

# HD14076B

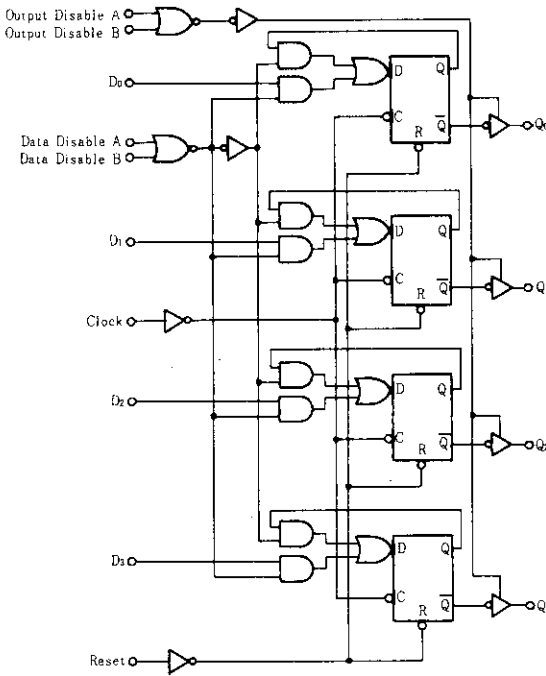
## 4-bit D-type Register

The HD14076B 4-bit Register consists of four D-type flip-flops operating synchronously from a common clock. OR gated output-disable inputs force the outputs into a high-impedance state for use in bus organized systems. OR gated data-disable inputs cause the Q outputs to be fed back to the D inputs of the flip-flops. Thus they are inhibited from changing state while the clocking process remains undisturbed. An asynchronous master reset is provided to clear all four flip-flops simultaneously independent of the clock or disable inputs.

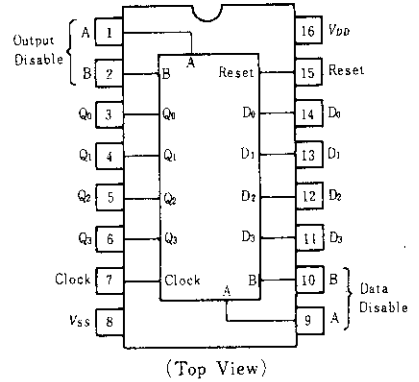
### ■ FEATURES

- Three-State Outputs with Gated Control Lines
- Fully Independent Clock Allows Unrestricted Operation for the Two Modes: Parallel Load and Do Nothing
- Asynchronous Master Reset
- For Bus Buffer Registers
- Quiescent Current = 5nA/pkg typ. @5V
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

### ■ LOGIC DIAGRAM



### ■ PIN ARRANGEMENT



### ■ TRUTH TABLE

| Reset | Clock | Inputs       |   |      | Output         |
|-------|-------|--------------|---|------|----------------|
|       |       | Data Disable |   | Data |                |
|       |       | A            | B | D    | Q              |
| 1     | ×     | ×            | × | ×    | 0              |
| 0     | 0     | ×            | × | ×    | Q <sub>n</sub> |
| 0     |       | 1            | × | ×    | Q <sub>n</sub> |
| 0     |       | ×            | 1 | ×    | Q <sub>n</sub> |
| 0     |       | 0            | 0 | 0    | 0              |
| 0     |       | 0            | 0 | 1    | 1              |

Note) × = Don't Care

When either output disable A or B (or both) is (are) high the output is disabled to the high-impedance state; however sequential operation of the flip-flops is not affected.

**ELECTRICAL CHARACTERISTICS**

| Characteristic        | Symbol   | Test Conditions            | -40°C                                                        |           | 25°C  |              |           | 85°C  |           | Unit    |         |
|-----------------------|----------|----------------------------|--------------------------------------------------------------|-----------|-------|--------------|-----------|-------|-----------|---------|---------|
|                       |          |                            | min                                                          | max       | min   | typ          | max       | min   | max       |         |         |
| Output Voltage        | $V_{OL}$ | $V_{DD} = 5.0$             | $V_{in} = V_{DD}$ or 0                                       | —         | 0.05  | —            | 0         | 0.05  | —         | 0.05    | V       |
|                       |          | 10                         |                                                              | —         | 0.05  | —            | 0         | 0.05  | —         | 0.05    |         |
|                       |          | 15                         |                                                              | —         | 0.05  | —            | 0         | 0.05  | —         | 0.05    |         |
|                       | $V_{OH}$ | $V_{DD} = 5.0$             | $V_{in} = 0$ or $V_{DD}$                                     | 4.95      | —     | 4.95         | 5.0       | —     | 4.95      | —       | V       |
|                       |          | 10                         |                                                              | 9.95      | —     | 9.95         | 10        | —     | 9.95      | —       |         |
|                       |          | 15                         |                                                              | 14.95     | —     | 14.95        | 15        | —     | 14.95     | —       |         |
| Input Voltage         | $V_{IL}$ | $V_{out} = 4.5$ or $0.5V$  | —                                                            | 1.5       | —     | 2.25         | 1.5       | —     | 1.5       | V       |         |
|                       |          | $V_{out} = 9.0$ or $1.0V$  | —                                                            | 3.0       | —     | 4.50         | 3.0       | —     | 3.0       |         |         |
|                       |          | $V_{out} = 13.5$ or $1.5V$ | —                                                            | 4.0       | —     | 6.75         | 4.0       | —     | 4.0       |         |         |
|                       | $V_{IH}$ | $V_{out} = 0.5$ or $4.5V$  | 3.5                                                          | —         | 3.5   | 2.75         | —         | 3.5   | —         | V       |         |
|                       |          | $V_{out} = 1.0$ or $9.0V$  | 7.0                                                          | —         | 7.0   | 5.50         | —         | 7.0   | —         |         |         |
|                       |          | $V_{out} = 1.5$ or $13.5V$ | 11.0                                                         | —         | 11.0  | 8.25         | —         | 11.0  | —         |         |         |
| Output Drive Current  | $I_{OH}$ | $V_{OH} = 2.5V$            | -1.0                                                         | —         | -0.8  | -1.7         | —         | -0.6  | —         | mA      |         |
|                       |          | $V_{OH} = 4.6V$            | -0.2                                                         | —         | -0.16 | -0.36        | —         | -0.12 | —         |         |         |
|                       |          | $V_{OH} = 9.5V$            | -0.5                                                         | —         | -0.4  | -0.9         | —         | -0.3  | —         |         |         |
|                       |          | $V_{OH} = 13.5V$           | -1.4                                                         | —         | -1.2  | -3.5         | —         | -1.0  | —         |         |         |
|                       | $I_{OL}$ | $V_{OL} = 0.4V$            | 0.52                                                         | —         | 0.44  | 0.88         | —         | 0.36  | —         | mA      |         |
|                       |          | $V_{OL} = 0.5V$            | 1.3                                                          | —         | 1.1   | 2.25         | —         | 0.9   | —         |         |         |
| $V_{OL} = 1.5V$       |          | 3.6                        | —                                                            | 3.0       | 8.8   | —            | 2.4       | —     |           |         |         |
| Input Current         | $I_{in}$ | 15                         | —                                                            | $\pm 0.3$ | —     | $\pm 0.0001$ | $\pm 0.3$ | —     | $\pm 0.0$ | $\mu A$ |         |
| Input Capacitance     | $C_{in}$ |                            | $V_{in} = 0$                                                 | —         | —     | —            | 5.0       | 7.5   | —         | pF      |         |
| Quiescent Current     | $I_{DD}$ | 5.0                        | Zero Signal,<br>per Package                                  | —         | 20    | —            | 0.005     | 20    | —         | 150     | $\mu A$ |
|                       |          | 10                         |                                                              | —         | 40    | —            | 0.010     | 40    | —         | 300     |         |
|                       |          | 15                         |                                                              | —         | 80    | —            | 0.015     | 80    | —         | 600     |         |
| Total Supply Current* | $I_T$    | 5.0                        | Dynamic + $I_{DD}$ ,<br>per Gate, $C_L = 50pF$<br>$f = 1kHz$ | —         | —     | —            | 0.75      | —     | —         | —       | $\mu A$ |
|                       |          | 10                         |                                                              | —         | —     | —            | 1.50      | —     | —         | —       |         |
|                       |          | 15                         |                                                              | —         | —     | —            | 2.25      | —     | —         | —       |         |

\* To calculate total supply current at frequency other than 1kHz.

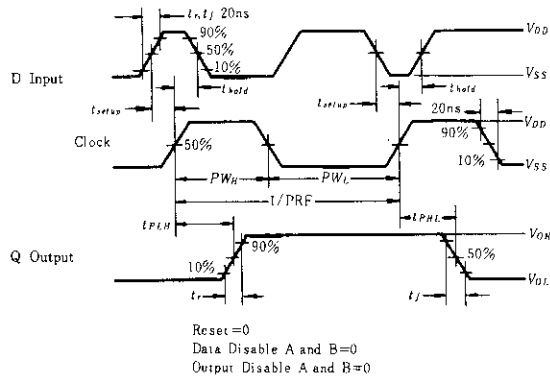
@ $V_{DD} = 5.0V$   $I_T = (0.75 \mu A/kHz)f + I_{DD}$ , @ $V_{DD} = 10V$   $I_T = (1.50 \mu A/kHz)f + I_{DD}$ , @ $V_{DD} = 15V$   $I_T = (2.25 \mu A/kHz)f + I_{DD}$

**SWITCHING CHARACTERISTICS** ( $C_L = 50\text{pF}$ ,  $T_a = 25^\circ\text{C}$ )

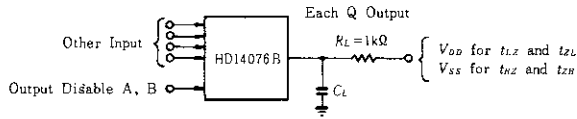
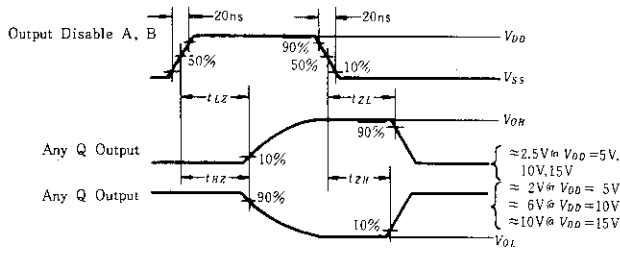
| Characteristic                 |       | Symbol                   | $V_{DD}$ (V) | min | typ | max | Unit          |
|--------------------------------|-------|--------------------------|--------------|-----|-----|-----|---------------|
| Output Rise Time               |       | $t_r$                    | 5.0          | —   | 180 | 360 | ns            |
|                                |       |                          | 10           | —   | 90  | 180 |               |
|                                |       |                          | 15           | —   | 65  | 130 |               |
| Output Fall Time               |       | $t_f$                    | 5.0          | —   | 100 | 200 | ns            |
|                                |       |                          | 10           | —   | 50  | 100 |               |
|                                |       |                          | 15           | —   | 40  | 80  |               |
| Propagation Delay Time         | Clock | $t_{PLH}$ ,<br>$t_{PHL}$ | 5.0          | —   | 300 | 600 | ns            |
|                                |       |                          | 10           | —   | 125 | 250 |               |
|                                |       |                          | 15           | —   | 90  | 180 |               |
|                                | Reset | 5.0                      | —            | 300 | 600 |     |               |
|                                |       | 10                       | —            | 125 | 250 |     |               |
|                                |       | 15                       | —            | 90  | 180 |     |               |
| Output Disable Time            |       | $t_{HZ}$ ,<br>$t_{LZ}$   | 5.0          | —   | 150 | 300 | ns            |
|                                |       |                          | 10           | —   | 60  | 120 |               |
|                                |       |                          | 15           | —   | 45  | 90  |               |
| Output Enable Time             |       | $t_{ZH}$ ,<br>$t_{ZL}$   | 5.0          | —   | 200 | 400 | ns            |
|                                |       |                          | 10           | —   | 80  | 160 |               |
|                                |       |                          | 15           | —   | 60  | 120 |               |
| Clock Pulse Width              |       | $PW_C$                   | 5.0          | 260 | 130 | —   | ns            |
|                                |       |                          | 10           | 110 | 55  | —   |               |
|                                |       |                          | 15           | 80  | 40  | —   |               |
| Reset Pulse Width              |       | $PW_R$                   | 5.0          | 370 | 185 | —   | ns            |
|                                |       |                          | 10           | 150 | 75  | —   |               |
|                                |       |                          | 15           | 110 | 55  | —   |               |
| Setup Time                     |       | $t_{setup}$              | 5.0          | 30  | 15  | —   | ns            |
|                                |       |                          | 10           | 10  | 5   | —   |               |
|                                |       |                          | 15           | 4   | 2   | —   |               |
| Hold Time                      |       | $t_{hold}$               | 5.0          | 130 | 65  | —   | ns            |
|                                |       |                          | 10           | 60  | 30  | —   |               |
|                                |       |                          | 15           | 50  | 25  | —   |               |
| Data Disable Setup Time        |       | $t_{setup}$              | 5.0          | 220 | 110 | —   | ns            |
|                                |       |                          | 10           | 80  | 40  | —   |               |
|                                |       |                          | 15           | 50  | 25  | —   |               |
| Clock Pulse Rise and Fall Time |       | $t_r$ ,<br>$t_f$         | 5.0          | —   | —   | 15  | $\mu\text{s}$ |
|                                |       |                          | 10           | —   | —   | 15  |               |
|                                |       |                          | 15           | —   | —   | 15  |               |
| Clock Frequency                |       | $PRF$                    | 5.0          | —   | 3.6 | 1.8 | MHz           |
|                                |       |                          | 10           | —   | 9.0 | 4.5 |               |
|                                |       |                          | 15           | —   | 12  | 6.0 |               |

■ DYNAMIC SIGNAL WAVEFORMS

● TIMING DIAGRAM



● Three-state Enable/Disable Delay





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

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