

# 74LVC16374A; 74LVCH16374A

16-bit edge-triggered D-type flip-flop; 5 V tolerant; 3-state

Rev. 11 — 16 January 2013

Product data sheet

## 1. General description

The 74LVC16374A and 74LVCH16374A are 16-bit edge-triggered flip-flops featuring separate D-type inputs with bus hold (74LVCH16374A only) for each flip-flop and 3-state outputs for bus-oriented applications. It consists of two sections of eight positive edge-triggered flip-flops. A clock input (nCP) and an output enable (nOE) are provided for each octal.

The flip-flops store the state of their individual D-inputs that meet the set-up and hold time requirements on the LOW-to-HIGH clock (CP) transition.

When pin  $\overline{\text{nOE}}$  is LOW, the contents of the flip-flops are available at the outputs. When pin  $\overline{\text{nOE}}$  is HIGH, the outputs go to the high-impedance OFF-state. Operation of input  $\overline{\text{nOE}}$  does not affect the state of the flip-flops.

Inputs can be driven from either 3.3 V or 5 V devices. When disabled, up to 5.5 V can be applied to the outputs. These features allow the use of these devices in mixed 3.3 V and 5 V applications.

Bus hold on data inputs eliminates the need for external pull-up resistors to hold unused inputs.

## 2. Features and benefits

- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low power consumption
- Multibyte flow-through standard pinout architecture
- Low inductance multiple supply pins for minimum noise and ground bounce
- Direct interface with TTL levels
- All data inputs have bus hold (74LVCH16374A only)
- High-impedance outputs when  $V_{CC} = 0$  V
- Complies with JEDEC standard:
  - ◆ JESD8-7A (1.65 V to 1.95 V)
  - ◆ JESD8-5A (2.3 V to 2.7 V)
  - ◆ JESD8-C/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-B exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 1000 V
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C

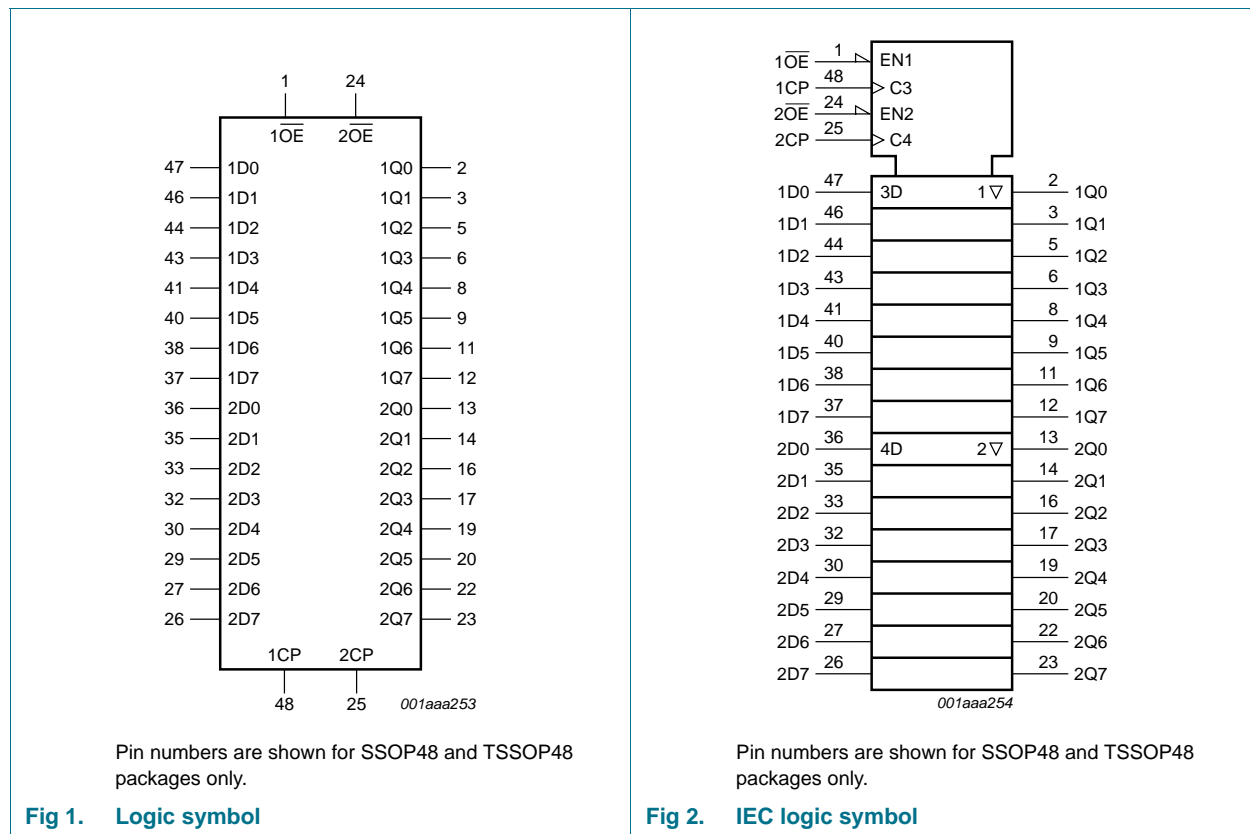


### 3. Ordering information

Table 1. Ordering information

| Type number                       | Package           |          |  | Version   |
|-----------------------------------|-------------------|----------|--|-----------|
|                                   | Temperature range | Name     | Description  |           |
| 74LVC16374ADL<br>74LVCH16374ADL   | -40 °C to +125 °C | SSOP48   | plastic shrink small outline package; 48 leads; body width 7.5 mm  | SOT370-1  |
| 74LVC16374ADGG<br>74LVCH16374ADGG | -40 °C to +125 °C | TSSOP48  | plastic thin shrink small outline package; 48 leads; body width 6.1 mm   | SOT362-1  |
| 74LVC16374ABX<br>74LVCH16374ABX   | -40 °C to +125 °C | HXQFN60U | plastic thermal enhanced extremely thin quad flat package; no leads; 60 terminals; UTLF based; body 4 × 6 × 0.5 mm | SOT1134-1 |

### 4. Functional diagram



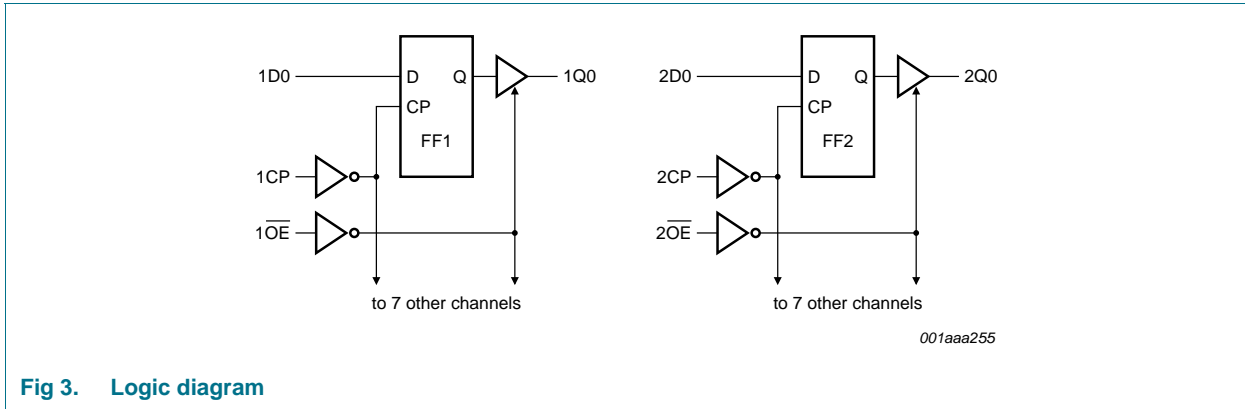


Fig 3. Logic diagram

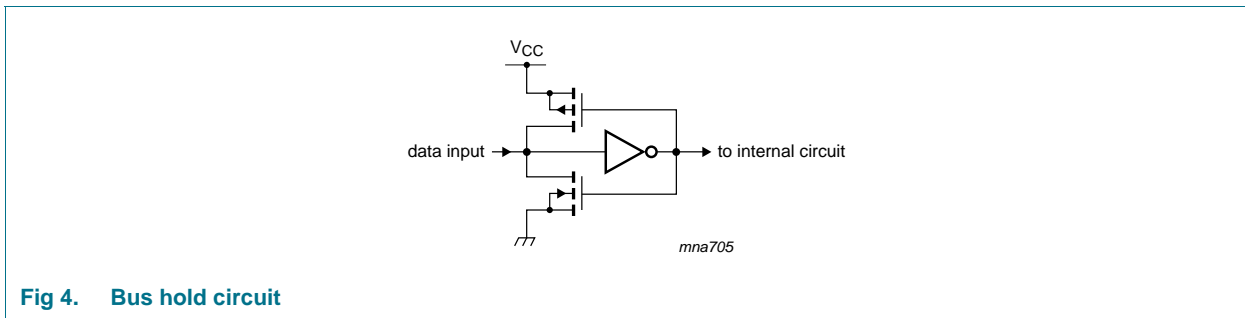


Fig 4. Bus hold circuit

## 5. Pinning information

### 5.1 Pinning

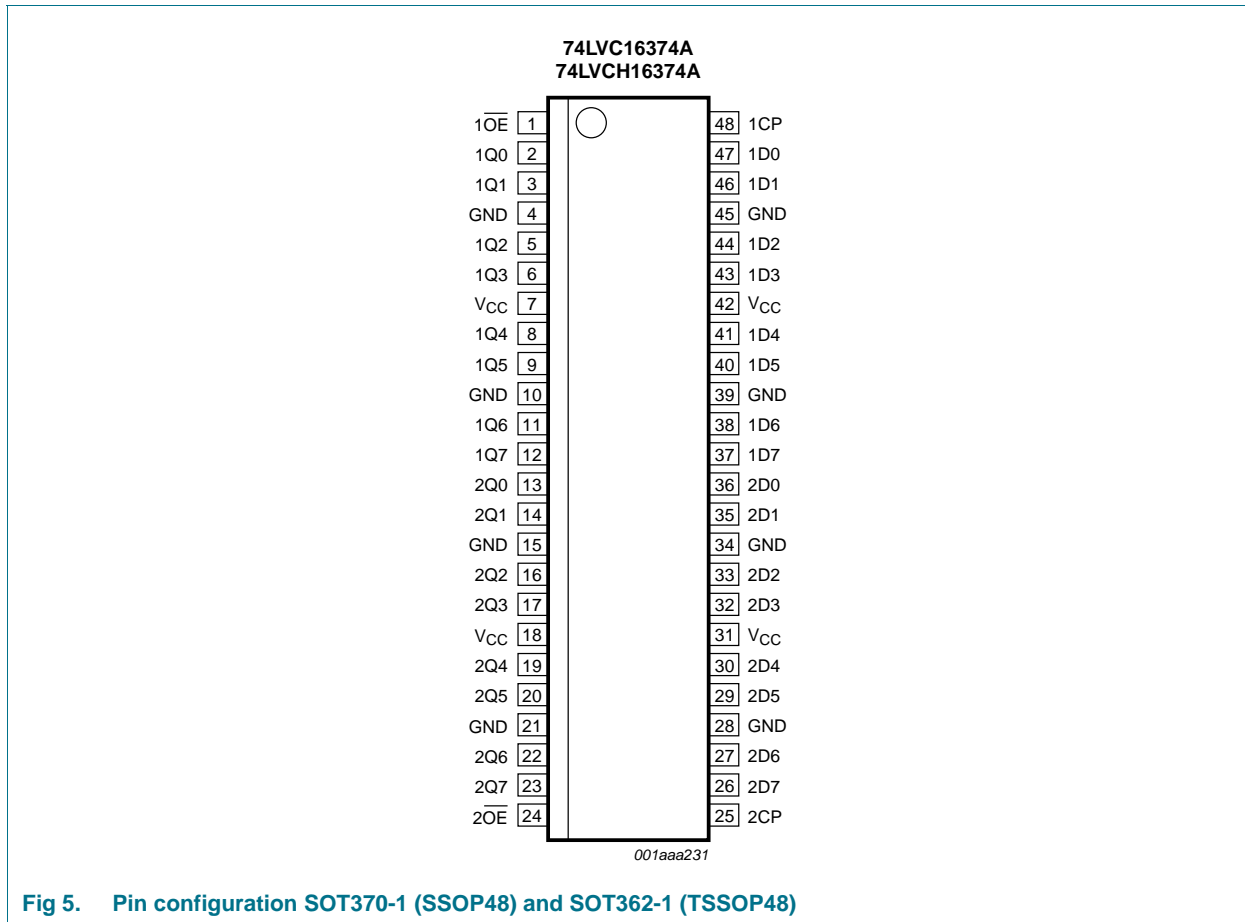
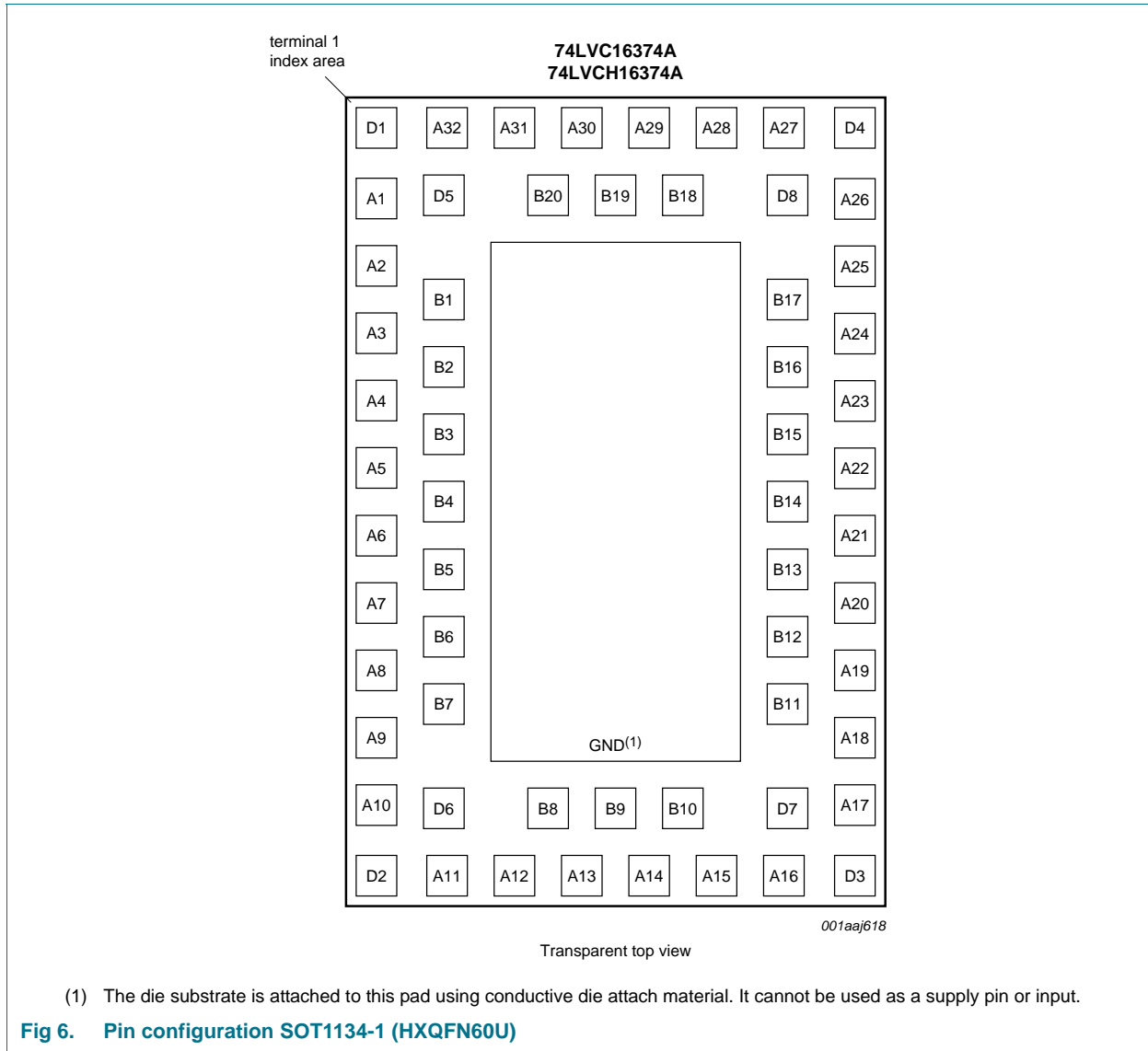


Fig 5. Pin configuration SOT370-1 (SSOP48) and SOT362-1 (TSSOP48)



## 5.2 Pin description

Table 2. Pin description

| Symbol                           | Pin                            |                                      | Description                      |
|----------------------------------|--------------------------------|--------------------------------------|----------------------------------|
|                                  | SOT370-1 and SOT362-1          | SOT1134-1                            |                                  |
| $\overline{1OE}, \overline{2OE}$ | 1, 24                          | A30, A13                             | output enable input (active LOW) |
| GND                              | 4, 10, 15, 21, 28, 34, 39, 45  | A32, A3, A8, A11, A16, A19, A24, A27 | ground (0 V)                     |
| V <sub>CC</sub>                  | 7, 18, 31, 42                  | A1, A10, A17, A26                    | supply voltage                   |
| 1Q0 to 1Q7                       | 2, 3, 5, 6, 8, 9, 11, 12       | B20, A31, D5, D1, A2, B2, B3, A5     | data output                      |
| 2Q0 to 2Q7                       | 13, 14, 16, 17, 19, 20, 22, 23 | A6, B5, B6, A9, D2, D6, A12, B8      | data output                      |
| 1D0 to 1D7                       | 47, 46, 44, 43, 41, 40, 38, 37 | B18, A28, D8, D4, A25, B16, B15, A22 | data input                       |
| 2D0 to 2D7                       | 36, 35, 33, 32, 30, 29, 27, 26 | A21, B13, B12, A18, D3, D7, A15, B10 | data input                       |
| 1CP, 2CP                         | 48, 25                         | A29, A14                             | clock input                      |

## 6. Functional description

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

| Operating mode                    | Input |     |     | Internal flip-flop | Output nQ0 to nQ7 |
|-----------------------------------|-------|-----|-----|--------------------|-------------------|
|                                   | nOE   | nCP | nDn |                    |                   |
| Load and read register            | L     | ↑   | l   | L                  | L                 |
|                                   | L     | ↑   | h   | H                  | H                 |
| Load register and disable outputs | H     | ↑   | l   | L                  | Z                 |
|                                   | H     | ↑   | h   | H                  | Z                 |

- [1] H = HIGH voltage level;  
h = HIGH voltage level one set-up time prior to the HIGH-to-LOW CP transition;  
L = LOW voltage level;  
l = LOW voltage level one set-up time prior to the HIGH-to-LOW CP transition;  
↑ = LOW-to-HIGH transition;  
Z = high-impedance OFF-state.

## 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                | +6.5                  | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V                                     | -50                 | -                     | mA   |
| V <sub>I</sub>   | input voltage           |  | <sup>[1]</sup> -0.5 | +6.5                  | V    |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V | -                   | ±50                   | mA   |
| V <sub>O</sub>   | output voltage          | output HIGH-or LOW-state                                 | <sup>[2]</sup> -0.5 | V <sub>CC</sub> + 0.5 | V    |
|                  |                         | output 3-state   | <sup>[2]</sup> -0.5 | +6.5                  | V    |
| I <sub>O</sub>   | output current          | V <sub>O</sub> = 0 V to V <sub>CC</sub>                  | -                   | ±50                   | mA   |
| I <sub>CC</sub>  | supply current          |  | -                   | 100                   | mA   |
| I <sub>GND</sub> | ground current          |  | -100                | -                     | mA   |
| T <sub>stg</sub> | storage temperature     |  | -65                 | +150                  | °C   |

**Table 4. Limiting values ...continued**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter               | Conditions                           | Min   | Max  | Unit |
|------------------|-------------------------|--------------------------------------|-------|------|------|
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C |       |      |      |
|                  |                         | (T)SSOP48 package                    | [3] - | 500  | mW   |
|                  |                         | HXQFN60U package                     | [4] - | 1000 | mW   |

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

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] Above 60 °C, the value of P<sub>tot</sub> derates linearly with 5.5 mW/K.

[4] Above 70 °C, the value of P<sub>tot</sub> derates linearly with 1.8 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol           | Parameter                           | Conditions                             | Min  | Typ | Max             | Unit |
|------------------|-------------------------------------|--|------|-----|-----------------|------|
| V <sub>CC</sub>  | supply voltage                      |  | 1.65 | -   | 3.6             | V    |
|                  |                                     | functional                             | 1.2  | -   | -               | V    |
| V <sub>I</sub>   | input voltage                       |  | 0    | -   | 5.5             | V    |
| V <sub>O</sub>   | output voltage                      | active mode                            | 0    | -   | V <sub>CC</sub> | V    |
|                  |                                     | power-down mode; V <sub>CC</sub> = 0 V | 0    | -   | 5.5             | V    |
| T <sub>amb</sub> | ambient temperature                 |  | -40  | -   | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 1.65 V to 2.7 V      | 0    | -   | 20              | ns/V |
|                  |                                     | V <sub>CC</sub> = 2.7 V to 3.6 V       | 0    | -   | 10              | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics**

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

| Symbol          | Parameter                | Conditions                         | -40 °C to +85 °C       |                    |                        | -40 °C to +125 °C      |                        | Unit |
|-----------------|--------------------------|------------------------------------|------------------------|--------------------|------------------------|------------------------|------------------------|------|
|                 |                          |                                    | Min                    | Typ <sup>[1]</sup> | Max                    | Min                    | Max                    |      |
| V <sub>IH</sub> | HIGH-level input voltage | V <sub>CC</sub> = 1.2 V            | 1.08                   | -                  | -                      | 1.08                   | -                      | V    |
|                 |                          | V <sub>CC</sub> = 1.65 V to 1.95 V | 0.65 × V <sub>CC</sub> | -                  | -                      | 0.65 × V <sub>CC</sub> | -                      | V    |
|                 |                          | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.7                    | -                  | -                      | 1.7                    | -                      | V    |
|                 |                          | V <sub>CC</sub> = 2.7 V to 3.6 V   | 2.0                    | -                  | -                      | 2.0                    | -                      | V    |
| V <sub>IL</sub> | LOW-level input voltage  | V <sub>CC</sub> = 1.2 V            | -                      | -                  | 0.12                   | -                      | 0.12                   | V    |
|                 |                          | V <sub>CC</sub> = 1.65 V to 1.95 V | -                      | -                  | 0.35 × V <sub>CC</sub> | -                      | 0.35 × V <sub>CC</sub> | V    |
|                 |                          | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                      | -                  | 0.7                    | -                      | 0.7                    | V    |
|                 |                          | V <sub>CC</sub> = 2.7 V to 3.6 V   | -                      | -                  | 0.8                    | -                      | 0.8                    | V    |

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

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

| Symbol            | Parameter                      | Conditions  | -40 °C to +85 °C      |                    |      | -40 °C to +125 °C     |      | Unit |
|-------------------|--------------------------------|---|-----------------------|--------------------|------|-----------------------|------|------|
|                   |                                |   | Min                   | Typ <sup>[1]</sup> | 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> = -100 μA; V <sub>CC</sub> = 1.65 V to 3.6 V   | V <sub>CC</sub> - 0.2 | V <sub>CC</sub>    | -    | V <sub>CC</sub> - 0.3 | -    | V    |
|                   |                                | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V  | 1.2                   | -                  | -    | 1.05                  | -    | V    |
|                   |                                | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V   | 1.8                   | -                  | -    | 1.65                  | -    | V    |
|                   |                                | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V  | 2.2                   | -                  | -    | 2.05                  | -    | V    |
|                   |                                | I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V  | 2.4                   | -                  | -    | 2.25                  | -    | 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> = 100 μA; V <sub>CC</sub> = 1.65 V to 3.6 V  | -                     | 0                  | 0.2  | -                     | 0.3  | V    |
|                   |                                | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V   | -                     | -                  | 0.45 | -                     | 0.65 | V    |
|                   |                                | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V  | -                     | -                  | 0.6  | -                     | 0.8  | V    |
|                   |                                | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V   | -                     | -                  | 0.4  | -                     | 0.6  | V    |
|                   |                                | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V   | -                     | -                  | 0.55 | -                     | 0.8  | V    |
| I <sub>I</sub>    | input leakage current          | V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 5.5 V or GND <sup>[2]</sup>   | -                     | ±0.1               | ±5   | -                     | ±20  | μA   |
| I <sub>OZ</sub>   | OFF-state output current       | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 3.6 V; V <sub>O</sub> = 5.5 V or GND <sup>[2]</sup> | -                     | ±0.1               | ±5   | -                     | ±20  | μA   |
| I <sub>OFF</sub>  | power-off leakage current      | V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V   | -                     | ±0.1               | ±10  | -                     | ±20  | μA   |
| I <sub>CC</sub>   | supply current                 | V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                                      | -                     | 0.1                | 20   | -                     | 80   | μA   |
| ΔI <sub>CC</sub>  | additional supply current      | per input pin; V <sub>CC</sub> = 2.7 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A             | -                     | 5                  | 500  | -                     | 5000 | μA   |
| C <sub>I</sub>    | input capacitance              | V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND to V <sub>CC</sub>   | -                     | 5.0                | -    | -                     | -    | pF   |
| I <sub>BHL</sub>  | bus hold LOW current           | V <sub>CC</sub> = 1.65; V <sub>I</sub> = 0.58 V <sup>[3][4]</sup>   | 10                    | -                  | -    | 10                    | -    | μA   |
|                   |                                | V <sub>CC</sub> = 2.3; V <sub>I</sub> = 0.7 V   | 30                    | -                  | -    | 25                    | -    | μA   |
|                   |                                | V <sub>CC</sub> = 3.0; V <sub>I</sub> = 0.8 V   | 75                    | -                  | -    | 60                    | -    | μA   |
| I <sub>BHH</sub>  | bus hold HIGH current          | V <sub>CC</sub> = 1.65; V <sub>I</sub> = 1.07 V <sup>[3][4]</sup>   | -10                   | -                  | -    | -10                   | -    | μA   |
|                   |                                | V <sub>CC</sub> = 2.3; V <sub>I</sub> = 1.7 V   | -30                   | -                  | -    | -25                   | -    | μA   |
|                   |                                | V <sub>CC</sub> = 3.0; V <sub>I</sub> = 2.0 V   | -75                   | -                  | -    | -60                   | -    | μA   |
| I <sub>BHLO</sub> | bus hold LOW overdrive current | V <sub>CC</sub> = 1.95 V <sup>[3][5]</sup>  | 200                   | -                  | -    | 200                   | -    | μA   |
|                   |                                | V <sub>CC</sub> = 2.7 V   | 300                   | -                  | -    | 300                   | -    | μA   |
|                   |                                | V <sub>CC</sub> = 3.6 V   | 500                   | -                  | -    | 500                   | -    | μA   |



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

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

| Symbol            | Parameter                                | Conditions                                 | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|-------------------|--|--|------------------|--------------------|-----|-------------------|-----|------|
|                   |  |  | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| I <sub>BHHO</sub> | bus hold<br>HIGH<br>overdrive<br>current | V <sub>CC</sub> = 1.95 V <sup>[3][5]</sup> | -200             | -                  | -   | -200              | -   | μA   |
|                   |  | V <sub>CC</sub> = 2.7 V                    | -300             | -                  | -   | -300              | -   | μA   |
|                   |  | V <sub>CC</sub> = 3.6 V                    | -500             | -                  | -   | -500              | -   | μA   |

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.[2] The bus hold circuit is switched off when V<sub>I</sub> > V<sub>CC</sub> allowing 5.5 V on the input pin.

[3] Valid for data inputs (74LVCH16374A) only; control inputs do not have a bus hold circuit.

[4] The specified sustaining current at the data inputs holds the input below the specified V<sub>I</sub> level.

[5] The specified overdrive current at the data input forces the data input to the opposite logic input state.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 10](#).

| Symbol           | Parameter            | Conditions  | -40 °C to +85 °C |                    |      | -40 °C to +125 °C |      | Unit |
|------------------|----------------------|---|------------------|--------------------|------|-------------------|------|------|
|                  |                      |   | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| t <sub>pd</sub>  | propagation<br>delay | nCP to nQn; see <a href="#">Figure 7</a> <sup>[2]</sup> | -                | 14                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.2 V                                 | -                | 14                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 2.1              | 6.9                | 13.5 | 2.1               | 15.6 | ns   |
|                  |                      | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 1.5              | 3.7                | 6.7  | 1.5               | 7.7  | ns   |
|                  |                      | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 3.4                | 6.0  | 1.5               | 7.5  | ns   |
|                  |                      | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.5              | 3.1                | 5.4  | 1.5               | 7.0  | ns   |
| t <sub>en</sub>  | enable time          | nOE to nQn; see <a href="#">Figure 9</a> <sup>[2]</sup> | -                | 20                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.2 V                                 | -                | 20                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 1.5              | 5.9                | 13.1 | 1.5               | 15.1 | ns   |
|                  |                      | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 1.5              | 3.4                | 6.9  | 1.5               | 8.0  | ns   |
|                  |                      | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 3.6                | 6.0  | 1.5               | 7.5  | ns   |
|                  |                      | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.0              | 2.7                | 5.2  | 1.0               | 6.5  | ns   |
| t <sub>dis</sub> | disable time         | nOE to nQn; see <a href="#">Figure 7</a> <sup>[2]</sup> | -                | 12                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.2 V                                 | -                | 12                 | -    | -                 | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 2.8              | 4.6                | 9.1  | 2.8               | 10.5 | ns   |
|                  |                      | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 1.0              | 2.5                | 4.9  | 1.0               | 5.7  | ns   |
|                  |                      | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 3.4                | 5.1  | 1.5               | 6.5  | ns   |
|                  |                      | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.5              | 3.1                | 4.9  | 1.5               | 6.5  | ns   |
| t <sub>w</sub>   | pulse width          | nCP HIGH; see <a href="#">Figure 7</a>                  | 5.0              | -                  | -    | 5.0               | -    | ns   |
|                  |                      | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 5.0              | -                  | -    | 5.0               | -    | ns   |
|                  |                      | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 4.0              | -                  | -    | 4.0               | -    | ns   |
|                  |                      | V <sub>CC</sub> = 2.7 V                                 | 3.0              | -                  | -    | 3.0               | -    | ns   |
|                  |                      | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 3.0              | 1.5                | -    | 3.0               | -    | ns   |

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

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 10](#).

| Symbol             | Parameter                     | Conditions   | -40 °C to +85 °C    |                    |     | -40 °C to +125 °C |     | Unit |    |
|--------------------|-------------------------------|--|---------------------|--------------------|-----|-------------------|-----|------|----|
|                    |                               |  | Min                 | Typ <sup>[1]</sup> | Max | Min               | Max |      |    |
| t <sub>su</sub>    | set-up time                   | nDn to nCP; see <a href="#">Figure 8</a>           |                     |                    |     |                   |     |      |    |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                 | 4.0                 | -                  | -   | 4.0               | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                   | 3.0                 | -                  | -   | 3.0               | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.7 V                            | 1.9                 | -                  | -   | 1.9               | -   | ns   |    |
| t <sub>h</sub>     | hold time                     | nDn to nCP; see <a href="#">Figure 8</a>           |                     |                    |     |                   |     |      |    |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                 | 3.0                 | -                  | -   | 3.0               | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                   | 2.5                 | -                  | -   | 2.5               | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.7 V                            | 1.1                 | -                  | -   | 1.1               | -   | ns   |    |
| f <sub>max</sub>   | maximum frequency             | see <a href="#">Figure 7</a>                       |                     |                    |     |                   |     |      |    |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                 | 100                 | -                  | -   | 80                | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                   | 125                 | -                  | -   | 100               | -   | ns   |    |
|                    |                               | V <sub>CC</sub> = 2.7 V                            | 150                 | -                  | -   | 120               | -   | MHz  |    |
| t <sub>sk(o)</sub> | output skew time              | V <sub>CC</sub> = 3.0 V to 3.6 V                   | <a href="#">[3]</a> | -                  | -   | 1.0               | -   | 1.5  | ns |
|                    |                               |  |                     |                    |     |                   |     |      |    |
| C <sub>PD</sub>    | power dissipation capacitance | per input; V <sub>I</sub> = GND to V <sub>CC</sub> | <a href="#">[4]</a> |                    |     |                   |     |      |    |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                 | -                   | 14.1               | -   | -                 | -   | -    | pF |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                   | -                   | 16.4               | -   | -                 | -   | -    | pF |
|                    |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                   | -                   | 18.5               | -   | -                 | -   | -    | pF |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.2 V, 1.8 V, 2.5 V, 2.7 V and 3.3 V respectively.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[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

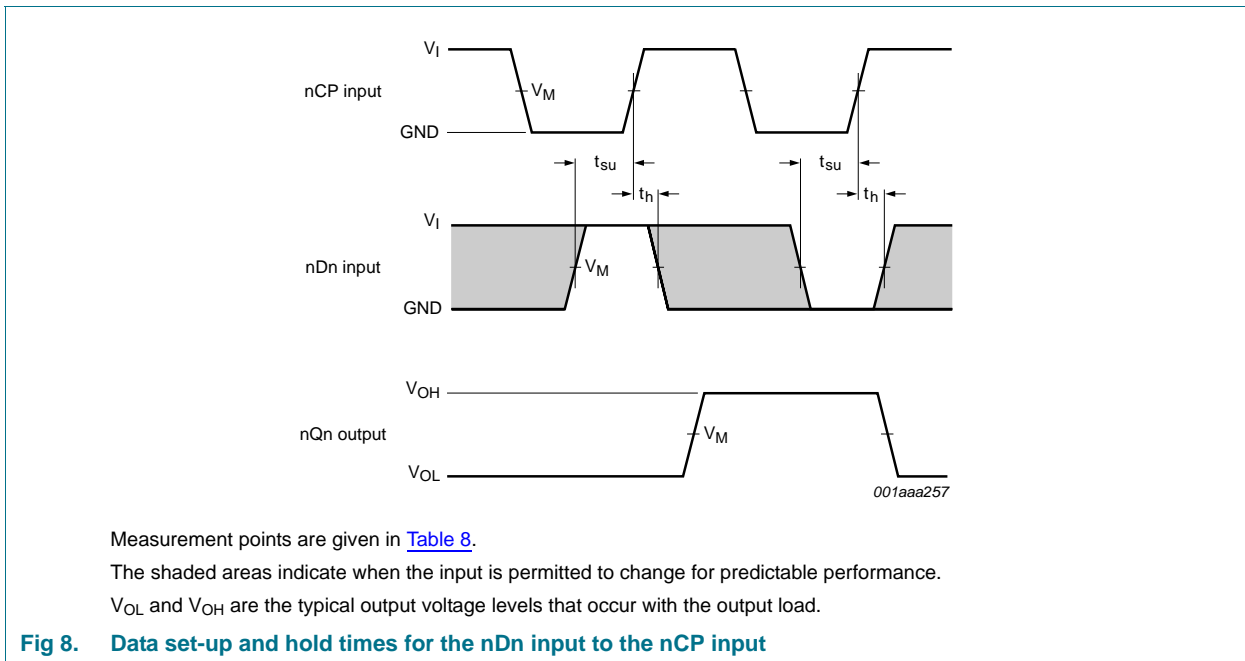
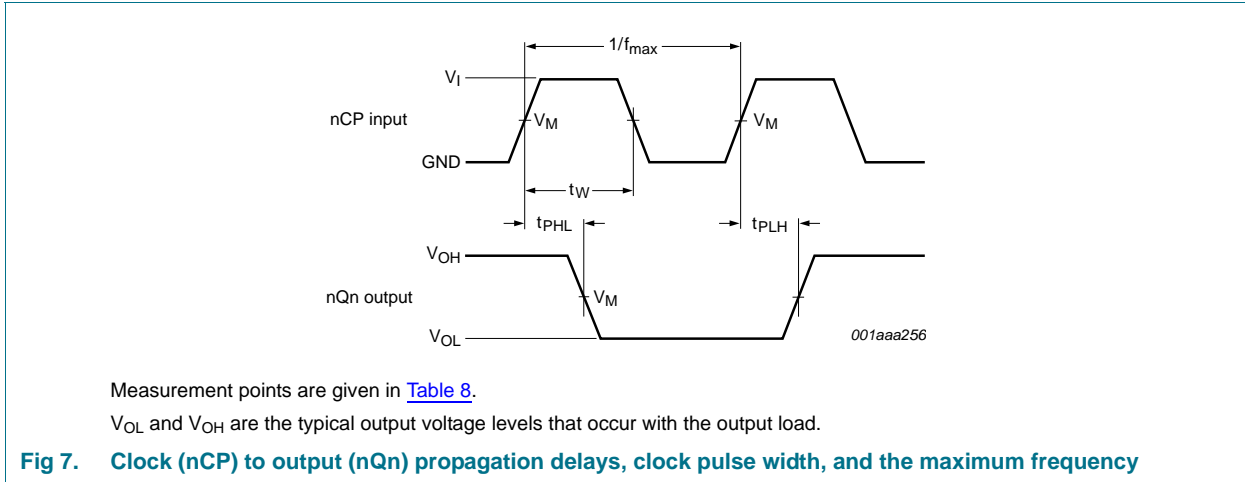
C<sub>L</sub> = output load capacitance in pF

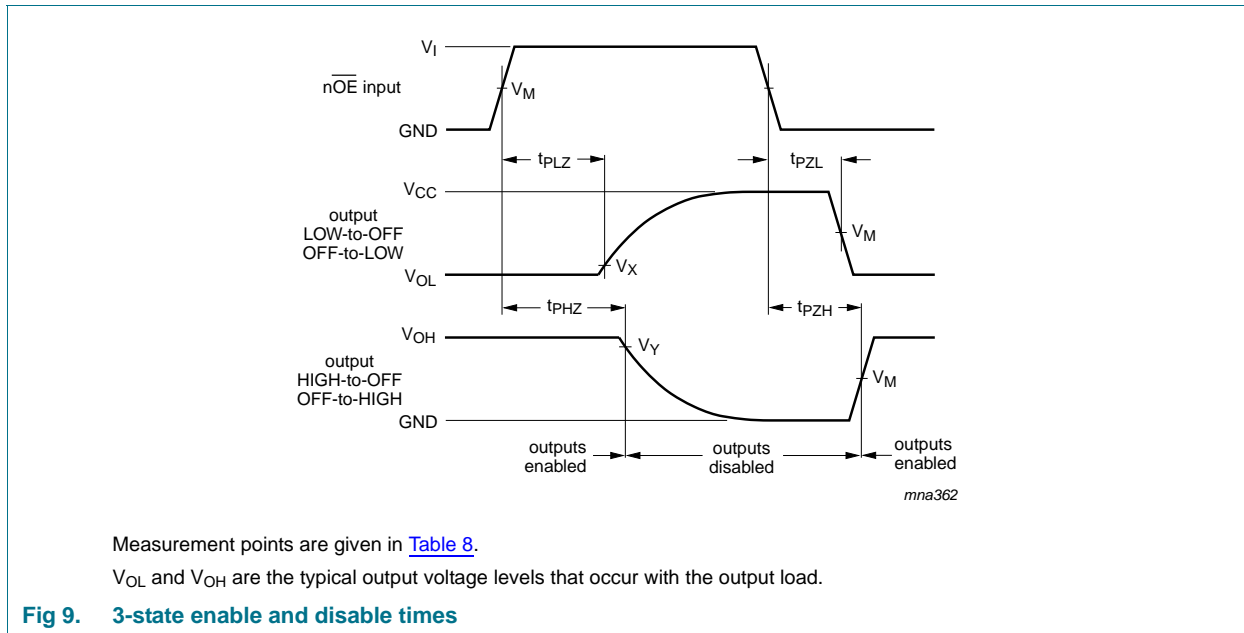
V<sub>CC</sub> = supply voltage in Volts

N = number of inputs switching

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs

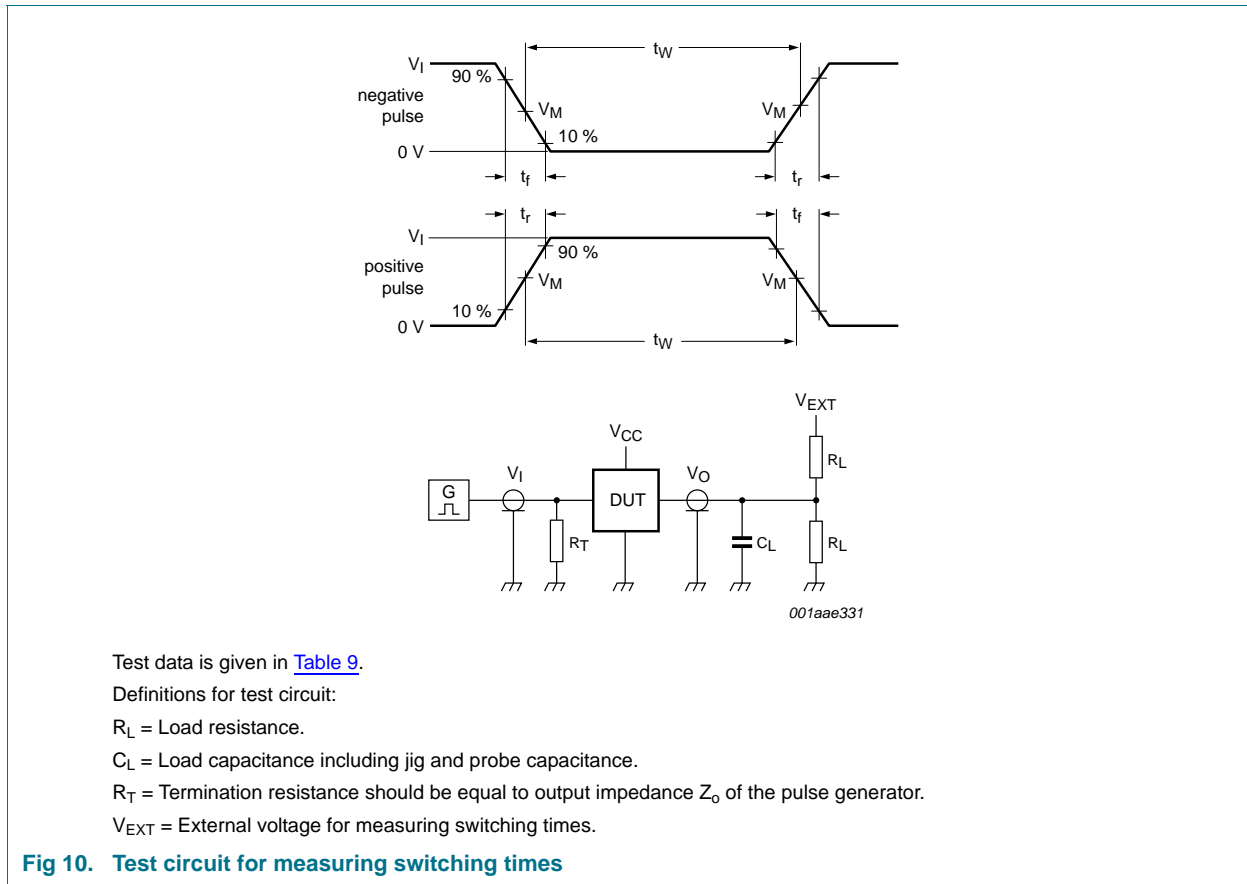
## 11. Waveforms





**Table 8. Measurement points**

| Supply voltage   | Input    |                     | Output              |                           |                           |
|------------------|----------|---------------------|---------------------|---------------------------|---------------------------|
|                  | $V_I$    | $V_M$               | $V_M$               | $V_X$                     | $V_Y$                     |
| 1.2 V            | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.3 V to 2.7 V   | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.7 V            | 2.7 V    | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |
| 3.0 V to 3.6 V   | 2.7 V    | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |



**Table 9. Test data**

| Supply voltage   | Input    |               | Load  |              | $V_{EXT}$          |                    |                    |
|------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
|                  | $V_I$    | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PLZ}, t_{PZL}$ | $t_{PHZ}, t_{PZH}$ |
| 1.2 V            | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 1 k $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 1.65 V to 1.95 V | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 1 k $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 2.3 V to 2.7 V   | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 2.7 V            | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 3.0 V to 3.6 V   | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |

## 12. Package outline

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1

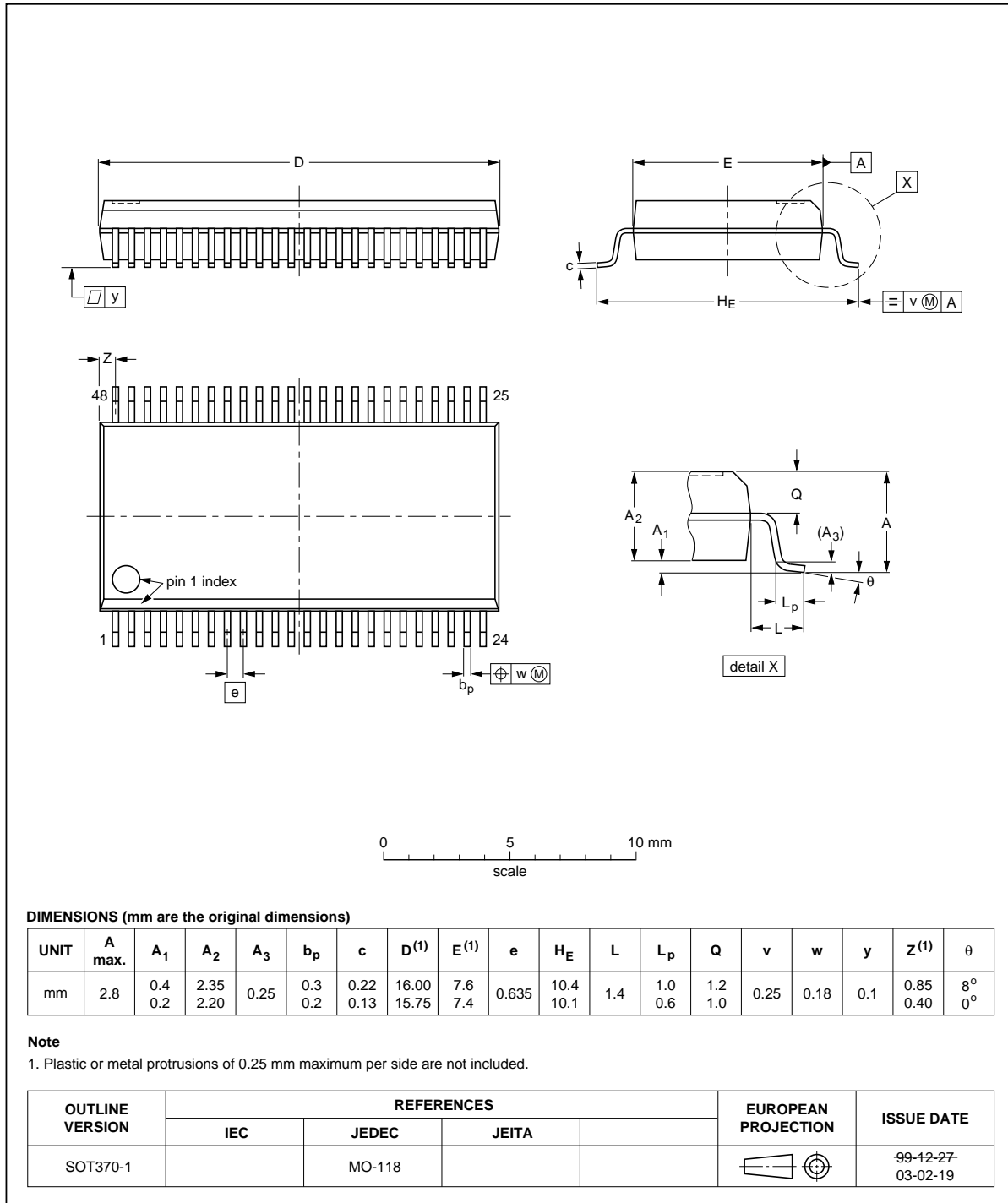


Fig 11. Package outline SOT370-1 (SSOP48)

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1

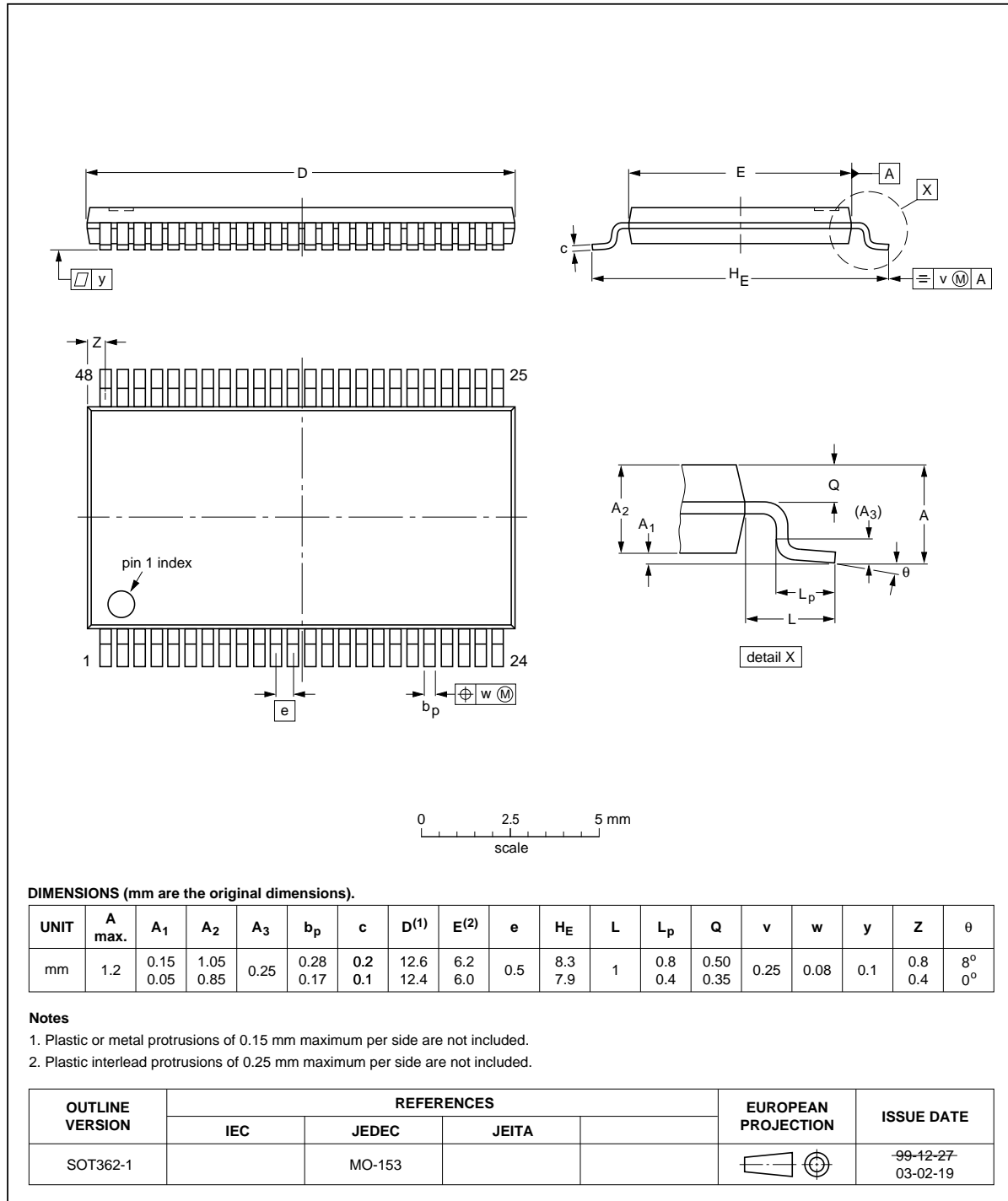


Fig 12. Package outline SOT362-1 (TSSOP48)

HXQFN60U: plastic thermal enhanced extremely thin quad flat package; no leads;  
60 terminals; UTLP based; body 4 x 6 x 0.5 mm

SOT1134-1

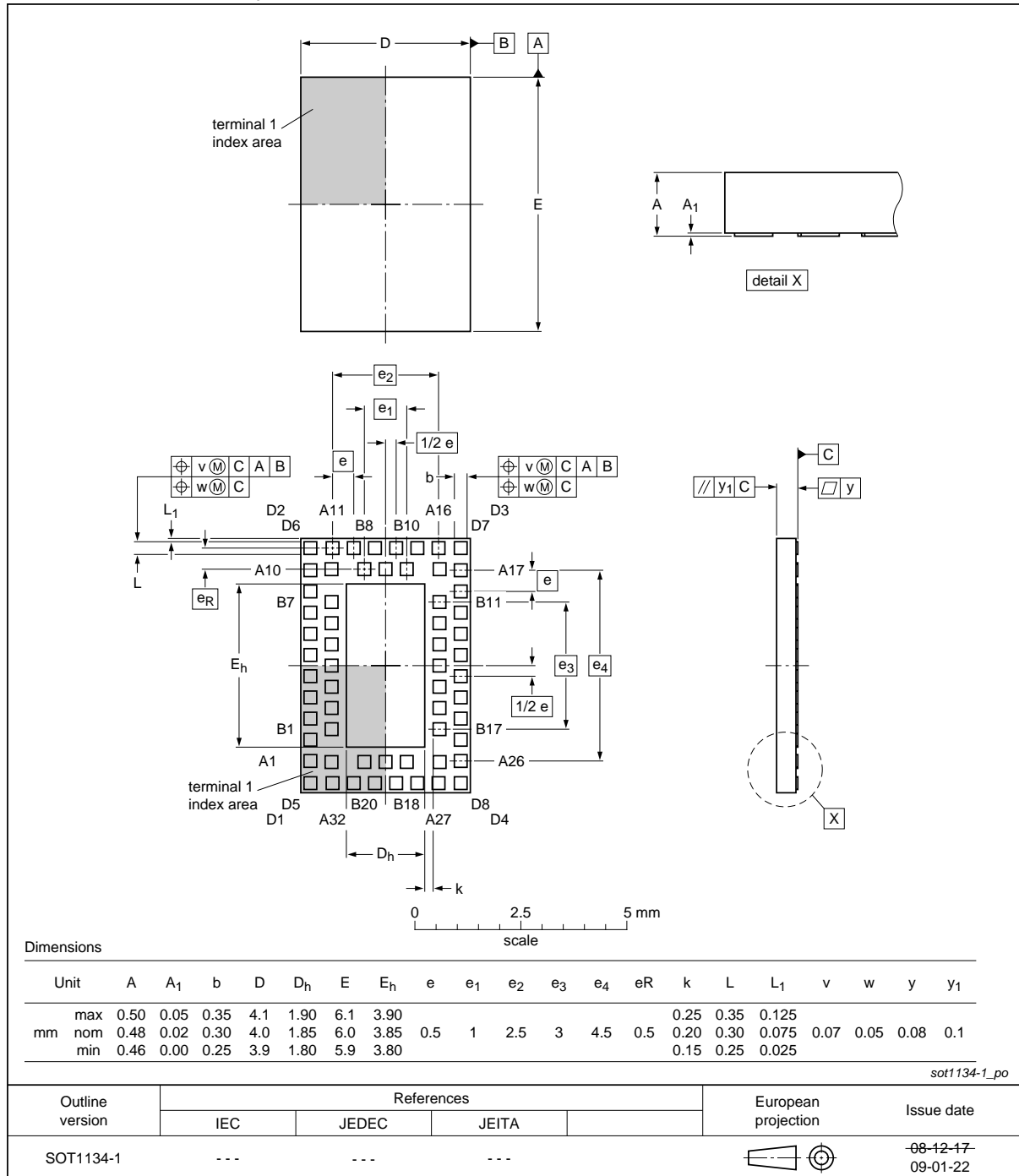


Fig 13. Package outline SOT1134-1 (HXQFN60U)



## 13. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description                 |
|---------|-----------------------------|
| CDM     | Charged Device Model        |
| DUT     | Device Under Test           |
| ESD     | ElectroStatic Discharge     |
| HBM     | Human Body Model            |
| MM      | Machine Model               |
| TTL     | Transistor-Transistor Logic |

## 14. Revision history

**Table 11. Revision history**

| Document ID                      | Release date   | Data sheet status     | Change notice | Supersedes                       |
|----------------------------------|--|-----------------------|---------------|----------------------------------|
| 74LVC_LVCH16374A v.11            | 20130116   | Product data sheet    | -             | 74LVC_LVCH16374A v.10            |
| Modifications:                   | <ul style="list-style-type: none"> <li>• Minor non-technical text changes and corrections</li> <li>• Document revision history correction</li> </ul> |                       |               |                                  |
| 74LVC_LVCH16374A v.10            | 20120301   | Product data sheet    | -             | 74LVC_LVCH16374A v.9             |
| 74LVC_LVCH16374A v.9             | 20111219   | Product data sheet    | -             | 74LVC_LVCH16374A v.8             |
| 74LVC_LVCH16374A v.8             | 20110621   | Product data sheet    | -             | 74LVC_LVCH16374A v.7             |
| 74LVC_LVCH16374A v.7             | 20100323   | Product data sheet    | -             | 74LVC_LVCH16374A v.6             |
| 74LVC_LVCH16374A v.6             | 20090212   | Product data sheet    | -             | 74LVC_LVCH16374A v.5             |
| 74LVC_LVCH16374A v.5             | 20031212   | Product specification | -             | 74LVC_H16374A v.4                |
| 74LVC_H16374A v.4                | 19980317   | Product specification | -             | 74LVC16374A_<br>74LVCH16374A v.3 |
| 74LVC16374A_<br>74LVCH16374A v.3 | 19980317   | Product specification | -             | 74LVC16374A v.2                  |
| 74LVC16374A v.2                  | 19970822   | Product specification | -             | 74LVC16374A v.1                  |
| 74LVC16374A v.1                  | -  | -                     | -             | -                                |

## 15. Legal information

### 15.1 Data sheet status

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

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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