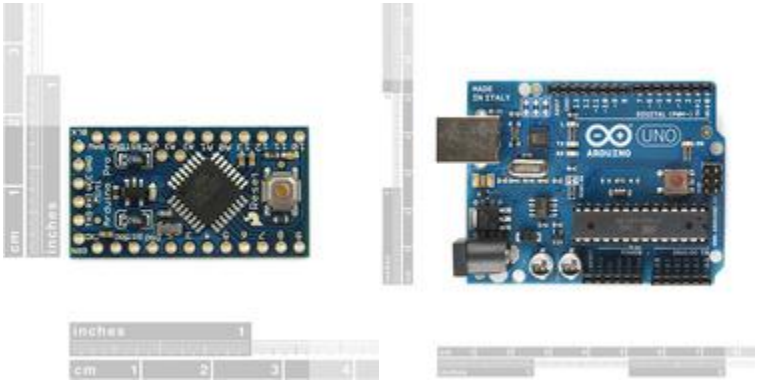
RB-Spa-677

Pro Mini 3.3V / 8MHz Arduino Compatible Microcontroller

What the Arduino Pro Mini is and isn't

The original, true-blue Arduino is open-source hardware, which means anyone is free to download the design files and spin their own version of the popular development board. SparkFun has jumped on this opportunity and created all sorts of Arduino variants, each with their own unique features, dimensions, and applications. Now one of those variants has landed in your hands; congratulations! It's a wild world out there in microcontroller-land, and you're about to take your first step away from the wonderful, though sometimes stifling, simplicity of the Arudino Uno.

So what differentiates the Arduino Pro Mini from the Arduino Uno? Well, obviously, the most major difference is the form factor. The Pro Mini's pretty...mini, measuring in at just 1.3x0.70". It's about 1/6th the size of the Arduino Uno. The compact size is great for projects where you may need to fit the Arduino into a tiny enclosure, but it also means that the Pro Mini is *not* compatible with Arduino shields (at least not physically compatible, you could still hard-wire the Mini up to any Arduino shield).



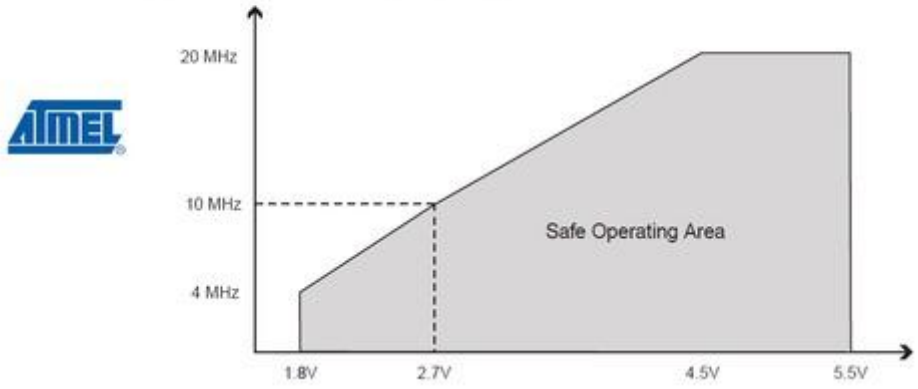
The Mini packs almost as much microprocessor-punch as the regular Arduino, but there are a few major hardware changes you should be aware of before you start adapting your project to the Mini. The first glaring hardware difference is the voltage that the Mini operates at: **3.3V**. Unlike the Arduino Uno, which has both a 5V and 3.3V regulator on board, the Mini only has one regulator. This means that if you've got peripherals that only work at 5V, you might have to do some level shifting before you hook it up to the Pro Mini (or you could go for the 5V variant of the Pro Mini).

A variation from the standard Arduino lies in the speed that the ATmega328 runs at. The Pro Mini 3.3V runs at **8MHz**; half the speed of an Arduino Uno. We put a slower resonator on the Mini to guarantee safe operation of the ATmega. That said, don't let the slower speed scare you away from using the Mini; 8MHz is still *plenty* fast, and the Mini will still be capable of controlling almost any project the Arduino Uno can.

Speed Grades

Maximum frequency is dependent on V_{CC}. As shown in Figure 28-1, the Maximum Frequency vs. V_{CC} curve is linear between $1.8V < V_{CC} < 2.7V$ and between $2.7V < V_{CC} < 4.5V$.

Figure 28-1. Maximum Frequency vs. V_{CC}



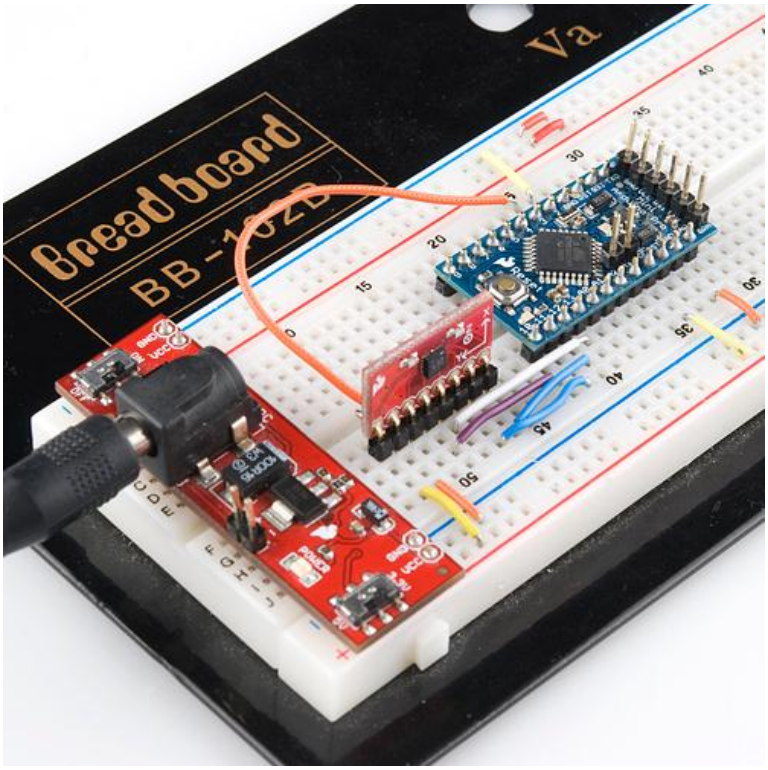
One last missing piece of hardware is the Atmega8U2-based **USB-to-Serial converter**, and the USB connector that goes with it. All of the USB circuitry had to go for us to make the Pro Mini as small as possible. The absence of this circuit means an external component, the FTDI Basic Breakout, is required to upload code to the Arduino Pro Mini.

Assembling the Pro Mini

The Arduino Pro Mini doesn't look like much when you first get it, it's as bare-bones as can be. We've left it up to you to solder headers or wires into the open holes. There are a few things I'll make you aware of though.

First, decide how you want to connect the FTDI Basic Breakout to the Pro Mini's **programming header**. The programming header is row of six pins on the side of the board, labeled 'BLK', 'GND', 'VCC', 'RXI', 'TXO', 'GRN'. Because the FTDI Basic board is equipped with a female header, I usually equip my Mini's programming header with mating male headers, either straight orright-angle.

Your method for assembling the rest of the headers is completely up to you. There are many options, you could solder in male headers to make it breadboard-compatible, female headers to make it compatible with our jumper wires, or just solder stranded-wire straight into the pins. It's versatility is what makes this board so great; assemble it in whatever way makes the most sense for your project.

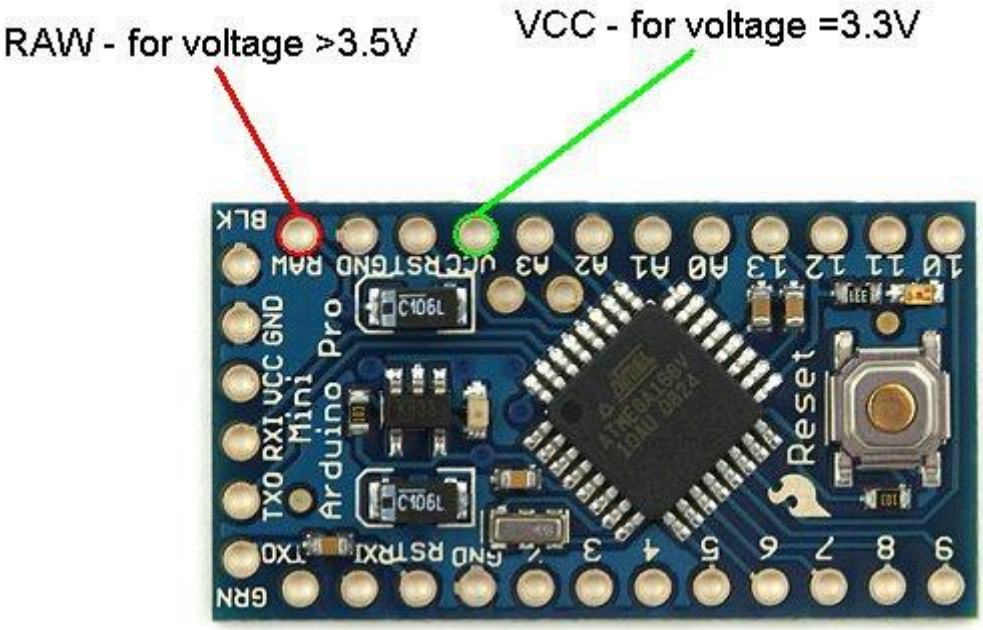


One more thing to add, if you think your board is missing the **4 and 5 analog pins**, check the labels on the bottom of the board. A4 and A5 are the two pins scrunched between the ATmega328 and A2 and A3. Keep their location in mind if you need to make use of all analog pins, or if you'll use them to communicate with any peripherals that use a two-wire/I²C interface.

Powering the Arduino Pro Mini

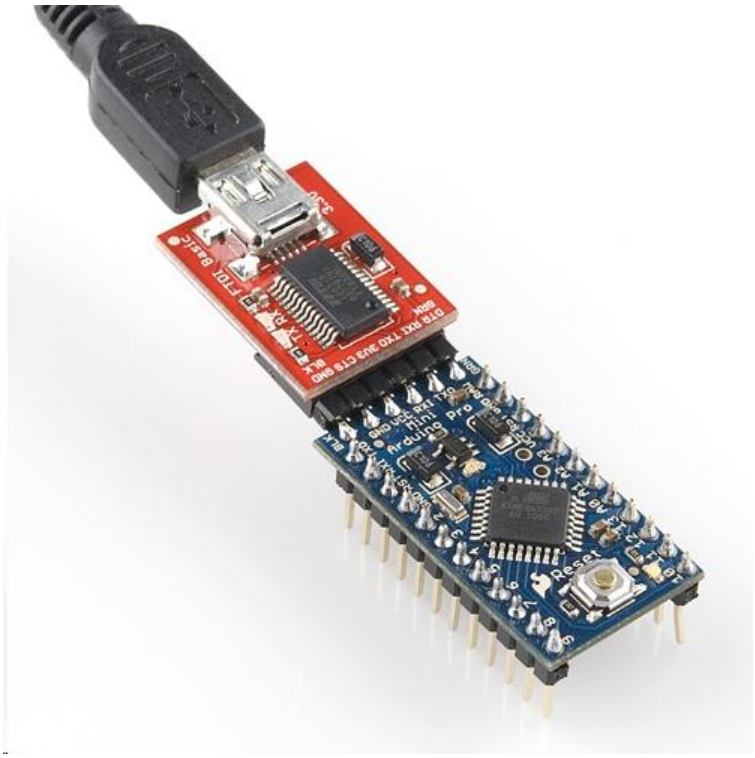
The most important factor in any project is what's going to power it all. The Pro Mini doesn't have a barrel jack, or any other obvious way to connect a power supply, so how do you power the thing?

There are a couple locations on the Pro Mini for you to connect your power source. If you have a supply that's **greater than 3.3V**, you'll want to connect that to the **'RAW'** pin on the Mini. This pin is akin to the 'VIN' pin on the Arduino Uno, and the voltage applied here is regulated to 3.3V before it gets to the processor. Just be careful not to apply more than 12V to this pin.



If you have a **regulated 3.3V** source from somewhere else in your project, you can connect that directly to the **'VCC'** pin. This will bypass the regulator and directly power the ATmega328. Don't forget to connect the **grounds (GND)** too!

There is a third power option that's only usually available while you're programming the Pro Mini. The FTDI Basic Breakout can be used to power the Mini, via your computer's USB port. However, keep in mind that this option may not be available when your project has entered the wild, away from any computers.



The actual power source choice is subject to your project's needs. If you want something that matches the compactness of the Pro Mini, a battery – LiPo, alkaline, coin cell, etc. – may be a good choice. Or you could use a wall power supply along with a barrel jack adapter. Or maybe a computer power supply connected via our Benchtop Power Board Kit. Endless options!

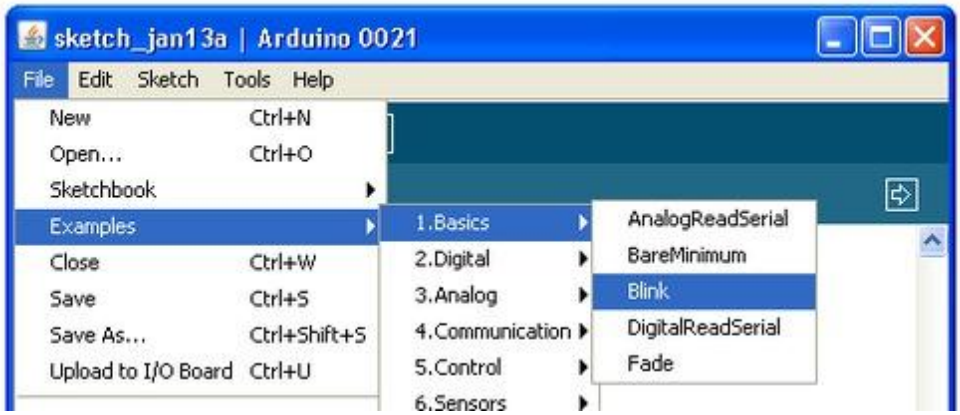
Programming the Pro Mini

If you've never used an Arduino before (how bold of you to go straight for the Mini!), you'll need to download the IDE and drivers. Any downloads you'll need can be found on Arduino'sdownloads page; make sure you pick the download that applies to your OS. Once downloaded, you'll need to **extract** (Windows) or **copy** (Mac) the **Arduino folder** into a directory of your choice on your machine. Next you'll need to **install the drivers** for the FTDI Basic Breakout. For more detailed installation instructions, nobody does it better than Arduino, but here's a quick breakdown.

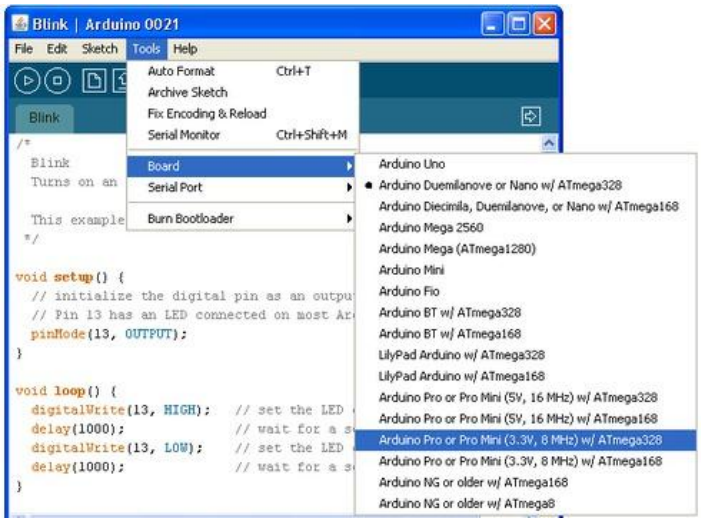
If you're a PC: you'll first need to plug the FTDI Basic Breakout in, at which point you'll be prompted to continue driver installation. Follow the instructions here under the “Installing drivers for the Arduino Duemilanove, Nano, or Diecimila with Windows7, Vista, or XP:” heading.

If you're a Mac: double-click the “FTDIUSBSerialDriver_10_4_10_5_10_6.mpkg” icon in the image that you downloaded, and follow the installer's instructions.

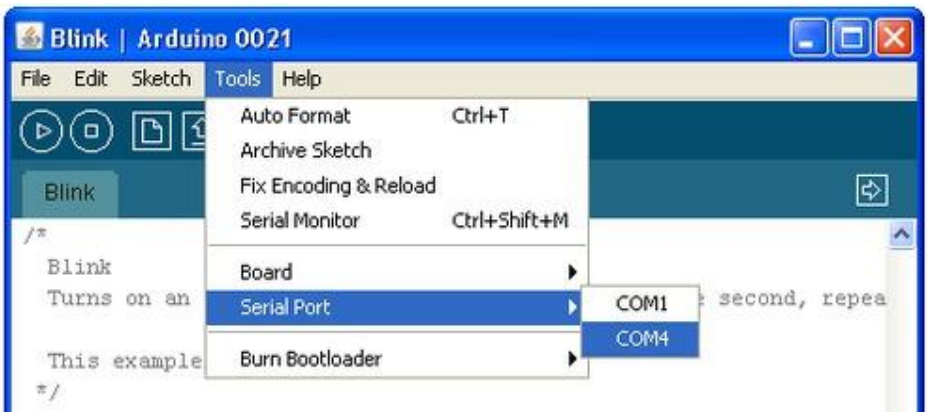
Once the Arduino files have a home on your computer, and the FTDI drivers are installed it's time to get programming. We'll start by uploading everyone's favorite sketch, **Blink**. Open up Arduino by double-clicking the *Arduino.exe* application, then open the blink sketch by going to*File* > *Examples* > *1.Basics* > *Blink*.



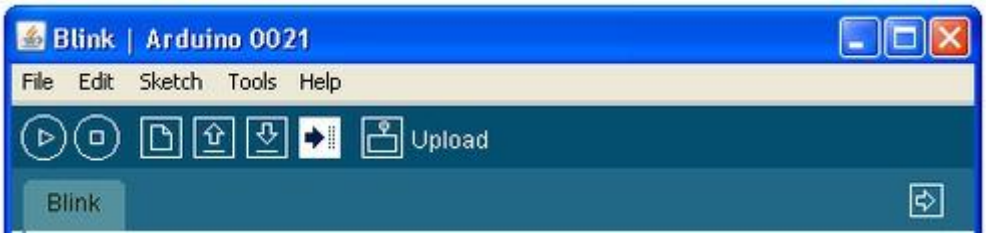
Before we can upload the sketch to the Mini, you'll need to tell Arduino what **board** you're using. Go to *Tools* > *Board* and select *Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328*. This tells Arduino to compile the code with an 8MHz clock speed in mind, that way the delay(1000) calls will actually delay one second.



You'll next need to tell Arduino which **serial port** your FTDI Basic Breakout has been assigned. On Windows this will be something like COM2, COM3, etc. On Mac it'll look something like '/dev/tty.usbserial-A6006hSc'.



Finally, your all set to upload the sketch to your Mini. Click on the ***Upload*** button. After a few moments you should see the red and green RX/TX LEDs on your FTDI board flash, followed by a “Done Uploading” message in Arduino's status bar. Voilà, Blinky! The Mini may be missing a few components, but it's got the most important component, LEDs!



Schematic and PCB Layout

Like it's predecessor, the Arduino Pro Mini is open-source hardware, which means you're free to download and use the schematic and PCB layout files. For more information on the Arduino Pro Mini, first check out our product page as well as Arduino's Pro Mini homepage.

And beyond...

The rest is up to you. You've got the power of an Arduino in a miniature little package, and we would love to hear what you do with it! If you don't have a project idea yet, here's a few projects that we've used the Mini in:

- iFOBing A Mazda
- Mixed Signal Costumes
- Snake Stomp Pads