# 74AHC1G17-Q100; 74AHCT1G17-Q100

## Single Schmitt trigger buffer

Rev. 2 — 12 January 2022 Product data sheet

## 1. General description

The 74AHC1G17-Q100 and 74AHCT1G17-Q100 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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 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-Q100: CMOS level
  - For 74AHCT1G17-Q100: TTL level
- SOT353-1 package option
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

## 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-Q100 | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AHCT1G17GW-Q100 | | | | |

# 5. Marking

**Table 2. Marking codes**

| Type number | Marking code[1] |
|---|---|
| 74AHC1G17GW-Q100 | AJ |
| 74AHCT1G17GW-Q100 | CJ |

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

# 6. Functional diagram

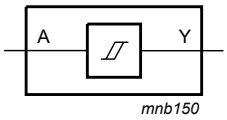



**Fig. 1. Logic symbol**

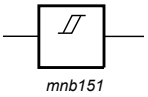



**Fig. 2. IEC logic symbol**

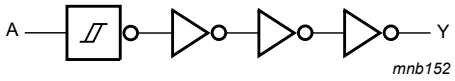



**Fig. 3. Logic diagram**

# 7. Pinning information

## 7.1. Pinning

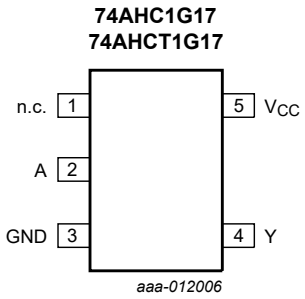



**Fig. 4. Pin configuration SOT353-1 (TSSOP5)**

## 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.

# 10. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol | Parameter | Conditions | 74AHC1G17-Q100 | | | 74AHCT1G17-Q100 | | | 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-Q100** | | | | | | | | | | |
| $V_{OH}$ | 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 |
| **74AHCT1G17-Q100** | | | | | | | | | | |
| $V_{OH}$ | 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 |
| $\Delta I_{CC}$ | 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. 5 and 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 | |
| **74AHC1G17-Q100** | | | | | | | | | | |
| $V_{T+}$ | 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-Q100** | | | | | | | | | | |
| $V_{T+}$ | 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

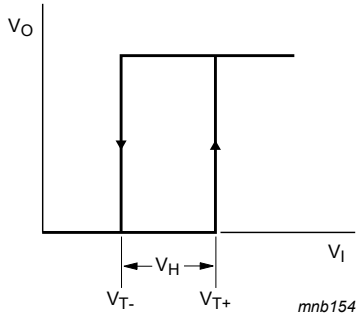



**Fig. 5. Transfer characteristic**

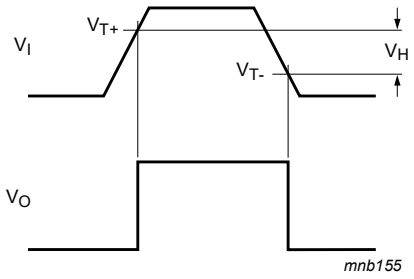



**Fig. 6. The definitions of $V_{T+}$, $V_{T-}$ and $V_H$**

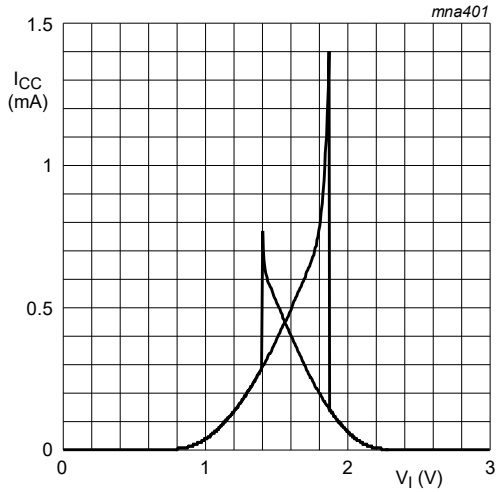



**Fig. 7. Typical 74AHC1G17-Q100 transfer characteristics; $V_{CC}$ = 3.0 V**

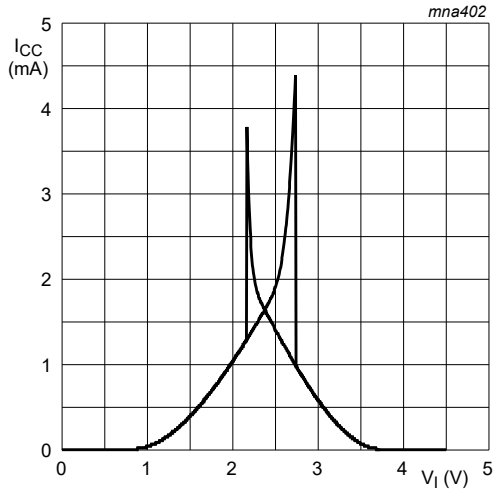



**Fig. 8. Typical 74AHC1G17-Q100 transfer characteristics; $V_{CC}$ = 4.5 V**

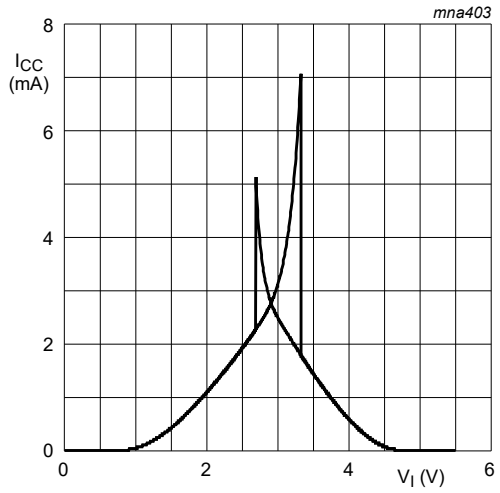



**Fig. 9. Typical 74AHC1G17-Q100 transfer characteristics; $V_{CC}$ = 5.5 V**

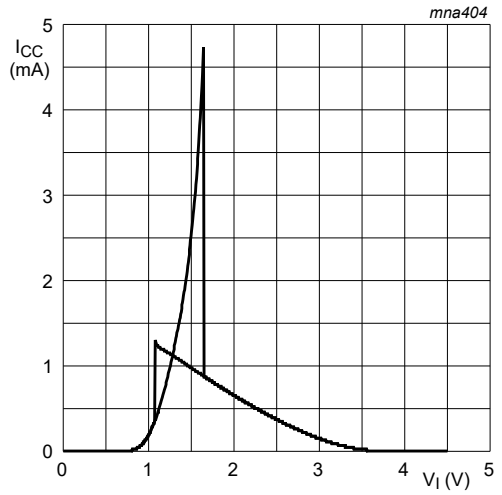



**Fig. 10. Typical 74AHCT1G17-Q100 transfer characteristics; $V_{CC}$ = 4.5 V**

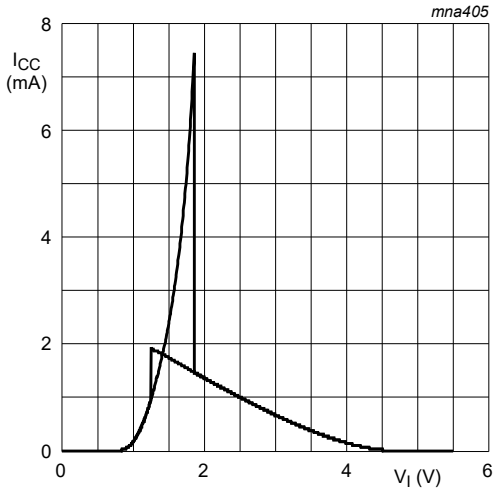



**Fig. 11. Typical 74AHCT1G17-Q100 transfer characteristics; $V_{CC}$ = 5.5 V**

# 12. Dynamic characteristics

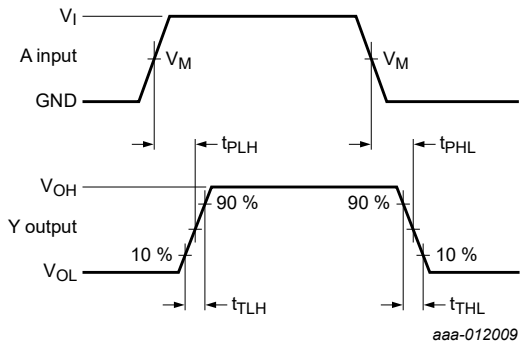
**Table 9. Dynamic characteristics**

*GND = 0 V; $t_r = t_f \leq 3.0$ ns. For waveform, see Fig. 12. For test circuit, see Fig. 13.*

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74AHC1G17-Q100** | | | | | | | | | | |
| $t_{pd}$ | 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 |
| **74AHCT1G17-Q100** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | A to Y [1]<br>$V_{CC}$ = 4.5 V to 5.5 V [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; $C_L$ = 50 pF; f = 1 MHz; $V_I$ = GND to $V_{CC}$ [4] | - | 13 | - | - | - | - | - | pF |

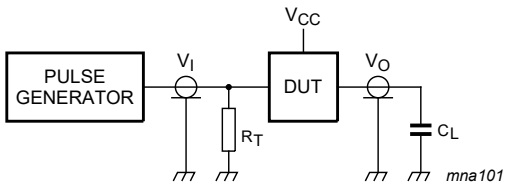
[1] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.
[2] Typical values are measured at $V_{CC}$ = 3.3 V.
[3] Typical values are measured at $V_{CC}$ = 5.0 V.
[4] $C_{PD}$ is used to determine the dynamic power dissipation $P_D$ (µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 Volt.

## 12.1. Waveform and test circuit




The test data is given in Table 10.

**Fig. 12. The input (A) to output (Y) propagation delays**




Test data is given in Table 10.

Definitions for test circuit:

$C_L$ = Load capacitance;

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

**Fig. 13. Test circuit for measuring switching times**

**Table 10. Test data**

| Type number | Input | | Output |
|---|---|---|---|
| | $V_I$ | $V_M$ | $V_M$ |
| 74AHC1G17-Q100 | GND to $V_{CC}$ | 0.5 × $V_{CC}$ | 0.5× $V_{CC}$ |
| 74AHCT1G17-Q100 | GND to 3.0 V | 1.5 V | 0.5 × $V_{CC}$ |

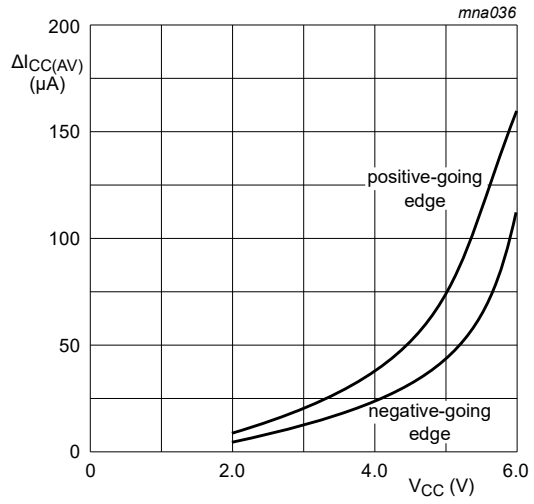
# 13. Application information

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:

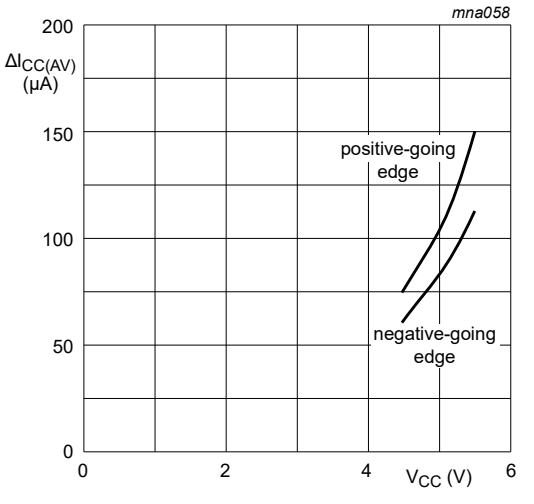
- $P_{add}$ = additional power dissipation (µW);
- $f_i$ = input frequency (MHz);
- $t_r$ = input rise time (ns); 10 % to 90 %;
- $t_f$ = input fall time (ns); 90 % to 10 %;
- $\Delta I_{CC(AV)}$ = average additional supply current (µA).

Average additional $I_{CC}$ differs with positive or negative input transitions, as shown in Fig. 14 and Fig. 15.




Linear change of $V_I$ between $0.1V_{CC}$ to $0.9V_{CC}$

**Fig. 14. Average additional $I_{CC}$ for 74AHC1G17-Q100 Schmitt trigger devices**

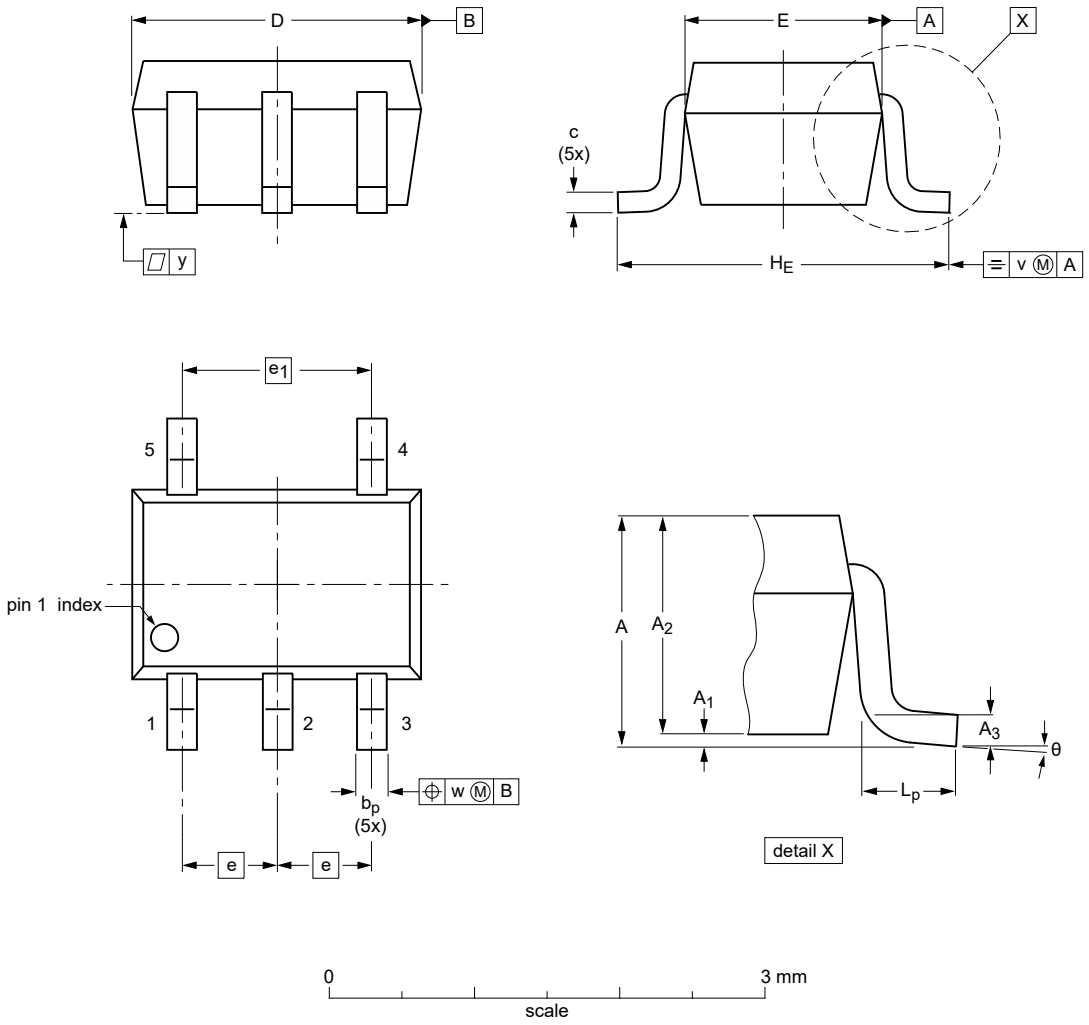



Linear change of $V_I$ between $0.1V_{CC}$ to $0.9V_{CC}$

**Fig. 15. Average additional $I_{CC}$ for 74AHCT1G17-Q100 Schmitt trigger devices**

# 14. Package outline

**TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm** **SOT353-1**




Dimensions (mm are the original dimensions)

| Unit | | A | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $e_1$ | $H_E$ | $L_p$ | v | w | y | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1.1 | 0.1 | 1.0 | 0.15 | 0.30 | 0.25 | 2.2 | 1.35 | 0.65 | 1.3 | 2.4 | 0.46 | 0.3 | 0.1 | 0.1 | 8° |
| | min | 0.8 | 0 | 0.8 | | 0.15 | 0.08 | 1.8 | 1.15 | | | 1.8 | 0.26 | | | | 0° |

Note
1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

*sot353-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT353-1 | | MO-203 | SC-88A | | | ~~21-12-15~~ 21-12-16 |

**Fig. 16. Package outline SOT353-1 (TSSOP5)**

# 15. Abbreviations

**Table 11. Abbreviations**

| Acronym | Description |
|---|---|
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MIL | Military |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

# 16. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74AHC_AHCT1G17_Q100 v.2 | 20220112 | Product data sheet | - | 74AHC_AHCT1G17_Q100 v.1 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Section 2 updated.<br>• Fig. 16: Package outline drawing for SOT353-1 (TSSOP5) has changed.<br>• Section 9: Derating values for $P_{tot}$ total power dissipation updated. | | | |
| 74AHC_AHCT1G17_Q100 v.1 | 20160308 | 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".
[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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