

Quadruple Operational Amplifiers

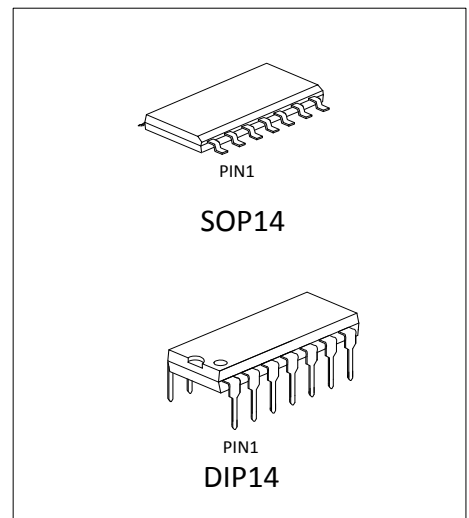
DESCRIPTION

The LMx24 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

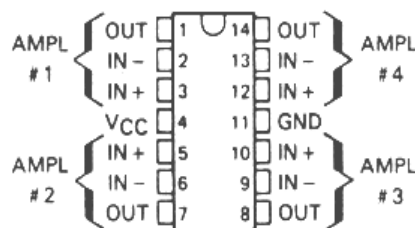
- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain 100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



ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM324N	DIP14	LM324	TUBE	1000/box
LM324M	SOP14	LM324	REEL	2500/reel
LM224N	DIP14	LM224	TUBE	1000/box
LM224M	SOP14	LM224	REEL	2500/reel

PACKAGE INFORMATION



DIP14/SOP14

ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{CC} = 5V$ (unless otherwise noted)

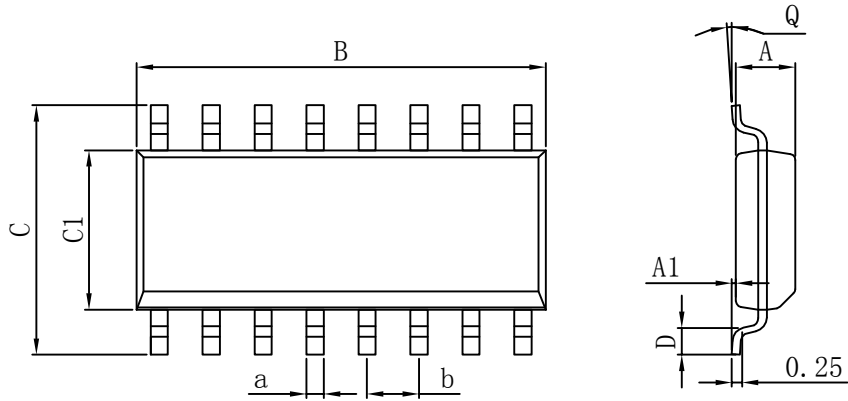
PARAMETER	TEST CONDITIONS*		LM224/ LM324			UNIT
			MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{CC} = 5V$ to MAX, $V_{IC} = V_{ICR}$ min, $V_O = 1.4V$	25 °C		3	7	mV
		Full temperature range			9	
αV_{IO} Average temperature coefficient of input offset voltage		Full temperature range		7		$\mu V/^\circ C$
I_{IO} Input offset current	$V_O = 1.4V$	25 °C		2	50	nA
		Full temperature range			150	
αI_{IO} Average temperature coefficient of input offset current		Full temperature range		10		$\mu A/^\circ C$
I_{IB} Input bias current	$V_O = 1.4V$	25 °C		-20	-250	nA
		Full temperature range			-500	
V_{ICR} Common-mode input voltage range	$V_{CC} = 5V$ to MAX	25 °C	0 to $V_{CC} - 1.5$			V
		Full temperature range	0 to $V_{CC} - 2$			
V_{OH} High-level output voltage	$R_L = 2\text{ k}\Omega$	25 °C	$V_{CC} - 1.5$			V
	$V_{CC} = \text{MAX}$, $R_L = 2\text{ k}\Omega$	Full temperature range	26			
	$V_{CC} = \text{MAX}$, $R_L = 10\text{ k}\Omega$	Full temperature range	27	28		
V_{OL} Low-level output voltage	$R_L = 10\text{ k}\Omega$	Full temperature range		5	20	mV
A_{VD} Large-signal differential voltage amplification	$V_{CC} = 15V$, $V_O = 1V$ to 11 V, $R_L \geq 2\text{ k}\Omega$	25 °C	25	100		V/mV
		Full temperature range	15			
CMRR Common-mode rejection ratio	$V_{CC} = 5V$ to MAX, $V_{IC} = V_{ICR}$ min	25 °C	65	80		dB
k_{SVR} Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$V_{CC} = 5V$ to MAX	25 °C	65	100		dB
V_{O1}/V_{O2} Crosstalk attenuation	$f = 1\text{ kHz}$ to 20 kHz	25 °C		120		dB
I_O Output current	$V_{CC} = 15V$, $V_{ID} = 1V$, $V_O = 0$	25 °C	-20	-30		mA
		Full temperature range	-10			
	$V_{CC} = 15V$, $V_{ID} = -1V$, $V_O = 15V$	25 °C	10	20		
		Full temperature range	5			
$V_{ID} = -1V$, $V_O = 200\text{ mV}$	25 °C	12	30		μA	
I_{OS} Short-circuit output current	V_{CC} at 5 V, GND at -5V, $V_O = 0$	25 °C		± 40	± 60	mA
I_{CC} Supply current (four amplifiers)	$V_O = 2.5V$, No load	Full temperature range		1.5	2.4	mA
	$V_{CC} = \text{MAX}$, $V_O = 0.5V_{CC}$, 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_{CC} for testing purposes is 30 V. LM224 Operating temperature -40 - 85° C, LM324 Operating temperature 0 -70° C, MAX Junction temperature + 125° C.

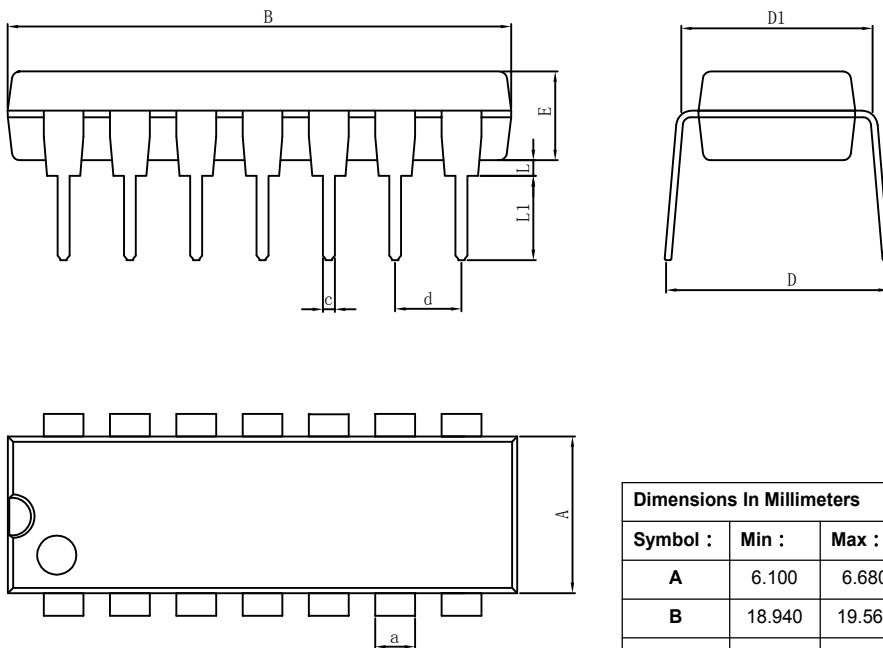
PACKAGE

SOP14



Dimensions In Millimeters					
Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	1.225	1.570	D	0.400	0.950
A1	0.100	0.250	Q	0°	8°
B	8.500	9.000	a	0.420 TYP	
C	5.800	6.250	b	1.270 TYP	
C1	3.800	4.000			

DIP14



Dimensions In Millimeters					
Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	6.100	6.680	L	0.500	0.800
B	18.940	19.560	L1	3.000	3.600
D	8.200	9.200	a	1.524 TYP	
D1	7.42	7.820	c	0.457 TYP	
E	3.100	3.550	d	2.540 TYP	