



MC74AC157 MC74ACT157

QUAD 2-INPUT
MULTIPLEXER

Quad 2-Input Multiplexer

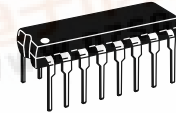
The MC74AC157/74ACT157 is a high-speed quad 2-input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (noninverted) form. The MC74AC157/74ACT157 can also be used as a function generator.

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

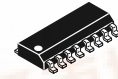


PIN NAMES

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



N SUFFIX
CASE 648-08
PLASTIC



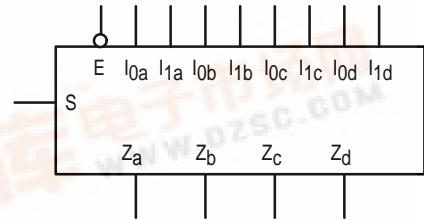
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CASE 751B-05
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TRUTH TABLE

| Inputs | | | | Outputs |
|--------|---|-------|-------|---------|
| E | S | I_0 | I_1 | Z |
| H | X | X | X | L |
| L | H | 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



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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:

$$Z_a = \bar{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S})$$

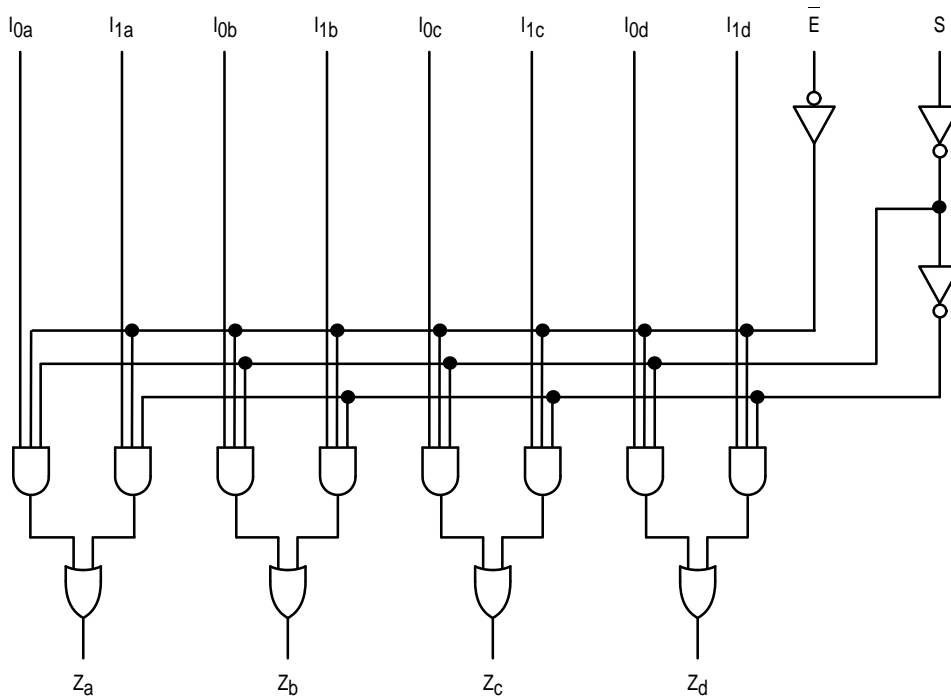
$$Z_b = \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

$$Z_c = \bar{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S})$$

$$Z_d = \bar{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})$$

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.

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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 | | 74AC | | Unit | Conditions |
|------------------|-----------------------------------|------------------------|------------------------|-------------------|---------------------------------|----|---|------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | 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} -12 mA I _{OH} -24 mA -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} 12 mA I _{OL} 24 mA 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}.

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

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 74AC | | Unit | Fig. No. |
|------------------|---|--------------------------|--|------------|-------------|--|--------------|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | | |
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay S to Z _n | 3.3 5.0 | 1.5 1.5 | 7.0 5.5 | 11.5 9.0 | 1.5 1.5 | 13.0 10.0 | ns | 3-6 |
| t _{PHL} | Propagation Delay S to Z _n | 3.3 5.0 | 1.5 1.5 | 6.5 5.0 | 11.0 8.5 | 1.5 1.0 | 12.0 9.5 | ns | 3-6 |
| t _{PLH} | Propagation Delay E to Z _n | 3.3 5.0 | 1.5 1.5 | 7.0 5.5 | 11.5 9.0 | 1.5 1.5 | 13.0 10.0 | ns | 3-6 |
| t _{PHL} | Propagation Delay E _n to Z _n | 3.3 5.0 | 1.5 1.5 | 6.5 5.5 | 11.0 9.0 | 1.5 1.0 | 12 9.5 | ns | 3-6 |
| t _{PLH} | Propagation Delay I _n to Z _n | 3.3 5.0 | 1.5 1.5 | 5.0 4.0 | 8.5 6.5 | 1.0 1.0 | 9.0 7.0 | ns | 3-5 |
| t _{PHL} | Propagation Delay I _n to Z _n | 3.3 5.0 | 1.5 1.5 | 5.0 4.0 | 8.0 6.5 | 1.0 1.0 | 9.0 7.0 | ns | 3-5 |

* 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 | | 74ACT | | Unit | Conditions |
|-------------------|--|------------------------|------------------------|-------------------|------------------------------------|----|---|------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | 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.

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

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Unit | Fig. No. |
|------------------|---|--------------------------|--|-----|-----|--|------|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | | |
| | | | 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.

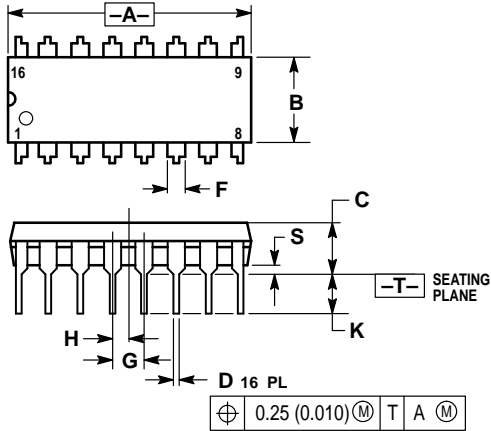
CAPACITANCE

| Symbol | Parameter | Value Typ | Unit | Test Conditions |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = 5.0 V |
| CPD | Power Dissipation Capacitance | 50 | pF | V _{CC} = 5.0 V |

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OUTLINE DIMENSIONS

N SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R

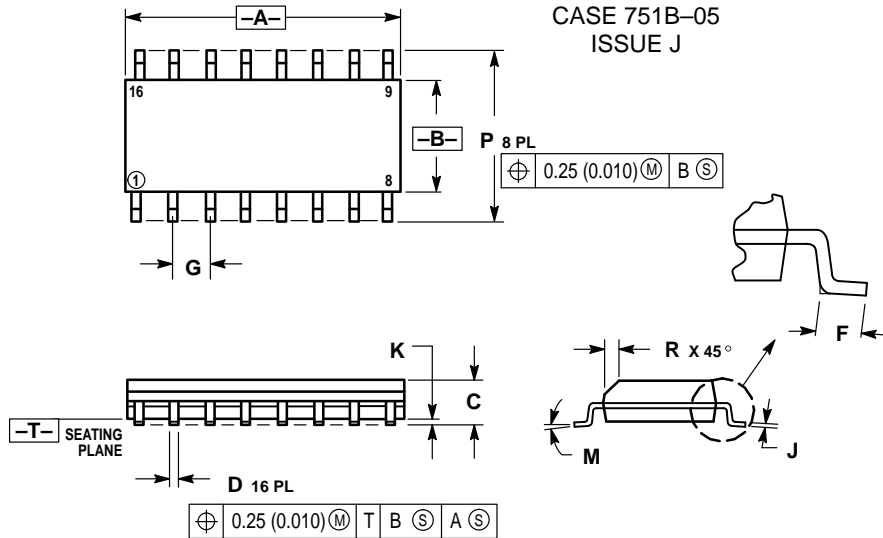


NOTES:

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 | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | 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.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | 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 |

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