



LMV324

Rail-to-Rail Low Power Quad Operational Amplifiers

Description

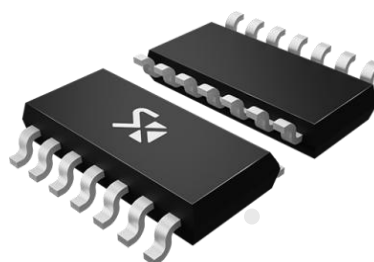
The LMV324 is a low-power quad operational amplifier featuring rail-to-rail output swing. It is a cost-effective solution suitable for applications requiring low operating voltage, space savings, and low cost. Specifically designed for low operating voltage, the LMV324 has a minimum operating voltage of 2.1V and a maximum recommended operating voltage of 5.5V.

The LMV324 is available in SOP-14 and DIP-14 package types.

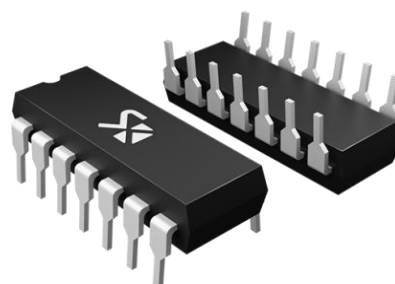
Features

- Low power consumption: 45uA/ch
- Rail-to-rail output swing
- No crossover distortion
- Supply voltage range: 2.1V to 5.5V
- Slew rate: 0.5V/us
- Gain bandwidth product: 1MHz

Package Outline Drawing



SOP-14

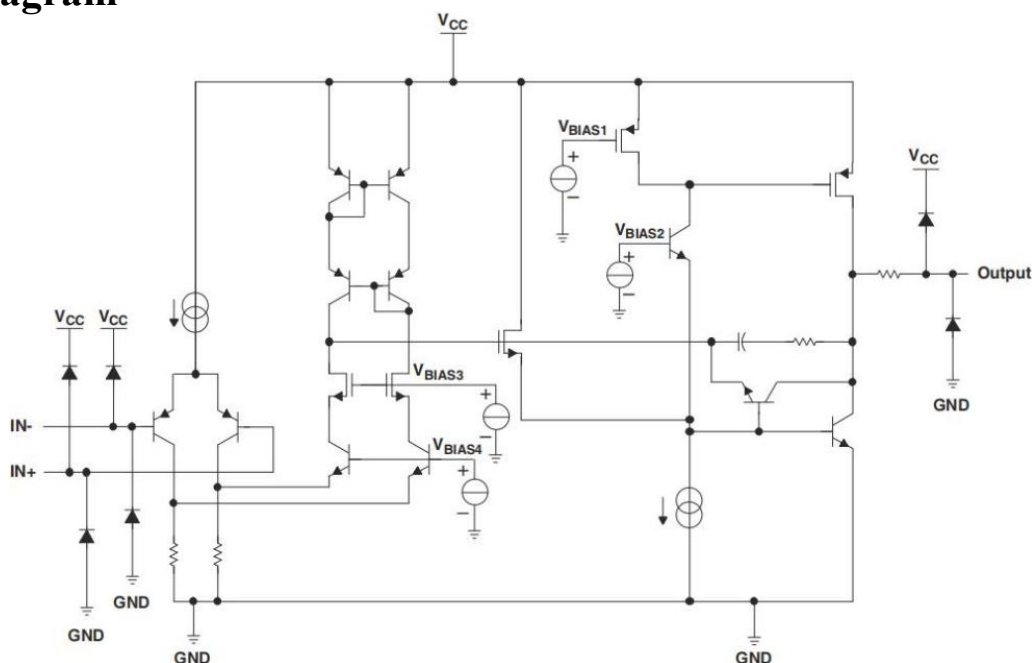


DIP-14

Applications

- Desktop computers
- HVAC
- Motor Control: AC induction
- Portable media players
- Professional audio mixers
- Refrigerators

Block Diagram



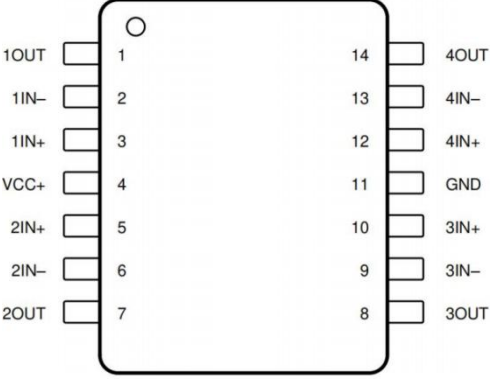


LMV324

Ordering Information

Type	Marking	Package
LMV324-D14	LMV324	DIP-14
LMV324-P14	LMV324	SOP-14

Pin Description

Pin Number	Pin Name	I/O	Description	
1	1OUT	O	Op-Amp 1 Output	
2	1IN-	I	Op-Amp 1 Inverting Input	
3	1IN+	I	Op-Amp 1 Non-Inverting Input	
4	VCC	P	Positive Power Supply	
5	2IN+	I	Op-Amp 2 Non-Inverting Input	
6	2IN-	I	Op-Amp 2 Inverting Input	
7	2OUT	O	Op-Amp 2 Output	
8	3OUT	O	Op-Amp 3 Output	
9	3IN-	I	Op-Amp 3 Inverting Input	
10	3IN+	I	Op-Amp 3 Non-Inverting Input	
11	GND	P	Negative Power Supply	
12	4IN+	I	Op-Amp 4 Non-Inverting Input	
13	4IN-	I	Op-Amp 4 Inverting Input	
14	4OUT	O	Op-Amp 4 Output	

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	2.1~5.5	V
Differential Input Voltage	V_{ID}	± 5.5	V
Common-mode Input Voltage	V_{ICM}	$-0.5 \sim V_{CC} + 0.5V$	V
Maximum Operating Junction Temperature	T_J	150	$^{\circ}\text{C}$
Operating Ambient Temperature	T_A	$-20 \sim +85$	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	$-65 \sim +150$	$^{\circ}\text{C}$
Lead Temperature(Soldering , 10 s)	T_W	260	$^{\circ}\text{C}$

Electrical Characteristics($T_A=25^{\circ}\text{C}$ $V_{CC}=2.7V$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input Offset Voltage	V_{IO}		-	± 0.8	± 5	mV
Input Offset Current	I_{IO}		-	± 10	-	nA
Input Bias Current	I_B		-	± 10	-	pA



LMV324

Input Common-mode Voltage Range	V_{ICM}	$V_{CC} = 5.5V$	-0.1	-	5.6	V
Open-loop Voltage Gain	A_{OL}	$R_L=5K\Omega, V_O=0.1\sim4.9V$	70	90	-	dB
		$R_L=100K\Omega, V_O=0.035\sim4.965V$	80	94	-	dB
Common-mode Rejection Ratio	CMRR	$V_{CC}=5.5V, V_{ICM}=-0.1\sim4V$	62	90	-	dB
		$V_{CC}=5.5V, V_{ICM}=-0.1\sim5.6V$	56	88	-	dB
Power Supply Rejection Ratio	PSRR	$V_{CC}=2.5V\sim5.5V, V_{ICM}=0.5V$	60	80	-	dB
Output Voltage Swing	$V_{(OH)}$	$R_L=10K\Omega,$ Referenced to 1.35V	$V_{CC}-100$	$V_{CC}-10$	-	mV
	$V_{(OL)}$		-	80	-	
Output Short-circuit Current	I_{SC}		-	50	-	mA
Supply Current	I_{CC}		-	45	-	uA
Gain Bandwidth Product	GBWP		-	1	-	MHz
Slew Rate	S_R		-	0.5	-	V/uS

Typical Applications

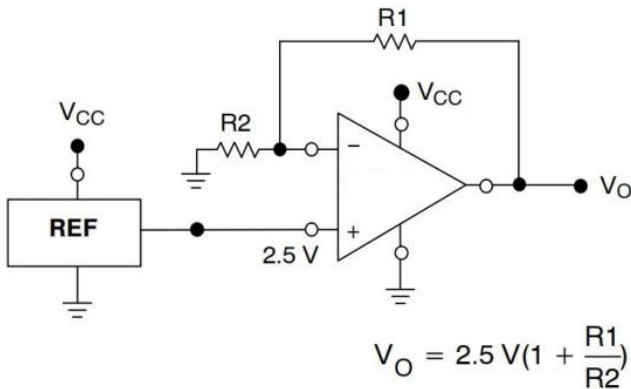


Figure 1. Reference Voltage

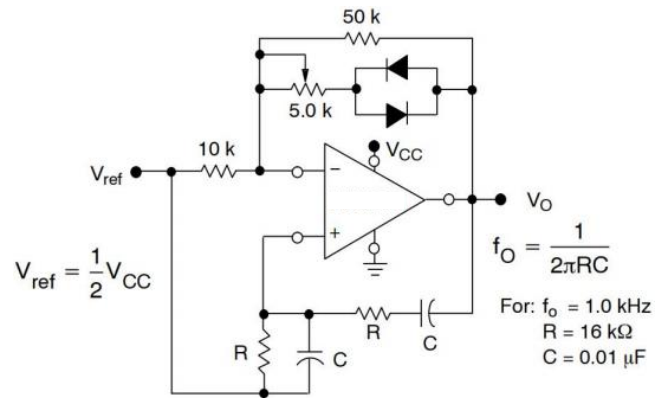


Figure 2. Wien Bridge Oscillator

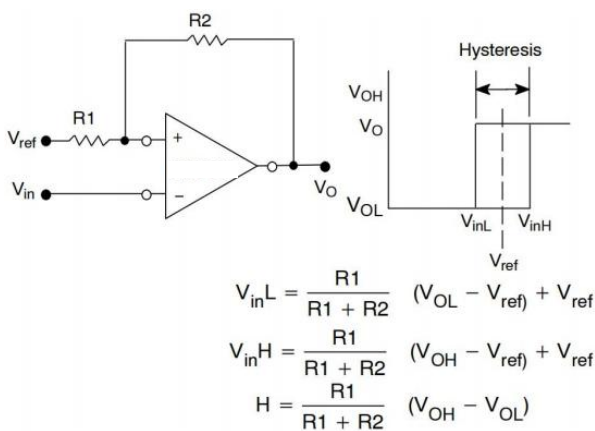


Figure 3. Hysteresis Comparator

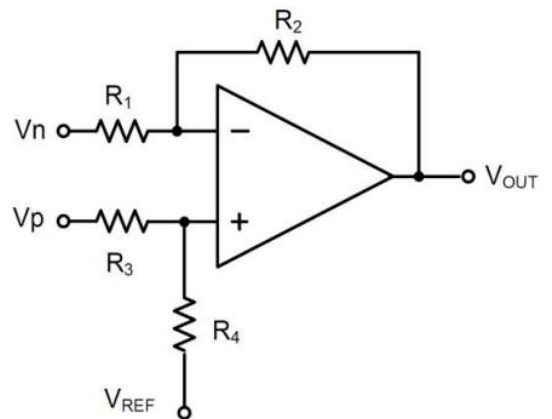


Figure 4. Differential Amplifier



Typical Characteristics

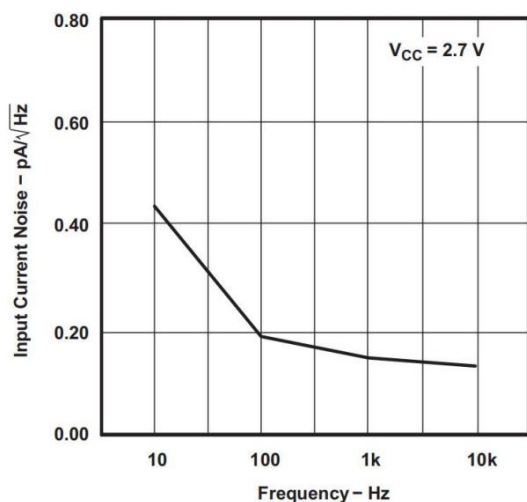


Fig 5. Input Current Noise vs. Frequency($V_{CC}=2.7\text{V}$)

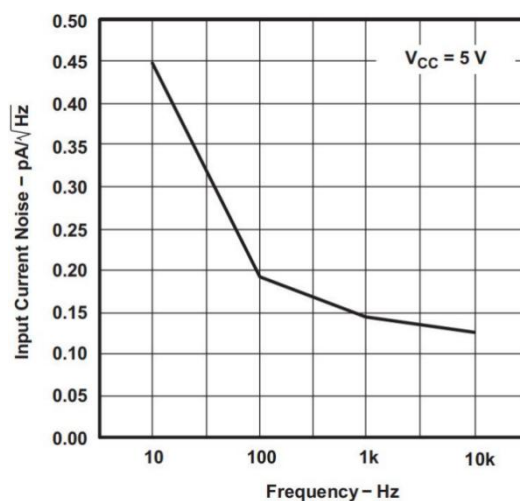


Fig 6. Input Current Noise vs. Frequency($V_{CC}=5\text{V}$)

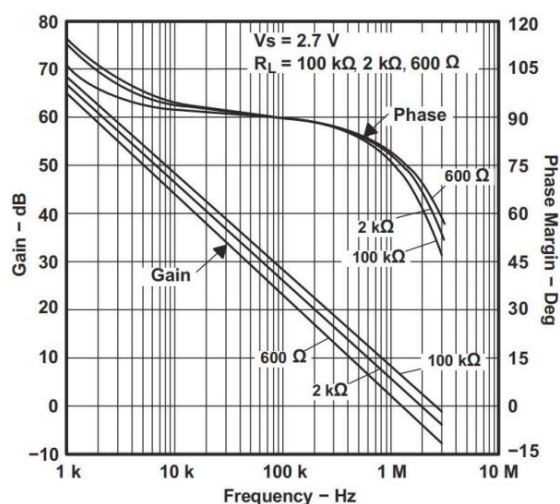


Fig 7. Frequency Response vs. Resistive Load($V_{CC}=2.7\text{V}$)

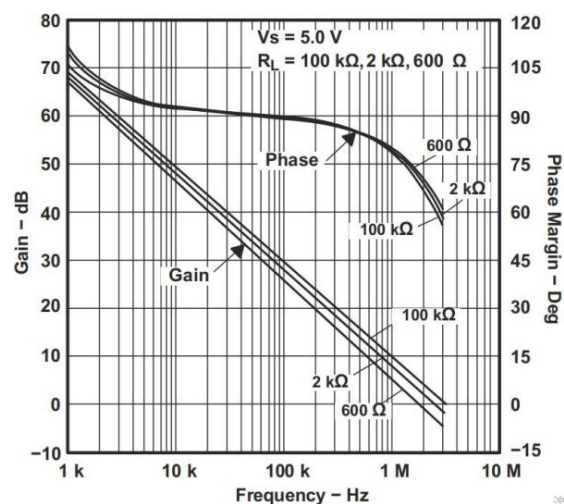


Fig 8. Frequency Response vs. Resistive Load($V_{CC}=5\text{V}$)

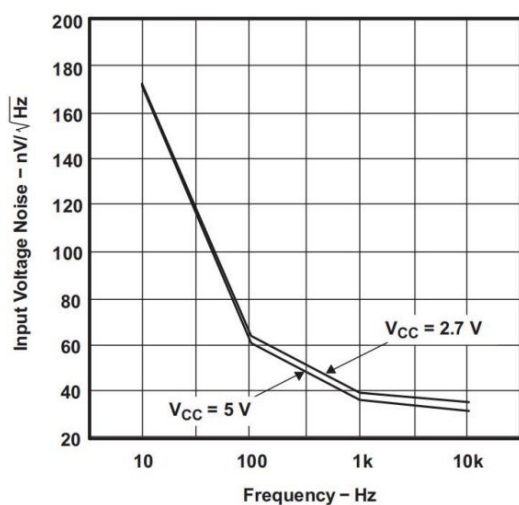


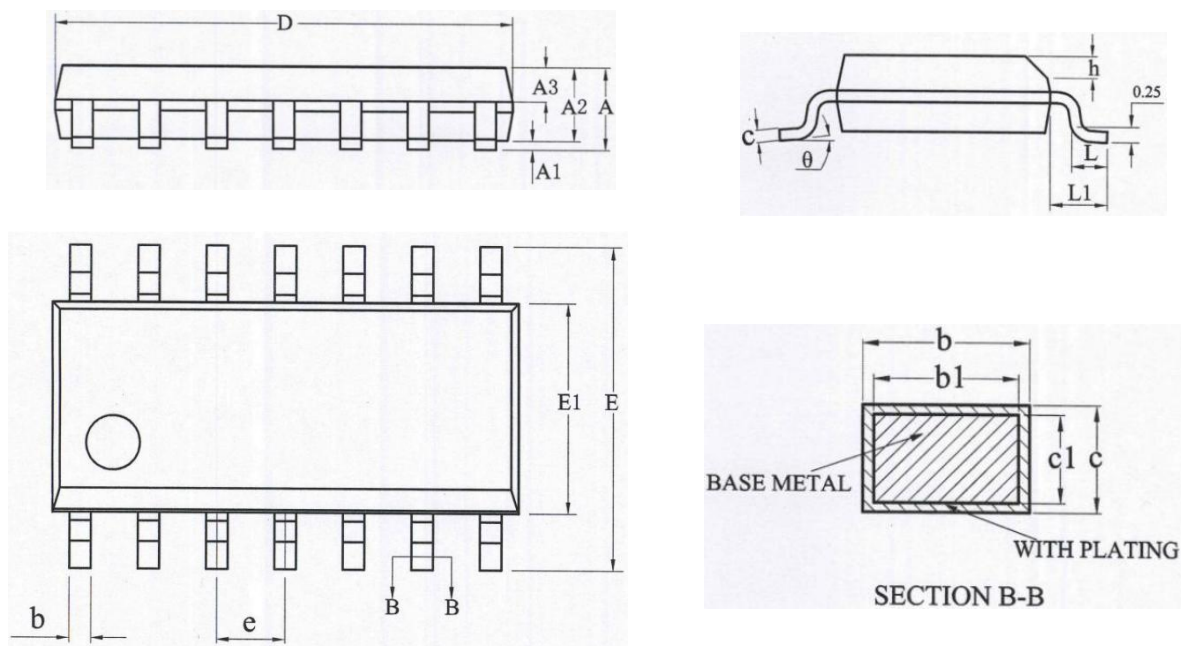
Fig 9. Input Voltage Noise vs. Frequency



Package Information

SOP-14

Dimensions in mm



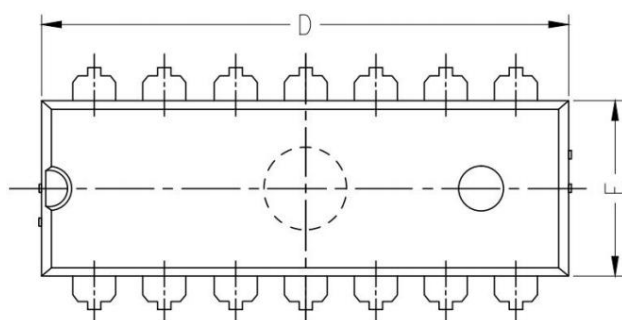
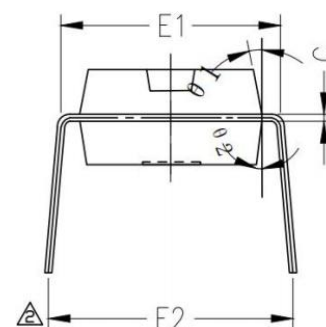
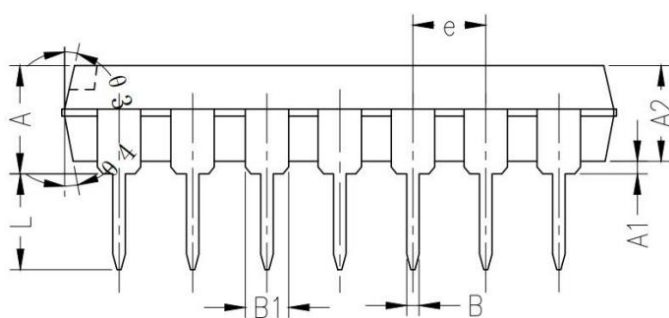
Symbol	Dimensions In Millimeters			Symbol	Dimensions In Millimeters		
	Min	Nom	Max		Min	Nom	Max
A	-	-	1.75	D	8.55	8.65	8.75
A1	0.10	-	0.225	E	5.80	6.00	6.20
A2	1.30	1.40	1.50	E1	3.80	3.90	4.00
A3	0.60	0.65	0.70	e	1.27 (BSC)		
b	0.39	-	0.47	h	0.25	-	0.50
b1	0.38	0.41	0.44	L	0.50	-	0.80
c	0.20	-	0.24	L1	1.05 (REF)		
c1	0.19	0.20	0.21	θ	0°	-	8°



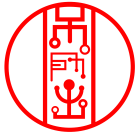
Package Information

DIP-14

Dimensions in mm



Symbol	Dimensions In Millimeters			Symbol	Dimensions In Millimeters		
	Min	Nom	Max		Min	Nom	Max
A	3.75	3.81	3.95	E1	7.35	7.62	7.85
A1	0.51	-	-	e	2.54 (BSC)		
A2	3.20	3.30	3.45	L	3.00	3.30	3.60
B	0.38	0.48	0.56	E2	8.00	8.40	8.80
B1	1.52 (BSC)			θ1	9°	-	15°
C	0.20	0.25	0.34	θ2	7°	-	13°
D	18.80	19.05	19.30	θ3	8°	-	14°
E	6.20	6.35	6.50	θ4	5°	-	12°



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