}$

$Q_{Ao}$  to  $Q_{Ho}$  = Outputs remain unchanged.

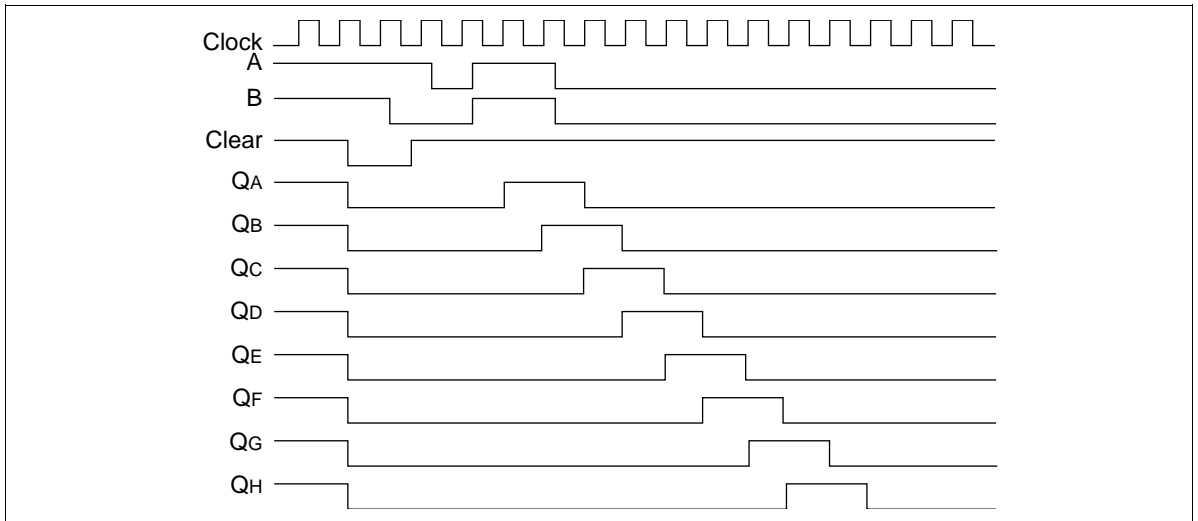
$Q_{An}$  to  $Q_{Gn}$  = Data shifted from the previous stage on a positive edge at the clock input.

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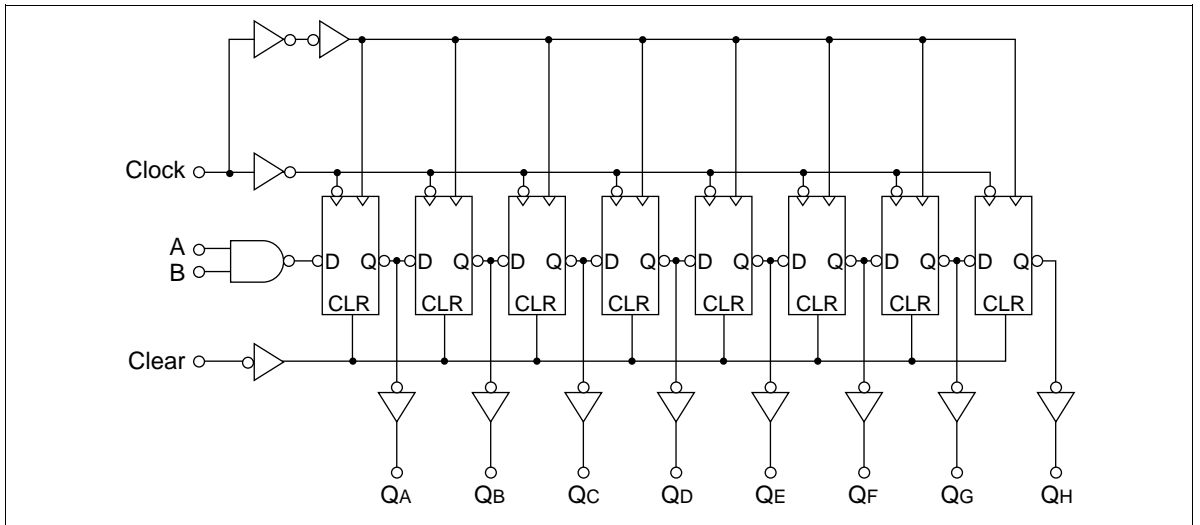
## Pin Arrangement



## Timing Diagram



Logic Diagram

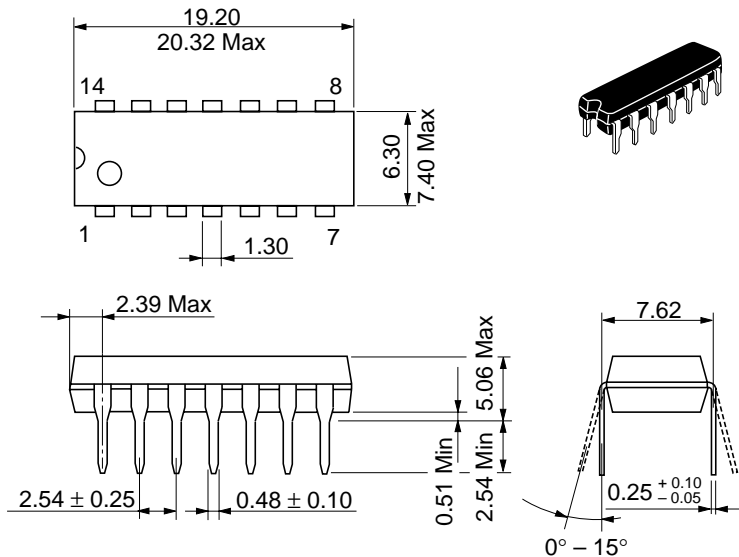


## DC Characteristics

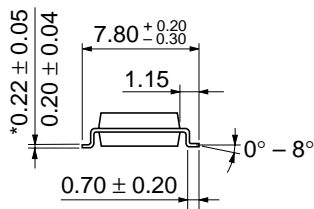
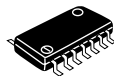
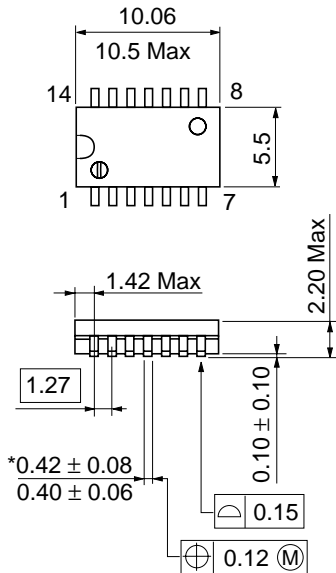
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5			V
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output 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	—			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			I <sub>OL</sub> = 4 mA
		6.0	—	—	0.26	—	0.33			I <sub>OL</sub> = 5.2 mA
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, I <sub>out</sub> = 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	—	—	25	—	20			
		6.0	—	—	29	—	24			
Propagation delay time	$t_{PHL}$	2.0	—	—	160	—	200	ns	Clock to Q	
		4.5	—	14	32	—	40			
		6.0	—	—	27	—	34			
	$t_{PLH}$	2.0	—	—	160	—	200	ns		
		4.5	—	15	32	—	40			
		6.0	—	—	27	—	34			
	$t_{PHL}$	2.0	—	—	175	—	220	ns	Clear to Q	
		4.5	—	17	35	—	44			
		6.0	—	—	30	—	37			
Setup time	$t_{su}$	2.0	100	—	—	125	—	ns	A, B to Clock	
		4.5	20	1	—	25	—			
		6.0	17	—	—	21	—			
Hold time	$t_h$	2.0	5	—	—	5	—	ns	Clock to A, B	
		4.5	5	0	—	5	—			
		6.0	5	—	—	5	—			
Removal time	$t_{rem}$	2.0	5	—	—	5	—	ns	Clear to Clock	
		4.5	5	0	—	5	—			
		6.0	5	—	—	5	—			
Pulse width	$t_w$	2.0	80	—	—	100	—	ns	Clock	
		4.5	16	8	—	20	—			
		6.0	14	—	—	17	—			
			2.0	80	—	—	100	—	ns	Clear
			4.5	16	5	—	20	—		
			6.0	14	—	—	17	—		
Output rise/fall time	$t_{TLH}$	2.0	—	—	75	—	95	ns		
	$t_{THL}$	4.5	—	5	15	—	19			
		6.0	—	—	13	—	16			
Input capacitance	$C_{in}$	—	—	5	10	—	10	pF		

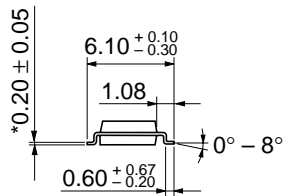
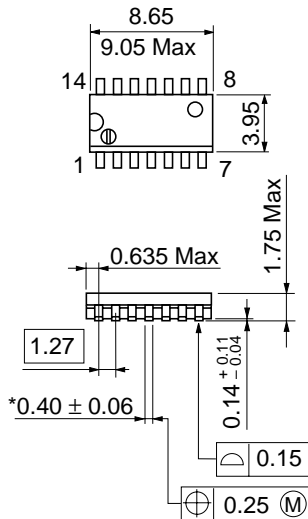


Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g



Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

\*Dimension including the plating thickness  
Base material dimension



Hitachi Code	FP-14DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.13 g



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