



# AiP74HC/HCT238

## 3-to-8 Line Decoder/Demultiplexer

### Product Specification

#### Specification Revision History:

| Version    | Date    | Description                                                                               |
|------------|---------|-------------------------------------------------------------------------------------------|
| 2012-06-A1 | 2012-06 | New                                                                                       |
| 2021-12-A2 | 2021-12 | Modify Ordering Information                                                               |
| 2022-01-A3 | 2022-01 | Modify ambient temperature to -40℃~+105℃ and add electrical characteristics of -40℃~+105℃ |
|            |         |                                                                                           |



## 1、 General Description

The AiP74HC/HCT238 decodes three binary weighted address inputs (A0, A1 and A2) to eight mutually exclusive outputs (Y0 to Y7). The device features three enable inputs ( $\bar{E}1$  and  $\bar{E}2$  and E3). Every output will be LOW unless  $\bar{E}1$  and  $\bar{E}2$  are LOW and E3 is HIGH. This multiple enable function allows easy parallel expansion to a 1-of-32 (5 to 32 lines) decoder with just four AiP74HC/HCT238 ICs and one inverter. The AiP74HC/HCT238 can be used as an eight output demultiplexer by using one of the active LOW enable inputs as the data input and the remaining enable inputs as strobes. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### Features:

- Input levels:
  - For AiP74HC238: CMOS level
  - For AiP74HCT238: TTL level
- Demultiplexing capability
- Multiple input enable for easy expansion
- Ideal for memory chip select decoding
- Active HIGH mutually exclusive outputs
- Specified from -40°C to +105°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                                                                |
|--------------------|----------------|--------------|----------------|---------------------|------------------|----------------------------------------------------------------------|
| AiP74HC238DA16.TB  | DIP16          | 74HC238      | 25<br>PCS/tube | 40<br>tube/box      | 1000<br>PCS/box  | Dimensions of plastic enclosure: 19.0mm×6.4mm<br>Pin spacing: 2.54mm |
| AiP74HCT238DA16.TB | DIP16          | 74HCT238     | 25<br>PCS/tube | 40<br>tube/box      | 1000<br>PCS/box  | Dimensions of plastic enclosure: 19.0mm×6.4mm<br>Pin spacing: 2.54mm |
| AiP74HC238SA16.TB  | SOP16(1)       | 74HC238      | 50<br>PCS/tube | 100<br>tube/box     | 5000<br>PCS/box  | Dimensions of plastic enclosure: 10.0mm×3.9mm<br>Pin spacing: 1.27mm |
| AiP74HC238SA16.TB  | SOP16(2)       | 74HC238      | 50<br>PCS/tube | 200<br>tube/box     | 10000<br>PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm<br>Pin spacing: 1.27mm |
| AiP74HCT238SA16.TB | SOP16          | 74HCT238     | 50<br>PCS/tube | 200<br>tube/box     | 10000<br>PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm<br>Pin spacing: 1.27mm |
| AiP74HC238TA16.TB  | TSSOP16        | 74HC238      | 92<br>PCS/tube | 100<br>tube/box     | 9200<br>PCS/box  | Dimensions of plastic enclosure: 5.0mm×4.4mm<br>Pin spacing: 0.65mm  |
| AiP74HCT238TA16.TB | TSSOP16        | 74HCT238     | 92<br>PCS/tube | 100<br>tube/box     | 9200<br>PCS/box  | Dimensions of plastic enclosure: 5.0mm×4.4mm<br>Pin spacing: 0.65mm  |

**Reel packing specifications:**

| Part number        | Packaging form | Marking code | Reel quantity    | Boxed reel quantity | Notes                                                                  |
|--------------------|----------------|--------------|------------------|---------------------|------------------------------------------------------------------------|
| AiP74HC238SA16.TR  | SOP16          | 74HC238      | 4000<br>PCS/reel | 8000<br>PCS/box     | Dimensions of plastic enclosure:<br>10.0mm×3.9mm<br>Pin spacing:1.27mm |
| AiP74HCT238SA16.TR | SOP16          | 74HCT238     | 4000<br>PCS/reel | 8000<br>PCS/box     | Dimensions of plastic enclosure:<br>10.0mm×3.9mm<br>Pin spacing:1.27mm |
| AiP74HC238TA16.TR  | TSSOP16        | 74HC238      | 5000<br>PCS/reel | 10000<br>PCS/box    | Dimensions of plastic enclosure:<br>5.0mm×4.4mm<br>Pin spacing:0.65mm  |
| AiP74HCT238TA16.TR | TSSOP16        | 74HCT238     | 5000<br>PCS/reel | 10000<br>PCS/box    | Dimensions of 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

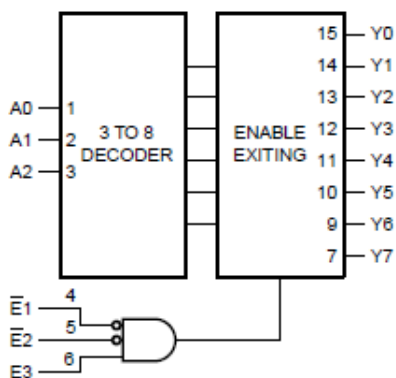


Figure 1. Logic symbol

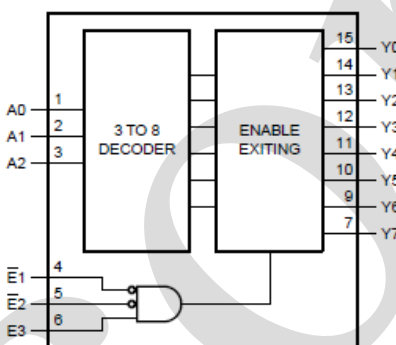


Figure 2. Functional diagram

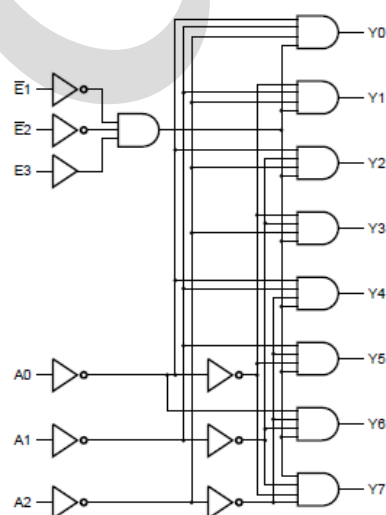
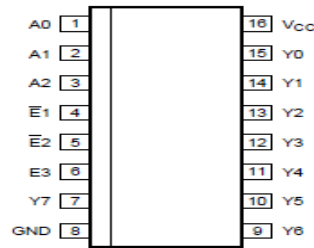


Figure 3. Logic diagram



## 2.2、Pin Configurations



## 2.3、Pin Description

| Pin No. | Pin Name        | Description                |
|---------|-----------------|----------------------------|
| 1       | A0              | address input              |
| 2       | A1              | address input              |
| 3       | A2              | address input              |
| 4       | $\bar{E}1$      | enable input (active LOW)  |
| 5       | $\bar{E}2$      | enable input (active LOW)  |
| 6       | E3              | enable input (active HIGH) |
| 7       | Y7              | output (active HIGH)       |
| 8       | GND             | ground (0V)                |
| 9       | Y6              | output (active HIGH)       |
| 10      | Y5              | output (active HIGH)       |
| 11      | Y4              | output (active HIGH)       |
| 12      | Y3              | output (active HIGH)       |
| 13      | Y2              | output (active HIGH)       |
| 14      | Y1              | output (active HIGH)       |
| 15      | Y0              | output (active HIGH)       |
| 16      | V <sub>CC</sub> | supply voltage             |

## 2.4、Function Table

| Input      |            |    |    |    |    | Output |    |    |    |    |    |    |    |
|------------|------------|----|----|----|----|--------|----|----|----|----|----|----|----|
| $\bar{E}1$ | $\bar{E}2$ | E3 | A0 | A1 | A2 | Y0     | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| H          | X          | X  | X  | X  | X  | L      | L  | L  | L  | L  | L  | L  | L  |
| X          | H          | X  | X  | X  | X  | L      | L  | L  | L  | L  | L  | L  | L  |
| X          | X          | L  | X  | X  | X  | L      | L  | L  | L  | L  | L  | L  | L  |
| L          | L          | H  | L  | L  | L  | H      | L  | L  | L  | L  | L  | L  | L  |
| L          | L          | H  | H  | L  | L  | L      | H  | L  | L  | L  | L  | L  | L  |
| L          | L          | H  | L  | H  | L  | L      | L  | H  | L  | L  | L  | L  | L  |
| L          | L          | H  | H  | H  | L  | L      | L  | L  | H  | L  | L  | L  | L  |
| L          | L          | H  | L  | L  | H  | L      | L  | L  | L  | H  | L  | L  | L  |
| L          | L          | H  | H  | L  | H  | L      | L  | L  | L  | L  | H  | L  | L  |
| L          | L          | H  | L  | H  | H  | L      | L  | L  | L  | L  | L  | H  | L  |
| L          | L          | H  | H  | H  | H  | L      | L  | L  | L  | L  | L  | 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     | °C   |
| total power dissipation | $P_{tot}$ | -                                    | -    | 500      | mW   |
| Soldering temperature   | $T_L$     | 10s                                  | DIP  | 245      | °C   |
|                         |           |                                      | SOP  | 250      | °C   |

Note:

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

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

[3] For (T)SSOP16 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 |
|-------------------------------------|---------------------|---------------|------|------|----------|------|
| <b>AiP74HC238</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    |
| 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  | -    | +105     | °C   |
| <b>AiP74HCT238</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    |
| input transition rise and fall rate | $\Delta t/\Delta V$ | $V_{CC}=4.5V$ | -    | 1.67 | 139      | ns/V |
| ambient temperature                 | $T_{amb}$           | -             | -40  | -    | +105     | °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 |
|---------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|
| AiP74HC238                |                  |                                                                                                                                  |                                                     |      |      |      |      |
| 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                                                |                                                     | -    | -    | 8.0  | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                |                                                     | -    | 3.5  | -    | pF   |
| AiP74HCT238               |                  |                                                                                                                                  |                                                     |      |      |      |      |
| 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> ; V <sub>CC</sub> =4.5V                                                      | I <sub>O</sub> =-20uA                               | 4.4  | 4.5  | -    | V    |
|                           |                  |                                                                                                                                  | I <sub>O</sub> =-4.0mA                              | 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> ; V <sub>CC</sub> =4.5V                                                      | I <sub>O</sub> =20uA                                | -    | 0    | 0.1  | V    |
|                           |                  |                                                                                                                                  | I <sub>O</sub> =4.0mA                               | -    | 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> =5.5V                                                                    |                                                     | -    | -    | ±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                                                |                                                     | -    | -    | 8.0  | uA   |
| additional supply current | ΔI <sub>CC</sub> | V <sub>I</sub> =V <sub>CC</sub> -2.1V; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =4.5V to 5.5V | An inputs                                           | -    | 70   | 252  | uA   |
|                           |                  |                                                                                                                                  | $\overline{\text{E}}1, \overline{\text{E}}2$ inputs | -    | 40   | 144  | uA   |
|                           |                  |                                                                                                                                  | E3 input                                            | -    | 145  | 522  | uA   |
| input capacitance         | C <sub>I</sub>   | -                                                                                                                                |                                                     | -    | 3.5  | -    | pF   |



## 3.3.2、DC Characteristics 2

(T<sub>amb</sub>=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                 | Symbol           | Conditions                                                                                                                                |                                                     | Min. | Typ. | Max. | Unit |
|---------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|
| AiP74HC238                |                  |                                                                                                                                           |                                                     |      |      |      |      |
| 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                                                                             |                                                     | -    | -    | ±1.0 | 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                                                         |                                                     | -    | -    | 80   | uA   |
| AiP74HCT238               |                  |                                                                                                                                           |                                                     |      |      |      |      |
| 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> ;<br>V <sub>CC</sub> =4.5V                                                            | I <sub>O</sub> =-20uA                               | 4.4  | -    | -    | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =-4.0mA                              | 3.84 | -    | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>CC</sub> =4.5V                                                            | I <sub>O</sub> =20uA                                | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =4.0mA                               | -    | -    | 0.33 | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =5.5V                                                                             |                                                     | -    | -    | ±1.0 | 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                                                         |                                                     | -    | -    | 80   | uA   |
| additional supply current | ΔI <sub>CC</sub> | V <sub>I</sub> =V <sub>CC</sub> -2.1V;<br>other inputs at V <sub>CC</sub><br>or GND; I <sub>O</sub> =0A;<br>V <sub>CC</sub> =4.5V to 5.5V | An inputs                                           | -    | -    | 315  | uA   |
|                           |                  |                                                                                                                                           | $\overline{\text{E}}1, \overline{\text{E}}2$ inputs | -    | -    | 180  | uA   |
|                           |                  |                                                                                                                                           | E3 input                                            | -    | -    | 653  | uA   |



## 3.3.3、DC Characteristics 3

(T<sub>amb</sub>= -40°C to +105°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                 | Symbol           | Conditions                                                                                                                                |                                                     | Min. | Typ. | Max. | Unit |
|---------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|
| AiP74HC238                |                  |                                                                                                                                           |                                                     |      |      |      |      |
| 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       | 3.7  | -    | -    | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =-5.2mA; V <sub>CC</sub> =6.0V       | 5.2  | -    | -    | 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        | -    | -    | 0.4  | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =5.2mA; V <sub>CC</sub> =6.0V        | -    | -    | 0.4  | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V                                                                             |                                                     | -    | -    | ±1.0 | 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                                                         |                                                     | -    | -    | 160  | uA   |
| AiP74HCT238               |                  |                                                                                                                                           |                                                     |      |      |      |      |
| 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> ;<br>V <sub>CC</sub> =4.5V                                                            | I <sub>O</sub> =-20uA                               | 4.4  | -    | -    | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =-4.0mA                              | 3.7  | -    | -    | V    |
| LOW-level output voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>CC</sub> =4.5V                                                            | I <sub>O</sub> =20uA                                | -    | -    | 0.1  | V    |
|                           |                  |                                                                                                                                           | I <sub>O</sub> =4.0mA                               | -    | -    | 0.4  | V    |
| input leakage current     | I <sub>I</sub>   | V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =5.5V                                                                             |                                                     | -    | -    | ±1.0 | 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                                                         |                                                     | -    | -    | 160  | uA   |
| additional supply current | ΔI <sub>CC</sub> | V <sub>I</sub> =V <sub>CC</sub> -2.1V;<br>other inputs at V <sub>CC</sub><br>or GND; I <sub>O</sub> =0A;<br>V <sub>CC</sub> =4.5V to 5.5V | An inputs                                           | -    | -    | 343  | uA   |
|                           |                  |                                                                                                                                           | $\overline{\text{E}}1, \overline{\text{E}}2$ inputs | -    | -    | 196  | uA   |
|                           |                  |                                                                                                                                           | E3 input                                            | -    | -    | 711  | uA   |



## 3.3.4、AC Characteristics 1

(T<sub>amb</sub>=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter                     | Symbol          | Conditions                                                |                                             | Min. | Typ. | Max. | Unit |
|-------------------------------|-----------------|-----------------------------------------------------------|---------------------------------------------|------|------|------|------|
| AiP74HC238                    |                 |                                                           |                                             |      |      |      |      |
| propagation delay             | t <sub>pd</sub> | An to Yn;<br>see Figure 5                                 | V <sub>CC</sub> =2.0V                       | -    | 47   | 150  | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =4.5V                       | -    | 17   | 30   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 14   | -    | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =6.0V                       | -    | 14   | 26   | ns   |
|                               |                 | E3 to Yn;<br>see Figure 5                                 | V <sub>CC</sub> =2.0V                       | -    | 52   | 160  | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =4.5V                       | -    | 19   | 32   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 16   | -    | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =6.0V                       | -    | 15   | 27   | ns   |
|                               |                 | $\bar{E}$ n to Yn;<br>see Figure 6                        | V <sub>CC</sub> =2.0V                       | -    | 50   | 155  | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =4.5V                       | -    | 18   | 31   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 17   | -    | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =6.0V                       | -    | 14   | 26   | ns   |
| transition time               | t <sub>t</sub>  | see Figure 5, 6                                           | V <sub>CC</sub> =2.0V                       | -    | 19   | 75   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =4.5V                       | -    | 7    | 15   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =6.0V                       | -    | 6    | 13   | ns   |
| power dissipation capacitance | C <sub>PD</sub> | per package; V <sub>I</sub> =GND to V <sub>CC</sub>       |                                             | -    | 72   | -    | pF   |
| AiP74HCT238                   |                 |                                                           |                                             |      |      |      |      |
| propagation delay             | t <sub>pd</sub> | An to Yn;<br>see Figure 5                                 | V <sub>CC</sub> =4.5V                       | -    | 19   | 35   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 18   | -    | ns   |
|                               |                 | E3 to Yn;<br>see Figure 5                                 | V <sub>CC</sub> =4.5V                       | -    | 20   | 37   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 20   | -    | ns   |
|                               |                 | $\bar{E}$ n to Yn;<br>see Figure 6                        | V <sub>CC</sub> =4.5V                       | -    | 20   | 35   | ns   |
|                               |                 |                                                           | V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF | -    | 21   | -    | ns   |
| transition time               | t <sub>t</sub>  | V <sub>CC</sub> =4.5V; see Figure 5, 6                    |                                             | -    | 7    | 15   | ns   |
| power dissipation capacitance | C <sub>PD</sub> | per package; V <sub>I</sub> =GND to V <sub>CC</sub> -1.5V |                                             | -    | 76   | -    | pF   |

Note:

[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.[2] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in uW).

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

f<sub>i</sub>=input frequency in MHz;f<sub>o</sub>=output frequency in MHz;C<sub>L</sub>=output load capacitance in pF;V<sub>CC</sub>=supply voltage in V;

N=number of inputs switching;

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



## 3.3.5、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 |
|-------------------|-----------------|----------------------------------------|-----------------------|------|------|------|------|
| AiP74HC238        |                 |                                        |                       |      |      |      |      |
| propagation delay | t <sub>pd</sub> | An to Yn;<br>see Figure 5              | V <sub>CC</sub> =2.0V | -    | -    | 190  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 38   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 33   | ns   |
|                   |                 | E3 to Yn;<br>see Figure 5              | V <sub>CC</sub> =2.0V | -    | -    | 200  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 40   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 34   | ns   |
|                   |                 | En to Yn;<br>see Figure 6              | V <sub>CC</sub> =2.0V | -    | -    | 195  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 39   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 33   | ns   |
| transition time   | t <sub>t</sub>  | see Figure 5, 6                        | V <sub>CC</sub> =2.0V | -    | -    | 95   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 19   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 16   | ns   |
| AiP74HCT238       |                 |                                        |                       |      |      |      |      |
| propagation delay | t <sub>pd</sub> | An to Yn;<br>see Figure 5              | V <sub>CC</sub> =4.5V | -    | -    | 44   | ns   |
|                   |                 | E3 to Yn;<br>see Figure 5              | V <sub>CC</sub> =4.5V | -    | -    | 46   | ns   |
|                   |                 | En to Yn;<br>see Figure 6              | V <sub>CC</sub> =4.5V | -    | -    | 44   | ns   |
| transition time   | t <sub>t</sub>  | V <sub>CC</sub> =4.5V; see Figure 5, 6 |                       | -    | -    | 19   | ns   |

Note:

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

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

**3.3.6、AC Characteristics 3**(T<sub>amb</sub>= -40°C to +105°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter         | Symbol          | Conditions                             |                       | Min. | Typ. | Max. | Unit |
|-------------------|-----------------|----------------------------------------|-----------------------|------|------|------|------|
| AiP74HC238        |                 |                                        |                       |      |      |      |      |
| propagation delay | t <sub>pd</sub> | An to Yn;<br>see Figure 5              | V <sub>CC</sub> =2.0V | -    | -    | 225  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 45   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 38   | ns   |
|                   |                 | E3 to Yn;<br>see Figure 5              | V <sub>CC</sub> =2.0V | -    | -    | 240  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 48   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 41   | ns   |
|                   |                 | $\bar{E}$ n to Yn;<br>see Figure 6     | V <sub>CC</sub> =2.0V | -    | -    | 235  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 47   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 40   | ns   |
| transition time   | t <sub>t</sub>  | see Figure 5, 6                        | V <sub>CC</sub> =2.0V | -    | -    | 110  | ns   |
|                   |                 |                                        | V <sub>CC</sub> =4.5V | -    | -    | 22   | ns   |
|                   |                 |                                        | V <sub>CC</sub> =6.0V | -    | -    | 19   | ns   |
| AiP74HCT238       |                 |                                        |                       |      |      |      |      |
| propagation delay | t <sub>pd</sub> | An to Yn;<br>see Figure 5              | V <sub>CC</sub> =4.5V | -    | -    | 53   | ns   |
|                   |                 | E3 to Yn;<br>see Figure 5              | V <sub>CC</sub> =4.5V | -    | -    | 56   | ns   |
|                   |                 | $\bar{E}$ n to Yn;<br>see Figure 6     | V <sub>CC</sub> =4.5V | -    | -    | 53   | ns   |
| transition time   | t <sub>t</sub>  | V <sub>CC</sub> =4.5V; see Figure 5, 6 |                       | -    | -    | 22   | ns   |

Note:

[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.[2] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.



## 4、Testing Circuit

### 4.1、AC Testing Circuit

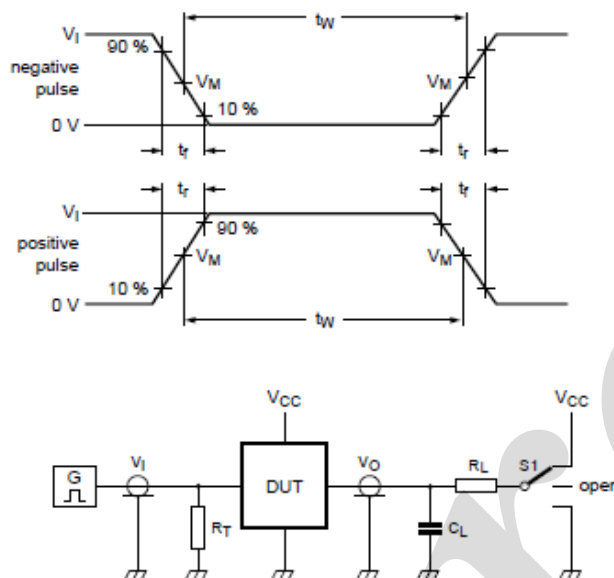


Figure 4. Test circuit for measuring switching times

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.

$R_L$ =Load resistance.

S1=Test selection switch.

### 4.2、AC Testing Waveforms

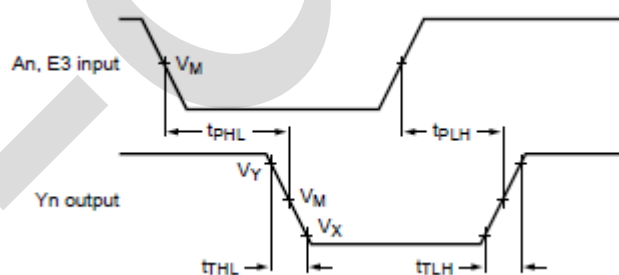


Figure 5. Input (An, E3) to output (Yn) propagation delays and output transition times

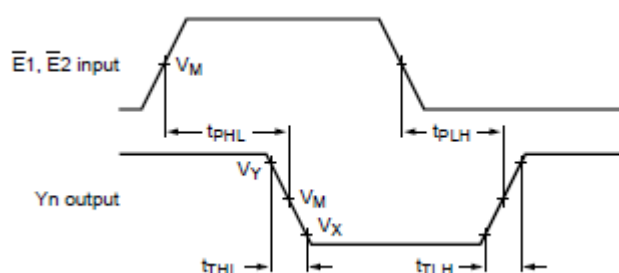


Figure 6. Input ( $\bar{E}1$ ,  $\bar{E}2$ ) to output ( $Y_n$ ) propagation delays and output transition times

#### 4.3、Measurement Points

| Type        | Input               | Output              |                     |                     |
|-------------|---------------------|---------------------|---------------------|---------------------|
|             | $V_M$               | $V_M$               | $V_X$               | $V_Y$               |
| AiP74HC238  | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |
| AiP74HCT238 | 1.3V                | 1.3V                | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |

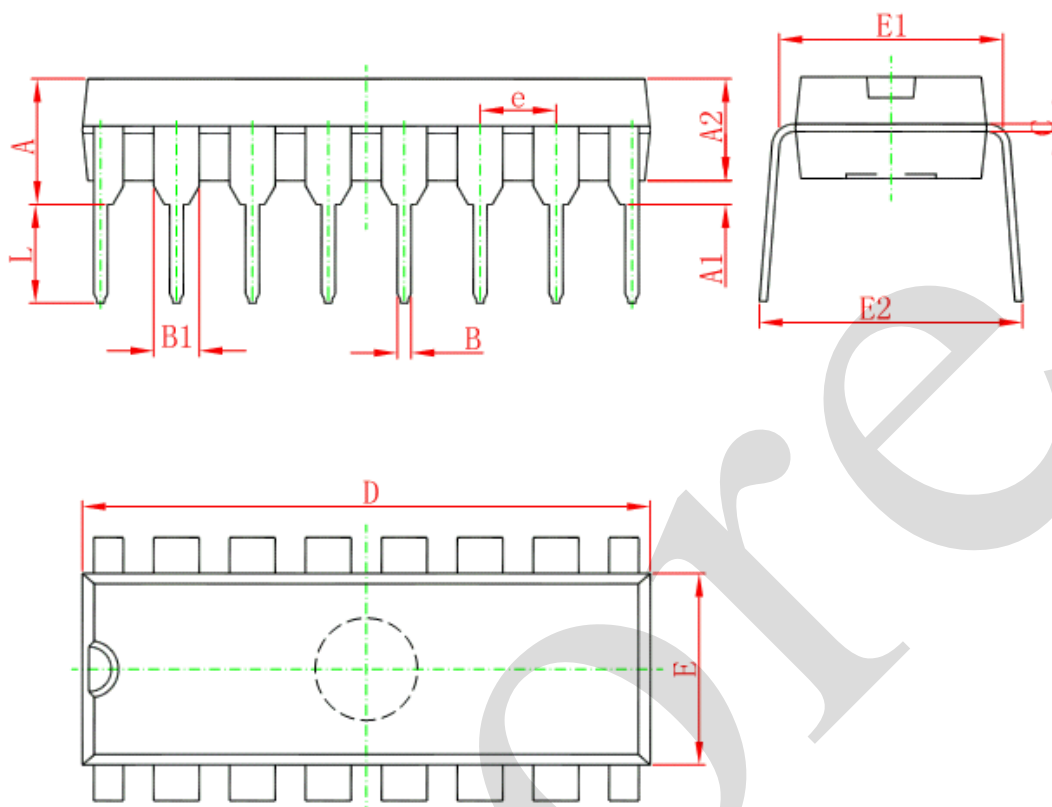
#### 4.4、Test Data

| Type        | Input    |            | Load       |             | S1 position        |
|-------------|----------|------------|------------|-------------|--------------------|
|             | $V_I$    | $t_r, t_f$ | $C_L$      | $R_L$       | $t_{PHL}, t_{PLH}$ |
| AiP74HC238  | $V_{CC}$ | 6ns        | 15pF, 50pF | 1k $\Omega$ | open               |
| AiP74HCT238 | 3V       | 6ns        | 15pF, 50pF | 1k $\Omega$ | open               |



## 5、Package Information

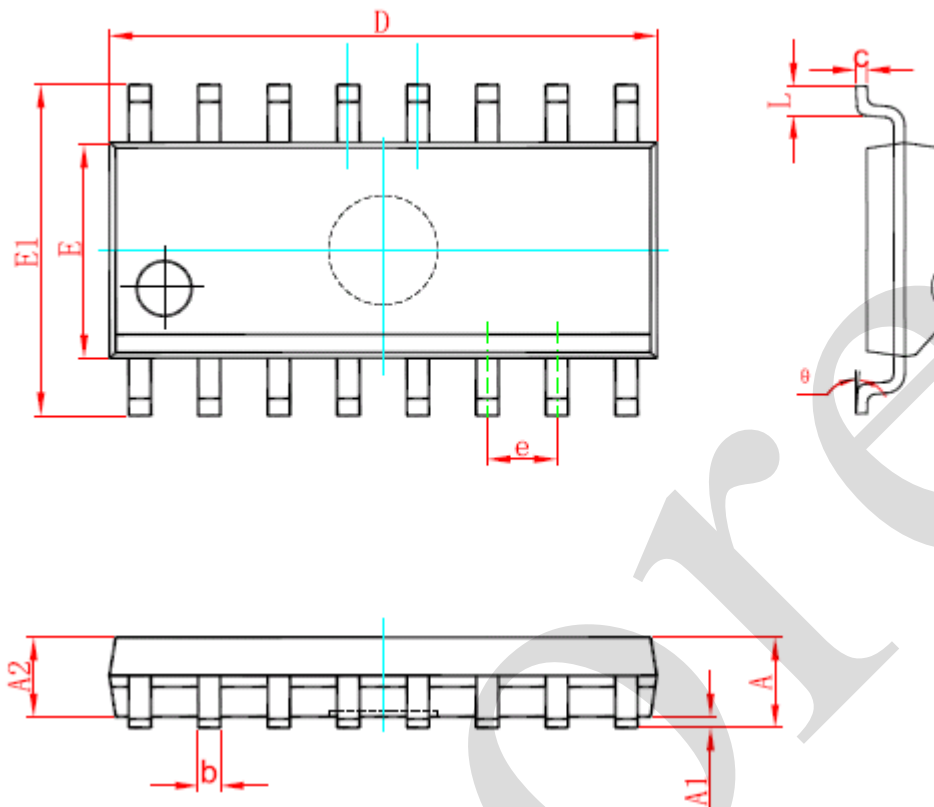
### 5.1、DIP16



| 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 |



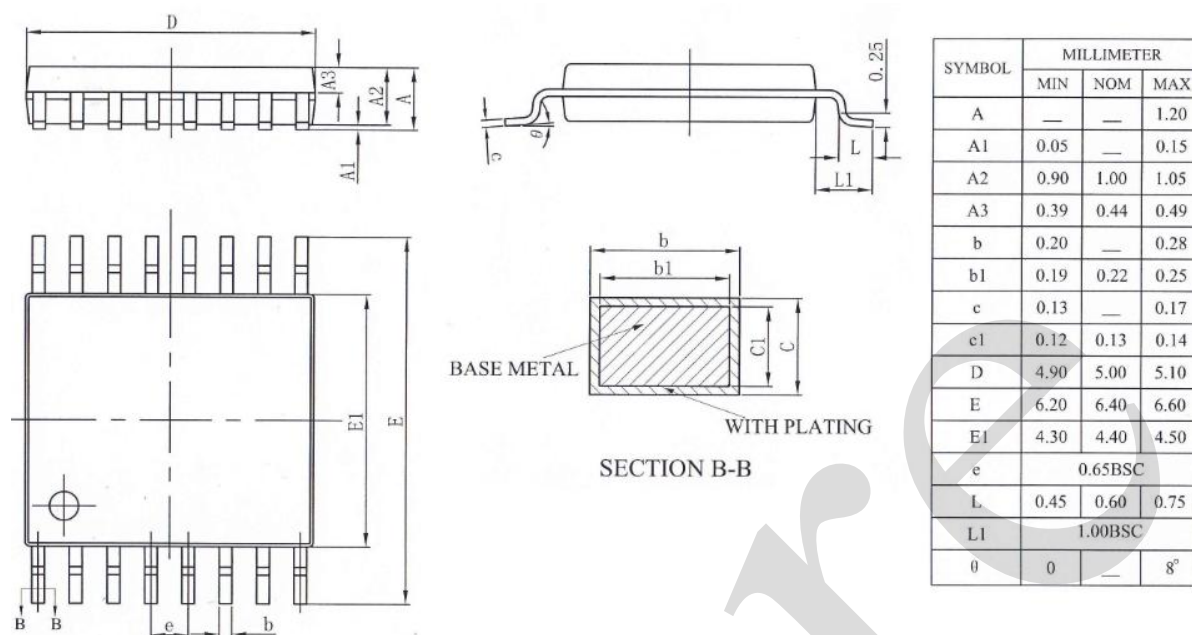
## 5.2、SOP16



| 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             | <p>○: Indicates that the content of hazardous substances or elements in the detection limit of the following 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.