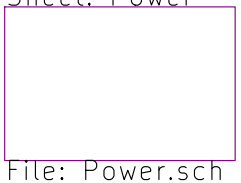
Sheet: Avionics

File: Avionics.sch

Sheet: Connectors

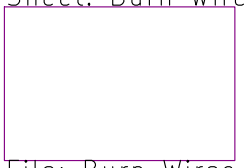
File: Connectors.sch

Sheet: Power



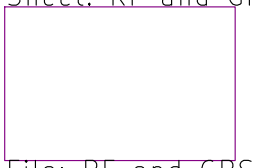
File: Power.sch

Sheet: Burn Wires



File: Burn_Wires.sch

Sheet: RF and GPS



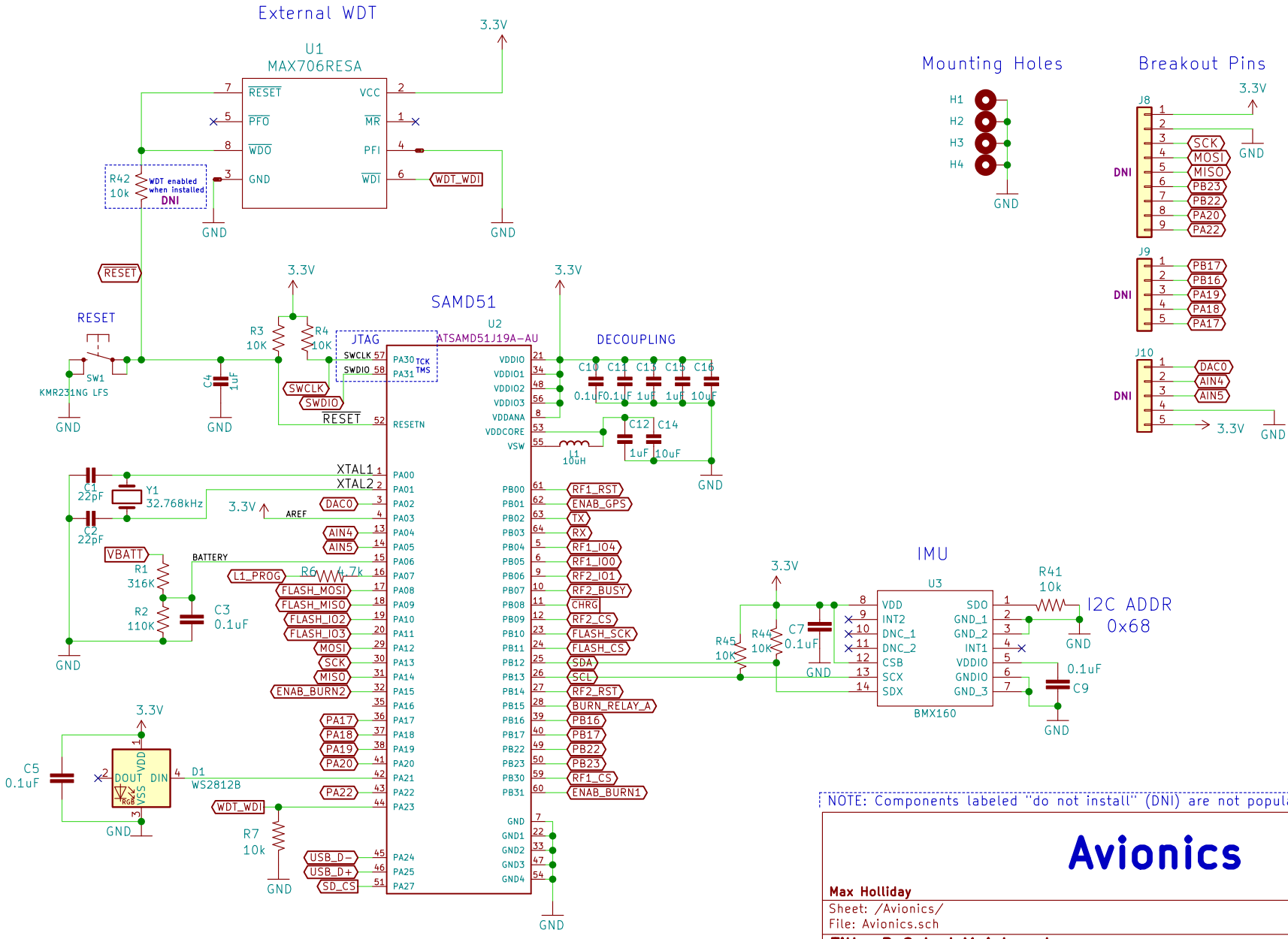
File: RF_and_GPS.sch

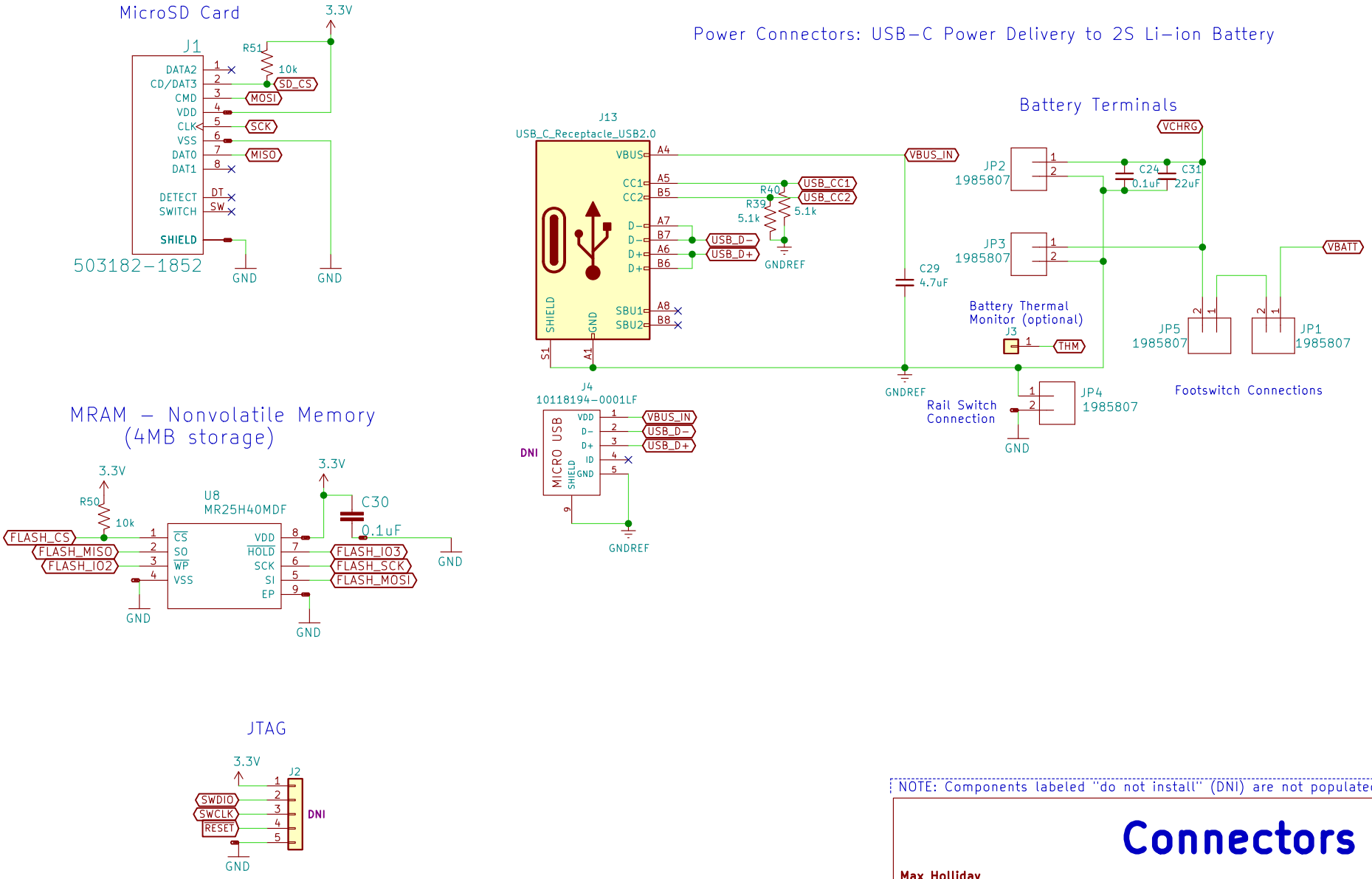
Max Holliday

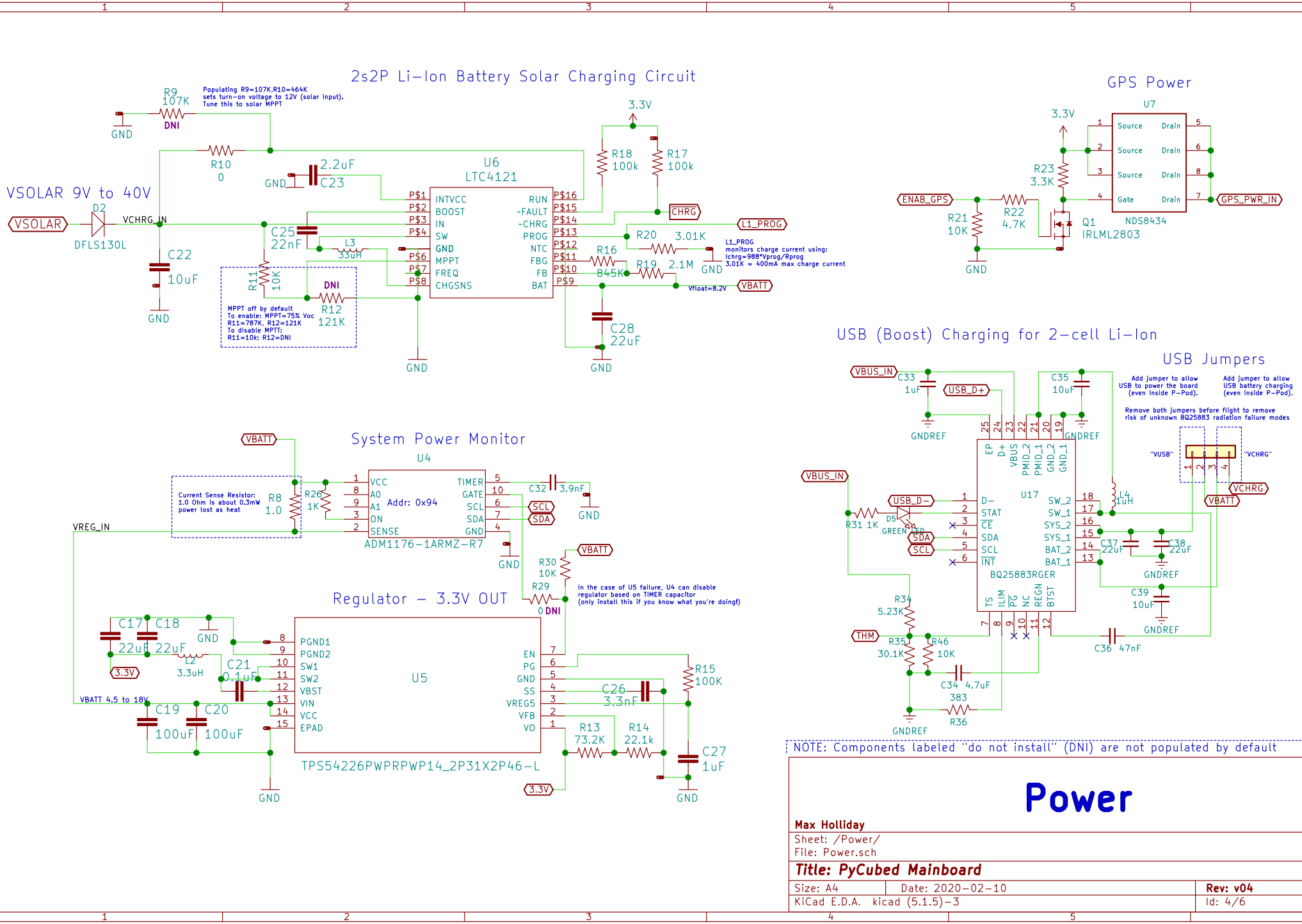
Sheet: /
File: mainboard.sch

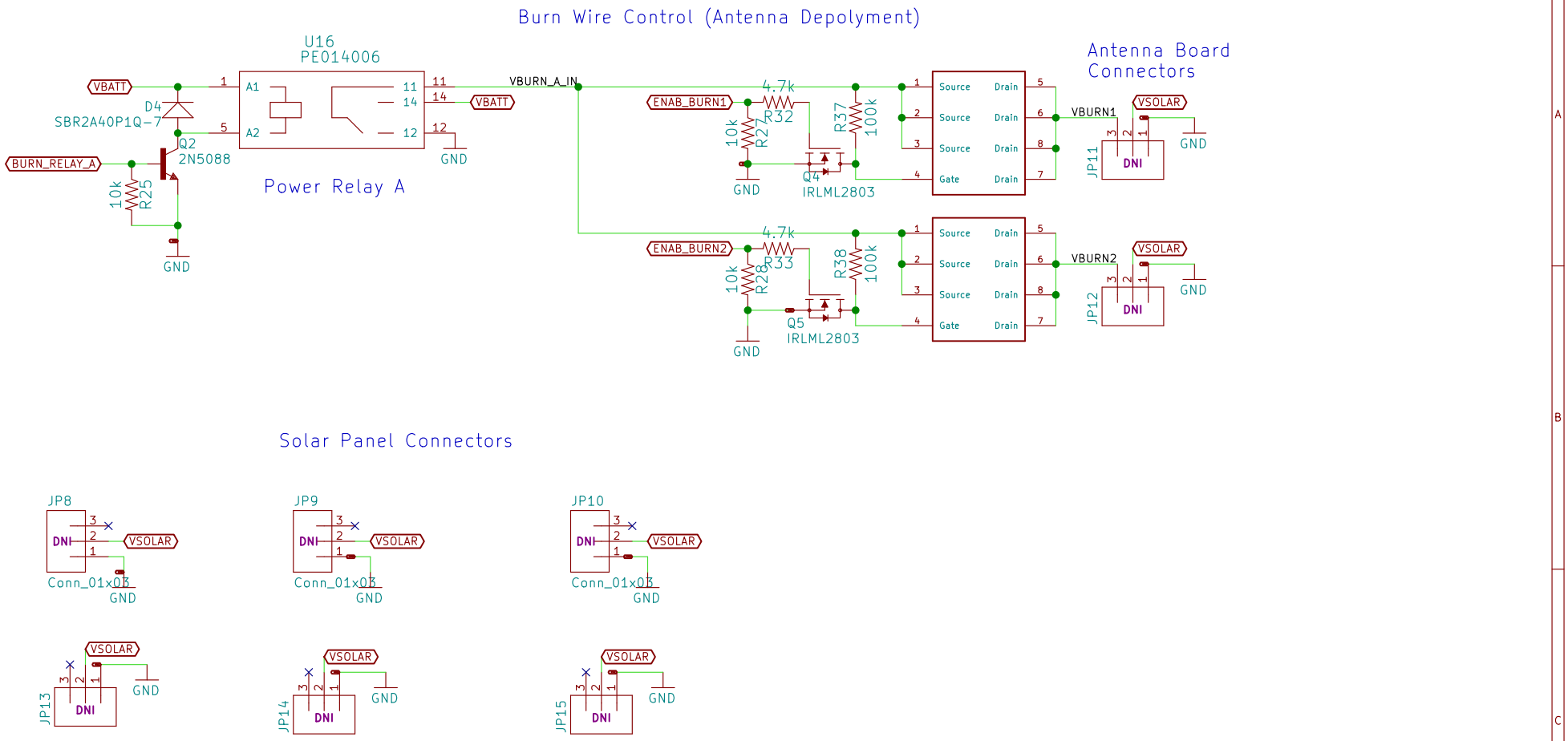
Title: PyCubed Mainboard

Size: A4	Date: 2020-02-10	**Rev: v04**
KiCad E.D.A. kicad (5.1.5)-3		Id: 1/6


External WDT
U1
MAX706RESA
3.3V
RESET
PFO
WDO
GND
VCC
MR
PFI
WDI
WDT_WDI
R42
10k
WDT enabled when installed
DNI
Mounting Holes
H1
H2
H3
H4
Breakout Pins
J8
J9
J10
DNI
SCK
MOSI
MISO
PB23
PB22
PA20
PA22
PB17
PB16
PA19
PA18
PA17
DAC0
AIN4
AIN5
SAMD51
U2
ATSAMD51J19A-AU
JTAG
SWCLK
SWDIO
RESETN
SW1
KMR231NG LFS
R3
10K
R4
10K
C4
1uF
DECOUPLING
C10
C11
C13
C15
C16
0.1uF
1uF
10uF
C12
C14
L1
10uH
VDDIO
VDDIO1
VDDIO2
VDDIO3
VDDANA
VDDCORE
VSW
XTAL1
XTAL2
C1
22pF
C2
22pF
Y1
32.768kHz
AREF
VBATT
R1
316K
R2
110K
BATTERY
C3
0.1uF
L1_PROG
R6
4.7k
FLASH_MOSI
FLASH_MISO
FLASH_IO2
FLASH_IO3
MOSI
SCK
MISO
ENAB_BURN2
C5
0.1uF
D1
WS2812B
DOUT
DIN
VDD
VSS
R7
10k
USB_D-
USB_D+
SD_CS
RF1_RST
ENAB_GPS
TX
RX
RF1_IO4
RF1_IO0
RF2_IO1
RF2_BUSY
CHRG
RF2_CS
FLASH_SCK
FLASH_CS
SDA
SCL
RF2_RST
BURN_RELAY_A
PB16
PB17
PB22
PB23
RF1_CS
ENAB_BURN1
IMU
U3
BMX160
VDD
INT2
DNC_1
DNC_2
CSB
SCX
SDX
SDO
GND_1
GND_2
INT1
VDDIO
GNDIO
GND_3
R44
10K
R45
10K
C7
0.1uF
R41
10k
I2C ADDR
0x68
C9
0.1uF
NOTE: Components labeled "do not install" (DNI) are not populated by default
Avionics
Max Holliday
Sheet: /Avionics/
File: Avionics.sch
Title: PyCubed Mainboard
Size: A4
Date: 2020-02-10
Rev: v04
KiCad E.D.A. kicad (5.1.5)-3
Id: 2/6


MicroSD Card
J1
503182-1852
DATA2
CD/DAT3
CMD
VDD
CLK
VSS
DAT0
DAT1
DETECT
SWITCH
SHIELD
DT
SW
R51
10k
SD_CS
MOSI
SCK
MISO
3.3V
GND
Power Connectors: USB-C Power Delivery to 2S Li-ion Battery
J13
USB_C_Receptacle_USB2.0
VBUS
CC1
CC2
D-
D+
SBU1
SBU2
SHIELD
GND
S1
A1
R40
R39
5.1k
USB_CC1
USB_CC2
USB_D-
USB_D+
GNDREF
VBUS_IN
C29
4.7uF
Battery Terminals
VCHRG
JP2
1985807
C24
0.1uF
C31
22uF
JP3
1985807
VBATT
JP5
1985807
JP1
1985807
Footswitch Connections
Battery Thermal
Monitor (optional)
J3
THM
Rail Switch
Connection
JP4
1985807
J4
10118194-0001LF
MICRO USB
VDD
D-
D+
ID
DNI
MRAM - Nonvolatile Memory
(4MB storage)
U8
MR25H40MDF
R50
10k
C30
0.1uF
FLASH_CS
FLASH_MISO
FLASH_IO2
FLASH_IO3
FLASH_SCK
FLASH_MOSI
JTAG
J2
SWDIO
SWCLK
RESET
NOTE: Components labeled "do not install" (DNI) are not populated by default
Connectors
Max Holliday
Sheet: /Connectors/
File: Connectors.sch
Title: PyCubed Mainboard
Size: A4
Date: 2020-02-10
Rev: v04
KiCad E.D.A. kicad (5.1.5)-3
Id: 3/6


2s2P Li-Ion Battery Solar Charging Circuit
Populating R9=107K,R10=464K
sets turn-on voltage to 12V (solar input).
Tune this to solar MPPT
R9 107K
DNI
GND
R10 0
2.2uF
C23
U6
LTC4121
VSOLAR 9V to 40V
VSOLAR
D2
DFLS130L
VCHRG_IN
C25 22nF
L3 33uH
C22 10uF
R11 10K
DNI
R12 121K
MPPT off by default
To enable: MPPT=75% Voc
R11=787K, R12=121K
To disable MPTI:
R11=10k; R12=DNI
INTVCC
BOOST
IN
SW
GND
MPPT
FREQ
CHGSNS
RUN
~FAULT
~CHRG
PROG
NTC
FBG
FB
BAT
3.3V
R18 100k
R17 100k
CHRG
L1_PROG
R20 3.01K
L1_PROG
monitors charge current using:
Ichrg=988*Vprog/Rprog
3.01K = 400mA max charge current
R16 845K
R19 2.1M
Vfloat=8.2V
VBATT
C28 22uF
GPS Power
U7
3.3V
R23 3.3K
ENAB_GPS
R21 10K
R22 4.7K
Q1
IRLML2803
NDS8434
Source
Drain
Gate
GPS_PWR_IN
USB (Boost) Charging for 2-cell Li-Ion
USB Jumpers
VBUS_IN
C33 1uF
USB_D+
C35 10uF
GNDREF
Add jumper to allow
USB to power the board
(even inside P-Pod).
Add jumper to allow
USB battery charging
(even inside P-Pod).
Remove both jumpers before flight to remove
risk of unknown BQ25883 radiation failure modes
"VUSB"
"VCHRG"
VCHRG
VBATT
U17
BQ25883RGER
D-
STAT
CE
SDA
SCL
INT
SW_2
SW_1
SYS_2
SYS_1
BAT_2
BAT_1
L4 1uH
C37 22uF
C38 22uF
C39 10uF
R31 1K
D5
GREEN LED
R34 5.23K
THM
R35 30.1K
R46 10K
C34 4.7uF
383
R36
C36 47nF
System Power Monitor
U4
VBATT
Current Sense Resistor:
1.0 Ohm is about 0.3mW
power lost as heat
R8 1.0
R26 1K
VCC
A0
A1
ON
SENSE
Addr: 0x94
TIMER
GATE
SCL
SDA
GND
ADM1176-1ARMZ-R7
C32 3.9nF
VREG_IN
R30 10K
R29 0 DNI
In the case of U5 failure, U4 can disable
regulator based on TIMER capacitor
(only install this if you know what you're doing!)
Regulator - 3.3V OUT
C17 22uF
C18 22uF
L2 3.3uH
C21 0.1uF
VBATT 4.5 to 18V
C19 100uF
C20 100uF
U5
PGND1
PGND2
SW1
SW2
VBST
VIN
VCC
EPAD
EN
PG
GND
SS
VREG5
VFB
VO
C26 3.3nF
R15 100K
R13 73.2K
R14 22.1k
C27 1uF
TPS54226PWPRPWP14_2P31X2P46-L
NOTE: Components labeled "do not install" (DNI) are not populated by default
Power
Max Holliday
Sheet: /Power/
File: Power.sch
Title: PyCubed Mainboard
Size: A4
Date: 2020-02-10
Rev: v04
KiCad E.D.A. kicad (5.1.5)-3
Id: 4/6



NOTE: Components labeled "do not install" (DNI) are not populated by default

Burn Wires

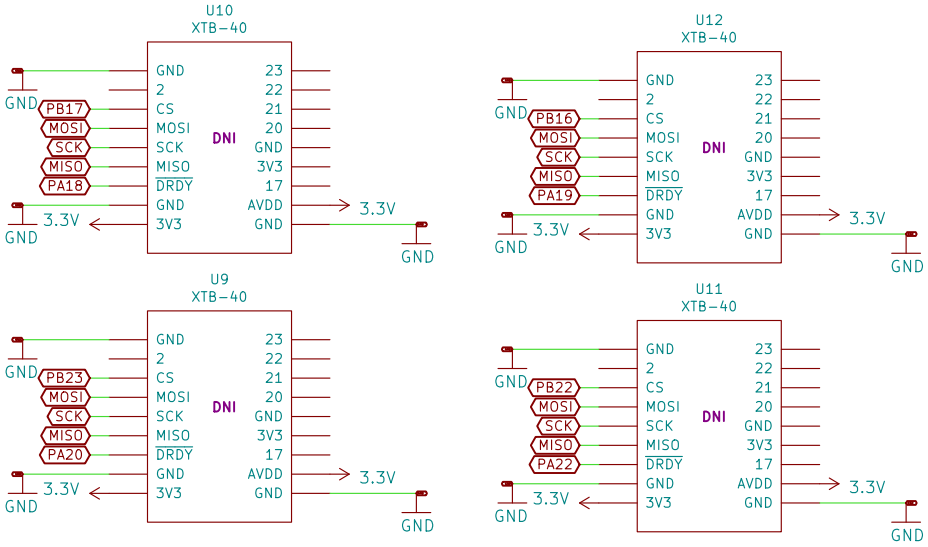
Max Holliday

Sheet: /Burn Wires/
File: Burn_Wires.sch

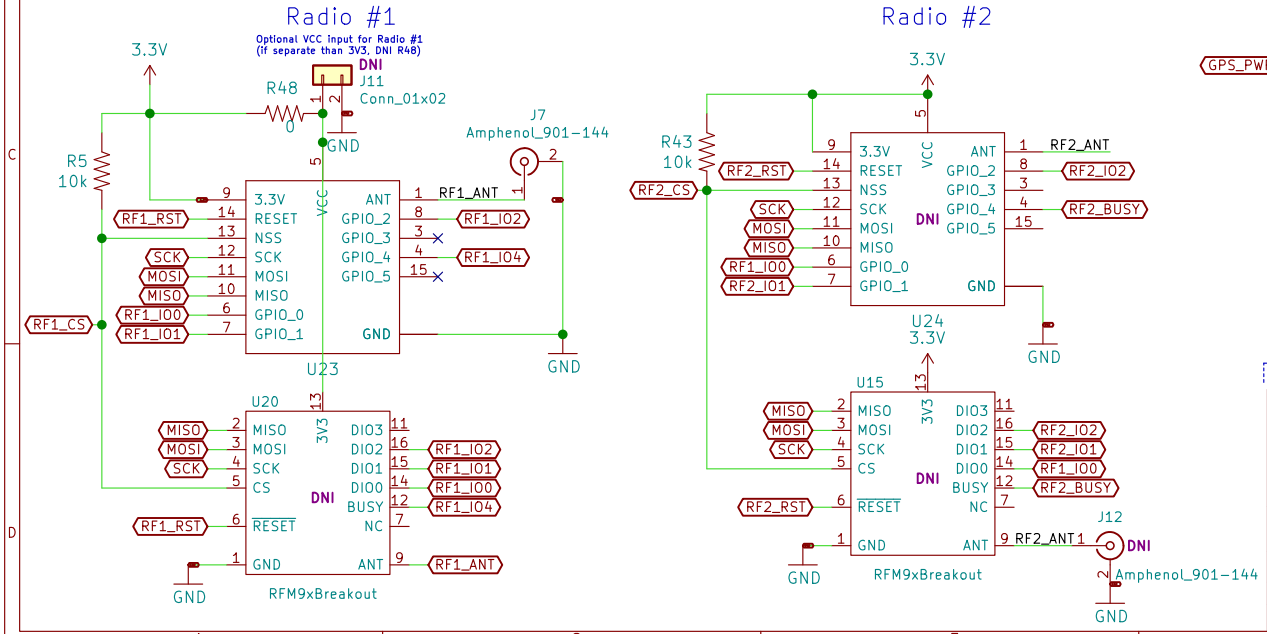
Title: PyCubed Mainboard

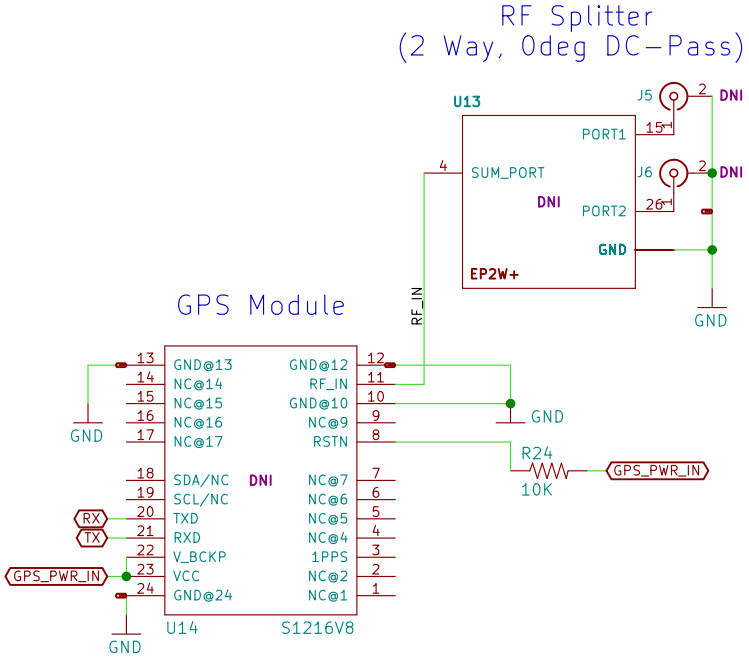
Size: A4	Date: 2020-02-10	**Rev: v04**
KiCad E.D.A. kicad (5.1.5)-3		Id: 5/6

Modular Payloads



Modular Radios (HopeRF format)





NOTE: Components labeled "do not install" (DNI) are not populated by default

Radio, GPS, Payloads

Max Holliday

Sheet: /RF and GPS/
File: RF_and_GPS.sch

Title: PyCubed Mainboard

Size: A4	Date: 2020-02-10	**Rev: v04**
KiCad E.D.A. kicad (5.1.5)-3		Id: 6/6