

# SN54HC245, SN74HC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS131B – DECEMBER 1982 – REVISED MAY 1997

- High-Current 3-State Outputs Drive Bus Lines Directly or up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

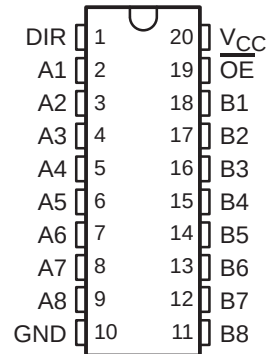
## description

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

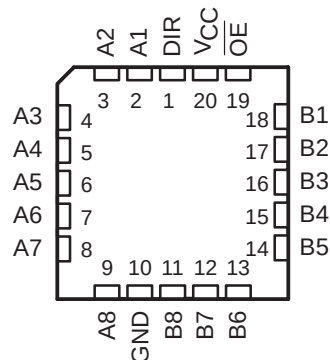
The devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

The SN54HC245 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC245 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54HC245 . . . J OR W PACKAGE  
SN74HC245 . . . DB, DW, N, OR PW PACKAGE  
(TOP VIEW)



SN54HC245 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

| INPUTS          |     | OPERATION       |
|-----------------|-----|-----------------|
| $\overline{OE}$ | DIR |                 |
| L               | L   | B data to A bus |
| L               | H   | A data to B bus |
| H               | X   | Isolation       |



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1997, Texas Instruments Incorporated

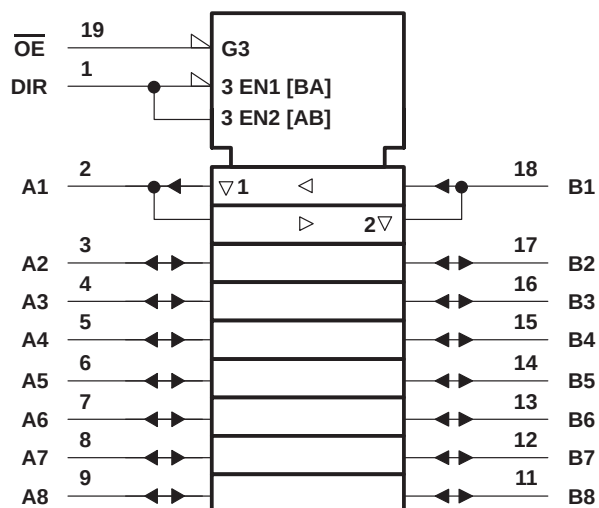
# SN54HC245, SN74HC245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

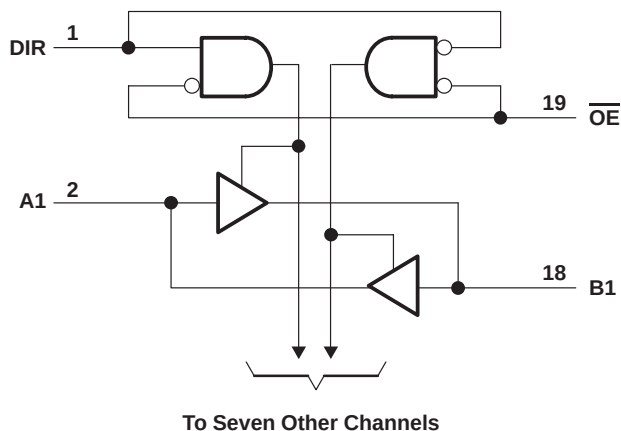
SCLS131B – DECEMBER 1982 – REVISED MAY 1997

#### logic symbol†



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

#### logic diagram (positive logic)



# SN54HC245, SN74HC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS131B – DECEMBER 1982 – REVISED MAY 1997

## absolute maximum ratings over operating free-air temperature range†

|                                                                             |                |
|-----------------------------------------------------------------------------|----------------|
| Supply voltage range, $V_{CC}$                                              | –0.5 V to 7 V  |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)  | ±20 mA         |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1) | ±20 mA         |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )                  | ±35 mA         |
| Continuous current through $V_{CC}$ or GND                                  | ±70 mA         |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package           | 115°C/W        |
| DW package                                                                  | 97°C/W         |
| N package                                                                   | 67°C/W         |
| PW package                                                                  | 128°C/W        |
| 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JEDEC 51, except for through-hole packages, which use a trace length of zero.

## recommended operating conditions

|                 |                                       |                         | SN54HC245 |     |     | SN74HC245       |     |     | UNIT |
|-----------------|---------------------------------------|-------------------------|-----------|-----|-----|-----------------|-----|-----|------|
|                 |                                       |                         | MIN       | NOM | MAX | MIN             | NOM | MAX |      |
| V <sub>CC</sub> | Supply voltage                        |                         | 2         | 5   | 6   | 2               | 5   | 6   | V    |
| V <sub>IH</sub> | High-level input voltage              | V <sub>CC</sub> = 2 V   | 1.5       |     |     | 1.5             |     |     | V    |
|                 |                                       | V <sub>CC</sub> = 4.5 V | 3.15      |     |     | 3.15            |     |     |      |
|                 |                                       | V <sub>CC</sub> = 6 V   | 4.2       |     |     | 4.2             |     |     |      |
| V <sub>IL</sub> | Low-level input voltage               | V <sub>CC</sub> = 2 V   | 0         |     |     | 0               |     |     | V    |
|                 |                                       | V <sub>CC</sub> = 4.5 V | 0         |     |     | 0               |     |     |      |
|                 |                                       | V <sub>CC</sub> = 6 V   | 0         |     |     | 0               |     |     |      |
| V <sub>I</sub>  | Input voltage                         |                         | 0         |     |     | V <sub>CC</sub> |     |     | V    |
| V <sub>O</sub>  | Output voltage                        |                         | 0         |     |     | V <sub>CC</sub> |     |     | V    |
| t <sub>t</sub>  | Input transition (rise and fall) time | V <sub>CC</sub> = 2 V   | 0         |     |     | 0               |     |     | ns   |
|                 |                                       | V <sub>CC</sub> = 4.5 V | 0         |     |     | 0               |     |     |      |
|                 |                                       | V <sub>CC</sub> = 6 V   | 0         |     |     | 0               |     |     |      |
| T <sub>A</sub>  | Operating free-air temperature        |                         | −55       |     |     | 125             |     |     | °C   |



**SN54HC245, SN74HC245**  
**OCTAL BUS TRANSCEIVERS**  
**WITH 3-STATE OUTPUTS**  
 SCLS131B – DECEMBER 1982 – REVISED MAY 1997

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

| PARAMETER       |                                                     | TEST CONDITIONS                                           | V <sub>CC</sub> | T <sub>A</sub> = 25°C |       |      | SN54HC245 |       | SN74HC245 |       | UNIT |
|-----------------|-----------------------------------------------------|-----------------------------------------------------------|-----------------|-----------------------|-------|------|-----------|-------|-----------|-------|------|
|                 |                                                     |                                                           |                 | MIN                   | TYP   | MAX  | MIN       | MAX   | MIN       | MAX   |      |
| V <sub>OH</sub> | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = –20 µA                                  | 2 V             | 1.9                   | 1.998 |      | 1.9       |       | 1.9       |       | V    |
|                 |                                                     |                                                           | 4.5 V           | 4.4                   | 4.499 |      | 4.4       |       | 4.4       |       |      |
|                 |                                                     |                                                           | 6 V             | 5.9                   | 5.999 |      | 5.9       |       | 5.9       |       |      |
|                 |                                                     | I <sub>OH</sub> = –6 mA                                   | 4.5 V           | 3.98                  | 4.3   |      | 3.7       |       | 3.84      |       |      |
|                 |                                                     | I <sub>OH</sub> = –7.8 mA                                 | 6 V             | 5.48                  | 5.8   |      | 5.2       |       | 5.34      |       |      |
| V <sub>OL</sub> | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OL</sub> = 20 µA                                   | 2 V             |                       | 0.002 | 0.1  |           | 0.1   |           | 0.1   | V    |
|                 |                                                     |                                                           | 4.5 V           |                       | 0.001 | 0.1  |           | 0.1   |           | 0.1   |      |
|                 |                                                     |                                                           | 6 V             |                       | 0.001 | 0.1  |           | 0.1   |           | 0.1   |      |
|                 |                                                     | I <sub>OL</sub> = 6 mA                                    | 4.5 V           |                       | 0.17  | 0.26 |           | 0.4   |           | 0.33  |      |
|                 |                                                     | I <sub>OL</sub> = 7.8 mA                                  | 6 V             |                       | 0.15  | 0.26 |           | 0.4   |           | 0.33  |      |
| I <sub>I</sub>  | DIR or $\overline{\text{OE}}$                       | V <sub>I</sub> = V <sub>CC</sub> or 0                     | 6 V             |                       | ±0.1  | ±100 |           | ±1000 |           | ±1000 | nA   |
| I <sub>OZ</sub> | A or B                                              | V <sub>O</sub> = V <sub>CC</sub> or 0                     | 6 V             |                       | ±0.01 | ±0.5 |           | ±10   |           | ±5    | µA   |
| I <sub>CC</sub> |                                                     | V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0 | 6 V             |                       |       | 8    |           | 160   |           | 80    | µA   |
| C <sub>i</sub>  | DIR or $\overline{\text{OE}}$                       |                                                           | 2 V to 6 V      |                       | 3     | 10   |           | 10    |           | 10    | pF   |

**switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

| PARAMETER        | FROM (INPUT)           | TO (OUTPUT) | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |     | SN54HC245 |     | SN74HC245 |     | UNIT |
|------------------|------------------------|-------------|-----------------|-----------------------|-----|-----|-----------|-----|-----------|-----|------|
|                  |                        |             |                 | MIN                   | TYP | MAX | MIN       | MAX | MIN       | MAX |      |
| t <sub>pd</sub>  | A or B                 | B or A      | 2 V             |                       | 40  | 105 |           | 160 |           | 130 | ns   |
|                  |                        |             | 4.5 V           |                       | 15  | 21  |           | 32  |           | 26  |      |
|                  |                        |             | 6 V             |                       | 12  | 18  |           | 27  |           | 22  |      |
| t <sub>en</sub>  | $\overline{\text{OE}}$ | A or B      | 2 V             |                       | 125 | 230 |           | 340 |           | 290 | ns   |
|                  |                        |             | 4.5 V           |                       | 23  | 46  |           | 68  |           | 58  |      |
|                  |                        |             | 6 V             |                       | 20  | 39  |           | 58  |           | 49  |      |
| t <sub>dis</sub> | $\overline{\text{OE}}$ | A or B      | 2 V             |                       | 74  | 200 |           | 300 |           | 250 | ns   |
|                  |                        |             | 4.5 V           |                       | 25  | 40  |           | 60  |           | 50  |      |
|                  |                        |             | 6 V             |                       | 21  | 34  |           | 51  |           | 43  |      |
| t <sub>t</sub>   |                        | A or B      | 2 V             |                       | 20  | 60  |           | 90  |           | 75  | ns   |
|                  |                        |             | 4.5 V           |                       | 8   | 12  |           | 18  |           | 15  |      |
|                  |                        |             | 6 V             |                       | 6   | 10  |           | 15  |           | 13  |      |



**SN54HC245, SN74HC245**  
**OCTAL BUS TRANSCEIVERS**  
**WITH 3-STATE OUTPUTS**

SCLS131B – DECEMBER 1982 – REVISED MAY 1997

switching characteristics over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$   
(unless otherwise noted) (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$ | $T_A = 25^\circ\text{C}$ |     |     | SN54HC245 |     | SN74HC245 |     | UNIT |
|-----------|-----------------|----------------|----------|--------------------------|-----|-----|-----------|-----|-----------|-----|------|
|           |                 |                |          | MIN                      | TYP | MAX | MIN       | MAX | MIN       | MAX |      |
| $t_{pd}$  | A or B          | B or A         | 2 V      |                          | 54  | 135 |           | 200 |           | 170 | ns   |
|           |                 |                | 4.5 V    |                          | 18  | 27  |           | 40  |           | 34  |      |
|           |                 |                | 6 V      |                          | 15  | 23  |           | 34  |           | 29  |      |
| $t_{en}$  | $\overline{OE}$ | A or B         | 2 V      |                          | 150 | 270 |           | 405 |           | 335 | ns   |
|           |                 |                | 4.5 V    |                          | 31  | 54  |           | 81  |           | 67  |      |
|           |                 |                | 6 V      |                          | 25  | 46  |           | 69  |           | 56  |      |
| $t_t$     |                 | A or B         | 2 V      |                          | 45  | 210 |           | 315 |           | 265 | ns   |
|           |                 |                | 4.5 V    |                          | 17  | 42  |           | 63  |           | 53  |      |
|           |                 |                | 6 V      |                          | 13  | 36  |           | 53  |           | 45  |      |

operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER |                                               | TEST CONDITIONS | TYP | UNIT |
|-----------|-----------------------------------------------|-----------------|-----|------|
| $C_{pd}$  | Power dissipation capacitance per transceiver | No load         | 40  | pF   |



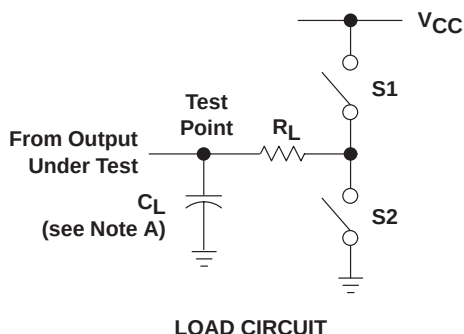
# SN54HC245, SN74HC245

## OCTAL BUS TRANSCEIVERS

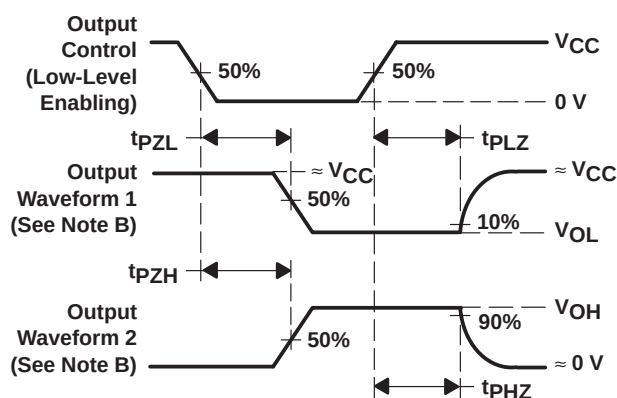
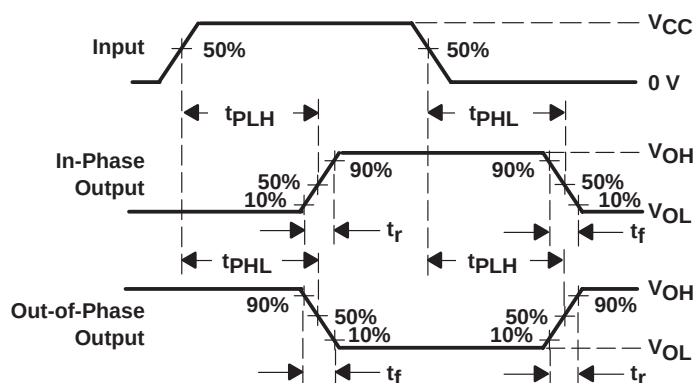
### WITH 3-STATE OUTPUTS

SCLS131B – DECEMBER 1982 – REVISED MAY 1997

#### PARAMETER MEASUREMENT INFORMATION



| PARAMETER         | $R_L$        | $C_L$           | S1     | S2     |
|-------------------|--------------|-----------------|--------|--------|
| $t_{en}$          | 1 k $\Omega$ | 50 pF or 150 pF | Open   | Closed |
|                   |              |                 | Closed | Open   |
| $t_{dis}$         | 1 k $\Omega$ | 50 pF           | Open   | Closed |
|                   |              |                 | Closed | Open   |
| $t_{pd}$ or $t_t$ | —            | 50 pF or 150 pF | Open   | Open   |



- NOTES:
- A.  $C_L$  includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - D. The outputs are measured one at a time with one input transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit 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.