

**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005****General Description**

The AA4005 is a Class AB audio power amplifier which can deliver 2.7W into 3Ω speakers with 5.0V power supply and THD+N less than 10%. It is designed specially for Notebook PC and portable media player applications.

The AA4005 features stereo full differential input or 2 sets of stereo Single-Ended audio input. There are 4 different gain settings at BTL mode - 6dB, 10dB, 15.6dB and 21.6dB, changed by setting GAIN0, GAIN1 pins.

AA4005 is available in TSSOP-20 (EDP) package.

**Features**

- Output Power, THD+N=10%  
1.5W at BTL Mode for 8Ω Speaker  
2.3W at BTL Mode for 4Ω Speaker  
2.7W at BTL Mode for 3Ω Speaker
- Supply Voltage Range: 4.5V to 5.5V
- 4 Selectable Internal Fixed Gain Setups
- Stereo Full Differential Input
- Low Power Consumption at Shutdown Mode  
150μA Typical
- Excellent Click/POP Noise Suppression
- Thermal Shutdown Protection

**Applications**

- Notebook PC
- Portable Media Player



Figure 1. Package Type of AA4005

**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Pin Configuration**

G Package  
(TSSOP-20 (EDP))

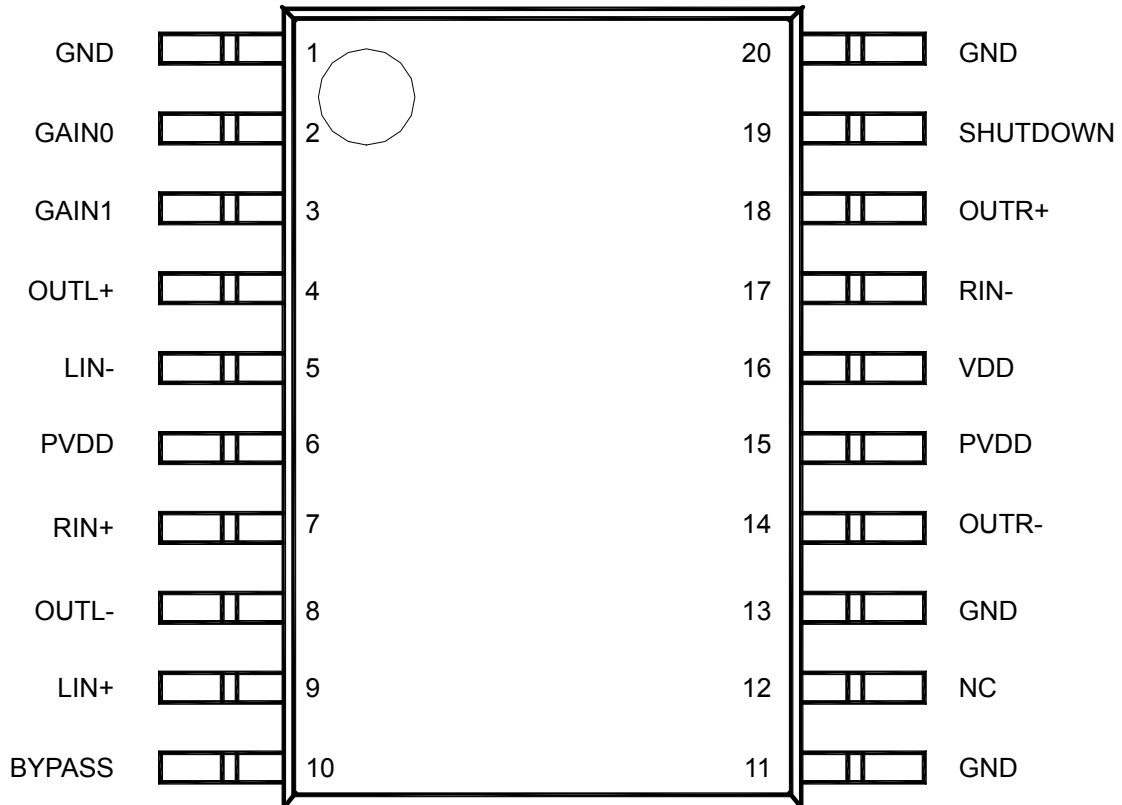


Figure 2. Pin Configuration of AA4005 (Top View)

**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005****Pin Description**

<b>PIN Number</b>	<b>PIN Name</b>	<b>Function</b>
1, 11, 13, 20	GND	Ground reference, it is better to connect with thermal pad.
2	Gain0	Internal gain setup 0, see table-1 below.
3	Gain1	Internal gain setup 1, see table-1 below.
4	OUTL+	Left channel positive output
5	LIN-	Left channel negative input
6, 15	PVDD	Power supply for output stage
7	RIN+	Right channel positive input for differential input, AC ground for Single-ended input.
8	OUTL-	Left channel negative output
9	LIN+	Left channel positive input for differential input, AC ground for Single-ended input
10	BYPASS	Internal reference voltage pin, connect a 1.0 $\mu$ F ceramic capacitor to GND
12	NC	No connected
14	OUTR-	Right channel negative output
16	VDD	Power supply for analog circuit
17	RIN-	Right channel negative input
18	OUTR+	Right channel positive output
19	SHUTDOWN	Shutdown mode select, L - Shutdown enable H - Shutdown disable, normal work

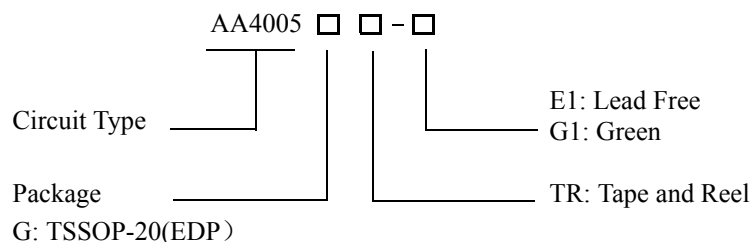


**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Table-1, Gain vs. Gain0, Gain1 Logic level**

GAIN0	GAIN1	Gain
L	L	6dB
L	H	10dB
H	L	15.6dB
H	H	21.6dB

**Ordering Information**



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TSSOP-20(EDP)	-40 to 85°C	AA4005GTR-E1	AA4005GTR-G1	AA4005G	AA4005G-G1	Tape and Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Power Supply Voltage	$V_{DD}$	6.0	V
Input Voltage	$V_{IN}$	-0.3 to $V_{DD}+0.3$	V
Power Dissipation (Note 2)	$P_D$	Internally limited	
Thermal Resistance	$\theta_{JA}$	35 (Note 3)	$^{\circ}\text{C}/\text{W}$
Operating Junction Temperature	$T_J$	150	$^{\circ}\text{C}$
ESD (Machine Mode)		200	V
ESD (Human Body Mode)		2000	V
Storage Temperature Range	$T_{STG}$	-65 to 150	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 Seconds)	$T_{LEAD}$	260	$^{\circ}\text{C}$

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by  $T_{JMAX}$ ,  $\theta_{JA}$  and the ambient temperature  $T_A$ . The maximum allowable power dissipation is  $P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA}$ . For the AA4005,  $T_{JMAX} = 150^{\circ}\text{C}$ , and the typical junction-to-ambient thermal resistance for TSSOP-20 (EDP) package can be found in the **Absolute Maximum Ratings** section.

Note 3: Chip is soldered to  $60\text{mm}^2$  ( $4\text{mm} \times 15\text{mm}$ ) copper (top side solder mask) of 1oz. on PCB with  $8 \times 0.5\text{mm}$  vias.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Input Voltage	$V_{DD}$	4.5	5.5	V
Operating Ambient Temperature Range	$T_A$	-40	85	$^{\circ}\text{C}$

**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005****Electrical Characteristics**

$V_{DD}=5.0V$ , Gain=6dB,  $T_A=25^{\circ}C$ ,  $f=1kHz$ , 22kHz Low pass filter, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent Current	$I_{DD}$	$V_{IN}=0, I_O=0$		6.5	12	mA
Shutdown Current	$I_{SD}$	$V_{SHUTDOWN}=0$		150	300	$\mu A$
SHUTDOWN	$V_{IL}$				0.8	V
	$V_{IH}$		2.0			V
Thermal Shutdown Temperature				165		$^{\circ}C$
Hysteresis Temp Window				35		$^{\circ}C$
Output Offset Voltage		$V_{IN}=0$ , No load		$\pm 5$	$\pm 25$	mV
Output Power	$P_O$	THD+N=1%, $R_L=3\Omega$		2.1		W
		THD+N=10%, $R_L=3\Omega$		2.7		W
		THD+N=1%, $R_L=4\Omega$		1.8		W
		THD+N=10%, $R_L=4\Omega$		2.3		W
		THD+N=1%, $R_L=8\Omega$		1.2		W
		THD+N=10%, $R_L=8\Omega$		1.5		W
Total Harmonic Distortion Plus Noise	THD+N	$P_O=1W, R_L=4\Omega$		0.08		%
Signal to Noise Ratio	S/N	$P_O=1W, R_L=4\Omega$		100		dB
Cross Talk	$X_{TALK}$	$f=1kHz$		-100		dB
Power Supply Rejection Ration	PSRR	$C_b=1\mu F, f=1kHz,$ $V_{ripple}=0.2V_{RMS}$		70		dB
Output Noise	$V_{NO}$	$f=20Hz\sim 20kHz, R_L=8\Omega$		18		$\mu V_{RMS}$



**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Performance Characteristics**

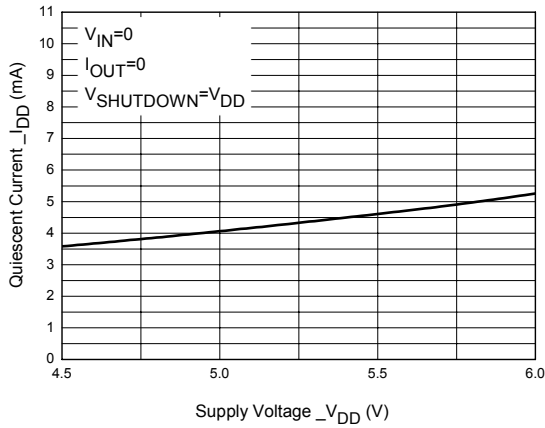


Figure 3. Quiescent Current vs. Supply Voltage

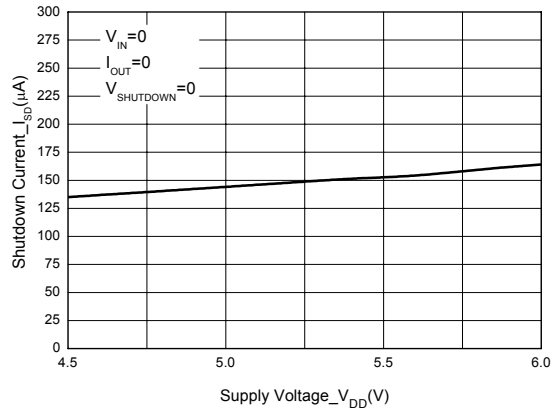


Figure 4. Shutdown Current vs. Supply Voltage

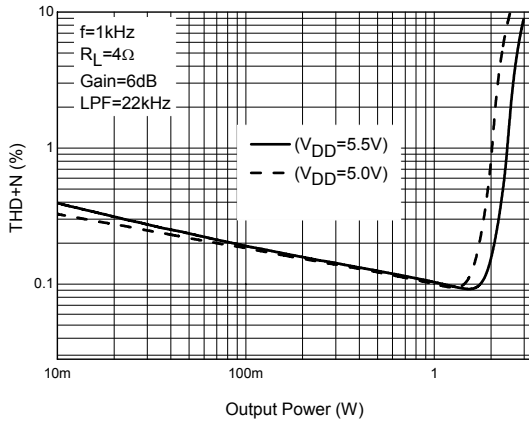


Figure 5. THD+N vs. Output Power

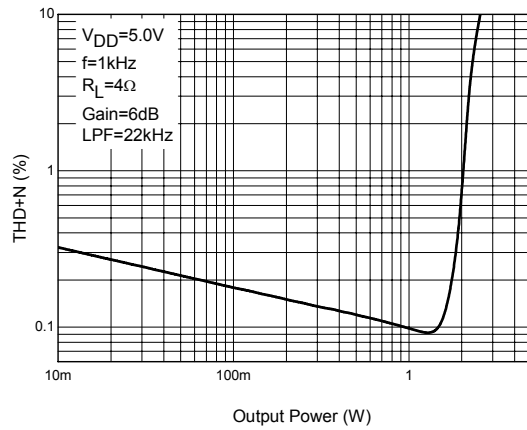


Figure 6. THD+N vs. Output Power



**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Performance Characteristics (Continued)**

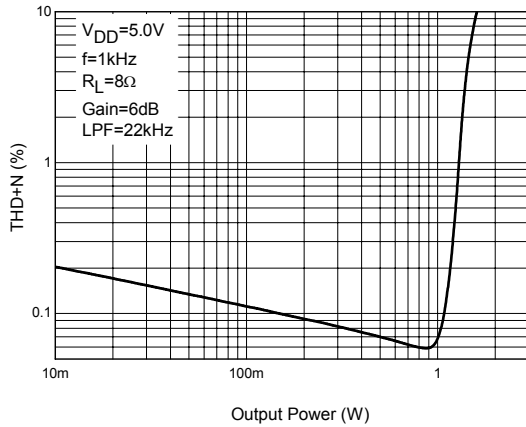


Figure 7. THD+N vs. Output Power

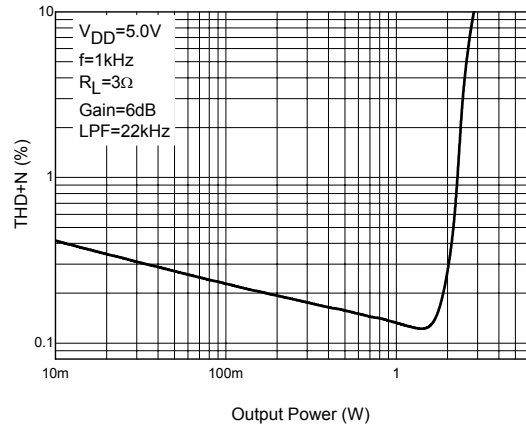


Figure 8. THD+N vs. Output Power

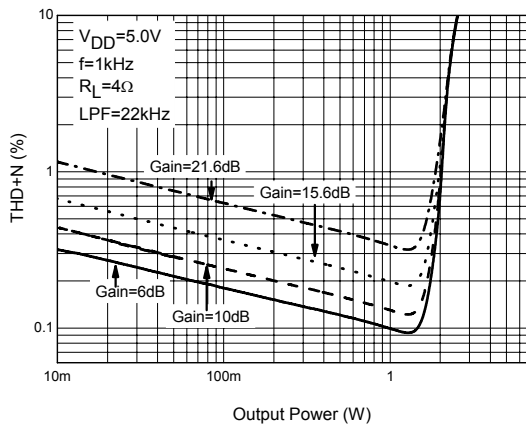


Figure 9. THD+N vs. Output Power

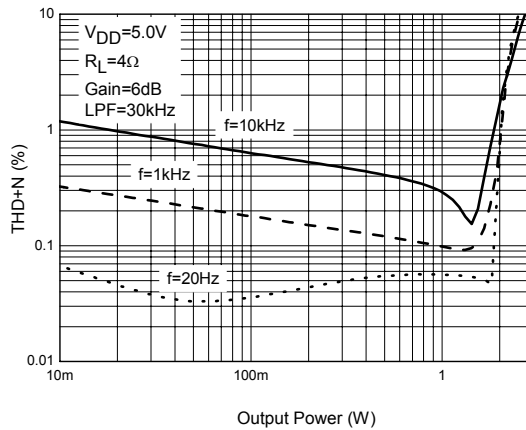


Figure 10. THD+N vs. Output Power





**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Performance Characteristics (Continued)**

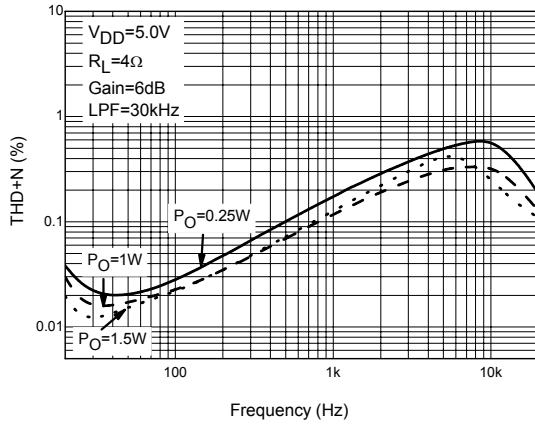


Figure 11. THD+N vs. Frequency

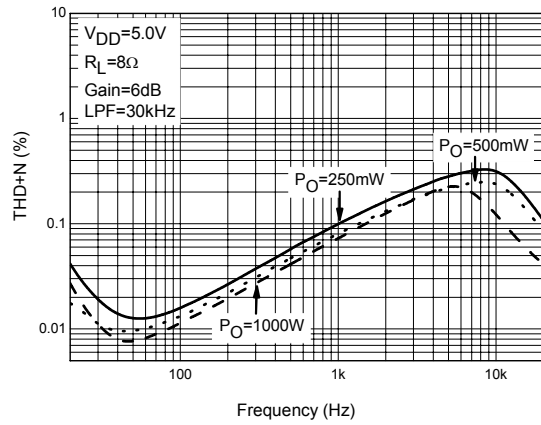


Figure 12. THD+N vs. Frequency

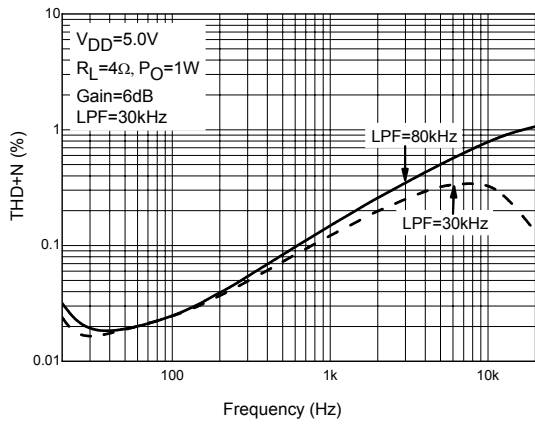


Figure 13. THD+N vs. Frequency

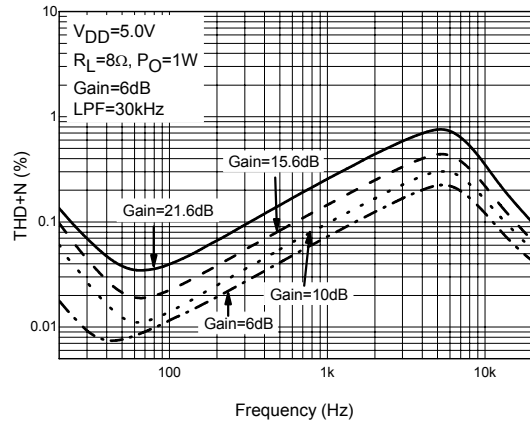


Figure 14. THD+N vs. Frequency



**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Performance Characteristics (Continued)**

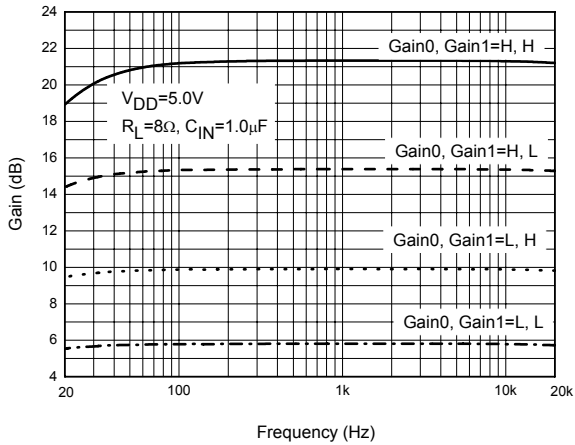


Figure 15. Gain vs. Frequency

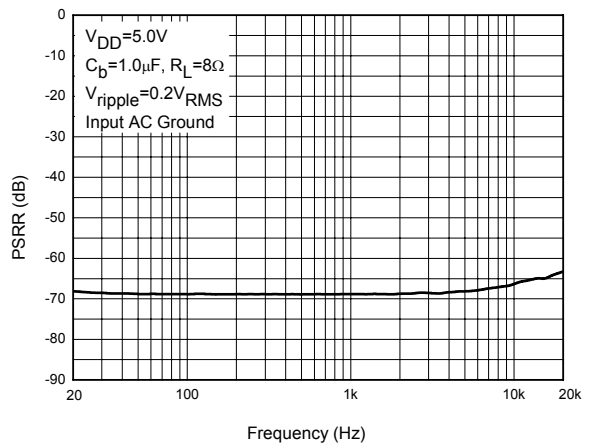


Figure 16. PSRR vs. Frequency

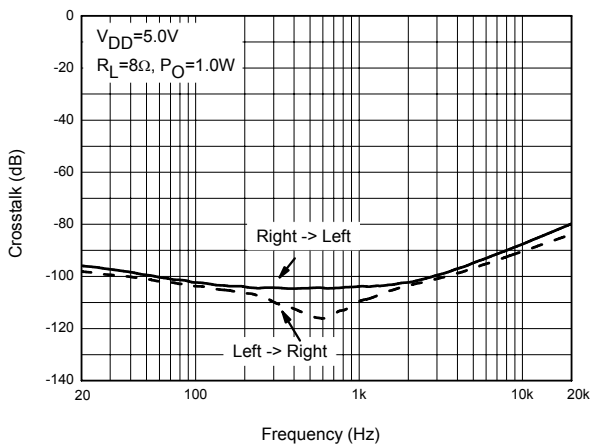


Figure 17. Crosstalk vs. Frequency



**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Application**

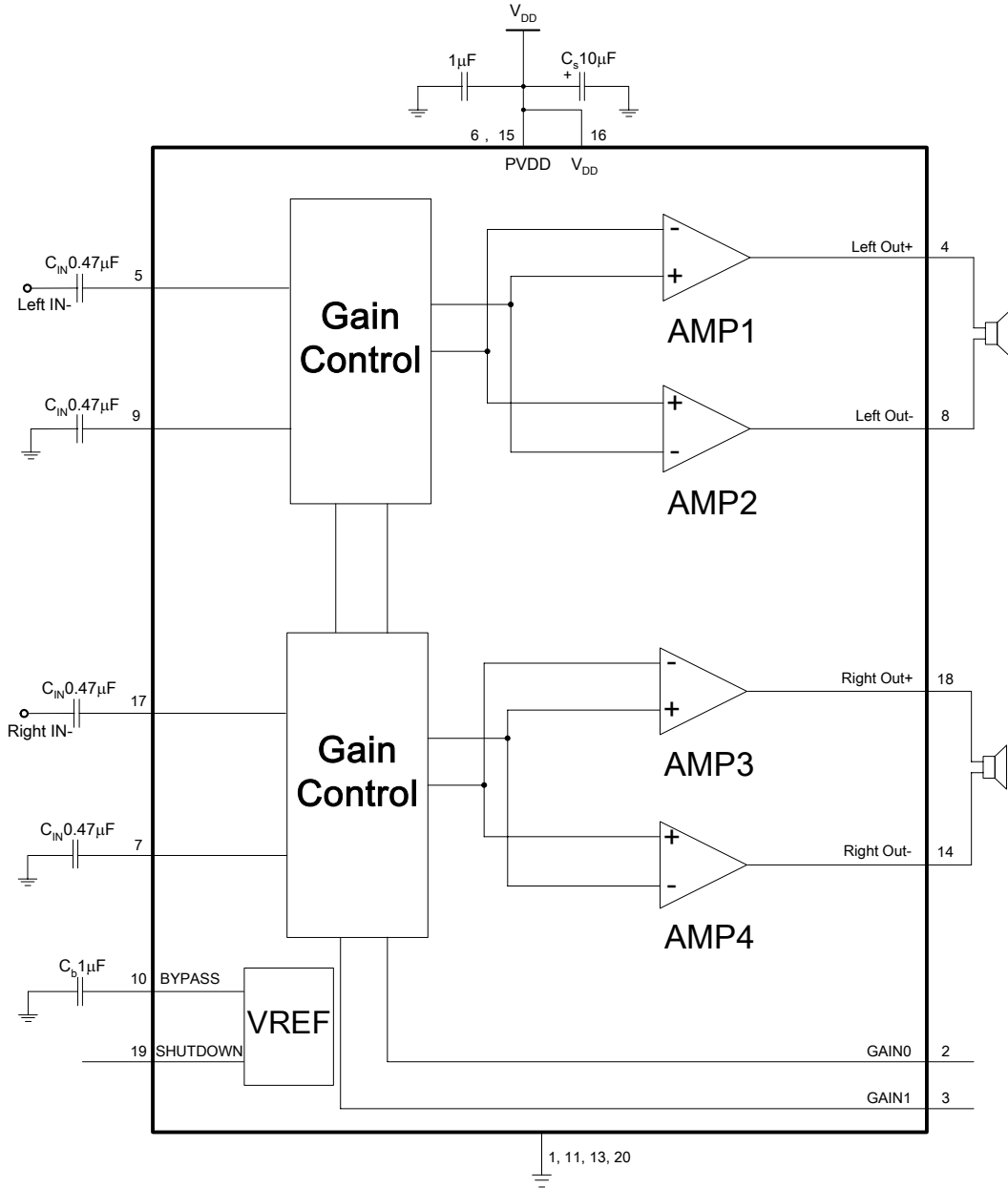


Figure 21. Typical Application of AA4005 for Single-ended input



**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Typical Application (Continued)**

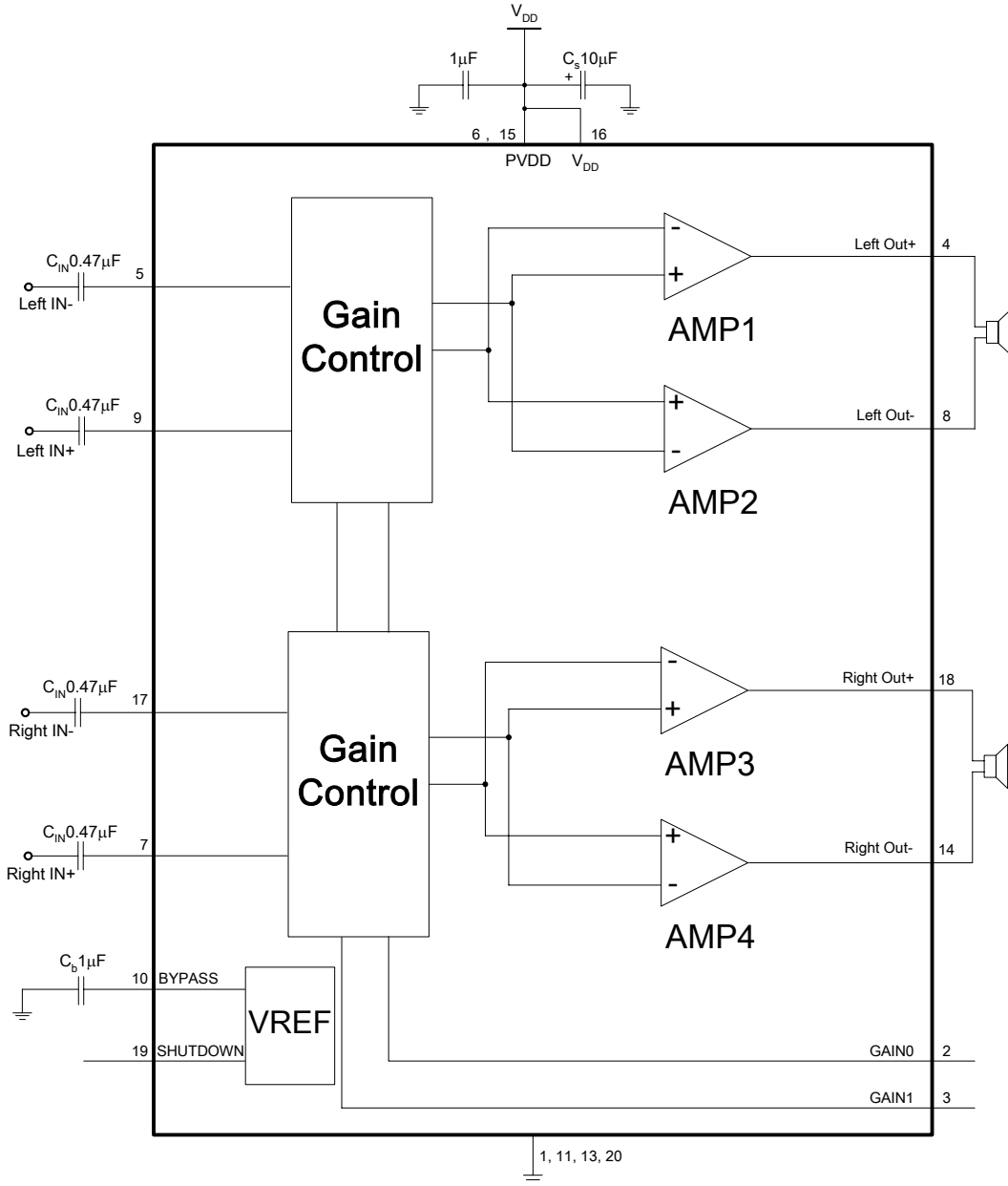


Figure 22. Typical Application of AA4005 for full differential input

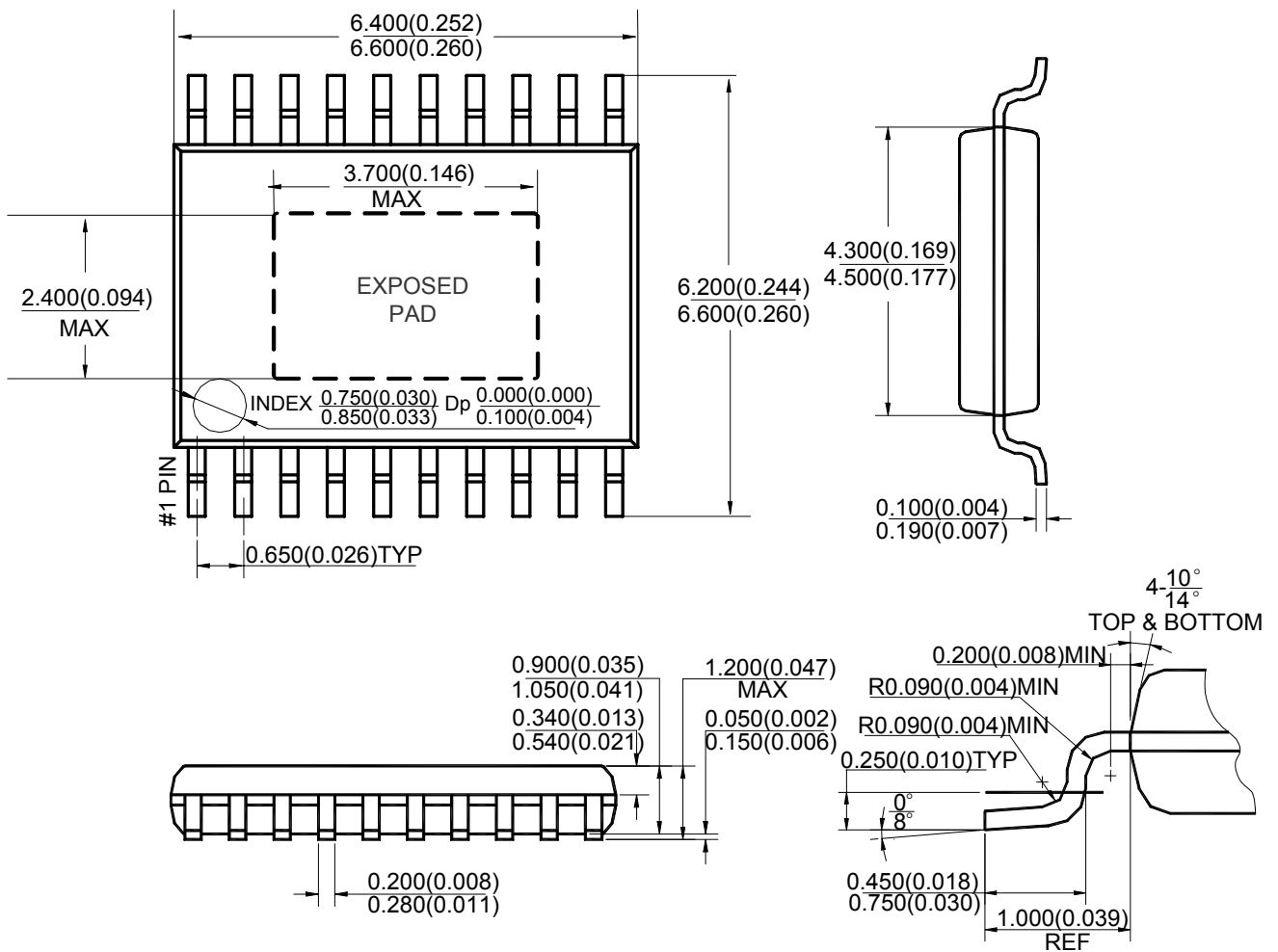


**2.7W Stereo Audio Power Amplifier with Shutdown, 4 Selectable Gain Setups AA4005**

**Mechanical Dimensions**

**TSSOP-20(EDP)**

**Unit: mm(inch)**





## BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

### IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

---

#### MAIN SITE

##### - Headquarters

##### BCD (Shanghai) Micro-electronics Limited

No. 1600, Zi Xing Road, Shanghai ZiZhu Science-based Industrial Park, 200241, P. R. C.  
Tel: +86-021-2416-2266, Fax: +86-021-2416-2277

##### - Wafer Fab

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.

800 Yishan Road, Shanghai 200233, China  
Tel: +021-6485-1491, Fax: +86-021-5450-0008

#### REGIONAL SALES OFFICE

##### Shenzhen Office

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office

Unit A Room 1203, Skyworth Bldg., Gaoxin Ave.1.S., Nanshan District  
Shenzhen 518057, China

Tel: +86-0755-8660-4900, Fax: +86-0755-8660-4958

##### Taiwan Office (Taipei)

##### BCD Semiconductor (Taiwan) Company Limited

3F, No.17, Lane 171, Sec. 2, Jiu-Zong Rd., Nei-Hu Dist., Taipei(114), Taiwan, R.O.C  
Tel: +886-2-2656-2808

Fax: +886-2-2656-2806/26562950

##### Taiwan Office (Hsinchu)

##### BCD Semiconductor (Taiwan) Company Limited

8F, No.176, Sec. 2, Gong-Dao 5th Road, East District  
HsinChu City 300, Taiwan, R.O.C

Tel: +886-3-5160181, Fax: +886-3-5160181

##### USA Office

##### BCD Semiconductor Corp.

48460 Kato Road, Fremont, CA 94538, USA  
Tel: +1-510-668-1950

Fax: +1-510-668-1990

##### Korea Office

##### BCD Semiconductor Limited Korea office.

Room 101-1112, Digital-Empire II, 486 Sin-dong,  
Yeongtong-Gu, Suwon-city, Gyeonggi-do, Korea

Tel: +82-31-695-8430