

## 74F377

### Octal D-Type Flip-Flop with Clock Enable

#### General Description

The 74F377 has eight edge-triggered, D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) input loads all flip-flops simultaneously, when the Clock Enable (CE) is LOW.

The register is fully edge-triggered. The state of each D input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's Q output. The CE input must be stable only one setup time prior to the LOW-to-HIGH clock transition for predictable operation.

#### Features

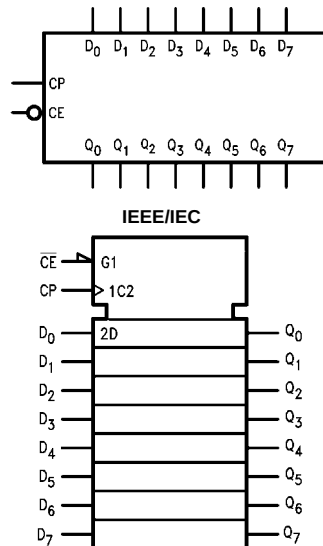
- Ideal for addressable register applications
- Clock enable for address and data synchronization applications
- Eight edge-triggered D-type flip-flops
- Buffered common clock
- See 74F273 for master reset version
- See 74F373 for transparent latch version
- See 74F374 for 3-STATE version

#### Ordering Code:

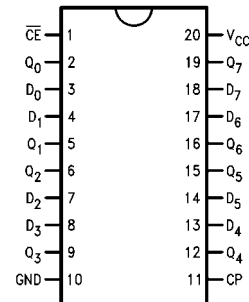
| Order Number | Package Number | Package Description                                                       |
|--------------|----------------|---------------------------------------------------------------------------|
| 74F377SC     | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F377SJ     | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide             |
| 74F377PC     | N20A           | 20-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

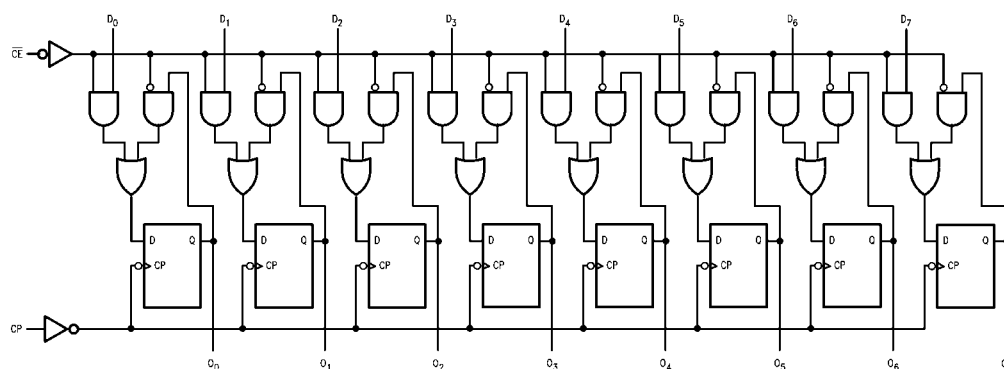
| Pin Names       | Description               | U.L.<br>HIGH/LOW | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
|-----------------|---------------------------|------------------|-------------------------------------------------|
| $D_0-D_7$       | Data Inputs               | 1.0/1.0          | $20\ \mu A/-0.6\ mA$                            |
| $\overline{CE}$ | Clock Enable (Active LOW) | 1.0/1.0          | $20\ \mu A/-0.6\ mA$                            |
| CP              | Clock Pulse Input         | 1.0/1.0          | $20\ \mu A/-0.6\ mA$                            |
| $Q_0-Q_7$       | Data Outputs              | 50/33.3          | $-1\ mA/20\ mA$                                 |

## Mode Select-Function Table

| Operating Mode | Inputs |                 |       | Output    |
|----------------|--------|-----------------|-------|-----------|
|                | CP     | $\overline{CE}$ | $D_n$ | $Q_n$     |
| Load "1"       | ↗      | L               | h     | H         |
| Load "0"       | ↗      | L               | L     | L         |
| Hold           | ↗      | h               | X     | No Change |
| (Do Nothing)   | X      | H               | X     | No Change |

H = HIGH Voltage Level  
 h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition  
 L = LOW Voltage Level  
 l = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition  
 X = Immaterial  
 ↗ = 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 <sub>CC</sub> 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<br>in HIGH State (with V <sub>CC</sub> = 0V) |                                      |
| Standard Output                                                        | −0.5V to V <sub>CC</sub>             |
| 3-STATE Output                                                         | −0.5V to +5.5V                       |
| Current Applied to Output<br>in LOW State (Max)                        | twice the rated I <sub>OL</sub> (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**

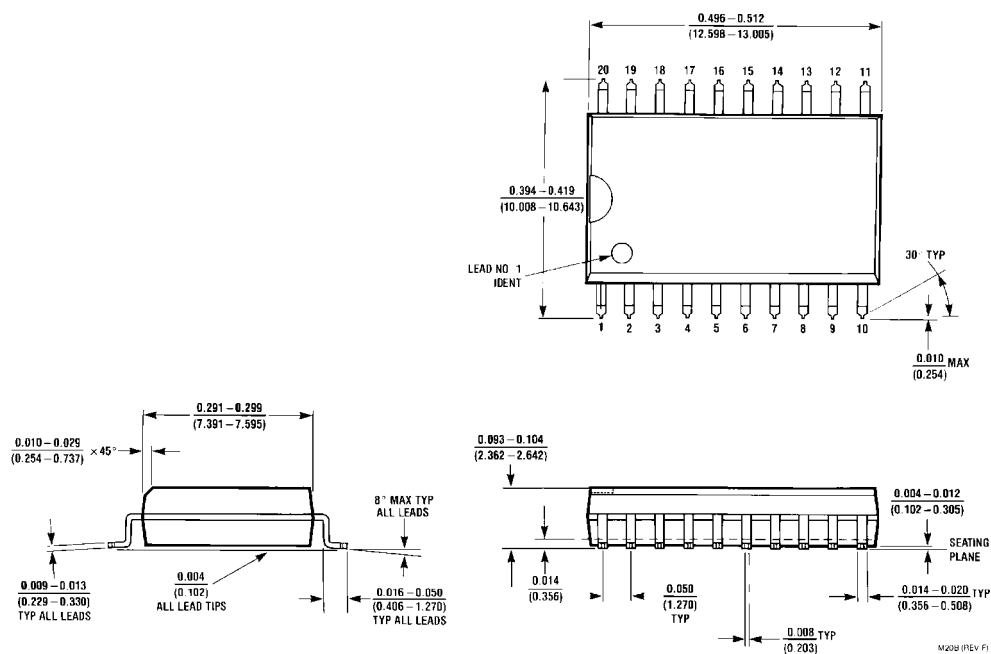
| Symbol           | Parameter                            | Min                                       | Typ        | Max  | Units | V <sub>CC</sub> | Conditions                                                                                 |
|------------------|--------------------------------------|-------------------------------------------|------------|------|-------|-----------------|--------------------------------------------------------------------------------------------|
| V <sub>IH</sub>  | Input HIGH Voltage                   | 2.0                                       |            |      | V     |                 | Recognized as a HIGH Signal                                                                |
| V <sub>IL</sub>  | Input LOW Voltage                    |                                           |            | 0.8  | V     |                 | Recognized as a LOW Signal                                                                 |
| V <sub>CD</sub>  | Input Clamp Diode Voltage            |                                           |            | −1.2 | V     | Min             | I <sub>IN</sub> = −18 mA                                                                   |
| V <sub>OH</sub>  | Output HIGH Voltage                  | 10% V <sub>CC</sub><br>5% V <sub>CC</sub> | 2.5<br>2.7 |      | V     | Min             | I <sub>OH</sub> = −1 mA<br>I <sub>OH</sub> = −1 mA                                         |
| V <sub>OL</sub>  | Output LOW Voltage                   | 10% V <sub>CC</sub>                       |            | 0.5  | V     | Min             | I <sub>OL</sub> = 20 mA                                                                    |
| I <sub>IH</sub>  | Input HIGH Current                   |                                           |            | 5.0  | μA    | Max             | V <sub>IN</sub> = 2.7V                                                                     |
| I <sub>BVI</sub> | Input HIGH Current<br>Breakdown Test |                                           |            | 7.0  | μA    | Max             | V <sub>IN</sub> = 7.0V                                                                     |
| I <sub>IL</sub>  | Input LOW Current                    |                                           |            | −0.6 | mA    | Max             | V <sub>IN</sub> = 0.5V                                                                     |
| I <sub>OS</sub>  | Output Short-Circuit Current         | −60                                       |            | −150 | mA    | Max             | V <sub>OUT</sub> = 0V                                                                      |
| I <sub>CEX</sub> | Output HIGH Leakage Current          |                                           |            | 50   | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub>                                                         |
| V <sub>ID</sub>  | Input Leakage<br>Test                | 4.75                                      |            |      | V     | 0.0             | I <sub>ID</sub> = 1.9 μA<br>All Other Pins Grounded                                        |
| I <sub>OD</sub>  | Output Leakage<br>Circuit Current    |                                           |            | 3.75 | μA    | 0.0             | V <sub>ID</sub> = 150 mV<br>All Other Pins Grounded                                        |
| I <sub>CCH</sub> | Power Supply Current                 |                                           | 35         | 46   | mA    | Max             | CP =  |
| I <sub>CCL</sub> |                                      |                                           | 44         | 56   |       |                 | D <sub>n</sub> = MR = HIGH                                                                 |

## AC Electrical Characteristics

| Symbol           | Parameter               | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     | Units |
|------------------|-------------------------|-----------------------------------------------------------------------------|-----|-----|---------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------|-----|-------|
|                  |                         | Min                                                                         | Typ | Max | Min                                                                                   | Max  | Min                                                                                | Max |       |
| f <sub>MAX</sub> | Maximum Clock Frequency | 130                                                                         |     |     | 85                                                                                    |      | 105                                                                                |     | MHz   |
| t <sub>PLH</sub> | Propagation Delay       | 3.0                                                                         |     | 7.0 | 2.0                                                                                   | 8.5  | 2.5                                                                                | 7.5 | ns    |
| t <sub>PHL</sub> | CP to Q <sub>n</sub>    | 4.0                                                                         |     | 9.0 | 3.0                                                                                   | 10.5 | 3.5                                                                                | 9.0 |       |

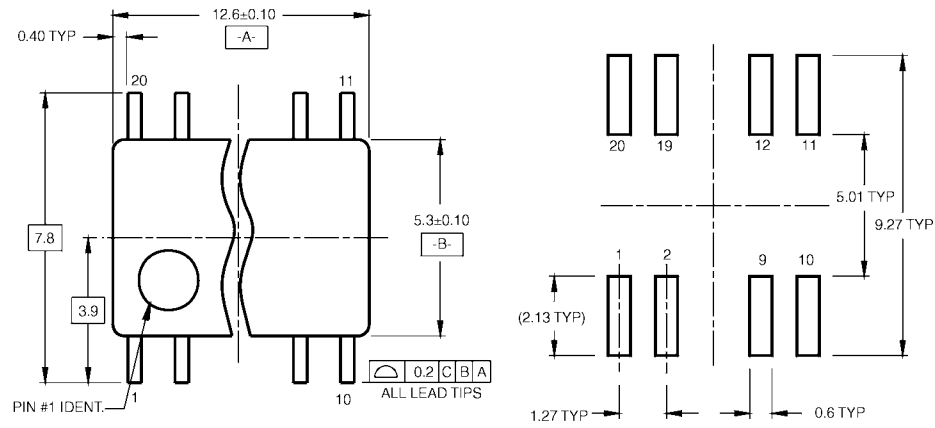
## AC Operating Requirements

| Symbol             | Parameter                    | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V |     | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = +5.0V |     | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V |     | Units |
|--------------------|------------------------------|---------------------------------------------------|-----|-------------------------------------------------------------|-----|----------------------------------------------------------|-----|-------|
|                    |                              | Min                                               | Max | Min                                                         | Max | Min                                                      | Max |       |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW      | 3.0                                               |     | 3.5                                                         |     | 3.0                                                      |     | ns    |
| t <sub>S</sub> (L) | D <sub>n</sub> to CP         | 3.5                                               |     | 4.0                                                         |     | 3.5                                                      |     |       |
| t <sub>H</sub> (H) | Hold Time, HIGH or LOW       | 0.5                                               |     | 1.0                                                         |     | 0.5                                                      |     | ns    |
| t <sub>H</sub> (L) | D <sub>n</sub> to CP         | 1.0                                               |     | 1.0                                                         |     | 1.0                                                      |     |       |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW      | 4.1                                               |     | 4.0                                                         |     | 4.1                                                      |     | ns    |
| t <sub>S</sub> (L) | $\overline{\text{CE}}$ to CP | 3.5                                               |     | 5.0                                                         |     | 4.0                                                      |     |       |
| t <sub>H</sub> (H) | Hold Time, HIGH to LOW       | 0.5                                               |     | 1.5                                                         |     | 0.5                                                      |     | ns    |
| t <sub>H</sub> (L) | $\overline{\text{CE}}$ to CP | 2.0                                               |     | 2.5                                                         |     | 2.0                                                      |     |       |
| t <sub>W</sub> (H) | Clock Pulse Width,           | 6.0                                               |     | 5.0                                                         |     | 6.0                                                      |     | ns    |
| t <sub>W</sub> (L) | HIGH or LOW                  | 6.0                                               |     | 5.0                                                         |     | 6.0                                                      |     |       |

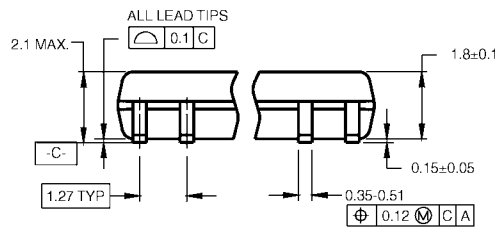


**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M20B**

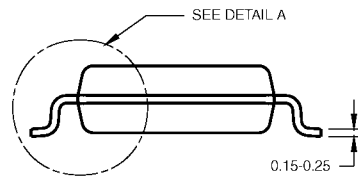
# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



## LAND PATTERN RECOMMENDATION



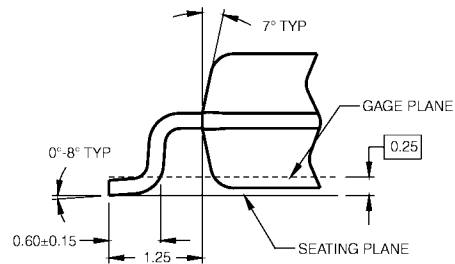
DIMENSIONS ARE IN MILLIMETERS



## NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

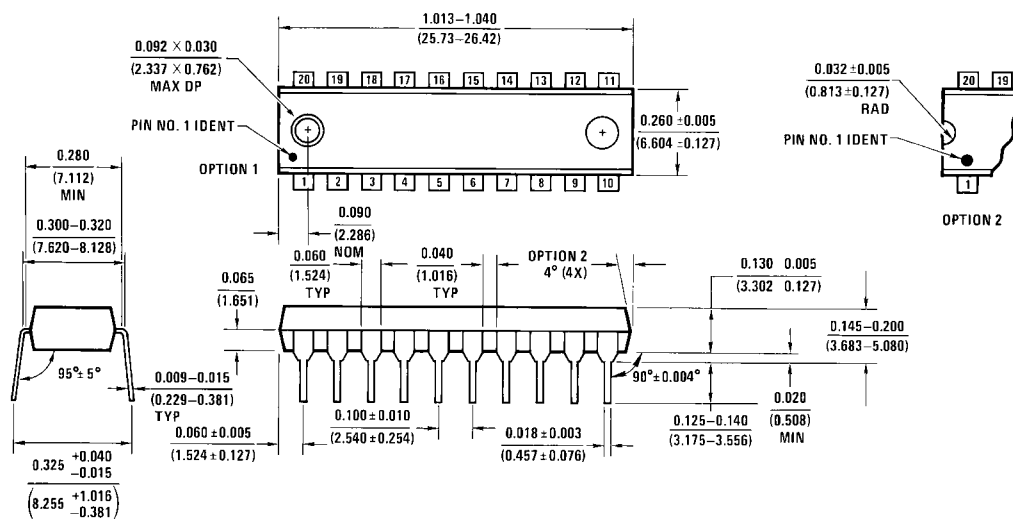
M20DRevB1



## DETAIL A

**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**

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



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide  
Package Number N20A

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2. 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.

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