



# **AiP74HC/HCT148**

## **8-to-3 Line Priority Encoder**

### **Product Specification**

**Specification Revision History:**

<b>Version</b>	<b>Date</b>	<b>Description</b>
2019-06-A1	2019-06	New



## 1、General Description

The AiP74HC/HCT148 encodes eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input EI and enable output EO) is provided to allow octal expansion without the need for external circuitry. The data inputs and outputs are active at the low logic level.

### Features:

- Input levels:
  - For AiP74HC148: CMOS level
  - For AiP74HCT148: TTL level
- Specified from -40°C to +85°C
- Packaging information: DIP16/SOP16/TSSOP16

### Ordering Information:

#### Tube packing specifications:

Type number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Packing box number	Packing quantity	Notes
AiP74HC148DA.TB	DIP16	74HC148	25 PCS/tube	40 tube/box	1000 PCS/box	10 box/pack	10000 PCS/pack	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT148DA.TB	DIP16	74HCT148	25 PCS/tube	40 tube/box	1000 PCS/box	10 box/pack	10000 PCS/pack	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC148SA.TB	SOP16	74HC148	50 PCS/tube	200 tube/box	10000 PCS/box	5 box/pack	50000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT148SA.TB	SOP16	74HCT148	50 PCS/tube	200 tube/box	10000 PCS/box	5 box/pack	50000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC148TA.TB	TSSOP16	74HC148	96 PCS/tube	120 tube/box	19200 PCS/box	10 box/pack	192000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT148TA.TB	TSSOP16	74HCT148	96 PCS/tube	120 tube/box	19200 PCS/box	10 box/pack	192000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

**Reel packing specifications:**

Type number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Packing quantity	Notes
AiP74HC148SA.TR	SOP16(1)	74HC148	2500 PCS/reel	5000 PCS/box	20000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT148SA.TR	SOP16(1)	74HCT148	2500 PCS/reel	5000 PCS/box	20000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC148SA.TR	SOP16(2)	74HC148	2500 PCS/reel	2500 PCS/box	40000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT148SA.TR	SOP16(2)	74HCT148	2500 PCS/reel	2500 PCS/box	40000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC148TA.TR	TSSOP16	74HC148	2500 PCS/reel	5000 PCS/box	40000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
AiP74HCT148TA.TR	TSSOP16	74HCT148	2500 PCS/reel	5000 PCS/box	40000 PCS/pack	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

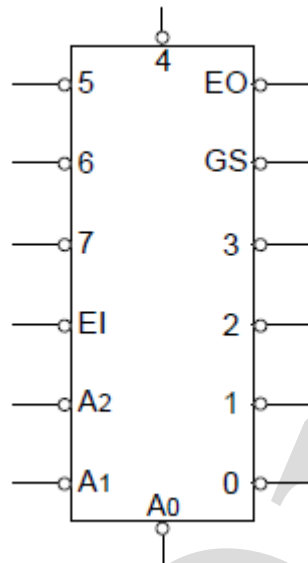


Figure 1. Logic symbol

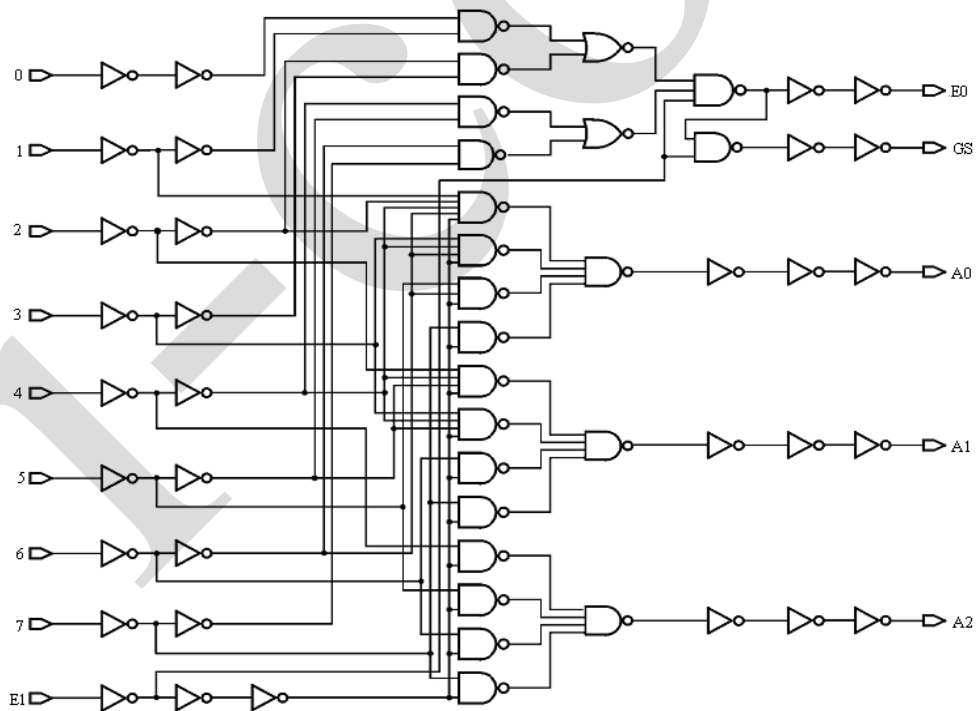
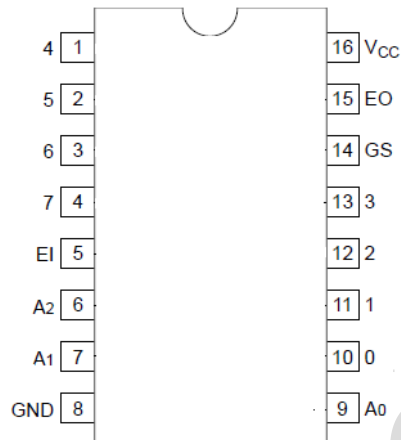


Figure 2. Functional diagram



## 2.2、Pin Configurations



## 2.3、Pin Description

Pin No.	Pin Name	Description
1	4	data input
2	5	data input
3	6	data input
4	7	data input
5	EI	enable input
6	A2	data output
7	A1	data output
8	GND	ground (0V)
9	A0	data output
10	0	data input
11	1	data input
12	2	data input
13	3	data input
14	GS	data output
15	EO	enable output
16	V <sub>CC</sub>	supply voltage



## 2.4、Function Table

Input									Output				
EI	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	X	L	H	L	L	H	L	H
L	X	X	X	X	X	L	H	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	H	H	L	H
L	X	X	X	L	H	H	H	H	H	L	L	L	H
L	X	X	L	H	H	H	H	H	H	L	H	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

Note: H=HIGH voltage level; L=LOW voltage level; X = don't care.

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

(Voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	$V_{CC}$	-	-0.5	+7.0	V
input clamping current	$I_{IK}$	$V_I < -0.5V$ or $V_I > V_{CC}+0.5V$	-	$\pm 20$	mA
output clamping current	$I_{OK}$	$V_O < -0.5V$ or $V_O > V_{CC}+0.5V$	-	$\pm 20$	mA
output current	$I_O$	$-0.5V < V_O < V_{CC}+0.5V$	-	$\pm 25$	mA
supply current	$I_{CC}$	-	-	+50	mA
ground current	$I_{GND}$	-	-50	-	mA
storage temperature	$T_{stg}$	-	-65	+150	$^{\circ}C$
total power dissipation	$P_{tot}$	-	-	500	mW
Soldering temperature	$T_L$	10s	DIP	245	$^{\circ}C$
			SOP	250	

Note:

[1] For DIP16 packages: above  $70^{\circ}C$  the value of  $P_{tot}$  derates linearly with 12mW/K.

[2] For SOP16 packages: above  $70^{\circ}C$  the value of  $P_{tot}$  derates linearly with 8mW/K.

[3] For (T)SSOP16 packages: above  $60^{\circ}C$  the value of  $P_{tot}$  derates linearly with 5.5mW/K.



### 3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
AiP74HC148						
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
input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC}=2.0V$	-	-	625	ns/V
		$V_{CC}=4.5V$	-	1.67	139	ns/V
		$V_{CC}=6.0V$	-	-	83	ns/V
ambient temperature	$T_{amb}$	-	-40	-	+85	°C
AiP74HCT148						
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
input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC}=2.0V$	-	-	-	ns/V
		$V_{CC}=4.5V$	-	1.67	139	ns/V
		$V_{CC}=6.0V$	-	-	-	ns/V
ambient temperature	$T_{amb}$	-	-40	-	+85	°C

### 3.3、Electrical Characteristics

#### 3.3.1、DC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
AiP74HC148							
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	$V_{OH}$	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	2.0	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	4.5	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	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	$V_{OL}$	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	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	$I_I$	$V_I=V_{CC} \text{ or } GND; V_{CC}=6.0V$	-	-	$\pm 0.1$	$\mu A$	
supply current	$I_{CC}$	$V_I=V_{CC} \text{ or } GND; I_O=0A; V_{CC}=6.0V$	-	-	8.0	$\mu A$	



input capacitance	$C_I$	-	-	3.5	-	pF	
AiP74HCT148							
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 $V_{IL}; V_{CC}=4.5V$	$I_O=-20\mu A$	4.4	4.5	-	V
			$I_O=-4.0mA$	3.98	4.32	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}; V_{CC}=4.5V$	$I_O=20\mu A$	-	0	0.1	V
			$I_O=4.0mA$	-	0.16	0.26	V
input leakage current	$I_I$	$V_I=V_{CC}$ or GND; $V_{CC}=5.5V$	-	-	$\pm 0.1$	$\mu A$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A; V_{CC}=5.5V$	-	-	8.0	$\mu A$	
additional supply current	$\Delta I_{CC}$	$V_I=V_{CC}-2.1V;$ other inputs at $V_{CC}$ or GND; $I_O=0A;$ $V_{CC}=4.5V$ to $5.5V$	-	100	360	$\mu A$	
input capacitance	$C_I$	-	-	3.5	-	pF	

### 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	
AiP74HC148							
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 $V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	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 $V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	-	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; $V_{CC}=6.0V$	-	-	$\pm 1.0$	$\mu A$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A; V_{CC}=6.0V$	-	-	80	$\mu A$	
input capacitance	$C_I$	-	-	-	-	pF	
AiP74HCT148							
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 $V_{IL}$ ; $V_{CC}=4.5V$	$I_O=-20\mu A$	4.4	-	-	V
			$I_O=-4.0mA$	3.84	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC}=4.5V$	$I_O=20\mu A$	-	-	0.1	V
			$I_O=4.0mA$	-	-	0.33	V
input leakage current	$I_I$	$V_I=V_{CC}$ or GND; $V_{CC}=5.5V$		-	-	$\pm 1.0$	$\mu A$
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$		-	-	80	$\mu A$
additional supply current	$\Delta I_{CC}$	$V_I=V_{CC}-2.1V$ ; other inputs at $V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=4.5V$ to $5.5V$		-	-	450	$\mu A$
input capacitance	$C_I$	-		-	-	-	pF

### 3.3.3、AC Characteristics 1

( $T_{amb}=25^{\circ}C$ , GND=0V,  $t_r=t_f=6ns$ ,  $C_L=50pF$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
AiP74HC148							
input to output propagation delay	$t_{pd}$	see Figure 4	$V_{CC}=2.0V$	-	50	160	ns
			$V_{CC}=4.5V$	-	18	32	ns
			$V_{CC}=5.0V$ ; $C_L=15pF$	-	15	-	ns
			$V_{CC}=6.0V$	-	14	27	ns
transition time	$t_t$	see Figure 4	$V_{CC}=2.0V$	-	19	75	ns
			$V_{CC}=4.5V$	-	7	15	ns
			$V_{CC}=6.0V$	-	6	6	ns
power dissipation capacitance	$C_{PD}$	$V_I=GND$ to $V_{CC}$	-	30	-	pF	
AiP74HCT148							
input to output propagation delay	$t_{pd}$	see Figure 4	$V_{CC}=4.5V$	-	20	35	ns
			$V_{CC}=5.0V$ ; $C_L=15pF$	-	17	-	ns
transition time	$t_t$	$V_{CC}=4.5V$ ; see Figure 4	-	7	15	ns	
power dissipation capacitance	$C_{PD}$	$V_I=GND$ to $V_{CC}-1.5V$	-	33	-	pF	

Note:

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

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

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in uW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$ =input frequency in MHz;

$f_o$ =output frequency in MHz;

$C_L$ =output load capacitance in pF;

$V_{CC}$ =supply voltage in V;

$\sum (C_L \times V_{CC}^2 \times f_o)$ =sum of outputs.



### 3.3.4、 AC Characteristics 2

( $T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $GND = 0\text{V}$ ,  $t_r = t_f = 6\text{ns}$ ,  $C_L = 50\text{pF}$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
AiP74HC148							
input to output propagation delay	$t_{pd}$	see Figure 4	$V_{CC} = 2.0\text{V}$	-	-	200	ns
			$V_{CC} = 4.5\text{V}$	-	-	40	ns
			$V_{CC} = 5.0\text{V}; C_L = 15\text{pF}$	-	-	-	ns
			$V_{CC} = 6.0\text{V}$	-	-	34	ns
transition time	$t_t$	see Figure 4	$V_{CC} = 2.0\text{V}$	-	-	95	ns
			$V_{CC} = 4.5\text{V}$	-	-	19	ns
			$V_{CC} = 6.0\text{V}$	-	-	16	ns
power dissipation capacitance	$C_{PD}$	$V_I = GND$ to $V_{CC}$	-	-	-	pF	
AiP74HCT148							
input to output propagation delay	$t_{pd}$	see Figure 4	$V_{CC} = 4.5\text{V}$	-	-	44	ns
			$V_{CC} = 5.0\text{V}; C_L = 15\text{pF}$	-	-	-	ns
transition time	$t_t$	$V_{CC} = 4.5\text{V}$ ; see Figure 4	-	-	19	ns	
power dissipation capacitance	$C_{PD}$	$V_I = GND$ to $V_{CC} - 1.5\text{V}$	-	-	-	pF	

Note:

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

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

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.



### 4、 Testing Circuit

#### 4.1、 AC Testing Circuit

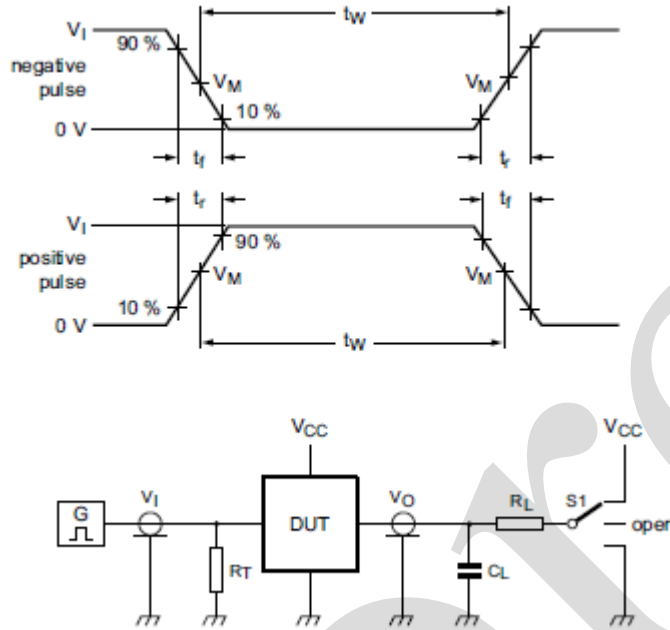


Figure 3. Test circuit for measuring switching times

Definitions for test circuit:

$C_L$ =Load capacitance including jig and probe capacitance.

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

$R_L$ =Load resistance.

S1=Test selection switch

#### 4.2、 AC Testing Waveforms

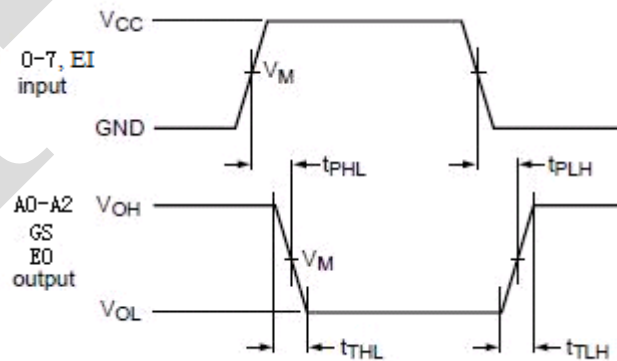


Figure 4. Input to output propagation delays and output transition times



### 4.3、 Measurement Points

Type	Input	Output
	$V_M$	$V_M$
AiP74HC148	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
AiP74HCT148	1.3V	1.3V

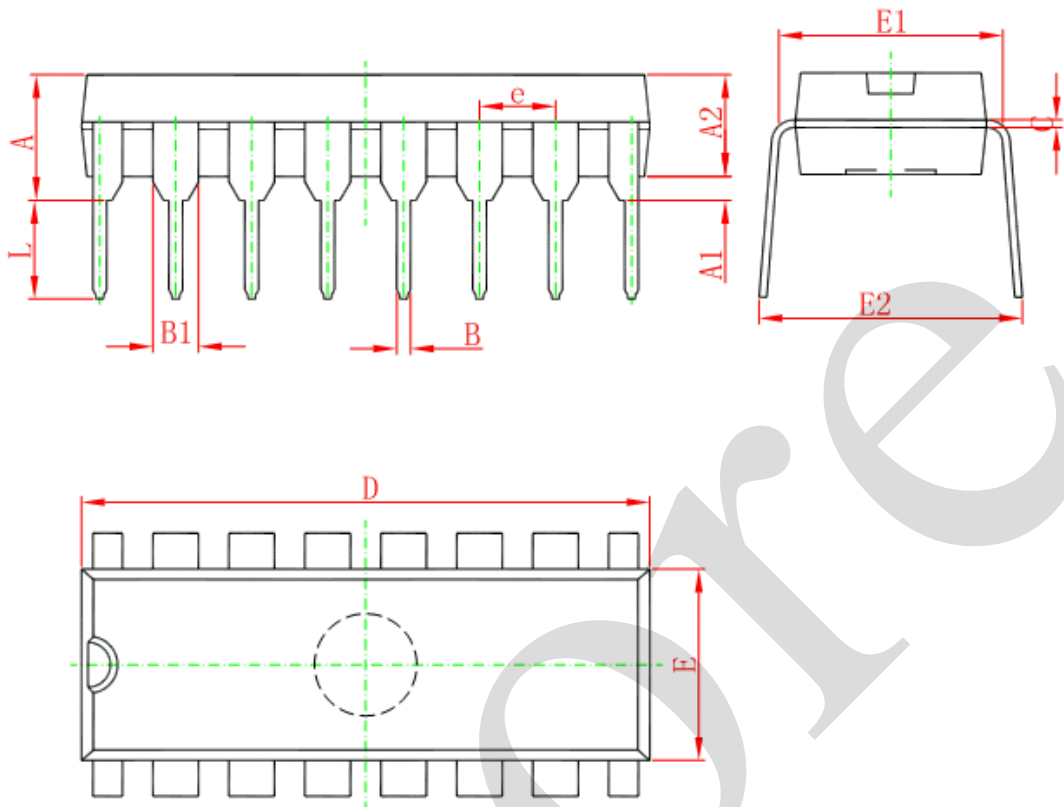
### 4.4、 Test Data

Type	Input		Load		S1 position
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$
AiP74HC148	$V_{CC}$	6ns	15pF, 50pF	1k $\Omega$	open
AiP74HCT148	3V	6ns	15pF, 50pF	1k $\Omega$	open



## 5、 Package Information

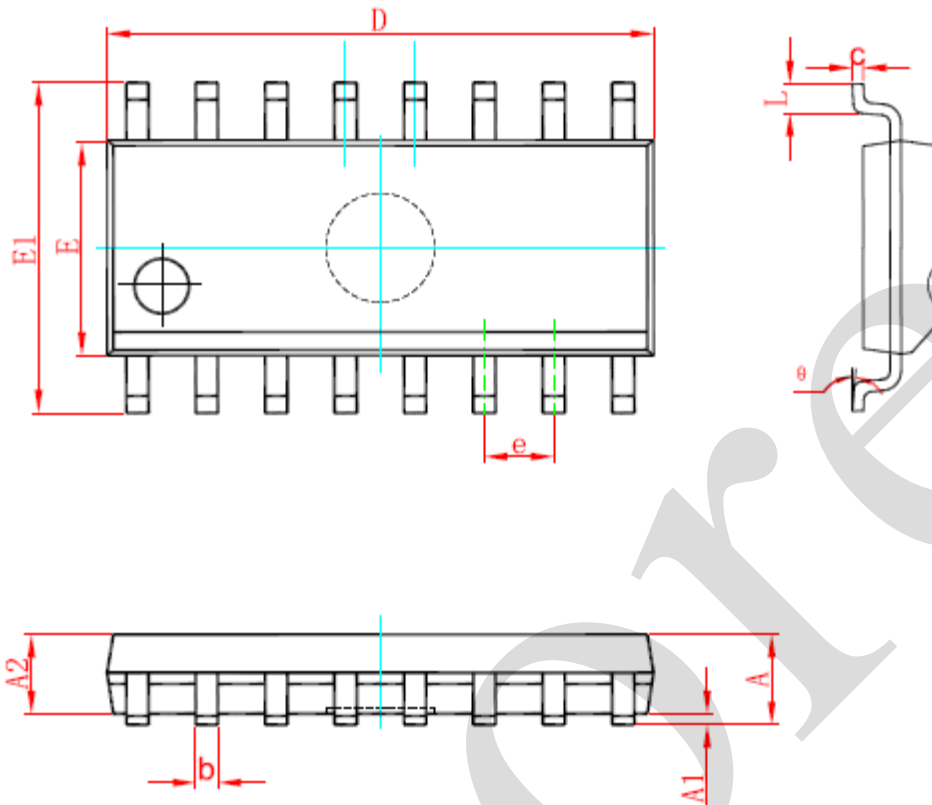
### 5.1、 DIP16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354



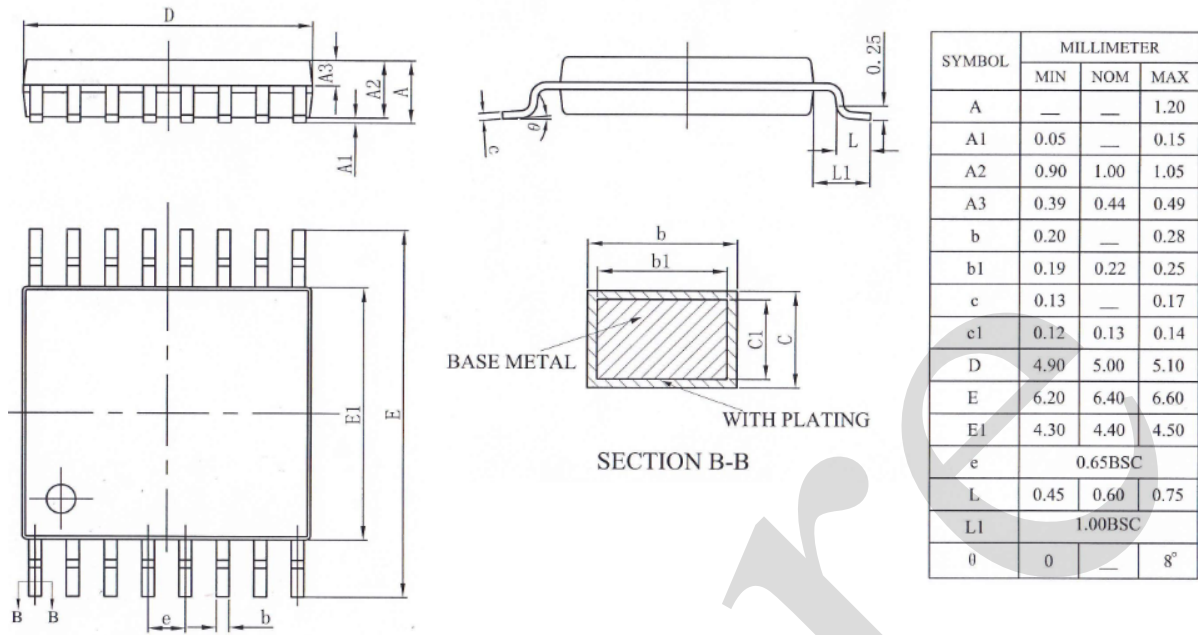
## 5.2、SOP16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



## 5.3、TSSOP16





## 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、 Notion

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.