



**THE DATASHEET OF
74HC3G14DC,125**



74HC3G14; HCT3G14

Triple inverting Schmitt trigger

Rev. 6 — 1 February 2019

Product data sheet

1. General description

The 74HC3G14; 74HCT3G14 is a triple inverter 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.

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- Complies with JEDEC standard no. 7A
- Input levels:
 - For 74HC3G14: CMOS level
 - For 74HCT3G14: TTL level
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- Unlimited input rise and fall times
- Multiple package options
- ESD protection:
 - HBM JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Applications

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

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-------------|-------------------|--------|---|----------|
| | Temperature range | Name | Description | |
| 74HC3G14DP | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74HCT3G14DP | | | | |
| 74HC3G14DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74HCT3G14DC | | | | |

5. Marking

Table 2. Marking

| Type number | Marking code [1] |
|-------------|------------------|
| 74HC3G14DP | H14 |
| 74HCT3G14DP | T14 |
| 74HC3G14DC | H14 |
| 74HCT3G14DC | T14 |

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

6. Functional diagram

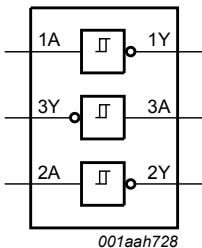


Fig. 1. Logic symbol

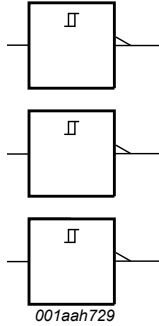


Fig. 2. IEC logic symbol

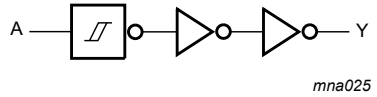


Fig. 3. Logic diagram (one Schmitt trigger)

7. Pinning information

7.1. Pinning

74HC3G14
74HCT3G14

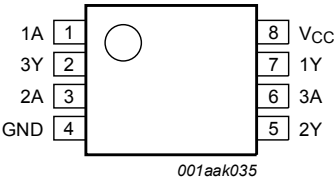


Fig. 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

7.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|---------|----------------|
| 1A, 2A, 3A | 1, 3, 6 | data input |
| GND | 4 | ground (0 V) |
| 1Y, 2Y, 3Y | 7, 5, 2 | data output |
| V _{CC} | 8 | supply voltage |

8. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

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

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] | - | 300 | mW |

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

[2] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.
For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.

10. Recommended operating conditions

Table 6. Recommended operating conditions

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

| Symbol | Parameter | Conditions | 74HC3G14 | | | 74HCT3G14 | | | 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 |

11. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V). All typical values are measured at $T_{amb} = 25\text{ °C}$.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|---|-------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC3G14 | | | | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | 5.9 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 4.5 V | 4.18 | 4.32 | - | 4.13 | - | 3.7 | - | V |
| | | I _O = -5.2 mA; V _{CC} = 6.0 V | 5.68 | 5.81 | - | 5.63 | - | 5.2 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| | | I _O = 5.2 mA; V _{CC} = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| I _{CC} | supply current | per input pin; V _{CC} = 6.0 V; V _I = V _{CC} or GND; I _O = 0 A | - | - | 1.0 | - | 10 | - | 20 | μA |
| C _I | input capacitance | | - | 2.0 | - | - | - | - | - | pF |
| 74HCT3G14 | | | | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 4.5 V | 4.18 | 4.32 | - | 4.13 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| I _{CC} | supply current | per input pin; V _{CC} = 5.5 V; V _I = V _{CC} or GND; I _O = 0 A | - | - | 1.0 | - | 10 | - | 20 | μA |
| ΔI _{CC} | additional supply current | per input; V _{CC} = 4.5 V to 5.5 V; V _I = V _{CC} - 2.1 V; I _O = 0 A | - | - | 300 | - | 375 | - | 410 | μA |
| C _I | input capacitance | | - | 2.0 | - | - | - | - | - | pF |

11.1. Transfer characteristics

Table 8. Transfer characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 10.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | Unit |
|------------------|--|-------------------------|-------|------|------|-------------------|-------------|--------------|------|
| | | | Min | Typ | Max | Min | Max (85 °C) | Max (125 °C) | |
| 74HC3G14 | | | | | | | | | |
| V _{T+} | positive-going threshold voltage | see Fig. 5, Fig. 6 | | | | | | | |
| | | V _{CC} = 2.0 V | 1.00 | 1.18 | 1.50 | 1.00 | 1.50 | 1.50 | V |
| | | V _{CC} = 4.5 V | 2.30 | 2.60 | 3.15 | 2.30 | 3.15 | 3.15 | V |
| | | V _{CC} = 6.0 V | 3.00 | 3.46 | 4.20 | 3.00 | 4.20 | 4.20 | V |
| V _{T-} | negative-going threshold voltage | see Fig. 5, Fig. 6 | | | | | | | |
| | | V _{CC} = 2.0 V | 0.30 | 0.60 | 0.90 | 0.30 | 0.90 | 0.90 | V |
| | | V _{CC} = 4.5 V | 1.13 | 1.47 | 2.00 | 1.13 | 2.00 | 2.00 | V |
| | | V _{CC} = 6.0 V | 1.50 | 2.06 | 2.60 | 1.50 | 2.60 | 2.60 | V |
| V _H | hysteresis voltage (V _{T+} - V _{T-}); see Fig. 5, Fig. 6 and Fig. 7 | | | | | | | | |
| | | V _{CC} = 2.0 V | 0.30 | 0.60 | 1.00 | 0.30 | 1.00 | 1.00 | V |
| | | V _{CC} = 4.5 V | 0.60 | 1.13 | 1.40 | 0.60 | 1.40 | 1.40 | V |
| | | V _{CC} = 6.0 V | 0.80 | 1.40 | 1.70 | 0.80 | 1.70 | 1.70 | V |
| 74HCT3G14 | | | | | | | | | |
| V _{T+} | positive-going threshold voltage | see Fig. 5, Fig. 6 | | | | | | | |
| | | V _{CC} = 4.5 V | 1.20 | 1.58 | 1.90 | 1.20 | 1.90 | 1.90 | V |
| | | V _{CC} = 5.5 V | 1.40 | 1.78 | 2.10 | 1.40 | 2.10 | 2.10 | V |
| V _{T-} | negative-going threshold voltage | see Fig. 5, Fig. 6 | | | | | | | |
| | | V _{CC} = 4.5 V | 0.50 | 0.87 | 1.20 | 0.50 | 1.20 | 1.20 | V |
| | | V _{CC} = 5.5 V | 0.60 | 1.11 | 1.40 | 0.60 | 1.40 | 1.40 | V |
| V _H | hysteresis voltage (V _{T+} - V _{T-}); see Fig. 5, Fig. 6 and Fig. 8 | | | | | | | | |
| | | V _{CC} = 4.5 V | 0.40 | 0.71 | - | 0.40 | - | - | V |
| | | V _{CC} = 5.5 V | 0.40 | 0.67 | - | 0.40 | - | - | V |

11.2. Transfer characteristics waveforms

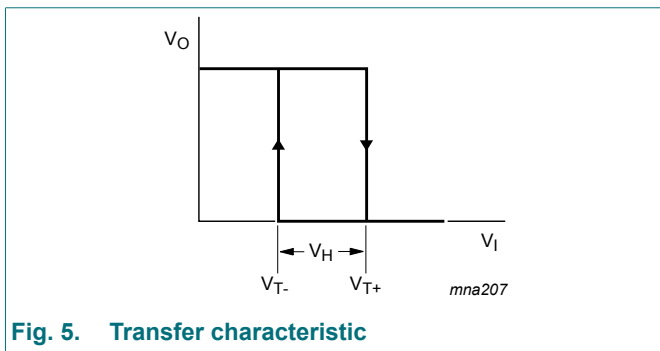


Fig. 5. Transfer characteristic

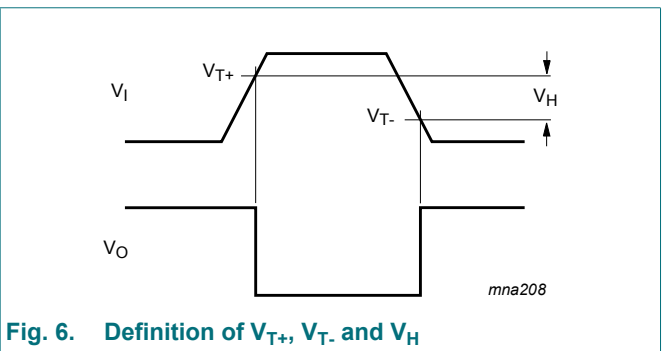


Fig. 6. Definition of V_{T+}, V_{T-} and V_H

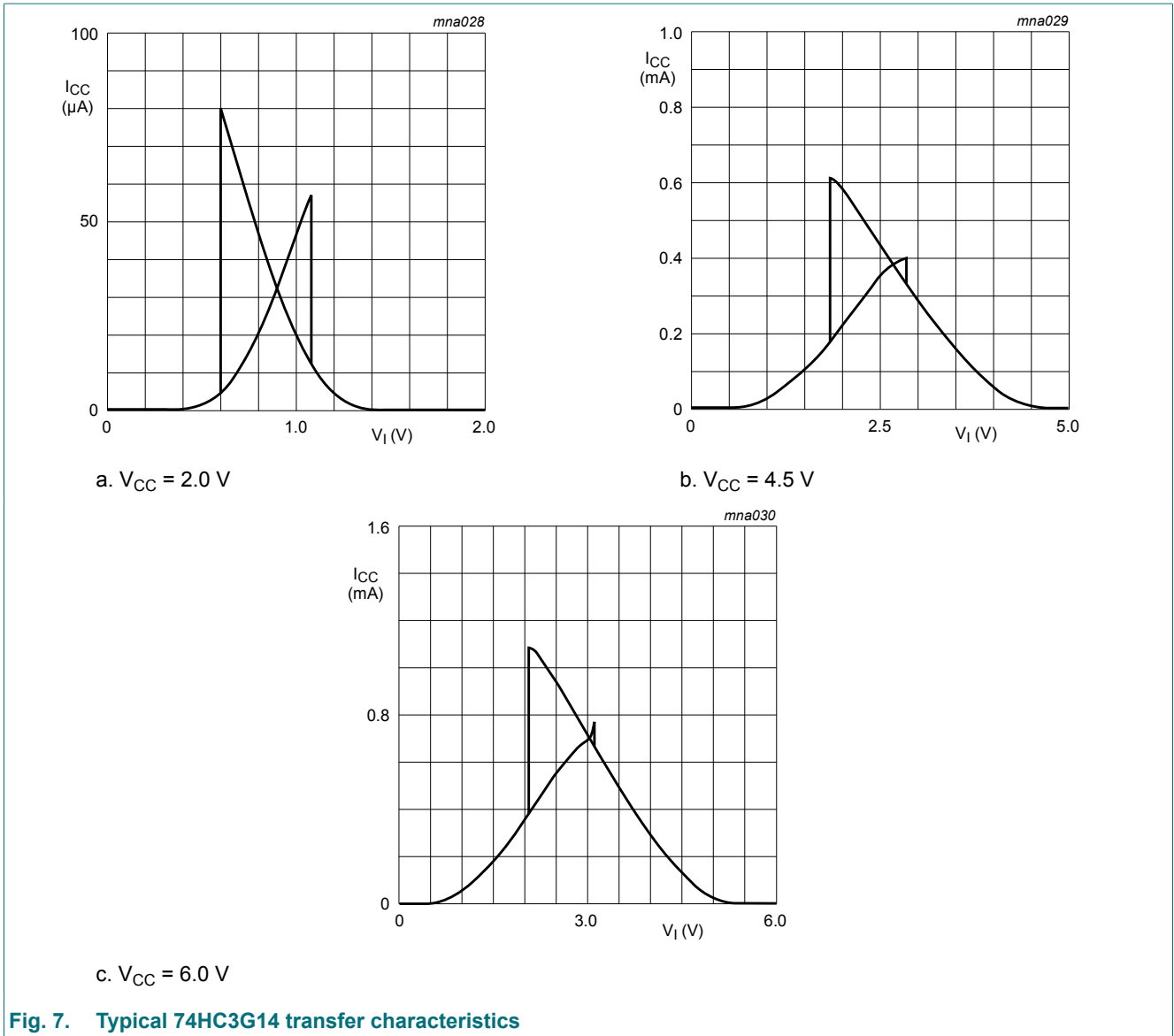


Fig. 7. Typical 74HC3G14 transfer characteristics

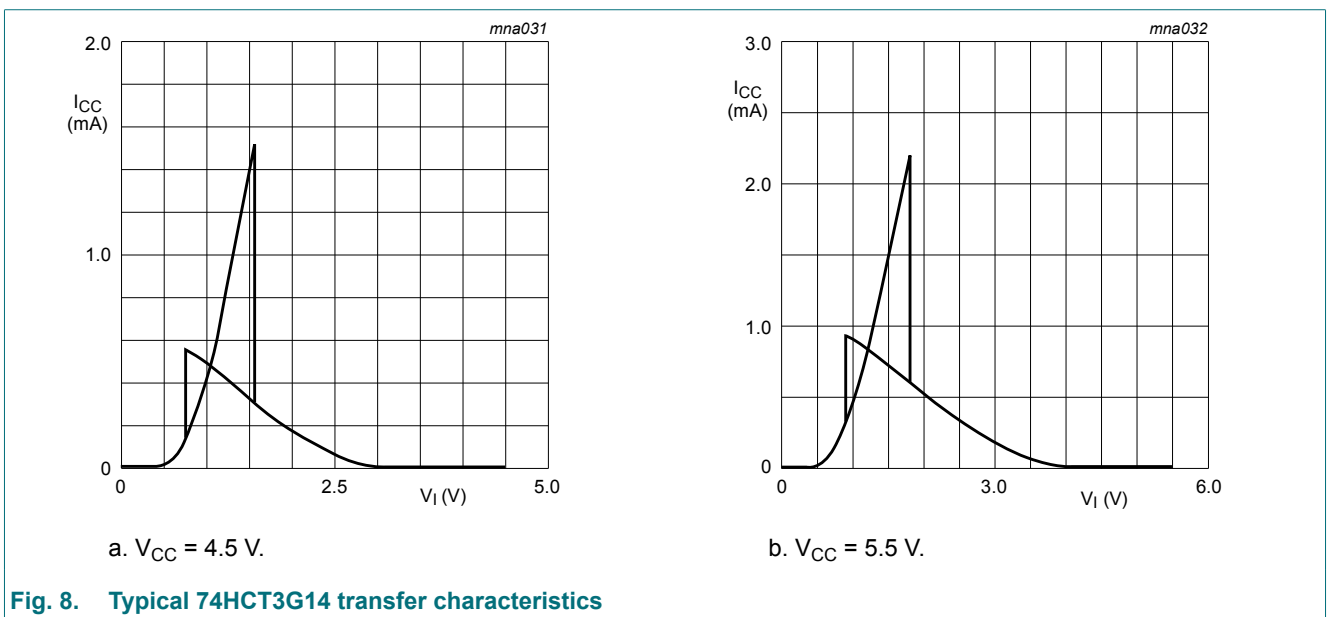


Fig. 8. Typical 74HCT3G14 transfer characteristics

12. Dynamic characteristics

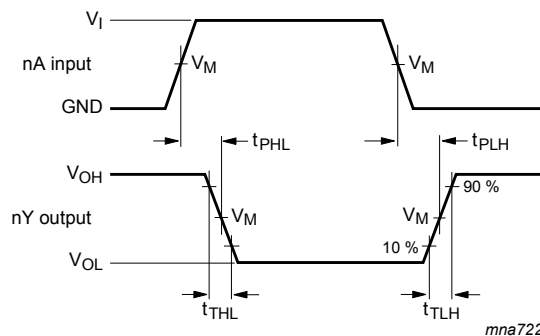
Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 10.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | Unit |
|------------------|-------------------------------|---|-------|-----|-----|-------------------|-------------|--------------|------|
| | | | Min | Typ | Max | Min | Max (85 °C) | Max (125 °C) | |
| 74HC3G14 | | | | | | | | | |
| t _{pd} | propagation delay | nA to nY; see Fig. 9 [1] | | | | | | | |
| | | V _{CC} = 2.0 V | - | 53 | 125 | - | 155 | 190 | ns |
| | | V _{CC} = 4.5 V | - | 16 | 25 | - | 31 | 38 | ns |
| | | V _{CC} = 6.0 V | - | 13 | 21 | - | 26 | 32 | ns |
| t _t | transition time | nY; see Fig. 9 [2] | | | | | | | |
| | | V _{CC} = 2.0 V | - | 20 | 75 | - | 95 | 110 | ns |
| | | V _{CC} = 4.5 V | - | 7 | 15 | - | 19 | 22 | ns |
| | | V _{CC} = 6.0 V | - | 5 | 13 | - | 16 | 19 | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} [3] | - | 10 | - | - | - | - | pF |
| 74HCT3G14 | | | | | | | | | |
| t _{pd} | propagation delay | nA to nY; V _{CC} = 4.5 V; see Fig. 9 [1] | - | 21 | 32 | - | 40 | 48 | ns |
| t _t | transition time | nY; V _{CC} = 4.5 V; see Fig. 9 [2] | - | 6 | 15 | - | 19 | 22 | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} - 1.5 V [3] | - | 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 μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz;
 f_o = output frequency in MHz;
 C_L = output load capacitance in pF;
 V_{CC} = supply voltage in V;
 N = number of inputs switching;
 $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

12.1. Waveforms and test circuit



Measurement points are given in Table 10.

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

Fig. 9. The data input (nA) to output (nY) propagation delays and output transition times

Table 10. Measurement points

| Type | Input | Output |
|-----------|-------------|-------------|
| | V_M | V_M |
| 74HC3G14 | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT3G14 | 1.3 V | 1.3 V |

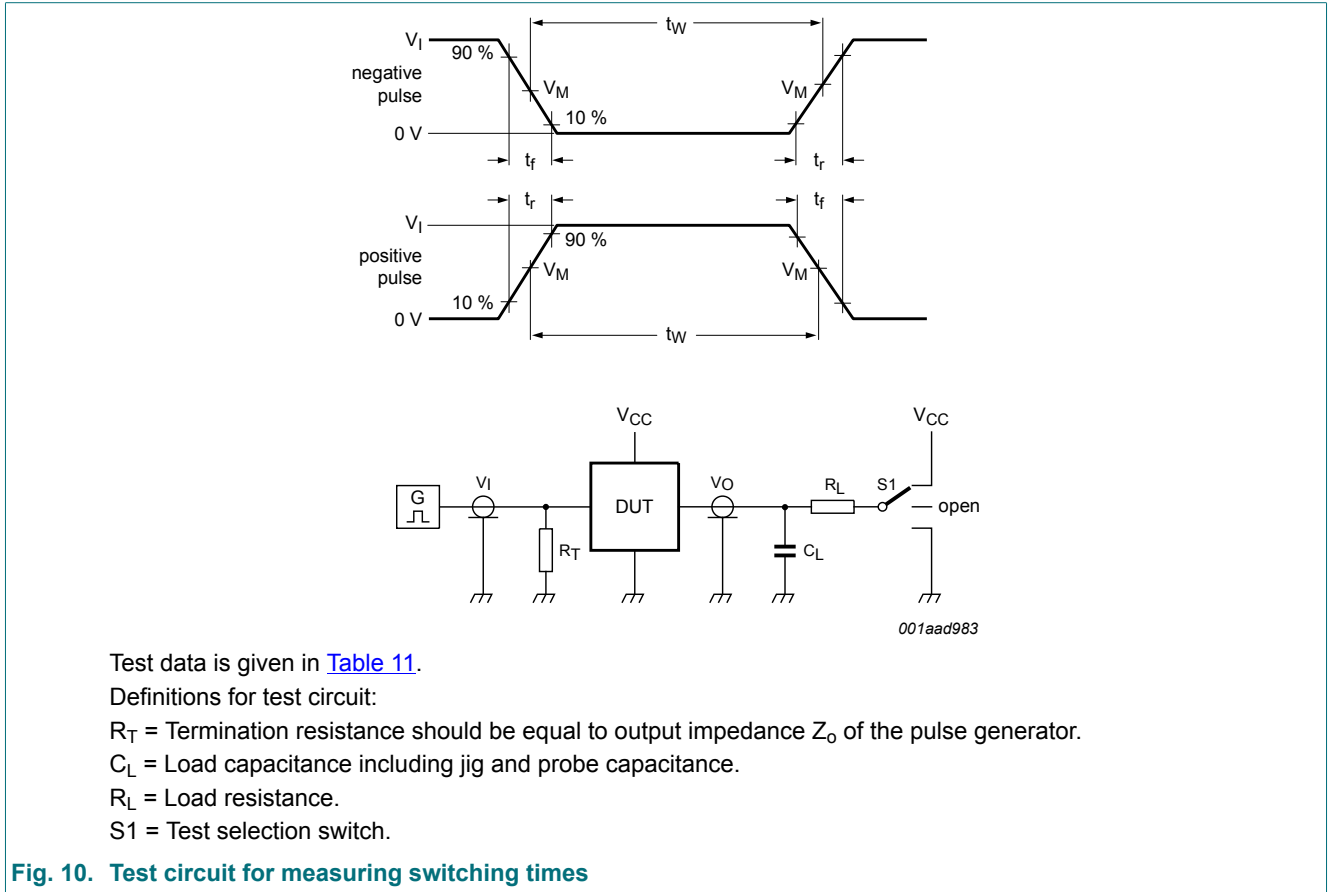


Fig. 10. Test circuit for measuring switching times

Table 11. Test data

| Type | Input | | Load | | S1 position |
|-----------|-----------------|-------------|-------|--------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PHL}, t_{PLH} |
| 74HC3G14 | GND to V_{CC} | ≤ 6 ns | 50 pF | 1 k Ω | open |
| 74HCT3G14 | GND to 3.0 V | ≤ 6 ns | 50 pF | 1 k Ω | open |

13. Application information

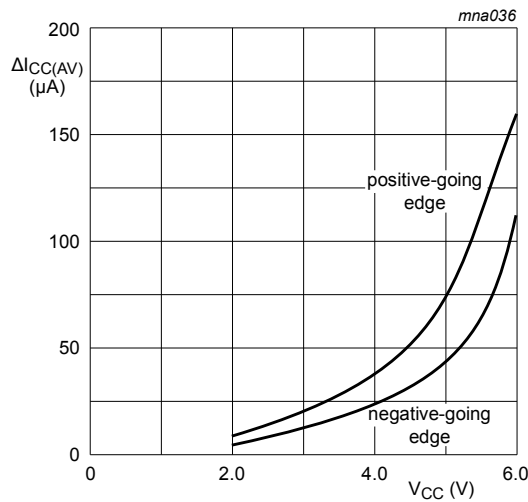
The slow input rise and fall times cause additional power dissipation, which can be calculated using the following formula:

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

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

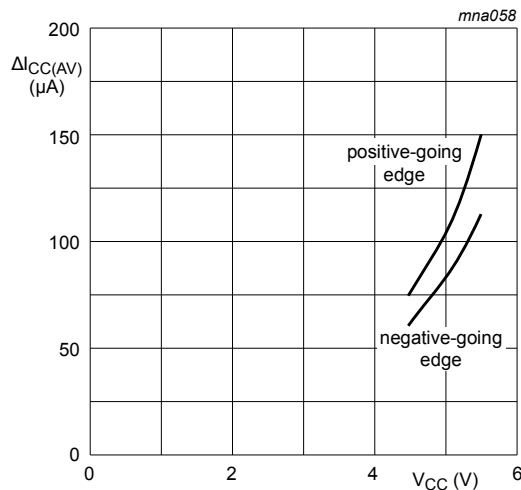
$\Delta I_{CC(AV)}$ differs with positive or negative input transitions, as shown in Fig. 11 and Fig. 12.

An example of a relaxation circuit using the 74HC3G14/74HCT3G14 is shown in Fig. 13.



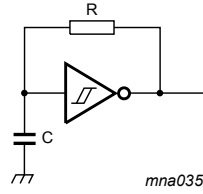
Linear change of V_I between $0.1V_{CC}$ to $0.9V_{CC}$.

Fig. 11. $\Delta I_{CC(AV)}$ as a function of V_{CC} for 74HC3G14



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 74HCT3G14

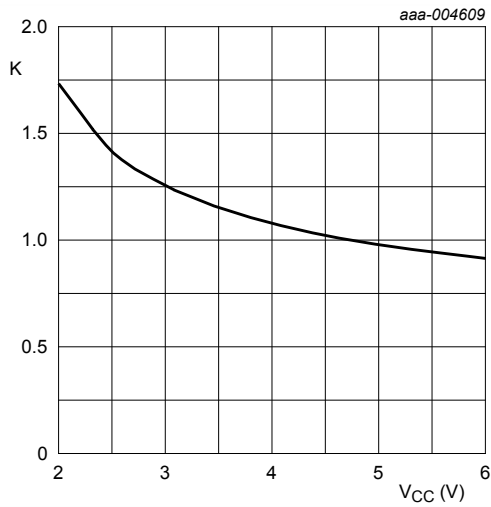


For 74HC3G14: $f = \frac{1}{T} \approx \frac{1}{0.8 \times RC}$

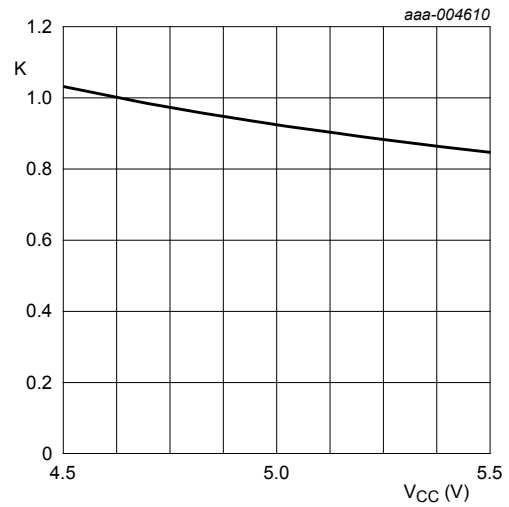
For 74HCT3G14: $f = \frac{1}{T} \approx \frac{1}{0.67 \times RC}$

For K-factor, see [Fig. 14](#)

Fig. 13. Relaxation oscillator



a. K-factor for 74HC3G14



b. K-factor for 74HCT3G14

Fig. 14. Typical K-factor for relaxation oscillator

14. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

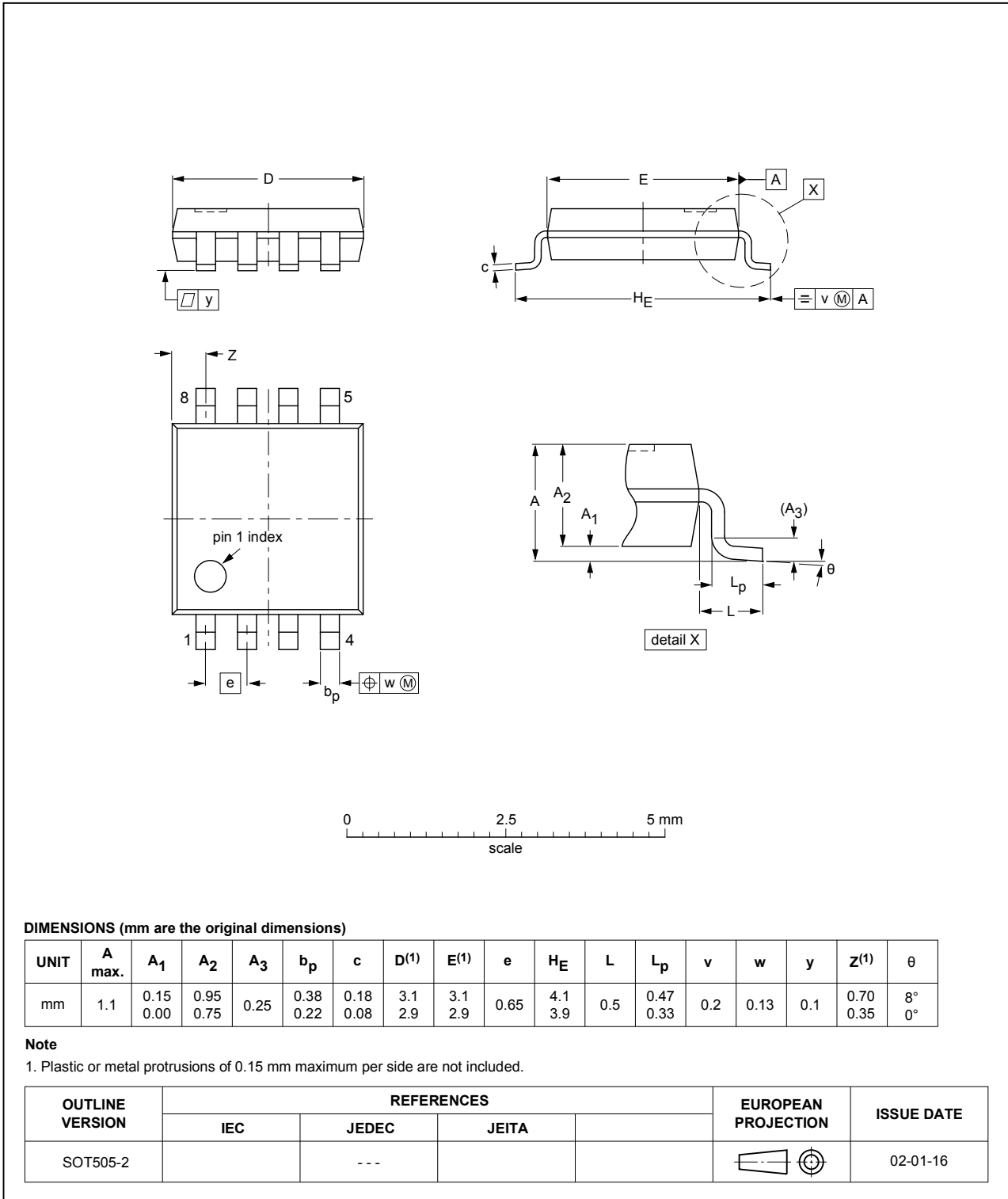


Fig. 15. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

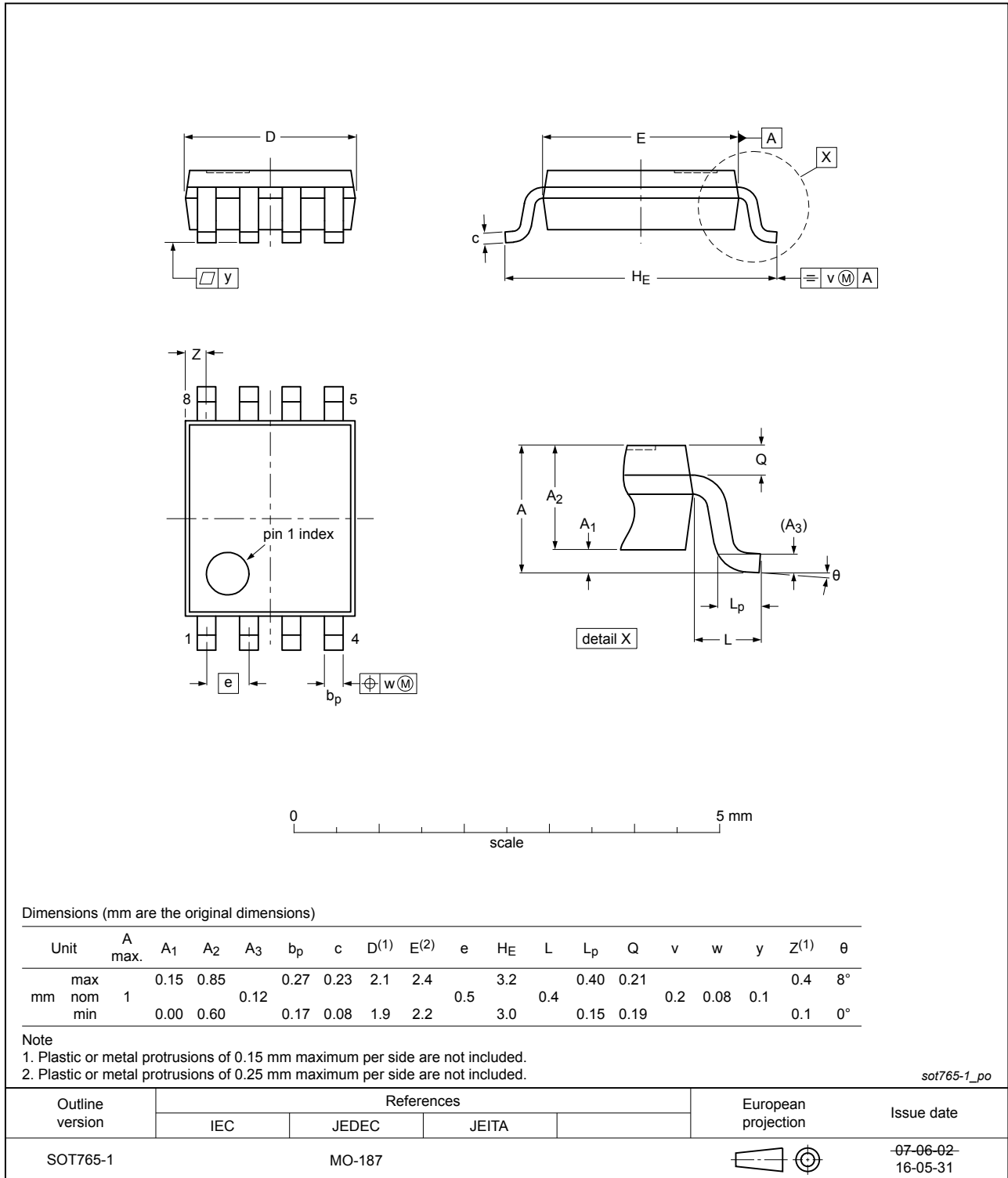


Fig. 16. Package outline SOT765-1 (VSSOP8)

15. Abbreviations

Table 12. 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 |

16. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------|--|-----------------------|---------------|------------------|
| 74HC_HCT3G14 v.6 | 20190201 | Product data sheet | - | 74HC_HCT3G14 v.5 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type numbers 74HC3G14GD and 74HCT3G14GD (SOT996-2) removed. Package outline drawing SOT765-1 (VSSOP8) updated. | | | |
| 74HC_HCT3G14 v.5 | 20131209 | Product data sheet | - | 74HC_HCT3G14 v.4 |
| Modifications: | <ul style="list-style-type: none"> Fig. 14 added (typical K-factor for relaxation oscillator). | | | |
| 74HC_HCT3G14 v.4 | 20131003 | Product data sheet | - | 74HC_HCT3G14 v.3 |
| Modifications: | <ul style="list-style-type: none"> For type numbers 74HC3G14GD and 74HCT3G14GD XSON8U has changed to XSON8. | | | |
| 74HC_HCT3G14 v.3 | 20090508 | Product data sheet | - | 74HC_HCT3G14 v.2 |
| 74HC_HCT3G14 v.2 | 20031104 | Product specification | - | 74HC_HCT3G14 v.1 |
| 74HC_HCT3G14 v.1 | 20020723 | Product specification | - | - |

17. Legal information

Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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