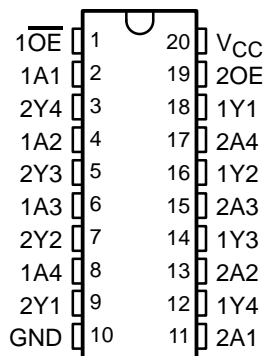


# SN74BCT2241 OCTAL BUFFER AND LINE/MOS DRIVER WITH 3-STATE OUTPUTS

SCBS035D – SEPTEMBER 1988 – REVISED MARCH 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- State-of-the-Art BiCMOS Design Significantly Reduces  $I_{CCZ}$
- Output Ports Have Equivalent 33- $\Omega$  Series Resistors, So No External Resistors Are Required
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- ESD Protection Exceeds JESD 22 – 2000-V Human-Body Model (A114-A)

DW, N OR NS PACKAGE  
(TOP VIEW)



## description/ordering information

This SN74BCT2241 is designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Together with the 'BCT2240 and 'BCT2244 devices, this device provides the choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable ( $\overline{OE}$ ) inputs, and complementary OE and  $\overline{OE}$  inputs. This device features high fan-out and improved fan-in.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor and OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

The outputs, which are designed to source or sink up to 12 mA, include 33- $\Omega$  series resistors to reduce overshoot and undershoot.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74BCT2241N	SN74BCT2241N
	SOIC – DW	Tube	SN74BCT2241DW	BCT2241
		Tape and reel	SN74BCT2241DWR	
	SOP – NS	Tape and reel	SN74BCT2241NSR	BCT2241

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

## FUNCTION TABLES

INPUTS		OUTPUT
1 $\overline{OE}$	1A	1Y
L	H	H
L	L	L
H	X	Z

INPUTS		OUTPUT
2OE	2A	2Y
H	H	H
H	L	L
L	X	Z



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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  
INSTRUMENTS**

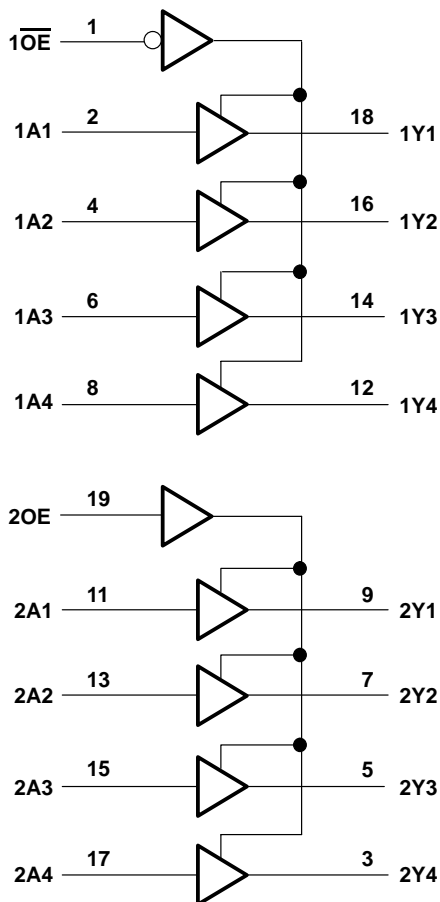
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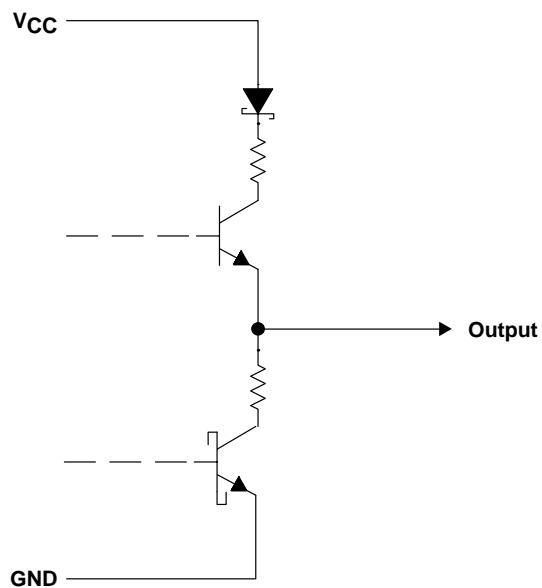
# SN74BCT2241 OCTAL BUFFER AND LINE/MOS DRIVER WITH 3-STATE OUTPUTS

SCBS035D – SEPTEMBER 1988 – REVISED MARCH 2003

## logic diagram (positive logic)



## schematic of Y outputs



# SN74BCT2241 OCTAL BUFFER AND LINE/MOS DRIVER WITH 3-STATE OUTPUTS

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## 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, $I_{IK}$ .....	–30 mA
Current into any output in the low state, $I_O$ .....	24 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package .....	58°C/W
N package .....	69°C/W
NS package .....	60°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 JESD 51-7.

## recommended operating conditions (see Note 3)

	MIN	NOM	MAX	UNIT
$V_{CC}$ Supply voltage	4.5	5	5.5	V
$V_{IH}$ High-level input voltage	2			V
$V_{IL}$ Low-level input voltage			0.8	V
$I_{IK}$ Input clamp current			–18	mA
$I_{OH}$ High-level output current			–12	mA
$I_{OL}$ Low-level output current			12	mA
$T_A$ Operating free-air temperature	0		70	°C

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



**SN74BCT2241**  
**OCTAL BUFFER AND LINE/MOS DRIVER**  
**WITH 3-STATE OUTPUTS**

SCBS035D – SEPTEMBER 1988 – REVISED MARCH 2003

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

PARAMETER	TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$	2.4	3.3		V
		$I_{OH} = -12\text{ mA}$	2			
	$V_{CC} = 4.75\text{ V}$ ,	$I_{OH} = -3\text{ mA}$	2.7			
$V_{OL}$	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 1\text{ mA}$		0.15	0.5	V
		$I_{OL} = 12\text{ mA}$		0.42	0.8	
$I_I$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-1	mA
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.7\text{ V}$			50	$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.5\text{ V}$			-50	$\mu\text{A}$
$I_{OS}‡$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$	-100		-225	mA
$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		23	37	mA
$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		48	76	mA
$I_{CCZ}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		6	9	mA
$C_i$	$V_{CC} = 5\text{ V}$ ,	$V_I = 2.5\text{ V}$ or $0.5\text{ V}$		6		pF
$C_o$	$V_{CC} = 5\text{ V}$ ,	$V_O = 2.5\text{ V}$ or $0.5\text{ V}$		11		pF

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

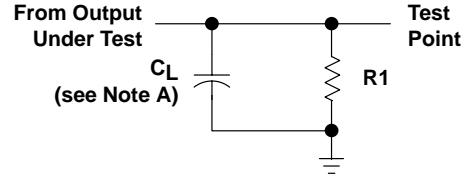
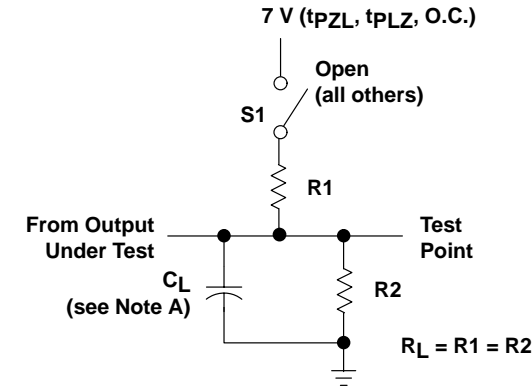
‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

**switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figure 1)**

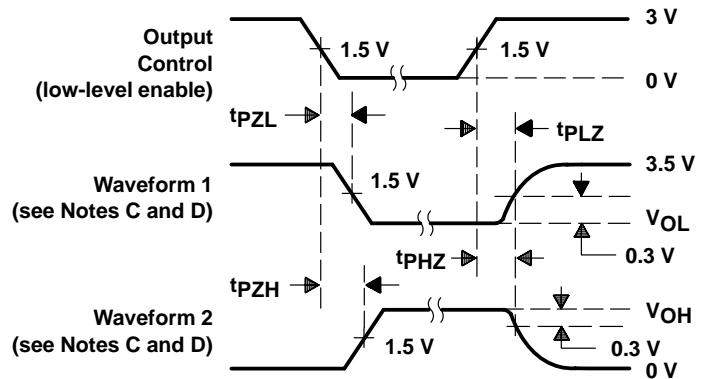
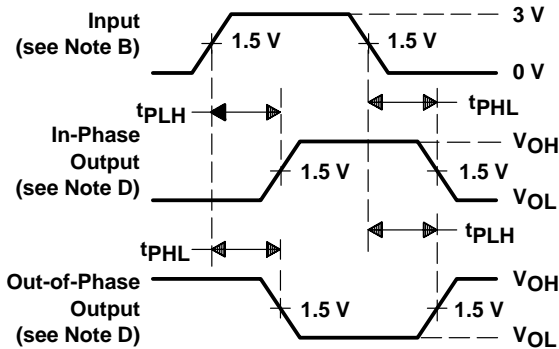
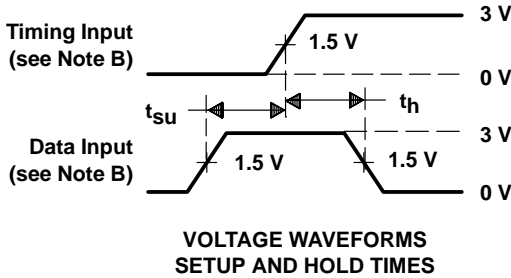
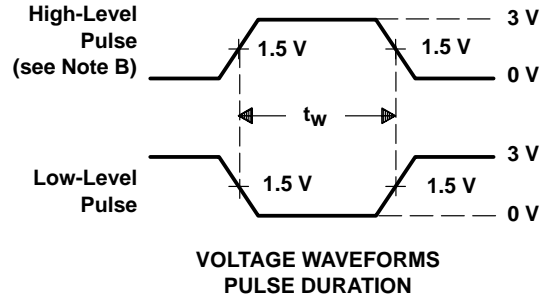
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$t_{PLH}$	A	Y	1.1	3	4.4	1.1	4.9	ns
$t_{PHL}$			2.9	4.9	6.6	2.9	6.9	
$t_{PZH}$	OE or $\overline{\text{OE}}$	Y	2.7	6	7.8	2.7	8.9	ns
$t_{PZL}$			4.1	7.7	9.4	4.1	10.3	
$t_{PHZ}$	OE or $\overline{\text{OE}}$	Y	2.5	5.2	7.2	2.5	8.7	ns
$t_{PLZ}$			3.2	7.1	9.5	3.2	11.3	



**PARAMETER MEASUREMENT INFORMATION**



**LOAD CIRCUIT FOR  
3-STATE AND OPEN-COLLECTOR OUTPUTS**



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $t_r = t_f \leq 2.5$  ns, duty cycle = 50%.  
 C. 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.  
 D. The outputs are measured one at a time with one transition per measurement.  
 E. When measuring propagation delay times of 3-state outputs, switch S1 is open.  
 F. All parameters and waveforms are not applicable to all devices.

**Figure 1. Load Circuit and Voltage Waveforms**

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

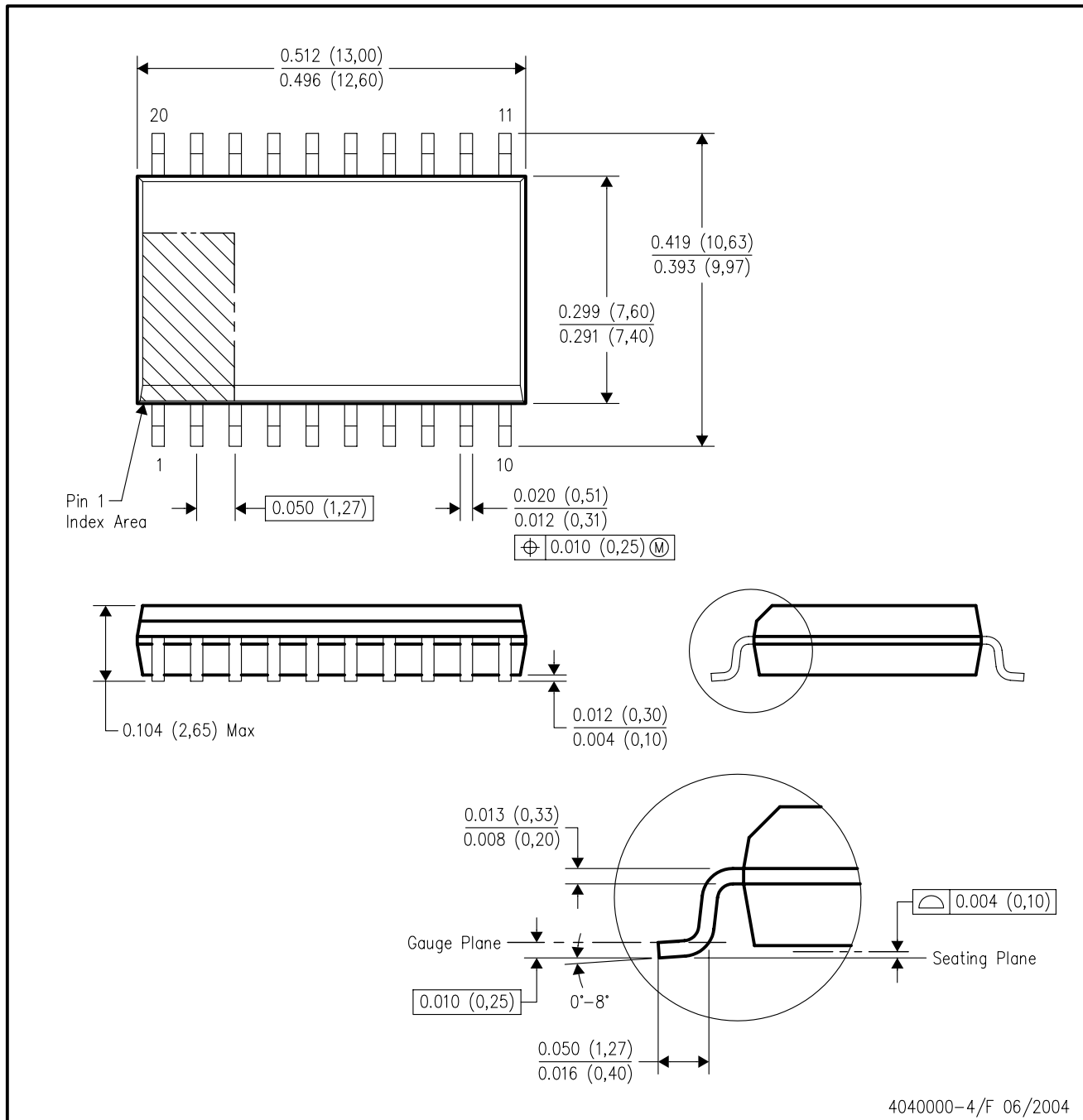
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AC.

## MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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