

# 74LVC162245A; 74LVCH162245A

16-bit transceiver with direction pin; 30  $\Omega$  series termination resistors; 5 V tolerant input/output; 3-state

Rev. 7 — 11 February 2019

Product data sheet

## 1. General description

The 74LVC162245A; 74LVCH162245A are 16-bit transceivers with non-inverting 3-state bus compatible outputs in both send and receive directions. Two send/receive (nDIR) inputs control direction, and two output enable (nOE) inputs make cascading easy. The nOE inputs control the outputs so that the buses are effectively isolated. This device can be used as two 8-bit transceivers or one 16-bit transceiver.

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 as translators in mixed 3.3 V and 5 V applications.

The 74LVCH162245A bus hold on data inputs eliminates the need for external pull-up resistors to hold unused inputs.

Both HIGH and LOW output stages include 30  $\Omega$  series termination resistors to reduce line noise.

## 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 pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- Integrated 30  $\Omega$  termination resistors
- High-impedance when  $V_{CC} = 0$  V
- All data inputs have bus hold (74LVCH162245A only)
- 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 ANSI/ESDA/Jedec JS-002 exceeds 1000 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

### 3. Ordering information

Table 1. Ordering information

| Type number      | Package           |             |                                                                                           |          |
|------------------|-------------------|-------------|-------------------------------------------------------------------------------------------|----------|
|                  | Temperature range | Name        | Description                                                                               | Version  |
| 74LVC162245ADL   | -40 °C to +125 °C | SSOP48      | plastic shrink small outline package; 48 leads; body width 7.5 mm                         | SOT370-1 |
| 74LVCH162245ADL  |                   |             |                                                                                           |          |
| 74LVC162245ADGG  | -40 °C to +125 °C | TSSOP48     | plastic thin shrink small outline package; 48 leads; body width 6.1 mm                    | SOT362-1 |
| 74LVCH162245ADGG |                   |             |                                                                                           |          |
| 74LVC162245ADGV  | -40 °C to +125 °C | TSSOP48 [1] | plastic thin shrink small outline package; 48 leads; body width 4.4 mm; lead pitch 0.4 mm | SOT480-1 |
| 74LVCH162245ADGV |                   |             |                                                                                           |          |

[1] Also known as TVSOP48.

### 4. Functional diagram

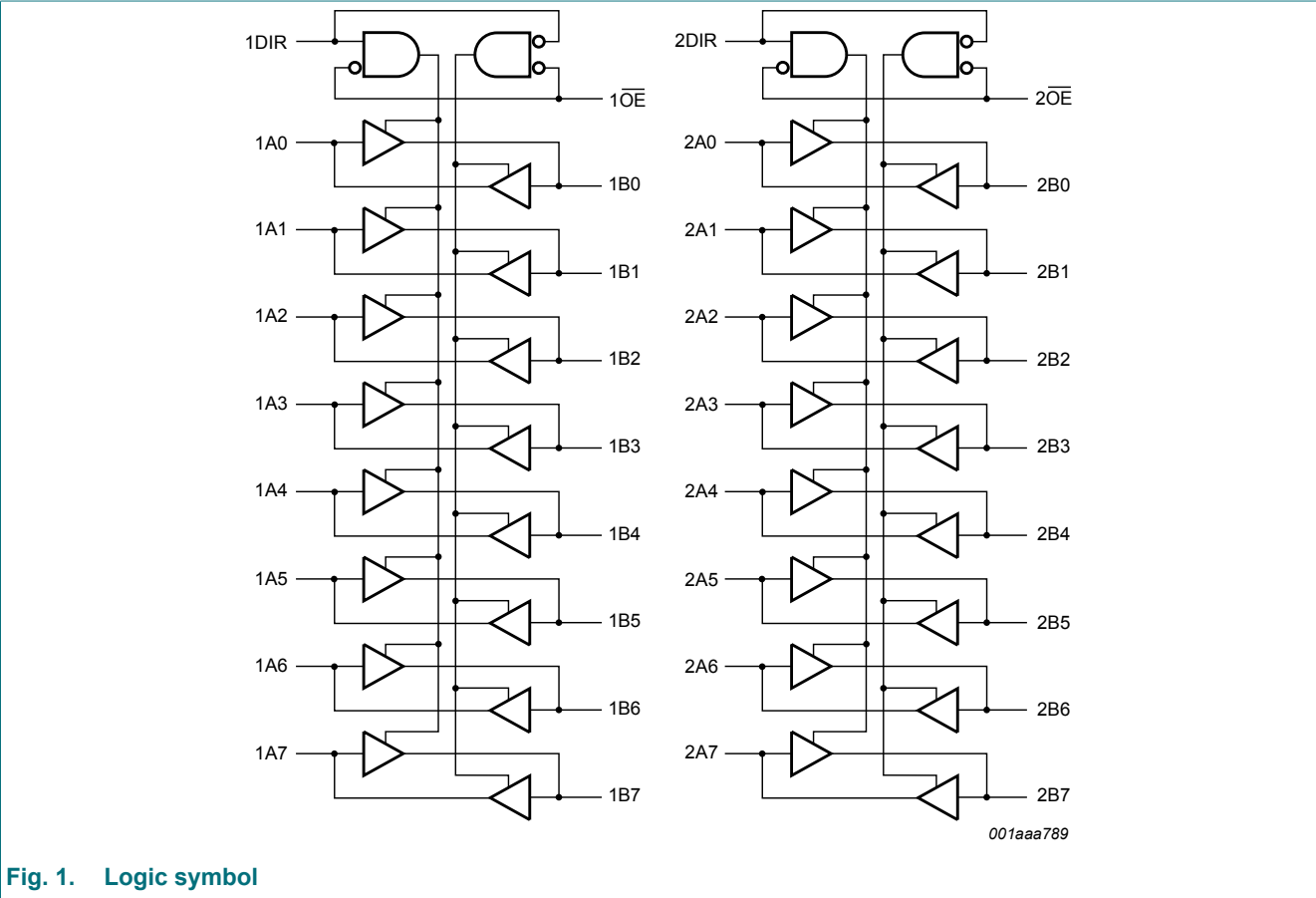


Fig. 1. Logic symbol

16-bit transceiver with direction pin; 30 Ω series termination resistors; 5 V tolerant input/output; 3-state

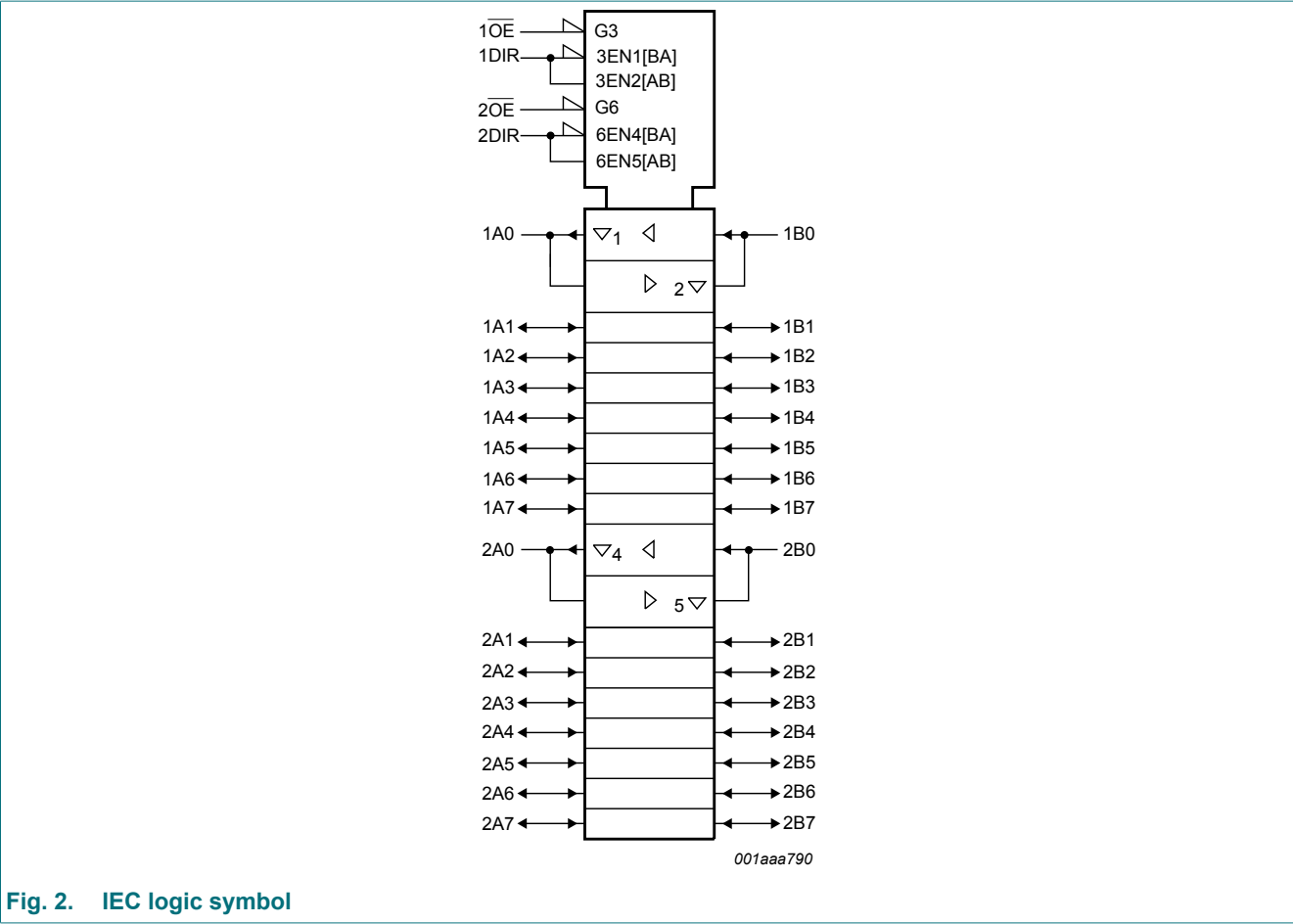


Fig. 2. IEC logic symbol

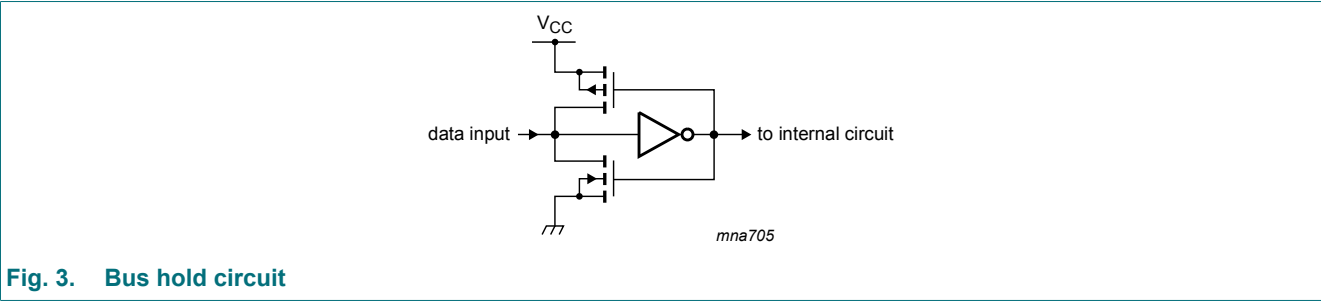


Fig. 3. Bus hold circuit

5. Pinning information

5.1. Pinning

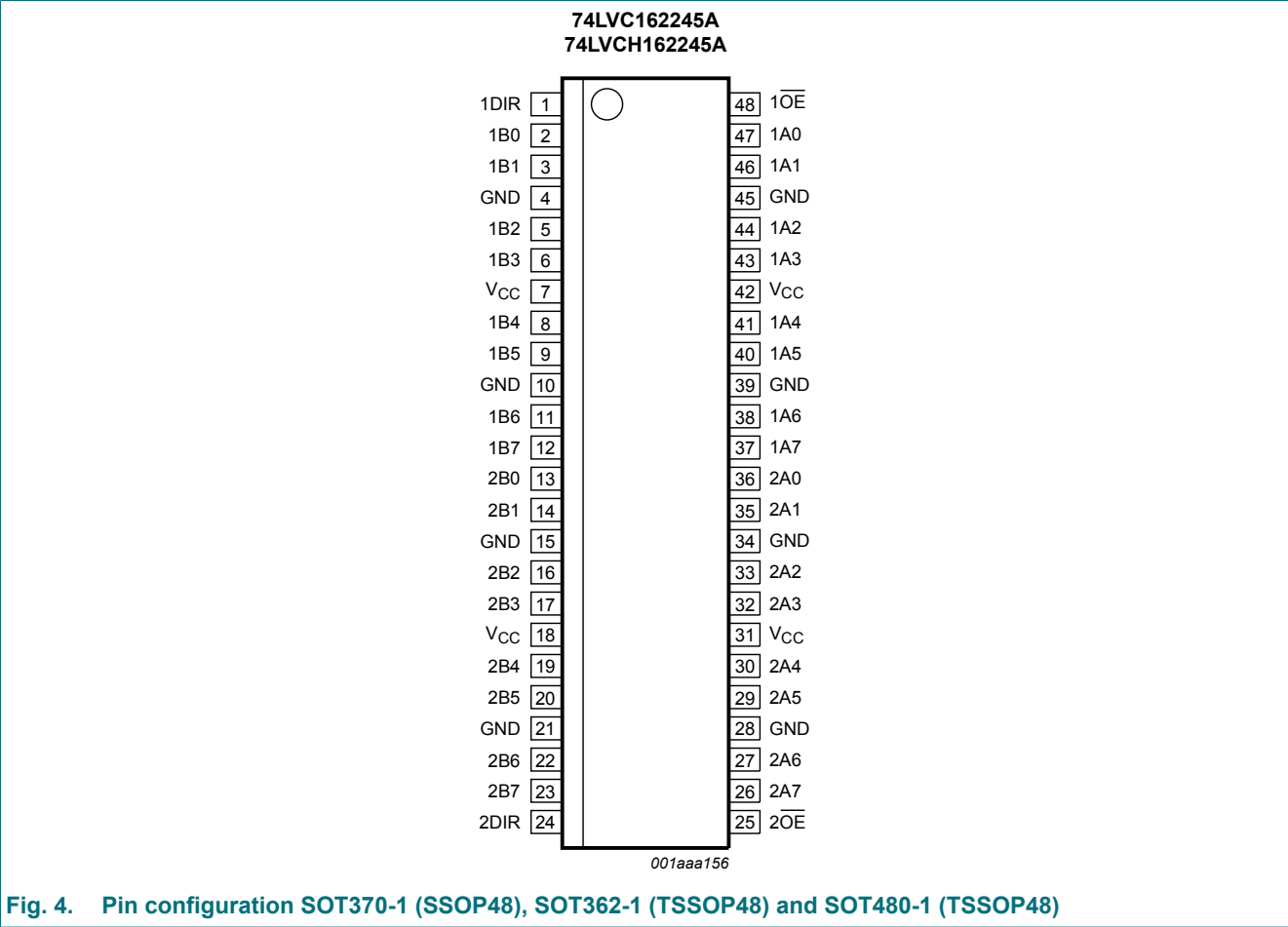


Fig. 4. Pin configuration SOT370-1 (SSOP48), SOT362-1 (TSSOP48) and SOT480-1 (TSSOP48)

5.2. Pin description

Table 2. Pin description

| Symbol          | Pin                            | Description                      |
|-----------------|--------------------------------|----------------------------------|
| 1DIR, 2DIR      | 1, 24                          | direction control input          |
| 1B0 to 1B7      | 2, 3, 5, 6, 8, 9, 11, 12       | data input/output                |
| 2B0 to 2B7      | 13, 14, 16, 17, 19, 20, 22, 23 | data input/output                |
| GND             | 4, 10, 15, 21, 28, 34, 39, 45  | ground (0 V)                     |
| V <sub>CC</sub> | 7, 18, 31, 42                  | supply voltage                   |
| 1OE, 2OE        | 48, 25                         | output enable input (active LOW) |
| 1A0 to 1A7      | 47, 46, 44, 43, 41, 40, 38, 37 | data input/output                |
| 2A0 to 2A7      | 36, 35, 33, 32, 30, 29, 27, 26 | data input/output                |

## 6. Functional description

Table 3. Function table

| Inputs <sup>[1]</sup> |      | Outputs   |           |
|-----------------------|------|-----------|-----------|
| nOE                   | nDIR | nAn       | nBn       |
| L                     | L    | nAn = nBn | inputs    |
| L                     | H    | inputs    | nBn = nAn |
| H                     | X    | Z         | Z         |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; 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           |                                                          | -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                                       | -0.5 | V <sub>CC</sub> + 0.5 | V    |
|                  |                         | output 3-state                                           | -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   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C                     | -    | 500                   | 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.

## 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  | -   | 3.6             | V    |
| V <sub>I</sub>      | input voltage                       |                                  | 0    | -   | 5.5             | V    |
| V <sub>O</sub>      | output voltage                      | output HIGH or LOW               | 0    | -   | V <sub>CC</sub> | V    |
|                     |                                     | output 3-state                   | 0    | -   | 5.5             | V    |
| T <sub>amb</sub>    | ambient temperature                 | in free air                      | -40  | -   | +125            | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | V <sub>CC</sub> = 1.2 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 [1]         | 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                                                                                         | 0.65V <sub>CC</sub>   | -               | -                   | 0.65V <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                                                                                         | -                     | -               | 0.35V <sub>CC</sub> | -                     | 0.35V <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       |
| 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 $\mu$ A;<br>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> = -2 mA; V <sub>CC</sub> = 1.65 V                                                                           | 1.2                   | -               | -                   | 1.05                  | -                   | V       |
|                          |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 2.3 V                                                                            | 1.8                   | -               | -                   | 1.65                  | -                   | V       |
|                          |                           | I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 2.7 V                                                                            | 2.2                   | -               | -                   | 2.05                  | -                   | V       |
|                          |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 3.0 V                                                                           | 2.2                   | -               | -                   | 2.0                   | -                   | 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 $\mu$ A;<br>V <sub>CC</sub> = 1.65 V to 3.6 V                                                         | -                     | -               | 0.2                 | -                     | 0.3                 | V       |
|                          |                           | I <sub>O</sub> = 2 mA; V <sub>CC</sub> = 1.65 V                                                                            | -                     | -               | 0.45                | -                     | 0.65                | V       |
|                          |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 2.3 V                                                                             | -                     | -               | 0.6                 | -                     | 0.8                 | V       |
|                          |                           | I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 2.7 V                                                                             | -                     | -               | 0.4                 | -                     | 0.6                 | V       |
|                          |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 3.0 V                                                                            | -                     | -               | 0.55                | -                     | 0.8                 | V       |
| I <sub>I</sub>           | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 3.6 V [2]                                                              | -                     | $\pm 0.1$       | $\pm 5$             | -                     | $\pm 20$            | $\mu$ A |
| I <sub>OZ</sub>          | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>O</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 3.6 V [2] [3] | -                     | $\pm 0.1$       | $\pm 5$             | -                     | $\pm 20$            | $\mu$ A |
| I <sub>OFF</sub>         | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0.0 V                                                          | -                     | $\pm 0.1$       | $\pm 10$            | -                     | $\pm 20$            | $\mu$ A |
| I <sub>CC</sub>          | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 3.6 V                                  | -                     | 0.1             | 20                  | -                     | 80                  | $\mu$ A |
| $\Delta$ I <sub>CC</sub> | additional supply current | per input pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V;<br>I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.7 V to 3.6 V         | -                     | 5               | 500                 | -                     | 5000                | $\mu$ A |
| C <sub>I</sub>           | input capacitance         | V <sub>CC</sub> = 0 V to 3.6 V;<br>V <sub>I</sub> = GND to V <sub>CC</sub>                                                 | -                     | 5.0             | -                   | -                     | -                   | pF      |
| C <sub>I/O</sub>         | input/output capacitance  | V <sub>CC</sub> = 0 V to 3.6 V;<br>V <sub>I</sub> = GND to V <sub>CC</sub>                                                 | -                     | 10              | -                   | -                     | -                   | pF      |
| I <sub>BHL</sub>         | bus hold LOW current      | V <sub>CC</sub> = 1.65; V <sub>I</sub> = 0.58 V [4] [5]                                                                    | 10                    | -               | -                   | 10                    | -                   | $\mu$ A |
|                          |                           | V <sub>CC</sub> = 2.3; V <sub>I</sub> = 0.7 V                                                                              | 30                    | -               | -                   | 25                    | -                   | $\mu$ A |
|                          |                           | V <sub>CC</sub> = 3.0; V <sub>I</sub> = 0.8 V                                                                              | 75                    | -               | -                   | 60                    | -                   | $\mu$ A |

16-bit transceiver with direction pin; 30  $\Omega$  series termination resistors; 5 V tolerant input/output; 3-state

| Symbol     | Parameter                       | Conditions                               | -40 °C to +85 °C |         |     | -40 °C to +125 °C |     | Unit    |
|------------|---------------------------------|------------------------------------------|------------------|---------|-----|-------------------|-----|---------|
|            |                                 |                                          | Min              | Typ [1] | Max | Min               | Max |         |
| $I_{BHH}$  | bus hold HIGH current           | $V_{CC} = 1.65$ ; $V_I = 1.07$ V [4] [5] | -10              | -       | -   | -10               | -   | $\mu$ A |
|            |                                 | $V_{CC} = 2.3$ ; $V_I = 1.7$ V           | -30              | -       | -   | -25               | -   | $\mu$ A |
|            |                                 | $V_{CC} = 3.0$ ; $V_I = 2.0$ V           | -75              | -       | -   | -60               | -   | $\mu$ A |
| $I_{BHLO}$ | bus hold LOW overdrive current  | $V_{CC} = 1.95$ V [4] [6]                | 200              | -       | -   | 200               | -   | $\mu$ A |
|            |                                 | $V_{CC} = 2.7$ V                         | 300              | -       | -   | 300               | -   | $\mu$ A |
|            |                                 | $V_{CC} = 3.6$ V                         | 500              | -       | -   | 500               | -   | $\mu$ A |
| $I_{BHHO}$ | bus hold HIGH overdrive current | $V_{CC} = 1.95$ V [4] [6]                | -200             | -       | -   | -200              | -   | $\mu$ A |
|            |                                 | $V_{CC} = 2.7$ V                         | -300             | -       | -   | -300              | -   | $\mu$ A |
|            |                                 | $V_{CC} = 3.6$ V                         | -500             | -       | -   | -500              | -   | $\mu$ A |

[1] All typical values are measured at  $V_{CC} = 3.3$  V (unless stated otherwise) and  $T_{amb} = 25$  °C.

[2] The bus hold circuit is switched off when  $V_I > V_{CC}$  allowing 5.5 V on the input terminal.

[3] For I/O ports the parameter  $I_{OZ}$  includes the input leakage current.

[4] Valid for data inputs of bus hold parts only (74LVCH162245A). Note that control inputs do not have a bus hold circuit.

[5] The specified sustaining current at the data input holds the input below the specified  $V_I$  level.

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

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 7.

| Symbol    | Parameter         | Conditions                                    | -40 °C to +85 °C |         |      | -40 °C to +125 °C |      | Unit |
|-----------|-------------------|-----------------------------------------------|------------------|---------|------|-------------------|------|------|
|           |                   |                                               | Min              | Typ [1] | Max  | Min               | Max  |      |
| $t_{pd}$  | propagation delay | nAn to nBn; nBn to nAn; see Fig. 5 [2]        |                  |         |      |                   |      |      |
|           |                   | $V_{CC} = 1.2$ V                              | -                | 12      | -    | -                 | -    | ns   |
|           |                   | $V_{CC} = 1.65$ V to 1.95 V                   | 1.5              | 6.6     | 16.0 | 1.5               | 18.4 | ns   |
|           |                   | $V_{CC} = 2.3$ V to 2.7 V                     | 1.0              | 3.5     | 7.8  | 1.0               | 9.1  | ns   |
|           |                   | $V_{CC} = 2.7$ V                              | 1.0              | 3.5     | 6.7  | 1.0               | 9.5  | ns   |
|           |                   | $V_{CC} = 3.0$ V to 3.6 V                     | 1.0              | 2.9     | 5.7  | 1.0               | 8.5  | ns   |
| $t_{en}$  | enable time       | n $\overline{OE}$ to nAn, nBn; see Fig. 6 [2] |                  |         |      |                   |      |      |
|           |                   | $V_{CC} = 1.2$ V                              | -                | 18      | -    | -                 | -    | ns   |
|           |                   | $V_{CC} = 1.65$ V to 1.95 V                   | 2.0              | 7.7     | 17.2 | 2.0               | 19.8 | ns   |
|           |                   | $V_{CC} = 2.3$ V to 2.7 V                     | 1.5              | 4.3     | 9.4  | 1.5               | 10.9 | ns   |
|           |                   | $V_{CC} = 2.7$ V                              | 1.5              | 4.6     | 8.5  | 1.5               | 9.5  | ns   |
|           |                   | $V_{CC} = 3.0$ V to 3.6 V                     | 1.0              | 3.5     | 7.5  | 1.0               | 7.5  | ns   |
| $t_{dis}$ | disable time      | n $\overline{OE}$ to nAn, nBn; see Fig. 6 [2] |                  |         |      |                   |      |      |
|           |                   | $V_{CC} = 1.2$ V                              | -                | 10      | -    | -                 | -    | ns   |
|           |                   | $V_{CC} = 1.65$ V to 1.95 V                   | 2.8              | 4.6     | 11.0 | 2.8               | 12.7 | ns   |
|           |                   | $V_{CC} = 2.3$ V to 2.7 V                     | 1.0              | 2.6     | 6.3  | 1.0               | 7.3  | ns   |
|           |                   | $V_{CC} = 2.7$ V                              | 1.5              | 3.4     | 7.5  | 1.5               | 11.0 | ns   |
|           |                   | $V_{CC} = 3.0$ V to 3.6 V                     | 1.5              | 3.2     | 6.5  | 1.5               | 8.5  | ns   |

16-bit transceiver with direction pin; 30 Ω series termination resistors; 5 V tolerant input/output; 3-state

| Symbol          | Parameter                     | Conditions                                             | -40 °C to +85 °C |         |     | -40 °C to +125 °C |     | Unit |
|-----------------|-------------------------------|--------------------------------------------------------|------------------|---------|-----|-------------------|-----|------|
|                 |                               |                                                        | Min              | Typ [1] | Max | Min               | Max |      |
| C <sub>PD</sub> | power dissipation capacitance | per input; V <sub>I</sub> = GND to V <sub>CC</sub> [3] |                  |         |     |                   |     |      |
|                 |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                     | -                | 10.4    | -   | -                 | -   | pF   |
|                 |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                       | -                | 14.0    | -   | -                 | -   | pF   |
|                 |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                       | -                | 17.2    | -   | -                 | -   | 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] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  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.

10.1. Waveforms and test circuit

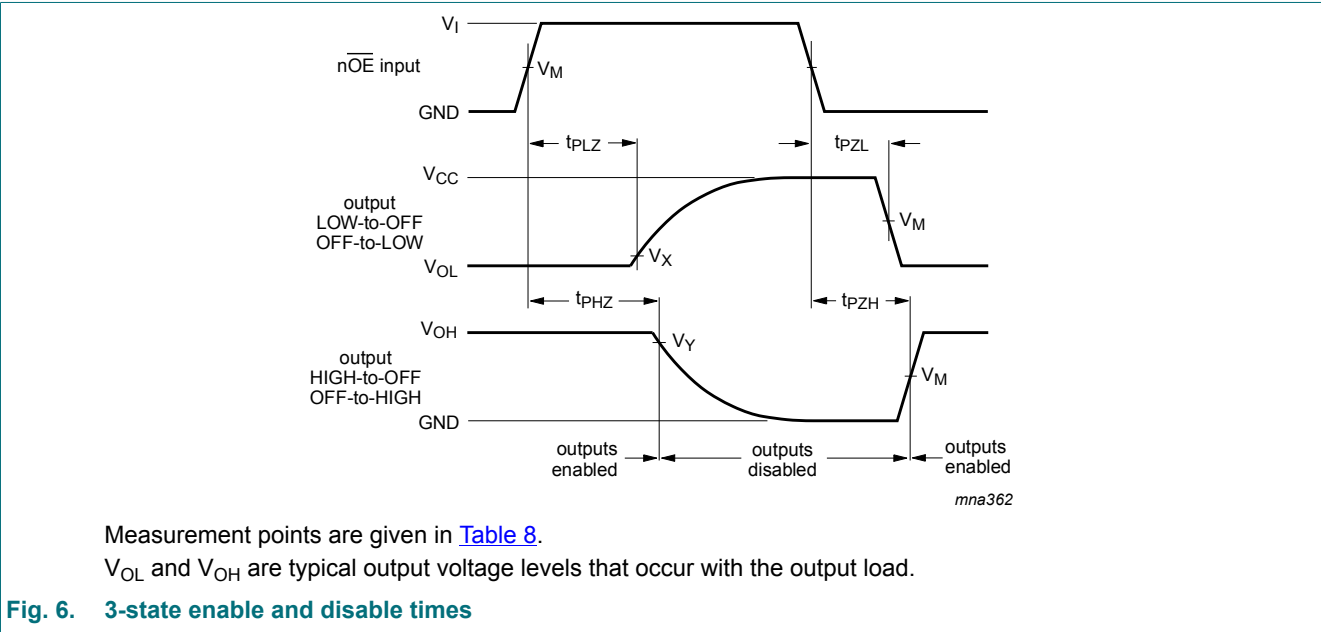
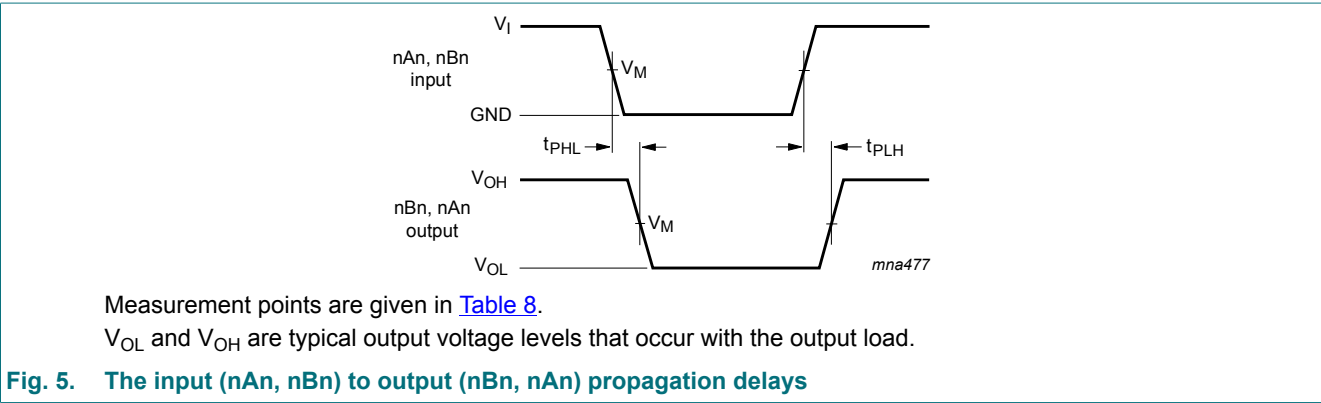
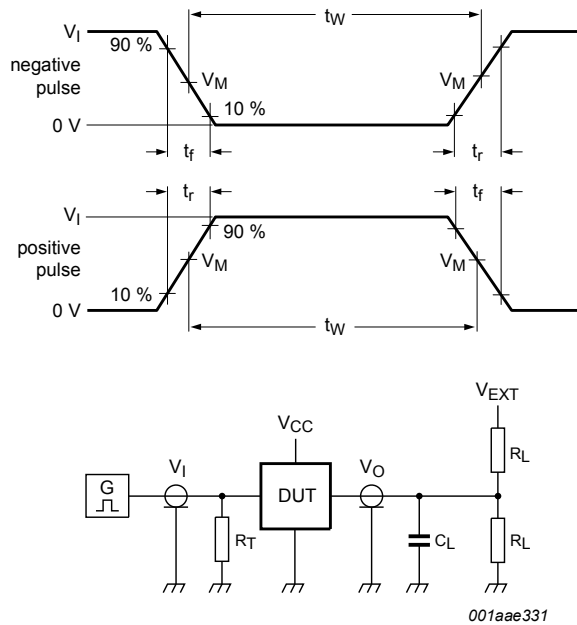


Table 8. Measurement points

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



Test data is given in [Table 9](#).

Definitions for 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. 7. Test circuit for measuring switching times

Table 9. Test data

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

11. Package outline

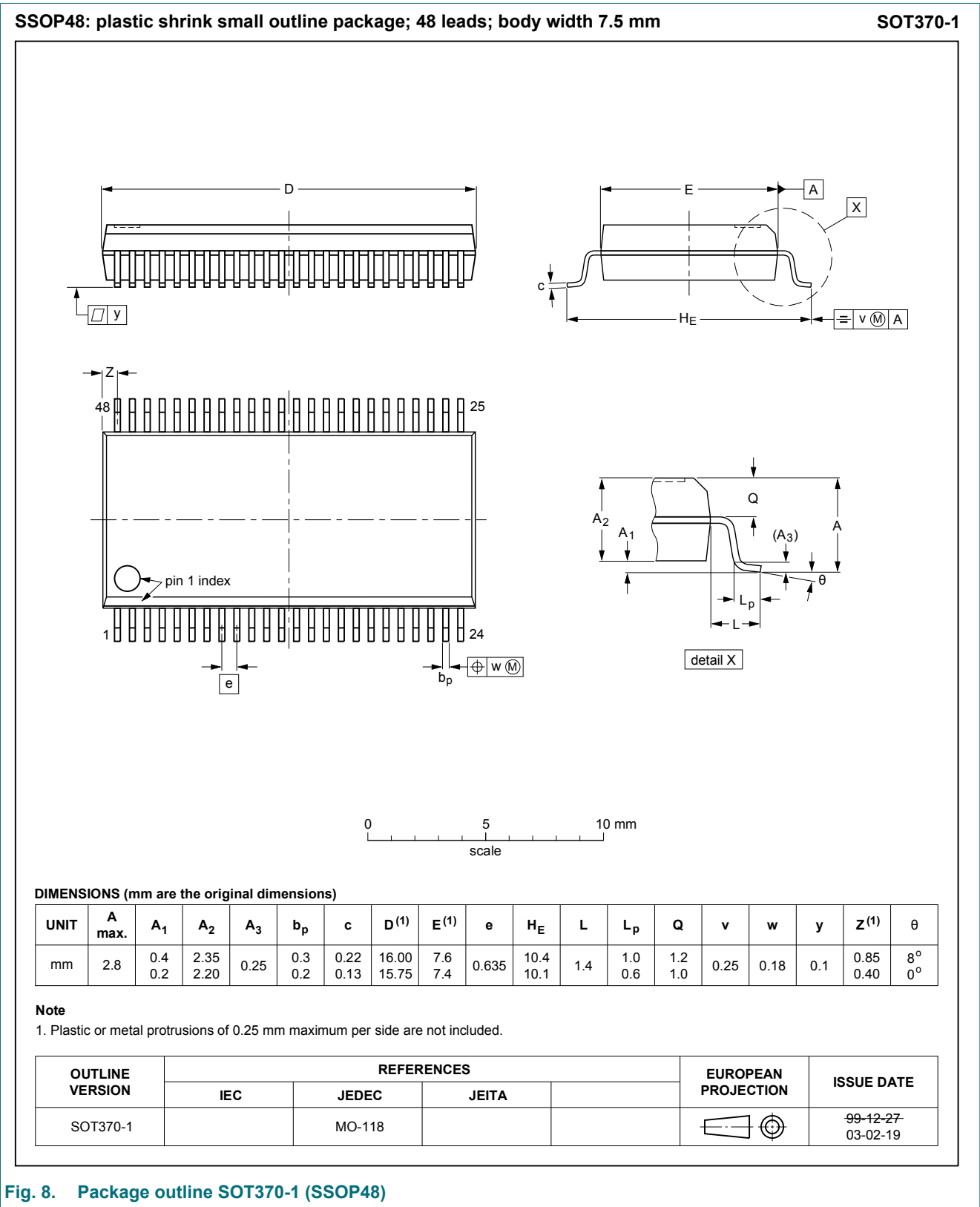
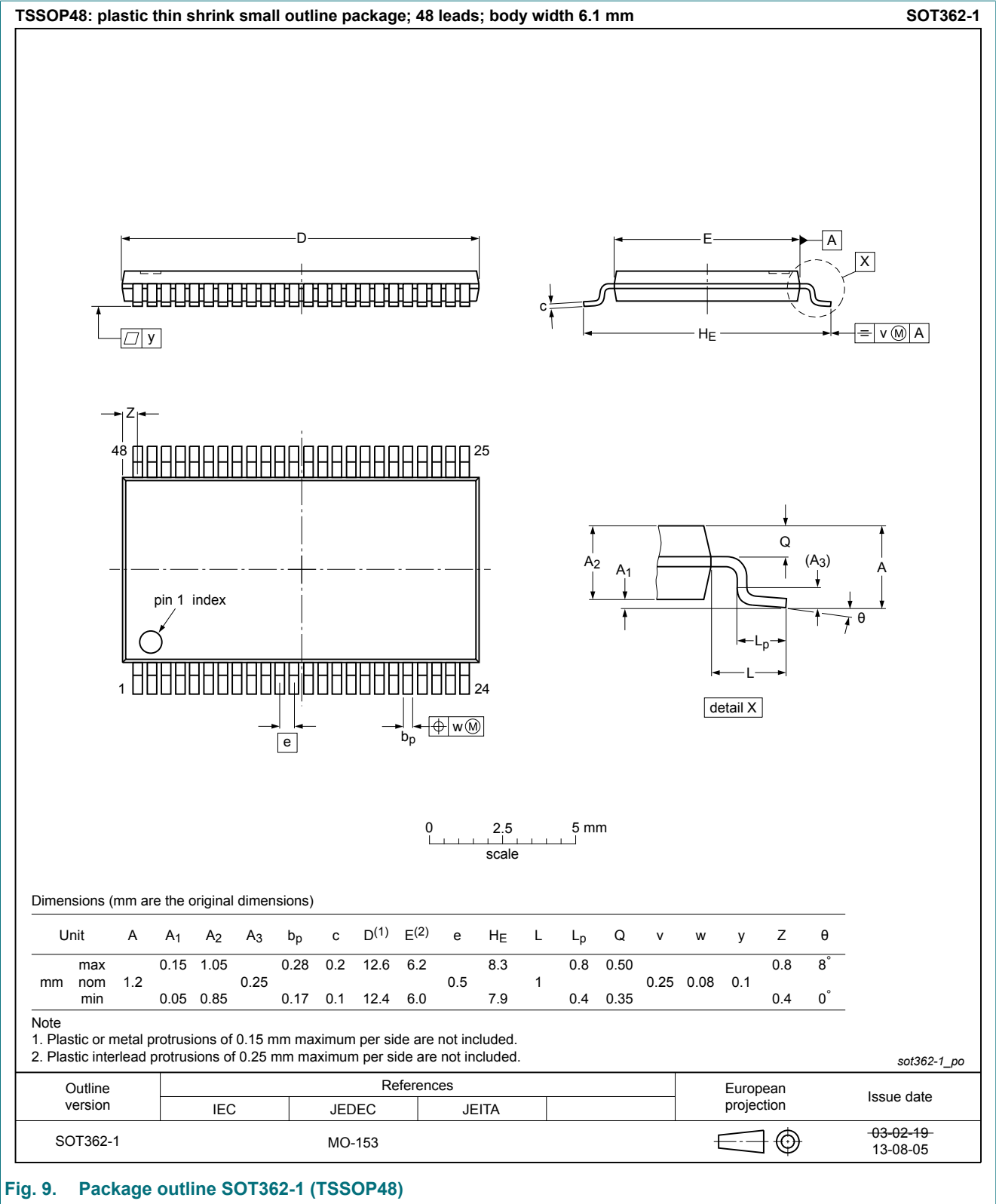
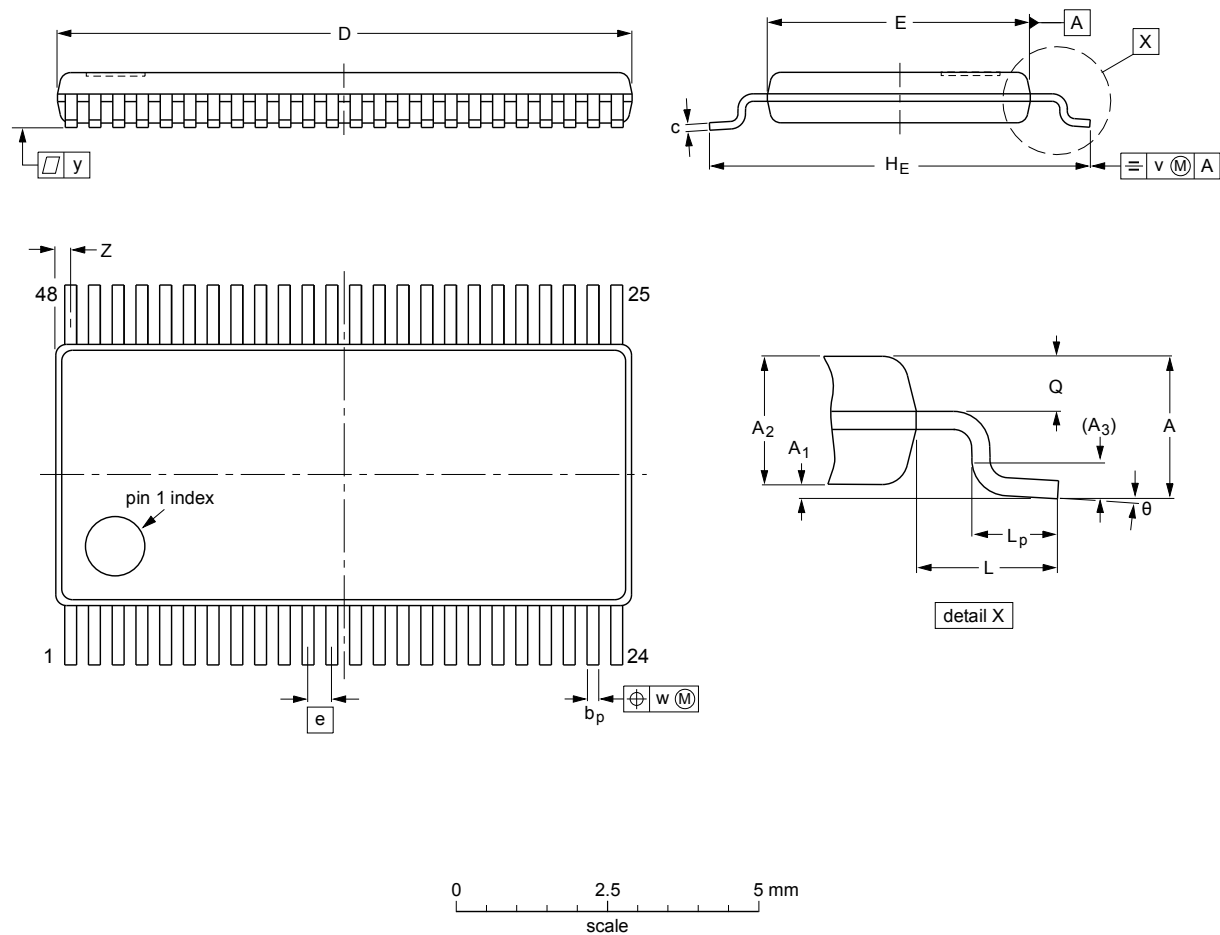


Fig. 8. Package outline SOT370-1 (SSOP48)



TSSOP48: plastic thin shrink small outline package; 48 leads; body width 4.4 mm; lead pitch 0.4 mm

SOT480-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A<br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(2)</sup> | e   | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y    | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|-----|----------------|---|----------------|------------|-----|------|------|------------------|----------|
| mm   | 1.1       | 0.15<br>0.05   | 0.95<br>0.85   | 0.25           | 0.23<br>0.13   | 0.20<br>0.09 | 9.8<br>9.6       | 4.5<br>4.3       | 0.4 | 6.6<br>6.2     | 1 | 0.7<br>0.5     | 0.4<br>0.3 | 0.2 | 0.07 | 0.08 | 0.4<br>0.1       | 8°<br>0° |

- Notes
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
  2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE             |
|--------------------|------------|--------|-------|--|------------------------|------------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                        |
| SOT480-1           |            | MO-153 |       |  |                        | -99-12-27-<br>03-02-18 |

Fig. 10. Package outline SOT480-1 (TSSOP48)

## 12. Abbreviations

Table 10. Abbreviations

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

## 13. Revision history

Table 11. Revision history

| Document ID                        | Release date                                                                                                                                                                                                                                                                                                                                                                                                 | Data sheet status     | Change notice | Supersedes                         |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------------------------------|
| 74LVC_LVCH162245A v.7              | 20190211                                                                                                                                                                                                                                                                                                                                                                                                     | Product data sheet    | -             | 74LVC_LVCH162245A v.6              |
| 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 74LVC162245ADGV and 74LVCH162245ADGV (SOT480-1) added.</li> <li>Package outline drawing <a href="#">SOT362-1</a> (TSSOP48) updated.</li> </ul>          |                       |               |                                    |
| 74LVC_LVCH162245A v.6              | 20111123                                                                                                                                                                                                                                                                                                                                                                                                     | Product data sheet    | -             | 74LVC_LVCH162245A v.5              |
| Modifications:                     | <ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Table 5</a>, <a href="#">Table 6</a>, <a href="#">Table 7</a> and <a href="#">Table 9</a>: values added for lower voltage ranges.</li> </ul> |                       |               |                                    |
| 74LVC_LVCH162245A v.5              | 20031208                                                                                                                                                                                                                                                                                                                                                                                                     | Product specification | -             | 74LVC_H162245A v.4                 |
| 74LVC_H162245A v.4                 | 19980217                                                                                                                                                                                                                                                                                                                                                                                                     | Product specification | -             | 74LVC162245A_<br>74LVCH162245A v.3 |
| 74LVC162245A_<br>74LVCH162245A v.3 | 19980217                                                                                                                                                                                                                                                                                                                                                                                                     | Product specification | -             | 74LVC162245A v.2                   |
| 74LVC162245A v.2                   | 19970801                                                                                                                                                                                                                                                                                                                                                                                                     | Product specification | -             | 74LVC162245A v.1                   |
| 74LVC162245A v.1                   | 19960108                                                                                                                                                                                                                                                                                                                                                                                                     | -                     | -             | -                                  |

## 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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Date of release: 11 February 2019

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