



LM324

QUAD OPERATIONAL AMPLIFIERS

DESCRIPTION

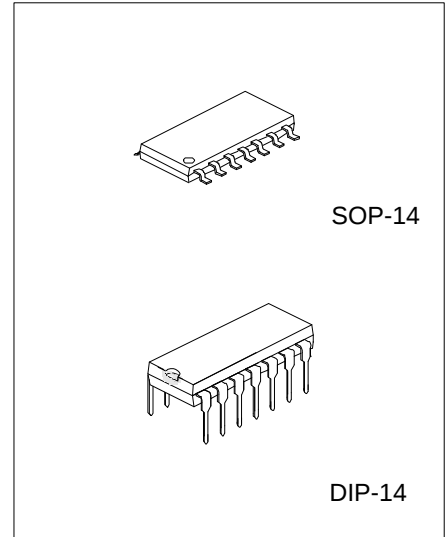
The LM324 consists of four independent, high gain internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide voltage range.

Operation from split power supplies is also possible so long as the difference between the two supplies 3 Volts to 32 volts.

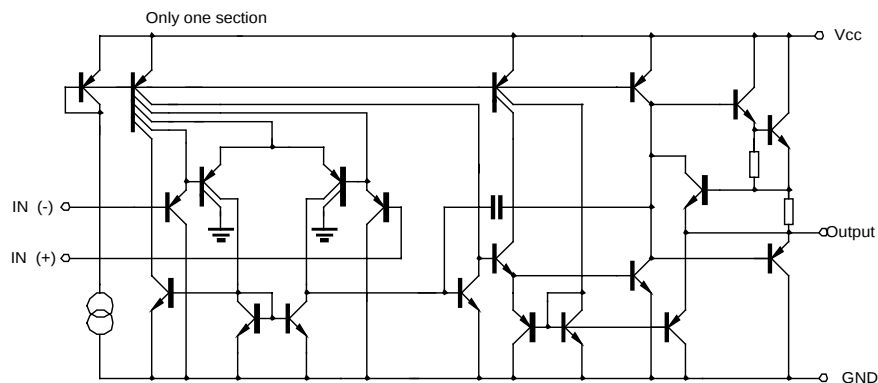
Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single power supply system.

FEATURES

- *Internally frequency compensated for unity gain
- *Large DC voltage gain :100dB
- *Wide operating supply range($V_{CC}=3V\sim 32V$)
- *Input common-mode voltage includes ground
- *Large output voltage swing: From 0V to $V_{CC}-1.5V$
- *Power drain suitable for battery operation



BLOCK DIAGRAM



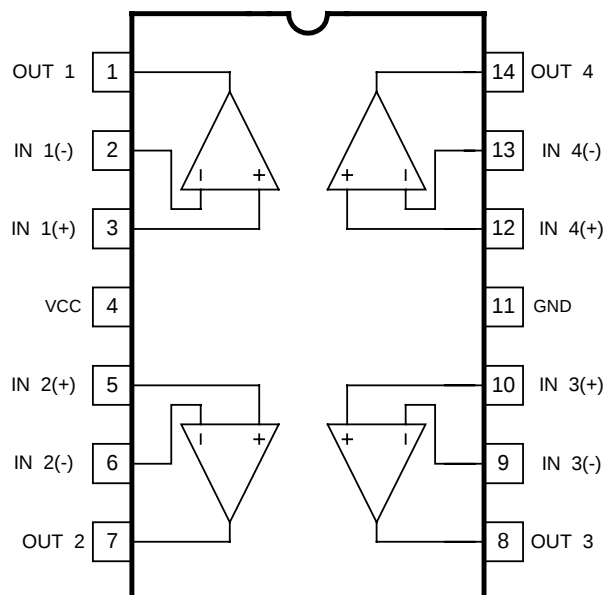
ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}C$)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	± 16	V
Differential input voltage	$V_i(\text{diff})$	32	V
Input Voltage	V_i	-0.3~32V	V
Power Dissipation	P_d	570	mW
Operating Temperature	T_{opr}	0 to +70	$^{\circ}C$
Storage Temperature	T_{stg}	-65 to 150	$^{\circ}C$

ELECTRICAL CHARACTERISTICS(Ta=25°C)

(Vcc=5.0V, All voltage referenced to GND unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	V _{IO}	V _{CM} =0 to V _{CC} -1.5 V _{O(p)} =1.4V, R _S =0		1.5	7.0	mV
Input offset current	I _{IO}			3.0	50	nA
Input Bias current	I _b			40	250	nA
Input Common-mode voltage range	V _{I(R)}	V _{CC} =30V	0	V _{CC} -1.5		V
Supply Current	I _{CC}	R _L =∞, V _{CC} =30V		1.0	3	mA
		V _{CC} =5V		0.7	1.2	mA
Large signal Voltage Gain	G _v	V _{CC} =15V, R _L >2kΩ V _{O(p)} =1V to 11V	25	100		V/mV
Output voltage Swing	V _(OH)	V _{CC} =30V, R _L =2kΩ	26			V
		V _{CC} =30V, R _L =10kΩ	27	28		V
	V _(OL)	V _{CC} =5, R _L >10kΩ		5	20	mV
Common-mode rejection Ratio	CMRR		65	75		dB
Power supply rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	f=1kHz to 20kHz		5	20	mV
Short circuit to GND	I _{SC}			40	60	mA
Output current	I _{source}	V _{I(+)} =1V, V _{I(-)} =0 V _{CC} =15V, V _{O(p)} =2V	20	40		mA
	I _{sink}	V _{I(+)} =0V, V _{I(-)} =1V V _{CC} =15V, V _{O(p)} =2V	10	13		mA
		V _{I(+)} =1V, V _{I(-)} =0 V _{CC} =15V, V _{O(p)} =200V	12	45		μA
Differential input voltage	V _{I(diff)}				V _{CC}	V

PIN CONFIGURATION

TYPICAL CHARACTERISTICS PERFORMANCE

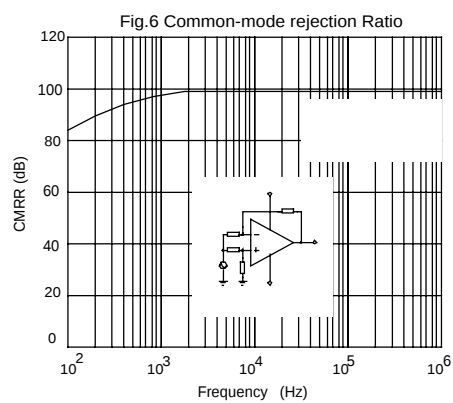
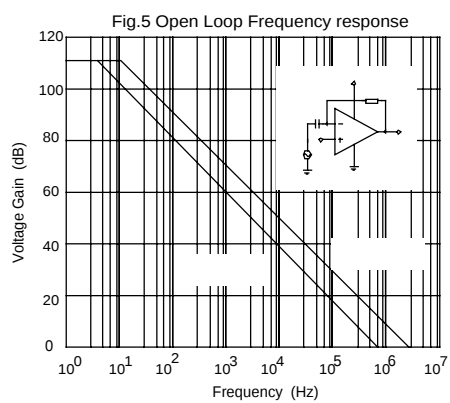
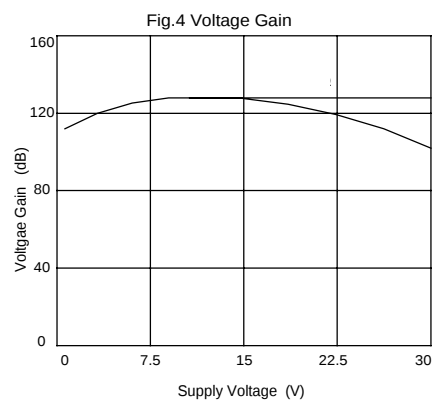
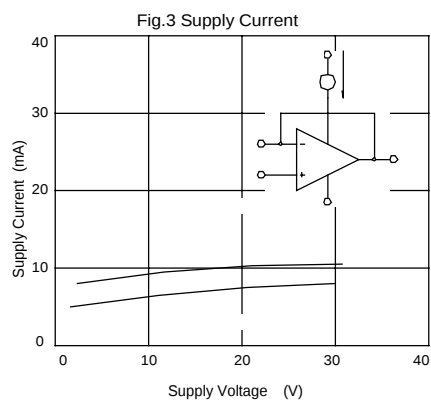
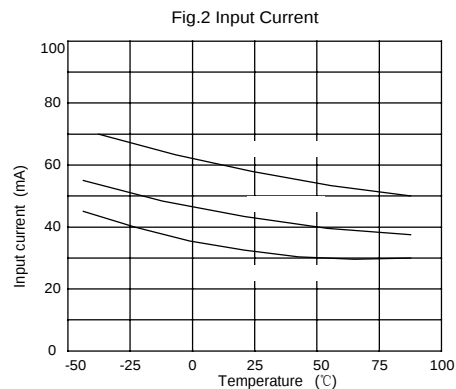
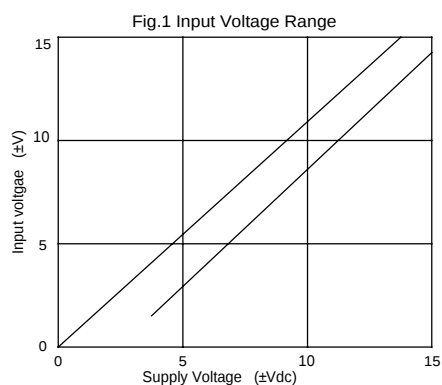


Fig.7

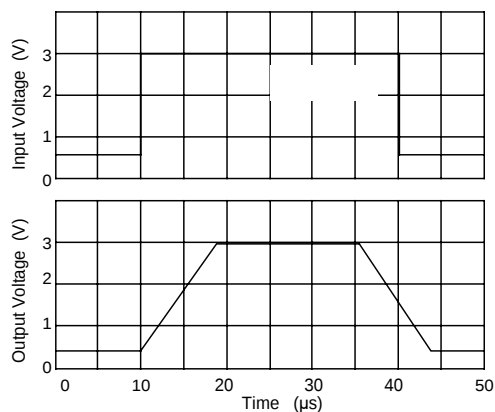


Fig.8 voltage Follower pulse response (small signal)

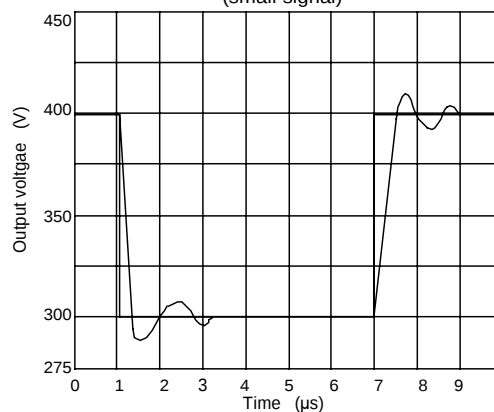


Fig.9 Large signal Frequency Response

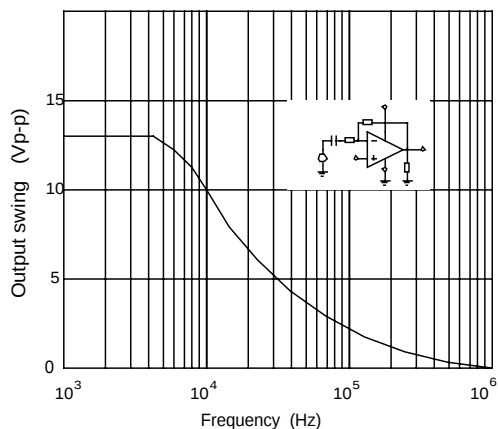


Fig.10 Output Characteristics current sourcing

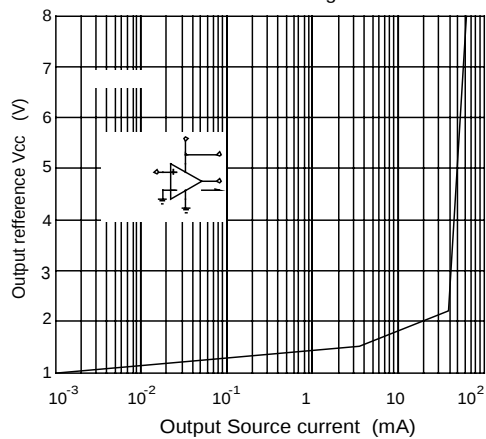


Fig.11 Output Characteristics Current sinking

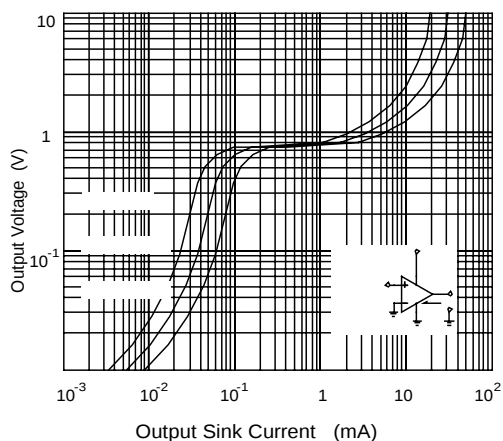


Fig.12 Current Limiting

