



# **AiP74HC/HCT4040**

## **12-stage Binary Ripple Counter**

### **Product Specification**

**Specification Revision History:**

<b>Version</b>	<b>Date</b>	<b>Description</b>
2023-08-A1	2023-08	New



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## 1、General Description

The AiP74HC4040/HCT4040 is a 12-stage binary ripple counter with a clock input ( $\overline{CP}$ ), an overriding asynchronous master reset input (MR) and twelve parallel outputs (Q0 to Q11). Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### Features:

- Input levels:  
For AiP74HC4040: CMOS level  
For AiP74HCT4040: TTL level
- 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
AiP74HC4040DA16.TB	DIP16	74HC4040	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT4040DA16.TB	DIP16	74HCT4040	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC4040SA16.TB	SOP16	74HC4040	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT4040SA16.TB	SOP16	74HCT4040	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC4040TA16.TB	TSSOP16	74HC4040	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT4040TA16.TB	TSSOP16	74HCT4040	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
AiP74HC4040SA16.TR	SOP16	74HC4040	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT4040SA16.TR	SOP16	74HCT4040	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC4040TA16.TR	TSSOP16	74HC4040	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
AiP74HCT4040TA16.TR	TSSOP16	74HCT4040	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

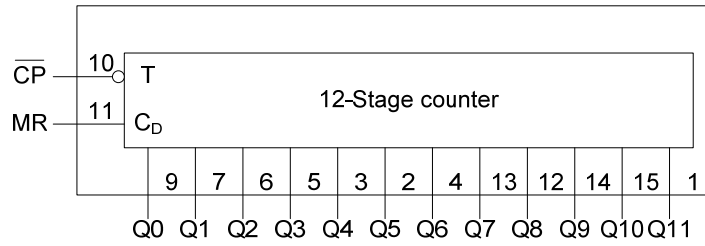


Figure 1. Functional diagram

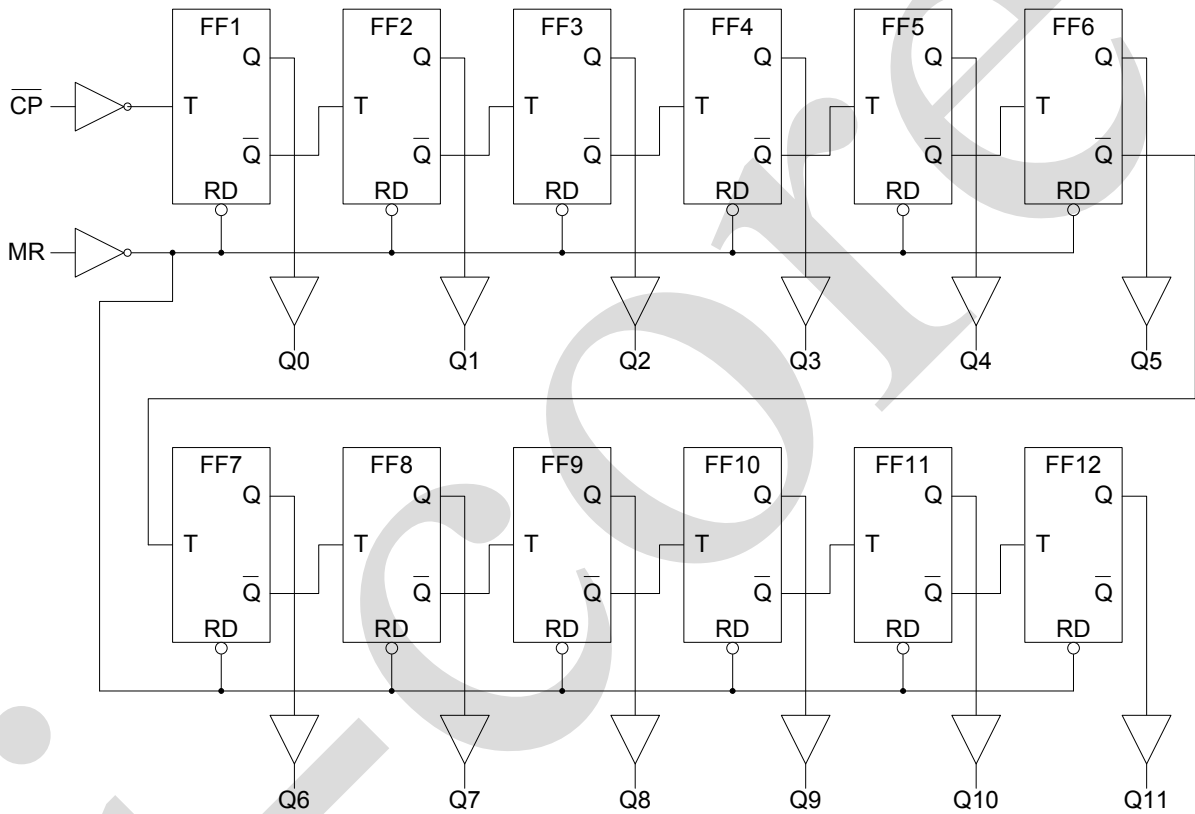
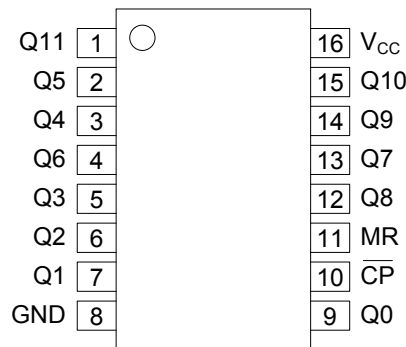


Figure 2. Logic diagram

### 2.2、Pin Configurations





## 2.3、Pin Description

Pin No.	Pin Name	Description
1	Q11	output 11
2	Q5	output 5
3	Q4	output 4
4	Q6	output 6
5	Q3	output 3
6	Q2	output 2
7	Q1	output 1
8	GND	ground (0V)
9	Q0	output 0
10	$\overline{\text{CP}}$	clock input (HIGH-to-LOW, edge-triggered)
11	MR	master reset input (active HIGH)
12	Q8	output 8
13	Q7	output 7
14	Q9	Output 9
15	Q10	output 10
16	V <sub>CC</sub>	positive supply voltage

## 2.4、Function Table

Input		Output
$\overline{\text{CP}}$	MR	Q0 to Q11
↑	L	no change
↓	L	count
X	H	L

Note:

H=HIGH voltage level;

L=LOW voltage level;

X=don't care;

↑=LOW-to-HIGH clock transition;

↓=HIGH-to-LOW clock transition.



## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

( $T_{amb}=25^{\circ}\text{C}$ , 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	$I_{IK}$	$V_I < -0.5\text{V}$ or $V_I > V_{CC} + 0.5\text{V}$	-	$\pm 20$	mA	
output clamping current	$I_{OK}$	$V_I < -0.5\text{V}$ or $V_I > V_{CC} + 0.5\text{V}$	-	$\pm 20$	mA	
output current	$I_O$	$0.5\text{V} < V_O < V_{CC} + 0.5\text{V}$	-	$\pm 25$	mA	
supply current	$I_{CC}$	-	-	$\pm 50$	mA	
ground current	$I_{GND}$	-	-	$\pm 50$	mA	
storage temperature	$T_{stg}$	-	-65	+150	$^{\circ}\text{C}$	
soldering temperature	$T_L$	10s	DIP		245	$^{\circ}\text{C}$
			SOP/TSSOP		260	$^{\circ}\text{C}$

### 3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>AiP74HC4040</b>						
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	$^{\circ}\text{C}$
<b>AiP74HCT4040</b>						
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	$^{\circ}\text{C}$





### 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	
<b>AiP74HC4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC}=2.0\text{V}$	1.5	1.2	-	V	
		$V_{CC}=4.5\text{V}$	3.15	2.4	-	V	
		$V_{CC}=6.0\text{V}$	4.2	3.2	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=2.0\text{V}$	-	0.8	0.5	V	
		$V_{CC}=4.5\text{V}$	-	2.1	1.35	V	
		$V_{CC}=6.0\text{V}$	-	2.8	1.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I=V_{IH}$ or $V_{IL}$	$I_O=-20\mu\text{A}; V_{CC}=2.0\text{V}$	1.9	2.0	-	V
			$I_O=-20\mu\text{A}; V_{CC}=4.5\text{V}$	4.4	4.5	-	V
			$I_O=-20\mu\text{A}; V_{CC}=6.0\text{V}$	5.9	6.0	-	V
			$I_O=-4.0\text{mA}; V_{CC}=4.5\text{V}$	3.98	4.32	-	V
			$I_O=-5.2\text{mA}; V_{CC}=6.0\text{V}$	5.48	5.81	-	V
LOW-level output voltage	$V_{OL}$	$V_I=V_{IH}$ or $V_{IL}$	$I_O=20\mu\text{A}; V_{CC}=2.0\text{V}$	-	0	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=4.5\text{V}$	-	0	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=6.0\text{V}$	-	0	0.1	V
			$I_O=4.0\text{mA}; V_{CC}=4.5\text{V}$	-	0.15	0.26	V
			$I_O=5.2\text{mA}; V_{CC}=6.0\text{V}$	-	0.16	0.26	V
input leakage current	$I_I$	$V_I=V_{CC}$ or GND; $V_{CC}=6.0\text{V}$	-	-	$\pm 1$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=6.0\text{V}$	-	-	8	$\mu\text{A}$	
<b>AiP74HCT4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	2.0	1.6	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	1.2	0.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I=V_{IH}$ or $V_{IL}; V_{CC}=4.5\text{V}$	$I_O=-20\mu\text{A}$	4.4	4.5	-	V
			$I_O=-4.0\text{mA}$	3.98	4.32	-	V
LOW-level output voltage	$V_{OL}$	$V_I=V_{IH}$ or $V_{IL}; V_{CC}=4.5\text{V}$	$I_O=20\mu\text{A}$	-	0	0.1	V
			$I_O=4.0\text{mA}$	-	0.15	0.26	V
input leakage current	$I_I$	$V_I=V_{CC}$ or GND; $V_{CC}=5.5\text{V}$	-	-	$\pm 1$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=5.5\text{V}$	-	-	8	$\mu\text{A}$	
additional supply current	$\Delta I_{CC}$	per input pin; $V_I=V_{CC}-2.1\text{V}$ ; other inputs at $V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=4.5\text{V}$ to $5.5\text{V}$	pin $\overline{\text{CP}}$	-	85	306	$\mu\text{A}$
			pin MR	-	110	396	$\mu\text{A}$



### 3.3.2、DC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC}=2.0\text{V}$	1.5	-	-	V	
		$V_{CC}=4.5\text{V}$	3.15	-	-	V	
		$V_{CC}=6.0\text{V}$	4.2	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=2.0\text{V}$	-	-	0.5	V	
		$V_{CC}=4.5\text{V}$	-	-	1.35	V	
		$V_{CC}=6.0\text{V}$	-	-	1.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O = -20\mu\text{A}; V_{CC} = 2.0\text{V}$	1.9	-	-	V
			$I_O = -20\mu\text{A}; V_{CC} = 4.5\text{V}$	4.4	-	-	V
			$I_O = -20\mu\text{A}; V_{CC} = 6.0\text{V}$	5.9	-	-	V
			$I_O = -4.0\text{mA}; V_{CC} = 4.5\text{V}$	3.84	-	-	V
			$I_O = -5.2\text{mA}; V_{CC} = 6.0\text{V}$	5.34	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O = 20\mu\text{A}; V_{CC} = 2.0\text{V}$	-	-	0.1	V
			$I_O = 20\mu\text{A}; V_{CC} = 4.5\text{V}$	-	-	0.1	V
			$I_O = 20\mu\text{A}; V_{CC} = 6.0\text{V}$	-	-	0.1	V
			$I_O = 4.0\text{mA}; V_{CC} = 4.5\text{V}$	-	-	0.33	V
			$I_O = 5.2\text{mA}; V_{CC} = 6.0\text{V}$	-	-	0.33	V
input leakage current	$I_I$	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0\text{V}$	-	-	$\pm 1.0$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 6.0\text{V}$	-	-	80	$\mu\text{A}$	
<b>AiP74HCT4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	2.0	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	-	-	0.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}; V_{CC} = 4.5\text{V}$	$I_O = -20\mu\text{A}$	4.4	-	-	V
			$I_O = -4.0\text{mA}$	3.84	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}; V_{CC} = 4.5\text{V}$	$I_O = 20\mu\text{A}$	-	-	0.1	V
			$I_O = 4.0\text{mA}$	-	-	0.33	V
input leakage current	$I_I$	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$	-	-	$\pm 1.0$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 5.5\text{V}$	-	-	80	$\mu\text{A}$	
additional supply current	$\Delta I_{CC}$	per input pin; $V_I = V_{CC} - 2.1\text{V}$ ; other inputs at $V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	pin $\overline{\text{CP}}$	-	-	383	$\mu\text{A}$
			pin MR	-	-	495	$\mu\text{A}$



### 3.3.3、DC Characteristics 3

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC}=2.0\text{V}$	1.5	-	-	V	
		$V_{CC}=4.5\text{V}$	3.15	-	-	V	
		$V_{CC}=6.0\text{V}$	4.2	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=2.0\text{V}$	-	-	0.5	V	
		$V_{CC}=4.5\text{V}$	-	-	1.35	V	
		$V_{CC}=6.0\text{V}$	-	-	1.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O = -20\mu\text{A}; V_{CC} = 2.0\text{V}$	1.9	-	-	V
			$I_O = -20\mu\text{A}; V_{CC} = 4.5\text{V}$	4.4	-	-	V
			$I_O = -20\mu\text{A}; V_{CC} = 6.0\text{V}$	5.9	-	-	V
			$I_O = -4.0\text{mA}; V_{CC} = 4.5\text{V}$	3.7	-	-	V
			$I_O = -5.2\text{mA}; V_{CC} = 6.0\text{V}$	5.2	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O = 20\mu\text{A}; V_{CC} = 2.0\text{V}$	-	-	0.1	V
			$I_O = 20\mu\text{A}; V_{CC} = 4.5\text{V}$	-	-	0.1	V
			$I_O = 20\mu\text{A}; V_{CC} = 6.0\text{V}$	-	-	0.1	V
			$I_O = 4.0\text{mA}; V_{CC} = 4.5\text{V}$	-	-	0.4	V
			$I_O = 5.2\text{mA}; V_{CC} = 6.0\text{V}$	-	-	0.4	V
input leakage current	$I_I$	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0\text{V}$	-	-	$\pm 1.0$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 6.0\text{V}$	-	-	160	$\mu\text{A}$	
<b>AiP74HCT4040</b>							
HIGH-level input voltage	$V_{IH}$	$V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	2.0	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	-	-	0.8	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}; V_{CC} = 4.5\text{V}$	$I_O = -20\mu\text{A}$	4.4	-	-	V
			$I_O = -4.0\text{mA}$	3.7	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}; V_{CC} = 4.5\text{V}$	$I_O = 20\mu\text{A}$	-	-	0.1	V
			$I_O = 4.0\text{mA}$	-	-	0.4	V
input leakage current	$I_I$	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$	-	-	$\pm 1.0$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 5.5\text{V}$	-	-	160	$\mu\text{A}$	
additional supply current	$\Delta I_{CC}$	per input pin; $V_I = V_{CC} - 2.1\text{V}$ ; other inputs at $V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	pin $\overline{\text{CP}}$	-	-	417	$\mu\text{A}$
			pin MR	-	-	539	$\mu\text{A}$



### 3.3.4、AC Characteristics 1

( $T_{amb}=25^{\circ}\text{C}$ ,  $\text{GND}=0\text{V}$ ,  $C_L=50\text{pF}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC4040</b>							
propagation delay	$t_{pd}$	$\overline{\text{CP}}$ to Q0; see Figure 4 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	47	150	ns
			$V_{CC}=4.5\text{V}$	-	17	30	ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	14	-	ns
			$V_{CC}=6.0\text{V}$	-	14	26	ns
		Qn to Qn+1; see Figure 4	$V_{CC}=2.0\text{V}$	-	28	100	ns
			$V_{CC}=4.5\text{V}$	-	10	20	ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	8	-	ns
			$V_{CC}=6.0\text{V}$	-	8	17	ns
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; see Figure 4	$V_{CC}=2.0\text{V}$	-	61	185	ns
		$V_{CC}=4.5\text{V}$	-	22	37	ns	
		$V_{CC}=6.0\text{V}$	-	18	31	ns	
transition time	$t_t$	Qn; see Figure 4 <sup>[2]</sup>	$V_{CC}=2.0\text{V}$	-	19	75	ns
			$V_{CC}=4.5\text{V}$	-	7	15	ns
			$V_{CC}=6.0\text{V}$	-	6	13	ns
pulse width	$t_w$	$\overline{\text{CP}}$ input, HIGH or LOW; see Figure 4	$V_{CC}=2.0\text{V}$	80	14	-	ns
			$V_{CC}=4.5\text{V}$	16	5	-	ns
			$V_{CC}=6.0\text{V}$	14	4	-	ns
		MR input, HIGH; see Figure 4	$V_{CC}=2.0\text{V}$	80	22	-	ns
			$V_{CC}=4.5\text{V}$	16	8	-	ns
			$V_{CC}=6.0\text{V}$	14	6	-	ns
recovery time	$t_{rec}$	MR to $\overline{\text{CP}}$ ; see Figure 4	$V_{CC}=2.0\text{V}$	50	8	-	ns
			$V_{CC}=4.5\text{V}$	10	3	-	ns
			$V_{CC}=6.0\text{V}$	9	2	-	ns
maximum frequency	$f_{max}$	$\overline{\text{CP}}$ input; see Figure 4	$V_{CC}=2.0\text{V}$	6	27	-	MHz
			$V_{CC}=4.5\text{V}$	30	82	-	MHz
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	90	-	MHz
			$V_{CC}=6.0\text{V}$	35	98	-	MHz
<b>AiP74HCT4040</b>							
propagation delay	$t_{pd}$	$\overline{\text{CP}}$ to Q0; see Figure 4 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	9	40	ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	16	-	ns
		Qn to Qn+1; see Figure 4	$V_{CC}=4.5\text{V}$	-	10	20	ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	8	-	ns
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; $V_{CC}=4.5\text{V}$ ; see Figure 4	-	23	45	ns	
transition time	$t_t$	Qn; $V_{CC}=4.5\text{V}$ ; see Figure 4 <sup>[2]</sup>	-	7	15	ns	
pulse width	$t_w$	$\overline{\text{CP}}$ input, HIGH or LOW; $V_{CC}=4.5\text{V}$ ; see Figure 4	16	7	-	ns	
		MR input, HIGH; $V_{CC}=4.5\text{V}$ ; see Figure 4	16	6	-	ns	
recovery time	$t_{rec}$	MR to $\overline{\text{CP}}$ ; $V_{CC}=4.5\text{V}$ ; see Figure 4	10	2	-	ns	
maximum frequency	$f_{max}$	$\overline{\text{CP}}$ input; see Figure 4	$V_{CC}=4.5\text{V}$	30	72	-	MHz
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	79	-	MHz



Note:

[1]  $t_{pd}$  is the same as  $t_{PHL}$ ,  $t_{PLH}$ .[2]  $t_t$  is the same as  $t_{THL}$ ,  $t_{TLH}$ .

### 3.3.5、AC Characteristics 2

(T<sub>amb</sub>=-40°C to +85°C, GND=0V, C<sub>L</sub>=50pF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC4040</b>							
propagation delay	$t_{pd}$	$\overline{CP}$ to Q0; see Figure 4 <sup>[1]</sup>	V <sub>CC</sub> =2.0V	-	-	190	ns
			V <sub>CC</sub> =4.5V	-	-	38	ns
			V <sub>CC</sub> =6.0V	-	-	33	ns
		Qn to Qn+1; see Figure 4	V <sub>CC</sub> =2.0V	-	-	125	ns
			V <sub>CC</sub> =4.5V	-	-	25	ns
			V <sub>CC</sub> =6.0V	-	-	21	ns
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; see Figure 4	V <sub>CC</sub> =2.0V	-	-	230	ns
			V <sub>CC</sub> =4.5V	-	-	46	ns
			V <sub>CC</sub> =6.0V	-	-	39	ns
transition time	$t_t$	Qn; see Figure 4 <sup>[2]</sup>	V <sub>CC</sub> =2.0V	-	-	95	ns
			V <sub>CC</sub> =4.5V	-	-	19	ns
			V <sub>CC</sub> =6.0V	-	-	16	ns
pulse width	$t_w$	$\overline{CP}$ input, HIGH or LOW; see Figure 4	V <sub>CC</sub> =2.0V	100	-	-	ns
			V <sub>CC</sub> =4.5V	20	-	-	ns
			V <sub>CC</sub> =6.0V	17	-	-	ns
		MR input, HIGH; see Figure 4	V <sub>CC</sub> =2.0V	100	-	-	ns
			V <sub>CC</sub> =4.5V	20	-	-	ns
			V <sub>CC</sub> =6.0V	17	-	-	ns
recovery time	$t_{rec}$	MR to $\overline{CP}$ ; see Figure 4	V <sub>CC</sub> =2.0V	65	-	-	ns
			V <sub>CC</sub> =4.5V	13	-	-	ns
			V <sub>CC</sub> =6.0V	11	-	-	ns
maximum frequency	$f_{max}$	$\overline{CP}$ input; see Figure 4	V <sub>CC</sub> =2.0V	4.8	-	-	MHz
			V <sub>CC</sub> =4.5V	24	-	-	MHz
			V <sub>CC</sub> =6.0V	28	-	-	MHz
<b>AiP74HCT4040</b>							
propagation delay	$t_{pd}$	$\overline{CP}$ to Q0; V <sub>CC</sub> =4.5V; see Figure 4 <sup>[1]</sup>	-	-	50	ns	
		Qn to Qn+1; V <sub>CC</sub> =4.5V; see Figure 4	-	-	25	ns	
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; V <sub>CC</sub> =4.5V; see Figure 4	-	-	56	ns	
transition time	$t_t$	Qn; V <sub>CC</sub> =4.5V; see Figure 4 <sup>[2]</sup>	-	-	19	ns	
pulse width	$t_w$	$\overline{CP}$ input, HIGH or LOW; V <sub>CC</sub> =4.5V; see Figure 4	20	-	-	ns	
		MR input, HIGH; V <sub>CC</sub> =4.5V; see Figure 4	20	-	-	ns	
recovery time	$t_{rec}$	MR to $\overline{CP}$ ; V <sub>CC</sub> =4.5V; see Figure 4	13	-	-	ns	
maximum frequency	$f_{max}$	$\overline{CP}$ input; V <sub>CC</sub> =4.5V; see Figure 4	24	-	-	MHz	

Note:

[1]  $t_{pd}$  is the same as  $t_{PHL}$ ,  $t_{PLH}$ .[2]  $t_t$  is the same as  $t_{THL}$ ,  $t_{TLH}$ .

### 3.3.6、AC Characteristics 3

(T<sub>amb</sub>=-40°C to +125°C, GND=0V, C<sub>L</sub>=50pF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC4040</b>							
propagation delay	$t_{pd}$	$\overline{CP}$ to Q0; see Figure 4 <sup>[1]</sup>	V <sub>CC</sub> =2.0V	-	-	225	ns
			V <sub>CC</sub> =4.5V	-	-	45	ns
			V <sub>CC</sub> =6.0V	-	-	38	ns
		Qn to Qn+1; see Figure 4	V <sub>CC</sub> =2.0V	-	-	150	ns
			V <sub>CC</sub> =4.5V	-	-	30	ns
			V <sub>CC</sub> =6.0V	-	-	26	ns
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; see Figure 4	V <sub>CC</sub> =2.0V	-	-	280	ns
			V <sub>CC</sub> =4.5V	-	-	56	ns
			V <sub>CC</sub> =6.0V	-	-	48	ns
transition time	$t_t$	Qn; see Figure 4 <sup>[2]</sup>	V <sub>CC</sub> =2.0V	-	-	110	ns
			V <sub>CC</sub> =4.5V	-	-	22	ns
			V <sub>CC</sub> =6.0V	-	-	19	ns
pulse width	$t_w$	$\overline{CP}$ input, HIGH or LOW; see Figure 4	V <sub>CC</sub> =2.0V	120	-	-	ns
			V <sub>CC</sub> =4.5V	24	-	-	ns
			V <sub>CC</sub> =6.0V	20	-	-	ns
		MR input, HIGH; see Figure 4	V <sub>CC</sub> =2.0V	120	-	-	ns
			V <sub>CC</sub> =4.5V	24	-	-	ns
			V <sub>CC</sub> =6.0V	20	-	-	ns
recovery time	$t_{rec}$	MR to $\overline{CP}$ ; see Figure 4	V <sub>CC</sub> =2.0V	75	-	-	ns
			V <sub>CC</sub> =4.5V	15	-	-	ns
			V <sub>CC</sub> =6.0V	13	-	-	ns
maximum frequency	$f_{max}$	$\overline{CP}$ input; see Figure 4	V <sub>CC</sub> =2.0V	4	-	-	MHz
			V <sub>CC</sub> =4.5V	20	-	-	MHz
			V <sub>CC</sub> =6.0V	24	-	-	MHz
<b>AiP74HCT4040</b>							
propagation delay	$t_{pd}$	$\overline{CP}$ to Q0; V <sub>CC</sub> =4.5V; see Figure 4 <sup>[1]</sup>	-	-	60	ns	
		Qn to Qn+1; V <sub>CC</sub> =4.5V; see Figure 4	-	-	30	ns	
HIGH to LOW Propagation delay	$t_{PHL}$	MR to Qn; V <sub>CC</sub> =4.5V; see Figure 4	-	-	68	ns	
transition time	$t_t$	Qn; V <sub>CC</sub> =4.5V; see Figure 4 <sup>[2]</sup>	-	-	22	ns	
pulse width	$t_w$	$\overline{CP}$ input, HIGH or LOW; V <sub>CC</sub> =4.5V; see Figure 4	24	-	-	ns	
		MR input, HIGH; V <sub>CC</sub> =4.5V; see Figure 4	24	-	-	ns	
recovery time	$t_{rec}$	MR to $\overline{CP}$ ; V <sub>CC</sub> =4.5V; see Figure 4	15	-	-	ns	
maximum frequency	$f_{max}$	$\overline{CP}$ input; V <sub>CC</sub> =4.5V; see Figure 4	20	-	-	MHz	

Note:

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



[2]  $t_t$  is the same as  $t_{THL}$ ,  $t_{TLH}$ .

## 4、Testing Circuit

### 4.1、AC Testing Circuit

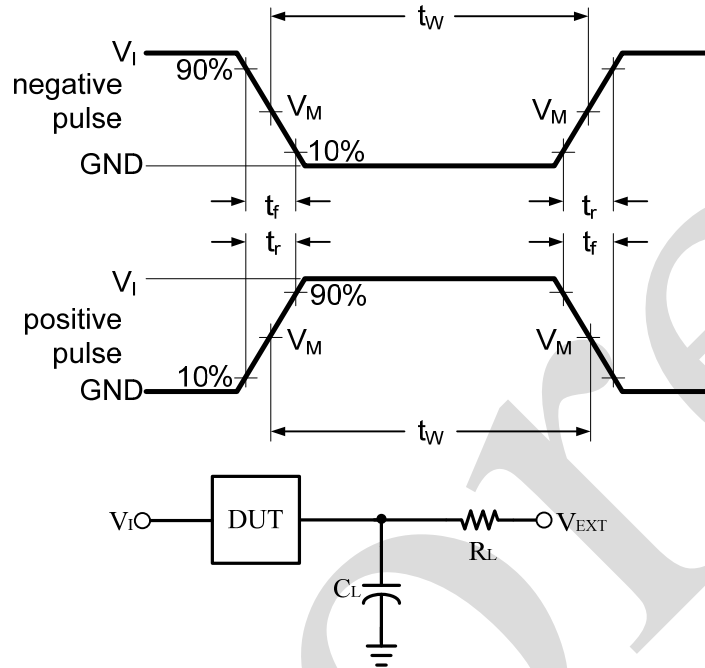
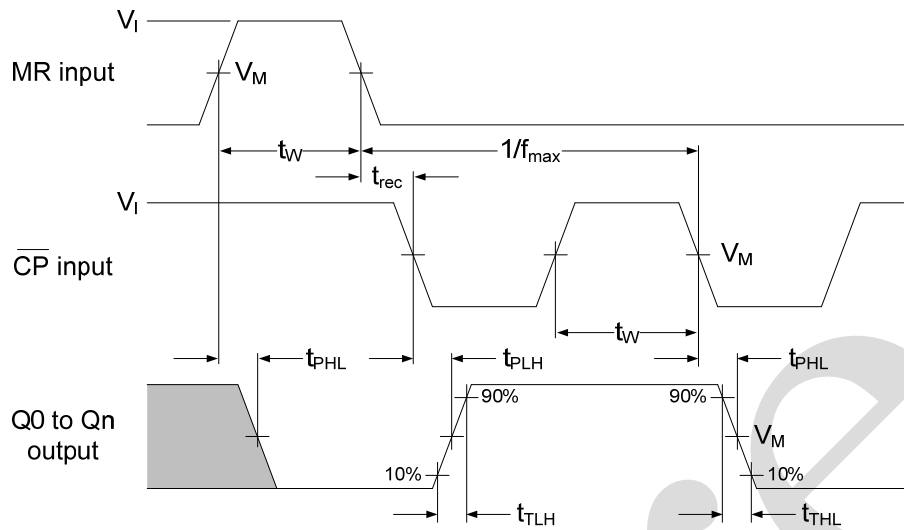


Figure 3. Test circuit for measuring switching times

$C_L$  includes probe and jig capacitance.



## 4.2、AC Testing Waveforms



AiP74HC4040:  $V_M=50\%$ ;  $V_I=GND$  to  $V_{CC}$ .

AiP74HCT4040:  $V_M=1.3V$ ;  $V_I=GND$  to  $3V$ .

Figure 4. Clock propagation delays, pulse width, transition times, maximum pulse frequency and master resets

## 4.3、Test Data

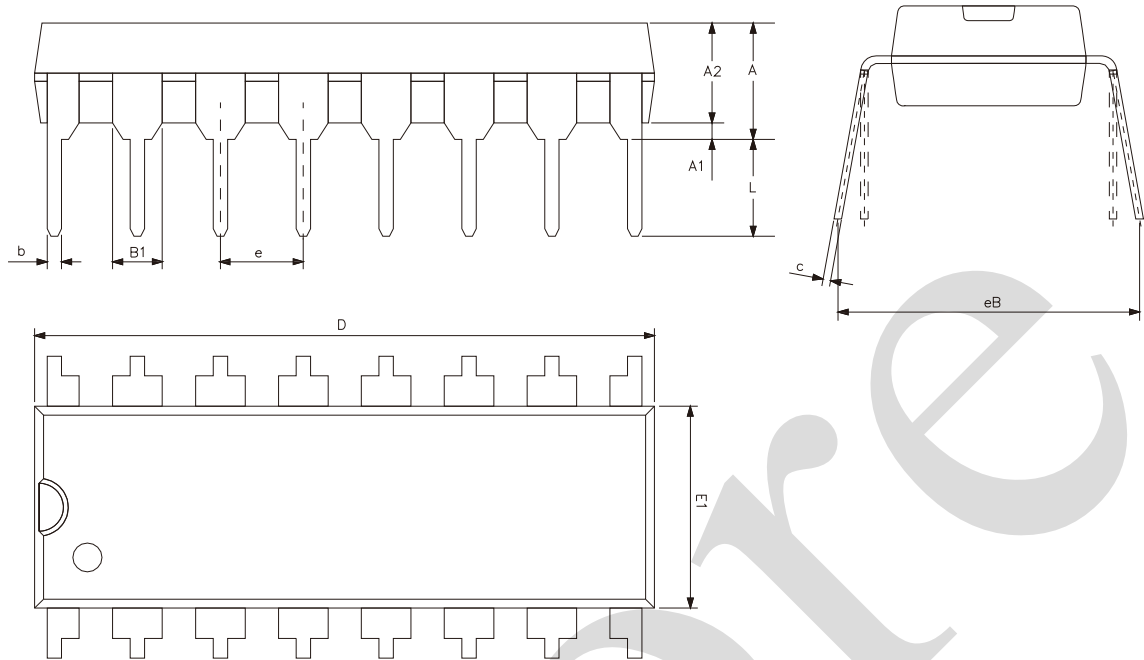
Type	Input		Load	Test
	$V_I$	$t_r, t_f$	$C_L$	
AiP74HC4040	$V_{CC}$	6ns	15pF, 50pF	$t_{PHL}, t_{PLH}$
AiP74HCT4040	3V	6ns	15pF, 50pF	$t_{PHL}, t_{PLH}$





## 5、Package Information

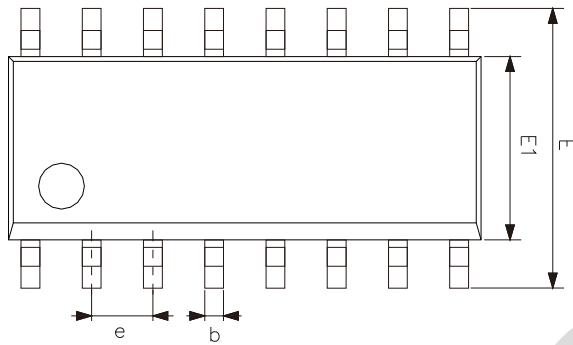
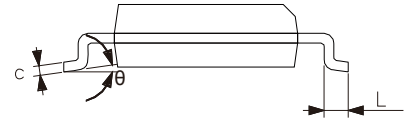
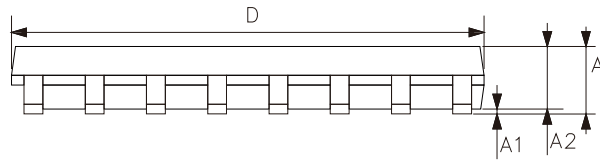
### 5.1、DIP16



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



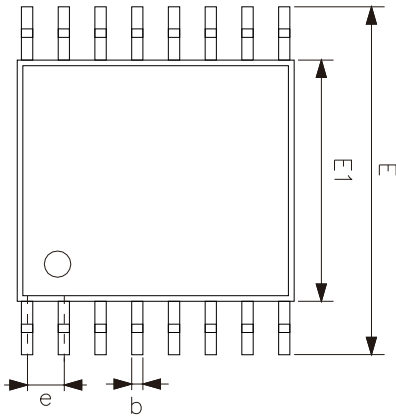
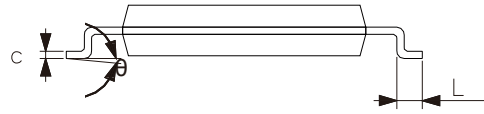
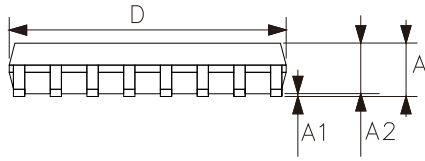
## 5.2、SOP16



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
$\theta$	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
$\theta$	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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