



CD4520 (LX)

Dual binary counter

Product Specification

Specification Revision History:

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



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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

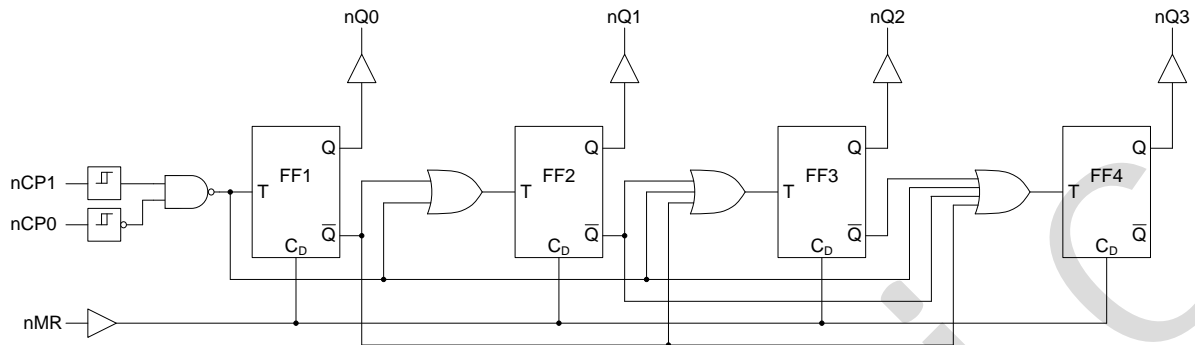
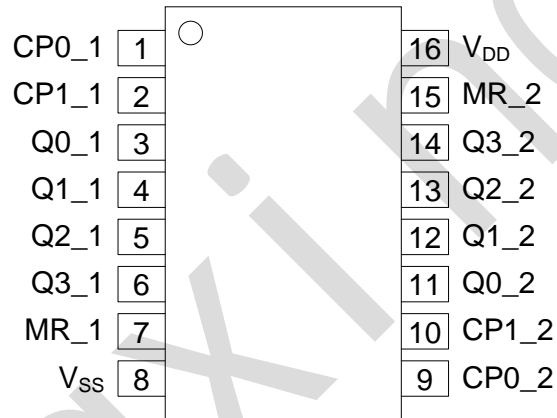


Figure 1. Functional diagram

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 _{SS}	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 _{DD}	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	-	-	± 2	μA
supply current	I_{DD}	5V	$V_I = 5\text{V}$ or GND; $I_O = 0\text{A}$	-	-	7.5	μA
		10V	$V_I = 10\text{V}$ or GND; $I_O = 0\text{A}$	-	-	15	μA
		15V	$V_I = 15\text{V}$ or GND; $I_O = 0\text{A}$	-	-	30	μA



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	-	-	± 4	μA
supply current	I_{DD}	5V	$V_I = 5\text{V}$ or GND; $I_O = 0\text{A}$	-	-	7.5	μA
		10V	$V_I = 10\text{V}$ or GND; $I_O = 0\text{A}$	-	-	15	μA
		15V	$V_I = 15\text{V}$ or GND; $I_O = 0\text{A}$	-	-	30	μA



3.3.3、AC Characteristics 1

($T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{SS} = 0\text{V}$, 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 $C_L = 50\text{pF}$ see Figure 4	-	110	220	ns
		10V		-	50	100	ns
		15V		-	40	80	ns
		nMR to nQn $C_L = 50\text{pF}$ see Figure 4	5V	-	75	150	ns
			10V	-	35	70	ns
			15V	-	25	50	ns
LOW to HIGH propagation delay time	t_{PLH}	5V	nCP0, nCP1 to nQn $C_L = 50\text{pF}$ see Figure 4	-	110	220	ns
		10V		-	50	100	ns
		15V		-	40	80	ns
transition time	t_{THL}, t_{TLH}	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	trec	5V	nMR input see Figure 5	50	25	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
set-up time	tsu	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	fmax	5V	nCP1, nCP0; see Figure 5	8	16	-	MHZ
		10V		15	30	-	MHZ
		15V		20	40	-	MHZ



3.3.4、AC Characteristics 2

($T_{amb} = -40^{\circ}C$ to $+125^{\circ}C$, $V_{SS} = 0V$, 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	t _{rec}	5V	nMR input see Figure 5	60	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
set-up time	t _{su}	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	f _{max}	5V	nCP1, nCP0; see Figure 5	6	-	-	MHZ
		10V		12	-	-	MHZ
		15V		16	-	-	MHZ



4、Testing Circuit

4.1、AC Testing Circuit

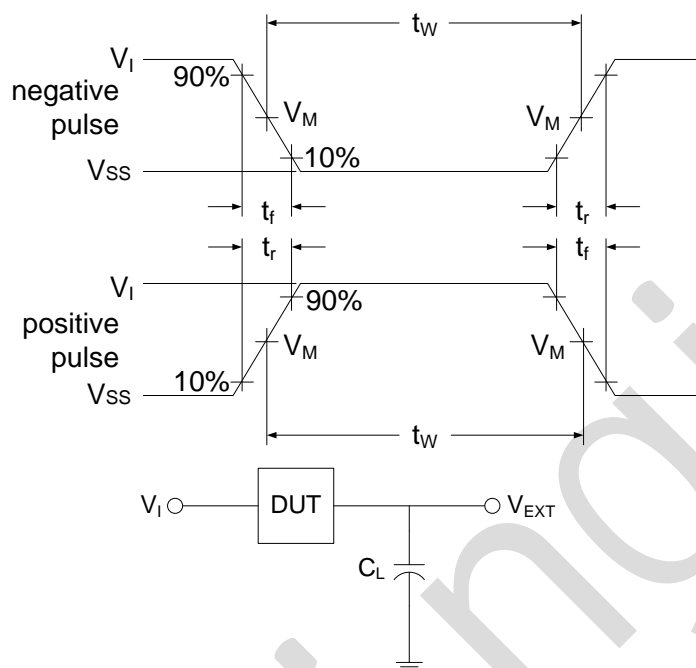


Figure 3. Load circuit

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

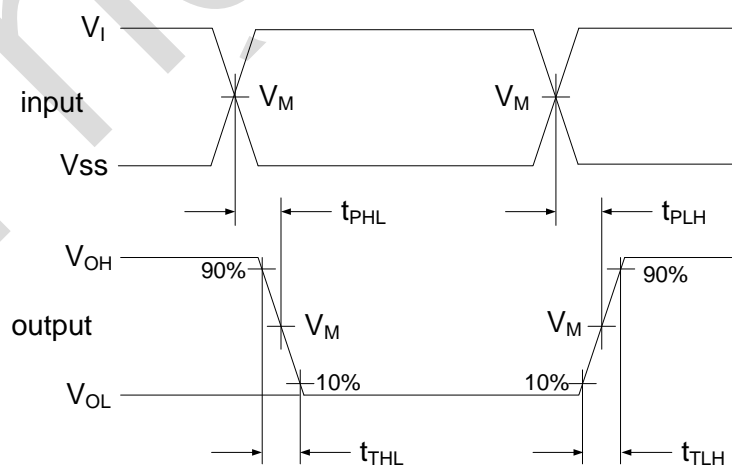


Figure 4. Propagation delay, output transition time

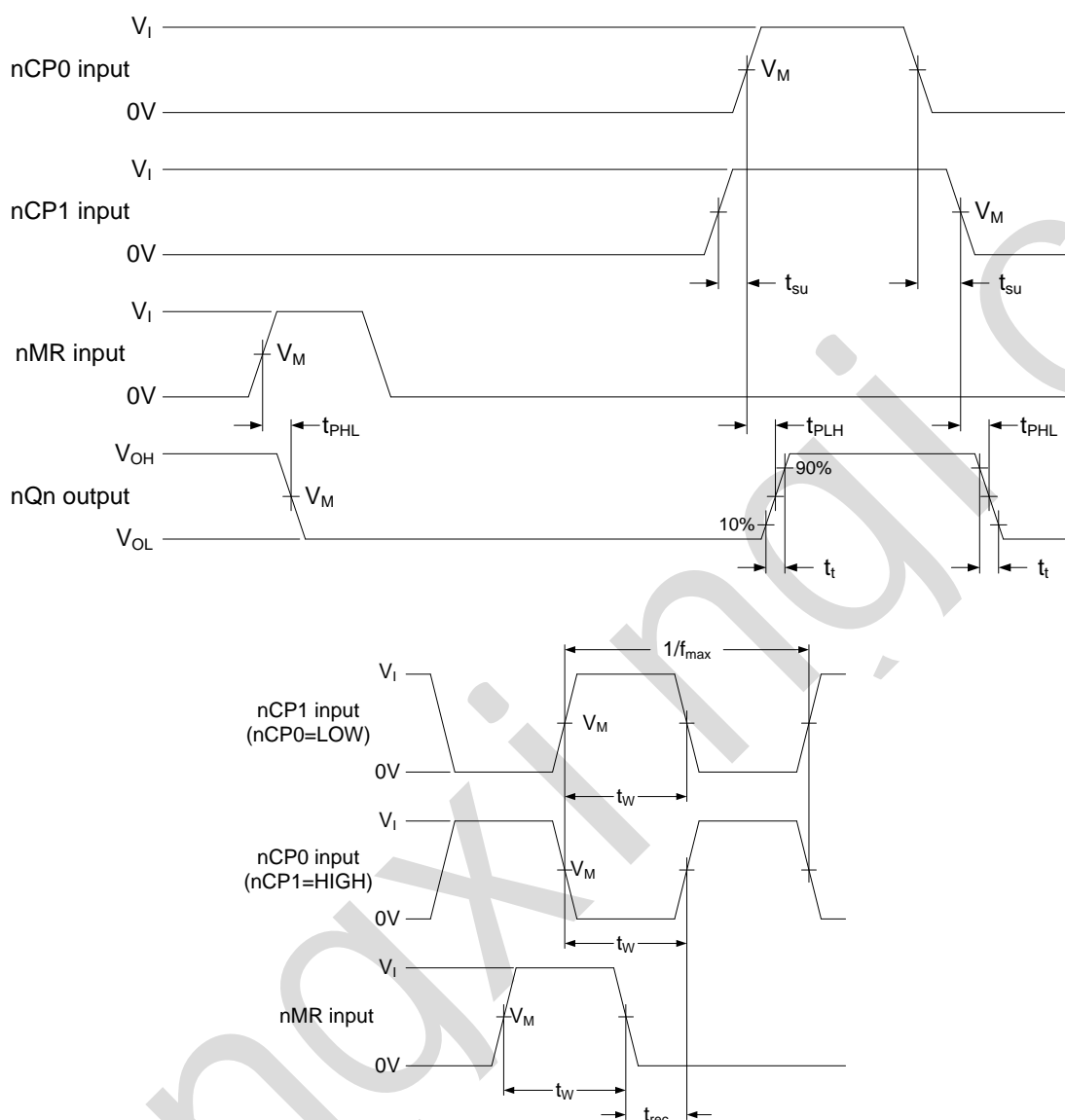


Figure 5 nCP0 and nCP1 set-up times, nMR recovery time, minimum nCP0, nCP1, and nMR pulse widths and maximum frequency

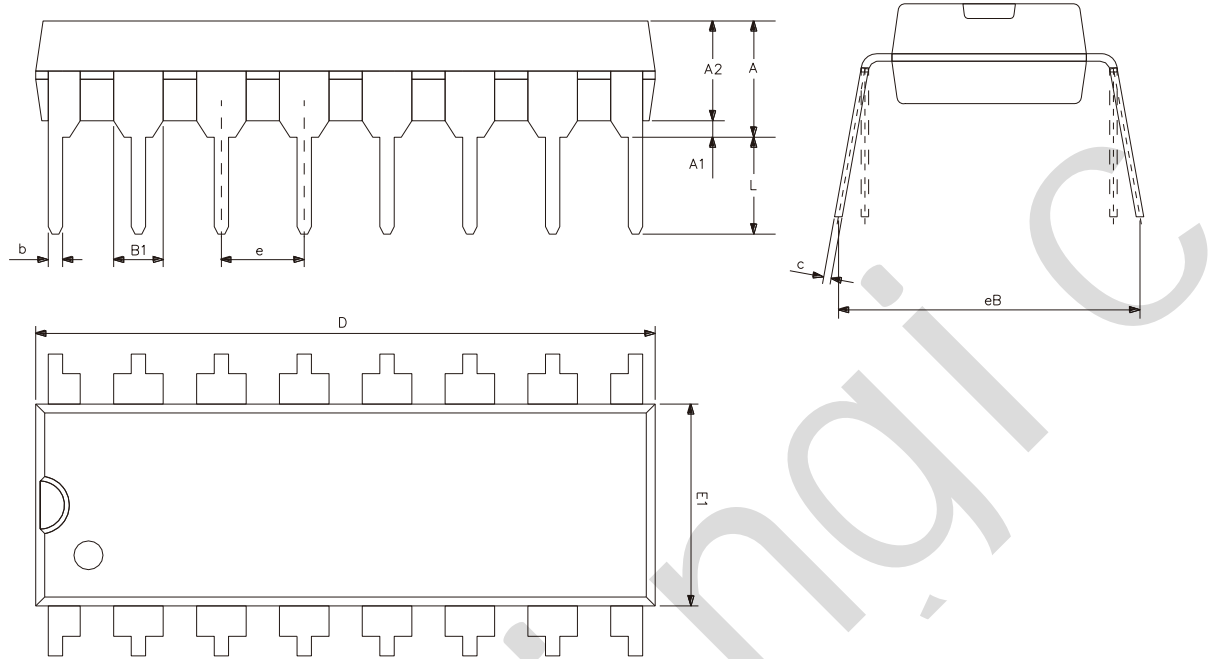
4.4. Measurement Points

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

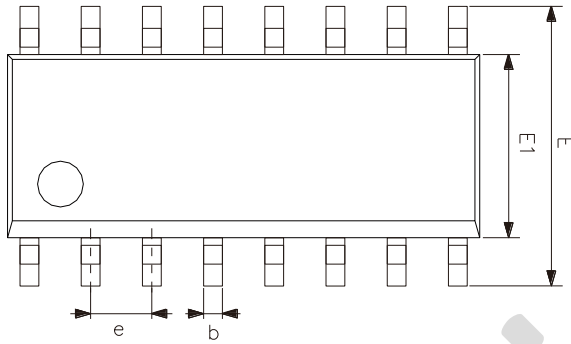
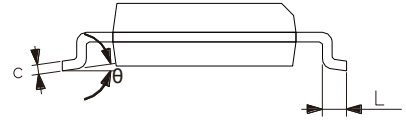
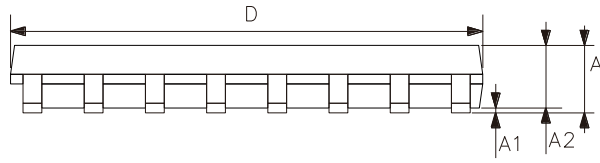
5.1、DIP16



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



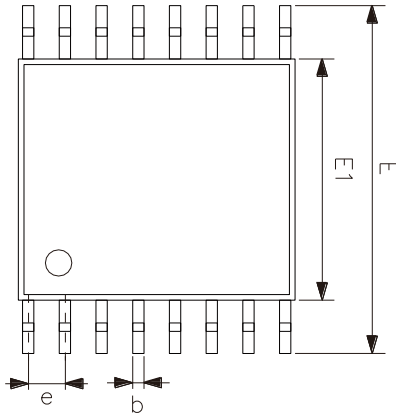
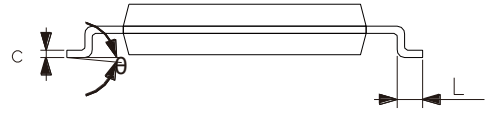
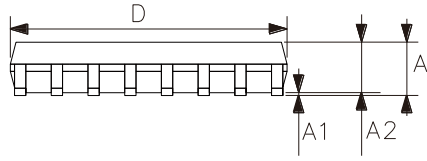
5.2、SOP16



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
θ	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
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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[74HC4040D.653](#) [74HC4060D.653](#) [74HCT4040D.653](#)