

# 74AHCT245A

Octal bus transceiver; 3-state

Rev. 2 — 26 October 2016

Product data sheet

## 1. General description

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The 74AHCT245A 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.

The 74AHCT245A is designed to operate over a  $V_{CC}$  range from 4.5 V to 5.5 V. The inputs are TTL compatible, which allows the device to be used to translate from 3.3 V to 5 V.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial Power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

## 2. Features and benefits

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- Direct interface with TTL levels
- Supply voltage range from 4.5 V to 5.5 V
- Typical  $t_{pd}$  of 3.0 ns at 5 V
- Typical  $V_{OL(p)} < 0.8$  V at  $V_{CC} = 5$  V,  $T_{amb} = 25$  °C
- Typical  $V_{OH(v)} > 2.3$  V at  $V_{CC} = 5$  V,  $T_{amb} = 25$  °C
- Supports mixed-mode voltage operation on all ports
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
  - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 2 kV
- Specified from  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C

### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AHCT245APW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

### 4. Functional diagram

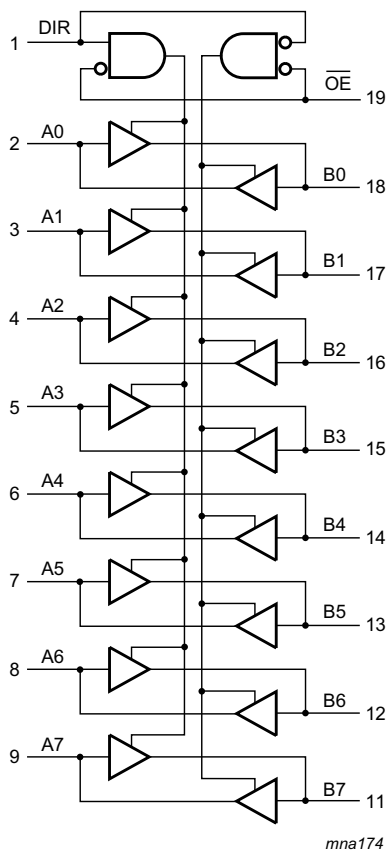


Fig 1. Logic symbol

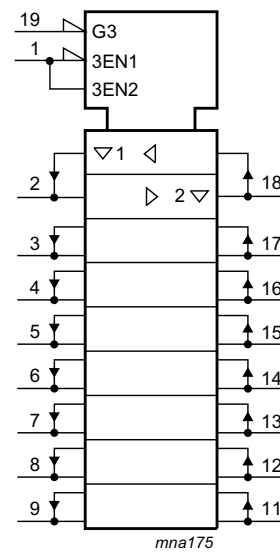


Fig 2. IEC logic symbol

## 5. Pinning information

### 5.1 Pinning

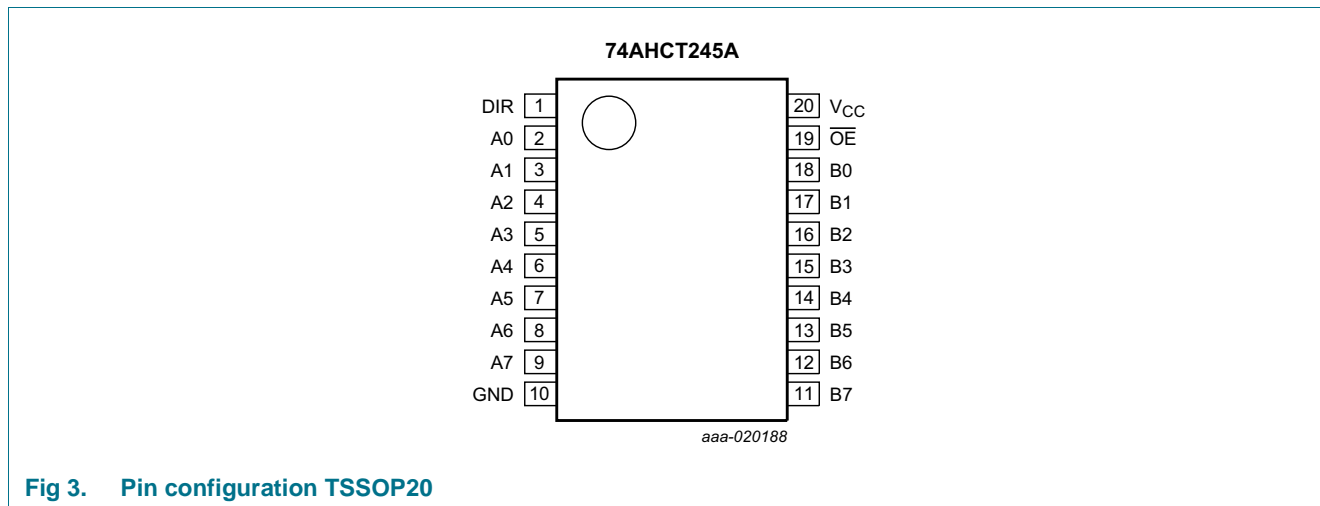


Fig 3. Pin configuration TSSOP20

### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
DIR	1	direction control
A0 to A7	2, 3, 4, 5, 6, 7, 8, 9	data input/output
GND	10	ground (0 V)
B0 to B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
$\overline{\text{OE}}$	19	output enable input (active LOW)
V <sub>CC</sub>	20	supply voltage

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

Input		Input/output		
$\overline{\text{OE}}$	DIR	An	Bn	
L	L	A = B	input	
L	H	input	B = A	
H	X	Z	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	+7.0	V
$V_I$	input voltage		-0.5	+7.0	V
$V_O$	output voltage	active mode	-0.5	$V_{CC} + 0.5$	V
		power-down or 3-state mode	-0.5	+7.0	V
$I_{IK}$	input clamping current	$V_I < 0\text{ V}$	-20	-	mA
$I_{OK}$	output clamping current	$V_O < 0\text{ V}$	-20	-	mA
$I_O$	output current	$V_O = 0\text{ V to }V_{CC}$	-	$\pm 25$	mA
$I_{CC}$	supply current		-	75	mA
$I_{GND}$	ground current		-75	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C to }+125\text{ °C}$	-	500	mW

[1] If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

[2] If the output current ratings are observed, the output voltage ratings may be exceeded.

[3] This value is limited to 7.0 V maximum.

[4] For TSSOP20 package: above 100 °C, the value of  $P_{tot}$  derates linearly with 10 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		4.5	5.5	V
$V_I$	input voltage		0	5.5	V
$V_O$	output voltage	active mode	0	$V_{CC}$	V
		power-down or 3-state mode	0	5.5	V
$T_{amb}$	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	20	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2	-	-	2	-	2	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	0.8	-	0.8	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
		$I_O = -50 \mu\text{A}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -8 \text{ mA}$	3.94	-	-	3.8	-	3.7	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
		$I_O = 50 \mu\text{A}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 8 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
$I_{OZ}$	OFF-state output current	$V_{CC} = 5.5 \text{ V}; V_I = V_{IH} \text{ or } V_{IL}; V_O = \text{GND to } 5.5 \text{ V}$	-	-	$\pm 0.25$	-	$\pm 2.5$	-	$\pm 2.5$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I \text{ or } V_O = \text{GND to } 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	-	0.5	-	5	-	5	$\mu\text{A}$
$I_I$	input leakage current	$V_I = V_{CC} \text{ or } \text{GND}; V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = V_{CC} \text{ or } \text{GND}; I_O = 0 \text{ A}; V_{CC} = 5.5 \text{ V}$	-	-	2	-	20	-	20	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = 3.4 \text{ V}; I_O = 0 \text{ A};$ other pins at $V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**  
*GND = 0 V. For test circuit, see Figure 6.*

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
t <sub>pd</sub>	propagation delay	An to Bn or Bn to An; see <a href="#">Figure 4</a>								
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.0	7.7	1	8.5	1	10	ns
		C <sub>L</sub> = 50 pF	-	4.8	8.7	1	9.5	1	11	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to An or $\overline{\text{OE}}$ to Bn; see <a href="#">Figure 5</a>								
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	4.5	13.8	1	15	1	17	ns
		C <sub>L</sub> = 50 pF	-	6.3	14.8	1	16	1	17.5	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to An or $\overline{\text{OE}}$ to Bn; see <a href="#">Figure 5</a>								
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.4	10.2	1	11.1	1	12.2	ns
		C <sub>L</sub> = 50 pF	-	5.7	15.4	1	16.5	1	18	ns
t <sub>sk(o)</sub>	output skew time	V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	-	-	1	-	1	-	1	ns
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5 V	-	2	6	-	6	-	6	pF
C <sub>I/O</sub>	input/output capacitance	V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5 V	-	5.5	-	-	-	-	-	pF
C <sub>PD</sub>	power dissipation capacitance	per buffer; C <sub>L</sub> = 0 pF; f = 10 MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	-	9	-	-	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 5 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> (μW).

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

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

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

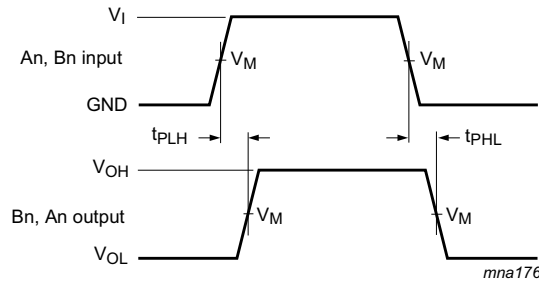
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in Volts.

**Table 8. Noise characteristics**  
 GND = 0 V. For test circuit, see [Figure 6](#).

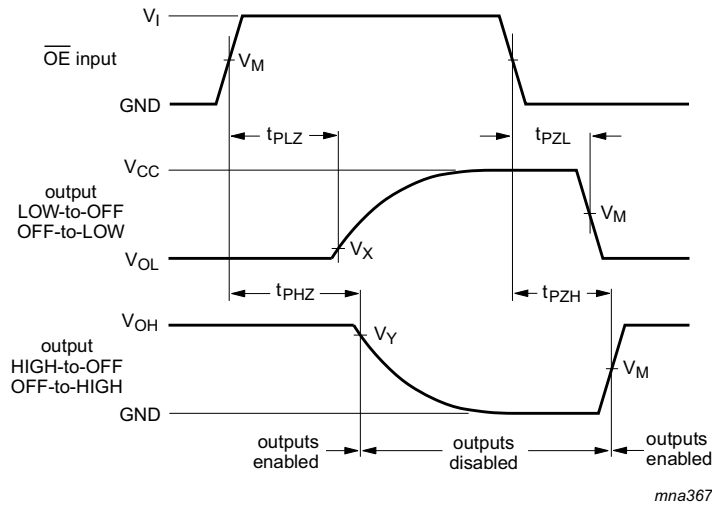
Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			Unit
			Min	Typ	Max	
<b>V<sub>CC</sub> = 5 V; C<sub>L</sub> = 50 pF</b>						
V <sub>OL(p)</sub>	LOW-level output voltage (peak)		-	0.5	1.5	V
V <sub>OL(v)</sub>	LOW-level output voltage (valley)		-1.5	-0.3	-	V
V <sub>OH(v)</sub>	HIGH-level output voltage (valley)		-	4.5	-	V
V <sub>IH(AC)</sub>	AC HIGH-level input voltage	dynamic	2	-	-	V
V <sub>IL(AC)</sub>	AC LOW-level input voltage	dynamic	-	-	0.8	V

## 11. Waveforms



Measurement points are given in [Table 9](#).  
 V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

**Fig 4. Propagation delay input (An, Bn) to output (Bn, An)**



Measurement points are given in [Table 9](#).  
 V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

**Fig 5. Enable and disable times**

Table 9. Measurement points

Input	Output		
$V_M$	$V_M$	$V_X$	$V_Y$
1.5 V	$0.5V_{CC}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$

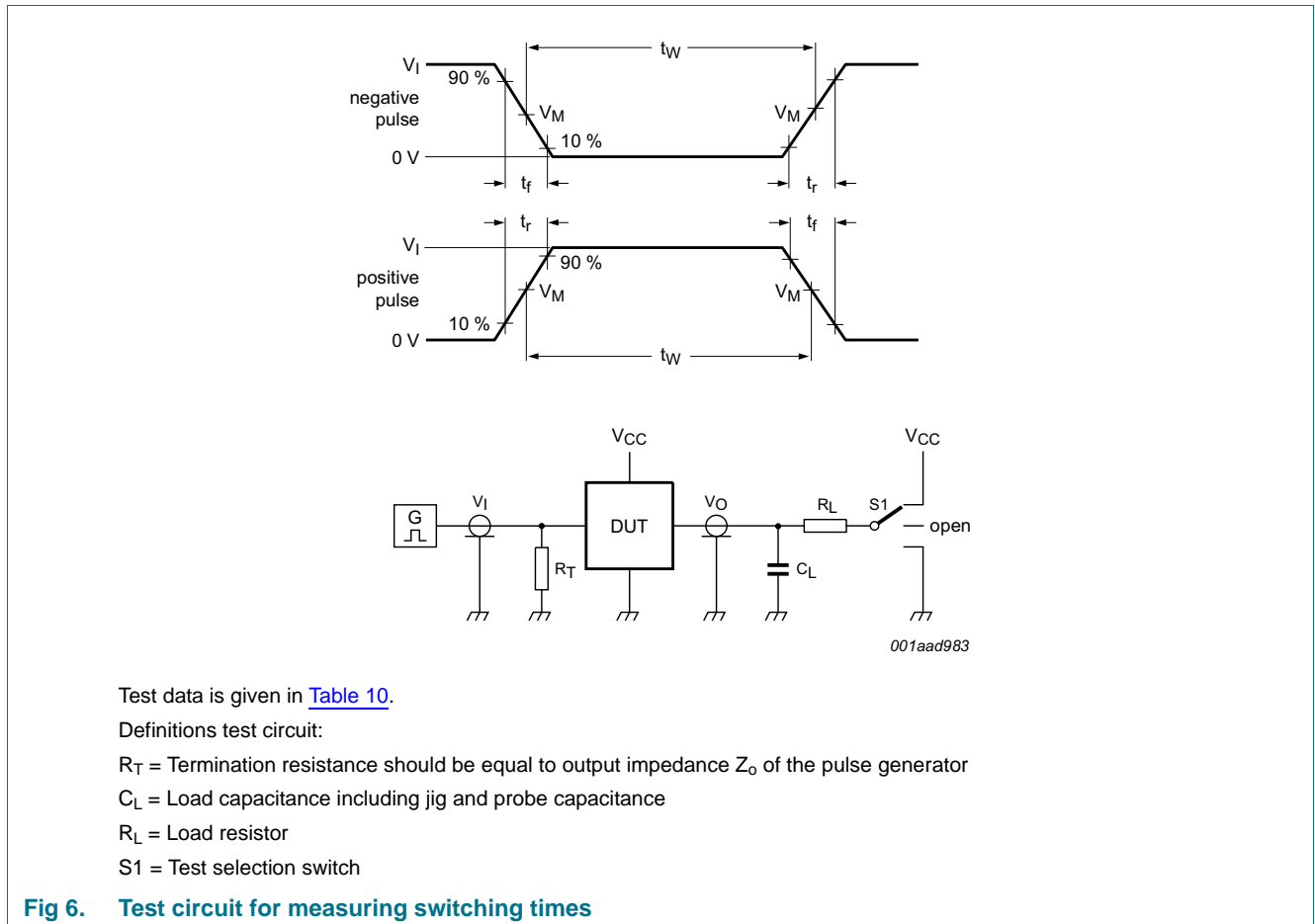


Fig 6. Test circuit for measuring switching times

Table 10. Test data

Input		Load		S1 position		
$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
GND to 3.0 V	3.0 ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$



12. Package outline

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

SOT360-1

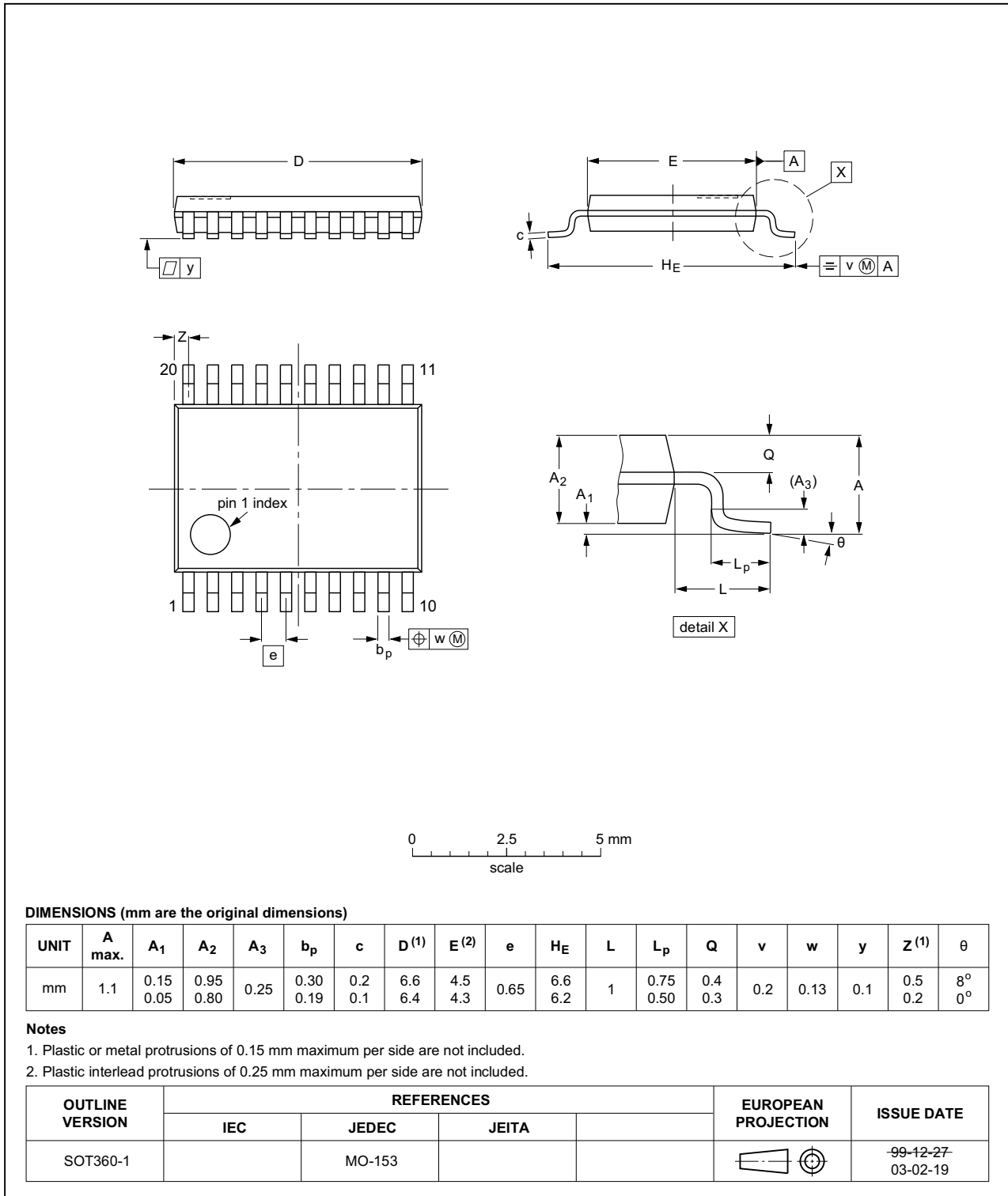


Fig 7. Package outline SOT360-1 (TSSOP20)

## 13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charge Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHCT245A v.2	20161026	Product data sheet	-	74AHCT245A v.1
Modifications:	• Type number 74AHCT245ABQ removed.			
74AHCT245A v.1	20160602	Product data sheet	-	-

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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.
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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