DATA SHEET

74ALVCH162245
16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

Product specification

1998 Jun 29

IC24 Data Handbook

PHILIPS

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16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

74ALVCH162245

FEATURES

• Wide supply voltage range of 1.2V to 3.6V

• Complies with JEDEC standard no. 8-1A

• CMOS low power consumption

• MULTIBYTE™ flow-through standard pin-out architecture

• Low inductance multiple V_{CC} and ground pins for minimum noise and ground bounce

• Direct interface with TTL levels

• Bus hold on all data inputs

• Integrated 30Ω termination resistor
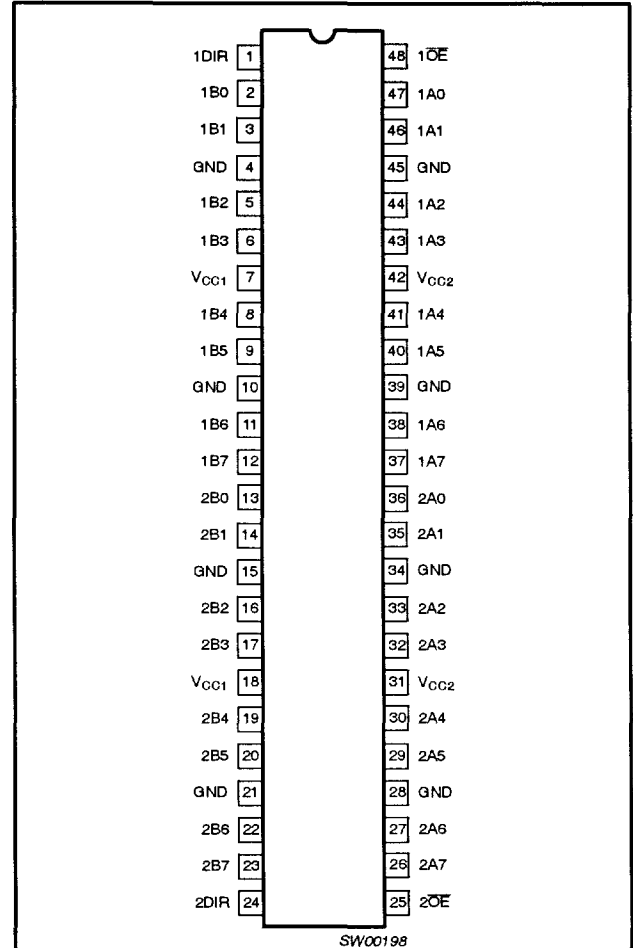
DESCRIPTION

The 74ALVCH162245 is a 16-bit transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions.

The 74ALVCH162245 features two output enable ($n\overline{OE}$) inputs for easy cascading and two send/receive (nDIR) inputs for direction control. $n\overline{OE}$ controls the outputs so that the buses are effectively isolated. This device can be used as two 8-bit transceivers or one 16-bit transceiver.

The 74ALVCH162245 is designed with 30Ω series resistors in both HIGH and LOW output states.

The 74ALVCH162245 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

PIN CONFIGURATION

1DIR	1	48	$1\overline{OE}$
1B0	2	47	1A0
1B1	3	46	1A1
GND	4	45	GND
1B2	5	44	1A2
1B3	6	43	1A3
V_{CC1}	7	42	V_{CC2}
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_{CC1}	18	31	V_{CC2}
2B4	19	30	2A4
2B5	20	29	2A5
GND	21	28	GND
2B6	22	27	2A6
2B7	23	26	2A7
2DIR	24	25	$2\overline{OE}$

SW00198

QUICK REFERENCE DATA

GND = 0V; T_{amb} = 25°C; t_r = t_f ≤ 2.5ns

SYMBOL	PARAMETER	CONDITIONS		TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay An to Bn; Bn to An	V_{CC} = 2.5V, C_L = 30pF V_{CC} = 3.3V, C_L = 50pF		2.4	ns
C_I	Input capacitance			4.0	pF
$C_{I/O}$	Input/output capacitance			8.0	pF
C_{PD}	Power dissipation capacitance per buffer	V_I = GND to V_{CC}[1]	Outputs enabled	27	pF
			Outputs disabled	4	pF

NOTES:
1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where: f_i = input frequency in MHz; C_L = output load capacitance in pF;
f_o = output frequency in MHz; V_{CC} = supply voltage in V; $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

ORDERING INFORMATION

| PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	−40°C to +85°C	74ALVCH162245 DL	ACH162245 DL	SOT370-1
48-Pin Plastic TSSOP Type II	−40°C to +85°C	74ALVCH162245 DGG	ACH162245 DGG	SOT362-1

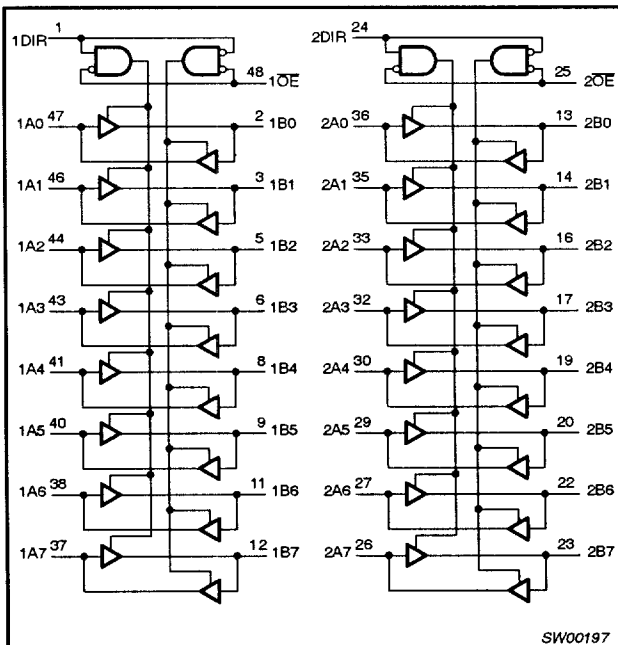## 16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

74ALVCH162245

PIN DESCRIPTION

| PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	1DIR	Direction control
2, 3, 5, 6, 8, 9, 11, 12	1B0 to 1B7	Data inputs/outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive supply voltage
13, 14, 16, 17, 19, 20, 22, 23	2B0 to 2B7	Data inputs/outputs
24	2DIR	Direction control
25	2OE	Output enable input (active LOW)
36, 35, 33, 32, 30, 29, 27, 26	2A0 to 2A7	Data inputs/outputs
47, 46, 44, 43, 41, 40, 38, 37	1A0 to 1A7	Data inputs/outputs
48	1OE	Output enable input (active LOW)

LOGIC SYMBOL

SW00197

LOGIC SYMBOL (IEEE/IEC)

SW00196

BUS HOLD CIRCUIT

SW00044
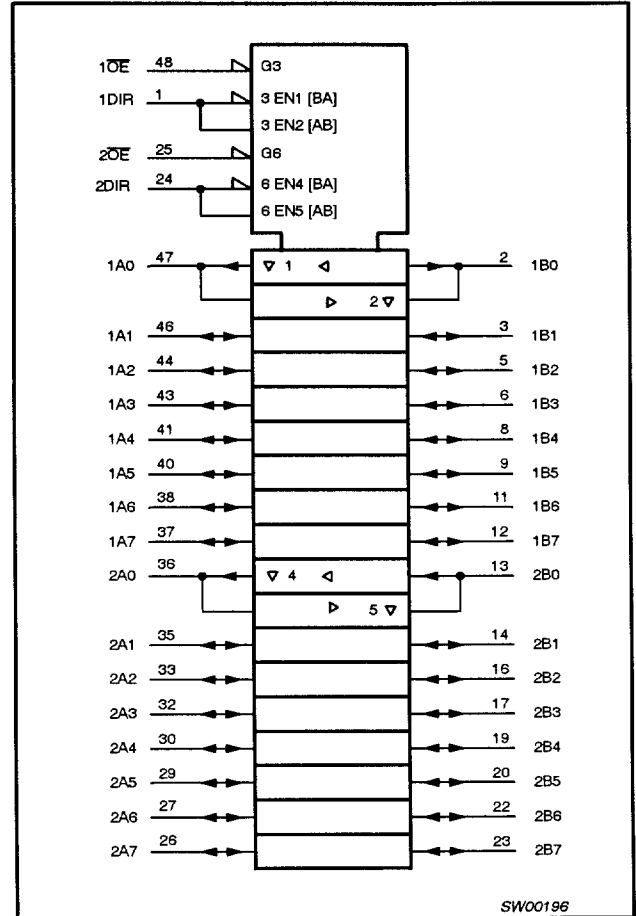
FUNCTION TABLE

INPUTS		INPUTS/OUTPUT	
nOE	nDIR	nAn	nBn
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
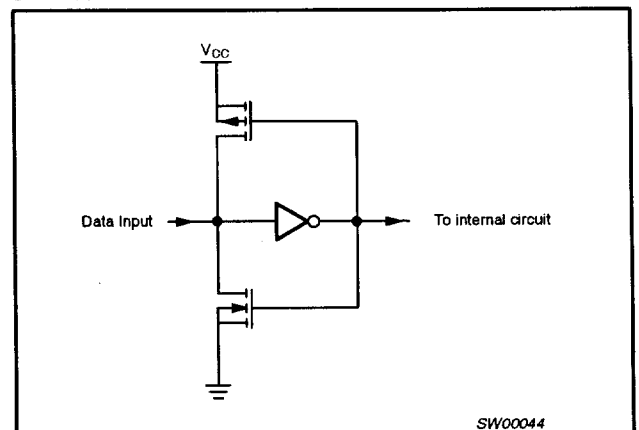
16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
V_{CC}	DC supply voltage 2.5V range (for max. speed performance @ 30 pF output load)		2.3	2.7	V
	DC supply voltage 3.3V range (for max. speed performance @ 50 pF output load)		3.0	3.6	
V_I	DC Input voltage range		0	V_{CC}	V
V_O	DC output voltage range		0	V_{CC}	V
T_{amb}	Operating free-air temperature range		−40	+85	°C
t_r, t_f	Input rise and fall times	V_{CC} = 2.3 to 3.0V V_{CC} = 3.0 to 3.6V	0 0	20 10	ns/V

ABSOLUTE MAXIMUM RATINGS

In accordance with the Absolute Maximum Rating System (IEC 134)
Voltages are referenced to GND (ground = 0V)

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	For data inputs with bus hold[1]	−0.5 to V_{CC} +0.5	V
		For control pins[1]	−0.5 to +4.6	
I_{OK}	DC output diode current	V_O > V_{CC} or V_O < 0	± 50	mA
V_O	DC output voltage	Note 1	−0.5 to V_{CC} +0.5	V
I_O	DC output source or sink current	V_O = 0 to V_{CC}	± 50	mA
I_{GND}, I_{CC}	DC V_{CC} or GND current		± 100	mA
T_{stg}	Storage temperature range		−65 to +150	°C
P_{TOT}	Power dissipation per package −plastic medium-shrink (SSOP) −plastic thin-medium-shrink (TSSOP)	For temperature range: −40 to +125 °C above +55°C derate linearly with 11.3 mW/K above +55°C derate linearly with 8 mW/K	850 600	mW

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

16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

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DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltage are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS Temp = -40°C to +85°C			UNIT
			MIN	TYP[1]	MAX	
V_{IH}	HIGH level Input voltage	V_{CC} = 2.3 to 2.7V	1.7	1.2		V
		V_{CC} = 2.7 to 3.6V	2.0	1.5		
V_{IL}	LOW level Input voltage	V_{CC} = 2.3 to 2.7V		1.2	0.7	V
		V_{CC} = 2.7 to 3.6V		1.5	0.8	
V_{OH}	HIGH level output voltage	V_{CC} = 2.3 to 3.6V; V_I = V_{IH} or V_{IL}; I_O = −100μA	V_{CC} − 0.2	V_{CC}		V
		V_{CC} = 2.3V; V_I = V_{IH} or V_{IL}; I_O = −4mA	V_{CC} − 0.4	V_{CC} − 0.11		
		V_{CC} = 2.3V; V_I = V_{IH} or V_{IL}; I_O = −6mA	V_{CC} − 0.6	V_{CC} − 0.17		
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = −4mA	V_{CC} − 0.5	V_{CC} − 0.09		
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = −8mA	V_{CC} − 0.7	V_{CC} − 0.19		
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = −6mA	V_{CC} − 0.6	V_{CC} − 0.13		
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = −12mA	V_{CC} − 1.0	V_{CC} − 0.27		
V_{OL}	LOW level output voltage	V_{CC} = 2.3 to 3.6V; V_I = V_{IH} or V_{IL}; I_O = 100μA		GND	0.20	V
		V_{CC} = 2.3V; V_I = V_{IH} or V_{IL}; I_O = 4mA		0.07	0.40	
		V_{CC} = 2.3V; V_I = V_{IH} or V_{IL}; I_O = 6mA		0.11	0.55	
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = 4mA		0.06	0.40	
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = 8mA		0.13	0.60	
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 6mA		0.09	0.55	
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 12mA		0.19	0.80	
I_I	Input leakage current per data pin with bus hold	V_{CC} = 2.3 to 3.6V; V_I = V_{CC} or GND		0.1	5	μA
I_{OZ}	3-State output OFF-state current	V_{CC} = 2.3 to 3.6V; V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND		0.1	10	μA
I_{CC}	Quiescent supply current	V_{CC} = 2.3 to 3.6V; V_I = V_{CC} or GND; I_O = 0		0.2	40	μA
ΔI_{CC}	Additional quiescent supply current given per data I/O pin with bus hold	V_{CC} = 2.3V to 3.6V; V_I = V_{CC} − 0.6V; I_O = 0		150	750	μA
I_{BHL}[2]	Bus hold LOW sustaining current	V_{CC} = 2.3V; V_I = 0.7V	45	−		μA
		V_{CC} = 3.0V; V_I = 0.8V	75	150		
I_{BHH}[2]	Bus hold HIGH sustaining current	V_{CC} = 2.3V; V_I = 1.7V	−45			μA
		V_{CC} = 3.0V; V_I = 2.0V	−75	−175		
I_{BHLO}[2]	Bus hold LOW overdrive current	V_{CC} = 3.6V	500			μA
I_{BHHO}[2]	Bus hold HIGH overdrive current	V_{CC} = 3.6V	−500			μA

NOTES:
1. All typical values are at T_{amb} = 25°C.
2. Valid for data inputs of bus hold parts.

16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

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AC CHARACTERISTICS FOR V_{CC} = 2.3V TO 2.7V RANGE

GND = 0V; t_r = t_f ≤ 2.0ns; C_L = 30pF

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			V_{CC} = 2.3 to 2.7V			
			MIN	TYP[1,2]	MAX	
t_{PHL}/t_{PLH}	Propagation delay nAn to nBn; nBn to nAn	1, 3	1.0	2.5	4.9	ns
t_{PZH}/t_{PZL}	3-State output enable time nOE to nAn; nOE to nBn	2, 3	1.0	2.9	6.8	ns
t_{PHZ}/t_{PLZ}	3-State output disable time nOE to nAn; nOE to nBn	2, 3	1.0	3.0	6.3	ns

NOTES:
1. All typical values are measured T_{amb} = 25°C.
2. Typical value is measured at V_{CC} = 2.5V

AC CHARACTERISTICS FOR V_{CC} = 3.0V TO 3.6V RANGE AND V_{CC} = 2.7V

GND = 0V; t_r = t_f ≤ 2.5ns; C_L = 50pF

SYMBOL	PARAMETER	WAVEFORM	LIMITS						UNIT
			V_{CC} = 3.3 ± 0.3V			V_{CC} = 2.7V			
			MIN	TYP[1,2]	MAX	MIN	TYP[1]	MAX	
t_{PHL}/t_{PLH}	Propagation delay nAn to nBn; nBn to nAn	1, 3	1.0	2.4	4.2	1.0	2.7	4.7	ns
t_{PZH}/t_{PZL}	3-State output enable time nOE to nAn; nOE to nBn	2, 3	1.0	3.0	5.6	1.0	3.9	6.7	ns
t_{PHZ}/t_{PLZ}	3-State output disable time nOE to nAn; nOE to nBn	2, 3	1.0	2.6	5.5	1.0	2.9	5.7	ns

NOTES:
1. All typical values are measured T_{amb} = 25°C.
2. Typical value is measured at V_{CC} = 3.3V

16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

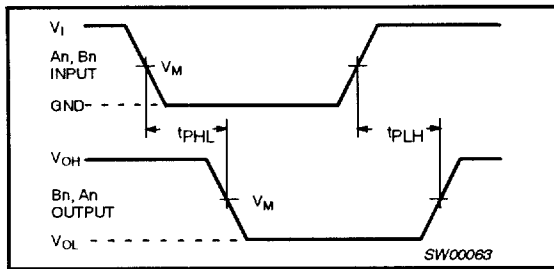## 74ALVCH162245

AC WAVEFORMS FOR V_{CC} = 2.3V TO 2.7V AND V_{CC} < 2.3V RANGE

V_M = 0.5 V_{CC}
V_X = V_{OL} + 0.15V
V_Y = V_{OH} −0.15V
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
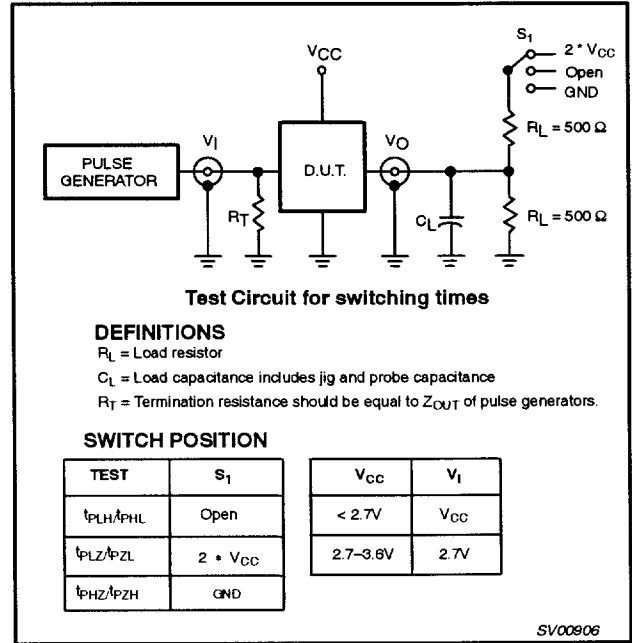V_I = V_{CC}

AC WAVEFORMS FOR V_{CC} = 3.0V TO 3.6V AND V_{CC} = 2.7V RANGE

V_M = 1.5 V
V_X = V_{OL} + 0.3V
V_Y = V_{OH} −0.3V
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
V_I = 2.7V

Waveform 1. Input (nAn, nBn) to output (nBn, nAn) propagation delay times

Waveform 2. 3-State enable and disable times

TEST CIRCUIT

Test Circuit for switching times

DEFINITIONS

R_L = Load resistor

C_L = Load capacitance includes jig and probe capacitance

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

SWITCH POSITION

TEST	S_1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 • V_{CC}
t_{PHZ}/t_{PZH}	GND

V_{CC}	V_I
< 2.7V	V_{CC}
2.7–3.6V	2.7V

SV00906

Waveform 3. Load circuitry for switching times
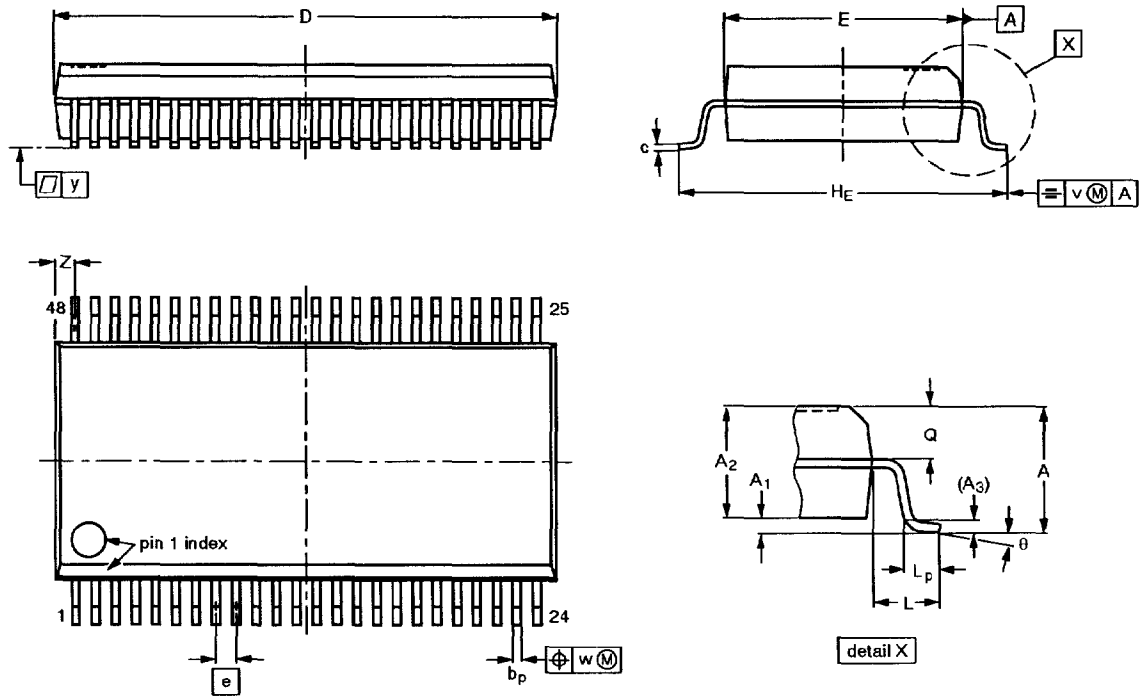
16-bit bus transceiver with direction pin and
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SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm   SOT370-1

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 direction pin and
30Ω termination resistor (3-State)

74ALVCH162245

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

SOT362-1

scale 0 — 2.5 — 5 mm
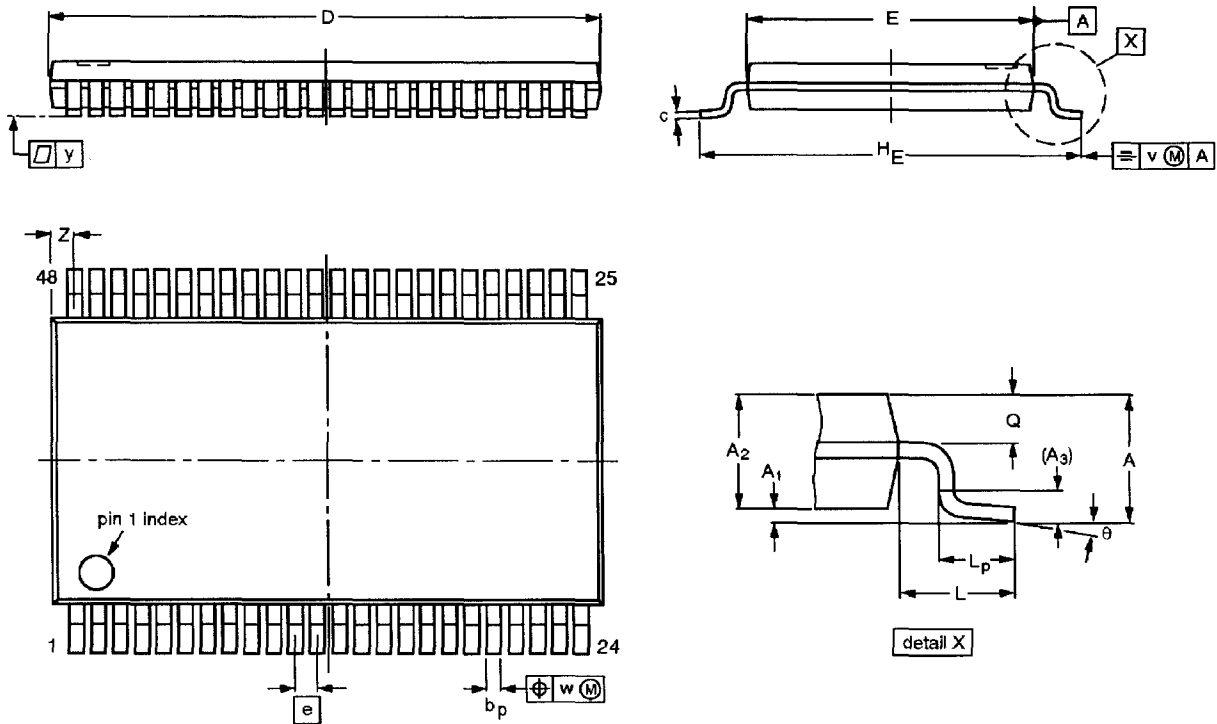
DIMENSIONS (mm are the original dimensions).

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D(1)	E(2)	e	Hᴇ	L	Lₚ	Q	v	w	y	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 VERSION	REFERENCES					EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ				
SOT362-1		MO-153ED					~~93-02-03~~ 95-02-10

NOTES

16-bit bus transceiver with direction pin and 30Ω termination resistor (3-State)

74ALVCH162245

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 chages 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.

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Product Information

74ALVCH162245; 16-bit bus transceiver with direction pin and 30 Ω termination resistor (3-State)

Information as of 2001-11-09

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⊞ Description

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The 74ALVCH162245 is designed with 30 Ohm series resistors in both HIGH and LOW output states.

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⊞ Features

- Wide supply voltage range of 1.2V to 3.6V
- Complies with JEDEC standard no. 8-1A
- CMOS low power consumption
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple V_{CC} and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- Bus hold on all data inputs
- Integrated 30 Ohm termination resistor

⊞ Applications

Ground And VCC Bounce Of High-Speed Integrated Circuits (date 01-Jan-93)
Interfacing 3 Volt and 5 Volt Applications
Live Insertion Aspects of Philips Logic Families (date 22-Jul-99)
Hardware and software verification procedure (date 07-Oct-98)

⊞ Datasheet

Type number	Title	Publication release date	Datasheet status	Page count	File size (kB)	Datasheet
74ALVCH162245	16-bit bus transceiver with direction pin and 30 Ω termination resistor (3-State)	29-Jun-98	Product Specification	11	105	Dowr Download

⊞ Products, packages, availability and ordering

Type number	North American Type number	Order code (12nc)	marking/packing Dowr IC packing info	package	device status	buy online
74ALVCH162245DGG	74ALVCH162245DG	9352 108 40112	Standard Marking * Tube	SOT362-1 (TSSOP48)	Full production	order this -
	74ALVCH162245DG-T	9352 108 40118	Standard Marking * Reel Pack, SMD, 13"	SOT362-1 (TSSOP48)	Full production	order this -
74ALVCH162245DL	74ALVCH162245DL	9351 878 10112	Standard Marking * Tube	SOT370-1 (SSOP48)	Full production	order this -
	74ALVCH162245DL-T	9351 878 10118	Standard Marking * Reel Pack, SMD, 13"	SOT370-1 (SSOP48)	Full production	order this -

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Prod 74ALVCH162245 links to the similar products page containing an overview of products that are similar in function or related to the Type number(s) as listed on this page. The similar products page includes products from the same catalog tree(s) , relevant selection guides and products from the same functional category.

⊞ Support & tools

Dowr CMOS 16-bit microcontroller family (date 01-May-98)