## National Semiconductor

# MM54C157/MM74C157 Quad 2-Input Multiplexers

## General Description

These multiplexers are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement transistors. They consist of four 2-input multiplexers with common select and enable inputs. When the enable input is at logical "0" the four outputs assume the values as selected from the inputs. When the enable input is at logical "1", the outputs assume logical "0". Select decoding is done internally resulting in a single select input only.

## Features

- Supply voltage range ......... 3V to 15V
- High noise immunity ......... 0.45 $V_{CC}$ (typ.)
- Low power ......... 50 nW (typ.)
- Tenth power TTL compatible ... Drive 2 LPTTL loads

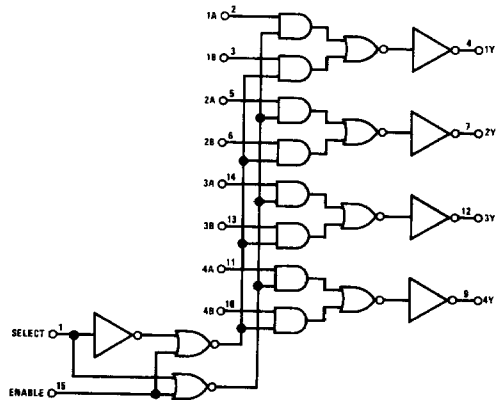## Logic & Connection Diagrams

### Dual-In-Line Package
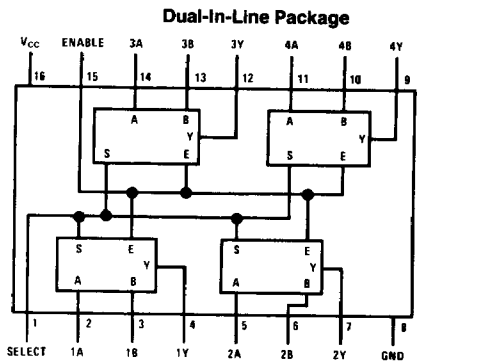


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**Top View**

**Order Number MM54C157\* or MM74C157\***

*Please look into Section 8, Appendix D
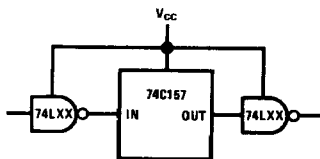for availability of various package types.



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## Truth Table

| Enable | Select | A | B | Output Y |
|--------|--------|---|---|----------|
| 1 | X | X | X | 0 |
| 0 | 0 | 0 | X | 0 |
| 0 | 0 | 1 | X | 1 |
| 0 | 1 | X | 0 | 0 |
| 0 | 1 | X | 1 | 1 |

### 74L Compatibility



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### Guaranteed Noise Margin as a Function of $V_{CC}$
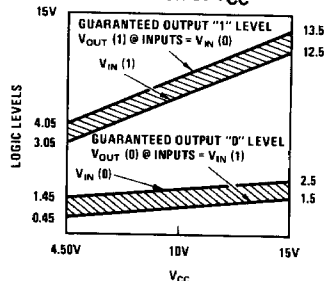


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## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|---|---|
| Voltage at Any Pin | $-0.3V$ to $V_{CC} + 0.3V$ |
| Operating Temperature Range | |
| MM54C157 | $-55°C$ to $+125°C$ |
| MM74C157 | $-40°C$ to $+85°C$ |

| | |
|---|---|
| Storage Temperature Range | $-65°C$ to $+150°C$ |
| Maximum $V_{CC}$ Voltage | 18V |
| Power Dissipation ($P_D$) | |
| Dual-In-Line | 700 mW |
| Small Outline | 500 mW |
| Operating $V_{CC}$ Range | 3V to 15V |
| Lead Temperature (Soldering, 10 sec.) | 260°C |

## DC Electrical Characteristics Min/Max limits apply across temperature range unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **CMOS TO CMOS** | | | | | | |
| $V_{IN(1)}$ | Logical "1" Input Voltage | $V_{CC} = 5V$ | 3.5 | | | V |
| | | $V_{CC} = 10V$ | 8.0 | | | V |
| $V_{IN(0)}$ | Logical "0" Input Voltage | $V_{CC} = 5V$ | | | 1.5 | V |
| | | $V_{CC} = 10V$ | | | 2.0 | V |
| $V_{OUT(1)}$ | Logical "1" Output Voltage | $V_{CC} = 5V$ | 4.5 | | | V |
| | | $V_{CC} = 10V$ | 9.0 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | $V_{CC} = 5V$ | | | 0.5 | V |
| | | $V_{CC} = 10V$ | | | 1.0 | V |
| $I_{IN(1)}$ | Logical "1" Input Current | $V_{CC} = 15V$ | | 0.005 | 1.0 | $\mu A$ |
| $I_{IN(0)}$ | Logical "0" Input Current | $V_{CC} = 15V$ | $-1.0$ | $-0.005$ | | $\mu A$ |
| $I_{CC}$ | Supply Current | $V_{CC} = 15V$ | | 0.05 | 60 | $\mu A$ |
| **CMOS TO TENTH POWER INTERFACE** | | | | | | |
| $V_{IN(1)}$ | Logical "1" Input Voltage | 54C $V_{CC} = 4.5V$ | $V_{CC} - 1.5$ | | | V |
| | | 74C $V_{CC} = 4.75V$ | $V_{CC} - 1.5$ | | | V |
| $V_{IN(0)}$ | Logical "0" Input Voltage | 54C $V_{CC} = 4.5V$ | | | 0.8 | V |
| | | 74C $V_{CC} = 4.75V$ | | | 0.8 | V |
| $V_{OUT(1)}$ | Logical "1" Output Voltage | 54C $V_{CC} = 4.5V, I_O = -360 \mu A$ | 2.4 | | | V |
| | | 74C $V_{CC} = 4.75V, I_O = -360 \mu A$ | 2.4 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | 54C $V_{CC} = 4.5V, I_O = 360 \mu A$ | | | 0.4 | V |
| | | 74C $V_{CC} = 4.75V, I_O = 360 \mu A$ | | | 0.4 | V |
| **OUTPUT DRIVE (See 54C/74C Family Characteristics Data Sheet) (Short Circuit Current)** | | | | | | |
| $I_{SOURCE}$ | Output Source Current | $V_{CC} = 5V, V_{IN(0)} = 0V$ $T_A = 25°C, V_{OUT} = 0V$ | $-1.75$ | | | mA |
| $I_{SOURCE}$ | Output Source Current | $V_{CC} = 10V, V_{IN(0)} = 0V$ $T_A = 25°C, V_{OUT} = 0V$ | $-8.0$ | | | mA |
| $I_{SINK}$ | Output Sink Current | $V_{CC} = 5V, V_{IN(1)} = 5V$ $T_A = 25°C, V_{OUT} = V_{CC}$ | 1.75 | | | mA |
| $I_{SINK}$ | Output Sink Current | $V_{CC} = 10V, V_{IN(1)} = 10V$ $T_A = 25°C, V_{OUT} = V_{CC}$ | 8.0 | | | mA |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

## AC Electrical Characteristics* $T_A = 25°C$, $C_L = 50$ pF, unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--------|-----------|------------|-----|-----|-----|-------|
| $t_{pd0}$, $t_{pd1}$ | Propagation Delay from Data to Output | $V_{CC} = 5.0V$<br>$V_{CC} = 10V$ | | 150<br>70 | 250<br>110 | ns<br>ns |
| $t_{pd0}$, $t_{pd1}$ | Propagation Delay from Select to Output | $V_{CC} = 5V$<br>$V_{CC} = 10V$ | | 180<br>80 | 300<br>130 | ns<br>ns |
| $t_{pd0}$, $t_{pd1}$ | Propagation Delay from Enable to Output | $V_{CC} = 5V$<br>$V_{CC} = 10V$ | | 180<br>80 | 300<br>130 | ns<br>ns |
| $C_{IN}$ | Input Capacitance | (Note 2) | | 5 | | pF |
| $C_{PD}$ | Power Dissipation Capacitance | (Note 3) | | 20 | | pF |

*AC Parameters are guaranteed by DC correlated testing.

Note 2: Capacitance is guaranteed by periodic testing.

Note 3: $C_{PD}$ determines the no load AC power consumption of any CMOS device. For complete explanation, see 54C/74C Family Characteristics, Application Note AN-90.

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