SN74HC/HCT112
Dual JK flip-flop with set and reset; negative-edge trigger

Product Specification

Specification Revision History:

Version	Date	Description
2023-06-A0	2023-06	New
2023-11-A1	2023-11	Parameter modification

Contents

1、General Description

The SN74HC/HCT112 is a dual negative-edge triggered JK flip-flop.

Features:

- Supply voltage range:
  SN74HC112: 2~6V
  SN74HCT112: 4.5~5.5V
- Input levels:
  SN74HC112: CMOS level
  SN74HCT112: TTL level
- 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
SN74HC112N(LX)	DIP16	SN74HC112N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74HCT112N(LX)	DIP16	SN74HCT112N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74HC112D(LX)	SOP16	HC112	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
SN74HCT112D(LX)	SOP16	HCT112	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
SN74HC112P(LX)	TSSOP16	HC112	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
SN74HCT112P(LX)	TSSOP16	HCT112	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
SN74HC112DR(LX)	SOP16	HC112	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
SN74HCT112DR(LX)	SOP16	HCT112	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
SN74HC112PR(LX)	TSSOP16	HC112	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
SN74HCT112PR(LX)	TSSOP16	HCT112	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm

Note 1: “XX” refers to variable content, meaning year and package batch serial number.
Note 2: 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

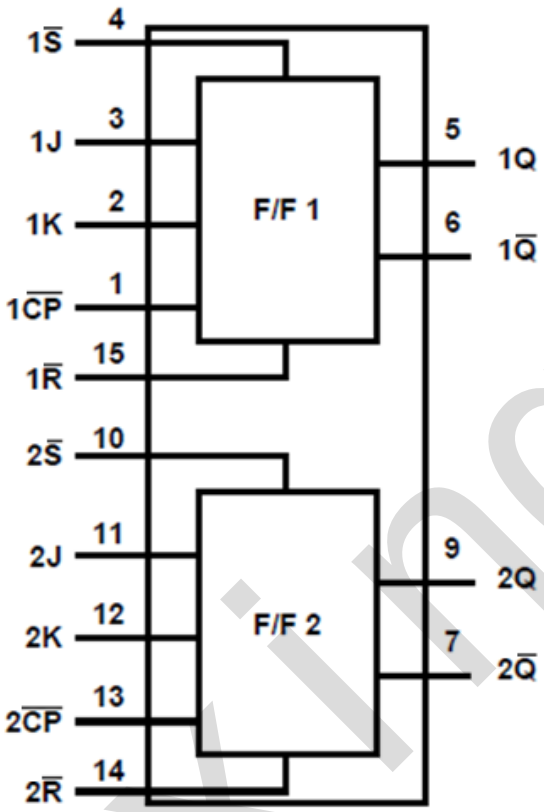
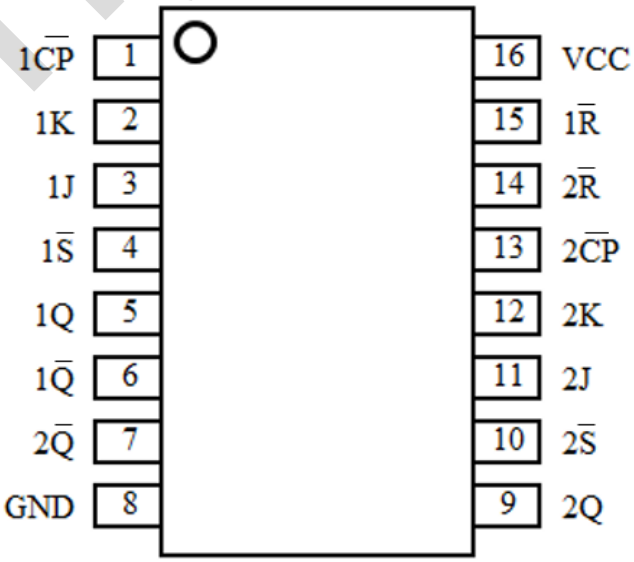


Figure 1. Functional diagram

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	$\overline{1CP}$	clock input (HIGH-to-LOW; edge-triggered)
2	1K	data input
3	1J	data input
4	$\overline{1S}$	set input (active LOW)
5	1Q	true flip-flop output
6	$\overline{1Q}$	complement flip-flop output
7	$\overline{2Q}$	complement flip-flop output
8	GND	ground (0V)
9	2Q	true flip-flop output
10	$\overline{2S}$	set input (active LOW)
11	2J	data input
12	2K	data input
13	$\overline{2CP}$	clock input (HIGH-to-LOW; edge-triggered)
14	$\overline{2R}$	reset input (active LOW)
15	$\overline{1R}$	reset input (active LOW)
16	VCC	supply voltage

2.4、Function Table

Inputs					Outputs	
$\overline{S}$	$\overline{R}$	$\overline{CP}$	J	K	Q	$\overline{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H(Note 1)	H(Note 1)
H	H	↓	L	L	No Change	
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	Toggle	
H	H	H	X	X	No Change	

H= High Level (Steady State)

L= Low Level (Steady State)

X= Don't Care

↓ = High-to-Low Transition

NOTE 1： Output states unpredictable if both S and R go High simultaneously after both being low at the same time

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, All voltage referenced to Vss, unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}	-		-0.5	+7	V
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-50	-	mA
input clamping current	I_{IK}	V_I < -0.5V or V_I > V_{CC}+0.5V		-	±20	mA
output clamping current	I_{OK}	V_O < -0.5V or V_O > V_{CC}+0.5V		-	±20	mA
output current	I_O	-0.5V < V_O < V_{CC}+0.5V		-	±25	mA
storage temperature	T_{stg}	-		-65	+150	℃
soldering temperature	T_L	10s	DIP	245		℃
			SOP/TSSOP	260		

3.2、Electrical Characteristics

3.2.1、DC Characteristics 1

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

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
SN74HC112							
HIGH-level input voltage	V_{IH}	2.0V	-	1.5	1.2	-	V
		4.5V	-	3.15	2.4	-	V
		6.0V	-	4.2	3.2	-	V
LOW-level input voltage	V_{IL}	2.0V	-	-	0.8	0.5	V
		4.5V	-	-	2.1	1.35	V
		6.0V	-	-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	2.0V	I_O=-20uA	1.9	2.0	-	V
		4.5V	I_O=-20uA	4.4	4.5	-	V
		6.0V	I_O=-20uA	5.9	6.0	-	V
		4.5V	I_O=-4.0mA	3.84	4.32	-	V
		6.0V	I_O=-5.2mA	5.34	5.81	-	V
LOW-level output voltage	V_{OL}	2.0V	I_O=20uA	-	0	0.1	V
		4.5V	I_O=20uA	-	0	0.1	V
		6.0V	I_O=20uA	-	0	0.1	V
		4.5V	I_O=4.0mA	-	0.15	0.33	V
		6.0V	I_O=5.2mA	-	0.16	0.33	V
input leakage current	I_I	6.0V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	80	uA
SN74HCT112							
HIGH-level input voltage	V_{IH}	4.5~5.5V	-	2.0	1.6	-	V
LOW-level input voltage	V_{IL}	4.5~5.5V	-	-	1.2	0.8	V
HIGH-level	V_{OH}	4.5V	I_O=-20uA	4.4	4.5	-	V

output voltage			I_O=-4.0mA	3.84	4.32	-	V
LOW-level output voltage	V_{OL}	4.5V	I_O=20uA	-	0	0.1	V
			I_O=4.0mA	-	0.15	0.33	V
input leakage current	I_I	5.5V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	80	uA
additional supply current	ΔI_{CC}	4.5~ 5.5V	One input at V_I=V_{CC}-2.1V; Other inputs at V_{CC} or GND; I_O=0A	-	-	135	uA

3.2.2、DC Characteristics 2

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

Parameter	Symbol	V_{CC}	Conditions	Min.	Typ.	Max.	Unit
SN74HC112							
HIGH-level input voltage	V_{IH}	2.0V	-	1.5	-	-	V
		4.5V	-	3.15	-	-	V
		6.0V	-	4.2	-	-	V
LOW-level input voltage	V_{IL}	2.0V	-	-	-	0.5	V
		4.5V	-	-	-	1.35	V
		6.0V	-	-	-	1.8	V
HIGH-level output voltage	V_{OH}	2.0V	I_O=-20uA	1.9	-	-	V
		4.5V	I_O=-20uA	4.4	-	-	V
		6.0V	I_O=-20uA	5.9	-	-	V
		4.5V	I_O=-4.0mA	3.7	-	-	V
		6.0V	I_O=-5.2mA	5.2	-	-	V
LOW-level output voltage	V_{OL}	2.0V	I_O=20uA	-	-	0.1	V
		4.5V	I_O=20uA	-	-	0.1	V
		6.0V	I_O=20uA	-	-	0.1	V
		4.5V	I_O=4.0mA	-	-	0.4	V
		6.0V	I_O=5.2mA	-	-	0.4	V
input leakage current	I_I	6.0V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	160	uA
SN74HCT112							
HIGH-level input voltage	V_{IH}	4.5~ 5.5V	-	2.0	-	-	V
LOW-level input voltage	V_{IL}	4.5~ 5.5V	-	-	-	0.8	V
HIGH-level output voltage	V_{OH}	4.5V	I_O=-20uA	4.4	-	-	V
			I_O=-4.0mA	3.7	-	-	V
LOW-level output voltage	V_{OL}	4.5V	I_O=20uA	-	-	0.1	V
			I_O=4.0mA	-	-	0.4	V
input leakage current	I_I	5.5V	V_I=V_{CC} or GND	-	-	±1	uA
supply current	I_{CC}	6.0V	V_I=V_{CC} or GND;I_O=0A	-	-	160	uA
additional	ΔI_{CC}	4.5~	One input at V_I=V_{CC}-2.1V;	-	-	147	uA

supply current		5.5V	Other inputs at V_{CC} or GND; I_O=0A				

3.3.3、AC Characteristics 1

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

Parameter	Symbol	V_{CC}	Conditions		Min.	Typ.	Max.	Unit
SN74HC112								
$n\overline{CP}$ to nQ propagation delay	t_{PLH}, t_{PHL}	2.0V	C_L=50pF	see Figure 5	-	55	220	ns
		4.5V	C_L=50pF		-	20	44	ns
		5.0V	C_L=15pF		-	17	-	ns
		6.0V	C_L=50pF		-	16	37	ns
$n\overline{CP}$ to $n\overline{Q}$ propagation delay		2.0V	C_L=50pF	see Figure 5	-	55	220	ns
		4.5V	C_L=50pF		-	20	44	ns
		5.0V	C_L=15pF		-	17	-	ns
		6.0V	C_L=50pF		-	16	37	ns
$n\overline{R}$ to $n\overline{Q}$、nQ propagation delay		2.0V	C_L=50pF	see Figure 6	-	58	225	ns
		4.5V	C_L=50pF		-	21	45	ns
		5.0V	C_L=15pF		-	18	-	ns
		6.0V	C_L=50pF		-	17	38	ns
$n\overline{S}$ to $n\overline{Q}$、nQ propagation delay		2.0V	C_L=50pF	see Figure 6	-	50	295	ns
		4.5V	C_L=50pF		-	18	39	ns
		5.0V	C_L=15pF		-	15	-	ns
		6.0V	C_L=50pF		-	14	33	ns
transition time	t_{THL}, t_{TLH}	2.0V	C_L=50pF	see Figure 5	-	19	95	ns
		4.5V	C_L=50pF		-	7	19	ns
		6.0V	C_L=50pF		-	6	16	ns
$n\overline{CP}$ HIGH or LOW pulse width	tw	2.0V	C_L=50pF	see Figure 5	100	22	-	ns
		4.5V	C_L=50pF		20	8	-	ns
		6.0V	C_L=50pF		17	6	-	ns
$n\overline{S}$,$n\overline{R}$ LOW pulse width		2.0V	C_L=50pF	see Figure 6	100	22	-	ns
		4.5V	C_L=50pF		20	8	-	ns
		6.0V	C_L=50pF		17	6	-	ns
$n\overline{R}$ to $n\overline{CP}$ recovery time	trec	2.0V	C_L=50pF	see Figure 6	125	22	-	ns
		4.5V	C_L=50pF		25	8	-	ns
		6.0V	C_L=50pF		21	6	-	ns
$n\overline{S}$ to $n\overline{CP}$ recovery time		2.0V	C_L=50pF	see Figure 6	100	-19	-	ns
		4.5V	C_L=50pF		20	-7	-	ns
		6.0V	C_L=50pF		17	-6	-	ns
nJ and nK to n$\overline{CP}$ set-up time	tsu	2.0V	C_L=50pF	see Figure 5	100	19	-	ns
		4.5V	C_L=50pF		20	7	-	ns
		6.0V	C_L=50pF		17	6	-	ns
nJ and nK to n$\overline{CP}$ hold time	th	2.0V	C_L=50pF	see Figure 5	0	-11	-	ns
		4.5V	C_L=50pF		0	-4	-	ns
		6.0V	C_L=50pF		0	-3	-	ns
maxiumum	fmax	2.0V	C_L=50pF	see Figure 5	4.8	20	-	MHz

frequency		4.5V	C_L=50pF		24	60	-	MHz
		5.0V	C_L=15pF		-	66	-	MHz
		6.0V	C_L=50pF		28	71	-	MHz
SN74HCT112								
n$\overline{CP}$ to nQ propagation delay	t_{PLH}, t_{PHL}	4.5V	C_L=50pF	see Figure 5	-	21	44	ns
		5.0V	C_L=15pF		-	19	-	ns
n$\overline{CP}$ to n$\overline{Q}$ propagation delay		4.5V	C_L=50pF	see Figure 5	-	23	50	ns
		5.0V	C_L=15pF		-	19	-	ns
n$\overline{R}$ to n$\overline{Q}$、nQ propagation delay		4.5V	C_L=50pF	see Figure 6	-	22	46	ns
		5.0V	C_L=15pF		-	19	-	ns
n$\overline{S}$ to n$\overline{Q}$、nQ propagation delay		4.5V	C_L=50pF	see Figure 6	-	18	40	ns
		5.0V	C_L=15pF		-	15	-	ns
transition time	t_{THL}, t_{TLH}	4.5V	C_L=50pF	see Figure 5	-	7	19	ns
n$\overline{CP}$ HIGH or LOW pulse width	tw	4.5V	C_L=50pF	see Figure 5	20	8	-	ns
n$\overline{S}$,n$\overline{R}$ LOW pulse width		4.5V	C_L=50pF	see Figure 6	23	10	-	ns
n$\overline{R}$ to n$\overline{CP}$ recovery time	trec	4.5V	C_L=50pF	see Figure 6	25	11	-	ns
n$\overline{S}$ to n$\overline{CP}$ recovery time		4.5V	C_L=50pF	see Figure 6	25	-8	-	ns
nJ and nK to n$\overline{CP}$ set-up time	tsu	4.5V	C_L=50pF	see Figure 5	20	7	-	ns
nJ and nK to n$\overline{CP}$ hold time	th	4.5V	C_L=50pF	see Figure 5	0	-7	-	ns
maxiumum frequency	fmax	4.5V	C_L=50pF	see Figure 5	24	64	-	MHz
		5.0V	C_L=15pF		-	70	-	MHz

3.3.4、AC Characteristics 2

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

Parameter	Symbol	V_{CC}	Conditions		Min.	Typ.	Max.	Unit
SN74HC112								
n$\overline{CP}$ to nQ propagation delay	t_{PLH}, t_{PHL}	2.0V	C_L=50pF	see Figure 3	-	-	265	ns
		4.5V	C_L=50pF		-	-	53	ns
		6.0V	C_L=50pF		-	-	45	ns
n$\overline{CP}$ to n$\overline{Q}$ propagation delay		2.0V	C_L=50pF	see Figure 3	-	-	265	ns
		4.5V	C_L=50pF		-	-	53	ns
		6.0V	C_L=50pF		-	-	45	ns
n$\overline{R}$ to n$\overline{Q}$、nQ propagation		2.0V	C_L=50pF	see Figure 4	-	-	270	ns
		4.5V	C_L=50pF		-	-	54	ns

delay		6.0V	C_L=50pF		-	-	46	ns
$\overline{nS}$ to $n\overline{Q}$、nQ propagation delay		2.0V	C_L=50pF	see Figure 4	-	-	235	ns
		4.5V	C_L=50pF		-	-	47	ns
		6.0V	C_L=50pF		-	-	40	ns
transition time	t_{THL}, t_{TLH}	2.0V	C_L=50pF	see Figure 3	-	-	110	ns
		4.5V	C_L=50pF		-	-	22	ns
		6.0V	C_L=50pF		-	-	19	ns
$n\overline{CP}$ HIGH or LOW pulse width	tw	2.0V	C_L=50pF	see Figure 3	120	-	-	ns
		4.5V	C_L=50pF		24	-	-	ns
		6.0V	C_L=50pF		20	-	-	ns
$\overline{nS}$,$\overline{nR}$ LOW pulse width		2.0V	C_L=50pF	see Figure 4	120	-	-	ns
		4.5V	C_L=50pF		24	-	-	ns
		6.0V	C_L=50pF		20	-	-	ns
$\overline{nR}$ to $n\overline{CP}$ recovery time	trec	2.0V	C_L=50pF	see Figure 4	150	-	-	ns
		4.5V	C_L=50pF		30	-	-	ns
		6.0V	C_L=50pF		26	-	-	ns
$\overline{nS}$ to $n\overline{CP}$ recovery time		2.0V	C_L=50pF	see Figure 4	120	-	-	ns
		4.5V	C_L=50pF		24	-	-	ns
		6.0V	C_L=50pF		20	-	-	ns
nJ and nK to n$\overline{CP}$ set-up time	tsu	2.0V	C_L=50pF	see Figure 3	120	-	-	ns
		4.5V	C_L=50pF		24	-	-	ns
		6.0V	C_L=50pF		20	-	-	ns
nJ and nK to n$\overline{CP}$ hold time	th	2.0V	C_L=50pF	see Figure 3	0	-	-	ns
		4.5V	C_L=50pF		0	-	-	ns
		6.0V	C_L=50pF		0	-	-	ns
maxiumum frequency	fmax	2.0V	C_L=50pF	see Figure 3	4.0	-	-	MHZ
		4.5V	C_L=50pF		20	-	-	MHZ
		6.0V	C_L=50pF		24	-	-	NHZ
SN74HCT112								
$n\overline{CP}$ to nQ propagation delay	t_{PLH}, t_{PHL}	4.5V	C_L=50pF	see Figure 3	-	-	53	ns
$n\overline{CP}$ to $n\overline{Q}$ propagation delay		4.5V	C_L=50pF	see Figure 3	-	-	60	ns
n**R** to $n\overline{Q}$、nQ propagation delay		4.5V	C_L=50pF	see Figure 4	-	-	56	ns
$\overline{nS}$ to $n\overline{Q}$、nQ propagation delay		4.5V	C_L=50pF	see Figure 4	-	-	48	Ns
transition time	t_{THL}, t_{TLH}	4.5V	C_L=50pF	see Figure 3	-	-	22	ns
$n\overline{CP}$ HIGH or LOW pulse width	tw	4.5V	C_L=50pF	see Figure 3	24	-	-	ns
$\overline{nS}$,$\overline{nR}$ LOW		4.5V	C_L=50pF	see Figure 4	27	-	-	ns

pulse width								
$n\bar{R}$ to $n\bar{C}P$ recovery time	trec	4.5V	C_L=50pF	see Figure 4	30	-	-	ns
$n\bar{S}$ to $n\bar{C}P$ recovery time		4.5V	C_L=50pF	see Figure 4	30	-	-	ns
nJ and nK to n$\bar{C}P$ set-up time	tsu	4.5V	C_L=50pF	see Figure 3	24	-	-	ns
nJ and nK to n$\bar{C}P$ hold time	th	4.5V	C_L=50pF	see Figure 3	0	-	-	ns
maxiumum frequency	fmax	4.5V	C_L=50pF	see Figure 3	20	-	-	MHZ

4、Testing Circuit

4.1、DC Testing Circuit

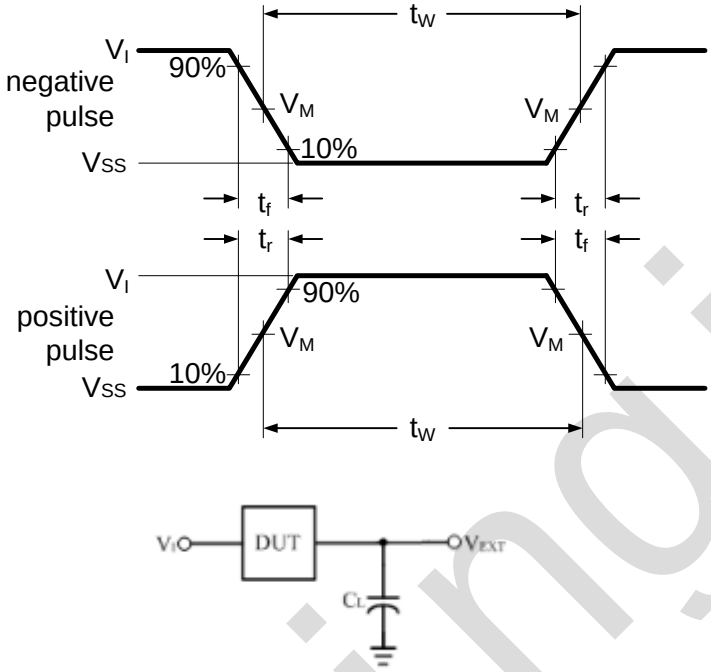


Figure 2 Load circuit

C_L includes probe and jig capacitance.

4.2、AC Testing Circuit

Type	Input		Load	V_{EXT}		
	V_I	$t_r = t_f$	C_L	t_{PLH}/t_{PHL}	t_{PLZ}/t_{PZL}	t_{PHZ}/t_{PZH}
SN74HC112	V_{CC}	6.0ns	50pF	Open	V_{CC}	GND
SN74HCT112	3.0V	6.0ns	50pF	Open	V_{CC}	GND

4.3、AC Testing Waveforms

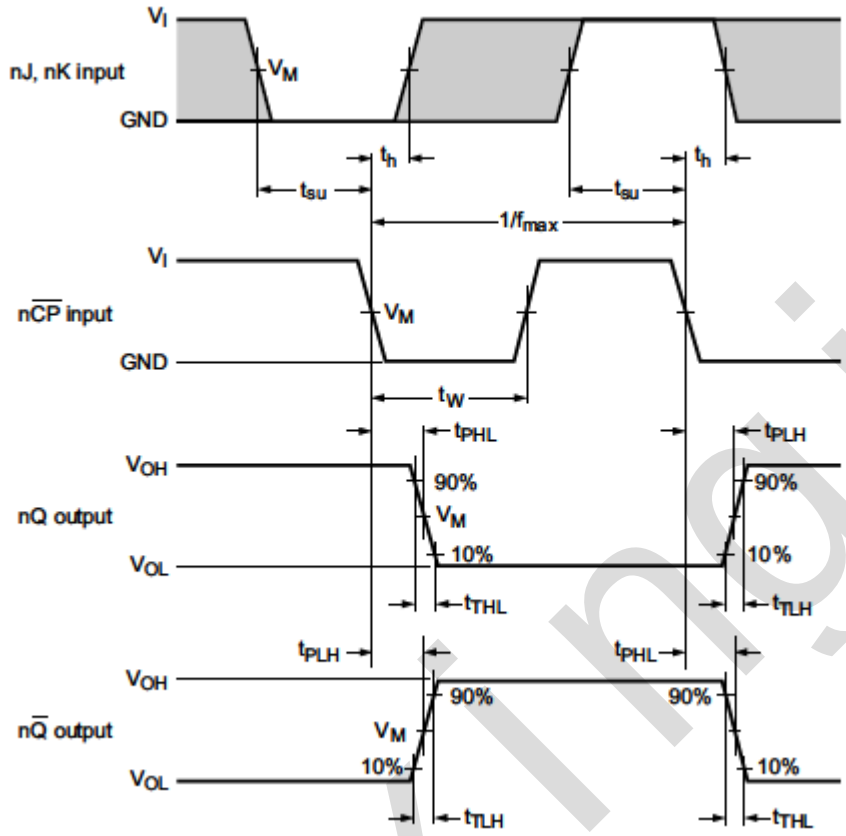


Figure 3 Clock propagation delays, output transition time, pulse width, set-up, hold times, and maximum frequency

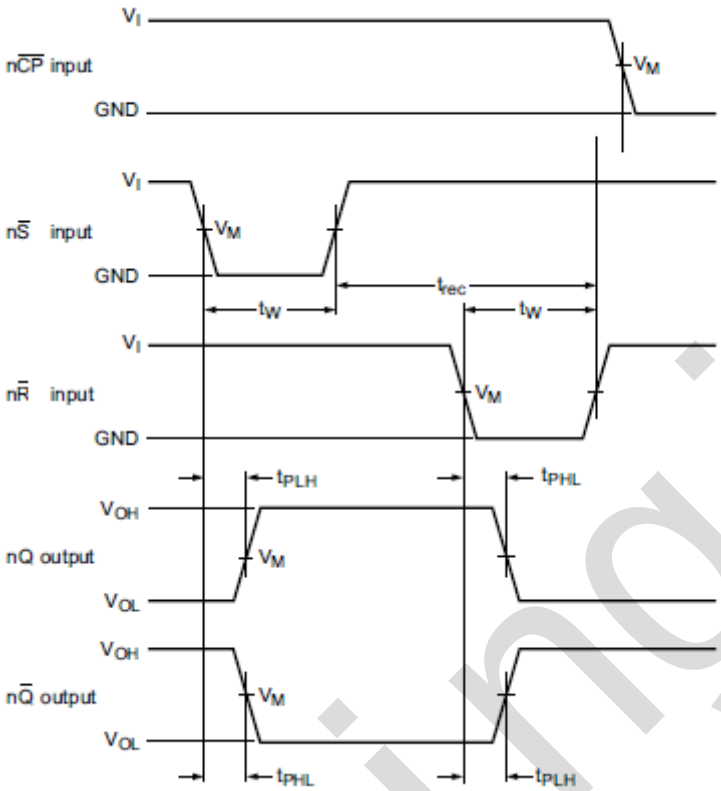


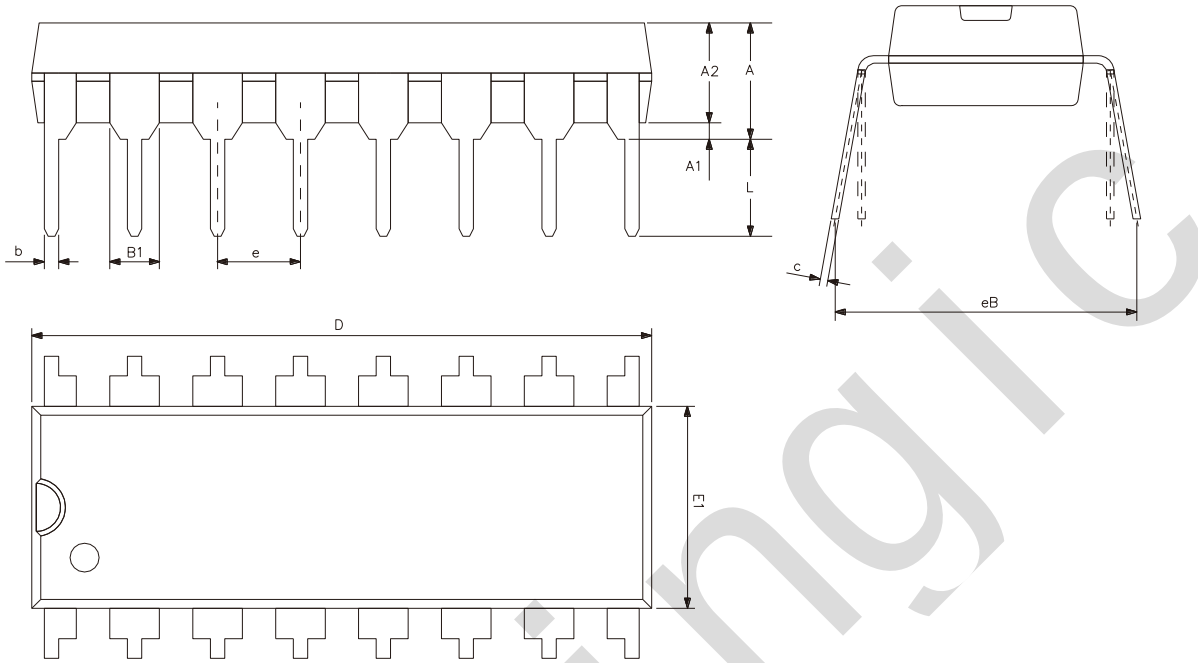
Figure 4 Set and reset propagation delays, pulse widths and recovery time

4.4、Measurement Points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74HC112	$0.5\times V_{CC}$	$0.5\times V_{CC}$	$0.1\times V_{CC}$	$0.9\times V_{CC}$
SN74HCT112	1.3V	1.3V	$0.1\times V_{CC}$	$0.9\times V_{CC}$

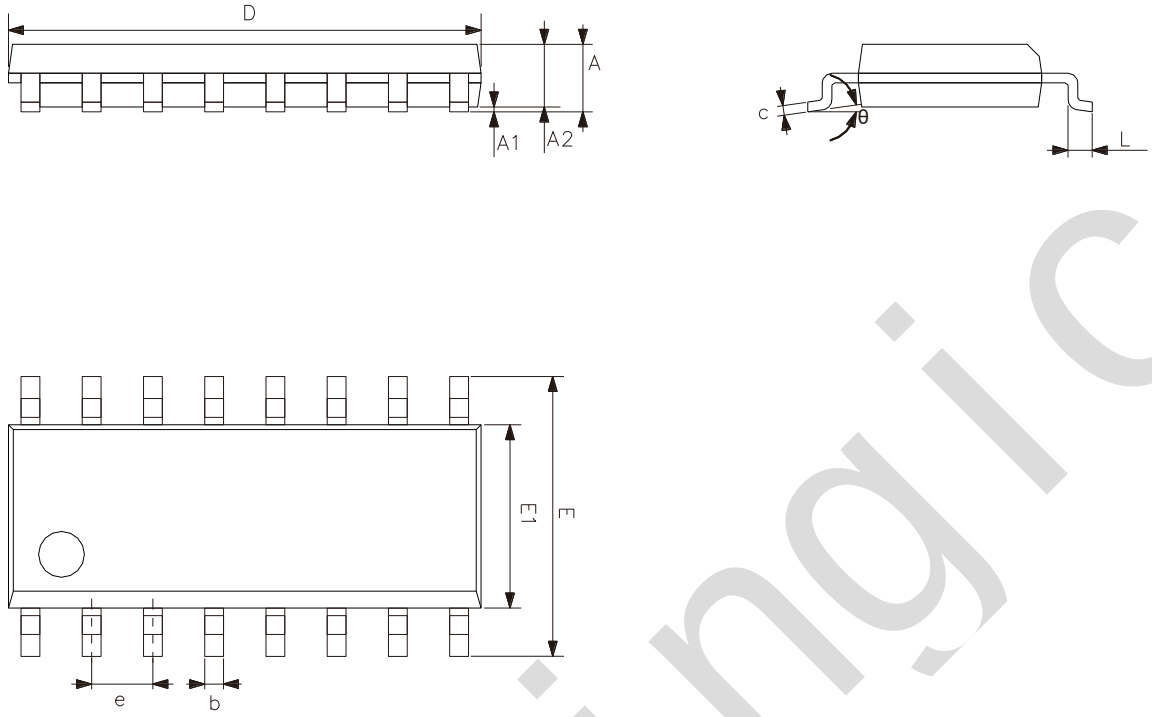
5、Package Information

5.1、DIP16



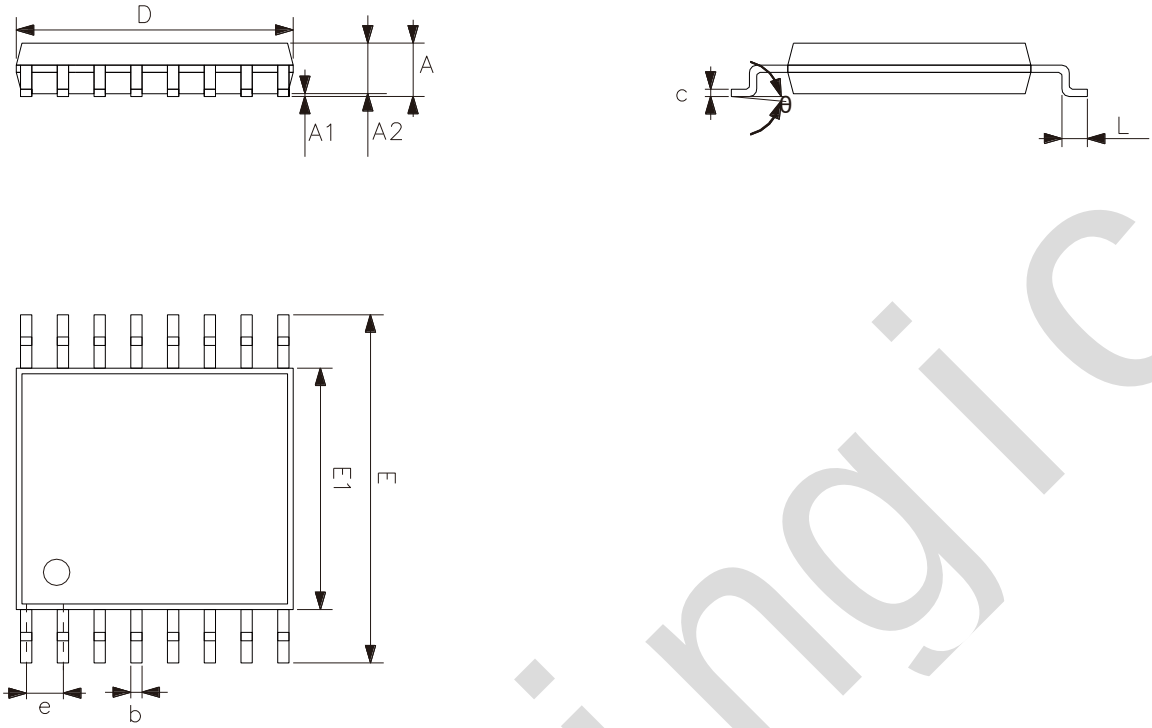
Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	-
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
c	0.20	0.36
eB	7.62	9.30

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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