FAIRCHILD SEMICONDUCTOR™

April 1988
Revised September 2000

# 74F258A
# Quad 2-Input Multiplexer with 3-STATE Outputs

## General Description

The 74F258A is a quad 2-input multiplexer with 3-STATE outputs. Four bits of data from two sources can be selected using a common data select input. The four outputs present the selected data in the complement (inverted) form. The outputs may be switched to a high impedance state with a HIGH on the common Output Enable ($\overline{OE}$) input, allowing the outputs to interface directly with bus-oriented systems.

## Features

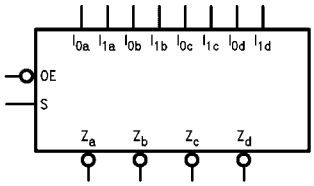
- Multiplexer expansion by tying outputs together
- Inverting 3-STATE outputs

## Ordering Code:

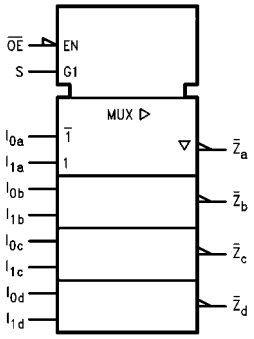
| Order Number | Package Number | Package Description |
|---|---|---|
| 74F258ASC | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| 74F258ASJ | M16D | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74F258APC | N16E | 16-Lead Plastic Dual-In-Line 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.

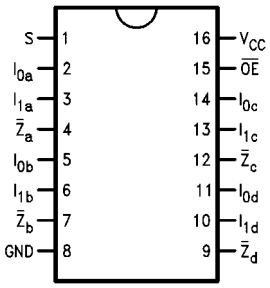
## Logic Symbols




**IEEE/IEC**




## Connection Diagram



## Unit Loading/Fan Out

| Pin Names | Description | U.L. HIGH/LOW | Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$ |
|---|---|---|---|
| S | Common Data Select Input | 1.0/1.0 | 20 μA/–0.6 mA |
| $\overline{OE}$ | 3-STATE Output Enable Input (Active LOW) | 1.0/1.0 | 20 μA/–0.6 mA |
| $I_{0a}$–$I_{0d}$ | Data Inputs from Source 0 | 1.0/1.0 | 20 μA/–0.6 mA |
| $I_{1a}$–$I_{1d}$ | Data Inputs from Source 1 | 1.0/1.0 | 20 μA/–0.6 mA |
| $\overline{Z}_a$–$\overline{Z}_d$ | 3-STATE Inverting Data Outputs | 150/40 (33.3) | –3 mA/24 mA (20 mA) |

## Truth Table

| Output Enable | Select Input | Data Inputs | | Output |
|---|---|---|---|---|
| $\overline{OE}$ | S | $I_0$ | $I_1$ | $\overline{Z}$ |
| H | X | X | X | Z |
| L | H | X | L | H |
| L | H | X | H | L |
| L | L | L | X | H |
| L | L | H | X | L |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

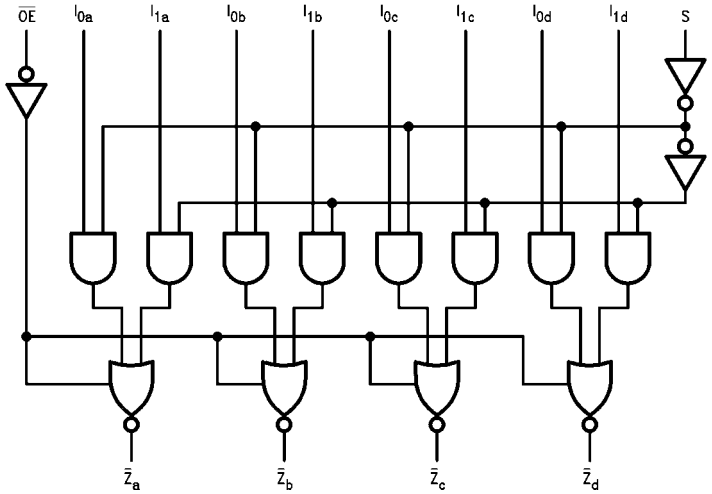
## Functional Description

The 74F258A is a quad 2-input multiplexer with 3-STATE outputs. It selects four bits of data from two sources under control of a common Select input (S). When the Select input is LOW, the $I_{0x}$ inputs are selected and when Select is HIGH, the $I_{1x}$ inputs are selected. The data on the selected inputs appears at the outputs in inverted form. The 74F258A 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 equation for the outputs is shown below:

$$\overline{Z}_n = \overline{OE} \bullet (I_{1n} \bullet S + I_{0n} \bullet \overline{S})$$

When the Output Enable input ($\overline{OE}$) is HIGH, the outputs are forced to a high impedance OFF state. If the outputs of the 3-STATE devices are tied together, all but one device must be in the high impedance state to avoid high currents that would exceed the maximum ratings. Designers should ensure that Output Enable signals to 3-STATE devices whose outputs are tied together are designed so there is no overlap.

## 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.

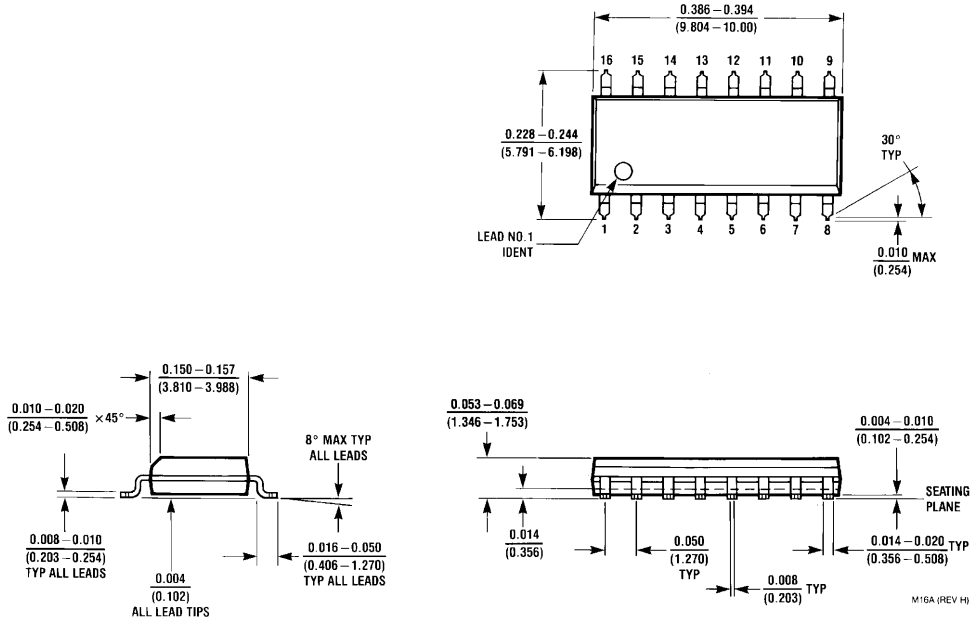
## DC Electrical Characteristics

| 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 | 10% $V_{CC}$ | 2.5 | | | V | Min | $I_{OH}$ = −1 mA |
| | Voltage | 10% $V_{CC}$ | 2.4 | | | | | $I_{OH}$ = −3 mA |
| | | 5% $V_{CC}$ | 2.7 | | | | | $I_{OH}$ = −1 mA |
| | | 5% $V_{CC}$ | 2.7 | | | | | $I_{OH}$ = −3 mA |
| $V_{OL}$ | Output LOW Voltage | 10% $V_{CC}$ | | | 0.5 | V | Min | $I_{OL}$ = 24 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 |
| $I_{OZH}$ | Output Leakage Current | | | | 50 | µA | Max | $V_{OUT}$ = 2.7V |
| $I_{OZL}$ | Output Leakage Current | | | | −50 | µA | Max | $V_{OUT}$ = 0.5V |
| $I_{OS}$ | Output Short-Circuit Current | | −60 | | −150 | mA | Max | $V_{OUT}$ = 0V |
| $I_{ZZ}$ | Bus Drainage Test | | | | 500 | µA | 0.0V | $V_{OUT}$ = $V_{CC}$ |
| $I_{CCH}$ | Power Supply Current | | | 6.2 | 9.5 | mA | Max | $V_O$ = HIGH |
| $I_{CCL}$ | Power Supply Current | | | 15.1 | 23 | mA | Max | $V_O$ = LOW |
| $I_{CCZ}$ | Power Supply Current | | | 11.3 | 17 | mA | Max | $V_O$ = HIGH Z |

## AC Electrical Characteristics

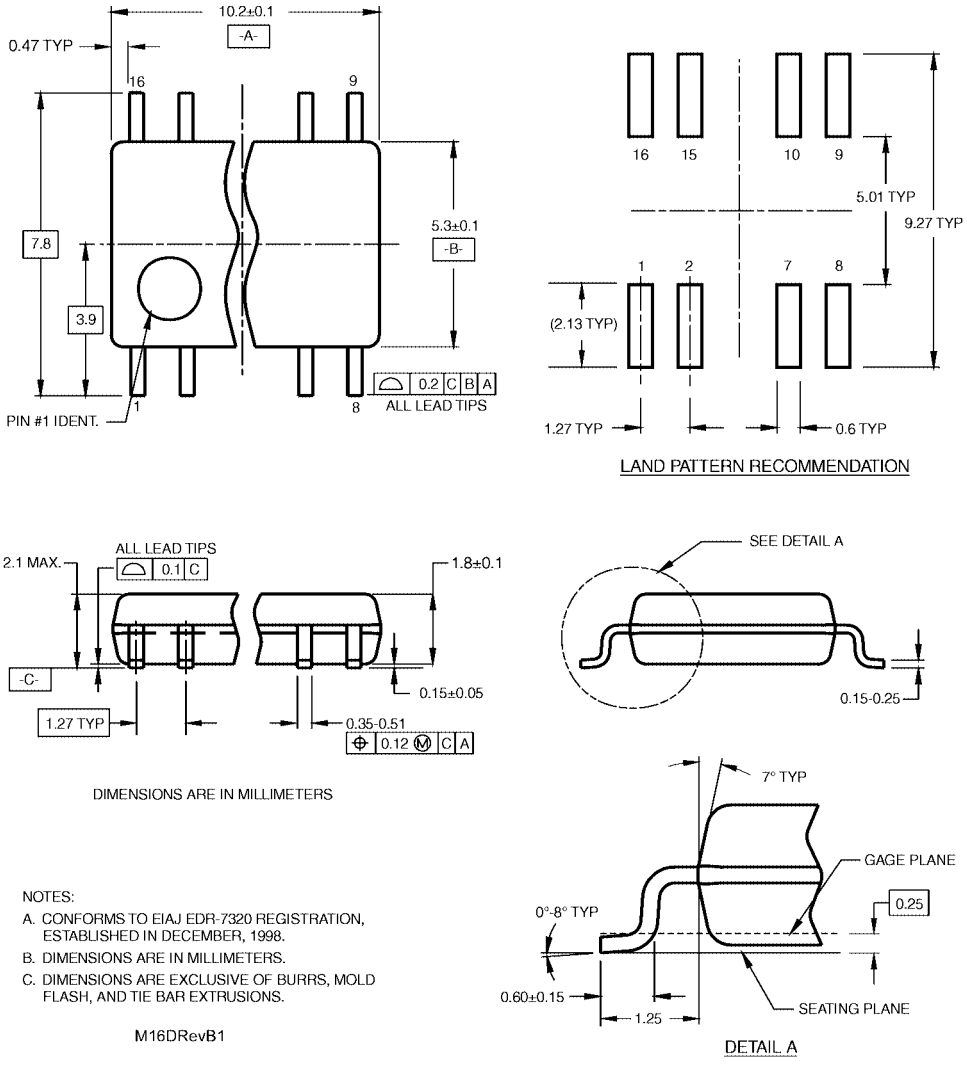
| Symbol | Parameter | $T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF | | | $T_A = -5°C$ to $+125°C$, $V_{CC} = 5.0V$, $C_L = 50$ pF | | $T_A = 0°C$ to $+70°C$, $V_{CC} = 5.0V$, $C_L = 50$ pF | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay | 2.5 | | 5.3 | 2.0 | 7.5 | 2.0 | 6.0 | ns |
| $t_{PHL}$ | $I_n$ to $\overline{Z}_n$ | 1.0 | | 4.0 | 1.0 | 6.0 | 1.0 | 5.0 | |
| $t_{PLH}$ | Propagation Delay | 3.0 | | 7.5 | 3.0 | 9.5 | 3.0 | 8.5 | ns |
| $t_{PHL}$ | S to $\overline{Z}_n$ | 2.5 | | 7.0 | 2.5 | 9.0 | 2.5 | 8.0 | |
| $t_{PZH}$ | Output Enable Time | 2.0 | | 6.0 | 2.0 | 8.0 | 2.0 | 7.0 | ns |
| $t_{PZL}$ | | 2.5 | | 7.0 | 2.5 | 9.0 | 2.5 | 8.0 | |
| $t_{PHZ}$ | Output Disable Time | 2.0 | | 6.0 | 1.5 | 7.0 | 2.0 | 7.0 | |
| $t_{PLZ}$ | | 2.0 | | 6.0 | 2.0 | 8.5 | 2.0 | 7.0 | |

## Physical Dimensions inches (millimeters) unless otherwise noted




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

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




NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

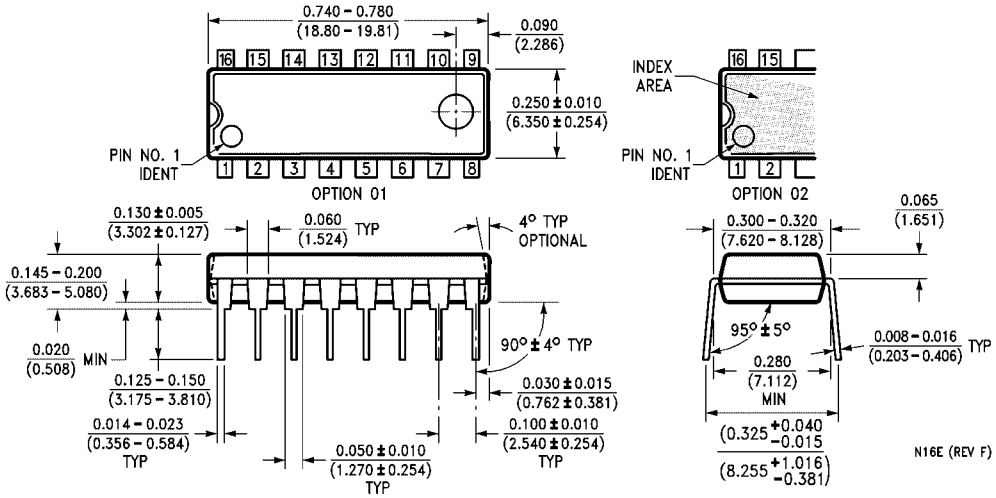
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1

**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**