

# 74AHC1G79; 74AHCT1G79

Single D-type flip-flop; positive-edge trigger

Rev. 6 — 23 September 2014

Product data sheet

## 1. General description

74AHC1G79 and 74AHCT1G79 are high-speed Si-gate CMOS devices. They provide a single positive-edge triggered D-type flip-flop.

Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up time prior to the LOW-to-HIGH clock transition for predictable operation.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

## 2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- SOT353-1 and SOT753 package options
- ESD protection:
  - ◆ HBM JESD22-A114F: 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  |
| 74AHC1G79GW  | –40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads;<br>body width 1.25 mm | SOT353-1 |
| 74AHCT1G79GW |                   |        |   |          |
| 74AHC1G79GV  | –40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads                                  | SOT753   |
| 74AHCT1G79GV |                   |        |   |          |

## 4. Marking

Table 2. Marking codes

| Type number  | Marking <sup>[1]</sup> |
|--------------|------------------------|
| 74AHC1G79GW  | AP                     |
| 74AHC1G79GV  | A79                    |
| 74AHCT1G79GW | CP                     |
| 74AHCT1G79GV | C79                    |

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

## 5. Functional diagram

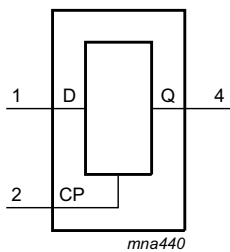


Fig 1. Logic symbol

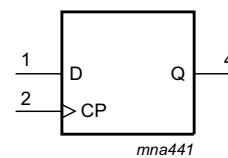


Fig 2. IEC logic symbol

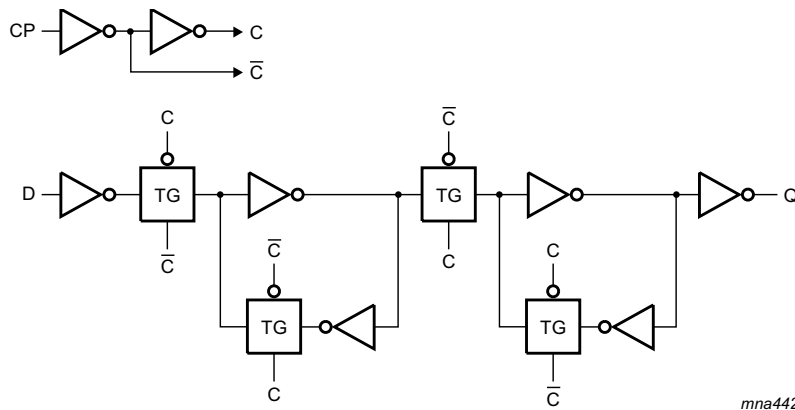


Fig 3. Logic diagram

## 6. Pinning information

### 6.1 Pinning

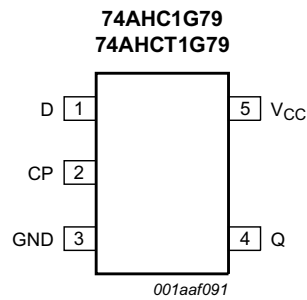


Fig 4. Pin configuration

### 6.2 Pin description

Table 3. Pin description

| Symbol          | Pin | Description       |
|-----------------|-----|-------------------|
| D               | 1   | data input        |
| CP              | 2   | clock pulse input |
| GND             | 3   | ground (0 V)      |
| Q               | 4   | data output       |
| V <sub>CC</sub> | 5   | supply voltage    |

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

| Inputs |   | Output |
|--------|---|--------|
| CP     | D | Q + 1  |
| ↑      | L | L      |
| ↑      | H | H      |
| L      | X | Q      |

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 ↑ = LOW-to-HIGH CP transition;  
 X = don't care;  
 Q + 1 = state after the next LOW-to-HIGH CP transition.

## 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 |
|-----------|-------------------------|--|------|------|------|
| $V_{CC}$  | 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 or $V_O > V_{CC} + 0.5$ V <a href="#">[1]</a> | -    | ±20  | mA   |
| $I_O$     | output current          | $-0.5$ V < $V_O$ < $V_{CC} + 0.5$ V                          | -    | ±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 <a href="#">[2]</a>            | -    | 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               | 74AHC1G79 |     |          | 74AHCT1G79 |     |          | Unit |
|---------------------|-------------------------------------|--------------------------|-----------|-----|----------|------------|-----|----------|------|
|                     |                                     |                          | Min       | Typ | Max      | Min        | Typ | Max      |      |
| $V_{CC}$            | supply voltage                      |                          | 2.0       | 5.0 | 5.5      | 4.5        | 5.0 | 5.5      | V    |
| $V_I$               | input voltage                       |                          | 0         | -   | 5.5      | 0          | -   | 5.5      | V    |
| $V_O$               | output voltage                      |                          | 0         | -   | $V_{CC}$ | 0          | -   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                          | -40       | +25 | +125     | -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       | -          | -   | 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  |      |
| <b>For type 74AHC1G79</b> |                          |                  |       |     |      |                  |      |                   |      |      |
| $V_{IH}$                  | 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    |

**Table 7. Static characteristics ...continued**  
 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 <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;<br>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;<br>V <sub>CC</sub> = 5.5 V  | -     | -   | 1.0  | -                | 10   | -                 | 40   | μA   |
| C <sub>I</sub>             | input capacitance         |  | -     | 1.5 | 10   | -                | 10   | -                 | 10   | pF   |
| <b>For type 74AHCT1G79</b> |                           |  |       |     |      |                  |      |                   |      |      |
| 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;<br>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;<br>V <sub>CC</sub> = 5.5 V  | -     | -   | 1.0  | -                | 10   | -                 | 40   | μA   |
| ΔI <sub>CC</sub>           | additional supply current | per input pin; V <sub>I</sub> = 3.4 V;<br>other inputs at V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V | -     | -   | 1.35 | -                | 1.5  | -                 | 1.5  | mA   |
| 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 [Figure 6](#). For waveforms see [Figure 5](#).*

| Symbol                     | Parameter                     | Conditions  | 25 °C |      |      | −40 °C to +85 °C |      | −40 °C to +125 °C |      | Unit |
|----------------------------|-------------------------------|---|-------|------|------|------------------|------|-------------------|------|------|
|                            |                               |   | Min   | Typ  | Max  | Min              | Max  | Min               | Max  |      |
| <b>For type 74AHC1G79</b>  |                               |   |       |      |      |                  |      |                   |      |      |
| $t_{pd}$                   | propagation delay             | CP to Q <a href="#">[1]</a>   |       |      |      |                  |      |                   |      |      |
|                            |                               | $V_{CC} = 3.0$ V to 3.6 V <a href="#">[2]</a>   |       |      |      |                  |      |                   |      |      |
|                            |                               | $C_L = 15$ pF   | -     | 4.9  | 8.4  | 1.0              | 9.8  | 1.0               | 11.5 | ns   |
|                            |                               | $C_L = 50$ pF   | -     | 6.9  | 12.0 | 1.0              | 14.0 | 1.0               | 15.5 | ns   |
|                            |                               | $V_{CC} = 4.5$ V to 5.5 V <a href="#">[3]</a>   |       |      |      |                  |      |                   |      |      |
|                            |                               | $C_L = 15$ pF   | -     | 3.5  | 5.6  | 1.0              | 7.0  | 1.0               | 8.0  | ns   |
|                            |                               | $C_L = 50$ pF   | -     | 5.1  | 8.0  | 1.0              | 10.0 | 1.0               | 11.0 | ns   |
| $t_{su}$                   | set-up time                   | D to CP   | 3.0   | 1.0  | -    | 3.0              | -    | 4.0               | -    | ns   |
| $t_h$                      | hold time                     | D to CP   | +2.0  | -1.0 | -    | 2.0              | -    | 3.0               | -    | ns   |
| $t_W$                      | pulse width                   | clock HIGH or LOW   | 3.0   | -    | -    | 3.0              | -    | 4.0               | -    | ns   |
| $f_{max}$                  | maximum frequency             |   | 90    | -    | -    | 90               | -    | 70                | -    | MHz  |
| $C_{PD}$                   | power dissipation capacitance | per buffer;<br>$C_L = 50$ pF; $f = 1$ MHz;<br>$V_I = GND$ to $V_{CC}$ <a href="#">[4]</a> | -     | 15   | -    | -                | -    | -                 | -    | pF   |
| <b>For type 74AHCT1G79</b> |                               |   |       |      |      |                  |      |                   |      |      |
| $t_{pd}$                   | propagation delay             | CP to Q <a href="#">[1]</a>   |       |      |      |                  |      |                   |      |      |
|                            |                               | $V_{CC} = 4.5$ V to 5.5 V <a href="#">[3]</a>   |       |      |      |                  |      |                   |      |      |
|                            |                               | $C_L = 15$ pF   | -     | 3.5  | 5.0  | 1.0              | 6.0  | 1.0               | 8.0  | ns   |
|                            |                               | $C_L = 50$ pF   | -     | 5.0  | 8.0  | 1.0              | 10.0 | 1.0               | 11.0 | ns   |
| $t_{su}$                   | set-up time                   | D to CP   | 3.0   | 1.0  | -    | 3.0              | -    | 4.0               | -    | ns   |
| $t_h$                      | hold time                     | D to CP   | +2.0  | -1.0 | -    | 2.0              | -    | 3.0               | -    | ns   |
| $t_W$                      | pulse width                   | clock HIGH or LOW   | 3.0   | -    | -    | 3.0              | -    | 4.0               | -    | ns   |
| $f_{max}$                  | maximum frequency             |   | 90    | -    | -    | 90               | -    | 70                | -    | MHz  |
| $C_{PD}$                   | power dissipation capacitance | per buffer;<br>$C_L = 50$ pF; $f = 1$ MHz;<br>$V_I = GND$ to $V_{CC}$ <a href="#">[4]</a> | -     | 16   | -    | -                | -    | -                 | -    | 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).

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

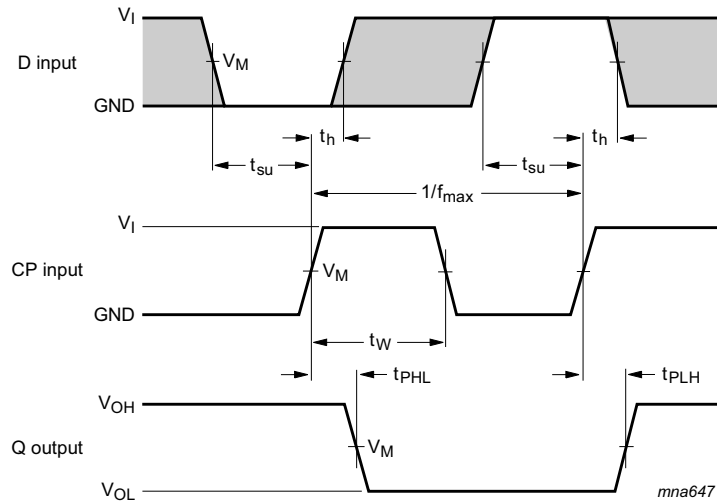
$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in Volts.

## 12. Waveforms



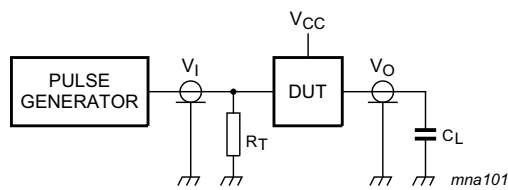
Measurement points are given in [Table 9](#).

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

**Fig 5. Clock (CP) to output (Q) propagation delay times, clock pulse width, D to set-up times, the CP to D hold times and maximum clock pulse frequency**

**Table 9. Measurement points**

| Type       | Inputs          |                     | Output              |
|------------|-----------------|---------------------|---------------------|
|            | $V_I$           | $V_M$               | $V_M$               |
| 74AHC1G79  | GND to $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 74AHCT1G79 | GND to 3.0 V    | 1.5 V               | $0.5 \times V_{CC}$ |



Test data is given in [Table 8](#). Definitions for test circuit:

$C_L$  = Load capacitance including jig and probe capacitance.

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

**Fig 6. Test circuit for measuring switching times**

## 13. Package outline

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

SOT353-1

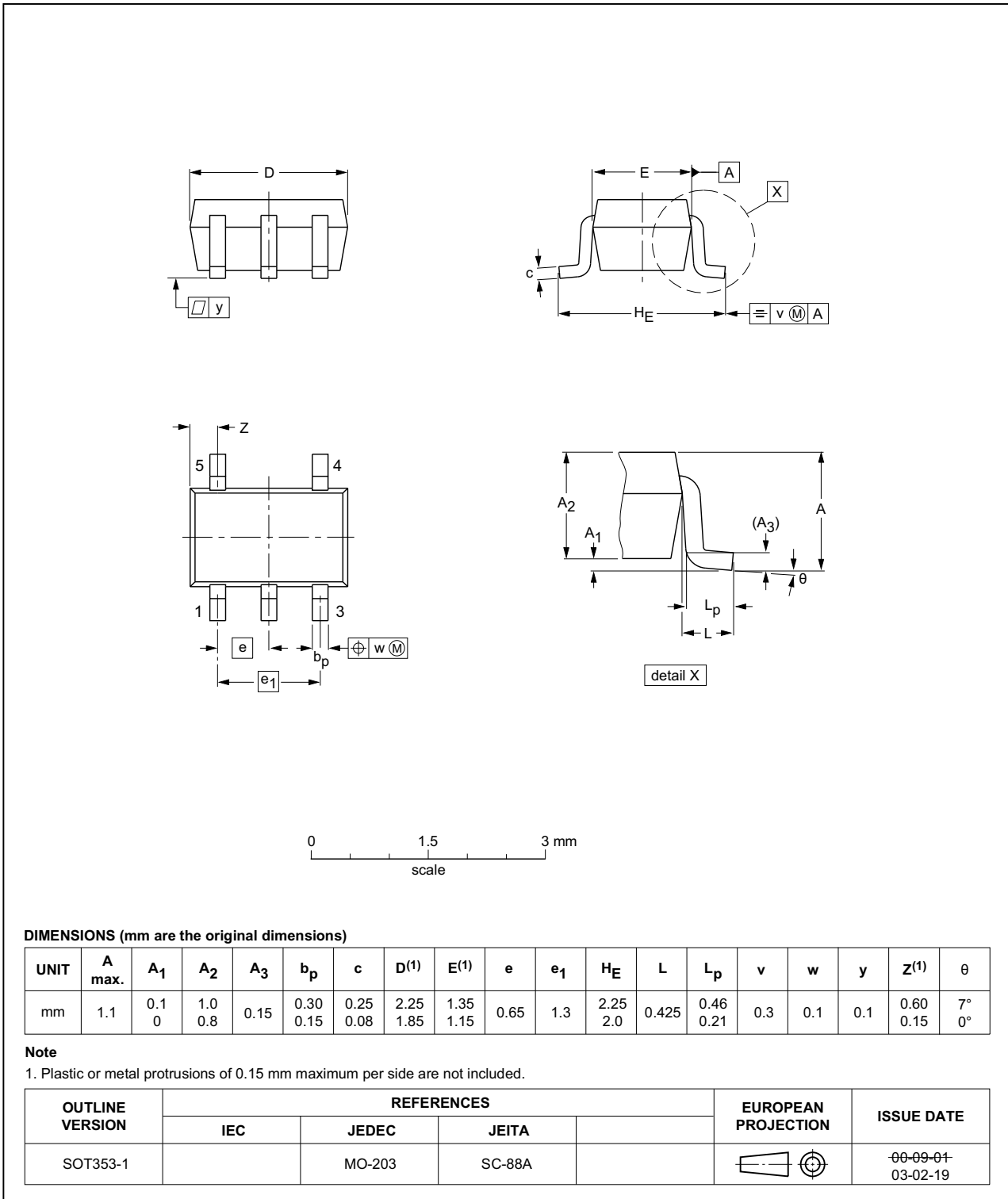


Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

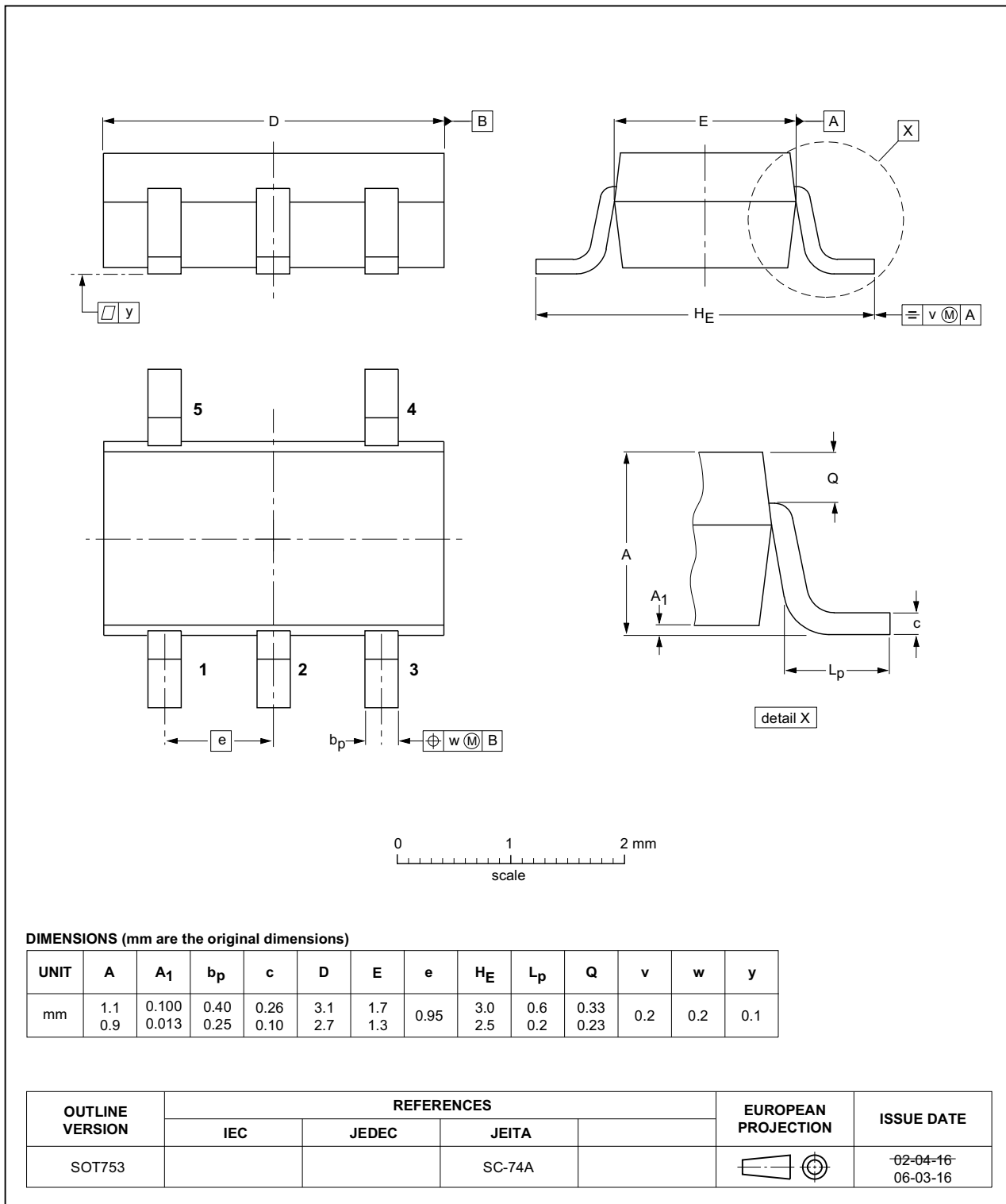


Fig 8. Package outline SOT753 (SC-74A)

## 14. Abbreviations

Table 10. Abbreviations

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

## 15. Revision history

Table 11. Revision history

| Document ID        | Release date   | Data sheet status     | Change notice | Supersedes         |
|--------------------|--|-----------------------|---------------|--------------------|
| 74AHC_AHCT1G79 v.6 | 20140923   | Product data sheet    | -             | 74AHC_AHCT1G79 v.5 |
| Modifications:     | <ul style="list-style-type: none"> <li><a href="#">Section 4</a>: table note added.</li> </ul> |                       |               |                    |
| 74AHC_AHCT1G79 v.5 | 20070702   | Product data sheet    | -             | 74AHC_AHCT1G79 v.4 |
| 74AHC_AHCT1G79 v.4 | 20020606   | Product specification | -             | 74AHC_AHCT1G79 v.3 |
| 74AHC_AHCT1G79 v.3 | 20020218   | Product specification | -             | 74AHC_AHCT1G79 v.2 |
| 74AHC_AHCT1G79 v.2 | 20010222   | Product specification | -             | 74AHC_AHCT1G79 v.1 |
| 74AHC_AHCT1G79 v.1 | 19990518   | Product specification | -             | -                  |

## 16. Legal information

### 16.1 Data sheet status

| 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".

[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 URL <http://www.nexperia.com>.

### 16.2 Definitions

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