

74AHCT244A

Octal buffer/line driver; 3-state

Rev. 1 — 23 November 2016

Product data sheet

1. General description

The 74AHCT244A is an 8-bit buffer/line driver with 3-state outputs and TTL inputs. The device features two output enables ($\overline{1OE}$ and $\overline{2OE}$). A HIGH on \overline{nOE} causes the associated outputs to assume a high-impedance OFF-state.

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

- Direct interface with TTL levels
- Supply voltage range from 4.5 V to 5.5 V
- Typical t_{pd} of 2.8 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 150 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 | | | |
|--------------|-------------------|---------|--|----------|
| | Temperature range | Name | Description | Version |
| 74AHCT244APW | -40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |

4. Functional diagram

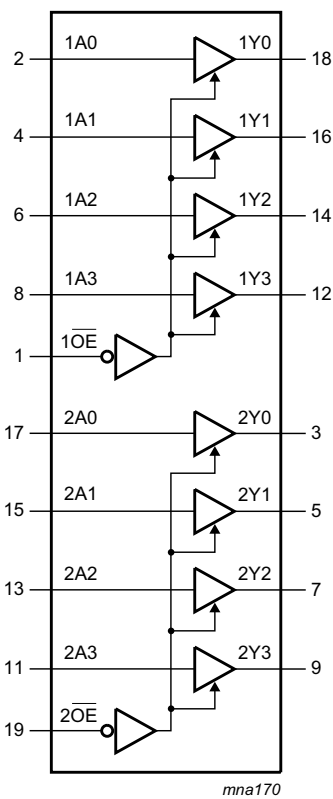


Fig 1. Logic symbol

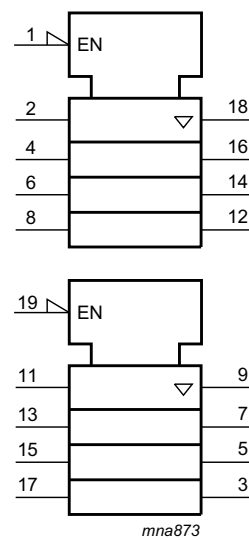


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning

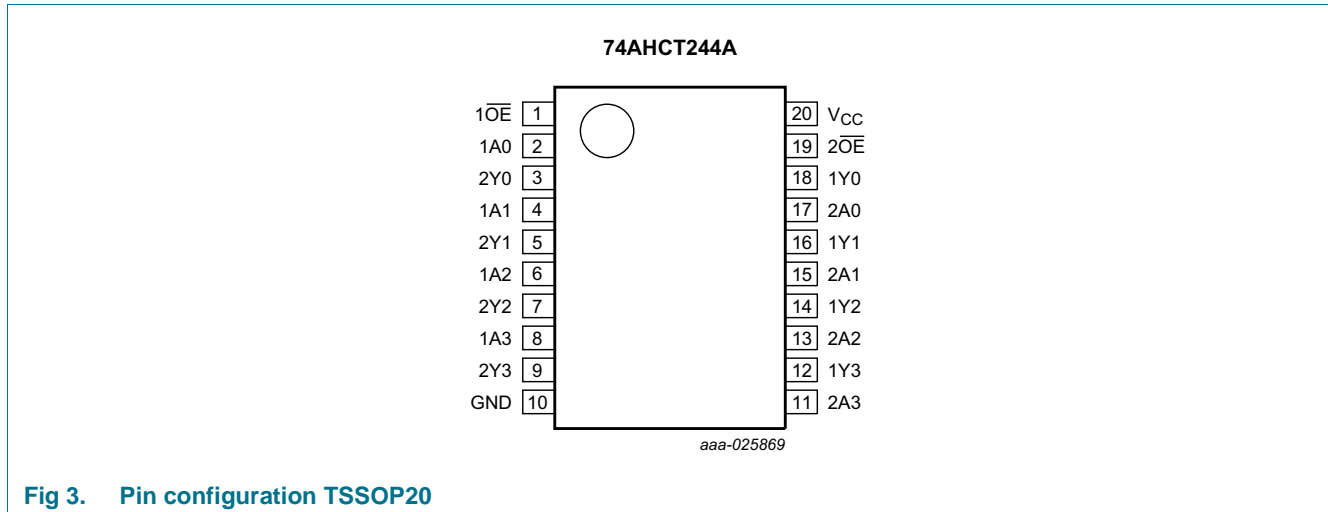


Fig 3. Pin configuration TSSOP20

5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-------------------------------------|----------------|----------------------------------|
| $\overline{1OE}$, $\overline{2OE}$ | 1, 19 | output enable input (active LOW) |
| 1A0, 1A1, 1A2, 1A3 | 2, 4, 6, 8 | data input |
| 2Y0, 2Y1, 2Y2, 2Y3 | 3, 5, 7, 9 | data output |
| GND | 10 | ground (0 V) |
| 2A0, 2A1, 2A2, 2A3 | 17, 15, 13, 11 | data input |
| 1Y0, 1Y1, 1Y2, 1Y3, | 18, 16, 14, 12 | data output |

6. Functional description

Table 3. Function table [1]

| Control | Input | Output |
|-------------------------|-------|--------|
| $\overline{\text{nOE}}$ | nAn | nYn |
| L | L | L |
| L | H | H |
| H | 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 | +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 | $V_I < 0$ V | -20 | - | mA |
| I_{OK} | output clamping current | $V_O < 0$ V | -20 | - | mA |
| I_O | output current | $V_O = 0$ V to V_{CC} | - | ± 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 | $T_{amb} = -40$ °C to +125 °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.

[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 | $V_I = V_{IH}$ 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 | $V_I = V_{IH}$ 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 | $V_{CC} = 5.5\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $V_O = \text{GND to }5.5\text{ V}$ | - | - | ± 0.25 | - | ± 2.5 | - | ± 2.5 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = \text{GND to }5.5\text{ V}$; $V_{CC} = 0\text{ V}$ | - | - | 0.5 | - | 5 | - | 5 | μA |
| I_I | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC} = 0\text{ V to }5.5\text{ V}$ | - | - | ± 0.1 | - | ± 1 | - | ± 1 | μA |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$ | - | - | 2 | - | 20 | - | 20 | μA |
| ΔI_{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 ^[1] | Max | Min | Max | Min | Max | |
| t _{pd} | propagation delay | nAn to nYn; see Figure 4 [2] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 2.8 | 7.4 | 1 | 8.5 | 1 | 9.5 | ns |
| | | C _L = 50 pF | - | 4.4 | 8.4 | 1 | 9.5 | 1 | 10.5 | ns |
| t _{en} | enable time | nOE to nYn; see Figure 5 | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.8 | 10.4 | 1 | 12 | 1 | 13 | ns |
| | | C _L = 50 pF | - | 5.4 | 11.4 | 1 | 13 | 1 | 14.5 | ns |
| t _{dis} | disable time | nOE to nYn; see Figure 5 [2] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 2.9 | 8 | 1 | 11 | 1 | 11 | ns |
| | | C _L = 50 pF | - | 5.1 | 11.4 | 1 | 13 | 1 | 14.5 | ns |
| t _{sk(o)} | skew | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF | - | - | 1 | - | 1 | - | 1 | ns |
| C _I | input capacitance | V _I = V _{CC} or GND; V _{CC} = 5 V | - | 2 | 6 | - | 6 | - | 6 | pF |
| C _O | output capacitance | V _O = V _{CC} or GND; V _{CC} = 5 V | - | 5 | - | - | - | - | - | pF |
| C _{PD} | power dissipation capacitance | per buffer; [3] C _L = 0 pF; f = 10 MHz; V _I = GND to V _{CC} | - | 8 | - | - | - | - | - | pF |

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 5 V.

[2] t_{pd} is the same as t_{PLH} and t_{PHL}.

t_{en} is the same as t_{PZL} and t_{PZH}.

t_{dis} is the same as t_{PLZ} and t_{PHZ}.

[3] C_{PD} is used to determine the dynamic power dissipation P_D (μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

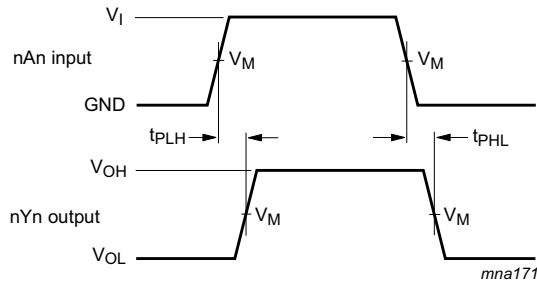
C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

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

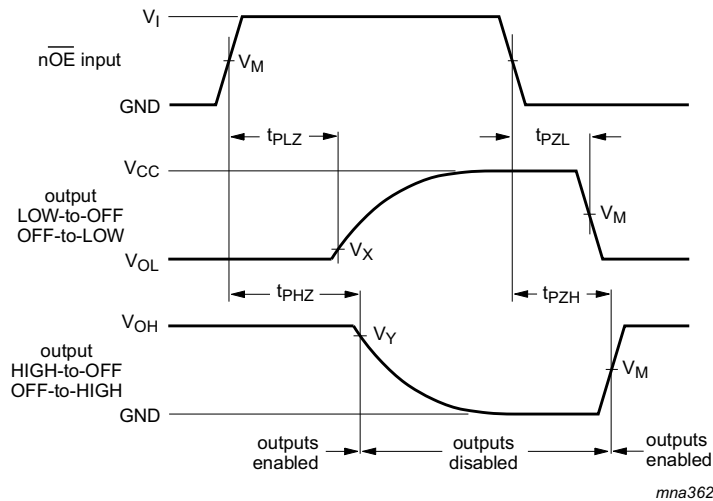
| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | Unit |
|--|---------------------------------------|------------|--------------------------|------|-----|------|
| | | | Min | Typ | Max | |
| V_{CC} = 5 V; C_L = 50 pF | | | | | | |
| V _{OL(p)} | LOW-level output voltage (peak) | | - | 0.5 | 1.5 | V |
| V _{OL(v)} | LOW-level output voltage (valley) | | -1.5 | -0.3 | - | V |
| V _{OH(v)} | HIGH-level output voltage (valley) | | - | 4.5 | - | V |
| V _{IH(AC)} | AC HIGH-level input voltage (dynamic) | | 2 | - | - | V |
| V _{IL(AC)} | AC LOW-level input voltage (dynamic) | | - | - | 0.8 | V |

11. Waveforms



Measurement points are given in [Table 9](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 4. Propagation delay input (nAn) to output (nYn)



Measurement points are given in [Table 9](#).
 V_{OL} and V_{OH} 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 | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |

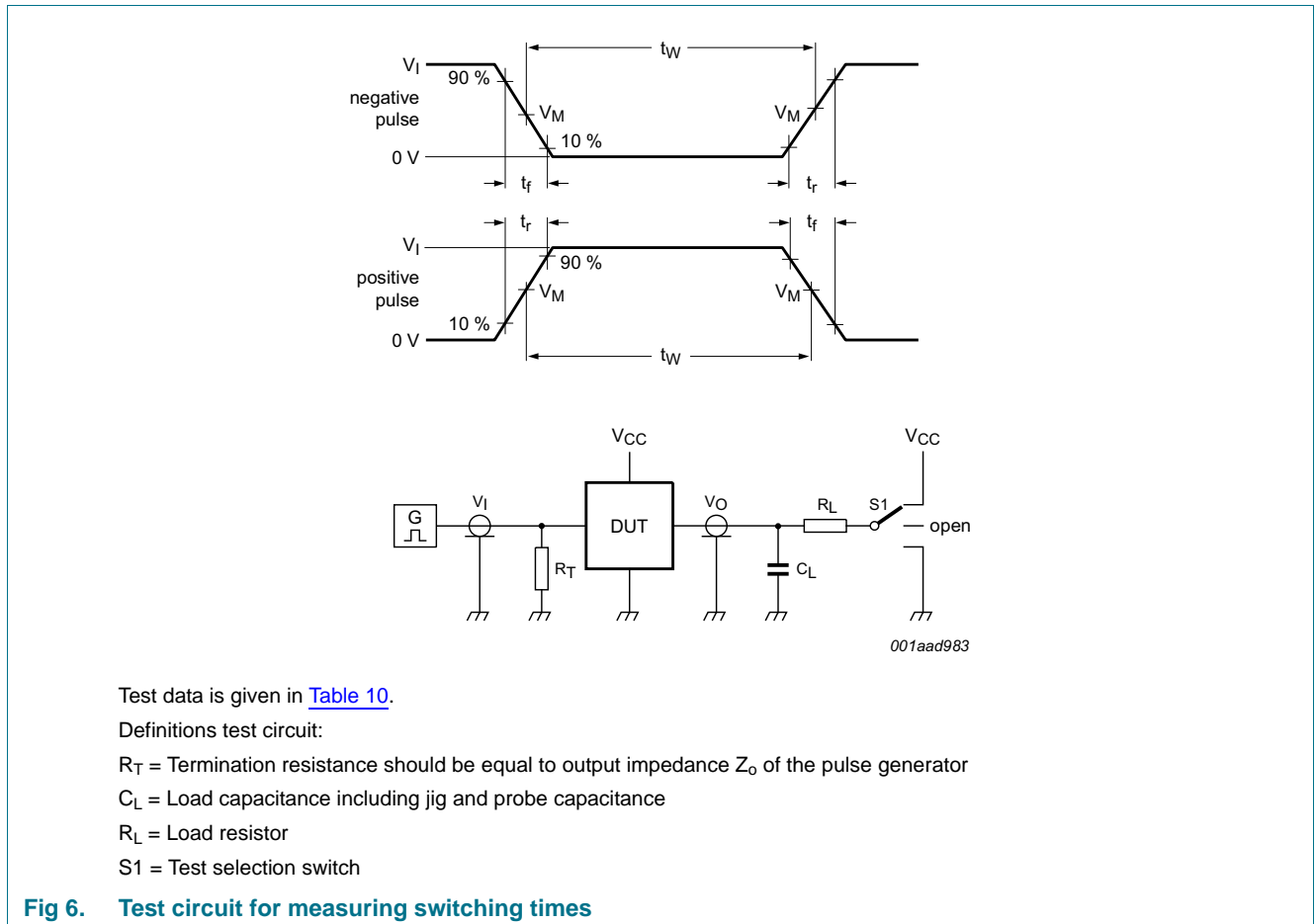


Fig 6. Test circuit for measuring switching times

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 kΩ | open | GND | V_{CC} |

12. Package outline

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

SOT360-1

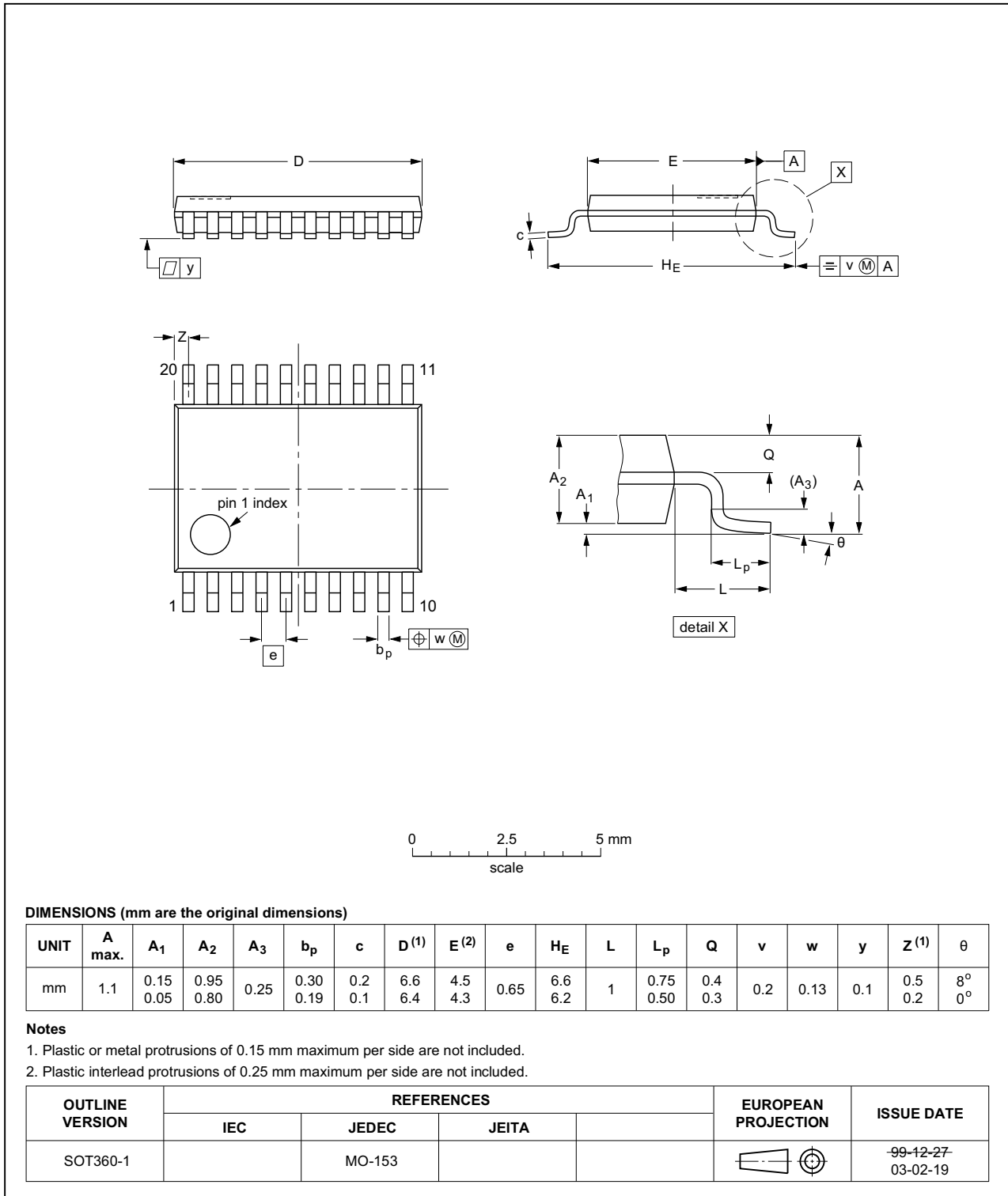


Fig 7. Package outline SOT360-1 (TSSOP20)

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 |
|----------------|--------------|--------------------|---------------|------------|
| 74AHCT244A v.1 | 20161123 | Product data sheet | - | - |

15. Legal information

15.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
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