National Semiconductor

August 2000

LM4882 Boomer® Audio Power Amplifier Series
250mW Audio Power Amplifier with Shutdown Mode

General Description

The LM4882 is a single-ended audio power amplifier capable of delivering 250mW of continuous average power into an 8Ω load with 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 LM4882 does not require bootstrap capacitors or snubber networks, it is optimally suited for low-power portable systems.

The LM4882 features an externally controlled, low power consumption shutdown mode which is virtually clickless and popless, as well as an internal thermal shutdown protection mechanism.

The unity-gain stable LM4882 can be configured by external gain-setting resistors.

Key Specifications

- THD+N at 1kHz at 250mW continuous average output power into 8Ω — 1.0% (max)
- Output Power at 1% THD+N at 1kHz into 4Ω — 380mW (typ)
- THD+N at 1kHz at 85mW continuous average output power into 32Ω — 0.1% (typ)
- Shutdown Current — 0.7µA (typ)

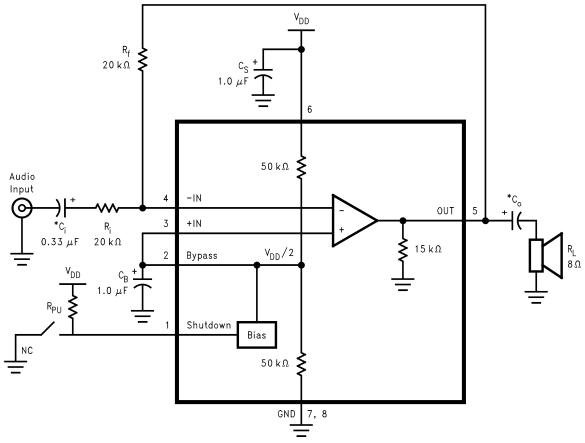
Features

- MSOP surface mount packaging
- "Click and Pop" Suppression Circuitry
- Supply voltages from 2.4V–5.5V
- Operating Temperature −40˚C to 85˚C
- Unity-gain stable
- External gain configuration capability
- No bootstrap capacitors, or snubber circuits are necessary

Applications

- Personal Computers
- Cellular Phones
- General Purpose Audio

Typical Application



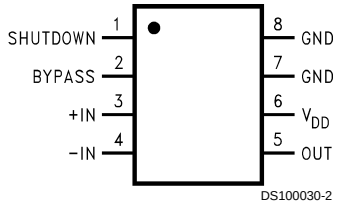
DS100030-1

*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

Connection Diagram

MSOP and SOIC Package



DS100030-2

Top View
Order Number LM4882MM or LM4882M
See NS Package Number MUA08A or M08A

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Absolute Maximum Ratings (Note 1)

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

Supply Voltage	6.0 V
Storage Temperature	−65˚C to +150˚C
Input Voltage	−0.3V to V_{DD} + 0.3V
Power Dissipation (Note 3)	Internally limited
ESD Susceptibility (Note 4)	2000V
PIn 5	1500V
Junction Temperature	150˚C
Soldering Information	
Small Outline Package	
Vapor Phase (60 seconds)	215˚C
Infrared (15 seconds)	220˚C

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

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

Operating Ratings

Temperature Range	
$T_{MIN} \le T_A \le T_{MAX}$	−40˚C ≤ T_A ≤ 85˚C
Supply Voltage	2.4V ≤ V_{DD} ≤ 5.5V

Electrical Characteristics (Notes 1, 2)

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

Symbol	Parameter	Conditions	LM4882		Units (Limits)
			Typical (Note 5)	Limit (Note 6)	
I_{DD}	Quiescent Current	V_{IN} = 0V, I_O = 0A	2	4.0	mA (max)
I_{SD}	Shutdown Current	$V_{pin1} = V_{DD}$	0.5	5	µA (max)
V_{OS}	Offset Voltage	V_{IN} = 0V	5	50	mV (max)
P_O	Output Power	THD + N = 1% (max); f = 1 kHz;			
		R_L = 4Ω	380		mW
		R_L = 8Ω	270	250	mW (min)
		R_L = 32Ω	95		mW
		THD + N = 10%; f = 1 kHz			
		R_L = 4Ω	480		mW
		R_L = 8Ω	325		mW
		R_L = 32Ω	125		mW
THD + N	Total Harmonic Distortion + Noise	R_L = 8Ω, P_O = 250 mWrms;	0.5		%
		R_L = 32Ω, P_O = 85 mWrms;	0.1		%
		f = 1 kHz			
PSRR	Power Supply Rejection Ratio	V_{pin3} = 2.5V, V_{ripple} = 200 mVrms, f = 120 Hz	50		dB

Electrical Characteristics (Notes 1, 2)

The following specifications apply for V_{DD} = 3V unless otherwise specified. Limits apply for T_A = 25˚C.

Symbol	Parameter	Conditions	LM4882		Units (Limits)
			Typical (Note 5)	Limit (Note 6)	
I_{DD}	Quiescent Current	V_{IN} = 0V, I_O = 0A	1.2		mA
I_{SD}	Shutdown Current	$V_{pin1} = V_{DD}$	0.3		µA
V_{OS}	Offset Voltage	V_{IN} = 0V	5		mV
P_O	Output Power	THD + N = 1% (max); f = 1 kHz			
		R_L = 8Ω	80		mW
		R_L = 32Ω	30		mW
		THD + N = 10%; f = 1 kHz			
		R_L = 8Ω	105		mW
		R_L = 32Ω	40		mW

Electrical Characteristics (Notes 1, 2) (Continued)

The following specifications apply for V_{DD} = 3V unless otherwise specified. Limits apply for T_A = 25˚C.

Symbol	Parameter	Conditions	LM4882		Units (Limits)
			Typical (Note 5)	Limit (Note 6)	
THD + N	Total Harmonic Distortion + Noise	R_L = 8Ω, P_O = 70 mWrms;	0.25		%
		R_L = 32Ω, P_O = 30 mWrms;	0.3		%
		f = 1 kHz			
PSRR	Power Supply Rejection Ratio	V_{pin3} = 2.5V, V_{ripple} = 200 mVrms, f = 120 Hz	50		dB

Note 1: All voltages are measured with respect to the ground pin, unless otherwise specified.

Note 2: *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 3: 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 LM4882, T_{JMAX} = 150˚C, and the typical junction-to-ambient thermal resistance, when board mounted, is 210˚C/W for the MUA08A Package and 170˚C/W for the M08A Package.

Note 4: Human body model, 100 pF discharged through a 1.5 kΩ resistor.

Note 5: Typicals are measured at 25˚C and represent the parametric norm.

Note 6: Limits are guaranteed to National's AOQL (Average Outgoing Quality Level).

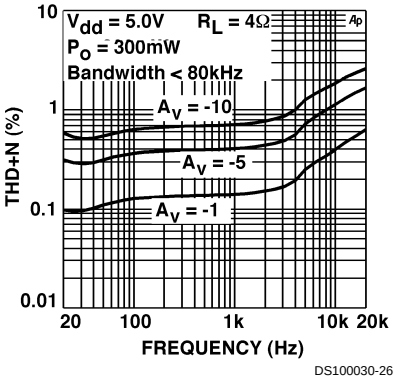
External Components Description

(Refer to *Figure 1*)

Components	Functional Description
1. R_i	Inverting input resistance which sets the closed-loop gain in conjunction with R_f. This resistor also forms a high pass filter with C_i at $f_c = 1 / (2\pi R_i C_i)$.
2. C_i	Input coupling capacitor which blocks the DC voltage at the amplifier's input terminals. Also creates a highpass filter with R_i at $f_c = 1 / (2\pi R_i C_i)$. Refer to the section, **Proper Selection of External Components,** for an explanation of how to determine the values of C_i.
3. R_f	Feedback resistance which sets closed-loop gain in conjunction with R_i.
4. C_S	Supply bypass capacitor which provides power supply filtering. Refer to the **Application Information** section for proper placement and selection of the supply bypass capacitor.
5. C_B	Bypass pin capacitor which provides half-supply filtering. Refer to the section, **Proper Selection of External Components,** for information concerning proper placement and selection of C_B.
6. C_O	Output coupling capacitor which blocks the DC voltage at the amplifier's output. Forms a high pass filter wth R_L at $f_O = 1 / (2\pi R_L C_O)$.

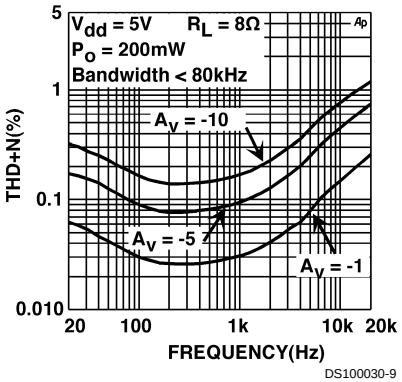
Typical Performance Characteristics

THD+N vs Frequency



DS100030-26

THD+N vs Frequency



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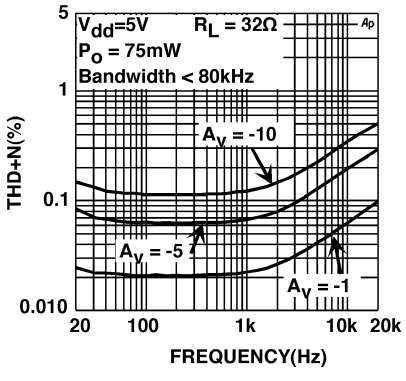
THD+N vs Frequency



DS100030-10