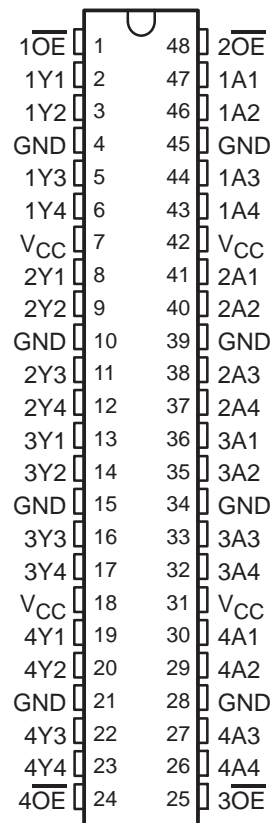


SN54ABT162244, SN74ABT162244 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS238E – JUNE 1992 – REVISED JUNE 2004

- Members of the Texas Instruments Widebus™ Family
- Output Ports Have Equivalent 25-Ω Series Resistors, So No External Resistors Are Required
- Typical V_{OLP} (Output Ground Bounce) <1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Impedance State During Power Up and Power Down
- I_{off} and Power-Up 3-State Support Hot Insertion
- Distributed V_{CC} and GND Pins Minimize High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- Latch-Up Performance Exceeds 500 mA Per JESD-17

SN54ABT162244 . . . WD PACKAGE
SN74ABT162244 . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



description/ordering information

The 'ABT162244 devices 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. These devices can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. These devices provide noninverting outputs and symmetrical active-low output-enable (\overline{OE}) inputs.

The outputs, which are designed to source or sink up to 12 mA, include equivalent 25-Ω series resistors to reduce overshoot and undershoot.

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.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SSOP – DL	Tube	SN74ABT162244DL	ABT162244
		Tape and reel	SN74ABT162244DLR	
	TSSOP – DGG	Tape and reel	SN74ABT162244DGGR	ABT162244
-55°C to 125°C	TVSOP – DGV	Tape and reel	SN74ABT162244DGV	AH2244
	CFP – WD	Tube	SNJ54ABT162244WD	SNJ54ABT162244WD

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



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Widebus is a trademark of Texas Instruments.

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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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54ABT162244, SN74ABT162244

16-BIT BUFFERS/DRIVERS

WITH 3-STATE OUTPUTS

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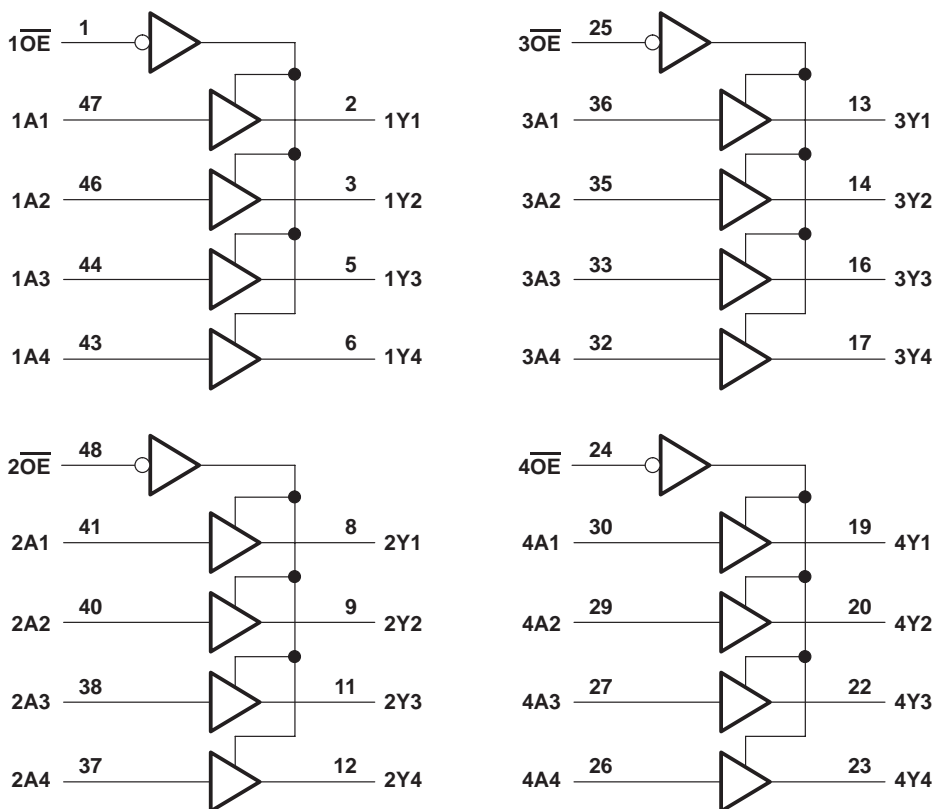
description/ordering information (continued)

These devices are fully specified for hot-insertion applications using I_{off} and power-up 3-state. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

FUNCTION TABLE
(each 4-bit buffer)

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

logic diagram (positive logic)



SN54ABT162244, SN74ABT162244

16-BIT BUFFERS/DRIVERS

WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	T _A = 25°C			SN54ABT162244		SN74ABT162244		UNIT	
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX		
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.2		-1.2		-1.2	V	
V _{OH}	V _{CC} = 4.5 V, I _{OH} = -1 mA			3.35		3.35		3.35	V	
	V _{CC} = 5 V, I _{OH} = -1 mA			3.85		3.85		3.85		
	V _{CC} = 4.5 V	I _{OH} = -3 mA			3.1		3.1			3.1
I _{OH} = -12 mA				2.6*				2.6		
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 8 mA			0.4			0.8	0.65	V
		I _{OL} = 12 mA						0.8*	0.8	
V _{hys}				100					mV	
I _I	V _{CC} = 0 to 5.5 V, V _I = V _{CC} or GND			±1		±1		±1	µA	
I _{OZPU}	V _{CC} = 0 to 2.1 V, V _O = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	µA	
I _{OZPD}	V _{CC} = 2.1 V to 0, V _O = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	µA	
I _{OZH}	V _{CC} = 2.1 V to 5.5 V, V _O = 2.7 V, $\overline{OE} \geq 2$ V			10		10		10	µA	
I _{OZL}	V _{CC} = 2.1 V to 5.5 V, V _O = 0.5 V, $\overline{OE} \geq 2$ V			-10		-10		-10	µA	
I _{off}	V _{CC} = 0, V _I or V _O ≤ 4.5 V			±100				±100	µA	
I _{CEX}	V _{CC} = 5.5 V, V _O = 5.5 V	Outputs high			50		50	50	µA	
I _O	V _{CC} = 5.5 V, V _O = 2.5 V			-25	-55	-100	-25	-100	-100	mA
I _{CC} ‡	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high			2		2	2	mA	
		Outputs low			30		30	30		
		Outputs disabled			2		2	2		
ΔI _{CC} §	Data inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND	Outputs enabled			50		50	µA	
			Outputs disabled			50		50		
	Control inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND			50		50	50		
C _i	V _I = 2.5 V or 0.5 V			3					pF	
C _o	V _O = 2.5 V or 0.5 V			8					pF	

* On products compliant to MIL-PRF-38535, this parameter does not apply.

† All typical values are at V_{CC} = 5 V.

‡ 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_{CC} or GND.



SN54ABT162244, SN74ABT162244
16-BIT 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)	SN54ABT162244					UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX		
			MIN	TYP	MAX				
t _{PLH}	A	Y	1	2.5	3.6	1	4.1	ns	
t _{PHL}			1	3.1	4.7	1	5.3		
t _{PZH}	\overline{OE}	Y	1	3.2	4.8	1	5.6	ns	
t _{PZL}			1	3.2	4.7	1	5.5		
t _{PHZ}	\overline{OE}	Y	1	3.2	5.3	1	6.3	ns	
t _{PLZ}			1	3.1	4.6	1	4.9		

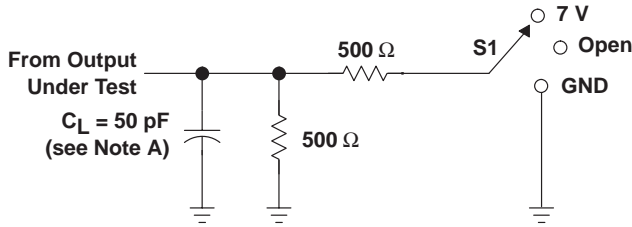
switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT162244					UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX		
			MIN	TYP	MAX				
t _{PLH}	A	Y	1	2.5	3.2	1	3.9	ns	
t _{PHL}			1	3.1	4	1	4.8		
t _{PZH}	\overline{OE}	Y	1	3.2	4.2	1	5.4	ns	
t _{PZL}			1	3.2	4.1	1	5.1		
t _{PHZ}	\overline{OE}	Y	1	3.2	4	1	4.6	ns	
t _{PLZ}			1	3.1	3.9	1	4.5		

SN54ABT162244, SN74ABT162244
16-BIT BUFFERS/DRIVERS
WITH 3-STATE OUTPUTS

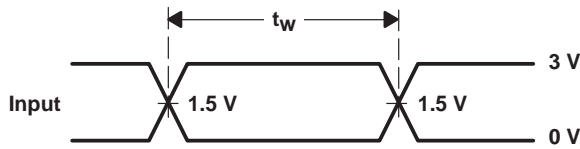
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PARAMETER MEASUREMENT INFORMATION

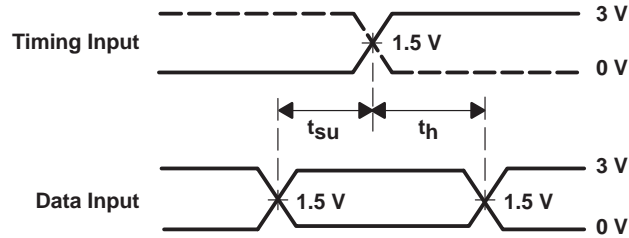


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open

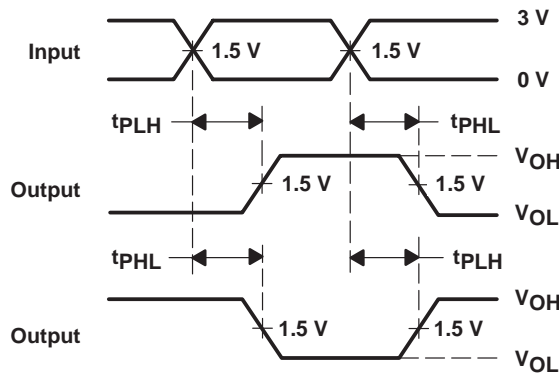
LOAD CIRCUIT



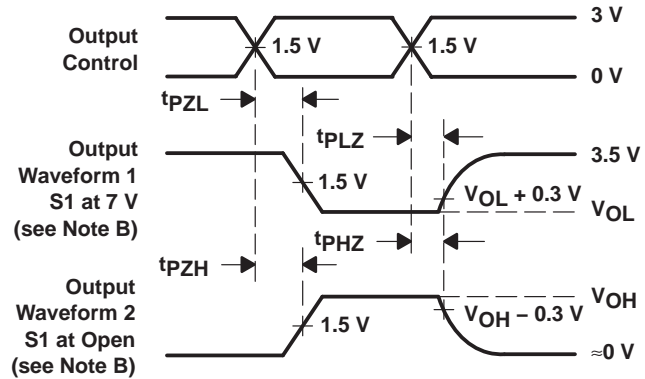
VOLTAGE WAVEFORMS PULSE DURATION



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. 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.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 D. The outputs are measured one at a time, with one transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9458701QXA	ACTIVE	CFP	WD	48	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9458701QX A SNJ54ABT162244 WD	Samples
74ABT162244DGGRG4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT162244	Samples
SN74ABT162244DGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT162244	Samples
SN74ABT162244DGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH2244	Samples
SN74ABT162244DL	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT162244	Samples
SN74ABT162244DLR	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT162244	Samples
SNJ54ABT162244WD	ACTIVE	CFP	WD	48	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9458701QX A SNJ54ABT162244 WD	Samples

(1) 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.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54ABT162244, SN74ABT162244 :

- Catalog: [SN74ABT162244](#)
- Military: [SN54ABT162244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

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
SN74ABT162244DGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	13.0	1.8	12.0	24.0	Q1
SN74ABT162244DGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74ABT162244DLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT162244DGGR	TSSOP	DGG	48	2000	367.0	367.0	45.0
SN74ABT162244DGVR	TVSOP	DGV	48	2000	367.0	367.0	38.0
SN74ABT162244DLR	SSOP	DL	48	1000	367.0	367.0	55.0

WD (R-GDFP-F**)

CERAMIC DUAL FLATPACK

48 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification only
 E. Falls within MIL STD 1835: GDFP1-F48 and JEDEC MO-146AA
 GDFP1-F56 and JEDEC MO-146AB

MECHANICAL DATA

DL (R-PDSO-G48)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MO-118

PowerPAD is a trademark of Texas Instruments.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

- 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

DGG (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 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 protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

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