
1

Getting Started

Sparkfun Inventor's Kit

Teacher's Helper

These worksheets and handouts are supplemental material intended to make the educator's job a little easier by providing easily editable content. You can use these files however you see fit. Add a question here, delete a question there and definitely add some graphics if you like. The worksheets are intended for use after completion of the SparkFun Inventor's Kit or as you go along. There is no particular order so you can use whichever worksheets you wish, whenever you think is best.

The SparkFun Inventor's Kit is a great introductory tool to get people interested in electronics and physical computing. This is the first collection of worksheets that pertain to the SparkFun Inventor's Kit. We would appreciate any feedback you feel would be useful. Topics we missed, projects you put together using the SparkFun Inventor's Kit, typos, gripes, material you have put together about this type of technology that you would like to share or stuff that was really, really useful. Basically we want you and your students to eventually be able to build robots that can sing, dance and take over the world... or at least your imagination.

Included material:

- Worksheets and handouts for S.I.K. circuits 1 – 14
- Answers to worksheets (creative answers left blank, Ohm's Law answers may vary)
- Expansion code for use in Arduino
- Images to create your own schematics
- Surveys for teachers and students to aid in development of material
- Fritzing (virtual prototyping software)

This material is a work in progress - feel free to contribute if you are so inclined.

Send feedback, worksheets or completed surveys to:

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// Installing Arduino // Installing Fritzing

Mac platform

1. Double click the file **arduino-0022.dmg** inside the folder \SIK Applications\Mac\
2. Go to “Arduino” in the devices section of the finder and move the “Arduino” application to the “Applications” folder.
3. Go to the “Arduino” device, double click and install:
“FTDI drivers for Intel Macs 0022.pkg”
or
“FTDI drivers for PPC Macs 0022.pkg”
then Restart your computer.
4. Plug your Arduino board into a free USB port using the USB cord provided.

PC platform

1. Unzip the file **arduino-0022** inside the folder \SIK Applications\PC\. We recommend unzipping to your c:\Program Files\ directory.
2. Open the folder containing your unzipped Arduino files and create a shortcut to Arduino.exe. Place this on your desktop for easy access.
3. Plug your Arduino board into a free USB port using the USB cord provided. Wait for a pop up box about installing drivers.
4. Skip “searching the internet.” Click “Install from a list or specific location” in the advanced section. Choose the location c:\program files\arduino-0022\drivers\Arduino Uno\

(You may have to do this last step more than once) (If you are using the Duemilanove you will have to choose the sub-directory, FTDI USB Drivers and you will have to do this twice)

If you are having issues with Java make sure you have the latest version of Java installed. If not you're ready to open the Arduino programming environment.

(For Linux info go to www.arduino.cc/playground/learning/linux)

Mac platform

1. Move the Fritzing folder from \SIK Applications\Mac\ to somewhere convenient on your computer.
2. Double click the file: **fritzing.2010.09.30.mac**

PC platform

1. Move the Fritzing file from \SIK Applications\PC\ to somewhere convenient on your computer.
2. Double click the file: **fritzing.2010.09.30.pc**

You're ready to start using Fritzing for virtual prototyping.

// A few notes about setup

A few more tidbits that will help to know

There are seven buttons at the top of your Arduino window, and these are their functions:



Compile

This checks your code for errors.



Stop

This stops the program.



New

This creates a new sketch.



Open

This opens an existing sketch.



Save

This saves the open sketch.



Upload

This uploads the sketch to your Arduino.



Serial Monitor

Used to display Serial Communication.

Selecting Your Board

You are using the SparkFun RedBoard with an ATmega 328 microcontroller. This means you will need to select “Arduino Uno” as your board. To do this you click on the “Tools” menu tab, then click the “Board” tab and select “Arduino Uno”. If you are using a different board you will need to select the correct model in order to properly upload to your board.

Selecting Your Com Port

Another option that is necessary to change occasionally is your “Serial Port”. This can also be found under the “Tools” menu tab. When you click on this tab you should be presented with at least one com port labeled “COM1” (or “COM2,” etc....) This indicates which USB port your board is plugged into. Sometimes you will need to make sure you are using the correct com port. Here is some information on your com ports depending on which platform you are using:

Mac Platform

The Mac version of the Arduino IDE refreshes your com port list every time you plug in a device. For this reason all you really need to do is select the com port called “/dev/cu.usbserial-XXXX” where XXXX will be a value that changes.

PC Platform

The PC version of the Arduino IDE creates a new com port for every distinct board you plug into your computer. You will need to find out which com port is the board you are currently trying to use. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu; the entry that disappears should be the Arduino board. Reconnect the board and select that serial port.

Installation

Arduino: <http://www.arduino.cc/en/Guide/HomePage>
Fritzing: <http://fritzing.org/download/>

Support

Arduino: <http://www.arduino.cc>, <http://www.freeduino.org>
Fritzing: <http://www.fritzing.org/learning/>

Forums

Arduino: <http://forum.sparkfun.com/viewforum.php?f=32>
Fritzing: <http://fritzing.org/forum/>

Basic Arduino Code Definitions

setup(): A function present in every Arduino sketch. Run once before the loop() function. Often used to set pinmode to input or output. The setup() function looks like:

```
void setup( ) {  
  //code goes here  
}
```

loop(): A function present in every single Arduino sketch. This code happens over and over again. The loop() is where (almost) everything happens. The one exception

to this is setup() and variable declaration. ModKit uses another type of loop called “forever()” which executes over Serial. The loop() function looks like:

```
void loop( ) {  
  //code goes here  
}
```

input: A pin mode that intakes information.

output: A pin mode that sends information.

HIGH: Electrical signal present (5V for RedBoard). Also ON or True in boolean logic.

LOW: No electrical signal present (0V). Also OFF or False in boolean logic.

digitalRead: Get a HIGH or LOW reading from a pin already declared as an input.

digitalWrite: Assign a HIGH or LOW value to a pin already declared as an output.

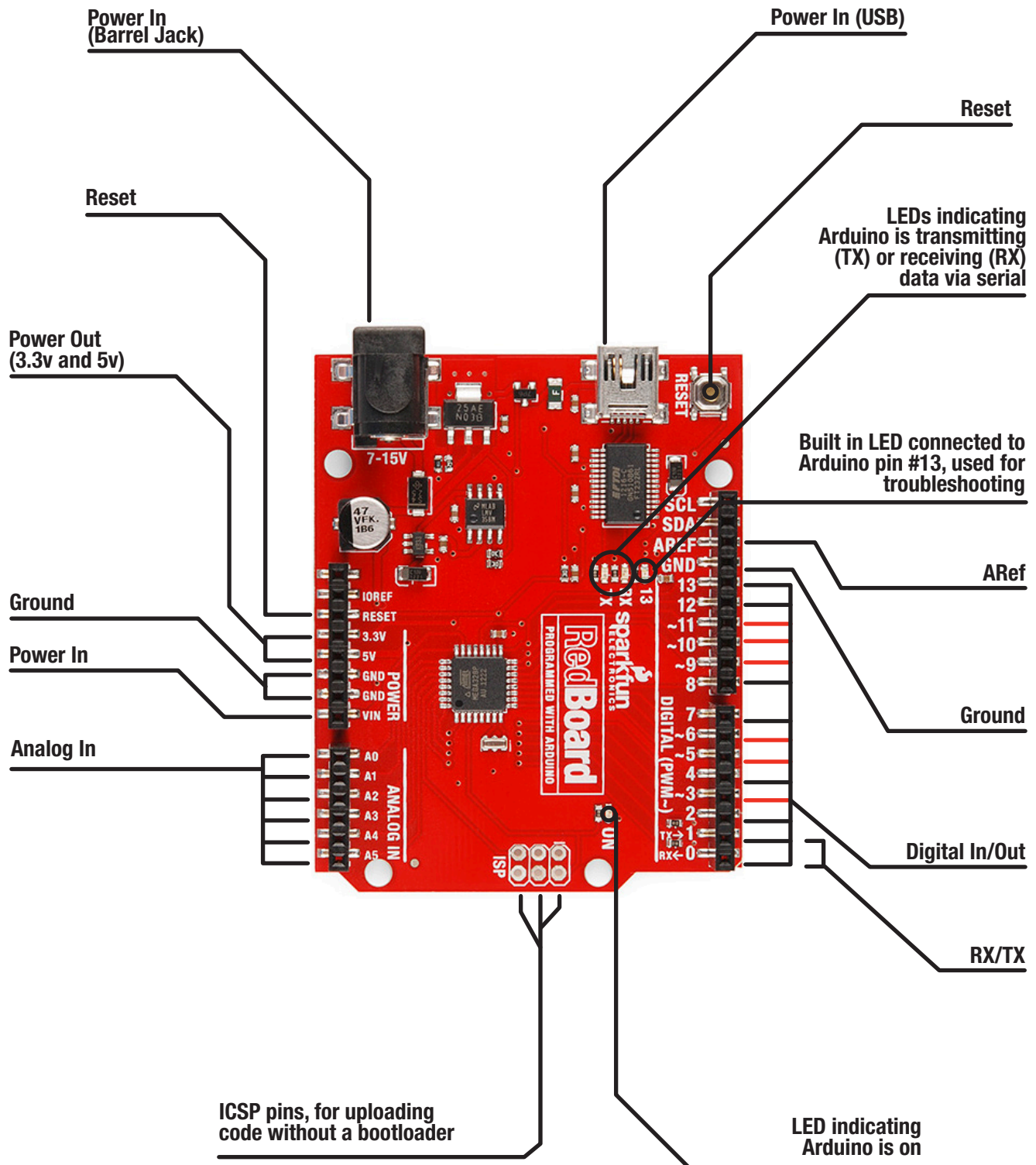
analogRead: Get a value between or including 0 (LOW) and 1023 (HIGH). This allows you to get readings from analog sensors or interfaces that have more than two states.

analogWrite: Assign a value between or including 0 (LOW) and 255 (HIGH). This allows you to set output to a PWM value instead of just HIGH or LOW.

PWM: Stands for Pulse-Width Modulation, a method of emulating an analog signal through a digital pin. A value between or including 0 and 255. Used with analogWrite.

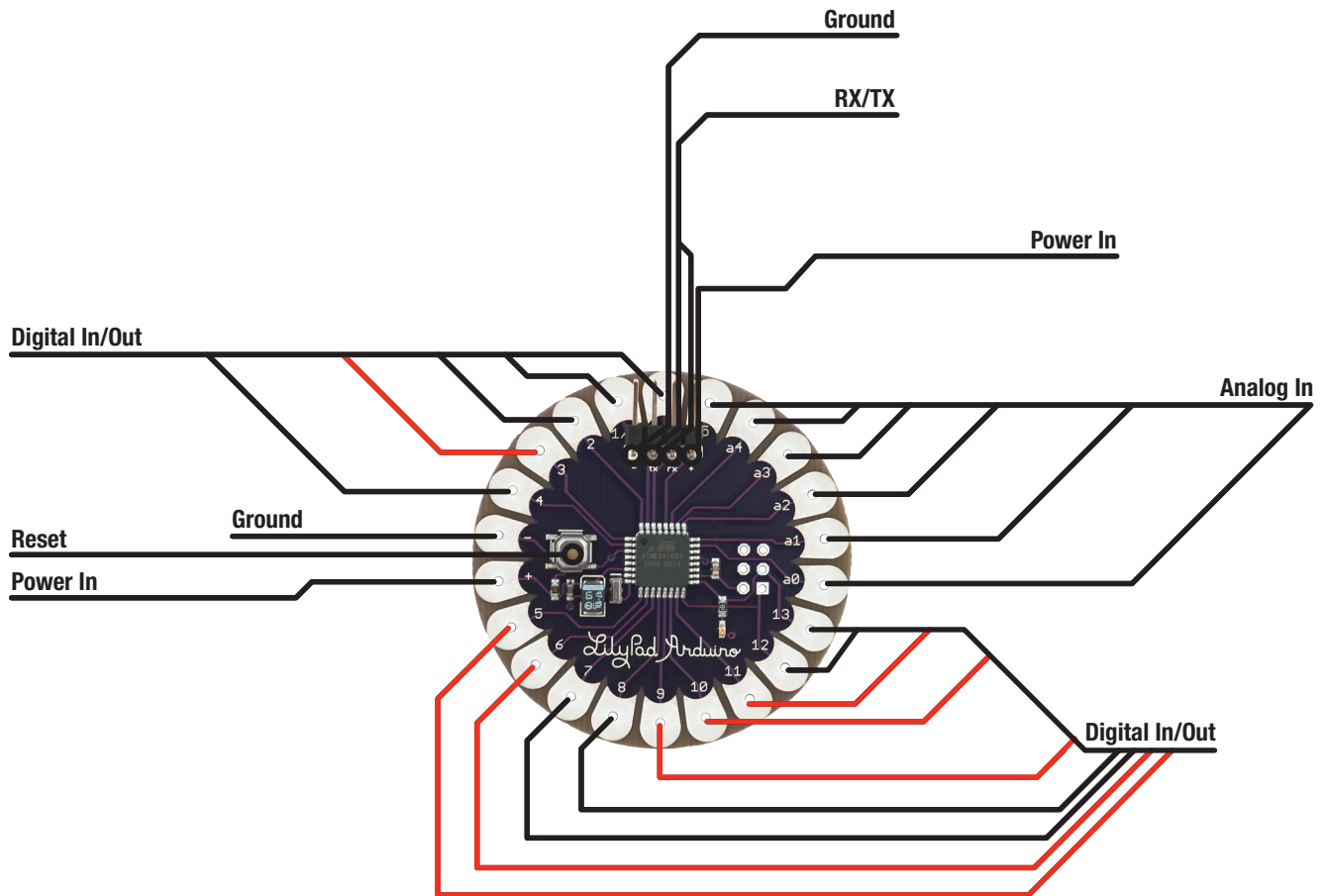
RedBoard Pin Type Definitions: (Take a look at your board)

Reset	3v3	5v	Gnd	Vin	Analog In	RX/TX	Digital	PWM(~)	AREF
Resets Arduino sketch on board	3.3 volts in and out	5 volts in and out	Ground	Voltage in for sources over 7V (9V - 12V)	Analog inputs, can also be used as Digital	Serial comm. Receive and Transmit	Input or output, HIGH or LOW	Digital pins with output option of PWM	External reference voltage used for analog



Red lines indicate which pins are PWM compatible.

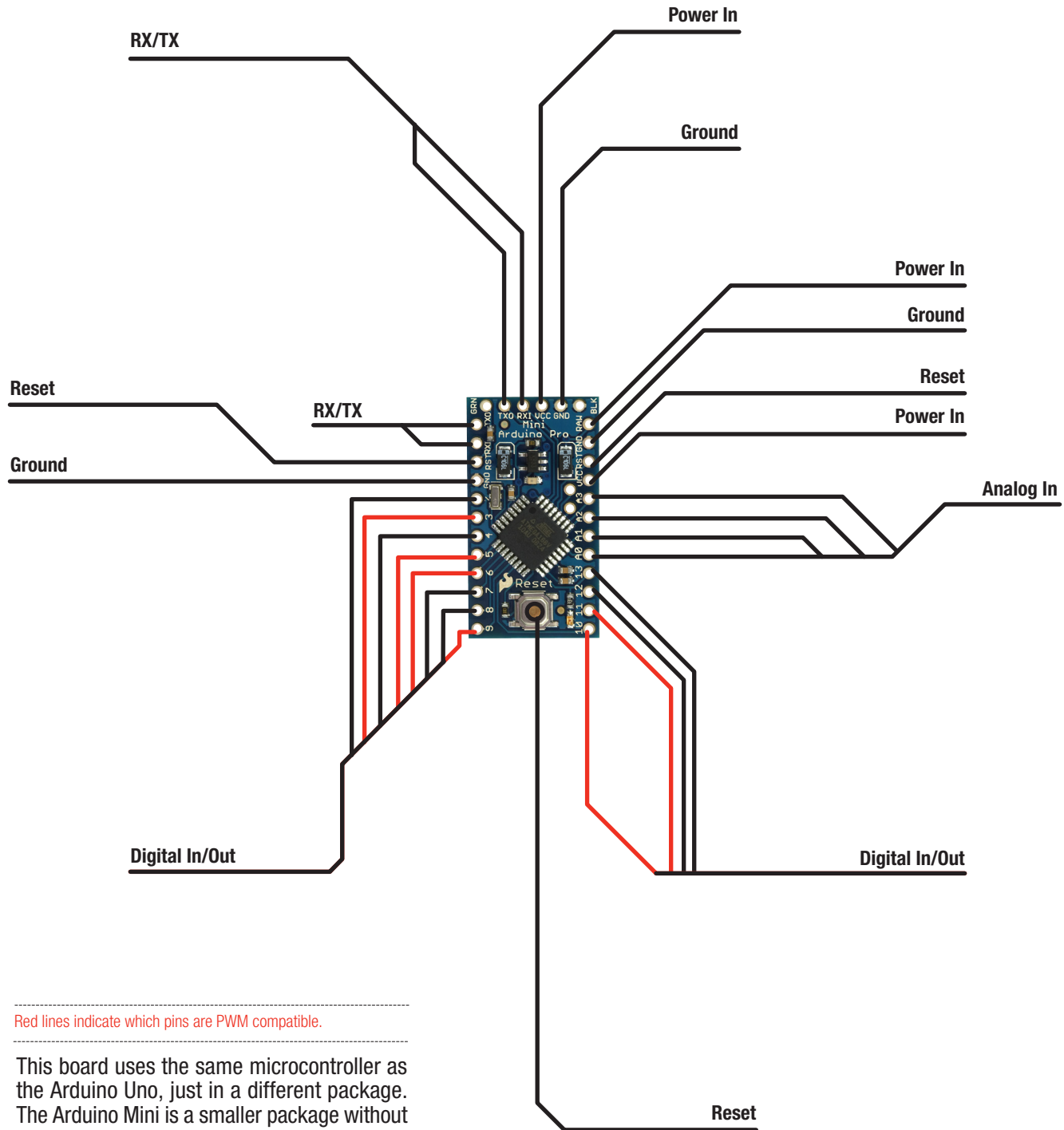
SparkFun RedBoard



Red lines indicate which pins are PWM compatible.

This board uses the same microcontroller as the Arduino Uno, just in a different package. The Lilypad is designed for use with conductive thread instead of wire. Other boards in the Arduino family can be found at <http://arduino.cc/en/Main/Hardware>

Arduino Lilypad



Red lines indicate which pins are PWM compatible.

This board uses the same microcontroller as the Arduino Uno, just in a different package. The Arduino Mini is a smaller package without the USB, Barrel Jack and Power Outs. Other boards in the Arduino family can be found at <http://arduino.cc/en/Main/Hardware>

Arduino Mini