

74F175 Quad D-Type Flip-Flop

General Description

The 74F175 is a high-speed quad D-type flip-flop. The device is useful for general flip-flop requirements where clock and clear inputs are common. The information on the D inputs is stored during the LOW-to-HIGH clock transition. Both true and complemented outputs of each flip-flop are provided. A Master Reset input resets all flip-flops, independent of the Clock or D inputs, LOW.

Features

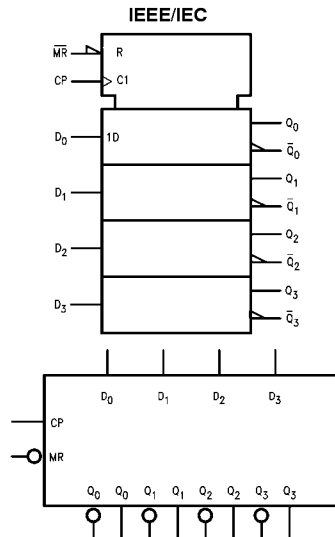
- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- Asynchronous common reset
- True and complement output

Ordering Code:

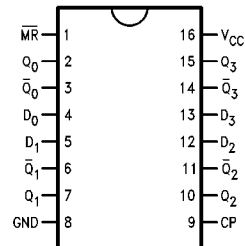
| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| 74F175SC | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| 74F175SJ | M16D | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74F175PC | N16E | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbols



Connection Diagram



Unit Loading/Fan Out

| Pin Names | Description | U.L. HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
|-------------------------------------|--|------------------|---|
| D_0 – D_3 | Data Inputs | 1.0/1.0 | 20 μ A/–0.6 mA |
| CP | Clock Pulse Input (Active Rising Edge) | 1.0/1.0 | 20 μ A/–0.6 mA |
| \overline{MR} | Master Reset Input (Active LOW) | 1.0/1.0 | 20 μ A/–0.6 mA |
| Q_0 – Q_3 | True Outputs | 50/33.3 | –1 mA/20 mA |
| $\overline{Q_0}$ – $\overline{Q_3}$ | Complement Outputs | 50/33.3 | –1 mA/20 mA |

Functional Description

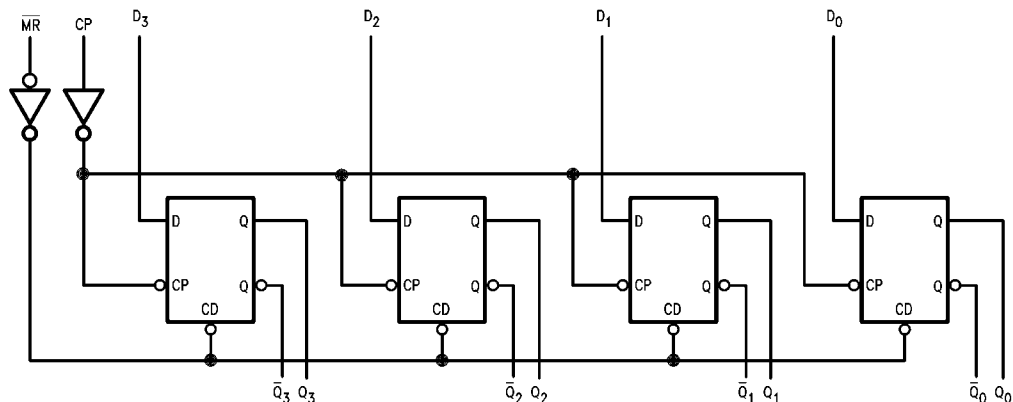
The 74F175 consists of four edge-triggered D-type flip-flops with individual D inputs and Q and \overline{Q} outputs. The Clock and Master Reset are common. The four flip-flops will store the state of their individual D inputs on the LOW-to-HIGH clock (CP) transition, causing individual Q and \overline{Q} outputs to follow. A LOW input on the Master Reset (\overline{MR}) will force all Q outputs LOW and \overline{Q} outputs HIGH independent of Clock or Data inputs. The 74F175 is useful for general logic applications where a common Master Reset and Clock are acceptable.

Truth Table

| Inputs | | | Outputs | |
|-----------------|------------|-------|---------|------------------|
| \overline{MR} | CP | D_n | Q_n | \overline{Q}_n |
| L | X | X | L | H |
| H | \nearrow | H | H | L |
| H | \nearrow | L | L | H |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
 \nearrow = LOW-to-HIGH Clock Transition

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Ratings (Note 1)

| | |
|--|--------------------------------------|
| Storage Temperature | -65°C to +150°C |
| Ambient Temperature under Bias | -55°C to +125°C |
| Junction Temperature under Bias | -55°C to +150°C |
| V _{CC} Pin Potential to Ground Pin | -0.5V to +7.0V |
| Input Voltage (Note 2) | -0.5V to +7.0V |
| Input Current (Note 2) | -30 mA to +5.0 mA |
| Voltage Applied to Output in HIGH State (with V _{CC} = 0V) | |
| Standard Output | -0.5V to V _{CC} |
| 3-STATE Output | -0.5V to +5.5V |
| Current Applied to Output in LOW State (Max) | twice the rated I _{OL} (mA) |


Recommended Operating Conditions

| | |
|------------------------------|----------------|
| Free Air Ambient Temperature | 0°C to +70°C |
| Supply Voltage | +4.5V to +5.5V |

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

| Symbol | Parameter | Min | Typ | Max | Units | V _{CC} | Conditions |
|------------------|-----------------------------------|---|------------|------|-------|-----------------|--|
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | | Recognized as a HIGH Signal |
| V _{IL} | Input LOW Voltage | | | 0.8 | V | | Recognized as a LOW Signal |
| V _{CD} | Input Clamp Diode Voltage | | | -1.2 | V | Min | I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 10% V _{CC} 5% V _{CC} | 2.5 2.7 | | V | Min | I _{OH} = -1 mA I _{OH} = -1 mA |
| V _{OL} | Output LOW Voltage | 10% V _{CC} | | 0.5 | V | Min | I _{OL} = 20 mA |
| I _{IH} | Input HIGH Current | | | 5.0 | μA | Max | V _{IN} = 2.7V |
| I _{BVI} | Input HIGH Current Breakdown Test | | | 7.0 | μA | Max | V _{IN} = 7.0V |
| I _{CEX} | Output HIGH Leakage Current | | | 50 | μA | Max | V _{OUT} = V _{CC} |
| V _{ID} | Input Leakage Test | 4.75 | | | V | 0.0 | I _{ID} = 1.9 μA All Other Pins Grounded |
| I _{OD} | Output Leakage Circuit Current | | | 3.75 | μA | 0.0 | V _{ID} = 150 mV All Other Pins Grounded |
| I _{IL} | Input LOW Current | | | -0.6 | mA | Max | V _{IN} = 0.5V |
| I _{OS} | Output Short-Circuit Current | -60 | | -150 | mA | Max | V _{OUT} = 0V |
| I _{CC} | Power Supply Current | | 22.5 | 34.0 | mA | Max | CP =  D _n = $\overline{\text{MR}}$ = HIGH |

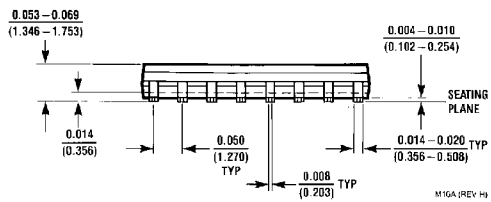
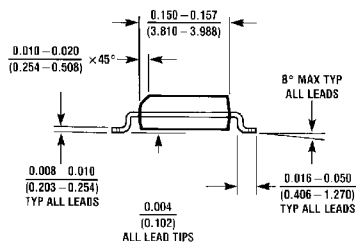
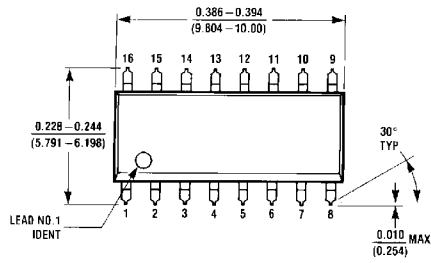
AC Electrical Characteristics

| Symbol | Parameter | T _A = +25°C V _{CC} = +5.0V C _L = 50 pF | | | T _A = -55°C to +125°C V _{CC} = +5.0V C _L = 50 pF | | T _A = 0°C to +70°C V _{CC} = +5.0V C _L = 50 pF | | Units |
|------------------|--|---|-----|------|---|------|--|------|-------|
| | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{MAX} | Maximum Clock Frequency | 100 | 140 | | 80 | | 100 | | MHz |
| t _{PLH} | Propagation Delay | 4.0 | 5.0 | 6.5 | 3.5 | 8.5 | 4.0 | 7.5 | ns |
| t _{PHL} | CP to Q _n or \overline{Q}_n | 4.0 | 6.5 | 8.5 | 4.0 | 10.5 | 4.0 | 9.5 | |
| t _{PHL} | Propagation Delay \overline{MR} to Q _n | 4.5 | 9.0 | 11.5 | 4.5 | 15.0 | 4.5 | 13.0 | ns |
| t _{PLH} | Propagation Delay \overline{MR} to \overline{Q}_n | 4.0 | 6.5 | 8.0 | 4.0 | 10.0 | 4.0 | 9.0 | ns |

AC Operating Requirements

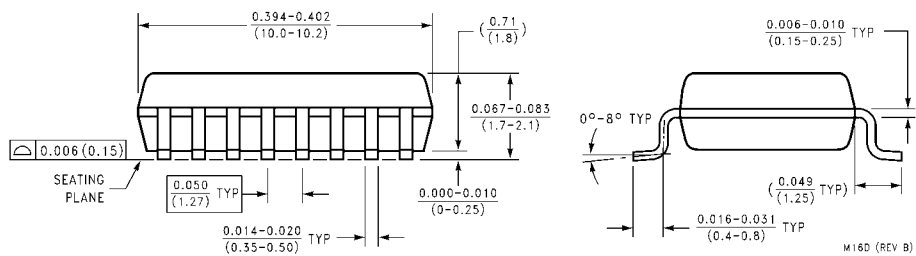
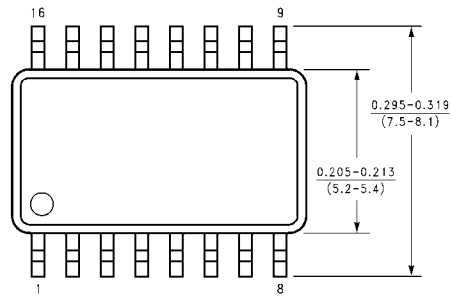
| Symbol | Parameter | T _A = +25°C V _{CC} = +5.0V | | T _A = -55°C to +125°C V _{CC} = +5.0V | | T _A = 0°C to +70°C V _{CC} = +5.0V | | Units |
|--------------------|--------------------------------------|---|-----|---|-----|--|-----|-------|
| | | Min | Max | Min | Max | Min | Max | |
| t _S (H) | Setup Time, HIGH or LOW | 3.0 | | 3.0 | | 3.0 | | ns |
| t _S (L) | D _n to CP | 3.0 | | 3.0 | | 3.0 | | |
| t _H (H) | Hold Time, HIGH or LOW | 1.0 | | 1.0 | | 1.0 | | |
| t _H (L) | D _n to CP | 1.0 | | 2.0 | | 1.0 | | ns |
| t _W (H) | CP Pulse Width | 4.0 | | 4.0 | | 4.0 | | |
| t _W (L) | HIGH or LOW | 5.0 | | 5.0 | | 5.0 | | ns |
| t _W (L) | \overline{MR} Pulse Width, LOW | 5.0 | | 5.0 | | 5.0 | | |
| t _{REC} | Recovery Time, \overline{MR} to CP | 5.0 | | 5.0 | | 5.0 | | ns |

Physical Dimensions inches (millimeters) unless otherwise noted



M16A (REV H)

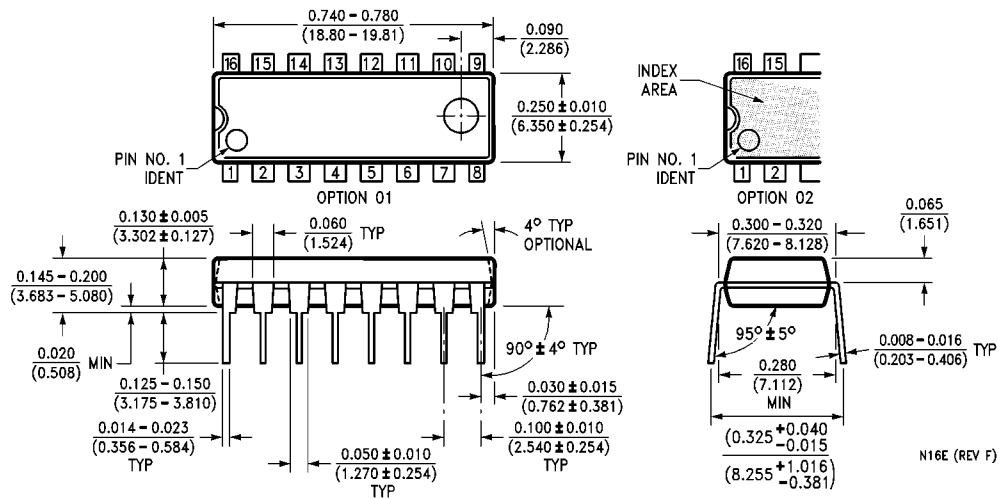
**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A**



M16D (REV B)

**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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

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