



AiP74LVC14

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
2023-07-B2	2023-07	Modification ESD level



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1、 General Description

The AiP74LVC14 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 .

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in mixed 3.3V and 5V applications.

Features:

- Wide supply voltage range from 1.2V to 3.6V
- 5V tolerant input for interfacing with 5V logic
- CMOS low power consumption
- Direct interface with TTL levels
- ESD-HBM:2000V
- Specified from -40°C to +125°C
- Packaging information: DIP14/SOP14/TSSOP14

**Ordering Information:****Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC14DA14.TB	DIP14	74LVC14	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.1mm×6.4mm Pin spacing: 2.54mm
AiP74LVC14SA14.TB	SOP14	74LVC14	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP74LVC14TA14.TB	TSSOP14	74LVC14	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
AiP74LVC14SA14.TR	SOP14	74LVC14	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP74LVC14TA14.TR	TSSOP14	74LVC14	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

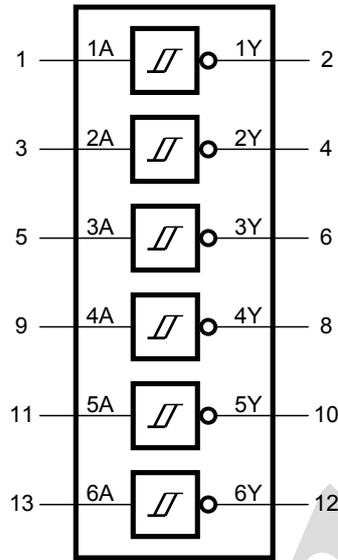


Figure 1. Logic symbol

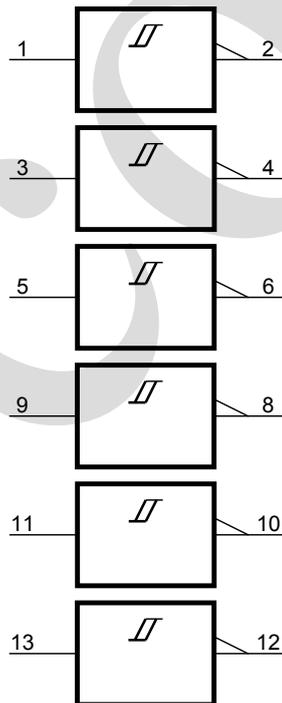


Figure 2. IEC logic symbol

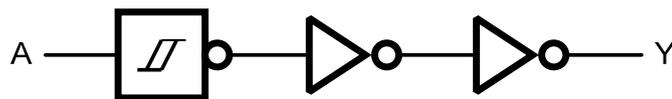
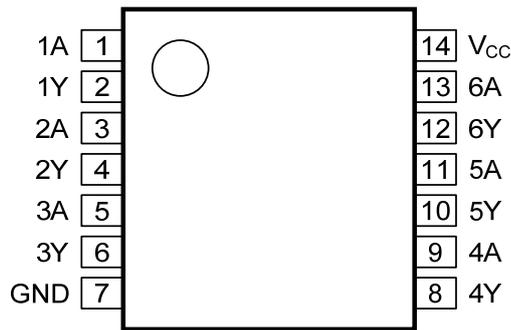


Figure 3. Logic diagram for one Schmitt trigger



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	+6.5	V
input voltage	V_I	-	-0.5	+6.5	V
output voltage	V_O	-	-0.5	$V_{CC}+0.5$	V
input clamping current	I_{IK}	$V_I < 0V$	-50	-	mA
output clamping current	I_{OK}	$V_O > V_{CC}$ or $V_O < 0V$	-	± 50	mA
output current	I_O	$V_O=0V$ to V_{CC}	-	± 50	mA
supply current	I_{CC}	-	-	100	mA
ground current	I_{GND}	-	-100	-	mA
total power dissipation	P_{tot}	-	-	500	mW
storage temperature	T_{stg}	-	-65	+150	$^{\circ}C$
Soldering temperature	T_L	10s	DIP	245	$^{\circ}C$
			SOP/TSSOP	260	$^{\circ}C$

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.65	-	3.6	V
		functional	1.2	-	-	V
input voltage	V_I	-	0	-	5.5	V
output voltage	V_O	-	0	-	V_{CC}	V
ambient temperature	T_{amb}	-	-40	-	+125	$^{\circ}C$



3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb}=-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, 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-}	$I_O=-100\mu\text{A}; V_{CC}=1.65\text{V to }3.6\text{V}$	$V_{CC} - 0.2$	-	-	V
			$I_O=-4\text{mA}; V_{CC}=1.65\text{V}$	1.2	-	-	V
			$I_O=-8\text{mA}; V_{CC}=2.3\text{V}$	1.8	-	-	V
			$I_O=-12\text{mA}; V_{CC}=2.7\text{V}$	2.2	-	-	V
			$I_O=-18\text{mA}; V_{CC}=3.0\text{V}$	2.4	-	-	V
			$I_O=-24\text{mA}; V_{CC}=3.0\text{V}$	2.2	-	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{T+}$ or V_{T-}	$I_O=100\mu\text{A}; V_{CC}=1.65\text{V to }3.6\text{V}$	-	-	0.20	V
			$I_O=4\text{mA}; V_{CC}=1.65\text{V}$	-	-	0.45	V
			$I_O=8\text{mA}; V_{CC}=2.3\text{V}$	-	-	0.6	V
			$I_O=12\text{mA}; V_{CC}=2.7\text{V}$	-	-	0.4	V
			$I_O=24\text{mA}; V_{CC}=3.0\text{V}$	-	-	0.55	V
input leakage current	I_I	$V_I=5.5\text{V or GND}; V_{CC}=3.6\text{V}$	-	-	± 5	μA	
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=3.6\text{V}$	-	-	10	μA	
additional supply current	ΔI_{CC}	per input pin; $V_I=V_{CC}-0.6\text{V}; I_O=0\text{A}; V_{CC}=2.7\text{V to }3.6\text{V}$	-	-	500	μA	
input capacitance	C_I	$V_{CC}=0\text{V to }3.6\text{V}; V_I= \text{GND to } V_{CC}$	-	4.0	-	pF	

3.3.2、DC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, 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-}	$I_O=-100\mu\text{A}; V_{CC}=1.65\text{V to }3.6\text{V}$	$V_{CC} - 0.3$	-	-	V
			$I_O=-4\text{mA}; V_{CC}=1.65\text{V}$	1.05	-	-	V
			$I_O=-8\text{mA}; V_{CC}=2.3\text{V}$	1.65	-	-	V
			$I_O=-12\text{mA}; V_{CC}=2.7\text{V}$	2.05	-	-	V
			$I_O=-18\text{mA}; V_{CC}=3.0\text{V}$	2.25	-	-	V
			$I_O=-24\text{mA}; V_{CC}=3.0\text{V}$	2.0	-	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{T+}$ or V_{T-}	$I_O=100\mu\text{A}; V_{CC}=1.65\text{V to }3.6\text{V}$	-	-	0.3	V
			$I_O=4\text{mA}; V_{CC}=1.65\text{V}$	-	-	0.65	V
			$I_O=8\text{mA}; V_{CC}=2.3\text{V}$	-	-	0.8	V
			$I_O=12\text{mA}; V_{CC}=2.7\text{V}$	-	-	0.6	V
			$I_O=24\text{mA}; V_{CC}=3.0\text{V}$	-	-	0.8	V
input leakage current	I_I	$V_I=5.5\text{V or GND}; V_{CC}=3.6\text{V}$	-	-	± 20	μA	
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=3.6\text{V}$	-	-	40	μA	
additional supply current	ΔI_{CC}	per input pin; $V_I=V_{CC}-0.6\text{V}; I_O=0\text{A}; V_{CC}=2.7\text{V to }3.6\text{V}$	-	-	5000	μA	



3.3.3、AC Characteristics 1

($T_{amb}=-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ. ^[1]	Max.	Unit	
nA to nY propagation delay	t_{PLH}, t_{PHL}	see Figure 5	$V_{CC}=1.2\text{V}$	-	11	-	ns
			$V_{CC}=1.65\text{V}$ to 1.95V	1.0	7.5	15	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	1.5	6.0	12	ns
			$V_{CC}=2.7\text{V}$	1.5	6.0	12	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	1.0	5.5	11	ns

Note:

[1] Typical values are measured at $T_{amb}=25^{\circ}\text{C}$ and $V_{CC}=1.2\text{V}, 1.8\text{V}, 2.5\text{V}, 2.7\text{V}$ and 3.3V respectively.

3.3.4、AC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
nA to nY propagation delay	t_{PLH}, t_{PHL}	see Figure 5	$V_{CC}=1.65\text{V}$ to 1.95V	1.0	-	16	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	1.5	-	13	ns
			$V_{CC}=2.7\text{V}$	1.5	-	13	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	1.0	-	12	ns

3.3.5、Transfer Characteristics 1

($T_{amb}=-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, 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	$V_{CC}=1.2\text{V}$	0.2	-	1.0	V
			$V_{CC}=1.65\text{V}$	0.4	-	1.3	V
			$V_{CC}=1.95\text{V}$	0.6	-	1.5	V
			$V_{CC}=2.3\text{V}$	0.8	-	1.7	V
			$V_{CC}=2.5\text{V}$	0.9	-	1.7	V
			$V_{CC}=2.7\text{V}$	1.1	-	2	V
			$V_{CC}=3\text{V}$	1.2	-	2	V
negative-going threshold voltage	V_{T-}	see Figure 6 and Figure 7	$V_{CC}=1.2\text{V}$	0.12	-	0.75	V
			$V_{CC}=1.65\text{V}$	0.15	-	0.85	V
			$V_{CC}=1.95\text{V}$	0.25	-	0.95	V
			$V_{CC}=2.3\text{V}$	0.4	-	1.1	V
			$V_{CC}=2.5\text{V}$	0.4	-	1.2	V
			$V_{CC}=2.7\text{V}$	0.8	-	1.4	V
			$V_{CC}=3\text{V}$	0.8	-	1.5	V
hysteresis voltage	V_H	$(V_{T+} - V_{T-});$ see Figure 6 and Figure 7	$V_{CC}=1.2\text{V}$	0.1	-	1.0	V
			$V_{CC}=1.65\text{V}$	0.2	-	1.15	V
			$V_{CC}=1.95\text{V}$	0.2	-	1.25	V
			$V_{CC}=2.3\text{V}$	0.3	-	1.3	V
			$V_{CC}=2.5\text{V}$	0.3	-	1.3	V
			$V_{CC}=2.7\text{V}$	0.3	-	1.1	V



			$V_{CC}=3V$	0.3	-	1.2	V
			$V_{CC}=3.6V$	0.3	-	1.2	V

3.3.6、 Transfer Characteristics 2

($T_{amb}=-40^{\circ}C$ to $+125^{\circ}C$, 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	$V_{CC}=1.2V$	0.2	-	1.0	V
			$V_{CC}=1.65V$	0.4	-	1.3	V
			$V_{CC}=1.95V$	0.6	-	1.5	V
			$V_{CC}=2.3V$	0.8	-	1.7	V
			$V_{CC}=2.5V$	0.9	-	1.7	V
			$V_{CC}=2.7V$	1.1	-	2	V
			$V_{CC}=3V$	1.2	-	2	V
			$V_{CC}=3.6V$	1.2	-	2	V
negative-going threshold voltage	V_{T-}	see Figure 6 and Figure 7	$V_{CC}=1.2V$	0.12	-	0.75	V
			$V_{CC}=1.65V$	0.15	-	0.85	V
			$V_{CC}=1.95V$	0.25	-	0.95	V
			$V_{CC}=2.3V$	0.4	-	1.1	V
			$V_{CC}=2.5V$	0.4	-	1.2	V
			$V_{CC}=2.7V$	0.8	-	1.4	V
			$V_{CC}=3V$	0.8	-	1.5	V
			$V_{CC}=3.6V$	0.8	-	1.5	V
hysteresis voltage	V_H	$(V_{T+} - V_{T-});$ see Figure 6 and Figure 7	$V_{CC}=1.2V$	0.1	-	1.0	V
			$V_{CC}=1.65V$	0.2	-	1.15	V
			$V_{CC}=1.95V$	0.2	-	1.25	V
			$V_{CC}=2.3V$	0.3	-	1.3	V
			$V_{CC}=2.5V$	0.3	-	1.3	V
			$V_{CC}=2.7V$	0.3	-	1.1	V
			$V_{CC}=3V$	0.3	-	1.2	V
			$V_{CC}=3.6V$	0.3	-	1.2	V



4、Testing Circuit

4.1、AC Testing Circuit

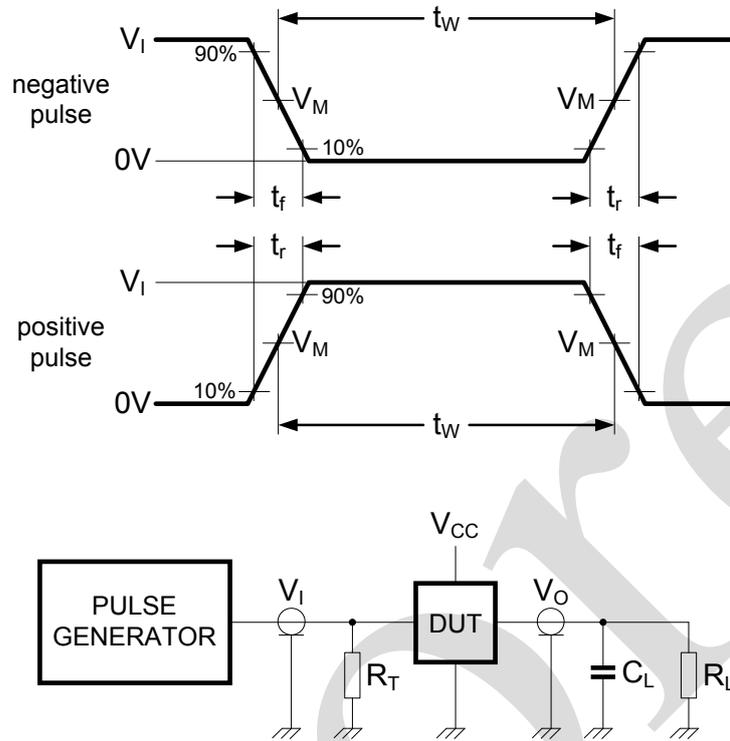


Figure 4. Load circuitry for switching times

Definitions for test circuit:

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.

4.2、AC Testing Waveforms

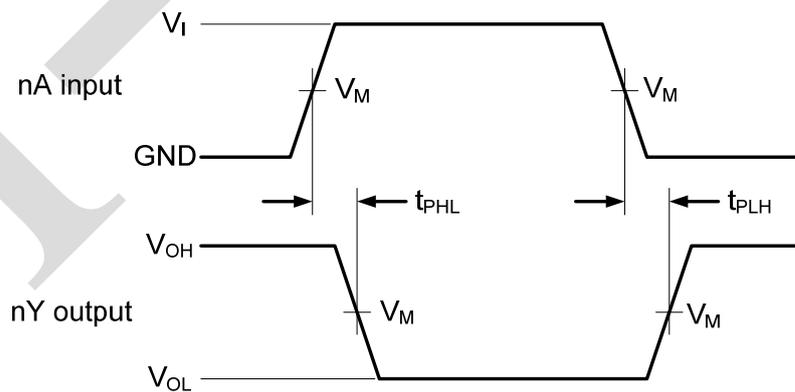


Figure 5. Propagation delay input (nA) to output (nY)



4.3. Transfer characteristics Waveforms

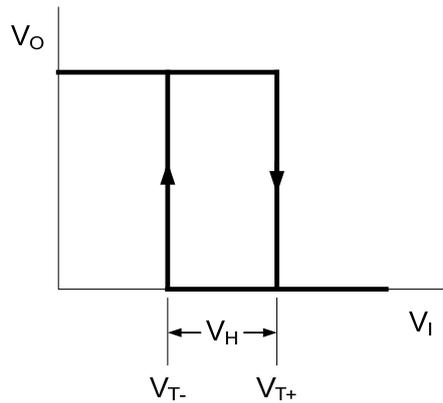
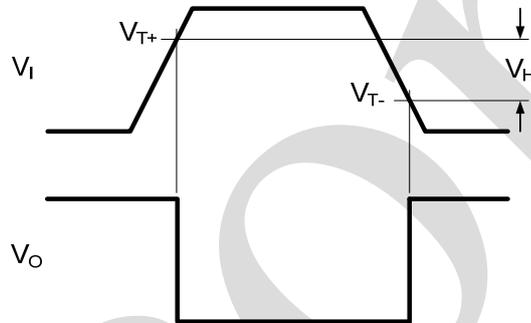


Figure 6. Transfer characteristic

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

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

4.4. Measurement Points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
< 2.7V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
$\geq 2.7V$	1.5V	1.5V

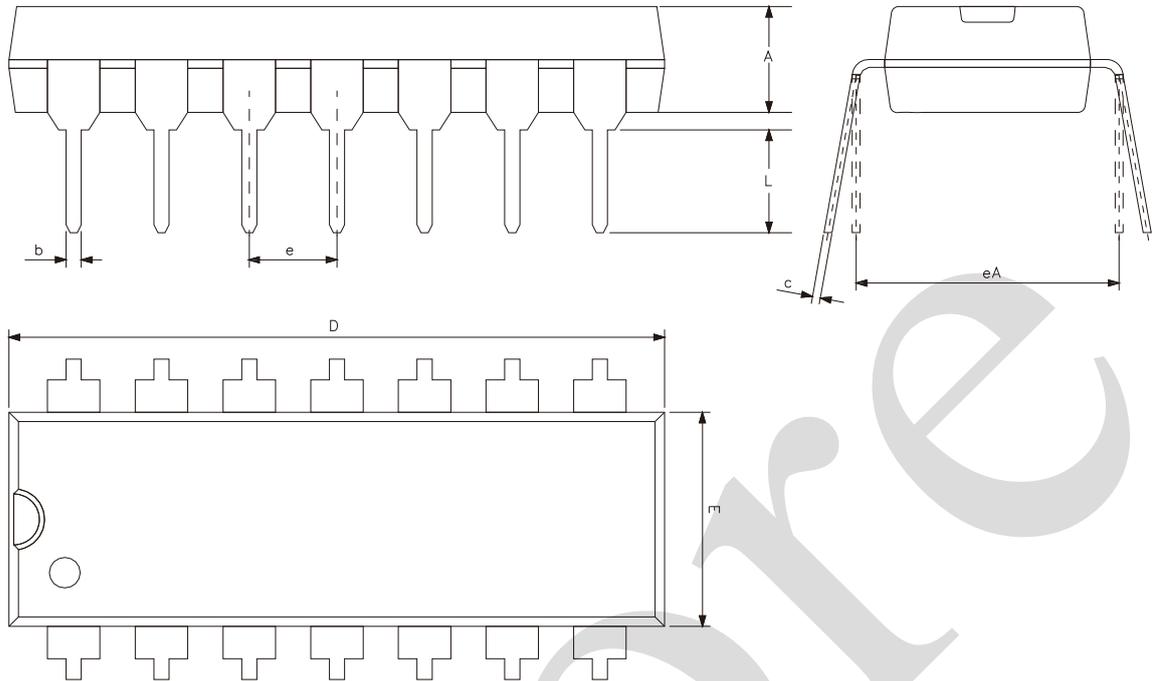
4.5. Test Data

Supply voltage	Input		Load	
V_{CC}	V_I	t_r, t_f	C_L	R_L
1.2V	V_{CC}	$\leq 3ns$	30pF	1k Ω
1.65V to 1.95V	V_{CC}	$\leq 3ns$	30pF	1k Ω
2.3V to 2.7V	V_{CC}	$\leq 3ns$	30pF	500 Ω
2.7V	2.7V	$\leq 3ns$	50pF	500 Ω
3.0V to 3.6V	2.7V	$\leq 3ns$	50pF	500 Ω



5、Package Information

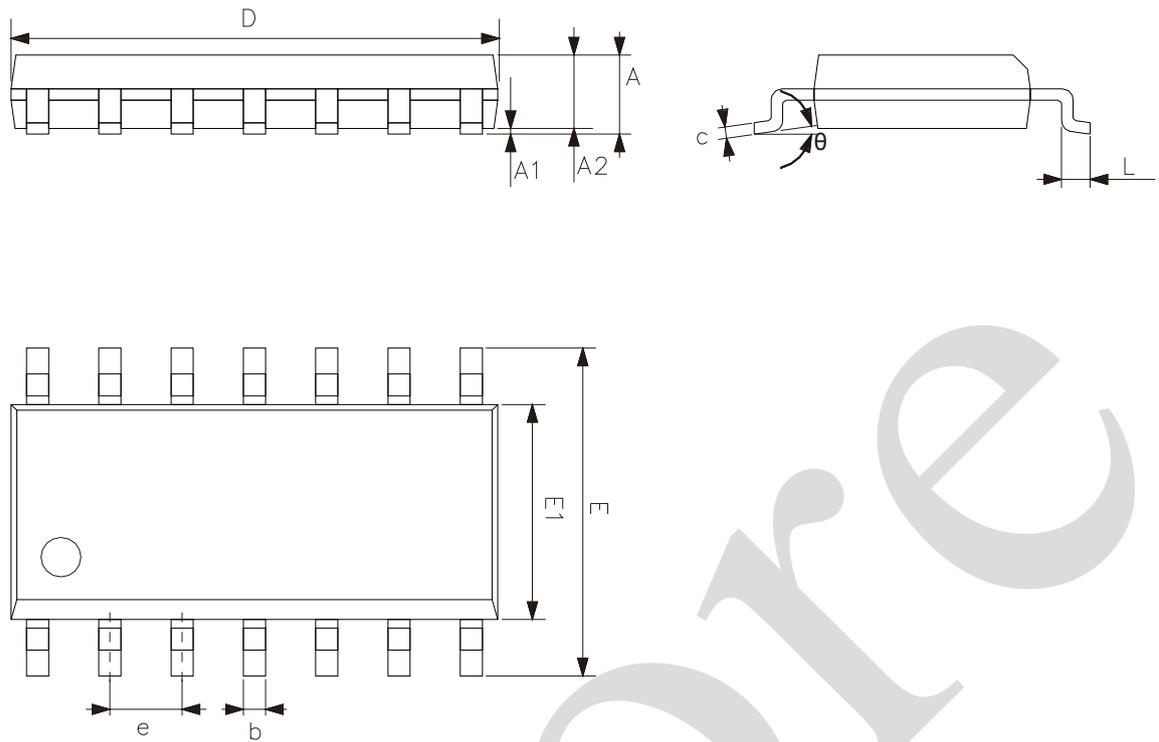
5.1、DIP14



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	-



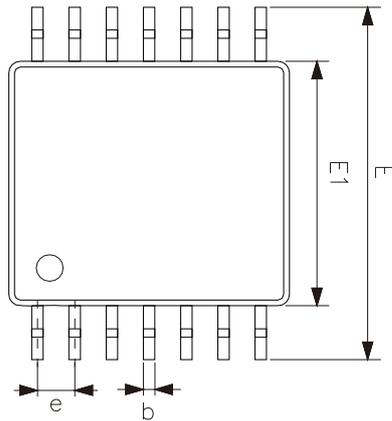
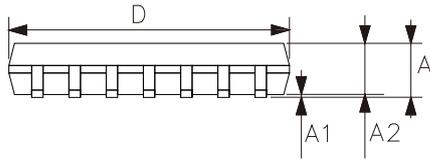
5.2、SOP14



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

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