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

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74HC112N	DIP-16	74HC112N	Tube	1000Pcs/Box
XBLW SN74HC112DTR	SOP-16	74HC112	Tape	2500Pcs/Reel
XBLW SN74HC112TDTR	TSSOP-16	74HC112	Tape	3000Pcs/Reel
XBLW SN74HCT112N	DIP-16	74HCT112N	Tube	1000Pcs/Box
XBLW SN74HCT112DTR	SOP-16	74HCT112	Tape	2500Pcs/Reel
XBLW SN74HCT112TDTR	TSSOP-16	74HCT112	Tape	3000Pcs/Reel

Block Diagram And Pin Description

Block Diagram

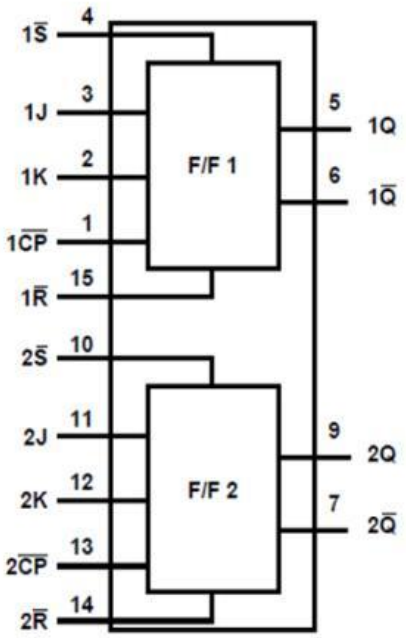
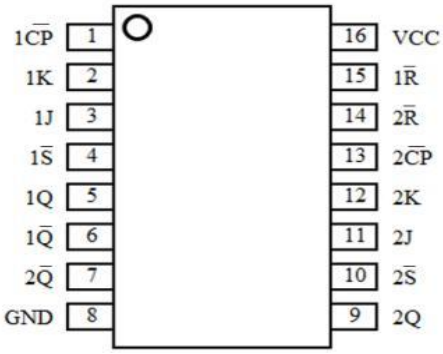


Figure 1. Functional diagram

Pin Configurations



Pin Description

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

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 sametime

Electrical Parameter

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
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		

Electrical Characteristics

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 output voltage	V_{OH}	4.5V	I_O=-20uA	4.4	4.5	-	V
			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

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 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	-	-	147	uA

AC Characteristics 1

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

Parameter	Symbol	Vcc	Conditions		Min.	Typ.	Max.	Unit
SN74HC112								
nCP tonQ 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
nCP tonQ 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
nR tonQ、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
nS tonQ、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
nCP 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
nS,nR 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
nR tonCP 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
nS tonCP 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 ton 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 ton 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 frequency	fmax	2.0V	C_L=50pF	see Figure 5	4.8	20	-	MHz
		4.5V	C_L=50pF		24	60	-	MHz
		5.0V	C_L=15pF		-	66	-	MHz

		6.0V	C_L=50pF		28	71	-	MHz
SN74HCT112								
nCP̄ tonQ propagation delay	t_{PLH}, t_{PHL}	4.5V	C_L=50pF	see Figure 5	-	21	44	ns
		5.0V	C_L=15pF		-	19	-	ns
nCP̄ tonQ̄ propagation delay		4.5V	C_L=50pF	see Figure 5	-	23	50	ns
		5.0V	C_L=15pF		-	19	-	ns
nR̄ tonQ̄、nQ propagation delay		4.5V	C_L=50pF	see Figure 6	-	22	46	ns
		5.0V	C_L=15pF		-	19	-	ns
nS̄ tonQ̄、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
nCP̄ HIGH or LOW pulse width	tw	4.5V	C_L=50pF	see Figure 5	20	8	-	ns
nS̄,nR̄ LOW pulse width		4.5V	C_L=50pF	see Figure 6	23	10	-	ns
nR̄ tonCP̄ recovery time	trec	4.5V	C_L=50pF	see Figure 6	25	11	-	ns
nS̄ tonCP̄ recovery time		4.5V	C_L=50pF	see Figure 6	25	-8	-	ns
nJ and nK ton CP̄ set-up time	tsu	4.5V	C_L=50pF	see Figure 5	20	7	-	ns
nJ and nK ton CP̄ 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

AC Characteristics 2

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

Parameter	Symbol	V_{CC}	Conditions		Min.	Typ.	Max.	Unit
SN74HC112								
nCP̄ tonQ 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
nCP̄ tonQ̄ 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
nR̄ tonQ̄、nQ propagation delay		2.0V	C_L=50pF	see Figure 4	-	-	270	ns
		4.5V	C_L=50pF		-	-	54	ns
		6.0V	C_L=50pF		-	-	46	ns
nS̄ tonQ̄、nQ		2.0V	C_L=50pF	see Figure 4	-	-	235	ns

propagation delay		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
nCP 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
nS,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
nR tonCP 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
nS tonCP 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 ton 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 ton 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								
nCP tonQ propagation delay	t_{PLH}, t_{PHL}	4.5V	C_L=50pF	see Figure 3	-	-	53	ns
nCP tonQ propagation delay		4.5V	C_L=50pF	see Figure 3	-	-	60	ns
nR tonQ、nQ propagation delay		4.5V	C_L=50pF	see Figure 4	-	-	56	ns
nS tonQ、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
nCP HIGH or LOW pulse width	tw	4.5V	C_L=50pF	see Figure 3	24	-	-	ns
nS,nR LOW pulse width		4.5V	C_L=50pF	see Figure 4	27	-	-	ns
nR tonCP recovery time	trec	4.5V	C_L=50pF	see Figure 4	30	-	-	ns

$n\overline{S}$ ton$\overline{CP}$ recovery time		4.5V	C_L=50pF	see Figure 4	30	-	-	ns
nJ and nK ton $\overline{CP}$ set-up time	tsu	4.5V	C_L=50pF	see Figure 3	24	-	-	ns
nJ and nK ton $\overline{CP}$ 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

Testing Circuit

AC Testing Circuit

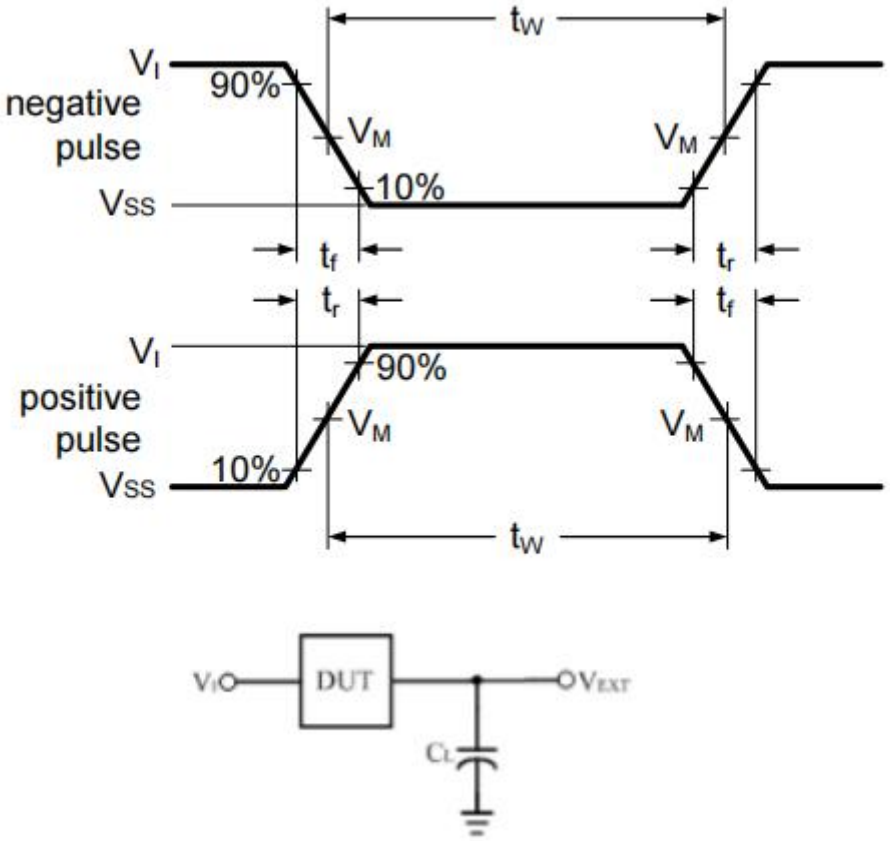


Figure 2 Load circuit

C_L includes probe and jig capacitance.

AC Testing Waveforms

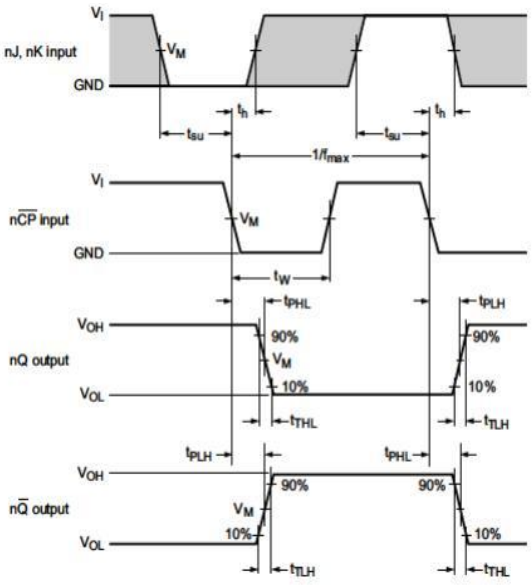


Figure 3 Clock propagation delays, output transition time, pulse width, set-up, hold times, and maximum frequency

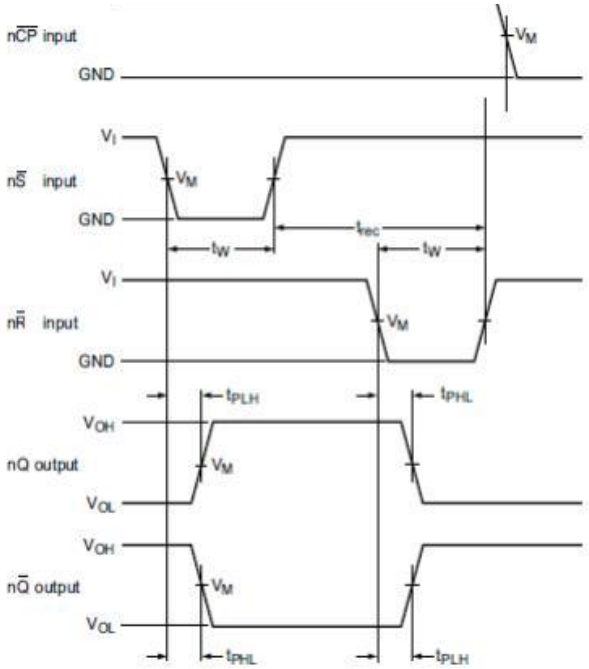


Figure 4 Set and reset propagation delays, pulse widths and recovery time

Measurement Points

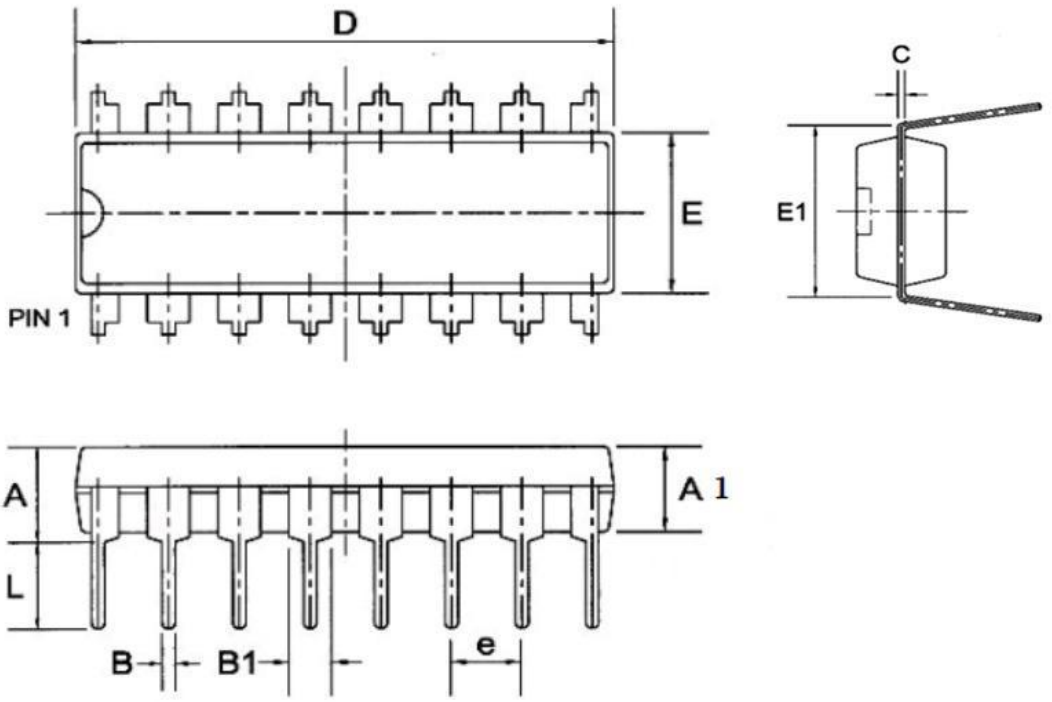
Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74HC112	0.5×V_{CC}	0.5×V_{CC}	0.1×V_{CC}	0.9×V_{CC}
SN74HCT112	1.3V	1.3V	0.1×V_{CC}	0.9×V_{CC}

Test Data

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

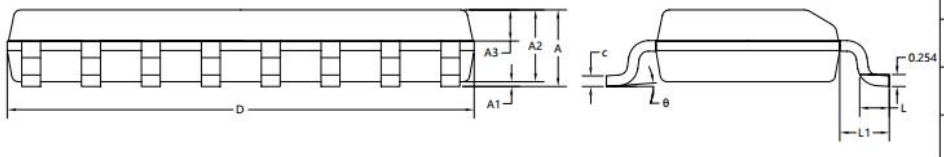
Package Information

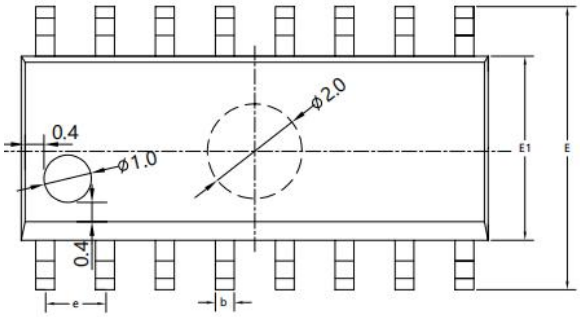
DIP16



Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	--	--	4.31
A1	3.15	3.30	3.65
B	--	0.50	--
B1	--	1.6	--
C	--	0.27	--
D	19.00	19.20	19.60
E	6.20	6.50	6.60
E1	--	8.0	--
e	--	2.3	--
L	3.00	3.20	3.60

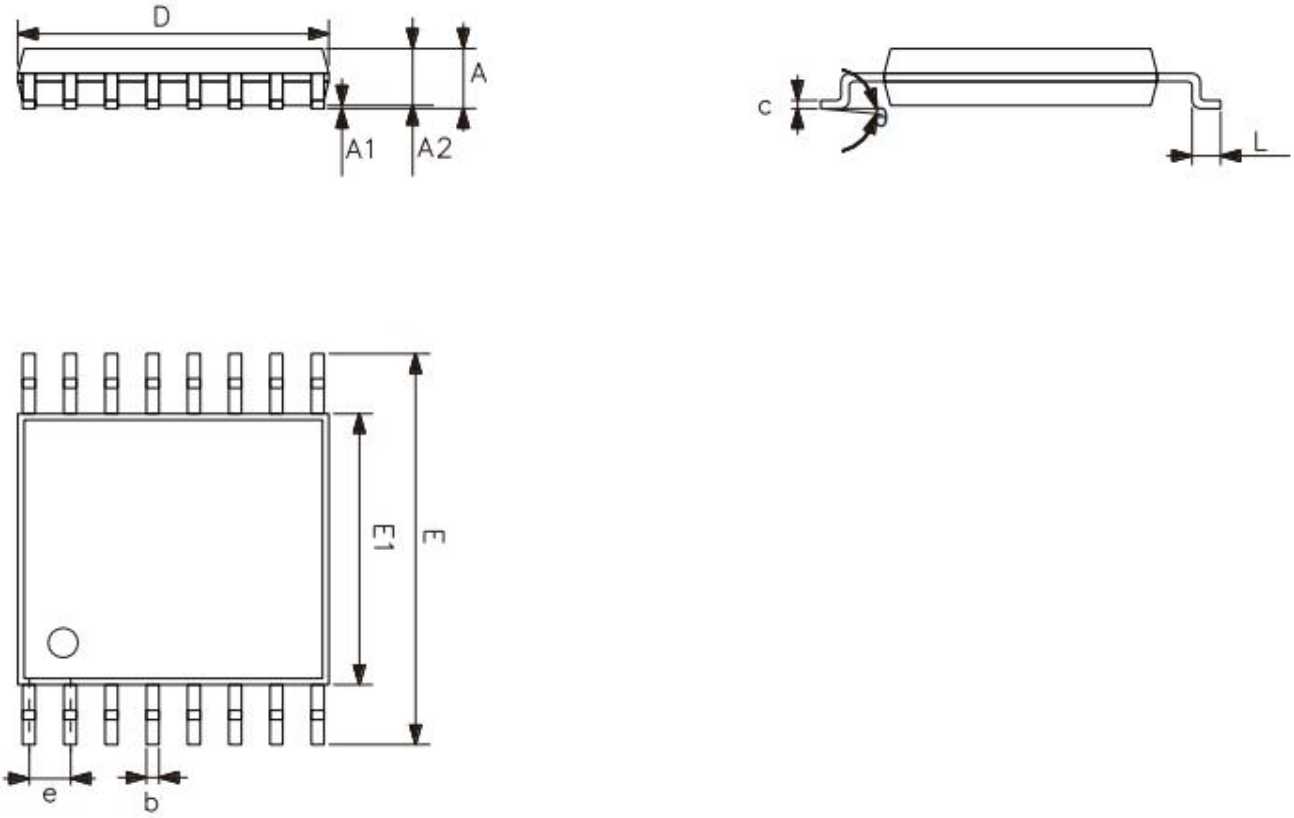
SOP16





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.50	1.60	1.70
A1	0.10	0.15	0.25
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.30	0.40	0.50
c	0.15	0.20	0.25
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.85	3.90	3.95
e	1.27BSC		
L	0.50	0.60	0.70
L1	1.05BSC		
θ	0°	4°	8°

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°

Statement：

✧ Shenzhen xinbole electronics co., ltd. reserves the right to change the product specifications, without notice! Before placing an order, the customer needs to confirm whether the information obtained is the latest version, and verify the integrity of the relevant information.

✧ Any semiconductor product is liable to fail or malfunction under certain conditions, and the buyer shall be responsible for complying with safety standards in the system design and whole machine manufacturing using Shenzhen xinbole electronics co., ltd products, and take appropriate security measures to avoid the potential risk of failure may result in personal injury or property losses of the situation occurred!

✧ This document is for referenceonly,and the actual use should be based on the application test results.

✧ Product performance is never ending, Shenzhen xinbole electronics co., ltd will be dedicated to provide customers with better performance, better quality of integrated circuit products.

单击下面可查看定价，库存，交付和生命周期等信息

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