

To all our customers

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

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# HD74HC390

## Dual Decade Counters



ADE-205-503 (Z)

1st. Edition

Sep. 2000

### Description

The HD74HC390 incorporate dual decade counters, each composed of a divide-by-two and a divide-by-five counter. The divide-by-two and divide-by-five counters can be cascaded to form dual decade, dual bi-quinary, or various combinations up to a single divide-by-100 counter.

The HD74HC390 is incremented on the high to low transition (negative edge) of the clock input, and each has an independent clear input. When clear is set high all four bits of each counter are set to a low level. This enables count truncation and allows the implementation of divide-by-N counter configurations.

### Features

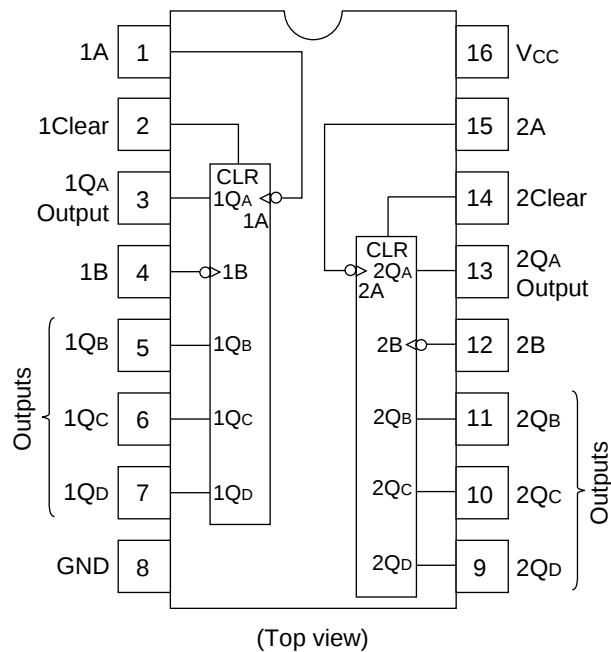
- High Speed Operation:  $t_{pd}$  (Clock A to  $Q_A$ ) = 11 ns typ ( $C_L$  = 50 pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage:  $V_{CC}$  = 2 to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a$  = 25°C)

### Function Table

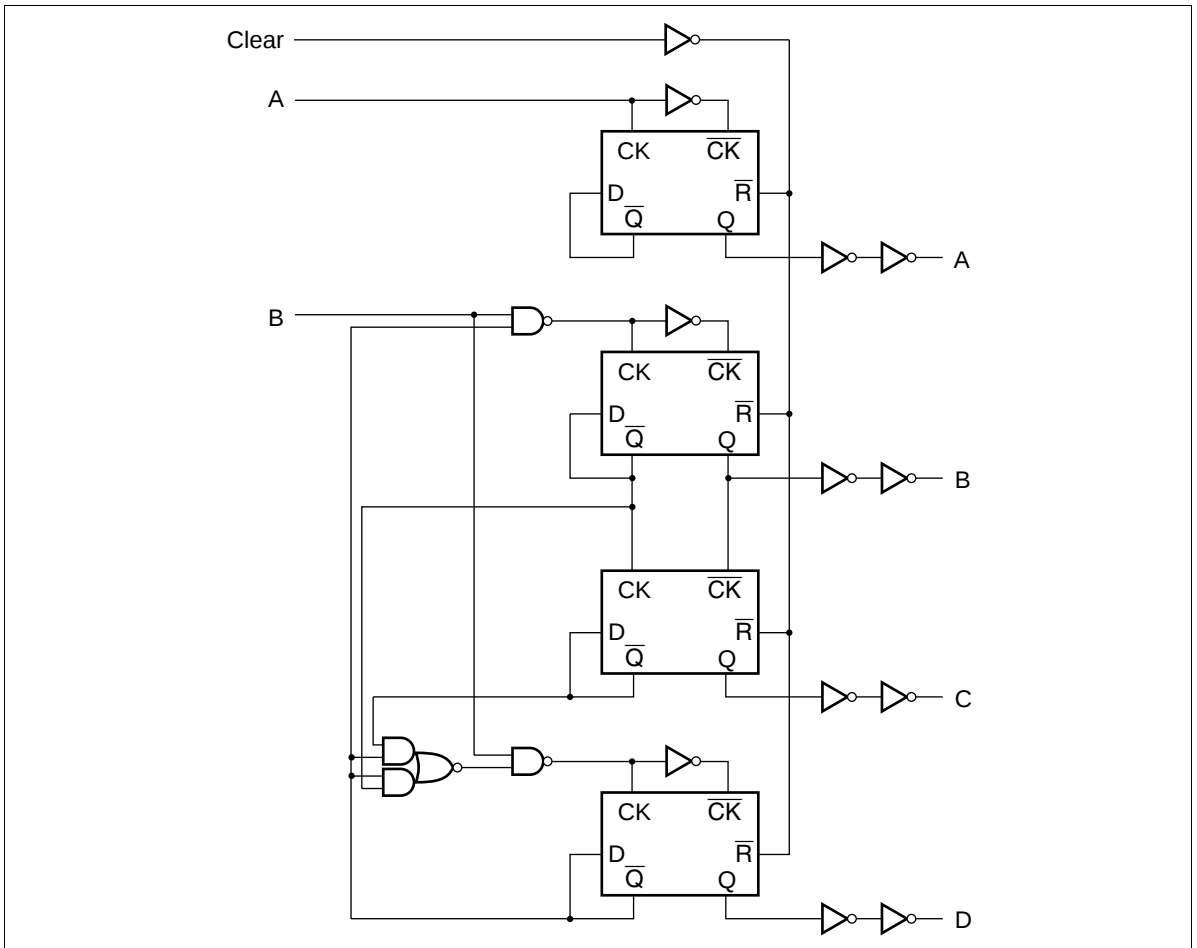
#### Clock

| A                                                                                  | B                                                                                   | Clear | Operation                   |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------|-----------------------------|
| X                                                                                  | X                                                                                   | H     | Clear $\div 2$ and $\div 5$ |
|  | X                                                                                   | L     | Increment $\div 2$          |
| X                                                                                  |  | L     | Increment $\div 5$          |

Pin Arrangement



## Block Diagram (1/2)



## DC Characteristics

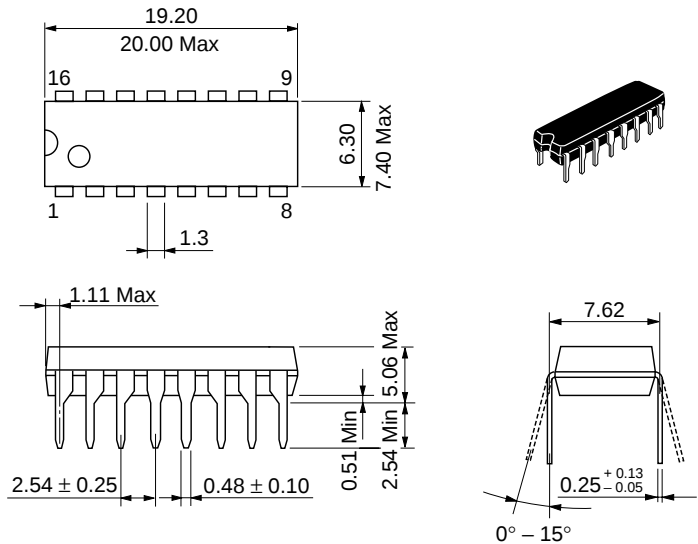
| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |      | Ta = -40 to +85°C |      | Unit | Test Conditions                                                   |                           |
|--------------------------|-----------------|---------------------|-----------|-----|------|-------------------|------|------|-------------------------------------------------------------------|---------------------------|
|                          |                 |                     | 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 ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

| Item                    | Symbol           | V <sub>CC</sub> (V) | Ta = 25°C |     | Ta = −40 to +85°C |     | Unit | Test Conditions |                                                                            |
|-------------------------|------------------|---------------------|-----------|-----|-------------------|-----|------|-----------------|----------------------------------------------------------------------------|
|                         |                  |                     | Min       | Typ | Max               | Min |      |                 | Max                                                                        |
| Maximum clock frequency | f <sub>max</sub> | 2.0                 | —         | —   | 5                 | —   | 4    | MHz             |                                                                            |
|                         |                  | 4.5                 | —         | —   | 27                | —   | 21   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 32                | —   | 25   |                 |                                                                            |
| Propagation delay time  | t <sub>PLH</sub> | 2.0                 | —         | —   | 120               | —   | 150  | ns              | Clock A to Q <sub>A</sub>                                                  |
|                         |                  | 4.5                 | —         | 11  | 24                | —   | 30   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 20                | —   | 26   |                 |                                                                            |
|                         | t <sub>PHL</sub> | 2.0                 | —         | —   | 290               | —   | 365  | ns              | Clock A to Q <sub>C</sub><br>(Q <sub>A</sub> connected to Clock B)         |
|                         |                  | 4.5                 | —         | 32  | 58                | —   | 73   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 49                | —   | 62   |                 |                                                                            |
|                         | t <sub>PLH</sub> | 2.0                 | —         | —   | 130               | —   | 165  | ns              | Clock B to Q <sub>B</sub>                                                  |
|                         |                  | 4.5                 | —         | 16  | 26                | —   | 33   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 22                | —   | 28   |                 |                                                                            |
|                         | t <sub>PHL</sub> | 2.0                 | —         | —   | 185               | —   | 230  | ns              | Clock B to Q <sub>C</sub>                                                  |
|                         |                  | 4.5                 | —         | 20  | 37                | —   | 46   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 31                | —   | 39   |                 |                                                                            |
|                         | t <sub>PLH</sub> | 2.0                 | —         | —   | 130               | —   | 165  | ns              | Clock B to Q <sub>D</sub>                                                  |
|                         |                  | 4.5                 | —         | 15  | 26                | —   | 33   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 22                | —   | 28   |                 |                                                                            |
|                         | t <sub>PHL</sub> | 2.0                 | —         | —   | 165               | —   | 205  | ns              | Clear to Q <sub>A</sub> , Q <sub>B</sub> , Q <sub>C</sub> , Q <sub>D</sub> |
|                         |                  | 4.5                 | —         | 14  | 33                | —   | 41   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 28                | —   | 35   |                 |                                                                            |
| Pulse width             | t <sub>w</sub>   | 2.0                 | 80        | —   | —                 | 100 | —    | ns              |                                                                            |
|                         |                  | 4.5                 | 16        | 8   | —                 | 20  | —    |                 |                                                                            |
|                         |                  | 6.0                 | 14        | —   | —                 | 17  | —    |                 |                                                                            |
| Removal time            | t <sub>h</sub>   | 2.0                 | 25        | —   | —                 | 31  | —    | ns              |                                                                            |
|                         |                  | 4.5                 | 5         | 1   | —                 | 6   | —    |                 |                                                                            |
|                         |                  | 6.0                 | 4         | —   | —                 | 5   | —    |                 |                                                                            |
| Output rise/fall time   | t <sub>TLH</sub> | 2.0                 | —         | —   | 75                | —   | 95   | ns              |                                                                            |
|                         |                  | 4.5                 | —         | 5   | 15                | —   | 19   |                 |                                                                            |
|                         |                  | 6.0                 | —         | —   | 13                | —   | 16   |                 |                                                                            |
| Input capacitance       | C <sub>in</sub>  | —                   | —         | 5   | 10                | —   | 10   | pF              |                                                                            |

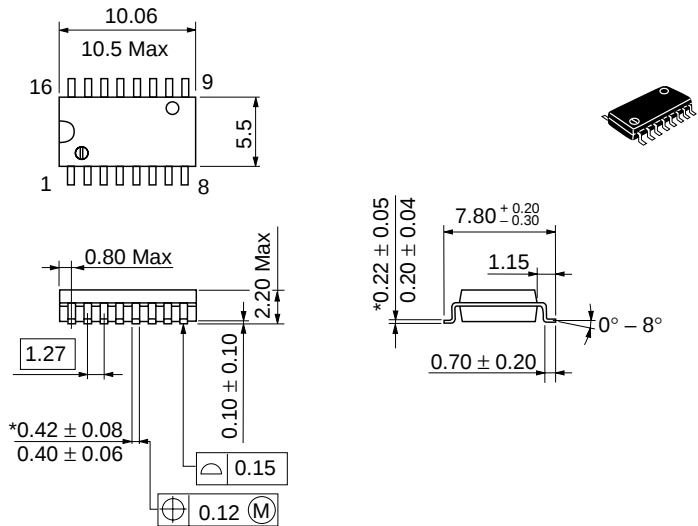
Package Dimensions

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   |

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