

# 74AVC4T774PW

## 4-bit dual supply translating transceiver; 3-state

Rev. 1 — 25 September 2017

Product data sheet

## 1 General description

The 74AVC4T774PW is a 4-bit, dual supply transceiver that enables bidirectional level translation. It features eight 1-bit input-output ports ( $A_n$  and  $B_n$ ), four direction control inputs (DIR1, DIR2, DIR3 and DIR4), 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 1.95 V for translating between the 0.8 V, 1.2 V, 1.5 V and 1.8 V supply voltage nodes or 1.1 V to 3.6 V for translating between the 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V supply voltage nodes. Pins  $A_n$ ,  $\overline{OE}$  and DIRn are referenced to  $V_{CC(A)}$  and pins  $B_n$  are referenced to  $V_{CC(B)}$ . A HIGH on DIRn allows transmission from  $A_n$  to  $B_n$  and a LOW on DIRn allows transmission from  $B_n$  to  $A_n$ . 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  $A_n$  and  $B_n$  are in the high-impedance OFF-state.

## 2 Features and benefits

- Wide supply voltage range:
  - $V_{CC(A)}$  and  $V_{CC(B)}$ : 0.8 V to 1.95 V or 1.1 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 1500 V
- Maximum data rates:
  - 380 Mbit/s ( $\geq 1.8$  V to 3.3 V translation)
  - 200 Mbit/s ( $\geq 1.1$  V to 3.3 V translation)
  - 200 Mbit/s ( $\geq 1.1$  V to 2.5 V translation)
  - 200 Mbit/s ( $\geq 1.1$  V to 1.8 V translation)
  - 150 Mbit/s ( $\geq 1.1$  V to 1.5 V translation)
  - 100 Mbit/s ( $\geq 1.1$  V to 1.2 V translation)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- $I_{OFF}$  circuitry provides partial Power-down mode operation

- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3 Ordering information

Table 1. Ordering information

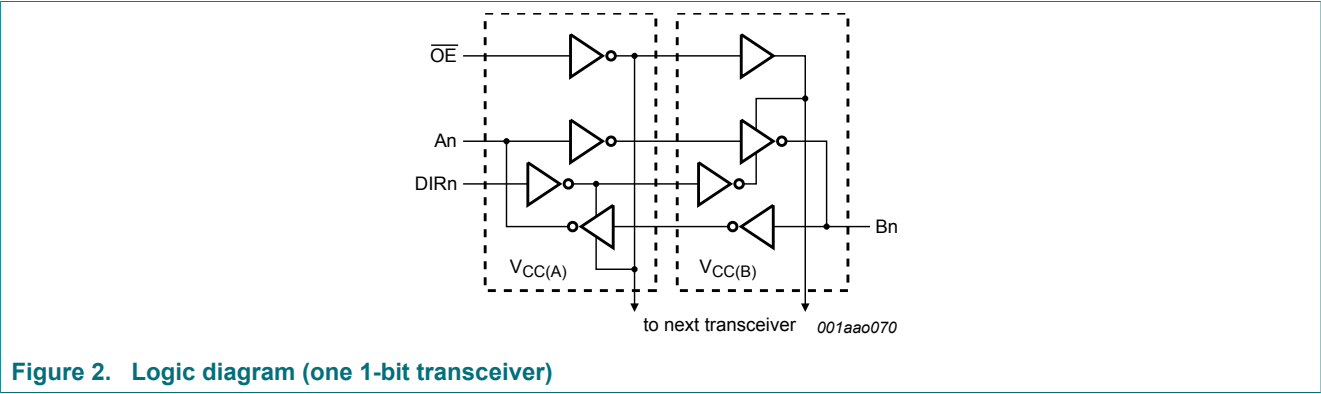
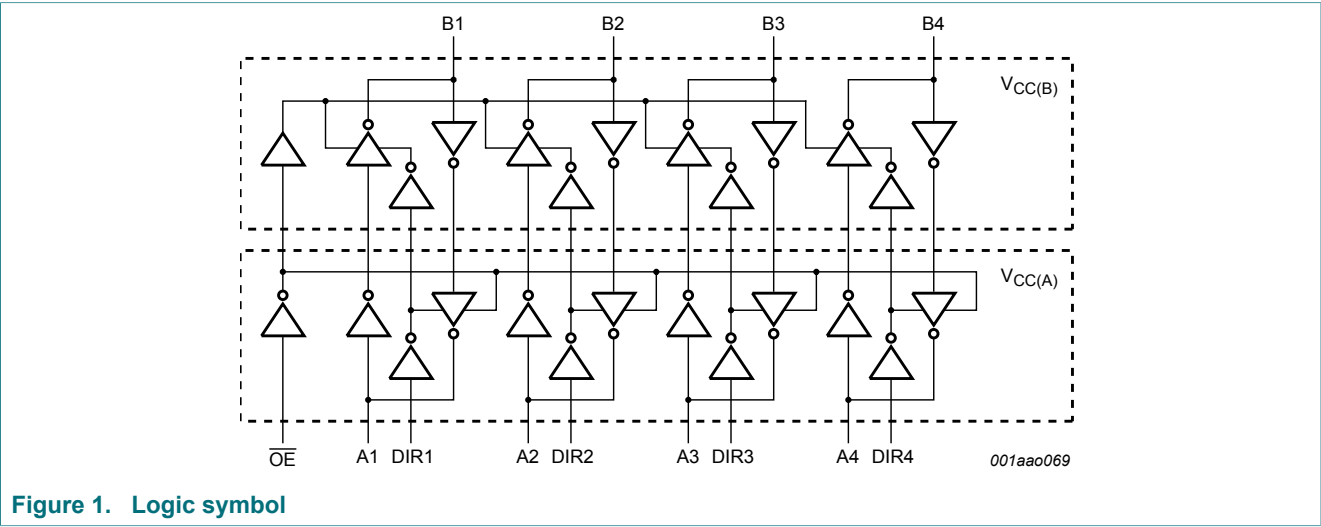
Type number	Package			
	Temperature range	Name	Description	Version
74AVC4T774PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

4 Marking

Table 2. Marking codes

Type number	Marking code
74AVC4T774PW	VC4T774

5 Functional diagram



6 Pinning information

6.1 Pinning

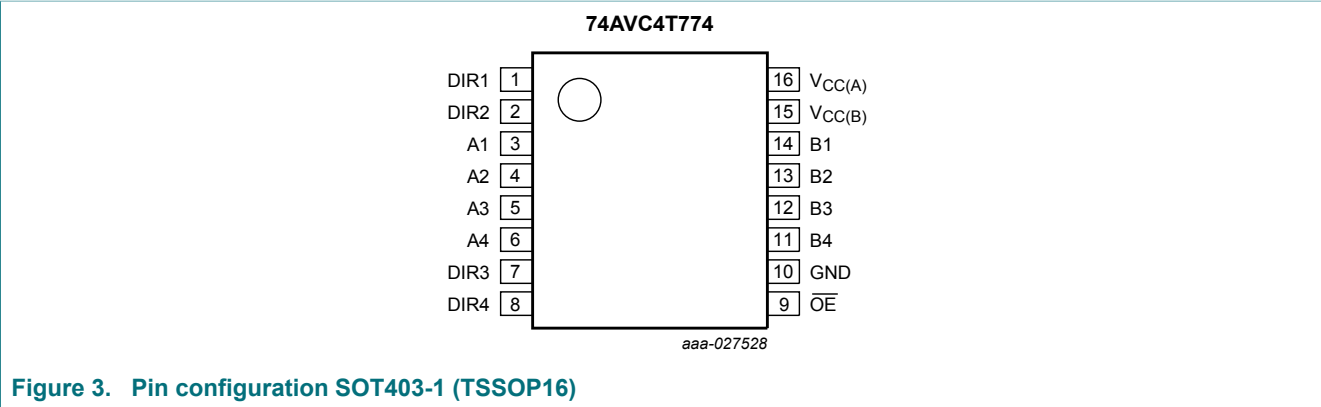


Figure 3. Pin configuration SOT403-1 (TSSOP16)

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
V <sub>CC</sub> (A)	16	supply voltage A (An, $\overline{\text{OE}}$ and DIRn inputs are referenced to V <sub>CC</sub> (A))
DIR1, DIR2, DIR3, DIR4	1, 2, 7, 8	direction control input
A1, A2, A3, A4	3, 4, 5, 6	data input or output
GND	10	ground (0 V)
B1, B2, B3, B4	14, 13, 12, 11	data input or output
$\overline{\text{OE}}$	9	output enable input (active LOW)
V <sub>CC</sub> (B)	15	supply voltage B (Bn pins are referenced to V <sub>CC</sub> (B))

## 7 Functional description

Table 4. Function table <sup>[1] [2]</sup>

Supply voltage	Input					Input/output	
$V_{CC(A)}, V_{CC(B)}$	$\overline{OE}$	DIR1	DIR2	DIR3	DIR4	An	Bn
0.8 V to 3.6 V	L	L	X	X	X	A1 = B1	input B1
0.8 V to 3.6 V	L	H	X	X	X	input A1	B1 = A1
0.8 V to 3.6 V	L	X	L	X	X	A2 = B2	input B2
0.8 V to 3.6 V	L	X	H	X	X	input A2	B2 = A2
0.8 V to 3.6 V	L	X	X	L	X	A3 = B3	input B3
0.8 V to 3.6 V	L	X	X	H	X	input A3	B3 = A3
0.8 V to 3.6 V	L	X	X	X	L	A4 = B4	input B4
0.8 V to 3.6 V	L	X	X	X	H	input A4	B4 = A4
0.8 V to 3.6 V	H	X	X	X	X	Z	Z
GND <sup>[3]</sup>	X	X	X	X	X	Z	Z

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

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

[3] 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	<sup>[1]</sup>	-0.5	+4.6	V
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$V_O$	output voltage	Active mode <sup>[1] [2] [3]</sup>	-0.5	$V_{CCO} + 0.5$	V
		Suspend or 3-state mode <sup>[1]</sup>	-0.5	+4.6	V
$I_O$	output current	$V_O = 0$ V to $V_{CCO}$ <sup>[2]</sup>	-	±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 <sup>[4]</sup>	-	500	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 TSSOP16 package: above 60 °C the value of  $P_{tot}$  derates linearly at 5.5 mW/K.

## 9 Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage A		0.8	3.6	V
$V_{CC(B)}$	supply voltage B		0.8	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	Active mode <sup>[1]</sup>	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	$V_{CCI} = 0.8 \text{ V to } 3.6 \text{ V}$ <sup>[2]</sup>	-	10	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  $T_{amb} = 25 \text{ °C}$  <sup>[1]</sup> <sup>[2]</sup>

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	$V_I = V_{IH} \text{ or } V_{IL}$				
		$I_O = -1.5 \text{ mA}; V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$	-	0.69	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$				
		$I_O = 1.5 \text{ mA}; V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V}$	-	0.07	-	V
$I_I$	input leakage current	DIRn, $\overline{OE}$ input; $V_I = 0 \text{ V or } 3.6 \text{ V}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	$\pm 0.025$	$\pm 0.25$	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	A or B port; $V_O = 0 \text{ V or } V_{CCO}$ ; $V_{CC(A)} = V_{CC(B)} = 3.6 \text{ V}$ <sup>[3]</sup>	-	$\pm 0.5$	$\pm 2.5$	$\mu\text{A}$
		suspend mode A port; $V_O = 0 \text{ V or } V_{CCO}$ ; $V_{CC(A)} = 3.6 \text{ V}; V_{CC(B)} = 0 \text{ V}$ <sup>[3]</sup>	-	$\pm 0.5$	$\pm 2.5$	$\mu\text{A}$
		suspend mode B port; $V_O = 0 \text{ V or } V_{CCO}$ ; $V_{CC(A)} = 0 \text{ V}; V_{CC(B)} = 3.6 \text{ V}$ <sup>[3]</sup>	-	$\pm 0.5$	$\pm 2.5$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	A port; $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}$ ; $V_{CC(A)} = 0 \text{ V}$ ; $V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
		B port; $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}$ ; $V_{CC(B)} = 0 \text{ V}$ ; $V_{CC(A)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
$C_I$	input capacitance	DIRn, $\overline{OE}$ input; $V_I = 0 \text{ V or } 3.3 \text{ V}$ ; $V_{CC(A)} = V_{CC(B)} = 3.3 \text{ V}$	-	2.0	-	pF
$C_{I/O}$	input/output capacitance	A and B port; $V_O = 3.3 \text{ V or } 0 \text{ V}$ ; $V_{CC(A)} = V_{CC(B)} = 3.3 \text{ V}$	-	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.

Table 8. Static characteristics <sup>[1] [2]</sup>

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 <sub>IH</sub>	HIGH-level input voltage	data input					
		V <sub>CCI</sub> = 0.8 V	0.70V <sub>CCI</sub>	-	0.70V <sub>CCI</sub>	-	V
		V <sub>CCI</sub> = 1.1 V to 1.95 V	0.65V <sub>CCI</sub>	-	0.65V <sub>CCI</sub>	-	V
		V <sub>CCI</sub> = 2.3 V to 2.7 V	1.6	-	1.6	-	V
		V <sub>CCI</sub> = 3.0 V to 3.6 V	2	-	2	-	V
		DIRn, $\overline{\text{OE}}$ input					
		V <sub>CC(A)</sub> = 0.8 V	0.70V <sub>CC(A)</sub>	-	0.70V <sub>CC(A)</sub>	-	V
		V <sub>CC(A)</sub> = 1.1 V to 1.95 V	0.65V <sub>CC(A)</sub>	-	0.65V <sub>CC(A)</sub>	-	V
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V	1.6	-	1.6	-	V
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V	2	-	2	-	V
V <sub>IL</sub>	LOW-level input voltage	data input					
		V <sub>CCI</sub> = 0.8 V	-	0.30V <sub>CCI</sub>	-	0.30V <sub>CCI</sub>	V
		V <sub>CCI</sub> = 1.1 V to 1.95 V	-	0.35V <sub>CCI</sub>	-	0.35V <sub>CCI</sub>	V
		V <sub>CCI</sub> = 2.3 V to 2.7 V	-	0.7	-	0.7	V
		V <sub>CCI</sub> = 3.0 V to 3.6 V	-	0.8	-	0.8	V
		DIRn, $\overline{\text{OE}}$ input					
		V <sub>CC(A)</sub> = 0.8 V	-	0.30V <sub>CC(A)</sub>	-	0.30V <sub>CC(A)</sub>	V
		V <sub>CC(A)</sub> = 1.1 V to 1.95 V	-	0.35V <sub>CC(A)</sub>	-	0.35V <sub>CC(A)</sub>	V
		V <sub>CC(A)</sub> = 2.3 V to 2.7 V	-	0.7	-	0.7	V
		V <sub>CC(A)</sub> = 3.0 V to 3.6 V	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>					
		I <sub>O</sub> = -100 µA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V	V <sub>CCO</sub> - 0.1	-	V <sub>CCO</sub> - 0.1	-	V
		I <sub>O</sub> = -3 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.1 V	0.85	-	0.85	-	V
		I <sub>O</sub> = -6 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V	1.05	-	1.05	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V	1.2	-	1.2	-	V
		I <sub>O</sub> = -9 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V	1.75	-	1.75	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V	2.3	-	2.3	-	V

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>					
		I <sub>O</sub> = 100 µA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V	-	0.1	-	0.1	V
		I <sub>O</sub> = 3 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.1 V	-	0.25	-	0.25	V
		I <sub>O</sub> = 6 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.4 V	-	0.35	-	0.35	V
		I <sub>O</sub> = 8 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 1.65 V	-	0.45	-	0.45	V
		I <sub>O</sub> = 9 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 2.3 V	-	0.55	-	0.55	V
		I <sub>O</sub> = 12 mA; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.0 V	-	0.7	-	0.7	V
I <sub>I</sub>	input leakage current	DIRn, $\overline{\text{OE}}$ input; V <sub>I</sub> = 0 V or 3.6 V; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 0.8 V to 3.6 V	-	±1	-	±5	µA
I <sub>OZ</sub>	OFF-state output current	A or B port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = V <sub>CC(B)</sub> = 3.6 V <sup>[3]</sup>	-	±5	-	±30	µA
		suspend mode A port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 3.6 V; V <sub>CC(B)</sub> = 0 V <sup>[3]</sup>	-	±5	-	±30	µA
		suspend mode B port; V <sub>O</sub> = 0 V or V <sub>CCO</sub> ; V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 3.6 V <sup>[3]</sup>	-	±5	-	±30	µA
I <sub>OFF</sub>	power-off leakage current	A port; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC(A)</sub> = 0 V; V <sub>CC(B)</sub> = 0.8 V to 3.6 V	-	±5	-	±30	µA
		B port; V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC(B)</sub> = 0 V; V <sub>CC(A)</sub> = 0.8 V to 3.6 V	-	±5	-	±30	µA

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
$I_{CC}$	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	$\mu$ A
		$V_{CC(A)} = 1.1$ V to $3.6$ V; $V_{CC(B)} = 1.1$ V to $3.6$ V	-	8	-	50	$\mu$ A
		$V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V	-	8	-	50	$\mu$ A
		$V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V	-2	-	-12	-	$\mu$ A
		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	$\mu$ A
		$V_{CC(A)} = 1.1$ V to $3.6$ V; $V_{CC(B)} = 1.1$ V to $3.6$ V	-	8	-	50	$\mu$ A
		$V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V	-2	-	-12	-	$\mu$ A
		$V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V	-	8	-	50	$\mu$ A
		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	$\mu$ A
		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	$\mu$ A
$\Delta I_{CC}$	additional supply current	$V_I = 3.0$ V; $V_{CC(A)} = V_{CC(B)} = 3.6$ V	-	500	-	650	$\mu$ A

[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	$\mu$ A
0.8 V	0.1	0.1	0.1	0.1	0.1	0.3	1.6	$\mu$ A
1.2 V	0.1	0.1	0.1	0.1	0.1	0.1	0.8	$\mu$ A
1.5 V	0.1	0.1	0.1	0.1	0.1	0.1	0.4	$\mu$ A
1.8 V	0.1	0.1	0.1	0.1	0.1	0.1	0.2	$\mu$ A
2.5 V	0.1	0.3	0.1	0.1	0.1	0.1	0.1	$\mu$ A
3.3 V	0.1	1.6	0.8	0.4	0.2	0.1	0.1	$\mu$ A



## 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	0.4	pF
		A port: (direction An to Bn); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		A port: (direction Bn to An); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		A port: (direction Bn to An); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction An to Bn); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		B port: (direction An to Bn); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction Bn to An); output enabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		B port: (direction Bn to An); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF

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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

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

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

**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 [Figure 6](#); for waveforms see [Figure 4](#) and [Figure 5](#)

Symbol	Parameter	Conditions	$V_{CC(B)}$				Unit
			0.8 V	1.2 V	1.5 V	1.8 V	
$t_{pd}$	propagation delay	An to Bn	14.5	7.3	6.5	6.2	ns
		Bn to An	14.5	12.7	12.4	12.3	ns
$t_{dis}$	disable time	$\overline{OE}$ to An	14.3	14.3	14.3	14.3	ns
		$\overline{OE}$ to Bn	17.0	9.9	9.0	9.4	ns
$t_{en}$	enable time	$\overline{OE}$ to An	18.2	18.2	18.2	18.2	ns
		$\overline{OE}$ to Bn	19.2	10.7	9.8	9.6	ns

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

**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 [Figure 6](#); for waveforms see [Figure 4](#) and [Figure 5](#)

Symbol	Parameter	Conditions	$V_{CC(A)}$				Unit
			0.8 V	1.2 V	1.5 V	1.8 V	
$t_{pd}$	propagation delay	An to Bn	14.5	12.7	12.4	12.3	ns
		Bn to An	14.5	7.3	6.5	6.2	ns
$t_{dis}$	disable time	$\overline{OE}$ to An	14.3	5.5	4.1	4.0	ns
		$\overline{OE}$ to Bn	17.0	13.8	13.4	13.1	ns
$t_{en}$	enable time	$\overline{OE}$ to An	18.2	5.6	4.0	3.2	ns
		$\overline{OE}$ to Bn	19.2	14.6	14.1	13.9	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  $t_{PZH}$ .

**Table 13. Dynamic characteristics for temperature range -40 °C to +85 °C <sup>[1]</sup>**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#); for waveforms see [Figure 4](#) and [Figure 5](#)

Symbol	Parameter	Conditions	V <sub>CC(B)</sub>										Unit
			1.2 V ±0.1 V		1.5 V ±0.1 V		1.8 V ±0.15 V		2.5 V ±0.2 V		3.3 V ±0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>CC(A)</sub> = 1.1 V to 1.3 V													
t <sub>pd</sub>	propagation delay	An to Bn	2.0	10.5	1.3	7.8	1.2	6.9	1.0	5.9	0.8	5.7	ns
		Bn to An	2.0	10.5	1.5	9.9	1.5	9.7	1.4	9.4	1.4	9.3	ns
t <sub>dis</sub>	disable time	OE to An	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	ns
		OE to Bn	2.0	11.1	2.0	8.6	1.0	8.0	0.7	7.0	1.0	8.0	ns
t <sub>en</sub>	enable time	OE to An	2.0	13.5	2.0	13.5	2.0	13.5	2.0	13.5	2.0	13.5	ns
		OE to Bn	2.0	15.0	2.0	11.0	2.0	9.4	1.0	7.8	1.0	7.4	ns
V <sub>CC(A)</sub> = 1.4 V to 1.6 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.5	9.9	1.0	7.1	1.0	6.0	0.5	4.8	0.5	4.3	ns
		Bn to An	1.3	7.8	1.0	7.1	0.9	6.9	0.8	6.6	0.6	6.5	ns
t <sub>dis</sub>	disable time	OE to An	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	ns
		OE to Bn	2.0	10.2	1.5	7.5	0.9	7.2	0.4	6.2	0.4	6.1	ns
t <sub>en</sub>	enable time	OE to An	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	ns
		OE to Bn	2.0	14.4	1.4	7.9	1.3	7.7	1.1	6.4	1.1	5.6	ns
V <sub>CC(A)</sub> = 1.65 V to 1.95 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.5	9.7	0.9	6.9	0.8	5.7	0.5	4.5	0.3	4.0	ns
		Bn to An	1.2	6.9	1.0	6.0	0.8	5.7	0.5	5.5	0.5	5.3	ns
t <sub>dis</sub>	disable time	OE to An	0.5	5.7	0.5	5.7	0.5	5.7	0.5	5.7	0.5	5.7	ns
		OE to Bn	2.0	9.9	1.5	7.0	0.8	6.9	0.2	5.8	0.2	5.9	ns
t <sub>en</sub>	enable time	OE to An	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	ns
		OE to Bn	1.5	13.9	1.2	7.2	1.2	6.9	0.8	5.4	0.6	5.0	ns
V <sub>CC(A)</sub> = 2.3 V to 2.7 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.4	9.4	0.8	6.6	0.5	5.5	0.4	4.2	0.2	3.7	ns
		Bn to An	1.0	5.9	0.5	4.8	0.5	4.5	0.4	4.2	0.3	3.9	ns
t <sub>dis</sub>	disable time	OE to An	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	ns
		OE to Bn	2.0	9.3	1.5	6.7	0.7	6.3	0.2	5.0	0.2	5.7	ns
t <sub>en</sub>	enable time	OE to An	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	ns
		OE to Bn	1.5	13.6	1.0	6.8	1.0	6.0	0.8	4.6	0.6	4.2	ns

Symbol	Parameter	Conditions	V <sub>CC(B)</sub>										Unit
			1.2 V ±0.1 V		1.5 V ±0.1 V		1.8 V ±0.15 V		2.5 V ±0.2 V		3.3 V ±0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>CC(A)</sub> = 3.0 V to 3.6 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.4	9.3	0.6	6.5	0.5	5.3	0.3	3.9	0.2	3.5	ns
		Bn to An	0.8	5.7	0.5	4.3	0.3	4.0	0.2	3.7	0.2	3.5	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to An	0.2	4.5	0.2	4.5	0.2	4.5	0.2	4.5	0.2	4.5	ns
		$\overline{\text{OE}}$ to Bn	2.0	9.0	1.5	6.4	0.7	6.1	0.2	4.8	0.2	5.6	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to An	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	ns
		$\overline{\text{OE}}$ to Bn	1.5	13.4	1.0	6.7	1.0	5.9	0.7	4.4	0.5	4.0	ns

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

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

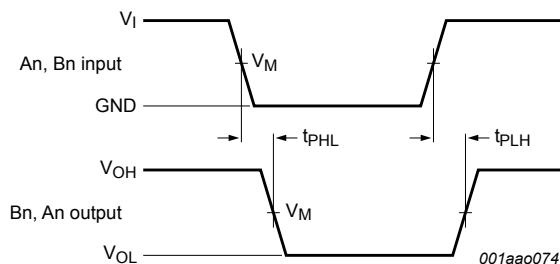
Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#); for waveforms see [Figure 4](#) and [Figure 5](#)

Symbol	Parameter	Conditions	V <sub>CC(B)</sub>										Unit
			1.2 V ±0.1 V		1.5 V ±0.1 V		1.8 V ±0.15 V		2.5 V ±0.2 V		3.3 V ±0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>CC(A)</sub> = 1.1 V to 1.3 V													
t <sub>pd</sub>	propagation delay	An to Bn	2.0	12.1	1.3	9.0	1.2	8.0	1.0	6.8	0.8	6.6	ns
		Bn to An	2.0	12.1	1.5	11.4	1.5	11.2	1.4	10.9	1.4	10.7	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to An	2.0	11.5	2.0	11.5	2.0	11.5	2.0	11.5	2.0	11.5	ns
		$\overline{\text{OE}}$ to Bn	2.0	12.8	2.0	9.9	1.0	9.2	0.7	8.1	1.0	9.2	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to An	2.0	15.6	2.0	15.6	2.0	15.6	2.0	15.6	2.0	15.6	ns
		$\overline{\text{OE}}$ to Bn	2.0	17.3	2.0	12.7	2.0	10.9	1.0	9.0	1.0	8.6	ns
V <sub>CC(A)</sub> = 1.4 V to 1.6 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.5	11.4	1.0	8.2	1.0	6.9	0.5	5.6	0.5	5.0	ns
		Bn to An	1.3	9.0	1.0	8.2	0.9	8.0	0.8	7.6	0.6	7.5	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to An	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	ns
		$\overline{\text{OE}}$ to Bn	2.0	11.8	1.5	8.7	0.9	8.3	0.4	7.2	0.4	7.1	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to An	1.0	8.7	1.0	8.7	1.0	8.7	1.0	8.7	1.0	8.7	ns
		$\overline{\text{OE}}$ to Bn	2.0	16.6	1.4	9.1	1.3	8.9	1.1	7.4	1.1	6.5	ns

Symbol	Parameter	Conditions	V <sub>CC(B)</sub>										Unit
			1.2 V ±0.1 V		1.5 V ±0.1 V		1.8 V ±0.15 V		2.5 V ±0.2 V		3.3 V ±0.3 V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>CC(A)</sub> = 1.65 V to 1.95 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.5	11.2	0.9	8.0	0.8	6.6	0.5	5.2	0.3	4.6	ns
		Bn to An	1.2	8.0	1.0	6.9	0.8	6.6	0.5	6.4	0.5	6.1	ns
t <sub>dis</sub>	disable time	OE to An	0.5	6.6	0.5	6.6	0.5	6.6	0.5	6.6	0.5	6.6	ns
		OE to Bn	2.0	11.4	1.5	8.1	0.8	8.0	0.2	6.7	0.2	6.8	ns
t <sub>en</sub>	enable time	OE to An	1.0	7.8	1.0	7.8	1.0	7.8	1.0	7.8	1.0	7.8	ns
		OE to Bn	1.5	16.0	1.2	8.3	1.2	8.0	0.8	6.3	0.6	5.8	ns
V <sub>CC(A)</sub> = 2.3 V to 2.7 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.4	10.9	0.8	7.6	0.5	6.4	0.4	4.9	0.2	4.3	ns
		Bn to An	1.0	6.8	0.5	5.6	0.5	5.2	0.4	4.9	0.3	4.5	ns
t <sub>dis</sub>	disable time	OE to An	0.2	4.6	0.2	4.6	0.2	4.6	0.2	4.6	0.2	4.6	ns
		OE to Bn	2.0	10.7	1.5	7.8	0.7	7.3	0.2	5.8	0.2	6.6	ns
t <sub>en</sub>	enable time	OE to An	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.2	ns
		OE to Bn	1.5	15.7	1.0	7.9	1.0	6.9	0.8	5.3	0.6	4.9	ns
V <sub>CC(A)</sub> = 3.0 V to 3.6 V													
t <sub>pd</sub>	propagation delay	An to Bn	1.4	10.7	0.6	7.5	0.5	6.1	0.3	4.5	0.2	4.1	ns
		Bn to An	0.8	6.6	0.5	5.0	0.3	4.6	0.2	4.3	0.2	4.1	ns
t <sub>dis</sub>	disable time	OE to An	0.2	5.2	0.2	5.2	0.2	5.2	0.2	5.2	0.2	5.2	ns
		OE to Bn	2.0	10.4	1.5	7.4	0.7	7.1	0.2	5.6	0.2	6.5	ns
t <sub>en</sub>	enable time	OE to An	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	ns
		OE to Bn	1.5	15.5	1.0	7.8	1.0	6.8	0.7	5.1	0.5	4.6	ns

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

## 11.1 Waveforms and test circuit



Measurement points are given in [Table 15](#).

V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

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

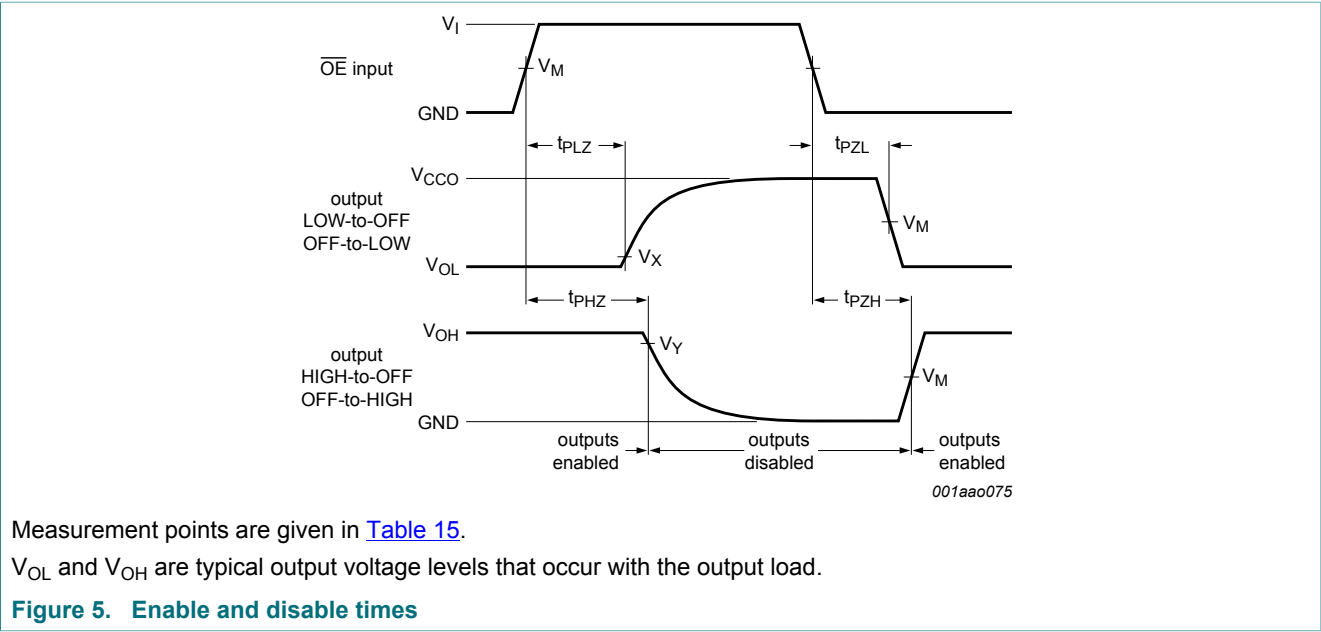
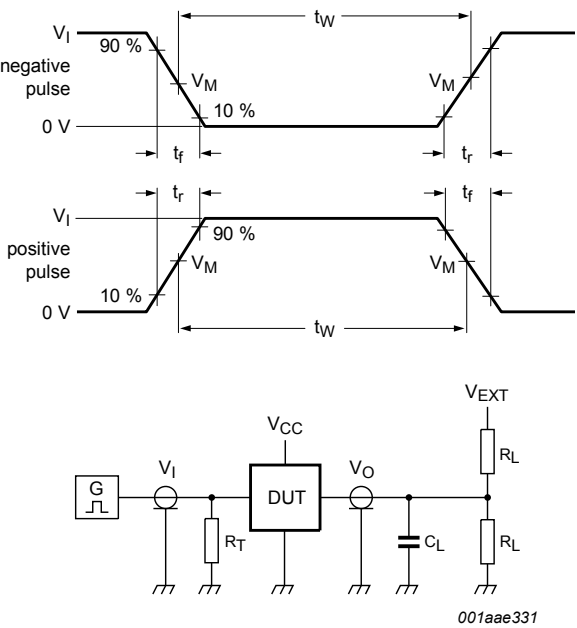


Table 15. Measurement points

Supply voltage	Input <sup>[1]</sup>	Output <sup>[2]</sup>		
$V_{CC(A)}, V_{CC(B)}$	$V_M$	$V_M$	$V_X$	$V_Y$
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.



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 the output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

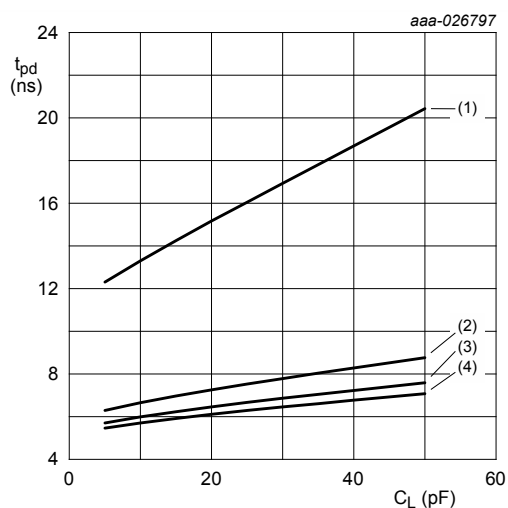
Figure 6. Test circuit for measuring switching times

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	$V_{CCI}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	$2V_{CCO}$
1.65 V to 2.7 V	$V_{CCI}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	$2V_{CCO}$
3.0 V to 3.6 V	$V_{CCI}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	$2V_{CCO}$

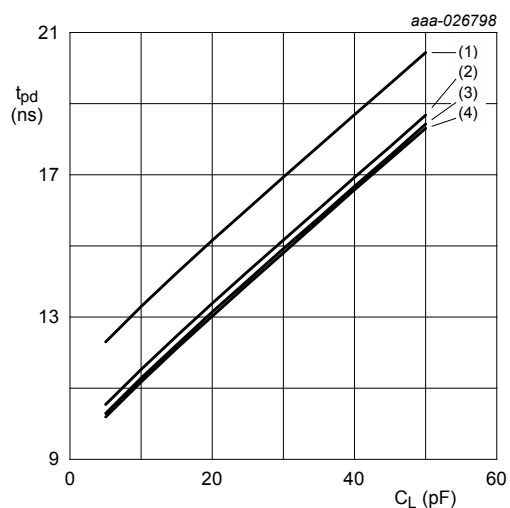
[1]  $V_{CCI}$  is the supply voltage associated with the data input port.  
[2]  $dV/dt \geq 1.0 \text{ V/ns}$   
[3]  $V_{CCO}$  is the supply voltage associated with the output port.

## 11.2 Typical propagation delay characteristics



a. Propagation delay (A to B);  $V_{CC(A)} = 0.8 \text{ V}$

- (1)  $V_{CC(B)} = 0.8 \text{ V}$
- (2)  $V_{CC(B)} = 1.2 \text{ V}$
- (3)  $V_{CC(B)} = 1.5 \text{ V}$
- (4)  $V_{CC(B)} = 1.8 \text{ V}$

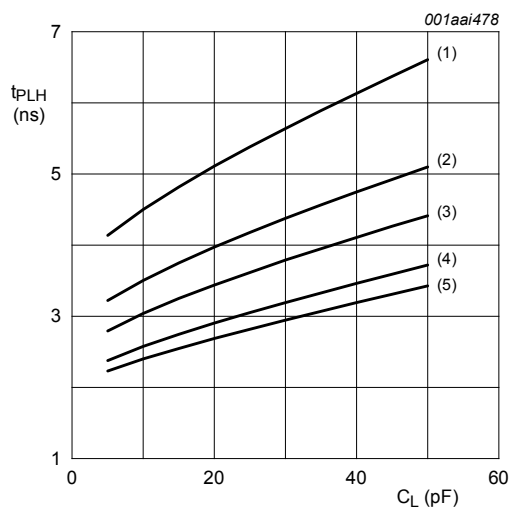
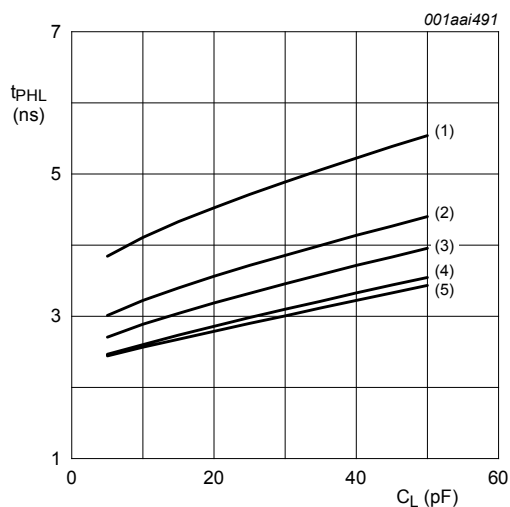
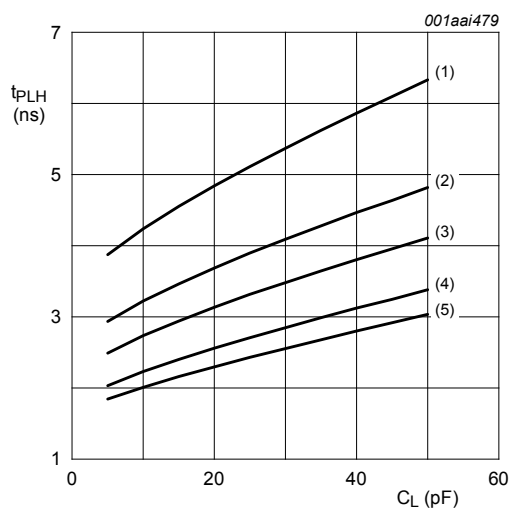
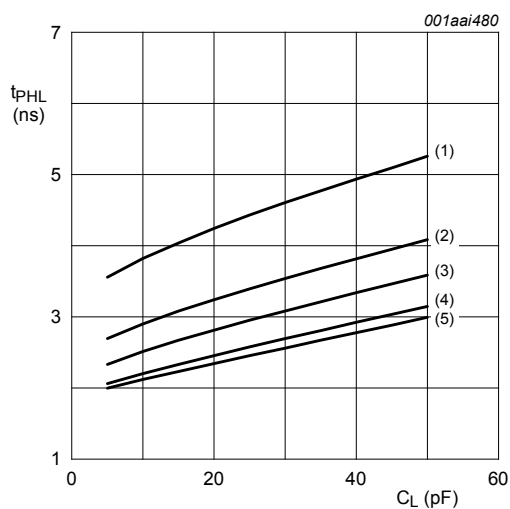


b. Propagation delay (A to B);  $V_{CC(B)} = 0.8 \text{ V}$

- (1)  $V_{CC(A)} = 0.8 \text{ V}$
- (2)  $V_{CC(A)} = 1.2 \text{ V}$
- (3)  $V_{CC(A)} = 1.5 \text{ V}$
- (4)  $V_{CC(A)} = 1.8 \text{ V}$

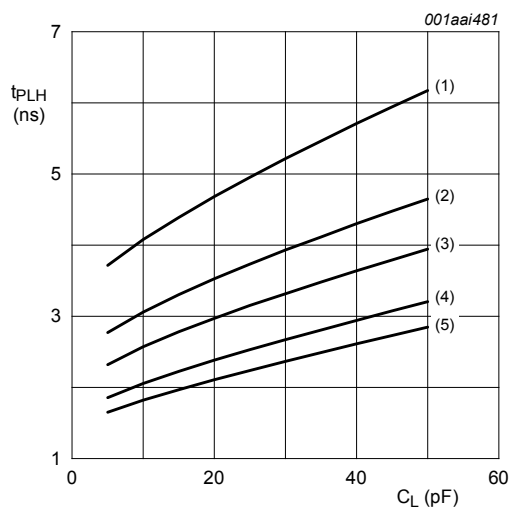
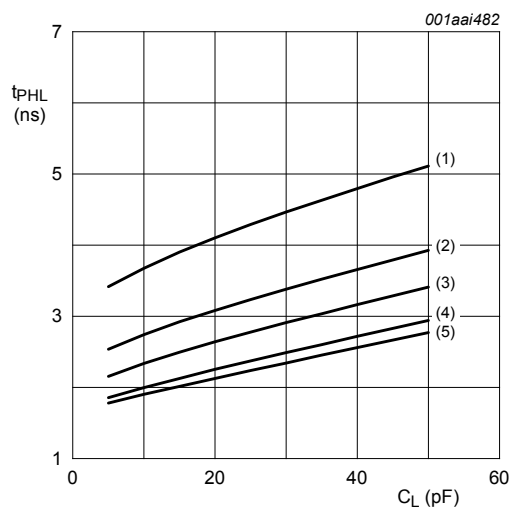
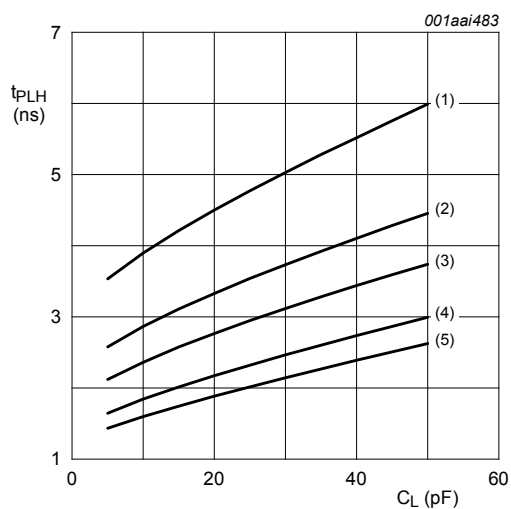
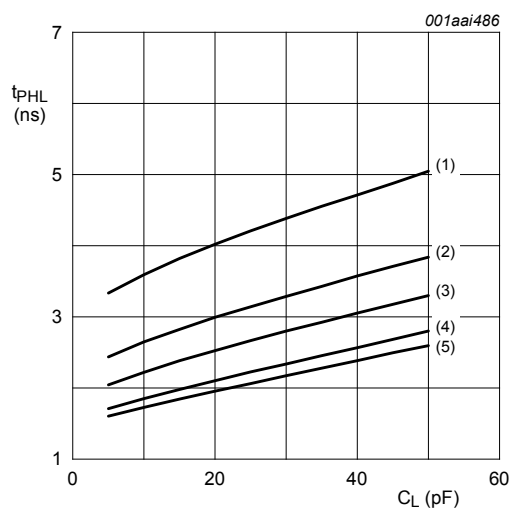
**Figure 7. Typical propagation delay versus load capacitance;  $T_{amb} = 25^\circ\text{C}$**



a. LOW to HIGH propagation delay (A to B);  $V_{CC(A)} = 1.2$  Vb. HIGH to LOW propagation delay (A to B);  $V_{CC(A)} = 1.2$  Vc. LOW to HIGH propagation delay (A to B);  $V_{CC(A)} = 1.5$  Vd. HIGH to LOW propagation delay (A to B);  $V_{CC(A)} = 1.5$  V

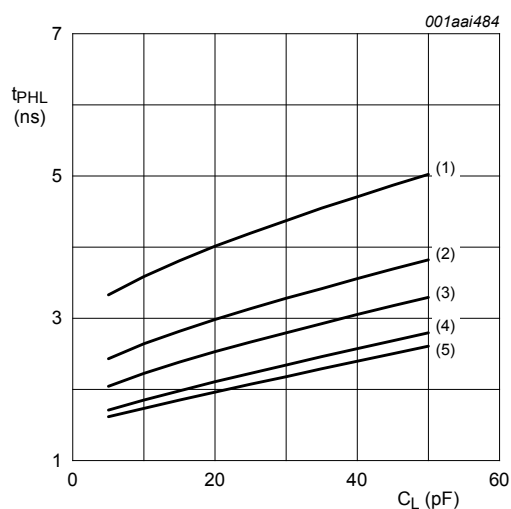
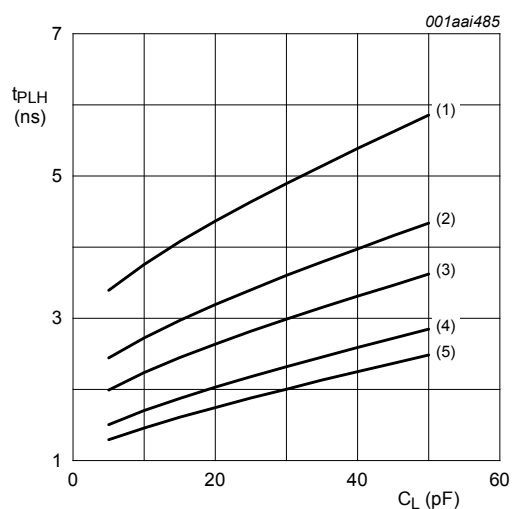
- (1)  $V_{CC(B)} = 1.2$  V  
 (2)  $V_{CC(B)} = 1.5$  V  
 (3)  $V_{CC(B)} = 1.8$  V  
 (4)  $V_{CC(B)} = 2.5$  V  
 (5)  $V_{CC(B)} = 3.3$  V

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

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

**Figure 9. Typical propagation delay versus load capacitance;  $T_{amb} = 25^\circ\text{C}$**



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

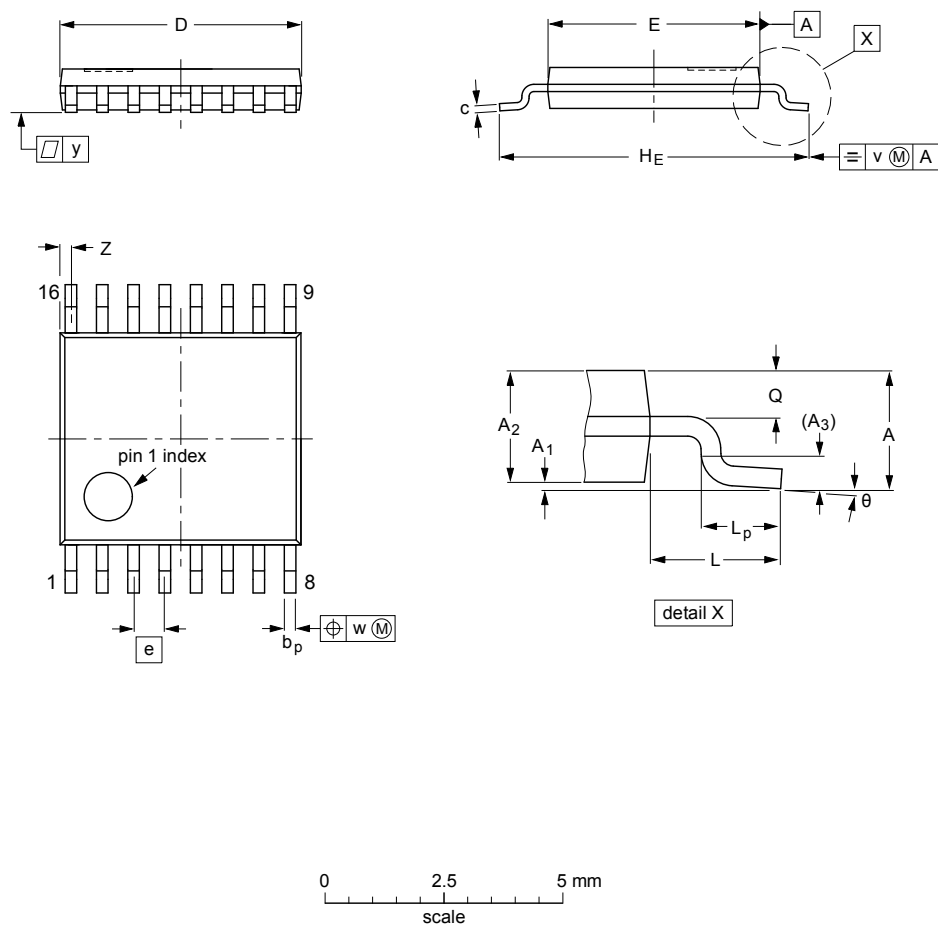
(4)  $V_{CC(B)} = 2.5 \text{ V}$

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

**Figure 10. Typical propagation delay versus load capacitance;  $T_{amb} = 25 \text{ }^{\circ}\text{C}$**

12 Package outline

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm SOT403-1



DIMENSIONS (mm are the original dimensions)

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

Notes

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

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

Figure 11. Package outline SOT403-1 (TSSOP16)

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
74AVC4T774PW v.1	20170925	Product sheet	-	-

## 15 Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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