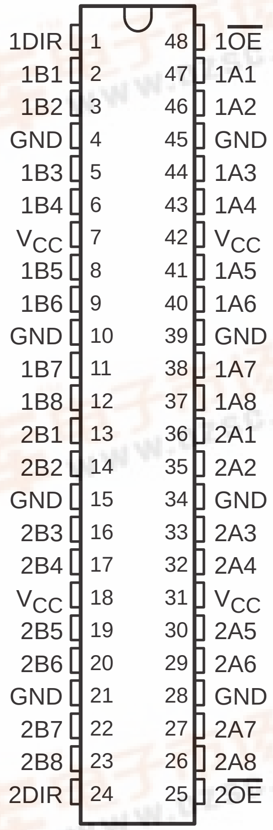
SN54ABT16245, SN74ABT16245
16-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS084B – D3712, JANUARY 1991 – REVISED DECEMBER 1992

- **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) < 1 V at V_{CC} = 5 V, T_A = 25°C**
- **Distributed V_{CC} and GND Pin Configuration Minimizes High-Speed Switching Noise**
- **Flow-Through Architecture Optimizes PCB Layout**
- **High-Drive Outputs (–32-mA I_{OH}, 64-mA I_{OL})**
- **Packaged in Plastic 300-mil Shrink Small-Outline and Thin Shrink Small-Outline Packages and 380-mil Fine-Pitch Ceramic Flat Packages Using 25-mil Center-to-Center Spacings**

SN54ABT16245 . . . WD PACKAGE
SN74ABT16245 . . . DGG OR DL PACKAGE
(TOP VIEW)



description

The ′ABT16245 is a 16-bit (dual-octal) noninverting 3-state transceiver designed for synchronous two-way communication between data buses. The control function implementation minimizes external timing requirements.

This device can be used as two 8-bit transceivers or one 16-bit transceiver. It allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the direction-control (DIR) input. The output-enable ($\overline{OE}$) input can be used to disable the device so that 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.

The SN74ABT16245 is available in TI’s shrink small-outline package (DL), which provides twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

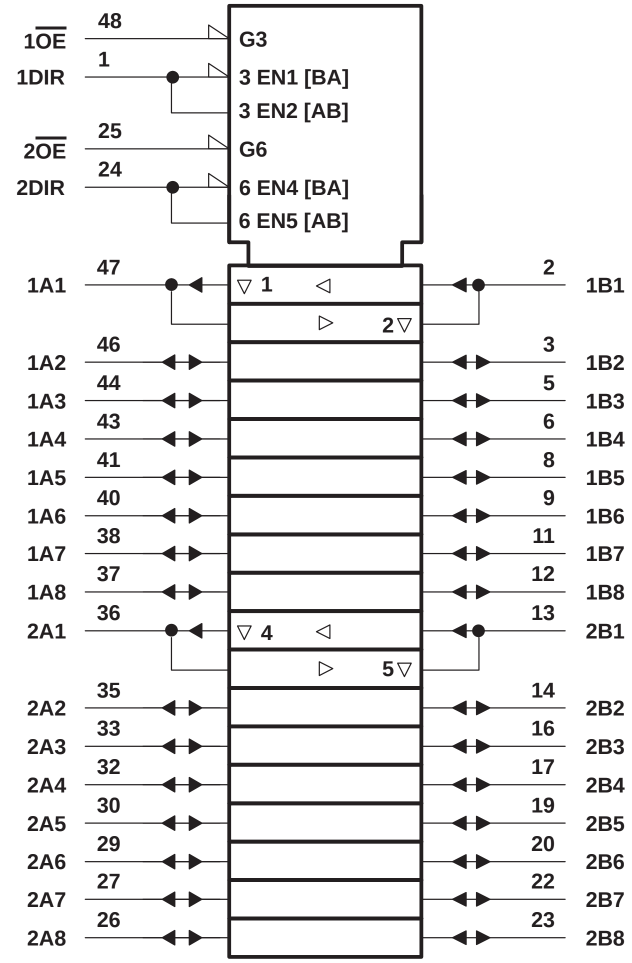
The SN54ABT16245 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74ABT16245 is characterized for operation from –40°C to 85°C.

FUNCTION TABLE
(each 8-bit section)

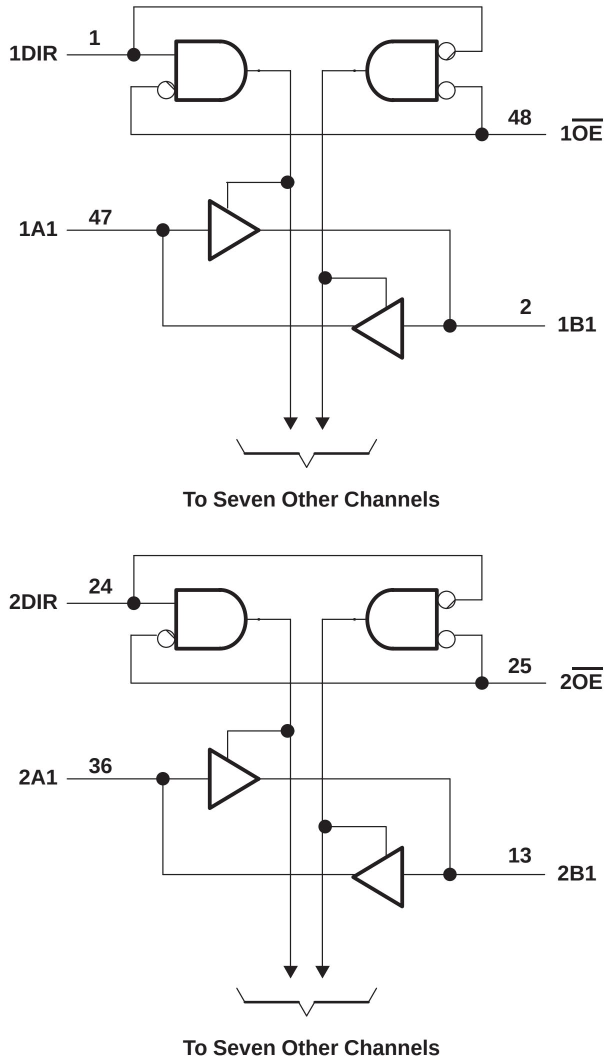
INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

Widebus and EPIC-IIB are trademarks of Texas Instruments Incorporated.

logic symbol†



logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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 state or power-off state, V_O	–0.5 V to 5.5 V
Current into any output in the low state, I_O: SN54ABT16245	96 mA
SN74ABT16245	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°C (in still air): DGG package	0.8 W
DL package	0.85 W
Storage temperature range	–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.

NOTE 1: The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

recommended operating conditions (see Note 2)

			SN54ABT16245		SN74ABT16245		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
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_A = 25°C			SN54ABT16245		SN74ABT16245		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} = – 3 mA		2.5			2.5		2.5		V
	V_{CC} = 5 V,	I_{OH} = – 3 mA		3			3		3		
	V_{CC} = 4.5 V,	I_{OH} = – 24 mA		2			2				
	V_{CC} = 4.5 V,	I_{OH} = – 32 mA		2[‡]					2		
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 48 mA				0.55		0.55			V
	V_{CC} = 4.5 V,	I_{OL} = 64 mA				0.55[‡]				0.55	
I_I	V_{CC} = 5.5 V, V_I = V_{CC} or GND		Control inputs			±1		±1		±1	µA
			A or B ports			±100		±100		±100	
I_{OZH}[§]	V_{CC} = 5.5 V,	V_O = 2.7 V				10[¶]		10		10[¶]	µA
I_{OZL}[§]	V_{CC} = 5.5 V,	V_O = 0.5 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		–50	–100	–180	–50	–180	–50	–180	mA
I_{CC}	V_{CC} = 5.5 V, I_O = 0, V_I = V_{CC} or GND	A or B ports	Outputs high			2		2		2	mA
			Outputs low			32		32		32	
			Outputs disabled			2		2		2	
ΔI_{CC}[‖]	V_{CC} = 5.5 V, One input at 3.4 V, Other inputs at V_{CC} or GND	Data inputs	Outputs enabled			1		1.5		1	mA
			Outputs disabled			0.05		1		0.05	
		Control inputs				1.5		1.5		1.5	
C_i	V_I = 2.5 V or 0.5 V		Control inputs		3						pF
C_{io}	V_O = 2.5 V or 0.5 V		A or B ports		8.5						pF

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

[¶] This data sheet limit may vary among suppliers.

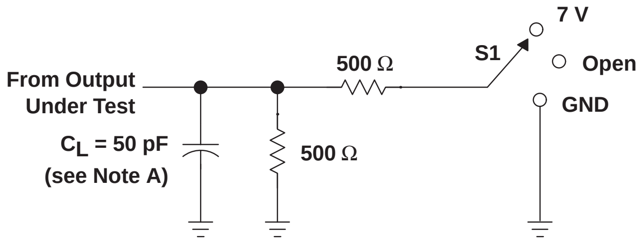
[#] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[‖] This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

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

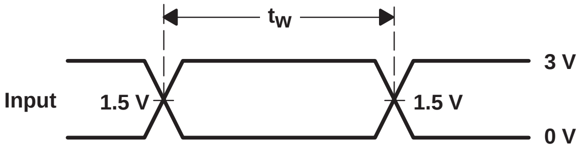
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, T_A = 25°C			SN54ABT16245		SN74ABT16245		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	1	2.2	3.4	0.5	4	1	3.9	ns
t_{PHL}			1	2.1	3.8	0.5	4.6	1	4.5	
t_{PZH}	OE	B or A	1	3.1	4.4	0.8	5.5	1	5.4	ns
t_{PZL}			1	3	6.1	0.9	7.3	1	7.2	
t_{PHZ}	OE	B or A	1.3	3.5	4.7	1.3	6.3	1.3	5.5	ns
t_{PLZ}			1.4	3.2	4.7	1.4	5.3	1.4	5.2	

PARAMETER MEASUREMENT INFORMATION

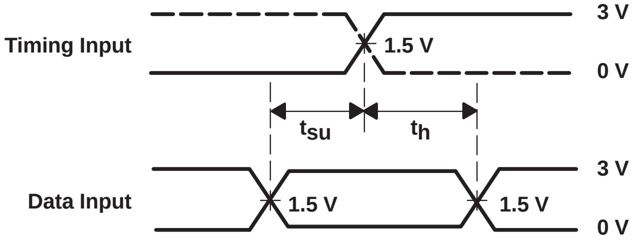


LOAD CIRCUIT FOR OUTPUTS

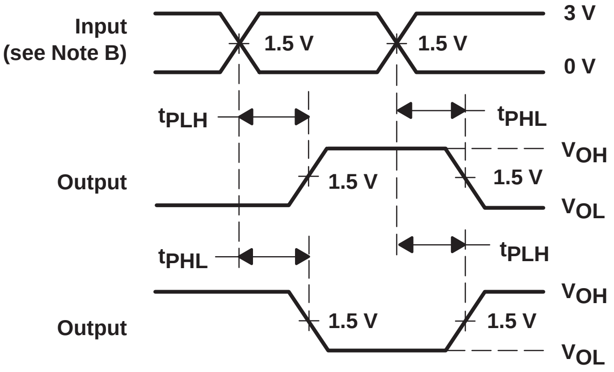
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



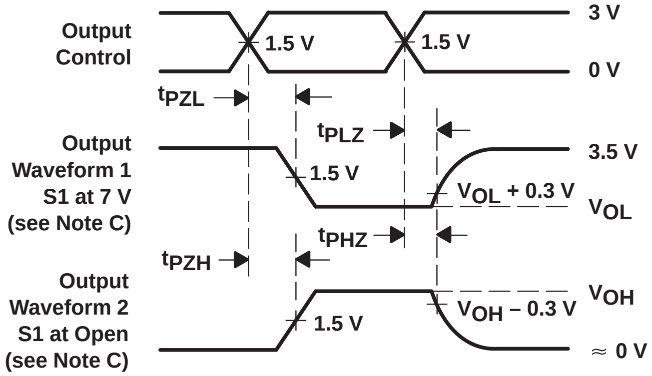
VOLTAGE WAVEFORMS
PULSE DURATION



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

Figure 1. Load Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.

Copyright © 1998, Texas Instruments Incorporated