



AiP706

Microprocessor Supervisory Circuit with Watchdog Controller

Product Specification

Specification Revision History:

Version	Date	Description
2020-08-A1	2020-08	New
2023-03-B1	2023-03	Update the template
2023-05-B2	2023-05	Modify the parameters
2024-01-B3	2024-01	Modify the content
2024-03-B4	2024-03	Modify the parameters
2025-06-B5	2025-06	Add V_{OHRSTN} and V_{OLRSTN} in the Electrical Characteristics; update the Package Information



Contents

1、 Overview	3
2、 Functional block diagram and pin description.....	6
2.1、 Functional block diagram.....	6
2.2、 Pin Arrangement Diagram.....	6
2.3、 Pin description.....	6
3、 Electrical characteristics.....	7
3.1、 Limit parameters	7
3.2、 Recommended conditions of use.....	7
3.3、 Electrical characteristics.....	7
4. Introduction of main functions	8
4.1、 Power detection	8
4.2、 Watchdog function	9
4.3、 External reset.....	9
4.4、 Independent voltage detection function.....	9
5、 Precautions for use	9
5.1、 Ensure effective RESETN reset signal.....	9
5.2、 Use independent voltage detection function to set additional DC reset voltage.	10
5.3、 Use the independent voltage detection function to set the negative potential detection.	10
5.4、 Match the controller with bidirectional attribute reset port.	11
6、 Package Information.....	12
6.1、 DIP8	12
6.2、 SOP8	13
7、 Statements And Notes	14
7.1、 The name and content of Hazardous substances or Elements in the product.....	14
7.2、 Notes	14



1、 Overview

AiP706 is amicroprocessor supervisory circuit with watchdog function. The circuit includes power supply voltage detection module, watchdog module, hardware reset module and an independent voltage detection module.

Features:

- Low level effective reset signal RESETN
- RESETN port gives effective output signal when VDD>1V.
- The power-on reset delay time is typically 200ms.
- The watchdog reset delay time is typically 1.6s
- Low power consumption
- ESD-HBM: 4000V
- Packaging form: DIP8/SOP8

Selection table:

model	Reset threshold voltage
AiP706L	4.63V
AiP706M	4.38V
AiP706J	4.00V
AiP706T	3.08V
AiP706S	2.93V
AiP706R	2.63V

Order information:

Pipe installation:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP706LDA8.TB	DIP8	AiP706L	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP706MDA8.TB	DIP8	AiP706M	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP706JDA8.TB	DIP8	AiP706J	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP706TDA8.TB	DIP8	AiP706T	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm



						2.54mm
AiP706SDA8.TB	DIP8	AiP706S	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP706RDA8.TB	DIP8	AiP706R	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP706LSA8.TB	SOP8	AiP706L	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706MSA8.TB	SOP8	AiP706M	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706JSA8.TB	SOP8	AiP706J	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706TSA8.TB	SOP8	AiP706T	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706SSA8.TB	SOP8	AiP706S	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706RSA8.TB	SOP8	AiP706R	100 PCS/ tube	100 Tube/box	10000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm

**Braiding:**

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP706LSA8.TR	SOP8	AiP706L	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706MSA8.TR	SOP8	AiP706M	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706JSA8.TR	SOP8	AiP706J	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706TSA8.TR	SOP8	AiP706T	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706SSA8.TR	SOP8	AiP706S	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP706RSA8.TR	SOP8	AiP706R	4000 PCS/ disk	8000 PCS/ box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm

Note: If the material object is inconsistent with the ordering information, please take the material object as the standard.



2、 Functional block diagram and pin description

2.1、 Functional block diagram

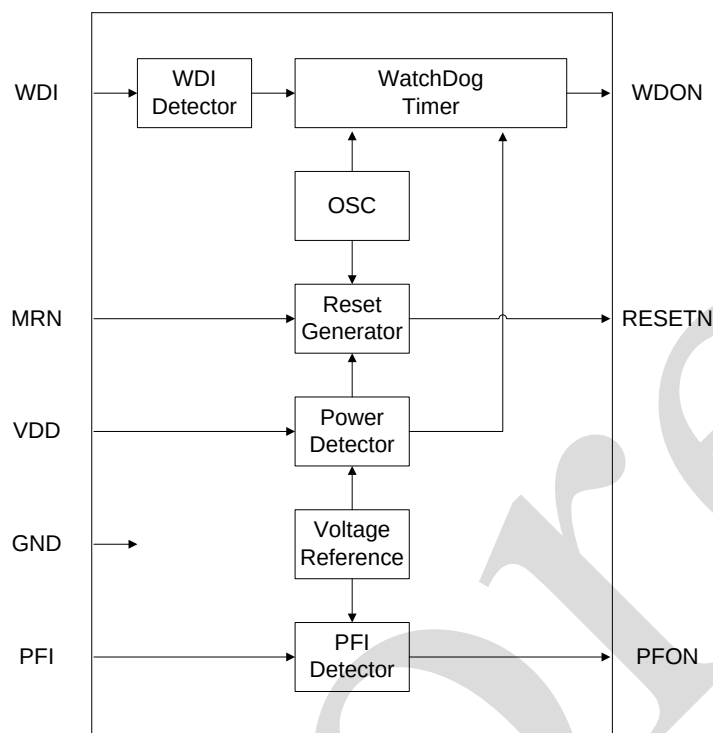


Figure 1. Functional block diagram

2.2、 Pin Arrangement Diagram

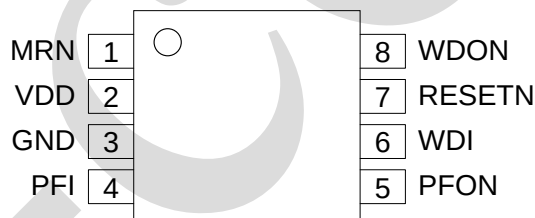


Figure 2, Pin Diagram

2.3、 Pin description

Lead foot	Symbol	Input / output	Work energy
1	MRN	I	Hardware reset signal input, active low.
2	VDD	Power	Power Supply
3	GND	Power	Ground
4	PFI	I	Independent voltage detection input
5	PFON	O	Independent voltage detection result output
6	WDI	I	Watchdog input
7	RESETN	O	Power supply detection reset output
8	WDON	O	Watchdog output



3、Electrical characteristics

3.1、Limit parameters

Unless otherwise specified, $T_{amb}=25^{\circ}\text{C}$

Parameter name	Symbol	condition		Fixed value	Unit
Power supply voltage	VDD	—		-0.3~6.0	V
Input voltage range	VIN	—		-0.3~VDD+0.3	V
storage temperature	T_{stg}	—		-65~+150	$^{\circ}\text{C}$
welding temperature	T_L	10 seconds	DIP	250	$^{\circ}\text{C}$
			SOP	260	

Note:

- 1) Operating above these specified values may cause permanent damage to the components. Extending the operation period under the absolute maximum condition may reduce the reliability of the component. These are only part of the specified values, and functional operations under other conditions outside the specifications are not supported.
- 2) All voltage values are based on the ground terminal as a reference point.

3.2、Recommended conditions of use

Parameter name	Symbol	minimum	typical	maximum	Unit
Power supply voltage	VDD	1	—	5.5	V
Working temperature	T_{amb}	-40	—	+125	$^{\circ}\text{C}$

3.3、Electrical characteristics

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

Parameter name	Symbol	Test strip	minimum	typical	maximum	Unit
Power supply voltage	VDD	—	1	—	5.5	V
Supply Current	IDD	AiP706L	—	50	150	μA
		AiP706M	—	50	150	μA
		AiP706J	—	50	150	μA
		AiP706T	—	50	150	μA
		AiP706S	—	50	150	μA
		AiP706R	—	50	150	μA
Reset threshold	V_T	AiP706L	4.530	4.63	4.730	V
		AiP706M	4.285	4.38	4.475	V
		AiP706J	3.914	4	4.086	V
		AiP706T	3.013	3.08	3.147	V
		AiP706S	2.867	2.93	2.993	V
		AiP706R	2.573	2.63	2.687	V
Reset threshold hysteresis	V_{hys}	—	—	40	—	mV
Reset Pulse Width	T_{RST}	—	120	200	280	ms
RESETN HIGH-level output voltage	V_{OHRSTN}	$I_{LOAD}=800\mu\text{A}$	3.5	-	-	V
RESETN LOW-level output voltage	V_{OLRSTN}	$I_{LOAD}=3.2\text{mA}$	-	-	0.4	V

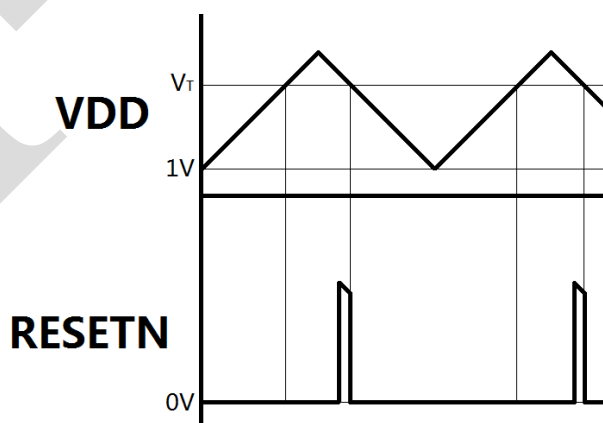


Watchdog timeout Period	T_{WD}	—	1.0	1.6	2.3	s
WDI HIGH-level input current	I_{WDI}	WDI=VDD	—	50	150	uA
WDI LOW-level input current		WDI=0V	-150	-50	—	uA
WDI HIGH-level input voltage	V_{WDI}	—	3.5	—	—	V
WDI LOW-level input voltage		—	—	—	0.8	V
WDON HIGH-level output voltage	V_{ODON}	Iload=800uA	3.5	—	—	V
WDON LOW-level output voltage		Iload=1.2mA	—	—	0.4	V
MRN LOW-level input current	I_{MRN}	MRN=0V	100	250	600	uA
MRN HIGH-level input voltage	V_{IMRN}	—	3	—	—	V
MRN LOW-level input voltage		—	—	—	0.8	V
PFI input detection voltage	V_{TP}	—	1.20	1.25	1.30	V
PFI input current	I_{PFI}	PFI=0~VDD	—	—	0.1	uA
PFON output high level voltage	V_{OPIO}	Iload=800uA	3.5	—	—	V
PFON output low level voltage		Iload=3.2mA	—	—	0.4	V

4. Introduction of main functions

4.1、Power detection

The circuit detects the power supply (VDD) voltage. When the power supply voltage is lower than the "Reset threshold (V_T)", the RESETN port outputs a low level. When the power supply voltage is higher than V_T , the time delay is fixed from the time when the power supply voltage exceeds V_T , typically 200 ms, and the RESETN port outputs a high level. There is a hysteresis voltage during the rise and fall of the power supply voltage near V_T , typically 40mV.





4.2、 Watchdog function

The AiP706 provides an optional watchdog module, including input port WDI and output port WDON.

When the power supply voltage is lower than the "Reset threshold (V_T)", reset the internal watchdog timer, the WDI input signal is invalid, and WDON keeps the output low level.

When the power supply voltage is higher than the "Reset threshold (V_T)", the internal watchdog timer turns on. When the WDI port maintains high level or low level within 1.6s (typical value), the internal watchdog timer overflows, and the WDON port outputs low level.

When the RESETN port outputs a low level or the WDI is suspended, the watchdog function would be turned off, the internal watchdog timer would be reset, and WDON outputs a low level.

When the RESETN port outputs a high level, the watchdog timer starts timing. Whenever the WDI port has an input signal change (rising edge or falling edge), the watchdog timer will reset and keep the WDON output high level.

4.3、 External reset

The AiP706 provides an external hardware reset function, which is controlled by the MRN port. When the input voltage of the MRN port is low, the RESET port will keep the output voltage low, and the watchdog function will reset.

When the power supply voltage is higher than the "Reset threshold (V_T)", when the input of the MRN port changes from low level to high level, the delay is fixed, typically 200 ms, and the RESETN port outputs high level.

4.4、 Independent voltage detection function

The AiP706 provides an independent voltage detection function, including voltage input port PFI and detection result output port PFON. This function is not affected by power supply detection, watchdog function or external reset. When the power supply voltage is higher than 1.8V, it always works.

This function compares the input voltage of PFI port with the fixed 1.25V internal reference voltage. When PFI input voltage is higher than 1.25V, PFON port outputs high level; When PFI input voltage is lower than 1.25V, PFON port outputs low level.

5、 Precautions for use

5.1、 Ensure effective RESETN reset signal.

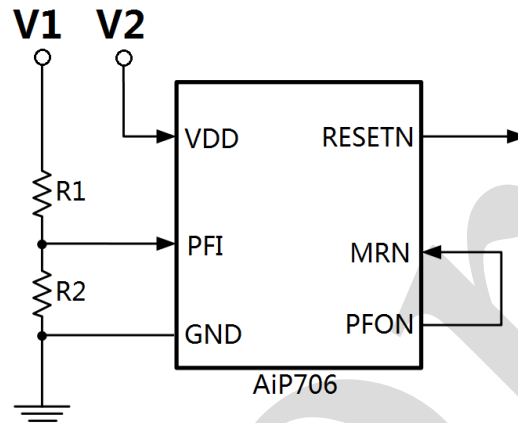
When the power supply voltage is lower than 1V, the RESETN port of the AiP706 cannot ensure stable and effective low-level signal output. When the user has a clear reset signal requirement within the power supply voltage range of 0~1V, it is strongly recommended to add a pull-down resistor to the ground on the RESETN port. The value of the pull-down resistance shall be determined according to the requirements of the use environment of the whole system. It is recommended to use 100K Ω , which can meet the requirements of most conditions.



5.2、 Use independent voltage detection function to set additional DC reset voltage.

When the whole system has two voltages that need to be monitored, the independent voltage detection function of the AiP706 can be used together with the power supply detection function. As shown in the figure below, in this scheme, V2 is monitored by the power supply detection function, and V1 is sampled by the resistor after voltage division, and monitored by the independent voltage detection function.

For example, if V2 is required to be higher than 2.93V and V1 is higher than 10V, V2 can be directly connected to the power supply of the AiP706S ($V_T=2.93V$), and $R1=700K\ \Omega$ and $R2=100K\ \Omega$ can be taken to meet the demand.

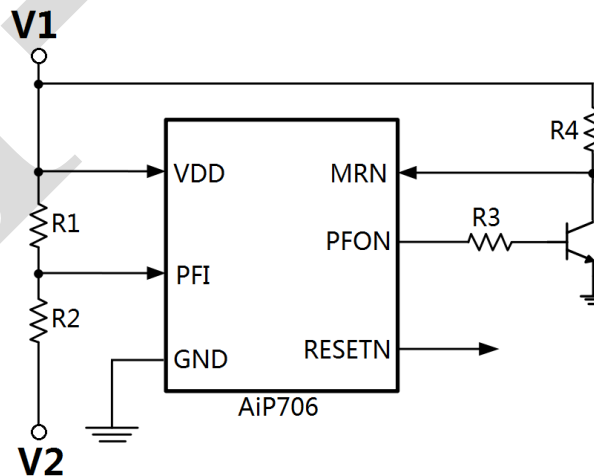


When designing the value of R1 and R2, the overall requirements for power consumption must be considered.

5.3、 Use the independent voltage detection function to set the negative potential detection.

When there is a monitoring demand for negative voltage (lower than GND) in the system, the independent voltage detection function of AiP706 can be used with appropriate peripheral components. As shown in the figure below, V1 is used as the system power supply in this scheme. At the same time, V2 is sampled after voltage division by resistance, and independent voltage detection function is used for detection.

For example, if the V1 power supply is 5V and the monitoring V2 is required to be lower than -10V, the demand can be realized by taking $R1=300K\ \Omega$ and $R2=900K\ \Omega$.





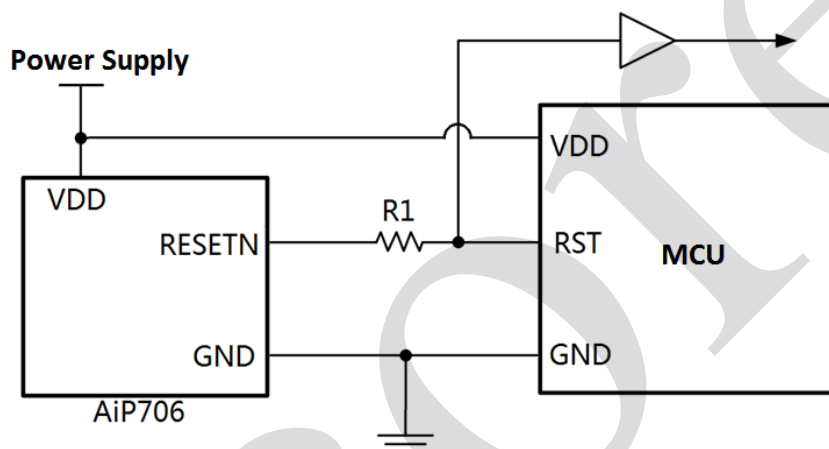
The above scheme meets the following requirements: $(V1-1.25)/R1=(1.25-V2)/R2$

When designing the value of R1 and R2, the overall requirements for power consumption must be considered.

When designing the value of R3 and R4, we must consider the overall requirements for power consumption and the model requirements of peripheral transistors.

5.4、 Match the controller with bidirectional attribute reset port.

The hardware reset pins of some microcontrollers have bidirectional properties (they can output signals under certain conditions). At this time, when using AiP706 to provide hardware reset signals for these devices, additional design is required on the interface. As shown in the figure below, this function can be achieved by serially connecting a resistor between the RESETN port of the AiP706 and the RST (IO attribute) of the controller.

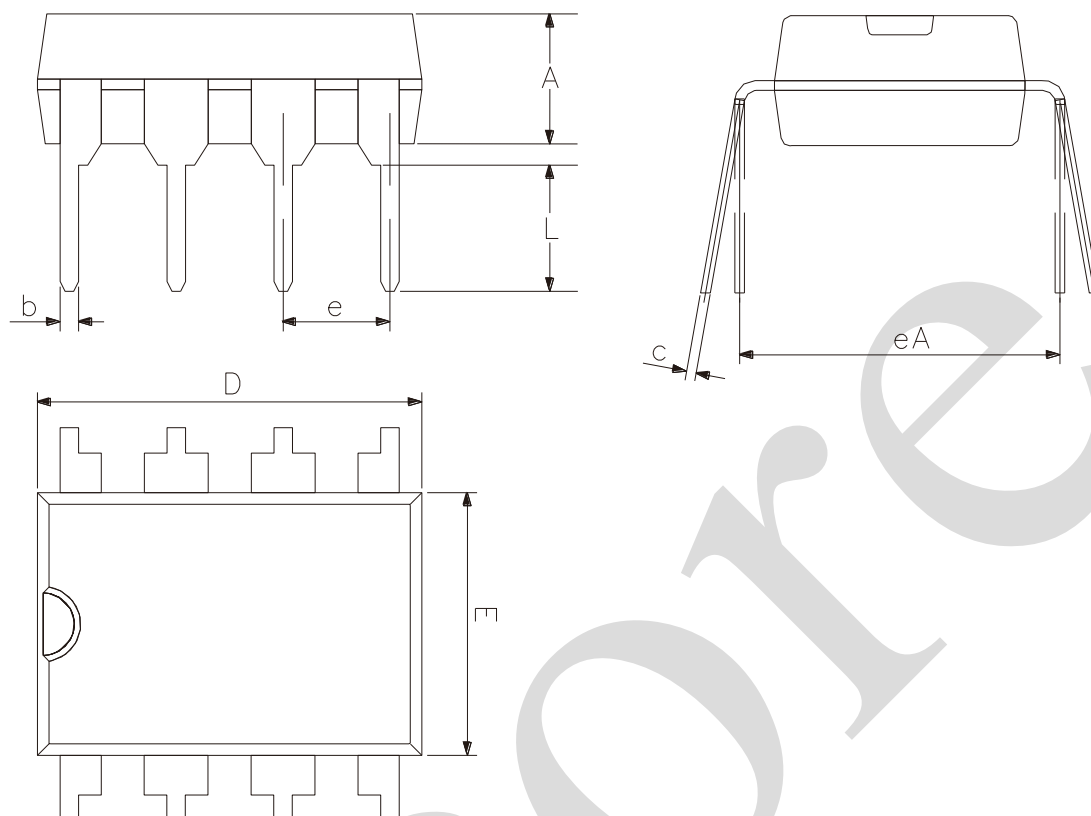


When designing the value of R1, the output driving ability of the microcontroller RST port must be considered. It is recommended to use 4.7K Ω , which can meet the requirements of most conditions.



6、Package Information

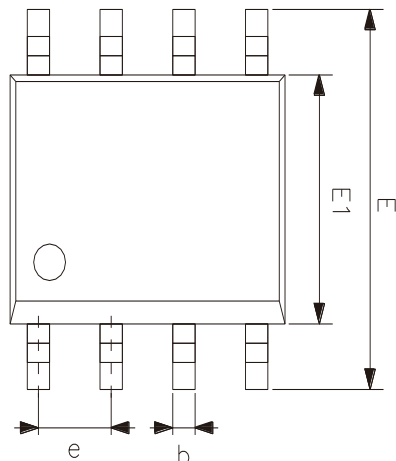
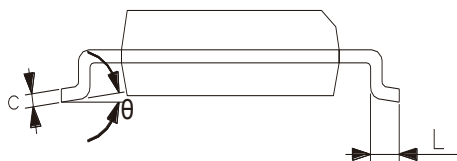
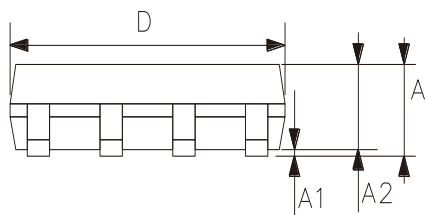
6.1、DIP8



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	3.00	3.60
b	0.36	0.56
c	0.20	0.36
D	9.00	9.45
E	6.15	6.60
e	2.54	
eA	7.62	9.30
L	3.00	—



6.2、SOP8



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	1.35	1.80
A1	0.05	0.25
A2	1.25	1.55
D	4.70	5.10
E	5.80	6.30
E1	3.70	4.10
b	0.306	0.51
c	0.19	0.25
e	1.27	
L	0.40	0.89
θ	0°	8°



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

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