

DATA SHEET

74LVT16244B

3.3 V LVT 16-bit buffer/driver (3-State)

Product data
Supersedes data of 1998 Oct 07

2002 Oct 31

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

FEATURES

- 16-bit bus interface
- 3-State buffers
- Output capability: +64 mA / -32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power-up 3-State
- No bus current loading when output is tied to 5 V bus
- Latch-up protection exceeds 500 mA per JEDEC Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

DESCRIPTION

The 74LVT16244B is a high-performance BiCMOS product designed for V_{CC} operation at 3.3 V.

This device is a 16-bit buffer and line driver featuring non-inverting 3-State bus outputs. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer.

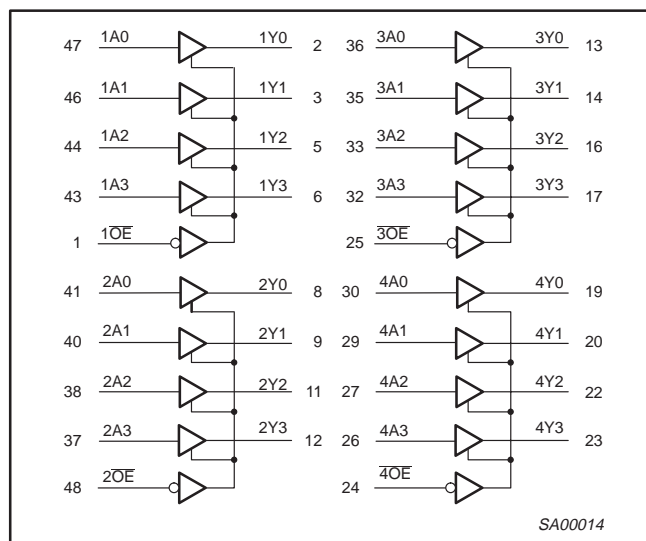
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25\text{ }^{\circ}\text{C}$	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay nAx to nYx	$C_L = 50\text{ pF}$; $V_{CC} = 3.3\text{ V}$	1.8	ns
C_{IN}	Input capacitance nOE	$V_I = 0\text{ V}$ or 3.0 V	3	pF
C_{OUT}	Output capacitance	Outputs disabled; $V_O = 0\text{ V}$ or 3.0 V	9	pF
I_{CCZ}	Total supply current	Outputs disabled; $V_{CC} = 3.6\text{ V}$	70	μA

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	TEMPERATURE RANGE	DWG NUMBER
74LVT16244BDL	48-Pin Plastic SSOP Type III	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	SOT370-1
74LVT16244BDGG	48-Pin Plastic TSSOP Type II	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	SOT362-1
74LVT16244BEV	56VFBGA Ball Grid Array	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	SOT702-1

LOGIC SYMBOL



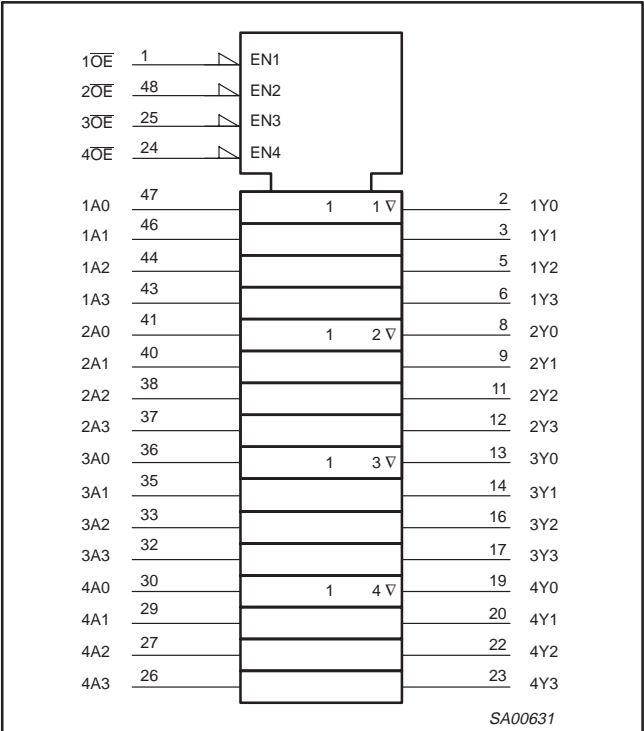
NOTE:

Pin numbers are shown for SSOP and TSSOP packages only.

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

LOGIC SYMBOL (IEEE/IEC)



NOTE:
Pin numbers are shown for SSOP and TSSOP packages only.

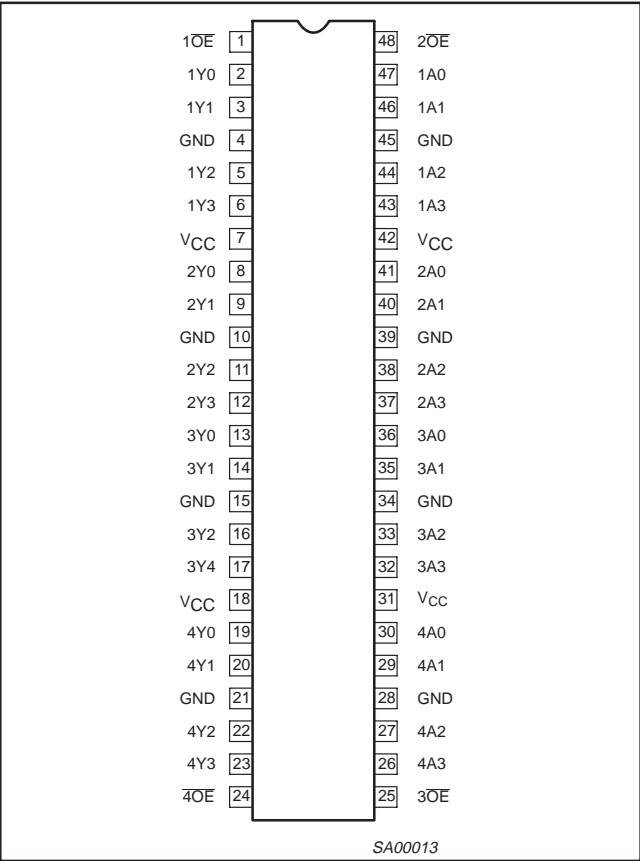
FUNCTION TABLE

INPUTS		OUTPUTS
nOE	nAx	nYx
L	L	L
L	H	H
H	X	Z

H = High voltage level
L = Low voltage level
X = Don't care
Z = High Impedance "off" state

PIN CONFIGURATION

48-pin SSOP and TSSOP



PIN DESCRIPTION

48-pin SSOP and TSSOP

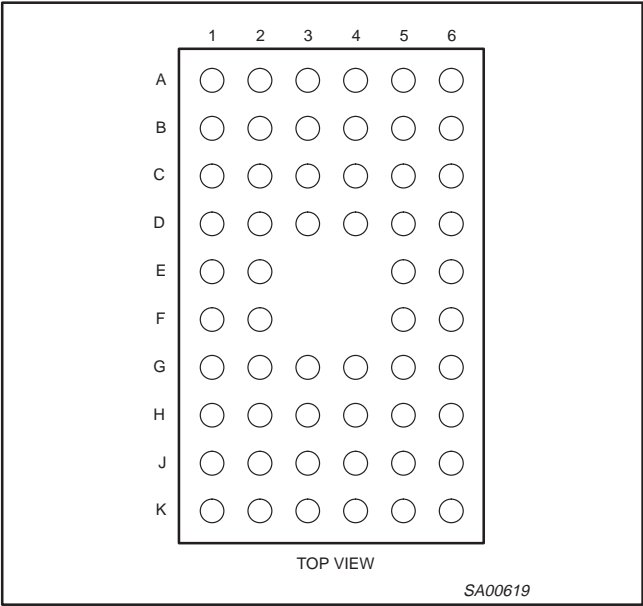
PIN NUMBER	SYMBOL	NAME AND FUNCTION
47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26	1A0 - 1A3, 2A0 - 2A3, 3A0 - 3A3, 4A0 - 4A3	Data inputs
2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23	1Y0 - 1Y3, 2Y0 - 2Y3, 3Y0 - 3Y3, 4Y0 - 4Y3	Data outputs
1, 48, 25, 24	1OE, 2OE, 3OE, 4OE	Output enables
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V _{CC}	Positive supply voltage

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

PIN CONFIGURATION

56-ball VFBGA terminal assignments



PIN DESCRIPTION

56-ball VFBGA terminal assignments

	1	2	3	4	5	6
A	1 $\overline{\text{OE}}$	NC	NC	NC	NC	2 $\overline{\text{OE}}$
B	1Y1	1Y0	GND	GND	1A0	1A1
C	1Y3	1Y2	V _{CC}	V _{CC}	1A2	1A3
D	2Y1	2Y0	GND	GND	2A0	2A1
E	2Y3	2Y2			2A2	2A3
F	3Y0	3Y1			3A1	3A0
G	3Y2	3Y3	GND	GND	3A3	3A2
H	4Y0	4Y1	V _{CC}	V _{CC}	4A1	4A0
J	4Y2	4Y3	GND	GND	4A3	4A2
K	4 $\overline{\text{OE}}$	NC	NC	NC	NC	3 $\overline{\text{OE}}$

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

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	mA
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	LIMITS		UNIT
		MIN	MAX	
V_{CC}	DC supply voltage	2.7	3.6	V
V_I	Input voltage	0	5.5	V
V_{IH}	HIGH-level input voltage	2.0		V
V_{IL}	Input voltage		0.8	V
I_{OH}	HIGH-level output current		−32	mA
I_{OL}	LOW-level output current		32	mA
	LOW-level output current; current duty cycle ≤ 50%; $f \geq 1$ kHz		64	
$\Delta t/\Delta v$	Input transition rise or fall rate; Outputs enabled		10	ns/V
T_{amb}	Operating free-air temperature range	−40	+85	°C

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS			UNIT
				Temp = -40 °C to +85 °C			
				MIN	TYP ¹	MAX	
V _{IK}	Input clamp voltage	V _{CC} = 2.7 V; I _{IK} = -18 mA			-0.85	-1.2	V
V _{OH}	High-level output voltage	V _{CC} = 2.7 V to 3.6 V; I _{OH} = -100 μA		V _{CC} -0.2	V _{CC}		V
		V _{CC} = 2.7 V; I _{OH} = -8 mA		2.4	2.5		
		V _{CC} = 3.0 V; I _{OH} = -32 mA		2.0	2.3		
V _{OL}	Low-level output voltage	V _{CC} = 2.7 V; I _{OL} = 100 μA			0.07	0.2	V
		V _{CC} = 2.7 V; I _{OL} = 24 mA			0.3	0.5	
		V _{CC} = 3.0 V; I _{OL} = 16 mA			0.25	0.4	
		V _{CC} = 3.0 V; I _{OL} = 32 mA			0.3	0.5	
		V _{CC} = 3.0 V; I _{OL} = 64 mA			0.4	0.55	
I _I	Input leakage current	V _{CC} = 3.6 V; V _I = V _{CC} or GND	Control pins		0.1	±1.0	μA
		V _{CC} = 0 V or 3.6 V; V _I = 5.5 V			0.4	10	
		V _{CC} = 3.6 V; V _I = V _{CC}	Data pins ⁴		0.1	1	
		V _{CC} = 3.6 V; V _I = 0			-0.4	-5	
I _{OFF}	Output off current	V _{CC} = 0 V; V _I or V _O = 0 V to 4.5 V			0.1	±100	μA
I _{HOLD}	Bus Hold current A inputs ⁶	V _{CC} = 3 V; V _I = 0.8 V		75	135		μA
		V _{CC} = 3 V; V _I = 2.0 V		-75	-135		
		V _{CC} = 0 V to 3.6 V; V _{CC} = 3.6 V		±500			
I _{EX}	Current into an output in the HIGH state when V _O > V _{CC}	V _O = 5.5 V; V _{CC} = 3.0 V			50	125	μA
I _{PU/PD}	Power-up/down 3-State output current ³	V _{CC} ≤ 1.2 V; V _O = 0.5 V to V _{CC} ; V _I = GND or V _{CC} OE/OE = Don't care			1	±100	μA
I _{OZH}	3-State output HIGH current	V _{CC} = 3.6 V; V _O = 3.0 V; V _I = V _{IL} or V _{IH}			0.5	5	μA
I _{OZL}	3-State output LOW current	V _{CC} = 3.6 V; V _O = 0.5 V; V _I = V _{IL} or V _{IH}			0.5	-5	μA
I _{CCH}	Quiescent supply current	V _{CC} = 3.6 V; Outputs HIGH, V _I = GND or V _{CC} , I _O = 0			0.07	0.12	mA
I _{CCL}		V _{CC} = 3.6 V; Outputs LOW, V _I = GND or V _{CC} , I _O = 0			4.0	6.0	
I _{CCZ}		V _{CC} = 3.6 V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵			0.07	0.12	
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 3 V to 3.6 V; One input at V _{CC} -0.6 V, Other inputs at V _{CC} or GND			0.1	0.2	mA

NOTES:

1. All typical values are at $V_{CC} = 3.3 \text{ V}$ and $T_{amb} = 25 \text{ °C}$.
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 0 V and 1.2 V with a transition time of up to 10 msec.
From $V_{CC} = 1.2 \text{ V}$ to $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ a transition time of 100 μsec is permitted. This parameter is valid for $T_{amb} = 25 \text{ °C}$ only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled to V_{CC} or GND.
6. This is the bus-hold overdrive current required to force the input to the opposite logic state.

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

AC CHARACTERISTICS

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

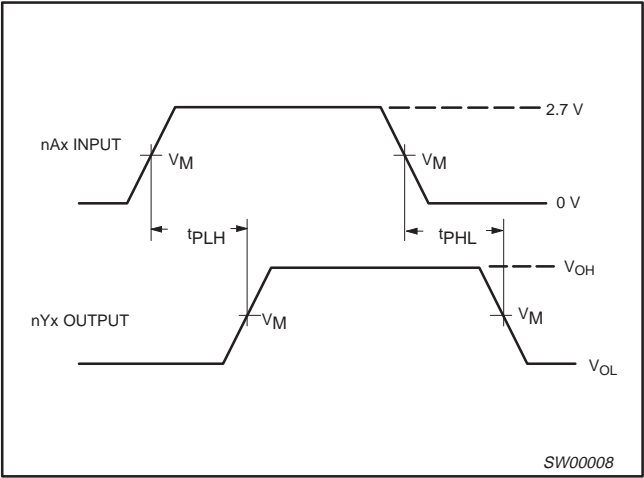
SYMBOL	PARAMETER	WAVEFORM	LIMITS				UNIT
			$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$			$V_{CC} = 2.7 \text{ V}$	
			MIN	TYP ¹	MAX	MAX	
t_{PLH} t_{PHL}	Propagation delay nAx to nYx	1	0.5 0.5	1.8 1.7	3.2 3.2	4.0 4.0	ns
t_{PZH} t_{PZL}	Output enable time to HIGH and LOW level	2	1.0 1.0	2.3 2.1	4.0 4.0	5.0 5.3	ns
t_{PHZ} t_{PLZ}	Output disable time from HIGH and LOW Level	2	1.0 1.0	3.2 2.9	4.5 4.0	5.0 4.4	ns

NOTE:

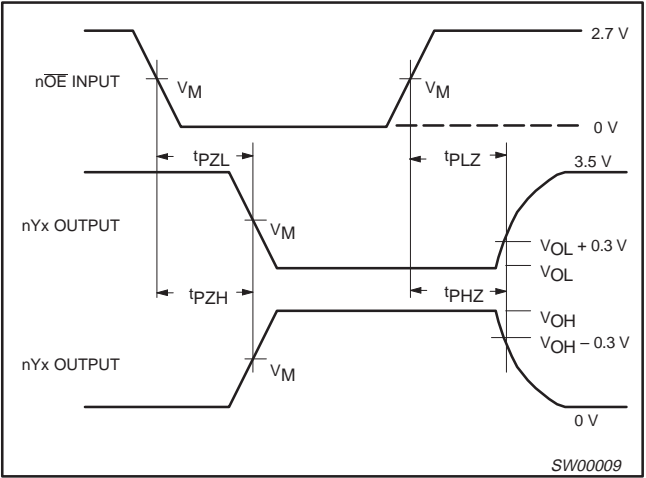
1. All typical values are at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C.

AC WAVEFORMS

$V_M = 1.5$ V; $V_{IN} = \text{GND to } 3.0$ V.



Waveform 1. Input (nAx) to Output (nYx) Propagation Delays

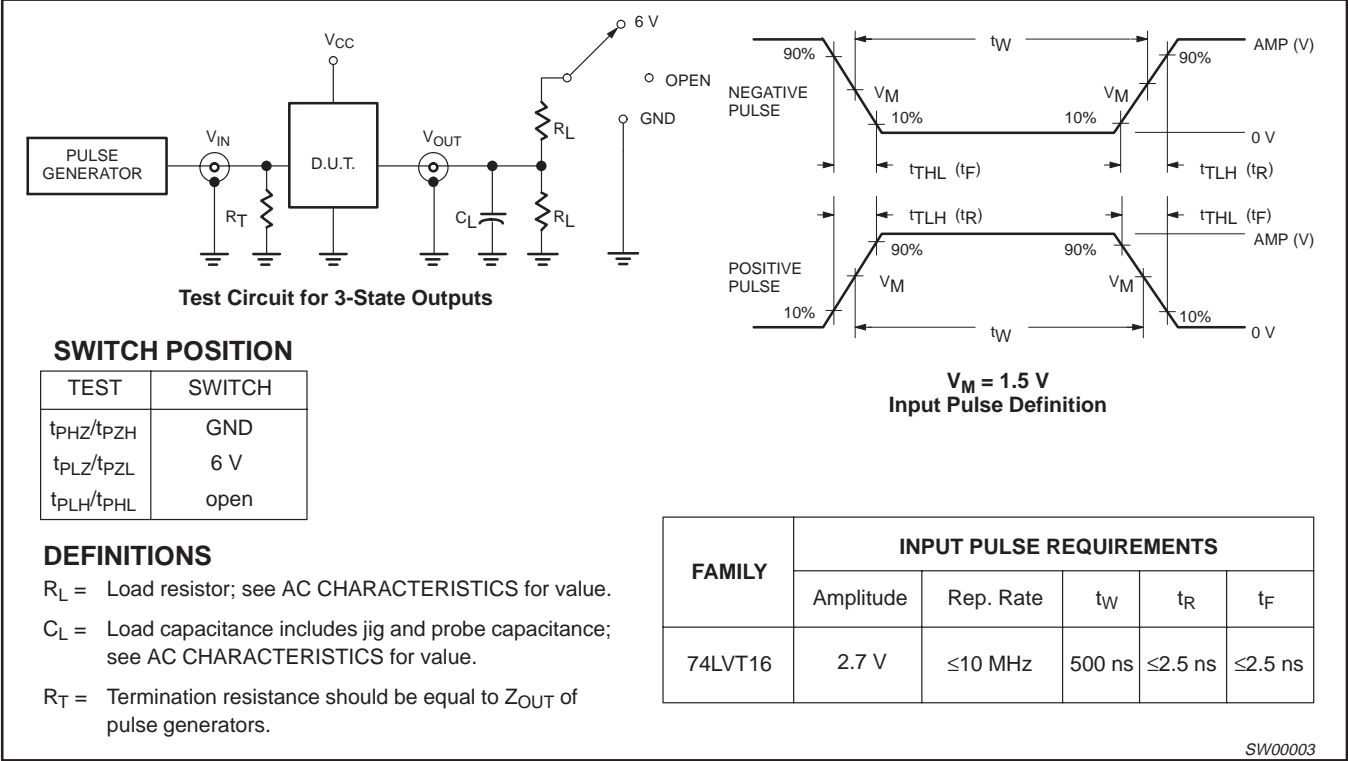


Waveform 2. 3-State Output Enable and Disable Times

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

TEST CIRCUIT AND WAVEFORMS

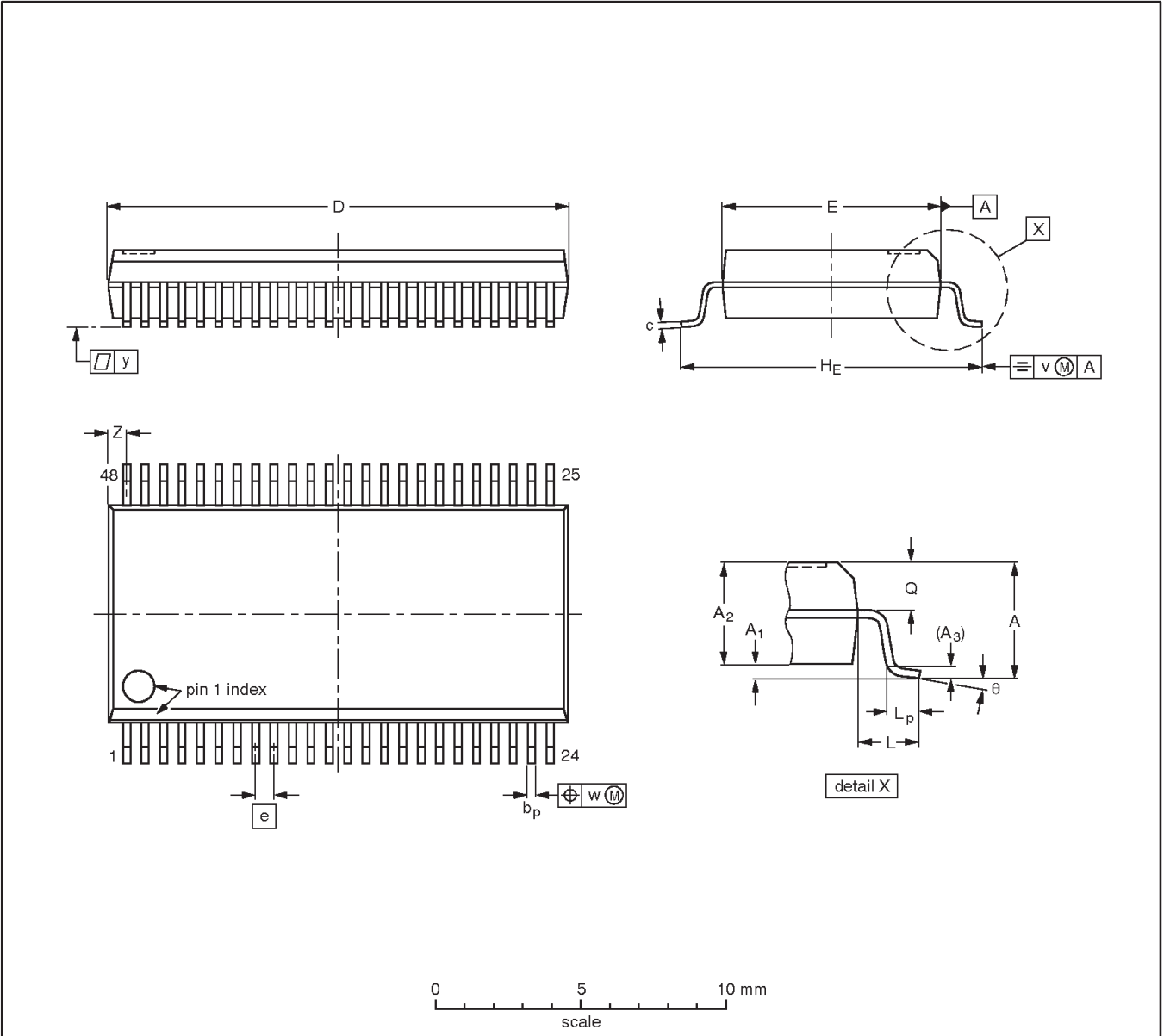


3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

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	0.4 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.

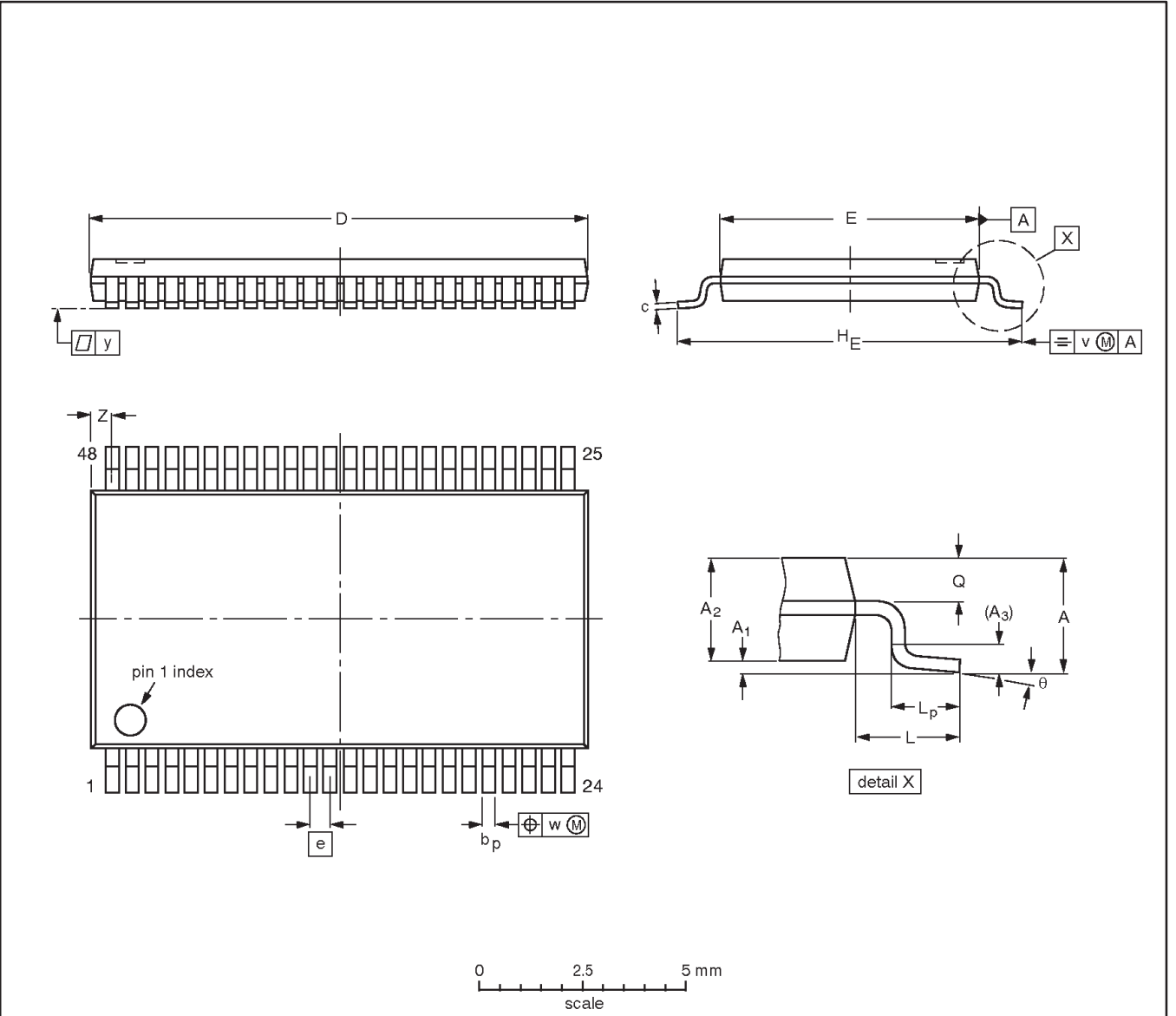
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT370-1		MO-118				95-02-04 99-12-27

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

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.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	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.

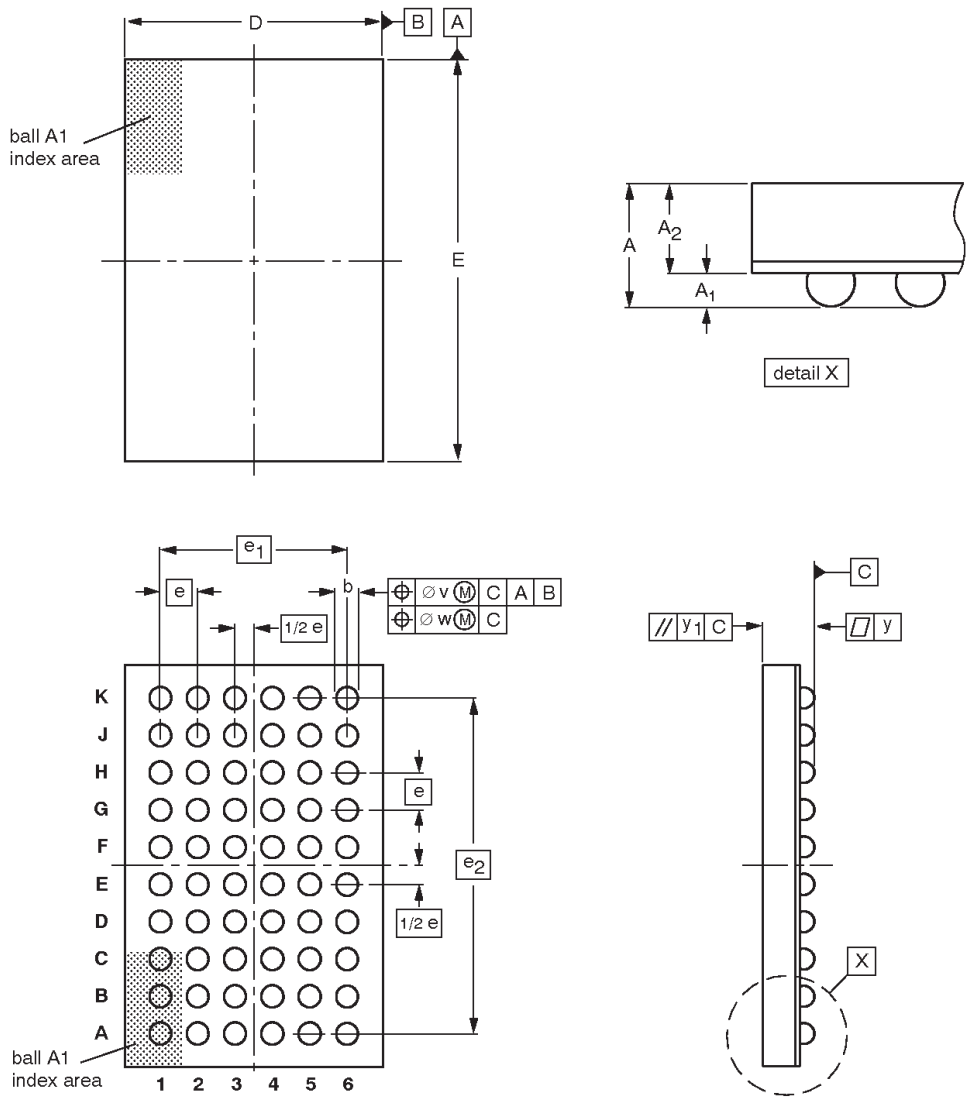
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT362-1		MO-153				-95-02-10 99-12-27

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

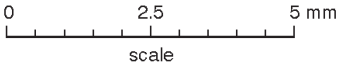
VFBGA56: plastic very thin fine-pitch ball grid array package; 56 balls;
body 4.5 x 7 x 0.65 mm

SOT702-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	b	D	E	e	e ₁	e ₂	v	w	y	y ₁
mm	1	0.3 0.2	0.7 0.6	0.45 0.35	4.6 4.4	7.1 6.9	0.65	3.25	5.85	0.15	0.08	0.08	0.1



OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT702-1		MO-225				01-06-25 02-08-08

3.3 V LVT 16-bit buffer/driver (3-State)

74LVT16244B

REVISION HISTORY

Rev	Date	Description
_4	20021031	Product data (9397 750 09136); supersedes 74LVT16244B_3 of 1998 Oct 07 (9397 750 04706). Engineering Change Notice 853–1778 27401 (date: 20011203). Modifications: • Add VFPGA56 (EV) package option.

Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

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

[2] 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>.

[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.

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 in the products—including circuits, standard cells, and/or software—described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). 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.

Contact information

For additional information please visit

<http://www.semiconductors.philips.com>.

Fax: +31 40 27 24825

For sales offices addresses send e-mail to:

sales.addresses@www.semiconductors.philips.com

© Koninklijke Philips Electronics N.V. 2002
All rights reserved. Printed in U.S.A.

Date of release: 10-02

Document order number:

9397 750 09136

Let's make things better.