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.

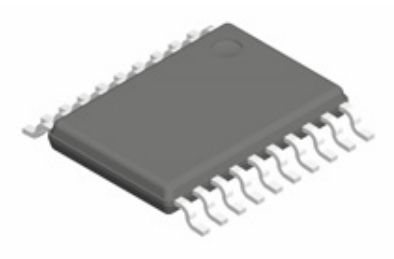
AA4005 is available in TSSOP-20 (EDP) package.

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: 3.0V to 5.5V
- 4 Selectable Internal Fixed Gain Setups
- Stereo Full Differential Input
- Low Power Consumption at Shutdown Mode 100μA Typical
- Excellent Click/POP Noise Suppression
- Thermal Shutdown Protection

Applications

- Notebook PC
- Portable Media Player



TSSOP-20（EDP）

Figure 1. Package Type of AA4005

Pin Configuration

G Package

(TSSOP-20(EDP))

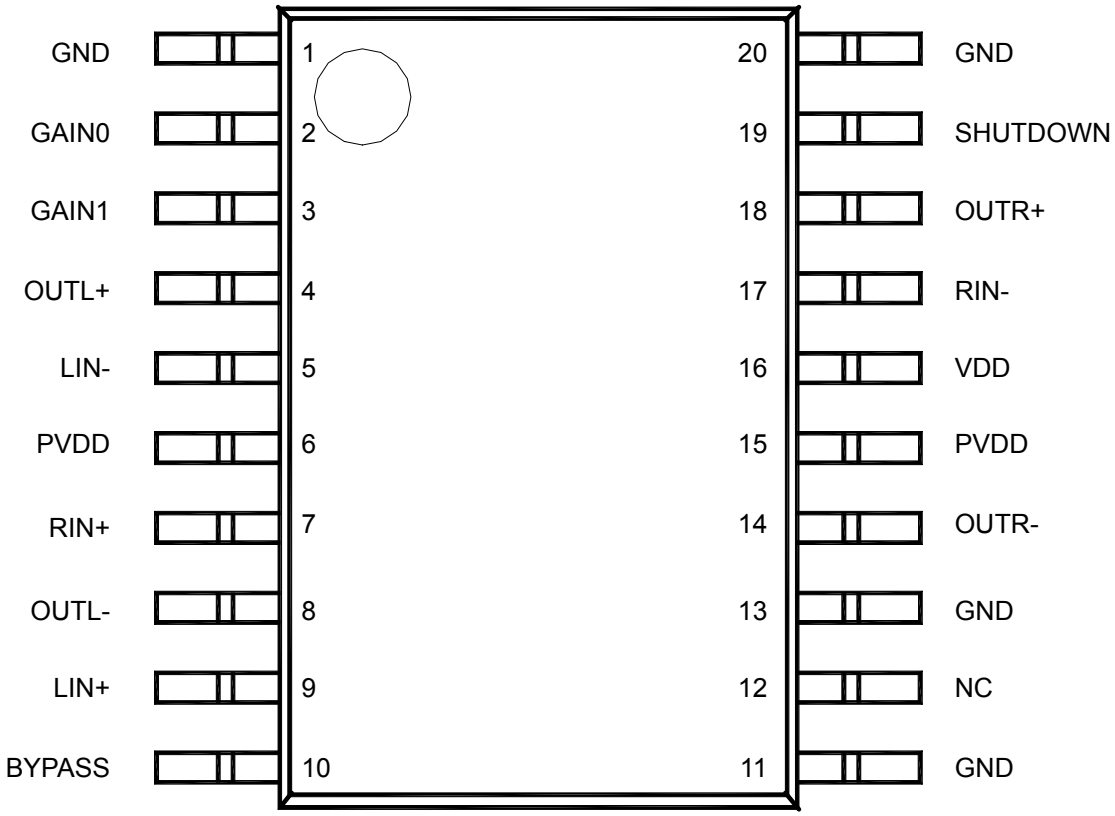


Figure 2. Pin Configuration of AA4005 (Top View)

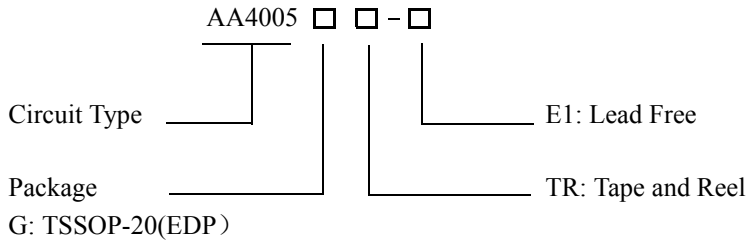
Pin Description

PIN Number	PIN Name	Function
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 1.0μF 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

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	Lead Free	
TSSOP-20(EDP)	-40 to 85°C	AA4005GTR-E1	AA4005G	Tape and Reel

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

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	θ_{JA}	35 (Note 3)	°C/W
Operating Junction Temperature	T_J	150	°C
ESD (Machine Mode)		200	V
ESD (Human Body Mode)		2000	V
Storage Temperature Range	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260	°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}, θ_{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°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 60mm^2 (4mm×15mm) copper (top side solder mask) of 1oz. on PCB with 8×0.5mm vias.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{DD}	3.0	5.5	V
Operating Ambient Temperature Range	T_A	-40	85	°C

Electrical Characteristics

V_{DD}=5.0V, Gain=6dB, T_A=25°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		100	200	μA
SHUTDOWN	V_{IL}				0.8	V
	V_{IH}		2.0			V
Thermal Shutdown Temperature				165		°C
Hysteresis Temp Window				35		°C
Output Offset Voltage		V_{IN}=0, No load		±5	±25	mV
Output Power	P_O	THD+N=1%, R_L=3Ω,		2.1		W
		THD+N=10%, R_L=3Ω,		2.7		W
		THD+N=1%, R_L=4Ω,		1.8		W
		THD+N=10%, R_L=4Ω,		2.3		W
		THD+N=1%, R_L=8Ω		1.2		W
		THD+N=10%, R_L=8W		1.5		W
Total Harmonic Distortion Plus Noise	THD+N	P_O=1W, R_L=4W		0.08		%
Signal to Noise Ratio	S/N	P_O=1W, R_L=4Ω		100		dB
Cross Talk	X_{TALK}	f=1kHz		-100		dB
Power Supply Rejection Ration	PSRR	C_b=1mF, f=1kHz, V_{ripple}=0.2V_{RMS}		70		dB
Output Noise	V_{NO}	f=20Hz~20kHz, R_L=8Ω		18		μV_{RMS}

Typical Performance Characteristics

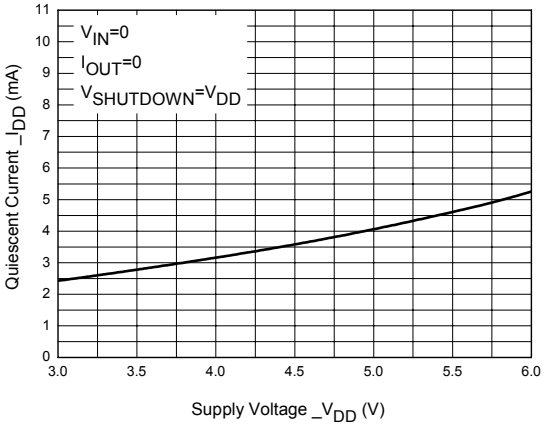


Figure 3. Quiescent Current vs. Supply Voltage

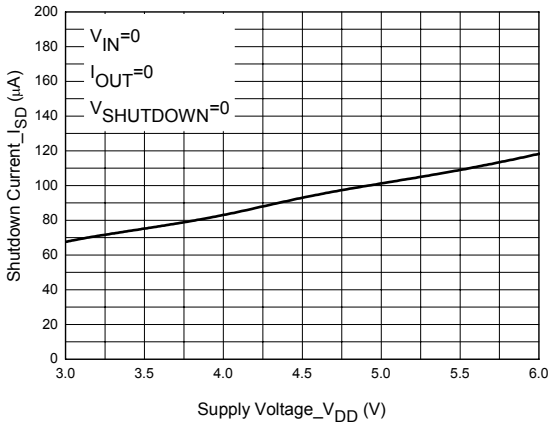


Figure 4. Shutdown Current vs. Supply Voltage

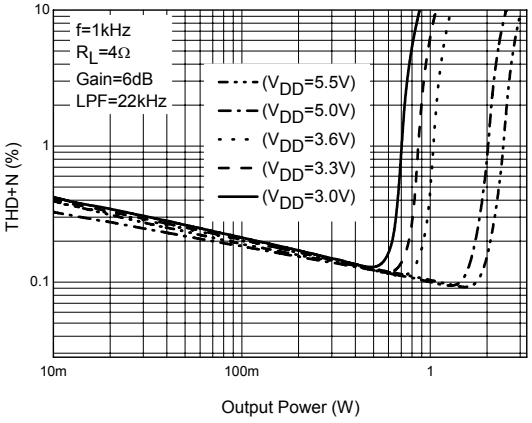


Figure 5. THD+N vs. Output Power

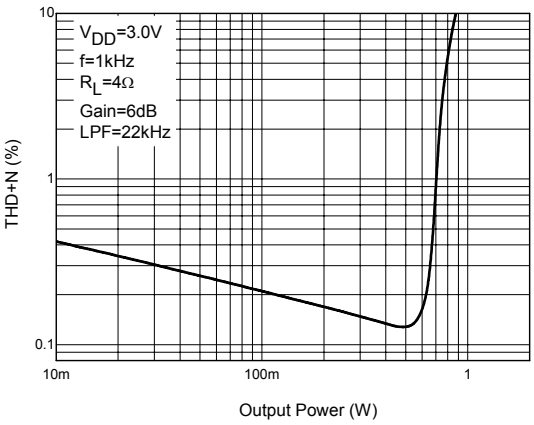


Figure 6. THD+N vs. Output Power

Typical Performance Characteristics (Continued)

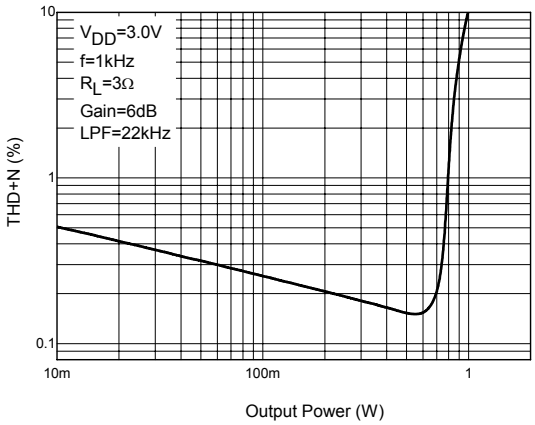


Figure 7. THD+N vs. Output Power

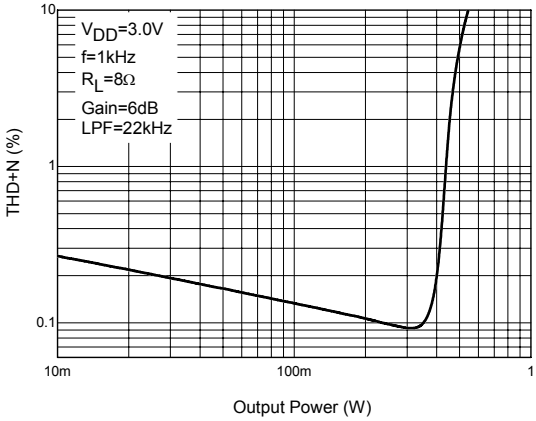


Figure 8. THD+N vs. Output Power

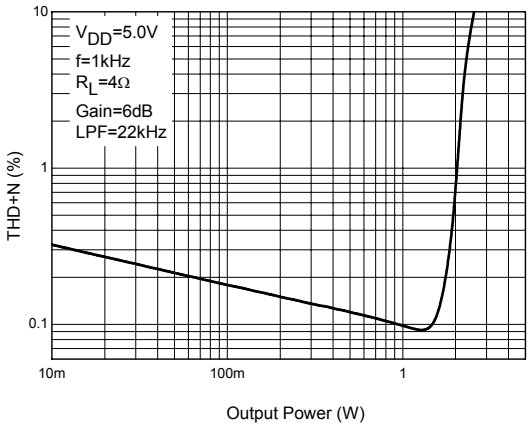


Figure 9. THD+N vs. Output Power

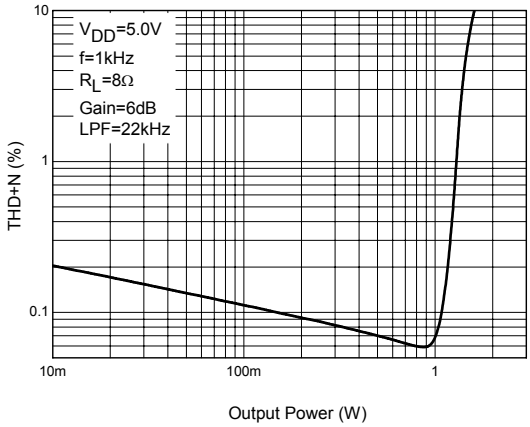


Figure 10. THD+N vs. Output Power

Typical Performance Characteristics (Continued)

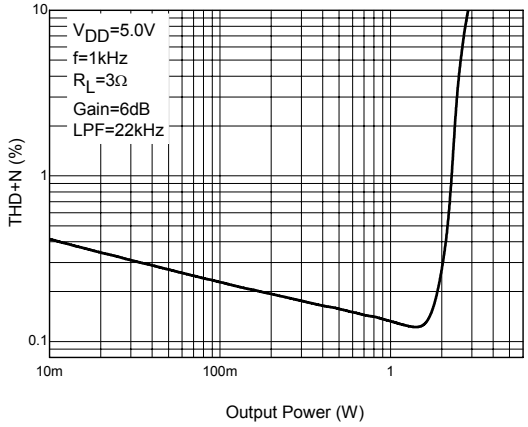


Figure 11. THD+N vs. Output Power

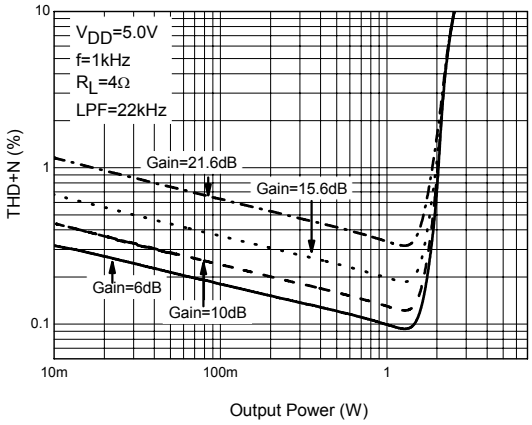


Figure 12. THD+N vs. Output Power

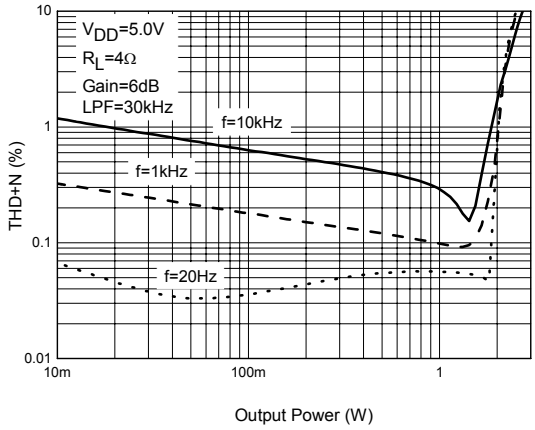


Figure 13. THD+N vs. Output Power

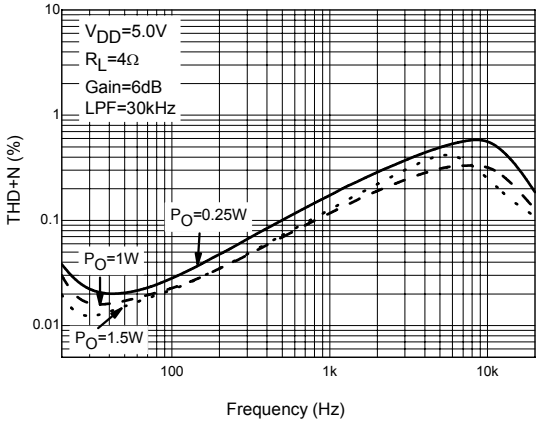


Figure 14. THD+N vs. Frequency

Typical Performance Characteristics (Continued)

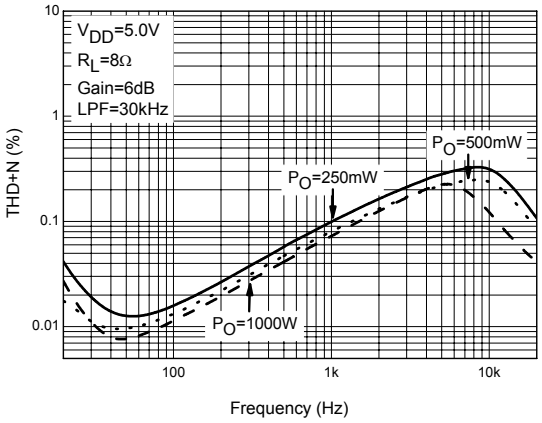


Figure 15. THD+N vs. Frequency

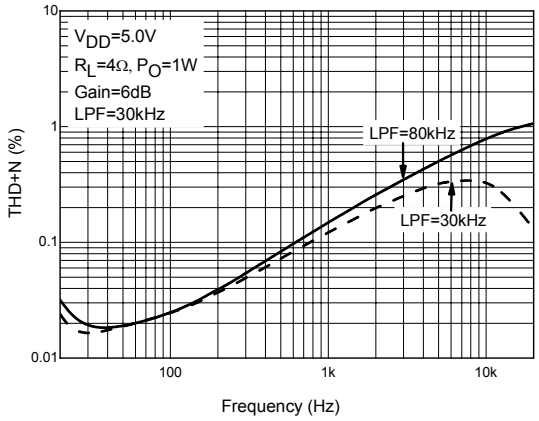


Figure 16. THD+N vs. Frequency

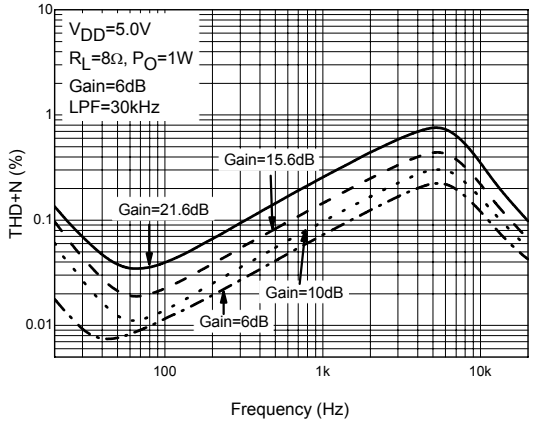


Figure 17. THD+N vs. Frequency

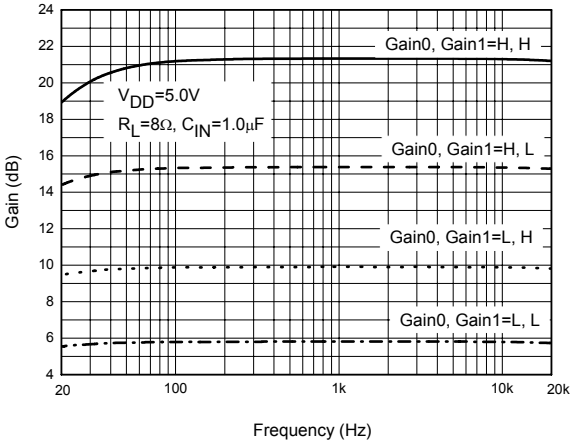


Figure 18. Gain vs. Frequency

Typical Performance Characteristics (Continued)

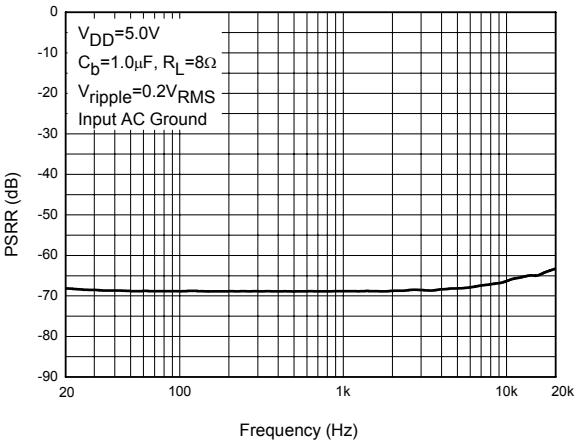


Figure 19. PSRR vs. Frequency

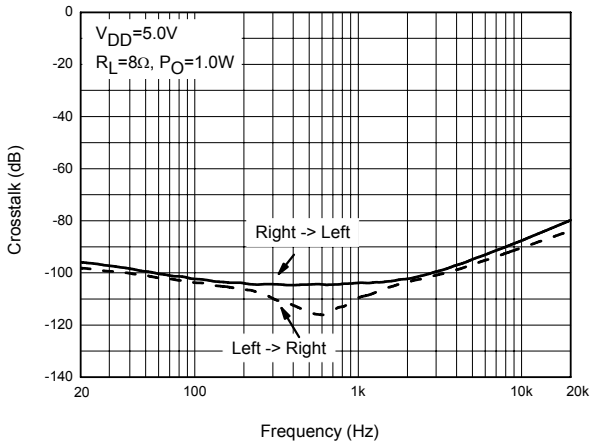


Figure 20. Crosstalk vs. Frequency

Typical Application

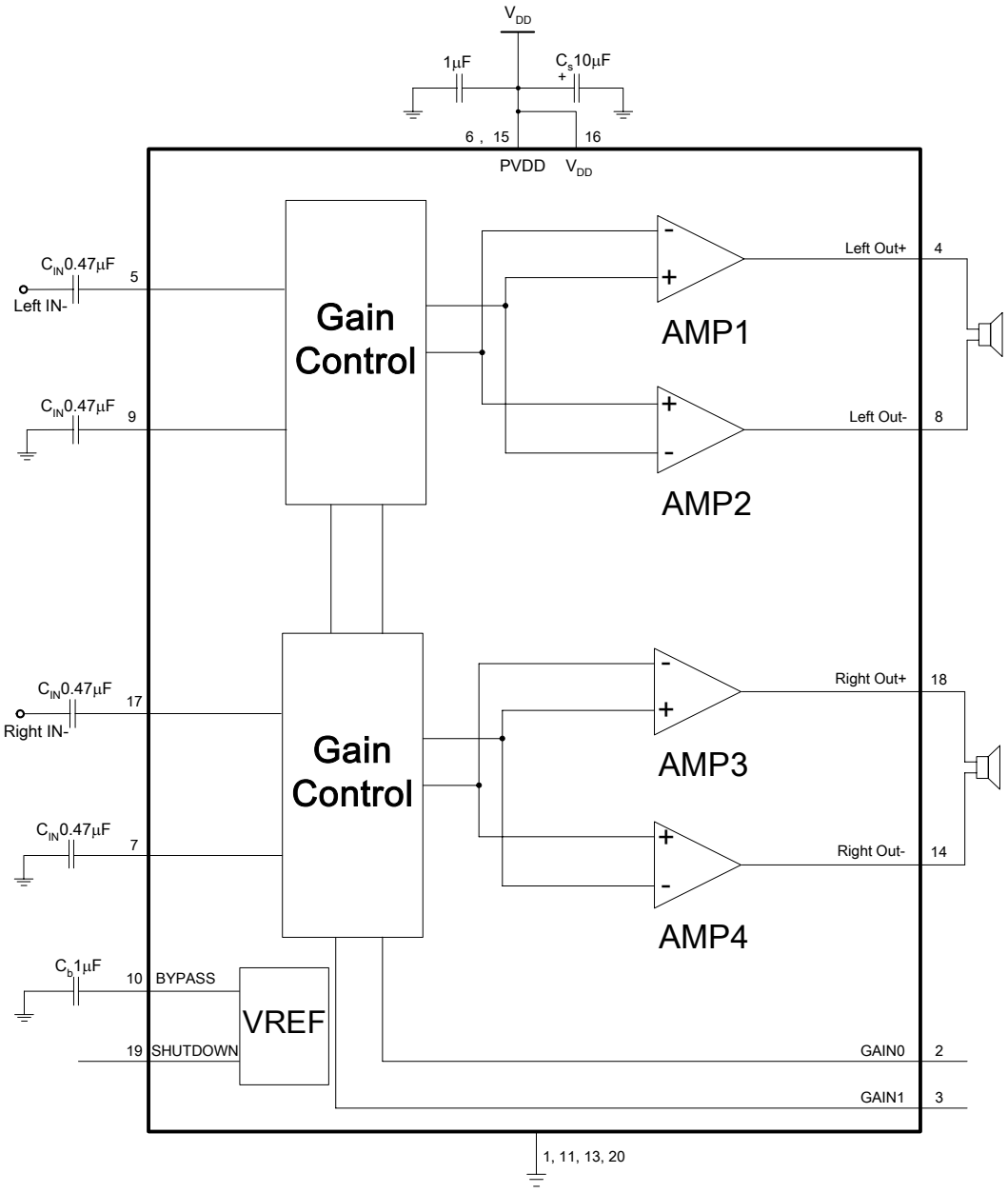


Figure 21. Typical Application of AA4005 for Single-ended input

Typical Application (Continued)

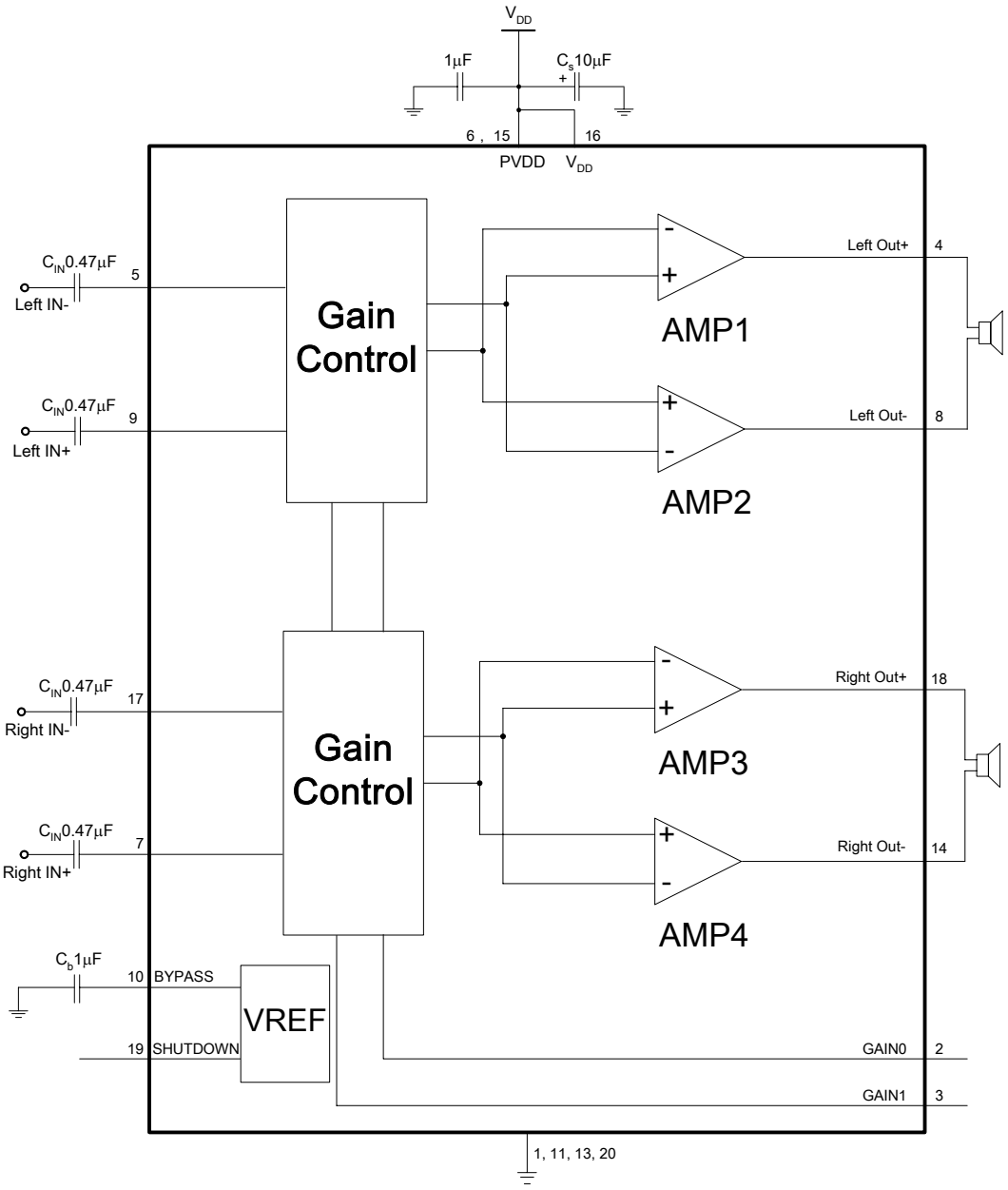
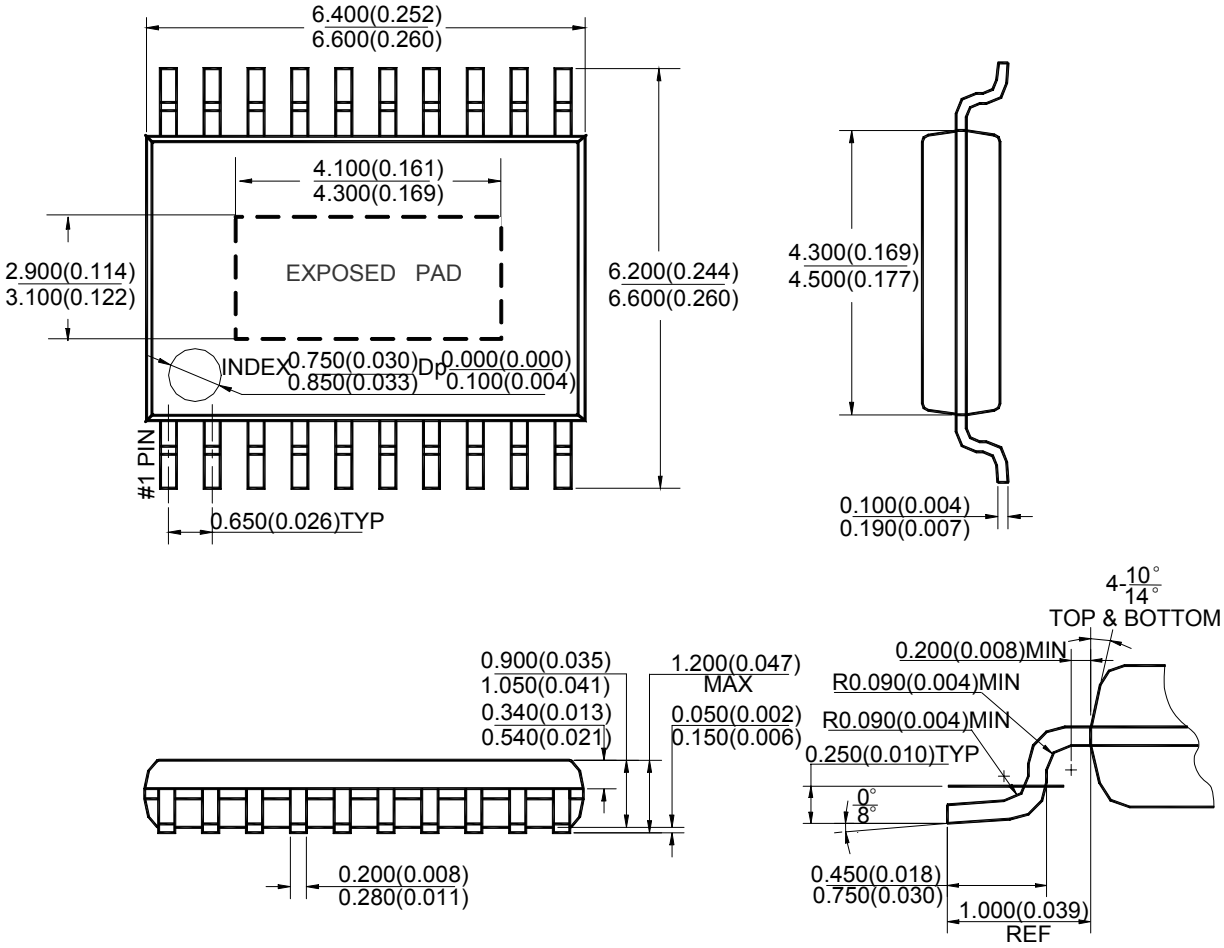


Figure 22. Typical Application of AA4005 for full differential input

Mechanical Dimensions

TSSOP-20(EDP) **Unit: mm(inch)**



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