

# 54AC/74AC251 • 54ACT/74ACT251

## 8-Input Multiplexer With 3-State Outputs

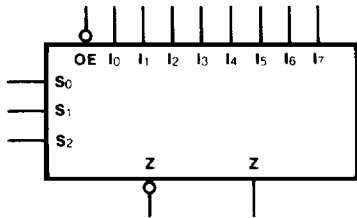
### Description

The 'AC/'ACT251 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 universal function generator to generate any logic function of four variables. Both true and complementary outputs are provided.

- Multifunctional Capability
- On-Chip Select Logic Decoding
- Inverting and Noninverting 3-State Outputs
- Outputs Source/Sink 24 mA
- 'ACT251 has TTL-Compatible Inputs

**Ordering Code:** See Section 6

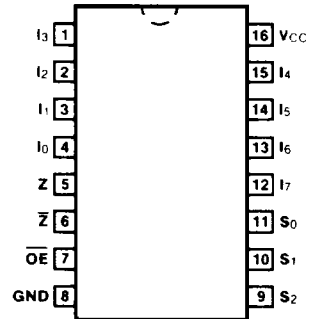
### Logic Symbol



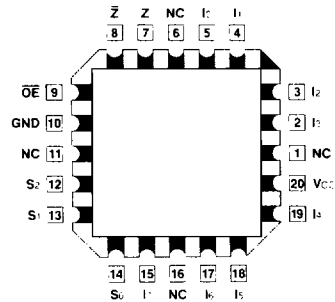
### Pin Names

- S<sub>0</sub> - S<sub>2</sub> Select Inputs
- $\overline{OE}$  3-State Output Enable Input
- I<sub>0</sub> - I<sub>7</sub> Multiplexer Inputs
- Z 3-State Multiplexer Output
- $\overline{Z}$  Complementary 3-State Multiplexer Output

### Connection Diagrams



**Pin Assignment for DIP, Flatpak and SOIC**



**Pin Assignment for LCC**

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## 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 true and complementary 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.

## Truth 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	$\overline{I_7}$	$I_7$

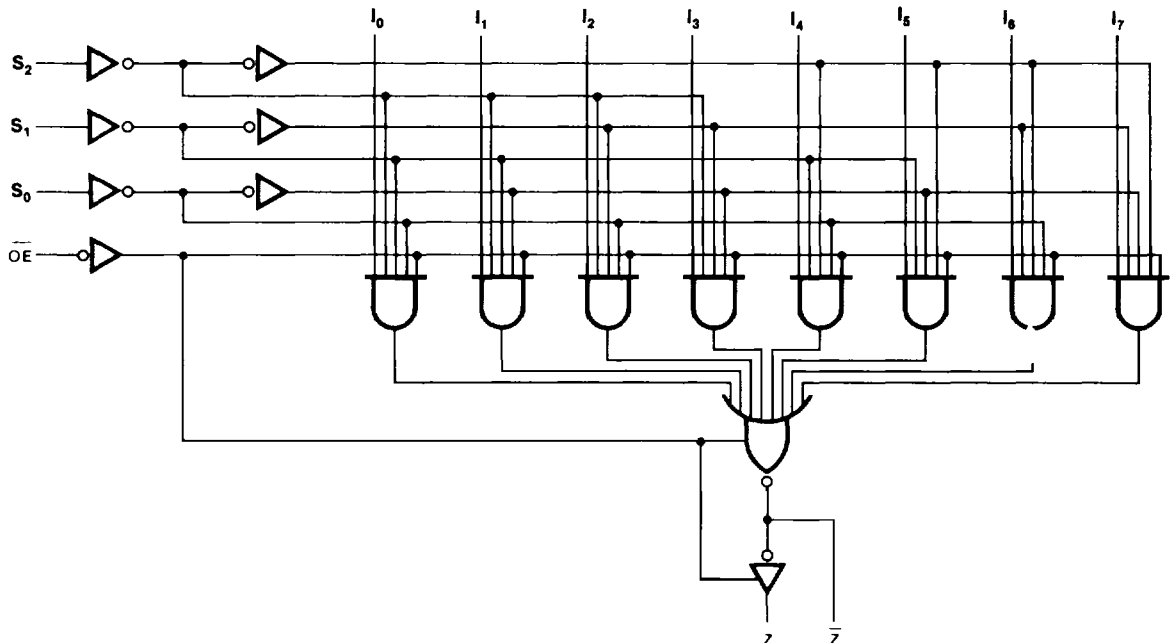
H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Z = High Impedance

## 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.

## DC Characteristics (unless otherwise specified)

Symbol	Parameter	54AC/ACT	74AC/ACT	Units	Conditions
I <sub>CC</sub>	Maximum Quiescent Supply Current	160	80	μA	V <sub>IN</sub> = V <sub>CC</sub> or Ground, V <sub>CC</sub> = 5.5 V, T <sub>A</sub> = Worst Case
I <sub>CC</sub>	Maximum Quiescent Supply Current	8.0	8.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or Ground, V <sub>CC</sub> = 5.5 V, T <sub>A</sub> = 25°C
I <sub>CC(T)</sub>	Maximum Additional I <sub>CC</sub> /Input (ACT251)	1.6	1.5	mA	V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V, V <sub>CC</sub> = 5.5 V, T <sub>A</sub> = Worst Case

## AC Characteristics

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC			54AC		74AC		Units	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -55°C to +125°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay S <sub>n</sub> to Z or $\bar{Z}$	3.3	1.0	11.5	17.5	1.0	21.0	1.0	19.0	ns	3-6
		5.0	1.0	8.5	12.5	1.0	15.5	1.0	13.5		
t <sub>PHL</sub>	Propagation Delay S <sub>n</sub> to Z or $\bar{Z}$	3.3	1.0	11.0	17.5	1.0	21.0	1.0	19.0	ns	3-6
		5.0	1.0	8.0	12.5	1.0	15.5	1.0	13.5		
t <sub>PLH</sub>	Propagation Delay I <sub>n</sub> to Z or $\bar{Z}$	3.3	1.0	10.0	14.0	1.0	17.0	1.0	15.5	ns	3-5
		5.0	1.0	7.0	10.0	1.0	12.0	1.0	11.0		
t <sub>PHL</sub>	Propagation Delay I <sub>n</sub> to Z or $\bar{Z}$	3.3	1.0	9.0	14.0	1.0	16.5	1.0	15.5	ns	3-5
		5.0	1.0	6.5	10.0	1.0	12.0	1.0	11.0		
t <sub>PZH</sub>	Output Enable Time $\bar{O}E$ to Z or $\bar{Z}$	3.3	1.0	7.5	11.0	1.0	13.0	1.0	12.0	ns	3-7
		5.0	1.0	5.5	8.0	1.0	10.0	1.0	9.0		
t <sub>PZL</sub>	Output Enable Time $\bar{O}E$ to Z or $\bar{Z}$	3.3	1.0	7.5	11.0	1.0	13.0	1.0	12.0	ns	3-8
		5.0	1.0	5.5	8.0	1.0	10.0	1.0	9.0		
t <sub>PHZ</sub>	Output Disable Time $\bar{O}E$ to Z or $\bar{Z}$	3.3	3.5	8.5	11.5	3.5	14.0	3.5	13.0	ns	3-7
		5.0	2.5	7.0	9.5	2.5	11.0	2.5	10.0		
t <sub>PLZ</sub>	Output Disable Time $\bar{O}E$ to Z or $\bar{Z}$	3.3	4.0	7.0	11.0	4.0	13.0	4.0	12.0	ns	3-8
		5.0	3.0	5.5	8.0	3.0	10.0	3.0	8.5		

\*Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

Military parameters given herein are for general references only. For current military specifications and subgroup testing information please request Fairchild's Table I data sheet from your Fairchild sales engineer or account representative.

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## AC Characteristics

Symbol	Parameter	V <sub>cc</sub> * (V)	74ACT			54ACT		74ACT		Units	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -55°C to +125°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay S <sub>n</sub> to Z or $\bar{Z}$	5.0	1.0	7.0	13.5	1.0	16.5	1.0	13.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay S <sub>n</sub> to Z or $\bar{Z}$	5.0	1.0	7.5	13.0	1.0	16.0	1.0	14.5	ns	3-6
t <sub>PLH</sub>	Propagation Delay I <sub>n</sub> to Z or $\bar{Z}$	5.0	1.0	5.5	10.0	1.0	13.0	1.0	10.5	ns	3-5
t <sub>PHL</sub>	Propagation Delay I <sub>n</sub> to Z or $\bar{Z}$	5.0	1.0	6.5	10.5	1.0	13.0	1.0	12.0	ns	3-5
t <sub>PZH</sub>	Output Enable Time $\bar{O}E$ to Z or $\bar{Z}$	5.0	1.0	5.0	9.0	1.0	11.0	1.0	9.0	ns	3-7
t <sub>PZL</sub>	Output Enable Time $\bar{O}E$ to Z or $\bar{Z}$	5.0	1.0	4.5	9.0	1.0	11.0	1.0	8.5	ns	3-8
t <sub>PHZ</sub>	Output Disable Time $\bar{O}E$ to Z or $\bar{Z}$	5.0	1.0	6.0	10.5	1.0	12.0	1.0	10.0	ns	3-7
t <sub>PLZ</sub>	Output Disable Time $\bar{O}E$ to Z or $\bar{Z}$	5.0	1.0	4.5	9.0	1.0	11.0	1.0	8.5	ns	3-8

\*Voltage Range 5.0 is 5.0 V ± 0.5 V

Military parameters given herein are for general references only. For current military specifications and subgroup testing information please request Fairchild's Table I data sheet from your Fairchild sales engineer or account representative.

## Capacitance

Symbol	Parameter	54/74AC/ACT	Units	Conditions
		Typ		
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>cc</sub> = 5.5 V
C <sub>PD</sub>	Power Dissipation Capacitance	70.0	pF	V <sub>cc</sub> = 5.5 V