



灵星芯微 芯片经营

深圳市灵星芯微电子科技有限公司

Shenzhen Lingxing Microelectronics Technology Co., Ltd.

Tab: 835-12-B4

Number: CD4520-AX-LJ-D067EN

# CD4520 (LX) Dual binary counter

## Product Specification

### Specification Revision History:

Version	Date	Description
2023-04-A1	2023-04	New



# Contents

<b>1、 General Description.....</b>	<b>3</b>
<b>2、 Block Diagram And Pin Description .....</b>	<b>4</b>
2.1、 Block Diagram .....	4
2.2、 Pin Configurations.....	4
2.3、 Pin Description .....	4
2.4、 Function Table.....	5
<b>3、 Electrical Parameter .....</b>	<b>5</b>
3.1、 Absolute Maximum Ratings.....	5
3.2、 Recommended Operating Conditions .....	5
3.3、 Electrical Characteristics .....	6
3.3.1、 DC Characteristics 1 .....	6
3.3.2、 DC Characteristics 2 .....	7
3.3.3、 AC Characteristics 1 .....	8
3.3.4、 AC Characteristics 2 .....	9
<b>4、 Testing Circuit .....</b>	<b>10</b>
4.1、 AC Testing Circuit .....	10
4.2、 Test Data .....	10
4.3、 AC Testing Waveforms.....	10
4.4、 Measurement Points .....	11
<b>5、 Package Information .....</b>	<b>12</b>
5.1、 DIP16 .....	12
5.2、 SOP16 .....	13
5.3、 TSSOP16.....	14
<b>6、 Statements And Notes .....</b>	<b>15</b>
6.1、 The name and content of Hazardous substances or Elements in the product .....	15
6.2、 Notes .....	15



## 1、General Description

The CD4520 is a dual 4-bit internally synchronous binary counter.

### Features:

- Supply voltage range: 3V to 15V
- Temperature range: -40°C to +125°C
- Packaging information: DIP/SOP/TSSOP16

### Ordering Information:

#### Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
CD4520BE(LX)	DIP16	CD4520BE	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing:2.54mm
CD4520BM(LX)	SOP16	CD4520BM	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
CD4520PW(LX)	TSSOP16	CD4520	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
CD4520BM(LX)	SOP16	CD4520BM	2500PCS/reel	5000PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
CD4520PW(LX)	TSSOP16	CD4520	5000PCS/reel	10000PCS/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

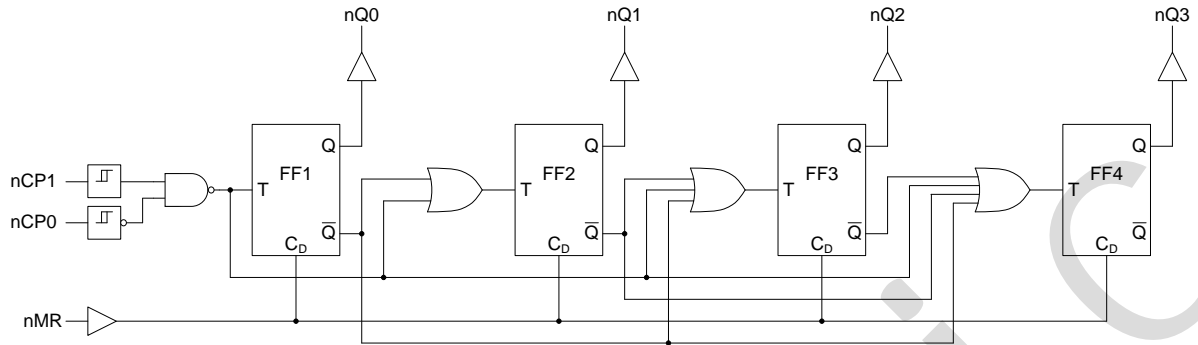
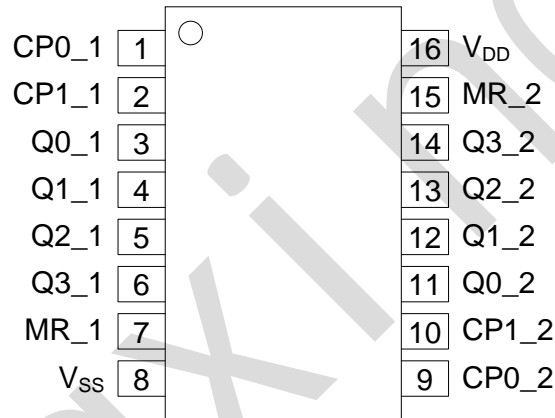


Figure 1. Functional diagram

### 2.2、Pin Configurations



### 2.3、Pin Description

Pin No.	Pin Name	Description
1	CP0_1	clock input(LOW-to-HIGH)
2	CP1_1	clock input(HIGH-to-LOW)
3	Q0_1	output
4	Q1_1	output
5	Q2_1	output
6	Q3_1	output
7	MR_1	master reset input
8	V <sub>SS</sub>	ground supply voltage
9	CP0_2	clock input(LOW-to-HIGH)
10	CP1_2	clock input(HIGH-to-LOW)
11	Q0_2	output
12	Q1_2	output
13	Q2_2	output
14	Q3_2	output
15	MR_2	master reset input
16	V <sub>DD</sub>	supply voltage



## 2.4、Function Table

nCP0	nCP1	nMR	Mode
↑	H	L	counter advances
L	↓	L	counter advances
↓	X	L	no change
X	↑	L	no change
↑	L	L	no change
H	↓	L	no change
X	X	H	nQ0 to nQ3 = LOW

Note:

H=HIGH voltage level; L=LOW voltage level;

X=don't care; ↑=positive-going transition; ↓=negative-going transition.

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

(Voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	$V_{DD}$	-	-0.5	+18	V
input voltage	$V_I$	all inputs	-0.5	$V_{DD}+0.5$	V
DC input current	$I_{IK}$	any one input	-	±10	mA
storage temperature	$T_{stg}$	-	-65	+150	°C
soldering temperature	$T_L$	10s	DIP	245	°C
			SOP/TSSOP	260	

### 3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	$V_{DD}$	-	3	-	15	V
ambient temperature	$T_{amb}$	in free air	-40	-	+125	°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  $V_{SS}$  (ground=0V), unless otherwise specified.)

Parameter	Symbol	$V_{DD}$	Conditions	Min.	Typ.	Max.	Unit
HIGH-level input voltage	$V_{IH}$	5V	-	3.5	-	-	V
		10V	-	7	-	-	V
		15V	-	11	-	-	V
LOW-level input voltage	$V_{IL}$	5V	-	-	-	1.5	V
		10V	-	-	-	3	V
		15V	-	-	-	4	V
HIGH-level output voltage	$V_{OH}$	5V	$ I_O  < 1\mu\text{A}$	4.95	-	-	V
		10V	$ I_O  < 1\mu\text{A}$	9.95	-	-	V
		15V	$ I_O  < 1\mu\text{A}$	14.95	-	-	V
LOW-level output voltage	$V_{OL}$	5V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
		10V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
		15V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
HIGH-level output current	$I_{OH}$	5V	$V_O = 4.6\text{V}$	-	-	-0.34	mA
		5V	$V_O = 2.5\text{V}$	-	-	-1.3	mA
		10V	$V_O = 9.5\text{V}$	-	-	-0.55	mA
		15V	$V_O = 13.5\text{V}$	-	-	-1.65	mA
LOW-level output current	$I_{OL}$	5V	$V_O = 0.4\text{V}$	0.34	-	-	mA
		10V	$V_O = 0.5\text{V}$	0.46	-	-	mA
		15V	$V_O = 1.5\text{V}$	1.4	-	-	mA
input leakage current	$I_I$	15V	$V_I = 15\text{V}$ or GND	-	-	$\pm 2$	$\mu\text{A}$
supply current	$I_{DD}$	5V	$V_I = 5\text{V}$ or GND; $I_O = 0\text{A}$	-	-	7.5	$\mu\text{A}$
		10V	$V_I = 10\text{V}$ or GND; $I_O = 0\text{A}$	-	-	15	$\mu\text{A}$
		15V	$V_I = 15\text{V}$ or GND; $I_O = 0\text{A}$	-	-	30	$\mu\text{A}$



### 3.3.2、DC Characteristics 2

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

Parameter	Symbol	$V_{DD}$	Conditions	Min.	Typ.	Max.	Unit
HIGH-level input voltage	$V_{IH}$	5V	-	3.5	-	-	V
		10V	-	7	-	-	V
		15V	-	11	-	-	V
LOW-level input voltage	$V_{IL}$	5V	-	-	-	1.5	V
		10V	-	-	-	3	V
		15V	-	-	-	4	V
HIGH-level output voltage	$V_{OH}$	5V	$ I_O  < 1\mu\text{A}$	4.95	-	-	V
		10V	$ I_O  < 1\mu\text{A}$	9.95	-	-	V
		15V	$ I_O  < 1\mu\text{A}$	14.95	-	-	V
LOW-level output voltage	$V_{OL}$	5V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
		10V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
		15V	$ I_O  < 1\mu\text{A}$	-	-	0.05	V
HIGH-level output current	$I_{OH}$	5V	$V_O = 4.6\text{V}$	-	-	-0.3	mA
		5V	$V_O = 2.5\text{V}$	-	-	-1.15	mA
		10V	$V_O = 9.5\text{V}$	-	-	-0.45	mA
		15V	$V_O = 13.5\text{V}$	-	-	-1.4	mA
LOW-level output current	$I_{OL}$	5V	$V_O = 0.4\text{V}$	0.29	-	-	mA
		10V	$V_O = 0.5\text{V}$	0.38	-	-	mA
		15V	$V_O = 1.5\text{V}$	1.2	-	-	mA
input leakage current	$I_I$	15V	$V_I = 15\text{V}$ or GND	-	-	$\pm 4$	$\mu\text{A}$
supply current	$I_{DD}$	5V	$V_I = 5\text{V}$ or GND; $I_O = 0\text{A}$	-	-	7.5	$\mu\text{A}$
		10V	$V_I = 10\text{V}$ or GND; $I_O = 0\text{A}$	-	-	15	$\mu\text{A}$
		15V	$V_I = 15\text{V}$ or GND; $I_O = 0\text{A}$	-	-	30	$\mu\text{A}$



### 3.3.3、AC Characteristics 1

( $T_{amb} = -40^{\circ}C$  to  $+85^{\circ}C$ ,  $V_{SS} = 0V$ , unless otherwise specified.)

Parameter	Symbol	V <sub>DD</sub>	Conditions	Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay time	t <sub>PHL</sub>	5V	nCP0, nCP1 to nQn C <sub>L</sub> =50pF see Figure 4	-	110	220	ns
		10V		-	50	100	ns
		15V		-	40	80	ns
		5V	nMR to nQn C <sub>L</sub> =50pF see Figure 4	-	75	150	ns
		10V		-	35	70	ns
		15V		-	25	50	ns
LOW to HIGH propagation delay time	t <sub>PLH</sub>	5V	nCP0, nCP1 to nQn C <sub>L</sub> =50pF see Figure 4	-	110	220	ns
		10V		-	50	100	ns
		15V		-	40	80	ns
transition time	t <sub>THL</sub> , t <sub>TLH</sub>	5V	nQn; see Figure 4	-	60	120	ns
		10V		-	30	60	ns
		15V		-	20	40	ns
pulse width	tw	5V	nCP0 input LOW; minimum width; see Figure 5	60	30	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
		5V	nCP0 input LOW; minimum width; see Figure 5	60	30	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
		5V	nCP0 input LOW; minimum width; see Figure 5	30	15	-	ns
		10V		20	10	-	ns
		15V		16	8	-	ns
recovery time	t <sub>rec</sub>	5V	nMR input see Figure 5	50	25	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
set-up time	t <sub>su</sub>	5V	nCP0 to nCP1; see Figure 5	50	25	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
		5V	nCP1 to nCP0; see Figure 5	50	25	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
maximum frequency	f <sub>max</sub>	5V	nCP1, nCP0; see Figure 5	8	16	-	MHZ
		10V		15	30	-	MHZ
		15V		20	40	-	MHZ





### 3.3.4、AC Characteristics 2

( $T_{amb} = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{SS} = 0\text{V}$ , unless otherwise specified.)

Parameter	Symbol	$V_{DD}$	Conditions	Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay time	$t_{PHL}$	5V	nCP0, nCP1 to nQn see Figure 4	-	-	265	ns
		10V		-	-	120	ns
		15V		-	-	95	ns
		nMR to nQn see Figure 4	5V	-	-	180	ns
			10V	-	-	85	ns
			15V	-	-	60	ns
LOW to HIGH propagation delay time	$t_{PLH}$	5V	nCP0, nCP1 to nQn see Figure 4	-	-	265	ns
		10V		-	-	120	ns
		15V		-	-	95	ns
transition time	$t_{THL}, t_{TLH}$	5V	nQn; see Figure 4	-	-	145	ns
		10V		-	-	72	ns
		15V		-	-	48	ns
pulse width	tw	5V	nCP0 input LOW; minimum width; see Figure 5	72	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
		5V	nCP0 input LOW; minimum width; see Figure 5	72	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
		5V	nCP0 input LOW; minimum width; see Figure 5	36	-	-	ns
		10V		24	-	-	ns
15V	20	-		-	ns		
recovery time	trec	5V	nMR input see Figure 5	60	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
set-up time	tsu	5V	nCP0 to nCP1; see Figure 5	60	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
		5V	nCP1 to nCP0; see Figure 5	60	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
maximum frequency	fmax	5V	nCP1, nCP0; see Figure 5	6	-	-	MHZ
		10V		12	-	-	MHZ
		15V		16	-	-	MHZ



## 4、Testing Circuit

### 4.1、AC Testing Circuit

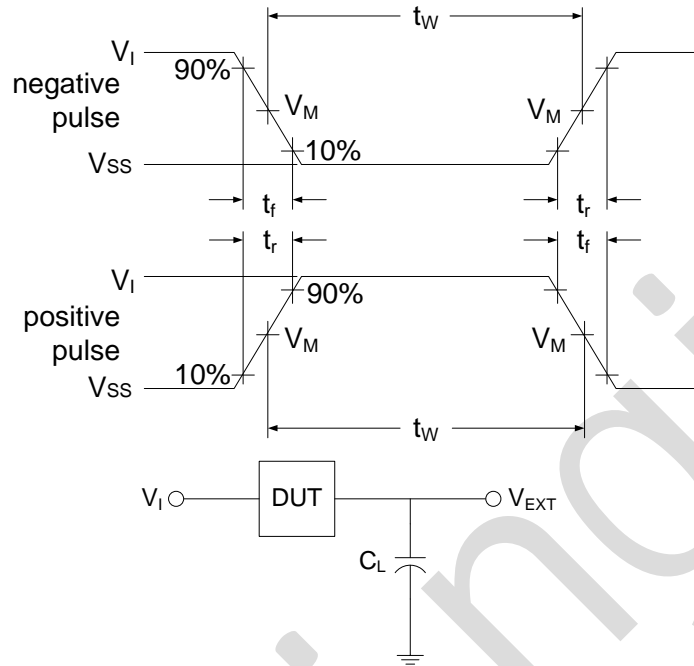


Figure 3. Load circuit

$C_L$  includes probe and jig capacitance.

### 4.2、Test Data

Supply voltage	Input		Load	$V_{EXT}$		
$V_{DD}$	$V_I$	$t_r = t_f$	$C_L$	$t_{PLH}/t_{PHL}$	$t_{PLZ}/t_{PZL}$	$t_{PHZ}/t_{PZH}$
5V to 15V	$V_{DD}$	$\leq 20\text{ns}$	50pF	Open	$V_{DD}$	$V_{SS}$

### 4.3、AC Testing Waveforms

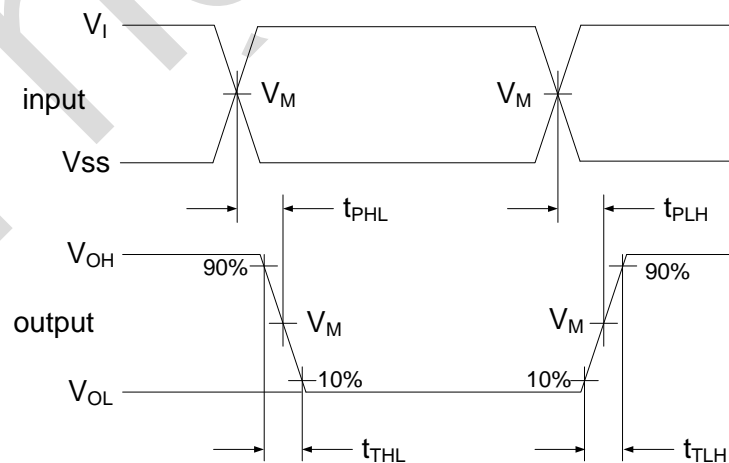


Figure 4. Propagation delay, output transition time

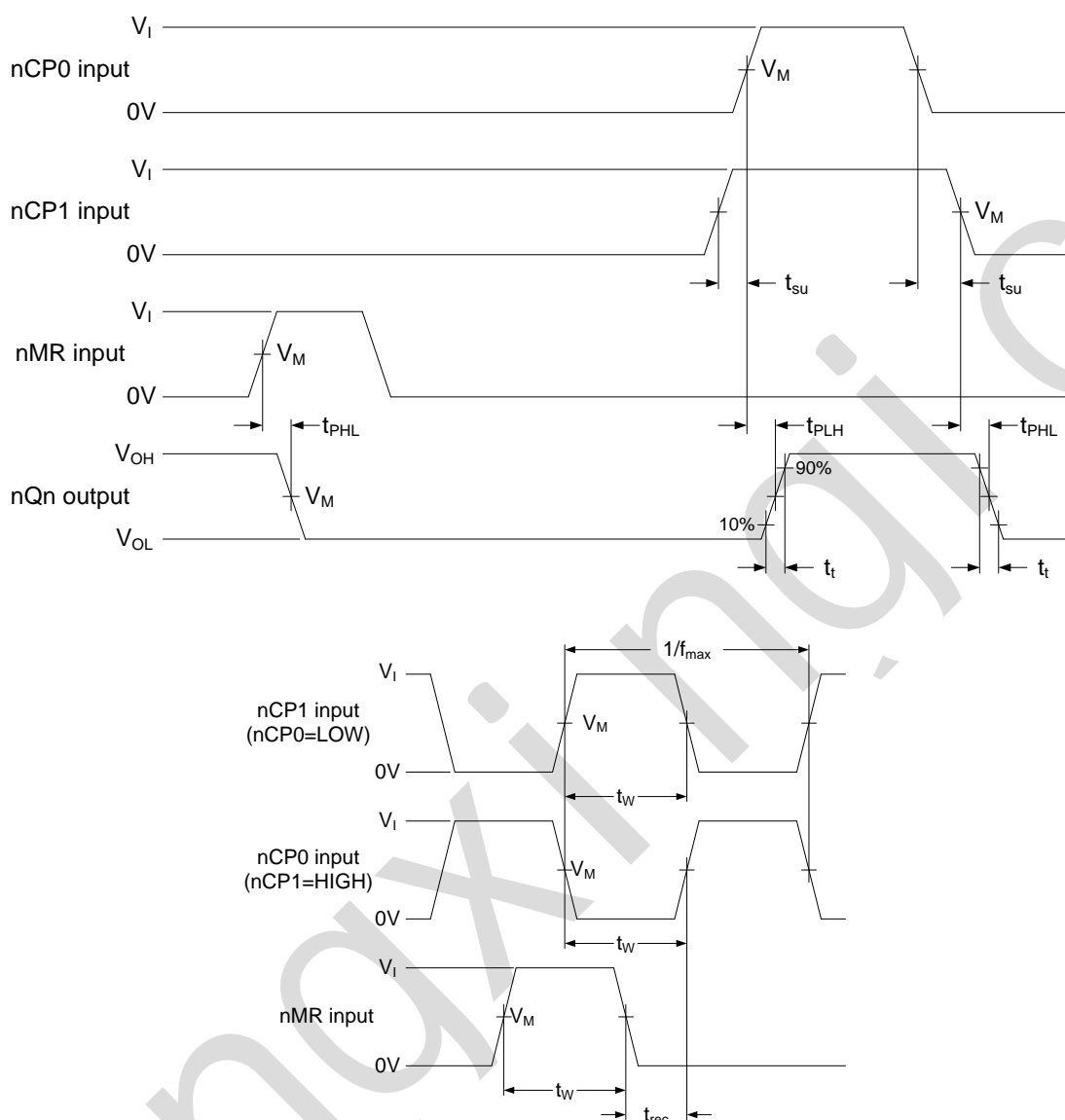


Figure 5 nCP0 and nCP1 set-up times, nMR recovery time, minimum nCP0, nCP1, and nMR pulse widths and maximum frequency

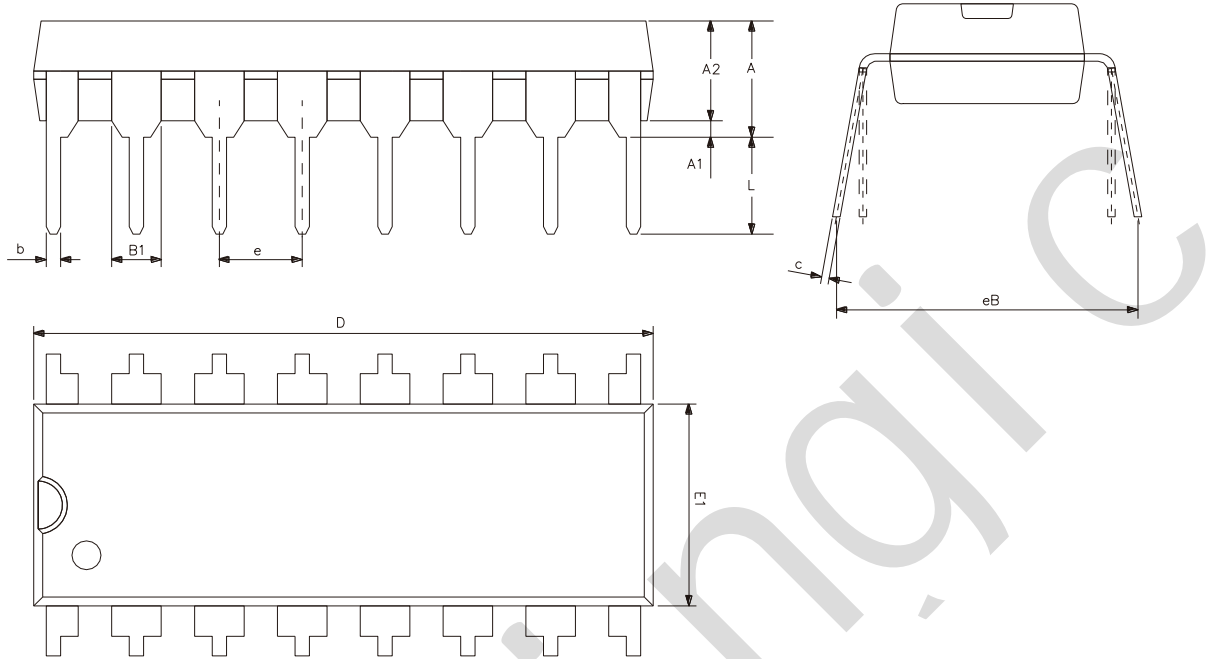
#### 4.4. Measurement Points

Supply voltage	Input	Output		
		$V_M$	$V_X$	$V_Y$
$V_{DD}$ 5V to 15V	$V_M$ $0.5 \times V_{DD}$	$V_M$ $0.5 \times V_{DD}$	$V_X$ $0.1 \times V_{DD}$	$V_Y$ $0.9 \times V_{DD}$



## 5、Package Information

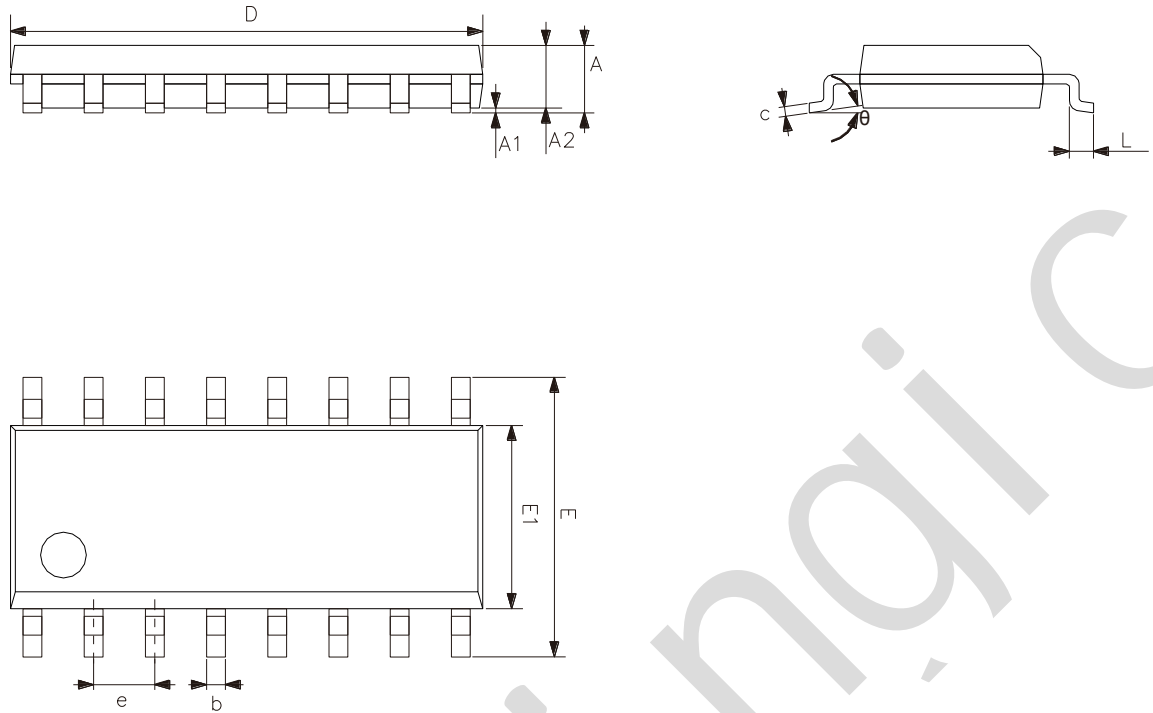
### 5.1、DIP16



Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	-
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
c	0.20	0.36
eB	7.62	9.30



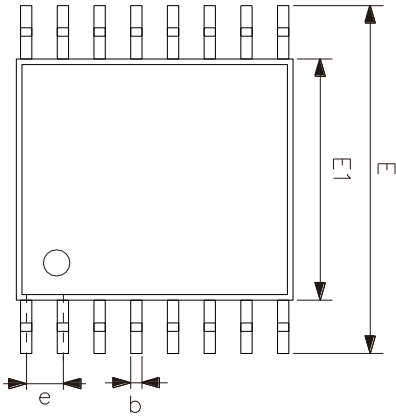
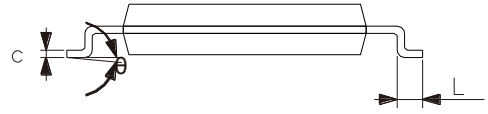
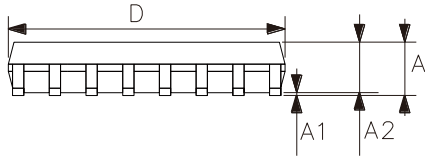
## 5.2、SOP16



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.35	1.80
A1	0.10	0.25
A2	1.25	1.55
b	0.33	0.51
c	0.19	0.25
D	9.50	10.10
E	5.80	6.30
E1	3.70	4.10
e	1.27	
L	0.35	0.89
$\theta$	0°	8°



### 5.3、TSSOP16



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
$\theta$	0°	8°



灵星芯微 集成电路

## 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 Lingxing 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. Lingxing 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 Lingxing's application to avoid failure in the application or the application of the customer's third party users. Lingxing 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 Lingxing'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.