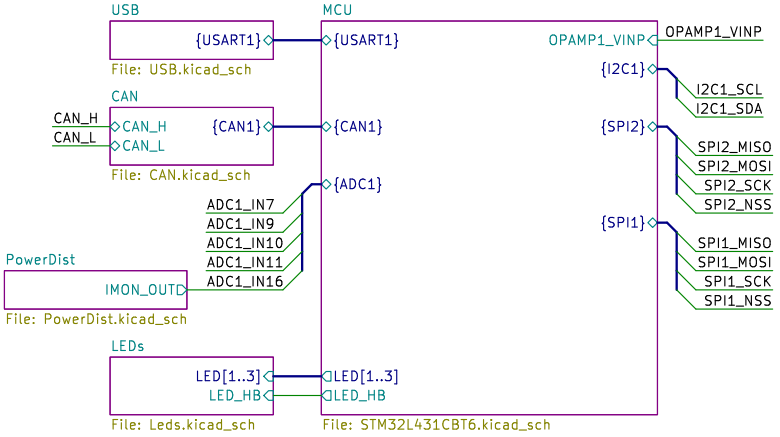
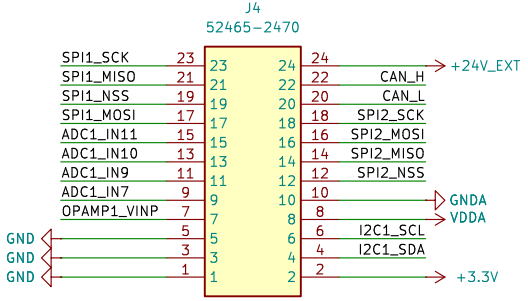


Daughterboard Connector

Connector mates with 53307-2471
Consult README for pin usage guide
Always verify pin functions with CubeMX



Board Notes

idk figure it out

Graphics/Mounting

LHRs
MH1 M3
MH3 M3
MH2 M3
MH4 M3

Changelog:
- Change pp values to be 24V
- Swap out buck converter for 24 – 5V converter
- Spec LDO for a little bit higher current
- Get rid of push button
- Remove isolation
- Swap out CAN chip for TCAN (noniso)
- Add 5v power mux
- Swap out Micro USB for USB-C
- Swap out FTDI chip for SiLabs chip
- Change all testpoints to pad testpoints
- Double check pins for UART and CAN bootloader
- Swap out 2 extra ADC pins for the better ones
- CubeMX to try and get the internal STM32 PGA
- Check over and redo MCU pins
- Connect IMON to MCU
- Move power/gnd to diff sides of conn
- Add datasheet links for all
- Part selection
- Footprint selection

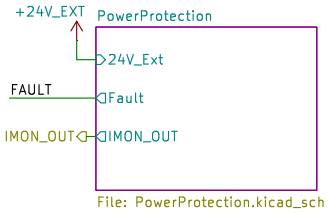
Longhorn Racing Solar

Sheet: /
File: PeripheralSOM.kicad_sch

Title: Peripheral SOM

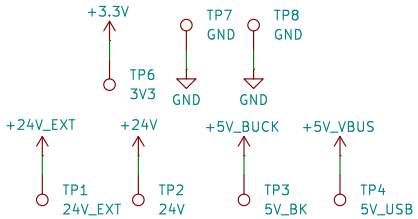
Size: A5	Date:	**Rev: B**
KiCad E.D.A. 9.0.3		Id: 1/7

Power Protection

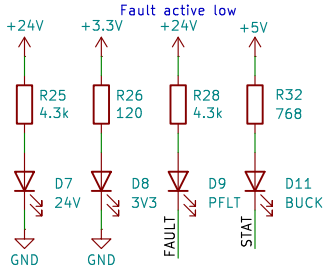


Current Limit: 1.2A
Overvoltage: ~27v
Undervoltage: ~20v
Use 1% resistors
for closest values

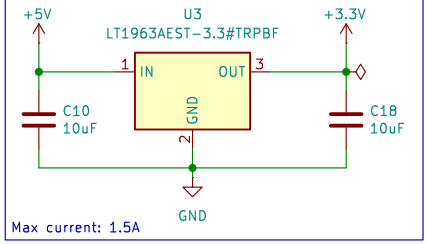
Testpoints



Indicators



5->3.3v LDO



Max current: 1.5A

24->5v Buck Converter

$$I_{INRMS} = I_{OUT} \cdot \sqrt{\frac{V_{OUT}}{V_{INmin}} \cdot \frac{(V_{INmin} - V_{OUT})}{V_{INmin}}} \qquad 1.2 \cdot \sqrt{\frac{5}{24} \cdot \frac{(24-5)}{24}} = 0.48733971724$$

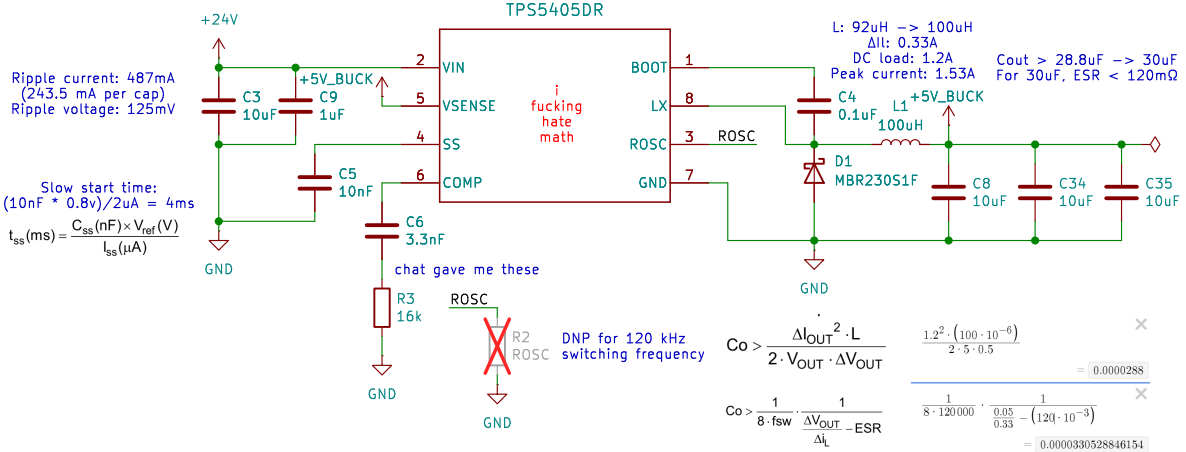
$$\Delta V_{IN} = \frac{I_{OUT\,max} \cdot 0.25}{C_{IN} \cdot f_{SW}} \qquad \frac{1.2 \cdot 0.25}{(20 \cdot 10^{-6})(120000)} = 0.125$$

$$\Delta i_L = \frac{(24-5) \cdot 5}{100 \times 10^{-6} \cdot 24 \cdot 120000} = \frac{95}{0.288} \approx 0.33\,A$$

$$L = \frac{V_{IN} - V_{OUT}}{I_O \cdot LIR} \cdot \frac{V_{OUT}}{V_{IN} \cdot fsw} \qquad \frac{24-5}{1.2 \cdot 0.3} \cdot \frac{5}{24 \cdot (120000)} = 0.000091628086419 8$$

Vin: 6.5v to 28v
Vout: 4.85v to 5.15v

U2
TPS5405DR



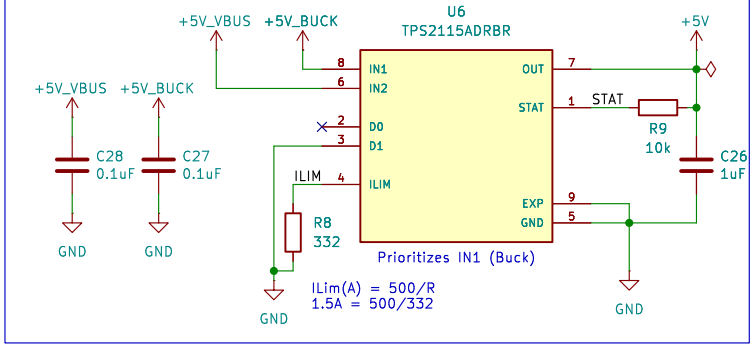
Slow start time:
(10nF * 0.8v)/2uA = 4ms

$$t_{ss}(ms) = \frac{C_{ss}(nF) \times V_{ref}(V)}{I_{ss}(\mu A)}$$

$$Co > \frac{\Delta I_{OUT}{}^2 \cdot L}{2 \cdot V_{OUT} \cdot \Delta V_{OUT}} \qquad \frac{1.2^2 \cdot (100 \cdot 10^{-6})}{2 \cdot 5 \cdot 0.5} = 0.0000288$$

$$Co > \frac{1}{8 \cdot fsw} \cdot \frac{1}{\frac{\Delta V_{OUT}}{\Delta i_L} - ESR} \qquad \frac{1}{8 \cdot 120000} \cdot \frac{1}{\frac{0.05}{0.33} - (120 \cdot 10^{-3})} = 0.0000330528846154$$

5v Power Mux



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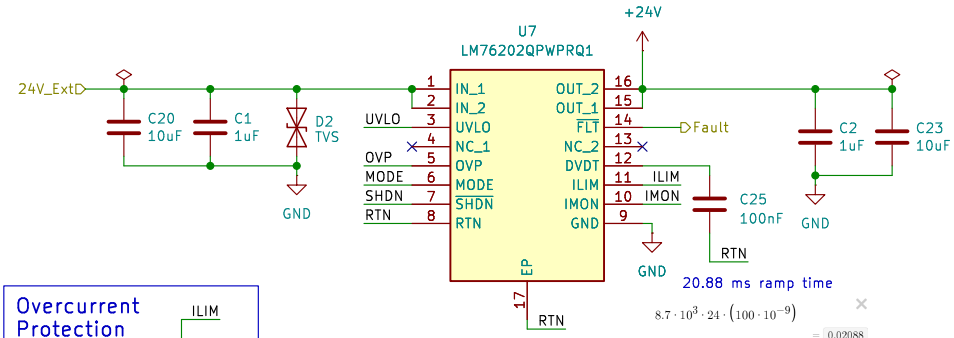
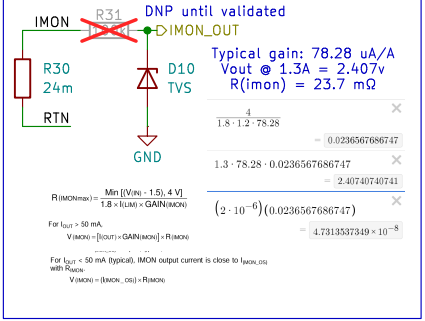
Title: Power Distribution

Size: A4	Date:	Rev:
KiCad E.D.A. 9.0.3		Id: 4/7

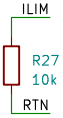


Current Monitoring

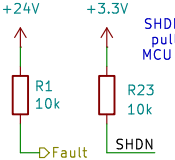


Overcurrent Protection

ILim(A) = 12/R(k)
1.2A = 12/10kΩ

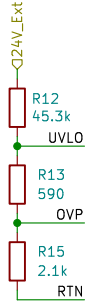


Pullups



SHDN has weak internal pullup – pulled up to MCU voltage after initial power on

Under/Overvoltage Protection



	Setpoint	Ideal	Actual
UVLO	20v	1.1v	1.12v
OVP	27v	1.19v	1.18v

OVP set to 27v for buck max voltage of 28v

$$\left(\frac{2.1+0.59}{2.1+0.59+45.3}\right)20 = 1.12106688894$$

$$\left(\frac{2.1}{2.1+0.59+45.3}\right)27 = 1.18149614503$$

Functional Mode Selection

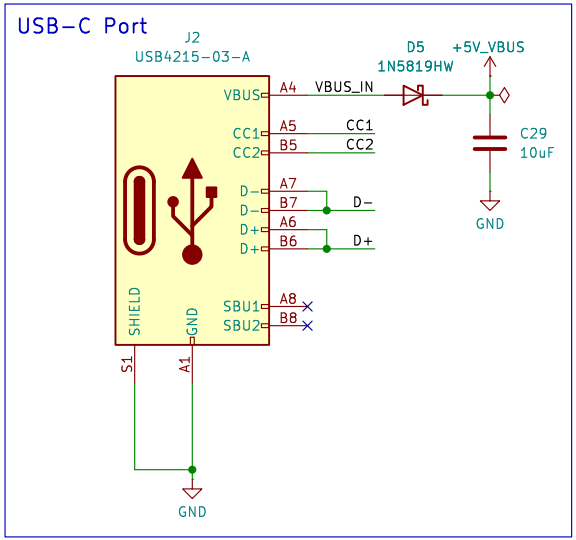
Set to circuit breaker (latchoff)

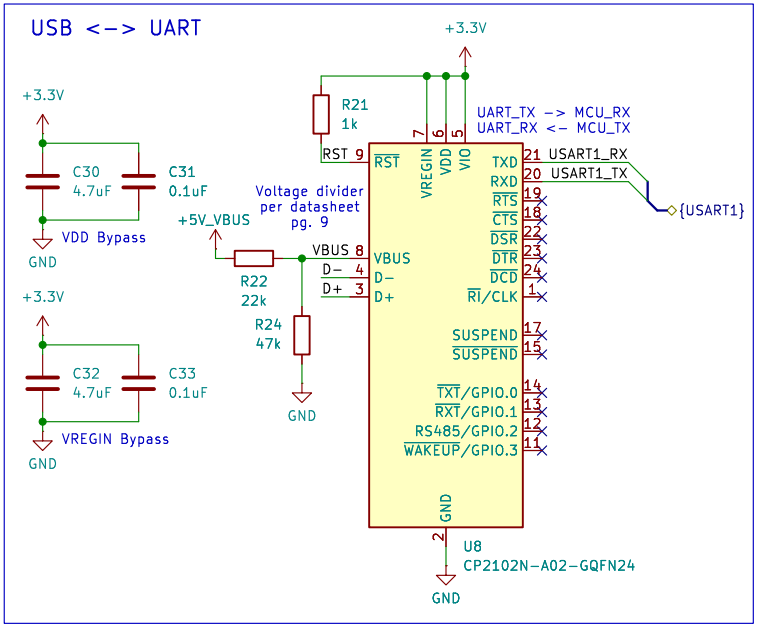
Use 0 ohm resistor for auto-retry (540ms)

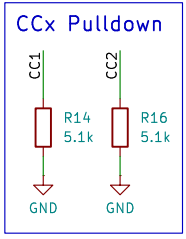
Sheet: /PowerDist/PowerProtection/
File: PowerProtection.kicad_sch

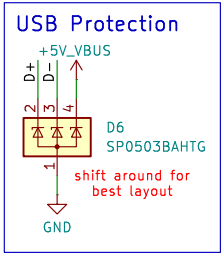
Title: Power Protection

Size: A5	Date:	Rev:
KiCad E.D.A. 9.0.3		Id: 6/7









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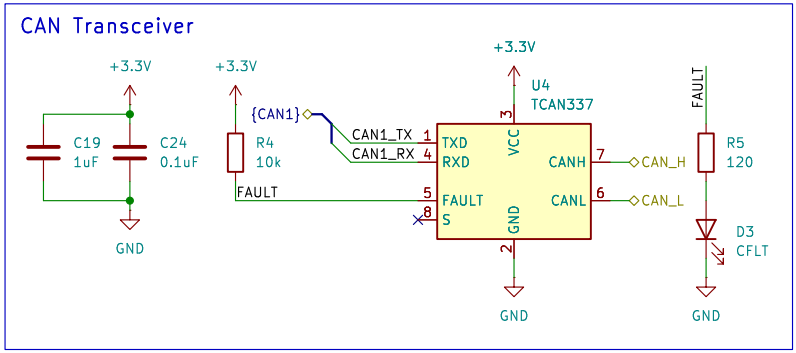
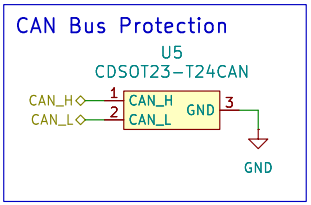
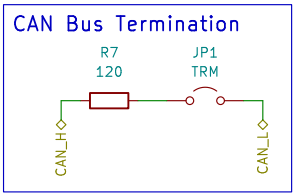
KiCad E.D.A. 9.0.3		Id: 3/7







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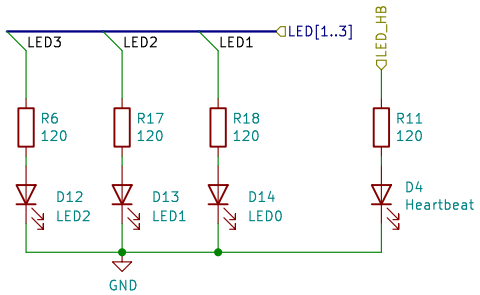
Size: A5	Date:	**Rev:**
KiCad E.D.A. 9.0.3		Id: 2/7



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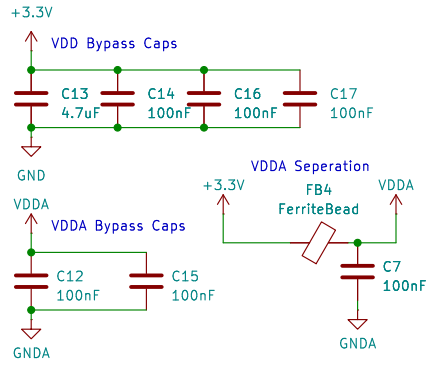
File: Leds.kicad_sch

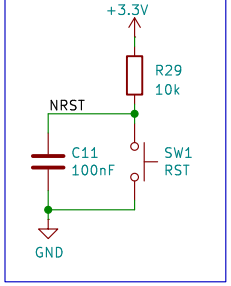
Title: LEDs

Size: A5	Date:	**Rev:**
KiCad E.D.A. 9.0.3		Id: 5/7

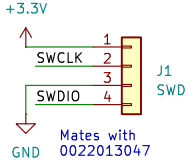
Bypass/Separation



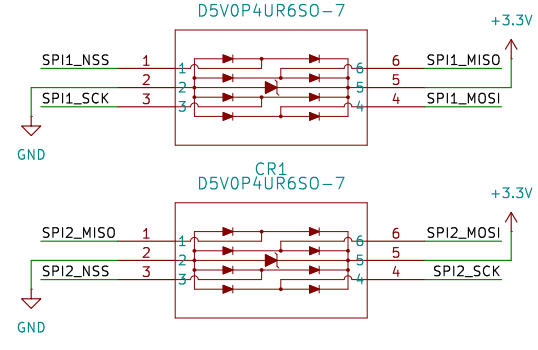
Reset Button



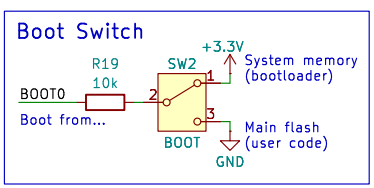
SWD Connector



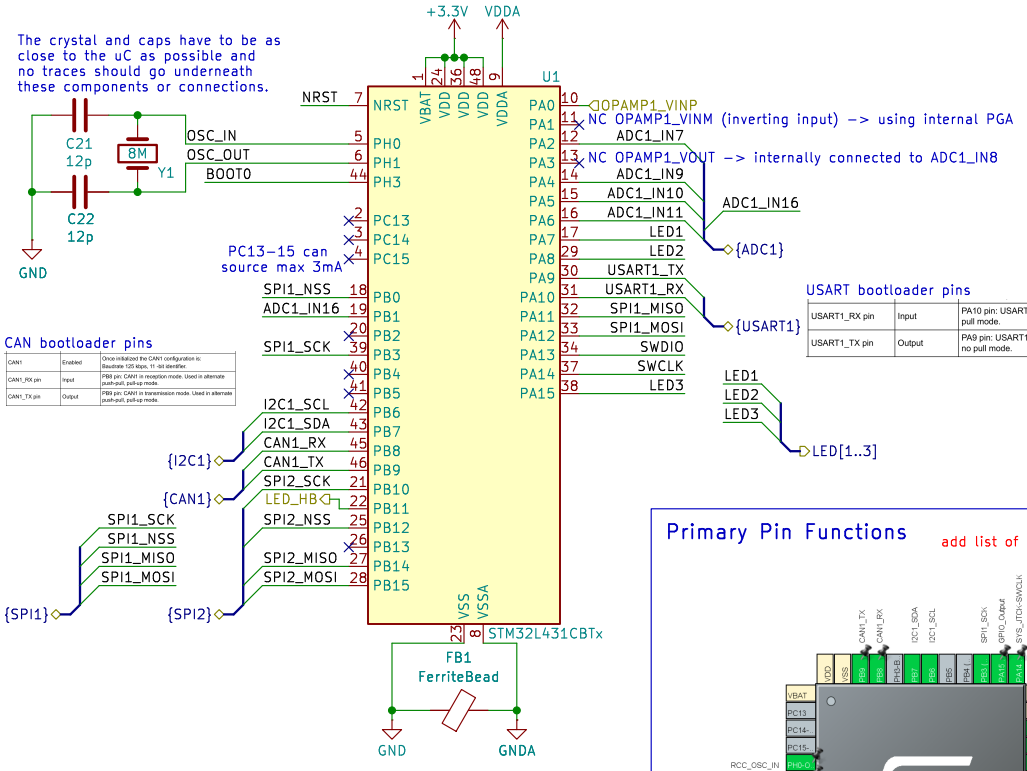
SPI Protection



Boot Switch



The crystal and caps have to be as close to the uC as possible and no traces should go underneath these components or connections.



CAN bootloader pins

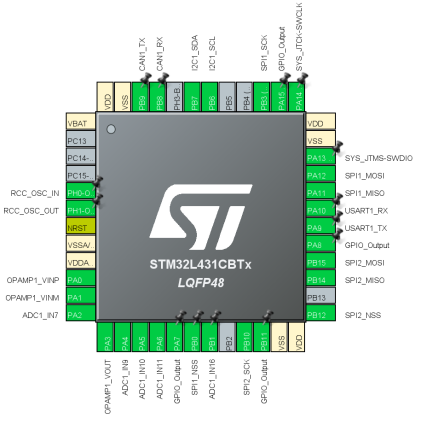
CAN1	Enabled	Once initialized the CAN1 configuration is: Baudrate 125 kbps, 11 -bit identifier.
CAN1_RX pin	Input	PB8 pin: CAN1 in reception mode. Used in alternate push-pull, pull-up mode.
CAN1_TX pin	Output	PB9 pin: CAN1 in transmission mode. Used in alternate push-pull, pull-up mode.

USART bootloader pins

USART1_RX pin	Input	PA10 pin: USART1 in reception mode. Used in input no pull mode.
USART1_TX pin	Output	PA9 pin: USART1 in transmission mode. Used in input no pull mode.

Primary Pin Functions

add list of alternate functions



Sheet: /MCU/
File: STM32L431CBT6.kicad_sch

Title: MCU

Size: User	Date:	**Rev:**
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