



# AiP4809

## 140mW Headphone Amplifier with Active Low Shutdown Mode

### Product Specification

#### Specification Revision History:

| Version    | Date    | Description                 |
|------------|---------|-----------------------------|
| 2017-08-A1 | 2017-08 | New                         |
| 2019-04-A2 | 2019-05 | Replace the new template    |
| 2022-01-A3 | 2022-01 | Modify Ordering Information |
| 2023-12-A4 | 2023-12 | Modify Ordering Information |



## 1、General Description

The AiP4809 is a dual audio power amplifier capable of delivering 140mW per channel of continuous average power into a 16Ω load with 0.1% (THD+N) from a 5V power supply. Boomer audio power amplifier was designed specifically to provide high quality output power with a minimal amount of external components. Since the AiP4809 does not require bootstrap capacitors or snubber networks, it is optimally suited for low-power portable systems. The unity-gain stable AiP4809 can be configured by external gain-setting resistors. The AiP4809 features an externally controlled, active-low, micro power consumption shutdown mode, as well as an internal thermal shutdown protection mechanism.

### Features:

- THD+N at 1KHz at 140mW continuous average power into 16Ω 0.1%
- THD+N at 1KHz at 80mW continuous average power into 32Ω 0.1%
- Active-low shutdown mode
- “Click and Pop” reduction circuitry
- Low shutdown current
- Unity-gain stable
- MSOP8 packaging

### Ordering Information:

#### Tube packing specifications:

| Part number   | Packaging form | Marking code | Tube quantity | Boxed tube quantity | Boxed quantity | Notes                                                           |
|---------------|----------------|--------------|---------------|---------------------|----------------|-----------------------------------------------------------------|
| AiP4809MA8.TB | MSOP8          | 4809         | 100 PCS/tube  | 100 tube/box        | 10000 PCS/box  | Dimensions of Plastic enclosure: 3mm×3mm<br>Pin spacing: 0.65mm |

#### Reel packing specifications:

| Part number   | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes                                                           |
|---------------|----------------|--------------|---------------|---------------------|-----------------------------------------------------------------|
| AiP4809MA8.TR | MSOP8          | 4809         | 5000 PCS/reel | 10000 PCS/box       | Dimensions of plastic enclosure: 3mm×3mm<br>Pin spacing: 0.65mm |

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



## 2、Block Diagram And Pin Description

### 2.1、Block Diagram

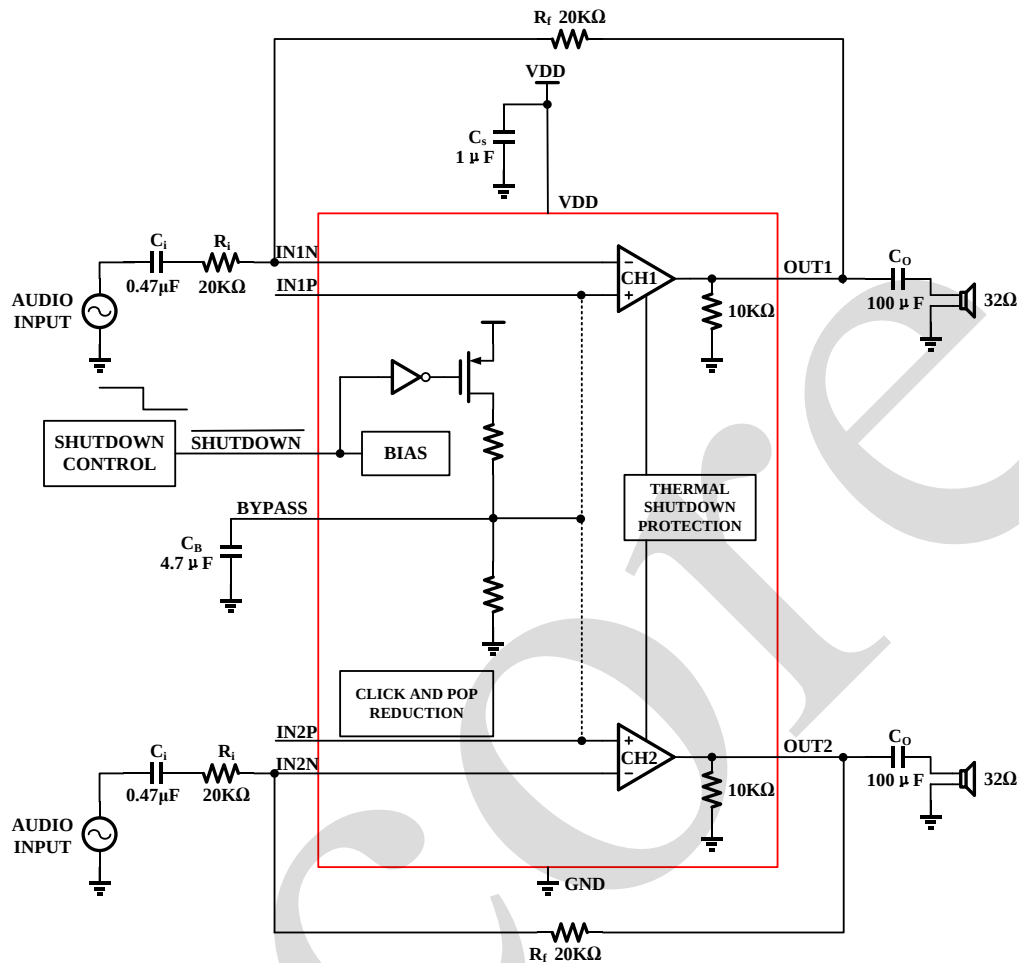


Figure1. Block Diagram

### 2.2、Pin Configurations

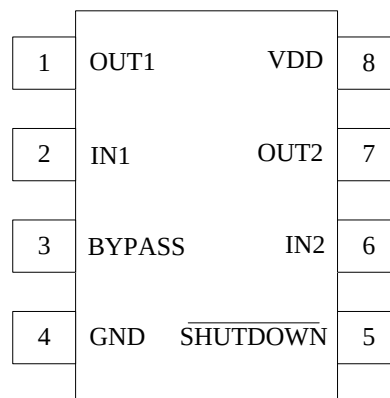


Figure2. Pin Configurations



## 2.3、Pin Description

| Pin No. | Pin Name | Description                                                                  |
|---------|----------|------------------------------------------------------------------------------|
| 1       | OUT1     | Output of channel 1                                                          |
| 2       | IN1      | Signal input of channel 1                                                    |
| 3       | BYPASS   | Bypass capacitor pin which increase chip performance                         |
| 4       | GND      | Ground pin                                                                   |
| 5       | SHUTDOWN | The device enters in shutdown mode when a low voltage is applied on this pin |
| 6       | IN2      | Signal input of channel 2                                                    |
| 7       | OUT2     | Output of channel 2                                                          |
| 8       | VDD      | Supply voltage pin                                                           |

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

(T<sub>amb</sub>=25°C, All voltage referenced to GND, unless otherwise specified)

| Characteristic        | Symbol           | Conditions | Value   | Unit |
|-----------------------|------------------|------------|---------|------|
| Power Supply Voltage  | VDD              | -          | 6.0     | V    |
| Operating Temperature | T <sub>amh</sub> | -          | -40~85  | °C   |
| Storage Temperature   | T <sub>stg</sub> | -          | -65~150 | °C   |
| Soldering Temperature | T <sub>L</sub>   | 10s MSOP   | 260     | °C   |

### 3.2、Electrical Characteristics

#### 3.2.1、DC Characteristics 1 (T<sub>amb</sub>=25°C, VDD=5V, unless otherwise specified)

| Parameter                    | Symbol            | Conditions                                      | Min. | Typ. | Max. | Unit |
|------------------------------|-------------------|-------------------------------------------------|------|------|------|------|
| Power Supply Voltage         | VDD               | VIN=0V                                          | 2.0  | 5.0  | 5.5  | V    |
| Supply Current               | IDD               | -                                               | -    | -    | 6.5  | mA   |
| Shutdown Current             | ISD               | V <sub>SHUTDOWN</sub> =0V                       | -    | 0.5  | 5    | μA   |
| Output offset voltage        | VOS               | VIN=0V                                          | -    | 4    | 50   | mV   |
| Output Power                 | PO                | THD=0.1%, RL=32Ω                                | 70   | 80   | -    | mW   |
|                              |                   | THD=0.1%, RL=16Ω                                | -    | 140  | -    | mW   |
| Total harmonic distortion    | THD               | PO=50mW, RL=32Ω                                 | -    | 0.3  | -    | %    |
| Channel Separation           | α <sub>cs</sub>   | PO=70mW, RL=32Ω                                 | -    | 70   | -    | dB   |
| Power supply rejection ratio | PSRR              | C <sub>B</sub> =1uF, V <sub>ripple</sub> =200mV | -    | 70   | -    | dB   |
| Shutdown voltage input high  | V <sub>SDIH</sub> | -                                               | 1.4  | -    | -    | V    |
| Shutdown voltage input low   | V <sub>SDIL</sub> | -                                               | -    | -    | 0.4  | V    |



## 3.2.2、DC Characteristics 2 (T<sub>amb</sub>=25℃, VDD=3.3V, unless otherwise specified)

| Parameter                    | Symbol            | Conditions                                      | Min. | Typ. | Max. | Unit |
|------------------------------|-------------------|-------------------------------------------------|------|------|------|------|
| Supply Current               | IDD               | -                                               | -    | -    | 2.5  | mA   |
| Shutdown Current             | ISD               | V <sub>SHUTDOWN</sub> =0V,                      | -    | -    | 1.8  | μA   |
| Output offset voltage        | VOS               | VIN=0V                                          | -    | 4    | -    | mV   |
| Output Power                 | PO                | THD=0.1%, RL=32Ω                                | -    | 30   | -    | mW   |
|                              |                   | THD=0.1%, RL=16Ω                                | -    | 60   | -    | mW   |
| Total harmonic distortion    | THD               | PO=50mW, RL=32Ω                                 | -    | 0.4  | -    | %    |
| Channel Separation           | α <sub>cs</sub>   | PO=70mW, RL=32Ω,                                | -    | 70   | -    | dB   |
| Power supply rejection ratio | PSRR              | C <sub>B</sub> =1uF, V <sub>RIPPLE</sub> =200mV | -    | 70   | -    | dB   |
| Shutdown voltage input high  | V <sub>SDIH</sub> | -                                               | 1.4  | -    | -    | V    |
| Shutdown voltage input low   | V <sub>SDIL</sub> | -                                               | -    | -    | 0.4  | V    |

## 4、Function Description

### 4.1、Shutdown the Amplifier

When active, the AiP4809's SHUTDOWN feature turns off the amplifier's bias circuitry, reducing the supply current. The low 0.5uA typical shutdown current is achieved by applying a voltage that is as near as GND as possible to the SHUTDOWN pin. There are a few ways to control the chip's SHUTDOWN. These include using a mechanical switch or a microcontroller.

### 4.2、Bypass Capacitor Value Selection

The capacitor connected to the BYPASS pin valued 4.7uF could improve the common mode bias voltage's stability of internal amplifier and PSRR feature of the amplifier. Larger capacitor brings better PSRR feature. But capacitor which too large could delay the establish of working point of amplifier. While selecting the bypass capacitor, we should consider about restraining PSRR and POP sound and the cost.

### 4.3、POP Reduction

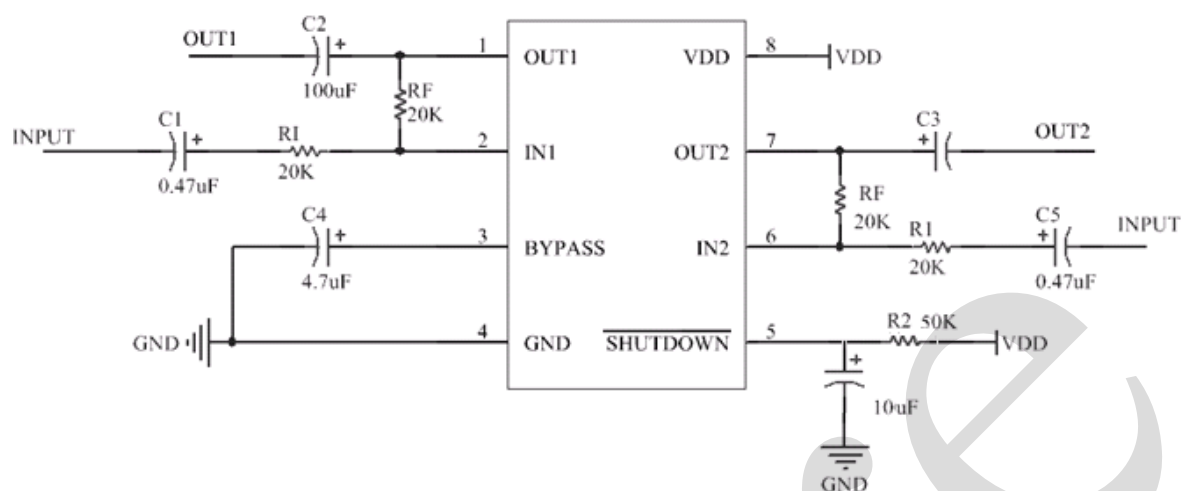
The AiP4809 contains circuitry that minimizes turn-on and shutdown transients or “clicks and pop”. Turning on includes power on system and SHUTDOWN pin reaches to high level. After power on, AiP4809's internal amplifier is working at the following mode. Internal current source charges capacitor of BYPASS. After the voltage of bypass reaches 1/2 VDD, the amplifier will work at the scale magnification mode according to the configuration of the resistor.

### 4.4、Over Temperature Protection

When ambient temperature exceeds the critical point, over temperature protection will stop amplifier circuit, in case the higher temperature damages the circuit.



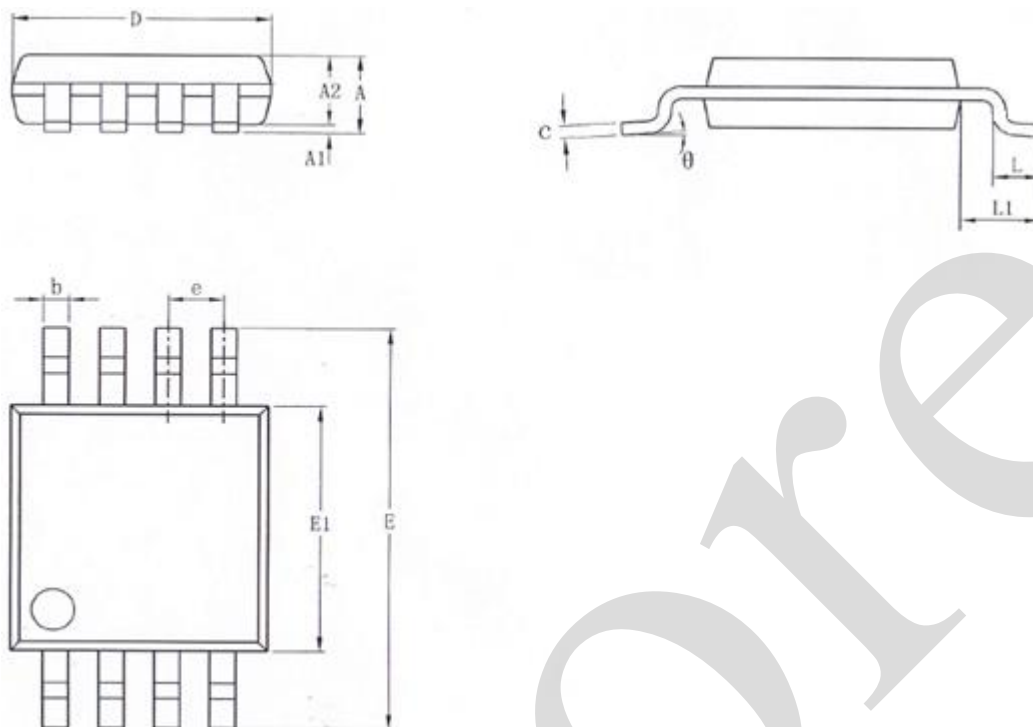
## 5、Typical Application Circuit And Application Note





## 6、Package Information

### 6.1、MSOP8



| Symbol | Dimensions (mm) |      |
|--------|-----------------|------|
|        | Min.            | Max. |
| A      | —               | 1.10 |
| A1     | 0.05            | 0.15 |
| A2     | 0.75            | 0.95 |
| b      | 0.22            | 0.38 |
| c      | 0.08            | 0.23 |
| D      | 2.90            | 3.10 |
| E      | 4.70            | 5.10 |
| E1     | 2.90            | 3.10 |
| e      | 0.65            |      |
| L      | 0.40            | 0.80 |
| L1     | 0.95            |      |
| θ      | 0°              | 8°   |



## 7、Statements And Notes:

### 7.1、The name and content of Hazardous substances or Elements in the product

| Part name               | Hazardous substances or Elements                                                                                                                                                                                                                                                 |                               |                               |                               |                          |                                |                   |                       |                           |                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------------|-------------------|-----------------------|---------------------------|----------------------|
|                         | Lead and lead compounds                                                                                                                                                                                                                                                          | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame              | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic resin           | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Chip                    | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| The lead                | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic sheet installed | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| explanation             | <p>○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.</p> <p>×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.</p> |                               |                               |                               |                          |                                |                   |                       |                           |                      |

### 7.2、Notion:

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.