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MC74AC352, MC74ACT352

Dual 4-Input Multiplexer

The MC74AC352/74ACT352 is a very high-speed dual 4-input multiplexer with common Select inputs and individual Enable inputs for each section. It can select two bits of data from four sources. The two buffered outputs present data in the inverted (complementary) form. The MC74AC352/74ACT352 is the functional equivalent of the MC74AC153/74ACT153 except with inverted outputs.

- Inverted Version of the MC74AC153/74ACT153
- Separate Enables for Each Multiplexer
- Outputs Source/Sink 24 mA
- ′ACT352 Has TTL Compatible Inputs

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DUAL 4-INPUT MULTIPLEXER

Pin	Name
16	V_{CC}
15	$\overline{E}_b$
14	S_0
13	I_{3b}
12	I_{2b}
11	I_{1b}
10	I_{0b}
9	$\overline{Z}_b$
1	$\overline{E}_a$
2	S_1
3	I_{3a}
4	I_{2a}
5	I_{1a}
6	I_{0a}
7	$\overline{Z}_a$
8	GND
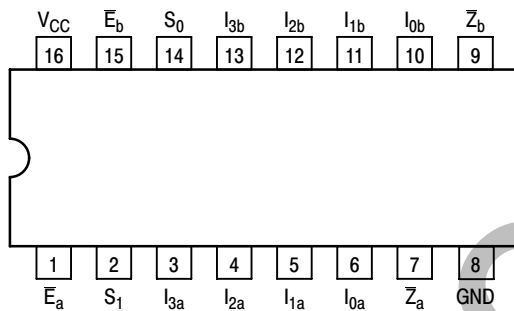
PIN NAMES

I_{0a}–I_{3a}	Side A Data Inputs
I_{0b}–I_{3b}	Side B Data Inputs
S_0, S_1	Common Select Inputs
$\overline{E}_a$	Side A Enable Input
$\overline{E}_b$	Side B Enable Input
Z_a, $\overline{Z}_b$	Multiplexer Outputs
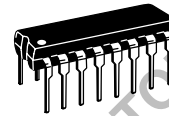
N SUFFIX
CASE 648-08
PLASTIC

D SUFFIX
CASE 751B-05
PLASTIC

LOGIC SYMBOL

TRUTH TABLE

Select Inputs		Inputs (a or b)					Output
S_0	S_1	$\overline{E}$	I_0	I_1	I_2	I_3	$\overline{Z}$
X	X	H	X	X	X	X	H
L	L	L	L	X	X	X	H
L	L	L	H	X	X	X	L
H	L	L	X	L	X	X	H
H	L	L	X	H	X	X	L
L	H	L	X	X	L	X	H
L	H	L	X	X	H	X	L
H	H	L	X	X	X	L	H
H	H	L	X	X	X	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
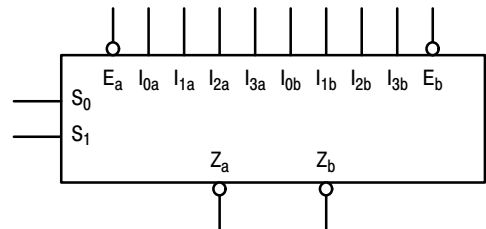
FUNCTIONAL DESCRIPTION

The MC74AC352/74ACT352 is a dual 4-input multiplexer. It selects two bits of data from up to four sources under the control of the common Select inputs (S_0, S_1). The two 4-input multiplexer circuits have individual active LOW Enables ($\overline{E}_a$, $\overline{E}_b$) which can be used to strobe the outputs independently. When the Enables ($\overline{E}_a$, $\overline{E}_b$) are HIGH, the corresponding outputs ($\overline{Z}_a$, $\overline{Z}_b$) are forced HIGH.

The logic equations for the outputs are shown below:

$$\overline{Z}_a = \overline{E}_a \cdot (I_{0a} \cdot \overline{S}_1 \cdot \overline{S}_0 + I_{1a} \cdot \overline{S}_1 \cdot S_0 + I_{2a} \cdot S_1 \cdot \overline{S}_0 + I_{3a} \cdot S_1 \cdot S_0)$$

$$\overline{Z}_b = \overline{E}_b \cdot (I_{0b} \cdot \overline{S}_1 \cdot \overline{S}_0 + I_{1b} \cdot \overline{S}_1 \cdot S_0 + I_{2b} \cdot S_1 \cdot \overline{S}_0 + I_{3b} \cdot S_1 \cdot S_0)$$

The MC74AC352/74ACT352 can be used to move data from a group of registers to a common output bus. The particular register from which the date came would be determined by the state of the Select inputs. A less obvious application is as a function generator. The MC74AC352/74ACT352 can generate two functions of three variables. This is useful for implementing highly irregular random logic.

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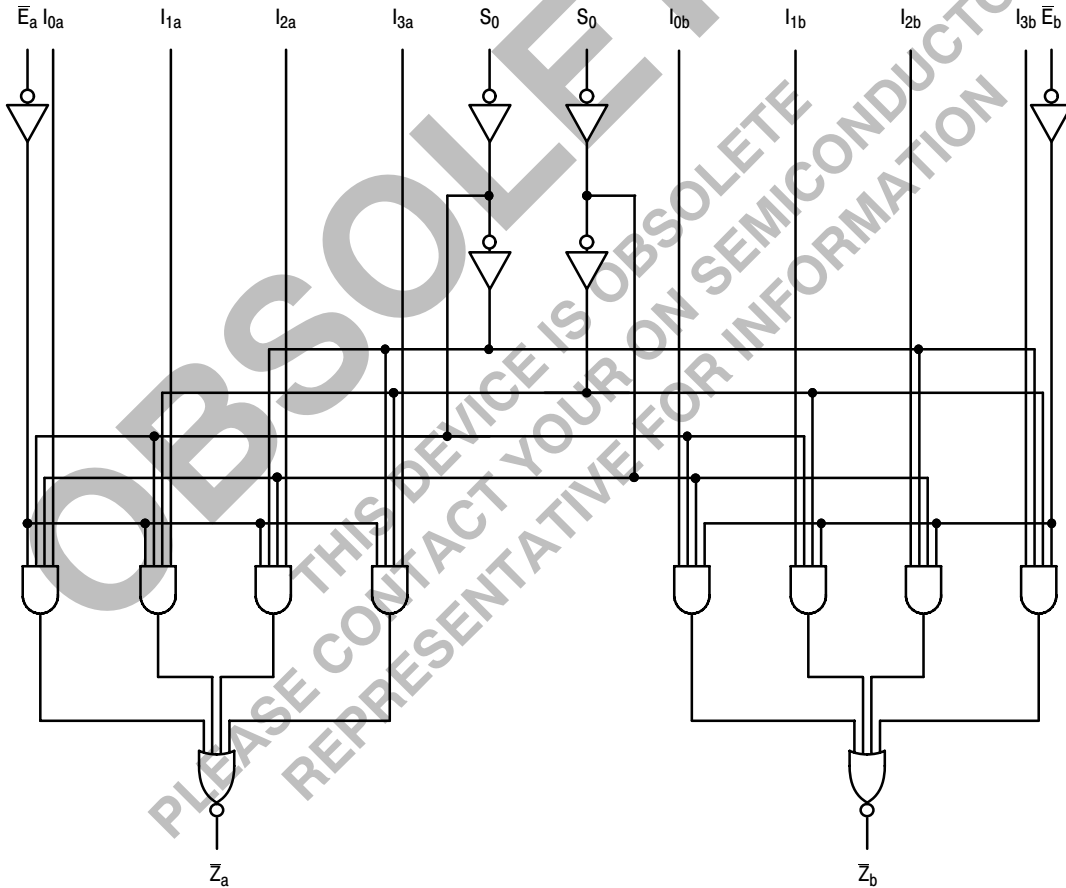
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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.

MC74AC352, MC74ACT352

DC CHARACTERISTICS

Symbol	Parameter	V_CC (V)	74AC T_A = +25°C Typ	74AC T_A = +25°C Guaranteed Limits	74AC T_A = −40°C to +85°C	Unit	Conditions
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} I_{OH} −12 mA −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} I_{OL} 12 mA 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = 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}.

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 S_n to $\overline{Z}_n$	3.3	2.0	8.5	15.0	1.0	17.5	ns	3-6
		5.0	2.0	6.5	11.0	1.0	12.5		
t_{PHL}	Propagation Delay S_n to $\overline{Z}_n$	3.3	2.0	8.0	14.5	1.0	16.5	ns	3-6
		5.0	2.0	6.0	11.0	1.0	12.0		
t_{PLH}	Propagation Delay $\overline{E}_n$ to $\overline{Z}_n$	3.3	2.0	6.0	13.5	1.0	16.0	ns	3-6
		5.0	2.0	4.5	9.5	1.0	11.0		
t_{PHL}	Propagation Delay $\overline{E}_n$ to $\overline{Z}_n$	3.3	2.0	5.5	11.0	1.0	12.5	ns	3-6
		5.0	2.0	4.0	8.0	1.0	9.0		
t_{PLH}	Propagation Delay I_n to $\overline{Z}_n$	3.3	2.0	7.0	12.5	1.0	14.5	ns	3-5
		5.0	2.0	5.0	9.0	1.0	10.5		
t_{PHL}	Propagation Delay I_n to $\overline{Z}_n$	3.3	2.0	7.0	11.5	1.0	13.0	ns	3-5
		5.0	2.0	5.0	8.5	1.0	10.0		

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

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74ACT T_A = +25°C	74ACT T_A = −40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits		
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_{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.

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 S_n to $\overline{Z}_n$	5.0	3.0	6.0	10.5	1.0	11.5	ns	3-6
t_{PHL}	Propagation Delay S_n to $\overline{Z}_n$	5.0	3.0	6.0	10.0	1.0	11.5	ns	3-6
t_{PLH}	Propagation Delay $\overline{E}_n$ to $\overline{Z}_n$	5.0	2.0	4.5	8.0	1.0	8.5	ns	3-6
t_{PHL}	Propagation Delay $\overline{E}_n$ to $\overline{Z}_n$	5.0	2.0	4.5	8.0	1.0	8.5	ns	3-6
t_{PLH}	Propagation Delay I_n to $\overline{Z}_n$	5.0	2.0	5.5	10.0	1.0	11.0	ns	3-5
t_{PHL}	Propagation Delay I_n to $\overline{Z}_n$	5.0	2.0	6.5	8.5	1.0	9.0	ns	3-5

* 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	50	pF	V_{CC} = 5.0 V

OUTLINE DIMENSIONS

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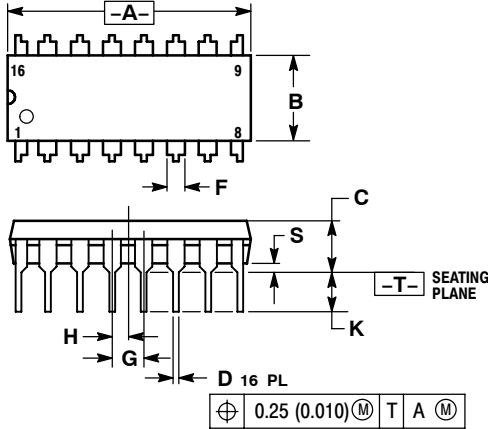
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL

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

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J
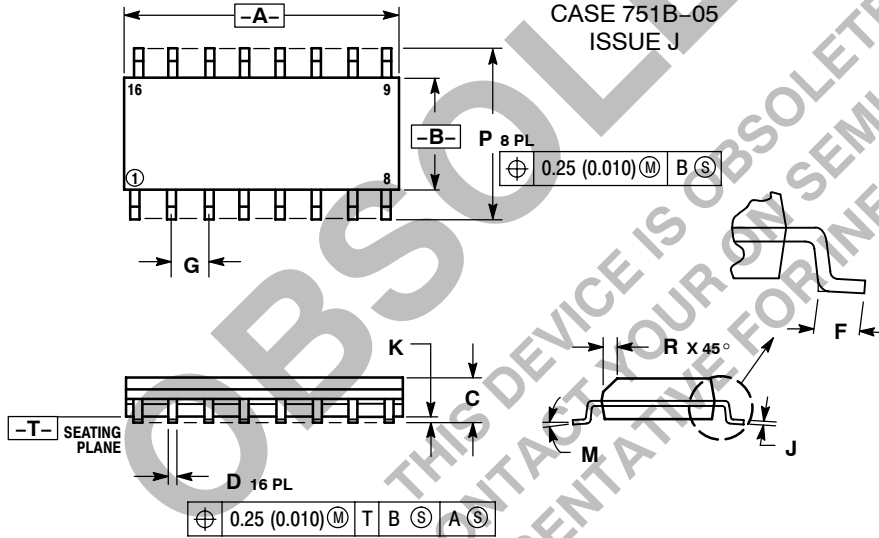
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) 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