

Kit 87 – 1 Watt Stereo Amplifier



This is a 1 watt stereo amplifier module Kit using the KA2209 IC from Samsung, which is equivalent to the TDA2822. It will operate well from 3-12V DC and will work from a battery since the quiescent current drain is low. It requires no heat sink for normal use. The input and output are both ground referenced. Maximum output will be obtained with a 12V power supply and 8 ohm speaker, however it is particularly suitable for driving headphones from a supply as low as 3V.

Specifications :

D.C. input : 3 – 12 V at 200 – 500 mA max.
Idle current : ~ 10 mA
Power output : > 1 Watt max. 4-8 ohms, 12V DC
> 500 mW, 32 ohm, 12V
> 500 mW, 4 ohm, 6V
~ 0.4 Watt RMS cont. per channel
Freq. Resp. : ~ 40 Hz to 200 kHz, 8 ohm, G=10
< 20 Hz to > 50 kHz, 32 ohm
THD : < 1 % @ 750 mW, 4-8Ω, 12V
< 0.2 % @ 250 mW, 4-8Ω, 12V
Gain : ~ x10 (20 dB) **OR** x100 (40dB)
S/N ratio : > 80 dB, G = 20 dB
> 60 dB, G = 40 dB
Sensitivity : < 300 mV, G = 20 dB
< 30 mV, G = 40 dB
Input Z : ~ 10 k ohm

Assembly Instructions :

Assembly is very straight forward, just follow the PC board overlay. Make sure you get the integrated circuit and the electrolytic capacitors the correct way around. The electrolytic capacitors are polarized, they have a + or - marked on them and they must be inserted correctly into the PCB. The IC and socket have a notch at one end, which is marked on the PC board overlay. If there is no notch on the IC, there will be a dot next to pin 1, which is the same end. Solder the socket in place first before installing the IC itself, then resistors, capacitors, and PCB pins. Leave the potentiometer until last.

The gain is adjustable from 10 to 100, i.e. 20 to 40 dB. Start with feedback resistors R1 and R3 of 1k ohm, this will give a gain of 10 which should be adequate for most applications. If you require more gain, you can remove resistors R1 and R3. This will give a gain of approximately 100, or 40 dB. We have also provided input attenuation via the potentiometer which can be used as a volume

control. You should keep the IC gain as low as necessary to achieve full output, with the input potentiometer and your signal source at maximum. This will keep the signal to noise ratio as high as possible. Extra gain provided by the amplifier will reduce the S/N ratio by a similar amount, since the input noise figure is constant. Other values for R1 and R3 of between 1k and 10k ohm can be used if an intermediate gain level is required.
Voltage Gain = $1 + R1/R2 = 1 + R3/R4$, however the maximum gain with no external feedback is approximately 100, or 40dB. ($GdB = 20 * \log Gv$)

If driving a pair of headphones, you may also require a 100 ohm resistor in series with each output to reduce the output level, depending on headphone impedance and sensitivity. Make sure you start with the volume right down to check. A number of headphones may be driven from the one amplifier if you wish, since most headphones have at least 16 ohm impedance, or more commonly 32 ohm.

Testing :

Check the voltage and polarity before connecting the battery or power supply. If it does not work, recheck all component positions and polarity. Check all solder joints, and all external wiring. The IC itself is quite robust, and there is very little else to go wrong. Remember when testing, it will not produce full output for more than a short duration because of limited heat dissipation. We found it easily exceeded the manufacturers specifications however.

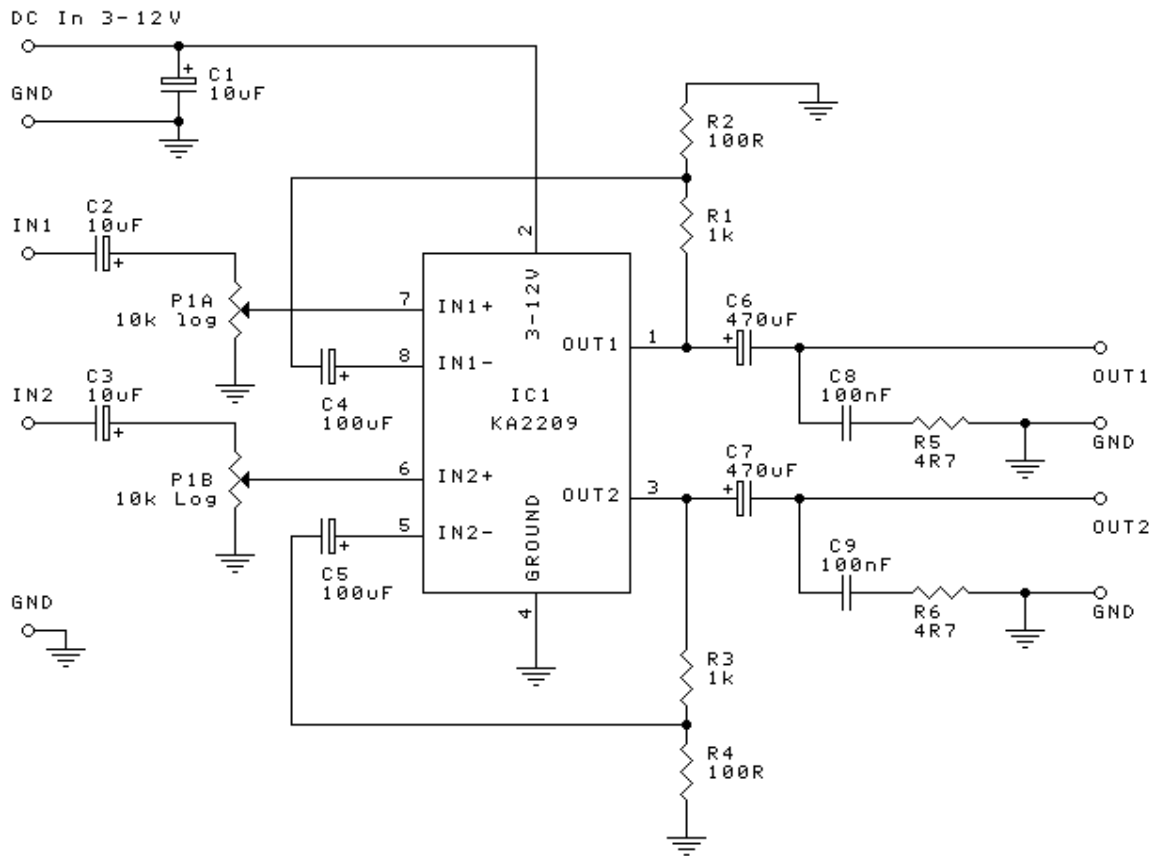
Circuit Description :

There are only a few external components, the IC contains most of the necessary circuitry. R1,R2 and R3,R4 are the feedback resistors. C1 provides power supply decoupling. C2 and C3 are the input coupling capacitors, which block any DC that might be present on the inputs. C4,C5 block DC in the feedback circuit from the inverting inputs, and C6,C7 are the output coupling capacitors. C8, R5 and C9,R6 act as zobel networks providing a high frequency load to maintain stability at frequencies where loud speaker inductive reactance may become excessive. The pot provides adjustable input level attenuation.

The data sheet contains further information about the KA2209. You may download it from the software download page on our website :

<http://www.kitsrus.com>

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Components :

Capacitors

C1, C2, C3	10 uF / 25V ecap	3
C4, C5	100 uF / 16V ecap	2
C6, C7	470 uF / 16V ecap	2
C8, C9	100 nF box poly	2

Resistors

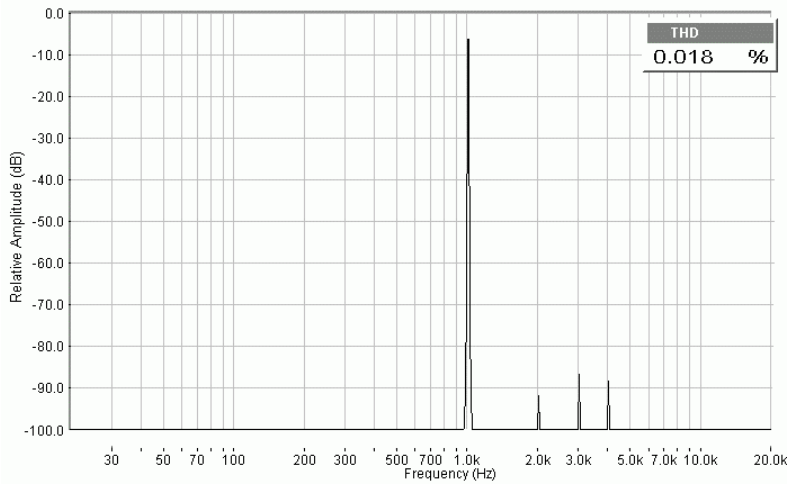
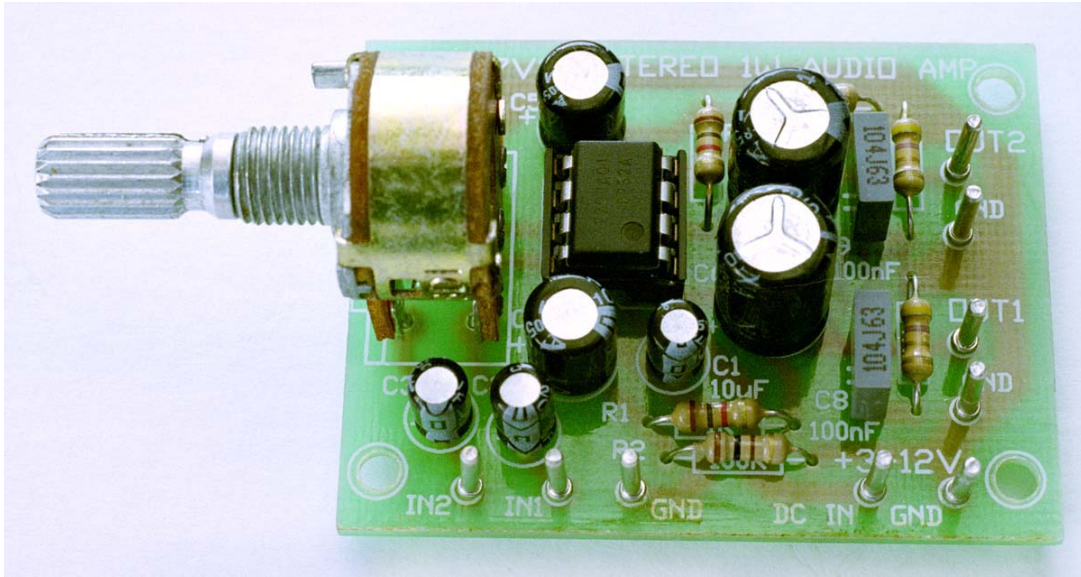
R1, R3	1k (brown, black, red)	2
R2, R4	100R (brown, black, brown)	2
R5, R6	4R7 ohm (yellow, violet, gold)	2
Pot 1	10k dual gang log pot. (A)	1

Misc.

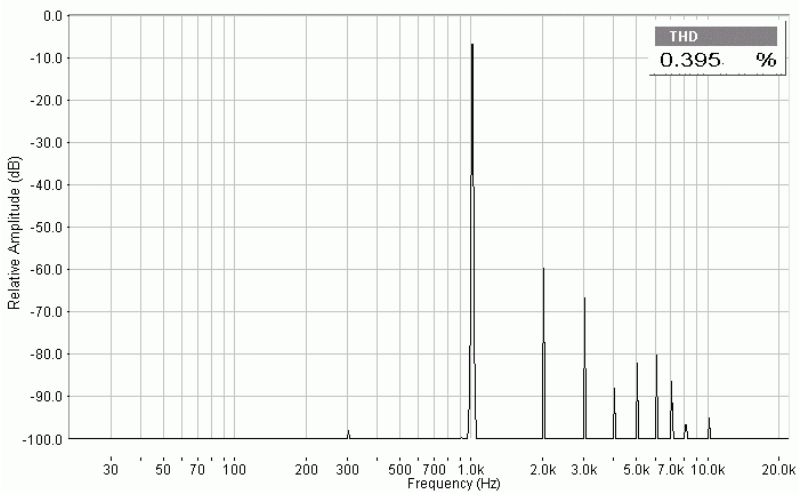
IC 1	KA2209 Integrated Circuit	1
	Kit 87 Printed Circuit Board	1
	8 pin IC socket	1
	PCB Pins	9

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Photo of completed kit.



THD @ 100 mW
12 V supply
32 Ohm Load
G = 20dB



THD @ 750 mW,
12 V supply
8 ohm load
G = 20dB