# AiP74LVC08
# Quad 2-input And Gate

# Product Specification

**Specification Revision History:**

| Version | Date | Description |
|---|---|---|
| 2017-05-A1 | 2017-05 | New |
| 2021-08-A2 | 2021-08 | Modify Supply Current Parameter |
| 2021-12-A3 | 2021-12 | Modify Ordering Information |
| 2022-02-A4 | 2022-02 | Modify ambient temperature to -40℃~+105℃ and add electrical characteristics of -40℃~+105℃ |

## 1、General Description

The AiP74LVC08 provides four 2-input AND gates.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3V and 5V applications.

**Features:**

- 5V tolerant inputs for interfacing with 5V logic
- Wide supply voltage range from 1.2V to 3.6V
- CMOS low power consumption
- Direct interface with TTL levels
- Specified from -40℃ to +105℃
- Packaging information: DIP14/SOP14/TSSOP14

**Ordering Information:**

**Tube packing specifications:**

| Part number | Packaging form | Marking code | Tube quantity | Boxed tube quantity | Boxed quantity | Notes |
|---|---|---|---|---|---|---|
| AiP74LVC08DA14.TB | DIP14 | 74LVC08 | 25 PCS/tube | 40 tube/box | 1000 PCS/box | Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm |
| AiP74LVC08SA14.TB | SOP14 | 74LVC08 | 50 PCS/tube | 200 tube/box | 10000 PCS/box | Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm |
| AiP74LVC08TA14.TB | TSSOP14 | 74LVC08 | 94 PCS/tube | 200 tube/box | 18800 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |

**Reel packing specifications:**

| Part number | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes |
|---|---|---|---|---|---|
| AiP74LVC08SA14.TR | SOP14 | 74LVC08 | 4000 PCS/reel | 8000 PCS/box | Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm |
| AiP74LVC08TA14.TR | TSSOP14 | 74LVC08 | 5000 PCS/reel | 10000 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

## 2、Block Diagram And Pin Description

### 2.1、Block Diagram

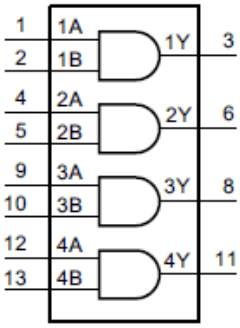



Figure 1. Logic symbol

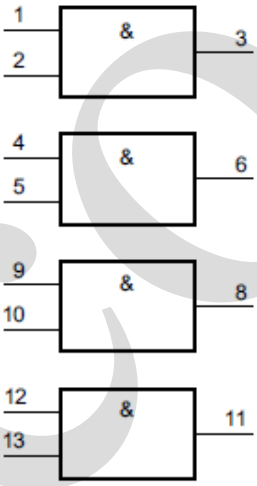



Figure 2. IEC logic symbol

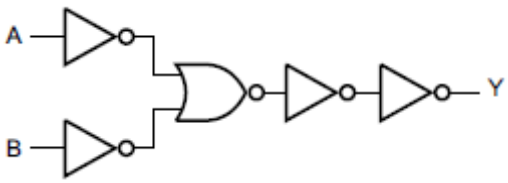
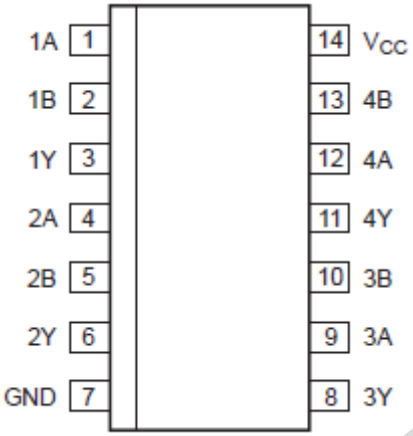



Figure 3. Logic diagram for one gate

## 2.2、Pin Configurations




## 2.3、Pin Description

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | 1A | data input |
| 2 | 1B | data input |
| 3 | 1Y | data output |
| 4 | 2A | data input |
| 5 | 2B | data input |
| 6 | 2Y | data output |
| 7 | GND | ground (0V) |
| 8 | 3Y | data output |
| 9 | 3A | data input |
| 10 | 3B | data input |
| 11 | 4Y | data output |
| 12 | 4A | data input |
| 13 | 4B | data input |
| 14 | $V_{CC}$ | supply voltage |

## 2.4、Function Table

| Input | | Output |
|---|---|---|
| **nA** | **nB** | **nY** |
| L | X | L |
| X | L | L |
| H | H | 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 | +6.5 | V |
| input clamping current | $I_{IK}$ | $V_I < 0V$ | | -50 | - | mA |
| input voltage | $V_I$ | - | | -0.5 | +6.5 | V |
| output clamping current | $I_{OK}$ | $V_O > V_{CC}$ or $V_O < 0V$ | | - | ±50 | mA |
| output voltage | $V_O$ | output in HIGH or LOW-state | | -0.5 | $V_{CC}$+0.5 | V |
| output current | $I_O$ | $V_O$=0V to $V_{CC}$ | | - | ±50 | mA |
| supply current | $I_{CC}$ | - | | - | 100 | mA |
| ground current | $I_{GND}$ | - | | -100 | - | mA |
| total power dissipation | $P_{tot}$ | - | | - | 500 | mW |
| storage temperature | $T_{stg}$ | - | | -65 | +150 | ℃ |
| Soldering Temperature | $T_L$ | 10s | DIP | 245 | | ℃ |
| | | | SOP | 250 | | ℃ |

Note:

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

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

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

### 3.2、Recommended Operating Conditions

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| supply voltage | $V_{CC}$ | - | 1.65 | - | 3.6 | V |
| | | functional | 1.2 | - | - | V |
| input voltage | $V_I$ | - | 0 | - | 5.5 | V |
| output voltage | $V_O$ | output HIGH or LOW state | 0 | - | $V_{CC}$ | V |
| ambient temperature | $T_{amb}$ | - | -40 | - | +105 | ℃ |
| input transition rise and fall rate | Δt/ΔV | $V_{CC}$=1.65V to 2.7V | 0 | - | 20 | ns/V |
| | | $V_{CC}$=2.7V to 3.6V | 0 | - | 10 | ns/V |

### 3.3、Electrical Characteristics

#### 3.3.1、DC Characteristics 1

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

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| HIGH-level input voltage | $V_{IH}$ | $V_{CC}$=1.2V | | 1.08 | - | - | V |
| | | $V_{CC}$=1.65V to 1.95V | | 0.65× $V_{CC}$ | - | - | V |
| | | $V_{CC}$=2.3V to 2.7V | | 1.7 | - | - | V |
| | | $V_{CC}$=2.7V to 3.6V | | 2.0 | - | - | V |
| LOW-level input voltage | $V_{IL}$ | $V_{CC}$=1.2V | | - | - | 0.12 | V |
| | | $V_{CC}$=1.65V to 1.95V | | - | - | 0.35× $V_{CC}$ | V |
| | | $V_{CC}$=2.3V to 2.7V | | - | - | 0.7 | V |
| | | $V_{CC}$=2.7V to 3.6V | | - | - | 0.8 | V |
| HIGH-level output voltage | $V_{OH}$ | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_O$=-100uA; $V_{CC}$=1.65V to 3.6V | $V_{CC}$ - 0.2 | - | - | V |
| | | | $I_O$=-4mA; $V_{CC}$=1.65V | 1.2 | - | - | V |
| | | | $I_O$=-8mA; $V_{CC}$=2.3V | 1.8 | - | - | V |
| | | | $I_O$=-12mA; $V_{CC}$=2.7V | 2.2 | - | - | V |
| | | | $I_O$=-18mA; $V_{CC}$=3.0V | 2.4 | - | - | V |
| | | | $I_O$=-24mA; $V_{CC}$=3.0V | 2.2 | - | - | V |
| LOW-level output voltage | $V_{OL}$ | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_O$=100uA; $V_{CC}$=1.65V to 3.6V | - | - | 0.2 | V |
| | | | $I_O$=4mA; $V_{CC}$=1.65V | - | - | 0.45 | V |
| | | | $I_O$=8mA; $V_{CC}$=2.3V | - | - | 0.6 | V |
| | | | $I_O$=12mA; $V_{CC}$=2.7V | - | - | 0.4 | V |
| | | | $I_O$=24mA; $V_{CC}$=3.0V | - | - | 0.55 | V |
| input leakage current | $I_I$ | $V_I$=5.5V or GND; $V_{CC}$=3.6V | | - | ±0.1 | ±5 | uA |
| supply current | $I_{CC}$ | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=3.6V | | - | 1.5 | 15 | uA |
| additional supply current | $\Delta I_{CC}$ | per input pin; $V_I$=$V_{CC}$-0.6V; $I_O$=0A; $V_{CC}$=2.7V to 3.6V | | - | 5 | 500 | uA |
| input capacitance | $C_I$ | $V_{CC}$=0V to 3.6V; $V_I$= GND to $V_{CC}$ | | - | 4.0 | - | pF |

Note: All typical values are measured at $V_{CC}$=3.3V (unless stated otherwise) and $T_{amb}$=25℃.

### 3.3.2、DC Characteristics 2

($T_{amb}$=-40℃ to +105℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| HIGH-level input voltage | $V_{IH}$ | $V_{CC}$=1.2V | | 1.08 | - | - | V |
| | | $V_{CC}$=1.65V to 1.95V | | 0.65× $V_{CC}$ | - | - | V |
| | | $V_{CC}$=2.3V to 2.7V | | 1.7 | - | - | V |
| | | $V_{CC}$=2.7V to 3.6V | | 2.0 | - | - | V |
| LOW-level input voltage | $V_{IL}$ | $V_{CC}$=1.2V | | - | - | 0.12 | V |
| | | $V_{CC}$=1.65V to 1.95V | | - | - | 0.35× $V_{CC}$ | V |
| | | $V_{CC}$=2.3V to 2.7V | | - | - | 0.7 | V |
| | | $V_{CC}$=2.7V to 3.6V | | - | - | 0.8 | V |
| HIGH-level output voltage | $V_{OH}$ | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_O$=-100uA; $V_{CC}$=1.65V to 3.6V | $V_{CC}$ - 0.3 | - | - | V |
| | | | $I_O$=-4mA; $V_{CC}$=1.65V | 1.05 | - | - | V |
| | | | $I_O$=-8mA; $V_{CC}$=2.3V | 1.65 | - | - | V |
| | | | $I_O$=-12mA; $V_{CC}$=2.7V | 2.05 | - | - | V |
| | | | $I_O$=-18mA; $V_{CC}$=3.0V | 2.25 | - | - | V |
| | | | $I_O$=-24mA; $V_{CC}$=3.0V | 2.0 | - | - | V |
| LOW-level output voltage | $V_{OL}$ | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_O$=100uA; $V_{CC}$=1.65V to 3.6V | - | - | 0.3 | V |
| | | | $I_O$=4mA; $V_{CC}$=1.65V | - | - | 0.65 | V |
| | | | $I_O$=8mA; $V_{CC}$=2.3V | - | - | 0.8 | V |
| | | | $I_O$=12mA; $V_{CC}$=2.7V | - | - | 0.6 | V |
| | | | $I_O$=24mA; $V_{CC}$=3.0V | - | - | 0.8 | V |
| input leakage current | $I_I$ | $V_I$=5.5V or GND; $V_{CC}$=3.6V | | - | - | ±20 | uA |
| supply current | $I_{CC}$ | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=3.6V | | - | - | 40 | uA |
| additional supply current | $\Delta I_{CC}$ | per input pin; $V_I$=$V_{CC}$-0.6V; $I_O$=0A; $V_{CC}$=2.7V to 3.6V | | - | - | 5000 | uA |

Note: All typical values are measured at $V_{CC}$=3.3V (unless stated otherwise) and $T_{amb}$=25℃.

### 3.3.3、AC Characteristics 1

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

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5 | $V_{CC}$=1.2V | - | 11.0 | - | ns |
| | | | $V_{CC}$=1.65V to 1.95V | 0.5 | 4.2 | 9.0 | ns |
| | | | $V_{CC}$=2.3V to 2.7V | 1.0 | 2.5 | 6.9 | ns |
| | | | $V_{CC}$=2.7V | 1.5 | 2.5 | 4.8 | ns |
| | | | $V_{CC}$=3.0V to 3.6V | 1.0 | 2.3 | 4.1 | ns |
| output skew time | $t_{sk(o)}$ | $V_{CC}$=3.0V to 3.6V | | - | - | 1.0 | ns |
| Power dissipation capacitance | $C_{PD}$ | per gate; $V_I$= GND to $V_{CC}$ | $V_{CC}$=1.65V to 1.95V | - | 4.4 | - | pF |
| | | | $V_{CC}$=2.3V to 2.7V | - | 7.7 | - | pF |
| | | | $V_{CC}$=3.0V to 3.6V | - | 10.5 | - | pF |

Note:

[1] Typical values are measured at $T_{amb}$=25℃ and $V_{CC}$=1.2V, 1.8V, 2.5V, 2.7V and 3.3V respectively.

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

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[4] $C_{PD}$ 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℃ to +105℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| nA, nB to nY propagation delay | $t_{pd}$ | see Figure 5 | $V_{CC}$=1.65V to 1.95V | 0.5 | - | 10.4 | ns |
| | | | $V_{CC}$=2.3V to 2.7V | 1.0 | - | 8.0 | ns |
| | | | $V_{CC}$=2.7V | 1.5 | - | 5.6 | ns |
| | | | $V_{CC}$=3.0V to 3.6V | 1.0 | - | 4.8 | ns |
| output skew time | $t_{sk(o)}$ | $V_{CC}$=3.0V to 3.6V | | - | - | 1.5 | ns |

Note:

[1] Typical values are measured at $T_{amb}$=25℃ and $V_{CC}$=1.2V, 1.8V, 2.5V, 2.7V and 3.3V respectively.

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

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

## 4、Testing Circuit

### 4.1、AC Testing Circuit

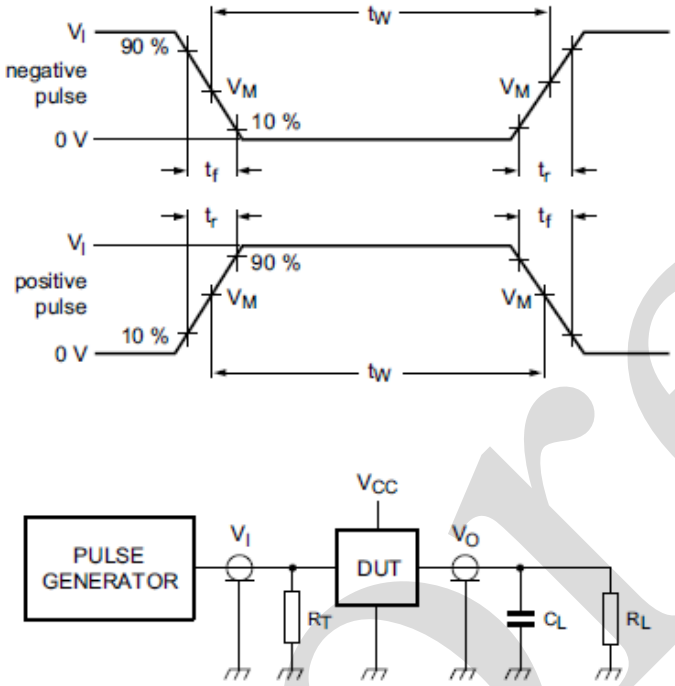



Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

$R_L$=Load resistance.

$C_L$=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

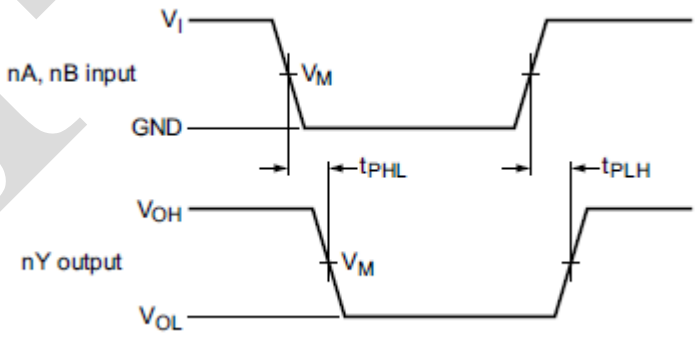



Figure 5. The input (nA, nB) to output (nY) propagation delays

### 4.3、Measurement Points

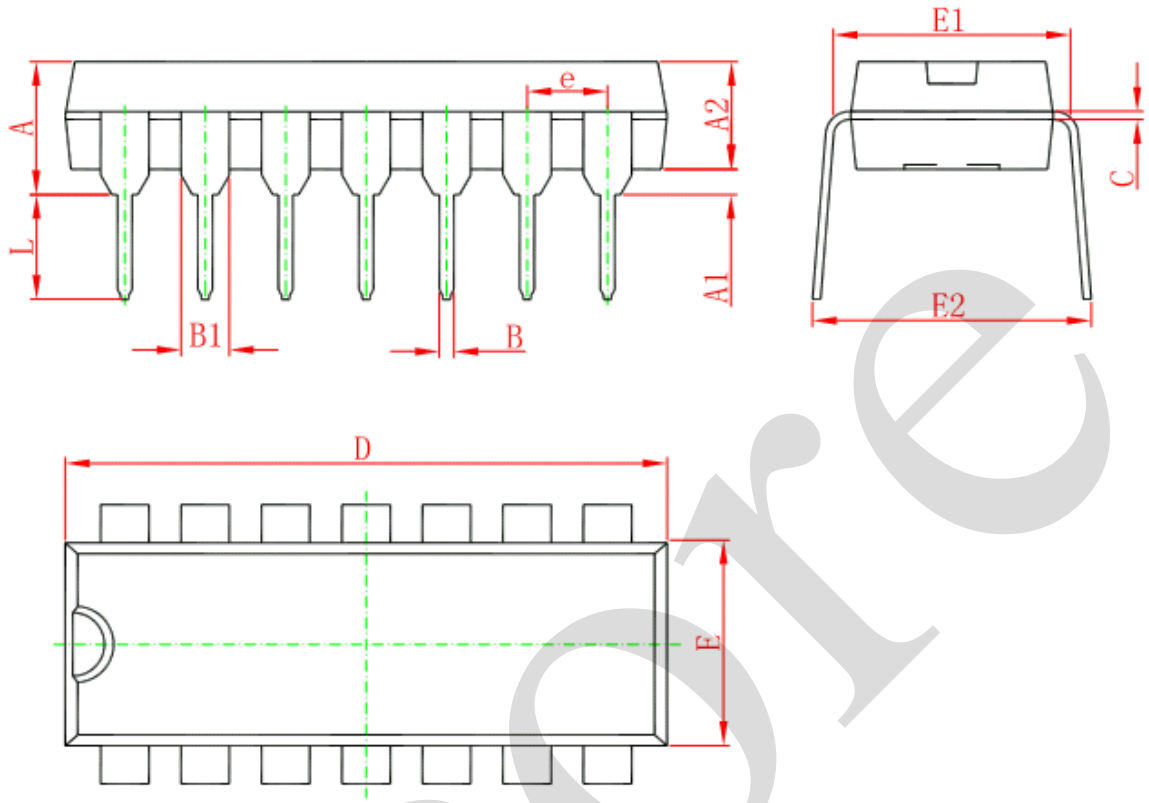
| Supply voltage | Input | Output |
|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ |
| < 2.7V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| ≥ 2.7V | 1.5V | 1.5V |

### 4.4、Test Data

| Supply voltage | Input | | Load | |
|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$ , $t_f$ | $C_L$ | $R_L$ |
| 1.2V | $V_{CC}$ | ≤ 2.0ns | 30pF | 1kΩ |
| 1.65V to 1.95V | $V_{CC}$ | ≤ 2.0ns | 30pF | 1kΩ |
| 2.3V to 2.7V | $V_{CC}$ | ≤ 2.0ns | 30pF | 500Ω |
| 2.7V | 2.7V | ≤ 2.5ns | 50pF | 500Ω |
| 3.0V to 3.6V | 2.7V | ≤ 2.5ns | 50pF | 500Ω |

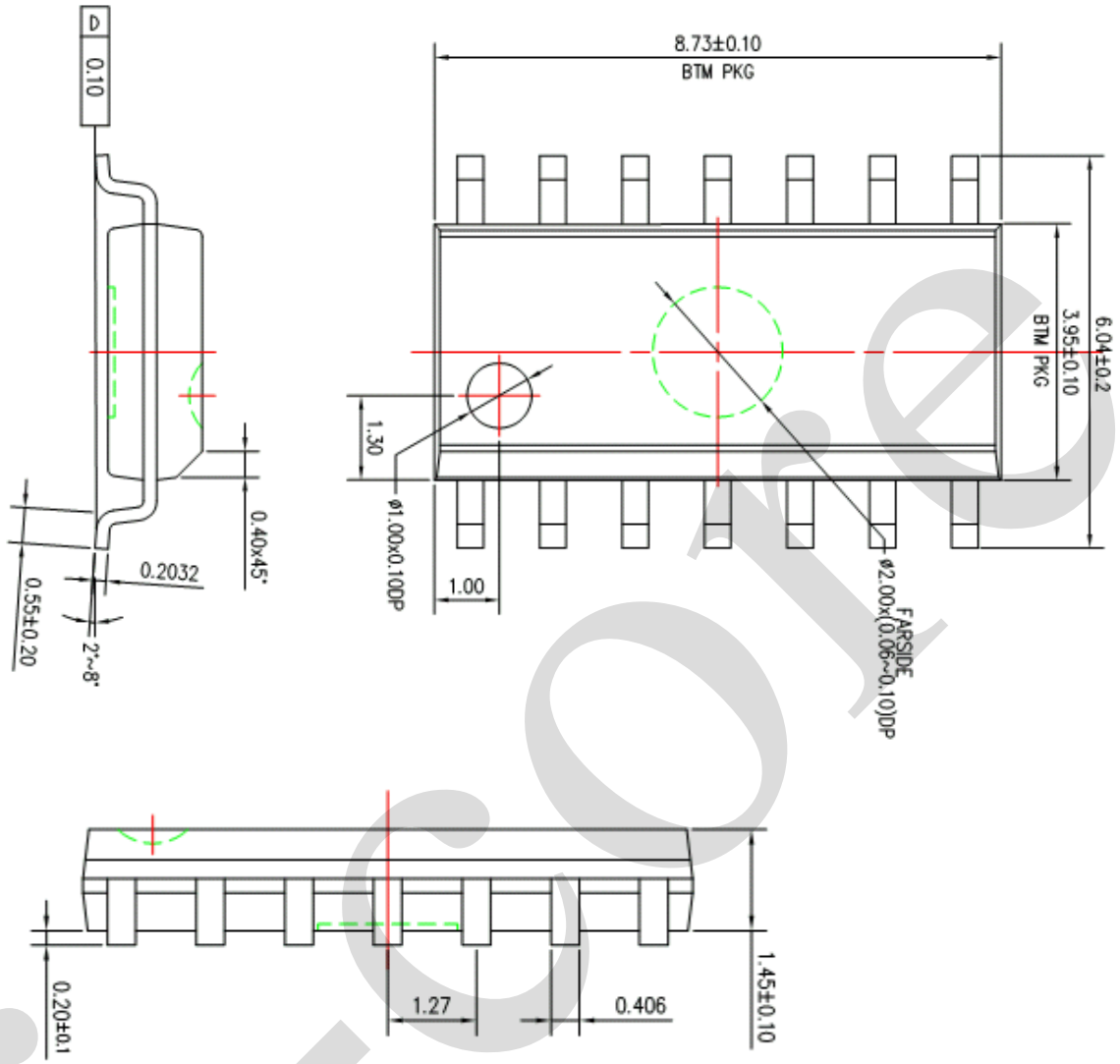
## 5、Package Information

### 5.1、DIP14

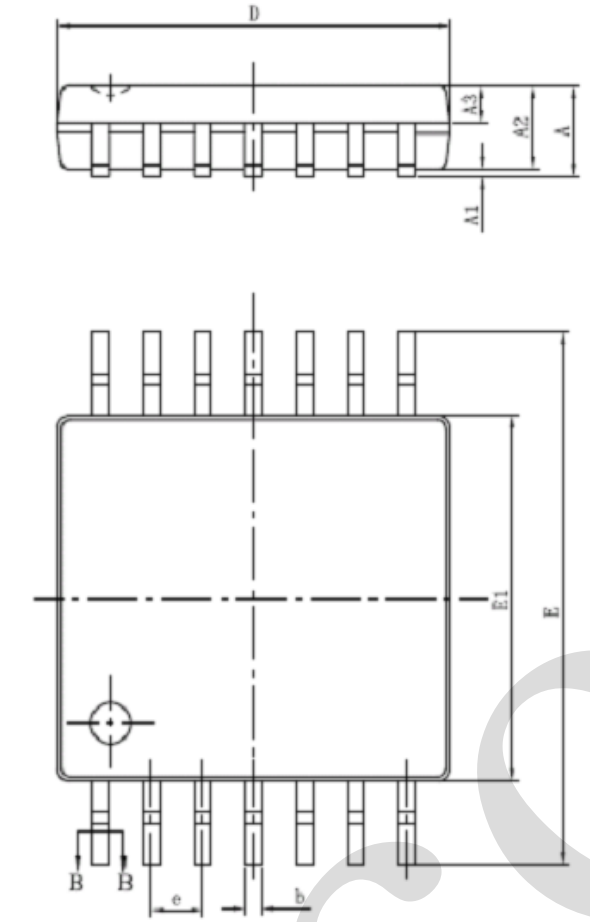



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 3.710 | 4.310 | 0.146 | 0.170 |
| A1 | 0.510 | | 0.020 | |
| A2 | 3.200 | 3.600 | 0.126 | 0.142 |
| B | 0.380 | 0.570 | 0.015 | 0.022 |
| B1 | 1.524 (BSC) | | 0.060 (BSC) | |
| C | 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 |

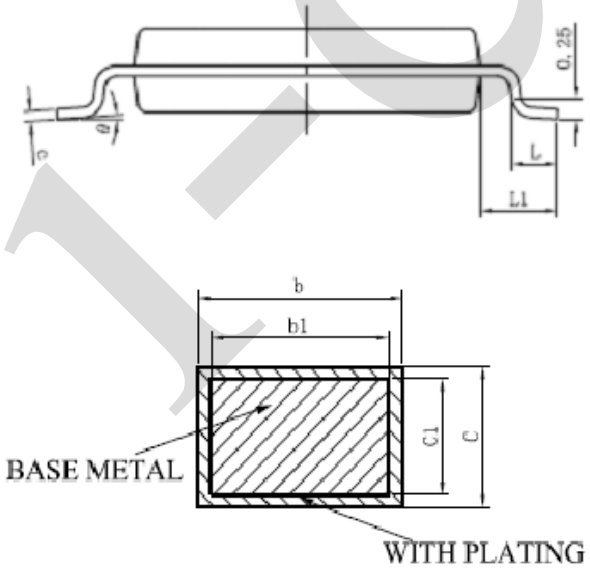
**5.2、SOP14**


0.10
8.73±0.10
BTM PKG
6.04±0.2
3.95±0.10
BTM PKG
1.30
Ø1.00x0.100P
1.00
Ø2.00x(0.06~0.10)DP
FARSIDE
0.40x45°
0.2032
0.55±0.20
2°~8°
0.20±0.1
1.27
0.406
1.45±0.10

**5.3、TSSOP14**




| SYMBOL | MILLIMETER | |
|---|---|---|
| | MIN | MAX |
| A | — | 1.20 |
| A1 | 0.05 | 0.15 |
| A2 | 0.90 | 1.05 |
| A3 | 0.39 | 0.49 |
| b | 0.20 | 0.30 |
| b1 | 0.19 | 0.25 |
| c | 0.13 | 0.19 |
| c1 | 0.12 | 0.14 |
| D | 4.86 | 5.06 |
| E1 | 4.30 | 4.50 |
| E | 6.20 | 6.60 |
| e | 0.65BSC | |
| L | 0.45 | 0.75 |
| L1 | 1.00BSC | |
| θ | 0 | 8° |




SECTION B-B

## 6、Statements And Notes

### 6.1、The name and content of Hazardous substances or Elements in the product

| Part name | Hazardous substances or Elements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lead and lead compounds | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic resin | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The lead | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic sheet installed | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| explanation | ○：Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.<br>×：Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements. | | | | | | | | | |

### 6.2、Notion

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

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

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

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