74LVT244A; 74LVTH244A 3.3 V octal buffer/line driver; 3-state Rev. 5 — 16 August 2017 P

Product data sheet

1 **General description**

The 74LVT244A; 74LVTH244A 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 enables $(1\overline{OE}, 2\overline{OE})$, each controlling four of the 3-state outputs.

Features and benefits

- Octal 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
 - JESD78 Class II exceeds 500 mA
- ESD protection:
 - HBM JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V

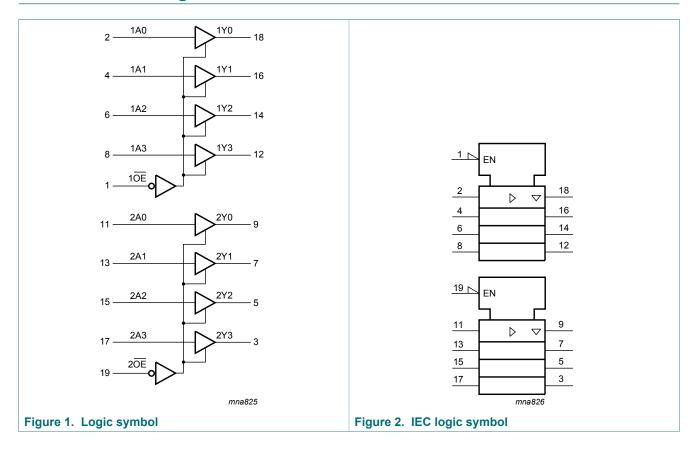
Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVT244AD	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads;	SOT163-1
74LVTH244AD			body width 7.5 mm	
74LVT244ADB	-40 °C to +85 °C	SSOP20	plastic shrink small outline package; 20 leads;	SOT339-1
74LVTH244ADB			body width 5.3 mm	
74LVT244APW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads;	SOT360-1
74LVTH244APW			body width 4.4 mm	
74LVT244ABQ	-40 °C to +85 °C	DHVQFN20	plastic dual in-line compatible thermal enhanced	SOT764-1
74LVTH244ABQ			very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	

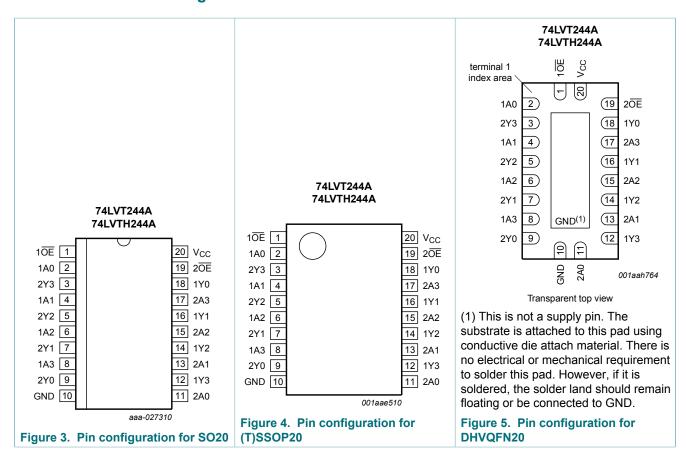


4 Functional diagram



5 Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Table 21 1 III decemption					
Symbol	Pin	Description			
1 OE , 2 OE	1, 19	output enable input (active low)			
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input			
2Y0, 2Y1, 2Y2, 2Y3	9, 7, 5, 3	data output			
GND	10	ground (0 V)			
2A0, 2A1, 2A2, 2A3	11, 13, 15, 17	data input			
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	data output			
V _{CC}	20	supply voltage			

6 Functional description

Table 3. Function table [1]

Control	Input	Output
nŌĒ	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
VI	input voltage	[1]	-0.5	+7.0	V
Vo	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
Tj	junction temperature	[2]	-	150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 \text{ to } +85 ^{\circ}\text{C}$ [3]	-	500	mW

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

For SSOP20 and TSSOP20 packages: above 60 °C derate linearly with 5.5 mW/K.

For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

^[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] For SO20 packages: above 70 °C derate linearly with 8 mW/K.

8 Recommended operating conditions

Table 5. 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
I _{OH}	HIGH-level output current		-32	-	-	mA
I _{OL}	LOW-level output current	none	-	-	32	mA
		current duty cycle ≤ 50 %; f _i ≥ 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

9 Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
T _{amb} = -40	0 °C to +85 °C					
V _{IK}	input clamping voltage	V _{CC} = 2.7 V; I _{IK} = -18 mA	-1.2	-0.9	-	V
V _{IH}	HIGH-level input voltage		2.0	-	-	V
V _{IL}	LOW-level input voltage		-	-	8.0	V
V _{OH}	HIGH-level output	V_{CC} = 2.7 V to 3.6 V; I_{OH} = -100 μA	V _{CC} - 0.2	V _{CC} - 0.1	-	V
	voltage	V _{CC} = 2.7 V to 3.6 V; I _{OH} = -8 mA	2.4	2.5	-	V
		V _{CC} = 3.0 V; I _{OH} = -32 mA	2.0	2.2	-	V
V _{OL}	LOW-level output	V _{CC} = 2.7 V; I _{OL} = 100 μA	-	0.1	0.2	V
voltage	voltage	V _{CC} = 2.7 V; I _{OL} = 24 mA	-	0.3	0.5	V
		V _{CC} = 3.0 V; I _{OL} = 16 mA	-	0.25	0.4	V
		V _{CC} = 3.0 V; I _{OL} = 32 mA	-	0.3	0.5	V
		V _{CC} = 3.0 V; I _{OL} = 64 mA	-	0.4	0.55	V
l _l	input leakage current	all input pins				
		V _{CC} = 0 V or 3.6 V; V _I = 5.5 V	-	0.1	10	μA
		control pins				
		$V_{CC} = 3.6 \text{ V}; V_I = V_{CC} \text{ or GND}$	-	±0.1	±1	μA
		data pins [2]				
		V _{CC} = 3.6 V; V _I = V _{CC}	-	0.1	1	μA
		V _{CC} = 3.6 V; V _I = 0 V	-5	-1	-	μA
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	±100	μA
I _{BHL}	bus hold LOW current	V _{CC} = 3 V; V _I = 0.8 V	75	150	-	μA
I _{BHH}	bus hold HIGH current	V _{CC} = 3 V; V _I = 2.0 V	-	-150	-75	μA

74LVT_LVTH244A

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Symbol	Parameter	Conditions		Min	Typ ^[1]	Max	Unit
I _{BHLO}	bus hold LOW overdrive current	nAn input; $V_{CC} = 3.6 \text{ V}$; $V_I = 0 \text{ V}$ to 3.6 V	[3]	500	-	-	μΑ
I _{внно}	bus hold HIGH overdrive current	nAn input; $V_{CC} = 3.6 \text{ V}$; $V_I = 0 \text{ V}$ to 3.6 V	[3]	-	-	-500	μΑ
I _{EX}	external current	nYn output in HIGH-state when $V_O > V_{CC}$; $V_O = 5.5 \text{ V}$; $V_{CC} = 3.0 \text{ V}$		-	60	125	μΑ
I _{O(pu/pd)}	power-up/power-down output current	$V_{CC} \le 1.2 \text{ V}; V_O = 0.5 \text{ V to } V_{CC};$ $V_I = \text{GND or } V_{CC}; n\overline{OE} = \text{don't care}$	[4]	-	±1	±100	μΑ
I _{OZ}	OFF-state output current	V_{CC} = 3.6 V; V_I = V_{IH} or V_{IL}					
	V _O = 3.0 V		-	1	5	μΑ	
		V _O = 0.5 V		-5	-1	-	μΑ
I _{CC}	supply current	V_{CC} = 3.6 V; V_I = GND or V_{CC} ; I_O = 0 A					
		output HIGH		-	0.13	0.19	mA
		output LOW		-	3	12	mA
		outputs disabled	[5]	-	0.13	0.19	mA
ΔI _{CC}	additional 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
Co	output capacitance	outputs disabled; $V_O = 0 \text{ V or } 3.0 \text{ V}$		-	8	-	pF

All typical values are measured at T_{amb} = 25 °C.

Unused pins at V_{CC} or GND.

This is the bus hold overdrive current required to force the input to the opposite logic state.

^[2] [3] [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 ± 0.3 V a transition time of 100 μs is permitted. This parameter is valid for T_{amb} = 25 °C only.

 I_{CC} is measured with outputs pulled to V_{CC} or GND. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

10 Dynamic characteristics

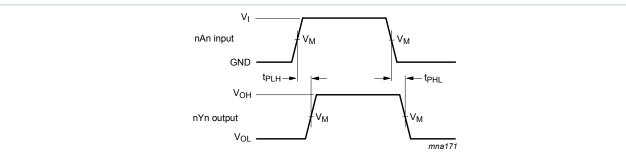
Table 7. Dynamic characteristics

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	nAn to nYn; see Figure 6				
	propagation delay	V _{CC} = 2.7 V	-	-	5.0	ns
		V _{CC} = 3.0 V to 3.6 V	1	2.5	4.1	ns
t _{PHL}	HIGH to LOW	nAn to nYn; see Figure 6				
	propagation delay	V _{CC} = 2.7 V	-	-	5.1	ns
		V _{CC} = 3.0 V to 3.6 V	1	2.6	4.1	ns
t _{PZH}	OFF-state to HIGH propagation delay	nOE to nYn; see Figure 7				
		V _{CC} = 2.7 V	-	-	6.3	ns
		V _{CC} = 3.0 V to 3.6 V	1	3.2	5.2	ns
t _{PZL}	OFF-state to LOW	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	6.7	ns
		V _{CC} = 3.0 V to 3.6 V	1.1	3.1	5.2	ns
t _{PHZ}	HIGH to OFF-state	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	6.3	ns
		V _{CC} = 3.0 V to 3.6 V	1.9	3.3	5.6	ns
t _{PLZ}	LOW to OFF-state	nOE to nYn; see Figure 7				
	propagation delay	V _{CC} = 2.7 V	-	-	5.6	ns
		V _{CC} = 3.0 V to 3.6 V	1.8	3.3	5.1	ns

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

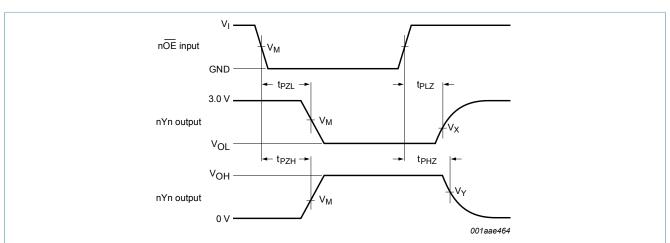
10.1 Waveforms and test circuit



Measurement points are given in Table 8.

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

Figure 6. Input (nAn) to output (nYn) propagation delays



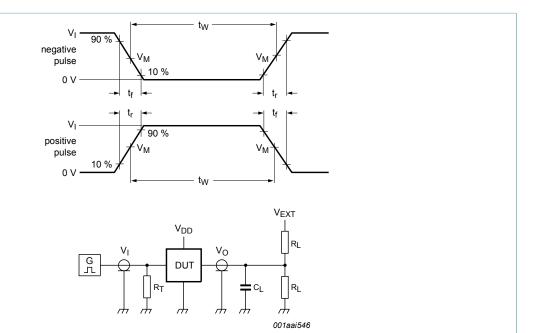
Measurement points are given in Table 8.

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

Figure 7. 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_0 of the pulse generator.

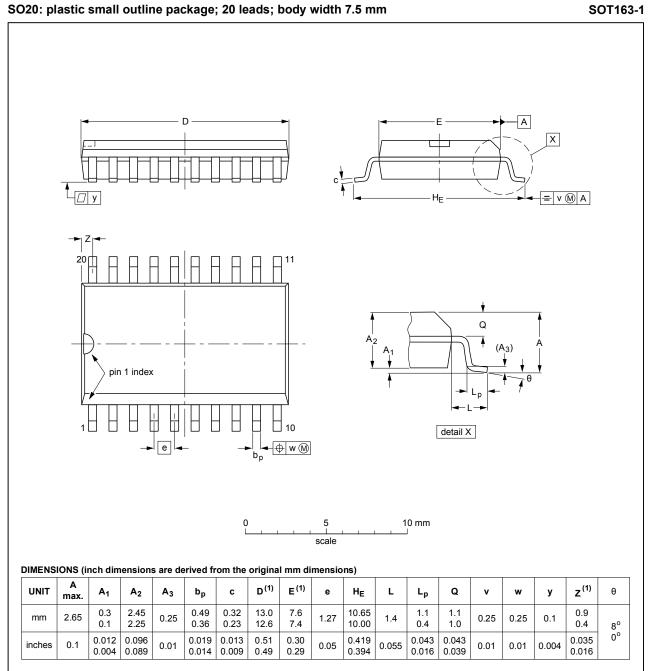
V_{EXT} = Test voltage for switching times.

Figure 8. Test circuit for measuring switching times

Table 9. Test data

Input				Load		V _{EXT}		
VI	fi	t _W	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

11 Package outline



Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE		REFERENCES			EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT163-1	075E04	MS-013				99-12-27 03-02-19

Figure 9. Package outline SOT163-1 (SO20)

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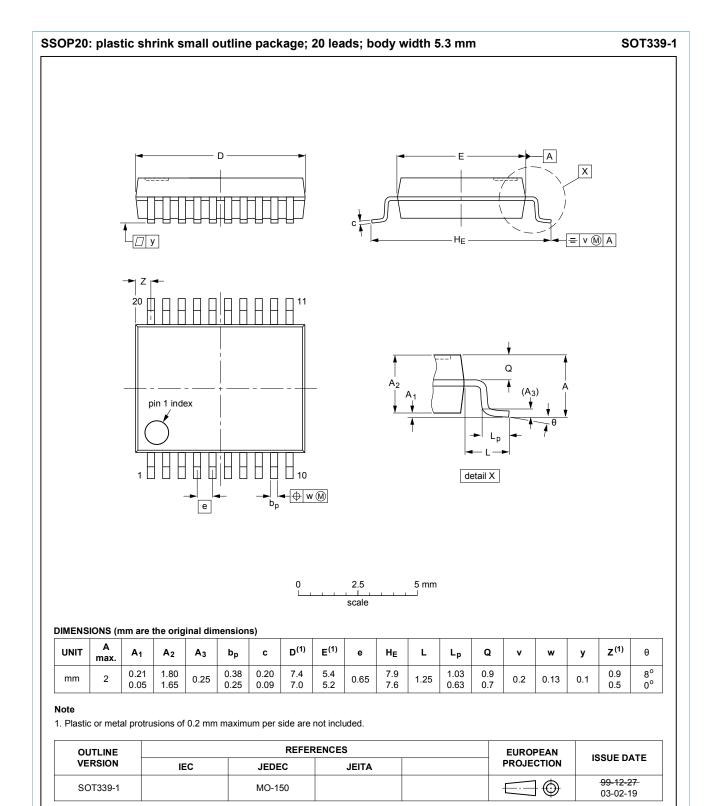


Figure 10. Package outline SOT339-1 (SSOP20)

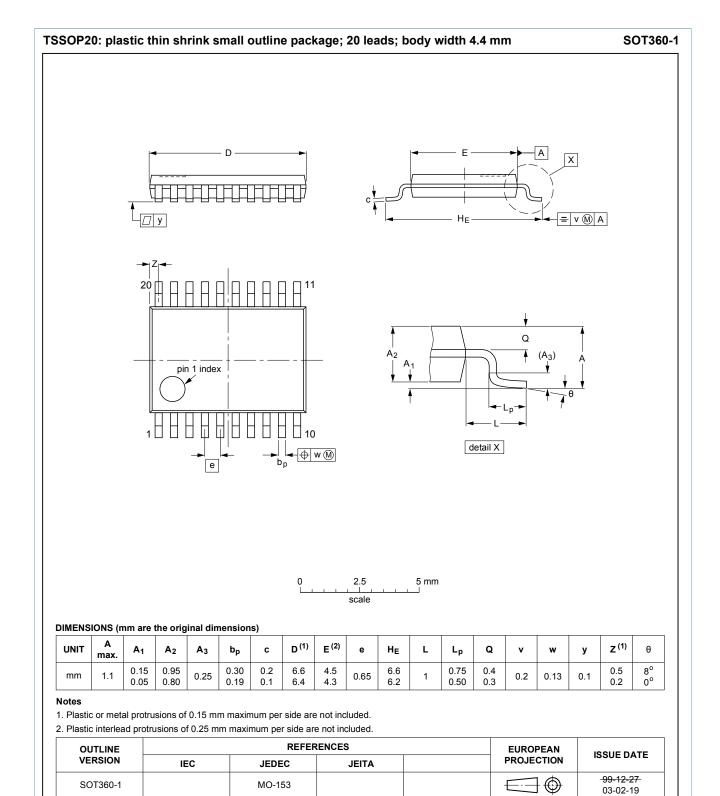
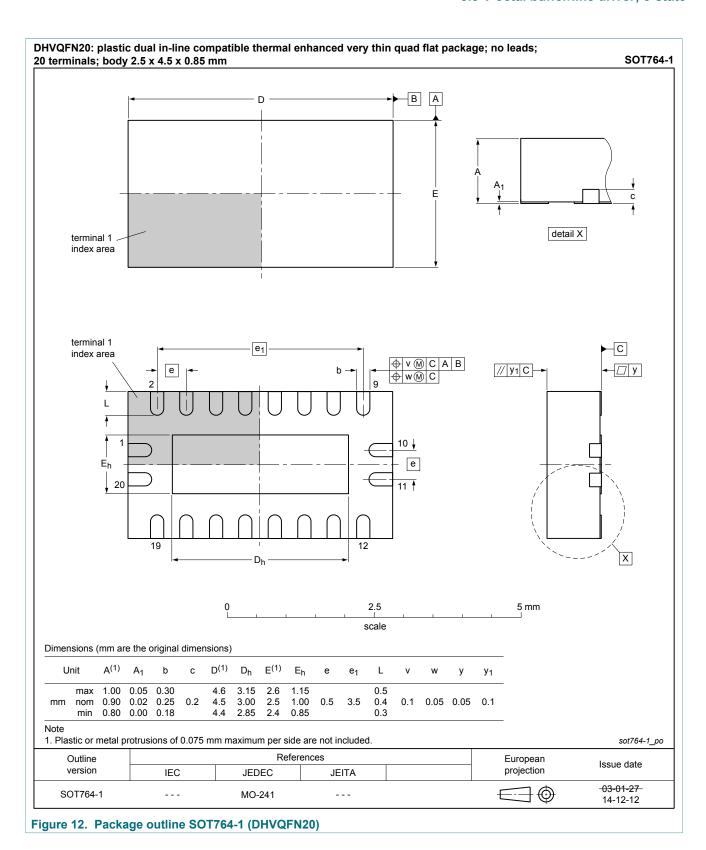


Figure 11. Package outline SOT360-1 (TSSOP20)



12 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

13 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVT_LVTH244A v.5	20170816	Product data sheet	-	74LVT_LVTH244A v.4		
Modifications:	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. 					
74LVT_LVTH244A v.4	20080903	Product data sheet	-	74LVT_LVTH244A v.3		
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Section 3 and Section 11 DHVQFN20 package added. 					
74LVT_LVTH244A v.3	20060315	Product specification	-	74LVT244A v.2		
74LVT244A v.2	19980219	Product specification	-	74LVT244A v.1		

14 Legal information

14.1 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.
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Product [short] data sheet	Production	This document contains the product specification.

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74LVT244A; 74LVTH244A

3.3 V octal buffer/line driver; 3-state

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