

# 74AVCH8T245

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

Rev. 5 — 27 December 2012

Product data sheet

### 1. General description

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The 74AVCH8T245 is an 8-bit, dual supply transceiver that enables bidirectional level translation. It features two 8-bit input-output ports (An and Bn), a direction control input (DIR), a output enable input ( $\overline{OE}$ ) and dual supply pins ( $V_{CC(A)}$  and  $V_{CC(B)}$ ). Both  $V_{CC(A)}$  and  $V_{CC(B)}$  can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins An,  $\overline{OE}$  and DIR are referenced to  $V_{CC(A)}$  and pins Bn are referenced to  $V_{CC(B)}$ . A HIGH on DIR allows transmission from An to Bn and a LOW on DIR allows transmission from Bn to An. The output enable input ( $\overline{OE}$ ) can be used to disable the outputs so the buses are effectively isolated.

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 An and Bn outputs are in the high-impedance OFF-state. The bus-hold circuitry on the powered-up side always stays active.

The 74AVCH8T245 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

### 2. Features and benefits

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- 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-A114E Class 3B exceeds 8000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1000 V
- Maximum data rates:
  - ◆ 380 Mbit/s ( $\geq 1.8$  V to 3.3 V translation)
  - ◆ 260 Mbit/s ( $\geq 1.1$  V to 3.3 V translation)

- ◆ 260 Mbit/s ( $\geq 1.1$  V to 2.5 V translation)
- ◆ 210 Mbit/s ( $\geq 1.1$  V to 1.8 V translation)
- ◆ 150 Mbit/s ( $\geq 1.1$  V to 1.5 V translation)
- ◆ 100 Mbit/s ( $\geq 1.1$  V to 1.2 V translation)
- Suspend mode
- Bus hold on data inputs
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C

### 3. Ordering information

Table 1. Ordering information

| Type number   | Package               |          |  | Version  |
|---------------|-----------------------|----------|--|----------|
|               | Temperature range     | Name     | Description  |          |
| 74AVCH8T245PW | $-40$ °C to $+125$ °C | TSSOP24  | plastic thin shrink small outline package; 24 leads; body width 4.4 mm   | SOT355-1 |
| 74AVCH8T245BQ | $-40$ °C to $+125$ °C | DHVQFN24 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body $3.5 \times 5.5 \times 0.85$ mm | SOT815-1 |

### 4. Functional diagram

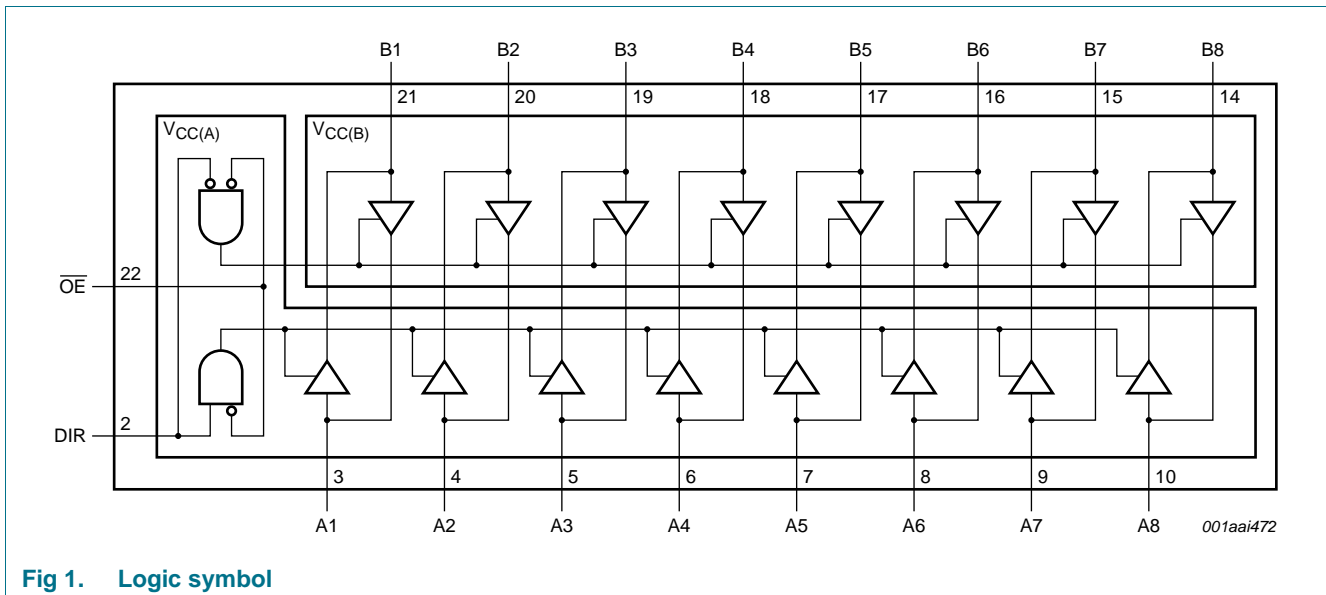


Fig 1. Logic symbol

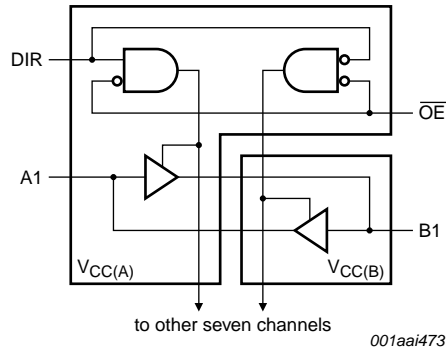


Fig 2. Logic diagram (one channel)

## 5. Pinning information

### 5.1 Pinning

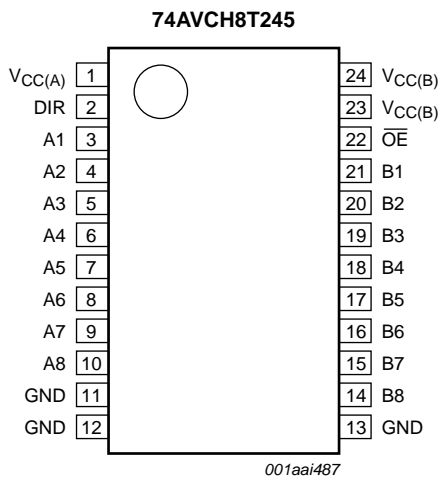
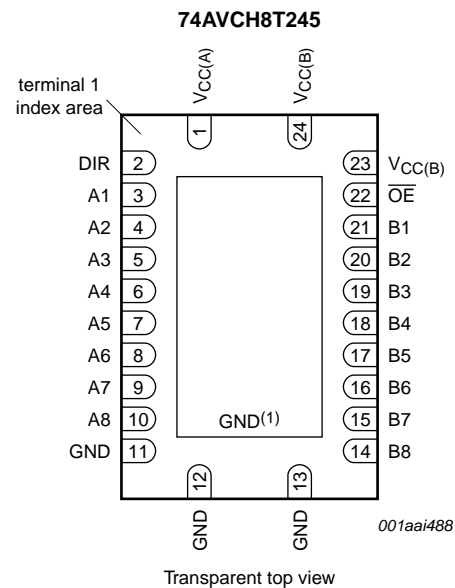


Fig 3. Pin configuration TSSOP24



- (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig 4. Pin configuration DHVQFN24

## 5.2 Pin description

**Table 2.** Pin description

| Symbol             | Pin                            | Description  |
|--------------------|--------------------------------|--|
| $V_{CC(A)}$        | 1                              | supply voltage A (An, $\overline{OE}$ and DIR inputs are referenced to $V_{CC(A)}$ ) |
| DIR                | 2                              | direction control  |
| A1 to A8           | 3, 4, 5, 6, 7, 8, 9, 10        | data input or output   |
| GND <sup>[1]</sup> | 11                             | ground (0 V)   |
| GND <sup>[1]</sup> | 12                             | ground (0 V)   |
| GND <sup>[1]</sup> | 13                             | ground (0 V)   |
| B1 to B8           | 21, 20, 19, 18, 17, 16, 15, 14 | data input or output   |
| $\overline{OE}$    | 22                             | output enable input (active LOW)   |
| $V_{CC(B)}$        | 23                             | supply voltage B (Bn inputs are referenced to $V_{CC(B)}$ )                          |
| $V_{CC(B)}$        | 24                             | supply voltage B (Bn inputs are referenced to $V_{CC(B)}$ )                          |

[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> |         |
|---------------------------|--------------------------------|--------------------|-----------------------------|---------|
| $V_{CC(A)}$ , $V_{CC(B)}$ | $\overline{OE}$ <sup>[2]</sup> | DIR <sup>[2]</sup> | An <sup>[2]</sup>           | Bn      |
| 0.8 V to 3.6 V            | L                              | L                  | An = Bn                     | input   |
| 0.8 V to 3.6 V            | L                              | H                  | input                       | Bn = An |
| 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 An, DIR and  $\overline{OE}$  input circuit is referenced to  $V_{CC(A)}$ ; The Bn input circuit is referenced to  $V_{CC(B)}$ .

[3] If at least one of  $V_{CC(A)}$  or  $V_{CC(B)}$  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           |                                    | <sup>[1]</sup> -0.5       | +4.6            | V    |
| $I_{OK}$    | output clamping current | $V_O < 0$ V                        | -50                       | -               | mA   |
| $V_O$       | output voltage          | Active mode                        | <sup>[1][2][3]</sup> -0.5 | $V_{CCO} + 0.5$ | V    |
|             |                         | Suspend or 3-state mode            | <sup>[1]</sup> -0.5       | +4.6            | V    |
| $I_O$       | output current          | $V_O = 0$ V to $V_{CC}$            | -                         | ±50             | mA   |
| $I_{CC}$    | supply current          | per $V_{CC(A)}$ or $V_{CC(B)}$ pin | -                         | 100             | mA   |

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

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

| Symbol           | Parameter               | Conditions   | Min   | Max  | Unit |
|------------------|-------------------------|--|-------|------|------|
| $I_{\text{GND}}$ | ground current          | per GND pin  | -100  | -    | mA   |
| $T_{\text{stg}}$ | storage temperature     |  | -65   | +150 | °C   |
| $P_{\text{tot}}$ | total power dissipation | $T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}$ | [4] - | 500  | mW   |

- [1] The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2]  $V_{\text{CCO}}$  is the supply voltage associated with the output port.  
 [3]  $V_{\text{CCO}} + 0.5\text{ V}$  should not exceed 4.6 V.  
 [4] For TSSOP24 package:  $P_{\text{tot}}$  derates linearly at 5.5 mW/K above 60 °C.  
 For DHVQFN24 package:  $P_{\text{tot}}$  derates linearly at 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5.** Recommended operating conditions

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

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

## 9. Static characteristics

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

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

| Symbol            | Parameter                       | Conditions   | Min   | Typ         | Max        | Unit          |
|-------------------|---------------------------------|--|-------|-------------|------------|---------------|
| $V_{\text{OH}}$   | HIGH-level output voltage       | $V_{\text{I}} = V_{\text{IH}}$ or $V_{\text{IL}}$<br>$I_{\text{O}} = -1.5\text{ mA}$ ; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 0.8\text{ V}$              | -     | 0.69        | -          | V             |
| $V_{\text{OL}}$   | LOW-level output voltage        | $V_{\text{I}} = V_{\text{IH}}$ or $V_{\text{IL}}$<br>$I_{\text{O}} = 1.5\text{ mA}$ ; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 0.8\text{ V}$               | -     | 0.07        | -          | V             |
| $I_{\text{I}}$    | input leakage current           | DIR, $\overline{\text{OE}}$ input; $V_{\text{I}} = 0\text{ V or }3.6\text{ V}$ ;<br>$V_{\text{CC(A)}} = V_{\text{CC(B)}} = 0.8\text{ V to }3.6\text{ V}$ | -     | $\pm 0.025$ | $\pm 0.25$ | $\mu\text{A}$ |
| $I_{\text{BHL}}$  | bus hold LOW current            | A or B port; $V_{\text{I}} = 0.42\text{ V}$ ; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 1.2\text{ V}$   | [3] - | 26          | -          | $\mu\text{A}$ |
| $I_{\text{BHH}}$  | bus hold HIGH current           | A or B port; $V_{\text{I}} = 0.78\text{ V}$ ; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 1.2\text{ V}$   | [4] - | -24         | -          | $\mu\text{A}$ |
| $I_{\text{BHLO}}$ | bus hold LOW overdrive current  | A or B port; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 1.2\text{ V}$  | [5] - | 27          | -          | $\mu\text{A}$ |
| $I_{\text{BHHO}}$ | bus hold HIGH overdrive current | A or B port; $V_{\text{CC(A)}} = V_{\text{CC(B)}} = 1.2\text{ V}$  | [6] - | -26         | -          | $\mu\text{A}$ |

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

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

| Symbol    | Parameter                 | Conditions   | Min | Typ       | Max       | Unit          |               |
|-----------|---------------------------|--|-----|-----------|-----------|---------------|---------------|
| $I_{OZ}$  | OFF-state output current  | A or B port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.6\text{ V}$   | [7] | -         | $\pm 0.5$ | $\pm 2.5$     | $\mu\text{A}$ |
|           |                           | suspend mode A port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = 3.6\text{ V}$ ; $V_{CC(B)} = 0\text{ V}$                    | [7] | -         | $\pm 0.5$ | $\pm 2.5$     | $\mu\text{A}$ |
|           |                           | suspend mode B port; $V_O = 0\text{ V}$ or $V_{CCO}$ ;<br>$V_{CC(A)} = 0\text{ V}$ ; $V_{CC(B)} = 3.6\text{ V}$                    | [7] | -         | $\pm 0.5$ | $\pm 2.5$     | $\mu\text{A}$ |
| $I_{OFF}$ | 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         | DIR, $\overline{OE}$ input; $V_I = 0\text{ V}$ or $3.3\text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$                       | -   | 1.5       | -         | pF            |               |
| $C_{I/O}$ | input/output capacitance  | A and B port; $V_O = 3.3\text{ V}$ or $0\text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$                                     | -   | 4.3       | -         | 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] The bus hold circuit can sink at least the minimum low sustaining current at  $V_{IL}$  max.  $I_{BHL}$  should be measured after lowering  $V_I$  to GND and then raising it to  $V_{IL}$  max.[4] The bus hold circuit can source at least the minimum high sustaining current at  $V_{IH}$  min.  $I_{BHH}$  should be measured after raising  $V_I$  to  $V_{CC}$  and then lowering it to  $V_{IH}$  min.[5] An external driver must source at least  $I_{BHLO}$  to switch this node from LOW to HIGH.[6] An external driver must sink at least  $I_{BHHO}$  to switch this node from HIGH to LOW.[7] 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    |
|  |                          | DIR, $\overline{OE}$ 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 <sub>IL</sub>  | LOW-level input voltage   | data input   |                        |                        |                        |                        |      |
|                  |                           | V <sub>CCI</sub> = 0.8 V   | -                      | 0.30V <sub>CCI</sub>   | -                      | 0.30V <sub>CCI</sub>   | V    |
|                  |                           | V <sub>CCI</sub> = 1.1 V to 1.95 V   | -                      | 0.35V <sub>CCI</sub>   | -                      | 0.35V <sub>CCI</sub>   | V    |
|                  |                           | V <sub>CCI</sub> = 2.3 V to 2.7 V  | -                      | 0.7                    | -                      | 0.7                    | V    |
|                  |                           | V <sub>CCI</sub> = 3.0 V to 3.6 V  | -                      | 0.8                    | -                      | 0.8                    | V    |
|                  |                           | DIR, $\overline{\text{OE}}$ input  |                        |                        |                        |                        |      |
|                  |                           | V <sub>CC(A)</sub> = 0.8 V   | -                      | 0.30V <sub>CC(A)</sub> | -                      | 0.30V <sub>CC(A)</sub> | V    |
|                  |                           | V <sub>CC(A)</sub> = 1.1 V to 1.95 V   | -                      | 0.35V <sub>CC(A)</sub> | -                      | 0.35V <sub>CC(A)</sub> | V    |
|                  |                           | V <sub>CC(A)</sub> = 2.3 V to 2.7 V  | -                      | 0.7                    | -                      | 0.7                    | V    |
|                  |                           | V <sub>CC(A)</sub> = 3.0 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 μA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V   | V <sub>CCO</sub> - 0.1 | -                      | V <sub>CCO</sub> - 0.1 | -                      | V    |
|                  |                           | I <sub>O</sub> = -3 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.1 V  | 0.85                   | -                      | 0.85                   | -                      | V    |
|                  |                           | I <sub>O</sub> = -6 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V  | 1.05                   | -                      | 1.05                   | -                      | V    |
|                  |                           | I <sub>O</sub> = -8 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V   | 1.2                    | -                      | 1.2                    | -                      | V    |
|                  |                           | I <sub>O</sub> = -9 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V  | 1.75                   | -                      | 1.75                   | -                      | V    |
|                  |                           | I <sub>O</sub> = -12 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V   | 2.3                    | -                      | 2.3                    | -                      | V    |
| V <sub>OL</sub>  | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>  |                        |                        |                        |                        |      |
|                  |                           | I <sub>O</sub> = 100 μA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V  | -                      | 0.1                    | -                      | 0.1                    | V    |
|                  |                           | I <sub>O</sub> = 3 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.1 V   | -                      | 0.25                   | -                      | 0.25                   | V    |
|                  |                           | I <sub>O</sub> = 6 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V   | -                      | 0.35                   | -                      | 0.35                   | V    |
|                  |                           | I <sub>O</sub> = 8 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V  | -                      | 0.45                   | -                      | 0.45                   | V    |
|                  |                           | I <sub>O</sub> = 9 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V   | -                      | 0.55                   | -                      | 0.55                   | V    |
|                  |                           | I <sub>O</sub> = 12 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V  | -                      | 0.7                    | -                      | 0.7                    | V    |
| I <sub>I</sub>   | input leakage current     | DIR, $\overline{\text{OE}}$ input; V <sub>I</sub> = 0 V or 3.6 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V | -                      | ±1                     | -                      | ±5                     | μA   |
| I <sub>BHL</sub> | bus hold LOW current      | A or B port <sup>[3]</sup>   |                        |                        |                        |                        |      |
|                  |                           | V <sub>I</sub> = 0.49 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V   | 15                     | -                      | 15                     | -                      | μA   |
|                  |                           | V <sub>I</sub> = 0.58 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V  | 25                     | -                      | 25                     | -                      | μA   |
|                  |                           | V <sub>I</sub> = 0.70 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V   | 45                     | -                      | 45                     | -                      | μA   |
|                  |                           | V <sub>I</sub> = 0.80 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V   | 100                    | -                      | 90                     | -                      | μA   |

**Table 7. Static characteristics ...continued** [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 |      |
| I <sub>BHH</sub>  | bus hold<br>HIGH current                 | A or B port [4]  |                  |     |                   |     |      |
|                   |  | V <sub>I</sub> = 0.91 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V   | -15              | -   | -15               | -   | μA   |
|                   |  | V <sub>I</sub> = 1.07 V;<br>V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V   | -25              | -   | -25               | -   | μA   |
|                   |  | V <sub>I</sub> = 1.60 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V   | -45              | -   | -45               | -   | μA   |
|                   |  | V <sub>I</sub> = 2.00 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V   | -100             | -   | -100              | -   | μA   |
| I <sub>BHLO</sub> | bus hold<br>LOW<br>overdrive<br>current  | A or B port [5]  |                  |     |                   |     |      |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.6 V  | 125              | -   | 125               | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.95 V   | 200              | -   | 200               | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.7 V  | 300              | -   | 300               | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6 V  | 500              | -   | 500               | -   | μA   |
| I <sub>BHHO</sub> | bus hold<br>HIGH<br>overdrive<br>current | A or B port [6]  |                  |     |                   |     |      |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.6 V  | -125             | -   | -125              | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.95 V   | -200             | -   | -200              | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.7 V  | -300             | -   | -300              | -   | μA   |
|                   |  | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6 V  | -500             | -   | -500              | -   | μA   |
| I <sub>OZ</sub>   | OFF-state<br>output<br>current           | A or B port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ;<br>V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6 V [7]                 | -                | ±5  | -                 | ±30 | μA   |
|                   |  | suspend mode A port;<br>V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 3.6 V;<br>V <sub>CC(B)</sub> = 0 V [7] | -                | ±5  | -                 | ±30 | μA   |
|                   |  | suspend mode B port;<br>V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 0 V;<br>V <sub>CC(B)</sub> = 3.6 V [7] | -                | ±5  | -                 | ±30 | μA   |
| I <sub>OFF</sub>  | power-off<br>leakage<br>current          | A port; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V;<br>V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 0.8 V to 3.6 V      | -                | ±5  | -                 | ±30 | μA   |
|                   |  | B port; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V;<br>V <sub>CC(B)</sub> = 0 V; V <sub>CC(A)</sub> = 0.8 V to 3.6 V      | -                | ±5  | -                 | ±30 | μA   |



**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 <sub>CC</sub> | supply current | A port; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A  |                  |     |                   |     |      |
|                 |                | V <sub>CC(A)</sub> = 0.8 V to 3.6 V;<br>V <sub>CC(B)</sub> = 0.8 V to 3.6 V  | -                | 10  | -                 | 55  | μA   |
|                 |                | V <sub>CC(A)</sub> = 1.1 V to 3.6 V;<br>V <sub>CC(B)</sub> = 1.1 V to 3.6 V  | -                | 8   | -                 | 50  | μA   |
|                 |                | V <sub>CC(A)</sub> = 3.6 V; V <sub>CC(B)</sub> = 0 V   | -                | 8   | -                 | 50  | μA   |
|                 |                | V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 3.6 V   | -2               | -   | -12               | -   | μA   |
|                 |                | B port; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A  |                  |     |                   |     |      |
|                 |                | V <sub>CC(A)</sub> = 0.8 V to 3.6 V;<br>V <sub>CC(B)</sub> = 0.8 V to 3.6 V  | -                | 10  | -                 | 55  | μA   |
|                 |                | V <sub>CC(A)</sub> = 1.1 V to 3.6 V;<br>V <sub>CC(B)</sub> = 1.1 V to 3.6 V  | -                | 8   | -                 | 50  | μA   |
|                 |                | V <sub>CC(A)</sub> = 3.6 V; V <sub>CC(B)</sub> = 0 V   | -2               | -   | -12               | -   | μA   |
|                 |                | V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 3.6 V   | -                | 8   | -                 | 50  | μA   |
|                 |                | A plus B port (I <sub>CC(A)</sub> + I <sub>CC(B)</sub> );<br>I <sub>O</sub> = 0 A; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ;<br>V <sub>CC(A)</sub> = 0.8 V to 3.6 V;<br>V <sub>CC(B)</sub> = 0.8 V to 3.6 V | -                | 20  | -                 | 70  | μA   |
|                 |                | A plus B port (I <sub>CC(A)</sub> + I <sub>CC(B)</sub> );<br>I <sub>O</sub> = 0 A; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ;<br>V <sub>CC(A)</sub> = 1.1 V to 3.6 V;<br>V <sub>CC(B)</sub> = 1.1 V to 3.6 V | -                | 16  | -                 | 65  | μA   |

[1] V<sub>CCO</sub> is the supply voltage associated with the output port.[2] V<sub>CCI</sub> is the supply voltage associated with the data input port.[3] The bus hold circuit can sink at least the minimum low sustaining current at V<sub>IL</sub> max. I<sub>BHL</sub> should be measured after lowering V<sub>I</sub> to GND and then raising it to V<sub>IL</sub> max.[4] The bus hold circuit can source at least the minimum high sustaining current at V<sub>IH</sub> min. I<sub>BHH</sub> should be measured after raising V<sub>I</sub> to V<sub>CC</sub> and then lowering it to V<sub>IH</sub> min.[5] An external driver must source at least I<sub>BHLO</sub> to switch this node from LOW to HIGH.[6] An external driver must sink at least I<sub>BHHO</sub> to switch this node from HIGH to LOW.[7] For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.**Table 8.** Typical total supply current (I<sub>CC(A)</sub> + I<sub>CC(B)</sub>)

| V <sub>CC(A)</sub> | V <sub>CC(B)</sub> |       |       |       |       |       |       | 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 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 7](#); for wave forms see [Figure 5](#) and [Figure 6](#)

| 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 | An to Bn              | 14.4        | 7.0   | 6.2   | 6.0   | 5.9   | 6.0   | ns   |
|           |                   | Bn to An              | 14.4        | 12.4  | 12.1  | 11.9  | 11.8  | 11.8  | ns   |
| $t_{dis}$ | disable time      | $\overline{OE}$ to An | 16.2        | 16.2  | 16.2  | 16.2  | 16.2  | 16.2  | ns   |
|           |                   | $\overline{OE}$ to Bn | 17.6        | 10.0  | 9.0   | 9.1   | 8.7   | 9.3   | ns   |
| $t_{en}$  | enable time       | $\overline{OE}$ to An | 21.9        | 21.9  | 21.9  | 21.9  | 21.9  | 21.9  | ns   |
|           |                   | $\overline{OE}$ to Bn | 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 10.** 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 7](#); for wave forms see [Figure 5](#) and [Figure 6](#)

| 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 | An to Bn              | 14.4        | 12.4  | 12.1  | 11.9  | 11.8  | 11.8  | ns   |
|           |                   | Bn to An              | 14.4        | 7.0   | 6.2   | 6.0   | 5.9   | 6.0   | ns   |
| $t_{dis}$ | disable time      | $\overline{OE}$ to An | 16.2        | 5.9   | 4.4   | 4.2   | 3.1   | 3.5   | ns   |
|           |                   | $\overline{OE}$ to Bn | 17.6        | 14.2  | 13.7  | 13.6  | 13.3  | 13.1  | ns   |
| $t_{en}$  | enable time       | $\overline{OE}$ to An | 21.9        | 6.4   | 4.4   | 3.5   | 2.6   | 2.3   | ns   |
|           |                   | $\overline{OE}$ to Bn | 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 11. 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 An to Bn); output enabled  | 0.2                     | 0.2   | 0.2   | 0.3   | 0.4   | 0.5   | pF   |
|          |                               | A port: (direction An to Bn); output disabled | 0.2                     | 0.2   | 0.2   | 0.3   | 0.4   | 0.5   | pF   |
|          |                               | A port: (direction Bn to An); output enabled  | 9                       | 9     | 10    | 10    | 11    | 13    | pF   |
|          |                               | A port: (direction Bn to An); output disabled | 0.6                     | 0.6   | 0.6   | 0.7   | 0.7   | 0.8   | pF   |
|          |                               | B port: (direction An to Bn); output enabled  | 9                       | 9     | 10    | 10    | 11    | 13    | pF   |
|          |                               | B port: (direction An to Bn); output disabled | 0.6                     | 0.6   | 0.6   | 0.7   | 0.7   | 0.8   | pF   |
|          |                               | B port: (direction Bn to An); output enabled  | 0.2                     | 0.2   | 0.2   | 0.3   | 0.4   | 0.5   | pF   |
|          |                               | B port: (direction Bn to An); output disabled | 0.2                     | 0.2   | 0.2   | 0.3   | 0.4   | 0.5   | pF   |

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

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

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

**Table 12. Dynamic characteristics for temperature range  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  [1]**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#); for wave forms see [Figure 5](#) and [Figure 6](#).

| Symbol   | Parameter         | Conditions            | $V_{CC(B)}$       |      |                   |      |                    |      |                   |      |                   |      | Unit |
|--|-------------------|-----------------------|-------------------|------|-------------------|------|--------------------|------|-------------------|------|-------------------|------|------|
|  |                   |                       | 1.2 V $\pm$ 0.1 V |      | 1.5 V $\pm$ 0.1 V |      | 1.8 V $\pm$ 0.15 V |      | 2.5 V $\pm$ 0.2 V |      | 3.3 V $\pm$ 0.3 V |      |      |
|  |                   |                       | Min               | Max  | Min               | Max  | Min                | Max  | Min               | Max  | Min               | Max  |      |
| <b><math>V_{CC(A)} = 1.1\text{ V to }1.3\text{ V}</math></b>   |                   |                       |                   |      |                   |      |                    |      |                   |      |                   |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5               | 9.0  | 0.5               | 6.7  | 0.5                | 5.8  | 0.5               | 4.9  | 0.5               | 4.8  | ns   |
|  |                   | Bn to An              | 0.5               | 9.0  | 0.5               | 8.5  | 0.5                | 8.3  | 0.5               | 8.0  | 0.5               | 7.8  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5               | 11.8 | 0.5               | 11.8 | 0.5                | 11.8 | 0.5               | 11.8 | 0.5               | 11.8 | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5               | 12.3 | 0.5               | 9.5  | 0.5                | 9.4  | 0.5               | 8.0  | 0.5               | 8.9  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.1               | 14.4 | 1.1               | 14.4 | 1.1                | 14.4 | 1.1               | 14.4 | 1.1               | 14.4 | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1               | 14.2 | 1.1               | 10.4 | 1.1                | 9.0  | 1.0               | 7.7  | 1.0               | 7.3  | ns   |
| <b><math>V_{CC(A)} = 1.4\text{ V to }1.6\text{ V}</math></b>   |                   |                       |                   |      |                   |      |                    |      |                   |      |                   |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5               | 8.5  | 0.5               | 5.6  | 0.5                | 4.7  | 0.5               | 4.4  | 0.5               | 4.1  | ns   |
|  |                   | Bn to An              | 0.5               | 6.7  | 0.5               | 5.6  | 0.5                | 5.3  | 0.5               | 5.2  | 0.5               | 5.0  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5               | 8.6  | 0.5               | 8.6  | 0.5                | 8.6  | 0.5               | 8.6  | 0.5               | 8.6  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5               | 11.2 | 0.5               | 8.4  | 0.5                | 7.6  | 0.5               | 7.2  | 0.5               | 7.8  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.1               | 8.7  | 1.1               | 8.7  | 1.1                | 8.7  | 1.1               | 8.7  | 1.1               | 8.7  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1               | 12.8 | 1.1               | 8.1  | 1.1                | 7.1  | 1.0               | 5.6  | 1.0               | 5.2  | ns   |
| <b><math>V_{CC(A)} = 1.65\text{ V to }1.95\text{ V}</math></b> |                   |                       |                   |      |                   |      |                    |      |                   |      |                   |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5               | 8.3  | 0.5               | 5.3  | 0.5                | 4.5  | 0.5               | 3.8  | 0.5               | 3.5  | ns   |
|  |                   | Bn to An              | 0.5               | 5.8  | 0.5               | 4.7  | 0.5                | 4.5  | 0.5               | 4.3  | 0.5               | 4.1  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5               | 7.1  | 0.5               | 7.1  | 0.5                | 7.1  | 0.5               | 7.1  | 0.5               | 7.1  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5               | 10.9 | 0.5               | 7.8  | 0.5                | 6.9  | 0.5               | 6.0  | 0.5               | 5.8  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.0               | 6.8  | 1.0               | 6.8  | 1.0                | 6.8  | 1.0               | 6.8  | 1.0               | 6.8  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1               | 12.4 | 1.1               | 8.2  | 1.0                | 6.7  | 0.5               | 5.1  | 0.5               | 4.5  | ns   |
| <b><math>V_{CC(A)} = 2.3\text{ V to }2.7\text{ V}</math></b>   |                   |                       |                   |      |                   |      |                    |      |                   |      |                   |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5               | 8.0  | 0.5               | 5.2  | 0.5                | 4.3  | 0.5               | 3.3  | 0.5               | 2.9  | ns   |
|  |                   | Bn to An              | 0.5               | 4.9  | 0.5               | 4.4  | 0.5                | 3.8  | 0.5               | 3.3  | 0.5               | 3.1  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5               | 5.1  | 0.5               | 5.1  | 0.5                | 5.1  | 0.5               | 5.1  | 0.5               | 5.1  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5               | 10.4 | 0.5               | 7.1  | 0.5                | 6.3  | 0.5               | 5.1  | 0.5               | 5.2  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 0.5               | 4.8  | 0.5               | 4.8  | 0.5                | 4.8  | 0.5               | 4.8  | 0.5               | 4.8  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1               | 11.9 | 1.1               | 7.9  | 0.5                | 6.4  | 0.5               | 4.6  | 0.5               | 4.0  | ns   |
| <b><math>V_{CC(A)} = 3.0\text{ V to }3.6\text{ V}</math></b>   |                   |                       |                   |      |                   |      |                    |      |                   |      |                   |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5               | 7.8  | 0.5               | 5.0  | 0.5                | 4.1  | 0.5               | 3.1  | 0.5               | 2.7  | ns   |
|  |                   | Bn to An              | 0.5               | 4.8  | 0.5               | 4.1  | 0.5                | 3.5  | 0.5               | 2.9  | 0.5               | 2.7  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5               | 4.9  | 0.5               | 4.9  | 0.5                | 4.9  | 0.5               | 4.9  | 0.5               | 4.9  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5               | 10.1 | 0.5               | 6.9  | 0.5                | 6.0  | 0.5               | 4.8  | 0.5               | 5.0  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 0.5               | 4.0  | 0.5               | 4.0  | 0.5                | 4.0  | 0.5               | 4.0  | 0.5               | 4.0  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1               | 11.7 | 1.1               | 7.8  | 0.5                | 6.2  | 0.5               | 4.5  | 0.5               | 3.9  | ns   |

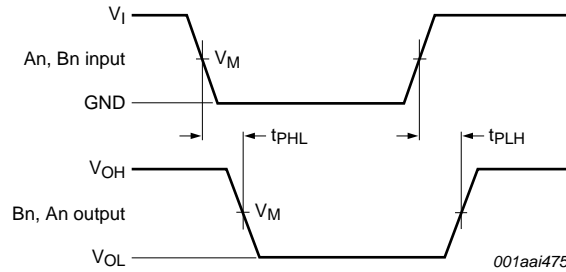
[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ ;  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ ;  $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .

**Table 13. Dynamic characteristics for temperature range  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  [1]**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#); for wave forms see [Figure 5](#) and [Figure 6](#)

| Symbol   | Parameter         | Conditions            | $V_{CC(B)}$                     |      |                                 |      |                                  |      |                                 |      |                                 |      | Unit |
|--|-------------------|-----------------------|---------------------------------|------|---------------------------------|------|----------------------------------|------|---------------------------------|------|---------------------------------|------|------|
|  |                   |                       | $1.2\text{ V} \pm 0.1\text{ V}$ |      | $1.5\text{ V} \pm 0.1\text{ V}$ |      | $1.8\text{ V} \pm 0.15\text{ V}$ |      | $2.5\text{ V} \pm 0.2\text{ V}$ |      | $3.3\text{ V} \pm 0.3\text{ V}$ |      |      |
|  |                   |                       | Min                             | Max  | Min                             | Max  | Min                              | Max  | Min                             | Max  | Min                             | Max  |      |
| <b><math>V_{CC(A)} = 1.1\text{ V to }1.3\text{ V}</math></b>   |                   |                       |                                 |      |                                 |      |                                  |      |                                 |      |                                 |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5                             | 9.9  | 0.5                             | 7.4  | 0.5                              | 6.4  | 0.5                             | 5.4  | 0.5                             | 5.3  | ns   |
|  |                   | Bn to An              | 0.5                             | 9.9  | 0.5                             | 9.4  | 0.5                              | 9.2  | 0.5                             | 8.8  | 0.5                             | 8.6  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5                             | 13.0 | 0.5                             | 13.0 | 0.5                              | 13.0 | 0.5                             | 13.0 | 0.5                             | 13.0 | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5                             | 13.6 | 0.5                             | 10.5 | 0.5                              | 10.4 | 0.5                             | 8.8  | 0.5                             | 9.8  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.1                             | 15.9 | 1.1                             | 15.9 | 1.1                              | 15.9 | 1.1                             | 15.9 | 1.1                             | 15.9 | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1                             | 15.7 | 1.1                             | 11.5 | 1.1                              | 9.9  | 1.0                             | 8.5  | 1.0                             | 8.1  | ns   |
| <b><math>V_{CC(A)} = 1.4\text{ V to }1.6\text{ V}</math></b>   |                   |                       |                                 |      |                                 |      |                                  |      |                                 |      |                                 |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5                             | 9.4  | 0.5                             | 6.2  | 0.5                              | 5.2  | 0.5                             | 4.9  | 0.5                             | 4.6  | ns   |
|  |                   | Bn to An              | 0.5                             | 7.4  | 0.5                             | 6.2  | 0.5                              | 5.9  | 0.5                             | 5.8  | 0.5                             | 5.5  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5                             | 9.5  | 0.5                             | 9.5  | 0.5                              | 9.5  | 0.5                             | 9.5  | 0.5                             | 9.5  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5                             | 12.4 | 0.5                             | 9.3  | 0.5                              | 8.4  | 0.5                             | 8.0  | 0.5                             | 8.6  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.1                             | 9.6  | 1.1                             | 9.6  | 1.1                              | 9.6  | 1.1                             | 9.6  | 1.1                             | 9.6  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1                             | 14.1 | 1.1                             | 9.0  | 1.1                              | 7.9  | 1.0                             | 6.2  | 1.0                             | 5.8  | ns   |
| <b><math>V_{CC(A)} = 1.65\text{ V to }1.95\text{ V}</math></b> |                   |                       |                                 |      |                                 |      |                                  |      |                                 |      |                                 |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5                             | 9.2  | 0.5                             | 5.9  | 0.5                              | 5.0  | 0.5                             | 4.2  | 0.5                             | 3.9  | ns   |
|  |                   | Bn to An              | 0.5                             | 6.4  | 0.5                             | 5.2  | 0.5                              | 5.0  | 0.5                             | 4.8  | 0.5                             | 4.6  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5                             | 7.9  | 0.5                             | 7.9  | 0.5                              | 7.9  | 0.5                             | 7.9  | 0.5                             | 7.9  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5                             | 12.0 | 0.5                             | 8.6  | 0.5                              | 7.6  | 0.5                             | 6.6  | 0.5                             | 6.4  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 1.0                             | 7.5  | 1.0                             | 7.5  | 1.0                              | 7.5  | 1.0                             | 7.5  | 1.0                             | 7.5  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1                             | 13.7 | 1.1                             | 9.1  | 1.0                              | 7.4  | 0.5                             | 5.7  | 0.5                             | 5.0  | ns   |
| <b><math>V_{CC(A)} = 2.3\text{ V to }2.7\text{ V}</math></b>   |                   |                       |                                 |      |                                 |      |                                  |      |                                 |      |                                 |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5                             | 8.8  | 0.5                             | 5.8  | 0.5                              | 4.8  | 0.5                             | 3.7  | 0.5                             | 3.2  | ns   |
|  |                   | Bn to An              | 0.5                             | 5.4  | 0.5                             | 4.9  | 0.5                              | 4.2  | 0.5                             | 3.7  | 0.5                             | 3.5  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5                             | 5.7  | 0.5                             | 5.7  | 0.5                              | 5.7  | 0.5                             | 5.7  | 0.5                             | 5.7  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5                             | 11.5 | 0.5                             | 7.9  | 0.5                              | 7.0  | 0.5                             | 5.7  | 0.5                             | 5.8  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 0.5                             | 5.3  | 0.5                             | 5.3  | 0.5                              | 5.3  | 0.5                             | 5.3  | 0.5                             | 5.3  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1                             | 13.1 | 1.1                             | 8.7  | 0.5                              | 7.1  | 0.5                             | 5.1  | 0.5                             | 4.4  | ns   |
| <b><math>V_{CC(A)} = 3.0\text{ V to }3.6\text{ V}</math></b>   |                   |                       |                                 |      |                                 |      |                                  |      |                                 |      |                                 |      |      |
| $t_{pd}$   | propagation delay | An to Bn              | 0.5                             | 8.6  | 0.5                             | 5.5  | 0.5                              | 4.6  | 0.5                             | 3.5  | 0.5                             | 3.0  | ns   |
|  |                   | Bn to An              | 0.5                             | 5.3  | 0.5                             | 4.6  | 0.5                              | 3.9  | 0.5                             | 3.2  | 0.5                             | 3.0  | ns   |
| $t_{dis}$  | disable time      | $\overline{OE}$ to An | 0.5                             | 5.4  | 0.5                             | 5.4  | 0.5                              | 5.4  | 0.5                             | 5.4  | 0.5                             | 5.4  | ns   |
|  |                   | $\overline{OE}$ to Bn | 0.5                             | 11.2 | 0.5                             | 7.6  | 0.5                              | 6.6  | 0.5                             | 5.3  | 0.5                             | 5.5  | ns   |
| $t_{en}$   | enable time       | $\overline{OE}$ to An | 0.5                             | 4.4  | 0.5                             | 4.4  | 0.5                              | 4.4  | 0.5                             | 4.4  | 0.5                             | 4.4  | ns   |
|  |                   | $\overline{OE}$ to Bn | 1.1                             | 12.9 | 1.1                             | 8.6  | 0.5                              | 6.9  | 0.5                             | 5.0  | 0.5                             | 4.3  | 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  $t_{PZH}$ .

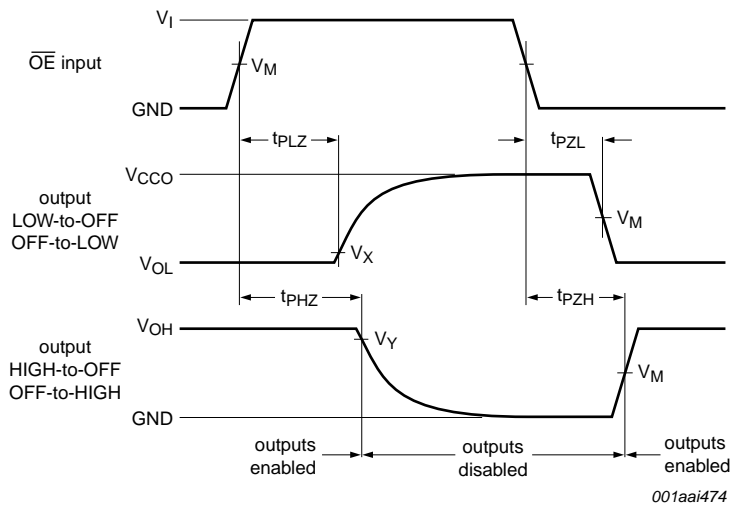
11. Waveforms



Measurement points are given in [Table 14](#).

$V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 5. The data input (An, Bn) to output (Bn, An) 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.

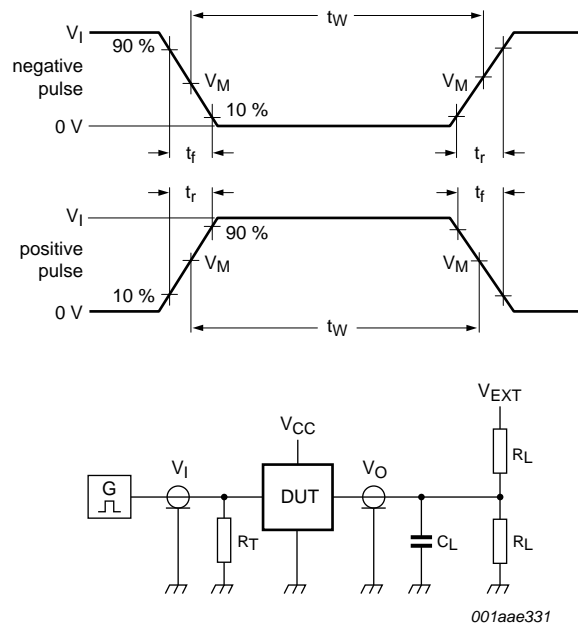
**Fig 6. Enable and disable times**

**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         | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.1 V$  | $V_{OH} - 0.1 V$  |
| 1.65 V to 2.7 V        | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.15 V$ | $V_{OH} - 0.15 V$ |
| 3.0 V to 3.6 V         | $0.5V_{CCI}$         | $0.5V_{CCO}$          | $V_{OL} + 0.3 V$  | $V_{OH} - 0.3 V$  |

[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.

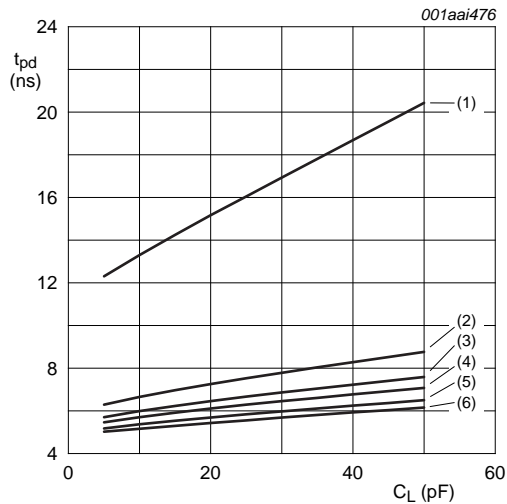
**Fig 7. Load circuit for switching times**

**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                | $2V_{CCO}$                        |

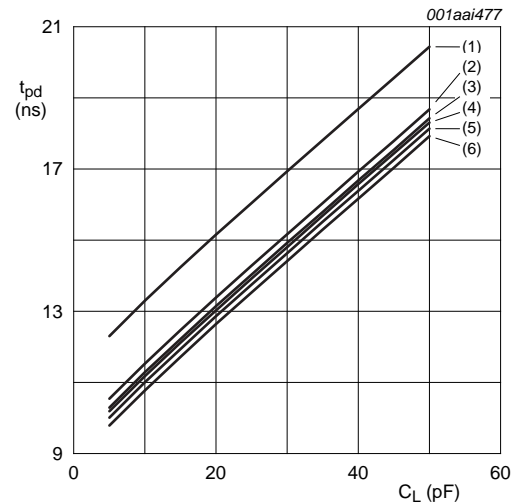
- [1]  $V_{CCI}$  is the supply voltage associated with the data input port.
- [2]  $dV/dt \geq 1.0 \text{ V/ns}$
- [3]  $V_{CCO}$  is the supply voltage associated with the output port.

## 12. Typical propagation delay characteristics



a. Propagation delay (An to Bn);  $V_{CC(A)} = 0.8\text{ V}$

- (1)  $V_{CC(B)} = 0.8\text{ V}$ .
- (2)  $V_{CC(B)} = 1.2\text{ V}$ .
- (3)  $V_{CC(B)} = 1.5\text{ V}$ .
- (4)  $V_{CC(B)} = 1.8\text{ V}$ .
- (5)  $V_{CC(B)} = 2.5\text{ V}$ .
- (6)  $V_{CC(B)} = 3.3\text{ V}$ .

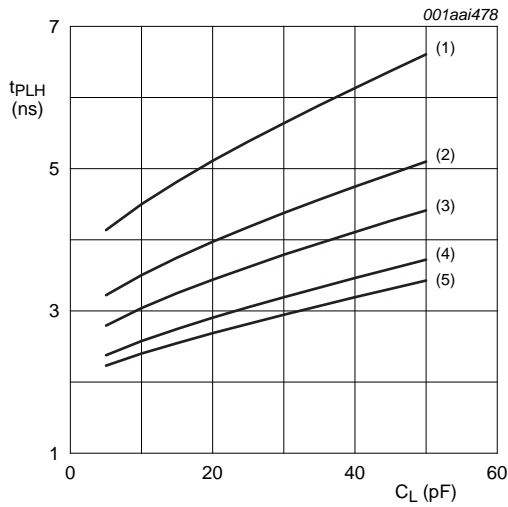


b. Propagation delay (An to Bn);  $V_{CC(B)} = 0.8\text{ V}$

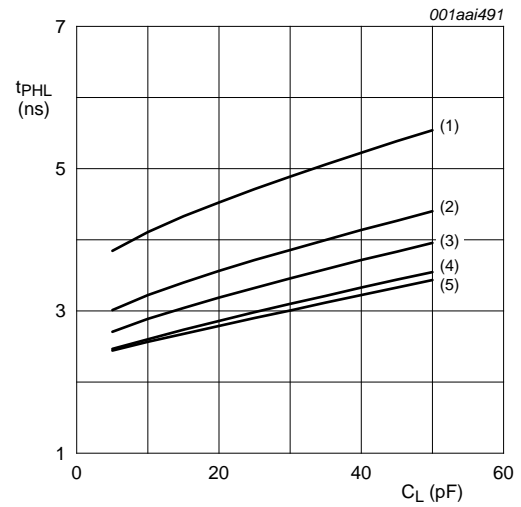
- (1)  $V_{CC(A)} = 0.8\text{ V}$ .
- (2)  $V_{CC(A)} = 1.2\text{ V}$ .
- (3)  $V_{CC(A)} = 1.5\text{ V}$ .
- (4)  $V_{CC(A)} = 1.8\text{ V}$ .
- (5)  $V_{CC(A)} = 2.5\text{ V}$ .
- (6)  $V_{CC(A)} = 3.3\text{ V}$ .

**Fig 8. Typical propagation delay vs load capacitance;  $T_{amb} = 25\text{ °C}$**

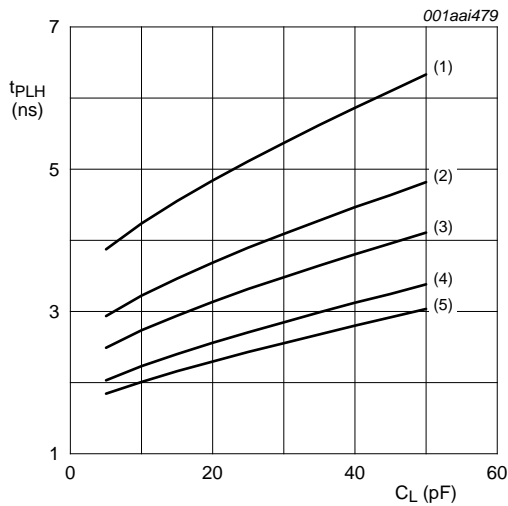




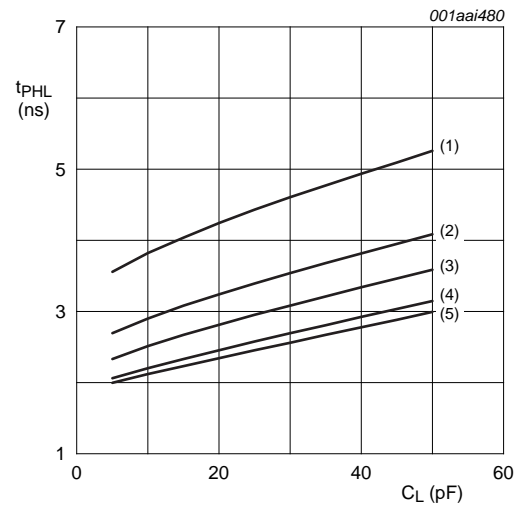
a. LOW to HIGH propagation delay (An to Bn);  
 $V_{CC(A)} = 1.2\text{ V}$



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



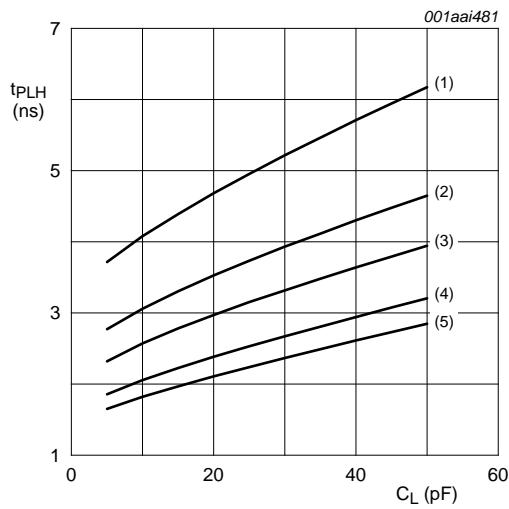
c. LOW to HIGH propagation delay (An to Bn);  
 $V_{CC(A)} = 1.5\text{ V}$



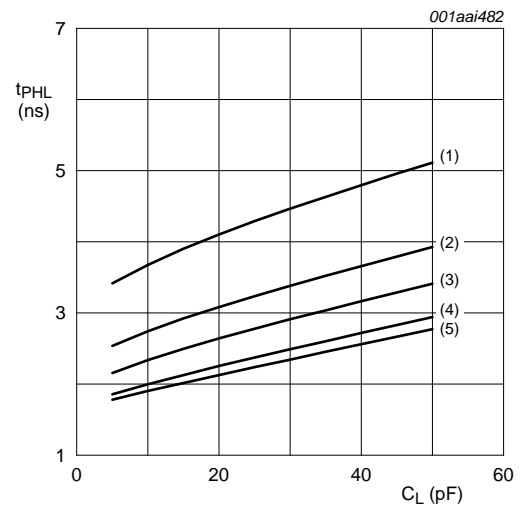
d. HIGH to LOW propagation delay (An to Bn);  
 $V_{CC(A)} = 1.5\text{ V}$

- (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)  $V_{CC(B)} = 3.3\text{ V}$ .

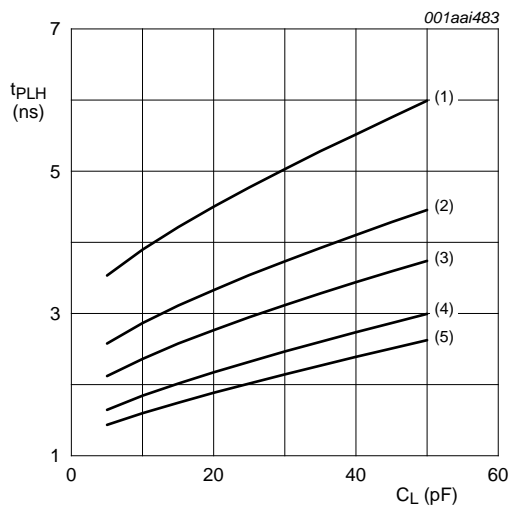
Fig 9. Typical propagation delay vs load capacitance;  $T_{amb} = 25\text{ }^\circ\text{C}$



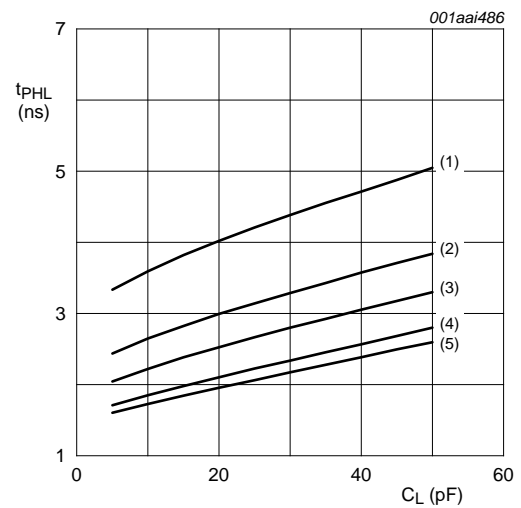
a. LOW to HIGH propagation delay (An to Bn);  
 $V_{CC(A)} = 1.8\text{ V}$



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



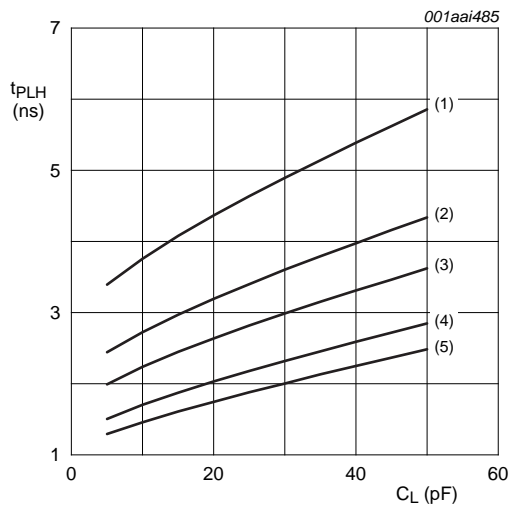
c. LOW to HIGH propagation delay (An to Bn);  
 $V_{CC(A)} = 2.5\text{ V}$



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

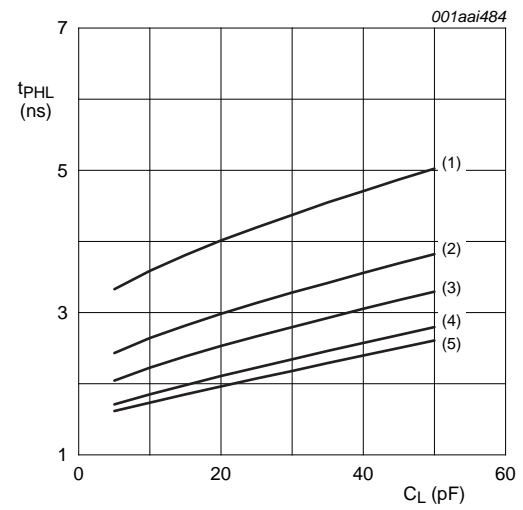
- (1)  $V_{CC(B)} = 1.2\text{ V}$ .
- (2)  $V_{CC(B)} = 1.5\text{ V}$ .
- (3)  $V_{CC(B)} = 1.8\text{ V}$ .
- (4)  $V_{CC(B)} = 2.5\text{ V}$ .
- (5)  $V_{CC(B)} = 3.3\text{ V}$ .

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



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

- (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 (An to Bn);  
 $V_{CC(A)} = 3.3 \text{ V}$

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

13. Package outline

TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1

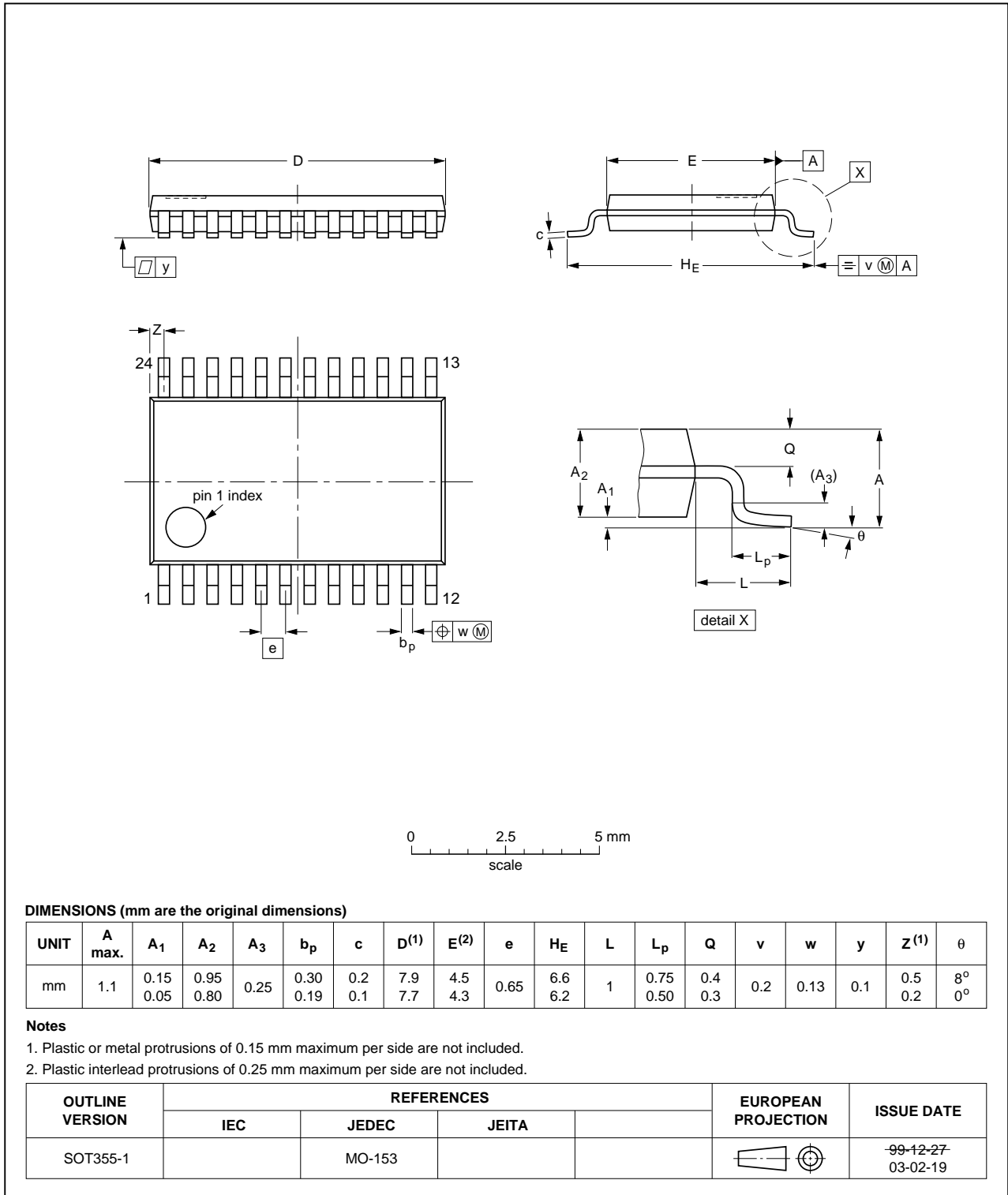


Fig 12. Package outline SOT355-1 (TSSOP24)

DHVQFN24: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body 3.5 x 5.5 x 0.85 mm

SOT815-1

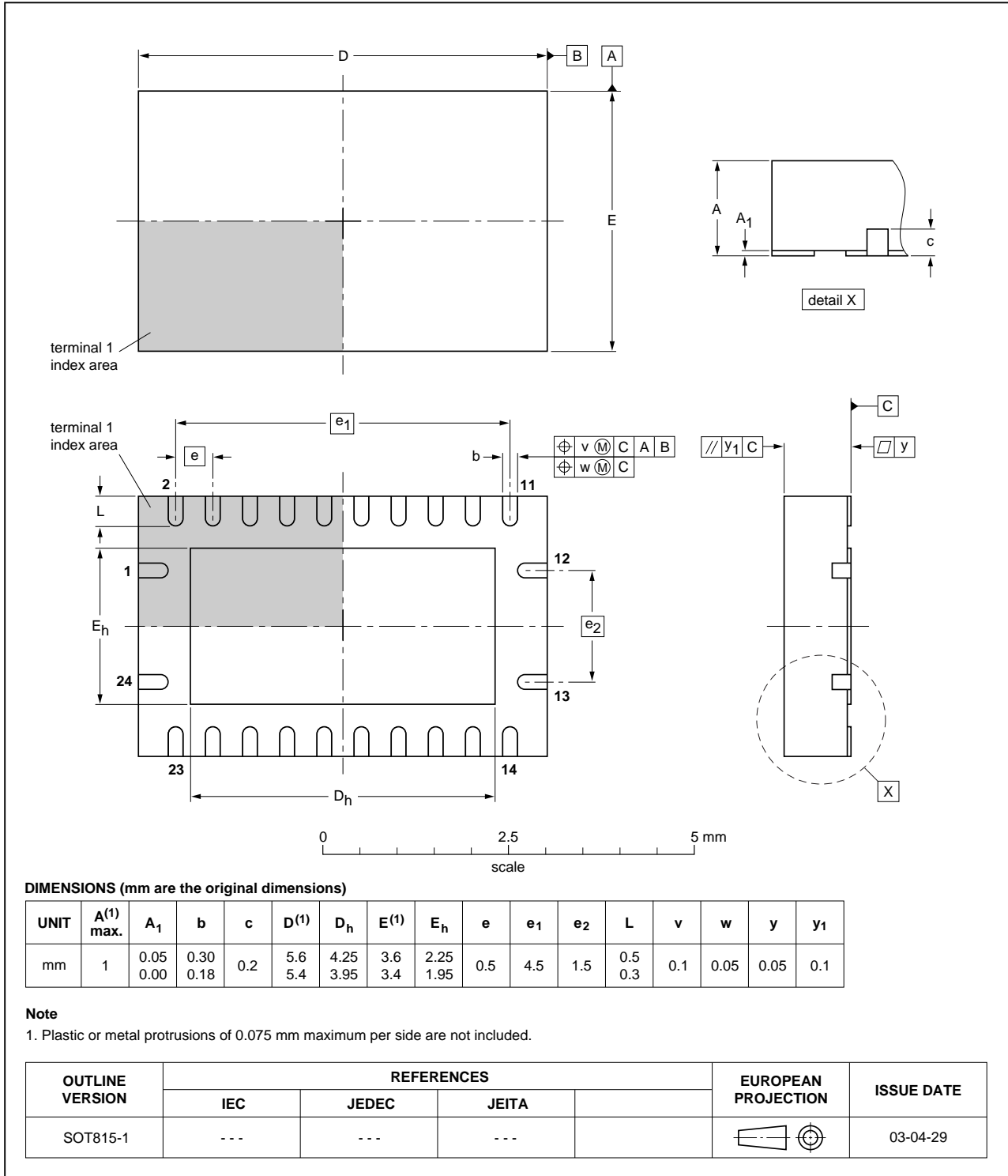


Fig 13. Package outline SOT815-1 (DHVQFN24)

## 14. Abbreviations

Table 16. 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                           |

## 15. Revision history

Table 17. Revision history

| Document ID     | Release date   | Data sheet status  | Change notice | Supersedes      |
|-----------------|--|--------------------|---------------|-----------------|
| 74AVCH8T245 v.5 | 20121227   | Product data sheet | -             | 74AVCH8T245 v.4 |
| Modifications:  | <ul style="list-style-type: none"> <li>• <a href="#">Table 4</a>: conditions I<sub>CC</sub> and I<sub>GND</sub> changed (errata).</li> </ul> |                    |               |                 |
| 74AVCH8T245 v.4 | 20111214   | Product data sheet | -             | 74AVCH8T245 v.3 |
| Modifications:  | <ul style="list-style-type: none"> <li>• Legal pages updated.</li> </ul>   |                    |               |                 |
| 74AVCH8T245 v.3 | 20110927   | Product data sheet | -             | 74AVCH8T245 v.2 |
| 74AVCH8T245 v.2 | 20090428   | Product data sheet | -             | 74AVCH8T245 v.1 |
| 74AVCH8T245 v.1 | 20080709   | 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>.

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## 17. Contact information

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