

# 74AHC1G07

Buffer with open-drain output

Rev. 8 — 25 February 2019

Product data sheet

## 1. General description

74AHC1G07 is a high-speed Si-gate CMOS device. It provides a non-inverting buffer.

The output of this device is open-drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions. For digital operation this device must have a pull-up resistor to establish a logic HIGH-level.

The 74AHC1G07 has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

## 2. Features and benefits

- High noise immunity
- Low power dissipation
- ESD protection:
  - HBM JESD22-A114E: exceeds 2000 V
  - MM JESD22-A115-A: exceeds 200 V
  - CDM JESD22-C101C: 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  |
| 74AHC1G07GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AHC1G07GV | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads                               | SOT753   |

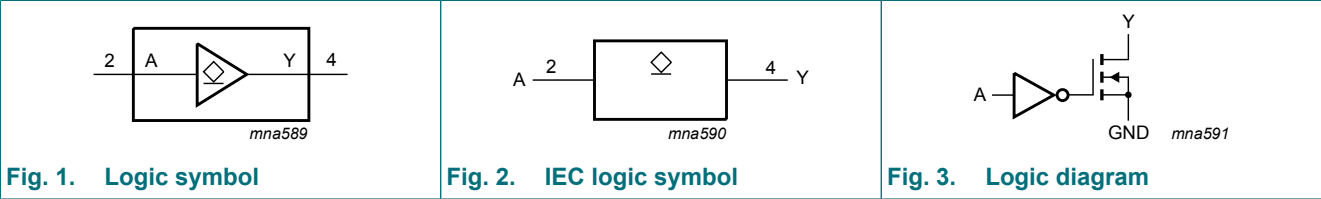
## 4. Marking

Table 2. Marking codes

| Type number | Marking [1] |
|-------------|-------------|
| 74AHC1G07GW | AS          |
| 74AHC1G07GV | A07         |

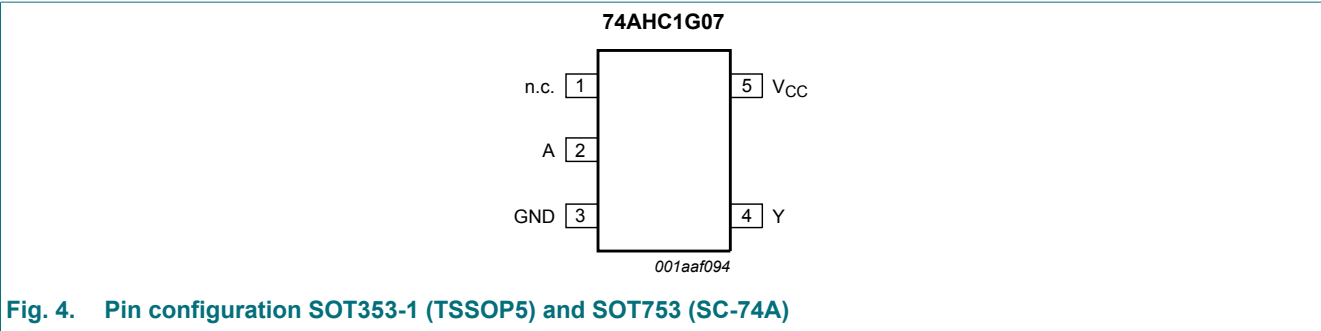
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

| Symbol          | Pin | Description    |
|-----------------|-----|----------------|
| n.c.            | 1   | not connected  |
| 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; Z = high-impedance OFF-state

| Input | Output |
|-------|--------|
| A     | Y      |
| L     | L      |
| H     | Z      |

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter               | Conditions                        | Min  | Max  | Unit |
|-----------|-------------------------|-----------------------------------|------|------|------|
| $V_{CC}$  | supply voltage          |                                   | -0.5 | +7.0 | V    |
| $V_I$     | input voltage           |                                   | -0.5 | +7.0 | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5$ V                    | -20  | -    | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5$ V [1]                | -    | ±20  | mA   |
| $I_O$     | output current          | $V_O > -0.5$ V                    | -    | ±25  | mA   |
| $V_O$     | output voltage          | active mode [1]                   | -0.5 | +7.0 | V    |
|           |                         | high-impedance mode [1]           | -0.5 | +7.0 | V    |
| $I_{CC}$  | 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 [2] | -    | 250  | mW   |

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

[2] For both TSSOP5 and SC-74A packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol              | Parameter                           | Conditions               | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|--------------------------|-----|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                          | 2.0 | 5.0 | 5.5      | V    |
| $V_I$               | input voltage                       |                          | 0   | -   | 5.5      | V    |
| $V_O$               | output voltage                      | active mode              | 0   | -   | $V_{CC}$ | V    |
|                     |                                     | high-impedance mode      | 0   | -   | 6.0      | V    |
| $T_{amb}$           | ambient temperature                 |                          | -40 | +25 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 3.3$ V ± 0.3 V | -   | -   | 100      | ns/V |
|                     |                                     | $V_{CC} = 5.0$ V ± 0.5 V | -   | -   | 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  |      |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC} = 2.0$ V | 1.5   | -   | -    | 1.5              | -    | 1.5               | -    | V    |
|          |                          | $V_{CC} = 3.0$ V | 2.1   | -   | -    | 2.1              | -    | 2.1               | -    | V    |
|          |                          | $V_{CC} = 5.5$ V | 3.85  | -   | -    | 3.85             | -    | 3.85              | -    | V    |
| $V_{IL}$ | LOW-level input voltage  | $V_{CC} = 2.0$ V | -     | -   | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|          |                          | $V_{CC} = 3.0$ V | -     | -   | 0.9  | -                | 0.9  | -                 | 0.9  | V    |
|          |                          | $V_{CC} = 5.5$ V | -     | -   | 1.65 | -                | 1.65 | -                 | 1.65 | 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 <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;<br>V <sub>CC</sub> = 0 V to 5.5 V                                                          | -     | -   | 0.1   | -                | 1.0  | -                 | 2.0   | µA   |
| I <sub>OZ</sub> | OFF-state output current | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V | -     | -   | ±0.25 |                  | ±2.5 |                   | ±10.0 | µA   |
| I <sub>CC</sub> | supply current           | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V                                 | -     | -   | 1.0   | -                | 10   | -                 | 20    | µA   |
| C <sub>I</sub>  | 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 test circuit see Fig. 6.

| Symbol           | Parameter                          | Conditions                                                                                 | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|------------------|------------------------------------|--------------------------------------------------------------------------------------------|-------|-----|------|------------------|------|-------------------|------|------|
|                  |                                    |                                                                                            | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| t <sub>PZL</sub> | OFF-state to LOW propagation delay | A to Y; see Fig. 5                                                                         |       |     |      |                  |      |                   |      |      |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF [1]                               | -     | 3.5 | 5.6  | 1.0              | 6.3  | 1.0               | 7.0  | ns   |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 50 pF [1]                               | -     | 5.0 | 8.0  | 1.0              | 9.0  | 1.0               | 10.0 | ns   |
|                  |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF [2]                               | -     | 2.5 | 3.9  | 1.0              | 4.6  | 1.0               | 4.9  | ns   |
| t <sub>PLZ</sub> | LOW to OFF-state propagation delay | A to Y; see Fig. 5                                                                         |       |     |      |                  |      |                   |      |      |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF [1]                               | -     | 5.8 | 7.9  | 1.0              | 8.4  | 1.0               | 8.9  | ns   |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 50 pF [1]                               | -     | 8.3 | 11.5 | 1.0              | 12.0 | 1.0               | 12.5 | ns   |
|                  |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF [2]                               | -     | 4.2 | 5.1  | 1.0              | 5.6  | 1.0               | 6.1  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance      | V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF [2]                               | -     | 6.0 | 7.5  | 1.0              | 8.0  | 1.0               | 8.5  | ns   |
|                  |                                    | per buffer; C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [3] | -     | 5   | -    | -                | -    | -                 | -    | pF   |

[1] Typical values are measured at V<sub>CC</sub> = 3.3 V.

[2] Typical values are measured at V<sub>CC</sub> = 5.0 V.

[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

11.1. Waveforms and test circuit

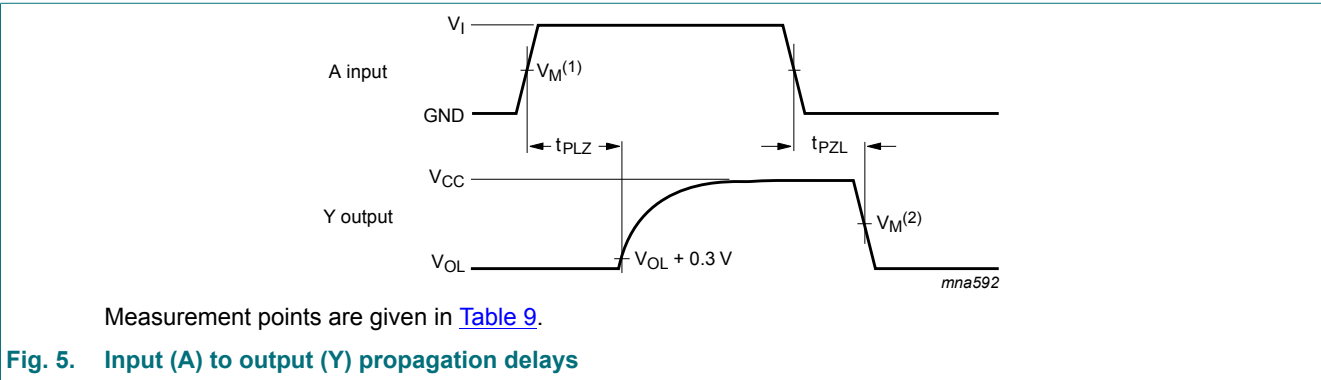
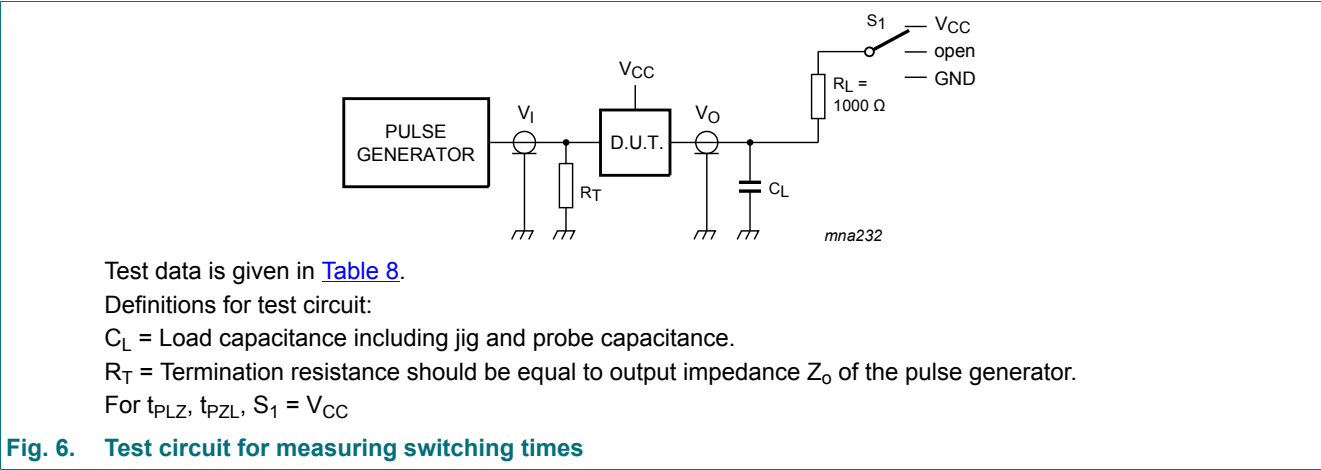


Table 9. Measurement point

| Input           |                     | Output              |
|-----------------|---------------------|---------------------|
| $V_I$           | $V_M^{(1)}$         | $V_M^{(2)}$         |
| GND to $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |



12. Package outline

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

SOT353-1

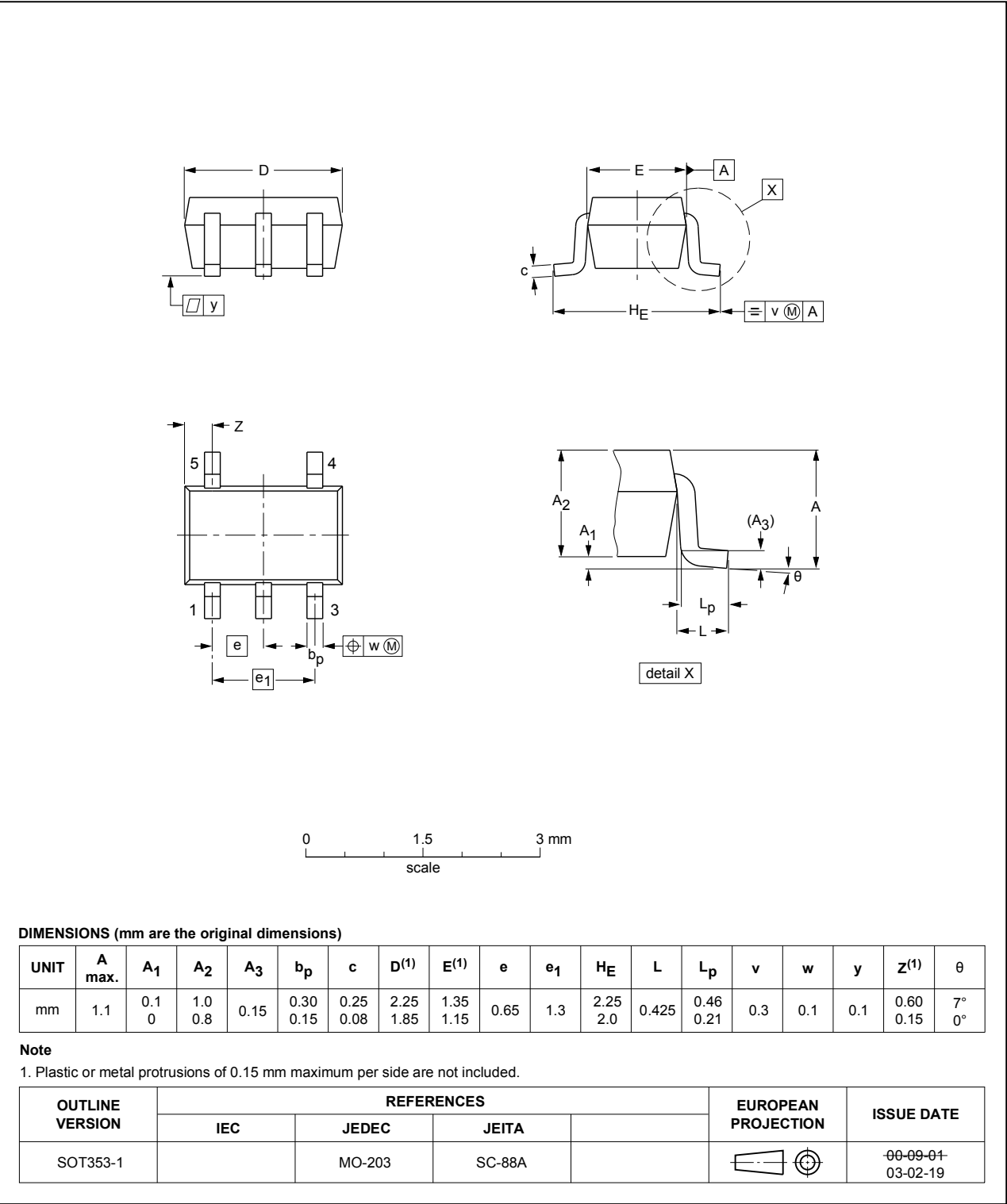


Fig. 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

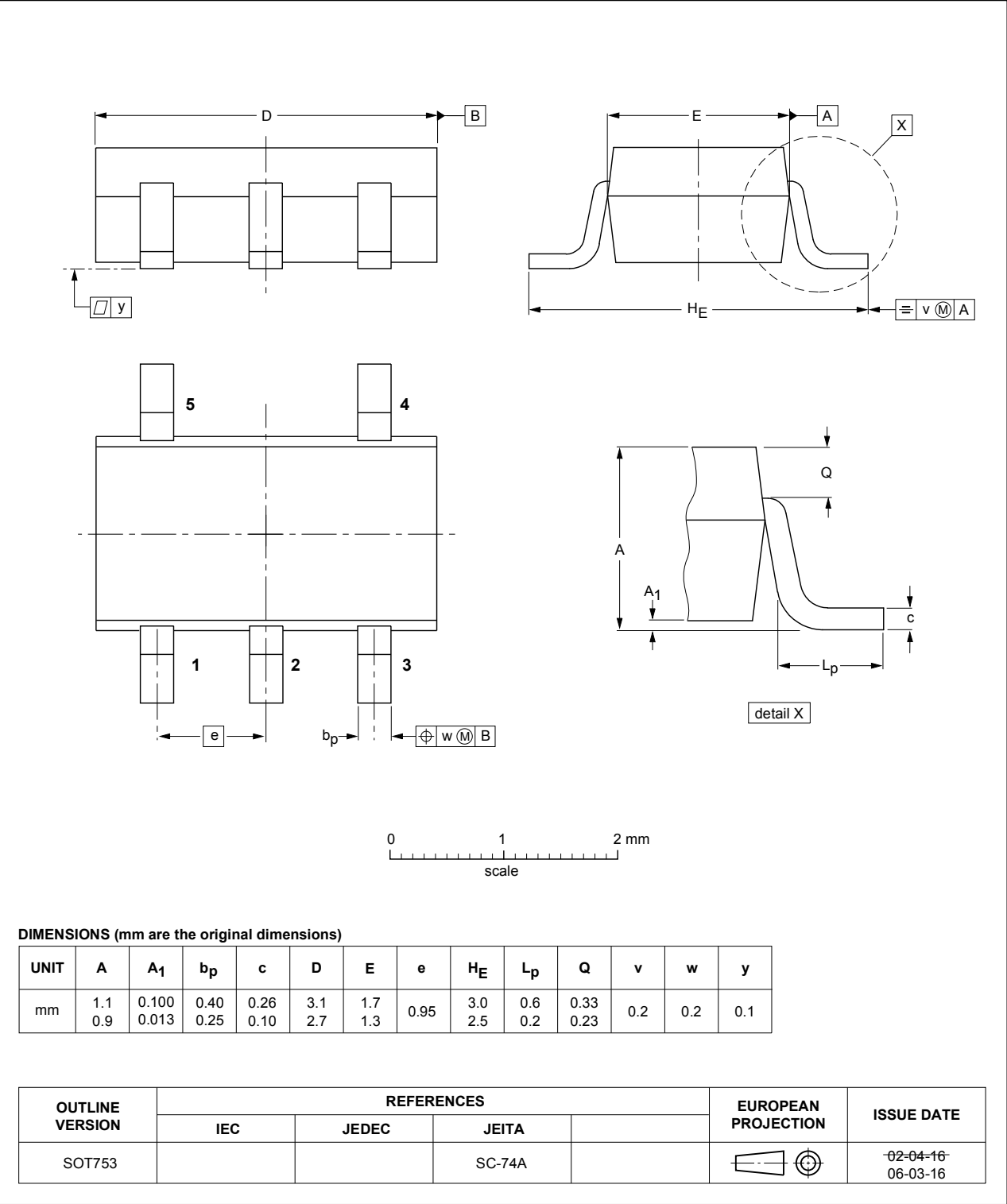


Fig. 8. Package outline SOT753 (SC-74A)

## 13. Abbreviations

Table 10. Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CDM     | Charged Device Model                    |
| CMOS    | Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                       |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| MM      | Machine Model                           |

## 14. Revision history

Table 11. Revision history

| Document ID        | Release date                                                                                                                                                                                                                                                                                                                                                                                                                   | Data sheet status     | Change notice | Supersedes         |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------------------|
| 74AHC1G07 v.8      | 20190225                                                                                                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74AHC_AHCT1G07 v.7 |
| 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>Type numbers 74AHCT1G07GW (SOT353-1) and 74AHCT1G07GV (SOT753) removed.</li> </ul>                                                                                                     |                       |               |                    |
| 74AHC_AHCT1G07 v.7 | 20141118                                                                                                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74AHC_AHCT1G07 v.6 |
| Modifications:     | <ul style="list-style-type: none"> <li><a href="#">Section 4</a>: table note added.</li> </ul>                                                                                                                                                                                                                                                                                                                                 |                       |               |                    |
| 74AHC_AHCT1G07 v.6 | 20070607                                                                                                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74AHC_AHCT1G07 v.5 |
| 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_AHCT1G07 v.5 | 20021002                                                                                                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74AHC_AHCT1G07 v.4 |
| 74AHC_AHCT1G07 v.4 | 20020606                                                                                                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74AHC_AHCT1G07 v.3 |
| 74AHC_AHCT1G07 v.3 | 20020221                                                                                                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74AHC_AHCT1G07 v.2 |
| 74AHC_AHCT1G07 v.2 | 20010209                                                                                                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74AHC_AHCT1G07 v.1 |
| 74AHC_AHCT1G07 v.1 | 20000502                                                                                                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | -                  |



## 15. Legal information

### Data sheet status

| Document status<br>[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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