# HD74HC166

Parallel-load 8-bit Shift Register

HITACHI

## Description

This device is an 8-bit shift register with an output from the last stage. Data may be loaded into the register either in parallel or in serial form. When the Shift/Load input is low, the data is loaded asynchronously in parallel. When the Shift/Load input is high, the data is loaded serially on the rising edge of either clock inhibit or Clock. Clear is asynchronous and active-low.

The 2-input NOR clock may be used either by combining two independent clock sources or by designating one of the clock inputs to act as a clock inhibit.

## Features

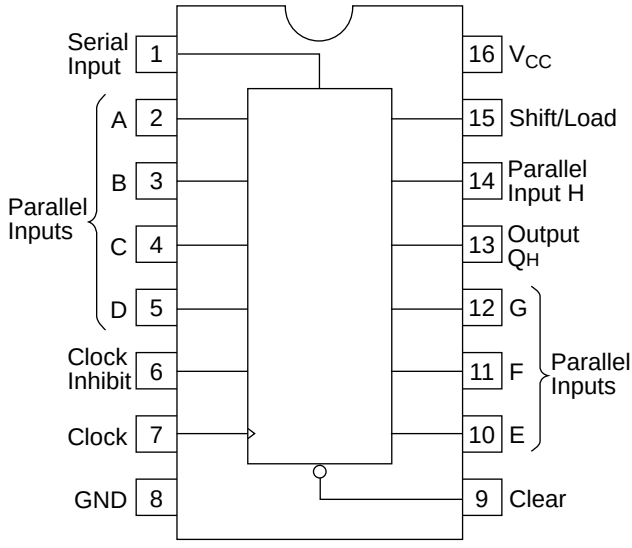
- High Speed Operation: $t_{pd}$ (Clock to $Q_H$) = 14 ns typ ($C_L$ = 50 pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC}$ = 2 to 6 V
- Low Input Current: 1 µA max
- Low Quiescent Supply Current: $I_{CC}$ (static) = 4 µA max (Ta = 25°C)

## Function Table

| Inputs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Parallel | Internal Outputs | | Output |
| Clear | Shift/Load | Clock Inhibit | Clock | Serial | A ⋯ H | $Q_A$ | $Q_B$ | $Q_H$ |
| L | X | X | X | X | X | L | L | L |
| H | X | L | L | X | X | $Q_{A0}$ | $Q_{B0}$ | $Q_{H0}$ |
| H | L | L | ⎍ | X | a ⋯ h | a | b | h |
| H | H | L | ⎍ | H | X | H | $Q_{An}$ | $Q_{Gn}$ |
| H | H | L | ⎍ | L | X | L | $Q_{An}$ | $Q_{Gn}$ |
| H | X | H | ⎍ | X | X | $Q_{A0}$ | $Q_{B0}$ | $Q_{H0}$ |

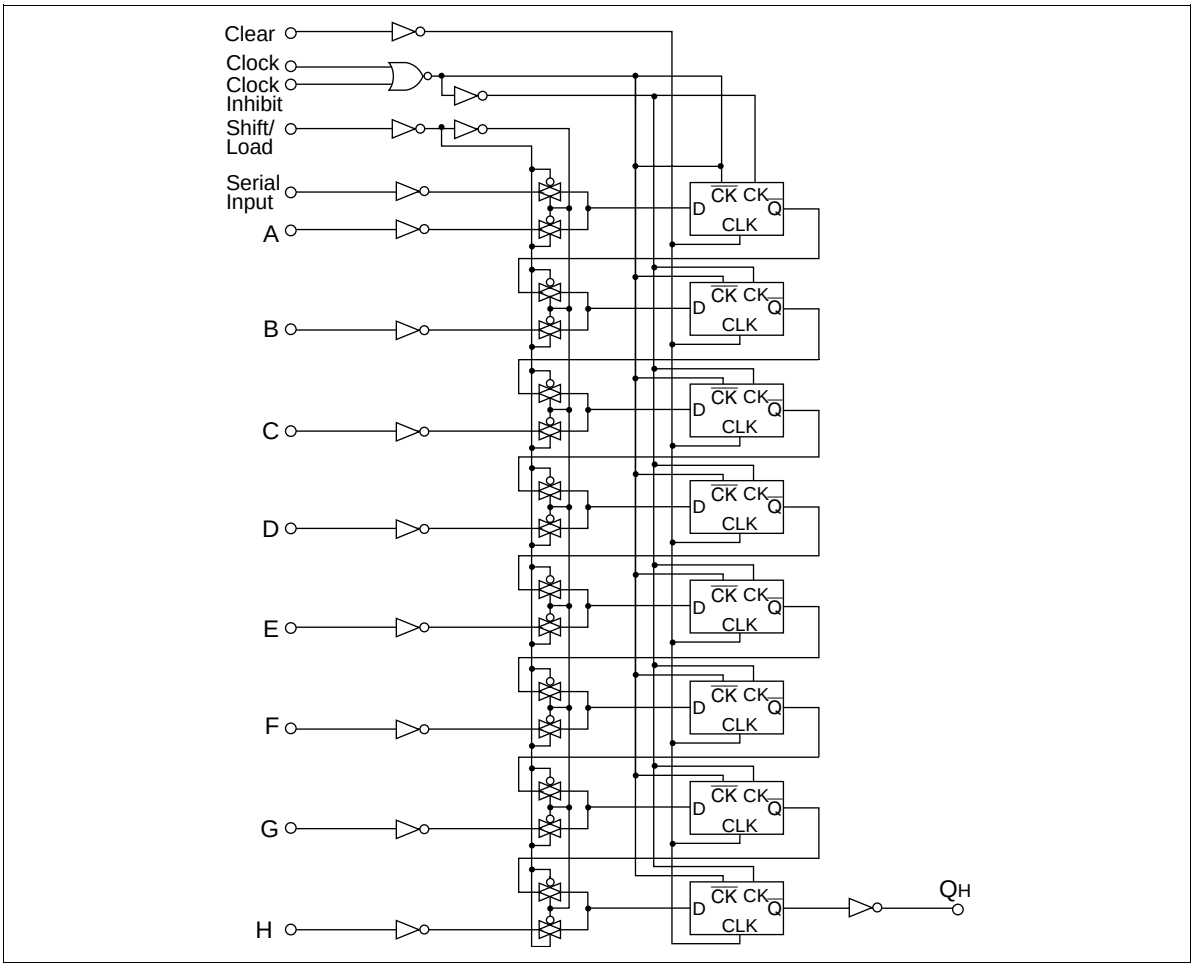
Hitachi semiconductor

## Pin Arrangement




(Top view)

## Logic Diagram



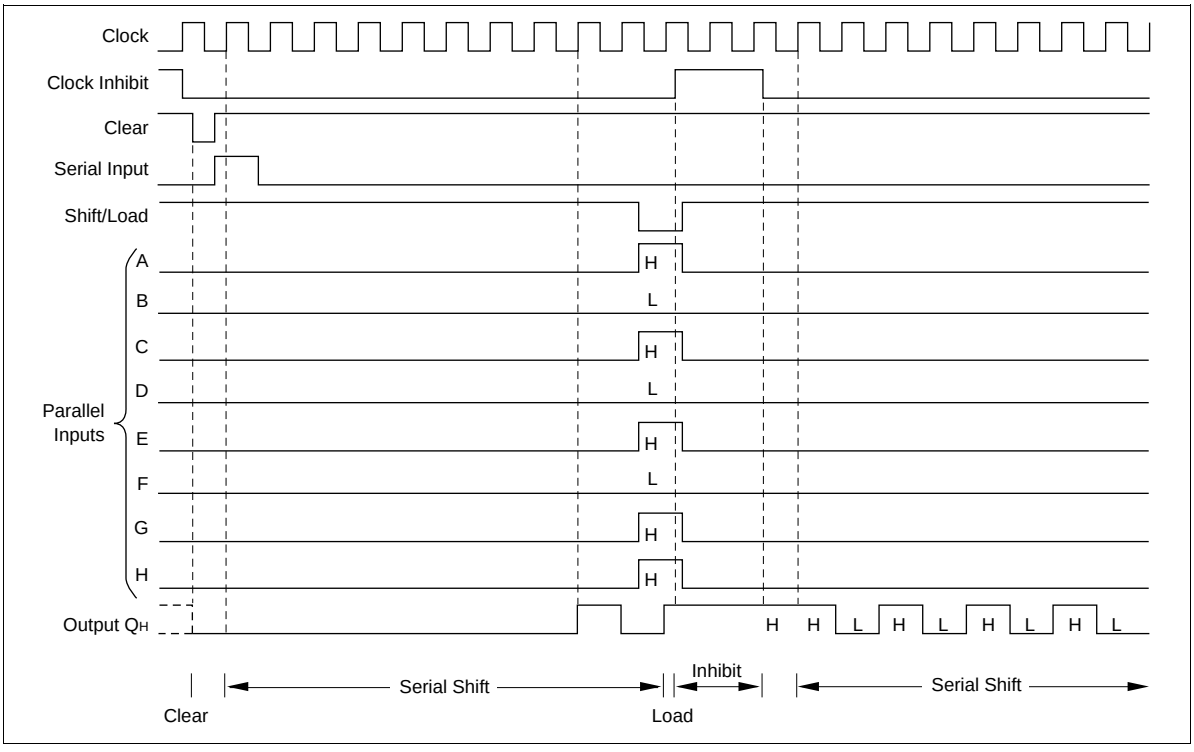
## DC Characteristics

| Item | Symbol | $V_{CC}$ (V) | Ta = 25°C Min | Typ | Max | Ta = –40 to +85°C Min | Max | Unit | Test Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| | $V_{OL}$ | 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 | | | $I_{OL}$ = 4 mA |
| | | 6.0 | — | — | 0.26 | — | 0.33 | | | $I_{OL}$ = 5.2 mA |
| Input current | Iin | 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 | |

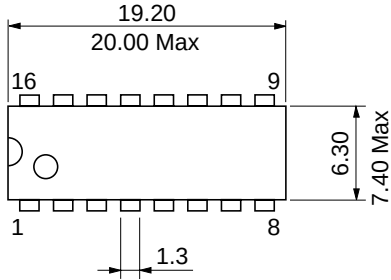
## AC Characteristics ($C_L$ = 50 pF, Input $t_r = t_f$ = 6 ns)

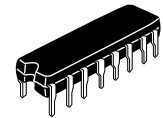
| | | | Ta = 25°C | | | Ta = –40 to +85°C | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Item** | **Symbol** | **$V_{cc}$ (V)** | **Min** | **Typ** | **Max** | **Min** | **Max** | **Unit** | **Test Conditions** |
| Maximum clock frequency | $f_{max}$ | 2.0 | — | — | 5 | — | 4 | MHz | |
| | | 4.5 | — | — | 25 | — | 20 | | |
| | | 6.0 | — | — | 29 | — | 24 | | |
| Propagation delay time | $t_{PHL}$ | 2.0 | — | — | 175 | — | 220 | ns | Clock to $Q_H$ |
| | $t_{PLH}$ | 4.5 | — | 14 | 35 | — | 44 | | |
| | | 6.0 | — | — | 30 | — | 37 | | |
| | $t_{PHL}$ | 2.0 | — | — | 150 | — | 190 | ns | Clear to $Q_H$ |
| | | 4.5 | — | 12 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Setup time | $t_{su}$ | 2.0 | 150 | — | — | 190 | — | ns | Shift/Load to Clock |
| | | 4.5 | 30 | 2 | — | 38 | — | | |
| | | 6.0 | 26 | — | — | 33 | — | | |
| | | 2.0 | 100 | — | — | 125 | — | ns | Data to Clock |
| | | 4.5 | 20 | 1 | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |
| Hold time | $t_h$ | 2.0 | 5 | — | — | 5 | — | ns | Clock to Data |
| | | 4.5 | 5 | 0 | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |
| Pulse width | $t_w$ | 2.0 | 80 | — | — | 100 | — | ns | Clock, Clear |
| | | 4.5 | 16 | 6 | — | 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 | Cin | — | — | 5 | 10 | — | 10 | pF | |

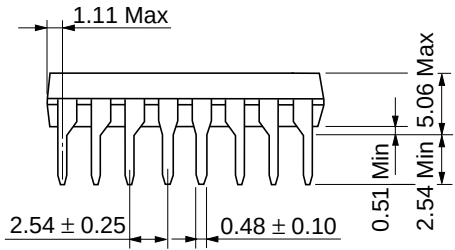
## Timing Diagram

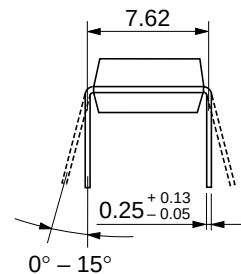


Unit: mm



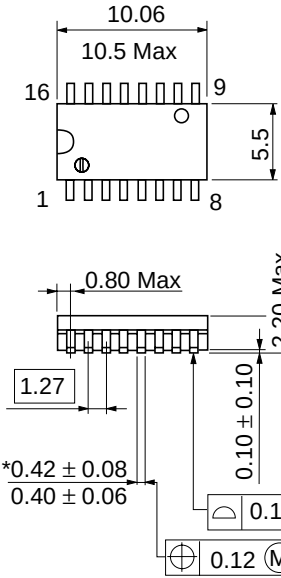



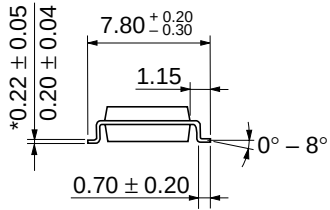


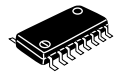




| | |
|---|---|
| Hitachi Code | DP-16 |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 1.07 g |

Unit: mm



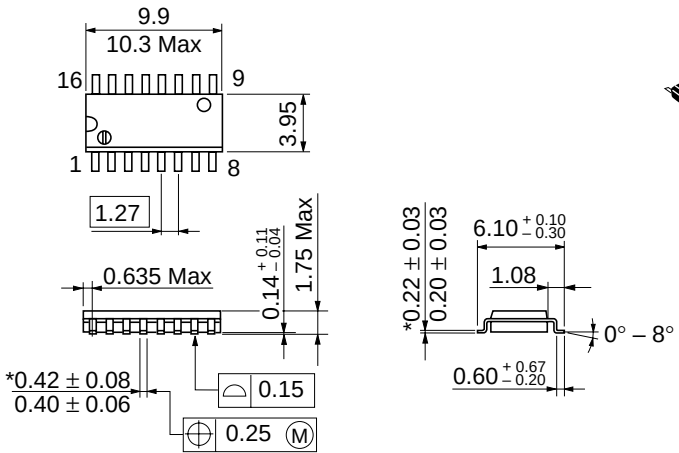



*Dimension including the plating thickness
Base material dimension

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

Unit: mm




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

*Dimension including the plating thickness
Base material dimension

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