AiP74LV14
Hex Inverting Schmitt Trigger

Product Specification

Specification Revision History:

Version	Date	Description
2017-05-A1	2017-05	New
2023-04-B1	2023-04	Update the template

Contents

1、General Description

The AiP74LV14 is a low-voltage Si-gate CMOS device that is pin and function compatible with AiP74HC14 and AiP74HCT14.

The AiP74LV14 provides six inverting buffers with Schmitt-trigger input. It is capable of transforming slowly-changing input signals into sharply defined, jitter-free output signals.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage V_{T+} and the negative voltage V_{T-} is defined as the input hysteresis voltage V_H.

Features:

- Operating voltage: 1.0V to 5.5V
- 5.5V tolerant inputs/outputs
- Power-down mode
- Specified from -40℃ to +125℃
- Packaging information: DIP14/SOP14/TSSOP14

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LV14DA14.TB	DIP14	74LV14	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74LV14SA14.TB	SOP14	74LV14	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP74LV14TA14.TB	TSSOP14	74LV14	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LV14SA14.TR	SOP14	74LV14	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP74LV14TA14.TR	TSSOP14	74LV14	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×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

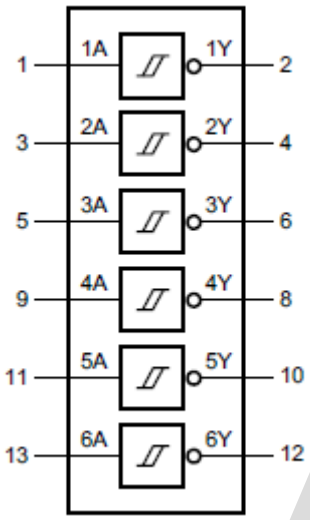


Figure 1. Logic symbol

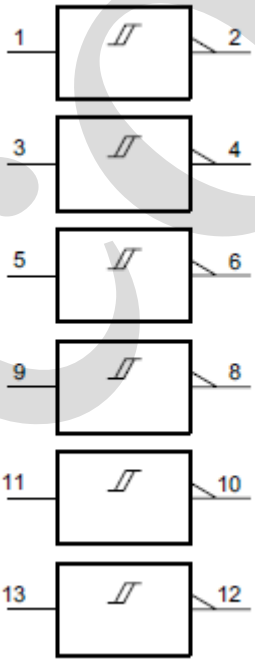


Figure 2. IEC logic symbol

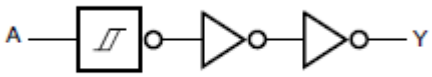
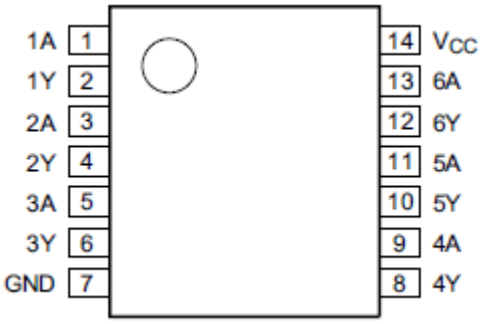


Figure 3. Logic diagram for one Schmitt-trigger

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1Y	data output
3	2A	data input
4	2Y	data output
5	3A	data input
6	3Y	data output
7	GND	ground (0V)
8	4Y	data output
9	4A	data input
10	5Y	data output
11	5A	data input
12	6Y	data output
13	6A	data input
14	V_{CC}	supply voltage

2.4、Function Table

Input	Output
nA	**nY**
L	H
H	L

Note: H=HIGH voltage level; L=LOW voltage level.

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	V_{CC}	-		-0.5	+7.0	V
input clamping current	I_{IK}	V_I < -0.5V or V_I > V_{CC}+0.5V		-	±20	mA
output clamping current	I_{OK}	V_O < -0.5V or V_O > V_{CC}+0.5V		-	±50	mA
output current	I_O	V_O= -0.5V to (V_{CC}+0.5V)		-	±25	mA
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-50	-	mA
storage temperature	T_{stg}	-		-65	+150	℃
total power dissipation	P_{tot}	-		-	500	mW
Soldering temperature	T_L	10s	DIP	245		℃
			SOP/TSSOP	260		

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.0	3.3	5.5	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
ambient temperature	T_{amb}	-	-40	-	+125	℃

Note: The static characteristics are guaranteed from V_{CC}=1.2V to V_{CC}=5.5V, but LV devices are guaranteed to function down to V_{CC}=1.0 V (with input levels GND or V_{CC}).

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I = V_{T+}$ or V_{T-}	I_O=-100uA; V_{CC}=1.2V	-	1.2	-	V
			I_O=-100uA; V_{CC}=2.0V	1.8	2.0	-	V
			I_O=-100uA; V_{CC}=2.7V	2.5	2.7	-	V
			I_O=-100uA; V_{CC}=3.0V	2.8	3.0	-	V
			I_O=-100uA; V_{CC}=4.5V	4.3	4.5	-	V
			I_O=-6mA; V_{CC}=3.0V	2.4	2.82	-	V
			I_O=-12mA; V_{CC}=4.5V	3.6	4.2	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{T+}$ or V_{T-}	I_O=100uA; V_{CC}=1.2V	-	0	-	V
			I_O=100uA; V_{CC}=2.0V	-	0	0.2	V
			I_O=100uA; V_{CC}=2.7V	-	0	0.2	V
			I_O=100uA; V_{CC}=3.0V	-	0	0.2	V
			I_O=100uA; V_{CC}=4.5V	-	0	0.2	V
			I_O=6mA; V_{CC}=3.0V	-	0.25	0.40	V
			I_O=12mA; V_{CC}=4.5V	-	0.35	0.55	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	1.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	20	uA
additional supply current	ΔI_{CC}	per input; V_I=V_{CC}-0.6V; V_{CC}=2.7V to 3.6V		-	-	500	uA
input capacitance	C_I	-		-	3.5	-	pF

Note: Typical values are measured at T_{amb}=25℃.

3.3.2、DC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I = V_{T+}$ or V_{T-}	I_O=-100uA; V_{CC}=2.0V	1.8	-	-	V
			I_O=-100uA; V_{CC}=2.7V	2.5	-	-	V
			I_O=-100uA; V_{CC}=3.0V	2.8	-	-	V
			I_O=-100uA; V_{CC}=4.5V	4.3	-	-	V
			I_O=-6mA; V_{CC}=3.0V	2.2	-	-	V
			I_O=-12mA; V_{CC}=4.5V	3.5	-	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{T+}$ or V_{T-}	I_O=100uA; V_{CC}=2.0V	-	-	0.2	V
			I_O=100uA; V_{CC}=2.7V	-	-	0.2	V
			I_O=100uA; V_{CC}=3.0V	-	-	0.2	V
			I_O=100uA; V_{CC}=4.5V	-	-	0.2	V
			I_O=6mA; V_{CC}=3.0V	-	-	0.50	V
			I_O=12mA; V_{CC}=4.5V	-	-	0.65	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	1.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	40	uA
additional supply current	ΔI_{CC}	per input; V_I=V_{CC}-0.6V; V_{CC}=2.7V to 3.6V		-	-	850	uA

Note: Typical values are measured at T_{amb}=25℃.

3.3.3、AC Characteristics 1

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nA to nY; propagation delay	t_{pd}	see Figure 5	V_{CC}=1.2V	-	80	-	ns
			V_{CC}=2.0V	-	27	37	ns
			V_{CC}=2.7V	-	20	28	ns
			V_{CC}=3.0V to 3.6V; C_L=15pF	-	13	-	ns
			V_{CC}=3.0V to 3.6V	-	15	22	ns
			V_{CC}=4.5V to 5.5V	-	-	18	ns
Power dissipation capacitance	C_{PD}	C_L=50pF; f_i=1MHz; V_I= GND to V_{CC}		-	15	-	pF

Note:

[1] Typical values are measured at T_{amb}=25℃.

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

[3] Typical values are measured at nominal supply voltage (V_{CC}=3.3V).

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

P_D=C_{PD} ×V_{CC}^2 ×f_i ×N+ ∑(C_L ×V_{CC}^2 ×f_o) where:

f_i=input frequency in MHz;

f_o=output frequency in MHz;

C_L=output load capacitance in pF;

N=number of inputs switching;

V_{CC}=supply voltage in V.

3.3.4、AC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
nA to nY; propagation delay	t_{pd}	see Figure 5	V_{CC}=2.0V	-	-	48	ns
			V_{CC}=2.7V	-	-	35	ns
			V_{CC}=3.0V to 3.6V	-	-	28	ns
			V_{CC}=4.5V to 5.5V	-	-	23	ns

Note:

[1] Typical values are measured at T_{amb}=25℃.

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

[3] Typical values are measured at nominal supply voltage (V_{CC}=3.3V).

3.3.5、Transfer Characteristics 1

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
positive-going threshold voltage	V_{T+}	see Figure 6 and Figure 7	V_{CC}=1.2V	-	0.70	-	V
			V_{CC}=2.0V	0.8	1.10	1.4	V
			V_{CC}=2.7V	1.0	1.45	2.0	V
			V_{CC}=3.0V	1.2	1.60	2.2	V
			V_{CC}=3.6V	1.5	1.95	2.4	V
			V_{CC}=4.5V	1.7	2.50	3.15	V
			V_{CC}=5.5V	2.1	3.00	3.85	V
negative-going threshold voltage	V_{T-}	see Figure 6 and Figure 7	V_{CC}=1.2V	-	0.34	-	V
			V_{CC}=2.0V	0.3	0.65	0.9	V
			V_{CC}=2.7V	0.4	0.90	1.4	V
			V_{CC}=3.0V	0.6	1.05	1.5	V
			V_{CC}=3.6V	0.8	1.30	1.8	V
			V_{CC}=4.5V	0.9	1.60	2.0	V
			V_{CC}=5.5V	1.1	2.00	2.6	V
hysteresis voltage	V_H	see Figure 6 and Figure 7	V_{CC}=1.2V	-	0.3	-	V
			V_{CC}=2.0V	0.2	0.55	0.8	V
			V_{CC}=2.7V	0.3	0.60	1.1	V
			V_{CC}=3.0V	0.4	0.65	1.2	V
			V_{CC}=3.6V	0.4	0.70	1.2	V
			V_{CC}=4.5V	0.4	0.80	1.4	V
			V_{CC}=5.5V	0.6	1.00	1.5	V

Note:All typical values are measured at T_{amb}=25℃.

3.3.6、Transfer Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
positive-going threshold voltage	V_{T+}	see Figure 6 and Figure 7	V_{CC}=2.0V	0.8	-	1.4	V
			V_{CC}=2.7V	1.0	-	2.0	V
			V_{CC}=3.0V	1.2	-	2.2	V
			V_{CC}=3.6V	1.5	-	2.4	V
			V_{CC}=4.5V	1.7	-	3.15	V
			V_{CC}=5.5V	2.1	-	3.85	V
negative-going threshold voltage	V_{T-}	see Figure 6 and Figure 7	V_{CC}=2.0V	0.3	-	0.9	V
			V_{CC}=2.7V	0.4	-	1.4	V
			V_{CC}=3.0V	0.6	-	1.5	V
			V_{CC}=3.6V	0.8	-	1.8	V
			V_{CC}=4.5V	0.9	-	2.0	V
			V_{CC}=5.5V	1.1	-	2.6	V
hysteresis voltage	V_H	see Figure 6 and Figure 7	V_{CC}=2.0V	0.2	-	0.8	V
			V_{CC}=2.7V	0.3	-	1.1	V
			V_{CC}=3.0V	0.4	-	1.2	V
			V_{CC}=3.6V	0.4	-	1.2	V
			V_{CC}=4.5V	0.4	-	1.4	V
			V_{CC}=5.5V	0.6	-	1.5	V

Note:All typical values are measured at T_{amb}=25℃.

4、Testing Circuit

4.1、AC Testing Circuit

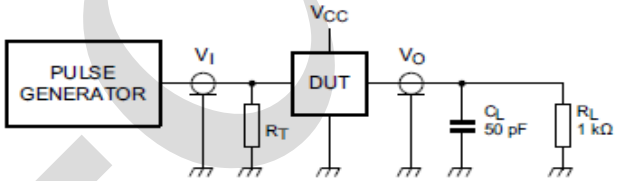


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

C_L=Load capacitance including jig and probe capacitance.

R_L=Load resistance.

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

4.2、AC Testing Waveforms

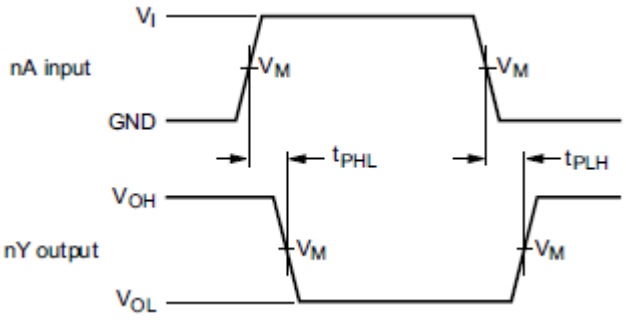


Figure 5. The input (nA) to output (nY) propagation delays

4.3、Transfer Characteristics Waveforms

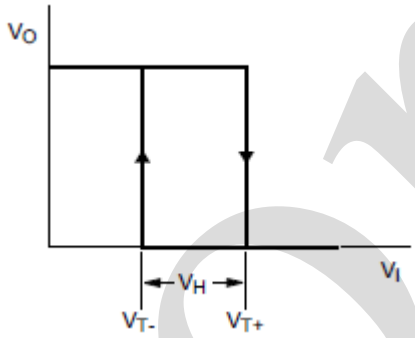


Figure 6. Transfer characteristics

V_{T+} and V_{T-} limits at 70% and 20%:

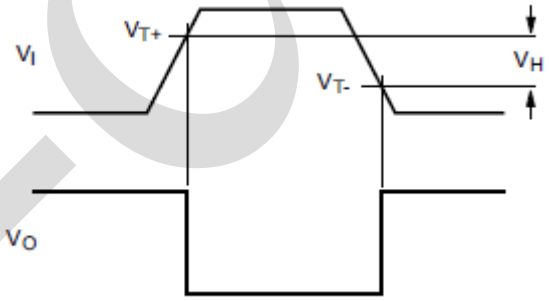
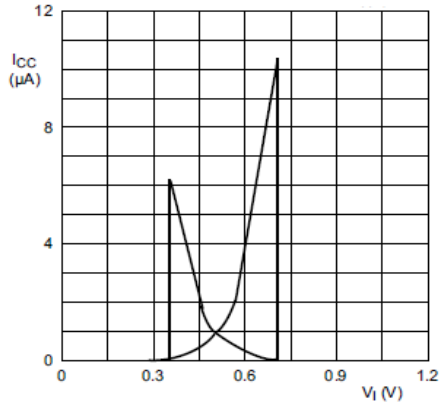
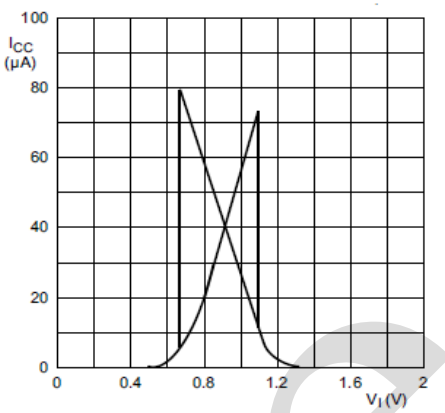


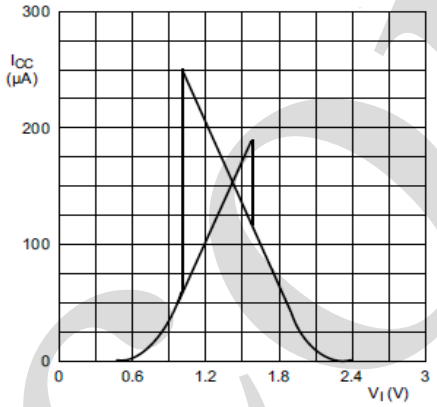
Figure 7. Definition of V_{T+}, V_{T-} and V_H



V_{CC} = 1.2 V.



V_{CC} = 2.0 V.



V_{CC} = 3.0 V.

Figure 8. Typical transfer characteristics

4.4、Measurement Points

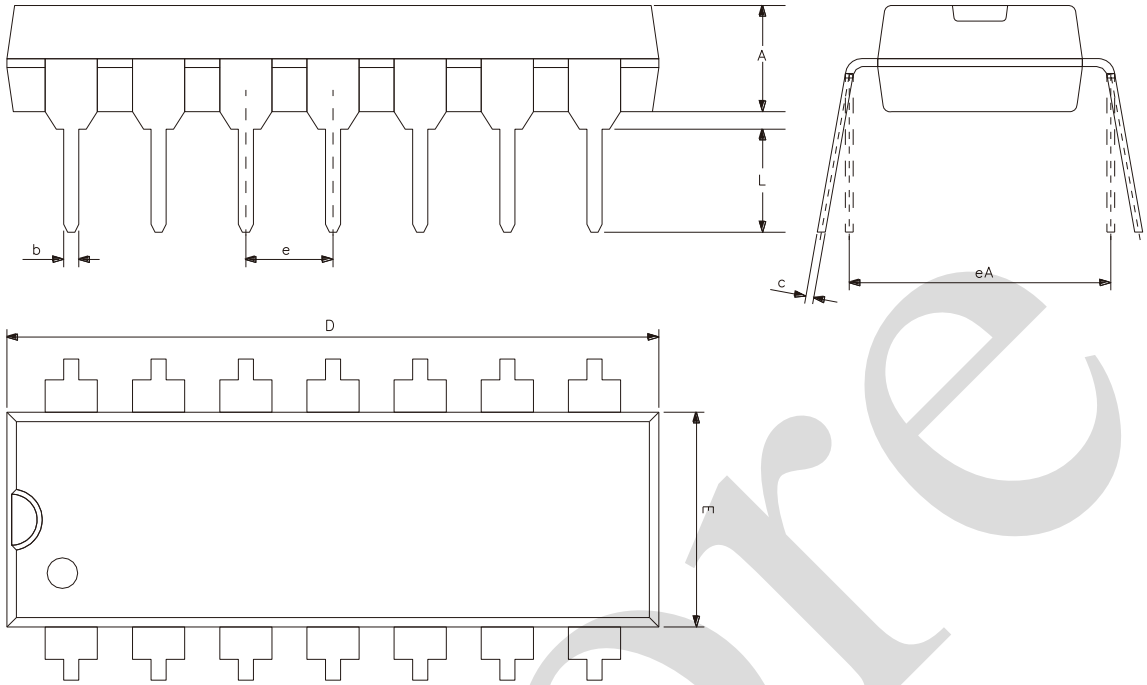
Supply voltage	Input	Output
V_{CC}	V_M	V_M
<2.7V	0.5×V_{CC}	0.5×V_{CC}
2.7V to 3.6V	1.5V	1.5V
≥4.5V	0.5×V_{CC}	0.5×V_{CC}

4.5、Test Data

Supply voltage	Input	
V_{CC}	V_I	t_r , t_f
<2.7V	V_{CC}	≤ 2.5ns
2.7V to 3.6V	2.7V	≤ 2.5ns
≥4.5V	V_{CC}	≤ 2.5ns

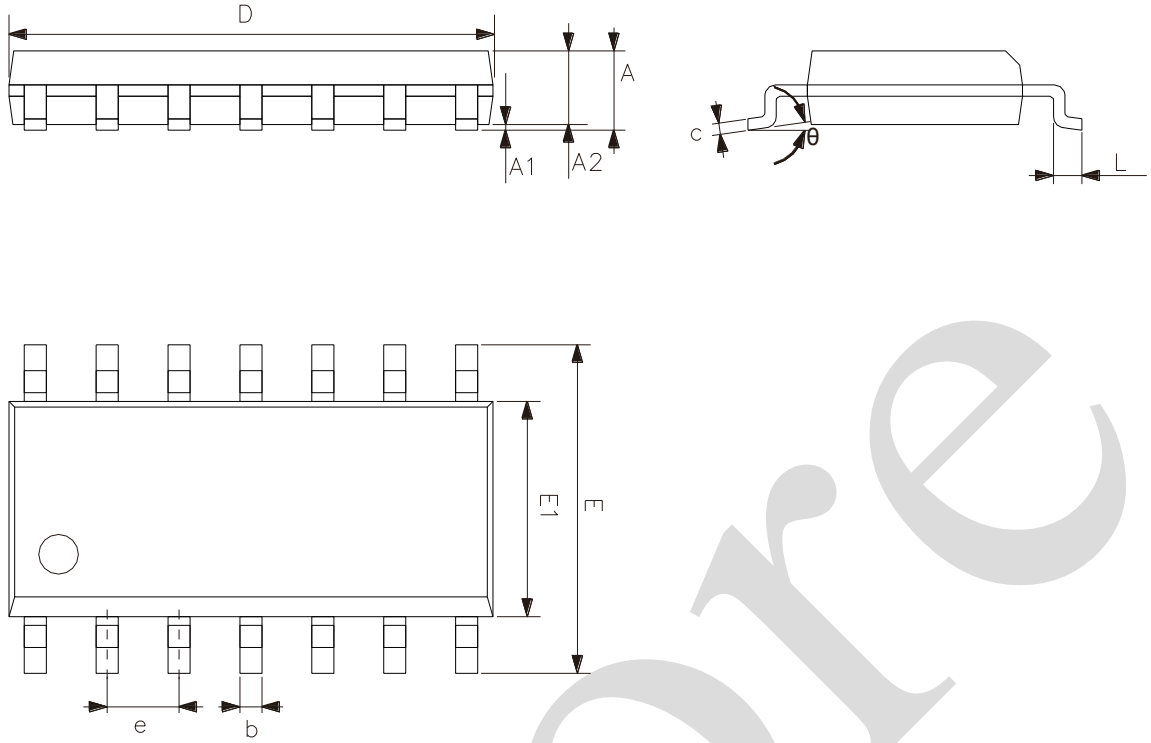
5、Package Information

5.1、DIP14



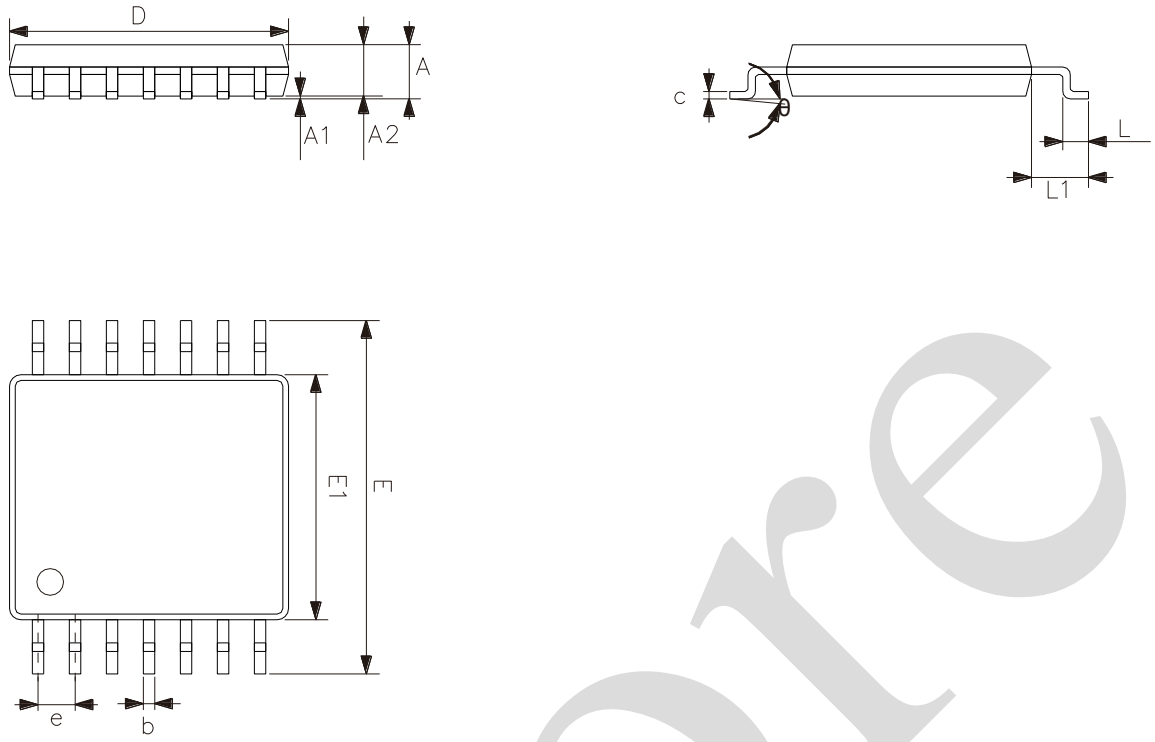
Symbol	Dimensions (mm)	
	Min.	Max.
A	3.05	3.60
b	0.33	0.56
c	0.20	0.36
D	18.80	19.40
E	6.20	6.60
e	2.54	
eA	7.62	10.90
L	2.92	-

5.2、SOP14



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.50	1.75
A1	0.05	0.25
A2	1.30	-
b	0.33	0.50
c	0.19	0.25
D	8.43	8.76
E	5.80	6.25
E1	3.75	4.00
e	1.27	
L	0.40	0.89
θ	0 °	8 °

5.3、TSSOP14



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	4.90	5.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
L1	1.00	
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.

The information in this chapter is provided for reference only and i-Core disclaims any express or implied warranties, including but not limited to applicability, special application or non-infringement of third party rights.

This product is not suitable for critical equipment such as life-saving, life-sustaining or safety equipment. It is also not suitable for applications that may result in personal injury, death, or serious property or environmental damage due to product malfunction or failure. I-Core will not be liable for any damages incurred by the customers at their own risk for such applications.

The customer is responsible for conducting all necessary tests i-Core's application to avoid failure in the application or the application of the customer' s third party users. I-Core does not accept any liability.

The Company reserves the right to change or improve the information published in this chapter at any time. The information in this chapter are subject to change without notice. We recommend the customer to consult our sales staff before purchasing.

Please obtain related materials form i-Core's regular channels and we are not responsible for its content if it is provided by sources other than our company.

In case of any conflict between the Chinese and English version, the version is subject to the Chinese one.