DATA SHEET

74ABT162245A

74ABTH162245A

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

Product specification

IC23 Data Handbook

Philips
Semiconductors

PHILIPS

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

74ABT162245A
74ABTH162245A

FEATURES

- 16-bit bidirectional bus interface

- Power-up 3-State

- Multiple V_{CC} and GND pins minimize switching noise

- 3-State buffers

- Output capability: +12mA/−32mA

- Latch-up protection exceeds 500mA per JEDEC Std 17

- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200V per Machine Model

- Same part as 74ABT16245A-1

- 74ABTH162245A incorporates bus hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs

DESCRIPTION

The 74ABT162245A high-performance BiCMOS device combines low static and dynamic power dissipation with high speed.

The 74ABT162245A device is a 16-bit 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 (1$\overline{OE}$, 2$\overline{OE}$) inputs for easy cascading and two Direction (1DIR, 2DIR) inputs for direction control.

The 74ABT162245A is designed with 30 ohm series resistance in both the upper and lower output structures on both A and B ports. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus receiver/transmitters.

The 74ABT162245A is the same as the 74ABT16245A-1. The part number has been changed to reflect industry standards

Two options are available, 74ABT162245A which does not have the bus hold feature and the 74ABTH162245A which incorporates the bus hold feature.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay nAx to nBx or nBx to nAx	C_L = 50pF; V_{CC} = 5V	2.0 3.0	ns
C_{IN}	Input capacitance	V_I = 0V or V_{CC}	3	pF
$C_{I/O}$	I/O pin capacitance	V_O = 0V or V_{CC}; 3-State	7	pF
I_{CCZ}	Quiescent supply current	Outputs disabled; V_{CC} = 5.5V	300	nA
I_{CCL}	Quiescent supply current	Outputs Low; V_{CC} = 5.5V	10	mA

ORDERING INFORMATION

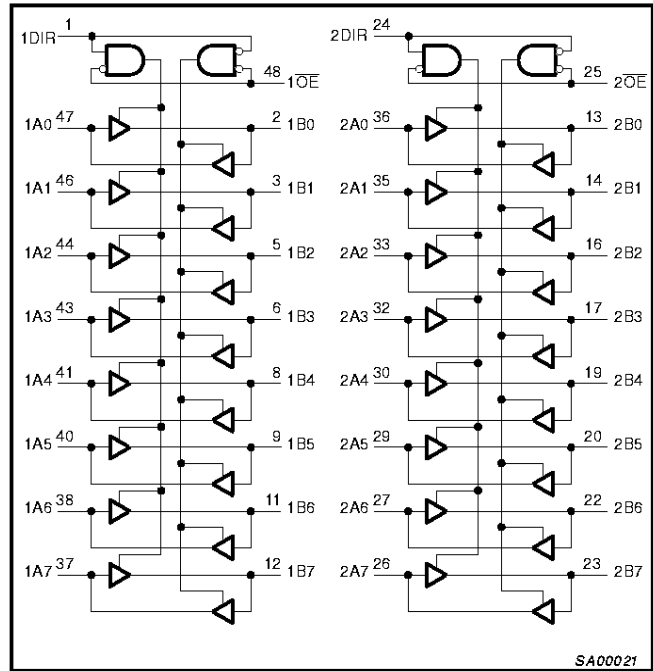| PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	−40°C to +85°C	74ABT162245A DL	BT162245A DL	SOT370-1
48-Pin Plastic TSSOP Type II	−40°C to +85°C	74ABT162245A DGG	BT162245A DGG	SOT362-1
48-Pin Plastic SSOP Type III	−40°C to +85°C	74ABTH162245A DL	BH162245A DL	SOT370-1
48-Pin Plastic TSSOP Type II	−40°C to +85°C	74ABTH162245A DGG	BH162245A DGG	SOT362-1

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16-Bit bus transceiver with 30Ω series termination
resistors (3-State)

74ABT162245A
74ABTH162245A

PIN CONFIGURATION

Pin		Pin	
1DIR	1	48	1OE
1B0	2	47	1A0
1B1	3	46	1A1
GND	4	45	GND
1B2	5	44	1A2
1B3	6	43	1A3
V_CC	7	42	V_CC
1B4	8	41	1A4
1B5	9	40	1A5
GND	10	39	GND
1B6	11	38	1A6
1B7	12	37	1A7
2B0	13	36	2A0
2B1	14	35	2A1
GND	15	34	GND
2B2	16	33	2A2
2B3	17	32	2A3
V_CC	18	31	V_CC
2B4	19	30	2A4
2B5	20	29	2A5
GND	21	28	GND
2B6	22	27	2A6
2B7	23	26	2A7
2DIR	24	25	2OE

SA00020
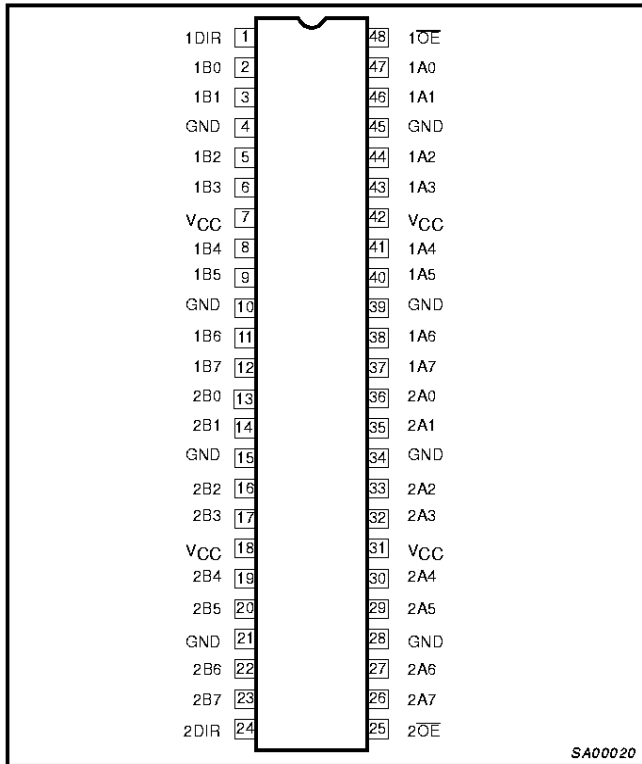
PIN DESCRIPTION

SYMBOL	PIN NUMBER	NAME AND FUNCTION
1DIR, 2DIR	1, 24	Direction control inputs (Active-High)
1A0 − 1A7, 2A0 − 2A7	47, 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)
1OE, 2OE	48, 25	Output enables
GND	4, 10, 15, 21 28, 34, 39, 45	Ground (0V)
V_CC	7, 18, 31, 42	Positive supply voltage

LOGIC SYMBOL

SA00021

FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
nOE	nDIR	nAx	nBx
L	L	A = B	Inputs
L	H	Inputs	B = A
H	X	Z	Z

H = HIGH voltage level
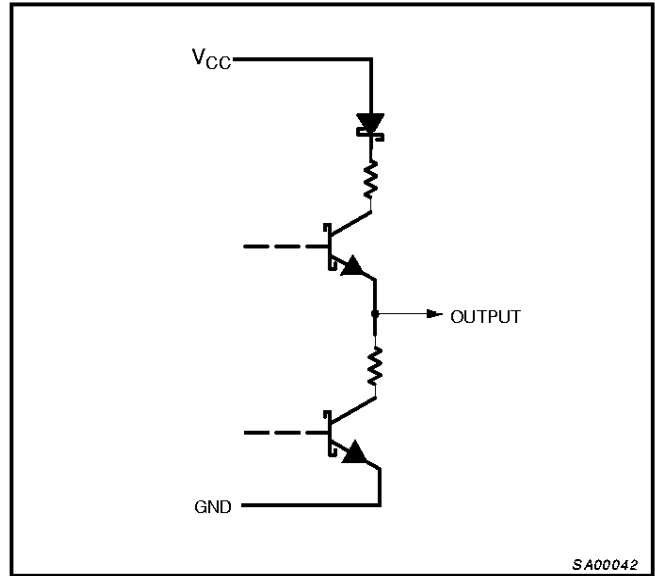L = LOW voltage level
X = DOn't care
Z = High impedance "off" state

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

**74ABT162245A
74ABTH162245A**

LOGIC SYMBOL (IEEE/IEC)

SA00022
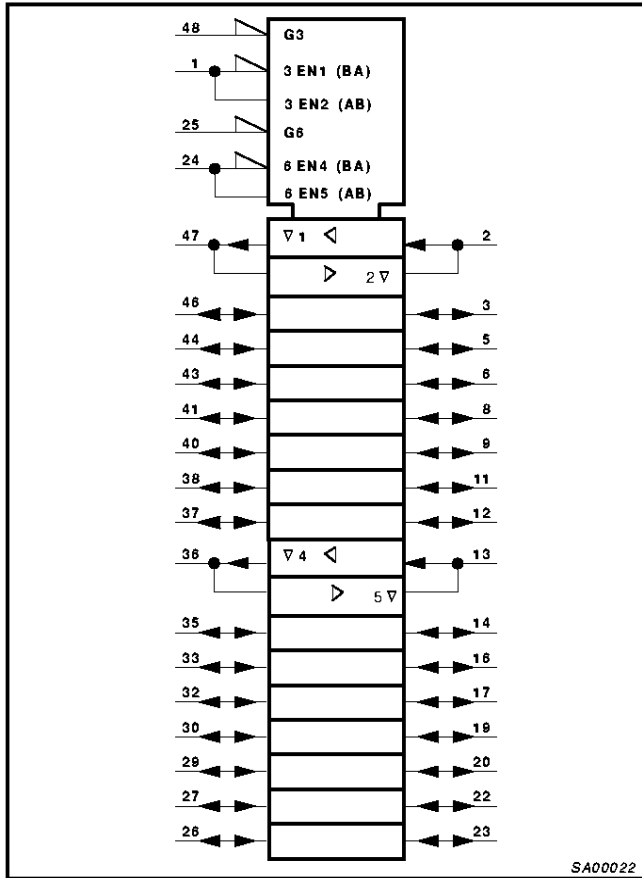
SCHEMATIC OF EACH OUTPUT

SA00042

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

74ABT162245A
74ABTH162245A

ABSOLUTE MAXIMUM RATINGS[1,2]

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		−0.5 to +7.0	V
I_{IK}	DC input diode current	$V_I < 0$	−18	mA
V_I	DC input voltage[3]		−1.2 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$	−50	mA
V_{OUT}	DC output voltage[3]	output in Off or High state	−0.5 to +5.5	V
I_{OUT}	DC output current	output in Low state	128	mA
		output in High state	−64	
T_{stg}	Storage temperature range		−65 to 150	°C

NOTES:
1. 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.
2. 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.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
V_{CC}	DC supply voltage	4.5	5.5	V
V_I	Input voltage	0	V_{CC}	V
V_{IH}	High-level input voltage	2.0		V
V_{IL}	Low-level Input voltage		0.8	V
I_{OH}	High-level output current		−32	mA
I_{OL}	Low-level output current		12	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
T_{amb}	Operating free-air temperature range	−40	+85	°C

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

74ABT162245A
74ABTH162245A

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS					UNIT
				$T_{amb} = +25°C$			$T_{amb} = -40°C$ to $+85°C$		
				Min	Typ	Max	Min	Max	
V_{IK}	Input clamp voltage	$V_{CC} = 4.5V$; $I_{IK} = -18mA$			−0.9	−1.2		−1.2	V
V_{OH}	High-level output voltage	$V_{CC} = 4.5V$; $I_{OH} = -3mA$; $V_I = V_{IL}$ or V_{IH}		2.5	2.9		2.5		V
		$V_{CC} = 5.0V$; $I_{OH} = -3mA$; $V_I = V_{IL}$ or V_{IH}		3.0	3.4		3.0		V
		$V_{CC} = 4.5V$; $I_{OH} = -32mA$; $V_I = V_{IL}$ or V_{IH}		2.0	2.4		2.0		V
V_{OL}	Low-level output voltage	$V_{CC} = 4.5V$; $I_{OL} = 8mA$; $V_I = V_{IL}$ or V_{IH}			0.46	0.65		0.65	V
	Low-level output voltage	$V_{CC} = 4.5V$; $I_{OL} = 12mA$; $V_I = V_{IL}$ or V_{IH}			0.50	0.80		0.80	V
I_I	Input leakage current	$V_{CC} = 5.5V$; $V_I = GND$ or $5.5V$	Control pins		±0.01	±1.0		±1.0	μA
I_{HOLD}	Bus hold current A and B inputs 74ABTH162245A	$V_{CC} = 4.5V$; $V_I = 0.8V$		50			50		μA
		$V_{CC} = 5.5V$; $V_I = 2.0V$		−75			−75		μA
I_{OFF}	Power-off leakage current	$V_{CC} = 0.0V$; V_O or $V_I ≤ 4.5V$			±5.0	±100		±100	μA
I_{PU}/I_{PD}	Power-up/down 3-State output current[3]	$V_{CC} = 2.0V$; $V_O = 0.5V$; $V_I = GND$ or V_{CC}; $V_{OE} = $ Don't care			±5.0	±50		±50	μA
$I_{IH}+I_{OZH}$	3-State output High current	$V_{CC} = 5.5V$; $V_O = 5.5V$; $V_I = V_{IL}$ or V_{IH}			0.5	10		10	μA
$I_{IL}+I_{OZL}$	3-State output Low current	$V_{CC} = 5.5V$; $V_O = 0.0V$; $V_I = V_{IL}$ or V_{IH}			−0.5	−10		−10	μA
I_{CEX}	Output high leakage current	$V_{CC} = 5.5V$; $V_O = 5.5V$; $V_I = GND$ or V_{CC}			5.0	50		50	μA
I_O	Output current[1]	$V_{CC} = 5.5V$; $V_O = 2.5V$		−50	−92	−180	−50	−180	mA
I_{CCH}	Quiescent supply current	$V_{CC} = 5.5V$; Outputs High, $V_I = GND$ or V_{CC}			0.3	0.70		0.70	mA
I_{CCL}		$V_{CC} = 5.5V$; Outputs Low, $V_I = GND$ or V_{CC}			10	19		19	mA
I_{CCZ}		$V_{CC} = 5.5V$; Outputs 3-State; $V_I = GND$ or V_{CC}			0.3	0.70		0.70	mA
ΔI_{CC}	Additional supply current per input pin[2]	Outputs enabled, one data input at 3.4V, other inputs at V_{CC} or GND; $V_{CC} = 5.5V$			400	700		700	μA
		Outputs 3-State, one data input at 3.4V, other inputs at V_{CC} or GND; $V_{CC} = 5.5V$ 74ABT162245A			100	250		250	μA
		Outputs 3-State, one data input at 3.4V, other inputs at V_{CC} or GND; $V_{CC} = 5.5V$ 74ABTH162245A			100	250		250	μA
		Control pins, outputs disabled, one enable input at 3.4V, other inputs at V_{CC} or GND; $V_{CC} = 5.5V$			400	700		700	μA

NOTES:
1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. This parameter is valid for any V_{CC} between 0V and 2.1V, with a transition time of up to 10msec. From $V_{CC} = 2.1V$ to $V_{CC} = 5 ±10\%$ a transition time of up to 100 μsec is permitted.

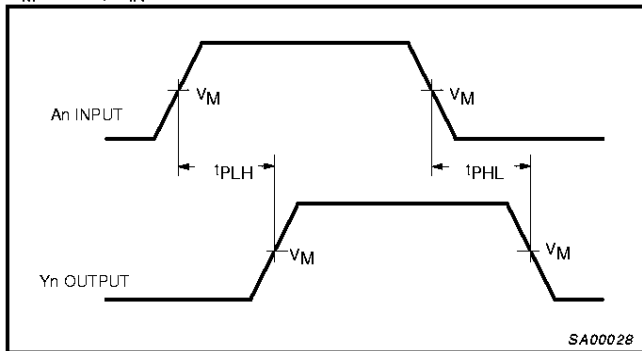## 16-Bit bus transceiver with 30Ω series termination resistors (3-State)

AC CHARACTERISTICS

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF, R_L = 500Ω

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			T_{amb} = +25°C V_{CC} = +5.0V			T_{amb} = −40°C to +85°C V_{CC} = +5.0V ±0.5V		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay nAx to nBx or nBx to nAx	1	1.0 1.5	2.0 3.0	3.3 4.5	1.0 1.5	3.5 4.9	ns
t_{PZH} t_{PZL}	Output enable time to High and Low level	2	1.5 2.0	3.1 5.0	4.3 6.1	1.5 2.0	5.0 7.0	ns
t_{PHZ} t_{PLZ}	Output disable time from High and Low level	2	1.7 1.5	3.5 3.2	4.8 4.5	1.7 1.5	5.4 4.9	ns

AC WAVEFORMS

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

Waveform 1. Waveforms Showing the Input to Output Propagation Delays
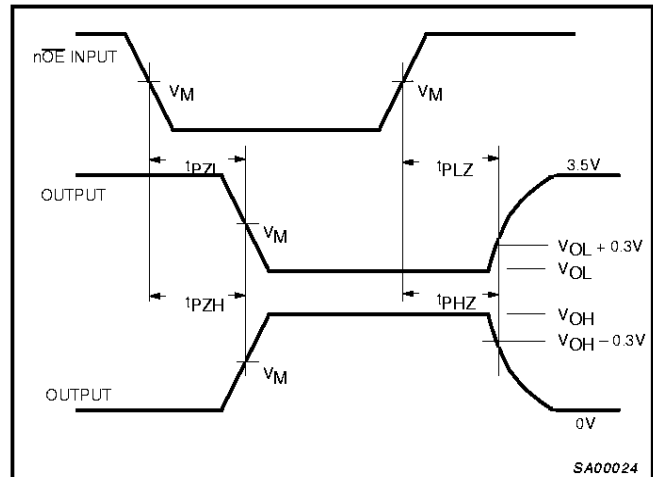
Waveform 2. Waveforms Showing the 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS
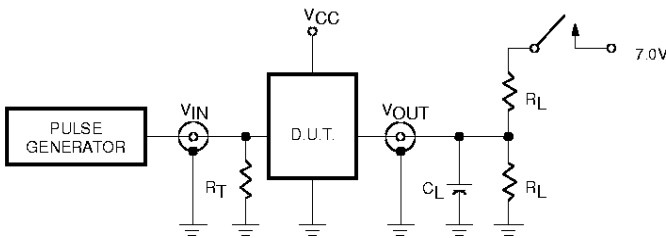
Test Circuit for 3-State Outputs
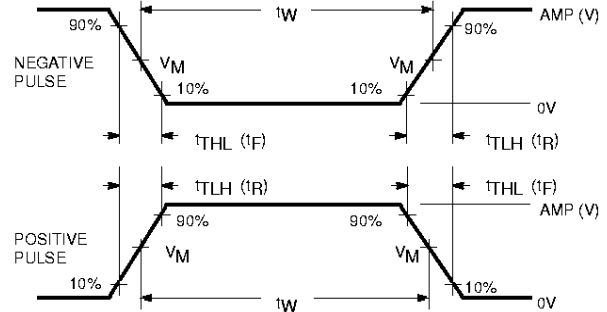
Input Pulse Definition

$V_M = 1.5V$

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

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

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_R	t_F
74ABT16	3.0V	1MHz	500ns	2.5ns	2.5ns

SA00018

16-Bit bus transceiver with 30Ω series termination resistors (3-State)

74ABT162245A
74ABTH162245A

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

SOT370-1

scale 0 5 10 mm
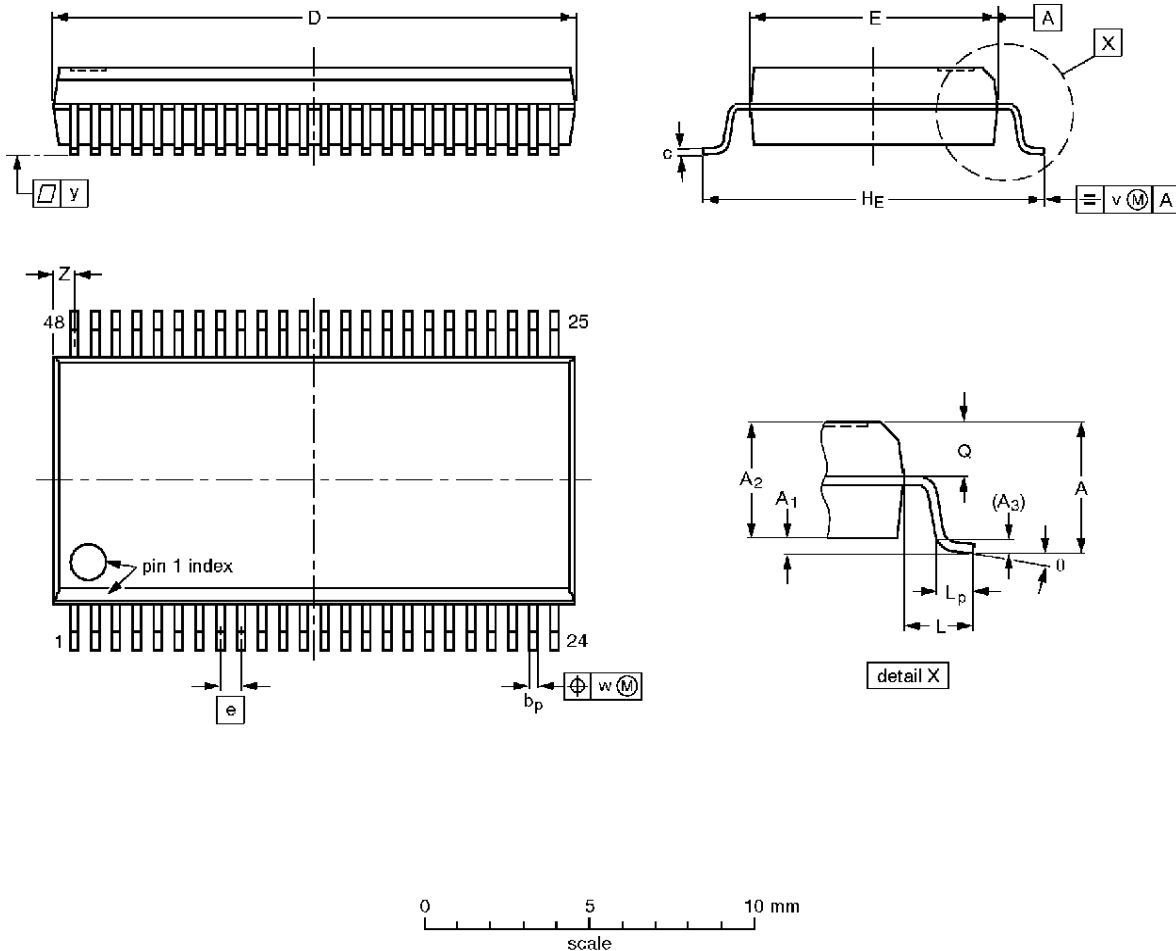
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	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 VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT370-1		MO-118AA				93-11-02 / 95-02-04

16-Bit bus transceiver with 30Ω series termination
resistors (3-State)

74ABT162245A
74ABTH162245A

TSSOP48:   plastic thin shrink small outline package; 48 leads; body width 6.1mm   SOT362-1
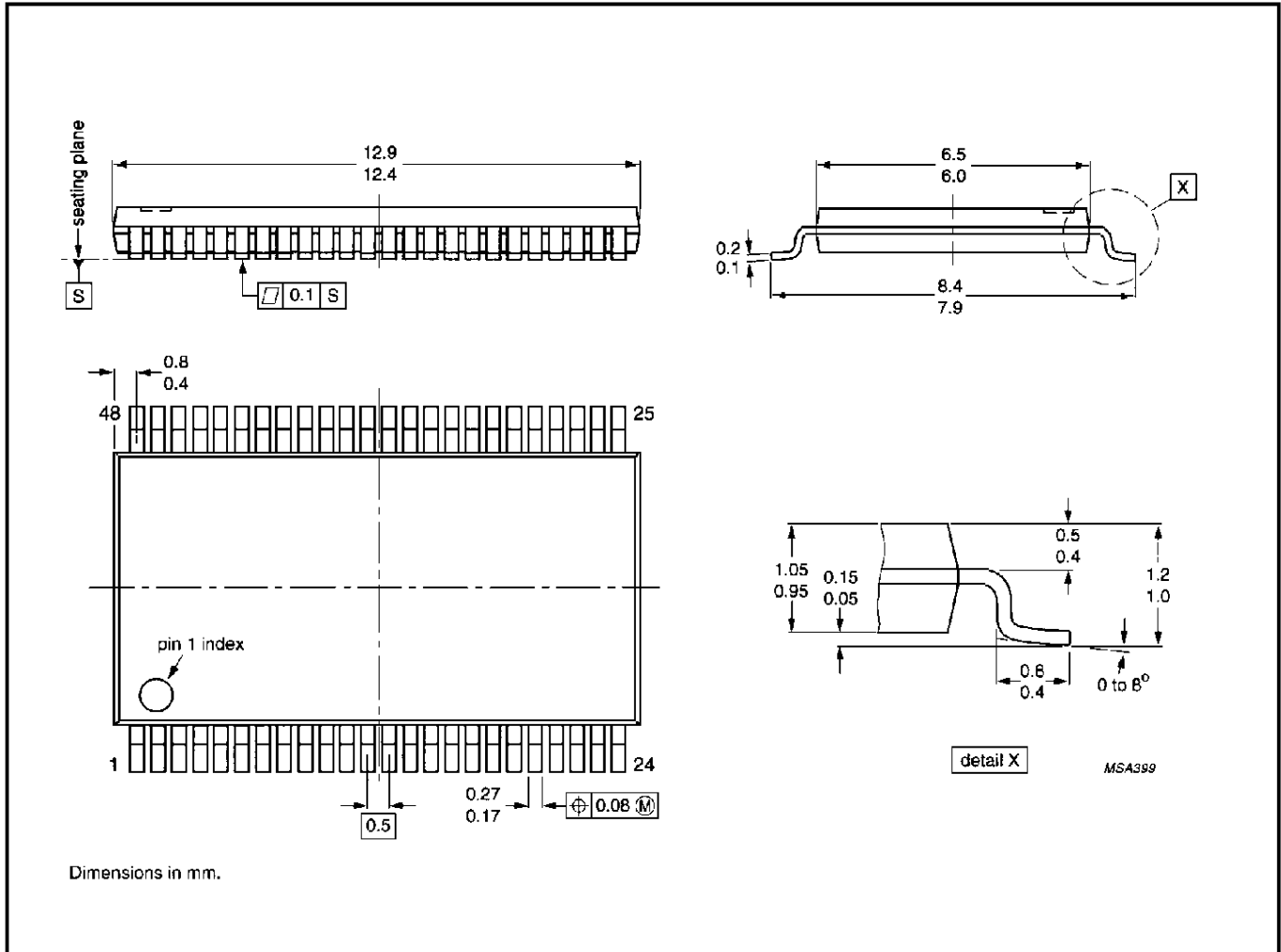
seating plane

12.9
12.4

□ 0.1 S

S

6.5
6.0

X

0.2
0.1

8.4
7.9

0.8
0.4

48   25

pin 1 index

1   24

0.27
0.17

⊕ 0.08 Ⓜ

0.5

Dimensions in mm.

0.5
0.4

1.05   0.15
0.95   0.05

1.2
1.0

0.6
0.4

0 to 8°

detail X   MSA399

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Product specification

16-Bit bus transceiver with 30Ω series termination
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74ABT162245A
74ABTH162245A

NOTES

16-Bit bus transceiver with 30Ω series termination
resistors (3-State)

74ABT162245A
74ABTH162245A

DEFINITIONS

Data Sheet Identification	Product Status	Definition
Objective Specification	**Formative or In Design**	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
Preliminary Specification	**Preproduction Product**	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product Specification	**Full Production**	This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.