

## QUADRUPLE OPERATIONAL AMPLIFIERS

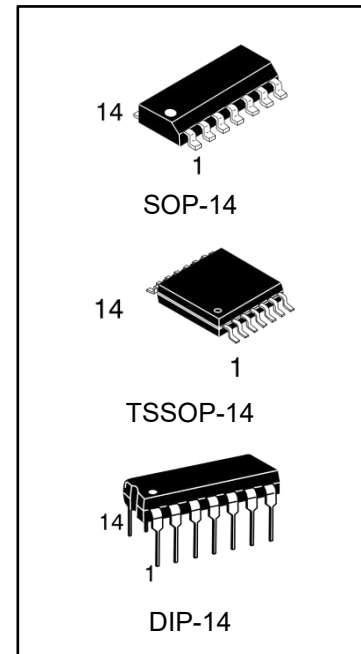
### DESCRIPTION

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

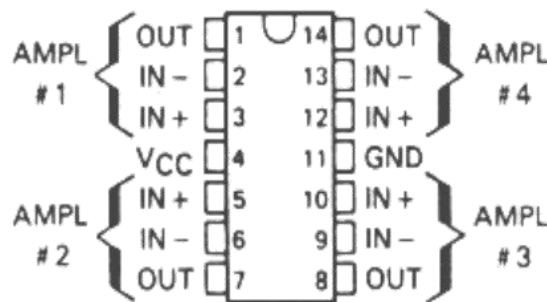
- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain 100 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 <sub>IO</sub> Input offset voltage	V <sub>CC</sub> = 5V to MAX, V <sub>IC</sub> = V <sub>ICR</sub> min, V <sub>O</sub> = 1.4V	25°C		3	5	mV
		Full temperature range			9	
αV <sub>IO</sub> Average temperature coefficient of input offset voltage		Full temperature range		7		μV/°C
I <sub>IO</sub> Input offset current	V <sub>O</sub> = 1.4V	25°C		2	50	nA
		Full temperature range			150	
αI <sub>IO</sub> Average temperature coefficient of input offset current		Full temperature range		10		pA/°C
I <sub>IB</sub> Input bias current	V <sub>O</sub> = 1.4V	25°C		-20	-250	nA
		Full temperature range			-500	
V <sub>ICR</sub> Common-mode input voltage range	V <sub>CC</sub> = 5V to MAX	25°C	0 to V <sub>CC</sub> -1.5			V
		Full temperature range	0 to V <sub>CC</sub> - 2			
V <sub>OH</sub> High-level output voltage	RL = 2 kΩ	25°C	V <sub>CC</sub> -1.5			V
	V <sub>CC</sub> = MAX, RL = 2kΩ	Full temperature range	26			
	V <sub>CC</sub> = MAX, RL = 10 kΩ	Full temperature range	27	28		
V <sub>OL</sub> Low-level output voltage	RL = 10 kΩ	Full temperature range		5	20	mV
A <sub>VD</sub> Large-signal differential voltage amplification	V <sub>CC</sub> = 15 V, V <sub>O</sub> = 1V to 11 V, RL ≥ 2 kΩ	25°C	25	100		V/mV
		Full temperature range	15			
CMRR Common-mode rejection ratio	V <sub>CC</sub> = 5V to MAX, V <sub>IC</sub> = V <sub>ICR</sub> min	25°C	65	80		dB
k <sub>SVR</sub> Supply voltage rejection ratio (ΔV <sub>CC</sub> /ΔV <sub>IO</sub> )	V <sub>CC</sub> = 5V to MAX	25°C	65	100		dB
V <sub>O1</sub> /V <sub>O2</sub> Crosstalk attenuation	f = 1kHz to 20 kHz	25°C		120		dB
I <sub>O</sub> Output current	V <sub>CC</sub> = 15 V, V <sub>ID</sub> = 1V, V <sub>O</sub> = 0	25 °C	-20	-30		mA
		Full temperature range	-10			
	V <sub>CC</sub> = 15 V, V <sub>ID</sub> = -1V, V <sub>O</sub> = 15V	25 °C	10	20		
		Full temperature range	5			
V <sub>ID</sub> = -1V, V <sub>O</sub> = 200 mV	25°C	12	30		μA	

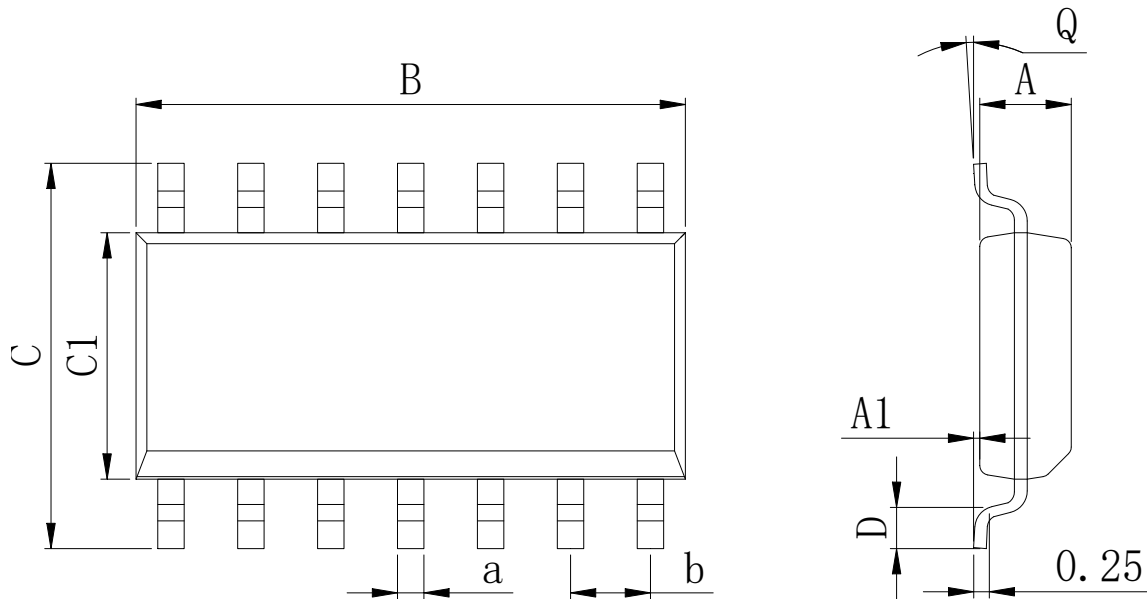
I <sub>os</sub> Short-circuit output current	V <sub>cc</sub> at 5 V, GND at -5V, V <sub>o</sub> =0	25°C		±40	±60	mA
I <sub>cc</sub> Supply current (four amplifiers)	V <sub>o</sub> = 2.5 V, No load	Full temperature range		1.5	2.4	mA
	V <sub>cc</sub> = MAX, V <sub>o</sub> = 0.5V <sub>cc</sub> , No load	Full temperature range		1.1	3	

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

"MAX" V<sub>cc</sub> 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**

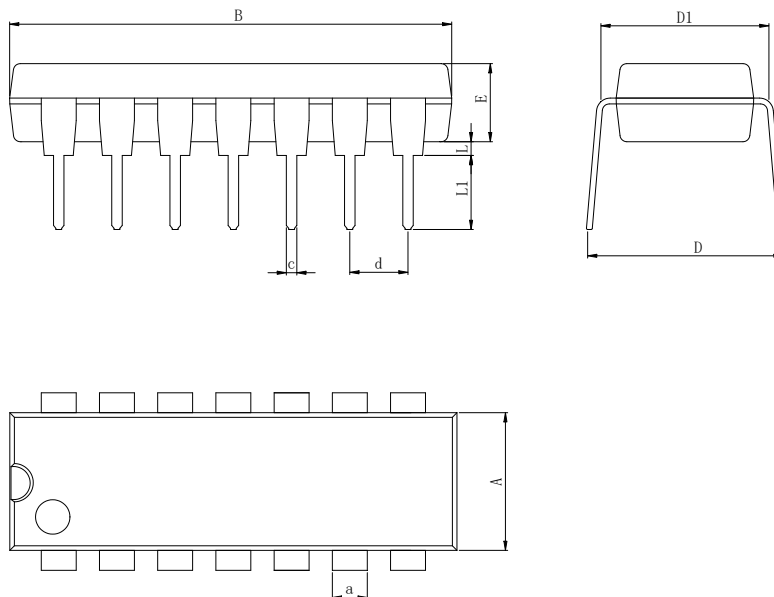
SOP-14



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	

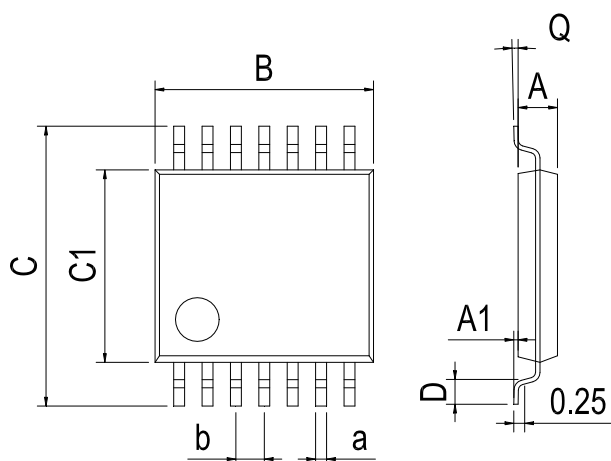
DIP-14



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

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