SN74HC90/HCT90
Decade and Binary Counters

Product Specification

Specification Revision History：

Version	Date	Description
2023-08-A0	2023-08	New
2023-11-A1	2023-11	Parameter modification

Contents

1、General Description

The SN74HC/HCT90 is a decade and binary counter. Output QA is connected to in CKB for BCD count. Output QD is connected to input CKA for bi-quinary count. In the counting modes, state changes are initiated by the falling edge of the clock.

Features:

- Supply voltage range:
  SN74HC90: 2~6V
  SN74HCT90: 4.5~5.5V
- Input levels:
  SN74HC90: CMOS level
  SN74HCT90: TTL level
- Temperature range:-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
SN74HC90N(LX)	DIP14	SN74HC90N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74HCT90N(LX)	DIP14	SN74HCT90N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74HC90D(LX)	SOP14	HC90	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
SN74HCT90D(LX)	SOP14	HCT90	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
SN74HC90P(LX)	TSSOP14	HC90	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
SN74HCT90P(LX)	TSSOP14	HCT90	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
SN74HC90DR(LX)	SOP14	HC90	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
SN74HCT90DR(LX)	SOP14	HCT90	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
SN74HC90PR(LX)	TSSOP14	HC90	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
SN74HCT90PR(LX)	TSSOP14	HCT90	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

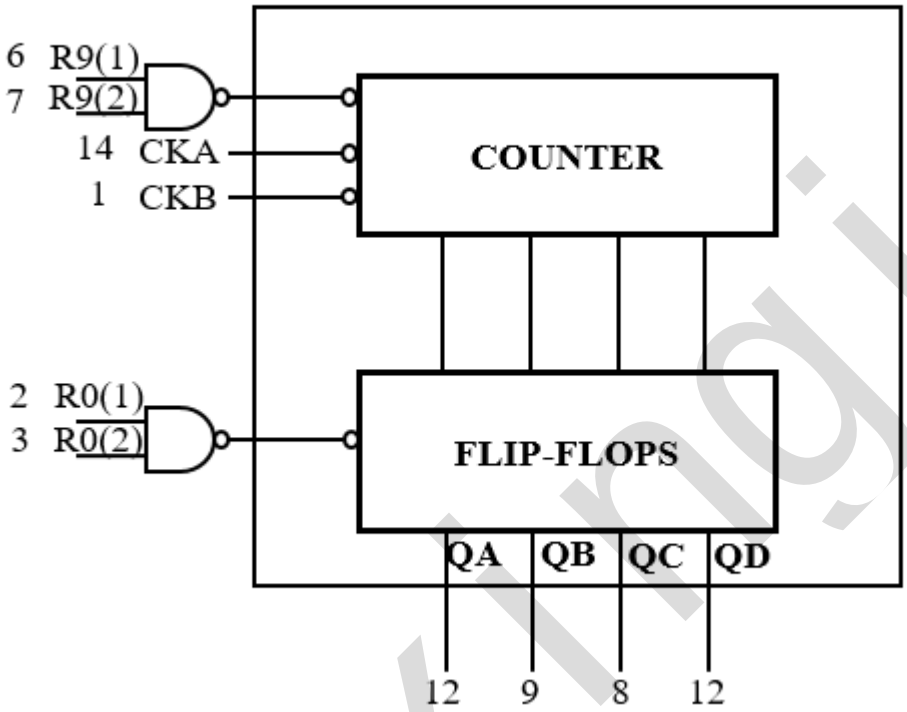
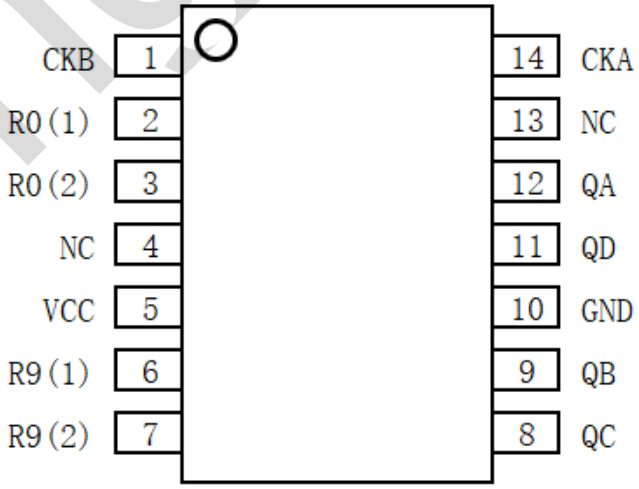


Figure 1. Logic symbol

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	CKB	÷5 Section Clock Input(Active falling edge)
2	R0(1)	Master reset input
3	R0(2)	Master reset input
4	NC	Not connect
5	VCC	supply voltage
6	R9(1)	Master set input(preset 9)
7	R9(2)	Master set input(preset 9)
8	QC	Output from ÷5
9	QB	Output from ÷5
10	GND	ground (0V)
11	QD	Output from ÷5
12	QA	Output from ÷2
13	NC	Not connect
14	CKA	÷2 Section Clock Input(Active falling edge)

2.4、Function Table

BCD COUNT SEQUENCE(See Note A)				
COUNT	Outputs			
	QD	QC	QB	QA
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

BI-QUINARY(See Note B)				
COUNT	Outputs			
	QA	QD	QC	QB
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	H	L	L	L

6	H	L	L	H
7	H	L	H	L
8	H	L	H	H
9	H	H	L	L

RESET/COUNT FUNCTION TABLE							
RESET INPUT				Output			
R0(1)	R0(2)	R9(1)	R9(2)	QD	QC	QB	QA
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L	COUNT			
L	X	L	X	COUNT			
L	X	X	L	COUNT			
X	L	L	X	COUNT			

Note:
H=HIGH voltage level; L=LOW voltage level; X=don't care
A:Output QA is connected to input CKB for BCD count
B:Output QD is connected to input CKA for bi-quinary count.

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	V
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-50	-	mA
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 $V_O > V_{CC}+0.5V$		-	±20	mA
output current	I_O	$-0.5V < V_O < V_{CC}+0.5V$		-	±25	mA
storage temperature	T_{stg}	-		-65	+150	℃
soldering temperature	T_L	10s	DIP	245		℃
			SOP/TSSOP	260		

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC90						
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
ambient	T_{amb}	-	-40	-	+125	℃

temperature						
SN74HCT90						
supply voltage	V_{CC}	-	4.5	5.0	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	℃

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	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
SN74HC90							
HIGH-level input voltage	V_{IH}	2.0V	-	1.5	1.2	-	V
		4.5V	-	3.15	2.4	-	V
		6.0V	-	4.2	3.2	-	V
LOW-level input voltage	V_{IL}	2.0V	-	-	0.8	0.5	V
		4.5V	-	-	2.1	1.35	V
		6.0V	-	-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	2.0V	I_O=-20uA	1.9	2.0	-	V
		4.5V	I_O=-20uA	4.4	4.5	-	V
		6.0V	I_O=-20uA	5.9	6.0	-	V
		4.5V	I_O=-4.0mA	3.84	4.32	-	V
		6.0V	I_O=-5.2mA	5.34	5.81	-	V
LOW-level output voltage	V_{OL}	2.0V	I_O=20uA	-	0	0.1	V
		4.5V	I_O=20uA	-	0	0.1	V
		6.0V	I_O=20uA	-	0	0.1	V
		4.5V	I_O=4.0mA	-	0.15	0.33	V
		6.0V	I_O=5.2mA	-	0.16	0.33	V
input leakage current	I_I	6.0V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	80	uA
SN74HCT90							
HIGH-level input voltage	V_{IH}	4.5~5.5V	-	2.0	1.6	-	V
LOW-level input voltage	V_{IL}	4.5~5.5V	-	-	1.2	0.8	V
HIGH-level output voltage	V_{OH}	4.5V	I_O=-20uA	4.4	4.5	-	V
			I_O=-4.0mA	3.84	4.32	-	V
LOW-level output voltage	V_{OL}	4.5V	I_O=20uA	-	0	0.1	V
			I_O=4.0mA	-	0.15	0.33	V
input leakage current	I_I	5.5V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	80	uA
additional supply current	ΔI_{CC}	4.5~5.5V	One input at V_I=V_{CC}-2.1V; Other inputs at V_{CC} or GND; I_O=0A	-	-	135	uA

3.3.2、DC Characteristics 2

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

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
SN74HC90							
HIGH-level input voltage	V_{IH}	2.0V	-	1.5	-	-	V
		4.5V	-	3.15	-	-	V
		6.0V	-	4.2	-	-	V
LOW-level input voltage	V_{IL}	2.0V	-	-	-	0.5	V
		4.5V	-	-	-	1.35	V
		6.0V	-	-	-	1.8	V
HIGH-level output voltage	V_{OH}	2.0V	I_O=-20uA	1.9	-	-	V
		4.5V	I_O=-20uA	4.4	-	-	V
		6.0V	I_O=-20uA	5.9	-	-	V
		4.5V	I_O=-4.0mA	3.7	-	-	V
		6.0V	I_O=-5.2mA	5.2	-	-	V
LOW-level output voltage	V_{OL}	2.0V	I_O=20uA	-	-	0.1	V
		4.5V	I_O=20uA	-	-	0.1	V
		6.0V	I_O=20uA	-	-	0.1	V
		4.5V	I_O=4.0mA	-	-	0.4	V
		6.0V	I_O=5.2mA	-	-	0.4	V
input leakage current	I_I	6.0V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	160	uA
SN74HCT90							
HIGH-level input voltage	V_{IH}	4.5~5.5V	-	2.0	-	-	V
LOW-level input voltage	V_{IL}	4.5~5.5V	-	-	-	0.8	V
HIGH-level output voltage	V_{OH}	4.5V	I_O=-20uA	4.4	-	-	V
			I_O=-4.0mA	3.7	-	-	V
LOW-level output voltage	V_{OL}	4.5V	I_O=20uA	-	-	0.1	V
			I_O=4.0mA	-	-	0.4	V
input leakage current	I_I	5.5V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	160	uA
additional supply current	ΔI_{CC}	4.5~5.5V	One input at V_I=V_{CC}-2.1V; Other inputs at V_{CC} or GND; I_O=0A	-	-	147	uA

3.3.3、AC Characteristics 1

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

Parameter	Symbol	V_{CC}	Conditions		Min.	Typ.	Max.	Unit
SN74HC90								
LOW to HIGH propagation delay	t_{PLH}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	48	ns
		5.0V	C_L=15pF	Set-to-9 to QA QD see Figure 4	-	-	30	ns
HIGH to LOW propagation delay	t_{PHL}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	50	ns
		5.0V	C_L=15pF	Set-to-0 to ANY see Figure 4	-	-	40	ns
		5.0V	C_L=15pF	Set-to-9 to QB QC see Figure 4	-	-	40	ns
Maximum frequency	fmax	5.0V	C_L=15pF	CKA to QA see Figure 4	32	-	-	MHZ
		5.0V	C_L=15pF	CKB to QB see Figure 4	16	-	-	MHZ
SN74HCT90								
LOW to HIGH propagation delay	t_{PLH}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	48	ns
		5.0V	C_L=15pF	Set-to-9 to QA QD see Figure 4	-	-	30	ns
HIGH to LOW propagation delay	t_{PHL}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	50	ns
		5.0V	C_L=15pF	Set-to-0 to ANY see Figure 4	-	-	40	ns
		5.0V	C_L=15pF	Set-to-9 to QB QC see Figure 4	-	-	40	ns
Maximum frequency	fmax	5.0V	C_L=15pF	CKA to QA see Figure 4	32	-	-	MHZ
		5.0V	C_L=15pF	CKB to QB see Figure 4	16	-	-	MHZ

3.3.4、AC Characteristics 2

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

Parameter	Symbol	V_{CC}	Conditions		Min.	Typ.	Max.	Unit
SN74HC90								
LOW to HIGH propagation delay	t_{PLH}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	57.6	ns
		5.0V	C_L=15pF	Set-to-9 to QA QD see Figure 4	-	-	36	ns
HIGH to LOW propagation delay	t_{PHL}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	60	ns
		5.0V	C_L=15pF	Set-to-0 to ANY see Figure 4	-	-	48	ns
		5.0V	C_L=15pF	Set-to-9 to QB QC see Figure 4	-	-	48	ns
Maximum frequency	fmax	5.0V	C_L=15pF	CKA to QA see Figure 4	26.7	-	-	MHZ
		5.0V	C_L=15pF	CKB to QB see Figure 4	13.3	-	-	MHZ
SN74HCT90								
LOW to HIGH propagation delay	t_{PLH}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	57.6	ns
		5.0V	C_L=15pF	Set-to-9 to QA QD see Figure 4	-	-	36	ns
HIGH to LOW propagation delay	t_{PHL}	5.0V	C_L=15pF	CKn to Qn see Figure 4	-	-	60	ns
		5.0V	C_L=15pF	Set-to-0 to ANY see Figure 4	-	-	48	ns
		5.0V	C_L=15pF	Set-to-9 to QB QC see Figure 4	-	-	48	ns
Maximum frequency	fmax	5.0V	C_L=15pF	CKA to QA see Figure 4	26.7	-	-	MHZ
		5.0V	C_L=15pF	CKB to QB see Figure 4	13.3	-	-	MHZ

4、Testing Circuit

4.1、AC Testing Circuit

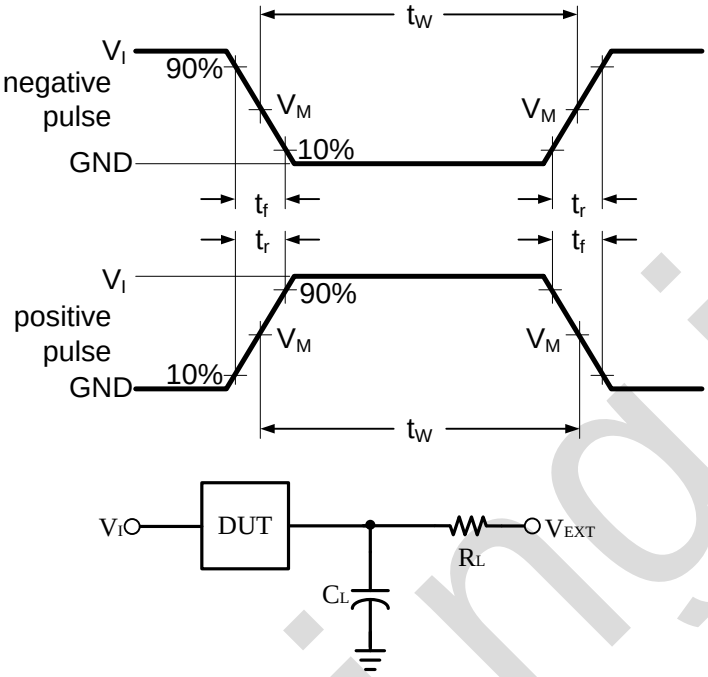


Figure 3. Test circuit for measuring switching times

C_L includes probe and jig capacitance.

4.2、Test Data

Type	Input		Load		V_{EXT}		
	V_I	$t_r = t_f$	C_L	R_L	t_{PLH}/t_{PHL}	t_{PLZ}/t_{PZL}	t_{PHZ}/t_{PZH}
SN74HC90	V_{CC}	3.0ns	15pF	2KΩ	Open	V_{CC}	GND
SN74HCT90	3.0V	3.0ns	15pF	2KΩ	Open	V_{CC}	GND

4.3、AC Testing Waveforms

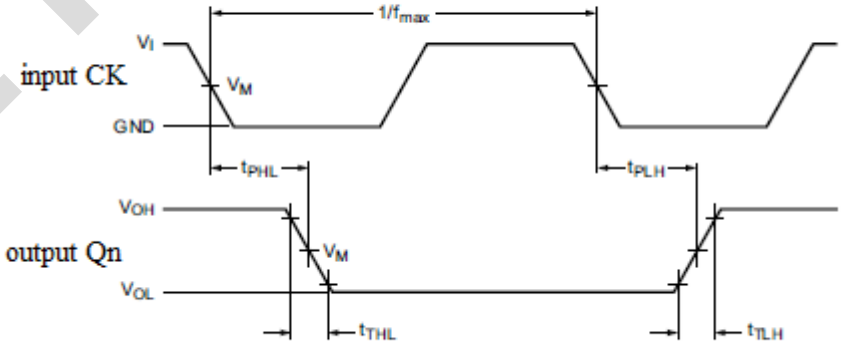


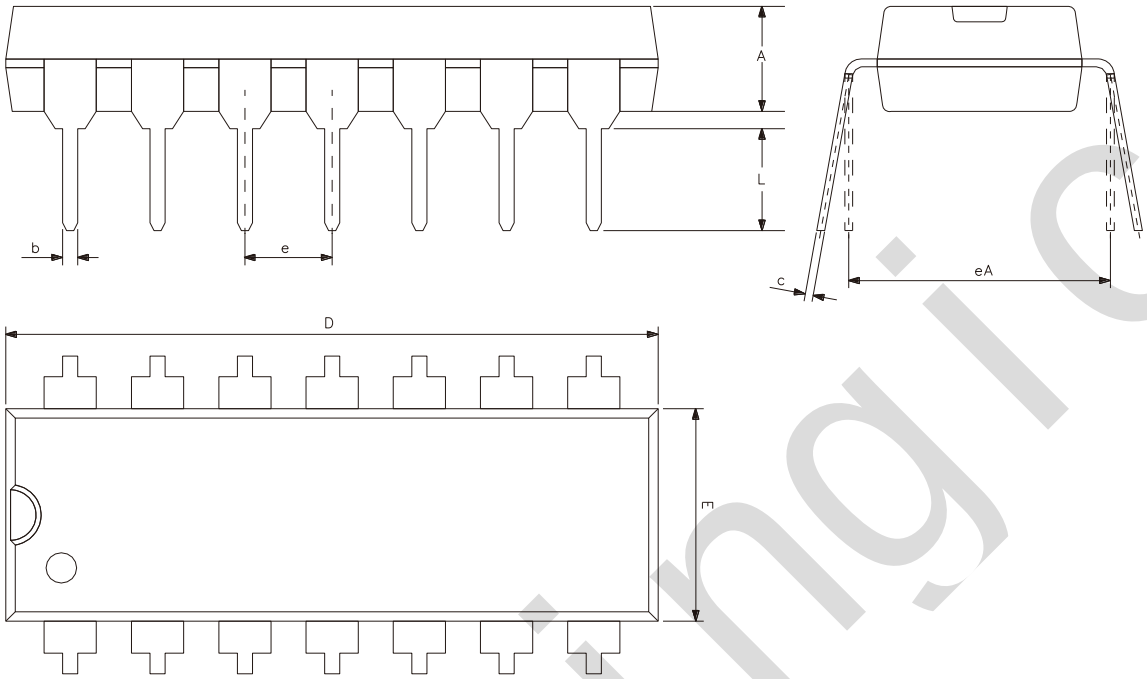
Figure 4. Propagation delay

4.4、Measurement Points

Type	Input	Output
	V_M	V_M
SN74HC90	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
SN74HCT90	1.3V	1.3V

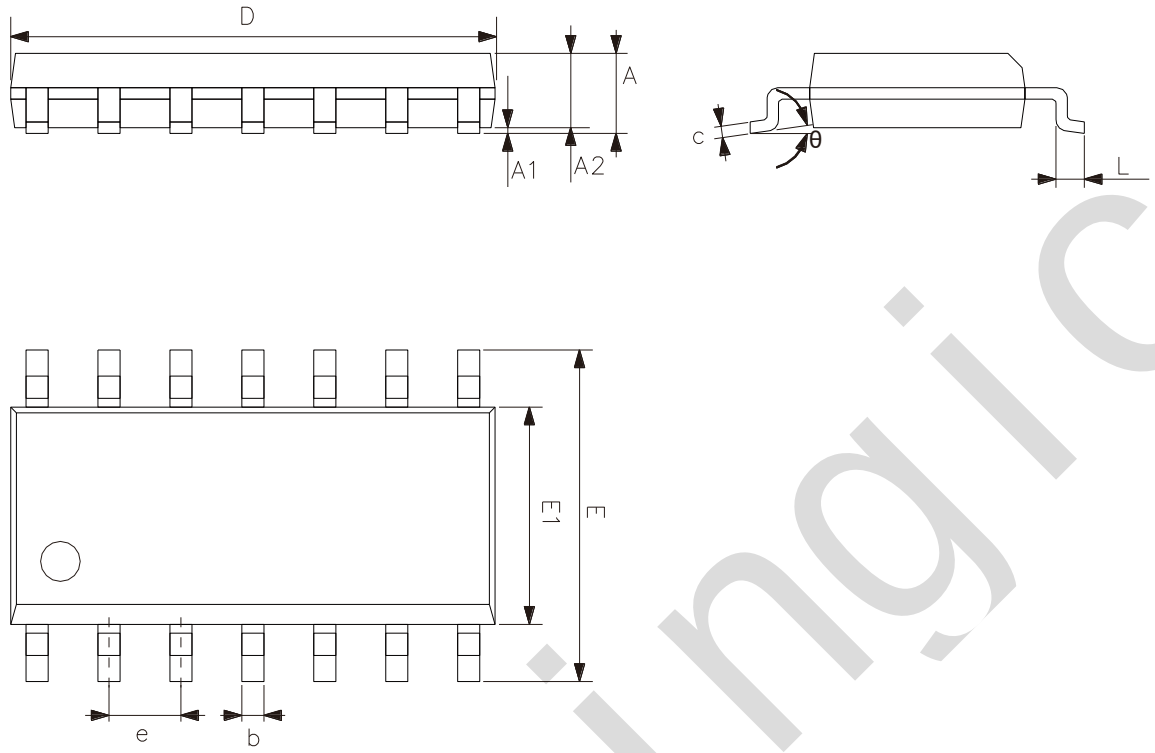
5、Package Information

5.1、DIP14



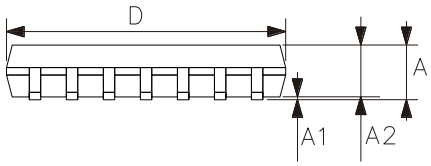
Symbol	Dimensions (mm)	
	Min.	Max.
A	3.05	3.60
b	0.33	0.56
c	0.20	0.36
D	18.80	19.40
E	6.20	6.60
e	2.54	
eA	7.62	10.90
L	2.92	-

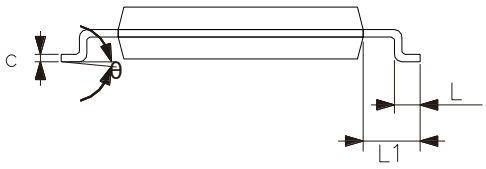
5.2、SOP14

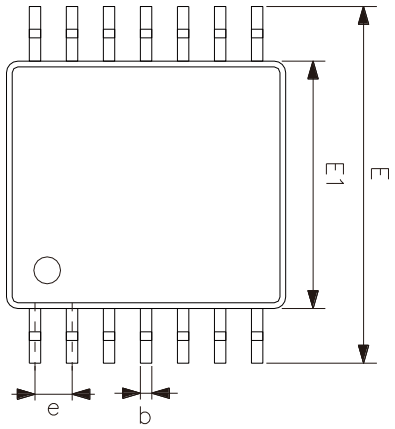


Symbol	Dimensions (mm)	
	Min.	Max.
A	1.50	1.75
A1	0.05	0.25
A2	1.30	-
b	0.33	0.50
c	0.19	0.25
D	8.43	8.76
E	5.80	6.25
E1	3.75	4.00
e	1.27	
L	0.40	0.89
θ	0°	8°

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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