

74F174 Hex D-Type Flip-Flop with Master Reset

General Description

The 74F174 is a high-speed hex D-type flip-flop. The device is used primarily as a 6-bit edge-triggered storage register. The information on the D inputs is transferred to storage during the LOW-to-HIGH clock transition. The device has a Master Reset to simultaneously clear all flip-flops.

Features

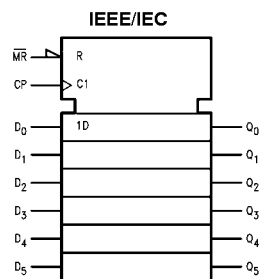
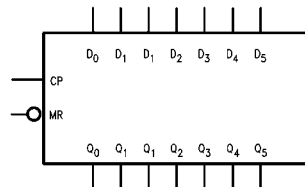
- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- Asynchronous common reset
- Guaranteed 4000V minimum ESD protection

Ordering Code:

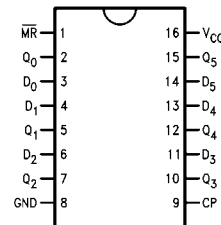
| Order Number | Package Number | Package Description |
|--------------|----------------|-----------------------------------------------------------------------------|
| 74F174SC | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| 74F174SJ | M16D | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74F174PC | 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_5 | 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_5 | Outputs | 50/33.3 | –1 mA/20 mA |

Functional Description

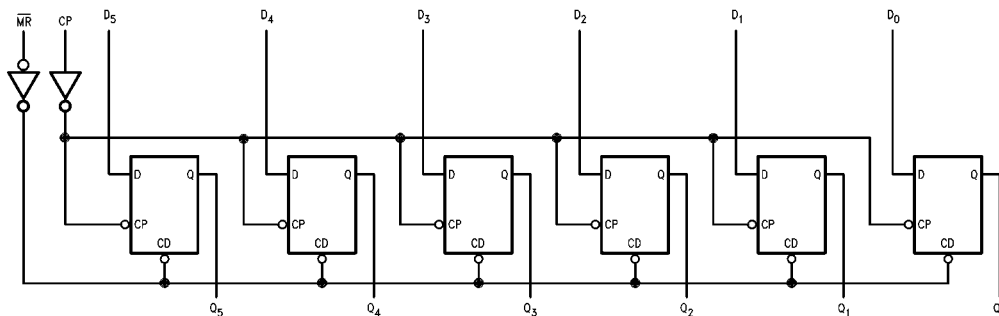
The 74F174 consists of six edge-triggered D-type flip-flops with individual D inputs and Q outputs. The Clock (CP) and Master Reset (\overline{MR}) are common to all flip-flops. Each D input's state is transferred to the corresponding flip-flop's output following the LOW-to-HIGH Clock (CP) transition. A LOW input to the Master Reset (\overline{MR}) will force all outputs LOW independent of Clock or Data inputs. The 74F174 is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

Truth Table

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

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) |
| ESD Last Passing Voltage (Min) | 4000V |


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} | | | V | Min | I _{OH} = -1 mA |
| | | 5% V _{CC} | 2.7 | | | | I _{OH} = -1 mA |
| V _{OL} | Output LOW Voltage | 10% V _{CC} | | 0.5 | V | Min | I _{OL} = 20 mA |
| | | 10% V _{CC} | | 0.5 | | | 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 _{IOD} = 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 _{CCH} | Power Supply Current | | 30 | 45 | mA | Max | CP =  D _n = $\overline{\text{MR}}$ = HIGH |
| I _{CCL} | Power Supply Current | | 30 | 45 | mA | Max | V _O = LOW |

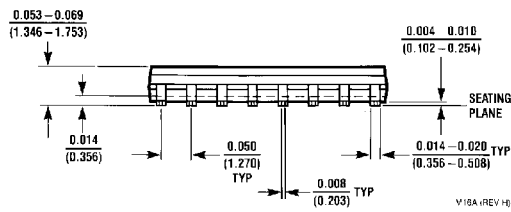
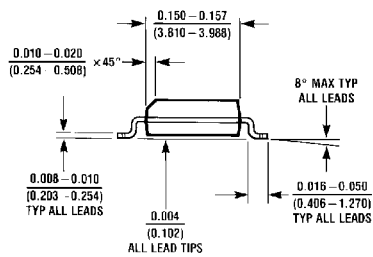
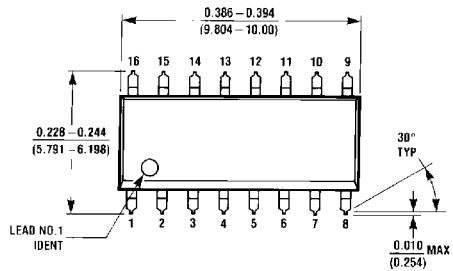
AC Electrical Characteristics

| 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 | 80 | | | 70 | | 80 | | MHz |
| t _{PLH} | Propagation Delay CP to Q _n | 3.5 | 5.5 | 8.0 | 3.0 | 10.0 | 3.5 | 9.0 | ns |
| t _{PHL} | Propagation Delay MR to Q _n | 4.0 | 7.0 | 10.0 | 4.0 | 12.0 | 4.0 | 11.0 | |
| t _{PHL} | Propagation Delay MR to Q _n | 5.0 | 10.0 | 14.0 | 5.0 | 16.0 | 5.0 | 15.0 | ns |

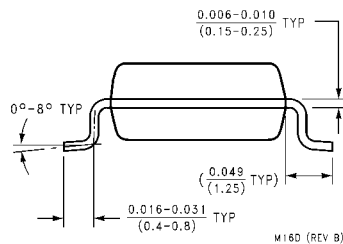
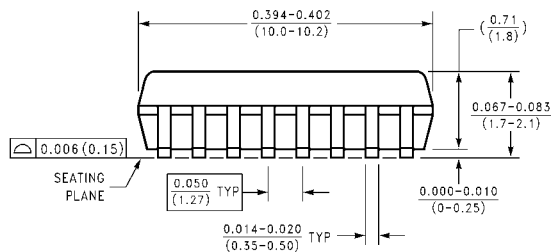
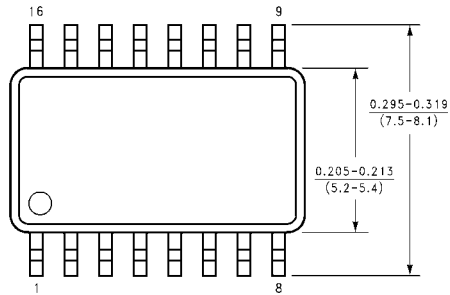
AC Operating Requirements

| 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 | 4.8 | | 5.0 | | 4.8 | | ns |
| t _S (L) | D _n to CP | 4.0 | | 5.0 | | 4.0 | | |
| t _H (H) | Hold Time, HIGH or LOW | 0 | | 2.0 | | 0 | | |
| t _H (L) | D _n to CP | 0 | | 2.0 | | 0 | | ns |
| t _W (H) | CP Pulse Width HIGH or LOW | 4.0 | | 5.0 | | 4.0 | | |
| t _W (L) | MR Pulse Width, LOW | 5.0 | | 6.5 | | 5.0 | | ns |
| t _{REC} | Recovery Time, MR to CP | 5.0 | | 6.0 | | 5.0 | | |

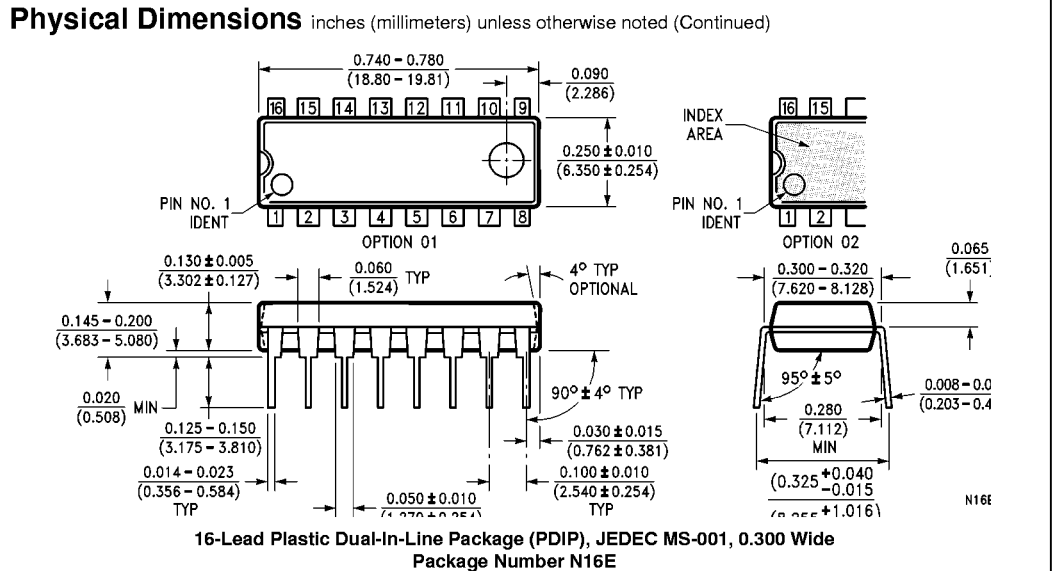
Physical Dimensions inches (millimeters) unless otherwise noted



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



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



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