



**THE DATASHEET OF  
74HCT1G08GV,125**



# 74HC1G08; 74HCT1G08

## 2-input AND gate

Rev. 5 — 14 March 2018

Product data sheet

## 1 General description

The 74HC1G08; 74HCT1G08 is a single 2-input AND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## 2 Features

- Input levels:
  - For 74HC1G08: CMOS level
  - For 74HCT1G08: TTL level
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ °C}$  to  $+85\text{ °C}$  and  $-40\text{ °C}$  to  $+125\text{ °C}$

## 3 Ordering information

Table 1. Ordering information

| Type number | Package           |        |                                                                        |          |
|-------------|-------------------|--------|------------------------------------------------------------------------|----------|
|             | Temperature range | Name   | Description                                                            | Version  |
| 74HC1G08GW  | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74HCT1G08GW |                   |        |                                                                        |          |
| 74HC1G08GV  | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads                               | SOT753   |
| 74HCT1G08GV |                   |        |                                                                        |          |

## 4 Marking

Table 2. Marking codes

| Type number | Marking |
|-------------|---------|
| 74HC1G08GW  | HE      |
| 74HCT1G08GW | TE      |
| 74HC1G08GV  | H08     |
| 74HCT1G08GV | T08     |

## 5 Functional diagram

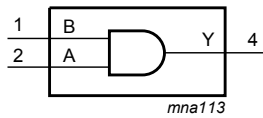


Figure 1. Logic symbol

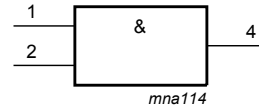


Figure 2. IEC logic symbol

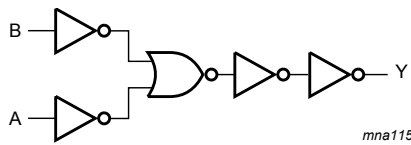


Figure 3. Logic diagram

## 6 Pinning information

### 6.1 Pinning

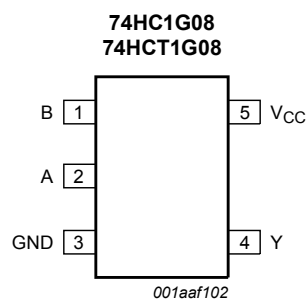


Figure 4. Pin configuration

## 6.2 Pin description

Table 3. Pin description

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

## 7 Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

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

## 8 Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).<sup>[1]</sup>

| Symbol           | Parameter               | Conditions                                                          | Min  | Max   | Unit |
|------------------|-------------------------|---------------------------------------------------------------------|------|-------|------|
| V <sub>CC</sub>  | supply voltage          |                                                                     | -0.5 | +7.0  | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | -    | ±20   | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V | -    | ±20   | mA   |
| I <sub>O</sub>   | output current          | -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V                   | -    | ±12.5 | mA   |
| I <sub>CC</sub>  | supply current          |                                                                     | -    | 25    | mA   |
| I <sub>GND</sub> | ground current          |                                                                     | -25  | -     | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                     | -65  | +150  | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C <sup>[2]</sup>                 | -    | 200   | mW   |

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

[2] Above 55 °C the value of P<sub>tot</sub> derates linearly with 2.5 mW/K.

## 9 Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol           | Parameter                           | Conditions              | 74HC1G08 |     |                 | 74HCT1G08 |     |                 | Unit |
|------------------|-------------------------------------|-------------------------|----------|-----|-----------------|-----------|-----|-----------------|------|
|                  |                                     |                         | Min      | Typ | Max             | Min       | Typ | Max             |      |
| V <sub>CC</sub>  | supply voltage                      |                         | 2.0      | 5.0 | 6.0             | 4.5       | 5.0 | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                         | 0        | -   | V <sub>CC</sub> | 0         | -   | V <sub>CC</sub> | V    |
| V <sub>O</sub>   | output voltage                      |                         | 0        | -   | V <sub>CC</sub> | 0         | -   | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                         | -40      | +25 | +125            | -40       | +25 | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 2.0 V | -        | -   | 625             | -         | -   | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 4.5 V | -        | -   | 139             | -         | -   | 139             | ns/V |
|                  |                                     | V <sub>CC</sub> = 6.0 V | -        | -   | 83              | -         | -   | -               | ns/V |

## 10 Static characteristics

**Table 7. Static characteristics**

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T<sub>amb</sub> = 25 °C.

| Symbol          | Parameter                 | Conditions                                                       | -40 °C to +85 °C |      |      | -40 °C to +125 °C |      | Unit |
|-----------------|---------------------------|------------------------------------------------------------------|------------------|------|------|-------------------|------|------|
|                 |                           |                                                                  | Min              | Typ  | Max  | Min               | Max  |      |
| <b>74HC1G08</b> |                           |                                                                  |                  |      |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                          | 1.5              | 1.2  | -    | 1.5               | -    | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                                          | 3.15             | 2.4  | -    | 3.15              | -    | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                                          | 4.2              | 3.2  | -    | 4.2               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                          | -                | 0.8  | 0.5  | -                 | 0.5  | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                                          | -                | 2.1  | 1.35 | -                 | 1.35 | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                                          | -                | 2.8  | 1.8  | -                 | 1.8  | V    |
| V <sub>OH</sub> | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>              |                  |      |      |                   |      |      |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V                 | 1.9              | 2.0  | -    | 1.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V                 | 4.4              | 4.5  | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V                 | 5.9              | 6.0  | -    | 5.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -2.0 mA; V <sub>CC</sub> = 4.5 V                | 4.13             | 4.32 | -    | 3.7               | -    | V    |
|                 |                           | I <sub>O</sub> = -2.6 mA; V <sub>CC</sub> = 6.0 V                | 5.63             | 5.81 | -    | 5.2               | -    | V    |
| V <sub>OL</sub> | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>              |                  |      |      |                   |      |      |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V                  | -                | 0    | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V                  | -                | 0    | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V                  | -                | 0    | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 2.0 mA; V <sub>CC</sub> = 4.5 V                 | -                | 0.15 | 0.33 | -                 | 0.4  | V    |
|                 |                           | I <sub>O</sub> = 2.6 mA; V <sub>CC</sub> = 6.0 V                 | -                | 0.16 | 0.33 | -                 | 0.4  | V    |
| I <sub>I</sub>  | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V | -                | -    | 1.0  | -                 | 1.0  | μA   |

| Symbol           | Parameter                 | Conditions                                                                   | -40 °C to +85 °C |      |      | -40 °C to +125 °C |     | Unit    |
|------------------|---------------------------|------------------------------------------------------------------------------|------------------|------|------|-------------------|-----|---------|
|                  |                           |                                                                              | Min              | Typ  | Max  | Min               | Max |         |
| $I_{CC}$         | supply current            | $V_I = V_{CC}$ or GND; $I_O = 0$ A;<br>$V_{CC} = 6.0$ V                      | -                | -    | 10   | -                 | 20  | $\mu$ A |
| $C_I$            | input capacitance         |                                                                              | -                | 1.5  | -    | -                 | -   | pF      |
| <b>74HCT1G08</b> |                           |                                                                              |                  |      |      |                   |     |         |
| $V_{IH}$         | HIGH-level input voltage  | $V_{CC} = 4.5$ V to 5.5 V                                                    | 2.0              | 1.6  | -    | 2.0               | -   | V       |
| $V_{IL}$         | LOW-level input voltage   | $V_{CC} = 4.5$ V to 5.5 V                                                    | -                | 1.2  | 0.8  | -                 | 0.8 | V       |
| $V_{OH}$         | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$                                                   |                  |      |      |                   |     |         |
|                  |                           | $I_O = -20$ $\mu$ A; $V_{CC} = 4.5$ V                                        | 4.4              | 4.5  | -    | 4.4               | -   | V       |
|                  |                           | $I_O = -2.0$ mA; $V_{CC} = 4.5$ V                                            | 4.13             | 4.32 | -    | 3.7               | -   | V       |
| $V_{OL}$         | LOW-level output voltage  | $V_I = V_{IH}$ or $V_{IL}$                                                   |                  |      |      |                   |     |         |
|                  |                           | $I_O = 20$ $\mu$ A; $V_{CC} = 4.5$ V                                         | -                | 0    | 0.1  | -                 | 0.1 | V       |
|                  |                           | $I_O = 2.0$ mA; $V_{CC} = 4.5$ V                                             | -                | 0.15 | 0.33 | -                 | 0.4 | V       |
| $I_I$            | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V                                      | -                | -    | 1.0  | -                 | 1.0 | $\mu$ A |
| $I_{CC}$         | supply current            | $V_I = V_{CC}$ or GND; $I_O = 0$ A;<br>$V_{CC} = 5.5$ V                      | -                | -    | 10   | -                 | 20  | $\mu$ A |
| $\Delta I_{CC}$  | additional supply current | per input; $V_{CC} = 4.5$ V to 5.5 V;<br>$V_I = V_{CC} - 2.1$ V; $I_O = 0$ A | -                | -    | 500  | -                 | 850 | $\mu$ A |
| $C_I$            | input capacitance         |                                                                              | -                | 1.5  | -    | -                 | -   | pF      |

## 11 Dynamic characteristics

**Table 8. Dynamic characteristics**

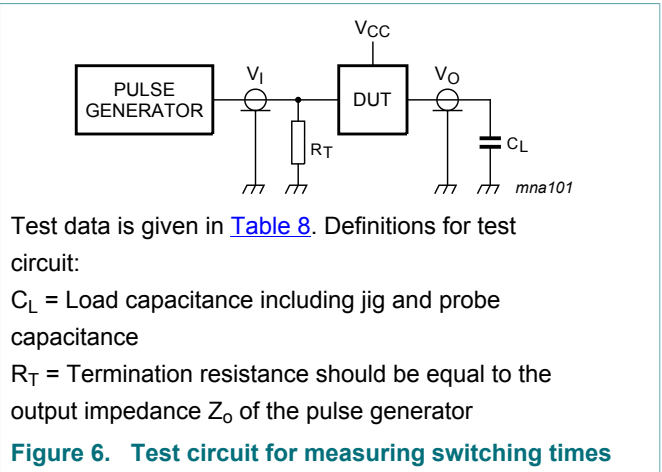
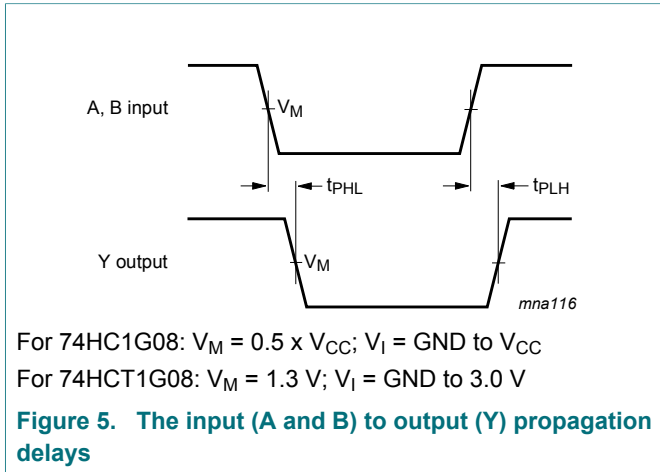
$GND = 0$  V;  $t_r = t_f \leq 6.0$  ns; All typical values are measured at  $T_{amb} = 25$  °C. For test circuit see [Figure 6](#)

| Symbol          | Parameter                     | Conditions                                                | -40 °C to +85 °C |     |     | -40 °C to +125 °C |     | Unit |
|-----------------|-------------------------------|-----------------------------------------------------------|------------------|-----|-----|-------------------|-----|------|
|                 |                               |                                                           | Min              | Typ | Max | Min               | Max |      |
| <b>74HC1G08</b> |                               |                                                           |                  |     |     |                   |     |      |
| $t_{pd}$        | propagation delay             | A and B to Y; see <a href="#">Figure 5</a> <sup>[1]</sup> |                  |     |     |                   |     |      |
|                 |                               | $V_{CC} = 2.0$ V; $C_L = 50$ pF                           | -                | 25  | 115 | -                 | 135 | ns   |
|                 |                               | $V_{CC} = 4.5$ V; $C_L = 50$ pF                           | -                | 9   | 23  | -                 | 27  | ns   |
|                 |                               | $V_{CC} = 5.0$ V; $C_L = 15$ pF                           | -                | 7   | -   | -                 | -   | ns   |
|                 |                               | $V_{CC} = 6.0$ V; $C_L = 50$ pF                           | -                | 8   | 20  | -                 | 23  | ns   |
| $C_{PD}$        | power dissipation capacitance | $V_I = GND$ to $V_{CC}$ <sup>[2]</sup>                    | -                | 19  | -   | -                 | -   | pF   |

| Symbol           | Parameter                     | Conditions                                      | -40 °C to +85 °C |     |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|-------------------------------------------------|------------------|-----|-----|-------------------|-----|------|
|                  |                               |                                                 | Min              | Typ | Max | Min               | Max |      |
| <b>74HCT1G08</b> |                               |                                                 |                  |     |     |                   |     |      |
| t <sub>pd</sub>  | propagation delay             | A and B to Y; see <a href="#">Figure 5</a>      | [1]              |     |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V; C <sub>L</sub> = 50 pF | -                | 11  | 23  | -                 | 27  | ns   |
|                  |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF | -                | 11  | -   | -                 | -   | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V | [2]              | -   | 21  | -                 | -   | pF   |

[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
 [2] C<sub>PD</sub> is used to determine the dynamic power dissipation P<sub>D</sub> (µW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum(C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz  
 f<sub>o</sub> = output frequency in MHz  
 C<sub>L</sub> = output load capacitance in pF  
 V<sub>CC</sub> = supply voltage in Volts  
 $\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs

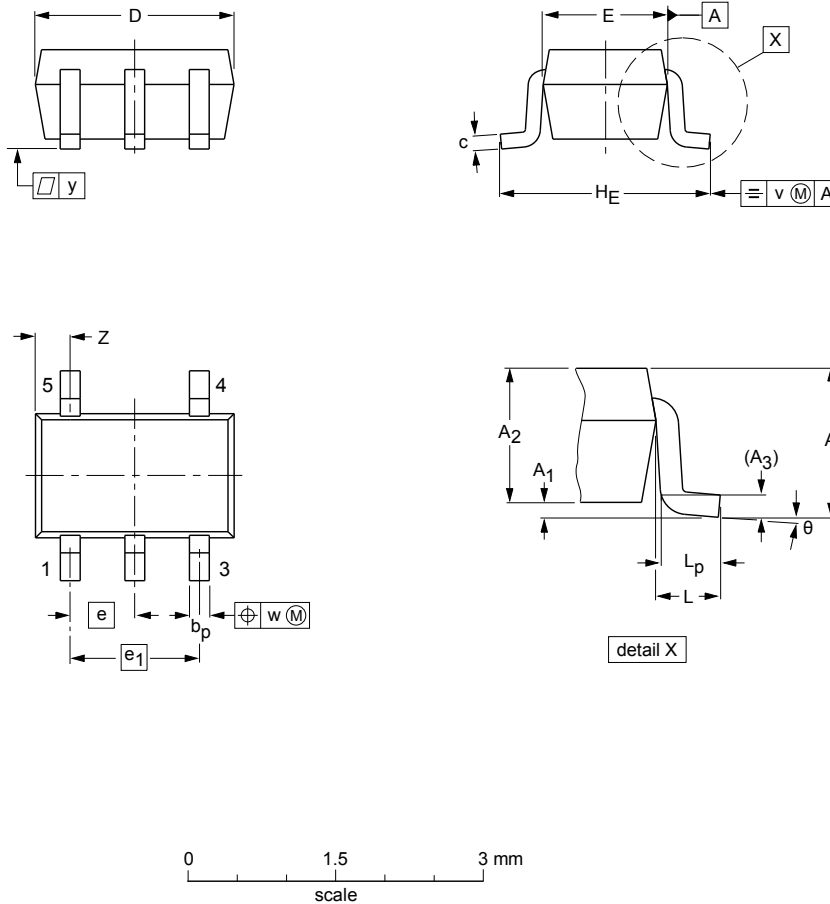
11.1 Waveform and test circuit



12 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 max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | H <sub>E</sub> | L     | L <sub>p</sub> | v   | w   | y   | Z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|----------------|-------|----------------|-----|-----|-----|------------------|----------|
| mm   | 1.1    | 0.1<br>0       | 1.0<br>0.8     | 0.15           | 0.30<br>0.15   | 0.25<br>0.08 | 2.25<br>1.85     | 1.35<br>1.15     | 0.65 | 1.3            | 2.25<br>2.0    | 0.425 | 0.46<br>0.21   | 0.3 | 0.1 | 0.1 | 0.60<br>0.15     | 7°<br>0° |

Note

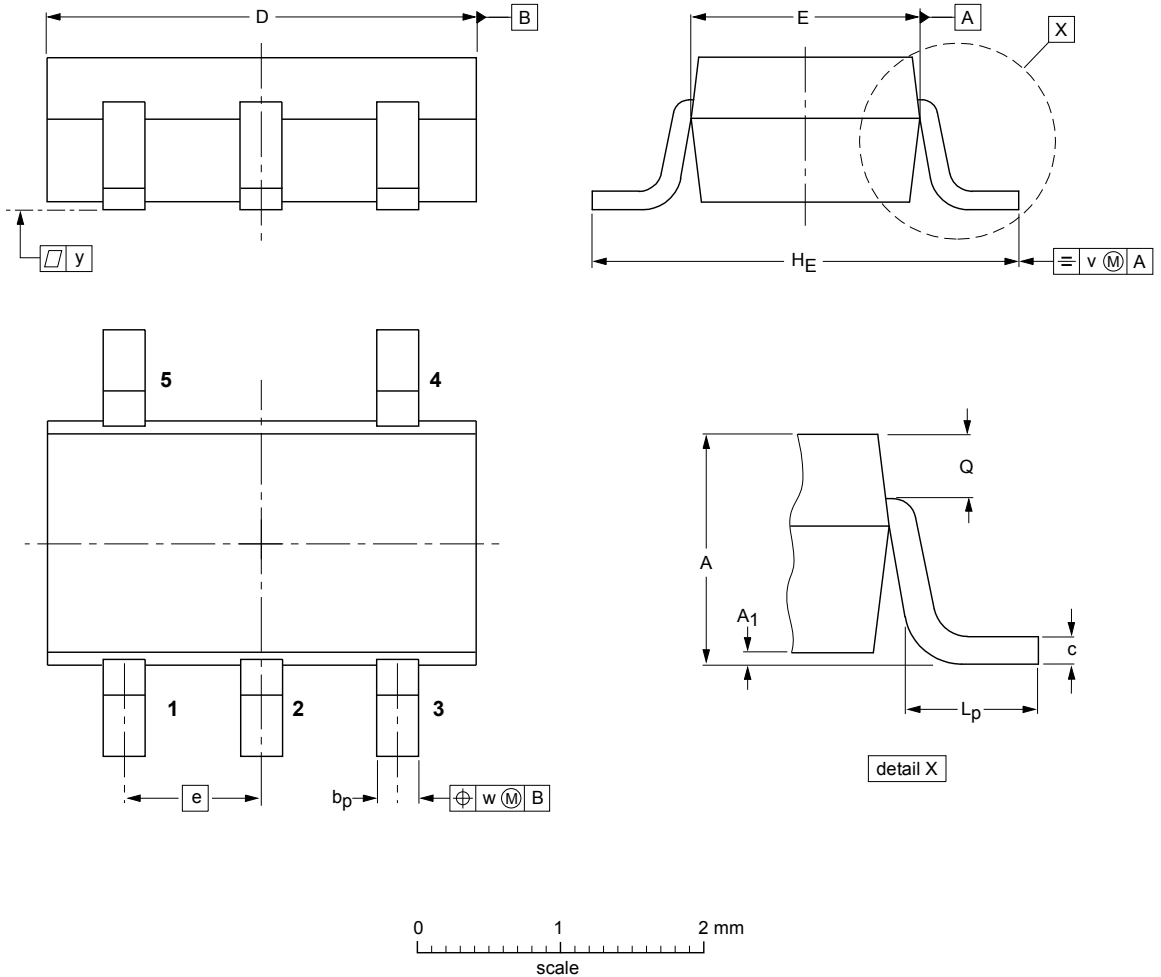
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |        |        | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|--------|--------|---------------------|----------------------|
|                 | IEC        | JEDEC  | JEITA  |                     |                      |
| SOT353-1        |            | MO-203 | SC-88A |                     | 00-09-01<br>03-02-19 |

Figure 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753



**DIMENSIONS** (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub> | b <sub>p</sub> | c            | D          | E          | e    | H <sub>E</sub> | L <sub>p</sub> | Q            | v   | w   | y   |
|------|------------|----------------|----------------|--------------|------------|------------|------|----------------|----------------|--------------|-----|-----|-----|
| mm   | 1.1<br>0.9 | 0.100<br>0.013 | 0.40<br>0.25   | 0.26<br>0.10 | 3.1<br>2.7 | 1.7<br>1.3 | 0.95 | 3.0<br>2.5     | 0.6<br>0.2     | 0.33<br>0.23 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES |       |        |  | EUROPEAN PROJECTION | ISSUE DATE            |
|-----------------|------------|-------|--------|--|---------------------|-----------------------|
|                 | IEC        | JEDEC | JEITA  |  |                     |                       |
| SOT753          |            |       | SC-74A |  |                     | -02-04-16<br>06-03-16 |

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

## 13 Abbreviations

Table 9. Abbreviations

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

## 14 Revision history

Table 10. Revision history

| Document ID      | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data sheet status         | Change notice | Supersedes       |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------|------------------|
| 74HC_HCT1G08 v.5 | 20180314                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet        | -             | 74HC_HCT1G08 v.4 |
| Modifications:   | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>                                                                                                                                                                                                                                         |                           |               |                  |
| 74HC_HCT1G08 v.4 | 20070717                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet        | -             | 74HC_HCT1G08 v.3 |
| Modifications:   | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Package SOT353 changed to SOT353-1 in <a href="#">Table 1</a> and <a href="#">Figure 7</a>.</li> <li>Quick Reference Data and Soldering sections removed.</li> <li><a href="#">Section 2</a> "Features" updated.</li> </ul> |                           |               |                  |
| 74HC_HCT1G08 v.3 | 20020517                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification     | -             | 74HC_HCT1G08 v.2 |
| 74HC_HCT1G08 v.2 | 20010302                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification     | -             | 74HC_HCT1G08 v.1 |
| 74HC_HCT1G08 v.1 | 19981110                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Preliminary specification | -             | -                |

## 15 Legal information

### 15.1 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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