

# HD74HC374/HD74HC534

Octal D-type Flip-Flops (with 3-state outputs)  
Octal D-type Flip-Flops (with inverted 3-state outputs)

## HITACHI

ADE-205-499 (Z)  
1st. Edition  
Sep. 2000

### Description

These devices are positive edge triggered flip-flops. The difference between HD74HC374 and HD74HC534 is only that the former is a true outputs and the latter is a false outputs. Data at the D inputs, meeting the setup and hold time requirements, are transferred to the Q outputs on positive going transitions of the clock (CK) input. When a high logic level is applied to the output control (OC) input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements.

### Features

- High Speed Operation:  $t_{pd}$  (Clock to Q) = 18 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  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )

### Function Table

| Output Control | Clock                                                                               | D | HD74HC374<br>Q | HD74HC534<br>$\bar{Q}$ |
|----------------|-------------------------------------------------------------------------------------|---|----------------|------------------------|
| L              |  | H | H              | L                      |
| L              |  | L | L              | H                      |
| L              | L                                                                                   | X | No change      | No change              |
| H              | X                                                                                   | X | Z              | Z                      |

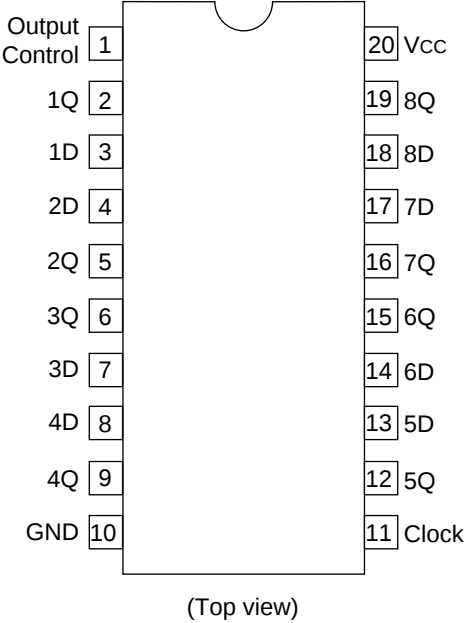
X : irrelevant

Z : off (high-impedance) state of a 3-state output.

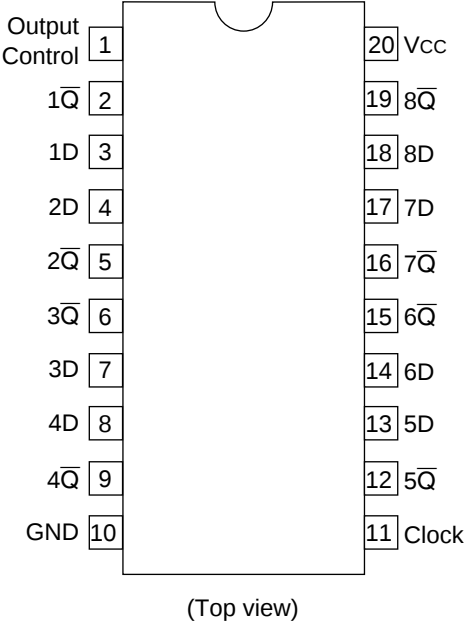
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Pin Arrangement

HD74HC374



HD74HC534

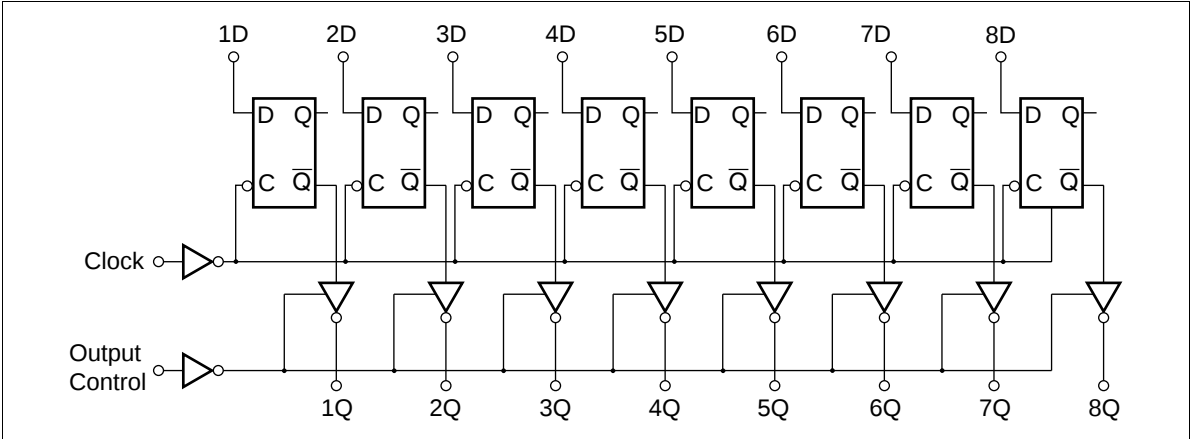


Absolute Maximum Ratings

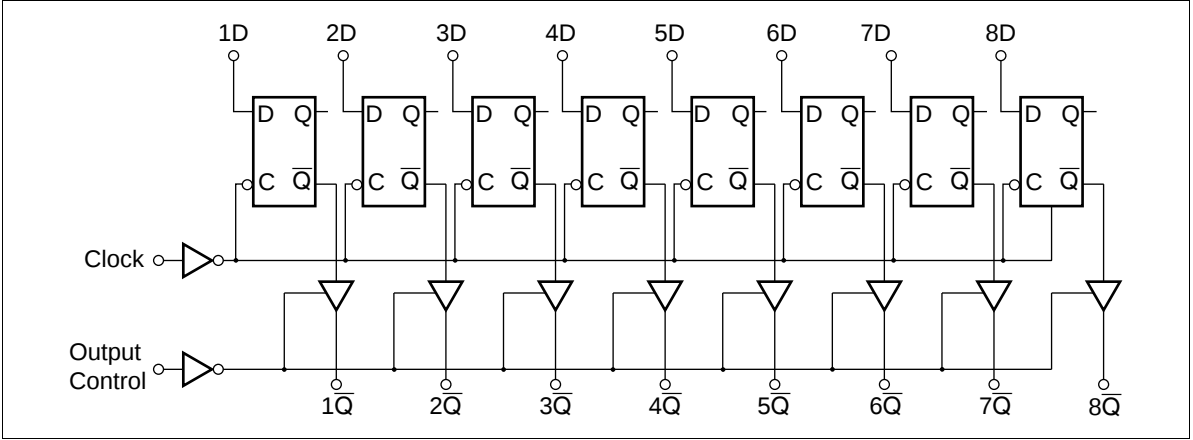
| Item                                | Symbol            | Rating                 | Unit |
|-------------------------------------|-------------------|------------------------|------|
| Supply voltage range                | $V_{CC}$          | -0.5 to +7.0           | V    |
| Input voltage                       | $V_{IN}$          | -0.5 to $V_{CC} + 0.5$ | V    |
| Output voltage                      | $V_{OUT}$         | -0.5 to $V_{CC} + 0.5$ | V    |
| DC current drain per pin            | $I_{OUT}$         | $\pm 35$               | mA   |
| DC current drain per $V_{CC}$ , GND | $I_{CC}, I_{GND}$ | $\pm 75$               | mA   |
| DC input diode current              | $I_{IK}$          | $\pm 20$               | mA   |
| DC output diode current             | $I_{OK}$          | $\pm 20$               | mA   |
| Power Dissipation per package       | $P_T$             | 500                    | mW   |
| Storage temperature                 | $T_{stg}$         | -65 to +150            | °C   |

Block Diagram

HD74HC374



HD74HC534



## 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              | —    |      |                                                                             |
|                          |                 | 6.0                 | 5.68      | —   | —    | 5.63              | —    |      |                                                                             |
|                          | 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 |      |                                                                             |
|                          |                 | 6.0                 | —         | —   | 0.26 | —                 | 0.33 |      |                                                                             |
| Off-state output current | I <sub>OZ</sub> | 6.0                 | —         | —   | ±0.5 | —                 | ±5.0 | µA   | Vin = V <sub>IH</sub> or V <sub>IL</sub> ,<br>Vout = V <sub>CC</sub> or GND |
| 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, Iout = 0 µA                                   |

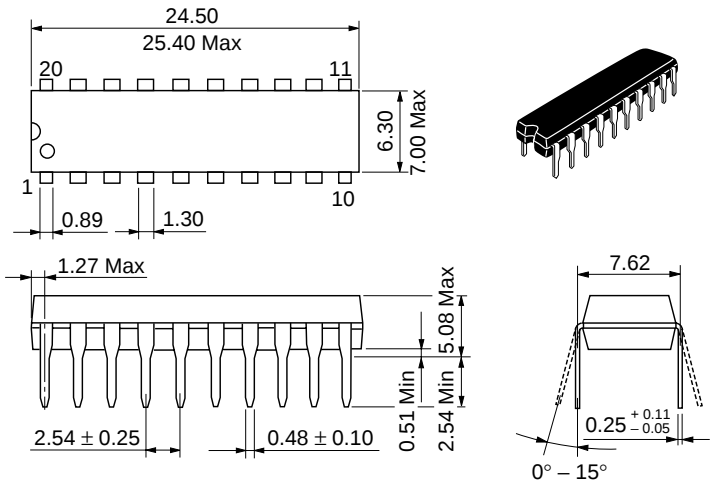
HD74HC374/HD74HC534

AC Characteristics (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 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                 | —         | —   | 6   | —                 | 5   | MHz  |                         |
|                         |                                      | 4.5                 | —         | —   | 30  | —                 | 24  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 35  | —                 | 28  |      |                         |
| Propagation delay time  | t <sub>PHL</sub><br>t <sub>PLH</sub> | 2.0                 | —         | —   | 140 | —                 | 175 | ns   |                         |
|                         |                                      | 4.5                 | —         | 18  | 28  | —                 | 35  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 24  | —                 | 30  |      |                         |
| Output enable time      | t <sub>ZL</sub>                      | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                         |
|                         |                                      | 4.5                 | —         | 11  | 30  | —                 | 38  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 26  | —                 | 33  |      |                         |
|                         | t <sub>ZH</sub>                      | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                         |
|                         |                                      | 4.5                 | —         | 14  | 30  | —                 | 38  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 26  | —                 | 33  |      |                         |
| Output disable time     | t <sub>LZ</sub>                      | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                         |
|                         |                                      | 4.5                 | —         | 13  | 30  | —                 | 38  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 26  | —                 | 33  |      |                         |
|                         | t <sub>HZ</sub>                      | 2.0                 | —         | —   | 150 | —                 | 190 | ns   |                         |
|                         |                                      | 4.5                 | —         | 16  | 30  | —                 | 38  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 26  | —                 | 33  |      |                         |
| Setup time              | t <sub>SU</sub>                      | 2.0                 | 100       | —   | —   | 125               | —   | ns   | Data to Clock           |
|                         |                                      | 4.5                 | 20        | 1   | —   | 25                | —   |      |                         |
|                         |                                      | 6.0                 | 17        | —   | —   | 21                | —   |      |                         |
| Hold time               | t <sub>H</sub>                       | 2.0                 | 25        | —   | —   | 31                | —   | ns   | Clock to Data           |
|                         |                                      | 4.5                 | 5         | 1   | —   | 6                 | —   |      |                         |
|                         |                                      | 6.0                 | 5         | —   | —   | 6                 | —   |      |                         |
| Pulse width             | t <sub>W</sub>                       | 2.0                 | 80        | —   | —   | 100               | —   | ns   | Clock or Output control |
|                         |                                      | 4.5                 | 16        | 6   | —   | 20                | —   |      |                         |
|                         |                                      | 6.0                 | 14        | —   | —   | 17                | —   |      |                         |
| Output rise/fall time   | t <sub>TLH</sub><br>t <sub>THL</sub> | 2.0                 | —         | —   | 60  | —                 | 75  | ns   |                         |
|                         |                                      | 4.5                 | —         | 4   | 12  | —                 | 15  |      |                         |
|                         |                                      | 6.0                 | —         | —   | 10  | —                 | 13  |      |                         |
| Input capacitance       | C <sub>in</sub>                      | —                   | —         | 5   | 10  | —                 | 10  | pF   |                         |

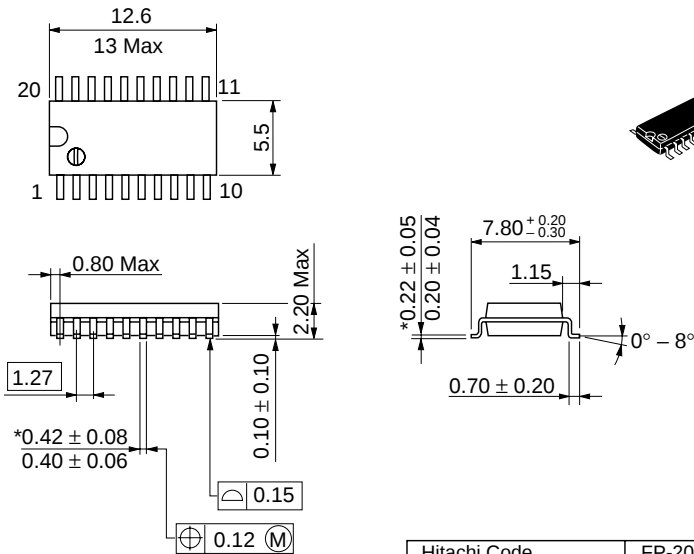
Package Dimensions

Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | DP-20N   |
| JEDEC                  | —        |
| EIAJ                   | Conforms |
| Mass (reference value) | 1.26 g   |

Unit: mm

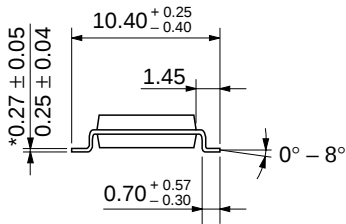
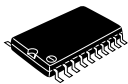
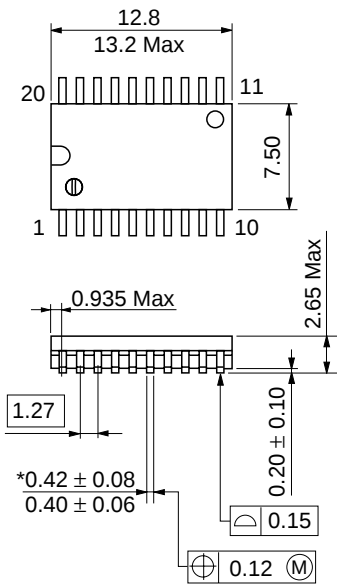


\*Dimension including the plating thickness  
Base material dimension

|                        |          |
|------------------------|----------|
| Hitachi Code           | FP-20DA  |
| JEDEC                  | —        |
| EIAJ                   | Conforms |
| Mass (reference value) | 0.31 g   |

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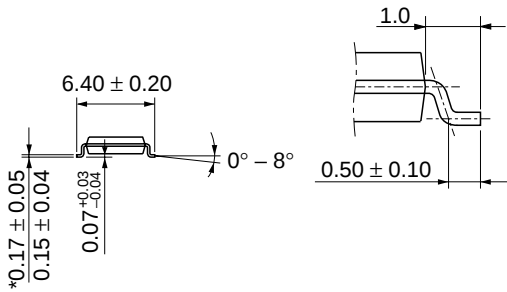
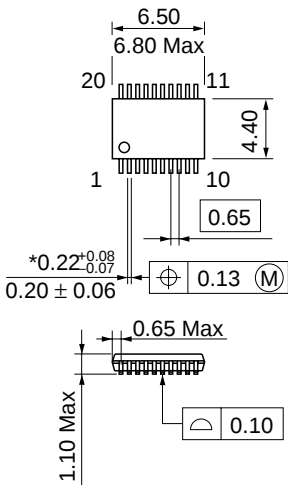
Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | FP-20DB  |
| JEDEC                  | Conforms |
| EIAJ                   | —        |
| Mass (reference value) | 0.52 g   |

\*Dimension including the plating thickness  
Base material dimension

Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | TTP-20DA |
| JEDEC                  | —        |
| EIAJ                   | —        |
| Mass (reference value) | 0.07 g   |

\*Dimension including the plating thickness  
Base material dimension

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