



# 8-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

The MC54/74F251 is a high-speed 8-input digital multiplexer. It provides, in one package, the ability to select one bit of data from up to eight sources. It can be used as a universal function generator to generate any logic function of four variables. Both assertion and negation outputs are provided.

- Multifunctional Capacity
- On-Chip Select Logic Decoding
- Inverting and Noninverting 3-State Outputs

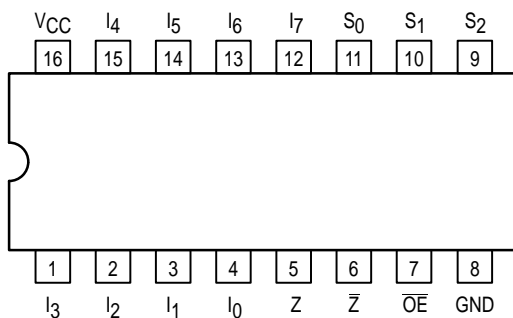
## FUNCTIONAL DESCRIPTION

This device is a logical implementation of a single-pole, 8-position switch with the switch position controlled by the state of three Select inputs,  $S_0$ ,  $S_1$ ,  $S_2$ . Both assertion and negation outputs are provided. The Output Enable input ( $\overline{OE}$ ) is active LOW. When it is activated, the logic function provided at the output is:

$$Z = \overline{OE} \cdot (I_0 \cdot \overline{S_0} \cdot \overline{S_1} \cdot \overline{S_2} + I_1 \cdot S_0 \cdot \overline{S_1} \cdot \overline{S_2} + I_2 \cdot \overline{S_0} \cdot S_1 \cdot \overline{S_2} + I_3 \cdot S_0 \cdot S_1 \cdot \overline{S_2} + I_4 \cdot \overline{S_0} \cdot \overline{S_1} \cdot S_2 + I_5 \cdot S_0 \cdot \overline{S_1} \cdot S_2 + I_6 \cdot \overline{S_0} \cdot S_1 \cdot S_2 + I_7 \cdot S_0 \cdot S_1 \cdot S_2 +$$

When the Output Enable is HIGH, both outputs are in the high impedance (high Z) state. This feature allows multiplexer expansion by tying the outputs of up to 128 devices together. When 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. The Output Enable signals should be designed to ensure there is no overlap in the active LOW portion of the enable voltages.

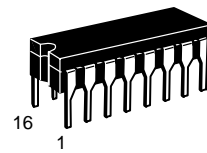
## CONNECTION DIAGRAM



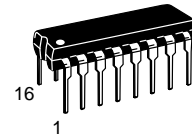
## MC54/74F251

### 8-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

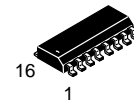
FAST™ SCHOTTKY TTL



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08

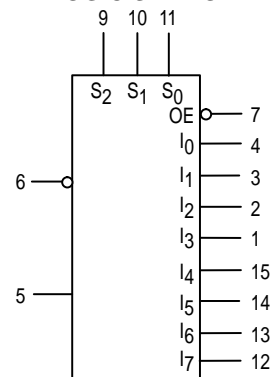


**D SUFFIX**  
SOIC  
CASE 751B-03

## ORDERING INFORMATION

MC54FXXXJ	Ceramic
MC74FXXXN	Plastic
MC74FXXXD	SOIC

## LOGIC SYMBOL



VCC = PIN 16  
GND = PIN 8

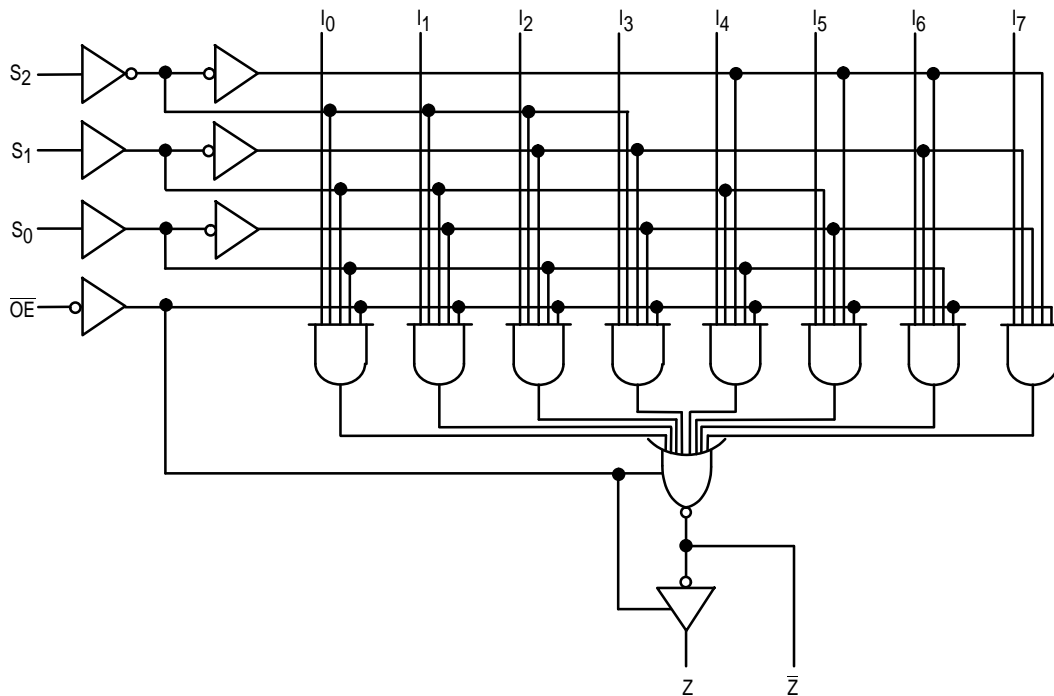
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## FUNCTION TABLE

Inputs				Outputs	
$\overline{OE}$	$S_2$	$S_1$	$S_0$	$\overline{Z}$	Z
H	X	X	X	Z	Z
L	L	L	L	$\overline{I_0}$	$I_0$
L	L	L	H	$\overline{I_1}$	$I_1$
L	L	H	L	$\overline{I_2}$	$I_2$
L	L	H	H	$\overline{I_3}$	$I_3$
L	H	L	L	$\overline{I_4}$	$I_4$
L	H	L	H	$\overline{I_5}$	$I_5$
L	H	H	L	$\overline{I_6}$	$I_6$
L	H	H	H	$\overline{I_7}$	$I_7$

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Don't Care  
 Z = High Impedance

## LOGIC DIAGRAM



## GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
$V_{CC}$	Supply Voltage	54, 74	4.5	5.0	5.5	V
$T_A$	Operating Ambient Temperature Range	54	-55	25	125	°C
		74	0	25	70	
$I_{OH}$	Output Current — High	54, 74			-3.0	mA
$I_{OL}$	Output Current — Low	54, 74			24	mA

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## 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	3.4		V	I <sub>OH</sub> = -3.0 mA	V <sub>CC</sub> = 4.50 V
		74	2.7	3.4		V	I <sub>OH</sub> = -3.0 mA	V <sub>CC</sub> = 4.75 V
V <sub>OL</sub>	Output LOW Voltage			0.35	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			15	22	mA	I <sub>n</sub> , S <sub>n</sub> = 4.5 V OE = GND	V <sub>CC</sub> = MAX
				16	24	mA	$\overline{\text{OE}}$ , I <sub>n</sub> = 4.5 V	V <sub>CC</sub> = MAX

### NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.
- Not more than one output should be shorted at a time, nor for more than 1 second.

## 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	4.0	8.0	3.5	9.5	4.0	9.0	ns
t <sub>PHL</sub>	S <sub>n</sub> to $\overline{Z}_n$	3.2	7.5	3.2	9.5	3.2	8.5	
t <sub>PLH</sub>	Propagation Delay	4.5	13	3.5	16.5	4.5	14	ns
t <sub>PHL</sub>	S <sub>n</sub> to Z <sub>n</sub>	4.5	9.0	3.0	10.5	4.0	10.5	
t <sub>PLH</sub>	Propagation Delay	3.0	5.7	2.5	8.0	3.0	7.0	ns
t <sub>PHL</sub>	I <sub>n</sub> to $\overline{Z}$	1.5	4.0	1.5	6.0	1.5	5.0	
t <sub>PLH</sub>	Propagation Delay	4.0	9.5	3.5	11.5	4.0	10.5	ns
t <sub>PHL</sub>	I <sub>n</sub> to Z	3.0	6.5	3.0	7.5	3.0	7.5	
t <sub>PZH</sub>	Output Enable Time	3.0	7.0	3.0	9.5	3.0	8.0	ns
t <sub>PZL</sub>	$\overline{\text{OE}}$ to $\overline{Z}$	3.0	8.5	3.0	10.5	3.0	9.5	
t <sub>PHZ</sub>	Output Disable Time	3.0	6.5	3.0	8.5	3.0	7.5	ns
t <sub>PLZ</sub>	$\overline{\text{OE}}$ to $\overline{Z}$	2.0	4.5	2.0	8.0	2.0	5.5	
t <sub>PZH</sub>	Output Enable Time	4.0	9.0	4.0	10	4.0	10	ns
t <sub>PZL</sub>	$\overline{\text{OE}}$ to Z	3.5	8.0	3.5	10	3.5	9.0	
t <sub>PHZ</sub>	Output Disable Time	3.0	6.0	3.0	7.0	3.0	7.0	ns
t <sub>PLZ</sub>	$\overline{\text{OE}}$ to Z	2.0	4.5	2.0	8.0	2.0	5.5	