
Options for wearable microcontrollers

by Boris Kourtoukov

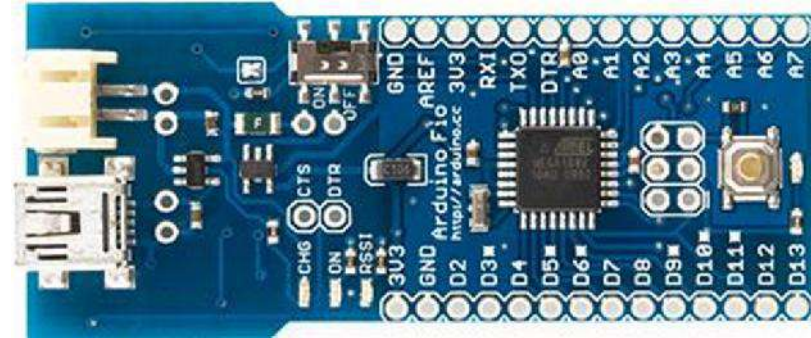
Introduction

In this presentation I hope to give an in-depth look at the current available microcontrollers useful directly for wearable projects. As well as tips from personal experience with some of these.

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Arduino Fio

Based on my experience the Fio is the most versatile board design for more complex wearable projects. It fits the main requirement of being a 3.3 volt board, making it compatible with the very common 3.7 volt LiPo batteries. It also has a charging circuit for the said batteries when the board is plugged in via the USB port. Speaking of which, programming the fio is easier than some of the latter boards in this presentation simply because you don't need a secondary FTDI breakout. Perhaps most importantly the Fio comes with an XBEE compatible slot on the back. This lets you connect any device with an XBEE footprint, I had a chance to use this with a bluetooth breakout from sparkfun.

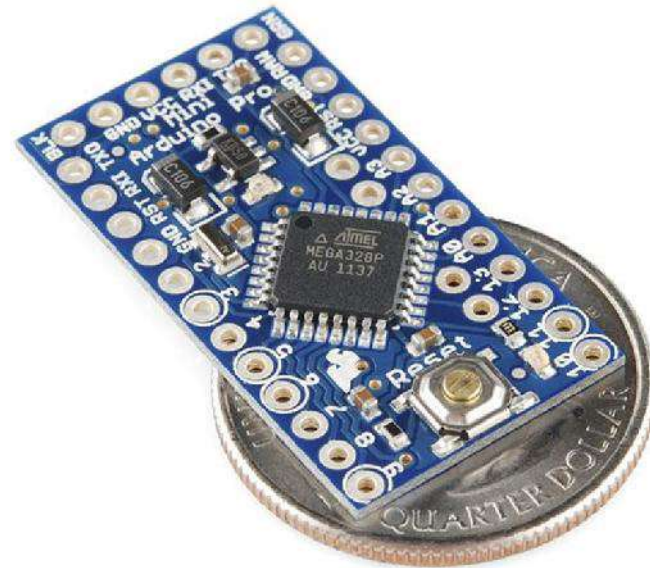


\$24.95 - \$34.95 (v3)

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Arduino Pro Mini

The biggest advantage of the Pro Mini is its size. The whole arduino fits on a 0.7x1.3" rectangle. It does require a bit more work to get going though. An FTDI breakout is necessary in order to program it and if using LiPo batteries it doesn't have a built in charging circuit. With that said it has more than enough inputs and outputs for most projects as well as having nearly the same amount of power as the much larger Fio. The other bonus is the price, pro mini comes in at just under \$10, which makes it very attractive for permanently embedded projects.



\$9.95

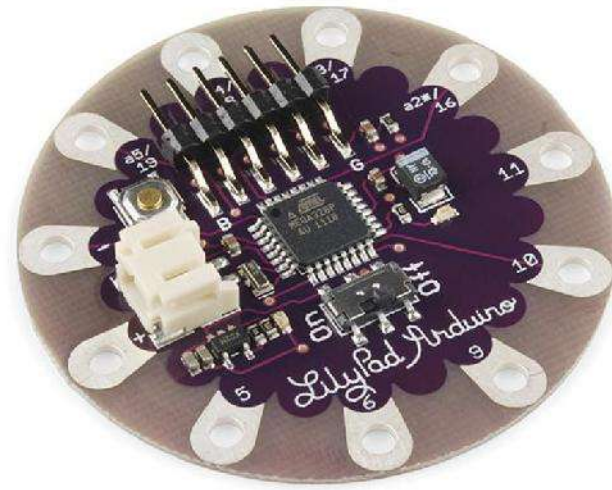
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Arduino LilyPad

The power of the LilyPad comes from its design and ecosystem. Leah Buechley created directly for wearables use. From the easy to sew tabs to the fact that it is washable, this board is great for projects that need to work with E-Textiles like conductive thread. These exact features are transferred to the LilyPad ecosystem. Which features numerous sensors and outputs from switches to XBEE breakouts.

There are four core boards: main, simple, simple snap and USB.

The main board is really handy if you need a lot of inputs and outputs for your project. It has a total of 22 pins, with 6 analog input pins. The only negative is that the battery requires a sewn connection rather than the more common LiPo plug that is available on the rest.



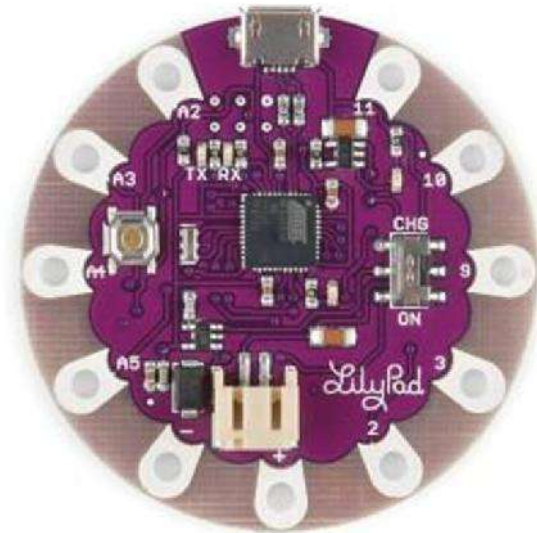
\$19 - \$29

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Arduino LilyPad - Continued

Simple and Simple snap are the same board as far as code is concerned. The snap has the addition of snap tabs that let it be far more easily added or removed. The snap has the benefit of a permanently attached LiPo battery. Be careful if you chose these as you need make sure that 11 I/O pins (4 analog) is enough for your project!

The USB version (right) has similar features to the Fio, including the LiPo charge circuit but excluding the XBEE slot. It makes for a much nicer development experience, but also echoes the warning about only having 11 I/O options.



\$19 - \$29

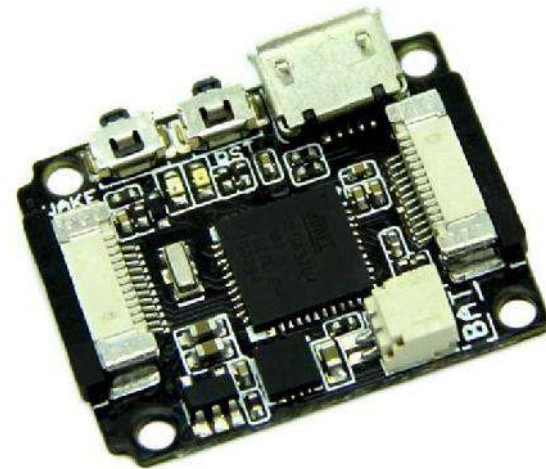
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Xadow

The Xadow is a peculiar new offering from Seeedstudio. Like the LilyPad the major benefits are the design and ecosystem.

The main feature of the Xadow system is the thin flexible connectors used to attach different compatible modules together. These connectors allow for a new way of working with wearables, retaining flexibility while maintaining stability.

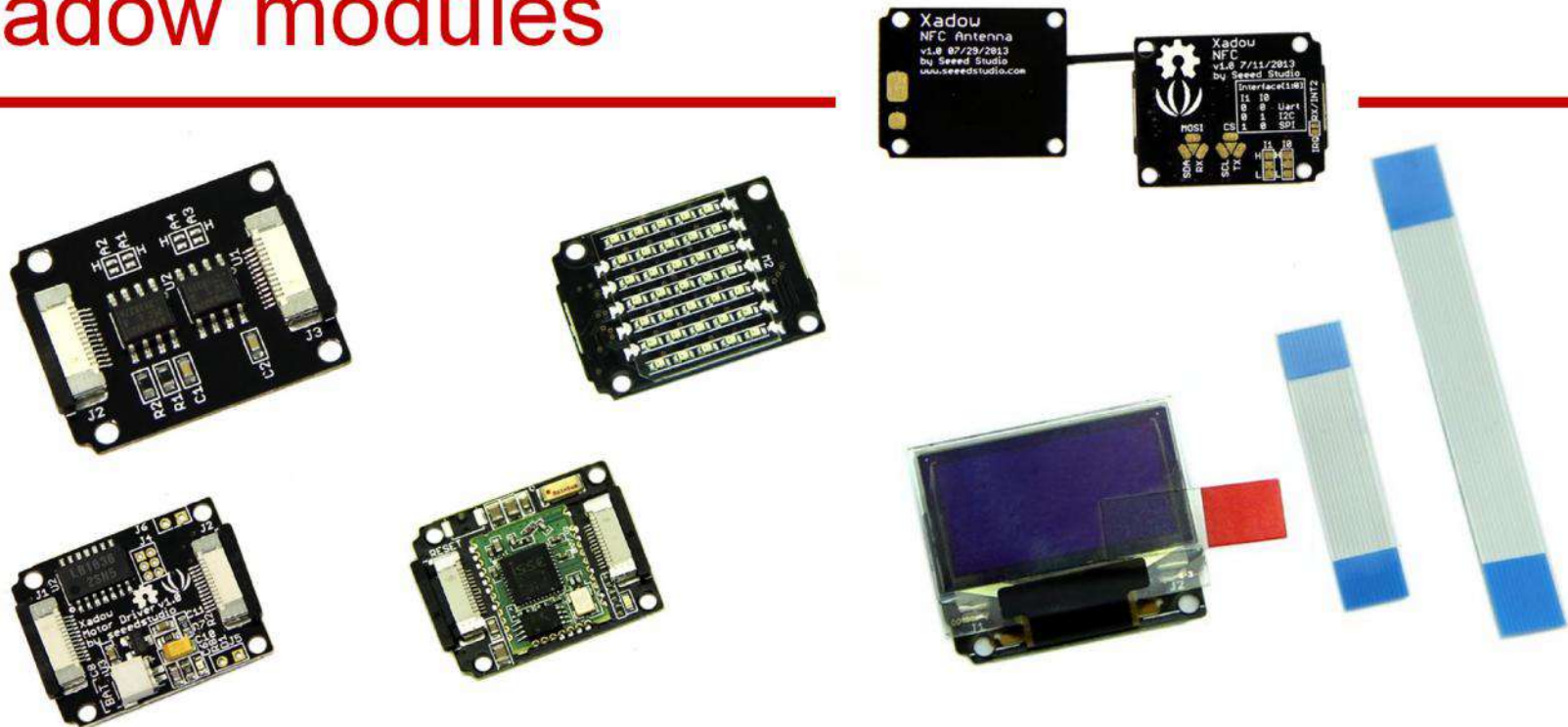
This leads to the compatible modules. Xadow has a more diverse selection than the LilyPad, modules range from data storage to a full GPS antenna.



\$19.90

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Xadow modules



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Flora

The Flora is a direct alternative to the LilyPad. It provides similar design values with a slightly more diverse ecosystem.

There are many sewable modules available, from high end GPS antenna to colour light sensors. This gives it a bit more of a punch when more complex functionality is necessary.

From my experience with sewing electronics, the smaller sew tab holes in the Flora could pose a bit of an annoyance while working with it.

One note is that although the Flora has a standard JST connector for LiPo batteries it doesn't have an on-board charging circuit to charge them. (This does allow for more power input options though)

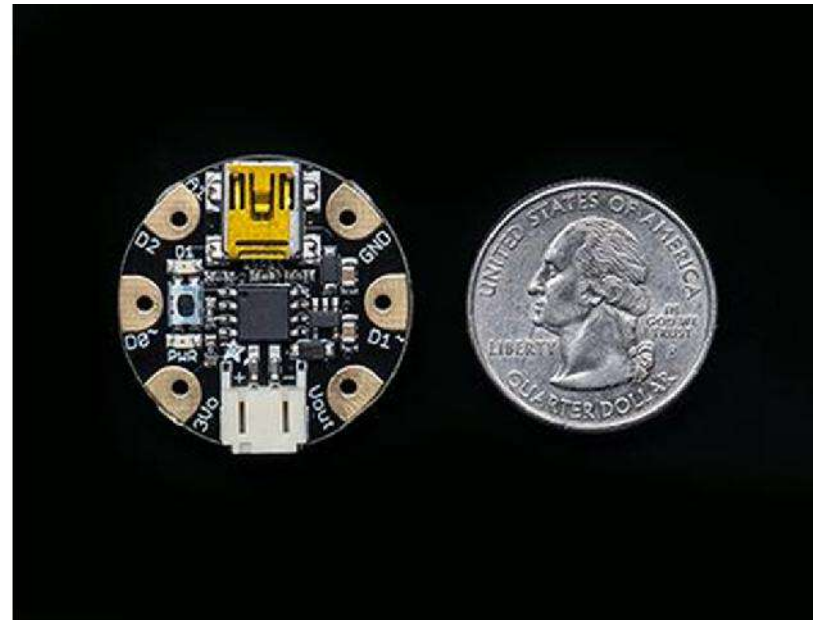


GEMMA

This is a very interesting direction in wearable microcontrollers. Also designed by Adafruit and heavily related to the Flora, the Gemma is great for really small projects that don't require a whole lot of I/O.

This thing is /almost/ the size of a quarter and priced cheaper than the mini. A great option for small permanent projects.

Though one major drawback is the complete lack of a serial port, making debugging sketches a bit more difficult. And possible issues with windows 8 not recognizing the board.



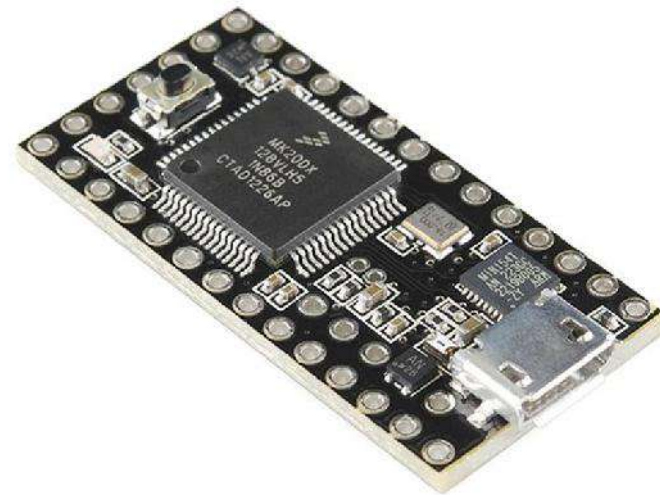
\$7.95

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Teensy 3.0

Here is a really interesting one, this tiny board (1.4 x 0.7") runs a full 32 bit ARM processor. (Similar architecture to what is used in many mobile phones today). This gives the board quite a punch, it is also possible to program this board directly with C or still use the Arduino IDE with just a small patch. (oh and it is a 3.3 volt device!)

With that said this device will shine for more advanced projects that can make use of the power available on-board.



\$19.95

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Thank you!

All sources and updates can
be found on [my blog](#).

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