

# GD54/74LS241

## OCTAL BUFFER/LINE DRIVERS/ LINE RECEIVERS NON INVERTED 3-STATE OUTPUTS

### Feature

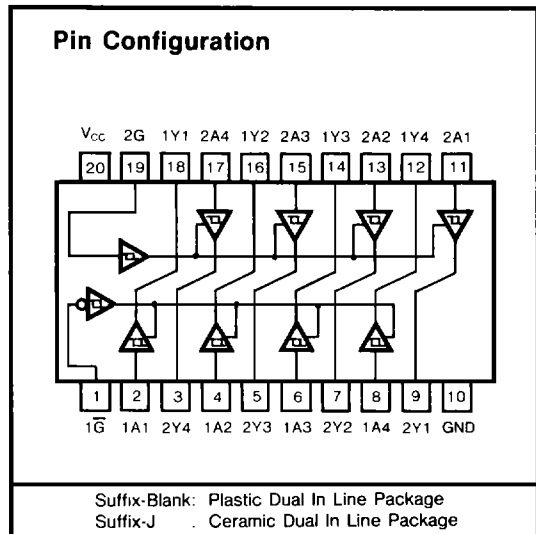
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- P-N-P Inputs Reduce D-C Loading
- Hysteresis at Inputs Improves Noise Margins

### Description

These octal buffers and line drivers are designed specifically to improve both the performance and density of three-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

This device features high fan-out, improved fan-in, and 400mV noise margin.

It can be used to drive terminated lines down to 133 ohms

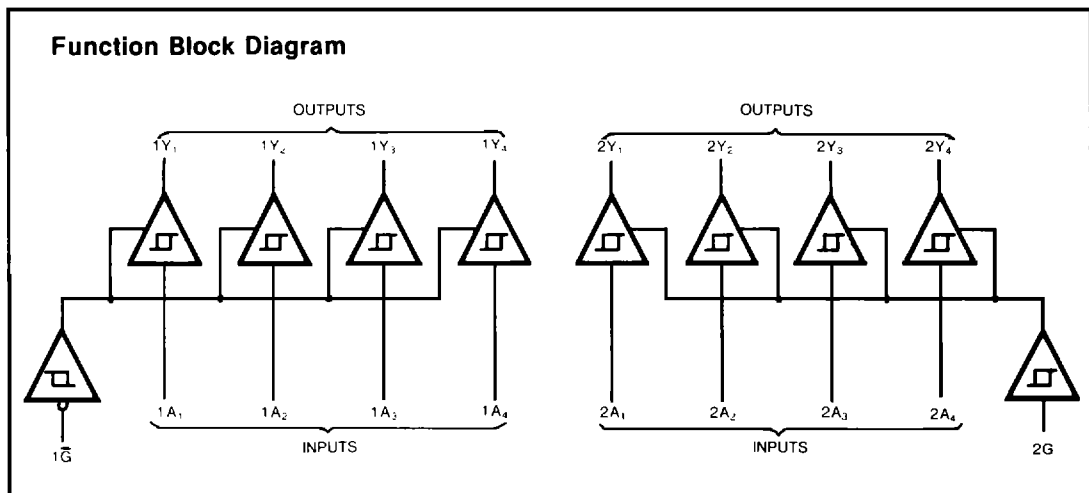


### Function Table (Note 1)

|    |    |    |
|----|----|----|
| 1A | 1G | 1Y |
| L  | L  | L  |
| H  | L  | H  |
| X  | H  | Z  |

|    |    |    |
|----|----|----|
| 2A | 2G | 2Y |
| L  | H  | L  |
| H  | H  | H  |
| X  | L  | Z  |

Note 1 Z: High-impedance  
X: irrelevant



## Absolute Maximum Ratings

- Supply voltage,  $V_{CC}$  ..... 7V
- Input voltage ..... 7V
- Operating free-air temperature range 54LS .....  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$   
74LS .....  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$
- Storage temperature range .....  $-65^{\circ}\text{C}$  to  $150^{\circ}\text{C}$

## Recommended Operating Conditions

| SYMBOL   | PARAMETER                      |    | MIN  | NOM | MAX  | UNIT               |
|----------|--------------------------------|----|------|-----|------|--------------------|
| $V_{CC}$ | Supply voltage                 | 54 | 4.5  | 5   | 5.5  | V                  |
|          |                                | 74 | 4.75 | 5   | 5.25 |                    |
| $I_{OH}$ | High-level output current      | 54 |      |     | -12  | mA                 |
|          |                                | 74 |      |     | -15  |                    |
| $I_{OL}$ | Low-level output current       | 54 |      |     | 12   | mA                 |
|          |                                | 74 |      |     | 24   |                    |
| $T_A$    | Operating free-air temperature | 54 | -55  |     | 125  | $^{\circ}\text{C}$ |
|          |                                | 74 | 0    |     | 70   |                    |

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

| SYMBOL          | PARAMETER                                           | TEST CONDITIONS                                                                   | MIN TYP (Note 1) MAX                         |              | UNIT         |               |    |
|-----------------|-----------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------|--------------|--------------|---------------|----|
|                 |                                                     |                                                                                   |                                              |              |              |               |    |
| $V_{IH}$        | High-level input voltage                            |                                                                                   | 2                                            |              | V            |               |    |
| $V_{IL}$        | Low-level input voltage                             |                                                                                   | 54                                           |              | 0.7          | V             |    |
|                 |                                                     |                                                                                   | 74                                           |              | 0.8          |               |    |
| $V_{IK}$        | Input clamp voltage                                 | $V_{CC}=\text{Min}, I_I=-18\text{mA}$                                             |                                              |              | -1.5         | V             |    |
| $V_{T+}-V_{T-}$ | Hysteresis                                          | $V_{CC}=\text{Min}$                                                               | 0.2                                          | 0.4          |              | V             |    |
| $V_{OH}$        | High-level output voltage                           | $V_{CC}=\text{Min}, V_{IH}=\text{Min}$<br>$V_{IL}=\text{Max}, I_{OH}=-1\text{mA}$ | 74                                           | 2.7          |              | V             |    |
|                 |                                                     | $V_{CC}=\text{Min}, V_{IH}=\text{Min}$<br>$V_{IL}=\text{Max}, I_{OH}=-3\text{mA}$ | 54,74                                        | 2.4          | 3.4          |               |    |
|                 |                                                     | $V_{CC}=\text{Min}, V_{IH}=\text{Min}$<br>$V_{IL}=0.5\text{V}, I_{OH}=\text{Max}$ | 54,74                                        | 2            |              |               |    |
| $V_{OL}$        | Low-level output voltage                            | $V_{CC}=\text{Min}$<br>$V_{IL}=\text{Max}$<br>$V_{IH}=\text{Min}$                 | $I_{OL}=12\text{mA}$<br>$I_{OL}=24\text{mA}$ | 54, 74<br>74 | 0.25<br>0.35 | 0.4<br>0.5    | V  |
|                 |                                                     |                                                                                   |                                              |              |              |               |    |
| $I_{OZH}$       | Off-state output current high-level voltage applied | $V_{CC}=\text{Max}, V_O=2.7\text{V}$<br>$V_{IH}=\text{Min}, V_{IL}=\text{Max}$    |                                              |              | 20           | $\mu\text{A}$ |    |
| $I_{OZL}$       | Off-state output current low-level voltage applied  | $V_{CC}=\text{Max}, V_O=0.4\text{V}$<br>$V_{IH}=\text{Min}, V_{IL}=\text{Max}$    |                                              |              | -20          | $\mu\text{A}$ |    |
| $I_I$           | Input current at maximum input voltage              | $V_{CC}=\text{Max}, V_I=7\text{V}$                                                |                                              |              | 0.1          | mA            |    |
| $I_{IH}$        | High-level input current                            | $V_{CC}=\text{Max}, V_I=2.7\text{V}$                                              |                                              |              | 20           | $\mu\text{A}$ |    |
| $I_{IL}$        | Low-level input current                             | $V_{CC}=\text{Max}, V_I=0.4\text{V}$                                              |                                              |              | -0.2         | mA            |    |
| $I_{OS}$        | Short-circuit output current                        | $V_{CC}=\text{Max}$ (Note 2)                                                      |                                              |              | -40          | -225          | mA |
| $I_{CC}$        | Supply Current                                      | Outputs high                                                                      |                                              |              | 17           | 27            | mA |
|                 |                                                     | Outputs low                                                                       |                                              |              | 26           | 46            |    |
|                 |                                                     | All outputs disabled                                                              |                                              |              | 32           | 54            |    |

Note 1: All typical values are at  $V_{CC}=5\text{V}$ ,  $T_A=25^{\circ}\text{C}$

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

**Switching Characteristics,  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$** 

| SYMBOL    | PARAMETER                                           | TEST CONDITION#                  | MIN | TYP | MAX | UNIT |
|-----------|-----------------------------------------------------|----------------------------------|-----|-----|-----|------|
| $t_{PLH}$ | Propagation delay time,<br>low-to-high-level output | $C_L = 45pF$ , $R_L = 667\Omega$ | 12  | 18  |     | ns   |
| $t_{PHL}$ | Propagation delay time,<br>high-to-low-level output |                                  | 12  | 18  |     | ns   |
| $t_{PZL}$ | Output enable time to low level                     |                                  | 20  | 30  |     | ns   |
| $t_{PZH}$ | Output enable time to high level                    |                                  | 15  | 23  |     | ns   |
| $t_{PLZ}$ | Output disable time from low level                  | $C_L = 5pF$ , $R_L = 667\Omega$  | 15  | 25  |     | ns   |
| $t_{PHZ}$ | Output disable time from high level                 |                                  | 10  | 18  |     | ns   |

# For load circuit and voltage waveforms, see page 3-11