
HD74HC95

4-bit Parallel Access Shift Register

HITACHI

Description

This 4-bit register features parallel and serial inputs, parallel outputs, mode control, and two clock inputs. The register has three mode operation:

- Parallel (broadside) load
- Shift right (the direction Q_A toward Q_D)
- Shift left (the direction Q_D toward Q_A)

Parallel loading is accomplished by applying the four bits of data and taking the mode control input high. The data is loaded into the associated flip-flops and appears at the outputs after the high-to-low transition of the clock-2 input. During loading, the entry of serial data is inhibited. Shift right is accomplished on the high-to-low transition of clock-1 when the mode control is low; shift left is accomplished on the high-to-low transition of clock-2 when the mode control is high by connecting the output of each flip-flop (Q_D to input C, etc.) and serial data is entered at input D. The clock input may be applied commonly to clock-1 and clock-2 if both modes can be clocked from the same source. Changes at the mode control input should normally be made while both clock inputs are low: however, conditions described in the last three lines of the function table will also ensure that register contents are protected.

Features

- High Speed Operation: t_{pd} (Clock to Q) = 17 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 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

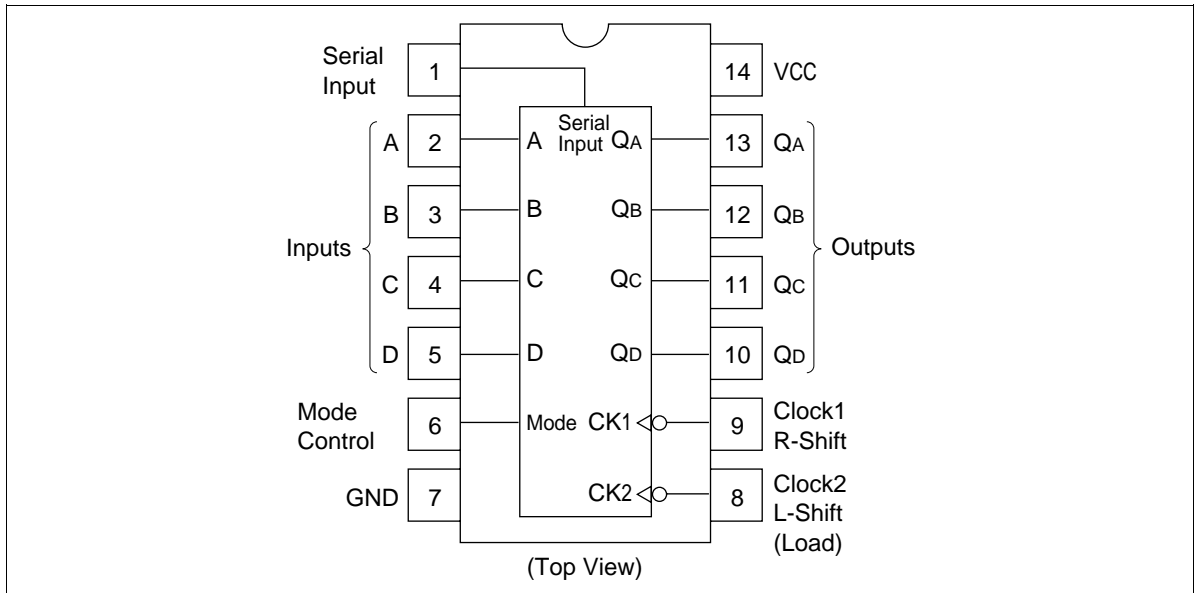
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Function Table

Inputs

| Mode Control | Clocks | | Serial | Parallel | | | | Outputs | | | |
|--------------|--------|-------|--------|-----------------|-----------------|-----------------|---|-----------------|-----------------|-----------------|-----------------|
| | 2 (L) | 1 (R) | | A | B | C | D | Q _A | Q _B | Q _C | Q _D |
| H | H | X | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| H | | X | X | a | b | c | d | a | b | c | d |
| H | | X | X | Q _{B+} | Q _{C+} | Q _{D+} | d | Q _{Bn} | Q _{Cn} | Q _{Dn} | d |
| L | L | H | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| L | X | | H | X | X | X | X | H | Q _{An} | Q _{Bn} | Q _{Cn} |
| L | X | | L | X | X | X | X | L | Q _{An} | Q _{Bn} | Q _{Cn} |
| | L | L | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| | L | L | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| | L | H | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| | H | L | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |
| | H | H | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} |

Pin Arrangement



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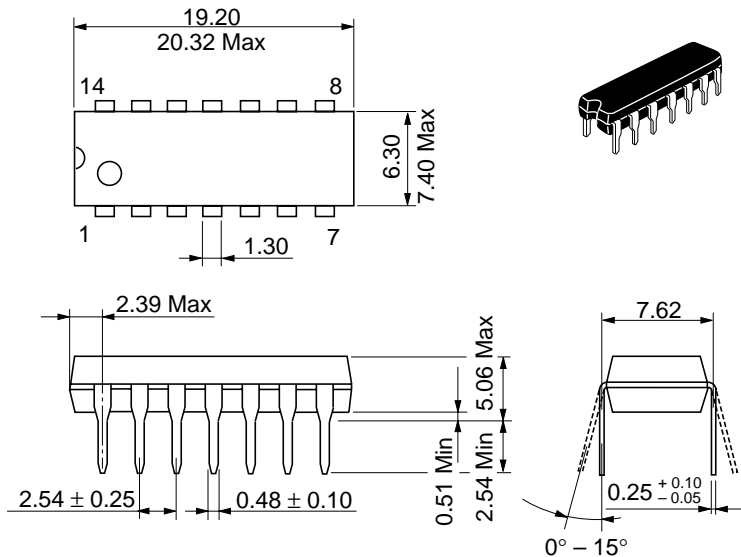
DC Characteristics

| 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 | — | | | I _{OH} = -4 mA |
| | | 6.0 | 5.68 | — | — | 5.63 | — | | | I _{OH} = -5.2 mA |
| | | 6.0 | — | 0.0 | 0.1 | — | 0.1 | | | V |
| | 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 | | | |
| 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 | |

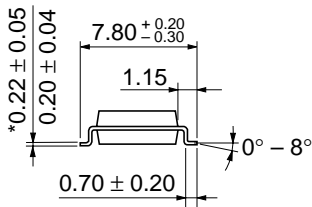
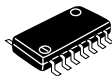
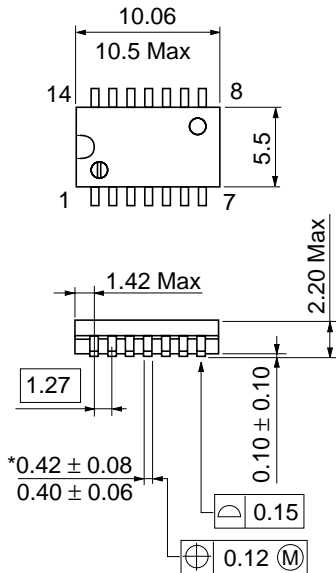
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AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

| 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 | — | — | 4 | — | 3 | MHz | |
| | | 4.5 | — | — | 20 | — | 16 | | |
| | | 6.0 | — | — | 24 | — | 19 | | |
| Propagation delay time | t_{PLH} | 2.0 | — | — | 145 | — | 180 | ns | |
| | | 4.5 | — | 17 | 29 | — | 36 | | |
| | | 6.0 | — | — | 25 | — | 31 | | |
| | t_{PHL} | 2.0 | — | — | 170 | — | 215 | ns | |
| | | 4.5 | — | 17 | 34 | — | 43 | | |
| | | 6.0 | — | — | 29 | — | 37 | | |
| Pulse width | t_w | 2.0 | 80 | — | — | 100 | — | ns | Clock |
| | | 4.5 | 16 | 6 | — | 20 | — | | |
| | | 6.0 | 14 | — | — | 17 | — | | |
| Setup time | t_{su} | 2.0 | 100 | — | — | 125 | — | ns | |
| | | 4.5 | 20 | 2 | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |
| Hold time | t_h | 2.0 | 10 | — | — | 10 | — | ns | |
| | | 4.5 | 10 | -1 | — | 10 | — | | |
| | | 6.0 | 10 | — | — | 10 | — | | |
| 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 | |

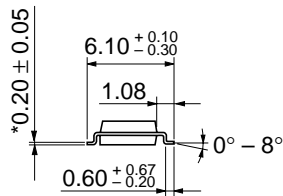
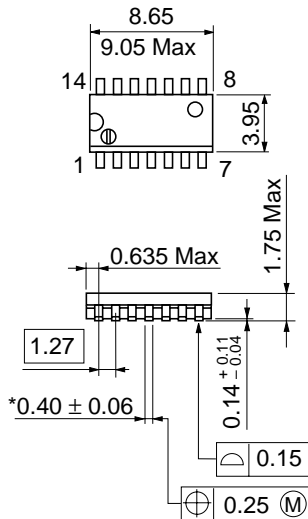


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|--------------------------|----------|
| Hitachi Code | DP-14 |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 0.97 g |



| | |
|--------------------------|----------|
| 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 |