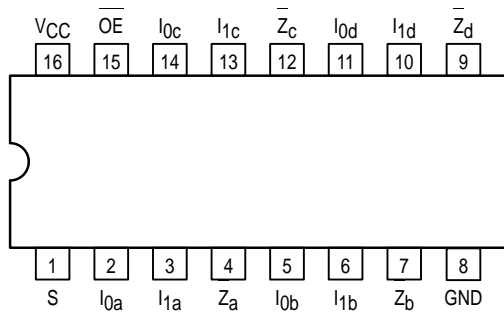# MOTOROLA

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 (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

**N SUFFIX
CASE 648-08
PLASTIC**

**D SUFFIX
CASE 751B-05
PLASTIC**

V_{CC}	$\overline{OE}$	I_{0c}	I_{1c}	$\overline{Z}_c$	I_{0d}	I_{1d}	$\overline{Z}_d$
16	15	14	13	12	11	10	9

1	2	3	4	5	6	7	8
S	I_{0a}	I_{1a}	$\overline{Z}_a$	I_{0b}	I_{1b}	$\overline{Z}_b$	GND

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
$\overline{Z}_a$–$\overline{Z}_d$	3-State Multiplexer Outputs
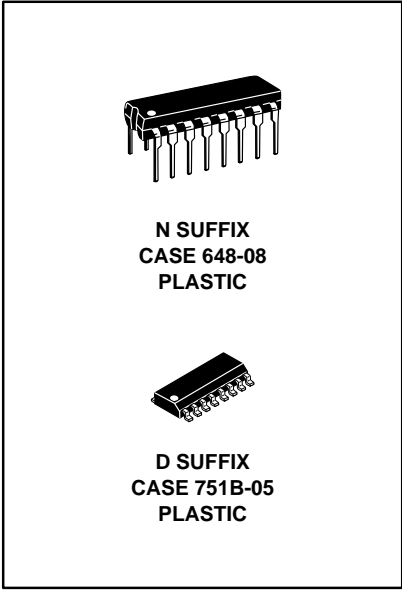
TRUTH TABLE

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

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

LOGIC SYMBOL

$\overline{OE}$ I_{0a} I_{1a} I_{0b} I_{1b} I_{0c} I_{1c} I_{0d} I_{1d}
S
Z_a Z_b Z_c Z_d
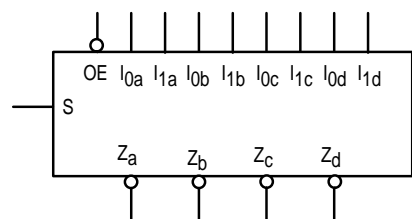
MC74AC258 MC74ACT258

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:

$\overline{Z}_a = \overline{OE} \cdot (I_{1a} \cdot S + I_{0a} \cdot \overline{S})$
$\overline{Z}_b = \overline{OE} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$
$\overline{Z}_c = \overline{OE} \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S})$
$Z_d = OE \cdot (I_{1d} \cdot S + I_{0d} \cdot S)$

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
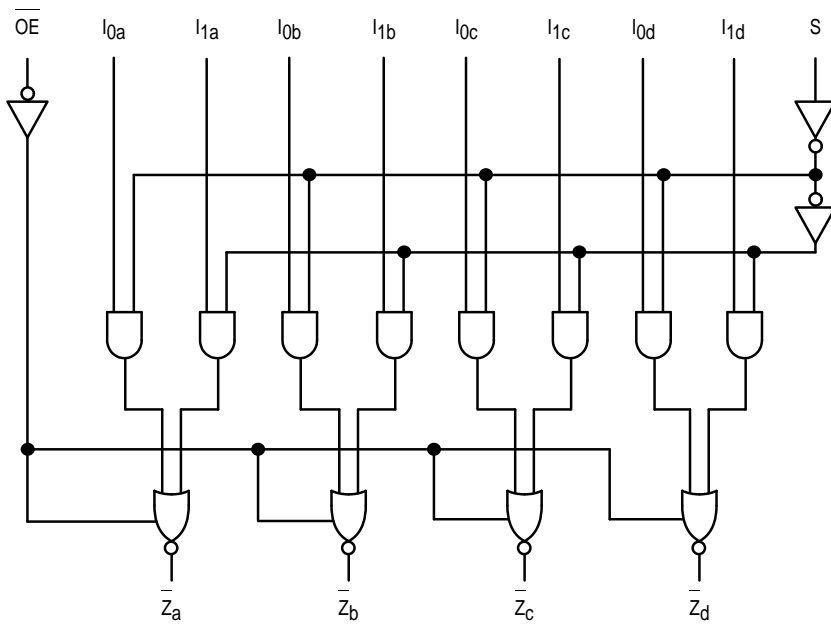
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	−0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
V_{out}	DC Output Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
I_{in}	DC Input Current, per Pin	±20	mA
I_{out}	DC Output Sink/Source Current, per Pin	±50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	±50	mA
T_{stg}	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_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Ref. to GND)		0		V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V_{CC} @ 3.0 V		150		ns/V
		V_{CC} @ 4.5 V		40		
		V_{CC} @ 5.5 V		25		
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V_{CC} @ 4.5 V		10		ns/V
		V_{CC} @ 5.5 V		8.0		
T_J	Junction Temperature (PDIP)				140	°C
T_A	Operating Ambient Temperature Range		−40	25	85	°C
I_{OH}	Output Current — High				−24	mA
I_{OL}	Output Current — Low				24	mA

1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V_{in} 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	V_{CC} (V)	74AC T_A = +25°C		74AC T_A = −40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{IL}	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	V	I_{OUT} = −50 µA
		3.0 4.5 5.5		2.56 3.86 4.86	2.46 3.76 4.76	V	*V_{IN} = V_{IL} or V_{IH} −12 mA I_{OH} −24 mA −24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	V	I_{OUT} = 50 µA
		3.0 4.5 5.5		0.36 0.36 0.36	0.44 0.44 0.44	V	*V_{IN} = V_{IL} or V_{IH} 12 mA I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	V_I = V_{CC}, GND
I_{OZ}	Maximum 3-State Current	5.5		±0.5	±5.0	µA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5			−75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	µA	V_{IN} = V_{CC} 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: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

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

Symbol	Parameter	V_{CC}* (V)	74AC $T_A = +25°C$ $C_L = 50$ pF			74AC $T_A = -40°C$ to $+85°C$ $C_L = 50$ pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay I_n to 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_{PHL}	Propagation Delay I_n to 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_{PLH}	Propagation Delay S to 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_{PHL}	Propagation Delay S to 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_{PZH}	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_{PZL}	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_{PHZ}	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_{PLZ}	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.

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DC CHARACTERISTICS

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

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

Symbol	Parameter	V_{CC}* (V)	74ACT T_A = +25°C C_L = 50 pF			74ACT T_A = −40°C to +85°C C_L = 50 pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay I_n to Z_n	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-5
t_{PHL}	Propagation Delay I_n to Z_n	5.0	2.0	5.5	7.5	1.5	8.0	ns	3-5
t_{PLH}	Propagation Delay S to Z_n	5.0	3.0	7.5	10.5	2.0	11.5	ns	3-6
t_{PHL}	Propagation Delay S to Z_n	5.0	1.5	7.0	9.5	1.5	11.0	ns	3-6
t_{PZH}	Output Enable Time	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-7
t_{PZL}	Output Enable Time	5.0	2.0	6.5	8.5	1.5	9.5	ns	3-8
t_{PHZ}	Output Disable Time	5.0	1.5	7.0	9.0	1.0	10.0	ns	3-7
t_{PLZ}	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_{IN}	Input Capacitance	4.5	pF	V_{CC} = 5.0 V
C_{PD}	Power Dissipation Capacitance	55	pF	V_{CC} = 5.0 V

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OUTLINE DIMENSIONS

N SUFFIX
PLASTIC DIP PACKAGE
CASE 648–08
ISSUE R
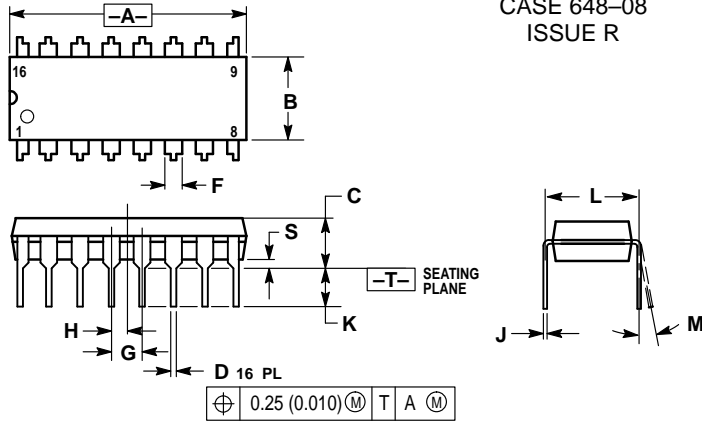
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0 °	10 °	0 °	10 °
S	0.020	0.040	0.51	1.01

⊕ | 0.25 (0.010) Ⓜ | T | A Ⓜ

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J

⊕ | 0.25 (0.010) Ⓜ | B Ⓢ
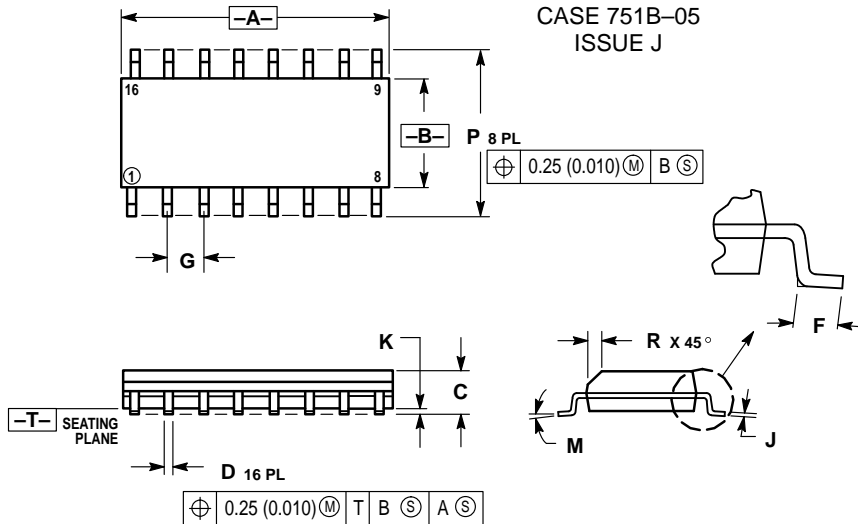
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

⊕ | 0.25 (0.010) Ⓜ | T | B Ⓢ | A Ⓢ

Ⓜ **MOTOROLA**   ◊