150-mW STEREO AUDIO POWER AMPLIFIER

■ General Description

LN4812 is a differential input stereo audio power amplifier circuit for mobile phones and other portable audio devices built-in speaker. It provides a stable output power of 150mW 16Ω loads.

The shutdown current of the LN4812 is less than 100nA, that can save energy for the system. At the same time the amplifier gain can be set by external resistors, that it is easy to use.

The LN4812 using small MSOP-10 package, to facilitate high-density mounting .

■ Applications

- Mobile Phones
- PDA
- Bluetooth headset

■ Key Specifications

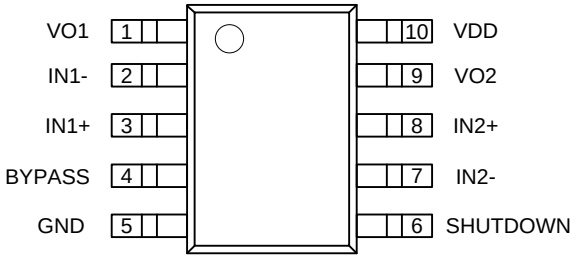
- 150mW Stereo Output
- Differential Inputs
- shutdown current is less than 0.1uA
- Built-in " wave " sound canceling circuit
- Wide input voltage range : 2.2V-5.0V

■ Package

- MSOP-10

■ Pin Configuration

(TOP VIEW)



MSOP-10

■ Ordering Information

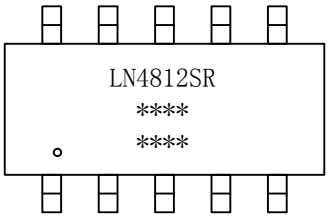
Ordering Number	Package
LN4812SR	MSOP-10

■ Pin Function Description

Pin Number	Pin Name	Function Description
1	VO1	VO1 is the audio output for channel 1.
2	IN1-	IN1- is the negative input for channel 1.
3	IN1+	IN1+is the positive input for channel 1.
4	BYPASS	Bypass Capacitance Input Pin
5	GND	GND is the ground connection.
6	SHUTDOWN	Puts the device in a low quiescent current mode when held high.
7	IN2+	IN2+ is the positive input for channel 2.
8	IN2-	IN2- is the negative input for channel 2.
9	VO2	VO2 is the audio output for channel 2.
10	VDD	VDD is the supply voltage terminal.

■ Marking Rule

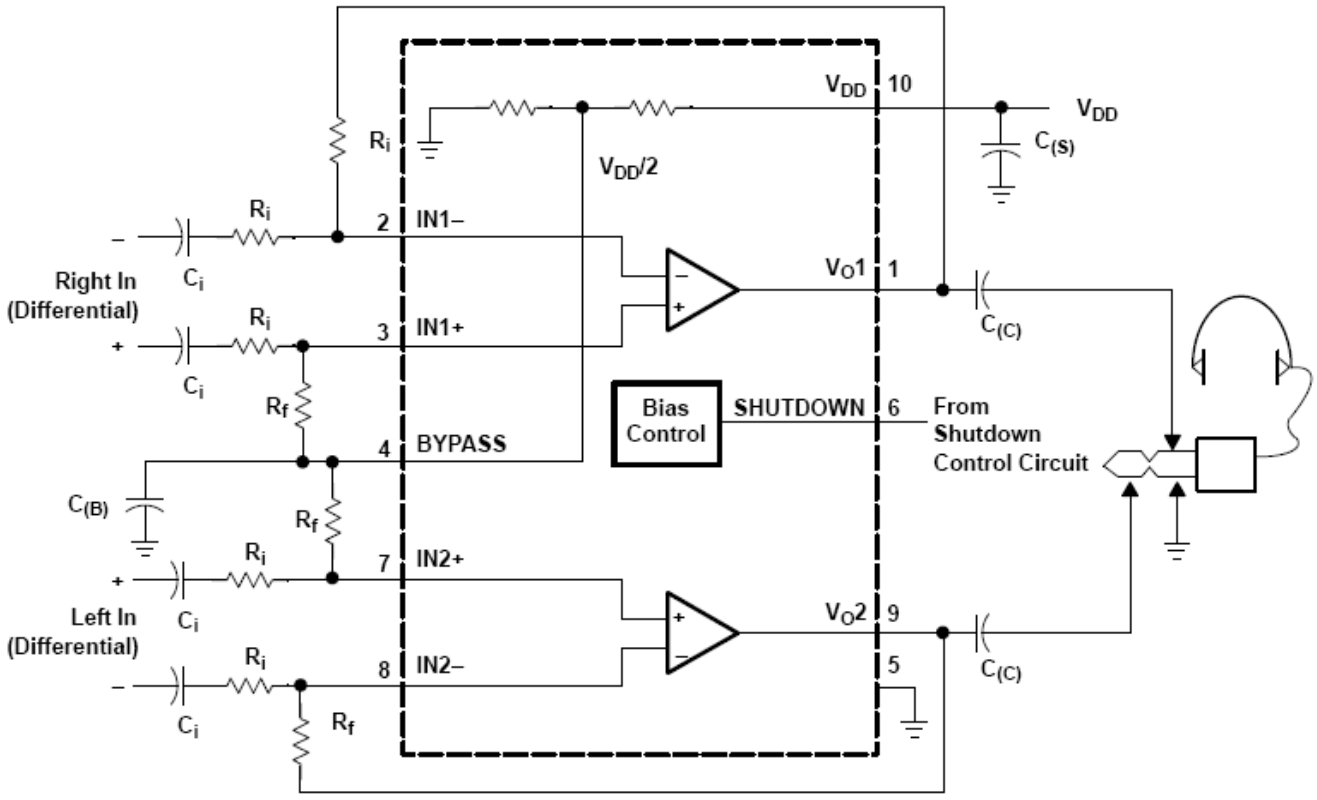
- MSOP-10



The second behavior wafer version

The third production information behavior

■ Typical Application Circuit



■ Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	VDD	-0.3—5.0	V
Input Voltage	VIN	-0.3—VDD+0.3	V
Operating Free-air Temperature	Topr	-40—85	℃
Storage Temperature Range	Tstg	-65—150	℃
ESD (HBM)	-	4000	V

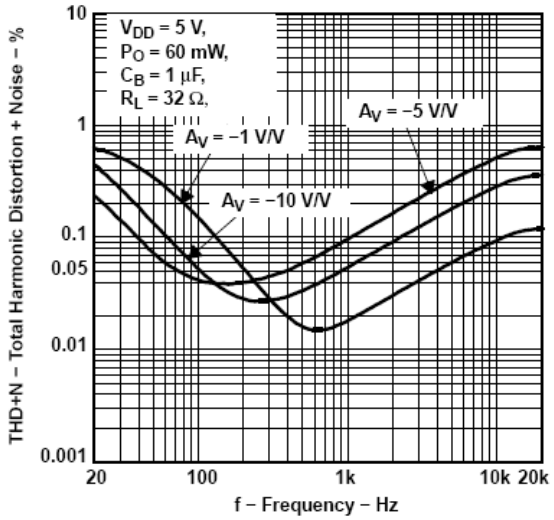
■ Electrical Characteristics

VDD=5V **(Unless otherwise specified. Limits apply for TA = 25°C.)**

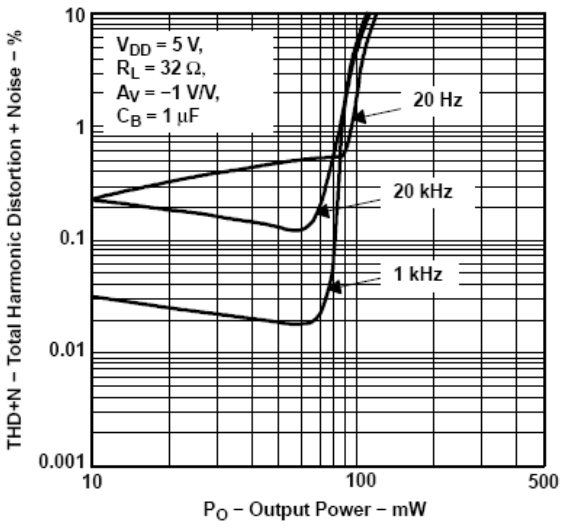
Parameter	Symbol	Condition	Min	Typ	Max	Unit
I_{DD}	Supply Current		—	1.5	3	mA
I_{SD}	Supply Current in SHUTDOWN Mode	Vshutdown=5V	—		0.1	μA
V_{SDIH}	Shutdown Voltage Input High		1.2	—	—	V
V_{SDIL}	Shutdown Voltage Input Low		—	—	0.4	V
V_{OS}	Output Offset Voltage	AV=2V/V	—		15	mV
P_O	Output Power (each channel)	THD = 1% (max); f = 1 kHz 16Ω Load		150		mW
T_{WU}	Wake-up time		—	170	220	ms
T_{SD}	Thermal Shutdown Temperature		150	170	190	℃
THD+N	Total harmonic distortion + noise	Po = 100mWrms; 20-20KHz	—	0.06	—	%
Bom	Maximum Output Power BW	G=10，THD<5%	20			KHz
PSRR	Supply Current	V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz	55	60	—	dB
PCS	Channel Isolation	1KHz		90		dB
T_{SDT}	Shut Down Time	16Ω Load	—	1.0	—	ms

■ Typical Performance Characteristics

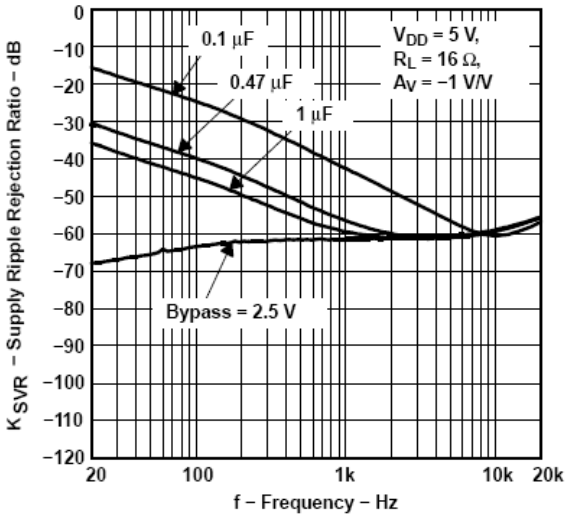
Total Harmonic Distortion + Noise VS Frequency



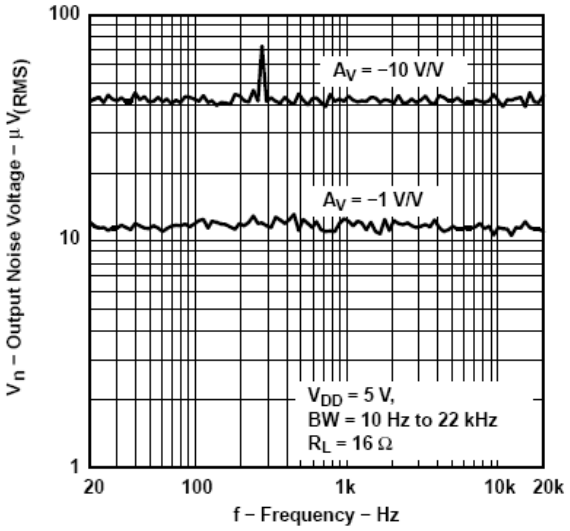
Total Harmonic Distortion + Noise VS Output Power



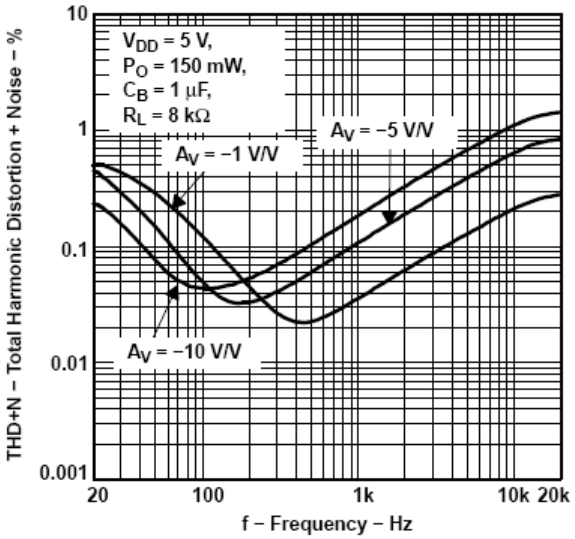
Supply Ripple Rejection Ratio VS Frequency



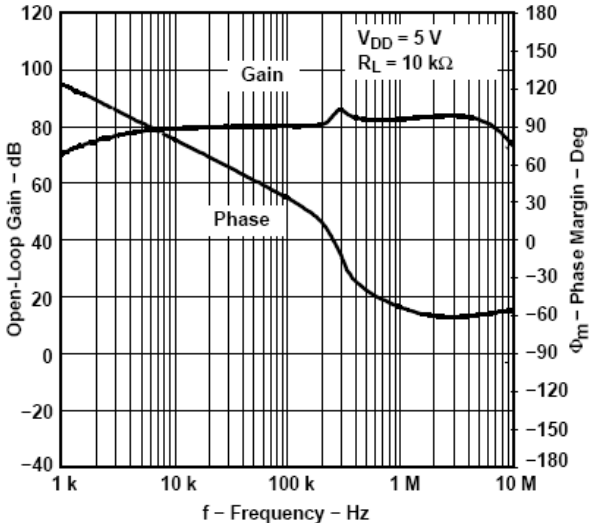
Output Noise Voltage VS Frequency



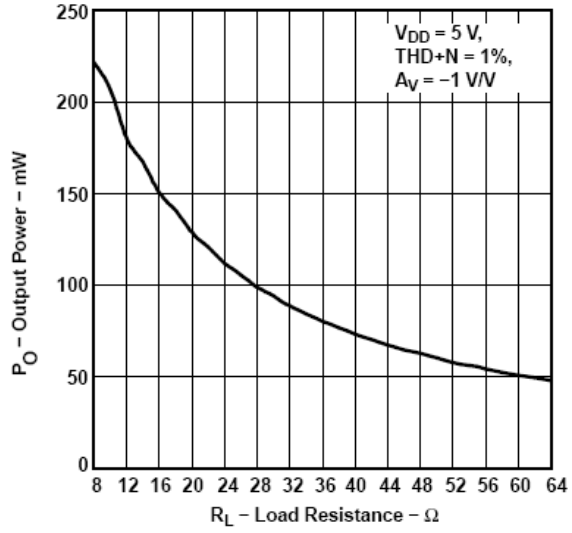
Crosstalk VS Frequency



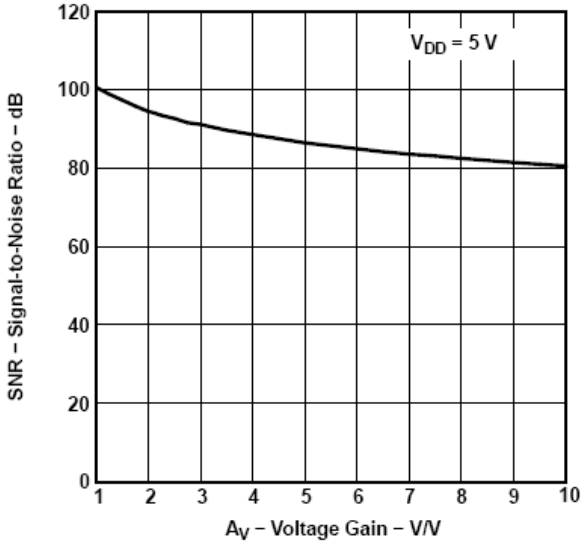
Open-loop Gain and Phase Margin VS Frequency



Output Power VS Load Resistance



Signal-TO-Noise Ratio VS Voltage Gain



■ Application Information

- Gain Setting Resistors

  The gain for the LN4812 is set by resistors Rf and Ri according to GAIN= - (Rf/Ri), and Ri is usually selected for resistance 5K-20K.

  When Rf> 50K, recommended to use metal film resistors, so that we can get better performance. Meanwhile, in order to prevent system instability, it is recommended Rf in parallel with a capacitor Cf, to forming a low -pass filter network together with Rf, and the cutoff frequency of the low pass filter is fc = 1 / (2πRfCf).

  For example, if Rf is 100 kΩ and CF is 5 pF then fc(lowpass) is 318kHz, which is well outside the audio range.

- Input Capacitor, Ci

  Input resistance Ri and the input capacitance Ci form a high -pass filter. Fc(highpass)= fc=1/(2πRiCi). The value of Ci directly affects the bass (low fre-quency) performance of the circuit. Consider the example where Ri is 10kΩ and the specification calls for a flat bass response down to 20Hz, and Ci is 1uF.

  ESR additional parasitic capacitance of the resistor will affect the audio signal, so we recommend using a low ESR ceramic capacitor.

- Power Coupling Capacitor C(s)

  For higher frequency transients, spikes, or digital hash on the line, a good low equivalent-series-resistance (ESR) ceramic capacitor, typically 0.1 μF, placed as close as possible to the device VDD lead, works best. For filtering lower-frequency noise signals, a larger aluminum

- BYPASS Capacitor $C_{(B)}$

  BYPASS circuit is a voltage divider network through an internal resistor to achieve, and the internal resistor is designed to in series 100K. To get a good job is usually the characteristics required to meet the CB * 100K> RiCi.

  For example, Ri = 10K, Ci = 1uF, the CB value preferably greater than 0.1uF, 1uF select more suggestions

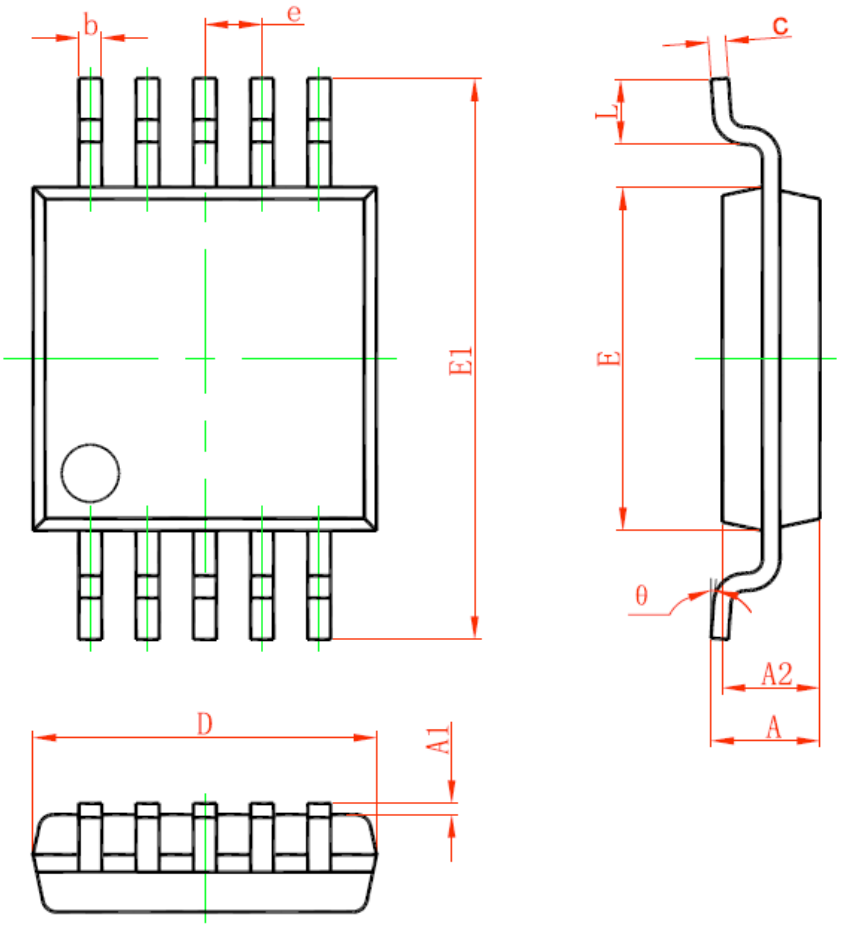
- Output Coupling Capacitors $C_{(C)}$

  In atypical single-supply, single-ended(SE) configuration, an output coupling capacitor ($C_{(C)}$) is required to block the dc bias at the output of the amplifier, thus preventing dc currents in the load. As with the input coupling capacitor, the output coupling capacitor and impedance of the load form a high-pass filter Fc=1/(2πRLCc).

  The main disadvantage, from a performance stand-point, is that the typically-small load impedance drives the low-frequency corner higher. Large values of $C_{(C)}$ are required to pass low frequencies into the load. The output coupling capacitor required in single-supply SE mode also places additional constraints on the selection of other components in the amplifier circuit. With the rules described earlier still valid, add the following relationship: C_B*100K>RiCi>>RLC_C.

■ Package Information

- **MSOP-10**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.50(BSC)		0.020(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°