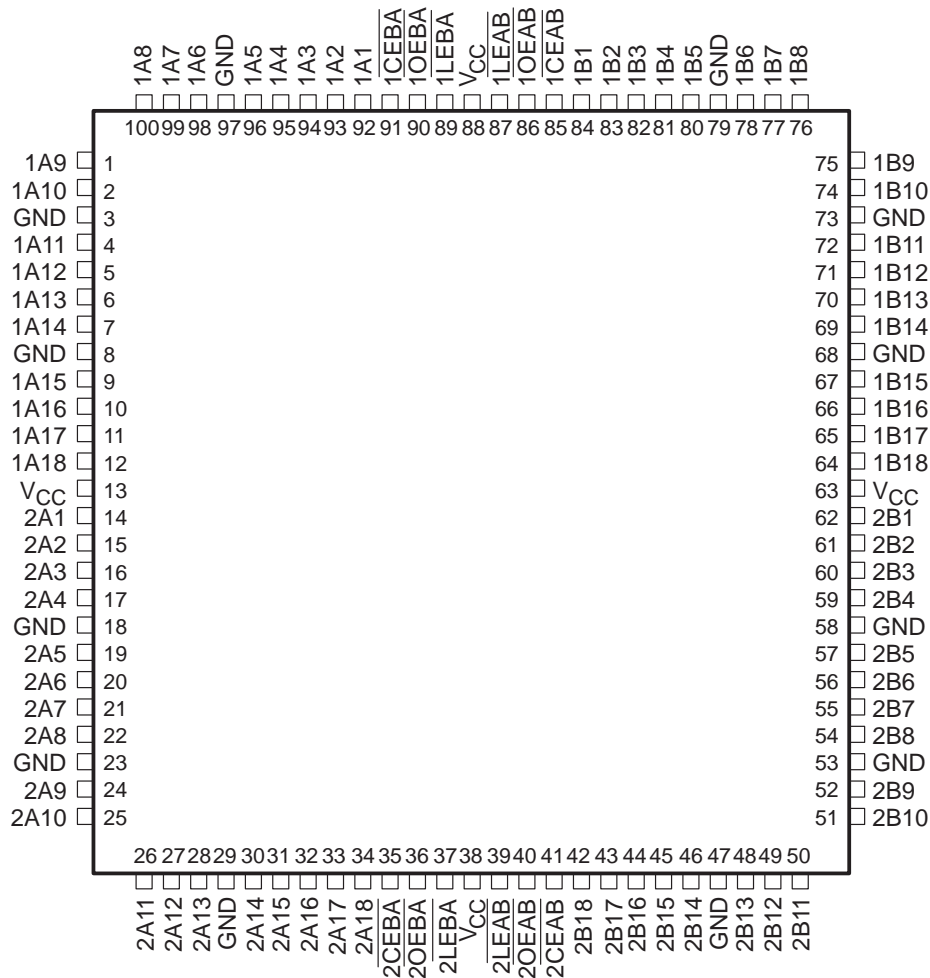


# SN54ABTH32543, SN74ABTH32543 36-BIT REGISTERED BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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- Members of the Texas Instruments *Widebus+*™ Family
- 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)  $< 0.8$  V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- High-Impedance State During Power Up and Power Down
- Released as DSCC SMD 5962-9557801NXD
- Distributed  $V_{CC}$  and GND Pin Configuration Minimizes High-Speed Switching Noise
- High-Drive Outputs ( $-32\text{-mA } I_{OH}$ ,  $64\text{-mA } I_{OL}$ )
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Package Options Include 100-Pin Plastic Thin Quad Flat (PZ) Package With  $14 \times 14\text{-mm}$  Body Using 0.5-mm Lead Pitch and Space-Saving 100-Pin Ceramic Quad Flat (HS) Package†

'ABTH32543 . . . PZ PACKAGE  
(TOP VIEW)



† The HS package is not production released.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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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.



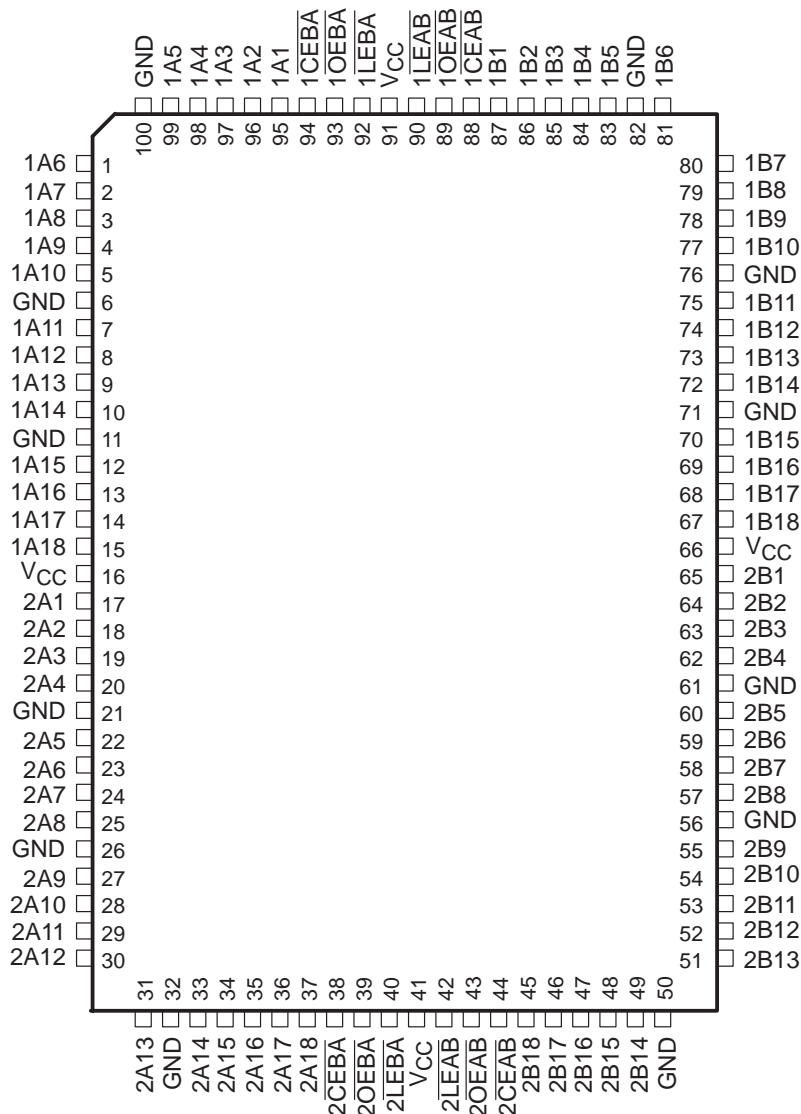
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# SN54ABTH32543, SN74ABTH32543 36-BIT REGISTERED BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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SN54ABTH32543 . . . HS PACKAGE†  
(TOP VIEW)



† For HS package availability, please contact the factory or your local TI Field Sales Office.

## description

The 'ABTH32543 are 36-bit registered transceivers that contain two sets of D-type latches for temporary storage of data flowing in either direction. These devices can be used as two 18-bit transceivers or one 36-bit transceiver. Separate latch-enable ( $\overline{LEAB}$  or  $\overline{LEBA}$ ) and output-enable ( $\overline{OEAB}$  or  $\overline{OEBA}$ ) inputs are provided for each register to permit independent control in either direction of data flow.

The A-to-B enable ( $\overline{CEAB}$ ) input must be low to enter data from A or to output data from B. If  $\overline{CEAB}$  is low and  $\overline{LEAB}$  is low, the A-to-B latches are transparent; a subsequent low-to-high transition of  $\overline{LEAB}$  puts the A latches in the storage mode. With  $\overline{CEAB}$  and  $\overline{OEAB}$  both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar but requires using the  $\overline{CEBA}$ ,  $\overline{LEBA}$ , and  $\overline{OEBA}$  inputs.



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**description (continued)**

When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V,  $\overline{OE}$  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.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

The SN54ABTH32543 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ABTH32543 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

**FUNCTION TABLE†**  
(each 18-bit section)

INPUTS				OUTPUT B
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A	
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	$B_0^{\ddagger}$
L	L	L	L	L
L	L	L	H	H

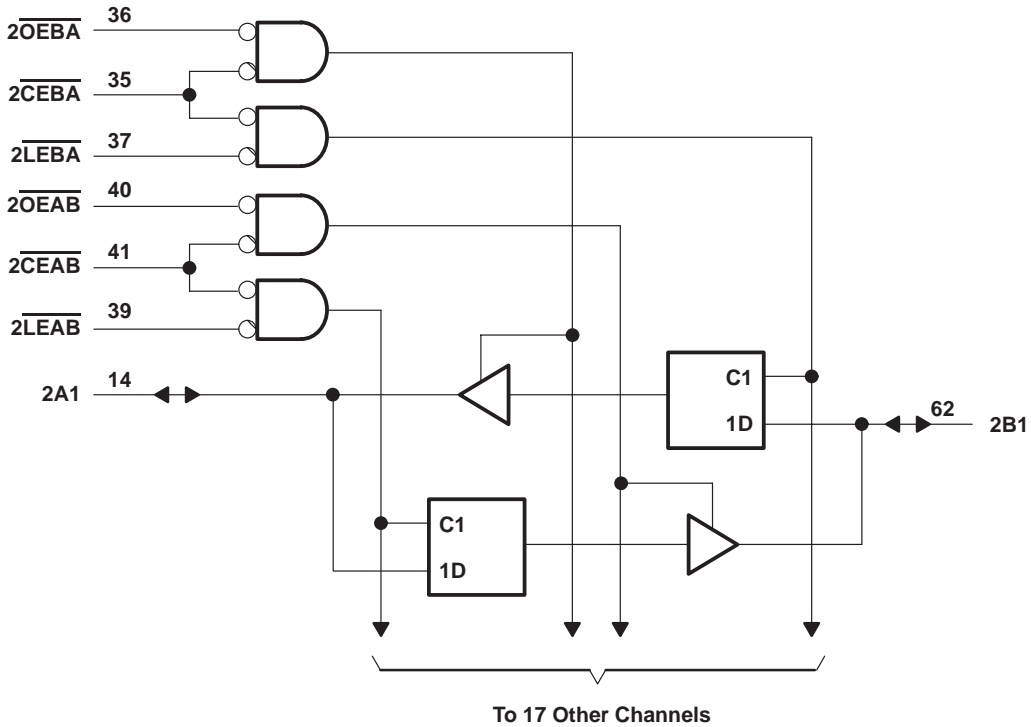
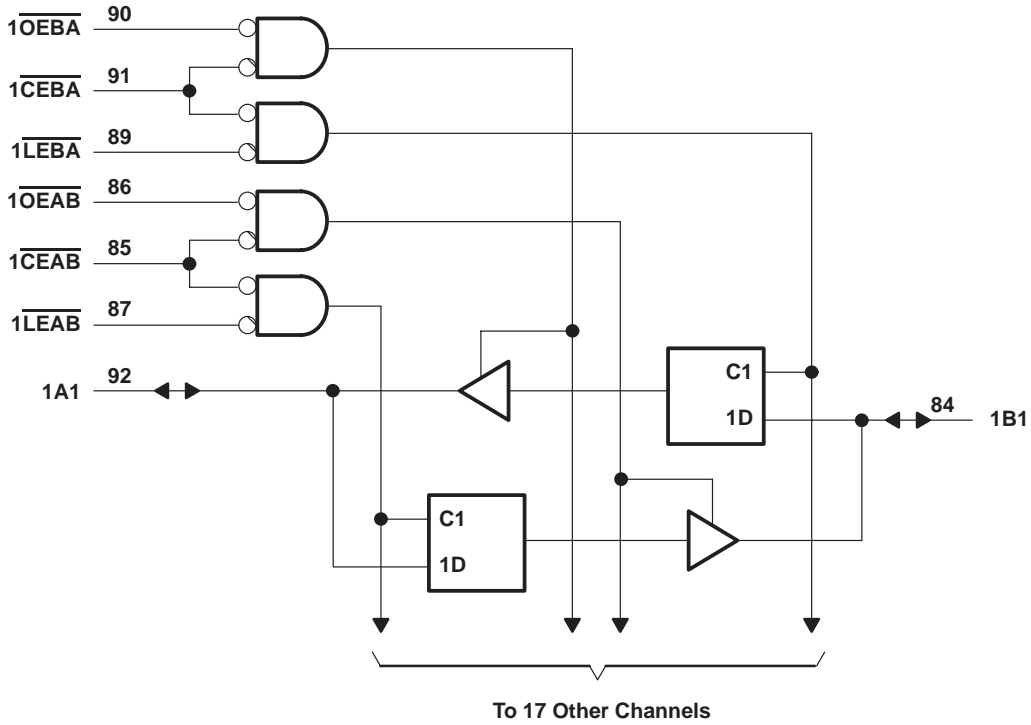
† A-to-B data flow is shown; B-to-A flow control is the same except that it uses  $\overline{CEBA}$ ,  $\overline{LEBA}$ , and  $\overline{OEBA}$ .

‡ Output level before the indicated steady-state input conditions were established

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**logic diagram (positive logic)**



Pin numbers shown are for the PZ package.



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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, $V_I$ (except I/O ports) (see Note 1) .....	–0.5 V to 7 V
Voltage range applied to any output in the high or power-off state, $V_O$ .....	–0.5 V to 5.5 V
Current into any output in the low state, $I_{O}$ : SN54ABTH32543 .....	96 mA
SN74ABTH32543 .....	128 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	–18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	–50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): PZ package .....	50°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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51.

## recommended operating conditions (see Note 3)

		SN54ABTH32543		SN74ABTH32543		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	Outputs enabled		10	10	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	200		200		μs/V
$T_A$	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused control pins must be held high or low to prevent them from floating.



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

PARAMETER	TEST CONDITIONS	SN54ABTH32543			SN74ABTH32543			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> = 4.5 V, I <sub>OH</sub> = -3 mA	2.5			2.5			V
	V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA	3			3			
	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -24 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
							0.55	
V <sub>hys</sub>			100			100		mV
I <sub>I</sub>	Control inputs, V <sub>CC</sub> = 0 to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND						±1	μA
	A or B ports, V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND						±20	
	Control inputs, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1				
	A or B ports, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±20				
I <sub>I</sub> (hold)	A or B ports, V <sub>CC</sub> = 4.5 V, V <sub>I</sub> = 0.8 V						100	μA
							-100	
I <sub>OZPU</sub> ‡	V <sub>CC</sub> = 0 to 2.1 V, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50			±50	μA
I <sub>OZPD</sub> ‡	V <sub>CC</sub> = 2.1 V to 0, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50			±50	μA
I <sub>off</sub>	V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V						±100	μA
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V, Outputs high			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	-100	-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			3	mA
		Outputs low		20			20	
		Outputs disabled		2			2	
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			1			1	mA
C <sub>i</sub>	Control inputs, V <sub>I</sub> = 2.5 V or 0.5 V		3.5			3.5		pF
C <sub>io</sub>	A or B ports, V <sub>O</sub> = 2.5 V or 0.5 V		9.5			9.5		pF

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

‡ This parameter is specified by characterization.

§ 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.

**timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)**

		V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C#		SN54ABTH32543		SN74ABTH32543		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration, $\overline{LEAB}$ or $\overline{LEBA}$ low	3.3		3.3		3.3		ns
t <sub>su</sub>	Setup time	Data before $\overline{LEAB}$ ↑ or $\overline{LEBA}$ ↑	2.1		2.6		2.1	ns
		Data before $\overline{CEAB}$ ↑ or $\overline{CEBA}$ ↑	1.7		2		1.7	
t <sub>h</sub>	Hold time	Data after $\overline{LEAB}$ ↑ or $\overline{LEBA}$ ↑	0.6		1.1		0.6	ns
		Data after $\overline{CEAB}$ ↑ or $\overline{CEBA}$ ↑	0.9		1.2		0.9	

# These limits apply only to the SN74ABTH32543.



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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)

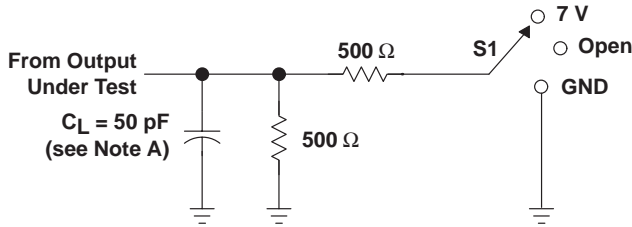
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}^\dagger$			SN54ABTH32543		SN74ABTH32543		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	1	3.5	5.2	0.5	6.3	1	5.9	ns
$t_{PHL}$			1	3.5	5.1	0.5	5.9	1	5.7	
$t_{PLH}$	$\overline{LE}$	A or B	1.9	4.6	6.3	0.8	7.9	1.9	7.5	ns
$t_{PHL}$			1.9	4.3	5.9	0.8	6.9	1.9	6.6	
$t_{PZH}$	$\overline{CE}$	A or B	1.7	4.3	6.7	0.8	8.3	1.7	8	ns
$t_{PZL}$			2.6	5.2	8	1	8.8	2.6	8.8	
$t_{PHZ}$	$\overline{CE}$	A or B	1.6	3.8	6.6	0.5	7.4	1.6	7.1	ns
$t_{PLZ}$			2.4	4.6	7	1	7.9	2.4	7.5	
$t_{PZH}$	$\overline{OE}$	A or B	1.4	3.8	6.1	0.5	7.6	1.4	7.3	ns
$t_{PZL}$			2.3	4.7	7.4	1	8.2	2.3	8.1	
$t_{PHZ}$	$\overline{OE}$	A or B	1.3	3.4	6.1	0.5	6.7	1.3	6.5	ns
$t_{PLZ}$			2	4.2	6.6	0.8	7.2	2	6.9	

<sup>†</sup> These limits apply only to the SN74ABTH32543.

**SN54ABTH32543, SN74ABTH32543**  
**36-BIT REGISTERED BUS TRANSCEIVERS**  
**WITH 3-STATE OUTPUTS**

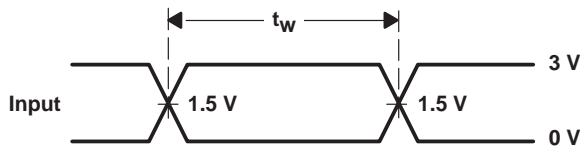
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**PARAMETER MEASUREMENT INFORMATION**

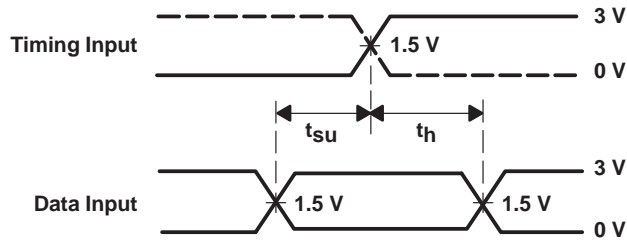


**LOAD CIRCUIT**

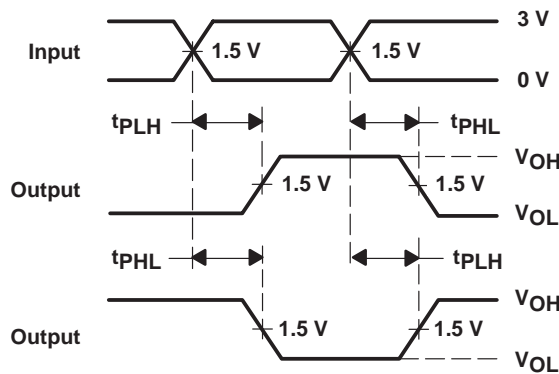
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



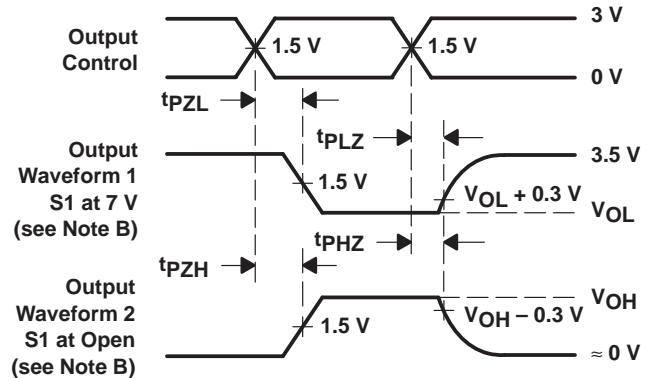
**VOLTAGE WAVEFORMS**  
**PULSE DURATION**



**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.

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



**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>
5962-9557801NXD	ACTIVE	LQFP	PZ	100	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
SN74ABTH32543PZ	ACTIVE	LQFP	PZ	100	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
SN74ABTH32543PZG4	ACTIVE	LQFP	PZ	100	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR

<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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PZ (S-PQFP-G100)

PLASTIC QUAD FLATPACK



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-026

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Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
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