CD4015
Dual 4-bit Static Shift Register

Product Specification

Specification Revision History：

Version	Date	Description
2023-05-A1	2023-05	New

Contents

1、General Description

The CD4015 is a dual edge-triggered 4-bit static shift register (serial-to-parallel converter).

Features:

- Supply voltage range:3V to 15V
- Temperature range:-40℃ to +125℃
- Packaging information: DIP16/SOP16/TSSOP16

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
CD4015DA16.TB	DIP16	CD4015	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
CD4015SA16.TB	SOP16	CD4015	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
CD4015TA16.TB	TSSOP16	CD4015	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
CD4015SA16.TR	SOP16	CD4015	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
CD4015TA16.TR	TSSOP16	CD4015	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

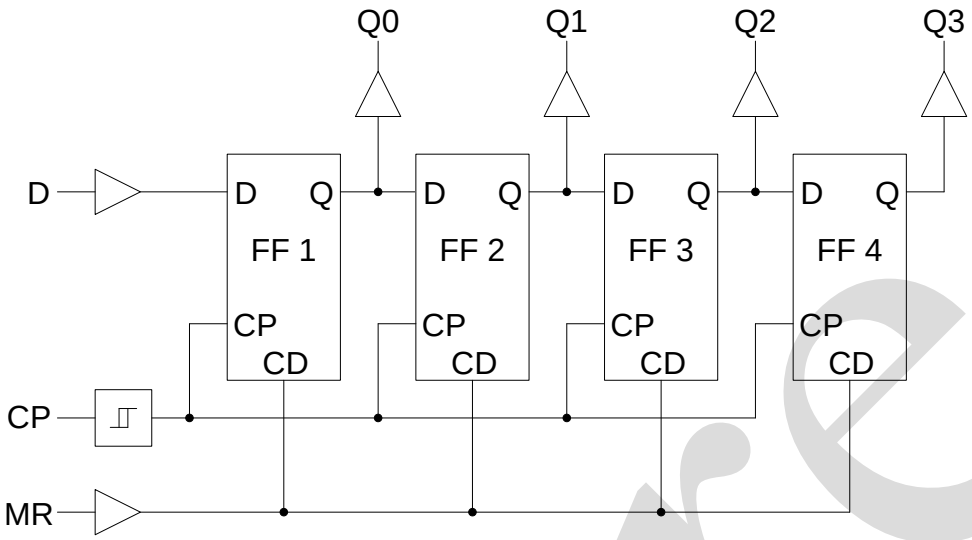
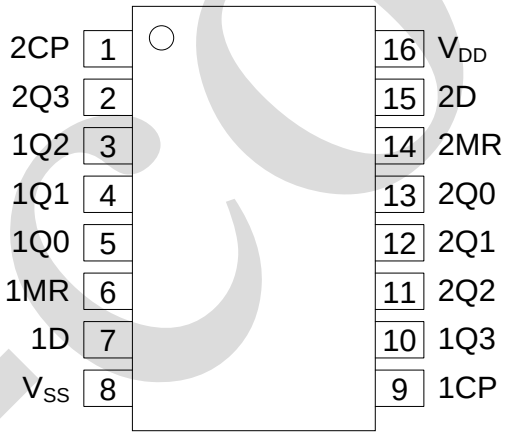


Figure 1. Functional diagram

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	2CP	clock input (LOW-to-HIGH edge-triggered)
2	2Q3	parallel output
3	1Q2	parallel output
4	1Q1	parallel output
5	1Q0	parallel output
6	1MR	master reset input(active high)
7	1D	serial data input
8	V_{SS}	ground (0V)
9	1CP	clock input (LOW-to-HIGH edge-triggered)
10	1Q3	parallel output
11	2Q2	parallel output
12	2Q1	parallel output
13	2Q0	parallel output
14	2MR	master reset input(active high)
15	2D	serial data input
16	V_{DD}	supply voltage

2.4、Function Table

Input			Output			
CP	D	MR	Q0	Q1	Q2	Q3
↑	D1	L	D1	X	X	X
↑	D2	L	D2	D1	X	X
↑	D3	L	D3	D2	D1	X
↑	D4	L	D4	D3	D2	D1
↓	X	L	No change	No change	No change	No change
X	X	H	L	L	L	L

Note:
H=HIGH voltage level; L=LOW voltage level; X=don't care; Dn=either HIGH or LOW;
↑=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	℃
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_{DD}	-	3	-	15	V
ambient temperature	T_{amb}	in free air	-40	-	+125	℃

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=-40℃ to +85℃, 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	$\|I_O\|$<1uA	4.95	-	-	V
		10V	$\|I_O\|$<1uA	9.95	-	-	V
		15V	$\|I_O\|$<1uA	14.95	-	-	V
LOW-level output voltage	V_{OL}	5V	$\|I_O\|$<1uA	-	-	0.05	V
		10V	$\|I_O\|$<1uA	-	-	0.05	V
		15V	$\|I_O\|$<1uA	-	-	0.05	V
HIGH-level output current	I_{OH}	5V	V_O=4.6V	-	-	-0.34	mA
		5V	V_O=2.5V	-	-	-1.3	mA
		10V	V_O=9.5V	-	-	-0.55	mA
		15V	V_O=13.5V	-	-	-1.65	mA
LOW-level output current	I_{OL}	5V	V_O=0.4V	0.34	-	-	mA
		10V	V_O=0.5V	0.46	-	-	mA
		15V	V_O=1.5V	1.4	-	-	mA
input leakage current	I_I	15V	V_I=15V or GND	-	-	±1	uA
supply current	I_{DD}	5V	V_I=5V or GND; I_O=0A	-	-	150	uA
		10V	V_I=10V or GND; I_O=0A	-	-	300	uA
		15V	V_I=15V or GND; I_O=0A	-	-	600	uA

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +125℃, 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	$\|I_O\|$<1uA	4.95	-	-	V
		10V	$\|I_O\|$<1uA	9.95	-	-	V
		15V	$\|I_O\|$<1uA	14.95	-	-	V
LOW-level output voltage	V_{OL}	5V	$\|I_O\|$<1uA	-	-	0.05	V
		10V	$\|I_O\|$<1uA	-	-	0.05	V
		15V	$\|I_O\|$<1uA	-	-	0.05	V
HIGH-level output current	I_{OH}	5V	V_O=4.6V	-	-	-0.3	mA
		5V	V_O=2.5V	-	-	-1.15	mA
		10V	V_O=9.5V	-	-	-0.45	mA
		15V	V_O=13.5V	-	-	-1.4	mA
LOW-level output current	I_{OL}	5V	V_O=0.4V	0.29	-	-	mA
		10V	V_O=0.5V	0.38	-	-	mA
		15V	V_O=1.5V	1.2	-	-	mA
input leakage current	I_I	15V	V_I=15V or GND	-	-	±1	uA
supply current	I_{DD}	5V	V_I=5V or GND; I_O=0A	-	-	150	uA
		10V	V_I=10V or GND; I_O=0A	-	-	300	uA
		15V	V_I=15V or GND; I_O=0A	-	-	600	uA

3.3.3、AC Characteristics 1

(T_{amb}=-40℃ to +85℃, V_{SS}=0V, unless otherwise specified.)

Parameter	Symbol	V_{DD}	Conditions	Min.	Typ.	Max.	Unit
nCP to Qn propagation delay time	t_{PHL}, t_{PLH}	5V	C_L=50pF,see Figure 3	-	125	250	ns
		10V		-	55	110	ns
		15V		-	40	80	ns
MR to Qn HIGH to LOW propagation delay	t_{PHL}	5V	C_L=50pF,see Figure 4	-	120	240	ns
		10V		-	55	110	ns
		15V		-	40	80	ns
transition time	t_{THL}, t_{TLH}	5V	C_L=50pF, see Figure 3	-	60	120	ns
		10V		-	30	60	ns
		15V		-	20	40	ns
nD to nCP set-up time	tsu	5V	C_L=50pF, see Figure 5	+25	-15	-	ns
		10V		+25	-10	-	ns
		15V		+20	-5	-	ns
nD to nCP hold time	th	5V	C_L=50pF, see Figure 5	40	20	-	ns
		10V		20	10	-	ns

		15V		15	8	-	ns
CP LOW; Minimum width Pulse width	tw	5V	C_L=50pF, see Figure 5	60	30	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
nMR HIGH; minimum width;		5V	C_L=50pF, see Figure 4	80	40	-	ns
		10V		30	15	-	ns
		15V		24	12	-	ns
recovery time	trec	5V	C_L=50pF, see Figure 4	50	20	-	ns
		10V		30	10	-	ns
		15V		20	5	-	ns
Maximum frequency	fmax	5V	C_L=50pF, see Figure 5	7	15	-	MHZ
		10V		15	30	-	MHZ
		15V		22	44	-	MHZ

3.3.4、AC Characteristics 2

(T_{amb}=-40℃ to +125℃, V_{SS}=0V, unless otherwise specified.)

Parameter	Symbol	V_{DD}	Conditions	Min.	Typ.	Max.	Unit
nCP to Qn propagation delay time	t_{PHL}, t_{PLH}	5V	C_L=50pF,see Figure 3	-	-	300	ns
		10V		-	-	132	ns
		15V		-	-	96	ns
MR to Qn HIGH to LOW propagation delay	t_{PHL}	5V	C_L=50pF,see Figure 4	-	-	288	ns
		10V		-	-	132	ns
		15V		-	-	96	ns
transition time	t_{THL}, t_{TLH}	5V	C_L=50pF, see Figure 3	-	-	244	ns
		10V		-	-	72	ns
		15V		-	-	48	ns
nD to nCP set-up time	tsu	5V	C_L=50pF, see Figure 5	30	-	-	ns
		10V		30	-	-	ns
		15V		24	-	-	ns
nD to nCP hold time	th	5V	C_L=50pF, see Figure 6	48	-	-	ns
		10V		24	-	-	ns
		15V		18	-	-	ns
CP LOW; Minimum width Pulse width	tw	5V	C_L=50pF, see Figure 6	72	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
nMR HIGH; minimum width;		5V	C_L=50pF, see Figure 4	96	-	-	ns
		10V		36	-	-	ns
		15V		28	-	-	ns
recovery time	trec	5V	C_L=50pF, see Figure 4	60	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
Maximum frequency	fmax	5V	C_L=50pF, see Figure 5	5.8	-	-	MHZ
		10V		12.5	-	-	MHZ
		15V		18.3	-	-	MHZ

4、Testing Circuit

4.1、AC Testing Circuit

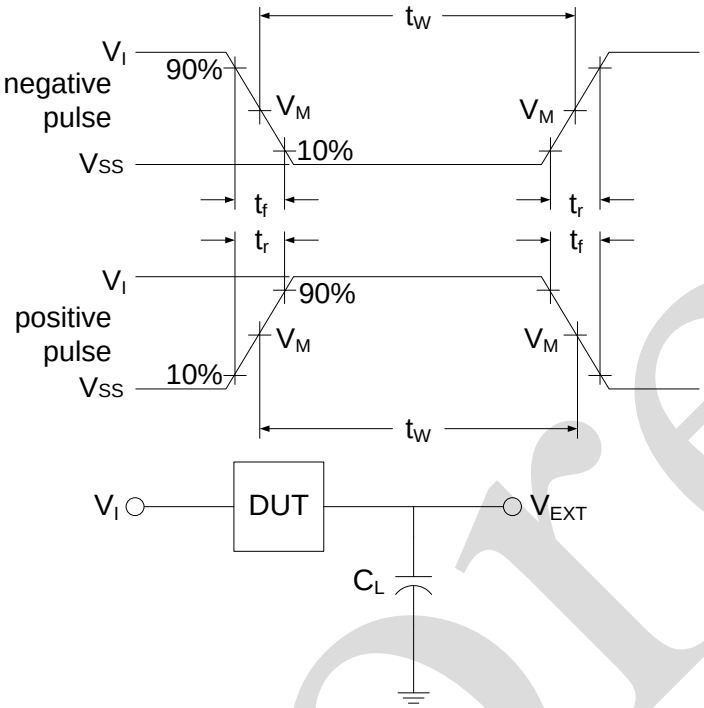


Figure 2. Load circuit

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}	≤ 20ns	50pF	Open	V_{DD}	V_{SS}

4.3、AC Testing Waveforms

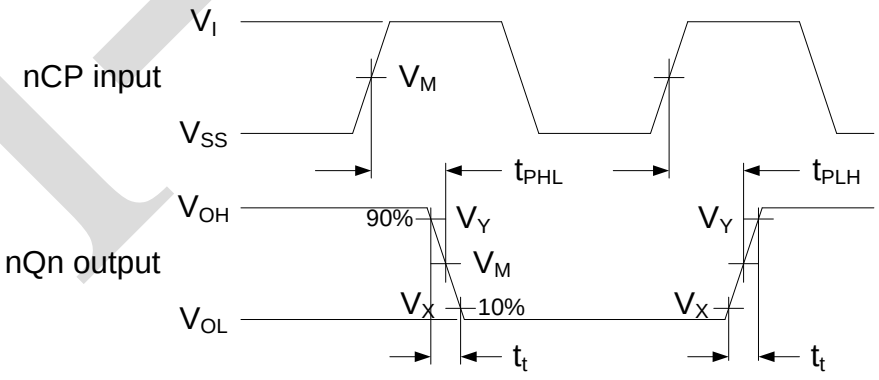


Figure 3. Propagation delay, output transition time

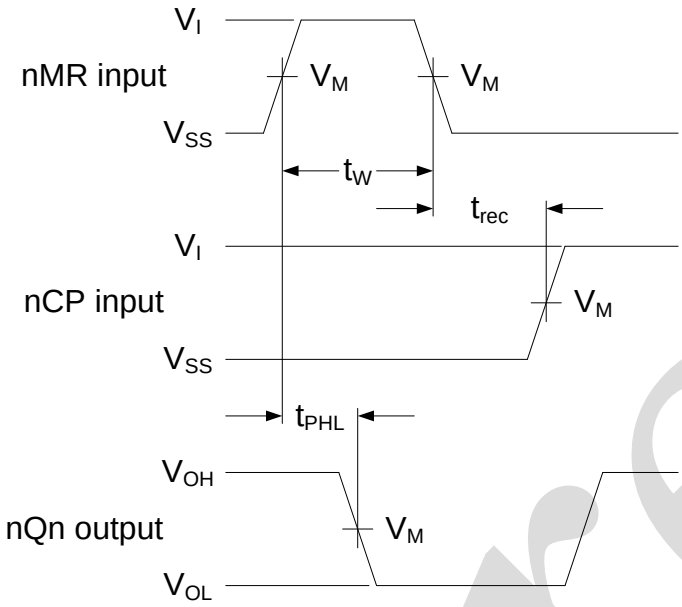


Figure 4. Waveforms showing MR recovery time, propagation delay and minimum pulse width

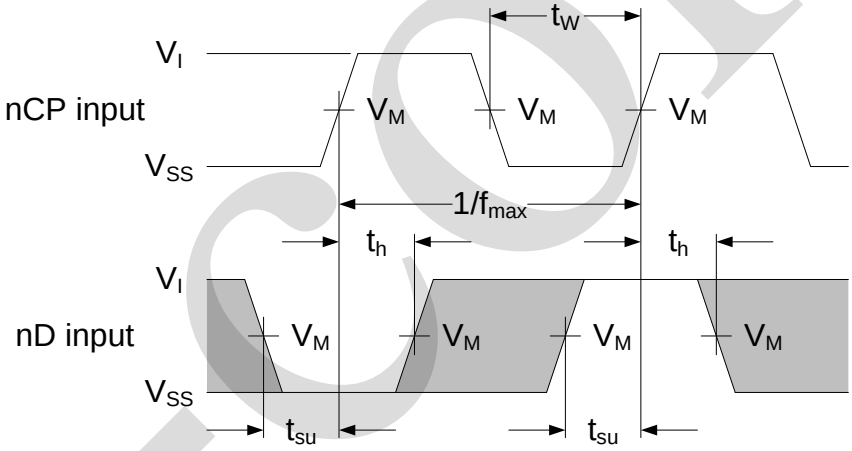


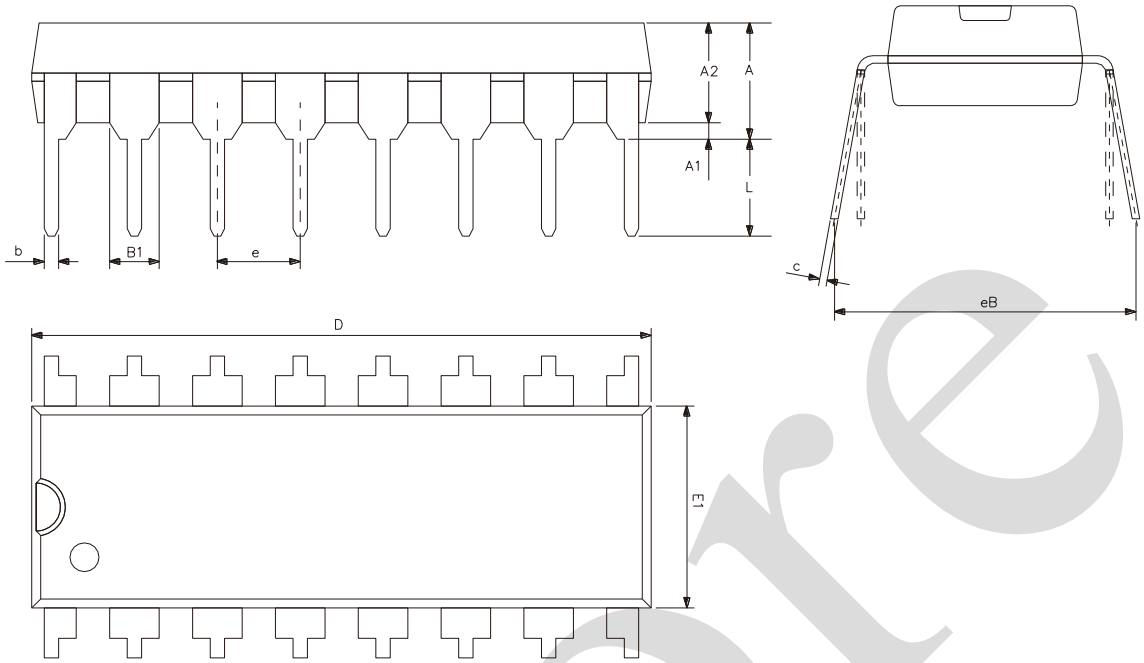
Figure 5. Waveforms showing set-up times, hold times, and minimum clock pulse width

4.4、Measurement Points

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

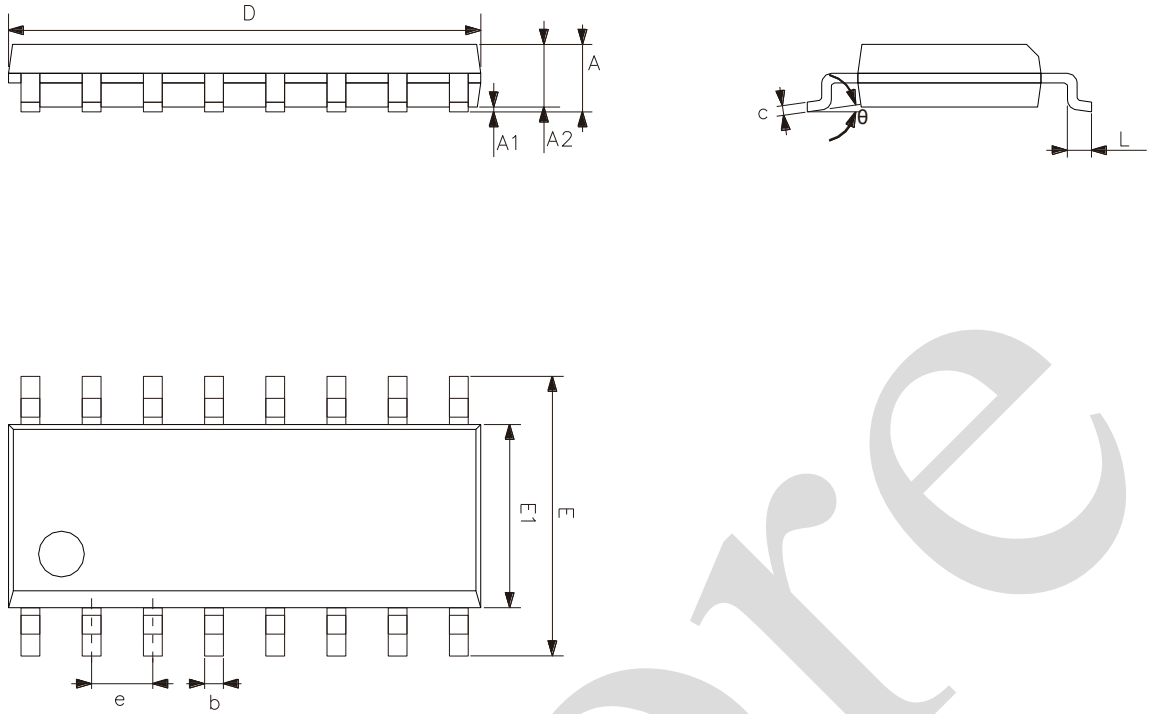
5、Package Information

5.1、DIP16



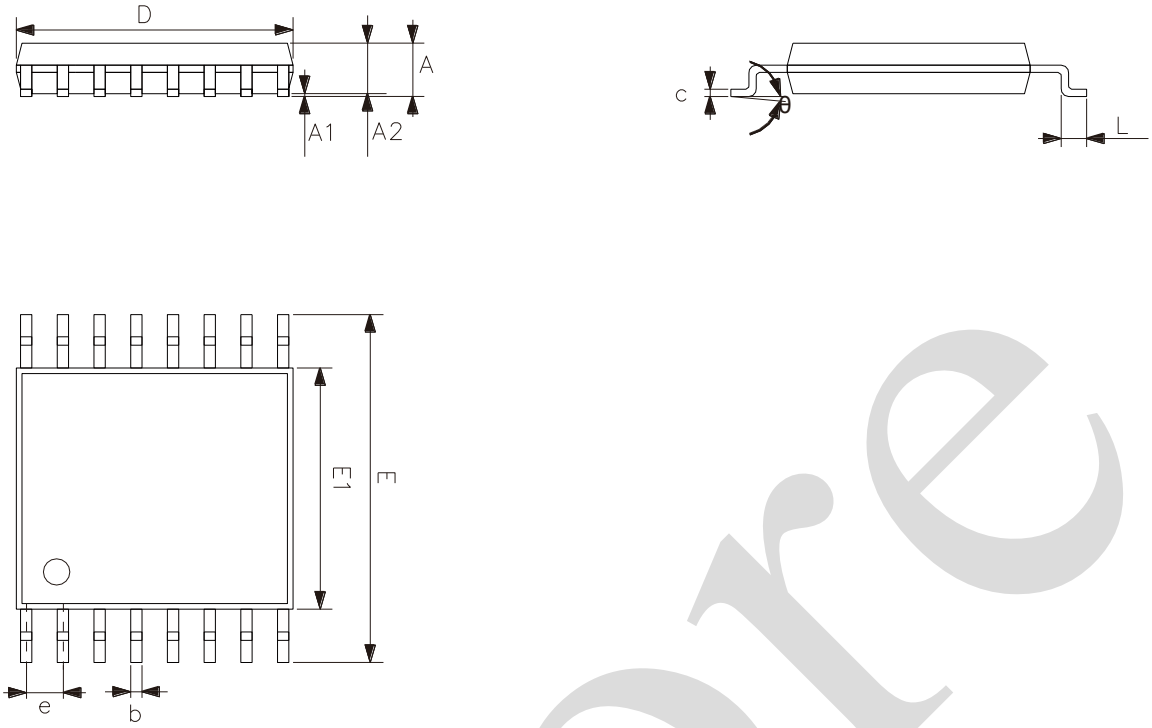
Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	-
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
c	0.20	0.36
eB	7.62	9.30

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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