



# 74ABT162245A; 74ABTH162245A

16-bit bus transceiver with 30  $\Omega$  series termination resistors;  
3-state

Rev. 7 — 24 June 2024

Product data sheet

## 1. General description

The 74ABT162245A; 74ABTH162245A is a 16-bit transceiver with 30  $\Omega$  termination resistors and 3-state outputs. The device can be used as two 8-bit transceivers or one 16-bit transceiver. The device features two output enables (1OE and 2OE) each controlling eight outputs, and two send/receive (1DIR and 2DIR) inputs for direction control. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. This device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

Two options are available, 74ABT162245A which does not have the bus hold feature and the 74ABTH162245A which incorporates the bus hold feature.

## 2. Features and benefits

- 16-bit bidirectional bus interface
- Multiple V<sub>CC</sub> and GND pins minimize switching noise
- 3-state buffers
- Output capability: +12 mA/–32 mA
- 74ABTH162245A incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Integrated 30  $\Omega$  termination resistors
- Supply voltage range from 4.5 to 5.5 V
- BiCMOS high speed and output drive
- Direct interface with TTL levels
- Power-up 3-state
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- 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

## 3. Ordering information

Table 1. Ordering information

| Type number   | Package           |         |   |                          |
|---|-------------------|---------|---|--------------------------|
|   | Temperature range | Name    | Description   | Version                  |
| <a href="#">74ABT162245ADGG</a><br><a href="#">74ABTH162245ADGG</a> | –40 °C to +85 °C  | TSSOP48 | plastic thin shrink small outline package;<br>48 leads; body width 6.1 mm | <a href="#">SOT362-1</a> |

4. Functional diagram

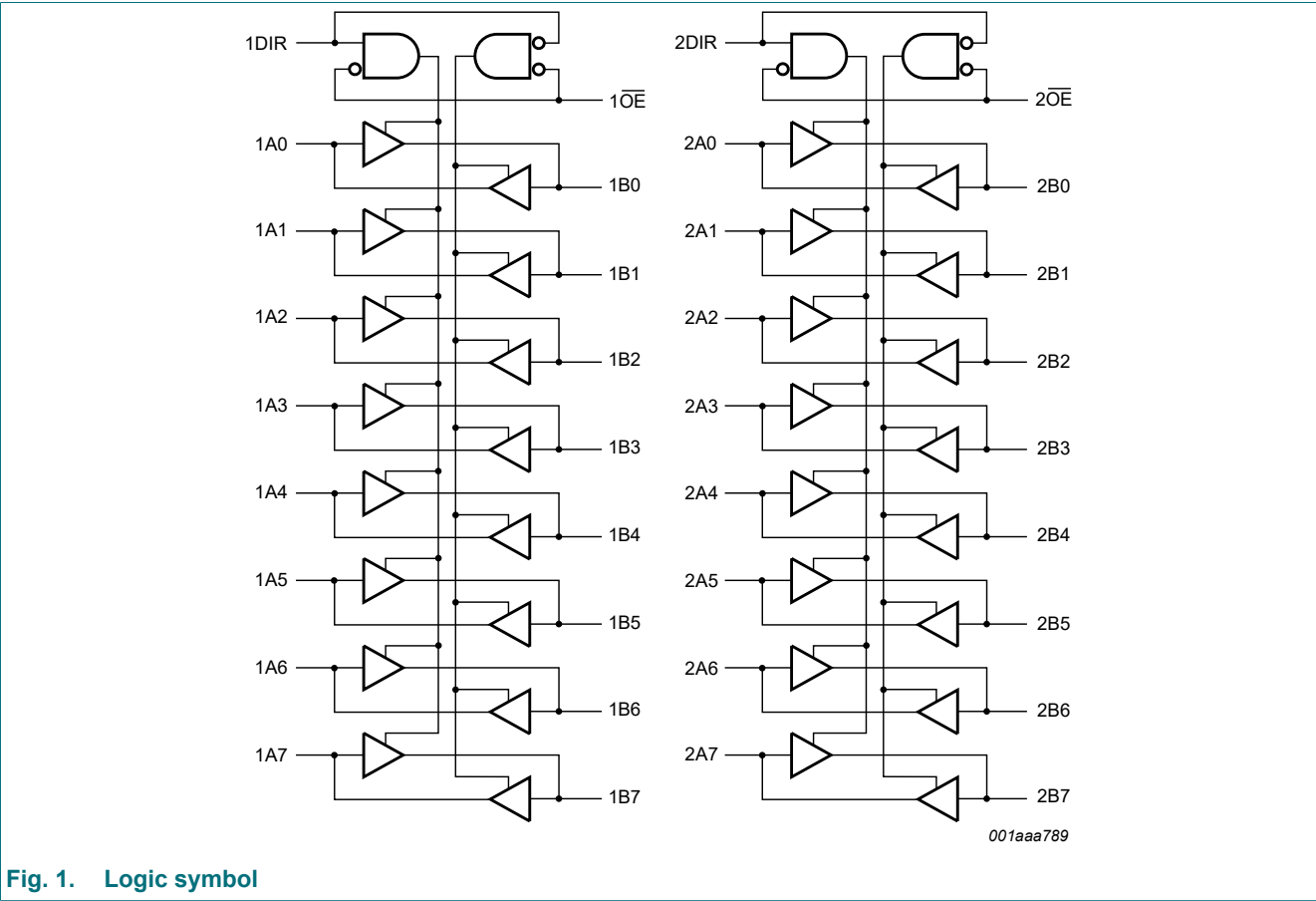
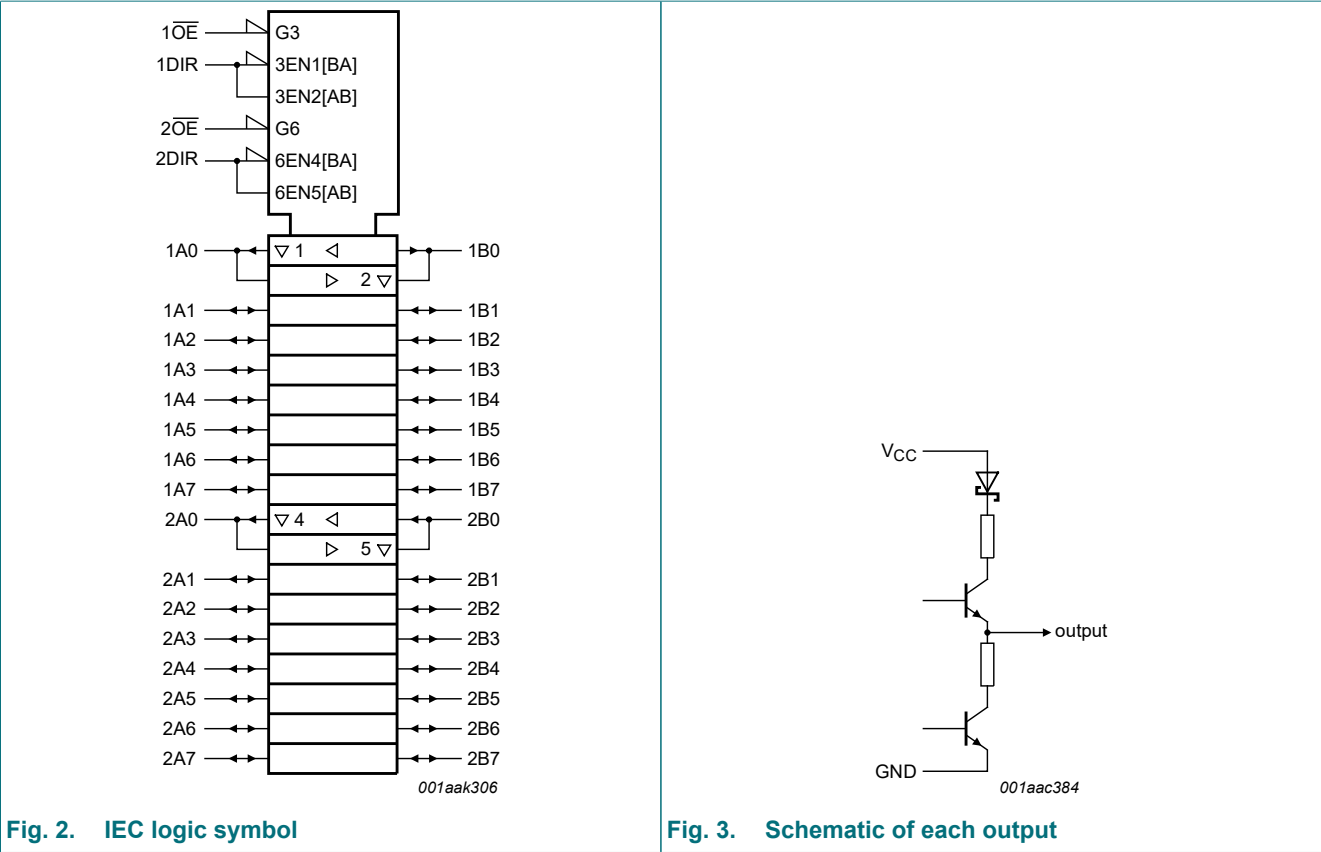
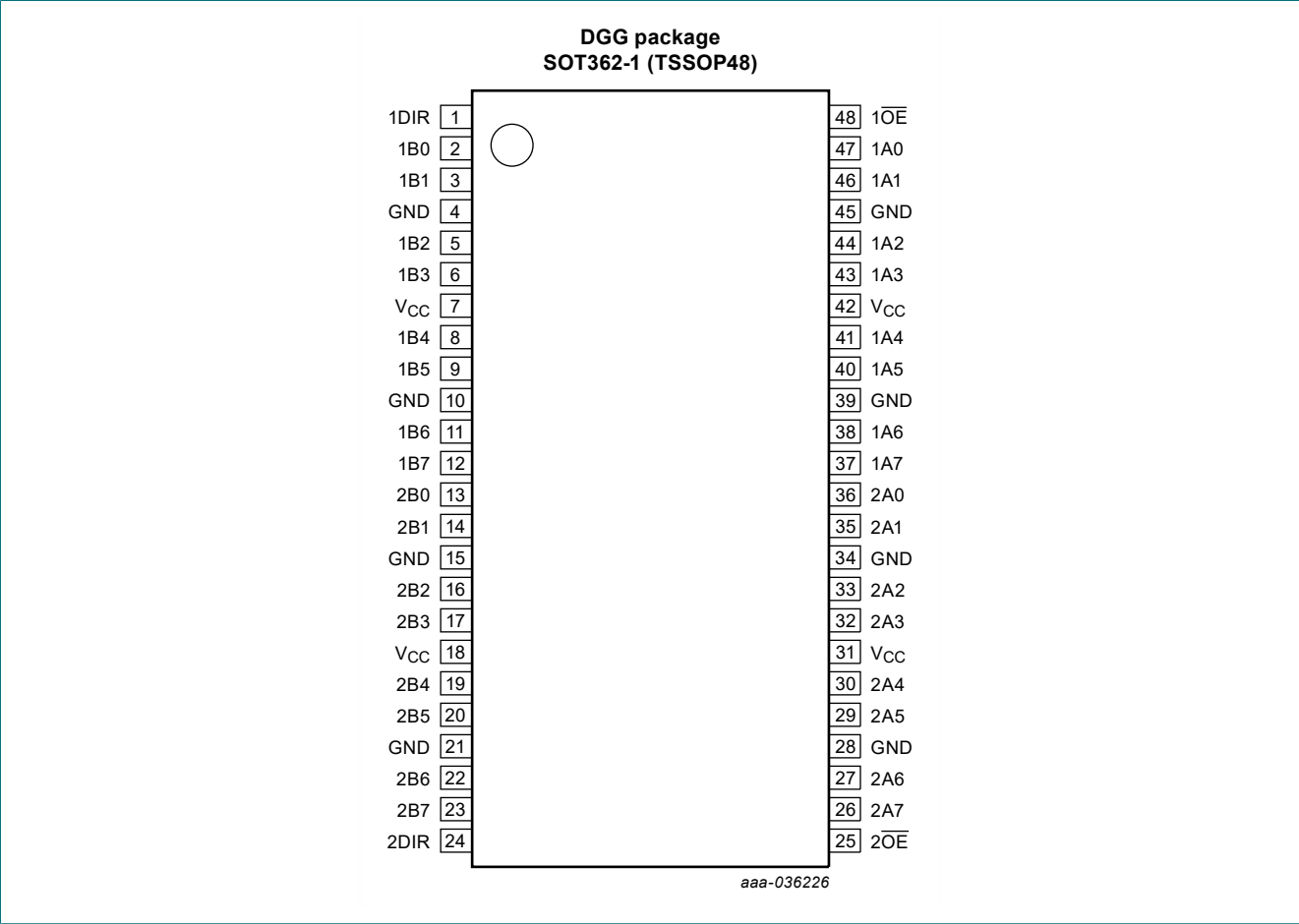


Fig. 1. Logic symbol



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

| Symbol                                 | Pin                            | Description             |
|--|--------------------------------|-------------------------|
| 1DIR, 2DIR                             | 1, 24                          | direction control input |
| 1A0, 1A1, 1A2, 1A3, 1A4, 1A5, 1A6, 1A7 | 47, 46, 44, 43, 41, 40, 38, 37 | data input/output       |
| 2A0, 2A1, 2A2, 2A3, 2A4, 2A5, 2A6, 2A7 | 36, 35, 33, 32, 30, 29, 27, 26 | data input/output       |
| GND                                    | 4, 10, 15, 21, 28, 34, 39, 45  | ground (0 V)            |
| 1B0, 1B1, 1B2, 1B3, 1B4, 1B5, 1B6, 1B7 | 2, 3, 5, 6, 8, 9, 11, 12       | data input/output       |
| 2B0, 2B1, 2B2, 2B3, 2B4, 2B5, 2B6, 2B7 | 13, 14, 16, 17, 19, 20, 22, 23 | data input/output       |
| 1OE, 2OE                               | 48, 25                         | output enable input     |
| VCC                                    | 7, 18, 31, 42                  | supply voltage          |

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     | nDIR | nAn              | nBn              |
| L       | L    | output nAn = nBn | input            |
| L       | H    | input            | output nBn = nAn |
| H       | X    | Z                | Z                |

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol           | Parameter               | Conditions                            | Min  | Max  | Unit |
|------------------|-------------------------|---------------------------------------|------|------|------|
| V <sub>CC</sub>  | supply voltage          |                                       | -0.5 | +7.0 | V    |
| V <sub>I</sub>   | input voltage           | [1]                                   | -1.2 | +7.0 | V    |
| V <sub>O</sub>   | output voltage          | output in OFF-state or HIGH-state [1] | -0.5 | +5.5 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V                  | -18  | -    | 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>j</sub>   | junction temperature    | [2]                                   | -    | 150  | °C   |
| T <sub>stg</sub> | storage temperature     |                                       | -65  | +150 | °C   |

- [1] The input and output voltage ratings may be exceeded if the input and output 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. Operating conditions

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

| Symbol           | Parameter                           | Conditions  | Min | Typ | Max             | Unit |
|------------------|-------------------------------------|-------------|-----|-----|-----------------|------|
| V <sub>CC</sub>  | supply voltage                      |             | 4.5 | -   | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |             | 0   | -   | V <sub>CC</sub> | V    |
| I <sub>OH</sub>  | HIGH-level output current           |             | -32 | -   | -               | mA   |
| I <sub>OL</sub>  | LOW-level output current            |             | -   | -   | 12              | mA   |
| Δt/ΔV            | input transition rise and fall rate |             | 0   | -   | 10              | ns/V |
| T <sub>amb</sub> | ambient temperature                 | in free air | -40 | -   | +85             | °C   |

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 |      | Unit |
|-----------------------|------------------------------------|--|-------|-------|------|------------------|------|------|
|                       |                                    |  | Min   | Typ   | Max  | Min              | Max  |      |
| V <sub>IK</sub>       | input clamping voltage             | V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = -18 mA  | -1.2  | -0.9  | -    | -1.2             | -    | V    |
| V <sub>IH</sub>       | HIGH-level input voltage           |  | 2.0   | -     | -    | 2.0              | -    | V    |
| V <sub>IL</sub>       | LOW-level input voltage            |  | -     | -     | 0.8  | -                | 0.8  | V    |
| V <sub>OH</sub>       | HIGH-level output voltage          | V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                                | 2.5   | 2.9   | -    | 2.5              | -    | V    |
|                       |                                    | V <sub>CC</sub> = 5.0 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                                | 3.0   | 3.4   | -    | 3.0              | -    | V    |
|                       |                                    | V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -32 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                               | 2.0   | 2.4   | -    | 2.0              | -    | V    |
| V <sub>OL</sub>       | LOW-level output voltage           | V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 8 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                                 | -     | 0.46  | 0.65 | -                | 0.65 | V    |
|                       |                                    | V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 12 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                                | -     | 0.5   | 0.8  | -                | 0.8  | V    |
| I <sub>I</sub>        | input leakage current              | n $\overline{\text{OE}}$ , nDIR; V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V  | -     | ±0.01 | ±1   | -                | ±1   | μA   |
| I <sub>OFF</sub>      | power-off leakage current          | V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V  | -     | ±5.0  | ±100 | -                | ±100 | μA   |
| I <sub>BHL</sub>      | bus hold LOW current               | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0.8 V [1]  | 50    | -     | -    | 50               | -    | μA   |
| I <sub>BHH</sub>      | bus hold HIGH current              | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 2.0 V [1]  | -75   | -     | -    | -75              | -    | μA   |
| I <sub>BHLO</sub>     | bus hold LOW overdrive current     | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 0 V to 5.5 V [1] [2]   | 500   | -     | -    | -                | -    | μA   |
| I <sub>BHHO</sub>     | bus hold HIGH overdrive current    | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 0 V to 5.5 V [1] [2]   | -500  | -     | -    | -                | -    | μA   |
| I <sub>O(pu/pd)</sub> | power-up/power-down output current | V <sub>CC</sub> = 2.0 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = GND or V <sub>CC</sub> ; n $\overline{\text{OE}}$ = don't care [3] | -     | ±5.0  | ±50  | -                | ±50  | μA   |
| I <sub>OZ</sub>       | OFF-state output current           | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>   |       |       |      |                  |      |      |
|                       |                                    | V <sub>O</sub> = 5.5 V   | -     | 0.5   | 10   | -                | 10   | μA   |
|                       |                                    | V <sub>O</sub> = 0.0 V   | -     | -0.5  | -10  | -                | -10  | μA   |
| I <sub>CEX</sub>      | output high leakage current        | V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>   | -     | 5.0   | 50   | -                | 50   | μA   |
| I <sub>O</sub>        | output current                     | V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V [4]  | -50   | -92   | -180 | -50              | -180 | mA   |
| I <sub>CC</sub>       | supply current                     | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>   |       |       |      |                  |      |      |
|                       |                                    | outputs HIGH   | -     | 0.3   | 0.7  | -                | 0.7  | mA   |
|                       |                                    | outputs LOW  | -     | 10    | 19   | -                | 19   | mA   |
|                       |                                    | outputs 3-state  | -     | 0.3   | 0.7  | -                | 0.7  | mA   |

| Symbol          | Parameter                 | Conditions   | 25 °C |     |     | -40 °C to +85 °C |     | Unit |
|-----------------|---------------------------|--|-------|-----|-----|------------------|-----|------|
|                 |                           |  | Min   | Typ | Max | Min              | Max |      |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_{CC} = 5.5\text{ V}$ ; one input at 3.4 V, other inputs at $V_{CC}$ or GND [5] |       |     |     |                  |     |      |
|                 |                           | outputs enabled  | -     | 400 | 700 | -                | 700 | μA   |
|                 |                           | 74ABT162245A; outputs 3-state  | -     | 1.0 | 50  | -                | 50  | μA   |
|                 |                           | 74ABTH162245A; outputs 3-state   | -     | 100 | 250 | -                | 250 | μA   |
|                 |                           | nOE, nDIR  | -     | 400 | 700 | -                | 700 | μA   |
| $C_I$           | input capacitance         | $V_I = 0\text{ V}$ or $V_{CC}$   | -     | 3   | -   | -                | -   | pF   |
| $C_{I/O}$       | input/output capacitance  | $V_O = 0\text{ V}$ or $V_{CC}$ ; outputs 3-state   | -     | 7   | -   | -                | -   | pF   |

- [1] Valid for data inputs of bus hold parts only (74ABTH162245A)
- [2] This is the bus hold overdrive current required to force the input to the opposite logic state.
- [3] This parameter is valid for any  $V_{CC}$  between 0 V and 2.1 V with a transition time of up to 10 ms.  
From  $V_{CC} = 2.1\text{ V}$  to  $V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$  a transition time of 100 μs is permitted.
- [4] Not more than one output should be tested at a time and the duration of the test should not exceed one second
- [5] This is the increase in supply current for each input at 3.4 V.

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

| Symbol    | Parameter                           | Conditions                           | $T_{amb} = 25\text{ °C}; V_{CC} = 5.0\text{ V}$ |     |     | $T_{amb} = -40\text{ °C to }85\text{ °C}; V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$ |     | Unit |
|-----------|-------------------------------------|--------------------------------------|---|-----|-----|---|-----|------|
|           |                                     |                                      | Min   | Typ | Max | Min   | Max |      |
| $t_{PLH}$ | LOW to HIGH propagation delay       | nAn to nBn or nBn to nAn; see Fig. 4 | 1.0   | 2.0 | 3.3 | 1.0   | 3.5 | ns   |
| $t_{PHL}$ | HIGH to LOW propagation delay       | nAn to nBn or nBn to nAn; see Fig. 4 | 1.5   | 3.0 | 4.5 | 1.5   | 4.9 | ns   |
| $t_{PZH}$ | OFF-state to HIGH propagation delay | nOE to nAn or nBn; see Fig. 5        | 1.5   | 3.1 | 4.3 | 1.5   | 5.0 | ns   |
| $t_{PZL}$ | OFF-state to LOW propagation delay  | nOE to nAn or nBn; see Fig. 5        | 2.0   | 5.0 | 6.1 | 2.0   | 7.0 | ns   |
| $t_{PHZ}$ | HIGH to OFF-state propagation delay | nOE to nAn or nBn; see Fig. 5        | 1.7   | 3.5 | 4.8 | 1.7   | 5.4 | ns   |
| $t_{PLZ}$ | LOW to OFF-state propagation delay  | nOE to nAn or nBn; see Fig. 5        | 1.5   | 3.2 | 4.5 | 1.5   | 4.9 | ns   |

10.1. Waveforms and test circuit

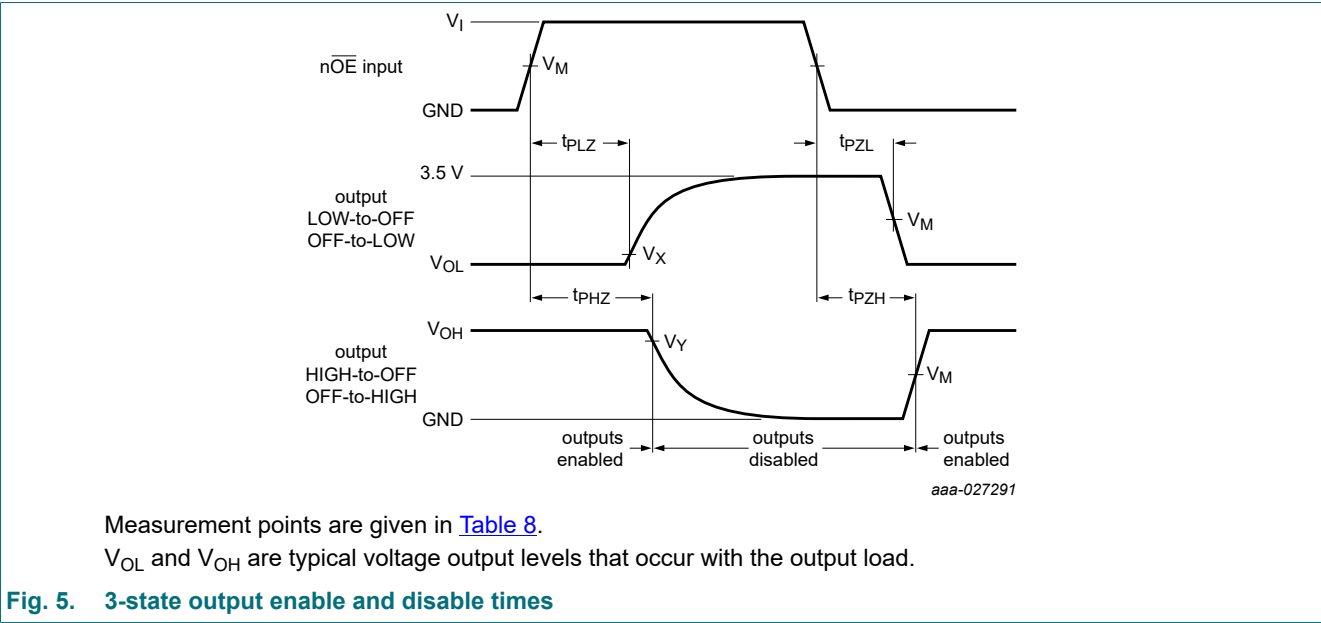
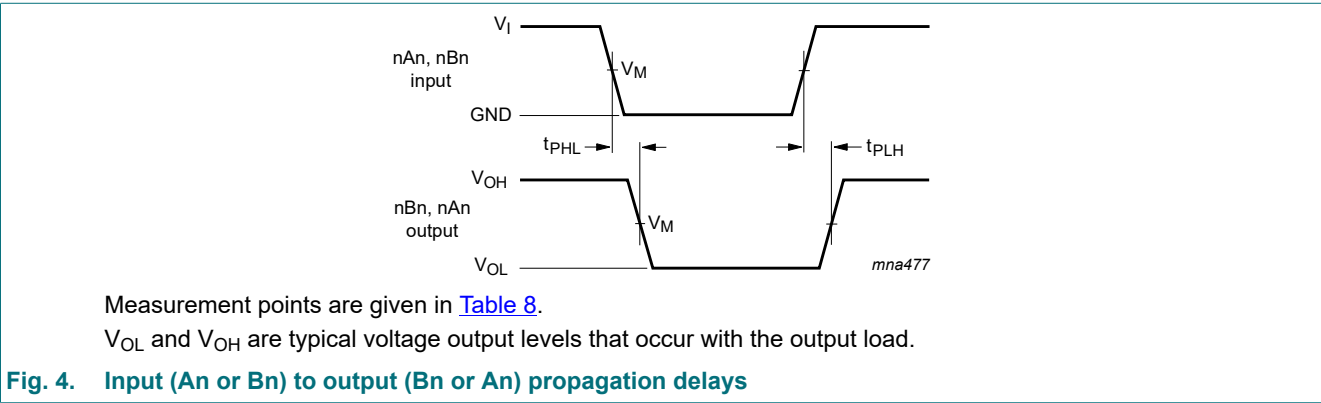


Table 8. Measurement points

| Input |       | Output |                         |                         |
|-------|-------|--------|-------------------------|-------------------------|
| $V_I$ | $V_M$ | $V_M$  | $V_X$                   | $V_Y$                   |
| 3.0 V | 1.5 V | 1.5 V  | $V_{OL} + 0.3\text{ V}$ | $V_{OH} - 0.3\text{ V}$ |



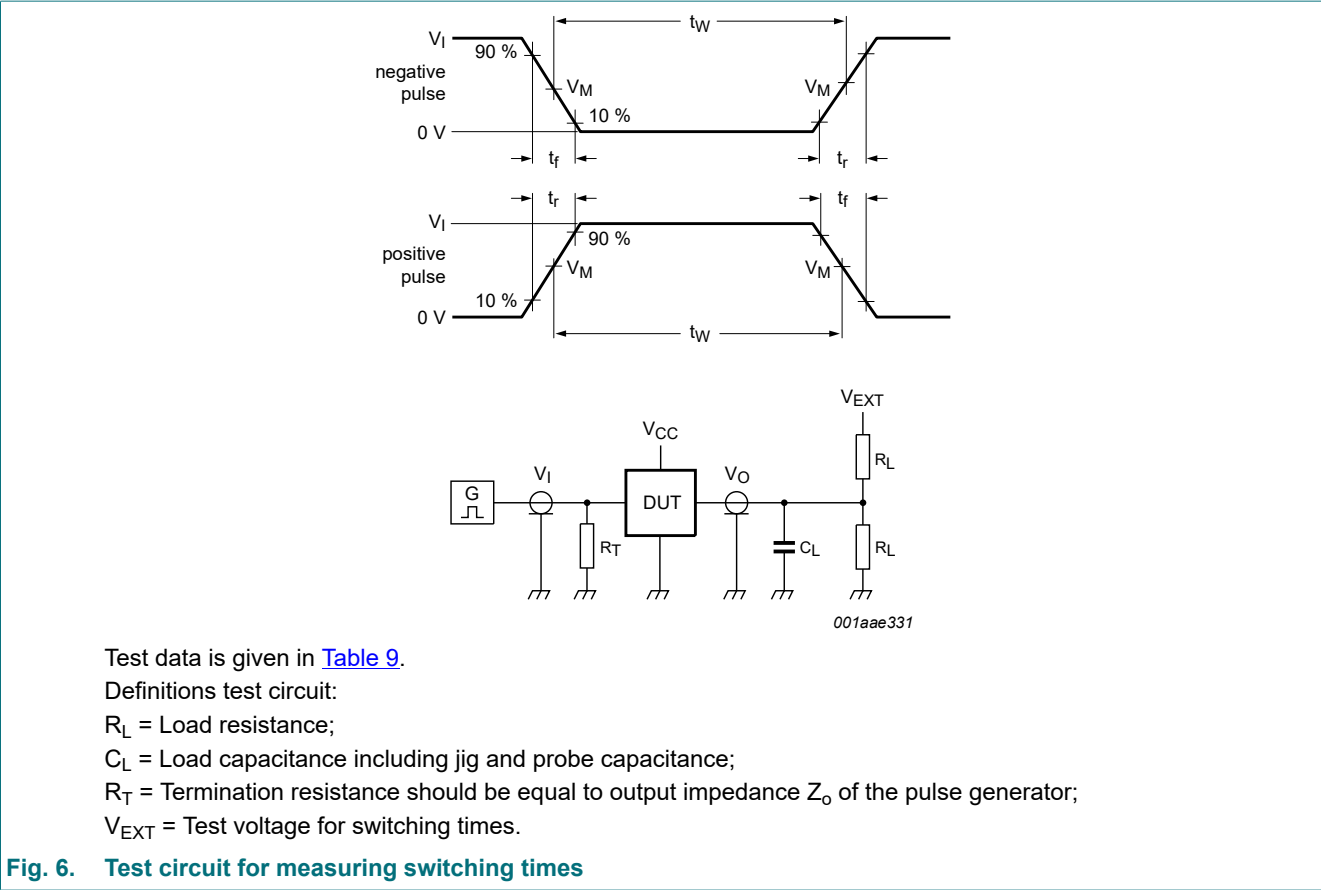


Table 9. Test data

| Input |              |        |               | Load  |       | $V_{EXT}$          |                    |                    |
|-------|--------------|--------|---------------|-------|-------|--------------------|--------------------|--------------------|
| $V_I$ | $f_i$        | $t_W$  | $t_r, t_f$    | $C_L$ | $R_L$ | $t_{PHZ}, t_{PZH}$ | $t_{PLZ}, t_{PZL}$ | $t_{PLH}, t_{PHL}$ |
| 3.0 V | $\leq 1$ MHz | 500 ns | $\leq 2.5$ ns | 50 pF | 500 Ω | open               | 7 V                | open               |

11. Package outline

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

SOT362-1

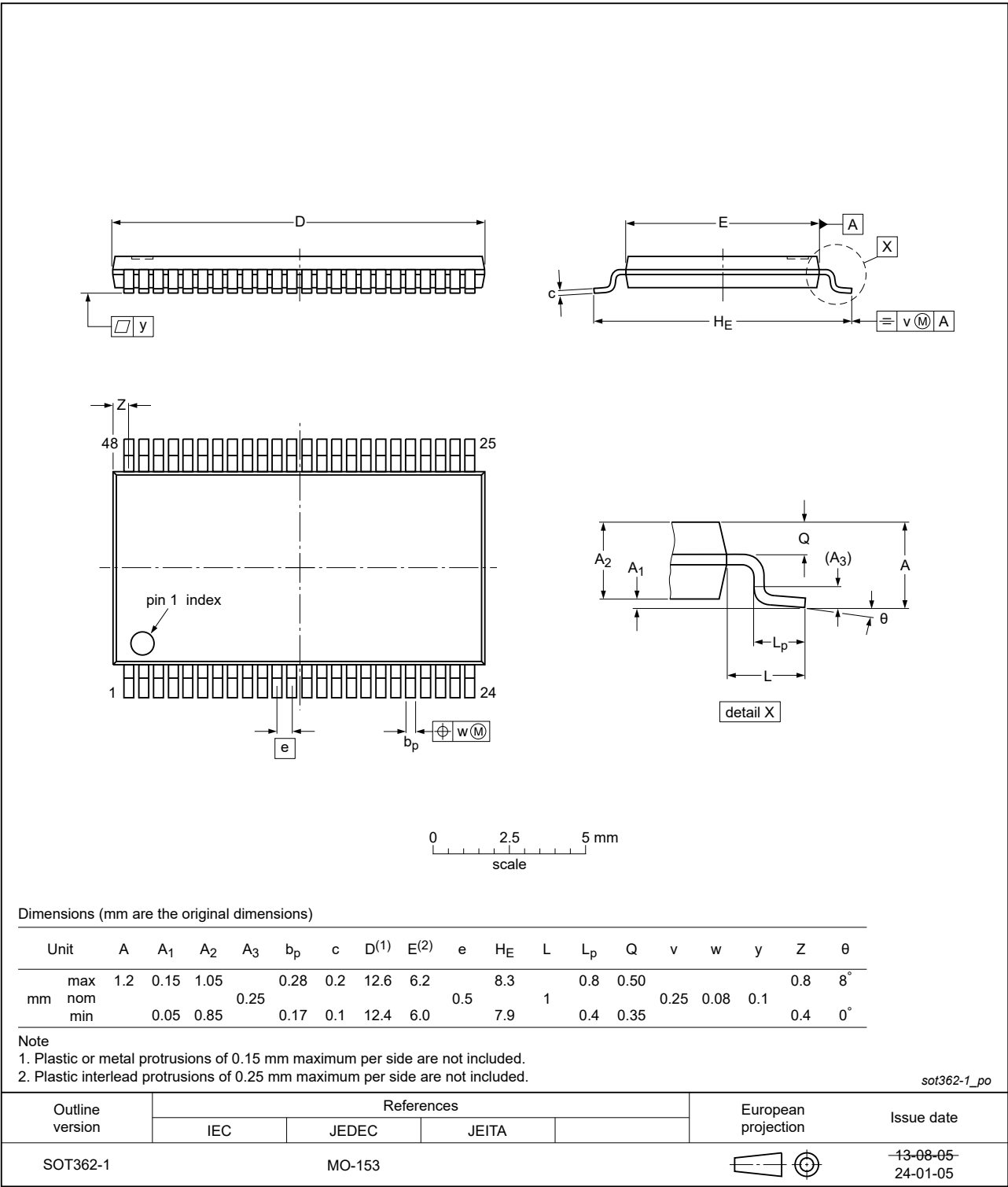


Fig. 7. Package outline SOT362-1 (TSSOP48)

12. Abbreviations

Table 10. Abbreviations

| Acronym | Description                                     |
|---------|---|
| ANSI    | American National Standards Institute           |
| BiCMOS  | Bipolar Complementary Metal Oxide Semiconductor |
| CDM     | Charged Device Model                            |
| DUT     | Device Under Test                               |
| ESD     | ElectroStatic Discharge                         |
| ESDA    | ElectroStatic Discharge Association             |
| HBM     | Human Body Model                                |
| JEDEC   | Joint Electron Device Engineering Council       |

13. Revision history

Table 11. Revision history

| Document ID           | Release date   | Data sheet status     | Change notice | Supersedes            |
|-----------------------|--|-----------------------|---------------|-----------------------|
| 74ABT_ABTH162245A v.7 | 20240624   | Product data sheet    | -             | 74ABT_ABTH162245A v.6 |
| Modifications:        | <ul style="list-style-type: none"><li><a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li></ul>   |                       |               |                       |
| 74ABT_ABTH162245A v.6 | 20240222   | Product data sheet    | -             | 74ABT_ABTH162245A v.5 |
| Modifications:        | <ul style="list-style-type: none"><li><a href="#">Fig. 7</a>: Updated package outline drawing SOT362-1 (TSSOP48).</li></ul>  |                       |               |                       |
| 74ABT_ABTH162245A v.5 | 20210702   | Product data sheet    | -             | 74ABT_H162245A v.4    |
| Modifications:        | <ul style="list-style-type: none"><li>Type number 74ABT162245ADL (SOT370-1 / SSOP48) removed.</li><li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li></ul>   |                       |               |                       |
| 74ABT_H162245A v.4    | 20190220   | Product data sheet    | -             | 74ABT_H162245A v.3    |
| Modifications:        | <ul style="list-style-type: none"><li>Type number 74ABTH162245ADL (SOT370-1) removed.</li></ul>  |                       |               |                       |
| 74ABT_H162245A v.3    | 20170831   | Product data sheet    | -             | 74ABT_H162245A v.2    |
| 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></ul> |                       |               |                       |
| 74ABT_H162245A v.2    | 19980225   | Product specification | -             | 74ABT_H162245A v.1    |
| 74ABT_H162245A v.1    | 19961120   | 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".
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