

## 54LS151/DM54LS151/DM74LS151 Data Selector/Multiplexer

### General Description

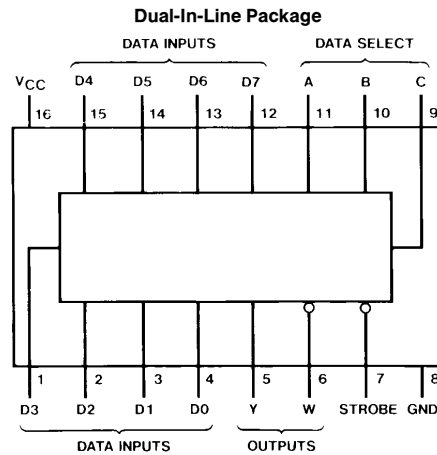
This data selector/multiplexer contains full on-chip decoding to select the desired data source. The 'LS151 selects one-of-eight data sources. The 'LS151 has a strobe input which must be at a low logic level to enable these devices. A high level at the strobe forces the W output high, and the Y output low.

The 'LS151 features complementary Y and W outputs.

### Features

- Select one-of-eight data lines
- Performs parallel-to-serial conversion
- Permits multiplexing from N lines to one line
- Also for use as Boolean function generator
- Typical average propagation delay time data input to W output 12.5 ns
- Typical power dissipation 30 mW
- Alternate Military/Aerospace device (54LS151) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

### Connection Diagram



TL/F/6392-1

Order Number 54LS151DMQB, 54LS151FMQB, 54LS151LMQB,  
DM54LS151J, DM54LS151W, DM74LS151M or DM74LS151N  
See NS Package Number E20A, J16A, M16A, N16E or W16A

### Truth Table

| Inputs |   |   |             | Outputs |                 |
|--------|---|---|-------------|---------|-----------------|
| Select |   |   | Strobe<br>S | Y       | W               |
| C      | B | A |             |         |                 |
| X      | X | X | H           | L       | H               |
| L      | L | L | L           | D0      | $\overline{D0}$ |
| L      | L | H | L           | D1      | $\overline{D1}$ |
| L      | H | L | L           | D2      | $\overline{D2}$ |
| L      | H | H | L           | D3      | $\overline{D3}$ |
| H      | L | L | L           | D4      | $\overline{D4}$ |
| H      | L | H | L           | D5      | $\overline{D5}$ |
| H      | H | L | L           | D6      | $\overline{D6}$ |
| H      | H | H | L           | D7      | $\overline{D7}$ |

H = High Level, L = Low Level, X = Don't Care  
D0, D1...D7 = the level of the respective D input

## Absolute Maximum Ratings (Note)

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

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 7V              |
| Operating Free Air Temperature Range |                 |
| DM54LS and 54LS                      | -55°C to +125°C |
| DM74LS                               | 0°C to +70°C    |
| Storage Temperature Range            | -65°C to +150°C |

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

| Symbol          | Parameter                      | DM54LS151 |     |      | DM74LS151 |     |      | Units |
|-----------------|--------------------------------|-----------|-----|------|-----------|-----|------|-------|
|                 |                                | Min       | Nom | Max  | Min       | Nom | Max  |       |
| V <sub>CC</sub> | Supply Voltage                 | 4.5       | 5   | 5.5  | 4.75      | 5   | 5.25 | V     |
| V <sub>IH</sub> | High Level Input Voltage       | 2         |     |      | 2         |     |      | V     |
| V <sub>IL</sub> | Low Level Input Voltage        |           |     | 0.7  |           |     | 0.8  | V     |
| I <sub>OH</sub> | High Level Output Current      |           |     | -0.4 |           |     | -0.4 | mA    |
| I <sub>OL</sub> | Low Level Output Current       |           |     | 4    |           |     | 8    | mA    |
| T <sub>A</sub>  | Free Air Operating Temperature | -55       |     | 125  | 0         |     | 70   | °C    |

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

| Symbol          | Parameter                         | Conditions   | Min  | Typ (Note 1)                                  | Max  | Units |
|-----------------|-----------------------------------|--|------|---|------|-------|
| V <sub>I</sub>  | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA   |      |   | -1.5 | V     |
| V <sub>OH</sub> | High Level Output Voltage         | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max<br>V <sub>IL</sub> = Max, V <sub>IH</sub> = Min | DM54 | 2.5   | 3.4  | V     |
|                 |                                   |  | DM74 | 2.7   | 3.4  |       |
| V <sub>OL</sub> | Low Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max<br>V <sub>IL</sub> = Max, V <sub>IH</sub> = Min | DM54 |   | 0.25 | V     |
|                 |                                   |  | DM74 |   | 0.35 |       |
|                 |                                   |  | DM74 | I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = Min |      |       |
| I <sub>I</sub>  | Input Current @ Max Input Voltage | V <sub>CC</sub> = Max, V <sub>I</sub> = 7V   |      |   | 0.1  | mA    |
| I <sub>IH</sub> | High Level Input Current          | V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V   |      |   | 20   | μA    |
| I <sub>IL</sub> | Low Level Input Current           | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V   |      |   | -0.4 | mA    |
| I <sub>OS</sub> | Short Circuit Output Current      | V <sub>CC</sub> = Max (Note 2)   | DM54 | -20   | -100 | mA    |
|                 |                                   |  | DM74 | -20   | -100 |       |
| I <sub>CC</sub> | Supply Current                    | V <sub>CC</sub> = Max (Note 3)   |      | 6   | 10   | mA    |

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

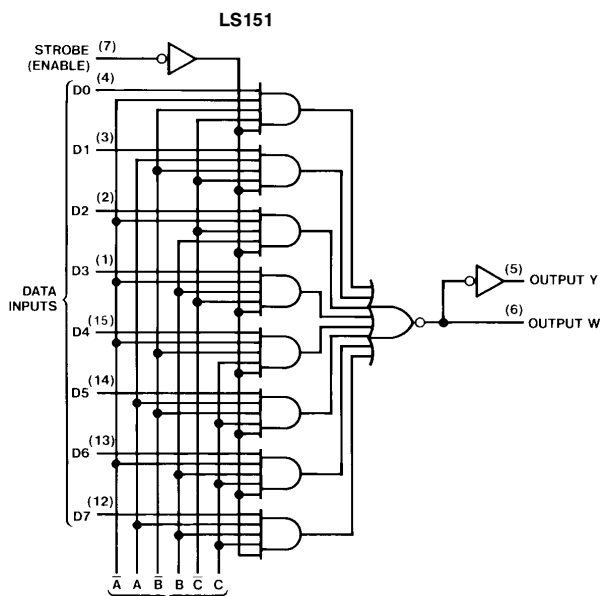
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I<sub>CC</sub> is measured with all outputs open, strobe and data select inputs at 4.5V, and all other inputs open.

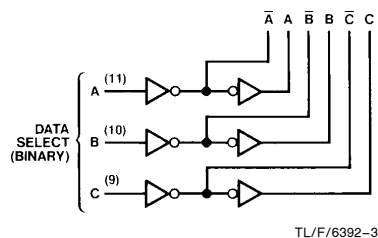
## Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

| Symbol    | Parameter  | From (Input)<br>To (output) | $R_L = 2\text{ k}\Omega$ |     |                      |     | Units |
|-----------|--|-----------------------------|--------------------------|-----|----------------------|-----|-------|
|           |  |                             | $C_L = 15\text{ pF}$     |     | $C_L = 50\text{ pF}$ |     |       |
|           |  |                             | Min                      | Max | Min                  | Max |       |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Select<br>(4 Levels) to Y   |                          | 43  |                      | 46  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Select<br>(4 Levels) to Y   |                          | 30  |                      | 36  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Select<br>(3 Levels) to W   |                          | 23  |                      | 25  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Select<br>(3 Levels) to W   |                          | 32  |                      | 40  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Strobe<br>to Y              |                          | 42  |                      | 44  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Strobe<br>to Y              |                          | 32  |                      | 40  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Strobe<br>to W              |                          | 24  |                      | 27  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Strobe<br>to W              |                          | 30  |                      | 36  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | D0 thru D7<br>to Y          |                          | 32  |                      | 35  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | D0 thru D7<br>to Y          |                          | 26  |                      | 33  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | D0 thru D7<br>to W          |                          | 21  |                      | 25  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | D0 thru D7<br>to W          |                          | 20  |                      | 27  | ns    |

## Logic Diagram



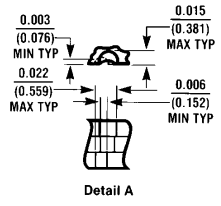
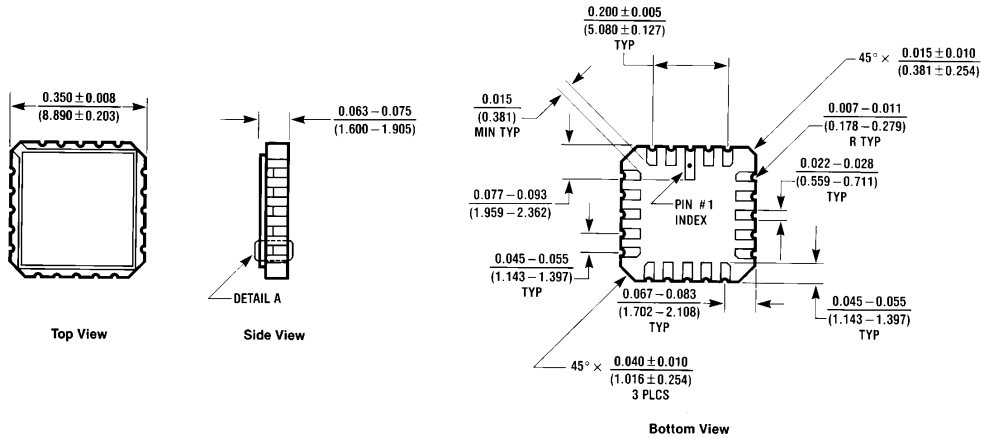
Address Buffers for 54LS151/74LS151



See Address Buffers to the Right

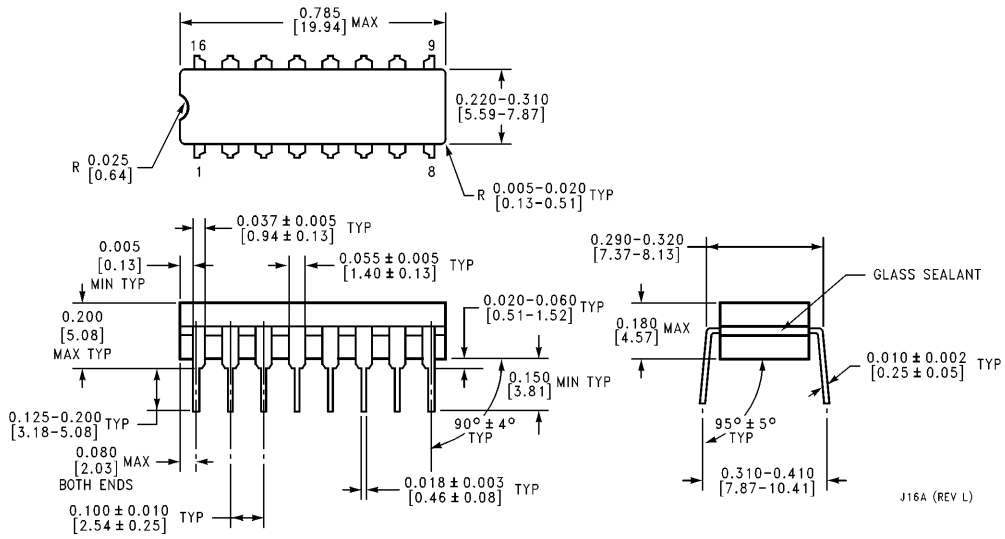
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**Physical Dimensions** inches (millimeters)



**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS151LMQB**  
**NS Package Number E20A**

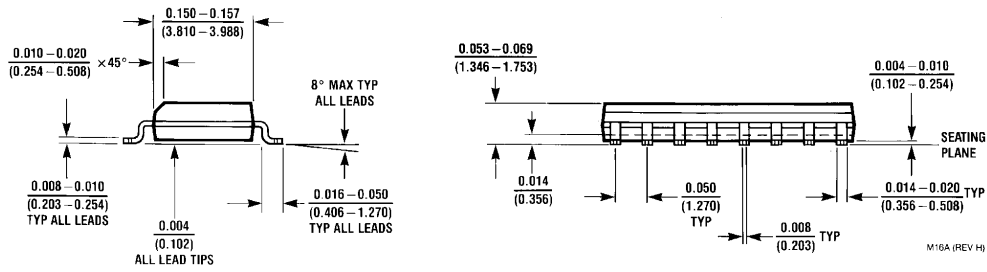
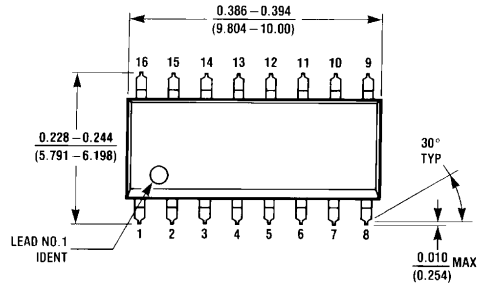
E20A (REV D)



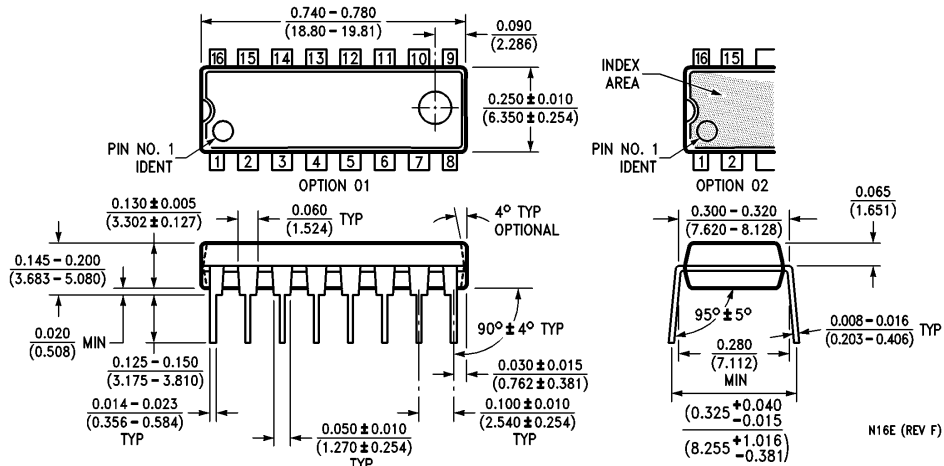
**Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS151DMQB or DM54LS151J**  
**NS Package Number J16A**

J16A (REV L)

**Physical Dimensions** inches (millimeters) (Continued)

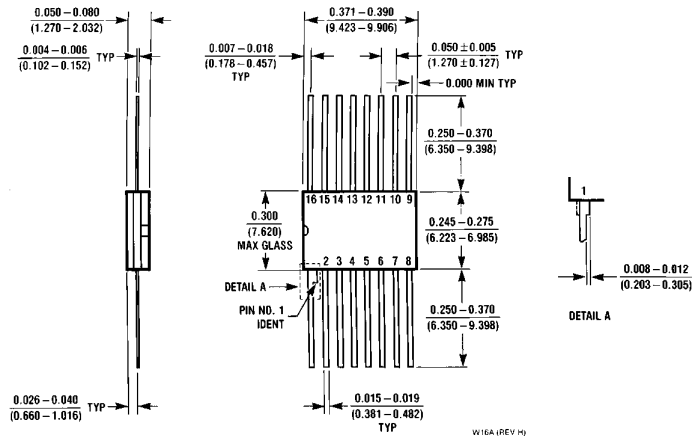


**16-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS151M**  
**NS Package Number M16A**



**16-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS151N**  
**NS Package Number N16E**

**Physical Dimensions** inches (millimeters) (Continued)



**16-Lead Ceramic Flat Package (W)**  
**Order Number 54LS151FMB or DM54LS151W**  
**NS Package Number W16A**

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