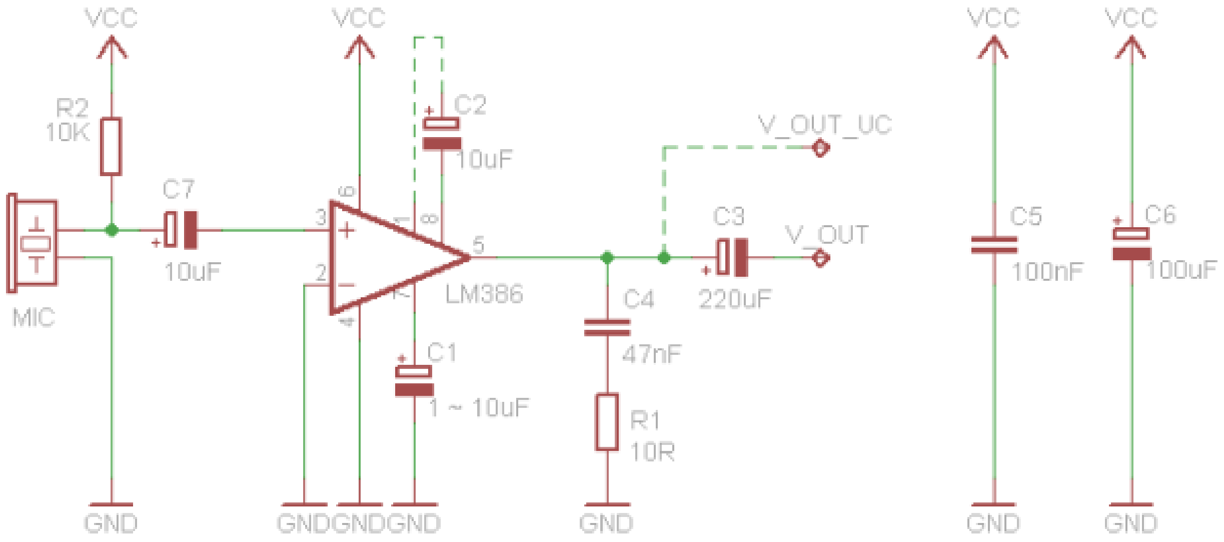
LM386 microphone amplifier

lowvoltage.wordpress.com/2011/05/15/lm386-mic-amp/

Dimitar Kovachev



In this schematic, a LM386-based audio amplifier takes its input from an electret microphone.

There are two output signals. V_OUT carries an AC-only voltage and should be used when interfacing with another piece of audio equipment. The voltage at V_OUT_UC is biased at 1/2 of the supply voltage VCC and is the better option for microcontroller input.

If volume control is needed, the VR1 potentiometer from the original schematic can be added back, before the input pin 3.

Sound sensor for the Arduino

Arduino's analog pins map a 0 ~ 5V voltage to a 0 ~ 1023 integer. In silence, an ideal sound sensor should consistently give readings of 511-512 – half of the 0 ~ 1023 range, corresponding to 1/2 VCC = 2.5V. When there's a very loud sound, the readings should sweep all the way to 0 and 1023. Moderate sounds should have readings somewhere in between. This makes it easier to set a threshold for detecting sounds of a given strength.

Sound	Readings range (ideal)	Amplitude (ideal)
(Silence)	511 ~ 512	1
Talking	300 ~ 723*	423*
Loud knock, broken glass	0 ~ 1023	1023

** These particular values are just an example*

For battery-powered applications, the current draw of the circuit may also be a concern.

LM386 sound sensor performance

Let's see how the LM386 sensor fares, in its 20x gain configuration (no C2 capacitor). V_OUT_UC is connected to Arduino's A0 pin and the Min-Max sketch is uploaded.

Sound	Readings range (LM386)	Amplitude (LM386)

(Silence)	455 ~ 547	92
Loud knock	132 ~ 897	765

Not too bad, not too great either. A loud knock gives a decent output sweep, but the readings in (relative) silence cover quite a wide range. The current draw of the sensor was 5.54mA.

Increasing the gain to 50x or 200x is unlikely to bring much improvement. It may push the output range a bit closer to 0 ~ 1024, but will increase the noise as well. At 20x gain, the output already covers 75% of the 0 ~ 1024 range.

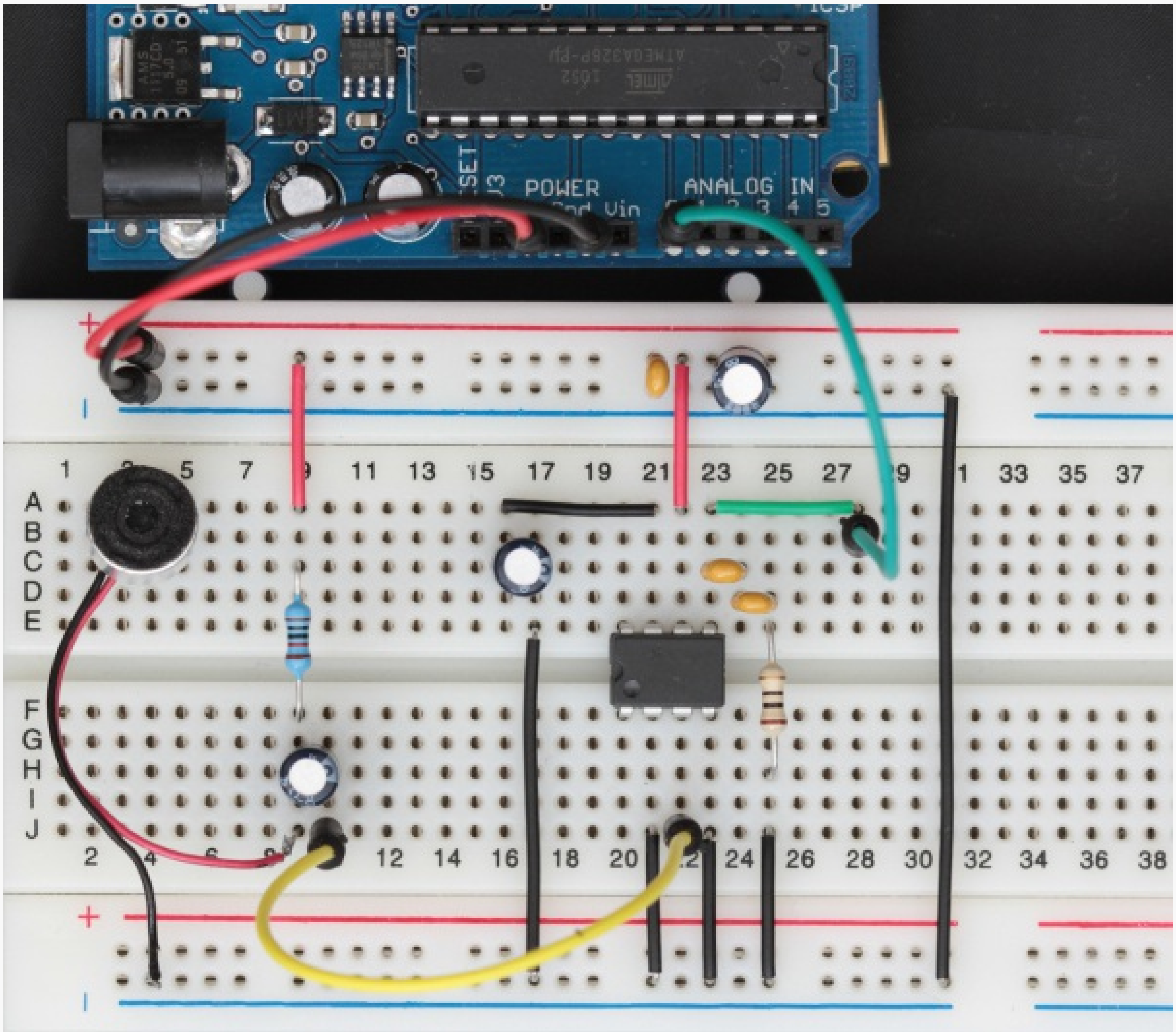
Side note: Picking the value for R2

Most sources suggest using a 1K ~ 10K resistor for R2. The easiest way to test which value works best is to use a trim-pot

Sound	Readings range (LM386)	Amplitude (LM386)
(Silence), R2=2K	369 ~ 576	207
(Silence), R2=5K	420 ~ 564	144
(Silence), R2=10K	447 ~ 549	102
Loud knock (R2=2K, 5K, 10K)	132 ~ 896	764

These are the results for my particular setup. The maximum output sweep was virtually identical for all R2 values tested and R2 = 10K yielded the lowest noise in silence.

Parts list



LM386 sound sensor on a breadboard (click for high-res)

Part	Value	Description
C1	1~10uF	Bypass capacitor
C2	10uF	Gain 200x. Optional.
C3	220uF	Output coupling capacitor
C4	47nF	Boucherot cell
C5	100nF	Power supply decoupling
C6	100uF	Power supply decoupling
C7	10uF	Microphone coupling capacitor
MIC		Electret microphone
R1	10R	Boucherot cell
R2	1 ~ 10K	Microphone load resistor
VSS	4 ~ 12V	Supply voltage

Downloads

- EAGLE schematic [.sch]
- Min-Max sketch code [.pde]

Related posts

- LM358 microphone amplifier
- LM386 audio amplifier
- Min-Max sketch

Links

- LM386 Datasheet [.pdf]
- “Powering microphones” by Tomi Engdahl