

Adafruit Arduino Selection Guide

Created by Bill Earl



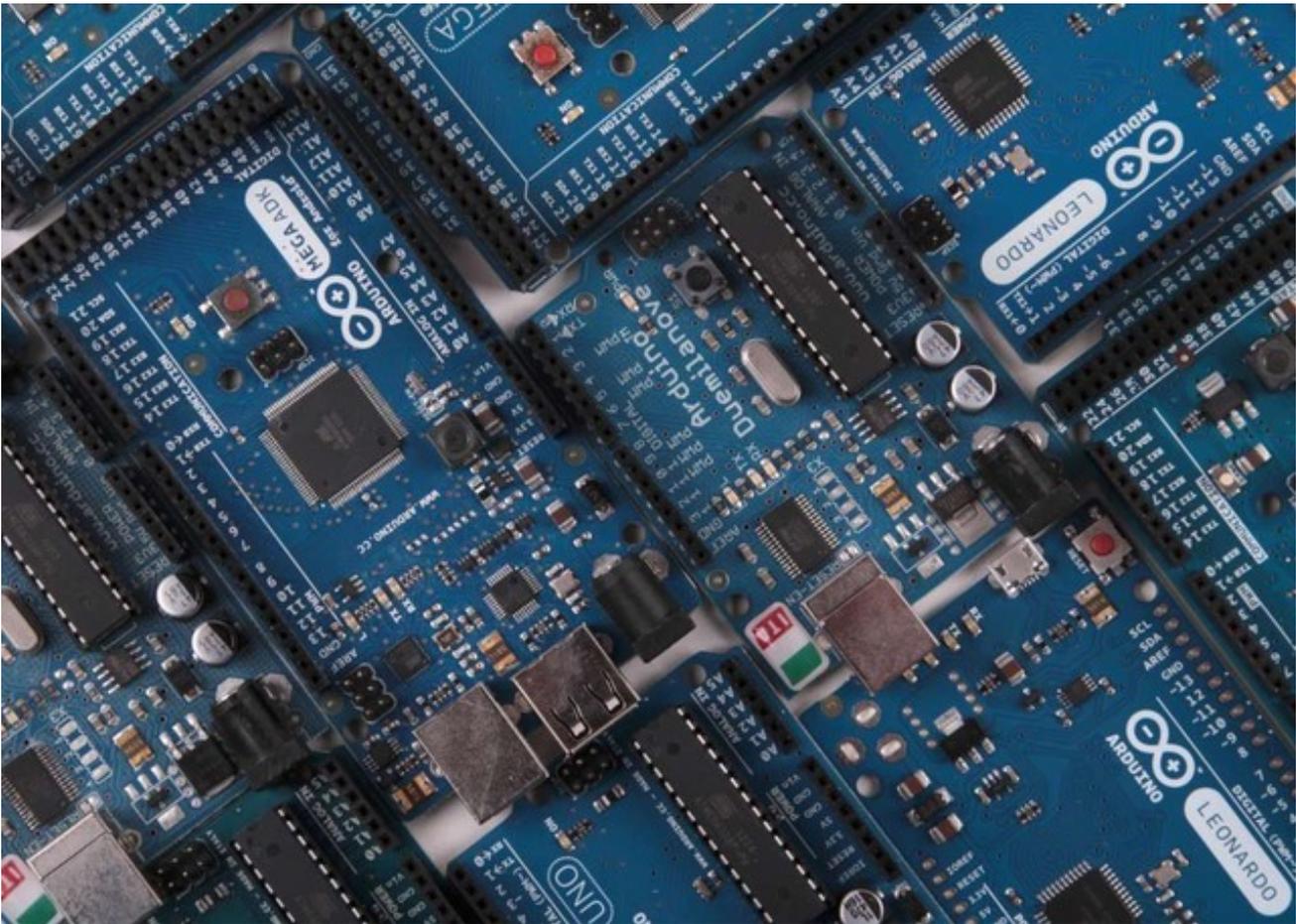
Last updated on 2014-08-21 11:30:10 AM EDT

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Selecting an Arduino

So many Arduinos, so little time...



There are many different Arduino and Arduino Compatible microcontroller boards. Which one is right for your needs? This guide will help you to select a board that best fits your project requirements and/or level of expertise. Whether you are just learning the ropes or have specific project requirements in mind, the Adafruit Arduino Selection Guide can help you to make the right choice.



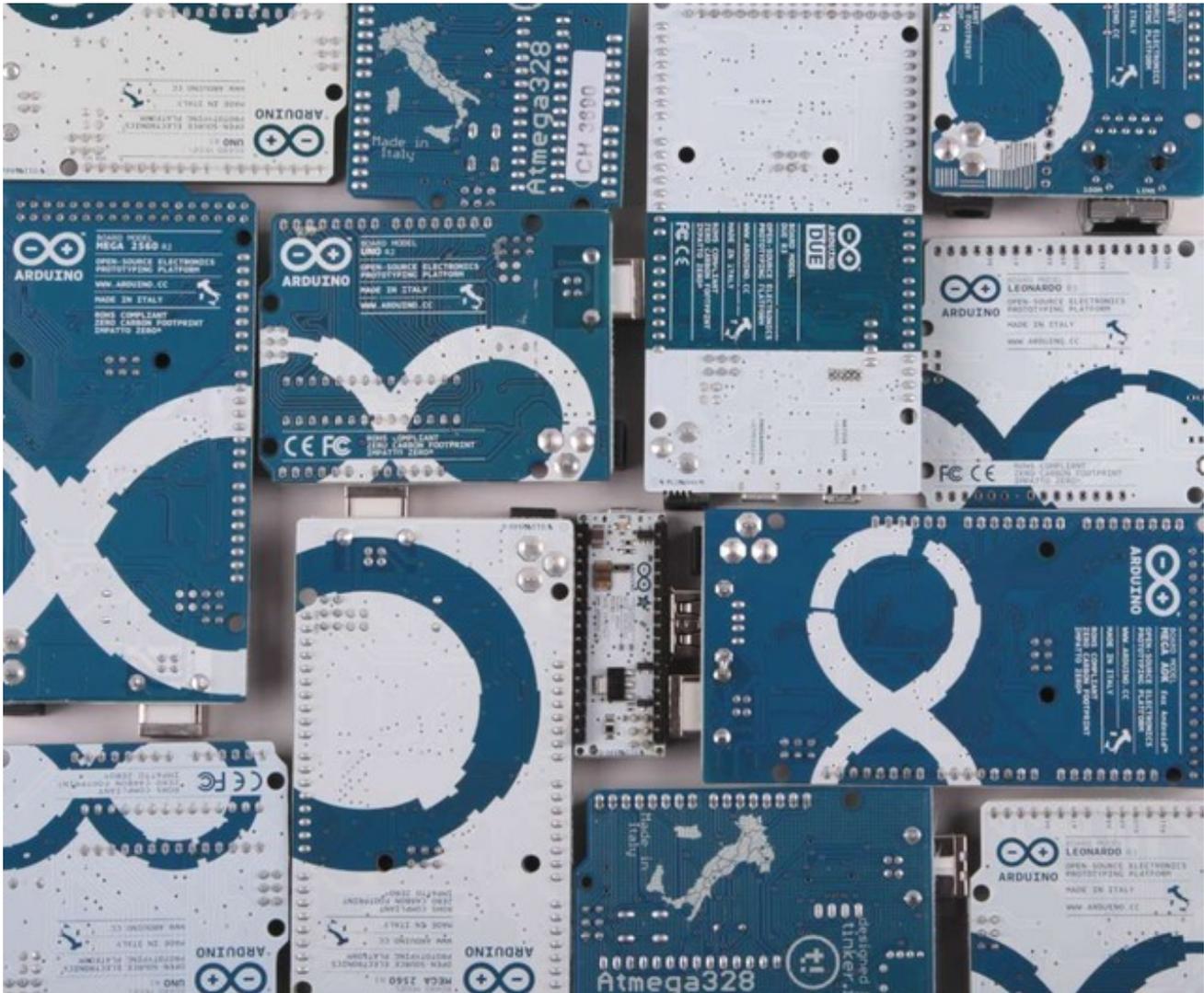
Wrapping it up!

So you have tested and debugged your project on the breadboard and are wondering how to package it nicely. Maybe even make it portable or wearable. In that case, head over to the "Big Ideas in Small Packages" page.

	Processor	Processor Voltage	Supply Voltage	Flash	SRAM	Digital I/O Pins	PWM Pins	Analog Inputs	Hardware Serial Ports	Dimensions	Shield Compatibility	Notes and Special Features
Uno	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	2.1"x2.7" 53x75mm	Excellent (most will work)	
	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	2.1"x2.7" 53x75mm	Very Good (some pin conflicts)	Has Ethernet port. Requires FTDI cable to program.
Mega	16MHz Atmega 2560	5v	7-12v	256Kb	8Kb	54	14	16	4	2.1"x4" 53x102mm	Good (some pinout differences)	
	16MHz Atmega 2560	5v	7-12v	256Kb	8Kb	54	14	16	4	2.1"x4" 53x102mm	Good (some pinout differences)	Works with Android Development Kit.
Leonardo	32U4	5v	7-12v	32Kb	2.5Kb	20*	7	12*	1	2.1"x2.7" 53x75mm	Fair (many pinout differences)	Native USB capabilities. USB Micro B programming port.
	ARM SAM3X8E	3.3v	7-12v	512Kb		54	12	12	4	2.1"x4" 53x102mm	Poor (voltage and pinout differences)	Fastest processor. Most memory. 2-channel DAC. USB Micro B programming port. Native micro USB ports.
Due	16MHz Atmega 32U4	5v	5v	32Kb	2.5Kb	20*	7	12*	1	0.7"x1.9" 18x49mm	N/A	Smallest board size. Native USB capabilities.
	16MHz Atmega 32U4	3.3v	3.5-16v	32Kb	2.5Kb	8*	4	4*	1	1.75" dia 44.5mm dia	N/A	Sewable pads. Fabric friendly design. Native USB Capabilities.
DC Boarduino	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	N/A	Can build without headers or sockets for smaller size. Requires FTDI cable for programming.
	16MHz Atmega 328	5v (USB)		32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	N/A	Can build without headers or sockets for smaller size. USB Micro B programming port.
Mini	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	Excellent (most will work)	Mini Pin Size and Prototyping Area. Requires FTDI cable for programming.

By the numbers

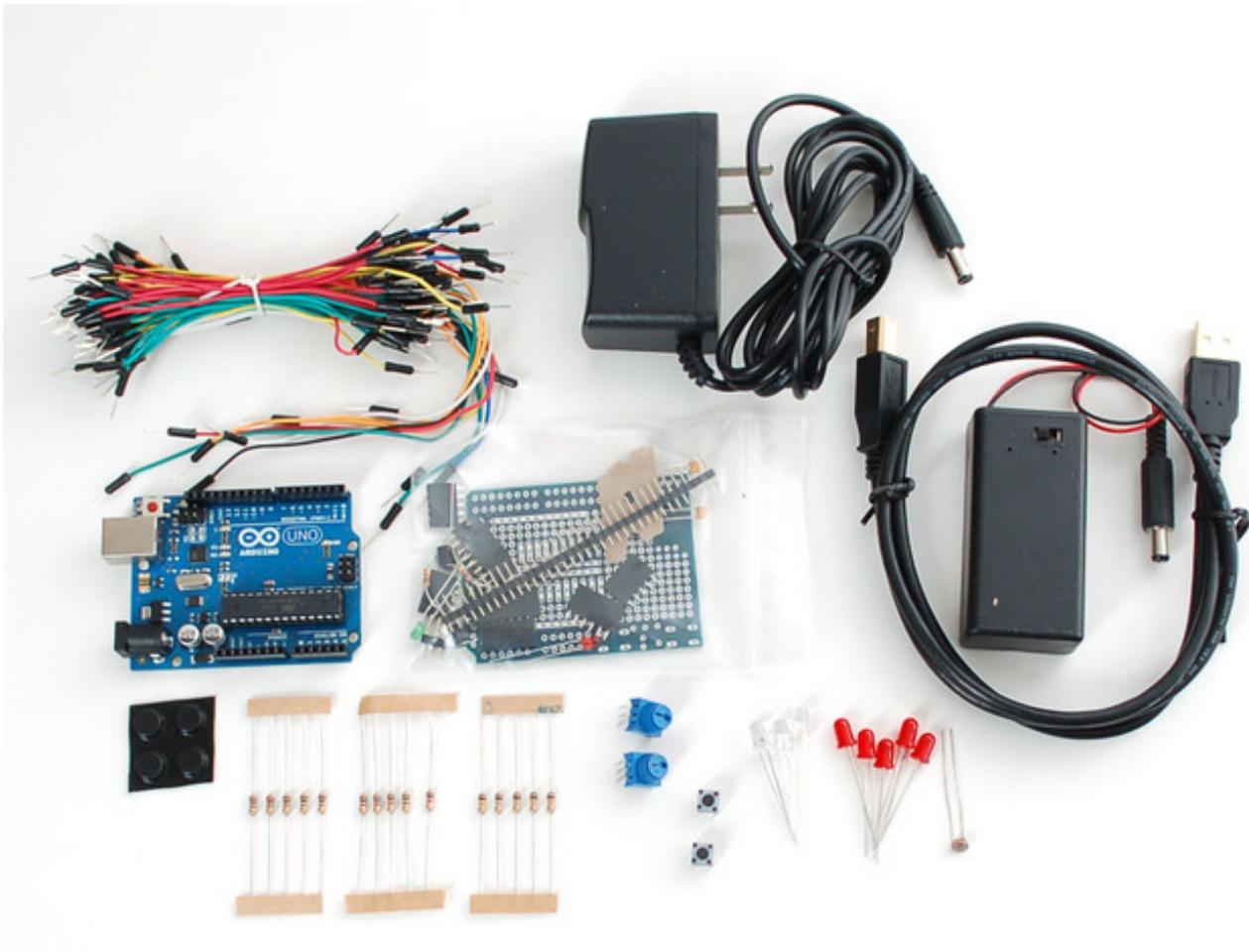
If you know exactly what you need and just want to know which boards have it, check out our handy Arduino Comparison Chart.



No Arduinos were harmed in the making of this guide.

Getting Started

If you are just getting started with the Arduino, congratulations and welcome to the world of microcontrollers and electronics!



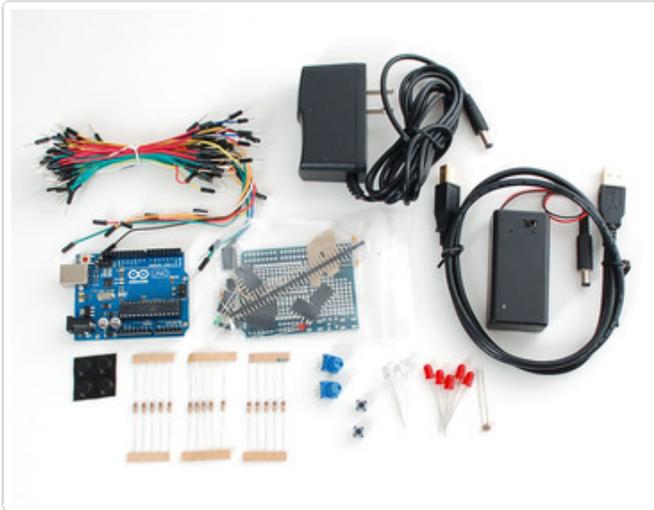
For most people getting started with the Arduino, the Arduino UNO is an excellent choice for a number of reasons:



The UNO is the **best documented** and **best supported** of the Arduinos - if not the best documented and best supported microcontroller development board *in the world*. Seriously! There are hundreds of books, forums and blogs full of helpful Arduino information and project ideas. Almost all of this information is specifically about or applicable to the UNO.

At Adafruit alone, in addition to our helpful **support forums**, we have dozens of **tutorials**. These include the outstanding [Arduino Lesson \(http://adafru.it/c50\)](http://adafru.it/c50) series by [Dr. Simon Monk \(http://adafru.it/1019\)](http://adafru.it/1019). As well as [product tutorials \(http://adafru.it/c51\)](http://adafru.it/c51) for almost all of our Arduino compatible products.

The UNO is also the **most compatible** of all the Arduinos. Almost all existing Arduino **libraries** and **shields** are compatible with the UNO. And the UNO will run just about all of the code that has been written for earlier versions of the Arduino such as the Duemilanove and Diecimila. When you start to branch out into more ambitious projects and interface to more different devices, compatibility is an important consideration.



For Real Beginners:

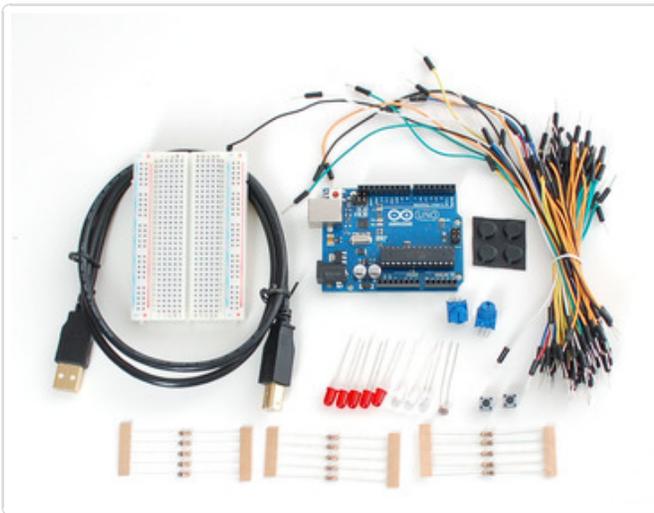
If you are new to both electronics and programming, you should consider one of our starter kits. These kits all include an Arduino Uno and a selection of accessories and electronic components to get you going.

The Adafruit [Budget Starter](http://adafru.it/193)

[Pack](http://adafru.it/193) (<http://adafru.it/193>) contains the processor, USB cable, a breadboard and some basic components.

The full Adafruit [Starter Pack](http://adafru.it/68) (<http://adafru.it/68>)

adds a power supply and a proto-shield kit so you can make your circuits permanent after you debug them on the breadboard.



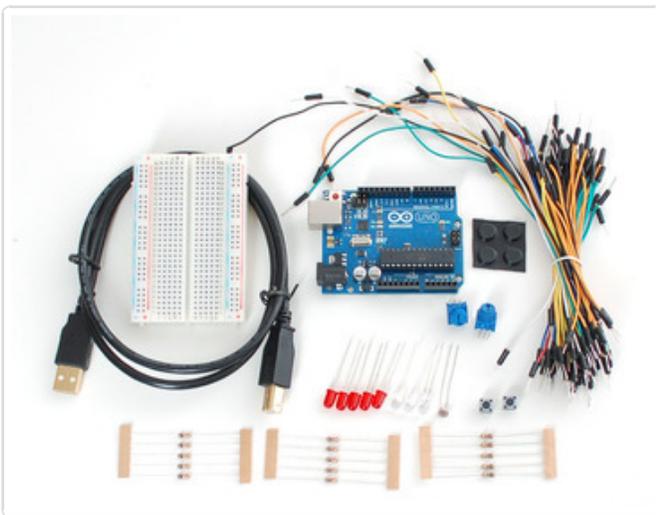
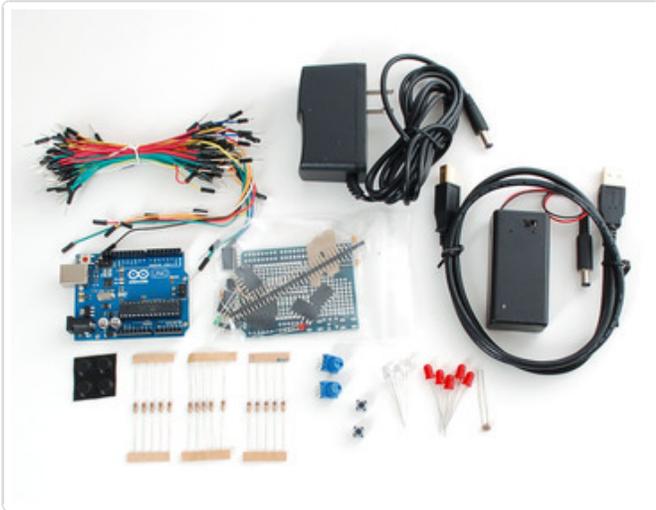
The [Arduino Starter Kit](http://adafru.it/1078) (<http://adafru.it/1078>)

comes direct from the Arduino team and includes supplies to build some fun and interesting projects. The starter kit has been developed together with a series of [ten video tutorials hosted by Arduino co-founder Massimo Banzi](#) (<http://adafru.it/c52>). [Read more about the kit on Arduino.cc](#) (<http://adafru.it/c53>)



For Programmers:

If you have some programming experience and want to get your feet wet with electronics, any of the Adafruit starter kits mentioned above will give you a good selection of parts to start with.





For the Electronics Tinkerer:

So you know your electronics and want to try your hand at programming? You probably have a good selection of common components already, so a bare [Uno](http://adafruit.com/uno)

(<http://adafruit.com/50>) might be a good place to start. You may also want to pick up a [power supply](http://adafruit.com/power-supply) (<http://adafruit.com/63>) and a [USB cable](http://adafruit.com/usb-cable) (<http://adafruit.com/62>).

You are no doubt already handy with a soldering iron, so you may also want to consider building yourself an Arduino Compatible [Menta](http://adafruit.com/menta) (<http://adafruit.com/795>). For this you will need an [FTDI Cable](http://adafruit.com/ftdi-cable) (<http://adafruit.com/70>) instead of the standard USB cable.



For Everyone:

Congratulations on getting started and don't forget to reward your new skills with an [Arduino Badge!](http://adafruit.com/arduino-badge) (<http://adafruit.com/1300>)



Bigger and Better Projects





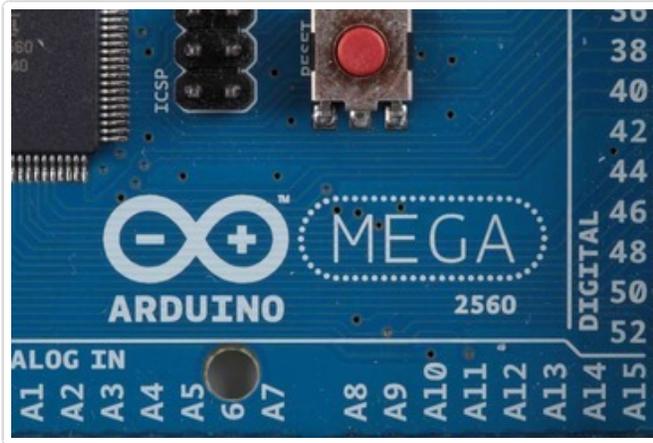
Time for an Upgrade?

So your project has outgrown the Uno and you need something more. There are many options for expansion: There are many Arduino boards with more pins, more memory, more connectivity and/or more computing power compared to the Uno.

But first keep in mind that moving to a processor with more capabilities than the Uno's Atmega 328P comes with some trade-offs in compatibility. Although many of these boards have headers that are laid out to accept standard Arduino shields, the pinouts of all these boards are somewhat different.

SPI, i2c, PWM and Pin change interrupts are on different pins from a standard Arduino. In addition to all that, the Due runs at 3.3v, and many libraries have not yet been ported to support the Due's ARM processor.

So use this guide to help you select a board that will take your project to the next level. But be aware that it may not be 100% "Plug & Play" with all the shields. See our [Shield Compatibility Guide \(http://adafruit.it/cB7\)](http://adafruit.it/cB7) for more details.

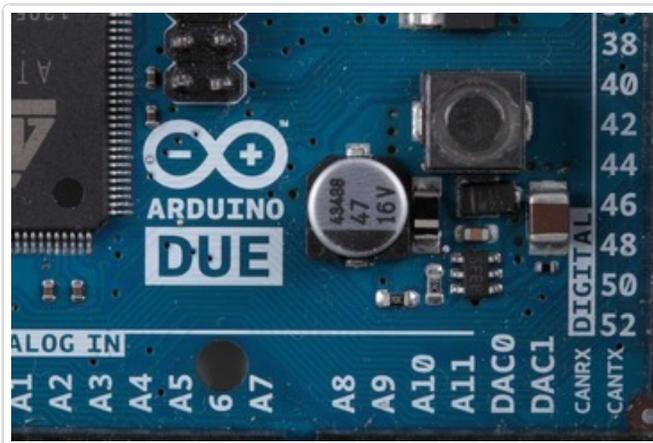


More Pins!

Stepping up to an [Arduino Mega](http://adafruit.com/191) (<http://adafruit.com/191>) gives you **40 extra digital pins** and **10 more analog input pins**.

The [Arduino Mega ADK](http://adafruit.com/563) (<http://adafruit.com/563>) also adds a USB port designed for integrating with Android devices.

The [Arduino Due](http://adafruit.com/1076) (<http://adafruit.com/1076>) gives you **40 extra digital pins**, **6 extra analog input pins** and **2 analog output pins**.





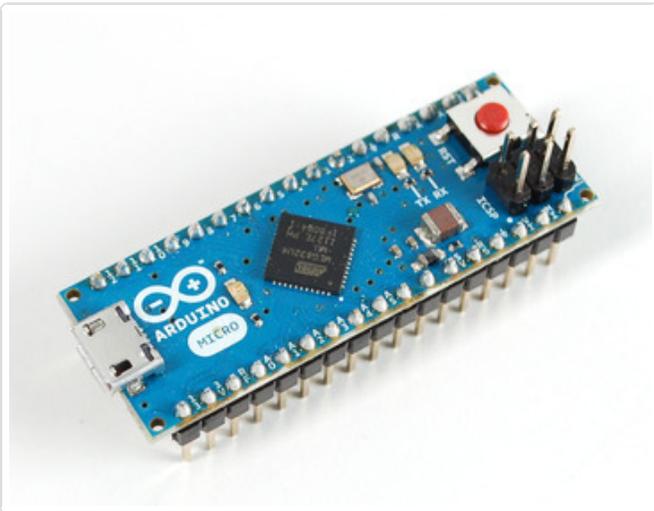
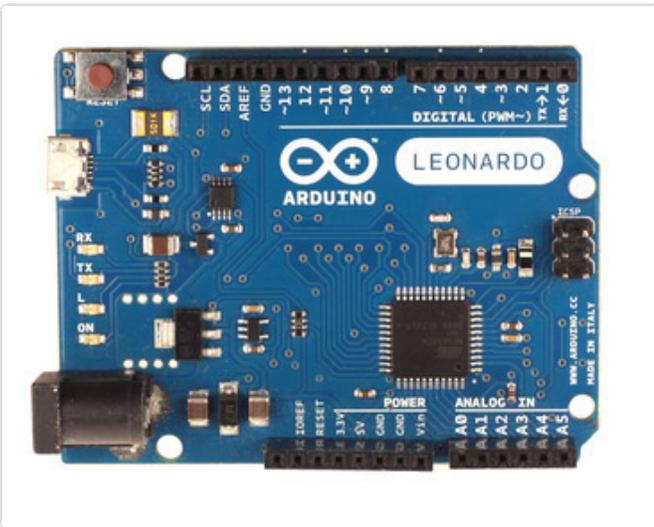
More Connectivity!

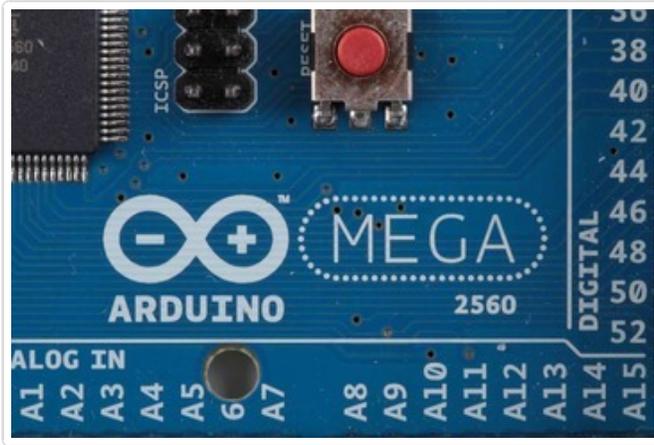
The [Arduino Ethernet](http://adafruit.it/418) (<http://adafruit.it/418>) is the simplest way to make your project part of the **Internet of Things**. As a bonus, it comes with a built-in SD card.

The Megas and the Due mentioned above all have **4 hardware serial ports** for efficient communication with serial devices.

The Due, [Leonardo](http://adafruit.it/849) (<http://adafruit.it/849>), [Micro](http://adafruit.it/1086) (<http://adafruit.it/1086>) and [Flora](http://adafruit.it/659) (<http://adafruit.it/659>) all have **native USB** capabilities, so they can emulate keyboards, mice etc.

The Due also supports the **CAN bus** - popular for automotive applications.



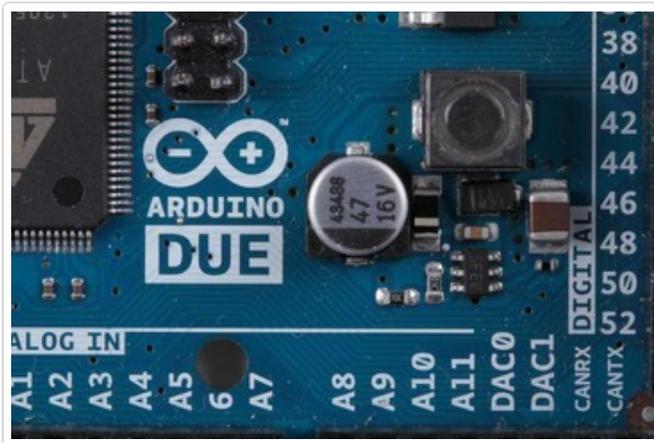


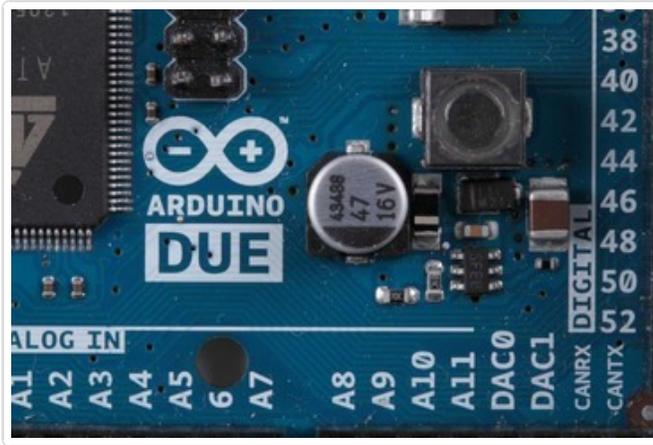
More Memory!

Having trouble fitting your code into Flash? Is your sketch crashing from lack of SRAM?

Either of the Megas will give you **8X the Flash** and **4X the SRAM**.

A Due has **16X the Flash** and **48X the SRAM** compared to an Arduino Uno!





More Speed!

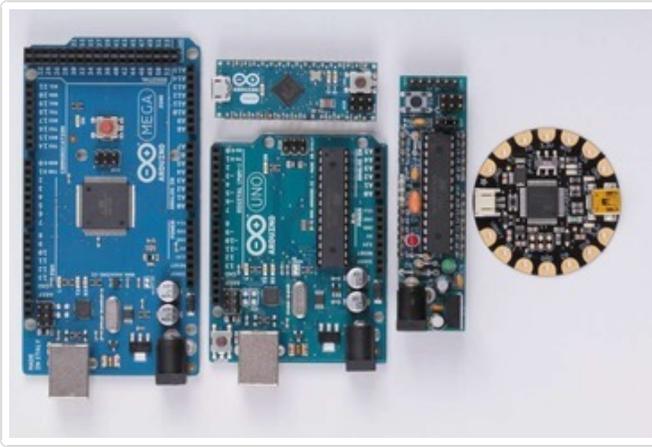
Almost all the Arduinos are based on **8-bit** microcontrollers running at **16MHz**. The Megas have more pins and memory, but they won't make your code run any faster.

The **Arduino Due** is based on a **32-bit** ARM processor running at **84MHz**. The Due is the clear winner in the speed department.

Big Ideas in Small Packages

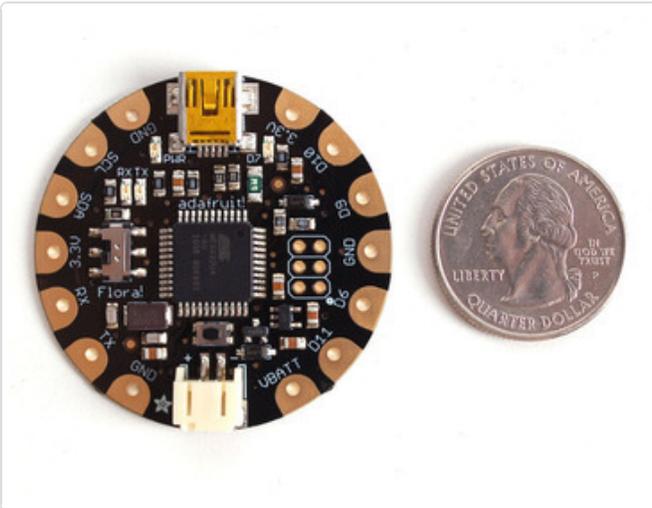


So you want to make your project a bit less bulky or need to fit it into a confined space - maybe even make it wearable. There are many great options for embeddable or wearable Arduino projects.



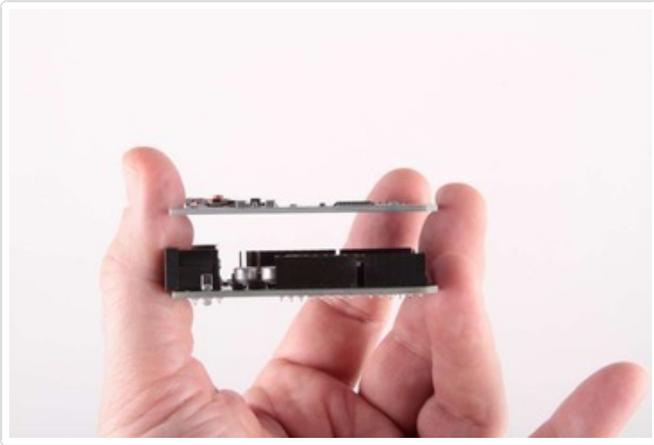
Keep it Small!

The [DC Boardino](http://adafru.it/72) (<http://adafru.it/72>) and [USB Boardino](http://adafru.it/91) (<http://adafru.it/91>) are the most Uno Compatible options. They are about 1/3 the size of an Uno but use the same Atmega 328P processor. Your Uno sketches should run without change. The Boardinios can be built without sockets or headers for a lower profile. The DC version can be made even more compact by eliminating the voltage regulator section of the board if you already have a regulated 5v supply.



The [Flora](http://adafru.it/659) (<http://adafru.it/659>) is both small and thin! It uses the same processor as the Leonardo, but takes up less than half the area.

The smallest of all is the [Micro](http://adafru.it/1086) (<http://adafru.it/1086>). This is about 2/3 the size of the Boardino and also uses the 32U4. Your Leonardo projects should easily port to the Flora or Micro.

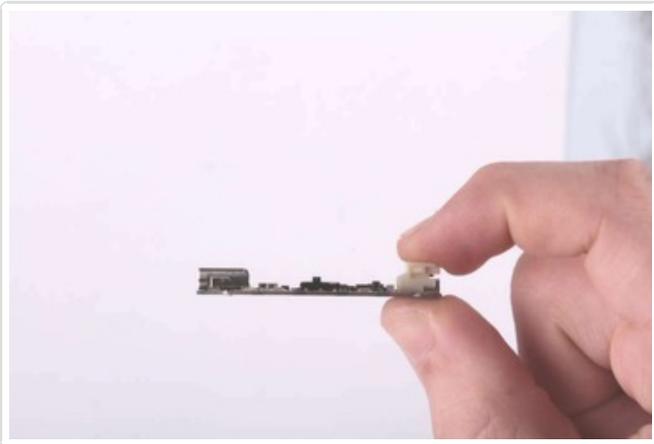


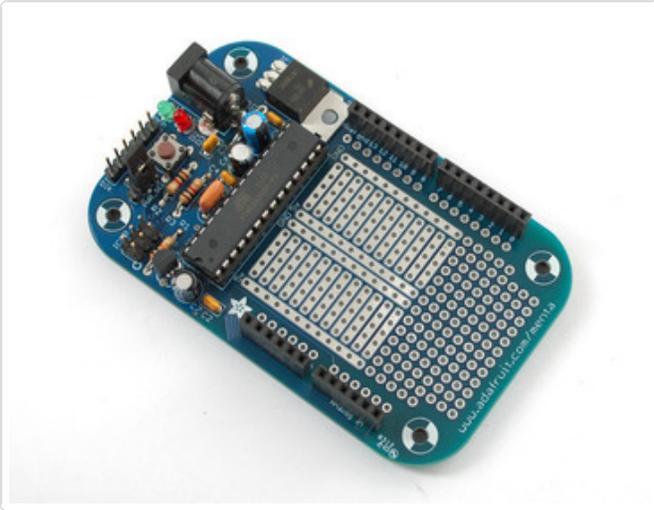
Not Too Tall!

A standard Arduino with headers is pretty chunky, and plugging things into the headers only makes it bulkier.

The Leonardo is available in a [headerless version](http://adafru.it/883) (<http://adafru.it/883>), and the [Flora](http://adafru.it/659) (<http://adafru.it/659>) has no headers either.

Both the [DC Boarduino](http://adafru.it/72) (<http://adafru.it/72>) and the [USB Boarduino](http://adafru.it/91) (<http://adafru.it/91>) can be built without sockets or headers to make a thinner package.





Integrate!

Sure you can switch to a tinier processor, but what do you do with the rest of the electronics? Short of a custom circuit board, there is the [Adafruit Menta](http://adafru.it/795) (<http://adafru.it/795>) with its built-in prototyping area.

The Menta is sized to slip into a **mint-tin** for a simple and attractive package. But they are also great for any embedded project that needs some custom circuitry.

The Menta uses an Atmega 328, so it is **compatible with the Uno**, and it has standard Arduino headers for **excellent shield compatibility!**





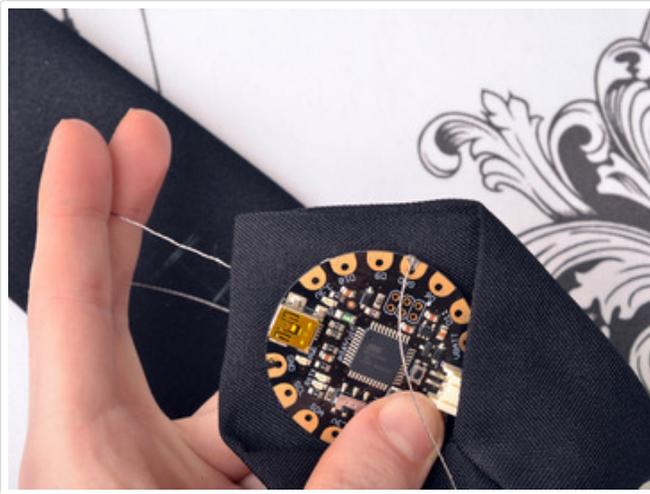
Wear it with Pride!

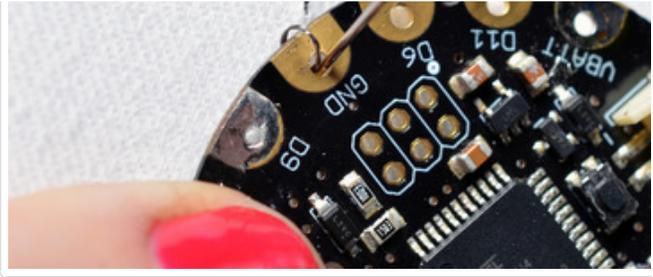
While many of these compact processors could be worked into a project you could wear. The [Flora](http://adafru.it/659) (<http://adafru.it/659>) is specifically designed for wearable projects.

In addition to the **thin profile** and **sewable connections**, these processors are designed with rounded shapes that are **fabric friendly** with no protruding pins or sharp edges to snag on fabrics.

With their attractive appearance and [selection of similarly styled Flora peripherals](#) (<http://adafru.it/c54>), these are the boards to go to when you want to wear your microprocessor on your sleeve.

The Flora is based on the Atmega 32U4 processor, so it is largely **Leonardo Compatible**.





Arduino Comparison Chart

The following table compares the basic features of the various Arduinos and Arduino Compatibles mentioned in this guide. (click for a larger view).

For shield compatibility, be sure to check our [Shield Compatibility Guide \(http://adafru.it/cB7\)](http://adafru.it/cB7).

	Processor	Processor Voltage	Supply Voltage	Flash	SRAM	Digital I/O Pins	PWM Pins	Analog Inputs	Hardware Serial Ports	Dimensions	Shield Compatibility	Notes and Special Features
Uno	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	2.1"x2.7" 53x75mm	Excellent (most will work)	
Uno Ethernet	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	2.1"x2.7" 53x75mm	Very Good (some pin conflicts)	Has Ethernet Port. Requires FTDI cable to program.
Mega	16MHz Atmega 2560	5v	7-12v	256Kb	8Kb	54	14	16	4	2.1"x4" 53x102mm	Good (some pinout differences)	
Mega ADK	16MHz Atmega 2560	5v	7-12v	256Kb	8Kb	54	14	16	4	2.1"x4" 53x102mm	Good (some pinout differences)	Works with Android Development Kit.
Leonardo	16MHz Atmega 32U4	5v	7-12v	32Kb	2.5Kb	20*	7	12*	1	2.1"x2.7" 53x75mm	Fair (many Pinout Differences)	Native USB capabilities. USB Micro B programming port.
Due	84MHz ARM SAM3X8E	3.3v	7-12v	512Kb	96Kb	54	12	12	4	2.1"x4" 53x102mm	POOR (voltage and pinout differences)	Fastest processor. Most memory. 2-channel DAC. USB micro B programming port. Native micro AB port.
Micro	16MHz Atmega 32U4	5v	5v	32Kb	2.5Kb	20*	7	12*	1	0.7"x1.9" 18x49mm	N/A	Smallest board size. Native USB capabilities
Flora	8MHz Atmega 32U4	3.3v	3.5-16v	32Kb	2.5Kb	8*	4	4*	1	1.75" dia 44.5mm dia	N/A	Sewable Pads. Fabric-friendly design. Native USB Capabilities
DC Boarduino	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	N/A	Can build without headers or sockets for smaller size. Requires FTDI cable for programming
USB Boarduino	16MHz Atmega 328	5v	5v (USB)	32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	N/A	Can build without headers or sockets for smaller size. USB Mini B programming port.
Menta	16MHz Atmega 328	5v	7-12v	32Kb	2Kb	14	6	6	1	0.8"x3" 20.5x76mm	Excellent (most will work)	Mint-Tin Size and Prototyping Area. Requires FTDI cable for programming.

**On the 32U4 processors there is some overlap between the Analog Input and Digital I/O pins, so the total number of I/O pins will be less than the sum of the two.*

For some very nicely done pinout charts of several of these Arduino boards, go to: <http://www.pighixx.com/arduino/> (<http://adafru.it/c5j>)