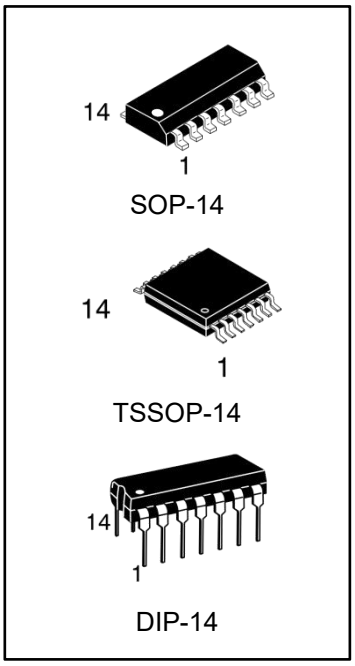
QUADRUPLE OPERATIONAL AMPLIFIERS

DESCRIPTION

The LMx24A consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.
Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits.



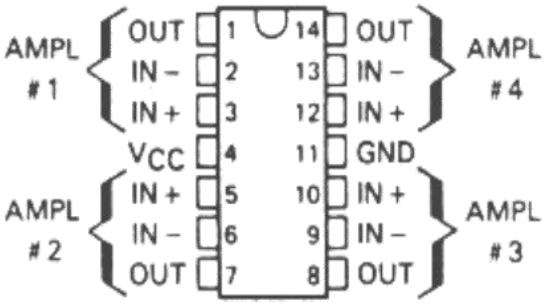
FEATURES

- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain 100 V/ mV Typ
- Internally frequency compensation

ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM324AN	DIP-14	LM324A	TUBE	1000/box
LM224AN	DIP-14	LM224A	TUBE	1000/box
LM324AM/TR	SOP-14	LM324A	REEL	2500/reel
LM224AM/TR	SOP-14	LM224A	REEL	2500/reel
LM324AMT/TR	TSSOP-14	LM324A	REEL	2500/reel
LM224AMT/TR	TSSOP-14	LM224A	REEL	2500/reel

PACKAGE INFORMATION



DIP14/SOP14/TSSOP14

ELECTRICAL CHARACTERISTICS

at specified free-air temperature, VCC = 5V (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM224A/ LM324A			UNIT
			MIN	TYP	MAX	
V_{IO} Input offset voltage	Vcc =5V to MAX, V_{IC} = V_{ICR} min, V_O=1.4V	25℃		3	5	mV
		Full temperature range			9	
αV_{IO} Average temperature coefficient of input offset voltage		Full temperature range		7		μV/℃
I_{IO} Input offset current	Vo=1.4V	25℃		2	50	nA
		Full temperature range			150	
αI_{IO} Average temperature coefficient of input offset current		Full temperature range		10		pA/℃
I_{IB} Input bias current	Vo=1.4V	25℃		-20	-250	nA
		Full temperature range			-500	
VICR Common-mode input voltage range	Vcc = 5V to MAX	25℃	0 to Vcc-1.5			V
		Full temperature range	0 to Vcc - 2			
VOH High-level output voltage	RL = 2 kΩ	25℃	Vcc-1.5			V
	Vcc = MAX, R_L =2kΩ	Full temperature range	26			
	Vcc = MAX, RL = 10 kΩ	Full temperature range	27	28		
V_{OL} Low-level output voltage	RL = 10 kΩ	Full temperature range		5	20	mV
A_{VD} Large-signal differential voltage amplification	Vcc = 15 V, Vo=1V to 11 V, RL ≥ 2 kΩ	25℃	25	100		V/mV
		Full temperature range	15			
CMRR Common-mode rejection ratio	Vcc = 5V to MAX, V_{IC} = V_{ICR} min	25℃	65	80		dB
k_{SVR} Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	Vcc = 5V to MAX	25℃	65	100		dB
Vo1/Vo2 Crosstalk attenuation	f=1kHz to 20 kHz	25℃		120		dB
I_O Output current	Vcc = 15 V, V_{ID}=1V,Vo= 0	25 ℃	-20	-30		mA
		Full temperature range	-10			
	Vcc = 15 V, V_{ID}= -1V, Vo=15V	25 ℃	10	20		
		Full temperature range	5			
	V_{ID}= -1V, Vo = 200 mV	25℃	12	30		μA

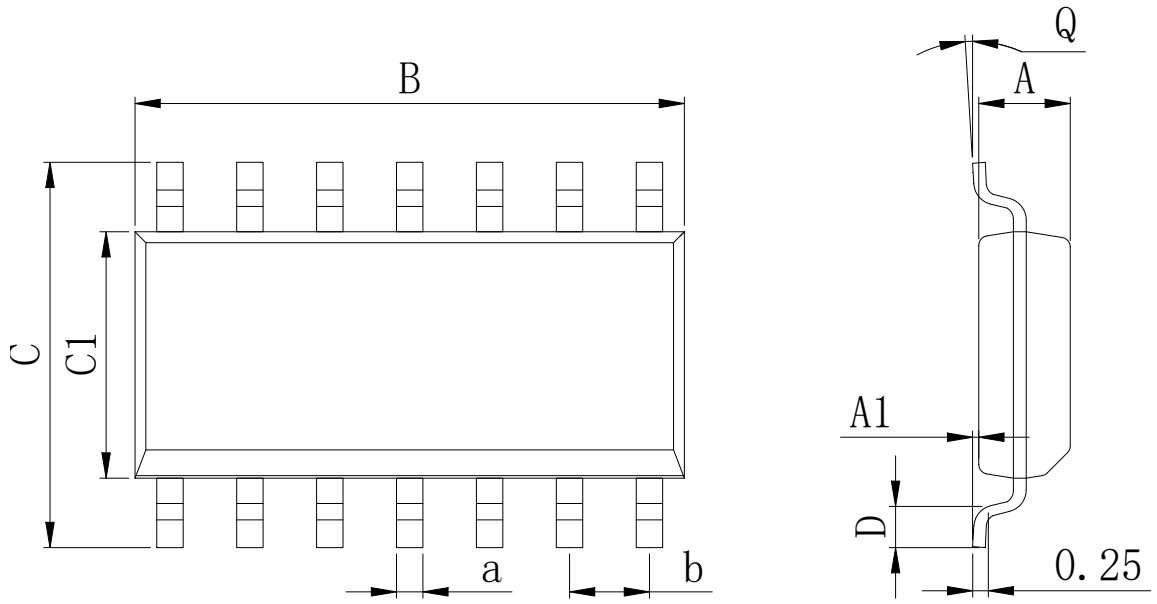
Ios Short-circuit output current	Vcc at 5 V, GND at -5V,Vo=0	25℃		±40	±60	mA
Icc	Vo = 2.5 V, No load	Full temperature range		1.5	2.4	mA
Supply current (four amplifiers)	Vcc = MAX, Vo = 0.5Vcc, No load	Full temperature range		1.1	3	

* All characteristics are measured under open loop conditions with zero common-mode input voltage unless otherwise specified.

"MAX" Vcc for testing purposes is 30 V. LM224A Operating temperature -40 - 85° C, LM324A Operating temperature 0 - 70° C, MAX Junction temperature + 125°C.

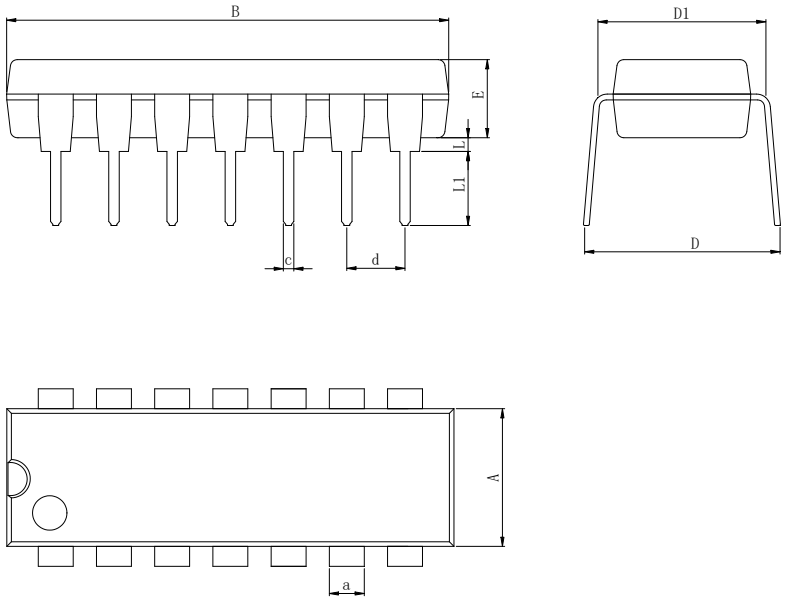
PHYSICAL DIMENSIONS

SOP-14



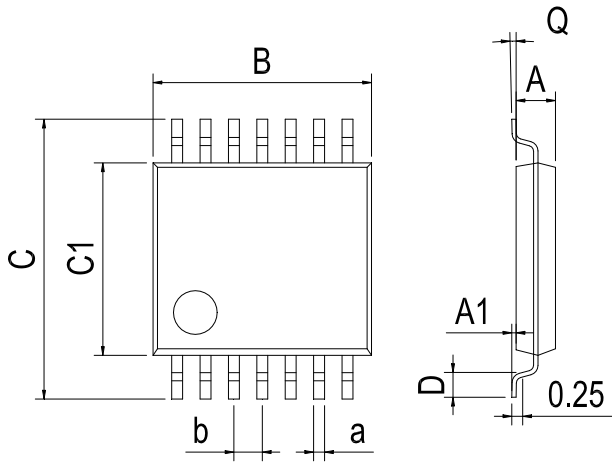
Dimensions In Millimeters(SOP-14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

DIP-14



Dimensions In Millimeters(DIP-14)										
Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.50	

TSSOP-14



Dimensions In Millimeters(TSSOP-14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

Revision History

DATE	REVISION	PAGE
2018-9-5	New	1-7
2023-8-29	Updated DIP-14 dimension	4

IMPORTANT STATEMENT:

Huaguan Semiconductor reserves the right to change its products and services without notice. Before ordering, the customer shall obtain the latest relevant information and verify whether the information is up to date and complete. Huaguan Semiconductor does not assume any responsibility or obligation for the altered documents.

Customers are responsible for complying with safety standards and taking safety measures when using Huaguan Semiconductor products for system design and machine manufacturing. You will bear all the following responsibilities: Select the appropriate Huaguan Semiconductor products for your application; Design, validate and test your application; Ensure that your application meets the appropriate standards and any other safety,security or other requirements. To avoid the occurrence of potential risks that may lead to personal injury or property loss.

Huaguan Semiconductor products have not been approved for applications in life support, military, aerospace and other fields, and Huaguan Semiconductor will not bear the consequences caused by the application of products in these fields. All problems, responsibilities and losses arising from the user's use beyond the applicable area of the product shall be borne by the user and have nothing to do with Huaguan Semiconductor, and the user shall not claim any compensation liability against Huaguan Semiconductor by the terms of this Agreement.

The technical and reliability data (including data sheets), design resources (including reference designs), application or other design suggestions, network tools, safety information and other resources provided for the performance of semiconductor products produced by Huaguan Semiconductor are not guaranteed to be free from defects and no warranty, express or implied, is made. The use of testing and other quality control technologies is limited to the quality assurance scope of Huaguan Semiconductor. Not all parameters of each device need to be tested.

The documentation of Huaguan Semiconductor authorizes you to use these resources only for developing the application of the product described in this document. You have no right to use any other Huaguan Semiconductor intellectual property rights or any third party intellectual property rights. It is strictly forbidden to make other copies or displays of these resources. You should fully compensate Huaguan Semiconductor and its agents for any claims, damages, costs, losses and debts caused by the use of these resources. Huaguan Semiconductor accepts no liability for any loss or damage caused by infringement.