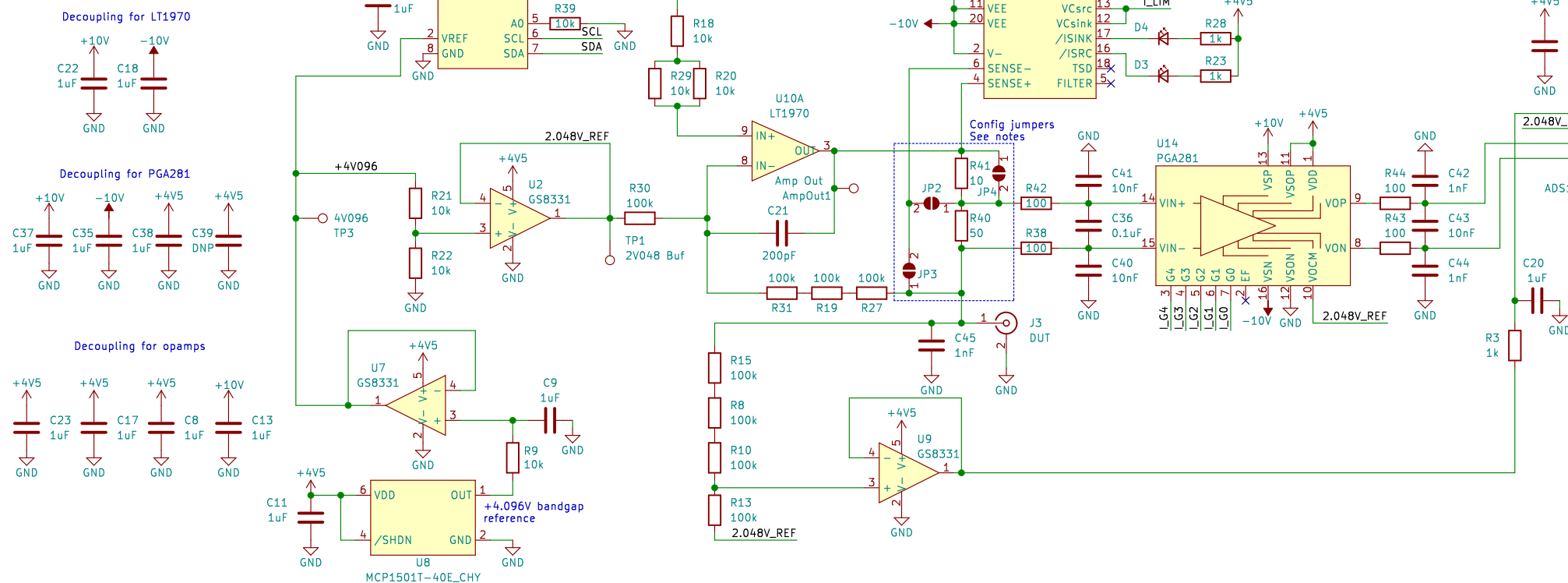


Analog front-end

Unipolar DAC output is fed to a power op-amp & shifted to bipolar to drive DUT. Voltage drop through a shunt resistor is measured with a chopper-stabilised instrumentation amplifier to sense current.

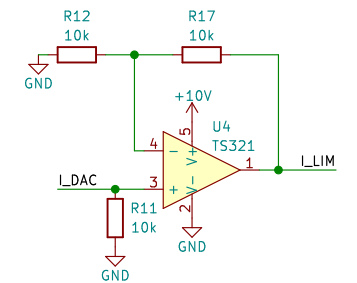


Config A:
R41 is shorted out. Current is only measured through R40 by the PGA281. Current limiting is sensed (LT1970 SENSE- pin) at the top and bottom of R40, which must be replaced with a 10 Ohm value.

Config B:
Current limiting is sensed over the 10 Ohm R41 shunt whilst the PGA281 senses over the 50 Ohm R40. This allows a 40mA current limit with a 5x increase in current resolution compared to config A. The disadvantage is that the power amplifier must supply higher voltages to overcome the drop across the higher value R40 resistor

Notes

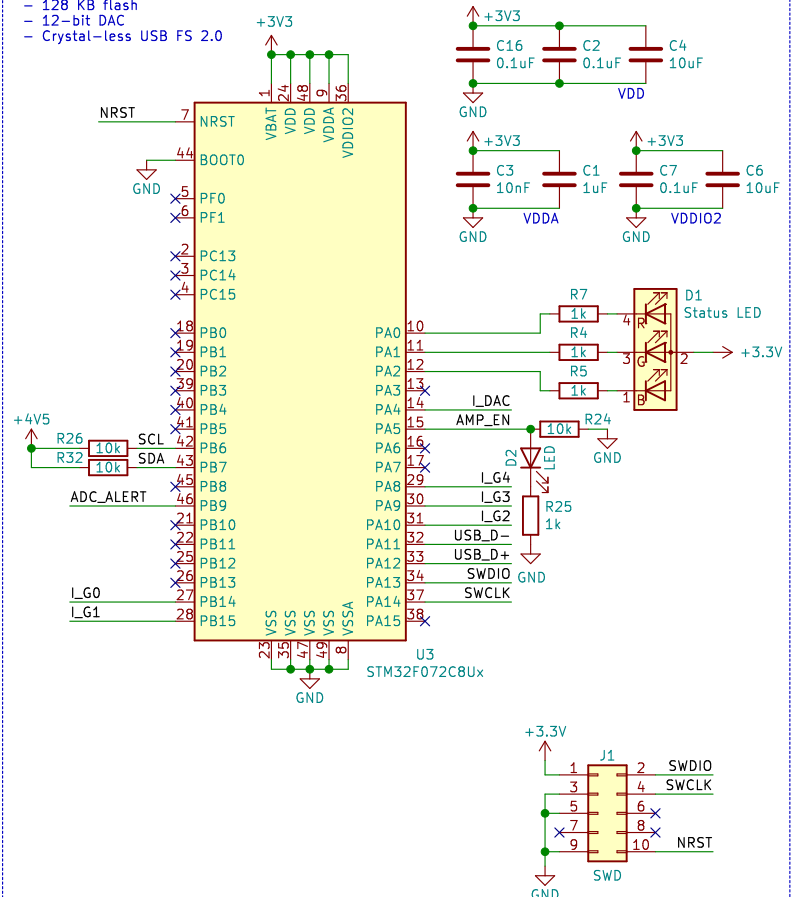
Configuration	
JP1	Short
JP2	Open
JP3	Short
R41	Removed
R40	10 Ohm



Microcontroller

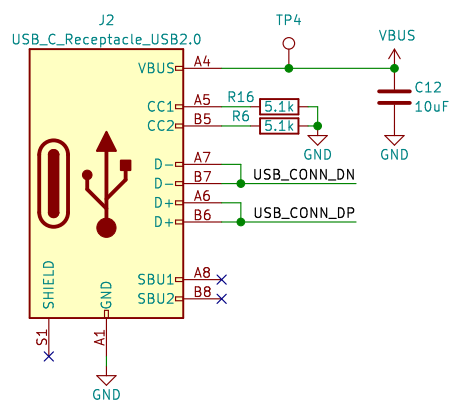
STM32F072C8U6

- 48 MHz Cortex M0 core
- 16 KB SRAM
- 128 KB flash
- 12-bit DAC
- Crystal-less USB FS 2.0



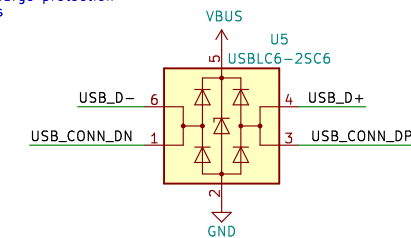
USB connector

USB-C connector configured as a USB 2.0 device



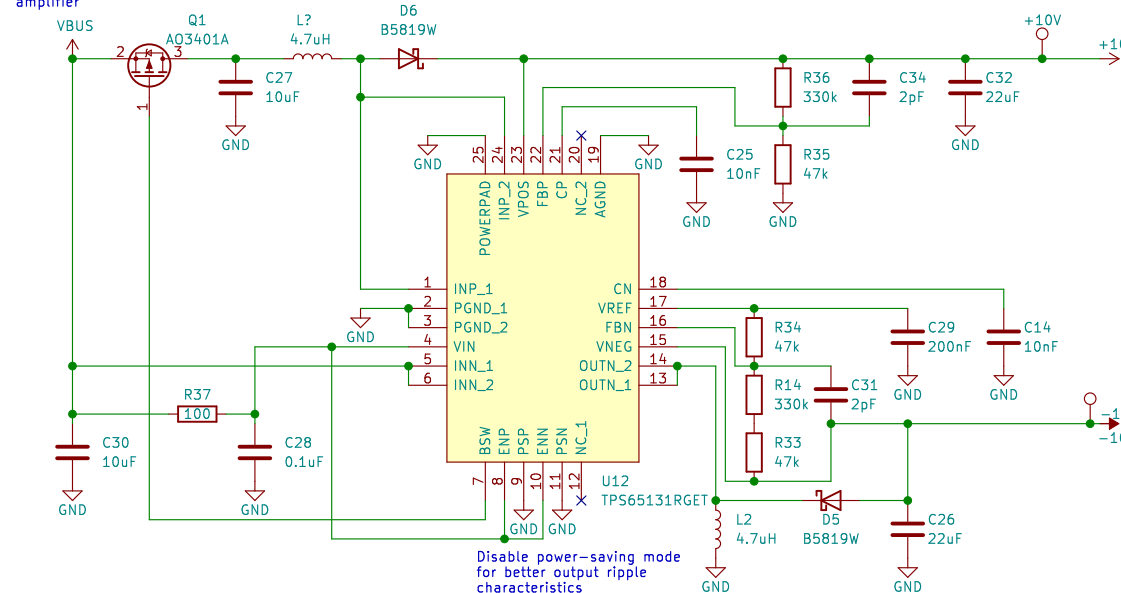
USB ESD protection

Electrostatic discharge protection for USB data lines



±9.7 V regulator

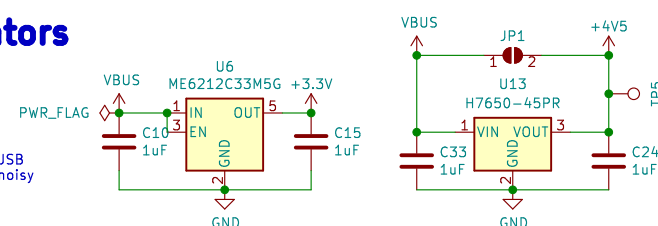
Take a USB input voltage and split it to +9.7 V and -9.7 V for the output amplifier



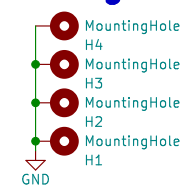
LDO regulators

+3.3V for microcontroller

+4.5V for ADC & DAC. Can be bypassed to run converters directly from USB 5V, but may suffer from noisy power supplies



Mounting holes



μSMU

Joel Troughton

Sheet: /
File: uSMU_v10.kicad_sch

Title: uSMU v1.0

Size: A3 Date: 2021-05-22
KiCad E.D.A. kicad (5.99.0-10483-ga6ad7a4a70)

Rev:
Id: 1/1