

## **QUADRUPLE OPERATIONAL AMPLIFIERS**

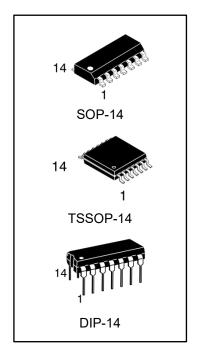
### **DESCRIPTION**

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**

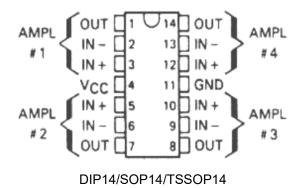
- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain 100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



http://www.hgsemi.com.cn



### **ELECTRICAL CHARACTERISTICS**

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

PARAMETER	TEST COL	NDITIONS*	LM224A	UNIT			
PARAIVIETER	i EST COI	ADITIONS*	MIN	TYP	MAX	UNII	
VIO Input offset voltage	Vcc =5V to MAX, VIC = VICR min, VO=1.4V	25℃ Full temperature range		3	5 9	mV	
αV <sub>IO</sub> Average temperature coefficient of input offsetvoltage		Full temperature range		7		<b>μV/</b> ℃	
IIO Input offset current	Vo=1.4V	25℃ Full temperature range		2	50 150	nA	
αIIO Average temperature coefficient of input offset current		Full temperature range		10		pA/℃	
IIB	Vo=1.4V	25℃		-20	-250	nA	
Input bias current	VO-1.4V	Full temperature range			-500	IIA	
VICR	Vcc = 5V to MAX	25℃	0 to Vcc-1.5			V	
Common-mode input voltage range		Full temperature range	0 to Vcc - 2				
	RL = 2 kΩ	RL = 2 kΩ 25℃					
VOH	Vcc = MAX, RL =2kΩ	Full temperature range	26			V	
High-level output voltage	Vcc = MAX, RL = 10 kΩ	Full temperature range	27	28		-	
VOL Low-level output voltage	RL = 10 kΩ	Full temperature range		5	20	mV	
AVD	Vcc = 15 V,	25℃	25	100		.,, .,	
Large-signal differential voltage amplification	Vo=1V to 11 V, RL ≥ 2 kΩ	Full temperature range	15			V/mV	
CMRR Common-mode rejection ratio	Vcc = 5V to MAX, VIC = VICR min	25℃	65	80		dB	
kSVR Supply voltage rejection ratio (ΔVcc/ΔVIO)	Vcc = 5V to MAX	25℃	65	100		dB	
Vo1/Vo2 Crosstalk attenuation	f=1kHz to 20 kHz	25℃		120		dB	
	Vcc = 15 V,	25 ℃ -20		-30			
	V <sub>ID</sub> =1V,V <sub>0</sub> = 0	Full temperature range	-10				
IO	Vcc = 15 V,	25 ℃	10	20		mA	
Output current	V <sub>ID</sub> = -1V, V <sub>0</sub> =15V	Full temperature range	5			1	
	V <sub>ID</sub> = -1V, Vo = 200 mV	25℃	12	30		μΑ	



## LM224A/324A

los 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	
Supply current (four amplifiers)	Vcc = MAX, Vo = 0.5Vcc, Noload	Full temperature range	1.1	3	mA

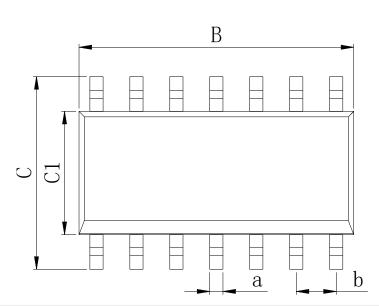
<sup>\*</sup> All characteristics are measured under open loop conditions with zero common-mode input voltage unless otherwise specified.

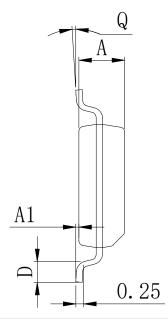
<sup>&</sup>quot;MAX" Vcc for testing purposes is 30 V. LM224A Operating temperature -40 -  $85^{\circ}$  C, LM324A Operating temperature 0 -  $70^{\circ}$  C, MAX Junction temperature +  $125^{\circ}$ C.



## **PHYSICAL DIMENSIONS**

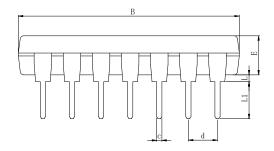
## SOP-14



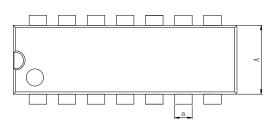


Dimensions In Millimeters(SOP-14)									
Symbol:	Α	A1	В	С	C1	D	Q	а	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	4 27 DCC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	1.27 BSC

DIP-14



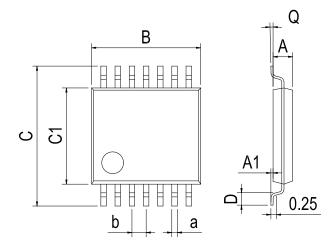




Dimensions In Millimeters(DIP-14)											
Symbol:	Α	В	D	D1	E	L	L1	а	С	d	
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54.000	
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.50	2.54 BSC	



TSSOP-14



Dimensions In Millimeters(TSSOP-14)									
Symbol:	Α	A1	В	С	C1	D	Q	а	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



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