

AAP661X

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

PRELIMINARY DATA

DESCRIPTION

The AAP661X ECM Pre Amplifiers were designed for high end audio headset microphone applications. 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.

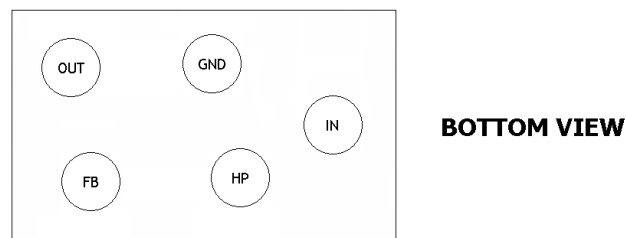
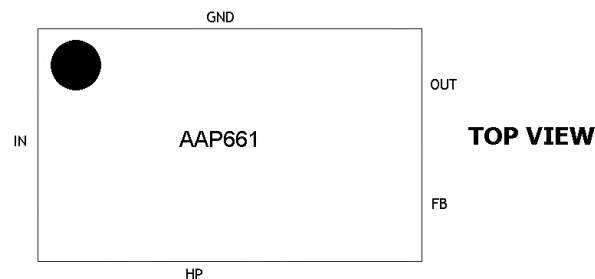
The AAP661X ECM Pre-Amplifier provides a number of performance advantages over prior ECM Pre-Amplifier products. Key features include ultra low input capacitance (0.35pF typical) and quiescent current (250μA typical), with ultra low equivalent input noise (1.9 μV RMS to 2.5 μV RMS, A-Weighted, with the microphone capacitor short circuited, gain version dependent). Additionally, the Pre-Amplifier supports a programmable high pass filter and DC output operation down to 1.23V. Other key features include THD performance 0.4% typical, output impedance of 25Ω typical, with exceptionally high tolerance to RF interference and ESD tolerance (8kV).

The AAP661X is offered with a fixed gain of 16dB, 19dB and 30dB. 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.

- Selectable Gain Configuration — 16dB, 19dB and 30dB
- 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)

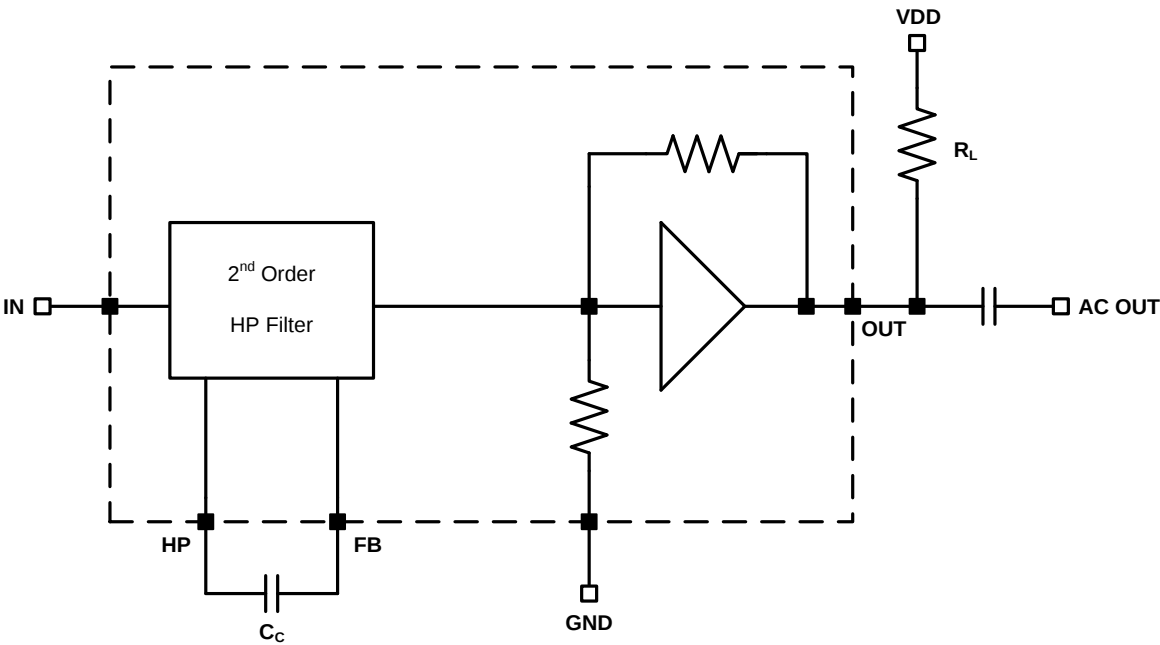
PIN CONFIGURATION: 5-Lead Micro SMD

AAP661X shown from the top and bottom.



FEATURES

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	Vesd,out	8000		V	OUT terminal
	Vesd	2000			Other terminals
Operating Ambient Temp		-40	85	°C	
Storage Temp Range		-40	100	°C	
Performance Operating Temp Range		-5	55	°C	

ELECTRICAL CHARACTERISTICS

Unless otherwise stated: T=25°C, VDD=1.8V, Vin=-40dBVrms for AAP661A and AAP661B, Vin=-60dBVrms for AAP661C
RL=2.2kΩ, Cc=100nF, Cmic=short

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

Note 1: IDD= (VDD – Vop)/RL

PSRR			60		dB	
AC CHARACTERISTICS						
Transfer Function (AAP661A)	TF	14	15	16	dB	
Transfer Function (AAP661B)	TF	18.5	19	19.5	dB	
Transfer Function (AAP661C)	TF	29	30	30.5	dB	
Gain Variation over Supply	ΔA_v			0.1	dB	1.6V < VDD < 3.5V
Gain Variation over Temp (AAP661A & AAP661B)	ΔA_v			0.2	dB	-5°C < T < 55 °C
Gain Variation over Temp (AAP661C)	ΔA_v			0.5	dB	-5°C < T < 55 °C
Input Referred Noise	e_n		2	2.5	$\mu\text{V RMS}$	Input shorted to GND, A-weighted values
Overload Margin (AAP661A & AAP661B)	V_{outmax}			825	mVpp	5% distortion, TF=11dB
Overload Margin (AAP661C)	V_{outmax}			422	mVpp	5% distortion, TF=11dB
LF Cutoff (AAP661A & AAP661B)	f_{LOW}		200		Hz	
LF Cutoff (AAP661C)	f_{LOW}	180	265	360	Hz	
HF Cutoff (AAP661A & AAP661B)	f_{HIGH}	20	85		kHz	
HF Cutoff (AAP661C)	f_{HIGH}	16	24		kHz	
Total Harmonic Distortion	THD		0.4		%	Vout=-23dBVrms
Input Capacitance	C_{IN}		0.35		pF	
Input Impedance	Z_{IN}	10			G Ω	
Output Impedance	Z_{OUT}		25	70	Ω	
Input Impedance of FB (AAP661A)	Z_{INFB}		17		k Ω	
Input Impedance of FB (AAP661B)	Z_{INFB}		12.1		k Ω	
Input Impedance of FB (AAP661C)	Z_{INFB}		6		k Ω	

APPLICATION

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

Example1: for a cutoff of $f = 100\text{Hz}$ using AAP661A

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

Example2: for a cutoff of $f = 100\text{Hz}$ using AAP661B

$$C_c = \frac{1}{2\pi * Z_{\text{INFB}} * f} = \frac{1}{2\pi * 12.1\text{k} * 100} = 44\text{nF}$$

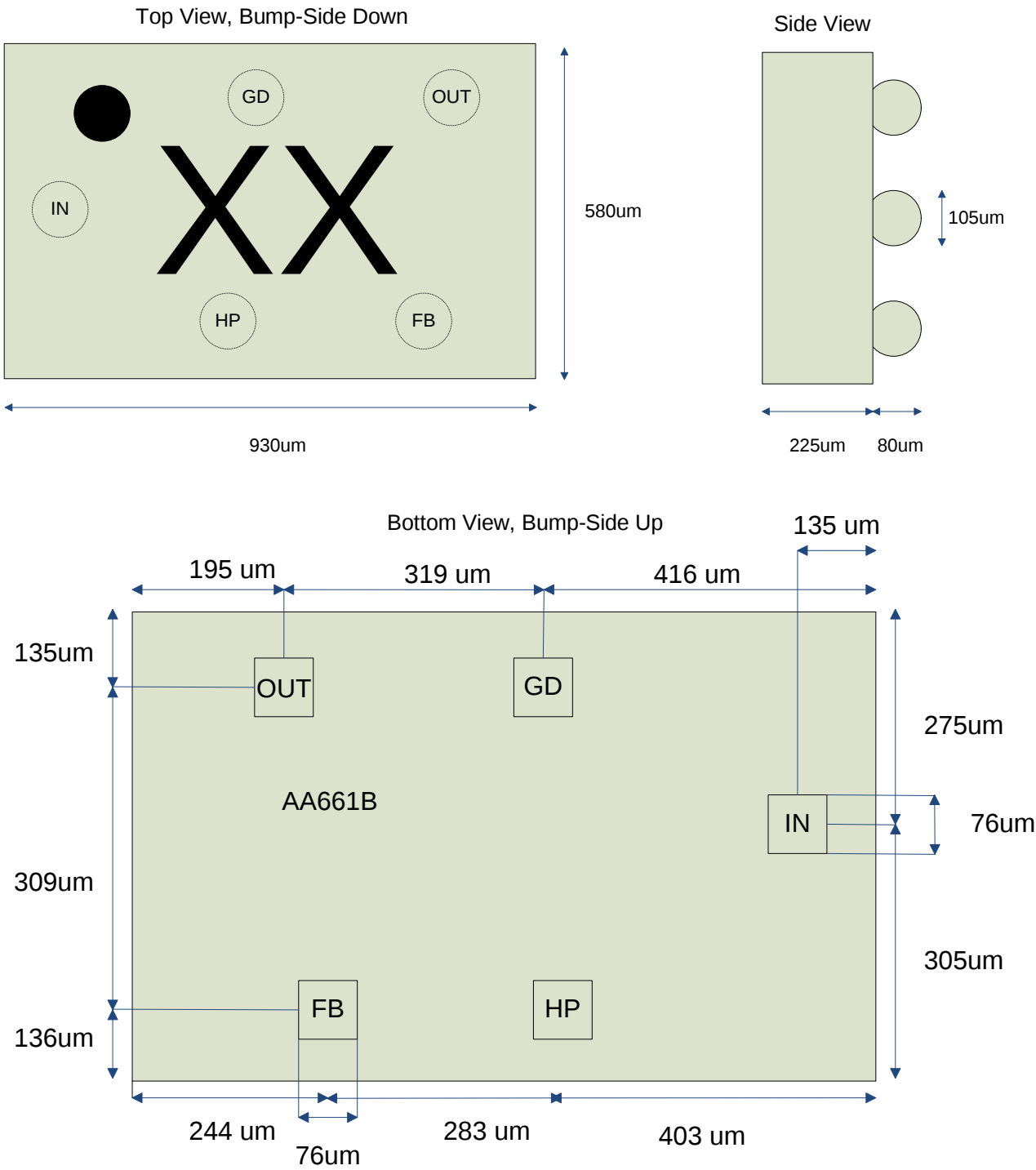
Example3: for a cutoff of $f = 100\text{Hz}$ using AAP661C

$$C_c = \frac{1}{2\pi * Z_{\text{INFB}} * f} = \frac{1}{2\pi * 6\text{k} * 100} = 265\text{nF}$$

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
AAP661C S-M5A-G-LF-W	Microphone ECM Interface	Pre-Amplifier, 30dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	Waffle-Pack	400
AAP661C S-M5A-G-LF-TR	Microphone ECM Interface	Pre-Amplifier, 30dB gain	S - Special -5°C to +55°C	5-pin Micro SMD	T&R	3500

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