

# SN54ABT16244, SN74ABT16244A 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS073D - D3711, SEPTEMBER 1991 - REVISED AUGUST 1993

- Members of the Texas Instruments *Widebus*™ Family
- State-of-the-Art *EPIC-IIB*™ 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,  $T_A = 25^\circ\text{C}$
- Distributed  $V_{CC}$  and GND Pin Configuration Minimizes High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- High-Drive Outputs ( $-32\text{-mA } I_{OH}$ ,  $64\text{-mA } I_{OL}$ )
- Packaged in Plastic 300-mil Shrink Small-Outline and Thin Shrink Small-Outline Packages and 380-mil Fine-Pitch Ceramic Flat Packages Using 25-mil Center-to-Center Spacings

## description

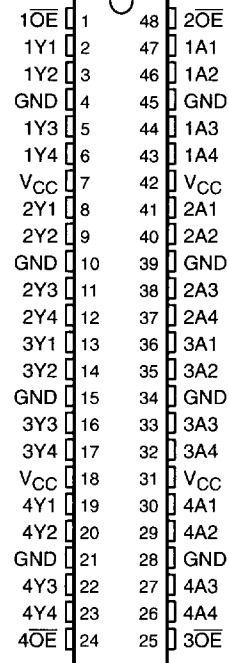
The SN54ABT16244 and SN74ABT16244A are 16-bit buffers and line drivers designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The devices can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. These devices provide true outputs and symmetrical  $\overline{OE}$  (active-low output-enable) inputs.

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 SN74ABT16244A is available in TI's shrink small-outline package (DL), which provides twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

The SN54ABT16244 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT16244A is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT16244 . . . WD PACKAGE  
SN74ABT16244A . . . DGG OR DL 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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**16-BIT BUFFERS/DRIVERS**  
**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 high state or power-off state, $V_O$ .....	-0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABT16244 .....	96 mA
SN74ABT16244A .....	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): DGG package .....	0.8 W
DL package .....	0.85 W
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.

**recommended operating conditions (see Note 2)**

		SN54ABT16244		SN74ABT16244A		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8	V
$V_I$	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current		-24		-32	mA
$I_{OL}$	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		10		10	ns/V
	Outputs enabled					
$T_A$	Operating free-air temperature	-55	125	-40	85	°C

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



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

PARAMETER	TEST CONDITIONS	T <sub>A</sub> = 25°C†			SN54ABT16244		SN74ABT16244A		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		±100	µA
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V	Outputs high		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, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high		3		2		3	mA
		Outputs low		32		32		32	
		Outputs disabled		3		2		3	
ΔI <sub>CCII</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	0.05		1.5		0.05	mA
			Outputs disabled	0.05		1		0.05	
		Control inputs		0.05		1.5		0.05	
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

† Characteristics for T<sub>A</sub> = 25°C apply to the SN74ABT16244A only.

‡ 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.

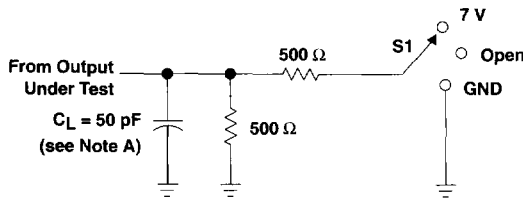
|| This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C†			SN54ABT16244		SN74ABT16244A		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1	2.3	3.2	0.7	3.7	1	3.5	ns
t <sub>PHL</sub>			1	2.6	3.7	0.5	4.3	1	4.1	
t <sub>PZH</sub>	OE	Y	1	3	3.8	0.7	5	1	4.8	ns
t <sub>PZL</sub>			1	3.2	4	0.9	5	1	4.8	
t <sub>PHZ</sub>	OE	Y	1	3.6	4.4	1	5	1	4.8	ns
t <sub>PLZ</sub>			1	2.9	3.7	1	4.3	1	4.1	

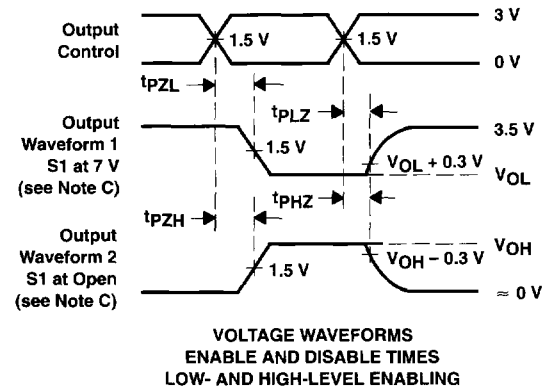
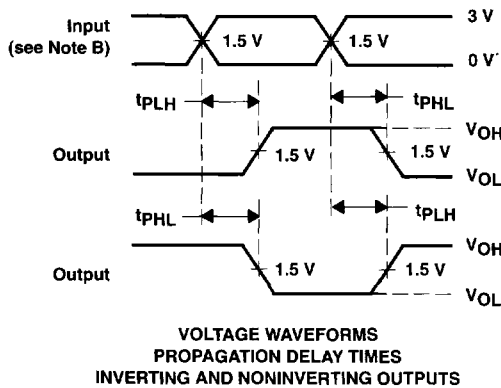
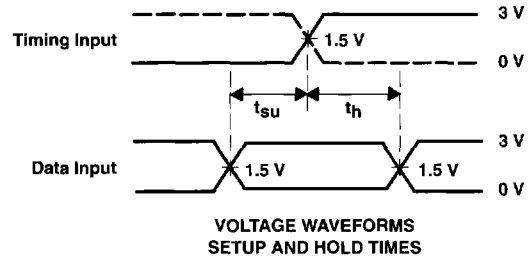
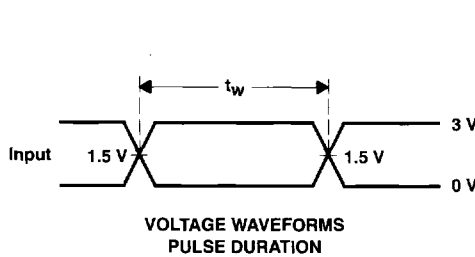


PARAMETER MEASUREMENT INFORMATION



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

LOAD CIRCUIT FOR OUTPUTS



- 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

