MOTOROLA

MC74AC157
MC74ACT157

**QUAD 2-INPUT
MULTIPLEXER**
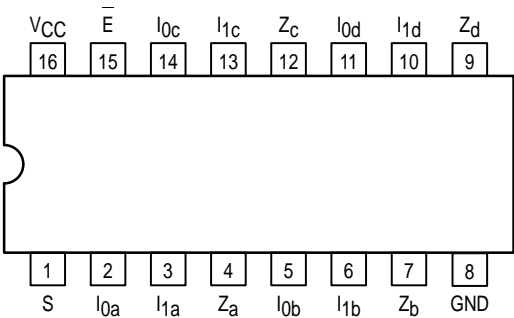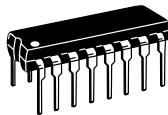
Quad 2-Input Multiplexer

The MC74AC157/74ACT157 is a high-speed quad 2-input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (noninverted) form. The MC74AC157/74ACT157 can also be used as a function generator.

- Outputs Source/Sink 24 mA
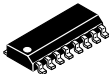- ′ACT157 Has TTL Compatible Inputs

**N SUFFIX
CASE 648-08
PLASTIC**

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

V_{CC}	$\overline{E}$	I_{0c}	I_{1c}	Z_c	I_{0d}	I_{1d}	Z_d
16	15	14	13	12	11	10	9
1	2	3	4	5	6	7	8
S	I_{0a}	I_{1a}	Z_a	I_{0b}	I_{1b}	Z_b	GND

PIN NAMES

I_{0a}–I_{0d}	Source 0 Data Inputs
I_{1a}–I_{1d}	Source 1 Data Inputs
E	Enable Input
S	Select Input
Z_a–Z_d	Outputs

TRUTH TABLE

Inputs				Outputs
$\overline{E}$	S	I_0	I_1	Z
H	X	X	X	L
L	X	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

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

LOGIC SYMBOL

$\overline{E}$ 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
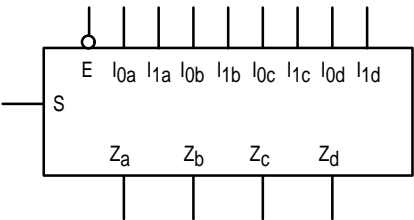
MC74AC157 MC74ACT157

FUNCTIONAL DESCRIPTION

The MC74AC157/74ACT157 is a quad 2-input multiplexer. It selects four bits of data from two sources under the control of a common Select input (S). The Enable input (E) is active-LOW. When E is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs. The MC74AC157/74ACT157 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:

$Z_a = \overline{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \overline{S})$
$Z_b = \overline{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$
$Z_c = \overline{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S})$
$Z_d = \overline{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot S)$

A common use of the MC74AC157/74ACT157 is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The MC74AC157/74ACT157 can generate any four of the sixteen different functions of two variables with one variable common. This is useful for implementing gating functions.

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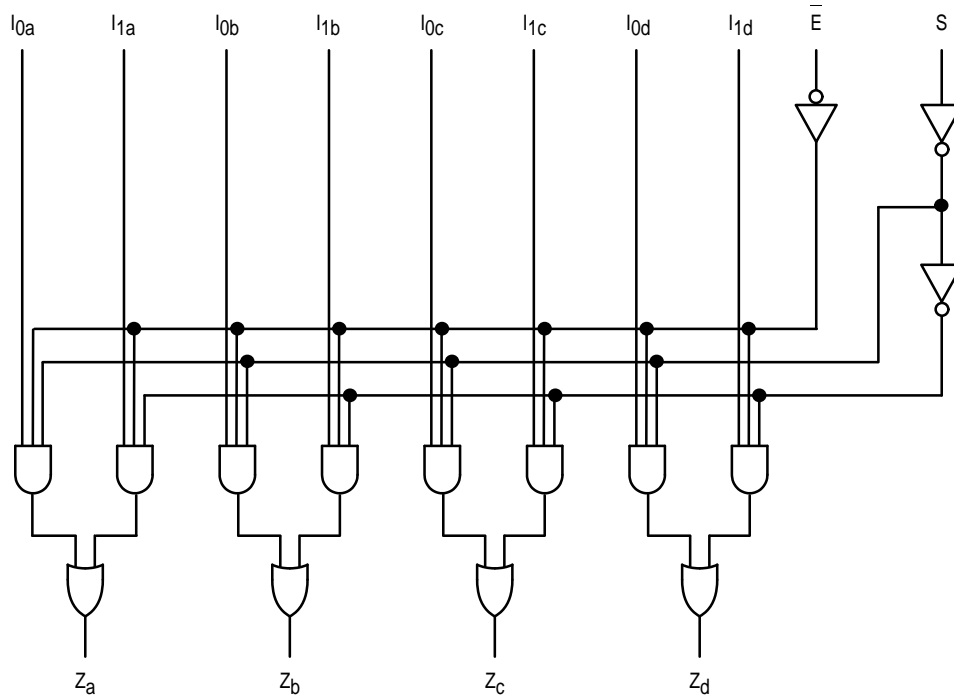
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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.

MC74AC157 MC74ACT157

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.

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	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V_{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V_{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I_{OUT} = −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	*V_{IN} = V_{IL} or V_{IH} $\quad$ −12 mA I_{OH} $\quad$ −24 mA $\quad$ −24 mA
		4.5		3.86	3.76		
		5.5		4.86	4.76		
V_{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I_{OUT} = 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	*V_{IN} = V_{IL} or V_{IH} $\quad$ 12 mA I_{OL} $\quad$ 24 mA $\quad$ 24 mA
		4.5		0.36	0.44		
		5.5		0.36	0.44		
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}.

FACT DATA

MC74AC157 MC74ACT157

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 to Z_n	3.3	1.5	7.0	11.5	1.5	13.0	ns	3-6
		5.0	1.5	5.5	9.0	1.5	10.0		
t_{PHL}	Propagation Delay S to Z_n	3.3	1.5	6.5	11.0	1.5	12.0	ns	3-6
		5.0	1.5	5.0	8.5	1.0	9.5		
t_{PLH}	$\underline{P}$ropagation Delay E to Z_n	3.3	1.5	7.0	11.5	1.5	13.0	ns	3-6
		5.0	1.5	5.5	9.0	1.5	10.0		
t_{PHL}	$\underline{P}$ropagation Delay E_n to Z_n	3.3	1.5	6.5	11.0	1.5	12	ns	3-6
		5.0	1.5	5.5	9.0	1.0	9.5		
t_{PLH}	Propagation Delay I_n to Z_n	3.3	1.5	5.0	8.5	1.0	9.0	ns	3-5
		5.0	1.5	4.0	6.5	1.0	7.0		
t_{PHL}	Propagation Delay I_n to Z_n	3.3	1.5	5.0	8.0	1.0	9.0	ns	3-5
		5.0	1.5	4.0	6.5	1.0	7.0		

* 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} −24 mA I_{OH} −24 mA
		5.5		4.86	4.76		
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} 24 mA I_{OL} 24 mA
		5.5		0.36	0.44		
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.

FACT DATA

MC74AC157 MC74ACT157

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 to Z_n	5.0	2.0		9.0	1.5	10.0	ns	3-6
t_{PHL}	Propagation Delay S to Z_n	5.0	2.0		9.5	2.0	10.5	ns	3-6
t_{PLH}	Propagation Delay E_n to Z_n	5.0	1.5		10	1.5	11.5	ns	3-6
t_{PHL}	Propagation Delay E_n to Z_n	5.0	1.5		8.5	1.0	9.0	ns	3-6
t_{PLH}	Propagation Delay I_n to Z_n	5.0	1.5		7.0	1.0	8.5	ns	3-5
t_{PHL}	Propagation Delay I_n to Z_n	5.0	1.5		7.5	1.0	8.5	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

MC74AC157 MC74ACT157

OUTLINE DIMENSIONS

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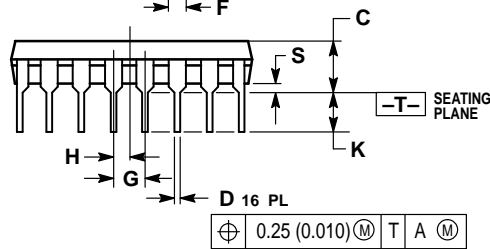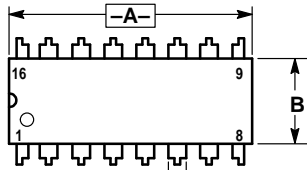
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

$\oplus$ 0.25 (0.010) Ⓜ T A Ⓜ

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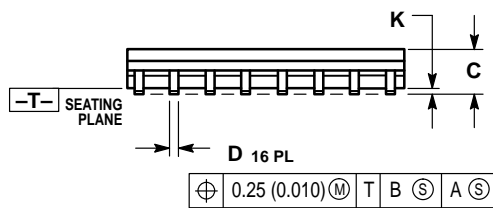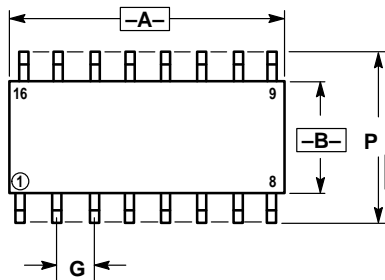
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005)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

$\oplus$ 0.25 (0.010) Ⓜ B Ⓢ

$\oplus$ 0.25 (0.010) Ⓜ T B Ⓢ A Ⓢ

| | MILLIMETERS | | INCHES | |
DIM	MIN	MAX	MIN	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

Ⓜ **MOTOROLA**

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