Phase 2 Power Supply and Mechanics

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Outline

- Phase 2 Power Supply Status
  - Design review
  - Backplanes
- Phase 2 Mechanics Status
  - Design
- System Test
- Production status

Phase 2 Power Supply

V2 PSU Design

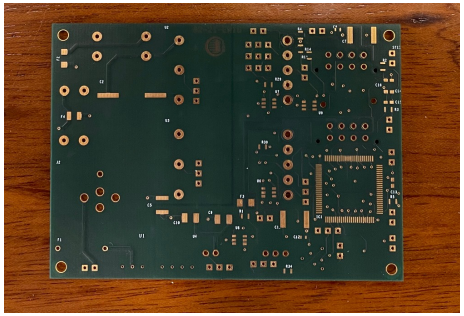
Features

Input
- 48V (3.1 A max), Isolated GND

Outputs with isolated GND from input
- 3.3V (20 A) for Digiopt12
- 5 V (20 A) for PACE
- 3.3V (0.7 A) for PACE Boot and SC FPGAs
- 2.2 V (5A) for DigiOpt12

4 Temperature sensors (T1..T4)

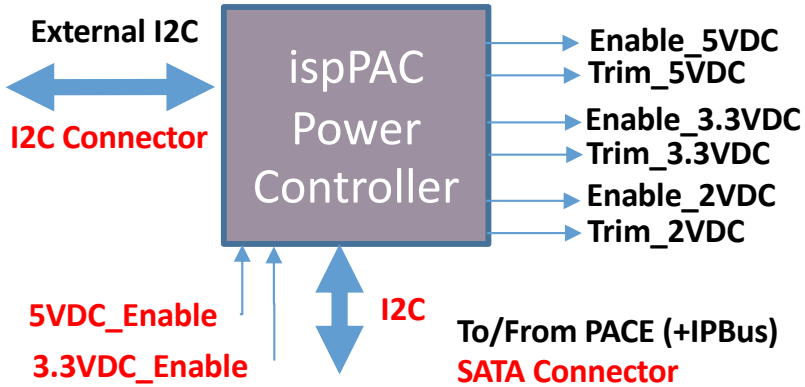
V2 PSU Dimensions



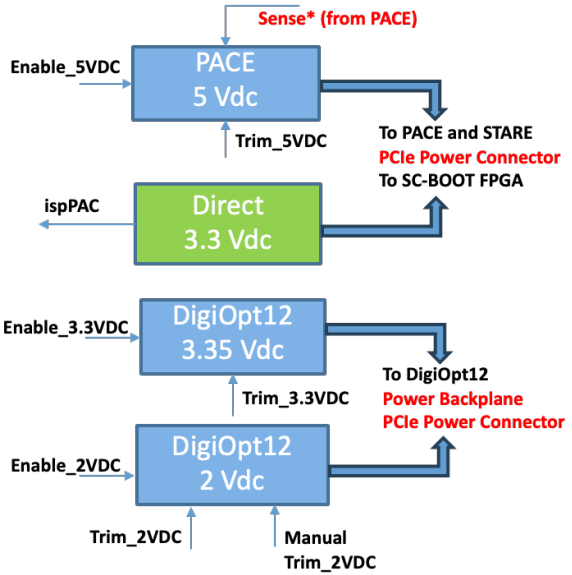
90 x 65 mm²

- 51% less than Ph1 PSU

V2 PSU Slow Control



DC/DC Enabling
- Manual (jumpers)
- External (I2C, PACE)



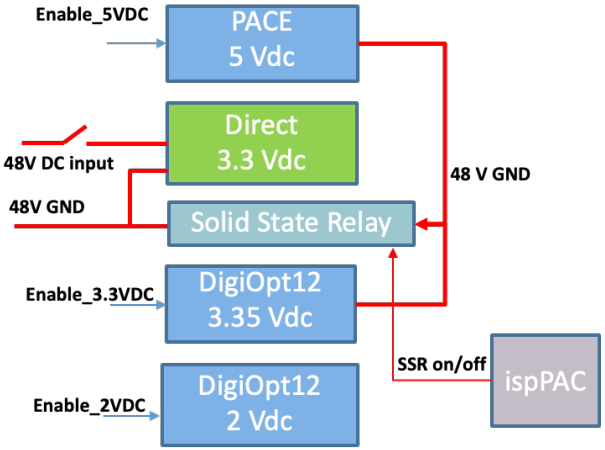
Phase 2 Power Supply

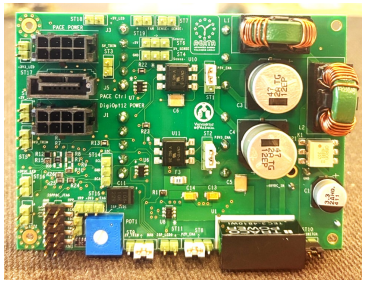
PSU V2 versions

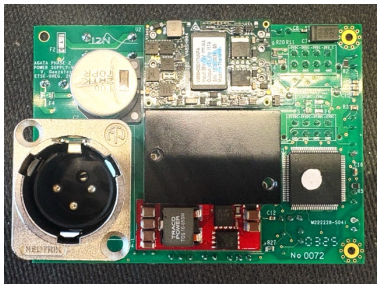
Design modifications

- V2.5 (prototype t12.2_rev2)
- Modify de 2V trace to increase current capacity for future demand of DigiOpt12 boards
- Fix DC/DC drill diameters to fit different models for component obsolescence/availability
- **First production batch of 50 units**

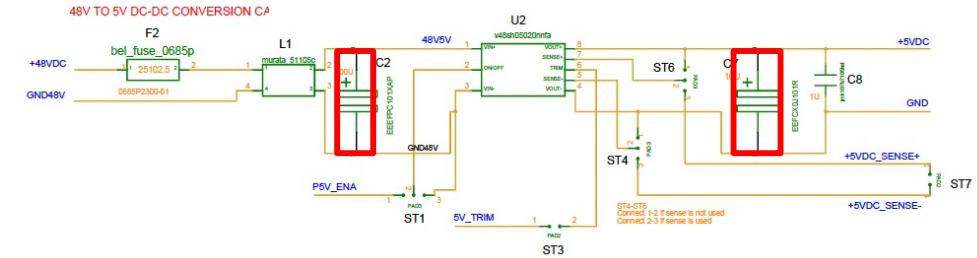
- **V2.6 (prototype t13_rev1)**
- Design modified due to obsolescence/availability
- Improve DC/DC stability

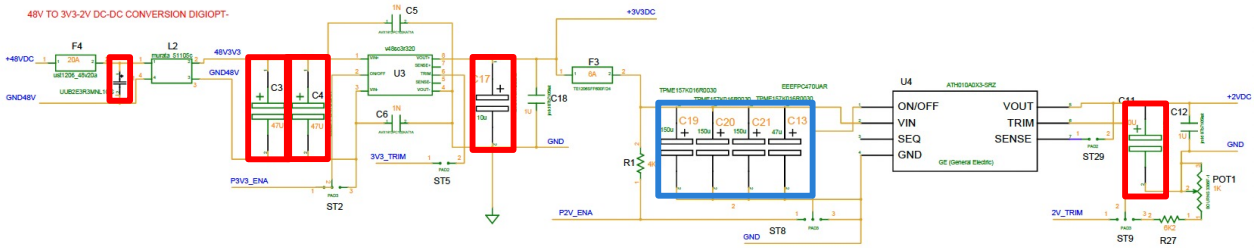






- V2.5 (prototype t12.2_rev2)



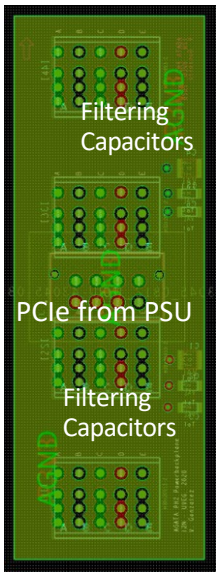


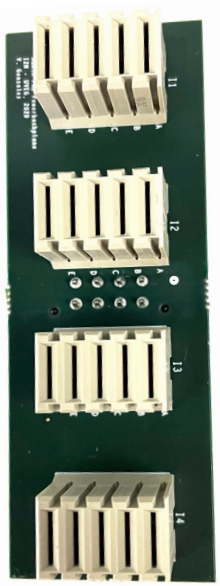
Phase 2 Power Supply

Backplanes

POWER BACKPLANE

- Distributes +3.3V and +2V to DigiOpt12
- Capacitors for additional filtering





SIGNAL BACKPLANE

- Distributes to CLKs, SynPat, SPI, I2C to DigiOpt12
- FireFly connection to PACE
- Additional local I2C Access
  - Through I2C bridge
- SIGNAL BACKPLANE redesigns

V2_t11

Missing Enable connection for i2C bridge

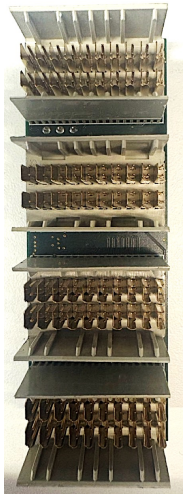
Improved SILKSCREEN information

V2.4

Firefly connector wrong pinout affects DigiOpt12 SYNC_PATTERN & CLOCK signals

V2.5 production

Firefly cable crosses signal pins. Corrected

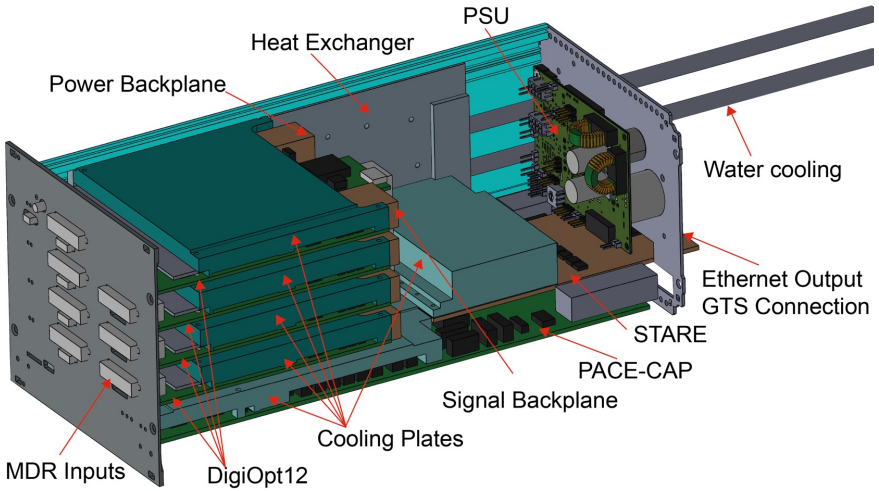


Firefly from PACE

i2C Bridge

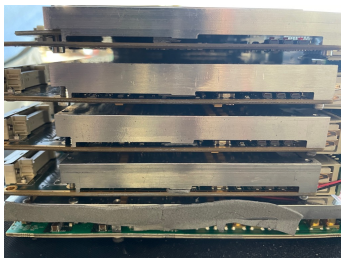
Phase 2 Mechanics

Design

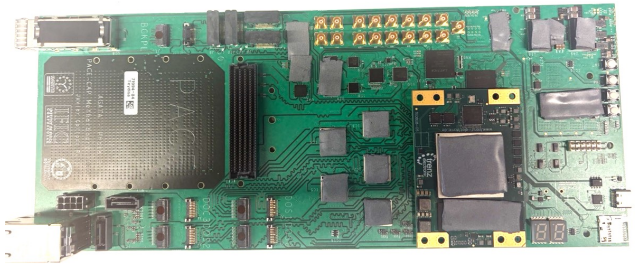


- Cut out to place USB programmer

- Increase heat dissipation using box sides

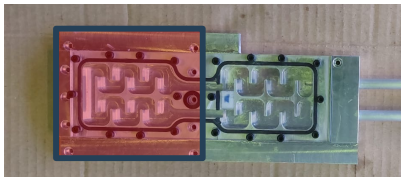


- Thermal Pads on top and bottom layers. Use bottom plate as heat spreader

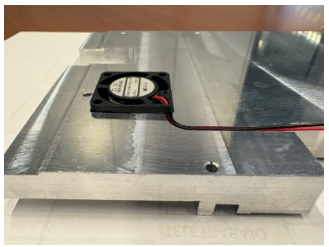


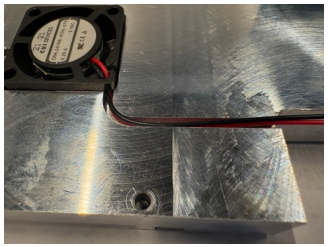
Modifications to control temperature

- New Heat Exchanger for better cooling

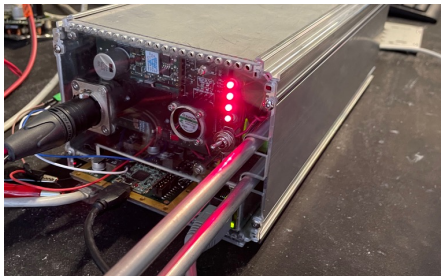


- Fan in PACE cooling block to lower temperature around DC/DC converters. 70,000 hours lifetime.





- Fan at rear panel to lower PSU temp

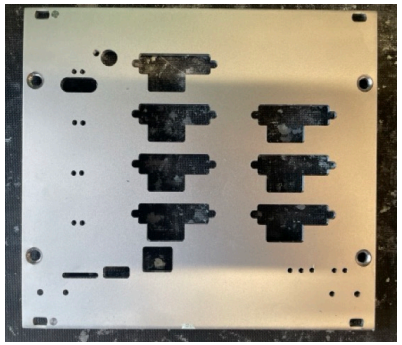


Phase 2 Mechanics

Design

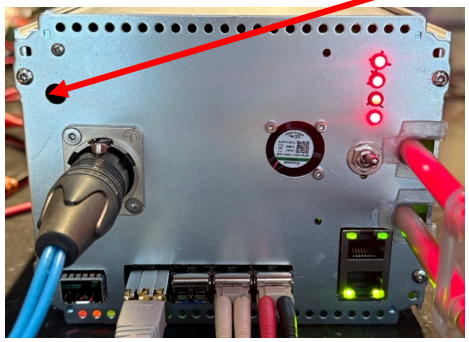
Front and rear panels

Front panel



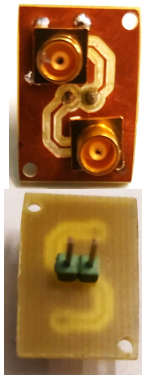
Aluminium prototype

Rear panel

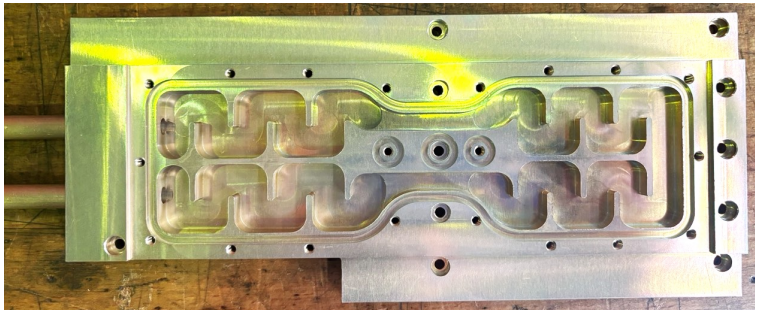


Steel prototype

Trigger connector

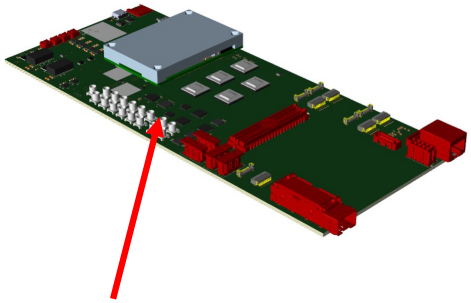


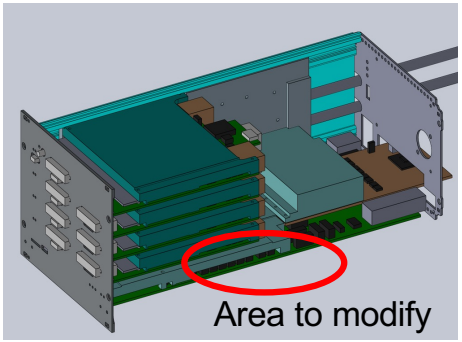
Heat exchange modification



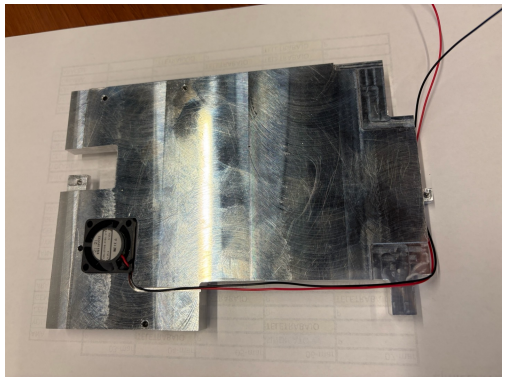
Alodine treatment to prevent corrosion

PACE cooling block modifications

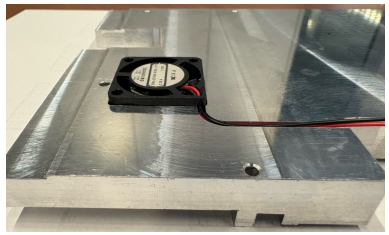




Cutout of PACE cooling block to connect the external trigger signal



PACE modified cooling block



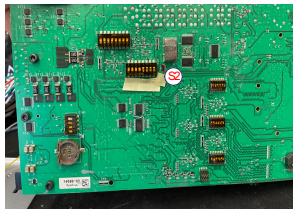
Groove for fan cabling

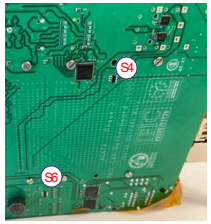
System test

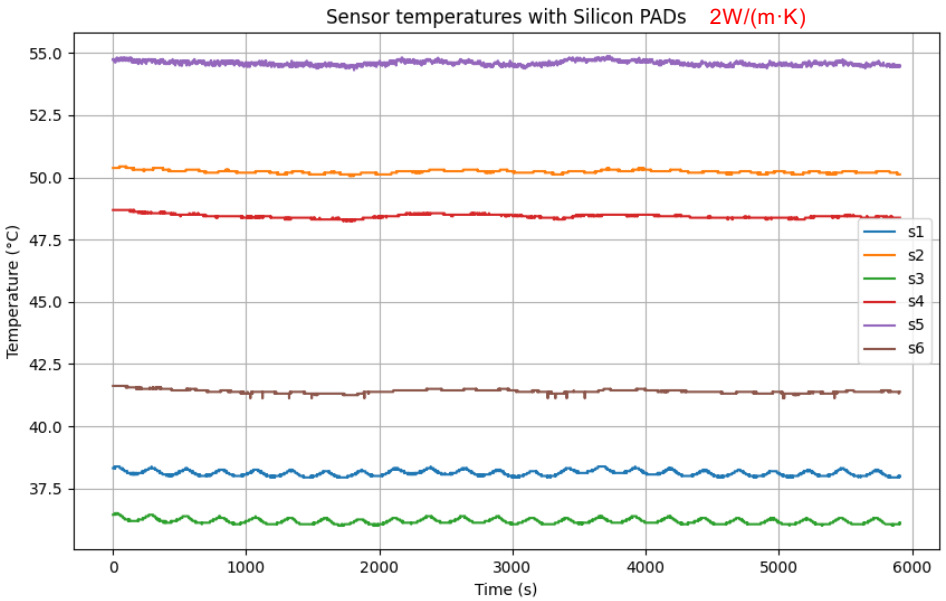
Thermal tests

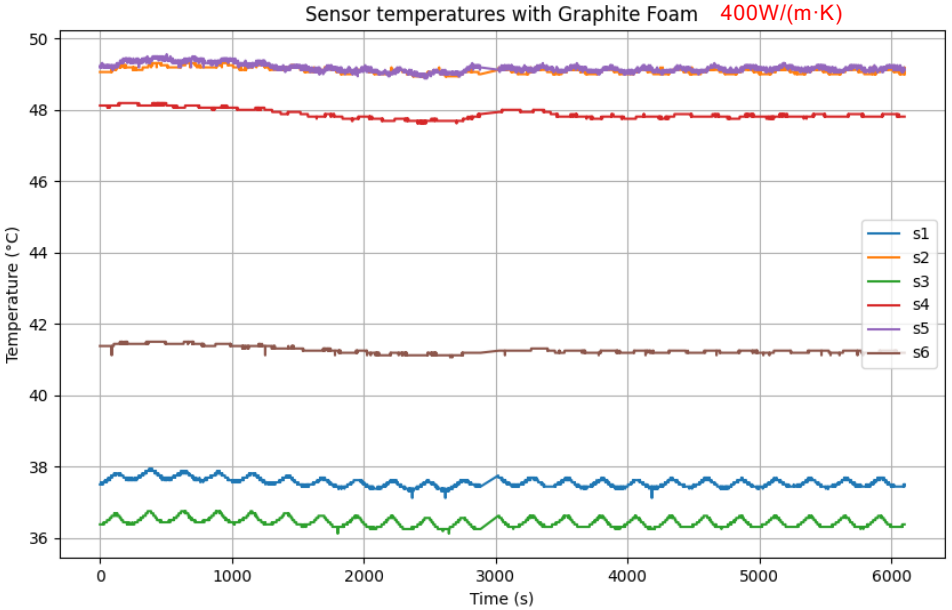
Tests with box closed (PACE prod. t58)

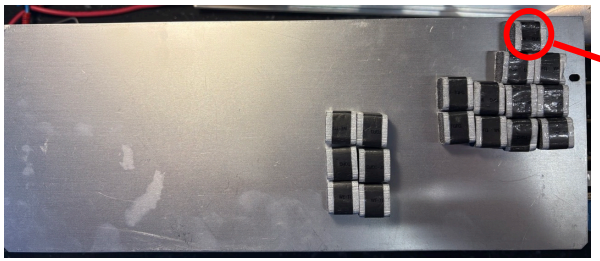
- Vcc =48 V, Icc = 1.99 A

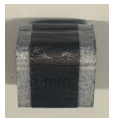












15x15x11.5 mm³

System test

Thermal tests

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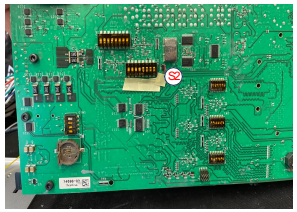
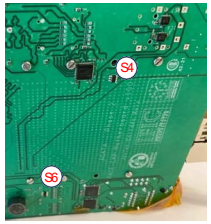
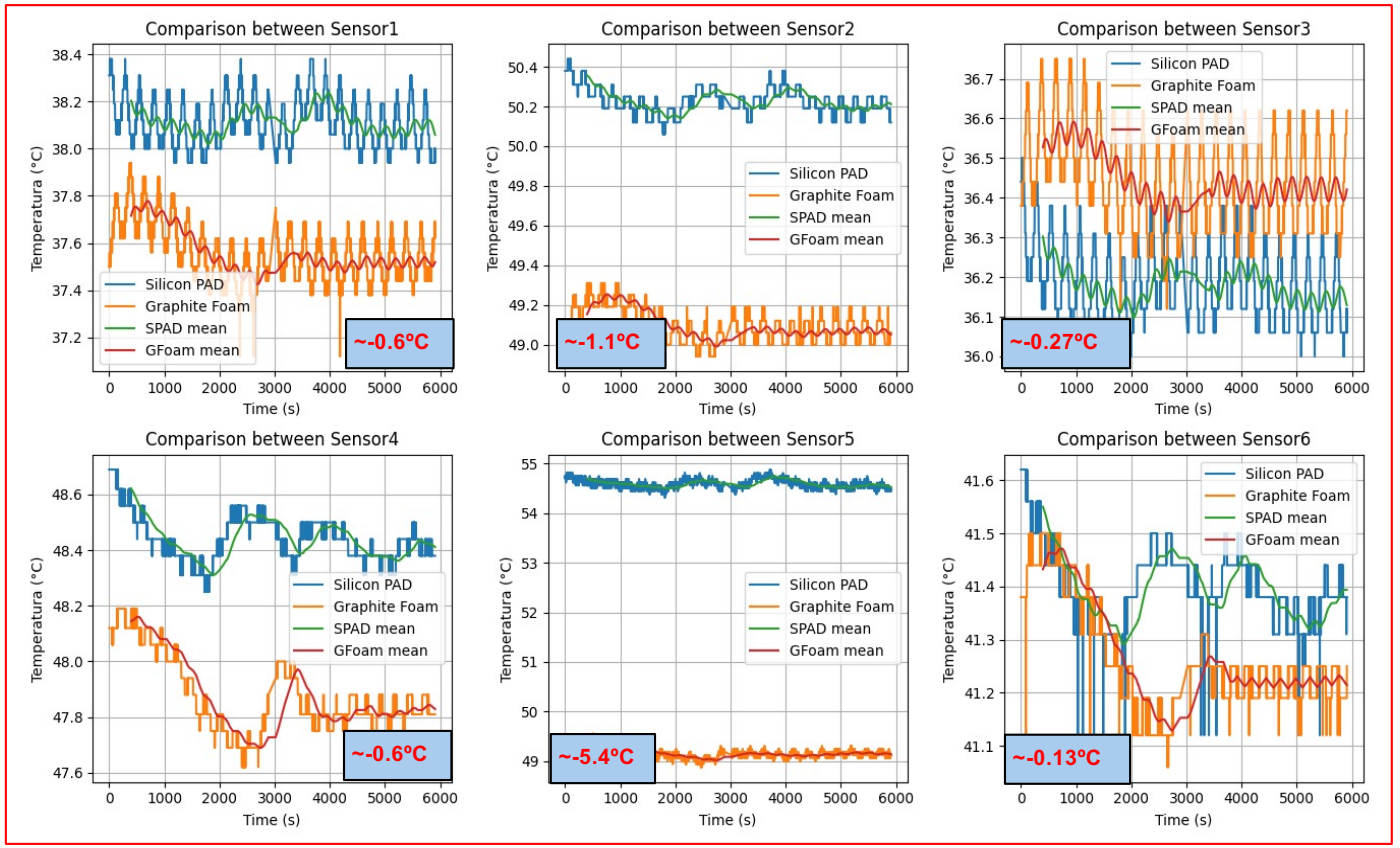
- Vcc =48 V, Icc = 1.99 A








```
|PACE|  PACE_SC_temp
48: 36.94 °C (S1)
49: 45.81 °C (S2)
4A: 36.44 °C (S3)
4C: 47.56 °C (S4)
4D: 48.62 °C (S5)
4E: 40.94 °C (S6)
```

Running from September 10th

Production status

PCBs

- Power backplane: 52 + 25 units
- Signal backplane: 60 + 25 units (expected)
- PSUv2.5: 50 units under CAT. Only minor change of resistor value to increase 2V output voltage
- PSUv2.6 (t13_rev1): board available end September

Mechanics

- Boxes: **90 units**
- Crates: **90 units**
- Cooling plates + heat exchangers:
  - 28 PACE cooling blocks (+8 to be update to new design)
  - **78** STARE cooling blocks
  - **240** Digitopt12 cooling blocks
  - **59** Heat exchanger
  - 2 Frontal panels -> Minor redesign to help in the assembly process
  - 1 Rear panel -> Minor redesign to help in the assembly process

Cables

- Firefly, HDMI, PCIe and SATA completed for at least 50 units

Thank you for your attention