

# DM54155/DM74155 Dual 2-Line to 4-Line Decoders/Demultiplexers

## General Description

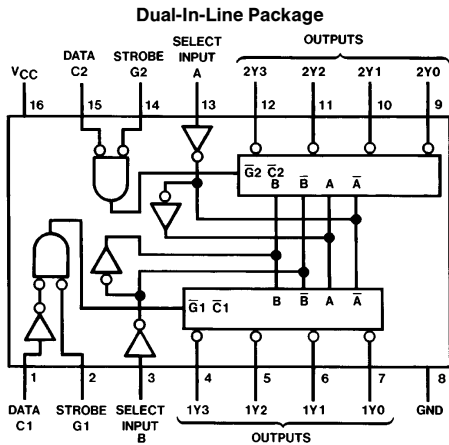
These TTL circuits feature dual 1-line-to-4-line demultiplexers with individual strobes and common binary-address inputs in a single 16-pin package. When both sections are enabled by the strobes, the common address inputs sequentially select and route associated input data to the appropriate output of each section. The individual strobes permit activating or inhibiting each of the 4-bit sections as desired. Data applied to input C1 is inverted at its outputs and data applied at C2 is true through its outputs. The inverter following the C1 data input permits use as a 3-to-8-line decoder, or 1-to-8-line demultiplexer, without external gating.

Input clamping diodes are provided on these circuits to minimize transmission-line effects and simplify system design.

## Features

- Applications:
  - Dual 2-to-4-line decoder
  - Dual 1-to-4-line demultiplexer
  - 3-to-8-line decoder
  - 1-to-8-line demultiplexer
- Individual strobes simplify cascading for decoding or demultiplexing larger words
- Input clamping diodes simplify system design

## Connection Diagram and Function Tables



Order Number DM54155J, DM54155W or DM74155N  
See NS Package Number J16A, N16A or W16A

**2-Line-to-4-Line Decoder or  
1-Line-to-4-Line Demultiplexer**

| Select |   | Strobe | Data | Outputs |     |     |     |
|--------|---|--------|------|---------|-----|-----|-----|
| B      | A | G1     | C1   | 1Y0     | 1Y1 | 1Y2 | 1Y3 |
| X      | X | H      | X    | H       | H   | H   | H   |
| L      | L | L      | H    | L       | H   | H   | H   |
| L      | H | L      | H    | H       | L   | H   | H   |
| H      | L | L      | H    | H       | H   | L   | H   |
| H      | H | L      | H    | H       | H   | H   | L   |
| X      | X | X      | L    | H       | H   | H   | H   |

| Select |   | Strobe | Data | Outputs |     |     |     |
|--------|---|--------|------|---------|-----|-----|-----|
| B      | A | G2     | C2   | 2Y0     | 2Y1 | 2Y2 | 2Y3 |
| X      | X | H      | X    | H       | H   | H   | H   |
| L      | L | L      | L    | L       | H   | H   | H   |
| L      | H | L      | L    | H       | L   | H   | H   |
| H      | L | L      | L    | H       | H   | L   | H   |
| H      | H | L      | L    | H       | H   | H   | L   |
| X      | X | X      | H    | H       | H   | H   | H   |

**3-Line-to-8-Line Decoder or  
1-Line-to-8-Line Demultiplexer**

| Select |     | Strobe | Outputs |     |     |     |     |     |     |     |
|--------|-----|--------|---------|-----|-----|-----|-----|-----|-----|-----|
| C†     | B A | G‡     | (0)     | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| C†     | B A | G‡     | 2Y0     | 2Y1 | 2Y2 | 2Y3 | 1Y0 | 1Y1 | 1Y2 | 1Y3 |
| X      | X X | H      | H       | H   | H   | H   | H   | H   | H   | H   |
| L      | L L | L      | L       | H   | H   | H   | H   | H   | H   | H   |
| L      | L H | L      | H       | L   | H   | H   | H   | H   | H   | H   |
| L      | H L | L      | H       | H   | L   | H   | H   | H   | H   | H   |
| L      | H H | L      | H       | H   | H   | L   | H   | H   | H   | H   |
| H      | L L | L      | H       | H   | H   | H   | L   | H   | H   | H   |
| H      | L H | L      | H       | H   | H   | H   | H   | L   | H   | H   |
| H      | H L | L      | H       | H   | H   | H   | H   | H   | L   | H   |
| H      | H H | L      | H       | H   | H   | H   | H   | H   | H   | L   |

†C = inputs C1 and C2 connected together  
‡G = inputs G1 and G2 connected together  
H = high level, L = low level, X = don't care

DM54155/DM74155 Dual 2-Line to 4-Line Decoders/Demultiplexers

## 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                        | 5.5V            |
| Operating Free Air Temperature Range |                 |
| DM54                                 | −55°C to +125°C |
| DM74                                 | 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                      | DM54155 |     |      | DM74155 |     |      | 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        |         |     | 0.8  |         |     | 0.8  | V     |
| I <sub>OH</sub> | High Level Output Current      |         |     | −0.8 |         |     | −0.8 | mA    |
| I <sub>OL</sub> | Low Level Output Current       |         |     | 16   |         |     | 16   | 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> = −12 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 | 2.4         |              |      | V     |
| V <sub>OL</sub> | Low Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max<br>V <sub>IH</sub> = Min, V <sub>IL</sub> = Max |             |              | 0.4  | V     |
| I <sub>I</sub>  | Input Current @ Max Input Voltage | V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V   |             |              | 1    | mA    |
| I <sub>IH</sub> | High Level Input Current          | V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V   |             |              | 40   | μA    |
| I <sub>IL</sub> | Low Level Input Current           | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V   |             |              | −1.6 | mA    |
| I <sub>OS</sub> | Short Circuit Output Current      | V <sub>CC</sub> = Max (Note 2)   | DM54<br>−20 |              | −55  | mA    |
|                 |                                   |  | DM74<br>−18 |              | −55  |       |
| I <sub>CC</sub> | Supply Current                    | V <sub>CC</sub> = Max (Note 3)   | DM54<br>25  | 25           | 35   | mA    |
|                 |                                   |  | DM74<br>25  | 25           | 40   |       |

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

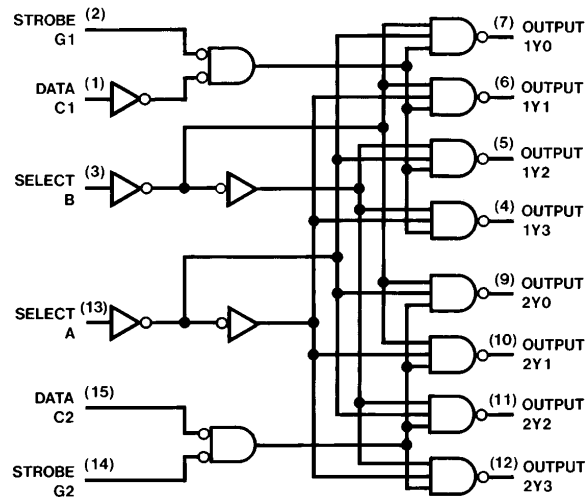
Note 2: Not more than one output should be shorted at a time.

Note 3: I<sub>CC</sub> is measured with the outputs open, A, B, and C1 inputs at 4.5V, and C2, G1, and G2 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) | $R_L = 400\Omega, C_L = 15\text{ pF}$ |     | Units |
|-----------|--|-----------------------------|---------------------------------------|-----|-------|
|           |  |                             | Min                                   | Max |       |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | A, B, C2, G1<br>or G2 to Y  |                                       | 20  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | A, B, C2, G1<br>or G2 to Y  |                                       | 27  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | A or B<br>to Y              |                                       | 32  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | A or B<br>to Y              |                                       | 32  | ns    |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output | C1<br>to Y                  |                                       | 24  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output | C1<br>to Y                  |                                       | 27  | ns    |

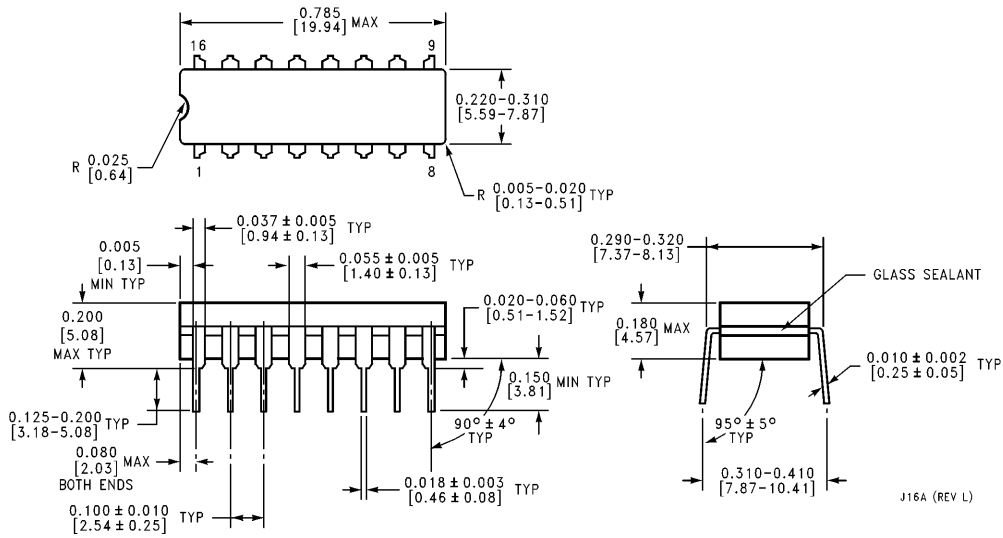
**Logic Diagram**



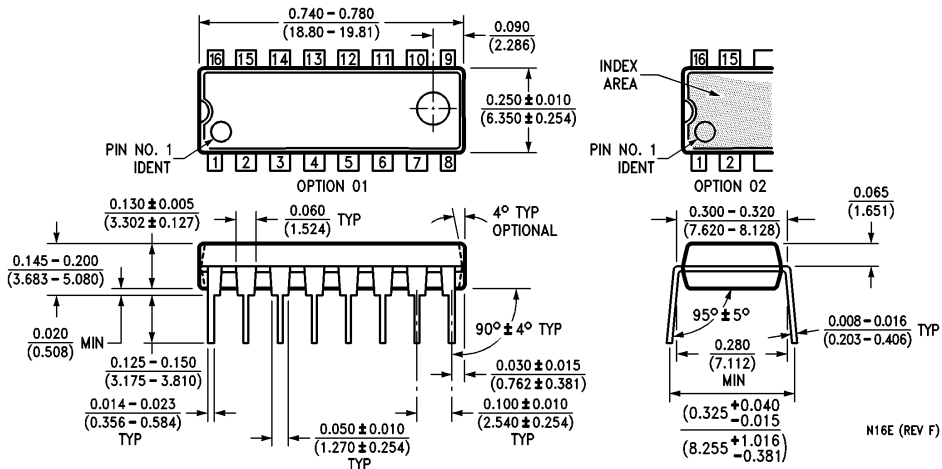
TL/F/6549-2



**Physical Dimensions** inches (millimeters)

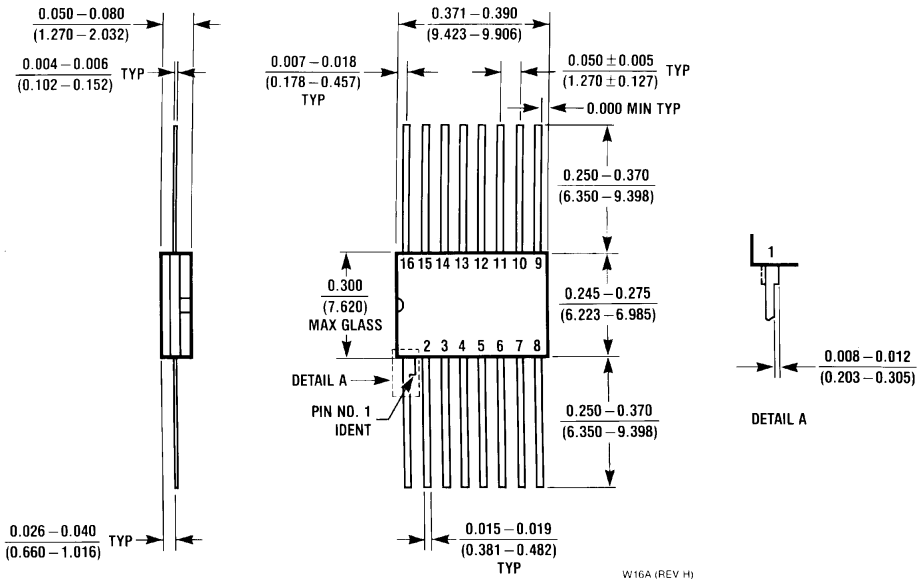


**16-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number DM54155J**  
**NS Package Number J16A**



**16-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74155N**  
**NS Package Number N16E**

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



**16-Lead Ceramic Flat Package (W)**  
**Order Number DM54155W**  
**NS Package Number W16A**

W16A (REV. H)

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