

Mono 1.1W, Fully Differential Input Excellent PSRR, Low Voltage Operation Selectable Shutdown Logic Level

FEATURES

- PSRR at 217Hz, 80dB at 5V
- Operation range: 2.5V ~ 6.5V
- Shutdown Current 0.1uA 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:
LM4894

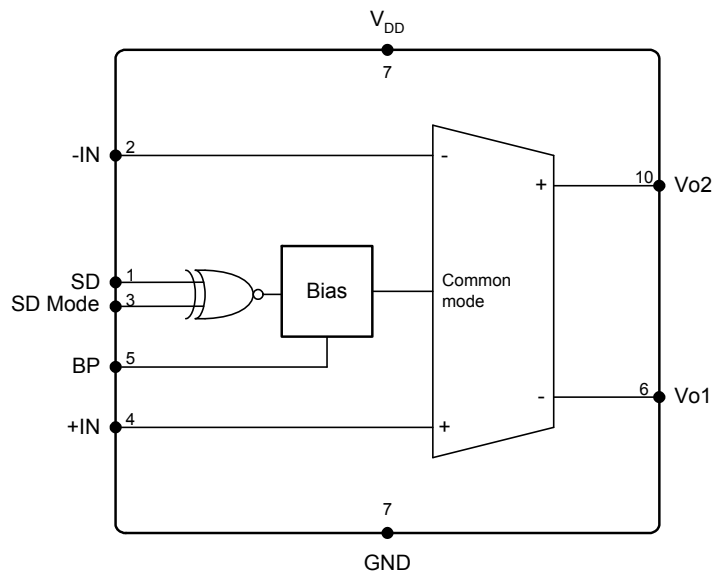
DESCRIPTION

The MS6894 is a fully differential 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 MS6894 is unity-gain stable and can be configured by external gain-setting resistors.

The MS6894 has good feature for portable equipment, these features include the fully differential input, low voltage operation, micropower consumption shutdown mode, enhance thermal pad and small package MSOP10, make the MS6894 ideally suited for use in portable electronic equipments.

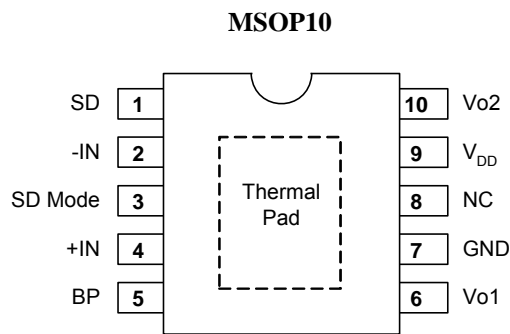
BLOCK DIAGRAM

Shutdown control		
SD Mode	SD	Status
0	0	Shutdown
0	1	Active
1	0	Active
1	1	Shutdown



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.
+IN	2	Positive differential input
SD Mode	3	The shutdown mode controls the shutdown logic level of the SD pin1. TTL compatible input
-IN	4	Negative differential input
BP	5	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} .
Vo1	6	Negative BTL output
GND	7	Ground
NC	8	No connected
V _{DD}	9	Supply voltage
Vo2	10	Positive BTL output



ORDERING INFORMATION

Package	Part number	Packaging Marking	Transport Media
10-Pin MSOP (lead free)	MS6894MGTR	6894G	3.5k Units Tape and Reel
10-Pin MSOP (lead free)	MS6894MGU	6894G	80 Units Tube

RoHS Compliance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Rating	Unit
V _{DD}	Supply voltage	6.5	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	6.5	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 _{SHDN} =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	-	80	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8Ω, 1.1W	-	-60	-55	dB
			-	0.1	0.178	%
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	1.3	-	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 _{SHDN} =0V	-	0.1	-	uA
PSRR	Power supply rejection ratio	R _L =8Ω, C _{BP} =1uF, f=217Hz	-	70	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8, 0.4W	-	-60	-55	dB
			-	0.1	0.178	%
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	0.5	-	W

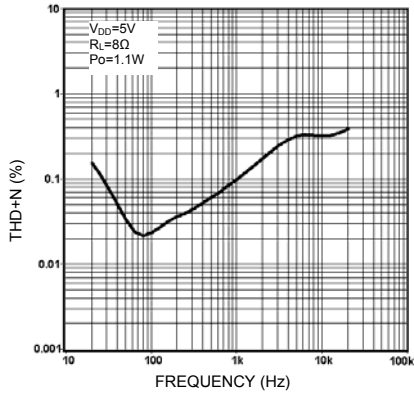
2.5V ELECTRICAL CHARACTERISTICS

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

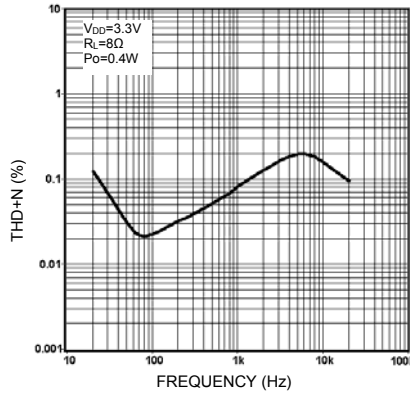
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _Q	Quiescent current	V _{IN} =0V, I _O =0A	-	2.2	-	mA
I _{SD}	Shutdown current	V _{SHDN} =0V	-	0.1	-	uA
PSRR	Power supply rejection ratio	R _L =8Ω, C _{BP} =1uF, f=217Hz	-	60	-	dB
THD+N	Total harmonic distortion plus noise	R _L =8Ω, 0.2W	-	-60	-55	dB
			-	0.1	0.178	%
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	0.28	-	W

TYPICAL PERFORMANCE CHARACTERISTICS

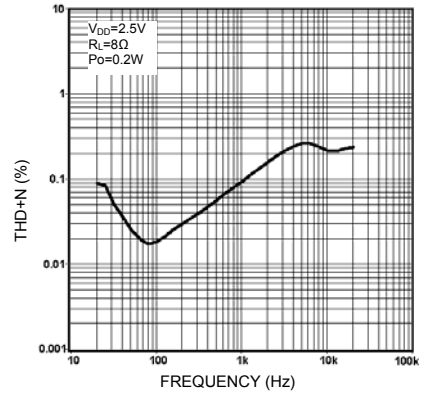
Ta = 25°C, BW < 30kHz, unless otherwise specified.



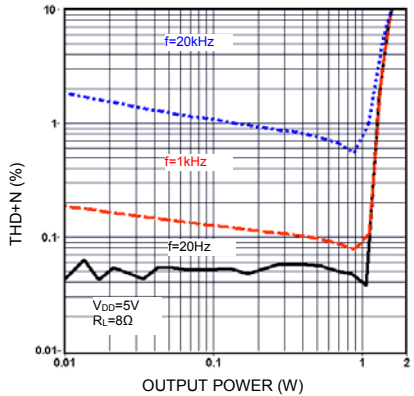
THD+N vs. frequency



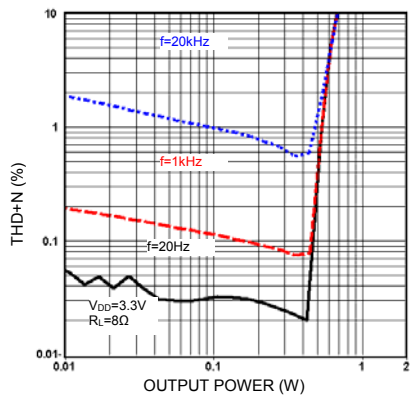
THD+N vs. frequency



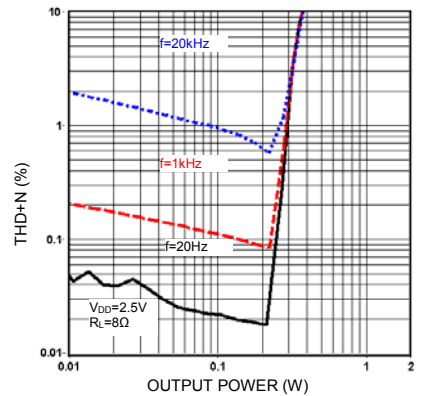
THD+N vs. frequency



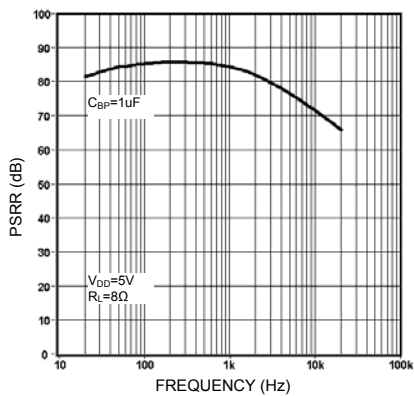
THD+N vs. output power



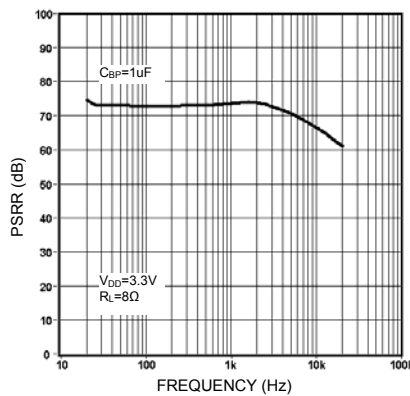
THD+N vs. output power



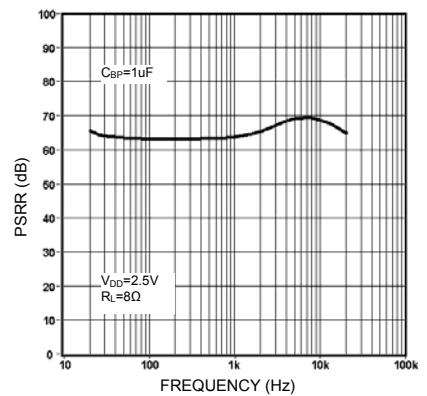
THD+N vs. output power



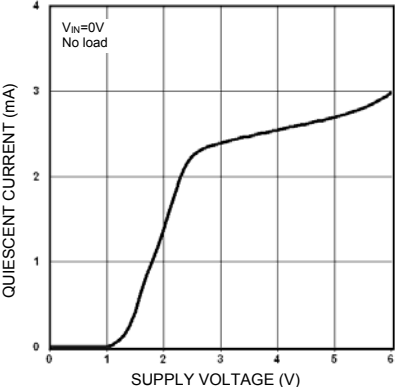
PSRR vs. frequency



PSRR vs. frequency



PSRR vs. frequency



Quiescent current vs. supply voltage

APPLICATION INFORMATION

Basic application example

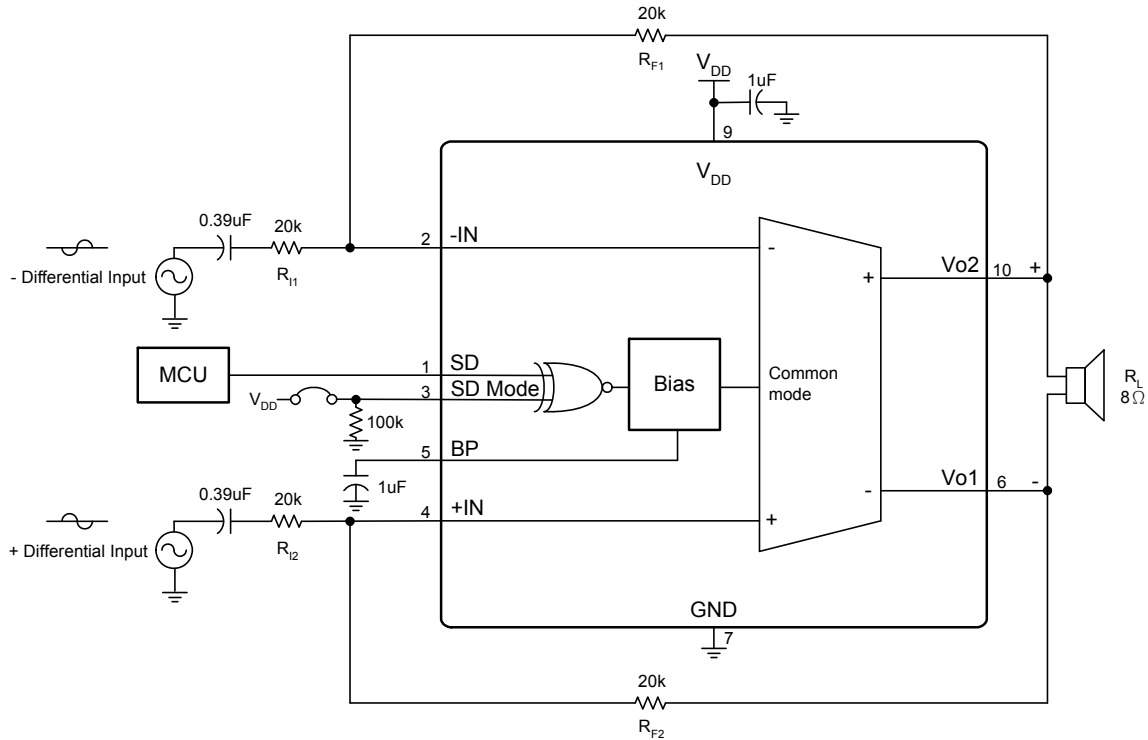


Fig.1 A audio amplifier application circuit.

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	Active
1	0	Active
1	1	Shutdown

External gain-setting

As shown in Fig.1, $R_{I1} = R_{I2}$ and $R_{F1} = R_{F2}$, the respective closed-loop gain is set at $-R_F/R_I$. It is important to match input resistors and feedback resistors to each other. The outputs are used to drive the mono bridged-tied load (BTL).

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:

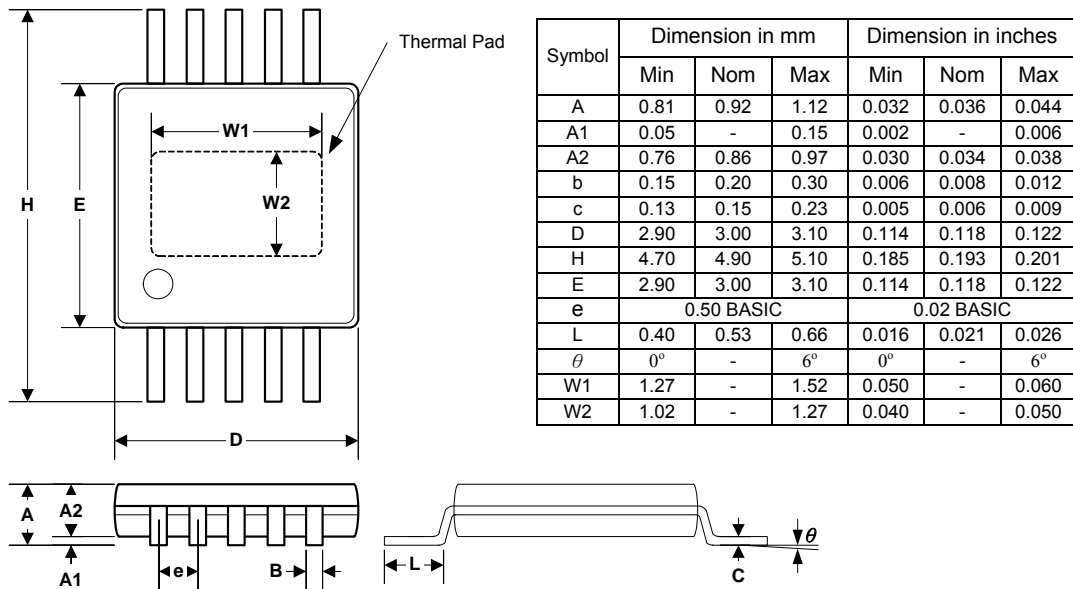
$$f_{cut-off} = 1 / (2 \pi * R_{IN} * C_{IN})$$

Thermal pad considerations

The thermal pad must be connected to ground. The package with thermal pad of the MS6894 requires special attention on thermal design. The thermal pad on the bottom of the MS6894 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.

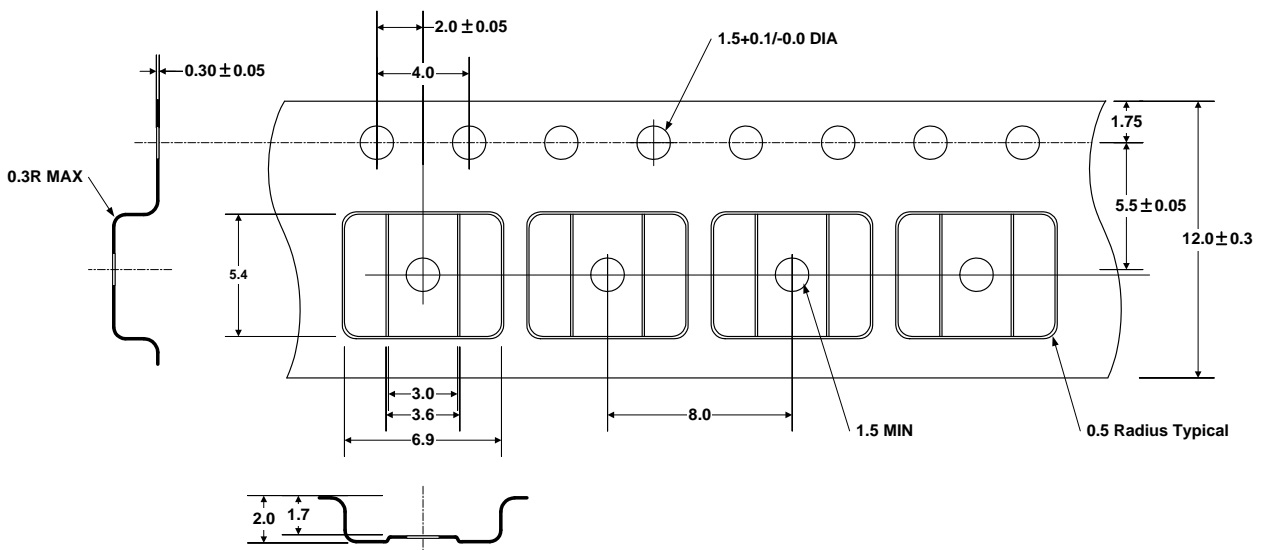
EXTERNAL DIMENSIONS

MSOP10 (Thermal Pad)

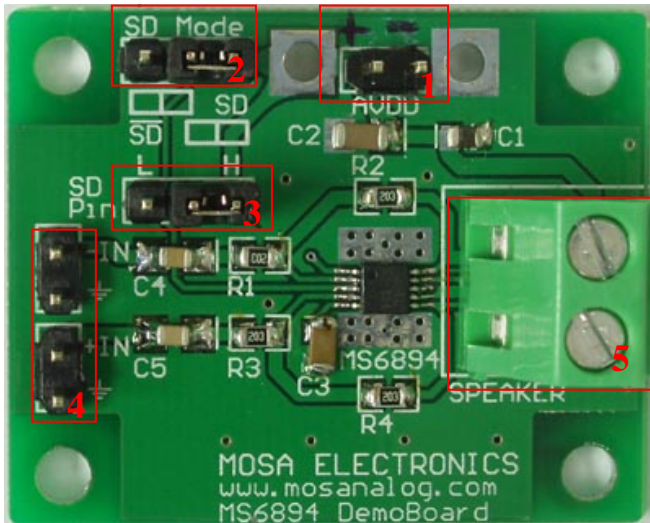


TAPE AND REEL (Unit : mm)

MSOP10



DEMO BOARD



Function description

Label 1: Supply Voltage

Supply voltage range is 2.5V to 6.5V, the left of jump is positive and the right of jump is negative.

Label 2: Shutdown mode selection (SD Mode)

The shutdown mode is low logic level shutdown mode when the jump is placed left position (\overline{SD}), the SD Mode is connected to GND. On the other hand, the chip is high logic level shutdown mode when the jump is placed right position (SD), the SD Mode is connected to V_{DD} .

Label 3: Shutdown pin (SD pin)

The shutdown may be enabled by either logic high or logic low that depending on shutdown mode selection. The SD Mode is placed left position (\overline{SD}), the chip enters shutdown when SD pin is placed left position (L), the SD Mode is connected to GND. On the other hand, the SD Mode is placed right position (SD), the chip enters shutdown when SD pin is placed right position (H), the SD Mode is connected to V_{DD} .

Label 4: Signal Input

Connected to audio signals.

Label 5: Speaker Output

Connected to speaker with 8ohm or 4 ohm.

Circuit

