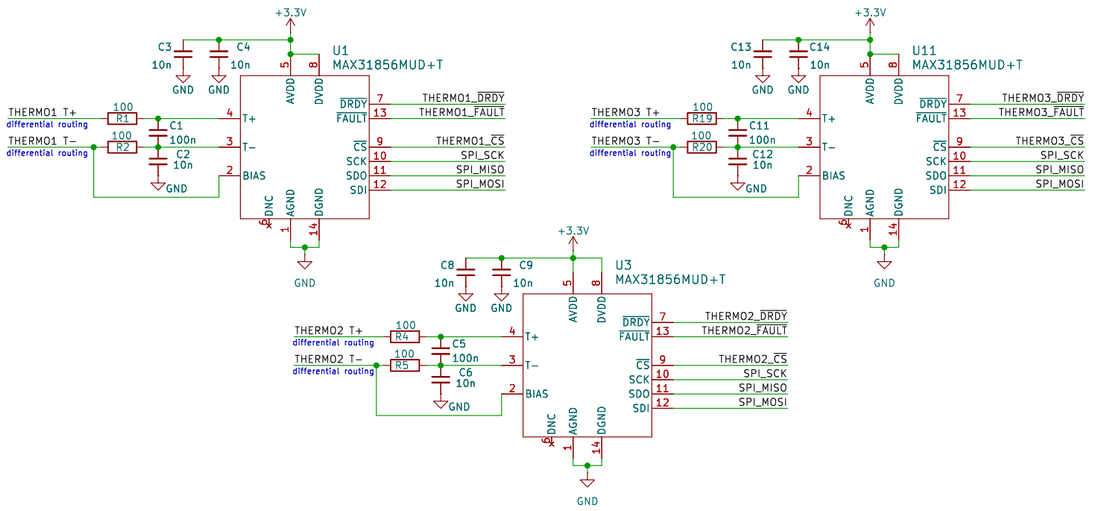
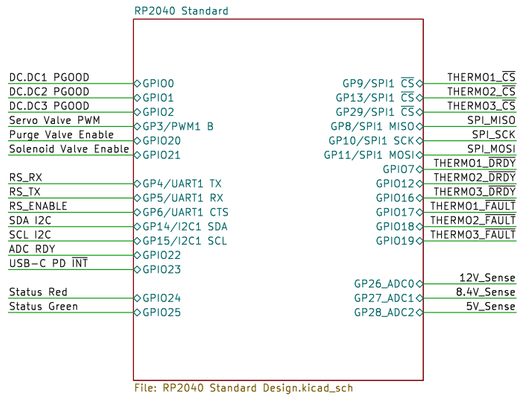
Thermocouples



Tem de se escolher contactos apropriados para os termocouples!

RP2040 Connections

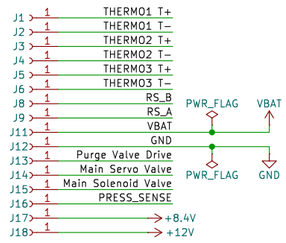
I2C Fast Mode should be set around 400kHz.
USB-C PD I2C ADDR is 0x08.
ADS1115 I2C ADDR is 0x90.
Higher frequencies may sink too much current.
The total current sunk by the RP2040 in all GPIOs must be below 50mA



File: RP2040 Standard Design.kicad_sch

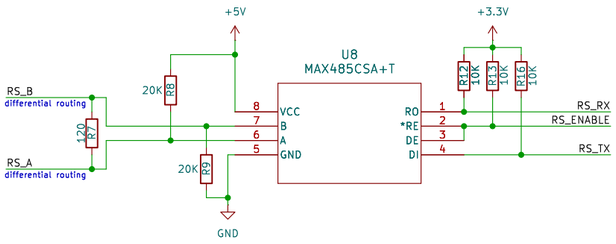
I/O Connectors

Thermocouples – 3 Differential Connections (6) – INPUTs –> To Type-K probes
RS485 Transceiver – 1 Differential Connection (2) – INPUT/OUTPUT
Purge Valve Drive – 1 Connection – INPUT
Main Valve PWM Signal Control – 1 Connection – OUTPUT
Pressure Sensor Signal Input – 1 Connection – INPUT
8.4V Power Line – 1 Connection – Power Input –> Servo Motors
12V Power Line – 1 Connection – Power Input –> Pressure Sensor & Valve Driver
Battery Power Supply – 1 Connection – Power Input
Battery Ground – 1 Connection – Power Output

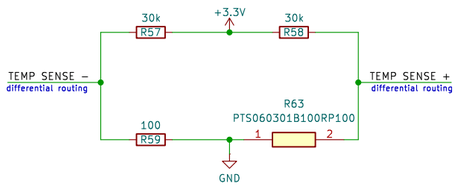


Temporarily assign PicoSocket as footprint.
After layout design select adequate connectors.

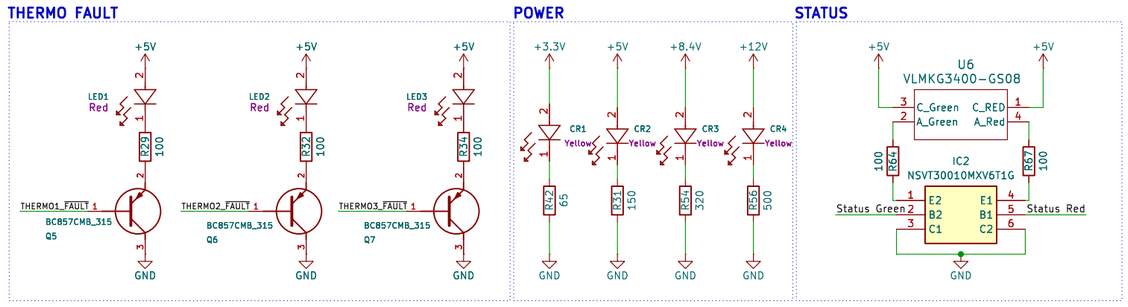
RS Transceiver



Temperature Sensor

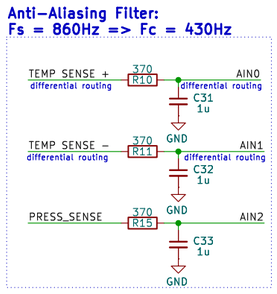


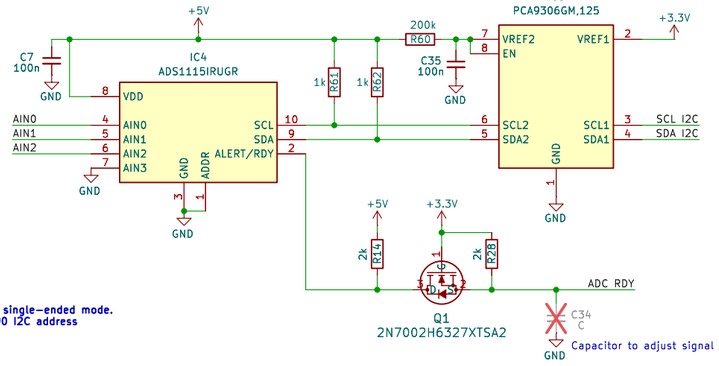
LEDs Drivers



ADC + I2C Translator

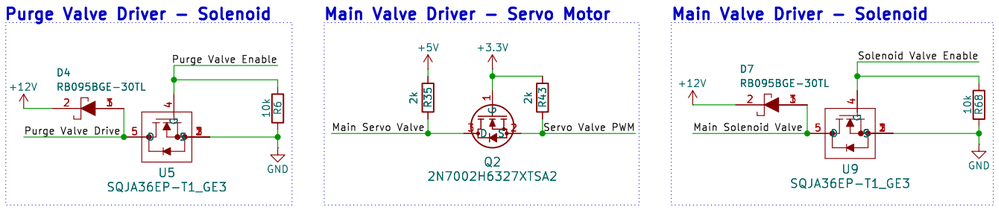
Anti-Aliasing Filter:
Fs = 860Hz => Fc = 430Hz



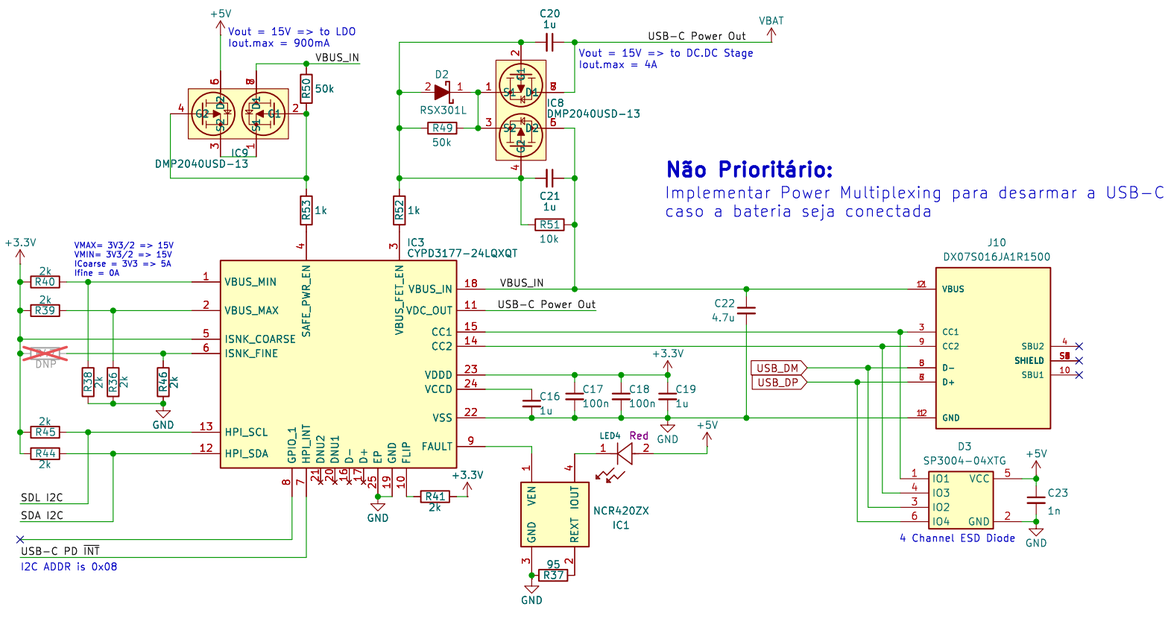


This ADC is to be set at max sampling rate (860Hz)
With AIN0 and AIN1 on differential mode and AIN2 in single-ended mode.
With ADDR to ground the ADC is configured for a 0x90 I2C address

Valve Drivers

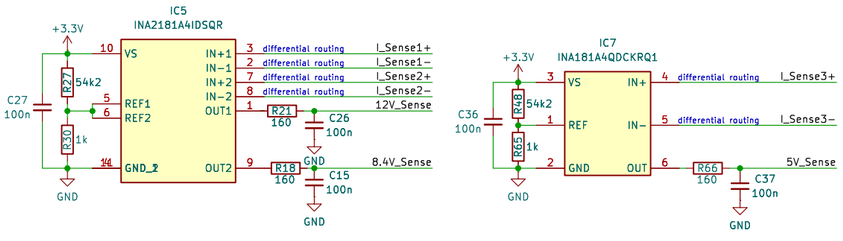


USB-C Power Delivery Controller (15V 5A)



Não Prioritário:
Implementar Power Multiplexing para desarmar a USB-C caso a bateria seja conectada

Current Sensor

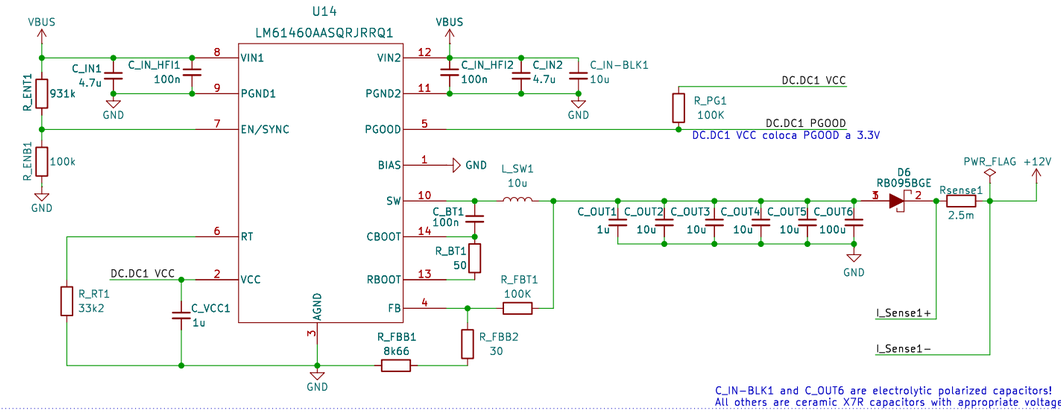


Buck Converters

>15V to 12V Converter

VBUS: 16V nominal when powered by battery
VBUS: 15V nominal when powered through USB-C PD

Vout is set to 12.5V to compensate Diode and Rsense drops.
The Schottky diode has a 425mV forward voltage drop.

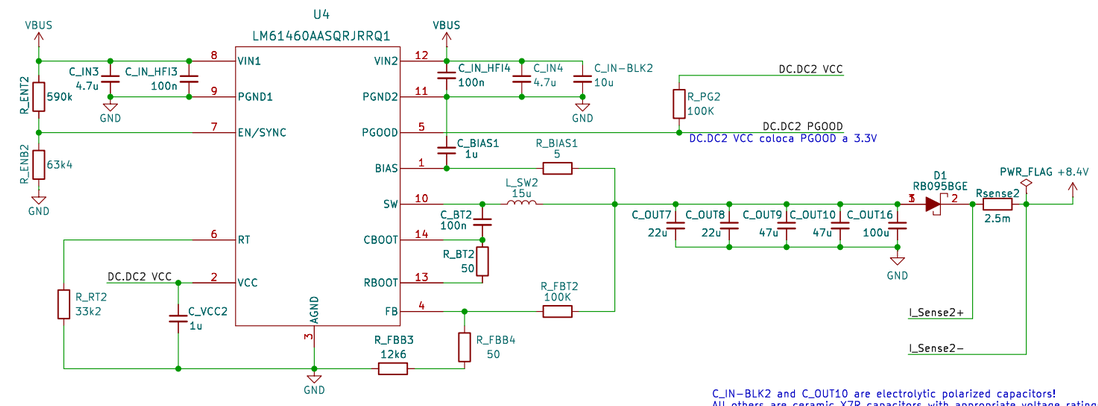


C_IN-BLK1 and C_OUT6 are electrolytic polarized capacitors!
All others are ceramic X7R capacitors with appropriate voltage ratings.

>15V to 8.4V Converter

VBUS: 16V nominal when powered by battery
VBUS: 15V nominal when powered through USB-C PD

Vout is set to 5.5V to compensate Diode and Rsense drops.
The Schottky diode has a 425mV forward voltage drop.

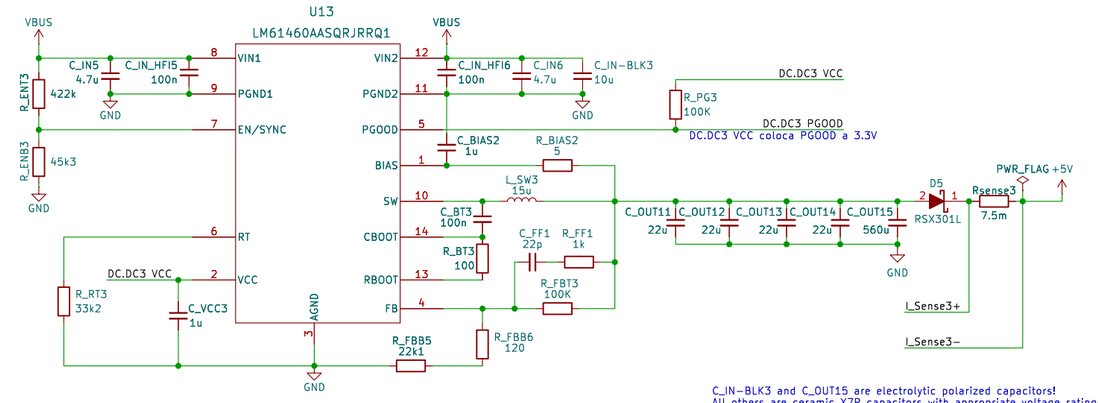


C_IN-BLK2 and C_OUT10 are electrolytic polarized capacitors!
All others are ceramic X7R capacitors with appropriate voltage ratings.

>15V to 5V Converter

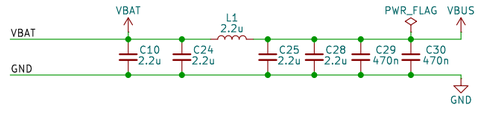
VBUS: 16V nominal when powered by battery
VBUS: 15V nominal when powered through USB-C PD

Vout is set to 5.5V to compensate Diode and Rsense drops
The Schottky diode has a 420mV forward voltage drop.



C_IN-BLK3 and C_OUT15 are electrolytic polarized capacitors!
All others are ceramic X7R capacitors with appropriate voltage ratings.

EMI Filter



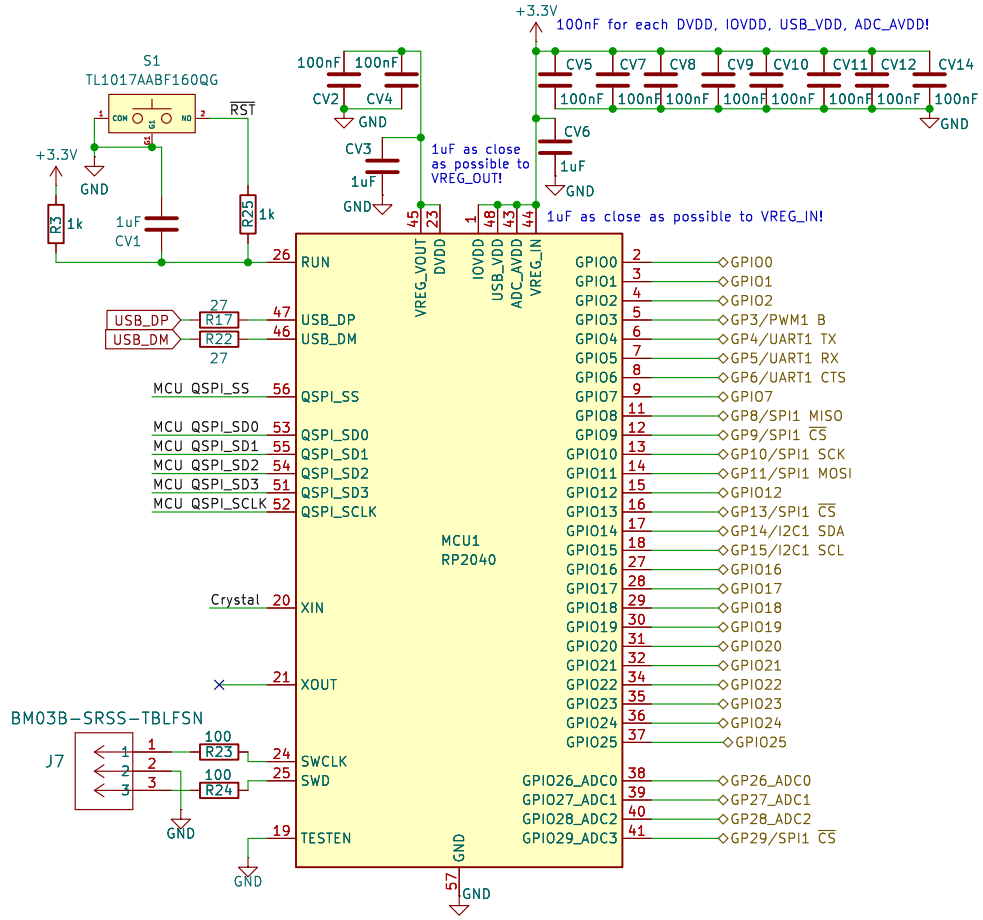
Teresa Monteiro
Rafael Novais
Miguel Leite
Miguel Amorim
Porto Space Team

Sheet: /
File: TVCS Top.kicad_sch

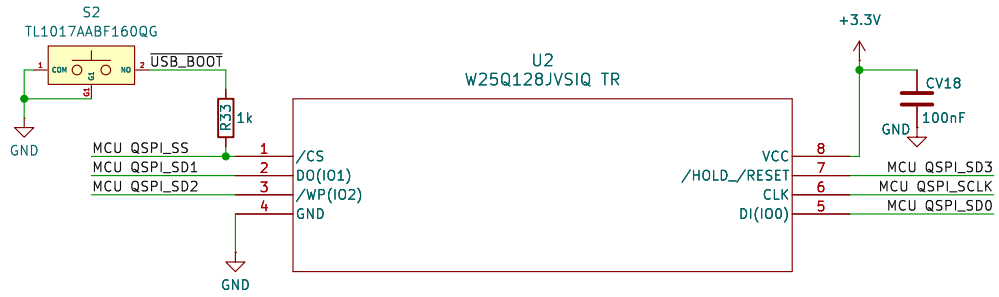
Title: Temperature & Valve Control System

Size: User	Date: 2025-02-20	**Rev:**
KiCad E.D.A. 8.0.8		Id: 1/2

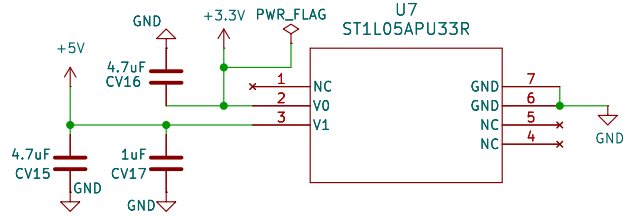
RP2040



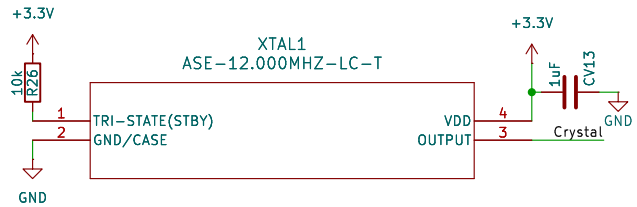
16MB Flash Memory



5V-3V3 LDO



Powered Crystal



Miguel Amorim
Porto Space Team
Sheet: /RP2040 Standard/
File: RP2040 Standard Design.kicad_sch

Title: RP2040 Standard

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KiCad E.D.A. 8.0.8		Id: 2/2