



June 1989

## 54LS153/DM54LS153/DM74LS153 Dual 4-Line to 1-Line Data Selectors/Multiplexers

### General Description

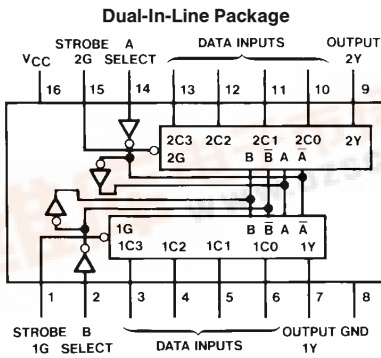
Each of these data selectors/multiplexers contains inverters and drivers to supply fully complementary, on-chip, binary decoding data selection to the AND-OR-invert gates. Separate strobe inputs are provided for each of the two four-line sections.

### Features

- Permits multiplexing from N lines to 1 line
- Performs at parallel-to-serial conversion

- Strobe (enable) line provided for cascading (N lines to n lines)
- High fan-out, low impedance, totem pole outputs
- Typical average propagation delay times
  - From data 14 ns
  - From strobe 19 ns
  - From select 22 ns
- Typical power dissipation 31 mW
- Alternate Military/Aerospace device (54LS153) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

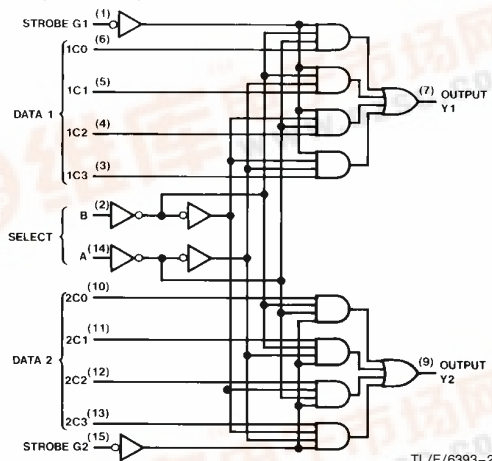
### Connection Diagram



TL/F/6393-1

Order Number 54LS153DMQB, 54LS153FMQB, 54LS153LMQB, DM54LS153J, DM54LS153W, DM74LS153M or DM74LS153N  
See NS Package Number E20A, J16A, M16A, N16E or W16A

### Logic Diagram



TL/F/6393-2

### Function Table

| Select Inputs |   | Data Inputs |    |    |    | Strobe | Output |
|---------------|---|-------------|----|----|----|--------|--------|
| B             | A | C0          | C1 | C2 | C3 | G      | Y      |
| X             | X | X           | X  | X  | X  | H      | L      |
| L             | L | L           | X  | X  | X  | L      | L      |
| L             | L | H           | X  | X  | X  | L      | H      |
| L             | H | X           | L  | X  | X  | L      | L      |
| L             | H | X           | H  | X  | X  | L      | H      |
| H             | L | X           | X  | L  | X  | L      | L      |
| H             | L | X           | X  | H  | X  | L      | H      |
| H             | H | X           | X  | X  | L  | L      | L      |
| H             | H | X           | X  | X  | H  | L      | H      |

Select inputs A and B are common to both sections.  
H = High Level, L = Low Level, X = Don't Care

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## 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                      | DM54LS153 |     |      | DM74LS153 |     |      | 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 | 0.25  |       |
| 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   |      |   | -0.36 | 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)   |      | 6.2   | 10    | mA    |

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

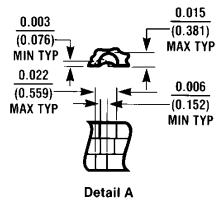
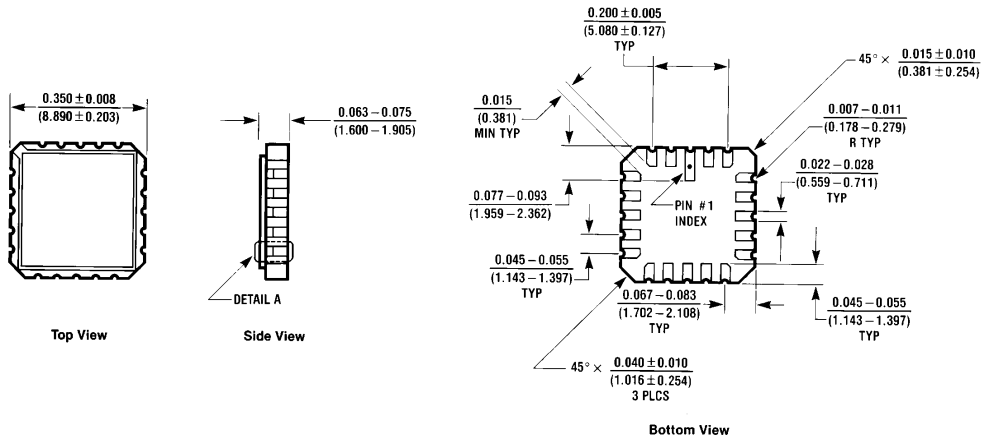
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I<sub>CC</sub> is measured with all outputs open and all other inputs grounded.

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

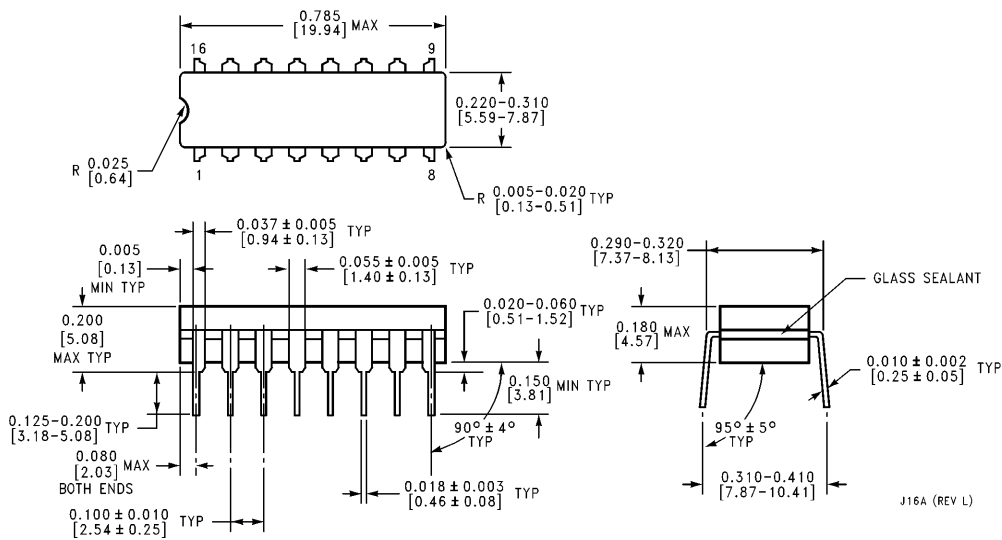
| Symbol    | Parameter  | From (Input)<br>to (Output) | $R_L = 2\text{ k}\Omega$ |     |                      |     | Units |
|-----------|--|-----------------------------|--------------------------|-----|----------------------|-----|-------|
|           |  |                             | $C_L = 15\text{ pF}$     |     | $C_L = 50\text{ pF}$ |     |       |
|           |  |                             | Min                      | Max | Min                  | Max |       |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Data to Y                   |                          | 15  |                      | 20  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Data to Y                   |                          | 26  |                      | 35  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Select to Y                 |                          | 29  |                      | 35  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Select to Y                 |                          | 38  |                      | 45  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | Strobe to Y                 |                          | 24  |                      | 30  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | Strobe to Y                 |                          | 32  |                      | 40  | ns    |

**Physical Dimensions** inches (millimeters)



**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS153LMBQ**  
**NS Package Number E20A**

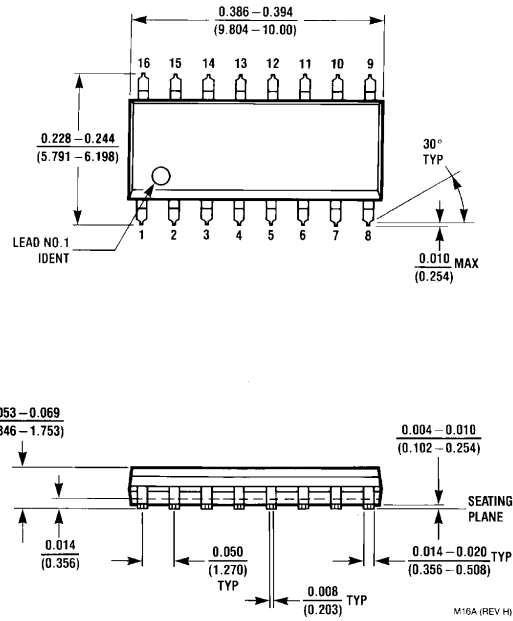
E20A (REV D)



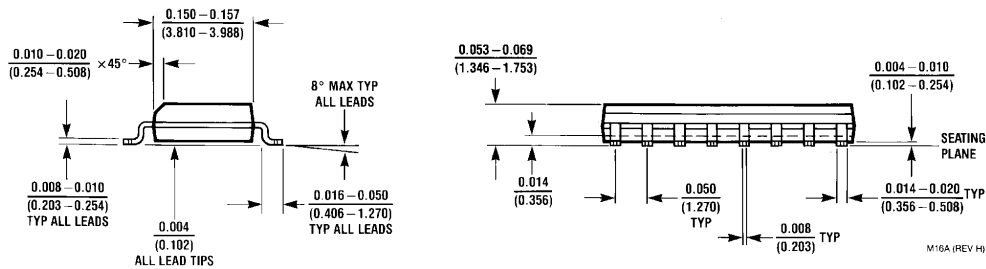
**16-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS153DMQB or DM54LS153J**  
**NS Package Number J16A**

J16A (REV L)

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

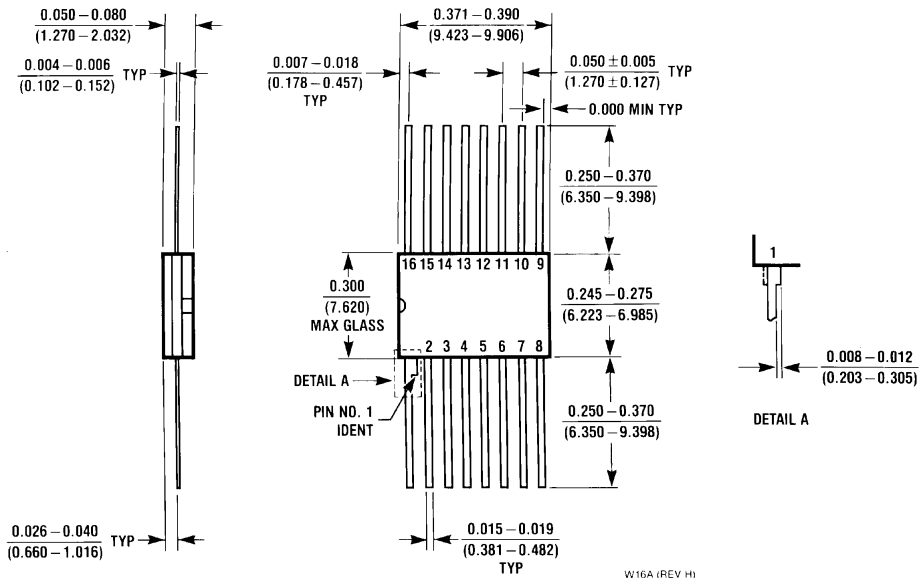


**16-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS153M**  
**NS Package Number M16A**



**16-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS153N**  
**NS Package Number N16E**

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



**16-Lead Ceramic Flat Package (W)**  
**Order Number 54LS153FMB or DM54LS153W**  
**NS Package Number W16A**

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