



# 74HC112; 74HCT112

Dual JK flip-flop with set and reset; negative-edge trigger

Rev. 5 — 15 January 2024

Product data sheet

## 1. General description

The 74HC112; 74HCT112 is a dual negative-edge triggered JK flip-flop. It features individual J and K inputs, clock ( $\overline{nCP}$ ) set ( $\overline{nSD}$ ) and reset ( $\overline{nRD}$ ) inputs. It also has complementary  $nQ$  and  $n\overline{Q}$  outputs. The set and reset are asynchronous active LOW inputs and operate independently of the clock input. The J and K inputs control the state changes of the flip-flops as described in the mode select function table. The J and K inputs must be stable one set-up time prior to the HIGH-to-LOW clock transition for predictable operation. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times.

## 2. Features and benefits

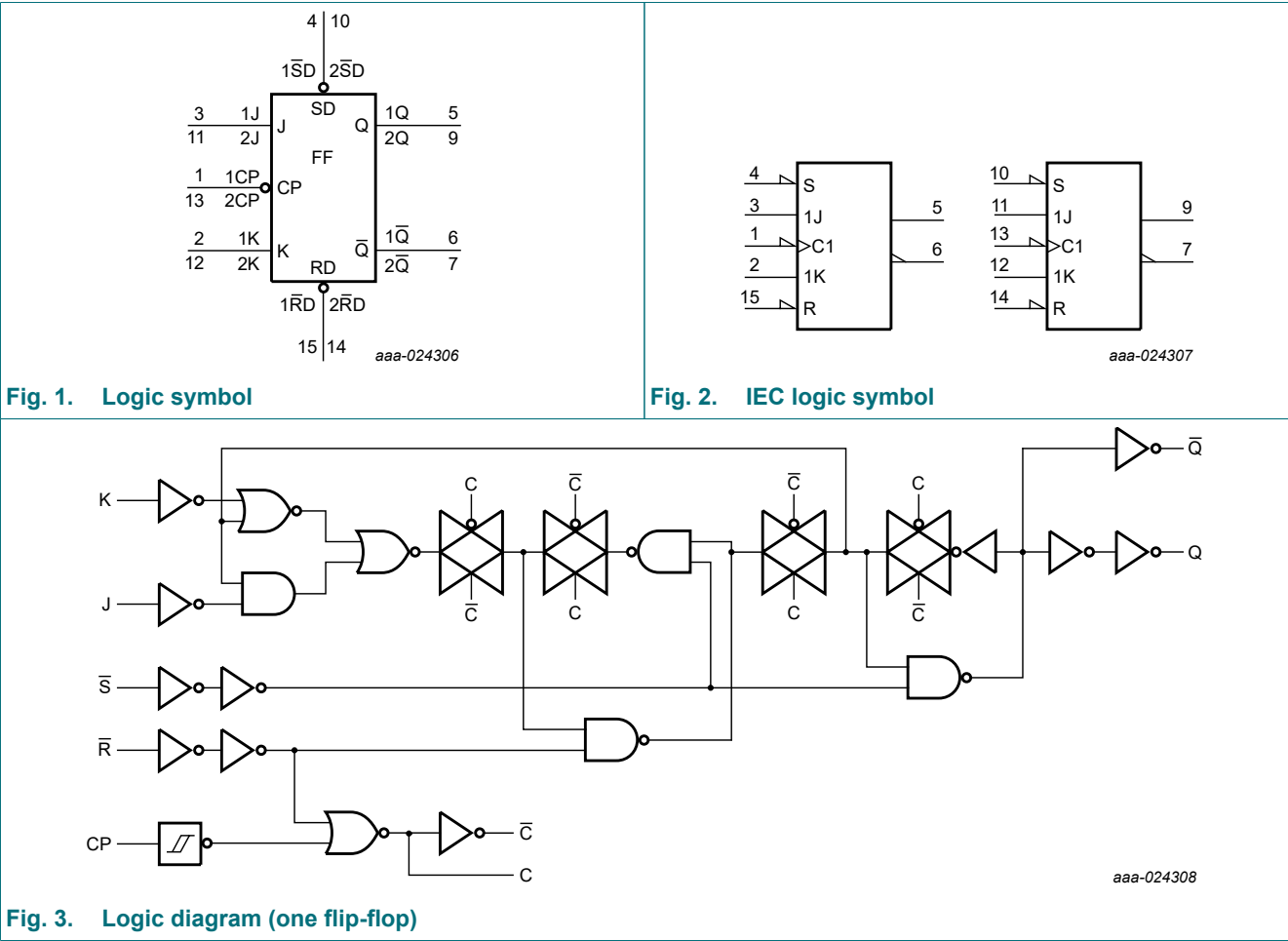
- Input levels:
  - For 74HC112: CMOS level
  - For 74HCT112: TTL level
- Asynchronous set and reset
- Specified in compliance with JEDEC standard no. 7A
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

## 3. Ordering information

Table 1. Ordering information

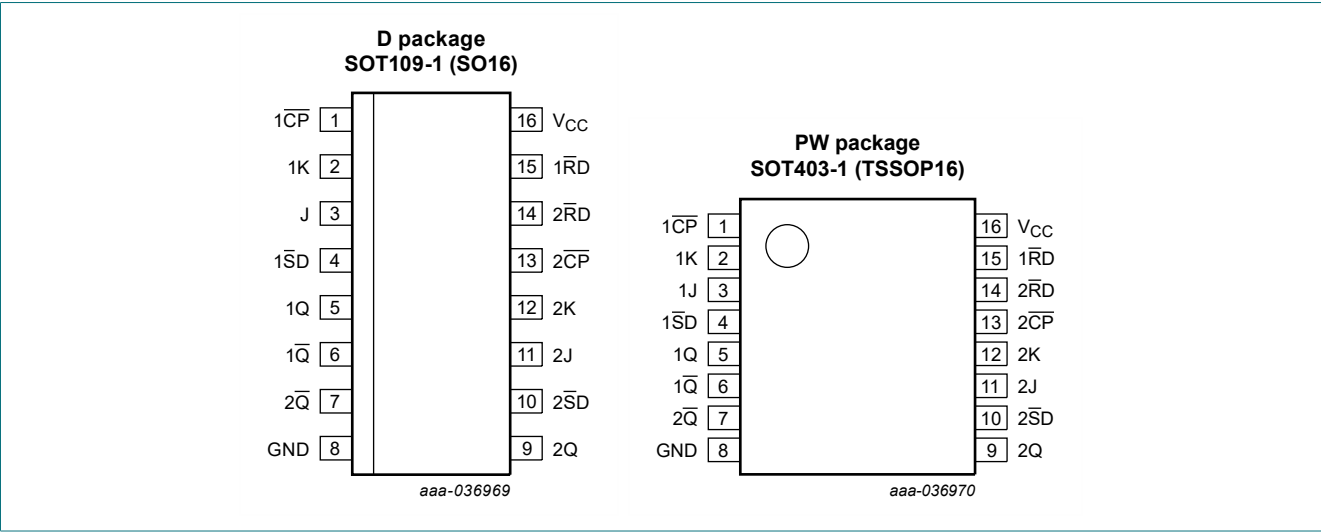
| Type number                                             | Package           |         |                                                                        |                          |
|---------------------------------------------------------|-------------------|---------|------------------------------------------------------------------------|--------------------------|
|                                                         | Temperature range | Name    | Description                                                            | Version                  |
| <a href="#">74HC112D</a><br><a href="#">74HCT112D</a>   | -40 °C to +125 °C | SO16    | plastic small outline package; 16 leads; body width 3.9 mm             | <a href="#">SOT109-1</a> |
| <a href="#">74HC112PW</a><br><a href="#">74HCT112PW</a> | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | <a href="#">SOT403-1</a> |

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

| Symbol   | Pin    | Description                               |
|----------|--------|-------------------------------------------|
| 1CP, 2CP | 1, 13  | clock input (HIGH-to-LOW; edge-triggered) |
| 1K, 2K   | 2, 12  | data input                                |
| 1J, 2J   | 3, 11  | data input                                |
| 1SD, 2SD | 4, 10  | set input (active LOW)                    |
| 1Q, 2Q   | 5, 9   | true flip-flop output                     |
| 1Q, 2Q   | 6, 7   | complement flip-flop output               |
| GND      | 8      | ground (0 V)                              |
| 1RD, 2RD | 15, 14 | reset input (active LOW)                  |
| VCC      | 16     | supply voltage                            |

6. Functional description

Table 3. Function selection

If nSD and nRD simultaneously go from LOW-to-HIGH, the output states are unpredictable.  
H = HIGH voltage level; h = HIGH voltage level one set-up time before the HIGH-to-LOW clock transition;  
L = LOW voltage level; l = LOW voltage level one set-up time before the HIGH-to-LOW clock transition;  
q = lowercase letters indicate the state of the referenced output one set-up time before the HIGH-to-LOW clock transition;  
X = don't care; ↓ = HIGH-to-LOW clock transition.

| Operating modes    | Input |     |     |    |    | Output |    |
|--------------------|-------|-----|-----|----|----|--------|----|
|                    | nSD   | nRD | nCP | nJ | nK | nQ     | nQ |
| Asynchronous set   | L     | H   | X   | X  | X  | H      | L  |
| Asynchronous reset | H     | L   | X   | X  | X  | L      | H  |
| Undetermined       | L     | L   | X   | X  | X  | H      | L  |
| Toggle             | H     | H   | ↓   | h  | h  | q      | q  |
| Load 0 (reset)     | H     | H   | ↓   | l  | h  | L      | H  |
| Load 1 (set)       | H     | H   | ↓   | h  | l  | H      | L  |
| Hold no change     | H     | H   | ↓   | l  | l  | q      | q  |

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 <sub>CC</sub>  | supply voltage          |                                                                     | -0.5 | +7   | 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                   | -    | ±25  | mA   |
| I <sub>CC</sub>  | supply current          |                                                                     | -    | +50  | mA   |
| I <sub>GND</sub> | ground current          |                                                                     | -50  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                     | -65  | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | [1]                                                                 | -    | 500  | mW   |

[1] For SOT109-1 (SO16) package: P<sub>tot</sub> derates linearly with 12.4 mW/K above 110 °C.  
For SOT403-1 (TSSOP16) package: P<sub>tot</sub> derates linearly with 8.5 mW/K above 91 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol           | Parameter                           | Conditions              | 74HC112 |      |                 | 74HCT112 |      |                 | 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 | -       | 1.67 | 139             | -        | 1.67 | 139             | ns/V |
|                  |                                     | V <sub>CC</sub> = 6.0 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  |      |
| 74HC112         |                          |                         |       |     |      |                  |      |                   |      |      |
| 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    |

Dual JK flip-flop with set and reset; negative-edge trigger

| Symbol           | Parameter                 | Conditions                                                                                                                        | 25 °C |      |      | -40 °C to +85 °C |      | -40 °C to +125 °C |     | Unit |
|------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------------------|------|-------------------|-----|------|
|                  |                           |                                                                                                                                   | Min   | Typ  | Max  | Min              | Max  | Min               | Max |      |
| 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   | -                 | ±1  | 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                                            | -     | -    | 4.0  | -                | 40   | -                 | 80  | µA   |
| C <sub>I</sub>   | input capacitance         |                                                                                                                                   | -     | 3.5  | -    | -                | -    | -                 | -   | pF   |
| 74HCT112         |                           |                                                                                                                                   |       |      |      |                  |      |                   |     |      |
| 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; V <sub>CC</sub> = 4.5 V                                                                                   | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1 | V    |
|                  |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 5.5 V                                                                                  | -     | 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   | -                 | ±1  | 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> = 5.5 V                                            | -     | -    | 4.0  | -                | 40   | -                 | 80  | µA   |
| ΔI <sub>CC</sub> | additional supply current | per input pin; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V |       |      |      |                  |      |                   |     |      |
|                  |                           | n $\overline{\text{SD}}$ inputs                                                                                                   | -     | 50   | 180  | -                | 225  | -                 | 245 | µA   |
|                  |                           | nK inputs                                                                                                                         | -     | 60   | 216  | -                | 270  | -                 | 294 | µA   |
|                  |                           | n $\overline{\text{RD}}$ inputs                                                                                                   | -     | 65   | 236  | -                | 293  | -                 | 319 | µA   |
|                  |                           | nJ, and n $\overline{\text{CP}}$ inputs                                                                                           | -     | 100  | 360  | -                | 450  | -                 | 490 | µA   |
| C <sub>I</sub>   | input capacitance         |                                                                                                                                   | -     | 3.5  | -    | -                | -    | -                 | -   | pF   |

10. Dynamic characteristics

**Table 7. Dynamic characteristics**  
 Voltages are referenced to GND (ground = 0 V);  $C_L = 50\text{ pF}$  unless otherwise specified; for test circuit, see Fig. 6.

| Symbol                  | Parameter         | Conditions                                    | 25 °C |        |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|-------------------------|-------------------|-----------------------------------------------|-------|--------|-----|------------------|-----|-------------------|-----|------|
|                         |                   |                                               | Min   | Typ[1] | Max | Min              | Max | Min               | Max |      |
| 74HC112                 |                   |                                               |       |        |     |                  |     |                   |     |      |
| t <sub>pd</sub>         | propagation delay | nCP to nQ; see Fig. 4 [2]                     |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | -     | 55     | 175 | -                | 220 | -                 | 265 | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | -     | 20     | 35  | -                | 44  | -                 | 53  | ns   |
|                         |                   | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF | -     | 17     | -   | -                | -   | -                 | -   | ns   |
|                         |                   | V <sub>CC</sub> = 6.0 V                       | -     | 16     | 30  | -                | 37  | -                 | 45  | ns   |
|                         |                   | nCP to nQ̄; see Fig. 4                        |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | -     | 55     | 175 | -                | 220 | -                 | 265 | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | -     | 20     | 35  | -                | 44  | -                 | 53  | ns   |
|                         |                   | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF | -     | 17     | -   | -                | -   | -                 | -   | ns   |
|                         |                   | V <sub>CC</sub> = 6.0 V                       | -     | 16     | 30  | -                | 37  | -                 | 45  | ns   |
|                         |                   | nRD to nQ, nQ̄; see Fig. 5                    |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | -     | 58     | 180 | -                | 225 | -                 | 270 | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | -     | 21     | 36  | -                | 45  | -                 | 54  | ns   |
|                         |                   | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF | -     | 18     | -   | -                | -   | -                 | -   | ns   |
|                         |                   | V <sub>CC</sub> = 6.0 V                       | -     | 17     | 31  | -                | 38  | -                 | 46  | ns   |
|                         |                   | nSD to nQ, nQ̄; see Fig. 5                    |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | -     | 50     | 155 | -                | 295 | -                 | 235 | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | -     | 18     | 31  | -                | 39  | -                 | 47  | ns   |
|                         |                   | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF | -     | 15     | -   | -                | -   | -                 | -   | ns   |
|                         |                   | V <sub>CC</sub> = 6.0 V                       | -     | 14     | 26  | -                | 33  | -                 | 40  | ns   |
| t <sub>t</sub>          | transition time   | nQ, nQ̄; see Fig. 4 [3]                       |       |        |     |                  |     |                   |     |      |
|                         |                   | 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   |
| t <sub>w</sub>          | pulse width       | nCP HIGH or LOW; see Fig. 4                   |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | 80    | 22     | -   | 100              | -   | 120               | -   | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | 16    | 8      | -   | 20               | -   | 24                | -   | ns   |
|                         |                   | V <sub>CC</sub> = 6.0 V                       | 14    | 6      | -   | 17               | -   | 20                | -   | ns   |
|                         |                   | nSD, nRD LOW; see Fig. 5                      |       |        |     |                  |     |                   |     |      |
|                         |                   | V <sub>CC</sub> = 2.0 V                       | 80    | 22     | -   | 100              | -   | 120               | -   | ns   |
|                         |                   | V <sub>CC</sub> = 4.5 V                       | 16    | 8      | -   | 20               | -   | 24                | -   | ns   |
| V <sub>CC</sub> = 6.0 V | 14                | 6                                             | -     | 17     | -   | 20               | -   | ns                |     |      |

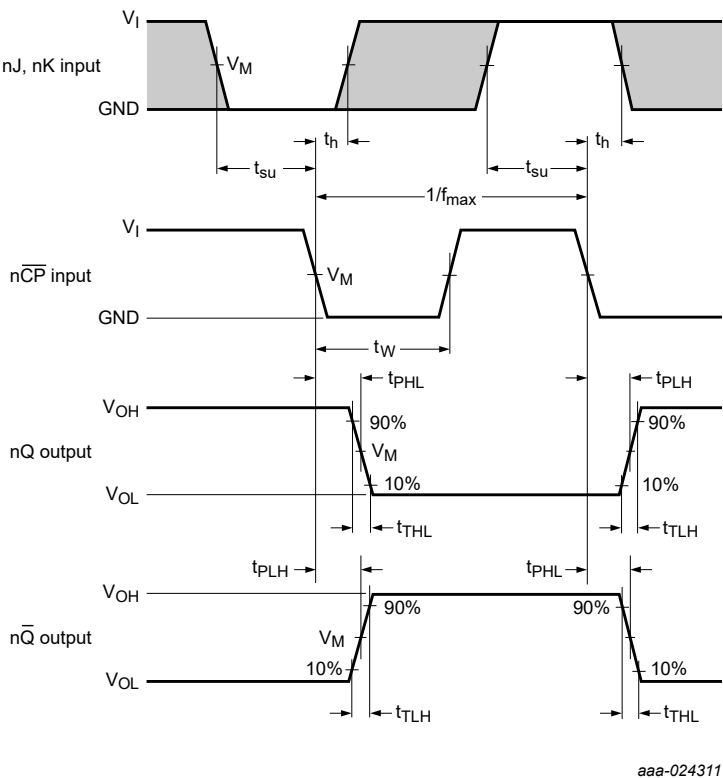
| Symbol           | Parameter                     | Conditions                                                                                         | 25 °C |        |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|----------------------------------------------------------------------------------------------------|-------|--------|-----|------------------|-----|-------------------|-----|------|
|                  |                               |                                                                                                    | Min   | Typ[1] | Max | Min              | Max | Min               | Max |      |
| $t_{\text{rec}}$ | recovery time                 | $\text{nRD}$ to $\text{nCP}$ ; see Fig. 5                                                          |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 2.0 \text{ V}$                                                                    | 80    | 22     | -   | 125              | -   | 150               | -   | ns   |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 16    | 8      | -   | 25               | -   | 30                | -   | ns   |
|                  |                               | $V_{\text{CC}} = 6.0 \text{ V}$                                                                    | 14    | 6      | -   | 21               | -   | 26                | -   | ns   |
|                  |                               | $\text{nSD}$ to $\text{nCP}$ ; see Fig. 5                                                          |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 2.0 \text{ V}$                                                                    | 80    | -19    | -   | 100              | -   | 120               | -   | ns   |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 16    | -7     | -   | 20               | -   | 24                | -   | ns   |
|                  |                               | $V_{\text{CC}} = 6.0 \text{ V}$                                                                    | 14    | -6     | -   | 17               | -   | 20                | -   | ns   |
| $t_{\text{su}}$  | set-up time                   | $\text{nJ}$ and $\text{nK}$ to $\text{nCP}$ ; see Fig. 4                                           |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 2.0 \text{ V}$                                                                    | 80    | 19     | -   | 100              | -   | 120               | -   | ns   |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 16    | 7      | -   | 20               | -   | 24                | -   | ns   |
|                  |                               | $V_{\text{CC}} = 6.0 \text{ V}$                                                                    | 14    | 6      | -   | 17               | -   | 20                | -   | ns   |
| $t_{\text{h}}$   | hold time                     | $\text{nJ}$ and $\text{nK}$ to $\text{nCP}$ ; see Fig. 4                                           |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 2.0 \text{ V}$                                                                    | 0     | -11    | -   | 0                | -   | 0                 | -   | ns   |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 0     | -4     | -   | 0                | -   | 0                 | -   | ns   |
|                  |                               | $V_{\text{CC}} = 6.0 \text{ V}$                                                                    | 0     | -3     | -   | 0                | -   | 0                 | -   | ns   |
| $f_{\text{max}}$ | maximum frequency             | $\text{nCP}$ ; see Fig. 4                                                                          |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 2.0 \text{ V}$                                                                    | 6     | 20     | -   | 4.8              | -   | 4.0               | -   | MHz  |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 30    | 60     | -   | 24               | -   | 20                | -   | MHz  |
|                  |                               | $V_{\text{CC}} = 5 \text{ V}; C_{\text{L}} = 15 \text{ pF}$                                        | -     | 66     | -   | -                | -   | -                 | -   | MHz  |
|                  |                               | $V_{\text{CC}} = 6.0 \text{ V}$                                                                    | 35    | 71     | -   | 28               | -   | 24                | -   | MHz  |
| $C_{\text{PD}}$  | power dissipation capacitance | $C_{\text{L}} = 50 \text{ pF}; f = 1 \text{ MHz}; V_{\text{I}} = \text{GND to } V_{\text{CC}}$ [4] | -     | 27     | -   |                  |     | -                 | -   | pF   |
| <b>74HCT112</b>  |                               |                                                                                                    |       |        |     |                  |     |                   |     |      |
| $t_{\text{pd}}$  | propagation delay             | $\text{nCP}$ to $\text{nQ}$ ; see Fig. 4 [2]                                                       |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | -     | 21     | 35  | -                | 44  | -                 | 53  | ns   |
|                  |                               | $V_{\text{CC}} = 5 \text{ V}; C_{\text{L}} = 15 \text{ pF}$                                        | -     | 19     | -   | -                | -   | -                 | -   | ns   |
|                  |                               | $\text{nCP}$ to $\text{nQ}$ ; see Fig. 4                                                           |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | -     | 23     | 40  | -                | 50  | -                 | 60  | ns   |
|                  |                               | $V_{\text{CC}} = 5 \text{ V}; C_{\text{L}} = 15 \text{ pF}$                                        | -     | 19     | -   | -                | -   | -                 | -   | ns   |
|                  |                               | $\text{nRD}$ to $\text{nQ}, \text{nQ}$ ; see Fig. 5                                                |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | -     | 22     | 37  | -                | 46  | -                 | 56  | ns   |
|                  |                               | $V_{\text{CC}} = 5 \text{ V}; C_{\text{L}} = 15 \text{ pF}$                                        | -     | 19     | -   | -                | -   | -                 | -   | ns   |
|                  |                               | $\text{nSD}$ to $\text{nQ}, \text{nQ}$ ; see Fig. 5                                                |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | -     | 18     | 32  | -                | 40  | -                 | 48  | ns   |
|                  |                               | $V_{\text{CC}} = 5 \text{ V}; C_{\text{L}} = 15 \text{ pF}$                                        | -     | 15     | -   | -                | -   | -                 | -   | ns   |
| $t_{\text{t}}$   | transition time               | $\text{nQ}, \text{nQ}$ ; see Fig. 4 [3]                                                            |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | -     | 7      | 15  | -                | 19  | -                 | 22  | ns   |
| $t_{\text{W}}$   | pulse width                   | $\text{nCP}$ HIGH or LOW; see Fig. 4                                                               |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 16    | 8      | -   | 20               | -   | 24                | -   | ns   |
|                  |                               | $\text{nSD}, \text{nRD}$ LOW; see Fig. 5                                                           |       |        |     |                  |     |                   |     |      |
|                  |                               | $V_{\text{CC}} = 4.5 \text{ V}$                                                                    | 18    | 10     | -   | 23               | -   | 27                | -   | ns   |

Dual JK flip-flop with set and reset; negative-edge trigger

| Symbol           | Parameter                     | Conditions                                                                     | 25 °C |        |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|--------------------------------------------------------------------------------|-------|--------|-----|------------------|-----|-------------------|-----|------|
|                  |                               |                                                                                | Min   | Typ[1] | Max | Min              | Max | Min               | Max |      |
| t <sub>rec</sub> | recovery time                 | nRD to nCP; see Fig. 5                                                         |       |        |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                        | 20    | 11     | -   | 25               | -   | 30                | -   | ns   |
|                  |                               | nSD to nCP; see Fig. 5                                                         |       |        |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                        | 20    | -8     | -   | 25               | -   | 30                | -   | ns   |
| t <sub>su</sub>  | set-up time                   | nJ and nK to nCP ; see Fig. 4                                                  |       |        |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                        | 16    | 7      | -   | 20               | -   | 24                | -   | ns   |
| t <sub>h</sub>   | hold time                     | nJ and nK to nCP; see Fig. 4                                                   |       |        |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                        | 0     | -7     | -   | 0                | -   | 0                 | -   | ns   |
| f <sub>max</sub> | maximum frequency             | nCP; see Fig. 4                                                                |       |        |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                        | 30    | 64     | -   | 24               | -   | 20                | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                                  | -     | 70     | -   | -                | -   | -                 | -   | MHz  |
| C <sub>PD</sub>  | power dissipation capacitance | C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [4] | -     | 30     | -   | -                | -   | -                 | -   | pF   |

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.  
[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
[3] t<sub>i</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.  
[4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) 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 V;  
N = number of inputs switching;  
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

10.1. Waveforms and test circuit



Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig. 4. Clock propagation delays, output transition time, pulse width, set-up, hold times, and maximum frequency**

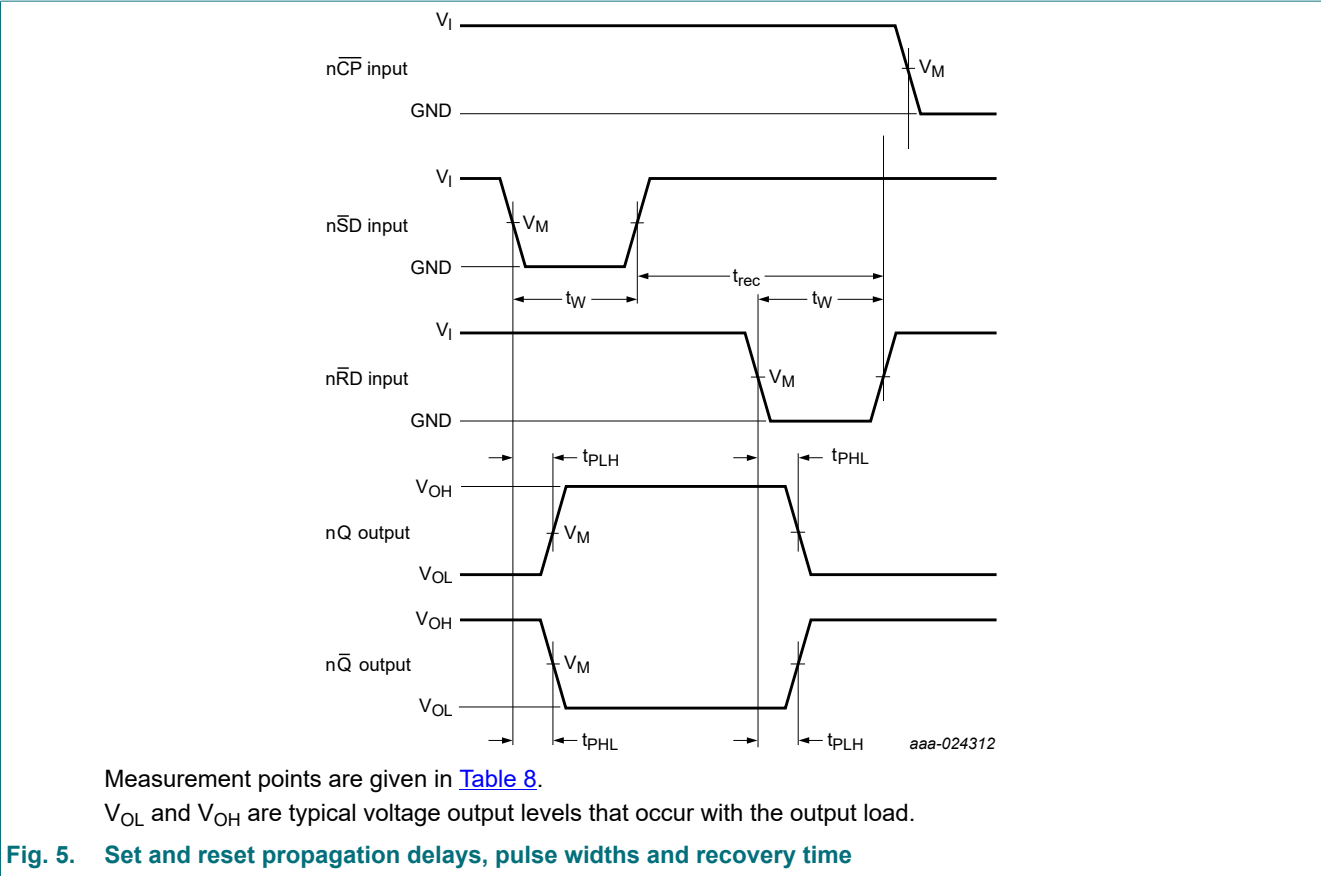
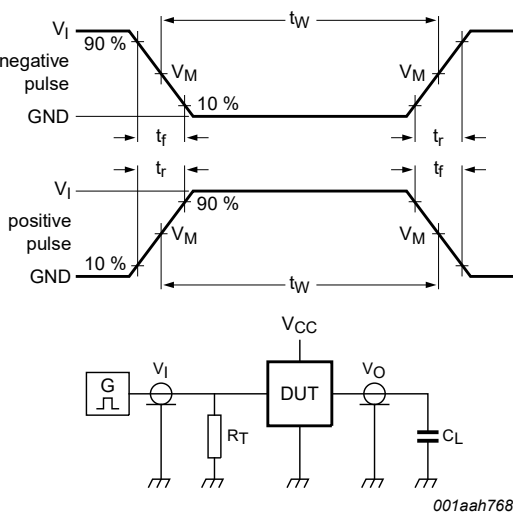


Table 8. Measurement points

| Type     | Input               | Output              |
|----------|---------------------|---------------------|
|          | $V_M$               | $V_M$               |
| 74HC112  | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 74HCT112 | 1.3 V               | 1.3 V               |



Test data is given in [Table 9](#).  
Definitions test circuit:  
 $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator;  
 $C_L$  = Load capacitance including jig and probe capacitance.

Fig. 6. Test circuit for measuring switching times

Table 9. Test data

| Type     | Input    |            | Load         | Test               |
|----------|----------|------------|--------------|--------------------|
|          | $V_I$    | $t_r, t_f$ | $C_L$        |                    |
| 74HC112  | $V_{CC}$ | 6 ns       | 15 pF, 50 pF | $t_{PLH}, t_{PHL}$ |
| 74HCT112 | 3 V      | 6 ns       | 15 pF, 50 pF | $t_{PLH}, t_{PHL}$ |

11. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

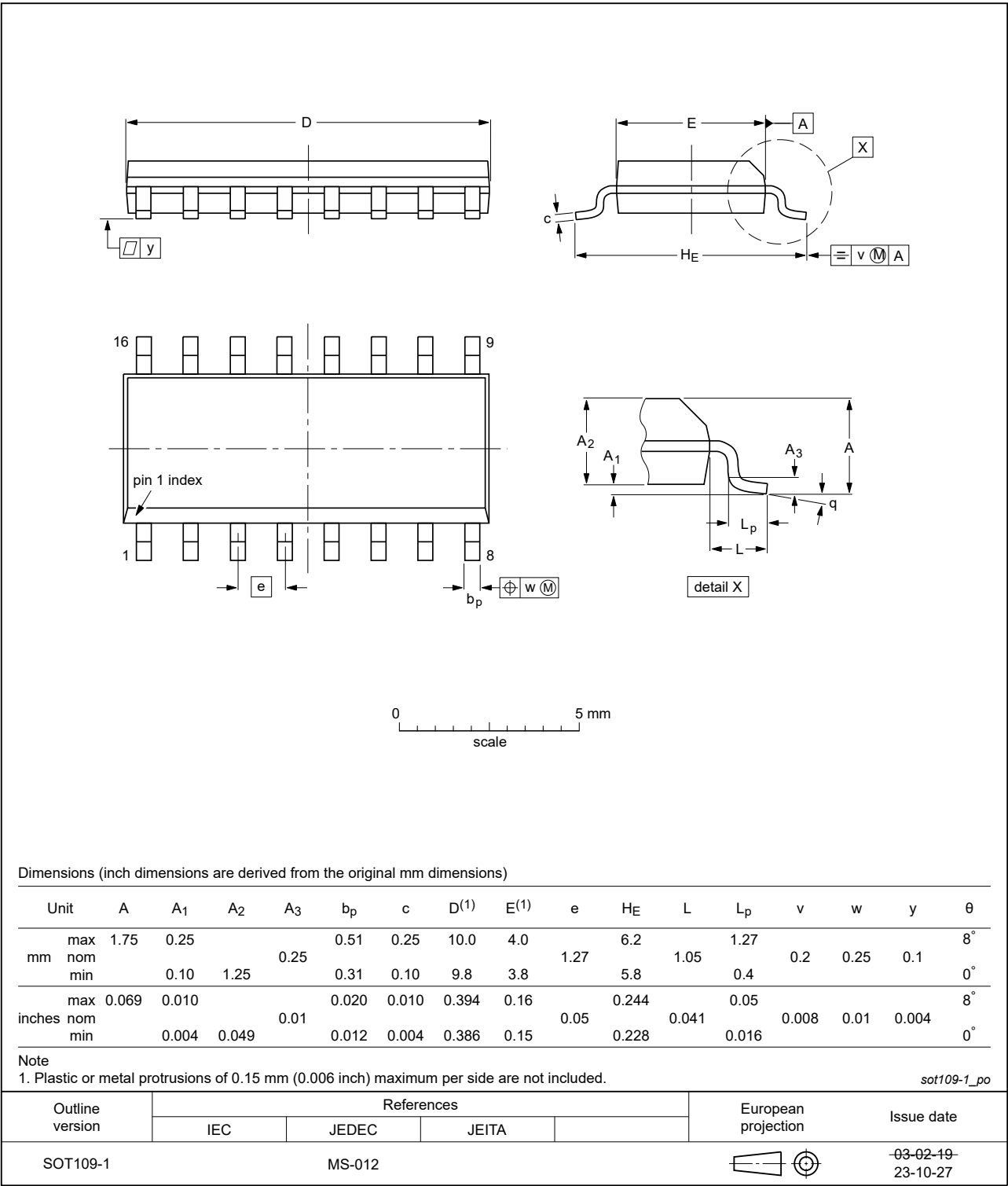


Fig. 7. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

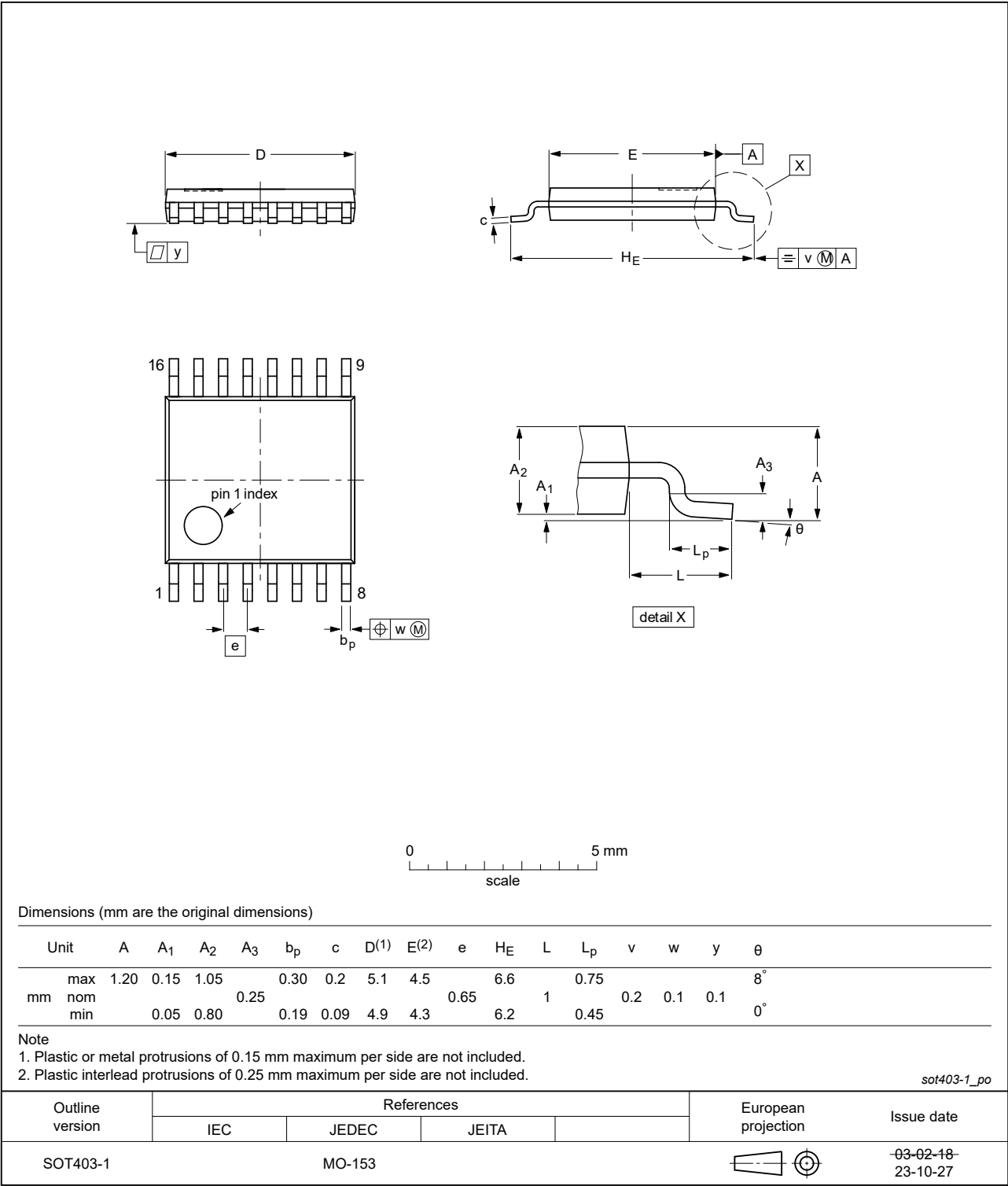


Fig. 8. Package outline SOT403-1 (TSSOP16)

12. 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                        |
| TTL     | Transistor-Transistor Logic             |

13. Revision history

Table 11. Revision history

| Document ID         | Release date                                                                                                                                                                                                                                                                                                                                                                                                        | Data sheet status     | Change notice | Supersedes          |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|---------------------|
| 74HC_HCT112 v.5     | 20240115                                                                                                                                                                                                                                                                                                                                                                                                            | Product data sheet    | -             | 74HC_HCT112 v.4     |
| Modifications:      | <ul style="list-style-type: none"><li>Section 2: ESD specification updated according to the latest JEDEC standard.</li><li>Fig. 7, Fig. 8: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153</li></ul>                                                                                                                                                                                       |                       |               |                     |
| 74HC_HCT112 v.4     | 20210111                                                                                                                                                                                                                                                                                                                                                                                                            | Product data sheet    | -             | 74HC_HCT112 v.3     |
| 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><li>Type numbers 74HC112DB and 74HCT112DB (SOT338-1 / SSOP16) removed.</li><li>Section 7: Derating values for P<sub>tot</sub> total power dissipation have been updated.</li></ul> |                       |               |                     |
| 74HC_HCT112 v.3     | 20160809                                                                                                                                                                                                                                                                                                                                                                                                            | Product data sheet    | -             | 74HC_HCT112_CNV 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 74HC112N and 74HCT112N removed.</li></ul>                                                                                                           |                       |               |                     |
| 74HC_HCT112_CNV v.2 | 19980610                                                                                                                                                                                                                                                                                                                                                                                                            | Product specification | -             | -                   |

14. 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>.

Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal

injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

**Trademarks**

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

1. General description..... 1

2. Features and benefits..... 1

3. Ordering information..... 1

4. Functional diagram..... 2

5. Pinning information..... 2

5.1. Pinning..... 2

5.2. Pin description..... 3

6. Functional description..... 3

7. Limiting values..... 4

8. Recommended operating conditions..... 4

9. Static characteristics..... 4

10. Dynamic characteristics..... 6

10.1. Waveforms and test circuit..... 9

11. Package outline..... 12

12. Abbreviations..... 14

13. Revision history..... 14

14. Legal information..... 15

© Nexperia B.V. 2024. All rights reserved

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

Date of release: 15 January 2024