SN54BCT245, SN74BCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS013F - SEPTEMBER 1988 - REVISED APRIL 1994

- State-of-the-Art BiCMOS Design Significantly Reduces I_{CC7}
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- Package Options Include Plastic Small-Outline (DW) and Shrink Small-Outline (DB) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic and Ceramic 300-mil DIPs (J, N)

description

These octal bus transceivers are designed for asynchronous communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus depending upon the level at the direction-control (DIR) input. The output-enable (\overline{OE}) input can be used to disable the device so the buses are effectively isolated.

The SN74BCT245 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

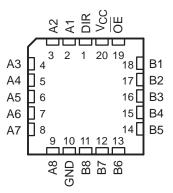
The SN54BCT245 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74BCT245 is characterized for operation from 0°C to 70°C.

| (| (TOP VIEW) | | | | | | | | | |
|--|---|--|--|---|--|--|--|--|--|--|
| DIR [A1 [A2 [A3 [A4 [A5 [A7 [A8 [GND] | 1 2 3 4 5 6 7 8 9 | | 20 19 18 17 16 15 14 13 12 11 | V _{CC} OE B1 B2 B3 B4 B5 B6 B7 B8 | | | | | | |
| | | | | , | | | | | | |

SN54BCT245 ... J OR W PACKAGE

SN74BCT245 . . . DB, DW, OR N PACKAGE

SN54BCT245 ... FK PACKAGE (TOP VIEW)



|--|

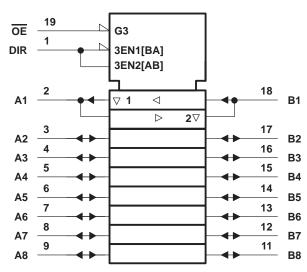
| INP | UTS | OPERATION |
|-----|-----|-----------------|
| OE | DIR | OPERATION |
| L | L | B data to A bus |
| L | Н | A data to B bus |
| н | Х | Isolation |

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.

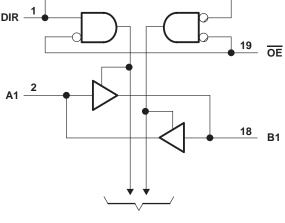
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logic symbol[†]







To Seven Other Channels

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

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

| Supply voltage range, V _{CC} | $\dots \dots \dots \dots \dots - 0.5$ V to 7 V |
|---|--|
| Input voltage range: Control inputs (see Note 1) | $\ldots \ldots - 0.5$ V to 7 V |
| I/O ports (see Note 1) | \ldots — 0.5 V to 5.5 V |
| Voltage range applied to any output in the disabled or power-off state, V_O | |
| Voltage range applied to any output in the high state, VO | $\dots \dots \dots \dots - 0.5$ V to V _{CC} |
| Current into any output in the low state: SN54BCT245 | 96 mA |
| SN74BCT245 | |
| Power dissipation (DB package only) (see Note 2) | |
| Operating free-air temperature range: SN54BCT245 | – 55°C to 125°C |
| SN74BCT245 | 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

 Power dissipation is application dependent and is a function of supply voltage, operating temperature, the number of outputs switching simultaneously, and output duty cycle. Because the thermal resistance of the DB package is higher than that of the DW or N packages, the DB package may not be suitable for some applications.



recommended operating conditions

| | | | | | SN54BCT245 | | | SN74BCT245 | | |
|-----|--|--------|-----|-----|------------|-----|-----|------------|------|--|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | UNIT | |
| Vcc | CC Supply voltage | | | 5 | 5.5 | 4.5 | 5 | 5.5 | V | |
| VIH | | | 2 | | | 2 | | | V | |
| VIL | Low-level input voltage | | | | 0.8 | | | 0.8 | V | |
| Iк | Input clamp current | | | | -18 | | | -18 | mA | |
| lau | High lovel output ourrent | A port | | -3 | | | -3 | | mA | |
| ЮН | High-level output current | B port | | | -12 | | | -15 | mA | |
| | I _{OL} Low-level output current | A port | | | 20 | | | 24 | m۸ | |
| OL | | B port | | | 48 | | | 64 | mA | |
| ТА | Operating free-air temperature | | -55 | | 125 | 0 | | 70 | °C | |

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

| PARAMETER | | TEO | TCONDITIONS | SN | SN54BCT245 | | | SN74BCT245 | | | |
|--|---------------|--------------------------|--|------|------------|-------|------|------------|-------|------|--|
| P/ | ARAMETER | IES | T CONDITIONS | MIN | TYP† | MAX | MIN | түр† | MAX | UNIT | |
| VIK | | V _{CC} = 4.5 V, | lj = -18 mA | | | -1.2 | | | -1.2 | V | |
| | Anort | | I _{OH} = -1 mA | 2.5 | 3.4 | | 2.5 | 3.4 | | | |
| | A port | V _{CC} = 4.5 V | $I_{OH} = -3 \text{ mA}$ | 2.4 | 3.3 | | 2.4 | 3.3 | | | |
| Vон | | | $I_{OH} = -3 \text{ mA}$ | 2.4 | 3.3 | | 2.4 | 3.3 | | V | |
| VIK VOH VOH II III IIII IIII IIII IIII IIII | B port | $V_{CC} = 4.5 V$ | I _{OH} = -12 mA | 2 | 3.2 | | | | | | |
| | | | I _{OH} = -15 mA | | | | 2 | 3.1 | | | |
| | A port | V _{CC} = 4.5 V | I _{OL} = 20 mA | | 0.3 | 0.5 | | | | | |
| Voi | | VCC = 4.5 V | I _{OL} = 24 mA | | | | | 0.35 | 0.5 | V | |
| VOL | B port | V _{CC} = 4.5 V | I _{OL} = 48 mA | | 0.38 | 0.55 | | | | v | |
| | Броп | VCC = 4.5 V | I _{OL} = 64 mA | | | | | 0.42 | 0.55 | | |
| | A or B port | | VI = 5.5 V | | | 1 | | | 1 | mA | |
| I | Control input | V _{CC} = 5.5 V, | v] = 5.5 v | | | 0.1 | | | 0.1 | ША | |
| . + | A or B port | V _{CC} = 5.5 V, | /, VI = 2.7 V | | | 70 | | | 70 | μA | |
| ΠH+ | Control input | VCC = 5.5 V, | V - 2.7 V | | | 20 | | | 20 | μΛ | |
| † | A or B port | V _{CC} = 5.5 V, | V ₁ = 0.5 V | | | -0.65 | | | -0.65 | mA | |
| ηΓ+ | Control input | VCC = 0.5 V, | v] = 0.3 v | | | -1.2 | | | -1.2 | ША | |
| 18 | A port | V _{CC} = 5.5 V, | $V_{O} = 0$ | -60 | -150 | -60 | | -150 | mA | | |
| IOSa | B port | VCC = 5.5 V, | VO = 0 | -100 | | -225 | -100 | | -225 | ША | |
| ICCL | A to B | V _{CC} = 5.5 V | | | 57 | 90 | | 57 | 90 | mA | |
| ICCH | A to B | V _{CC} = 5.5 V | | | 36 | 57 | | 36 | 57 | mA | |
| ICCZ | | V _{CC} = 5.5 V | | | 10 | 15 | | 10 | 15 | mA | |
| Ci | Control input | $V_{CC} = 5 V,$ | $V_{I} = 2.5 \text{ V or } 0.5 \text{ V}$ | | 7 | | | 7 | | pF | |
| <u>.</u> | A to B | V _{CC} = 5 V, | V _O = 2.5 V or 0.5 V | | 9 | | | 9 | | pF | |
| Cio | B to A | V CC = 5 V, | $v_{\rm O} = 2.5 \ v_{\rm OI} \ 0.5 \ v_{\rm O}$ | | 12 | | | 12 | | h | |

[†] All typical values are at V_{CC} = 5 V, T_A = 25°C. [‡] For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current. § Not more than one output should be tested at a time, and the duration of the test should not exceed one second.



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switching characteristics (see Note 3)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | Cl R1 R2 | C = 5 V = 50 p = 500 g = 500 g = 500 g = 25°C | F, ,, ,2, | C R R | L = 50 p 1 = 500 2 = 500 | Ω, | | UNIT |
|------------------|-----------------|----------------|----------------|--|-----------------|-------------|--------------------------------|------------|------|------|
| | | | ′BCT245 | | | SN54BCT245 | | SN74BCT245 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| ^t PLH | A or B | B or A | 1 | 4.4 | 6 | 1 | 7.2 | 1 | 7 | ns |
| ^t PHL | | BUR | 1.5 | 4.8 | 6.6 | 1.5 | 7.6 | 1.5 | 7 | 115 |
| ^t PZH | ŌĒ | A or B | 1.5 | 8 | 9.4 | 1.5 | 11.2 | 1.5 | 10.9 | ns |
| ^t PZL | ÛE | AUB | 1.5 | 8 | 10.2 | 1.5 | 11.8 | 1.5 | 11.6 | 115 |
| ^t PHZ | ŌĒ | A or B | 1.5 | 5.8 | 8.3 | 1.5 | 9.7 | 1.5 | 9.3 | |
| ^t PLZ | | AUB | 1.5 | 5.1 | 7.8 | 1.5 | 9.6 | 1.5 | 9.1 | ns |

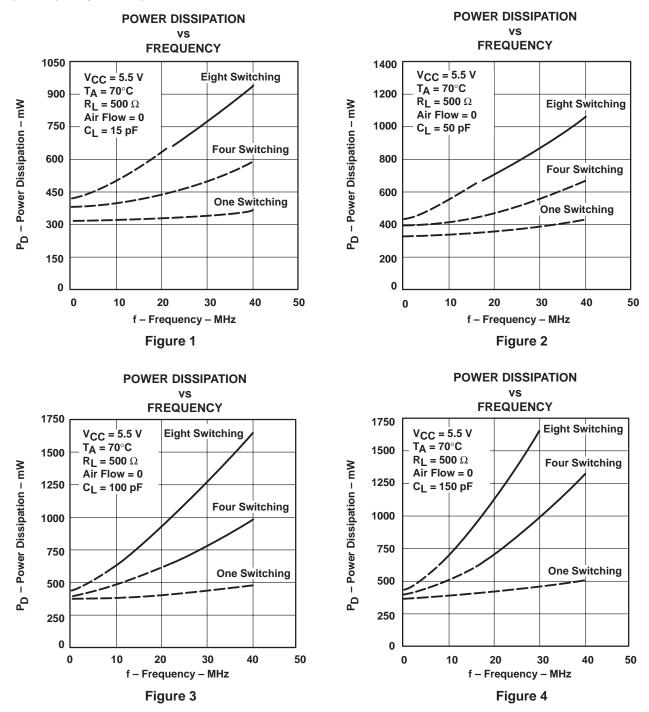
[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



TYPICAL CHARACTERISTICS[†]

Figures 1 through 4 show the typical power dissipation for an SN74BCT245 over variations in outputs switching, output frequency, and capacitive load.



[†] The dashed lines are for the DB package only.



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