



74AHC1G17; 74AHCT1G17

Single Schmitt trigger buffer

Rev. 4 — 15 September 2023

Product data sheet

1. General description

The 74AHC1G17 and 74AHCT1G17 are single buffers with Schmitt-trigger inputs. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features and benefits

- 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 74AHC1G17: CMOS level
 - For 74AHCT1G17: TTL level
- SOT353-1 and SOT753 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. Applications

- Wave and pulse shapers
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|---|-------------------|--------|---|--------------------------|
| | Temperature range | Name | Description | Version |
| 74AHC1G17GW 74AHCT1G17GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AHC1G17GV 74AHCT1G17GV | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |

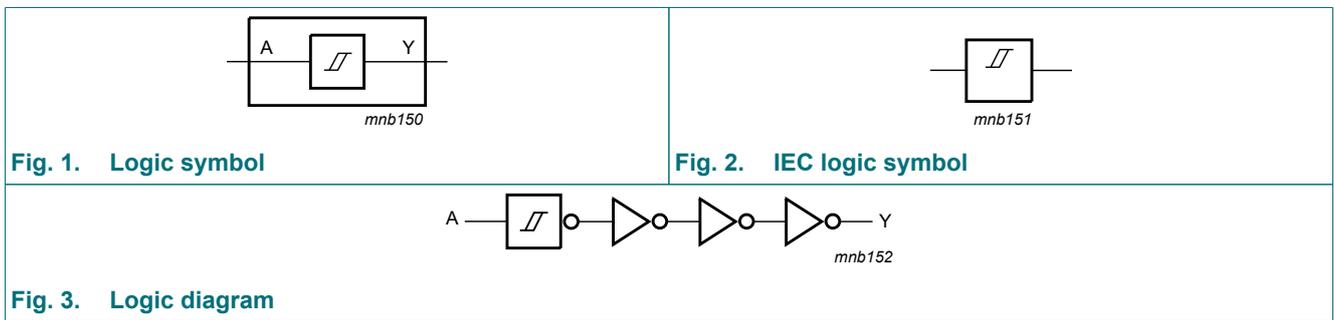
5. Marking

Table 2. Marking codes

| Type number | Marking code[1] |
|--------------|-----------------|
| 74AHC1G17GW | AJ |
| 74AHCT1G17GW | CJ |
| 74AHC1G17GV | A17 |
| 74AHCT1G17GV | C17 |

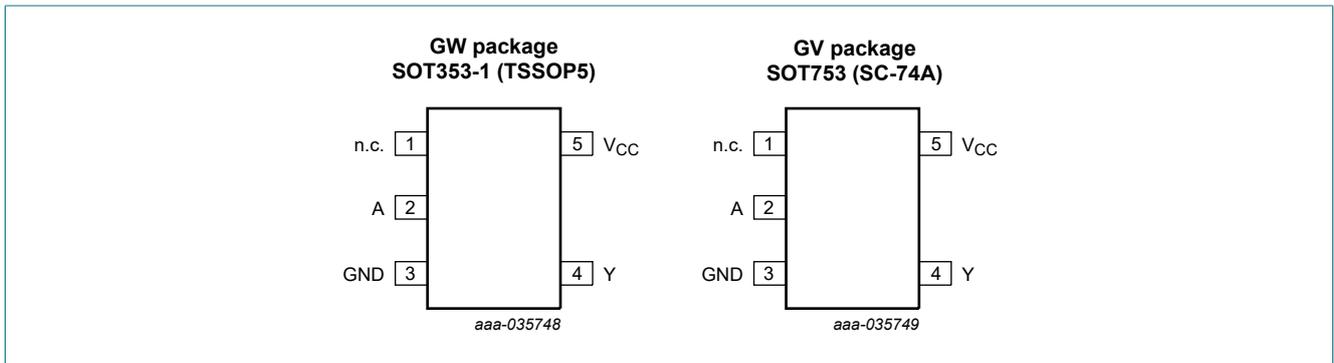
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning



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 | L |
| H | H |

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.

10. Recommended operating conditions

Table 6. Recommended operating conditions

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

| Symbol | Parameter | Conditions | 74AHC1G17 | | | 74AHCT1G17 | | | 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 | |
| 74AHC1G17 | | | | | | | | | | |
| V_{OH} | HIGH-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | | | | | |
| | | $I_O = -50 \mu A$; $V_{CC} = 2.0 V$ | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | $I_O = -50 \mu A$; $V_{CC} = 3.0 V$ | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | $I_O = -50 \mu A$; $V_{CC} = 4.5 V$ | 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-} | | | | | | | | |
| | | $I_O = 50 \mu A$; $V_{CC} = 2.0 V$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 50 \mu A$; $V_{CC} = 3.0 V$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 50 \mu A$; $V_{CC} = 4.5 V$ | - | 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 |
| 74AHCT1G17 | | | | | | | | | | |
| V_{OH} | HIGH-level output voltage | $V_I = V_{T+}$ or V_{T-} ; $V_{CC} = 4.5 V$ | | | | | | | | |
| | | $I_O = -50 \mu A$ | 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-} ; $V_{CC} = 4.5 V$ | | | | | | | | |
| | | $I_O = 50 \mu A$ | - | 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 |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-----------------|---------------------------|--|-------|-----|------|------------------|-----|-------------------|-----|---------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V | - | - | 1.0 | - | 10 | - | 40 | μ A |
| 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 |

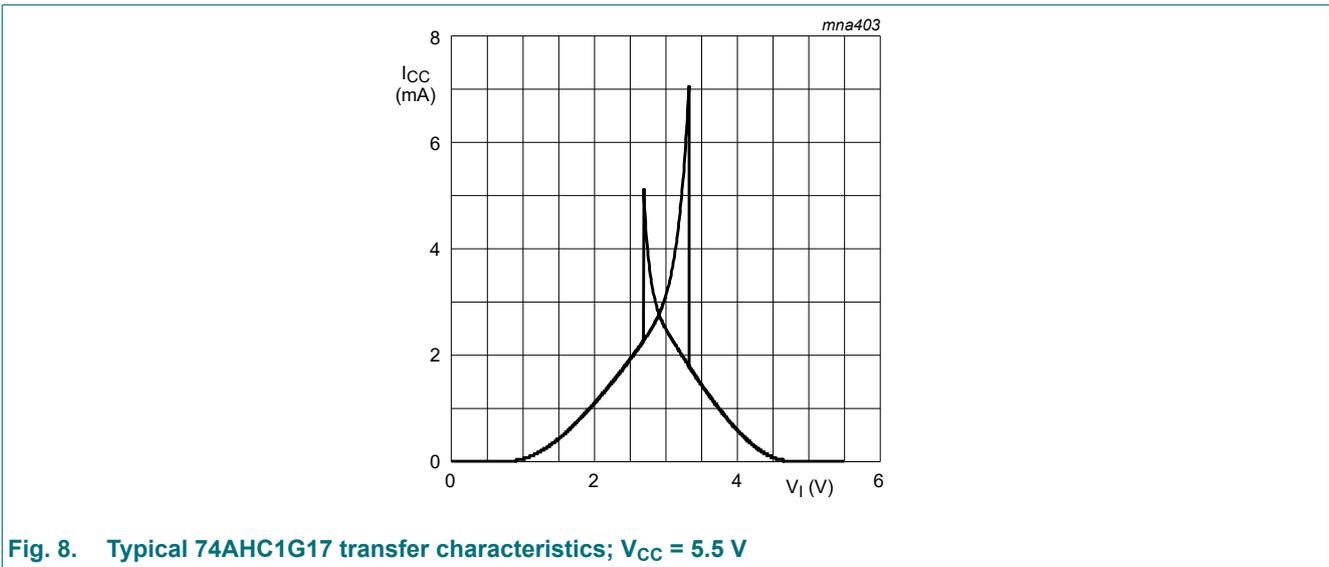
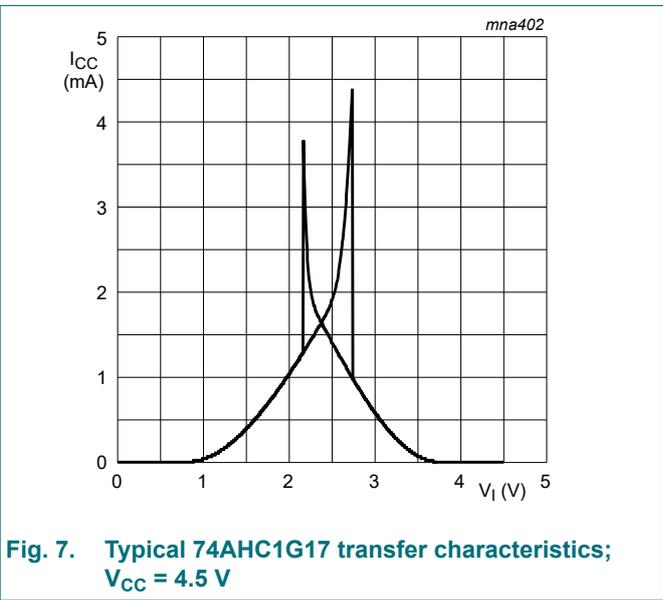
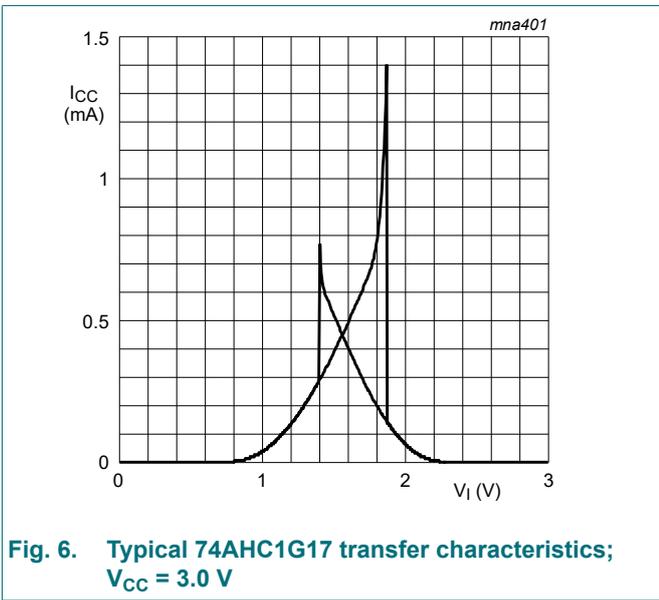
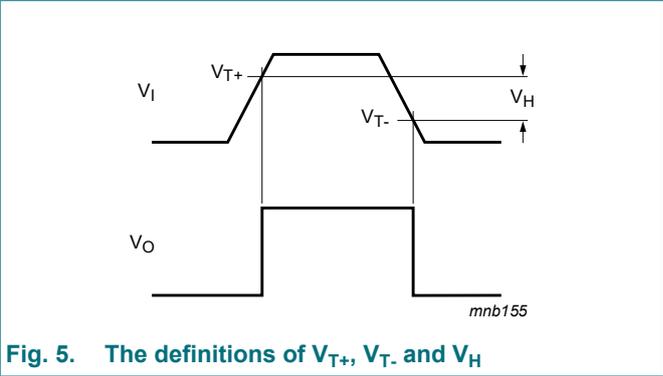
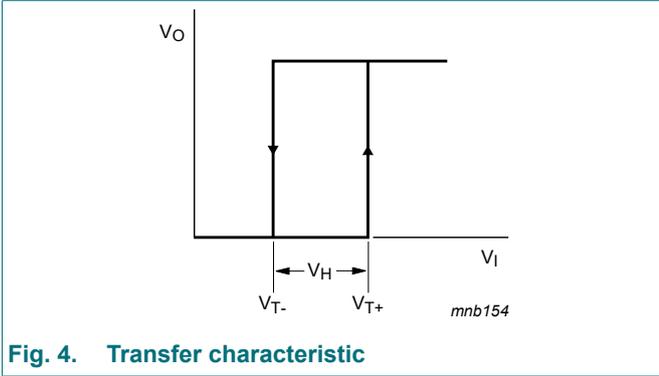
11.1. Transfer characteristics

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 | |
| 74AHC1G17 | | | | | | | | | | |
| 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 |
| 74AHCT1G17 | | | | | | | | | | |
| 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



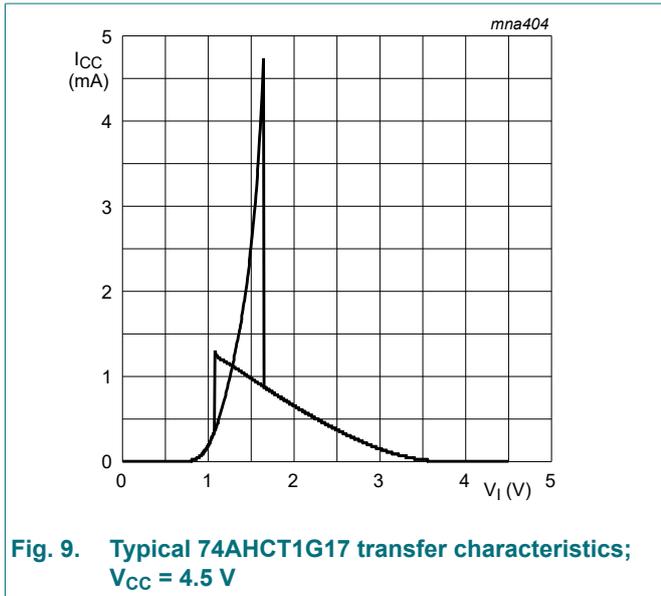


Fig. 9. Typical 74AHCT1G17 transfer characteristics; $V_{CC} = 4.5\text{ V}$

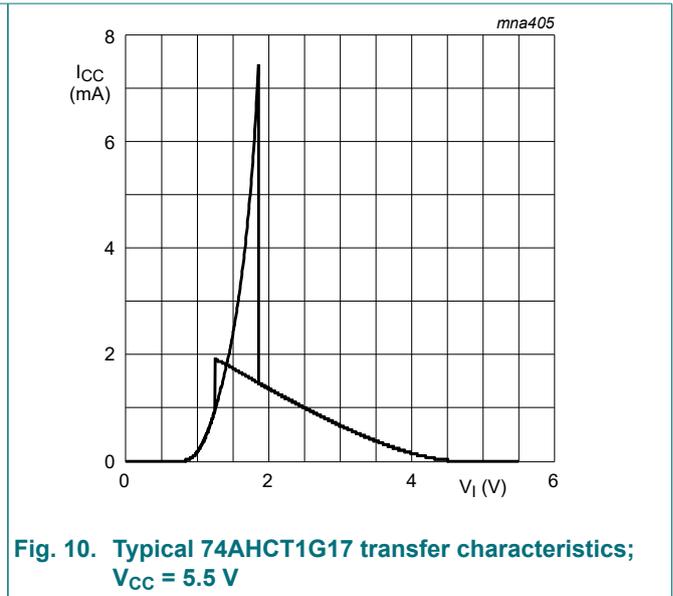


Fig. 10. Typical 74AHCT1G17 transfer characteristics; $V_{CC} = 5.5\text{ V}$

12. Dynamic characteristics

Table 9. Dynamic characteristics

$GND = 0\text{ V}$; $t_r = t_f \leq 3.0\text{ ns}$. 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 | |
| 74AHC1G17 | | | | | | | | | | |
| t_{pd} | propagation delay | A to Y [1] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ [2] | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.2 | 12.8 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 6.0 | 16.3 | 1.0 | 18.5 | 1.0 | 20.5 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ [3] | | | | | | | | |
| C_{PD} | power dissipation capacitance | $C_L = 15\text{ pF}$ | - | 3.2 | 8.6 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 4.6 | 10.6 | 1.0 | 12.0 | 1.0 | 13.5 | ns |
| | | per buffer; $C_L = 50\text{ pF}$; $f = 1\text{ MHz}$; $V_I = GND\text{ to }V_{CC}$ [4] | - | 12 | - | - | - | - | - | pF |
| 74AHCT1G17 | | | | | | | | | | |
| t_{pd} | propagation delay | A to Y [1] | | | | | | | | |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ [3] | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.1 | 7.0 | 1.0 | 8.0 | 1.0 | 9.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 5.9 | 8.5 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| C_{PD} | power dissipation capacitance | per buffer; $C_L = 50\text{ pF}$; $f = 1\text{ MHz}$; $V_I = GND\text{ to }V_{CC}$ [4] | - | 13 | - | - | - | - | - | pF |

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] Typical values are measured at $V_{CC} = 3.3\text{ V}$.
- [3] Typical values are measured at $V_{CC} = 5.0\text{ V}$.
- [4] C_{PD} is used to determine the dynamic power dissipation P_D (μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum(C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz; f_o = output frequency in MHz;
 C_L = output load capacitance in pF; V_{CC} = supply voltage in V.

12.1. Waveform and test circuit

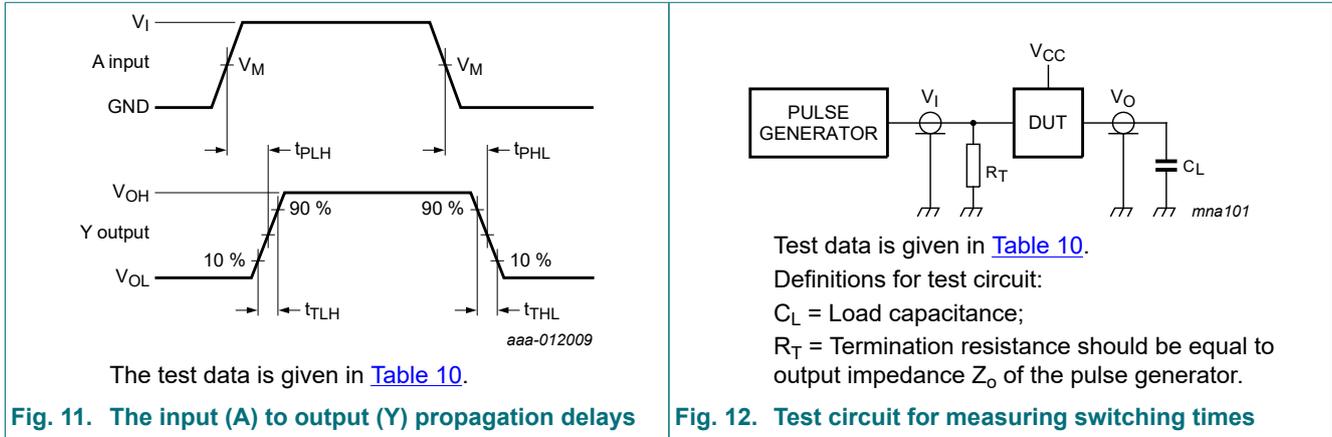


Table 10. Test data

| Type number | Input | | Output |
|-------------|-----------------|---------------------|---------------------|
| | V_I | V_M | V_M |
| 74AHC1G17 | GND to V_{CC} | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 74AHCT1G17 | GND to 3.0 V | 1.5 V | $0.5 \times V_{CC}$ |

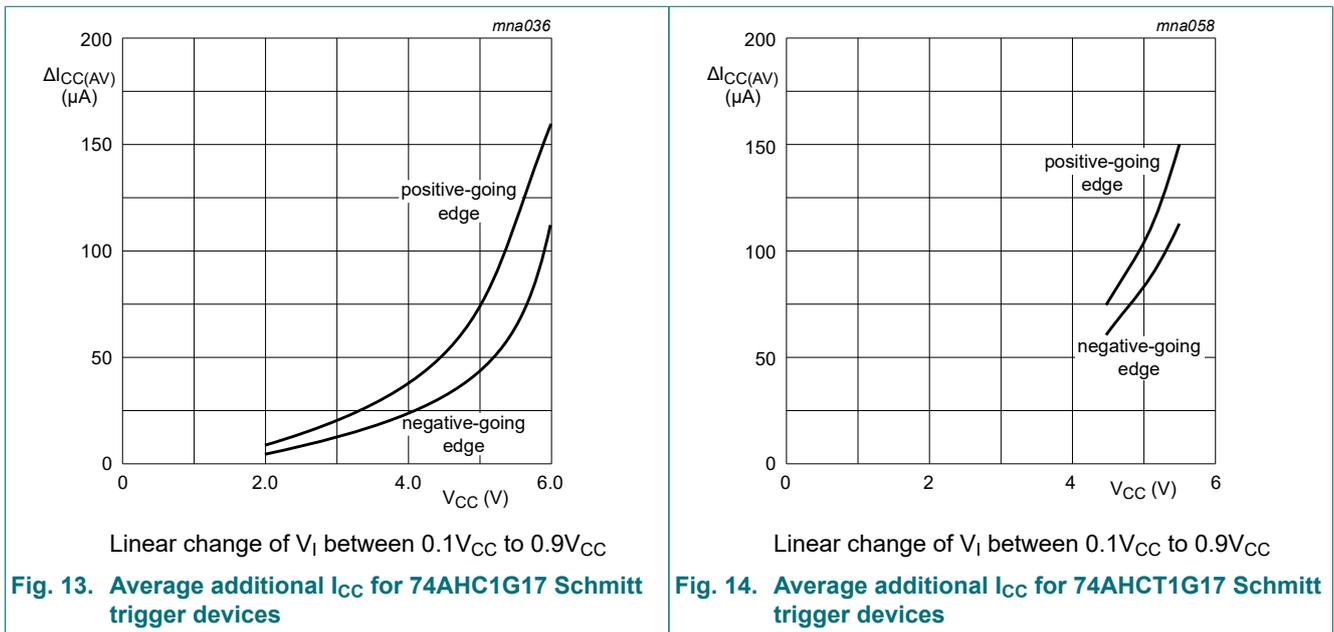
13. Application information

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

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

- 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](#).



14. Package outline

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

SOT353-1

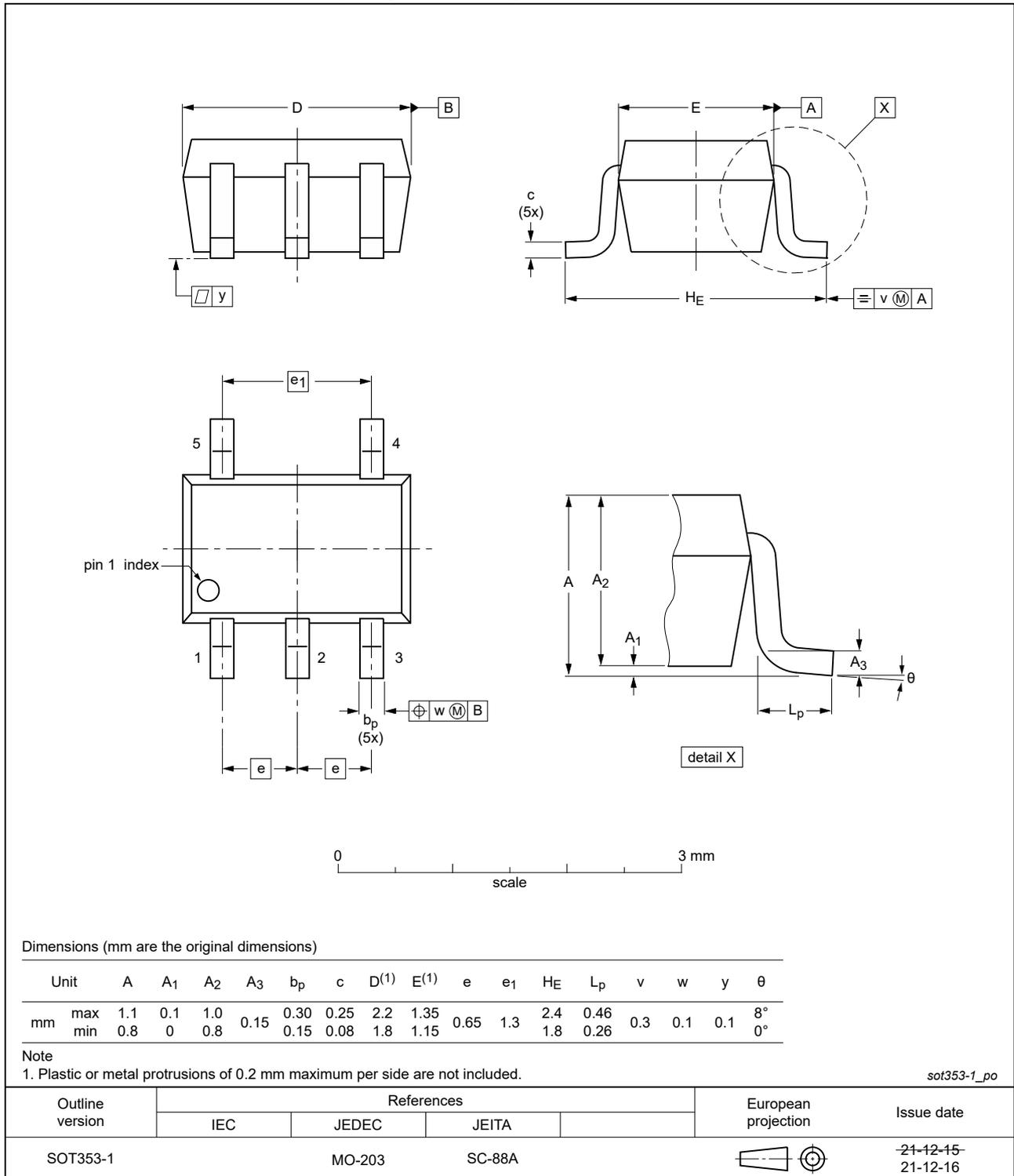


Fig. 15. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

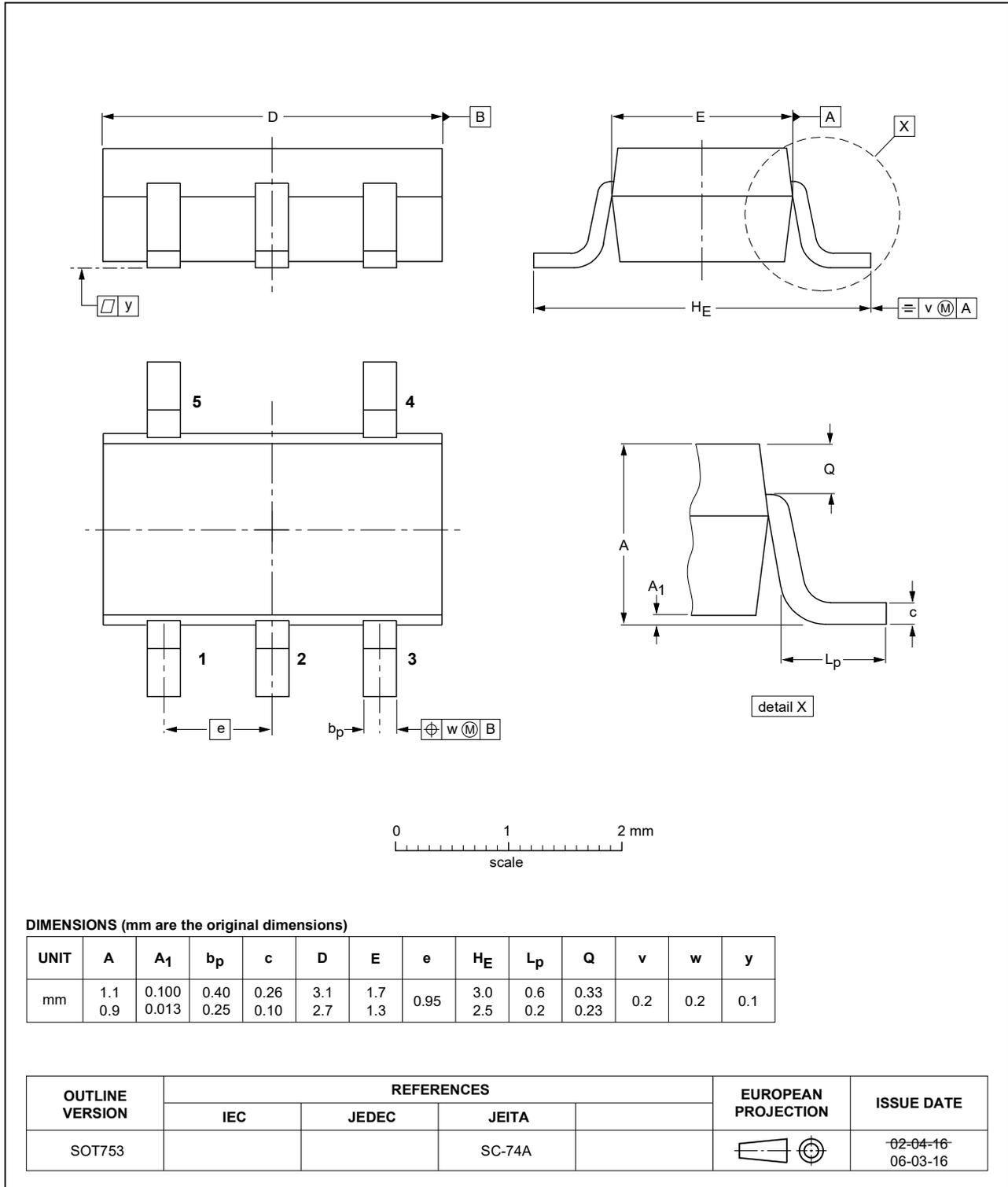


Fig. 16. Package outline SOT753 (SC-74A)

15. Abbreviations

Table 11. Abbreviations

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

16. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|--|--------------------|---------------|--------------------|
| 74AHC_AHCT1G17 v.4 | 20230915 | Product data sheet | - | 74AHC_AHCT1G17 v.3 |
| Modifications: | <ul style="list-style-type: none"> • Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74AHC_AHCT1G17 v.3 | 20220112 | Product data sheet | - | 74AHC_AHCT1G17 v.2 |
| Modifications: | <ul style="list-style-type: none"> • 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. • Section 2 updated. • Fig. 15: Package outline drawing for SOT353-1 (TSSOP5) has changed. • Section 9: Derating values for P_{tot} total power dissipation updated. | | | |
| 74AHC_AHCT1G17 v.2 | 20161005 | Product data sheet | - | 74AHC_AHCT1G17 v.1 |
| Modifications: | <ul style="list-style-type: none"> • Type numbers 74AHC1G17GF, 74AHC1G17GM, 74AHCT1G17GF and 74AHCT1G17GM removed. | | | |
| 74AHC_AHCT1G17 v.1 | 20140318 | Product data sheet | - | - |

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".
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