

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

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

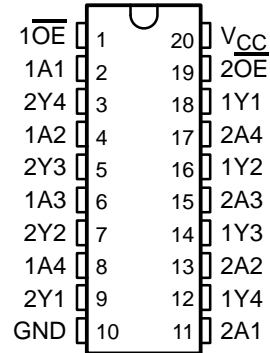
#### description

These octal buffers and line drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. With the 'ALS240A, 'ALS241C, 'AS240A, and 'AS241A, these devices provide the choice of selected combinations of inverting outputs, symmetrical active-low output-enable ( $\overline{OE}$ ) inputs, and complementary OE and  $\overline{OE}$  inputs.

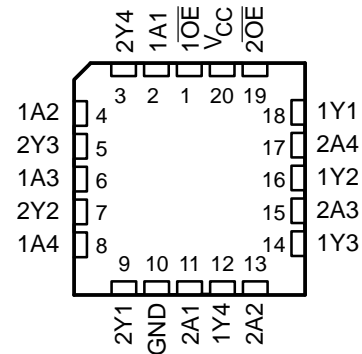
The -1 version of SN74ALS244C is identical to the standard version, except that the recommended maximum  $I_{OL}$  for the -1 version is 48 mA. There is no -1 version of the SN54ALS244C.

The SN54ALS244C and SN54AS244A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS244C and SN74AS244A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS244C, SN54AS244A . . . J PACKAGE  
SN74ALS244C, SN74AS244A . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS244C, SN54AS244A . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each buffer)

| INPUTS          |   | OUTPUT |
|-----------------|---|--------|
| $\overline{OE}$ | A | Y      |
| L               | H | H      |
| L               | L | L      |
| H               | X | Z      |

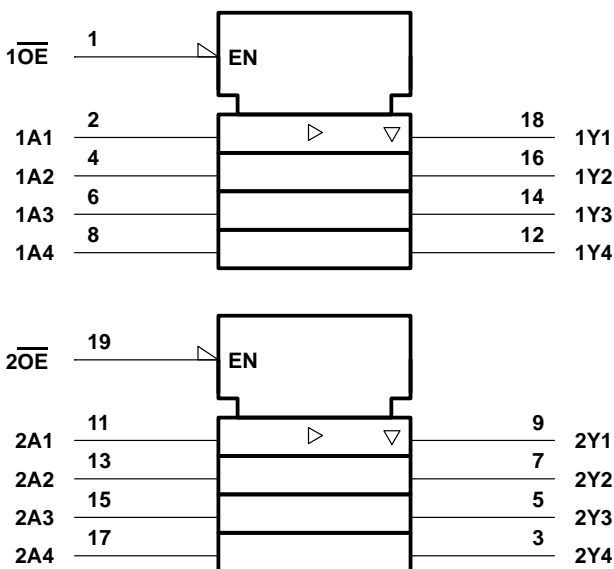
# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

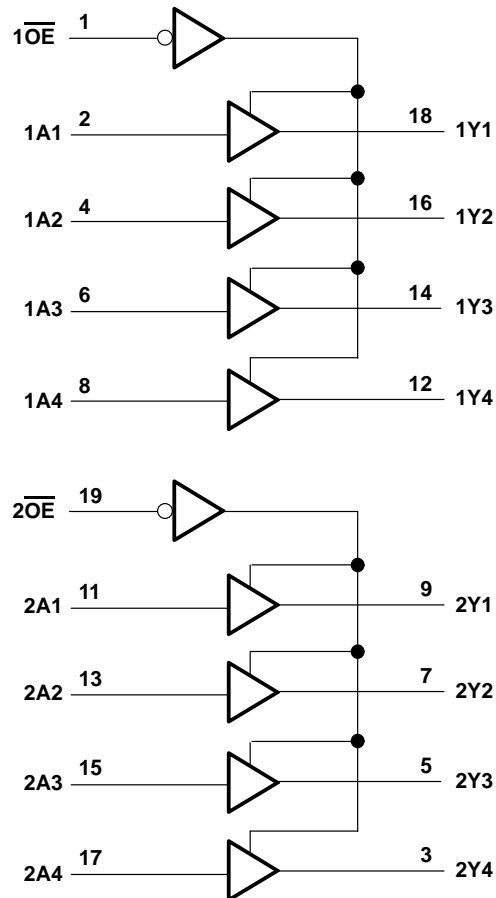
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#### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

#### logic diagram (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, $T_A$ : SN54ALS244C | –55°C to 125°C |
| SN74ALS244C   | 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.

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

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#### recommended operating conditions

|          |                                | SN54ALS244C |     |      | SN74ALS244C |     |     | 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        |             |     | 0.8† |             |     | 0.8 | V    |
|          |                                |             |     | 0.7‡ |             |     |     |      |
| $I_{OH}$ | 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 over temperature range -55°C to 70°C

‡ Applies over temperature range 70°C to 125°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                                  |                                      | SN54ALS244C         |      |      | SN74ALS244C         |      |     | UNIT |
|-----------------------------|--|--------------------------------------|---------------------|------|------|---------------------|------|-----|------|
|                             |  |                                      | MIN                 | TYP† | MAX  | MIN                 | TYP† | MAX |      |
| V <sub>IK</sub>             | V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = −18 mA |                                      | −1.5                |      |      | −1.5                |      |     | V    |
| V <sub>OH</sub>             | V <sub>CC</sub> = 4.5 V to 5.5 V                 | I <sub>OH</sub> = −0.4 mA            | V <sub>CC</sub> − 2 |      |      | V <sub>CC</sub> − 2 |      |     | V    |
|                             |  | I <sub>OH</sub> = −3 mA              | 2.4                 | 3.2  |      | 2.4                 | 3.2  |     |      |
|                             | V <sub>CC</sub> = 4.5 V                          | I <sub>OH</sub> = −12 mA             | 2                   |      |      |                     |      |     |      |
|                             |  | I <sub>OH</sub> = −15 mA             |                     |      |      | 2                   |      |     |      |
| V <sub>OL</sub>             | V <sub>CC</sub> = 4.5 V                          | I <sub>OL</sub> = 12 mA              | 0.25                | 0.4  |      | 0.25                | 0.4  | V   |      |
|                             |  | I <sub>OL</sub> = 24 mA              |                     |      |      | 0.35                | 0.5  |     |      |
|                             |  | I <sub>OL</sub> = 48 mA (-1 version) |                     |      |      | 0.35                | 0.5  |     |      |
| I <sub>OZH</sub>            | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V  | 20                                   |                     |      | 20   |                     |      | μA  |      |
| I <sub>OZL</sub>            | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.4 V  | −20                                  |                     |      | −20  |                     |      | μA  |      |
| I <sub>I</sub>              | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V    | 0.1                                  |                     |      | 0.1  |                     |      | mA  |      |
| I <sub>IH</sub>             | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V  | 20                                   |                     |      | 20   |                     |      | μA  |      |
| I <sub>IL</sub>             | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V  | −0.1                                 |                     |      | −0.1 |                     |      | mA  |      |
| I <sub>O</sub> <sup>#</sup> | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V | −20                                  | −112                |      | −30  | −112                |      | mA  |      |
| I <sub>CC</sub>             | V <sub>CC</sub> = 5.5 V                          | Outputs high                         | 9                   | 18   |      | 9                   | 17   | mA  |      |
|                             |  | Outputs low                          | 15                  | 25   |      | 15                  | 24   |     |      |
|                             |  | Outputs disabled                     | 17                  | 29   |      | 17                  | 27   |     |      |

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

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

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

## 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 |
|------------------|------------------------|----------------|--|-----|-------------|-----|------|
|                  |                        |                | SN54ALS244C  |     | SN74ALS244C |     |      |
|                  |                        |                | MIN  | MAX | MIN         | MAX |      |
| t <sub>PLH</sub> | A                      | Y              | 1  | 16  | 2           | 10  | ns   |
| t <sub>PHL</sub> |                        |                | 3  | 12  | 3           | 10  |      |
| t <sub>PZH</sub> | $\overline{\text{OE}}$ | Y              | 1  | 26  | 3           | 20  | ns   |
| t <sub>PZL</sub> |                        |                | 1  | 24  | 3           | 20  |      |
| t <sub>PHZ</sub> | $\overline{\text{OE}}$ | Y              | 2  | 10  | 2           | 10  | ns   |
| t <sub>PLZ</sub> |                        |                | 1  | 26  | 1           | 13  |      |

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

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

|   |                |
|---|----------------|
| Supply voltage, V <sub>CC</sub>                                   | 7 V            |
| Input voltage, V <sub>I</sub>                                     | 7 V            |
| Voltage applied to a disabled 3-state output                      | 5.5 V          |
| Operating free-air temperature range, T <sub>A</sub> : SN54AS244A | –55°C to 125°C |
| SN74AS244A  | 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.

#### recommended operating conditions

|                 |                                | SN54AS244A |     |     | SN74AS244A |     |     | UNIT |
|-----------------|--------------------------------|------------|-----|-----|------------|-----|-----|------|
|                 |                                | MIN        | NOM | MAX | MIN        | NOM | MAX |      |
| V <sub>CC</sub> | Supply voltage                 | 4.5        | 5   | 5.5 | 4.5        | 5   | 5.5 | 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      |            |     | –12 |            |     | –15 | mA   |
| I <sub>OL</sub> | Low-level output current       |            |     | 48  |            |     | 64  | mA   |
| T <sub>A</sub>  | Operating free-air temperature | –55        |     | 125 | 0          |     | 70  | °C   |



# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

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

| PARAMETER       | TEST CONDITIONS   |                          | SN54AS244A   |      |      | SN74AS244A   |      |      | UNIT          |
|-----------------|---|--------------------------|--------------|------|------|--------------|------|------|---------------|
|                 |   |                          | MIN          | TYP† | MAX  | MIN          | TYP† | MAX  |               |
| $V_{IK}$        | $V_{CC} = 4.5\text{ V}$ ,<br>$I_I = -18\text{ mA}$                    |                          |              |      | -1.2 |              |      | -1.2 | V             |
| $V_{OH}$        | $V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ,<br>$I_{OH} = -2\text{ mA}$ |                          | $V_{CC} - 2$ |      |      | $V_{CC} - 2$ |      |      | V             |
|                 | $V_{CC} = 4.5\text{ V}$   | $I_{OH} = -3\text{ mA}$  | 2.4          | 3.4  |      | 2.4          | 3.4  |      |               |
|                 |   | $I_{OH} = -12\text{ mA}$ | 2.4          |      |      |              |      |      |               |
|                 |   | $I_{OH} = -15\text{ mA}$ |              |      |      | 2.4          |      |      |               |
| $V_{OL}$        | $V_{CC} = 4.5\text{ V}$   | $I_{OL} = 48\text{ mA}$  |              |      | 0.55 |              |      |      | V             |
|                 |   | $I_{OL} = 64\text{ mA}$  |              |      |      |              |      | 0.55 |               |
| $I_{OZH}$       | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.7\text{ V}$                     |                          |              |      | 50   |              |      | 50   | $\mu\text{A}$ |
| $I_{OZL}$       | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 0.4\text{ V}$                     |                          |              |      | -50  |              |      | -50  | $\mu\text{A}$ |
| $I_I$           | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 7\text{ V}$                       |                          |              |      | 0.1  |              |      | 0.1  | mA            |
| $I_{IH}$        | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 2.7\text{ V}$                     |                          |              |      | 20   |              |      | 20   | $\mu\text{A}$ |
| $I_{IL}$        | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 2.7\text{ V}$                     | $\overline{OE}$          |              |      | -0.5 |              |      | -0.5 | mA            |
|                 |   | A                        |              |      | -1   |              |      | -1   |               |
| $I_{O\ddagger}$ | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.25\text{ V}$                    |                          | -50          |      | -150 | -50          |      | -150 | mA            |
| $I_{CC}$        | $V_{CC} = 5.5\text{ V}$   | Outputs high             | 22           | 34   |      | 22           | 34   |      | mA            |
|                 |   | Outputs low              | 60           | 90   |      | 60           | 90   |      |               |
|                 |   | Outputs disabled         | 34           | 54   |      | 34           | 54   |      |               |

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

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

### 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>R <sub>1</sub> = 500 Ω,<br>R <sub>2</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX§ |      |            |     | UNIT |
|------------------|-----------------|----------------|--|------|------------|-----|------|
|                  |                 |                | SN54AS244A   |      | SN74AS244A |     |      |
|                  |                 |                | MIN  | MAX  | MIN        | MAX |      |
| t <sub>PLH</sub> | A               | Y              | 2  | 9    | 2          | 6.2 | ns   |
| t <sub>PHL</sub> |                 |                | 1  | 7    | 1          | 6.2 |      |
| t <sub>PZH</sub> | $\overline{OE}$ | Y              | 1  | 10   | 1          | 9   | ns   |
| t <sub>PZL</sub> |                 |                | 2  | 8    | 2          | 7.5 |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Y              | 1  | 6.5  | 1          | 6   | ns   |
| t <sub>PLZ</sub> |                 |                | 1  | 10.5 | 1          | 9   |      |

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A

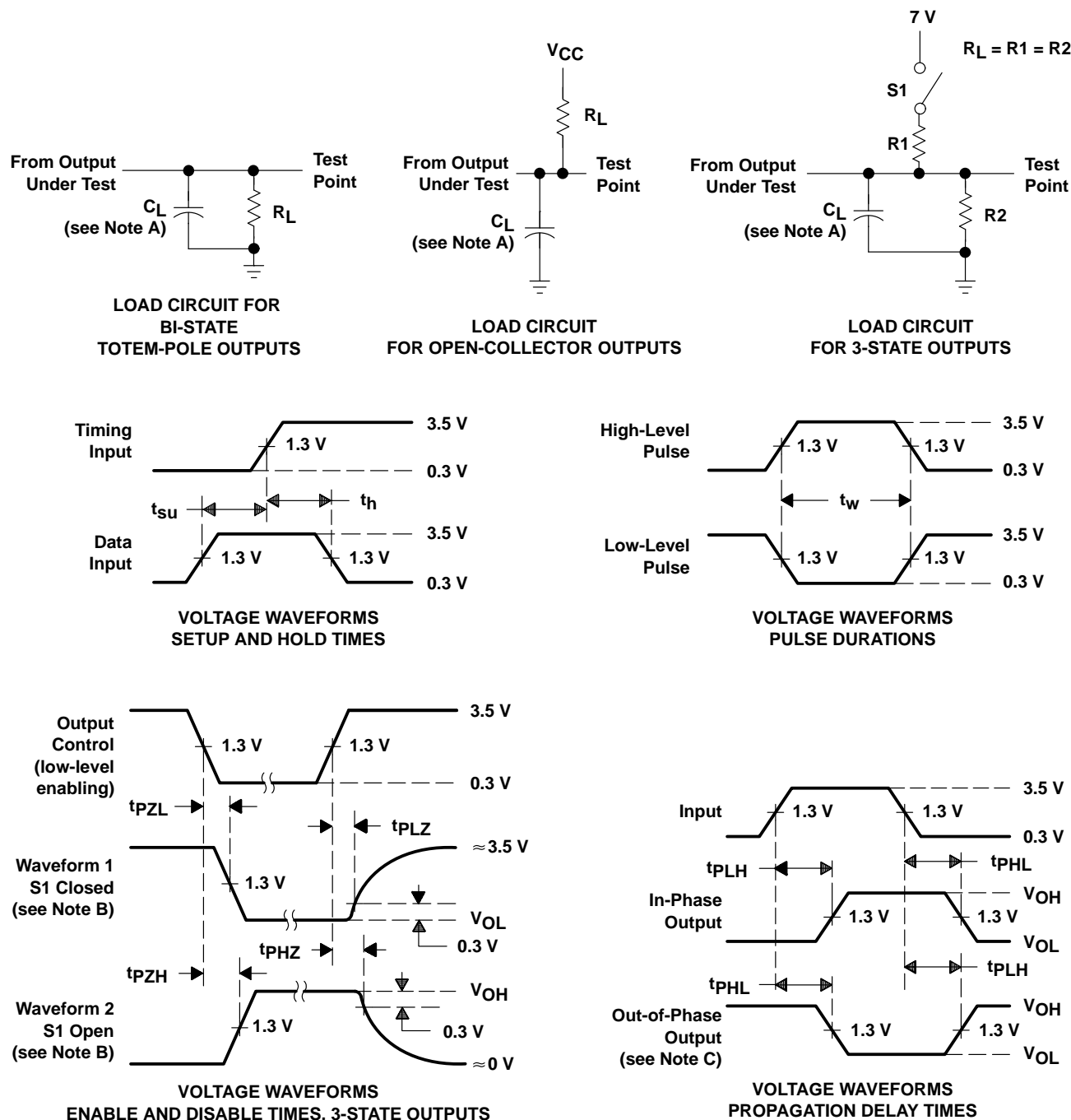
## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

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#### 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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