

# 74AVC4T245

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

Rev. 6 — 20 March 2019

Product data sheet

### 1. General description

The 74AVC4T245 is an 4-bit, dual supply transceiver that enables bidirectional level translation. The device can be used as two 2-bit transceivers or as a 4-bit transceiver. It features four 2-bit input-output ports (nAn and nBn), a direction control input (nDIR), a output enable input (n $\overline{OE}$ ) 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 nAn, n $\overline{OE}$  and nDIR are referenced to  $V_{CC(A)}$  and pins nBn are referenced to  $V_{CC(B)}$ . A HIGH on nDIR allows transmission from nAn to nBn and a LOW on nDIR allows transmission from nBn to nAn. The output enable input (n $\overline{OE}$ ) 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 nAn and nBn 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-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)
  - 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)
  - 100 Mbit/s ( $\geq$  1.1 V to 1.2 V translation)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- $I_{OFF}$  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

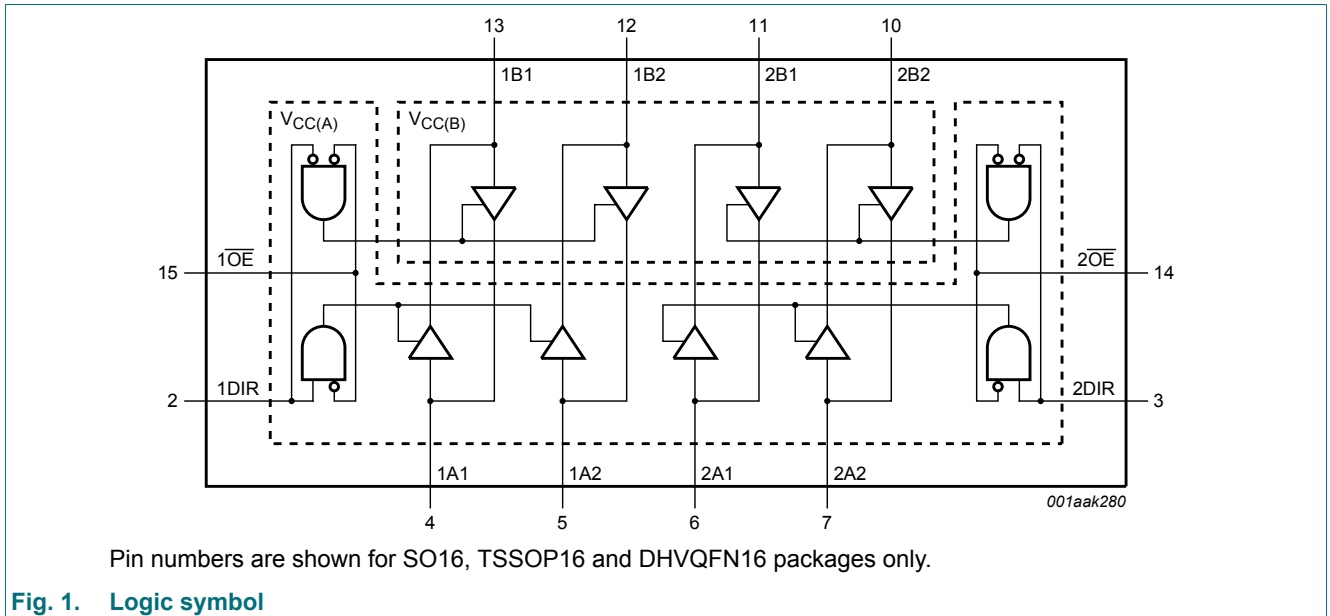
| Type number  | Package           |          |  |           |
|--------------|-------------------|----------|--|-----------|
|              | Temperature range | Name     | Description  | Version   |
| 74AVC4T245D  | -40 °C to +125 °C | SO16     | plastic small outline package; 16 leads; body width 3.9 mm   | SOT109-1  |
| 74AVC4T245PW | -40 °C to +125 °C | TSSOP16  | plastic thin shrink small outline package; 16 leads; body width 4.4 mm   | SOT403-1  |
| 74AVC4T245BQ | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm | SOT763-1  |
| 74AVC4T245GU | -40 °C to +125 °C | XQFN16   | plastic, extremely thin quad flat package; no leads; 16 terminals; body 1.80 x 2.60 x 0.50 mm                                  | SOT1161-1 |

### 4. Marking

Table 2. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| 74AVC4T245D  | 74AVC4T245D  |
| 74AVC4T245PW | VC4T245      |
| 74AVC4T245BQ | C4T245       |
| 74AVC4T245GU | BT5          |

### 5. Functional diagram



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

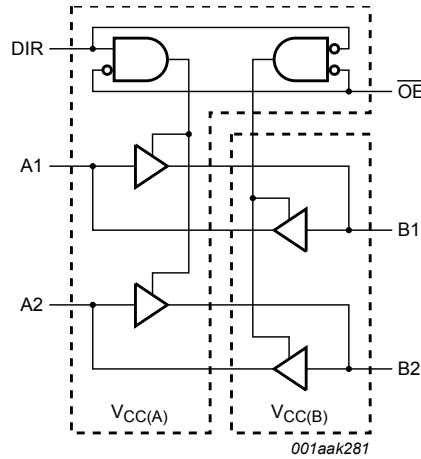


Fig. 2. Logic diagram (one 2-bit transceiver)

## 6. Pinning information

### 6.1. Pinning

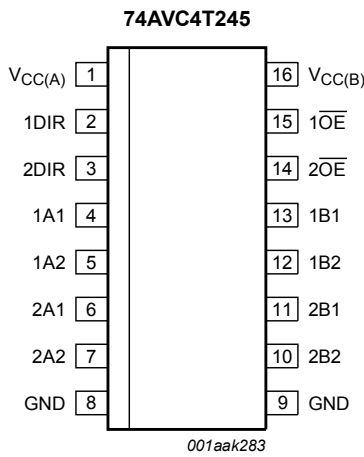


Fig. 3. Pin configuration SOT109-1 (SO16)

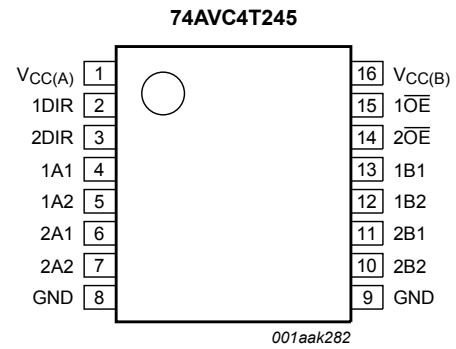


Fig. 4. Pin configuration SOT403-1 (TSSOP16)

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

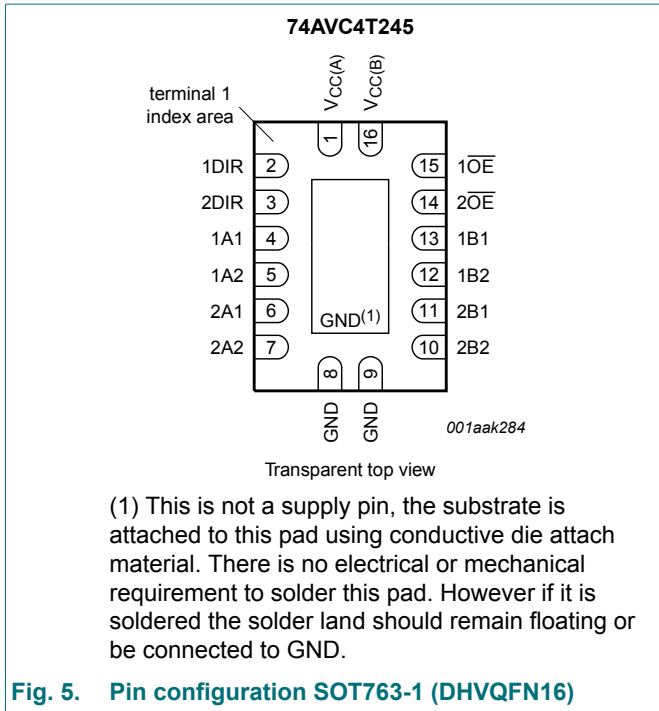


Fig. 5. Pin configuration SOT763-1 (DHVQFN16)

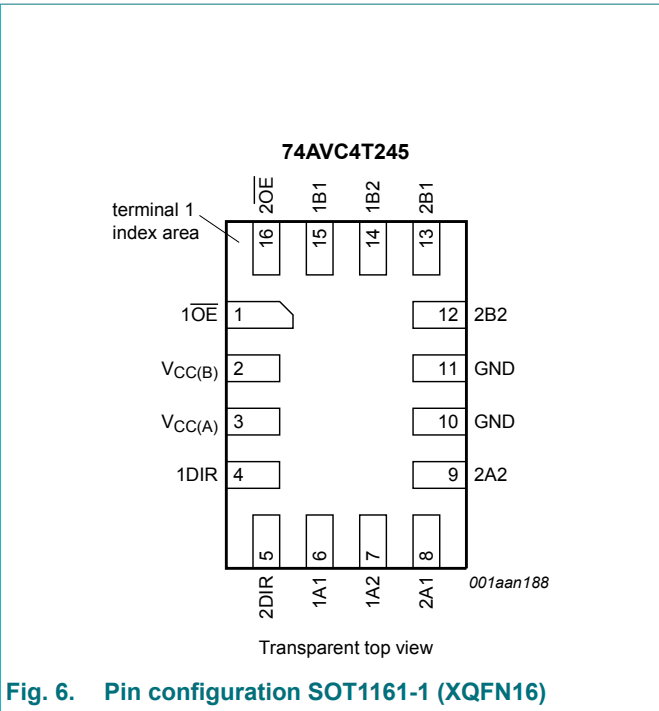


Fig. 6. Pin configuration SOT1161-1 (XQFN16)

6.2. Pin description

Table 3. Pin description

| Symbol             | Pin                             |           | Description   |
|--------------------|---------------------------------|-----------|---|
|                    | SOT109-1, SOT403-1 and SOT763-1 | SOT1161-1 |   |
| V <sub>CC(A)</sub> | 1                               | 3         | supply voltage A (nAn, nOE and nDIR inputs are referenced to V <sub>CC(A)</sub> ) |
| 1DIR, 2DIR         | 2, 3                            | 4, 5      | direction control   |
| 1A1, 1A2           | 4, 5                            | 6, 7      | data input or output  |
| 2A1, 2A2           | 6, 7                            | 8, 9      | data input or output  |
| GND[1]             | 8, 9                            | 10, 11    | ground (0 V)  |
| 2B2, 2B1           | 10, 11                          | 12, 13    | data input or output  |
| 1B2, 1B1           | 12, 13                          | 14, 15    | data input or output  |
| 2OE, 1OE           | 14, 15                          | 16, 1     | output enable input (active LOW)  |
| V <sub>CC(B)</sub> | 16                              | 2         | supply voltage B (nBn inputs are referenced to V <sub>CC(B)</sub> )               |

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

## 7. Functional description

**Table 4. Function table**

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

| Supply voltage | Input  |         | Input/output[1] |           |
|----------------|--------|---------|-----------------|-----------|
|                | nOE[2] | nDIR[2] | nAn[2]          | nBn[2]    |
| 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[1]         | X      | X       | Z               | Z         |

[1] If at least one of  $V_{CC(A)}$  or  $V_{CC(B)}$  is at GND level, the device goes into suspend mode.

[2] The nAn, nDIR and nOE input circuit is referenced to  $V_{CC(A)}$ ; The nBn input circuit is referenced to  $V_{CC(B)}$ .

## 8. Limiting values

**Table 5. 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      |      |                 |      |
|             |                         | SO16, TSSOP16 and DHVQFN16 [4]     | -    | 500             | mW   |
|             |                         | XQFN16                             | -    | 250             | 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] For SO16 package: above 70 °C derates linearly with 8 mW/K.

For TSSOP16 package: above 60 °C the value of  $P_{tot}$  derates linearly at 5.5 mW/K.

For DHVQFN16 package: above 60 °C the value of  $P_{tot}$  derates linearly at 4.5 mW/K.

## 9. Recommended operating conditions

Table 6. 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 | $V_{CCI} = 0.8 \text{ V to } 3.6 \text{ V}$ [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.

## 10. Static characteristics

Table 7. Typical static characteristics at  $T_{amb} = 25 \text{ °C}$

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). [1][2]

| Symbol    | Parameter                 | Conditions  | Min | Typ         | Max        | Unit          |
|-----------|---------------------------|---|-----|-------------|------------|---------------|
| $V_{OH}$  | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$  |     |             |            |               |
|           |                           | $I_O = -1.5 \text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$   | -   | 0.69        | -          | V             |
| $V_{OL}$  | LOW-level output voltage  | $V_I = V_{IH}$ or $V_{IL}$  |     |             |            |               |
|           |                           | $I_O = 1.5 \text{ mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$  | -   | 0.07        | -          | V             |
| $I_I$     | input leakage current     | nDIR, n $\overline{OE}$ 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 $V_O = 0 \text{ V to } 3.6 \text{ V}$ ; $V_{CC(A)} = 0 \text{ V}$ ;<br>$V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$ | -   | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$ |
|           |                           | B port; $V_I$ or $V_O = 0 \text{ V to } 3.6 \text{ V}$ ; $V_{CC(B)} = 0 \text{ V}$ ;<br>$V_{CC(A)} = 0.8 \text{ V to } 3.6 \text{ V}$ | -   | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$ |
| $C_I$     | input capacitance         | nDIR, n $\overline{OE}$ input; $V_I = 0 \text{ V or } 3.3 \text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3 \text{ V}$                     | -   | 1.0         | -          | pF            |
| $C_{I/O}$ | input/output capacitance  | A and B port; $V_O = 3.3 \text{ V or } 0 \text{ V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 3.3 \text{ V}$                                      | -   | 4.0         | -          | 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.

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

Table 8. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). [1][2]

| Symbol          | Parameter                 | Conditions  | -40 °C to +85 °C       |                        | -40 °C to +125 °C      |                        | Unit |
|-----------------|---------------------------|---|------------------------|------------------------|------------------------|------------------------|------|
|                 |                           |   | Min                    | Max                    | Min                    | Max                    |      |
| V <sub>IH</sub> | HIGH-level input voltage  | data input  |                        |                        |                        |                        |      |
|                 |                           | V <sub>CCI</sub> = 0.8 V  | 0.70V <sub>CCI</sub>   | -                      | 0.70V <sub>CCI</sub>   | -                      | V    |
|                 |                           | V <sub>CCI</sub> = 1.1 V to 1.95 V  | 0.65V <sub>CCI</sub>   | -                      | 0.65V <sub>CCI</sub>   | -                      | V    |
|                 |                           | V <sub>CCI</sub> = 2.3 V to 2.7 V   | 1.6                    | -                      | 1.6                    | -                      | V    |
|                 |                           | V <sub>CCI</sub> = 3.0 V to 3.6 V   | 2                      | -                      | 2                      | -                      | V    |
|                 |                           | nDIR, nOE input   |                        |                        |                        |                        |      |
|                 |                           | V <sub>CC(A)</sub> = 0.8 V  | 0.70V <sub>CC(A)</sub> | -                      | 0.70V <sub>CC(A)</sub> | -                      | V    |
|                 |                           | V <sub>CC(A)</sub> = 1.1 V to 1.95 V  | 0.65V <sub>CC(A)</sub> | -                      | 0.65V <sub>CC(A)</sub> | -                      | V    |
| 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    |
|                 |                           | nDIR, nOE 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>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;<br>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    |
| 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;<br>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>I</sub>  | input leakage current     | nDIR, nOE input; V <sub>I</sub> = 0 V or 3.6 V;<br>V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V | -                      | ±1                     | -                      | ±5                     | µA   |

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

| Symbol  | Parameter                 | Conditions  | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|---|---------------------------|---|------------------|-----|-------------------|-----|------|
|   |                           |   | Min              | Max | Min               | Max |      |
| I <sub>OZ</sub>   | OFF-state output current  | A or B port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6 V [3]   | -                | ±5  | -                 | ±30 | µA   |
|   |                           | suspend mode A port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 3.6 V; V <sub>CC(B)</sub> = 0 V [3]  | -                | ±5  | -                 | ±30 | µA   |
|   |                           | suspend mode B port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 3.6 V [3]  | -                | ±5  | -                 | ±30 | µA   |
| I <sub>OFF</sub>  | power-off leakage current | A port; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; 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; V <sub>CC(B)</sub> = 0 V; V <sub>CC(A)</sub> = 0.8 V to 3.6 V  | -                | ±5  | -                 | ±30 | µA   |
| 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; 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; 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; 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; 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> ); I <sub>O</sub> = 0 A; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; V <sub>CC(A)</sub> = 0.8 V to 3.6 V; 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> ); I <sub>O</sub> = 0 A; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; V <sub>CC(A)</sub> = 1.1 V to 3.6 V; 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] For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

Table 9. 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   |



## 11. Dynamic characteristics

**Table 10. Typical power dissipation capacitance at  $V_{CC(A)} = V_{CC(B)}$  and  $T_{amb} = 25\text{ °C}$**

*Voltages are referenced to GND (ground = 0 V). [1][2]*

| 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  | 9.5                     | 9.7   | 9.8   | 9.9   | 10.7  | 11.9  | pF   |
|          |                               | A port: (direction nBn to nAn); output disabled | 0.6                     | 0.6   | 0.6   | 0.6   | 0.7   | 0.7   | pF   |
|          |                               | B port: (direction nAn to nBn); output enabled  | 9.5                     | 9.7   | 9.8   | 9.9   | 10.7  | 11.9  | pF   |
|          |                               | B port: (direction nAn to nBn); output disabled | 0.6                     | 0.6   | 0.6   | 0.6   | 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  $\mu\text{W}$ ).

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

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

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

**Table 11. Typical dynamic characteristics at  $V_{CC(A)} = 0.8\text{ V}$  and  $T_{amb} = 25\text{ °C}$**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for waveforms see Fig. 7 and Fig. 8.[1]

| 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              | 14.5        | 7.3   | 6.5   | 6.2   | 5.9   | 6.0   | ns   |
|           |                   | nBn to nAn              | 14.5        | 12.7  | 12.4  | 12.3  | 12.1  | 12.0  | ns   |
| $t_{dis}$ | disable time      | $n\overline{OE}$ to nAn | 14.3        | 14.3  | 14.3  | 14.3  | 14.3  | 14.3  | ns   |
|           |                   | $n\overline{OE}$ to nBn | 17.0        | 9.9   | 9.0   | 9.4   | 9.0   | 9.7   | ns   |
| $t_{en}$  | enable time       | $n\overline{OE}$ to nAn | 18.2        | 18.2  | 18.2  | 18.2  | 18.2  | 18.2  | ns   |
|           |                   | $n\overline{OE}$ to nBn | 19.2        | 10.7  | 9.8   | 9.6   | 9.7   | 10.2  | 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. Typical dynamic characteristics at  $V_{CC(B)} = 0.8\text{ V}$  and  $T_{amb} = 25\text{ °C}$**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for waveforms see Fig. 7 and Fig. 8.[1]

| 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              | 14.5        | 12.7  | 12.4  | 12.3  | 12.1  | 12.0  | ns   |
|           |                   | nBn to nAn              | 14.5        | 7.3   | 6.5   | 6.2   | 5.9   | 6.0   | ns   |
| $t_{dis}$ | disable time      | $n\overline{OE}$ to nAn | 14.3        | 5.5   | 4.1   | 4.0   | 3.0   | 3.5   | ns   |
|           |                   | $n\overline{OE}$ to nBn | 17.0        | 13.8  | 13.4  | 13.1  | 12.9  | 12.7  | ns   |
| $t_{en}$  | enable time       | $n\overline{OE}$ to nAn | 18.2        | 5.6   | 4.0   | 3.2   | 2.4   | 2.2   | ns   |
|           |                   | $n\overline{OE}$ to nBn | 19.2        | 14.6  | 14.1  | 13.9  | 13.7  | 13.6  | 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  $t_{PZH}$ .

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

Table 13. Dynamic characteristics for temperature range -40 °C to +85 °C

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for waveforms see Fig. 7 and Fig. 8.[1]

| Symbol  | Parameter         | Conditions              | $V_{CC(B)}$   |      |               |      |                |      |               |      |               |      | 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  |      |
| <b><math>V_{CC(A)} = 1.1 \text{ V to } 1.3 \text{ V}</math></b>   |                   |                         |               |      |               |      |                |      |               |      |               |      |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 0.5           | 9.4  | 0.5           | 7.1  | 0.5            | 6.2  | 0.5           | 5.2  | 0.5           | 5.1  | ns   |
|   |                   | nBn to nAn              | 0.5           | 9.4  | 0.5           | 8.9  | 0.5            | 8.7  | 0.5           | 8.4  | 0.5           | 8.2  | ns   |
| $t_{dis}$   | disable time      | $\overline{nOE}$ to nAn | 1.8           | 10.9 | 1.8           | 10.9 | 1.8            | 10.9 | 1.8           | 10.9 | 1.8           | 10.9 | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.9           | 12.4 | 1.9           | 9.6  | 1.9            | 9.5  | 1.4           | 8.1  | 1.2           | 9.1  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 1.4           | 12.8 | 1.4           | 12.8 | 1.4            | 12.8 | 1.4           | 12.8 | 1.4           | 12.8 | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.1           | 13.3 | 1.1           | 10.0 | 1.1            | 8.9  | 1.0           | 7.9  | 1.0           | 7.7  | ns   |
| <b><math>V_{CC(A)} = 1.4 \text{ V to } 1.6 \text{ V}</math></b>   |                   |                         |               |      |               |      |                |      |               |      |               |      |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 0.3           | 8.9  | 0.3           | 6.3  | 0.3            | 5.2  | 0.3           | 4.2  | 0.3           | 4.2  | ns   |
|   |                   | nBn to nAn              | 0.7           | 7.1  | 0.7           | 6.3  | 0.5            | 6.0  | 0.4           | 5.7  | 0.3           | 5.6  | ns   |
| $t_{dis}$   | disable time      | $\overline{nOE}$ to nAn | 1.8           | 10.2 | 1.8           | 10.2 | 1.5            | 10.2 | 1.3           | 10.2 | 1.6           | 10.2 | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.9           | 11.3 | 1.9           | 10.3 | 1.9            | 9.1  | 1.4           | 7.4  | 1.2           | 7.6  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 1.1           | 9.4  | 1.4           | 9.4  | 1.1            | 9.4  | 0.7           | 9.4  | 0.4           | 9.4  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.4           | 12.1 | 1.4           | 9.6  | 1.1            | 7.7  | 0.9           | 5.8  | 0.9           | 5.6  | ns   |
| <b><math>V_{CC(A)} = 1.65 \text{ V to } 1.95 \text{ V}</math></b> |                   |                         |               |      |               |      |                |      |               |      |               |      |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 0.1           | 8.7  | 0.1           | 6.0  | 0.1            | 4.9  | 0.1           | 3.9  | 0.3           | 3.9  | ns   |
|   |                   | nBn to nAn              | 0.6           | 6.2  | 0.6           | 5.3  | 0.5            | 4.9  | 0.3           | 4.6  | 0.3           | 4.5  | ns   |
| $t_{dis}$   | disable time      | $\overline{nOE}$ to nAn | 1.8           | 8.6  | 1.6           | 8.6  | 1.8            | 8.6  | 1.3           | 8.6  | 1.6           | 8.6  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.7           | 10.9 | 1.7           | 9.9  | 1.6            | 8.7  | 1.2           | 6.9  | 1.0           | 6.9  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 1.0           | 7.2  | 1.0           | 7.2  | 1.0            | 7.2  | 0.6           | 7.2  | 0.4           | 7.2  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.2           | 11.7 | 1.2           | 9.2  | 1.0            | 7.4  | 0.8           | 5.3  | 0.8           | 4.6  | ns   |
| <b><math>V_{CC(A)} = 2.3 \text{ V to } 2.7 \text{ V}</math></b>   |                   |                         |               |      |               |      |                |      |               |      |               |      |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 0.1           | 8.4  | 0.1           | 5.7  | 0.1            | 4.6  | 0.2           | 3.5  | 0.1           | 3.6  | ns   |
|   |                   | nBn to nAn              | 0.6           | 5.2  | 0.6           | 4.2  | 0.4            | 3.9  | 0.2           | 3.4  | 0.2           | 3.3  | ns   |
| $t_{dis}$   | disable time      | $\overline{nOE}$ to nAn | 1.0           | 6.2  | 1.0           | 6.2  | 1.0            | 6.2  | 1.0           | 6.2  | 1.0           | 6.2  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.5           | 10.4 | 1.5           | 8.8  | 1.3            | 8.2  | 1.1           | 6.2  | 0.9           | 5.2  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 0.7           | 4.8  | 0.7           | 4.8  | 0.7            | 4.8  | 0.6           | 4.8  | 0.4           | 4.8  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 0.9           | 11.3 | 0.9           | 8.8  | 0.8            | 7.0  | 0.6           | 4.8  | 0.6           | 4.0  | ns   |
| <b><math>V_{CC(A)} = 3.0 \text{ V to } 3.6 \text{ V}</math></b>   |                   |                         |               |      |               |      |                |      |               |      |               |      |      |
| $t_{pd}$  | propagation delay | nAn to nBn              | 0.1           | 8.2  | 0.1           | 5.6  | 0.1            | 4.5  | 0.1           | 3.3  | 0.1           | 2.9  | ns   |
|   |                   | nBn to nAn              | 0.6           | 5.1  | 0.6           | 4.2  | 0.4            | 3.4  | 0.2           | 3.0  | 0.1           | 2.8  | ns   |
| $t_{dis}$   | disable time      | $\overline{nOE}$ to nAn | 0.7           | 5.6  | 0.7           | 5.6  | 0.7            | 5.6  | 0.7           | 5.6  | 0.7           | 5.6  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 1.4           | 10.2 | 1.4           | 9.3  | 1.2            | 8.1  | 1.0           | 6.4  | 0.8           | 6.2  | ns   |
| $t_{en}$  | enable time       | $\overline{nOE}$ to nAn | 0.6           | 3.8  | 0.6           | 3.8  | 0.6            | 3.8  | 0.6           | 3.8  | 0.4           | 3.8  | ns   |
|   |                   | $\overline{nOE}$ to nBn | 0.8           | 11.3 | 0.8           | 8.7  | 0.6            | 6.8  | 0.5           | 4.7  | 0.5           | 3.8  | 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  $t_{PZH}$ .

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

Table 14. Dynamic characteristics for temperature range -40 °C to +125 °C

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for waveforms see Fig. 7 and Fig. 8.[1]

| 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  |      |
| <b>V<sub>CC(A)</sub> = 1.1 V to 1.3 V</b>   |                   |                                 |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                             | propagation delay | nAn to nBn                      | 0.5                | 10.4 | 0.5           | 7.9  | 0.5            | 6.9  | 0.5           | 5.8  | 0.5           | 5.7  | ns   |
|   |                   | nBn to nAn                      | 0.5                | 10.4 | 0.5           | 9.8  | 0.5            | 9.6  | 0.5           | 9.3  | 0.5           | 9.1  | ns   |
| t <sub>dis</sub>                            | disable time      | n $\overline{\text{OE}}$ to nAn | 1.8                | 12.0 | 1.8           | 12.0 | 1.8            | 12.0 | 1.8           | 12.0 | 1.8           | 12.0 | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.9                | 13.7 | 1.9           | 10.6 | 1.9            | 10.5 | 1.4           | 9.0  | 1.2           | 10.1 | ns   |
| t <sub>en</sub>                             | enable time       | n $\overline{\text{OE}}$ to nAn | 1.4                | 14.1 | 1.4           | 14.1 | 1.4            | 14.1 | 1.4           | 14.1 | 1.4           | 14.1 | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.1                | 14.7 | 1.1           | 11.0 | 1.1            | 9.8  | 1.0           | 8.7  | 1.0           | 8.5  | ns   |
| <b>V<sub>CC(A)</sub> = 1.4 V to 1.6 V</b>   |                   |                                 |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                             | propagation delay | nAn to nBn                      | 0.3                | 9.8  | 0.3           | 7.0  | 0.3            | 5.8  | 0.3           | 4.7  | 0.3           | 4.7  | ns   |
|   |                   | nBn to nAn                      | 0.7                | 7.9  | 0.7           | 7.0  | 0.5            | 6.6  | 0.4           | 6.3  | 0.3           | 6.2  | ns   |
| t <sub>dis</sub>                            | disable time      | n $\overline{\text{OE}}$ to nAn | 1.8                | 11.3 | 1.8           | 11.3 | 1.5            | 11.3 | 1.3           | 11.3 | 1.6           | 11.3 | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.9                | 12.5 | 1.9           | 11.4 | 1.9            | 10.1 | 1.4           | 8.2  | 1.2           | 8.4  | ns   |
| t <sub>en</sub>                             | enable time       | n $\overline{\text{OE}}$ to nAn | 1.1                | 10.4 | 1.4           | 10.4 | 1.1            | 10.4 | 0.7           | 10.4 | 0.4           | 10.4 | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.4                | 13.3 | 1.4           | 10.6 | 1.1            | 8.5  | 0.9           | 6.4  | 0.9           | 6.2  | ns   |
| <b>V<sub>CC(A)</sub> = 1.65 V to 1.95 V</b> |                   |                                 |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                             | propagation delay | nAn to nBn                      | 0.1                | 9.6  | 0.1           | 6.6  | 0.1            | 5.4  | 0.1           | 4.3  | 0.3           | 4.3  | ns   |
|   |                   | nBn to nAn                      | 0.6                | 6.9  | 0.6           | 5.9  | 0.5            | 5.4  | 0.3           | 5.1  | 0.3           | 5.0  | ns   |
| t <sub>dis</sub>                            | disable time      | n $\overline{\text{OE}}$ to nAn | 1.8                | 9.5  | 1.6           | 9.5  | 1.8            | 9.5  | 1.3           | 9.5  | 1.6           | 9.5  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.7                | 12.0 | 1.7           | 10.9 | 1.6            | 9.6  | 1.2           | 7.6  | 1.0           | 7.6  | ns   |
| t <sub>en</sub>                             | enable time       | n $\overline{\text{OE}}$ to nAn | 1.0                | 8.0  | 1.0           | 8.0  | 1.0            | 8.0  | 0.6           | 8.0  | 0.4           | 8.0  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.2                | 12.9 | 1.2           | 10.2 | 1.0            | 8.2  | 0.8           | 5.9  | 0.8           | 5.1  | ns   |
| <b>V<sub>CC(A)</sub> = 2.3 V to 2.7 V</b>   |                   |                                 |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                             | propagation delay | nAn to nBn                      | 0.1                | 9.3  | 0.1           | 6.3  | 0.1            | 5.1  | 0.2           | 4.0  | 0.1           | 4.0  | ns   |
|   |                   | nBn to nAn                      | 0.6                | 5.8  | 0.6           | 4.7  | 0.4            | 4.3  | 0.2           | 3.9  | 0.2           | 3.8  | ns   |
| t <sub>dis</sub>                            | disable time      | n $\overline{\text{OE}}$ to nAn | 1.0                | 6.9  | 1.0           | 6.9  | 1.0            | 6.9  | 1.0           | 6.9  | 1.0           | 6.9  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.5                | 11.5 | 1.5           | 10.4 | 1.3            | 9.1  | 1.1           | 6.9  | 0.9           | 5.8  | ns   |
| t <sub>en</sub>                             | enable time       | n $\overline{\text{OE}}$ to nAn | 0.7                | 5.3  | 0.7           | 5.3  | 0.7            | 5.3  | 0.6           | 5.3  | 0.4           | 5.3  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 0.9                | 12.4 | 0.9           | 9.7  | 0.8            | 7.7  | 0.6           | 5.3  | 0.6           | 4.4  | ns   |
| <b>V<sub>CC(A)</sub> = 3.0 V to 3.6 V</b>   |                   |                                 |                    |      |               |      |                |      |               |      |               |      |      |
| t <sub>pd</sub>                             | propagation delay | nAn to nBn                      | 0.1                | 9.1  | 0.1           | 6.2  | 0.1            | 5.0  | 0.1           | 3.8  | 0.1           | 3.3  | ns   |
|   |                   | nBn to nAn                      | 0.6                | 5.7  | 0.6           | 4.7  | 0.4            | 3.9  | 0.2           | 3.4  | 0.1           | 3.3  | ns   |
| t <sub>dis</sub>                            | disable time      | n $\overline{\text{OE}}$ to nAn | 0.7                | 6.2  | 0.7           | 6.2  | 0.7            | 6.2  | 0.7           | 6.2  | 0.7           | 6.2  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 1.4                | 11.3 | 1.4           | 10.3 | 1.2            | 9.0  | 1.0           | 7.1  | 0.8           | 6.9  | ns   |
| t <sub>en</sub>                             | enable time       | n $\overline{\text{OE}}$ to nAn | 0.6                | 4.2  | 0.6           | 4.2  | 0.6            | 4.2  | 0.6           | 4.2  | 0.4           | 4.2  | ns   |
|   |                   | n $\overline{\text{OE}}$ to nBn | 0.8                | 12.4 | 0.8           | 9.6  | 0.6            | 7.5  | 0.5           | 5.2  | 0.5           | 4.2  | 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>.

11.1. Waveforms and test circuit

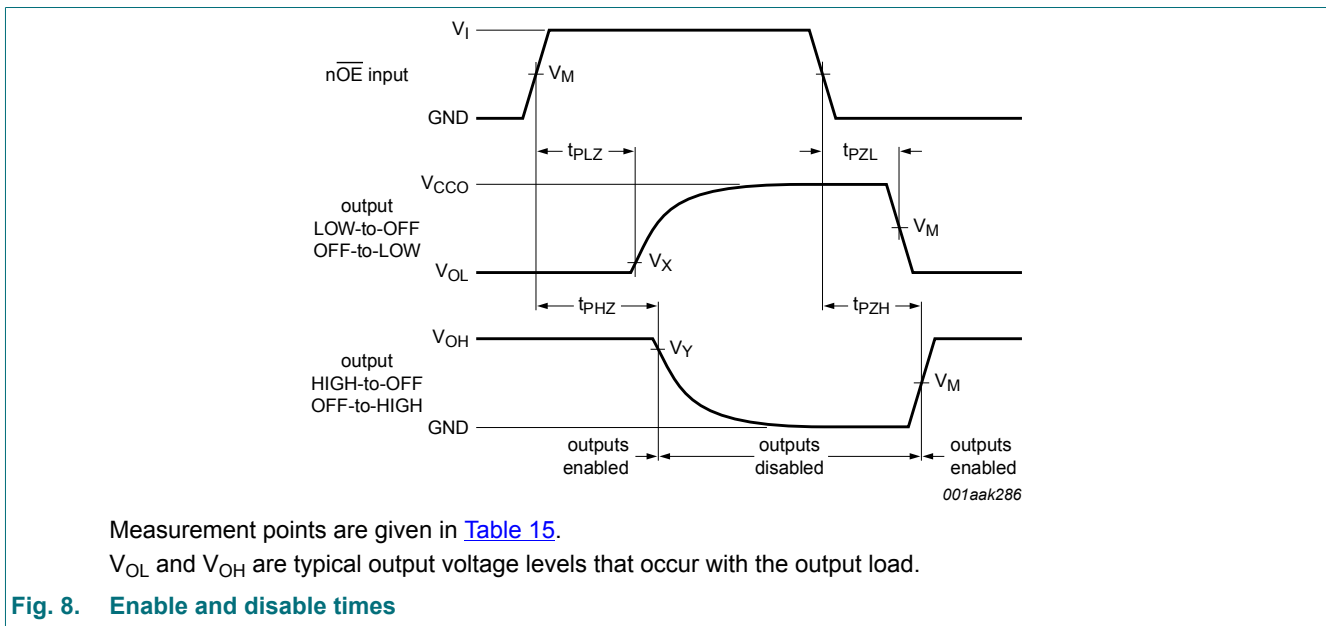
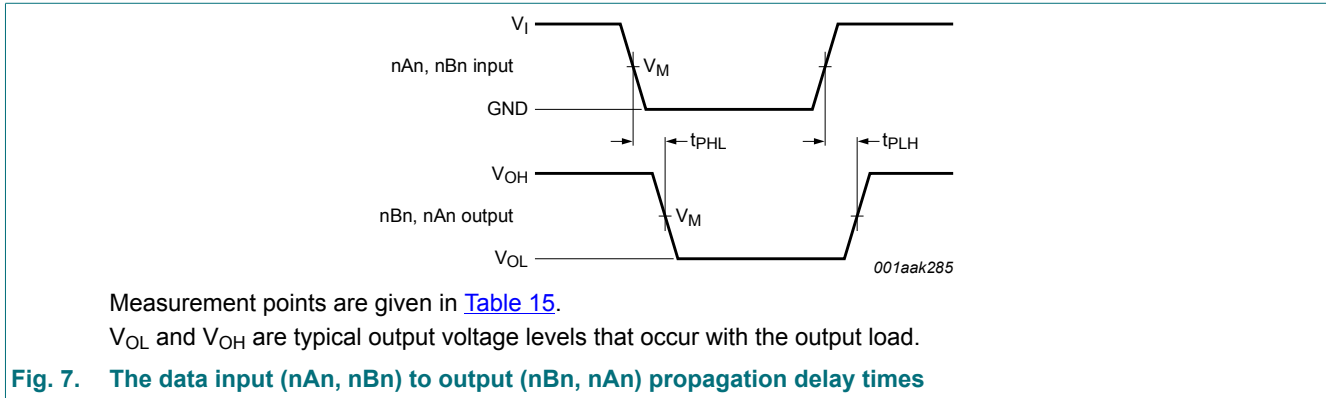
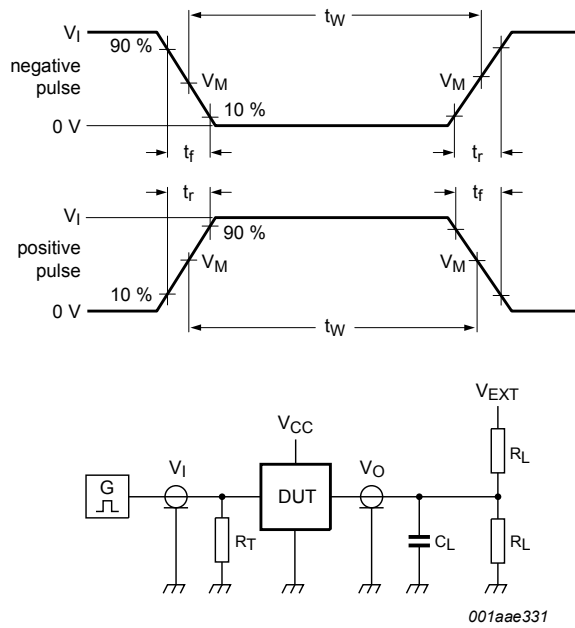


Table 15. Measurement points

| Supply voltage         | Input[1]     | Output[2]    |                          |                          |
|------------------------|--------------|--------------|--------------------------|--------------------------|
| $V_{CC(A)}, V_{CC(B)}$ | $V_M$        | $V_M$        | $V_X$                    | $V_Y$                    |
| 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.

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



Test data is given in [Table 16](#).  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance.  
 $V_{EXT}$  = External voltage for measuring switching times.

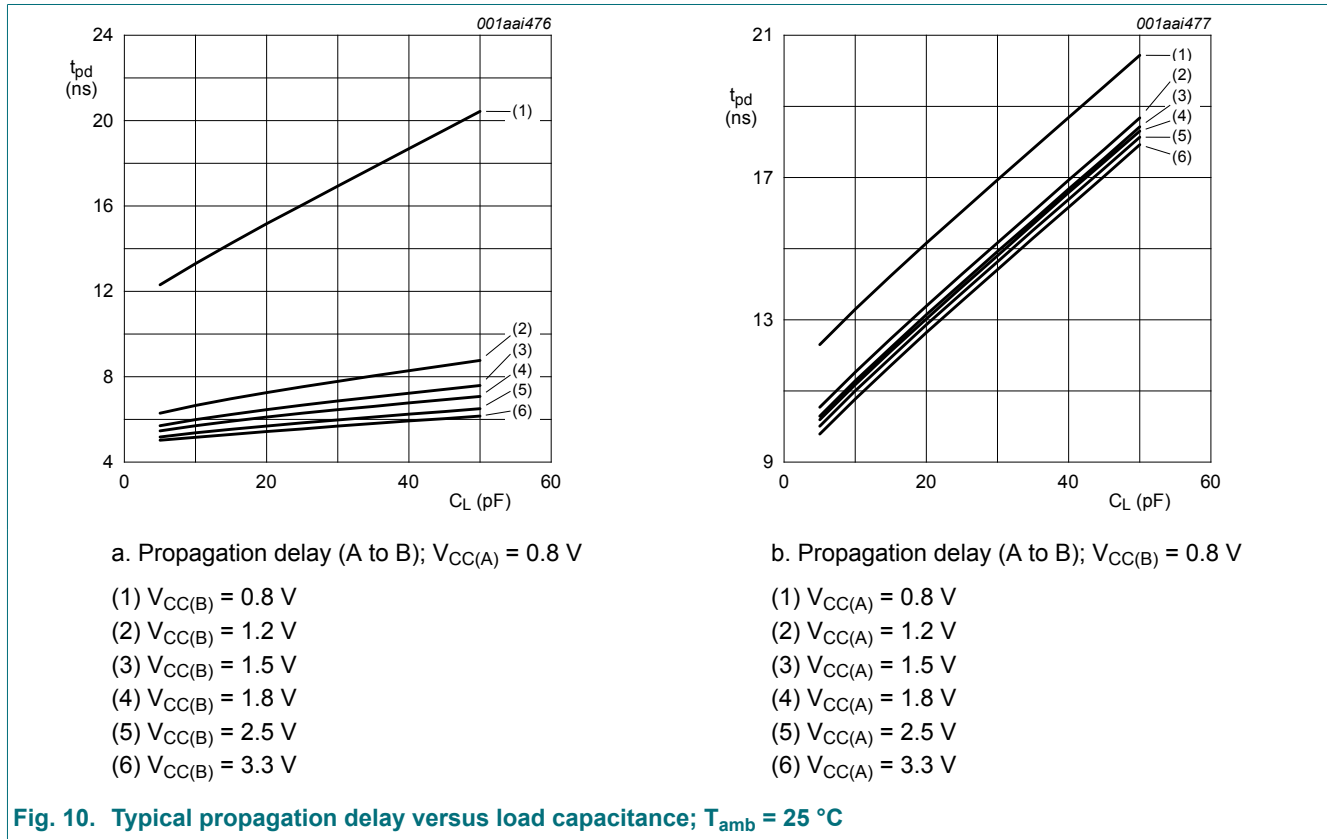
Fig. 9. Test circuit for measuring switching times

Table 16. Test data

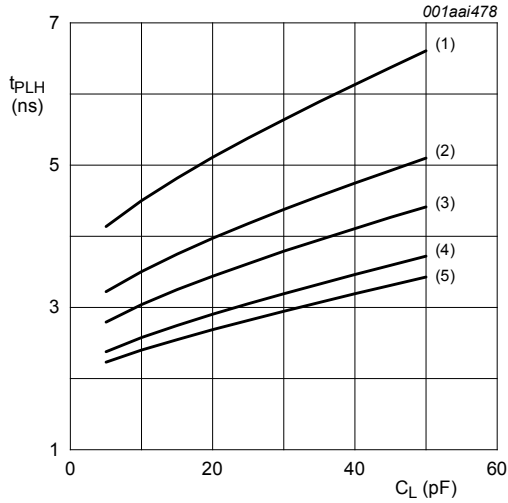
| Supply voltage         | Input        |                         | Load  |              | $V_{EXT}$          |                    |                        |
|------------------------|--------------|-------------------------|-------|--------------|--------------------|--------------------|------------------------|
| $V_{CC(A)}, V_{CC(B)}$ | $V_{I1}$ [1] | $\Delta t/\Delta V$ [2] | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ [3] |
| 0.8 V to 1.6 V         | $V_{CCI}$    | $\leq 1.0$ ns/V         | 15 pF | 2 k $\Omega$ | open               | GND                | $2V_{CCO}$             |
| 1.65 V to 2.7 V        | $V_{CCI}$    | $\leq 1.0$ ns/V         | 15 pF | 2 k $\Omega$ | open               | GND                | $2V_{CCO}$             |
| 3.0 V to 3.6 V         | $V_{CCI}$    | $\leq 1.0$ 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]  $dV/dt \geq 1.0$  V/ns  
 [3]  $V_{CCO}$  is the supply voltage associated with the output port.

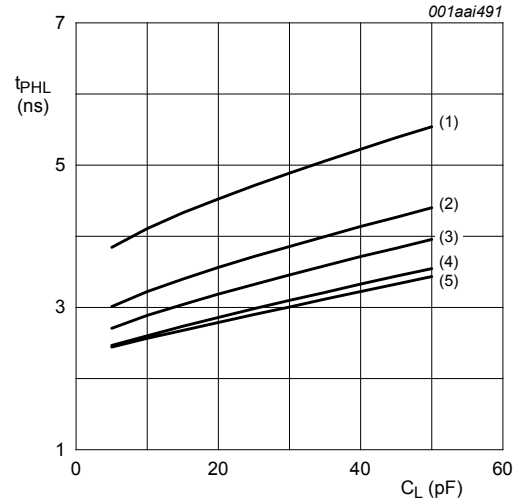
## 12. Typical propagation delay characteristics



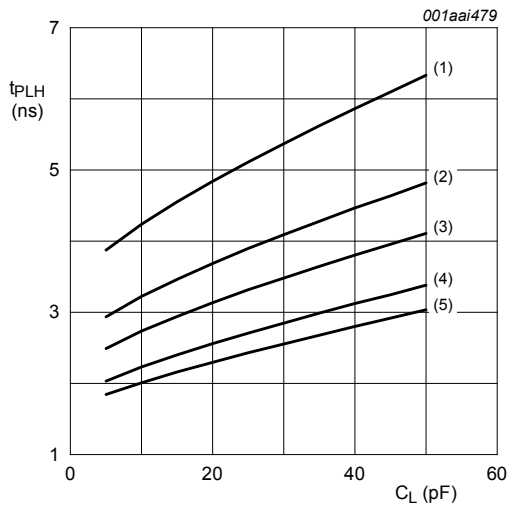
4-bit dual supply translating transceiver with configurable voltage translation; 3-state



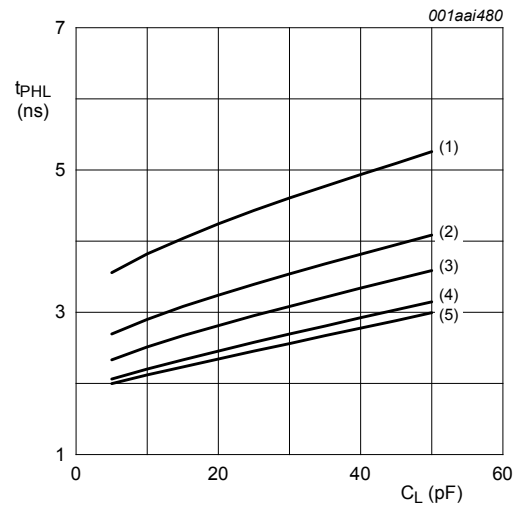
a. LOW to HIGH propagation delay (A to B);  $V_{CC(A)} = 1.2\text{ V}$



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



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



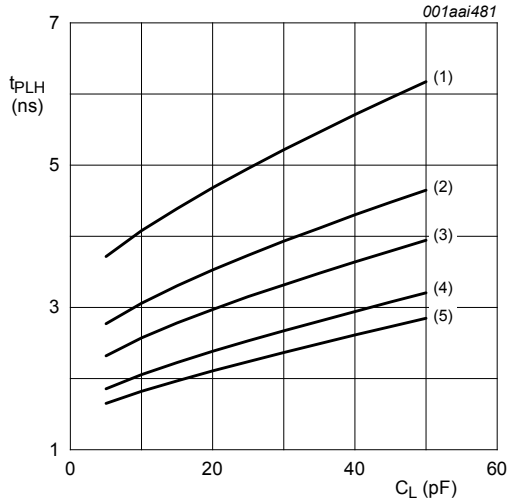
d. HIGH to LOW propagation delay (A to B);  $V_{CC(A)} = 1.5\text{ V}$

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

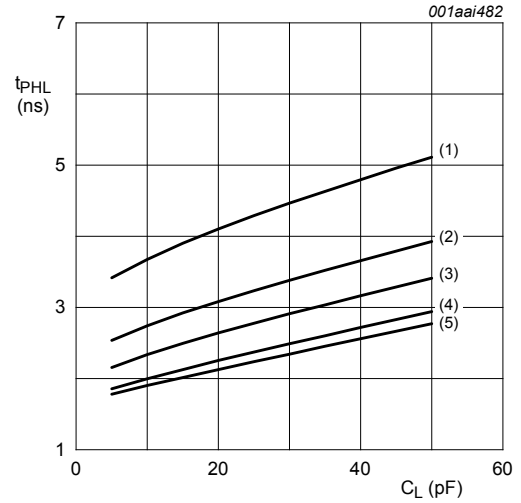
Fig. 11. Typical propagation delay versus load capacitance;  $T_{amb} = 25\text{ }^\circ\text{C}$



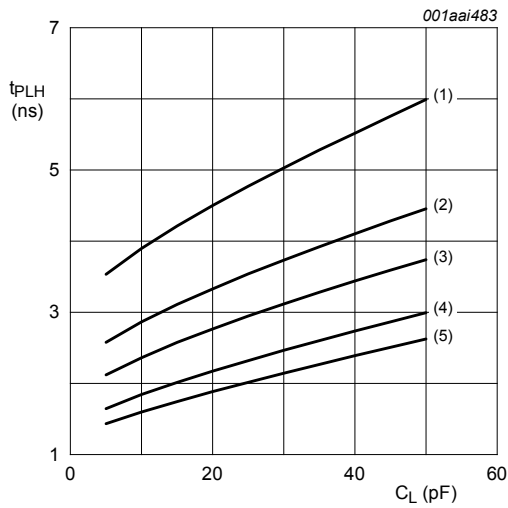
4-bit dual supply translating transceiver with configurable voltage translation; 3-state



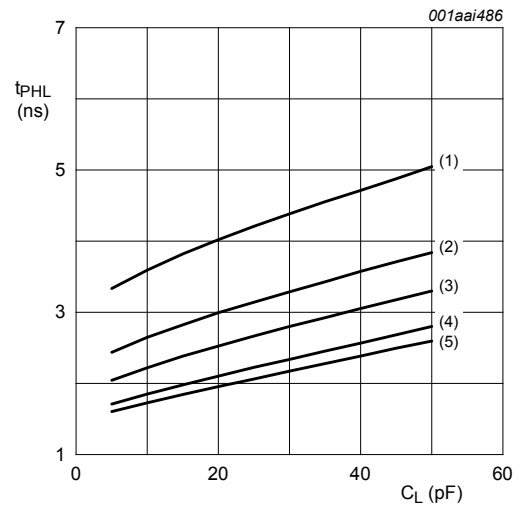
a. LOW to HIGH propagation delay (A to B);  $V_{CC(A)} = 1.8\text{ V}$



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



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

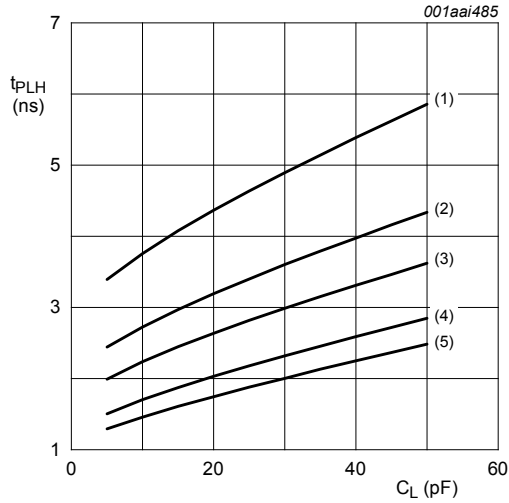


d. HIGH to LOW propagation delay (A to B);  $V_{CC(A)} = 2.5\text{ V}$

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

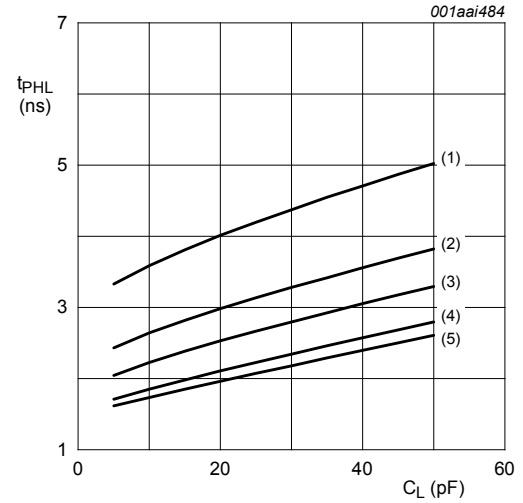
Fig. 12. Typical propagation delay versus load capacitance;  $T_{amb} = 25\text{ }^\circ\text{C}$

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



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

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



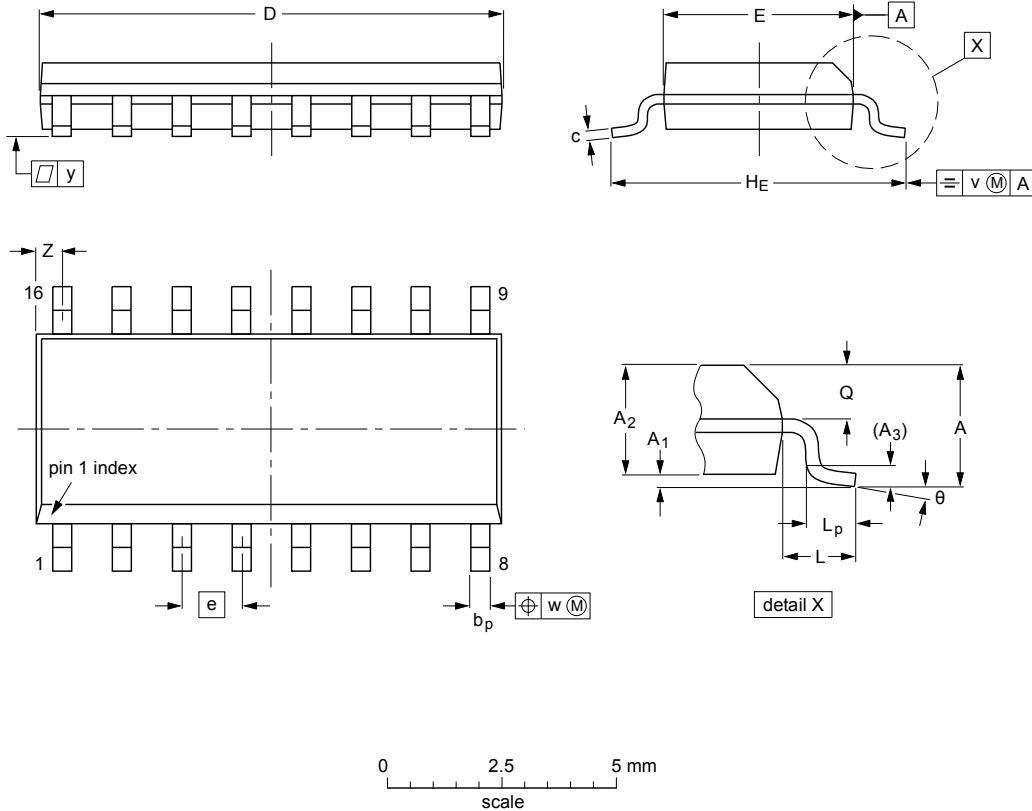
b. HIGH to LOW propagation delay (A to B);  $V_{CC(A)} = 3.3\text{ V}$

Fig. 13. Typical propagation delay versus load capacitance;  $T_{amb} = 25\text{ }^\circ\text{C}$

13. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | Z <sup>(1)</sup> | θ        |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75   | 0.25<br>0.10   | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 10.0<br>9.8      | 4.0<br>3.8       | 1.27 | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.010<br>0.004 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.39<br>0.38     | 0.16<br>0.15     | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.020 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

Note

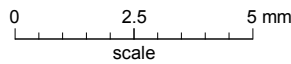
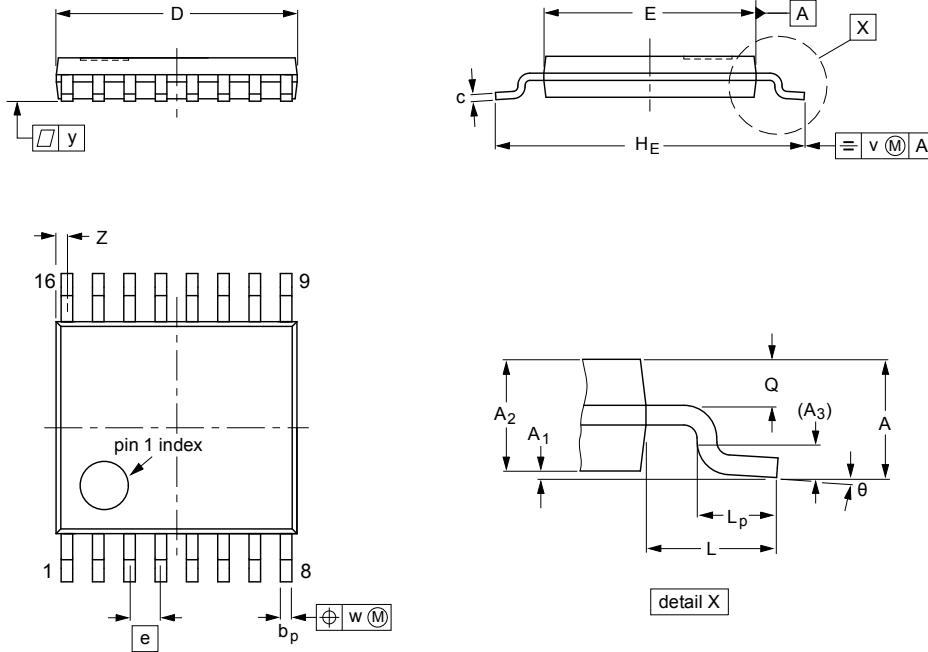
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES |        |       |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC  | JEITA |  |                     |                      |
| SOT109-1        | 076E07     | MS-012 |       |  |                     | 99-12-27<br>03-02-19 |

Fig. 14. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c          | D <sup>(1)</sup> | E <sup>(2)</sup> | e    | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.1    | 0.15<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 5.1<br>4.9       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.40<br>0.06     | 8°<br>0° |

**Notes**

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

| OUTLINE VERSION | REFERENCES |        |       |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC  | JEITA |  |                     |                      |
| SOT403-1        |            | MO-153 |       |  |                     | 99-12-27<br>03-02-18 |

Fig. 15. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

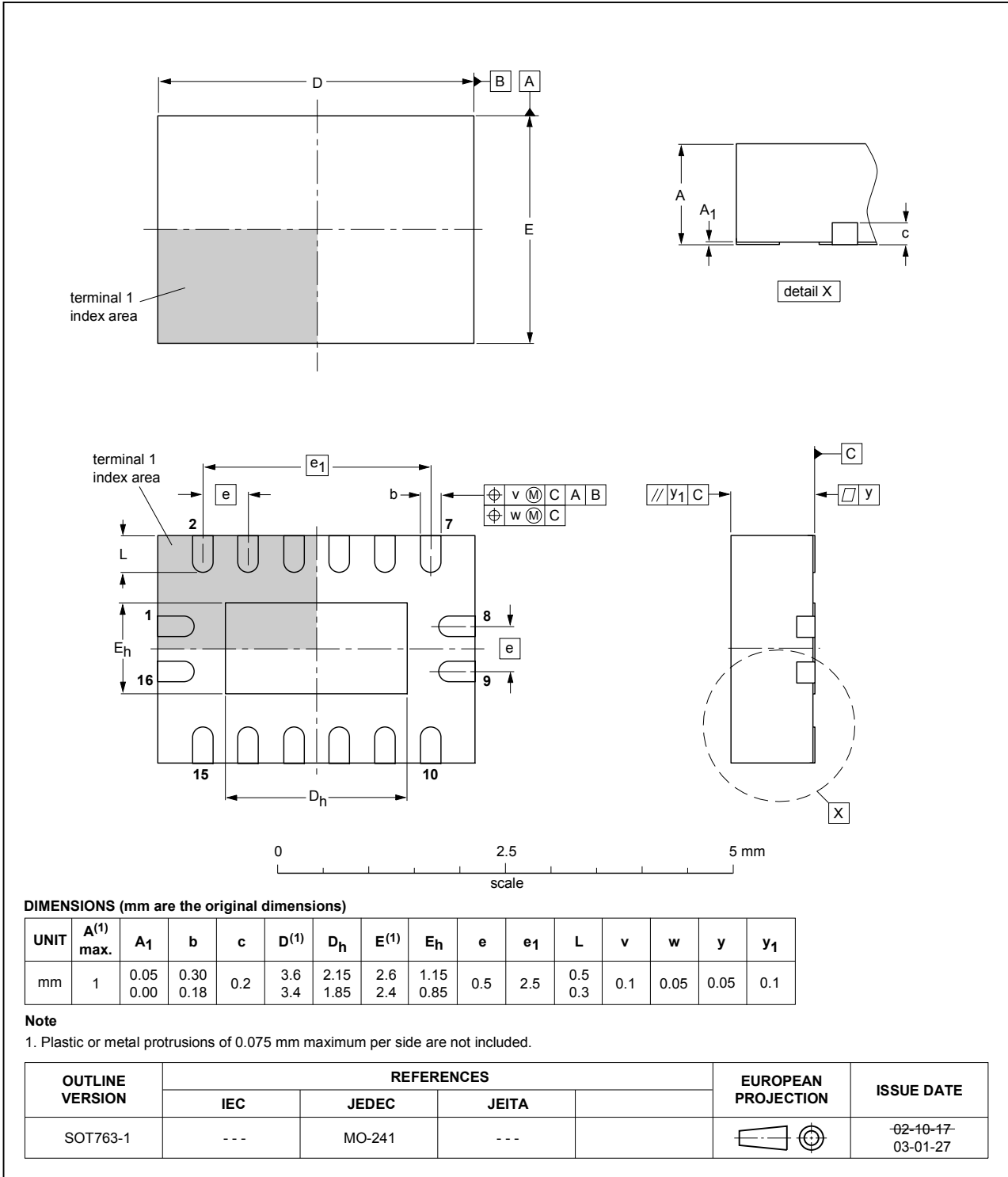
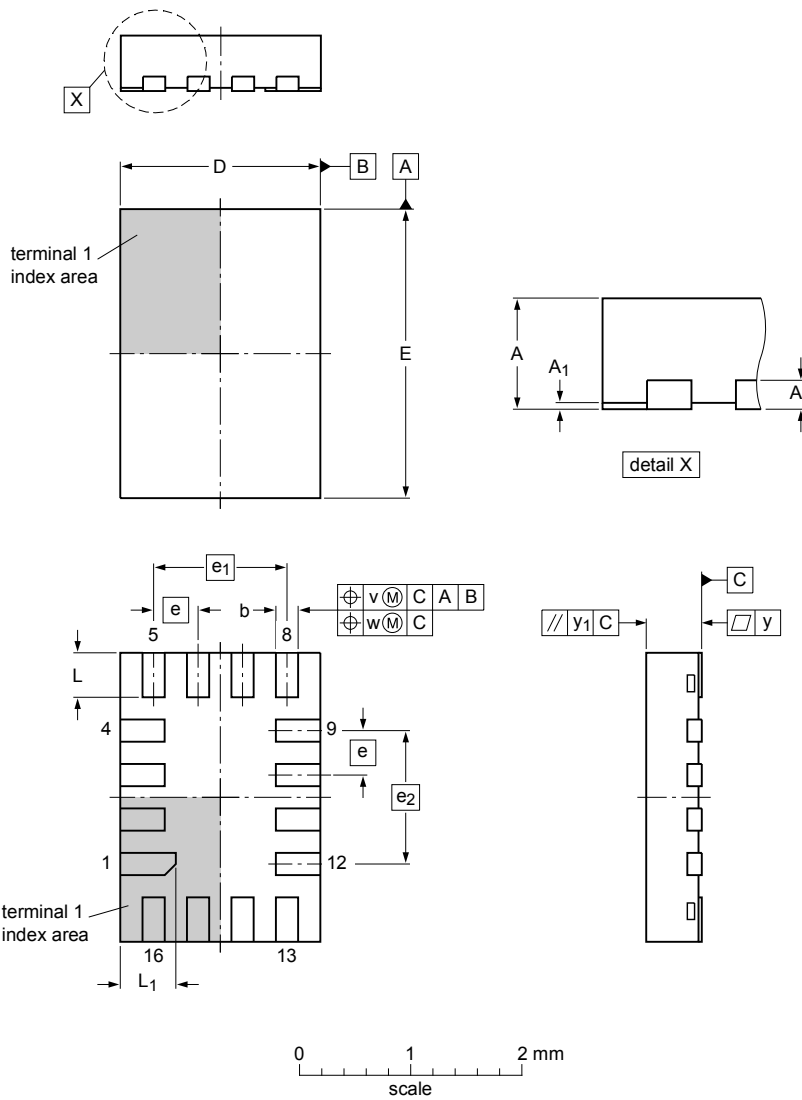


Fig. 16. Package outline SOT763-1 (DHVQFN16)

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

XQFN16: plastic, extremely thin quad flat package; no leads;  
16 terminals; body 1.80 x 2.60 x 0.50 mm

SOT1161-1



Dimensions

| Unit <sup>(1)</sup> | A   | A <sub>1</sub> | A <sub>3</sub> | b    | D   | E   | e   | e <sub>1</sub> | e <sub>2</sub> | L    | L <sub>1</sub> | v   | w    | y    | y <sub>1</sub> |
|---------------------|-----|----------------|----------------|------|-----|-----|-----|----------------|----------------|------|----------------|-----|------|------|----------------|
| max                 | 0.5 | 0.05           |                | 0.25 | 1.9 | 2.7 |     |                |                | 0.45 | 0.55           |     |      |      |                |
| mm nom              |     |                | 0.127          | 0.20 | 1.8 | 2.6 | 0.4 | 1.2            | 1.2            | 0.40 | 0.50           | 0.1 | 0.05 | 0.05 | 0.05           |
| min                 |     | 0.00           |                | 0.15 | 1.7 | 2.5 |     |                |                | 0.35 | 0.45           |     |      |      |                |

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot1161-1\_po

| Outline version | References |       |       | European projection | Issue date           |
|-----------------|------------|-------|-------|---------------------|----------------------|
|                 | IEC        | JEDEC | JEITA |                     |                      |
| SOT1161-1       | ---        | ---   | ---   |                     | 09-12-28<br>09-12-29 |

Fig. 17. Package outline SOT1161-1 (XQFN16)

## 14. Abbreviations

Table 17. 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 18. Revision history

| Document ID    | Release date  | Data sheet status  | Change notice | Supersedes     |
|----------------|---|--------------------|---------------|----------------|
| 74AVC4T245 v.6 | 20190320  | Product data sheet | -             | 74AVC4T245 v.5 |
| Modifications: | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                    |               |                |
| 74AVC4T245 v.5 | 20151207  | Product data sheet | -             | 74AVC4T245 v.4 |
| Modifications: | <ul style="list-style-type: none"> <li><a href="#">Table 5</a>: conditions <math>I_{CC}</math> and <math>I_{GND}</math> changed (errata).</li> </ul>  |                    |               |                |
| 74AVC4T245 v.4 | 20111207  | Product data sheet | -             | 74AVC4T245 v.3 |
| Modifications: | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>  |                    |               |                |
| 74AVC4T245 v.3 | 20110922  | Product data sheet | -             | 74AVC4T245 v.2 |
| 74AVC4T245 v.2 | 20101209  | Product data sheet | -             | 74AVC4T245 v.1 |
| 74AVC4T245 v.1 | 20090720  | Product data sheet | -             | -              |

## 16. Legal information

### Data sheet status

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

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

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## Contents

|  |           |
|--|-----------|
| <b>1. General description</b> .....                        | <b>1</b>  |
| <b>2. Features and benefits</b> .....                      | <b>1</b>  |
| <b>3. Ordering information</b> .....                       | <b>2</b>  |
| <b>4. Marking</b> .....                                    | <b>2</b>  |
| <b>5. Functional diagram</b> .....                         | <b>2</b>  |
| <b>6. Pinning information</b> .....                        | <b>3</b>  |
| 6.1. Pinning.....  | 3         |
| 6.2. Pin description.....                                  | 4         |
| <b>7. Functional description</b> .....                     | <b>5</b>  |
| <b>8. Limiting values</b> .....                            | <b>5</b>  |
| <b>9. Recommended operating conditions</b> .....           | <b>6</b>  |
| <b>10. Static characteristics</b> .....                    | <b>6</b>  |
| <b>11. Dynamic characteristics</b> .....                   | <b>9</b>  |
| 11.1. Waveforms and test circuit.....                      | 13        |
| <b>12. Typical propagation delay characteristics</b> ..... | <b>15</b> |
| <b>13. Package outline</b> .....                           | <b>19</b> |
| <b>14. Abbreviations</b> .....                             | <b>23</b> |
| <b>15. Revision history</b> .....                          | <b>23</b> |
| <b>16. Legal information</b> .....                         | <b>24</b> |

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Date of release: 20 March 2019

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