



74AHC1G14; 74AHCT1G14

Inverting Schmitt trigger

Rev. 12 — 12 November 2024

Product data sheet

1. General description

The 74AHC1G14 and 74AHCT1G14 are single inverters with Schmitt-trigger inputs. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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

- Wide supply voltage range from 2.0 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- CMOS low power dissipation
- Symmetrical output impedance
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD78 Class II Level A
- 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. Applications

- Wave and pulse shapers
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|---|-------------------|--------|--|---------------------------|
| | Temperature range | Name | Description | Version |
| 74AHC1G14GW 74AHCT1G14GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AHC1G14GV 74AHCT1G14GV | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74AHC1G14GZ 74AHCT1G14GZ | -40 °C to +125 °C | XSON5 | plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body 1.1 × 0.85 × 0.5 mm | SOT8065-1 |

5. Marking

Table 2. Marking codes

| Type number | Marking code ^[1] |
|--------------|-----------------------------|
| 74AHC1G14GW | AF |
| 74AHCT1G14GW | CF |
| 74AHC1G14GV | A14 |
| 74AHCT1G14GV | C14 |
| 74AHC1G14GZ | AF |
| 74AHCT1G14GZ | CF |

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

6. Functional diagram

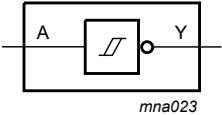


Fig. 1. Logic symbol

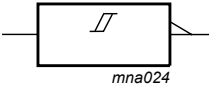


Fig. 2. IEC logic symbol

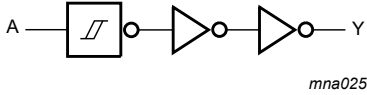
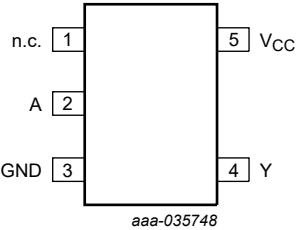


Fig. 3. Logic diagram

7. Pinning information

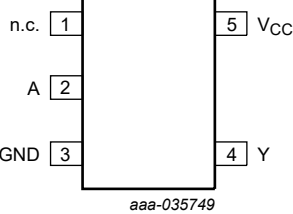
7.1. Pinning

GW package
SOT353-1 (TSSOP5)



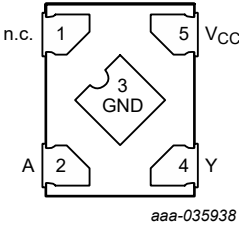
aaa-035748

GV package
SOT753 (SC-74A)



aaa-035749

GZ package
SOT8065-1 (XSON5)



aaa-035938

Transparent top view

7.2. 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 _{CC} | 5 | supply voltage |

8. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

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

9. 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 or V _O > V _{CC} + 0.5 V [1] | - | ±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 [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_{tot} derates linearly with 3.3 mW/K above 74 °C.
For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.
For SOT8065-1 (XSON5) package: P_{tot} derates linearly with 3.2 mW/K above 72 °C.

10. Recommended operating conditions

Table 6. Recommended operating conditions

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

| Symbol | Parameter | Conditions | 74AHC1G14 | | | 74AHCT1G14 | | | 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 |

11. 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 | |
| 74AHC1G14 | | | | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = -50 µA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -50 µA; V _{CC} = 3.0 V | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | I _O = -50 µA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 3.0 V | 2.58 | - | - | 2.48 | - | 2.40 | - | V |
| | | I _O = -8.0 mA; V _{CC} = 4.5 V | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = 50 µA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 µA; V _{CC} = 3.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 µA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | | I _O = 8.0 mA; V _{CC} = 4.5 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 1.0 | - | 10 | - | 40 | µA |
| C _I | input capacitance | | - | 1.5 | 10 | - | 10 | - | 10 | pF |
| 74AHCT1G14 | | | | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = -50 µA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -8.0 mA | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 50 µA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 8.0 mA | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 1.0 | - | 10 | - | 40 | µA |
| ΔI _{CC} | additional supply current | per input pin; V _I = 3.4 V; other inputs at V _{CC} or GND; 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 |

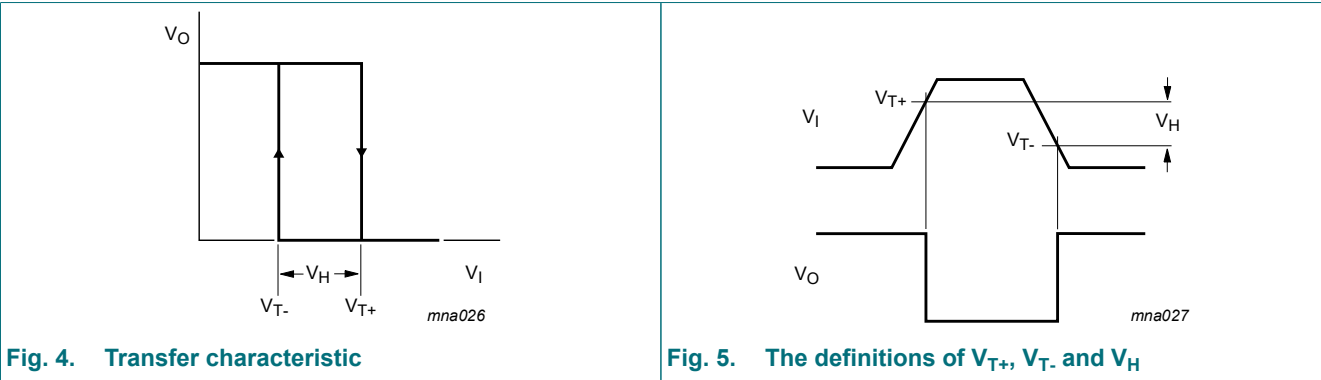
11.1. Transfer characteristics

Table 8. Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). See Fig. 4 and 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 | |
| 74AHC1G14 | | | | | | | | | | |
| V _{T+} | positive-going threshold voltage | V _{CC} = 3.0 V | - | - | 2.2 | - | 2.2 | - | 2.2 | V |
| | | V _{CC} = 4.5 V | - | - | 3.15 | - | 3.15 | - | 3.15 | V |
| | | V _{CC} = 5.5 V | - | - | 3.85 | - | 3.85 | - | 3.85 | V |
| V _{T-} | negative-going threshold voltage | V _{CC} = 3.0 V | 0.9 | - | - | 0.9 | - | 0.9 | - | V |
| | | V _{CC} = 4.5 V | 1.35 | - | - | 1.35 | - | 1.35 | - | V |
| | | V _{CC} = 5.5 V | 1.65 | - | - | 1.65 | - | 1.65 | - | V |
| V _H | hysteresis voltage | V _{CC} = 3.0 V | 0.3 | - | 1.2 | 0.3 | 1.2 | 0.25 | 1.2 | V |
| | | V _{CC} = 4.5 V | 0.4 | - | 1.4 | 0.4 | 1.4 | 0.35 | 1.4 | V |
| | | V _{CC} = 5.5 V | 0.5 | - | 1.6 | 0.5 | 1.6 | 0.45 | 1.6 | V |
| 74AHCT1G14 | | | | | | | | | | |
| V _{T+} | positive-going threshold voltage | V _{CC} = 4.5 V | - | - | 2.0 | - | 2.0 | - | 2.0 | V |
| | | V _{CC} = 5.5 V | - | - | 2.0 | - | 2.0 | - | 2.0 | V |
| V _{T-} | negative-going threshold voltage | V _{CC} = 4.5 V | 0.5 | - | - | 0.5 | - | 0.5 | - | V |
| | | V _{CC} = 5.5 V | 0.6 | - | - | 0.6 | - | 0.6 | - | V |
| V _H | hysteresis voltage | V _{CC} = 4.5 V | 0.4 | - | 1.4 | 0.4 | 1.4 | 0.35 | 1.4 | V |
| | | V _{CC} = 5.5 V | 0.4 | - | 1.6 | 0.4 | 1.6 | 0.35 | 1.6 | V |

11.2. Transfer characteristic waveforms



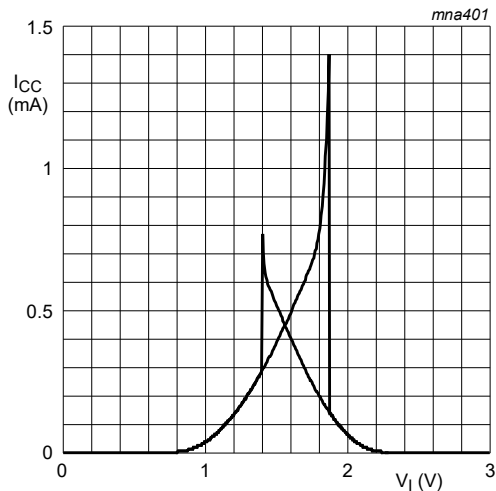


Fig. 6. Typical 74AHC1G14 transfer characteristics; $V_{CC} = 3.0\text{ V}$

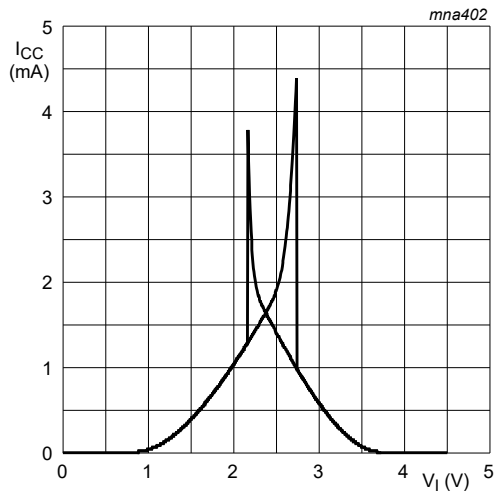


Fig. 7. Typical 74AHC1G14 transfer characteristics; $V_{CC} = 4.5\text{ V}$

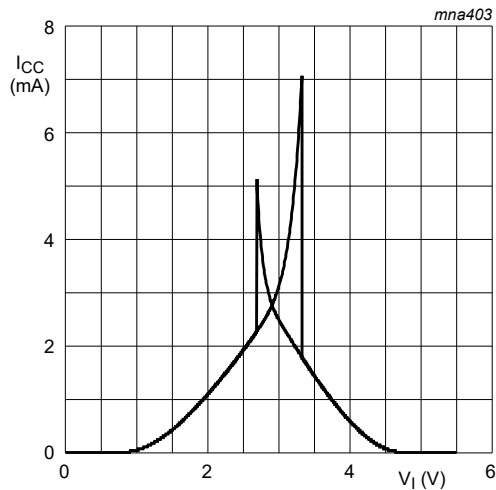


Fig. 8. Typical 74AHC1G14 transfer characteristics; $V_{CC} = 5.5\text{ V}$

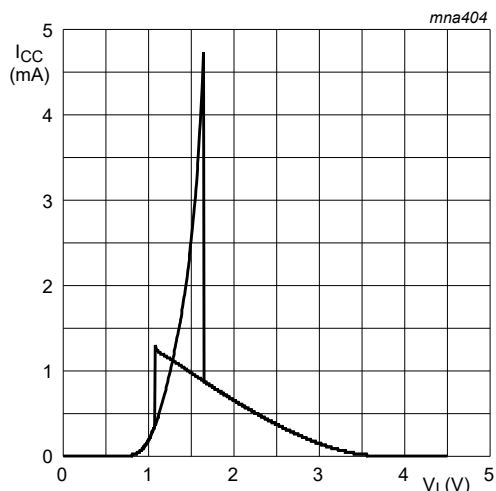


Fig. 9. Typical 74AHCT1G14 transfer characteristics; $V_{CC} = 4.5\text{ V}$

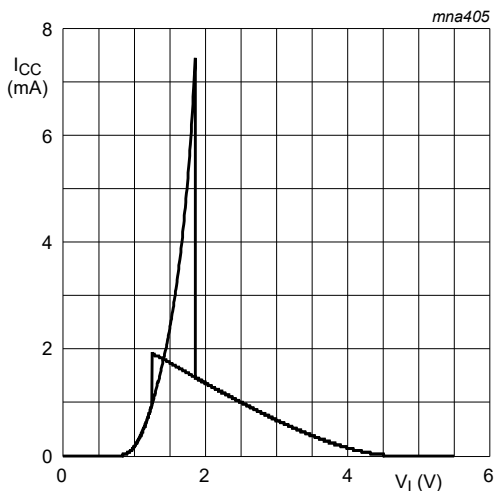


Fig. 10. Typical 74AHCT1G14 transfer characteristics; $V_{CC} = 5.5\text{ V}$

12. Dynamic characteristics

Table 9. Dynamic characteristics

GND = 0 V; $t_r = t_f \leq 3.0$ ns. For waveform see Fig. 11. For test circuit see Fig. 12.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-----------------|-------------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74AHC1G14 | | | | | | | | | | |
| t _{pd} | propagation delay | A to Y; [1] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V [2] | | | | | | | | |
| | | C _L = 15 pF | - | 4.2 | 12.8 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | C _L = 50 pF | - | 6.0 | 16.3 | 1.0 | 18.5 | 1.0 | 20.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V [3] | | | | | | | | |
| | | C _L = 15 pF | - | 3.2 | 8.6 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| | | C _L = 50 pF | - | 4.6 | 10.6 | 1.0 | 12.0 | 1.0 | 13.5 | ns |
| C _{PD} | power dissipation capacitance | per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [4] | - | 12 | - | - | - | - | - | pF |
| 74AHCT1G14 | | | | | | | | | | |
| t _{pd} | propagation delay | A to Y; V _{CC} = 4.5 V to 5.5 V [1][3] | | | | | | | | |
| | | C _L = 15 pF | - | 4.1 | 7.0 | 1.0 | 8.0 | 1.0 | 9.0 | ns |
| | | C _L = 50 pF | - | 5.9 | 8.5 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _I = GND to V _{CC} [4] | - | 13 | - | - | - | - | - | 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 (μ W).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ 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 V.

12.1. Waveform and test circuit

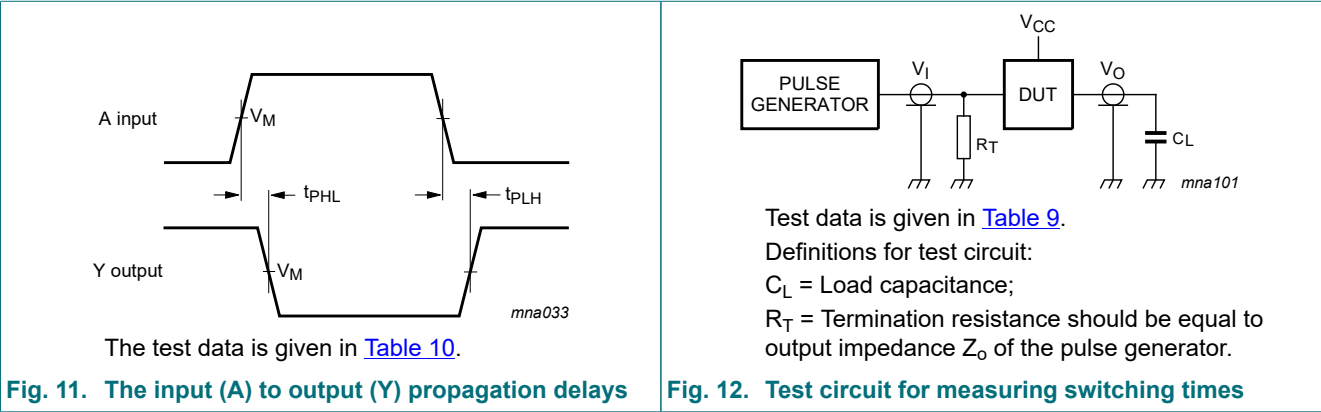


Table 10. Test data

| Type number | Input | | Output |
|-------------|-----------------|---------------------|---------------------|
| | V_I | V_M | V_M |
| 74AHC1G14 | GND to V_{CC} | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 74AHCT1G14 | GND to 3.0 V | 1.5 V | $0.5 \times V_{CC}$ |

13. Application information

The slow input rise and fall times cause additional power dissipation, which can be calculated using the following formula:

$P_{add} = f_i \times (t_r \times \Delta I_{CC(AV)} + t_f \times \Delta I_{CC(AV)}) \times V_{CC}$ where:

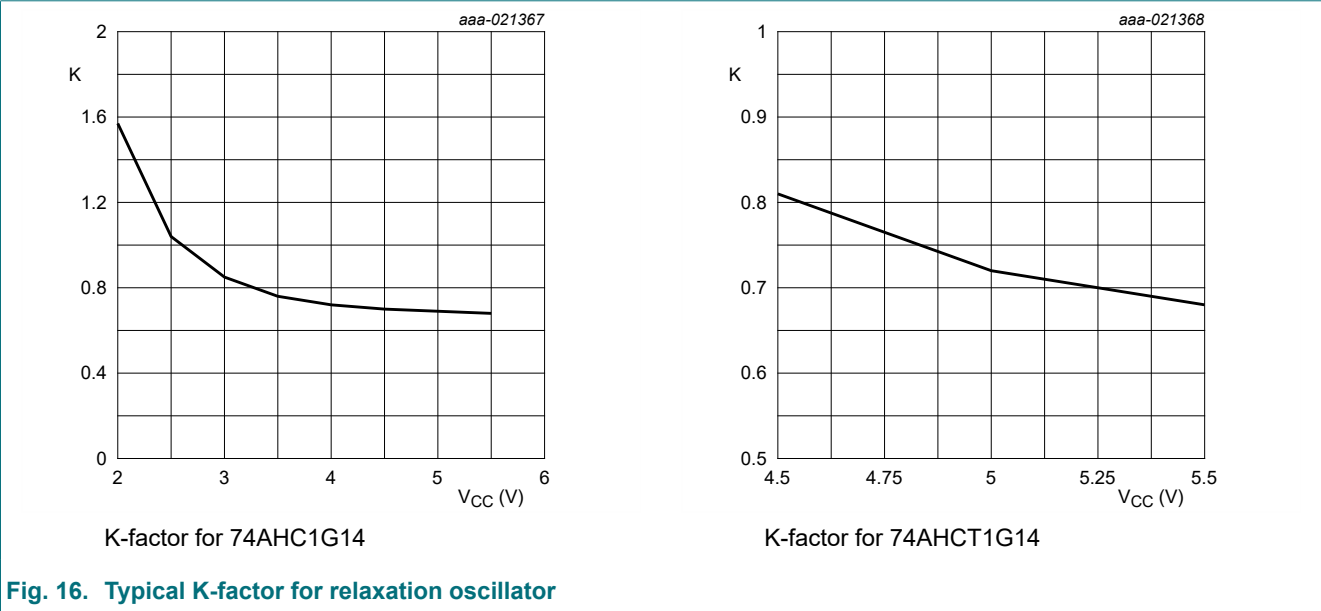
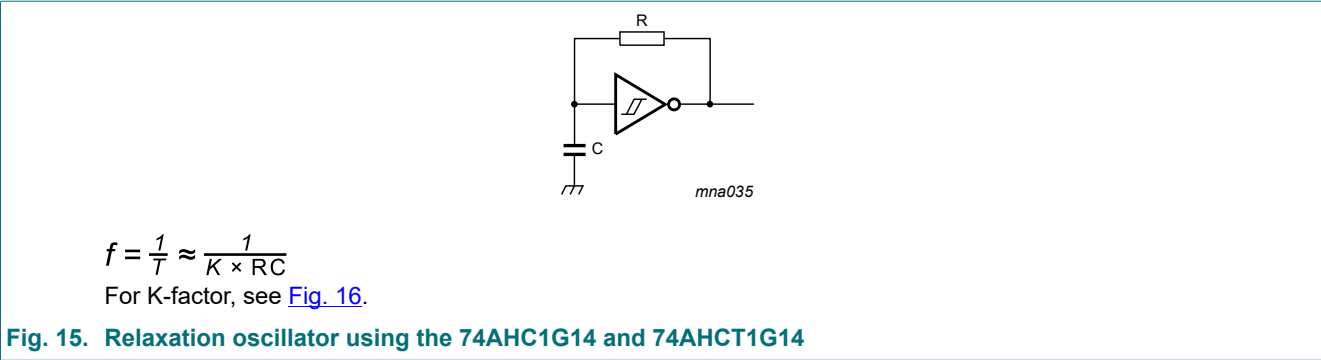
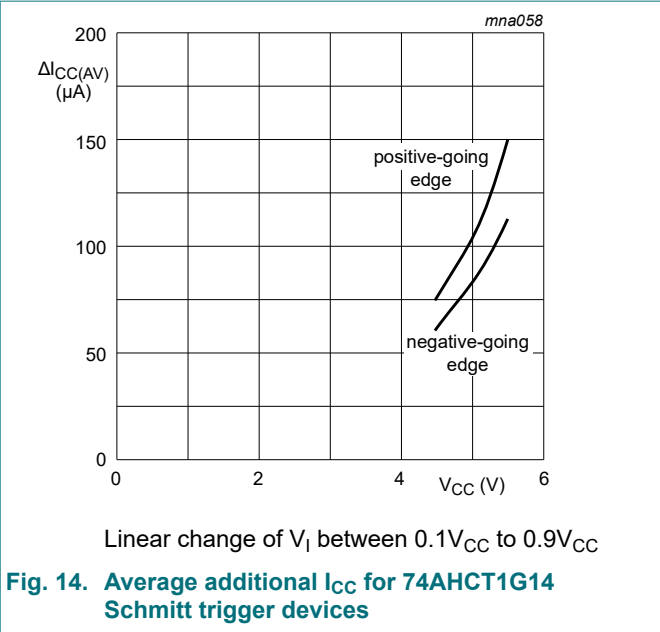
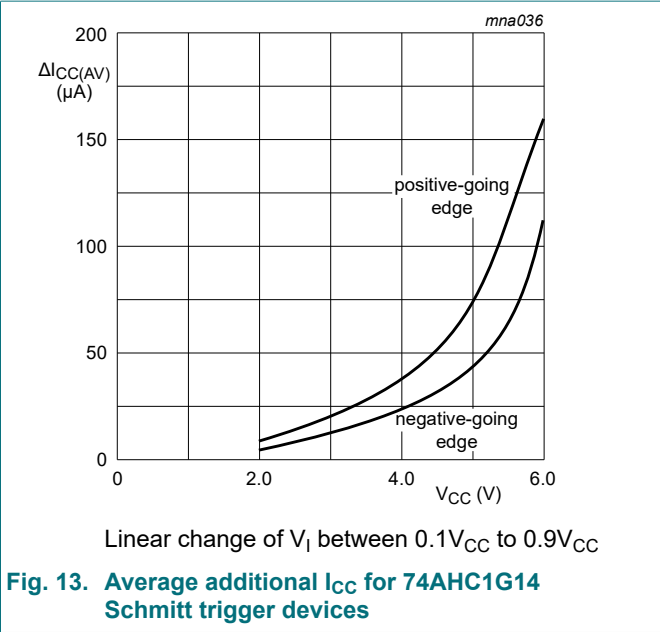
- P_{add} = additional power dissipation (μW);
- f_i = input frequency (MHz);
- t_r = input rise time (ns); 10 % to 90 %;
- t_f = input fall time (ns); 90 % to 10 %;
- $\Delta I_{CC(AV)}$ = average additional supply current (μA).

Average additional I_{CC} differs with positive or negative input transitions, as shown in [Fig. 13](#) and [Fig. 14](#).

For 74AHC1G14 and 74AHCT1G14 used in relaxation oscillator circuit, see [Fig. 15](#).

Note to the application information:

- All values given are typical unless otherwise specified.



14. Package outline

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

SOT353-1

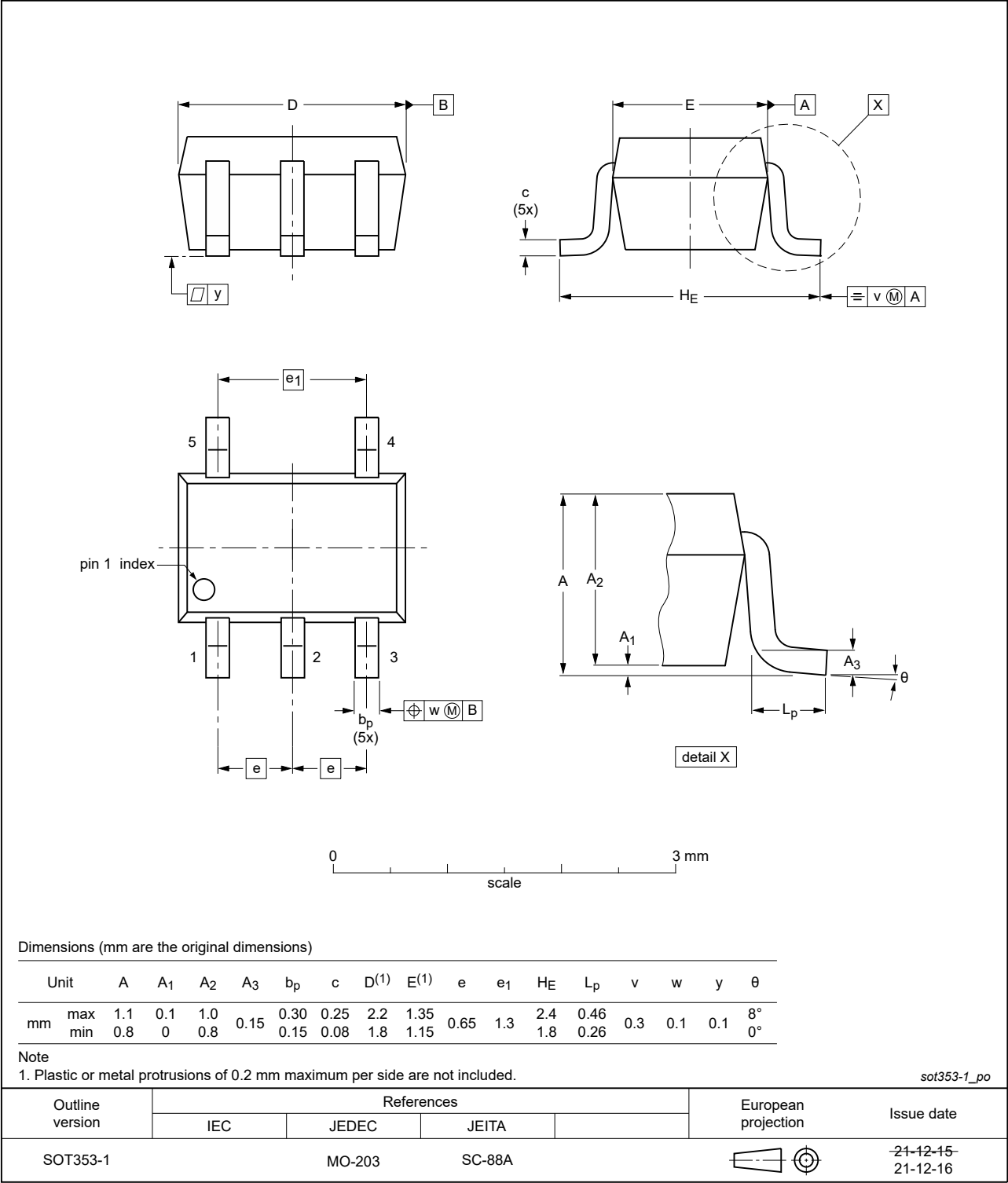


Fig. 17. Package outline SOT353-1 (TSSOP5)

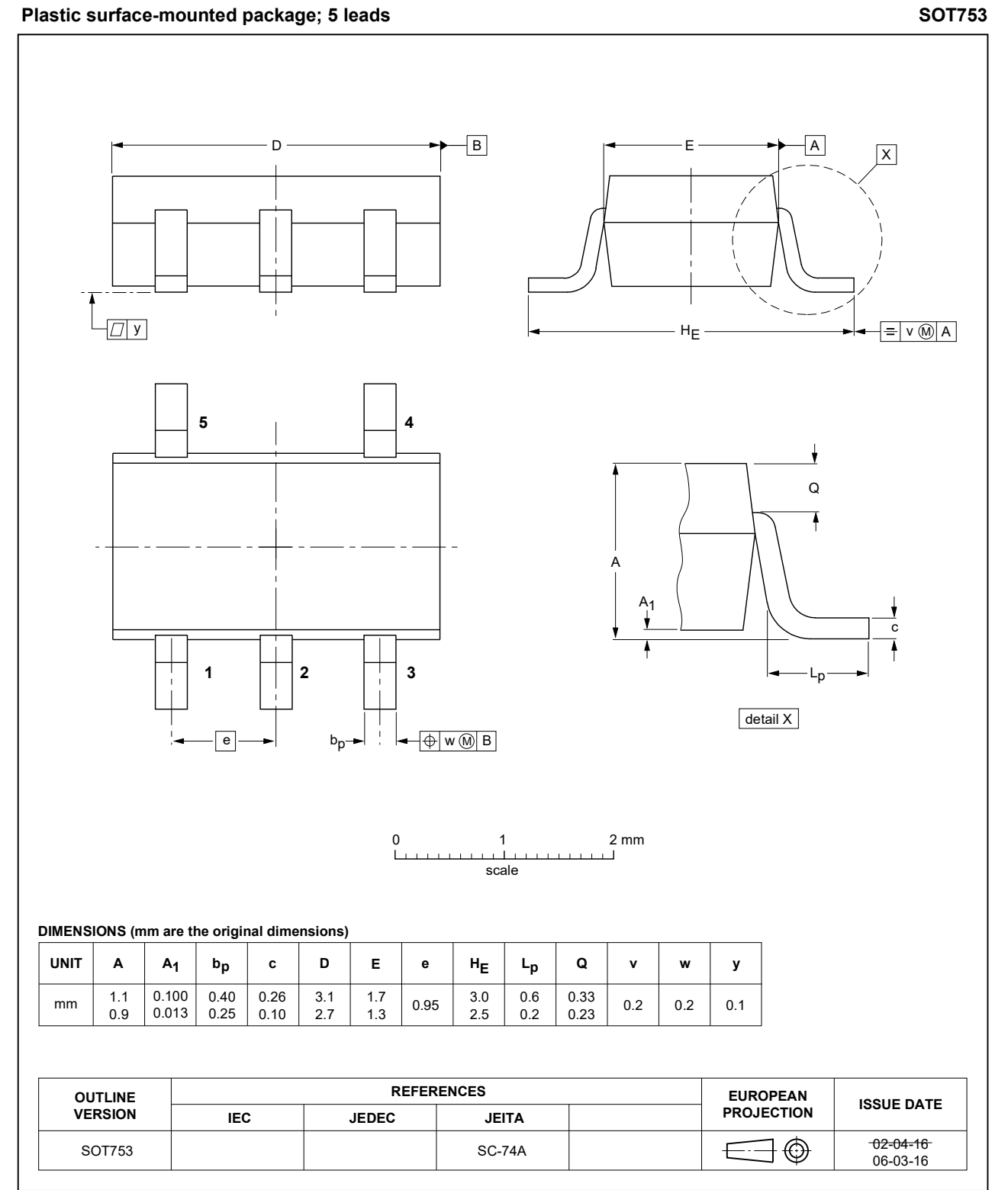


Fig. 18. Package outline SOT753 (SC-74A)

XSON5: Plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body 1.1 × 0.85 × 0.5 mm

SOT8065-1

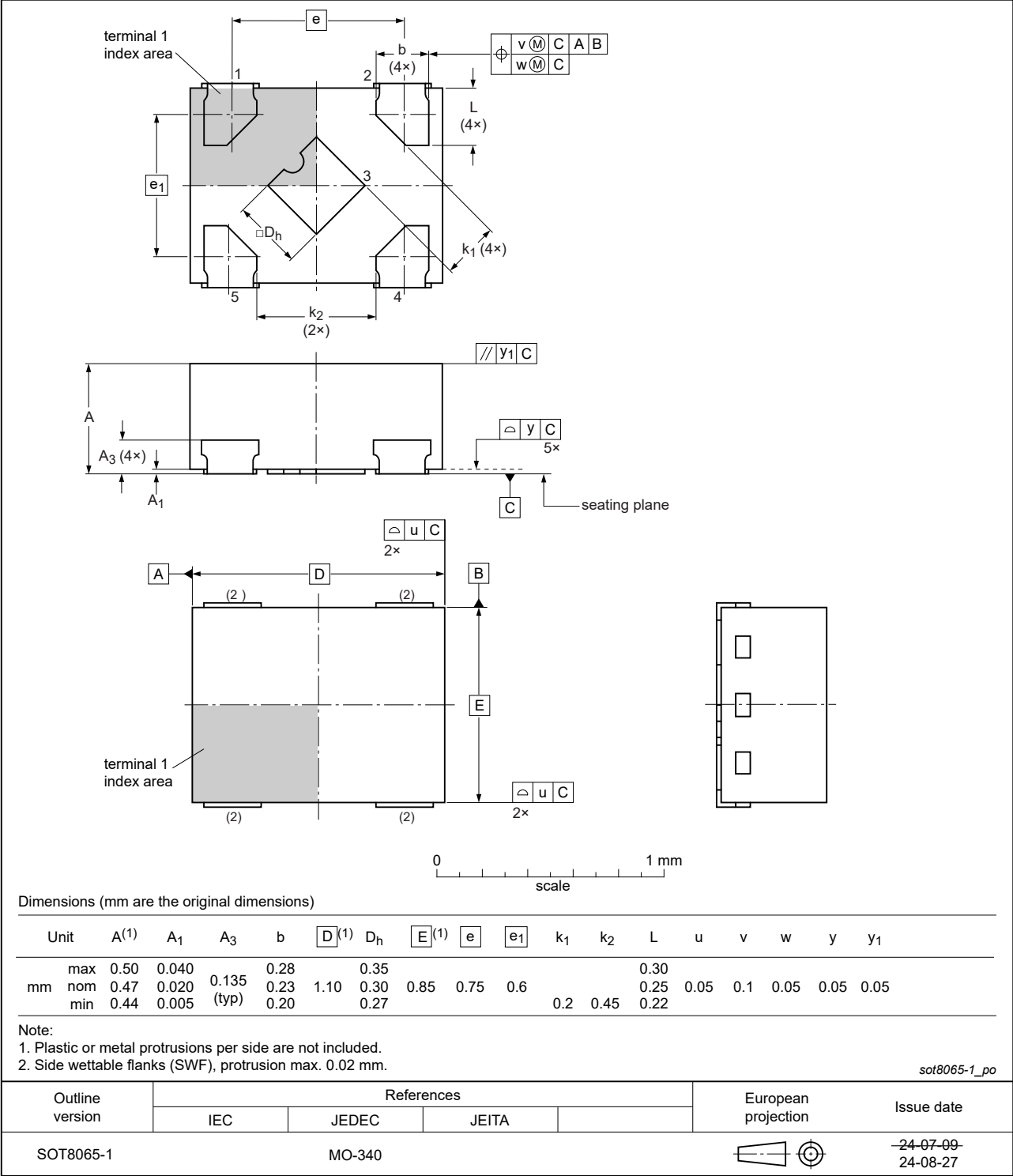


Fig. 19. Package outline SOT8065-1 (XSON5)

15. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|---|
| ANSI | American National Standards Institute |
| CDM | Charged Device Model |
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| ESDA | ElectroStatic Discharge Association |
| HBM | Human Body Model |
| JEDEC | Joint Electron Device Engineering Council |
| TTL | Transistor-Transistor Logic |

16. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------|--|-----------------------|---------------|---------------------|
| 74AHC_AHCT1G14 v.12 | 20241112 | Product data sheet | - | 74AHC_AHCT1G14 v.11 |
| Modifications: | • Type numbers 74AHC1G14GZ and 74AHCT1G14GZ (SOT8065-1/XSON5) added. | | | |
| 74AHC_AHCT1G14 v.11 | 20230912 | Product data sheet | - | 74AHC_AHCT1G14 v.10 |
| Modifications: | • Section 2 : ESD specification updated according to the latest JEDEC standard. | | | |
| 74AHC_AHCT1G14 v.10 | 20220112 | Product data sheet | - | 74AHC_AHCT1G14 v.9 |
| Modifications: | • Section 1 and Section 2 updated. • Fig. 17 : Package outline drawing for SOT353-1 (TSSOP5) has changed. | | | |
| 74AHC_AHCT1G14 v.9 | 20200403 | Product data sheet | - | 74AHC_AHCT1G14 v.8 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Table 5 : Derating values for P _{tot} total power dissipation updated. | | | |
| 74AHC_AHCT1G14 v.8 | 20160113 | Product data sheet | - | 74AHC_AHCT1G14 v.7 |
| Modifications: | • Fig. 16 added (typical K-factor for relaxation oscillator). | | | |
| 74AHC_AHCT1G14 v.7 | 20141118 | Product data sheet | - | 74AHC_AHCT1G14 v.6 |
| Modifications: | • Table 2 : table note added. | | | |
| 74AHC_AHCT1G14 v.6 | 20090518 | Product data sheet | - | 74AHC_AHCT1G14 v.5 |
| Modifications: | • Table 7 : the conditions for HIGH-level output voltage and LOW-level output voltage have been changed. | | | |
| 74AHC_AHCT1G14 v.5 | 20070629 | Product data sheet | - | 74AHC_AHCT1G14 v.4 |
| 74AHC_AHCT1G14 v.4 | 20020528 | Product specification | - | 74AHC_AHCT1G14 v.3 |
| 74AHC_AHCT1G14 v.3 | 20020218 | Product specification | - | 74AHC_AHCT1G14 v.2 |
| 74AHC_AHCT1G14 v.2 | 20010222 | Product specification | - | 74AHC_AHCT1G14 v.1 |
| 74AHC_AHCT1G14 v.1 | 19990805 | Product specification | - | - |

17. 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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