1.2-Walts Mono Filter-free Audio Power Amplifier

Features

- 2.5-5.5V Operation Voltage
- 63dB PSRR at 217Hz, VDD=5V
- 0.1μA ultra low current shutdown mode
- Improved pop & click circuitry
- Unique Modulation Scheme Reduces EMI Emissions
- 0.1-μA Shutdown Current
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- External gain configuration capability
- Shutdown Pin has 0.4V Compatible Thresholds
- BTL output can drive capacitive loads
- RoHS compliant and 100% lead(Pb)-free

DIP-8

SOP-8


MSOP-8

Applications

- PMP,PSP, Game, Data-Bank
- Cellular and Smart mobile phone

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM4890N	DIP-8	LM4890	TUBE	2000/box
LM4890M/TR	SOP-8	LM4890	REEL	2500/reel
LM4890MM/TR	MSOP-8	4890	REEL	3000/reel

General Description

The LM4890 is an audio power amplifier designed for portable communication device applications such as mobile phone applications. The LM4890 is capable of delivering 1.2W of continuous average power to an 8Ω load and with less than 1% distortion (THD+N) from a 5.2V power supply, and 350mW to a 8Ω load from a 3V power supply.

The LM4890 provides high quality audio while requiring few external components and minimal power consumption. It features a low-power shutdown mode, which is achieved by driving the SHUTDOWN pin with logic low.

The LM4890 contains circuitry to prevent from “pop and click” noise that would otherwise occur during turn-on and turn-off transitions. For maximum flexibility, the LM4890 provides an externally controlled gain (with resistors), as well as an externally controlled turn-on and turn-off times (with the bypass capacitor).

Typical Application Circuit

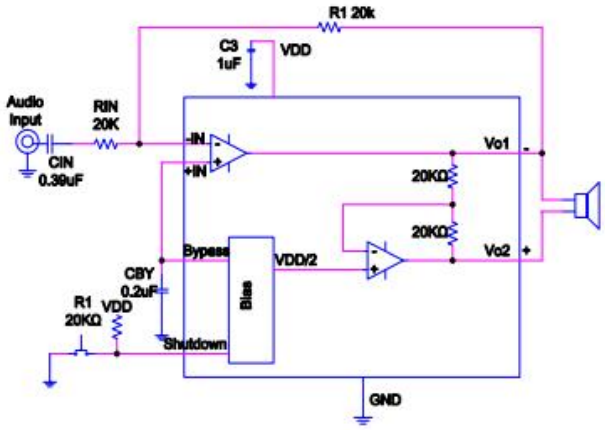


Figure 1.Single Input

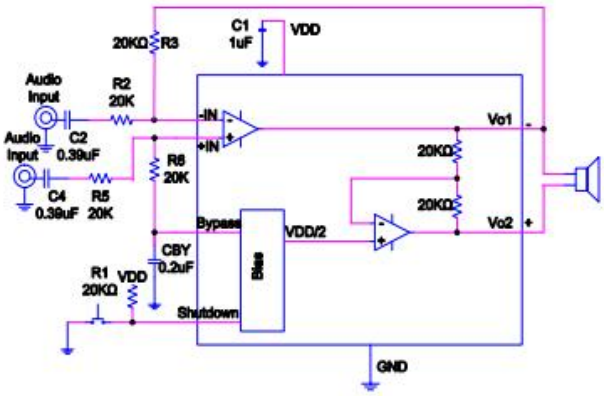
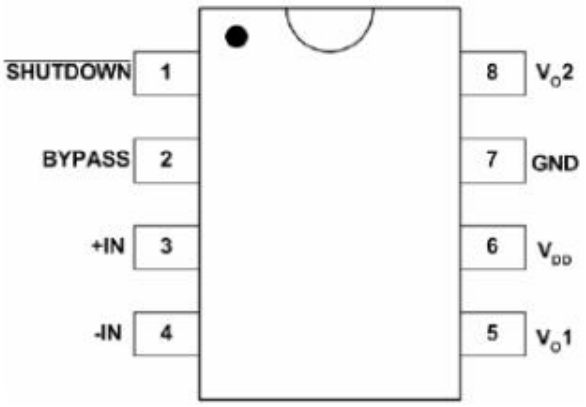


Figure 2.Differential Input

Functional Pin Description

Pin Configurations



DIP-8/SOP-8/MSOP-8

Pin Description

Pin	Name	Description
1	SHDN	The device enters in shutdown mode when a low level is applied on this pin.
2	BYPASS	Bypass capacitor pin which provides the common mode voltage.
3	+IN	Positive input of the first amplifier, receives the common mode voltage.
4	-IN	Negative input of the first amplifier, receives the audio input signal. Connected to the feedback resistor Rf and to the input resistor Rin.
5	VO1	Negative output of the LM4890. Connected to the load and to the feedback resistor Rf.
6	VDD	Analog VDD input supply.
7	GND	Ground connection for circuitry.
8	VO2	Positive output of the LM4890.

Absolute Maximum Ratings

Condition	Min	Max
Input Voltage to GND	-0.3V	6V
Other pin Voltage to GND	-0.3V	6V
Junction Temperature, T_{JMAX}	-	150°C
Storage Temperature Rang, Tstg	-65°C	150°C
ESD Susceptibility	-	2kV
Maximum Soldering Temperature (at leads, 10 sec)	-	260°C
Thermal Resistance θ_{JA}	-	165°C/W
Package Dissipation P_D	-	0.9W

Note:Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

Electrical Characteristics

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
VOS	Output offset voltage (measured differentially)	Vi=0V,Av=2V/V,VDD=2.5V to 5.5V			5	25	mV
IQ	Quiescent current	VDD=5.5V, no load			2.5		mA
		VDD=3.6V, no load			1.40		
		VDD=2.5V, no load			1.06		
ISHDN	Shutdown Current	VSHDN=0.35V, VDD=2.5V to 5.5V		0.1	2.0		μA
RDS(ON)	Static drain-source on-state resistance	VDD=5.5V, no load			400		mΩ
		VDD=3.6V, no load			500		
		VDD=2.5V, no load			700		
Po	Output power	VDD=5.2V, RL=8Ω, THD=1%, f=1KHz			1.2		W
VSHDN	Start up voltage threshold			1.4			V
	Shutdown voltage threshold					0.4	
THD+N	Total harmonic distortion plus noise	VDD=5V,Po=1W,RL=8Ω,f=1KHz			0.123		%
		VDD=3.6V,Po=0.5W,RL=8Ω,f=1KHz			0.130		
		VDD=2.5V,Po=0.2W,RL=8Ω,f=1KHz			0.163		
PSRR	Supply ripple rejection ratio	VDD=3.6V,Inputs ac-grounded with Ci=2uF	F=217Hz, V(ripple)=200mV		-63		dB
CMRR	Common mode rejection ratio	VDD=3.6V, Vic=1Vpp	F=217Hz		-62		dB
Zt	Start-up time from shutdown	VDD=3.6V			45		mS

Typical Operating Characteristics

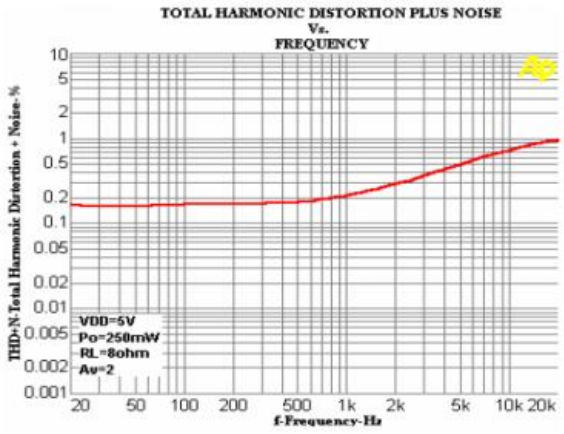


Figure 3.

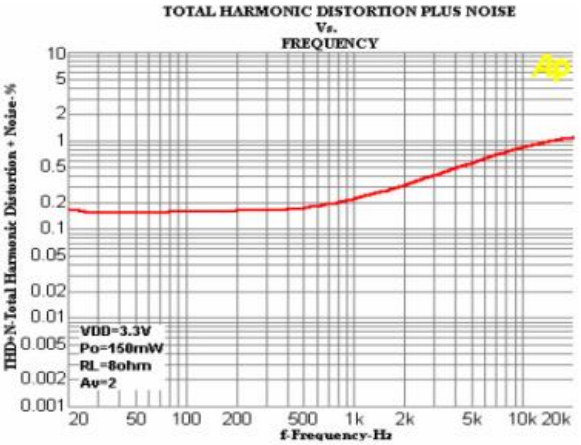


Figure 4.

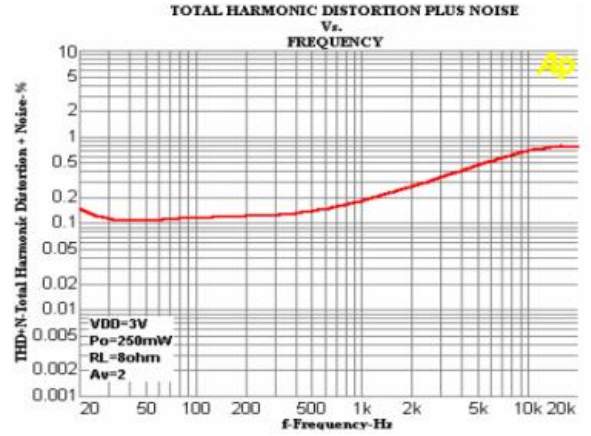


Figure 5.

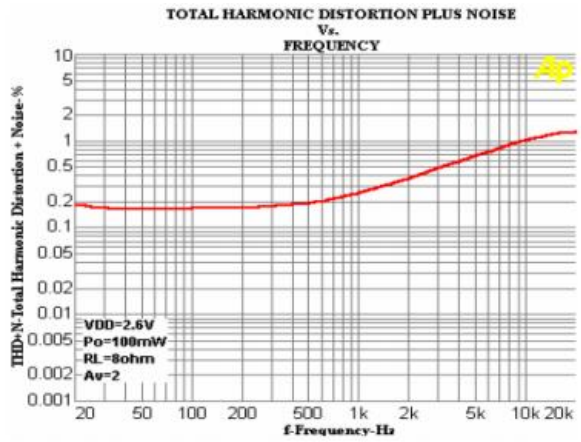


Figure 6.

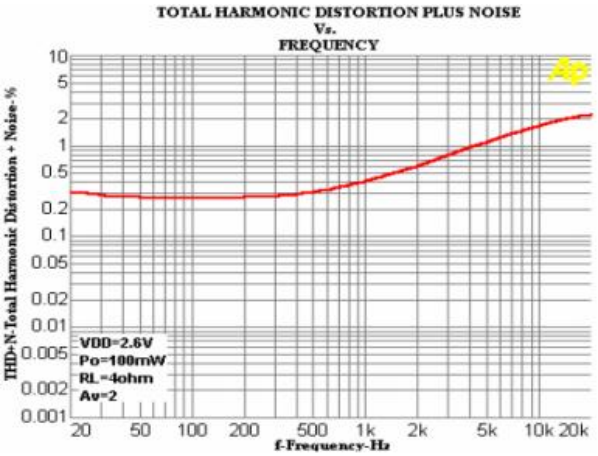


Figure 7.

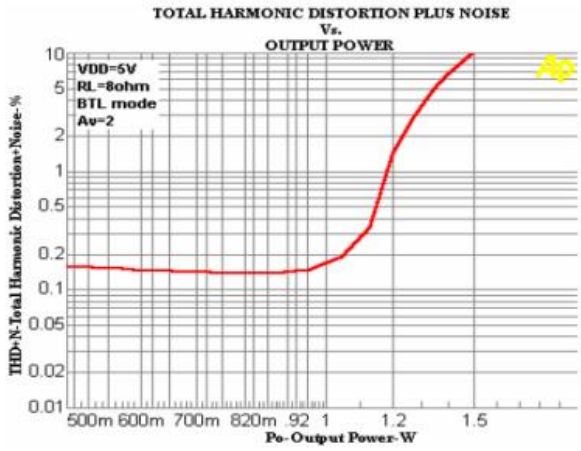


Figure 8.

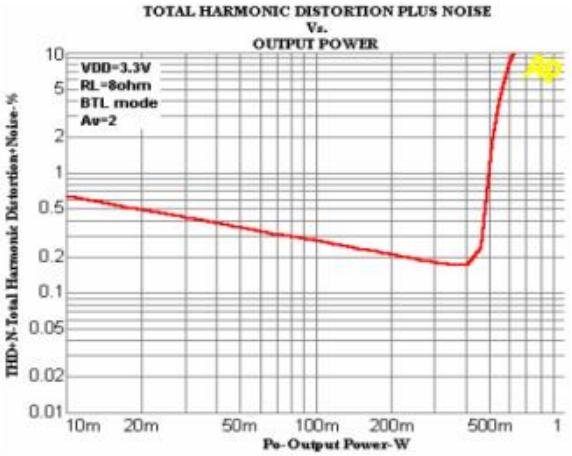


Figure 9.

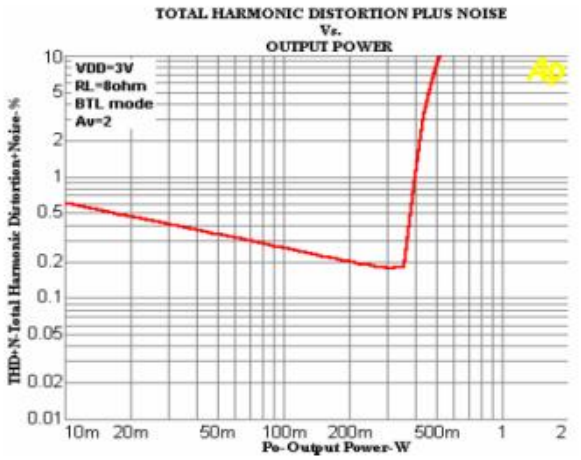


Figure 10.

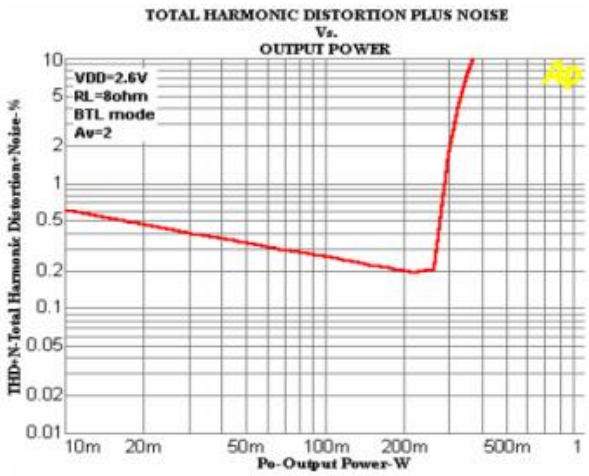


Figure 11.

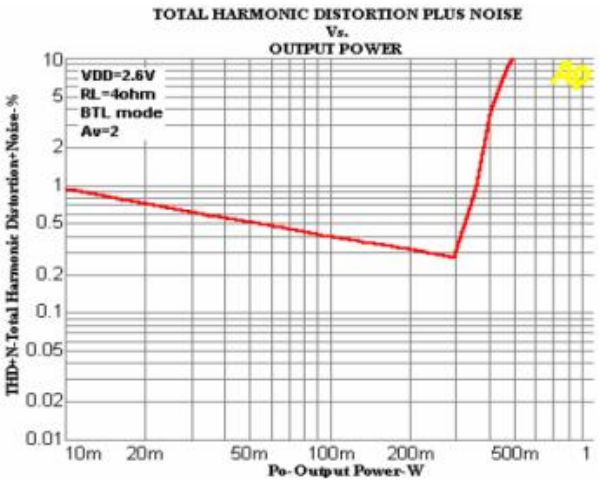


Figure 12.

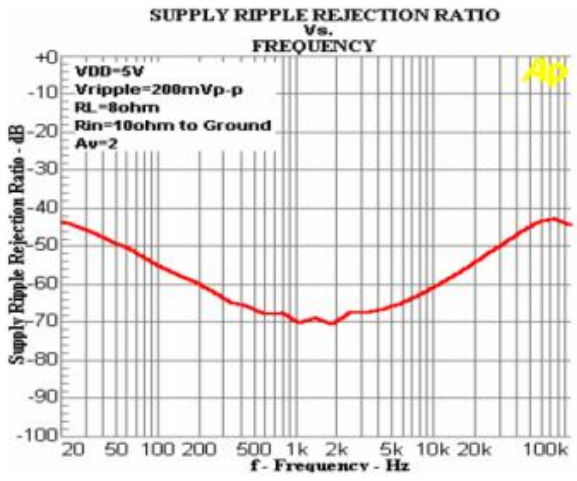


Figure 13.

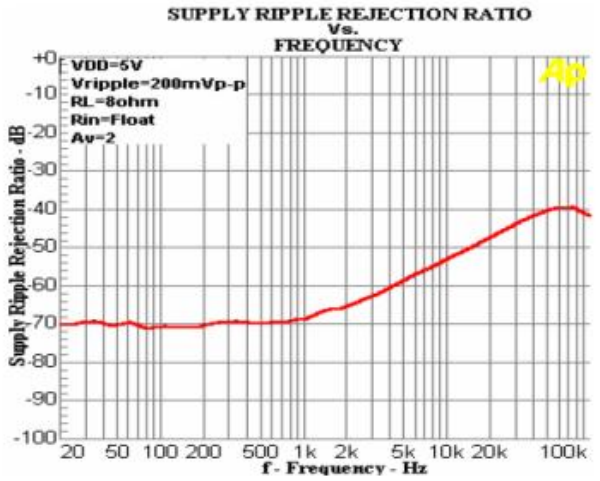


Figure 14.

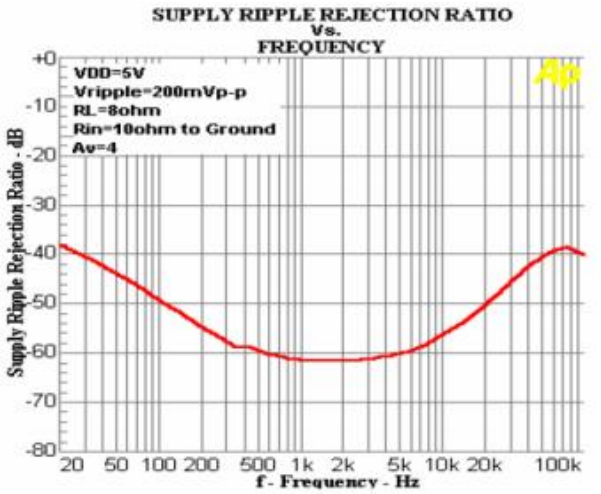


Figure 15.

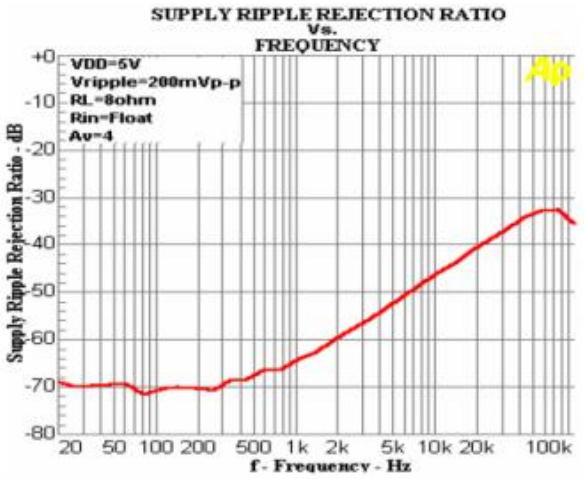


Figure 16.

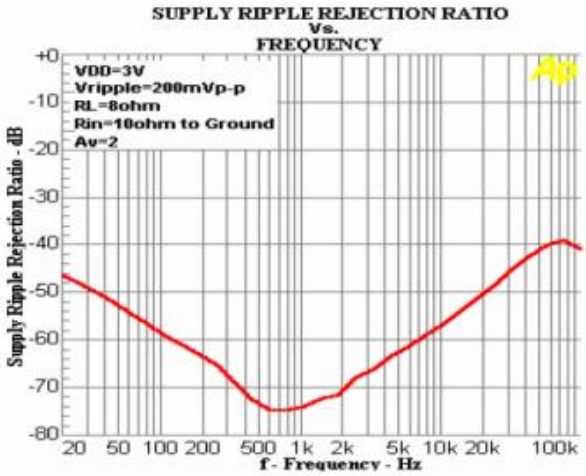


Figure 17.

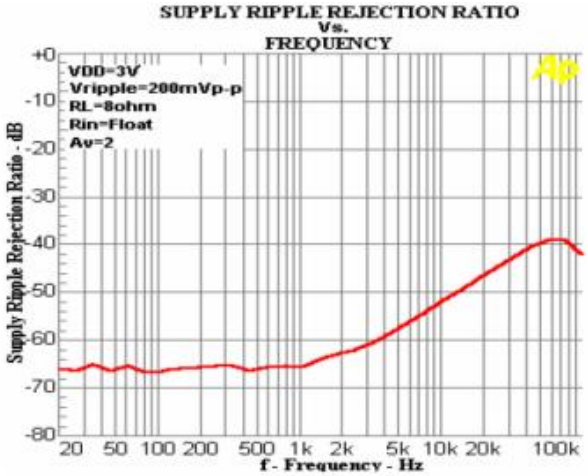


Figure 18.

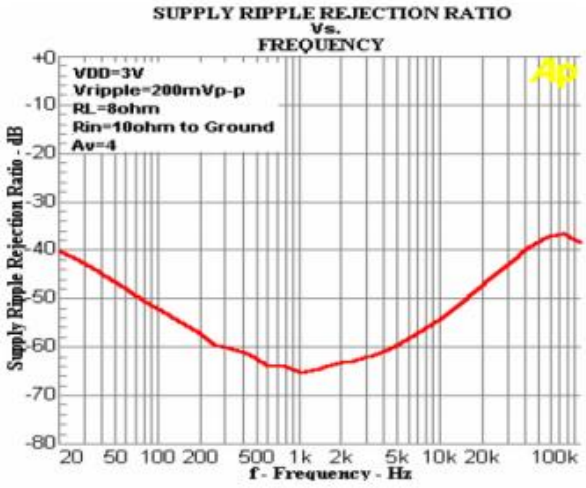


Figure 19.

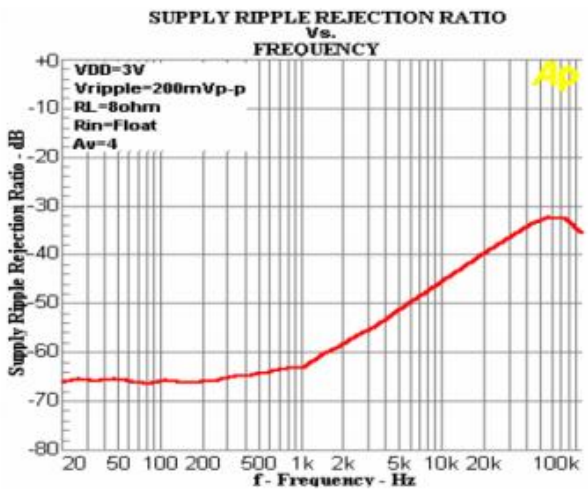


Figure 20.

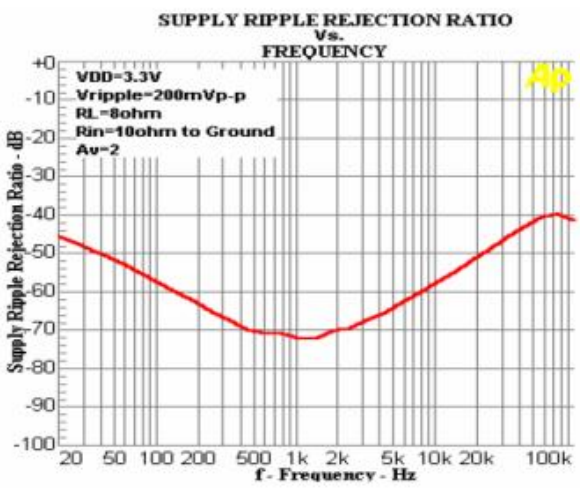


Figure 21.

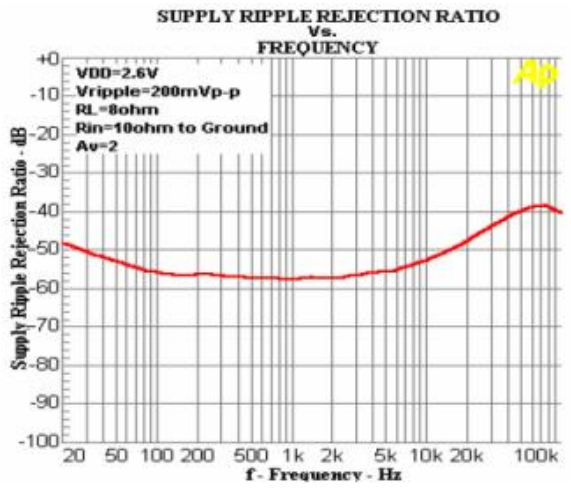


Figure 22.

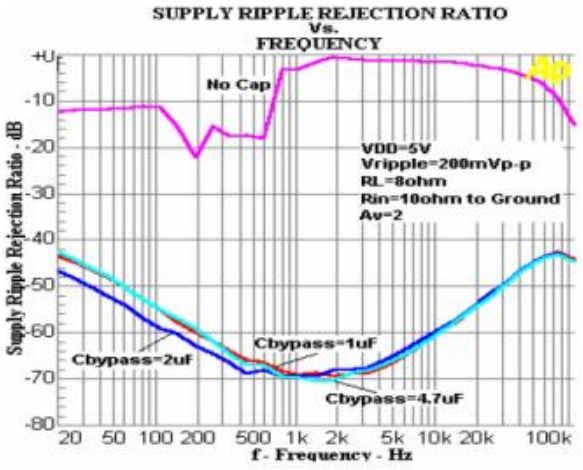


Figure 23.

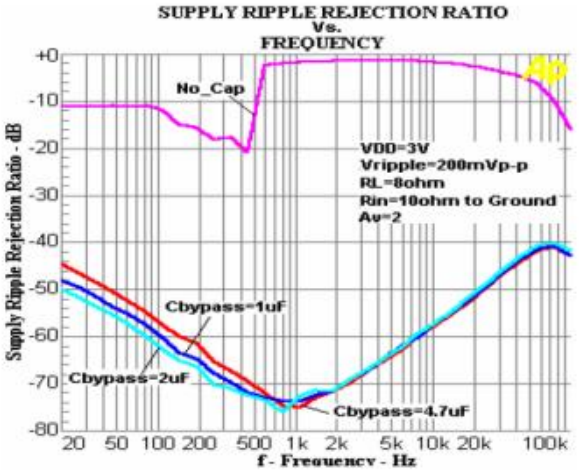


Figure 24.

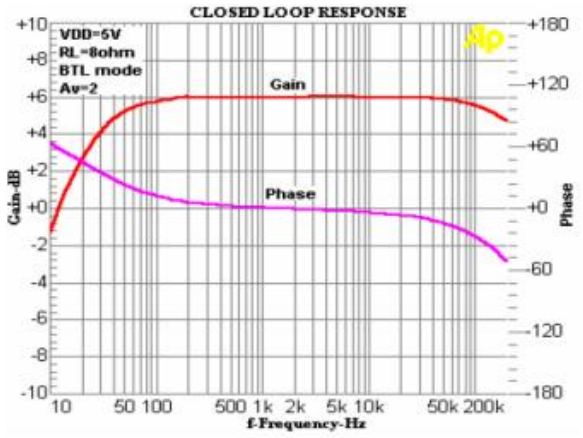


Figure 25.

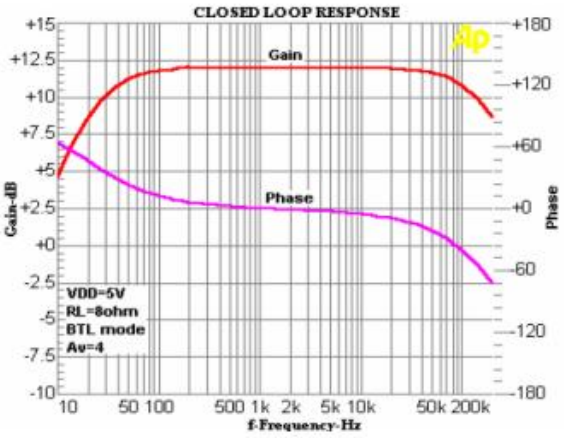


Figure 26.

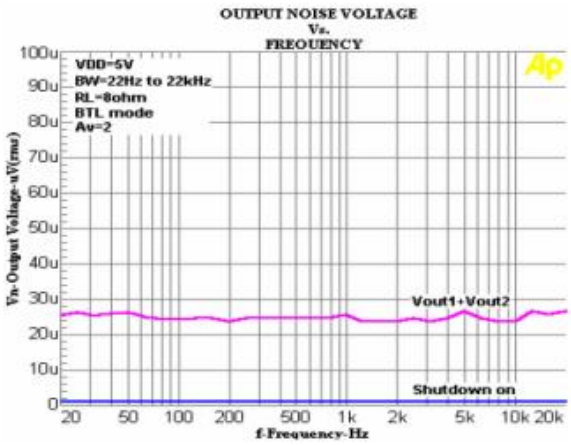


Figure 27.

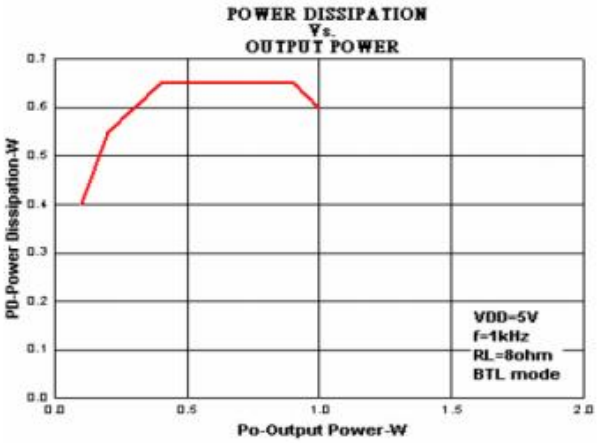


Figure 28.

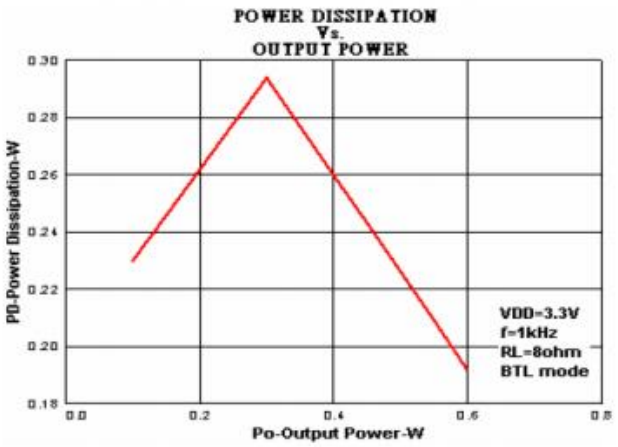


Figure 29.

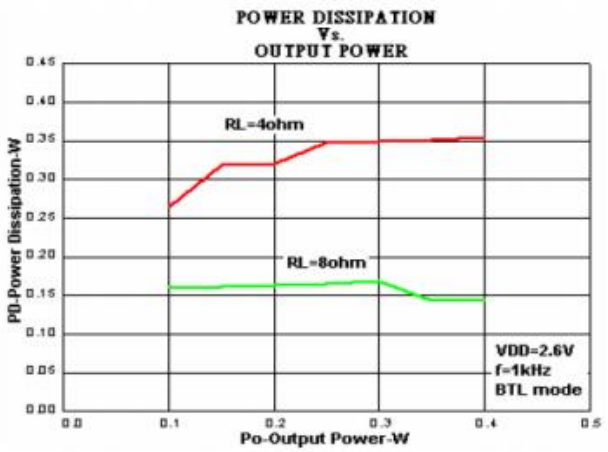


Figure 30.

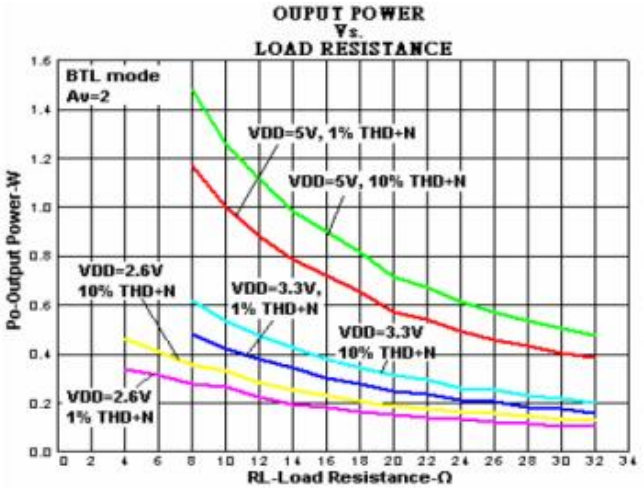


Figure 31.

Layout Considerations

As output power increases, interconnect resistance (PCB traces and wires) between the amplifier, load and power supply create a voltage drop. The voltage loss on the traces between the LM4890 and the load results is lower output power and decreased efficiency. Higher trace resistance between the supply and the LM4890 has the same effect as a poorly regulated supply, increase ripple on the supply line also reducing the peak output power. The effects of residual trace resistance increases as output current increases due to higher output power, decreased load impedance or both. To maintain the highest output voltage swing and corresponding peak output power, the PCB traces that connect the output pins to the load and the supply pins to the power supply should be as wide as possible to minimize trace resistance.

The use of power and ground planes will give the best THD+N performance. While reducing trace resistance, the use of power planes also creates parasite capacitors that help to filter the power supply line.

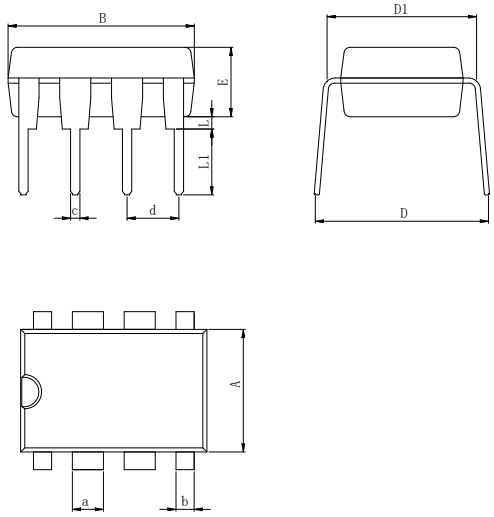
The inductive nature of the transducer load can also result in overshoot on one or both edges, clamped by the parasitic diodes to GND and VDD in each case. From an EMI standpoint, this is an aggressive waveform that can radiate or conduct to other components in the system and cause interference. It is essential to keep the power and output traces short and well shielded if possible. Use of ground planes, beads, and micro-strip layout techniques are all useful in preventing unwanted interference.

As the distance from the LM4890 and the speaker increase, the amount of EMI radiation will increase since the output wires or traces acting as antenna become more efficient with length. What is acceptable EMI is highly application specific.

Ferrite chip inductors placed close to the LM4890 may be needed to reduce EMI radiation. The value of the ferrite chip is very application specific.

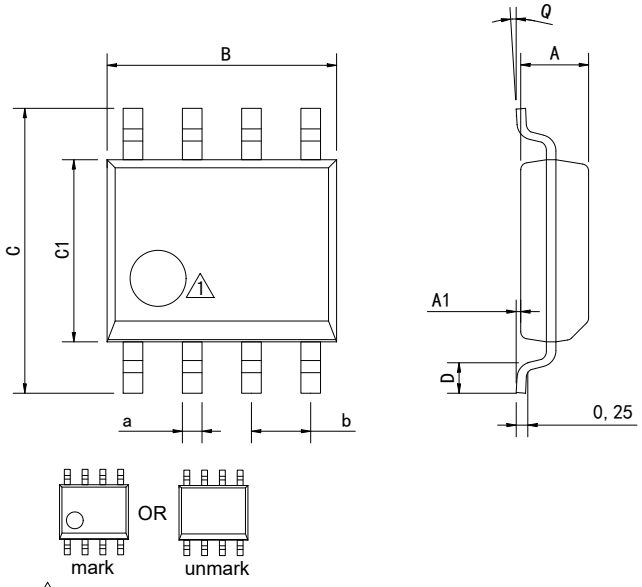
Physical Dimensions

DIP-8



Dimensions In Millimeters(DIP-8)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

SOP-8

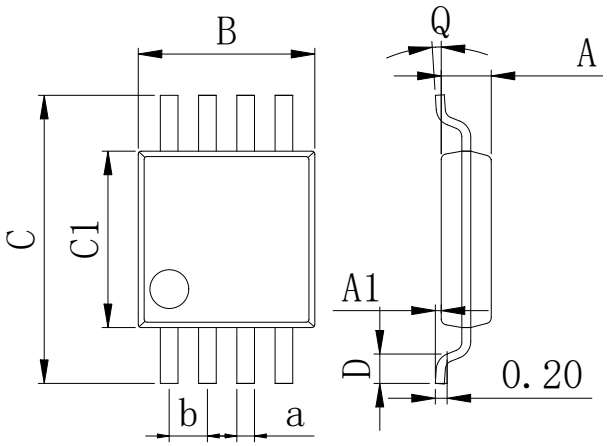


1 Package top mark may be in lower left corner or unmark

Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

Physical Dimensions

MSOP-8



Dimensions In Millimeters(MSOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2014-6	New	1-13
V1.1	2018-9	Updated DIP-8 dimension、Add annotation for Maximum Ratings.	3、10
V1.2	2024-10	Update Lead Temperature	3
V1.3	2025-12	Update important statements、Update SOP-8 Dimension drawing	10、13

IMPORTANT STATEMENT:

Huaguan Semiconductor reserves the right to change products and services offered without prior notice. Customers should obtain the latest relevant information before placing orders and verify that such information is current and complete. Huaguan Semiconductor assumes no responsibility or liability for altered documents.

Customers are responsible for complying with safety standards and implementing safety measures when using Huaguan Semiconductor products in system design and end-product manufacturing. You assume full responsibility for: selecting the appropriate Huaguan Semiconductor products for your application; designing, validating, and testing your application; and ensuring that your application complies with applicable standards and all other safety, security, or other requirements. This is to prevent potential risks that may lead to personal injury or property damage.

Huaguan Semiconductor products are not approved for use in life support, military, aerospace, or other high-risk applications. Huaguan products are neither intended nor warranted for use in such systems or equipment. Any failure or malfunction may lead to personal injury or severe property damage. Such applications are deemed "Unsafe Use." Unsafe Use includes, but is not limited to: surgical and medical equipment, nuclear energy control equipment, aircraft or spacecraft instruments, control or operation of vehicle power, braking, or safety systems, traffic signal instruments, all types of safety devices, and any other applications intended to support or sustain life. Huaguan Semiconductor shall not be liable for consequences resulting from Unsafe Use in these fields. Users must independently evaluate and assume all risks. Any issues, liabilities, or losses arising from the use of products beyond their approved applications shall be solely borne by the user. Users may not claim any compensation from Huaguan Semiconductor based on these terms. If any third party claims against Huaguan Semiconductor due to such Unsafe Use, the user shall compensate Huaguan Semiconductor for all resulting damages and liabilities.

Huaguan Semiconductor provides technical and reliability data (including datasheets), design resources (including reference designs), application or other design advice, web tools, safety information, and other resources for its semiconductor products. However, no guarantee is made that these resources are free from defects, and no express or implied warranties are provided. The use of testing and other quality control techniques is limited to Huaguan Semiconductor's quality assurance scope. Not all parameters of each device are tested.

Huaguan Semiconductor's documentation authorizes you to use these resources only for developing applications related to the products described herein. You are not granted rights to any other intellectual property of Huaguan Semiconductor or any third party. Any other reproduction or display of these resources is strictly prohibited. You shall fully indemnify Huaguan Semiconductor and its agents against any claims, damages, costs, losses, and liabilities arising from your use of these resources. Huaguan Semiconductor shall not be held responsible.