



AiP5908

8-key Touch Chip

Product Specification

Specification Revision History:

Version	Date	Description
2019-02-A1	2019-02	New
2023-02-B1	2023-02	Update the template
2024-04-B2	2024-04	Modify the parameters
2024-05-B3	2024-05	Add package form



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1、General Description

AiP5908 is an 8-key touch chip and can be adjusted through external capacitance and command configuration.

AiP5908 has a built-in I²C interface, which can be directly connected to the controller.

Features:

- Capacitive touch key: 8 channels:
Configured as single-key mode or multi-key mode
- Sensitivity is adjustable:
The hardware can be adjusted through the C0 port external capacitance
The software can be adjusted globally, or each key can be adjusted individually
Suitable for various forms of capacitance when the touch keys
Suitable for the application of the thickness panel within 15mm
- Automatically adapt to changes in the external environment (such as changes in temperature and humidity)
- Communication interface: I²C
A key result indicator port is used as an MCU interrupt signal
- Ultra-low power consumption:
Operating frequency 1MHz, typical current: 70uA@5V
Operating frequency 500KHz, typical current: 43uA @5V
Operating frequency 250KHz, typical current: 30uA @5V
Operating frequency 125KHz, typical current: 23uA @5V
Configuration mode, supply current: 1uA @5V
- Packaging information: SOP14/QFN16



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP5908SA14.TB	SOP14	AiP5908	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm

Reel packing specifications:

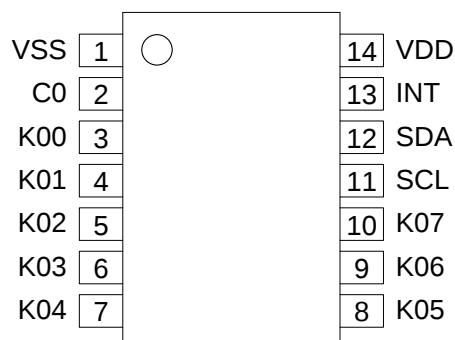
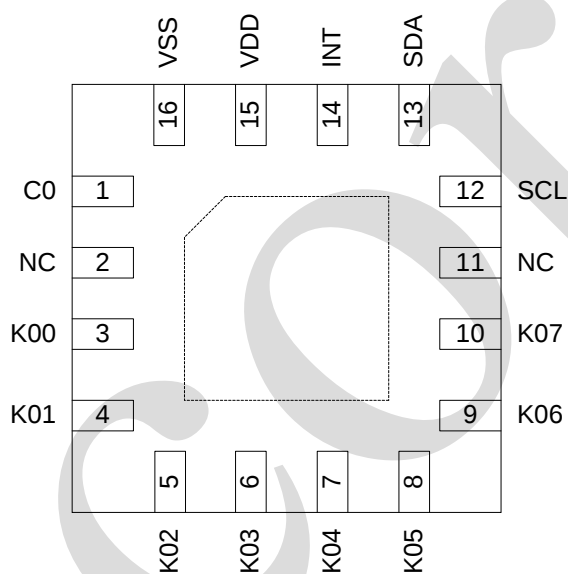
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP5908SA14.TR	SOP14	AiP5908	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP5908QA16.TR	QFN16	AiP5908	3000 PCS/7 inch reel	30000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.5mm
AiP5908QA16.TR	QFN16	AiP5908	6000 PCS/13 inch reel	12000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.5mm

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



2、Pin Description

2.1、Pin Configurations

**SOP14****QFN16**



2.3、Pin Description

Pin No.		Pin Name	I/O	Description
SOP14	QFN16			
1	16	VSS	POWER	ground
2	1	C0	I/O	external capacitance: 10nF
3	3	K00	I/O	key port (floating when not in use)
4	4	K01	I/O	key port (floating when not in use)
5	5	K02	I/O	key port (floating when not in use)
6	6	K03	I/O	key port (floating when not in use)
7	7	K04	I/O	key port (floating when not in use)
8	8	K05	I/O	key port (floating when not in use)
9	9	K06	I/O	key port (floating when not in use)
10	10	K07	I/O	key port (floating when not in use)
11	12	SCL	I	I ² C communication clock input pin
12	13	SDA	I/O	I ² C communication data pin
13	14	INT	O	key valid output, valid level optional
14	15	VDD	POWER	supply voltage
-	2	NC	-	not connected
-	11	NC	-	not connected

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25°C, unless otherwise specified)

Characteristic	Symbol	Conditions	Value	Unit
supply voltage	VDD	-	-0.3 to +6.5	V
input voltage	V _I	all ports	-0.3 to VDD+0.3	V
output voltage	V _O	all ports	-0.3 to VDD+0.3	V
HIGH-level output current	I _{OH}	INT, Kx	-10	mA
LOW-level output current	I _{OL}	INT, Kx	20	mA
storage temperature	T _{stg}	-	-65 to +150	°C
soldering temperature	T _L	10s	260	°C

3.2、Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
supply voltage	VDD	2.2	5.0	5.5	V
I ² C HIGH-level input voltage	V _{IH}	0.8VDD	-	-	V
I ² C LOW-level input voltage	V _{IL}	-	-	0.2VDD	V
operating temperature	T _{amb}	0	-	+70	°C



3.3、Electrical Characteristics

3.3.1、DC Characteristics

($T_{amb}=25^{\circ}\text{C}$, $VDD=5\text{V}$, $VSS=0\text{V}$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	VDD	-	2.2	5	5.5	V
HIGH-level input voltage	V_{IH}	VDD=2.2V to 5.5V, SCL, SDA	0.8VDD	-	VDD	V
		VDD=2.2V to 5.5V, Kx	VDD-0.1	-	VDD	V
LOW-level input voltage	V_{IL}	VDD=2.2V to 5.5V, SCL, SDA	0	-	0.2VDD	V
		VDD=2.2V to 5.5V, Kx	0	-	0.1	V
HIGH-level output voltage	V_{OH}	VDD=2.2V to 5.5V, $I_{OH}=-10\text{mA}$, INT, Kx	VDD-1.0	-	-	V
LOW-level output voltage	V_{OL}	VDD=2.2V to 5.5V, $I_{OL}=20\text{mA}$, SDA, INT, Kx	-	-	1.0	V
HIGH-level input leakage current	I_{IH}	SCL, SDA	-	-	1	μA
LOW-level input leakage current	I_{IL}	SCL, SDA	-	140	-	μA
pull-up resistance	R_{PU}	VDD=5V, SCL, SDA	-	35	-	$\text{K}\Omega$
		VDD=3V, SCL, SDA	-	70	-	$\text{K}\Omega$
supply current	I_{STB}	sleep mode	-	0.7	2	μA
supply current	I_{DD}	operating mode, 1MHz clock	-	70	115	μA
		operating mode, 500KHz clock	-	43	85	μA
		operating mode, 250KHz clock	-	30	55	μA
		operating mode, 125KHz clock	-	23	40	μA

3.3.2、AC Characteristics

($T_{amb}=25^{\circ}\text{C}$, $VDD=5\text{V}$, $VSS=0\text{V}$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
input capacitance	C_{IN}	-	-	-	10	pF
output capacitance	C_{OUT}					
I/O capacitance	C_{IO}					



4、Function Description

4.1、Function Registers List

NO.	Function Registers	Address	Description
1	system control register	0x3A	Enable key detection/configuration mode
2	operating mode register	0x21	Configure the system operating mode
3	detection reference update register	0x22	Configure the internal detection reference update speed
4	development mode register 1	0x2D	Turn on/off the Development mode
5	development mode register 2	0x2A	Turn on/off the Development mode
6	key channel enable control register	0x23	Turn on/off the key port
7	global sensitivity register	0x20	Configure the global key sensitivity
8	key threshold register	0x00~0x07	Configure a single key sensitivity
9	key value register (R)	0x34	Store the current key detection results (read-only)

4.2、Register Description

4.2.1、System Control Register (Address 0x3A)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x3A	SYS								0x00

SYS= 0x5A Enter the configuration mode, the touch detection function is off, and the function register can be set.

SYS= 0x00 Enter working mode while initializing the touch detection module.

After the circuit is powered on, although SYS=0x00, the circuit does not stably perform the touch function because the touch detection module is not internally initialized. Therefore, after the power-on, must first enter the configuration mode, and then enter the operating mode.

4.2.2、Operating Mode Register (Address 0x21)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x21	0	1	0	1	INT	M/S	OSC		0x00

INT= 0 When the key is triggered, INT port output “L”; INT port returns to “H” when the key is released.

INT= 1 When the key is triggered, INT port output a fixed width LOW-level pulse.

M/S= 0 Single-key mode: The touch chip only recognizes a single key

M/S= 1 Multi-key mode: Press all the keys at the same time, and output all the valid key values.

OSC= 00 system clock selection: 1000KHz

OSC= 01 system clock selection: 500KHz

OSC= 10 system clock selection: 250KHz

OSC= 11 system clock selection: 125KHz

B7 to B4 must be set to 0101, otherwise it will not work properly



In single-key mode, when multiple keys are pressed simultaneously:

If there is an order, only one pressed key can be detected;

If pressed simultaneously, all pressed keys are invalid.

The faster the system clock, the greater the power consumption, but at the same time can obtain faster key detection efficiency.

4.2.3、Detection Reference Update Register (Address 0x22)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x22	UD								0x20

UD= 0x20 Update the key detection reference value in the default mode

UD= 0x00 Update the key detection reference value in high-speed mode

In the high-speed mode, the automatic update of the key detection reference value can be accelerated, but it has a bad effect on the anti-interference ability of the circuit. Therefore, it is not recommended to modify the configuration of the register when there is no special use requirement.

Special circumstances shall refer to:

1. Unable to avoid powering on while holding the key down.
2. Unable to avoid rapid temperature and humidity changes after power on.
3. Other changes in the peripheral environment or hardware conditions with a large amplitude in a short time

4.2.4、Development Mode Register 1/2 (Address 0x2D, 0x2A)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x2D	TM0								0x00
Address 0x2A	TM1								0x10

TM0= 0x00
TM1= 0x10 Normal operating mode

TM0= 0x80
TM1= 0xFF Development mode, relax the key detection standard, so that the overall module can touch the key port of the chip, can also trigger the key function.
The setting value of “Key Threshold Register” is not valid. Therefore, it is not recommended to modify the register when working normally.



4.2.5、Key Channel Enable Control Register (Address 0x23)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x23	K7	K6	K5	K4	K3	K2	K1	K0	0x00

Kn= 0 Turn on the corresponding K0n port

Kn= 1 Turn off the corresponding K0n port

4.2.6、Global Sensitivity Register (Address 0x20)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x20	GSR								0x02

GSR= 0x01~0x0F Adjust the sensitivity of all the key ports

The smaller the value, the lower the sensitivity, and the smaller the corresponding scan period, allowing faster key input.

The larger the value, the higher the sensitivity, and the longer the corresponding scan period, and the key frequency should be slowed down.

4.2.7、Key Threshold Register (Address 0x00~0x07)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x00	OR0								0x04
Address 0x01	OR1								0x04
Address 0x02	OR2								0x04
Address 0x03	OR3								0x04
Address 0x04	OR4								0x04
Address 0x05	OR5								0x04
Address 0x06	OR6								0x04
Address 0x07	OR7								0x04

ORn= 0x01~0xFF ORn corresponds to the key K0n, which is used to set the sensitivity of a key individually.

The smaller the value, the higher the sensitivity.

4.2.8、Key Value Register (R, Address 0x34)

Bit	B7	B6	B5	B4	B3	B2	B1	B0	Reset value
Address 0x34	VR7	VR6	VR5	VR4	VR3	VR2	VR1	VR0	0x00

The register can only perform read operations.

VRn corresponds to the key K0n, which is used to store the state of each key

VRn= 0 Key K0n is not currently pressed

VRn= 1 Key K0n is currently pressed



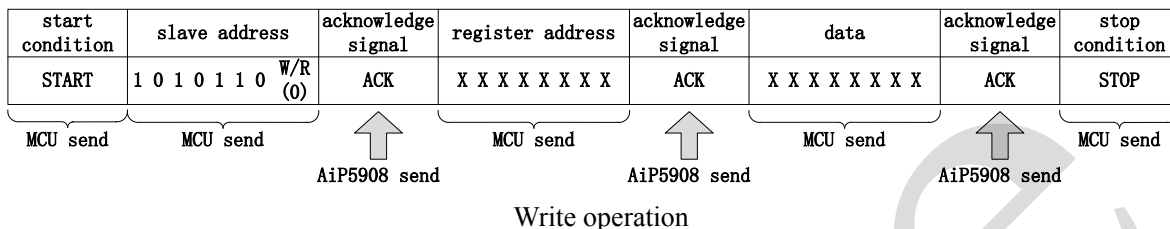
4.3、I²C Communication Method Description

4.3.1、Overview

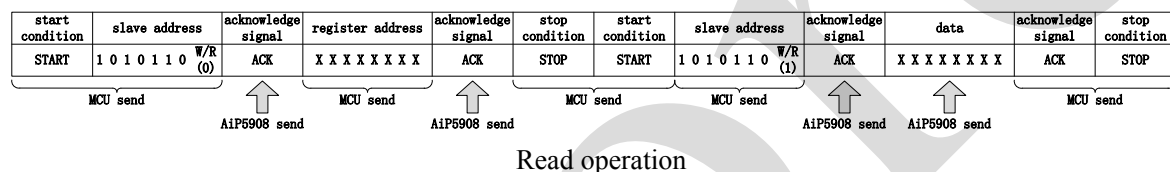
AiP5908 provides a standard I²C interface. Serial data line (SDA) and serial clock line (SCL) have built-in pull-up resistance. The SDA and SCL must remain HIGH-level when the bus is idle.

AiP5908 can only be used as slave for I²C communication with slave address 1010110.

AiP5908 I²C communication uses the “address + data” mode to perform the communication:



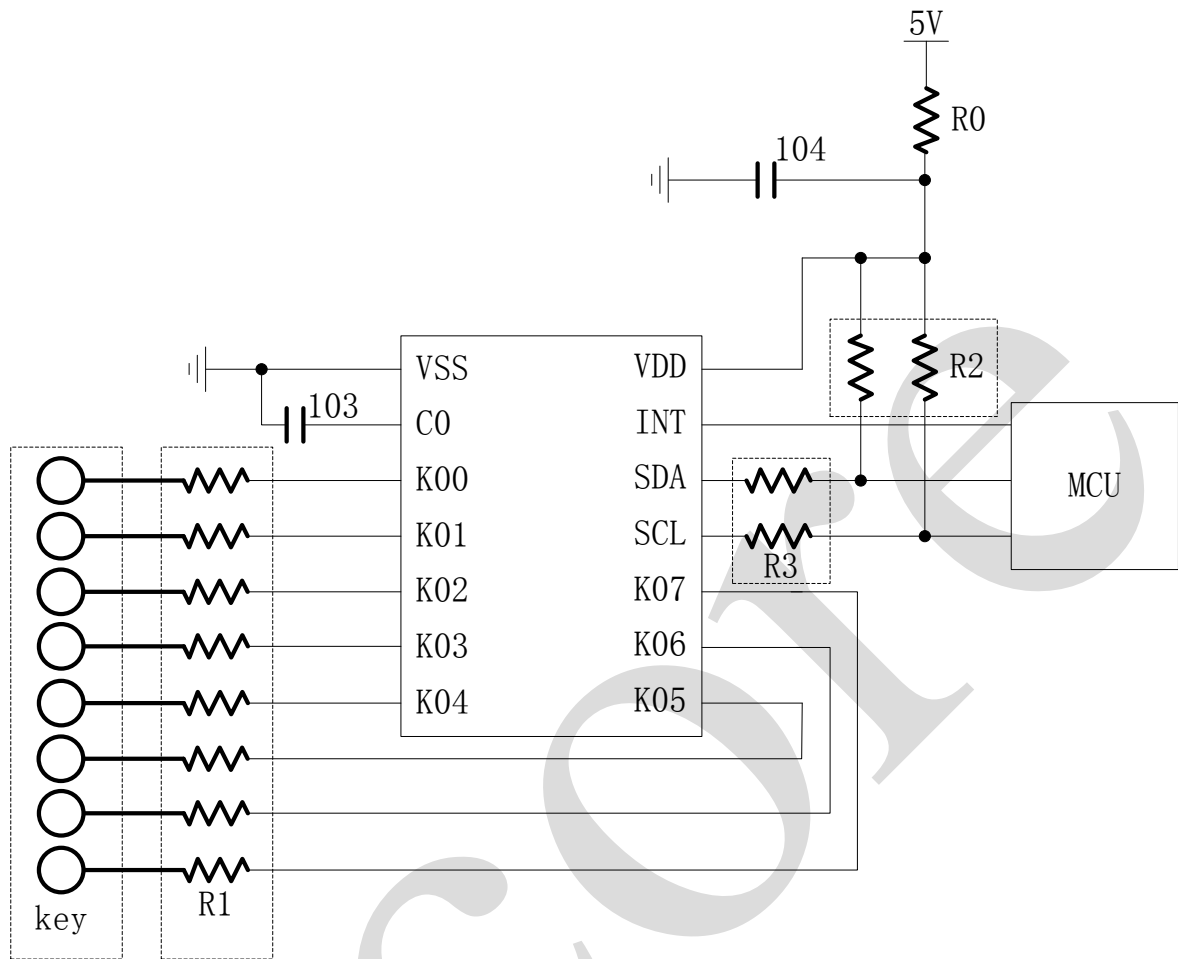
After the slave address, W/R is the read/write command. Follow up to write operation when W/R=0 and read operation later when W/R=1.



For reading operation, it is necessary to set the required register address with a START-STOP cycle, and then use the next START-STOP cycle to read the data.



5、Typical Application Circuit And Application Note



* The resistance R0 at power supply port and 104 capacitance can improve the anti-interference ability, R0 recommended resistance value is 22Ω.

* The resistance R1 in series at the key port can improve the anti-interference ability, and the recommended resistance value range is 1K to 20KΩ.

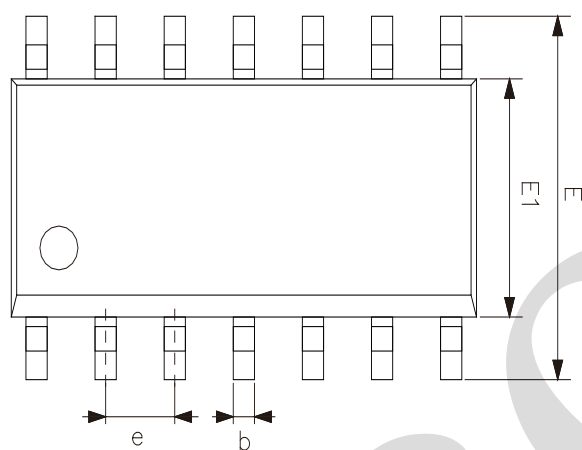
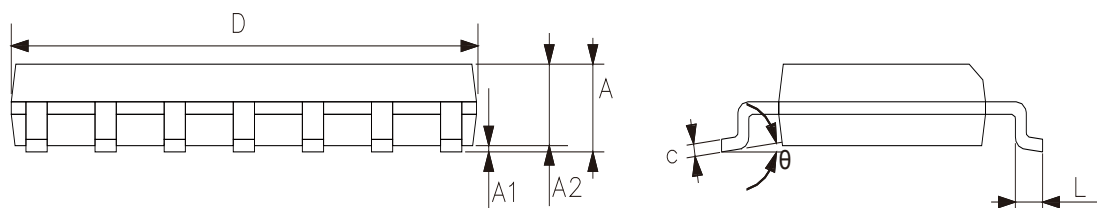
* The pull-up resistance R2 at SDA and SCL port, recommended resistance value: 5K to 10KΩ.

* The resistance R3 in serial at SDA and SCL ports, recommended resistance value: 200 to 2000Ω.



6、Package Information

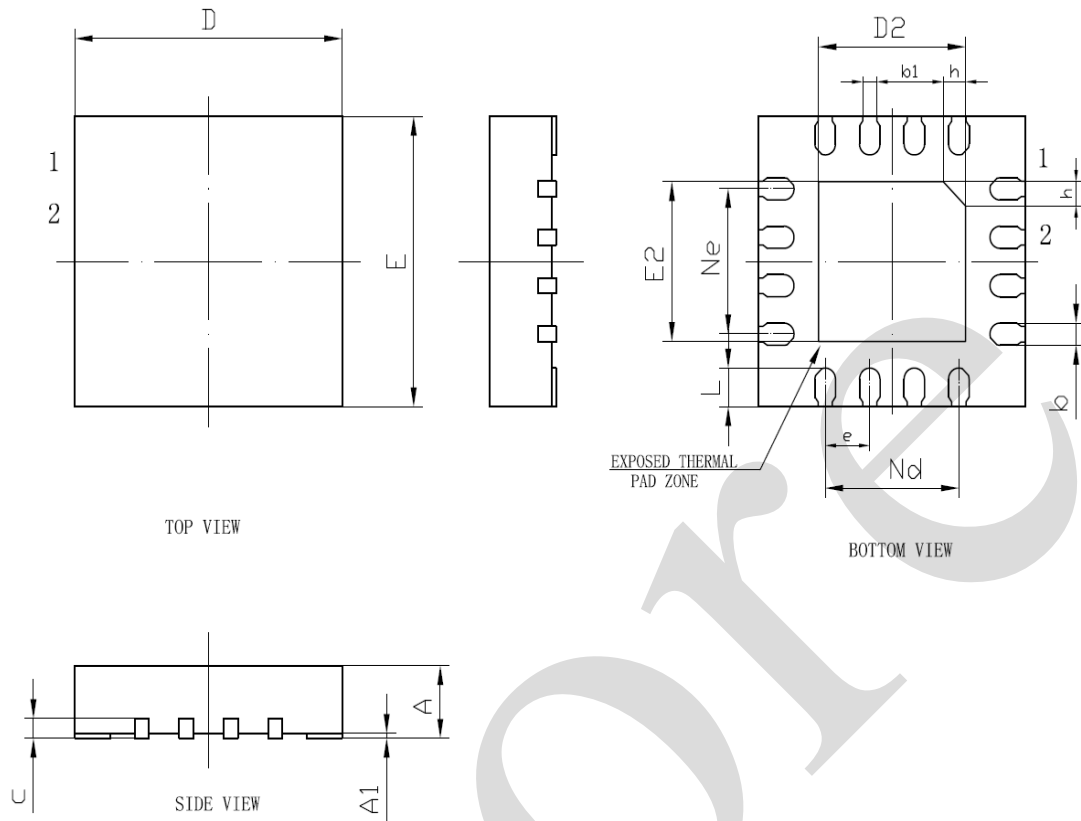
6.1、SOP14



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	1.50	1.75
A1	0.05	0.25
A2	1.30	—
b	0.33	0.50
c	0.19	0.25
D	8.43	8.76
E	5.80	6.25
E1	3.75	4.00
e	1.27	
L	0.40	0.89
θ	0°	8°



6.2、QFN16



2024/01/B	Dimensions In Millimeters	
Symbol	Min	Max
A	0.70	0.80
A1	0	0.05
b	0.18	0.30
b1	0.16	
c	0.18	0.25
D	2.90	3.10
D2	1.55	1.80
e	0.50	
Ne	1.50	
Nd	1.50	
E	2.90	3.10
E2	1.55	1.80
L	0.30	0.50
h	0.20	0.45



7、Statements And Notes

7.1、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.									

7.2、Notes

We recommend you to read this chapter carefully before using this product.

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