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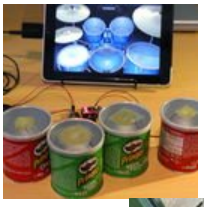

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Ever wanted to unleash your inner rock god, but couldn't find the space to put a drum kit? Frustrated at trying to play GarageBand with fat fingers? Or just someone who can't stop eating crisps? Whichever it is, this is the project for you!

This Instructable will show how to make a set of mini drum pads using Pringles tins, an Arduino, and some piezo sensors, which will trigger any MIDI device or computer drum synth. The pads are velocity-sensitive and as easy to play as drumming your fingers. Let the fun begin...

## Step 1: Ingredients!









First and foremost, you'll need 4 snack-sized Pringles cans in your favourite flavours. The other components are:

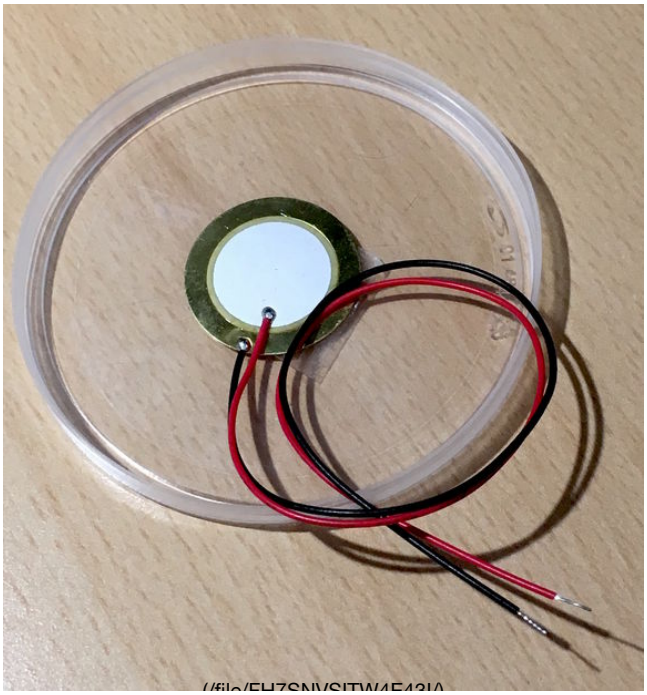
- Arduino Micro, Sparkfun Pro Micro or compatible (5V, 16MHz variant)
- 4 x Piezoelectric elements (see below)
- 1 x PNP small-signal transistor (BC558, 2N3906, or similar)
- 5-pin DIN socket
- 5 x 10K resistors
- 2 x 220 Ohm resistors
- 470 Ohm resistor
- 78L05 voltage regulator
- 1 x 22uF and 1 x 1uF electrolytic capacitor (10V or greater voltage rating)
- 100nF capacitor
- Red LED
- 1N4001 diode (or similar)
- 9V (PP3) battery and battery clip
- Prototyping board (7 x 4.5cm approx)
- Assorted 0.1" pitch PCB headers and sockets
- Double-sided adhesive tape
- Hook-up wire, solder, etc.

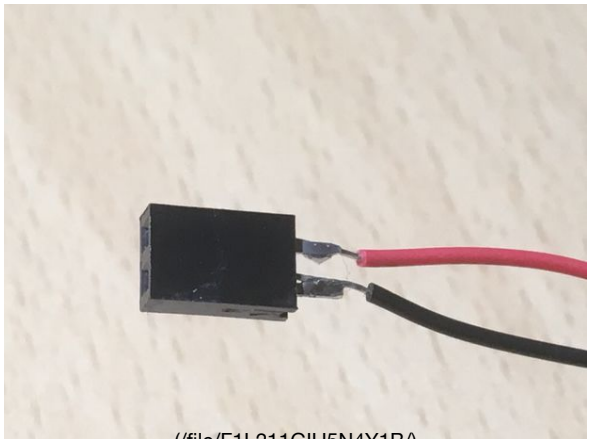
**About the piezo transducers**

What you're looking for is just a piezo element - not in a plastic case, and not with any attached electronics to make it into a beeper or sounder. I've used a couple - LS03807 (http://cpc.farnell.com/multicomp/abt-441-rc/piezo-element-27mm-4-200hz-leaded/dp/LS03807) from CPC, and YU85G (http://www.maplin.co.uk/p/3v-ceramic-piezo-transducer-3528-yu85g) from Maplin, with good results. The latter is bigger in diameter which will make playing with two fingers easier. If you can, get ones with ready-soldered wire connections - the bare discs are tricky to solder neatly.



## Step 2: Make the drum pads



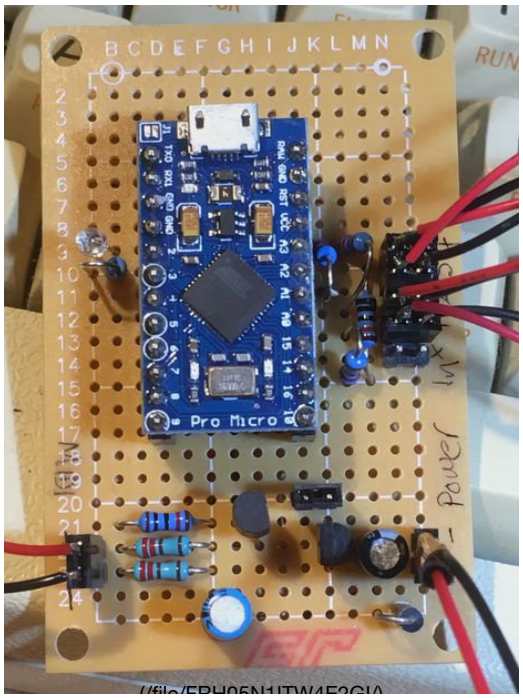



Begin by eating all the Pringles. I found that getting a child to help made this much quicker.

Wipe clean the inside of the tin and give the lid a wash to remove all grease. When dry, attach the piezo to the centre of the lid using double-sided tape, ensuring the whole metal disc is attached firmly.

Drill a small (5mm) hole in the side of the tin, poke the wires through it to the outside, then attach the lid to the can. For building the prototype, I soldered a 2-way 0.1" socket to the leads, which plugs onto a matching header on the board.

## Step 3: Assembling the circuit board



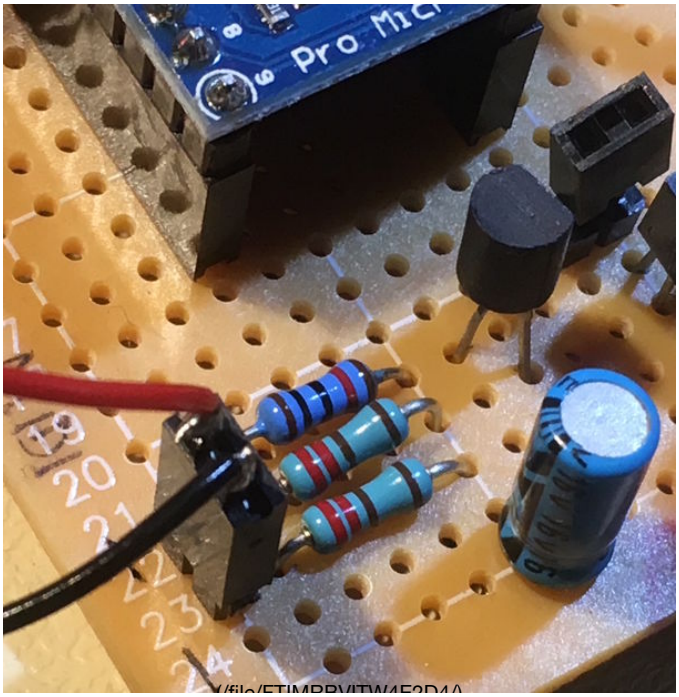

The circuit is simple enough to put together on a breadboard, but I've made a soldered version for robustness. The complete schematic is attached as file *midi-trigger.pdf*, but you may find it easier to construct in individual stages, as shown in the following three steps.

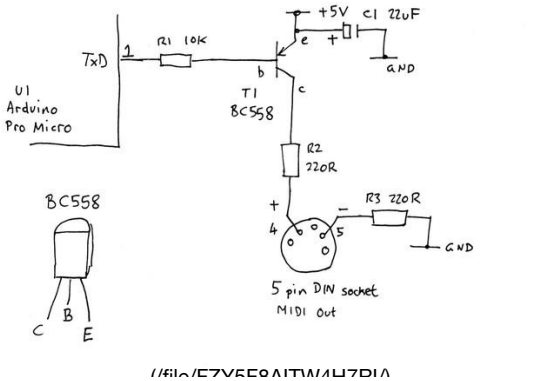
The pictures and circuit sketches show a 24-pin Pro Micro clone (see

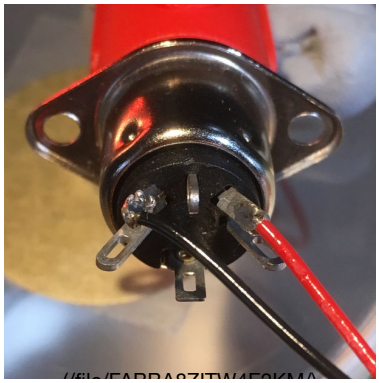
https://www.sparkfun.com/products/12640). Note that an Arduino / Adafruit "Micro" board has a different pinout, although the signal names are the same.

**midi-trigger.pdf** (/files/orig/FJN/4VWY/ITW4AUZX/FJN4VWYITW4AUZX.pdf)

## Step 4: MIDI output circuit



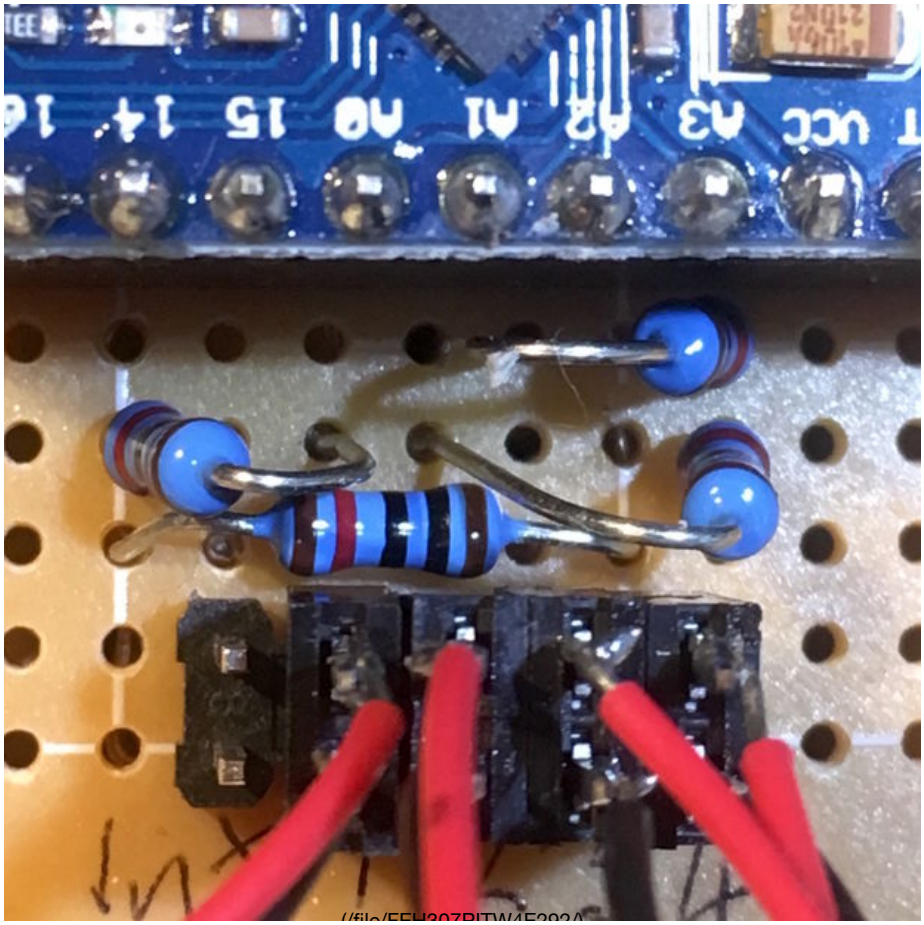


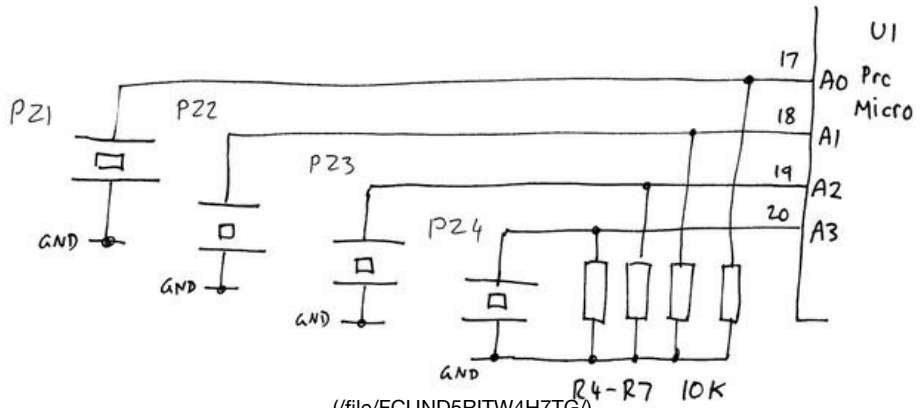



This bit of the circuit uses a transistor connected to the TXD (serial output) from the Arduino to drive the MIDI output, as shown in the circuit. Make sure you get the C, B and E connections on the transistor the right way round - the BC558 and many other transistors are connected as shown in the sketch, but some other types can vary.

I found there's a lot of conflicting information on the Internet about how MIDI is wired to a 5-pin DIN socket, so follow the photo when wiring up: the red wire is the '+' connection (to R2 in the circuit) and black is the '-' (to R3).

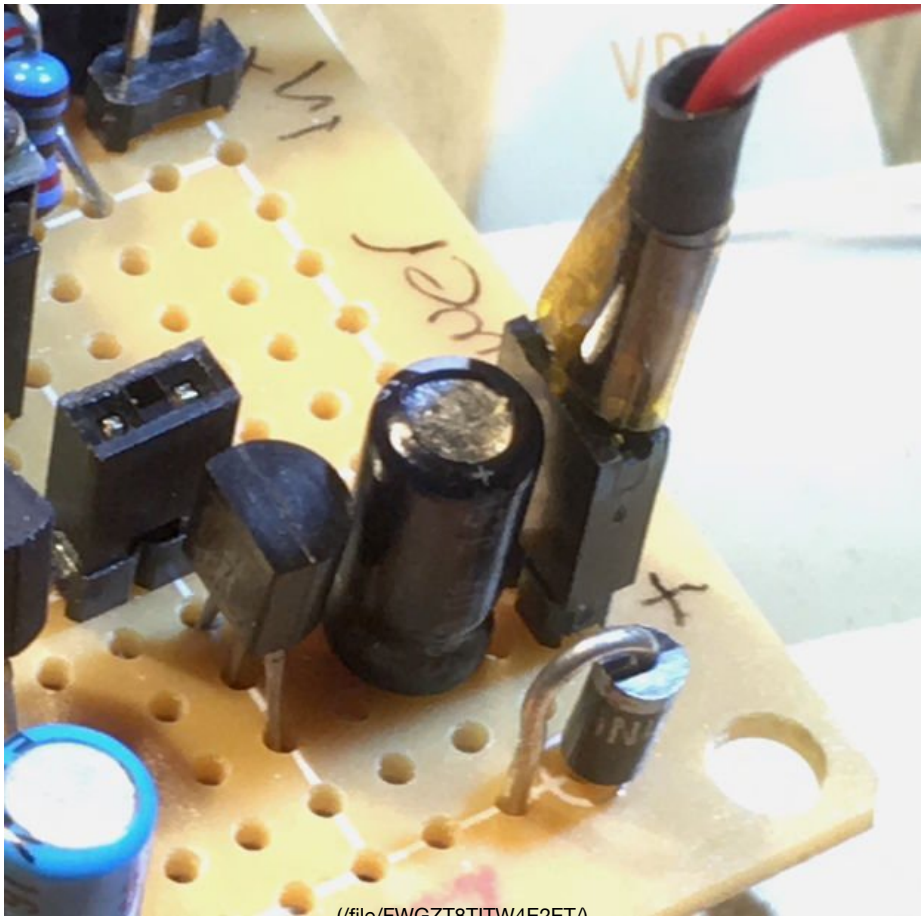
## Step 5: Pad inputs circuit

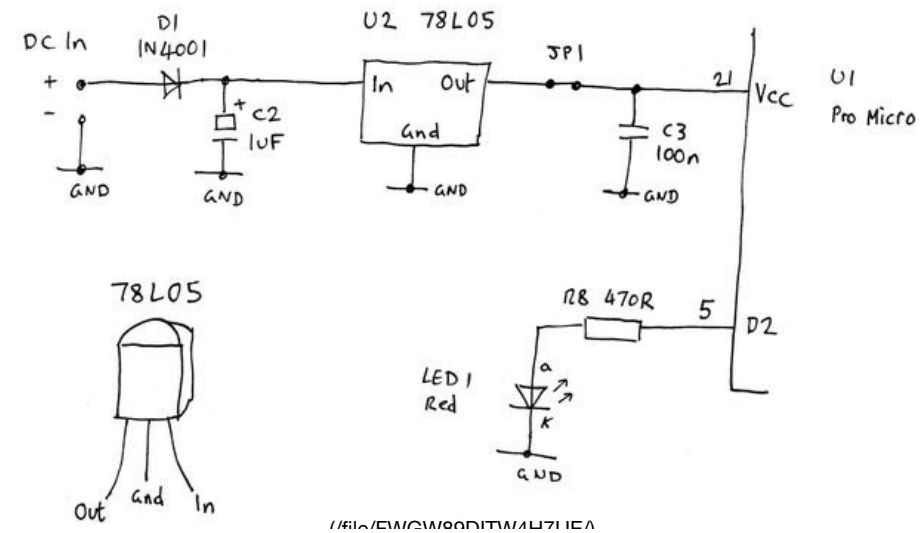





Each pad is connected directly to one of the Arduino's analog inputs (A0-A3), with a 10K resistor connected to ground as shown. You'll need a connector of some sort to allow the pads to be unplugged while assembling the rest of the board.

## Step 6: Power supply circuit (optional)



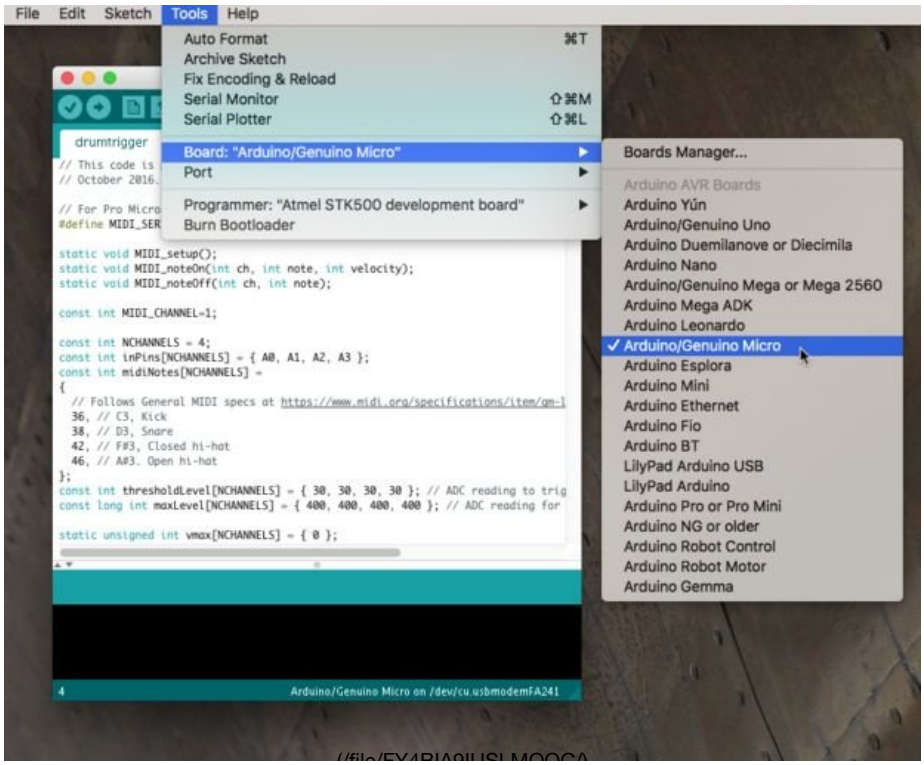



You can power the Arduino over its USB connection, plugging it in to a computer or a power bank. For maximum portability, though, I added a simple voltage regulator to run it from a 9V (PP3) battery. Current drain is about 50mA, so if you're going to use it a lot a rechargeable PP3 is a good idea. I included a removable jumper (JP1) so the regulator circuit can be disconnected when the Arduino is being powered from USB during programming.

In the circuit D1 is an "idiot diode" and will prevent the circuit from being destroyed should the battery be connected the wrong way round by mistake - this is surprisingly easy.

Also shown in the circuit here is a status LED connected to the D2 pin on the Arduino. The firmware flashes this whenever a trigger is detected. This is also completely optional, but can be a really useful troubleshooting aid.

## Step 7: Programming and testing




If you're new to Arduino it's a good idea to get the Arduino IDE set up and working with a simple example program first. Here are some useful links:

- Arduino software download page: https://www.arduino.cc/en/Main/Software (https://www.arduino.cc/en/Main/Software)
- Arduino Micro page: https://www.arduino.cc/en/Main/ArduinoBoardMicro (https://www.arduino.cc/en/Main/ArduinoBoardMicro)
- Sparkfun's hook-up guide: https://learn.sparkfun.com/tutorials/pro-micro--fi... (https://learn.sparkfun.com/tutorials/pro-micro--fio-v3-hookup-guide)
  - Note that the latest versions of the Arduino IDE have support for the Micro board built-in, so you won't need to add extra board support files.

If you included a status LED (see previous page), the attached file *blink.ino* will toggle it on and off every second. If this is working you can download *drumtrigger.ino*, which is the complete drum trigger program in one file.

The impatient among you can just upload it to the Arduino, plug everything together, and go!

If things aren't quite working right, try the following tips:

- The status LED will blink any time a trigger input is sensed on the A0-A3 pins. If this isn't working, re-check the wiring to the piezo sensors. You can simulate a trigger input by temporarily linking one of A0-A3 to the +5V supply with a piece of wire; the status LED should flash quickly for as long

as a high voltage level is detected on any input.

- If the status LED is being triggered, but you're getting no MIDI action, check the polarity of the wiring to the DIN socket. The drum trigger transmits on MIDI channel 1, but it can be helpful to use a synth that can be set to MIDI "Omni" mode to avoid confusion.
- You can also plug the circuit into the MIDI In on a computer and use a 'MIDI Monitor' program (often built into sequencer or DAW software) to show any received Note On and Note Off messages.

**Blink.ino** (/files/orig/F96/5BMH/IUSLMFGT/F965BMHIUSLMFGT.ino)

**drumtrigger.ino** (/files/orig/FKC/57UF/IU9VFK5E/FKC57UFIU9VFK5E.ino)

## Step 8: In use

# Pringle Can MIDI Drums by

TheSpodShed (/member/TheSpodShed/) in arduino (/tag/type-id/category-technology/channel-arduino/)

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With a bit of luck, you can plug it straight in to a MIDI drum synth and start playing. The four pads transmit kick drum, snare, closed hi-hat and open hi-hat note values according to the General Midi specification (see "General MIDI Level 1 Percussion Key Map" at https://www.midi.org/specifications/item/gm-level... (https://www.midi.org/specifications/item/gm-level-1-sound-set) ).

In the first picture I'm using Apple's GarageBand on an iPad via a Yamaha i-MX1 MIDI interface. For newer iOS devices with a Lightning port, a standard USB-to-MIDI cable plugged into Apple's Camera Connection Kit adapter works fine.

If the MIDI channel or note values aren't right for your intended use, you can edit *drumtrigger.ino* to suit. Change the value of `MIDI_CHANNEL` or the values in `midiNotes`, respectively. To convert from note names to numbers there are many handy charts on the 'net e.g. http://www.midimountain.com/midi/midi_note_numbers... (http://www.midimountain.com/midi/midi_note_numbers.html) .



**ндогонят (/member/ндогонят)** 4 hours ago Reply

Hi,

I love the idea, and I'm on the verge of making it with 6 drums connected from A0 to A5 (using a Deek Robot with an ATMega328P, although I usually make my own Arduino compatible boards clocked at 20MHz). I'm going to power it through USB attached to the MacBook, so far so good. How would I do to send the TX back to the USB (and avoid the MIDI connection completely) so it's recognised as an autonomous USB device without the need of a MIDI adapter plugged in another USB port (I don't have so many ports...)?

I'm voting for you anyway :-)

Cheers

**Omy4 (/member/Omy4)** 21 hours ago Reply

its very hard man

**moekoe (/member/moekoe)** a day ago Reply

Very nice and simple solution of a drum kit! :)
Will definitely build one. Also voted for you in the constest!

**Jean-Claude GERMAIN (/member/Jean-Claude GERMAIN)** 2 days ago Reply

That's clever !

Concerning the code I get "Serial1 was not detected in this scope"

I use an arduino UNO card, unstead Pro Micro card. Could it be the reason of the error message ?

Many thanks for your help

Jean-Claude from France

**TheSpodShed (/member/TheSpodShed)** (author) ▸ Jean-Claude GERMAIN (/member/Jean-Claude GERMAIN) a day ago Reply

Yes - the 32U4 based boards like the Micro and Leonardo have a "Serial", which is the USB connection to the host, and a "Serial1" which is the separate Rx/Tx pins on the board.

For a Uno you can change Serial1 to Serial everywhere, and use the Uno's Tx pin for MIDI out, but note that this serial port is also used for programming the Uno. So you will need to disconnect anything connected to MIDI out when uploading the sketch, to stop it receiving rubbish.

Thanks

Ian

**Jean-Claude GERMAIN (/member/Jean-Claude GERMAIN)** ▸ TheSpodShed (/member/TheSpodShed) a day ago Reply

Hi Ian,

Many thanks for your quick answer, which is very accurate

For me, the simplest solution is to order a Arduino micro card. So I

placed an order a few minutes ago. I'll be back to you when It works
Have a good day
Jean Claude

**Ardu95 (/member/Ardu95)** 3 days ago Reply

Nice job. Cool idea and your project description is really good.

This will be a nice christmas present for my son.

**TheSpodShed (/member/TheSpodShed)** (author) ▸ Ardu95 (/member/Ardu95)
a day ago Reply

Thanks - if you build one, post a picture!

Cheers

Ian

**makendo (/member/makendo)** 6 days ago Reply

Very cool. I think you need to branch out and try some more varieties of Pringles, though! Would be great to see it in action, too

**TheSpodShed (/member/TheSpodShed)** (author) ▸ makendo (/member/makendo)
6 days ago Reply

Ta-daa! Quick video now posted. Disclaimer - I am *not* a drummer, as you can tell.

**randyis714 (/member/randyis714)** ▸ TheSpodShed (/member/TheSpodShed)
3 days ago Reply

Hello, I love this,I NEED this! Lol....awesome idea,but where is the video of you trying them out?

**TheSpodShed (/member/TheSpodShed)** (author) ▸ randyis714 (/member/randyis714)
a day ago Reply

It's just under the first picture, on the front page (for me at least). The video itself is at https://vimeo.com/189460103 (https://vimeo.com/189460103) (called "Pringles can drum kit") if that's easier.

Thanks

Ian

**makendo (/member/makendo)** ▸ TheSpodShed (/member/TheSpodShed) Reply
6 days ago

great stuff. Sounds crisp

**soccermathcat (/member/soccermathcat)** ▸ makendo (/member/makendo)
3 days ago Reply

Was that a pun? *crisp*

**SusanH75 (/member/SusanH75)** 3 days ago Reply

This is just so awesome!

**miticm (/member/miticm)** 4 days ago Reply

perfect! That is so cool

**Ninjacat1 (/member/Ninjacat1)** 5 days ago Reply

That is epic

**ThriftStore Hacker (/member/ThriftStore Hacker)** 6 days ago Reply

Awesome build.

**Anirudh Ralhan (/member/Anirudh Ralhan)** 6 days ago Reply

That's some creative recycling there....

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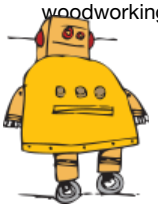

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