

April 1988 Revised January 2004

74F158A Quad 2-Input Multiplexer

General Description

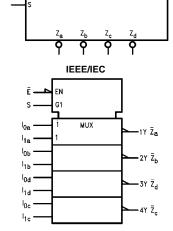
The F158A is a high speed quad 2-input multiplexer. It selects four bits of data from two sources using the common Select and Enable inputs. The four outputs present the selected data in the inverted form. The F158A can also generate any four of the 16 different functions of two variables.

Ordering Code:

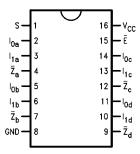
Order Number	Package Number	Package Description
74F158ASC (Note 1)	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74F158ASJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F158APC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Note 1: 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

Dia Nama	December	U.L.	Input I _{IH} /I _{IL}		
Pin Names	Description	HIGH/LOW	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		
Ē	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

	In	Outputs				
Ē	S	I ₀	I ₁	z		
Н	Х	Х	Х	Н		
L	L	L	Х	Н		
L	L	Н	Х	L		
L	Н	Х	L	Н		
L	Н	Х	Н	L		

H = HIGH Voltage Level

L = LOW Voltage Level

 $\begin{aligned} &X = Immaterial \\ &\overline{Z}_n = \overline{E} \times (I_{1n}S + I_{0n} \ \overline{S}) \end{aligned}$

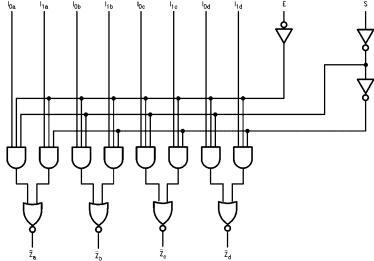
11 (111 011 7

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 (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 2)

-65°C to +150°C Storage Temperature -55°C to +125°C

Ambient Temperature under Bias Junction Temperature under Bias -55°C to +150°C

V_{CC} Pin Potential to Ground Pin -0.5V to +7.0VInput Voltage (Note 3) -0.5V to +7.0VInput Current (Note 3) -30 mA to +5.0 mA

Voltage Applied to Output in HIGH State (with $V_{CC} = 0V$)

Standard Output 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

-0.5V to V_{CC} Note 2: 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 3: Either voltage limit or current limit is sufficient to protect inputs.

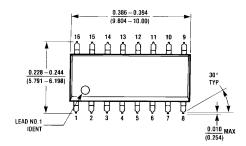
DC Electrical Characteristics

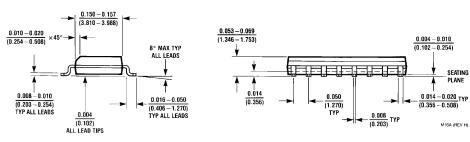
Symbol	Parameter		Min	Тур	Max	Units	V _{CC}	Conditions	
V _{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal	
V _{IL}	Input LOW Voltage				8.0	V		Recognized as a LOW Signal	
V _{CD}	Input Clamp Diode Voltage				-1.2	V	Min	$I_{IN} = -18 \text{ mA}$	
V _{OH}	Output HIGH	10% V _{CC}	2.5			V	Min	$I_{OH} = -1 \text{ mA}$	
	Voltage	$5\% V_{CC}$	2.7			V	IVIIII	$I_{OH} = -1 \text{ mA}$	
V _{OL}	Output LOW	10% V _{CC}			0.5	٧	Min	I _{OL} = 20 mA	
	Voltage				0.5				
I _{IH}	Input HIGH				5.0		Max	V _{IN} = 2.7V	
	Current				5.0	μА	IVIAX		
I _{BVI}	Input HIGH Current				7.0		Max	V 7.0V	
	Breakdown Test				7.0	μА	iviax	V _{IN} = 7.0V	
I _{CEX}	Output HIGH				50	μА	Max	\/ \/	
	Leakage Current							$V_{OUT} = V_{CC}$	
V _{ID}	Input Leakage		4.75			٧	0.0	I _{ID} = 1.9 μA	
	Test		4.75					All Other Pins Grounded	
I _{OD}	Output Leakage				3.75	μА	0.0	V _{IOD} = 150 mV	
	Circuit Current							All Other Pins Grounded	
I _{IL}	Input LOW Current				-0.6	mA	Max	V _{IN} = 0.5V	
los	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

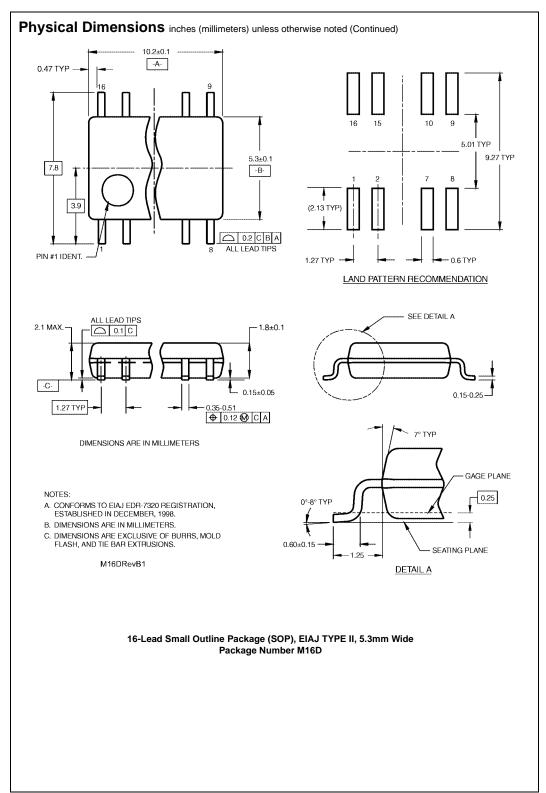
Symbol	Parameter	$T_{A} = +25^{\circ}C$ $V_{CC} = +5.0V$ $C_{L} = 50 \text{ pF}$			$T_A = -55^{\circ}C \text{ to } +125^{\circ}C$ $V_{CC} = +5.0V$ $C_L = 50 \text{ pF}$		$T_A = 0^{\circ}C \text{ to } ++70^{\circ}C$ $V_{CC} = +5.0V$ $C_L = 50 \text{ pF}$		Units
		Min	Тур	Max	Min	Max	Min	Max	
t _{PLH}	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	115
t _{PLH}	Propagation Delay	2.5	4.5	6.0	2.5	8.0	2.5	7.0	no
t _{PHL}	Ē to Z̄ _n	2.0	4.0	6.0	2.0	7.0	2.0	6.5	ns
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	115

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) 0.740 - 0.780 0.090 (18.80 - 19.81)(2.286)**16 15 14 13 12 11 10 9** 16 15 INDEX AREA 0.250 ± 0.010 $\overline{(6.350 \pm 0.254)}$ PIN NO. 1 PIN NO. 1 1 2 3 4 5 6 7 8 1 2 OPTION 01 OPTION 02 0.065 $\frac{0.130 \pm 0.005}{(3.302 \pm 0.127)}$ $\frac{0.060}{(1.524)}$ TYP (1.651)4° TYP 0.300 - 0.320OPTIONAL (7.620 - 8.128) 0.145 - 0.200 (3.683 - 5.080)95°±5° 0.008 **-** 0.016 (0.203 **-** 0.406) TYP 90° ± 4° TYP 0.020 $\frac{0.280}{(7.112)}$ MIN (0.508)0.125 - 0.150 (3.175 - 3.810) 0.030 ± 0.015 (0.762 ± 0.381) 0.014 - 0.023 0.100 ± 0.010 (0.325 +0.040 -0.015 (0.356 - 0.584) (2.540 ± 0.254) 0.050 ± 0.010 N16E (REV F) TYP (1.270 ± 0.254)

16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N16E

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- 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.

www.fairchildsemi.com