



THE DATASHEET OF 74AVCH4T245D,118



74AVCH4T245

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

Rev. 6 — 11 April 2024

Product data sheet

1. General description

The 74AVCH4T245 is a 4-bit, dual supply transceiver that enables bidirectional level translation. The device can be used as two 2-bit transceivers or as a 4-bit transceiver. It features two 2-bit input-output ports (nAn and nBn), a direction control input (nDIR), an output enable input (n \overline{OE}) and dual supply pins ($V_{CC(A)}$ and $V_{CC(B)}$). Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins nAn, n \overline{OE} and nDIR are referenced to $V_{CC(A)}$ and pins nBn are referenced to $V_{CC(B)}$. A HIGH on nDIR allows transmission from nAn to nBn and a LOW on nDIR allows transmission from nBn to nAn. The output enable input (n \overline{OE}) can be used to disable the outputs so the buses are effectively isolated.

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

The 74AVCH4T245 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

2. Features and benefits

- Wide supply voltage range: $V_{CC(A)}$: 0.8 V to 3.6 V; $V_{CC(B)}$: 0.8 V to 3.6 V
- Complies with JEDEC standards:
 - JESD8-12 (0.8 V to 1.3 V)
 - JESD8-11 (0.9 V to 1.65 V)
 - JESD8-7 (1.2 V to 1.95 V)
 - JESD8-5 (1.8 V to 2.7 V)
 - JESD8-B (2.7 V to 3.6 V)
- Maximum data rates:
 - 380 Mbit/s (\geq 1.8 V to 3.3 V translation)
 - 200 Mbit/s (\geq 1.1 V to 3.3 V translation)
 - 200 Mbit/s (\geq 1.1 V to 2.5 V translation)
 - 200 Mbit/s (\geq 1.1 V to 1.8 V translation)
 - 150 Mbit/s (\geq 1.1 V to 1.5 V translation)
 - 100 Mbit/s (\geq 1.1 V to 1.2 V translation)
- Suspend mode
- Bus hold on data inputs
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- I_{OFF} circuitry provides partial Power-down mode operation
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 3B exceeds 8000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

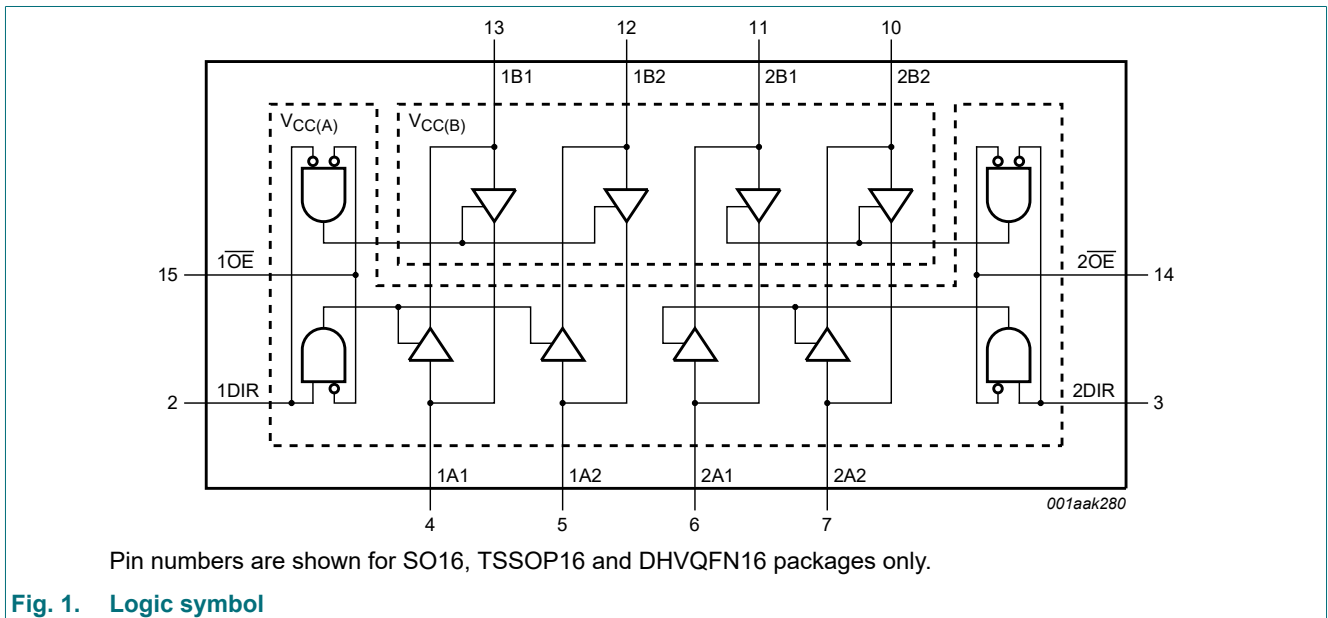
Type number	Package			Version
	Temperature range	Name	Description	
74AVCH4T245D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74AVCH4T245PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74AVCH4T245BQ	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1
74AVCH4T245GU	-40 °C to +125 °C	XQFN16	plastic, extremely thin quad flat package; no leads; 16 terminals; body 1.80 × 2.60 × 0.50 mm	SOT1161-1

4. Marking

Table 2. Marking codes

Type number	Marking code
74AVCH4T245D	74AVCH4T245D
74AVCH4T245PW	CH4T245
74AVCH4T245BQ	H4T245
74AVCH4T245GU	K4

5. Functional diagram



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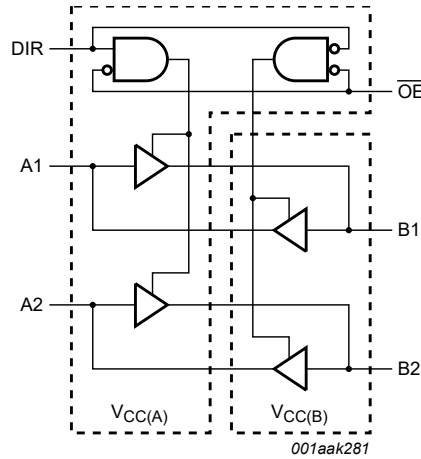


Fig. 2. Logic diagram (one 2-bit transceiver)

6. Pinning information

6.1. Pinning

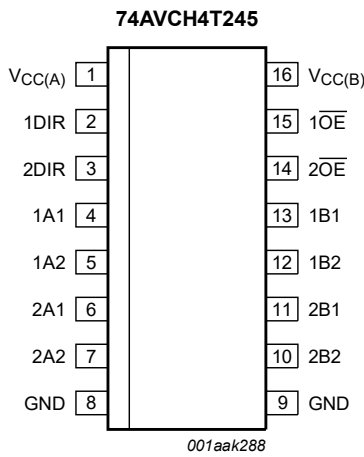


Fig. 3. Pin configuration SOT109-1 (SO16)

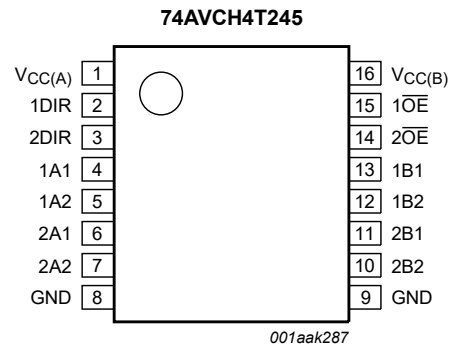
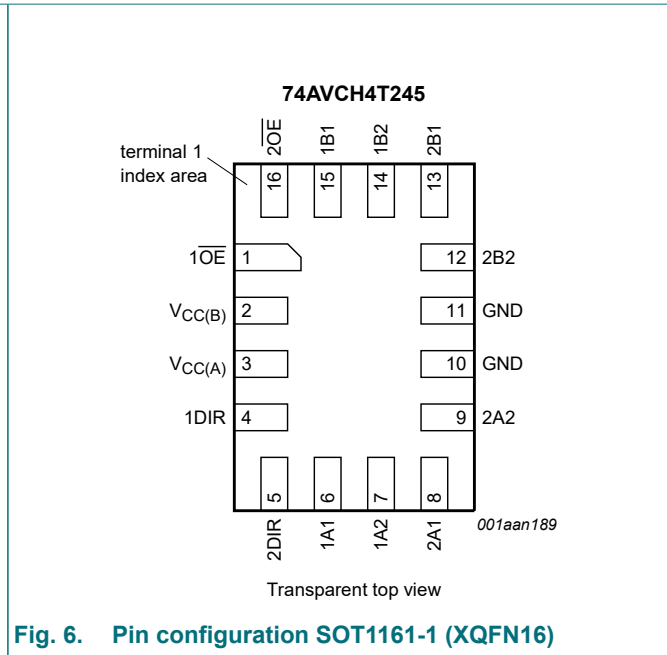
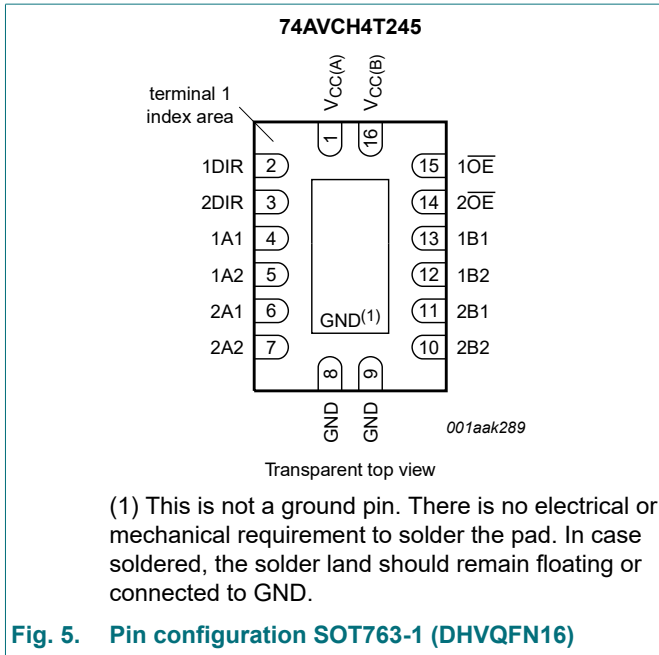


Fig. 4. Pin configuration SOT403-1 (TSSOP16)

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6.2. Pin description

Table 3. Pin description

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

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

7. Functional description

Table 4. Function table

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

Supply voltage $V_{CC(A)}$, $V_{CC(B)}$	Input		Input/output [1]	
	nOE [2]	nDIR [2]	nAn [2]	nBn [2]
0.8 V to 3.6 V	L	L	nAn = nBn	input
0.8 V to 3.6 V	L	H	input	nBn = nAn
0.8 V to 3.6 V	H	X	Z	Z
GND [1]	X	X	Z	Z

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

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

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage A		-0.5	+4.6	V
$V_{CC(B)}$	supply voltage B		-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage	[1]	-0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode [1] [2] [3]	-0.5	$V_{CCO} + 0.5$	V
		Suspend or 3-state mode [1]	-0.5	+4.6	V
I_O	output current	$V_O = 0$ V to V_{CCO} [2]	-	± 50	mA
I_{CC}	supply current	per $V_{CC(A)}$ or $V_{CC(B)}$ pin	-	100	mA
I_{GND}	ground current	per GND pin	-100	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C			
		SO16, TSSOP16 and DHVQFN16 [4]	-	500	mW
		XQFN16	-	250	mW

[1] The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.

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

[3] $V_{CCO} + 0.5$ V should not exceed 4.6 V.

[4] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.

For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

For SOT763-1 (DHVQFN16) package: P_{tot} derates linearly with 11.2 mW/K above 106 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

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

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

10. Static characteristics

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

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

V_{CCO} is the supply voltage associated with the output port; V_{CCI} is the supply voltage associated with the data input port.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL} ; $I_O = -1.5 \text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$	-	0.69	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL} ; $I_O = 1.5 \text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$	-	0.07	-	V
I_I	input leakage current	nDIR, \overline{nOE} input; $V_I = 0 \text{ V}$ or 3.6 V ; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	± 0.025	± 0.25	μA
I_{BHL}	bus hold LOW current	A or B port; $V_I = 0.42 \text{ V}$; $V_{CC(A)} = V_{CC(B)} = 1.2 \text{ V}$ [1]	-	26	-	μA
I_{BHH}	bus hold HIGH current	A or B port; $V_I = 0.78 \text{ V}$; $V_{CC(A)} = V_{CC(B)} = 1.2 \text{ V}$ [2]	-	-24	-	μA
I_{BHLO}	bus hold LOW overdrive current	A or B port; $V_{CC(A)} = V_{CC(B)} = 1.2 \text{ V}$ [3]	-	27	-	μA
I_{BHHO}	bus hold HIGH overdrive current	A or B port; $V_{CC(A)} = V_{CC(B)} = 1.2 \text{ V}$ [4]	-	-26	-	μA
I_{OZ}	OFF-state output current	A or B port; $V_O = 0 \text{ V}$ or V_{CCO} ; $V_{CC(A)} = V_{CC(B)} = 3.6 \text{ V}$ [5]	-	± 0.5	± 2.5	μA
		suspend mode A port; $V_O = 0 \text{ V}$ or V_{CCO} ; $V_{CC(A)} = 3.6 \text{ V}$; $V_{CC(B)} = 0 \text{ V}$ [5]	-	± 0.5	± 2.5	μA
		suspend mode B port; $V_O = 0 \text{ V}$ or V_{CCO} ; $V_{CC(A)} = 0 \text{ V}$; $V_{CC(B)} = 3.6 \text{ V}$ [5]	-	± 0.5	± 2.5	μA

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{OFF}	power-off leakage current	A port; V_I or $V_O = 0$ V to 3.6 V; $V_{CC(A)} = 0$ V; $V_{CC(B)} = 0.8$ V to 3.6 V	-	± 0.1	± 1	μ A
		B port; V_I or $V_O = 0$ V to 3.6 V; $V_{CC(B)} = 0$ V; $V_{CC(A)} = 0.8$ V to 3.6 V	-	± 0.1	± 1	μ A
C_I	input capacitance	nDIR, $n\overline{OE}$ input; $V_I = 0$ V or 3.3 V; $V_{CC(A)} = V_{CC(B)} = 3.3$ V	-	1.0	-	pF
$C_{I/O}$	input/output capacitance	A and B port; $V_O = 3.3$ V or 0 V; $V_{CC(A)} = V_{CC(B)} = 3.3$ V	-	4.0	-	pF

- [1] The bus hold circuit can sink at least the minimum low sustaining current at V_{IL} max. I_{BHL} should be measured after lowering V_I to GND and then raising it to V_{IL} max.
- [2] The bus hold circuit can source at least the minimum high sustaining current at V_{IH} min. I_{BHH} should be measured after raising V_I to V_{CC} and then lowering it to V_{IH} min.
- [3] An external driver must source at least I_{BHLO} to switch this node from LOW to HIGH.
- [4] An external driver must sink at least I_{BHHO} to switch this node from HIGH to LOW.
- [5] For I/O ports, the parameter I_{OZ} includes the input leakage current.

Table 8. Static characteristics

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

V_{CCO} is the supply voltage associated with the output port; V_{CCI} is the supply voltage associated with the data input port.

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	data input					
		$V_{CCI} = 0.8$ V	$0.70V_{CCI}$	-	$0.70V_{CCI}$	-	V
		$V_{CCI} = 1.1$ V to 1.95 V	$0.65V_{CCI}$	-	$0.65V_{CCI}$	-	V
		$V_{CCI} = 2.3$ V to 2.7 V	1.6	-	1.6	-	V
		$V_{CCI} = 3.0$ V to 3.6 V	2	-	2	-	V
		nDIR, $n\overline{OE}$ input					
		$V_{CC(A)} = 0.8$ V	$0.70V_{CC(A)}$	-	$0.70V_{CC(A)}$	-	V
		$V_{CC(A)} = 1.1$ V to 1.95 V	$0.65V_{CC(A)}$	-	$0.65V_{CC(A)}$	-	V
		$V_{CC(A)} = 2.3$ V to 2.7 V	1.6	-	1.6	-	V
$V_{CC(A)} = 3.0$ V to 3.6 V	2	-	2	-	V		
V_{IL}	LOW-level input voltage	data input					
		$V_{CCI} = 0.8$ V	-	$0.30V_{CCI}$	-	$0.30V_{CCI}$	V
		$V_{CCI} = 1.1$ V to 1.95 V	-	$0.35V_{CCI}$	-	$0.35V_{CCI}$	V
		$V_{CCI} = 2.3$ V to 2.7 V	-	0.7	-	0.7	V
		$V_{CCI} = 3.0$ V to 3.6 V	-	0.8	-	0.8	V
		nDIR, $n\overline{OE}$ input					
		$V_{CC(A)} = 0.8$ V	-	$0.30V_{CC(A)}$	-	$0.30V_{CC(A)}$	V
		$V_{CC(A)} = 1.1$ V to 1.95 V	-	$0.35V_{CC(A)}$	-	$0.35V_{CC(A)}$	V
		$V_{CC(A)} = 2.3$ V to 2.7 V	-	0.7	-	0.7	V
$V_{CC(A)} = 3.0$ V to 3.6 V	-	0.8	-	0.8	V		

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Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = -100 μA; V _{CC(A)} = V _{CC(B)} = 0.8 V to 3.6 V	V _{CCO} - 0.1	-	V _{CCO} - 0.1	-	V
		I _O = -3 mA; V _{CC(A)} = V _{CC(B)} = 1.1 V	0.85	-	0.85	-	V
		I _O = -6 mA; V _{CC(A)} = V _{CC(B)} = 1.4 V	1.05	-	1.05	-	V
		I _O = -8 mA; V _{CC(A)} = V _{CC(B)} = 1.65 V	1.2	-	1.2	-	V
		I _O = -9 mA; V _{CC(A)} = V _{CC(B)} = 2.3 V	1.75	-	1.75	-	V
		I _O = -12 mA; V _{CC(A)} = V _{CC(B)} = 3.0 V	2.3	-	2.3	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = 100 μA; V _{CC(A)} = V _{CC(B)} = 0.8 V to 3.6 V	-	0.1	-	0.1	V
		I _O = 3 mA; V _{CC(A)} = V _{CC(B)} = 1.1 V	-	0.25	-	0.25	V
		I _O = 6 mA; V _{CC(A)} = V _{CC(B)} = 1.4 V	-	0.35	-	0.35	V
		I _O = 8 mA; V _{CC(A)} = V _{CC(B)} = 1.65 V	-	0.45	-	0.45	V
		I _O = 9 mA; V _{CC(A)} = V _{CC(B)} = 2.3 V	-	0.55	-	0.55	V
		I _O = 12 mA; V _{CC(A)} = V _{CC(B)} = 3.0 V	-	0.7	-	0.7	V
I _I	input leakage current	nDIR, nOE input; V _I = 0 V or 3.6 V; V _{CC(A)} = V _{CC(B)} = 0.8 V to 3.6 V	-	±1	-	±5	μA
I _{BHL}	bus hold LOW current	A or B port [1]					
		V _I = 0.49 V; V _{CC(A)} = V _{CC(B)} = 1.4 V	15	-	15	-	μA
		V _I = 0.58 V; V _{CC(A)} = V _{CC(B)} = 1.65 V	25	-	25	-	μA
		V _I = 0.70 V; V _{CC(A)} = V _{CC(B)} = 2.3 V	45	-	45	-	μA
		V _I = 0.80 V; V _{CC(A)} = V _{CC(B)} = 3.0 V	100	-	90	-	μA
I _{BHH}	bus hold HIGH current	A or B port [2]					
		V _I = 0.91 V; V _{CC(A)} = V _{CC(B)} = 1.4 V	-15	-	-15	-	μA
		V _I = 1.07 V; V _{CC(A)} = V _{CC(B)} = 1.65 V	-25	-	-25	-	μA
		V _I = 1.60 V; V _{CC(A)} = V _{CC(B)} = 2.3 V	-45	-	-45	-	μA
		V _I = 2.00 V; V _{CC(A)} = V _{CC(B)} = 3.0 V	-100	-	-100	-	μA
I _{BHLO}	bus hold LOW overdrive current	A or B port [3]					
		V _{CC(A)} = V _{CC(B)} = 1.6 V	125	-	125	-	μA
		V _{CC(A)} = V _{CC(B)} = 1.95 V	200	-	200	-	μA
		V _{CC(A)} = V _{CC(B)} = 2.7 V	300	-	300	-	μA
		V _{CC(A)} = V _{CC(B)} = 3.6 V	500	-	500	-	μA
I _{BHHO}	bus hold HIGH overdrive current	A or B port [4]					
		V _{CC(A)} = V _{CC(B)} = 1.6 V	-125	-	-125	-	μA
		V _{CC(A)} = V _{CC(B)} = 1.95 V	-200	-	-200	-	μA
		V _{CC(A)} = V _{CC(B)} = 2.7 V	-300	-	-300	-	μA
		V _{CC(A)} = V _{CC(B)} = 3.6 V	-500	-	-500	-	μA

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Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
I _{OZ}	OFF-state output current	A or B port; V _O = 0 V or V _{CCO} ; V _{CC(A)} = V _{CC(B)} = 3.6 V [5]	-	±5	-	±30	μA
		suspend mode A port; V _O = 0 V or V _{CCO} ; V _{CC(A)} = 3.6 V; V _{CC(B)} = 0 V [5]	-	±5	-	±30	μA
		suspend mode B port; V _O = 0 V or V _{CCO} ; V _{CC(A)} = 0 V; V _{CC(B)} = 3.6 V [5]	-	±5	-	±30	μA
I _{OFF}	power-off leakage current	A port; V _I or V _O = 0 V to 3.6 V; V _{CC(A)} = 0 V; V _{CC(B)} = 0.8 V to 3.6 V	-	±5	-	±30	μA
		B port; V _I or V _O = 0 V to 3.6 V; V _{CC(B)} = 0 V; V _{CC(A)} = 0.8 V to 3.6 V	-	±5	-	±30	μA
I _{CC}	supply current	A port; V _I = 0 V or V _{CCI} ; I _O = 0 A					
		V _{CC(A)} = 0.8 V to 3.6 V; V _{CC(B)} = 0.8 V to 3.6 V	-	10	-	55	μA
		V _{CC(A)} = 1.1 V to 3.6 V; V _{CC(B)} = 1.1 V to 3.6 V	-	8	-	50	μA
		V _{CC(A)} = 3.6 V; V _{CC(B)} = 0 V	-	8	-	50	μA
		V _{CC(A)} = 0 V; V _{CC(B)} = 3.6 V	-2	-	-12	-	μA
		B port; V _I = 0 V or V _{CCI} ; I _O = 0 A					
		V _{CC(A)} = 0.8 V to 3.6 V; V _{CC(B)} = 0.8 V to 3.6 V	-	10	-	55	μA
		V _{CC(A)} = 1.1 V to 3.6 V; V _{CC(B)} = 1.1 V to 3.6 V	-	8	-	50	μA
		V _{CC(A)} = 3.6 V; V _{CC(B)} = 0 V	-2	-	-12	-	μA
		V _{CC(A)} = 0 V; V _{CC(B)} = 3.6 V	-	8	-	50	μA
		A plus B port (I _{CC(A)} + I _{CC(B)}); I _O = 0 A; V _I = 0 V or V _{CCI} ; V _{CC(A)} = 0.8 V to 3.6 V; V _{CC(B)} = 0.8 V to 3.6 V	-	20	-	70	μA
		A plus B port (I _{CC(A)} + I _{CC(B)}); I _O = 0 A; V _I = 0 V or V _{CCI} ; V _{CC(A)} = 1.1 V to 3.6 V; V _{CC(B)} = 1.1 V to 3.6 V	-	16	-	65	μA

- [1] The bus hold circuit can sink at least the minimum low sustaining current at V_{IL} max. I_{BHL} should be measured after lowering V_I to GND and then raising it to V_{IL} max.
- [2] The bus hold circuit can source at least the minimum high sustaining current at V_{IH} min. I_{BHH} should be measured after raising V_I to V_{CC} and then lowering it to V_{IH} min.
- [3] An external driver must source at least I_{BHLO} to switch this node from LOW to HIGH.
- [4] An external driver must sink at least I_{BHHO} to switch this node from HIGH to LOW.
- [5] For I/O ports, the parameter I_{OZ} includes the input leakage current.

Table 9. Typical total supply current (I_{CC(A)} + I_{CC(B)})

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

11. Dynamic characteristics

Table 10. Typical power dissipation capacitance at $V_{CC(A)} = V_{CC(B)}$ and $T_{amb} = 25\text{ °C}$ [1] [2]

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

Symbol	Parameter	Conditions	$V_{CC(A)} = V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
C_{PD}	power dissipation capacitance	A port: (direction nAn to nBn); output enabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		A port: (direction nAn to nBn); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		A port: (direction nBn to nAn); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		A port: (direction nBn to nAn); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction nAn to nBn); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		B port: (direction nAn to nBn); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction nBn to nAn); output enabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		B port: (direction nBn to nAn); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF

[1] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

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

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

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

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for wave forms see Fig. 7 and Fig. 8.

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} .

Symbol	Parameter	Conditions	$V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	propagation delay	nAn to nBn	14.5	7.3	6.5	6.2	5.9	6.0	ns
		nBn to nAn	14.5	12.7	12.4	12.3	12.1	12.0	ns
t_{dis}	disable time	n $\overline{O}E$ to nAn	14.3	14.3	14.3	14.3	14.3	14.3	ns
		n $\overline{O}E$ to nBn	17.0	9.9	9.0	9.4	9.0	9.7	ns
t_{en}	enable time	n $\overline{O}E$ to nAn	18.2	18.2	18.2	18.2	18.2	18.2	ns
		n $\overline{O}E$ to nBn	19.2	10.7	9.8	9.6	9.7	10.2	ns

Table 12. Typical dynamic characteristics at $V_{CC(B)} = 0.8\text{ V}$ and $T_{amb} = 25\text{ °C}$

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for wave forms see Fig. 7 and Fig. 8.

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} .

Symbol	Parameter	Conditions	$V_{CC(A)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	propagation delay	nAn to nBn	14.5	12.7	12.4	12.3	12.1	12.0	ns
		nBn to nAn	14.5	7.3	6.5	6.2	5.9	6.0	ns
t_{dis}	disable time	n $\overline{O}E$ to nAn	14.3	5.5	4.1	4.0	3.0	3.5	ns
		n $\overline{O}E$ to nBn	17.0	13.8	13.4	13.1	12.9	12.7	ns
t_{en}	enable time	n $\overline{O}E$ to nAn	18.2	5.6	4.0	3.2	2.4	2.2	ns
		n $\overline{O}E$ to nBn	19.2	14.6	14.1	13.9	13.7	13.6	ns

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

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

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for wave forms see Fig. 7 and Fig. 8.

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} .

Symbol	Parameter	Conditions	$V_{CC(B)}$										Unit
			1.2 V ± 0.1 V		1.5 V ± 0.1 V		1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
$V_{CC(A)} = 1.1 V$ to $1.3 V$													
t_{pd}	propagation delay	nAn to nBn	0.5	9.4	0.5	7.1	0.5	6.2	0.5	5.2	0.5	5.1	ns
		nBn to nAn	0.5	9.4	0.5	8.9	0.5	8.7	0.5	8.4	0.5	8.2	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	10.9	1.8	10.9	1.8	10.9	1.8	10.9	1.8	10.9	ns
		\overline{nOE} to nBn	1.9	12.4	1.9	9.6	1.9	9.5	1.4	8.1	1.2	9.1	ns
t_{en}	enable time	\overline{nOE} to nAn	1.4	12.8	1.4	12.8	1.4	12.8	1.4	12.8	1.4	12.8	ns
		\overline{nOE} to nBn	1.1	13.3	1.1	10.0	1.1	8.9	1.0	7.9	1.0	7.7	ns
$V_{CC(A)} = 1.4 V$ to $1.6 V$													
t_{pd}	propagation delay	nAn to nBn	0.3	8.9	0.3	6.3	0.3	5.2	0.3	4.2	0.3	4.2	ns
		nBn to nAn	0.7	7.1	0.7	6.3	0.5	6.0	0.4	5.7	0.3	5.6	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	10.2	1.8	10.2	1.5	10.2	1.3	10.2	1.6	10.2	ns
		\overline{nOE} to nBn	1.9	11.3	1.9	10.3	1.9	9.1	1.4	7.4	1.2	7.6	ns
t_{en}	enable time	\overline{nOE} to nAn	1.1	9.4	1.4	9.4	1.1	9.4	0.7	9.4	0.4	9.4	ns
		\overline{nOE} to nBn	1.4	12.1	1.4	9.6	1.1	7.7	0.9	5.8	0.9	5.6	ns
$V_{CC(A)} = 1.65 V$ to $1.95 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	8.7	0.1	6.0	0.1	4.9	0.1	3.9	0.3	3.9	ns
		nBn to nAn	0.6	6.2	0.6	5.3	0.5	4.9	0.3	4.6	0.3	4.5	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	8.6	1.6	8.6	1.8	8.6	1.3	8.6	1.6	8.6	ns
		\overline{nOE} to nBn	1.7	10.9	1.7	9.9	1.6	8.7	1.2	6.9	1.0	6.9	ns
t_{en}	enable time	\overline{nOE} to nAn	1.0	7.2	1.0	7.2	1.0	7.2	0.6	7.2	0.4	7.2	ns
		\overline{nOE} to nBn	1.2	11.7	1.2	9.2	1.0	7.4	0.8	5.3	0.8	4.6	ns
$V_{CC(A)} = 2.3 V$ to $2.7 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	8.4	0.1	5.7	0.1	4.6	0.2	3.5	0.1	3.6	ns
		nBn to nAn	0.6	5.2	0.6	4.2	0.4	3.9	0.2	3.4	0.2	3.3	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.0	6.2	1.0	6.2	1.0	6.2	1.0	6.2	1.0	6.2	ns
		\overline{nOE} to nBn	1.5	10.4	1.5	8.8	1.3	8.2	1.1	6.2	0.9	5.2	ns
t_{en}	enable time	\overline{nOE} to nAn	0.7	4.8	0.7	4.8	0.7	4.8	0.6	4.8	0.4	4.8	ns
		\overline{nOE} to nBn	0.9	11.3	0.9	8.8	0.8	7.0	0.6	4.8	0.6	4.0	ns
$V_{CC(A)} = 3.0 V$ to $3.6 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	8.2	0.1	5.6	0.1	4.5	0.1	3.3	0.1	2.9	ns
		nBn to nAn	0.6	5.1	0.6	4.2	0.4	3.4	0.2	3.0	0.1	2.8	ns
t_{dis}	disable time	\overline{nOE} to nAn	0.7	5.6	0.7	5.6	0.7	5.6	0.7	5.6	0.7	5.6	ns
		\overline{nOE} to nBn	1.4	10.2	1.4	9.3	1.2	8.1	1.0	6.4	0.8	6.2	ns
t_{en}	enable time	\overline{nOE} to nAn	0.6	3.8	0.6	3.8	0.6	3.8	0.6	3.8	0.4	3.8	ns
		\overline{nOE} to nBn	0.8	11.3	0.8	8.7	0.6	6.8	0.5	4.7	0.5	3.8	ns

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

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

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9; for wave forms see Fig. 7 and Fig. 8

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} .

Symbol	Parameter	Conditions	$V_{CC(B)}$										Unit
			1.2 V ± 0.1 V		1.5 V ± 0.1 V		1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
$V_{CC(A)} = 1.1 V$ to $1.3 V$													
t_{pd}	propagation delay	nAn to nBn	0.5	10.4	0.5	7.9	0.5	6.9	0.5	5.8	0.5	5.7	ns
		nBn to nAn	0.5	10.4	0.5	9.8	0.5	9.6	0.5	9.3	0.5	9.1	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	12.0	1.8	12.0	1.8	12.0	1.8	12.0	1.8	12.0	ns
		\overline{nOE} to nBn	1.9	13.7	1.9	10.6	1.9	10.5	1.4	9.0	1.2	10.1	ns
t_{en}	enable time	\overline{nOE} to nAn	1.4	14.1	1.4	14.1	1.4	14.1	1.4	14.1	1.4	14.1	ns
		\overline{nOE} to nBn	1.1	14.7	1.1	11.0	1.1	9.8	1.0	8.7	1.0	8.5	ns
$V_{CC(A)} = 1.4 V$ to $1.6 V$													
t_{pd}	propagation delay	nAn to nBn	0.3	9.8	0.3	7.0	0.3	5.8	0.3	4.7	0.3	4.7	ns
		nBn to nAn	0.7	7.9	0.7	7.0	0.5	6.6	0.4	6.3	0.3	6.2	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	11.3	1.8	11.3	1.5	11.3	1.3	11.3	1.6	11.3	ns
		\overline{nOE} to nBn	1.9	12.5	1.9	11.4	1.9	10.1	1.4	8.2	1.2	8.4	ns
t_{en}	enable time	\overline{nOE} to nAn	1.1	10.4	1.4	10.4	1.1	10.4	0.7	10.4	0.4	10.4	ns
		\overline{nOE} to nBn	1.4	13.3	1.4	10.6	1.1	8.5	0.9	6.4	0.9	6.2	ns
$V_{CC(A)} = 1.65 V$ to $1.95 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	9.6	0.1	6.6	0.1	5.4	0.1	4.3	0.3	4.3	ns
		nBn to nAn	0.6	6.9	0.6	5.9	0.5	5.4	0.3	5.1	0.3	5.0	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.8	9.5	1.6	9.5	1.8	9.5	1.3	9.5	1.6	9.5	ns
		\overline{nOE} to nBn	1.7	12.0	1.7	10.9	1.6	9.6	1.2	7.6	1.0	7.6	ns
t_{en}	enable time	\overline{nOE} to nAn	1.0	8.0	1.0	8.0	1.0	8.0	0.6	8.0	0.4	8.0	ns
		\overline{nOE} to nBn	1.2	12.9	1.2	10.2	1.0	8.2	0.8	5.9	0.8	5.1	ns
$V_{CC(A)} = 2.3 V$ to $2.7 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	9.3	0.1	6.3	0.1	5.1	0.2	4.0	0.1	4.0	ns
		nBn to nAn	0.6	5.8	0.6	4.7	0.4	4.3	0.2	3.9	0.2	3.8	ns
t_{dis}	disable time	\overline{nOE} to nAn	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	ns
		\overline{nOE} to nBn	1.5	11.5	1.5	10.4	1.3	9.1	1.1	6.9	0.9	5.8	ns
t_{en}	enable time	\overline{nOE} to nAn	0.7	5.3	0.7	5.3	0.7	5.3	0.6	5.3	0.4	5.3	ns
		\overline{nOE} to nBn	0.9	12.4	0.9	9.7	0.8	7.7	0.6	5.3	0.6	4.4	ns
$V_{CC(A)} = 3.0 V$ to $3.6 V$													
t_{pd}	propagation delay	nAn to nBn	0.1	9.1	0.1	6.2	0.1	5.0	0.1	3.8	0.1	3.3	ns
		nBn to nAn	0.6	5.7	0.6	4.7	0.4	3.9	0.2	3.4	0.1	3.3	ns
t_{dis}	disable time	\overline{nOE} to nAn	0.7	6.2	0.7	6.2	0.7	6.2	0.7	6.2	0.7	6.2	ns
		\overline{nOE} to nBn	1.4	11.3	1.4	10.3	1.2	9.0	1.0	7.1	0.8	6.9	ns
t_{en}	enable time	\overline{nOE} to nAn	0.6	4.2	0.6	4.2	0.6	4.2	0.6	4.2	0.4	4.2	ns
		\overline{nOE} to nBn	0.8	12.4	0.8	9.6	0.6	7.5	0.5	5.2	0.5	4.2	ns

11.1. Waveforms and test circuit

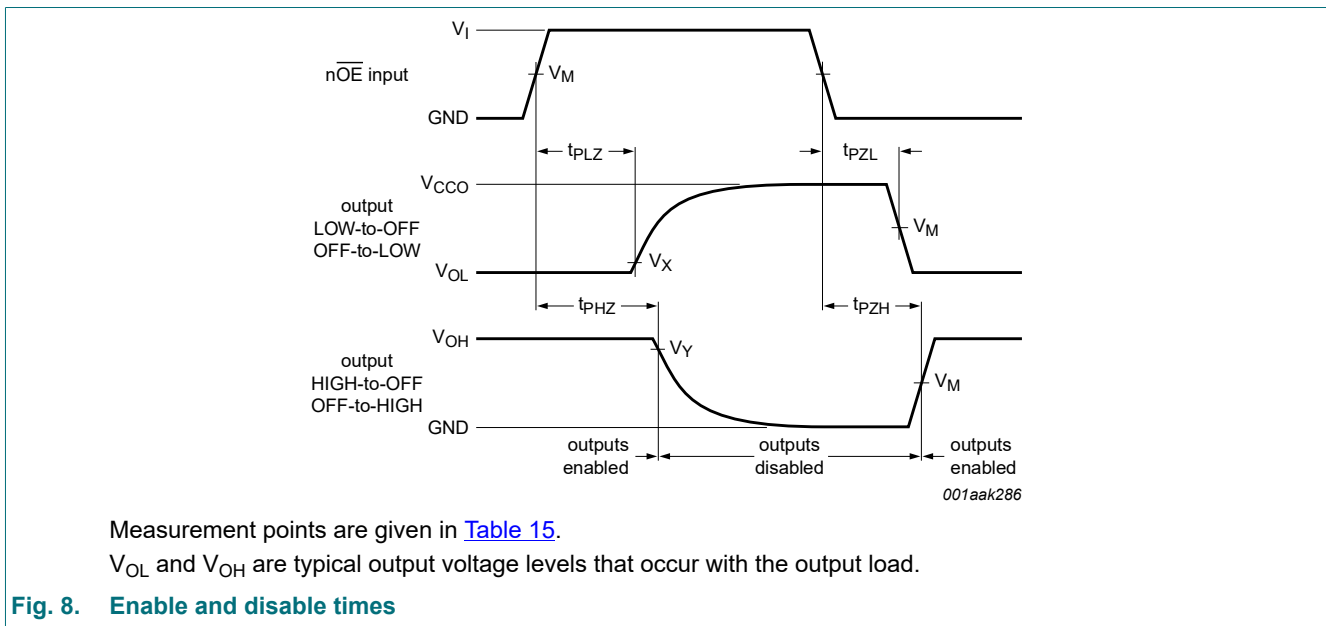
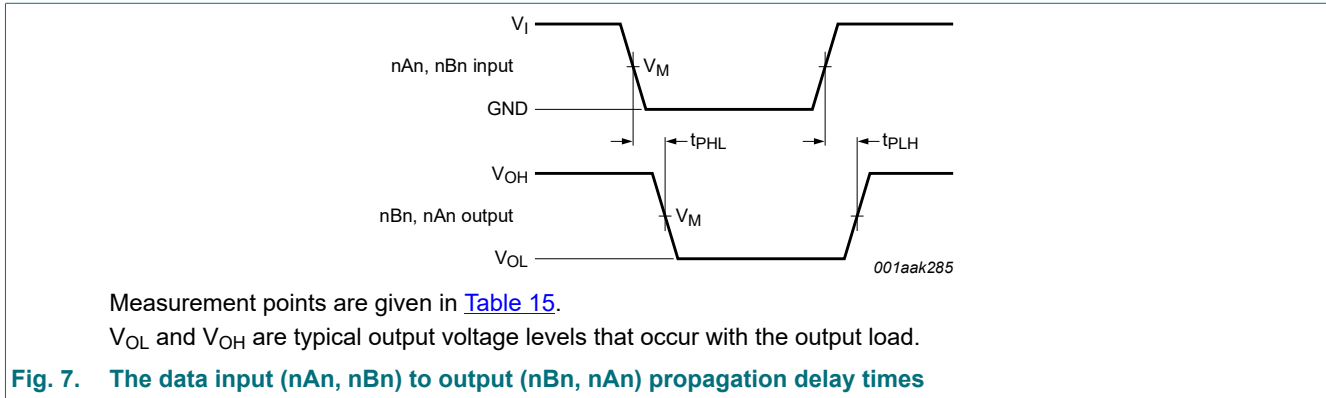


Table 15. Measurement points

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

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

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

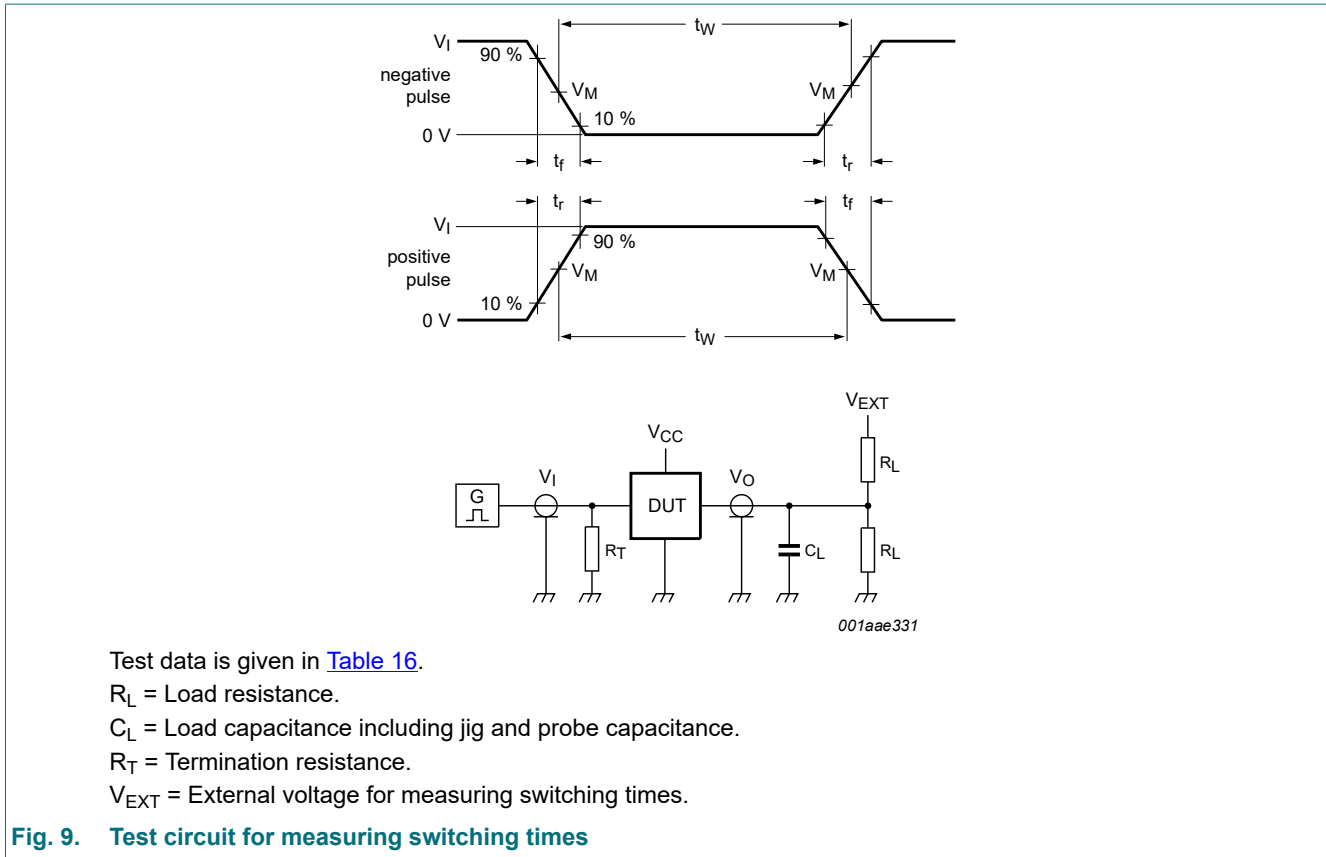
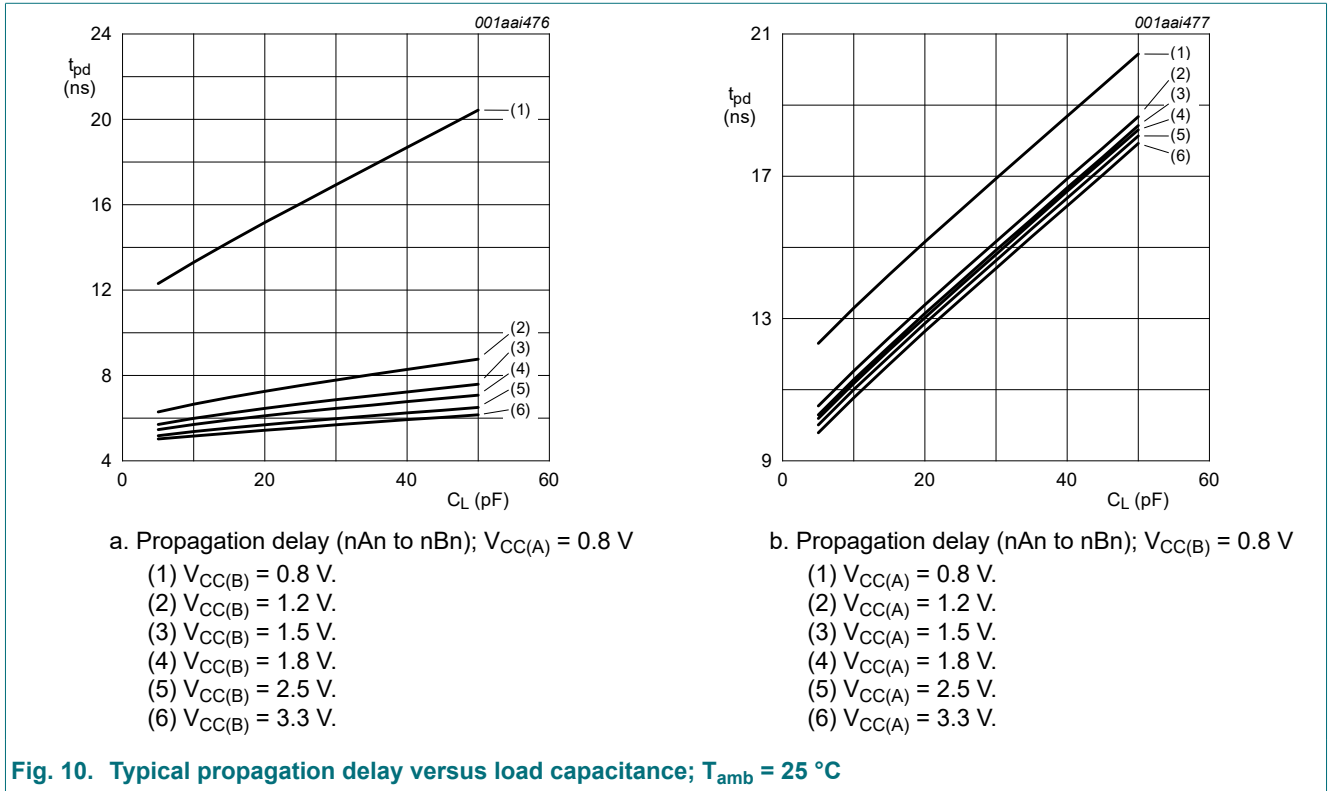


Table 16. Test data

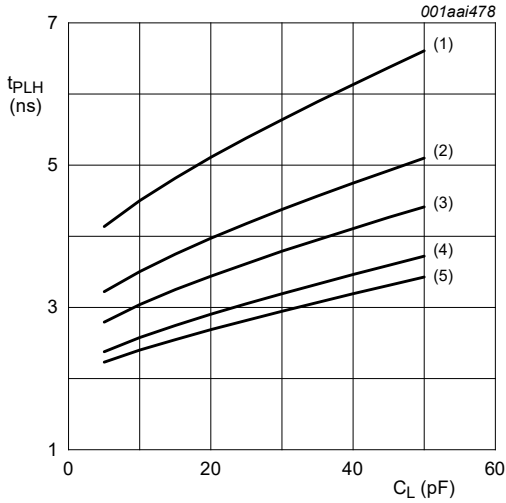
Supply voltage	Input		Load		V_{EXT}		
$V_{CC(A)}, V_{CC(B)}$	V_I [1]	$\Delta t/\Delta V$ [2]	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} [3]
0.8 V to 1.6 V	V_{CCI}	$\leq 1.0 \text{ ns/V}$	15 pF	2 k Ω	open	GND	$2V_{CCO}$
1.65 V to 2.7 V	V_{CCI}	$\leq 1.0 \text{ ns/V}$	15 pF	2 k Ω	open	GND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

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

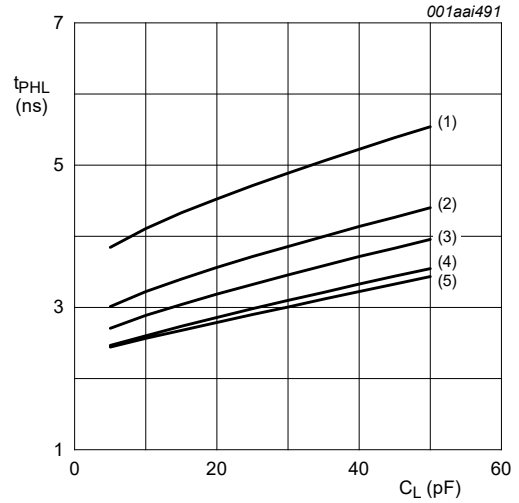
11.2. Typical propagation delay characteristics



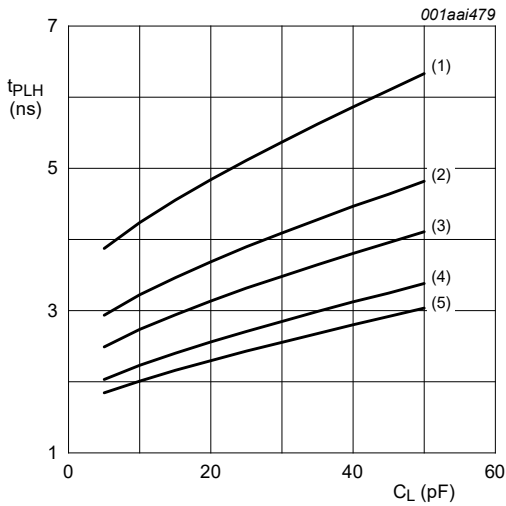
4-bit dual supply translating transceiver with configurable voltage translation; 3-state



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

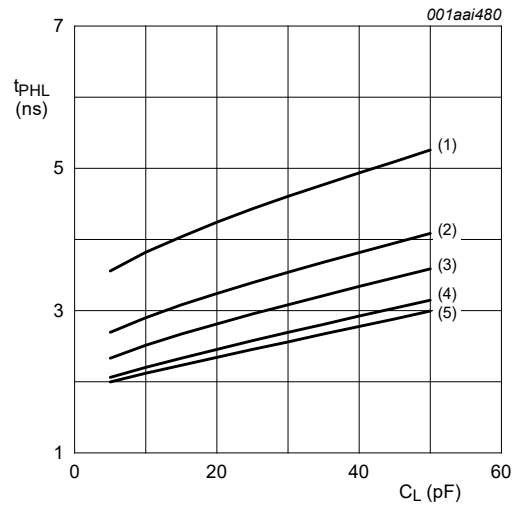


b. HIGH to LOW propagation delay (nAn to nBn); $V_{CC(A)} = 1.2\text{ V}$



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

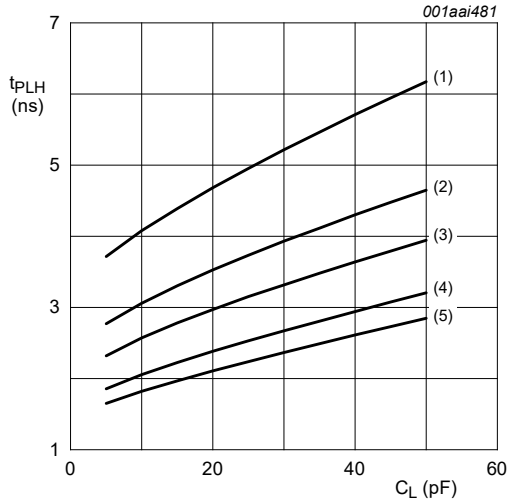
- (1) $V_{CC(B)} = 1.2\text{ V}$.
- (2) $V_{CC(B)} = 1.5\text{ V}$.
- (3) $V_{CC(B)} = 1.8\text{ V}$.
- (4) $V_{CC(B)} = 2.5\text{ V}$.
- (5) $V_{CC(B)} = 3.3\text{ V}$.



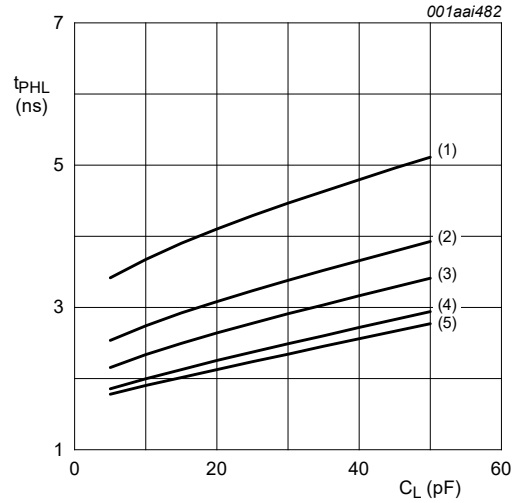
d. HIGH to LOW propagation delay (nAn to nBn); $V_{CC(A)} = 1.5\text{ V}$

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

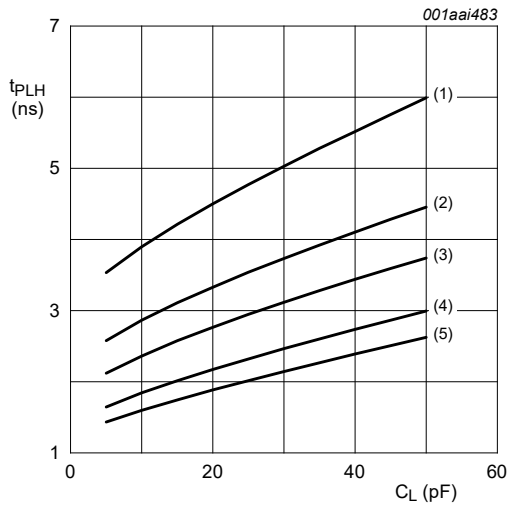
4-bit dual supply translating transceiver with configurable voltage translation; 3-state



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

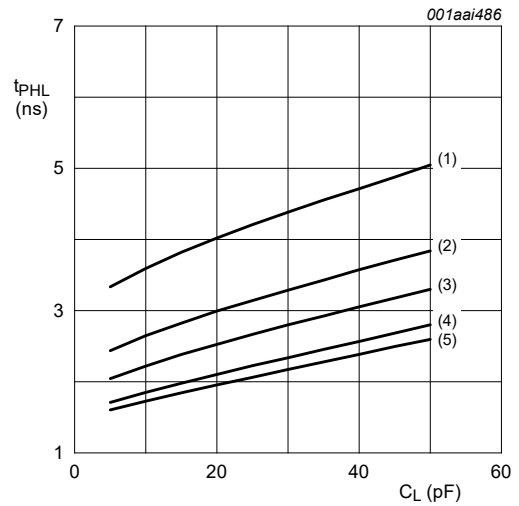


b. HIGH to LOW propagation delay (nAn to nBn); $V_{CC(A)} = 1.8\text{ V}$



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

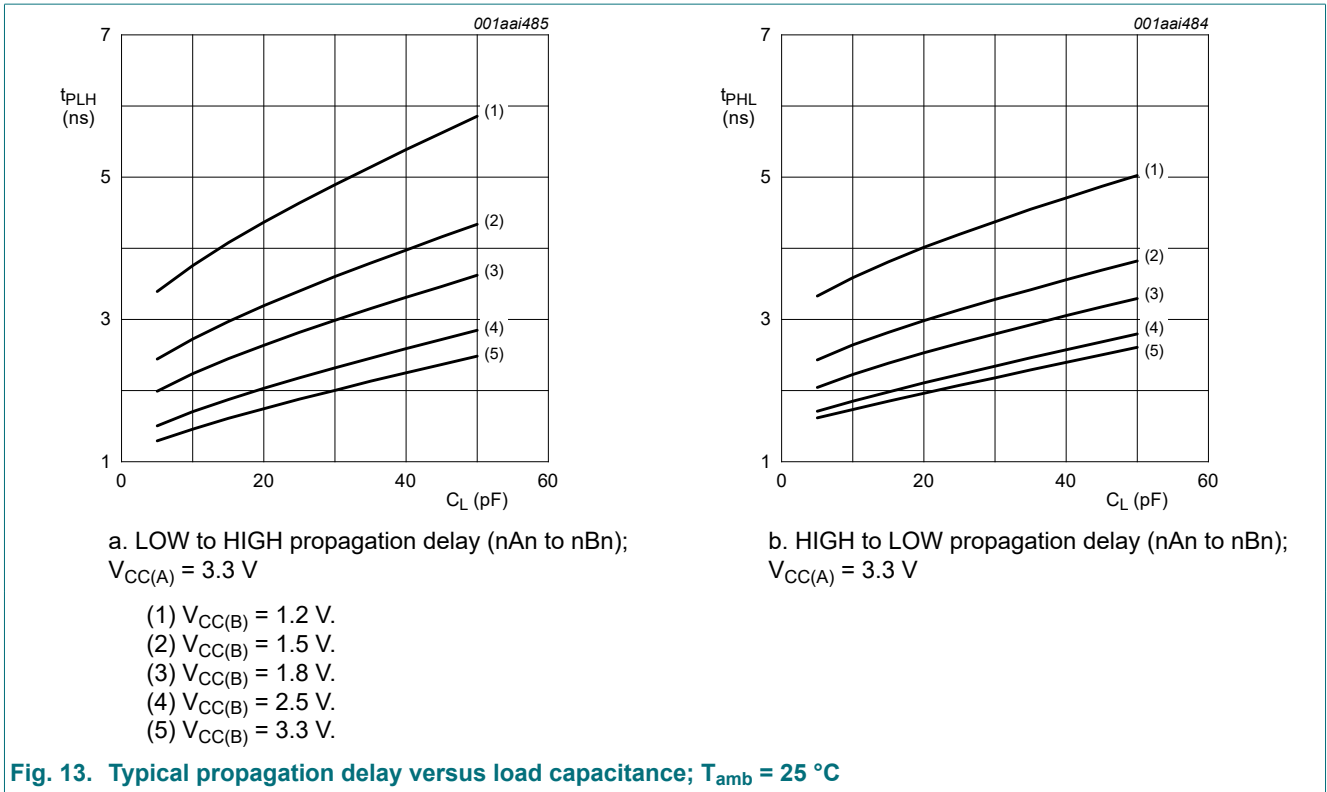
- (1) $V_{CC(B)} = 1.2\text{ V}$.
- (2) $V_{CC(B)} = 1.5\text{ V}$.
- (3) $V_{CC(B)} = 1.8\text{ V}$.
- (4) $V_{CC(B)} = 2.5\text{ V}$.
- (5) $V_{CC(B)} = 3.3\text{ V}$.



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

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

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



12. Package outline

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

SOT109-1

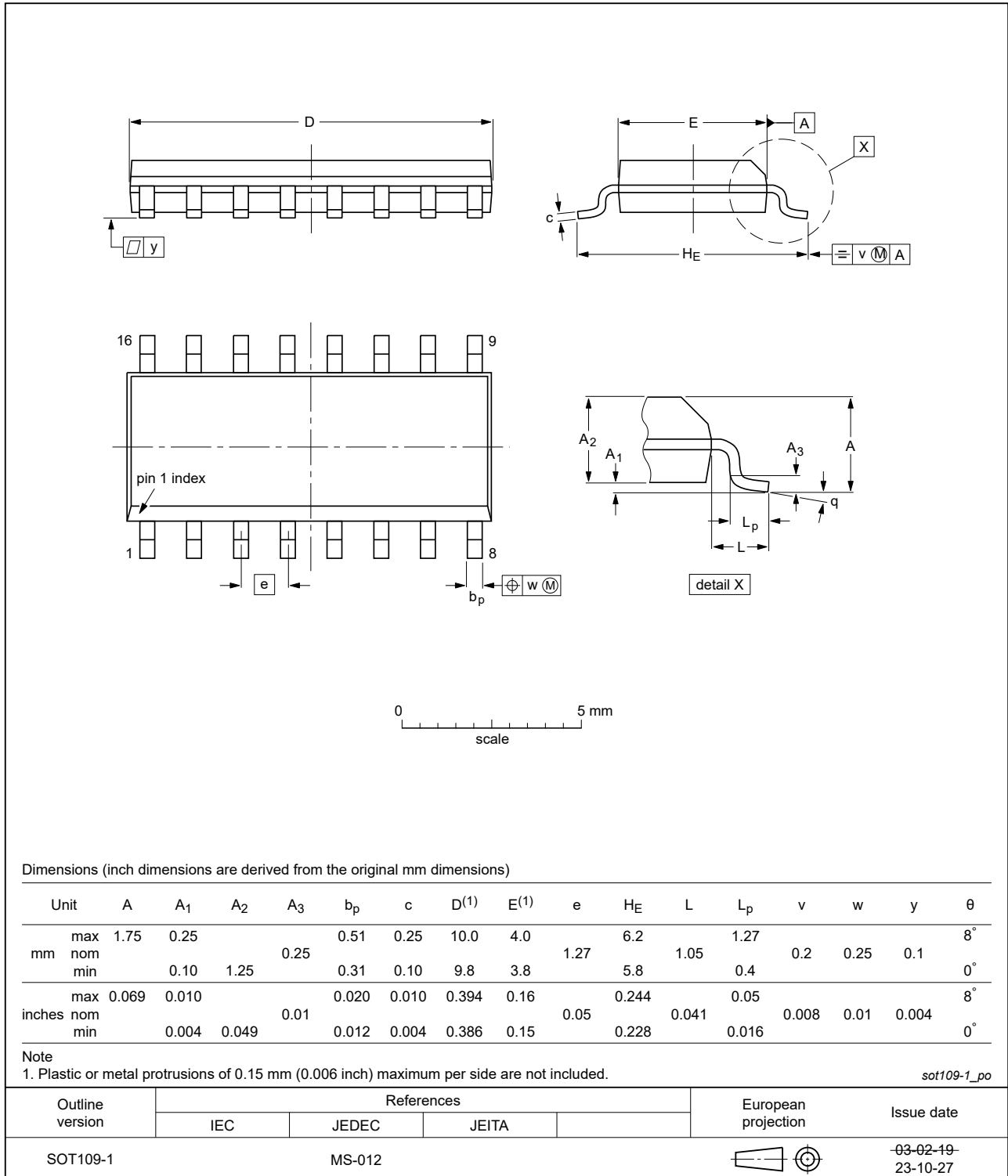


Fig. 14. Package outline SOT109-1 (SO16)

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

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

SOT403-1

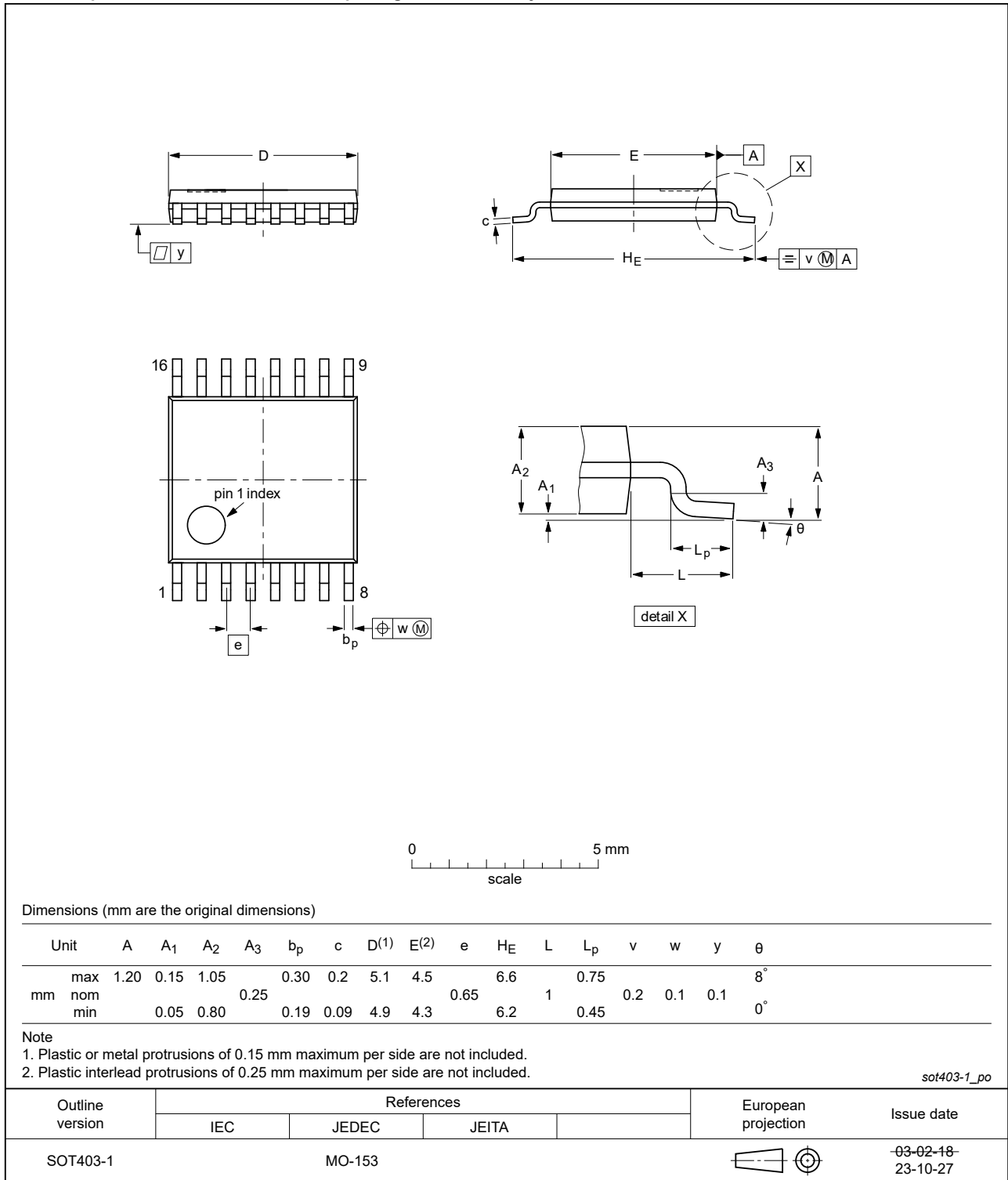


Fig. 15. Package outline SOT403-1 (TSSOP16)

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

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

SOT763-1

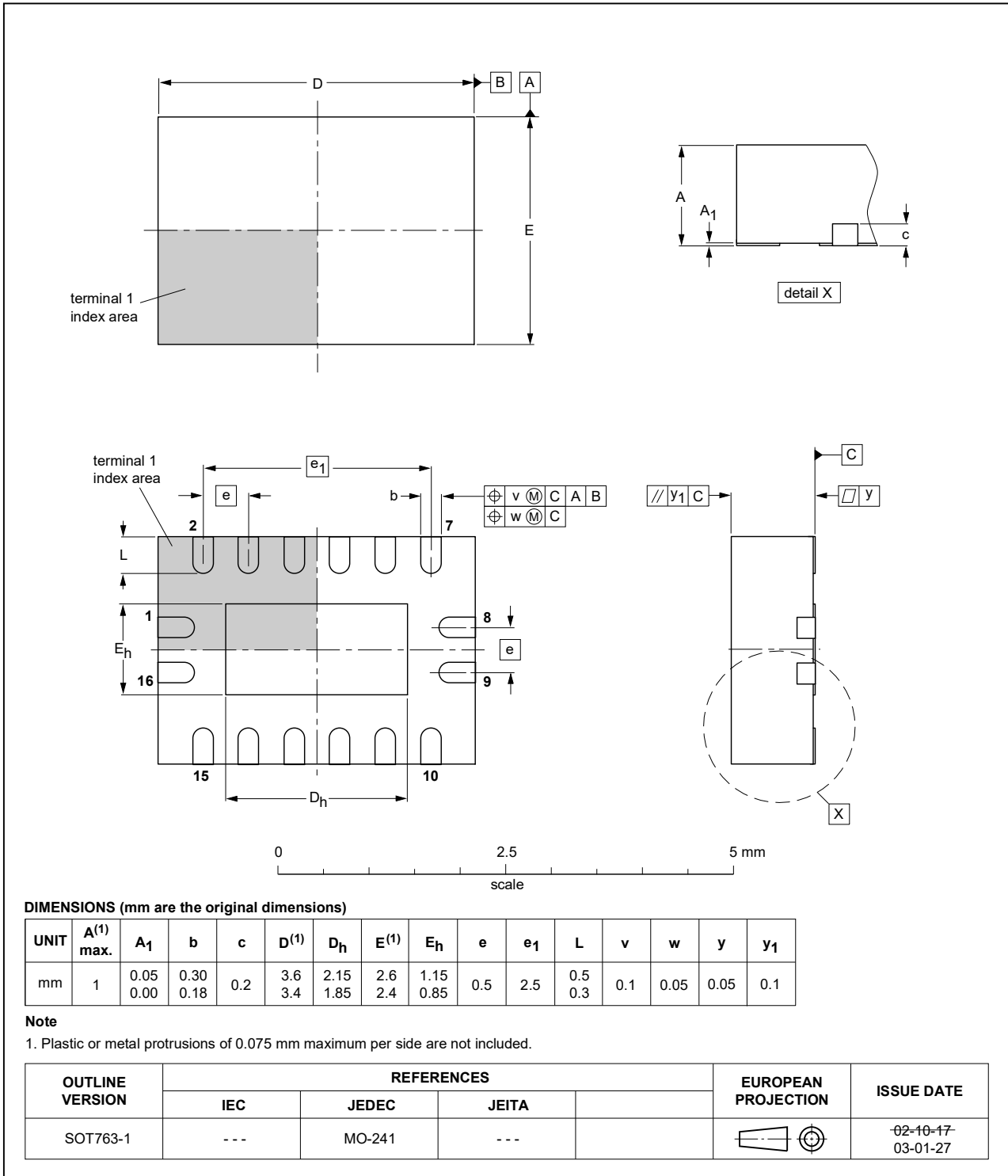


Fig. 16. Package outline SOT763-1 (DHVQFN16)

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

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

SOT1161-1

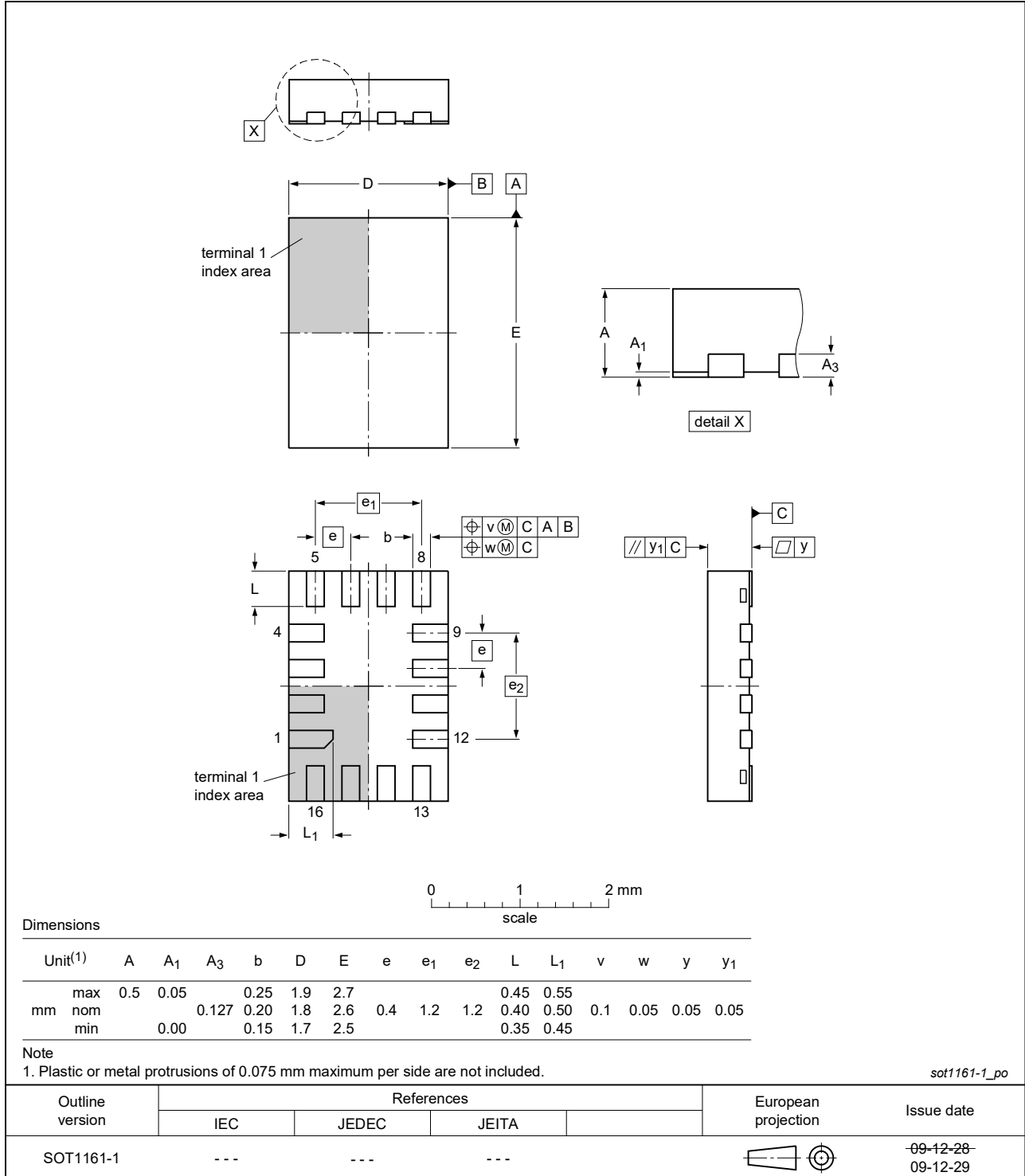


Fig. 17. Package outline SOT1161-1 (XQFN16)

13. Abbreviations

Table 17. Abbreviations

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

14. Revision history

Table 18. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVCH4T245 v.6	20240411	Product data sheet	-	74AVCH4T245 v.5
Modifications:	<ul style="list-style-type: none"> • Fig. 14, Fig. 15: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153. • Section 2: ESD specification updated according to the latest JEDEC standard. 			
74AVCH4T245 v.5	20151217	Product data sheet	-	74AVCH4T245 v.4
Modifications:	<ul style="list-style-type: none"> • Table 5: conditions I_{CC} and I_{GND} changed (errata). 			
74AVCH4T245 v.4	20111214	Product data sheet	-	74AVCH4T245 v.3
Modifications:	<ul style="list-style-type: none"> • Legal pages updated. 			
74AVCH4T245 v.3	20110927	Product data sheet	-	74AVCH4T245 v.2
74AVCH4T245 v.2	20101203	Product data sheet	-	74AVCH4T245 v.1
74AVCH4T245 v.1	20090806	Product data sheet	-	-

15. Legal information

Data sheet status

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

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

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