NXU0304

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

Rev. 1 — 19 August 2024 Product data sheet

1. General description

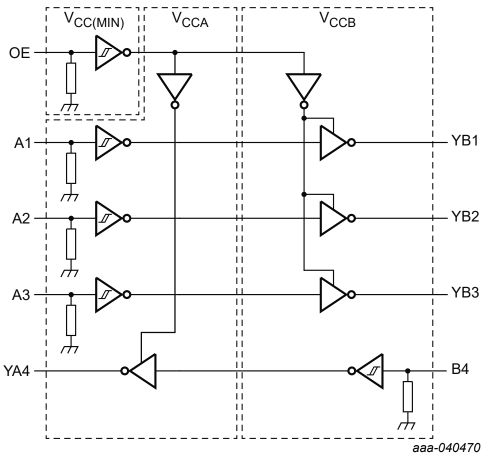
The NXU0304 is a 4-bit, dual-supply level translating buffer with 3-state outputs. It features four data inputs (An and B4), four data outputs (YBn and YA4) and an output enable input (OE).

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 for 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 μA (T_{amb} = 25 °C)
  - 5 μA (T_{amb} = -40 °C to +125 °C)
- Schmitt-trigger inputs with integrated static high ohmic pull-down resistor on the input
- Maximum data rates:
  - 250 Mbps (≥ 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 °C to +85 °C and -40 °C to +125 °C
- Similar functions: NXU0104 and NXU0204

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
NXU0304PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
NXU0304BQ	-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	SOT762-1
NXU0304BZ	-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	SOT8014-1
NXU0304GU12	-40 °C to +125 °C	XQFN12	plastic, extremely thin quad flat package; no leads; 12 terminals; body 1.70 × 2.0 × 0.50 mm	SOT1174-1

5. Marking

Table 2. Marking

Type number	Marking code[1]
NXU0304PW	NXU0304
NXU0304BQ	U0304
NXU0304BZ	L03
NXU0304GU12	L6

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

6. Functional diagram

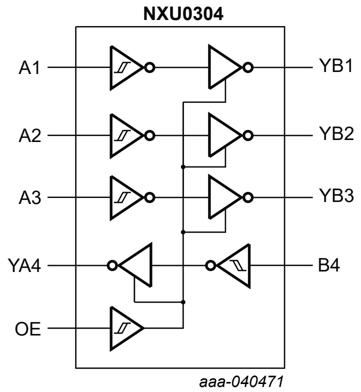


Fig. 1. Logic symbol

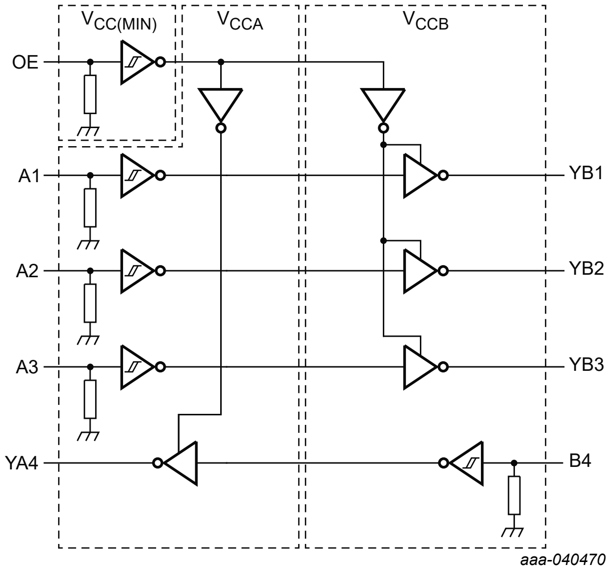
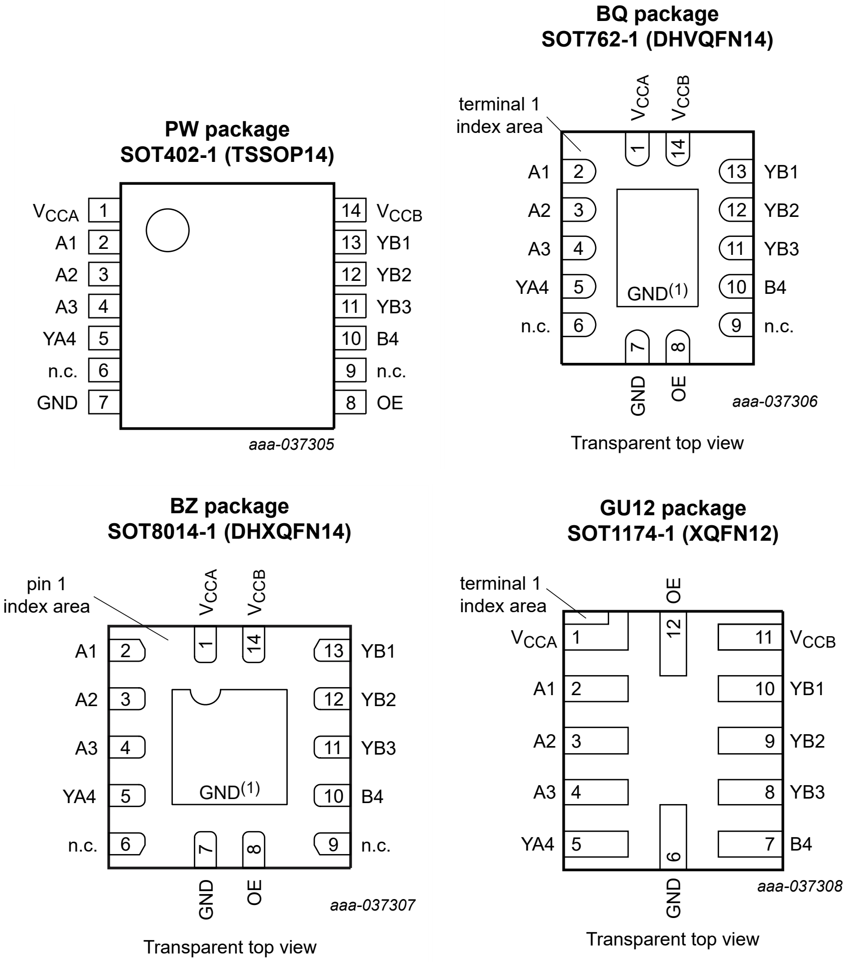


Fig. 2. Functional block diagram

7. Pinning information

7.1. Pinning



(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_{CCA}	1	1	-	supply voltage A-side (A1, A2, A3, YA4)
A1, A2, A3, B4	2, 3, 4, 10	2, 3, 4, 7	I	data inputs A-side and referenced to V_{CCA} data input B-side and referenced to V_{CCB}
n.c.	6, 9	-	-	not connected
GND	7	6	-	ground (0 V)
YB1, YB2, YB3, YA4	13, 12, 11, 5	10, 9, 8, 5	O	data outputs B-side and referenced to V_{CCB} data output A-side and referenced to V_{CCA}
OE	8	12	I	output enable input (active HIGH)
V_{CCB}	14	11	-	supply voltage B-side (YB1, YB2, YB3, 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_{CCA}, V_{CCB}	OE	An, B4	YBn, YA4
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_{CCA} or V_{CCB} is below 100 mV or GND, the device goes into suspend mode (Hi-Z).
[2] If either V_{CCA} or V_{CCB} disconnected (floating), the device goes into suspend mode (Hi-Z).

8.1. Overview

The NXU0304 is a 4-bit, dual-supply level translating buffer with 3-state outputs. It features four data inputs (An and B4), four data outputs (YBn 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.

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

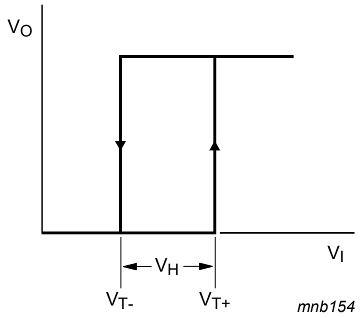


Fig. 3. Transfer characteristic

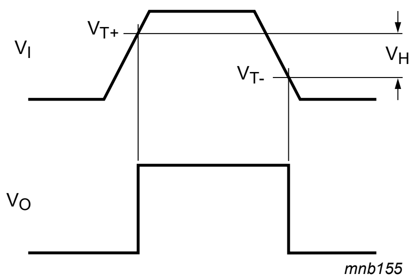
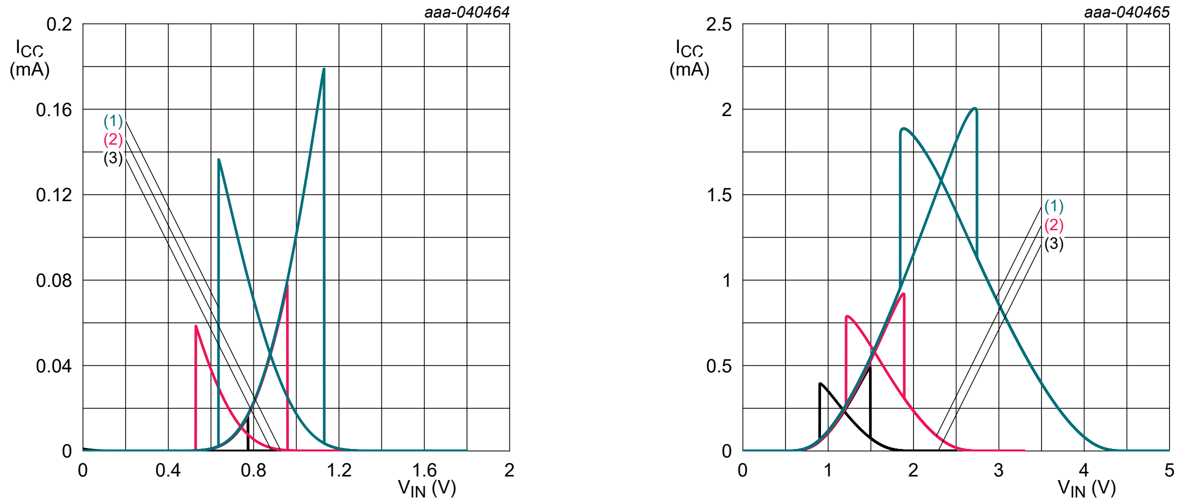


Fig. 4. The definitions of V_{T+}, V_{T-} and V_H



T_{amb} = 25 °C
(1) V_{CC} = 1.2 V
(2) V_{CC} = 1.5 V
(3) V_{CC} = 1.8 V

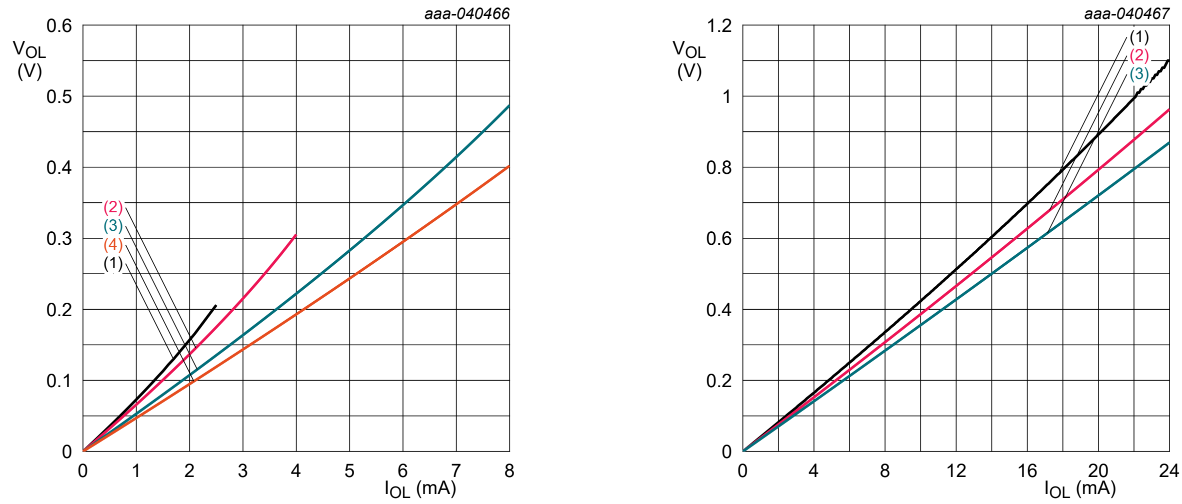
T_{amb} = 25 °C
(1) V_{CC} = 2.5 V
(2) V_{CC} = 3.3 V
(3) V_{CC} = 5.0 V

Fig. 5. Typical transfer characteristics for data inputs An, B4

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.

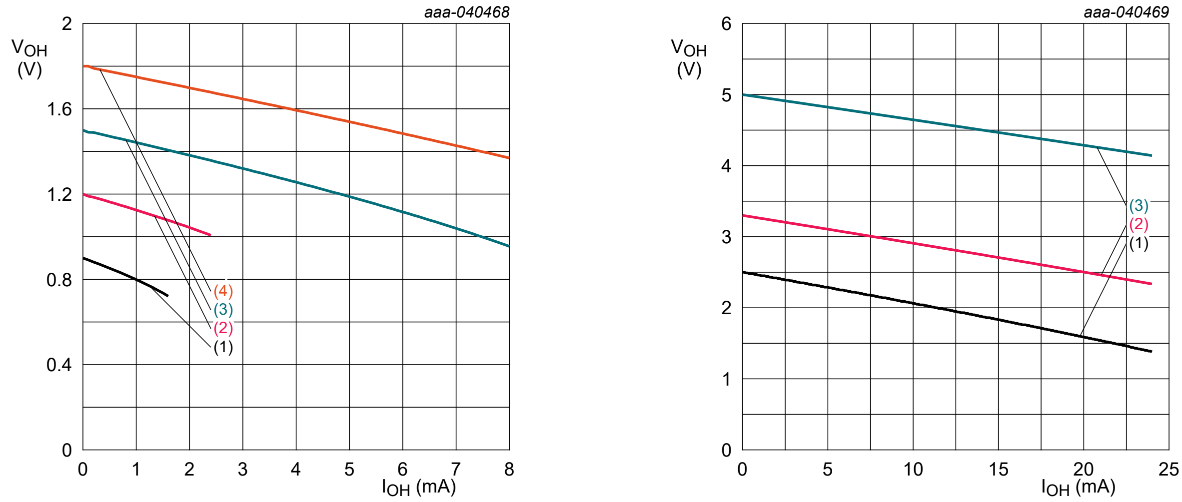
Output transfer characteristics



T_{amb} = 25 °C
(1) V_{CC} = 0.9 V
(2) V_{CC} = 1.2 V
(3) V_{CC} = 1.5 V
(4) V_{CC} = 1.8 V

T_{amb} = 25 °C
(1) V_{CC} = 2.5 V
(2) V_{CC} = 3.3 V
(3) V_{CC} = 5.0 V

Fig. 6. Typical LOW-level output voltage (V_{OL}) versus LOW-level output current (I_{OL}) for data outputs YBn, YA4



T_{amb} = 25 °C
(1) V_{CC} = 0.9 V
(2) V_{CC} = 1.2 V
(3) V_{CC} = 1.5 V
(4) V_{CC} = 1.8 V

T_{amb} = 25 °C
(1) V_{CC} = 2.5 V
(2) V_{CC} = 3.3 V
(3) V_{CC} = 5.0 V

Fig. 7. Typical HIGH-level output voltage (V_{OH}) versus HIGH-level output current (I_{OH}) for data outputs YBn, YA4

8.4. Suspend mode and I_{OFF} protection circuitry

When either V_{CCA} or V_{CCB} 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_{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). It is advisable to keep the inputs in low state before disconnecting (floating) either supply.

Below a graphical explanation:

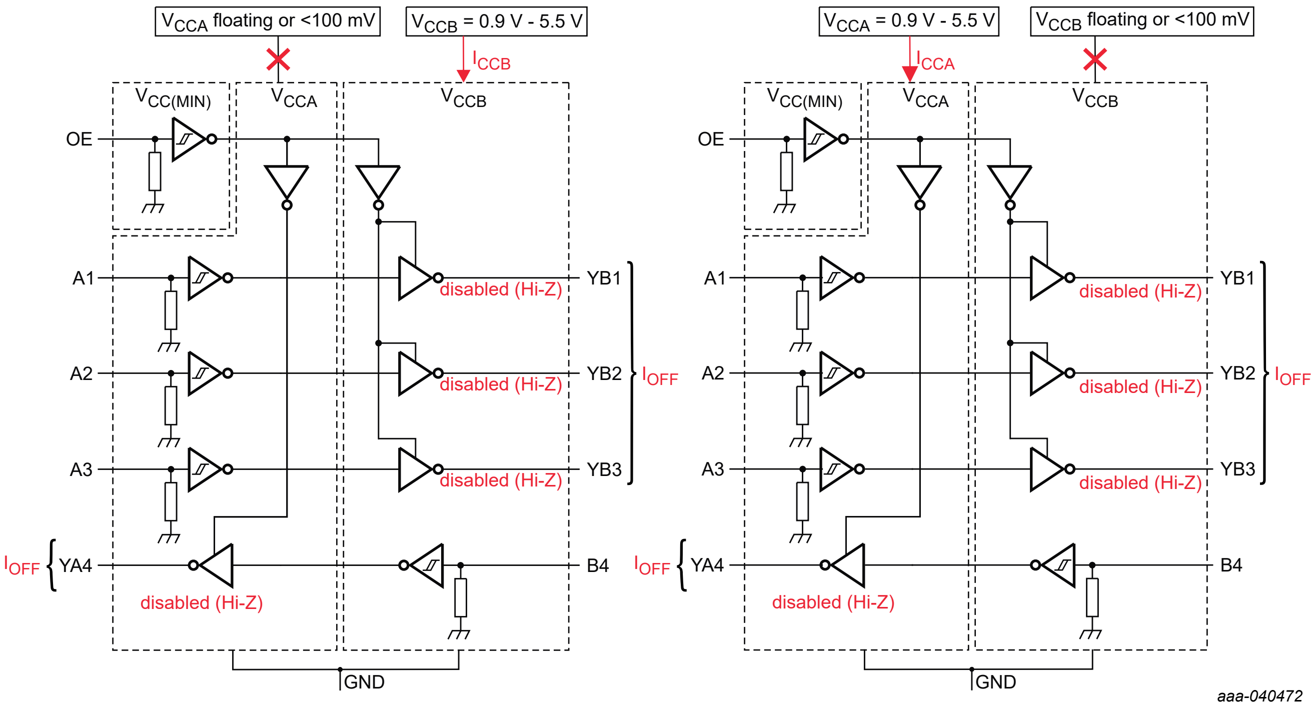


Fig. 8. Suspend mode and I_{OFF} protection circuitry

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_{CCA}	supply voltage A		-0.5	+6.5	V
V_{CCB}	supply voltage B		-0.5	+6.5	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage	[1]	-0.5	+6.5	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode [1][2][3]	-0.5	V_{CCO} + 0.5	V
		Suspend or 3-state mode [1]	-0.5	+6.5	V
I_O	output current	V_O = 0 V to V_{CCO} [2]	-	±25	mA
I_{CC}	supply current	I_{CCA} or I_{CCB}; per V_{CC} pin	-	100	mA
I_{GND}	ground current	per GND pin	-100	-	mA
T_{stg}	storage temperature		-65	+150	°C

Symbol	Parameter	Conditions	Min	Max	Unit
P_{tot}	total power dissipation	SOT402-1 (TSSOP14) SOT762-1 (DHVQFN14) [4]	-	500	mW
		SOT8014-1 (DHXQFN14) SOT1174-1 (XQFN12) [5]	-	250	mW

[1] The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).
[3] V_{CCO} + 0.5 V should not exceed 6.5 V.
[4] For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C.
For SOT762-1 (DHVQFN14) package: P_{tot} derates linearly with 9.6 mW/K above 98 °C.
[5] For SOT8014-1 (DHXQFN14) package: P_{tot} derates linearly with 8.7 mW/K above 121 °C.
For SOT1174-1 (XQFN12) package: P_{tot} derates linearly with 5.6 mW/K above 105 °C.

10. ESD ratings

Table 6. ESD ratings

Symbol	Parameter	Conditions	Value	Unit
V_{ESD}	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_{CCA}	supply voltage A		0.9	5.5	V
V_{CCB}	supply voltage B		0.9	5.5	V
V_I	input voltage		0	5.5	V
V_O	output voltage	Active mode [1]	0	V_{CCO}	V
		Suspend or 3-state mode	0	5.5	V
T_{amb}	ambient temperature		-40	+125	°C

[1] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).

12. Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Condition	SOT402-1	SOT762-1	SOT8014-1	SOT1174-1	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; JEDEC test board	134	98	98	172	°C/W
$R_{th(j-c)}$	thermal resistance from case (top) of package	in free air; JEDEC test board	59	65	71	82	°C/W
Ψ_{j-top}	thermal characterization parameter from junction to top of package	in free air; 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	An, B4 inputs								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.58	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.71	-	0.44	0.88	0.44	0.88	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.89	-	0.60	0.98	0.60	0.98	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	1.05	-	0.76	1.13	0.76	1.13	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	1.39	-	1.08	1.56	1.08	1.56	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	1.75	-	1.48	1.92	1.48	1.92	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	2.50	-	2.19	2.74	2.19	2.74	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	3.02	-	2.65	3.33	2.65	3.33	V
		OE input (referenced to V_{CCA} or V_{CCB})								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.58	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.70	-	0.44	0.88	0.44	0.88	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.89	-	0.60	0.98	0.60	0.98	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	1.04	-	0.76	1.13	0.76	1.13	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	1.38	-	1.08	1.56	1.08	1.56	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	1.74	-	1.48	1.92	1.48	1.92	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	2.50	-	2.19	2.74	2.19	2.74	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	3.03	-	2.65	3.33	2.65	3.33	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-}	negative-going threshold voltage	An, B4 inputs								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.33	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.40	-	0.17	0.48	0.17	0.48	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.50	-	0.28	0.59	0.28	0.59	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	0.59	-	0.35	0.69	0.35	0.69	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	0.84	-	0.56	0.97	0.56	0.97	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	1.12	-	0.89	1.5	0.89	1.5	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	1.71	-	1.51	1.97	1.51	1.97	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	2.10	-	1.88	2.4	1.88	2.4	V
		OE input (referenced to V_{CCA} or V_{CCB})								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.33	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.41	-	0.17	0.48	0.17	0.48	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.51	-	0.28	0.59	0.28	0.59	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	0.59	-	0.35	0.69	0.35	0.69	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	0.84	-	0.56	0.97	0.56	0.97	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	1.12	-	0.89	1.5	0.89	1.5	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	1.69	-	1.51	1.97	1.51	1.97	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	2.07	-	1.88	2.46	1.88	2.46	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_H	hysteresis voltage	An, B4 inputs								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.25	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.31	-	0.2	0.4	0.2	0.4	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.39	-	0.25	0.5	0.25	0.5	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	0.46	-	0.3	0.55	0.3	0.55	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	0.59	-	0.38	0.65	0.38	0.65	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	0.63	-	0.46	0.72	0.46	0.72	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	0.79	-	0.58	0.93	0.58	0.93	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	0.93	-	0.69	1.06	0.69	1.06	V
		OE input (referenced to V_{CCA} or V_{CCB})								
		$V_{CCA} = V_{CCB} = 0.9$ V	-	0.25	-	-	-	-	-	V
		$V_{CCA} = V_{CCB} = 1.1$ V	-	0.30	-	0.15	0.41	0.15	0.41	V
		$V_{CCA} = V_{CCB} = 1.4$ V	-	0.39	-	0.2	0.5	0.2	0.5	V
		$V_{CCA} = V_{CCB} = 1.65$ V	-	0.44	-	0.23	0.55	0.23	0.55	V
		$V_{CCA} = V_{CCB} = 2.3$ V	-	0.54	-	0.32	0.65	0.32	0.65	V
		$V_{CCA} = V_{CCB} = 3.0$ V	-	0.62	-	0.39	0.72	0.39	0.72	V
		$V_{CCA} = V_{CCB} = 4.5$ V	-	0.81	-	0.57	0.97	0.57	0.97	V
		$V_{CCA} = V_{CCB} = 5.5$ V	-	0.96	-	0.69	1.18	0.69	1.18	V
V_{OH}	HIGH-level output voltage	$V_I = V_{T+(MAX)}$ [1][2]								
		$I_O = -0.1$ mA; $V_{CCO} = 0.9$ V to 5.5 V	$V_{CCO} - 0.1$	0.9	-	$V_{CCO} - 0.1$	-	$V_{CCO} - 0.1$	-	V
		$I_O = -1.5$ mA; $V_{CCO} = 1.1$ V	0.825	1.0	-	0.825	-	0.825	-	V
		$I_O = -3$ mA; $V_{CCO} = 1.4$ V	1.05	1.2	-	1.05	-	1.05	-	V
		$I_O = -4.5$ mA; $V_{CCO} = 1.65$ V	1.2	1.4	-	1.2	-	1.2	-	V
		$I_O = -8$ mA; $V_{CCO} = 2.3$ V	1.7	1.94	-	1.7	-	1.7	-	V
		$I_O = -10$ mA; $V_{CCO} = 3.0$ V	2.2	2.6	-	2.2	-	2.2	-	V
		$I_O = -12$ mA; $V_{CCO} = 4.5$ V	3.7	4.1	-	3.7	-	3.7	-	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_{OL}	LOW-level output voltage	$V_I = V_{T-(MIN)}$	[1][2]								
		I_O = 0.1 mA; V_{CCO} = 0.9 V to 5.5 V		-	0	0.1	-	0.1	-	0.1	V
		I_O = 1.5 mA; V_{CCO} = 1.1 V		-	0.12	0.275	-	0.275	-	0.275	V
		I_O = 3 mA; V_{CCO} = 1.4 V		-	0.17	0.35	-	0.35	-	0.35	V
		I_O = 4.5 mA; V_{CCO} = 1.65 V		-	0.23	0.45	-	0.45	-	0.45	V
		I_O = 8 mA; V_{CCO} = 2.3 V		-	0.35	0.7	-	0.7	-	0.7	V
		I_O = 10 mA; V_{CCO} = 3.0 V		-	0.39	0.8	-	0.8	-	0.8	V
		I_O = 8 mA; V_{CCO} = 4.5 V		-	0.28	0.5	-	0.5	-	0.5	V
		I_O = 12 mA; V_{CCO} = 4.5 V		-	0.43	0.8	-	0.8	-	0.8	V
I_I	input leakage current	An, B4 inputs; V_I = 0 V to 5.5 V; V_{CCI} = 0.9 V to 5.5 V	[3]	-0.1	1	1.5	-0.1	1.85	-0.1	2	µA
		OE input; V_I = 0 V to 5.5 V; V_{CCI} = 0.9 V to 5.5 V	[3]	-0.1	1	1.5	-0.1	1.85	-0.1	2	µA
I_{OZ}	OFF-state output current	suspend mode YBn, YA4 output; $V_{CCA} = V_{CCB}$ = 0.9 V to 5.5 V; V_I = 0 V or V_{CCI}; V_O = 0 V or V_{CCO}; OE = GND	[1]	-0.1	-	0.1	-0.5	0.5	-2	2	µA
I_{OFF}	power-off leakage current	YBn, YA4 output; V_I or V_O = 0 V to 5.5 V; V_{CCA} = 0 V; V_{CCB} = 0.9 V to 5.5 V		-1.5	-	1.5	-1.85	1.85	-2	2	µA
		YBn, YA4 output; V_I or V_O = 0 V to 5.5 V; V_{CCB} = 0 V; V_{CCA} = 0.9 V to 5.5 V		-1.5	-	1.5	-1.85	1.85	-2	2	µA
		YBn, YA4 output; V_I or V_O = GND; V_{CCA} = floating; V_{CCB} = 0.9 V to 5.5 V	[4]	-1.5	-	1.5	-1.85	1.85	-2	2	µA
		YBn, YA4 output; V_I or V_O = GND; V_{CCB} = floating; V_{CCA} = 0.9 V to 5.5 V	[4]	-1.5	-	1.5	-1.85	1.85	-2	2	µA

Symbol	Parameter	Conditions		+25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
I_{CC}	supply current	I_{CCA}; V_I = 0 V or V_{CCI}; I_O = 0 A	[3]								
		V_{CCA}, V_{CCB} = 0.9 V to 5.5 V		-	1	1.8	-	2.5	-	3	μA
		V_{CCA} = 5.5 V; V_{CCB} = 0 V		-	1	1.8	-	2.5	-	3	μA
		V_{CCA} = 0 V; V_{CCB} = 5.5 V		-0.1	-	0.1	-0.4	0.4	-1	1	μA
		$I_{CCB;}$ V_I = 0 V or V_{CCI}; I_O = 0 A	[3]								
		V_{CCA}, V_{CCB} = 0.9 V to 5.5 V		-	1	1.8	-	2.5	-	3	μA
		V_{CCB} = 5.5 V; V_{CCA} = 0 V		-	1	1.8	-	2.5	-	3	μA
		V_{CCB} = 0 V; V_{CCA} = 5.5 V		-0.1	-	0.1	-0.4	0.4	-1	1	μA
		I_{CCA} or I_{CCB}; V_I or V_O = GND; I_O = 0 A									
		I_{CCA}; V_{CCB} = floating; V_{CCA} = 5.5 V	[4]	-	1	1.5	-	2.5	-	3	μA
		I_{CCB}; V_{CCA} = floating; V_{CCB} = 5.5 V	[4]	-	1	1.5	-	2.5	-	3	μA
		I_{CCA} + I_{CCB} combined; V_I = 0 V or V_{CCI}; I_O = 0 A; V_{CCA} = V_{CCB} = 0.9 V to 5.5 V	[3]	-	2	3	-	4.5	-	5	μA

[1] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).
[2] Typical values for V_{OL} and V_{OH} are measured at V_{CCO} is 0.9 V.
[3] V_{CCI} is the supply voltage associated with the inputs (An, B4).
[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 °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	μA
0.9 V	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	μA
1.2 V	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	μA
1.5 V	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	μA
1.8 V	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	μA
2.5 V	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	μA
3.3 V	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	μA
5.0 V	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	μA

Table 11. Typical total supply current I_{CCB} at T_{amb} = 25 °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	μA
0.9 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
1.2 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
1.5 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
1.8 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
2.5 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
3.3 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.7	μA
5.0 V	0.01	0.2	0.25	0.3	0.4	0.45	0.5	0.9	μA

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

[1] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).
[2] V_{CCI} is the supply voltage associated with the inputs (An, B4).

Table 13. Typical dynamic characteristics at V_{CCA} = 0.9 V and T_{amb} = 25 °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
		B4 to YA4	[1]	55.4	34.1	29.8	28.1	27.1	26.5	27.5	ns
t_{dis}	disable time	OE to YA4	[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 YA4	[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 V and T_{amb} = 25 °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
		B4 to YA4	[1]	54.5	43.7	40.3	39.2	38.5	38.6	39.5	ns
t_{dis}	disable time	OE to A4	[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 YA4	[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_{amb} = 25 °C

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 12.

Symbol	Parameter	Conditions	Supply voltage (V_{CCA} = V_{CCB})							Unit
			0.9 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	5.0 V	
C_{PD}	power dissipation capacitance	V_{CCA}[1][2][3] f_i = 10 MHz; V_I = GND to V_{CCI}; t_r = t_f = 1 ns; C_L = 0 pF; R_L = ∞ Ω								
		An to YBn; outputs disabled	1.5	1.6	1.7	1.7	1.9	2.1	2.7	pF
		B4 to YA4; 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
		B4 to YA4; outputs enabled	10	10.4	10.6	10.7	10.9	11.3	12.1	pF
		V_{CCB}[1][2][3] f_i = 10 MHz; V_I = GND to V_{CCI}; t_r = t_f = 1 ns; C_L = 0 pF; R_L = ∞ Ω								
		An to YBn; outputs disabled	1.5	1.6	1.7	1.7	1.9	2.1	2.7	pF
		B4 to YA4; 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
		B4 to YA4; outputs enabled	1.5	1.6	1.7	1.7	1.9	2.1	2.7	pF
C_I	input capacitance	V_I = 0 V or V_{CCI} [2]	1.9	1.9	1.9	1.9	1.9	1.9	1.9	pF
C_O	output capacitance	OE = GND; V_{CCA} = 3.3 V; V_{CCB} = 3.3 V; V_O = 0 V or V_{CCI}	3.2	3.2	3.2	3.2	3.2	3.2	3.2	pF

[1] C_{PD} per channel is used to determine the dynamic power dissipation (P_{DYN} in μW).
$P_{DYN} = N \times (C_{PD} \times V_{CCI}^2 \times f_i) + N \times (C_L \times V_{CCO}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = load capacitance in pF;
V_{CCI} = the supply voltage associated with the input pins in V;
V_{CCO} = the supply voltage associated with the output pins in V;
N = total number of inputs or outputs switching.

[2] V_{CCI} is the supply voltage associated with the inputs (An, B4).

[3] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).

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_{CCB}												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_{pd}	propagation delay	An to YBn [1]													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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
		B4 to YA4													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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

Symbol	Parameter	Conditions	V_{CCB}												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_{en}	enable time	OE to YBn [1]													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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 YA4													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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

Symbol	Parameter	Conditions		V_{CCB}												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_{dis}	disable time	OE to YBn	[1]													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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 YA4														
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{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 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.

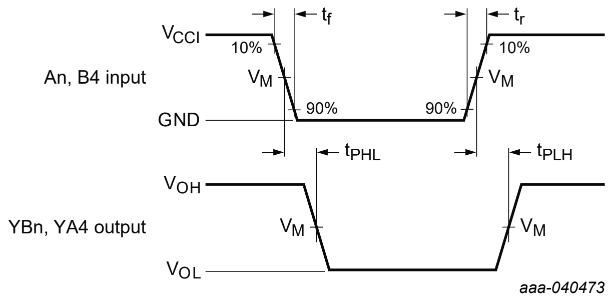
Symbol	Parameter	Conditions	V_{CCB}												Unit
			1.2 V ± 0.1 V		1.5 V ± 0.1 V		1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		5.0 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	propagation delay	An to YBn [1]													
		V_{CCA} = 1.2 V ± 0.1 V	6.0	42.1	5.3	31.1	5.0	27.4	4.7	23.6	4.7	22.2	4.7	22.3	ns
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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
		B4 to YA4													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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

Symbol	Parameter	Conditions	V_{CCB}												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_{en}	enable time	OE to YBn [1]													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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 YA4													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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

Symbol	Parameter	Conditions		V_{CCB}												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_{dis}	disable time	OE to YBn	[1]													
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 3.3 V ± 0.3 V		11.3	46.4	8.4	28.2	6.7	22.7	4.1	15.5	4.9	15.0	4.1	12.8	ns
		V_{CCA} = 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 YA4														
		V_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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_{CCA} = 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

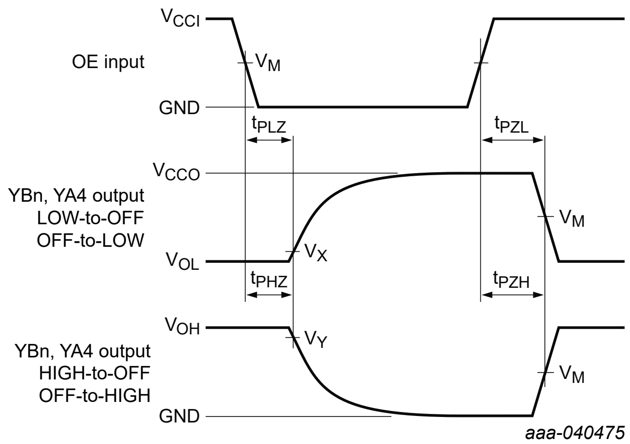
[1] t_{pd} is the same as t_{PLH} and t_{PHL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}; t_{en} is the same as t_{PZL} and t_{PZH}.

14.1. Waveforms and test circuit



V_{CCI} is the supply voltage associated with the control input or inputs (An, B4).
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.
Measurement points are given in Table 18.

Fig. 9. Input (An, B4) to output (YBn, YA4) propagation delay times



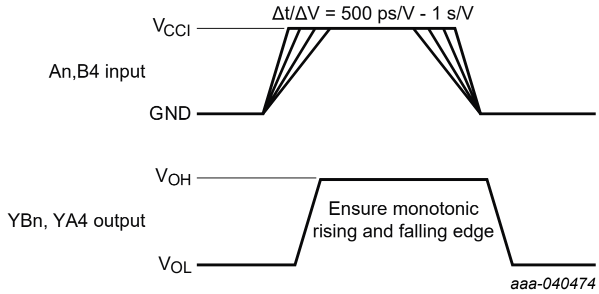
V_{CCI} is the supply voltage associated with the control input or inputs (An, B4).
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.
Measurement points are given in Table 18.

Fig. 10. Enable and disable times

Table 18. Measurement points

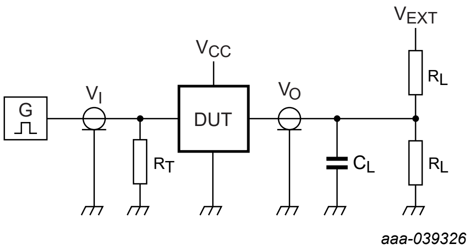
Supply voltage	Input[1]	Output[2]		
V_{CCA}, V_{CCB}	V_M	V_M	V_X	V_Y
0.9 V to 1.6 V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1 V	V_{OH} - 0.1 V
1.65 V to 2.7 V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15 V	V_{OH} - 0.15 V
3.0 V to 5.5 V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3 V	V_{OH} - 0.3 V

[1] V_{CCI} is the supply voltage associated with the inputs (An, B4).
[2] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).



V_{CCI} is the supply voltage associated with the control input or inputs (An, B4).
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 11. Input transition rise and fall rate



Test data is given in Table 19.
R_L = Load resistance;
C_L = Load capacitance including jig and probe capacitance;
R_T = Termination resistance;
V_{EXT} = External voltage for measuring switching times.

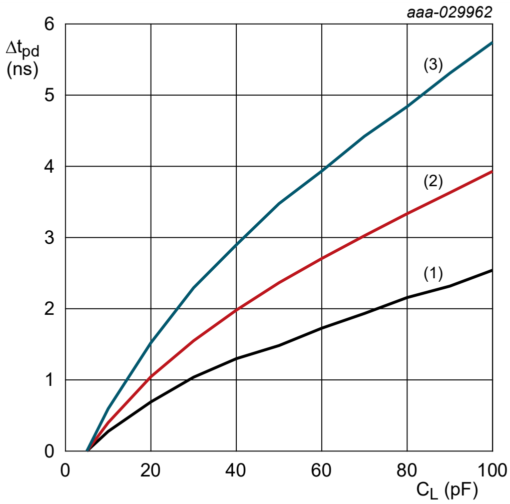
Fig. 12. Test circuit for measuring switching times

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	≤1.0 ns/V	V_{CCI}	open	GND	2 × V_{CCO}

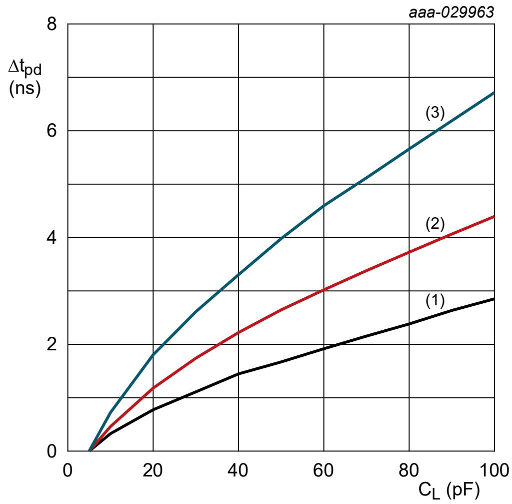
[1] V_{CCI} is the supply voltage associated with the inputs (An, B4).
[2] V_{CCO} is the supply voltage associated with the outputs (YBn, YA4).

14.2. Additional propagation delay versus load capacitance graphs



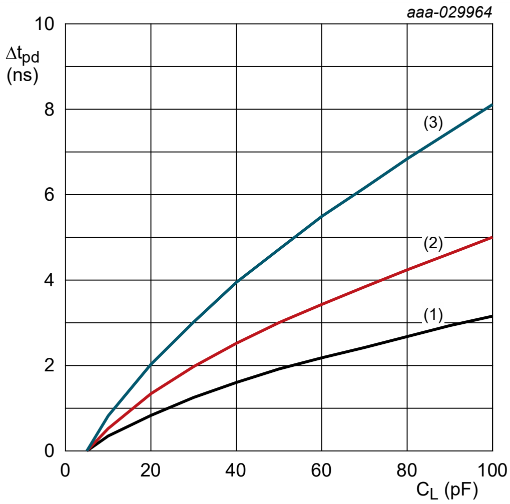
T_{amb} = -40 °C to +125 °C
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
(1) Minimum: V_{CCO} = 5.5 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 5 V
(3) Maximum: V_{CCO} = 4.5 V

Fig. 13. Additional propagation delay versus load capacitance



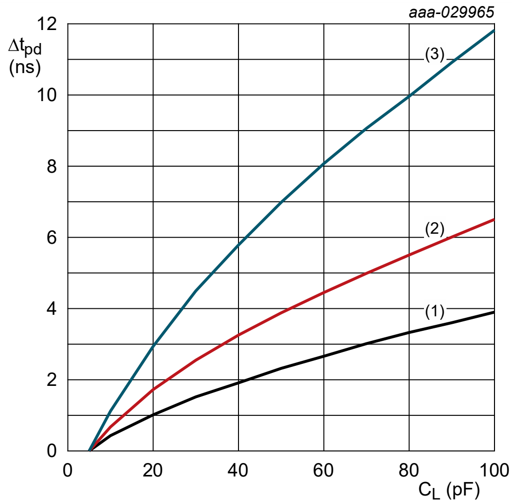
T_{amb} = -40 °C to +125 °C
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
(1) Minimum: V_{CCO} = 3.6 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 3.3 V
(3) Maximum: V_{CCO} = 3 V

Fig. 14. Additional propagation delay versus load capacitance



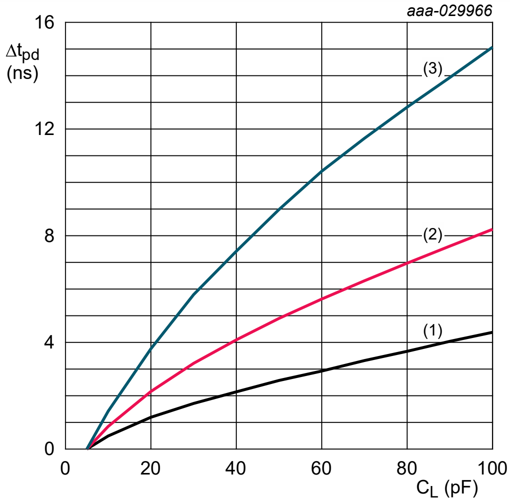
T_{amb} = -40 °C to +125 °C
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
(1) Minimum: V_{CCO} = 2.7 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 2.5 V
(3) Maximum: V_{CCO} = 2.3 V

Fig. 15. Additional propagation delay versus load capacitance



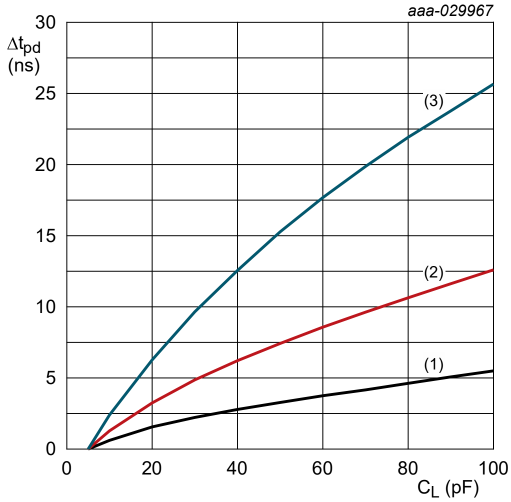
T_{amb} = -40 °C to +125 °C
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
(1) Minimum: V_{CCO} = 1.95 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 1.8 V
(3) Maximum: V_{CCO} = 1.65 V

Fig. 16. Additional propagation delay versus load capacitance



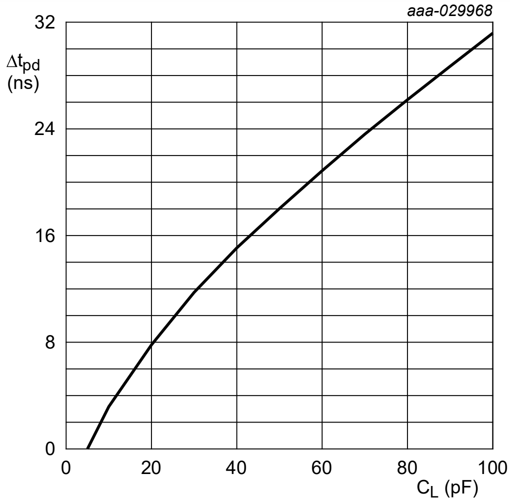
T_{amb} = -40 °C to +125 °C
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
(1) Minimum: V_{CCO} = 1.6 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 1.5 V
(3) Maximum: V_{CCO} = 1.4 V

Fig. 17. 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} = 1.3 V
(2) Typical: T_{amb} = 25 °C; V_{CCO} = 1.2 V
(3) Maximum: V_{CCO} = 1.1 V

Fig. 18. Additional propagation delay versus load capacitance



T_{amb} = 25 °C;
For t_{PLH}, t_{PHL}, t_{PZH} and t_{PZL}.
V_{CCO} = 0.9 V

Fig. 19. Additional propagation delay versus load capacitance

15. Application information

The NXU0304 is a 4-bit level-shifting transceiver suitable for level-translation purposes. This device is ideal in any application requiring level-shifting between two voltage domains and especially designed for applications where push-pull drivers are utilized to the data inputs pins. Below an example of possible SPI application.

Typical application schematic (SPI interface)

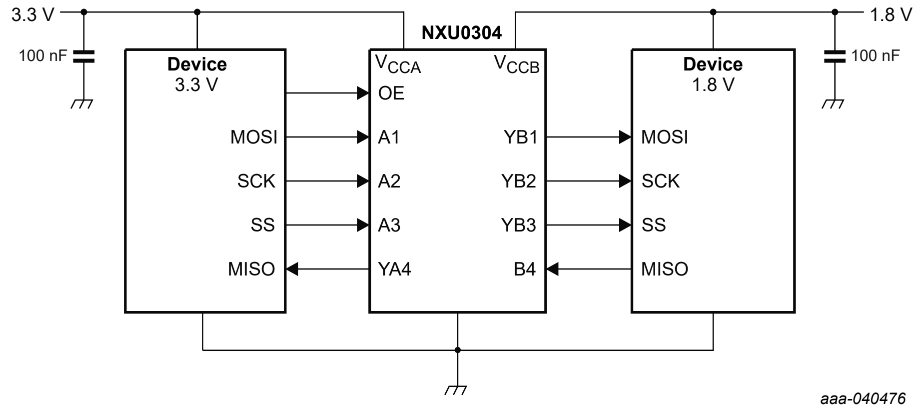
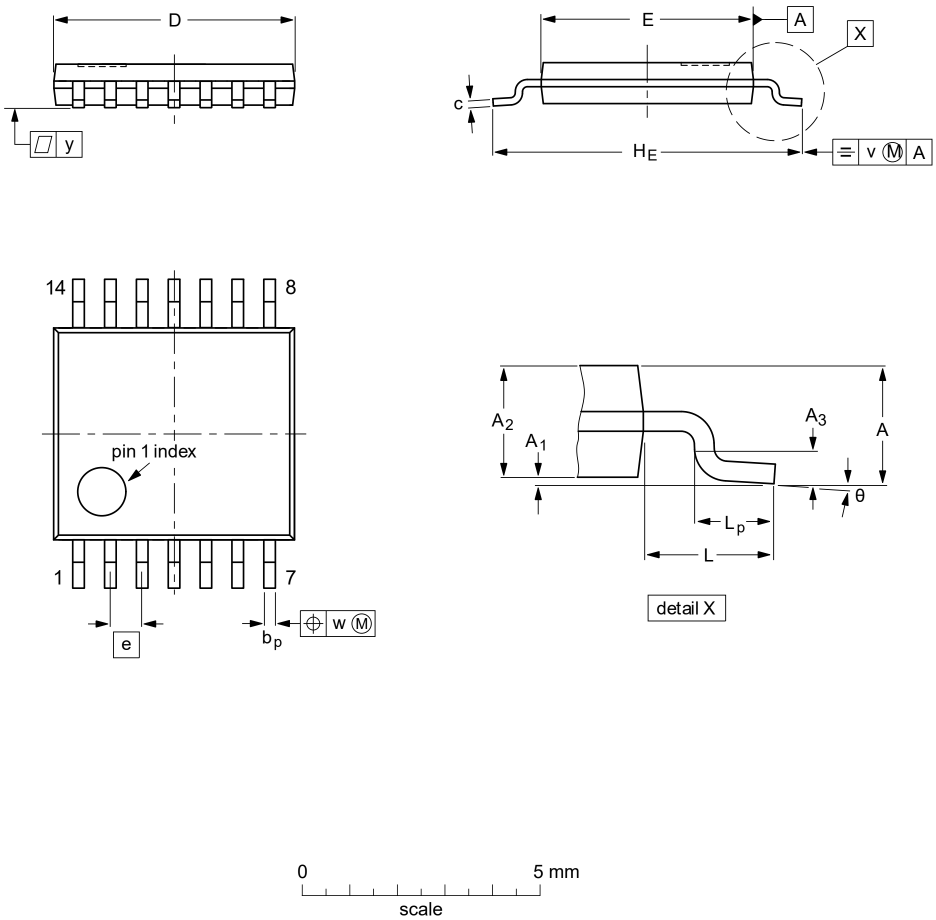


Fig. 20. SPI interface application

16. Package outline

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm **SOT402-1**



Dimensions (mm are the original dimensions)

Unit		A	A_1	A_2	A_3	b_p	c	D(1)	E(2)	e	H_E	L	L_p	v	w	y	θ
mm	max	1.20	0.15	1.05		0.30	0.2	5.1	4.5		6.6		0.75				8°
	nom				0.25					0.65		1		0.2	0.1	0.1	
	min		0.05	0.80		0.19	0.09	4.9	4.3		6.2		0.45				0°

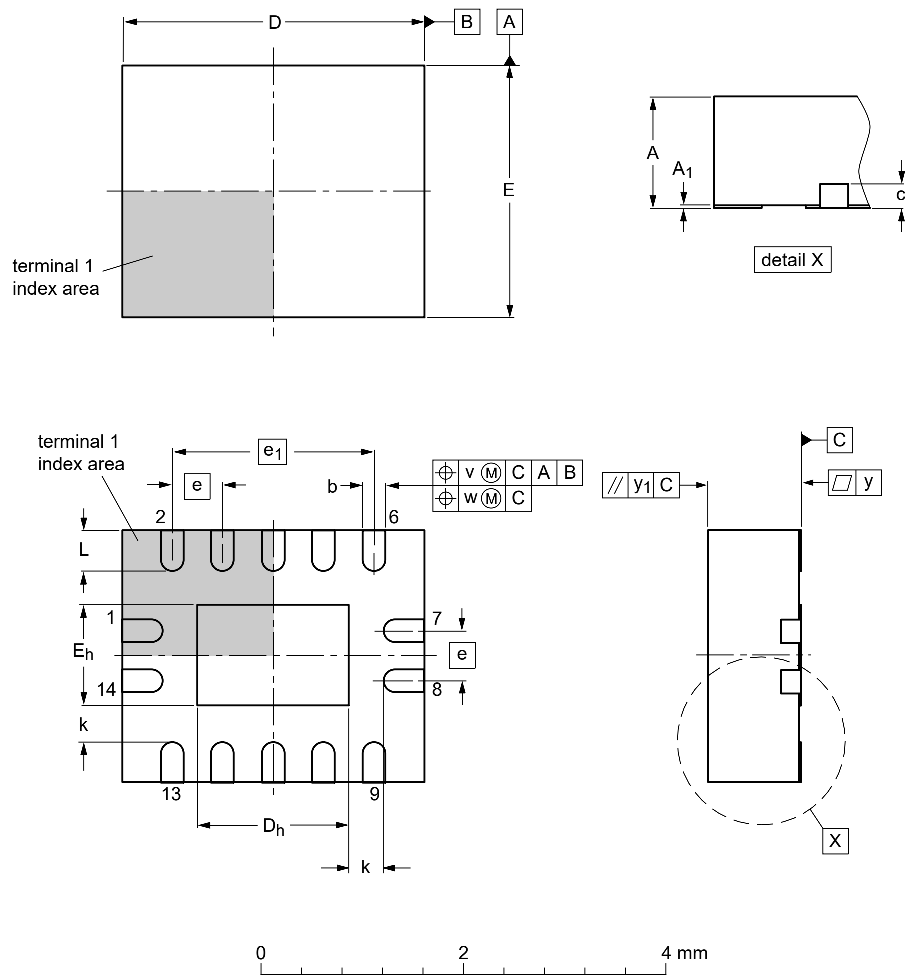
Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

sot402-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT402-1		MO-153				~~03-02-18~~ 23-10-27

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**



Dimensions (mm are the original dimensions)

Unit		A(1)	A_1	b	c	D(1)	D_h	E(1)	E_h	e	e_1	k	L	v	w	y	y_1
	max	1	0.05	0.30		3.1	1.65	2.6	1.15				0.5				
mm	nom		0.02	0.25	0.2	3.0	1.50	2.5	1.00	0.5	2		0.4	0.1	0.05	0.05	0.1
	min		0.00	0.18		2.9	1.35	2.4	0.85			0.2	0.3				

Note

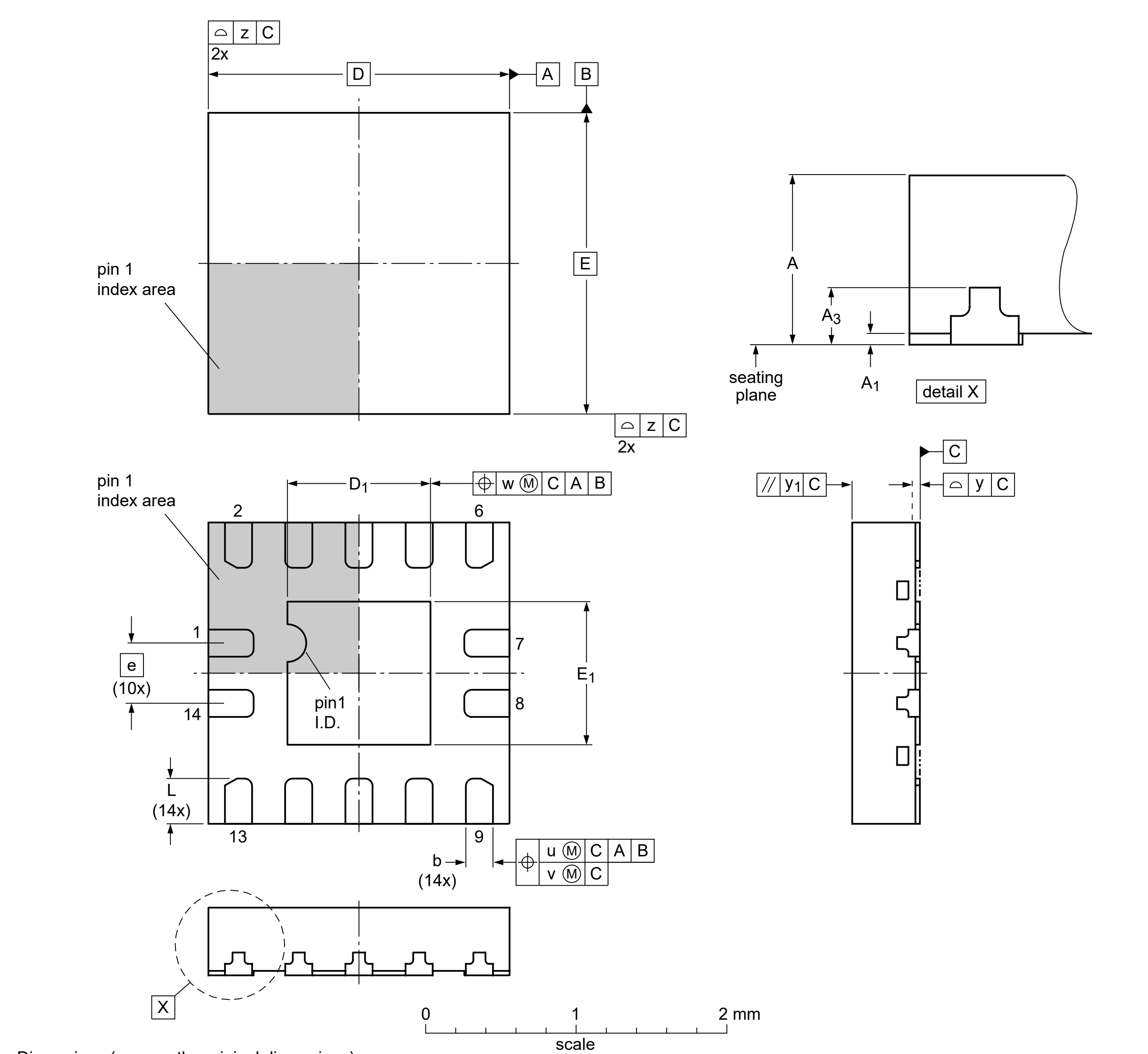
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot762-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT762-1		MO-241				~~15-04-10~~ 15-05-05

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**



Dimensions (mm are the original dimensions)

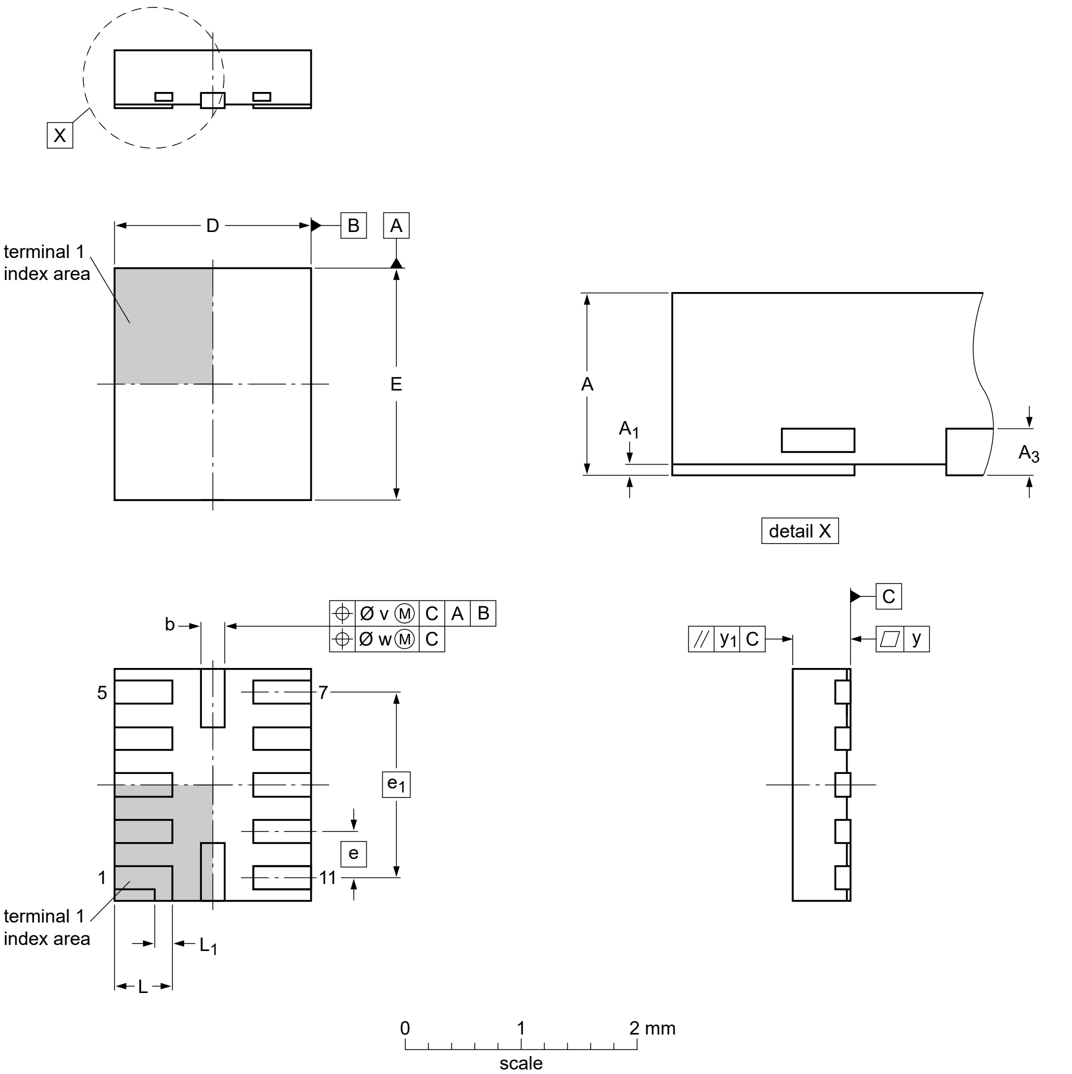
Unit		A	A1	A3	b	D	D1	E	E1	e	k	L	u	v	w	y	y1	z
mm	max	0.48	0.05		0.23		1.00		1.00			0.35						
	nom	0.45	0.02	0.15 (typ)	0.18	2.0	0.95	2.0	0.95	0.4		0.30	0.1	0.05	0.1	0.05	0.05	0.05
	min	0.42	0.00		0.13		0.90		0.90		0.2	0.25						

sot8014-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT8014-1						~~20-09-18~~ 20-09-22

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**



Dimensions

Unit(1)		A	A_1	A_3	b	D	E	e	e_1	L	L_1	v	w	y	y_1
mm	max	0.5	0.05		0.25	1.8	2.1			0.55					
	nom			0.127	0.20	1.7	2.0	0.4	1.6	0.50	0.15	0.1	0.05	0.05	0.05
	min		0.00		0.15	1.6	1.9			0.45					

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

sot1174-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1174-1	- - -	MO-288	- - -			~~10-04-07~~ 10-04-21

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
NXU0304 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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Date of release: 19 August 2024