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Kind regards,

Team Nexperia

74LVT16245B; 74LVTH16245B

3.3 V 16-bit transceiver; 3-state

Rev. 10 — 1 March 2012

Product data sheet

General description 1.

The 74LVT16245B; 74LVTH16245B is a high-performance BiCMOS product designed for V_{CC} operation at 3.3 V.

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 input (nOE) for easy cascading and a direction input (nDIR) for direction control.

2. Features and benefits

- 16-bit bidirectional 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
- Live insertion and extraction permitted
- Power-up 3-state
- 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

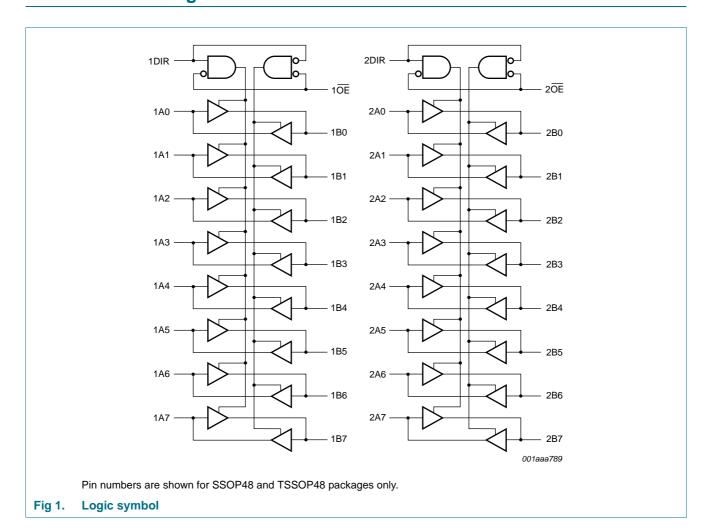


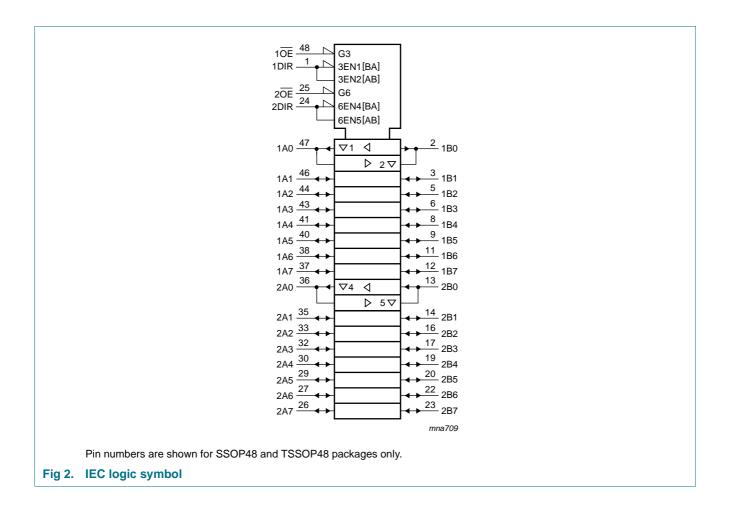
3. Ordering information

Table 1. Ordering information

Type number	Package				
	Temperature range	Name	Description	Version	
74LVT16245BDL	–40 °C to +85 °C	SSOP48	plastic shrink small outline package; 48 leads;	SOT370-1	
74LVTH16245BDL			body width 7.5 mm		
74LVT16245BDGG	–40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads;	SOT362-1	
74LVTH16245BDGG			body width 6.1 mm		
74LVT16245BEV	–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	
74LVT16245BBX	–40 °C to +125 °C	HXQFN60	plastic compatible thermal enhanced extremely	SOT1134-2	
74LVTH16245BBX	_		thin quad flat package; no leads; 60 terminals; body $4\times6\times0.5$ mm		

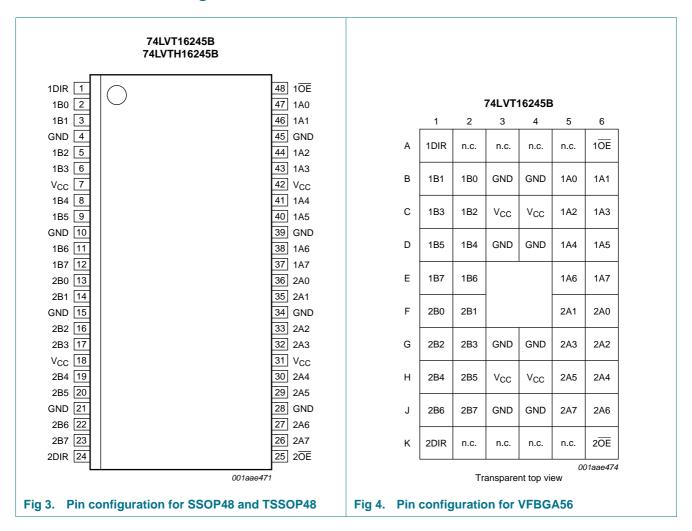
4. Functional diagram





5. Pinning information

5.1 Pinning



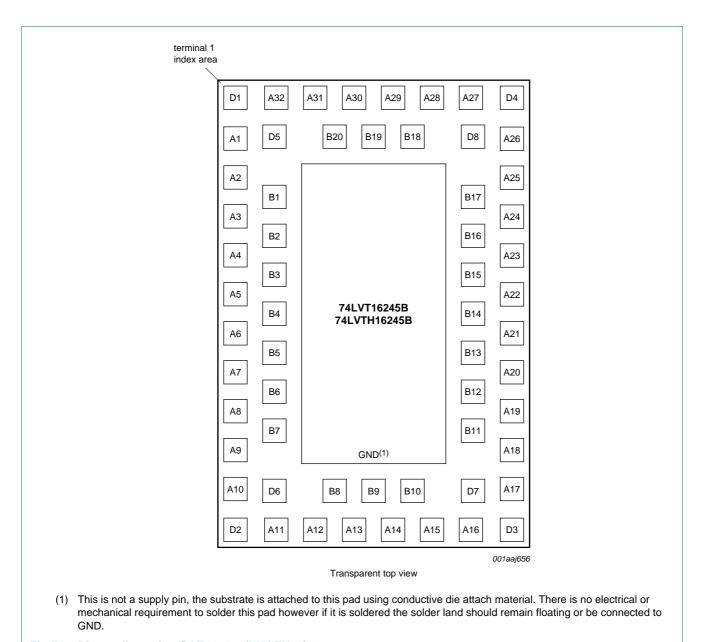


Fig 5. Pin configuration SOT1134-2 (HXQFN60)

5.2 Pin description

Table 2. Pin description

Symbol	Pin			Description
	SOT370-1 and SOT362-1	SOT702-1	SOT1134-2	
1DIR, 2DIR	1, 24	A1, K1	A30, A13	direction control input
1B0 to 1B7	2, 3, 5, 6, 8, 9, 11, 12	B2, B1, C2, C1, D2, D1, E2, E1	B20, A31, D5, D1, A2, B2, B3, A5	data input/output
2B0 to 2B7	13, 14, 16, 17, 19, 20, 22, 23	F1, F2, G1, G2, H1, H2, J1, J2	A6, B5, B6, A9, D2, D6, A12, B8	data input/output
GND	4, 10, 15, 21, 28, 34, 39, 45	B3, D3, G3, J3, J4, G4, D4, B4	A32, A3, A8, A11, A16, A19, A24, A27	ground (0 V)
V _{CC}	7, 18, 31, 42	C3, H3, H4, C4	A1, A10, A17, A26	supply voltage
10E, 20E	48, 25	A6, K6	A29, A14	output enable input (active LOW)
2A0 to 2A7	36, 35, 33, 32, 30, 29, 27, 26	F6, F5, G6, G5, H6, H5, J6, J5	A21, B13, B12, A18, D3, D7, A15, B10	data input/output
1A0 to 1A7	47, 46, 44, 43, 41, 40, 38, 37	B5, B6, C5, C6, D5, D6, E5, E6	B18, A28, D8, D4, A25, B16, B15, A22	data input/output
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

6.1 Function table

Table 3. Function table [1]

Control		Input/output				
nOE	nDIR	nAn	nBn			
L	L	output nAn = nBn	input			
L	Н	input	output nBn = nAn			
Н	X		Z			

^[1] H = HIGH voltage level;

L = LOW voltage level;

Z = high-impedance OFF-state.

X = don't care;

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
VI	input voltage		<u>[1]</u> –0.5	+7.0	V
Vo	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
Io	output current	output in LOW-state	-	128	mA
O		output in HIGH-state	-64	-	mA
T _{stg}	storage temperature		-65	+150	°C
T _j	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	<u>[3]</u> _	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
VI	input voltage		0	-	5.5	V
V_{IH}	HIGH-level input voltage		2.0	-	-	V
V_{IL}	LOW-level input voltage		-	-	8.0	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
$\Delta t/\Delta V$	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 Ptot derates linearly with 5.5 mW/K.

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

Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	Min	Тур	o 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} = $-100 \mu A$; V_{CC} = 2.7 V to 3.6 V	V _{CC} -	- 0.2 V _C	c -	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	-	0.0	7 0.2	V
		I _{OL} = 24 mA	-	0.3	0.5	V
		V _{CC} = 3.0 V				
		I _{OL} = 16 mA	-	0.2	5 0.4	V
		I _{OL} = 32 mA	-	0.3	0.5	V
		I _{OL} = 64 mA	-	0.4	0.55	V
l _l	input leakage current	control pins				
		$V_{CC} = 3.6 \text{ V}; V_I = V_{CC} \text{ or GND}$	-	0.1	±1	μΑ
		$V_{CC} = 0 \text{ V or } 3.6 \text{ V}; V_{I} = 5.5 \text{ V}$	-	0.1	10	μΑ
		input/output data pins; V _{CC} = 3.6 V	[2]			
		V _I = 5.5 V	-	0.1	20	μΑ
		$V_I = V_{CC}$	-	0.5	10	μΑ
		V _I = 0 V	-5	-0.	1 -	μΑ
l _{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	$V_{CC} = 3 \text{ V}; V_{I} = 0.8 \text{ V}$	[<u>3</u>] 75	135	5 -	μΑ
I _{BHH}	bus hold HIGH current	$V_{CC} = 3 \text{ V}; V_{I} = 2.0 \text{ V}$	-	-13	35 –75	μΑ
I _{BHLO}	bus hold LOW overdrive current	nAn input; $V_I = 0 \text{ V}$ to 3.6 V; $V_{CC} = 3.6 \text{ V}$	500	-	-	μА
I _{BHHO}	bus hold HIGH overdrive current	nAn input; $V_I = 0 \text{ V}$ to 3.6 V; $V_{CC} = 3.6 \text{ V}$	-	-	-500	μΑ
I _{LO}	output leakage current	output in HIGH-state when $V_O > V_{CC}$; $V_O = 5.5 \text{ V}; V_{CC} = 3.0 \text{ V}$	-	75	125	μА
I _{O(pu/pd)}	power-up/power-down output current	$V_{CC} \le \underline{1.2} \text{ V; } V_O = 0.5 \text{ V to } V_{CC}; V_I = \text{GND or } V_{CC}; n\overline{\text{OE}} = \text{don't care}$	[4] -	40	±100	μΑ
I _{CC}	supply current	V_{CC} = 3.6 V; V_{I} = GND or V_{CC} ; I_{O} = 0 A				
		outputs HIGH	-	0.0	7 0.12	mA
		outputs LOW	-	4.7	6.0	mA
		outputs disabled	[5] _	0.0	7 0.12	mΑ
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
Cı	input capacitance	pins nDIR and n \overline{OE} , $V_O = 0 \text{ V or } 3.0 \text{ V}$	-	3	-	pF

Table 6. Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$C_{\text{io}(\text{off})}$	off-state input/output capacitance	pins nAn and nBn, outputs disabled; $V_O = GND$ or V_{CC}	-	9	-	pF

- [1] Typical values are measured at V_{CC} = 3.3 V and at T_{amb} = 25 °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.
- [4] 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

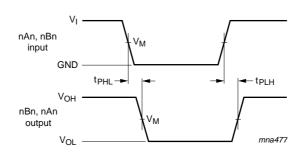
Table 7. Dynamic characteristics

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
$T_{amb} = -4$	0 °C to +85 °C					
t _{PLH}	LOW to HIGH propagation delay	nAn to nBn or nBn to nAn; see <u>Figure 6</u>				
		$V_{CC} = 2.7 \text{ V}$	-	-	3.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	1.9	3.3	ns
t _{PHL}	HIGH to LOW propagation delay	nAn to nBn or nBn to nAn; see Figure 6				
		$V_{CC} = 2.7 \text{ V}$	-	-	3.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	1.7	3.3	ns
t _{PZH}	OFF-state to HIGH propagation delay	nOE to nAn or nBn; see Figure 7				
		$V_{CC} = 2.7 \text{ V}$	-	-	5.3	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	2.8	4.5	ns
t _{PZL}	OFF-state to LOW	nOE to nAn or nBn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	5.1	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	2.8	4.1	ns
t _{PHZ}	HIGH to OFF-state	nOE to nAn or nBn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	5.7	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.5	3.2	5.1	ns
t _{PLZ}	LOW to OFF-state	nOE to nAn or nBn; see Figure 7				
	propagation delay	$V_{CC} = 2.7 \text{ V}$	-	-	4.6	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.5	3.0	4.6	ns

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

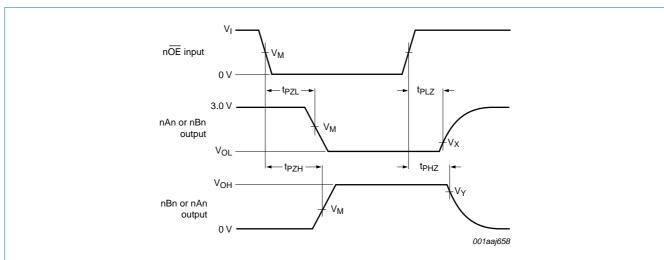
11. Waveforms



Measurements points are given in Table 8.

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

Fig 6. Propagation delay input (nAn, nBn) to output (nBn, nAn)



Measurements points are given in Table 8.

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

Fig 7. 3-state output enable and disable times

Table 8. Measurement points

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

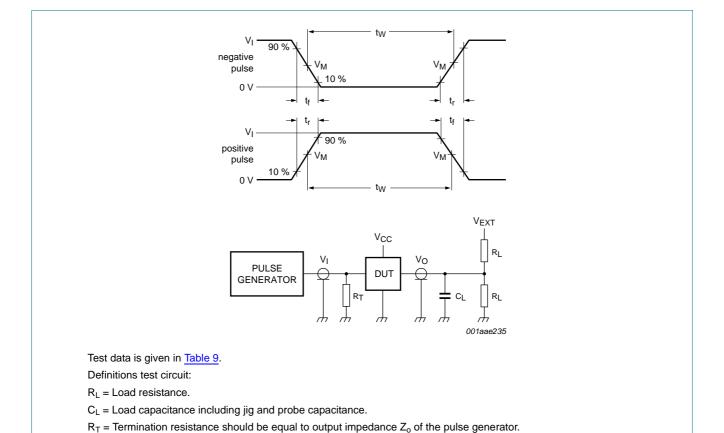


Fig 8. Test circuit for measuring switching times

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

Table 9. Test data

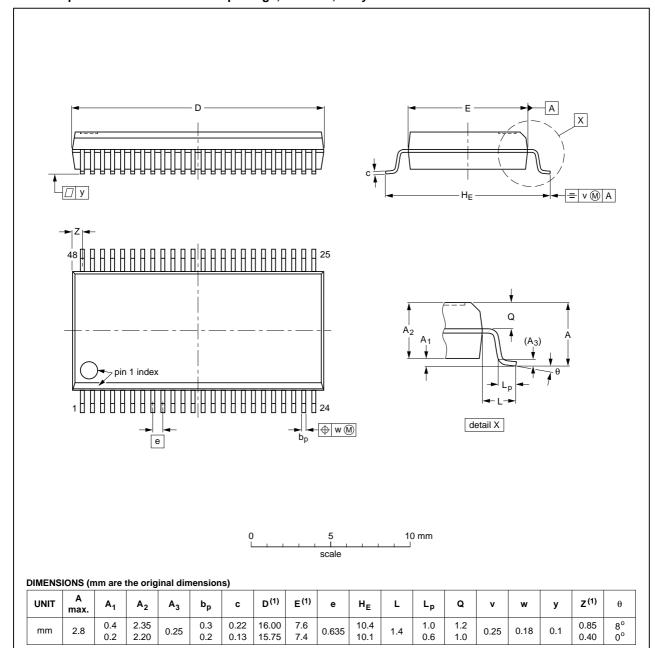
Input				Load		V _{EXT}			
V_{I}	f _i t _W t		t _r , t _f	CL	R_L	t _{PHZ} , t _{PZH} t _{PLZ} , t _{PZL}		t _{PLH} , t _{PHL}	
2.7 V	≤ 10 MHz	500 ns	≤ 2.5 ns	50 pF	500 Ω	GND	6 V	open	

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12. Package outline

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

SOT370-1



Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE				
	VERSION	IEC	JEDEC	JEITA		PROJECTION	1990E DATE	
	SOT370-1		MO-118				99-12-27 03-02-19	

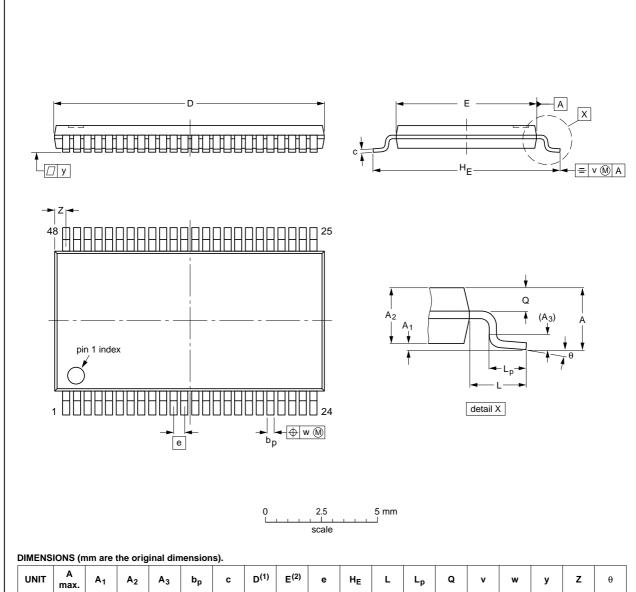
Fig 9. Package outline SOT370-1 (SSOP48)

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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		REFERENCES				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)

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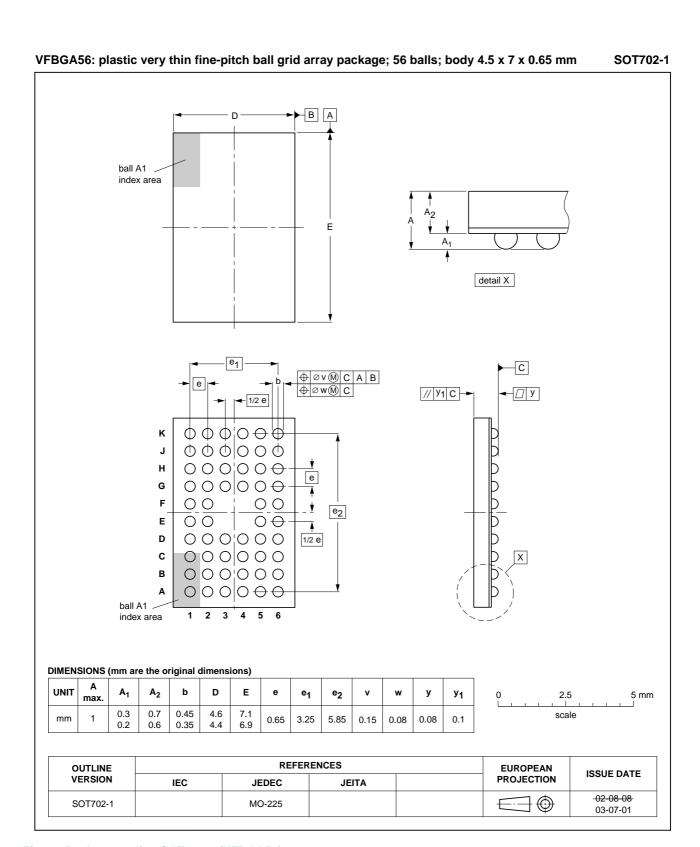


Fig 11. Package outline SOT702-1 (VFBGA56)

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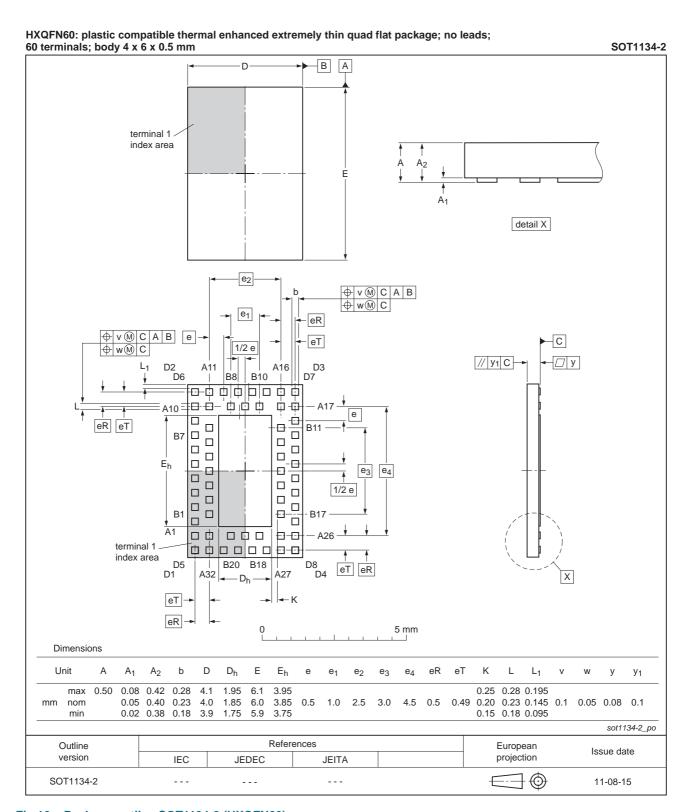


Fig 12. Package outline SOT1134-2 (HXQFN60)

74LVT_LVTH16245B

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13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

December 1D	Dalasas data	Data about status	01	0
Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH16245B v.10	20120301	Product data sheet	-	74LVT_LVTH16245B v.9
Modifications:	 For type nun SOT1134-2. 	nber 74LVT16245BBX and 74	LVTH16245BBX the	sot code has changed to
74LVT_LVTH16245B v.9	20111122	Product data sheet	-	74LVT_LVTH16245B v.8
Modifications:	 Legal pages 	updated.		
74LVT_LVTH16245B v.8	20110617	Product data sheet	-	74LVT_LVTH16245B v.7
74LVT_LVTH16245B v.7	20100329	Product data sheet	-	74LVT_LVTH16245B v.6
74LVT_LVTH16245B v.6	20090409	Product data sheet	-	74LVT_LVTH16245B v.5
74LVT_LVTH16245B v.5	20090312	Product data sheet	-	74LVT_LVTH16245B v.4
74LVT_LVTH16245B v.4	20060323	Product data sheet	-	74LVT16245B v.3
74LVT16245B v.3	20021031	Product data sheet	-	74LVT16245B v.2
74LVT16245B v.2	19980219	Product specification	-	74LVT16245B v.1
74LVT16245B v.1	19940523	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"
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3.3 V 16-bit transceiver; 3-state

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