FAIRCHILD SEMICONDUCTOR™

April 1988
Revised July 1999

74F158A
Quad 2-Input Multiplexer

General Description

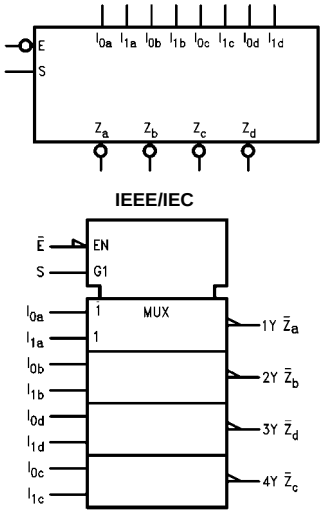
The F158A is a high speed quad 2-input multiplexer. It selects four bits of data from two sources using the common Select and Enable inputs. The four outputs present the selected data in the inverted form. The F158A can also generate any four of the 16 different functions of two variables.

Ordering Code:

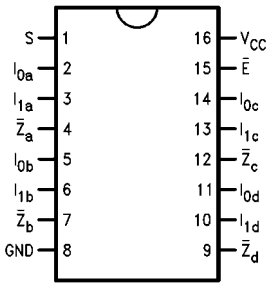
Order Number	Package Number	Package Description
74F158ASC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
74F158ASJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F158APC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

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}
I_{0a}–I_{0d}	Source 0 Data Inputs	1.0/1.0	20 μA/–0.6 mA
I_{1a}–I_{1d}	Source 1 Data Inputs	1.0/1.0	20 μA/–0.6 mA
$\overline{E}$	Enable Input (Active LOW)	1.0/1.0	20 μA/–0.6 mA
S	Select Input	1.0/1.0	20 μA/–0.6 mA
$\overline{Z}_a$–$\overline{Z}_d$	Inverted Outputs	50/33.3	–1 mA/20 mA

Truth Table

Inputs				Outputs
$\overline{E}$	S	I_0	I_1	$\overline{Z}$
H	X	X	X	H
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

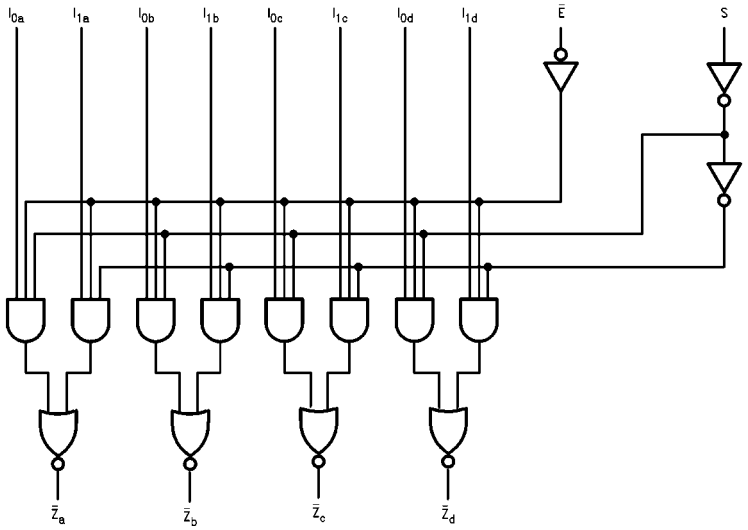
H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
$\overline{Z}_n = \overline{E} \times (I_{1n}S + I_{0n}\overline{S})$

Functional Description

The F158A quad 2-input multiplexer selects four bits of data from two sources under the control of a common Select input (S) and presents the data in inverted form at the four outputs. The Enable input ($\overline{E}$) is active LOW. When $\overline{E}$ is HIGH, all of the outputs ($\overline{Z}$) are forced HIGH regardless of all other inputs. The F158A 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.

A common use of the F158A 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 F158A can generate four functions of two variables with one variable common. This is useful for implementing gating functions.

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.

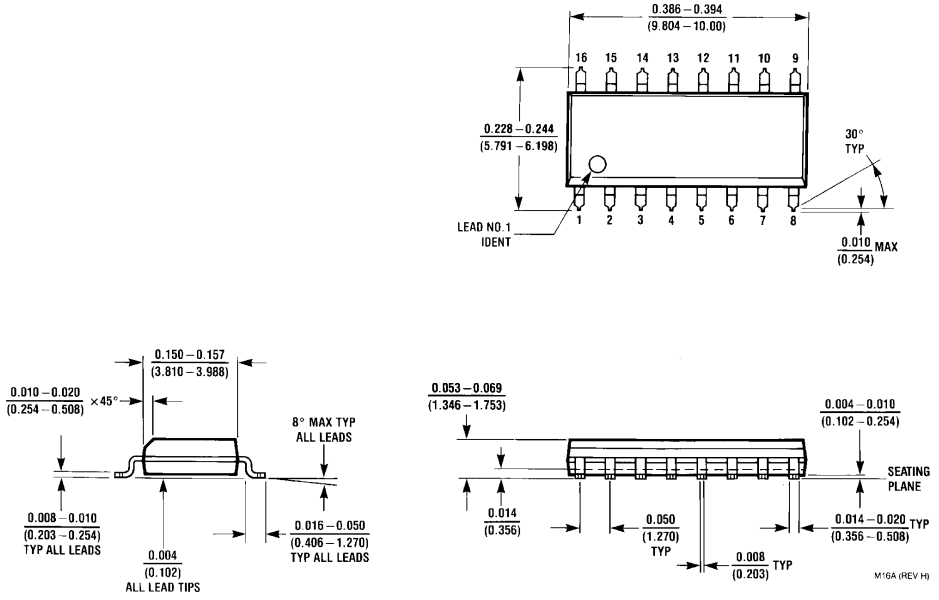
DC Electrical Characteristics

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}	2.5			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
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			10	15	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			15	25	mA	Max	V_O = LOW

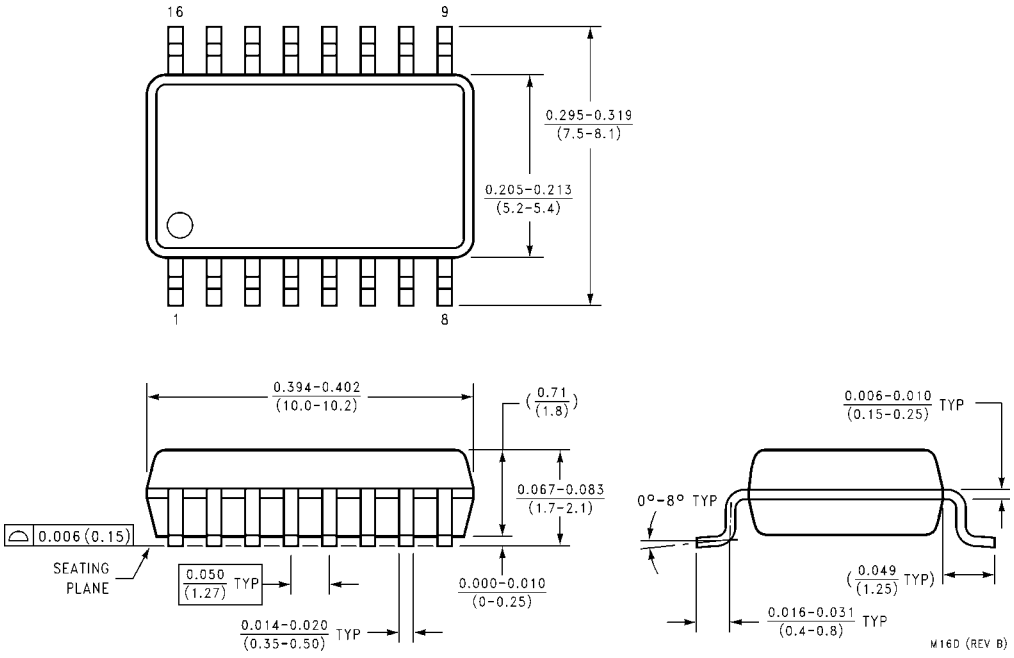
AC Electrical Characteristics

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_{PLH}	Propagation Delay	3.0	5.5	8.5	3.0	10.5	3.0	9.5	ns
t_{PHL}	S to $\overline{Z}_n$	2.5	4.5	6.5	2.5	8.0	2.5	7.0	
t_{PLH}	Propagation Delay	2.5	4.5	6.0	2.5	8.0	2.5	7.0	ns
t_{PHL}	$\overline{E}$ to $\overline{Z}_n$	2.0	4.0	6.0	2.0	7.0	2.0	6.5	
t_{PLH}	Propagation Delay	2.5	4.0	5.9	2.5	8.5	2.5	7.0	ns
t_{PHL}	I_n to $\overline{Z}_n$	1.5	2.5	4.0	1.0	5.0	1.5	4.5	

Physical Dimensions inches (millimeters) unless otherwise noted

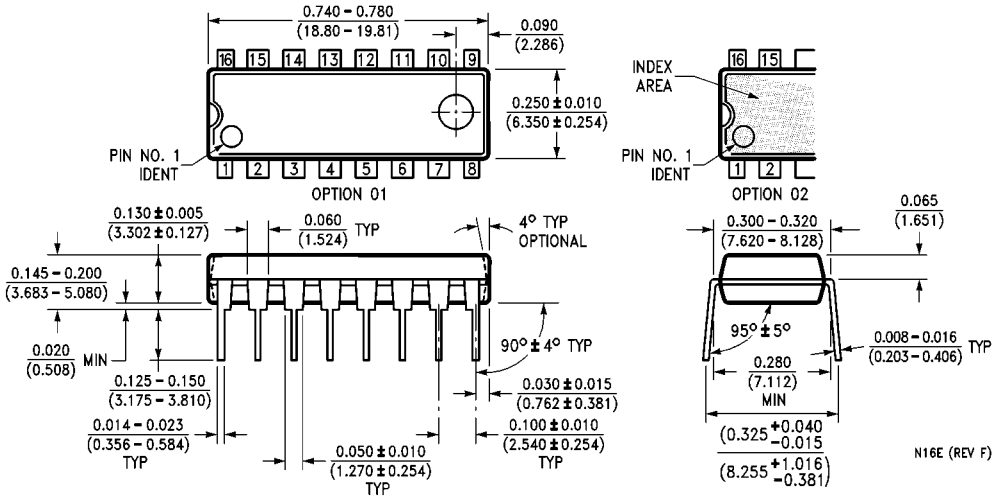


16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A



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

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