### INTEGRATED CIRCUITS

# DATA SHEET

# 74ABT16245B 74ABTH16245B

16-bit bus transceiver (3-State)

Product data Supersedes data of 1998 Feb 25





### 16-bit bus transceiver (3-State)

### 74ABT16245B 74ABTH16245B

#### **FEATURES**

- 16-bit bidirectional bus interface
- Power-up 3-State
- Multiple V<sub>CC</sub> and GND pins minimize switching noise
- 3-State buffers
- Output capability: +64 mA / -32 mA
- Latch-up protection exceeds 500 mA per JEDEC Std 17
- Live insertion/extraction permitted
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- 74ABTH16245B incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs

#### **DESCRIPTION**

The 74ABT16245B high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT16245B device is a dual octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. The device features two Output Enable (1ŌE, 2ŌE) inputs for easy cascading and two Direction (1DIR, 2DIR) inputs for direction control.

Two options are available, 74ABT16245B which does not have the bus hold feature and the 74ABTH16245B which incorporates the bus hold feature.

#### **QUICK REFERENCE DATA**

SYMBOL	PARAMETER	CONDITIONS T <sub>amb</sub> = 25 °C; GND = 0 V	TYPICAL	UNIT
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nBx or nBx to nAx	$C_L = 50 \text{ pF}; V_{CC} = 5 \text{ V}$	2.0 2.3	ns
C <sub>IN</sub>	Input capacitance	$V_I = 0 \text{ V or } V_{CC}$	4	pF
C <sub>I/O</sub>	I/O pin capacitance	V <sub>O</sub> = 0 V or V <sub>CC</sub> ; 3-State	7	pF
I <sub>CCZ</sub>	Quiescent supply current	Outputs disabled; V <sub>CC</sub> = 5.5 V	500	μΑ
I <sub>CCL</sub>	Quiescent supply current	Output Low; V <sub>CC</sub> = 5.5 V	10	mA

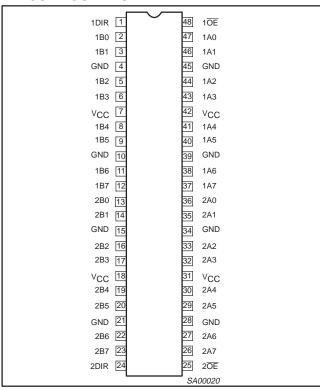
### ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	PART NUMBER	DWG NUMBER
48-Pin Plastic SSOP Type III	−40 °C to +85 °C	74ABT16245BDL	SOT370-1
48-Pin Plastic TSSOP Type II	−40 °C to +85 °C	74ABT16245BDGG	SOT362-1
48-Pin Plastic SSOP Type III	-40 °C to +85 °C	74ABTH16245BDL	SOT370-1

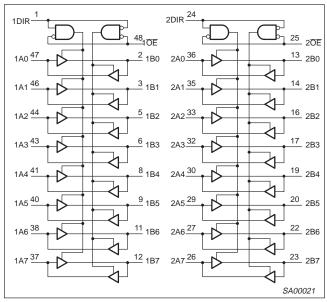
### 16-bit bus transceiver (3-State)

### 74ABT16245B 74ABTH16245B

#### **PIN CONFIGURATION**



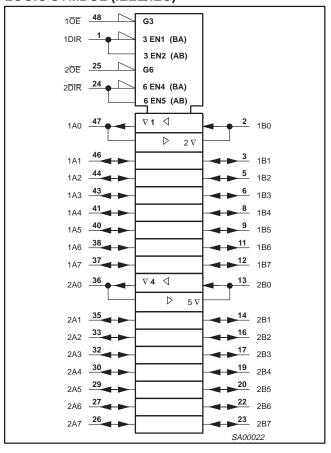
### **LOGIC SYMBOL**



#### **PIN DESCRIPTION**

SYMBOL	PIN NUMBER	NAME AND FUNCTION
1DIR, 2DIR	1, 24	Direction control inputs (Active-HIGH)
1A0 – 1A7, 2A0 – 2A7 46, 44, 43 41, 40, 38, 37 36, 35, 33, 32 30, 29, 27, 26		Data inputs/outputs (A side)
1B0 – 1B7 2B0 – 2B7	2, 3, 5, 6 8, 9, 11, 12 13, 14, 16, 17 19, 20, 22, 23	Data inputs/outputs (B side)
10E, 20E	48, 25	Output enables
GND	4, 10, 15, 21 28, 34, 39, 45	Ground (0 V)
V <sub>CC</sub>	7, 18, 31, 42	Positive supply voltage

### LOGIC SYMBOL (IEEE/IEC)



### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

#### **FUNCTION TABLE**

INP	UTS	INPUTS/OUTPUTS				
nOE	nDIR	nAx	nBx			
L	L	A = B	Inputs			
L	Н	Inputs	B = A			
Н	Х	Z	Z			

H = HIGH voltage level

= LOW voltage level

= Don't care

Z = High impedance "off" scale

### ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +7.0	V
I <sub>IK</sub>	DC input diode current	V <sub>I</sub> < 0 V	-18	mA
VI	DC input voltage <sup>3</sup>		−1.2 to +7.0	V
I <sub>OK</sub>	DC output diode current	V <sub>O</sub> < 0 V	-50	mA
V <sub>OUT</sub>	DC output voltage <sup>3</sup>	output in Off or HIGH state	−0.5 to +5.5	V
	DC submit surrent	output in LOW state	128	A
Гоит	DC output current	output in HIGH state	-64	mA
T <sub>stg</sub>	Storage temperature range		-65 to 150	°C

### **RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIM	UNIT	
STWIBUL	PARAMETER	Min	Max	UNIT
V <sub>CC</sub>	DC supply voltage	4.5	5.5	V
VI	Input voltage	0	V <sub>CC</sub>	V
V <sub>IH</sub>	HIGH-level input voltage	2.0		V
V <sub>IL</sub>	LOW-level Input voltage		0.8	V
I <sub>OH</sub>	HIGH-level output current		-32	mA
I <sub>OL</sub>	LOW-level output current		64	mA
Δt/Δν	Input transition rise or fall rate	0	10	ns/V
T <sub>amb</sub>	Operating free-air temperature range	-40	+85	°C

<sup>1.</sup> Stresses beyond those listed 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.

The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## 16-bit bus transceiver (3-State)

### DC ELECTRICAL CHARACTERISTICS

					LIMITS			
SYMBOL	PARAMETER	TEST CONDITIONS	T <sub>ar</sub>	<sub>nb</sub> = +25	°C	T <sub>amb</sub> =	–40 °C 35 °C	UNIT
			Min	Тур	Max	Min	Max	1
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = -18 mA		-0.9	-1.2		-1.2	٧
		$V_{CC}$ = 4.5 V; $I_{OH}$ = -3 mA; $V_I$ = $V_{IL}$ or $V_{IH}$	2.5	2.9		2.5		V
V <sub>OH</sub>	High-level output voltage	$V_{CC}$ = 5.0 V; $I_{OH}$ = -3 mA; $V_I$ = $V_{IL}$ or $V_{IH}$	3.0	3.4		3.0		V
		$V_{CC} = 4.5 \text{ V}; I_{OH} = -32 \text{ mA}; V_I = V_{IL} \text{ or } V_{IH}$	2.0	2.4		2.0		V
V <sub>OL</sub>	Low-level output voltage	$V_{CC}$ = 4.5 V; $I_{OL}$ = 64 mA; $V_I$ = $V_{IL}$ or $V_{IH}$		0.42	0.55		0.55	V
I <sub>I</sub>	Input leakage current	$V_{CC} = 5.5 \text{ V}; V_I = \text{GND or } 5.5 \text{ V}$ Control pins		±0.01	±1.0		±1.0	μΑ
	Bus hold current	V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0.8 V	50			50		
I <sub>HOLD</sub>	A and B inputs 74ABTH16245B	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 2.0 V	-75			-75		μΑ
74AB1F10243B		$V_{CC} = 5.5 \text{ V}; V_I = 0 \text{ to } 5.5 \text{ V}$	±500					
I <sub>OFF</sub>	Power-off leakage current	$V_{CC} = 0.0 \text{ V}; V_{O} \text{ or } V_{I} \leq 4.5 \text{ V}$		±5.0	±100		±100	μΑ
I <sub>PU</sub> /I <sub>PD</sub>	Power-up/down 3-State output current	$V_{CC}$ = 2.0 V; $V_{O}$ = 0.5 V; $V_{I}$ = GND or $V_{CC}$ ; $V_{OE}$ = Don't care		±5.0	±50		±50	μΑ
I <sub>IH</sub> +I <sub>OZH</sub>	3-State output HIGH current	$V_{CC} = 5.5 \text{ V}; V_{O} = 5.5 \text{ V}; V_{I} = V_{IL} \text{ or } V_{IH}$		0.1	10		10	μА
I <sub>IL</sub> +I <sub>OZL</sub>	3-State output LOW current	$V_{CC} = 5.5 \text{ V}; V_O = 0.0 \text{ V}; V_I = V_{IL} \text{ or } V_{IH}$		0.1	10		10	μΑ
I <sub>CEX</sub>	Output high leakage current	$V_{CC} = 5.5 \text{ V}; V_{O} = 5.5 \text{ V}; V_{I} = \text{GND or } V_{CC}$		5.0	50		50	μА
I <sub>O</sub>	Output current <sup>1</sup>	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V	-50	-92	-180	<del>-</del> 50	-180	mA
I <sub>CCH</sub>		$V_{CC}$ = 5.5 V; Outputs High, $V_{I}$ = GND or $V_{CC}$		0.30	0.70		0.70	mA
I <sub>CCL</sub>	Quiescent supply current	$V_{CC}$ = 5.5 V; Outputs Low, $V_{I}$ = GND or $V_{CC}$		10	19		19	mA
I <sub>CCZ</sub>		$V_{CC}$ = 5.5 V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>		0.30	0.70		0.70	mA
		Outputs enabled, one data input at 3.4 V, other inputs at $V_{CC}$ or GND; $V_{CC}$ = 5.5 V		400	700		700	μΑ
Δl <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	Outputs disabled, one data input at 3.4 V, other inputs at $V_{CC}$ or GND; $V_{CC}$ = 5.5 V		100	250		250	μΑ
		Control pins, outputs disabled, one enable input at 3.4 V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$		400	700		700	μΑ

- 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 at 3.4 V.
   This is the bus hold overdrive current required to force the input to the opposite logic state.

### 16-bit bus transceiver (3-State)

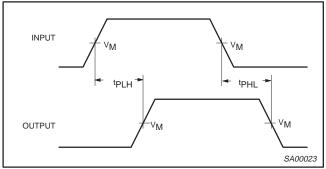
### **AC CHARACTERISTICS**

GND = 0V;  $t_R$  =  $t_F$  = 2.5ns;  $C_L$  = 50pF,  $R_L$  = 500 $\Omega$ 

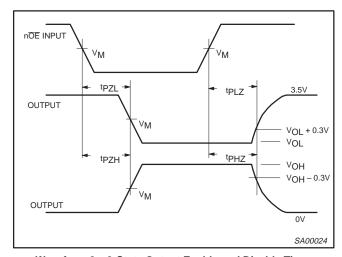
SYMBOL	PARAMETER	WAVEFORM	T <sub>a</sub>	<sub>mb</sub> = +25 ° <sub>CC</sub> = +5.0	℃ V	T <sub>amb</sub> = -40 ° V <sub>CC</sub> = +5.0	UNIT	
			Min	Тур	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay nAx to nBx or nBx to nAx	1	1.0 1.0	2.0 2.3	3.2 3.5	1.0 1.0	3.5 4.0	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High and Low level	2	1.0 1.7	3.1 4.0	4.4 5.2	1.0 1.7	5.1 6.1	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High and Low level	2	1.7 1.5	3.5 3.2	4.9 4.4	1.7 1.5	5.4 5.0	ns

#### **AC WAVEFORMS**

 $V_M = 1.5V$ ,  $V_{IN} = GND$  to 3.0V



Waveform 1. Input to Output Propagation Delays

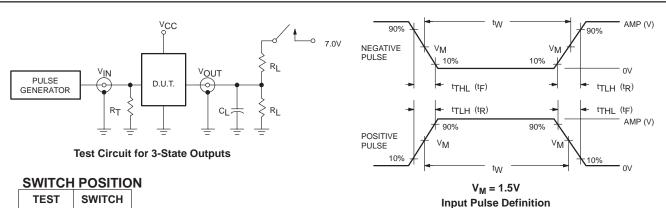


Waveform 2. 3-State Output Enable and Disable Times

### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

### **TEST CIRCUIT**



TEST	SWITCH
t <sub>PLZ</sub>	closed
t <sub>PZL</sub>	closed
All other	open

### **DEFINITIONS**

R<sub>L</sub> = Load resistor; see AC CHARACTERISTICS for value.

 $C_L = Load$  capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

 $R_{T} = \quad \text{Termination resistance should be equal to $Z_{OUT}$ of pulse generators.}$ 

FAMILY	IN	PUT PULSE R	EQUIRE	MENTS	
FAMILI	Amplitude	Rep. Rate	t <sub>W</sub>	t <sub>R</sub>	t <sub>F</sub>
74ABT/H16	3.0V	1MHz	500ns	2.5ns	2.5ns

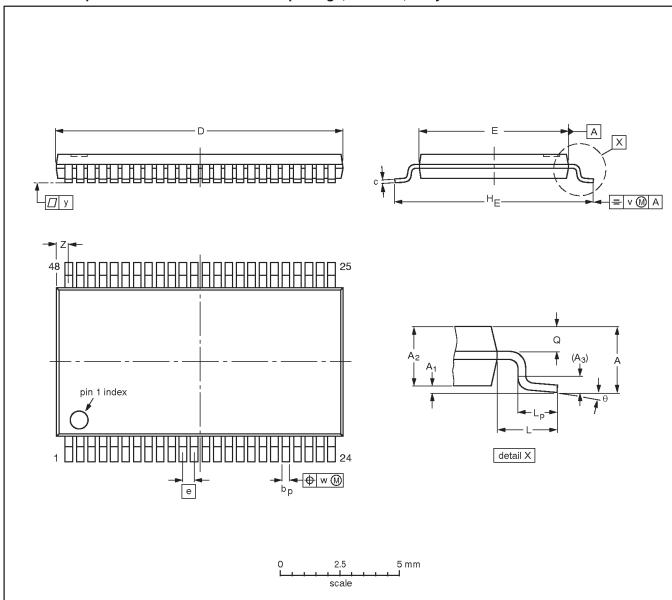
SA00018

### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1



### DIMENSIONS (mm are the original dimensions).

UNIT	A max.	Α1	A <sub>2</sub>	А3	bp	С	D <sup>(1)</sup>	E <sup>(2)</sup>	е	HE	L	Lp	Q	٧	w	у	z	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	12.6 12.4	6.2 6.0	0.5	8.3 7.9	1	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.8 0.4	8° 0°

### Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

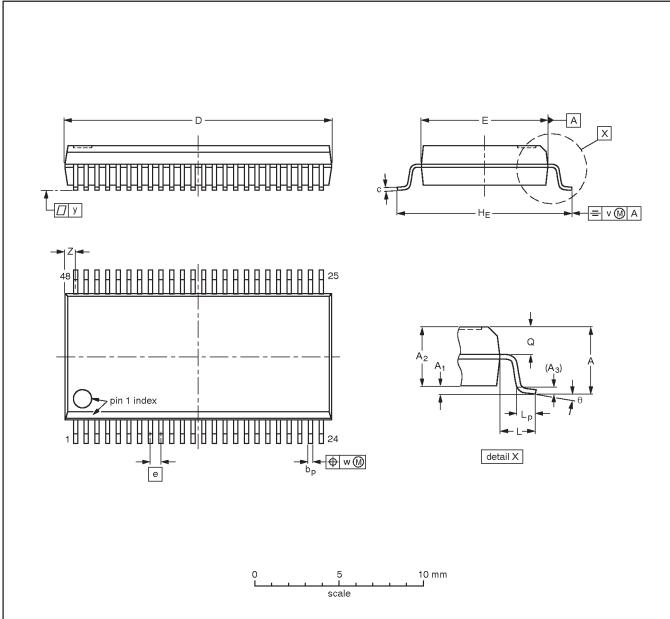
OUTLINE		REFER	RENCES		EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	EIAJ		PROJECTION	ISSUE DATE
SOT362-1		MO-153				<del>-95-02-10-</del> 99-12-27

### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1



### DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	c	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	٧	w	у	Z <sup>(1)</sup>	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	16.00 15.75	7.6 7.4	0.635	10.4 10.1	1.4	1.0 0.6	1.2 1.0	0.25	0.18	0.1	0.85 0.40	8° 0°

#### Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	EIAJ		PROJECTION	1330E DATE	
SOT370-1		MO-118				<del>95-02-04</del> 99-12-27	

### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

### **REVISION HISTORY**

Rev	Date	Description
_3	20021213	Product data (9397 750 10854); ECN 853-1742 29296 of 12 December 2002. Supersedes data of 25 February 1998 (9397 750 03486).
		Modifications:
		Ordering information table: remove "North America" column; remove 74ABTH16245BDGG package offering.
_2	19980225	Product specification (9397 750 03486). ECN 853-1742 19018 of 25 February 1998. Supersedes data of 20 November 1996.

### 16-bit bus transceiver (3-State)

74ABT16245B 74ABTH16245B

#### Data sheet status

Level	Data sheet status [1]	Product status <sup>[2] [3]</sup>	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development.  Phillips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

#### **Definitions**

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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<sup>[2]</sup> The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.