MOTOROLA

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

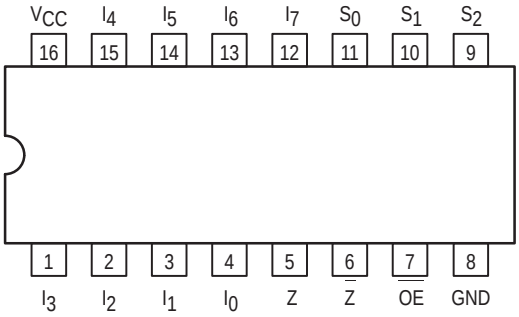
FUNCTIONAL DESCRIPTION

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 (OE) is active LOW. When it is activated, the logic function provided at the output is:

$$
\begin{aligned}
Z = \overline{OE} \bullet (&I_0 \bullet \overline{S_0} \bullet \overline{S_1} \bullet \overline{S_2} + I_1 \bullet S_0 \bullet \overline{S_1} \bullet \overline{S_2} + \\
&I_2 \bullet \overline{S_0} \bullet \overline{S_1} \bullet S_2 + I_3 \bullet S_0 \bullet \overline{S_1} \bullet S_2 + \\
&I_4 \bullet \overline{S_0} \bullet S_1 \bullet S_2 + I_5 \bullet S_0 \bullet S_1 \bullet S_2 + \\
&I_6 \bullet S_0 \bullet S_1 \bullet S_2 + I_7 \bullet S_0 \bullet S_1 \bullet S_2 +
\end{aligned}
$$

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.

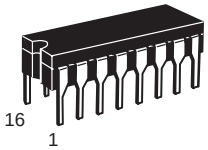
CONNECTION DIAGRAM



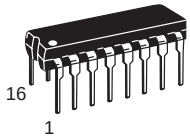
MC54/74F251

8-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

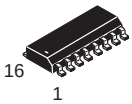
FAST™ SCHOTTKY TTL



J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08

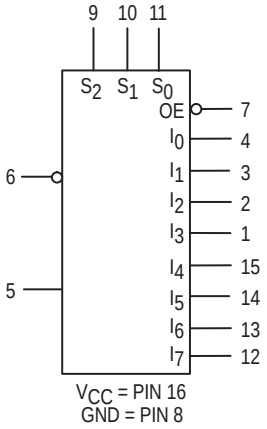


D SUFFIX
SOIC
CASE 751B-03

ORDERING INFORMATION

MC54FXXXJ	Ceramic
MC74FXXXN	Plastic
MC74FXXXD	SOIC

LOGIC SYMBOL

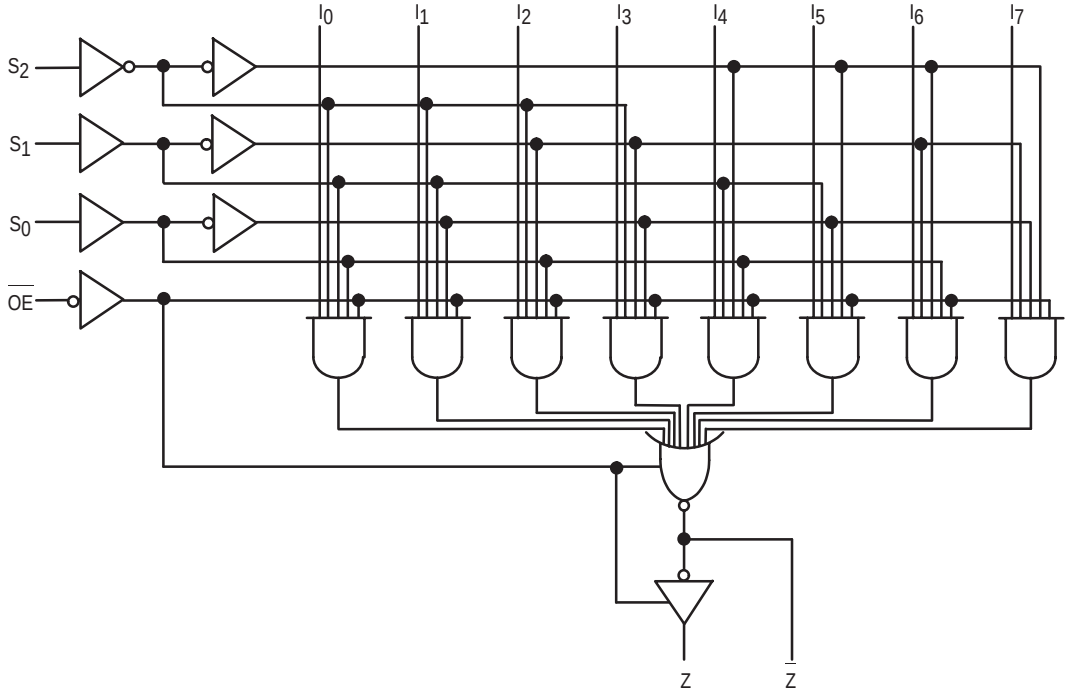


FUNCTION TABLE

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

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits Min	Limits Typ	Limits Max	Unit	Test Conditions	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage	
V_{IL}	Input LOW Voltage				0.8	V	Guaranteed Input LOW Voltage	
V_{IK}	Input Clamp Diode Voltage				–1.2	V	I_{IN} = –18 mA	V_{CC} = MIN
V_{OH}	Output HIGH Voltage	54, 74	2.4	3.4		V	I_{OH} = –3.0 mA	V_{CC} = 4.50 V
		74	2.7	3.4		V	I_{OH} = –3.0 mA	V_{CC} = 4.75 V
V_{OL}	Output LOW Voltage			0.35	0.5	V	I_{OL} = 24 mA	V_{CC} = MIN
I_{OZH}	Output Off Current — HIGH				50	µA	V_{OUT} = 2.7 V	V_{CC} = MAX
I_{OZL}	Output Off Current — LOW				–50	µA	V_{OUT} = 0.5 V	V_{CC} = MAX
I_{IH}	Input HIGH Current				20	µA	V_{IN} = 2.7 V	V_{CC} = MAX
					100	µA	V_{IN} = 7.0 V	
I_{IL}	Input LOW Current				–0.6	mA	V_{IN} = 0.5 V	V_{CC} = MAX
I_{OS}	Output Short Circuit Current (Note 2)		–60		–150	mA	V_{OUT} = 0 V	V_{CC} = MAX
I_{CC}	Power Supply Current			15	22	mA	I_n, S_n = 4.5 V $\overline{OE}$ = GND	V_{CC} = MAX
				16	24		$\overline{OE}$, I_n = 4.5 V	V_{CC} = MAX

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

AC CHARACTERISTICS

Symbol	Parameter	54/74F T_A = +25°C V_{CC} = +5.0 V C_L = 50 pF Min	54/74F Max	54F T_A = -55 °Cto +125°C V_{CC} = 5.0 V ±10% C_L = 50 pF Min	54F Max	74F T_A = 0°C to 70°C V_{CC} = 5.0 V ± 10% C_L = 50 pF Min	74F Max	Unit
t_{PLH}	Propagation Delay	4.0	8.0	3.5	9.5	4.0	9.0	ns
t_{PHL}	S_n to $\overline{Z}_n$	3.2	7.5	3.2	9.5	3.2	8.5	
t_{PLH}	Propagation Delay	4.5	13	3.5	16.5	4.5	14	ns
t_{PHL}	S_n to Z_n	4.5	9.0	3.0	10.5	4.0	10.5	
t_{PLH}	Propagation Delay	3.0	5.7	2.5	8.0	3.0	7.0	ns
t_{PHL}	I_n to $\overline{Z}$	1.5	4.0	1.5	6.0	1.5	5.0	
t_{PLH}	Propagation Delay	4.0	9.5	3.5	11.5	4.0	10.5	ns
t_{PHL}	I_n to Z	3.0	6.5	3.0	7.5	3.0	7.5	
t_{PZH}	Output Enable Time	3.0	7.0	3.0	9.5	3.0	8.0	ns
t_{PZL}	$\overline{OE}$ to $\overline{Z}$	3.0	8.5	3.0	10.5	3.0	9.5	
t_{PHZ}	Output Disable Time	3.0	6.5	3.0	8.5	3.0	7.5	ns
t_{PLZ}	$\overline{OE}$ to $\overline{Z}$	2.0	4.5	2.0	8.0	2.0	5.5	
t_{PZH}	Output Enable Time	4.0	9.0	4.0	10	4.0	10	ns
t_{PZL}	$\overline{OE}$ to Z	3.5	8.0	3.5	10	3.5	9.0	
t_{PHZ}	Output Disable Time	3.0	6.0	3.0	7.0	3.0	7.0	ns
t_{PLZ}	$\overline{OE}$ to Z	2.0	4.5	2.0	8.0	2.0	5.5	

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