

September 1986 Revised February 2000

### **DM74174**

## Hex/Quad D-Type Flip-Flop with Clear

### **General Description**

These positive-edge triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic. All have a direct clear

Information at the D inputs meeting the setup and hold time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the HIGH or LOW level, the D input signal has no effect at the output.

### **Features**

- Contains six flip-flops with single-rail outputs
- Buffered clock and direct clear inputs
- Individual data input to each flip-flop
- Applications include:

Buffer/storage registers

Shift registers

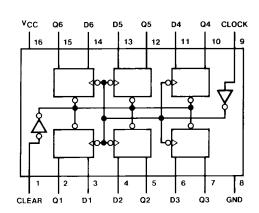
Pattern generators

- Typical clock frequency 40 MHz
- Typical power dissipation per flip-flop 38 mW

### **Ordering Code:**

| Order Number | Package Number | Package Description   |
|--------------|----------------|---|
| DM74174      | N16E           | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

### **Connection Diagram**



### **Function Table**

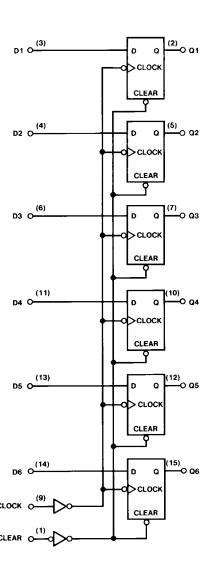
(Each Flip-Flop)

|       | Inputs |   | Outputs |  |  |
|-------|--------|---|---------|--|--|
| Clear | Clock  | D | Q       |  |  |
| L     | Х      | Х | L       |  |  |
| Н     | 1      | Н | Н       |  |  |
| Н     | 1      | L | L       |  |  |
| Н     | L      | Х | $Q_0$   |  |  |

- H = HIGH Level (steady state)
- L = LOW Level (steady state)
- X = Don't Care

  ↑ = Transition from LOW-to-HIGH level
- $\mathbf{Q}_0$  = The level of  $\mathbf{Q}$  before the indicated steady-state input conditions were established.

# Logic Diagram



### **Absolute Maximum Ratings**(Note 1)

Supply Voltage 7V Input Voltage 5.5V Operating Free Air Temperature Range  $0^{\circ}$ C to +70°C Storage Temperature Range  $-65^{\circ}$ C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

### **Recommended Operating Conditions**

| Symbol           | Pa  | rameter    | Min  | Nom | Max  | Units |
|------------------|---|------------|------|-----|------|-------|
| V <sub>CC</sub>  | Supply Voltage  |            | 4.75 | 5   | 5.25 | V     |
| V <sub>IH</sub>  | HIGH Level Input Voltage  |            | 2    |     |      | V     |
| V <sub>IL</sub>  | LOW Level Input Voltage HIGH Level Output Current LOW Level Output Current Clock Frequency (Note 2) |            |      |     | 0.8  | V     |
| I <sub>ОН</sub>  |   |            |      |     | -0.8 | mA    |
| I <sub>OL</sub>  |   |            |      |     | 16   | mA    |
| f <sub>CLK</sub> |   |            | 0    |     | 30   | MHz   |
| t <sub>W</sub>   | Pulse Width   | Clock LOW  | 25   |     |      |       |
|                  | (Note 2)  | Clock HIGH | 10   |     |      | ns    |
|                  |   | Clear      | 20   |     |      |       |
| t <sub>SU</sub>  | Data Setup Time (Note 2)  |            | 20   |     |      | ns    |
| t <sub>H</sub>   | Data Hold Time (Note 2)   |            | 0    |     |      | ns    |
| t <sub>REL</sub> | Clear Release Time (Note 2)   |            | 30   |     |      | ns    |
| T <sub>A</sub>   | Free Air Operating Temperature  |            | 0    |     | 70   | °C    |

**Note 2:**  $T_A = 25^{\circ}C$  and  $V_{CC} = 5V$ .

### **Electrical Characteristics**

over recommended operating free air temperature range (unless otherwise noted)

| Symbol          | Parameter                         | Conditions                                     | Min | Typ<br>(Note 3) | Max  | Units    |
|-----------------|-----------------------------------|--|-----|-----------------|------|----------|
| VI              | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = -12 mA |     |                 | -1.5 | V        |
| V <sub>OH</sub> | HIGH Level                        | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max   | 2.4 |                 |      | V        |
|                 | Output Voltage                    | $V_{IL} = Max, V_{IH} = Min$                   | 2.4 |                 |      | ľ        |
| V <sub>OL</sub> | LOW Level                         | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max   |     |                 | 0.4  | V        |
|                 | Output Voltage                    | $V_{IH} = Min, V_{IL} = Max$                   |     |                 | 0.4  | <b>V</b> |
| I <sub>I</sub>  | Input Current @ Max Input Voltage | $V_{CC} = Max, V_I = 5.5V$                     |     |                 | 1    | mA       |
| I <sub>IH</sub> | HIGH Level Input Current          | $V_{CC} = Max, V_I = 2.4V$                     |     |                 | 40   | μΑ       |
| I <sub>IL</sub> | LOW Level Input Current           | $V_{CC} = Max, V_I = 0.4V$                     |     |                 | -1.6 | mA       |
| Ios             | Short Circuit Output Current      | V <sub>CC</sub> = Max (Note 4)                 | -18 |                 | -57  | mA       |
| I <sub>CC</sub> | Supply Current                    | V <sub>CC</sub> = Max (Note 5)                 |     | 45              | 65   | mA       |

Note 3: All typicals are at  $V_{CC} = 5V$ ,  $T_A = 25^{\circ}C$ .

Note 4: Not more than one output should be shorted at a time.

Note 5: With all outputs open and all DATA and CLEAR inputs at 4.5V, I<sub>CC</sub> is measured after a momentary ground, then 4.5V applied to the CLOCK input.

### **Switching Characteristics**

at  $V_{CC} = 5V$  and  $T_A = 25^{\circ}C$ 

| Symbol           | Parameter  | From (Input)   | $R_L = 400\Omega$ , $C_L = 15 pF$ |     | Units |
|------------------|--|----------------|-----------------------------------|-----|-------|
| Symbol           |  | To (Output)    | Min                               | Max | Onits |
| f <sub>MAX</sub> | Maximum Clock Frequency                            |                | 30                                |     | MHz   |
| t <sub>PLH</sub> | Propagation Delay Time<br>LOW-to-HIGH Level Output | Clock to Any Q |                                   | 25  | ns    |
| t <sub>PHL</sub> | Propagation Delay Time<br>HIGH-to-LOW Level Output | Clock to Any Q |                                   | 25  | ns    |
| t <sub>PHL</sub> | Propagation Delay Time<br>HIGH-to-LOW Level Output | Clear to Any Q |                                   | 40  | ns    |

#### Physical Dimensions inches (millimeters) unless otherwise noted 0.740 - 0.780 0.090 (18.80 - 19.81)(2.286)<u>16 15 14 13 12 11 10 9</u> 16 T5 T INDEX AREA 0.250 ± 0.010 $(6.350 \pm 0.254)$ PIN NO. 1 PIN NO. 1 2 3 4 5 6 7 8 1 2 \_ IDENT IDENT OPTION 01 OPTION 02 0.065 $\frac{0.130 \pm 0.005}{(3.302 \pm 0.127)}$ $\frac{0.060}{(1.524)}$ 4° TYP 0.300 - 0.320 (1.651)OPTIONAL (7.620 <del>-</del> 8.128) 0.145 - 0.200 $\overline{(3.683 - 5.080)}$ 95°±5° $\frac{0.008 - 0.016}{(0.203 - 0.406)}$ TYP 90° ± 4° TYP 0.020 0.280 (0.508)0.125 - 0.150 (3.175 - 3.810) (7.112) MIN $(0.762 \pm 0.381)$ $\frac{0.014 - 0.023}{(0.356 - 0.584)}$ $0.100 \pm 0.010$ (0.325 +0.040 -0.015 $(2.540 \pm 0.254)$ 0.050 ± 0.010 (1.270 ± 0.254) N16E (REV F) TYP

16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N16E

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

### LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com