



# AiP74HC/HCT04 Hex Inverter

## Product Specification

### Specification Revision History:

| Version    | Date    | Description |
|------------|---------|-------------|
| 2019-05-A1 | 2019-05 | New         |
|            |         |             |
|            |         |             |
|            |         |             |



## 1、 General Description

The AiP74HC/HCT04 is a hex inverter. The 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 AiP74HC04: CMOS level  
For AiP74HCT04: TTL level
- Specified from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Packaging information: DIP14/SOP14/TSSOP14

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

| Type number     | Packaging form | Marking code | Tube quantity  | Boxed tube quantity | Boxed quantity   | Packing box number | Packing quantity   | Notes                                                                |
|-----------------|----------------|--------------|----------------|---------------------|------------------|--------------------|--------------------|----------------------------------------------------------------------|
| AiP74HC04DA.TB  | DIP14          | 74HC04       | 25<br>PCS/tube | 40<br>tube/box      | 1000<br>PCS/box  | 10<br>box/pack     | 10000<br>PCS/pack  | Dimensions of plastic enclosure: 19.0mm×6.4mm<br>Pin spacing: 2.54mm |
| AiP74HCT04DA.TB | DIP14          | 74HCT04      | 25<br>PCS/tube | 40<br>tube/box      | 1000<br>PCS/box  | 10<br>box/pack     | 10000<br>PCS/pack  | Dimensions of plastic enclosure: 19.0mm×6.4mm<br>Pin spacing: 2.54mm |
| AiP74HC04SA.TB  | SOP14          | 74HC04       | 50<br>PCS/tube | 200<br>tube/box     | 10000<br>PCS/box | 5<br>box/pack      | 50000<br>PCS/pack  | Dimensions of plastic enclosure: 8.7mm×3.9mm<br>Pin spacing: 1.27mm  |
| AiP74HCT04SA.TB | SOP14          | 74HCT04      | 50<br>PCS/tube | 200<br>tube/box     | 10000<br>PCS/box | 5<br>box/pack      | 50000<br>PCS/pack  | Dimensions of plastic enclosure: 8.7mm×3.9mm<br>Pin spacing: 1.27mm  |
| AiP74HC04TA.TB  | TSSOP14        | 74HC04       | 94<br>PCS/tube | 200<br>tube/box     | 18800<br>PCS/box | 10<br>box/pack     | 188000<br>PCS/pack | Dimensions of plastic enclosure: 5.0mm×4.4mm<br>Pin spacing: 0.65mm  |
| AiP74HCT04TA.TB | TSSOP14        | 74HCT04      | 94<br>PCS/tube | 200<br>tube/box     | 18800<br>PCS/box | 10<br>box/pack     | 188000<br>PCS/pack | Dimensions of plastic enclosure: 5.0mm×4.4mm<br>Pin spacing: 0.65mm  |

**Reel packing specifications:**

| Type number     | Packaging form | Marking code | Reel quantity    | Boxed reel quantity | Packing quantity  | Notes                                                                     |
|-----------------|----------------|--------------|------------------|---------------------|-------------------|---------------------------------------------------------------------------|
| AiP74HC04SA.TR  | SOP14          | 74HC04       | 2500<br>PCS/reel | 5000<br>PCS/box     | 40000<br>PCS/pack | Dimensions of<br>plastic enclosure:<br>8.7mm×3.9mm<br>Pin spacing: 1.27mm |
| AiP74HCT04SA.TR | SOP14          | 74HCT04      | 2500<br>PCS/reel | 5000<br>PCS/box     | 40000<br>PCS/pack | Dimensions of<br>plastic enclosure:<br>8.7mm×3.9mm<br>Pin spacing: 1.27mm |
| AiP74HC04TA.TR  | TSSOP14        | 74HC04       | 3000<br>PCS/reel | 6000<br>PCS/box     | 48000<br>PCS/pack | Dimensions of<br>plastic enclosure:<br>5.0mm×4.4mm<br>Pin spacing: 0.65mm |
| AiP74HCT04TA.TR | TSSOP14        | 74HCT04      | 3000<br>PCS/reel | 6000<br>PCS/box     | 48000<br>PCS/pack | Dimensions of<br>plastic enclosure:<br>5.0mm×4.4mm<br>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

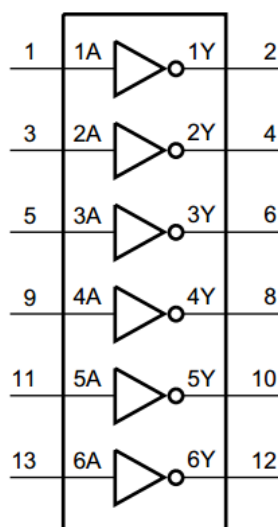


Figure 1. Logic symbol

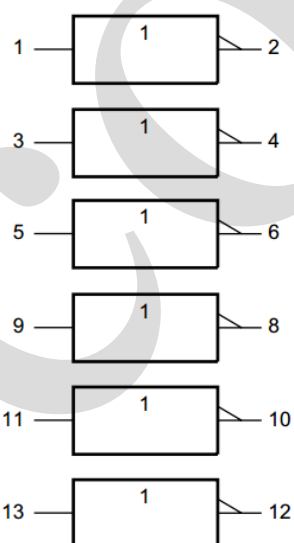


Figure 2. IEC logic symbol

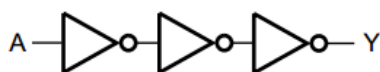
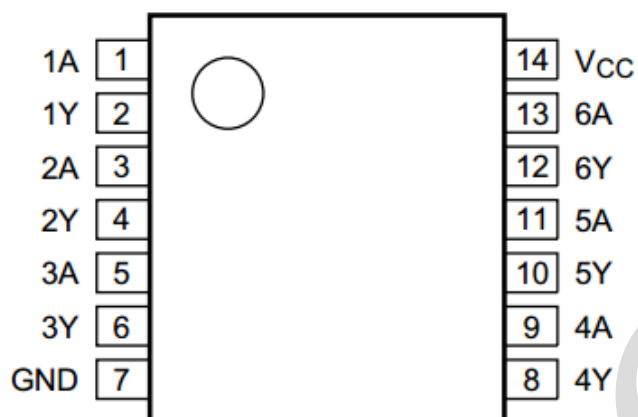


Figure 3. Logic diagram for one gate



## 2.2、Pin Configurations



## 2.3、Pin Description

| Pin No. | Pin Name        | Description    |
|---------|-----------------|----------------|
| 1       | 1A              | data input     |
| 2       | 1Y              | data output    |
| 3       | 2A              | data input     |
| 4       | 2Y              | data output    |
| 5       | 3A              | data input     |
| 6       | 3Y              | data output    |
| 7       | GND             | ground (0V)    |
| 8       | 4Y              | data output    |
| 9       | 4A              | data input     |
| 10      | 5Y              | data output    |
| 11      | 5A              | data input     |
| 12      | 6Y              | data output    |
| 13      | 6A              | data input     |
| 14      | V <sub>CC</sub> | supply voltage |

## 2.4、Function Table

| Input | Output |
|-------|--------|
| nA    | nY     |
| L     | H      |
| H     | L      |

Note: H=HIGH voltage level; L=LOW voltage level.



## 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       | 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   |
| total power dissipation | $P_{tot}$ | -                                    | -    | 500      | mW   |
| storage temperature     | $T_{stg}$ | -                                    | -65  | +150     | °C   |
| Soldering temperature   | $T_L$     | 10s                                  | DIP  | 245      | °C   |
|                         |           |                                      | SOP  | 250      |      |

Note:

[1] For DIP14 packages: above 70°C the value of  $P_{tot}$  derates linearly with 12mW/K.

[2] For SOP14 packages: above 70°C the value of  $P_{tot}$  derates linearly with 8mW/K.

[3] For (T)SSOP14 packages: above 60°C the value of  $P_{tot}$  derates linearly with 5.5mW/K.

### 3.2、Recommended Operating Conditions

| Parameter                           | Symbol              | Conditions    | Min. | Typ. | Max.     | Unit |
|-------------------------------------|---------------------|---------------|------|------|----------|------|
| AiP74HC04                           |                     |               |      |      |          |      |
| 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   |
| AiP74HCT04                          |                     |               |      |      |          |      |
| 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

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

| Parameter                 | Symbol           | Conditions                                                                                                                                      |                                               | Min. | Typ. | Max. | Unit |
|---------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------|------|------|------|
| AiP74HC04                 |                  |                                                                                                                                                 |                                               |      |      |      |      |
| HIGH-level input voltage  | V <sub>IH</sub>  | V <sub>CC</sub> =2.0V                                                                                                                           |                                               | 1.5  | 1.2  | -    | V    |
|                           |                  | V <sub>CC</sub> =4.5V                                                                                                                           |                                               | 3.15 | 2.4  | -    | V    |
|                           |                  | V <sub>CC</sub> =6.0V                                                                                                                           |                                               | 4.2  | 3.2  | -    | V    |
| LOW-level input voltage   | V <sub>IL</sub>  | V <sub>CC</sub> =2.0V                                                                                                                           |                                               | -    | 0.8  | 0.5  | V    |
|                           |                  | V <sub>CC</sub> =4.5V                                                                                                                           |                                               | -    | 2.1  | 1.35 | V    |
|                           |                  | V <sub>CC</sub> =6.0V                                                                                                                           |                                               | -    | 2.8  | 1.8  | V    |
| HIGH-level output voltage | V <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =-20uA; V <sub>CC</sub> =2.0V  | 1.9  | 2.0  | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V  | 4.4  | 4.5  | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-20uA; V <sub>CC</sub> =6.0V  | 5.9  | 6.0  | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-4.0mA; V <sub>CC</sub> =4.5V | 3.98 | 4.32 | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-5.2mA; V <sub>CC</sub> =6.0V | 5.48 | 5.81 | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =20uA; V <sub>CC</sub> =2.0V   | -    | 0    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V   | -    | 0    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =20uA; V <sub>CC</sub> =6.0V   | -    | 0    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =4.0mA; V <sub>CC</sub> =4.5V  | -    | 0.15 | 0.26 | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =5.2mA; V <sub>CC</sub> =6.0V  | -    | 0.16 | 0.26 | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V                                                                                  |                                               | -    | -    | ±0.1 | uA   |
| supply current            | I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =6.0V                                                              |                                               | -    | -    | 2.0  | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                               |                                               | -    | 3.5  | -    | pF   |
| AiP74HCT04                |                  |                                                                                                                                                 |                                               |      |      |      |      |
| HIGH-level input voltage  | V <sub>IH</sub>  | V <sub>CC</sub> =4.5V to 5.5V                                                                                                                   |                                               | 2.0  | 1.6  | -    | V    |
| LOW-level input voltage   | V <sub>IL</sub>  | V <sub>CC</sub> =4.5V to 5.5V                                                                                                                   |                                               | -    | 1.2  | 0.8  | V    |
| HIGH-level output voltage | V <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V  | 4.4  | 4.5  | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-4.0mA; V <sub>CC</sub> =4.5V | 3.98 | 4.32 | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V   | -    | 0    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =5.2mA; V <sub>CC</sub> =4.5V  | -    | 0.15 | 0.26 | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V                                                                                  |                                               | -    | -    | ±0.1 | uA   |
| supply current            | I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =5.5V                                                              |                                               | -    | -    | 2.0  | uA   |
| additional supply current | ΔI <sub>CC</sub> | per input pin; V <sub>I</sub> =V <sub>CC</sub> -2.1V; I <sub>O</sub> =0A; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> =4.5V to 5.5V |                                               | -    | 120  | 432  | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                               |                                               | -    | 3.5  | -    | pF   |



## 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 |
|---------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------|------|------|------|
| AiP74HC04                 |                  |                                                                                                                                                 |                                               |      |      |      |      |
| HIGH-level input voltage  | V <sub>IH</sub>  | V <sub>CC</sub> =2.0V                                                                                                                           |                                               | 1.5  | -    | -    | V    |
|                           |                  | V <sub>CC</sub> =4.5V                                                                                                                           |                                               | 3.15 | -    | -    | V    |
|                           |                  | V <sub>CC</sub> =6.0V                                                                                                                           |                                               | 4.2  | -    | -    | V    |
| LOW-level input voltage   | V <sub>IL</sub>  | V <sub>CC</sub> =2.0V                                                                                                                           |                                               | -    | -    | 0.5  | V    |
|                           |                  | V <sub>CC</sub> =4.5V                                                                                                                           |                                               | -    | -    | 1.35 | V    |
|                           |                  | V <sub>CC</sub> =6.0V                                                                                                                           |                                               | -    | -    | 1.8  | V    |
| HIGH-level output voltage | V <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =-20uA; V <sub>CC</sub> =2.0V  | 1.9  | -    | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V  | 4.4  | -    | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-20uA; V <sub>CC</sub> =6.0V  | 5.9  | -    | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-4.0mA; V <sub>CC</sub> =4.5V | 3.84 | -    | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-5.2mA; V <sub>CC</sub> =6.0V | 5.34 | -    | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =20uA; V <sub>CC</sub> =2.0V   | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V   | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =20uA; V <sub>CC</sub> =6.0V   | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =4.0mA; V <sub>CC</sub> =4.5V  | -    | -    | 0.33 | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =5.2mA; V <sub>CC</sub> =6.0V  | -    | -    | 0.33 | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V                                                                                  |                                               | -    | -    | ±1   | uA   |
| supply current            | I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =6.0V                                                              |                                               | -    | -    | 20   | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                               |                                               | -    | -    | -    | pF   |
| AiP74HCT04                |                  |                                                                                                                                                 |                                               |      |      |      |      |
| HIGH-level input voltage  | V <sub>IH</sub>  | V <sub>CC</sub> =4.5V to 5.5V                                                                                                                   |                                               | 2.0  | -    | -    | V    |
| LOW-level input voltage   | V <sub>IL</sub>  | V <sub>CC</sub> =4.5V to 5.5V                                                                                                                   |                                               | -    | -    | 0.8  | V    |
| HIGH-level output voltage | V <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V  | 4.4  | -    | -    | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =-4.0mA; V <sub>CC</sub> =4.5V | 3.84 | -    | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                                                             | I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V   | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                                 | I <sub>O</sub> =5.2mA; V <sub>CC</sub> =4.5V  | -    | -    | 0.33 | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V                                                                                  |                                               | -    | -    | ±1   | uA   |
| supply current            | I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =5.5V                                                              |                                               | -    | -    | 20   | uA   |
| additional supply current | ΔI <sub>CC</sub> | per input pin; V <sub>I</sub> =V <sub>CC</sub> -2.1V; I <sub>O</sub> =0A; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> =4.5V to 5.5V |                                               | -    | -    | 540  | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                               |                                               | -    | -    | -    | pF   |



## 3.3.3、AC 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 |
|--------------------------------|----------|-----------------------------------------------------------|---------------------------------------|------|------|------|
| AiP74HC04                      |          |                                                           |                                       |      |      |      |
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5                                              | $V_{CC}=2.0\text{V}$                  | -    | 25   | ns   |
|                                |          |                                                           | $V_{CC}=4.5\text{V}$                  | -    | 9    | ns   |
|                                |          |                                                           | $V_{CC}=5.0\text{V}; C_L=15\text{pF}$ | -    | 7    | ns   |
|                                |          |                                                           | $V_{CC}=6.0\text{V}$                  | -    | 7    | ns   |
| transition time                | $t_t$    | see Figure 5                                              | $V_{CC}=2.0\text{V}$                  | -    | 19   | ns   |
|                                |          |                                                           | $V_{CC}=4.5\text{V}$                  | -    | 7    | ns   |
|                                |          |                                                           | $V_{CC}=6.0\text{V}$                  | -    | 6    | ns   |
| power dissipation capacitance  | $C_{PD}$ | per package;<br>$V_I = \text{GND to } V_{CC}$             | -                                     | 21   | -    | pF   |
| AiP74HCT04                     |          |                                                           |                                       |      |      |      |
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5                                              | $V_{CC}=4.5\text{V}$                  | -    | 10   | ns   |
|                                |          |                                                           | $V_{CC}=5.0\text{V}; C_L=15\text{pF}$ | -    | 8    | ns   |
| transition time                | $t_t$    | see Figure 5                                              | $V_{CC}=4.5\text{V}$                  | -    | 7    | ns   |
| power dissipation capacitance  | $C_{PD}$ | per package;<br>$V_I = \text{GND to } V_{CC}-1.5\text{V}$ | -                                     | 24   | -    | 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).

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

$N$ =number of inputs switching;

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



## 3.3.4、AC Characteristics 2

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

| Parameter                      | Symbol   | Conditions                                                | Min.                                  | Typ. | Max. | Unit   |
|--------------------------------|----------|-----------------------------------------------------------|---------------------------------------|------|------|--------|
| AiP74HC04                      |          |                                                           |                                       |      |      |        |
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5                                              | $V_{CC}=2.0\text{V}$                  | -    | -    | 105 ns |
|                                |          |                                                           | $V_{CC}=4.5\text{V}$                  | -    | -    | 21 ns  |
|                                |          |                                                           | $V_{CC}=5.0\text{V}; C_L=15\text{pF}$ | -    | -    | - ns   |
|                                |          |                                                           | $V_{CC}=6.0\text{V}$                  | -    | -    | 18 ns  |
| transition time                | $t_t$    | see Figure 5                                              | $V_{CC}=2.0\text{V}$                  | -    | -    | 95 ns  |
|                                |          |                                                           | $V_{CC}=4.5\text{V}$                  | -    | -    | 19 ns  |
|                                |          |                                                           | $V_{CC}=6.0\text{V}$                  | -    | -    | 16 ns  |
| power dissipation capacitance  | $C_{PD}$ | per package;<br>$V_I = \text{GND to } V_{CC}$             | -                                     | -    | -    | pF     |
| AiP74HCT04                     |          |                                                           |                                       |      |      |        |
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5                                              | $V_{CC}=4.5\text{V}$                  | -    | -    | 24 ns  |
|                                |          |                                                           | $V_{CC}=5.0\text{V}; C_L=15\text{pF}$ | -    | -    | - ns   |
| transition time                | $t_t$    | see Figure 5                                              | $V_{CC}=4.5\text{V}$                  | -    | -    | 19 ns  |
| power dissipation capacitance  | $C_{PD}$ | per package;<br>$V_I = \text{GND to } V_{CC}-1.5\text{V}$ | -                                     | -    | -    | 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 uW).

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

$N$ =number of inputs switching;

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



## 4、Testing Circuit

### 4.1、AC Testing Circuit

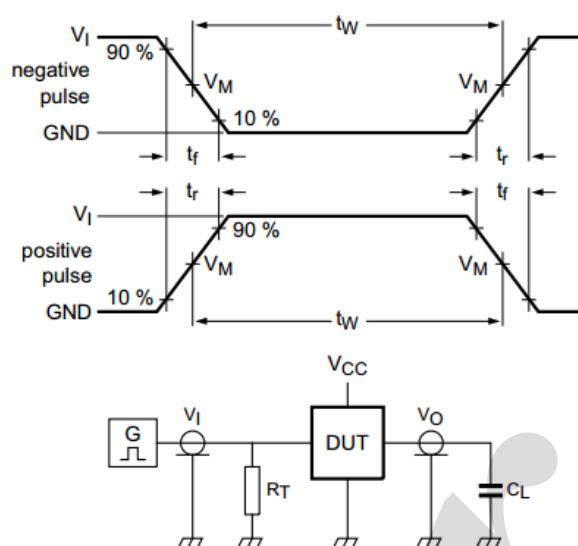


Figure 4. Test circuit for measuring switching times

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.

### 4.2、AC Testing Waveforms

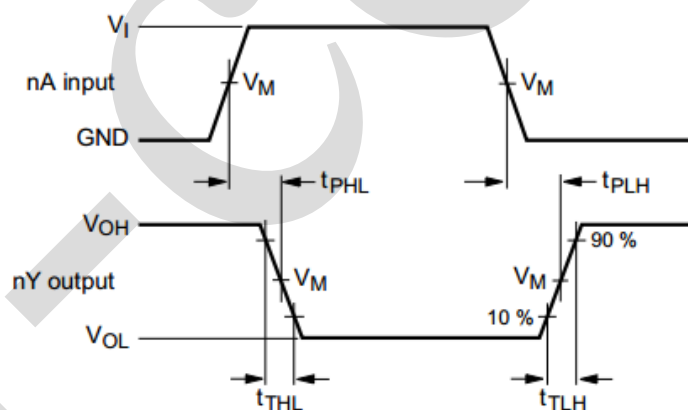


Figure 5. The input (nA) to output (nY) propagation delay times



## 4.3、Measurement Points

| Type       | Input               | Output              |
|------------|---------------------|---------------------|
|            | $V_M$               | $V_M$               |
| AiP74HC04  | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| AiP74HCT04 | 1.3V                | 1.3V                |

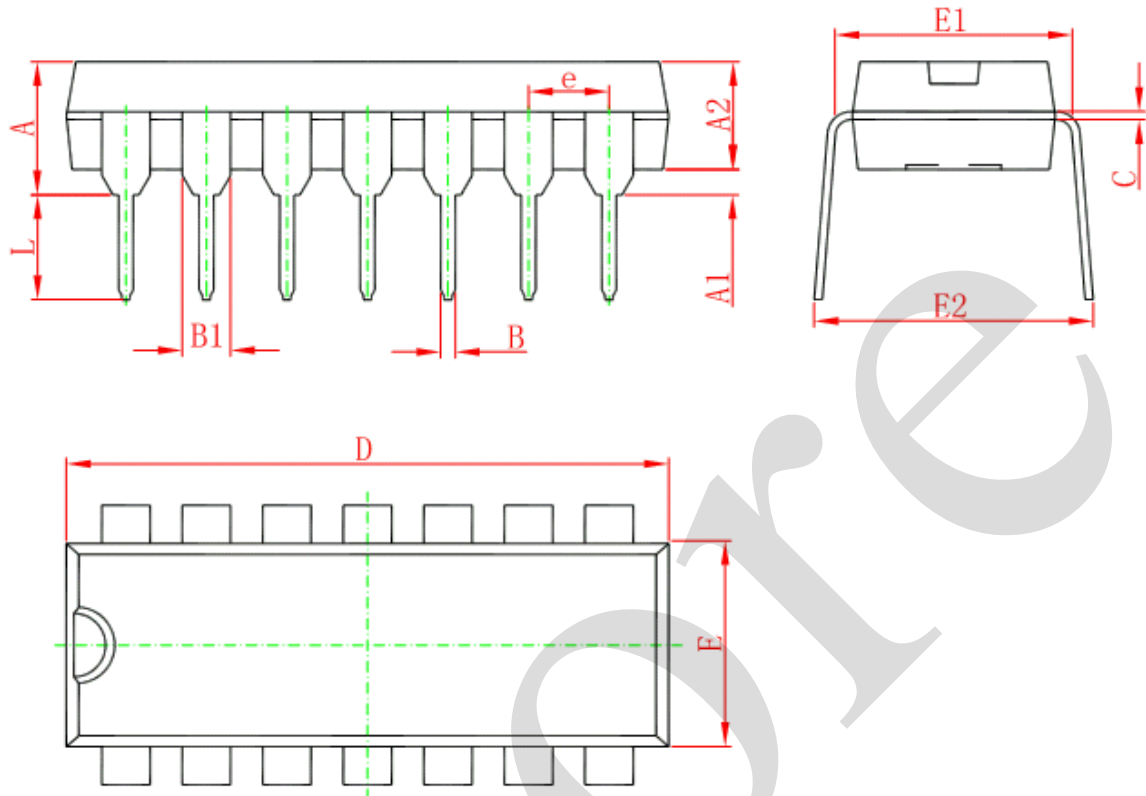
## 4.4、Test Data

| Type       | Input    |            | Load       | Test               |
|------------|----------|------------|------------|--------------------|
|            | $V_I$    | $t_r, t_f$ | $C_L$      |                    |
| AiP74HC04  | $V_{CC}$ | 6.0ns      | 15pF, 50pF | $t_{PLH}, t_{PHL}$ |
| AiP74HCT04 | 3.0V     | 6.0ns      | 15pF, 50pF | $t_{PLH}, t_{PHL}$ |



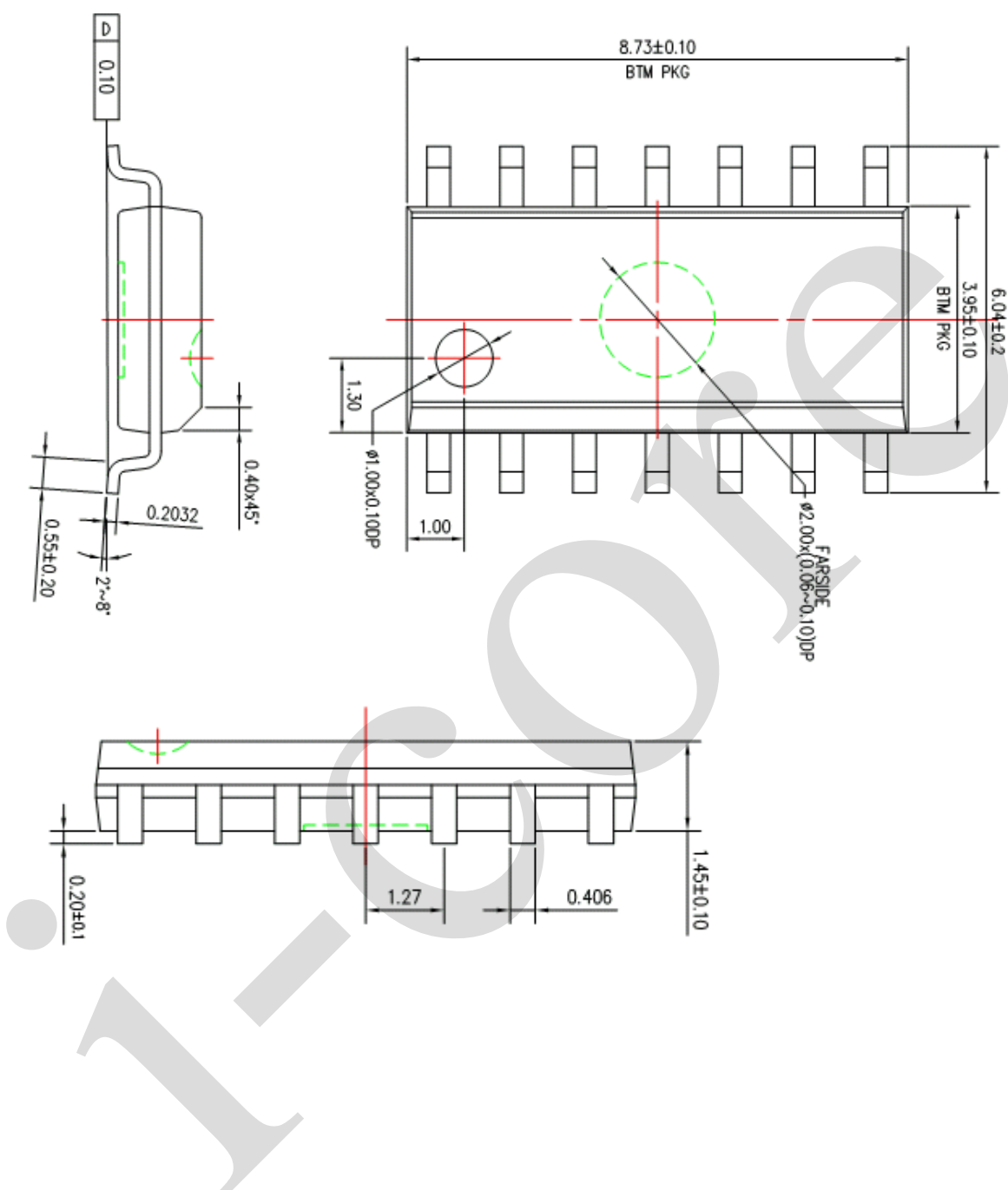
## 5、Package Information

### 5.1、DIP14



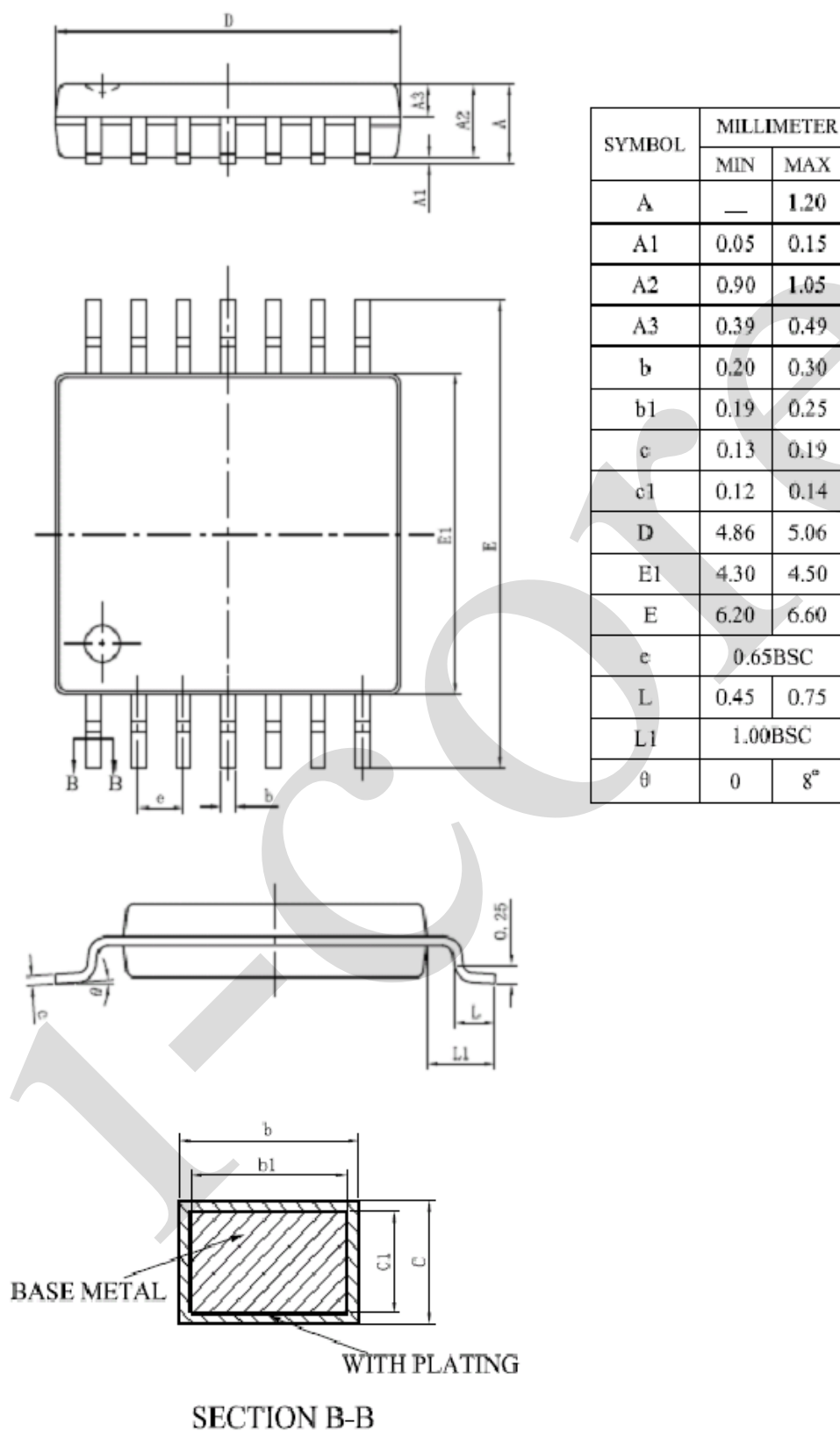
| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min                       | Max    | Min                  | Max   |
| A      | 3.710                     | 4.310  | 0.146                | 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、SOP14





## 5.3、TSSOP14





## 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             | <p>○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.</p> <p>×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.</p> |                               |                               |                               |                          |                                |                   |                       |                           |                      |

### 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.