



# DUAL 4-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

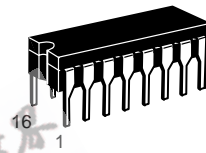
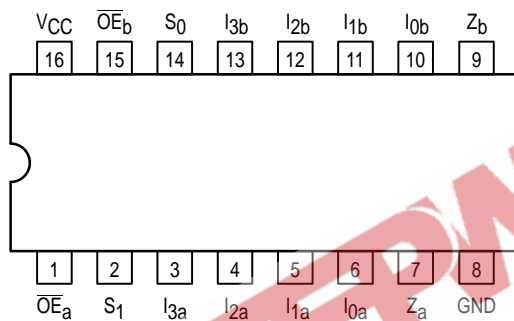
The MC54/74F253 is a Dual 4-Input Multiplexer with 3-State Outputs. It can select two bits of data from four sources using common select inputs. The outputs may be individually switched to a high-impedance state with a HIGH on the respective Output Enable ( $\overline{OE}$ ) inputs, allowing the outputs to interface directly with bus-oriented systems.

**MC54/74F253**

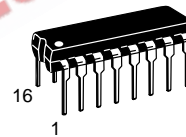
**DUAL 4-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS**

**FAST™ SCHOTTKY TTL**

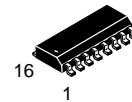
**CONNECTION DIAGRAM DIP (TOP VIEW)**



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08



**D SUFFIX**  
SOIC  
CASE 751B-03

**ORDERING INFORMATION**

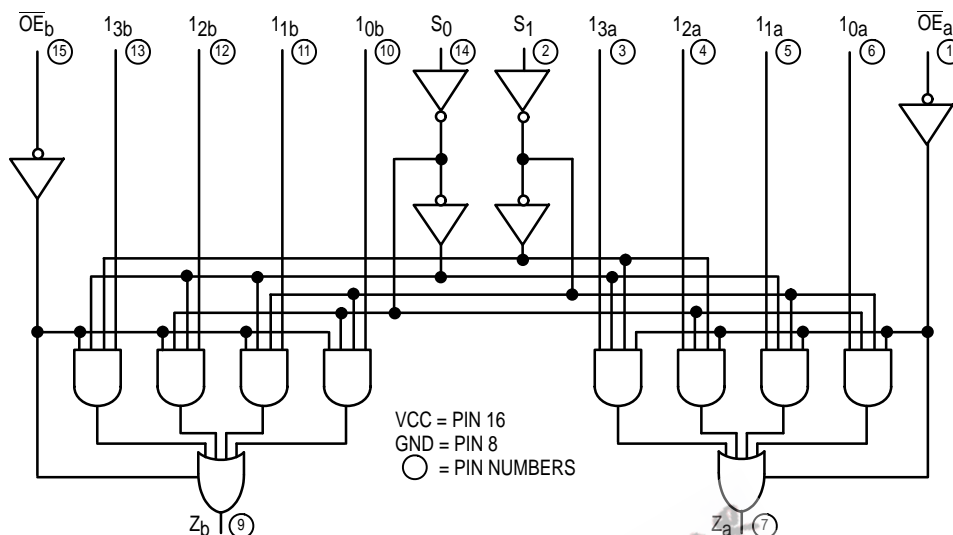
MC54FXXXJ Ceramic  
MC74FXXXN Plastic  
MC74FXXXD SOIC

**GUARANTEED OPERATING RANGES**

Symbol	Parameter		Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	54, 74	4.5	5.0	5.5	V
T <sub>A</sub>	Operating Ambient Temperature Range	54	-55	25	125	°C
		74	0	25	70	
I <sub>OH</sub>	Output Current — High	54, 74			-3.0	mA
I <sub>OL</sub>	Output Current — Low	54, 74			24	mA

# MC54/74F253

## LOGIC DIAGRAM



## FUNCTIONAL DESCRIPTION

The F253 contains two identical 4-input Multiplexers with 3-State Outputs. They select two bits from four sources selected by common Select Inputs ( $S_0$ ,  $S_1$ ). The 4-input multiplexers have individual Output Enable ( $\overline{OE}_a$ ,  $\overline{OE}_b$ ) inputs which, when HIGH, force the outputs to a high impedance (high Z) state.

The F253 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 shown below:

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

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

If the outputs of 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 that there is no overlap.

## FUNCTION TABLE

Select Inputs		Data Inputs				Output Enable	Output
$S_0$	$S_1$	$I_0$	$I_1$	$I_2$	$I_3$	$\overline{OE}$	Z
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
H	L	X	L	X	X	L	L
H	L	X	H	X	X	L	H
L	H	X	X	L	X	L	L
L	H	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Don't Care  
 Z = High Impedance (off)  
 Address inputs  $S_0$  and  $S_1$  are common to both sections.

## MC54/74F253

### DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions	
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage	
V <sub>IL</sub>	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage	
V <sub>IK</sub>	Input Clamp Diode Voltage			-1.2	V	I <sub>IN</sub> = -18 mA	V <sub>CC</sub> = MIN
V <sub>OH</sub>	Output HIGH Voltage	54, 74	2.4		V	I <sub>OH</sub> = -3.0 mA	V <sub>CC</sub> = 4.50 V
		74	2.7		V	I <sub>OH</sub> = -3.0 mA	V <sub>CC</sub> = 4.75 V
V <sub>OL</sub>	Output LOW Voltage			0.5	V	I <sub>OL</sub> = 24 mA	V <sub>CC</sub> = MIN
I <sub>OZH</sub>	Output Off Current — HIGH			50	μA	V <sub>OUT</sub> = 2.7 V	V <sub>CC</sub> = MAX
I <sub>OZL</sub>	Output Off Current — LOW			-50	μA	V <sub>OUT</sub> = 0.5 V	V <sub>CC</sub> = MAX
I <sub>IH</sub>	Input HIGH Current			20	μA	V <sub>IN</sub> = 2.7 V	V <sub>CC</sub> = MAX
				100	μA	V <sub>IN</sub> = 7.0 V	
I <sub>IL</sub>	Input LOW Current			-0.6	mA	V <sub>IN</sub> = 0.5 V	V <sub>CC</sub> = MAX
I <sub>OS</sub>	Output Short Circuit Current (Note 2)	-60		-150	mA	V <sub>OUT</sub> = 0 V	V <sub>CC</sub> = MAX
I <sub>CC</sub>	Power Supply Current Total, Output HIGH			16	mA	OE <sub>n</sub> = GND I <sub>O</sub> = 4.5 V; S <sub>n</sub> , I <sub>1</sub> - I <sub>3</sub> = GND	
	Total, Output LOW			23		I <sub>n</sub> , S <sub>n</sub> , OE <sub>n</sub> = GND V <sub>CC</sub> = MAX	
	Total at HIGH-Z			23		OE <sub>n</sub> = 4.5 V, V <sub>CC</sub> = MAX I <sub>n</sub> , S <sub>n</sub> = GND	

### AC CHARACTERISTICS

Symbol	Parameter	54/74F		54F		74F		Unit
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0 V C <sub>L</sub> = 50 pF		T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = 5.0 V ± 10% C <sub>L</sub> = 50 pF		T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = 5.0 V ± 10% C <sub>L</sub> = 50 pF		
		Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	4.5	11.5	3.5	15	4.5	13.5	ns
t <sub>PHL</sub>	S <sub>n</sub> to Z <sub>n</sub>	3.0	9.0	2.5	11	3.0	10	
t <sub>PLH</sub>	Propagation Delay	3.0	7.0	2.5	9.0	3.0	8.0	ns
t <sub>PHL</sub>	I <sub>n</sub> to Z <sub>n</sub>	2.5	6.0	2.5	8.0	2.5	7.0	
t <sub>PZH</sub>	Output Enable Time	3.0	8.0	2.5	10	3.0	9.0	ns
t <sub>PZL</sub>		3.0	8.0	2.5	10	3.0	9.0	
t <sub>PHZ</sub>	Output Disable Time	2.0	5.0	2.0	6.5	2.0	6.0	ns
t <sub>PLZ</sub>		2.0	6.0	2.0	8.0	2.0	7.0	