

Mono 1.1W Power Amplifier Selectable Shutdown Logic Level Low Voltage Operation

FEATURES

- Operation range: 2.5V~5.5V
- Shutdown Current 0.1uA at 5V
- PSRR at 217Hz, 60dB at 5V
- Output power, THD+N=1%
R_L=8Ω, 1.1W at 5V, 0.4W at 3.3V, 200mW at 2.5V
- Unity-gain stable
- Space-saving MSOP10, enhance thermal pad

APPLICATIONS

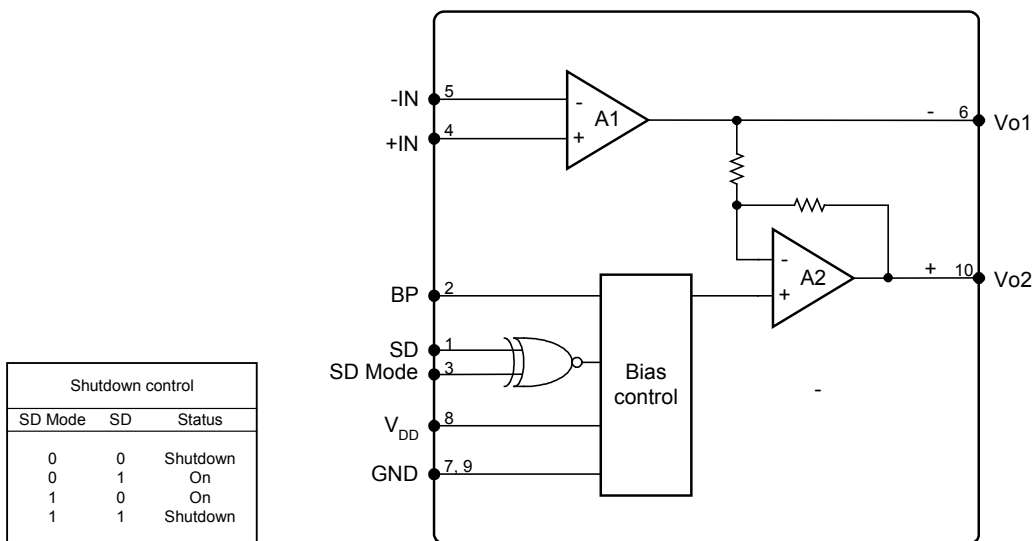
- Portable electronic devices
- PDAs
- Communication headsets
- Cross-reference:
LM4901

DESCRIPTION

The MS6901 is a low distortion power amplifier that can drive 1.1W of continuous average power into a mono 8Ω bridged-tied load (BTL). Operation with 2.5V supply, it can drive 200mw into a mono 8Ω. The shutdown may be enabled by either logic high or logic low that depending on shutdown mode selection. The BTL configuration eliminates the need for external coupling capacitors on the output in most applications. The MS6901 is unity-gain stable and can be configured by external gain-setting resistors.

The MS6901 has good feature for portable equipment, these features include the low voltage operation, micropower consumption shutdown mode, enhance thermal pad and small package MSOP10, make the MS6901 ideally suited for use in portable electronic equipments.

BLOCK DIAGRAM



PIN CONFIGURATION

Symbol	Pin	Description
SD	1	Shutdown places the entire device in shutdown mode depending on SD Mode selection. TTL compatible input. SD Mode = 0, the device enters shutdown when SD is logic low. SD Mode = 1, the device enters shutdown when SD is logic high.
BP	2	Bypass is the cap to the voltage divider for internal mid-supply bias. This terminal should be connected to a 0.1- μ F to 10- μ F capacitor C_{BP} .
SD Mode	3	The shutdown mode controls the shutdown logic level of the SD pin1. TTL compatible input
+IN	4	Non-inverting input
-IN	5	Inverting input
Vo1	6	BTL negative output
GND	7	Ground
V _{DD}	8	Supply voltage
GND	9	Ground
Vo2	10	BTL positive output

MSOP10

ORDERING INFORMATION

Package	Part number	Packaging Marking	Transport Media
10-Pin MSOP (lead free)	MS6901MGTR	6901G	3.5k Units Tape and Reel
10-Pin MSOP (lead free)	MS6901MGU	6901G	80 Units Tube

RoHS Compliance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Rating	Unit
V _{DD}	Supply voltage	6	V
V _{ESD}	Electrostatic handling	3500	V
T _{STG}	Storage temperature range	-65 to 150	°C
T _A	Operating ambient temperature range	-40 to 85	°C
T _J	Maximum junction temperature	150	°C
T _S	Soldering temperature, 10 seconds	260	°C
R _{THJA}	Thermal resistance from junction to ambient in free air MSOP10 (enhance thermal pad)	50	°C/W

OPERATING RATINGS

Symbol	Parameter	Min	Typ	Max	Unit
V _{DD}	Supply voltage	2.5	5	5.5	V

5V ELECTRICAL CHARACTERISTICS

T_a = 25°C, V_{DD}=5V, f=1kHz, BW<30kHz, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _Q	Quiescent current	V _{IN} =0V, I _O =0A	-	2.7	-	mA
I _{SHDN}	Shutdown current	V _{SD} =0V@V _{SDM} =0V	-	0.1	-	uA
V _{SDH}	Shutdown input voltage high		2.0	-	-	V
V _{SDL}	Shutdown input voltage low		-	-	0.8	V
V _{SDMH}	SD Mode input voltage high		2.0	-	-	V
V _{SDML}	SD Mode input voltage low		-	-	0.8	V
PSRR	Power supply rejection ratio	R _L =8Ω, C _{BP} =1uF, f=217Hz	-	60	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8Ω, 1.1W	-	-54	-50	dB
			-	0.2	0.316	%
S/N	Signal-to-noise ratio	R _L =8Ω, 1.1W	90	103	-	dB
P _o	Output power	R _L =8Ω, THD+N = 1%	-	1.1	-	W

3.3V ELECTRICAL CHARACTERISTICS

T_a = 25°C, V_{DD}=3.3V, f=1kHz, BW<30kHz, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _Q	Quiescent current	V _{IN} =0V, I _O =0A	-	2.4	-	mA
I _{SD}	Shutdown current	V _{SD} =0V@V _{SDM} =0V	-	0.1	-	uA
PSRR	Power supply rejection ratio	R _L =8Ω, C _{BP} =1uF, f=217Hz	-	60	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8, 0.4W	-	-54	-50	dB
			-	0.2	0.316	%
S/N	Signal-to-noise ratio	R _L =8Ω, 0.4W	90	100	-	dB
P _o	Output power	R _L =8Ω, THD+N = 1%	-	0.4	-	W

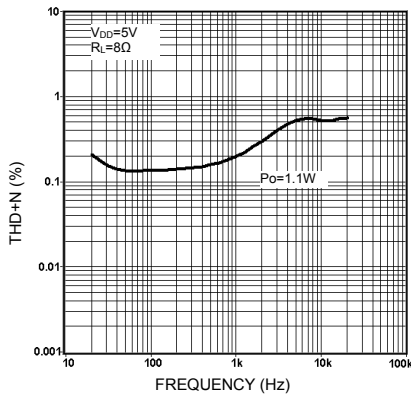
2.5V ELECTRICAL CHARACTERISTICS

T_a = 25°C, V_{DD}=2.5V, f=1kHz, BW<30kHz, unless otherwise specified.

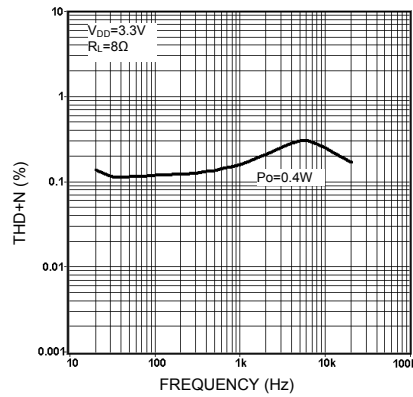
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _Q	Quiescent current	V _{IN} =0V, I _O =0A	-	2.2	-	mA
I _{SD}	Shutdown current	V _{SD} =0V@V _{SDM} =0V	-	0.1	-	uA
PSRR	Power supply rejection ratio	R _L =8Ω, C _{BP} =1uF, f=217Hz	-	60	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8Ω, 0.2W	-	-53	-50	dB
			-	0.22	0.316	%
S/N	Signal-to-noise ratio	R _L =8Ω, 0.2W	90	98	-	dB
P _o	Output power	R _L =8Ω, THD+N = 1%	-	0.2	-	W

TYPICAL PERFORMANCE CHARACTERISTICS

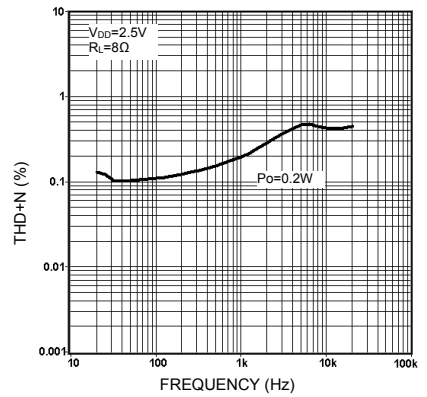
Ta = 25°C, BW < 30kHz, unless otherwise specified.



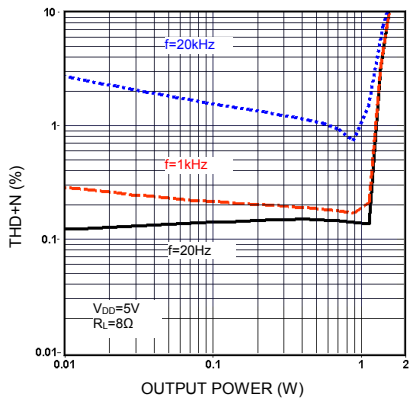
THD+N vs. frequency



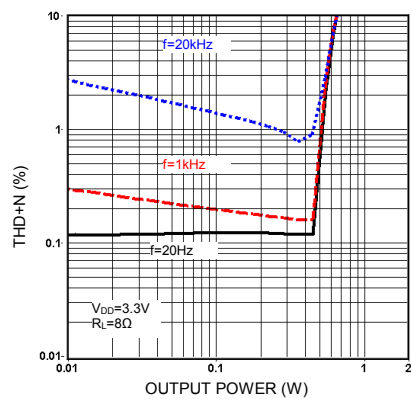
THD+N vs. frequency



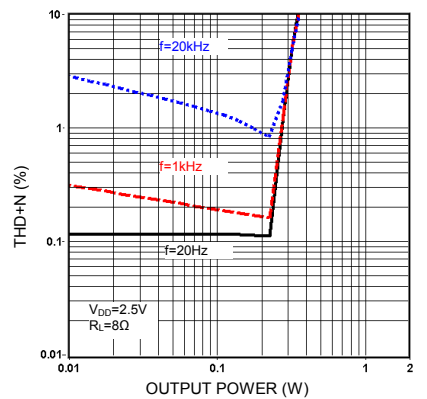
THD+N vs. frequency



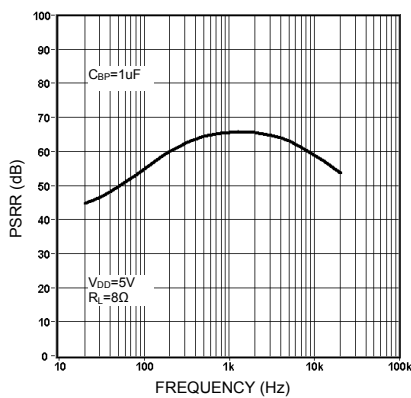
THD+N vs. output power



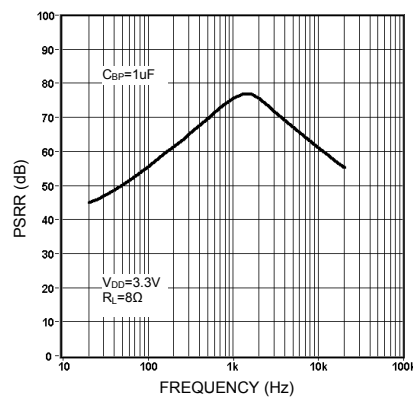
THD+N vs. output power



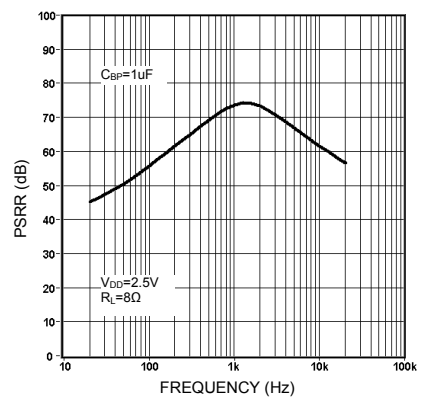
THD+N vs. output power



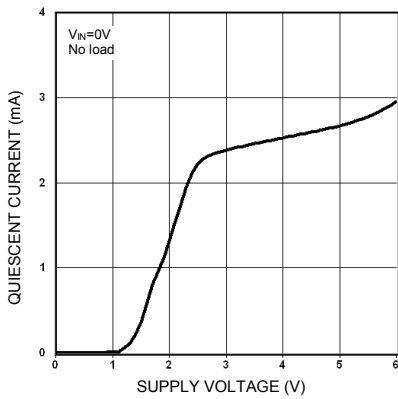
PSRR vs. frequency



PSRR vs. frequency



PSRR vs. frequency



Quiescent current vs. supply voltage

APPLICATION INFORMATION

Basic application example

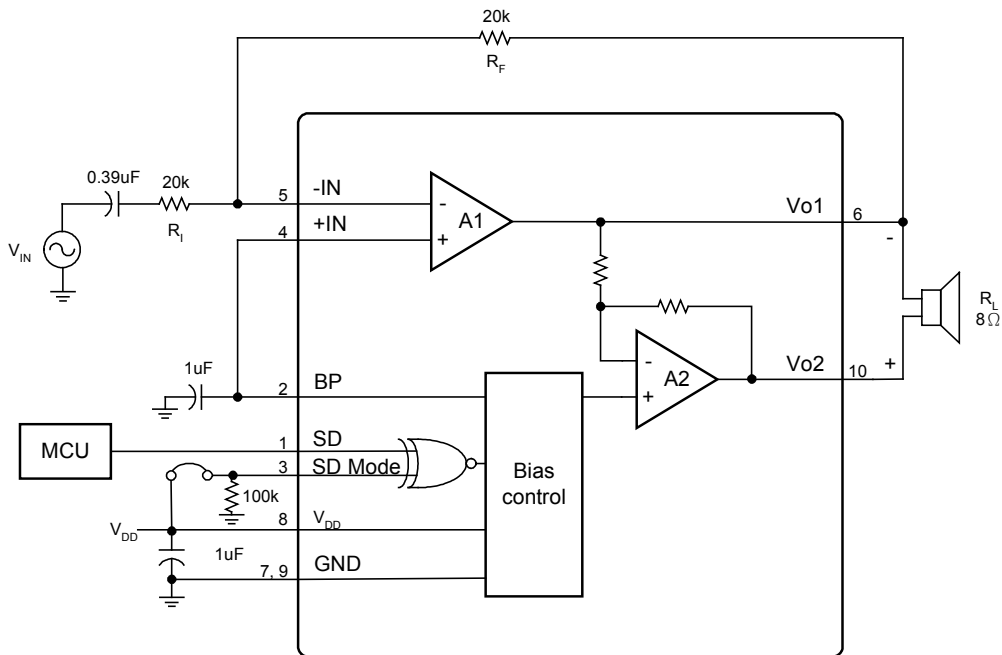


Fig.1 A audio amplifier application circuit.

External gain-setting

As shown in Fig.1, The amplifier A1 is independent amplifiers with an externally configured gain of $A_V = -R_F/R_I$. The amplifier A2 is a closed-loop gain of $A_V = -1$ fixed by two internal resistors. The outputs of A1 and A2 are used to drive the mono bridged-tied load (BTL).

Shutdown Control

The shutdown may be enabled by either logic high or logic low that depending on shutdown mode selection. Both the SD pin and the SD Mode pin are TTL compatible input. The SD Mode is logic low, the device enters shutdown when SD is logic low. The SD Mode is logic high, the device enters shutdown when SD is logic high.

Shutdown control		
SD Mode	SD	Status
0	0	Shutdown
0	1	On
1	0	On
1	1	Shutdown

High Pass Filter

The input capacitor C_{IN} and resistor R_{IN} are decided the cut-off frequency of the HPF. The equation is as follows:

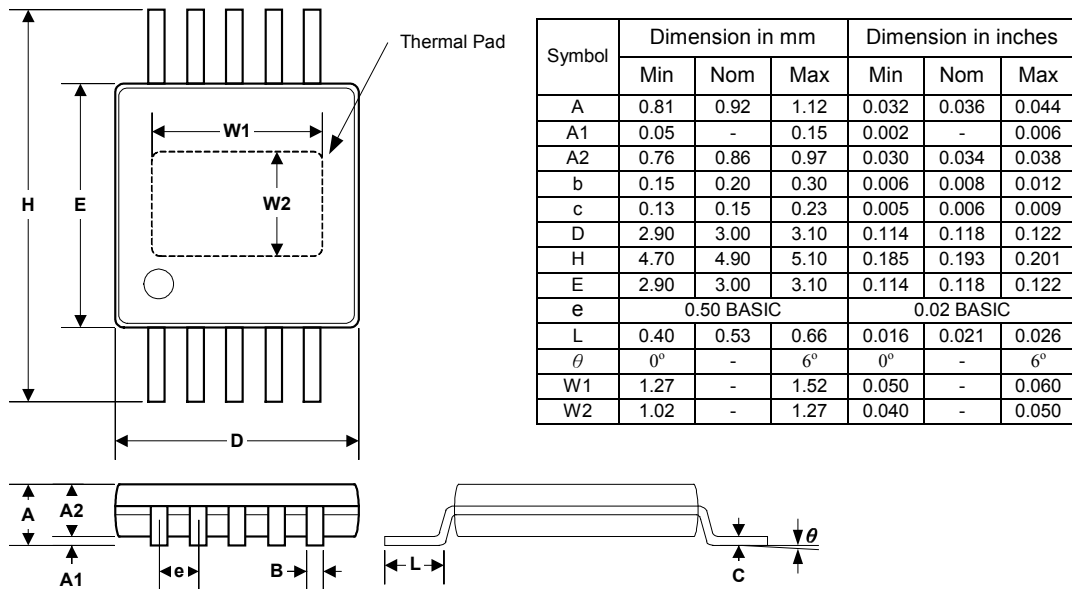
$$f_{\text{cut-off}} = 1 / (2 \pi * R_{IN} * C_{IN})$$

Thermal pad considerations

The thermal pad must be connected to ground. The package with thermal pad of the MS6901 requires special attention on thermal design. The thermal pad on the bottom of the MS6901 should be soldered down to a copper pad on the circuit board. Heat can be conducted away from the thermal pad through the copper plane to ambient. If the copper plane is not on the top surface of the circuit board, 9 vias of 13 mil or smaller in diameter should be used to thermally couple the thermal pad to the bottom plane. For good thermal conduction, the vias must be plated through and solder filled.

EXTERNAL DIMENSIONS

MSOP10 (Thermal Pad)



TAPE AND REEL (Unit : mm)

MSOP10

