

# SN54ABT244, SN74ABT244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCB5099D – D3655, JANUARY 1991 – REVISED JULY 1993

- State-of-the-Art *EPIC-II B*™ BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical  $V_{OLP}$  (Output Ground Bounce) < 1 V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- High-Drive Outputs ( $-32\text{-mA } I_{OH}$ ,  $64\text{-mA } I_{OL}$ )
- Package Options Include Plastic Small-Outline (SOIC) and Shrink Small-Outline (SSOP) Packages, Ceramic Chip Carriers, and Plastic and Ceramic DIPs

## description

These 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. Taken together with the 'ABT240 and 'ABT241, these devices provide the choice of selected combinations of inverting and noninverting outputs, symmetrical  $\overline{OE}$  (active-low output-enable) inputs, and complementary OE and  $\overline{OE}$  inputs.

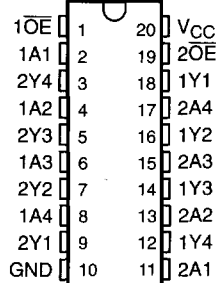
The 'ABT244 is organized as two 4-bit buffers/line drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

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

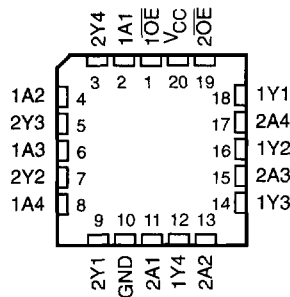
The SN74ABT244 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54ABT244 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT244 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT244 . . . J PACKAGE  
SN74ABT244 . . . DB, DW, OR N PACKAGE  
(TOP VIEW)



SN54ABT244 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each buffer)

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

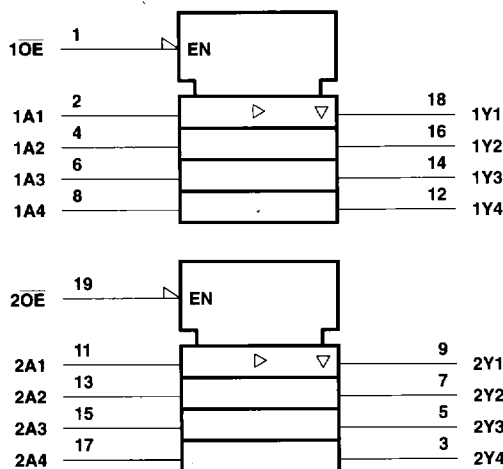
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# SN54ABT244, SN74ABT244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

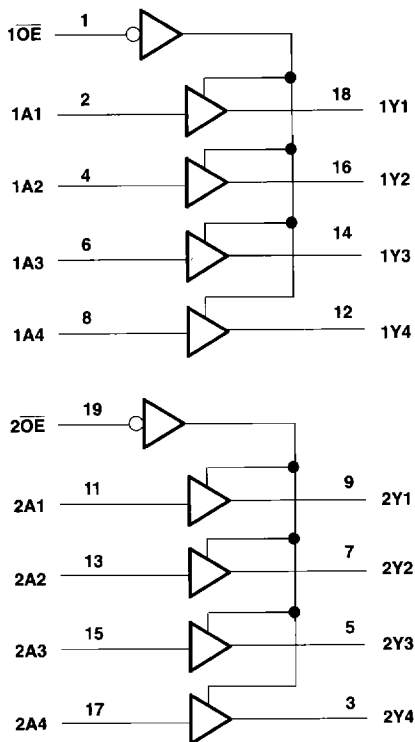
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## logic symbol†



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

## logic diagram (positive logic)



## 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 applied to any output in the high state or power-off state, $V_O$ .....	-0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABT244 .....	96 mA
SN74ABT244 .....	128 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air): DB package .....	0.65 W
DW package .....	0.85 W
N package .....	1.3 W
Storage temperature range .....	$-65^\circ\text{C}$ to $150^\circ\text{C}$

‡ 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.

# SN54ABT244, SN74ABT244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 2)

		SN54ABT244		SN74ABT244		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	4.5	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
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current		-24		-32	mA
I <sub>OL</sub>	Low-level output current		48		64	mA
Δt/Δv	Input transition rise or fall rate		5		5	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°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	T <sub>A</sub> = 25°C			SN54ABT244		SN74ABT244		UNIT
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		-1.2		-1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA	2.5			2.5		2.5		V
	V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA	3			3		3		
	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -24 mA	2			2				
	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -32 mA	2‡					2		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 48 mA			0.55		0.55			V
	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 64 mA			0.55‡			0.55		
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1		±1		±1	μA
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			10§		10§		10§	μA
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.5 V			-10§		-10§		-10§	μA
I <sub>off</sub>	V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V			±100				±100	μA
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V			50		50		50	μA
I <sub>O</sub> ¶	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	-50	-100	-180	-50	-180	-50	-180	mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0,	Outputs high		1	250	250	250	250	μA
		Outputs low		24	30	30	30	30	mA
		Outputs disabled		0.5	250	250	250	250	μA
ΔI <sub>CC</sub> #	V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	Data inputs		Outputs enabled		1.5	1.5	1.5	mA
				Outputs disabled		0.05	0.05	0.05	
		Control inputs		1.5	1.5	1.5			
C <sub>i</sub>	V <sub>I</sub> = 2.5 V or 0.5 V			3					pF
C <sub>o</sub>	V <sub>O</sub> = 2.5 V or 0.5 V			8					pF

† All typical values are at V<sub>CC</sub> = 5 V.

‡ On products compliant to MIL-STD-883, Class B, this parameter does not apply.

§ This data sheet limit may vary among suppliers.

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

# This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

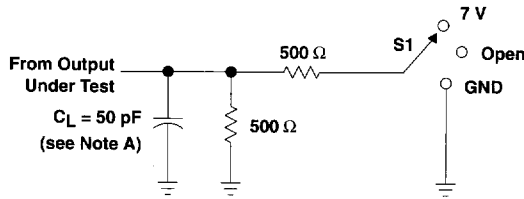
**SN54ABT244, SN74ABT244  
OCTAL BUFFERS/DRIVERS  
WITH 3-STATE OUTPUTS**

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

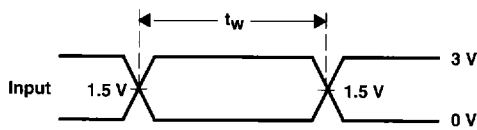
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ$ C			SN54ABT244		SN74ABT244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	1	2.6	4.1	1	5.3	1	4.6	ns
$t_{PHL}$			1	2.9	4.2	1	5	1	4.6	
$t_{PZH}$	OE	Y	1.1	3.1	4.6	0.8	5.7	1.1	5.1	ns
$t_{PZL}$			2.1	4.1	5.6	1.2	7.9	2.1	6.1	
$t_{PHZ}$	OE	Y	2.1	4.1	5.6	1.2	7.6	2.1	6.6	ns
$t_{PLZ}$			1.7	3.7	5.2	1	7.9	1.7	5.7	

PARAMETER MEASUREMENT INFORMATION

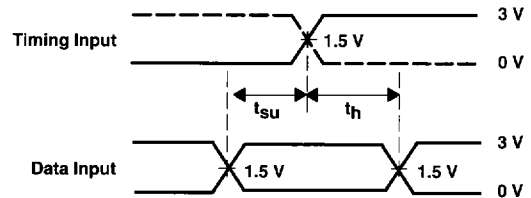


TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open

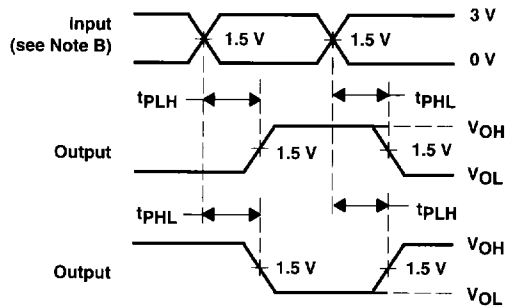
LOAD CIRCUIT FOR OUTPUTS



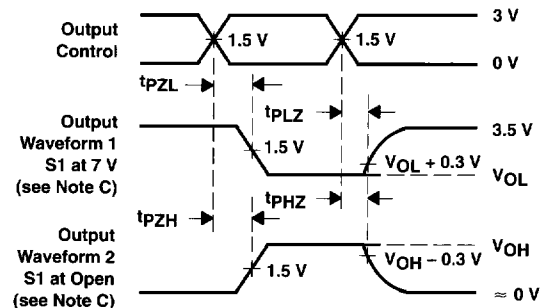
VOLTAGE WAVEFORMS  
 PULSE DURATION



VOLTAGE WAVEFORMS  
 SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
 PROPAGATION DELAY TIMES  
 INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
 ENABLE AND DISABLE TIMES  
 LOW- AND HIGH-LEVEL ENABLING

- 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,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.  
 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.

Figure 1. Load Circuit and Voltage Waveforms

