AiP74HC/HCT173
Quad D-type flip-flop; positive-edge trigger; 3-state

Product Specification

Specification Revision History：

Version	Date	Description
2022-07-A1	2022-07	New

Contents

1、General Description

The AiP74HC/HCT173 is a quad positive-edge triggered D-type flip-flop.Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

Features:

- Input levels:
  For AiP74HC173: CMOS level
  For AiP74HCT173: TTL level
- Gated output enable control mode
- Edge-triggered D-type register
- Asynchronous master reset
- Specified from -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
AiP74HC173DA16.TB	DIP16	74HC173	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT173DA16.TB	DIP16	74HCT173	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC173SA16.TB	SOP16	74HC173	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT173SA16.TB	SOP16	74HCT173	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC173TA16.TB	TSSOP16	74HC173	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT173TA16.TB	TSSOP16	74HCT173	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
AiP74HC173SA16.TR	SOP16	74HC173	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT173SA16.TR	SOP16	74HCT173	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC173TA16.TR	TSSOP16	74HC173	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
AiP74HCT173TA16.TR	TSSOP16	74HCT173	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

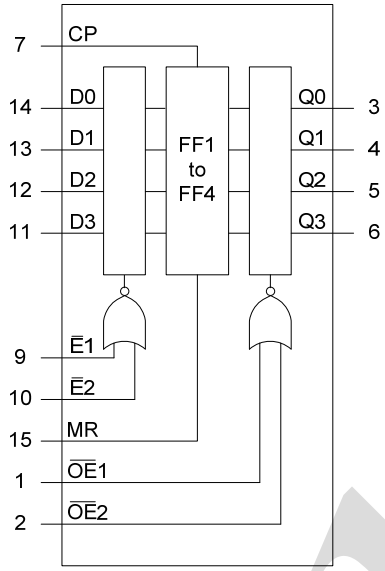


Figure 1. Functional diagram

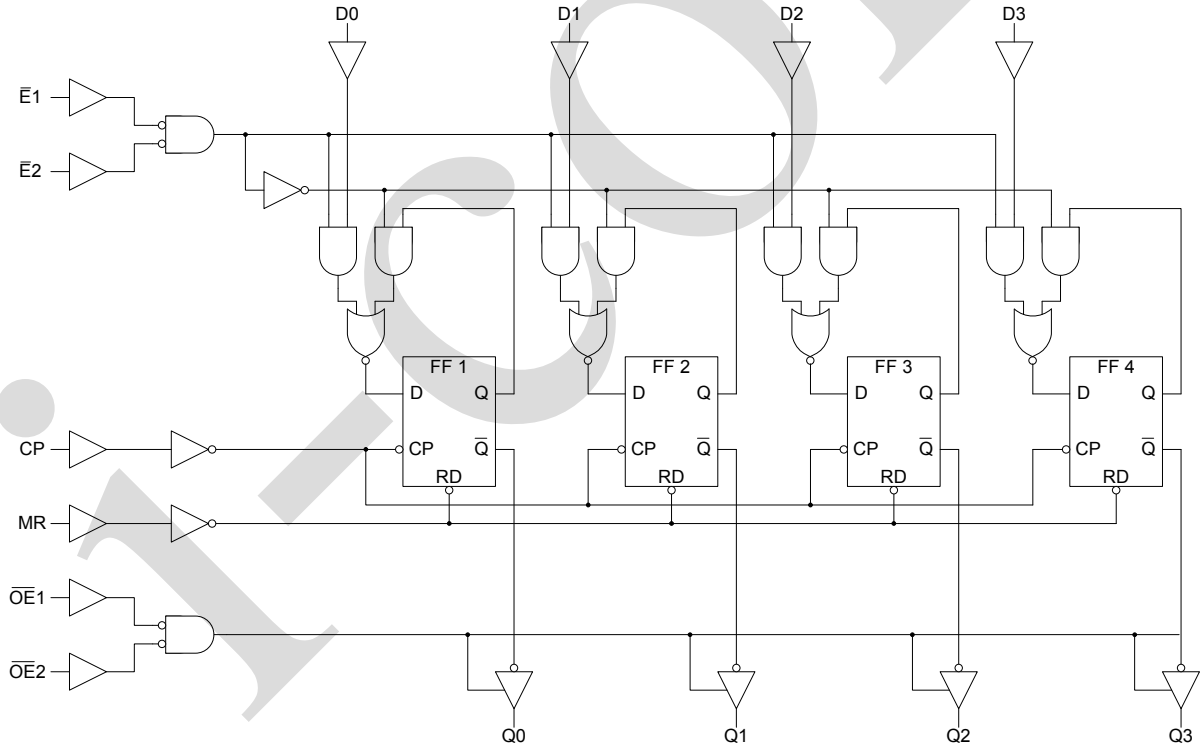
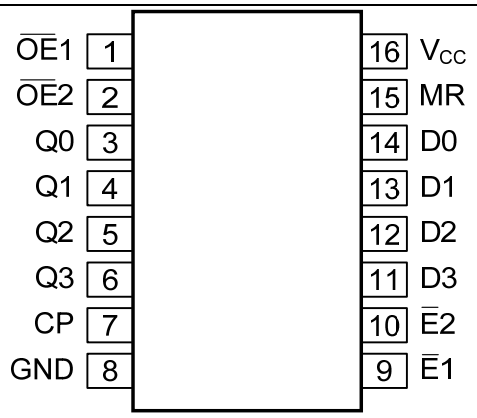


Figure 2. Logic diagram

2.2、Pin Configurations


$\overline{OE}$1 1
$\overline{OE}$2 2
Q0 3
Q1 4
Q2 5
Q3 6
CP 7
GND 8
16 V_{CC}
15 MR
14 D0
13 D1
12 D2
11 D3
10 $\overline{E}$2
9 $\overline{E}$1

2.3、Pin Description

Pin No.	Pin Name	Description
1	$\overline{OE}1$	output enable input (active LOW)
2	$\overline{OE}2$	output enable input (active LOW)
3	Q0	3-state flip-flop output
4	Q1	3-state flip-flop output
5	Q2	3-state flip-flop output
6	Q3	3-state flip-flop output
7	CP	clock input (LOW-to-HIGH, edge triggered)
8	GND	ground (0 V)
9	$\overline{E}1$	data enable input (active LOW)
10	$\overline{E}2$	data enable input (active LOW)
11	D3	data input
12	D2	data input
13	D1	data input
14	D0	data input
15	MR	asynchronous master reset (active HIGH)
16	V_{CC}	supply voltage

2.4、Function Table

Register operating mode	Inputs					Outputs
	MR	CP	$\overline{E}1$	$\overline{E}2$	Dn	Qn (register)
Reset (clear)	H	X	X	X	X	L
Parallel load	L	↑	l	l	l	L
	L	↑	l	l	h	H
Hold (do nothing)	L	X	h	X	X	qn
	L	X	X	h	X	qn

3-state buffer operating mode	Inputs			Outputs			
	Qn (register)	$\overline{OE}1$	$\overline{OE}2$	Q0	Q1	Q2	Q3
Read	L	L	L	L	L	L	L
	H	L	L	H	H	H	H
Disabled	X	H	X	Z	Z	Z	Z
	X	X	H	Z	Z	Z	Z

Note:

H=HIGH voltage level;

h=HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition;

L=LOW voltage level;

I=LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition;

qn=lower case letters indicate the state of the referenced input (or output) one set-up time prior to the LOW-to-HIGH CP transition;

X=don't care;

Z=high impedance OFF-state;

↑=LOW-to-HIGH clock transition.

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Characteristic	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}	-		-0.5	+7.0	V
input clamping current	I_{IK}	V_I<-0.5V or V_I>V_{CC}+0.5V		-	±20	
output clamping current	I_{OK}	V_O<-0.5V or V_O>V_{CC}+0.5V		-	±20	
output current	I_O	V_O=-0.5V to (V_{CC}+0.5V)		-	±35	
supply current	I_{CC}	-		-	+70	
ground current	I_{GND}	-		-70	-	
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
AiP74HC173						
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 temperature	T_{amb}	-	-40	-	+125	℃
AiP74HCT173						
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}=25℃, voltages are referenced to GND (ground=0V), nless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	1.2	-	V
		V_{CC}=4.5V		3.15	2.4	-	V
		V_{CC}=6.0V		4.2	3.2	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	0.8	0.5	V
		V_{CC}=4.5V		-	2.1	1.35	V
		V_{CC}=6.0V		-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=2.0V	1.9	2.0	-	V
			I_O=-20uA; V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-20uA; V_{CC}=6.0V	5.9	6.0	-	V
			I_O=-6.0mA; V_{CC}=4.5V	3.98	4.32	-	V
			I_O=-7.8mA; V_{CC}=6.0V	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=2.0V	-	0	0.1	V
			I_O=20uA; V_{CC}=4.5V	-	0	0.1	V
			I_O=20uA; V_{CC}=6.0V	-	0	0.1	V
			I_O=6.0mA; V_{CC}=4.5V	-	0.15	0.26	V
			I_O=7.8mA; V_{CC}=6.0V	-	0.16	0.26	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±1.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	8.0	uA
AiP74HCT173							
HIGH-level input voltage	V_{IH}	V_{CC}=4.5V to 5.5V		2.0	1.6	-	V
LOW-level input voltage	V_{IL}	V_{CC}=4.5V to 5.5V		-	1.2	0.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=-20uA	4.4	4.5	-	V
			I_O=-6.0mA	3.98	4.32	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=20uA	-	0	0.1	V
			I_O=6.0mA	-	0.15	0.26	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=5.5V; V_O=V_{CC} or GND		-	-	±1.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	8.0	uA
additional supply current	ΔI_{CC}	per input pin; V_I=V_{CC}-2.1V; other inputs at V_{CC} or GND; I_O=0A; V_{CC}=4.5V to 5.5V	$\overline{OE1}$, $\overline{OE2}$	-	50	180	uA
			MR	-	60	216	uA
			$\overline{E1}$, $\overline{E2}$	-	40	144	uA
			Dn	-	25	190	uA
			CP	-	100	360	uA

3.3.2、DC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA; V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA; V_{CC}=6.0V	5.9	-	-	V
			I_O=-6.0mA; V_{CC}=4.5V	3.84	-	-	V
			I_O=-7.8mA; V_{CC}=6.0V	5.34	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA; V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA; V_{CC}=6.0V	-	-	0.1	V
			I_O=6.0mA; V_{CC}=4.5V	-	-	0.33	V
			I_O=7.8mA; V_{CC}=6.0V	-	-	0.33	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±5.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	80	uA
AiP74HCT173							
HIGH-level input voltage	V_{IH}	V_{CC}=4.5V to 5.5V		2.0	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=4.5V to 5.5V		-	-	0.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=-20uA	4.4	-	-	V
			I_O=-6.0mA	3.84	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=20uA	-	-	0.1	V
			I_O=6.0mA	-	-	0.33	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=5.5V; V_O=V_{CC} or GND		-	-	±5.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	80	uA
additional supply current	ΔI_{CC}	per input pin; V_I=V_{CC}-2.1V; other inputs at V_{CC} or GND; I_O=0A; V_{CC}=4.5V to 5.5V	$\overline{OE1}$, $\overline{OE2}$	-	-	225	uA
			MR	-	-	270	uA
			$\overline{E1}$, $\overline{E2}$	-	-	180	uA
			Dn	-	-	112.5	uA
			CP	-	-	450	uA

3.3.3、DC Characteristics 3

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA; V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA; V_{CC}=6.0V	5.9	-	-	V
			I_O=-6.0mA; V_{CC}=4.5V	3.7	-	-	V
			I_O=-7.8mA; V_{CC}=6.0V	5.2	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA; V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA; V_{CC}=6.0V	-	-	0.1	V
			I_O=6.0mA; V_{CC}=4.5V	-	-	0.4	V
			I_O=7.8mA; V_{CC}=6.0V	-	-	0.4	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=6.0V; V_O=V_{CC} or GND		-	-	±10.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	160	uA
AiP74HCT173							
HIGH-level input voltage	V_{IH}	V_{CC}=4.5V to 5.5V		2.0	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=4.5V to 5.5V		-	-	0.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=-20uA	4.4	-	-	V
			I_O=-6.0mA	3.7	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}; V_{CC}=4.5V	I_O=20uA	-	-	0.1	V
			I_O=6.0mA	-	-	0.4	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_{CC}=5.5V; V_O=V_{CC} or GND		-	-	±10.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	160	uA
additional supply current	ΔI_{CC}	per input pin; V_I=V_{CC}-2.1V; other inputs at V_{CC} or GND; I_O=0A; V_{CC}=4.5V to 5.5V	$\overline{OE1}$, $\overline{OE2}$	-	-	245	uA
			MR	-	-	294	uA
			$\overline{E1}$, $\overline{E2}$	-	-	196	uA
			Dn	-	-	122.5	uA
			CP	-	-	490	uA

3.3.4、AC Characteristics 1

(T_{amb}=25℃, voltages are referenced to GND (ground=0V); C_L=50pF, unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
propagation delay	t_{pd}	CP to Qn; see Figure 4[1]	V_{CC}=2.0V	-	55	175	ns
			V_{CC}=4.5V	-	20	35	ns
			V_{CC}=5.0V; C_L=15pF	-	17	-	ns
			V_{CC}=6.0V	-	16	30	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; see Figure 5	V_{CC}=2.0V	-	44	150	ns
			V_{CC}=4.5V	-	16	30	ns
			V_{CC}=5.0V; C_L=15pF	-	13	-	ns
			V_{CC}=6.0V	-	13	26	ns
enable time	t_{en}	$\overline{OE}$n to Qn; see Figure 6[2]	V_{CC}=2.0V	-	52	150	ns
			V_{CC}=4.5V	-	19	30	ns
			V_{CC}=6.0V	-	15	26	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; see Figure 6[3]	V_{CC}=2.0V	-	52	150	ns
			V_{CC}=4.5V	-	19	30	ns
			V_{CC}=6.0V	-	15	26	ns
transition time	t_t	see Figure 4[4]	V_{CC}=2.0V	-	14	60	ns
			V_{CC}=4.5V	-	5	12	ns
			V_{CC}=6.0V	-	4	10	ns
pulse width	t_W	CP HIGH or LOW; see Figure 4	V_{CC}=2.0V	80	14	-	ns
			V_{CC}=4.5V	16	5	-	ns
			V_{CC}=6.0V	14	4	-	ns
		MR HIGH; see Figure 5	V_{CC}=2.0V	80	14	-	ns
			V_{CC}=4.5V	16	5	-	ns
			V_{CC}=6.0V	14	4	-	ns
recovery time	t_{rec}	MR to CP; see Figure 5	V_{CC}=2.0V	60	-8	-	ns
			V_{CC}=4.5V	12	-3	-	ns
			V_{CC}=6.0V	10	-2	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	100	33	-	ns
			V_{CC}=4.5V	20	12	-	ns
			V_{CC}=6.0V	17	10	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	60	17	-	ns
			V_{CC}=4.5V	12	6	-	ns
			V_{CC}=6.0V	10	5	-	ns
hold time	t_h	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	0	-17	-	ns
			V_{CC}=4.5V	0	-6	-	ns
			V_{CC}=6.0V	0	-5	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	1	-11	-	ns
			V_{CC}=4.5V	1	-4	-	ns
			V_{CC}=6.0V	1	-3	-	ns
maximum frequency	f_{max}	CP; see Figure 4	V_{CC}=2.0V	6	26	-	MHz
			V_{CC}=4.5V	30	80	-	MHz
			V_{CC}=5.0V; C_L=15pF	-	88	-	MHz

			V_{CC}=6.0V	35	95	-	MHz
AiP74HCT173							
propagation delay	t_{pd}	CP to Qn; see Figure 4[1]	V_{CC}=4.5V	-	20	40	ns
			V_{CC}=5.0V; C_L=15pF	-	17	-	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; see Figure 5	V_{CC}=4.5V	-	20	37	ns
			V_{CC}=5.0V; C_L=15pF	-	17	-	ns
enable time	t_{en}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[2]		-	20	35	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[3]		-	19	30	ns
transition time	t_t	V_{CC}=4.5V; see Figure 4[4]		-	5	12	ns
pulse width	t_W	CP HIGH or LOW; V_{CC}=4.5V; see Figure 4		16	7	-	ns
		MR HIGH; V_{CC}=4.5V; see Figure 5		15	6	-	ns
recovery time	t_{rec}	MR to CP; V_{CC}=4.5V; see Figure 5		12	-2	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7		22	13	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7		12	7	-	ns
hold time	t_h	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7		0	-6	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7		0	-3	-	ns
maximum frequency	f_{max}	CP; see Figure 4	V_{CC}=4.5V	30	80	-	MHz
			V_{CC}=5.0V; C_L=15pF	-	88	-	MHz

Note:

[1] t_{pd} is the same as t_{PHL} and t_{PLH}.

[2] t_{en} is the same as t_{PZH} and t_{PZL}.

[3] t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[4] t_t is the same as t_{THL} and t_{TLH}.

3.3.5、AC Characteristics 2

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V); C_L=50pF, unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
propagation delay	t_{pd}	CP to Qn; see Figure 4[1]	V_{CC}=2.0V	-	-	220	ns
			V_{CC}=4.5V	-	-	44	ns
			V_{CC}=6.0V	-	-	37	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; see Figure 5	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
enable time	t_{en}	$\overline{OE}$n to Qn; see Figure 6[2]	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; see Figure 6[3]	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
transition time	t_t	see Figure 4[4]	V_{CC}=2.0V	-	-	75	ns
			V_{CC}=4.5V	-	-	15	ns
			V_{CC}=6.0V	-	-	13	ns
pulse width	t_W	CP HIGH or LOW; see Figure 4	V_{CC}=2.0V	100	-	-	ns
			V_{CC}=4.5V	20	-	-	ns
			V_{CC}=6.0V	17	-	-	ns
		MR HIGH; see Figure 5	V_{CC}=2.0V	100	-	-	ns
			V_{CC}=4.5V	20	-	-	ns
			V_{CC}=6.0V	17	-	-	ns
recovery time	t_{rec}	MR to CP; see Figure 5	V_{CC}=2.0V	75	-	-	ns
			V_{CC}=4.5V	15	-	-	ns
			V_{CC}=6.0V	13	-	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	125	-	-	ns
			V_{CC}=4.5V	25	-	-	ns
			V_{CC}=6.0V	21	-	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	75	-	-	ns
			V_{CC}=4.5V	15	-	-	ns
			V_{CC}=6.0V	13	-	-	ns
hold time	t_h	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	0	-	-	ns
			V_{CC}=4.5V	0	-	-	ns
			V_{CC}=6.0V	0	-	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	1	-	-	ns
			V_{CC}=4.5V	1	-	-	ns
			V_{CC}=6.0V	1	-	-	ns
maximum frequency	f_{max}	CP; see Figure 4	V_{CC}=2.0V	4.8	-	-	MHz
			V_{CC}=4.5V	24	-	-	MHz
			V_{CC}=6.0V	28	-	-	MHz
AiP74HCT173							

propagation delay	t_{pd}	CP to Qn; V_{CC}=4.5V; see Figure 4[1]	-	-	50	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; V_{CC}=4.5V; see Figure 5	-	-	46	ns
enable time	t_{en}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[2]	-	-	44	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[3]	-	-	38	ns
transition time	t_t	V_{CC}=4.5V; see Figure 4[4]	-	-	15	ns
pulse width	t_W	CP HIGH or LOW; V_{CC}=4.5V; see Figure 4	20	-	-	ns
		MR HIGH; V_{CC}=4.5V; see Figure 5	19	-	-	ns
recovery time	t_{rec}	MR to CP; V_{CC}=4.5V; see Figure 5	15	-	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7	28	-	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7	15	-	-	ns
hold time	t_h	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7	0	-	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7	0	-	-	ns
maximum frequency	f_{max}	CP; V_{CC}=4.5V; see Figure 4	24	-	-	MHz

Note:

[1] t_{pd} is the same as t_{PHL} and t_{PLH}.

[2] t_{en} is the same as t_{PZH} and t_{PZL}.

[3] t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[4] t_t is the same as t_{THL} and t_{TLH}.

3.3.6、AC Characteristics 3

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V); C_L=50pF, unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC173							
propagation delay	t_{pd}	CP to Qn; see Figure 4[1]	V_{CC}=2.0V	-	-	265	ns
			V_{CC}=4.5V	-	-	53	ns
			V_{CC}=6.0V	-	-	45	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; see Figure 5	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
enable time	t_{en}	$\overline{OE}$n to Qn; see Figure 6[2]	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; see Figure 6[3]	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
transition time	t_t	see Figure 4[4]	V_{CC}=2.0V	-	-	90	ns
			V_{CC}=4.5V	-	-	18	ns
			V_{CC}=6.0V	-	-	15	ns
pulse width	t_W	CP HIGH or LOW; see Figure 4	V_{CC}=2.0V	120	-	-	ns
			V_{CC}=4.5V	24	-	-	ns
			V_{CC}=6.0V	20	-	-	ns

		MR HIGH; see Figure 5	V_{CC}=2.0V	120	-	-	ns
			V_{CC}=4.5V	24	-	-	ns
			V_{CC}=6.0V	20	-	-	ns
recovery time	t_{rec}	MR to CP; see Figure 5	V_{CC}=2.0V	90	-	-	ns
			V_{CC}=4.5V	18	-	-	ns
			V_{CC}=6.0V	15	-	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	150	-	-	ns
			V_{CC}=4.5V	30	-	-	ns
			V_{CC}=6.0V	26	-	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	90	-	-	ns
			V_{CC}=4.5V	18	-	-	ns
			V_{CC}=6.0V	15	-	-	ns
hold time	t_h	$\overline{E}$n to CP; see Figure 7	V_{CC}=2.0V	0	-	-	ns
			V_{CC}=4.5V	0	-	-	ns
			V_{CC}=6.0V	0	-	-	ns
		Dn to CP; see Figure 7	V_{CC}=2.0V	1	-	-	ns
			V_{CC}=4.5V	1	-	-	ns
			V_{CC}=6.0V	1	-	-	ns
maximum frequency	f_{max}	CP; see Figure 4	V_{CC}=2.0V	4	-	-	MHz
			V_{CC}=4.5V	20	-	-	MHz
			V_{CC}=6.0V	24	-	-	MHz
AiP74HCT173							
propagation delay	t_{pd}	CP to Qn; V_{CC}=4.5V; see Figure 4[1]		-	-	60	ns
High to LOW propagation delay	t_{PHL}	MR to Qn; V_{CC}=4.5V; see Figure 5		-	-	56	ns
enable time	t_{en}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[2]		-	-	53	ns
disable time	t_{dis}	$\overline{OE}$n to Qn; V_{CC}=4.5V; see Figure 6[3]		-	-	45	ns
transition time	t_t	V_{CC}=4.5V; see Figure 4[4]		-	-	19	ns
pulse width	t_W	CP HIGH or LOW; V_{CC}=4.5V; see Figure 4		24	-	-	ns
		MR HIGH; V_{CC}=4.5V; see Figure 5		22	-	-	ns
recovery time	t_{rec}	MR to CP; V_{CC}=4.5V; see Figure 5		18	-	-	ns
set-up time	t_{su}	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7		33	-	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7		18	-	-	ns
hold time	t_h	$\overline{E}$n to CP; V_{CC}=4.5V; see Figure 7		0	-	-	ns
		Dn to CP; V_{CC}=4.5V; see Figure 7		0	-	-	ns
maximum frequency	f_{max}	CP; V_{CC}=4.5V; see Figure 4		20	-	-	MHz

Note:

[1] t_{pd} is the same as t_{PHL} and t_{PLH}.

[2] t_{en} is the same as t_{PZH} and t_{PZL}.

[3] t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[4] t_t is the same as t_{THL} and t_{TLH}.

4、Testing Circuit

4.1、AC Testing Circuit

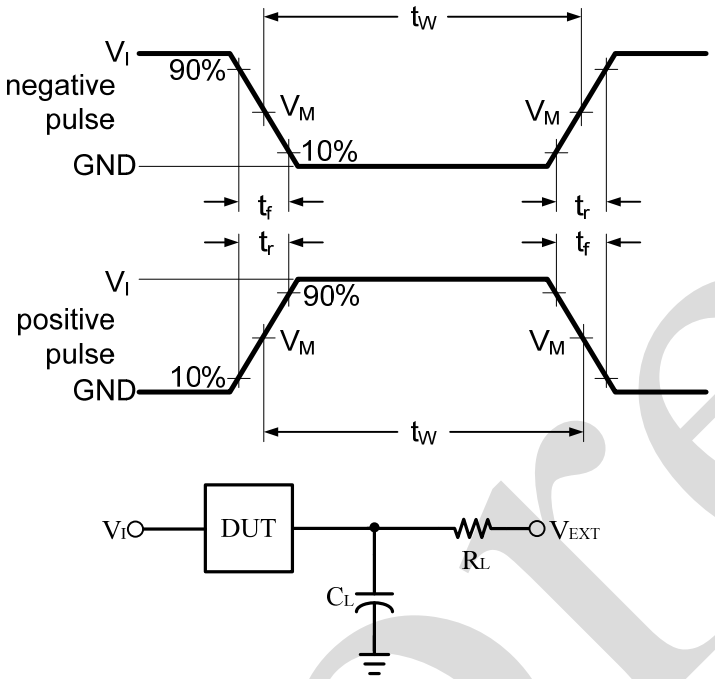


Figure 3. Test circuit for measuring switching times

Test circuit definitions:

C_L includes probe and jig capacitance.

4.2、AC Testing Waveforms

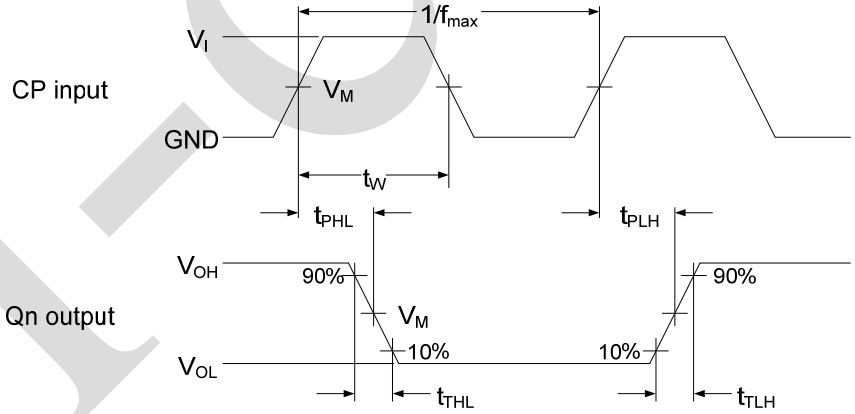


Figure 4. The clock (CP) to outputs (Qn) propagation delays, clock pulse width, output transition times and maximum frequency

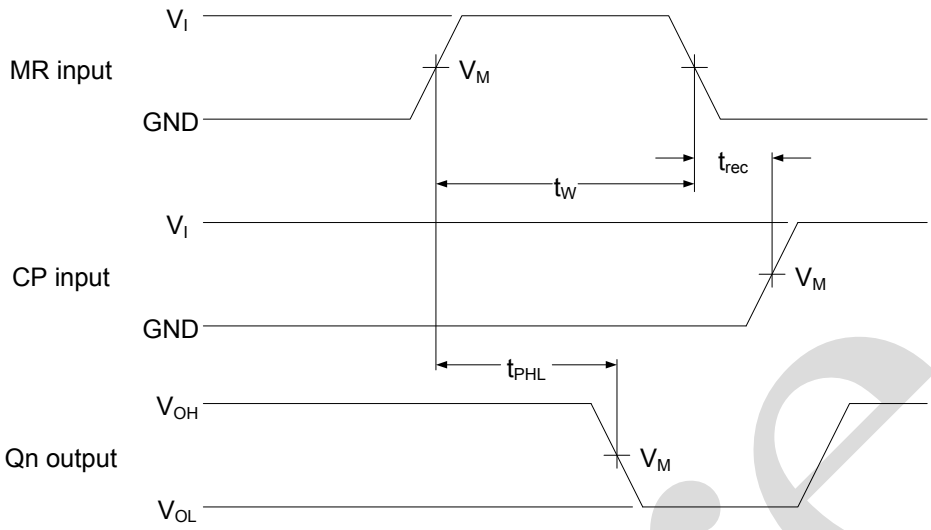


Figure 5. The master reset (MR) pulse width, master reset to output (Qn) propagation delays, and the master reset to clock (CP) recovery times

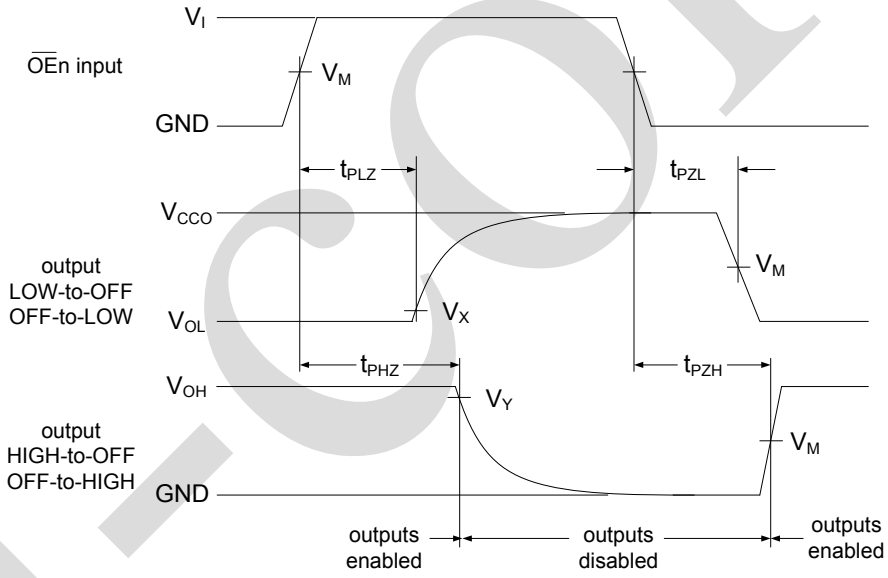


Figure 6. 3-state enable and disable times

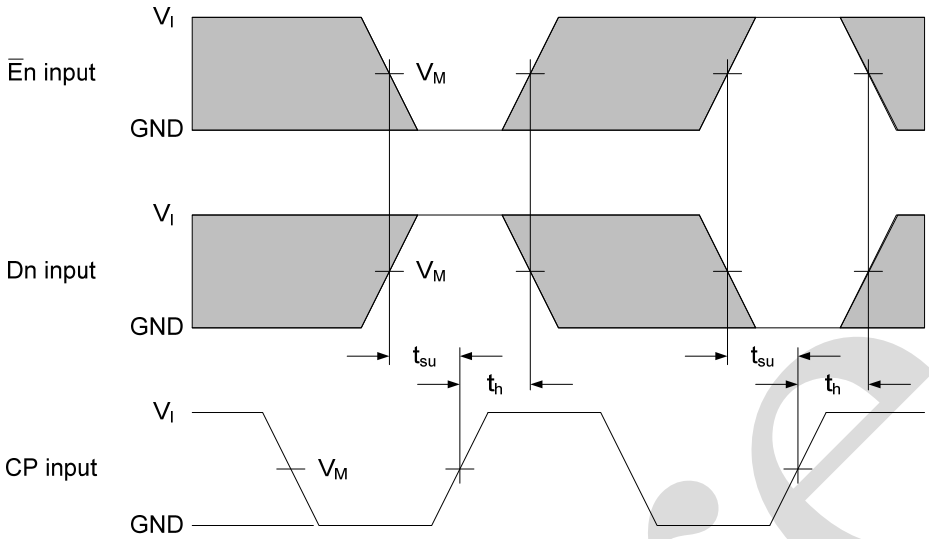


Figure 7. The data set-up and hold times from input ($\overline{En}$, Dn) to clock (CP)

4.3、Measurement Points

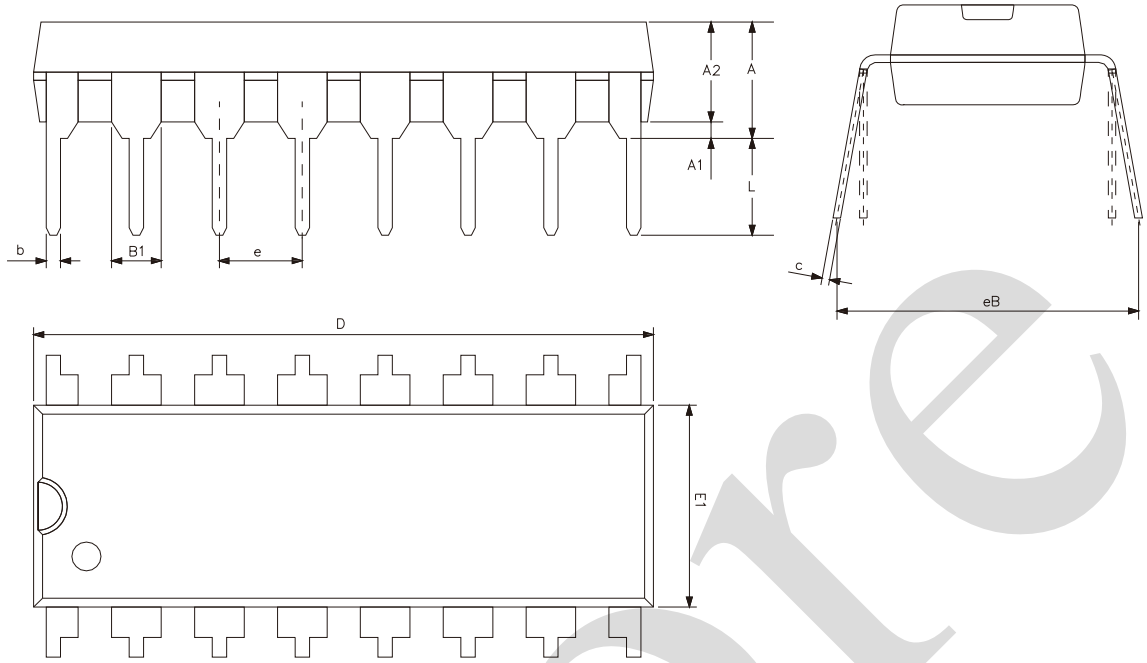
Type	Input	Output		
	V_M	V_M	V_X	V_Y
AiP74HC173	0.5×V_{CC}	0.5×V_{CC}	0.1×V_{CC}	0.9×V_{CC}
AiP74HCT173	1.3V	1.3V	0.1×V_{CC}	0.9×V_{CC}

4.4、Test Data

Type	Input		Load		Test		
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
AiP74HC173	V_{CC}	6ns	15pF, 50pF	1kΩ	open	GND	V_{CC}
AiP74HCT173	3V	6ns	15pF, 50pF	1kΩ	open	GND	V_{CC}

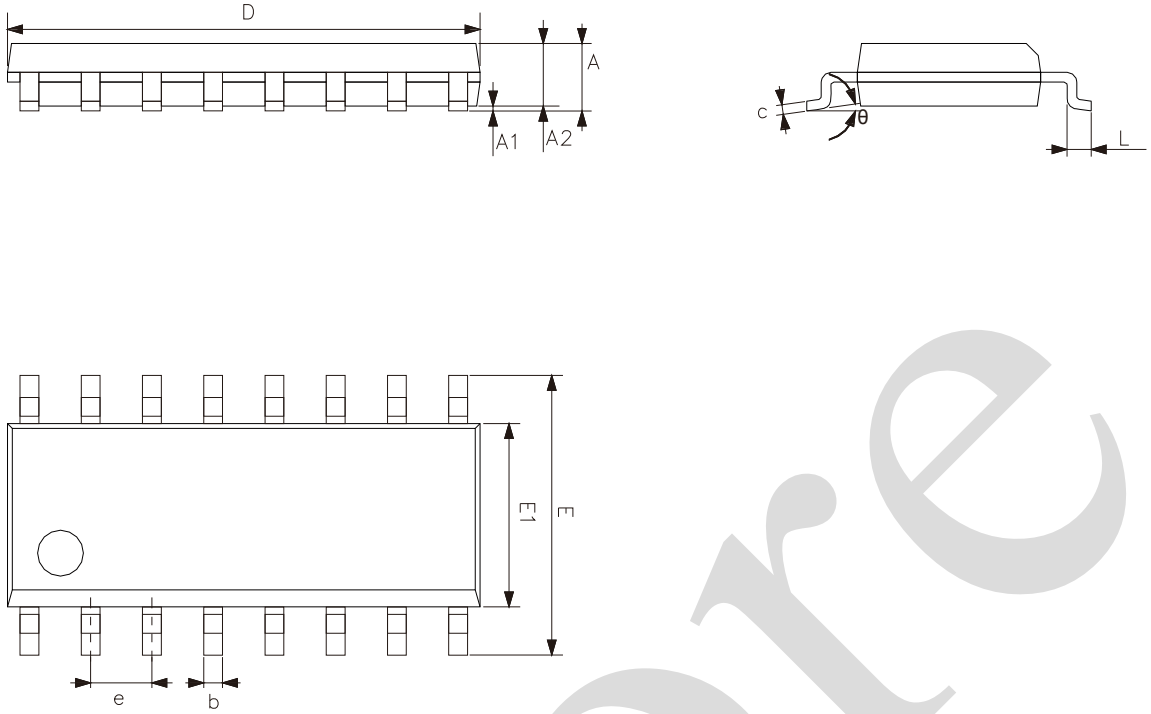
5、Package Information

5.1、DIP16



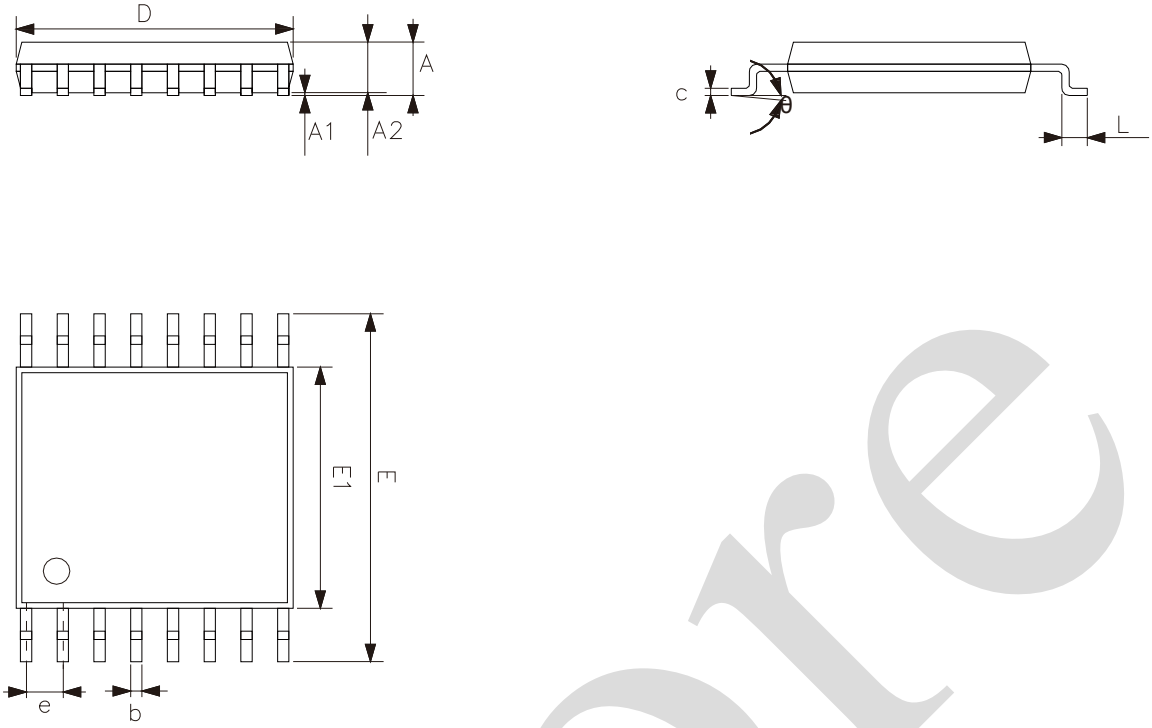
Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	-
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
c	0.20	0.36
eB	7.62	9.30

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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