

Excellent Integrated System Limited

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

[NXP Semiconductors/Freescale Semiconductor, Inc.](#)
[74ALVT162245DGG,11](#)

For any questions, you can email us directly:

sales@integrated-circuit.com

DATA SHEET

74ALVT162245

**2.5V/3.3V ALVT 16-bit transceiver with
30Ω termination resistors (3-State)**

Product specification
Supersedes data of 1996 Mar 05
IC23 Data Handbook

1998 Feb 13

2.5V/3.3V 16-bit transceiver with 30Ω termination resistors (3-State)

74ALVT162245

FEATURES

- 16-bit bidirectional bus interface
- 3-State buffers
- 5V I/O compatible
- Output capability: +12mA/-12mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Outputs include series resistance of 30Ω making external termination resistors unnecessary
- Power-up 3-State
- No bus current loading when output is tied to 5V bus
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^\circ C$	TYPICAL		UNIT
			2.5V	3.3V	
t_{PLH} t_{PHL}	Propagation delay nAx to nBx or nBx to nAx	$C_L = 50\text{pF}$	2.9 2.4	2.3 2.0	ns
C_{IN}	Input capacitance DIR, OE	$V_I = 0\text{V}$ or V_{CC}	3	3	pF
$C_{I/O}$	I/O pin capacitance	$V_{I/O} = 0\text{V}$ or V_{CC}	9	9	pF
I_{CCZ}	Total supply current	Outputs disabled	40	70	µA

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	-40°C to +85°C	74ALVT162245 DL	AV162245 DL	SOT370-1
48-Pin Plastic TSSOP Type II	-40°C to +85°C	74ALVT162245 DGG	AV162245 DGG	SOT362-1

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 24	nDIR	Direction control input
47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26	nA0 – nA7	Data inputs/outputs (A side)
2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23	nB0 – nB7	Data inputs/outputs (B side)
25, 48	nOE	Output enable input (active-Low)
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V _{CC}	Positive supply voltage

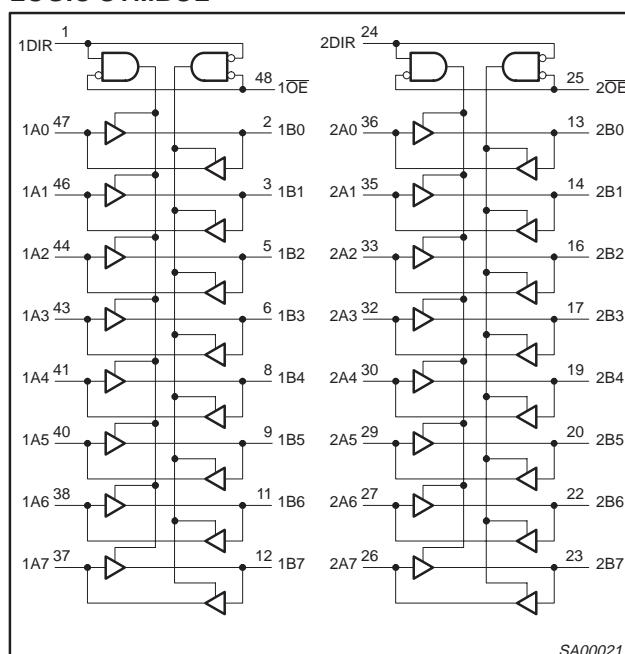
DESCRIPTION

The 74ALVT162245 is a high-performance BiCMOS product designed for V_{CC} operation at 2.5V or 3.3V with I/O compatibility up to 5V.

This 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 an Output Enable (nOE) input for easy cascading and a Direction (DIR) input for direction control.

The 74ALVT162245 is designed with 30Ω series resistance in both the High and Low states of the output. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus transceivers/transmitters.

LOGIC SYMBOL



2.5V/3.3V 16-bit transceiver
with 30Ω termination resistors (3-State)

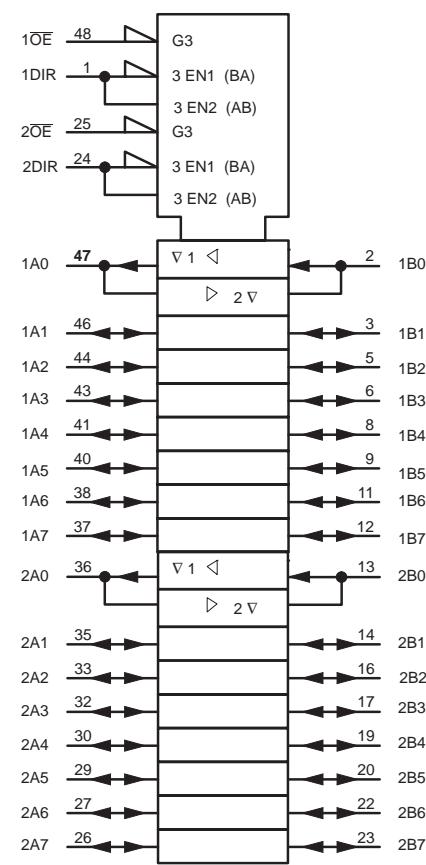
74ALVT162245

PIN CONFIGURATION

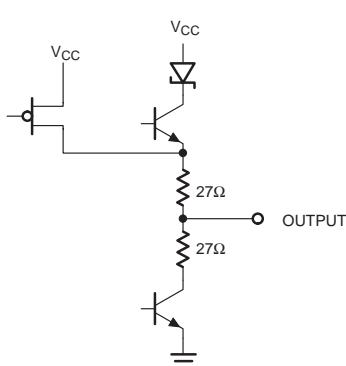
1DIR	1	48	1OE
1B0	2	47	1A0
1B1	3	46	1A1
GND	4	45	GND
1B2	5	44	1A2
1B3	6	43	1A3
VCC	7	42	VCC
1B4	8	41	1A4
1B5	9	40	1A5
GND	10	39	GND
1B6	11	38	1A6
1B7	12	37	1A7
2B0	13	36	2A0
2B1	14	35	2A1
GND	15	34	GND
2B2	16	33	2A2
2B3	17	32	2A3
VCC	18	31	VCC
2B4	19	30	2A4
2B5	20	29	2A5
GND	21	28	GND
2B6	22	27	2A6
2B7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

SW00061

LOGIC SYMBOL (IEEE/IEC)



SCHEMATIC OF EACH OUTPUT



SW00206

FUNCTION TABLE

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

H = High voltage level

L = Low voltage level

X = Don't care

Z = High Impedance "off" state

**2.5V/3.3V 16-bit transceiver
with 30Ω termination resistors (3-State)**

74ALVT162245

ABSOLUTE MAXIMUM RATINGS^{1,2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		−0.5 to +4.6	V
I_{IK}	DC input diode current	$V_I < 0$	−50	mA
V_I	DC input voltage ³		−0.5 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 +7.0	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 negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	2.5V RANGE LIMITS		3.3V RANGE LIMITS		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	DC supply voltage	2.3	2.7	3.0	3.6	V
V_I	Input voltage	0	5.5	0	5.5	V
V_{IH}	High-level input voltage	1.7		2.0		V
V_{IL}	Input voltage		0.7		0.8	V
I_{OH}	High-level output current		−8		−12	mA
I_{OL}	Low-level output current		12		12	mA
$\Delta t/\Delta v$	Input transition rise or fall rate; Outputs enabled		10		10	ns/V
T_{amb}	Operating free-air temperature range	−40	+85	−40	+85	°C

**2.5V/3.3V 16-bit transceiver
with 30Ω termination resistors (3-State)**

74ALVT162245

DC ELECTRICAL CHARACTERISTICS (3.3V ± 0.3V RANGE)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT	
			Temp = -40°C to +85°C				
			MIN	TYP ¹	MAX		
V _{IK}	Input clamp voltage	V _{CC} = 3.0V; I _{IK} = -18mA		-0.85	-1.2	V	
V _{OH}	High-level output voltage	V _{CC} = 3.0V; I _{OH} = -12mA	2.0	2.3		V	
V _{OL}	Low-level output voltage	V _{CC} = 3.0V; I _{OL} = 12mA		0.6	0.8	V	
I _I	Input leakage current	V _{CC} = 3.6V; V _I = V _{CC} or GND	Control pins	0.1	±1	μA	
		V _{CC} = 0 or 3.6V; V _I = 5.5V		0.1	10		
		V _{CC} = 3.6V; V _I = V _{CC}	Data pins ⁴	0.5	1		
		V _{CC} = 3.6V; V _I = 0V		0.1	-5		
I _{OFF}	Off current	V _{CC} = 0V; V _I or V _O = 0 to 4.5V		0.1	±100	μA	
I _{HOLD}	Bus Hold current Data inputs ⁶	V _{CC} = 3V; V _I = 0.8V		75	130	μA	
		V _{CC} = 3V; V _I = 2.0V		-75	-140		
		V _{CC} = 0V to 3.6V; V _{CC} = 3.6V		±500			
I _{EX}	Current into an output in the High state when V _O > V _{CC}	V _O = 5.5V; V _{CC} = 3.0V		50	125	μA	
I _{PU/PD}	Power up/down 3-State output current ³	V _{CC} ≤ 1.2V; V _O = 0.5V to V _{CC} ; V _I = GND or V _{CC} OE/OE' = Don't care		40	±100	μA	
I _{CCH} I _{CCL} I _{CCZ}	Quiescent supply current	V _{CC} = 3.6V; Outputs High, V _I = GND or V _{CC} , I _O = 0		0.07	0.1	mA	
		V _{CC} = 3.6V; Outputs Low, V _I = GND or V _{CC} , I _O = 0		3.5	5		
		V _{CC} = 3.6V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵		0.07	0.1		
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 3V to 3.6V; One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND		0.04	0.4	mA	

NOTES:

1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
3. This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From V_{CC} = 1.2V to V_{CC} = 3.3V ± 0.3V a transition time of 100μsec is permitted. This parameter is valid for T_{amb} = 25°C only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled up to V_{CC} or pulled down to ground.
6. This is the bus hold overdrive current required to force the input to the opposite logic state.

AC CHARACTERISTICS (3.3V ± 0.3V RANGE)

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF; R_L = 500Ω; T_{amb} = -40°C to +85°C.

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT	
			V _{CC} = 3.3V ± 0.3V				
			MIN	TYP ¹	MAX		
t _{PLH} t _{PHL}	Propagation delay nAx to nBx or nBx to nAx	1	0.5 0.5	2.3 2.0	3.6 3.1	ns	
t _{PZH} t _{PZL}	Output enable time to High and Low level	2	1.0 1.0	3.0 2.6	5.0 3.9	ns	
t _{PHZ} t _{PLZ}	Output disable time from High and Low Level	2	1.0 1.0	3.6 3.0	5.2 4.6	ns	

NOTE:

1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.

**2.5V/3.3V 16-bit transceiver
with 30Ω termination resistors (3-State)**

74ALVT162245

DC ELECTRICAL CHARACTERISTICS (2.5V ± 0.2V RANGE)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT	
			Temp = -40°C to +85°C				
			MIN	TYP ¹	MAX		
V_{IK}	Input clamp voltage	$V_{CC} = 2.3V$; $I_{IK} = -18mA$		-0.85	-1.2	V	
V_{OH}	High-level output voltage	$V_{CC} = 2.3V$; $I_{OH} = -8mA$	1.7			V	
V_{OL}	Low-level output voltage	$V_{CC} = 2.3V$; $I_{OL} = 12mA$		0.6	0.7		
I_I	Input leakage current	$V_{CC} = 2.7V$; $V_I = V_{CC}$ or GND	Control pins	0.1	±1	μA	
		$V_{CC} = 0$ or $2.7V$; $V_I = 5.5V$		0.1	10		
		$V_{CC} = 2.7V$; $V_I = V_{CC}$	Data pins ⁴	0.1	1		
		$V_{CC} = 2.7V$; $V_I = 0$		0.1	-5		
I_{OFF}	Off current	$V_{CC} = 0V$; V_I or $V_O = 0$ to $4.5V$		0.1	±100	μA	
I_{HOLD}	Bus Hold current	$V_{CC} = 2.3V$; $V_I = 0.7V$		90		μA	
	Data inputs ⁶	$V_{CC} = 2.3V$; $V_I = 1.7V$		-75			
I_{EX}	Current into an output in the High state when $V_O > V_{CC}$	$V_O = 5.5V$; $V_{CC} = 2.3V$		20	125	μA	
$I_{PU/PD}$	Power up/down 3-State output current ³	$V_{CC} \leq 1.2V$; $V_O = 0.5V$ to V_{CC} ; $V_I = GND$ or V_{CC} OE/OE = Don't care		40	100	μA	
I_{CCH}	Quiescent supply current	$V_{CC} = 2.7V$; Outputs High, $V_I = GND$ or V_{CC} , $I_O = 0$		0.04	0.1	mA	
I_{CCL}		$V_{CC} = 2.7V$; Outputs Low, $V_I = GND$ or V_{CC} , $I_O = 0$		2.5	4.5		
I_{CCZ}		$V_{CC} = 2.7V$; Outputs Disabled; $V_I = GND$ or V_{CC} , $I_O = 0^5$		0.04	0.1		
ΔI_{CC}	Additional supply current per input pin ²	$V_{CC} = 2.3V$ to $2.7V$; One input at $V_{CC}-0.6V$, Other inputs at V_{CC} or GND		0.05	0.4	mA	

NOTES:

1. All typical values are at $V_{CC} = 2.5V$ and $T_{amb} = 25^\circ C$.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
3. This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From $V_{CC} = 1.2V$ to $V_{CC} = 2.5V \pm 0.2V$ a transition time of 100μsec is permitted. This parameter is valid for $T_{amb} = 25^\circ C$ only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled up to V_{CC} or pulled down to ground.
6. Not guaranteed.

AC CHARACTERISTICS (2.5V ± 0.2V RANGE)

$GND = 0V$; $t_R = t_F = 2.5ns$; $C_L = 50pF$; $R_L = 500\Omega$; $T_{amb} = -40^\circ C$ to $+85^\circ C$.

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT	
			$V_{CC} = 2.5V \pm 0.2V$				
			MIN	TYP ¹	MAX		
t_{PLH} t_{PHL}	Propagation delay nAx to nBx or nBx to nAx	1	1.5 1.5	2.9 2.4	5.3 4.7	ns	
t_{PZH} t_{PZL}	Output enable time to High and Low level	2	1.5 1.5	4.3 3.1	6.3 4.6	ns	
t_{PHZ} t_{PLZ}	Output disable time from High and Low Level	2	1.5 1.5	4.2 3.3	6.2 5.1	ns	

NOTE:

1. All typical values are at $V_{CC} = 2.5V$ and $T_{amb} = 25^\circ C$.

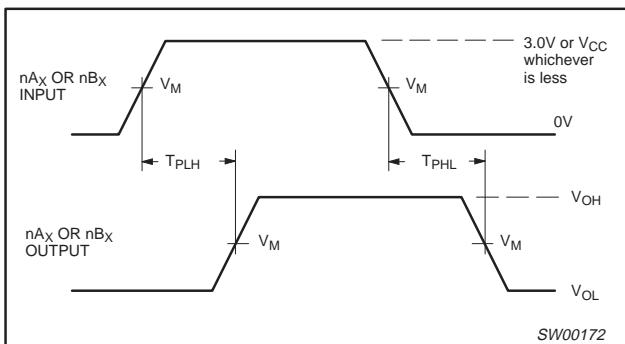
**2.5V/3.3V 16-bit transceiver
with 30Ω termination resistors (3-State)**

74ALVT162245

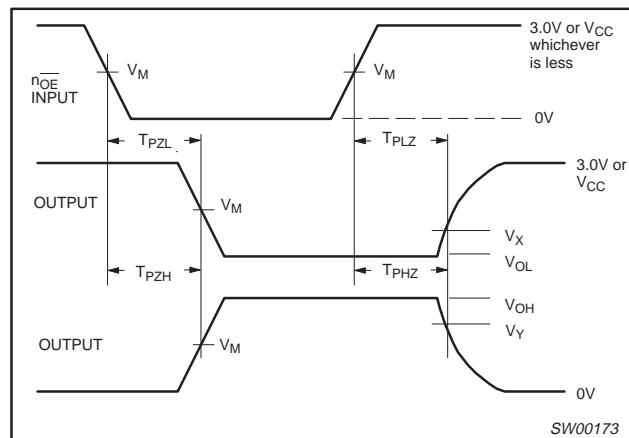
AC WAVEFORMS

NOTES:

1. $V_M = 1.5V$ at $V_{CC} \geq 3.0V$, $V_M = V_{CC}/2$ at $V_{CC} \leq 2.7V$
2. $V_X = V_{OL} + 0.3V$ at $V_{CC} \geq 3.0V$, $V_X = V_{OL} + 0.1 \cdot V_{CC}$ at $V_{CC} \leq 2.7V$
3. $V_Y = V_{OH} - 0.3V$ at $V_{CC} \geq 3.0V$, $V_Y = V_{OH} - 0.1 \cdot V_{CC}$ at $V_{CC} \leq 2.7V$

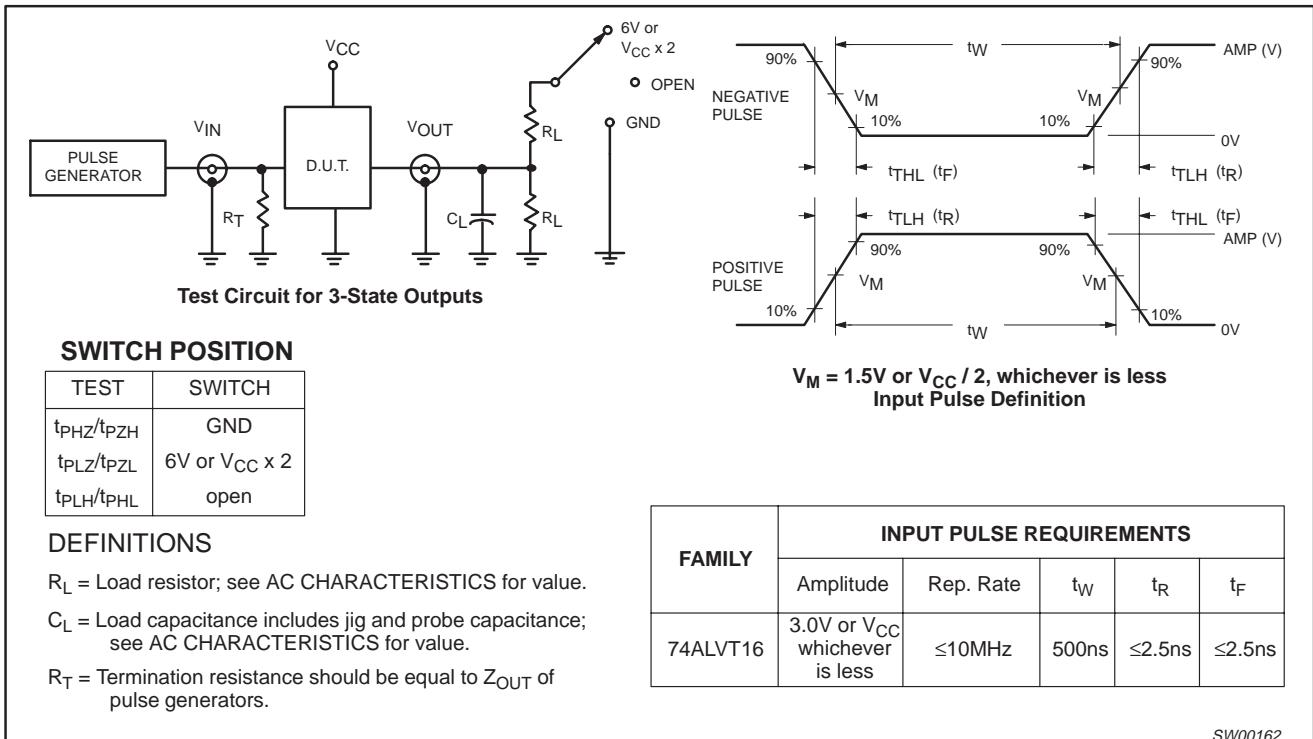


Waveform 1. Input to Output Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS

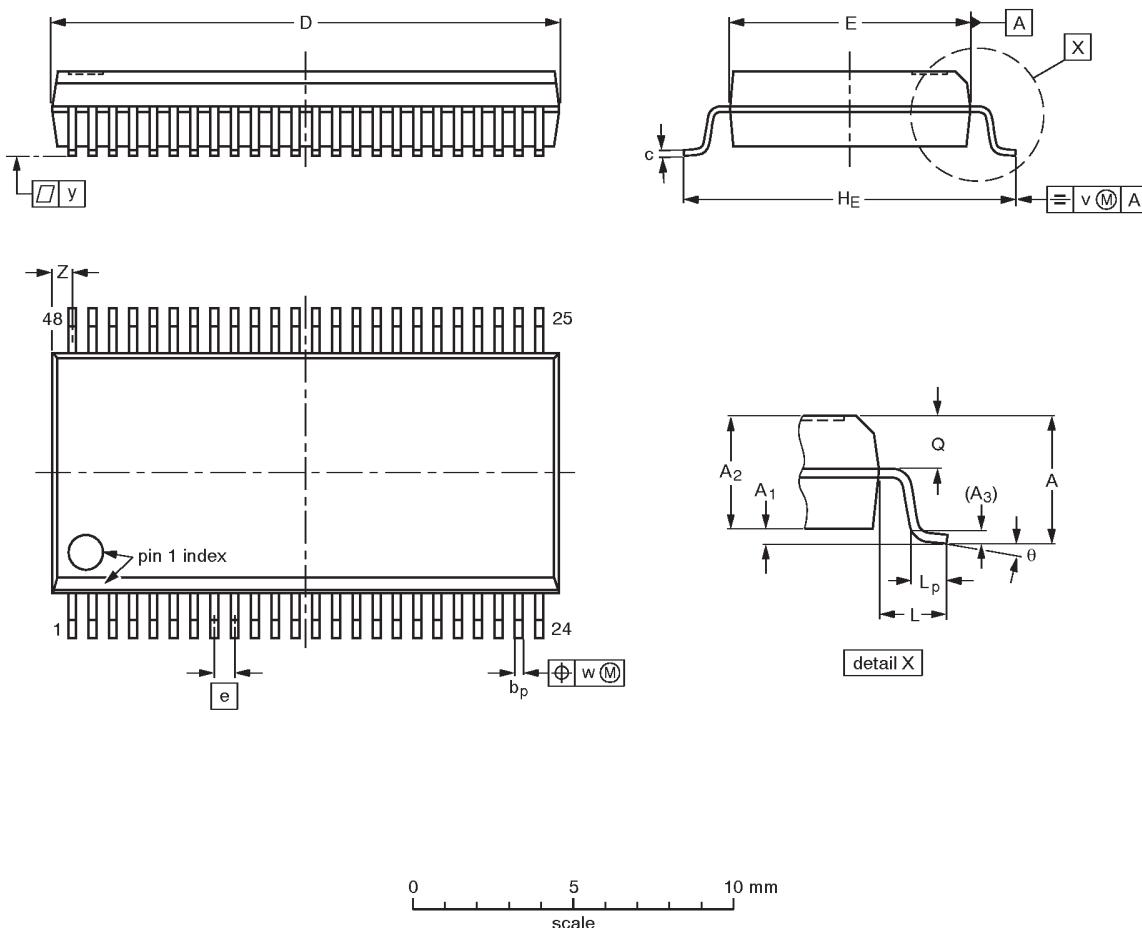


**2.5V/3.3V ALVT 16-bit transceiver
with 30Ω termination resistors (3-State)**

74ALVT162245

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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.8 0.2	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 1.0	1.2 0.25	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.

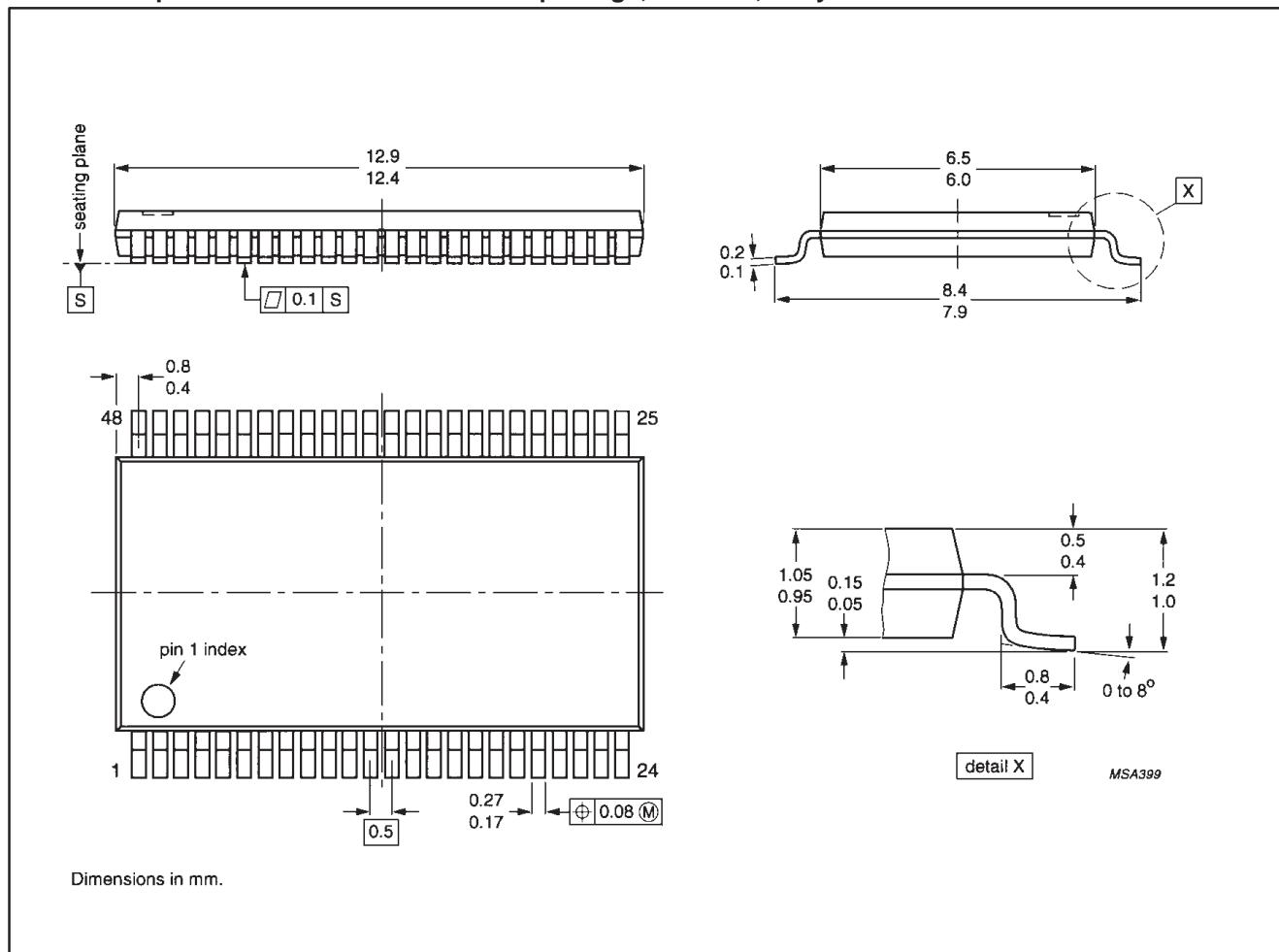
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT370-1		MO-118AA				93-11-02 95-02-04

2.5V/3.3V ALVT 16-bit transceiver
with 30Ω termination resistors (3-State)

74ALVT162245

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

SOT362-1



**2.5V/3.3V ALVT 16-bit transceiver with
30Ω termination resistors (3-State)**

74ALVT162245

Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	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	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.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

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 134). 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.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Disclaimers

Life support — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 1998
 All rights reserved. Printed in U.S.A.

print code

Document order number:

Date of release: 05-98

9397-750-03648

Let's make things better.

Philips
Semiconductors



PHILIPS