

# GD54/74LS245

## OCTAL BUS TRANSCEIVER; NON-INVERTED 3-STATE OUTPUTS

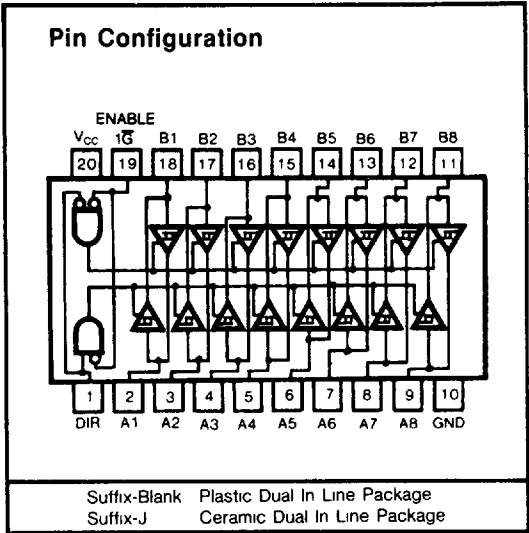
### Feature

- Bidirectional Bus Transceiver in a High-Density 20-Pin Package
- 3-State Outputs Drive Bus Lines Directly
- P-N-P Inputs D-C Loading on Bus Lines
- Hysteresis at Bus Inputs Improve Noise Margins
- Typical Propagation Delay Times; Port to Port ... 8 ns

### Description

These octal bus transceiver are designed for asynchronous two-way communication between data buses. The control function implementation minimizes external timing requirements.

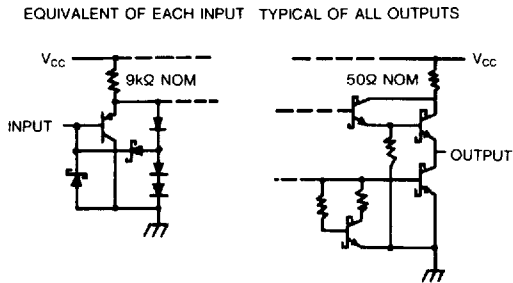
The device allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the directional control (DIR) input. The enable input ( $\overline{G}$ ) can be used to disable the device so that the buses are effectively isolated.



### Schematics of Inputs and Outputs

#### Function Table

| ENABLE<br>$\overline{G}$ | DIRECTION<br>CONTROL<br>DIR | OPERATION       |
|--------------------------|-----------------------------|-----------------|
| L                        | L                           | B data to A bus |
| L                        | H                           | A data to B bus |
| H                        | X                           | Isolation       |



### Absolute Maximum Ratings

- Supply voltage,  $V_{cc}$  ..... 7V
- Input voltage ..... 7V
- Off-state output voltage ..... 5.5V
- Operating free-air temperature range 54LS ..... -55°C to 125°C  
74LS ..... 0°C to 70°C
- Storage temperature range ..... -65°C to 150°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  | °C   |
|          |                                | 74 | 0    |     | 70   |      |

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

| SYMBOL                            | PARAMETER                                              |                            | TEST CONDITIONS                                                                           |                       | MIN                 | TYP<br>(Note 1) | MAX  | UNIT |
|-----------------------------------|--------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------------|-----------------------|---------------------|-----------------|------|------|
| V <sub>IH</sub>                   | High-level input voltage                               |                            |                                                                                           |                       | 2                   |                 |      | V    |
| V <sub>IL</sub>                   | Low-level input voltage                                |                            |                                                                                           |                       | 54                  | 0.7             |      | V    |
|                                   |                                                        |                            |                                                                                           |                       | 74                  | 0.8             |      |      |
| V <sub>IK</sub>                   | Input clamp voltage                                    |                            | V <sub>CC</sub> =Min, I <sub>I</sub> =−18mA                                               |                       |                     |                 | −1.5 | V    |
| V <sub>T+</sub> − V <sub>T−</sub> | Hysteresis                                             |                            | V <sub>CC</sub> =Min,                                                                     |                       | 0.2                 | 0.4             |      | V    |
| V <sub>OH</sub>                   | High-level output voltage                              |                            | V <sub>CC</sub> =Min, V <sub>IH</sub> =Min<br>V <sub>IL</sub> =Max, I <sub>OH</sub> =−1mA |                       | 74                  | 2.7             |      | V    |
|                                   |                                                        |                            | V <sub>CC</sub> =Min, V <sub>IH</sub> =Min<br>V <sub>IL</sub> =Max, I <sub>OH</sub> =−3mA |                       | 54,74               | 2.4 3.4         |      |      |
|                                   |                                                        |                            | V <sub>CC</sub> =Min, V <sub>IH</sub> =Min<br>V <sub>IL</sub> =0.5V, I <sub>OH</sub> =Max |                       | 54,74               | 2               |      |      |
| V <sub>OL</sub>                   | Low-level output voltage                               |                            | V <sub>CC</sub> =Min<br>V <sub>IL</sub> =Max<br>V <sub>IH</sub> =Min                      | I <sub>OL</sub> =12mA | 54, 74              | 0.25 0.4        |      | V    |
|                                   |                                                        |                            |                                                                                           | I <sub>OL</sub> =24mA | 74                  | 0.35 0.5        |      |      |
| I <sub>OZH</sub>                  | Off-state output current<br>high-level voltage applied |                            | V <sub>CC</sub> =Max, V <sub>O</sub> =2.7V<br>V <sub>IH</sub> =Min, V <sub>IL</sub> =Max  |                       | $\bar{G}$ at 2V     |                 | 20   | μA   |
| I <sub>OZL</sub>                  | Off-state output current<br>low-level voltage applied  |                            | V <sub>CC</sub> =Max, V <sub>O</sub> =0.4V<br>V <sub>IH</sub> =Min, V <sub>IL</sub> =Max  |                       |                     |                 | −200 | μA   |
| I <sub>I</sub>                    | Input current at maximum<br>maximum input voltage      | A or B<br>DIR or $\bar{G}$ | V <sub>CC</sub> =Max                                                                      |                       | V <sub>I</sub> =55V | 0.1             |      | mA   |
|                                   |                                                        |                            |                                                                                           |                       | V <sub>I</sub> =7V  |                 |      |      |
| 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                                                |                       |                     |                 | −0.2 | mA   |
| I <sub>OS</sub>                   | Short-circuit output current                           |                            | V <sub>CC</sub> =Max (Note 2)                                                             |                       | −40                 |                 | −225 | mA   |
| I <sub>CC</sub>                   | Supply<br>Current                                      | Outputs high               | V <sub>CC</sub> =5.25V, Outputs open                                                      |                       | 48                  |                 | 70   | mA   |
|                                   |                                                        | Outputs low                |                                                                                           |                       | 62                  |                 | 90   |      |
|                                   |                                                        | All outputs disabled       |                                                                                           |                       | 64                  |                 | 95   |      |

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<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C

| SYMBOL           | PARAMETER                                           | TEST CONDITION#                              | MIN | TYP | MAX | UNIT |
|------------------|-----------------------------------------------------|----------------------------------------------|-----|-----|-----|------|
| t <sub>PLH</sub> | Propagation delay time,<br>low-to-high-level output | C <sub>L</sub> = 45pF, R <sub>L</sub> = 667Ω | 8   | 12  |     | ns   |
| t <sub>PHL</sub> | Propagation delay time,<br>high-to-low-level output |                                              | 8   | 12  |     | ns   |
| t <sub>PZL</sub> | Output enable time to low level                     |                                              | 27  | 40  |     | ns   |
| t <sub>PZH</sub> | Output enable time to high level                    |                                              | 25  | 40  |     | ns   |
| t <sub>PLZ</sub> | Output disable time from low level                  | C <sub>L</sub> = 5pF, R <sub>L</sub> = 667Ω  | 15  | 25  |     | ns   |
| t <sub>PHZ</sub> | Output disable time from high level                 |                                              | 15  | 25  |     | ns   |

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