

# SN54ALS541, SN74ALS540, SN74ALS541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS025C – APRIL 1982 – REVISED JANUARY 1995

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading
- Data Flow-Through Pinout (All Inputs on Opposite Side From Outputs)
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

These octal buffers and line drivers are designed to have the performance of the popular SN54ALS240A/SN74ALS240A series and, at the same time, offer a pinout with inputs and outputs on opposite sides of the package. This arrangement greatly facilitates printed-circuit-board layout.

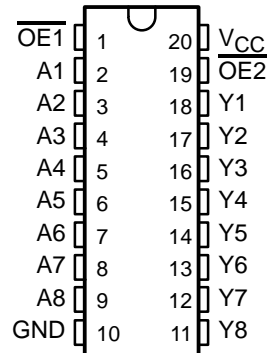
The 3-state control gate is a 2-input NOR such that if either output-enable ( $\overline{OE1}$  or  $\overline{OE2}$ ) input is high, all eight outputs are in the high-impedance state.

The SN74ALS540 provides inverted data. The 'ALS541 provide true data at the outputs.

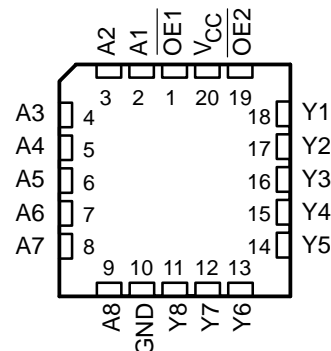
The -1 versions of SN74ALS540 and SN74ALS541 are identical to the standard versions, except that the recommended maximum  $I_{OL}$  is increased to 48 mA. There is no -1 version of the SN54ALS541.

The SN54ALS541 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS540 and SN74ALS541 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS541 . . . J PACKAGE  
SN74ALS540, SN74ALS541 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS541 . . . FK PACKAGE  
(TOP VIEW)



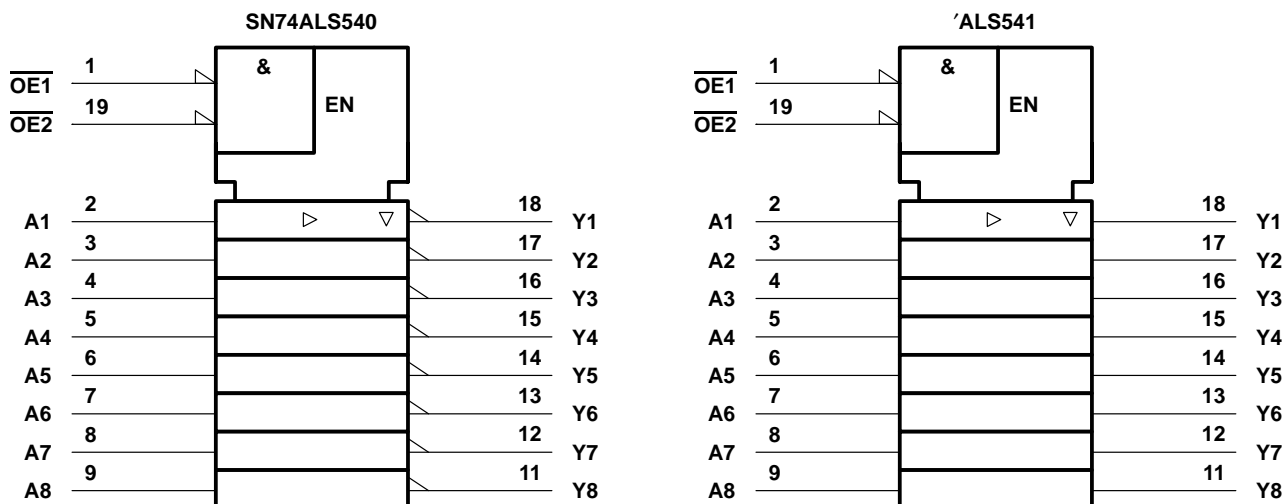
# SN54ALS541, SN74ALS540, SN74ALS541

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

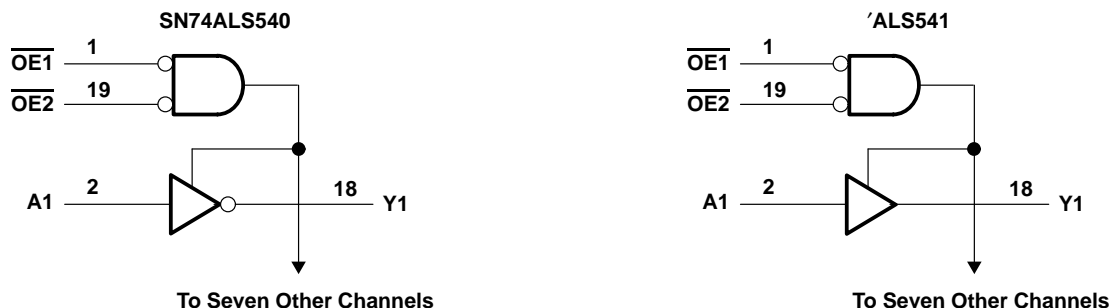
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#### logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

#### logic diagrams (positive logic)



#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

|  |                |
|--|----------------|
| Supply voltage, $V_{CC}$                                 | 7 V            |
| Input voltage, $V_I$                                     | 7 V            |
| Voltage applied to a disabled 3-state output             | 5.5 V          |
| Operating free-air temperature range, $T_A$ : SN54ALS541 | –55°C to 125°C |
| SN74ALS540, SN74ALS541                                   | 0°C to 70°C    |
| Storage temperature range                                | –65°C to 150°C |

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

# SN54ALS541, SN74ALS540, SN74ALS541

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

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#### recommended operating conditions

|          |                                | SN54ALS541 |     |     | SN74ALS540<br>SN74ALS541 |     |     | UNIT |
|----------|--------------------------------|------------|-----|-----|--------------------------|-----|-----|------|
|          |                                | MIN        | NOM | MAX | MIN                      | NOM | MAX |      |
| $V_{CC}$ | Supply voltage                 | 4.5        | 5   | 5.5 | 4.5                      | 5   | 5.5 | V    |
| $V_{IH}$ | High-level input voltage       | 2          |     |     | 2                        |     |     | V    |
| $V_{IL}$ | Low-level input voltage        |            |     | 0.7 |                          |     | 0.8 | V    |
| $I_{OH}$ | High-level output current      |            |     | -12 |                          |     | -15 | mA   |
| $I_{OL}$ | Low-level output current       |            |     | 12  |                          |     | 24  | mA   |
|          |                                |            |     |     |                          |     | 48† |      |
| $T_A$    | Operating free-air temperature | -55        |     | 125 | 0                        |     | 70  | °C   |

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

#### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER |            | TEST CONDITIONS            |                    | SN54ALS541   |      |      | SN74ALS540<br>SN74ALS541 |      |      | UNIT |
|-----------|------------|----------------------------|--------------------|--------------|------|------|--------------------------|------|------|------|
|           |            |                            |                    | MIN          | TYP‡ | MAX  | MIN                      | TYP‡ | MAX  |      |
| $V_{IK}$  |            | $V_{CC} = 4.5$ V,          | $I_I = -18$ mA     |              |      | -1.2 |                          |      | -1.2 | V    |
| $V_{OH}$  |            | $V_{CC} = 4.5$ V to 5.5 V, | $I_{OH} = -0.4$ mA | $V_{CC} - 2$ |      |      | $V_{CC} - 2$             |      |      | V    |
|           |            | $V_{CC} = 4.5$ V           | $I_{OH} = -3$ mA   | 2.4          | 3.2  |      | 2.4                      | 3.2  |      |      |
|           |            |                            | $I_{OH} = -12$ mA  | 2            |      |      |                          |      |      |      |
|           |            |                            | $I_{OH} = -15$ mA  |              |      |      | 2                        |      |      |      |
| $V_{OL}$  |            | $V_{CC} = 4.5$ V           | $I_{OL} = 12$ mA   |              | 0.25 | 0.4  |                          | 0.25 | 0.4  | V    |
|           |            |                            | $I_{OL} = 24$ mA   |              |      |      |                          | 0.35 | 0.5  |      |
|           |            |                            | $I_{OL} = 48$ mA†  |              |      |      |                          | 0.35 | 0.5  |      |
| $I_{OZH}$ |            | $V_{CC} = 5.5$ V,          | $V_O = 2.7$ V      |              |      | 20   |                          |      | 20   | μA   |
| $I_{OZL}$ |            | $V_{CC} = 5.5$ V,          | $V_O = 0.4$ V      |              |      | -20  |                          |      | -20  | μA   |
| $I_I$     |            | $V_{CC} = 5.5$ V,          | $V_I = 7$ V        |              |      | 0.1  |                          |      | 0.1  | mA   |
| $I_{IH}$  |            | $V_{CC} = 5.5$ V,          | $V_I = 2.7$ V      |              |      | 20   |                          |      | 20   | μA   |
| $I_{IL}$  |            | $V_{CC} = 5.5$ V,          | $V_I = 0.4$ V      |              |      | -0.2 |                          |      | -0.1 | mA   |
| $I_O^§$   |            | $V_{CC} = 5.5$ V,          | $V_O = 2.25$ V     | -20          |      | -112 | -30                      |      | -112 | mA   |
| $I_{CC}$  | SN74ALS540 | $V_{CC} = 5.5$ V           | Outputs high       |              | 5    | 10   |                          | 5    | 10   | mA   |
|           |            |                            | Outputs low        |              | 13   | 22   |                          | 13   | 22   |      |
|           |            |                            | Outputs disabled   |              | 11   | 19   |                          | 11   | 19   |      |
|           | 'ALS541    | $V_{CC} = 5.5$ V           | Outputs high       |              | 6    | 14   |                          | 6    | 14   |      |
|           |            |                            | Outputs low        |              | 15   | 25   |                          | 15   | 25   |      |
|           |            |                            | Outputs disabled   |              | 13.5 | 32   |                          | 13.5 | 22   |      |

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

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

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



# SN54ALS541, SN74ALS540, SN74ALS541

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

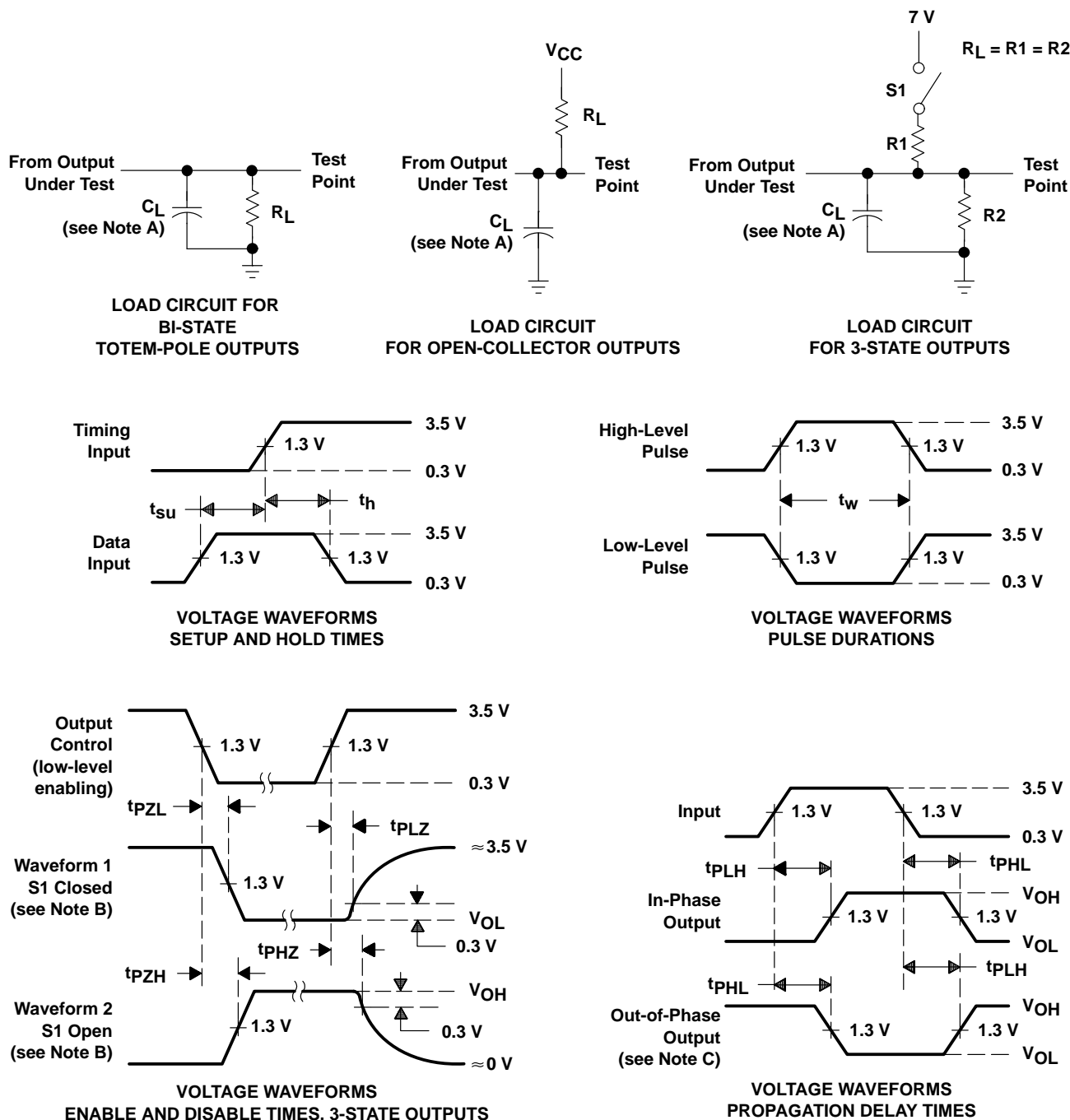
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#### switching characteristics (see Figure 1)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R1 = 500 Ω,<br>R2 = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |            |     |            |     | UNIT |
|------------------|-----------------|----------------|--|-----|------------|-----|------------|-----|------|
|                  |                 |                | SN54ALS541   |     | SN74ALS540 |     | SN74ALS541 |     |      |
|                  |                 |                | MIN  | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>PLH</sub> | A               | Y              | 4  | 17  | 2          | 12  | 4          | 14  | ns   |
| t <sub>PHL</sub> |                 |                | 2  | 14  | 2          | 9   | 2          | 10  |      |
| t <sub>PZH</sub> | $\overline{OE}$ | Y              | 5  | 18  | 5          | 15  | 5          | 15  | ns   |
| t <sub>PZL</sub> |                 |                | 8  | 28  | 8          | 20  | 8          | 20  |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Y              | 1  | 12  | 1          | 10  | 1          | 10  | ns   |
| t <sub>PLZ</sub> |                 |                | 2  | 14  | 2          | 12  | 2          | 12  |      |

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

PARAMETER MEASUREMENT INFORMATION  
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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