Quad Operational Amplifier

Rev.2. Oct. 2013

VSP MIKRON | **LM324M2**

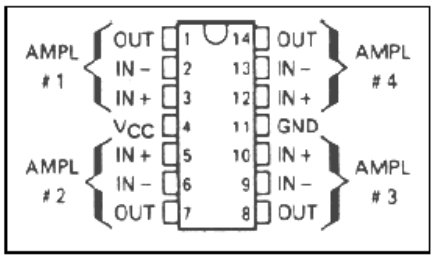
DESCRIPTION

The LM324 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 o 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

PACKAGE INFORMATION



ELECTRICAL CHARACTERISTICS

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

PARAMETER	TEST CONDITIONS*		LM324			UNIT
			MIN	TYP	MAX	
V_{IO} Input offset voltage	Vcc =5V to MAX, $V_{IC} = V_{ICR}$ min, V_O=1.4V	25 °□		3	7	mV
		Full range			9	
αV_{IO} Average temperature coefficient of input offset voltage		Full range		7		µV/°C
I_{IO} Input offset current	Vo=1.4V	25 ° □		2	50	nA
		Full range			150	
αI_{IO} Average temperature coefficient of input offset current		Full range		10		pA/°C
I_{IB} Input bias current	Vo=1.4V	25 °□		−20	−250	nA
		Full range			−500	
VICR Common−mode input voltage range	Vcc = 5V to MAX	25 °□	0 to Vcc−1.5			V
		Full range	0 to Vcc − 2			
VOH High−level output voltage	RL = 2 kΩ	25 °□	Vcc−1.5			V
	Vcc = MAX, R_L =2kΩ	Full range	26			
	Vcc = MAX, RL = 10 kΩ	Full range	27	28		
V_{OL} Low−level output voltage	RL = 10 kΩ	Full range		5	20	mV
A_{VD} Large−signal differential voltage amplification	Vcc = 15 V, Vo=1V to 11 V, R_L ≥ 2 kΩ	25 °□	25	100		V/mV
		Full 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 ($\Delta Vcc/\Delta V_{IO}$)	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 range	−10			
	Vcc = 15 V, V_{ID}= −1V, Vo=15V	25 °□	10	20		
		Full range	5			
	V_{ID}= −1V, Vo = 200 mV	25 °C	12	30		µA
Ios Short−circuit output current	Vcc at 5 V, GND at −5V,Vo=0	25 °□		±40	±60	mA
Icc Supply current (four amplifiers)	Vo = 2.5 V, No load	Full range		1.5	2.4	mA
	Vcc = MAX, Vo = 0.5Vcc, No load	Full range		1.1	3	

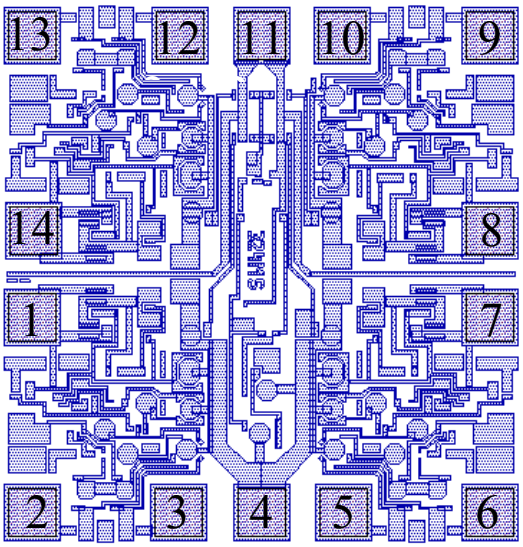
* All characteristics are measured under open loop conditions with zero common−mode input voltage unless otherwise specified. "MAX" Vcc for testing purposes is 30 V. Full range is 0 °□ to 70 °□

Slew rate	V+=15V DC R_L=2kΩ	25 ^{0}C	0.4	0.5	0.6	V/uS

VSP MIKRON	LM324M2

Wafer size: 100 mm
Wafer Thickness: 460±30µm (or 350±30µm, 280±30µm)
Top metal: AlSi
Backside metal: - (or Ti-Ni (V)-Ag)

PAD LOCATION LM324M2



Chip Size 1.09 x 1.12 mm^2

PAD LOCATION COORDINATES

Pad N	Pad Name	Pad size (µm × µm)	Coordinates, µm X	Coordinates, µm Y	Pad N	Pad size (µm × µm)	Pad Name	Coordinates, µm X	Coordinates, µm Y
1	#1 OUT	90 × 90	112	477	8	90 × 90	#3 OUT	977	642
2	#1 IN−	90 × 90	112	112	9	90 × 90	#3 IN−	977	1007
3	#1 IN+	90 × 90	390	112	10	90 × 90	#3 IN+	700	1007
4	V_{CC}	90 × 90	545.0	112	11	90 × 90	GND	545	1007
5	#2 IN+	90 × 90	700	112	12	90 × 90	#4 IN+	390	1007
6	#2 IN−	90 × 90	977	112	13	90 × 90	#4 IN−	112	1007
7	#2 OUT	90 × 90	977	477	14	90 × 90	#4 OUT	112	642