

74AVC2T245-Q100

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

Rev. 1 — 14 June 2019

Product data sheet

1. General description

The 74AVC2T245-Q100 is a 2-bit, dual supply transceiver that enables bidirectional level translation. The device can be used as two 1-bit transceivers or as a 2-bit transceiver. It features two 2-bit input-output ports (An and Bn) and direction control inputs (DIRn), an output enable input (\overline{OE}) and dual supply pins ($V_{CC(A)}$ and $V_{CC(B)}$). Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins An, \overline{OE} and DIRn are referenced to $V_{CC(A)}$ and pins Bn are referenced to $V_{CC(B)}$. A HIGH on DIRn allows transmission from An to Bn and a LOW on DIRn allows transmission from Bn to An. The output enable input (\overline{OE}) can be used to disable the outputs so the buses are effectively isolated.

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

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range:
 - $V_{CC(A)}$: 0.8 V to 3.6 V
 - $V_{CC(B)}$: 0.8 V to 3.6 V
- Complies with JEDEC standards:
 - JESD8-12 (0.8 V to 1.3 V)
 - JESD8-11 (0.9 V to 1.65 V)
 - JESD8-7 (1.2 V to 1.95 V)
 - JESD8-5 (1.8 V to 2.7 V)
 - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114E Class 3B exceeds 8000 V
 - CDM JESD22-C101C exceeds 1000 V
- Maximum data rates:
 - 380 Mbit/s (≥ 1.8 V to 3.3 V translation)
 - 200 Mbit/s (≥ 1.1 V to 3.3 V translation)
 - 200 Mbit/s (≥ 1.1 V to 2.5 V translation)
 - 200 Mbit/s (≥ 1.1 V to 1.8 V translation)
 - 150 Mbit/s (≥ 1.1 V to 1.5 V translation)
 - 100 Mbit/s (≥ 1.1 V to 1.2 V translation)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- I_{OFF} circuitry provides partial Power-down mode operation

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AVC2T245GU-Q100	-40 °C to +125 °C	XQFN10	plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 x 1.80 x 0.50 mm	SOT1160-1

4. Marking

Table 2. Marking codes

Type number	Marking code
74AVC2T245GU-Q100	B3

5. Functional diagram

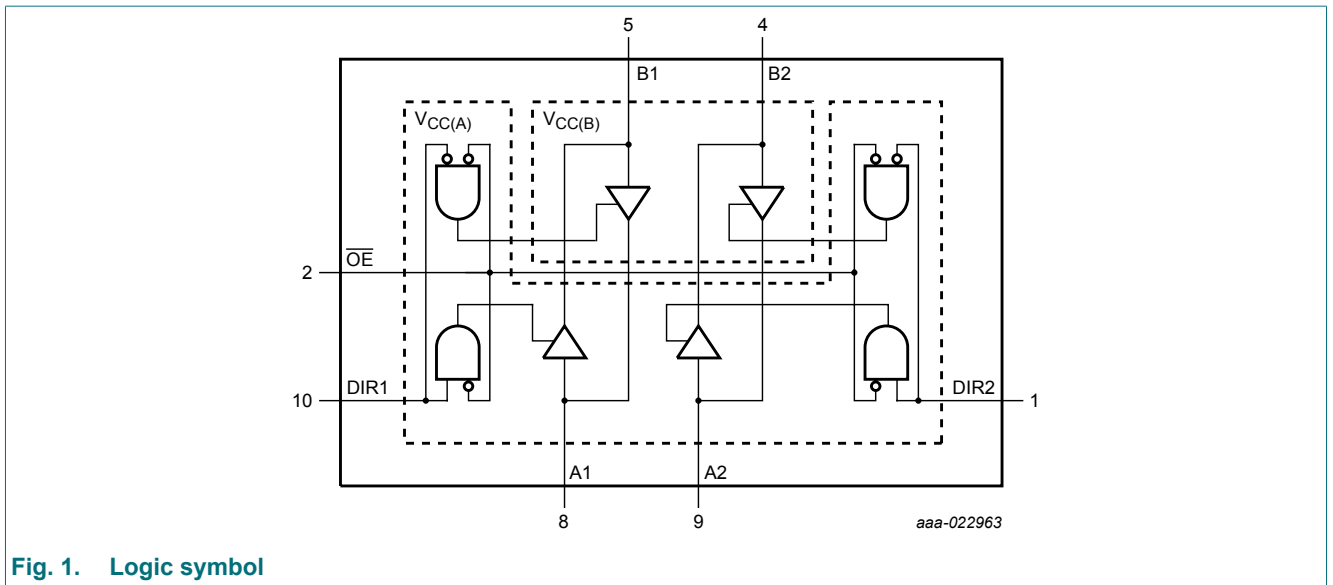


Fig. 1. Logic symbol

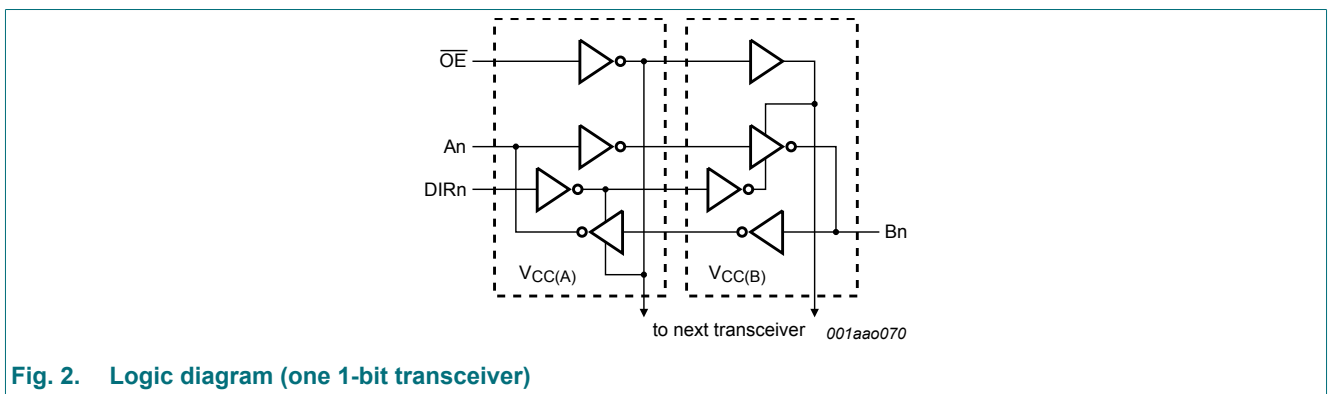


Fig. 2. Logic diagram (one 1-bit transceiver)

6. Pinning information

6.1. Pinning

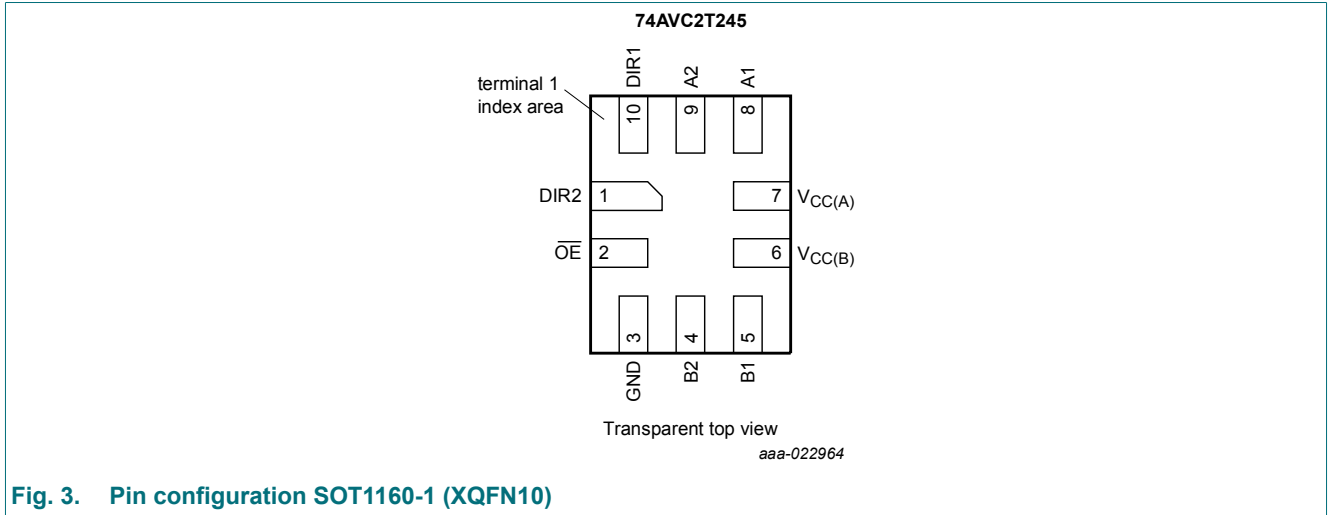


Fig. 3. Pin configuration SOT1160-1 (XQFN10)

6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
DIR1, DIR2	10, 1	direction control
\overline{OE}	2	output enable input (active LOW)
$V_{CC(B)}$	6	supply voltage B (Bn inputs are referenced to $V_{CC(B)}$)
$V_{CC(A)}$	7	supply voltage A (An, \overline{OE} and DIRn inputs are referenced to $V_{CC(A)}$)
A1, A2	8, 9	data input or output
B1, B2	5, 4	data input or output
GND	3	ground (0 V)

7. Functional description

Table 4. Function table

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

Supply voltage	Input		Input/output	
	\overline{OE} [1]	DIRn[1]	An[1]	Bn[1]
$V_{CC(A)}, V_{CC(B)}$				
0.8 V to 3.6 V	L	L	An = Bn	input
0.8 V to 3.6 V	L	H	input	Bn = An
0.8 V to 3.6 V	H	X	Z	Z
GND[2]	X	X	Z	Z

[1] The An, DIRn and \overline{OE} input circuit is referenced to $V_{CC(A)}$; The Bn input circuit is referenced to $V_{CC(B)}$.

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

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	$I_{CC(A)}$ or $I_{CC(B)}$	-	100	mA
I_{GND}	ground current		-100	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C [4]	-	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 SOT1160-1 package: above 115 °C derates linearly with 7.1 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

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	$V_{CCI} = 0.8$ V to 3.6 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 $T_{amb} = 25\text{ °C}$ [1][2]

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

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	DIRn, \overline{OE} input; $V_I = 0\text{ V}$ or 3.6 V ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$ to 3.6 V	-	± 0.025	± 0.25	μA
I_{OZ}	OFF-state output current	A or B port; $V_O = 0\text{ V}$ or V_{CCO} ; $V_{CC(A)} = V_{CC(B)} = 3.6\text{ V}$ [3]	-	± 0.5	± 2.5	μA
		suspend mode A port; $V_O = 0\text{ V}$ or V_{CCO} ; $V_{CC(A)} = 3.6\text{ V}$; $V_{CC(B)} = 0\text{ V}$ [3]	-	± 0.5	± 2.5	μA
		suspend mode B port; $V_O = 0\text{ V}$ or V_{CCO} ; $V_{CC(A)} = 0\text{ V}$; $V_{CC(B)} = 3.6\text{ V}$ [3]	-	± 0.5	± 2.5	μA
I_{OFF}	power-off leakage current	V_I or $V_O = 0\text{ V}$ to 3.6 V	-	± 0.1	± 1	μA
		A port; $V_{CC(A)} = 0\text{ V}$; $V_{CC(B)} = 0.8\text{ V}$ to 3.6 V	-	± 0.1	± 1	μA
		B port; $V_{CC(B)} = 0\text{ V}$; $V_{CC(A)} = 0.8\text{ V}$ to 3.6 V	-	± 0.1	± 1	μA
C_I	input capacitance	DIRn, \overline{OE} input; $V_I = 0\text{ V}$ or 3.3 V ; $V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$	-	2.0	-	pF
$C_{I/O}$	input/output capacitance	A and B port; $V_O = 3.3\text{ V}$ or 0 V ; $V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$	-	4.0	-	pF

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

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

[3] For I/O ports, the parameter I_{OZ} includes the input leakage current.

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Table 8. Static characteristics [1][2]

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

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V _{IH}	HIGH-level input voltage	data input					
		V _{CCI} = 0.8 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
		DIRn, \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
		DIRn, \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		
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = -100 μ A; 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		

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Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
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	DIRn, \overline{OE} 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 _{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 [3]	-	±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 [3]	-	±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 [3]	-	±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

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Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
ΔI_{CC}	additional supply current	$V_I = 3.0\text{ V}; V_{CC(A)} = V_{CC(B)} = 3.6\text{ V}$	-	500	-	650	μA

- [1] V_{CCO} is the supply voltage associated with the output port.
- [2] V_{CCI} is the supply voltage associated with the data input port.
- [3] For I/O ports, the parameter I_{OZ} includes the input leakage current.

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 An to Bn); output enabled	0.2	0.2	0.2	0.2	0.3	0.6	pF
		A port: (direction An to Bn); output disabled	0.2	0.2	0.2	0.2	0.3	0.6	pF
		A port: (direction Bn to An); output enabled	9	9	9	10	12	14	pF
		A port: (direction Bn to An); output disabled	0.6	0.7	0.7	0.7	0.8	0.9	pF
		B port: (direction An to Bn); output enabled	9	9	9	10	12	14	pF
		B port: (direction An to Bn); output disabled	0.6	0.7	0.7	0.7	0.8	0.9	pF
		B port: (direction Bn to An); output enabled	0.2	0.2	0.2	0.2	0.3	0.6	pF
		B port: (direction Bn to An); output disabled	0.2	0.2	0.2	0.2	0.3	0.6	pF

- [1] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$ 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;
 $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
- [2] $f_i = 10\text{ MHz}; V_I = \text{GND to } V_{CC}; t_r = t_f = 1\text{ ns}; C_L = 0\text{ pF}; R_L = \infty\ \Omega$.

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Table 11. Typical dynamic characteristics at $V_{CC(A)} = 0.8\text{ V}$ and $T_{amb} = 25\text{ °C}$ [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6; for waveforms see Fig. 4 and Fig. 5

Symbol	Parameter	Conditions	$V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	propagation delay	An to Bn	17.5	8.0	7.0	6.7	6.6	6.7	ns
		Bn to An	17.6	14.8	14.4	14.2	14.0	13.8	ns
t_{dis}	disable time	\overline{OE} to An	17.0	17.0	17.0	17.0	17.0	17.0	ns
		\overline{OE} to Bn	19.7	10.9	9.8	10.0	9.3	9.9	ns
t_{en}	enable time	\overline{OE} to An	30.3	30.2	30.2	30.2	30.1	30.1	ns
		\overline{OE} to Bn	34.3	22.7	21.5	21.0	21.1	21.5	ns

[1] t_{pd} is the same as t_{PLH} and t_{PHL} ; t_{dis} is the same as t_{PLZ} and t_{PHZ} ; t_{en} is the same as t_{PZL} and t_{PZH} .**Table 12. Typical dynamic characteristics at $V_{CC(B)} = 0.8\text{ V}$ and $T_{amb} = 25\text{ °C}$ [1]**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6; for waveforms see Fig. 4 and Fig. 5

Symbol	Parameter	Conditions	$V_{CC(A)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	propagation delay	An to Bn	17.5	14.8	14.3	14.1	13.9	13.8	ns
		Bn to An	17.6	8.0	7.1	6.8	6.6	6.7	ns
t_{dis}	disable time	\overline{OE} to An	17.0	5.8	4.1	4.0	2.9	3.4	ns
		\overline{OE} to Bn	19.7	15.6	15.0	14.7	14.4	14.1	ns
t_{en}	enable time	\overline{OE} to An	30.3	6.2	4.1	3.1	2.2	1.8	ns
		\overline{OE} to Bn	34.3	18.1	17.2	16.8	16.5	16.3	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} .

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Table 13. Dynamic characteristics for temperature range -40 °C to +85 °C [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6; for waveforms see Fig. 4 and Fig. 5

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	An to Bn	1.1	9.2	1.1	6.9	0.9	5.9	0.9	5.3	0.8	5.2	ns
		Bn to An	1.1	9.2	1	8.5	1	8.2	0.9	8.2	0.8	8	ns
t _{dis}	disable time	\overline{OE} to An	2.4	10	2.4	10	2.4	10	2.4	10	2.4	10	ns
		\overline{OE} to Bn	2.7	10.8	2.3	8.4	2.5	8	2.1	7	2.6	7.8	ns
t _{en}	enable time	\overline{OE} to An	1.5	12.4	1.5	12.4	1.5	12.4	1.5	12.4	1.5	12.4	ns
		\overline{OE} to Bn	1.9	12.6	1.7	9.3	1.6	8	1.5	6.9	1.4	6.7	ns
V_{CC(A)} = 1.4 V to 1.6 V													
t _{pd}	propagation delay	An to Bn	1	8.5	1	5.5	0.9	4.7	0.9	3.8	0.8	3.5	ns
		Bn to An	1.1	6.9	1	5.5	1	5.3	0.9	5	0.8	4.8	ns
t _{dis}	disable time	\overline{OE} to An	2	6.3	2	6.3	2	6.3	2	6.3	2	6.3	ns
		\overline{OE} to Bn	2.6	9.8	2.2	6.7	2.5	6.5	2	5.4	2.5	6	ns
t _{en}	enable time	\overline{OE} to An	1.2	6.8	1.2	6.8	1.2	6.8	1.2	6.8	1.2	6.8	ns
		\overline{OE} to Bn	1.7	11	1.5	6.8	1.4	5.8	1.3	4.8	1.3	4.4	ns
V_{CC(A)} = 1.65 V to 1.95 V													
t _{pd}	propagation delay	An to Bn	1	8.2	1	5.3	0.9	4.4	0.8	3.4	0.7	3.2	ns
		Bn to An	0.9	5.9	0.9	4.7	0.9	4.4	0.8	4.1	0.7	3.9	ns
t _{dis}	disable time	\overline{OE} to An	2.1	5.9	2.1	5.9	2.1	5.9	2.1	5.9	2.1	5.9	ns
		\overline{OE} to Bn	2.4	9.5	2.1	6.4	2.3	6.2	1.8	5	2.3	5.6	ns
t _{en}	enable time	\overline{OE} to An	1.1	5.3	1.1	5.3	1.1	5.3	1.1	5.3	1.1	5.3	ns
		\overline{OE} to Bn	1.6	10.5	1.4	6.3	1.3	5.3	1.2	4.3	1.1	3.9	ns
V_{CC(A)} = 2.3 V to 2.7 V													
t _{pd}	propagation delay	An to Bn	0.9	8.2	0.9	5	0.8	4.1	0.7	3.1	0.6	2.7	ns
		Bn to An	0.9	5.3	0.9	3.8	0.8	3.4	0.7	3.1	0.6	3	ns
t _{dis}	disable time	\overline{OE} to An	1.5	4.3	1.5	4.3	1.5	4.3	1.5	4.3	1.5	4.3	ns
		\overline{OE} to Bn	2.3	9	1.9	6	2.2	5.8	1.6	4.6	2.1	5.1	ns
t _{en}	enable time	\overline{OE} to An	0.9	3.6	0.9	3.6	0.9	3.6	0.9	3.6	0.9	3.6	ns
		\overline{OE} to Bn	1.3	10	1.3	5.8	1.2	4.8	1.1	3.7	1.1	3.3	ns
V_{CC(A)} = 3.0 V to 3.6 V													
t _{pd}	propagation delay	An to Bn	0.8	8	0.8	4.8	0.7	3.9	0.6	3	0.5	2.6	ns
		Bn to An	0.8	5.2	0.8	3.5	0.7	3.2	0.6	2.7	0.5	2.6	ns
t _{dis}	disable time	\overline{OE} to An	1.9	4.7	1.9	4.7	1.9	4.7	1.9	4.7	1.9	4.7	ns
		\overline{OE} to Bn	2.2	8.6	1.9	5.8	2	5.6	1.5	4.4	2	5	ns
t _{en}	enable time	\overline{OE} to An	0.9	2.9	0.9	2.9	0.9	2.9	0.9	2.9	0.9	2.9	ns
		\overline{OE} to Bn	1.5	9.8	1.4	5.6	1.2	4.6	1.1	3.5	1.1	3.1	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}.

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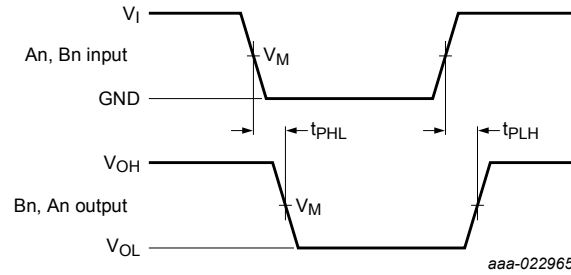
Table 14. Dynamic characteristics for temperature range -40 °C to +125 °C [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6; for waveforms see Fig. 4 and Fig. 5

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	An to Bn	1.1	9.7	1.1	7.3	0.9	6.3	0.9	5.6	0.8	5.5	ns
		Bn to An	1.1	9.7	1	8.9	1	8.6	0.9	8.6	0.8	8.4	ns
t _{dis}	disable time	\overline{OE} to An	2.4	10.5	2.4	10.5	2.4	10.5	2.4	10.5	2.4	10.5	ns
		\overline{OE} to Bn	2.7	11.6	2.3	9.1	2.5	8.6	2.1	7.5	2.6	8.4	ns
t _{en}	enable time	\overline{OE} to An	1.5	13	1.5	13	1.5	13	1.5	13	1.5	13	ns
		\overline{OE} to Bn	1.9	13	1.7	9.6	1.6	8.4	1.5	7.2	1.4	7	ns
V_{CC(A)} = 1.4 V to 1.6 V													
t _{pd}	propagation delay	An to Bn	1	8.9	1	5.7	0.9	4.9	0.9	4	0.8	3.7	ns
		Bn to An	1.1	7.3	1	5.7	1	5.5	0.9	5.2	0.8	5.1	ns
t _{dis}	disable time	\overline{OE} to An	2	6.7	2	6.7	2	6.7	2	6.7	2	6.7	ns
		\overline{OE} to Bn	2.6	10.2	2.2	7.1	2.5	6.9	2	5.7	2.5	6.3	ns
t _{en}	enable time	\overline{OE} to An	1.2	7.3	1.2	7.3	1.2	7.3	1.2	7.3	1.2	7.3	ns
		\overline{OE} to Bn	1.7	11.4	1.5	7.1	1.4	6.1	1.3	5.1	1.3	4.7	ns
V_{CC(A)} = 1.65 V to 1.95 V													
t _{pd}	propagation delay	An to Bn	1	8.6	1	5.5	0.9	4.6	0.8	3.6	0.7	3.4	ns
		Bn to An	0.9	6.3	0.9	4.9	0.9	4.6	0.8	4.3	0.7	4.1	ns
t _{dis}	disable time	\overline{OE} to An	2.1	6.2	2.1	6.2	2.1	6.2	2.1	6.2	2.1	6.2	ns
		\overline{OE} to Bn	2.4	10	2.1	6.8	2.3	6.6	1.8	5.3	2.3	5.9	ns
t _{en}	enable time	\overline{OE} to An	1.1	5.7	1.1	5.7	1.1	5.7	1.1	5.7	1.1	5.7	ns
		\overline{OE} to Bn	1.6	11	1.4	6.7	1.3	5.7	1.2	4.6	1.1	4.2	ns
V_{CC(A)} = 2.3 V to 2.7 V													
t _{pd}	propagation delay	An to Bn	0.9	8.6	0.9	5.2	0.8	4.3	0.7	3.3	0.6	2.9	ns
		Bn to An	0.9	5.6	0.9	4	0.8	3.6	0.7	3.3	0.6	3.2	ns
t _{dis}	disable time	\overline{OE} to An	1.5	4.6	1.5	4.6	1.5	4.6	1.5	4.6	1.5	4.6	ns
		\overline{OE} to Bn	2.3	9.5	1.9	6.4	2.2	6.1	1.6	4.9	2.1	5.4	ns
t _{en}	enable time	\overline{OE} to An	0.9	3.9	0.9	3.9	0.9	3.9	0.9	3.9	0.9	3.9	ns
		\overline{OE} to Bn	1.3	10.5	1.3	6.2	1.2	5.1	1.1	4	1.1	3.6	ns
V_{CC(A)} = 3.0 V to 3.6 V													
t _{pd}	propagation delay	An to Bn	0.8	8.4	0.8	5.1	0.7	4.1	0.6	3.2	0.5	2.7	ns
		Bn to An	0.8	5.5	0.8	3.7	0.7	3.4	0.6	2.9	0.5	2.7	ns
t _{dis}	disable time	\overline{OE} to An	1.9	5	1.9	5	1.9	5	1.9	5	1.9	5	ns
		\overline{OE} to Bn	2.2	9	1.9	6.2	2	5.9	1.5	4.7	2	5.2	ns
t _{en}	enable time	\overline{OE} to An	0.9	3.1	0.9	3.1	0.9	3.1	0.9	3.1	0.9	3.1	ns
		\overline{OE} to Bn	1.5	10.2	1.4	5.9	1.2	5	1.1	3.7	1.1	3.3	ns

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

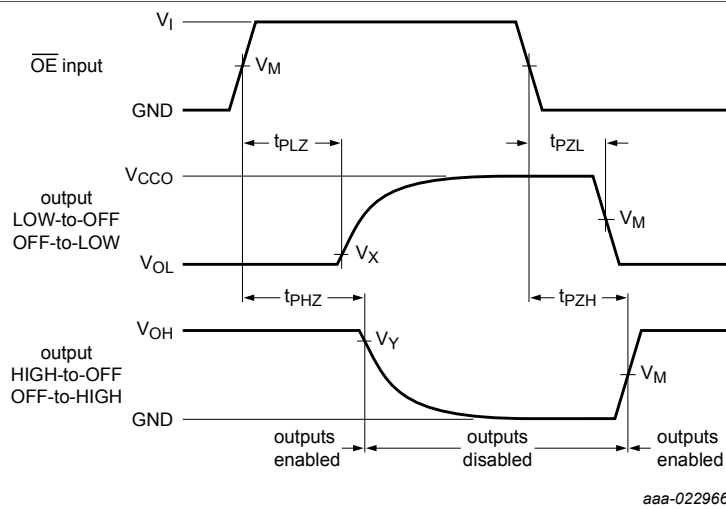
11.1. Waveforms and test circuit



Measurement points are given in Table 15.

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

Fig. 4. The data input (An, Bn) to output (Bn, An) propagation delay times



Measurement points are given in Table 15.

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

Fig. 5. Enable and disable times

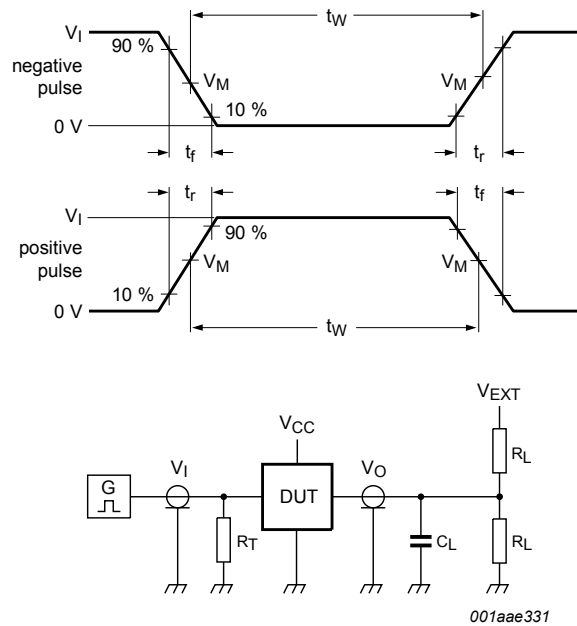
Table 15. Measurement points

Supply voltage	Input [1]	Output [2]		
	V_M	V_M	V_X	V_Y
0.8 V to 1.6 V	$0.5V_{CC1}$	$0.5V_{CC0}$	$V_{OL} + 0.1 V$	$V_{OH} - 0.1 V$
1.65 V to 2.7 V	$0.5V_{CC1}$	$0.5V_{CC0}$	$V_{OL} + 0.15 V$	$V_{OH} - 0.15 V$
3.0 V to 3.6 V	$0.5V_{CC1}$	$0.5V_{CC0}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$

[1] V_{CC1} is the supply voltage associated with the data input port.

[2] V_{CC0} is the supply voltage associated with the output port.

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



Test data is given in [Table 16](#).

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = termination resistance should be equal to output impedance Z_o of the pulse generator.

V_{EXT} = External voltage for measuring switching times.

Fig. 6. Test circuit for measuring switching times

Table 16. Test data

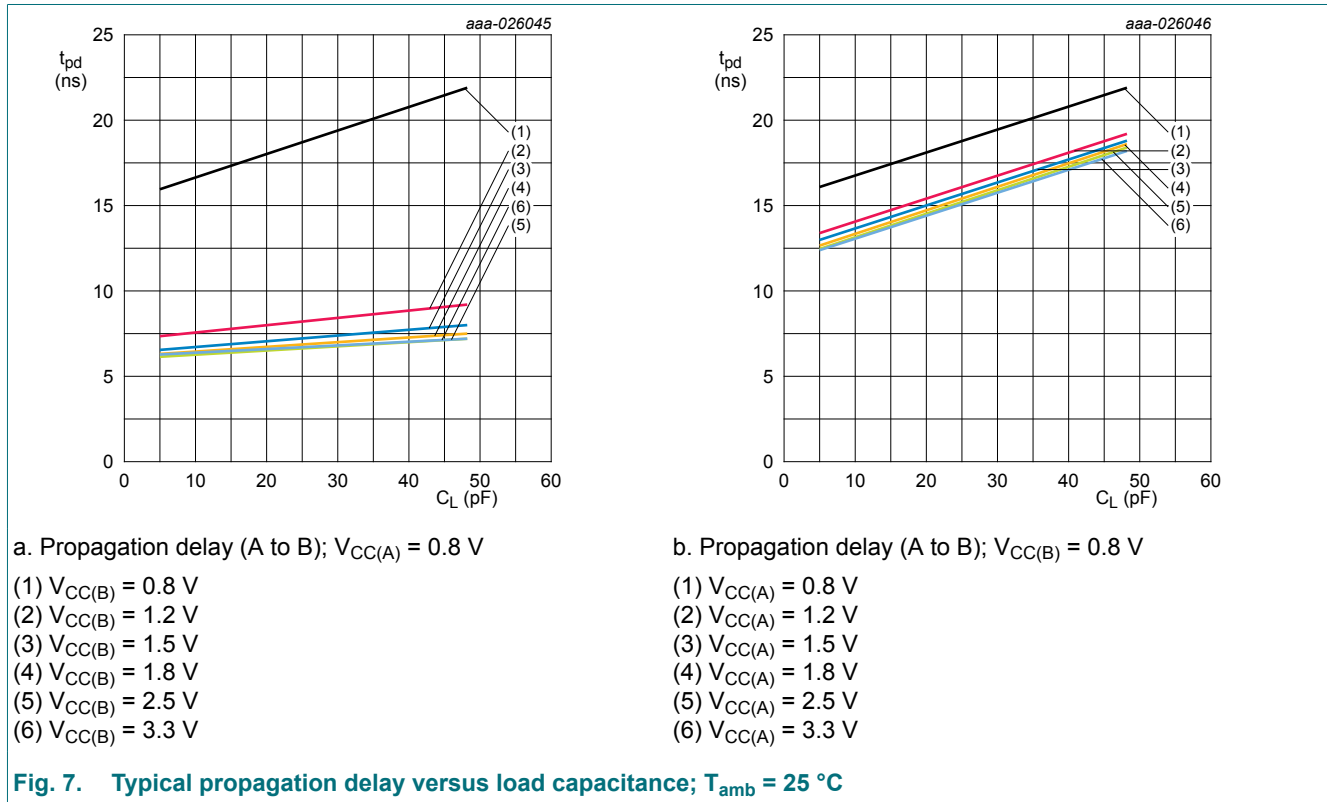
Supply voltage	Input		Load		V_{EXT}		
$V_{CC(A)}, V_{CC(B)}$	V_I [1]	$\Delta t/\Delta V$ [2]	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} [3]
0.8 V to 1.6 V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 k Ω	open	GND	$2V_{CCO}$
1.65 V to 2.7 V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 k Ω	open	GND	$2V_{CCO}$
3.0 V to 3.6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

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

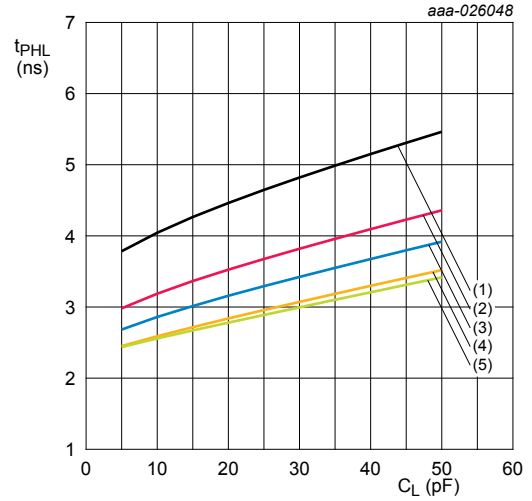
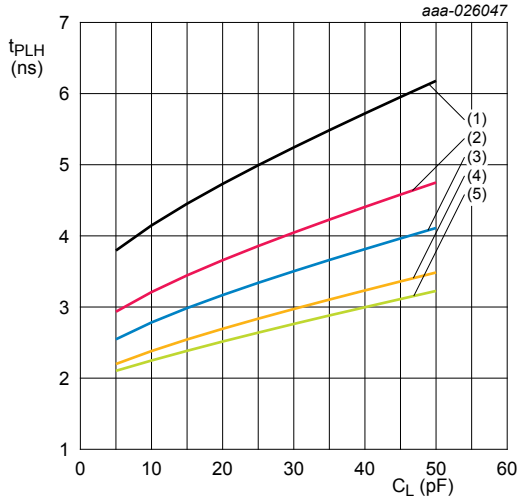
[2] $dV/dt \geq 1.0$ V/ns

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

12. Typical propagation delay characteristics

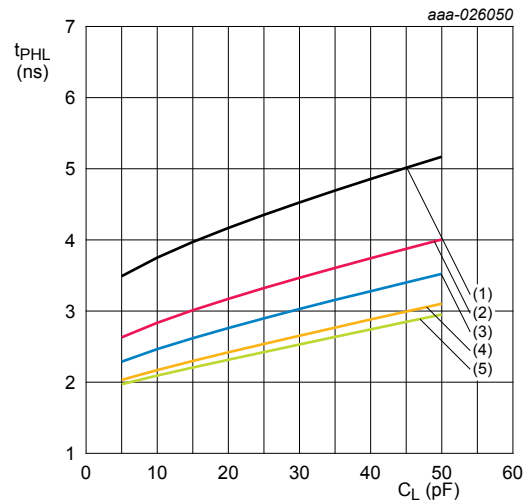
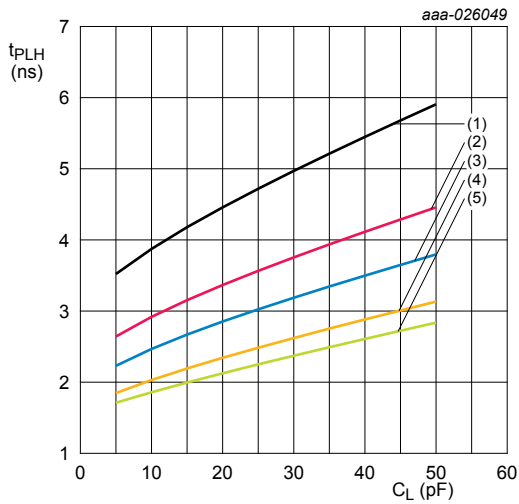


2-bit dual supply translating transceiver with configurable voltage translation; 3-state



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

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



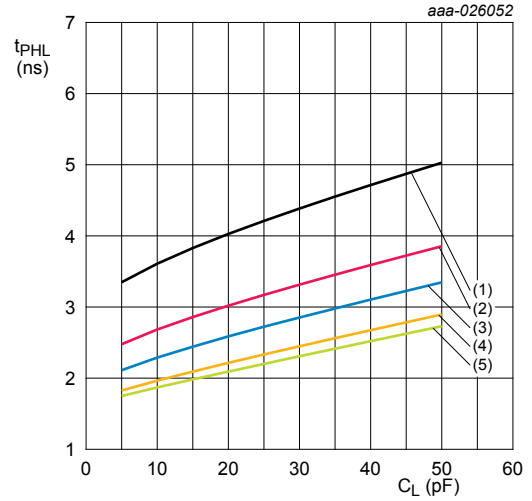
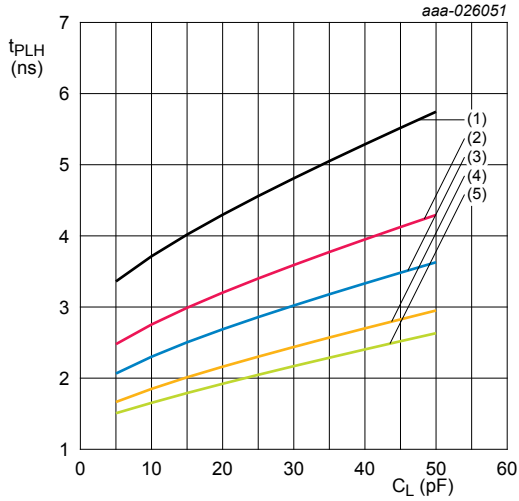
c. LOW to HIGH propagation delay (A to B); $V_{CC(A)} = 1.5\text{ V}$

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

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

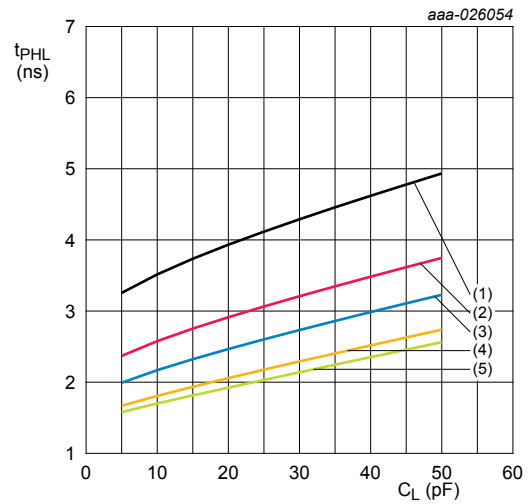
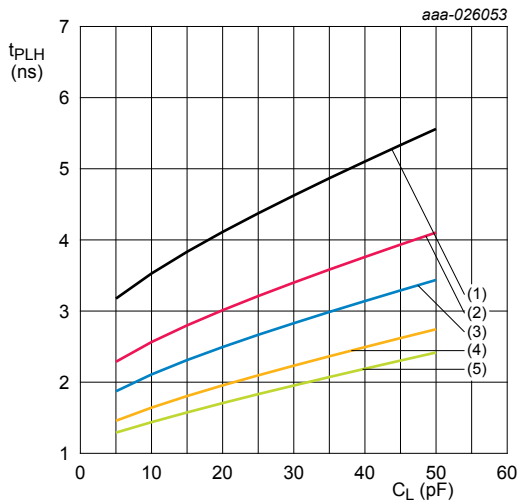
Fig. 8. Typical propagation delay versus load capacitance; $T_{amb} = 25\text{ °C}$

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



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

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



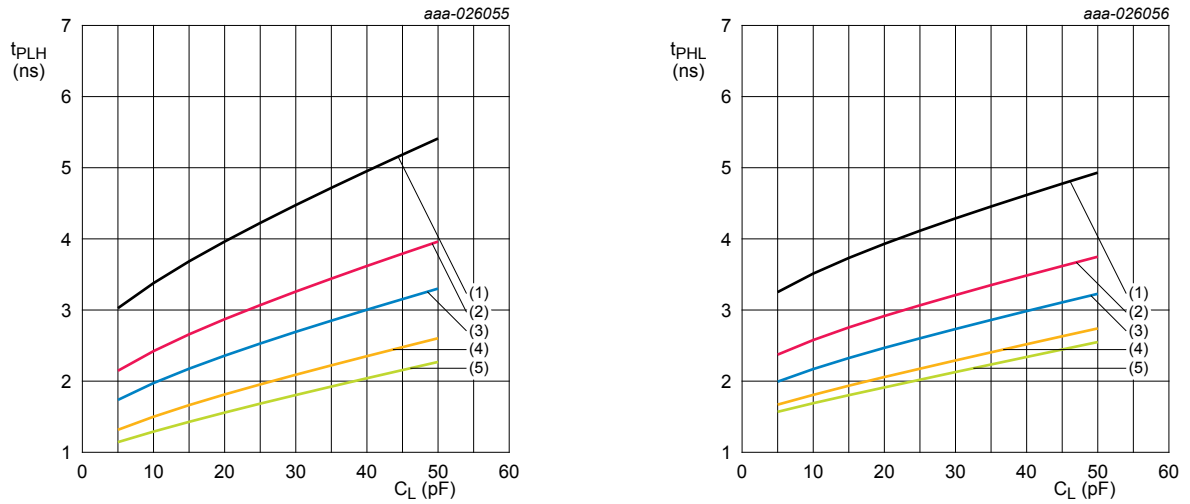
c. LOW to HIGH propagation delay (A to B); $V_{CC(A)} = 2.5\text{ V}$

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

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

Fig. 9. Typical propagation delay versus load capacitance; $T_{amb} = 25\text{ °C}$

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



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

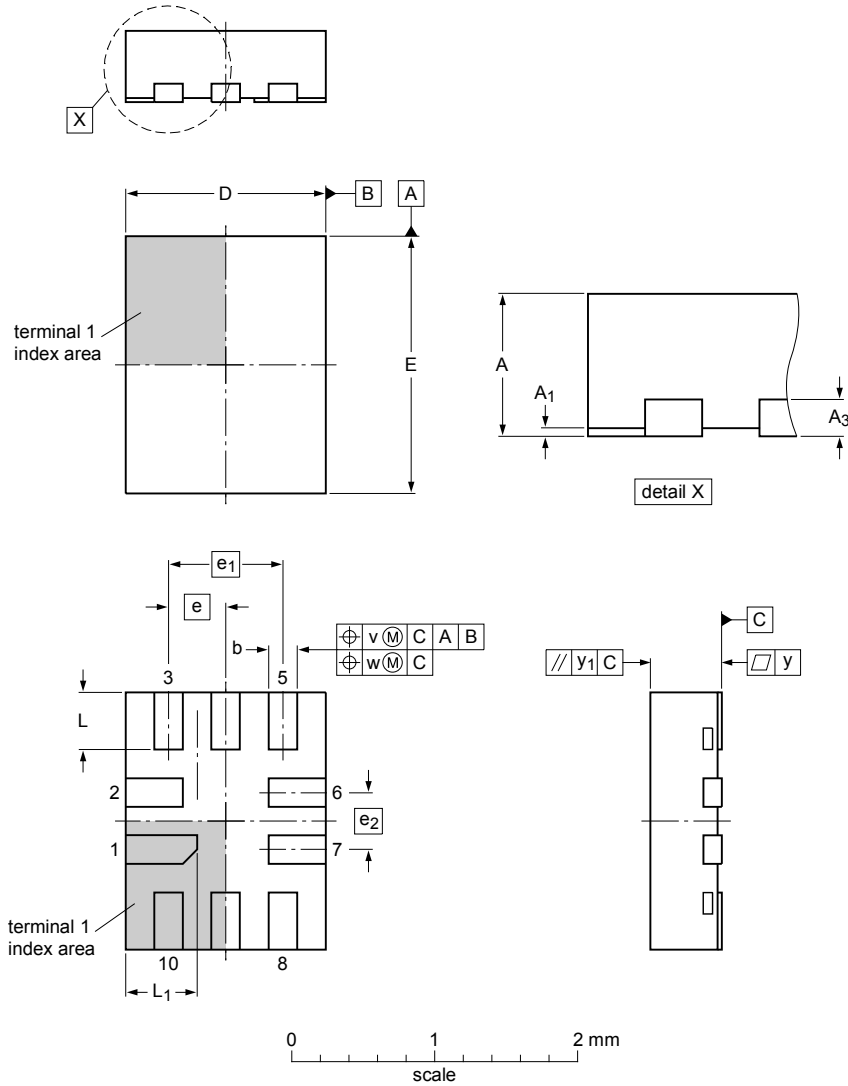
- (1) $V_{CC(B)} = 1.2\text{ V}$
- (2) $V_{CC(B)} = 1.5\text{ V}$
- (3) $V_{CC(B)} = 1.8\text{ V}$
- (4) $V_{CC(B)} = 2.5\text{ V}$
- (5) $V_{CC(B)} = 3.3\text{ V}$

Fig. 10. Typical propagation delay versus load capacitance; $T_{amb} = 25\text{ °C}$

13. Package outline

XQFN10: plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 x 1.80 x 0.50 mm

SOT1160-1



Dimensions

Unit ⁽¹⁾	A	A ₁	A ₃	b	D	E	e	e ₁	e ₂	L	L ₁	v	w	y	y ₁
mm	max 0.5	0.05		0.25	1.5	1.9				0.45	0.55				
	nom		0.127	0.20	1.4	1.8	0.4	0.8	0.4	0.40	0.50	0.1	0.05	0.05	0.05
	min	0.00		0.15	1.3	1.7				0.35	0.45				

Note

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

sot1160-1_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT1160-1	---	---	---		09-12-28 09-12-29

Fig. 11. Package outline SOT1160-1 (XQFN10)

14. Abbreviations

Table 17. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model

15. Revision history

Table 18. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVC2T245_Q100 v.1	20190614	Product data sheet	-	-

16. Legal information

Data sheet status

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

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