SOFTWARE & SYSTEMS DESIGN

DroidCycle: Smartphone eBike computer

mbed, ADK, high voltage and electric bicycles

ARM

UBM Electronics

ACKNOWLEDGEMENTS

Sandia National Laboratories

mbed.org

Giles Barton-Owen
<https://mbed.org/users/p07gbar/>

<https://github.com/DanielCasner/>


Robot Garden

ARM

UBM Electronics

EBIKE COMPUTER

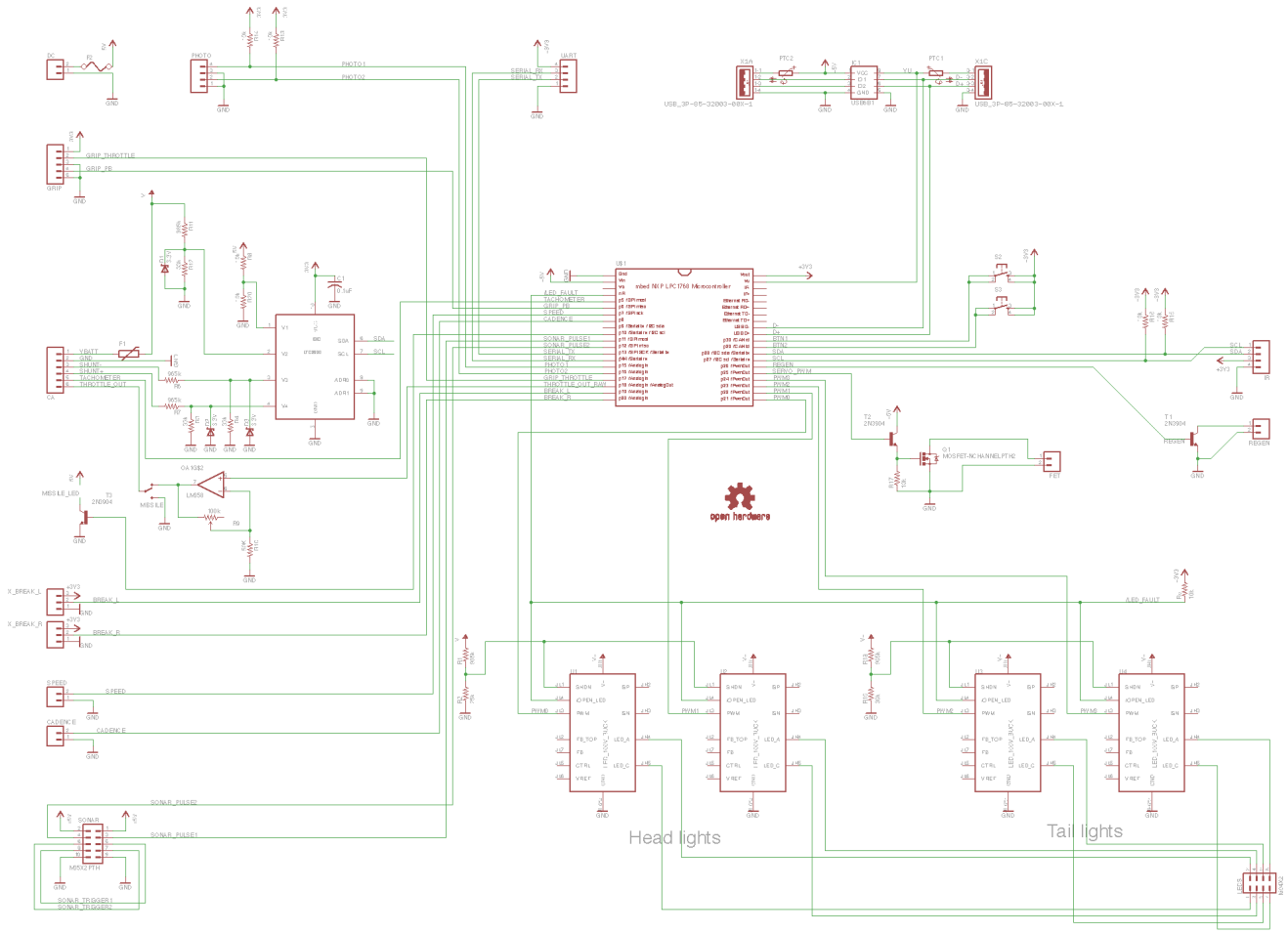
FEATURE LIST

- Base functions:
  - Android smartphone for UI
  - Monitor battery state of charge
  - Measure speed, cadence etc.
  - Throttle control
    - Current control
    - Cruise control
  - Head and tail lights
- Feature Creep:
  - Auto headlights
  - Traction control
  - Motor temperature monitoring
  - Sonar rangers
  - Electromagnet

SOLUTIONS

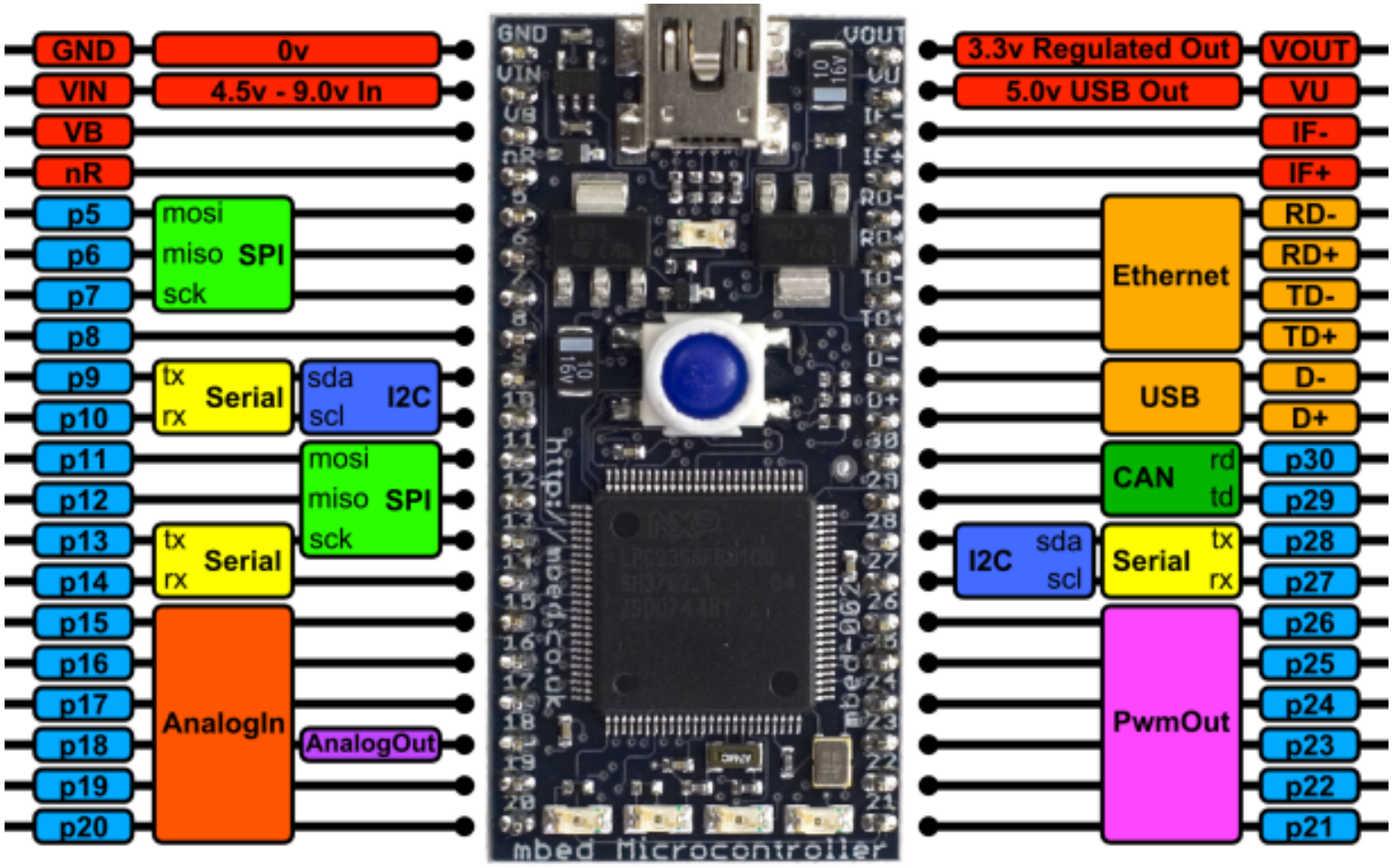
- mbed microcontroller module
- Android SDK and ADK
  - Eclipse IDE
- EAGLE CAD
- LTSpice
- PCB fabrication
- Breadboard
- 3D printing

SCHEMATIC

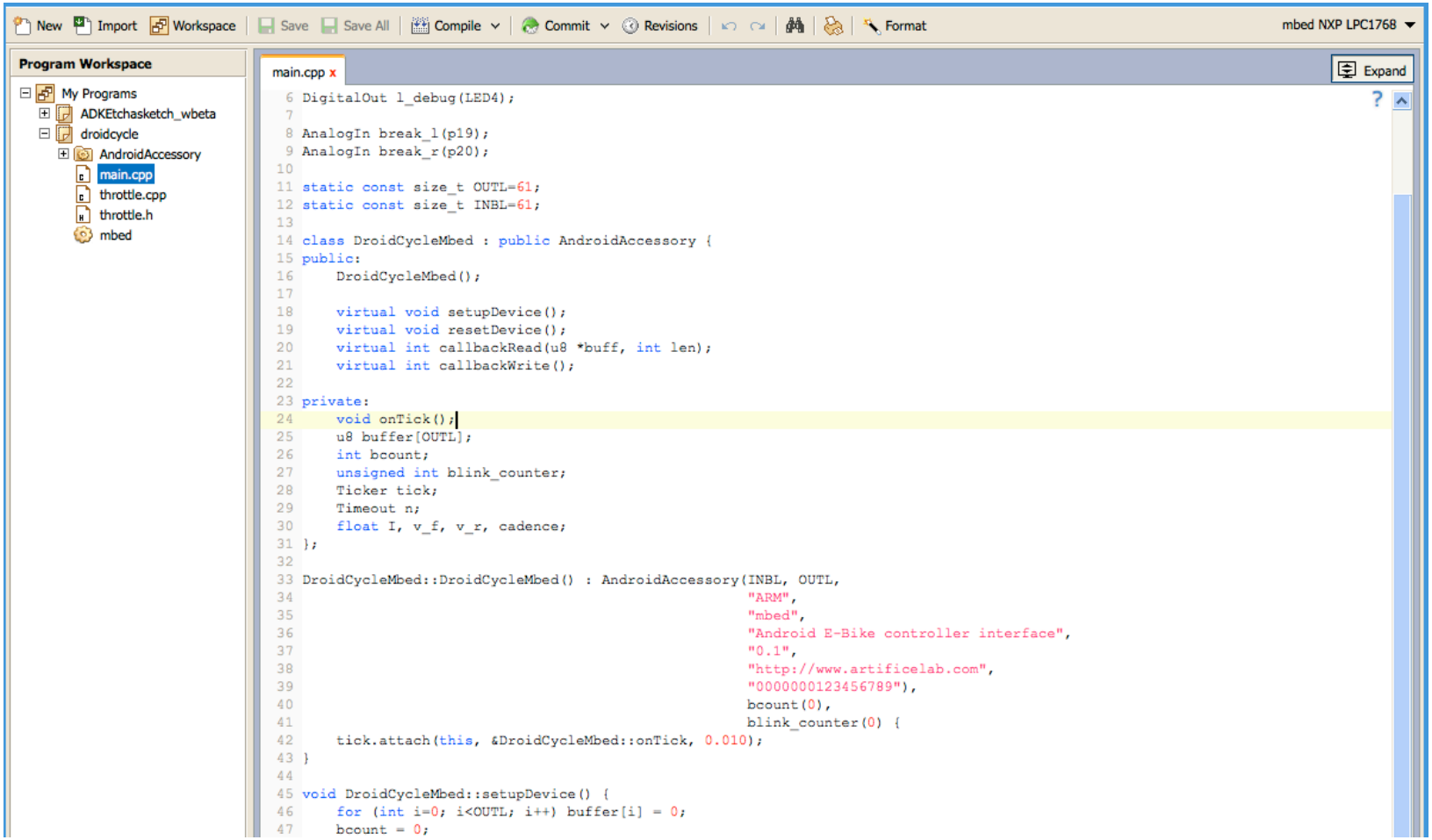


https://github.com/DanielCasner/droidcycle

MBED MICROCONTROLLER MODULE

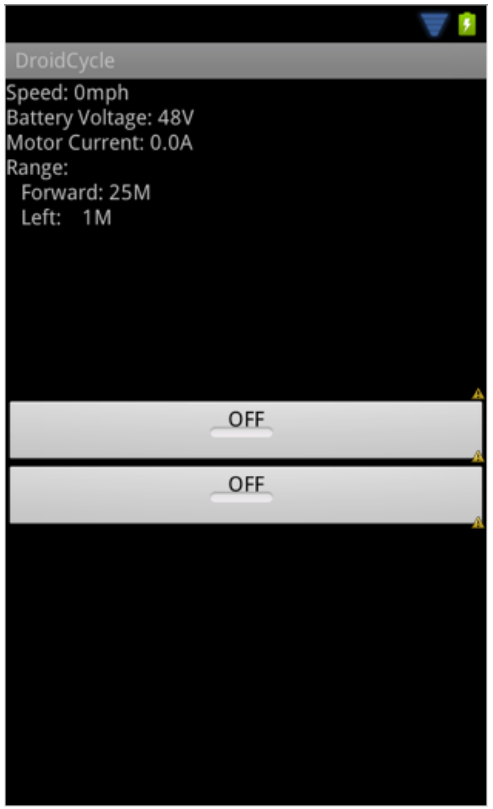


WEB IDE

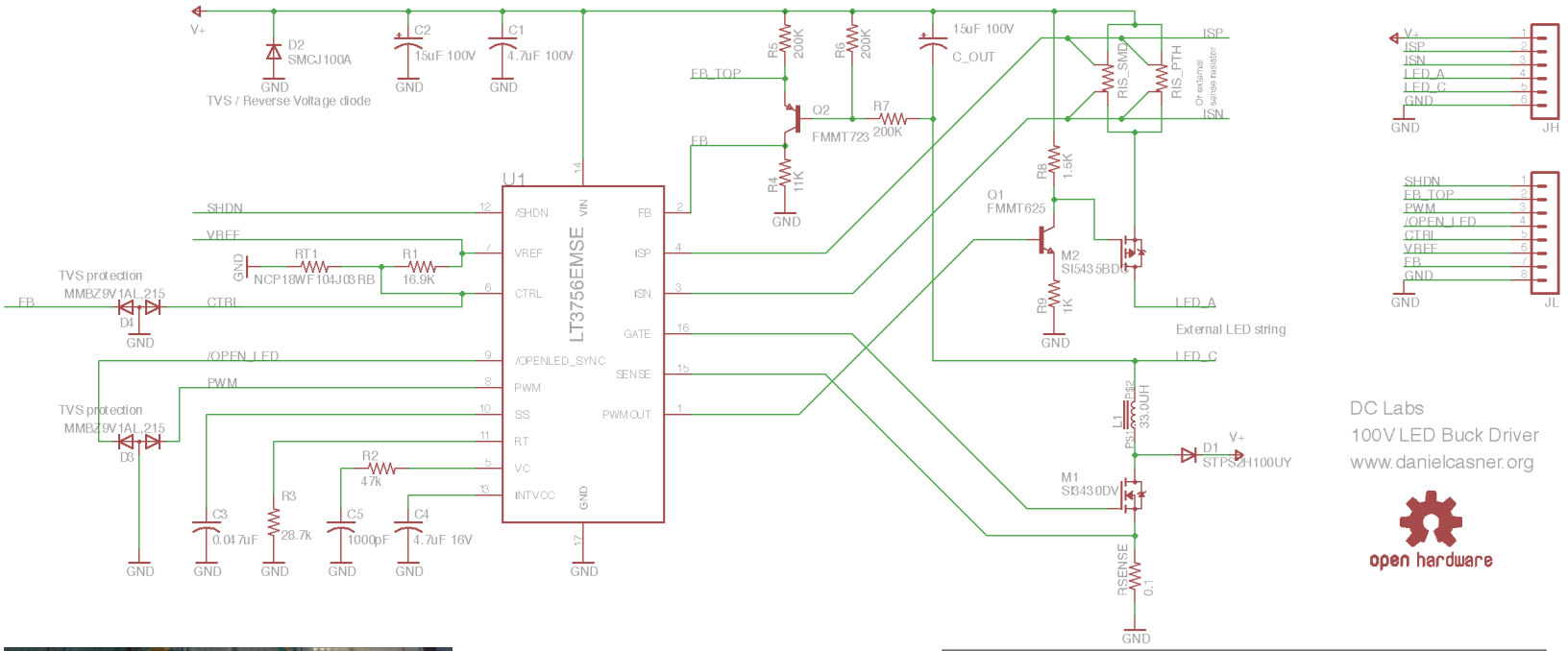

New
Import
Workspace
Save
Save All
Compile
Commit
Revisions
Format
mbed NXP LPC1768
Program Workspace
My Programs
ADKEtchasketch_wbeta
droidcycle
AndroidAccessory
main.cpp
throttle.cpp
throttle.h
mbed
main.cpp x
Expand
6 DigitalOut l_debug(LED4);
7
8 AnalogIn break_l(p19);
9 AnalogIn break_r(p20);
10
11 static const size_t OUTL=61;
12 static const size_t INBL=61;
13
14 class DroidCycleMbed : public AndroidAccessory {
15 public:
16 DroidCycleMbed();
17
18 virtual void setupDevice();
19 virtual void resetDevice();
20 virtual int callbackRead(u8 *buff, int len);
21 virtual int callbackWrite();
22
23 private:
24 void onTick();
25 u8 buffer[OUTL];
26 int bcount;
27 unsigned int blink_counter;
28 Ticker tick;
29 Timeout n;
30 float I, v_f, v_r, cadence;
31 };
32
33 DroidCycleMbed::DroidCycleMbed() : AndroidAccessory(INBL, OUTL,
34 "ARM",
35 "mbed",
36 "Android E-Bike controller interface",
37 "0.1",
38 "http://www.artificelab.com",
39 "0000000123456789"),
40 bcount(0),
41 blink_counter(0) {
42 tick.attach(this, &DroidCycleMbed::onTick, 0.010);
43 }
44
45 void DroidCycleMbed::setupDevice() {
46 for (int i=0; i<OUTL; i++) buffer[i] = 0;
47 bcount = 0;

ANDROID DEVELOPMENT

- http://developer.android.com
  - Good documentation
  - But a lot to learn
- Eclipse IDE
  - ADT plugin
  - Lots of wizards and warnings
- Version problems

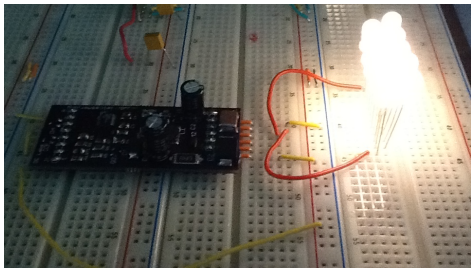


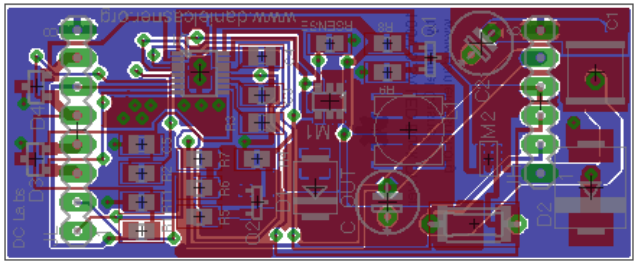
PCB FABRICATION FOR HIGH FREQUENCY CIRCUITS



DC Labs
100V LED Buck Driver
www.danielcasner.org

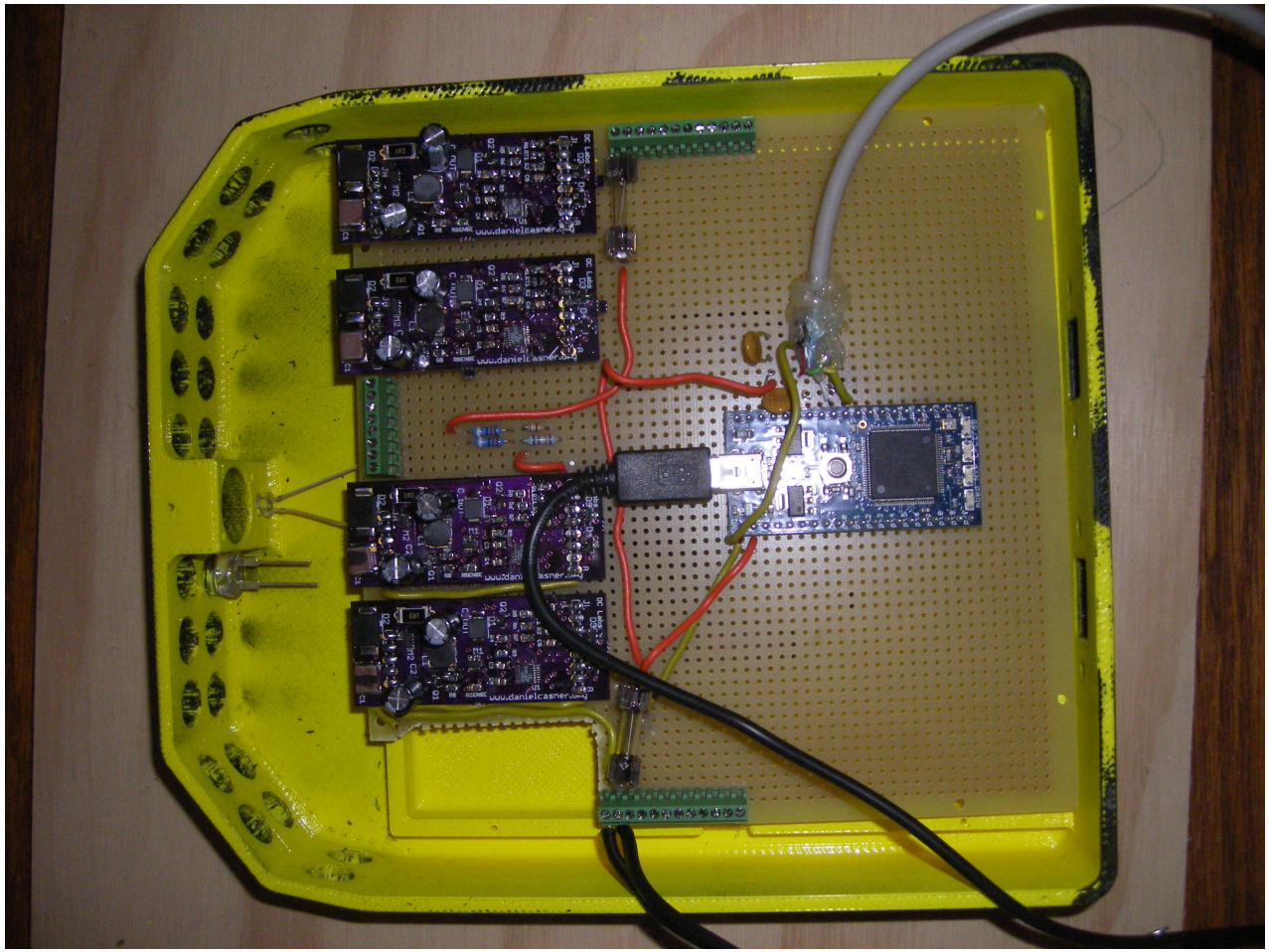
open hardware



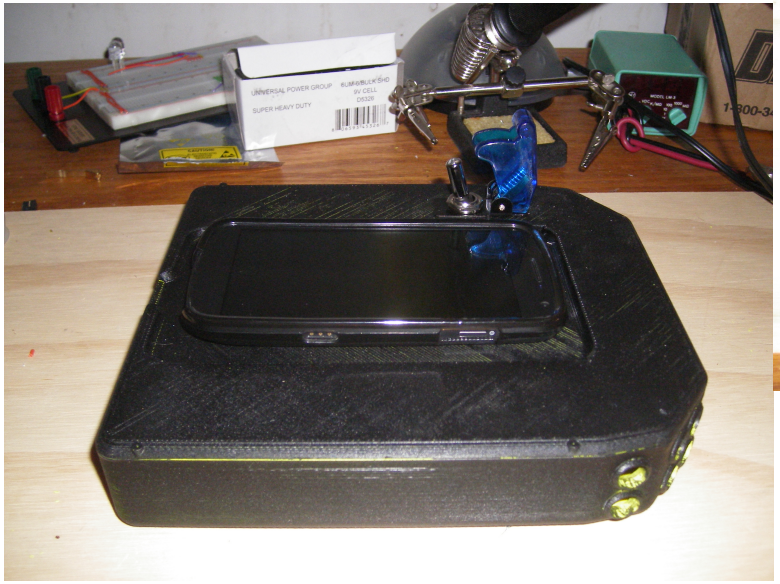


https://github.com/DanielCasner/LED-drivers

BREADBOARDING



3D PRINTING



https://github.com/DanielCasner/droidcycle

THE END

- **Questions?**

- Open Source
  - https://github.com/DanielCasner/
- Documentation
  - http://www.danielcasner.org/tag/ebike/