

# 74LVT16244B; 74LVTH16244B

3.3 V 16-bit buffer/driver; 3-state

Rev. 13 — 12 August 2021

Product data sheet

## 1. General description

The 74LVT16244B; 74LVTH16244B is a 16-bit buffer/line driver with 3-state outputs. The device can be used as four 4-bit buffers, two 8-bit buffers or one 16-bit buffer. The device features four output enables (1OE, 2OE, 3OE and 4OE), each controlling four of the 3-state outputs. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. Bus hold data inputs eliminate the need for external pull-up resistors to define unused inputs

## 2. Features and benefits

- 16-bit bus interface
- 3-state buffers
- Wide supply voltage range from 2.7 to 3.6 V
- Overvoltage tolerant inputs to 5.5 V
- BiCMOS high speed and output drive
- Output capability: +64 mA and -32 mA
- Direct interface with TTL levels
- Bus hold data inputs eliminate need for external pull-up resistors to hold unused inputs
- Power-up 3-state
- Live insertion and extraction permitted
- No bus current loading when output is tied to 5 V bus
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- Complies with JEDEC standard JESD8C (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to 85 °C

## 3. Ordering information

Table 1. Ordering information

| Type number     | Package           |         |                                                                        |          |
|-----------------|-------------------|---------|------------------------------------------------------------------------|----------|
|                 | Temperature range | Name    | Description                                                            | Version  |
| 74LVT16244BDGG  | -40 °C to +85 °C  | TSSOP48 | plastic thin shrink small outline package; 48 leads; body width 6.1 mm | SOT362-1 |
| 74LVTH16244BDGG |                   |         |                                                                        |          |

4. Functional diagram

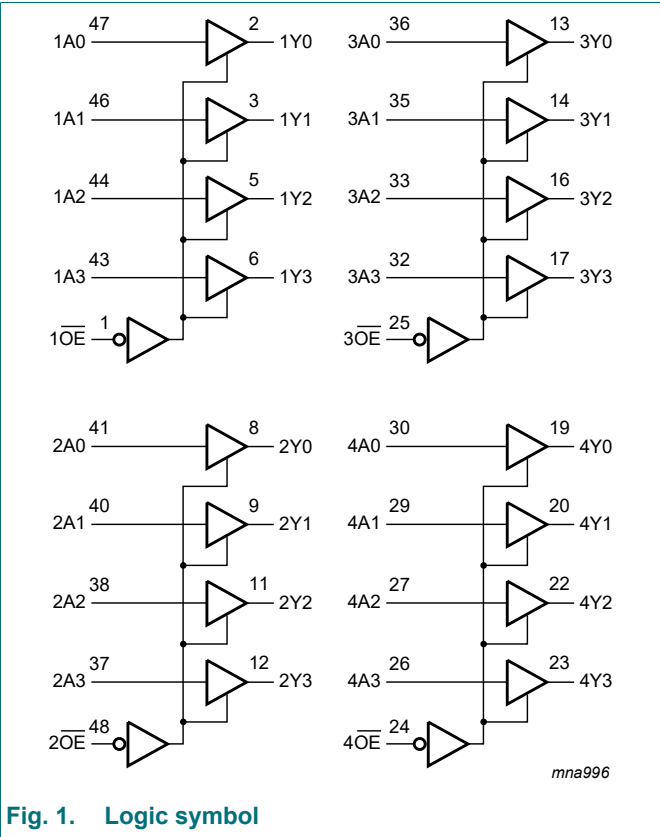


Fig. 1. Logic symbol

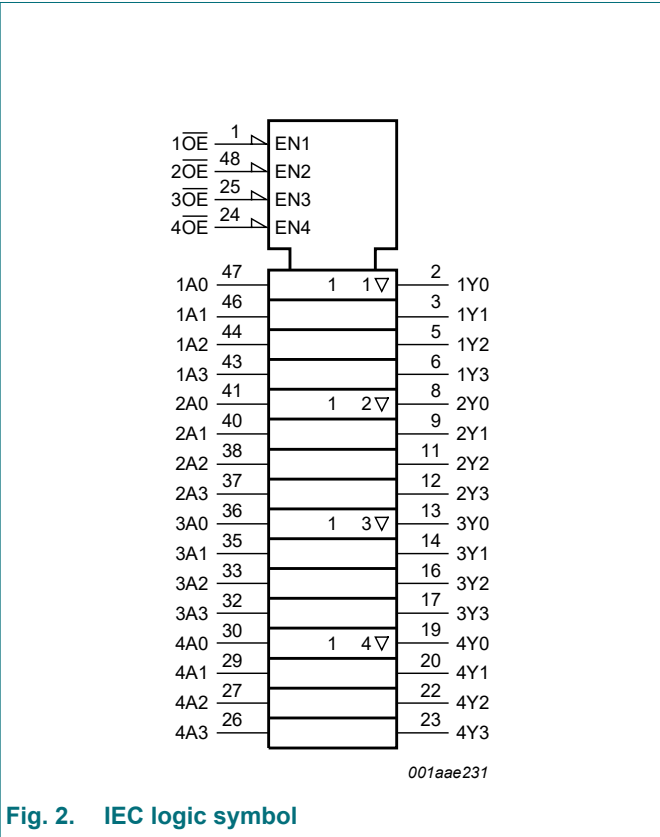


Fig. 2. IEC logic symbol

5. Pinning information

5.1. Pinning

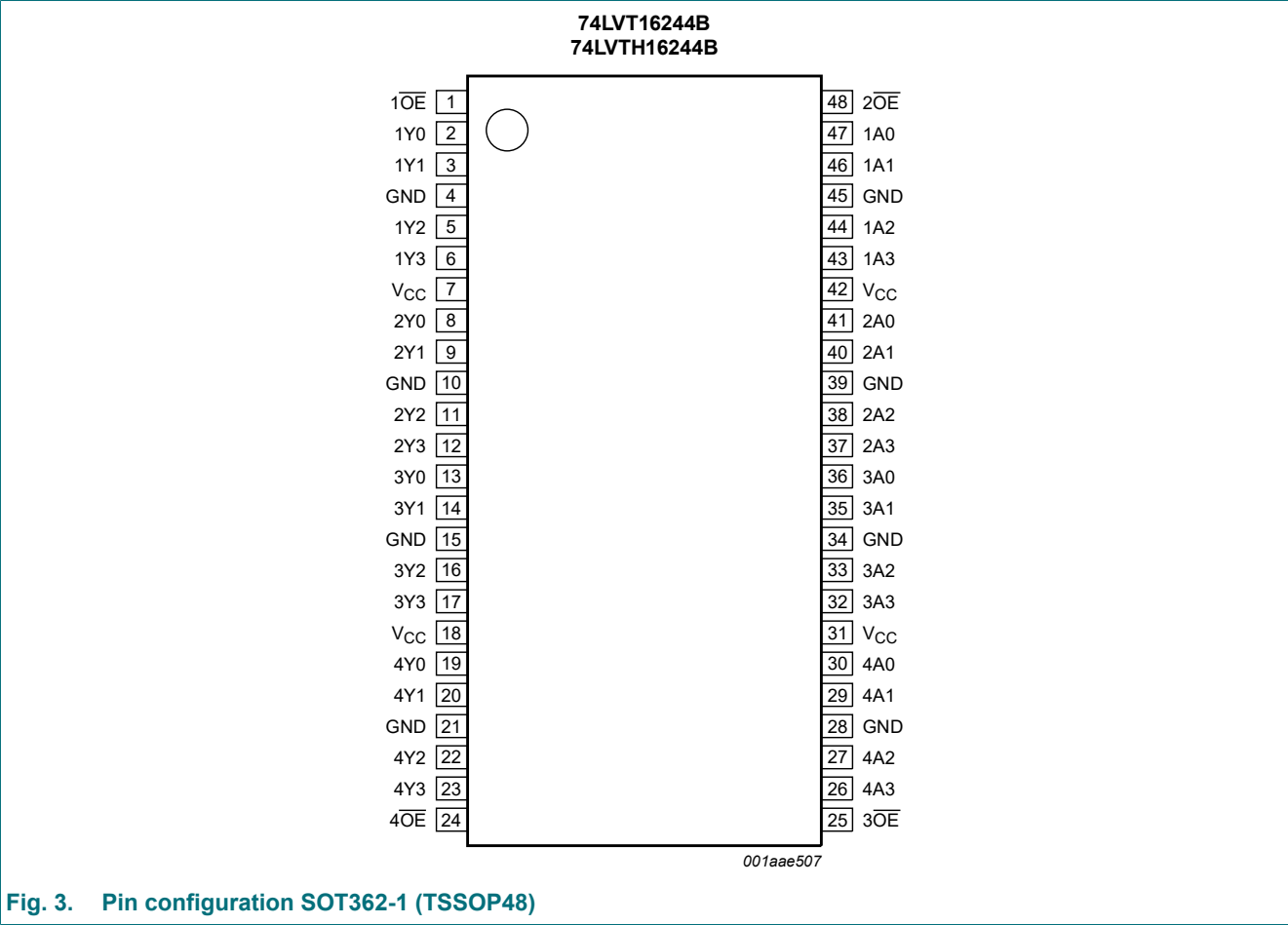


Fig. 3. Pin configuration SOT362-1 (TSSOP48)

5.2. Pin description

Table 2. Pin description

| Symbol             | Pin                           | Description                      |
|--------------------|-------------------------------|----------------------------------|
| 1OE, 2OE, 3OE, 4OE | 1, 48, 25, 24                 | output enable input (active LOW) |
| 1Y0, 1Y1, 1Y2, 1Y3 | 2, 3, 5, 6                    | data output                      |
| 2Y0, 2Y1, 2Y2, 2Y3 | 8, 9, 11, 12                  | data output                      |
| 3Y0, 3Y1, 3Y2, 3Y3 | 13, 14, 16, 17                | data output                      |
| 4Y0, 4Y1, 4Y2, 4Y3 | 19, 20, 22, 23                | data output                      |
| GND                | 4, 10, 15, 21, 28, 34, 39, 45 | ground (0 V)                     |
| V <sub>CC</sub>    | 7, 18, 31, 42                 | supply voltage                   |
| 1A0, 1A1, 1A2, 1A3 | 47, 46, 44, 43                | data input                       |
| 2A0, 2A1, 2A2, 2A3 | 41, 40, 38, 37                | data input                       |
| 3A0, 3A1, 3A2, 3A3 | 36, 35, 33, 32                | data input                       |
| 4A0, 4A1, 4A2, 4A3 | 30, 29, 27, 26                | data input                       |

## 6. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.*

| Control | Input | Output |
|---------|-------|--------|
| nOE     | nAn   | nYn    |
| L       | L     | L      |
| L       | H     | H      |
| H       | X     | Z      |

## 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 | +4.6 | V    |
| V <sub>I</sub>   | input voltage           | [1]                                   | -0.5 | +7.0 | V    |
| V <sub>O</sub>   | output voltage          | output in OFF-state or HIGH-state [1] | -0.5 | +7.0 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V                  | -50  | -    | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < 0 V                  | -50  | -    | mA   |
| I <sub>O</sub>   | output current          | output in LOW-state                   | -    | 128  | mA   |
|                  |                         | output in HIGH-state                  | -64  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                       | -65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature    | [2]                                   | -    | 150  | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +85 °C;  | -    | 500  | mW   |

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

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol           | Parameter                           | Conditions                                        | Min | Typ | Max | Unit |
|------------------|-------------------------------------|---------------------------------------------------|-----|-----|-----|------|
| V <sub>CC</sub>  | supply voltage                      |                                                   | 2.7 | -   | 3.6 | V    |
| V <sub>I</sub>   | input voltage                       |                                                   | 0   | -   | 5.5 | V    |
| V <sub>IH</sub>  | HIGH-level input voltage            |                                                   | 2.0 | -   | -   | V    |
| V <sub>IL</sub>  | LOW-level input voltage             |                                                   | -   | -   | 0.8 | V    |
| I <sub>OH</sub>  | HIGH-level output current           |                                                   | -32 | -   | -   | mA   |
| I <sub>OL</sub>  | LOW-level output current            | none                                              | -   | -   | 32  | mA   |
|                  |                                     | current duty cycle ≤ 50 %; f <sub>i</sub> ≥ 1 kHz | -   | -   | 64  | mA   |
| T <sub>amb</sub> | ambient temperature                 | in free-air                                       | -40 | -   | +85 | °C   |
| Δt/ΔV            | input transition rise and fall rate | outputs enabled                                   | -   | -   | 10  | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

| Symbol          | Parameter                                 | Conditions                                                                                                                            | Min            | Typ [1]  | Max       | Unit          |
|-----------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|-----------|---------------|
| $V_{IK}$        | input clamping voltage                    | $V_{CC} = 2.7\text{ V}$ ; $I_{IK} = -18\text{ mA}$                                                                                    | -1.2           | -0.85    | -         | V             |
| $V_{OH}$        | HIGH-level output voltage                 | $I_{OH} = -100\text{ }\mu\text{A}$ ; $V_{CC} = 2.7\text{ V}$ to $3.6\text{ V}$                                                        | $V_{CC} - 0.2$ | $V_{CC}$ | -         | V             |
|                 |                                           | $I_{OH} = -8\text{ mA}$ ; $V_{CC} = 2.7\text{ V}$                                                                                     | 2.4            | 2.5      | -         | V             |
|                 |                                           | $I_{OH} = -32\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$                                                                                    | 2.0            | 2.3      | -         | V             |
| $V_{OL}$        | LOW-level output voltage                  | $V_{CC} = 2.7\text{ V}$                                                                                                               |                |          |           |               |
|                 |                                           | $I_{OL} = 100\text{ }\mu\text{A}$                                                                                                     | -              | 0.07     | 0.2       | V             |
|                 |                                           | $I_{OL} = 24\text{ mA}$                                                                                                               | -              | 0.3      | 0.5       | V             |
|                 |                                           | $V_{CC} = 3.0\text{ V}$                                                                                                               |                |          |           |               |
|                 |                                           | $I_{OL} = 16\text{ mA}$                                                                                                               | -              | 0.25     | 0.4       | V             |
|                 |                                           | $I_{OL} = 32\text{ mA}$                                                                                                               | -              | 0.3      | 0.5       | V             |
|                 |                                           | $I_{OL} = 64\text{ mA}$                                                                                                               | -              | 0.4      | 0.55      | V             |
| $I_I$           | input leakage current                     | all input pins; $V_{CC} = 0\text{ V}$ or $3.6\text{ V}$ ; $V_I = 5.5\text{ V}$                                                        | -              | 0.1      | 10        | $\mu\text{A}$ |
|                 |                                           | control pins; $V_{CC} = 3.6\text{ V}$ ; $V_I = V_{CC}$ or GND                                                                         | -              | 0.1      | $\pm 1.0$ | $\mu\text{A}$ |
|                 |                                           | data pins; $V_{CC} = 3.6\text{ V}$ [2]                                                                                                |                |          |           |               |
|                 |                                           | $V_I = V_{CC}$                                                                                                                        | -              | 0.1      | 1         | $\mu\text{A}$ |
|                 |                                           | $V_I = 0\text{ V}$                                                                                                                    | -5             | -0.1     | -         | $\mu\text{A}$ |
| $I_{OFF}$       | power-off leakage current                 | $V_{CC} = 0\text{ V}$ ; $V_I$ or $V_O = 0\text{ V}$ to $4.5\text{ V}$                                                                 | -              | 0.1      | $\pm 100$ | $\mu\text{A}$ |
| $I_{BHL}$       | bus hold LOW current                      | $V_{CC} = 3\text{ V}$ ; $V_I = 0.8\text{ V}$ [3]                                                                                      | 75             | 135      | -         | $\mu\text{A}$ |
| $I_{BHH}$       | bus hold HIGH current                     | $V_{CC} = 3\text{ V}$ ; $V_I = 2.0\text{ V}$                                                                                          | -              | -135     | -75       | $\mu\text{A}$ |
| $I_{BHLO}$      | bus hold LOW overdrive current            | nAn input; $V_{CC} = 3.6\text{ V}$ ; $V_I = 0\text{ V}$ to $3.6\text{ V}$                                                             | 500            | -        | -         | $\mu\text{A}$ |
| $I_{BHLO}$      | bus hold HIGH overdrive current           | nAn input; $V_{CC} = 3.6\text{ V}$ ; $V_I = 0\text{ V}$ to $3.6\text{ V}$                                                             | -              | -        | -500      | $\mu\text{A}$ |
| $I_{LO}$        | output leakage current                    | output in HIGH-state when $V_O > V_{CC}$ ; $V_O = 5.5\text{ V}$ ; $V_{CC} = 3.0\text{ V}$                                             | -              | 50       | 125       | $\mu\text{A}$ |
| $I_{O(pu/pd)}$  | power-up/<br>power-down<br>output current | $V_{CC} \leq 1.2\text{ V}$ ; $V_O = 0.5\text{ V}$ to $V_{CC}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; nOE = don't care [4]                 | -              | 1        | $\pm 100$ | $\mu\text{A}$ |
| $I_{OZ}$        | OFF-state output current                  | $V_{CC} = 3.6\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$                                                                                  |                |          |           |               |
|                 |                                           | output HIGH: $V_O = 3.0\text{ V}$                                                                                                     | -              | 0.5      | 5         | $\mu\text{A}$ |
|                 |                                           | output LOW: $V_O = 0.5\text{ V}$                                                                                                      | -5             | +0.5     | -         | $\mu\text{A}$ |
| $I_{CC}$        | supply current                            | $V_{CC} = 3.6\text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\text{ A}$                                                         |                |          |           |               |
|                 |                                           | output HIGH                                                                                                                           | -              | 0.07     | 0.12      | mA            |
|                 |                                           | output LOW                                                                                                                            | -              | 4.0      | 6.0       | mA            |
|                 |                                           | outputs disabled [5]                                                                                                                  | -              | 0.07     | 0.12      | mA            |
| $\Delta I_{CC}$ | additional supply current                 | per input pin; $V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$ ; one input at $V_{CC} - 0.6\text{ V}$ , other inputs at $V_{CC}$ or GND [6] | -              | 0.1      | 0.2       | mA            |

| Symbol         | Parameter          | Conditions                                      | Min | Typ [1] | Max | Unit |
|----------------|--------------------|-------------------------------------------------|-----|---------|-----|------|
| C <sub>I</sub> | input capacitance  | V <sub>I</sub> = 0 V or 3.0 V                   | -   | 3       | -   | pF   |
| C <sub>O</sub> | output capacitance | outputs disabled; V <sub>O</sub> = 0 V or 3.0 V | -   | 9       | -   | pF   |

- [1] Typical values are measured at V<sub>CC</sub> = 3.3 V and at T<sub>amb</sub> = 25 °C.  
 [2] Unused pins at V<sub>CC</sub> or GND.  
 [3] This is the bus hold overdrive current required to force the input to the opposite logic state.  
 [4] This parameter is valid for any V<sub>CC</sub> between 0 V and 1.2 V with a transition time of up to 10 ms. From V<sub>CC</sub> = 1.2 V to V<sub>CC</sub> = 3.3 V ± 0.3 V a transition time of 100 µs is permitted. This parameter is valid for T<sub>amb</sub> = 25 °C only.  
 [5] I<sub>CC</sub> is measured with outputs pulled to V<sub>CC</sub> or GND.  
 [6] This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); T<sub>amb</sub> = -40 °C to +85 °C; for test circuit see Fig. 6.

| Symbol           | Parameter                           | Conditions                                  | Min | Typ [1] | Max | Unit |
|------------------|-------------------------------------|---------------------------------------------|-----|---------|-----|------|
| t <sub>PLH</sub> | LOW to HIGH propagation delay       | nAn to nYn; see Fig. 4                      |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 4.0 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 0.5 | 1.8     | 3.2 | ns   |
| t <sub>PHL</sub> | HIGH to LOW propagation delay       | nAn to nYn; see Fig. 4                      |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 4.0 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 0.5 | 1.7     | 3.2 | ns   |
| t <sub>PZH</sub> | OFF-state to HIGH propagation delay | n $\overline{\text{OE}}$ to nYn; see Fig. 5 |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 5.0 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 1.0 | 2.3     | 4.0 | ns   |
| t <sub>PZL</sub> | OFF-state to LOW propagation delay  | n $\overline{\text{OE}}$ to nYn; see Fig. 5 |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 5.3 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 1.0 | 2.1     | 4.0 | ns   |
| t <sub>PHZ</sub> | HIGH to OFF-state propagation delay | n $\overline{\text{OE}}$ to nYn; see Fig. 5 |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 5.0 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 1.0 | 3.2     | 4.5 | ns   |
| t <sub>PLZ</sub> | LOW to OFF-state propagation delay  | n $\overline{\text{OE}}$ to nYn; see Fig. 5 |     |         |     |      |
|                  |                                     | V <sub>CC</sub> = 2.7 V                     | -   | -       | 4.4 | ns   |
|                  |                                     | V <sub>CC</sub> = 3.0 V to 3.6 V            | 1.0 | 2.9     | 4.0 | ns   |

- [1] Typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

10.1. Waveforms and test circuit

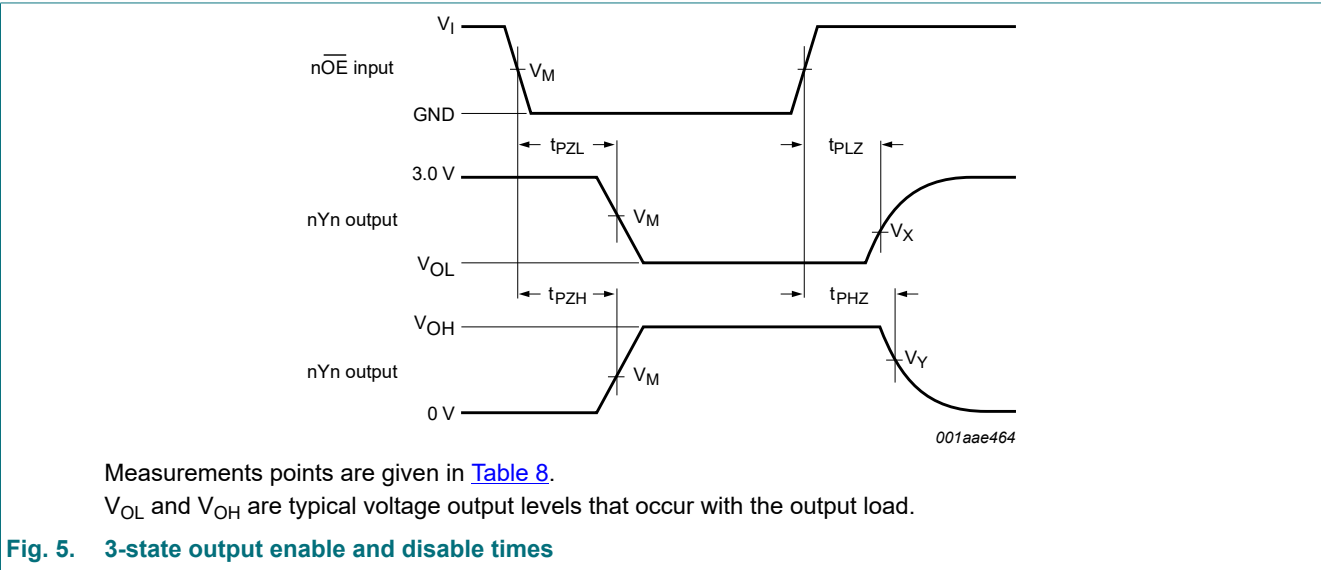
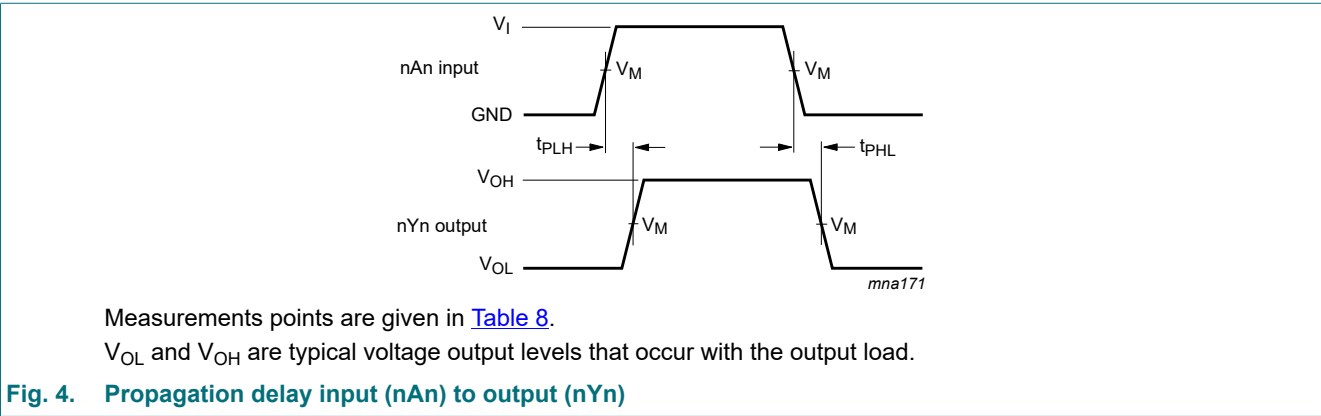
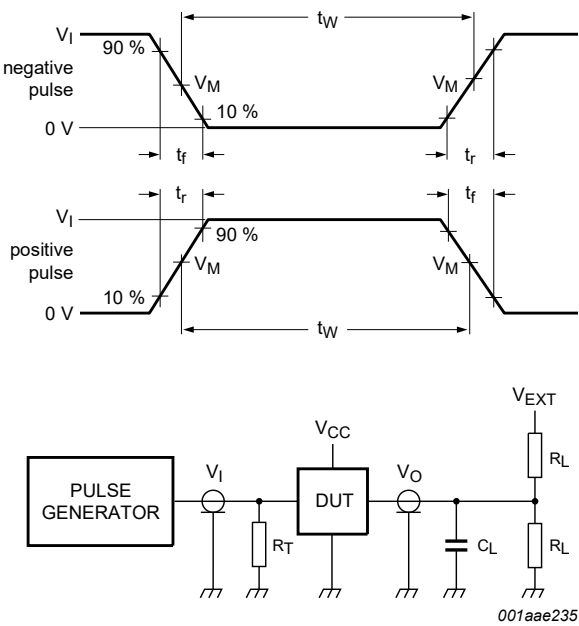


Table 8. Measurement points

| Input | Output |                         |                         |
|-------|--------|-------------------------|-------------------------|
| $V_M$ | $V_M$  | $V_X$                   | $V_Y$                   |
| 1.5 V | 1.5 V  | $V_{OL} + 0.3\text{ V}$ | $V_{OH} - 0.3\text{ V}$ |



Test data is given in [Table 9](#).  
Definitions test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

Fig. 6. Test circuit for measuring switching times

Table 9. Test data

| Input |               |        |               | Load  |              | $V_{EXT}$          |                    |                    |
|-------|---------------|--------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_I$ | $f_i$         | $t_W$  | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PHZ}, t_{PZH}$ | $t_{PLZ}, t_{PZL}$ | $t_{PLH}, t_{PHL}$ |
| 2.7 V | $\leq 10$ MHz | 500 ns | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | GND                | 6 V                | open               |

11. Package outline

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

SOT362-1

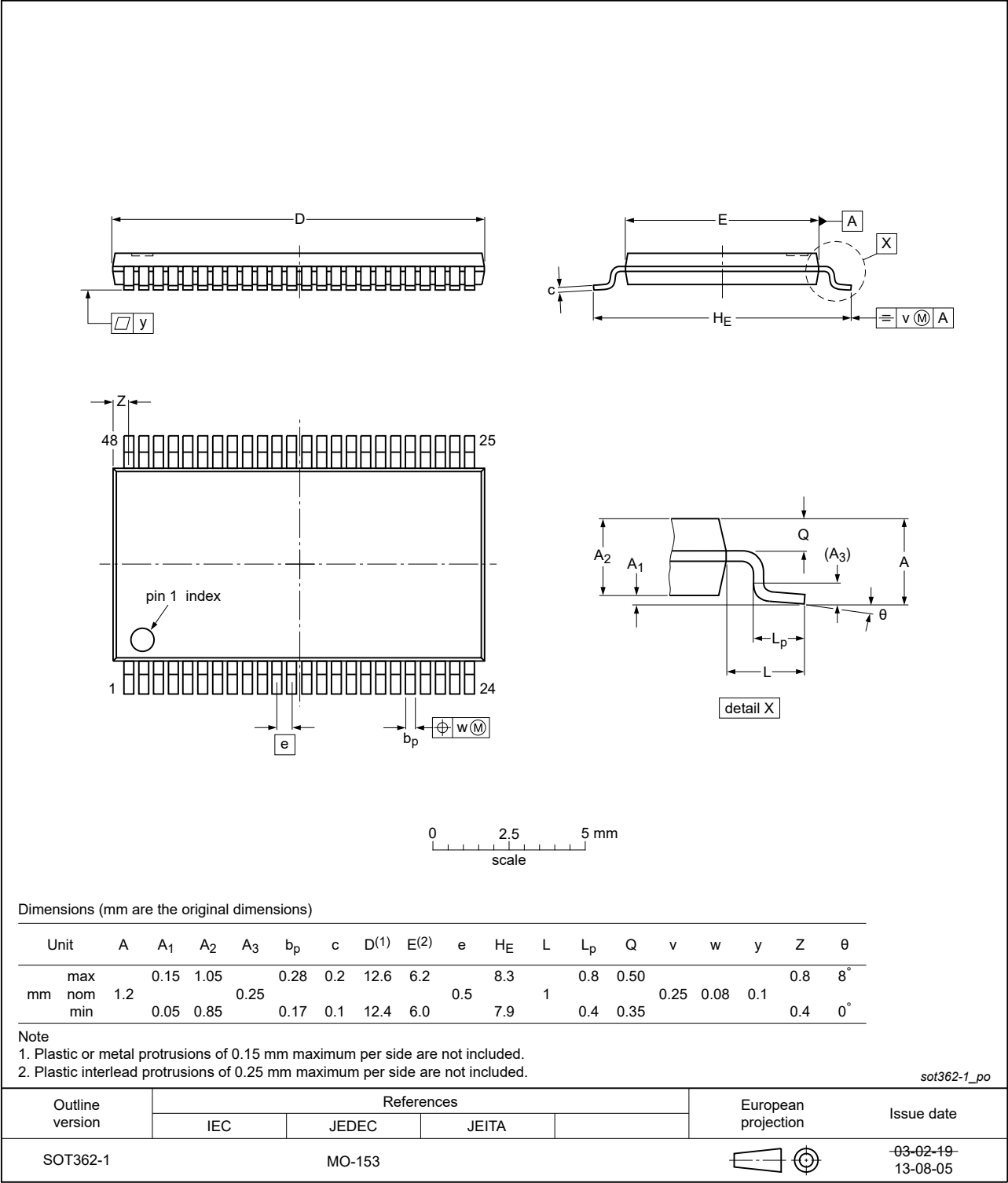


Fig. 7. Package outline SOT362-1 (TSSOP48)

## 12. Abbreviations

Table 10. Abbreviations

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

## 13. Revision history

Table 11. Revision history

| Document ID           | Release date                                                                                                                                                                                                                                                                                                                                                                                                                  | Data sheet status     | Change notice | Supersedes            |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------------|
| 74LVT_LVTH16244B v.13 | 20210812                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.12 |
| Modifications:        | <ul style="list-style-type: none"> <li>Section 1 and Section 2 updated.</li> <li>Type numbers 74LVT16244BDL and 74LVTH16244BDL (SOT370-1/SSOP48) removed.</li> <li>Section 7: Derating values for <math>P_{tot}</math> total power dissipation removed.</li> </ul>                                                                                                                                                            |                       |               |                       |
| 74LVT_LVTH16244B v.12 | 20181019                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.11 |
| 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 74LVT16244BEV (SOT702-1), 74LVT16244BBX (SOT1134-2) and 74LVTH16244BBX (SOT1134-2) removed.</li> <li>Package outline drawing <a href="#">SOT362-1</a> updated</li> </ul> |                       |               |                       |
| 74LVT_LVTH16244B v.11 | 20120301                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.10 |
| Modifications:        | <ul style="list-style-type: none"> <li>For type number 74LVT16244BBX and 74LVTH16244BBX the sot code has changed to SOT1134-2.</li> </ul>                                                                                                                                                                                                                                                                                     |                       |               |                       |
| 74LVT_LVTH16244B v.10 | 20111122                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.9  |
| Modifications:        | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>                                                                                                                                                                                                                                                                                                                                                        |                       |               |                       |
| 74LVT_LVTH16244B v.9  | 20110620                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.8  |
| 74LVT_LVTH16244B v.8  | 20100322                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.7  |
| 74LVT_LVTH16244B v.7  | 20090326                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.6  |
| 74LVT_LVTH16244B v.6  | 20081113                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT_LVTH16244B v.5  |
| 74LVT_LVTH16244B v.5  | 20060321                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet    | -             | 74LVT16244B v.4       |
| 74LVT16244B v.4       | 20021031                                                                                                                                                                                                                                                                                                                                                                                                                      | Product specification | -             | 74LVT16244B v.3       |
| 74LVT16244B v.3       | 19981007                                                                                                                                                                                                                                                                                                                                                                                                                      | Product specification | -             | 74LVT16244B v.2       |
| 74LVT16244B v.2       | 19980219                                                                                                                                                                                                                                                                                                                                                                                                                      | Product specification | -             | -                     |

## 14. Legal information

### Data sheet status

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

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

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## Contents

|                                          |    |
|------------------------------------------|----|
| 1. General description.....              | 1  |
| 2. Features and benefits.....            | 1  |
| 3. Ordering information.....             | 1  |
| 4. Functional diagram.....               | 2  |
| 5. Pinning information.....              | 3  |
| 5.1. Pinning.....                        | 3  |
| 5.2. Pin description.....                | 3  |
| 6. Functional description.....           | 4  |
| 7. Limiting values.....                  | 4  |
| 8. Recommended operating conditions..... | 4  |
| 9. Static characteristics.....           | 5  |
| 10. Dynamic characteristics.....         | 6  |
| 10.1. Waveforms and test circuit.....    | 7  |
| 11. Package outline.....                 | 9  |
| 12. Abbreviations.....                   | 10 |
| 13. Revision history.....                | 10 |
| 14. Legal information.....               | 11 |

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