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Kind regards,

Team Nexperia

74LVT16244B; 74LVTH16244B

3.3 V 16-bit buffer/driver; 3-state
Rev. 11 — 1 March 2012

Product data sheet

1. **General description**

The 74LVT16244B; 74LVTH16244B 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.

Features and benefits 2.

- 16-bit bus interface
- 3-state buffers
- Output capability: +64 mA and -32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Bus hold data inputs eliminate need for external pull-up resistors to hold unused inputs
- Power-up 3-state
- Live insertion and extraction permitted
- No bus current loading when output is tied to 5 V bus
- Latch-up protection
 - ◆ JESD78B Class II exceeds 500 mA
- ESD protection:
 - ♦ HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V

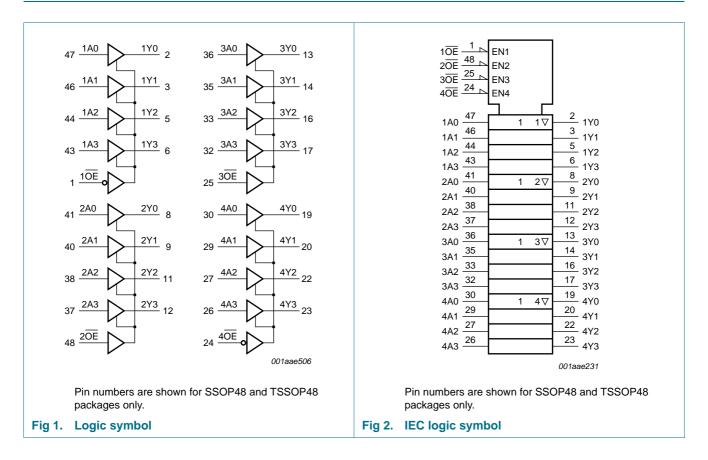
Ordering information 3.

Table 1. **Ordering information**

Type number	Package	Package								
	Temperature range	Name	Description	Version						
74LVT16244BDL	–40 °C to +85 °C	SSOP48	plastic shrink small outline package; 48 leads;	SOT370-1						
74LVTH16244BDL			body width 7.5 mm							
74LVT16244BDGG	–40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package;	SOT362-1						
74LVTH16244BDGG			48 leads; body width 6.1 mm							
74LVT16244BEV	–40 °C to +85 °C	VFBGA56	plastic very thin fine-pitch ball grid array package; 56 balls; body $4.5 \times 7 \times 0.65$ mm	SOT702-1						
74LVT16244BBX	–40 °C to +125 °C	HXQFN60	plastic compatible thermal enhanced extremely	SOT1134-2						
74LVTH16244BBX	_		thin quad flat package; no leads; 60 terminals; body $4 \times 6 \times 0.5$ mm							

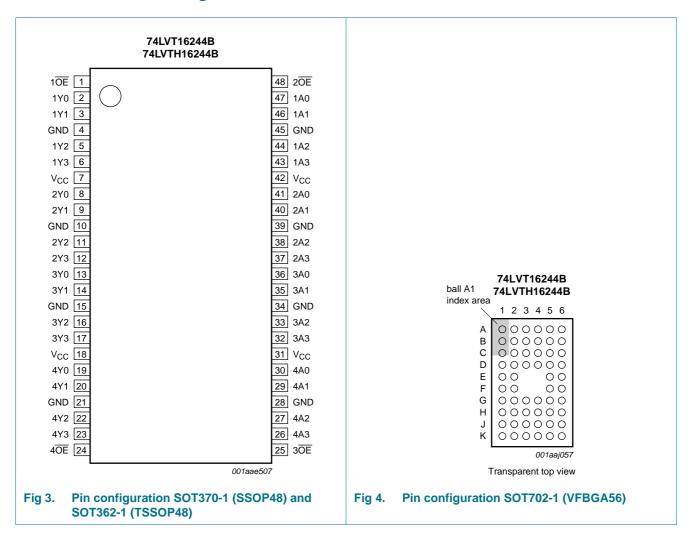


4. Functional diagram



5. Pinning information

5.1 Pinning



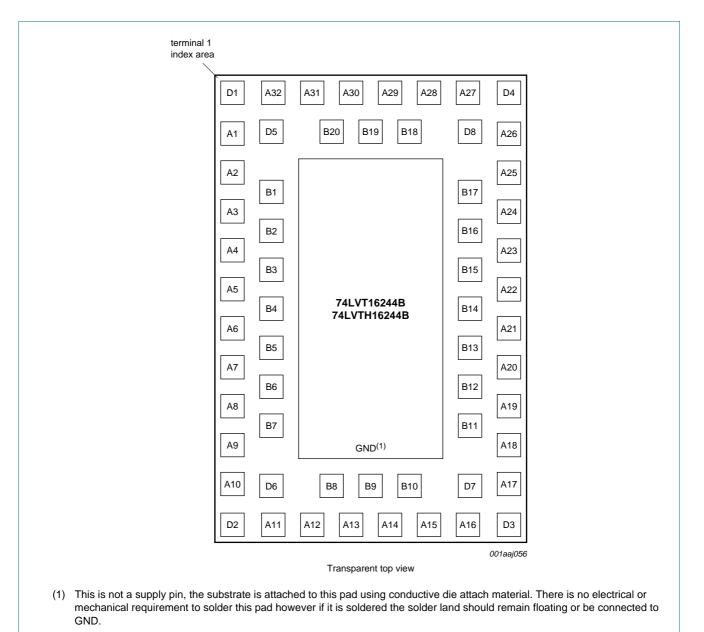


Fig 5. Pin configuration SOT1134-2 (HXQFN60)

5.2 Pin description

Table 2. Pin description

Symbol	Pin		Description	
	SOT370-1 and SOT362-1	SOT702-1	SOT1134-2	
1 <u>OE</u> , 2 <u>OE</u> , 3OE, 4OE	1, 48, 25, 24	A1, A6, K6, K1	A30, A29, A14, A13	output enable input (active LOW)
1Y0 to 1Y3	2, 3, 5, 6	B2, B1, C2, C1	B20, A31, D5, D1	data output
2Y0 to 2Y3	8, 9, 11, 12	D2, D1, E2, E1	A2, B2, B3, A5	data output
3Y0 to 3Y3	13, 14, 16, 17	F1, F2, G1, G2	A6, B5, B6, A9	data output
4Y0 to 4Y3	19, 20, 22, 23	H1, H2, J1, J2	D2, D6, A12, B8	data output
GND	4, 10, 15, 21, 28, 34, 39, 45	B3, B4, D3, D4, G3, G4, J3, J4	A32, A3, A8, A11, A16, A19, A24, A27	ground (0 V)
V _{CC}	7, 18, 31, 42	C3, C4, H3, H4	A1, A10, A17, A26	supply voltage
1A0 to 1A3	47, 46, 44, 43	B5, B6, C5, C6	B18, A28, D8, D4	data input
2A0 to 2A3	41, 40, 38, 37	D5, D6, E5, E6	A25, B16, B15, A22	data input
3A0 to 3A3	36, 35, 33, 32	F6, F5, G6, G5	A21, B13, B12, A18	data input
4A0 to 4A3	30, 29, 27, 26	H6, H5, J6, J5	D3, D7, A15, B10	data input
n.c.	-	A2, A3, A4, A5, K2, K3, K4, K5	A4, A7, A20, A23, B1, B4, B7, B9, B11, B14, B17, B19	not connected

6. Functional description

Table 3. Function table[1]

Control	Input	Output
nOE	nAn	nYn
L	L	L
L	Н	Н
Н	X	Z

^[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+4.6	V
V_{I}	input voltage		<u>[1]</u> –0.5	+7.0	V
V _O	output voltage	output in OFF-state or HIGH-state	<u>[1]</u> –0.5	+7.0	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
I _{OK}	output clamping current	V _O < 0 V	-50	-	mA

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Table 4. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
I_{O}	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-64	-	mA
T _{stg}	storage temperature		-65	+150	°C
Tj	junction temperature		[2] -	150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +85 ^{\circ}\text{C};$			
		(T)SSOP48 package	[3] _	500	mW
		VFBGA56 package	<u>[4]</u> _	1000	mW
		HXQFN60 package	<u>[4]</u> _	1000	mW

^[1] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	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}	LOW-level input voltage		-	-	0.8	V
I _{OH}	HIGH-level output current		-32	-	-	mA
I _{OL}	LOW-level output current	none	-	-	32	mA
		current duty cycle \leq 50 %; $f_i \geq$ 1 kHz	-	-	64	mA
T _{amb}	ambient temperature	in free-air	-40	-	+85	°C
Δt/ΔV	input transition rise and fall rate	outputs enabled	-	-	10	ns/V

^[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.

^[3] Above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.

^[4] Above 70 °C the value of P_{tot} derates linearly with 1.8 mW/K.

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
T _{amb} = -	40 °C to +85 °C[1]						
V _{IK}	input clamping voltage	$V_{CC} = 2.7 \text{ V}; I_{IK} = -18 \text{ mA}$		-1.2	-0.85	-	V
V _{OH}	HIGH-level output voltage	I_{OH} = -100 μ A; V_{CC} = 2.7 V to 3.6 V		$V_{CC}-0.2$	V_{CC}	-	V
		$I_{OH} = -8 \text{ mA}; V_{CC} = 2.7 \text{ V}$		2.4	2.5	-	V
		$I_{OH} = -32 \text{ mA}; V_{CC} = 3.0 \text{ V}$		2.0	2.3	-	V
V_{OL}	LOW-level output voltage	V _{CC} = 2.7 V					
		I _{OL} = 100 μA		-	0.07	0.2	V
		I _{OL} = 24 mA		-	0.3	0.5	V
		V _{CC} = 3.0 V					
		I _{OL} = 16 mA		-	0.25	0.4	V
		I _{OL} = 32 mA		-	0.3	0.5	V
		I _{OL} = 64 mA		-	0.4	0.55	V
I _I	input leakage current	all input pins; $V_{CC} = 0 \text{ V or } 3.6 \text{ V}; V_I = 5.5 \text{ V}$		-	0.1	10	μΑ
		control pins; $V_{CC} = 3.6 \text{ V}$; $V_I = V_{CC} \text{ or GND}$		-	0.1	±1.0	μΑ
		data pins; V _{CC} = 3.6 V	[2]				
		$V_I = V_{CC}$		-	0.1	1	μΑ
		V _I = 0 V		-5	-0.1	-	μА
I _{OFF}	power-off leakage current	$V_{CC} = 0 \text{ V}$; $V_I \text{ or } V_O = 0 \text{ V to } 4.5 \text{ V}$		-	0.1	±100	μΑ
I _{BHL}	bus hold LOW current	$V_{CC} = 3 \text{ V}; V_{I} = 0.8 \text{ V}$	[3]	75	135	-	μΑ
I _{BHH}	bus hold HIGH current	$V_{CC} = 3 \text{ V}; V_{I} = 2.0 \text{ V}$		-	-135	-75	μΑ
I _{BHLO}	bus hold LOW overdrive current	nAn input; $V_{CC} = 0 \text{ V}$ to 3.6 V; $V_I = 3.6 \text{ V}$		500	-	-	μА
I _{BHHO}	bus hold HIGH overdrive current	nAn input; $V_{CC} = 0 \text{ V}$ to 3.6 V; $V_I = 3.6 \text{ V}$		-	-	-500	μА
I_{LO}	output leakage current	output in HIGH-state when $V_O > V_{CC}$; $V_O = 5.5 \text{ V}$; $V_{CC} = 3.0 \text{ V}$		-	50	125	μΑ
I _{O(pu/pd)}	power-up/power-down output current	$V_{CC} \le \underline{1.2} \text{ V}; V_O = 0.5 \text{ V to } V_{CC}; V_I = GND \text{ or } V_{CC}; n\overline{OE} = don't \text{ care}$	<u>[4]</u>	-	1	±100	μΑ
loz	OFF-state output current	$V_{CC} = 3.6 \text{ V}; V_I = V_{IH} \text{ or } V_{IL}$					
		output HIGH: V _O = 3.0 V		-	0.5	5	μΑ
		output LOW: V _O = 0.5 V		-5	+0.5	-	μΑ
I _{CC}	supply current	V_{CC} = 3.6 V; V_I = GND or V_{CC} ; I_O = 0 A					
		output HIGH		-	0.07	0.12	mA
		output LOW		-	4.0	6.0	mA
		outputs disabled	[5]	-	0.07	0.12	mA
Δl _{CC}	additional supply current	per input pin; V_{CC} = 3.0 V to 3.6 V; one input at V_{CC} – 0.6 V other inputs at V_{CC} or GND	[6]	-	0.1	0.2	mA

Product data sheet

Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Cı	input capacitance	$V_1 = 0 \ V \ or \ 3.0 \ V$	-	3	-	pF
Co	output capacitance	outputs disabled; $V_O = 0 \text{ V}$ or 3.0 V	-	9	-	pF

- [1] Typical values are measured at $V_{CC} = 3.3 \text{ V}$ and at $T_{amb} = 25 \,^{\circ}\text{C}$.
- [2] Unused pins at V_{CC} or GND.
- [3] This is the bus hold overdrive current required to force the input to the opposite logic state.
- This parameter is valid for any V_{CC} between 0 V and 1.2 V with a transition time of up to 10 ms. From V_{CC} = 1.2 V to V_{CC} = 3.3 V \pm 0.3 V a transition time of 100 μ s is permitted. This parameter is valid for T_{amb} = 25 °C only.
- [5] I_{CC} is measured with outputs pulled to V_{CC} or GND.
- [6] This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

10. Dynamic characteristics

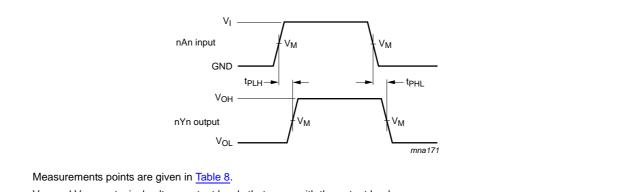
Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -40	°C to +85 °C[1]					
t _{PLH}	LOW to HIGH	nAn to nYn; see Figure 6				
	propagation delay	V _{CC} = 2.7 V	-	-	4.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	1.8	3.2	ns
t _{PHL}	HIGH to LOW	nAn to nYn; see Figure 6				
	propagation delay	V _{CC} = 2.7 V	-	-	4.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	1.7	3.2	ns
t _{PZH}	OFF-state to HIGH	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	5.0	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.3	4.0	ns
t _{PZL}	OFF-state to LOW	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	5.3	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.1	4.0	ns
t _{PHZ}	HIGH to OFF-state	nOE to nYn; see Figure 7				
	propagation delay	$V_{CC} = 2.7 \text{ V}$	-	-	5.0	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	3.2	4.5	ns
t _{PLZ}	LOW to OFF-state	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	4.4	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	2.9	4.0	ns

^[1] Typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

11. Waveforms



 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 6. Propagation delay input (nAn) to output (nYn)

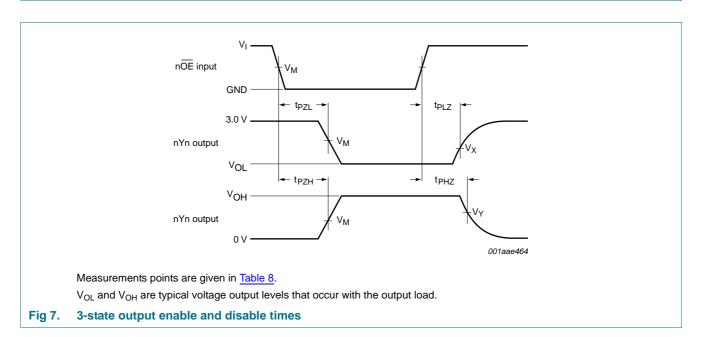


Table 8. Measurement points

Input	Output		
V_{M}	V _M	V _X	V _Y
1.5 V	1.5 V	V _{OL} + 0.3 V	$V_{OH} - 0.3 V$

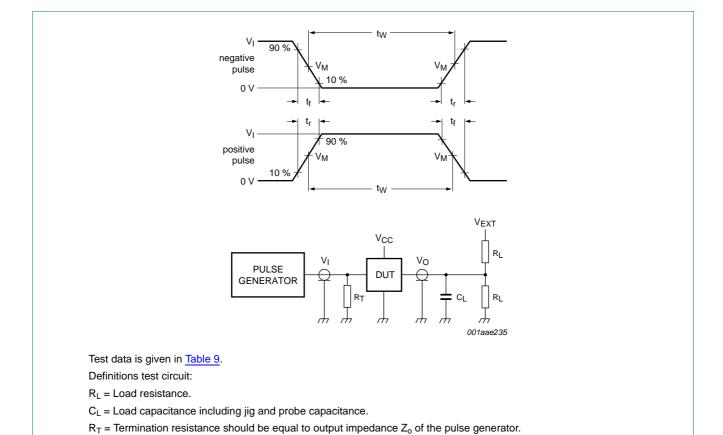


Fig 8. Test circuit for measuring switching times

Test data

 V_{EXT} = External voltage for measuring switching times.

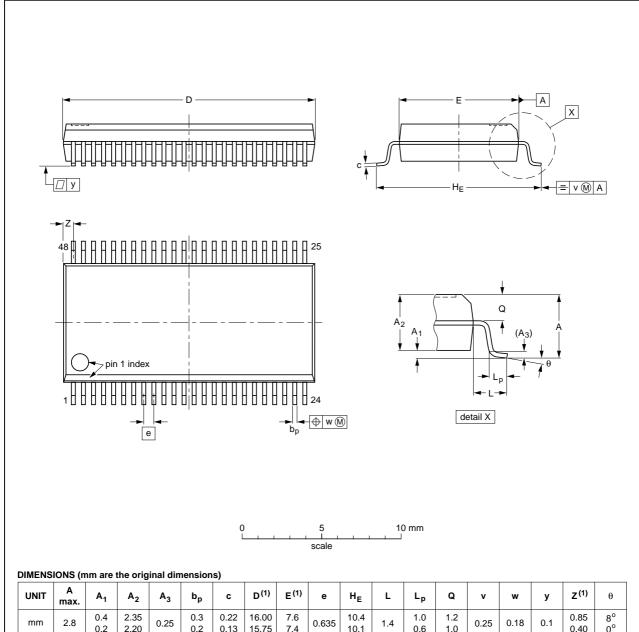
Input V_{EXT} Load V_{I} C_L R_{L} f_i t_r, t_f t_{PHZ} , t_{PZH} t_{W} t_{PLZ} , t_{PZL} t_{PLH}, t_{PHL} 2.7 V ≤ 10 MHz 500 Ω **GND** 500 ns ≤ 2.5 ns 50 pF 6 V open

Table 9.

12. Package outline

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

SOT370-1



UNIT	A max.	A ₁	A ₂	A ₃	b _p	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	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.

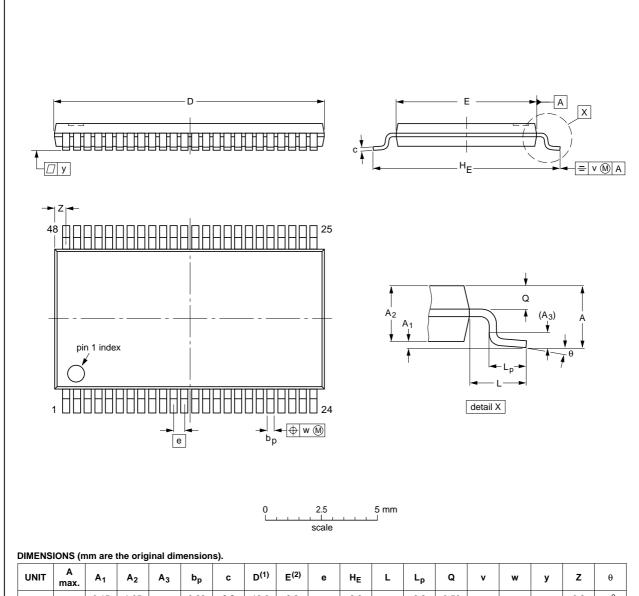
OUTLINE		REFER	ENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT370-1		MO-118			99-12-27 03-02-19

Fig 9. Package outline SOT370-1 (SSOP48)

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

SOT362-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	Q	v	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	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT362-1		MO-153				99-12-27 03-02-19	

Fig 10. Package outline SOT362-1 (TSSOP48)

74LVT_LVTH16244B

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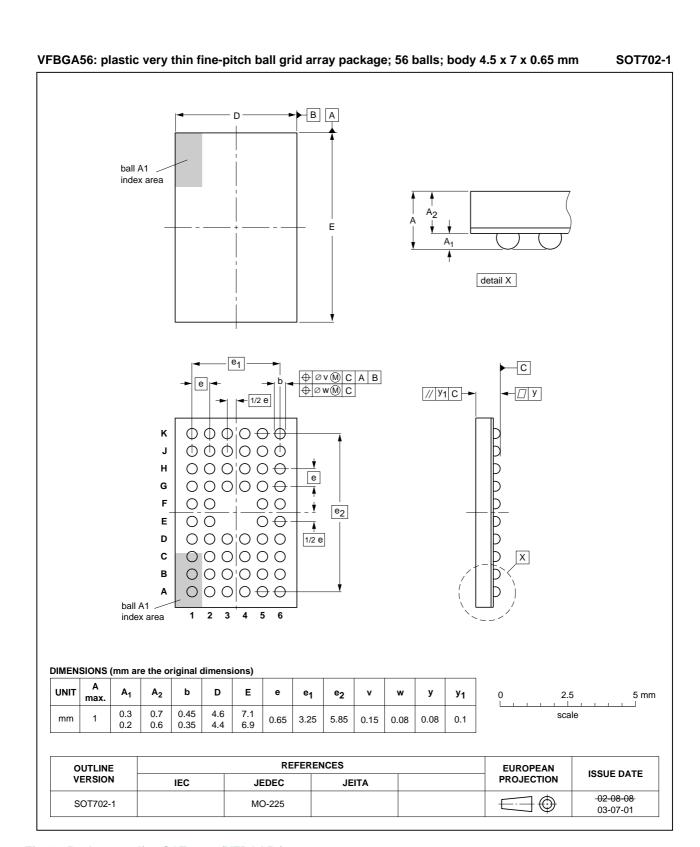


Fig 11. Package outline SOT702-1 (VFBGA56)

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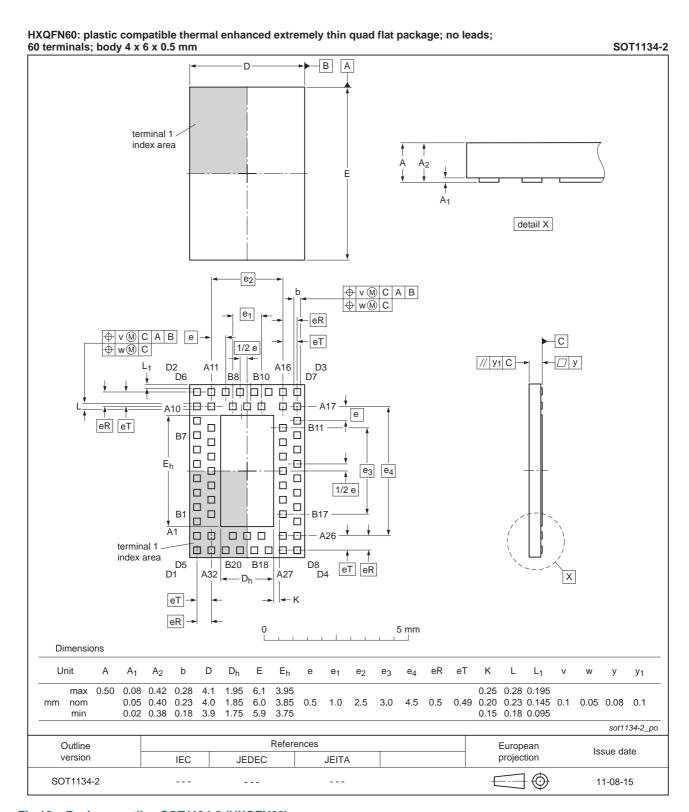


Fig 12. Package outline SOT1134-2 (HXQFN60)

74LVT_LVTH16244B

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13. Abbreviations

Table 10. Abbreviations

Acronym	Description
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

- I CONTROL TO THE CO	. ,			
Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH16244B v.11	20120301	Product data sheet	-	74LVT_LVTH16244B v.10
Modifications:	 For type num SOT1134-2. 	ber 74LVT16244BBX and 74L	VTH16244BBX the s	sot code has changed to
74LVT_LVTH16244B v.10	20111122	Product data sheet	-	74LVT_LVTH16244B v.9
Modifications:	 Legal pages 	updated.		
74LVT_LVTH16244B v.9	20110620	Product data sheet	-	74LVT_LVTH16244B v.8
74LVT_LVTH16244B v.8	20100322	Product data sheet	-	74LVT_LVTH16244B v.7
74LVT_LVTH16244B v.7	20090326	Product data sheet	-	74LVT_LVTH16244B v.6
74LVT_LVTH16244B v.6	20081113	Product data sheet	-	74LVT_LVTH16244B v.5
74LVT_LVTH16244B v.5	20060321	Product data sheet	-	74LVT16244B v.4
74LVT16244B v.4	20021031	Product specification	-	74LVT16244B v.3
74LVT16244B v.3	19981007	Product specification	-	74LVT16244B v.2
74LVT16244B v.2	19980219	Product specification	-	-
-				

15. Legal information

15.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design
- [2] The term 'short data sheet' is explained in section "Definitions"
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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3.3 V 16-bit buffer/driver; 3-state

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