

## MM74C154 4-Line to 16-Line Decoder/Demultiplexer

### General Description

The MM74C154 one of sixteen decoder is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. The device is provided with two strobe inputs, both of which must be in the logical "0" state for normal operation. If either strobe input is in the logical "1" state, all 16 outputs will go to the logical "1" state.

To use the product as a demultiplexer, one of the strobe inputs serves as a data input terminal, while the other strobe input must be maintained in the logical "0" state. The information will then be transmitted to the selected output as determined by the 4-line input address.

### Features

- Supply voltage range: 3V to 15V
- Tenth power TTL compatible: Drive 2 LPTTL loads
- High noise margin: 1V guaranteed
- High noise immunity: 0.45 V<sub>CC</sub> (typ.)

### Applications

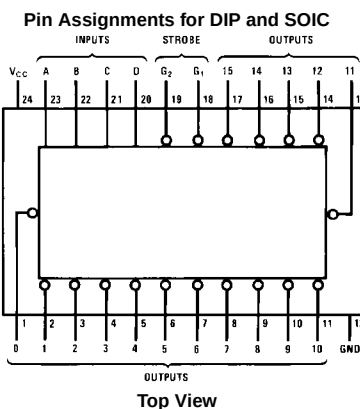
- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm systems
- Industrial electronics
- Remote metering
- Computers

### Ordering Code:

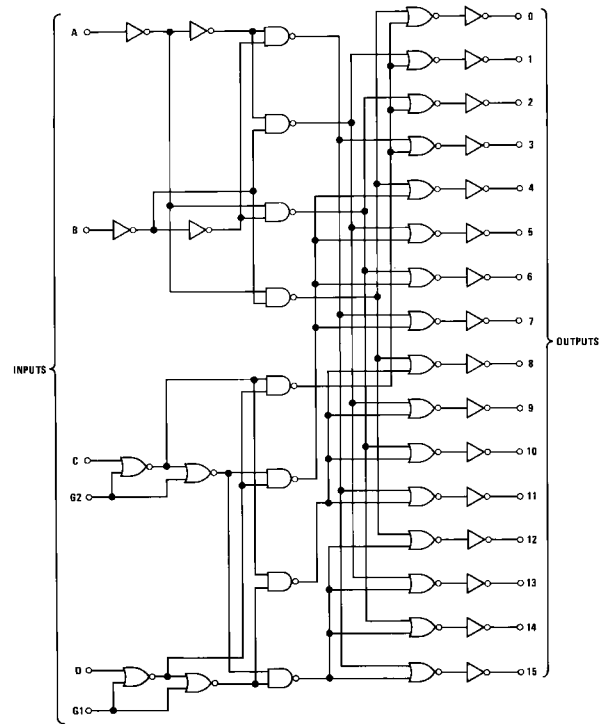
| Order Number | Package Number | Package Description                                                        |
|--------------|----------------|----------------------------------------------------------------------------|
| MM74C154WM   | M24B           | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| MM74C154N    | N24A           | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.600" Wide     |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Connection Diagram



## Logic Diagram



## Truth Table

| Inputs |    |   |   |   | Outputs |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|--------|----|---|---|---|---------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| G1     | G2 | D | C | B | A       | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| L      | L  | L | L | L | L       | L | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | L | L | H       | H | L | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | L | H | L       | H | H | L | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | L | H | H       | H | H | H | L | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | L | L       | H | H | H | H | H | L | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | H | L       | H | H | H | H | H | L | H | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | H | H       | H | H | H | H | H | H | L | H | H | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | L | L       | L | H | H | H | H | H | H | H | L | H | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | L | L       | H | H | H | H | H | H | H | H | H | L | H  | H  | H  | H  | H  | H  |
| L      | L  | L | H | L | H       | L | H | H | H | H | H | H | H | H | H | L  | H  | H  | H  | H  | H  |
| L      | L  | L | H | L | H       | H | H | H | H | H | H | H | H | H | H | H  | L  | H  | H  | H  | H  |
| L      | L  | L | H | H | L       | L | H | H | H | H | H | H | H | H | H | H  | H  | L  | H  | H  | H  |
| L      | L  | L | H | H | H       | L | H | H | H | H | H | H | H | H | H | H  | H  | H  | L  | H  | H  |
| L      | L  | L | H | H | H       | H | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | L  | H  |
| L      | L  | L | H | H | H       | H | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | L  |
| L      | H  | X | X | X | X       | H | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| H      | L  | X | X | X | X       | H | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |
| H      | H  | X | X | X | X       | H | H | H | H | H | H | H | H | H | H | H  | H  | H  | H  | H  | H  |

X = "Don't Care" Condition

|                                          |                          |                          |           |
|------------------------------------------|--------------------------|--------------------------|-----------|
| <b>Absolute Maximum Ratings</b> (Note 1) |                          | Operating $V_{CC}$ Range | 3V to 15V |
| Voltage at Any Pin                       | -0.3V to $V_{CC} + 0.3V$ | Lead Temperature         | 260°C     |
| Operating Temperature Range              | -40°C to +85°C           | (Soldering, 10 seconds)  |           |
| Storage Temperature Range                | -65°C to +150°C          |                          |           |
| Maximum $V_{CC}$ Voltage                 | 18V                      |                          |           |
| Power Dissipation                        |                          |                          |           |
| Dual-In-Line                             | 700 mW                   |                          |           |
| Small Outline                            | 500 mW                   |                          |           |

**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.

## DC Electrical Characteristics

Min/max limits apply across temperature range unless otherwise noted

| Symbol                                                                              | Parameter                  | Conditions                                                                | Min            | Typ    | Max | Units   |
|-------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------|----------------|--------|-----|---------|
| <b>CMOS TO CMOS</b>                                                                 |                            |                                                                           |                |        |     |         |
| $V_{IN(1)}$                                                                         | Logical "1" Input Voltage  | $V_{CC} = 5.0V$                                                           | 3.5            |        |     | V       |
|                                                                                     |                            | $V_{CC} = 10V$                                                            | 8.0            |        |     | V       |
| $V_{IN(0)}$                                                                         | Logical "0" Input Voltage  | $V_{CC} = 5.0V$                                                           |                |        | 1.5 | V       |
|                                                                                     |                            | $V_{CC} = 10V$                                                            |                |        | 2.0 | V       |
| $V_{OUT(1)}$                                                                        | Logical "1" Output Voltage | $V_{CC} = 5.0V, I_O = -10\mu A$                                           | 4.5            |        |     | V       |
|                                                                                     |                            | $V_{CC} = 10V, I_O = -10\mu A$                                            | 9.0            |        |     | V       |
| $V_{OUT(0)}$                                                                        | Logical "0" Output Voltage | $V_{CC} = 5.0V, I_O = 10\mu A$                                            |                |        | 0.5 | V       |
|                                                                                     |                            | $V_{CC} = 10V, I_O = 10\mu A$                                             |                |        | 1.0 | V       |
| $I_{IN(1)}$                                                                         | Logical "1" Input Current  | $V_{CC} = 15V, V_{IN} = 15V$                                              |                | 0.005  | 1.0 | $\mu A$ |
| $I_{IN(0)}$                                                                         | Logical "0" Input Current  | $V_{CC} = 15V, V_{IN} = 0V$                                               | -1.0           | -0.005 |     | $\mu A$ |
| $I_{CC}$                                                                            | Supply Current             | $V_{CC} = 15V$                                                            |                | 0.05   | 300 | $\mu A$ |
| <b>CMOS TO LPTTL INTERFACE</b>                                                      |                            |                                                                           |                |        |     |         |
| $V_{IN(1)}$                                                                         | Logical "1" Input Voltage  | $V_{CC} = 4.75V$                                                          | $V_{CC} - 1.5$ |        |     | V       |
| $V_{IN(0)}$                                                                         | Logical "0" Input Voltage  | $V_{CC} = 4.75V$                                                          |                |        | 0.8 | V       |
| $V_{OUT(1)}$                                                                        | Logical "1" Output Voltage | $V_{CC} = 4.75V, I_O = -100\mu A$                                         | 2.4            |        |     | V       |
| $V_{OUT(0)}$                                                                        | Logical "0" Output Voltage | $V_{CC} = 4.75V, I_O = 360\mu A$                                          |                |        | 0.4 | V       |
| <b>OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)</b> |                            |                                                                           |                |        |     |         |
| $I_{SOURCE}$                                                                        | Output Source Current      | $V_{CC} = 5.0V, V_{IN(0)} = 0V$<br>$T_A = 25^\circ C, V_{OUT} = 0V$       | -1.75          |        |     | mA      |
| $I_{SOURCE}$                                                                        | Output Source Current      | $V_{CC} = 10V, V_{IN(0)} = 0V$<br>$T_A = 25^\circ C, V_{OUT} = 0V$        | -8.0           |        |     | mA      |
| $I_{SINK}$                                                                          | Output Sink Current        | $V_{CC} = 5.0V, V_{IN(1)} = 5.0V$<br>$T_A = 25^\circ C, V_{OUT} = V_{CC}$ | 1.75           |        |     | mA      |
| $I_{SINK}$                                                                          | Output Sink Current        | $V_{CC} = 10V, V_{IN(1)} = 10V$<br>$T_A = 25^\circ C, V_{OUT} = V_{CC}$   | 8.0            |        |     | mA      |

## AC Electrical Characteristics (Note 2)

$T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise noted

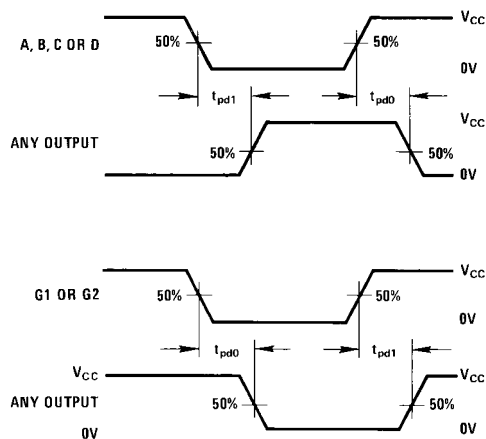
| Symbol    | Parameter                                                       | Conditions                                      | Min | Typ        | Max        | Units |
|-----------|-----------------------------------------------------------------|-------------------------------------------------|-----|------------|------------|-------|
| $t_{pd0}$ | Propagation Delay to a Logical "0" from Any Input to Any Output | $V_{CC} = 5.0\text{V}$<br>$V_{CC} = 10\text{V}$ |     | 275<br>100 | 400<br>200 | ns    |
| $t_{pd0}$ | Propagation Delay to a Logical "0" from G1 or G2 to Any Output  | $V_{CC} = 5.0\text{V}$<br>$V_{CC} = 10\text{V}$ |     | 275<br>100 | 400<br>200 | ns    |
| $t_{pd0}$ | Propagation Delay to a Logical "0" from Any Input to Any Output | $V_{CC} = 5.0\text{V}$<br>$V_{CC} = 10\text{V}$ |     | 265<br>100 | 400<br>200 | ns    |
| $t_{pd1}$ | Propagation Delay to a Logical "1" from G1 or G2 to Any Output  | $V_{CC} = 5.0\text{V}$<br>$V_{CC} = 10\text{V}$ |     | 265<br>100 | 400<br>200 | ns    |
| $C_{IN}$  | Input Capacitance                                               | (Note 3)                                        |     | 5.0        |            | pF    |
| $C_{PD}$  | Power Dissipation Capacitance                                   | (Note 4)                                        |     | 60         |            | pF    |

**Note 2:** AC Parameters are guaranteed by DC correlated testing.

**Note 3:** Capacitance is guaranteed by periodic testing.

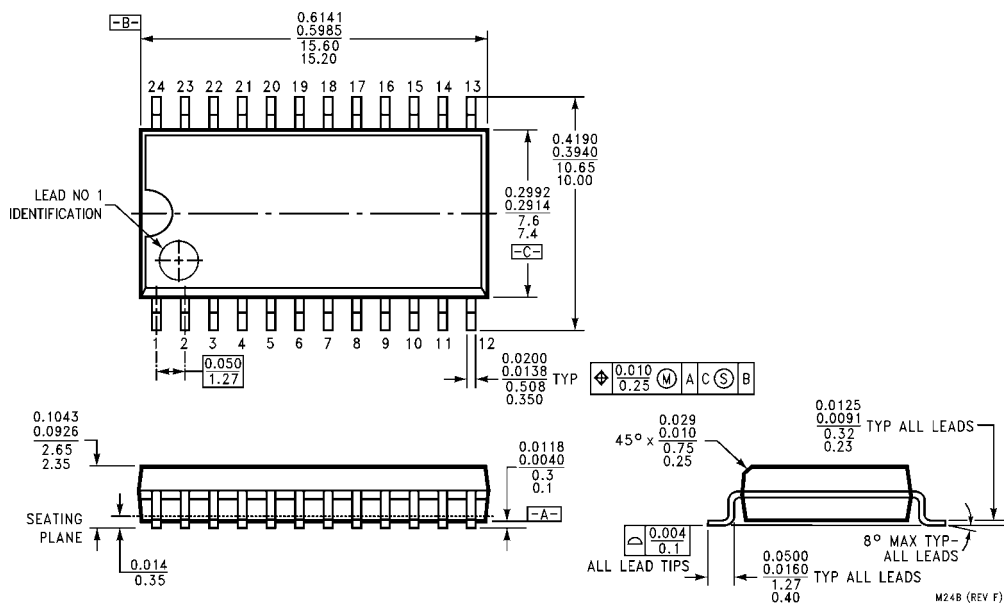
**Note 4:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note AN-90.

## Switching Time Waveforms



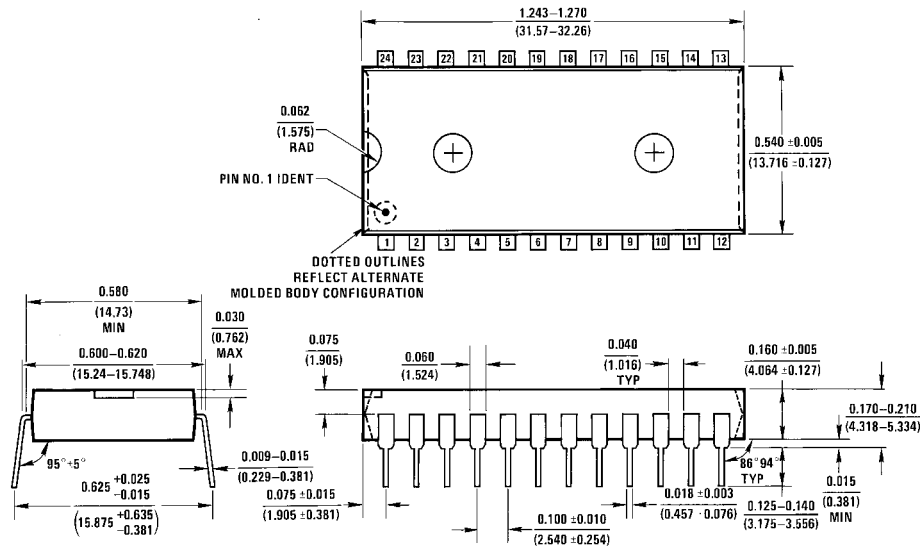
$t_r = t_f = 20\text{ ns}$

# Physical Dimensions inches (millimeters) unless otherwise noted



24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M24B

# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



N24A (REV E)

24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.600" Wide  
Package Number N24A

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