

The background of the slide is a close-up, slightly blurred image of a green printed circuit board (PCB). In the center, there is a circular logo with a stylized, three-lobed shape inside. Below the logo, the word "SERENITY" is printed in a light, sans-serif font. The overall image has a teal/green color scheme.

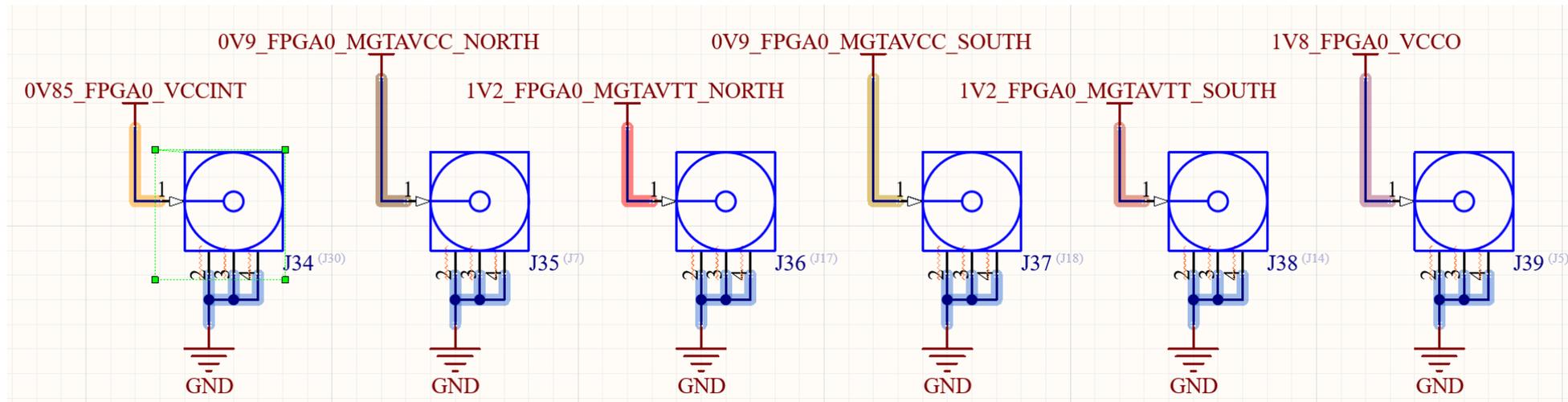
SERENITY

# Improving Testing and Commissioning

Lessons learned while developing the Serenity-S1

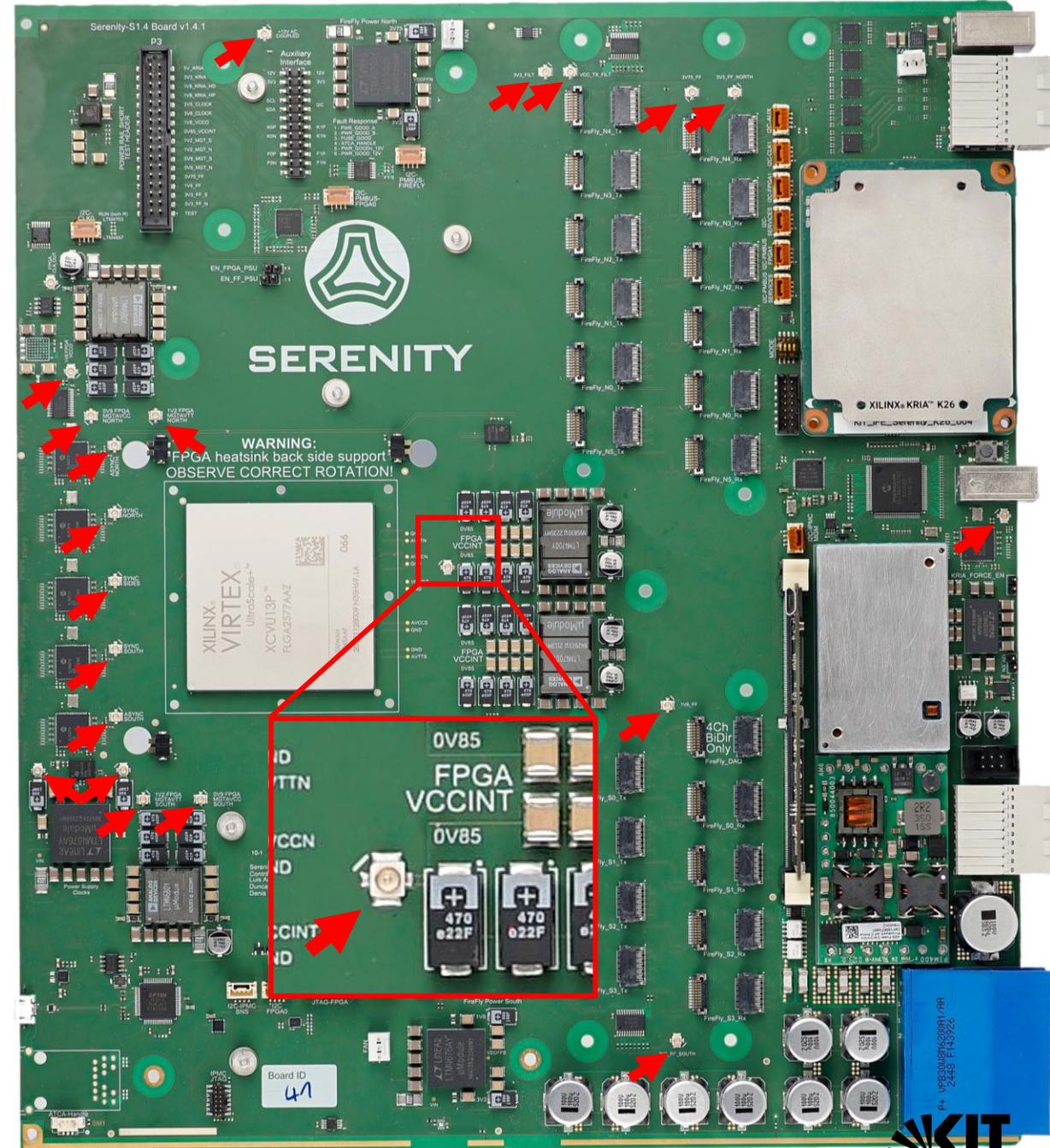
# Power supply measurement

- Test points for power are well established
- Always requires good GND connection
- Solution: Use differential connector
  - uFL connectors are cheap and small
  - [MOLEX 73412-0110](#) 0.42€/piece, 2.6x2.6mm



# Power supply measurement

- We have them all over the Serenity-S1
- Just connect an oscilloscope or a multimeter (using a small adaptor)

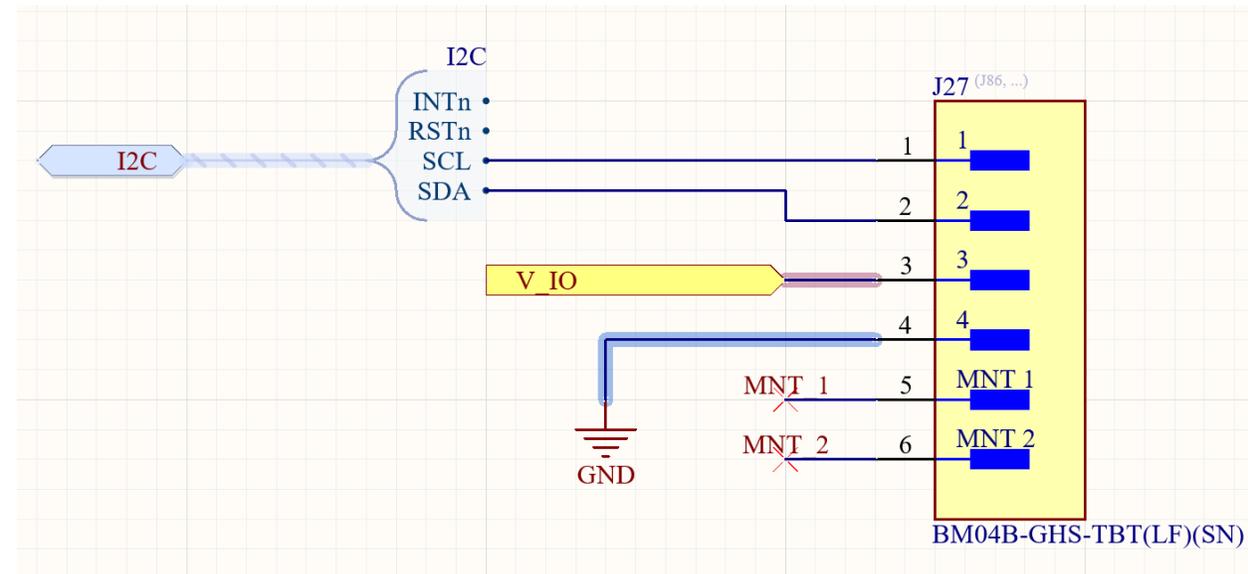
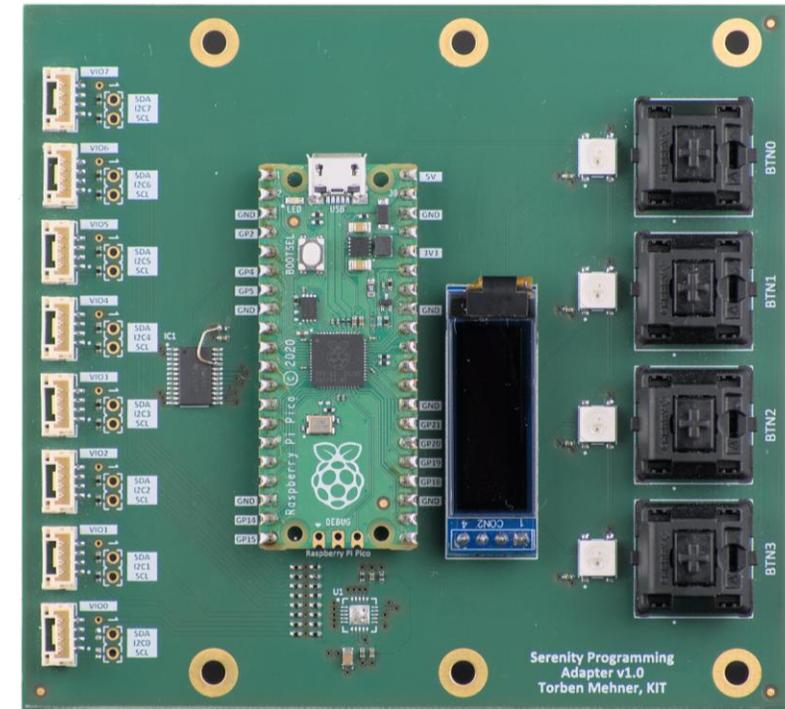


Thanks, Hendrik and Robert for the pictures!



# Serenity Programming Adapter

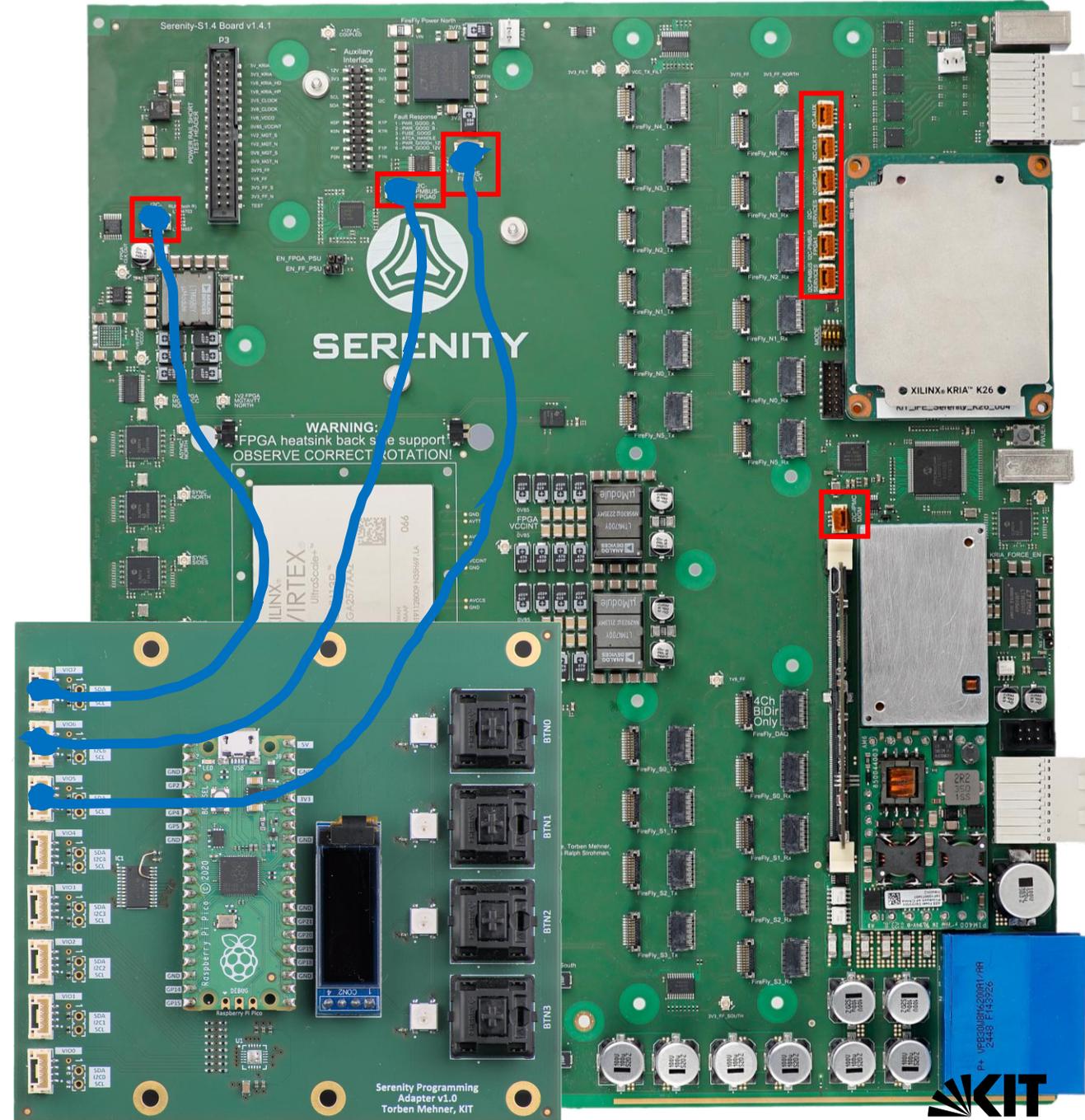
- A Raspberry Pi Pico based breakout board is used
  - 8 I2C buses with level shifting (1.65V – 5.5V)
  - Adds 4 buttons
  - Optional: I2C OLED display, ADC
  - Supports MicroPython (very quick and easy)
- Connects to I2C using small and cheap JST connector
  - [BM04B-GHS-TBT \(LF\)\(SN\)](#) 0.73€/piece, 8.3x4.3mm
  - V\_IO enables level shifting, but is no power delivery
  - Sparkfun QWIIC pinout, but with level shifting



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# Serenity Programming Adapter

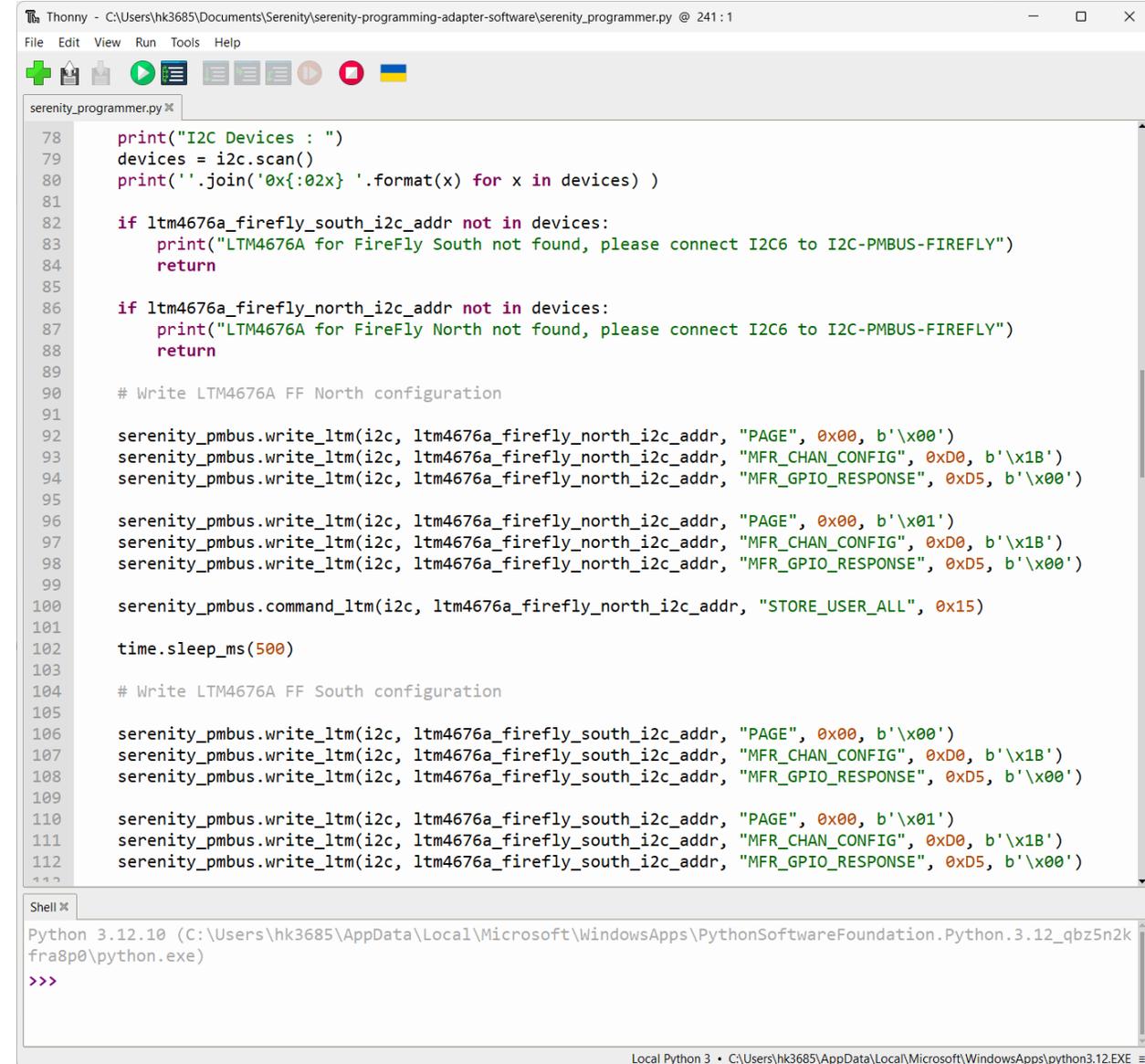
- We have them for every I2C bus on the Serenity
  - This helped a lot with debugg I2C
  - And commissioning I2C devices



Thanks, Hendrik and Robert for the pictures!

# Serenity Programming Adapter – Software

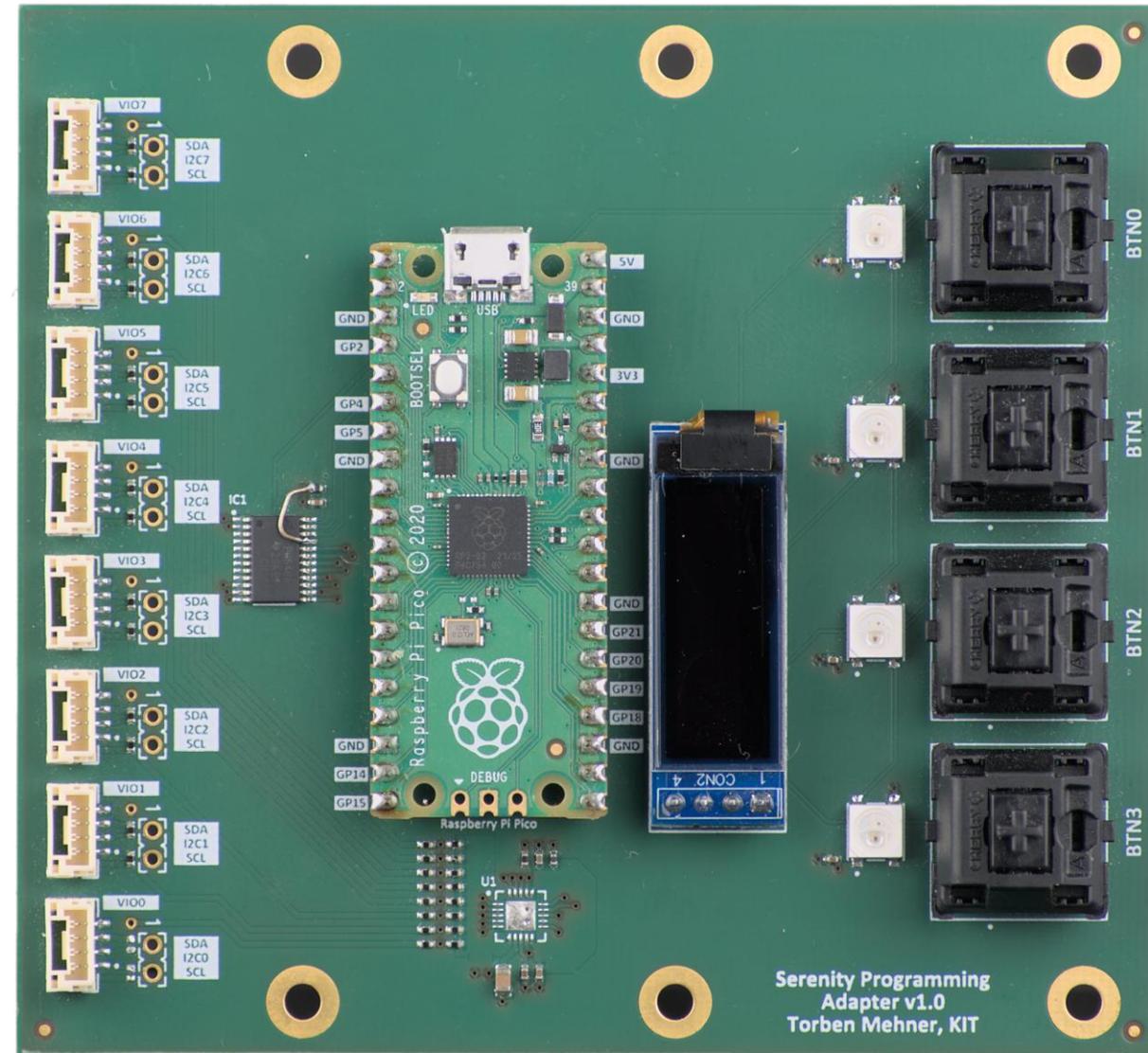
- Software available in [CERN Gitlab](#)
  - I would push it to IPE/EPS Gilab, but that's currently not an option
  - Should probably be renamed to MST, btw
- The following python libraries exist
  - Power: Generic PMBus, MAX34451
  - Clocks: ZL30274, Si5395A, LMK61E2
  - Other: SSD1306 I2C OLED Display
- Recommended DIE
  - [Thonny](#)
  - VS Code with [MicroPico Addon](#)



```
Thonny - C:\Users\hk3685\Documents\Serenity\serenity-programming-adapter-software\serenity_programmer.py @ 241 : 1
File Edit View Run Tools Help
serenity_programmer.py x
78 print("I2C Devices : ")
79 devices = i2c.scan()
80 print(''.join('0x{:02x} '.format(x) for x in devices) )
81
82 if ltm4676a_firefly_south_i2c_addr not in devices:
83     print("LTM4676A for FireFly South not found, please connect I2C6 to I2C-PMBUS-FIREFLY")
84     return
85
86 if ltm4676a_firefly_north_i2c_addr not in devices:
87     print("LTM4676A for FireFly North not found, please connect I2C6 to I2C-PMBUS-FIREFLY")
88     return
89
90 # Write LTM4676A FF North configuration
91
92 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "PAGE", 0x00, b'\x00')
93 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "MFR_CHAN_CONFIG", 0xD0, b'\x1B')
94 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "MFR_GPIO_RESPONSE", 0xD5, b'\x00')
95
96 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "PAGE", 0x00, b'\x01')
97 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "MFR_CHAN_CONFIG", 0xD0, b'\x1B')
98 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "MFR_GPIO_RESPONSE", 0xD5, b'\x00')
99
100 serenity_pmbus.command_ltm(i2c, ltm4676a_firefly_north_i2c_addr, "STORE_USER_ALL", 0x15)
101
102 time.sleep_ms(500)
103
104 # Write LTM4676A FF South configuration
105
106 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "PAGE", 0x00, b'\x00')
107 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "MFR_CHAN_CONFIG", 0xD0, b'\x1B')
108 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "MFR_GPIO_RESPONSE", 0xD5, b'\x00')
109
110 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "PAGE", 0x00, b'\x01')
111 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "MFR_CHAN_CONFIG", 0xD0, b'\x1B')
112 serenity_pmbus.write_ltm(i2c, ltm4676a_firefly_south_i2c_addr, "MFR_GPIO_RESPONSE", 0xD5, b'\x00')
113
Shell x
Python 3.12.10 (C:\Users\hk3685\AppData\Local\Microsoft\WindowsApps\PythonSoftwareFoundation.Python.3.12_qbz5n2k
fra8p0\python.exe)
>>>
```

# Future of Serenity Programming Adapter

- Revision possible to:
  - Make level shifter address flexible (currently 0x74)
  - Add UART (reading) support
  - Break out IOs



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