



AiP224/AiP324

Quad Operational Amplifiers

Product Specification

Specification Revision History:

Version	Date	Description
2019-03-A1	2019-03	New
2019-12-A2	2019-12	Update ordering information
2021-12-A3	2021-12	Modify ordering information; Modify the range of operating voltage
2023-02-B1	2023-02	Replace the template
2023-06-B2	2023-06	Modify parameters
2024-08-B3	2024-08	Modify parameters



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1、General Description

AiP224/AiP324 consists of four independent high-gain frequency-compensated operational amplifiers that are appropriate for not only single power supplies with a wide voltage range but also dual power mode. Under recommended conditions, the supply current is independent of the supply voltage. Applications include sensing amplifier, audio amplifier, industrial control, DC amplification blocks and all the occasions using the conventional operational amplifiers.

Features:

- Wide Supply Ranges
Single Supply: 3V to 36V
Dual Supplies: $\pm 1.5\text{V}$ to $\pm 18\text{V}$
- Low Supply-Current Drain Independent of Supply Voltage: 0.8mA Typical
- Wide Unit Gain Bandwidth: 1.2MHz
- Built-in Frequency Compensation
- Low Input Bias and Offset Parameters
Input Offset Voltage: 3mV Typical
Input Offset Current: 2nA Typical
Input Bias Current: 20nA Typical
- Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage: $\pm 36\text{V}$
- Open-Loop Differential Voltage Amplification: 100VdB Typical
- Packing Form: DIP14/SOP14/TSSOP14



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP224SA14.TB	SOP14	AiP224	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP324SA14.TB		AiP324				
AiP224DA14.TB	DIP14	AiP224	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP324DA14.TB		AiP324				
AiP324TA14.TB	TSSOP14	AiP324	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

Reel packing specifications:

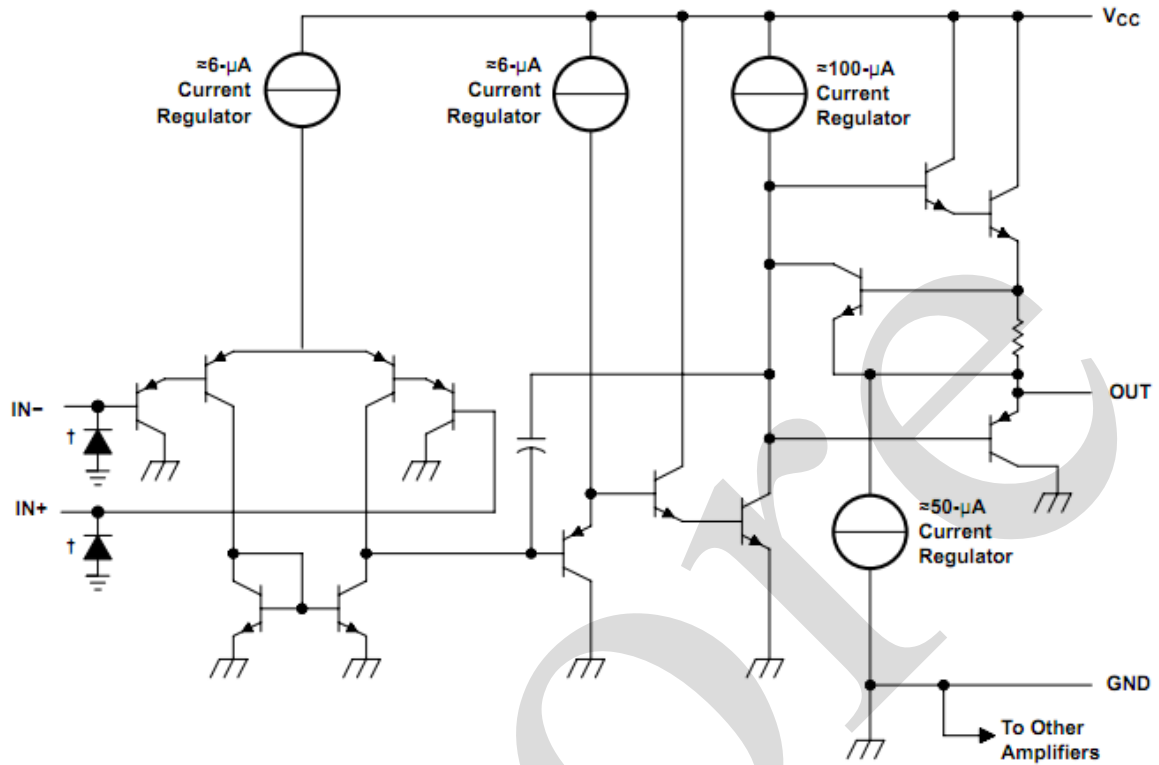
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP224SA14.TR	SOP14	AiP224	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
AiP324SA14.TR		AiP324			
AiP324TA14.TR	TSSOP14	AiP324	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 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.

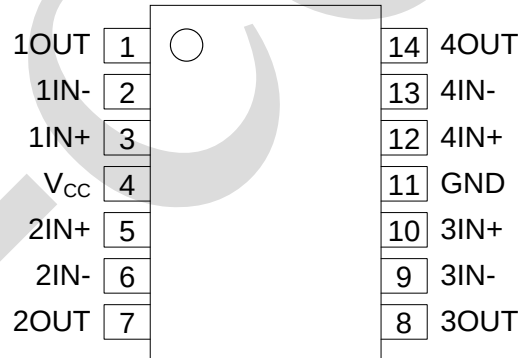


2、Block Diagram And Pin Description

2.1、Block Diagram



2.2、Pin Configurations





2.3、Pin Description

Pin No.	Pin Name	Description
1	1OUT	Channel 1 Output
2	1IN-	Channel 1 Negative input
3	1IN+	Channel 1 Positive input
4	V _{CC}	Power supply
5	2IN+	Channel 2 Positive input
6	2IN-	Channel 2 Negative input
7	2OUT	Channel 2 Output
8	3OUT	Channel 3 Output
9	3IN-	Channel 3 Negative input
10	3IN+	Channel 3 Positive input
11	GND	Ground
12	4IN+	Channel 4 Positive input
13	4IN-	Channel 4 Negative input
14	4OUT	Channel 4 Output

3、Electrical Parameter

3.1、Absolute Maximum Ratings

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

Characteristic		Symbol	Conditions		Value	Unit
Supply Voltage		V _{CC}	-		40 or ±20	V
Differential Input Voltage		V _{ID}	-		±40	V
Input Voltage		V _I	-		-0.3~40	V
Thermal Resistance	DIP14	θ _{JA}	-		88	°C/W
	SOP14				131	
	TSSOP14				175	
Operating Junction Temperature		T _J	-		150	°C
Storage Temperature		T _{stg}	-		-65~150	°C
Soldering Temperature		T _L	10s	DIP	245	°C
				SOP/TSSOP	260	

3.2、Recommended Operating Conditions

Characteristic	Symbol	Conditions		Value	Unit	Characteristic
Supply Voltage	V _{CC}	-		3	36	V
Common-mode Voltage	V _{CM}	-		0	V _{CC} -2	V
Operating Temperature Range	T _{amb}	-	AiP224	-40	125	℃
			AiP324	-40	85	



3.3、Electrical Characteristics

3.3.1、DC Characteristics

($V_{CC}=5V$, $T_{amb}=25^{\circ}C$, unless otherwise specified)

Characteristic	Symbol	Conditions		T _{amb}	Specification Parameters						Unit
					AiP224			AiP324			
					最小	典型	最大	最小	典型	最大	
Input Offset Voltage	V _{IO}	V _{CC} =5~36V, V _{IC} =V _{ICR(min)} , V _O =1.4V		25℃	-	3	5	-	3	7	mV
				Full range	-	-	7	-	-	9	
Input Offset Current	I _{IO}	V _O =1.4V		25℃	-	2	30	-	2	50	nA
				Full range	-	-	100	-	-	150	
Input Bias Current	I _{IB}	V _O =1.4V		25℃	-	-20	-150	-	-20	-250	nA
				Full range	-	-	-300	-	-	-500	
Common-mode Input Voltage Range	V _{ICR}	V _{CC} =5~36V		25℃	0~ V _{CC} -1.5	-	-	0~ V _{CC} -1.5	-	-	V
				Full range	0~ V _{CC} -2	-	-	0~ V _{CC} -2	-	-	
High-level Output Voltage	V _{OH}	R _L =2kΩ		25℃	3.5	-	-	3.5	-	-	V
		V _{CC} =30V	R _L =2kΩ	Full range	26	-	-	26	-	-	
			R _L ≥10kΩ	Full range	27	28	-	27	28	-	
Low-level Output Voltage	V _{OL}	R _L ≤10kΩ		Full range	-	5	20	-	5	20	mV
Large-signal Differential Voltage Amplification	A _{VD}	V _{CC} =15V, V _O =1V~11V, R _L ≥2kΩ		25℃	50	100	-	25	100	-	V/mV
				Full range	25	-	-	15	-	-	
Common-mode Rejection Ratio	CMRR	V _{CC} =5~36V, V _{IC} =V _{ICR(min)}		25℃	70	80	-	65	100	-	dB
Supply-Voltage Rejection Ratio	PSRR	V _{CC} =5~36V		25℃	65	100	-	65	100	-	dB
Crosstalk Attenuation	V _{O1} /V _{O2}	f=1kHz~20kHz		25℃	-	120	-	-	120	-	dB
Output Current	I _O	V _{CC} =15V, V _{ID} =1V, V _O =0	Source	25℃	-20	-30	-60	-20	-30	-60	mA
				Full range	-10	-	-	-10	-	-	
		V _{CC} =15V, V _{ID} =-1V, V _O =15V	Sink	25℃	10	20	-	10	20	-	
				Full range	5	-	-	5	-	-	
		V _{ID} =-1V, V _O =200mV			25℃	12	30	-	12	30	-
Short-circuit Output Current	I _{OS}	V _{CC} =5V, V _O =0V, GND=-5V		25℃	-	±40	±60	-	±40	±60	mA
Supply Current	I _{CC}	V _O =2.5V, No Load		Full range	-	0.8	1.2	-	0.8	1.2	mA
		V _{CC} =36V, V _O =0.5V _{CC} , No Load		Full range	-	1.4	3.5	-	1.4	3.5	
Slew Rate	SR	V _{CC} =±18V,		Full	-	0.5	-	-	0.5	-	V/us



		$R_L=1M\Omega$, $C_L=30pF$, $V_I=\pm 10V$, 图 1	range							
Unity-gain Bandwidth	GBP	$V_{CC}=\pm 18V$, $R_L=1M\Omega$, $C_L=20pF$, 图 1	Full range	-	1.2	-	-	1.2	-	MHz
Equivalent Input Noise Voltage	e_N	$V_{CC}=\pm 18V$, $R_s=100\Omega$, $f=1kHz$, $V_I=0V$, 图 2	Full range	-	35	-	-	35	-	nV/ $\sqrt{Hz}$

4、Testing Circuit

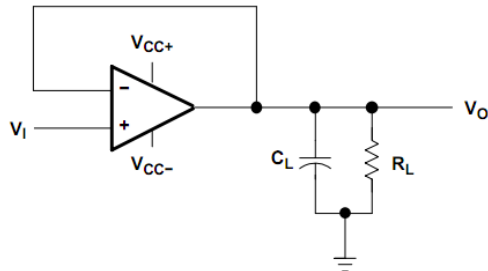


Figure 1: Unity-Gain Amplifier

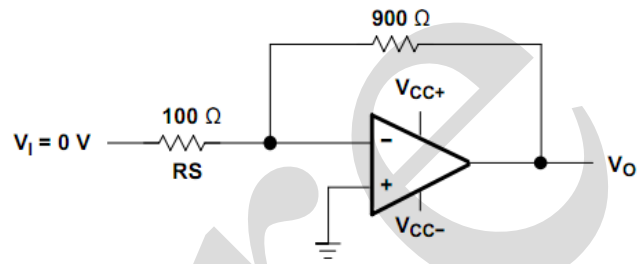
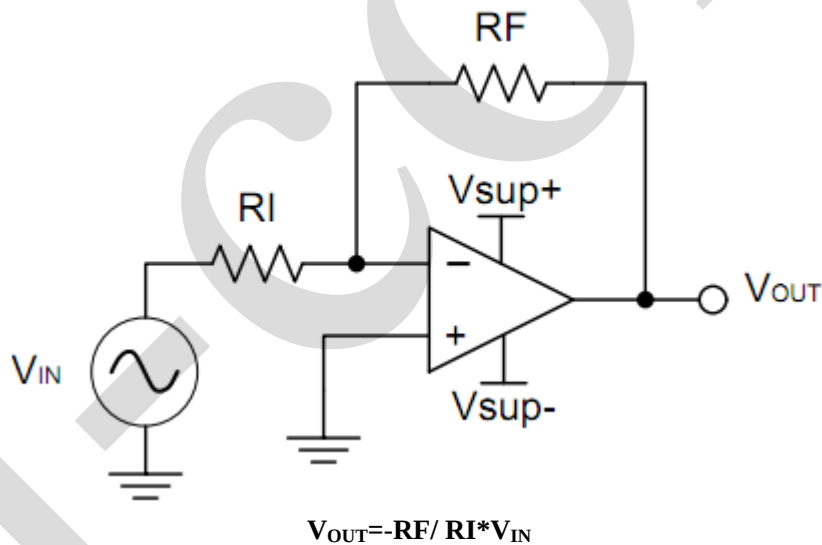


Figure 2: Noise-Test Circuit

5、Typical Application Circuit And Application Note

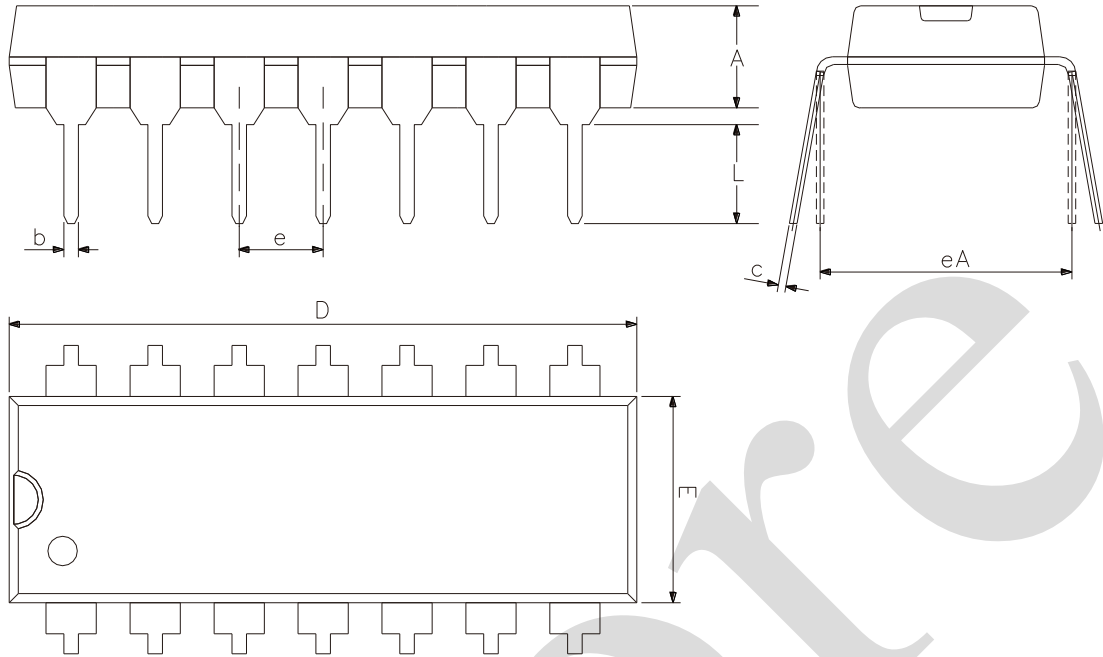
5.1 Application Circuit





6、Package Information

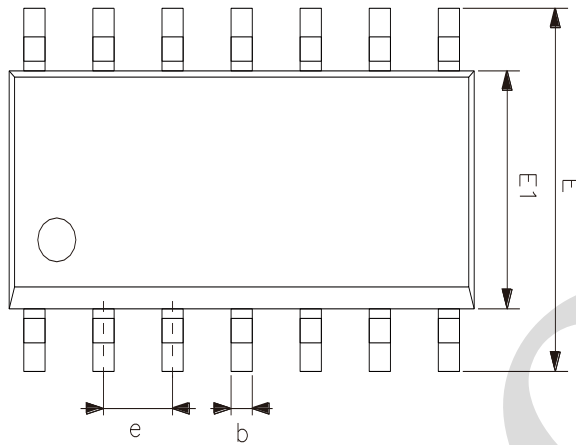
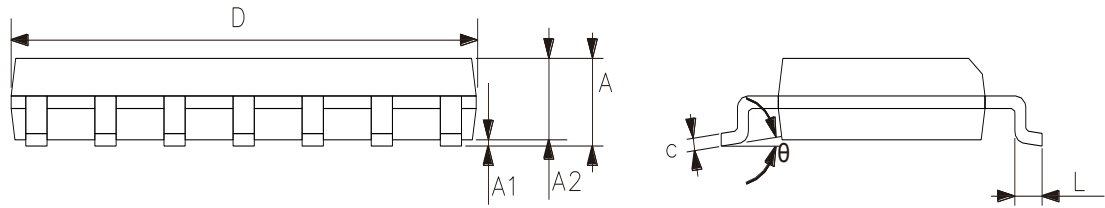
6.1、DIP14



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	3.05	3.60
b	0.33	0.56
c	0.20	0.36
D	18.80	19.40
E	6.20	6.60
e	2.54	
eA	7.62	10.90
L	2.92	—



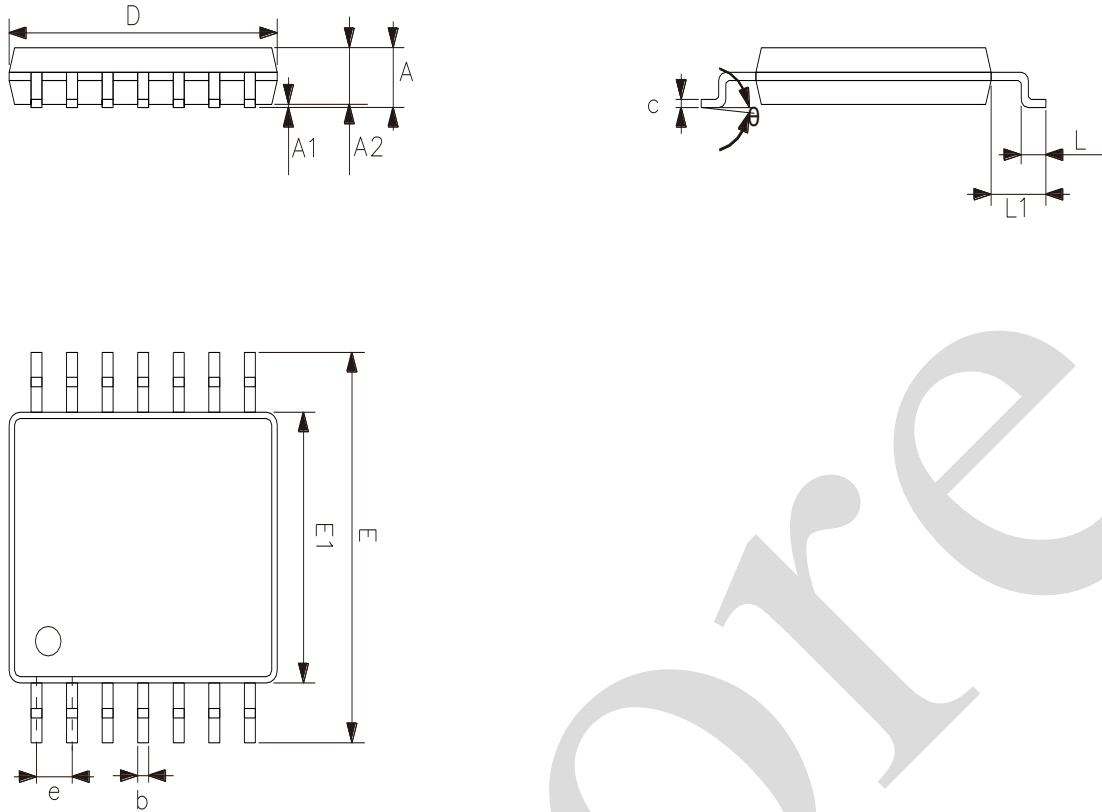
6.2、SOP14



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°



6.3、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°



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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