

# 74ALVC245

Octal bus transceiver; 3-state

Rev. 3 — 30 April 2021

Product data sheet

## 1. General description

The 74ALVC245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74ALVC245 features an output enable input ( $\overline{OE}$ ) for easy cascading and send/receive input (DIR) for direction control.  $\overline{OE}$  controls the outputs, so that the buses are effectively isolated.

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 3.6 V
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.5 V)
  - JESD8B (2.7 V to 3.6 V)
- 3.6 V tolerant inputs/outputs
- CMOS low-power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74ALVC245D	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74ALVC245PW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74ALVC245BQ	-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

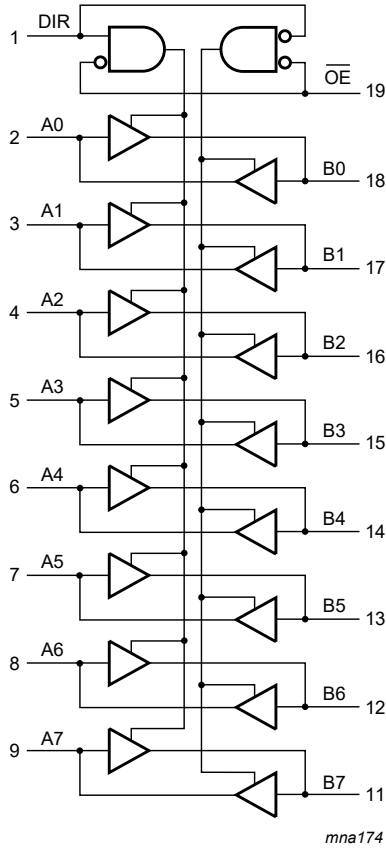


Fig. 1. Logic symbol

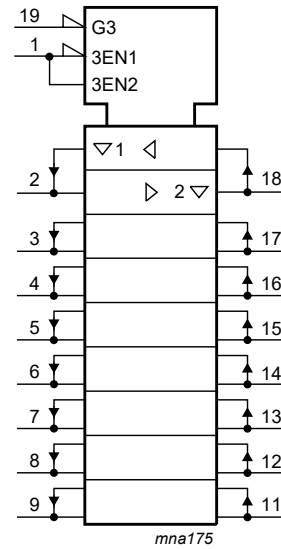
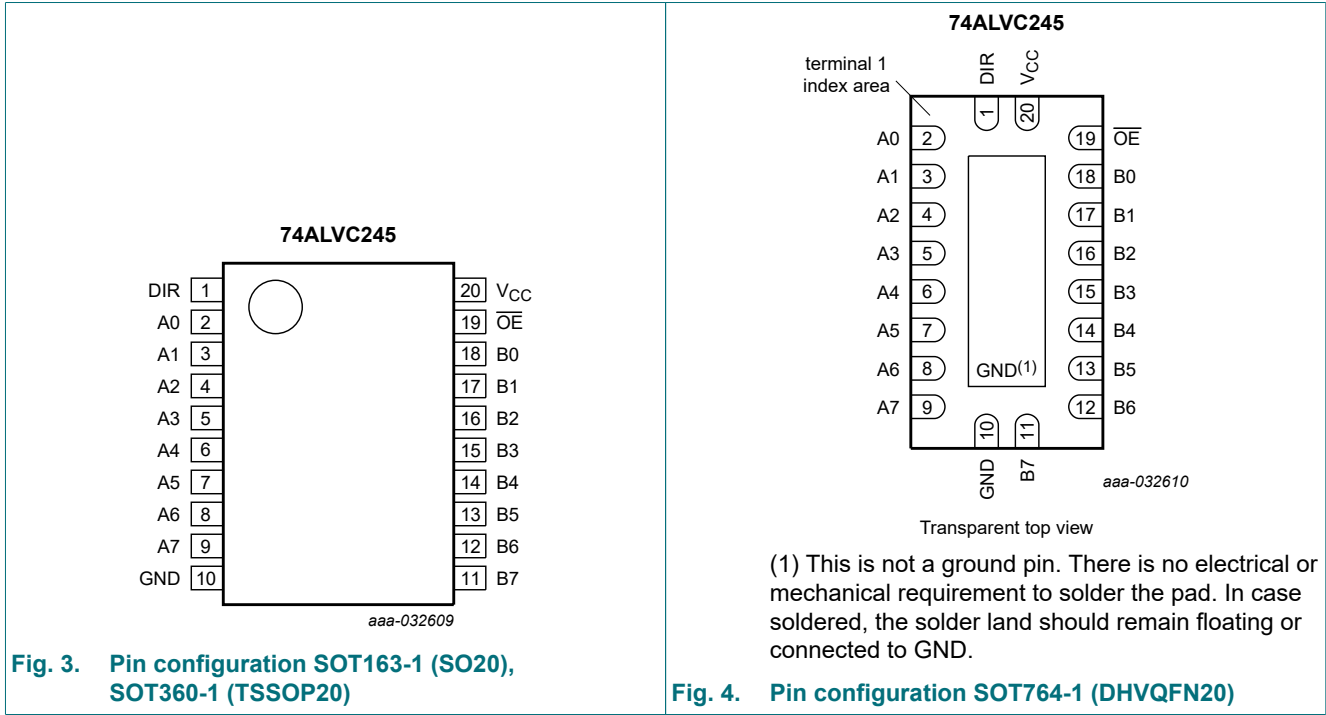


Fig. 2. IEC logic symbol

## 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
B0, B1, B2, B3, B4, B5, B6, B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
GND	10	ground (0 V)
OE	19	output enable input (active LOW)
V <sub>CC</sub>	20	supply voltage

## 6. Functional description

Table 3. Function table

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

Input		Input/output	
OE	DIR	An	Bn
L	L	A = B	input
L	H	input	B = A
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	+4.6	V	
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA	
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	$\pm 50$	mA	
$V_O$	output voltage	output HIGH or LOW state	[2]	-0.5	$V_{CC} + 0.5$	V
		output 3-state	[2]	-0.5	+4.6	V
		power-down mode; $V_{CC} = 0$ V		-0.5	+4.6	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	mA	
$I_{CC}$	supply current		-	100	mA	
$I_{GND}$	ground current		-100	-	mA	
$T_{stg}$	storage temperature		-65	+150	°C	
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +85 °C	-	500	mW	

[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	output HIGH or LOW state	0	$V_{CC}$	V
		output 3-state	0	3.6	V
		power-down mode; $V_{CC} = 0$ V	0	3.6	V
$T_{amb}$	ambient temperature		-40	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	-	20	ns/V
		$V_{CC} = 2.7$ V to 3.6 V	-	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>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V	V <sub>CC</sub> - 0.2	-	-	V
		I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 1.65 V	1.25	-	-	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.3 V	1.8	-	-	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 2.3 V	1.7	-	-	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 3.0 V	2.4	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V	-	-	0.2	V
		I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 1.65 V	-	-	0.3	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.3 V	-	-	0.4	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 2.3 V	-	-	0.6	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V	-	-	0.4	V
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 3.6 V [2]	-	±0.1	±10.0	µA
		I <sub>I</sub> = input leakage current	-	±0.1	±5.0	µA
		I <sub>OFF</sub> = power-off leakage current	-	±0.1	±10.0	µA
		I <sub>CC</sub> = supply current	-	0.2	10	µA
		ΔI <sub>CC</sub> = additional supply current	-	5	750	µA
		C <sub>I</sub> = input capacitance	-	3.5	-	pF
		C <sub>I/O</sub> = input/output capacitance	-	3.5	-	pF

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

[2] For transceivers, the parameter I<sub>OZ</sub> includes the input leakage current.

## 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 <sub>pd</sub>	propagation delay	An to Bn; Bn to An; see Fig. 5 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	2.7	6.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.1	3.5	ns
		V <sub>CC</sub> = 2.7 V	1.0	3.0	3.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.3	3.4	ns
t <sub>en</sub>	enable time	OE to An; OE to Bn; see Fig. 6 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	4.0	8.6	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	3.0	6.0	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.6	6.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.9	5.5	ns
t <sub>dis</sub>	disable time	OE to An; OE to Bn; see Fig. 6 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	4.4	8.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.3	4.8	ns
		V <sub>CC</sub> = 2.7 V	1.0	3.3	5.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	3.2	5.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V [3]				
		outputs enabled	-	25	-	pF
		outputs disabled	-	1	-	pF

[1] All typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V and 3.3 V.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

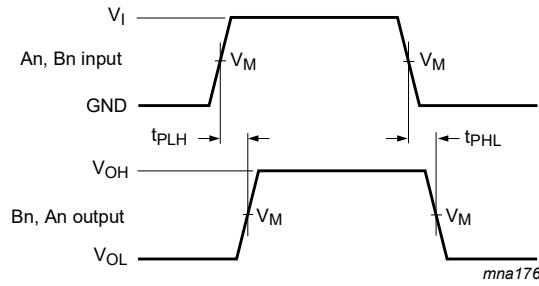
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

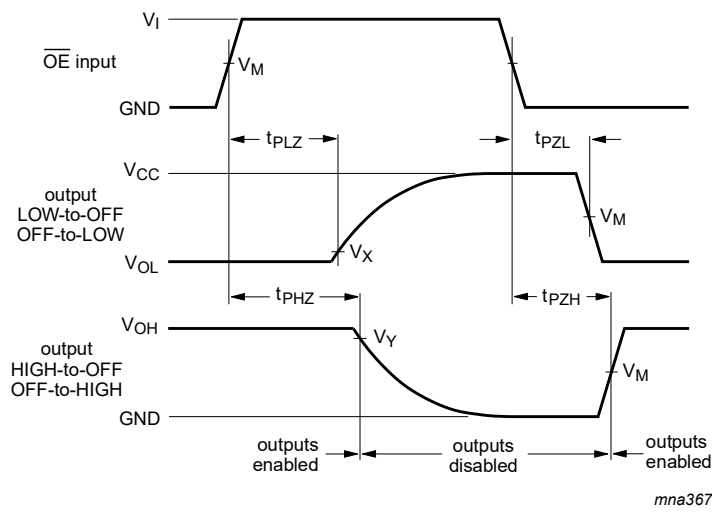
10.1. Waveforms and test circuit



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

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

Fig. 5. Propagation delay input (An, Bn) to output (Bn, An)



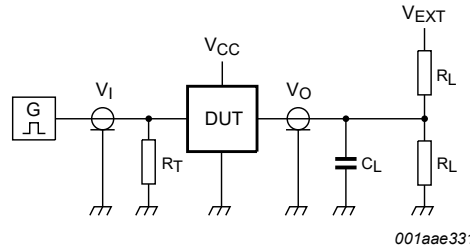
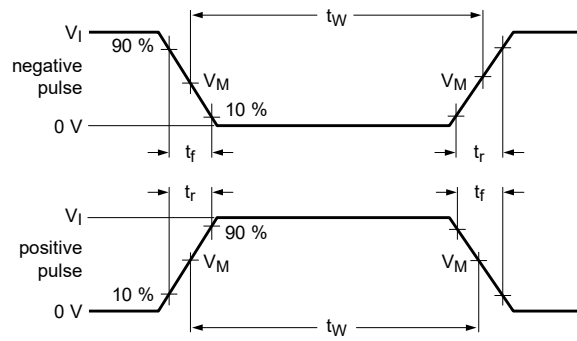
Measurement points are given in [Table 8](#).

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

Fig. 6. Enable and disable times

Table 8. Measurement points

Supply voltage	Input		Output		
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
1.65 V to 1.95 V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.3 V to 2.7 V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.7 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$



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

Definitions test circuit:

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

$C_L$  = Load capacitance including jig and probe capacitance

$R_L$  = Load resistor

**Fig. 7. Test circuit for measuring switching times**

**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$		
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND



### 11. Package outline

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

SOT163-1

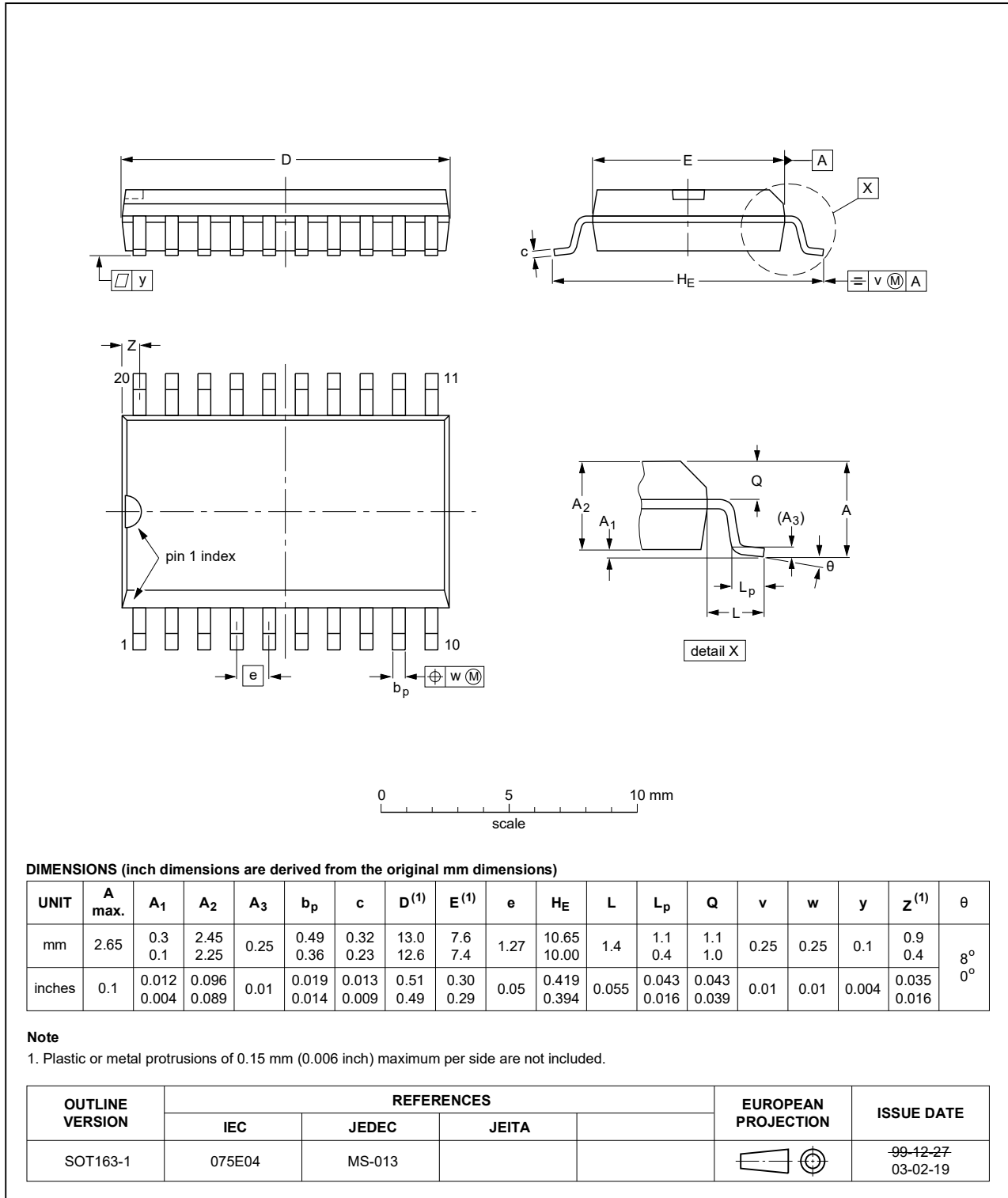


Fig. 8. Package outline SOT163-1 (SO20)

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

SOT360-1

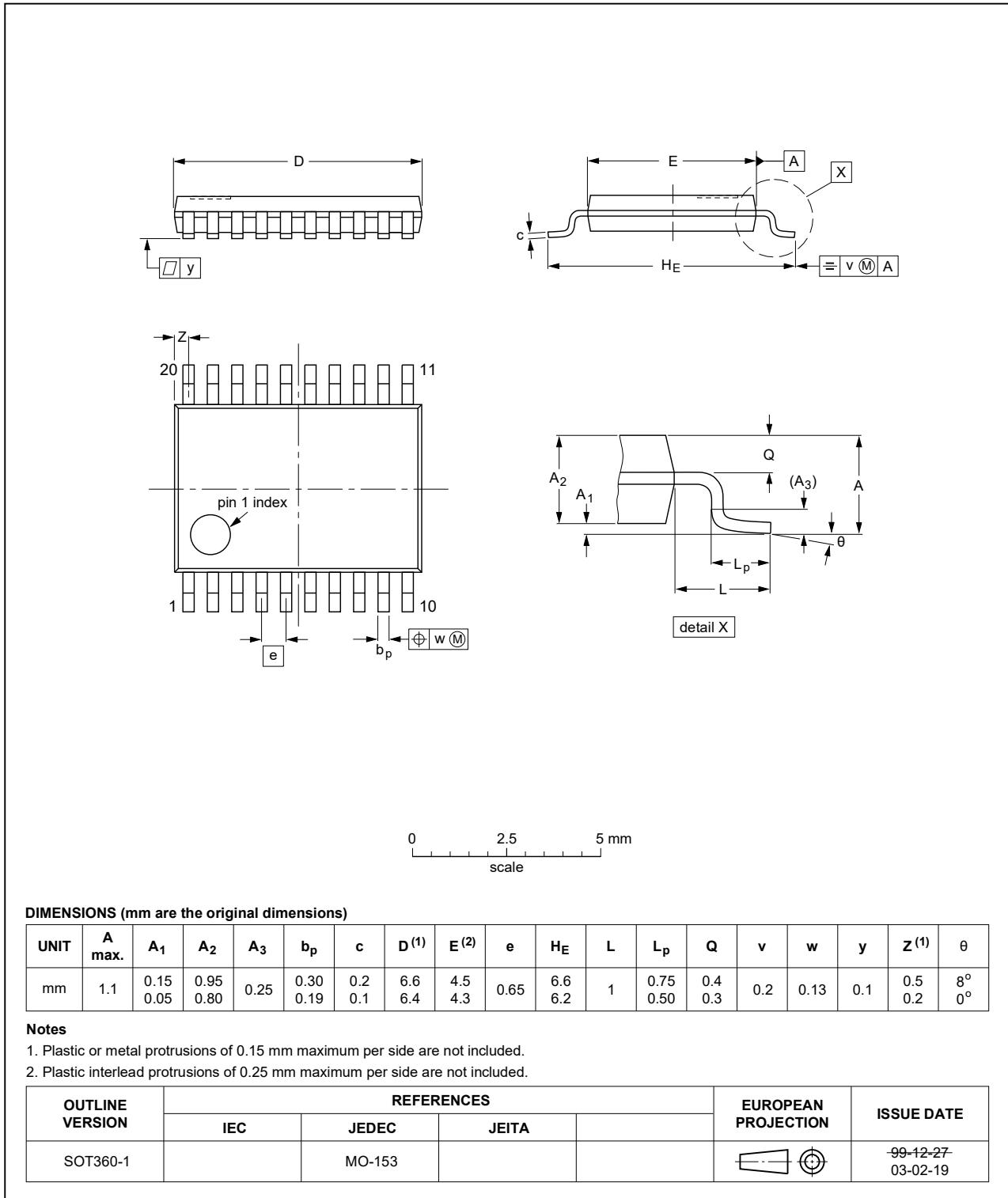


Fig. 9. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm

SOT764-1



Fig. 10. Package outline SOT764-1 (DHVQFN20)

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	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
74ALVC245 v.3	20210430	Product data sheet	-	74ALVC245 v.2
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><a href="#">Section 2</a>: Reference to JESD36 removed.</li> <li><a href="#">Section 7</a>: Derating values for <math>P_{tot}</math> total power dissipation removed (errata).</li> <li>Package outline drawing <a href="#">SOT764-1</a> (DHVQFN20) updated.</li> </ul>			
74ALVC245 v.2	20080107	Product data sheet		74ALVC245 v.1
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 3</a>: DHVQFN20 package added.</li> <li><a href="#">Section 7</a>: derating values added for DHVQFN20 package.</li> <li><a href="#">Section 11</a>: outline drawing added for DHVQFN20 package.</li> </ul>			
74ALVC245 v.1	20030710	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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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