

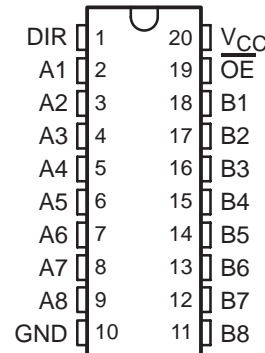
# SN74ABT245B-EP OCTAL BUS TRANSCEIVER WITH 3-STATE OUTPUTS

SCBS798 - FEBRUARY 2004

- **Controlled Baseline**
  - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree†**
- **Typical  $V_{OLP}$  (Output Ground Bounce) <1 V at  $V_{CC} = 5 V$ ,  $T_A = 25^\circ C$**
- **$I_{off}$  and Power-Up 3-State Support Hot Insertion**
- **High-Drive Outputs (–24-mA  $I_{OH}$ , 32-mA  $I_{OL}$ )**
- **Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD 17**
- **ESD Protection Exceeds JESD 22**
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)

† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

DB PACKAGE  
(TOP VIEW)



## description/ordering information

This octal bus transceiver is designed for asynchronous communication between data buses. The device transmits data 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 be used to disable the device so the buses are effectively isolated.

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.

This device is 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 device when it is 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.

## ORDERING INFORMATION

$T_A$	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	SSOP – DB	Tape and reel	SN74ABT245BMDREP	ABT245MEP

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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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.

 **TEXAS  
INSTRUMENTS**

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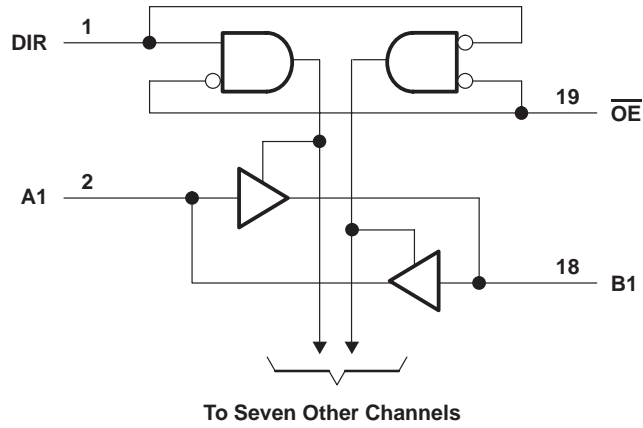
**SN74ABT245B-EP**  
**OCTAL BUS TRANSCEIVER**  
**WITH 3-STATE OUTPUTS**

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**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 diagram (positive logic)**



**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 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, $I_O$ .....	96 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) .....	70°C/W
Storage temperature range, $T_{Stg}$ (see Note 3) .....	-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 JESD 51-7.  
 3. Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See [http://www.ti.com/ep\\_quality](http://www.ti.com/ep_quality) for additional information on enhanced plastic packaging.

**recommended operating conditions (see Note 4)**

	MIN	MAX	UNIT
$V_{CC}$ Supply voltage	4.5	5.5	V
$V_{IH}$ High-level input voltage	2		V
$V_{IL}$ Low-level input voltage		0.8	V
$V_I$ Input voltage	0	$V_{CC}$	V
$I_{OH}$ High-level output current		-24	mA
$I_{OL}$ Low-level output current		32	mA
$\Delta t/\Delta v$ Input transition rise or fall rate		5	ns/V
$T_A$ Operating free-air temperature	-55	125	°C

NOTE 4: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN74ABT245B-EP

## OCTAL BUS TRANSCEIVER

### WITH 3-STATE OUTPUTS

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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			MIN	MAX	UNIT
		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> = 32 mA			0.55	0.55	V	
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	±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	±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>OZH</sub> ‡	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 2.7 V, $\overline{OE} \geq 2$ V			10	10	µA	
I <sub>OZL</sub> ‡	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 0.5 V, $\overline{OE} \geq 2$ V			-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		µA	
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V			50	50	µA	
I <sub>O</sub> §	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	-50	-140	-180	-50	-180	mA
I <sub>CC</sub>	A or B ports V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high	5	250	250	µA	
		Outputs low	22	30	30	mA	
		Outputs disabled	1	250	250	µA	
ΔI <sub>CC</sub> ¶	Data inputs V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	Outputs enabled		1.5	1.5	mA	
	Control inputs V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	Outputs disabled		50	50	µA	
C <sub>i</sub>	Control inputs V <sub>I</sub> = 2.5 V or 0.5 V			4		pF	
C <sub>io</sub>	A or B ports V <sub>O</sub> = 2.5 V or 0.5 V			8		pF	

† All typical values are at V<sub>CC</sub> = 5 V.

‡ The parameters I<sub>OZH</sub> and I<sub>OZL</sub> 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.

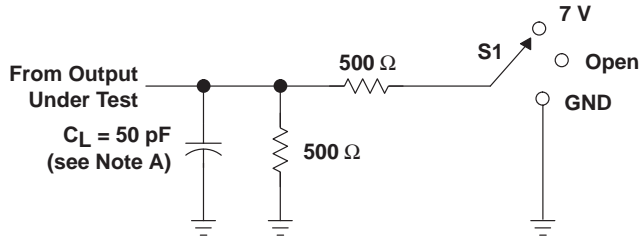
¶ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V<sub>CC</sub> or GND.

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			MIN	MAX	UNIT
			MIN	TYP	MAX			
t <sub>PLH</sub>	A or B	B or A	1	2	3.2	0.8	3.8	ns
t <sub>PHL</sub>			1	2.6	3.5	1	4.2	
t <sub>PZH</sub>	$\overline{OE}$	A or B	2	3.5	4.5	1.2	6.2	ns
t <sub>PZL</sub>			1.9	4	5.3	1.3	6.8	
t <sub>PHZ</sub>	$\overline{OE}$	A or B	2.2	4.4	5.4	2.2	6.1	ns
t <sub>PLZ</sub>			1.5	3	4	1.0	4.9	
t <sub>sk(o)</sub>					0.5		ns	

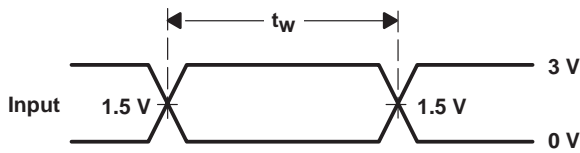


PARAMETER MEASUREMENT INFORMATION

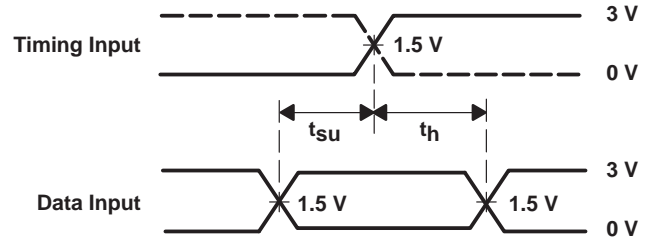


LOAD CIRCUIT

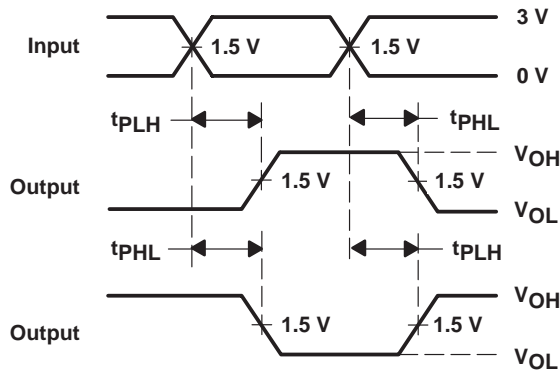
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



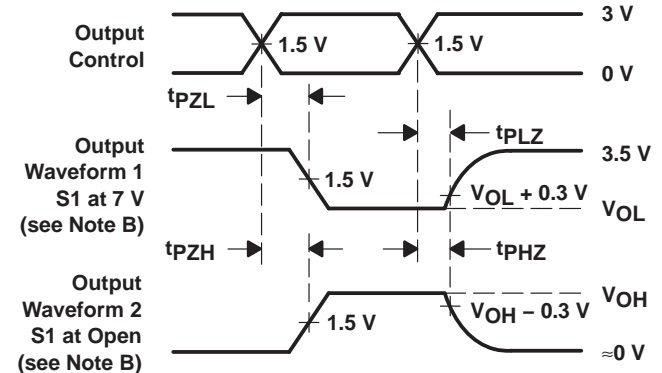
VOLTAGE WAVEFORMS  
 PULSE DURATION



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.  
 E. All parameters and waveforms are not applicable to all devices.

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>
SN74ABT245BMDREP	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04738-01XE	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<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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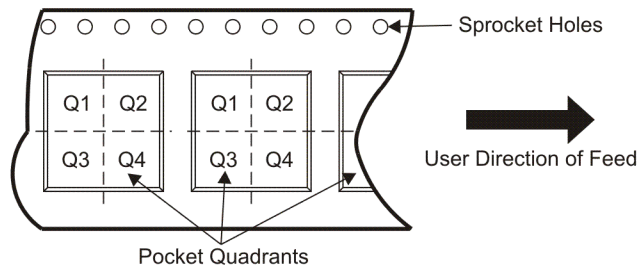
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

**TAPE AND REEL INFORMATION**



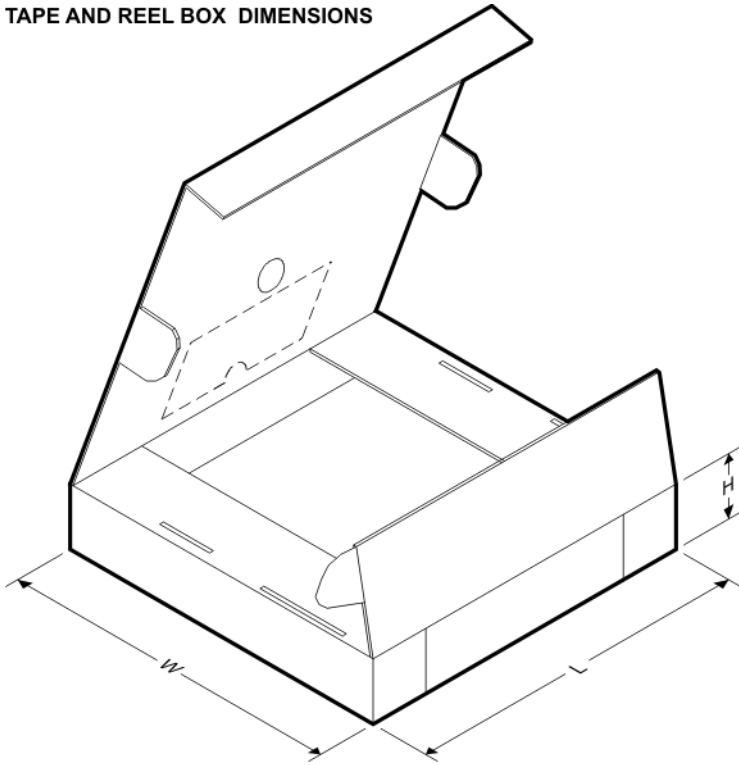
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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
SN74ABT245BMBDBREP	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT245BMDREP	SSOP	DB	20	2000	346.0	346.0	33.0



DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 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 flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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