

# SN54ABT2952, SN74ABT2952 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS202 – NOVEMBER 1990 – REVISED OCTOBER 1992

- State-of-the-Art *EPIC-II B*™ BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Two 8-Bit Back-to-Back Registers Store Data Flowing in Both Directions
- Noninverting Outputs
- Typical  $V_{OLP}$  (Output Ground Bounce) < 1 V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- Package Options Include Plastic Small-Outline (SOIC) and Shrink Small-Outline (SSOP) Packages, Ceramic Chip Carriers, and Plastic and Ceramic DIPs

## description

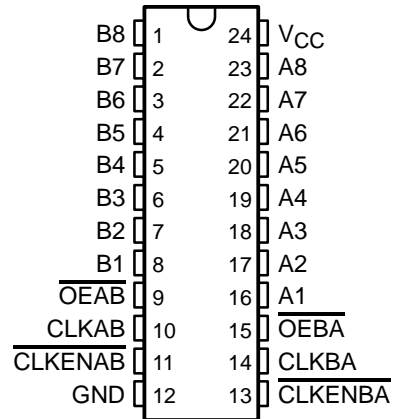
The 'ABT2952 consists of two 8-bit back-to-back registers that store data flowing in both directions between two bidirectional buses. Data on the A or B bus is stored in the registers on the low-to-high transition of the clock (CLKAB or CLKBA) input provided that the clock-enable ( $\overline{\text{CLKENAB}}$  or  $\overline{\text{CLKENBA}}$ ) input is low. Taking the output-enable ( $\overline{\text{OEAB}}$  or  $\overline{\text{OEBA}}$ ) input low accesses the data on either port.

To ensure the high-impedance state during power up or power down,  $\overline{\text{OE}}$  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.

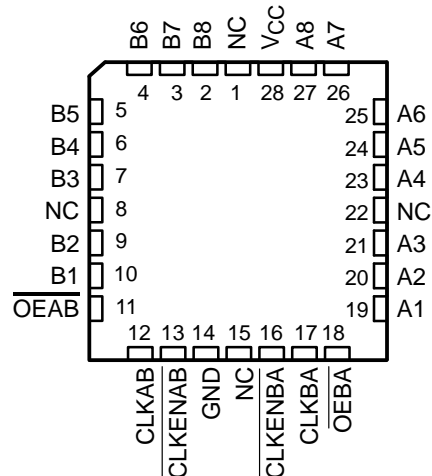
The SN74ABT2952 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54ABT2952 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT2952 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT2952 . . . JT PACKAGE  
SN74ABT2952 . . . DB, DW, OR NT PACKAGE  
(TOP VIEW)



SN54ABT2952 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

PRODUCT PREVIEW

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# SN54ABT2952, SN74ABT2952

## OCTAL BUS TRANSCEIVERS AND REGISTERS

### WITH 3-STATE OUTPUTS

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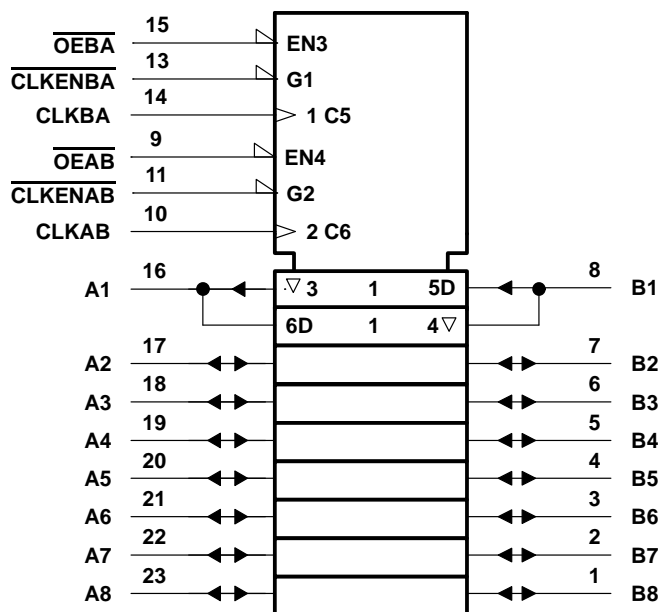
FUNCTION TABLE†

INPUTS				OUTPUT
CLKENAB	CLKAB	OEAB	A	B
H	X	L	X	B <sub>0</sub> ‡
X	H or L	L	X	B <sub>0</sub> ‡
L	↑	L	L	L
L	↑	L	H	H
X	X	H	X	Z

† A-to-B data flow is shown; B-to-A data flow is similar but uses  $\overline{\text{CLKENBA}}$ ,  $\text{CLKBA}$ , and  $\overline{\text{OEBA}}$ .

‡ Level of B before the indicated steady-state input conditions were established.

logic symbol§



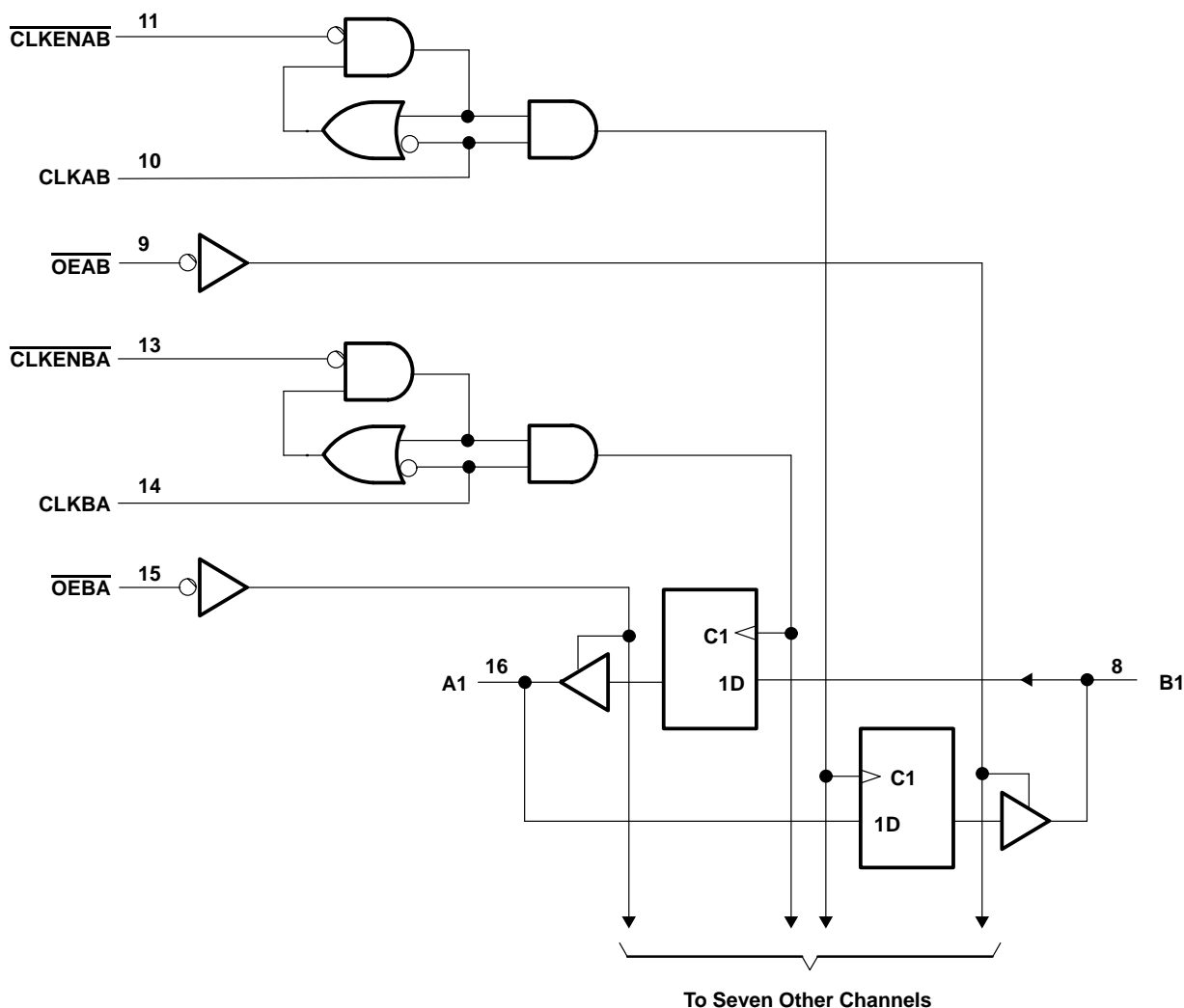
§ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DB, DW, JT, and NT packages.

PRODUCT PREVIEW

# SN54ABT2952, SN74ABT2952 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS202 – NOVEMBER 1990 – REVISED OCTOBER 1992

## logic diagram (positive logic)



Pin numbers shown are for the DB, DW, JT, and NT packages.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

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 state or power-off state, $V_O$	–0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABT2952	96 mA
SN74ABT2952	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	0.7 W
DW package	1 W
NT package	1.3 W
Storage temperature range	–65°C to 150°C

<sup>†</sup> 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.



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# SN54ABT2952, SN74ABT2952

## OCTAL BUS TRANSCEIVERS AND REGISTERS

### WITH 3-STATE OUTPUTS

SCBS202 – NOVEMBER 1990 – REVISED OCTOBER 1992

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

		SN54ABT2952		SN74ABT2952		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	ns/V
$T_A$	Operating free-air temperature	-55	125	-40	85	°C

NOTE 2: Unused or floating pins (input or I/O) 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			SN54ABT2952		SN74ABT2952		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		Control inputs		±1		±1		±1		μA
			A or B ports		±100		±100		±100		
I <sub>OZH</sub> §	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V		50			50		50		μA	
I <sub>OZL</sub> §	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.5 V		−50			−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					±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		A or B ports		Outputs high		250		250		μA
					Outputs low		35		35		mA
					Outputs disabled		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		1.5			1.5		1.5		mA	
C <sub>i</sub>	V <sub>I</sub> = 2.5 V or 0.5 V		Control inputs		3.5				pF		
C <sub>io</sub>	V <sub>O</sub> = 2.5 V or 0.5 V		A or B ports		7.5				pF		

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

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

§ The parameters  $I_{OZH}$  and  $I_{OZL}$  include the input leakage current.

¶ 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.

PRODUCT PREVIEW



# SN54ABT2952, SN74ABT2952 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS202 – NOVEMBER 1990 – REVISED OCTOBER 1992

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		SN54ABT2952		SN74ABT2952		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>clock</sub>	Clock frequency		0	150	0	150	0	150	MHz
t <sub>w</sub>	Pulse duration	CLK high	3		3		3		ns
		CLK low	3.5		3.5		3.5		
t <sub>su</sub>	Setup time before CLK↑	A or B	High	4	4		4		ns
			Low	3	3		3		
		$\overline{\text{CLKEN}}$	High	3.5	3.5		3.5		
			Low	2.5	2.5		2.5		
t <sub>h</sub>	Hold time after CLK↑	A or B	0		0		0		ns
		$\overline{\text{CLKEN}}$	0		0		0		

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			SN54ABT2952		SN74ABT2952		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			150			150		150		MHz
t <sub>PLH</sub>	CLKAB or CLKBA	B or A								ns
t <sub>PHL</sub>										
t <sub>PZH</sub>	$\overline{\text{OEBA}}$ or $\overline{\text{OEAB}}$	A or B								ns
t <sub>PZL</sub>										
t <sub>PHZ</sub>	$\overline{\text{OEBA}}$ or $\overline{\text{OEAB}}$	A or B								ns
t <sub>PLZ</sub>										

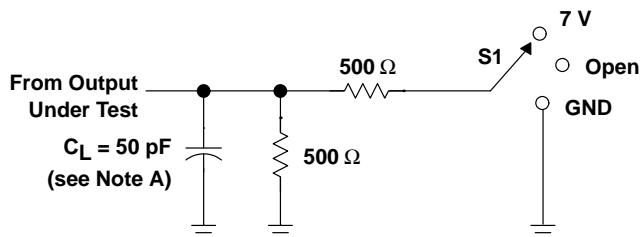
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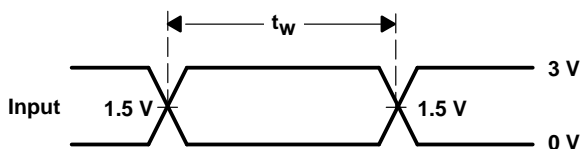
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## PARAMETER MEASUREMENT INFORMATION

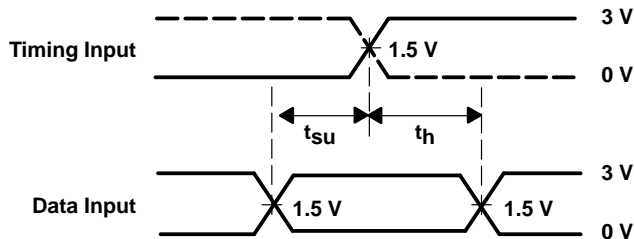


LOAD CIRCUIT FOR OUTPUTS

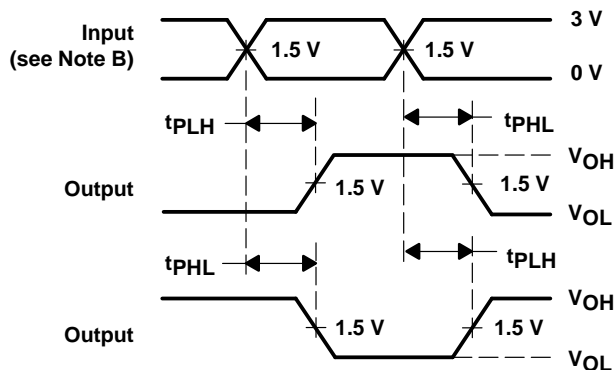
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



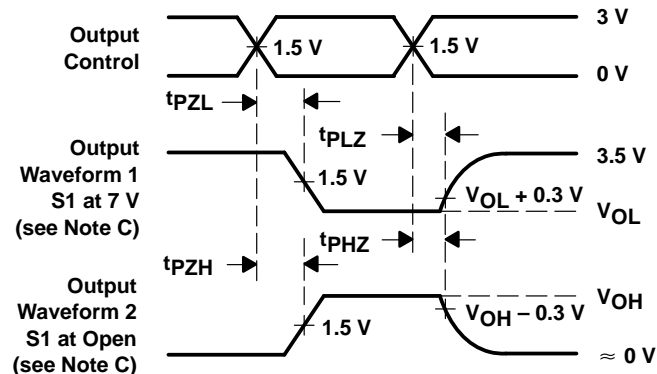
VOLTAGE WAVEFORMS  
PULSE DURATION



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:
- $C_L$  includes probe and jig capacitance.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  - 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.
  - The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PRODUCT PREVIEW

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