



AiP74HC/HCT390

Dual Decade Ripple Counter

Product Specification

Specification Revision History:

Version	Date	Description
2022-08-A1	2022-08	New



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1、General Description

The AiP74HC/HCT390 is a dual 4-bit decade ripple counter divided into four separately clocked sections. The counters have two divide-by-2 sections and two divide-by-5 sections. These sections share an asynchronous master reset input (nMR) and can be used in a BCD decade or bi-quinary configuration. If master reset inputs 1MR and 2MR are used to clear all 8 bits of the counter simultaneously, numerous counting configurations are possible within one package. Section clocks $\overline{nCP0}$ and $\overline{nCP1}$, allow ripple counter or frequency division applications of divide-by-2, 4, 5, 10, 20, 25, 50 or 100.

The HIGH-to-LOW transition of the clock inputs $\overline{nCP0}$ and $\overline{nCP1}$ trigger each section. For BCD decade operation, the nQ0 output is connected to the $\overline{nCP1}$ input of the divide-by-5 section. For bi-quinary decade operation, the nQ3 output is connected to the $\overline{nCP0}$ input and nQ0 becomes the decade output. A HIGH on the nMR input overrides the clocks and sets the four outputs LOW. Inputs include clamp diodes. It enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

Features:

- Input levels:
For AiP74HC390: CMOS level
For AiP74HCT390: TTL level
- Two BCD decade or bi-quinary counters
- One device can be configured to divide-by-2, 4, 5, 10, 20, 25, 50 or 100
- Two master reset inputs to clear each decade counter individually
- Specified from -40°C to +125°C
- Packaging information: DIP16/SOP16/TSSOP16

**Ordering Information:****Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74HC390DA16.TB	DIP16	74HC390	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT390DA16.TB	DIP16	74HCT390	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC390SA16.TB	SOP16	74HC390	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT390SA16.TB	SOP16	74HCT390	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC390TA16.TB	TSSOP16	74HC390	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT390TA16.TB	TSSOP16	74HCT390	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
AiP74HC390SA16.TR	SOP16	74HC390	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT390SA16.TR	SOP16	74HCT390	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC390TA16.TR	TSSOP16	74HC390	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT390TA16.TR	TSSOP16	74HCT390	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

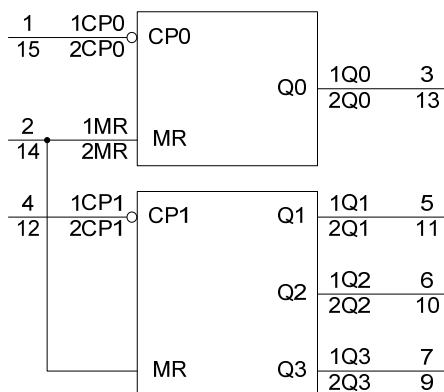


Figure 1. Logic symbol

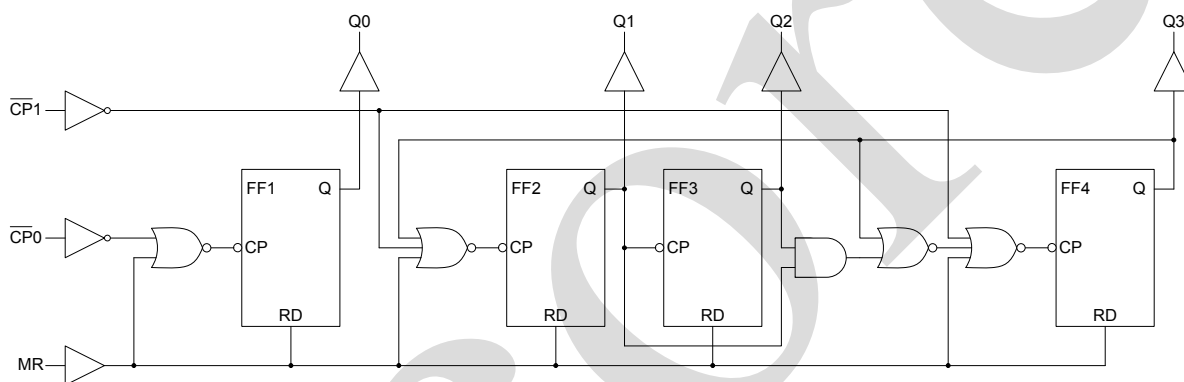
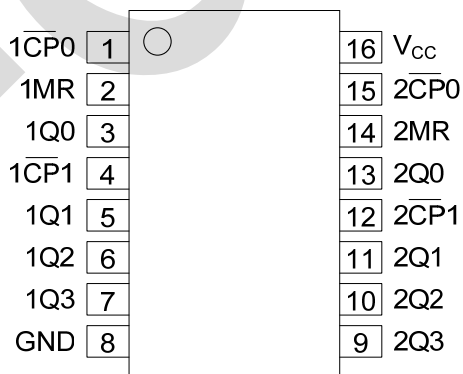


Figure 2. Logic diagram (one counter)

2.2、Pin Configurations





2.3、Pin Description

Pin No.	Pin Name	Description
1	$\overline{1CP0}$	clock input divide-by-2 section (HIGH-to-LOW; edge-triggered)
2	1MR	asynchronous master reset input (active HIGH)
3	1Q0	flip-flop outputs
4	$\overline{1CP1}$	clock input divide-by-5 section (HIGH-to-LOW; edge-triggered)
5	1Q1	flip-flop outputs
6	1Q2	flip-flop outputs
7	1Q3	flip-flop outputs
8	GND	ground (0V)
9	2Q3	flip-flop outputs
10	2Q2	flip-flop outputs
11	2Q1	flip-flop outputs
12	$\overline{2CP1}$	clock input divide-by-5 section (HIGH-to-LOW; edge-triggered)
13	2Q0	flip-flop outputs
14	2MR	asynchronous master reset input (active HIGH)
15	$\overline{2CP0}$	clock input divide-by-2 section (HIGH-to-LOW; edge-triggered)
16	V _{CC}	supply voltage

2.4、Function Table

2.4.1、BCD Count Sequence

Count	Output			
	nQ0	nQ1	nQ2	nQ3
0	L	L	L	L
1	H	L	L	L
2	L	H	L	L
3	H	H	L	L
4	L	L	H	L
5	H	L	H	L
6	L	H	H	L
7	H	H	H	L
8	L	L	L	H
9	H	L	L	H

Note: Output nQ0 connected to $\overline{nCP1}$; counter input on $\overline{nCP0}$.

H=HIGH voltage level;

L=LOW voltage level;



2.4.2、Bi-quinary Count Sequence

Count	Output			
	nQ0	nQ1	nQ2	nQ3
0	L	L	L	L
1	L	H	L	L
2	L	L	H	L
3	L	H	H	L
4	L	L	L	H
5	H	H	L	L
6	H	L	L	L
7	H	H	H	L
8	H	L	H	L
9	H	H	L	H

Note: Output nQ3 connected to nCP0 ; counter input on nCP1 .

H=HIGH voltage level;

L=LOW voltage level;

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	mA
output clamping current	I _{OK}	V _I <-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
supply current	I _{CC}	-	-	+50	mA
ground current	I _{GND}	-	-50	-	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
AiP74HC390						
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	°C
AiP74HCT390						
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	°C

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC390							
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 =-4.0mA; V _{CC} =4.5V	3.98	4.32	-	V
			I _O =-5.2mA; 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 =4.0mA; V _{CC} =4.5V	-	0.15	0.26	V
			I _O =5.2mA; 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	uA
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	8	uA
AiP74HCT390							
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 =-4.0mA	3.98	4.32	-	V
LOW-level	V _{OL}	V _I =V _{IH} or V _{IL} ;	I _O =20uA	-	0	0.1	V



output voltage		$V_{CC}=4.5V$	$I_O=4.0mA$	-	0.15	0.26	V
input leakage current	I_I	$V_I=V_{CC}$ or GND; $V_{CC}=5.5V$		-	-	± 1	μA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0A$; $V_{CC}=5.5V$		-	-	8	μA
additional supply current	ΔI_{CC}	per input pin; $V_I=V_{CC}-2.1V$; other inputs at V_{CC} or GND; $V_{CC}=4.5V$ to $5.5V$	$\overline{nCP0}$ inputs	-	45	162	μA
			$\overline{nCP1}$, nMR inputs	-	60	216	μA

3.3.2、DC Characteristics 2

($T_{amb}=-40^{\circ}C$ to $+85^{\circ}C$, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC390							
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 =-4.0mA; V _{CC} =4.5V	3.84	-	-	V
			I _O =-5.2mA; 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 =4.0mA; V _{CC} =4.5V	-	-	0.33	V
			I _O =5.2mA; 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
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	80	uA
AiP74HCT390							
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 =-4.0mA	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 =4.0mA	-	-	0.33	V
input leakage current	I _I	V _I =V _{CC} or GND; V _{CC} =5.5V		-	-	±1.0	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	nCP0 inputs	-	-	202.5	uA



		inputs at V_{CC} or GND; $V_{CC}=4.5V$ to $5.5V$	$\overline{nCP1}$, nMR inputs	-	-	270	uA
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3.3.3、DC Characteristics 3

($T_{amb}=-40^{\circ}C$ to $+125^{\circ}C$, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AiP74HC390							
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 =-4.0mA; V _{CC} =4.5V	3.7	-	-	V
			I _O =-5.2mA; 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 =4.0mA; V _{CC} =4.5V	-	-	0.4	V
			I _O =5.2mA; 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
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	160	uA
AiP74HCT390							
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 =-4.0mA	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 =4.0mA	-	-	0.4	V
input leakage current	I _I	V _I =V _{CC} or GND; V _{CC} =5.5V		-	-	±1.0	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; V _{CC} =4.5V to 5.5V	nCP0 inputs	-	-	220.5	uA
			nCP1 ,nMR inputs	-	-	294	uA



3.3.4、AC Characteristics 1

(T_{amb}=25℃, GND=0V, C_L=50pF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ. ^[1]	Max.	Unit	
AiP74HC390							
propagation delay	t _{PLH} , t _{PHL}	nCP0 to nQ0; see Figure 4	V _{CC} =2.0V	-	47	145	ns
			V _{CC} =4.5V	-	17	29	ns
			V _{CC} =5.0V; C _L =15pF	-	14	-	ns
			V _{CC} =6.0V	-	14	25	ns
		nCP1 to nQ1; see Figure 4	V _{CC} =2.0V	-	50	155	ns
			V _{CC} =4.5V	-	18	31	ns
			V _{CC} =5.0V; C _L =15pF	-	15	-	ns
			V _{CC} =6.0V	-	14	26	ns
		nCP1 to nQ2; see Figure 4	V _{CC} =2.0V	-	74	210	ns
			V _{CC} =4.5V	-	27	42	ns
			V _{CC} =5.0V; C _L =15pF	-	23	-	ns
			V _{CC} =6.0V	-	22	36	ns
		nCP1 to nQ3; see Figure 4	V _{CC} =2.0V	-	50	155	ns
			V _{CC} =4.5V	-	18	31	ns
			V _{CC} =5.0V; C _L =15pF	-	15	-	ns
			V _{CC} =6.0V	-	14	26	ns
HIGH to LOW Propagation delay	t _{PHL}	nMR to nQn; see Figure 5	V _{CC} =2.0V	-	52	165	ns
			V _{CC} =4.5V	-	19	33	ns
			V _{CC} =5.0V; C _L =15pF	-	16	-	ns
			V _{CC} =6.0V	-	15	28	ns
transition time	t _{THL} , t _{TLH}	nQn; see Figure 4	V _{CC} =2.0V	-	19	75	ns
			V _{CC} =4.5V	-	7	15	ns
			V _{CC} =6.0V	-	6	13	ns
pulse width	t _w	nCP0, nCP1; HIGH or LOW; see Figure 4	V _{CC} =2.0V	80	19	-	ns
			V _{CC} =4.5V	16	7	-	ns
			V _{CC} =6.0V	14	6	-	ns
		nMR HIGH; see Figure 5	V _{CC} =2.0V	80	28	-	ns
			V _{CC} =4.5V	17	10	-	ns
			V _{CC} =6.0V	14	8	-	ns
recovery time	t _{rec}	nMR to nCPn; see Figure 5	V _{CC} =2.0V	75	22	-	ns
			V _{CC} =4.5V	15	8	-	ns
			V _{CC} =6.0V	13	6	-	ns
maximum frequency	f _{max}	nCPn; see Figure 4	V _{CC} =2.0V	6	20	-	MHz
			V _{CC} =4.5V	30	60	-	MHz
			V _{CC} =5.0V; C _L =15pF	-	66	-	MHz
			V _{CC} =6.0V	35	71	-	MHz
AiP74HCT390							
propagation delay	t _{PLH} , t _{PHL}	nCP0 to nQ0; see Figure 4	V _{CC} =4.5V	-	21	34	ns
			V _{CC} =5.0V; C _L =15pF	-	18	-	ns
		nCP1 to nQ1; see Figure 4	V _{CC} =4.5V	-	22	38	ns
			V _{CC} =5.0V; C _L =15pF	-	19	-	ns



		nCP1 to nQ2; see Figure 4	V _{CC} =4.5V	-	30	51	ns
			V _{CC} =5.0V; C _L =15pF	-	26	-	ns
		nCP1 to nQ3; see Figure 4	V _{CC} =4.5V	-	22	38	ns
			V _{CC} =5.0V; C _L =15pF	-	19	-	ns
HIGH to LOW Propagation delay	t _{PHL}	nMR to nQn; see Figure 5	V _{CC} =4.5V	-	21	36	ns
			V _{CC} =5.0V; C _L =15pF	-	18	-	ns
transition time	t _{THL} , t _{TLH}	nQn; V _{CC} =4.5V; see Figure 4		-	7	15	ns
pulse width	t _w	nCP0, nCP1; HIGH or LOW; V _{CC} =4.5V; see Figure 4		18	8	-	ns
		nMR HIGH; V _{CC} =4.5V; see Figure 5		17	10	-	ns
recovery time	t _{rec}	nMR to nCPn; V _{CC} =4.5V; see Figure 5		15	8	-	ns
maximum frequency	f _{max}	nCPn; see Figure 4	V _{CC} =4.5V	27	55	-	MHz
			V _{CC} =5.0V; C _L =15pF	-	61	-	MHz

Note:

[1] All typical values are measured at T_{amb}=25°C.

3.3.5、AC Characteristics 2

(T_{amb}=-40°C to +85°C, GND=0V, C_L=50pF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
AiP74HC390						
propagation delay	t _{PLH} , t _{PHL}	nCP0 to nQ0; see Figure 4	V _{CC} =2.0V	-	-	180 ns
			V _{CC} =4.5V	-	-	36 ns
			V _{CC} =6.0V	-	-	31 ns
		nCP1 to nQ1; see Figure 4	V _{CC} =2.0V	-	-	195 ns
			V _{CC} =4.5V	-	-	39 ns
			V _{CC} =6.0V	-	-	33 ns
		nCP1 to nQ2; see Figure 4	V _{CC} =2.0V	-	-	265 ns
			V _{CC} =4.5V	-	-	53 ns
			V _{CC} =6.0V	-	-	45 ns
		nCP1 to nQ3; see Figure 4	V _{CC} =2.0V	-	-	195 ns
			V _{CC} =4.5V	-	-	39 ns
			V _{CC} =6.0V	-	-	33 ns
HIGH to LOW Propagation delay	t _{PHL}	nMR to nQn; see Figure 5	V _{CC} =2.0V	-	-	205 ns
			V _{CC} =4.5V	-	-	41 ns
			V _{CC} =6.0V	-	-	35 ns
transition time	t _{THL} , t _{TLH}	nQn; see Figure 4	V _{CC} =2.0V	-	-	95 ns
			V _{CC} =4.5V	-	-	19 ns
			V _{CC} =6.0V	-	-	16 ns
pulse width	t _w	nCP0, nCP1; HIGH or LOW; see Figure 4	V _{CC} =2.0V	100	-	- ns
			V _{CC} =4.5V	20	-	- ns
			V _{CC} =6.0V	17	-	- ns
		nMR HIGH; see Figure 5	V _{CC} =2.0V	105	-	- ns
			V _{CC} =4.5V	21	-	- ns
			V _{CC} =6.0V	18	-	- ns



recovery time	t_{rec}	nMR to $n\overline{CPn}$; see Figure 5	$V_{CC}=2.0V$	95	-	-	ns
			$V_{CC}=4.5V$	19	-	-	ns
			$V_{CC}=6.0V$	16	-	-	ns
maximum frequency	f_{max}	$n\overline{CPn}$; see Figure 4	$V_{CC}=2.0V$	4.8	-	-	MHz
			$V_{CC}=4.5V$	24	-	-	MHz
			$V_{CC}=6.0V$	28	-	-	MHz
AiP74HCT390							
propagation delay	t_{PLH}, t_{PHL}	$n\overline{CP0}$ to nQ0; $V_{CC}=4.5V$; see Figure 4	-	-	43	ns	
		$n\overline{CP1}$ to nQ1; $V_{CC}=4.5V$; see Figure 4	-	-	48	ns	
		$n\overline{CP1}$ to nQ2; $V_{CC}=4.5V$; see Figure 4	-	-	64	ns	
		$n\overline{CP1}$ to nQ3; $V_{CC}=4.5V$; see Figure 4	-	-	48	ns	
HIGH to LOW Propagation delay	t_{PHL}	nMR to nQn; $V_{CC}=4.5V$; see Figure 5	-	-	45	ns	
transition time	t_{THL}, t_{TLH}	nQn; $V_{CC}=4.5V$; see Figure 4	-	-	19	ns	
pulse width	t_w	$n\overline{CP0}$, $n\overline{CP1}$; HIGH or LOW; $V_{CC}=4.5V$; see Figure 4	23	-	-	ns	
		nMR HIGH; $V_{CC}=4.5V$; see Figure 5	21	-	-	ns	
recovery time	t_{rec}	nMR to $n\overline{CPn}$; $V_{CC}=4.5V$; see Figure 5	19	-	-	ns	
maximum frequency	f_{max}	$n\overline{CPn}$; $V_{CC}=4.5V$; see Figure 4	22	-	-	MHz	

3.3.6、AC Characteristics 3

($T_{amb}=-40^{\circ}C$ to $+125^{\circ}C$, GND=0V, $C_L=50pF$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
AiP74HC390						
propagation delay	t_{pd}	$\overline{nCP0}$ to nQ0; see Figure 4	$V_{CC}=2.0V$	-	-	220 ns
			$V_{CC}=4.5V$	-	-	44 ns
			$V_{CC}=6.0V$	-	-	38 ns
		$\overline{nCP1}$ to nQ1; see Figure 4	$V_{CC}=2.0V$	-	-	235 ns
			$V_{CC}=4.5V$	-	-	47 ns
			$V_{CC}=6.0V$	-	-	40 ns
		$\overline{nCP1}$ to nQ2; see Figure 4	$V_{CC}=2.0V$	-	-	315 ns
			$V_{CC}=4.5V$	-	-	63 ns
			$V_{CC}=6.0V$	-	-	54 ns
		$\overline{nCP1}$ to nQ3; see Figure 4	$V_{CC}=2.0V$	-	-	235 ns
			$V_{CC}=4.5V$	-	-	47 ns
			$V_{CC}=6.0V$	-	-	40 ns
HIGH to LOW Propagation delay	t_{PHL}	nMR to nQn; see Figure 5	$V_{CC}=2.0V$	-	-	250 ns
			$V_{CC}=4.5V$	-	-	50 ns
			$V_{CC}=6.0V$	-	-	43 ns
transition time	t_t	nQn; see Figure 4	$V_{CC}=2.0V$	-	-	110 ns
			$V_{CC}=4.5V$	-	-	22 ns
			$V_{CC}=6.0V$	-	-	19 ns
pulse width	t_w	$\overline{nCP0}, \overline{nCP1}$; HIGH or LOW;	$V_{CC}=2.0V$	120	-	ns
			$V_{CC}=4.5V$	24	-	ns

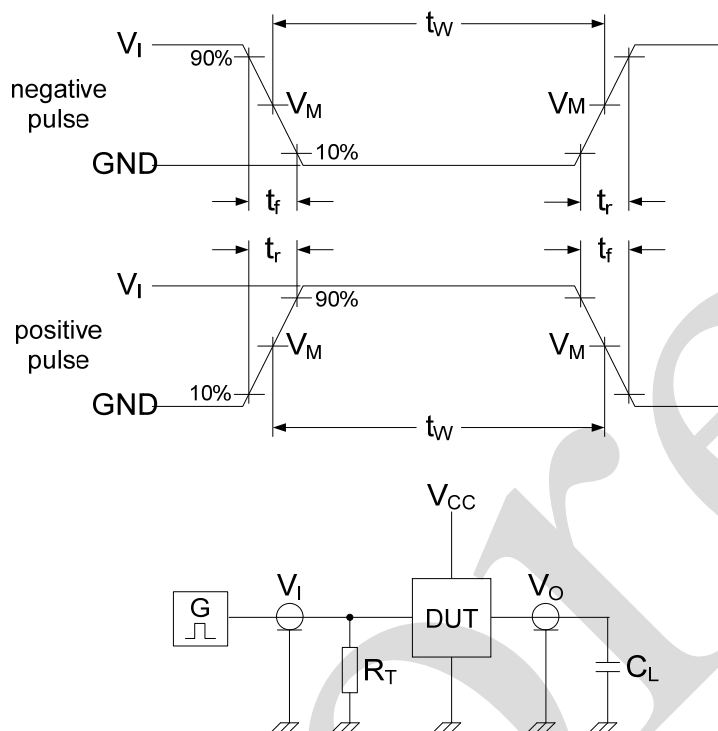


		see Figure 4	V _{CC} =6.0V	20	-	-	ns
		nMR HIGH; see Figure 5	V _{CC} =2.0V	130	-	-	ns
			V _{CC} =4.5V	26	-	-	ns
			V _{CC} =6.0V	22	-	-	ns
recovery time	t _{rec}	nMR to nCP _n ; see Figure 5	V _{CC} =2.0V	110	-	-	ns
			V _{CC} =4.5V	22	-	-	ns
			V _{CC} =6.0V	19	-	-	ns
maximum frequency	f _{max}	nCP _n ; see Figure 4	V _{CC} =2.0V	4	-	-	MHz
			V _{CC} =4.5V	20	-	-	MHz
			V _{CC} =6.0V	24	-	-	MHz
AiP74HCT390							
propagation delay	t _{pd}	nCP0 to nQ0; V _{CC} =4.5V; see Figure 4	-	-	51	ns	
		nCP1 to nQ1; V _{CC} =4.5V; see Figure 4	-	-	57	ns	
		nCP1 to nQ2; V _{CC} =4.5V; see Figure 4	-	-	77	ns	
		nCP1 to nQ3; V _{CC} =4.5V; see Figure 4	-	-	57	ns	
HIGH to LOW Propagation delay	t _{PHL}	nMR to nQ _n ; V _{CC} =4.5V; see Figure 5	-	-	54	ns	
transition time	t _t	nQ _n ; V _{CC} =4.5V; see Figure 4	-	-	22	ns	
pulse width	t _w	nCP0 , nCP1 ; HIGH or LOW; V _{CC} =4.5V; see Figure 4	27	-	-	ns	
		nMR HIGH; V _{CC} =4.5V; see Figure 5	26	-	-	ns	
recovery time	t _{rec}	nMR to nCP _n ; V _{CC} =4.5V; see Figure 5	22	-	-	ns	
maximum frequency	f _{max}	nCP _n ; V _{CC} =4.5V; see Figure 4	18	-	-	MHz	



4、Testing Circuit

4.1、AC Testing Circuit



Definitions test circuit:

R_T =termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L =load capacitance including jig and probe capacitance.

Figure 3. Test circuit for measuring switching times

4.2、AC Testing Waveforms

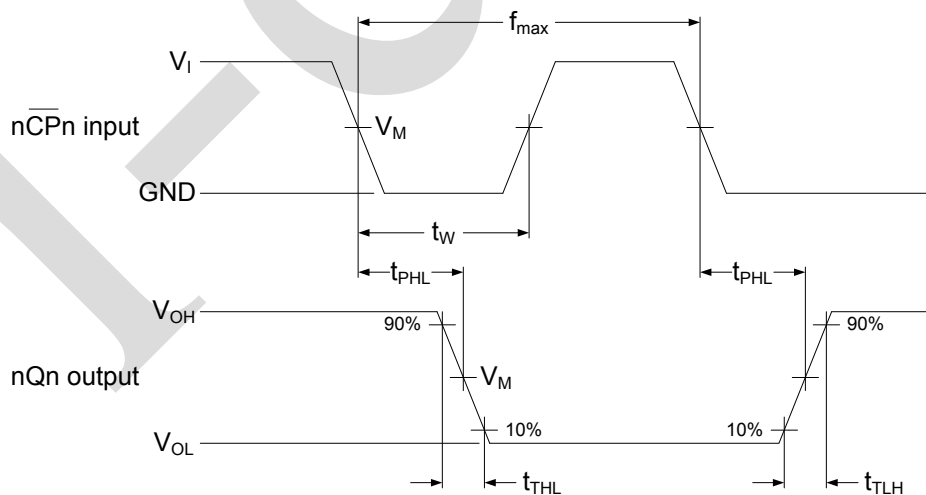


Figure 4. The clock input ($\overline{nCPn}$) to output (nQn) propagation delays, output transition time, clock pulse width and maximum clock frequency

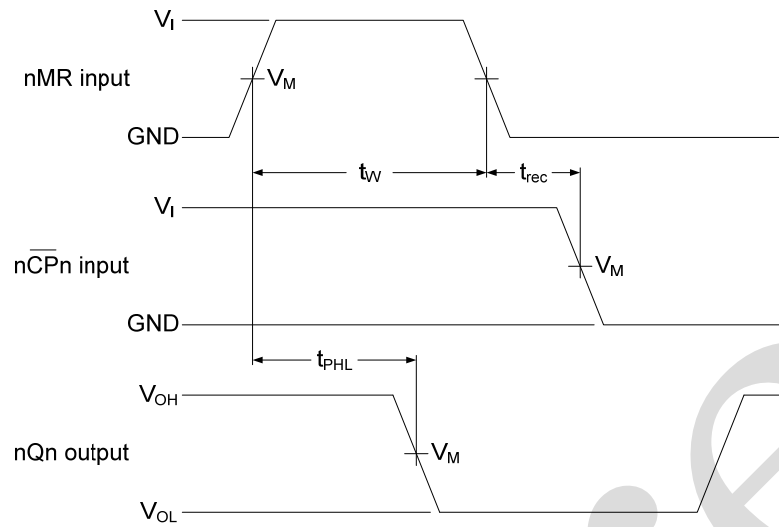


Figure 5. The master reset (nMR) pulse width, master reset to output (nQn) propagation delays and master reset to clock (nCPn) recovery time

4.3、Measurement Points

Type	Input	Output
	V_M	V_M
AiP74HC390	$0.5V_{CC}$	$0.5V_{CC}$
AiP74HCT390	1.3V	1.3V

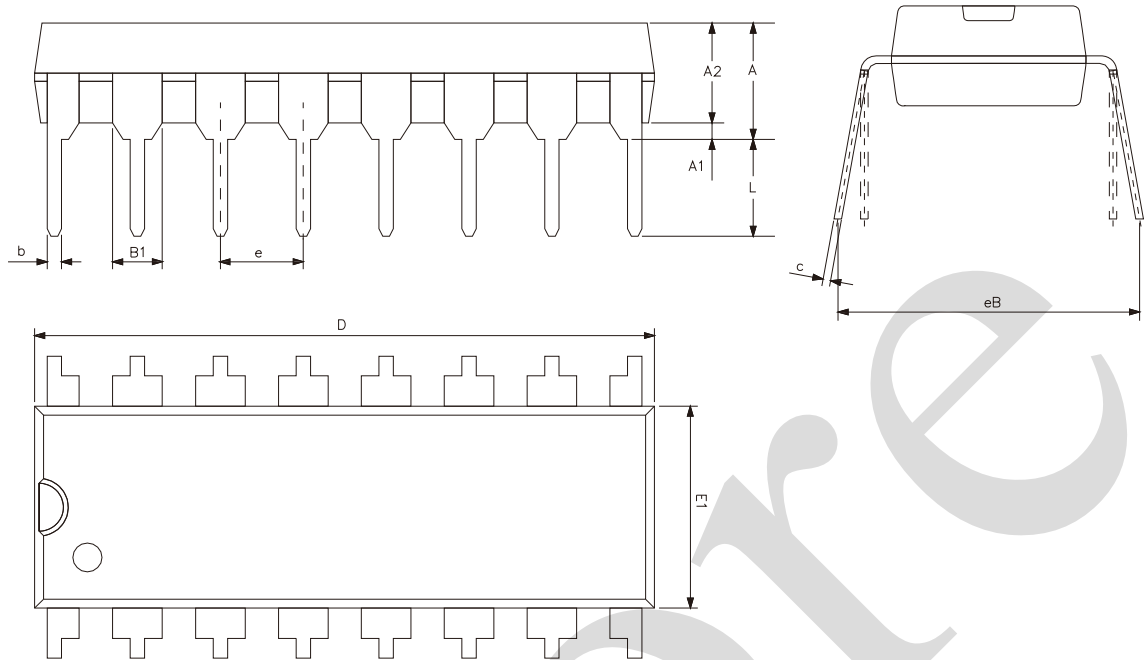
4.4、Test Data

Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
AiP74HC390	V_{CC}	6ns	15pF, 50pF	t_{PHL}, t_{PLH}
AiP74HCT390	3V	6ns	15pF, 50pF	t_{PHL}, t_{PLH}



5、Package Information

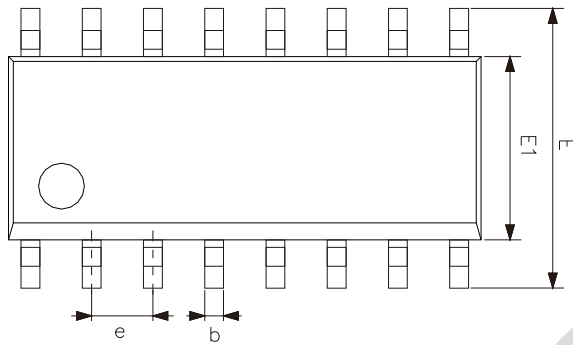
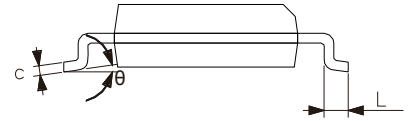
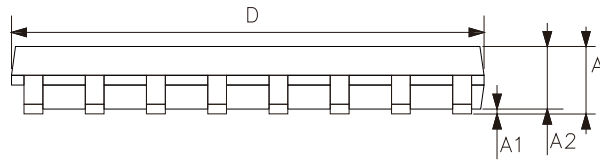
5.1、DIP16



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



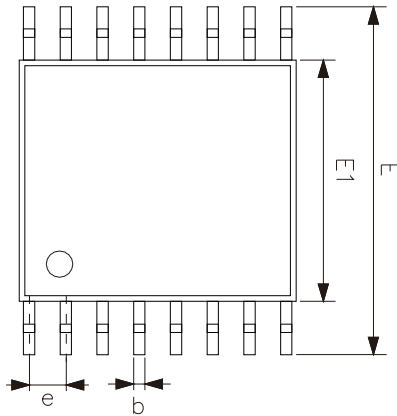
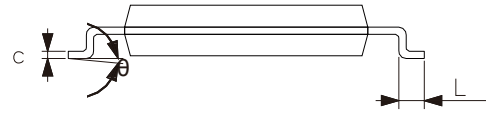
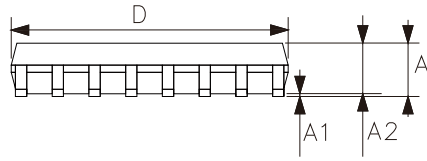
5.2、SOP16



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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