AiP74AVC2T45
2-bit Dual Supply Translating Transceiver;3-state

Product Specification

Specification Revision History：

Version	Date	Description
2019-06-A1	2019-06	New
2023-04-B1	2023-04	Update the template

Contents

1、General Description

The AiP74AVC2T45 is a dual-bit, dual-supply transceiver that enables bidirectional level translation. It features two data input-output ports (nA and nB), a direction control input (DIR) 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 0.8V and 3.6V making the device suitable for translating between any of the low voltage nodes (0.8V, 1.2V, 1.5V, 1.8V, 2.5V and 3.3V). Pins nA and DIR are referenced to $V_{CC(A)}$ and pins nB are referenced to $V_{CC(B)}$. A HIGH on DIR allows transmission from nA to nB and a LOW on DIR allows transmission from nB to nA.

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 and B are in the high-impedance OFF-state.

Features:

- Wide supply voltage range:
  $V_{CC(A)}$: 0.8V to 3.6V
  $V_{CC(B)}$: 0.8V to 3.6V
- Maximum data rates:
  500Mbit/s (1.8V to 3.3V translation)
  320Mbit/s (<1.8V to 3.3V translation)
  320Mbit/s (translate to 2.5V or 1.8V)
  280Mbit/s (translate to 1.5V)
  240Mbit/s (translate to 1.2V)
- Suspend mode
- Inputs accept voltages up to 3.6V
- I_{OFF} circuitry provides partial Power-down mode operation
- Specified from -40℃ to +125℃
- Packaging information: TSSOP8/VSSOP8

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74AVC2T45TA8.TB	TSSOP8	CFXX	100 PCS/tube	200 tube/box	20000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74AVC2T45TA8.TR	TSSOP8	CFXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing:0.65mm
AiP74AVC2T45YA8.TR	VSSOP8	CFXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 2.0mm×2.3mm Pin spacing:0.50mm

Note 1: “XX” refers to variable content, meaning year and package batch serial number.

Note 2: If the physical information is inconsistent with the ordering information, please refer to the actual product.

2、Block Diagram And Pin Description

2.1、Block Diagram

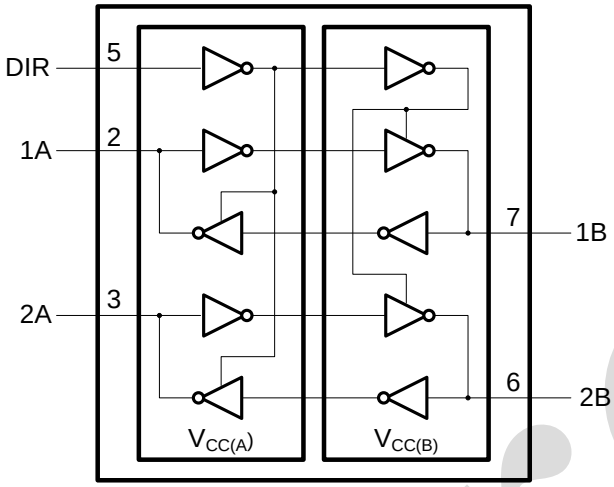


Figure 1. Logic symbol

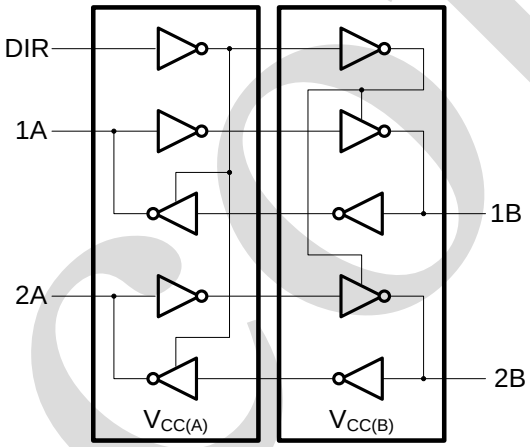
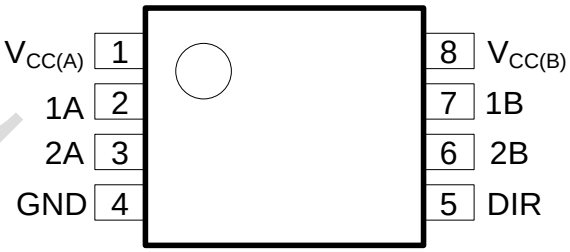


Figure 2. Logic diagram

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	$V_{CC(A)}$	supply voltage A (referenced to pins 1A, 2A and DIR)
2	1A	data input or output
3	2A	data input or output
4	GND	ground (0V)
5	DIR	direction control
6	2B	data input or output
7	1B	data input or output
8	$V_{CC(B)}$	supply voltage B (referenced to pins 1B and 2B)

2.4、Function Table

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

Supply voltage	Input	Input/output[1]	
$V_{CC(A)}$, $V_{CC(B)}$	DIR[2]	nA	nB
0.8V to 3.6V	L	nA=nB	input
0.8V to 3.6V	H	input	nB=nA
GND[3]	X	Z	Z

Note:

[1] The input circuit of the data I/O is always active.

[2] The DIR input circuit is referenced to $V_{CC(A)}$.

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

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Characteristic	Symbol	Conditions	Min.	Max.	Unit
Supply Voltage A	$V_{CC(A)}$	-	-0.5	+4.6	V
Supply Voltage B	$V_{CC(B)}$	-	-0.5	+4.6	V
input clamping current	I_{IK}	V_I<0V	-50	-	mA
Input Voltage	V_I	-[1]	-0.5	+4.6	V
output clamping current	I_{OK}	V_O<0V	-50	-	mA
output voltage	V_O	Active mode[1][2][3]	-0.5	V_{CCO}+0.5	V
		Suspend or 3-state mode[1]	-0.5	+4.6	V
output current	I_O	V_O=0V to V_{CCO}	-	±50	mA
supply current	I_{CC}	$I_{CC(A)}$ or $I_{CC(B)}$	-	100	mA
ground current	I_{GND}	-	-100	-	mA
Storage Temperature	T_{stg}	-	-65	+150	℃
total power dissipation	P_{tot}	-	-	250	mW
Soldering Temperature	T_L	10s	260		℃

Note:

[1] The minimum input voltage rating 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}+0.5V should not exceed 4.6V.

3.2、Recommended Operating Conditions

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

Note:

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

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

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}; I_O=-1.5mA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V	-	0.69	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}; I_O=1.5mA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V	-	0.07	-	V
input leakage current	I_I	DIR input; V_I=0V or 3.6V; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V	-	-	±1	uA
OFF-state output current	I_{OZ}	A or B port; V_O=0V or V_{CCO}; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V[1][2]	-	-	±2.5	uA
power-off current leakage	I_{OFF}	A port; V_I or V_O=0V to 3.6V; $V_{CC(A)}$=0V; $V_{CC(B)}$=0.8V to 3.6V	-	-	±1	uA
		B port; V_I or V_O=0V to 3.6V; $V_{CC(B)}$=0V; $V_{CC(A)}$=0.8V to 3.6V	-	-	±1	uA
input capacitance	C_I	DIR input; V_I=0V or 3.3V; $V_{CC(A)}$=$V_{CC(B)}$=3.3V	-	1.0	-	pF
input/output capacitance	$C_{I/O}$	A and B port; Suspend mode; V_O=V_{CCO} or GND; $V_{CC(A)}$=$V_{CC(B)}$=3.3V[2]	-	4.0	-	pF

Note:

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

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

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	data input[1]	V_{CCI}=0.8V	0.70V_{CCI}	-	-	V
			V_{CCI}=1.1V to 1.95V	0.65V_{CCI}	-	-	V
			V_{CCI}=2.3V to 2.7V	1.6	-	-	V
			V_{CCI}=3.0V to 3.6V	2	-	-	V
		DIR input	$V_{CC(A)}$=0.8V	0.70$V_{CC(A)}$	-	-	V
			$V_{CC(A)}$=1.1V to 1.95V	0.65$V_{CC(A)}$	-	-	V
			$V_{CC(A)}$=2.3V to 2.7V	1.6	-	-	V
			$V_{CC(A)}$=3.0V to 3.6V	2	-	-	V
LOW-level input voltage	V_{IL}	data input[1]	V_{CCI}=0.8V	-	-	0.30V_{CCI}	V
			V_{CCI}=1.1V to 1.95V	-	-	0.35V_{CCI}	V
			V_{CCI}=2.3V to 2.7V	-	-	0.7	V
			V_{CCI}=3.0V to 3.6V	-	-	0.9	V
		DIR input	$V_{CC(A)}$=0.8V	-	-	0.30$V_{CC(A)}$	V
			$V_{CC(A)}$=1.1V to 1.95V	-	-	0.35$V_{CC(A)}$	V
			$V_{CC(A)}$=2.3V to 2.7V	-	-	0.7	V
			$V_{CC(A)}$=3.0V to 3.6V	-	-	0.9	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}[2]	I_O=-100uA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V	V_{CCO}-0.1	-	-	V
			I_O=-3mA; $V_{CC(A)}$=$V_{CC(B)}$=1.1V	0.85	-	-	V
			I_O=-6mA; $V_{CC(A)}$=$V_{CC(B)}$=1.4V	1.05	-	-	V
			I_O=-8 mA; $V_{CC(A)}$=$V_{CC(B)}$=1.65V	1.2	-	-	V
			I_O=-9mA; $V_{CC(A)}$=$V_{CC(B)}$=2.3V	1.75	-	-	V
			I_O=-12mA; $V_{CC(A)}$=$V_{CC(B)}$=3.0V	2.3	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=100uA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V	-	-	0.1	V
			I_O=3mA; $V_{CC(A)}$=$V_{CC(B)}$=1.1V	-	-	0.25	V
			I_O=6mA; $V_{CC(A)}$=$V_{CC(B)}$=1.4V	-	-	0.35	V
			I_O=8mA; $V_{CC(A)}$=$V_{CC(B)}$=1.65V	-	-	0.45	V
			I_O=9mA; $V_{CC(A)}$=$V_{CC(B)}$=2.3V	-	-	0.55	V
			I_O=12mA; $V_{CC(A)}$=$V_{CC(B)}$=3.0V	-	-	0.7	V
input leakage current	I_I	DIR input; V_I=0V or 3.6V; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V		-	-	±1	uA

OFF-state output current	I_{OZ}	A or B port; V_O=0V or V_{CCO}; $V_{CC(A)}$=$V_{CC(B)}$=3.6V[2][3]		-	-	±5	uA
power-off leakage current	I_{OFF}	A port; V_I or V_O=0V to 3.6V; $V_{CC(A)}$=0V; $V_{CC(B)}$=0.8V to 3.6V		-	-	±5	uA
		B port; V_I or V_O=0V to 3.6V; $V_{CC(B)}$=0V; $V_{CC(A)}$=0.8V to 3.6V		-	-	±5	uA
supply current	I_{CC}	A port; V_I=0V or V_{CCI}; I_O=0A[1]	$V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V	-	-	8	uA
			$V_{CC(A)}$=3.6V; $V_{CC(B)}$=0V	-	-	8	uA
			$V_{CC(A)}$=0V; $V_{CC(B)}$=3.6V	-2	-	-	uA
		B port; V_I=0V or V_{CCI}; I_O=0A[1]	$V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V	-	-	8	uA
			$V_{CC(A)}$=3.6V; $V_{CC(B)}$=0V	-2	-	-	uA
			$V_{CC(A)}$=0V; $V_{CC(B)}$=3.6V	-	-	8	uA
		A plus B port ($I_{CC(A)}$+$I_{CC(B)}$); I_O=0A;V_I=0V or V_{CCI}; $V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V[1]		-	-	16	uA

Note:

[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.

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

3.3.3、DC Characteristics 3

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	data input[1]	V_{CCI}=0.8V	0.70V_{CCI}	-	-	V
			V_{CCI}=1.1V to 1.95V	0.65V_{CCI}	-	-	V
			V_{CCI}=2.3V to 2.7V	1.6	-	-	V
			V_{CCI}=3.0V to 3.6V	2	-	-	V
		DIR input	$V_{CC(A)}$=0.8V	0.70$V_{CC(A)}$	-	-	V
			$V_{CC(A)}$=1.1V to 1.95V	0.65$V_{CC(A)}$	-	-	V
			$V_{CC(A)}$=2.3V to 2.7V	1.6	-	-	V
			$V_{CC(A)}$=3.0V to 3.6V	2	-	-	V
LOW-level input voltage	V_{IL}	data input[1]	V_{CCI}=0.8V	-	-	0.30V_{CCI}	V
			V_{CCI}=1.1V to 1.95V	-	-	0.35V_{CCI}	V
			V_{CCI}=2.3V to 2.7V	-	-	0.7	V
			V_{CCI}=3.0V to 3.6V	-	-	0.9	V
		DIR input	$V_{CC(A)}$=0.8V	-	-	0.30$V_{CC(A)}$	V
			$V_{CC(A)}$=1.1V to 1.95V	-	-	0.35$V_{CC(A)}$	V
			$V_{CC(A)}$=2.3V to 2.7V	-	-	0.7	V

			$V_{CC(A)}$=3.0V to 3.6V	-	-	0.9	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}[2]	I_O=-100uA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V	V_{CCO}-0.1	-	-	V
			I_O=-3mA; $V_{CC(A)}$=$V_{CC(B)}$=1.1V	0.85	-	-	V
			I_O=-6mA; $V_{CC(A)}$=$V_{CC(B)}$=1.4V	1.05	-	-	V
			I_O=-8 mA; $V_{CC(A)}$=$V_{CC(B)}$=1.65V	1.2	-	-	V
			I_O=-9mA; $V_{CC(A)}$=$V_{CC(B)}$=2.3V	1.75	-	-	V
			I_O=-12mA; $V_{CC(A)}$=$V_{CC(B)}$=3.0V	2.3	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=100uA; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V	-	-	0.1	V
			I_O=3mA; $V_{CC(A)}$=$V_{CC(B)}$=1.1V	-	-	0.25	V
			I_O=6mA; $V_{CC(A)}$=$V_{CC(B)}$=1.4V	-	-	0.35	V
			I_O=8mA; $V_{CC(A)}$=$V_{CC(B)}$=1.65V	-	-	0.45	V
			I_O=9mA; $V_{CC(A)}$=$V_{CC(B)}$=2.3V	-	-	0.55	V
			I_O=12mA; $V_{CC(A)}$=$V_{CC(B)}$=3.0V	-	-	0.7	V
input leakage current	I_I	DIR input; V_I=0V or 3.6V; $V_{CC(A)}$=$V_{CC(B)}$=0.8V to 3.6V		-	-	±1.5	uA
OFF-state output current	I_{OZ}	A or B port; V_O=0V or V_{CCO}; $V_{CC(A)}$=$V_{CC(B)}$=3.6V[2][3]		-	-	±7.5	uA
power-off leakage current	I_{OFF}	A port; V_I or V_O=0V to 3.6V; $V_{CC(A)}$=0V; $V_{CC(B)}$=0.8V to 3.6V		-	-	±35	uA
		B port; V_I or V_O=0V to 3.6V; $V_{CC(B)}$=0V; $V_{CC(A)}$=0.8V to 3.6V		-	-	±35	uA
supply current	I_{CC}	A port; V_I=0V or V_{CCI}; I_O=0A[1]	$V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V	-	-	11.5	uA
			$V_{CC(A)}$=3.6V; $V_{CC(B)}$=0V	-	-	11.5	uA
			$V_{CC(A)}$=0V; $V_{CC(B)}$=3.6V	-8	-	-	uA
		B port; V_I=0V or V_{CCI}; I_O=0A[1]	$V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V	-	-	11.5	uA
			$V_{CC(A)}$=3.6V; $V_{CC(B)}$=0V	-8	-	-	uA
			$V_{CC(A)}$=0V; $V_{CC(B)}$=3.6V	-	-	11.5	uA

		A plus B port ($I_{CC(A)}$+$I_{CC(B)}$); I_O=0A;V_I=0V or V_{CCI}; $V_{CC(A)}$=0.8V to 3.6V; $V_{CC(B)}$=0.8V to 3.6V[1]	-	-	23	uA

Note:

[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.

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

3.3.4、AC Characteristics 1

(T_{amb}=25℃, $V_{CC(A)}$=0.8V, voltages are referenced to GND (ground=0V), unless otherwise specified)[1][2]

Parameter	Symbol	Conditions	$V_{CC(B)}$						Unit
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
propagation delay	t_{pd}	A to B[1]	15.5	8.1	7.6	7.7	8.4	9.2	ns
		B to A[1]	15.5	12.7	12.3	12.2	12.0	11.8	ns
disable time	t_{dis}	DIR to A[2]	12.2	12.2	12.2	12.2	12.2	12.2	ns
		DIR to B[2]	11.7	7.9	7.6	8.2	8.7	10.2	ns
enable time	t_{en}	DIR to A[3]	27.2	20.6	19.9	20.4	20.7	22.0	ns
		DIR to B[3]	27.7	20.3	19.8	19.9	20.6	21.4	ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}

[2] t_{dis} is the same as t_{PLZ} and t_{PHZ}

[3] t_{en} is the same as t_{PZL} and t_{PZH}

t_{en} is a calculated value using the formula shown in Section 5.4

3.3.5、AC Characteristics 2

(T_{amb}=25℃, $V_{CC(B)}$=0.8V, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions	$V_{CC(A)}$						Unit
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
propagation delay	t_{pd}	A to B[1]	15.5	12.7	12.3	12.2	12.0	11.8	ns
		B to A[1]	15.5	8.1	7.6	7.7	8.4	9.2	ns
disable time	t_{dis}	DIR to A[2]	12.2	4.9	3.8	3.7	2.8	3.4	ns
		DIR to B[2]	11.7	9.2	9.0	8.8	8.7	8.6	ns
enable time	t_{en}	DIR to A[3]	27.2	17.3	16.6	16.5	17.1	17.8	ns
		DIR to B[3]	27.7	17.6	16.1	15.9	14.8	15.2	ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}

[2] t_{dis} is the same as t_{PLZ} and t_{PHZ}

[3] t_{en} is the same as t_{PZL} and t_{PZH}

t_{en} is a calculated value using the formula shown in Section 5.4

3.3.6、AC Characteristics 3

(T_{amb}=25℃,$V_{CC(A)}$=$V_{CC(B)}$=0.8V,voltages are referenced to GND (ground=0V),unless otherwise specified)

Parameter	Symbol	Conditions	$V_{CC(A)}$ and $V_{CC(B)}$						Unit
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
power dissipation capacitance	C_{PD}	A port: (direction A to B); B port: (direction B to A)	1	2	2	2	2	2	pF
		A port: (direction B to A); B port: (direction A to B)	9	11	11	12	14	17	pF

Note:

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

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

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

[2] f_i=10MHz; V_I=GND to V_{CC}; t_r=t_f=1ns; C_L=0pF; R_L=∞Ω.

3.3.7、AC Characteristics 4

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)[1][2]

Parameter	Symbol	Conditions	$V_{CC(B)}$										Unit
			1.2V±0.1V		1.5V±0.1V		1.8V±0.15V		2.5V±0.2V		3.3V±0.3V		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
propagation delay	t_{pd}	A to B[1]											
		$V_{CC(A)}$=1.1V to 1.3V	1.0	9.0	0.7	6.8	0.6	6.1	0.5	5.7	0.5	6.1	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.0	8.0	0.7	5.4	0.6	4.6	0.5	3.7	0.5	3.5	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.0	7.7	0.6	5.1	0.5	4.3	0.5	3.4	0.5	3.1	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.0	7.2	0.5	4.7	0.5	3.9	0.5	3.0	0.5	2.6	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.0	7.1	0.5	4.5	0.5	3.7	0.5	2.8	0.5	2.4	ns
		B to A[1]											
		$V_{CC(A)}$=1.1V to 1.3V	1.0	9.0	0.8	8.0	0.7	7.7	0.6	7.2	0.5	7.1	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.0	6.8	0.8	5.4	0.7	5.1	0.6	4.7	0.5	4.5	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.0	6.1	0.7	4.6	0.5	4.4	0.5	3.9	0.5	3.7	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.0	5.7	0.6	3.8	0.5	3.4	0.5	3.0	0.5	2.8	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.0	6.1	0.6	3.6	0.5	3.1	0.5	2.6	0.5	2.4	ns
disable time	t_{dis}	DIR to A[2]											
		$V_{CC(A)}$=1.1V to 1.3V	2.2	8.8	2.2	8.8	2.2	8.8	2.2	8.8	2.2	8.8	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.6	6.3	1.6	6.3	1.6	6.3	1.6	6.3	1.6	6.3	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.6	5.5	1.6	5.5	1.6	5.5	1.6	5.5	1.6	5.5	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.5	4.2	1.5	4.2	1.5	4.2	1.5	4.2	1.5	4.2	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.5	4.7	1.5	4.7	1.5	4.7	1.5	4.7	1.5	4.7	ns
		DIR to B[2]											
		$V_{CC(A)}$=1.1V to 1.3V	2.2	8.4	1.8	6.7	2.0	6.9	1.7	6.2	2.4	7.2	ns

		$V_{CC(A)}$=1.4V to 1.6V	2.0	7.6	1.8	5.9	1.6	6.0	1.2	4.8	1.7	5.5	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.8	7.7	1.8	5.7	1.4	5.8	1.0	4.5	1.5	5.2	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.7	7.3	2.0	5.2	1.5	5.1	0.6	4.2	1.1	4.8	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.7	7.2	0.7	5.5	0.6	5.5	0.7	4.1	1.7	4.7	ns
enable time	t_{en}	DIR to A[3][4]											
		$V_{CC(A)}$=1.1V to 1.3V	-	17.4	-	14.7	-	14.6	-	13.4	-	14.3	ns
		$V_{CC(A)}$=1.4V to 1.6V	-	14.4	-	11.3	-	11.1	-	9.5	-	10.0	ns
		$V_{CC(A)}$=1.65V to 1.95V	-	13.8	-	10.3	-	10.2	-	8.4	-	8.9	ns
		$V_{CC(A)}$=2.3V to 2.7V	-	13.0	-	9.0	-	8.5	-	7.2	-	7.6	ns
		$V_{CC(A)}$=3.0V to 3.6V	-	13.3	-	9.1	-	8.6	-	6.7	-	7.1	ns
		DIR to B[3][4]											
		$V_{CC(A)}$=1.1V to 1.3V	-	17.8	-	15.6	-	14.9	-	14.5	-	14.9	ns
		$V_{CC(A)}$=1.4V to 1.6V	-	14.3	-	11.7	-	10.9	-	10.0	-	9.8	ns
		$V_{CC(A)}$=1.65V to 1.95V	-	13.2	-	10.6	-	9.8	-	8.9	-	8.6	ns
		$V_{CC(A)}$=2.3V to 2.7V	-	11.4	-	8.9	-	8.1	-	7.2	-	6.8	ns
		$V_{CC(A)}$=3.0V to 3.6V	-	11.8	-	9.2	-	8.4	-	7.5	-	7.1	ns

Note: [1] t_{pd} is the same as t_{PLH} and t_{PHL}

[2] t_{dis} is the same as t_{PLZ} and t_{PHZ}

[3] t_{en} is the same as t_{PZL} and t_{PZH}

[4] t_{en} is a calculated value using the formula shown in Section 5.4

3.3.8、AC Characteristics 5

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified)[1][2]

Parameter	Symbol	Conditions	$V_{CC(B)}$										Unit
			1.2V±0.1V		1.5V±0.1V		1.8V±0.15V		2.5V±0.2V		3.3V±0.3V		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
propagation delay	t_{pd}	A to B[1]											
		$V_{CC(A)}$=1.1V to 1.3V	1.0	9.9	0.7	7.5	0.6	6.8	0.5	6.3	0.5	6.8	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.0	8.8	0.7	6.0	0.6	5.1	0.5	4.1	0.5	3.9	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.0	8.5	0.6	5.7	0.5	4.8	0.5	3.8	0.5	3.5	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.0	8.0	0.5	5.2	0.5	4.3	0.5	3.3	0.5	2.9	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.0	7.9	0.5	5.0	0.5	4.1	0.5	3.1	0.5	2.7	ns
		B to A[1]											
		$V_{CC(A)}$=1.1V to 1.3V	1.0	9.9	0.8	8.8	0.7	8.5	0.6	8.0	0.5	7.9	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.0	7.5	0.8	6.0	0.7	5.7	0.6	5.2	0.5	5.0	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.0	6.8	0.7	5.1	0.5	4.9	0.5	4.3	0.5	4.1	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.0	6.3	0.6	4.2	0.5	3.8	0.5	3.3	0.5	3.1	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.0	6.8	0.6	4.0	0.5	3.5	0.5	2.9	0.5	2.7	ns
disable time	t_{dis}	DIR to A[2]											
		$V_{CC(A)}$=1.1V to 1.3V	2.2	9.7	2.2	9.7	2.2	9.7	2.2	9.7	2.2	9.7	ns
		$V_{CC(A)}$=1.4V to 1.6V	1.6	7.0	1.6	7.0	1.6	7.0	1.6	7.0	1.6	7.0	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.6	6.1	1.6	6.1	1.6	6.1	1.6	6.1	1.6	6.1	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.5	4.7	1.5	4.7	1.5	4.7	1.5	4.7	1.5	4.7	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.5	5.2	1.5	5.2	1.5	5.2	1.5	5.2	1.5	5.2	ns
		DIR to B[2]											

		$V_{CC(A)}$=1.1V to 1.3V	2.2	9.2	1.8	7.4	2.0	7.6	1.7	6.9	2.4	8.0	ns
		$V_{CC(A)}$=1.4V to 1.6V	2.0	8.3	1.8	6.5	1.6	6.6	1.2	5.3	1.7	6.1	ns
		$V_{CC(A)}$=1.65V to 1.95V	1.8	8.5	1.8	6.3	1.4	6.4	1.0	5.0	1.5	5.8	ns
		$V_{CC(A)}$=2.3V to 2.7V	1.7	8.0	2.0	5.8	1.5	5.7	0.6	4.7	1.1	5.3	ns
		$V_{CC(A)}$=3.0V to 3.6V	1.7	7.9	0.7	6.1	0.6	6.1	0.7	4.6	1.7	5.2	ns
enable time	t_{en}	DIR to A[3][4]											
		$V_{CC(A)}$=1.1V to 1.3V	-	19.1	-	16.2	-	16.1	-	14.9	-	15.9	ns
		$V_{CC(A)}$=1.4V to 1.6V	-	15.8	-	12.5	-	12.3	-	10.5	-	11.1	ns
		$V_{CC(A)}$=1.65V to 1.95V	-	15.3	-	11.4	-	11.3	-	9.3	-	9.9	ns
		$V_{CC(A)}$=2.3V to 2.7V	-	14.3	-	10.0	-	9.5	-	8.0	-	8.4	ns
		$V_{CC(A)}$=3.0V to 3.6V	-	14.7	-	10.1	-	9.6	-	7.5	-	7.9	ns
		DIR to B[3][4]											
		$V_{CC(A)}$=1.1V to 1.3V	-	19.6	-	17.2	-	16.5	-	16.0	-	16.5	ns
		$V_{CC(A)}$=1.4V to 1.6V	-	15.8	-	13.0	-	12.1	-	11.1	-	10.9	ns
		$V_{CC(A)}$=1.65V to 1.95V	-	14.6	-	11.8	-	10.9	-	9.9	-	9.6	ns
		$V_{CC(A)}$=2.3V to 2.7V	-	12.7	-	9.9	-	9.0	-	8.0	-	7.6	ns
		$V_{CC(A)}$=3.0V to 3.6V	-	13.1	-	10.2	-	9.3	-	8.3	-	7.9	ns

Note: [1] t_{pd} is the same as t_{PLH} and t_{PHL}

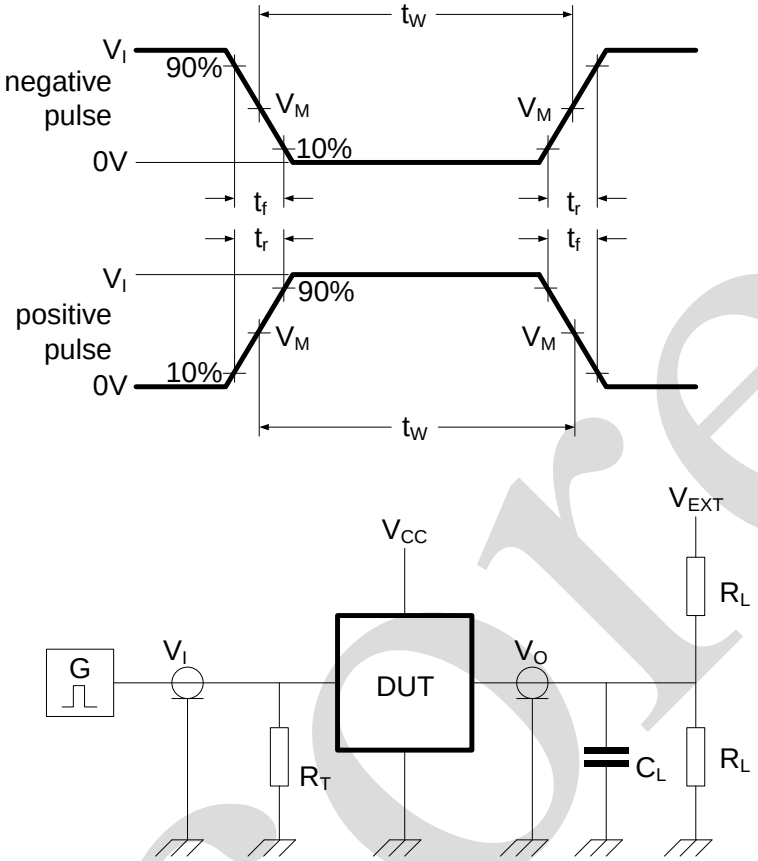
[2] t_{dis} is the same as t_{PLZ} and t_{PHZ}

[3] t_{en} is the same as t_{PZL} and t_{PZH}

[4] t_{en} is a calculated value using the formula shown in Section 5.4

4、Testing Circuit

4.1、AC Testing Circuit



R_L=Load resistance.

C_L=Load capacitance including jig and probe capacitance.

R_T=Termination resistance.

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

Figure 3. Test circuit for measuring switching times

4.2、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]
1.1V to 1.6V	V_{CCI}	≤1.0ns/V	15pF	2kΩ	open	GND	$2V_{CCO}$
1.65V to 2.7V	V_{CCI}	≤1.0ns/V	15pF	2kΩ	open	GND	$2V_{CCO}$
3.0V to 3.6V	V_{CCI}	≤1.0ns/V	15pF	2kΩ	open	GND	$2V_{CCO}$

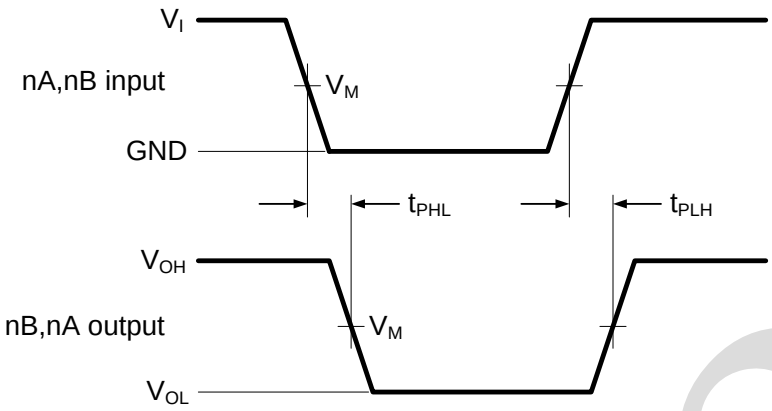
Note:

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

[2] dV/dt≥1.0V/ns

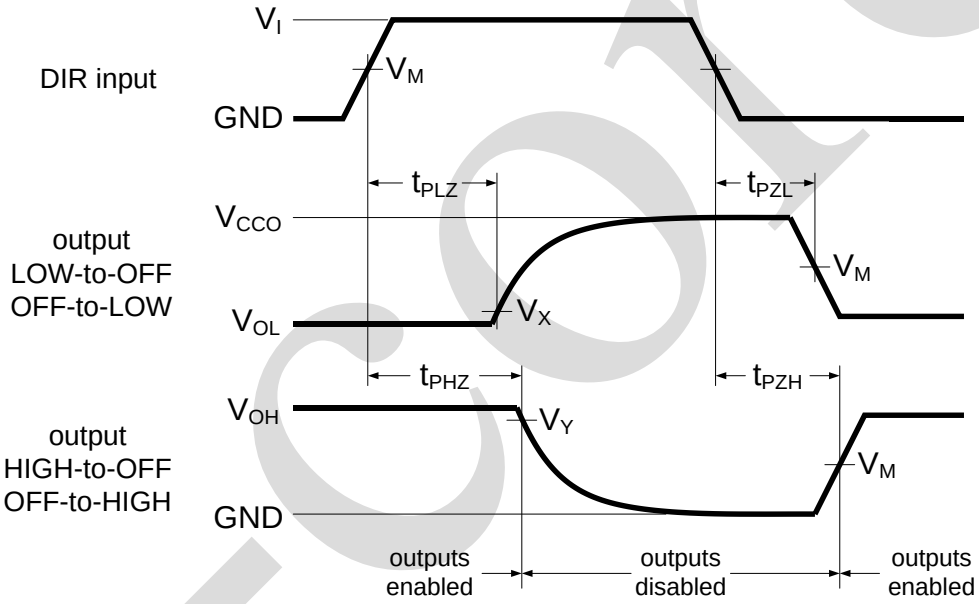
[3] V_{CCO} is the supply voltage associated with the output port.

4.3、AC Testing Waveforms



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

Figure 4. The data input (nA, nB) to output (nB, nA) propagation delay times



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

Figure 5. Enable and disable times

4.4、Measurement points

Supply voltage	Input[1]	Output[2]		
$V_{CC(A)}$, $V_{CC(B)}$	V_M	V_M	V_X	V_Y
1.1V to 1.6V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL}+0.1V	V_{OH}-0.1V
1.65V to 2.7V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL}+0.15V	V_{OH}-0.15V
3.0V to 3.6V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL}+0.3V	V_{OH}-0.3V

Note:

[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.

5、Typical Application Circuit And Application Note

5.1、Unidirectional logic level-shifting application

The circuit given in Figure 6 is an example of the AiP74AVC2T45 being used in an unidirectional logic level-shifting application.

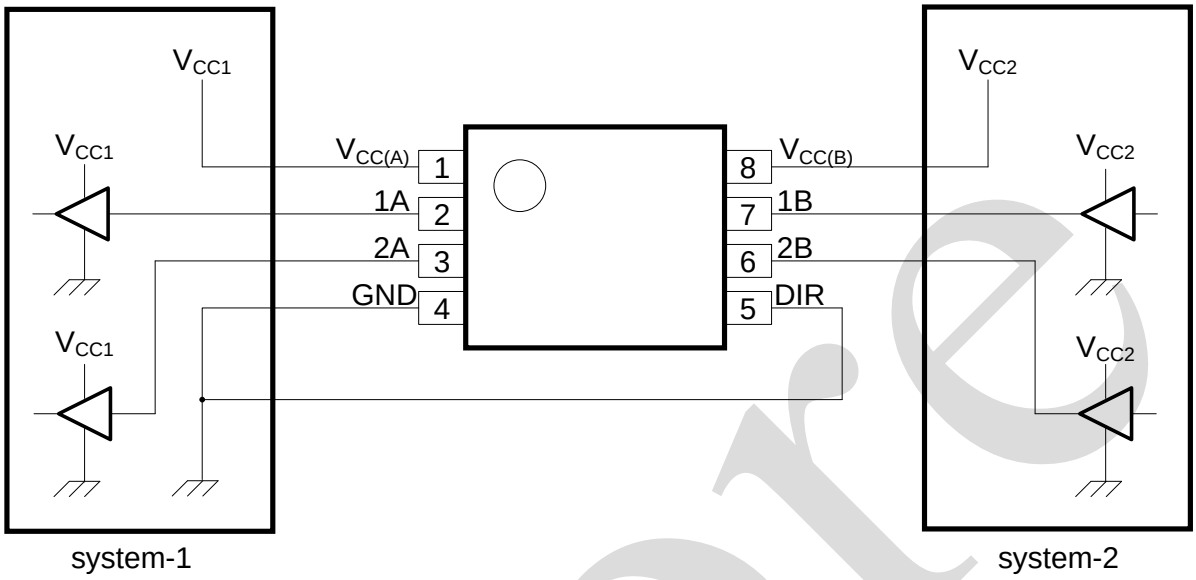


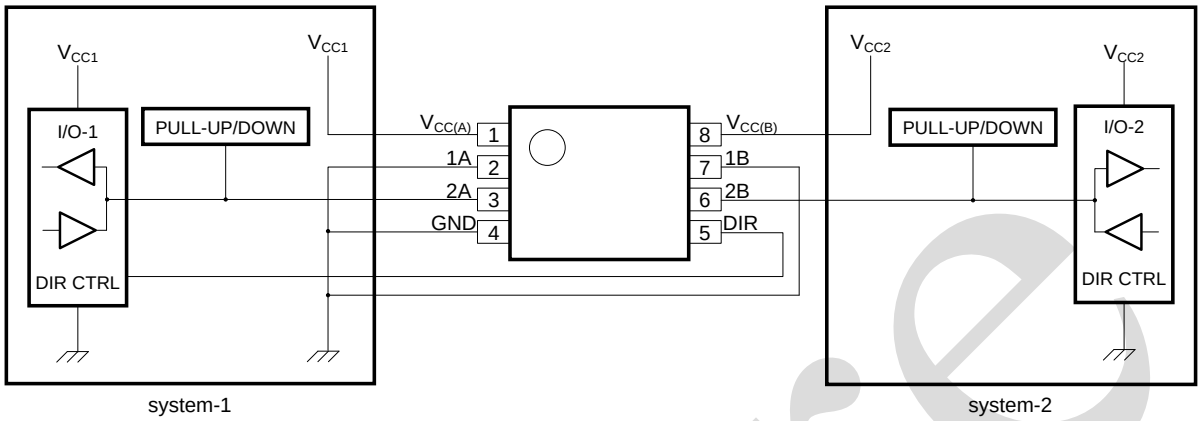
Figure 6. Unidirectional logic level-shifting application

Table 1. Unidirectional logic level-shifting application

Pin	Name	Function	Description
1	$V_{CC(A)}$	V_{CC1}	supply voltage of system-1 (0.8V to 3.6V)
2	1A	OUT1	output level depends on V_{CC1} voltage
3	2A	OUT2	output level depends on V_{CC1} voltage
4	GND	GND	device GND
5	DIR	DIR	the GND (LOW level) determines B port to A port direction
6	2B	IN2	input threshold value depends on V_{CC2} voltage
7	1B	IN1	input threshold value depends on V_{CC2} voltage
8	$V_{CC(B)}$	V_{CC2}	supply voltage of system-2 (0.8V to 3.6V)

5.2、Bidirectional logic level-shifting application

Figure 7 shows the AiP74AVC2T45 being used in a bidirectional logic level-shifting application. Since the device does not have an output enable (OE) pin, the system designer should take precautions to avoid bus contention between system-1 and system-2 when changing directions.



System-1 and system-2 must use the same conditions, i.e., both pull-up or both pull-down.

Figure 7. Bidirectional logic level-shifting application

Table 2 gives a sequence that will illustrate data transmission from system-1 to system-2 and then from system-2 to system-1.

Table 2. Bidirectional logic level-shifting application

State	DIR CTRL	I/O-1	I/O-2	Description
1	H	output	input	system-1 data to system-2
2	H	Z	Z	system-2 is getting ready to send data to system-1. I/O-1 and I/O-2 are disabled. The bus-line state depends on the pull-up or pull-down.
3	L	Z	Z	DIR bit is set LOW. I/O-1 and I/O-2 still are disabled. The bus-line state depends on the pull-up or pull-down.
4	L	input	output	system-2 data to system-1

Note: H=HIGH voltage level; L=LOW voltage level; Z=high-impedance OFF-state.

System-1 and system-2 must use the same conditions, i.e., both pull-up or both pull-down.

5.3、Power-up considerations

The device is designed such that no special power-up sequence is required other than GND being applied first.

Table 3. Typical total supply current ($I_{CC(A)}$ + $I_{CC(B)}$)

$V_{CC(A)}$	$V_{CC(B)}$							Unit
	0V	0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
0V	0	0.1	0.1	0.1	0.1	0.1	0.1	uA
0.8V	0.1	0.1	0.1	0.1	0.1	0.7	2.3	uA
1.2V	0.1	0.1	0.1	0.1	0.1	0.3	1.4	uA
1.5V	0.1	0.1	0.1	0.1	0.1	0.1	0.9	uA
1.8V	0.1	0.1	0.1	0.1	0.1	0.1	0.5	uA
2.5V	0.1	0.7	0.3	0.1	0.1	0.1	0.1	uA
3.3V	0.1	2.3	1.4	0.9	0.5	0.1	0.1	uA

5.4、Enable times

The enable times for the AiP74AVC2T45 are calculated from the following formulas:

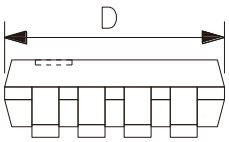
• t_{en} (DIR to nA) = t_{dis} (DIR to nB) + t_{pd} (nB to nA)

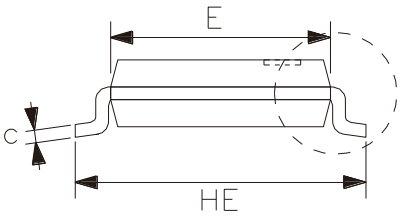
• t_{en} (DIR to nB) = t_{dis} (DIR to nA) + t_{pd} (nA to nB)

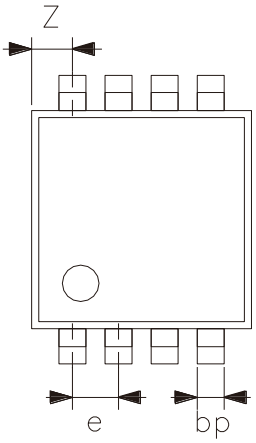
In a bidirectional application, these enable times provide the maximum delay from the time the DIR bit is switched until an output is expected. For example, if the AiP74AVC2T45 initially is transmitting from A to B, then the DIR bit is switched, the B port of the device must be disabled before presenting it with an input. After the B port has been disabled, an input signal applied to it appears on the corresponding A port after the specified propagation delay.

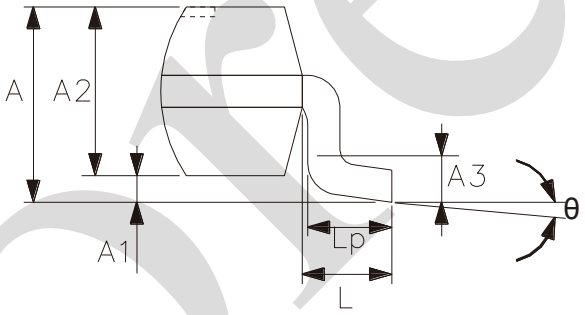
6、Package Information

6.1、TSSOP8



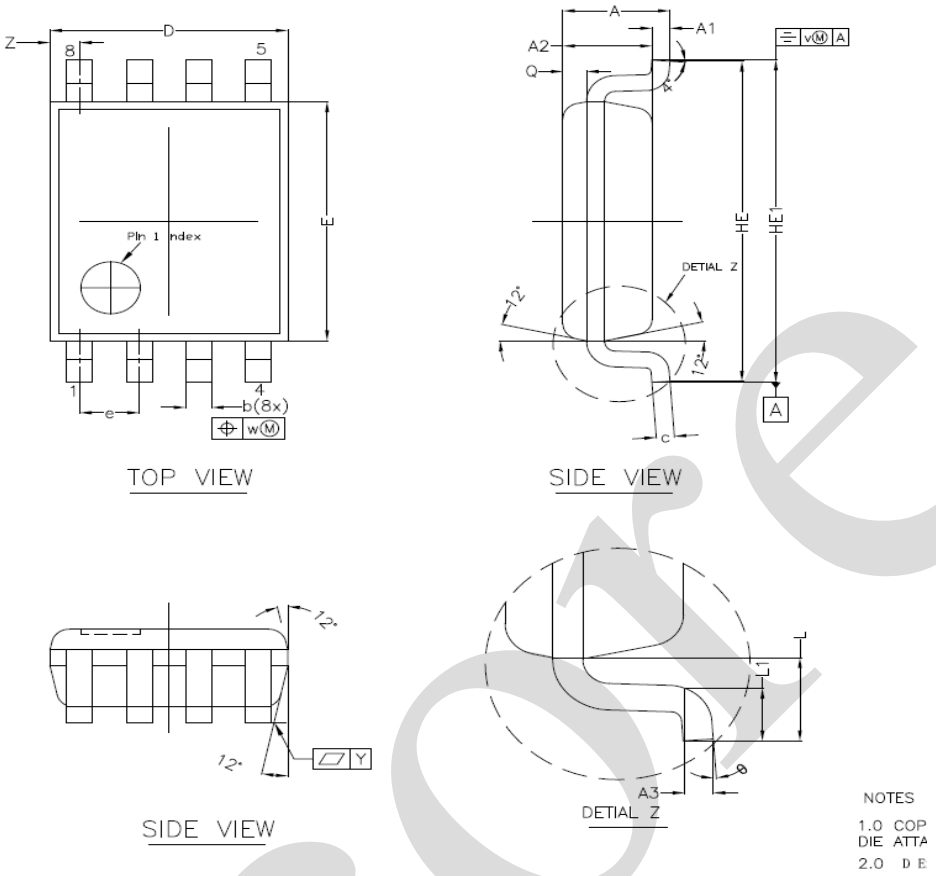






Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.10
A1	0	0.15
A2	0.75	0.95
A3	0.25	
bp	0.22	0.38
c	0.08	0.18
D	2.90	3.10
E	2.90	3.10
HE	3.90	4.10
L	0.50	
Lp	0.33	0.47
e	0.65	
Z	0.35	0.70
θ	0 °	8 °

6.2、VSSOP8



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.00
A1	0.00	0.15
A2	0.60	0.85
A3	0.12	
Q	0.19	0.21
b	0.17	0.27
c	0.08	0.23
D	1.90	2.10
E	2.20	2.40
HE	3.00	3.20
HE1	3.00	3.40
e	0.50	
L	0.40	
L1	0.15	0.40
Y	0.10	
Z	0.10	0.40
θ	0 °	8 °

7、Statements And Notes

7.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○：Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×：Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

7.2、Notes

We Recommend you to read this chapter carefully before using this product.

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