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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74HC589

8-bit Serial or Parallel-input/Serial-output Shift Register (with 3-state outputs)



ADE-205-511 (Z)
1st. Edition
Sep. 2000

Description

The HD74HC589 is similar in function to the HD74HC597, which is not a 3-state device.

This device consists of an 8-bit storage latch which feeds parallel data to an 8-bit shift register. Data can also be loaded serially (see Function Table). The shift register output, O_H , is a three-state output, allowing this device to be used in bus-oriented systems.

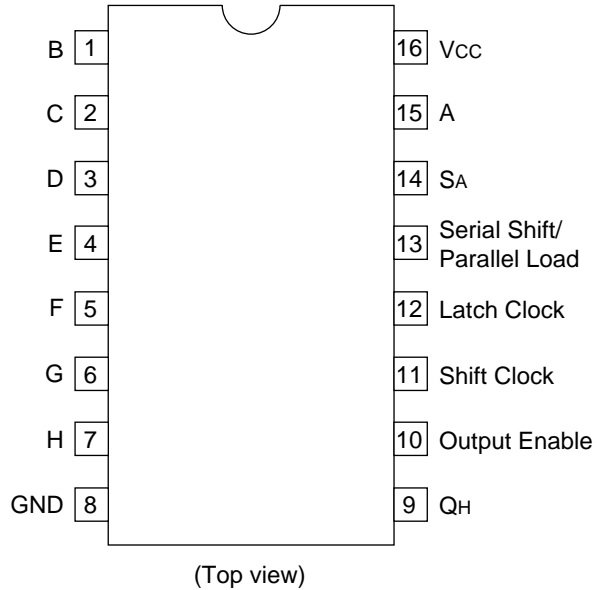
Features

- High Speed Operation: t_{pd} (Shift Clock to Q_H) = 15 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 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

Function Table

| Latch Clock LCK | Shift Clock SCK | Serial Shift/ Parallel Load | Output Enable \overline{OE} | Function |
|--------------------|--------------------|--------------------------------|----------------------------------|------------------------------------------------------------|
| | X | X | X | Data are loaded into input latches |
| | X | L | L | Data are loaded from input into shift registers |
| X | X | L | L | Data are transferred from input latches to shift registers |
| L, H, | L, H, | X | H | Outputs are disabled |
| X | | H | L | Serial shift $Q_n = Q_{n-1}$, $Q_0 = \text{SER}$ |

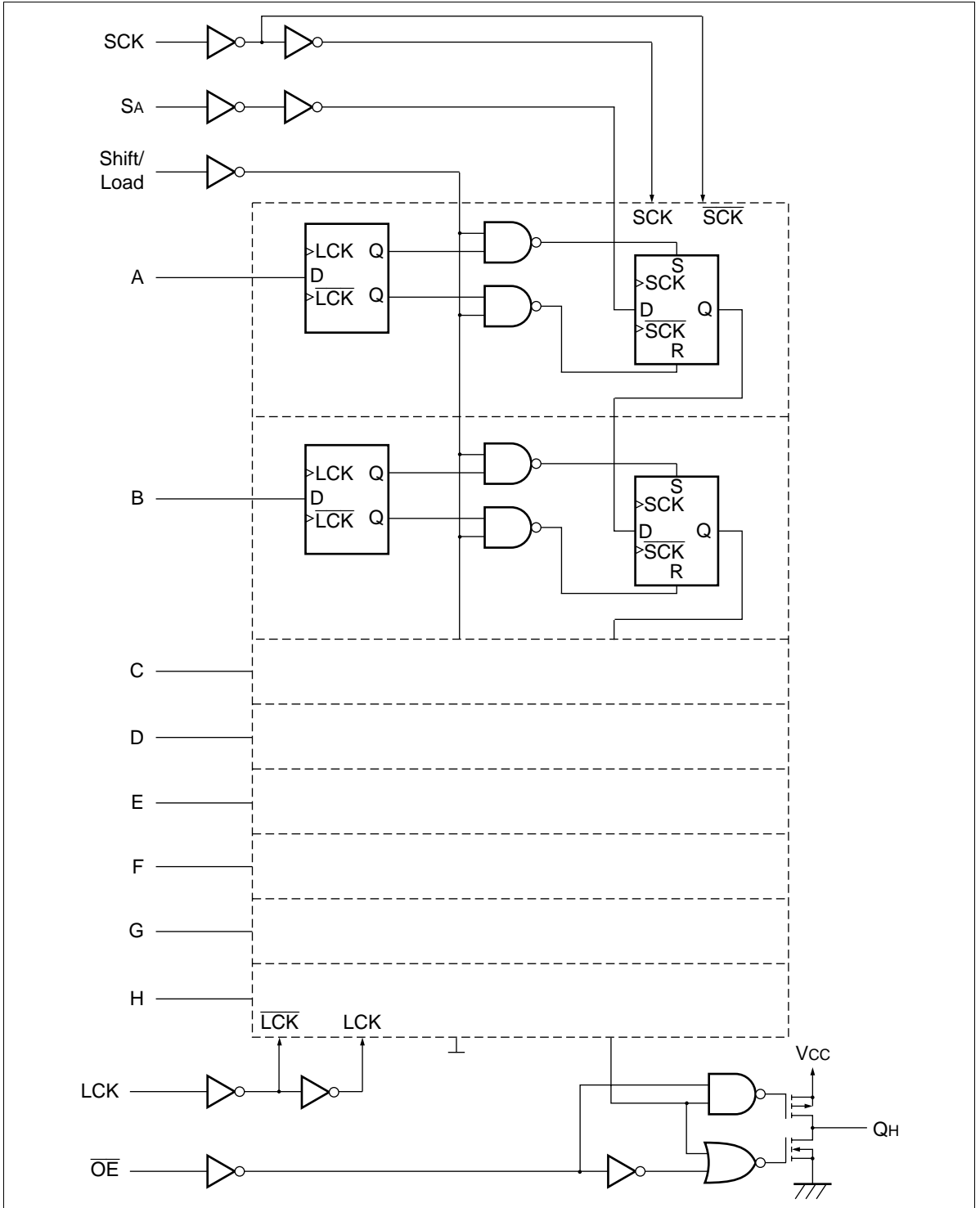
Pin Arrangement



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 | $^{\circ}C$ |

Logic Diagram



HD74HC589

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} = -6 mA | |
| | | 6.0 | 5.68 | — | — | 5.63 | — | | I _{OH} = -7.8 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} = 6 mA |
| | | 6.0 | — | — | 0.26 | — | 0.33 | | | I _{OL} = 7.8 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 | |
| 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 | |

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

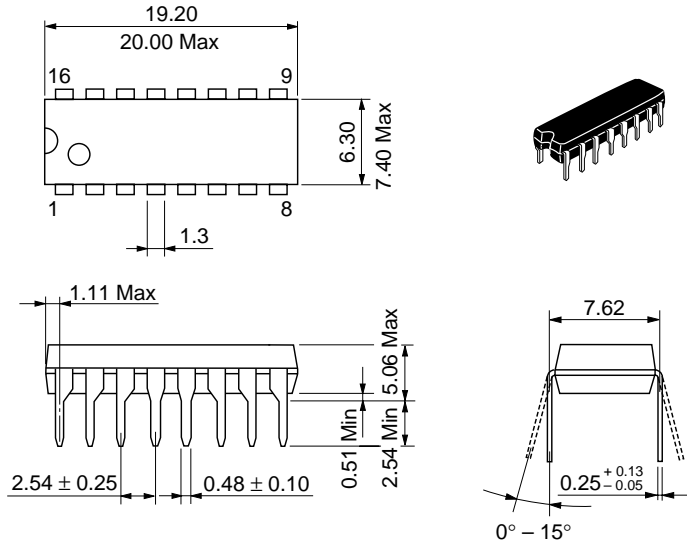
| Item | Symbol | V_{CC} (V) | Ta = 25°C | | Ta = -40 to +85°C | | Unit | Test Conditions | |
|-------------------------|-----------|--------------|-----------|-----|-------------------|-----|------|------------------------------------|------------------------------------------|
| | | | Min | Typ | Max | Min | | | Max |
| Maximum clock frequency | f_{max} | 2.0 | — | — | 5 | — | 4 | MHz | |
| | | 4.5 | — | — | 27 | — | 21 | | |
| | | 6.0 | — | — | 32 | — | 25 | | |
| Propagation delay time | t_{PLH} | 2.0 | — | — | 200 | — | 250 | ns | Latch clock to Q_H |
| | | 4.5 | — | 20 | 40 | — | 50 | | |
| | | 6.0 | — | — | 34 | — | 43 | | |
| | t_{PHL} | 2.0 | — | — | 175 | — | 220 | ns | Shift clock to Q_H |
| | | 4.5 | — | 15 | 35 | — | 44 | | |
| | | 6.0 | — | — | 30 | — | 37 | | |
| t_{PLH} | 2.0 | — | — | 175 | — | 220 | ns | Serial shift/prallel load to Q_H | |
| | 4.5 | — | 16 | 35 | — | 44 | | | |
| | 6.0 | — | — | 30 | — | 37 | | | |
| Output enable time | t_{ZL} | 2.0 | — | — | 150 | — | 190 | ns | |
| | | 4.5 | — | 9 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Output disable time | t_{LZ} | 2.0 | — | — | 150 | — | 190 | ns | |
| | | 4.5 | — | 14 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Pulse width | t_w | 2.0 | 80 | — | — | 100 | — | ns | |
| | | 4.5 | 16 | 8 | — | 20 | — | | |
| | | 6.0 | 14 | — | — | 17 | — | | |
| Setup time | t_{su} | 2.0 | 100 | — | — | 125 | — | ns | Data to latch clock |
| | | 4.5 | 20 | 1 | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |
| | t_{su} | 2.0 | 100 | — | — | 125 | — | ns | S_A to shift clock |
| | | 4.5 | 20 | — | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |
| | t_{su} | 2.0 | 100 | — | — | 125 | — | ns | Serial shift/prallel load to shift clock |
| | | 4.5 | 20 | — | — | 25 | — | | |
| | | 6.0 | 17 | — | — | 21 | — | | |

AC Characteristics ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$) (cont)

| Item | Symbol | V_{CC} (V) | Ta = 25°C | | Ta = -40 to +85°C | | Unit | Test Conditions | |
|--------------------------|-----------|--------------|-----------|-----|-------------------|-----|------|-----------------|-----------------------------------------------|
| | | | Min | Typ | Max | Min | | | Max |
| Hold time | t_h | 2.0 | 5 | — | — | 5 | — | ns | Latch clock to data |
| | | 4.5 | 5 | 0 | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |
| | t_h | 2.0 | 5 | — | — | 5 | — | ns | Shift clock to S_A |
| | | 4.5 | 5 | — | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |
| | t_h | 2.0 | 5 | — | — | 5 | — | ns | Shift clock to serial shift/ parallel load |
| | | 4.5 | 5 | — | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |
| 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 | |

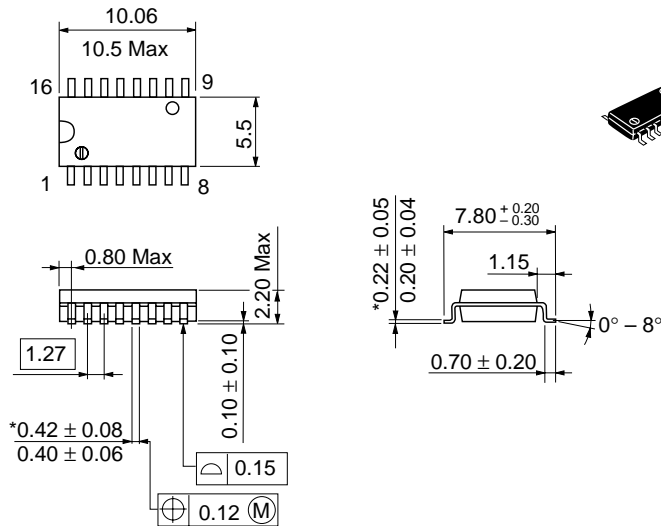
Package Dimensions

Unit: mm



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

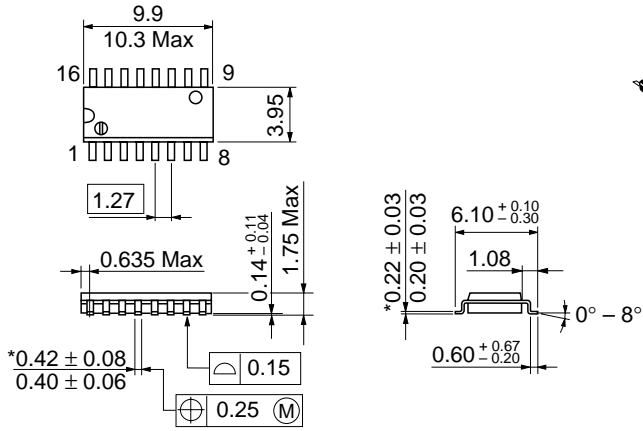
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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