National Semiconductor

August 2000

LM4862 Boomer® Audio Power Amplifier Series
675 mW Audio Power Amplifier with Shutdown Mode

General Description

The LM4862 is a bridge-connected audio power amplifier capable of delivering typically 675mW of continuous average power to 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. Since the LM4862 does not require output coupling capacitors, bootstrap capacitors, or snubber networks, it is optimally suited for low-power portable systems.

The LM4862 features an externally controlled, low-power consumption shutdown mode, as well as an internal thermal shutdown protection mechanism.

The unity-gain stable LM4862 can be configured by external gain-setting resistors.

Key Specifications

- THD+N for 500mW continuous average output power at 1kHz into 8Ω — 1% (max)
- Output power at 10% THD+N at 1kHz into 8Ω — 825mW (typ)
- Shutdown Current — 0.7µA (typ)

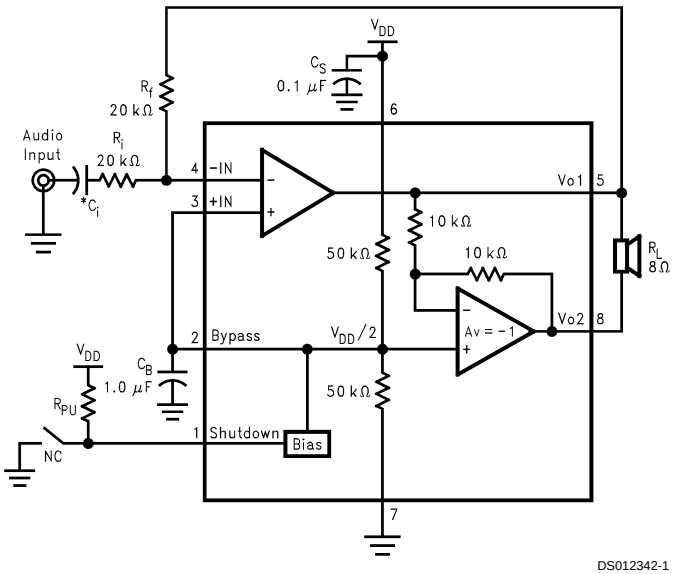
Features

- No output coupling capacitors, bootstrap capacitors or snubber circuits are necessary
- Small Outline or DIP packaging
- Unity-gain stable
- External gain configuration capability
- Pin compatible with LM4861

Applications

- Portable computers
- Cellular phones
- Toys and games

Typical Application

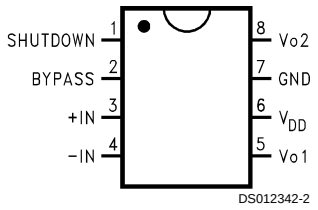


*Refer to the **Application Information** section for information concerning proper selection of the input coupling capacitor.

FIGURE 1. Typical Audio Amplifier Application Circuit

Connection Diagram

Small Outline and DIP Package



Top View
Order Number LM4862M, LM4862N
See NS Package Number M08A or N08E

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Absolute Maximum Ratings (Note 2)

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 3)	Internally limited
ESD Susceptibility (Note 4)	3500V
ESD Susceptibility (Note 5)	250V
Junction Temperature	150˚C
Soldering Information	
Small Outline Package	
Vapor Phase (60 sec.)	215˚C
Infrared (15 sec.)	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} (typ)—M08A	35˚C/W
θ_{JA} (typ)—M08A	170˚C/W
θ_{JC} (typ)—N08E	37˚C/W
θ_{JA} (typ)—N08E	107˚C/W

Operating Ratings

Temperature Range	
$T_{MIN} \le T_A \le T_{MAX}$	−40˚C ≤ T_A ≤ 85˚C
Supply Voltage	2.7V ≤ V_{DD} ≤ 5.5V

Electrical Characteristics (Note 1) (Note 2)

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

Symbol	Parameter	Conditions	LM4862		Units (Limits)
			Typical (Note 6)	Limit (Note 7)	
V_{DD}	Supply Voltage			2.7	V (min)
				5.5	V (max)
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, I_O = 0A (Note 8)	3.6	6.0	mA (max)
I_{SD}	Shutdown Current	V_{PIN1} = V_{DD}	0.7	5	µA (max)
V_{OS}	Output Offset Voltage	V_{IN} = 0V	5	50	mV (max)
P_O	Output Power	THD = 1% (max); f = 1 kHz; R_L = 8Ω	675	500	mW (min)
		THD + N = 10%; f = 1 kHz; R_L = 8Ω	825		mW
THD + N	Total Harmonic Distortion + Noise	P_O = 500 mWrms; R_L = 8Ω A_{VD} = 2; 20 Hz ≤ f ≤ 20 kHz	0.55		%
PSRR	Power Supply Rejection Ratio	V_{DD} = 4.9V to 5.1V	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 $P_{DMAX} = (T_{MAX} - T_A)/\theta_{JA}$. For the LM4862, T_{JMAX} = 150˚C. The typical junction-to-ambient thermal resistance, when board mounted, is 170˚C/W for package number M08A and is 107˚C/W for package number N08E.

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

Note 5: Machine Model, 200 pF–240 pF discharged through all pins.

Note 6: Typicals are measured at 25˚C and represent the parametric norm.

Note 7: Limits are guaranteed to National’s AOQL (Average Outgoing Quality Level).

Note 8: The quiescent power supply current depends on the offset voltage when a practical load is connected to the amplifier.

Automatic Switching Circuit

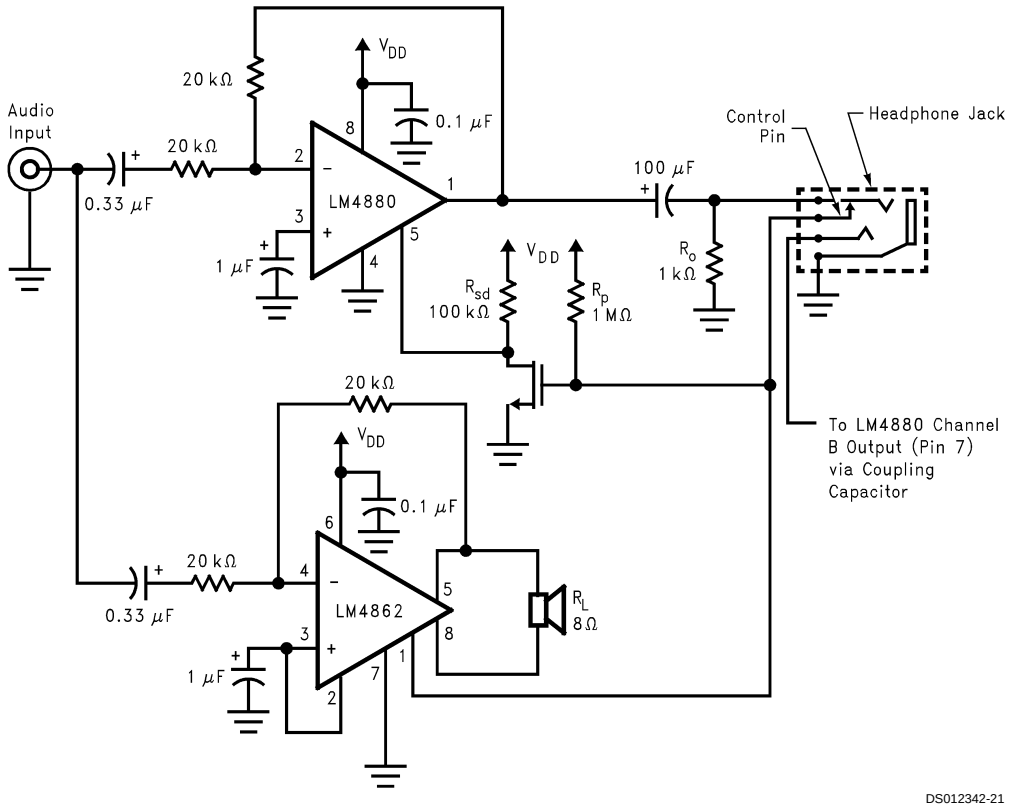

FIGURE 2. Automatic Switching Circuit

External Components Description (*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 value of C_i.
3.	R_F	Feedback resistance which sets the closed-loop gain in conjunction with R_i.
4.	C_S	Supply bypass capacitor which provides power supply filtering. Refer to the **Power Supply Bypassing** 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 **Proper Selection of External Components** section for proper placement and selection of the half-supply bypass capacitor.