Avionics

File: Avionics.kicad_sch

Connectors

File: Connectors.kicad_sch

Power

File: Power.kicad_sch

Burn Wires

File: Burn_Wires.kicad_sch

RF

File: RF_and_GPS.kicad_sch

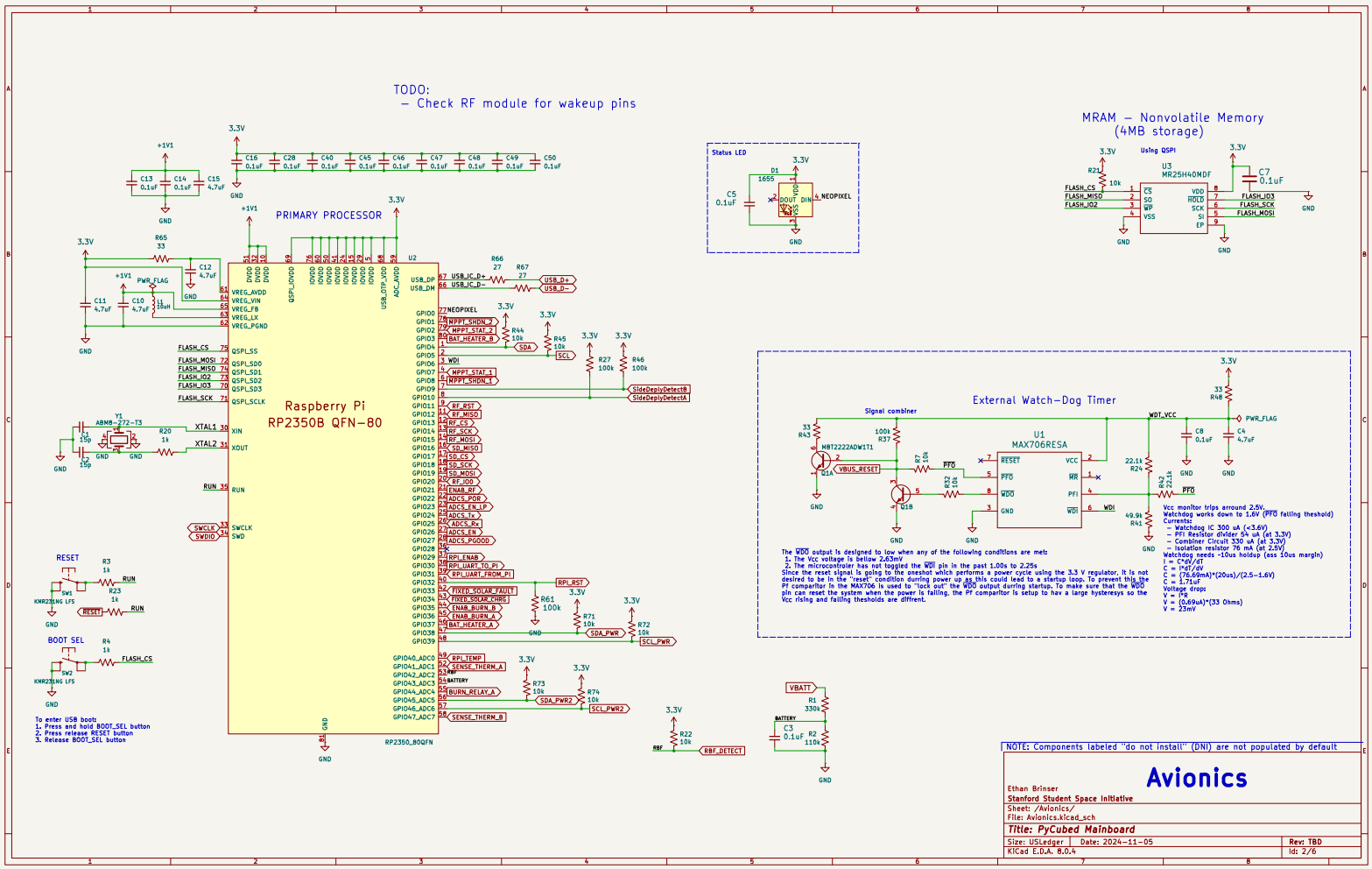
PiCubed

Ethan Brinser
Stanford Student Space Initiative

Sheet: /
File: mainboard.kicad_sch

Title: PyCubed Mainboard

Size: A4	Date: 2024-11-05	Rev: TBD
KiCad E.D.A. 8.0.4		Id: 1/6


TODO:
– Check RF module for wakeup pins
PRIMARY PROCESSOR
Raspberry Pi
RP2350B QFN-80
RP2350_80QFN
Status LED
MRAM – Nonvolatile Memory
(4MB storage)
Using QSPI
U3
MR25H40MDF
C7
0.1uF
FLASH_CS
FLASH_MISO
FLASH_IO2
FLASH_IO3
FLASH_SCK
FLASH_MOSI
External Watch-Dog Timer
Signal combiner
U1
MAX706RESA
MBT2222ADW1T1
VBUS_RESET
WDT_VCC
PWR_FLAG
WDI
PFO
PFI
RESET
BOOT SEL
To enter USB boots
1. Press and hold BOOT_SEL button
2. Press release RESET button
3. Release BOOT_SEL button
The WDO output is designed to low when any of the following conditions are met:
1. The Vcc voltage is bellow 2.63mV
2. The microcontroler has not toggled the WDI pin in the past 1.00s to 2.25s
Since the reset signal is going to the oneshot which performs a power cycle using the 3.3 V regulator, it is not desired to be in the "reset" condition durring power up as this could lead to a startup loop. To prevent this the Pf comparitor in the MAX706 is used to "lock out" the WDO output durring startup. To make sure that the WDO pin can reset the system when the power is failing, the Pf comparitor is setup to hav a large hysteresys so the Vcc rising and failing thesholds are diffrent.
Vcc monitor trips arround 2.5V.
Watchdog works down to 1.6V (PFO failing theshold)
Currents:
– Watchdog IC 300 uA (<3.6V)
– PFI Resistor divider 54 uA (at 3.3V)
– Combiner Circuit 330 uA (at 3.3V)
– Isolation resistor 76 mA (at 2.6V)
Watchdog needs ~10us holdup (ass 10us margin)
I = C*dV/dT
C = I*dT/dV
C = (76.69mA)*(20us)/(2.5–1.6V)
C = 1.71uF
Voltage drops:
V = I*R
V = (0.69uA)*(33 Ohms)
V = 23mV
NOTE: Components labeled "do not install" (DNI) are not populated by default
Avionics
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Stanford Student Space Initiative
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Size: USLedger
Date: 2024-11-05
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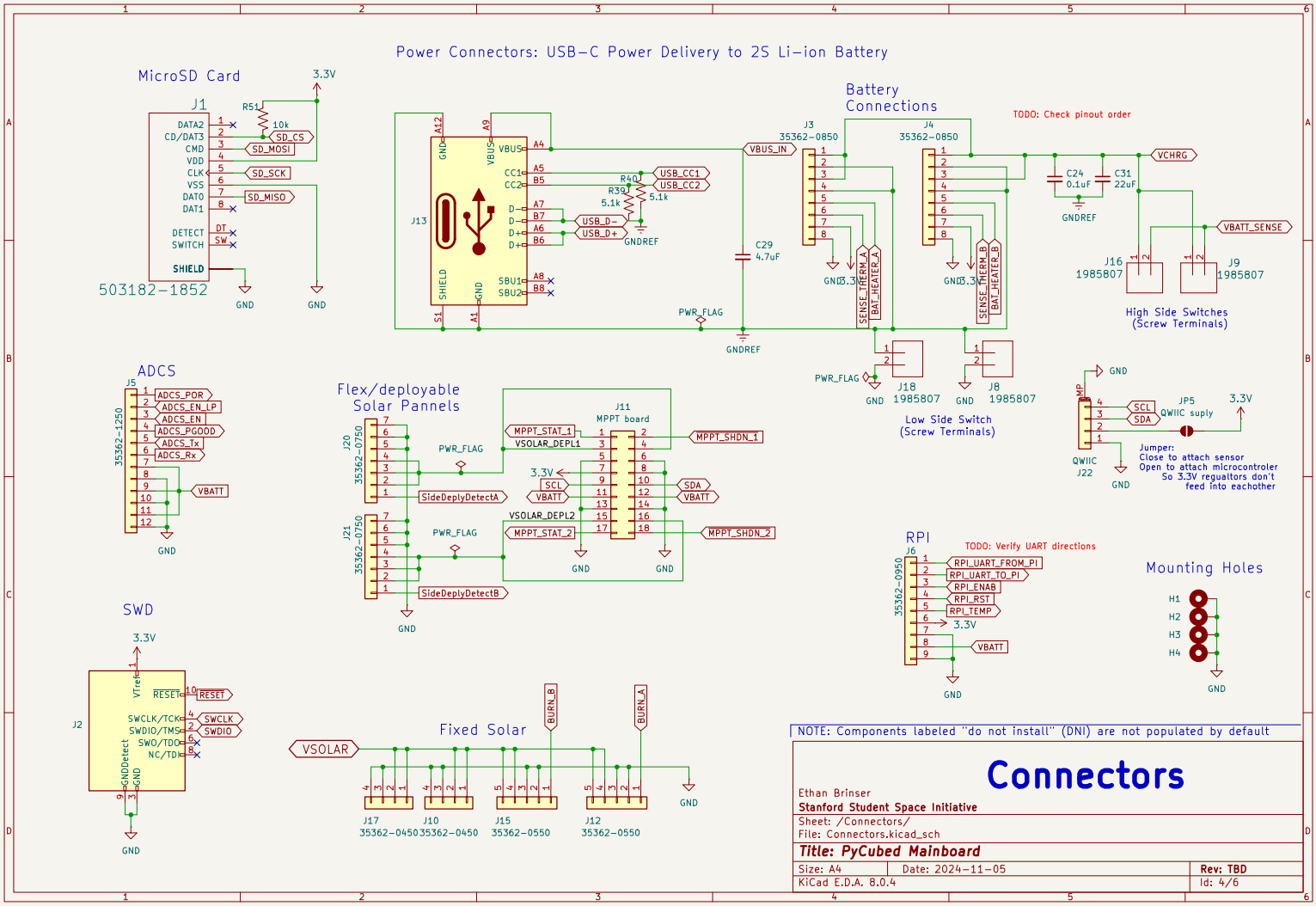
Id: 2/6


Power Connectors: USB-C Power Delivery to 2S Li-ion Battery
MicroSD Card
J1
503182-1852
R51
10k
3.3V
DATA2
CD/DAT3
CMD
VDD
CLK
VSS
DAT0
DAT1
DETECT SWITCH
SHIELD
SD_CS
SD_MOSI
SD_SCK
SD_MISO
DT
SW
GND
J13
VBUS
CC1
CC2
D-
D+
SBU1
SBU2
SHIELD
R40
R39
5.1k
USB_CC1
USB_CC2
USB_D-
USB_D+
GNDREF
C29
4.7uF
VBUS_IN
PWR_FLAG
Battery Connections
J3
35362-0850
J4
35362-0850
TODO: Check pinout order
SENSE_THERM_A
BAT_HEATER_A
SENSE_THERM_B
BAT_HEATER_B
C24
0.1uF
C31
22uF
VCHRG
VBATT_SENSE
J16
1985807
J9
1985807
High Side Switches
(Screw Terminals)
J18
1985807
J8
1985807
Low Side Switch
(Screw Terminals)
ADCS
J5
35362-1250
ADCS_POR
ADCS_EN_LP
ADCS_EN
ADCS_PGOOD
ADCS_Tx
ADCS_Rx
VBATT
Flex/deployable
Solar Pannels
J20
35362-0750
J21
35362-0750
SideDeplyDetectA
SideDeplyDetectB
J11
MPPT board
MPPT_STAT_1
VSOLAR_DEPL1
MPPT_SHDN_1
MPPT_STAT_2
VSOLAR_DEPL2
MPPT_SHDN_2
SCL
SDA
JP5
QWIIC suply
QWIIC
J22
Jumper:
Close to attach sensor
Open to attach microcontroler
So 3.3V regualtors don't
feed into eachother
SWD
J2
VTref
RESET
SWCLK/TCK
SWDIO/TMS
SWO/TDO
NC/TDI
GNDDetect
SWCLK
SWDIO
RPI
J6
35362-0950
TODO: Verify UART directions
RPI_UART_FROM_PI
RPI_UART_TO_PI
RPI_ENAB
RPI_RST
RPI_TEMP
Mounting Holes
H1
H2
H3
H4
Fixed Solar
VSOLAR
BURN_B
BURN_A
J17
35362-0450
J10
35362-0450
J15
35362-0550
J12
35362-0550
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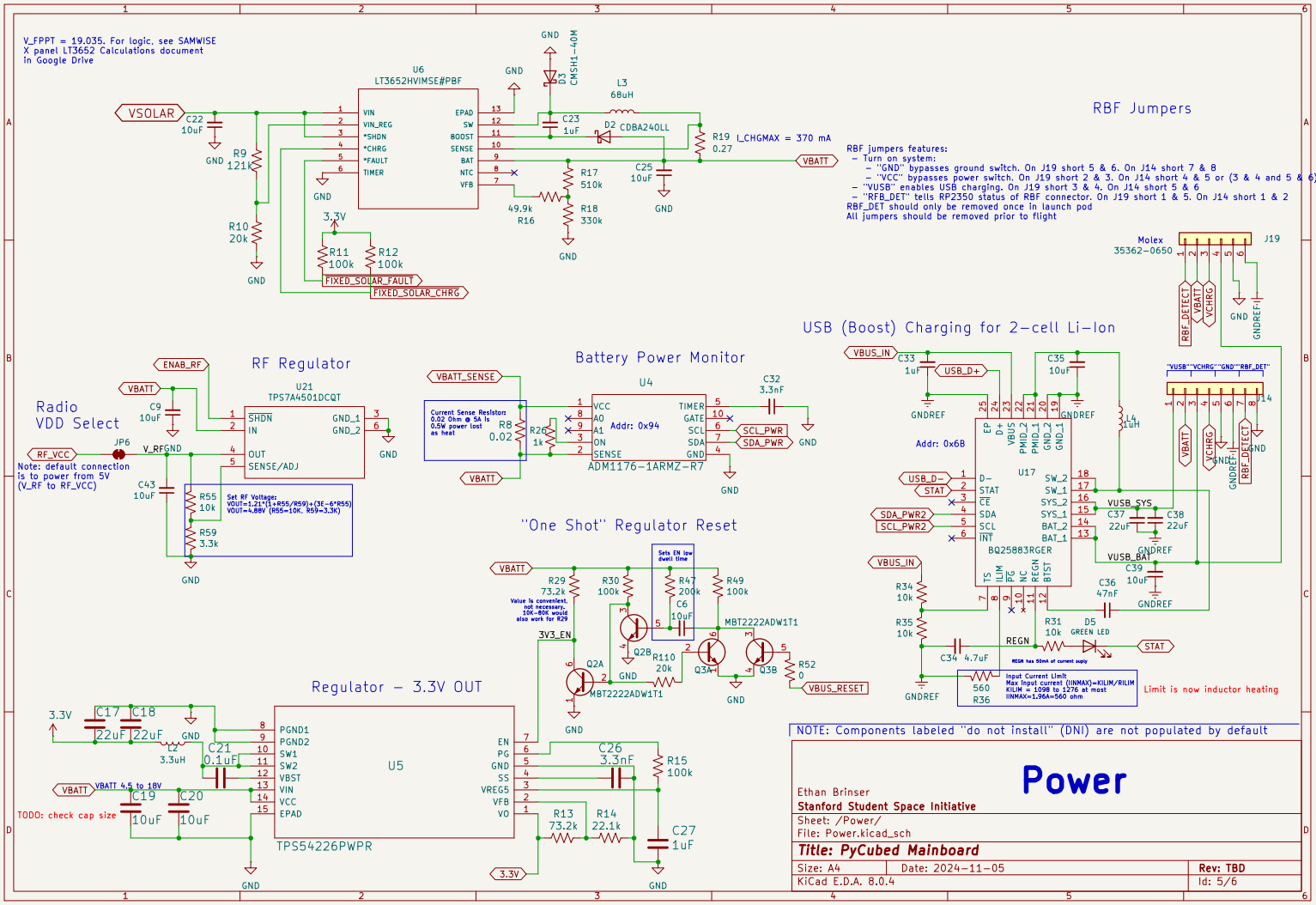
V_FPPT = 19.035. For logic, see SAMWISE X panel LT3652 Calculations document in Google Drive
U6
LT3652HVIMSE#PBF
VSOLAR
C22 10uF
R9 121k
R10 20k
R11 100k
R12 100k
3.3V
FIXED_SOLAR_FAULT
FIXED_SOLAR_CHRG
D3 CMSH1-40M
L3 68uH
D2 CDBA240LL
C23 1uF
C25 10uF
R17 510k
R18 330k
49.9k R16
R19 0.27
I_CHGMAX = 370 mA
VBATT
RBF Jumpers
RBF jumpers features:
– Turn on system:
– "GND" bypasses ground switch. On J19 short 5 & 6. On J14 short 7 & 8
– "VCC" bypasses power switch. On J19 short 2 & 3. On J14 short 4 & 5 or (3 & 4 and 5 & 6)
– "VUSB" enables USB charging. On J19 short 3 & 4. On J14 short 5 & 6
– "RFB_DET" tells RP2350 status of RBF connector. On J19 short 1 & 5. On J14 short 1 & 2
RBF_DET should only be removed once in launch pod
All jumpers should be removed prior to flight
Molex 35362-0650
J19
RBF_DETECT
VBATT
VCHRG
GND
GNDREF
USB (Boost) Charging for 2–cell Li–Ion
VBUS_IN
C33 1uF
C35 10uF
L4 1uH
U17
BQ25883RGER
Addr: 0x6B
USB_D+
USB_D–
STAT
SDA_PWR2
SCL_PWR2
VUSB_SYS
VUSB_BAT
C37 22uF
C38 22uF
C39 10uF
C36 47nF
R34 10k
R35 10k
R31 10k
D5 GREEN LED
REGN
C34 4.7uF
560 R36
Input Current Limit
Max Input current (IINMAX)=KILIM/RILIM
KILIM = 1098 to 1276 at most
IINMAX=1.964=560 ohm
REGN has 50mA of current supply
Limit is now inductor heating
RF Regulator
Radio VDD Select
ENAB_RF
U21
TPS7A4501DCQT
C9 10uF
C43 10uF
JP6
RF_VCC
V_RF
R55 10k
R59 3.3k
Set RF Voltage:
VOUT=1.21*(1+R55/R59)+(3E-6*R55)
VOUT=4.88V (R55=10K, R59=3.3K)
Note: default connection is to power from 5V (V_RF to RF_VCC)
Battery Power Monitor
VBATT_SENSE
U4
ADM1176-1ARMZ-R7
Addr: 0x94
R8 0.02
R26 1k
C32 3.3nF
SCL_PWR
SDA_PWR
Current Sense Resistor: 0.02 Ohm @ 5A is 0.5W power lost as heat
"One Shot" Regulator Reset
R29 73.2k
R30 100k
R47 200k
R49 100k
C6 10uF
Sets EN low dwell time
Value is convenient, not necessary. 10K–80K would also work for R29
MBT2222ADW1T1
Q2A
Q2B
Q3A
Q3B
R110 20k
R52 0
3V3_EN
VBUS_RESET
Regulator – 3.3V OUT
U5
TPS54226PWPR
C17 22uF
C18 22uF
L2 3.3uH
C21 0.1uF
C19 10uF
C20 10uF
VBATT 4.5 to 18V
TODO: check cap size
C26 3.3nF
R15 100k
R13 73.2k
R14 22.1k
C27 1uF
3.3V
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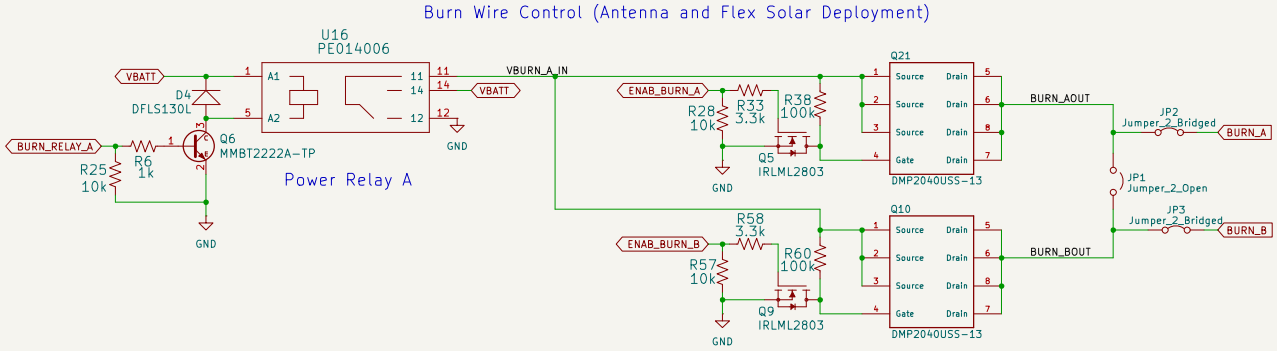

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Burn Wires

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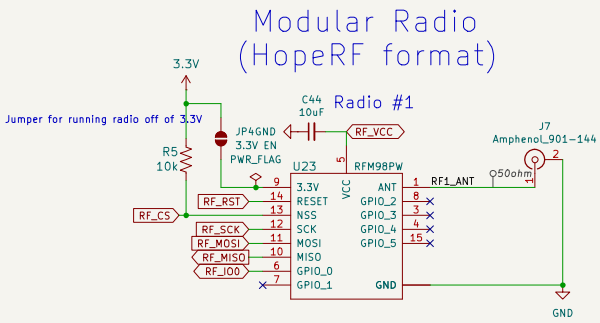

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Radio, GPS, Payloads

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