CD40174
Hex D-type flip-flop

Product Specification

Specification Revision History:

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

1、General Description

The CD40174 is a hex edge-triggered D-type flip-flop.

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
CD40174DA16.TB	DIP16	CD40174	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing:2.54mm
CD40174SA16.TB	SOP16	CD40174	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
CD40174TA16.TB	TSSOP16	CD40174	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
CD40174SA16.TR	SOP16	CD40174	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
CD40174TA16.TR	TSSOP16	CD40174	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

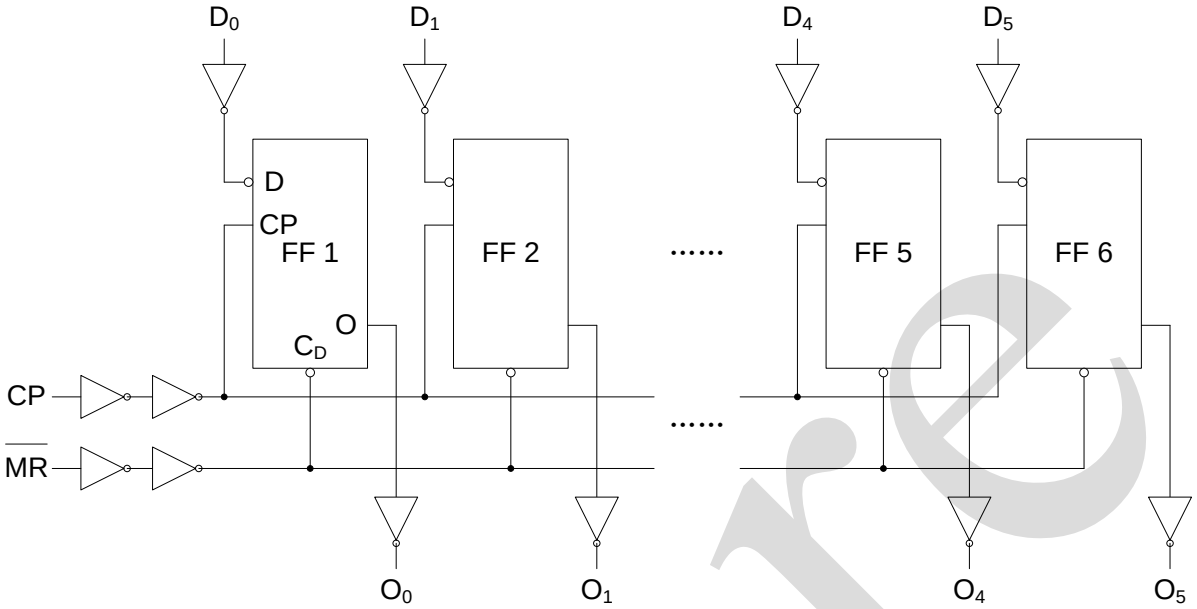


Figure 1. Functional diagram

2.2、Pin Configurations

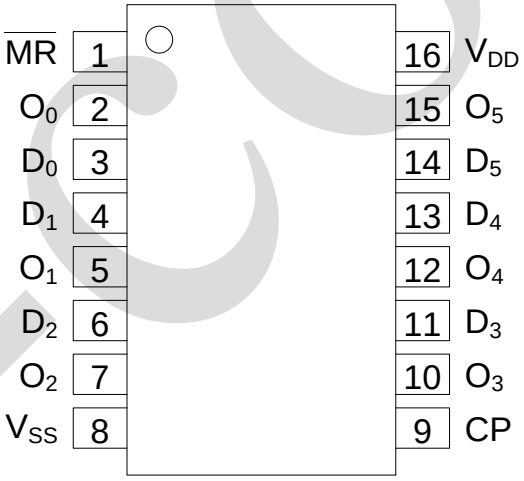


Figure 2. Pin configurations

2.3、Pin Description

Pin No.	Pin Name	Description
1	$\overline{MR}$	clock input
2	O_0	buffered output
3	D_0	data input
4	D_1	data input
5	O_1	buffered output
6	D_2	data input
7	O_2	buffered output
8	V_{SS}	ground supply voltage
9	CP	clock input
10	O_3	buffered output
11	D_3	data input
12	O_4	buffered output
13	D_4	data input
14	D_5	data input
15	O_5	buffered output
16	V_{DD}	supply voltage

2.4、Function Table

Input			Output
CP	**D**	**$\overline{MR}$**	**O**
↑	H	H	H
↑	L	H	L
↓	X	H	no change
X	X	L	L

Note: H=HIGH voltage level; L=LOW voltage level. X=state is immaterial.

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	-	-	±2	uA
supply current	I_{DD}	5V	V_I=5V or GND; I_O=0A	-	-	7.5	uA
		10V	V_I=10V or GND; I_O=0A	-	-	15	uA
		15V	V_I=15V or GND; I_O=0A	-	-	30	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	-	-	±4	uA
supply current	I_{DD}	5V	V_I=5V or GND; I_O=0A	-	-	7.5	uA
		10V	V_I=10V or GND; I_O=0A	-	-	15	uA
		15V	V_I=15V or GND; I_O=0A	-	-	30	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
propagation delay time	t_{PHL}, t_{PLH}	5V	CP to Qn See Figure 4	-	75	155	ns
		10V		-	30	65	ns
		15V		-	20	45	ns
$\overline{MR}$ to Qn HIGH to LOW propagation delay time	t_{PHL}	5V	See Figure 5	-	85	175	ns
		10V		-	35	70	ns
		15V		-	25	50	ns
transition time	t_{THL}, t_{TLH}	5V	See Figure 4	-	60	120	ns
		10V		-	30	60	ns
		15V		-	20	40	ns
set-up time	t_{su}	5V	See Figure 5	20	10	-	ns
		10V		10	5	-	ns
		15V		10	5	-	ns
hold time	t_{hold}	5V		10	0	-	ns
		10V		5	0	-	ns
		15V		5	0	-	ns
Minimum clock pulse width; LOW	t_{WCPL}	5V		70	35	-	ns
		10V		30	15	-	ns
		15V		20	10	-	ns
Minimum $\overline{MR}$ pulse width; LOW	t_{WMRL}	5V		70	35	-	ns
		10V		35	15	-	ns
		15V		25	10	-	ns
Recovery time for $\overline{MR}$	t_{RMR}	5V		45	25	-	ns
		10V		20	10	-	ns
		15V		15	5	-	ns
Maximum clock pulse frequency	f_{max}	5V	-	5	11	-	MHZ
		10V	-	15	30	-	MHZ
		15V	-	20	45	-	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
propagation delay time	t_{PHL}, t_{PLH}	5V	CP to Qn See Figure 4	-	-	186	ns
		10V		-	-	78	ns
		15V		-	-	54	ns
$\overline{MR}$ to Qn HIGH to LOW propagation delay time	t_{PHL}	5V	See Figure 5	-	-	210	ns
		10V		-	-	84	ns
		15V		-	-	60	ns
transition time	t_{THL}, t_{TLH}	5V	See Figure 4	-	-	144	ns
		10V		-	-	72	ns
		15V		-	-	48	ns
set-up time	t_{su}	5V		24	-	-	ns
		10V		12	-	-	ns
		15V		12	-	-	ns
hold time	t_{hold}	5V		12	-	-	ns
		10V		6	-	-	ns
		15V		6	-	-	ns
Minimum clock pulse width;LOW	t_{WCPL}	5V	See Figure 5	84	-	-	ns
		10V		36	-	-	ns
		15V		24	-	-	ns
Minimum $\overline{MR}$ pulse width;LOW	t_{WMRL}	5V		84	-	-	ns
		10V		45	-	-	ns
		15V		30	-	-	ns
Recovery time for $\overline{MR}$	t_{RMR}	5V		54	-	-	ns
		10V		24	-	-	ns
		15V		18	-	-	ns
Maximum clock pulse frequency	f_{max}	5V	-	4	-	-	MHZ
		10V	-	12	-	-	MHZ
		15V	-	16	-	-	MHZ

4、Testing Circuit

4.1、AC Testing Circuit

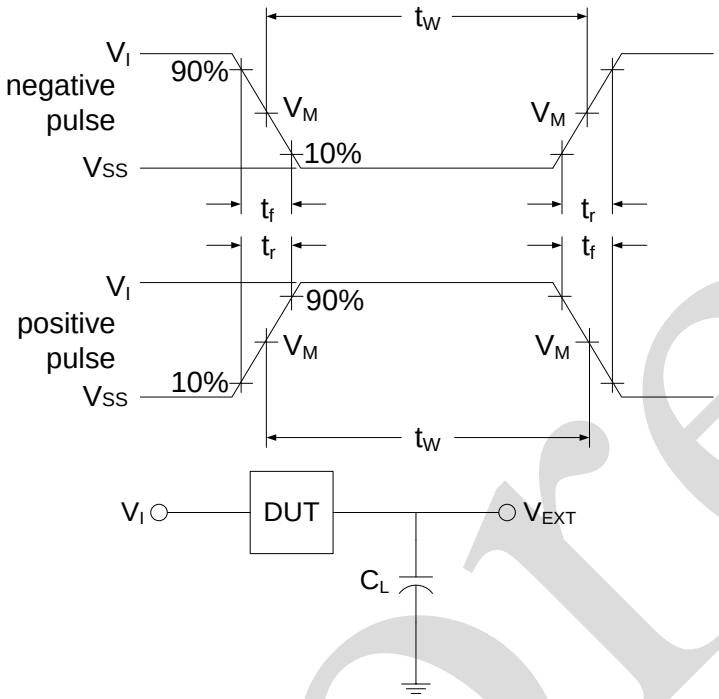


Figure 3. Load circuit

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}	≤ 20ns	50pF	Open	V_{DD}	V_{SS}

4.3、AC Testing Waveforms

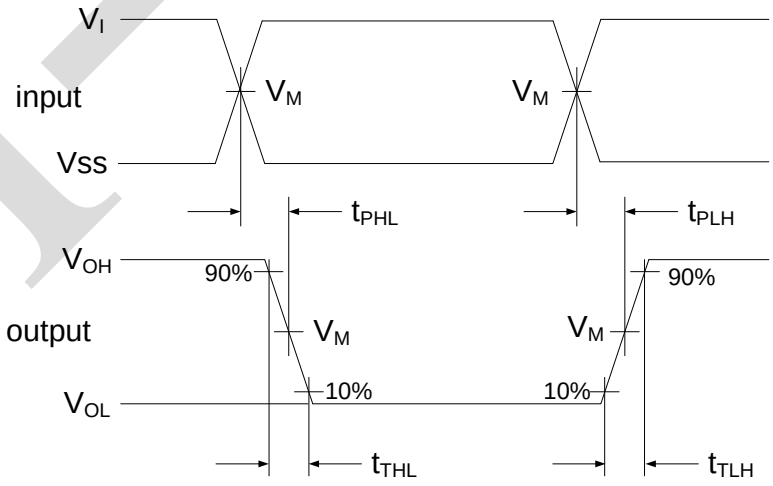


Figure 4. Propagation delay, output transition time

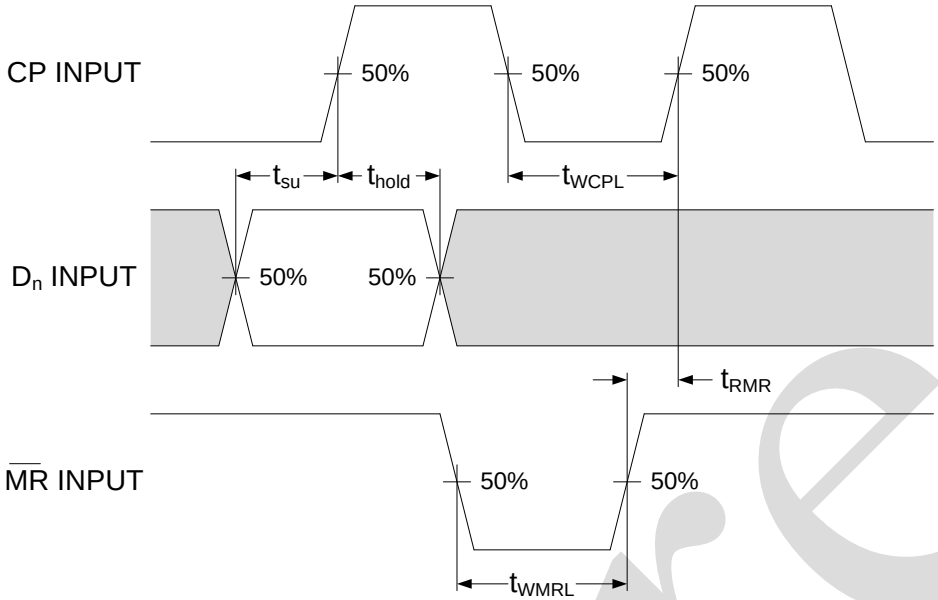


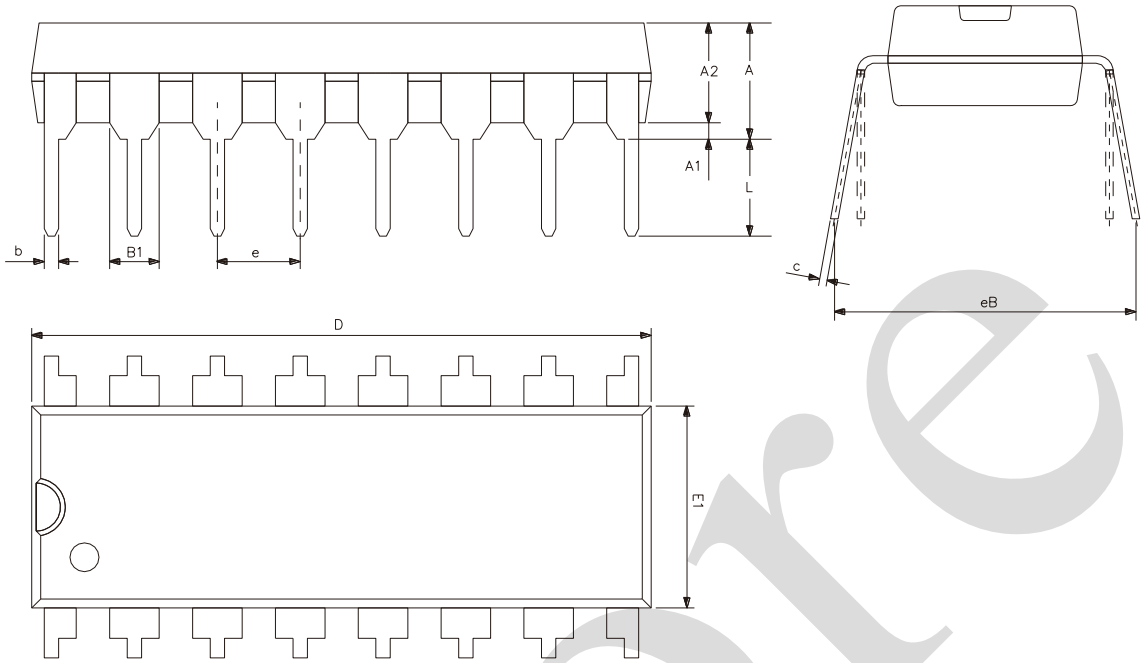
Figure 5. Waveforms showing minimum pulse widths for CP and $\overline{MR}$, $\overline{MR}$ to CP recovery time, and set-up time and hold time for Dn to CP. Set-up and hold times are shown as positive values but may be specified as negative values.

4.4、Measurement Points

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

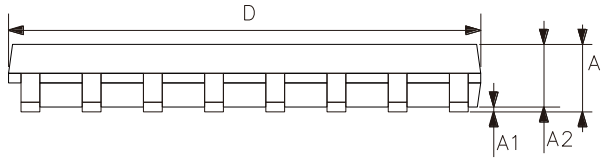
5、Package Information

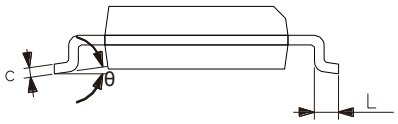
5.1、DIP16

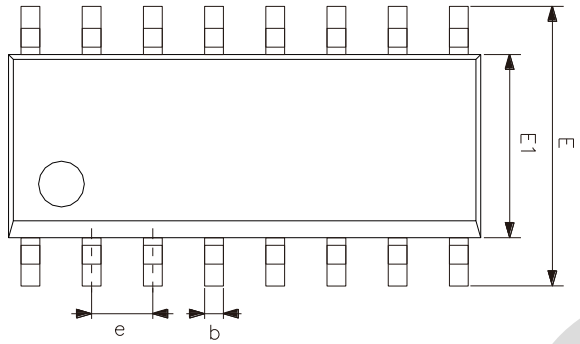


Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	-
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
c	0.20	0.36
eB	7.62	9.30

5.2、SOP16

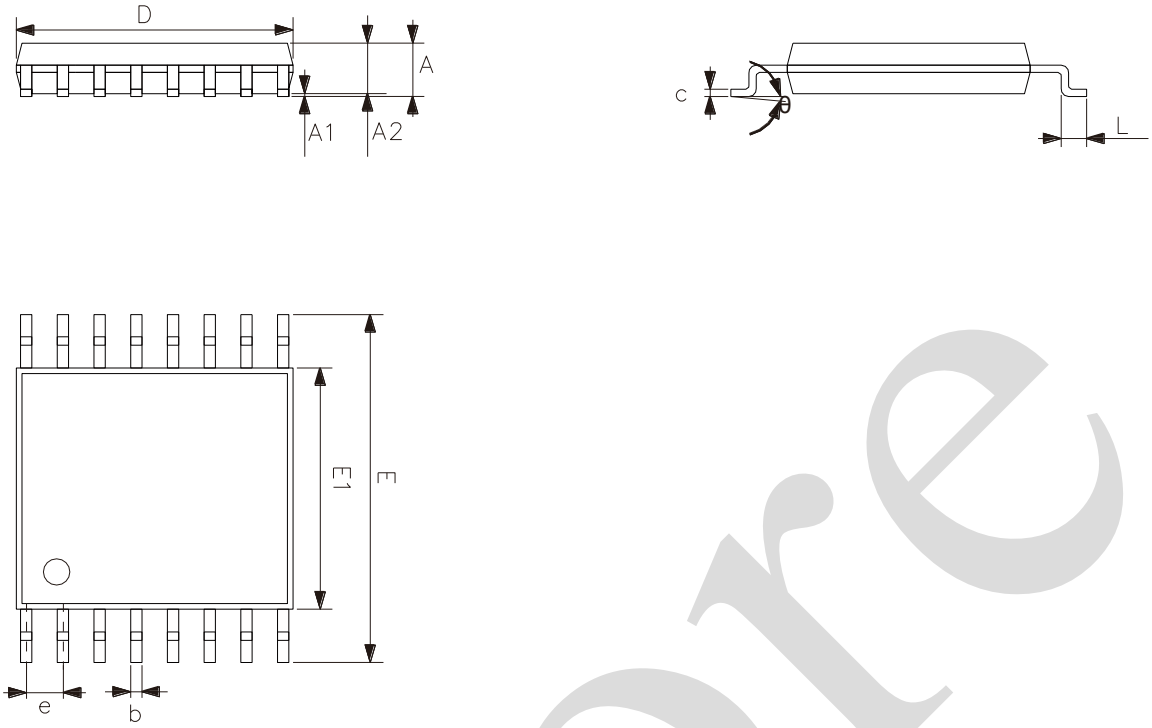






Symbol	Dimensions (mm)	
	Min.	Max.
A	1.35	1.80
A1	0.10	0.25
A2	1.25	1.55
b	0.33	0.51
c	0.19	0.25
D	9.50	10.10
E	5.80	6.30
E1	3.70	4.10
e	1.27	
L	0.35	0.89
θ	0°	8°

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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