



AiP8051/8052/8053/8054/8059 250MHz Rail-to-Rail Operational Amplifier

Product Specification

Specification Revision History:

Version	Date	Description
2022-12-A0	2022-12	New
2023-11-A1	2023-11	Modify parameters
2024-03-A2	2024-03	Update ordering information
2024-03-A3	2024-03	Modify parameters
2024-04-A4	2024-04	Modify parameters
2024-07-A5	2024-07	Modify the content
2024-07-A6	2024-07	Modify parameters
2024-08-A7	2024-08	Modify parameters
2024-12-A8	2024-12	Modify parameters
2025-04-A9	2025-04	Modify the offset voltage parameter
2026-01-A10	2026-01	Add quiescent current of AiP8053/AiP8059
2026-04-A11	2026-04	Add DFN8 package form for AiP8052



Contents

1、General Description.....	1
2、Pin Configurations And Pin Description.....	5
2.1、Pin Configurations (Top View).....	5
2.2、Pin Description.....	6
3、Electrical Parameter	8
3.1、Absolute Maximum Ratings.....	8
3.2、Recommended Operating Conditions.....	8
3.3、Electrical Characteristics	9
4、Function Description	10
5、Package Information	11
5.1、SOT23-5.....	11
5.2、SOT23-6.....	12
5.3、SOT353.....	13
5.4、SOT363.....	14
5.5、SOP8	15
5.6、MSOP8.....	16
5.7、TSSOP8.....	17
5.8、DFN8.....	18
5.9、MSOP10.....	19
5.10、SOP14	20
5.11、TSSOP14.....	21
6、Statements And Notes	22
6.1、The name and content of Hazardous substances or Elements in the product.....	22
6.2、Notes	22



1、General Description

The AiP805X series consists of rail-to-rail input/output operational amplifiers. Among them, AiP8051, AiP8052 and AiP8054 are single-channel, dual-channel and quad-channel op amps without shutdown pins respectively. AiP8053 is a single-channel op amp with a shutdown pin, and AiP8059 is a dual-channel op amp with a shutdown pin. This series is mainly applied to low-voltage, high-frequency signal processing, video processing, tunable lasers, barcode scanners and other fields.

Features:

- Supply voltage: 2.5V to 5.5V
- Unit-gain bandwidth: 250MHz
- Gain bandwidth product: 120MHz
- High slew rate: 180V/us
- Low offset voltage: $\leq 2\text{mV}$
- Low noise: $6.5\text{nV}/\sqrt{\text{Hz}}$
- Rail-to-rail input/output
- High output short-circuit current: $>100\text{mA}$
- Excellent video performance
- Low input bias current: 3pA
- Thermal shutdown
- Package form:
 - AiP8051: SOT23-5/SOT353/SOP8
 - AiP8052: SOP8/MSOP8/TSSOP8/DFN8
 - AiP8053: SOT23-6/ SOT363/SOP8
 - AiP8054: SOP14/TSSOP14
 - AiP8059: MSOP10



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP8051SA8.TB	SOP8	AiP8051	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP8052SA8.TB	SOP8	AiP8052	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP8052TB8.TB	TSSOP8	8052	100 PCS/tube	200 tube/box	20000 PCS/box	Dimensions of plastic enclosure: 3.0mm×4.4mm Pin spacing: 0.65mm
AiP8052MA8.TB	MSOP8	AiP8052	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm
AiP8053SA8.TB	SOP8	AiP8053	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP8054SA14.TB	SOP14	AiP8054	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP8054TA14.TB	TSSOP14	AiP8054	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP8059MA10.TB	MSOP10	AiP8059	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.50mm

**Reel packing specifications:**

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP8051GB235.TR	SOT23-5	8051XX	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP8051GC353.TR	SOT353	8051XX	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm
AiP8051SA8.TR	SOP8	AiP8051	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP8052SA8.TR	SOP8	AiP8052	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP8052TB8.TR	TSSOP8	8052	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 3.0mm×4.4mm Pin spacing: 0.65mm
AiP8052MA8.TR	MSOP8	AiP8052	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm
AiP8052XB8.TR	DFN8	AiP8052	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.0mm×2.0mm Pin spacing: 0.50mm
AiP8053GB236.TR	SOT23-6	8053XX	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP8053GC363.TR	SOT363	8053XX	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm
AiP8053SA8.TR	SOP8	AiP8053	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm



AiP8054SA14.TR	SOP14	AiP8054	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP8054TA14.TR	TSSOP14	AiP8054	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP8059MA10.TR	MSOP10	AiP8059	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.50mm

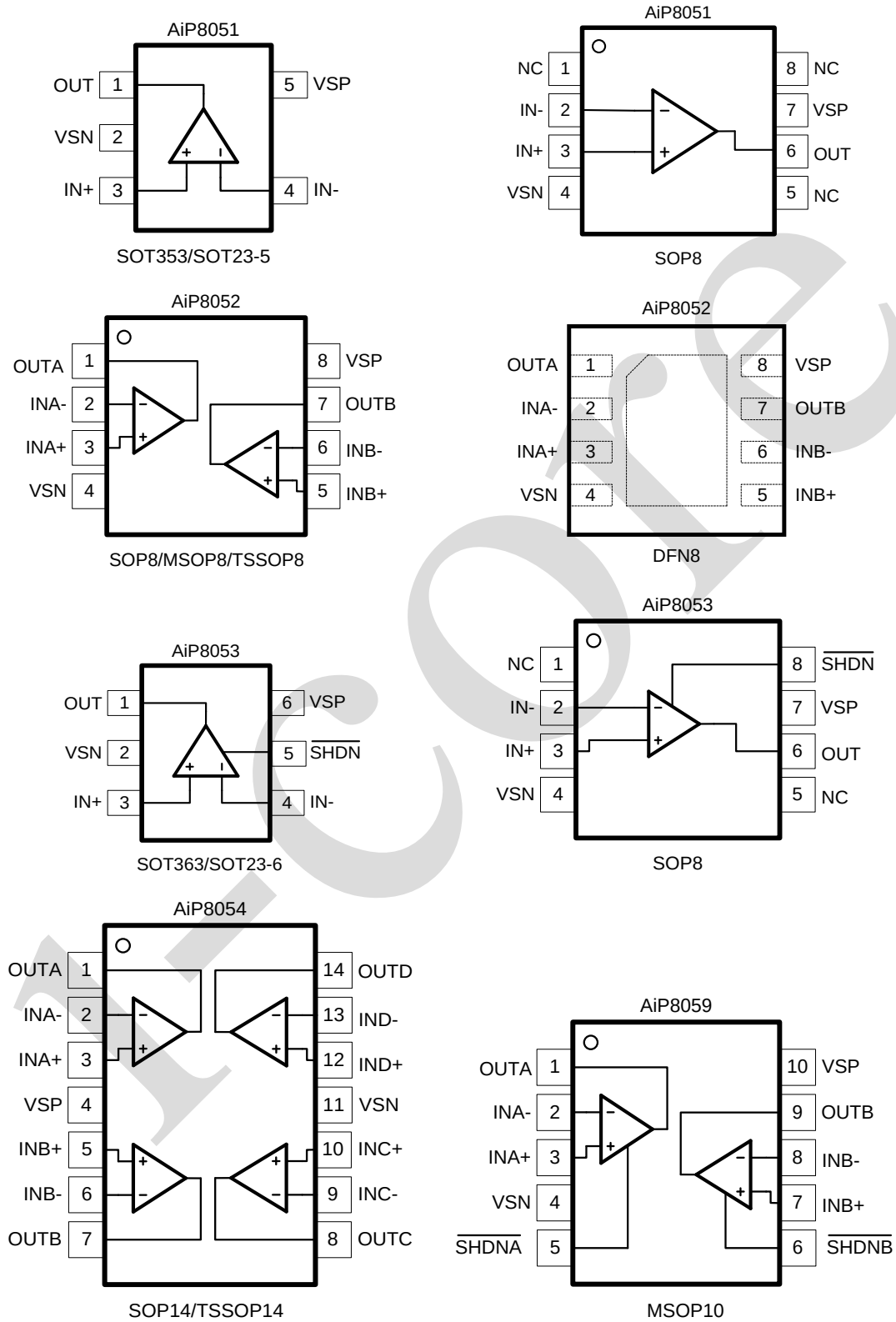
Note 1: “XX” refers to variable content, meaning package batch serial number.

Note 2: If the physical information is inconsistent with the ordering information, please refer to the actual product.



2、Pin Configurations And Pin Description

2.1、Pin Configurations (Top View)





2.2、Pin Description

AiP8051 Pin Description

Pin No.		Pin Name	Description
SOT23-5 SOT353	SOP8		
1	6	OUT	amplifier output
2	4	VSN	ground (negative power supply)
3	3	IN+	amplifier positive input
4	2	IN-	amplifier negative input
5	7	VSP	positive power supply
-	1, 5, 8	NC	not connected

AiP8052 Pin Description

Pin No.	Pin Name	Description	Pin No.	Pin Name	Description
1	OUTA	amplifier A output	5	INB+	amplifier B positive input
2	INA-	amplifier A negative input	6	INB-	amplifier B negative input
3	INA+	amplifier A positive input	7	OUTB	amplifier B output
4	VSN	ground (negative power supply)	8	VSP	positive power supply

AiP8053 Pin Description

Pin No.		Pin Name	Description
SOT23-6/SOT363	SOP8		
1	6	OUT	amplifier output
2	4	VSN	ground (negative power supply)
3	3	IN+	amplifier positive input
4	2	IN-	amplifier negative input
5	8	<u>SHDN</u>	amplifier shutdown pin, Low level: amplifier shutdown High level: normal operation
6	7	VSP	positive power supply
-	1, 5	NC	not connected



AiP8054 Pin Description

Pin No.	Pin Name	Description	Pin No.	Pin Name	Description
1	OUTA	amplifier A output	8	OUTC	amplifier C output
2	INA-	amplifier A negative input	9	INC-	amplifier C negative input
3	INA+	amplifier A positive input	10	INC+	amplifier C positive input
4	VSP	positive power supply	11	VSN	ground (negative power supply)
5	INB+	amplifier B positive input	12	IND+	amplifier D positive input
6	INB-	amplifier B negative input	13	IND-	amplifier D negative input
7	OUTB	amplifier B output	14	OUTD	amplifier D output

AiP8059 Pin Description: MSOP10

Pin No.	Pin Name	Description	Pin No.	Pin Name	Description
1	OUTA	amplifier A output	6	<u>SHDNB</u>	amplifier A shutdown pin, Low level: amplifier shutdown High level: normal operation
2	INA-	amplifier A negative input	7	INB+	amplifier B positive input
3	INA+	amplifier A positive input	8	INB-	amplifier B negative input
4	VSN	ground (negative power supply)	9	OUTB	amplifier B output
5	<u>SHDNA</u>	amplifier A shutdown pin, Low level: amplifier shutdown High level: normal operation	10	VSP	positive power supply

**3、Electrical Parameter****3.1、Absolute Maximum Ratings**(T_{amb}=25℃, unless otherwise specified)

Characteristic	Symbol	Conditions		Min.	Max.	Unit
supply voltage	VSP	-		-	6	V
supply current	I _{VSP}	-		-	60	mA
storage temperature	T _{stg}	-		-65	+150	℃
soldering temperature	T _L	10s	SOT23-5/SOT23-6	260		℃
			SOT353/SOT363	260		
			TSSOP8/MSOP8/SOP8/DFN8	260		
			MSOP10	260		
			TSSOP14	260		
			SOP14	260		
ESD	V(ESD)	HBM		4000	-	V

3.2、Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
supply voltage (single power supply)	VS	2.5	5	5.5	V
supply voltage (dual power supply)	VS	±1.25	-	±2.75	V
ambient temperature	T _{amb}	-40	-	+125	℃



3.3、Electrical Characteristics

($T_{amb}=25^{\circ}\text{C}$, $V_{SP}=5\text{V}$, $V_{SN}=0\text{V}$, $R_F=0\Omega$, $R_L=1\text{k}\Omega$ and connected to $V_S/2$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
input offset voltage	V _{OS}	V _{cm} =V _S /2	-2	-	+2	mV
		V _{cm} =V _S /2, -40℃ to 125℃	-5	-	+5	mV
input offset voltage drift	ΔV _{OS} /ΔT	-40℃ to 125℃	-	10	-	μV/℃
input bias current	I _B	T _{amb} =25℃	-	3	-	pA
		T _{amb} =85℃	-	150	-	pA
		T _{amb} =125℃	-	300	-	pA
input offset current	I _{OS}	-	-	3	-	pA
input noise density	e _n	f=1MHz	-	6.5	-	nV/√Hz
input current noise	i _n	f=1MHz	-	50	-	fA/√Hz
input capacitance	C _{in}	differential mode	-	2.5	-	pF
		common mode	-	1	-	pF
common-mode rejection ratio	CMRR	V _{CM} =0V to 3V, V _S =5V	65	85	-	dB
		V _{CM} =0V to 3V, V _S =5V, -40℃ to 125℃	50	-	-	dB
common-mode voltage range	V _{CM}	-	V _{SN} -0.1	-	V _{SP} +0.1	V
power supply rejection ratio	PSRR	V _S =3V to 5.5V	70	90	-	dB
		V _S =3V to 5.5V, -40℃ to 125℃	65	-	-	dB
open-loop voltage gain	A _{VOL}	R _L =2kΩ	85	110	-	dB
		R _L =2kΩ, -40℃ to 125℃	75	-	-	dB
Frequency Characteristics						
small-signal bandwidth	f _{-3dB}	G=+1, V _o =100mV _{pp} , R _F =25Ω	-	250	-	MHz
		G=+2, V _o =100mV _{pp}	-	90	-	MHz
gain bandwidth product	GBW	G=+10	-	120	-	MHz
bandwidth for 0.1dB gain flatness	f _{0.1dB}	G=+2, V _o =100mV _{pp}	-	25	-	MHz
slew rate	SR	V _S =+5V, G=+1, 4V step	-	200	-	V/us
		V _S =+5V, G=+1, 2V step	-	180	-	V/us
		V _S =+3V, G=+1, 2V step	-	160	-	V/us
rise and fall time	t _F	G=+1, V _o =200mV _{pp} , 10% to 90%	-	2.5	-	ns
		G=+1, V _o =2V _{pp} , 10% to 90%	-	5.5	-	ns
settling time	ts,0.1%	V _S =+5V, G=+1, 2V Output Step	-	22	-	ns
	ts,0.01%	-	-	40	-	ns
overload recovery time	t _R	V _{IN} *Gain=V _S	-	30	-	ns
harmonic distortion	HD2	G=+1, f=1MHz, V _o =2V _{pp} , R _L =200Ω, V _{CM} =1.5V	-	-78	-	dBc
	HD3	-	-	-90	-	dBc
differential gain	GE	NTSC, R _L =150Ω	-	0.02	-	%



error						
differential phase error	PE	NTSC, $R_L=150\Omega$	-	0.3	-	degrees
channel-to-channel crosstalk	Xtalk, AiP8052	$f=5\text{MHz}$	-	-100	-	dB
	Xtalk, AiP8054	-	-	-84	-	dB
output swing from supply rail	V_{OL}, V_{OH}	$R_L=100k\Omega$	-	10	30	mV
		$R_L=100k\Omega$, -40°C to 125°C	-	-	35	mV
input impedance	R_i	differential mode	-	$10^{13} 2$	-	ΩpF
		common-mode	-	$10^{13} 2$	-	ΩpF
closed-loop output impedance	R_{OUT}	$G=1, f=100\text{kHz}, I_{out}=0$	-	0.01	-	Ω
open-loop output impedance	R_O	$f=100\text{kHz}, I_{out}=0$	-	17	-	Ω
output short-circuit current	I_{SC}	Sink current	100	140	-	mA
		Source current	100	240	-	mA
quiescent current per amplifier	I_Q	AiP8051, AiP8053	-	7.6	11	mA
		AiP8051, AiP8053 -40°C to 125°C	-	-	13	mA
		AiP8052, AiP8054, AiP8059	-	7.2	10	mA
		AiP8052, AiP8054, AiP8059 -40°C to 125°C	-	-	12	mA
		AiP8053/AiP8059	-	2	20	μA
shutdown current	I_{SD}	AiP8053/AiP8059	-	2	20	μA
input logic high of SHDN	V_{IH}	-	1.6	-	-	V
input logic low of SHDN	V_{IL}	-	-	-	0.6	V

4、Function Description

The AiP805X is a CMOS, rail-to-rail I/O, high-speed, voltage-feedback operational amplifier designed for video, high-speed, and other applications. It is available as a single, dual, or quad op amp.

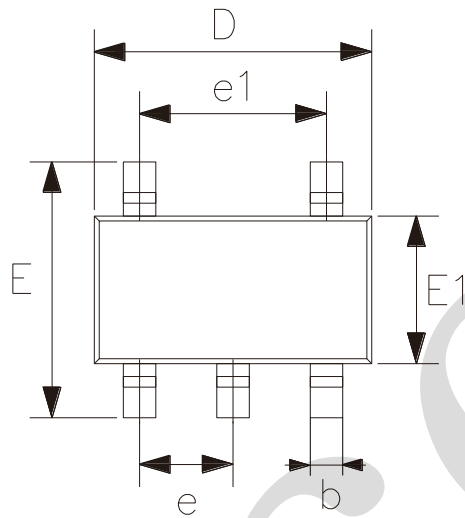
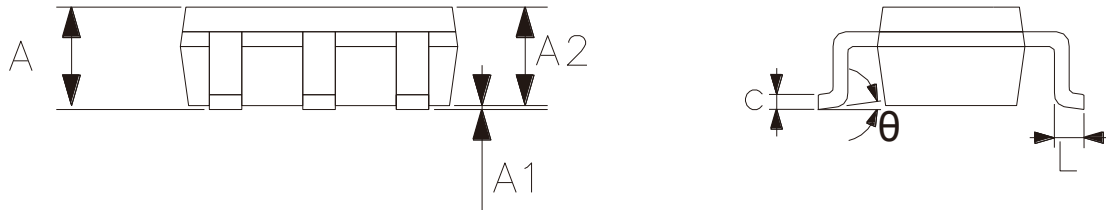
The amplifier features a 250MHz unity-gain bandwidth, and 180V/ μs slew rate, and the amplifier is unity-gain stable and can operate as a +1V/V voltage follower.

The AiP805X is specified over a power-supply voltage range of +2.5V to +5.5V ($\pm 1.25\text{V}$ to $\pm 2.75\text{V}$).



5、Package Information

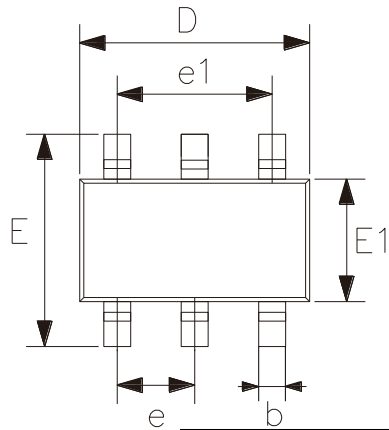
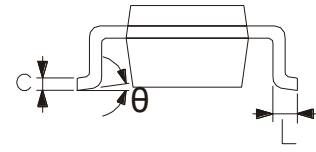
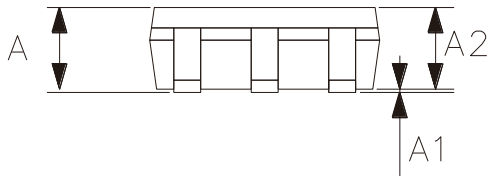
5.1、SOT23-5



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	—	1.26
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°



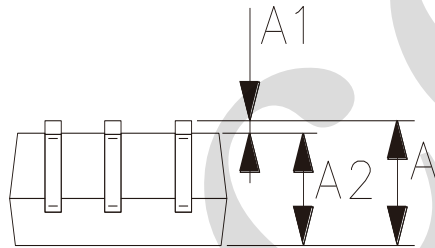
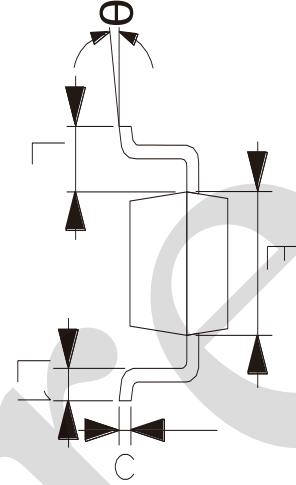
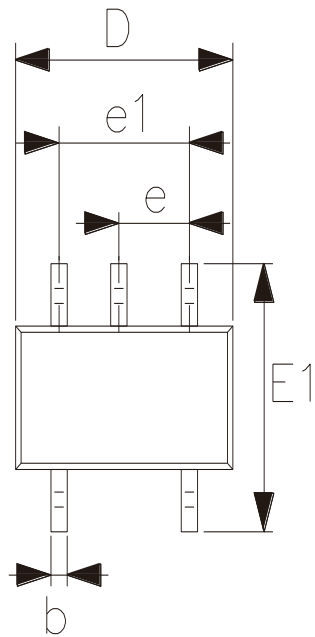
5.2、SOT23-6



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	—	1.25
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°



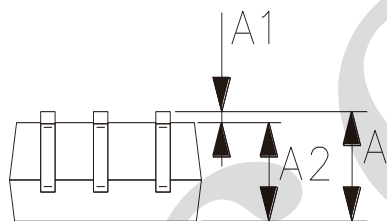
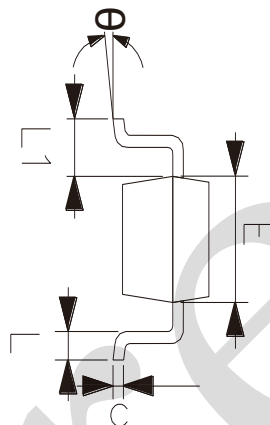
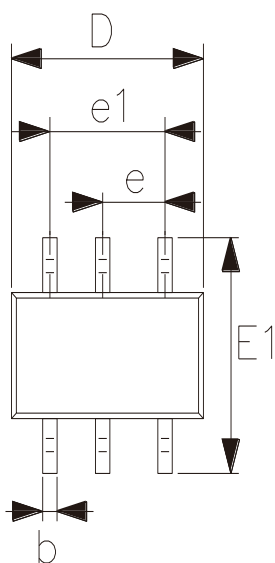
5.3、SOT353



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	0.90	1.10
A1	0.00	0.10
A2	0.90	1.00
b	0.15	0.35
c	0.11	0.175
D	2.00	2.20
E	1.15	1.35
E1	2.15	2.45
e	0.65	
e1	1.20	1.40
L	0.525	
L1	0.26	0.46
θ	0°	8°



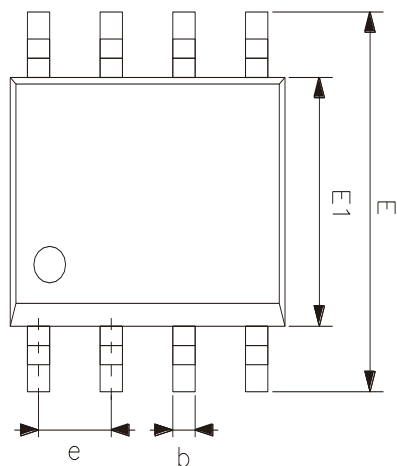
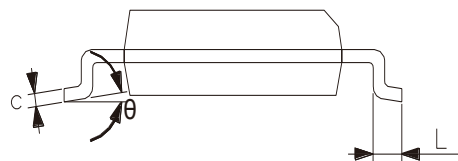
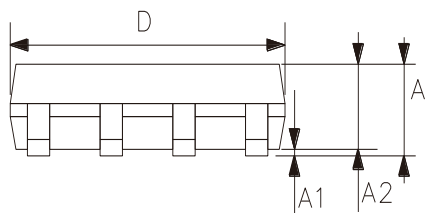
5.4、SOT363



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	0.90	1.10
A1	0.00	0.10
A2	0.90	1.00
b	0.15	0.35
c	0.11	0.175
D	2.00	2.20
E1	2.15	2.45
E	1.15	1.35
e	0.65	
e1	1.20	1.40
L	0.26	0.46
L1	0.525	
θ	0°	8°



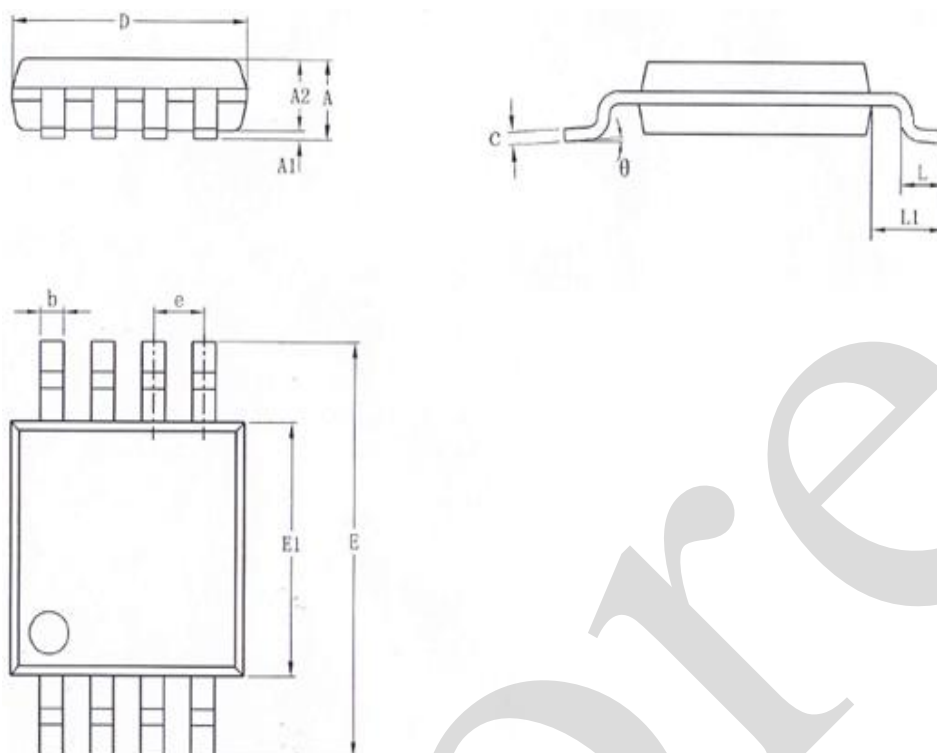
5.5、SOP8



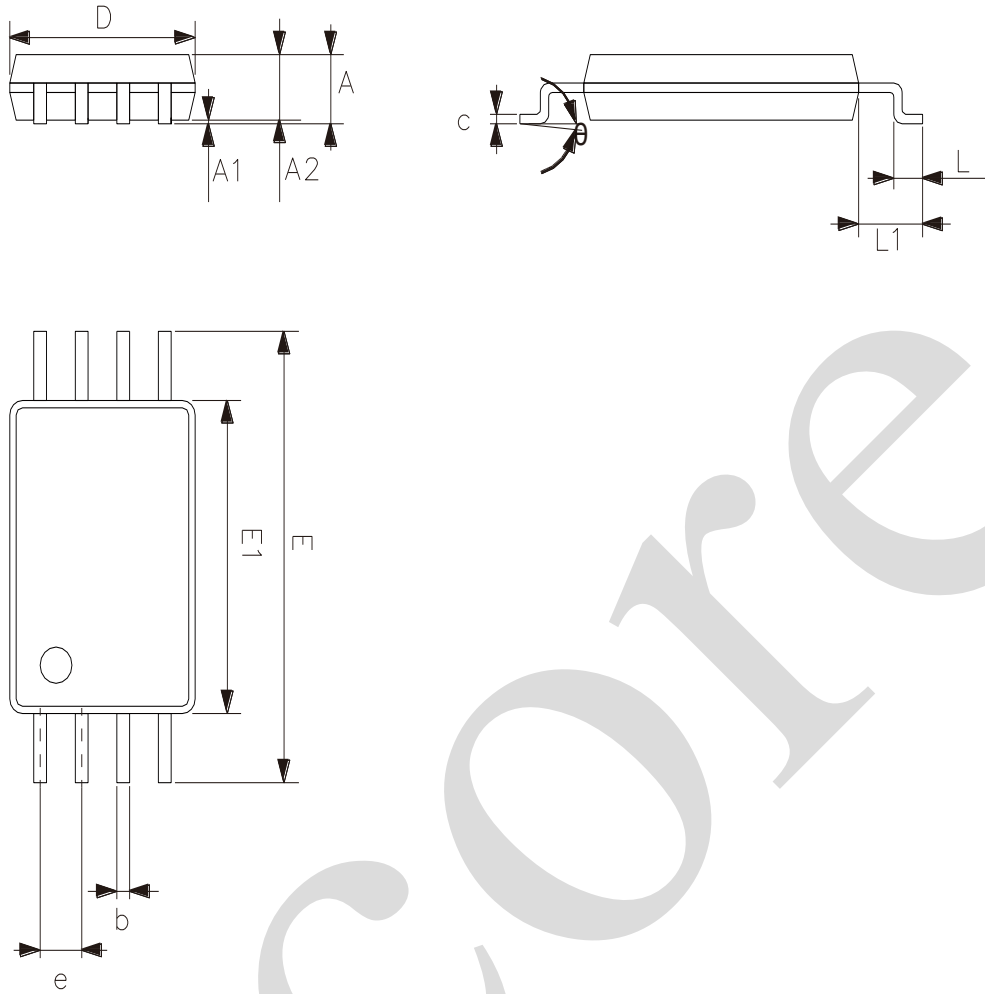
2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	1.35	1.80
A1	0.05	0.25
A2	1.25	1.55
D	4.70	5.10
E	5.80	6.30
E1	3.70	4.10
b	0.306	0.51
c	0.19	0.25
e	1.27	
L	0.40	0.89
θ	0°	8°



5.6、MSOP8



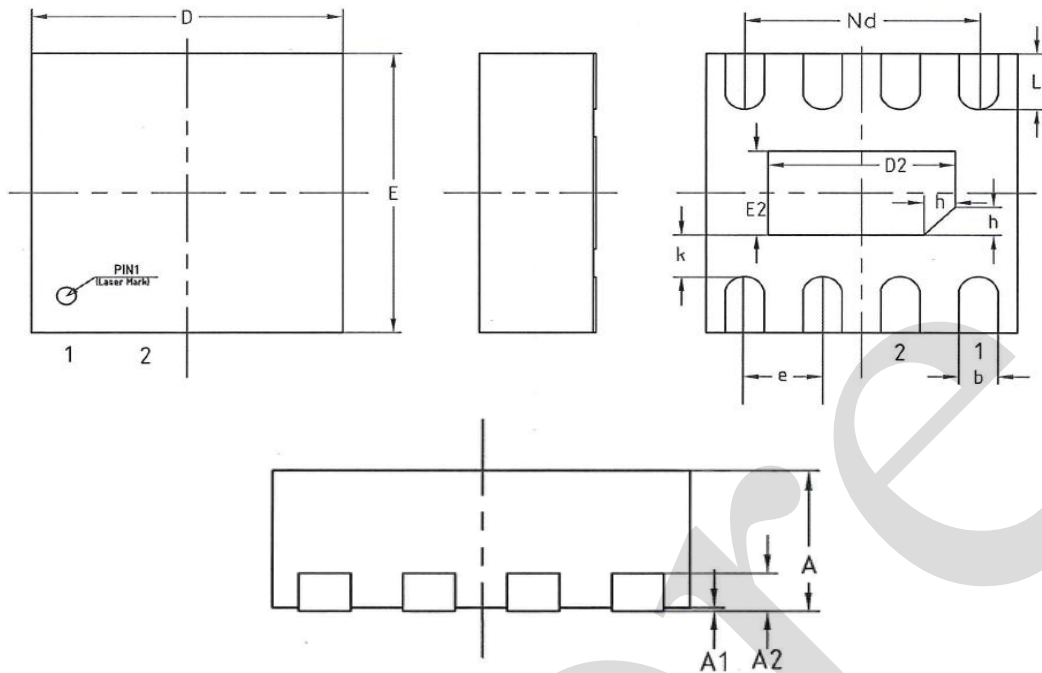
2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	—	1.10
A1	0.05	0.15
A2	0.75	0.95
b	0.22	0.38
c	0.08	0.23
D	2.90	3.10
E	4.70	5.10
E1	2.90	3.10
e	0.65	
L	0.40	0.80
L1	0.95	
θ	0°	8°

**5.7、TSSOP8**

2023/12/A Symbol	Dimensions In Millimeters	
	Min	Max
A	—	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	2.90	3.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
L1	1.00	
θ	0°	8°



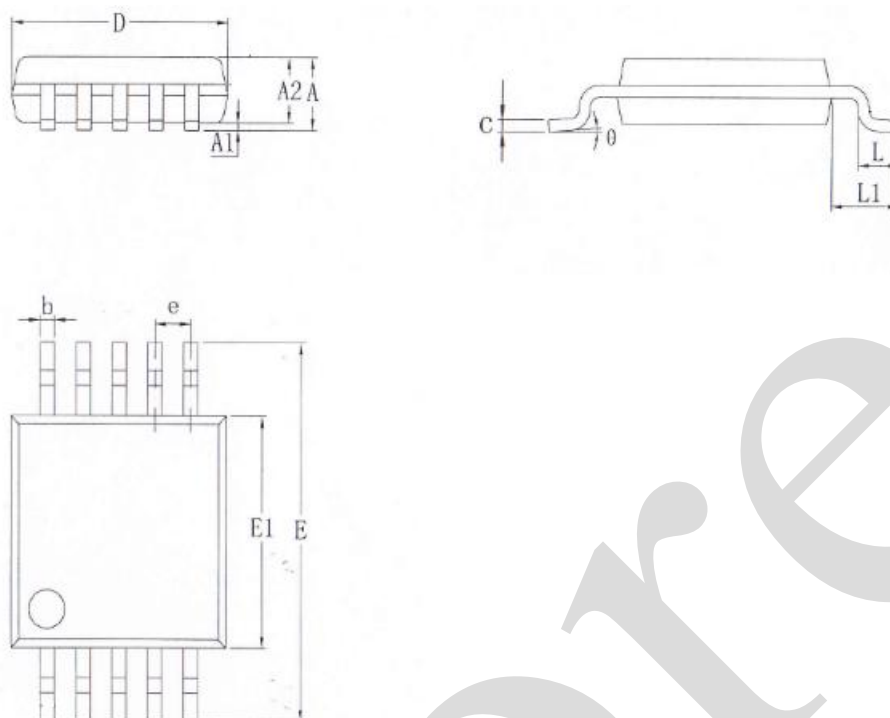
5.8、DFN8



2025/03/B	Dimensions In Millimeters	
Symbol	Min	Max
A	0.70	0.80
A1	0.00	0.05
A3	0.20	
b	0.19	0.30
D	1.90	2.10
E	1.90	2.10
D2	0.60	0.85
E2	1.10	1.35
e	0.50	
L	0.30	0.40



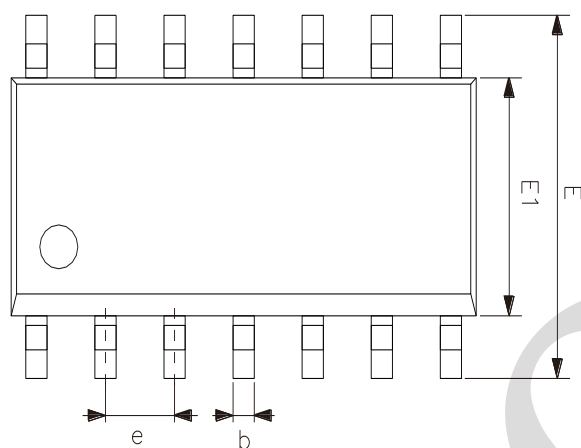
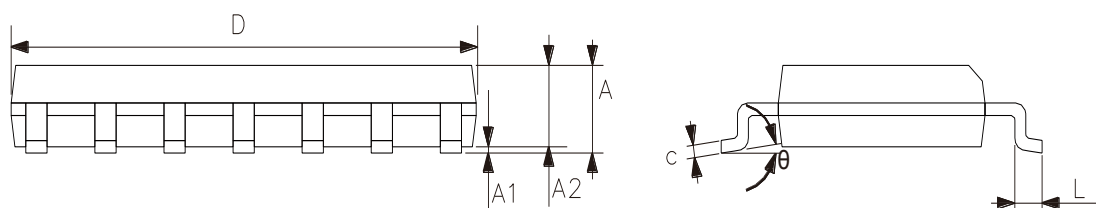
5.9、MSOP10



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	—	1.10
A1	0.05	0.15
A2	0.75	0.95
b	0.17	0.27
c	0.08	0.23
D	2.90	3.10
E	4.70	5.10
E1	2.90	3.10
e	0.50	
L	0.40	0.80
L1	0.95	
θ	0°	8°



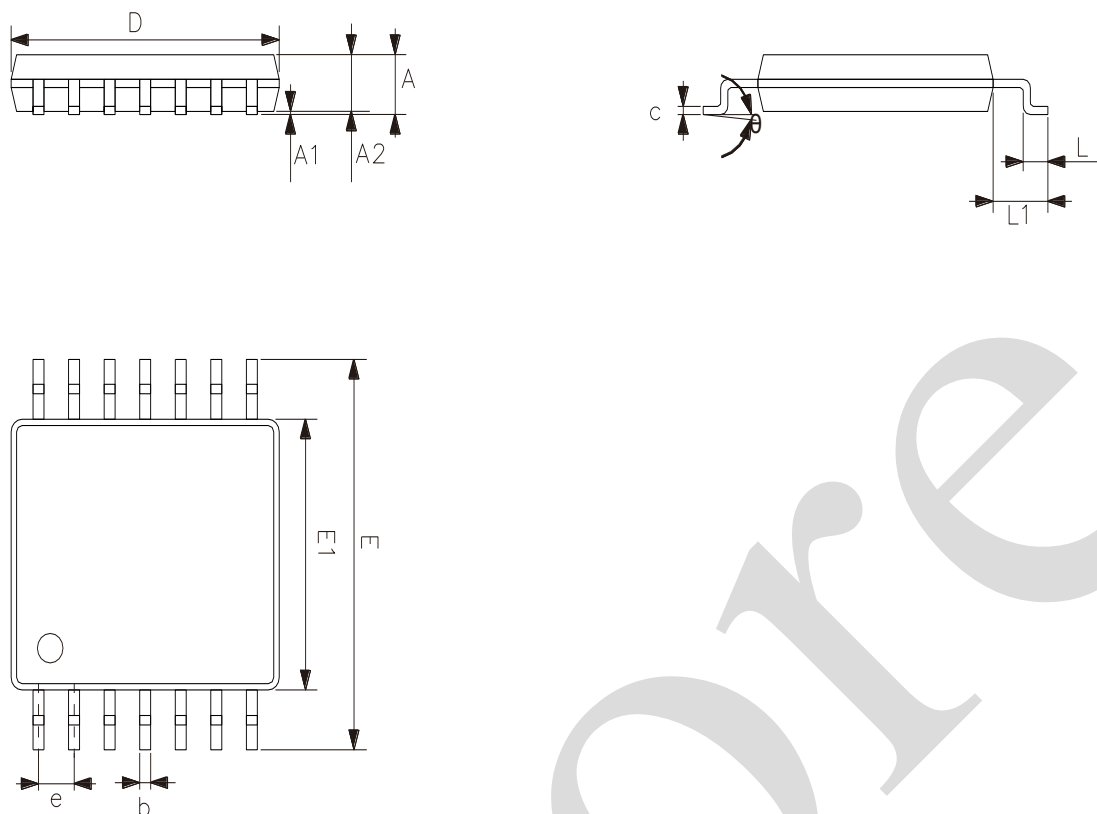
5.10、SOP14



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°



5.11、TSSOP14



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	—	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	4.90	5.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
L1	1.00	
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

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

The information in this chapter is provided for reference only and i-Core disclaims any express or implied warranties, including but not limited to applicability, special application or non-infringement of third party rights.

This product is not suitable for critical equipment such as life-saving, life-sustaining or safety equipment. It is also not suitable for applications that may result in personal injury, death, or serious property or environmental damage due to product malfunction or failure. I-Core will not be liable for any damages incurred by the customers at their own risk for such applications.

The customer is responsible for conducting all necessary tests i-Core's application to avoid failure in the application or the application of the customer's third party users. I-Core does not accept any liability.

The Company reserves the right to change or improve the information published in this chapter at any time. The information in this chapter are subject to change without notice. We recommend the customer to consult our sales staff before purchasing.

Please obtain related materials from i-Core's regular channels and we are not responsible for its content if it is provided by sources other than our company.

In case of any conflict between the Chinese and English version, the version is subject to the Chinese one.