

# SN54BCT25244, SN74BCT25244 25-Ω OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS064A – JUNE 1990 – REVISED NOVEMBER 1993

- State-of-the-Art BiCMOS Design Significantly Reduces  $I_{CCZ}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- Designed to Facilitate Incident-Wave Switching for Line Impedances of 25 Ω or Greater
- Distributed  $V_{CC}$  and GND Pins Minimize Noise Generated by the Simultaneous Switching of Outputs
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacs (W), and Standard Plastic and Ceramic 300-mil DIPs (JT, NT)

## description

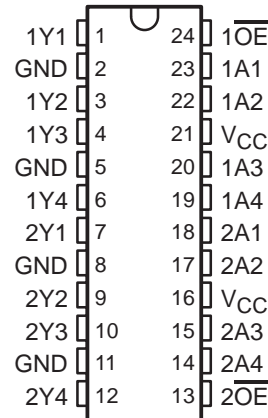
These 25-Ω octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

These buffers are capable of sinking 188-mA  $I_{OL}$ , which facilitates switching 25-Ω transmission lines on the incident wave. The distributed  $V_{CC}$  and GND pins minimize switching noise for more reliable system operation.

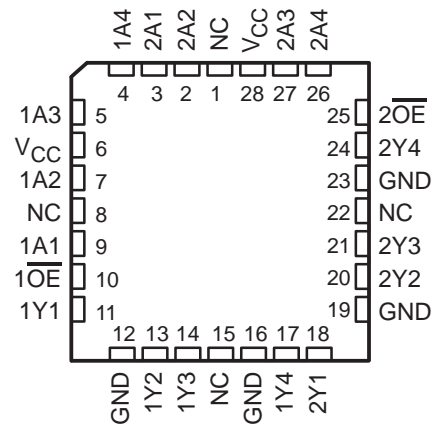
When the output-enable ( $1\overline{OE}$  and  $2\overline{OE}$ ) inputs are low, the device transmits data from the A inputs to the Y outputs. When  $1\overline{OE}$  and  $2\overline{OE}$  are high, the outputs are in the high-impedance state.

The SN54BCT25244 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74BCT25244 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54BCT25244 . . . JT OR W PACKAGE  
SN74BCT25244 . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54BCT25244 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

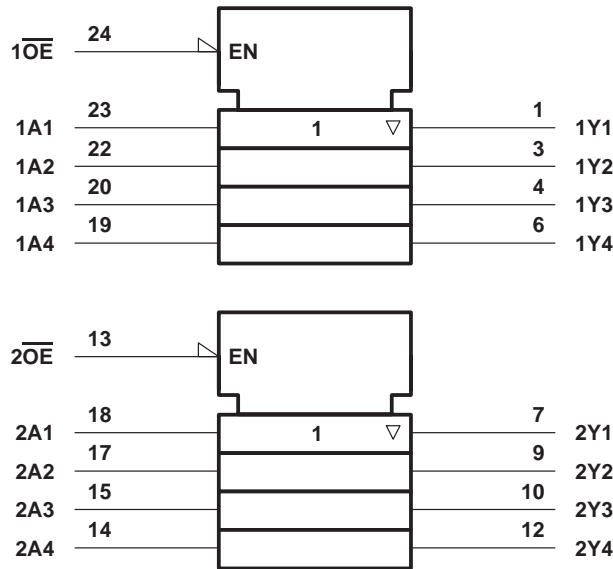
FUNCTION TABLE  
(each buffer/driver)

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

# SN54BCT25244, SN74BCT25244 25-Ω OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

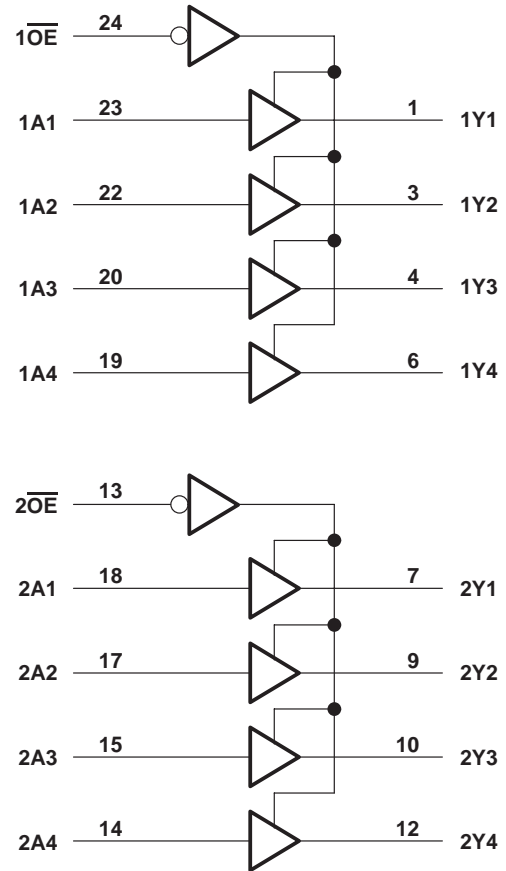
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## logic symbol†



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

## logic diagram (positive logic)



Pin numbers shown are for the DW, JT, NT, and W packages.

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

|   |                    |
|---|--------------------|
| Supply voltage range, $V_{CC}$ .....  | -0.5 V to 7 V      |
| Input voltage range, $V_I$ (see Note 1) .....                                       | -0.5 V to 7 V      |
| Voltage range applied to any output in the disabled or power-off state, $V_O$ ..... | -0.5 V to 5.5 V    |
| Voltage range applied to any output in the high state, $V_O$ .....                  | -0.5 V to $V_{CC}$ |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....                                   | -30 mA             |
| Current into any output in the low state, $I_O$ : SN54BCT25244 .....                | 250 mA             |
| SN74BCT25244 .....  | 376 mA             |
| Operating free-air temperature range: SN54BCT25244 .....                            | -55°C to 125°C     |
| SN74BCT25244 .....  | 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.

NOTE 1: The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

# SN54BCT25244, SN74BCT25244 25-Ω OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 2)

|                 |                                | SN54BCT25244 |     |     | SN74BCT25244 |     |     | 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>IK</sub> | Input clamp current            |              |     | -18 |              |     | -18 | mA   |
| I <sub>OH</sub> | High-level output current      |              |     | -53 |              |     | -80 | mA   |
| I <sub>OL</sub> | Low-level output current       |              |     | 125 |              |     | 188 | mA   |
| T <sub>A</sub>  | Operating free-air temperature | -55          |     | 125 | 0            |     | 70  | °C   |

NOTE 2: Unused or floating inputs must be held high or low.

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

| PARAMETER         | TEST CONDITIONS  | SN54BCT25244             |      | SN74BCT25244 |      | 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> = 4.75 V, I <sub>OH</sub> = -3 mA      |                          |      |              | 2.7  |      | V    |     |
|                   | V <sub>CC</sub> = 4.5 V                                |                          |      | 2            |      |      |      |     |
|                   |  | I <sub>OH</sub> = -80 mA |      |              |      | 2    |      |     |
| V <sub>OL</sub>   | V <sub>CC</sub> = 4.5 V                                |                          |      | 0.38         | 0.55 | 0.42 | 0.55 | V   |
|                   |  |                          |      |              | 0.8  |      |      |     |
|                   |  |                          |      |              |      |      | 0.7  |     |
| I <sub>I</sub>    | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 5.5 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> = 0.5 V        |                          |      | -0.6         |      | -0.6 | 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> = 0.5 V        |                          |      | -50          |      | -50  | μA   |     |
| I <sub>CCCL</sub> | V <sub>CC</sub> = 5.5 V, Outputs open                  |                          |      | 90           | 119  | 90   | 119  | mA  |
| I <sub>CCCH</sub> | V <sub>CC</sub> = 5.5 V, Outputs open                  |                          |      | 59           | 78   | 59   | 78   | mA  |
| I <sub>CCZ</sub>  | V <sub>CC</sub> = 5.5 V, Outputs open                  |                          |      | 7            | 11   | 7    | 11   | mA  |
| C <sub>i</sub>    | V <sub>CC</sub> = 5 V, V <sub>I</sub> = 2.5 V or 0.5 V |                          |      | 5.5          |      | 5.5  |      | pF  |
| C <sub>o</sub>    | V <sub>CC</sub> = 5 V, V <sub>O</sub> = 2.5 V or 0.5 V |                          |      | 17           |      | 17   |      | pF  |

† All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

## switching characteristics over recommended ranges of supply voltage and operating free-air temperature, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Note 3)

| PARAMETER        | FROM (INPUT)    | TO (OUTPUT) | V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C |     |     | SN54BCT25244 |      | SN74BCT25244 |      | UNIT |
|------------------|-----------------|-------------|--|-----|-----|--------------|------|--------------|------|------|
|                  |                 |             | MIN  | TYP | MAX | MIN          | MAX  | MIN          | MAX  |      |
| t <sub>PLH</sub> | A               | Y           | 1  | 3.2 | 4.9 | 1            | 5.6  | 1            | 5.5  | ns   |
| t <sub>PHL</sub> |                 |             | 2  | 4   | 5.6 | 2            | 6.3  | 2            | 6    |      |
| t <sub>PZH</sub> | OE              | Y           | 3.2  | 5.6 | 8.5 | 3.2          | 9.7  | 3.2          | 9.3  | ns   |
| t <sub>PZL</sub> |                 |             | 3.7  | 6.3 | 9.2 | 3.7          | 10.4 | 3.7          | 10.2 |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | Y           | 1.6  | 3.6 | 5.5 | 1.6          | 6.5  | 1.6          | 6.3  | ns   |
| t <sub>PLZ</sub> |                 |             | 3.1  | 5.3 | 7.8 | 3.1          | 9.5  | 3.1          | 8.4  |      |

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





**PACKAGING INFORMATION**

| Orderable Device  | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74BCT25244DW    | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244DWE4  | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244DWG4  | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244DWR   | ACTIVE                | SOIC         | DW              | 24   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244DWRE4 | ACTIVE                | SOIC         | DW              | 24   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244DWRG4 | ACTIVE                | SOIC         | DW              | 24   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT25244NT    | ACTIVE                | PDIP         | NT              | 24   | 15          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74BCT25244NTE4  | ACTIVE                | PDIP         | NT              | 24   | 15          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74BCT25244DWR | SOIC         | DW              | 24   | 2000 | 330.0              | 24.4               | 10.75   | 15.7    | 2.7     | 12.0    | 24.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74BCT25244DWR | SOIC         | DW              | 24   | 2000 | 346.0       | 346.0      | 41.0        |

# MECHANICAL DATA

NT (R-PDIP-T\*\*) 24 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - $\triangle$  The 28 pin end lead shoulder width is a vendor option, either half or full width.





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