

Grounding and cold/warm interface

15 May 2020

Claudio Gotti

INFN & Univ. Milano-Bicocca

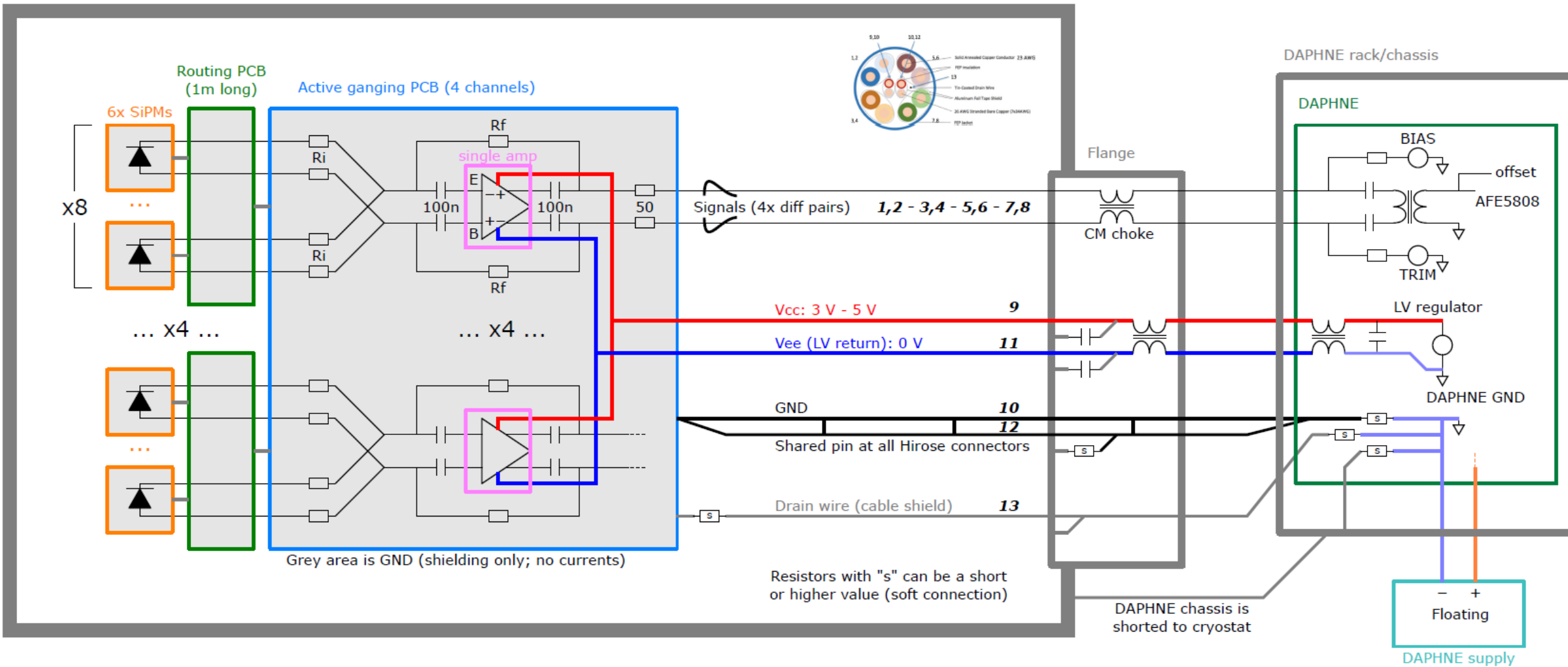
for the PD & electronics working groups

References

- EDMS folder:
<https://edms.cern.ch/document/2342785/1>
- Cold/warm interface:
Cold_Warm_PDS_Interface_4_27_2020.pdf
- Cable harness:
Photon_Detector_Cable_Harness_Document_Rev_4_4_27_2020.pdf

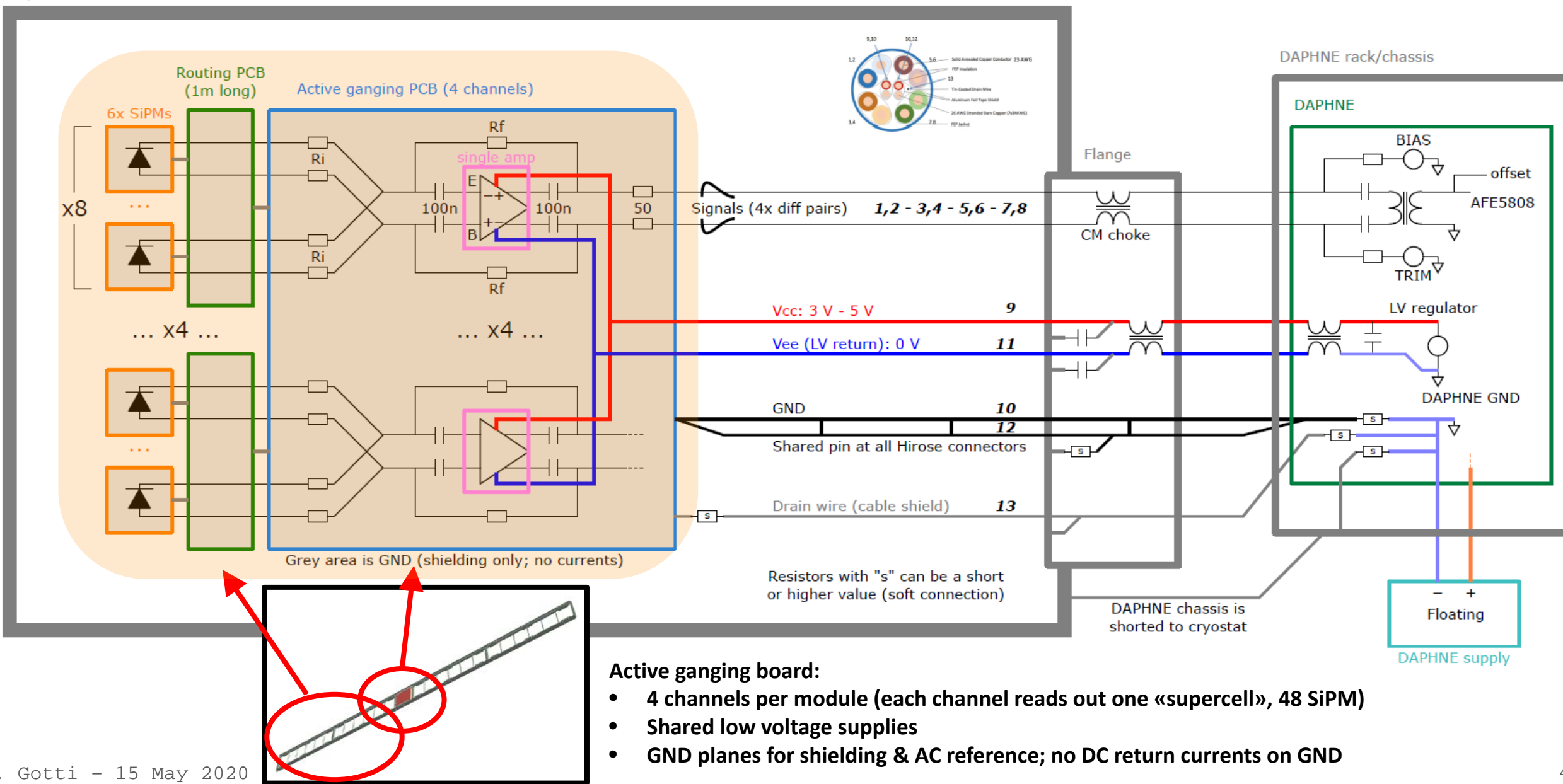
Grounding & interface scheme

Cryostat



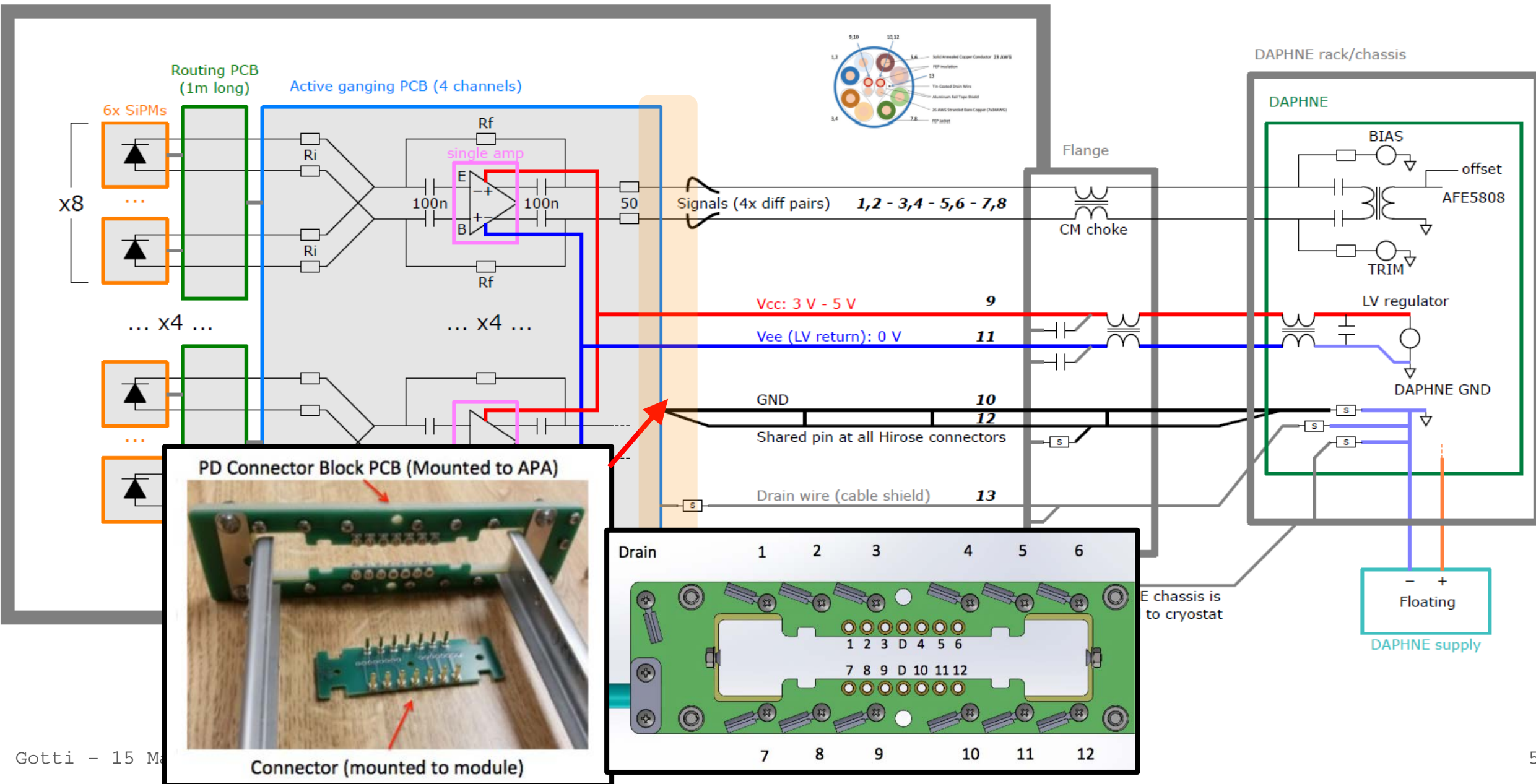
Grounding & interface scheme – active ganging

Cryostat



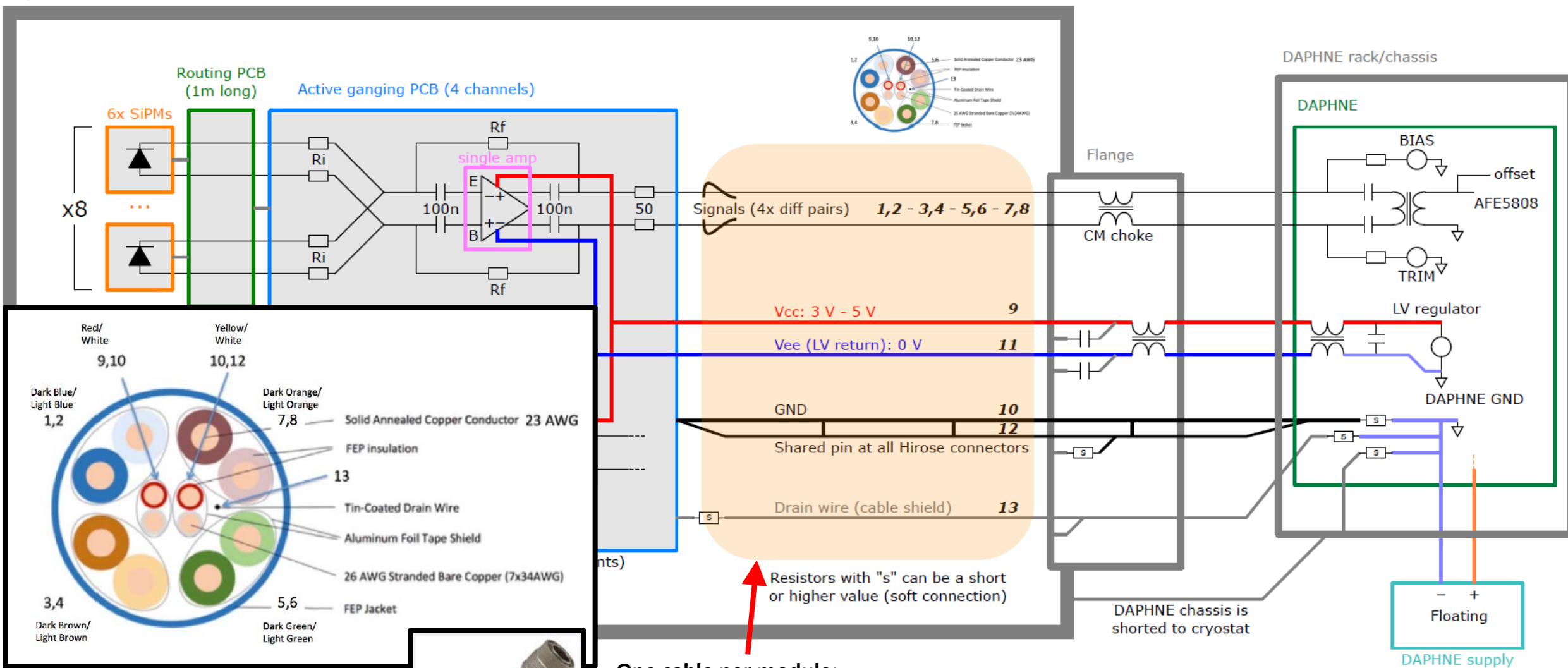
Grounding & interface scheme – pins

Cryostat



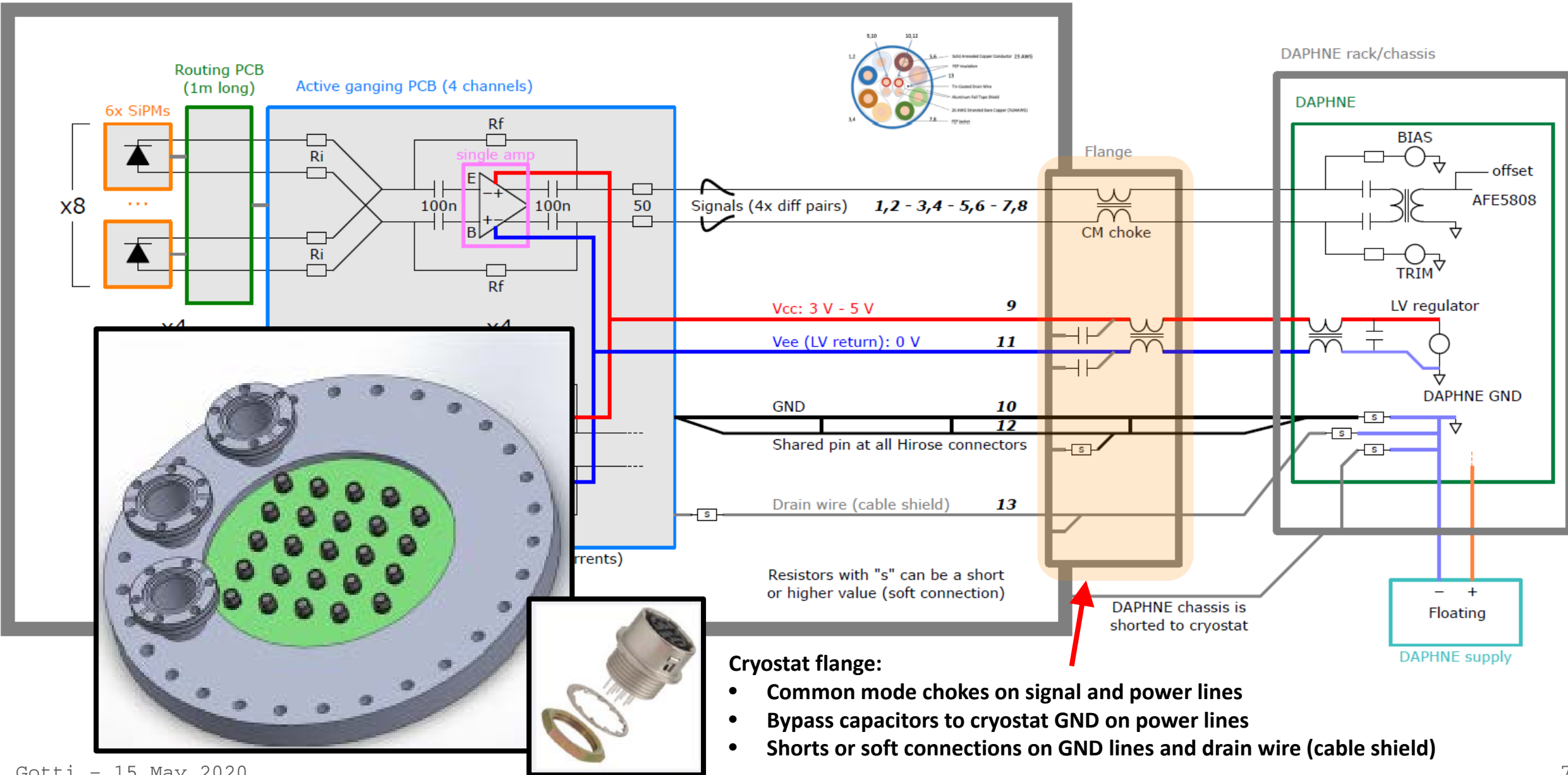
Grounding & interface scheme – cable

Cryostat



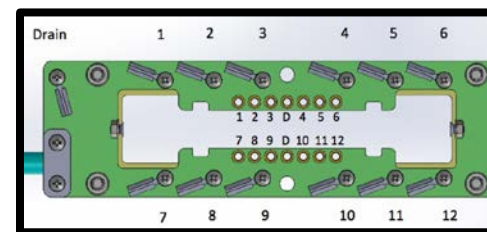
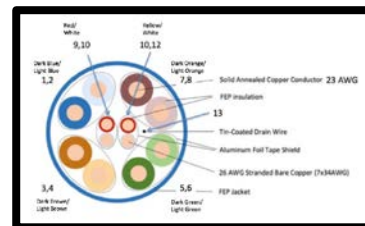
Grounding & interface scheme – flange

Cryostat

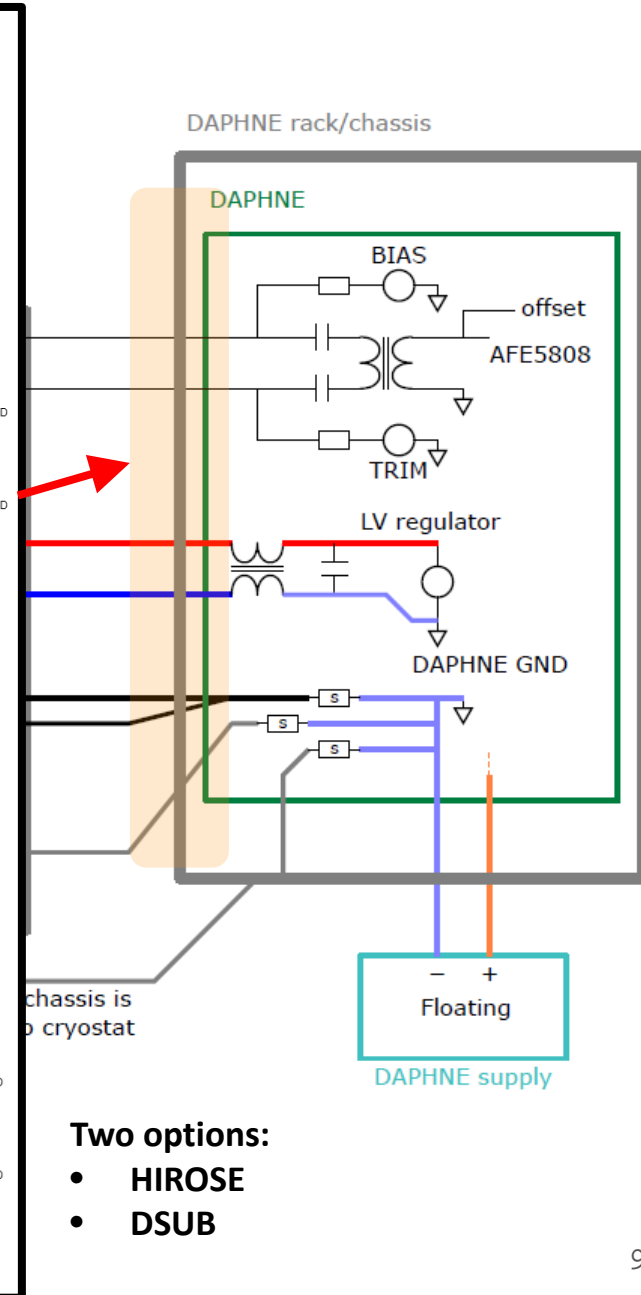
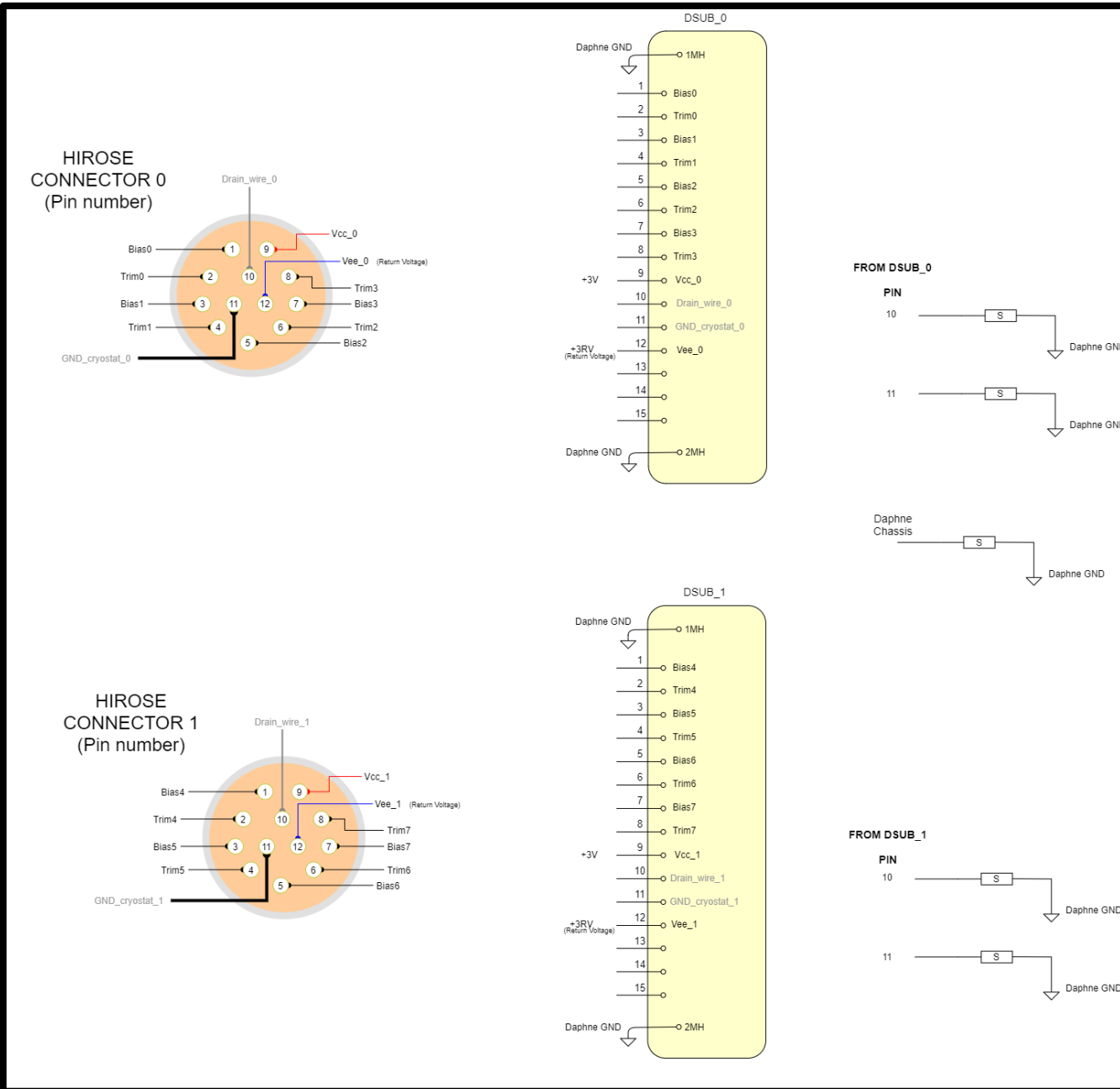
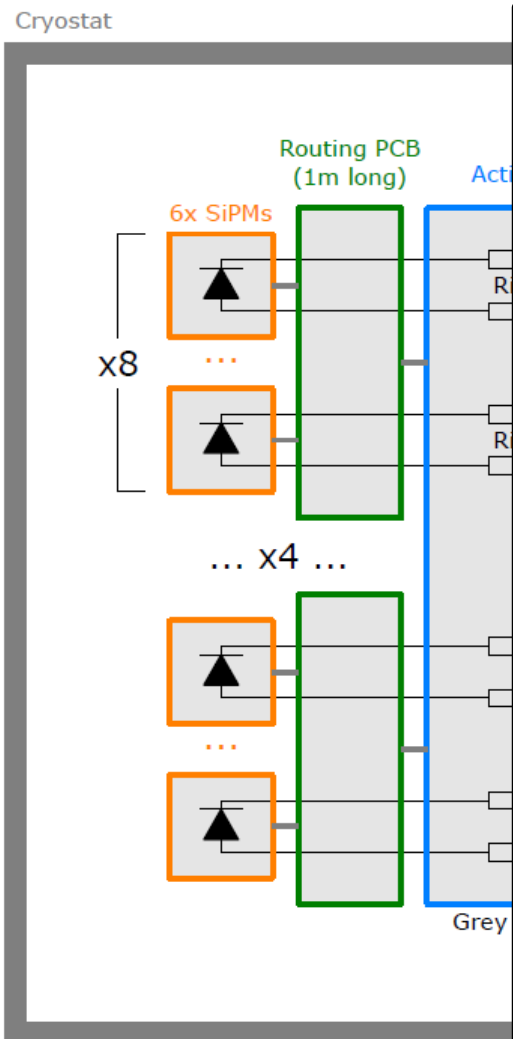


Grounding & interface scheme – pinout summary

Hirose pin number	Wire Number	Wire color code	PD Connector board screw	Use
1	1	Dark Blue	2	Supercell 1 signal
2	2	Light Blue	1	Supercell 1 signal
3	3	Dark brown	6	Supercell 2 signal
4	4	Light Brown	5	Supercell 2 signal
5	5	Dark Green	12	Supercell 3 signal
6	6	Light Green	11	Supercell 3 signal
7	7	Dark Orange	8	Supercell 4 signal
8	8	Light Orange	7	Supercell 4 signal
9	9	Red	3	+ Vcc Cold Amp
10	13	Drain Wire	Drain Wire Lug	Ground Shields (Detector Ground)
11	10,12	White (2 wires)	9	(Detector Ground)
12	11	Yellow	4	Vee (Current Return)

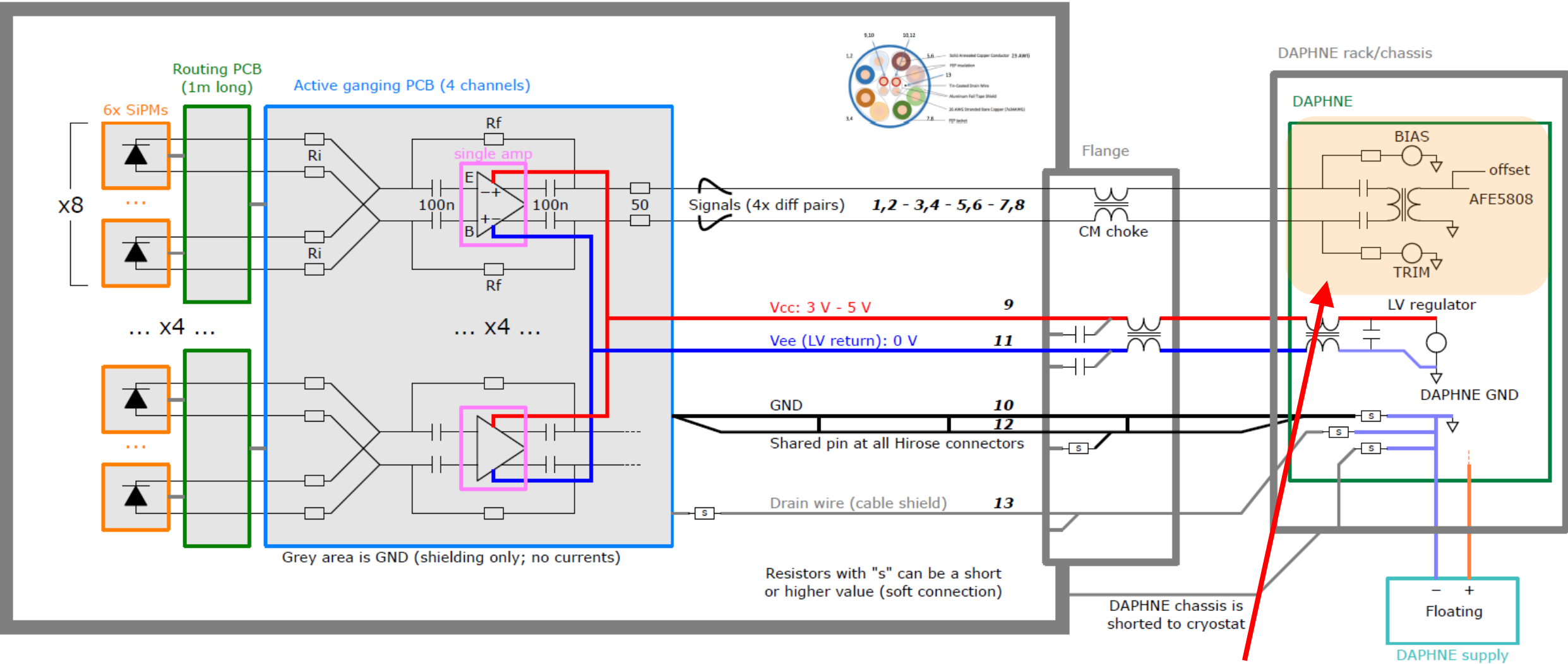


Grounding & interface scheme – DAPHNE connector



Grounding & interface scheme – AFE5808

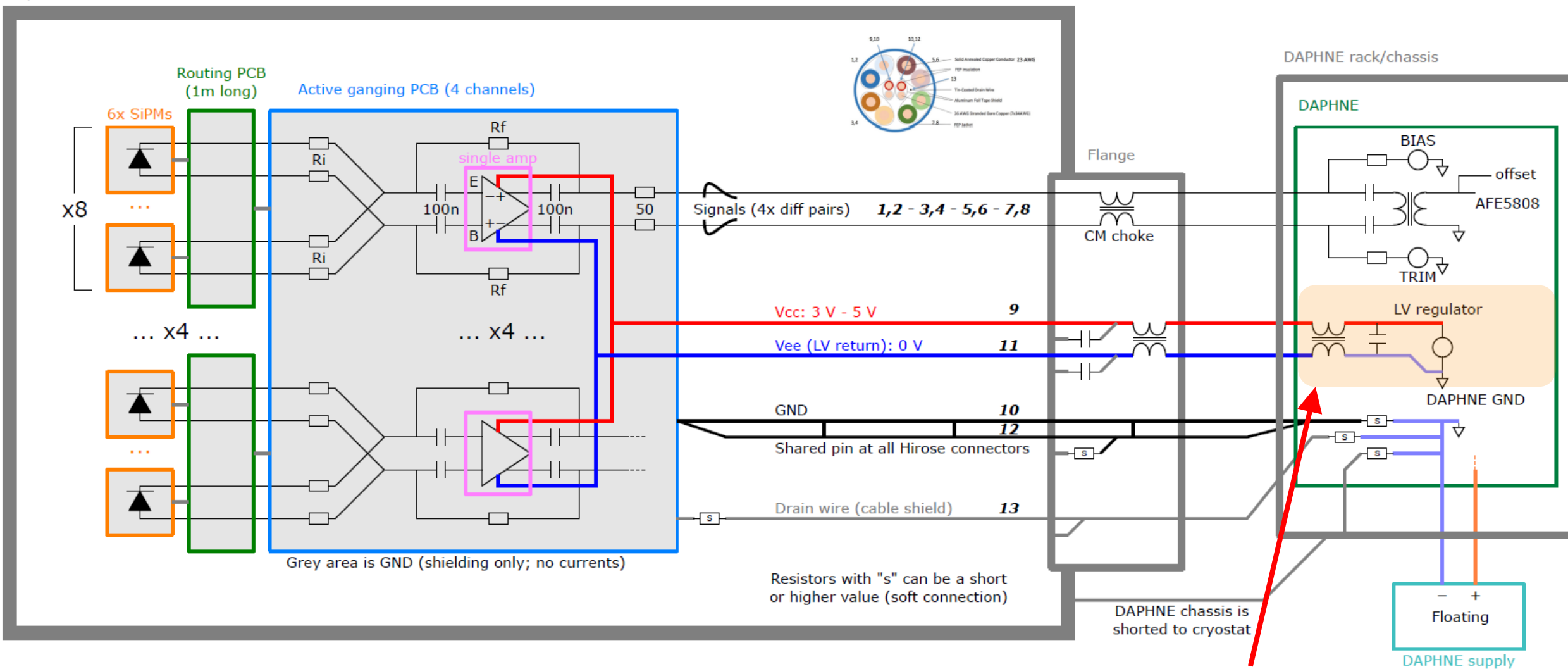
Cryostat



- Transformer for differential to single ended conversion
- Active termination inside the AFE5808

Grounding & interface scheme – LV regulator

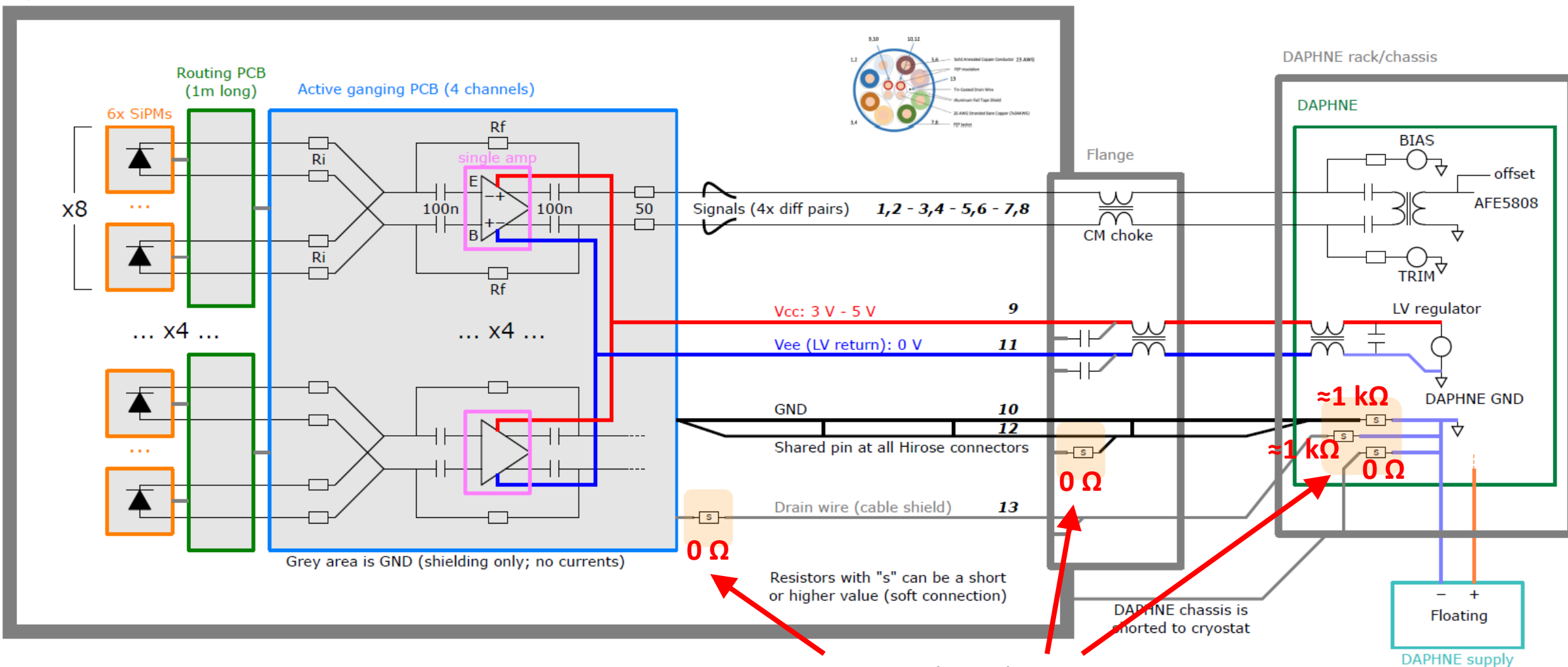
Cryostat



- Low noise linear regulator
- Range 3-5 V to be fixed
- Current < 10 mA

Grounding & interface scheme – GND connections

Cryostat

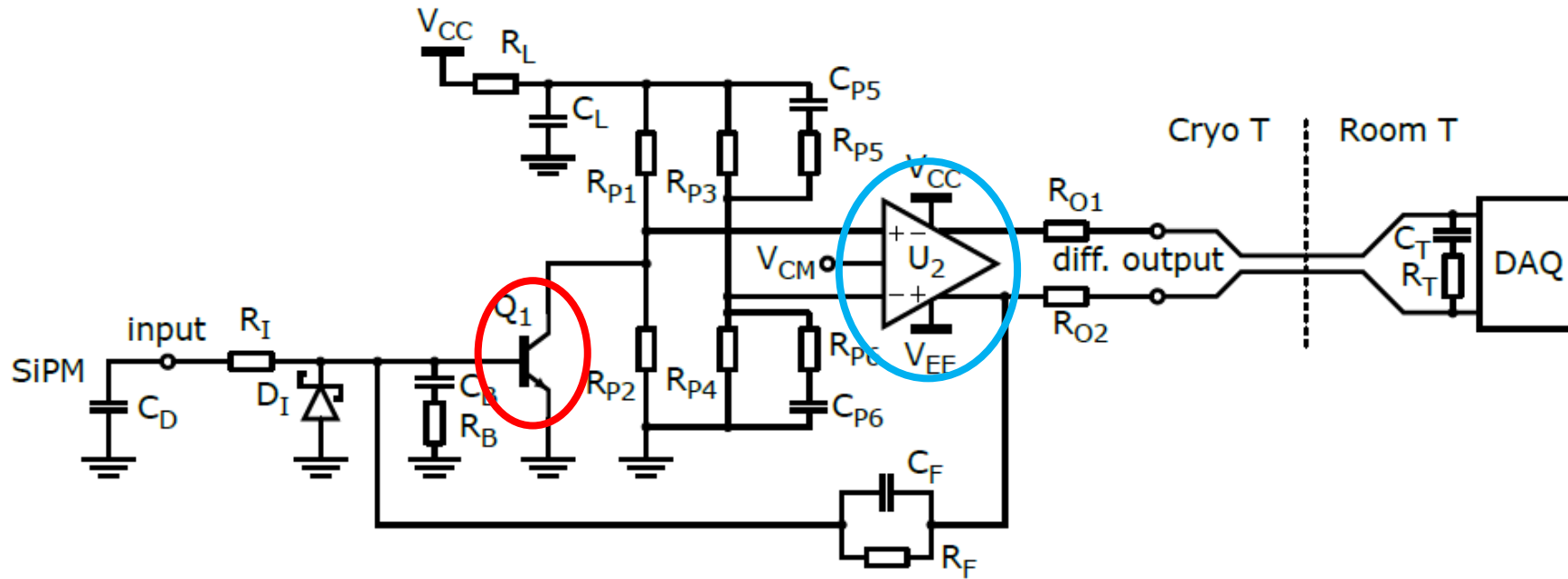


GND connection options:

- Baseline as indicated?
- Flexible; not to be decided now

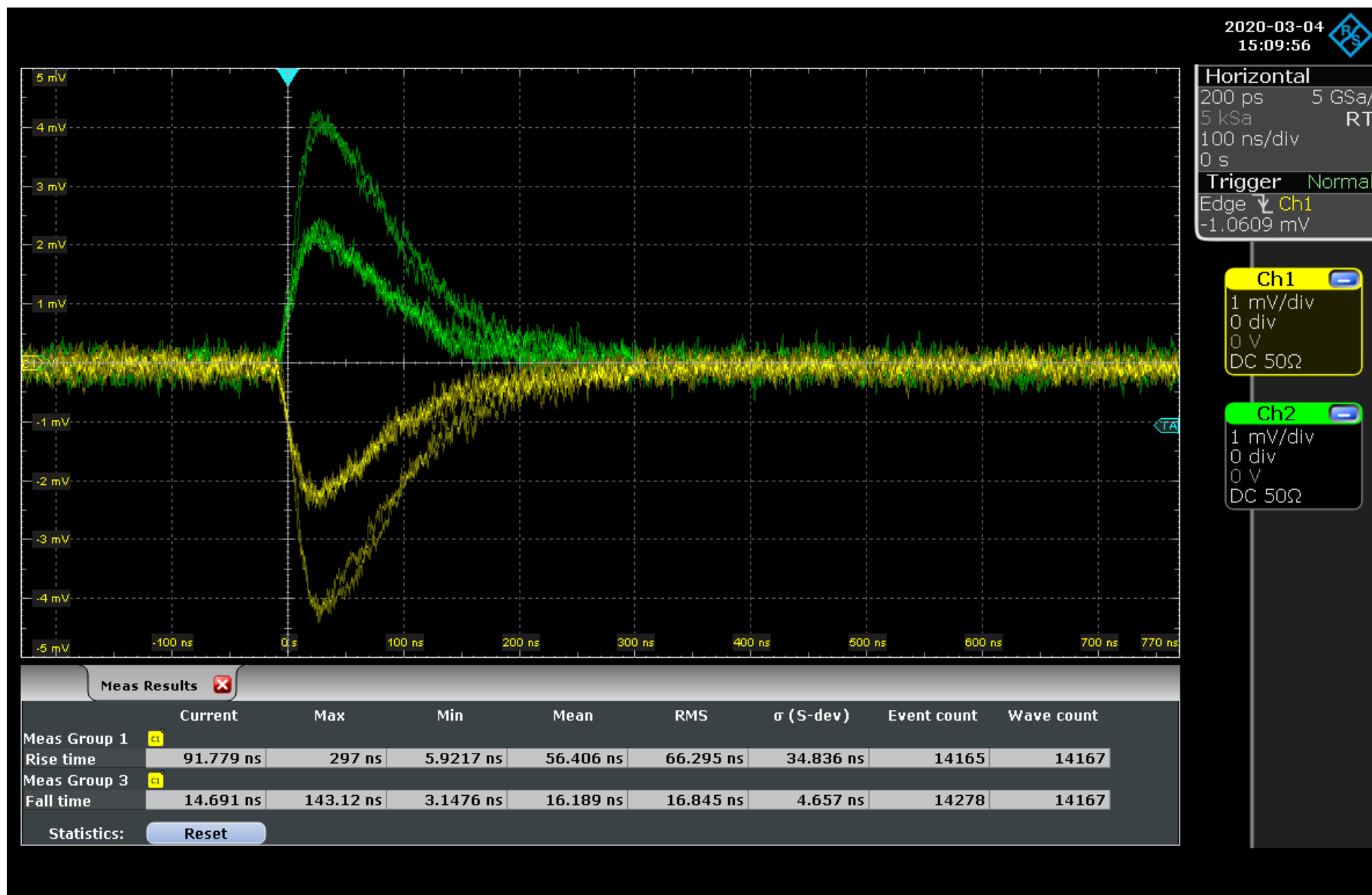
Spare

Cold amplifier design



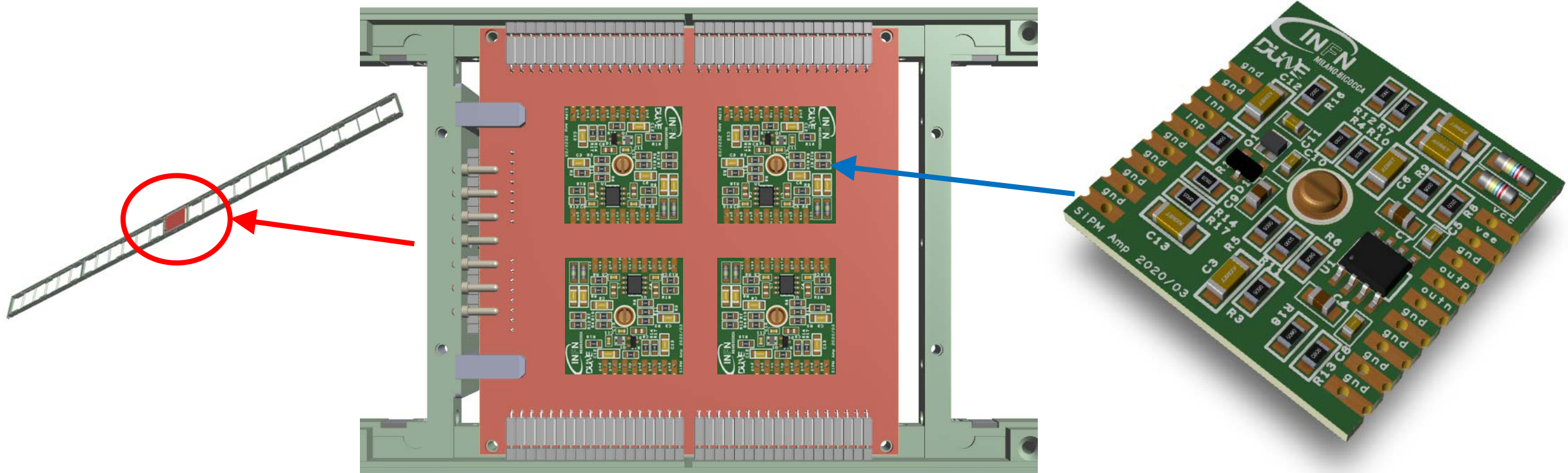
- Evolution of G. Cancelo's design described in the TDR
- **Q1**: SiGe bipolar transistor **BFP640** for low series noise (0.4 nV/VHz white)
- **U2**: Fully differential opamp **THS4531** for high open loop gain and differential outputs
- Two-stage design gives flexibility in tuning open loop gain to match SiPM capacitance
- Low power consumption (≈ 2.5 mW/channel)
- (Almost) rail-to-rail outputs on 50 ohm load
- Further details: [arXiv:1911.06562](https://arxiv.org/abs/1911.06562) | [2020 JINST 15 P01008](https://doi.org/10.1088/1742-6596/2020/1/P01008)

SiPM signals



Updated design

- Minor changes to the schematic to make it fully compliant with the interface / grounding diagram
- Smaller layout (now $\approx 3 \times 3 \text{ cm}^2$) to fit the 4-channel active ganging board
- Single channel can be unplugged/modified/replaced: good for prototyping and testing phase
- Work in progress with D. Warner



Grounding & interface scheme – connectors

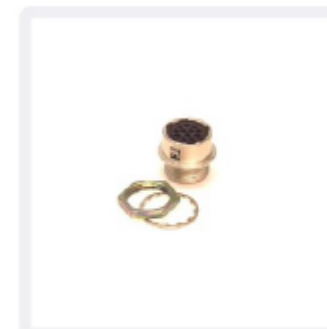


HR10A-10P-12PC(73)

[Datasheet](#)

Digi-Key Part Number	HR1674-ND
Manufacturer	Hirose Electric Co Ltd
Manufacturer Part Number	HR10A-10P-12PC(73)
Description	CONN PLUG HSG MALE 12POS INLINE
Manufacturer Standard Lead Time	12 Weeks
Detailed Description	12 Position Circular Connector Plug Housing Free Hanging (In-Line) Backshell, Cable Clamp, Strain Relief

Connector Type 1: Male cable end plug



HR10A-10R-12SC(71)

[Datasheet](#)

Digi-Key Part Number	HR1679-ND
Manufacturer	Hirose Electric Co Ltd
Manufacturer Part Number	HR10A-10R-12SC(71)
Description	CONN RCPT HSG FEMALE 12POS PNL MT
Manufacturer Standard Lead Time	12 Weeks
Detailed Description	12 Position Circular Connector Receptacle Housing Panel Mount

Connector Type 3: Female panel mount (Upper-Lower APA junction)



HR10A-10J-12SC(73)

[Datasheet](#)

Digi-Key Part Number	HR1663-ND
Manufacturer	Hirose Electric Co Ltd
Manufacturer Part Number	HR10A-10J-12SC(73)
Description	CONN JCK HSG FEMALE 12POS INLINE
Manufacturer Standard Lead Time	12 Weeks
Detailed Description	12 Position Circular Connector Jack Housing Free Hanging (In-Line) Backshell, Cable Clamp, Strain Relief

Connector Type 2: Female cable end plug



HR10A-10R-12SB(71)

[Datasheet](#)

Digi-Key Part Number	HR1647-ND
Manufacturer	Hirose Electric Co Ltd
Manufacturer Part Number	HR10A-10R-12SB(71)
Description	CONN RCPT FEMALE 12POS SOLDER
Manufacturer Standard Lead Time	12 Weeks
Detailed Description	12 Position Circular Connector Receptacle, Female Sockets Solder

Connector Type 4: Female PCB mount (cryostat flange)