August 2001

National Semiconductor

LM4808 Boomer® Audio Power Amplifier Series

Dual 105 mW Headphone Amplifier

General Description

The LM4808 is a dual audio power amplifier capable of delivering 105mW per channel of continuous average power into a 16Ω load with 0.1% (THD+N) from a 5V power supply.

Boomer audio power amplifiers were designed specifically to provide high quality output power with a minimal amount of external components using surface mount packaging. Since the LM4808 does not require bootstrap capacitors or snubber networks, it is optimally suited for low-power portable systems.

The unity-gain stable LM4808 can be configured by external gain-setting resistors.

Key Specifications

- THD+N at 1kHz at 105mW continuous average output power into 16Ω 0.1% (typ)
- THD+N at 1kHz at 70mW continuous average output power into 32Ω 0.1% (typ)
- Output power at 0.1% THD+N at 1kHz into 32Ω 70mW (typ)

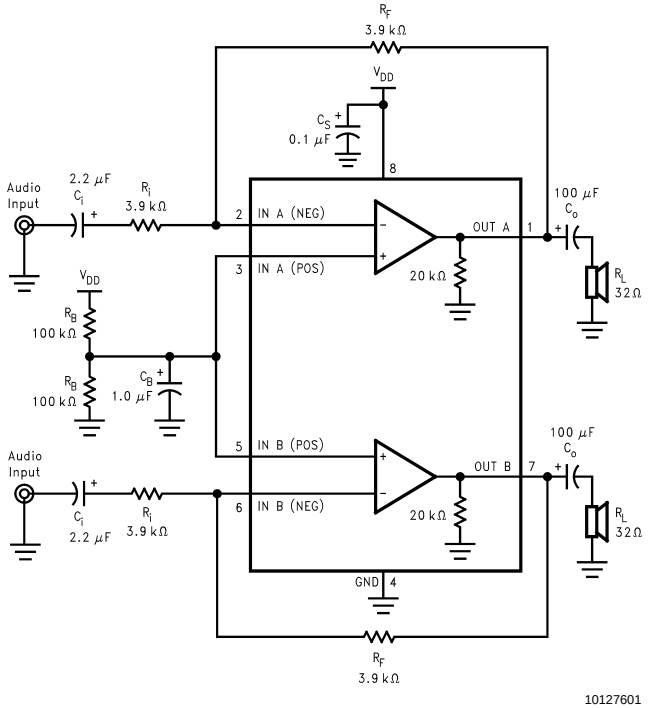
Features

- LLP, MSOP, and SOP surface mount packaging
- Switch on/off click suppression
- Excellent power supply ripple rejection
- Unity-gain stable
- Minimum external components

Applications

- Headphone Amplifier
- Personal Computers
- Portable electronic devices

Typical Application



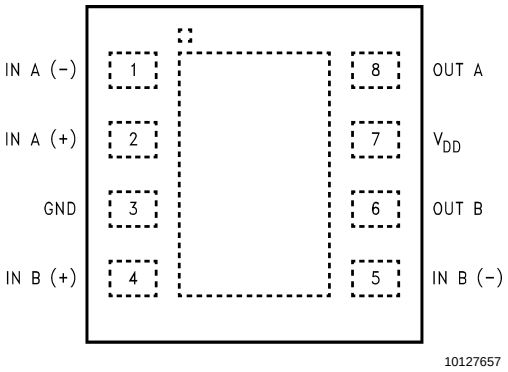
*Refer to the **Application Information** Section for information concerning proper selection of the input and output coupling capacitors.

FIGURE 1. Typical Audio Amplifier Application Circuit

Boomer® is a registered trademark of National Semiconductor Corporation.

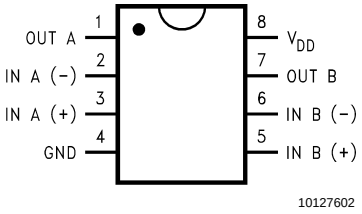
Connection Diagrams

LLP Package



Top View
Order Number LM4808LD
See NS Package Number LDA08B

SOP & MSOP Package



Top View
Order Number LM4808M, LM4808MM
See NS Package Number M08A, MUA08A

Absolute Maximum Ratings (Note 3)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage	6.0V
Storage Temperature	−65˚C to +150˚C
Input Voltage	−0.3V to V_{DD} + 0.3V
Power Dissipation (Note 4)	Internally limited
ESD Susceptibility (Note 5)	3500V
ESD Susceptibility (Note 6)	250V
Junction Temperature	150˚C
Soldering Information (Note 1)	
Small Outline Package	
Vapor Phase (60 seconds)	215˚C
Infrared (15 seconds)	220˚C
Thermal Resistance	
θ_{JC} (MSOP)	56˚C/W
θ_{JA} (MSOP)	210˚C/W
θ_{JC} (SOP)	35˚C/W
θ_{JA} (SOP)	170˚C/W
θ_{JC} (LLP)	15˚C/W
θ_{JA} (LLP)	117˚C/W (Note 9)
θ_{JA} (LLP)	150˚C/W (Note 10)

Operating Ratings

Temperature Range	
$T_{MIN} \le T_A \le T_{MAX}$	$-40˚C \le T_A \le 85˚C$
Supply Voltage	$2.0V \le V_{DD} \le 5.5V$

Note 1: See AN-450 "Surface Mounting and their Effects on Product Reliability" for other methods of soldering surface mount devices.

Electrical Characteristics (Notes 2, 3)

The following specifications apply for V_{DD} = 5V unless otherwise specified, limits apply to T_A = 25˚C.

Symbol	Parameter	Conditions	LM4808		Units (Limits)
			Typ (Note 7)	**Limit** (Note 8)	
V_{DD}	Supply Voltage			2.0	V (min)
				5.5	V (max)
I_{DD}	Supply Current	V_{IN} = 0V, I_O = 0A	1.2	3.0	mA (max)
P_{tot}	Total Power Dissipation	V_{IN} = 0V, I_O = 0A	6	16.5	mW (max)
V_{OS}	Input Offset Voltage	V_{IN} = 0V	10	50	mV (max)
Ibias	Input Bias Current		10		pA
V_{CM}	Common Mode Voltage		0		V
			4.3		V
G_V	Open-Loop Voltage Gain	R_L = 5kΩ	67		dB
Io	Max Output Current	THD+N < 0.1 %	70		mA
R_O	Output Resistance		0.1		Ω
V_O	Output Swing	R_L = 32Ω, 0.1% THD+N, Min	.3		V
		R_L = 32Ω, 0.1% THD+N, Max	4.7		
PSRR	Power Supply Rejection Ratio	Cb = 1.0µF, Vripple = 100mV_{PP}, f = 100Hz	89		dB
Crosstalk	Channel Separation	R_L = 32Ω	75		dB
THD+N	Total Harmonic Distortion + Noise	f = 1 kHz			
		R_L = 16Ω,	0.05		%
		V_O =3.5V_{PP} (at 0 dB)	66		dB
		R_L = 32Ω,	0.05		%
		V_O =3.5V_{PP} (at 0 dB)	66		dB
SNR	Signal-to-Noise Ratio	V_O = 3.5V_{pp} (at 0 dB)	105		dB
f_G	Unity Gain Frequency	Open Loop, R_L = 5kΩ	5.5		MHz
P_o	Output Power	THD+N = 0.1%, f = 1 kHz			
		R_L = 16Ω	105		mW
		R_L = 32Ω	70	60	mW
		THD+N = 10%, f = 1 kHz			
		R_L = 16Ω	150		mW
		R_L = 32Ω	90		mW
C_I	Input Capacitance		3		pF

Electrical Characteristics (Notes 2, 3) (Continued)

The following specifications apply for V_{DD} = 5V unless otherwise specified, limits apply to T_A = 25˚C.

Symbol	Parameter	Conditions	LM4808		Units (Limits)
			Typ (Note 7)	**Limit** (Note 8)	
C_L	Load Capacitance			200	pF
SR	Slew Rate	Unity Gain Inverting	3		V/µs

Electrical Characteristics (Notes 2, 3)

The following specifications apply for V_{DD} = 3.3V unless otherwise specified, limits apply to T_A = 25˚C.

Symbol	Parameter	Conditions	Conditions		Units (Limits)
			Typ (Note 7)	**Limit** (Note 8)	
I_{DD}	Supply Current	V_{IN} = 0V, I_O = 0A	1.0		mA (max)
V_{OS}	Input Offset Voltage	V_{IN} = 0V	7		mV (max)
P_o	Output Power	THD+N = 0.1%, f = 1 kHz			
		R_L = 16Ω	40		mW
		R_L = 32Ω	28		mW
		THD+N = 10%, f = 1 kHz			
		R_L = 16Ω	56		mW
		R_L = 32Ω	38		mW

Electrical Characteristics (Notes 2, 3)

The following specifications apply for V_{DD} = 2.6V unless otherwise specified, limits apply to T_A = 25˚C.

Symbol	Parameter	Conditions	Conditions		Units (Limits)
			Typ (Note 7)	**Limit** (Note 8)	
I_{DD}	Supply Current	V_{IN} = 0V, I_O = 0A	0.9		mA (max)
V_{OS}	Input Offset Voltage	V_{IN} = 0V	5		mV (max)
P_o	Output Power	THD+N = 0.1%, f = 1 kHz			
		R_L = 16Ω	20		mW
		R_L = 32Ω	16		mW
		THD+N = 10%, f = 1 kHz			
		R_L = 16Ω	31		mW
		R_L = 32Ω	22		mW

Note 2: All voltages are measured with respect to the ground pin, unless otherwise specified.

Note 3: *Absolute Maximum Ratings* indicate limits beyond which damage to the device may occur. *Operating Ratings* indicate conditions for which the device is functional, but do not guarantee specific performance limits. *Electrical Characteristics* state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 4: The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{JMAX}, θ_{JA}, and the ambient temperature T_A. The maximum allowable power dissipation is $P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA}$. For the LM4808, T_{JMAX} = 150˚C, and the typical junction-to-ambient thermal resistance, when board mounted, is 210˚C/W for package MUA08A and 170˚C/W for package M08A.

Note 5: Human body model, 100 pF discharged through a 1.5 kΩ resistor.

Note 6: Machine Model, 220 pF–240 pF discharged through all pins.

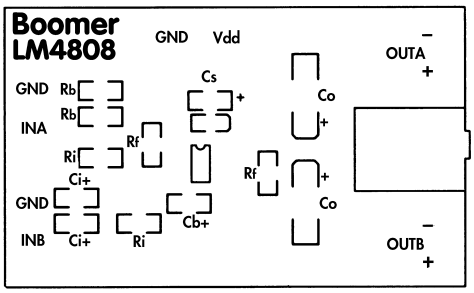
Note 7: Typicals are measured at 25˚C and represent the parametric norm.

Note 8: Tested limits are guaranteed to National's AOQL (Average Outgoing Quality Level). Datasheet min/max specification limits are guaranteed by design, test, or statistical analysis.

Note 9: The given θ_{JA} is for an LM4808 packaged in an LDA08B with the Exposed-DAP soldered to a printed circuit board copper pad with an area equivalent to that of the Exposed-DAP itself.

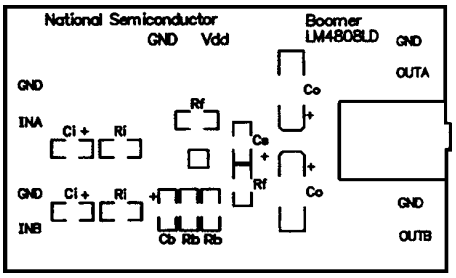
Note 10: The given θ_{JA} is for an LM4808 packaged in an LDA08B with the Exposed-DAP not soldered to any printed circuit board copper.

Demonstration Board Layout



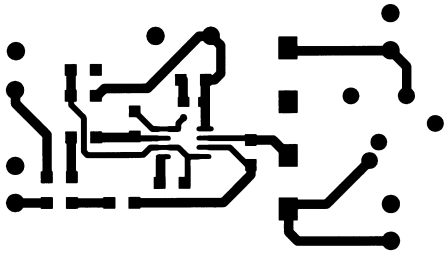
10127639

Recommended SO PC Board Layout: Top Silkscreen



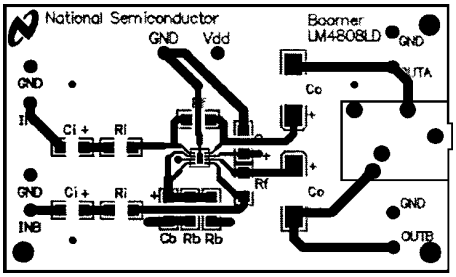
10127660

Recommended LD PC Board Layout: Top Silkscreen



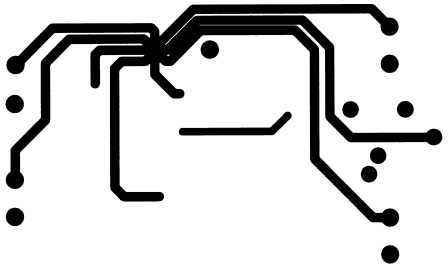
10127640

Recommended SOP PC Board Layout: Top Layer



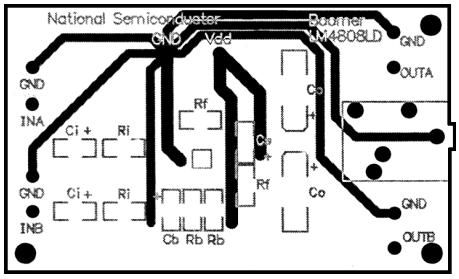
10127661

Recommended LD PC Board Layout: Top Layer



10127642

Recommended SOP PC Board Layout: Bottom Layer



10127662

Recommended LD PC Board Layout: Bottom Layer