



**MOTOROLA**

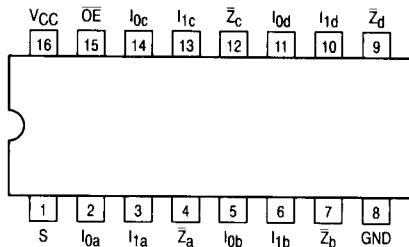
**MC74AC258  
MC74ACT258**

**QUAD 2-INPUT  
MULTIPLEXER WITH  
3-STATE OUTPUTS**

**Quad 2-Input Multiplexer  
with 3-State Outputs**

The MC74AC258/74ACT258 is a quad 2-input multiplexer with 3-state outputs. Four bits of data from two sources can be selected using a common data select input. The four outputs present the selected data in the complement (inverted) form. The outputs may be switched to a high impedance state with a HIGH on the common Output Enable ( $\overline{OE}$ ) input, allowing the outputs to interface directly with bus-oriented systems.

- Multiplexer Expansion by Tying Outputs Together
- Inverting 3-State Outputs
- Outputs Source/Sink 24 mA
- 'ACT258 Has TTL Compatible Inputs



**PIN NAMES**

- S Common Data Select Input
- $\overline{OE}$  3-State Output Enable Input
- $I_{0a}-I_{0d}$  Data Inputs from Source 0
- $I_{1a}-I_{1d}$  Data Inputs from Source 1
- $Z_a-Z_d$  3-State Multiplexer Outputs



**N SUFFIX  
CASE 648-08  
PLASTIC**



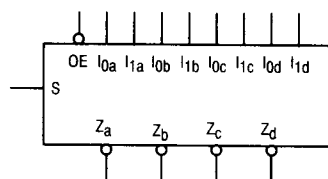
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CASE 751B-05  
PLASTIC**

**TRUTH TABLE**

Output Enable	Select Input	Data Inputs		Outputs
$\overline{OE}$	S	$I_0$	$I_1$	$Z$
H	X	X	X	Z
L	H	X	L	H
L	H	X	H	L
L	L	L	X	H
L	L	L	L	L

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial  
Z = High Impedance

**LOGIC SYMBOL**



## MC74AC258 • MC74ACT258

### FUNCTIONAL DESCRIPTION

The MC74AC258/74ACT258 is a quad 2-input multiplexer with 3-state outputs. It selects four bits of data from two sources under control of a common Select input (S). When the Select input is LOW, the  $I_{0x}$  inputs are selected and when Select is HIGH, the  $I_{1x}$  inputs are selected. The data on the selected inputs appears at the outputs in inverted form. The MC74AC258/74ACT258 is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

$$\bar{Z}_a = \overline{OE} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S})$$

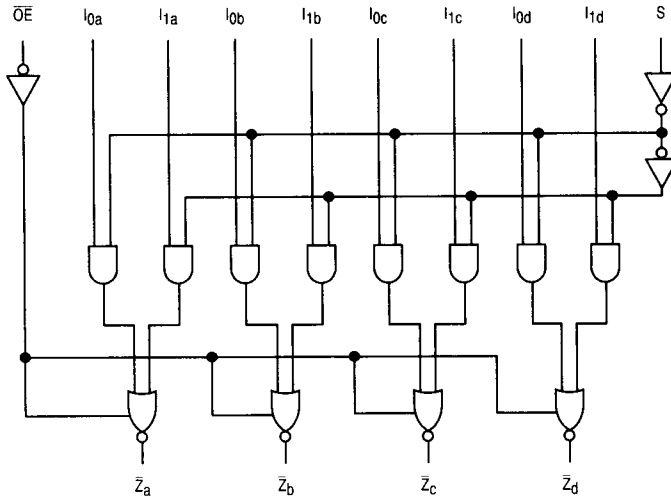
$$\bar{Z}_b = \overline{OE} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

$$\bar{Z}_c = \overline{OE} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S})$$

$$\bar{Z}_d = \overline{OE} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})$$

When the Output Enable input ( $\overline{OE}$ ) is HIGH, the outputs are forced to a high impedance state. If 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. Designers should ensure the Output Enable signals to 3-state devices whose outputs are tied together are designed so there is no overlap.

### 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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## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V <sub>in</sub>	DC Input Voltage (Referenced to GND)	-0.5 to V <sub>CC</sub> +0.5	V
V <sub>out</sub>	DC Output Voltage (Referenced to GND)	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>in</sub>	DC Input Current, per Pin	±20	mA
I <sub>out</sub>	DC Output Sink/Source Current, per Pin	±50	mA
I <sub>CC</sub>	DC V <sub>CC</sub> or GND Current per Output Pin	±50	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V <sub>CC</sub>	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Ref. to GND)	0		V <sub>CC</sub>	V	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V <sub>CC</sub> @ 3.0 V		150		ns/V
		V <sub>CC</sub> @ 4.5 V		40		
		V <sub>CC</sub> @ 5.5 V		25		
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V <sub>CC</sub> @ 4.5 V		10		ns/V
		V <sub>CC</sub> @ 5.5 V		8.0		
T <sub>J</sub>	Junction Temperature (PDIP)			140	°C	
T <sub>A</sub>	Operating Ambient Temperature Range	-40	25	85	°C	
I <sub>OH</sub>	Output Current — High			-24	mA	
I <sub>OL</sub>	Output Current — Low			24	mA	

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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### DC CHARACTERISTICS

Symbol	Parameter	VCC (V)	74AC		74AC		Unit	Conditions
			TA = +25°C		TA = -40°C to +85°C			
			Typ	Guaranteed Limits				
VIH	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		V	VOUT = 0.1 V or VCC - 0.1 V
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
VIL	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		V	VOUT = 0.1 V or VCC - 0.1 V
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
VOH	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		V	IOUT = -50 µA
		4.5	4.49	4.4	4.4			
		5.5	5.49	5.4	5.4			
		3.0		2.56	2.46		V	*VIN = VIL or VIH -12 mA IOH -24 mA -24 mA
		4.5		3.86	3.76			
		5.5		4.86	4.76			
VOL	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		V	IOUT = 50 µA
		4.5	0.001	0.1	0.1			
		5.5	0.001	0.1	0.1			
		3.0		0.36	0.44		V	*VIN = VIL or VIH 12 mA IOL 24 mA 24 mA
		4.5		0.36	0.44			
		5.5		0.36	0.44			
IIN	Maximum Input Leakage Current	5.5		±0.1	±1.0		µA	VI = VCC, GND
IOZ	Maximum 3-State Current	5.5		±0.5	±5.0		µA	VI (OE) = VIL, VIH VI = VCC, GND VO = VCC, GND
IOLD	†Minimum Dynamic Output Current	5.5			75		mA	VOLD = 1.65 V Max
IOHD		5.5			-75		mA	VOHD = 3.85 V Min
ICC	Maximum Quiescent Supply Current	5.5		8.0	80		µA	VIN = VCC or GND

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: IIN and ICC @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V VCC.

## MC74AC258 • MC74ACT258

**AC CHARACTERISTICS** (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC			74AC		Unit	Fig. No.
			T <sub>A</sub> = +25°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		
t <sub>PLH</sub>	Propagation Delay I <sub>n</sub> to $\bar{Z}_n$	3.3 5.0	2.0 1.5	6.0 4.5	9.5 7.5	1.5 1.0	11.0 8.5	ns	3-5
t <sub>PHL</sub>	Propagation Delay I <sub>n</sub> to $\bar{Z}_n$	3.3 5.0	2.0 1.5	5.0 4.0	8.5 6.5	1.5 1.0	9.5 7.0	ns	3-5
t <sub>PLH</sub>	Propagation Delay S to $\bar{Z}_n$	3.3 5.0	3.0 2.0	7.5 6.0	12.0 9.5	2.5 1.5	14.0 10.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay S to $\bar{Z}_n$	3.3 5.0	2.5 1.5	7.5 5.5	11.5 9.0	2.0 1.5	13.0 10.0	ns	3-6
t <sub>PZH</sub>	Output Enable Time	3.3 5.0	2.5 1.5	6.0 4.5	9.5 7.5	2.0 1.5	10.5 8.5	ns	3-7
t <sub>PZL</sub>	Output Enable Time	3.3 5.0	2.0 1.5	5.5 5.5	9.0 7.0	1.5 1.0	10.0 8.0	ns	3-8
t <sub>PHZ</sub>	Output Disable Time	3.3 5.0	2.5 2.0	5.5 5.5	10.0 8.5	2.0 1.5	11.0 9.0	ns	3-7
t <sub>PLZ</sub>	Output Disable Time	3.3 5.0	2.0 1.5	5.5 5.0	9.0 7.0	2.0 1.5	10.0 8.0	ns	3-8

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

## MC74AC258 • MC74ACT258

### DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74ACT		74ACT		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	2.0	2.0			
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	0.8	0.8			
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I <sub>OUT</sub> = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76	V	*V <sub>IIN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -24 mA I <sub>OH</sub> = -24 mA	
		5.5		4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I <sub>OUT</sub> = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44	V	*V <sub>IIN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 24 mA I <sub>OL</sub> = 24 mA	
		5.5		0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND	
ΔI <sub>CC</sub> T	Additional Max. I <sub>CC</sub> /Input	5.5	0.6		1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V	
I <sub>OZ</sub>	Maximum 3-State Current	5.5		±0.5	±5.0	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND	
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5			75	mA	V <sub>OLD</sub> = 1.65 V Max	
I <sub>OHD</sub>		5.5			-75	mA	V <sub>OHD</sub> = 3.85 V Min	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V <sub>IIN</sub> = V <sub>CC</sub> or GND	

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

## MC74AC258 • MC74ACT258

**AC CHARACTERISTICS** (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT			74ACT		Unit	Fig. No.
			T <sub>A</sub> = +25°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		
t <sub>PLH</sub>	Propagation Delay I <sub>n</sub> to $\bar{Z}_n$	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-5
t <sub>PHL</sub>	Propagation Delay I <sub>n</sub> to $\bar{Z}_n$	5.0	2.0	5.5	7.5	1.5	8.0	ns	3-5
t <sub>PLH</sub>	Propagation Delay S to $\bar{Z}_n$	5.0	3.0	7.5	10.5	2.0	11.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay S to $\bar{Z}_n$	5.0	1.5	7.0	9.5	1.5	11.0	ns	3-6
t <sub>PZH</sub>	Output Enable Time	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-7
t <sub>PZL</sub>	Output Enable Time	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-8
t <sub>PHZ</sub>	Output Disable Time	5.0	1.5	7.0	9.0	1.0	10.0	ns	3-7
t <sub>PLZ</sub>	Output Disable Time	5.0	2.0	6.0	8.0	1.5	9.0	ns	3-8

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

### CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
C <sub>PD</sub>	Power Dissipation Capacitance	55	pF	V <sub>CC</sub> = 5.0 V