

# SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDAS124C – APRIL 1982 – REVISED AUGUST 1996

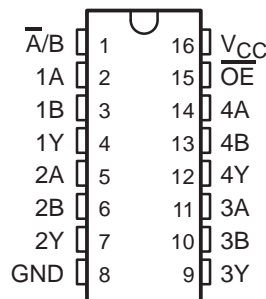
- 3-State Outputs Interface Directly With System Bus
- Provide Bus Interface From Multiple Sources in High-Performance Systems
- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

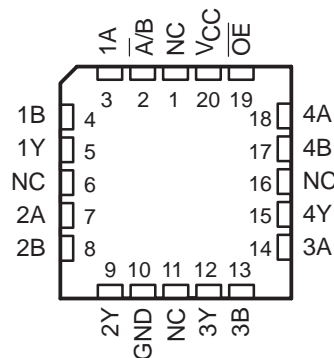
These data selectors/multiplexers are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems. The 3-state outputs do not load the data lines when the output-enable ( $\overline{OE}$ ) input is at a high logic level.

The SN54ALS257A and SN54ALS258A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS257A, SN74ALS258A, SN74AS257, and SN74AS258 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS257A, SN54ALS258A . . . J PACKAGE  
SN74ALS257A, SN74ALS258A, SN74AS257,  
SN74AS258 . . . D OR N PACKAGE  
(TOP VIEW)



SN54ALS257A, SN54ALS258A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

| INPUTS          |                  | OUTPUT Y |   |   |   |
|-----------------|------------------|----------|---|---|---|
| $\overline{OE}$ | $\overline{A/B}$ | DATA     |   | SN54ALS257A<br>SN74ALS257A<br>SN74AS257 | SN54ALS258A<br>SN74ALS258A<br>SN74AS258 |
|                 |                  | A        | B |   |   |
| H               | X                | X        | X | Z                                       | Z                                       |
| L               | L                | L        | X | L                                       | H                                       |
| L               | L                | H        | X | H                                       | L                                       |
| L               | H                | X        | L | L                                       | H                                       |
| L               | H                | X        | H | H                                       | L                                       |



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
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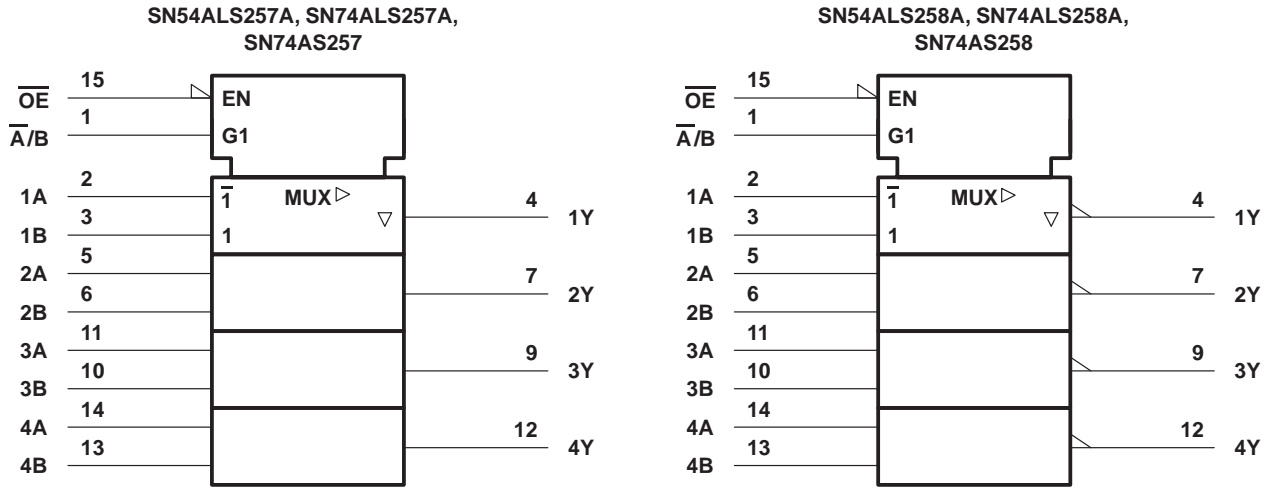
# SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258

## QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### WITH 3-STATE OUTPUTS

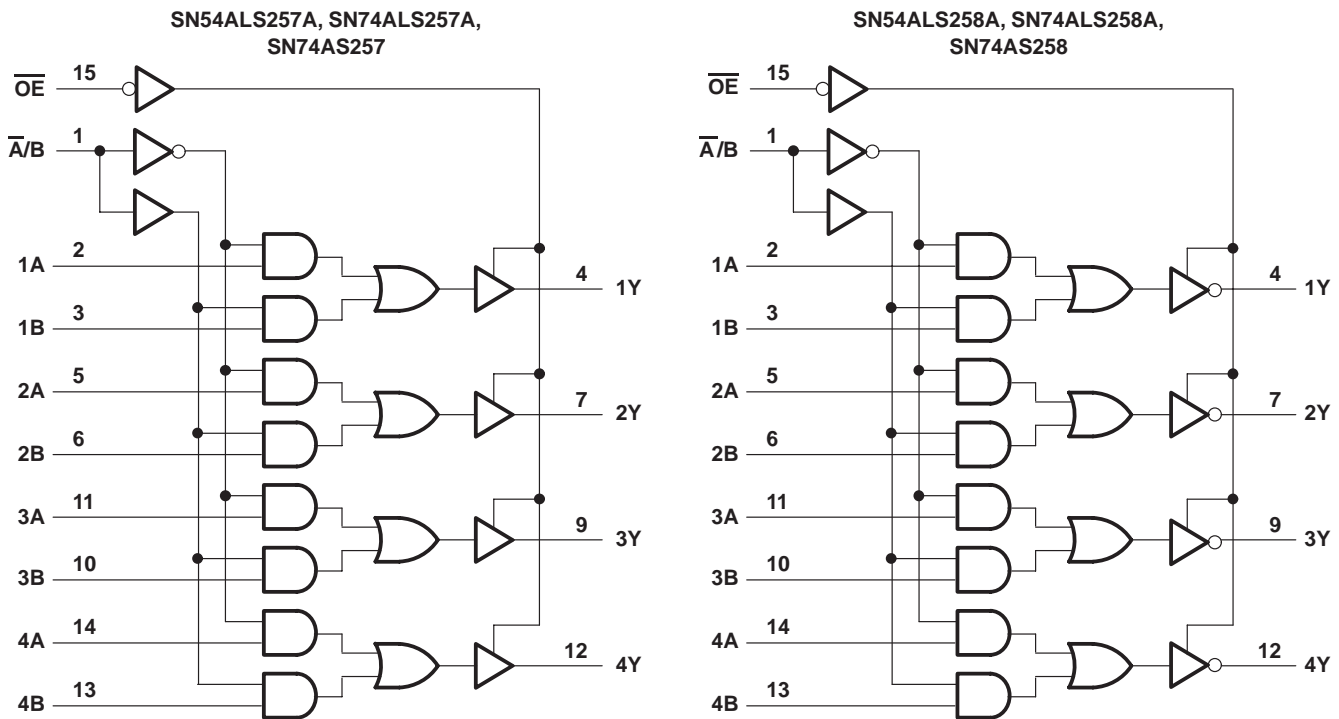
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#### logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, and N packages.

#### logic diagrams (positive logic)



Pin numbers shown are for the D, J, and N packages.

# SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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## 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                          |
| Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 1): | D package .....                |
|  | N package .....                |
| D package .....  | 1.3 W                          |
| N package .....  | 1.1 W                          |
| Operating free-air temperature range, $T_A$ : SN54ALS257A, SN54ALS258A .....       | –55°C to 125°C                 |
|  | SN74ALS257A, SN74ALS258A ..... |
| SN74ALS257A, SN74ALS258A .....   | 0°C to 70°C                    |
| Storage temperature range, $T_{stg}$ .....   | –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.

NOTE 1: The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

## recommended operating conditions

|                                      | SN54ALS257A<br>SN54ALS258A |     |     | SN74ALS257A<br>SN74ALS258A |     |      | 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   |                            |     | –1  |                            |     | –2.6 | mA   |
| $I_{OL}$ Low-level output current    |                            |     | 12  |                            |     | 24   | mA   |
| $T_A$ Operating free-air temperature | –55                        |     | 125 | 0                          |     | 70   | °C   |



# SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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

| PARAMETER        | TEST CONDITIONS   |                           | SN54ALS257A<br>SN54ALS258A |      |      | SN74ALS257A<br>SN74ALS258A |      |     | 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    |
|                  | V <sub>CC</sub> = 4.5 V                                     | I <sub>OH</sub> = -1 mA   | 2.4                        | 3.3  |      |                            |      |     |      |
|                  |   | I <sub>OH</sub> = -2.6 mA |                            |      |      | 2.4                        | 3.2  |     |      |
| V <sub>OH</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>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>  | SN54ALS257A,<br>SN74ALS257A                                 | V <sub>CC</sub> = 5.5 V   | Outputs high               | 3    | 8    | 3                          | 6    | mA  |      |
|                  |   |                           | Outputs low                | 8    | 12   | 8                          | 12   |     |      |
|                  |   |                           | Outputs disabled           | 9    | 14   | 9                          | 14   |     |      |
|                  | SN54ALS258A,<br>SN74ALS258A                                 | V <sub>CC</sub> = 5.5 V   | Outputs high               | 2.5  | 5    | 2.5                        | 4    |     |      |
|                  |   |                           | Outputs low                | 7    | 11   | 7                          | 11   |     |      |
|                  |   |                           | Outputs disabled           | 8    | 13   | 8                          | 13   |     |      |

† 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<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 |
|------------------|-----------------|----------------|--|-----|-------------|-----|------|
|                  |                 |                | SN54ALS257A  |     | SN74ALS257A |     |      |
|                  |                 |                | MIN  | MAX | MIN         | MAX |      |
| t <sub>PLH</sub> | A or B          | Any Y          | 2  | 12  | 2           | 10  | ns   |
| t <sub>PHL</sub> |                 |                | 2  | 14  | 2           | 12  |      |
| t <sub>PLH</sub> | A̅/B            | Any Y          | 4  | 21  | 6           | 18  | ns   |
| t <sub>PHL</sub> |                 |                | 6  | 25  | 6           | 22  |      |
| t <sub>PZH</sub> | OE̅             | Any Y          | 3  | 20  | 4           | 16  | ns   |
| t <sub>PZL</sub> |                 |                | 4  | 22  | 5           | 18  |      |
| t <sub>PHZ</sub> | OE̅             | Any Y          | 2  | 12  | 2           | 10  | ns   |
| t <sub>PLZ</sub> |                 |                | 2  | 35  | 4           | 15  |      |

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



# SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS 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>R <sub>1</sub> = 500 Ω,<br>R <sub>2</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |             |     | UNIT |
|------------------|-----------------|----------------|--|-----|-------------|-----|------|
|                  |                 |                | SN54ALS258A  |     | SN74ALS258A |     |      |
|                  |                 |                | MIN  | MAX | MIN         | MAX |      |
| t <sub>PLH</sub> | A or B          | Any Y          | 1  | 12  | 2           | 8   | ns   |
| t <sub>PHL</sub> |                 |                | 2  | 9   | 2           | 7   |      |
| t <sub>PLH</sub> | $\bar{A}/B$     | Any Y          | 4  | 28  | 5           | 25  | ns   |
| t <sub>PHL</sub> |                 |                | 5  | 25  | 6           | 20  |      |
| t <sub>PZH</sub> | $\overline{OE}$ | Any Y          | 3  | 20  | 4           | 18  | ns   |
| t <sub>PZL</sub> |                 |                | 5  | 21  | 5           | 18  |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Any Y          | 2  | 12  | 2           | 10  | ns   |
| t <sub>PLZ</sub> |                 |                | 3  | 37  | 4           | 18  |      |

† For conditions shown 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          |
| Maximum power dissipation at T <sub>A</sub> = 55°C (in still air) (see Note 1): |                |
| D package   | 1.3 W          |
| N package   | 1.1 W          |
| Operating free-air temperature range, T <sub>A</sub> : SN74AS257, SN74AS258     | 0°C to 70°C    |
| Storage temperature range, T <sub>stg</sub>                                     | -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.

NOTE 1: The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

## recommended operating conditions

|                 |                                | SN74AS257<br>SN74AS258 |     |     | UNIT |
|-----------------|--------------------------------|------------------------|-----|-----|------|
|                 |                                | MIN                    | NOM | MAX |      |
| V <sub>CC</sub> | Supply voltage                 | 4.5                    | 5   | 5.5 | V    |
| V <sub>IH</sub> | High-level input voltage       | 2                      |     |     | V    |
| V <sub>IL</sub> | Low-level input voltage        |                        |     | 0.8 | V    |
| I <sub>OH</sub> | High-level output current      |                        |     | -15 | mA   |
| I <sub>OL</sub> | Low-level output current       |                        |     | 48  | mA   |
| T <sub>A</sub>  | Operating free-air temperature | 0                      |     | 70  | °C   |



**SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258**  
**QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS**  
**WITH 3-STATE OUTPUTS**

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

| PARAMETER       | TEST CONDITIONS  | SN74AS257<br>SN74AS258                            |                  | UNIT          |               |           |
|-----------------|--|---|------------------|---------------|---------------|-----------|
|                 |  | MIN   | TYP†             |               | MAX           |           |
| $V_{IK}$        | $V_{CC} = 4.5\text{ V}$ ,<br>$I_I = -18\text{ mA}$                   | -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             |               |           |
|                 | $V_{CC} = 4.5\text{ V}$ ,<br>$I_{OH} = -15\text{ mA}$                | 2.4   | 3.2              |               |               |           |
| $V_{OL}$        | $V_{CC} = 4.5\text{ V}$ ,<br>$I_{OL} = 48\text{ mA}$                 | 0.35  | 0.5              | V             |               |           |
| $I_{OZH}$       | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.7\text{ V}$                    | 50  |                  | $\mu\text{A}$ |               |           |
| $I_{OZL}$       | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 0.4\text{ V}$                    | -50   |                  | $\mu\text{A}$ |               |           |
| $I_I$           | A, B, or $\overline{OE}$   | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 7\text{ V}$   | 0.1              |               | mA            |           |
|                 | $\overline{A/B}$   |   | 0.2              |               |               |           |
| $I_{IH}$        | A, B, or $\overline{OE}$   | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 2.7\text{ V}$ | 20               |               | $\mu\text{A}$ |           |
|                 | $\overline{A/B}$   |   | 40               |               |               |           |
| $I_{IL}$        | A, B, or $\overline{OE}$   | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 0.4\text{ V}$ | -0.5             |               | mA            |           |
|                 | $\overline{A/B}$   |   | -1               |               |               |           |
| $I_{O\ddagger}$ | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.25\text{ V}$                   | -30   | -112             |               | mA            |           |
| $I_{CC}$        | SN74AS257  | $V_{CC} = 5.5\text{ V}$                           | Outputs high     |               | mA            |           |
|                 |  |   | Outputs low      |               |               | 12.1 19.7 |
|                 |  |   | Outputs disabled |               |               | 19 30.6   |
|                 | SN74AS258  | $V_{CC} = 5.5\text{ V}$                           | Outputs high     |               |               | 19.7 31.9 |
|                 |  |   | Outputs low      |               |               | 8.4 13.5  |
|                 |  |   | Outputs disabled |               |               | 15.2 24.6 |
|                 |  |   |                  | 15.5 25.2     |               |           |

† 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,  $I_{OS}$ .



**SN54ALS257A, SN54ALS258A, SN74ALS257A, SN74ALS258A, SN74AS257, SN74AS258**  
**QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS**  
**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>R <sub>1</sub> = 500 Ω,<br>R <sub>2</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     | UNIT |
|------------------|-----------------|----------------|--|-----|------|
|                  |                 |                | SN74AS257  |     |      |
|                  |                 |                | MIN  | MAX |      |
| t <sub>PLH</sub> | A or B          | Any Y          | 1  | 5.5 | ns   |
| t <sub>PHL</sub> |                 |                | 1  | 6   |      |
| t <sub>PLH</sub> | $\bar{A}/B$     | Any Y          | 2  | 11  | ns   |
| t <sub>PHL</sub> |                 |                | 2  | 10  |      |
| t <sub>PZH</sub> | $\overline{OE}$ | Any Y          | 2  | 7.5 | ns   |
| t <sub>PZL</sub> |                 |                | 2  | 9.5 |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Any Y          | 1.5  | 6.5 | ns   |
| t <sub>PLZ</sub> |                 |                | 2  | 7   |      |

**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 |
|------------------|-----------------|----------------|--|-----|------|
|                  |                 |                | SN74AS258  |     |      |
|                  |                 |                | MIN  | MAX |      |
| t <sub>PLH</sub> | A or B          | Any Y          | 1  | 5   | ns   |
| t <sub>PHL</sub> |                 |                | 1  | 4   |      |
| t <sub>PLH</sub> | $\bar{A}/B$     | Any Y          | 2  | 9.5 | ns   |
| t <sub>PHL</sub> |                 |                | 2  | 10  |      |
| t <sub>PZH</sub> | $\overline{OE}$ | Any Y          | 2  | 8   | ns   |
| t <sub>PZL</sub> |                 |                | 2  | 10  |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Any Y          | 1.5  | 6   | ns   |
| t <sub>PLZ</sub> |                 |                | 2  | 6.5 |      |

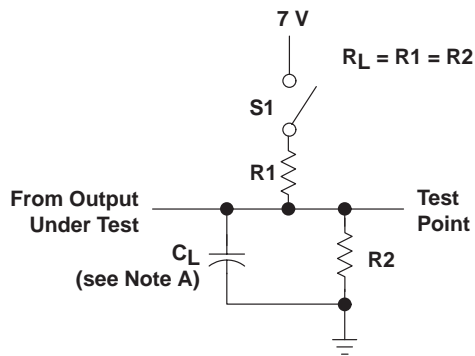
† For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.



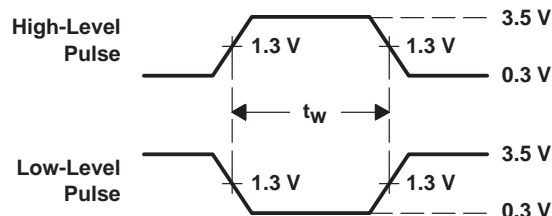
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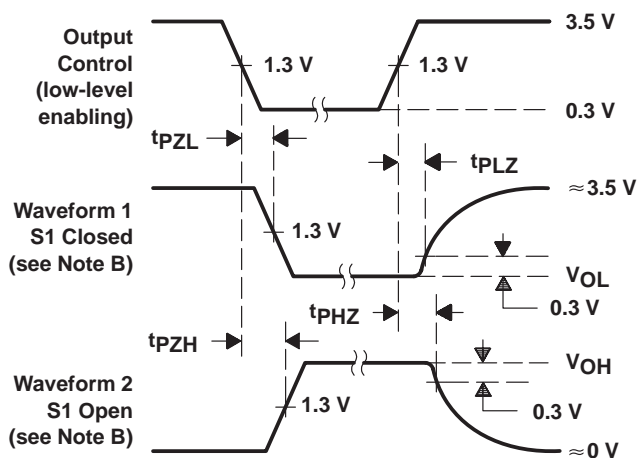
## PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



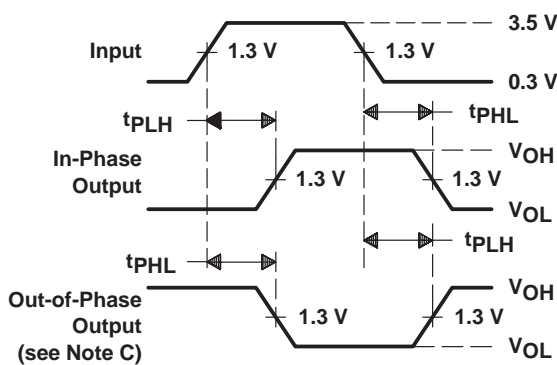
LOAD CIRCUIT  
FOR 3-STATE OUTPUTS



VOLTAGE WAVEFORMS  
PULSE DURATIONS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES

- 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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