

# NXU0204

## 4-bit dual-supply voltage level translating buffer; 3-state

Rev. 1 — 19 August 2024

Product data sheet

## 1. General description

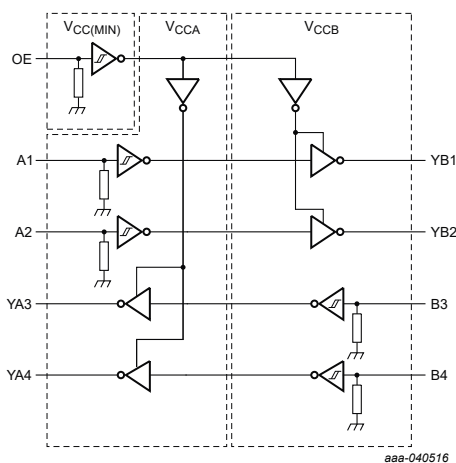
The NXU0204 is a 4-bit, dual-supply level translating buffer with 3-state outputs. It features four data inputs (A1, A2, B3 and B4), four data outputs (YB1, YB2, YA3 and YA4) and an output enable input (OE).

Both  $V_{CCA}$  and  $V_{CCB}$  can be supplied at any voltage between 0.9 V and 5.5 V making the device suitable for translating between any of the voltage nodes (1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V).

This device facilitates asynchronous communication between data buses. Transmit data with a fixed direction (unidirectionally) from the A bus to the B bus on three channels and from the B bus to the A bus on one channel. The OE pin can be referenced to  $V_{CCA}$  and  $V_{CCB}$  domain and when OE pin is set LOW the outputs are disabled and enter a high-impedance OFF-state which isolates the buses. The OE pin can be left floating or externally pulled down to ground to ensure the high-impedance state of the outputs during power up or power down.

This device ensures low static and dynamic power consumption across the entire supply range and is fully specified for partial power down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry prevents potentially damaging backflow current through the device when it is powered down or if one of the power supplies is disconnected (floating).

No power supply sequencing is required and output glitches during power supply transitions are prevented. As a result, glitches will not appear on the outputs for supply transitions during power-up/down.



## 2. Features and benefits

- Wide supply voltage range:
  - $V_{CCA}$ : 0.9 V to 5.5 V
  - $V_{CCB}$ : 0.9 V to 5.5 V
- Low power consumption for supply voltage range 1.1 V to 5.5 V
  - 3  $\mu$ A ( $T_{amb} = 25^\circ\text{C}$ )
  - 5  $\mu$ A ( $T_{amb} = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Schmitt-trigger inputs with integrated static high ohmic pull-down resistor on the input
- Maximum data rates:
  - 250 Mbps ( $\geq 1.8$  V to 5 V translation)
- High output drive 12 mA at 5 V
- Output enable (OE) allows connection to  $V_{CCA}$  or  $V_{CCB}$  domain
- Suspend mode when either one of the supply voltages is below 100 mV or disconnected (floating)
- Low noise overshoot and undershoot  $<10\%$  of  $V_{CCO}$
- $I_{OFF}$  circuitry provides partial power-down mode operation
- Latch-up performance exceeds 100 mA per JESD78D Class II
- Complies with JEDEC standard:
  - JESD8-12 (0.9 V to 1.3 V)
  - JESD8-11 (1.4 V to 1.6 V)
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD12-6 (4.5 V to 5.5 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2500 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1500 V
- Specified from  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  and  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$
- Similar functions: NXU0104 and NXU0304

## 3. Applications

- General purpose I/O level translation
- Noisy environments or slow input signals
- Supports push-pull voltage translation as UART, SPI and JTAG protocols
- Consumer

4. Ordering information

Table 1. Ordering information

| Type number                 | Package           |          |                                                                                                                                                             |                           |
|-----------------------------|-------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                             | Temperature range | Name     | Description                                                                                                                                                 | Version                   |
| <a href="#">NXU0204PW</a>   | -40 °C to +125 °C | TSSOP14  | plastic thin shrink small outline package; 14 leads; body width 4.4 mm                                                                                      | <a href="#">SOT402-1</a>  |
| <a href="#">NXU0204BQ</a>   | -40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm                                | <a href="#">SOT762-1</a>  |
| <a href="#">NXU0204BZ</a>   | -40 °C to +125 °C | DHXQFN14 | plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package; no leads; 14 terminals; 0.4 mm pitch; body 2 mm × 2 mm × 0.48 mm | <a href="#">SOT8014-1</a> |
| <a href="#">NXU0204GU12</a> | -40 °C to +125 °C | XQFN12   | plastic, extremely thin quad flat package; no leads; 12 terminals; body 1.70 × 2.0 × 0.50 mm                                                                | <a href="#">SOT1174-1</a> |

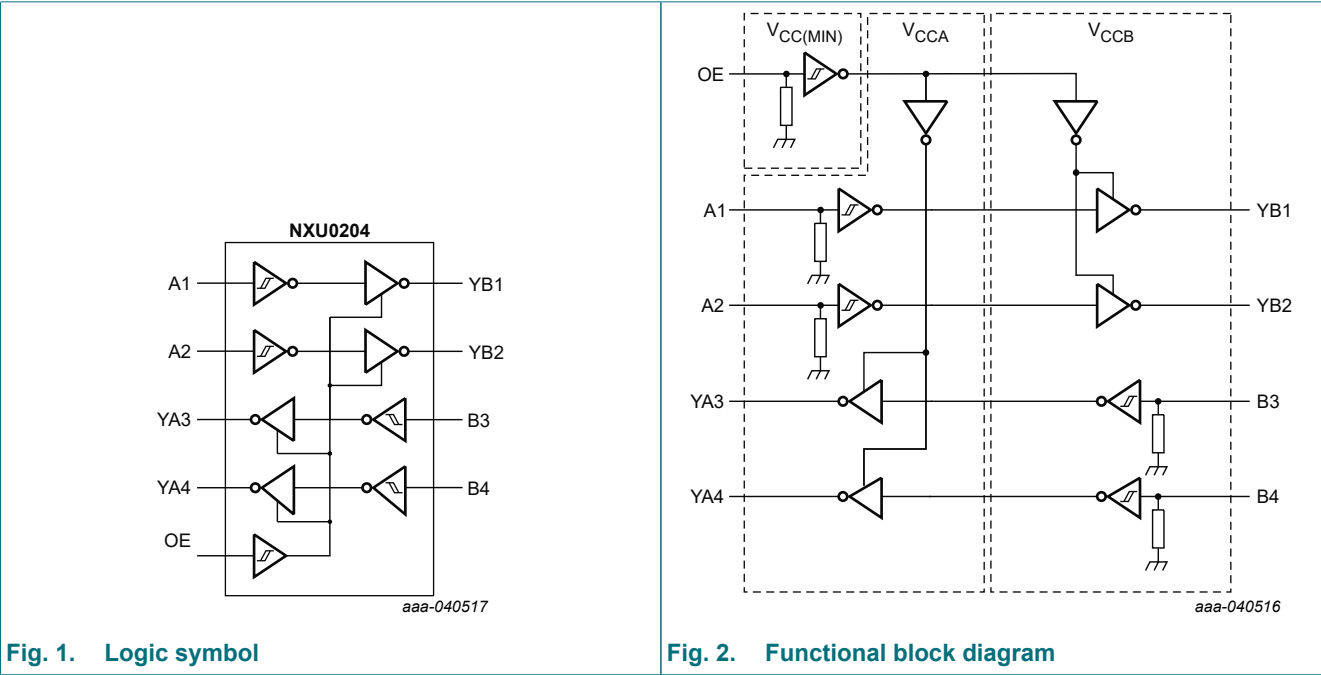
5. Marking

Table 2. Marking

| Type number | Marking code[1] |
|-------------|-----------------|
| NXU0204PW   | NXU0204         |
| NXU0204BQ   | U0204           |
| NXU0204BZ   | L02             |
| NXU0204GU12 | L5              |

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning

**PW package**  
**SOT402-1 (TSSOP14)**

aaa-039475

**BQ package**  
**SOT762-1 (DHVQFN14)**

aaa-039476

Transparent top view

**BZ package**  
**SOT8014-1 (DHXQFN14)**

aaa-039477

Transparent top view

**GU12 package**  
**SOT1174-1 (XQFN12)**

aaa-039478

Transparent top view

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

7.2. Pin description

Table 3. Pin description

| Symbol             | Pin                           |             | I/O | Description                                                                                                     |
|--------------------|-------------------------------|-------------|-----|-----------------------------------------------------------------------------------------------------------------|
|                    | SOT402-1, SOT762-1, SOT8014-1 | SOT1174-1   |     |                                                                                                                 |
| V <sub>CCA</sub>   | 1                             | 1           | -   | supply voltage A-side (A1, A2, YA3, YA4)                                                                        |
| A1, A2, B3, B4     | 2, 3, 11, 10                  | 2, 3, 8, 7  | I   | data inputs A-side and referenced to V <sub>CCA</sub><br>data input B-side and referenced to V <sub>CCB</sub>   |
| n.c.               | 6, 9                          | -           | -   | not connected                                                                                                   |
| GND                | 7                             | 6           | -   | ground (0 V)                                                                                                    |
| YB1, YB2, YA3, YA4 | 13, 12, 4, 5                  | 10, 9, 4, 5 | O   | data outputs B-side and referenced to V <sub>CCB</sub><br>data output A-side and referenced to V <sub>CCA</sub> |
| OE                 | 8                             | 12          | I   | output enable input (active HIGH)                                                                               |
| V <sub>CCB</sub>   | 14                            | 11          | -   | supply voltage B-side (YB1, YB2, B3, B4)                                                                        |

8. 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   |
|-------------------------------------|-------|--------|----------|
| V <sub>CCA</sub> , V <sub>CCB</sub> | OE    | An, Bn | YBn, YAn |
| 0.9 V to 5.5 V                      | H     | L      | L        |
| 0.9 V to 5.5 V                      | H     | H      | H        |
| 0.9 V to 5.5 V                      | L     | X      | Z        |
| GND [1]                             | X     | X      | Z        |
| Floating [2]                        | X     | X      | Z        |

[1] If either V<sub>CCA</sub> or V<sub>CCB</sub> is below 100 mV or GND, the device goes into suspend mode (Hi-Z).  
[2] If either V<sub>CCA</sub> or V<sub>CCB</sub> disconnected (floating), the device goes into suspend mode (Hi-Z).

8.1. Overview

The NXU0204 is a 4-bit, dual-supply level translating buffer with 3-state outputs. It features four data inputs (A1, A2, B3 and B4), four data outputs (YB1, YB2, YA3 and YA4), and an output enable input (OE). Both V<sub>CCA</sub> and V<sub>CCB</sub> can be supplied at any voltage between 0.9 V and 5.5 V.

8.2. Inputs

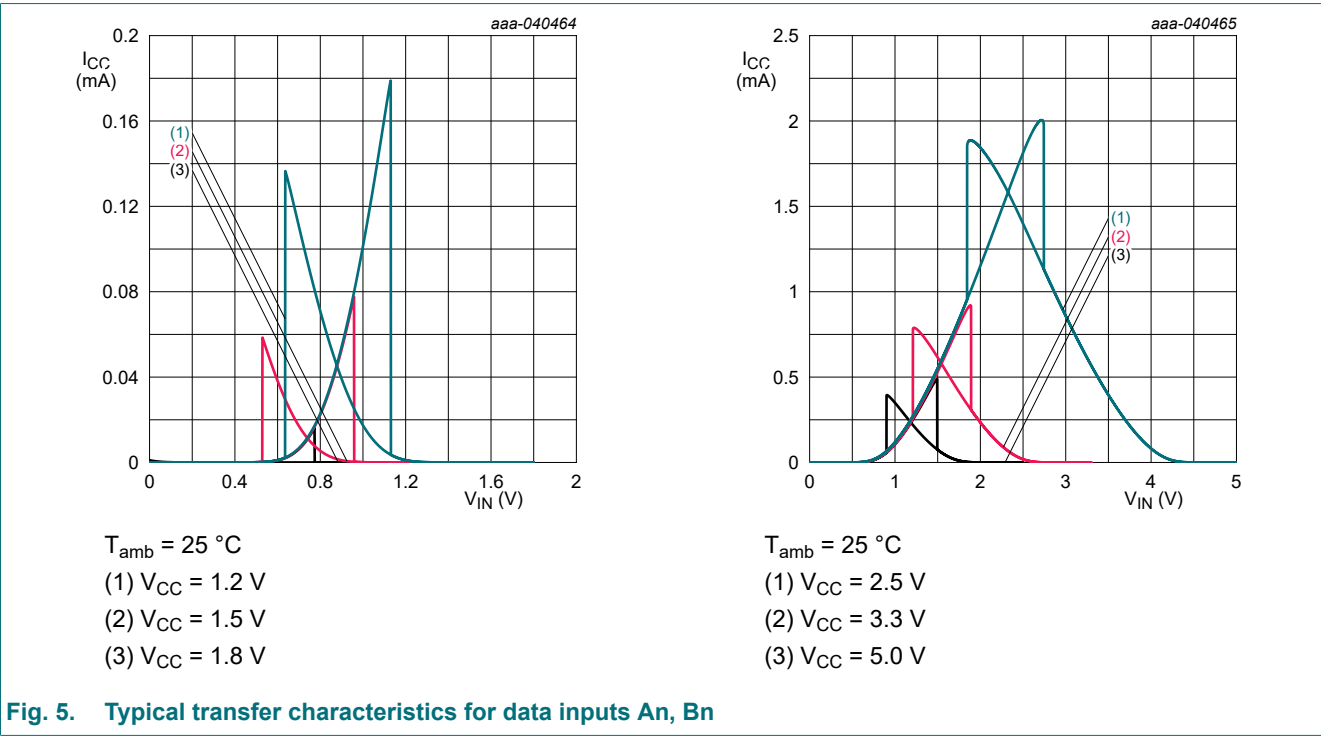
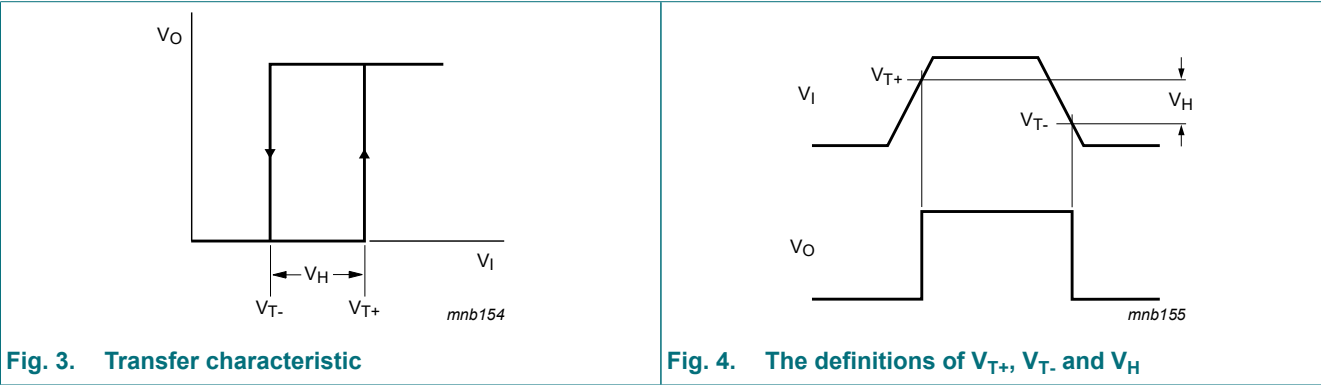
The inputs have integrated pull-down resistors of 6.5 MΩ (typical) which prevent an undefined state at the Schmitt-trigger input and the output. If an external pull-up is required, it should be no larger than 1 MΩ to avoid contention with the 6.5 MΩ internal pull-down.

Additionally, each input is provided with a through Schmitt-trigger which makes this device tolerant for slow and noisy input signals. Prolonged input slopes at a slow rate may lead to increased dynamic current consumption.

The output-enable input (OE) can be referenced to  $V_{CCA}$  and  $V_{CCB}$  domain by making use of the developed  $V_{CC(MIN)}$  circuitry. When the OE pin is set LOW, the output is disabled and enters high-impedance OFF-state which isolates the output. The OE pin can be left floating or externally pulled down to ground to ensure outputs remain in the high-impedance state during power up or power down.

The input signals can be safely driven above the supply voltage, as long as the maximum input voltage value specified in the Recommended Operating Conditions is not exceeded.

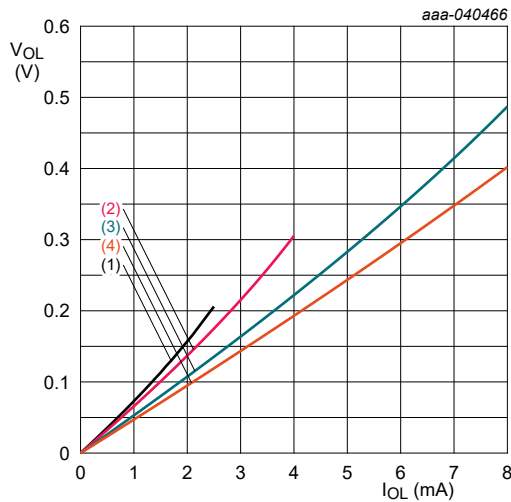
Input transfer characteristics



### 8.3. Outputs

Balanced output enables the device to both sink and source similar currents. The high drive capability of this device creates fast edges and capable of driving larger currents.

#### Output transfer characteristics



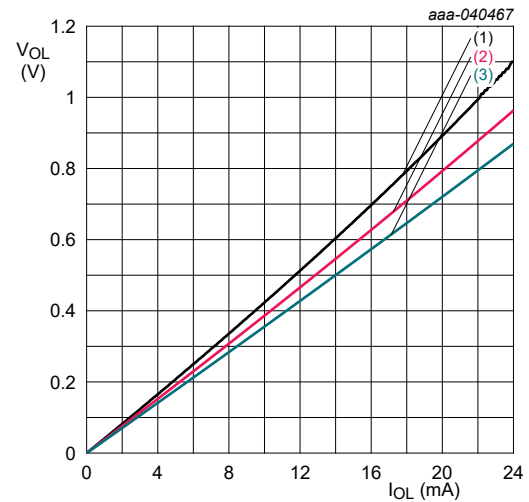
$T_{amb} = 25^\circ\text{C}$

(1)  $V_{CC} = 0.9\text{ V}$

(2)  $V_{CC} = 1.2\text{ V}$

(3)  $V_{CC} = 1.5\text{ V}$

(4)  $V_{CC} = 1.8\text{ V}$



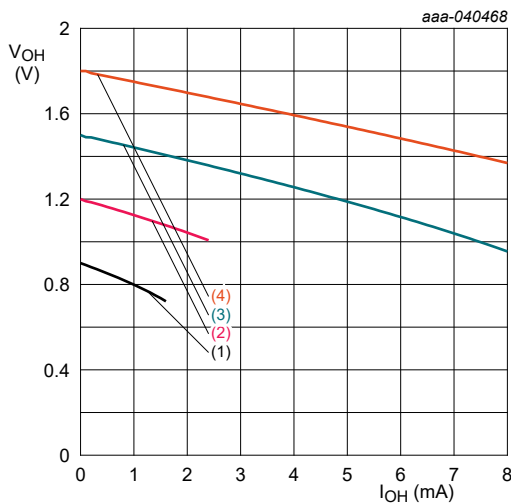
$T_{amb} = 25^\circ\text{C}$

(1)  $V_{CC} = 2.5\text{ V}$

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

(3)  $V_{CC} = 5.0\text{ V}$

Fig. 6. Typical LOW-level output voltage ( $V_{OL}$ ) versus LOW-level output current ( $I_{OL}$ ) for data outputs YBn, YAn



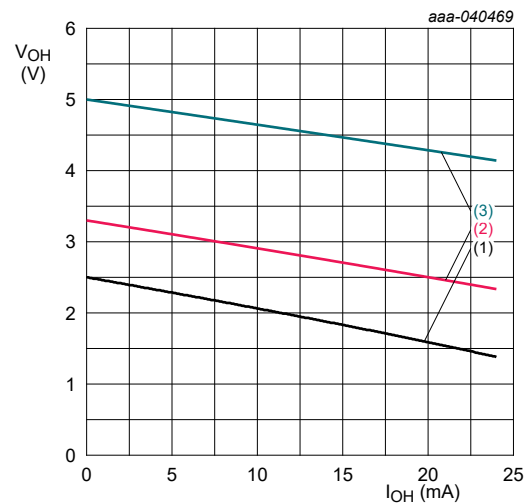
$T_{amb} = 25^\circ\text{C}$

(1)  $V_{CC} = 0.9\text{ V}$

(2)  $V_{CC} = 1.2\text{ V}$

(3)  $V_{CC} = 1.5\text{ V}$

(4)  $V_{CC} = 1.8\text{ V}$



$T_{amb} = 25^\circ\text{C}$

(1)  $V_{CC} = 2.5\text{ V}$

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

(3)  $V_{CC} = 5.0\text{ V}$

Fig. 7. Typical HIGH-level output voltage ( $V_{OH}$ ) versus HIGH-level output current ( $I_{OH}$ ) for data outputs YBn, YAn

8.4. Suspend mode and I<sub>OFF</sub> protection circuitry

When either V<sub>CCA</sub> or V<sub>CCB</sub> drops below 100 mV or becomes disconnected (floating) the product enters suspend mode (Hi-Z). All outputs are disabled and in transition to a high-impedance OFF-state. The I<sub>OFF</sub> circuitry prevents potentially damaging backflow current through the device when it is powered down or if one of the power supplies is disconnected (floating). It is advisable to keep the inputs in low state before disconnecting (floating) either supply.

Below a graphical explanation:

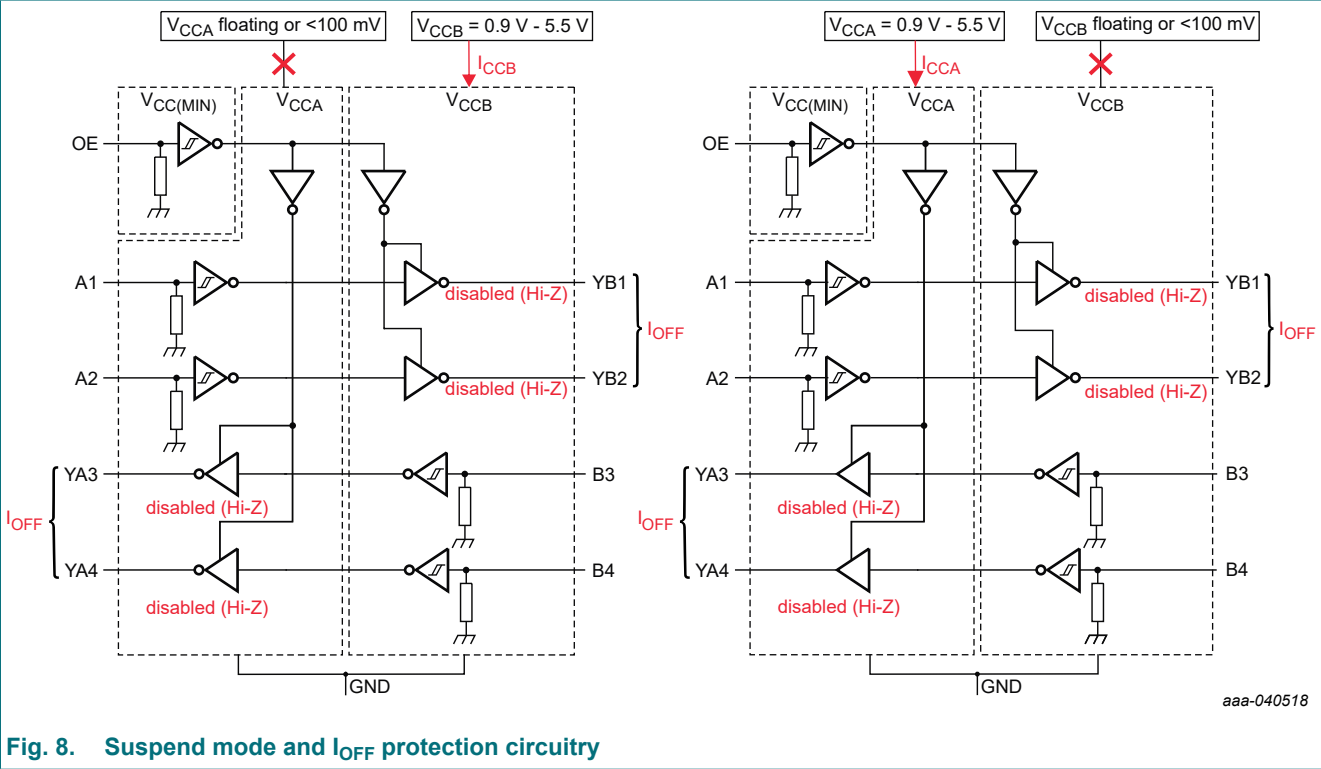


Fig. 8. Suspend mode and I<sub>OFF</sub> protection circuitry

9. 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 <sub>CCA</sub> | supply voltage A        |                                                                | -0.5 | +6.5                   | V    |
| V <sub>CCB</sub> | supply voltage B        |                                                                | -0.5 | +6.5                   | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V                                           | -50  | -                      | mA   |
| V <sub>I</sub>   | input voltage           | [1]                                                            | -0.5 | +6.5                   | V    |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < 0 V                                           | -50  | -                      | mA   |
| V <sub>O</sub>   | output voltage          | Active mode [1][2][3]                                          | -0.5 | V <sub>CCO</sub> + 0.5 | V    |
|                  |                         | Suspend or 3-state mode [1]                                    | -0.5 | +6.5                   | V    |
| I <sub>O</sub>   | output current          | V <sub>O</sub> = 0 V to V <sub>CCO</sub> [2]                   | -    | ±25                    | mA   |
| I <sub>CC</sub>  | supply current          | I <sub>CCA</sub> or I <sub>CCB</sub> ; per V <sub>CC</sub> pin | -    | 100                    | mA   |
| I <sub>GND</sub> | ground current          | per GND pin                                                    | -100 | -                      | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                | -65  | +150                   | °C   |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol           | Parameter               | Conditions                                     | Min | Max | Unit |
|------------------|-------------------------|------------------------------------------------|-----|-----|------|
| P <sub>tot</sub> | total power dissipation | SOT402-1 (TSSOP14) [4]<br>SOT762-1 (DHVQFN14)  | -   | 500 | mW   |
|                  |                         | SOT8014-1 (DHXQFN14) [5]<br>SOT1174-1 (XQFN12) | -   | 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<sub>CCO</sub> is the supply voltage associated with the outputs (YBn, YAn).
- [3] V<sub>CCO</sub> + 0.5 V should not exceed 6.5 V.
- [4] For SOT402-1 (TSSOP14) package: P<sub>tot</sub> derates linearly with 7.3 mW/K above 81 °C.  
For SOT762-1 (DHVQFN14) package: P<sub>tot</sub> derates linearly with 9.6 mW/K above 98 °C.
- [5] For SOT8014-1 (DHXQFN14) package: P<sub>tot</sub> derates linearly with 8.7 mW/K above 121 °C.  
For SOT1174-1 (XQFN12) package: P<sub>tot</sub> derates linearly with 5.6 mW/K above 105 °C.

10. ESD ratings

Table 6. ESD ratings

| Symbol           | Parameter                       | Conditions                           | Value  | Unit |
|------------------|---------------------------------|--------------------------------------|--------|------|
| V <sub>ESD</sub> | electrostatic discharge voltage | HBM: ANSI/ESDA/JEDEC JS-001 class 2  | ± 2500 | V    |
|                  |                                 | CDM: ANSI/ESDA/JEDEC JS-002 class C3 | ± 1500 | V    |

11. Recommended operating conditions

Table 7. Recommended operating conditions

| Symbol           | Parameter           | Conditions              | Min | Max              | Unit |
|------------------|---------------------|-------------------------|-----|------------------|------|
| V <sub>CCA</sub> | supply voltage A    |                         | 0.9 | 5.5              | V    |
| V <sub>CCB</sub> | supply voltage B    |                         | 0.9 | 5.5              | V    |
| V <sub>I</sub>   | input voltage       |                         | 0   | 5.5              | V    |
| V <sub>O</sub>   | output voltage      | Active mode [1]         | 0   | V <sub>CCO</sub> | V    |
|                  |                     | Suspend or 3-state mode | 0   | 5.5              | V    |
| T <sub>amb</sub> | ambient temperature |                         | -40 | +125             | °C   |

- [1] V<sub>CCO</sub> is the supply voltage associated with the outputs (YBn, YAn).

12. Thermal characteristics

Table 8. Thermal characteristics

| Symbol               | Parameter                                                          | Condition                        | SOT402-1 | SOT762-1 | SOT8014-1 | SOT1174-1 | Unit |
|----------------------|--------------------------------------------------------------------|----------------------------------|----------|----------|-----------|-----------|------|
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient                        | in free air;<br>JEDEC test board | 134      | 98       | 98        | 172       | °C/W |
| R <sub>th(j-c)</sub> | thermal resistance from case (top) of package                      | in free air;<br>JEDEC test board | 59       | 65       | 71        | 82        | °C/W |
| Ψ <sub>j-top</sub>   | thermal characterization parameter from junction to top of package | in free air;<br>JEDEC test board | 5.4      | 14       | 3.4       | 3.3       | °C/W |



## 13. Static characteristics

**Table 9. Static characteristics**

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

| Symbol   | Parameter                        | Conditions                                       | +25 °C |      |     | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|----------|----------------------------------|--------------------------------------------------|--------|------|-----|------------------|------|-------------------|------|------|
|          |                                  |                                                  | Min    | Typ  | Max | Min              | Max  | Min               | Max  |      |
| $V_{T+}$ | positive-going threshold voltage | A1, A2, B3, B4 inputs                            |        |      |     |                  |      |                   |      |      |
|          |                                  | $V_{CCA} = V_{CCB} = 0.9\text{ V}$               | -      | 0.58 | -   | -                | -    | -                 | -    | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.1\text{ V}$               | -      | 0.71 | -   | 0.44             | 0.88 | 0.44              | 0.88 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.4\text{ V}$               | -      | 0.89 | -   | 0.60             | 0.98 | 0.60              | 0.98 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.65\text{ V}$              | -      | 1.05 | -   | 0.76             | 1.13 | 0.76              | 1.13 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 2.3\text{ V}$               | -      | 1.39 | -   | 1.08             | 1.56 | 1.08              | 1.56 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 3.0\text{ V}$               | -      | 1.75 | -   | 1.48             | 1.92 | 1.48              | 1.92 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 4.5\text{ V}$               | -      | 2.50 | -   | 2.19             | 2.74 | 2.19              | 2.74 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 5.5\text{ V}$               | -      | 3.02 | -   | 2.65             | 3.33 | 2.65              | 3.33 | V    |
|          |                                  | OE input (referenced to $V_{CCA}$ or $V_{CCB}$ ) |        |      |     |                  |      |                   |      |      |
|          |                                  | $V_{CCA} = V_{CCB} = 0.9\text{ V}$               | -      | 0.58 | -   | -                | -    | -                 | -    | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.1\text{ V}$               | -      | 0.70 | -   | 0.44             | 0.88 | 0.44              | 0.88 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.4\text{ V}$               | -      | 0.89 | -   | 0.60             | 0.98 | 0.60              | 0.98 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 1.65\text{ V}$              | -      | 1.04 | -   | 0.76             | 1.13 | 0.76              | 1.13 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 2.3\text{ V}$               | -      | 1.38 | -   | 1.08             | 1.56 | 1.08              | 1.56 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 3.0\text{ V}$               | -      | 1.74 | -   | 1.48             | 1.92 | 1.48              | 1.92 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 4.5\text{ V}$               | -      | 2.50 | -   | 2.19             | 2.74 | 2.19              | 2.74 | V    |
|          |                                  | $V_{CCA} = V_{CCB} = 5.5\text{ V}$               | -      | 3.03 | -   | 2.65             | 3.33 | 2.65              | 3.33 | V    |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol          | Parameter                        | Conditions                                                     | +25 °C |      |     | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-----------------|----------------------------------|----------------------------------------------------------------|--------|------|-----|------------------|------|-------------------|------|------|
|                 |                                  |                                                                | Min    | Typ  | Max | Min              | Max  | Min               | Max  |      |
| V <sub>T-</sub> | negative-going threshold voltage | A1, A2, B3, B4 inputs                                          |        |      |     |                  |      |                   |      |      |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 0.9 V                    | -      | 0.33 | -   | -                | -    | -                 | -    | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.1 V                    | -      | 0.40 | -   | 0.17             | 0.48 | 0.17              | 0.48 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.4 V                    | -      | 0.50 | -   | 0.28             | 0.59 | 0.28              | 0.59 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.65 V                   | -      | 0.59 | -   | 0.35             | 0.69 | 0.35              | 0.69 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 2.3 V                    | -      | 0.84 | -   | 0.56             | 0.97 | 0.56              | 0.97 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.0 V                    | -      | 1.12 | -   | 0.89             | 1.5  | 0.89              | 1.5  | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 4.5 V                    | -      | 1.71 | -   | 1.51             | 1.97 | 1.51              | 1.97 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 5.5 V                    | -      | 2.10 | -   | 1.88             | 2.4  | 1.88              | 2.4  | V    |
|                 |                                  | OE input (referenced to V <sub>CCA</sub> or V <sub>CCB</sub> ) |        |      |     |                  |      |                   |      |      |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 0.9 V                    | -      | 0.33 | -   | -                | -    | -                 | -    | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.1 V                    | -      | 0.41 | -   | 0.17             | 0.48 | 0.17              | 0.48 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.4 V                    | -      | 0.51 | -   | 0.28             | 0.59 | 0.28              | 0.59 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.65 V                   | -      | 0.59 | -   | 0.35             | 0.69 | 0.35              | 0.69 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 2.3 V                    | -      | 0.84 | -   | 0.56             | 0.97 | 0.56              | 0.97 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.0 V                    | -      | 1.12 | -   | 0.89             | 1.5  | 0.89              | 1.5  | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 4.5 V                    | -      | 1.69 | -   | 1.51             | 1.97 | 1.51              | 1.97 | V    |
|                 |                                  | V <sub>CCA</sub> = V <sub>CCB</sub> = 5.5 V                    | -      | 2.07 | -   | 1.88             | 2.46 | 1.88              | 2.46 | V    |

## 4-bit dual-supply voltage level translating buffer; 3-state

| Symbol          | Parameter                 | Conditions                                                     | +25 °C                 |      |     | -40 °C to +85 °C       |      | -40 °C to +125 °C      |      | Unit |
|-----------------|---------------------------|----------------------------------------------------------------|------------------------|------|-----|------------------------|------|------------------------|------|------|
|                 |                           |                                                                | Min                    | Typ  | Max | Min                    | Max  | Min                    | Max  |      |
| V <sub>H</sub>  | hysteresis voltage        | A1, A2, B3, B4 inputs                                          |                        |      |     |                        |      |                        |      |      |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 0.9 V                    | -                      | 0.25 | -   | -                      | -    | -                      | -    | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.1 V                    | -                      | 0.31 | -   | 0.2                    | 0.4  | 0.2                    | 0.4  | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.4 V                    | -                      | 0.39 | -   | 0.25                   | 0.5  | 0.25                   | 0.5  | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.65 V                   | -                      | 0.46 | -   | 0.3                    | 0.55 | 0.3                    | 0.55 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 2.3 V                    | -                      | 0.59 | -   | 0.38                   | 0.65 | 0.38                   | 0.65 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.0 V                    | -                      | 0.63 | -   | 0.46                   | 0.72 | 0.46                   | 0.72 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 4.5 V                    | -                      | 0.79 | -   | 0.58                   | 0.93 | 0.58                   | 0.93 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 5.5 V                    | -                      | 0.93 | -   | 0.69                   | 1.06 | 0.69                   | 1.06 | V    |
|                 |                           | OE input (referenced to V <sub>CCA</sub> or V <sub>CCB</sub> ) |                        |      |     |                        |      |                        |      |      |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 0.9 V                    | -                      | 0.25 | -   | -                      | -    | -                      | -    | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.1 V                    | -                      | 0.30 | -   | 0.15                   | 0.41 | 0.15                   | 0.41 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.4 V                    | -                      | 0.39 | -   | 0.2                    | 0.5  | 0.2                    | 0.5  | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 1.65 V                   | -                      | 0.44 | -   | 0.23                   | 0.55 | 0.23                   | 0.55 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 2.3 V                    | -                      | 0.54 | -   | 0.32                   | 0.65 | 0.32                   | 0.65 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.0 V                    | -                      | 0.62 | -   | 0.39                   | 0.72 | 0.39                   | 0.72 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 4.5 V                    | -                      | 0.81 | -   | 0.57                   | 0.97 | 0.57                   | 0.97 | V    |
|                 |                           | V <sub>CCA</sub> = V <sub>CCB</sub> = 5.5 V                    | -                      | 0.96 | -   | 0.69                   | 1.18 | 0.69                   | 1.18 | V    |
| V <sub>OH</sub> | HIGH-level output voltage | V <sub>I</sub> = V <sub>T+(MAX)</sub> [1][2]                   |                        |      |     |                        |      |                        |      |      |
|                 |                           | I <sub>O</sub> = -0.1 mA; V <sub>CCO</sub> = 0.9 V to 5.5 V    | V <sub>CCO</sub> - 0.1 | 0.9  | -   | V <sub>CCO</sub> - 0.1 | -    | V <sub>CCO</sub> - 0.1 | -    | V    |
|                 |                           | I <sub>O</sub> = -1.5 mA; V <sub>CCO</sub> = 1.1 V             | 0.825                  | 1.0  | -   | 0.825                  | -    | 0.825                  | -    | V    |
|                 |                           | I <sub>O</sub> = -3 mA; V <sub>CCO</sub> = 1.4 V               | 1.05                   | 1.2  | -   | 1.05                   | -    | 1.05                   | -    | V    |
|                 |                           | I <sub>O</sub> = -4.5 mA; V <sub>CCO</sub> = 1.65 V            | 1.2                    | 1.4  | -   | 1.2                    | -    | 1.2                    | -    | V    |
|                 |                           | I <sub>O</sub> = -8 mA; V <sub>CCO</sub> = 2.3 V               | 1.7                    | 1.94 | -   | 1.7                    | -    | 1.7                    | -    | V    |
|                 |                           | I <sub>O</sub> = -10 mA; V <sub>CCO</sub> = 3.0 V              | 2.2                    | 2.6  | -   | 2.2                    | -    | 2.2                    | -    | V    |
|                 |                           | I <sub>O</sub> = -12 mA; V <sub>CCO</sub> = 4.5 V              | 3.7                    | 4.1  | -   | 3.7                    | -    | 3.7                    | -    | V    |

## 4-bit dual-supply voltage level translating buffer; 3-state

| Symbol           | Parameter                 | Conditions                                                                                                                    | +25 °C |      |       | -40 °C to +85 °C |       | -40 °C to +125 °C |       | Unit |
|------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------|------|-------|------------------|-------|-------------------|-------|------|
|                  |                           |                                                                                                                               | Min    | Typ  | Max   | Min              | Max   | Min               | Max   |      |
| V <sub>OL</sub>  | LOW-level output voltage  | V <sub>I</sub> = V <sub>T-(MIN)</sub> [1][2]                                                                                  |        |      |       |                  |       |                   |       |      |
|                  |                           | I <sub>O</sub> = 0.1 mA; V <sub>CCO</sub> = 0.9 V to 5.5 V                                                                    | -      | 0    | 0.1   | -                | 0.1   | -                 | 0.1   | V    |
|                  |                           | I <sub>O</sub> = 1.5 mA; V <sub>CCO</sub> = 1.1 V                                                                             | -      | 0.12 | 0.275 | -                | 0.275 | -                 | 0.275 | V    |
|                  |                           | I <sub>O</sub> = 3 mA; V <sub>CCO</sub> = 1.4 V                                                                               | -      | 0.17 | 0.35  | -                | 0.35  | -                 | 0.35  | V    |
|                  |                           | I <sub>O</sub> = 4.5 mA; V <sub>CCO</sub> = 1.65 V                                                                            | -      | 0.23 | 0.45  | -                | 0.45  | -                 | 0.45  | V    |
|                  |                           | I <sub>O</sub> = 8 mA; V <sub>CCO</sub> = 2.3 V                                                                               | -      | 0.35 | 0.7   | -                | 0.7   | -                 | 0.7   | V    |
|                  |                           | I <sub>O</sub> = 10 mA; V <sub>CCO</sub> = 3.0 V                                                                              | -      | 0.39 | 0.8   | -                | 0.8   | -                 | 0.8   | V    |
|                  |                           | I <sub>O</sub> = 8 mA; V <sub>CCO</sub> = 4.5 V                                                                               | -      | 0.28 | 0.5   | -                | 0.5   | -                 | 0.5   | V    |
|                  |                           | I <sub>O</sub> = 12 mA; V <sub>CCO</sub> = 4.5 V                                                                              | -      | 0.43 | 0.8   | -                | 0.8   | -                 | 0.8   | V    |
| I <sub>I</sub>   | input leakage current     | An, Bn inputs; V <sub>I</sub> = 0 V to 5.5 V; V <sub>CCI</sub> = 0.9 V to 5.5 V [3]                                           | -0.1   | 1    | 1.5   | -0.1             | 1.85  | -0.1              | 2     | μA   |
|                  |                           | OE input; V <sub>I</sub> = 0 V to 5.5 V; V <sub>CCI</sub> = 0.9 V to 5.5 V [3]                                                | -0.1   | 1    | 1.5   | -0.1             | 1.85  | -0.1              | 2     | μA   |
| I <sub>OZ</sub>  | OFF-state output current  | suspend mode YBn, YAn output; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CCA</sub> = 5.5 V; V <sub>CCB</sub> = 0 V [1] | -0.1   | -    | 0.1   | -0.5             | 0.5   | -2                | 2     | μA   |
| I <sub>OFF</sub> | power-off leakage current | YBn, YAn output; V <sub>I</sub> or V <sub>O</sub> = 0 V to 5.5 V; V <sub>CCA</sub> = 0 V; V <sub>CCB</sub> = 0.9 V to 5.5 V   | -1.5   | -    | 1.5   | -1.85            | 1.85  | -2                | 2     | μA   |
|                  |                           | YBn, YAn output; V <sub>I</sub> or V <sub>O</sub> = 0 V to 5.5 V; V <sub>CCB</sub> = 0 V; V <sub>CCA</sub> = 0.9 V to 5.5 V   | -1.5   | -    | 1.5   | -1.85            | 1.85  | -2                | 2     | μA   |
|                  |                           | YBn, YAn output; V <sub>I</sub> or V <sub>O</sub> = GND; V <sub>CCA</sub> = floating; V <sub>CCB</sub> = 0.9 V to 5.5 V [4]   | -1.5   | -    | 1.5   | -1.85            | 1.85  | -2                | 2     | μA   |
|                  |                           | YBn, YAn output; V <sub>I</sub> or V <sub>O</sub> = GND; V <sub>CCB</sub> = floating; V <sub>CCA</sub> = 0.9 V to 5.5 V [4]   | -1.5   | -    | 1.5   | -1.85            | 1.85  | -2                | 2     | μA   |

## 4-bit dual-supply voltage level translating buffer; 3-state

| Symbol          | Parameter      | Conditions                                                                                                                                                              | +25 °C |     |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|-----|------------------|-----|-------------------|-----|------|
|                 |                |                                                                                                                                                                         | Min    | Typ | Max | Min              | Max | Min               | Max |      |
| I <sub>CC</sub> | supply current | I <sub>CCA</sub> ; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A [3]                                                                                  |        |     |     |                  |     |                   |     |      |
|                 |                | V <sub>CCA</sub> , V <sub>CCB</sub> = 0.9 V to 5.5 V                                                                                                                    | -      | 1   | 1.8 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | V <sub>CCA</sub> = 5.5 V; V <sub>CCB</sub> = 0 V                                                                                                                        | -      | 1   | 1.8 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | V <sub>CCA</sub> = 0 V; V <sub>CCB</sub> = 5.5 V                                                                                                                        | -0.1   | -   | 0.1 | -0.4             | 0.4 | -1                | 1   | μA   |
|                 |                | I <sub>CCB</sub> ; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A [3]                                                                                  |        |     |     |                  |     |                   |     |      |
|                 |                | V <sub>CCA</sub> , V <sub>CCB</sub> = 0.9 V to 5.5 V                                                                                                                    | -      | 1   | 1.8 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | V <sub>CCB</sub> = 5.5 V; V <sub>CCA</sub> = 0 V                                                                                                                        | -      | 1   | 1.8 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | V <sub>CCB</sub> = 0 V; V <sub>CCA</sub> = 5.5 V                                                                                                                        | -0.1   | -   | 0.1 | -0.4             | 0.4 | -1                | 1   | μA   |
|                 |                | I <sub>CCA</sub> or I <sub>CCB</sub> ; V <sub>I</sub> or V <sub>O</sub> = GND; I <sub>O</sub> = 0 A                                                                     |        |     |     |                  |     |                   |     |      |
|                 |                | I <sub>CCA</sub> ; V <sub>CCB</sub> = floating; V <sub>CCA</sub> = 5.5 V [4]                                                                                            | -      | 1   | 1.5 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | I <sub>CCB</sub> ; V <sub>CCA</sub> = floating; V <sub>CCB</sub> = 5.5 V [4]                                                                                            | -      | 1   | 1.5 | -                | 2.5 | -                 | 3   | μA   |
|                 |                | I <sub>CCA</sub> + I <sub>CCB</sub> combined; V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A; V <sub>CCA</sub> = V <sub>CCB</sub> = 0.9 V to 5.5 V [3] | -      | 2   | 3   | -                | 4.5 | -                 | 5   | μA   |

[1] V<sub>CCO</sub> is the supply voltage associated with the outputs (YBn, YAn).

[2] Typical values for V<sub>OL</sub> and V<sub>OH</sub> are measured at V<sub>CCO</sub> is 0.9 V.

[3] V<sub>CCI</sub> is the supply voltage associated with the inputs (An, Bn).

[4] Floating is defined, if one of the supply pins is not actively driven externally and has a leakage not exceeding 10 nA

**Table 10. Typical total supply current  $I_{CCA}$  at  $T_{amb} = 25\text{ °C}$** 

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

| $V_{CCA}$ | $V_{CCB}$ |       |       |       |       |       |       |       | Unit          |
|-----------|-----------|-------|-------|-------|-------|-------|-------|-------|---------------|
|           | 0 V       | 0.9 V | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |               |
| 0 V       | 0.00      | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | $\mu\text{A}$ |
| 0.9 V     | 0.2       | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | $\mu\text{A}$ |
| 1.2 V     | 0.3       | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | $\mu\text{A}$ |
| 1.5 V     | 0.4       | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | $\mu\text{A}$ |
| 1.8 V     | 0.4       | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | $\mu\text{A}$ |
| 2.5 V     | 0.4       | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | $\mu\text{A}$ |
| 3.3 V     | 0.5       | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | $\mu\text{A}$ |
| 5.0 V     | 0.9       | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | $\mu\text{A}$ |

**Table 11. Typical total supply current  $I_{CCB}$  at  $T_{amb} = 25\text{ °C}$** 

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

| $V_{CCA}$ | $V_{CCB}$ |       |       |       |       |       |       |       | Unit          |
|-----------|-----------|-------|-------|-------|-------|-------|-------|-------|---------------|
|           | 0 V       | 0.9 V | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |               |
| 0 V       | 0.00      | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | $\mu\text{A}$ |
| 0.9 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 1.2 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 1.5 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 1.8 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 2.5 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 3.3 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.7   | $\mu\text{A}$ |
| 5.0 V     | 0.01      | 0.2   | 0.25  | 0.3   | 0.4   | 0.45  | 0.5   | 0.9   | $\mu\text{A}$ |

14. Dynamic characteristics

Table 12. Maximum data rate and output skew  
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12.

| Symbol             | Parameter        | Conditions                                                                                                                 | T <sub>amb</sub> = -40 °C to +125 °C |      |     | Unit |
|--------------------|------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|-----|------|
|                    |                  |                                                                                                                            | Min                                  | Typ  | Max |      |
| f <sub>data</sub>  | data rate        | 50% duty cycle input; one channel switching; 20% of pulse > 0.7xV <sub>CCO</sub> ; 20% of pulse < 0.3xV <sub>CCO</sub> [1] |                                      |      |     |      |
|                    |                  | Up translation [1][2]                                                                                                      |                                      |      |     |      |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                       | -                                    | 350  | 250 | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                     | -                                    | 350  | 250 | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                       | -                                    | 220  | 100 | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                     | -                                    | 230  | 150 | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                       | -                                    | 300  | 140 | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 100  | 40  | Mbps |
|                    |                  | Down translation [1][2]                                                                                                    |                                      |      |     |      |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                       | -                                    | 250  | 170 | Mbps |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 150  | 60  | Mbps |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                       | -                                    | 80   | 30  | Mbps |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 150  | 60  | Mbps |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                       | -                                    | 80   | 30  | Mbps |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                     | -                                    | 70   | 30  | Mbps |
| t <sub>sk(o)</sub> | output skew time | Timing skew between any switching outputs on the rising or falling edge                                                    |                                      |      |     |      |
|                    |                  | Up translation [1][2]                                                                                                      |                                      |      |     |      |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                       | -                                    | 0.15 | 0.7 | ns   |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                     | -                                    | 0.25 | 1   | ns   |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 4.5 V to 5.5 V                                                       | -                                    | 0.5  | 2.1 | ns   |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                     | -                                    | 0.25 | 1   | ns   |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                       | -                                    | 0.5  | 2.1 | ns   |
|                    |                  | V <sub>CCI</sub> = 1.1 V to 1.3 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 0.5  | 2.1 | ns   |
|                    |                  | Down translation [1][2]                                                                                                    |                                      |      |     |      |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 3.0 V to 3.6 V                                                       | -                                    | 0.15 | 0.8 | ns   |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 0.25 | 1.1 | ns   |
|                    |                  | V <sub>CCI</sub> = 4.5 V to 5.5 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                       | -                                    | 0.6  | 2.5 | ns   |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 1.65 V to 1.95 V                                                     | -                                    | 0.25 | 2.5 | ns   |
|                    |                  | V <sub>CCI</sub> = 3.0 V to 3.6 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                       | -                                    | 0.6  | 2.5 | ns   |
|                    |                  | V <sub>CCI</sub> = 1.65 V to 1.95 V; V <sub>CCO</sub> = 1.1 V to 1.3 V                                                     | -                                    | 0.6  | 2.5 | ns   |

[1] V<sub>CCO</sub> is the supply voltage associated with the outputs (YBn, YAn).  
[2] V<sub>CCI</sub> is the supply voltage associated with the inputs (An, Bn)..

4-bit dual-supply voltage level translating buffer; 3-state

Table 13. Typical dynamic characteristics at  $V_{CCA} = 0.9\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12; for waveforms see Fig. 9, Fig. 11 and Fig. 10.

| Symbol    | Parameter         | Conditions    | $V_{CCB}$ |       |       |       |       |       |       | Unit |
|-----------|-------------------|---------------|-----------|-------|-------|-------|-------|-------|-------|------|
|           |                   |               | 0.9 V     | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| $t_{pd}$  | propagation delay | An to YBn [1] | 61        | 44    | 41    | 39.5  | 38.5  | 38.5  | 39.4  | ns   |
|           |                   | Bn to YAn [1] | 55.4      | 34.1  | 29.8  | 28.1  | 27.1  | 26.5  | 27.5  | ns   |
| $t_{dis}$ | disable time      | OE to YAn [1] | 65        | 67    | 68    | 70    | 74    | 79    | 92    | ns   |
|           |                   | OE to YBn [1] | 67        | 51    | 47    | 47    | 44    | 44    | 42    | ns   |
| $t_{en}$  | enable time       | OE to YAn [1] | 70        | 58    | 58    | 58    | 58    | 58.2  | 58.2  | ns   |
|           |                   | OE to YBn [1] | 67        | 51    | 47    | 47    | 44    | 44    | 42    | 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 14. Typical dynamic characteristics at  $V_{CCB} = 0.9\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12; for waveforms see Fig. 9, Fig. 11 and Fig. 10.

| Symbol    | Parameter         | Conditions    | $V_{CCA}$ |       |       |       |       |       |       | Unit |
|-----------|-------------------|---------------|-----------|-------|-------|-------|-------|-------|-------|------|
|           |                   |               | 0.9 V     | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| $t_{pd}$  | propagation delay | An to YBn [1] | 61        | 44    | 41    | 39.5  | 38.5  | 38.5  | 39.4  | ns   |
|           |                   | Bn to YAn [1] | 54.5      | 43.7  | 40.3  | 39.2  | 38.5  | 38.6  | 39.5  | ns   |
| $t_{dis}$ | disable time      | OE to YAn [1] | 65        | 51    | 47    | 47    | 44    | 45    | 44    | ns   |
|           |                   | OE to YBn [1] | 67        | 68    | 70    | 72    | 76    | 81    | 94    | ns   |
| $t_{en}$  | enable time       | OE to YAn [1] | 60        | 52    | 52    | 52    | 52    | 50    | 70    | ns   |
|           |                   | OE to YBn [1] | 70        | 60    | 52    | 52    | 52    | 50    | 50    | 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 15. Typical dynamic characteristics at T<sub>amb</sub> = 25 °C  
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12.

| Symbol          | Parameter                     | Conditions                                                                                                                                                                            | Supply voltage (V <sub>CCA</sub> = V <sub>CCB</sub> ) |       |       |       |       |       |       | Unit |
|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|------|
|                 |                               |                                                                                                                                                                                       | 0.9 V                                                 | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| C <sub>PD</sub> | power dissipation capacitance | V <sub>CCA</sub> [1][2][3]<br>f <sub>i</sub> = 10 MHz; V <sub>I</sub> = GND to V <sub>CCI</sub> ; t <sub>r</sub> = t <sub>f</sub> = 1 ns; C <sub>L</sub> = 0 pF; R <sub>L</sub> = ∞ Ω |                                                       |       |       |       |       |       |       |      |
|                 |                               | An to YBn; outputs disabled                                                                                                                                                           | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
|                 |                               | Bn to YAn; outputs disabled                                                                                                                                                           | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
|                 |                               | An to YBn; outputs enabled                                                                                                                                                            | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
|                 |                               | Bn to YAn; outputs enabled                                                                                                                                                            | 10                                                    | 10.4  | 10.6  | 10.7  | 10.9  | 11.3  | 12.1  | pF   |
|                 |                               | V <sub>CCB</sub> [1][2][3]<br>f <sub>i</sub> = 10 MHz; V <sub>I</sub> = GND to V <sub>CCI</sub> ; t <sub>r</sub> = t <sub>f</sub> = 1 ns; C <sub>L</sub> = 0 pF; R <sub>L</sub> = ∞ Ω |                                                       |       |       |       |       |       |       |      |
|                 |                               | An to YBn; outputs disabled                                                                                                                                                           | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
|                 |                               | Bn to YAn; outputs disabled                                                                                                                                                           | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
|                 |                               | An to YBn; outputs enabled                                                                                                                                                            | 10                                                    | 10.4  | 10.6  | 10.7  | 10.9  | 11.3  | 12.1  | pF   |
|                 |                               | Bn to YAn; outputs enabled                                                                                                                                                            | 1.5                                                   | 1.6   | 1.7   | 1.7   | 1.9   | 2.1   | 2.7   | pF   |
| C <sub>I</sub>  | input capacitance             | V <sub>I</sub> = 0 V or V <sub>CCI</sub> [2]                                                                                                                                          | 1.9                                                   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | pF   |
| C <sub>O</sub>  | output capacitance            | OE = GND; V <sub>CCA</sub> = 3.3 V;<br>V <sub>CCB</sub> = 3.3 V; V <sub>O</sub> = 0V or V <sub>CCI</sub>                                                                              | 3.2                                                   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | pF   |

[1] C<sub>PD</sub> per channel is used to determine the dynamic power dissipation (P<sub>DYN</sub> in μW).  
P<sub>DYN</sub> = N × (C<sub>PD</sub> × V<sub>CCI</sub><sup>2</sup> × f<sub>i</sub>) + N × (C<sub>L</sub> × V<sub>CCO</sub><sup>2</sup> × f<sub>o</sub>) where:  
f<sub>i</sub> = input frequency in MHz;  
f<sub>o</sub> = output frequency in MHz;  
C<sub>L</sub> = load capacitance in pF;  
V<sub>CCI</sub> = the supply voltage associated with input pins in V;  
V<sub>CCO</sub> = the supply voltage associated with the output pins in V;  
N = total number of inputs or outputs switching.

[2] V<sub>CCI</sub> is the supply voltage associated with the inputs (An, Bn).

[3] V<sub>CCO</sub> is the supply voltage associated with the outputs (YBn, YAn).

Table 16. Dynamic characteristics for temperature range -40 °C to +85 °C  
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12; for waveforms see Fig. 9, Fig. 11 and Fig. 10.

| Symbol          | Parameter         | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                 |                   |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>pd</sub> | propagation delay | An to YBn [1]                     |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |                   | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 6.0              | 42.1 | 5.3           | 30.1 | 5.0            | 26.5 | 4.7           | 22.8 | 4.7           | 21.5 | 4.7           | 21.9 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 5.3              | 33.4 | 4.6           | 21.4 | 4.2            | 18.1 | 3.8           | 14.6 | 3.8           | 13.3 | 3.8           | 12.7 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 5.0              | 31.3 | 4.3           | 19.2 | 3.5            | 15.6 | 3.4           | 12.4 | 3.4           | 11.2 | 3.4           | 10.1 | ns   |
|                 |                   | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 4.6              | 29.5 | 3.7           | 17.3 | 3.4            | 13.6 | 3.0           | 10.1 | 2.9           | 8.8  | 2.9           | 7.7  | ns   |
|                 |                   | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 4.6              | 29.1 | 3.8           | 16.6 | 3.5            | 12.9 | 3.1           | 9.4  | 2.9           | 7.9  | 2.8           | 6.8  | ns   |
|                 |                   | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 4.8              | 29.6 | 4.1           | 16.3 | 3.7            | 12.5 | 3.2           | 8.7  | 2.9           | 7.3  | 2.6           | 6.1  | ns   |
|                 |                   | Bn to YAn                         |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |                   | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 6.7              | 42.1 | 5.9           | 34.4 | 5.5            | 32.3 | 5.1           | 30.4 | 5.1           | 29.8 | 5.1           | 30.3 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 6.1              | 30.6 | 5.2           | 22.5 | 4.5            | 20.3 | 4.1           | 18.2 | 4.1           | 17.4 | 4.1           | 17.1 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 5.7              | 27.4 | 4.7           | 19.1 | 4.0            | 16.4 | 3.5           | 14.1 | 3.5           | 13.3 | 3.5           | 12.8 | ns   |
|                 |                   | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 5.4              | 23.7 | 4.4           | 15.3 | 3.6            | 12.7 | 3.2           | 10.3 | 3.2           | 9.6  | 3.3           | 8.9  | ns   |
|                 |                   | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 5.3              | 22.3 | 4.3           | 13.9 | 3.5            | 11.3 | 3.0           | 9.1  | 3.1           | 8.1  | 3.1           | 7.4  | ns   |
|                 |                   | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 5.1              | 22.7 | 4.1           | 13.3 | 3.5            | 10.4 | 3.0           | 7.9  | 2.8           | 6.9  | 2.7           | 6.2  | ns   |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol          | Parameter   | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                 |             |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>en</sub> | enable time | OE to YBn [1]                     |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |             | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 8.5              | 42.8 | 7.7           | 31.8 | 7.4            | 28.5 | 7.2           | 25.5 | 7.2           | 24.6 | 7.2           | 24.2 | ns   |
|                 |             | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 7.9              | 39.4 | 6.4           | 23.1 | 5.8            | 19.8 | 5.6           | 16.7 | 5.6           | 15.7 | 5.6           | 15.2 | ns   |
|                 |             | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 7.5              | 38.5 | 6.1           | 22.2 | 5.2            | 17.2 | 4.7           | 13.7 | 4.6           | 12.5 | 4.6           | 11.8 | ns   |
|                 |             | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 7.1              | 37.5 | 5.3           | 21.3 | 4.4            | 16.1 | 3.9           | 10.7 | 3.7           | 9.5  | 3.7           | 8.6  | ns   |
|                 |             | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 6.6              | 37.1 | 5.1           | 20.8 | 4.1            | 15.5 | 3.4           | 10.1 | 3.3           | 8.2  | 3.2           | 7.3  | ns   |
|                 |             | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 6.2              | 36.5 | 4.5           | 20.2 | 3.6            | 15.1 | 2.9           | 9.4  | 2.6           | 7.4  | 2.6           | 6.2  | ns   |
|                 |             | OE to YAn                         |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |             | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 8.5              | 42.8 | 8.7           | 42.7 | 8.7            | 42.7 | 8.7           | 42.7 | 8.5           | 42.7 | 8.5           | 42.7 | ns   |
|                 |             | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 7.4              | 38.6 | 6.4           | 28.2 | 6.5            | 28.2 | 6.5           | 28.2 | 6.4           | 28.2 | 6.4           | 28.2 | ns   |
|                 |             | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 6.5              | 33.3 | 5.6           | 23.8 | 5.2            | 23.8 | 5.2           | 23.8 | 5.2           | 23.8 | 5.2           | 23.8 | ns   |
|                 |             | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 5.6              | 28.6 | 4.7           | 19.6 | 4.3            | 17.7 | 4.1           | 15.8 | 4.1           | 15.8 | 3.4           | 15.8 | ns   |
|                 |             | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 5.2              | 27.8 | 4.2           | 18.2 | 3.7            | 16.1 | 3.4           | 9.2  | 3.4           | 8.3  | 3.0           | 8.3  | ns   |
|                 |             | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 4.8              | 25.7 | 3.8           | 16.0 | 3.3            | 9.7  | 2.8           | 7.4  | 2.7           | 6.6  | 2.7           | 6.2  | ns   |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol           | Parameter    | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                  |              |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>dis</sub> | disable time | OE to YBn [1]                     |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                  |              | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 11.7             | 44.1 | 10.9          | 37.2 | 11.5           | 36.2 | 10.6          | 32.9 | 10.8          | 33.7 | 9.9           | 32.2 | ns   |
|                  |              | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 11.6             | 44.2 | 8.5           | 26.4 | 8.9            | 25.1 | 7.4           | 21.6 | 7.4           | 22.1 | 7.4           | 20.2 | ns   |
|                  |              | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 11.6             | 44.4 | 8.4           | 26.3 | 6.9            | 21.3 | 5.3           | 18.1 | 5.3           | 18.4 | 6.3           | 16.3 | ns   |
|                  |              | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 11.6             | 44.9 | 8.3           | 26.4 | 7.1            | 21.3 | 4.7           | 17.9 | 6.0           | 15.3 | 4.6           | 13.7 | ns   |
|                  |              | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 11.3             | 45.6 | 8.2           | 26.6 | 6.7            | 21.4 | 4.1           | 15.1 | 4.9           | 14.6 | 4.1           | 12.2 | ns   |
|                  |              | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 11.3             | 47.1 | 8.4           | 27.2 | 6.4            | 24.6 | 3.4           | 16.7 | 4.9           | 17.1 | 3.1           | 12.7 | ns   |
|                  |              | OE to YAn                         |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                  |              | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 11.6             | 58.7 | 11.6          | 58.7 | 11.6           | 58.7 | 11.6          | 58.7 | 11.6          | 58.7 | 11.6          | 58.7 | ns   |
|                  |              | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 10.8             | 50.5 | 8.5           | 39.4 | 8.5            | 39.4 | 8.5           | 39.4 | 8.7           | 39.4 | 8.7           | 39.4 | ns   |
|                  |              | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 7.5              | 49.5 | 7.5           | 37.9 | 7.5            | 34.3 | 5.0           | 34.3 | 5.0           | 34.3 | 4.0           | 27.0 | ns   |
|                  |              | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 7.5              | 44.5 | 7.5           | 32.5 | 5.0            | 28.9 | 5.0           | 25.1 | 5.0           | 16.1 | 2.6           | 19.5 | ns   |
|                  |              | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 7.5              | 39.6 | 7.5           | 27.2 | 5.0            | 22.4 | 5.0           | 15.0 | 5.0           | 14.9 | 4.7           | 18.1 | ns   |
|                  |              | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 7.5              | 33.7 | 7.5           | 20.4 | 4.9            | 16.5 | 4.9           | 12.3 | 4.9           | 11.9 | 3.6           | 12.3 | ns   |

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

Table 17. Dynamic characteristics for temperature range -40 °C to +125 °C  
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12; for waveforms see Fig. 9, Fig. 11 and Fig. 10.

| Symbol          | Parameter         | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                 |                   |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>pd</sub> | propagation delay | A to YBn [1]                      |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |                   | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 6.0              | 42.1 | 5.3           | 31.1 | 5.0            | 27.4 | 4.7           | 23.6 | 4.7           | 22.2 | 4.7           | 22.3 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 5.3              | 34.1 | 4.6           | 22.6 | 4.2            | 19.2 | 3.8           | 15.7 | 3.8           | 14.2 | 3.8           | 13.4 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 5.0              | 31.8 | 4.3           | 20.4 | 3.5            | 16.6 | 3.4           | 13.3 | 3.4           | 12.1 | 3.4           | 10.7 | ns   |
|                 |                   | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 4.6              | 29.9 | 3.7           | 18.3 | 3.4            | 14.5 | 3.0           | 10.9 | 2.9           | 9.4  | 2.9           | 8.2  | ns   |
|                 |                   | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 4.6              | 29.5 | 3.8           | 17.6 | 3.5            | 13.7 | 3.1           | 10.1 | 2.9           | 8.5  | 2.8           | 7.2  | ns   |
|                 |                   | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 4.8              | 29.9 | 4.1           | 17.2 | 3.7            | 13.2 | 3.2           | 9.3  | 2.9           | 7.7  | 2.6           | 6.4  | ns   |
|                 |                   | B to YAn                          |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |                   | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 6.7              | 42.7 | 5.9           | 35.2 | 5.5            | 32.7 | 5.1           | 30.6 | 5.1           | 30.1 | 5.1           | 30.7 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 6.1              | 31.9 | 5.2           | 24.2 | 4.5            | 21.5 | 4.1           | 19.1 | 4.1           | 18.3 | 4.1           | 17.8 | ns   |
|                 |                   | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 5.7              | 28.6 | 4.7           | 20.3 | 4.0            | 17.5 | 3.5           | 15.1 | 3.5           | 14.2 | 3.5           | 13.6 | ns   |
|                 |                   | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 5.4              | 24.6 | 4.4           | 16.3 | 3.6            | 13.6 | 3.2           | 11.2 | 3.2           | 10.2 | 3.3           | 9.6  | ns   |
|                 |                   | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 5.3              | 23.2 | 4.3           | 14.9 | 3.5            | 12.2 | 3.0           | 9.6  | 3.1           | 8.6  | 3.1           | 7.9  | ns   |
|                 |                   | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 5.1              | 23.2 | 4.1           | 14.2 | 3.5            | 11.1 | 3.0           | 8.4  | 2.8           | 7.4  | 2.7           | 6.6  | ns   |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol          | Parameter   | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                 |             |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>en</sub> | enable time | OE to YBn [1]                     |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |             | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 8.5              | 43.3 | 7.7           | 32.7 | 7.4            | 29.4 | 7.2           | 26.2 | 7.2           | 25.3 | 7.2           | 24.8 | ns   |
|                 |             | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 7.9              | 39.8 | 6.4           | 24.3 | 6.1            | 21.1 | 5.6           | 17.6 | 5.6           | 16.5 | 5.6           | 15.9 | ns   |
|                 |             | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 7.5              | 38.9 | 6.1           | 23.4 | 5.2            | 18.2 | 4.7           | 14.6 | 4.6           | 13.3 | 4.6           | 12.6 | ns   |
|                 |             | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 7.1              | 37.9 | 5.3           | 22.4 | 4.4            | 17.2 | 3.9           | 11.5 | 3.7           | 10.2 | 3.7           | 9.2  | ns   |
|                 |             | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 6.6              | 37.4 | 5.1           | 21.9 | 4.1            | 16.5 | 3.4           | 10.8 | 3.3           | 8.8  | 3.2           | 7.7  | ns   |
|                 |             | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 6.2              | 36.9 | 4.5           | 21.4 | 3.6            | 16.1 | 2.9           | 10.2 | 2.6           | 8.1  | 2.6           | 6.5  | ns   |
|                 |             | OE to YAn                         |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                 |             | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 8.5              | 43.2 | 8.7           | 43.2 | 8.7            | 43.2 | 8.7           | 43.2 | 8.5           | 43.2 | 8.5           | 43.2 | ns   |
|                 |             | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 7.4              | 39.7 | 6.4           | 29.4 | 6.5            | 29.4 | 6.5           | 29.4 | 6.4           | 29.4 | 6.4           | 29.4 | ns   |
|                 |             | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 6.5              | 34.3 | 5.6           | 24.9 | 5.2            | 23.2 | 5.2           | 23.2 | 5.2           | 23.2 | 5.2           | 23.2 | ns   |
|                 |             | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 5.6              | 29.0 | 4.7           | 20.5 | 4.3            | 18.6 | 4.1           | 16.6 | 4.1           | 16.6 | 3.4           | 16.6 | ns   |
|                 |             | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 5.2              | 28.0 | 4.2           | 19.1 | 3.7            | 16.7 | 3.4           | 9.6  | 3.4           | 8.9  | 3.0           | 8.9  | ns   |
|                 |             | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 4.8              | 28.4 | 3.8           | 16.6 | 3.3            | 10.4 | 2.8           | 7.9  | 2.7           | 7.2  | 2.7           | 6.5  | ns   |

4-bit dual-supply voltage level translating buffer; 3-state

| Symbol           | Parameter    | Conditions                        | V <sub>CCB</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 |      | 5.0 V ± 0.5 V |      |      |
|                  |              |                                   | Min              | Max  | Min           | Max  | Min            | Max  | Min           | Max  | Min           | Max  | Min           | Max  |      |
| t <sub>dis</sub> | disable time | OE to YBn [1]                     |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                  |              | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 11.7             | 45.2 | 10.9          | 38.2 | 11.5           | 36.8 | 10.6          | 33.2 | 10.8          | 33.9 | 9.9           | 33.4 | ns   |
|                  |              | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 11.6             | 45.2 | 8.5           | 27.8 | 8.9            | 26.3 | 7.4           | 22.6 | 7.4           | 23.2 | 7.4           | 21.2 | ns   |
|                  |              | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 11.6             | 45.4 | 8.4           | 27.8 | 6.9            | 22.6 | 5.3           | 19.2 | 5.3           | 19.5 | 6.3           | 17.3 | ns   |
|                  |              | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 11.6             | 45.8 | 8.3           | 27.9 | 7.1            | 22.6 | 4.7           | 18.9 | 6.0           | 16.0 | 4.6           | 14.1 | ns   |
|                  |              | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 11.3             | 46.4 | 8.2           | 28.2 | 6.7            | 22.7 | 4.1           | 15.5 | 4.9           | 15.0 | 4.1           | 12.8 | ns   |
|                  |              | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 11.3             | 59.2 | 8.4           | 28.8 | 6.4            | 25.6 | 3.4           | 16.9 | 4.9           | 17.1 | 3.1           | 13.3 | ns   |
|                  |              | OE to YAn                         |                  |      |               |      |                |      |               |      |               |      |               |      |      |
|                  |              | V <sub>CCA</sub> = 1.2 V ± 0.1 V  | 11.6             | 59.6 | 11.6          | 59.6 | 11.6           | 59.6 | 11.6          | 59.6 | 11.6          | 59.6 | 11.6          | 58.9 | ns   |
|                  |              | V <sub>CCA</sub> = 1.5 V ± 0.1 V  | 10.8             | 51.3 | 8.5           | 40.8 | 8.5            | 40.8 | 8.5           | 40.8 | 8.7           | 40.8 | 8.7           | 40.8 | ns   |
|                  |              | V <sub>CCA</sub> = 1.8 V ± 0.15 V | 7.5              | 50.3 | 7.5           | 40.8 | 7.5            | 39.4 | 5.0           | 39.4 | 5.0           | 39.4 | 4.0           | 39.4 | ns   |
|                  |              | V <sub>CCA</sub> = 2.5 V ± 0.2 V  | 7.5              | 44.8 | 7.5           | 33.7 | 5.0            | 30.1 | 5.0           | 25.9 | 5.0           | 25.9 | 2.6           | 19.2 | ns   |
|                  |              | V <sub>CCA</sub> = 3.3 V ± 0.3 V  | 7.5              | 39.9 | 7.5           | 28.3 | 5.0            | 23.5 | 5.0           | 16.2 | 5.0           | 15.0 | 4.7           | 17.1 | ns   |
|                  |              | V <sub>CCA</sub> = 5.0 V ± 0.5 V  | 7.5              | 34.2 | 7.5           | 21.5 | 4.9            | 17.5 | 4.9           | 12.9 | 4.9           | 11.6 | 3.6           | 11.9 | 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>.

14.1. Waveforms and test circuit

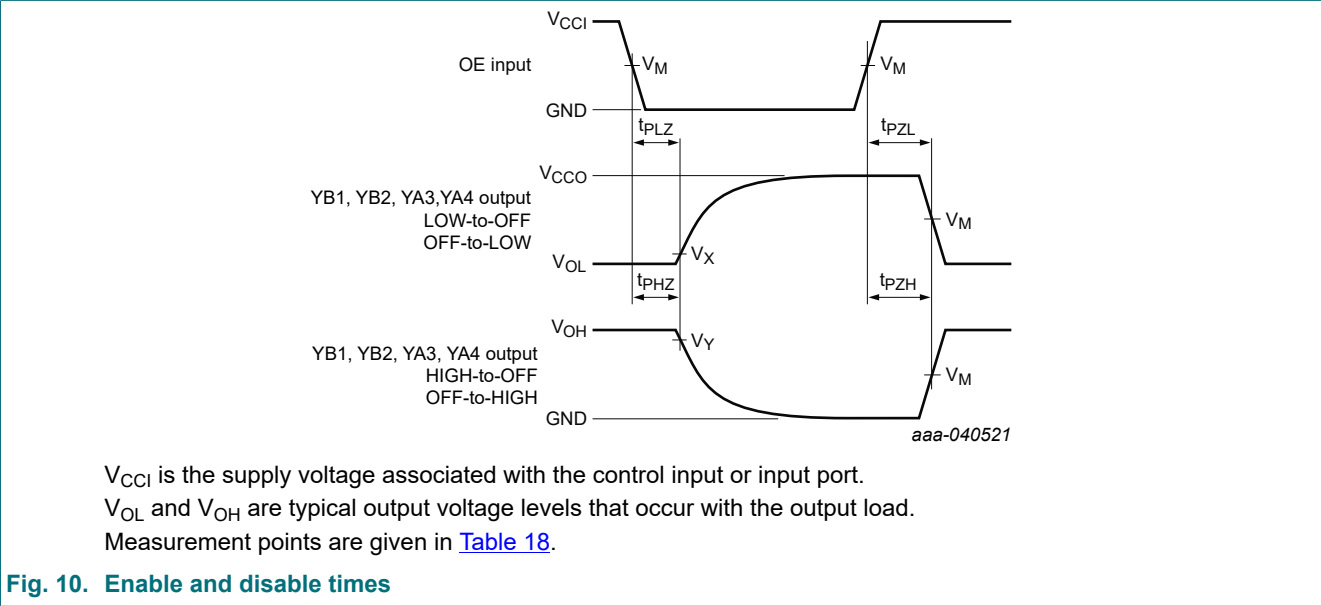
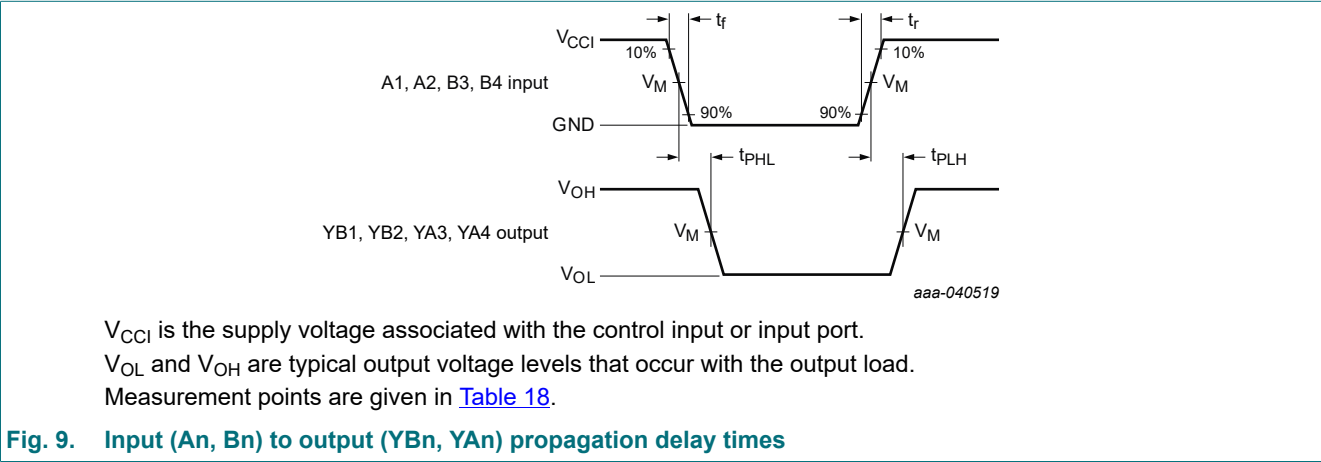


Table 18. Measurement points

| Supply voltage     | Input[1]             | Output[2]            |                           |                           |
|--------------------|----------------------|----------------------|---------------------------|---------------------------|
| $V_{CCA}, V_{CCB}$ | $V_M$                | $V_M$                | $V_X$                     | $V_Y$                     |
| 0.9 V to 1.6 V     | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.1 \text{ V}$  | $V_{OH} - 0.1 \text{ V}$  |
| 1.65 V to 2.7 V    | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 3.0 V to 5.5 V     | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |

[1]  $V_{CCI}$  is the supply voltage associated with the inputs (An, Bn).  
 [2]  $V_{CCO}$  is the supply voltage associated with the outputs (YBn, YAn).



4-bit dual-supply voltage level translating buffer; 3-state

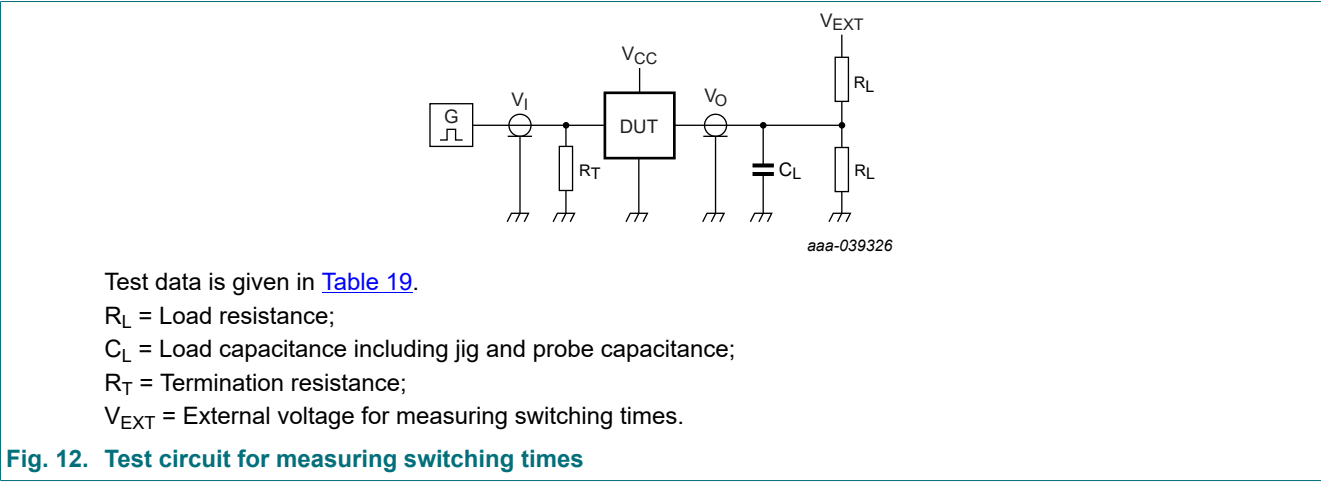
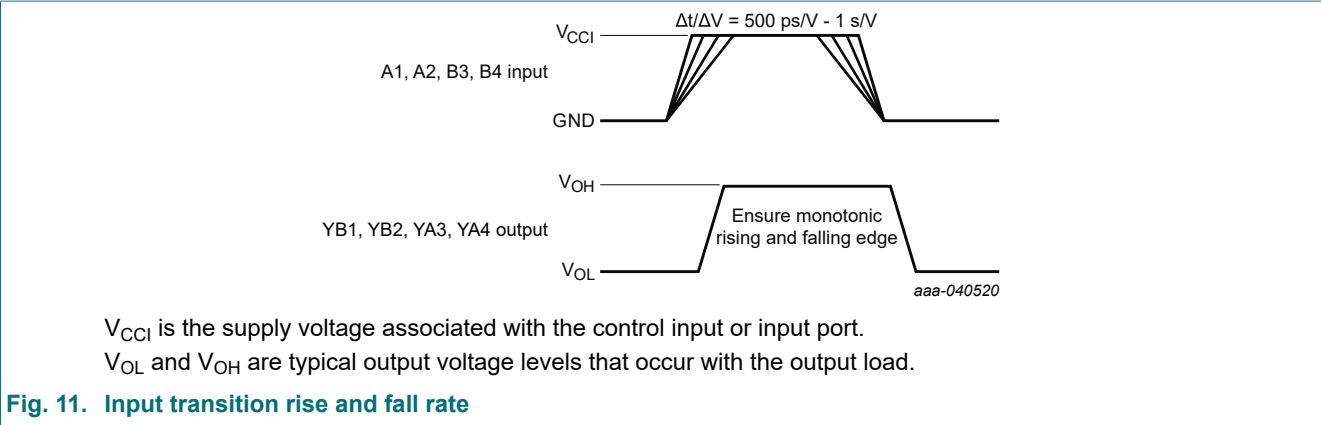
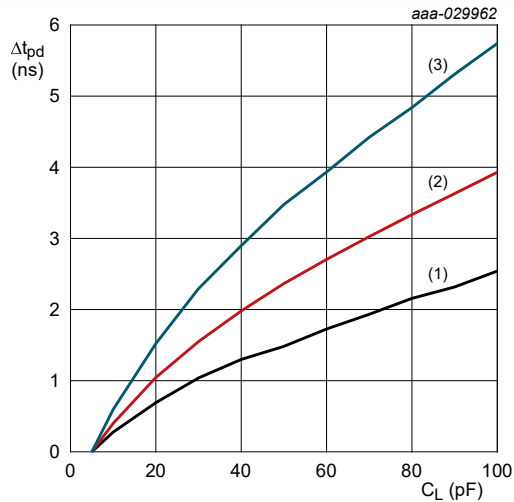


Table 19. Test data

| Supply voltage     | Load  |       | Input                   |           | $V_{EXT}$          |                    |                        |
|--------------------|-------|-------|-------------------------|-----------|--------------------|--------------------|------------------------|
| $V_{CCA}, V_{CCB}$ | $C_L$ | $R_L$ | $t_r, t_f$              | $V_I$ [1] | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ [2] |
| 0.9 V to 5.5 V     | 5 pF  | 10 kΩ | $\leq 1.0 \text{ ns/V}$ | $V_{CCI}$ | open               | GND                | $2 \times V_{CCO}$     |

[1]  $V_{CCI}$  is the supply voltage associated with the inputs ( $A_n, B_n$ ).  
[2]  $V_{CCO}$  is the supply voltage associated with the outputs ( $YB_n, YA_n$ ).

## 14.2. Additional propagation delay versus load capacitance graphs



$T_{amb} = -40$  °C to  $+125$  °C

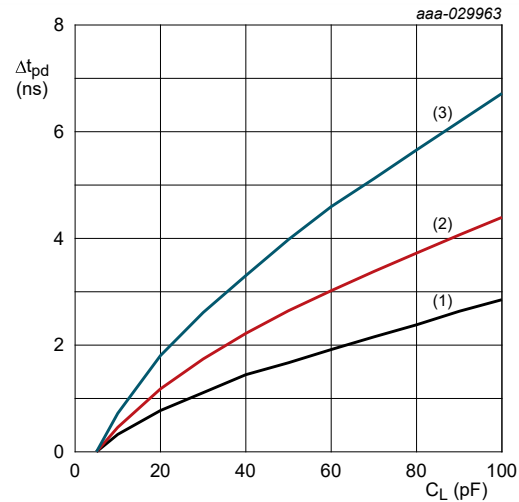
For  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PZH}$  and  $t_{PZL}$ .

(1) Minimum:  $V_{CCO} = 5.5$  V

(2) Typical:  $T_{amb} = 25$  °C;  $V_{CCO} = 5$  V

(3) Maximum:  $V_{CCO} = 4.5$  V

**Fig. 13. Additional propagation delay versus load capacitance**



$T_{amb} = -40$  °C to  $+125$  °C

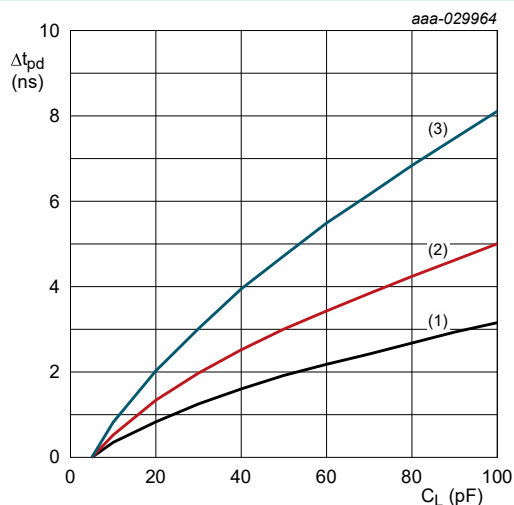
For  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PZH}$  and  $t_{PZL}$ .

(1) Minimum:  $V_{CCO} = 3.6$  V

(2) Typical:  $T_{amb} = 25$  °C;  $V_{CCO} = 3.3$  V

(3) Maximum:  $V_{CCO} = 3$  V

**Fig. 14. Additional propagation delay versus load capacitance**



$T_{amb} = -40$  °C to  $+125$  °C

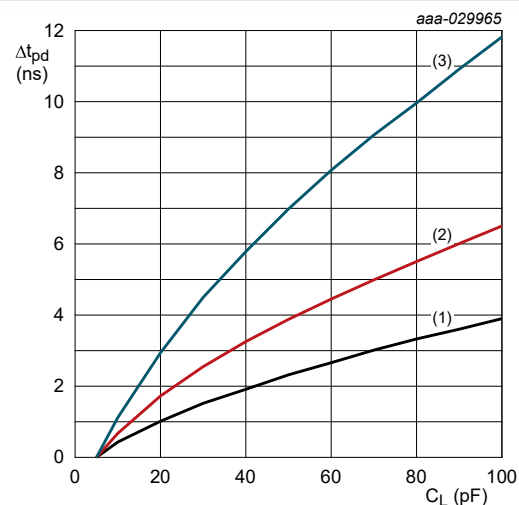
For  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PZH}$  and  $t_{PZL}$ .

(1) Minimum:  $V_{CCO} = 2.7$  V

(2) Typical:  $T_{amb} = 25$  °C;  $V_{CCO} = 2.5$  V

(3) Maximum:  $V_{CCO} = 2.3$  V

**Fig. 15. Additional propagation delay versus load capacitance**



$T_{amb} = -40$  °C to  $+125$  °C

For  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PZH}$  and  $t_{PZL}$ .

(1) Minimum:  $V_{CCO} = 1.95$  V

(2) Typical:  $T_{amb} = 25$  °C;  $V_{CCO} = 1.8$  V

(3) Maximum:  $V_{CCO} = 1.65$  V

**Fig. 16. Additional propagation delay versus load capacitance**

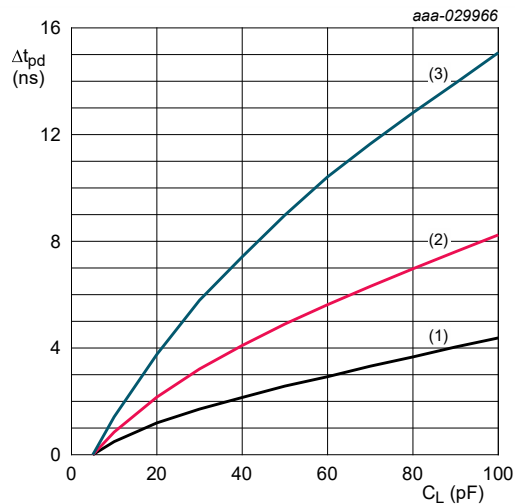


Fig. 17. Additional propagation delay versus load capacitance

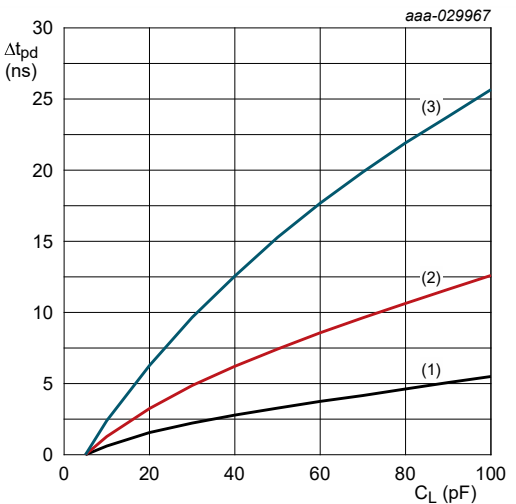


Fig. 18. Additional propagation delay versus load capacitance

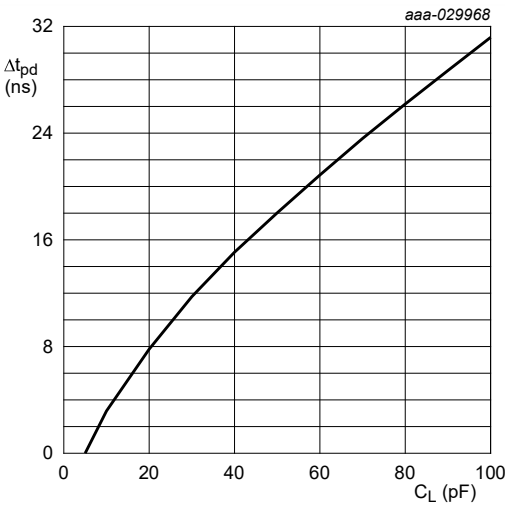


Fig. 19. Additional propagation delay versus load capacitance

15. Application information

The NXU0204 is a 4-bit, dual supply, unidirectional voltage translator suitable for level-shifting between two voltage domains. This device is ideal for applications utilizing push-pull drivers on the input pins. Below is an example of a possible configuration for translating from a 1.2 V device to a 3.3 V device. The Schmitt-trigger input is accommodating to slow or noisy input signals, allowing use in a wide range of applications.

Typical 4-wire UART application

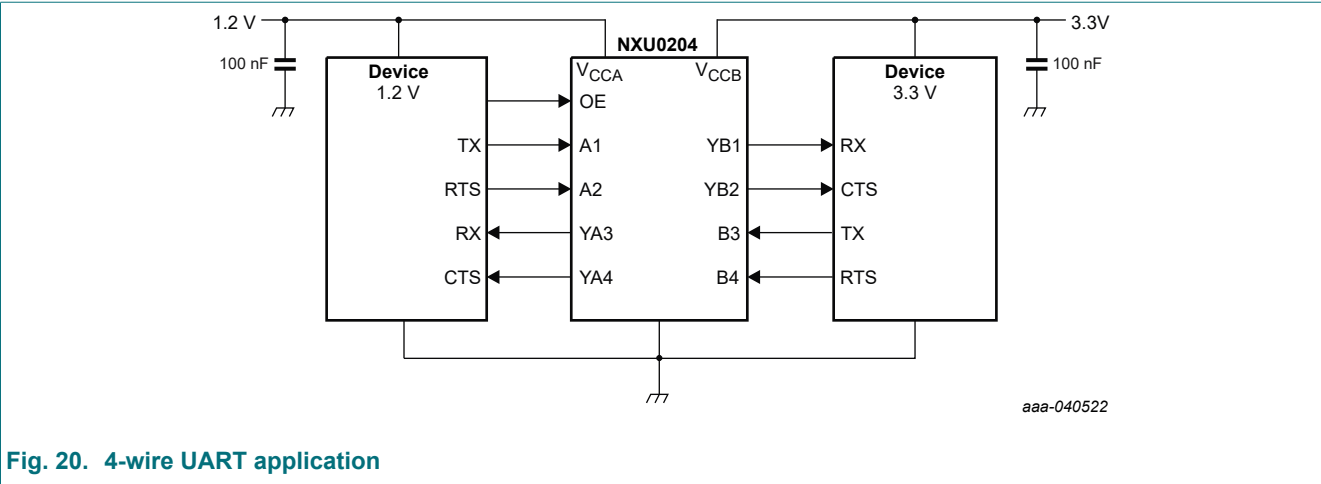


Fig. 20. 4-wire UART application

16. Package outline

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

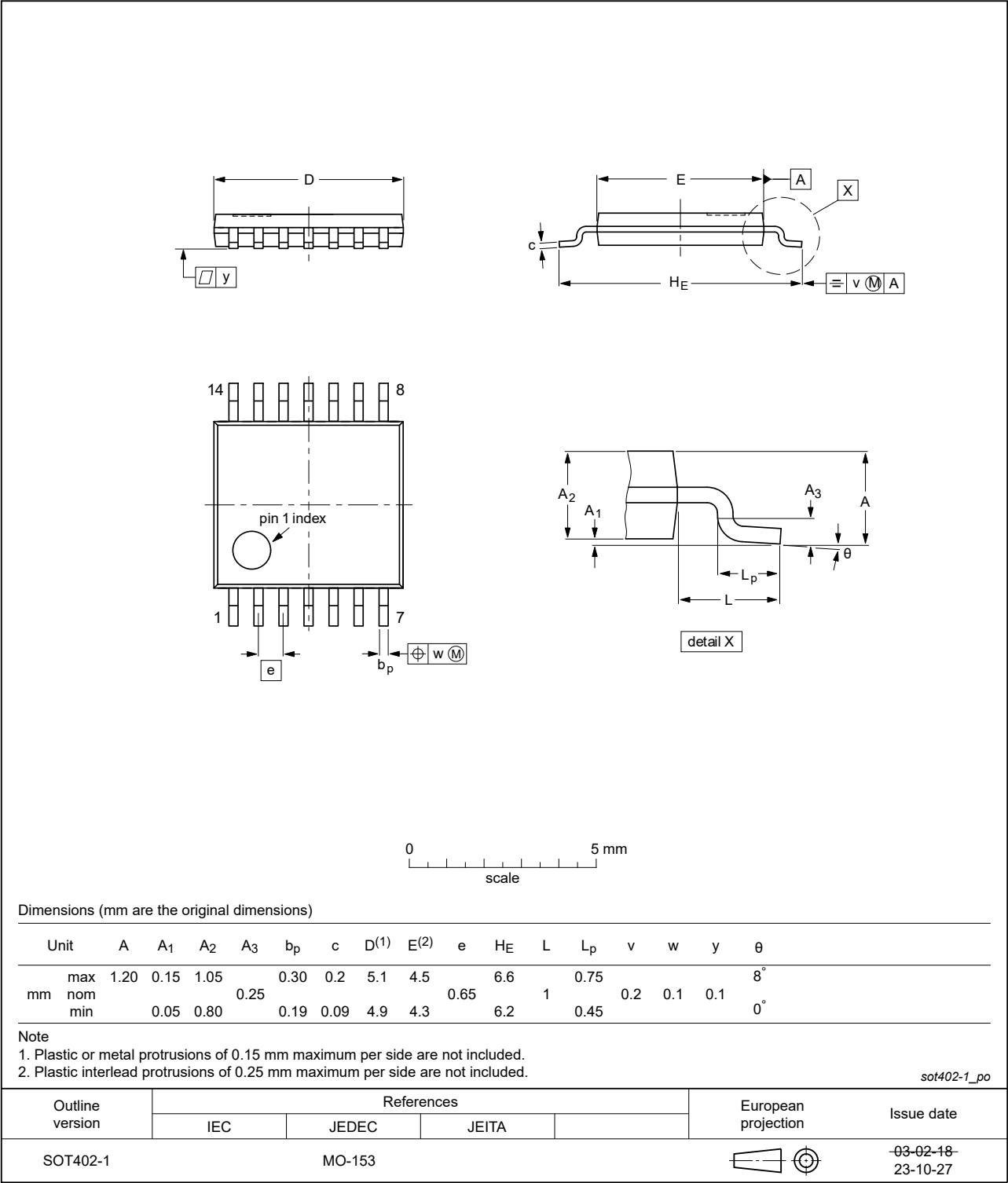


Fig. 21. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads;  
14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

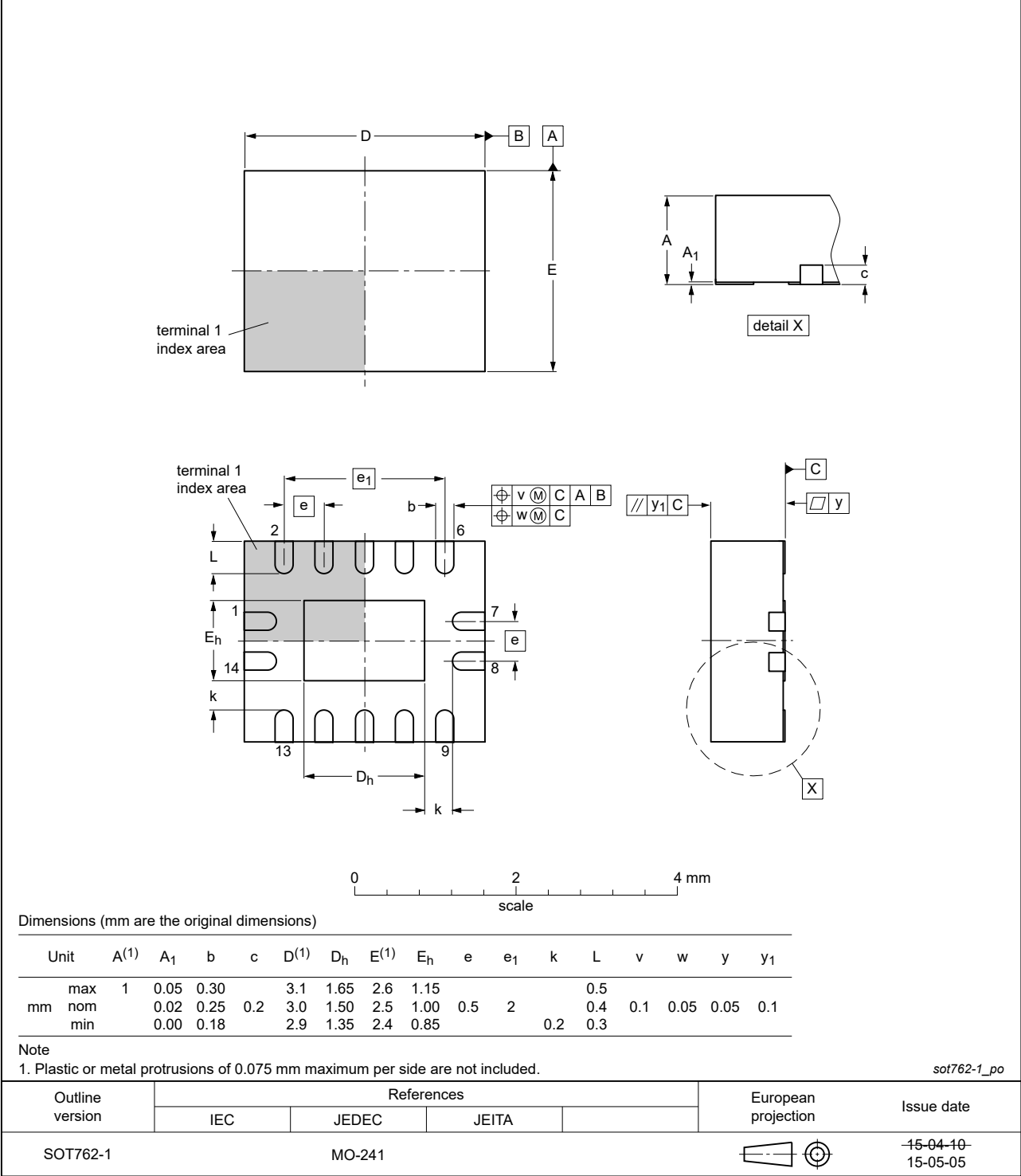


Fig. 22. Package outline SOT762-1 (DHVQFN14)

DHXQFN14: plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package;  
no leads; 14 terminals; 0.4 mm pitch; body 2 mm x 2 mm x 0.48 mm

SOT8014-1

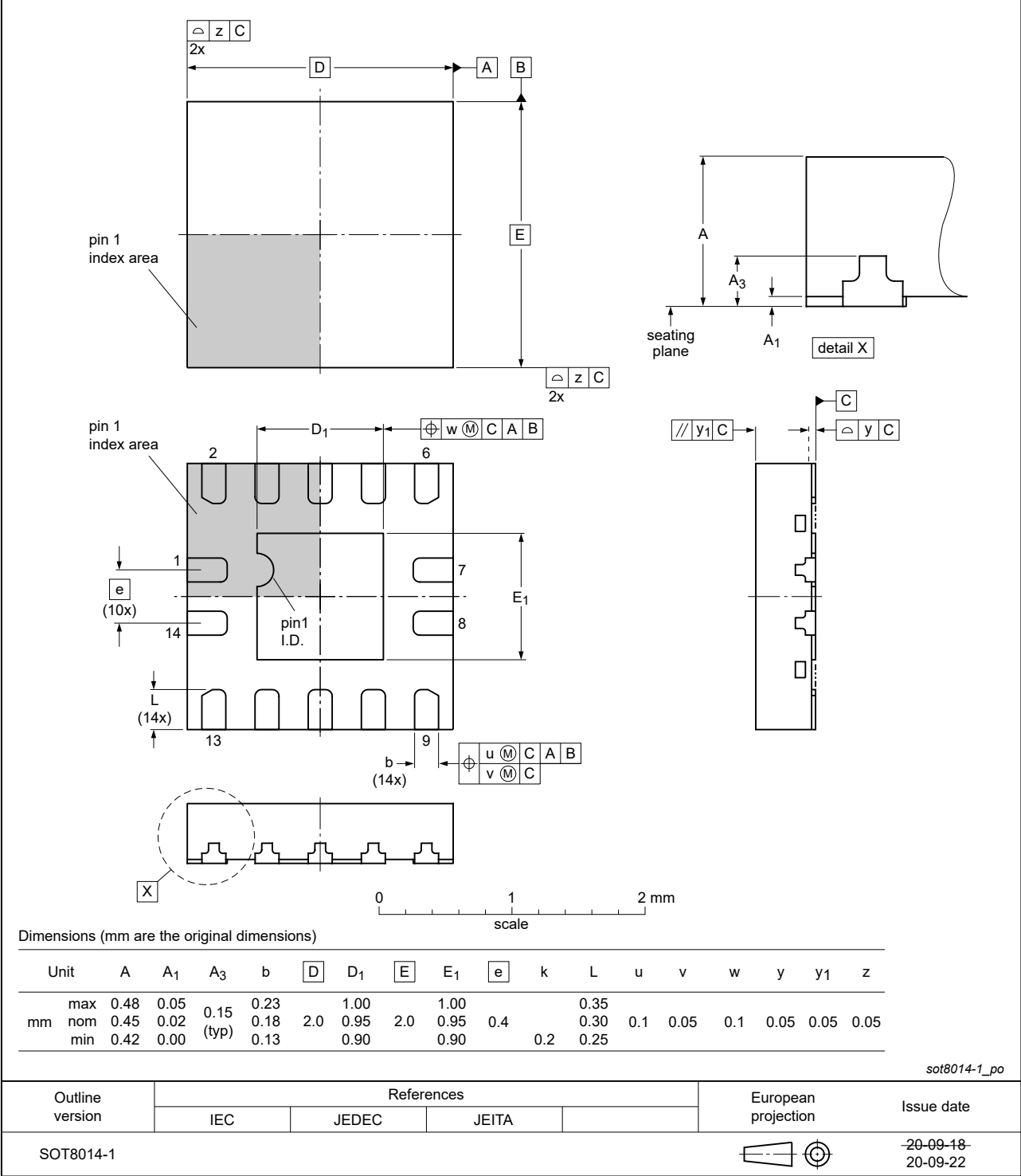


Fig. 23. Package outline SOT8014-1 (DHXQFN14)

XQFN12: plastic, extremely thin quad flat package; no leads;  
12 terminals; body 1.70 x 2.00 x 0.50 mm

SOT1174-1

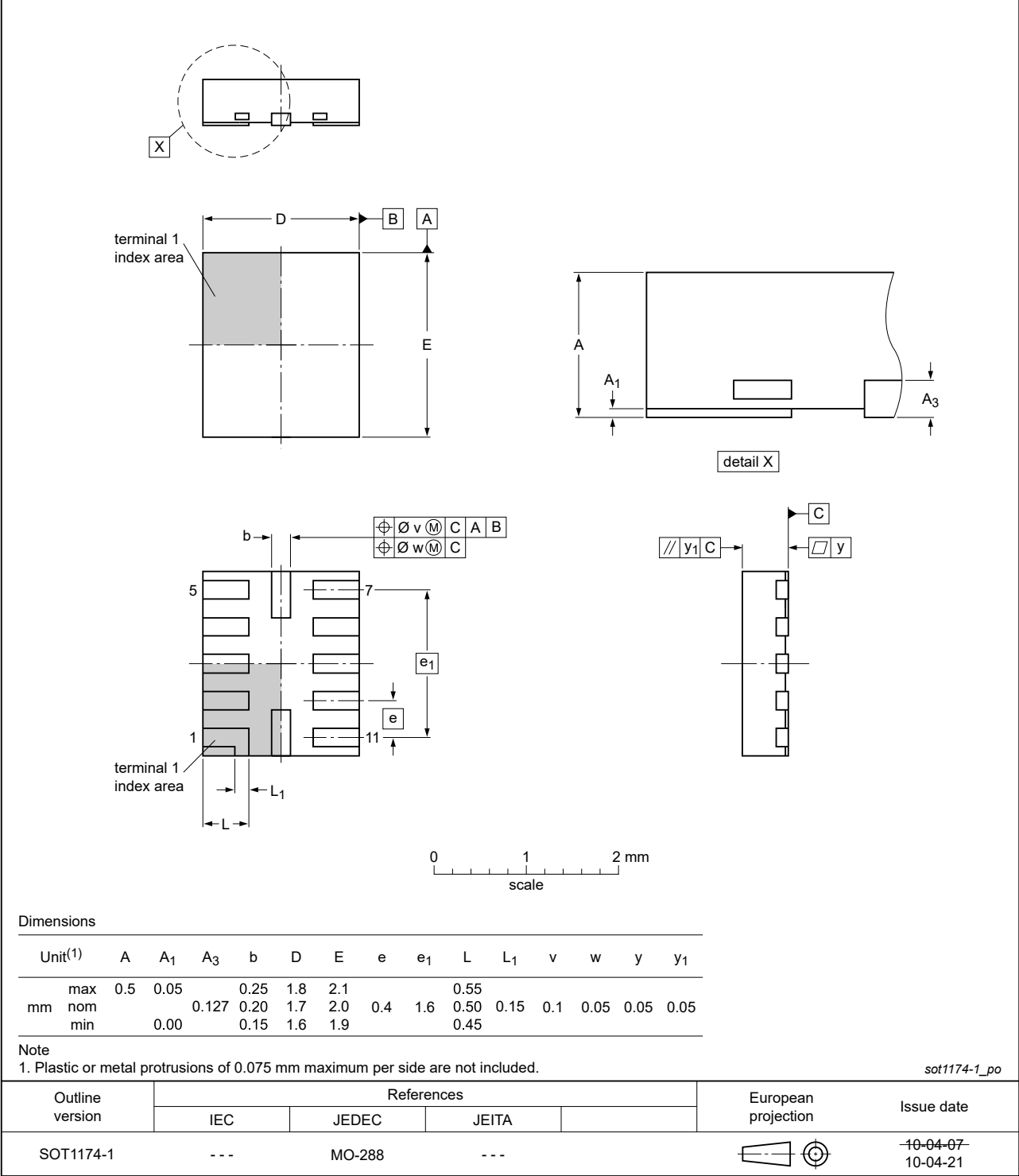


Fig. 24. Package outline SOT1174-1 (XQFN12)



17. Abbreviations

Table 20. Abbreviations

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

18. Revision history

Table 21. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| NXU0204 v.1 | 20240819     | Product data sheet | -             | -          |

19. Legal information

Data sheet status

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

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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