



# **AiP74LVC2G02**

## **Dual 2-input Nor Gate**

# **Product Specification**

**Specification Revision History:**

<b>Version</b>	<b>Date</b>	<b>Description</b>
2017-05-A1	2017-05	New
2023-04-B1	2023-04	Update the template



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## 1、 General Description

The AiP74LVC2G02 provides a 2-input NOR gate function.

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

### Features:

- Wide supply voltage range from 1.65V to 5.5V
- 5V tolerant outputs for interfacing with 5V logic
- $\pm 24\text{mA}$  output drive ( $V_{CC}=3.0\text{V}$ )
- CMOS low power consumption
- Specified from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Packaging information: TSSOP8/VSSOP8

### Ordering Information:

#### Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC2G02TA8.TB	TSSOP8	BLXX	100 PCS/tube	200 tube/box	20000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm

#### Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC2G02TA8.TR	TSSOP8	BLXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm
AiP74LVC2G02YA8.TR	VSSOP8	BLXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 2.0mm×2.3mm Pin spacing: 0.50mm

Note 1: "XX" refers to variable content, meaning year and package batch serial number.

Note 2: 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

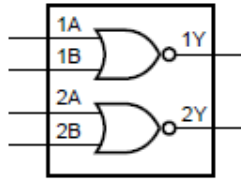


Figure 1. Logic symbol

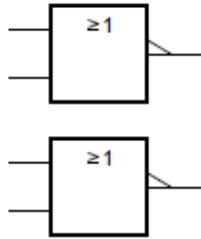


Figure 2. IEC logic symbol

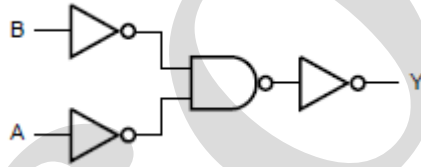
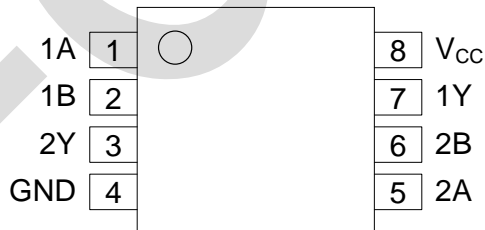


Figure 3. Logic diagram (one gate)

### 2.2、Pin Configurations





## 2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1B	data input
3	2Y	data output
4	GND	ground (0V)
5	2A	data input
6	2B	data input
7	1Y	data output
8	V <sub>CC</sub>	supply voltage

## 2.4、Function Table

Input		Output
nA	nB	nY
L	L	H
X	H	L
H	X	L

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 <sub>CC</sub>	-	-0.5	+6.5	V
input voltage	V <sub>I</sub>	-	-0.5	+6.5	V
output voltage	V <sub>O</sub>	Active mode	-0.5	V <sub>CC</sub> +0.5	V
		Power-down mode; V <sub>CC</sub> =0V	-0.5	+6.5	V
input clamping current	I <sub>IK</sub>	V <sub>I</sub> < 0V	-50	-	mA
output clamping current	I <sub>OK</sub>	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0V	-	±50	mA
output current	I <sub>O</sub>	V <sub>O</sub> =0V to V <sub>CC</sub>	-	±50	mA
supply current	I <sub>CC</sub>	-	-	100	mA
ground current	I <sub>GND</sub>	-	-100	-	mA
storage temperature	T <sub>stg</sub>	-	-65	+150	°C
total power dissipation	P <sub>tot</sub>	-	-	300	mW
soldering temperature	T <sub>L</sub>	10s	260		°C



## 3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	$V_{CC}$	-	1.65	-	5.5	V
input voltage	$V_I$	-	0	-	5.5	V
output voltage	$V_O$	Active mode	0	-	$V_{CC}$	V
		Power-down mode; $V_{CC}=0V$	0	-	5.5	V
ambient temperature	$T_{amb}$	-	-40	-	+125	°C

## 3.3、Electrical Characteristics

### 3.3.1、DC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	$V_{IH}$	$V_{CC}=1.65V$ to $1.95V$	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3V$ to $2.7V$	1.7	-	-	V	
		$V_{CC}=2.7V$ to $3.6V$	2.0	-	-	V	
		$V_{CC}=4.5V$ to $5.5V$	$0.7 \times V_{CC}$	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=1.65V$ to $1.95V$	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3V$ to $2.7V$	-	-	0.7	V	
		$V_{CC}=2.7V$ to $3.6V$	-	-	0.8	V	
		$V_{CC}=4.5V$ to $5.5V$	-	-	$0.3 \times V_{CC}$	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O=-100\mu A$ ; $V_{CC}=1.65V$ to $5.5V$	$V_{CC}-0.1$	-	-	V
			$I_O=-4mA$ ; $V_{CC}=1.65V$	1.2	1.53	-	V
			$I_O=-8mA$ ; $V_{CC}=2.3V$	1.9	2.13	-	V
			$I_O=-12mA$ ; $V_{CC}=2.7V$	2.2	2.50	-	V
			$I_O=-24mA$ ; $V_{CC}=3.0V$	2.3	2.60	-	V
			$I_O=-32mA$ ; $V_{CC}=4.5V$	3.8	4.10	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O=100\mu A$ ; $V_{CC}=1.65V$ to $5.5V$	-	-	0.10	V
			$I_O=4mA$ ; $V_{CC}=1.65V$	-	0.08	0.45	V
			$I_O=8mA$ ; $V_{CC}=2.3V$	-	0.14	0.30	V
			$I_O=12mA$ ; $V_{CC}=2.7V$	-	0.19	0.40	V
			$I_O=24mA$ ; $V_{CC}=3.0V$	-	0.37	0.55	V
			$I_O=32mA$ ; $V_{CC}=4.5V$	-	0.43	0.55	V
input leakage current	$I_I$	$V_I=5.5V$ or GND; $V_{CC}=0V$ to $5.5V$	-	-	$\pm 1$	$\mu A$	
power-off leakage current	$I_{OFF}$	$V_I$ or $V_O=5.5V$ ; $V_{CC}=0V$	-	-	$\pm 2$	$\mu A$	
supply current	$I_{CC}$	$V_I=5.5V$ or GND; $I_O=0A$ ; $V_{CC}=1.65V$ to $5.5V$	-	-	4	$\mu A$	
additional supply current	$\Delta I_{CC}$	per pin; $V_I=V_{CC}-0.6V$ ; $I_O=0A$ ; $V_{CC}=2.3V$ to $5.5V$	-	-	500	$\mu A$	
input capacitance	$C_I$	-	-	2.5	-	pF	



Note: All typical values are measured at  $T_{amb}=25^{\circ}\text{C}$ .

### 3.3.2、DC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	$V_{IH}$	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	1.7	-	-	V	
		$V_{CC}=2.7\text{V}$ to $3.6\text{V}$	2.0	-	-	V	
		$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	$0.7 \times V_{CC}$	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	-	0.7	V	
		$V_{CC}=2.7\text{V}$ to $3.6\text{V}$	-	-	0.8	V	
		$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	-	$0.3 \times V_{CC}$	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O=-100\mu\text{A}$ ; $V_{CC}=1.65\text{V}$ to $5.5\text{V}$	$V_{CC}-0.1$	-	-	V
			$I_O=-4\text{mA}$ ; $V_{CC}=1.65\text{V}$	0.95	-	-	V
			$I_O=-8\text{mA}$ ; $V_{CC}=2.3\text{V}$	1.7	-	-	V
			$I_O=-12\text{mA}$ ; $V_{CC}=2.7\text{V}$	1.9	-	-	V
			$I_O=-24\text{mA}$ ; $V_{CC}=3.0\text{V}$	2.0	-	-	V
			$I_O=-32\text{mA}$ ; $V_{CC}=4.5\text{V}$	3.4	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_O=100\mu\text{A}$ ; $V_{CC}=1.65\text{V}$ to $5.5\text{V}$	-	-	0.10	V
			$I_O=4\text{mA}$ ; $V_{CC}=1.65\text{V}$	-	-	0.70	V
			$I_O=8\text{mA}$ ; $V_{CC}=2.3\text{V}$	-	-	0.45	V
			$I_O=12\text{mA}$ ; $V_{CC}=2.7\text{V}$	-	-	0.60	V
			$I_O=24\text{mA}$ ; $V_{CC}=3.0\text{V}$	-	-	0.80	V
			$I_O=32\text{mA}$ ; $V_{CC}=4.5\text{V}$	-	-	0.80	V
input leakage current	$I_I$	$V_I=5.5\text{V}$ or GND; $V_{CC}=0\text{V}$ to $5.5\text{V}$	-	-	$\pm 1$	$\mu\text{A}$	
power-off leakage current	$I_{OFF}$	$V_I$ or $V_O=5.5\text{V}$ ; $V_{CC}=0\text{V}$	-	-	$\pm 2$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I=5.5\text{V}$ or GND; $I_O=0\text{A}$ ; $V_{CC}=1.65\text{V}$ to $5.5\text{V}$	-	-	4	$\mu\text{A}$	
additional supply current	$\Delta I_{CC}$	per pin; $V_I=V_{CC}-0.6\text{V}$ ; $I_O=0\text{A}$ ; $V_{CC}=2.3\text{V}$ to $5.5\text{V}$	-	-	500	$\mu\text{A}$	



### 3.3.3、AC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ. <sup>[1]</sup>	Max.	Unit	
nA, nB to nY propagation delay	$t_{PHL}$	see Figure 5	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	12.5	18.8	ns
			$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	10.5	15.8	ns
			$V_{CC}=2.7\text{V}$	-	10	15	ns
			$V_{CC}=3.0\text{V}$ to $3.6\text{V}$	-	9.5	14.3	ns
			$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	9	13.5	ns
nA, nB to nY propagation delay	$t_{PLH}$	see Figure 5	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	14	21	ns
			$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	10	15	ns
			$V_{CC}=2.7\text{V}$	-	9.5	14.3	ns
			$V_{CC}=3.0\text{V}$ to $3.6\text{V}$	-	8.5	12.8	ns
			$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	7.5	11.3	ns

Note:

[1] Typical values are measured at normal  $V_{CC}$  and  $T_{amb}=25^{\circ}\text{C}$ .

### 3.3.4、AC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
nA, nB to nY propagation delay	$t_{PHL}$	see Figure 5	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	-	20.8	ns
			$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	-	17.8	ns
			$V_{CC}=2.7\text{V}$	-	-	17	ns
			$V_{CC}=3.0\text{V}$ to $3.6\text{V}$	-	-	16.3	ns
			$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	-	15.5	ns
nA, nB to nY propagation delay	$t_{PLH}$	see Figure 5	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	-	23	ns
			$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	-	17	ns
			$V_{CC}=2.7\text{V}$	-	-	16.3	ns
			$V_{CC}=3.0\text{V}$ to $3.6\text{V}$	-	-	14.8	ns
			$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	-	13.3	ns



## 4、Testing Circuit

### 4.1、AC Testing Circuit

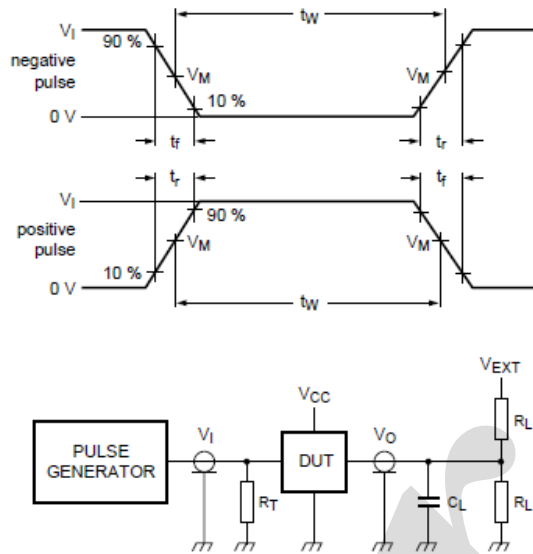


Figure 4. Test circuit for measuring switching times

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.

$V_{EXT}$ =External voltage for measuring switching times.

### 4.2、AC Testing Waveforms

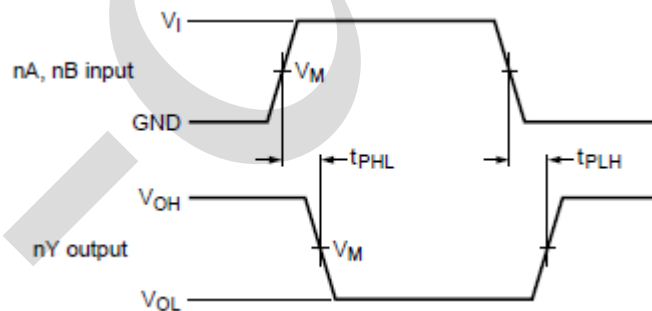


Figure 5. The input (nA, nB) to output (nY) propagation delays



## 4.3、Measurement Points

Supply voltage	Input	Output
$V_{CC}$	$V_M$	$V_M$
1.65V to 1.95V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3V to 2.7V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7V	1.5V	1.5V
3.0V to 3.6V	1.5V	1.5V
4.5V to 5.5V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

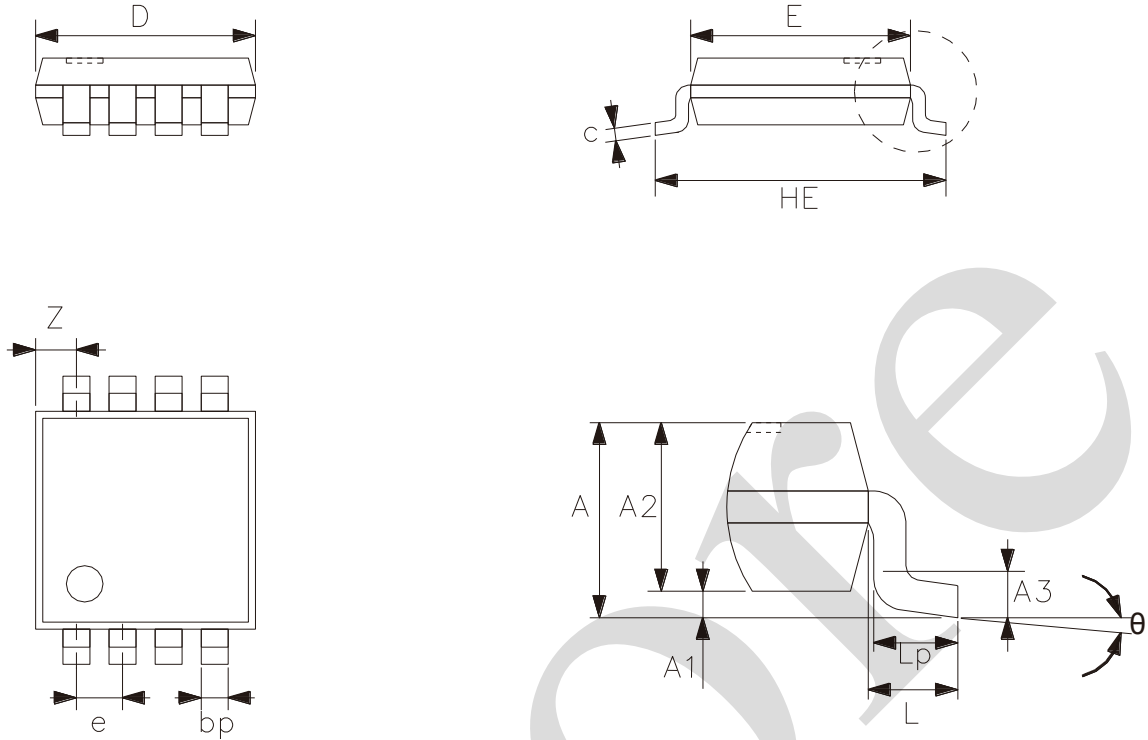
## 4.4、Test Data

Supply voltage	Input		Load		$V_{EXT}$
	$V_I$	$t_r = t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$
1.65V to 1.95V	$V_{CC}$	$\leq 3ns$	30pF	1k $\Omega$	open
2.3V to 2.7V	$V_{CC}$	$\leq 3ns$	30pF	500 $\Omega$	open
2.7V	2.7V	$\leq 3ns$	50pF	500 $\Omega$	open
3.0V to 3.6V	2.7V	$\leq 3ns$	50pF	500 $\Omega$	open
4.5V to 5.5V	$V_{CC}$	$\leq 3ns$	50pF	500 $\Omega$	open



## 5、Package Information

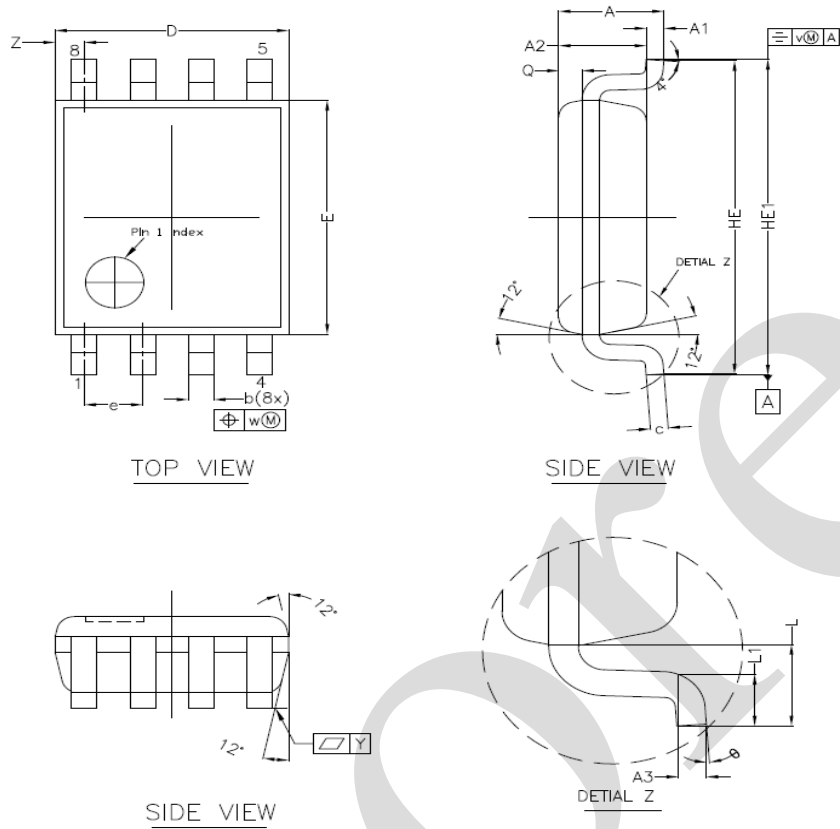
### 5.1、TSSOP8



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.10
A1	0	0.15
A2	0.75	0.95
A3	0.25	
bp	0.22	0.38
c	0.08	0.18
D	2.90	3.10
E	2.90	3.10
HE	3.90	4.10
L	0.50	
Lp	0.33	0.47
e	0.65	
Z	0.35	0.70
θ	0°	8°



**5.2、VSSOP8**



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.00
A1	0.00	0.15
A2	0.60	0.85
A3	0.12	
Q	0.19	0.21
b	0.17	0.27
c	0.08	0.23
D	1.90	2.10
E	2.20	2.40
HE	3.00	3.20
HE1	3.00	3.40
e	0.50	
L	0.40	
L1	0.15	0.40
Y	0.10	
Z	0.10	0.40
θ	0°	8°



## 6、 Statements And Notes

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

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

### 6.2、 Notes

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