

74LVT245

3.3 V octal transceiver with direction pin; 3-state

Rev. 5 — 4 August 2021

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 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 JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to 85 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVT245D	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LVT245PW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74LVT245BQ	-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	SOT764-1

4. Functional diagram

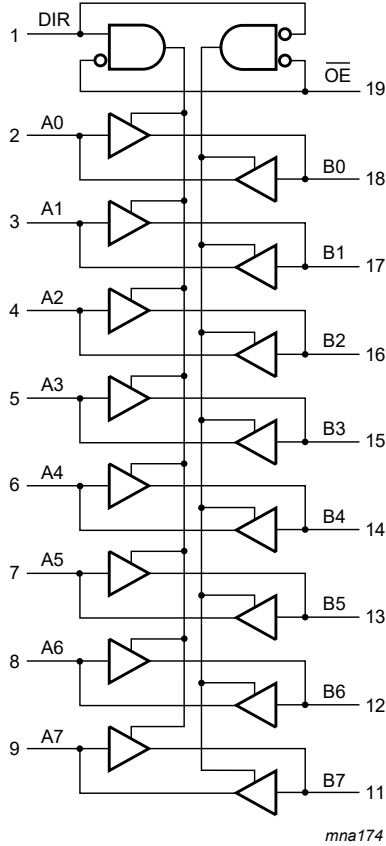


Fig. 1. Logic diagram

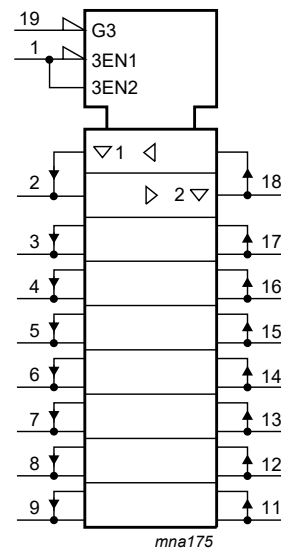
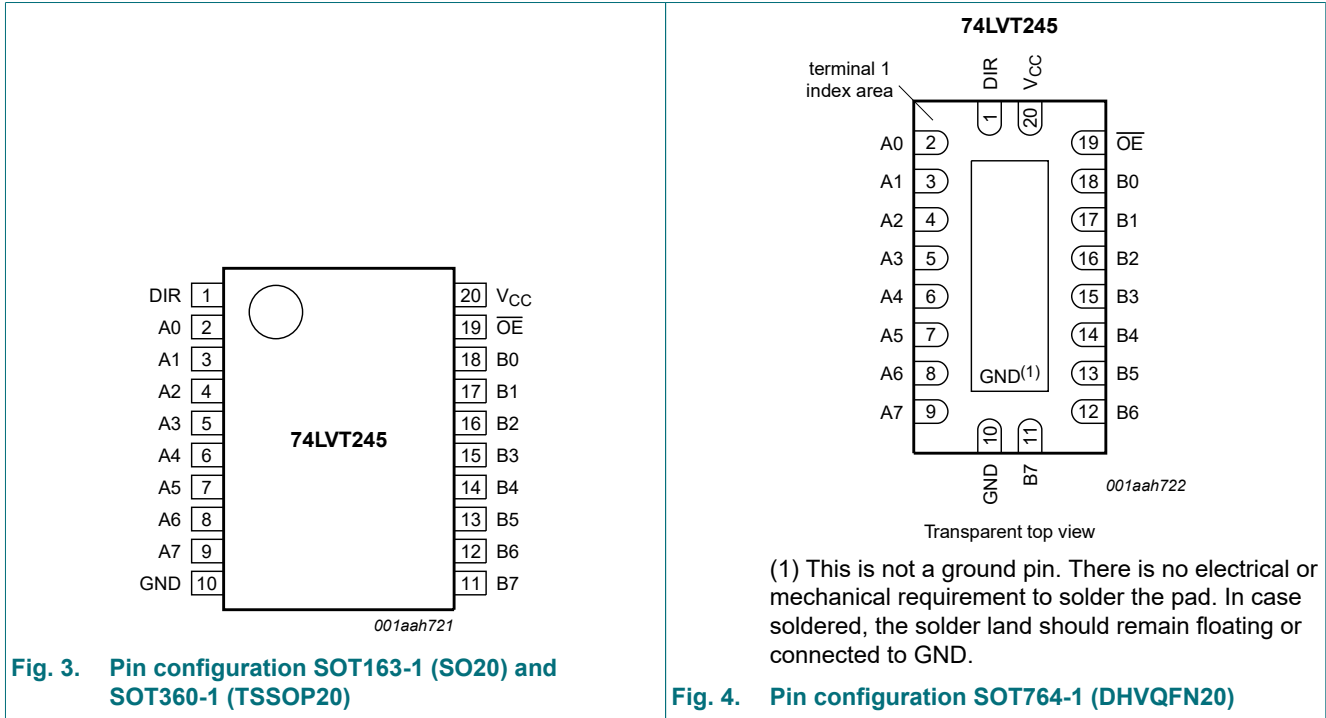


Fig. 2. IEC logic symbol

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 _{CC}	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_{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 or HIGH state [1]	-0.5	+7	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
P_{tot}	total power dissipation	$T_{amb} = -40$ °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_{CC}	supply voltage		2.7	3.6	V
V_I	input voltage		0	5.5	V
I_{OH}	HIGH-level output current		-	-32	mA
I_{OL}	LOW-level output current		-	32	mA
		current duty cycle ≤ 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	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_{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		-	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_{CC} = 2.7$ V to 3.6 V; $I_{OH} = -100$ μ A	$V_{CC} - 0.2$	$V_{CC} - 0.1$	-	V
		$V_{CC} = 2.7$ V; $I_{OH} = -8$ mA	2.4	2.5	-	
		$V_{CC} = 3.0$ V; $I_{OH} = -32$ mA	2.0	2.2	-	V

3.3 V octal transceiver with direction pin; 3-state

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
V _{OL}	LOW-level output voltage	V _{CC} = 2.7 V; I _{OL} = 100 μA		0.1	0.2	V
		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
I _I	input leakage current	control pins				
		V _{CC} = 0 V or 3.6 V; V _I = 5.5 V	-	1	10	μA
		V _{CC} = 3.6 V; V _I = V _{CC} or GND	-	±0.1	±1	μA
		I/O data pins [2]				
		V _{CC} = 3.6 V; V _I = 5.5 V	-	1	20	μA
		V _{CC} = 3.6 V; V _I = V _{CC}	-	0.1	1	μA
I _{OFF}	power-off leakage current	V _{CC} = 0 V; V _I or V _O = 0 V to 4.5 V	-	1	±100	μA
		V _O = 5.5 V; V _{CC} = 3.6 V; output HIGH	-	60	125	μA
I _{O(pu/pd)}	power-up/power-down output current	V _{CC} ≤ 1.2 V; V _O = 0.5 V to V _{CC} ; V _I = GND or V _{CC} ; \overline{OE} = don't care [3]	-	15	±100	μA
I _{BHL}	bus hold LOW current	V _{CC} = 3.0 V; V _I = 0.8 V	75	150	-	μA
I _{BHH}	bus hold HIGH current	V _{CC} = 3.0 V; V _I = 2.0 V	-	-150	-75	μA
I _{BHLO}	bus hold LOW overdrive current	V _{CC} = 0 V to 3.0 V; V _I = 3.6 V [4]	500	-	-	μA
I _{BHHO}	bus hold HIGH overdrive current	V _{CC} = 0 V to 3.0 V; V _I = 3.6 V [4]	-	-	-500	μA
I _{CC}	supply current	V _{CC} = 3.6 V; V _I = V _{CC} or GND; I _O = 0 A				
		outputs HIGH	-	0.13	0.19	mA
		outputs LOW	-	3	12	mA
I _{CC}	additional supply current	per input pin; V _{CC} = 3.0 V to 3.6 V; one input = V _{CC} - 0.6 V; other inputs at V _{CC} or GND [5]	-	0.1	0.2	mA
		outputs disabled	-	0.13	0.19	mA
		outputs disabled	-	0.13	0.19	mA
C _I	input capacitance	DIR and \overline{OE} inputs; outputs disabled; V _I = 0 V or 3.0 V	-	4	-	pF
C _{I/O}	input/output capacitance	at input/output data pins, outputs disabled; V _{I/O} = 0 V or 3.0 V	-	10	-	pF

[1] All typical values are measured at V_{CC} = 3.3 V (unless stated otherwise) and T_{amb} = 25 °C.

[2] Unused pins at V_{CC} or GND.

[3] 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 ms is permitted. This parameter is valid for T_{amb} = +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_{CC} or GND.

10. Dynamic characteristics

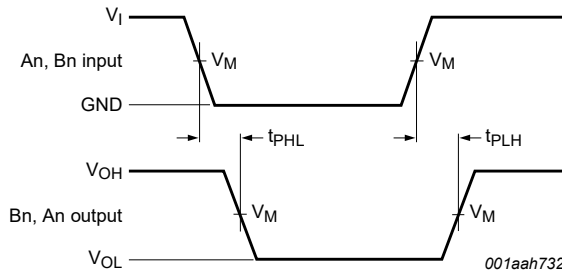
Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see [Fig. 7](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
t _{PLH}	LOW to HIGH propagation delay	An to Bn or Bn to An; see Fig. 5				
		V _{CC} = 2.7 V	-	-	4.7	ns
		V _{CC} = 3.3 V ± 0.3 V	1.0	2.4	4.0	ns
t _{PHL}	HIGH to LOW propagation delay	An to Bn or Bn to An; see Fig. 5				
		V _{CC} = 2.7 V	-	-	4.6	ns
		V _{CC} = 3.3 V ± 0.3 V	1.0	2.4	4.0	ns
t _{PZH}	OFF-state to HIGH propagation delay	see Fig. 6				
		V _{CC} = 2.7 V	-	-	7.1	ns
		V _{CC} = 3.3 V ± 0.3 V	1.1	3.3	5.5	ns
t _{PZL}	OFF-state to LOW propagation delay	see Fig. 6				
		V _{CC} = 2.7 V	-	-	6.5	ns
		V _{CC} = 3.3 V ± 0.3 V	1.1	3.3	5.5	ns
t _{PHZ}	HIGH to OFF-state propagation delay	see Fig. 6				
		V _{CC} = 2.7 V	-	-	6.5	ns
		V _{CC} = 3.3 V ± 0.3 V	2.2	3.6	5.9	ns
t _{PLZ}	LOW to OFF-state propagation delay	see Fig. 6				
		V _{CC} = 2.7 V	-	-	4.8	ns
		V _{CC} = 3.3 V ± 0.3 V	2.0	3.4	4.8	ns

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

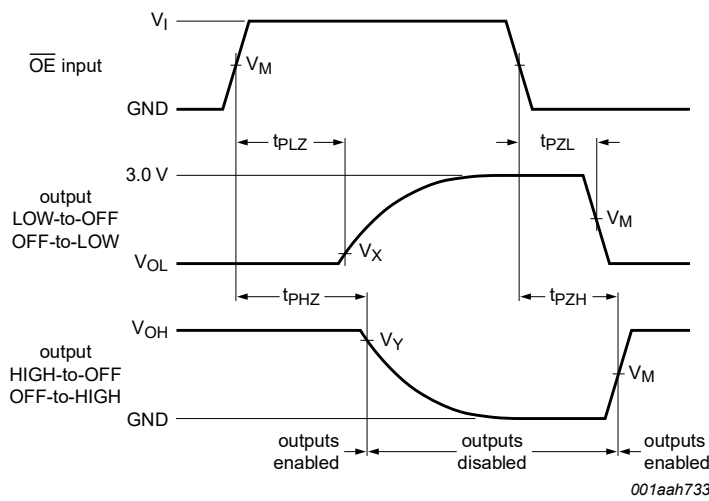
10.1. Waveforms and test circuit



See Table 8 for measurement points

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

Fig. 5. Input (An, Bn) to output (Bn, An) propagation delays and output transition times



See Table 8 for measurement points

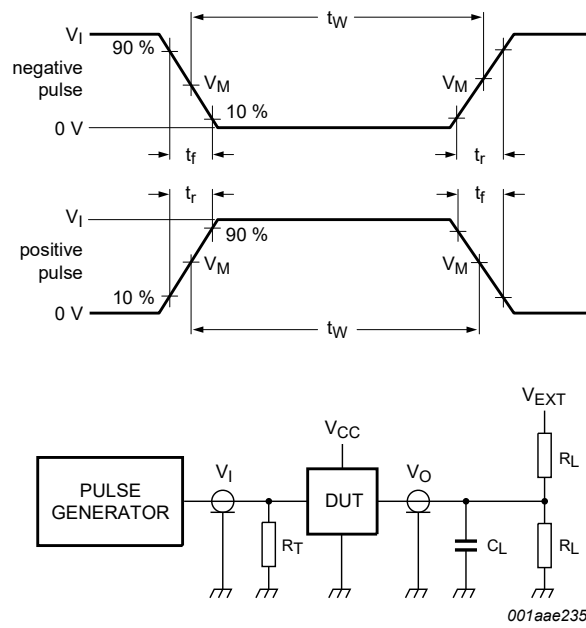
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 6. 3-state output enable and disable times

Table 8. Measurement points

V_{CC}	Input		Output		
	V_I	V_M	V_M	V_X	V_Y
2.7 V to 3.6 V	GND to 2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$

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. 7. 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	≤ 10 MHz	500 ns	≤ 2.5 ns	500 Ω	50 pF	GND	6 V	open

11. Package outline

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

SOT163-1

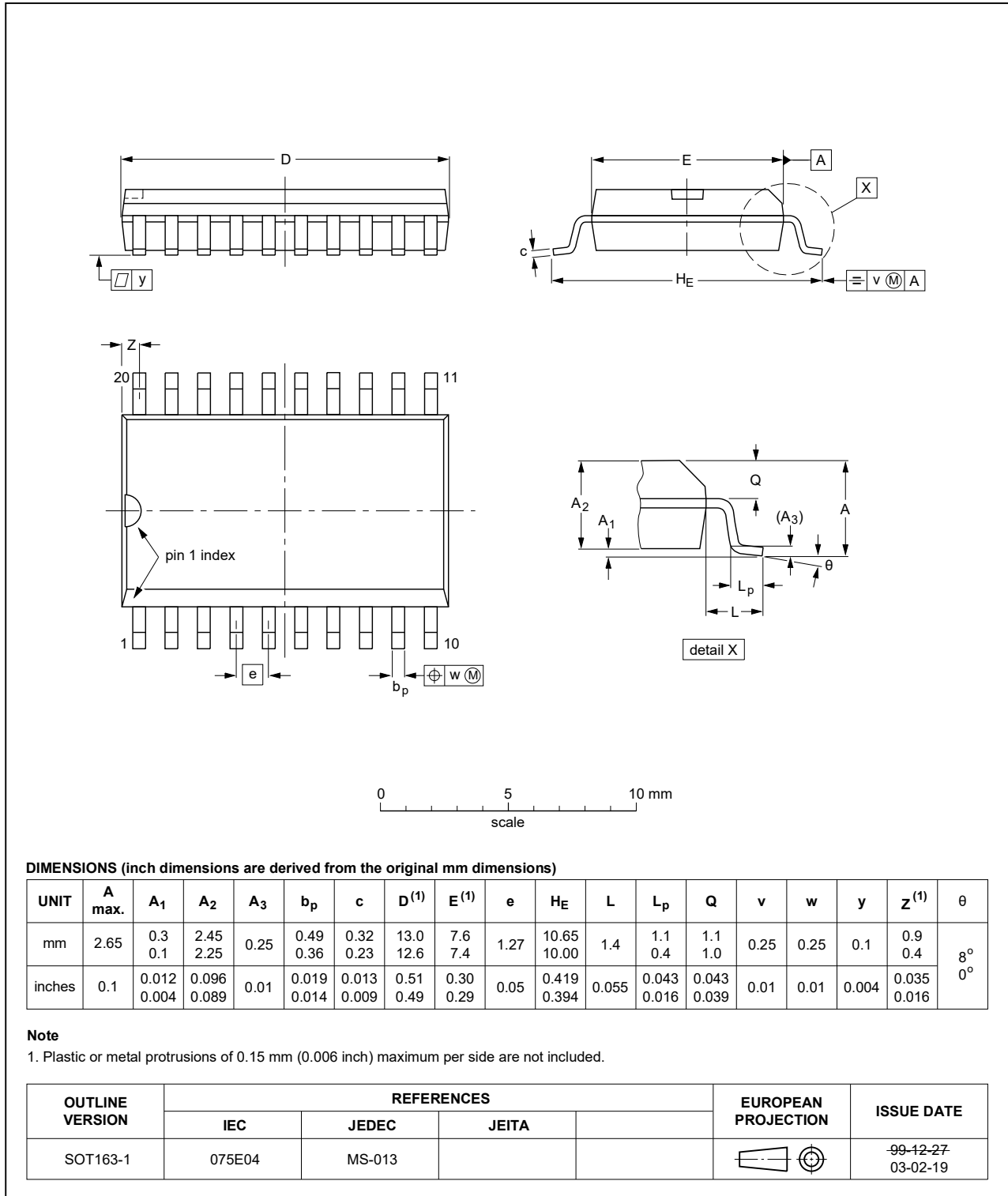


Fig. 8. Package outline SOT163-1 (SO20)

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

SOT360-1

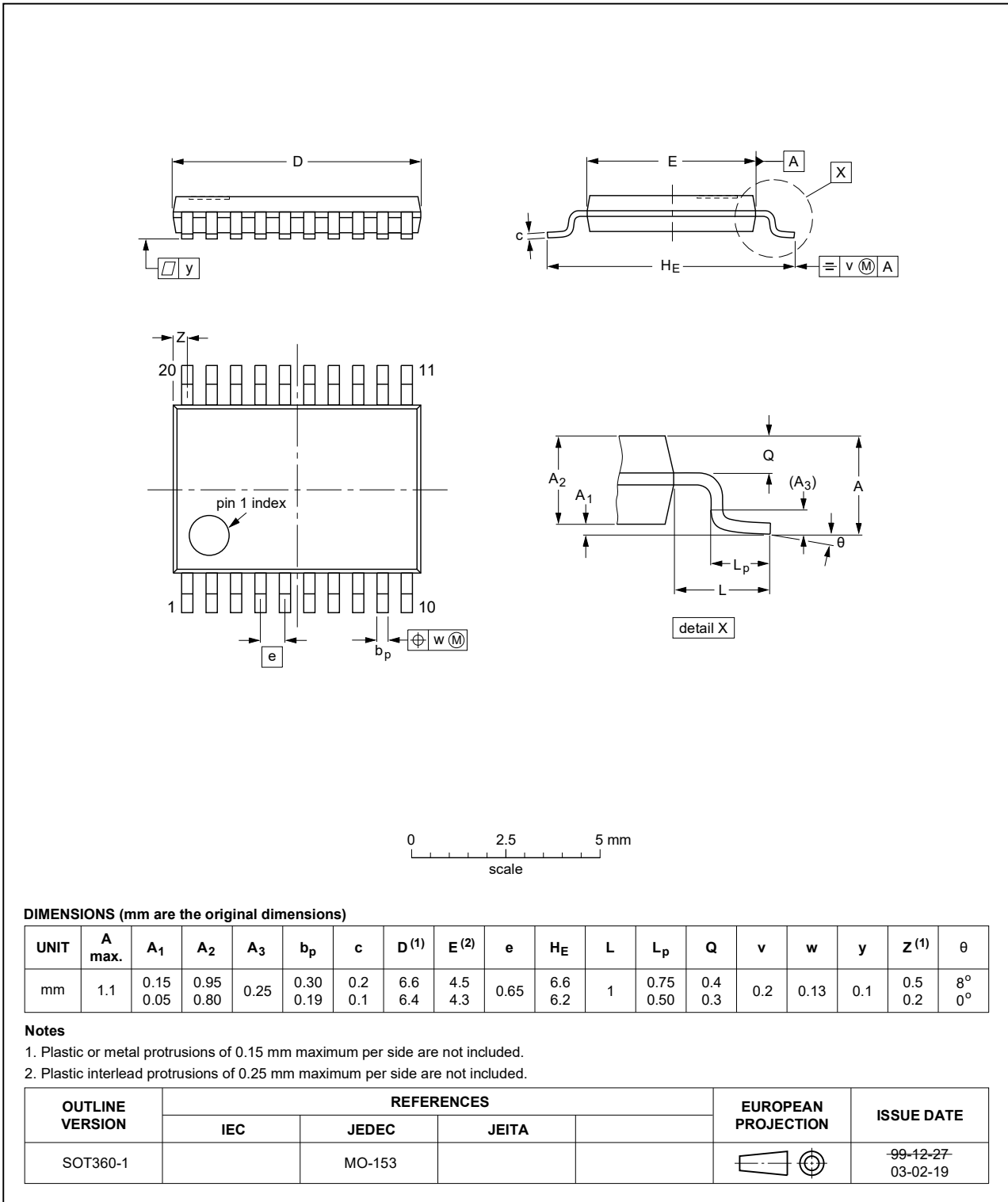


Fig. 9. Package outline SOT360-1 (TSSOP20)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
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
74LVT245 v.5	20210804	Product data sheet	-	74LVT245 v.4
Modifications:	<ul style="list-style-type: none"> 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. Type number 74LVT245DB (SOT339-1/SSOP20) removed. Section 1 and Section 2 updated. Section 7: Derating values for P_{tot} total power dissipation removed. Fig. 10: Package outline drawing SOT764-1 (DHVQFN20) updated. 			
74LVT245 v.4	20131224	Product data sheet	-	74LVT245 v.3
Modifications:	<ul style="list-style-type: none"> Minimum, typical and maximum value of I_{BHH} corrected (errata). 			
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	-	-

14. Legal information

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.

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Contents

1. General description	1
2. Features and benefits	1
3. Ordering information	1
4. Functional diagram	2
5. Pinning information	3
5.1. Pinning.....	3
5.2. Pin description.....	3
6. Functional description	3
7. Limiting values	4
8. Recommended operating conditions	4
9. Static characteristics	4
10. Dynamic characteristics	6
10.1. Waveforms and test circuit.....	7
11. Package outline	9
12. Abbreviations	12
13. Revision history	12
14. Legal information	13

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