

revOSD – On-screen Display

Justin Kenny – IME 458 5.25.2012

Agenda

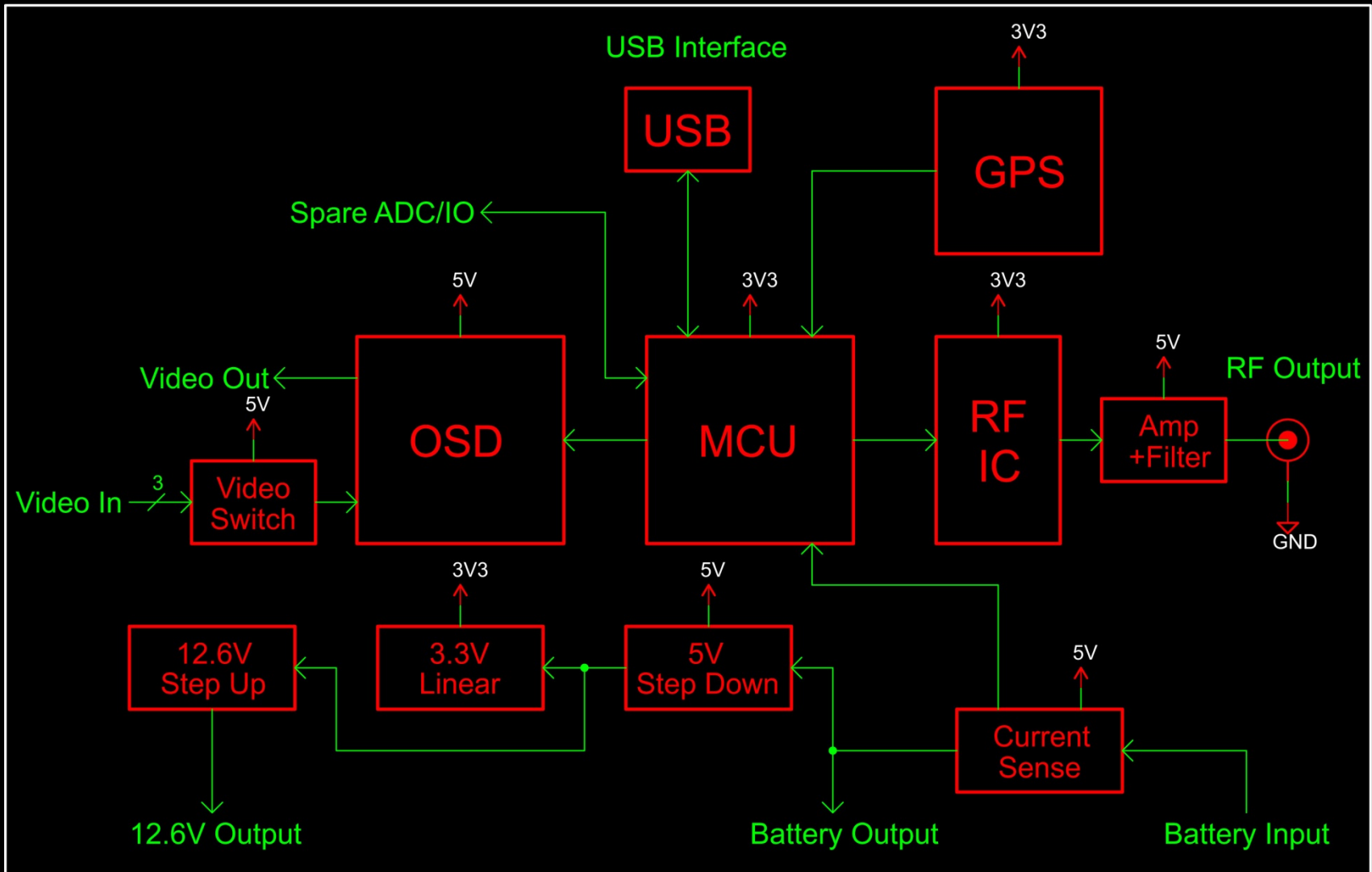
- Project Description + Goals
- Block Diagram + Descriptions
- Schematic + Layout
- Construction, Testing + Problems Encountered
- Conclusions + Demo

Project Description + Goals

- Design a PCB to provide an on-screen display containing battery + location information for an RC vehicle
- Provide regulated 5V and 12.6V supplies for RC systems
- Transmit telemetry via RF transmitter

Block Diagram

rev0SD v1.2 Block Diagram



MCU, RF IC, GPS

- Used TI MSP430F5508 – 24MHz, USB, SPI, UART, 10-bit ADC, 48-pin 0.5mm pitch QFP
- Used GTop FGPMMPA6B GPS module – built in patch antenna, outputs NMEA at 38400 baud
- Used Analog Devices ADF7012 – GFSK transmitter, 75-1000MHz range
 - Used Skyworks SKY65017 100mW amplifier

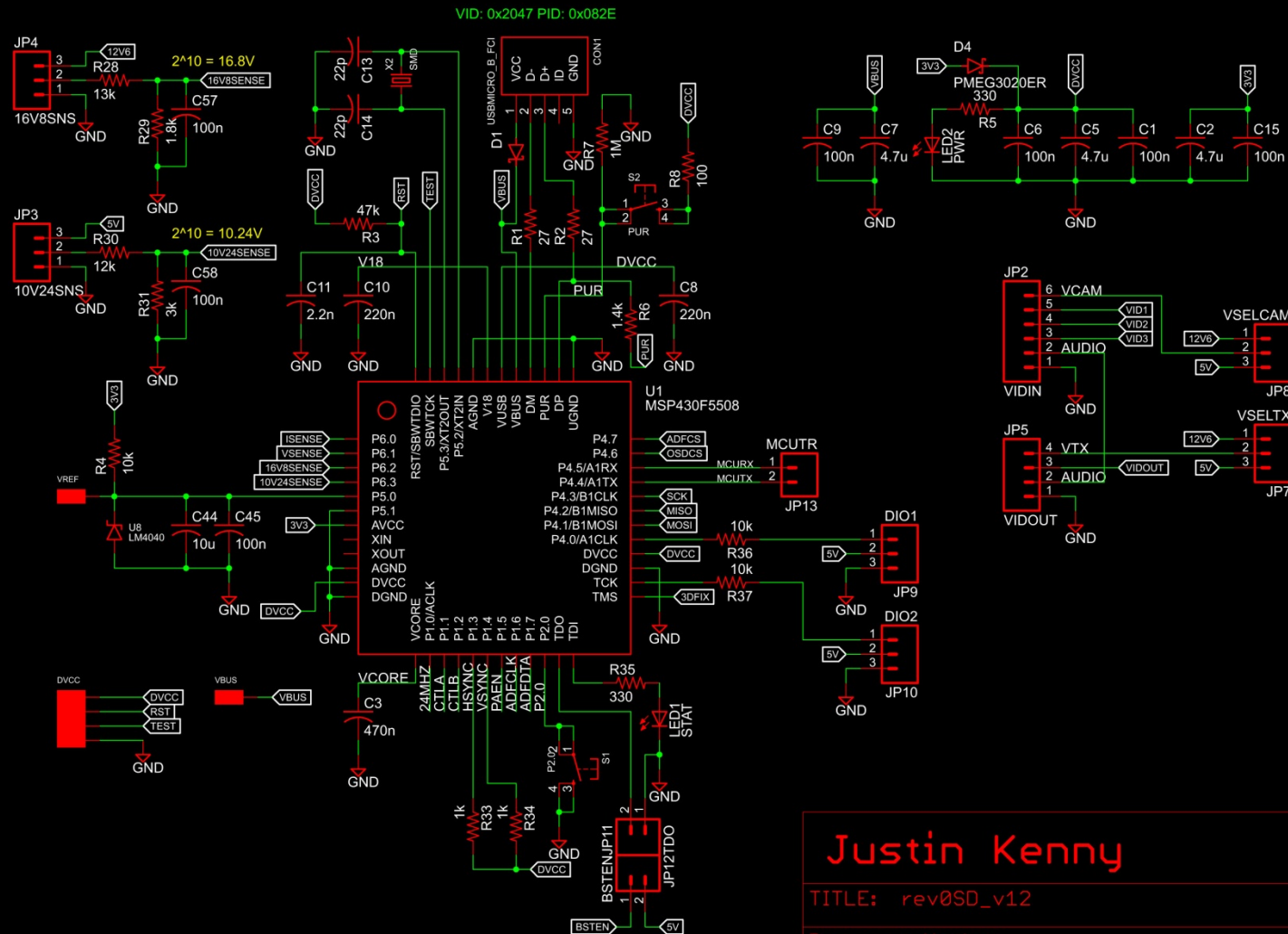
Power + Analog

- Used $0.5\text{m}\Omega$ current sense resistor + TI INA214 current shunt monitor
- Used TI LM4040 2.048V reference + 4 divided ADC inputs to read battery voltage, current, and 2 spare channels with range 10.24, 16.8V
- Used TI TPS5430 5V 3A step down, TLV1117 3.3V 800mA linear, and TPS61085 12.6V 300mA step up regulators

Video Generation

- Used Maxim MAX7456 OSD generator – SPI input, outputs NTSC or PAL video
- Used Rohm BH76330FVM video switch + buffer amplifier to select video channel

Schematic (1/4)

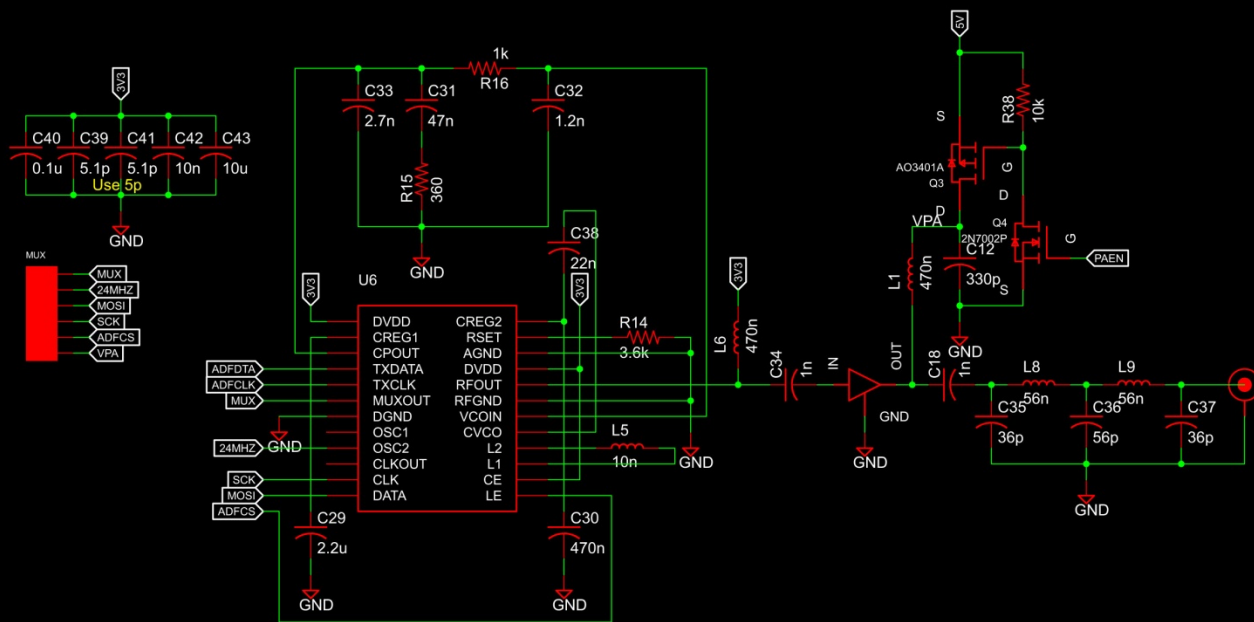


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1. Microcontroller

REV:
1.1

Schematic (2/4)

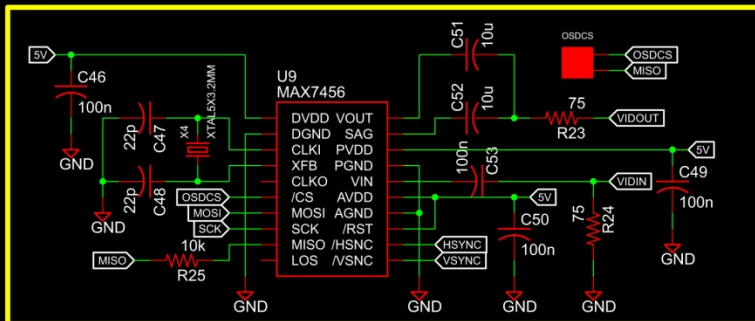


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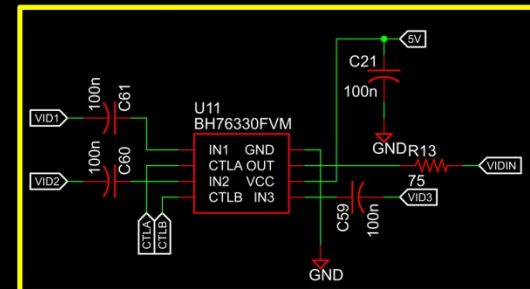
REV:
1.1

Schematic (3/4)

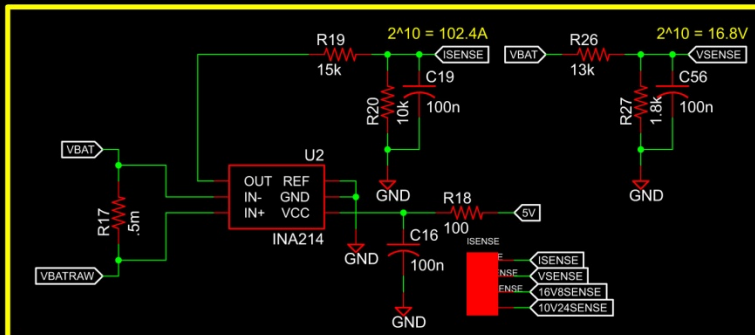
OSD



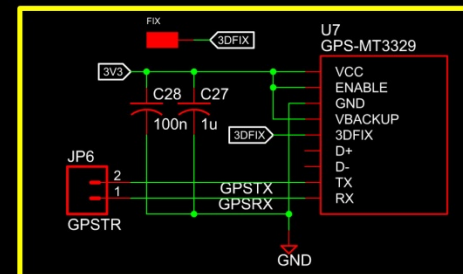
Video Select SW



Current Sense Circuit



GPS Module



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TITLE: rev0SD_v12

Document Number:

3. Video/Sensors

REV:

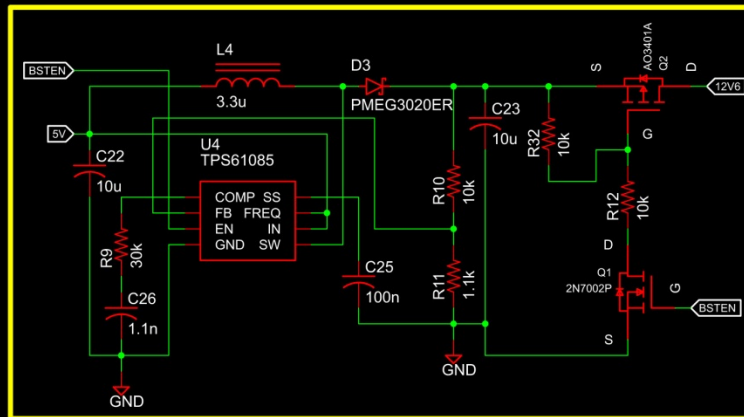
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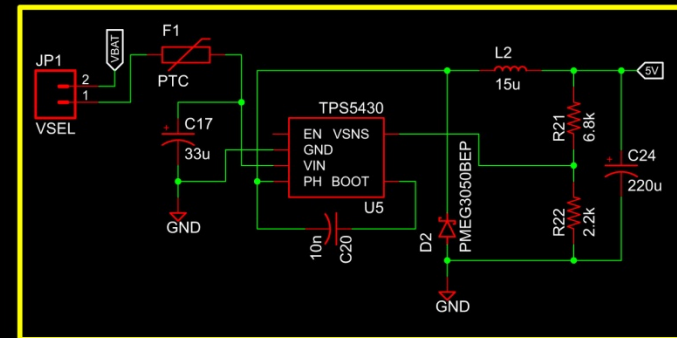
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Schematic (4/4)

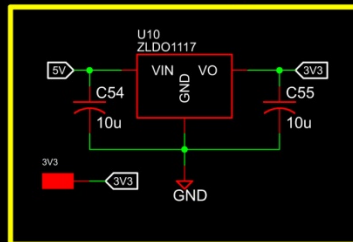
12.6V Boost Conv.



5V Buck Conv.



3.3V Linear Reg.



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TITLE: rev0SD_v12

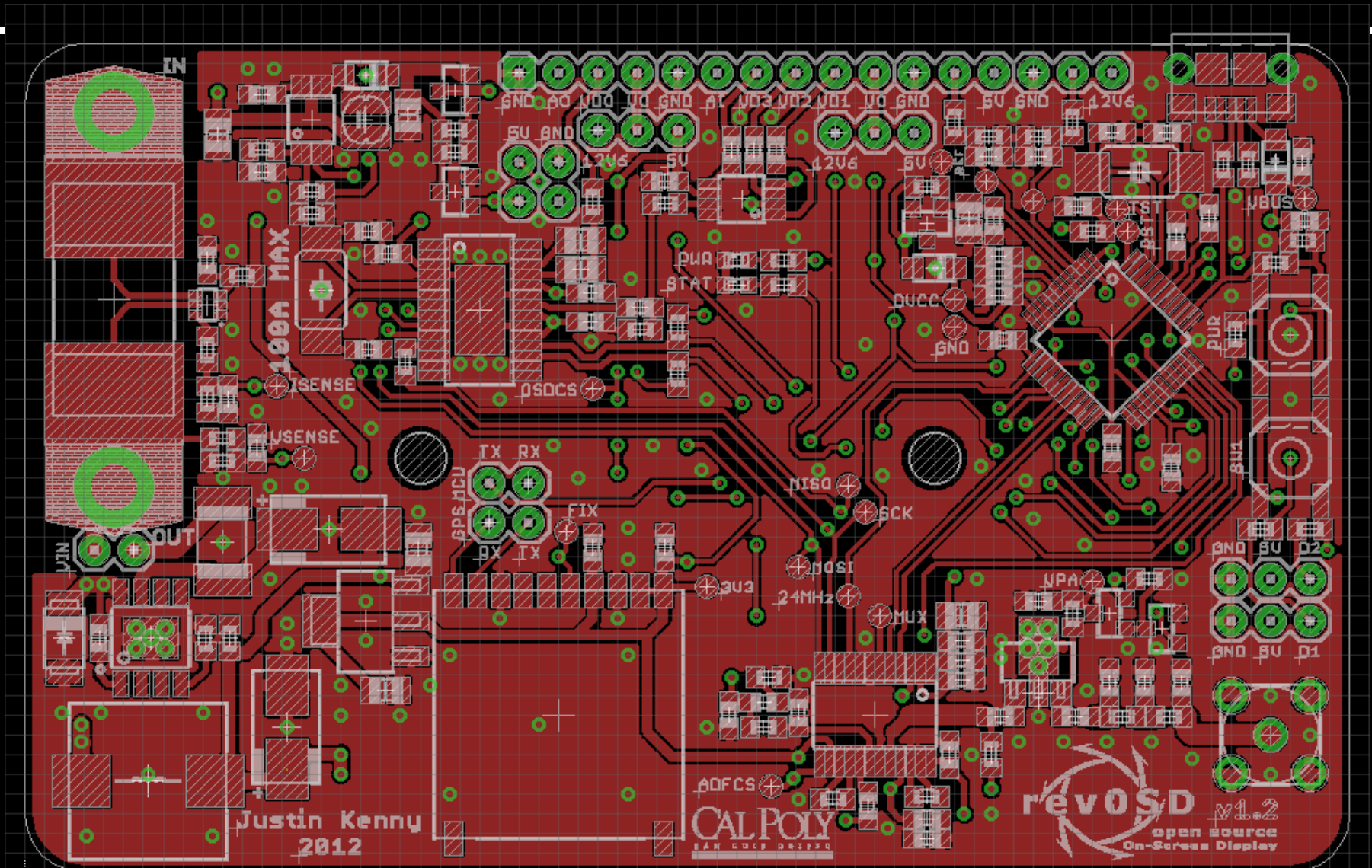
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4. Power Mgmt.

REV:
1.1

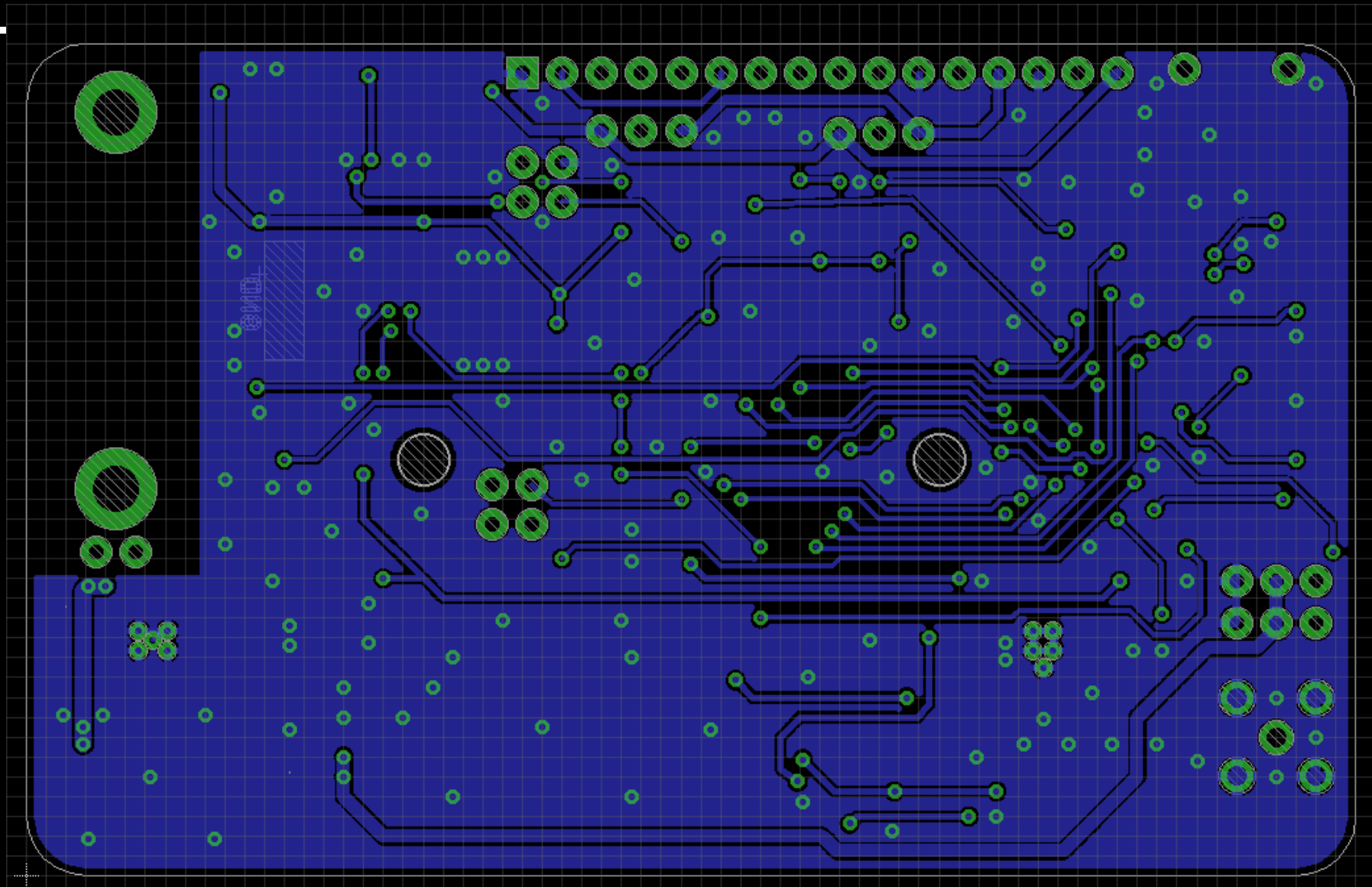
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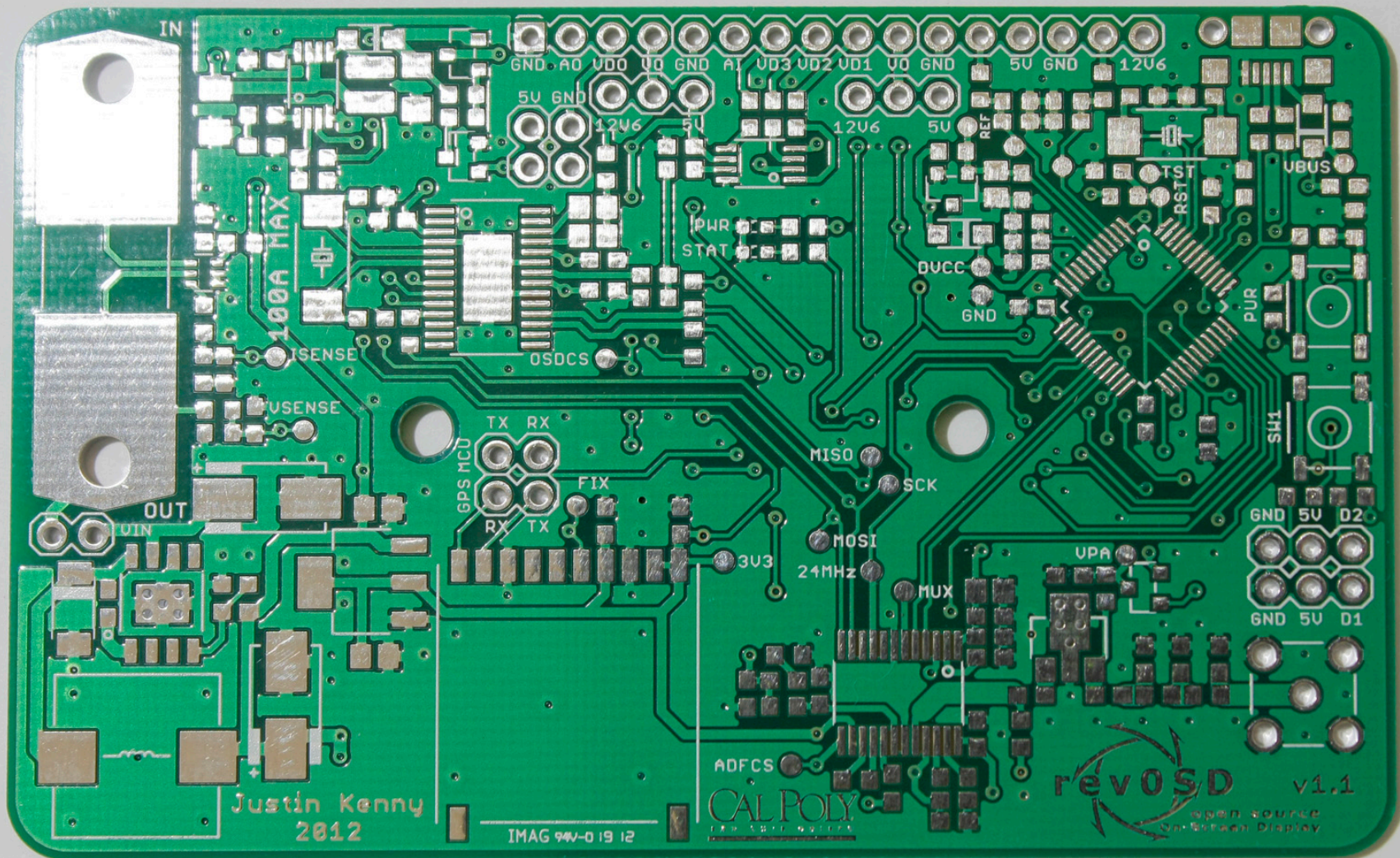
Layout (Top)



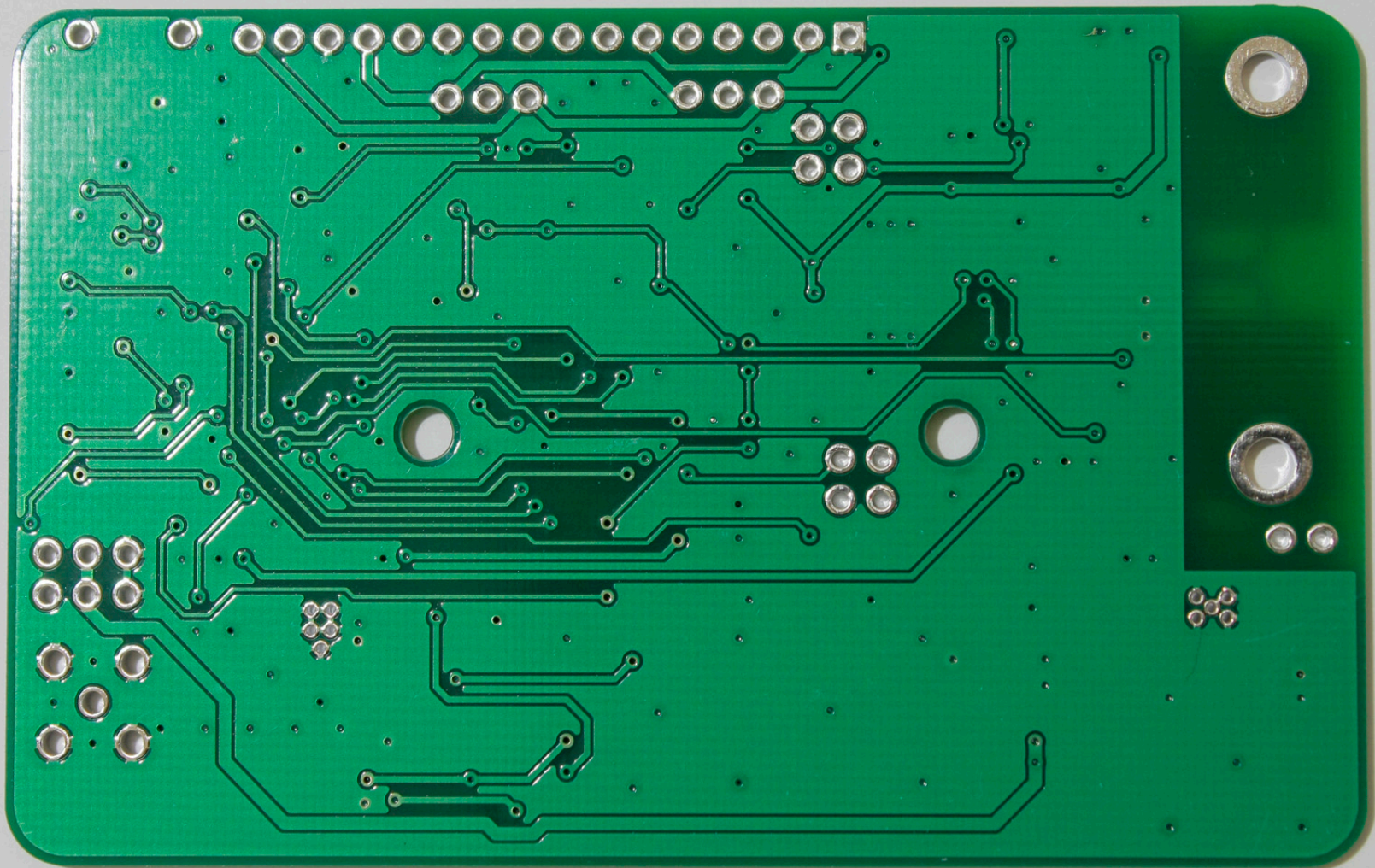
Layout (Bottom)



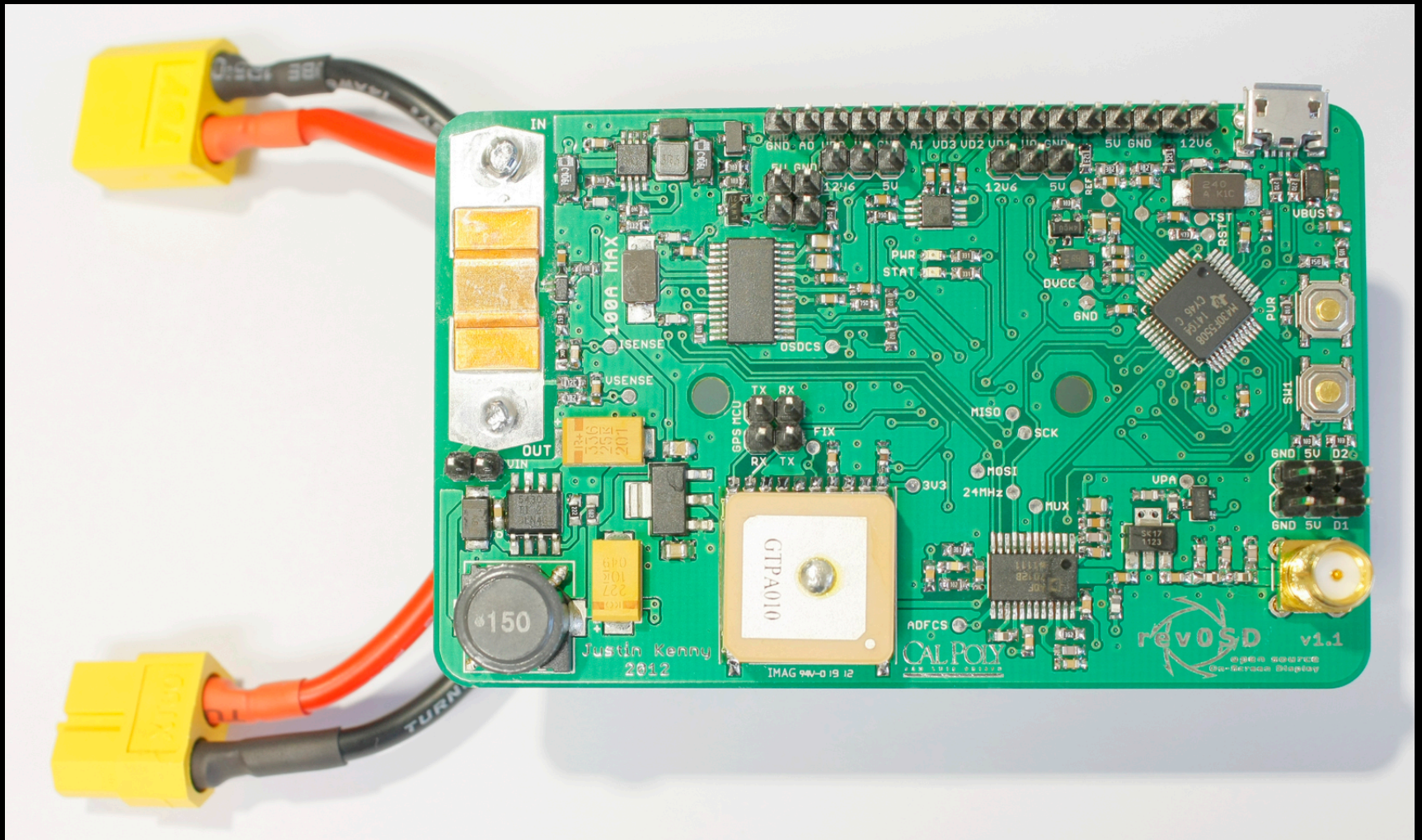
PCB (Top)



PCB (Bottom)



Finished Project



Construction + Testing

- First board partial reflow; only components that needed it, remaining were hand soldered
- Second board full reflow; only through-hole components hand soldered
- Tested power supply first, then MCU and remaining components
- 2 major errors, 5 total changes for next revision

Conclusions

- Read datasheets thoroughly and carefully
- If time permits, make prototype modules of individual components/blocks in design
- Route functional blocks individually then connect (component placement is critical)
- Hand soldering tiny components is not hard, just use lots of flux!
- Use silkscreen layer over ground plane for nice logos/text

Demo

Thanks for Listening!