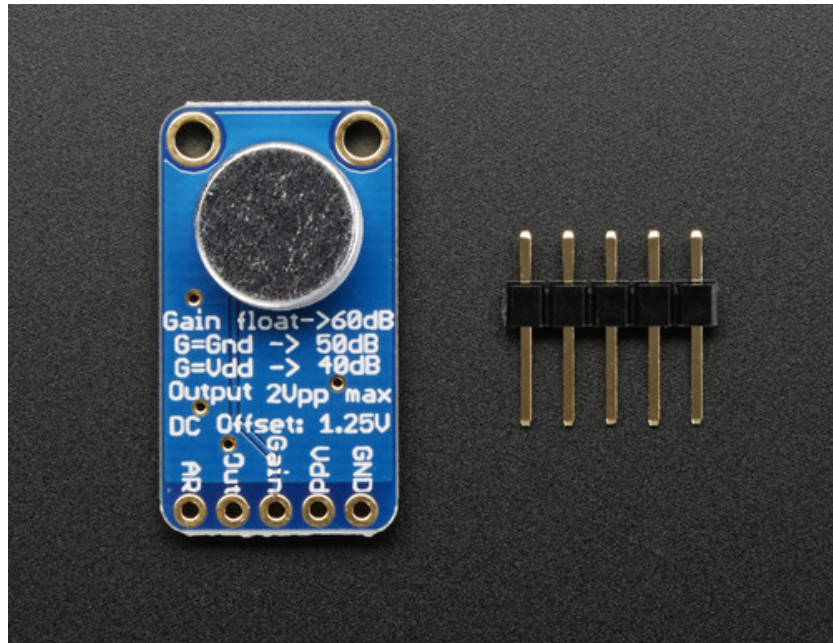


## Adafruit AGC Electret Microphone Amplifier - MAX9814

Created by lady ada

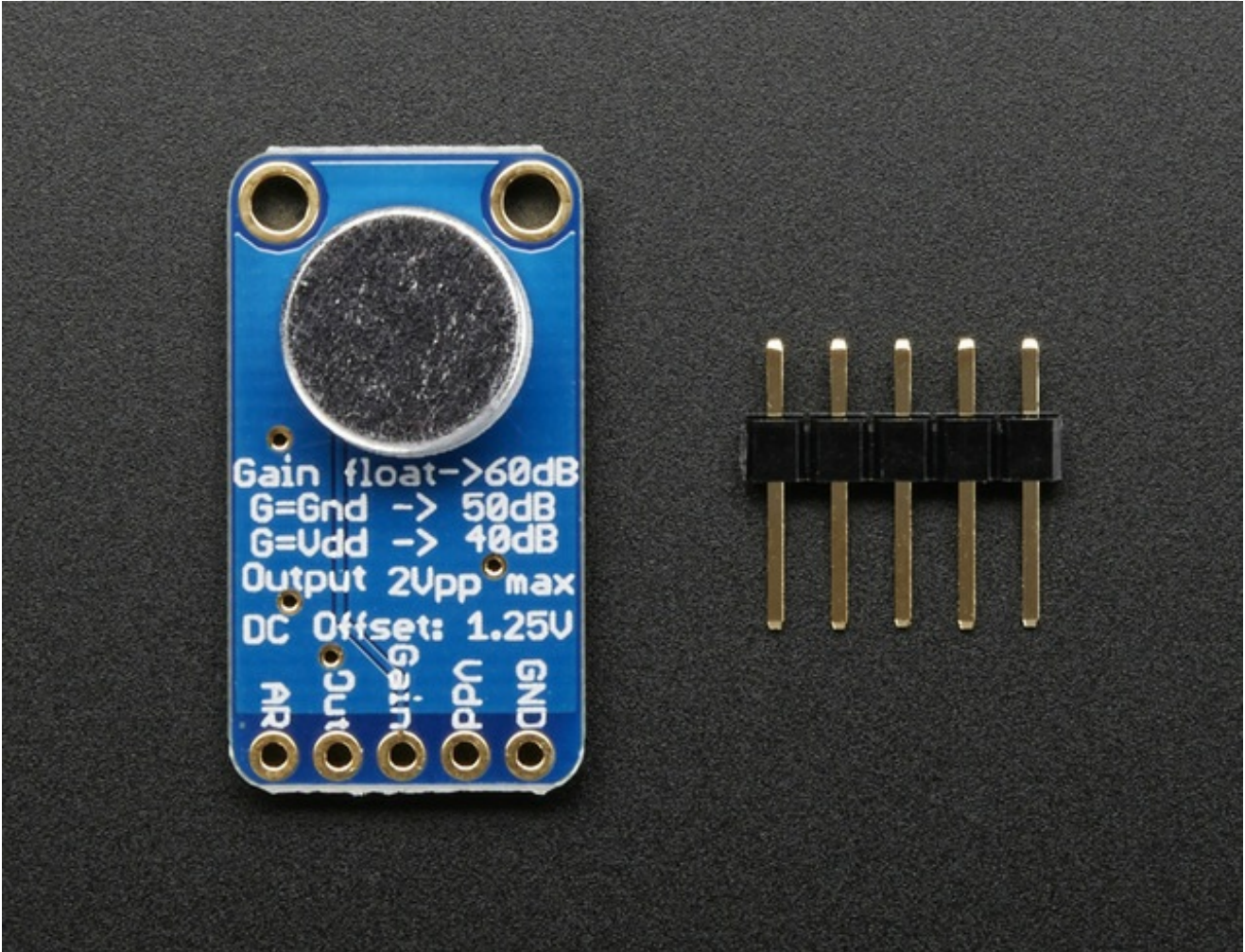


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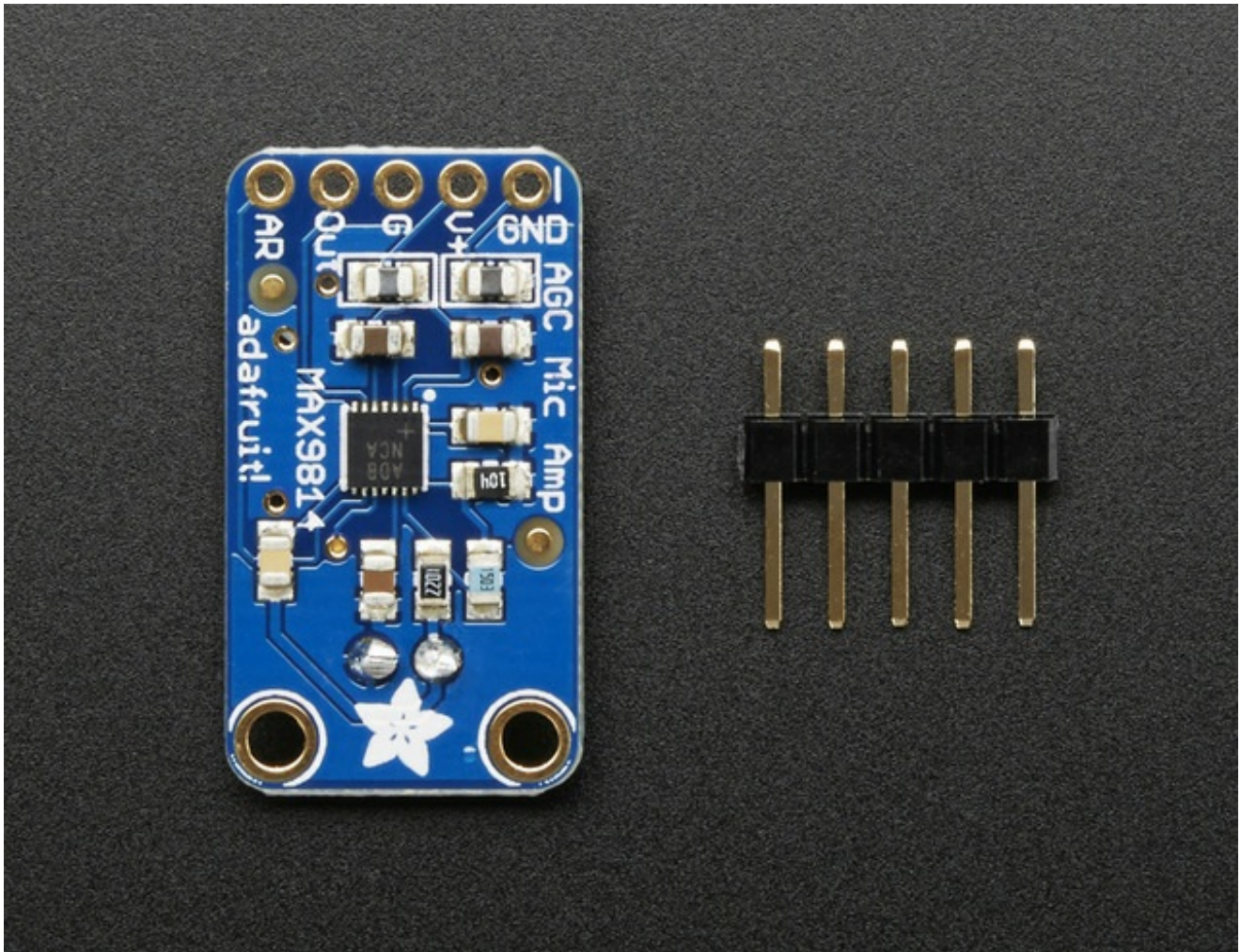
# Overview



This fancy microphone amplifier module is a step above the rest, with built in automatic gain control. The AGC in the amplifier means that nearby 'loud' sounds will be quieted so they don't overwhelm & 'clip' the amplifier, and even quiet, far-away sounds will be amplified. This amplifier is great for when you want to record or detect audio in a setting where levels change and you don't want to have to tweak the amplifier gain all the time.

The chip at the heart of this amp is the [MAX9814](http://adafru.it/d9r) (<http://adafru.it/d9r>), and has a few options you can configure with the breakout. The default 'max gain' is 60dB, but can be set to 40dB or 50dB by jumpering the **Gain** pin to VCC or ground. You can also change the Attack/Release ratio, from the default 1:4000 to 1:2000 or 1:500. The output from the amp is about 2Vpp max on a 1.25V DC bias, so it can be easily used with any Analog/Digital converter that is up to 3.3V input. If you want to pipe it into a Line Input, just use a 1uF blocking capacitor in series.

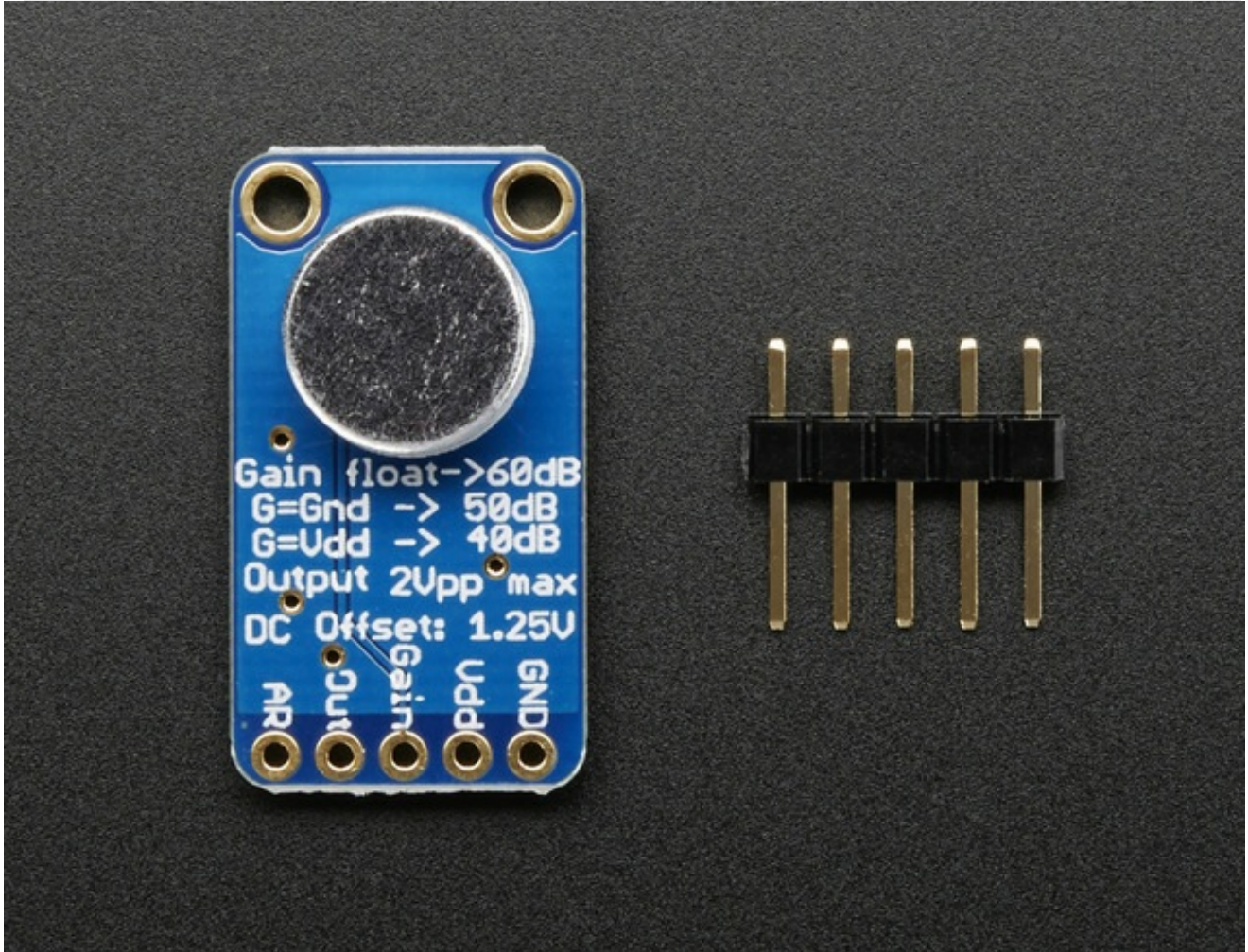
Each order comes with one assembled and tested board, with electret mic pre-soldered on, and a small piece of header.



Specifications:

- Supply Voltage: 2.7v-5.5v @ 3mA current
- Output: 2Vpp on 1.25V bias
- Frequency Response: 20Hz - 20 KHz
- Programmable Attack and Release Ratio
- Automatic gain, selectable max from 40dB, 50dB or 60dB
- Low Input-Referred Noise Density of  $30\text{nV}/\sqrt{\text{Hz}}$
- Low THD: 0.04% (typ)

# Assembly

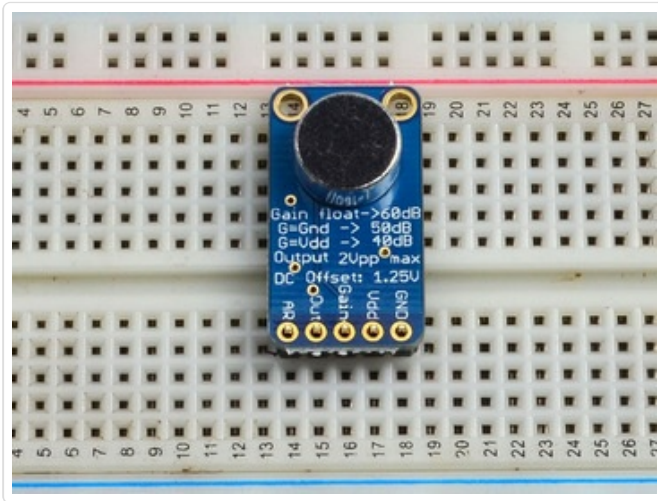
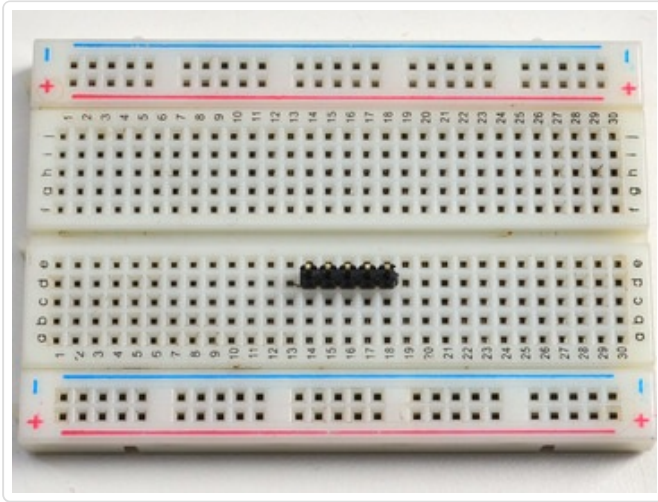


Assembly is really easy, you can use straight or 'right-angle' style headers to attach to the PCB. We'll be using the plain straight headers included

The board comes with all surface-mount components pre-soldered. The included header strip can be soldered on for convenient use on a breadboard or with 0.1" connectors. You can also skip this step and solder on wires.

## Prepare the header strip:

Cut the strip to length if necessary. It will be easier to solder if you insert it into a breadboard - **long pins down**.



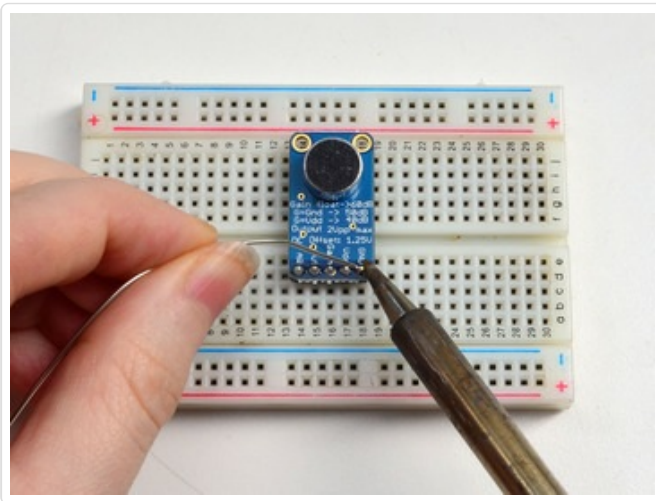
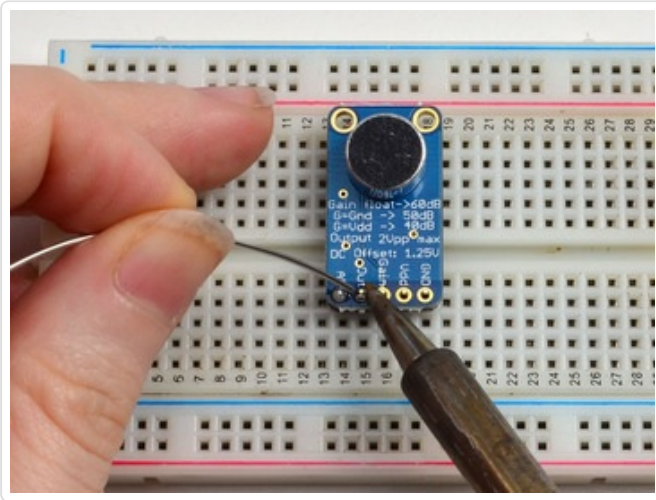
### Add the breakout board:

Place the breakout board over the pins so that the short pins poke through the breakout pads

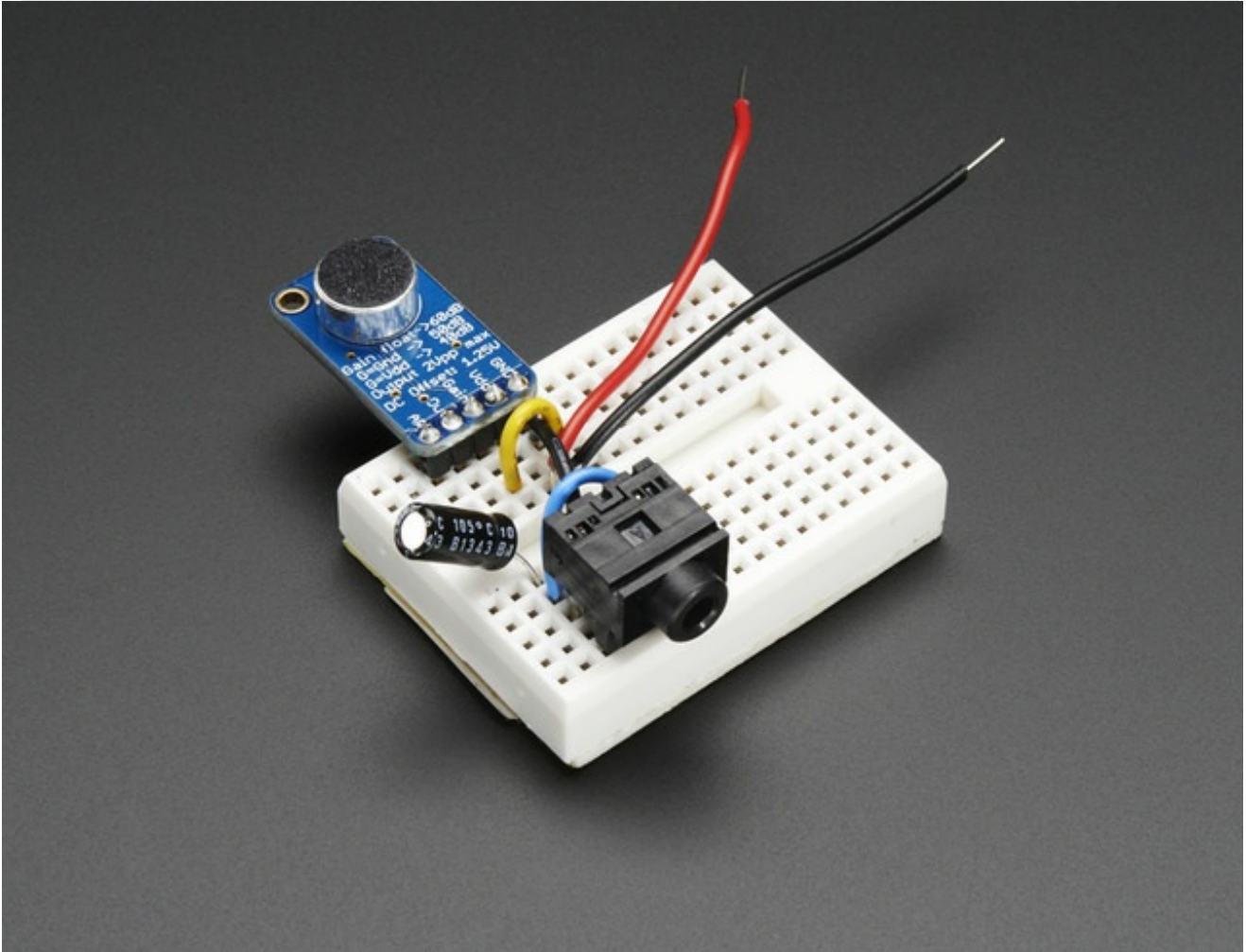
### And Solder!

Be sure to solder all 5 pins for reliable electrical contact.

*(For tips on soldering, be sure to check out our [Guide to Excellent Soldering](http://adafru.it/aTk) (<http://adafru.it/aTk>)).*



## Wiring and Test



The microphone amp is thankfully quite simple to get started. No microcontroller or programming required. We suggest wiring it up directly with a battery pack and headphones to start while you get a hang of how the AGC acts and responds.

You'll need a [3 or 4 AA/AAA battery pack](http://adafru.it/727) (http://adafru.it/727)(or some external source of 3-5VDC) - we suggest batteries since they are very electrically-quiet compared to USB or wall power adapters.

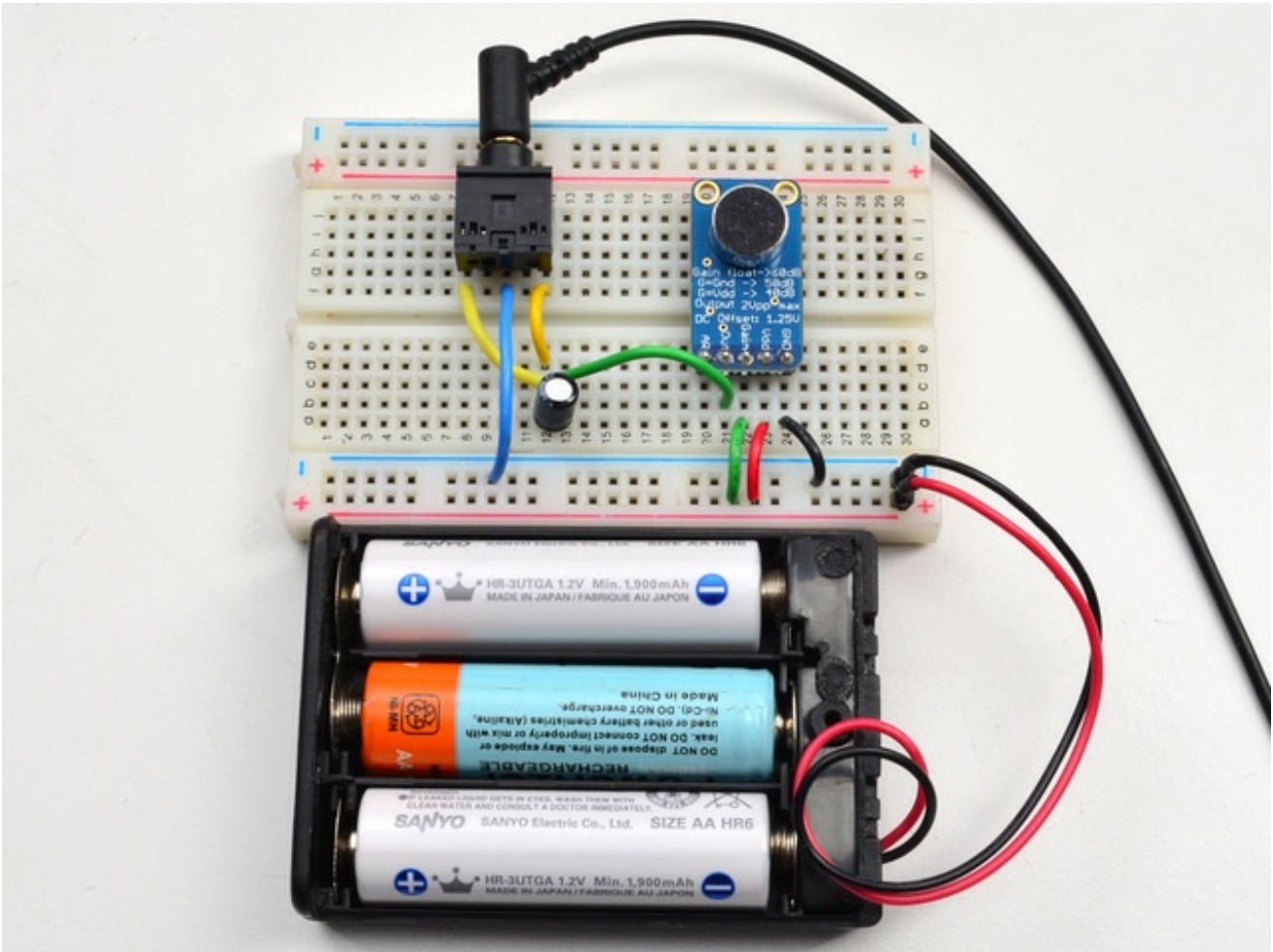
You'll also need [a headphone jack, this breadboard-friendly one](http://adafru.it/1699) (http://adafru.it/1699) works great, and a 1 to 100uF electrolytic capacitor. This is just to protect your headphones from the DC bias voltage. Just about any capacitor will work.

Find the 'cheapest' headphones you have, or use earbuds, they wont load down the microphone amp as much! This is not a good time to use your huge Sennheiser cans. Don't connect to speakers or you will get really horrible feedback effects



# Wiring

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Connect the amplifier, battery pack and headphone jack as shown above.

For the Microphone amp:

- **GND** connects to the battery pack ground - black wire
- **VDD** connects to the battery pack positive - red wire
- Connect the **Gain** pin to VDD for now - green wire
- Connect the **OUT** pin to a 1uF-100uF capacitor (really any value will do). If the capacitor is polarized, connect the OUT pin to the positive side - green wire

For the headphone jack

- Connect the **Left** and **Right** pins together (the microphone is mono out) to the negative side of the capacitor - yellow wires.
- Connect the center ground pin to the battery ground - blue wire

## Test!

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Now try listening to sounds on the headphones, you should notice a strange 'effect' where you can hear people from further away than your hearing is used to! Try setting the **Gain** pin to the GND pin to get 10dB more gain. You can also remove the Gain wire, to set the gain to 60dB but you may find the gain is way too high, and it sounds 'too noisy', so we suggest sticking to 40 or 50dB for most purposes.

You can also try adjusting the A/R (attack/response) ratio by connecting the A/R pin to VDD or GND but we found that the default no-wire works pretty well for most purposes.

## Do more!

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Now that you have the amplifier tested, you can use this microphone amp just like our non-AGC board.

Check out <http://learn.adafruit.com/adafruit-microphone-amplifier-breakout/measuring-sound-levels> (<http://adafru.it/d9p>) and <http://learn.adafruit.com/adafruit-microphone-amplifier-breakout/more-cool-projects> (<http://adafru.it/d9q>) for other projects that can be adapted to use this amplifier.

# Downloads

## Datasheets

Datasheet for the MAX9814 (<http://adafru.it/d9o>)

Datasheet for the electret mic capsule (<http://adafru.it/aW6>)

## 3D models

Thanks to Aron Rubin!

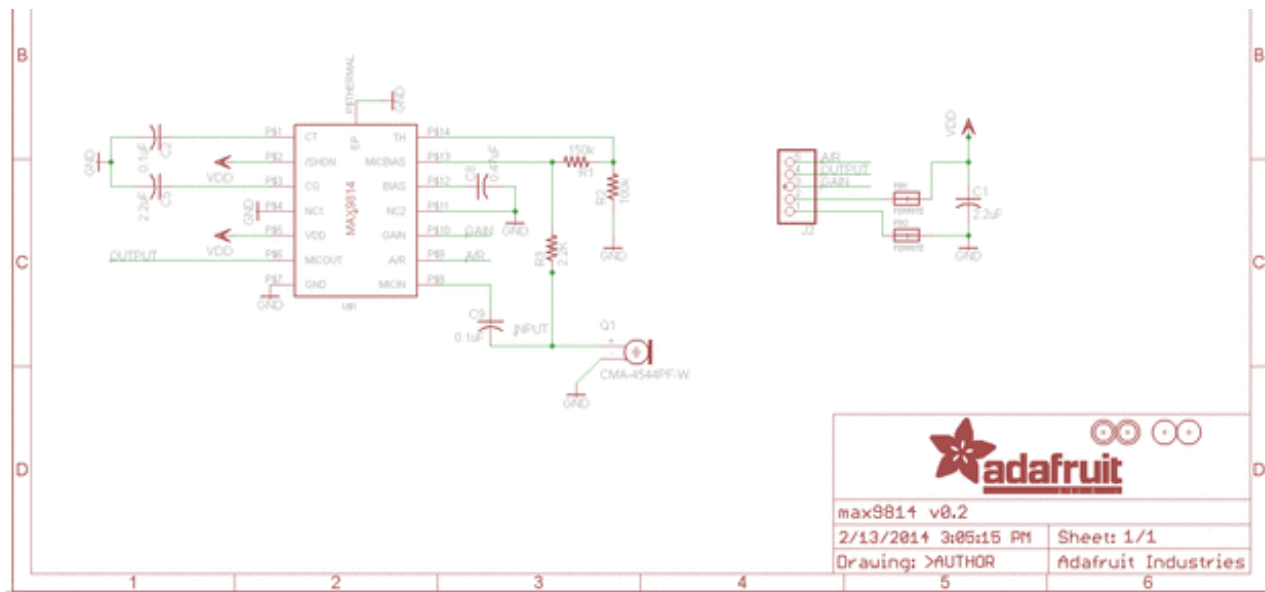
adafruit\_mic\_agc.pdf

<http://adafru.it/frD>

adafruit\_mic\_agc.skp

<http://adafru.it/frE>

## Schematics



## PCB Dimensional Diagram

