

# Introduction to Arduino Microcontrollers

...and how they can be  
used in Amateur Radio

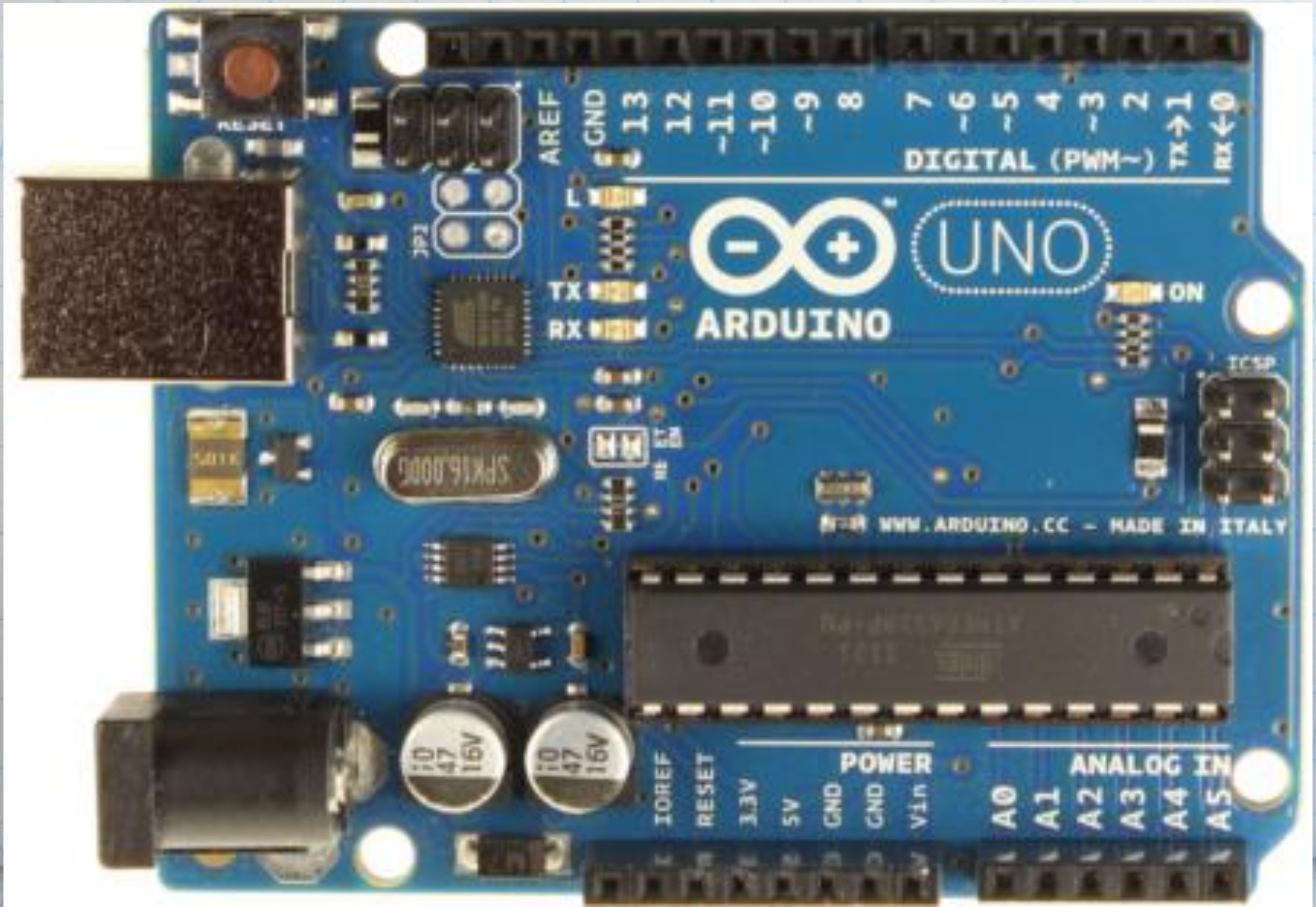
Andrew Rohne, KE8P  
August 6, 2013

# Presentation Outline

- Basics
- Terminology
- Hardware
- Amateur Radio Applications
- Getting Started
- More Information

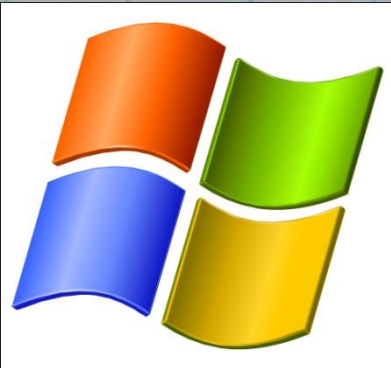


# What is it?



# Open Source

- Open Source Hardware
- Open Source Bootloader
- Open Source Development Kit
- Community Driven Support





# Terminology

- I/O Board - main microcontroller
- Shield - add-on boards
- Sketch - the program
- Sensor - components (thermistors, etc.)
- Modules - serial data (GPS module, etc.)

# What do these do?

Digital IO (LEDs, switches)

Analog IO (resistive sensor data)

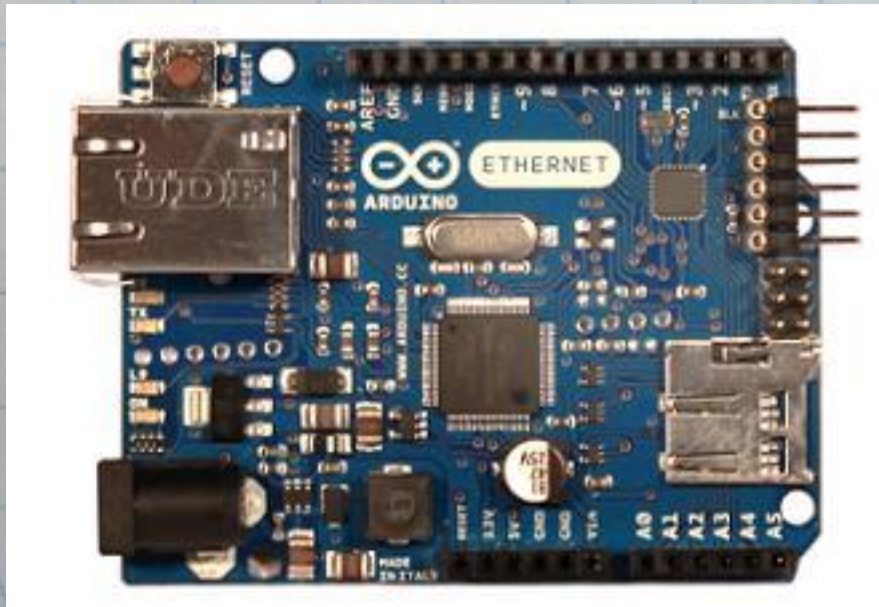
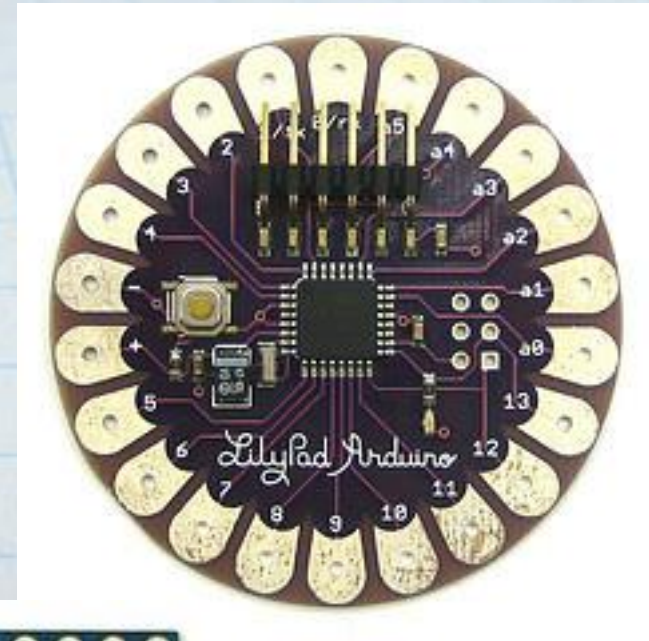
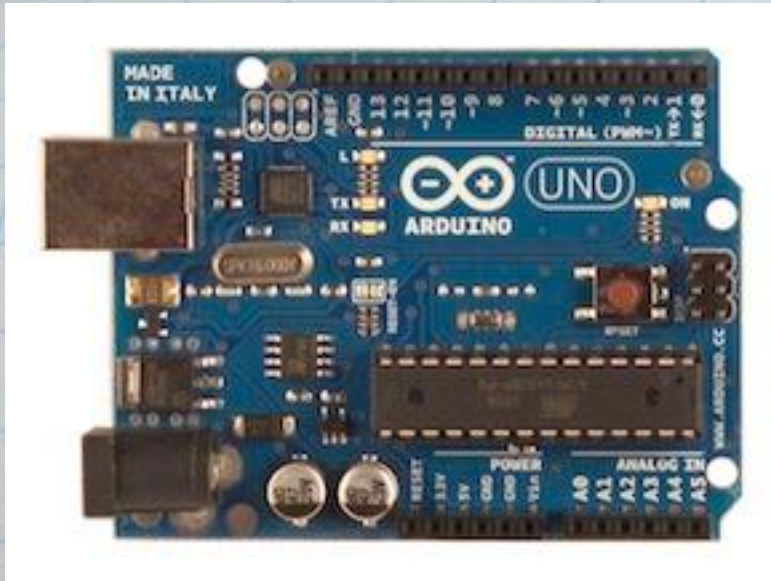
Serial Connection (Sensors, GPS, etc)

Program from your computer

Your limit is only your creativity!

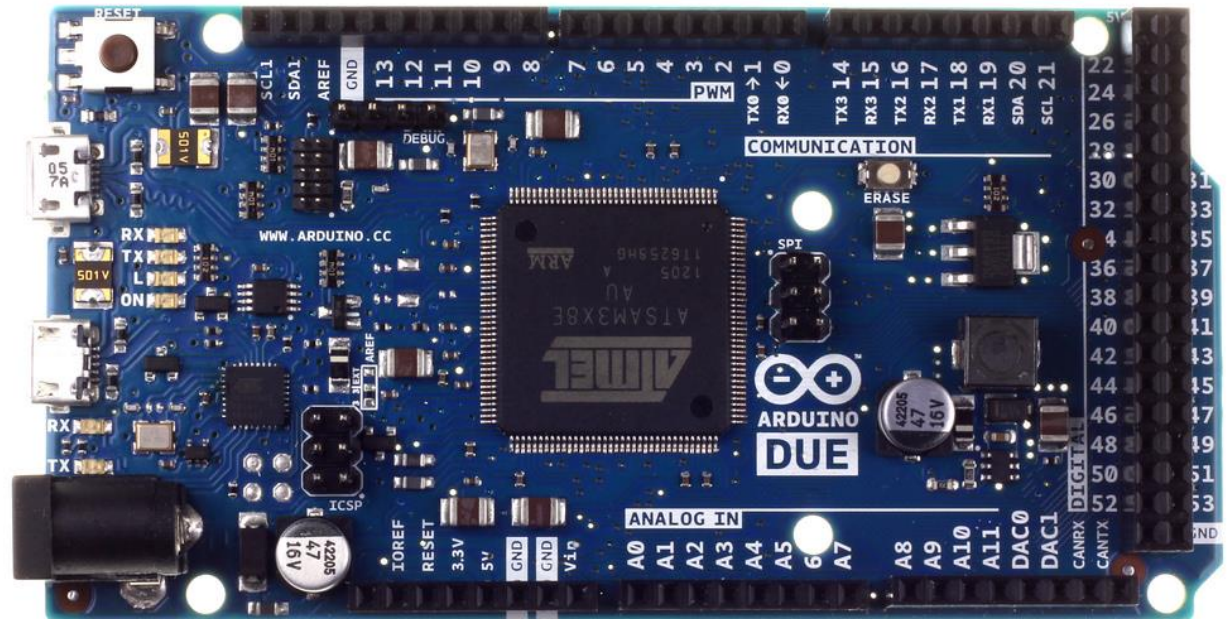
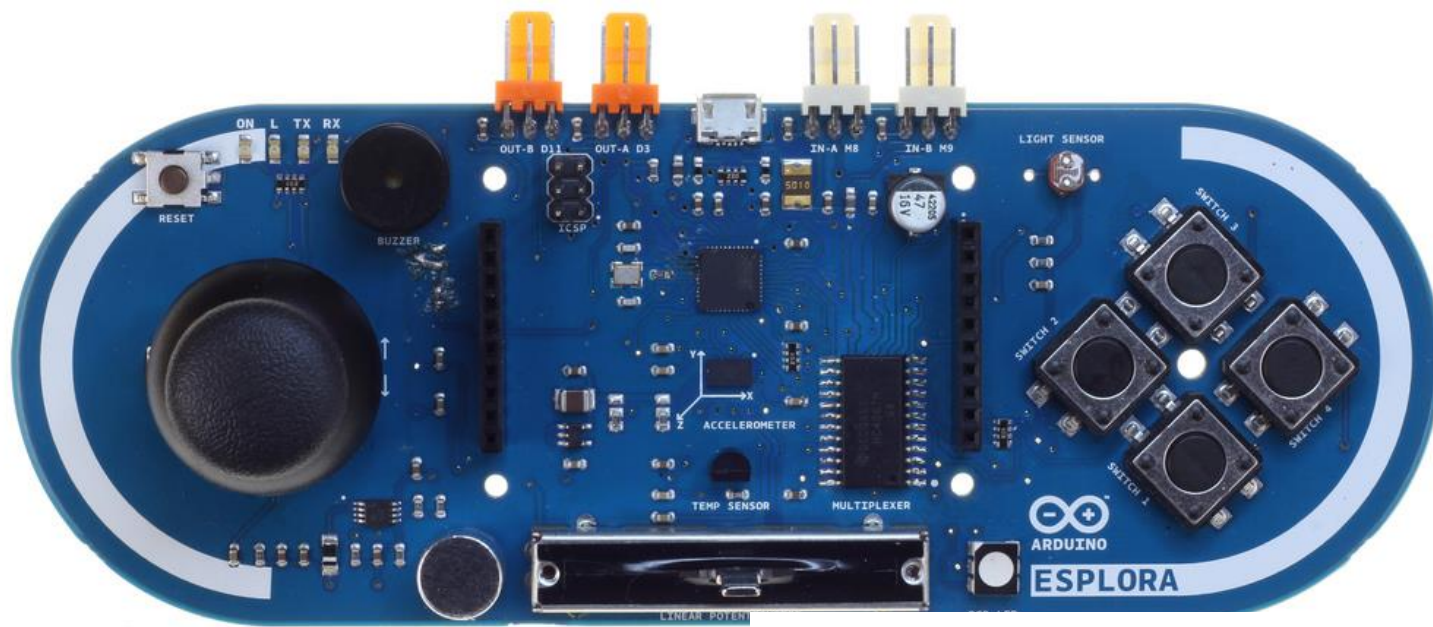


# Arduino I/O Boards





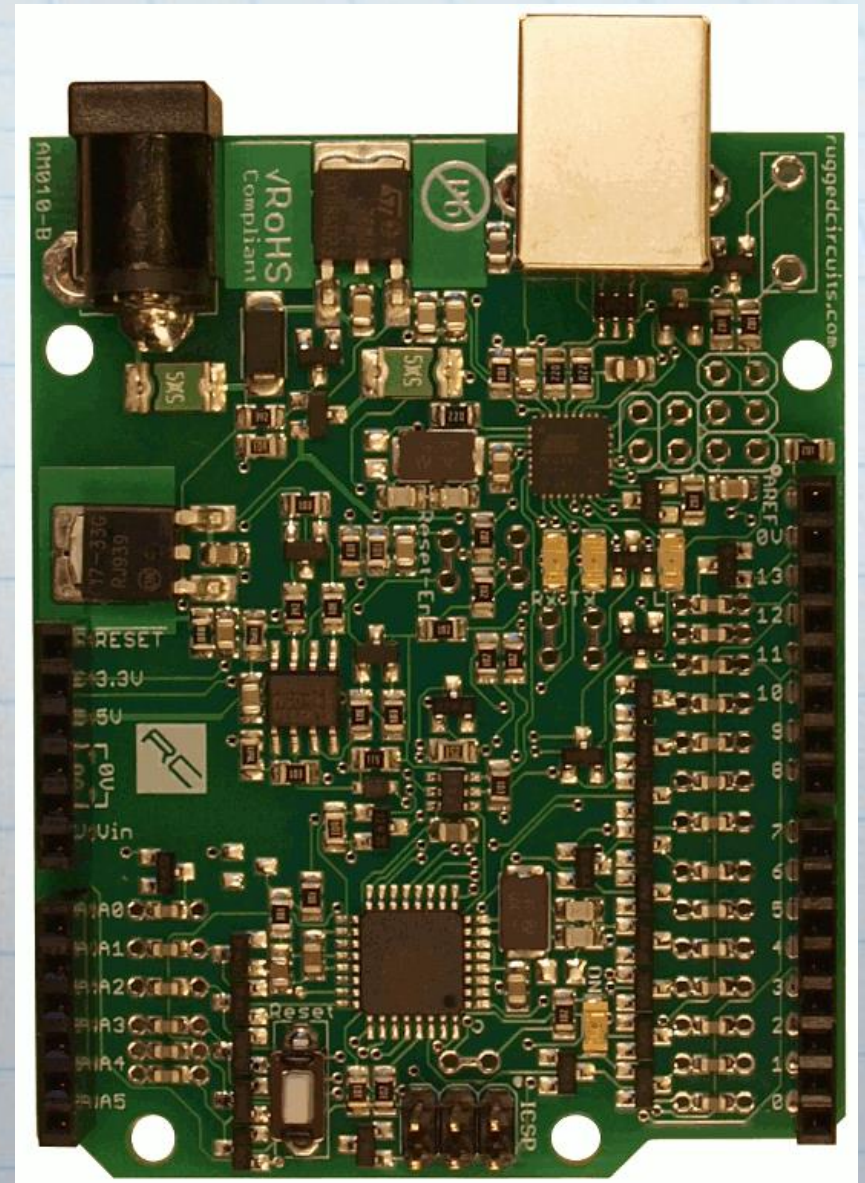
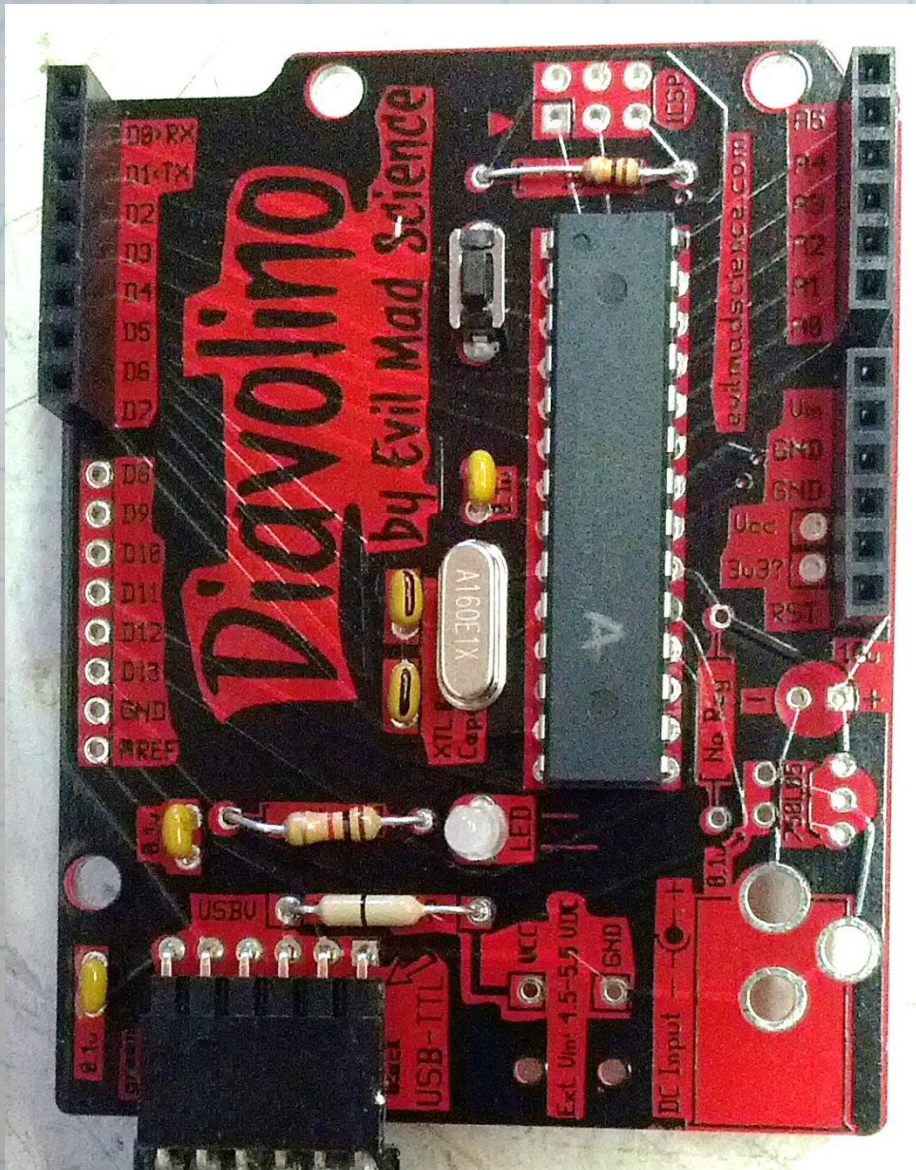
# More Boards



15 current boards



# Compatible Boards



These are two of MANY!

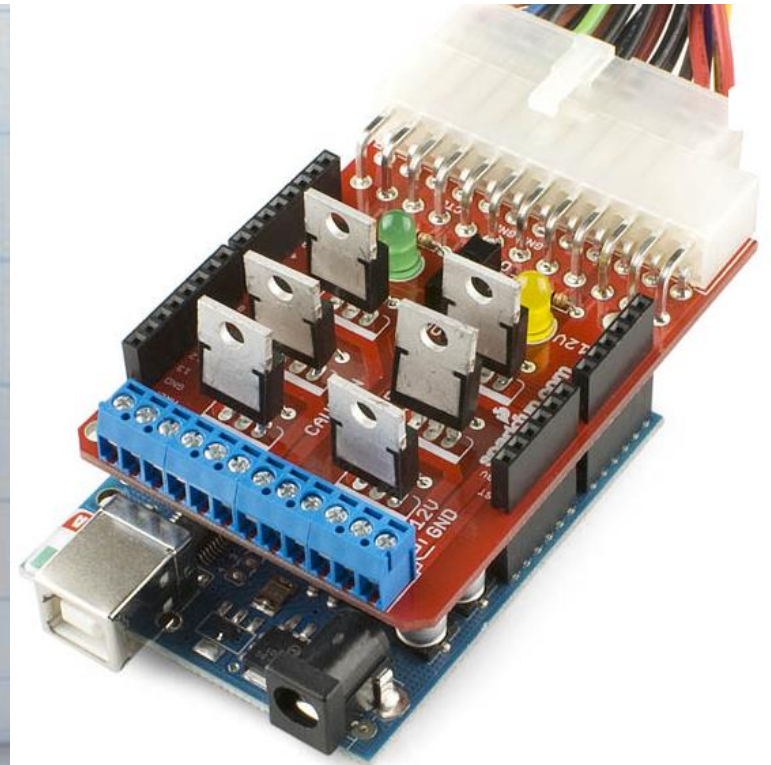
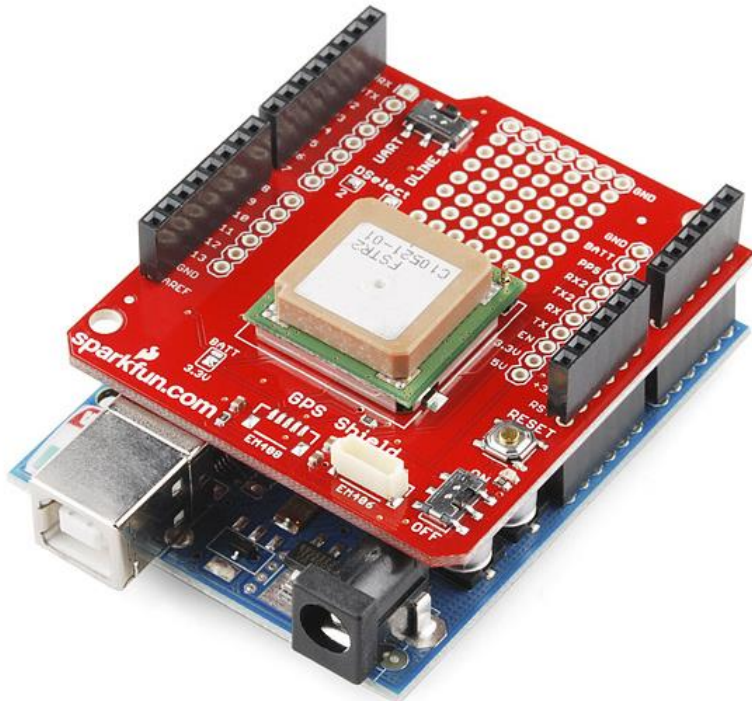
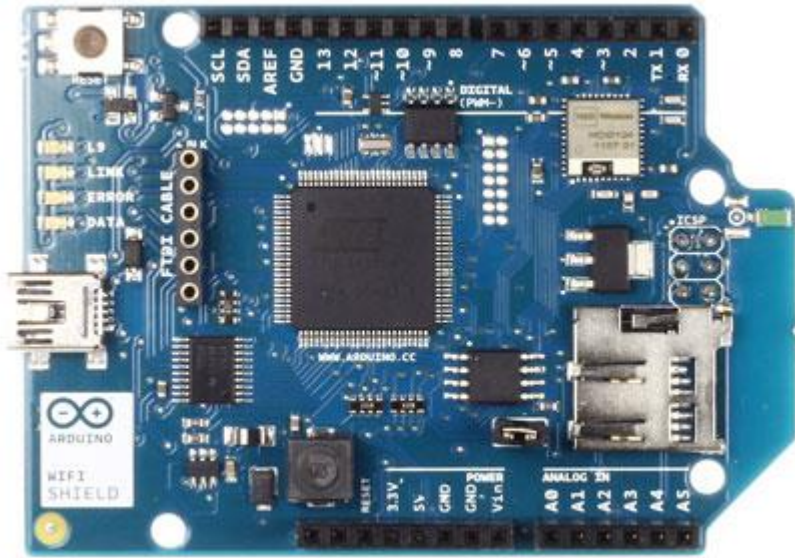


# Compatible Boards





# Shields





# Shields



Touchscreen Shield

Datalogging Shield



Wave Shield





# More Shields...



XBee Shield



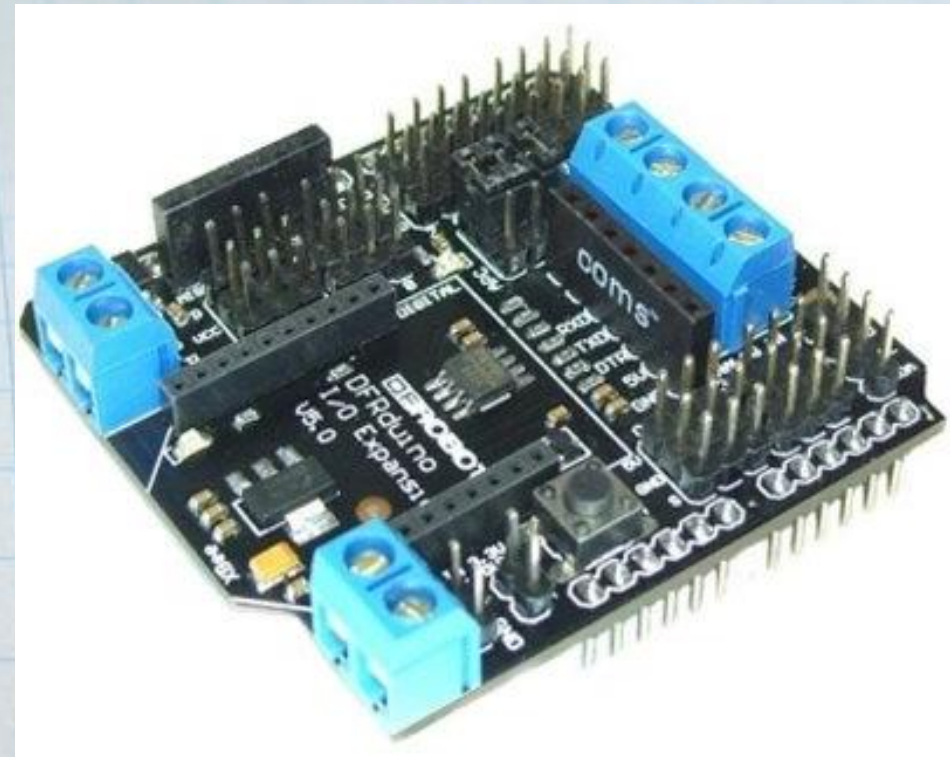
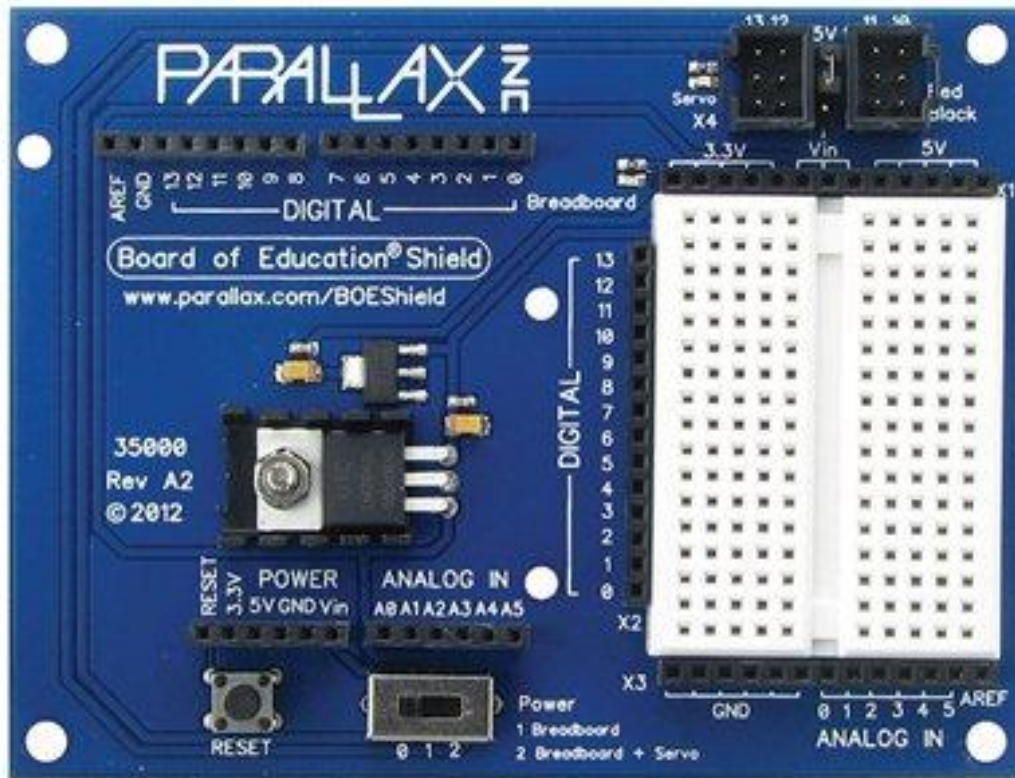
Ethernet Shield



Wifi Shield

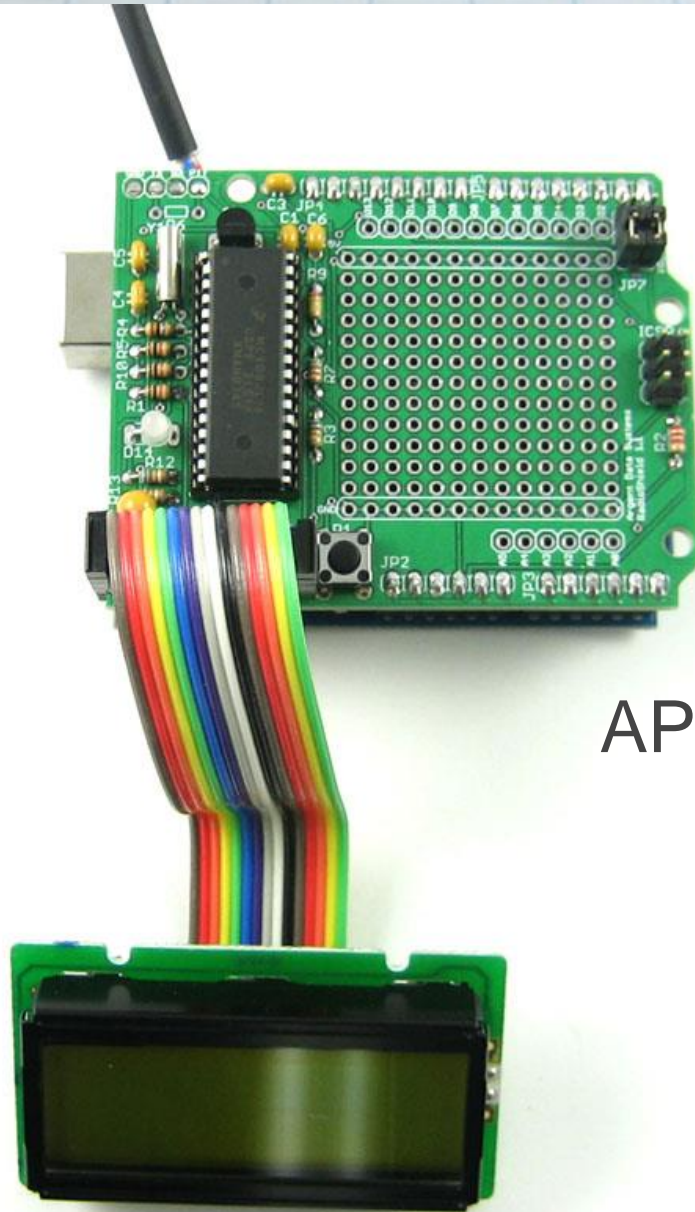


# And more shields...





# Even more shields!



APRS Shield

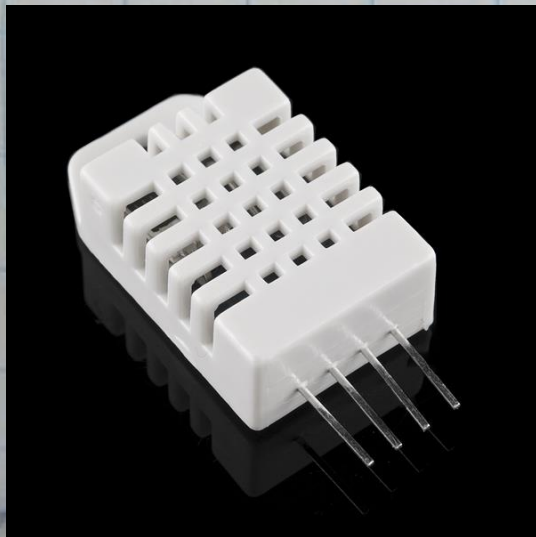
# Modules



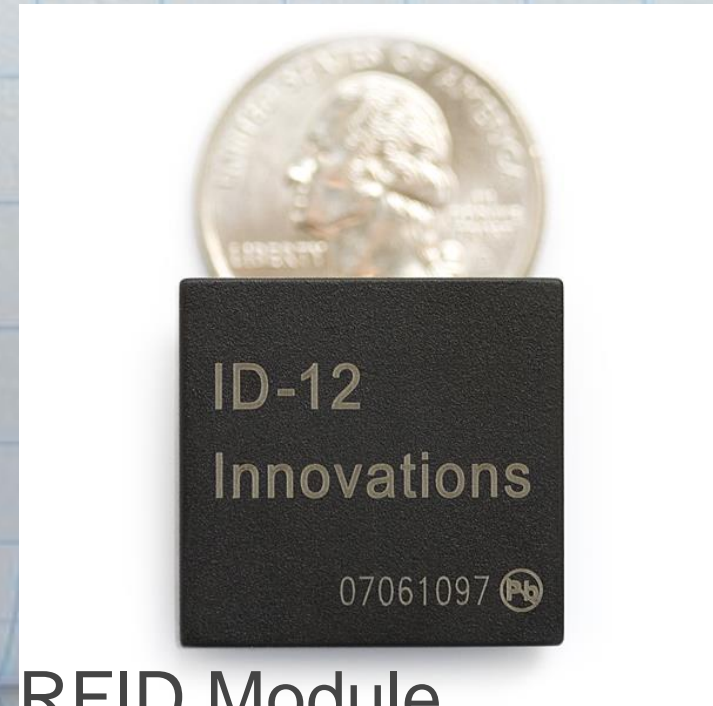
GPS Module



Bluetooth Module



Temperature &  
Humidity Sensor



RFID Module



# Sensors and Modules



Gas Sensor

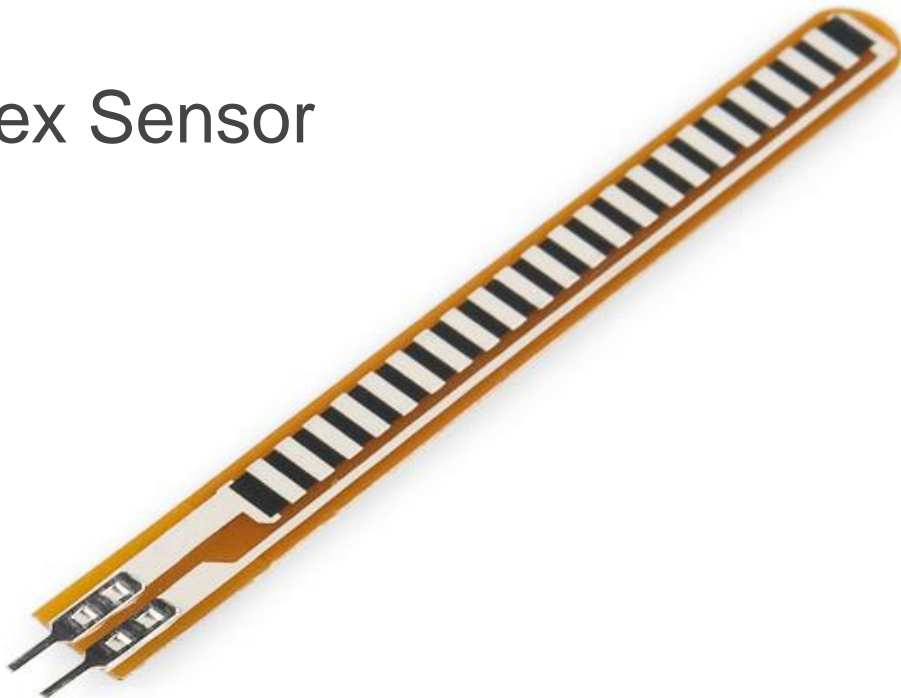


Temp & Humidity



Fingerprint Scanner

Flex Sensor

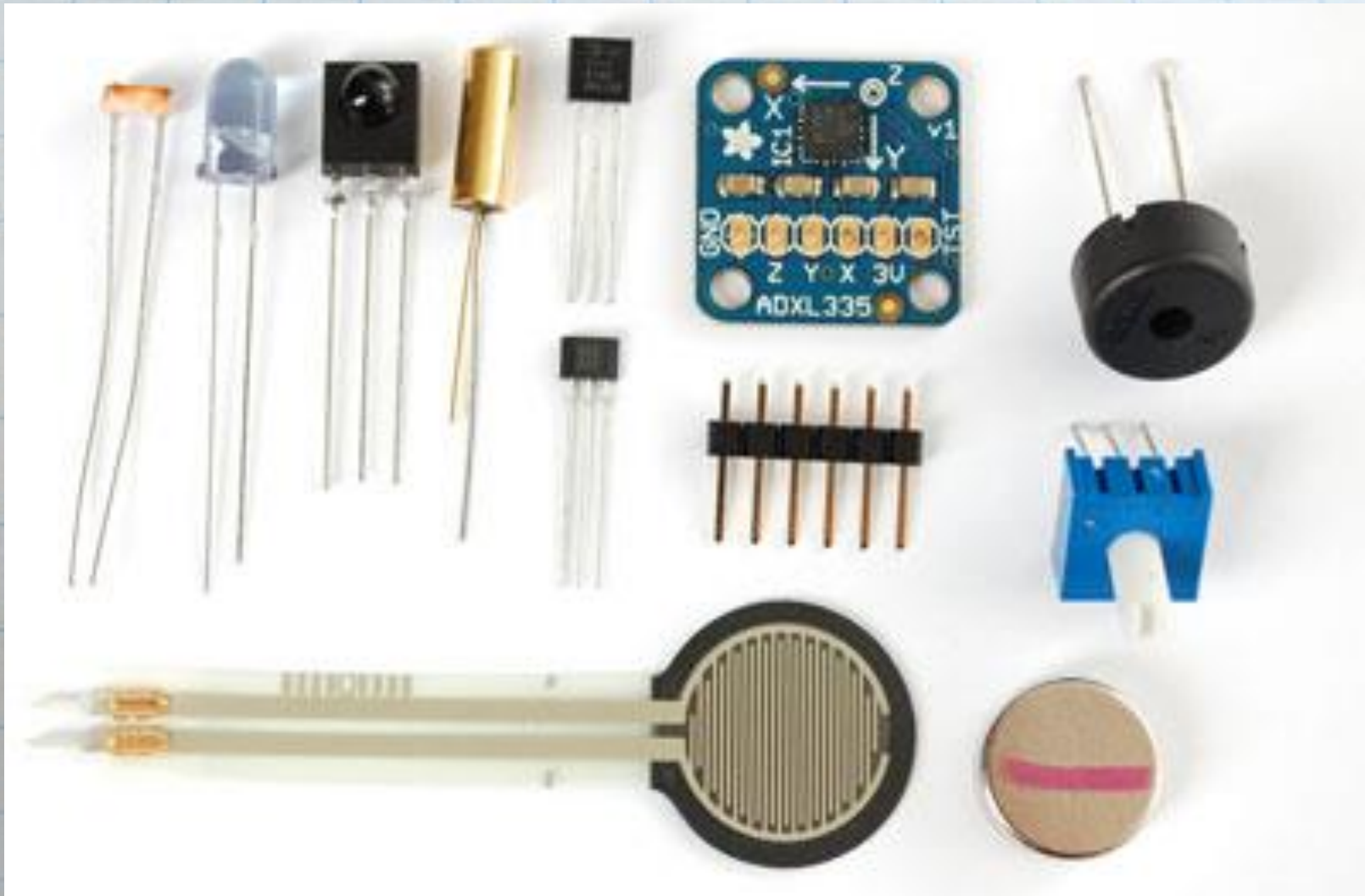


Geiger Counter



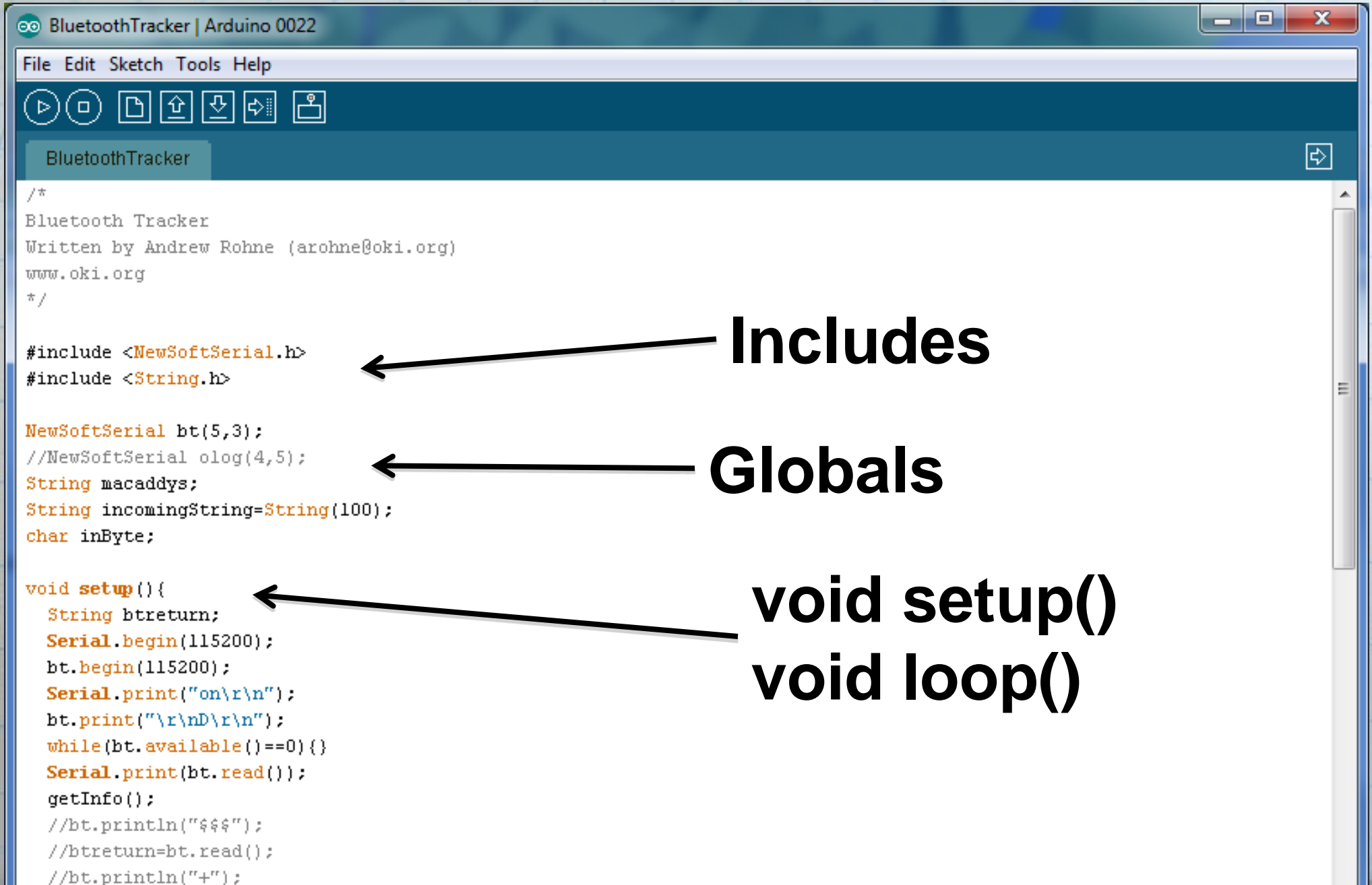
# Sensors

Photoresistor, infrared, force sensitive resistor, Hall effect, Piezo, tilt sensor..





# Sketches



BluetoothTracker | Arduino 0022

File Edit Sketch Tools Help

BluetoothTracker

```
/*
Bluetooth Tracker
Written by Andrew Rohne (arohne@oki.org)
www.oki.org
*/

#include <NewSoftSerial.h>
#include <String.h>

NewSoftSerial bt(5,3);
//NewSoftSerial olog(4,5);
String macaddys;
String incomingString=String(100);
char inByte;

void setup(){
  String btreturn;
  Serial.begin(115200);
  bt.begin(115200);
  Serial.print("on\r\n");
  bt.print("\r\nD\r\n");
  while(bt.available()==0){}
  Serial.print(bt.read());
  getInfo();
  //bt.println("$$$");
  //btreturn=bt.read();
  //bt.println("+");
```

**Includes**

**Globals**

**void setup()  
void loop()**



# **Amateur Radio Applications**



# Applications - APRS

Argent Data



Trackduino



# Rig Adjustment for Doppler Effect



# Morse Code Keyboard



# Arduino Controlled Tuner





# Morse Code Keyer

# Other Examples

- Weather Stations
- Remote Antenna Switches



# Getting Started

Sparkfun Getting Started in Arduino Kit (\$95)

Sparkfun Starter Kit for Arduino (\$60)

Adafruit Experimentation Kit (\$85)

Adafruit Starter Pack (\$65)

OR

Arduino Board (Uno \$20 or Mega \$35) +  
Breadboard, wires, components, etc.

# With Starter Sets



## Book is open source!



# **Other Open Source Hardware**

## **Raspberry Pi**

# Raspberry Pi

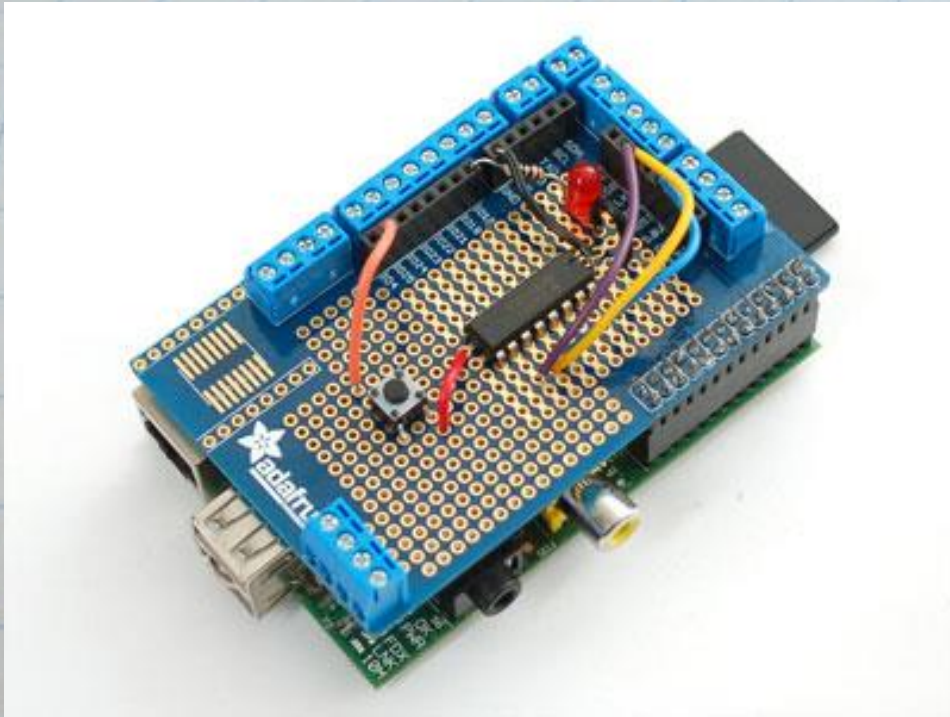




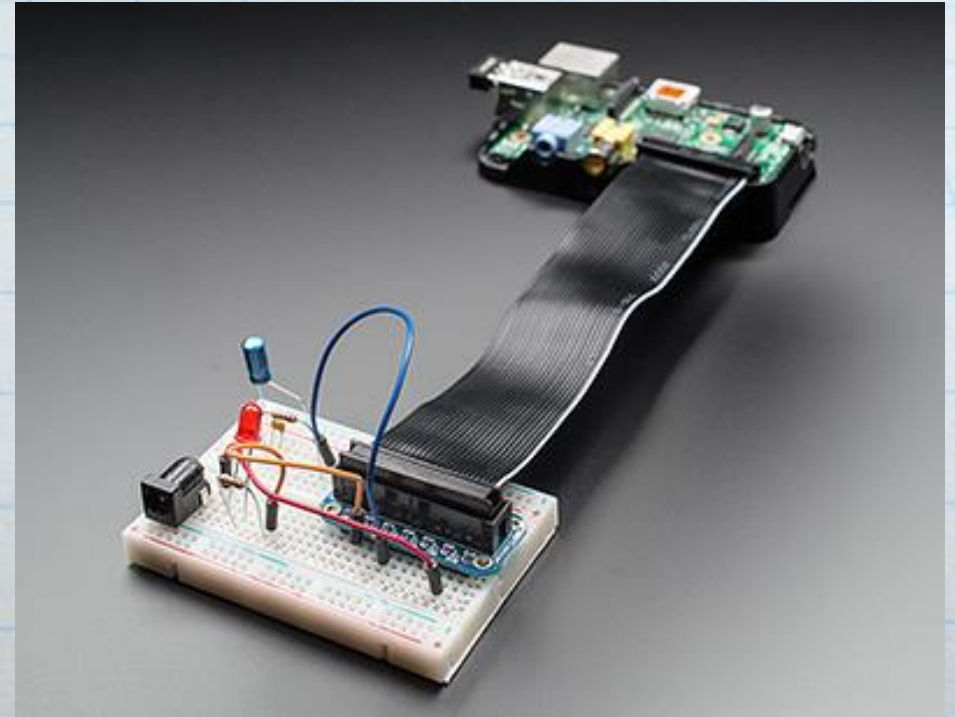
# Pi TNC



# Raspberry Pi Accessories



Pi Plate



Pi Cobbler



# Temperature/Humidity Sensor



# Temperature/Humidity Sensor

## Humidity

71.9  
%

humidity

Last updated 3 months ago

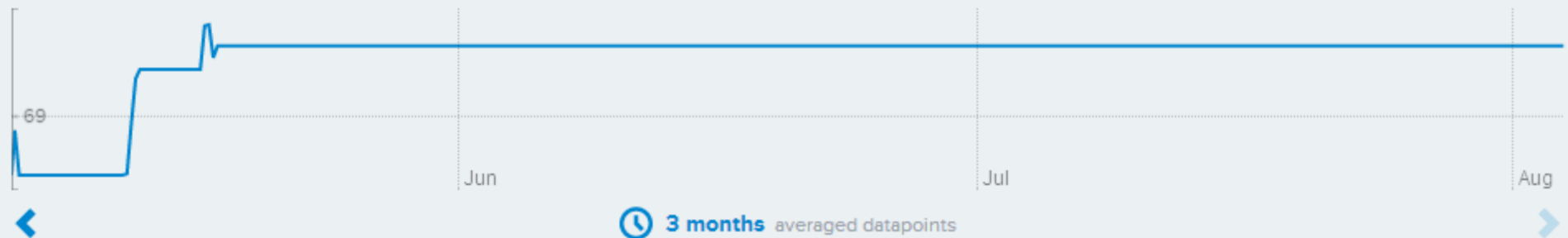


## Temperature

69.6  
F

temperature

Last updated 3 months ago





# **Other Open Source Hardware**

## **Beaglebone Black**

# Beaglebone Black

- Beaglebone makes several boards
- Black is the newest, \$45 Pi competitor
- A little faster than the Pi, 2GB onboard storage, more input/output pins





# Beaglebone Black WX Station





# “Capes”

## BeagleBone Capes Catalog



BeagleBone Breadboard [↗](#)  
BeagleBoardToys

**BB Black**  
Compatible



BeagleBone Breakout Cape [↗](#)  
BeagleBoardToys

**BB Black**  
Compatible



BeagleBone DVI-D Cape [↗](#)  
BeagleBoardToys



BeagleBone LCD7 Cape [↗](#)  
BeagleBoardToys

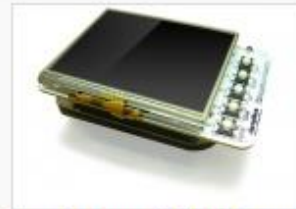
**BB Black**  
Compatible



Proto Cape Kit  
Adafruit



TT3201 CAN Cape [↗](#)  
TowerTech



BeagleBone LCD3 Cape [↗](#)  
BeagleBoardToys

**BB Black**  
Compatible



BeagleBone Battery Cape [↗](#)  
BeagleBoardToys

**BB Black**  
Compatible



BeagleBone MSTP Cape [↗](#)  
Plano CAD



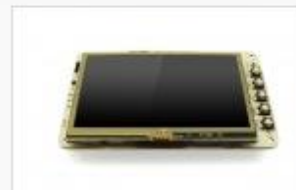
BeagleBone VGA Cape [↗](#)  
BeagleBoardToys



BeagleBone CANBus Cape [↗](#)  
BeagleBoardToys



BeagleBone ProfiBus Cape [↗](#)  
BeagleBoardToys

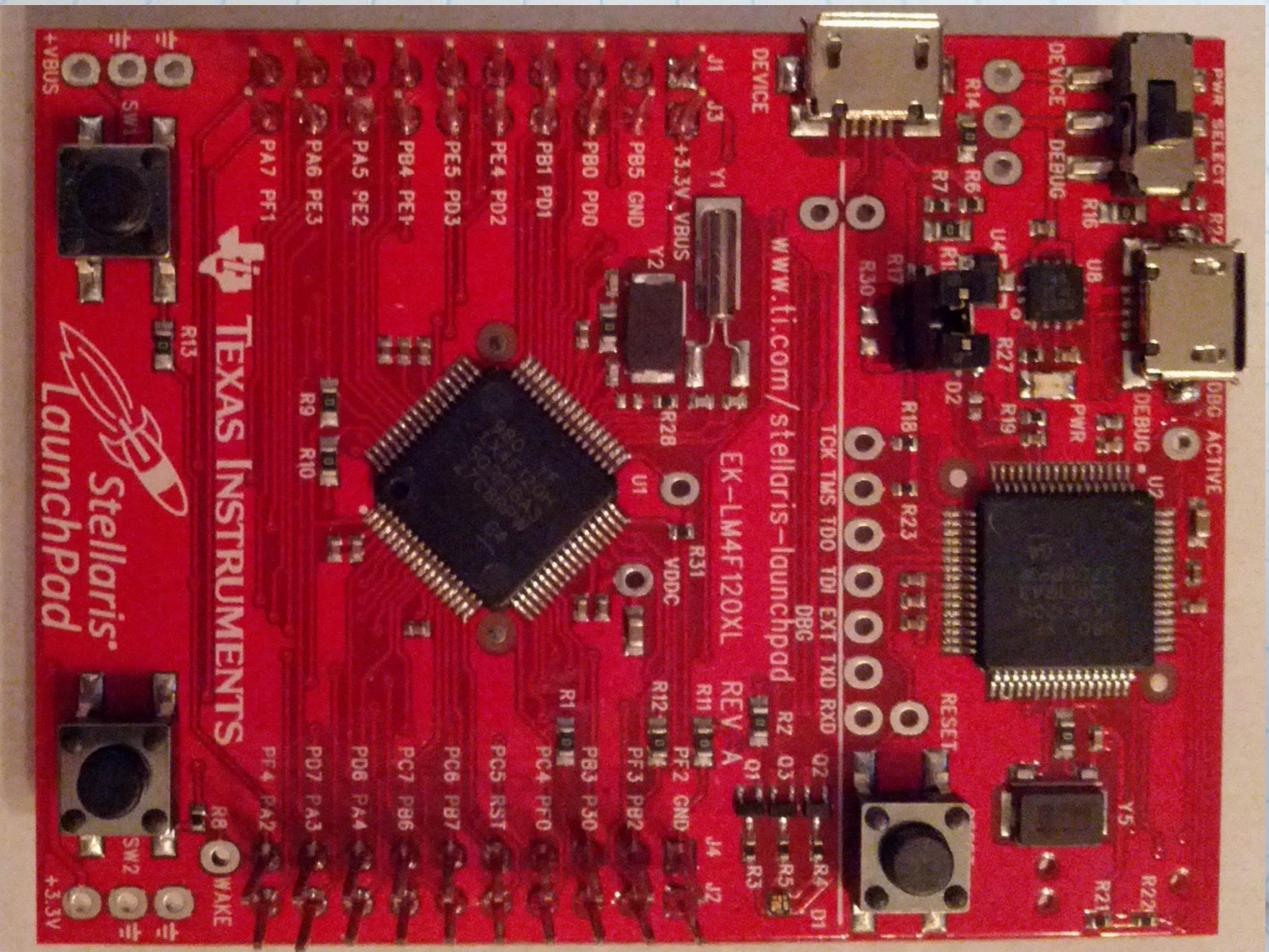




# Other Open Source Hardware



# TI Launchpad





# Ten Tec Rebel 506



# Ten Tec Rebel 506

- Open Hardware
  - Schematics and board layout on Yahoo Group
- Open Software
  - Source uploaded to Yahoo Group
  - Ten Tec will support rigs with official firmware
  - Extendable!
- Out very soon!
- ~\$200



# Resources

Links to presentation and everything mentioned today:

<http://ke8p.us/go/ohkyin>

Andrew Rohne, KE8P

[ke8p@ke8p.us](mailto:ke8p@ke8p.us)

Twitter: @KE8P

Web: <http://ke8p.us>

**TRI STATE HAMS**

**[WWW.TRISTATEHAMS.ORG](http://WWW.TRISTATEHAMS.ORG)**



# Tristatehams.org



## Tri-State Hams



Hello KE8P

August 03, 2013, 09:44:26 pm

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Tri-State Hams

### ? Tri-State Hams table at Cincy Mini Maker Faire??? October 19, 2013

July 23, 2013, 01:25:43 pm by KE8P | Views: 11 | Comments: 0



I am considering getting a space at the Cincinnati Mini Maker Faire. I think it would be a great idea to potentially recruit new club members, collaborate with others in the area that have similar interests (e.g. electronics, computers), and to show off what we build.

My initial thoughts are a table and display board with the following items:

- Map of club meeting locations, days, times, and websites
- Map (saved, probably) of APRS, possibly also of HSMM-Mesh
- Some ham radio promo materials (ARRL, others, club newsletters)
- Pictures of home-built projects (kits okay!)
- Some radios to demo (may have to stick with VHF only due to space, I'm not sure what we can do here)
- Pics of field day setups, service events, club stations, Foxhunts, test setups (like the HSMM-Mesh field trial last spring)

Home-built projects includes ANYTHING - it could be a desk, a station acc...

[Read More](#) | [Write Comment](#)

### Recent Announcements

No posts were found.

### Calendar

August 2013						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	[3]
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

No calendar events were found.

### Band Conditions

📁 Pan Ohio Hope Ride is coming through soon!


# Tristatehams.org

Nets in the Tri-State Area x

www.tristatehams.org/index.php?page=nets

ABP

## Tri-State Hams

 **Hello KE8P**  
August 03, 2013, 09:45:58 pm

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Tri-State Hams » Nets in the Tri-State Area

### Nets in the Tri-State Area

#### Amateur Radio Clubs of Greater Cincinnati

- Cincinnati Area Ten Tuners  
Wednesdays at 8:00pm (0100Z) on 28.800 MHz
- OH-KY-IN Tech Talk 9:00  
Wednesdays at 9:00pm on 146.670- MHz (123Hz PL)
- Milford Amateur Radio Club  
Sundays at 9:00pm on 147.345+ MHz
- GCARA 1936 Net  
Thursdays at 9:00pm on 1.936 MHz
- WARN Training  
1st Wednesday of the Month at 7:30pm on 146.88- MHz (123Hz PL)
- Queen City Emergency Net  
Tuesdays at 9:00pm on 147.24+ MHz (123Hz PL)
- Northern Kentucky 6m AM Net  
Thursdays at 8:00pm on 50.4 MHz



# Tristatehams.org

- Moderated
  - “Heavier hand” than QRZ and especially eHam
- Local
  - If you ask a local question, you can get a local answer
  - Local elmers
  - Testing (HSMM!)