

# 74HC280; 74HCT280

## 9-bit odd/even parity generator/checker

Rev. 3 — 15 September 2016

Product data sheet

### 1. General description

The 74HC280; 74HCT280 is a 9-bit parity generator or checker. Both even and odd parity outputs are available. The even parity output (PE) is HIGH when an even number of data inputs (I0 to I8) is HIGH. The odd parity output (PO) is HIGH when an odd number of data inputs are HIGH. Expansion to larger word sizes is accomplished by tying the even outputs (PE) of up to nine parallel devices to the final stage data inputs. Inputs include clamp diodes. It enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### 2. Features and benefits

- Complies with JEDEC standard no. 7A
- Input levels:
  - ◆ For 74HC280: CMOS level
  - ◆ For 74HCT280: TTL level
- Word-length easily expanded by cascading
- Generates either odd or even parity for nine data bits
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

### 3. Ordering information

Table 1. Ordering information

| Type number | Temperature range                                               | Name   | Description                                                       | Version  |
|-------------|-----------------------------------------------------------------|--------|-------------------------------------------------------------------|----------|
| 74HC280D    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO14   | plastic small outline package; 14 leads; body width 3.9 mm        | SOT108-1 |
| 74HCT280D   |                                                                 |        |                                                                   |          |
| 74HCT280DB  | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SSOP14 | plastic shrink small outline package; 14 leads; body width 5.3 mm | SOT337-1 |

4. Functional diagram

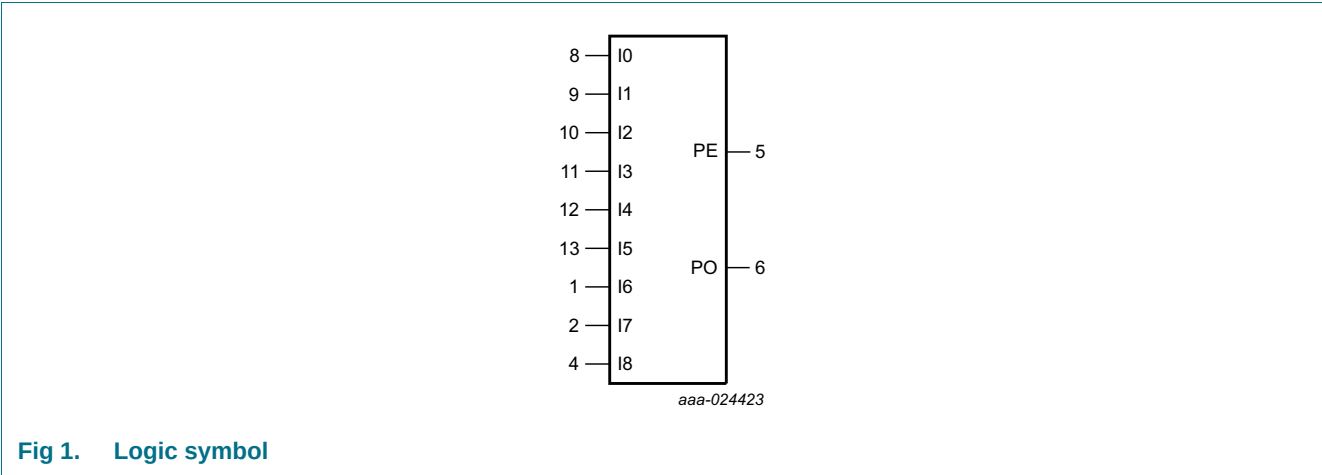


Fig 1. Logic symbol

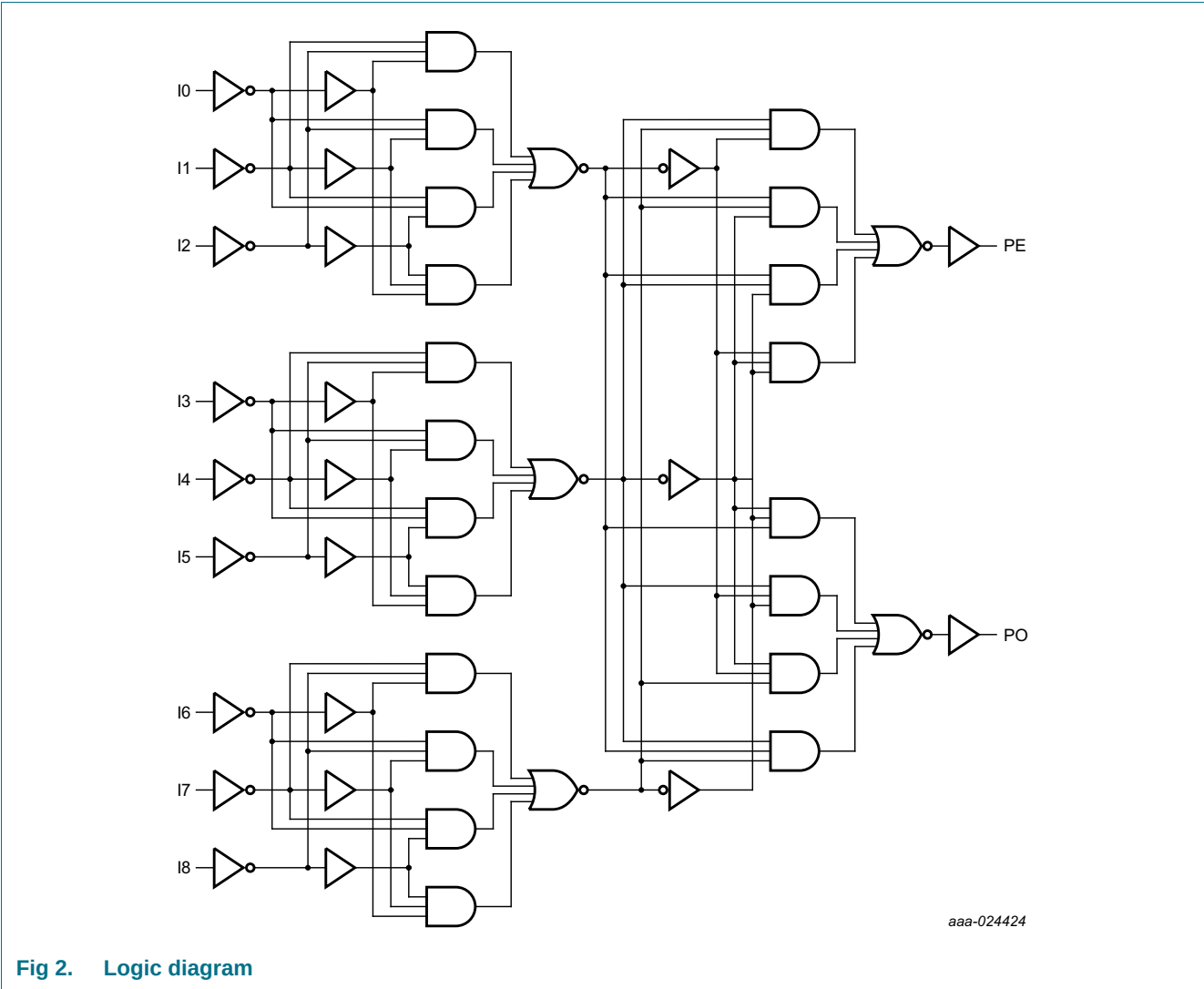
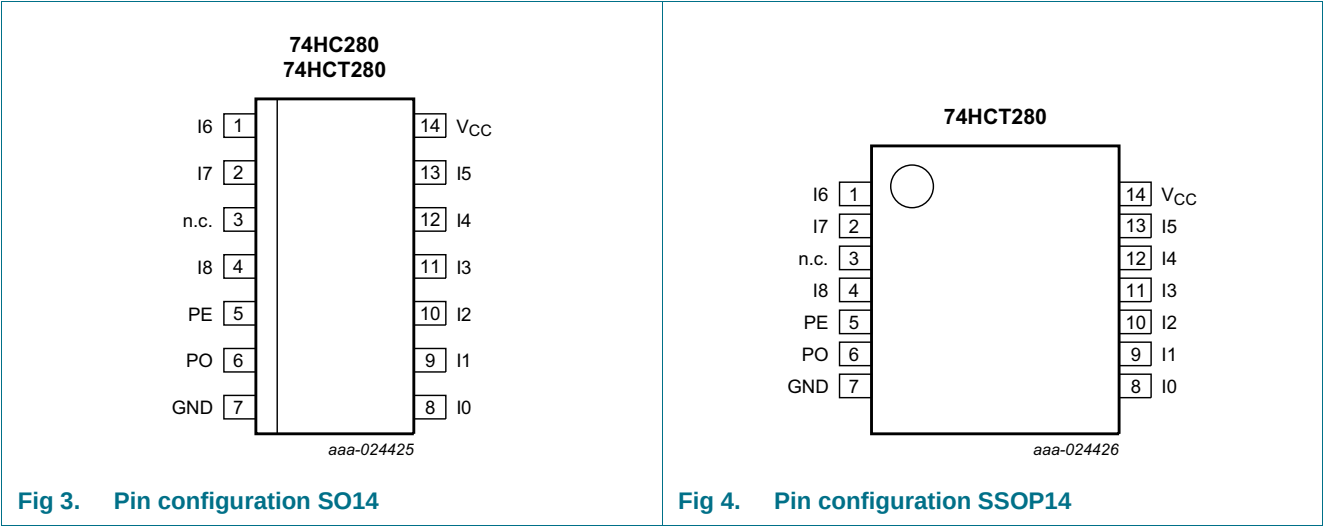


Fig 2. Logic diagram

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol                             | Pin                           | Description        |
|------------------------------------|-------------------------------|--------------------|
| I0, I1, I2, I3, I4, I5, I6, I7, I8 | 8, 9, 10, 11, 12, 13, 1, 2, 4 | data input         |
| GND                                | 7                             | ground (0 V)       |
| PE                                 | 5                             | even parity output |
| PO                                 | 6                             | odd parity output  |
| V <sub>CC</sub>                    | 14                            | supply voltage     |

6. Functional description

Table 3. Function table<sup>[1]</sup>

| Inputs                                | Outputs |    |
|---------------------------------------|---------|----|
| number of HIGH data inputs (I0 to I8) | PE      | PO |
| even                                  | H       | L  |
| odd                                   | L       | H  |

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

## 7. Limiting values

**Table 4. 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       | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ <a href="#">[1]</a> | -    | $\pm 20$ | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ <a href="#">[1]</a> | -    | $\pm 20$ | mA   |
| $I_O$     | output current          | $-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$                              | -    | $\pm 25$ | mA   |
| $I_{CC}$  | supply current          |                                                                            | -    | 50       | mA   |
| $I_{GND}$ | ground current          |                                                                            | -50  | -        | mA   |
| $T_{stg}$ | storage temperature     |                                                                            | -65  | +150     | °C   |
| $P_{tot}$ | total power dissipation | SO14 and SSOP14 packages <a href="#">[2]</a>                               | -    | 500      | mW   |

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

[2] For SO14 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.  
For SSOP14 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V)

| Symbol              | Parameter                           | Conditions              | 74HC280 |      |          | 74HCT280 |      |          | Unit |
|---------------------|-------------------------------------|-------------------------|---------|------|----------|----------|------|----------|------|
|                     |                                     |                         | Min     | Typ  | Max      | Min      | Typ  | Max      |      |
| $V_{CC}$            | supply voltage                      |                         | 2.0     | 5.0  | 6.0      | 4.5      | 5.0  | 5.5      | V    |
| $V_I$               | input voltage                       |                         | 0       | -    | $V_{CC}$ | 0        | -    | $V_{CC}$ | V    |
| $V_O$               | output voltage                      |                         | 0       | -    | $V_{CC}$ | 0        | -    | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                         | -40     | +25  | +125     | -40      | +25  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | -       | -    | 625      | -        | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 4.5\text{ V}$ | -       | 1.67 | 139      | -        | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$ | -       | -    | 83       | -        | -    | -        | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; 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  |      |
| 74HC280         |                           |                                                                                        |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                                                | 1.5   | 1.2  | -    | 1.5              | -    | 1.5               | -    | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                                                                | 3.15  | 2.4  | -    | 3.15             | -    | 3.15              | -    | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                                                                | 4.2   | 3.2  | -    | 4.2              | -    | 4.2               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                                                | -     | 0.8  | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                                                                | -     | 2.1  | 1.35 | -                | 1.35 | -                 | 1.35 | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                                                                | -     | 2.8  | 1.8  | -                | 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              | -    | 1.9               | -    | V    |
|                 |                           | I <sub>O</sub> = –20 μA; V <sub>CC</sub> = 4.5 V                                       | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = –20 μA; V <sub>CC</sub> = 6.0 V                                       | 5.9   | 6.0  | -    | 5.9              | -    | 5.9               | -    | V    |
|                 |                           | I <sub>O</sub> = –4.0 mA; V <sub>CC</sub> = 4.5 V                                      | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
|                 |                           | I <sub>O</sub> = –5.2 mA; V <sub>CC</sub> = 6.0 V                                      | 5.48  | 5.81 | -    | 5.34             | -    | 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  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V                                        | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V                                        | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V                                       | -     | 0.15 | 0.26 | -                | 0.33 | -                 | 0.4  | V    |
|                 |                           | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V                                       | -     | 0.16 | 0.26 | -                | 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                       | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0 | μA   |
| I <sub>CC</sub> | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V | -     | -    | 8.0  | -                | 80   | -                 | 160  | μA   |
| C <sub>I</sub>  | input capacitance         |                                                                                        | -     | 3.5  | -    | -                | -    | -                 | -    | pF   |
| 74HCT280        |                           |                                                                                        |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V                                                       | 2.0   | 1.6  | -    | 2.0              | -    | 2.0               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                       | -     | 1.2  | 0.8  | -                | 0.8  | -                 | 0.8  | V    |
| V <sub>OH</sub> | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V          |       |      |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = –20 μA                                                                | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = –4.0 mA                                                               | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
| V <sub>OL</sub> | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V          |       |      |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = 20 μA                                                                 | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 4.0 mA                                                                | -     | 0.15 | 0.26 | -                | 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> = 5.5 V                       | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0 | μA   |

**Table 6.** Static characteristics ...continued

At recommended operating conditions; 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 |         |
| $I_{CC}$        | supply current            | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V;<br>$I_O = 0$ A                                                              | -     | -   | 8.0 | -                | 80  | -                 | 160 | $\mu$ A |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_I = V_{CC} - 2.1$ V;<br>other inputs at $V_{CC}$ or GND;<br>$V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A |       |     |     |                  |     |                   |     |         |
|                 |                           | In inputs                                                                                                            | -     | 100 | 360 | -                | 450 | -                 | 490 | $\mu$ A |
| $C_I$           | input capacitance         |                                                                                                                      | -     | 3.5 | -   | -                | -   | -                 | -   | pF      |

## 10. Dynamic characteristics

**Table 7.** Dynamic characteristicsVoltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit, see [Figure 6](#).

| Symbol          | Parameter                     | Conditions                                                               | 25 °C |     |     | –40 °C to +85 °C |     | –40 °C to +125 °C |     | Unit |
|-----------------|-------------------------------|--------------------------------------------------------------------------|-------|-----|-----|------------------|-----|-------------------|-----|------|
|                 |                               |                                                                          | Min   | Typ | Max | Min              | Max | Min               | Max |      |
| 74HC280         |                               |                                                                          |       |     |     |                  |     |                   |     |      |
| t <sub>pd</sub> | propagation delay             | In to PE; see <a href="#">Figure 5</a> <a href="#">[1]</a>               |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 2.0 V                                                  | -     | 55  | 200 | -                | 250 | -                 | 300 | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                  | -     | 20  | 40  | -                | 50  | -                 | 60  | ns   |
|                 |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                          | -     | 17  | -   | -                | -   | -                 | -   | ns   |
|                 |                               | V <sub>CC</sub> = 6.0 V                                                  | -     | 16  | 34  | -                | 43  | -                 | 51  | ns   |
|                 |                               | In to PO; see <a href="#">Figure 5</a>                                   |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 2.0 V                                                  | -     | 63  | 200 | -                | 250 | -                 | 300 | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                  | -     | 23  | 40  | -                | 50  | -                 | 60  | ns   |
|                 |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                          | -     | 20  | -   | -                | -   | -                 | -   | ns   |
|                 |                               | V <sub>CC</sub> = 6.0 V                                                  | -     | 18  | 34  | -                | 43  | -                 | 51  | ns   |
| t <sub>t</sub>  | transition time               | see <a href="#">Figure 5</a> <a href="#">[2]</a>                         |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 2.0 V                                                  | -     | 19  | 75  | -                | 95  | -                 | 110 | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                  | -     | 7   | 15  | -                | 19  | -                 | 22  | ns   |
|                 |                               | V <sub>CC</sub> = 6.0 V                                                  | -     | 6   | 13  | -                | 16  | -                 | 19  | ns   |
| C <sub>PD</sub> | power dissipation capacitance | per package; V <sub>I</sub> = GND to V <sub>CC</sub> <a href="#">[3]</a> | -     | 65  | -   | -                | -   | -                 | -   | pF   |

**Table 7. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit, see [Figure 6](#).

| Symbol          | Parameter                     | Conditions                                                                       | 25 °C |     |     | –40 °C to +85 °C |     | –40 °C to +125 °C |     | Unit |
|-----------------|-------------------------------|----------------------------------------------------------------------------------|-------|-----|-----|------------------|-----|-------------------|-----|------|
|                 |                               |                                                                                  | Min   | Typ | Max | Min              | Max | Min               | Max |      |
| 74HCT280        |                               |                                                                                  |       |     |     |                  |     |                   |     |      |
| t <sub>pd</sub> | propagation delay             | In to PE; see <a href="#">Figure 5</a> <a href="#">[1]</a>                       |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                          | -     | 21  | 42  | -                | 53  | -                 | 63  | ns   |
|                 |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                  | -     | 18  | -   | -                | -   | -                 | -   | ns   |
|                 |                               | In to PO; see <a href="#">Figure 5</a>                                           |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                          | -     | 26  | 45  | -                | 56  | -                 | 68  | ns   |
|                 |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                  | -     | 22  | -   | -                | -   | -                 | -   | ns   |
| t <sub>t</sub>  | transition time               | see <a href="#">Figure 5</a> <a href="#">[2]</a>                                 |       |     |     |                  |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 4.5 V                                                          | -     | 7   | 15  | -                | 19  | -                 | 22  | ns   |
| C <sub>PD</sub> | power dissipation capacitance | per package; V <sub>I</sub> = GND to V <sub>CC</sub> – 1.5 V <a href="#">[3]</a> | -     | 65  | -   | -                | -   | -                 | -   | pF   |

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

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

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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

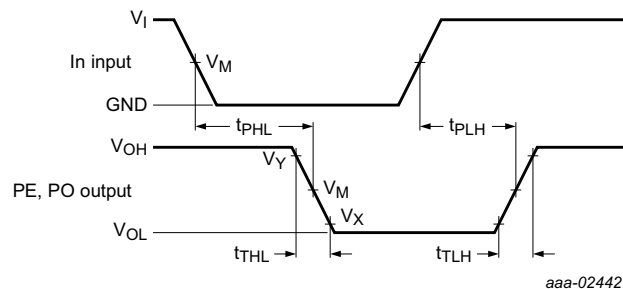
$C_L$  = output load capacitance in pF;

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

$N$  = number of inputs switching;

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

## 11. Waveforms



Measurement points are given in [Table 8](#).

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

**Fig 5. Input (In) to output (PE, PO) propagation delays and output transition times**

Table 8. Measurement points

| Type     | Input       | Output      |             |             |
|----------|-------------|-------------|-------------|-------------|
|          | $V_M$       | $V_M$       | $V_X$       | $V_Y$       |
| 74HC280  | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{CC}$ | $0.9V_{CC}$ |
| 74HCT280 | 1.3 V       | 1.3 V       | $0.1V_{CC}$ | $0.9V_{CC}$ |

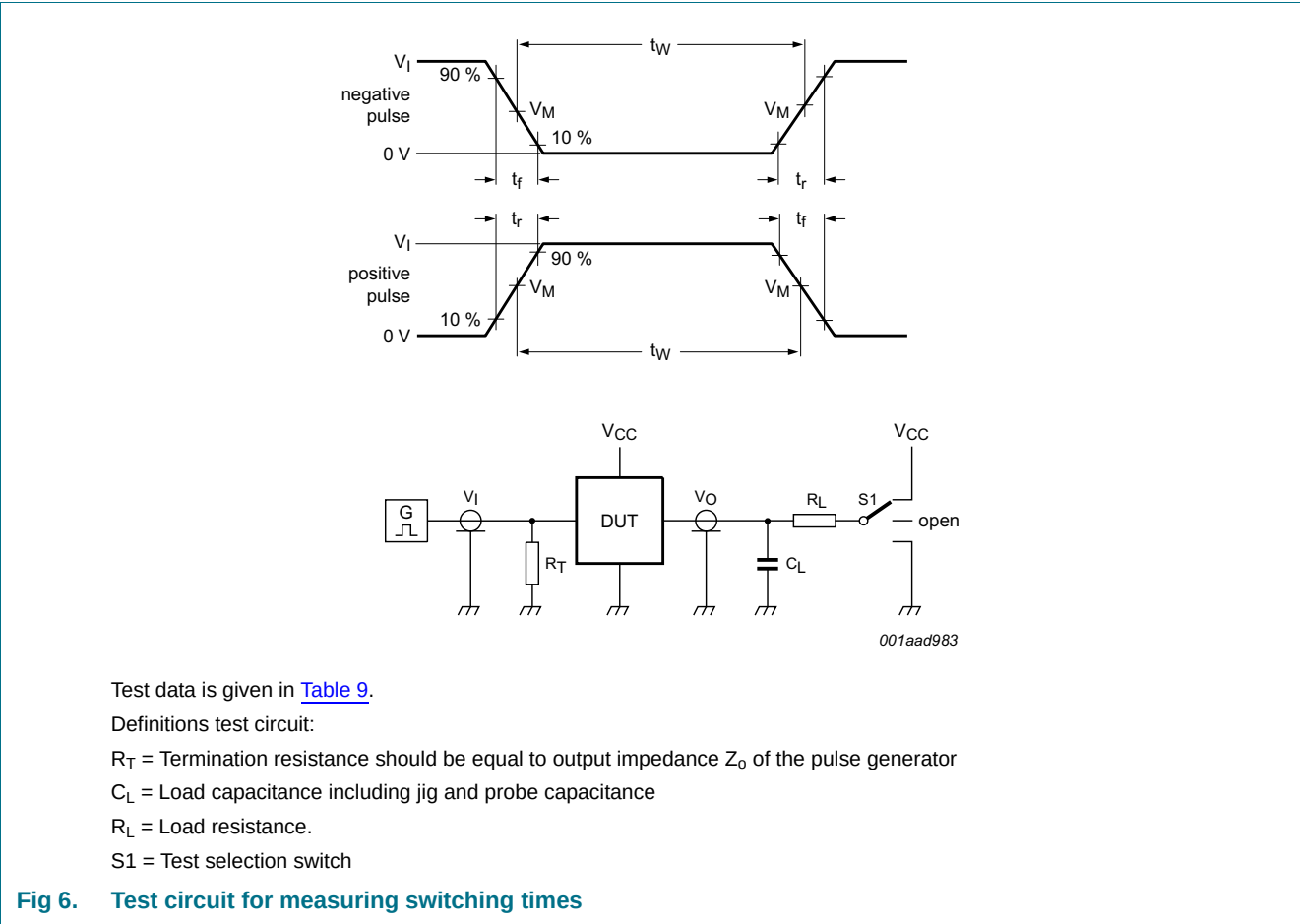
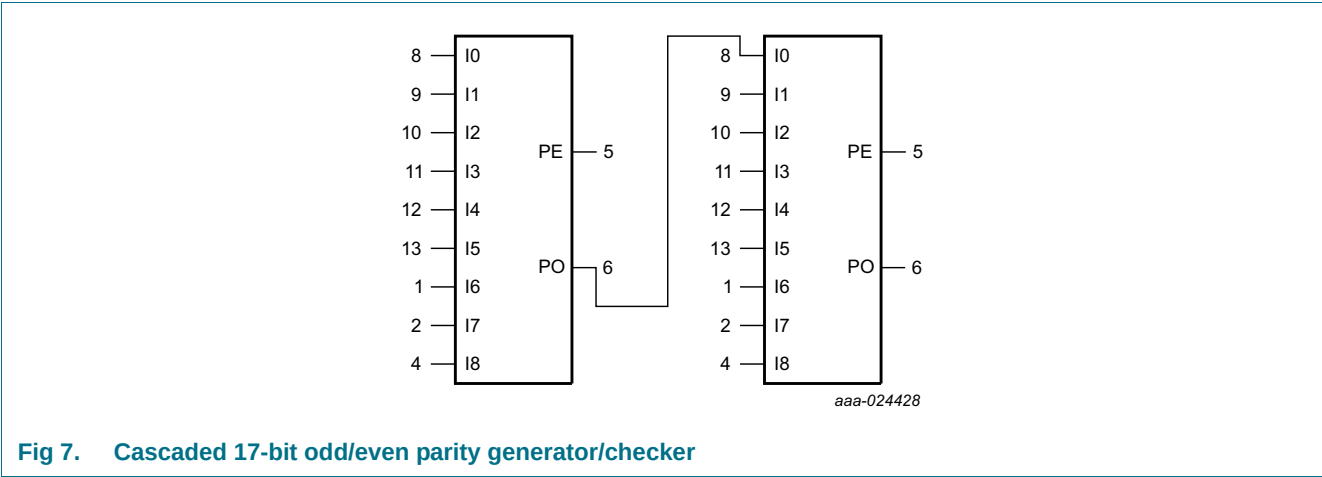


Table 9. Test data

| Type     | Input    |            | Load         |              | S1 position        |
|----------|----------|------------|--------------|--------------|--------------------|
|          | $V_I$    | $t_r, t_f$ | $C_L$        | $R_L$        | $t_{PHL}, t_{PLH}$ |
| 74HC280  | $V_{CC}$ | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               |
| 74HCT280 | 3 V      | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               |



12. Application information



13. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

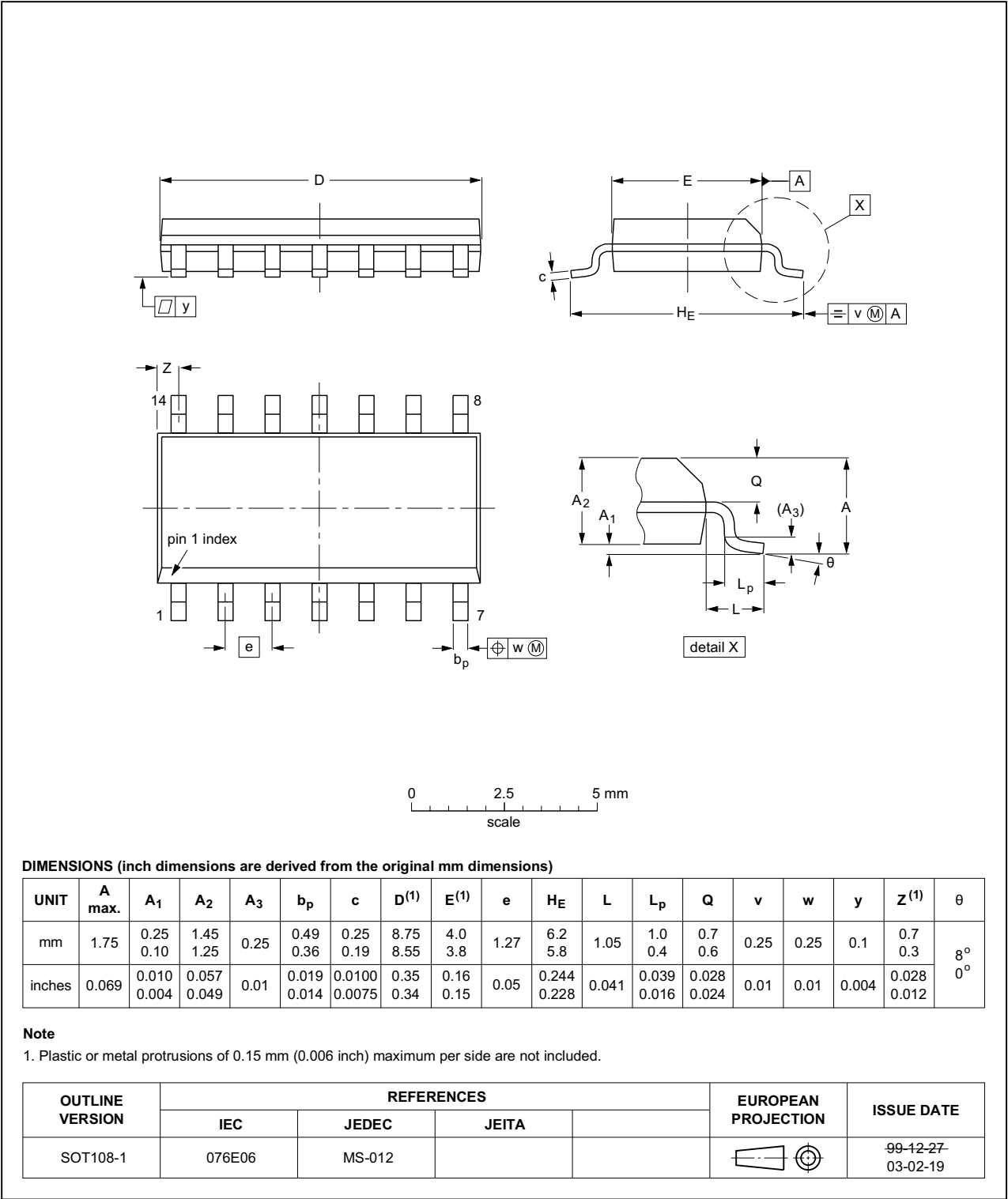


Fig 8. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

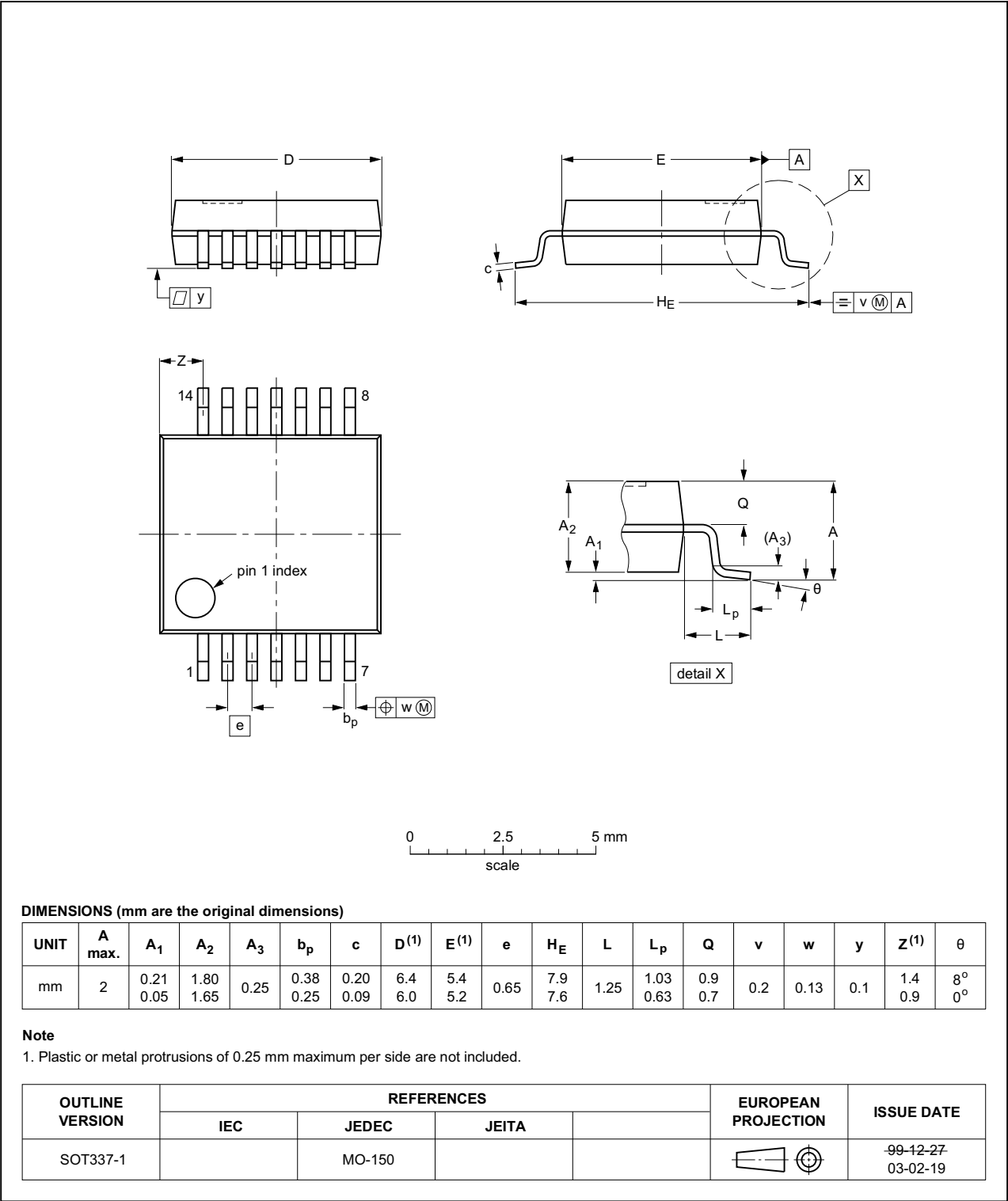


Fig 9. Package outline SOT337-1 (SSOP14)

## 14. Abbreviations

Table 10. Abbreviations

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

## 15. Revision history

Table 11. Revision history

| Document ID     | Release date                                                                                                                                                                                                                                                                                           | Data sheet status     | Change notice | Supersedes      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|
| 74HC_HCT280 v.3 | 20160915                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74HC_HCT280 v.2 |
| 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>Type numbers 74HC280N, 74HCT280N removed.</li></ul> |                       |               |                 |
| 74HC_HCT280 v.2 | 19901201                                                                                                                                                                                                                                                                                               | Product specification | -             | -               |

## 16. Legal information

### 16.1 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>.

### 16.2 Definitions

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