

# 74LVTN16244B

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

Rev. 6 — 4 October 2018

Product data sheet

## 1. General description

The 74LVTN16244B 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.

## 2. Features and benefits

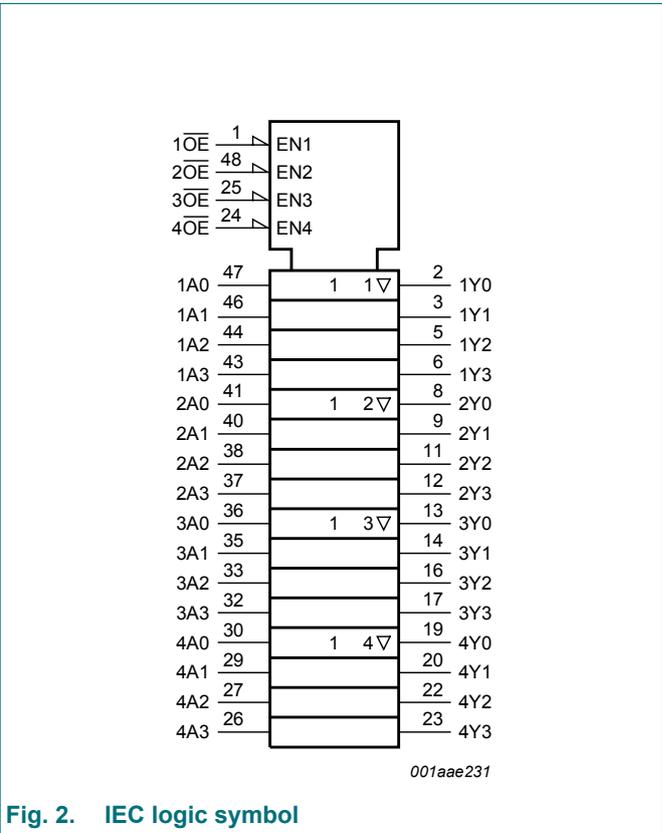
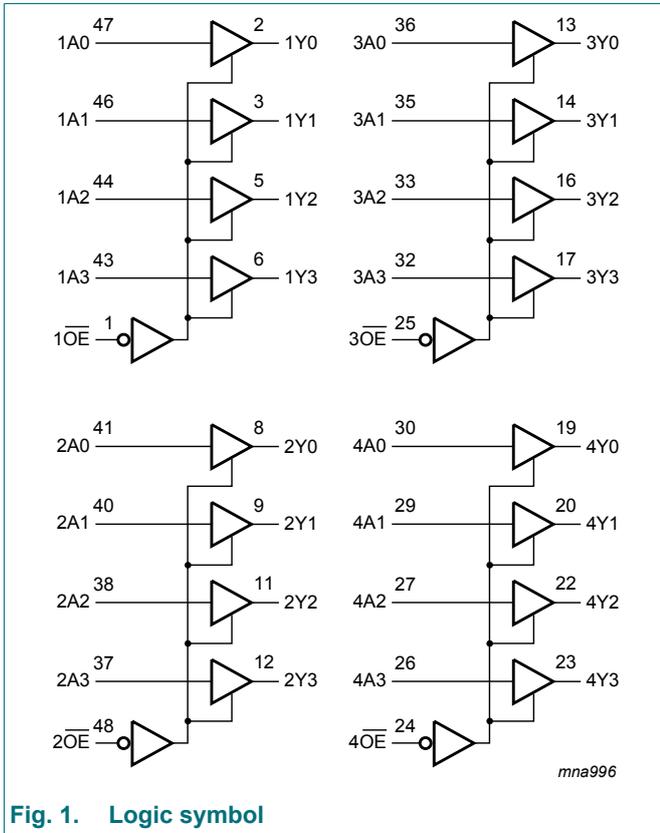
- 16-bit bus interface
- 3-state buffers
- Output capability: +64 mA and -32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Power-up 3-state
- Live insertion and extraction permitted
- No bus current loading when output is tied to 5 V bus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

## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVTN16244BDGG	-40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1

### 4. Functional diagram



## 5. Pinning information

### 5.1. Pinning

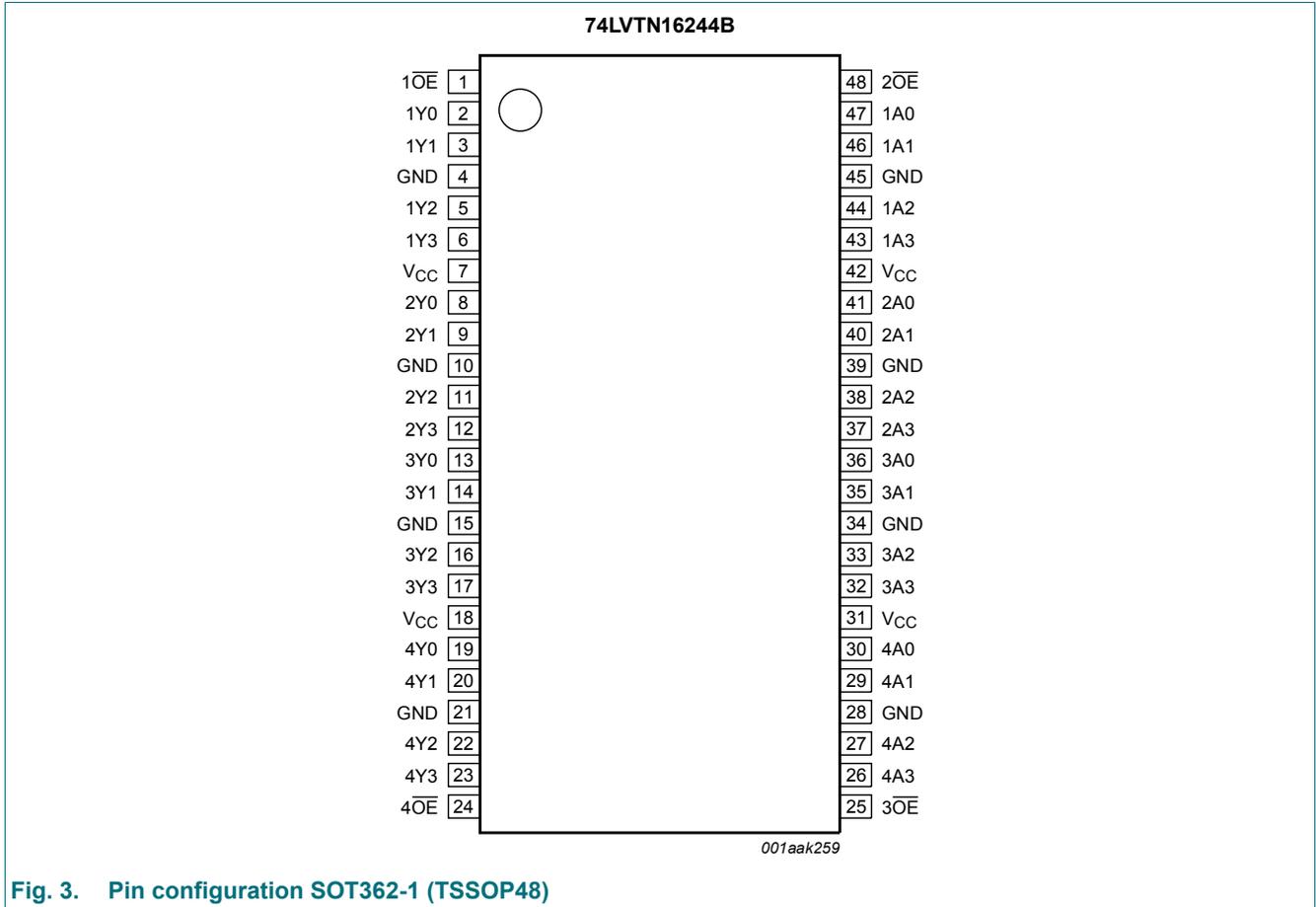


Fig. 3. Pin configuration SOT362-1 (TSSOP48)

### 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{1OE}$ , $\overline{2OE}$ , $\overline{3OE}$ , $\overline{4OE}$	1, 48, 25, 24	output enable input (active LOW)
1Y0, 1Y1, 1Y2, 1Y3	2, 3, 5, 6	data output
2Y0, 2Y1, 2Y2, 2Y3	8, 9, 11, 12	data output
3Y0, 3Y1, 3Y2, 3Y3	13, 14, 16, 17	data output
4Y0, 4Y1, 4Y2, 4Y3	19, 20, 22, 23	data output
GND	4, 10, 15, 21, 28, 34, 39, 45	ground (0 V)
V <sub>CC</sub>	7, 18, 31, 42	supply voltage
1A0, 1A1, 1A2, 1A3	47, 46, 44, 43	data input
2A0, 2A1, 2A2, 2A3	41, 40, 38, 37	data input
3A0, 3A1, 3A2, 3A3	36, 35, 33, 32	data input
4A0, 4A1, 4A2, 4A3	30, 29, 27, 26	data input

## 6. Functional description

**Table 3. Function table**

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

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

## 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 <sub>CC</sub>	supply voltage		-0.5	+4.6	V
V <sub>I</sub>	input voltage		[1] -0.5	+7.0	V
V <sub>O</sub>	output voltage	output in OFF-state or HIGH-state	[1] -0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA
I <sub>O</sub>	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-64	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
T <sub>j</sub>	junction temperature		[2] -	150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +85 °C;	[3] -	500	mW

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

[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<sub>tot</sub> derates linearly with 5.5 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		2.7	-	3.6	V
V <sub>I</sub>	input voltage		0	-	5.5	V
V <sub>IH</sub>	HIGH-level input voltage		2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage		-	-	0.8	V
I <sub>OH</sub>	HIGH-level output current		-32	-	-	mA
I <sub>OL</sub>	LOW-level output current	none	-	-	32	mA
		current duty cycle ≤ 50 %; f <sub>i</sub> ≥ 1 kHz	-	-	64	mA
T <sub>amb</sub>	ambient temperature	in free-air	-40	-	+85	°C
Δt/ΔV	input transition rise and fall rate	outputs enabled	-	-	10	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
$V_{IK}$	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	$I_{OH} = -100\text{ }\mu\text{A}$ ; $V_{CC} = 2.7\text{ V}$ to $3.6\text{ V}$	$V_{CC} - 0.2$	$V_{CC}$	-	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	$V_{CC} = 2.7\text{ V}$				
		$I_{OL} = 100\text{ }\mu\text{A}$	-	0.07	0.2	V
		$I_{OL} = 24\text{ mA}$	-	0.3	0.5	V
		$V_{CC} = 3.0\text{ V}$				
		$I_{OL} = 16\text{ mA}$	-	0.25	0.4	V
		$I_{OL} = 32\text{ mA}$	-	0.3	0.5	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	$\mu\text{A}$
		control pins; $V_{CC} = 3.6\text{ V}$ ; $V_I = V_{CC}$ or GND	-	0.1	$\pm 1.0$	$\mu\text{A}$
		data pins; unused pins at $V_{CC}$ or GND				
		$V_I = V_{CC}$ ; $V_{CC} = 3.6\text{ V}$	-	0.1	1	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0\text{ V}$ ; $V_I$ or $V_O = 0\text{ V}$ to $4.5\text{ V}$	-	0.1	$\pm 100$	$\mu\text{A}$
		$V_I = 0\text{ V}$ ; $V_{CC} = 3.6\text{ V}$	-5	-0.1	-	$\mu\text{A}$
$I_{LO}$	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	$\mu\text{A}$
$I_{O(pu/pd)}$	power-up/ power-down output current	$V_{CC} \leq 1.2\text{ V}$ ; $V_O = 0.5\text{ V}$ to $V_{CC}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; $n\overline{OE} = \text{don't care}$	-	1	$\pm 100$	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_{CC} = 3.6\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$				
		output HIGH: $V_O = 3.0\text{ V}$	-	0.5	5	$\mu\text{A}$
		output LOW: $V_O = 0.5\text{ V}$	-5	+0.5	-	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 3.6\text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\text{ A}$				
		output HIGH	-	0.07	0.12	mA
		output LOW	-	4.0	6.0	mA
		outputs disabled	-	0.07	0.12	mA
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$ ; one input at $V_{CC} - 0.6\text{ V}$ , other inputs at $V_{CC}$ or GND	-	0.1	0.2	mA
$C_I$	input capacitance	$V_I = 0\text{ V}$ or $3.0\text{ V}$	-	3	-	pF
$C_O$	output capacitance	outputs disabled; $V_O = 0\text{ V}$ or $3.0\text{ V}$	-	9	-	pF

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

[2] This parameter is valid for any  $V_{CC}$  between  $0\text{ V}$  and  $1.2\text{ V}$  with a transition time of up to  $10\text{ ms}$ .  
From  $V_{CC} = 1.2\text{ V}$  to  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  a transition time of  $100\text{ }\mu\text{s}$  is permitted. This parameter is valid for  $T_{amb} = 25\text{ }^{\circ}\text{C}$  only.

[3]  $I_{CC}$  is measured with outputs pulled to  $V_{CC}$  or GND.

[4] This is the increase in supply current for each input at the specified voltage level other than  $V_{CC}$  or GND.

## 10. Dynamic characteristics

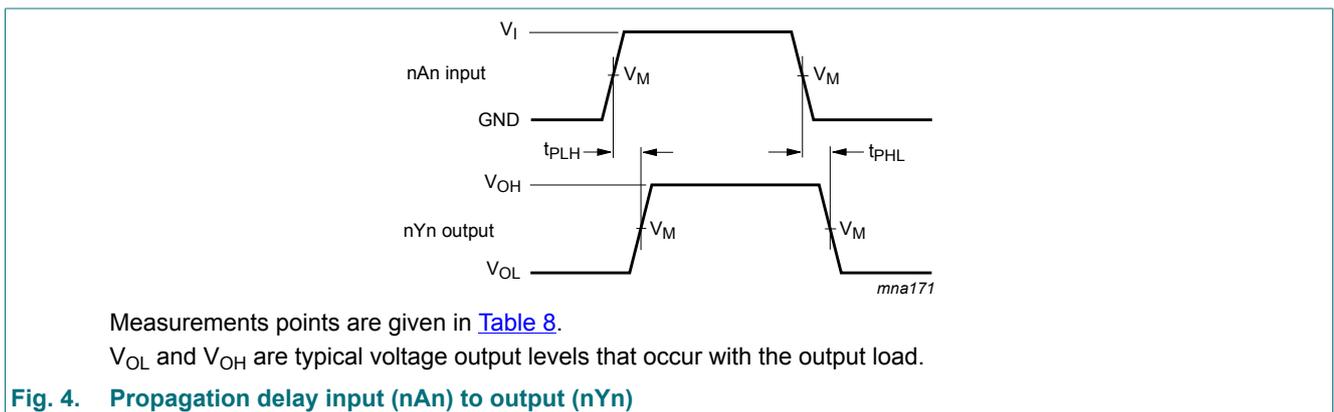
**Table 7. Dynamic characteristics**

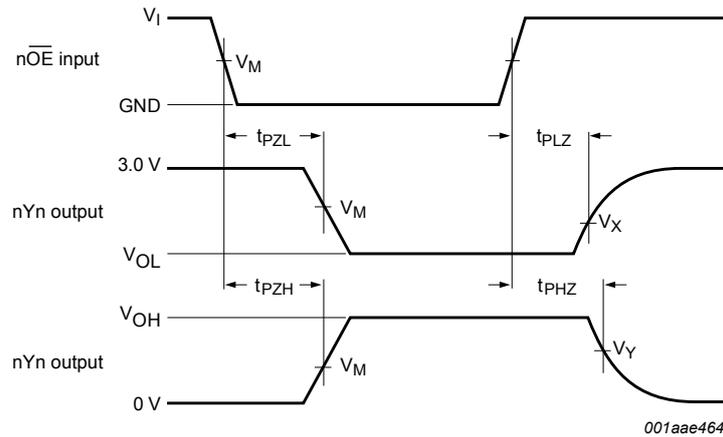
Voltages are referenced to GND (ground = 0 V);  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ ; for test circuit see Fig. 6.

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
$t_{PLH}$	LOW to HIGH propagation delay	nAn to nYn; see Fig. 4				
		$V_{CC} = 2.7\text{ V}$	-	-	4.0	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.5	1.8	3.2	ns
$t_{PHL}$	HIGH to LOW propagation delay	nAn to nYn; see Fig. 4				
		$V_{CC} = 2.7\text{ V}$	-	-	4.0	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.5	1.7	3.2	ns
$t_{PZH}$	OFF-state to HIGH propagation delay	$n\overline{OE}$ to nYn; see Fig. 5				
		$V_{CC} = 2.7\text{ V}$	-	-	5.0	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	2.3	4.0	ns
$t_{PZL}$	OFF-state to LOW propagation delay	$n\overline{OE}$ to nYn; see Fig. 5				
		$V_{CC} = 2.7\text{ V}$	-	-	5.3	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	2.1	4.0	ns
$t_{PHZ}$	HIGH to OFF-state propagation delay	$n\overline{OE}$ to nYn; see Fig. 5				
		$V_{CC} = 2.7\text{ V}$	-	-	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 propagation delay	$n\overline{OE}$ to nYn; see Fig. 5				
		$V_{CC} = 2.7\text{ V}$	-	-	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  $V_{CC} = 3.3\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

### 10.1. Waveforms and test circuit





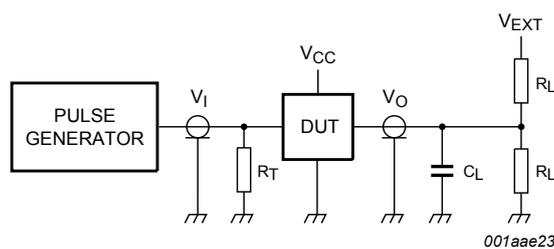
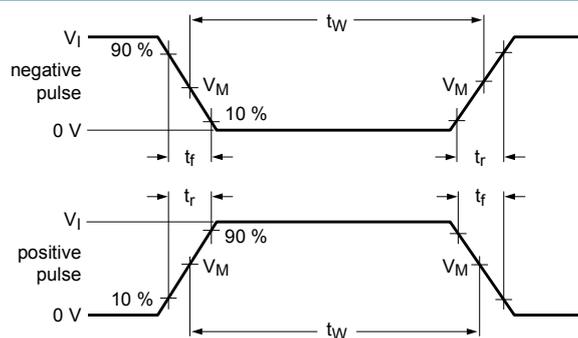
Measurements points are given in [Table 8](#).

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

**Fig. 5. 3-state output enable and disable times**

**Table 8. Measurement points**

Input	Output		
$V_M$	$V_M$	$V_X$	$V_Y$
1.5 V	1.5 V	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$



Test data is given in [Table 9](#).

Definitions test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

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

**Fig. 6. Test circuit for measuring switching times**

**Table 9. Test data**

Input				Load		$V_{EXT}$		
$V_I$	$f_i$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHZ}, t_{PZH}$	$t_{PLZ}, t_{PZL}$	$t_{PLH}, t_{PHL}$
2.7 V	$\leq 10 \text{ MHz}$	500 ns	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	GND	6 V	open

11. Package outline

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

SOT362-1

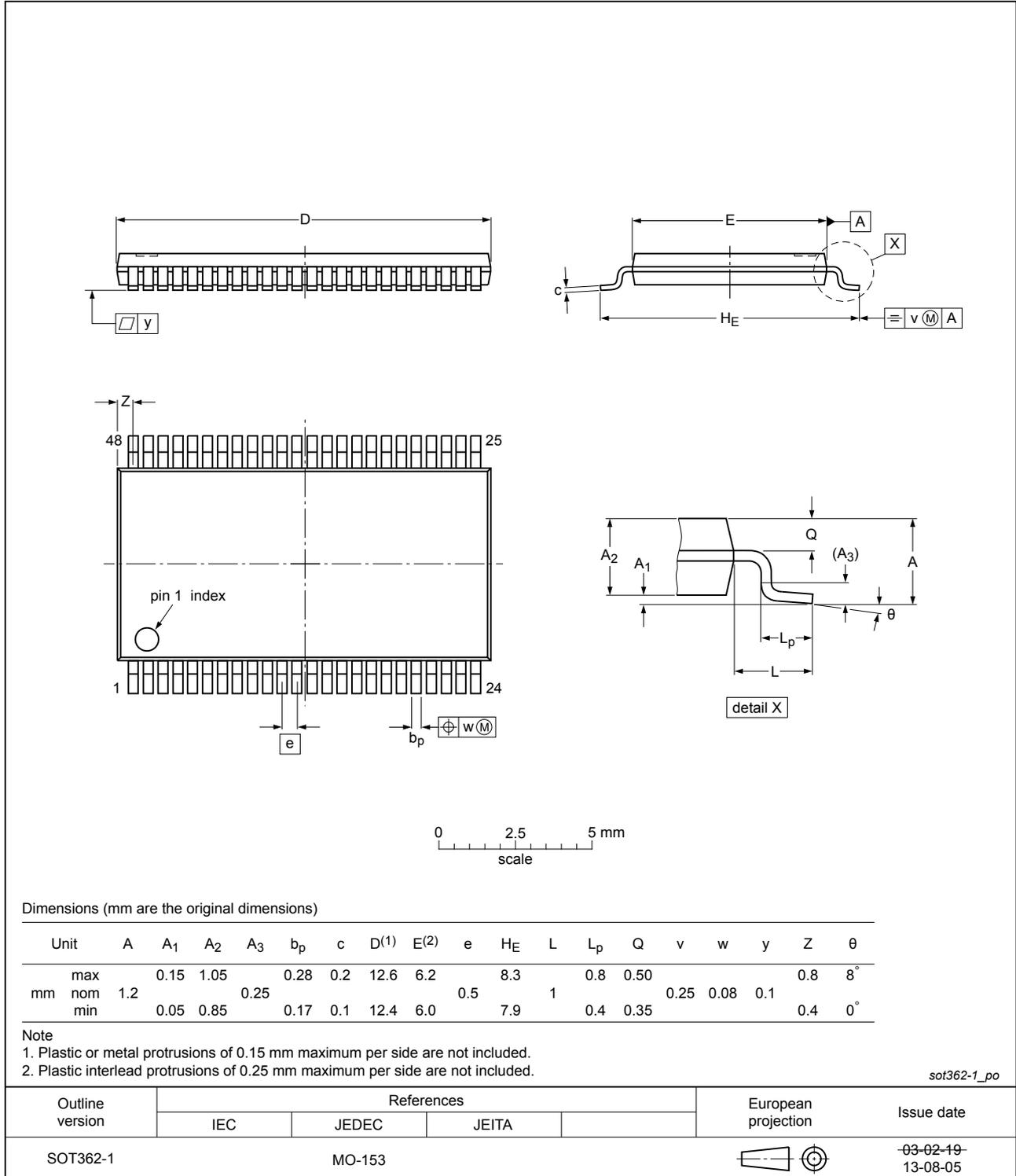


Fig. 7. Package outline SOT362-1 (TSSOP48)

## 12. 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

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVTN16244B v.6	20181004	Product data sheet	-	74LVTN16244B v.5
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type numbers 74LVTN16244BBX (SOT1134-2) removed.</li> <li>Package outline drawing <a href="#">SOT362-1</a> updated</li> </ul>			
74LVTN16244B v.5	20120402	Product data sheet	-	74LVTN16244B v.4
Modifications:	<ul style="list-style-type: none"> <li>For type number 74LVTN16244BBX the sot code has changed to SOT1134-2.</li> </ul>			
74LVTN16244B v.4	20111122	Product data sheet	-	74LVTN16244B v.3
Modifications:	<ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>			
74LVTN16244B v.3	20110614	Product data sheet	-	74LVTN16244B v.2
74LVTN16244B v.2	20100323	Product data sheet	-	74LVTN16244B v.1
74LVTN16244B v.1	20090713	Product data sheet	-	-

## 14. Legal information

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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.
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