



# 74AHC1G86; 74AHCT1G86

2-input EXCLUSIVE-OR gate

Rev. 7.1 — 11 October 2023

Product data sheet

## 1. General description

The 74AHC1G86; 74AHCT1G86 is a single 2-input EXCLUSIVE-OR gate. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

## 2. Features

- Wide supply voltage range from 2.0 to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- Symmetrical output impedance
- Balanced propagation delays
- Input levels:
  - For 74AHC1G86: CMOS level
  - For 74AHCT1G86: TTL level
- Multiple package options
- 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 +125 °C

## 3. Ordering information

Table 1. Ordering information

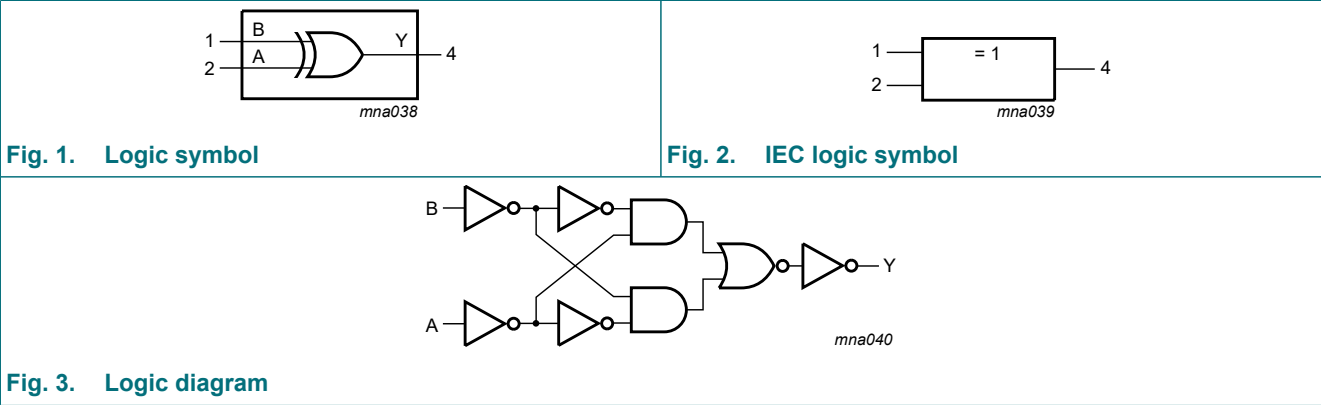
| Type number                                                 | Package           |        |                                                                           |                          |
|-------------------------------------------------------------|-------------------|--------|---------------------------------------------------------------------------|--------------------------|
|                                                             | Temperature range | Name   | Description                                                               | Version                  |
| <a href="#">74AHC1G86GW</a><br><a href="#">74AHCT1G86GW</a> | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads;<br>body width 1.25 mm | <a href="#">SOT353-1</a> |
| <a href="#">74AHC1G86GV</a><br><a href="#">74AHCT1G86GV</a> | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads                                  | <a href="#">SOT753</a>   |

## 4. Marking

Table 2. Marking codes

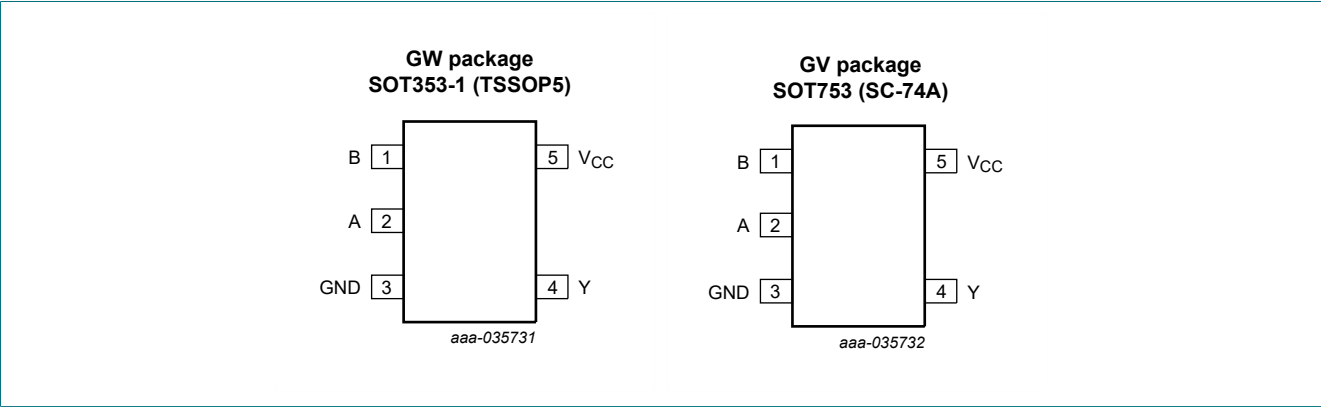
| Type number  | Marking code |
|--------------|--------------|
| 74AHC1G86GW  | AH           |
| 74AHCT1G86GW | CH           |
| 74AHC1G86GV  | A86          |
| 74AHCT1G86GV | C86          |

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

| Symbol          | Pin | Description    |
|-----------------|-----|----------------|
| B               | 1   | data input     |
| A               | 2   | data input     |
| GND             | 3   | ground (0 V)   |
| Y               | 4   | data output    |
| V <sub>CC</sub> | 5   | supply voltage |

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | L      |
| L      | H | H      |
| H      | L | H      |
| H      | H | L      |

8. Limiting values

Table 5. 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 | +7.0 | V    |
| V <sub>I</sub>   | input voltage           |                                                                         | -0.5 | +7.0 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V                                                 | -20  | -    | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V [1] | -    | ±20  | mA   |
| I <sub>O</sub>   | output current          | -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V                       | -    | ±25  | mA   |
| I <sub>CC</sub>  | supply current          |                                                                         | -    | 75   | mA   |
| I <sub>GND</sub> | ground current          |                                                                         | -75  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                         | -65  | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C [2]                                | -    | 250  | mW   |

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

[2] For SOT353-1 (TSSOP5) package: P<sub>tot</sub> derates linearly with 3.3 mW/K above 74 °C.  
For SOT753 (SC-74A) package: P<sub>tot</sub> derates linearly with 3.8 mW/K above 85 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

| Symbol           | Parameter                           | Conditions                      | 74AHC1G86 |     |                 | 74AHCT1G86 |     |                 | Unit |
|------------------|-------------------------------------|---------------------------------|-----------|-----|-----------------|------------|-----|-----------------|------|
|                  |                                     |                                 | Min       | Typ | Max             | Min        | Typ | Max             |      |
| V <sub>CC</sub>  | supply voltage                      |                                 | 2.0       | 5.0 | 5.5             | 4.5        | 5.0 | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                                 | 0         | -   | 5.5             | 0          | -   | 5.5             | V    |
| V <sub>O</sub>   | output voltage                      |                                 | 0         | -   | V <sub>CC</sub> | 0          | -   | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                                 | -40       | +25 | +125            | -40        | +25 | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 3.3 V ± 0.3 V | -         | -   | 100             | -          | -   | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 5.0 V ± 0.5 V | -         | -   | 20              | -          | -   | 20              | ns/V |

## 10. Static characteristics

**Table 7. 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  |      |
| 74AHC1G86       |                           |                                                                                        |       |     |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                                                | 1.5   | -   | -    | 1.5              | -    | 1.5               | -    | V    |
|                 |                           | V <sub>CC</sub> = 3.0 V                                                                | 2.1   | -   | -    | 2.1              | -    | 2.1               | -    | V    |
|                 |                           | V <sub>CC</sub> = 5.5 V                                                                | 3.85  | -   | -    | 3.85             | -    | 3.85              | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                                                | -     | -   | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                 |                           | V <sub>CC</sub> = 3.0 V                                                                | -     | -   | 0.9  | -                | 0.9  | -                 | 0.9  | V    |
|                 |                           | V <sub>CC</sub> = 5.5 V                                                                | -     | -   | 1.65 | -                | 1.65 | -                 | 1.65 | 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> = -50 µA; V <sub>CC</sub> = 2.0 V                                       | 1.9   | 2.0 | -    | 1.9              | -    | 1.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 3.0 V                                       | 2.9   | 3.0 | -    | 2.9              | -    | 2.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 4.5 V                                       | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V                                      | 2.58  | -   | -    | 2.48             | -    | 2.40              | -    | V    |
|                 |                           | I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V                                      | 3.94  | -   | -    | 3.8              | -    | 3.70              | -    | 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> = 50 µA; V <sub>CC</sub> = 2.0 V                                        | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 3.0 V                                        | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 4.5 V                                        | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V                                       | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
|                 |                           | I <sub>O</sub> = 8.0 mA; V <sub>CC</sub> = 4.5 V                                       | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>  | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V                          | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | µA   |
| I <sub>CC</sub> | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V | -     | -   | 1.0  | -                | 10   | -                 | 40   | µA   |
| C <sub>I</sub>  | input capacitance         |                                                                                        | -     | 1.5 | 10   | -                | 10   | -                 | 10   | pF   |
| 74AHCT1G86      |                           |                                                                                        |       |     |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V                                                       | 2.0   | -   | -    | 2.0              | -    | 2.0               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                       | -     | -   | 0.8  | -                | 0.8  | -                 | 0.8  | V    |
| V <sub>OH</sub> | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V          |       |     |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = -50 µA                                                                | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = -8.0 mA                                                               | 3.94  | -   | -    | 3.8              | -    | 3.70              | -    | V    |
| V <sub>OL</sub> | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V          |       |     |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = 50 µA                                                                 | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 8.0 mA                                                                | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>  | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V                          | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | µA   |
| I <sub>CC</sub> | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V | -     | -   | 1.0  | -                | 10   | -                 | 40   | µA   |

| Symbol          | Parameter                 | Conditions                                                                                         | 25 °C |     |      | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|-----------------|---------------------------|----------------------------------------------------------------------------------------------------|-------|-----|------|------------------|-----|-------------------|-----|------|
|                 |                           |                                                                                                    | Min   | Typ | Max  | Min              | Max | Min               | Max |      |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_I = 3.4$ V;<br>other inputs at $V_{CC}$ or GND;<br>$I_O = 0$ A; $V_{CC} = 5.5$ V | -     | -   | 1.35 | -                | 1.5 | -                 | 1.5 | mA   |
| $C_I$           | input capacitance         |                                                                                                    | -     | 1.5 | 10   | -                | 10  | -                 | 10  | pF   |

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

$GND = 0$  V;  $t_r = t_f = \leq 3.0$  ns. For waveform see Fig. 4. For test circuit see Fig. 5.

| Symbol          | Parameter                     | Conditions                                                                                 | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-----------------|-------------------------------|--------------------------------------------------------------------------------------------|-------|-----|------|------------------|------|-------------------|------|------|
|                 |                               |                                                                                            | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| 74AHC1G86       |                               |                                                                                            |       |     |      |                  |      |                   |      |      |
| t <sub>pd</sub> | propagation delay             | A and B to Y [1]                                                                           |       |     |      |                  |      |                   |      |      |
|                 |                               | V <sub>CC</sub> = 3.0 V to 3.6 V [2]                                                       |       |     |      |                  |      |                   |      |      |
|                 |                               | C <sub>L</sub> = 15 pF                                                                     | -     | 4.0 | 11.0 | 1.0              | 13.0 | 1.0               | 14.0 | ns   |
|                 |                               | C <sub>L</sub> = 50 pF                                                                     | -     | 5.8 | 14.5 | 1.0              | 16.5 | 1.0               | 18.5 | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V to 5.5 V [3]                                                       |       |     |      |                  |      |                   |      |      |
|                 |                               | C <sub>L</sub> = 15 pF                                                                     | -     | 3.4 | 6.8  | 1.0              | 8.0  | 1.0               | 8.5  | ns   |
|                 |                               | C <sub>L</sub> = 50 pF                                                                     | -     | 4.9 | 8.8  | 1.0              | 10.0 | 1.0               | 11.5 | ns   |
| C <sub>PD</sub> | power dissipation capacitance | per buffer; C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [4] | -     | 9   | -    | -                | -    | -                 | -    | pF   |
| 74AHCT1G86      |                               |                                                                                            |       |     |      |                  |      |                   |      |      |
| t <sub>pd</sub> | propagation delay             | A and B to Y [1]                                                                           |       |     |      |                  |      |                   |      |      |
|                 |                               | V <sub>CC</sub> = 4.5 V to 5.5 V [3]                                                       |       |     |      |                  |      |                   |      |      |
|                 |                               | C <sub>L</sub> = 15 pF                                                                     | -     | 3.5 | 6.9  | 1.0              | 8.0  | 1.0               | 9.0  | ns   |
|                 |                               | C <sub>L</sub> = 50 pF                                                                     | -     | 5.0 | 7.9  | 1.0              | 9.0  | 1.0               | 10.5 | ns   |
| C <sub>PD</sub> | power dissipation capacitance | per buffer; C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [4] | -     | 11  | -    | -                | -    | -                 | -    | pF   |

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

[2] Typical values are measured at  $V_{CC} = 3.3$  V.

[3] Typical values are measured at  $V_{CC} = 5.0$  V.

[4]  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu$ W).

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

11.1. Waveform and test circuit

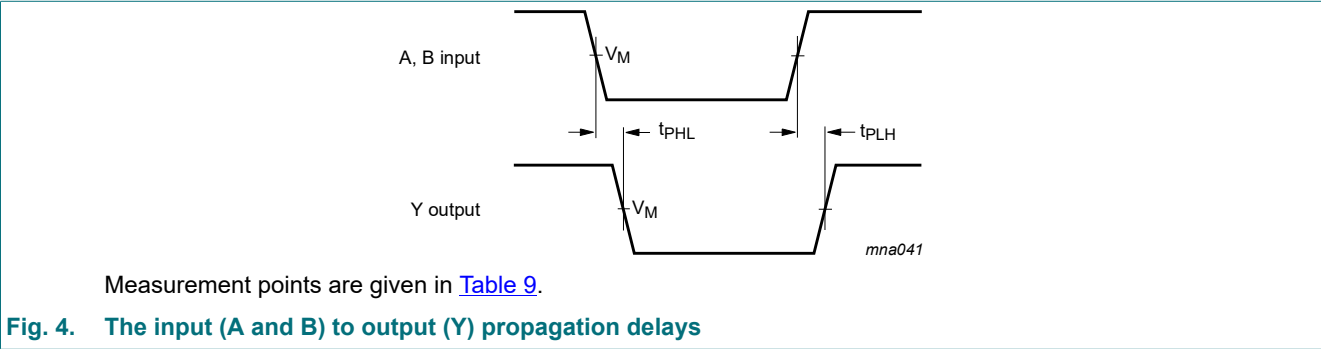
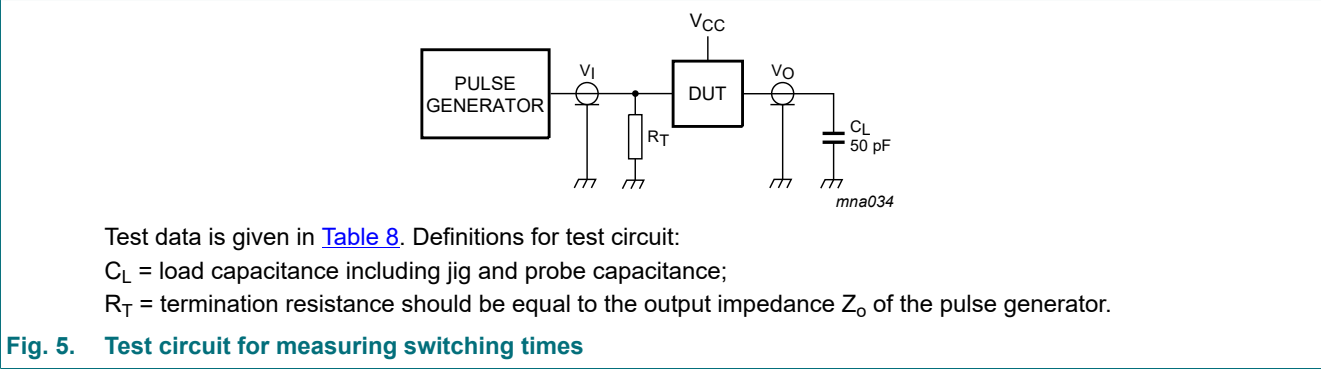


Table 9. Measurement points

| Type       | Input           |                     | Output              |
|------------|-----------------|---------------------|---------------------|
|            | $V_I$           | $V_M$               | $V_M$               |
| 74AHC1G86  | GND to $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 74AHCT1G86 | GND to 3.0 V    | 1.5 V               | $0.5 \times V_{CC}$ |



12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

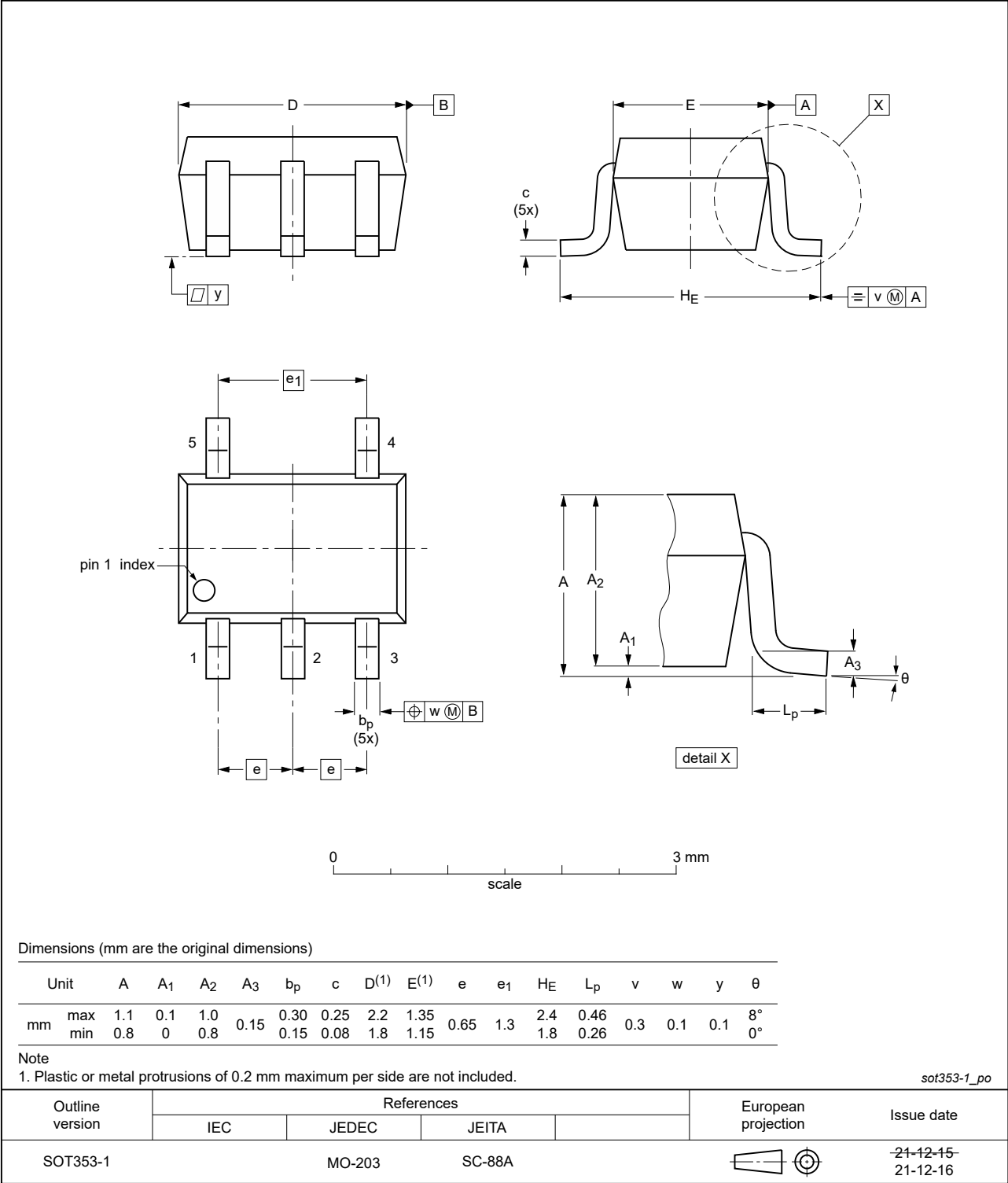


Fig. 6. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

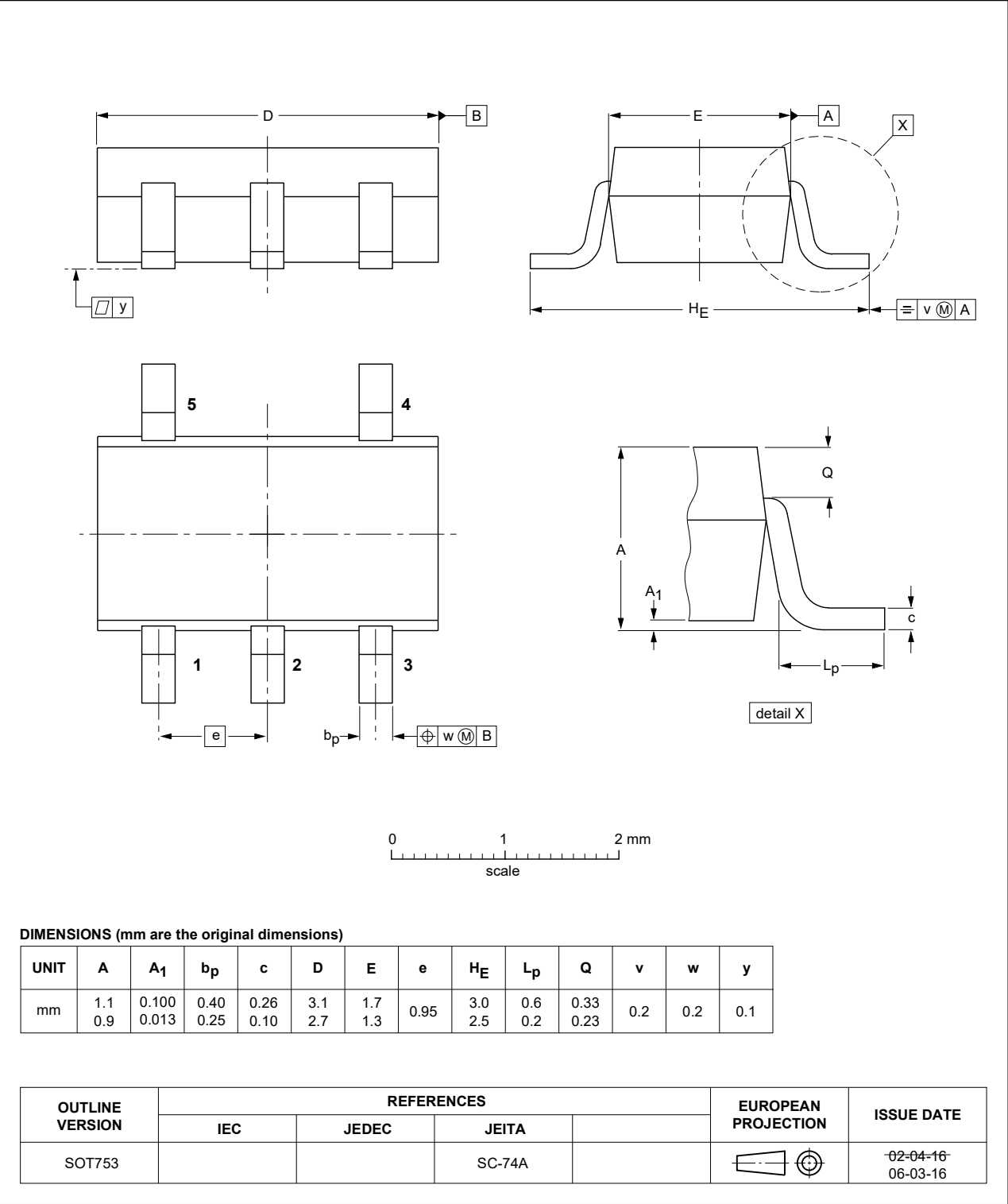


Fig. 7. Package outline SOT753 (SC-74A)



## 13. Abbreviations

Table 10. Abbreviations

| Acronym | Description                 |
|---------|-----------------------------|
| CDM     | Charged Device Model        |
| DUT     | Device Under Test           |
| ESD     | ElectroStatic Discharge     |
| HBM     | Human Body Model            |
| TTL     | Transistor-Transistor Logic |

## 14. Revision history

Table 11. Revision history

| Document ID          | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data sheet status     | Change notice | Supersedes           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|----------------------|
| 74AHC_AHCT1G86 v.7.1 | 20231011                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet    | -             | 74AHC_AHCT1G86 v.6   |
| Modifications:       | <ul style="list-style-type: none"> <li><a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li> </ul>                                                                                                                                                                                                                                                                                                                                                    |                       |               |                      |
| 74AHC_AHCT1G86 v.6   | 20220111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet    | -             | 74AHC_AHCT1G86 v.5   |
| 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 1</a> and <a href="#">Section 2</a> updated.</li> <li>SOT353-1 (TSSOP5) package outline drawing has changed.</li> <li><a href="#">Section 8</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul> |                       |               |                      |
| 74AHC_AHCT1G86 v.5   | 20070704                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet    | -             | 74AHC_AHCT1G86 v.4   |
| 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>Package SOT353 changed to SOT353-1 in <a href="#">Section 3</a> and <a href="#">Section 12</a>.</li> <li>Quick reference data and Soldering sections removed.</li> </ul>                                                                    |                       |               |                      |
| 74AHC_AHCT1G86 v.4   | 20020606                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | 74AHC_AHCT1G86 v.3   |
| 74AHC_AHCT1G86 v.3   | 20020218                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | 74AHC_AHCT1G86 v.2   |
| 74AHC_AHCT1G86 v.2   | 20010406                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | 74AHC1G_AHCT1G86 v.1 |
| 74AHC1G_AHCT1G86 v.1 | 19990920                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | -                    |

## 15. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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