



# THE DATASHEET OF 74LVT245DB





# 74LVT245

3.3 V octal transceiver with direction pin; 3-state

Rev. 6 — 12 June 2024

Product data sheet

## 1. General description

The 74LVT245 is an 8-bit transceiver with 3-state outputs. The device features an output enable ( $\overline{OE}$ ) and send/receive (DIR) for direction control. A HIGH on  $\overline{OE}$  causes the outputs to assume a high-impedance OFF-state. Bus hold data inputs eliminate the need for external pull-up resistors to define unused inputs.

## 2. Features and benefits

- Wide supply voltage range from 2.7 V to 3.6 V
- 3-state buffers
- Octal bidirectional bus interface
- Overvoltage tolerant inputs to 5.5 V
- Direct interface with TTL levels
- BiCMOS high speed and output drive
- Output capability: +64 mA/-32 mA
- Latch-up protection exceeds 500 mA per JEDEC class II level A
- Bus-hold data inputs eliminate the need for external pull-up resistors for unused inputs
- No bus current loading when output is tied to 5 V bus
- Live insertion/extraction permitted
- Power-up 3-state
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Complies with JEDEC standards JEDEC8C (2.7 V to 3.6 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to 85 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
<a href="#">74LVT245D</a>	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	<a href="#">SOT163-1</a>
<a href="#">74LVT245PW</a>	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	<a href="#">SOT360-1</a>
<a href="#">74LVT245BQ</a>	-40 °C to +85 °C	DHVQFN20	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	<a href="#">SOT764-1</a>

### 4. Functional diagram

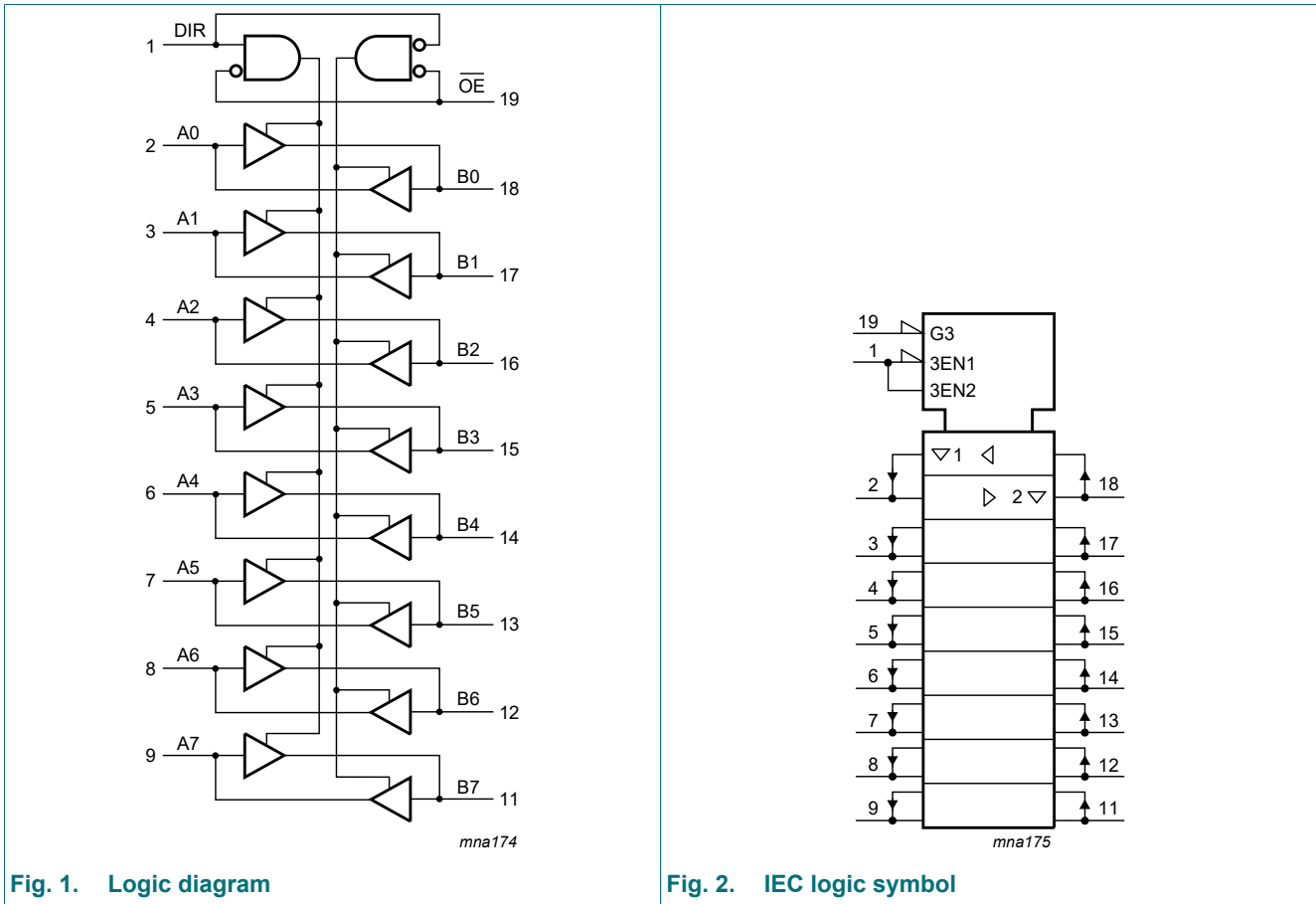
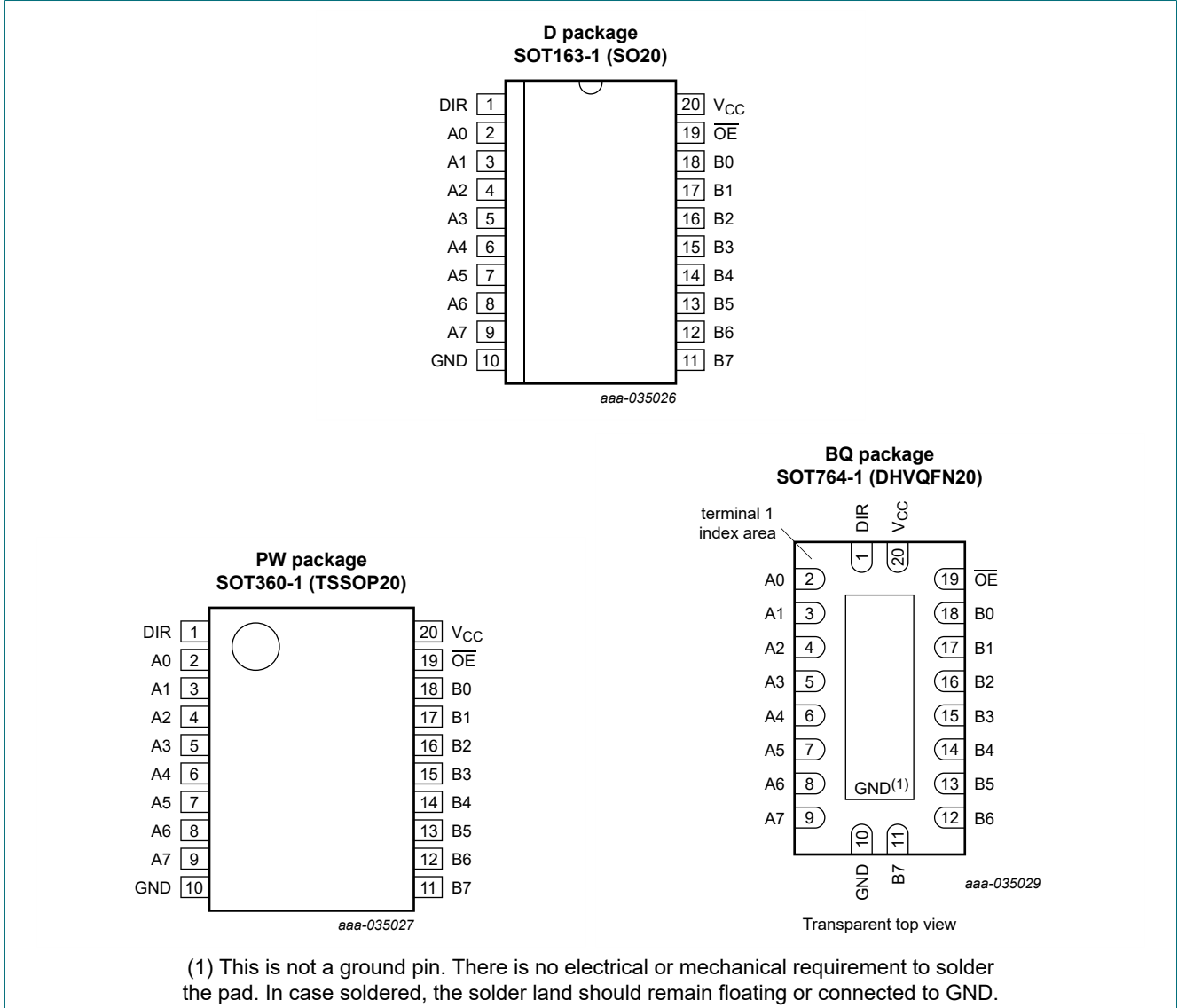


Fig. 1. Logic diagram

Fig. 2. IEC logic symbol

## 5. Pinning information

### 5.1. Pinning



### 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
DIR	1	direction control
A0, A1, A2, A3, A4, A5, A6, A7	2, 3, 4, 5, 6, 7, 8, 9	data input/output
GND	10	ground (0 V)
B0, B1, B2, B3, B4, B5, B6, B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
OE	19	output enable input (active LOW)
V <sub>CC</sub>	20	supply voltage

## 6. Functional description

**Table 3. Function selection**

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

Inputs		Inputs/outputs	
OE	DIR	An	Bn
L	L	An = Bn	inputs
L	H	inputs	Bn = An
H	X	Z	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 or HIGH state [1]	-0.5	+7	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	-	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. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		2.7	3.6	V
V <sub>I</sub>	input voltage		0	5.5	V
I <sub>OH</sub>	HIGH-level output current		-	-32	mA
I <sub>OL</sub>	LOW-level output current		-	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	output 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	-40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 2.7 V; I <sub>IK</sub> = -18 mA	-1.2	-0.9	-	V
V <sub>IH</sub>	HIGH-level input voltage		2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage		-	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = 2.7 V to 3.6 V; I <sub>OH</sub> = -100 μA	V <sub>CC</sub> - 0.2	V <sub>CC</sub> - 0.1	-	V
		V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -8 mA	2.4	2.5	-	
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -32 mA	2.0	2.2	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 100 μA		0.1	0.2	V
		V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 24 mA	-	0.3	0.5	V
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA	-	0.25	0.4	V
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 32 mA	-	0.3	0.5	V
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 64 mA	-	0.4	0.55	V
I <sub>I</sub>	input leakage current	control pins				
		V <sub>CC</sub> = 0 V or 3.6 V; V <sub>I</sub> = 5.5 V	-	1	10	μA
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	±0.1	±1	μA
		I/O data pins [2]				
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 5.5 V	-	1	20	μA
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub>	-	0.1	1	μA
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V	-5	-1	-	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 0 V to 4.5 V	-	1	±100	μA
I <sub>LO</sub>	output leakage current	V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 3.6 V; output HIGH	-	60	125	μA
I <sub>O(pu/pd)</sub>	power-up/power-down output current	V <sub>CC</sub> ≤ 1.2 V; V <sub>O</sub> = 0.5 V to V <sub>CC</sub> ; V <sub>I</sub> = GND or V <sub>CC</sub> ; $\overline{OE}$ = don't care [3]	-	15	±100	μA
I <sub>BHL</sub>	bus hold LOW current	V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 0.8 V	75	150	-	μA
I <sub>BHH</sub>	bus hold HIGH current	V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 2.0 V	-	-150	-75	μA
I <sub>BHLO</sub>	bus hold LOW overdrive current	V <sub>CC</sub> = 0 V to 3.0 V; V <sub>I</sub> = 3.6 V [4]	500	-	-	μA
I <sub>BHHO</sub>	bus hold HIGH overdrive current	V <sub>CC</sub> = 0 V to 3.0 V; V <sub>I</sub> = 3.6 V [4]	-	-	-500	μA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A				
		outputs HIGH	-	0.13	0.19	mA
		outputs LOW	-	3	12	mA
	outputs disabled	-	0.13	0.19	mA	
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 3.0 V to 3.6 V; one input = V <sub>CC</sub> - 0.6 V; other inputs at V <sub>CC</sub> or GND [5]	-	0.1	0.2	mA
C <sub>I</sub>	input capacitance	DIR and $\overline{OE}$ inputs; outputs disabled; V <sub>I</sub> = 0 V or 3.0 V	-	4	-	pF

## 3.3 V octal transceiver with direction pin; 3-state

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
C <sub>I/O</sub>	input/output capacitance	at input/output data pins, outputs disabled; V <sub>I/O</sub> = 0 V or 3.0 V	-	10	-	pF

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

[2] Unused pins at V<sub>CC</sub> or GND.

[3] This parameter is valid for any V<sub>CC</sub> between 0 V and 1.2 V with a transition time of up to 10 ms.

From V<sub>CC</sub> = 1.2 V to V<sub>CC</sub> = 3.3 V ± 0.3 V a transition time of 100 ms is permitted. This parameter is valid for T<sub>amb</sub> = +25 °C only.

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

[5] This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND.

## 10. Dynamic characteristics

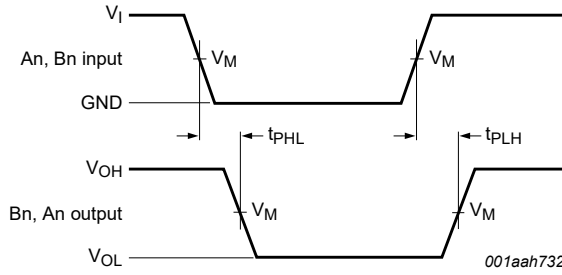
**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
t <sub>PLH</sub>	LOW to HIGH propagation delay	An to Bn or Bn to An; see Fig. 3				
		V <sub>CC</sub> = 2.7 V	-	-	4.7	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	1.0	2.4	4.0	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	An to Bn or Bn to An; see Fig. 3				
		V <sub>CC</sub> = 2.7 V	-	-	4.6	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	1.0	2.4	4.0	ns
t <sub>PZH</sub>	OFF-state to HIGH propagation delay	see Fig. 4				
		V <sub>CC</sub> = 2.7 V	-	-	7.1	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	1.1	3.3	5.5	ns
t <sub>PZL</sub>	OFF-state to LOW propagation delay	see Fig. 4				
		V <sub>CC</sub> = 2.7 V	-	-	6.5	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	1.1	3.3	5.5	ns
t <sub>PHZ</sub>	HIGH to OFF-state propagation delay	see Fig. 4				
		V <sub>CC</sub> = 2.7 V	-	-	6.5	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	2.2	3.6	5.9	ns
t <sub>PLZ</sub>	LOW to OFF-state propagation delay	see Fig. 4				
		V <sub>CC</sub> = 2.7 V	-	-	4.8	ns
		V <sub>CC</sub> = 3.3 V ± 0.3 V	2.0	3.4	4.8	ns

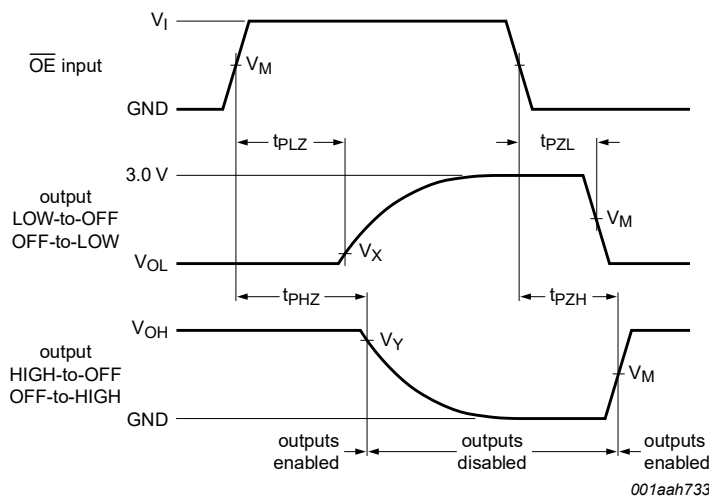
[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 3.3 V.

10.1. Waveforms and test circuit



See Table 8 for measurement points.  
 VOL and VOH are typical output voltage levels that occur with the output load.

Fig. 3. Input (An, Bn) to output (Bn, An) propagation delays and output transition times



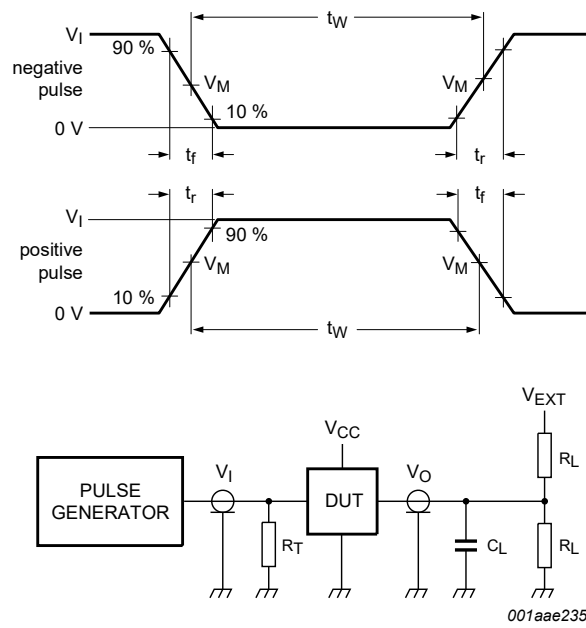
See Table 8 for measurement points.  
 VOL and VOH are typical output voltage levels that occur with the output load.

Fig. 4. 3-state output enable and disable times

Table 8. Measurement points

V <sub>CC</sub>	Input		Output		
	V <sub>I</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>
2.7 V to 3.6 V	GND to 2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V

3.3 V octal transceiver with direction pin; 3-state



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. 5. Test circuit for switching times**

**Table 9. Test data**

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

### 11. Package outline

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

SOT163-1



Fig. 6. Package outline SOT163-1 (SO20)

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

SOT360-1

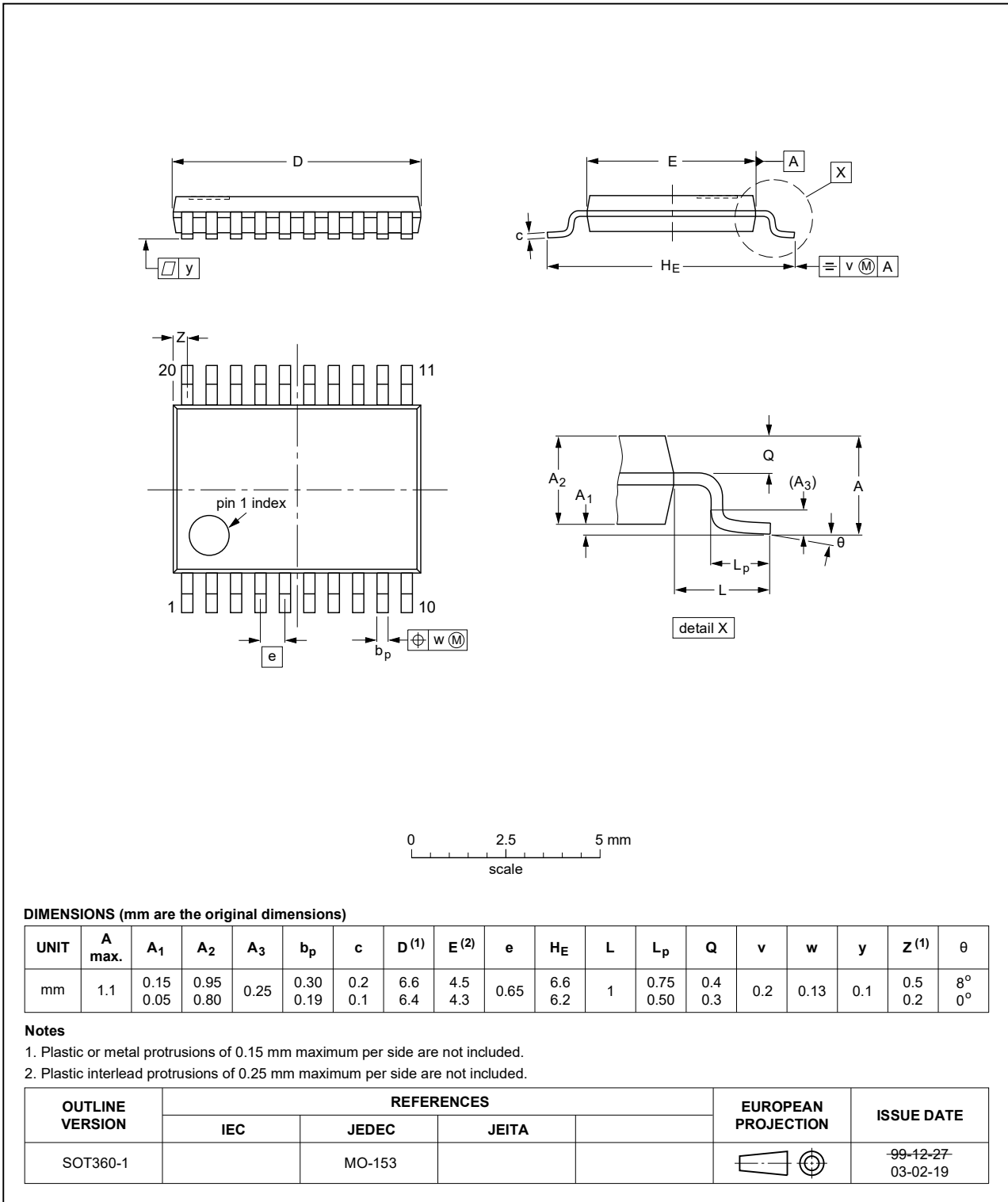


Fig. 7. Package outline SOT360-1 (TSSOP20)



## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT245 v.6	20240612	Product data sheet	-	74LVT245 v.5
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li> </ul>			
74LVT245 v.5	20210804	Product data sheet	-	74LVT245 v.4
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 number 74LVT245DB (SOT339-1/SSOP20) removed.</li> <li>• <a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li>• <a href="#">Section 7</a>: Derating values for <math>P_{tot}</math> total power dissipation removed.</li> <li>• <a href="#">Fig. 8</a>: Package outline drawing SOT764-1 (DHVQFN20) updated.</li> </ul>			
74LVT245 v.4	20131224	Product data sheet	-	74LVT245 v.3
Modifications:	<ul style="list-style-type: none"> <li>• Minimum, typical and maximum value of <math>I_{BHH}</math> corrected (errata).</li> </ul>			
74LVT245 v.3	20080508	Product data sheet	-	74LVT245 v.2
74LVT245 v.2	19980219	Product specification	-	74LVT245 v.1
74LVT245 v.1	19940520	Product specification	-	-

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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.
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