AiP74LVC8T245-Q1
8-bit Dual Supply Translating Transceiver; 3-state

Product Specification

Specification Revision History：

Version	Date	Description
2022-06-A1	2022-06	New
2023-11-A2	2023-11	Modify ordering information

Contents

1、General Description

The AiP74LVC8T245-Q1 are 8-bit dual supply translating transceivers with 3-state outputs that enable bidirectional level translation.

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

Features:

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
- Wide supply voltage range:
  $V_{CC(A)}$: 1.2V to 5.5V
  $V_{CC(B)}$: 1.2V to 5.5V
- ±24mA output drive (V_{CC}=3.0V)
- Inputs accept voltages up to 5.5V
- Low power consumption
- High-impedance when $V_{CC(A)}$ or $V_{CC(B)}$ =0V
- ESD-HBM:3000V(AEC-Q100-002)
- ESD-CDM:All pins 750V (AEC-Q100-011)
- LATCH-UP:±100mA,T_{amb}=125℃(AEC-Q100-004)
- Specified from -40℃ to +125℃
- Packaging information: TSSOP24

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC8T245-Q1 TA24.TB	TSSOP24	74LVC8T245Q	62 PCS/tube	200 tube/box	12400 PCS/box	Dimensions of plastic enclosure: 7.8mm×4.4mm Pin spacing: 0.65mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC8T245-Q1 TA24.TR	TSSOP24	74LVC8T245Q	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 7.8mm×4.4mm Pin spacing: 0.65mm

Note: 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

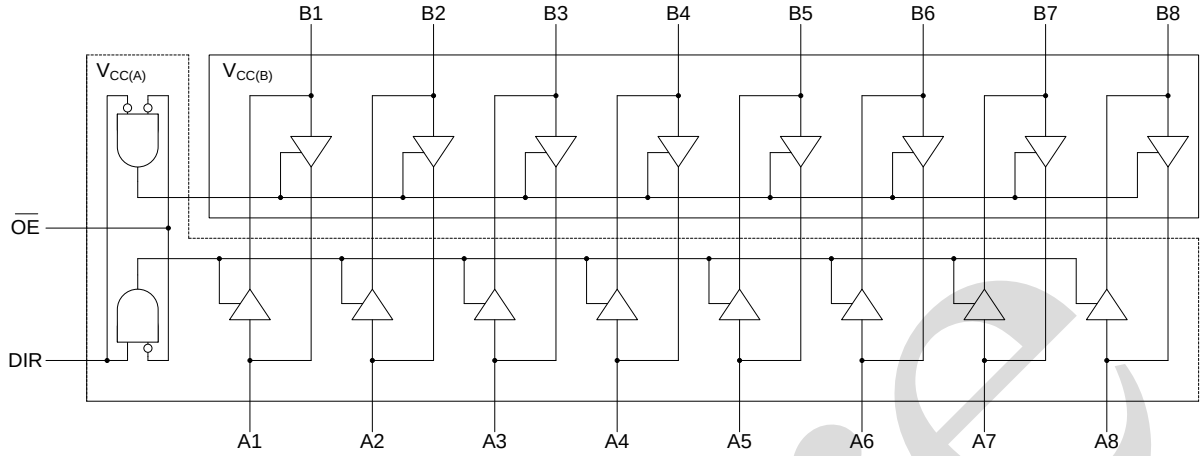


Figure 1. Logic symbol

2.2、Pin Configurations

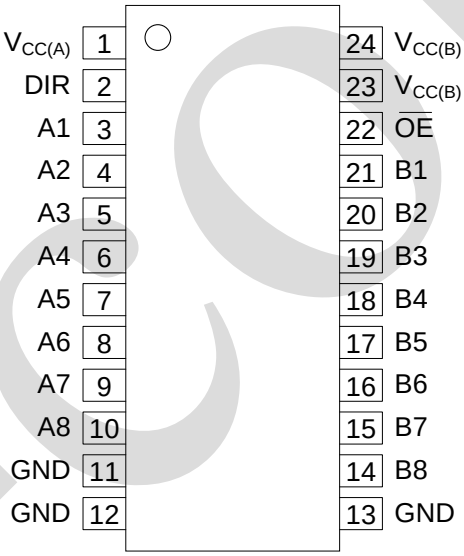


Figure 2. Pin Configurations

2.3、Pin Description

Pin No.	Pin Name	Description
1	$V_{CC(A)}$	supply voltage A (An inputs/outputs, $\overline{OE}$ and DIR inputs are referenced to $V_{CC(A)}$)
2	DIR	direction control
3,4,5,6,7,8,9,10	A1 to A8	data input or output
11	GND[1]	ground (0V)
12	GND[1]	ground (0V)
13	GND[1]	ground (0V)
21,20,19,18,17,16,15,14	B1 to B8	data input or output
22	$\overline{OE}$	output enable input (active LOW)
23	$V_{CC(B)}$	supply voltage B (Bn inputs/outputs are referenced to $V_{CC(B)}$)
24	$V_{CC(B)}$	supply voltage B (Bn inputs/outputs are referenced to $V_{CC(B)}$)

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

2.4、Function Table

Supply voltage	Input		Input/output[2]	
$V_{CC(A)}$, $V_{CC(B)}$	$\overline{OE}$ [1]	DIR[2]	An[2]	Bn[2]
1.2V to 5.5V	L	L	An=Bn	input
1.2V to 5.5V	L	H	input	Bn=An
1.2V to 5.5V	H	X	Z	Z
GND[3]	X	X	Z	Z

Note:

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

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

3、Electrical Parameter

3.1、Absolute Maximum Ratings

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage A	$V_{CC(A)}$	-	-0.5	+6.5	V
supply voltage B	$V_{CC(B)}$	-	-0.5	+6.5	V
supply current	I_{CC}	$I_{CC(A)}$ or $I_{CC(B)}$; per V_{CC} pin	-	100	mA
ground current	I_{GND}	per GND pin	-100	-	mA
input clamping current	I_{IK}	V_I<0V	-50	-	mA
input voltage	V_I	-	-0.5	+6.5	V
output clamping current	I_{OK}	V_O<0V	-50	-	mA
output voltage	V_O	Active mode[1]	-0.5	V_{CCO}+0.5	V
		Suspend or 3-state mode	-0.5	+6.5	V
output current	I_O	V_O=0V to V_{CCO}[1]	-	±50	mA
storage temperature	T_{stg}	-	-65	+150	℃
soldering temperature	T_L	10s	260		℃

Note:

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

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage A	$V_{CC(A)}$	-	1.2	-	5.5	V
supply voltage B	$V_{CC(B)}$	-	1.2	-	5.5	V
input voltage	V_I	-	0	-	5.5	V
ambient temperature	T_{amb}	-	-40	-	+125	℃

3.3、Electrical Characteristics

3.3.1、DC Characteristics

(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}=1.2V	0.8V_{CCI}	-	-	V
			V_{CCI}=1.4V to 1.95V	0.65V_{CCI}	-	-	V
			V_{CCI}=2.3V to 2.7V	1.7	-	-	V
			V_{CCI}=3.0V to 3.6V	2.0	-	-	V
			V_{CCI}=4.5V to 5.5V	0.7V_{CCI}	-	-	V
		DIR, $\overline{OE}$ input	V_{CCI}=1.2V	0.8$V_{CC(A)}$	-	-	V
			V_{CCI}=1.4V to 1.95V	0.65$V_{CC(A)}$	-	-	V
			V_{CCI}=2.3V to 2.7V	1.7	-	-	V
			V_{CCI}=3.0V to 3.6V	2.0	-	-	V
			V_{CCI}=4.5V to 5.5V	0.7$V_{CC(A)}$	-	-	V
LOW-level input voltage	V_{IL}	data input[1]	V_{CCI}=1.2V	-	-	0.2V_{CCI}	V
			V_{CCI}=1.4V to 1.95V	-	-	0.35V_{CCI}	V
			V_{CCI}=2.3V to 2.7V	-	-	0.7	V
			V_{CCI}=3.0V to 3.6V	-	-	0.8	V
			V_{CCI}=4.5V to 5.5V	-	-	0.3V_{CCI}	V
		DIR, $\overline{OE}$ input	V_{CCI}=1.2V	-	-	0.2$V_{CC(A)}$	V
			V_{CCI}=1.4V to 1.95V	-	-	0.35$V_{CC(A)}$	V
			V_{CCI}=2.3V to 2.7V	-	-	0.7	V
			V_{CCI}=3.0V to 3.6V	-	-	0.8	V
			V_{CCI}=4.5V to 5.5V	-	-	0.3$V_{CC(A)}$	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH}	I_O=-100uA; V_{CCO}=1.2V to 4.5V[2]	V_{CCO}-0.1	-	-	V
			I_O=-6mA; V_{CCO}=1.4V	1.0	-	-	V
			I_O=-8mA; V_{CCO}=1.65V	1.2	-	-	V
			I_O=-12mA; V_{CCO}=2.3V	1.9	-	-	V
			I_O=-24mA; V_{CCO}=3.0V	2.4	-	-	V
			I_O=-32mA; V_{CCO}=4.5V	3.8	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IL}[2]	I_O=100uA; V_{CCO}=1.2V to 4.5V	-	-	0.1	V
			I_O=6mA; V_{CCO}=1.4V	-	-	0.3	V
			I_O=8mA; V_{CCO}=1.65V	-	-	0.45	V
			I_O=12mA; V_{CCO}=2.3V	-	-	0.3	V
			I_O=24mA; V_{CCO}=3.0V	-	-	0.55	V
			I_O=32mA; V_{CCO}=4.5V	-	-	0.55	V
input leakage current	I_I	DIR, $\overline{OE}$ input;V_I=0V or 5.5V; V_{CCI}=1.2V to 5.5V		-	-	±10	uA
OFF-state output current	I_{OZ}	A or B port; V_O=0V or V_{CCO}; V_{CCO}=1.2V to 5.5V[2]		-	-	±10	uA
		suspend mode A port; V_O=0V or V_{CCO}; $V_{CC(A)}$=5.5V; $V_{CC(B)}$=0V[2]		-	-	±10	uA
		suspend mode B port;		-	-	±10	uA

		V_O=0V or V_{CCO}; $V_{CC(A)}$=0V; $V_{CC(B)}$=5.5V[2]					
power-off leakage current	I_{OFF}	A port; V_I or V_O=0V to 5.5V; $V_{CC(A)}$=0V; $V_{CC(B)}$=1.2V to 5.5V		-	-	±10	uA
		B port; V_I or V_O=0V to 5.5V; $V_{CC(B)}$=0V; $V_{CC(A)}$=1.2V to 5.5V		-	-	±10	uA
supply current	I_{CC}	A port; V_I=0V or V_{CCI}; I_O=0A[1]	$V_{CC(A)}$,$V_{CC(B)}$=1.2V to 5.5V	-	-	20	uA
			$V_{CC(A)}$=5.5V;$V_{CC(B)}$=0V	-	-	20	uA
			$V_{CC(A)}$=0V;$V_{CC(B)}$=5.5V	-4	-	-	uA
		B port; V_I=0V or V_{CCI}; I_O=0A	$V_{CC(A)}$,$V_{CC(B)}$=1.2V to 5.5V	-	-	20	uA
			$V_{CC(B)}$=0V;$V_{CC(A)}$=5.5V	-4	-	-	uA
			$V_{CC(B)}$=5.5V;$V_{CC(A)}$=0V	-	-	20	uA
		A plus B port ($I_{CC(A)}$+$I_{CC(B)}$); I_O=0A; V_I=0V or V_{CCI}	$V_{CC(A)}$,$V_{CC(B)}$=1.2V to 5.5V	-	-	30	uA
additional supply current	ΔI_{CC}	per input; $V_{CC(A)}$,$V_{CC(B)}$ =3.0V to 5.5V	DIR and $\overline{OE}$ input; DIR or $\overline{OE}$ input at $V_{CC(A)}$-0.6V; A port at $V_{CC(A)}$ or GND; B port=open	-	-	75	uA
			A port; A port at $V_{CC(A)}$-0.6V; DIR at $V_{CC(A)}$; B port=open	-	-	75	uA
			B port; B port at $V_{CC(B)}$-0.6V; DIR at GND; A port=open	-	-	75	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.

3.3.2、AC Characteristics

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

Parameter	Symbol	Conditions	$V_{CC(B)}$										Unit
			1.5V±0.1V		1.8V±0.15V		2.5V±0.2V		3.3V±0.3V		5.0V±0.5V		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$V_{CC(A)}$=1.5V±0.1V													
propagation delay	t_{PLH}, t_{PHL}	An to Bn	-	19.4	-	16.8	-	14.4	-	13.8	-	13.8	ns
		Bn to An	-	19.2	-	17.9	-	16.7	-	15.8	-	15.2	ns
disable time	t_{PLZ}, t_{PHZ}	$\overline{OE}$ to An	-	32	-	32	-	32	-	32	-	32	ns
		$\overline{OE}$ to Bn	-	40	-	38	-	19	-	17	-	15	ns
enable time	t_{PZL}, t_{PZH}	$\overline{OE}$ to An	-	37	-	37	-	37	-	37	-	37	ns
		$\overline{OE}$ to Bn	-	41	-	39	-	20	-	17	-	16	ns
$V_{CC(A)}$=1.8V±0.15V													
propagation delay	t_{PLH}, t_{PHL}	An to Bn	-	18	-	14.4	-	12.2	-	11.1	-	11	ns
		Bn to An	-	16.7	-	14	-	12.5	-	11.7	-	11.1	ns
disable time	t_{PLZ}, t_{PHZ}	$\overline{OE}$ to An	-	32	-	31.8	-	31.6	-	31.3	-	31.2	ns
		$\overline{OE}$ to Bn	-	40	-	36.2	-	17.1	-	16.0	-	14.3	ns
enable time	t_{PZL}, t_{PZH}	$\overline{OE}$ to An	-	27	-	27	-	26.8	-	26.7	-	26.7	ns
		$\overline{OE}$ to Bn	-	39	-	38	-	20	-	15.6	-	14.8	ns
$V_{CC(A)}$=2.5V±0.2V													
propagation delay	t_{PLH}, t_{PHL}	An to Bn	-	16.8	-	13.1	-	10.1	-	9	-	8.4	ns
		Bn to An	-	14.3	-	11.7	-	9.8	-	8.7	-	7.8	ns
disable time	t_{PLZ}, t_{PHZ}	$\overline{OE}$ to An	-	12	-	12	-	12	-	12	-	12	ns
		$\overline{OE}$ to Bn	-	37	-	33.6	-	15	-	14.3	-	10.9	ns
enable time	t_{PZL}, t_{PZH}	$\overline{OE}$ to An	-	17	-	17	-	17	-	17	-	17	ns
		$\overline{OE}$ to Bn	-	37	-	32.5	-	17.5	-	13.5	-	11	ns
$V_{CC(A)}$=3.3V±0.3V													
propagation delay	t_{PLH}, t_{PHL}	An to Bn	-	16.1	-	12.3	-	8.9	-	7.7	-	7.2	ns
		Bn to An	-	13.5	-	10.8	-	8.7	-	7.5	-	6.6	ns
disable time	t_{PLZ}, t_{PHZ}	$\overline{OE}$ to An	-	12	-	12	-	12	-	12	-	12	ns
		$\overline{OE}$ to Bn	-	34	-	31	-	14.5	-	12.5	-	10.4	ns
enable time	t_{PZL}, t_{PZH}	$\overline{OE}$ to An	-	13.5	-	13.5	-	13.3	-	13.2	-	13.2	ns
		$\overline{OE}$ to Bn	-	36.8	-	31.4	-	18.1	-	12.4	-	10.5	ns
$V_{CC(A)}$=5.0V±0.5V													
propagation delay	t_{PLH}, t_{PHL}	An to Bn	-	15.5	-	11.7	-	8	-	6.9	-	6.2	ns
		Bn to An	-	13.5	-	10.5	-	8.1	-	6.9	-	6	ns
disable time	t_{PLZ}, t_{PHZ}	$\overline{OE}$ to An	-	9.2	-	9.2	-	9.2	-	9.2	-	9.2	ns
		$\overline{OE}$ to Bn	-	35.8	-	32.5	-	13.5	-	12	-	9.8	ns
enable time	t_{PZL}, t_{PZH}	$\overline{OE}$ to An	-	10.7	-	10.7	-	10.7	-	10.7	-	10.7	ns
		$\overline{OE}$ to Bn	-	36.8	-	31.4	-	18.4	-	13.5	-	10.7	ns

4、Testing Circuit

4.1、AC Testing Circuit

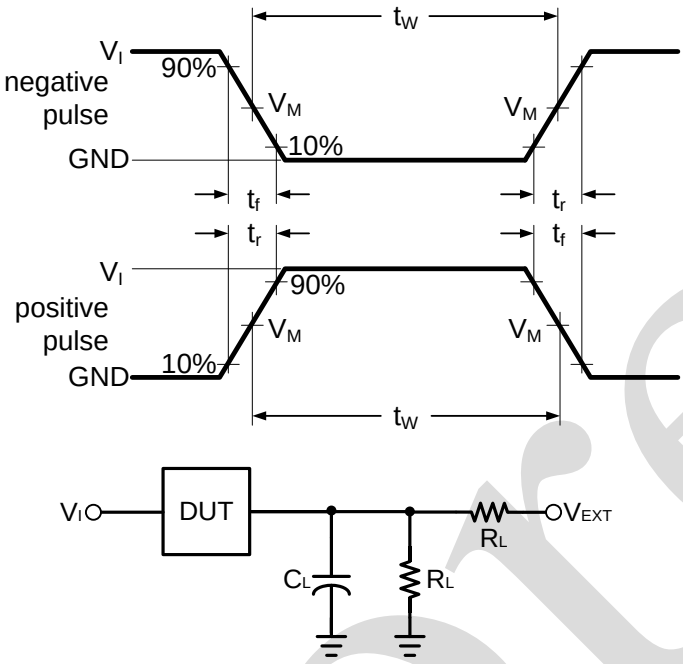


Figure 3. Load circuit

C_L includes probe and jig capacitance.

R_L=Load resistance.

4.2、Test Data

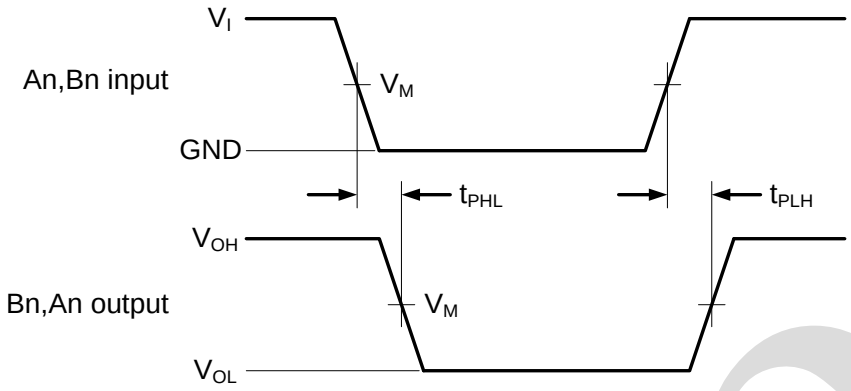
Supply voltage	Input		Load		V_{EXT}		
$V_{CC(A)}$,$V_{CC(B)}$	V_I[1]	$t_r = t_f$	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}[2]
1.2V to 5.5V	V_{CCI}	≤ 3ns	15pF	2kΩ	open	GND	$2V_{CCO}$

Note:

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

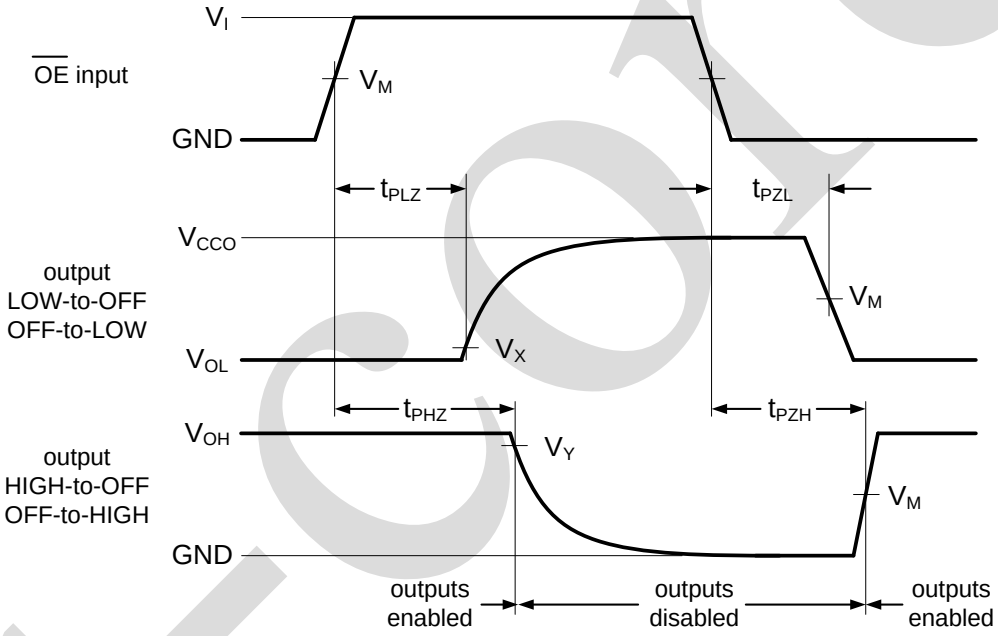
[2] V_{CCO} is the supply voltage associated with the output port.

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 (An, Bn) to output (Bn, An) 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
1.2V 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 5.5V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL}+0.3V	V_{OH}-0.3V

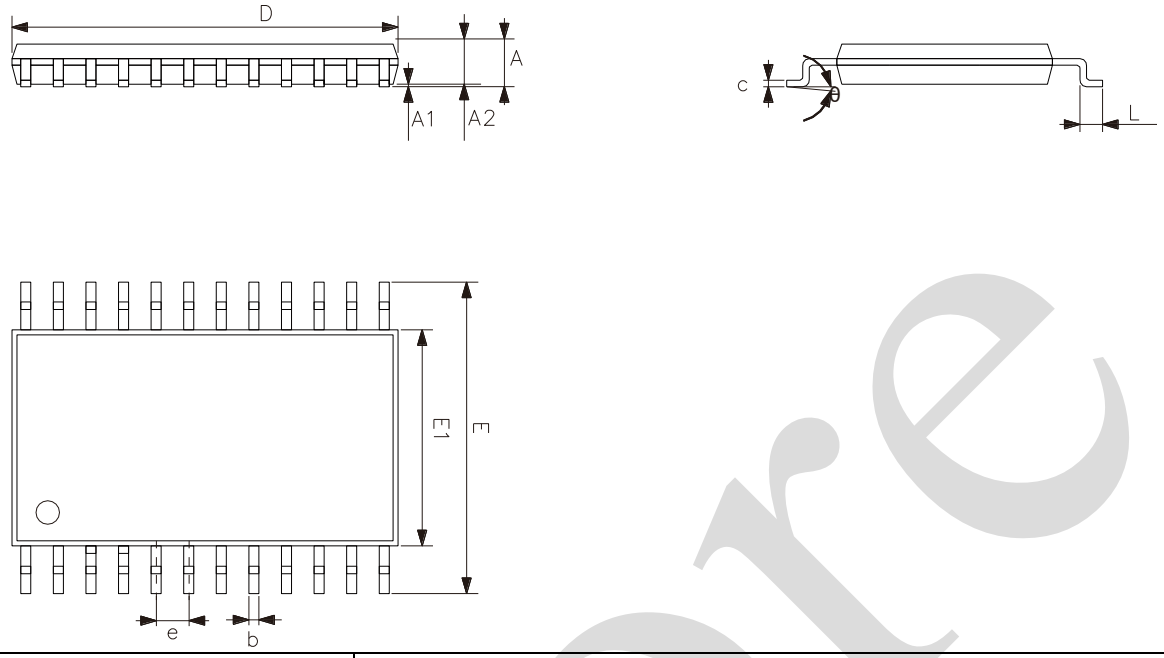
Note:

[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、Package Information

5.1、TSSOP24



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	7.70	7.90
E	6.20	6.60
E1	4.30	4.50
e	0.65	
L	0.45	0.75
θ	0 °	8 °

6、Statements And Notes

6.1、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.									

6.2、Notes

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

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