

# 74HC2G17-Q100; 74HCT2G17-Q100

## Dual non-inverting Schmitt trigger

Rev. 1 — 22 May 2013

Product data sheet

### 1. General description

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The 74HC2G17-Q100; 74HCT2G17-Q100 are dual buffers with Schmitt-trigger inputs. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ . Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

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

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- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- Input levels:
  - ◆ For 74HC2G17-Q100: CMOS level
  - ◆ For 74HCT2G17-Q100: TTL level
- Complies with JEDEC standard no. 7A
- High noise immunity
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- Low power dissipation
- Balanced propagation delays
- Unlimited input rise and fall times
- Multiple package options

### 3. Applications

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- Wave and pulse shaper for highly noisy environments
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

| Type number      | Package           |       |                                                  |         |
|------------------|-------------------|-------|--------------------------------------------------|---------|
|                  | Temperature range | Name  | Description                                      | Version |
| 74HC2G17GW-Q100  | –40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads         | SOT363  |
| 74HC2G17GV-Q100  | –40 °C to +125 °C | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457  |
| 74HCT2G17GW-Q100 | –40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads         | SOT363  |
| 74HCT2G17GV-Q100 | –40 °C to +125 °C | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457  |

5. Marking

Table 2. Marking

| Type number      | Marking code <sup>[1]</sup> |
|------------------|-----------------------------|
| 74HC2G17GW-Q100  | HV                          |
| 74HC2G17GV-Q100  | HV                          |
| 74HCT2G17GW-Q100 | TV                          |
| 74HCT2G17GV-Q100 | TV                          |

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

6. Functional diagram

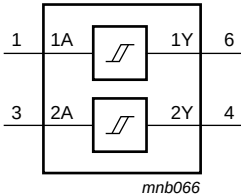


**Fig 1. Logic symbol**

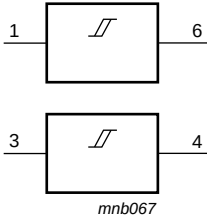


**Fig 2. IEC logic symbol**

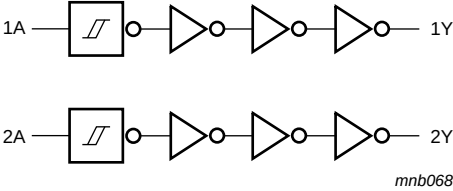


**Fig 3. Logic diagram**

7. Pinning information

7.1 Pinning

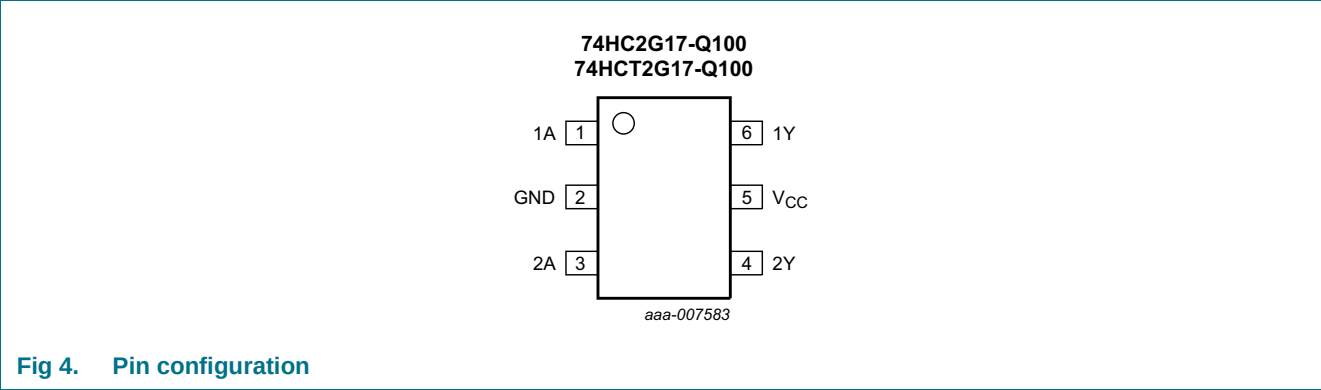


Fig 4. Pin configuration

7.2 Pin description

Table 3. Pin description

| Symbol          | Pin | Description    |
|-----------------|-----|----------------|
| 1A              | 1   | data input     |
| GND             | 2   | ground (0 V)   |
| 2A              | 3   | data input     |
| 2Y              | 4   | data output    |
| V <sub>CC</sub> | 5   | supply voltage |
| 1Y              | 6   | data output    |

8. Functional description

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

| Input | Output |
|-------|--------|
| nA    | nY     |
| L     | L      |
| H     | H      |

[1] H = HIGH voltage level;  
L = LOW voltage level.

## 9. 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    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ | [1] - | ±20  | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ | [1] - | ±20  | mA   |
| $I_O$     | output current          | $V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$       | [1] - | ±25  | mA   |
| $I_{CC}$  | supply current          |                                                        | [1] - | 50   | mA   |
| $I_{GND}$ | ground current          |                                                        | [1] - | -50  | mA   |
| $T_{stg}$ | storage temperature     |                                                        | -65   | +150 | °C   |
| $P_{tot}$ | total power dissipation |                                                        | [2] - | 250  | mW   |

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

[2] For SC-88 and SC-74 packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.

## 10. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol                | Parameter           | Conditions | Min | Typ | Max      | Unit |
|-----------------------|---------------------|------------|-----|-----|----------|------|
| <b>74HC2G17-Q100</b>  |                     |            |     |     |          |      |
| $V_{CC}$              | supply voltage      |            | 2.0 | 5.0 | 6.0      | V    |
| $V_I$                 | input voltage       |            | 0   | -   | $V_{CC}$ | V    |
| $V_O$                 | output voltage      |            | 0   | -   | $V_{CC}$ | V    |
| $T_{amb}$             | ambient temperature |            | -40 | +25 | +125     | °C   |
| <b>74HCT2G17-Q100</b> |                     |            |     |     |          |      |
| $V_{CC}$              | supply voltage      |            | 4.5 | 5.0 | 5.5      | V    |
| $V_I$                 | input voltage       |            | 0   | -   | $V_{CC}$ | V    |
| $V_O$                 | output voltage      |            | 0   | -   | $V_{CC}$ | V    |
| $T_{amb}$             | ambient temperature |            | -40 | +25 | +125     | °C   |

## 11. Static characteristics

**Table 7. Static characteristics for 74HC2G17**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol                                     | Parameter                 | Conditions                                               | Min  | Typ  | Max | Unit |
|--------------------------------------------|---------------------------|----------------------------------------------------------|------|------|-----|------|
| <b><math>T_{amb} = 25\text{ °C}</math></b> |                           |                                                          |      |      |     |      |
| $V_{OH}$                                   | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$                               |      |      |     |      |
|                                            |                           | $I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 2.0\text{ V}$ | 1.9  | 2.0  | -   | V    |
|                                            |                           | $I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 4.5\text{ V}$ | 4.4  | 4.5  | -   | V    |
|                                            |                           | $I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 6.0\text{ V}$ | 5.9  | 6.0  | -   | V    |
|                                            |                           | $I_O = -4.0\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$         | 4.18 | 4.32 | -   | V    |
|                                            |                           | $I_O = -5.2\text{ mA}$ ; $V_{CC} = 6.0\text{ V}$         | 5.68 | 5.81 | -   | V    |

**Table 7.** Static characteristics for 74HC2G17 ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol                                                                                        | Parameter                 | Conditions                                                                | Min  | Typ  | Max       | Unit          |
|-----------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------|------|------|-----------|---------------|
| $V_{OL}$                                                                                      | LOW-level output voltage  | $V_I = V_{T+}$ or $V_{T-}$                                                |      |      |           |               |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 2.0\ \text{V}$                           | -    | 0    | 0.1       | V             |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 4.5\ \text{V}$                           | -    | 0    | 0.1       | V             |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 6.0\ \text{V}$                           | -    | 0    | 0.1       | V             |
|                                                                                               |                           | $I_O = 4.0\ \text{mA}; V_{CC} = 4.5\ \text{V}$                            | -    | 0.15 | 0.26      | V             |
|                                                                                               |                           | $I_O = 5.2\ \text{mA}; V_{CC} = 6.0\ \text{V}$                            | -    | 0.16 | 0.26      | V             |
| $I_I$                                                                                         | input leakage current     | $V_I = \text{GND}$ or $V_{CC}; V_{CC} = 6.0\ \text{V}$                    | -    | -    | $\pm 0.1$ | $\mu\text{A}$ |
| $I_{CC}$                                                                                      | supply current            | $V_I = \text{GND}$ or $V_{CC}; I_O = 0\ \text{A}; V_{CC} = 6.0\ \text{V}$ | -    | -    | 1.0       | $\mu\text{A}$ |
| $C_I$                                                                                         | input capacitance         |                                                                           | -    | 2.0  | -         | pF            |
| <b><math>T_{\text{amb}} = -40\ ^\circ\text{C}</math> to <math>+85\ ^\circ\text{C}</math></b>  |                           |                                                                           |      |      |           |               |
| $V_{OH}$                                                                                      | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$                                                |      |      |           |               |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 2.0\ \text{V}$                          | 1.9  | -    | -         | V             |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 4.5\ \text{V}$                          | 4.4  | -    | -         | V             |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 6.0\ \text{V}$                          | 5.9  | -    | -         | V             |
|                                                                                               |                           | $I_O = -4.0\ \text{mA}; V_{CC} = 4.5\ \text{V}$                           | 4.13 | -    | -         | V             |
|                                                                                               |                           | $I_O = -5.2\ \text{mA}; V_{CC} = 6.0\ \text{V}$                           | 5.63 | -    | -         | V             |
| $V_{OL}$                                                                                      | LOW-level output voltage  | $V_I = V_{T+}$ or $V_{T-}$                                                |      |      |           |               |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 2.0\ \text{V}$                           | -    | -    | 0.1       | V             |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 4.5\ \text{V}$                           | -    | -    | 0.1       | V             |
|                                                                                               |                           | $I_O = 20\ \mu\text{A}; V_{CC} = 6.0\ \text{V}$                           | -    | -    | 0.1       | V             |
|                                                                                               |                           | $I_O = 4.0\ \text{mA}; V_{CC} = 4.5\ \text{V}$                            | -    | -    | 0.33      | V             |
|                                                                                               |                           | $I_O = 5.2\ \text{mA}; V_{CC} = 6.0\ \text{V}$                            | -    | -    | 0.33      | V             |
| $I_I$                                                                                         | input leakage current     | $V_I = \text{GND}$ or $V_{CC}; V_{CC} = 6.0\ \text{V}$                    | -    | -    | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                                                      | supply current            | $V_I = \text{GND}$ or $V_{CC}; I_O = 0\ \text{A}; V_{CC} = 6.0\ \text{V}$ | -    | -    | 10.0      | $\mu\text{A}$ |
| <b><math>T_{\text{amb}} = -40\ ^\circ\text{C}</math> to <math>+125\ ^\circ\text{C}</math></b> |                           |                                                                           |      |      |           |               |
| $V_{OH}$                                                                                      | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$                                                |      |      |           |               |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 2.0\ \text{V}$                          | 1.9  | -    | -         | V             |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 4.5\ \text{V}$                          | 4.4  | -    | -         | V             |
|                                                                                               |                           | $I_O = -20\ \mu\text{A}; V_{CC} = 6.0\ \text{V}$                          | 5.9  | -    | -         | V             |
|                                                                                               |                           | $I_O = -4.0\ \text{mA}; V_{CC} = 4.5\ \text{V}$                           | 3.7  | -    | -         | V             |
|                                                                                               |                           | $I_O = -5.2\ \text{mA}; V_{CC} = 6.0\ \text{V}$                           | 5.2  | -    | -         | V             |

**Table 7.** Static characteristics for 74HC2G17 ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol   | Parameter                | Conditions                                                                         | Min | Typ | Max       | Unit          |
|----------|--------------------------|------------------------------------------------------------------------------------|-----|-----|-----------|---------------|
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{T+}$ or $V_{T-}$                                                         |     |     |           |               |
|          |                          | $I_O = 20\ \mu\text{A}$ ; $V_{CC} = 2.0\ \text{V}$                                 | -   | -   | 0.1       | V             |
|          |                          | $I_O = 20\ \mu\text{A}$ ; $V_{CC} = 4.5\ \text{V}$                                 | -   | -   | 0.1       | V             |
|          |                          | $I_O = 20\ \mu\text{A}$ ; $V_{CC} = 6.0\ \text{V}$                                 | -   | -   | 0.1       | V             |
|          |                          | $I_O = 4.0\ \text{mA}$ ; $V_{CC} = 4.5\ \text{V}$                                  | -   | -   | 0.4       | V             |
|          |                          | $I_O = 5.2\ \text{mA}$ ; $V_{CC} = 6.0\ \text{V}$                                  | -   | -   | 0.4       | V             |
| $I_I$    | input leakage current    | $V_I = \text{GND}$ or $V_{CC}$ ; $V_{CC} = 6.0\ \text{V}$                          | -   | -   | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$ | supply current           | $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\ \text{A}$ ;<br>$V_{CC} = 6.0\ \text{V}$ | -   | -   | 20.0      | $\mu\text{A}$ |

**Table 8.** Static characteristics for 74HCT2G17

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol                                                          | Parameter                 | Conditions                                                                                            | Min  | Typ  | Max       | Unit          |
|-----------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| $T_{\text{amb}} = 25\ ^\circ\text{C}$                           |                           |                                                                                                       |      |      |           |               |
| $V_{OH}$                                                        | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5\ \text{V}$                                                 |      |      |           |               |
|                                                                 |                           | $I_O = -20\ \mu\text{A}$                                                                              | 4.4  | 4.5  | -         | V             |
|                                                                 |                           | $I_O = -4.0\ \text{mA}$                                                                               | 4.18 | 4.32 | -         | V             |
| $V_{OL}$                                                        | LOW-level output voltage  | $V_I = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5\ \text{V}$                                                 |      |      |           |               |
|                                                                 |                           | $I_O = -20\ \mu\text{A}$                                                                              | -    | 0    | 0.1       | V             |
|                                                                 |                           | $I_O = -4.0\ \text{mA}$                                                                               | -    | 0.15 | 0.26      | V             |
| $I_I$                                                           | input leakage current     | $V_I = \text{GND}$ or $V_{CC}$ ; $V_{CC} = 5.5\ \text{V}$                                             | -    | -    | $\pm 0.1$ | $\mu\text{A}$ |
| $I_{CC}$                                                        | supply current            | $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\ \text{A}$ ;<br>$V_{CC} = 5.5\ \text{V}$                    | -    | -    | 1.0       | $\mu\text{A}$ |
| $\Delta I_{CC}$                                                 | additional supply current | $V_I = V_{CC} - 2.1\ \text{V}$ ;<br>$V_{CC} = 4.5\ \text{V}$ to $5.5\ \text{V}$ ; $I_O = 0\ \text{A}$ | -    | -    | 300       | $\mu\text{A}$ |
| $C_I$                                                           | input capacitance         |                                                                                                       | -    | 2.0  | -         | pF            |
| $T_{\text{amb}} = -40\ ^\circ\text{C}$ to $+85\ ^\circ\text{C}$ |                           |                                                                                                       |      |      |           |               |
| $V_{OH}$                                                        | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5\ \text{V}$                                                 |      |      |           |               |
|                                                                 |                           | $I_O = -20\ \mu\text{A}$                                                                              | 4.4  | -    | -         | V             |
|                                                                 |                           | $I_O = -4.0\ \text{mA}$                                                                               | 4.13 | -    | -         | V             |
| $V_{OL}$                                                        | LOW-level output voltage  | $V_I = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5\ \text{V}$                                                 |      |      |           |               |
|                                                                 |                           | $I_O = -20\ \mu\text{A}$                                                                              | -    | -    | 0.1       | V             |
|                                                                 |                           | $I_O = -4.0\ \text{mA}$                                                                               | -    | -    | 0.33      | V             |
| $I_I$                                                           | input leakage current     | $V_I = \text{GND}$ or $V_{CC}$ ; $V_{CC} = 5.5\ \text{V}$                                             | -    | -    | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                        | supply current            | $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\ \text{A}$ ;<br>$V_{CC} = 5.5\ \text{V}$                    | -    | -    | 10.0      | $\mu\text{A}$ |
| $\Delta I_{CC}$                                                 | additional supply current | $V_I = V_{CC} - 2.1\ \text{V}$ ;<br>$V_{CC} = 4.5\ \text{V}$ to $5.5\ \text{V}$ ; $I_O = 0\ \text{A}$ | -    | -    | 375       | $\mu\text{A}$ |

**Table 8.** Static characteristics for 74HCT2G17 ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol                                     | Parameter                 | Conditions                                                                                          | Min | Typ | Max  | Unit |
|--------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------|-----|-----|------|------|
| <b>T<sub>amb</sub> = –40 °C to +125 °C</b> |                           |                                                                                                     |     |     |      |      |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>T+</sub> or V <sub>T–</sub> ; V <sub>CC</sub> = 4.5 V                       |     |     |      |      |
|                                            |                           | I <sub>O</sub> = –20 µA                                                                             | 4.4 | -   | -    | V    |
|                                            |                           | I <sub>O</sub> = –4.0 mA                                                                            | 3.7 | -   | -    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>T+</sub> or V <sub>T–</sub> ; V <sub>CC</sub> = 4.5 V                       |     |     |      |      |
|                                            |                           | I <sub>O</sub> = –20 µA                                                                             | -   | -   | 0.1  | V    |
|                                            |                           | I <sub>O</sub> = –4.0 mA                                                                            | -   | -   | 0.4  | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>CC</sub> = 5.5 V                                   | -   | -   | ±1.0 | µA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V          | -   | -   | 20.0 | µA   |
| ΔI <sub>CC</sub>                           | additional supply current | V <sub>I</sub> = V <sub>CC</sub> – 2.1 V;<br>V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A | -   | -   | 410  | µA   |

## 12. Dynamic characteristics

**Table 9.** Dynamic characteristicsVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#).

| Symbol          | Parameter                     | Conditions                                                  | 25 °C |     |     | –40 °C to +125 °C |                |                 | Unit |
|-----------------|-------------------------------|-------------------------------------------------------------|-------|-----|-----|-------------------|----------------|-----------------|------|
|                 |                               |                                                             | Min   | Typ | Max | Min               | Max<br>(85 °C) | Max<br>(125 °C) |      |
| 74HC2G17-Q100   |                               |                                                             |       |     |     |                   |                |                 |      |
| t <sub>pd</sub> | propagation delay             | nA to nY; see <a href="#">Figure 5</a> <a href="#">[1]</a>  |       |     |     |                   |                |                 |      |
|                 |                               | V <sub>CC</sub> = 2.0 V; C <sub>L</sub> = 50 pF             | -     | 36  | 115 | -                 | 140            | 175             | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V; C <sub>L</sub> = 50 pF             | -     | 12  | 22  | -                 | 27             | 34              | ns   |
|                 |                               | V <sub>CC</sub> = 6.0 V; C <sub>L</sub> = 50 pF             | -     | 10  | 18  | -                 | 22             | 28              | ns   |
| t <sub>t</sub>  | transition time               | nY; see <a href="#">Figure 5</a> <a href="#">[2]</a>        |       |     |     |                   |                |                 |      |
|                 |                               | V <sub>CC</sub> = 2.0 V; C <sub>L</sub> = 50 pF             | -     | 20  | 75  | -                 | 95             | 110             | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V; C <sub>L</sub> = 50 pF             | -     | 7   | 15  | -                 | 19             | 22              | ns   |
|                 |                               | V <sub>CC</sub> = 6.0 V; C <sub>L</sub> = 50 pF             | -     | 5   | 13  | -                 | 16             | 19              | ns   |
| C <sub>PD</sub> | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> <a href="#">[3]</a> | -     | 10  | -   | -                 | -              | -               | pF   |

**Table 9. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#).

| Symbol          | Parameter                     | Conditions                                      | 25 °C               |     |     | –40 °C to +125 °C |                |                 | Unit |
|-----------------|-------------------------------|-------------------------------------------------|---------------------|-----|-----|-------------------|----------------|-----------------|------|
|                 |                               |                                                 | Min                 | Typ | Max | Min               | Max<br>(85 °C) | Max<br>(125 °C) |      |
| 74HCT2G17-Q100  |                               |                                                 |                     |     |     |                   |                |                 |      |
| t <sub>pd</sub> | propagation delay             | nA to nY; see <a href="#">Figure 5</a>          | <a href="#">[1]</a> |     |     |                   |                |                 |      |
|                 |                               | V <sub>CC</sub> = 4.5 V; C <sub>L</sub> = 50 pF | -                   | 21  | 29  | -                 | 36             | 45              | ns   |
| t <sub>t</sub>  | transition time               | nY; see <a href="#">Figure 5</a>                | <a href="#">[2]</a> |     |     |                   |                |                 |      |
|                 |                               | V <sub>CC</sub> = 4.5 V; C <sub>L</sub> = 50 pF | -                   | 6   | 15  | -                 | 19             | 22              | ns   |
| C <sub>PD</sub> | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> – 1.5 V | <a href="#">[3]</a> | -   | 10  | -                 | -              | -               | pF   |

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$

[2]  $t_t$  is the same as  $t_{TLH}$  and  $t_{THL}$

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

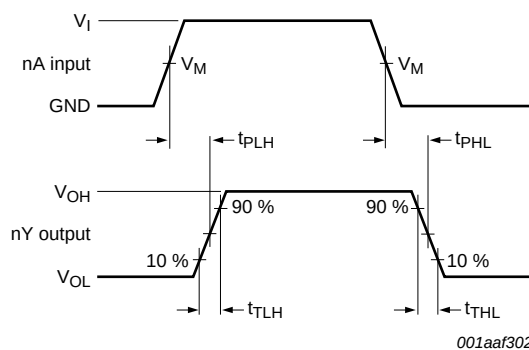
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

## 13. Waveforms



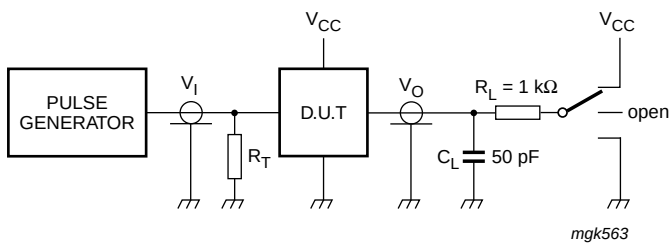
Measurement points are given in [Table 10](#).

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

**Fig 5. The data input (nA) to output (nY) propagation delays and output transition times**

**Table 10. Measurement points**

| Type           | Input       |                 |             | Output      |
|----------------|-------------|-----------------|-------------|-------------|
|                | $V_M$       | $V_I$           | $t_r = t_f$ | $V_M$       |
| 74HC2G17-Q100  | $0.5V_{CC}$ | GND to $V_{CC}$ | 6.0 ns      | $0.5V_{CC}$ |
| 74HCT2G17-Q100 | 1.3 V       | GND to 3.0 V    | 6.0 ns      | 1.3 V       |



Test data is given in [Table 11](#).

Definitions test circuit:

$R_L$  = Load resistance.

$C_L$  = 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

Table 11. Test data

| Type           | Input           |            | Test               |
|----------------|-----------------|------------|--------------------|
|                | $V_I$           | $t_r, t_f$ | $t_{PHL}, t_{PLH}$ |
| 74HC2G17-Q100  | GND to $V_{CC}$ | 6 ns       | open               |
| 74HCT2G17-Q100 | GND to 3.0 V    | 6 ns       | open               |

## 14. Transfer characteristics

Table 12. Transfer characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#).

| Symbol | Parameter | Conditions | 25 °C |     |     | -40 °C to +125 °C |             |              | Unit |
|--------|-----------|------------|-------|-----|-----|-------------------|-------------|--------------|------|
|        |           |            | Min   | Typ | Max | Min               | Max (85 °C) | Max (125 °C) |      |

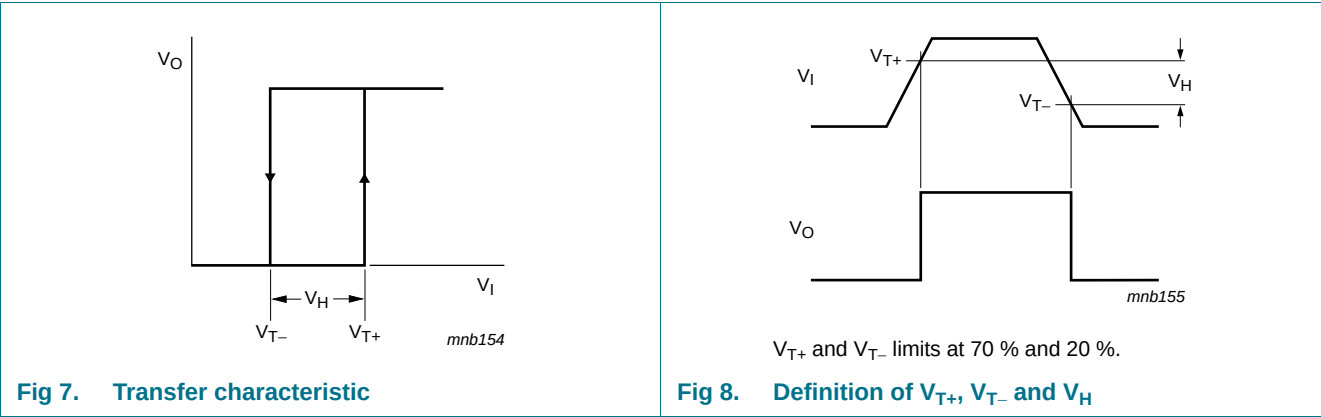
### 74HC2G17-Q100

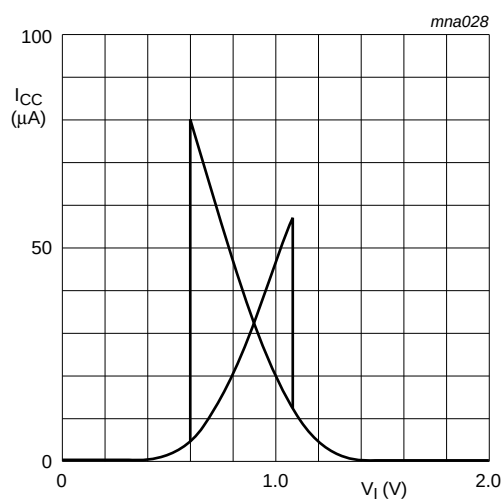
|          |                                  |                                                                                                          |      |      |      |      |      |      |   |
|----------|----------------------------------|----------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|---|
| $V_{T+}$ | positive-going threshold voltage | see <a href="#">Figure 7</a> , <a href="#">Figure 8</a>                                                  |      |      |      |      |      |      |   |
|          |                                  | $V_{CC} = 2.0\text{ V}$                                                                                  | 1.00 | 1.18 | 1.50 | 1.00 | 1.50 | 1.50 | V |
|          |                                  | $V_{CC} = 4.5\text{ V}$                                                                                  | 2.30 | 2.60 | 3.15 | 2.30 | 3.15 | 3.15 | V |
|          |                                  | $V_{CC} = 6.0\text{ V}$                                                                                  | 3.00 | 3.46 | 4.20 | 3.00 | 4.20 | 4.20 | V |
| $V_{T-}$ | negative-going threshold voltage | see <a href="#">Figure 7</a> , <a href="#">Figure 8</a>                                                  |      |      |      |      |      |      |   |
|          |                                  | $V_{CC} = 2.0\text{ V}$                                                                                  | 0.30 | 0.60 | 0.90 | 0.30 | 0.90 | 0.90 | V |
|          |                                  | $V_{CC} = 4.5\text{ V}$                                                                                  | 1.13 | 1.47 | 2.00 | 1.13 | 2.00 | 2.00 | V |
|          |                                  | $V_{CC} = 6.0\text{ V}$                                                                                  | 1.50 | 2.06 | 2.60 | 1.50 | 2.60 | 2.60 | V |
| $V_H$    | hysteresis voltage               | $V_{T+} - V_{T-}$ ; see <a href="#">Figure 7</a> , <a href="#">Figure 8</a> and <a href="#">Figure 9</a> |      |      |      |      |      |      |   |
|          |                                  | $V_{CC} = 2.0\text{ V}$                                                                                  | 0.30 | 0.60 | 1.00 | 0.30 | 1.00 | 1.00 | V |
|          |                                  | $V_{CC} = 4.5\text{ V}$                                                                                  | 0.60 | 1.13 | 1.40 | 0.60 | 1.40 | 1.40 | V |
|          |                                  | $V_{CC} = 6.0\text{ V}$                                                                                  | 0.80 | 1.40 | 1.70 | 0.80 | 1.70 | 1.70 | V |

Table 12. Transfer characteristics ...continued  
Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 6.

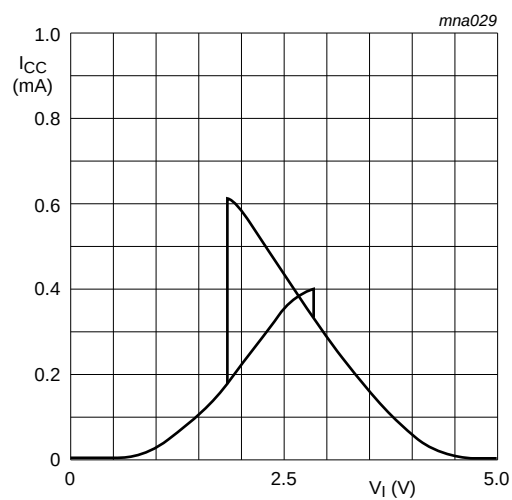
| Symbol          | Parameter                           | Conditions                                                                                                                   | 25 °C |      |      | –40 °C to +125 °C |                |                 | Unit |
|-----------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------|------|------|-------------------|----------------|-----------------|------|
|                 |                                     |                                                                                                                              | Min   | Typ  | Max  | Min               | Max<br>(85 °C) | Max<br>(125 °C) |      |
| 74HCT2G17-Q100  |                                     |                                                                                                                              |       |      |      |                   |                |                 |      |
| V <sub>T+</sub> | positive-going<br>threshold voltage | see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>                                                                    |       |      |      |                   |                |                 |      |
|                 |                                     | V <sub>CC</sub> = 4.5 V                                                                                                      | 1.20  | 1.58 | 1.90 | 1.20              | 1.90           | 1.90            | V    |
|                 |                                     | V <sub>CC</sub> = 5.5 V                                                                                                      | 1.40  | 1.78 | 2.10 | 1.40              | 2.10           | 2.10            | V    |
| V <sub>T–</sub> | negative-going<br>threshold voltage | see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>                                                                    |       |      |      |                   |                |                 |      |
|                 |                                     | V <sub>CC</sub> = 4.5 V                                                                                                      | 0.50  | 0.87 | 1.20 | 0.50              | 1.20           | 1.20            | V    |
|                 |                                     | V <sub>CC</sub> = 5.5 V                                                                                                      | 0.60  | 1.11 | 1.40 | 0.60              | 1.40           | 1.40            | V    |
| V <sub>H</sub>  | hysteresis voltage                  | V <sub>T+</sub> – V <sub>T–</sub> ; see <a href="#">Figure 7</a> ,<br><a href="#">Figure 8</a> and <a href="#">Figure 10</a> |       |      |      |                   |                |                 |      |
|                 |                                     | V <sub>CC</sub> = 4.5 V                                                                                                      | 0.40  | 0.71 | -    | 0.40              | -              | -               | V    |
|                 |                                     | V <sub>CC</sub> = 5.5 V                                                                                                      | 0.40  | 0.67 | -    | 0.40              | -              | -               | V    |

15. Waveforms transfer characteristics

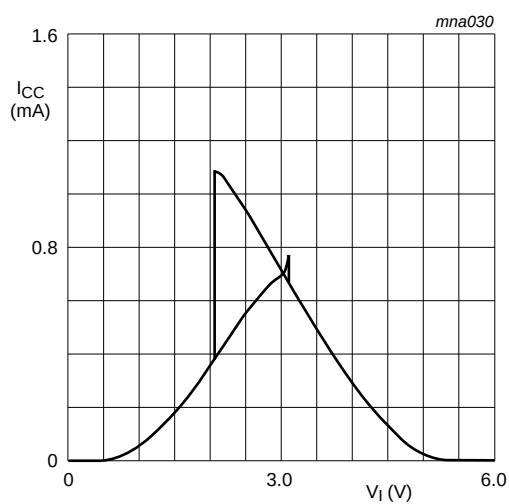




a.  $V_{CC} = 2.0 V$



b.  $V_{CC} = 4.5 V$



c.  $V_{CC} = 6.0 V$

Fig 9. Typical 74HC2G17 transfer characteristics

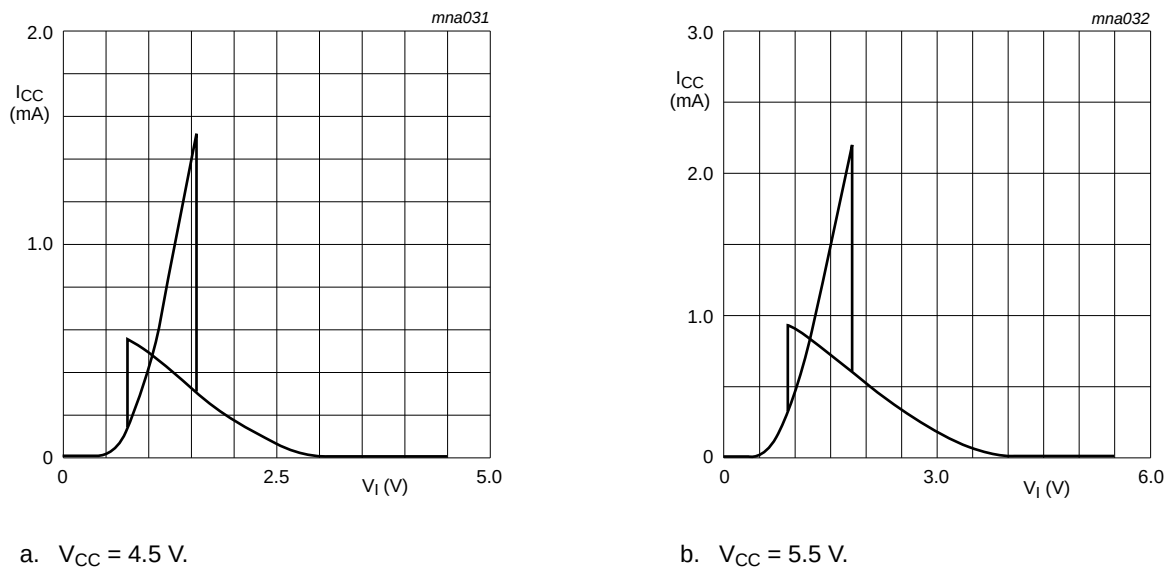


Fig 10. Typical 74HCT2G17-Q100 transfer characteristics

## 16. 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 ( $\mu$ W);

$f_i$  = 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 ( $\mu$ A).

$\Delta I_{CC(AV)}$  differs with positive or negative input transitions, as shown in [Figure 11](#) and [Figure 12](#).

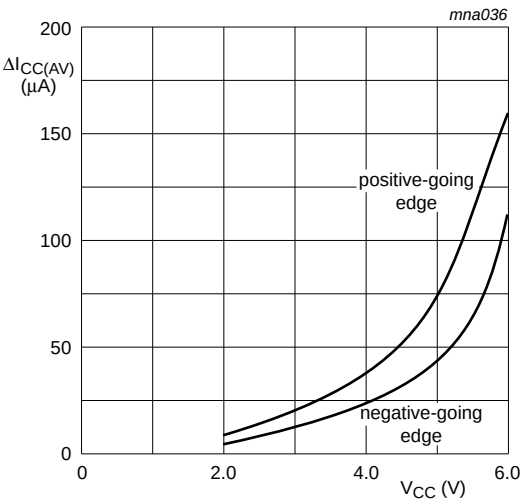


Fig 11.  $\Delta I_{CC(AV)}$  as a function of  $V_{CC}$  for 74HC2G17-Q100; linear change of  $V_I$  between  $0.1V_{CC}$  to  $0.9V_{CC}$

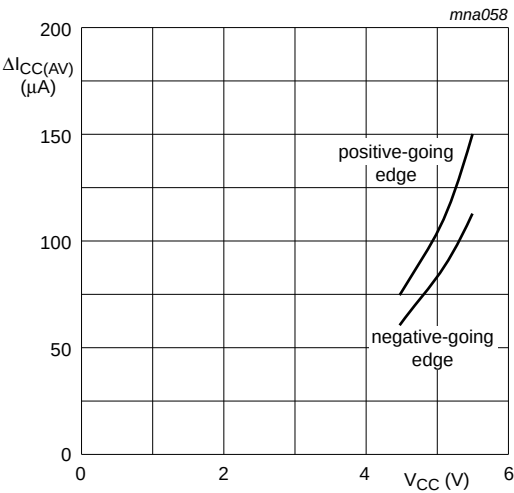


Fig 12.  $\Delta I_{CC(AV)}$  as a function of  $V_{CC}$  for 74HCT2G17-Q100; linear change of  $V_I$  between  $0.1V_{CC}$  to  $0.9V_{CC}$

17. Package outline

Plastic surface-mounted package; 6 leads

SOT363

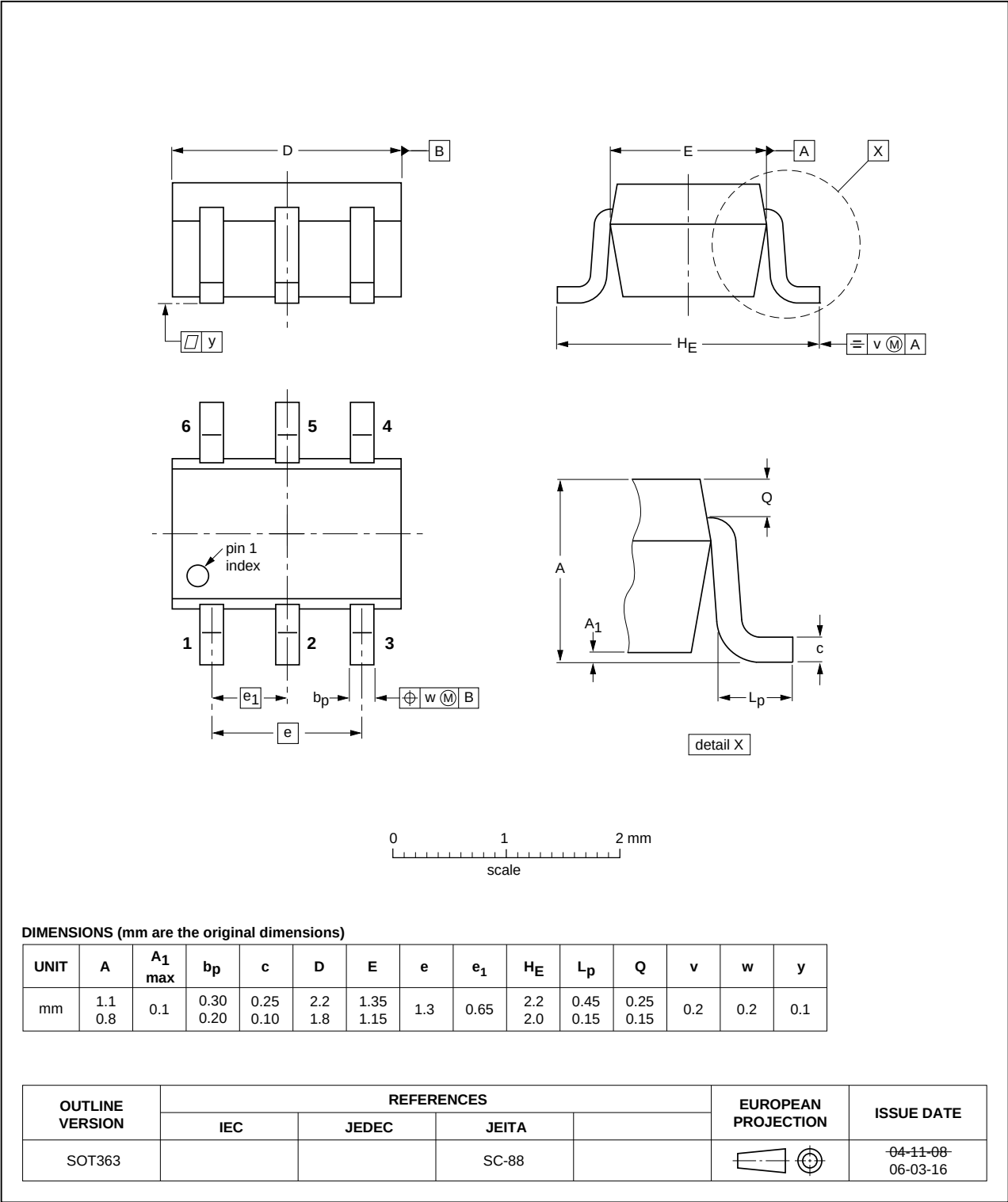


Fig 13. Package outline SOT363 (SC-88)

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

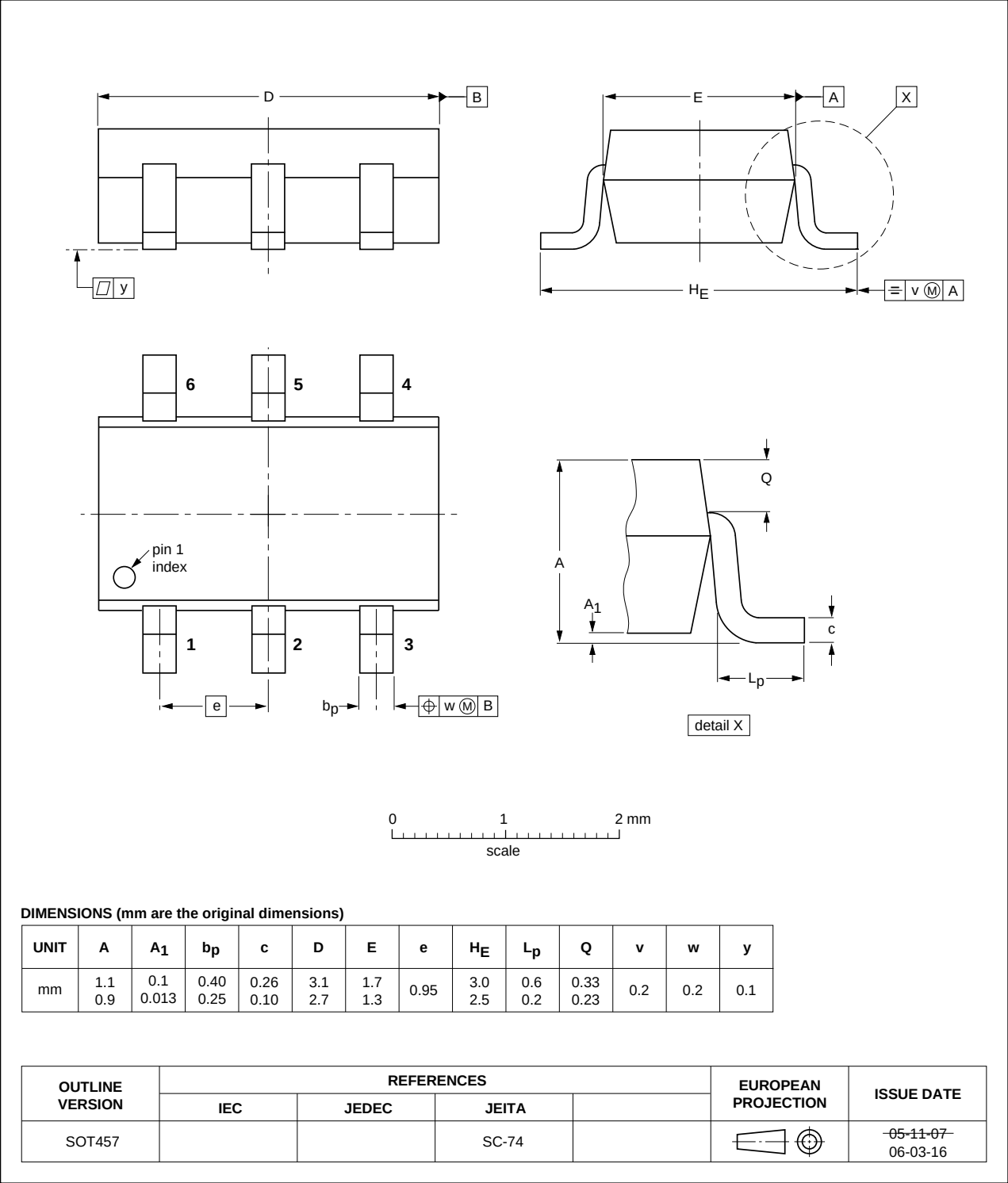


Fig 14. Package outline SOT457 (SC-74)

## 18. Abbreviations

Table 13. Abbreviations

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

## 19. Revision history

Table 14. Revision history

| Document ID           | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------------|--------------|--------------------|---------------|------------|
| 74HC_HCT2G17_Q100 v.1 | 20130522     | Product data sheet | -             | -          |

## 20. Legal information

### 20.1 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>.

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## 22. Contents

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|           |                                                     |           |
|-----------|-----------------------------------------------------|-----------|
| <b>1</b>  | <b>General description</b> . . . . .                | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits</b> . . . . .              | <b>1</b>  |
| <b>3</b>  | <b>Applications</b> . . . . .                       | <b>1</b>  |
| <b>4</b>  | <b>Ordering information</b> . . . . .               | <b>2</b>  |
| <b>5</b>  | <b>Marking</b> . . . . .                            | <b>2</b>  |
| <b>6</b>  | <b>Functional diagram</b> . . . . .                 | <b>2</b>  |
| <b>7</b>  | <b>Pinning information</b> . . . . .                | <b>3</b>  |
| 7.1       | Pinning . . . . .                                   | 3         |
| 7.2       | Pin description . . . . .                           | 3         |
| <b>8</b>  | <b>Functional description</b> . . . . .             | <b>3</b>  |
| <b>9</b>  | <b>Limiting values</b> . . . . .                    | <b>4</b>  |
| <b>10</b> | <b>Recommended operating conditions</b> . . . . .   | <b>4</b>  |
| <b>11</b> | <b>Static characteristics</b> . . . . .             | <b>4</b>  |
| <b>12</b> | <b>Dynamic characteristics</b> . . . . .            | <b>7</b>  |
| <b>13</b> | <b>Waveforms</b> . . . . .                          | <b>8</b>  |
| <b>14</b> | <b>Transfer characteristics</b> . . . . .           | <b>9</b>  |
| <b>15</b> | <b>Waveforms transfer characteristics</b> . . . . . | <b>10</b> |
| <b>16</b> | <b>Application information</b> . . . . .            | <b>12</b> |
| <b>17</b> | <b>Package outline</b> . . . . .                    | <b>14</b> |
| <b>18</b> | <b>Abbreviations</b> . . . . .                      | <b>16</b> |
| <b>19</b> | <b>Revision history</b> . . . . .                   | <b>16</b> |
| <b>20</b> | <b>Legal information</b> . . . . .                  | <b>17</b> |
| 20.1      | Data sheet status . . . . .                         | 17        |
| 20.2      | Definitions . . . . .                               | 17        |
| 20.3      | Disclaimers . . . . .                               | 17        |
| 20.4      | Trademarks . . . . .                                | 18        |
| <b>21</b> | <b>Contact information</b> . . . . .                | <b>18</b> |
| <b>22</b> | <b>Contents</b> . . . . .                           | <b>19</b> |