A Pickup for my Guitalele

The Piezo Pickup

I had a piezo pickup on my Guitalele but the sound was not very good so I decided to replace it with a microphone type pickup. These are quite expensive, but I'm comfortable working with electronics, and I'm a cheapskate so I decided to make one.

A decided to use an easily available Mic module, a 6050 electret.

It comes with a built in FET amplifier so it needs biasing.
The data sheet says normal operation is from a 2V supply (who makes 2V batteries?) and that it recommends a 2.2K load.

6050 Electret

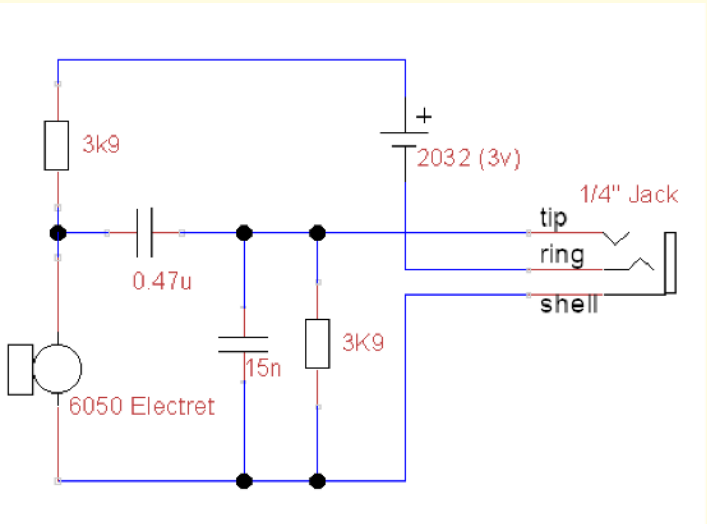
I decided to use a 2032 Lithium battery which is around 3V. Seemingly the usual FET used inside electrets is a TF2123.

I bought some from Amazon and mine take 200uA at Vgs=0V so they are probably TF2123-E4s.

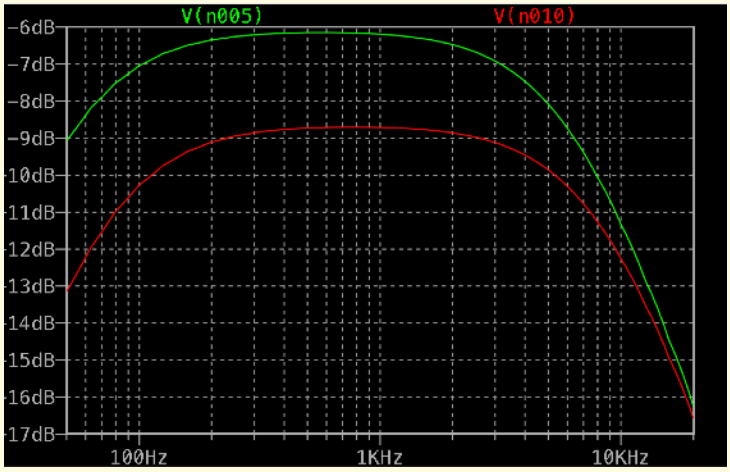
Pinch off voltage is around -380mV so max input signal from the sensor is around 0.76Vp-p. Voltage gain is around 1.5dB so max output voltage will be around 0.9V p-p.

A 2.2K load resistor, as recommended with a 2V supply, will put the mid point at 0.44V Volts from the positive rail allowing a swing of +/-0.8. I decided on a 3.9K which allows a higher swing. There is a wide variation in the FET characteristics so if the pinch off voltage is lower then maybe I can higher swing at the output.

I decided to add a filter to take out low and high frequencies and reduce the likelihood of feedback howl.



The circuit



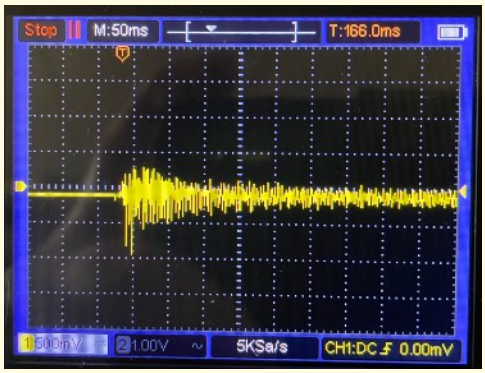
Frequency Response.
Green is with a 1M load and Red with a 4.7K

The circuit is very simple. It is shown with a stereo jack which is used to switch the battery in circuit only when the jack is inserted. It has to be a mono jack plug – but most guitar cables are.

The battery capacity is specified as 225Ah which would give an operating lifetime of 1125 hours. I'll probably just change it every 3-4 years.

I needed to see how big the signal was going to be so I built the circuit on a breadboard and fitted it into the soundhole.

I put the mic at the end so I could rotate the whole assembly to see if it sounded better under the top string or the bottom string. In the event there was hardly any difference to my ear.



I found that with a very hard strum with a plectrum I could get peaks of 1 Volt into a 1M oscilloscope probe.

In practice the signal will go to a load of around 4.7K (the **modified MX400**) so the signal would be slightly over a third or around 400mV.

While I don't usually strum hard with a pick, it's good to know the pickup could handle it.

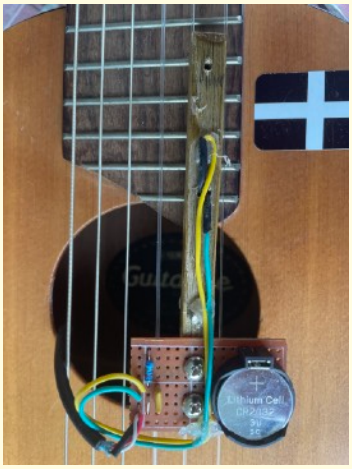
The breadboard worked, so the next job was to build the final model.

I decided to have the sensor in the middle of the sound hole mounted on a piece of wood. The wood is a piece of fencing that had been out in the rain for maybe 10-20 years, but it was treated wood so it seemed solid. I left it to dry out completely on the top of the multifuel burner for a few hours.

The sensor in the middle and the circuit at the end.

It sounds much better than the piezo pickup.

With effectively a mic facing into the room feedback howl comes in, but this happens at about the same time as it comes in through the vocal mic when using "semi close" miking - i.e 1"-2"



The component side.

And the finished job

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