

# 74AVC16T245

16-bit dual supply translating transceiver with configurable voltage translation; 3-state

Rev. 6 — 9 September 2013

Product data sheet

## 1. General description

The 74AVC16T245 is a 16-bit transceiver with bidirectional level voltage translation and 3-state outputs. The device can be used as two 8-bit transceivers or as a 16-bit transceiver. It has dual supplies ( $V_{CC(A)}$  and  $V_{CC(B)}$ ) for voltage translation and four 8-bit input-output ports ( $nA_n$  and  $nB_n$ ) each with its own output enable ( $\overline{nOE}$ ) and send/receive ( $nDIR$ ) input for direction control.  $V_{CC(A)}$  and  $V_{CC(B)}$  can be independently supplied at any voltage between 0.8 V and 3.6 V making the device suitable for low voltage translation between any of the following voltages: 0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V. A HIGH on  $nDIR$  selects transmission from  $nA_n$  to  $nB_n$  while a LOW on  $nDIR$  selects transmission from  $nB_n$  to  $nA_n$ . A HIGH on  $\overline{nOE}$  causes the outputs to assume a high-impedance OFF-state.

The device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing any damaging backflow current through the device when it is powered down. In suspend mode when either  $V_{CC(A)}$  or  $V_{CC(B)}$  are at GND level, both  $nA_n$  and  $nB_n$  are in the high-impedance OFF-state.

## 2. Features and benefits

- Wide supply voltage range:
  - ◆  $V_{CC(A)}$ : 0.8 V to 3.6 V
  - ◆  $V_{CC(B)}$ : 0.8 V to 3.6 V
- Complies with JEDEC standards:
  - ◆ JESD8-12 (0.8 V to 1.3 V)
  - ◆ JESD8-11 (0.9 V to 1.65 V)
  - ◆ JESD8-7 (1.2 V to 1.95 V)
  - ◆ JESD8-5 (1.8 V to 2.7 V)
  - ◆ JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F Class 3B exceeds 8000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101D exceeds 1000 V
- Maximum data rates:
  - ◆ 380 Mbit/s ( $\geq 1.8$  V to 3.3 V translation)
  - ◆ 200 Mbit/s ( $\geq 1.1$  V to 3.3 V translation)
  - ◆ 200 Mbit/s ( $\geq 1.1$  V to 2.5 V translation)
  - ◆ 200 Mbit/s ( $\geq 1.1$  V to 1.8 V translation)
  - ◆ 150 Mbit/s ( $\geq 1.1$  V to 1.5 V translation)

nexperia

- ◆ 100 Mbit/s ( $\geq 1.1\text{ V}$  to  $1.2\text{ V}$  translation)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- $I_{\text{OFF}}$  circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number    | Package                                                         |                        |                                                                                                                                      |           |
|----------------|-----------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                | Temperature range                                               | Name                   | Description                                                                                                                          | Version   |
| 74AVC16T245DGG | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP48                | plastic thin shrink small outline package; 48 leads; body width 6.1 mm                                                               | SOT362-1  |
| 74AVC16T245DGV | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP48 <sup>[1]</sup> | plastic thin shrink small outline package; 48 leads; body width 4.4 mm; lead pitch 0.4 mm                                            | SOT480-1  |
| 74AVC16T245EV  | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | VFBGA56                | plastic very thin fine-pitch ball grid array package; 56 balls; body $4.5 \times 7 \times 0.65\text{ mm}$                            | SOT702-1  |
| 74AVC16T245BX  | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | HXQFN60                | plastic compatible thermal enhanced extremely thin quad flat package; no leads; 60 terminals; body $4 \times 6 \times 0.5\text{ mm}$ | SOT1134-2 |

[1] Also known as TVSOP48.

4. Functional diagram

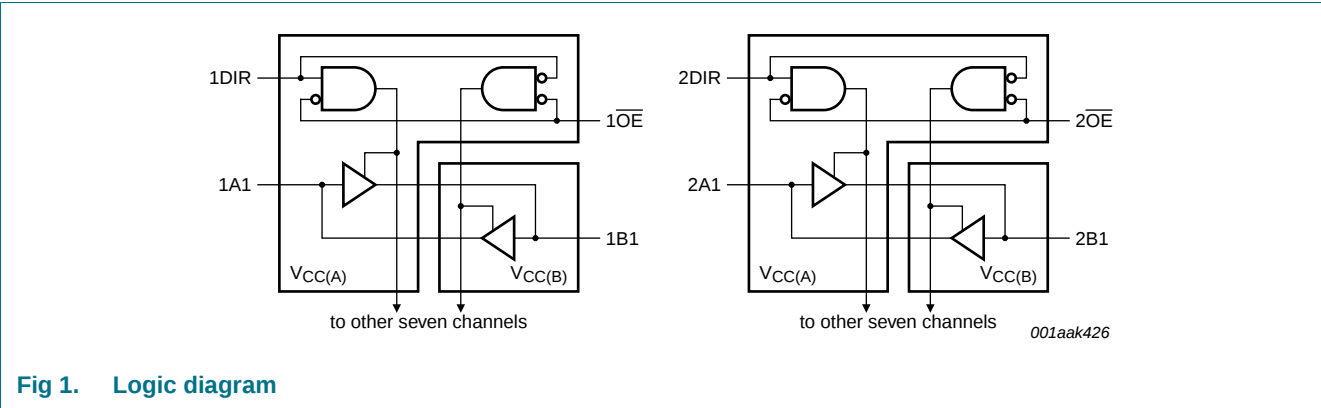


Fig 1. Logic diagram

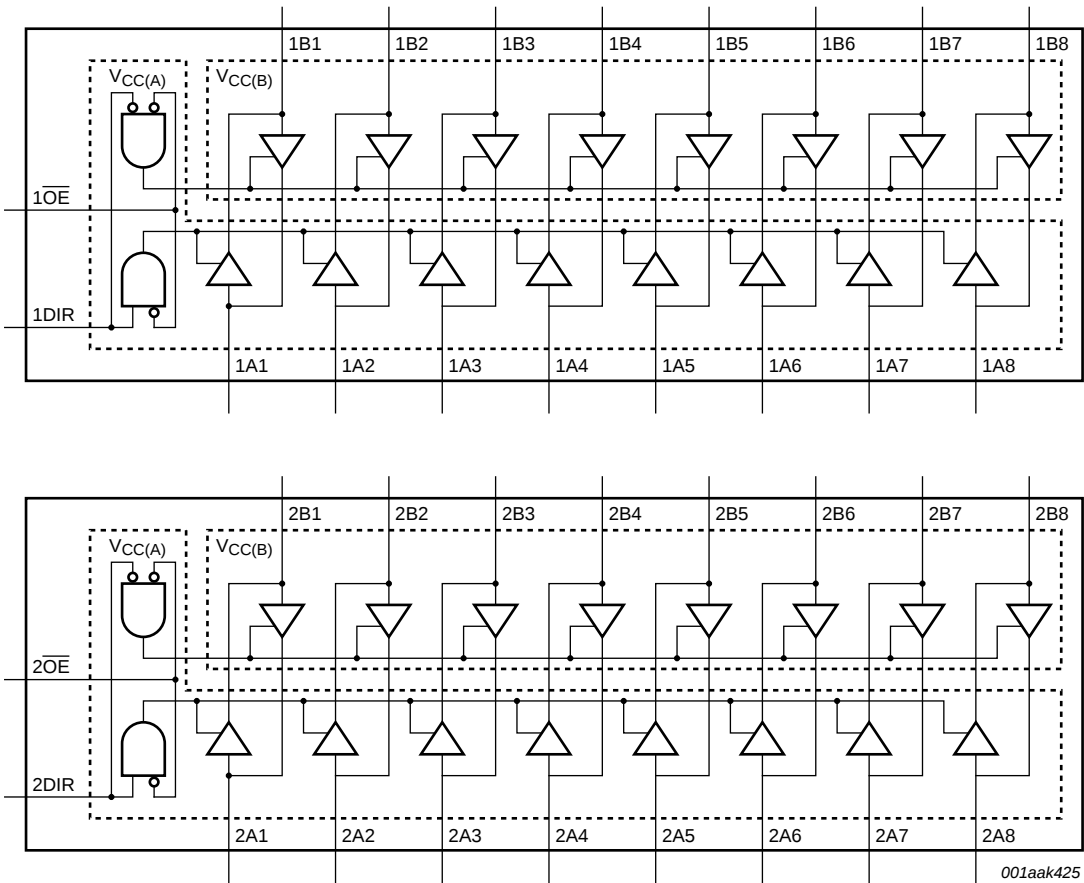
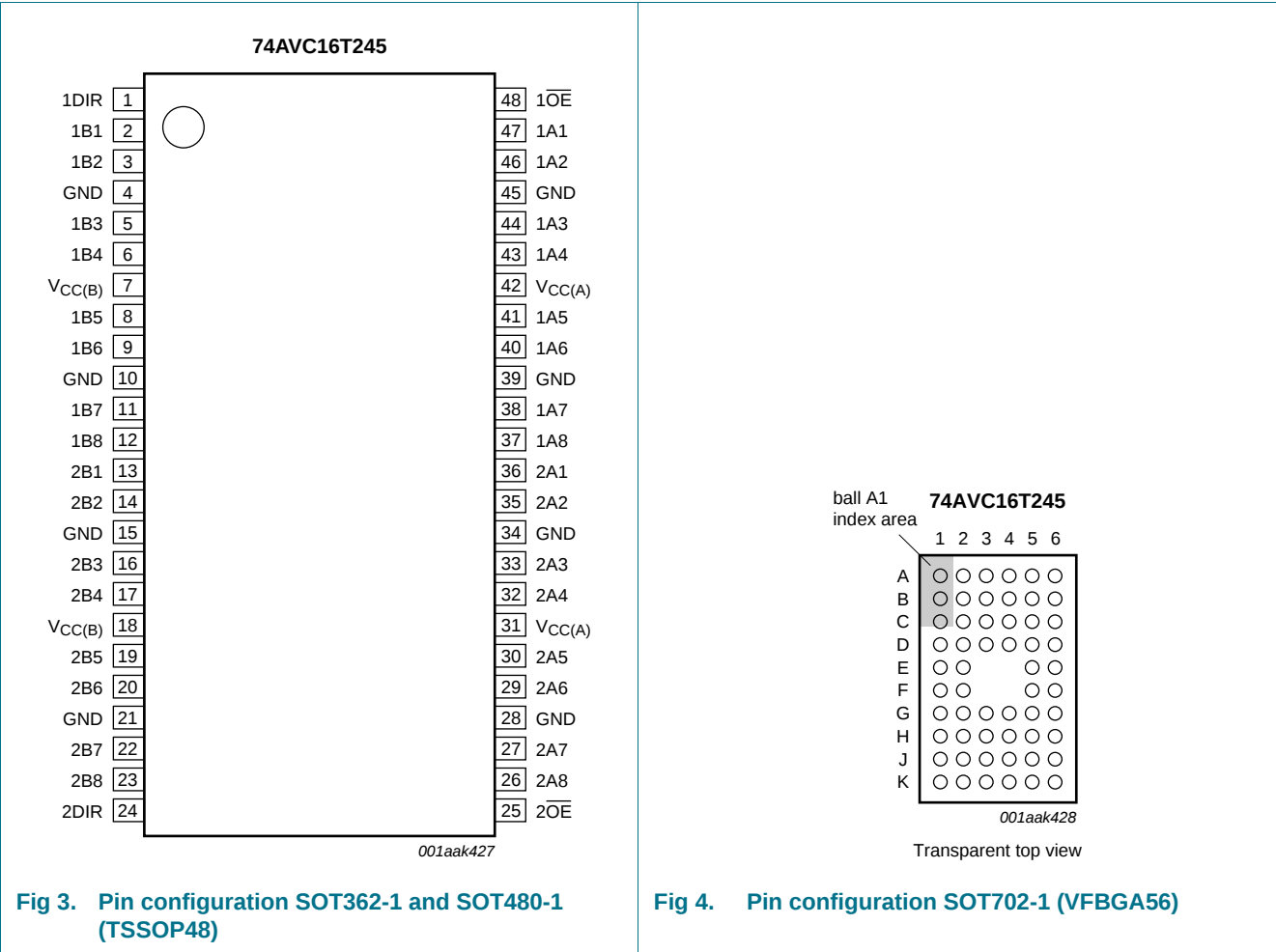
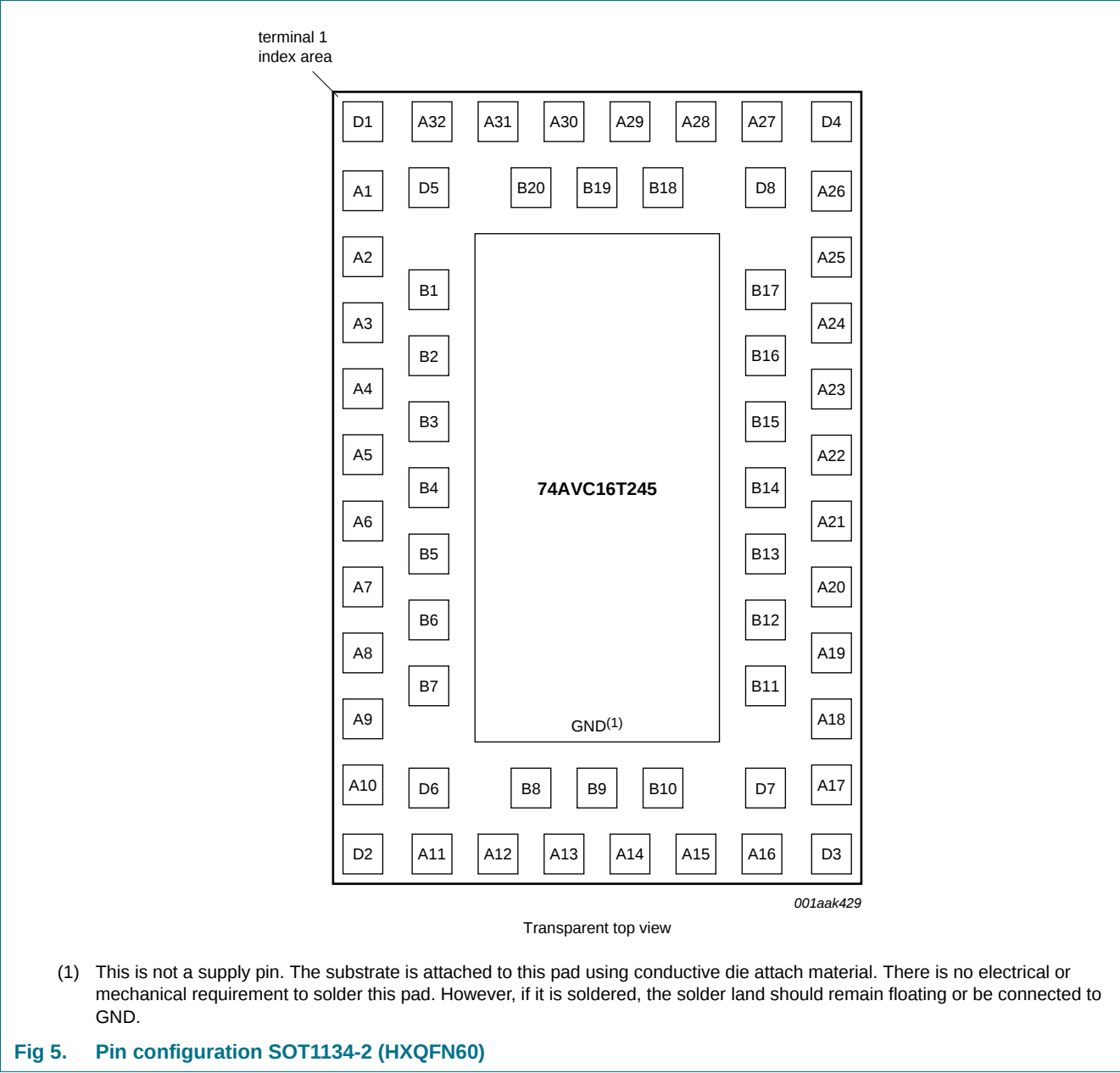


Fig 2. Logic symbol

5. Pinning information

5.1 Pinning





## 5.2 Pin description

**Table 2.** Pin description

| Symbol                              | Pin                            |                                |                                                      | Description                                                                                    |
|-------------------------------------|--------------------------------|--------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------|
|                                     | SOT362-1 and SOT480-1          | SOT702-1                       | SOT1134-2                                            |                                                                                                |
| 1DIR, 2DIR                          | 1, 24                          | A1, K1                         | A30, A13                                             | direction control                                                                              |
| 1B1 to 1B8                          | 2, 3, 5, 6, 8, 9, 11, 12       | B2, B1, C2, C1, D2, D1, E2, E1 | B20, A31, D5, D1, A2, B2, B3, A5                     | data input or output                                                                           |
| 2B1 to 2B8                          | 13, 14, 16, 17, 19, 20, 22, 23 | F1, F2, G1, G2, H1, H2, J1, J2 | A6, B5, B6, A9, D2, D6, A12, B8                      | data input or output                                                                           |
| GND <sup>[1]</sup>                  | 4, 10, 15, 21, 28, 34, 39, 45  | B3, D3, G3, J3, J4, G4, D4, B4 | A32, A3, A8, A11, A16, A19, A24, A27                 | ground (0 V)                                                                                   |
| V <sub>CC(B)</sub>                  | 7, 18                          | C3, H3                         | A1, A10                                              | supply voltage B (nBn inputs are referenced to V <sub>CC(B)</sub> )                            |
| $\overline{1OE}$ , $\overline{2OE}$ | 48, 25                         | A6, K6                         | A29, A14                                             | output enable input (active LOW)                                                               |
| 1A1 to 1A8                          | 47, 46, 44, 43, 41, 40, 38, 37 | B5, B6, C5, C6, D5, D6, E5, E6 | B18, A28, D8, D4, A25, B16, B15, A22                 | data input or output                                                                           |
| 2A1 to 2A8                          | 36, 35, 33, 32, 30, 29, 27, 26 | F6, F5, G6, G5, H6, H5, J6, J5 | A21, B13, B12, A18, D3, D7, A15, B10                 | data input or output                                                                           |
| V <sub>CC(A)</sub>                  | 31, 42                         | C4, H4                         | A17, A26                                             | supply voltage A (nAn, $\overline{nOE}$ and nDIR inputs are referenced to V <sub>CC(A)</sub> ) |
| n.c.                                | -                              | A2, A3, A4, A5, K2, K3, K4, K5 | A4, A7, A20, A23, B1, B4, B7, B9, B11, B14, B17, B19 | not connected                                                                                  |

[1] All GND pins must be connected to ground (0 V).

## 6. Functional description

**Table 3.** Function table<sup>[1]</sup>

| Supply voltage     | Input                           |                     | Input/output <sup>[3]</sup> |                    |
|--------------------|---------------------------------|---------------------|-----------------------------|--------------------|
|                    | $\overline{nOE}$ <sup>[2]</sup> | nDIR <sup>[2]</sup> | nAn <sup>[2]</sup>          | nBn <sup>[2]</sup> |
| 0.8 V to 3.6 V     | L                               | L                   | nAn = nBn                   | input              |
| 0.8 V to 3.6 V     | L                               | H                   | input                       | nBn = nAn          |
| 0.8 V to 3.6 V     | H                               | X                   | Z                           | Z                  |
| GND <sup>[3]</sup> | X                               | X                   | Z                           | Z                  |

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

[2] The nAn, nDIR and  $\overline{nOE}$  input circuit is referenced to V<sub>CC(A)</sub>; The nBn input circuit is referenced to V<sub>CC(B)</sub>.

[3] If at least one of V<sub>CC(A)</sub> or V<sub>CC(B)</sub> is at GND level, the device goes into suspend mode.

## 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 |
|-------------|-------------------------|------------------------------------|----------------|-----------------|------|
| $V_{CC(A)}$ | supply voltage A        |                                    | -0.5           | +4.6            | V    |
| $V_{CC(B)}$ | supply voltage B        |                                    | -0.5           | +4.6            | V    |
| $I_{IK}$    | input clamping current  | $V_I < 0$ V                        | -50            | -               | mA   |
| $V_I$       | input voltage           |                                    | [1] -0.5       | +4.6            | V    |
| $I_{OK}$    | output clamping current | $V_O < 0$ V                        | -50            | -               | mA   |
| $V_O$       | output voltage          | Active mode                        | [1][2][3] -0.5 | $V_{CCO} + 0.5$ | V    |
|             |                         | Suspend or 3-state mode            | [1] -0.5       | +4.6            | V    |
| $I_O$       | output current          | $V_O = 0$ V to $V_{CCO}$           | [2] -          | $\pm 50$        | mA   |
| $I_{CC}$    | supply current          | per $V_{CC(A)}$ or $V_{CC(B)}$ pin | -              | 100             | mA   |
| $I_{GND}$   | ground current          | per GND pin                        | -100           | -               | mA   |
| $T_{stg}$   | storage temperature     |                                    | -65            | +150            | °C   |
| $P_{tot}$   | total power dissipation | $T_{amb} = -40$ °C to +125 °C;     |                |                 |      |
|             |                         | TSSOP48 package                    | [4] -          | 500             | mW   |
|             |                         | VFBGA56 package                    | [5] -          | 1000            | mW   |
|             |                         | HXQFN60 package                    | [5] -          | 1000            | mW   |

- [1] The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2]  $V_{CCO}$  is the supply voltage associated with the output port.  
 [3]  $V_{CCO} + 0.5$  V should not exceed 4.6 V.  
 [4] Above 60 °C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.  
 [5] Above 70 °C the value of  $P_{tot}$  derates linearly with 1.8 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions                 | Min   | Max       | Unit |
|---------------------|-------------------------------------|----------------------------|-------|-----------|------|
| $V_{CC(A)}$         | supply voltage A                    |                            | 0.8   | 3.6       | V    |
| $V_{CC(B)}$         | supply voltage B                    |                            | 0.8   | 3.6       | V    |
| $V_I$               | input voltage                       |                            | 0     | 3.6       | V    |
| $V_O$               | output voltage                      | Active mode                | [1] 0 | $V_{CCO}$ | V    |
|                     |                                     | Suspend or 3-state mode    | 0     | 3.6       | V    |
| $T_{amb}$           | ambient temperature                 |                            | -40   | +125      | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CCI} = 0.8$ V to 3.6 V | [2] - | 5         | ns/V |

- [1]  $V_{CCO}$  is the supply voltage associated with the output port.  
 [2]  $V_{CCI}$  is the supply voltage associated with the input port.

## 9. Static characteristics

**Table 6.** Typical static characteristics at  $T_{amb} = 25\text{ }^{\circ}\text{C}$  [1][2]

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

| Symbol    | Parameter                 | Conditions                                                                                                                         | Min | Typ         | Max        | Unit                    |
|-----------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|------------|-------------------------|
| $V_{OH}$  | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$<br>$I_O = -1.5\text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$                                      | -   | 0.69        | -          | V                       |
| $V_{OL}$  | LOW-level output voltage  | $V_I = V_{IH}$ or $V_{IL}$<br>$I_O = 1.5\text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$                                       | -   | 0.07        | -          | V                       |
| $I_I$     | input leakage current     | nDIR, $\overline{nOE}$ input; $V_I = 0\text{ V}$ or $3.6\text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$ to $3.6\text{ V}$   | -   | $\pm 0.025$ | $\pm 0.25$ | $\mu\text{A}$           |
| $I_{OZ}$  | OFF-state output current  | A or B port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.6\text{ V}$                                           | [3] | -           | $\pm 0.5$  | $\pm 2.5$ $\mu\text{A}$ |
|           |                           | suspend mode A port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = 3.6\text{ V}$ ; $V_{CC(B)} = 0\text{ V}$                    | [3] | -           | $\pm 0.5$  | $\pm 2.5$ $\mu\text{A}$ |
|           |                           | suspend mode B port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = 0\text{ V}$ ; $V_{CC(B)} = 3.6\text{ V}$                    | [3] | -           | $\pm 0.5$  | $\pm 2.5$ $\mu\text{A}$ |
| $I_{OFF}$ | power-off leakage current | A port; $V_I$ or $V_O = 0\text{ V}$ to $3.6\text{ V}$ ;<br>$V_{CC(A)} = 0\text{ V}$ ; $V_{CC(B)} = 0.8\text{ V}$ to $3.6\text{ V}$ | -   | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$           |
|           |                           | B port; $V_I$ or $V_O = 0\text{ V}$ to $3.6\text{ V}$ ;<br>$V_{CC(B)} = 0\text{ V}$ ; $V_{CC(A)} = 0.8\text{ V}$ to $3.6\text{ V}$ | -   | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$           |
| $C_I$     | input capacitance         | nDIR, $\overline{nOE}$ input; $V_I = 0\text{ V}$ or $3.3\text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$                     | -   | 2.0         | -          | pF                      |
| $C_{I/O}$ | input/output capacitance  | A and B port; $V_O = 3.3\text{ V}$ or $0\text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$                                     | -   | 4.5         | -          | pF                      |

[1]  $V_{CCO}$  is the supply voltage associated with the output port.

[2]  $V_{CCI}$  is the supply voltage associated with the data input port.

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

**Table 7.** Static characteristics [1][2]

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              | Max | Min               | Max |      |
| $V_{IH}$ | HIGH-level input voltage     | data input                                    |                  |     |                   |     |      |
|          |                              | $V_{CCI} = 0.8\text{ V}$                      | $0.70V_{CCI}$    | -   | $0.70V_{CCI}$     | -   | V    |
|          |                              | $V_{CCI} = 1.1\text{ V}$ to $1.95\text{ V}$   | $0.65V_{CCI}$    | -   | $0.65V_{CCI}$     | -   | V    |
|          |                              | $V_{CCI} = 2.3\text{ V}$ to $2.7\text{ V}$    | 1.6              | -   | 1.6               | -   | V    |
|          |                              | $V_{CCI} = 3.0\text{ V}$ to $3.6\text{ V}$    | 2                | -   | 2                 | -   | V    |
|          | nDIR, $\overline{nOE}$ input |                                               |                  |     |                   |     |      |
|          |                              | $V_{CC(A)} = 0.8\text{ V}$                    | $0.70V_{CC(A)}$  | -   | $0.70V_{CC(A)}$   | -   | V    |
|          |                              | $V_{CC(A)} = 1.1\text{ V}$ to $1.95\text{ V}$ | $0.65V_{CC(A)}$  | -   | $0.65V_{CC(A)}$   | -   | V    |
|          |                              | $V_{CC(A)} = 2.3\text{ V}$ to $2.7\text{ V}$  | 1.6              | -   | 1.6               | -   | V    |
|          |                              | $V_{CC(A)} = 3.0\text{ V}$ to $3.6\text{ V}$  | 2                | -   | 2                 | -   | V    |

**Table 7.** Static characteristics ...continued<sup>[1][2]</sup>

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              | Max             | Min               | Max             |               |
| $V_{IL}$ | LOW-level input voltage   | data input                                                                                                                         |                  |                 |                   |                 |               |
|          |                           | $V_{CCI} = 0.8 \text{ V}$                                                                                                          | -                | $0.30V_{CCI}$   | -                 | $0.30V_{CCI}$   | V             |
|          |                           | $V_{CCI} = 1.1 \text{ V to } 1.95 \text{ V}$                                                                                       | -                | $0.35V_{CCI}$   | -                 | $0.35V_{CCI}$   | V             |
|          |                           | $V_{CCI} = 2.3 \text{ V to } 2.7 \text{ V}$                                                                                        | -                | 0.7             | -                 | 0.7             | V             |
|          |                           | $V_{CCI} = 3.0 \text{ V to } 3.6 \text{ V}$                                                                                        | -                | 0.8             | -                 | 0.8             | V             |
|          |                           | nDIR, $\overline{nOE}$ input                                                                                                       |                  |                 |                   |                 |               |
|          |                           | $V_{CC(A)} = 0.8 \text{ V}$                                                                                                        | -                | $0.30V_{CC(A)}$ | -                 | $0.30V_{CC(A)}$ | V             |
|          |                           | $V_{CC(A)} = 1.1 \text{ V to } 1.95 \text{ V}$                                                                                     | -                | $0.35V_{CC(A)}$ | -                 | $0.35V_{CC(A)}$ | V             |
|          |                           | $V_{CC(A)} = 2.3 \text{ V to } 2.7 \text{ V}$                                                                                      | -                | 0.7             | -                 | 0.7             | V             |
|          |                           | $V_{CC(A)} = 3.0 \text{ V to } 3.6 \text{ V}$                                                                                      | -                | 0.8             | -                 | 0.8             | V             |
| $V_{OH}$ | HIGH-level output voltage | $V_I = V_{IH} \text{ or } V_{IL}$                                                                                                  |                  |                 |                   |                 |               |
|          |                           | $I_O = -100 \mu\text{A}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$                                            | $V_{CCO} - 0.1$  | -               | $V_{CCO} - 0.1$   | -               | V             |
|          |                           | $I_O = -3 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.1 \text{ V}$                                                                 | 0.85             | -               | 0.85              | -               | V             |
|          |                           | $I_O = -6 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.4 \text{ V}$                                                                 | 1.05             | -               | 1.05              | -               | V             |
|          |                           | $I_O = -8 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.65 \text{ V}$                                                                | 1.2              | -               | 1.2               | -               | V             |
|          |                           | $I_O = -9 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 2.3 \text{ V}$                                                                 | 1.75             | -               | 1.75              | -               | V             |
|          |                           | $I_O = -12 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.0 \text{ V}$                                                                | 2.3              | -               | 2.3               | -               | V             |
| $V_{OL}$ | LOW-level output voltage  | $V_I = V_{IH} \text{ or } V_{IL}$                                                                                                  |                  |                 |                   |                 |               |
|          |                           | $I_O = 100 \mu\text{A}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$                                             | -                | 0.1             | -                 | 0.1             | V             |
|          |                           | $I_O = 3 \text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 1.1 \text{ V}$                                                                     | -                | 0.25            | -                 | 0.25            | V             |
|          |                           | $I_O = 6 \text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 1.4 \text{ V}$                                                                     | -                | 0.35            | -                 | 0.35            | V             |
|          |                           | $I_O = 8 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.65 \text{ V}$                                                                 | -                | 0.45            | -                 | 0.45            | V             |
|          |                           | $I_O = 9 \text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 2.3 \text{ V}$                                                                     | -                | 0.55            | -                 | 0.55            | V             |
|          |                           | $I_O = 12 \text{ mA}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.0 \text{ V}$                                                                 | -                | 0.7             | -                 | 0.7             | V             |
| $I_I$    | input leakage current     | nDIR, $\overline{nOE}$ input; $V_I = 0 \text{ V or } 3.6 \text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$ | -                | $\pm 1$         | -                 | $\pm 5$         | $\mu\text{A}$ |
| $I_{OZ}$ | OFF-state output current  | A or B port; $V_O = 0 \text{ V or } V_{CCO}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.6 \text{ V}$                                          | <sup>[3]</sup>   | $\pm 5$         | -                 | $\pm 30$        | $\mu\text{A}$ |
|          |                           | suspend mode A port;<br>$V_O = 0 \text{ V or } V_{CCO}$ ; $V_{CC(A)} = 3.6 \text{ V}$ ;<br>$V_{CC(B)} = 0 \text{ V}$               | <sup>[3]</sup>   | $\pm 5$         | -                 | $\pm 30$        | $\mu\text{A}$ |
|          |                           | suspend mode B port;<br>$V_O = 0 \text{ V or } V_{CCO}$ ; $V_{CC(A)} = 0 \text{ V}$ ;<br>$V_{CC(B)} = 3.6 \text{ V}$               | <sup>[3]</sup>   | $\pm 5$         | -                 | $\pm 30$        | $\mu\text{A}$ |

**Table 7.** Static characteristics ...continued<sup>[1][2]</sup>

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              | Max | Min               | Max |      |
| $I_{OFF}$ | power-off leakage current | A port; $V_I$ or $V_O = 0$ V to 3.6 V;<br>$V_{CC(A)} = 0$ V; $V_{CC(B)} = 0.8$ V to 3.6 V                                                              | -                | ±5  | -                 | ±30 | μA   |
|           |                           | B port; $V_I$ or $V_O = 0$ V to 3.6 V;<br>$V_{CC(B)} = 0$ V; $V_{CC(A)} = 0.8$ V to 3.6 V                                                              | -                | ±5  | -                 | ±30 | μA   |
| $I_{CC}$  | supply current            | A port; $V_I = 0$ V or $V_{CCI}$ ; $I_O = 0$ A                                                                                                         |                  |     |                   |     |      |
|           |                           | $V_{CC(A)} = 0.8$ V to 3.6 V;<br>$V_{CC(B)} = 0.8$ V to 3.6 V                                                                                          | -                | 30  | -                 | 125 | μA   |
|           |                           | $V_{CC(A)} = 1.1$ V to 3.6 V;<br>$V_{CC(B)} = 1.1$ V to 3.6 V                                                                                          | -                | 25  | -                 | 100 | μA   |
|           |                           | $V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V                                                                                                                 | -                | 25  | -                 | 100 | μA   |
|           |                           | $V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V                                                                                                                 | -5               | -   | -20               | -   | μA   |
|           |                           | B port; $V_I = 0$ V or $V_{CCI}$ ; $I_O = 0$ A                                                                                                         |                  |     |                   |     |      |
|           |                           | $V_{CC(A)} = 0.8$ V to 3.6 V;<br>$V_{CC(B)} = 0.8$ V to 3.6 V                                                                                          | -                | 30  | -                 | 125 | μA   |
|           |                           | $V_{CC(A)} = 1.1$ V to 3.6 V;<br>$V_{CC(B)} = 1.1$ V to 3.6 V                                                                                          | -                | 25  | -                 | 100 | μA   |
|           |                           | $V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V                                                                                                                 | -5               | -   | -20               | -   | μA   |
|           |                           | $V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V                                                                                                                 | -                | 25  | -                 | 100 | μA   |
|           |                           | A plus B port ( $I_{CC(A)} + I_{CC(B)}$ );<br>$I_O = 0$ A; $V_I = 0$ V or $V_{CCI}$ ;<br>$V_{CC(A)} = 0.8$ V to 3.6 V;<br>$V_{CC(B)} = 0.8$ V to 3.6 V | -                | 55  | -                 | 185 | μA   |
|           |                           | A plus B port ( $I_{CC(A)} + I_{CC(B)}$ );<br>$I_O = 0$ A; $V_I = 0$ V or $V_{CCI}$ ;<br>$V_{CC(A)} = 1.1$ V to 3.6 V;<br>$V_{CC(B)} = 1.1$ V to 3.6 V | -                | 45  | -                 | 150 | μA   |

[1]  $V_{CCO}$  is the supply voltage associated with the output port.[2]  $V_{CCI}$  is the supply voltage associated with the data input port.[3] For I/O ports, the parameter  $I_{OZ}$  includes the input leakage current.**Table 8.** Typical total supply current ( $I_{CC(A)} + I_{CC(B)}$ )

| $V_{CC(A)}$ | $V_{CC(B)}$ |       |       |       |       |       |       | Unit |
|-------------|-------------|-------|-------|-------|-------|-------|-------|------|
|             | 0 V         | 0.8 V | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V |      |
| 0 V         | 0           | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | μA   |
| 0.8 V       | 0.1         | 0.1   | 0.1   | 0.1   | 0.1   | 0.3   | 1.6   | μA   |
| 1.2 V       | 0.1         | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.8   | μA   |
| 1.5 V       | 0.1         | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.4   | μA   |
| 1.8 V       | 0.1         | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.2   | μA   |
| 2.5 V       | 0.1         | 0.3   | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | μA   |
| 3.3 V       | 0.1         | 1.6   | 0.8   | 0.4   | 0.2   | 0.1   | 0.1   | μA   |

## 10. Dynamic characteristics

**Table 9.** Typical power dissipation capacitance at  $V_{CC(A)} = V_{CC(B)}$  and  $T_{amb} = 25\text{ °C}$  [1][2]

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

| Symbol   | Parameter                     | Conditions                                      | $V_{CC(A)} = V_{CC(B)}$ |       |       |       |       |       | Unit |
|----------|-------------------------------|-------------------------------------------------|-------------------------|-------|-------|-------|-------|-------|------|
|          |                               |                                                 | 0.8 V                   | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V |      |
| $C_{PD}$ | power dissipation capacitance | A port: (direction nAn to nBn); output enabled  | 0.2                     | 0.2   | 0.2   | 0.2   | 0.3   | 0.4   | pF   |
|          |                               | A port: (direction nAn to nBn); output disabled | 0.2                     | 0.2   | 0.2   | 0.2   | 0.3   | 0.4   | pF   |
|          |                               | A port: (direction nBn to nAn); output enabled  | 9                       | 9.7   | 9.8   | 10.3  | 11.7  | 13.7  | pF   |
|          |                               | A port: (direction nBn to nAn); output disabled | 0.6                     | 0.6   | 0.6   | 0.7   | 0.7   | 0.7   | pF   |
|          |                               | B port: (direction nAn to nBn); output enabled  | 9                       | 9.7   | 9.8   | 10.3  | 11.7  | 13.7  | pF   |
|          |                               | B port: (direction nAn to nBn); output disabled | 0.6                     | 0.6   | 0.6   | 0.7   | 0.7   | 0.7   | pF   |
|          |                               | B port: (direction nBn to nAn); output enabled  | 0.2                     | 0.2   | 0.2   | 0.2   | 0.3   | 0.4   | pF   |
|          |                               | B port: (direction nBn to nAn); output disabled | 0.2                     | 0.2   | 0.2   | 0.2   | 0.3   | 0.4   | pF   |

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

[2]  $f_i = 10\text{ MHz}$ ;  $V_i = \text{GND to } V_{CC}$ ;  $t_r = t_f = 1\text{ ns}$ ;  $C_L = 0\text{ pF}$ ;  $R_L = \infty\text{ }\Omega$ .

**Table 10.** Typical dynamic characteristics at  $V_{CC(A)} = 0.8\text{ V}$  and  $T_{amb} = 25\text{ °C}$  [\[1\]](#)Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#); for wave forms see [Figure 6](#) and [Figure 7](#)

| Symbol    | Parameter         | Conditions              | $V_{CC(B)}$ |       |       |       |       |       | Unit |
|-----------|-------------------|-------------------------|-------------|-------|-------|-------|-------|-------|------|
|           |                   |                         | 0.8 V       | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 14.4        | 7.0   | 6.2   | 6.0   | 5.9   | 6.0   | ns   |
|           |                   | nBn to nAn              | 14.4        | 12.4  | 12.1  | 11.9  | 11.8  | 11.8  | ns   |
| $t_{dis}$ | disable time      | $\overline{nOE}$ to nAn | 16.2        | 16.2  | 16.2  | 16.2  | 16.2  | 16.2  | ns   |
|           |                   | $\overline{nOE}$ to nBn | 17.6        | 10.0  | 9.0   | 9.1   | 8.7   | 9.3   | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 21.9        | 21.9  | 21.9  | 21.9  | 21.9  | 21.9  | ns   |
|           |                   | $\overline{nOE}$ to nBn | 22.2        | 11.1  | 9.8   | 9.4   | 9.4   | 9.6   | ns   |

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ ;  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ ;  $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .**Table 11.** Typical dynamic characteristics at  $V_{CC(B)} = 0.8\text{ V}$  and  $T_{amb} = 25\text{ °C}$  [\[1\]](#)Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#); for wave forms see [Figure 6](#) and [Figure 7](#)

| Symbol    | Parameter         | Conditions              | $V_{CC(A)}$ |       |       |       |       |       | Unit |
|-----------|-------------------|-------------------------|-------------|-------|-------|-------|-------|-------|------|
|           |                   |                         | 0.8 V       | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 14.4        | 12.4  | 12.1  | 11.9  | 11.8  | 11.8  | ns   |
|           |                   | nBn to nAn              | 14.4        | 7.0   | 6.2   | 6.0   | 5.9   | 6.0   | ns   |
| $t_{dis}$ | disable time      | $\overline{nOE}$ to nAn | 16.2        | 5.9   | 4.4   | 4.2   | 3.1   | 3.5   | ns   |
|           |                   | $\overline{nOE}$ to nBn | 17.6        | 14.2  | 13.7  | 13.6  | 13.3  | 13.1  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 21.9        | 6.4   | 4.4   | 3.5   | 2.6   | 2.3   | ns   |
|           |                   | $\overline{nOE}$ to nBn | 22.2        | 17.7  | 17.2  | 17.0  | 16.8  | 16.7  | ns   |

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ ;  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ ;  $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .

**Table 12. Dynamic characteristics for temperature range –40 °C to +85 °C [1]**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#); for wave forms see [Figure 6](#) and [Figure 7](#).

| Symbol                                | Parameter         | Conditions                     | V <sub>CC(B)</sub> |      |               |      |                |      |               |      |               |      | Unit |
|---------------------------------------|-------------------|--------------------------------|--------------------|------|---------------|------|----------------|------|---------------|------|---------------|------|------|
|                                       |                   |                                | 1.2 V ± 0.1 V      |      | 1.5 V ± 0.1 V |      | 1.8 V ± 0.15 V |      | 2.5 V ± 0.2 V |      | 3.3 V ± 0.3 V |      |      |
|                                       |                   |                                | Min                | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  |      |
| V <sub>CC(A)</sub> = 1.1 V to 1.3 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 9.2  | 0.5           | 6.9  | 0.5            | 6.0  | 0.5           | 5.1  | 0.5           | 4.9  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 9.2  | 0.5           | 8.7  | 0.5            | 8.5  | 0.5           | 8.2  | 0.5           | 8.0  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 11.6 | 1.5           | 11.6 | 1.5            | 11.6 | 1.5           | 11.6 | 1.5           | 11.6 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 12.5 | 1.5           | 9.7  | 1.5            | 9.5  | 1.0           | 8.1  | 1.0           | 8.9  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 14.5 | 1.0           | 14.5 | 1.0            | 14.5 | 1.0           | 14.5 | 1.0           | 14.5 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.1                | 14.9 | 1.1           | 11.0 | 1.1            | 9.6  | 1.0           | 8.1  | 1.0           | 7.7  | ns   |
| V <sub>CC(A)</sub> = 1.4 V to 1.6 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 8.7  | 0.5           | 6.2  | 0.5            | 5.2  | 0.5           | 4.1  | 0.5           | 3.7  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 6.9  | 0.5           | 6.2  | 0.5            | 5.9  | 0.5           | 5.6  | 0.5           | 5.5  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 9.1  | 1.5           | 9.1  | 1.5            | 9.1  | 1.5           | 9.1  | 1.5           | 9.1  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 11.4 | 1.5           | 8.7  | 1.5            | 7.5  | 1.0           | 6.5  | 1.0           | 6.3  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 10.1 | 1.0           | 10.1 | 1.0            | 10.1 | 1.0           | 10.1 | 1.0           | 10.1 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 13.5 | 1.0           | 10.1 | 0.5            | 8.1  | 0.5           | 5.9  | 0.5           | 5.2  | ns   |
| V <sub>CC(A)</sub> = 1.65 V to 1.95 V |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 8.5  | 0.5           | 5.9  | 0.5            | 4.8  | 0.5           | 3.7  | 0.5           | 3.3  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 6.0  | 0.5           | 5.2  | 0.5            | 4.8  | 0.5           | 4.5  | 0.5           | 4.4  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 7.7  | 1.5           | 7.7  | 1.5            | 7.7  | 1.5           | 7.7  | 1.5           | 7.7  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 11.1 | 1.5           | 8.4  | 1.5            | 7.1  | 1.0           | 5.9  | 1.0           | 5.7  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 7.8  | 1.0           | 7.8  | 1.0            | 7.8  | 1.0           | 7.8  | 1.0           | 7.8  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 13.0 | 1.0           | 9.2  | 0.5            | 7.4  | 0.5           | 5.3  | 0.5           | 4.5  | ns   |
| V <sub>CC(A)</sub> = 2.3 V to 2.7 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 8.2  | 0.5           | 5.6  | 0.5            | 4.6  | 0.5           | 3.3  | 0.5           | 2.8  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 5.1  | 0.5           | 4.1  | 0.5            | 3.7  | 0.5           | 3.4  | 0.5           | 3.2  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.0                | 6.1  | 1.0           | 6.1  | 1.0            | 6.1  | 1.0           | 6.1  | 1.0           | 6.1  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 10.6 | 1.0           | 7.9  | 1.0            | 6.6  | 1.0           | 6.1  | 1.0           | 5.2  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 0.5                | 5.3  | 0.5           | 5.3  | 0.5            | 5.3  | 0.5           | 5.3  | 0.5           | 5.3  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 0.5                | 12.5 | 0.5           | 9.4  | 0.5            | 7.3  | 0.5           | 5.1  | 0.5           | 4.5  | ns   |
| V <sub>CC(A)</sub> = 3.0 V to 3.6 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 8.0  | 0.5           | 5.5  | 0.5            | 4.4  | 0.5           | 3.2  | 0.5           | 2.7  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 4.9  | 0.5           | 3.7  | 0.5            | 3.3  | 0.5           | 2.9  | 0.5           | 2.7  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 0.5                | 5.0  | 0.5           | 5.0  | 0.5            | 5.0  | 0.5           | 5.0  | 0.5           | 5.0  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 10.3 | 1.0           | 7.7  | 1.0            | 6.5  | 1.0           | 5.2  | 0.5           | 5.0  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 0.5                | 4.3  | 0.5           | 4.3  | 0.5            | 4.2  | 0.5           | 4.1  | 0.5           | 4.0  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 0.5                | 12.4 | 0.5           | 9.3  | 0.5            | 7.2  | 0.5           | 4.9  | 0.5           | 4.0  | ns   |

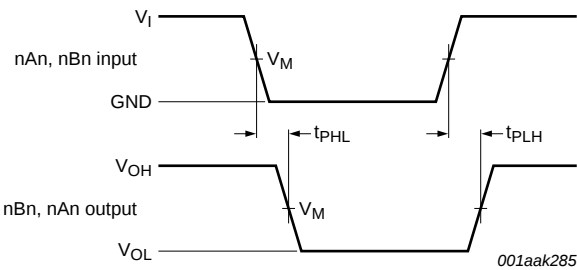
[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>; t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>; t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

**Table 13. Dynamic characteristics for temperature range –40 °C to +125 °C [1]**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#); for wave forms see [Figure 6](#) and [Figure 7](#)

| Symbol                                | Parameter         | Conditions                     | V <sub>CC(B)</sub> |      |               |      |                |      |               |      |               |      | Unit |
|---------------------------------------|-------------------|--------------------------------|--------------------|------|---------------|------|----------------|------|---------------|------|---------------|------|------|
|                                       |                   |                                | 1.2 V ± 0.1 V      |      | 1.5 V ± 0.1 V |      | 1.8 V ± 0.15 V |      | 2.5 V ± 0.2 V |      | 3.3 V ± 0.3 V |      |      |
|                                       |                   |                                | Min                | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  |      |
| V <sub>CC(A)</sub> = 1.1 V to 1.3 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 10.2 | 0.5           | 7.6  | 0.5            | 6.6  | 0.5           | 5.7  | 0.5           | 5.4  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 10.2 | 0.5           | 9.6  | 0.5            | 9.4  | 0.5           | 9.1  | 0.5           | 8.8  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 12.8 | 1.5           | 12.8 | 1.5            | 12.8 | 1.5           | 12.8 | 1.5           | 12.8 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 13.8 | 1.5           | 10.7 | 1.5            | 10.5 | 1.0           | 9.0  | 1.5           | 9.8  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 16.0 | 1.0           | 16.0 | 1.0            | 16.0 | 1.0           | 16.0 | 1.0           | 16.0 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.1                | 16.4 | 1.1           | 12.1 | 1.1            | 10.6 | 1.0           | 9.0  | 1.0           | 8.5  | ns   |
| V <sub>CC(A)</sub> = 1.4 V to 1.6 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 9.6  | 0.5           | 6.9  | 0.5            | 5.8  | 0.5           | 4.6  | 0.5           | 4.1  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 7.6  | 0.5           | 6.9  | 0.5            | 6.5  | 0.5           | 6.2  | 0.5           | 6.1  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 10.1 | 1.5           | 10.1 | 1.5            | 10.1 | 1.5           | 10.1 | 1.5           | 10.1 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 12.6 | 1.5           | 9.6  | 1.5            | 8.3  | 1.0           | 7.2  | 1.0           | 7.0  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 11.2 | 1.0           | 11.2 | 1.0            | 11.2 | 1.0           | 11.2 | 1.0           | 11.2 | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 14.9 | 1.0           | 11.2 | 0.5            | 9.0  | 0.5           | 6.5  | 0.5           | 5.8  | ns   |
| V <sub>CC(A)</sub> = 1.65 V to 1.95 V |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 9.4  | 0.5           | 6.5  | 0.5            | 5.3  | 0.5           | 4.1  | 0.5           | 3.7  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 6.6  | 0.5           | 5.8  | 0.5            | 5.3  | 0.5           | 5.0  | 0.5           | 4.9  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.5                | 8.5  | 1.5           | 8.5  | 1.5            | 8.5  | 1.5           | 8.5  | 1.5           | 8.5  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.5                | 12.3 | 1.5           | 9.3  | 1.5            | 7.9  | 1.0           | 6.5  | 1.0           | 6.3  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 1.0                | 8.6  | 1.0           | 8.6  | 1.0            | 8.6  | 1.0           | 8.6  | 1.0           | 8.6  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 14.3 | 1.0           | 10.2 | 0.5            | 8.2  | 0.5           | 5.9  | 0.5           | 5.0  | ns   |
| V <sub>CC(A)</sub> = 2.3 V to 2.7 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 9.1  | 0.5           | 6.2  | 0.5            | 5.1  | 0.5           | 3.7  | 0.5           | 3.1  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 5.7  | 0.5           | 4.6  | 0.5            | 4.1  | 0.5           | 3.8  | 0.5           | 3.6  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 1.0                | 6.8  | 1.0           | 6.8  | 1.0            | 6.8  | 1.0           | 6.8  | 1.0           | 6.8  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 11.7 | 1.0           | 8.7  | 1.0            | 7.3  | 1.0           | 6.8  | 1.0           | 5.8  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 0.5                | 5.9  | 0.5           | 5.9  | 0.5            | 5.9  | 0.5           | 5.9  | 0.5           | 5.9  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 0.5                | 13.8 | 0.5           | 10.4 | 0.5            | 8.1  | 0.5           | 5.7  | 0.5           | 5.0  | ns   |
| V <sub>CC(A)</sub> = 3.0 V to 3.6 V   |                   |                                |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                       | propagation delay | nAn to nBn                     | 0.5                | 8.8  | 0.5           | 6.1  | 0.5            | 4.9  | 0.5           | 3.6  | 0.5           | 3.0  | ns   |
|                                       |                   | nBn to nAn                     | 0.5                | 5.4  | 0.5           | 4.1  | 0.5            | 3.7  | 0.5           | 3.2  | 0.5           | 3.0  | ns   |
| t <sub>dis</sub>                      | disable time      | $\overline{\text{nOE}}$ to nAn | 0.5                | 5.5  | 0.5           | 5.5  | 0.5            | 5.5  | 0.5           | 5.5  | 0.5           | 5.5  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 1.0                | 11.4 | 1.0           | 8.5  | 1.0            | 7.2  | 1.0           | 5.8  | 0.5           | 5.5  | ns   |
| t <sub>en</sub>                       | enable time       | $\overline{\text{nOE}}$ to nAn | 0.5                | 4.8  | 0.5           | 4.8  | 0.5            | 4.7  | 0.5           | 4.6  | 0.5           | 4.4  | ns   |
|                                       |                   | $\overline{\text{nOE}}$ to nBn | 0.5                | 13.7 | 0.5           | 10.3 | 0.5            | 8.0  | 0.5           | 5.4  | 0.5           | 4.4  | ns   |

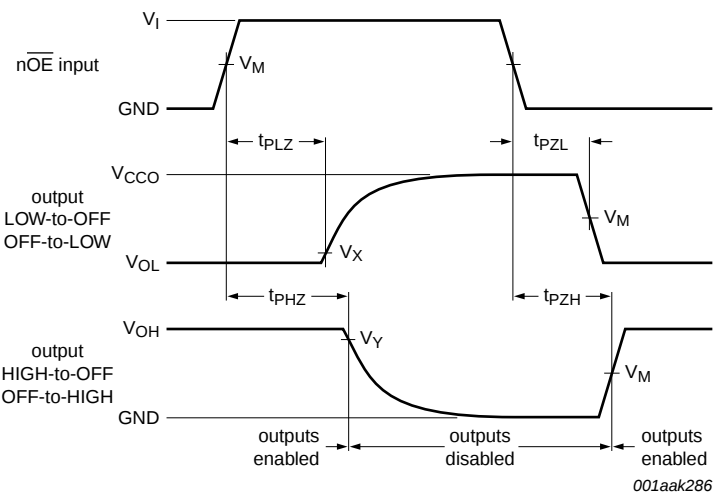
[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>; t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>; t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

11. Waveforms



Measurement points are given in [Table 14](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 6. The data input (nAn, nBn) to output (nBn, nAn) propagation delay times**



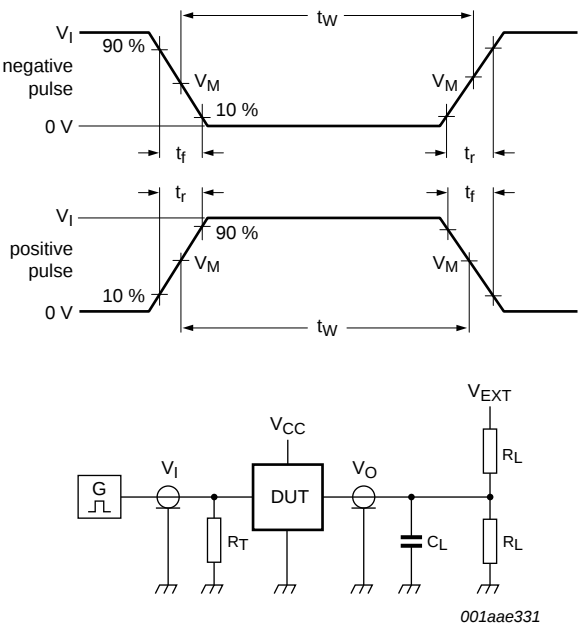
Measurement points are given in [Table 14](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 7. Enable and disable times**

**Table 14. Measurement points**

| Supply voltage         | Input <sup>[1]</sup> | Output <sup>[2]</sup> |                          |                          |
|------------------------|----------------------|-----------------------|--------------------------|--------------------------|
| $V_{CC(A)}, V_{CC(B)}$ | $V_M$                | $V_M$                 | $V_X$                    | $V_Y$                    |
| 0.8 V to 1.6 V         | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.1\text{ V}$  | $V_{OH} - 0.1\text{ V}$  |
| 1.65 V to 2.7 V        | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.15\text{ V}$ | $V_{OH} - 0.15\text{ V}$ |
| 3.0 V to 3.6 V         | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.3\text{ V}$  | $V_{OH} - 0.3\text{ V}$  |

[1]  $V_{CCI}$  is the supply voltage associated with the data input port.  
[2]  $V_{CCO}$  is the supply voltage associated with the output port.



Test data is given in [Table 15](#).  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance.  
 $V_{EXT}$  = External voltage for measuring switching times.

Fig 8. Test circuit for measuring switching times

Table 15. Test data

| Supply voltage         | Input                |                                    | Load  |              | $V_{EXT}$          |                    |                                   |
|------------------------|----------------------|------------------------------------|-------|--------------|--------------------|--------------------|-----------------------------------|
| $V_{CC(A)}, V_{CC(B)}$ | $V_I$ <sup>[1]</sup> | $\Delta t/\Delta V$ <sup>[2]</sup> | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ <sup>[3]</sup> |
| 0.8 V to 1.6 V         | $V_{CCI}$            | $\leq 1.0 \text{ ns/V}$            | 15 pF | 2 k $\Omega$ | open               | GND                | $2V_{CCO}$                        |
| 1.65 V to 2.7 V        | $V_{CCI}$            | $\leq 1.0 \text{ ns/V}$            | 15 pF | 2 k $\Omega$ | open               | GND                | $2V_{CCO}$                        |
| 3.0 V to 3.6 V         | $V_{CCI}$            | $\leq 1.0 \text{ ns/V}$            | 15 pF | 2 k $\Omega$ | open               | GND                | $2V_{CCO}$                        |

[1]  $V_{CCI}$  is the supply voltage associated with the data input port.  
[2]  $dV/dt \geq 1.0 \text{ V/ns}$   
[3]  $V_{CCO}$  is the supply voltage associated with the output port.

12. Typical propagation delay characteristics

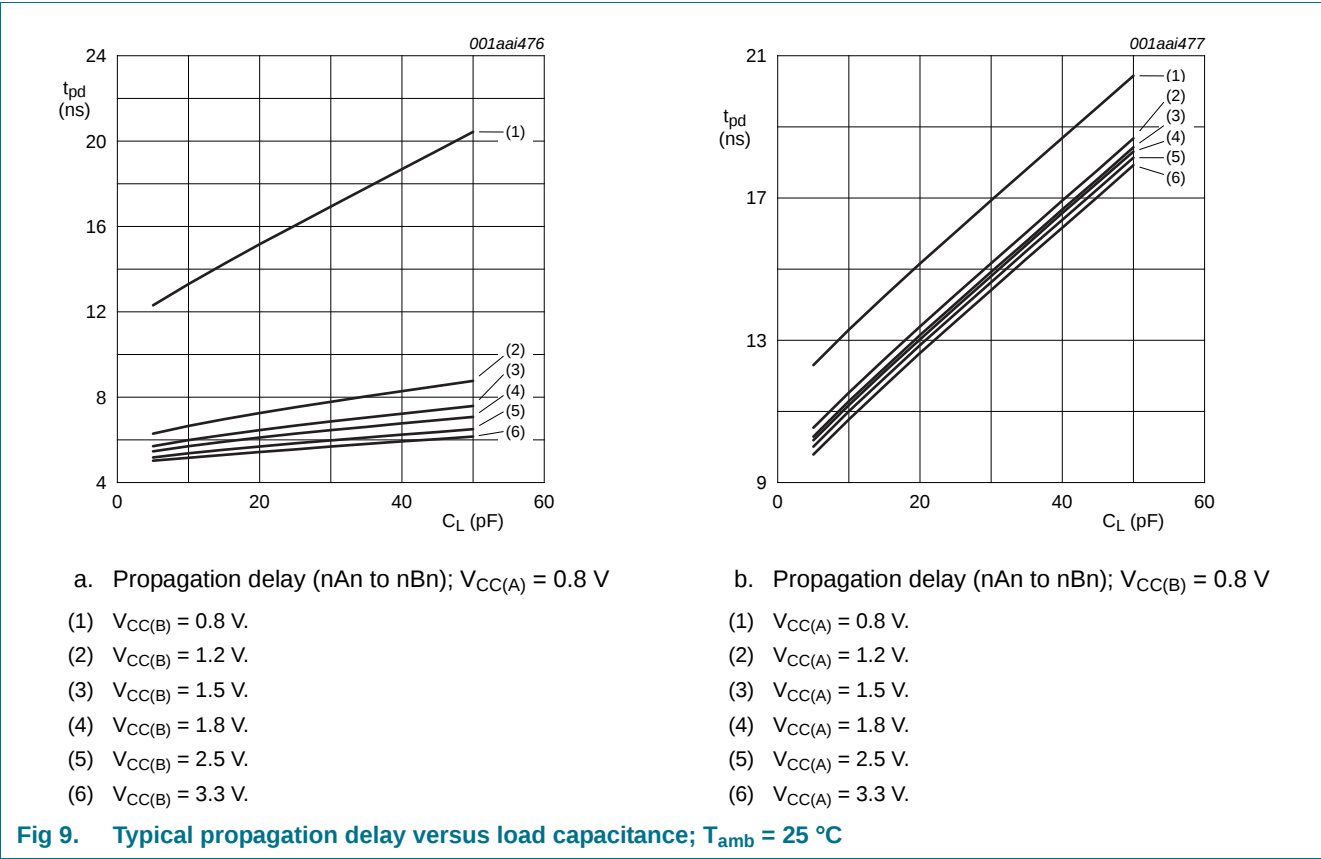
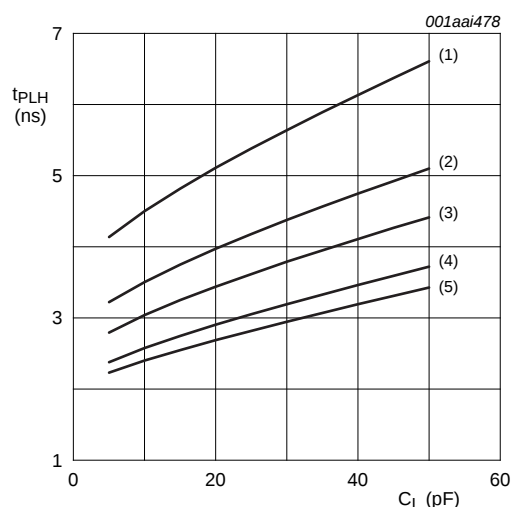
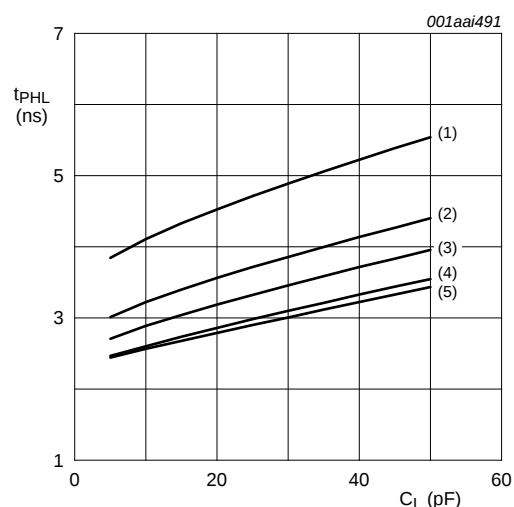


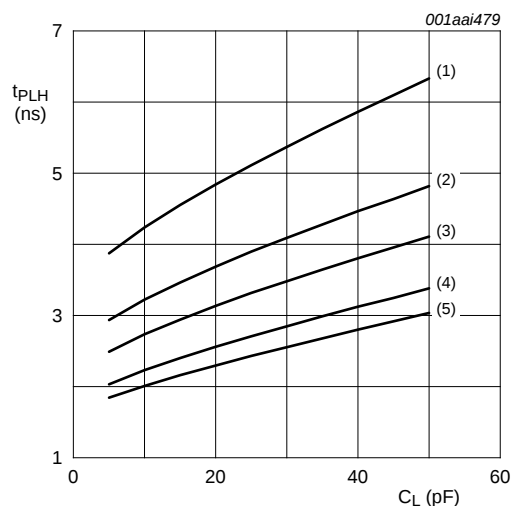
Fig 9. Typical propagation delay versus load capacitance;  $T_{amb} = 25\text{ }^{\circ}\text{C}$



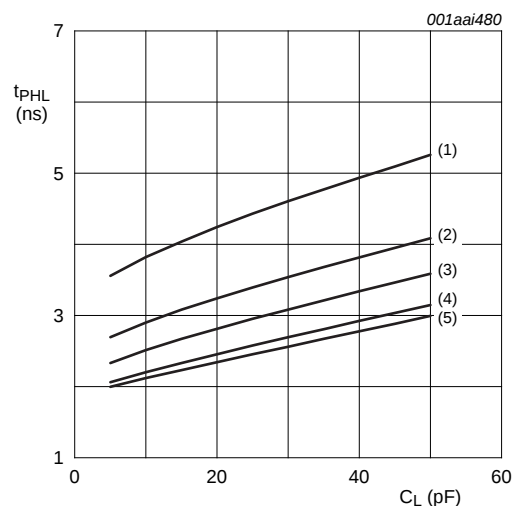
a. LOW to HIGH propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.2\text{ V}$



b. HIGH to LOW propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.2\text{ V}$



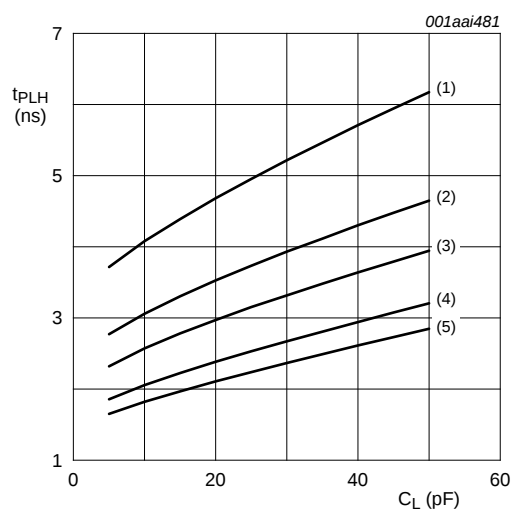
c. LOW to HIGH propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.5\text{ V}$



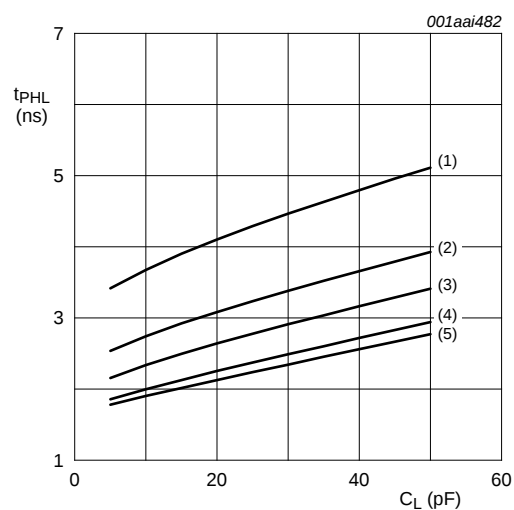
d. HIGH to LOW propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.5\text{ V}$

- (1)  $V_{CC(B)} = 1.2\text{ V}$ .
- (2)  $V_{CC(B)} = 1.5\text{ V}$ .
- (3)  $V_{CC(B)} = 1.8\text{ V}$ .
- (4)  $V_{CC(B)} = 2.5\text{ V}$ .
- (5)  $V_{CC(B)} = 3.3\text{ V}$ .

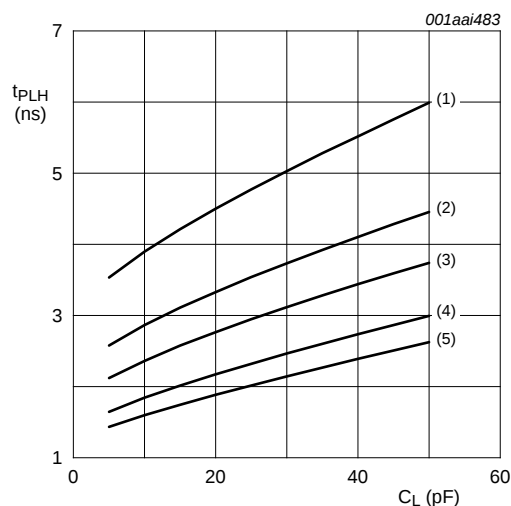
**Fig 10. Typical propagation delay versus load capacitance;  $T_{amb} = 25\text{ °C}$**



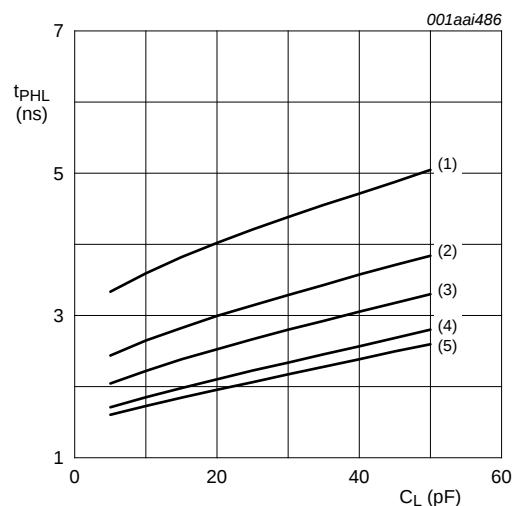
a. LOW to HIGH propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.8 \text{ V}$



b. HIGH to LOW propagation delay (nAn to nBn);  
 $V_{CC(A)} = 1.8 \text{ V}$



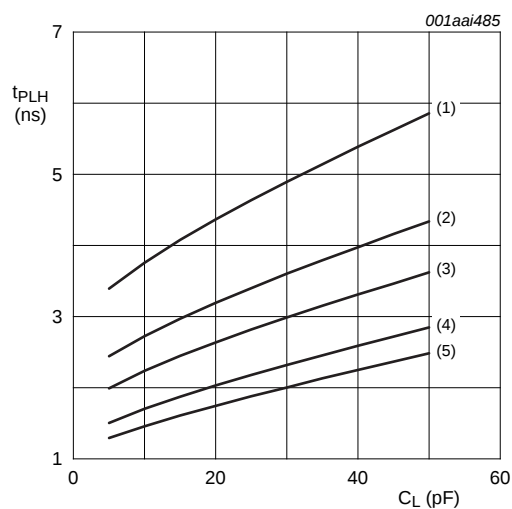
c. LOW to HIGH propagation delay (nAn to nBn);  
 $V_{CC(A)} = 2.5 \text{ V}$



d. HIGH to LOW propagation delay (nAn to nBn);  
 $V_{CC(A)} = 2.5 \text{ V}$

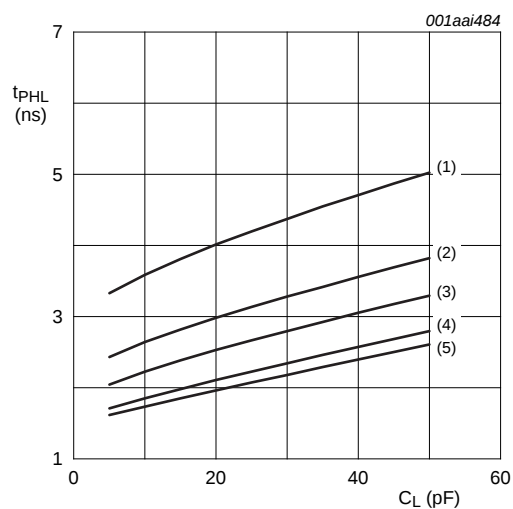
- (1)  $V_{CC(B)} = 1.2 \text{ V}$ .
- (2)  $V_{CC(B)} = 1.5 \text{ V}$ .
- (3)  $V_{CC(B)} = 1.8 \text{ V}$ .
- (4)  $V_{CC(B)} = 2.5 \text{ V}$ .
- (5)  $V_{CC(B)} = 3.3 \text{ V}$ .

**Fig 11. Typical propagation delay versus load capacitance;  $T_{amb} = 25^\circ\text{C}$**



a. LOW to HIGH propagation delay (nAn to nBn);  
 $V_{CC(A)} = 3.3 \text{ V}$

- (1)  $V_{CC(B)} = 1.2 \text{ V}$ .
- (2)  $V_{CC(B)} = 1.5 \text{ V}$ .
- (3)  $V_{CC(B)} = 1.8 \text{ V}$ .
- (4)  $V_{CC(B)} = 2.5 \text{ V}$ .
- (5)  $V_{CC(B)} = 3.3 \text{ V}$ .



b. HIGH to LOW propagation delay (nAn to nBn);  
 $V_{CC(A)} = 3.3 \text{ V}$

**Fig 12. Typical propagation delay versus load capacitance;  $T_{amb} = 25 \text{ }^{\circ}\text{C}$**

13. Package outline

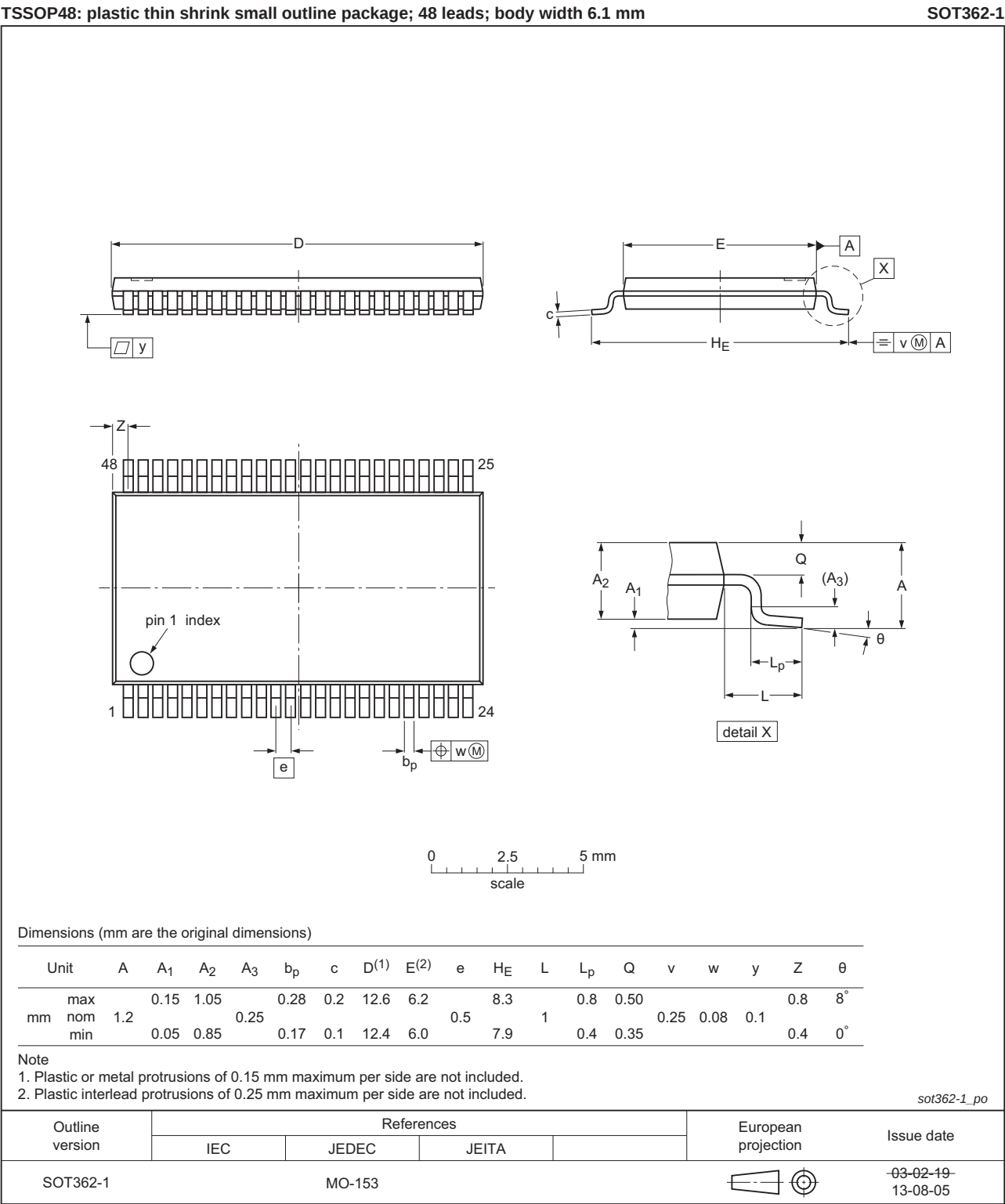


Fig 13. Package outline SOT362-1 (TSSOP48)

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

SOT480-1

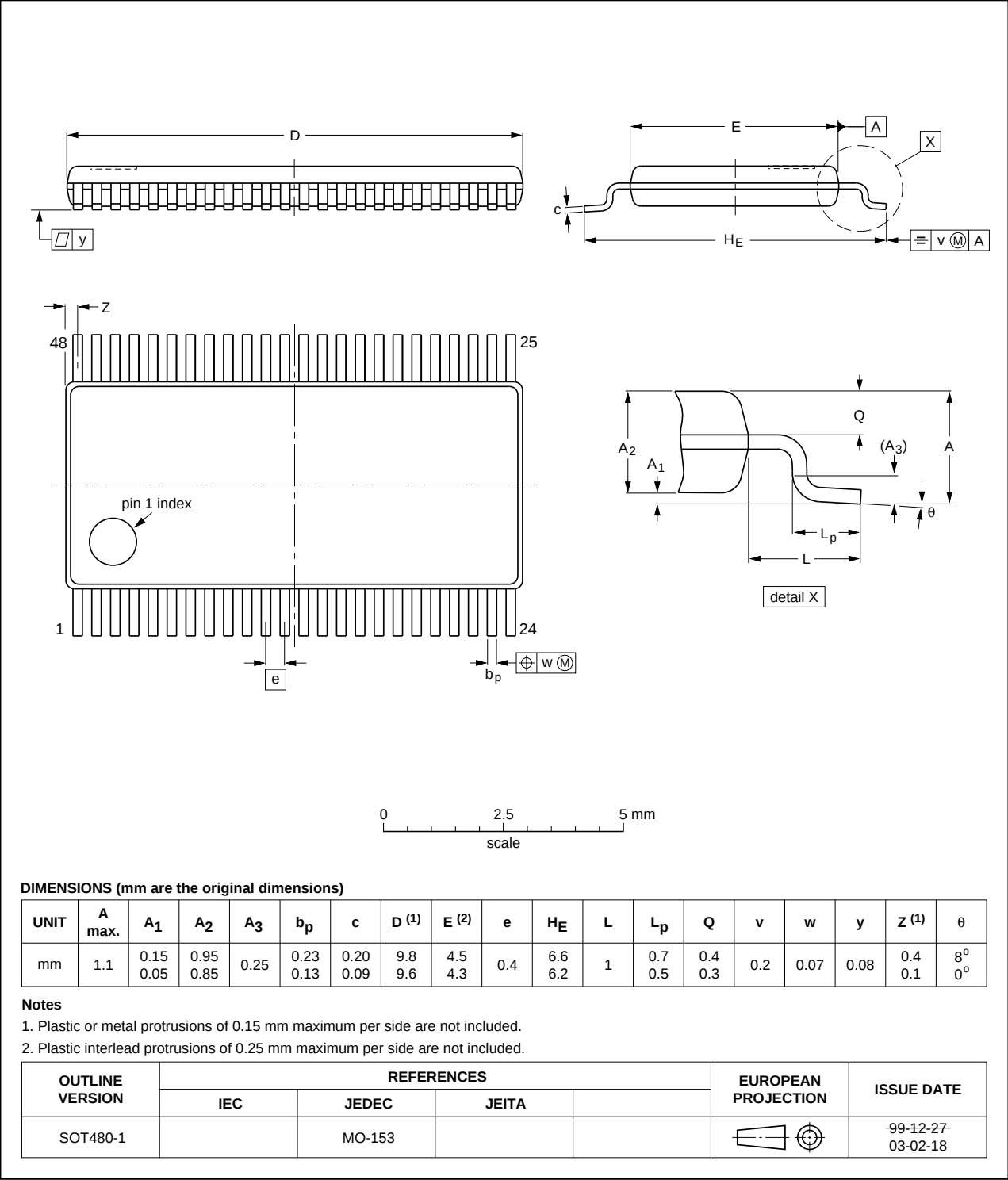


Fig 14. Package outline SOT480-1 (TSSOP48)

VFBGA56: plastic very thin fine-pitch ball grid array package; 56 balls; body 4.5 x 7 x 0.65 mm SOT702-1

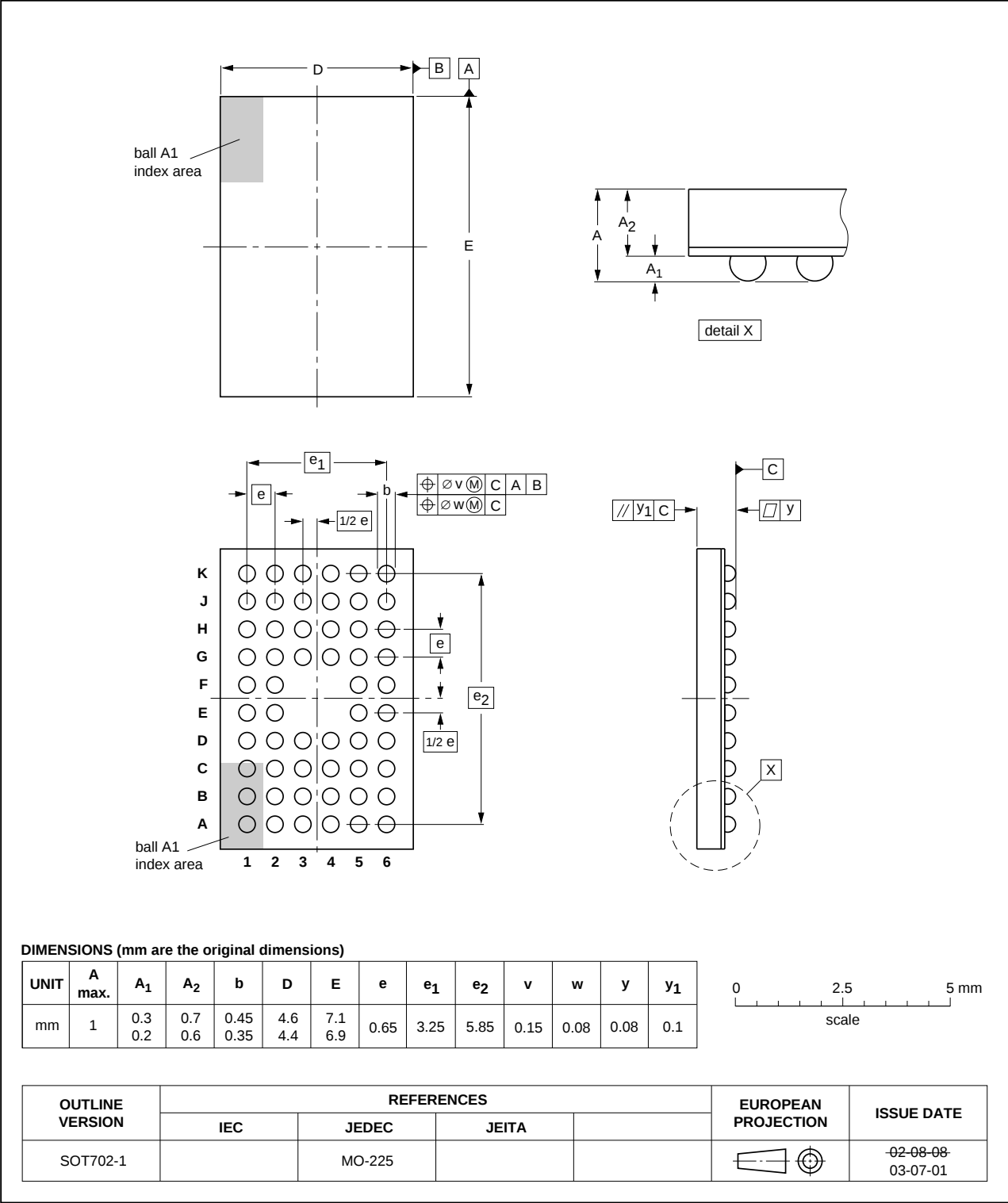


Fig 15. Package outline SOT702-1 (VFBGA56)

HXQFN60: plastic compatible thermal enhanced extremely thin quad flat package; no leads;  
 60 terminals; body 4 x 6 x 0.5 mm

SOT1134-2

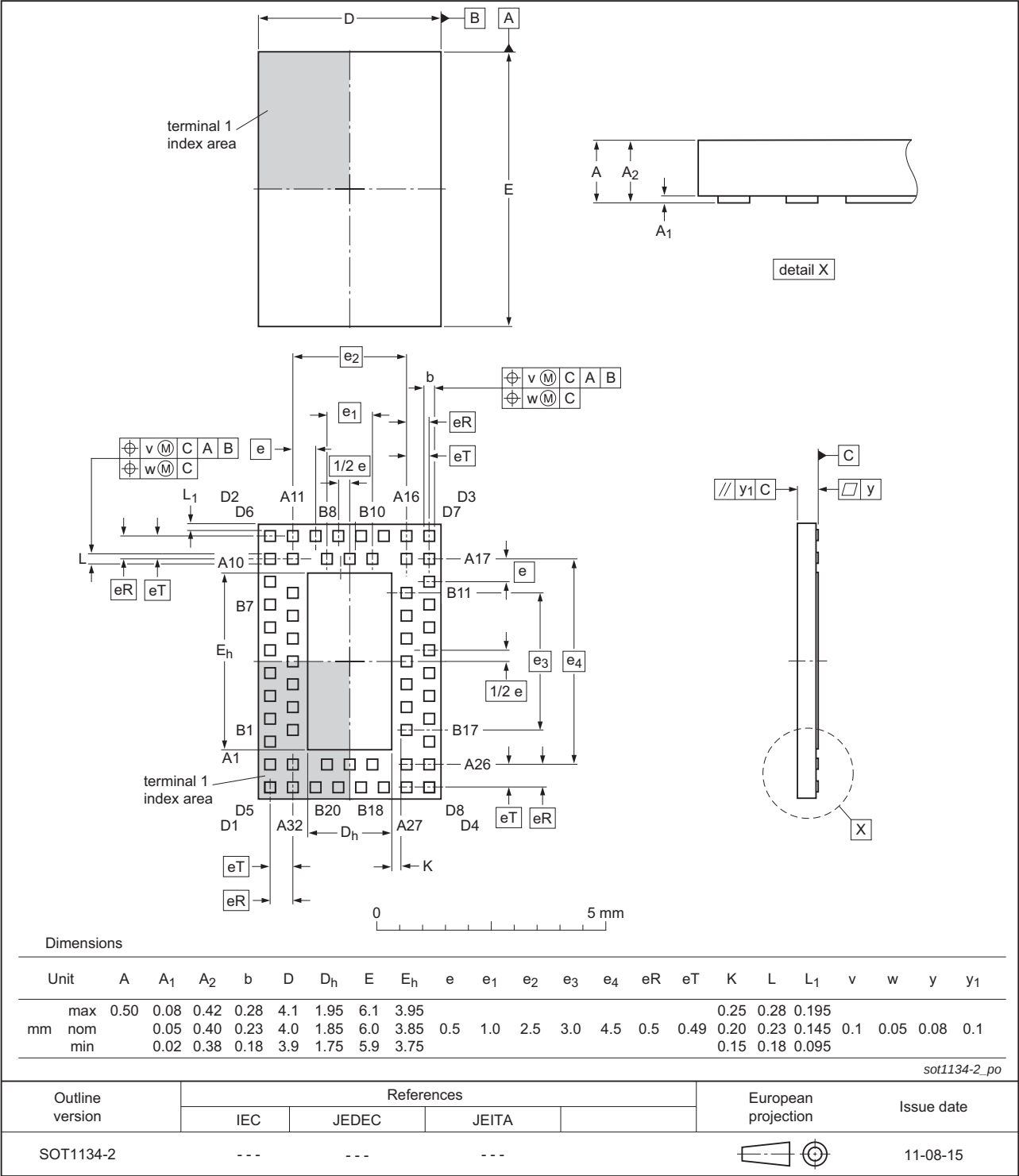


Fig 16. Package outline SOT1134-2 (HXQFN60)

## 14. Abbreviations

Table 16. Abbreviations

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

## 15. Revision history

Table 17. Revision history

| Document ID     | Release date                                                                                  | Data sheet status  | Change notice | Supersedes      |
|-----------------|-----------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| 74AVC16T245 v.6 | 20130909                                                                                      | Product data sheet | -             | 74AVC16T245 v.5 |
| Modifications:  | • <a href="#">Table 4</a> : conditions I <sub>CC</sub> and I <sub>GND</sub> changed (errata). |                    |               |                 |
| 74AVC16T245 v.5 | 20120309                                                                                      | Product data sheet | -             | 74AVC16T245 v.4 |
| Modifications:  | • For type number 74AVC16T245BX the sot code has changed to SOT1134-2.                        |                    |               |                 |
| 74AVC16T245 v.4 | 20111208                                                                                      | Product data sheet | -             | 74AVC16T245 v.3 |
| Modifications:  | • Legal pages updated.                                                                        |                    |               |                 |
| 74AVC16T245 v.3 | 20110609                                                                                      | Product data sheet | -             | 74AVC16T245 v.2 |
| 74AVC16T245 v.2 | 20100330                                                                                      | Product data sheet | -             | 74AVC16T245 v.1 |
| 74AVC16T245 v.1 | 20091001                                                                                      | Product data sheet | -             | -               |

## 16. Legal information

### 16.1 Data sheet status

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

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

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

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

### 16.2 Definitions

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

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

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

### 16.3 Disclaimers

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

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

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

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

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

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

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

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

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

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

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

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

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

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

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

## 16.4 Trademarks

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

## 17. Contact information

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

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

## 18. Contents

---

|           |                                                            |           |
|-----------|------------------------------------------------------------|-----------|
| <b>1</b>  | <b>General description . . . . .</b>                       | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits . . . . .</b>                     | <b>1</b>  |
| <b>3</b>  | <b>Ordering information . . . . .</b>                      | <b>2</b>  |
| <b>4</b>  | <b>Functional diagram . . . . .</b>                        | <b>2</b>  |
| <b>5</b>  | <b>Pinning information . . . . .</b>                       | <b>4</b>  |
| 5.1       | Pinning . . . . .                                          | 4         |
| 5.2       | Pin description . . . . .                                  | 6         |
| <b>6</b>  | <b>Functional description . . . . .</b>                    | <b>6</b>  |
| <b>7</b>  | <b>Limiting values . . . . .</b>                           | <b>7</b>  |
| <b>8</b>  | <b>Recommended operating conditions . . . . .</b>          | <b>7</b>  |
| <b>9</b>  | <b>Static characteristics . . . . .</b>                    | <b>8</b>  |
| <b>10</b> | <b>Dynamic characteristics . . . . .</b>                   | <b>11</b> |
| <b>11</b> | <b>Waveforms . . . . .</b>                                 | <b>15</b> |
| <b>12</b> | <b>Typical propagation delay characteristics . . . . .</b> | <b>17</b> |
| <b>13</b> | <b>Package outline . . . . .</b>                           | <b>21</b> |
| <b>14</b> | <b>Abbreviations . . . . .</b>                             | <b>25</b> |
| <b>15</b> | <b>Revision history . . . . .</b>                          | <b>25</b> |
| <b>16</b> | <b>Legal information . . . . .</b>                         | <b>26</b> |
| 16.1      | Data sheet status . . . . .                                | 26        |
| 16.2      | Definitions . . . . .                                      | 26        |
| 16.3      | Disclaimers . . . . .                                      | 26        |
| 16.4      | Trademarks . . . . .                                       | 27        |
| <b>17</b> | <b>Contact information . . . . .</b>                       | <b>27</b> |
| <b>18</b> | <b>Contents . . . . .</b>                                  | <b>28</b> |