

LM4900 Boomer® Audio Power Amplifier Series 265mW at 3.3V Supply Audio Power Amplifier with Shutdown Mode

General Description

The LM4900 is a bridged audio power amplifier capable of delivering 265mW of continuous average power into an 8Ω load with 1% THD+N from a 3.3V power supply.

Boomer® audio power amplifiers were designed specifically to provide high quality output power from a low supply voltage while requiring a minimal amount of external components. Since the LM4900 does not require output coupling capacitors, bootstrap capacitors or snubber networks, it is optimally suited for low-power portable applications.

The LM4900 features an externally controlled, low power consumption shutdown mode, and thermal shutdown protection.

The closed loop response of the unity-gain stable LM4900 can be configured by external gain-setting resistors.

Features

- MSOP, LLP, and SOP packaging
- No output coupling capacitors, bootstrap capacitors, or snubber circuits are necessary
- Thermal shutdown protection circuitry
- Unity-gain stable
- External gain configuration capability
- Latest generation 'click and pop' suppression circuitry

Applications

- Cellular phones
- PDA's
- Any portable audio application

Key Specifications

- THD+N at 1kHz for 265mW continuous average output power into 8Ω,
 $V_{DD} = 3.3V$ 1.0% (max)
- THD+N at 1kHz for 675mW continuous average output power into 8Ω,
 $V_{DD} = 5V$ 1.0% (max)
- Shutdown current 0.1μA (typ)

Typical Application

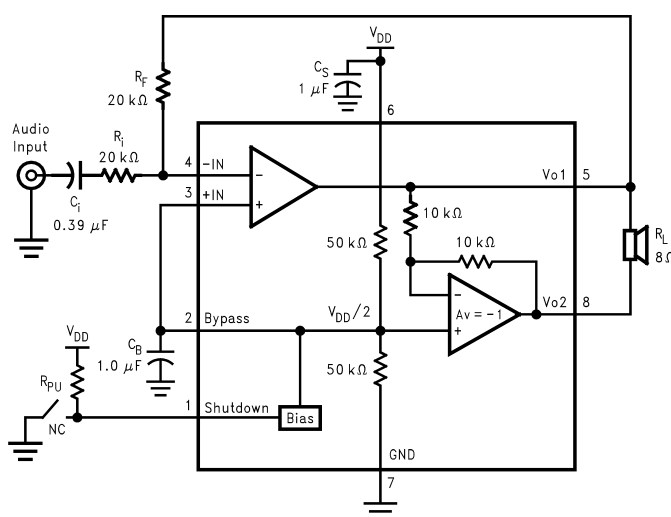
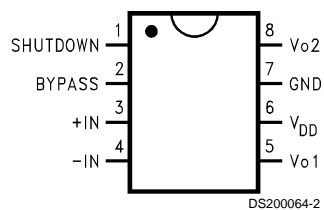


FIGURE 1. Typical Audio Amplifier Application Circuit

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Connection Diagrams

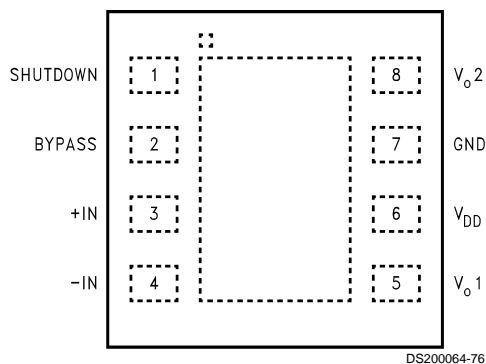
MSOP and SOP Package



Top View

Order Number LM4900MM, LM4900M
See NS Package Number MUA08A, M08A

LLP Package



Top View

Order Number LM4900LD
See NS Package Number LDA08B

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)	2000V
ESD Susceptibility (Note 5)	200V
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} (M08A)	35°C/W
θ_{JA} (M08A)	170°C/W
θ_{JC} (MUA08A)	56°C/W
θ_{JA} (MUA08A)	190°C/W
θ_{JA} (LDA08B)	67°C/W

Operating Ratings

Temperature Range

$$T_{MIN} \leq T_A \leq T_{MAX}$$

$$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$$

Supply Voltage

$$2.0V \leq V_{DD} \leq 5.5V$$

Electrical Characteristics (Note 1) (Note 2)

The following specifications apply for $V_{DD} = 5V$, for all available packages, unless otherwise specified. Limits apply for $T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	LM4900		Units (Limits)
			Typical (Note 6)	Limit (Notes 7, 9)	
I_{DD}	Quiescent Power Supply Current	$V_{IN} = 0V$, $I_O = 0A$ (Note 8)	4	6.0	mA (max)
I_{SD}	Shutdown Current	$V_{PIN1} = V_{DD}$	0.1	5	μA (max)
V_{OS}	Output Offset Voltage	$V_{IN} = 0V$	5	50	mV (max)
P_O	Output Power	THD = 1% (max); $f = 1\text{kHz}$; $R_L = 8\Omega$;	675	300	mW (min)
THD+N	Total Harmonic Distortion+Noise	$P_O = 400\text{ mWrms}$; $A_{VD} = 2$; $R_L = 8\Omega$; $20\text{Hz} \leq f \leq 20\text{kHz}$, BW < 80kHz	0.4		%
PSRR	Power Supply Rejection Ratio	$V_{RIPPLE} = 200\text{mV sine p-p}$			dB
		$f = 217\text{Hz}$ (Note 10)	70		
		$f = 1\text{KHz}$ (Note 10)	67		
		$f = 217\text{Hz}$ (Note 11)	55		
		$f = 1\text{KHz}$ (Note 11)	55		

Electrical Characteristics (Note 1) (Note 2)

The following specifications apply for $V_{DD} = 3.3V$, for all available packages, unless otherwise specified. Limits apply for $T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	LM4900		Units (Limits)
			Typical (Note 6)	Limit (Notes 7, 9)	
I_{DD}	Quiescent Power Supply Current	$V_{IN} = 0V$, $I_O = 0A$ (Note 8)	3	5	mA (max)
I_{SD}	Shutdown Current	$V_{PIN1} = V_{DD}$	0.1	3	μA (max)
V_{OS}	Output Offset Voltage	$V_{IN} = 0V$	5	50	mV (max)
P_O	Output Power	THD = 1% (max); $f = 1\text{kHz}$; $R_L = 8\Omega$;	265		mW (min)
THD+N	Total Harmonic Distortion+Noise	$P_O = 250\text{ mWrms}$; $A_{VD} = 2$; $R_L = 8\Omega$; $20\text{Hz} \leq f \leq 20\text{kHz}$, BW < 80kHz	0.4		%
PSRR	Power Supply Rejection Ratio	$V_{RIPPLE} = 200\text{mV sine p-p}$			dB
		$f = 217\text{Hz}$ (Note 10)	73		
		$f = 1\text{KHz}$ (Note 10)	70		
		$f = 217\text{Hz}$ (Note 11)	60		
		$f = 1\text{KHz}$ (Note 11)	68		

Electrical Characteristics (Note 1) (Note 2)

The following specifications apply for $V_{DD} = 2.6V$, for all available packages, unless otherwise specified. Limits apply for $T_A = 25^\circ C$

Symbol	Parameter	Conditions	LM4900		Units (Limits)
			Typical (Note 6)	Limit (Notes 7, 9)	
I_{DD}	Quiescent Power Supply Current	$V_{IN} = 0V$, $I_O = 0A$ (Note 8)	2.6	4	mA (max)
I_{SD}	Shutdown Current	$V_{PIN1} = V_{DD}$	0.1	2.0	μA (max)
V_{OS}	Output Offset Voltage	$V_{IN} = 0V$	5		mV
P_O	Output Power	THD = 1% (max); $f = 1kHz$; $R_L = 8\Omega$	130		mW
THD+N	Total Harmonic Distortion+Noise	$P_O = 100$ mWrms; $A_{VD} = 2$; $R_L = 8\Omega$; $20Hz \leq f \leq 20kHz$, BW < 80kHz	0.4		%
PSRR	Power Supply Rejection Ratio	$V_{RIPPLE} = 200mV$ sine p-p			dB
		$f = 217Hz$ (Note 11)	58		
		$f = 1KHz$ (Note 11)	63		

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 $P_{DMAX} = (T_{JMAX} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower. For the LM4900, $T_{JMAX} = 150^\circ C$. The typical junction-to-ambient thermal resistance, when board mounted, is $190^\circ C/W$ for package number MUA08A.

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

Note 5: Machine Model, 220pF–240pF discharged through all pins.

Note 6: Typicals are measured at $25^\circ C$ 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.

Note 9: Datasheet min/max specification limits are guaranteed by design, test, or statistical analysis.

Note 10: Unterminated input.

Note 11: 10 Ω terminated input.