

# SN54ABTH25245, SN74ABTH25245 25-Ω OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS251F – JUNE 1992 – REVISED MAY 1997

- State-of-the-Art *EPIC-IIB™* BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- 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-Impedance State During Power Up and Power Down
- Designed to Facilitate Incident-Wave Switching for Line Impedances of 25 Ω or Greater
- Distributed  $V_{CC}$  and GND Pin Configuration Minimizes High-Speed Switching Noise
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Package Options Include Plastic Small-Outline (DW) Package, Ceramic Chip Carriers (FK), and Standard Plastic (NT) and Ceramic (JT) DIPs

## description

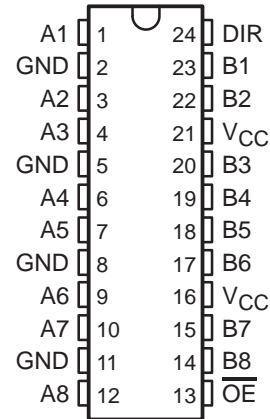
The 'ABTH25245 are 25-Ω octal bus transceivers designed for asynchronous communication between data buses. They improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented transceivers.

These devices allow noninverted data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can disable the device so that both buses are effectively isolated. When  $\overline{OE}$  is low, the device is active.

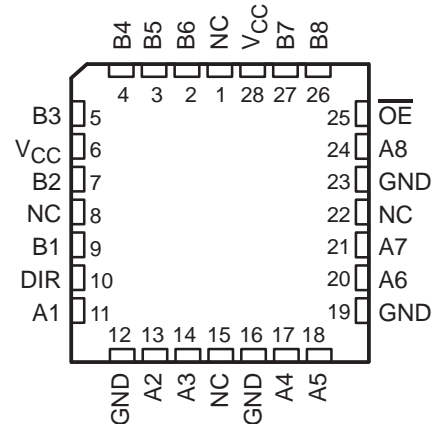
These transceivers are capable of sinking 188 mA of  $I_{OL}$  current, which facilitates switching 25-Ω transmission lines on the incident wave. The distributed  $V_{CC}$  and GND pins minimize switching noise for more-reliable system operation.

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

SN54ABTH25245 . . . JT PACKAGE  
SN74ABTH25245 . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54ABTH25245 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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**TEXAS  
INSTRUMENTS**

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# SN54ABTH25245, SN74ABTH25245 25-Ω OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## description (continued)

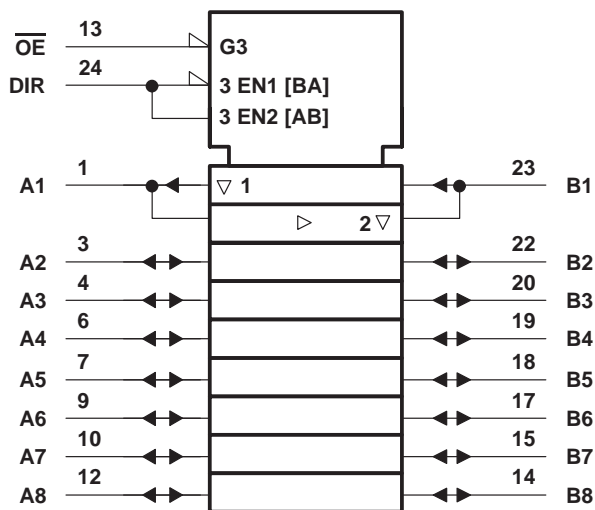
When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABTH25245 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ABTH25245 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

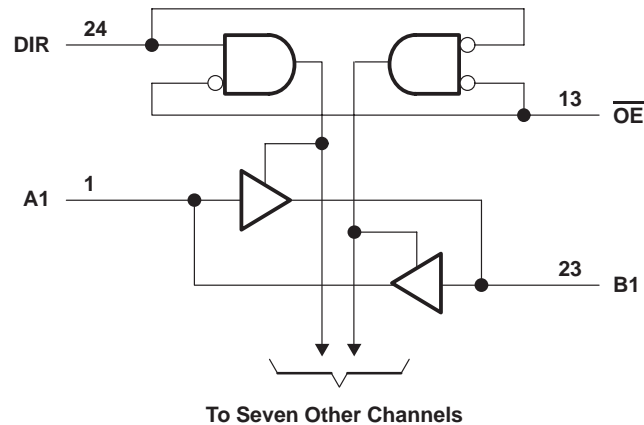
INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

## logic symbol†



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

logic diagram (positive logic)



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

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 disabled or power-off state, $V_O$ .....	-0.5 V to 5.5 V
Voltage range applied to any output in the high state, $V_O$ .....	-0.5 V to $V_{CC}$
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Current into any output in the low state, $I_O$ : SN74ABTH25245 (A port) .....	376 mA
SN74ABTH25245 (B port) .....	128 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package .....	81°C/W
NT package .....	67°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, except for through-hole packages, which use a trace length of zero.

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**recommended operating conditions (see Note 3)**

			SN54ABTH25245		SN74ABTH25245		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
$I_{IK}$	Input clamp current			-18		-18	mA
$I_{OH}$	High-level output current	A port		-80		-80	mA
		B port		-32		-32	
$I_{OL}$	Low-level output current	A port		188		188	mA
		B port		64		64	
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled	Control inputs	4	4		ns/V
			A or B ports	10	10		
$\Delta t/\Delta V_{CC}$	Power-up ramp rate		200		200		$\mu s/V$
$T_A$	Operating free-air temperature		-55	125	-40	85	$^{\circ}C$

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	SN54ABTH25245		SN74ABTH25245		UNIT
			MIN	TYP†	MAX	MIN	
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		V
V <sub>OH</sub>	A port	V <sub>CC</sub> = 4.75 V, I <sub>OH</sub> = -3 mA	2.7		2.7		V
		V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -80 mA	2.4		2.4		
	B port	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA	2.5		2.5		
		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> = -32 mA	2*		2		
V <sub>OL</sub>	A port	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 94 mA		0.55		V
			I <sub>OL</sub> = 188 mA		0.7		
	B port	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 64 mA	0.55*		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		
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
			V <sub>I</sub> = 2 V		-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		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		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			50		μA
I <sub>O</sub> §	B port	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	-50	-210	-50	-210	mA
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V, Outputs open, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high		500		μA
			Outputs low		20		mA
			Outputs disabled		500		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		mA
C <sub>i</sub>	Control inputs	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			4		pF
C <sub>io</sub>	A or B ports	V <sub>CC</sub> = 5 V, V <sub>O</sub> = V <sub>CC</sub> or GND			11.5		pF

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

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

‡ This parameter is characterized, but not production tested.

§ 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.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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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)

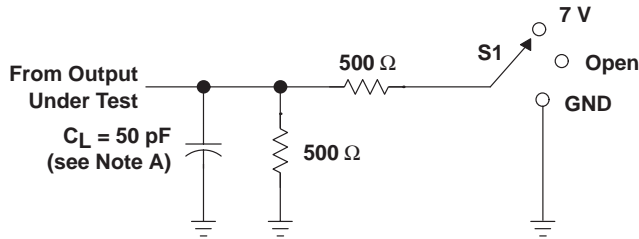
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ$ C			SN54ABTH25245		SN74ABTH25245		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	1	2.3	3.5	1		1	3.9	ns
$t_{PHL}$			1	2.4	3.5	1		1	4.3	
$t_{PZH}$	$\overline{OE}$	A or B	1.5	3.7	5.4	1.5		1.5	6.5	ns
$t_{PZL}$			1.4	4	5.8	1.4		1.4	6.8	
$t_{PHZ}$	$\overline{OE}$	A or B	2	4.3	6.1	2		2	7.2	ns
$t_{PLZ}$			2	3.9	5.8	2		2	6.4	

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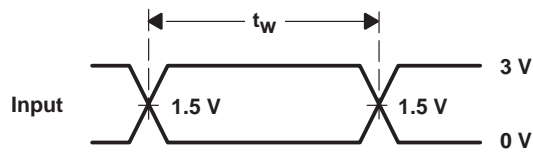
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PARAMETER MEASUREMENT INFORMATION

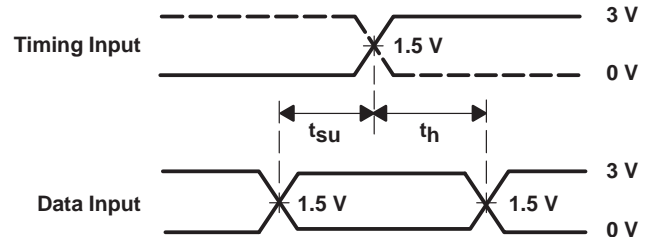


LOAD CIRCUIT

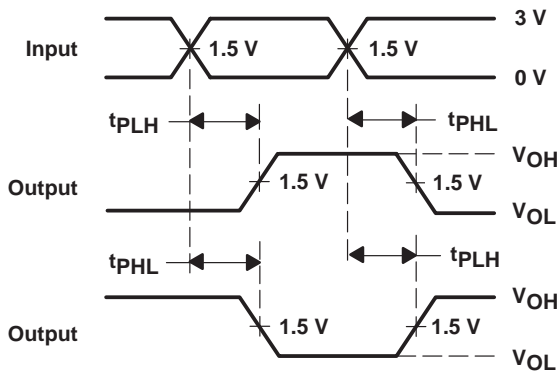
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



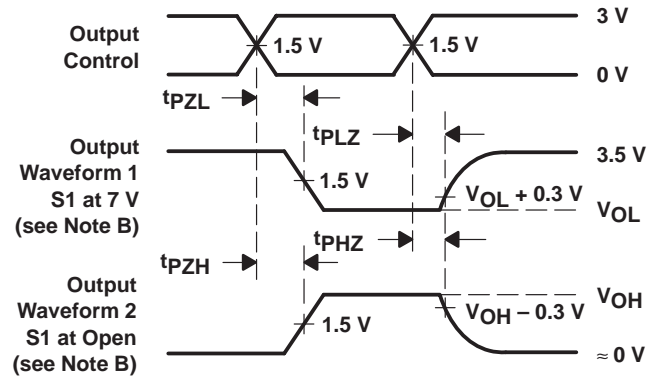
VOLTAGE WAVEFORMS  
PULSE DURATION



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 part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74ABTH25245DW</a>	Active	Production	SOIC (DW)   24	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245
SN74ABTH25245DW.B	Active	Production	SOIC (DW)   24	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245
<a href="#">SN74ABTH25245DWR</a>	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245
SN74ABTH25245DWR.B	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245
SN74ABTH25245DWRG4	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245
SN74ABTH25245DWRG4.B	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABTH25245

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**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
SN74ABTH25245DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74ABTH25245DWRG4	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABTH25245DWR	SOIC	DW	24	2000	350.0	350.0	43.0
SN74ABTH25245DWRG4	SOIC	DW	24	2000	350.0	350.0	43.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABTH25245DW	DW	SOIC	24	25	506.98	12.7	4826	6.6
SN74ABTH25245DW.B	DW	SOIC	24	25	506.98	12.7	4826	6.6

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.

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