

# 74F157A

## Quad 2-Input Multiplexer

### General Description

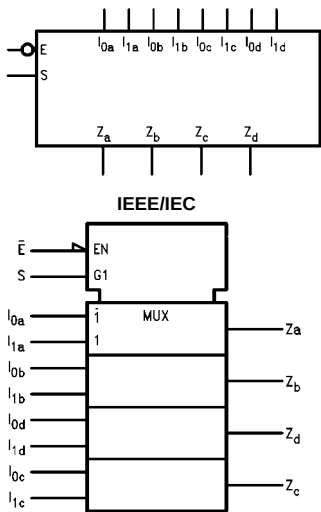
The F157A is a high-speed quad 2-input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (non-inverted) form. The F157A can also be used to generate any four of the 16 different functions to two variables.

### Ordering Code:

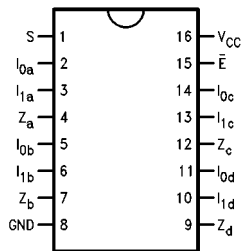
| Order Number | Package Number | Package Description                                                         |
|--------------|----------------|-----------------------------------------------------------------------------|
| 74F157ASC    | M16A           | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| 74F157ASJ    | M16D           | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74F157APC    | 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



74F157A Quad 2-Input Multiplexer

# Unit Loading/Fan Out

| Pin Names       | Description               | U.L.<br>HIGH/LOW | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
|-----------------|---------------------------|------------------|-------------------------------------------------|
| $I_{0a}-I_{0d}$ | Source 0 Data Inputs      | 1.0/1.0          | 20 $\mu$ A/-0.6 mA                              |
| $I_{1a}-I_{1d}$ | Source 1 Data Inputs      | 1.0/1.0          | 20 $\mu$ A/-0.6 mA                              |
| $\bar{E}$       | Enable Input (Active LOW) | 1.0/1.0          | 20 $\mu$ A/-0.6 mA                              |
| S               | Select Input              | 1.0/1.0          | 20 $\mu$ A/-0.6 mA                              |
| $Z_a-Z_d$       | Outputs                   | 50/33.3          | -1 mA/20 mA                                     |

## Truth Table

| Inputs    |   |       |       | Output |
|-----------|---|-------|-------|--------|
| $\bar{E}$ | S | $I_0$ | $I_1$ | Z      |
| H         | X | X     | X     | L      |
| L         | H | X     | L     | L      |
| L         | H | X     | H     | H      |
| L         | L | L     | X     | L      |
| L         | L | H     | X     | H      |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

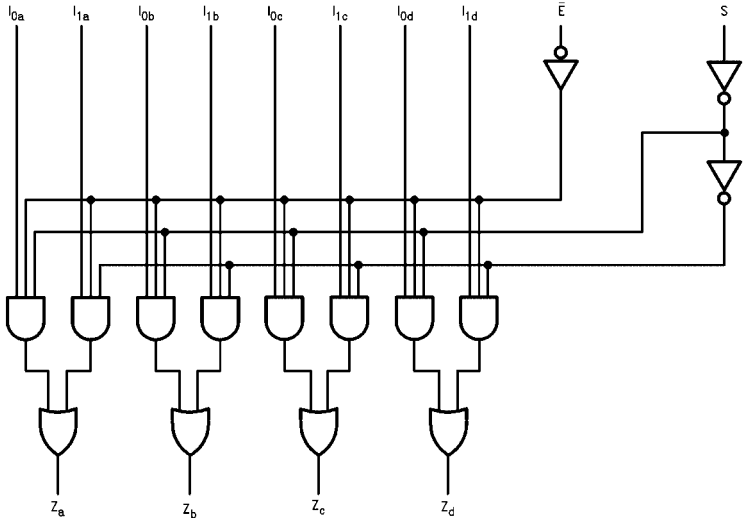
## Functional Description

The F157A is a quad 2-input multiplexer. It selects four bits of data from two sources under the control of a common Select input (S). The Enable input ( $\bar{E}$ ) is active LOW. When  $\bar{E}$  is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs. The F157A is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

$$Z_n = \bar{E} \cdot (I_{1n}S + I_{0n}\bar{S})$$

A common use of the F157A is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The F157A can generate any four of the 16 different functions of two variables with one variable common. This is useful for implementing highly irregular logic.

## 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.

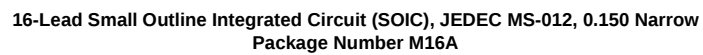
**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

**DC Electrical Characteristics**

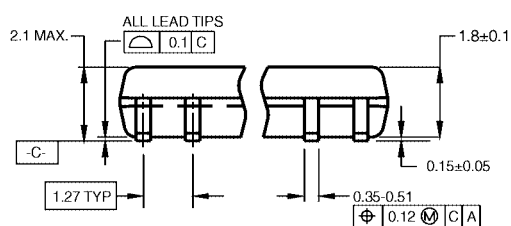
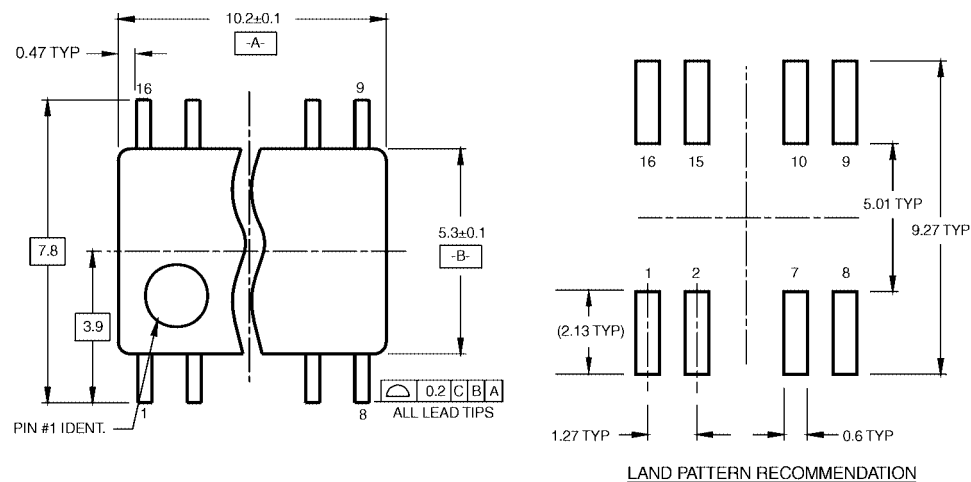
| Symbol           | Parameter                         | Min                                       | Typ        | Max  | Units | V <sub>CC</sub> | Conditions                                           |
|------------------|-----------------------------------|-------------------------------------------|------------|------|-------|-----------------|------------------------------------------------------|
| 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 Breakdown Test |                                           |            | 7.0  | μA    | Max             | V <sub>IN</sub> = 7.0V                               |
| 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 Test                | 4.75                                      |            |      | V     | 0.0             | I <sub>ID</sub> = 1.9 μA<br>All Other Pins Grounded  |
| I <sub>OD</sub>  | Output Leakage Circuit Current    |                                           |            | 3.75 | μA    | 0.0             | V <sub>IOD</sub> = 150 mV<br>All Other Pins Grounded |
| 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>CCH</sub> | Power Supply Current              |                                           | 15         | 23   | mA    | Max             | V <sub>O</sub> = HIGH                                |
| I <sub>CCL</sub> | Power Supply Current              |                                           | 15         | 23   | mA    | Max             | V <sub>O</sub> = LOW                                 |

**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  |       |
| t <sub>PLH</sub> | Propagation Delay<br>S to Z <sub>n</sub>              | 4.0                                                                         | 7.0 | 10.0 | 4.0                                                                                   | 12.0 | 4.0                                                                                | 11.0 | ns    |
| t <sub>PHL</sub> |                                                       | 3.0                                                                         | 5.0 | 7.0  | 3.0                                                                                   | 9.0  | 3.0                                                                                | 8.0  |       |
| t <sub>PLH</sub> | Propagation Delay<br>Ē to Z <sub>n</sub>              | 5.0                                                                         | 7.0 | 9.5  | 5.0                                                                                   | 13.0 | 5.0                                                                                | 11.0 | ns    |
| t <sub>PHL</sub> |                                                       | 2.5                                                                         | 4.5 | 6.5  | 2.5                                                                                   | 7.5  | 2.5                                                                                | 7.0  |       |
| t <sub>PLH</sub> | Propagation Delay<br>I <sub>n</sub> to Z <sub>n</sub> | 2.5                                                                         | 4.5 | 6.0  | 2.5                                                                                   | 7.5  | 2.5                                                                                | 6.5  | ns    |
| t <sub>PHL</sub> |                                                       | 2.5                                                                         | 4.0 | 5.5  | 1.5                                                                                   | 7.5  | 2.0                                                                                | 7.0  |       |



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

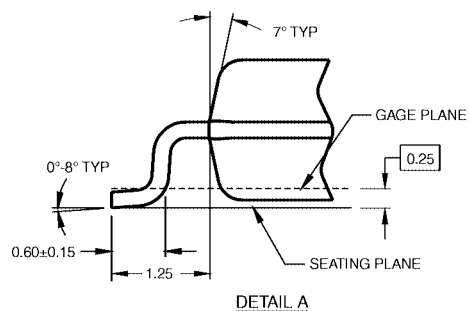
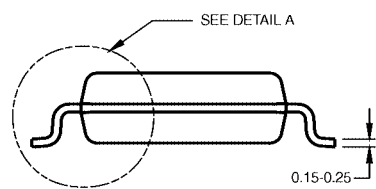


DIMENSIONS ARE IN MILLIMETERS

## NOTES:

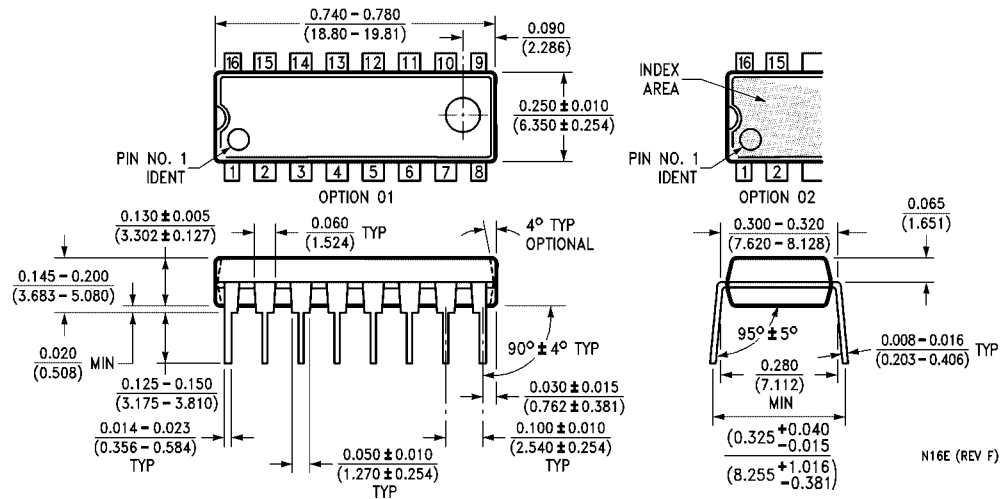
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- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1



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

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



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