

# 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

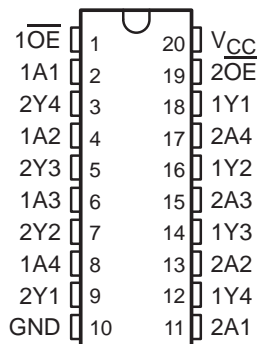
## description

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.

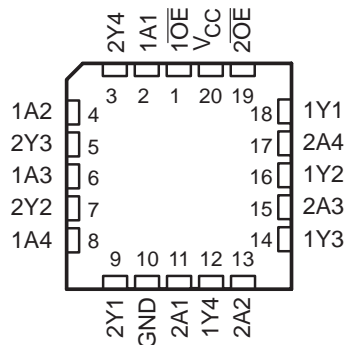
The -1 version of SN74ALS244C is identical to the standard version, except that the recommended maximum  $I_{OL}$  for the -1 version is 48 mA. There is no -1 version of the SN54ALS244C.

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)



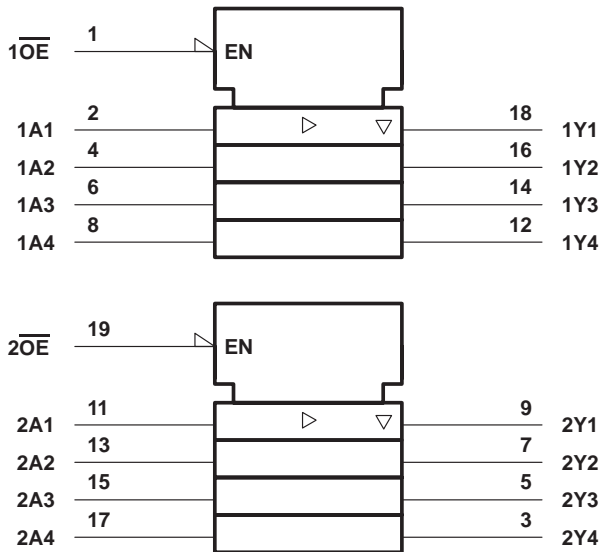
FUNCTION TABLE  
(each buffer)

| 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

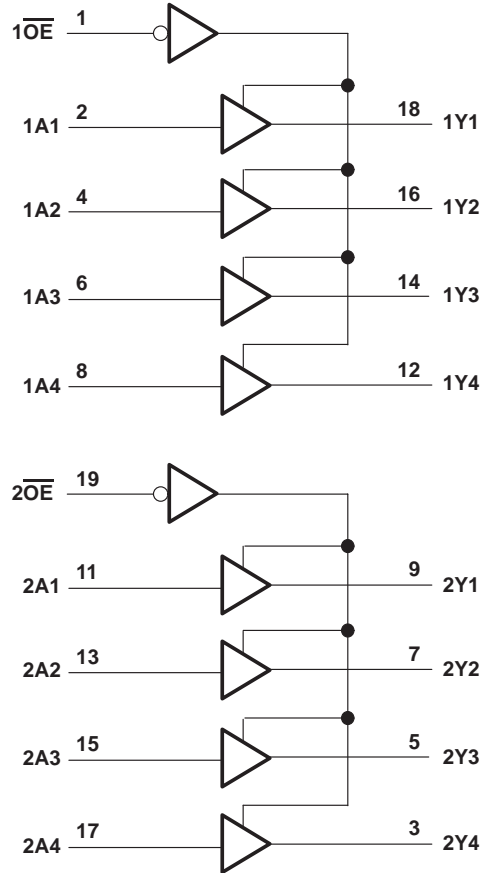
SDAS142C – JULY 1987 – REVISED AUGUST 1995

## 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

SDAS142C – JULY 1987 – REVISED AUGUST 1995

## recommended operating conditions

|                 |                                | SN54ALS244C |     |     | SN74ALS244C |     |     | 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    |    |
|                 |                                | 0.7‡        |     |     |             |     |     |      |    |
| I <sub>OH</sub> | High-level output current      | -12         |     |     | -15         |     |     | mA   |    |
| I <sub>OL</sub> | Low-level output current       | 12          |     |     | 24          |     |     | mA   |    |
|                 |                                |             |     |     | 48§         |     |     |      |    |
| T <sub>A</sub>  | 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<sub>CC</sub> 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>  | 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

# The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.



# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

## 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 |
|------------------|-----------------|----------------|--|-----|-------------|-----|------|
|                  |                 |                | 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> | $\overline{OE}$ | Y              | 1  | 26  | 3           | 20  | ns   |
| t <sub>PZL</sub> |                 |                | 1  | 24  | 3           | 20  |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | 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   |



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

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 <sub>IK</sub>  | V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA          |   | -1.2                |      |     | -1.2                |       |     | V    |
| V <sub>OH</sub>  | V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -2 mA |   | V <sub>CC</sub> - 2 |      |     | V <sub>CC</sub> - 2 |       |     | V    |
|                  | V <sub>CC</sub> = 4.5 V                                   | I <sub>OH</sub> = -3 mA                         | 2.4                 | 3.4  |     | 2.4                 | 3.4   |     |      |
|                  |   | I <sub>OH</sub> = -12 mA                        | 2.4                 |      |     |                     |       |     |      |
|                  |   | I <sub>OH</sub> = -15 mA                        |                     |      |     | 2.4                 |       |     |      |
| V <sub>OL</sub>  | V <sub>CC</sub> = 4.5 V                                   |   | 0.55                |      |     | 0.55                |       |     | V    |
|                  |   | I <sub>OL</sub> = 48 mA                         |                     |      |     |                     |       |     |      |
|                  |   | I <sub>OL</sub> = 64 mA                         |                     |      |     |                     |       |     |      |
| I <sub>OZH</sub> | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V           |   | 50                  |      |     | 50                  |       |     | μA   |
| I <sub>OZL</sub> | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.4 V           |   | -50                 |      |     | -50                 |       |     | 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>  | $\overline{\text{OE}}$                                    | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V | -0.5                |      |     | -0.5                |       |     | mA   |
|                  | A   |   | -1                  |      |     | -1                  |       |     |      |
| I <sub>O‡</sub>  | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V          |   | -50                 | -150 |     | -50                 | -150  | mA  |      |
| I <sub>CC</sub>  | V <sub>CC</sub> = 5.5 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

## switching characteristics (see Figure 1)

| PARAMETER        | FROM (INPUT)           | TO (OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, 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> | $\overline{\text{OE}}$ | Y           | 1  | 10   | 1          | 9   | ns   |
| t <sub>PZL</sub> |                        |             | 2  | 8    | 2          | 7.5 |      |
| t <sub>PHZ</sub> | $\overline{\text{OE}}$ | Y           | 1  | 6.5  | 1          | 6   | ns   |
| t <sub>PLZ</sub> |                        |             | 1  | 10.5 | 1          | 9   |      |

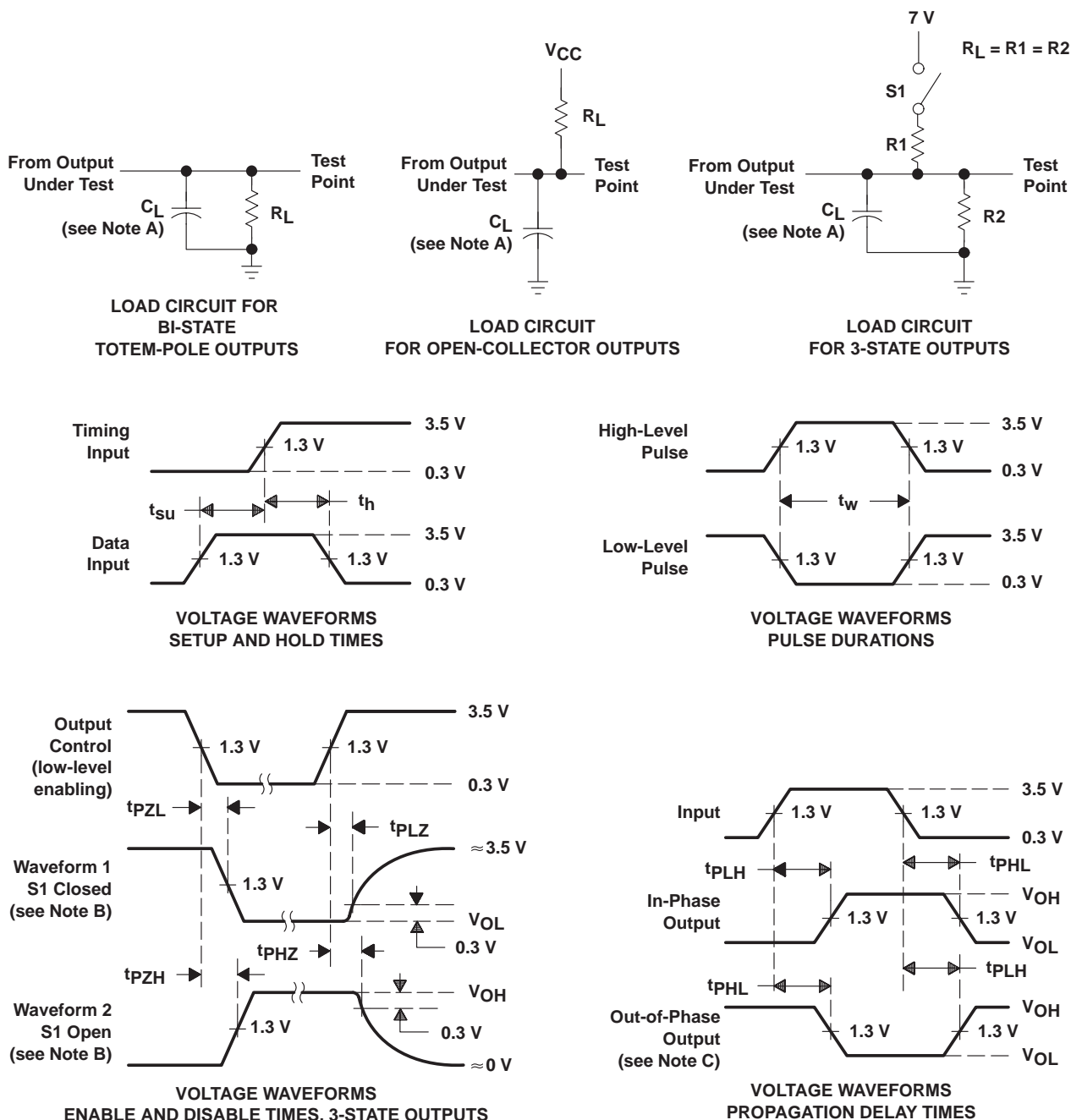
§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

## 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



## **IMPORTANT NOTICE**

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

**CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.**

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.