

# 74LVT244B; 74LVTH244B

3.3 V octal buffer/line driver; 3-state

Rev. 03 — 3 March 2006

Product data sheet

## 1. General description

The 74LVT244B; 74LVTH244B is a high-performance BiCMOS product designed for  $V_{CC}$  operation at 3.3 V.

This device is an octal buffer that is ideal for driving bus lines. The device features two output enable inputs ( $\overline{1OE}$  and  $\overline{2OE}$ ), each controlling four of the 3-state outputs.

## 2. Features

- Octal bus interface
- 3-state buffers
- Speed upgrade of 74LVT244A
- 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:
  - ◆ JESD78: exceeds 500 mA
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-C exceeds 2000 V
  - ◆ MM EIA/JESD22-A115-A 200 V

## 3. Quick reference data

**Table 1. Quick reference data**

$GND = 0 V$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PLH}$	LOW-to-HIGH propagation delay $nAn$ to $nYn$	$C_L = 50\text{ pF}$ ; $V_{CC} = 3.3\text{ V}$	-	1.9	-	ns
$t_{PHL}$	HIGH-to-LOW propagation delay $nAn$ to $nYn$	$C_L = 50\text{ pF}$ ; $V_{CC} = 3.3\text{ V}$	-	2.0	-	ns

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Table 1. Quick reference data ...continued

 $GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

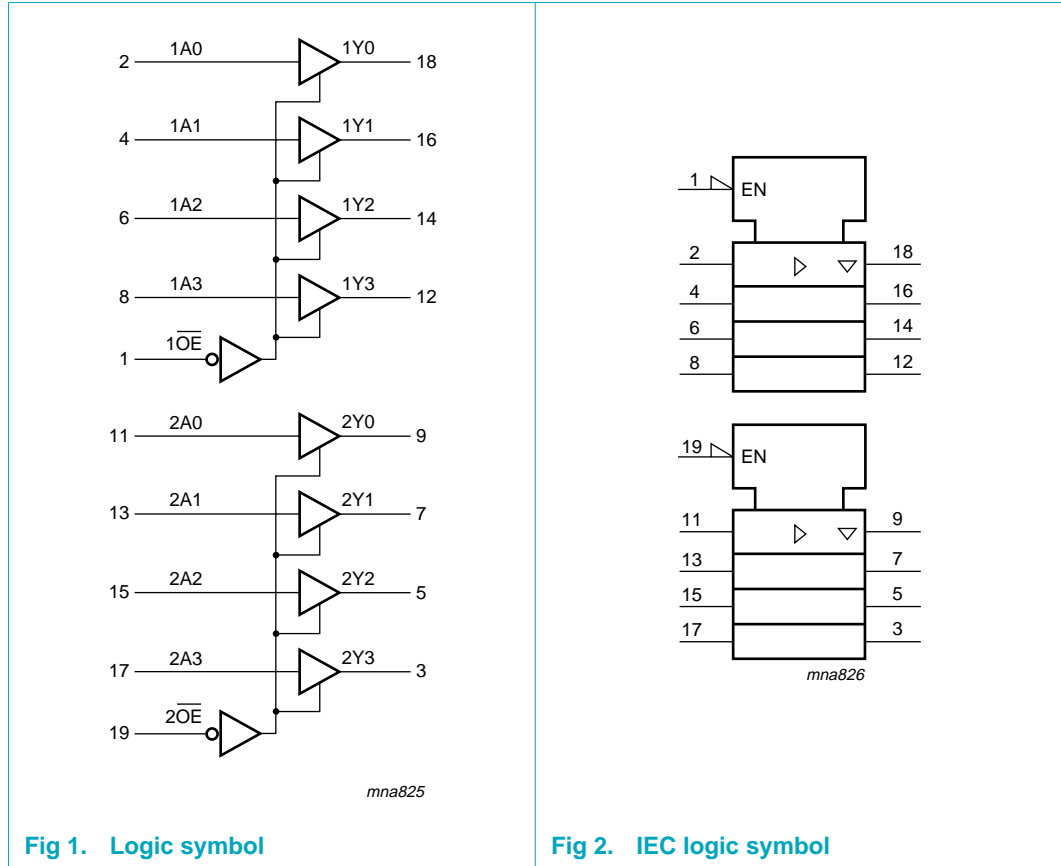
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_i$	input capacitance	$V_I = 0\text{ V}$ or $3.0\text{ V}$	-	4	-	pF
$C_o$	output capacitance	outputs disabled; $V_O = 0\text{ V}$ or $3.0\text{ V}$	-	8	-	pF
$I_{CC}$	quiescent supply current	outputs disabled; $V_{CC} = 3.6\text{ V}$ ; $I_O = 0\text{ A}$ ; $V_I = GND$ or $V_{CC}$	-	0.13	-	mA

## 4. Ordering information

Table 2. Ordering information

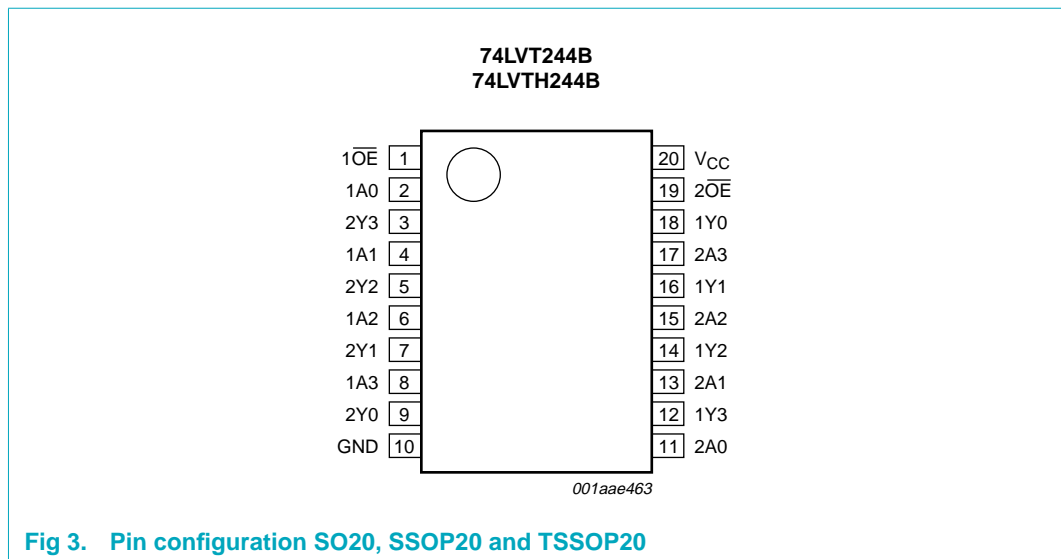
Type number	Package			Version
	Temperature range	Name	Description	
74LVT244BD	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LVT244BDB	-40 °C to +85 °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74LVT244BPW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74LVTH244BD	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LVTH244BDB	-40 °C to +85 °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74LVTH244BPW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

5. Functional diagram



6. Pinning information

6.1 Pinning



## 6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
$1\overline{OE}$	1	1 output enable input
1A0	2	1 data input 0
2Y3	3	2 data output 3
1A1	4	1 data input 1
2Y2	5	2 data output 2
1A2	6	1 data input 2
2Y1	7	2 data output 1
1A3	8	1 data input 3
2Y0	9	2 data output 0
GND	10	ground (0 V)
2A0	11	2 data input 0
1Y3	12	1 data output 3
2A1	13	2 data input 1
1Y2	14	1 data output 2
2A2	15	2 data input 2
1Y1	16	1 data output 1
2A3	17	2 data input 3
1Y0	18	1 data output 0
$2\overline{OE}$	19	2 output enable input
V <sub>CC</sub>	20	supply voltage

## 7. Functional description

### 7.1 Function table

Table 4. Function table [\[1\]](#)

Control	Input	Output
$n\overline{OE}$	nAn	nYn
L	L	L
	H	H
H	X	Z

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

## 8. Limiting values

**Table 5. 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		[1] -0.5	+7.0	V
$V_O$	output voltage	output in OFF-state or HIGH-state	[1] -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
$I_O$	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-	-64	mA
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		[2] -	150	°C

[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.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		2.7	-	3.6	V
$V_I$	input voltage		0	-	5.5	V
$V_{IH}$	HIGH-state input voltage		2.0	-	-	V
$V_{IL}$	LOW-state input voltage		-	-	0.8	V
$I_{OH}$	HIGH-state output current		-	-	-32	mA
$I_{OL}$	LOW-state 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

## 10. Static characteristics

**Table 7. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math> [1]</b>							
$V_{IK}$	input clamping voltage	$V_{CC} = 2.7\text{ V}; I_{IK} = -18\text{ mA}$	-	-0.9	-1.2	V	
$V_{OH}$	HIGH-state output voltage	$V_{CC} = 2.7\text{ V}$					
		$I_{OH} = -100\text{ }\mu\text{A}$	$V_{CC} - 2.0$	$V_{CC} - 2.1$	-	V	
		$I_{OH} = -8\text{ mA}$	2.4	2.5	-	V	
		$V_{CC} = 3.0\text{ V}$					
$V_{OL}$	LOW-state output voltage	$V_{CC} = 2.7\text{ V}$					
		$I_{OL} = 100\text{ }\mu\text{A}$	-	0.1	0.2	V	
		$I_{OL} = 24\text{ mA}$	-	0.3	0.5	V	
		$V_{CC} = 3.0\text{ V}$					
$V_{OL}$	LOW-state output voltage	$V_{CC} = 3.0\text{ V}$					
		$I_{OL} = 16\text{ mA}$	-	0.25	0.4	V	
		$I_{OL} = 32\text{ mA}$	-	0.3	0.5	V	
		$I_{OL} = 64\text{ mA}$	-	0.4	0.55	V	
$I_{LI}$	input leakage current	all 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	$V_{CC} = 3.6\text{ V}; V_I = V_{CC}\text{ or GND}$	-	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
		I/O data pins	$V_{CC} = 3.6\text{ V}$	[2]			
			$V_I = V_{CC}$	-	0.1	1	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0\text{ V}; V_I\text{ or }V_O = 0\text{ V to }4.5\text{ V}$	-	1	$\pm 100$	$\mu\text{A}$	
		$V_I = 0\text{ V}$	-	-1	-5	$\mu\text{A}$	
$I_{HOLD}$	bus hold current data input	$V_{CC} = 3\text{ V}$	[3]				
		$V_I = 0.8\text{ V}$	75	130	-	$\mu\text{A}$	
		$V_I = 2.0\text{ V}$	-75	-140	-	$\mu\text{A}$	
		$V_{CC} = 0\text{ V to }3.6\text{ V}$					
$I_{EX}$	external current into output	$V_I = 3.6\text{ V}$	$\pm 500$	-	-	$\mu\text{A}$	
		output in HIGH-state when $V_O > V_{CC}; V_O = 5.5\text{ V}; V_{CC} = 3.3\text{ V}$	-	60	125	$\mu\text{A}$	
$I_{O(pu/pd)}$	power-up/power-down output current	$V_{CC} \leq 1.2\text{ V}; V_O = 0.5\text{ V to }V_{CC}; V_I = \text{GND or }V_{CC}; \overline{nOE} = \text{don't care}$	[4]	$\pm 1$	$\pm 100$	$\mu\text{A}$	
$I_{OZ}$	OFF-state output current	$V_{CC} = 3.6\text{ V}; V_I = V_{IH}\text{ or }V_{IL}$					
		output HIGH: $V_O = 3.0\text{ V}$	-	1	5	$\mu\text{A}$	
		output LOW: $V_O = 0.5\text{ V}$	-	-1	-5	$\mu\text{A}$	
$I_{CC}$	quiescent supply current	$V_{CC} = 3.6\text{ V}; V_I = \text{GND or }V_{CC}; I_O = 0\text{ A}$					
		output HIGH	-	0.13	0.19	mA	
		output LOW	-	2	5	mA	
		outputs disabled	[5]	-	0.13	0.19	mA

**Table 7.** Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\Delta I_{CC}$	additional quiescent supply current	per input pin; $V_{CC} = 3.0$ V to 3.6 V; one input at $V_{CC} - 0.6$ V and other inputs at $V_{CC}$ or GND	[6] -	0.1	0.2	mA
$C_i$	input capacitance	$V_I = 0$ V or 3.0 V	-	4	-	pF
$C_o$	output capacitance	outputs disabled; $V_O = 0$ V or 3.0 V	-	8	-	pF

[1] Typical values are measured 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  $\mu$ 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  $V_{CC} - 0.6$  V.

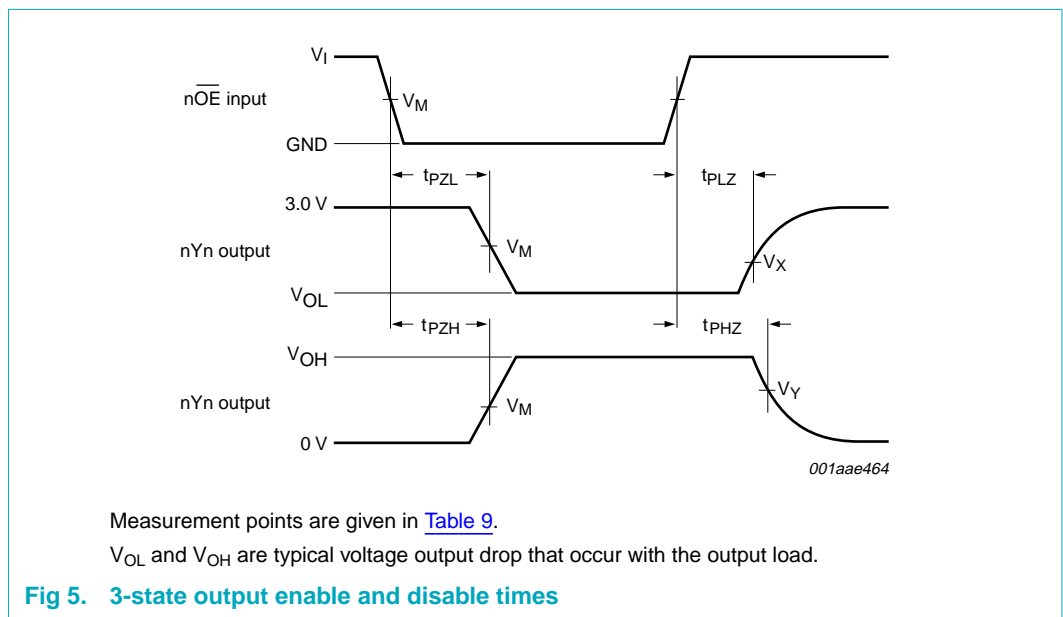
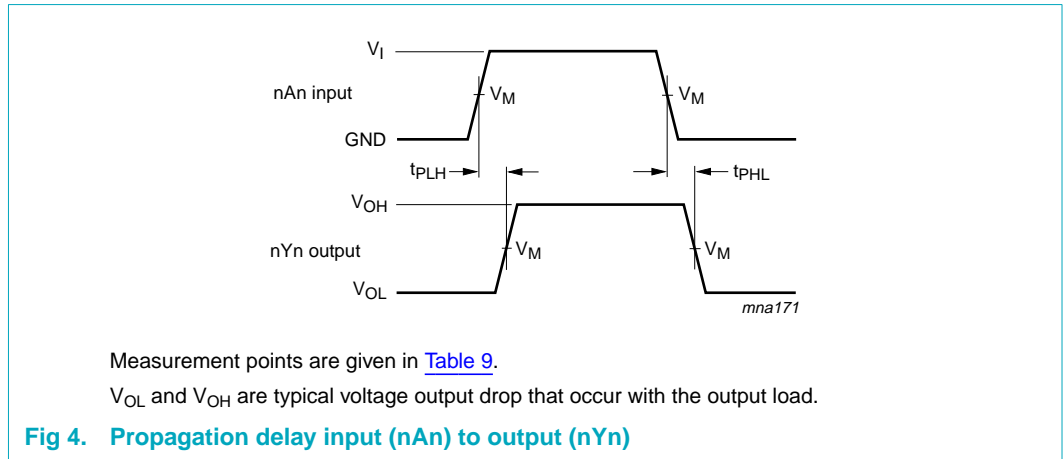
## 11. Dynamic characteristics

**Table 8.** Dynamic characteristicsVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C [1]</b>						
$t_{PLH}$	LOW-to-HIGH propagation delay nAn to nYn	see <a href="#">Figure 4</a>	-	-	3.8	ns
		$V_{CC} = 2.7$ V	-	-	3.8	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.1	1.9	3.5	ns
$t_{PHL}$	HIGH-to-LOW propagation delay nAn to nYn	see <a href="#">Figure 4</a>	-	-	3.6	ns
		$V_{CC} = 2.7$ V	-	-	3.6	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.3	2.0	3.3	ns
$t_{PZH}$	output enable time to HIGH-level $\overline{nOE}$ to nYn	see <a href="#">Figure 5</a>	-	-	5.3	ns
		$V_{CC} = 2.7$ V	-	-	5.3	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.1	2.8	4.5	ns
$t_{PZL}$	output enable time to LOW-level $\overline{nOE}$ to nYn	see <a href="#">Figure 5</a>	-	-	4.9	ns
		$V_{CC} = 2.7$ V	-	-	4.9	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.4	2.3	4.4	ns
$t_{PHZ}$	output disable time from HIGH-level $\overline{nOE}$ to nYn	see <a href="#">Figure 5</a>	-	-	4.5	ns
		$V_{CC} = 2.7$ V	-	-	4.5	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.9	2.9	4.4	ns
$t_{PLZ}$	output disable time from LOW-level $\overline{nOE}$ to nYn	see <a href="#">Figure 5</a>	-	-	4.4	ns
		$V_{CC} = 2.7$ V	-	-	4.4	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.8	2.5	4.4	ns

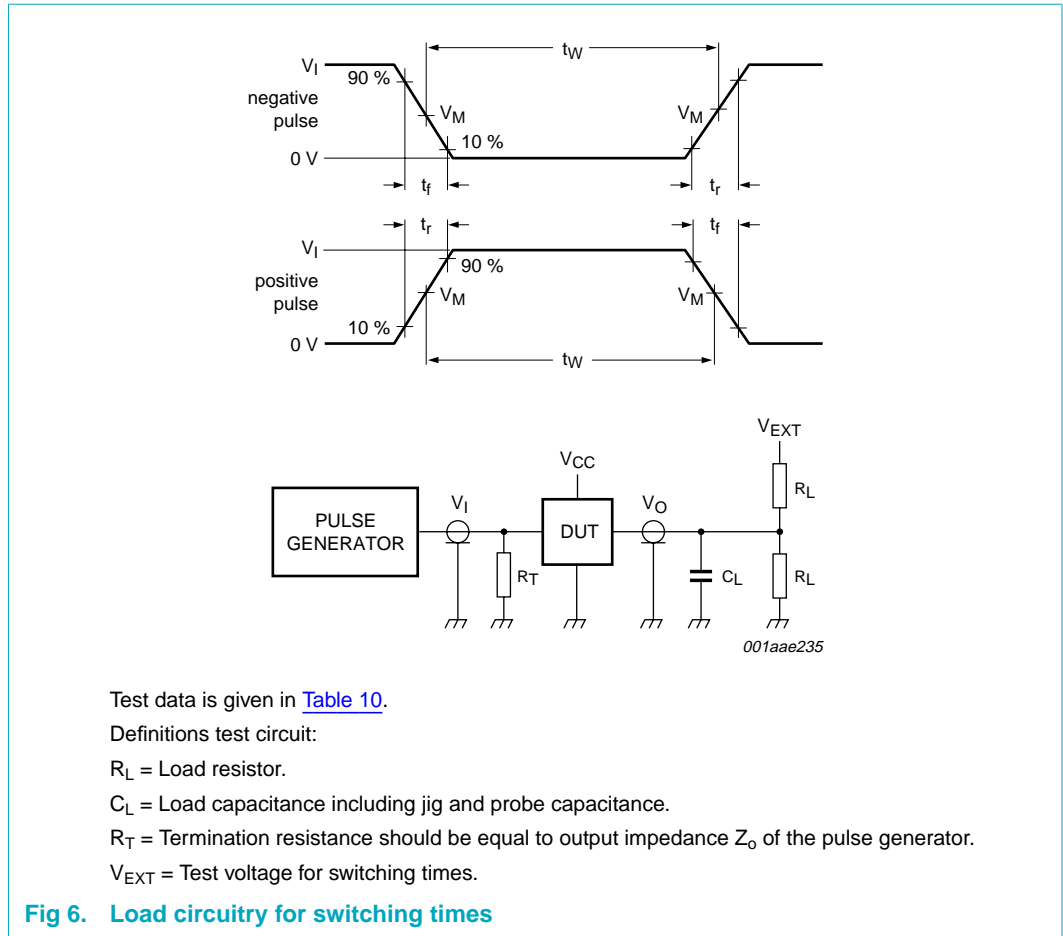
[1] Typical values are measured at  $V_{CC} = 3.3$  V and  $T_{amb} = 25$  °C.

12. Waveforms



**Table 9. Measurement points**

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



**Table 10. 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	$\leq 10$ MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	GND	6 V	open

13. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

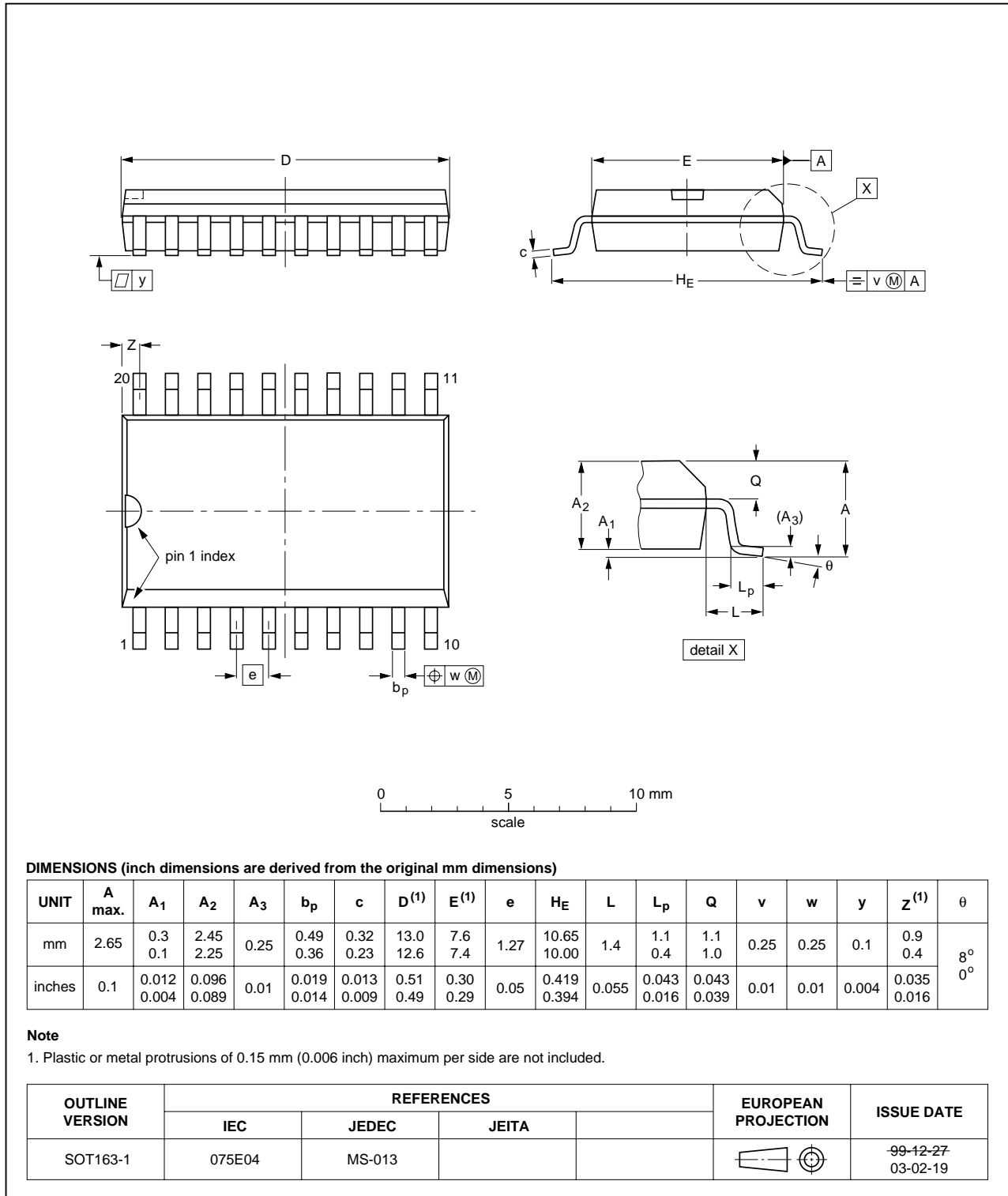


Fig 7. Package outline SOT163-1 (SO20)

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1

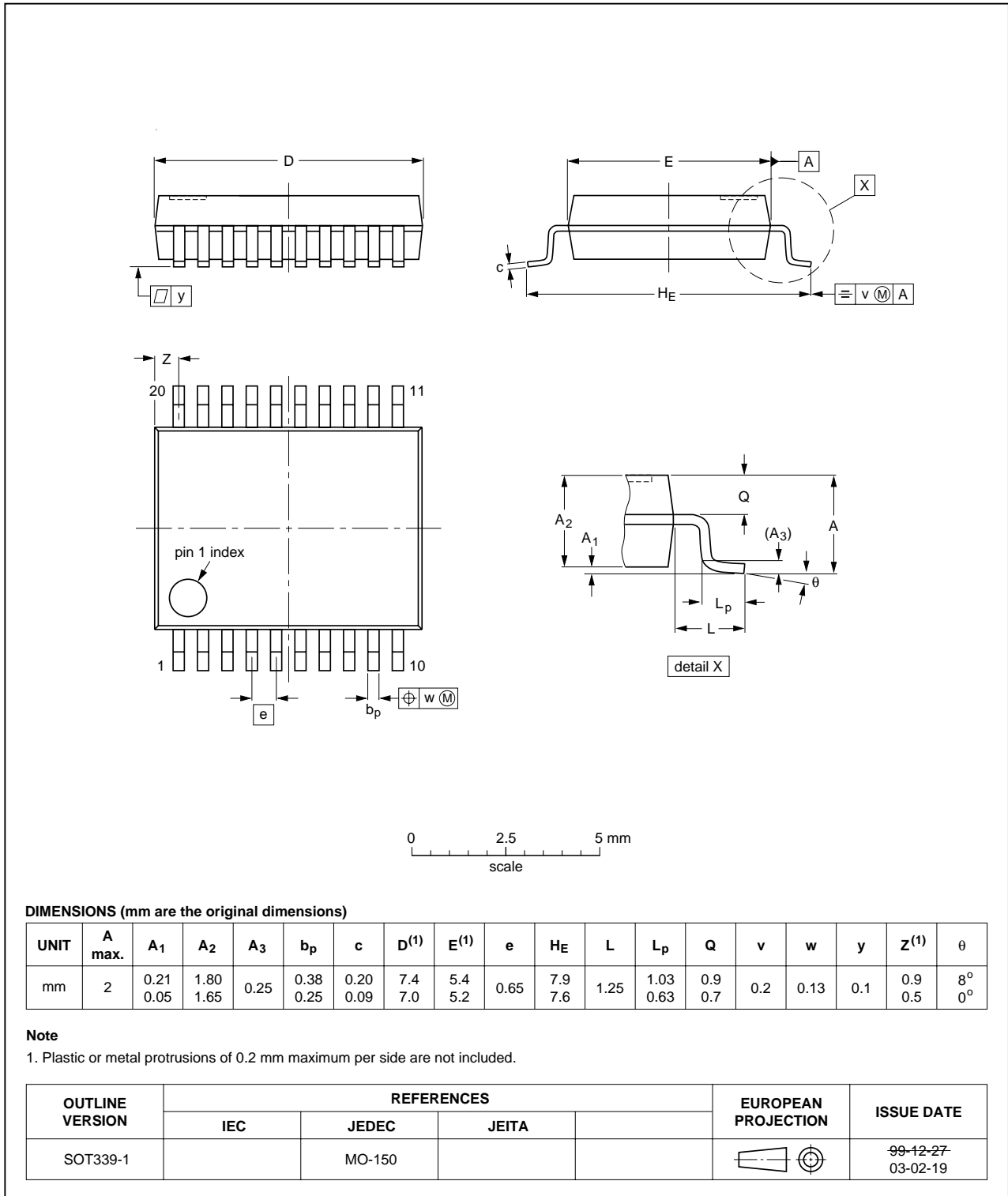


Fig 8. Package outline SOT339-1 (SSOP20)

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

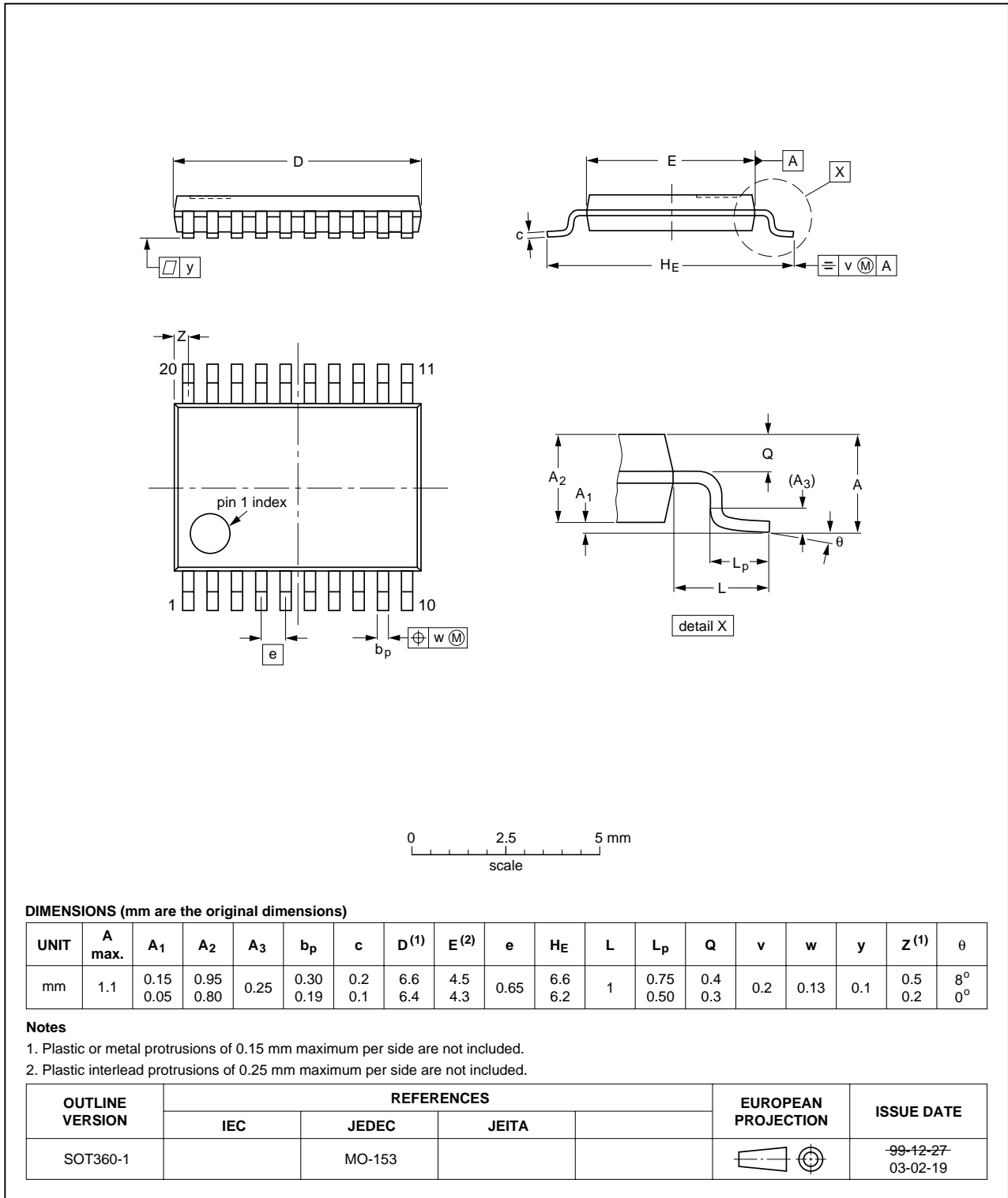


Fig 9. Package outline SOT360-1 (TSSOP20)

## 14. Abbreviations

Table 11. 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

## 15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH244B_3	20060303	Product data sheet	-	74LVT244B_2 (9397 750 11918)
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li> <li><a href="#">Section 4</a>: Added type numbers 74LVTH244BD, 74LVTH244BDB and 74LVTH244BPW.</li> </ul>			
74LVT244B_2	20030919	Product specification	-	74LVT244B_1 (9397 750 04814)
74LVT244B_1	19981101	Product specification	-	-

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### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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## 18. Contents

<b>1</b>	<b>General description</b> .....	<b>1</b>
<b>2</b>	<b>Features</b> .....	<b>1</b>
<b>3</b>	<b>Quick reference data</b> .....	<b>1</b>
<b>4</b>	<b>Ordering information</b> .....	<b>2</b>
<b>5</b>	<b>Functional diagram</b> .....	<b>3</b>
<b>6</b>	<b>Pinning information</b> .....	<b>3</b>
6.1	Pinning .....	3
6.2	Pin description .....	4
<b>7</b>	<b>Functional description</b> .....	<b>4</b>
7.1	Function table .....	4
<b>8</b>	<b>Limiting values</b> .....	<b>5</b>
<b>9</b>	<b>Recommended operating conditions</b> .....	<b>5</b>
<b>10</b>	<b>Static characteristics</b> .....	<b>6</b>
<b>11</b>	<b>Dynamic characteristics</b> .....	<b>7</b>
<b>12</b>	<b>Waveforms</b> .....	<b>8</b>
<b>13</b>	<b>Package outline</b> .....	<b>10</b>
<b>14</b>	<b>Abbreviations</b> .....	<b>13</b>
<b>15</b>	<b>Revision history</b> .....	<b>13</b>
<b>16</b>	<b>Legal information</b> .....	<b>14</b>
16.1	Data sheet status .....	14
16.2	Definitions .....	14
16.3	Disclaimers .....	14
16.4	Trademarks .....	14
<b>17</b>	<b>Contact information</b> .....	<b>14</b>
<b>18</b>	<b>Contents</b> .....	<b>15</b>



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