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April 1988
 Revised September 2000

74F153 Dual 4-Input Multiplexer

General Description

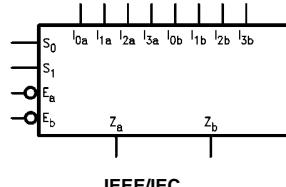
The F153 is a high-speed dual 4-input multiplexer with common select inputs and individual enable inputs for each section. It can select two lines of data from four sources. The two buffered outputs present data in the true (non-inverted) form. In addition to multiplexer operation, the F153 can generate any two functions of three variables.

Ordering Code:

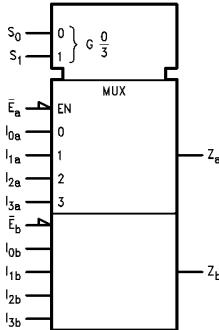
Order Number	Package Number	Package Description
74F153SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
74F153SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F153PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

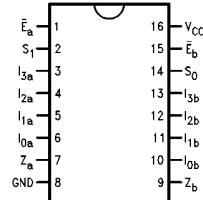
Logic Symbols



IEEE/IEC



Connection Diagram



74F153

Unit Loading/Fan Out

Pin Names	Description	U.L. HIGH/LOW	Input I_H/I_L Output I_{OH}/I_{OL}
I_{0a} - I_{3a}	Side A Data Inputs	1.0/1.0	$20 \mu A/-0.6 \text{ mA}$
I_{0b} - I_{3b}	Side B Data Inputs	1.0/1.0	$20 \mu A/-0.6 \text{ mA}$
S_0, S_1	Common Select Inputs	1.0/1.0	$20 \mu A/-0.6 \text{ mA}$
\bar{E}_a	Side A Enable Input (Active LOW)	1.0/1.0	$20 \mu A/-0.6 \text{ mA}$
\bar{E}_b	Side B Enable Input (Active LOW)	1.0/1.0	$20 \mu A/-0.6 \text{ mA}$
Z_a	Side A Output	50/33.3	$-1 \text{ mA}/20 \text{ mA}$
Z_b	Side B Output	50/33.3	$-1 \text{ mA}/20 \text{ mA}$

Truth Table

Select Inputs	Inputs (a or b)					Output		
	S_0	S_1	\bar{E}	I_0	I_1	I_2	I_3	Z
X	X	H		X	X	X	X	L
L	L	L		L	X	X	X	L
L	L	L		H	X	X	X	H
H	L	L		X	L	X	X	L
H	L	L		X	H	X	X	H
L	H	L		X	X	L	X	L
L	H	L		X	X	H	X	H
H	H	L		X	X	X	L	L
H	H	L		X	X	X	H	H

H = HIGH Voltage Level

L = LOW

X = Immortal

Functional Description

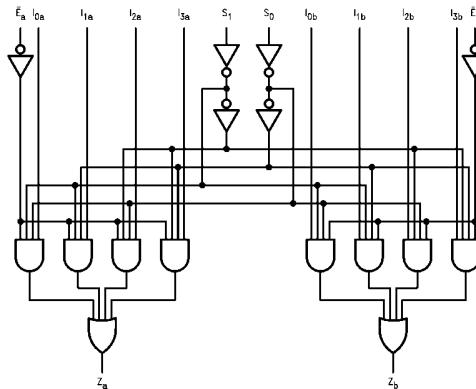
The F153 is a dual 4-input multiplexer. It can select two bits of data from up to four sources under the control of the common Select inputs (S_0, S_1). The two 4-input multiplexer circuits have individual active LOW Enables (\bar{E}_a, \bar{E}_b) which can be used to strobe the outputs independently. When the Enables (\bar{E}_a, \bar{E}_b) are HIGH, the corresponding outputs (Z_a, Z_b) are forced LOW. The F153 is the logic implementation of a 2-pole, 4-position switch, where the position of the switch is determined by the logic levels supplied to the two Select inputs. The logic equations for the outputs are as follows:

$$Z_a = \bar{E}_a \cdot (I_{0a} \cdot \bar{S}_1 \cdot \bar{S}_0 + I_{1a} \cdot \bar{S}_1 \cdot S_0 + I_{2a} \cdot S_1 \cdot \bar{S}_0 + I_{3a} \cdot S_1 \cdot S_0)$$

$$Z_b = \bar{E}_b \cdot (I_{0b} \cdot \bar{S}_1 \cdot \bar{S}_0 + I_{1b} \cdot \bar{S}_1 \cdot S_0 + I_{2b} \cdot S_1 \cdot \bar{S}_0 + I_{3b} \cdot S_1 \cdot S_0)$$

The F153 can be used to move data from a group of registers to a common output bus. The particular register from which the data came would be determined by the state of the Select inputs. A less obvious application is as a function generator. The F153 can generate two functions of three variables. This is useful for implementing highly irregular random 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.

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Absolute Maximum Ratings(Note 1)

Storage Temperature	-65°C to +150°C	
Ambient Temperature under Bias	-55°C to +125°C	Free Air Ambient Temperature
Junction Temperature under Bias	-55°C to +150°C	Supply Voltage
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)	

Recommended Operating Conditions

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

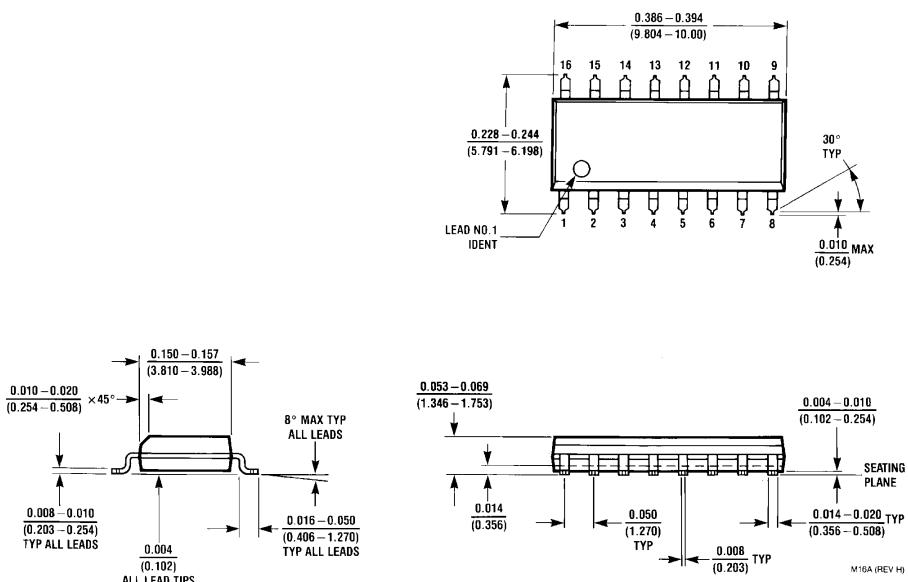
Symbol	Parameter	Min	Typ	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V_{IL}	Input LOW Voltage		0.8		V		Recognized as a LOW Signal
V_{CD}	Input Clamp Diode Voltage		-1.2		V	Min	$I_{IN} = -18$ mA
V_{OH}	Output HIGH Voltage 10% V_{CC} 5% V_{CC}	2.5 2.7			V	Min	$I_{OH} = -1$ mA $I_{OH} = -1$ mA
V_{OL}	Output LOW Voltage 10% V_{CC}		0.5		V	Min	$I_{OL} = 20$ mA
I_{IH}	Input HIGH Current		5.0		μ A	Max	$V_{IN} = 2.7$ V
I_{BVI}	Input HIGH Current Breakdown Test		7.0		μ A	Max	$V_{IN} = 7.0$ V
I_{CEX}	Output High Leakage Current		50		μ A	Max	$V_{OUT} = V_{CC}$
V_{ID}	Input Leakage Test	4.75			V	0.0	$I_{ID} = 1.9$ μ A All Other Pins Grounded
I_{OD}	Output Leakage Circuit Current		3.75		μ A	0.0	$V_{IOD} = 150$ mV All Other Pins Grounded
I_{IL}	Input LOW Current		-0.6		mA	Max	$V_{IN} = 0.5$ V
I_{OS}	Output Short-Circuit Current	-60	-150		mA	Max	$V_{OUT} = 0$ V
I_{CCL}	Power Supply Current		12	20	mA	Max	$V_O = LOW$

AC Electrical Characteristics

Symbol	Parameter	$T_A = +25^\circ C$ $V_{CC} = +5.0V$ $C_L = 50$ pF			$T_A = 0^\circ C$ to $+70^\circ C$ $V_{CC} = +5.0V$ $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay S_n to Z_n	4.5 3.5	8.1 7.0	10.5 9.0	4.5 3.5	12.0 10.5	ns
t_{PHL}	Propagation Delay \bar{E}_n to Z_n	4.5 3.0	7.1 5.7	9.0 7.0	4.5 2.5	10.5 8.0	ns
t_{PLH}	Propagation Delay I_n to Z_n	3.0 2.5	5.3 5.1	7.0 6.5	3.0 2.5	8.0 7.5	ns

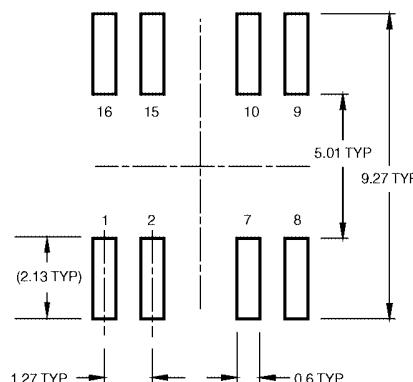
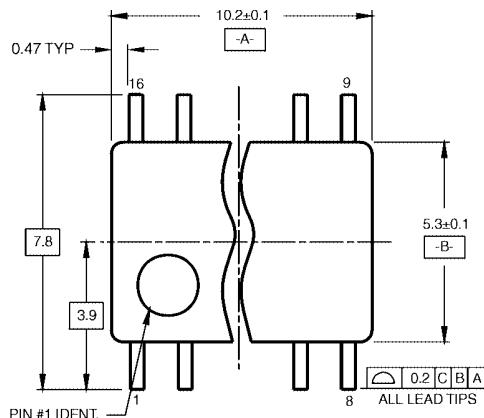
74F153

Physical Dimensions inches (millimeters) unless otherwise noted

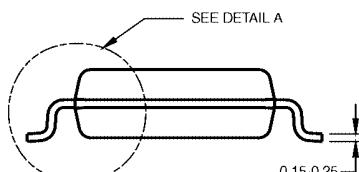
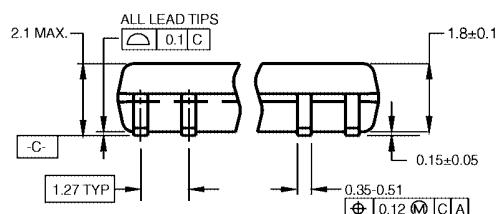


16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A

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



LAND PATTERN RECOMMENDATION



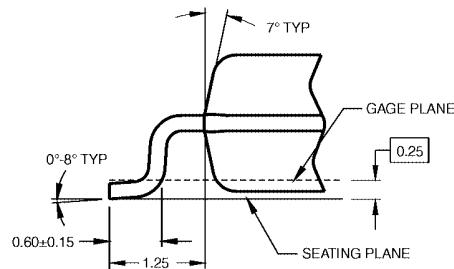
DIMENSIONS ARE IN MILLIMETERS

NOTES:

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.

M16DRoyR1

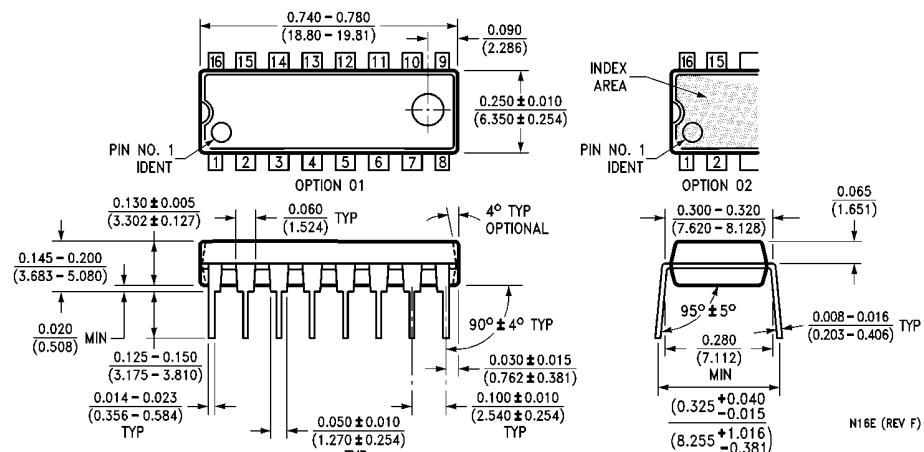


DETAIL A

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

74F153 Dual 4-Input Multiplexer

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

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