AAP661X

PRELIMINARY DATA

Electret Microphone (ECM) Pre-Amplifier w/Programmable Filter

DESCRIPTION

The AAP661X ECM Pre Amplifiers were designed for the recent exclusive use of Plantronics, Inc. of Santa Cruz, CA for high end audio headset microphone applications. The AAP661X is now available for general sale to the audio microphone marketplace. The performance of this Pre-Amplifier is such that it enables design of enhanced end system products, due to its various gain options, ultra-low noise and other high performance features.

The AAP661X ECM Pre-Amplifier provides a number of performance advantages over prior ECM Pre-Amplifier products. Key features include ultra low input capacitance (0.35pF typical) and quiescent current (250µA typical), with ultra low equivalent input noise (1.9 µV RMS to 2.5 µV RMS, A-Weighted, with the microphone capacitor short circuited, gain version dependent). Additionally, the Pre-Amplifier sports a programmable high pass filter and DC output operation down to 1.23V. Other key features include THD performance below 0.5% maximum, output impedance of 25Ω typical, with exceptionally high tolerance to RF interference and ESD tolerance (8kV).

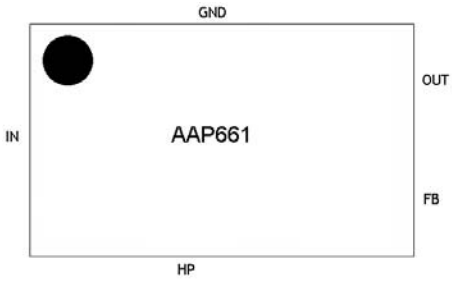
The AAP661X is offered with two gain options, 16dB and 19dB. Packaging is bumped chip scale SMD configuration with a size of 930µm x 580µm and an overall thickness of 320µm (including solder bumps). Optimum for small diameter microphones, the die is RoHS compliant, with lead free solder pads of 118µm diameter. Packing styles available are 2" x 2" Waffle Pack or Tape and Reel.

FEATURES

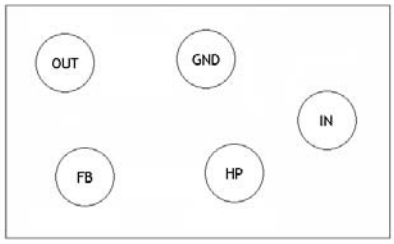
- Selectable Gain Configurations—16dB and 19dB
- Ultra Low Input Capacitance—0.35pF Typ.
- Ultra Low Equivalent Input Noise Performance—1.9 µV RMS to 2.5µV RMS, Cmic = SC, Varies with Gain
- 8kV ESD Tolerance
- High RFI Tolerance, Low Output Impedance (25Ω)
- Excellent THD Performance (< 0.5%)
- Ultra Low Quiescent Current (250µA Typical)
- Chip-Scale SMD Bumped Packaging (930µm x 580µm, 320µm thick)

PIN CONFIGURATION: 5-Lead Micro SMD

AAP661X shown from the top and bottom.

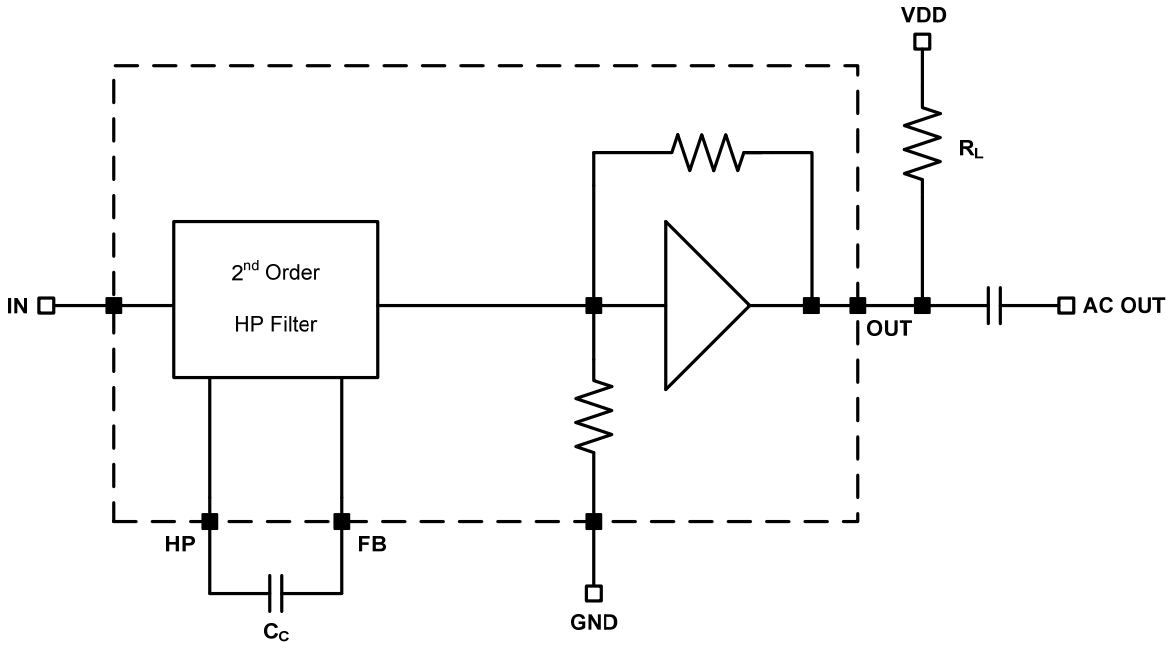


TOP VIEW



BOTTOM VIEW

Functional Block Diagram



MAXIMUM RATINGS

PARAMETER	SYMBOL	PARAMETERS		UNITS	CONDITIONS
		MIN.	MAX.		
Applied Voltage (all pins)		-0.5	2.5	V	Max voltage between pin and GND
Supply Current	IDD		2	mA	
ESD	$V_{esd,out}$	8000		V	OUT terminal
	V_{esd}	2000			Other terminals
Operating Ambient Temp		-40	85	ºC	
Storage Temp Range		-40	100	ºC	
Performance Operating Temp Range		-5	55	ºC	

ELECTRICAL CHARACTERISTICS

Unless otherwise stated: T=25ºC, VDD=1.8V, V_{in}=-40dBVrms, R_L=2.2kΩ, C_c=100nF, C_{mic}=short

PARAMETER	SYMBOL	PARAMETERS			UNITS	CONDITIONS
		MIN	TYP	MAX		
OPERATING SUPPLY						
Supply Voltage	VDD	1.6	1.8	5.5	V	R_L=3.3kΩ
Operating Output Voltage	V_{op}	1.18	1.23	1.3	V	
Supply Current	IDD		250		µA	Note 1

Note 1: IDD = (VDD – V_{op}) / R_L

PSRR			60		dB	
AC CHARACTERISTICS						
Transfer Function (AAP661A)	TF	14	15	16	dB	
Transfer Function (AAP661B)	TF	18.5	19	19.5	dB	
Gain Variation over Supply	Δ Av			0.1	dB	1.6V < VDD < 3.5V
Gain Variation over Temp	Δ Av			0.2	dB	-5ºC < T < 55 ºC
Input Referred Noise	e_n		2	2.5	µV RMS	Input shorted to GND, A-weighted values
Overload Margin	V_{outmax}			825	mVpp	5% distortion, TF=11dB
LF Cutoff	f_{LOW}		200		Hz	
HF Cutoff	f_{HIGH}	20	85		kHz	
Total Harmonic Distortion	THD		0.4		%	Vout=-23dBVrms
Input Capacitance	C_{IN}		0.35		pF	
Input Impedance	Z_{IN}	10			GΩ	
Output Impedance	Z_{OUT}		25	70	Ω	
Input Impedance of FB (AAP661A)	$Z_{IN}FB$		17		kΩ	
Input Impedance of FB (AAP661B)	$Z_{IN}FB$		12.1		kΩ	

APPLICATION

Use the following equation to calculate the capacitor (C_c) value to program the low frequency cutoff of the high-pass filter:

Example 1: for a cutoff of f = 100Hz using the AAP661A

$$C_c = \frac{1}{2\pi * Z_{IN}FB * f} = \frac{1}{2\pi * 17k * 100} = 94nF$$

Example 2: for a cutoff of f = 300Hz using the AAP661B

$$C_c = \frac{1}{2\pi * Z_{IN}FB * f} = \frac{1}{2\pi * 12.1k * 300} = 44nF$$

TEST SUGGESTIONS

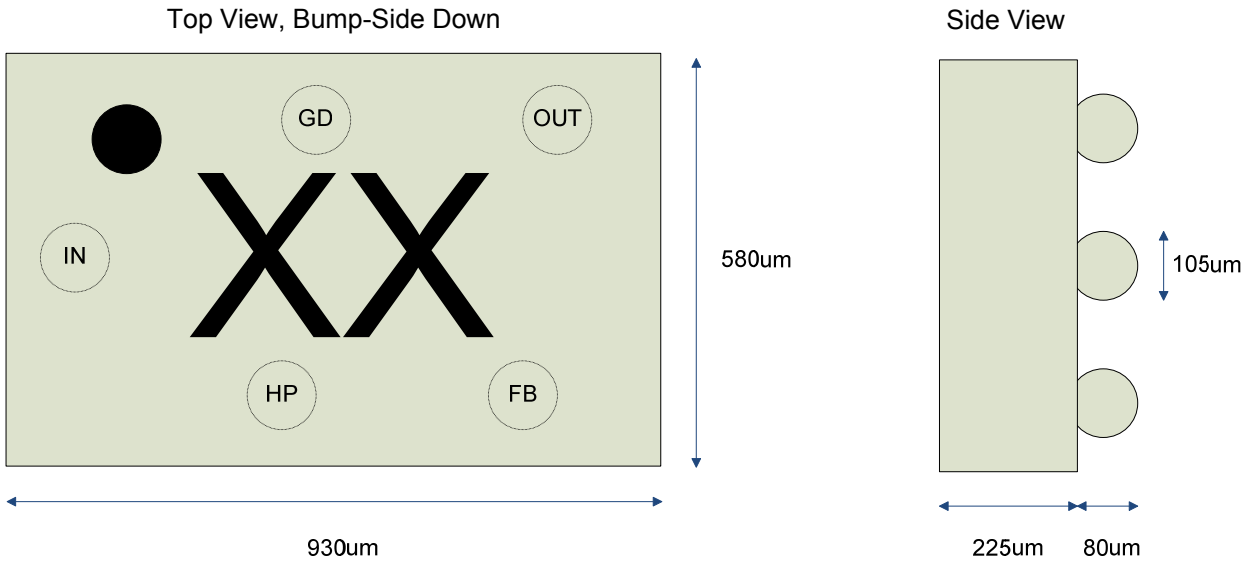
A suitable input amplitude is -44dBV (6.301 mVRMS). With a gain of 15dB, this will give -29dBV out (35.48 mVRMS). With a gain of 19dB, this will give -25dBV out (56.23 mVRMS).

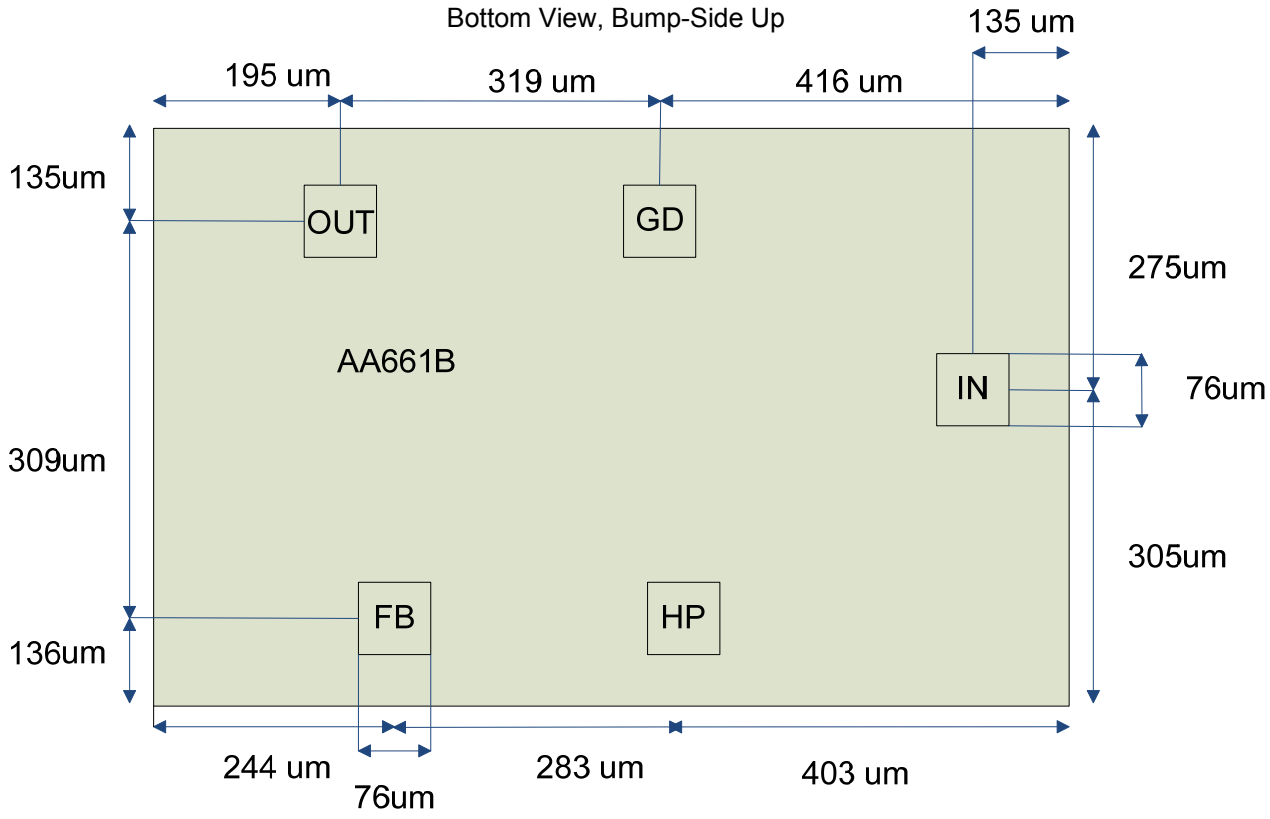
With the input shorted to ground, the DC voltage at the FB pin should be about 600mV, and the DC voltage at the HP pin should be about 800mV. Due to the high impedances, a DVM with 10 MΩ input resistance minimum should be used with the negative input grounded to the lab bench.

ORDERING INFORMATION

Ordering PN	Subgroup	Description	Temp. Range	Package	Packing Type	Packing Qty
AAP661A S-M5A-G-LF-W	Microphone ECM Interface	Pre-Amplifier, 16dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	Waffle-Pack	400
AAP661A S-M5A-G-LF-TR	Microphone ECM Interface	Pre-Amplifier, 16dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	T&R	3500
AAP661B S-M5A-G-LF-W	Microphone ECM Interface	Pre-Amplifier, 19dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	Waffle-Pack	400
AAP661B S-M5A-G-LF-TR	Microphone ECM Interface	Pre-Amplifier, 19dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	T&R	3500

PACKAGE DIMENSIONS AND MARKING





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