Power Supplies for Belle II PXD
General remarks and grounding

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PS location

- Option 1:
  - distribution, control, monitoring custom made board on the electronics hut. Based on DCDC and Digital-to-Analog converters, mixed signal FPGA
  - Local regulation on DHH (for lines with I>100mA?) hardware settings?, monitoring?
- Option 2:
  - Same as 1 but using a commercial system (CAEN, WIENER… does it exist?)
- Option 3:
  - Distribution, control, monitoring, regulation on custom made board on the DOCK (water cooling, limited space, radiation tolerant components?)

Voltage distribution

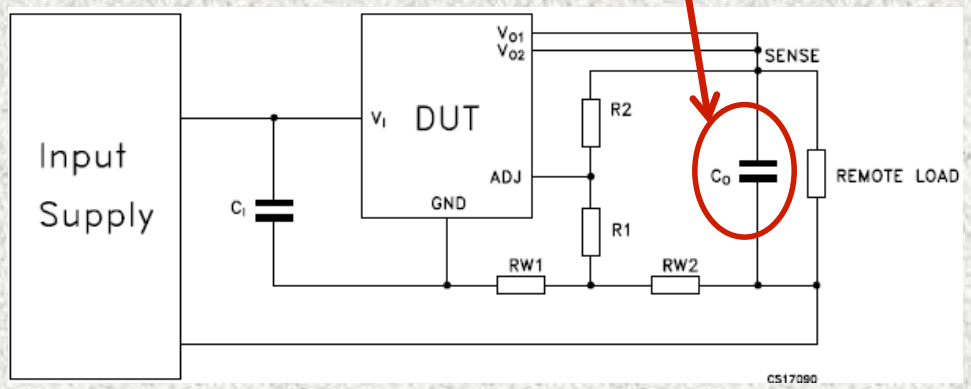
2 Groups	7 Groups	Name	Type	Voltage, V	Current, mA	Return current, mA
Analog	DCD Ana	VDDA	Analog supply	1,8	2300	
		RefIn	Analog ref	1,1	100	
		AmpLow	Analog Amp	0,35	1500	
		AGND	Analog ground	0		3900
Digital	DCD Dig	VDDD	Digital supply	1,8	800	
		DGND	Common digital ground	0		800
	SW Dig	VDDS	Digital supply	3,3	4	
		DGND	Digital ground	0		8
		VJTAG	JTAG supply	1,8	4	
Analog	SW Ana	Vsource	Source	7	100	
		VCCG	Common clear gate	7	0	
		Vclear_on	Clear on	17	30	
		Vclear_off	Clear off	8	30	
		Vgate_on	Gate on	4	30	
		Vgate_off	Gate off	13	30	
						220
Digital	DHP	VDDIO	DHP IO rail	1,8	100	
		VDDC	DHP Core	1,2	500	
		DGND	Digital ground	0		600
Analog	DEPFET	Vbulk	Bulk	17	0	
		Vguard	Guard ring	?	0	
		Vbias	Back plane	-20	0	

+DHH

Rad-hard regulator

RHFL4913A - Rad-hard adjustable positive voltage regulator

Decoupling capacitor



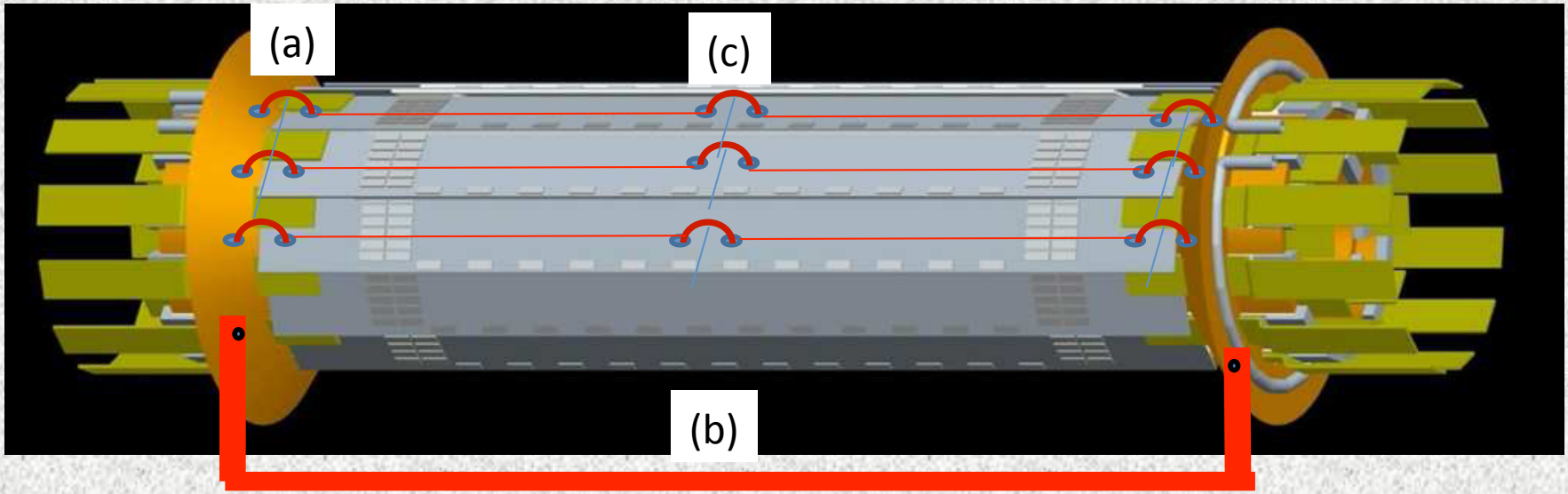
Features

- 3 A low dropout voltage
- Embedded overtemperature and overcurrent protection
- Adjustable overcurrent limitation
- Output overload monitoring/signalling
- Adjustable output voltage
- Inhibit (ON/OFF) TTL-compatible control
- Programmable output short-circuit current
- Remote sensing operation
- Rad-hard: guaranteed up to 300 krad Mil Std 883E Method 1019.6 high dose rate and 0.01 rad/s in ELDRS conditions
- Heavy ion, SEL immune

Symbol	Parameter	Value	Unit
V_I	DC input voltage, V_I - V_{GROUND}	12	V
V_O	DC output voltage range	1.23 to 9	V
I_O	Output current, RHFL4913KPA	2	A
I_O	Output current, RHFL4913SCA	3	A
P_D	T_C = 25 °C power dissipation	15	W

3 inputs (AmpLow, RefIn, DHPcore) are below this range

Grounding

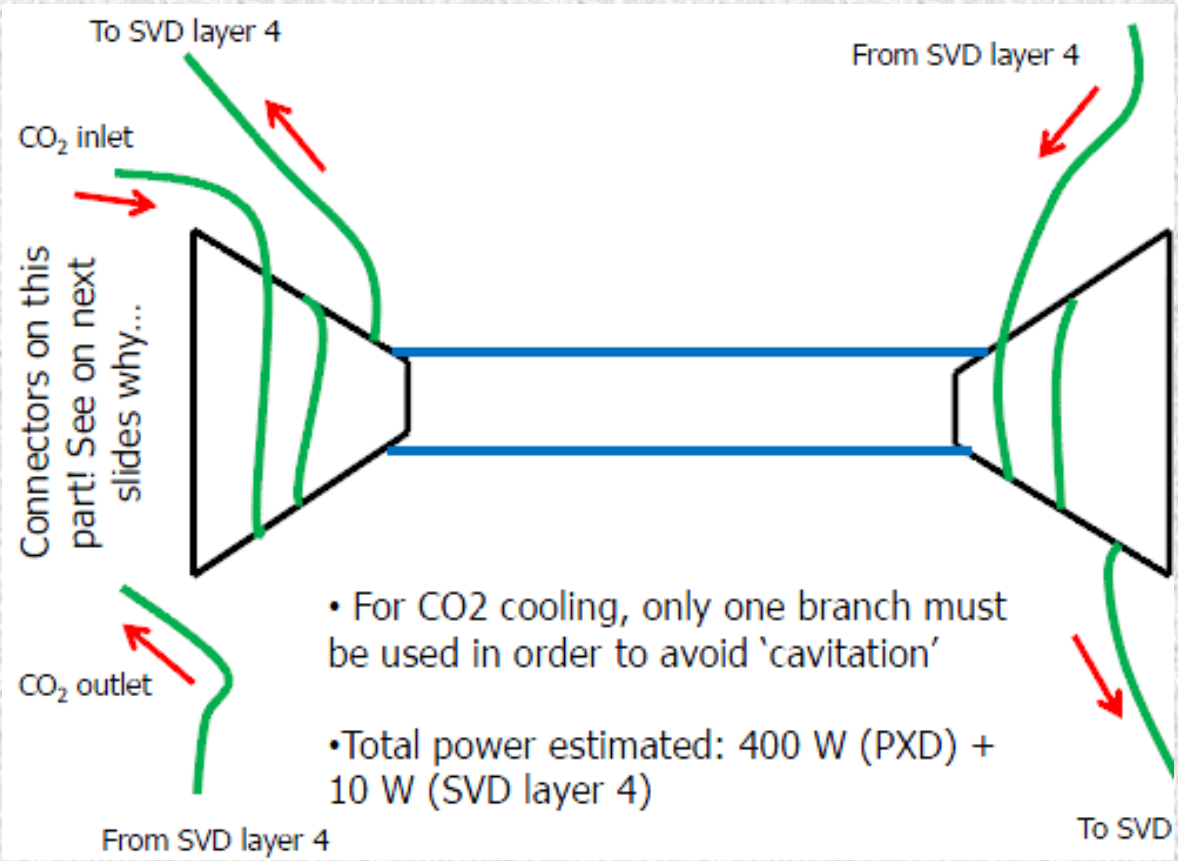


(a) All floating voltage references in a half-module should be connected togeather in a single common point => **the cooling block**

- How to connect both cooling blocks togheather?
  - (b) through few wide (~cm?) straps ☺
    - low inductance
  - (c) through several narrow lines on the module + wire bondings ☹
    - high inductance
    - no space left on module metal layers

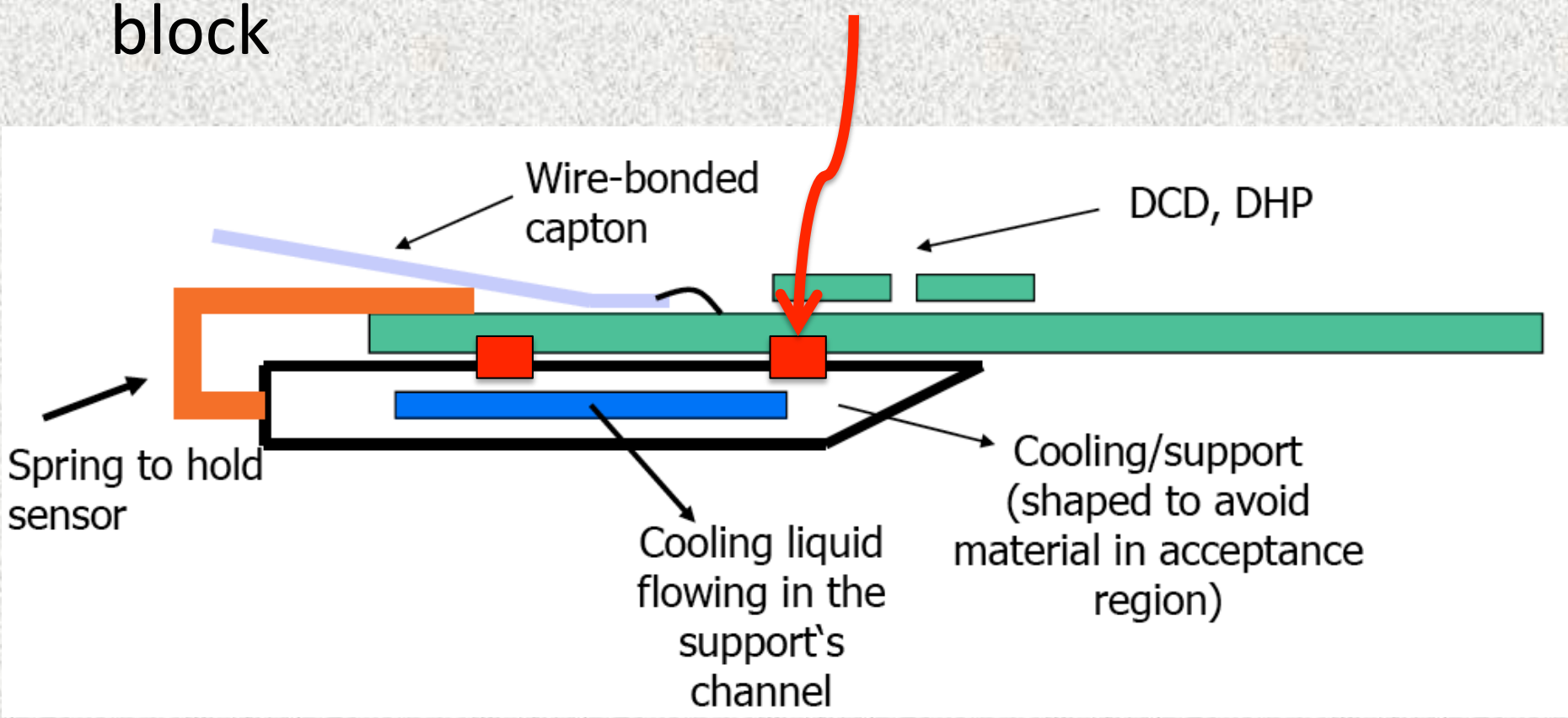
Grounding

Electrical connections to other detectors / systems well under control to avoid grounding loops as in example the cooling pipes shared with SVD



Grounding

- Pads on the backside of the module to connect references togeather on the cooling block



Decoupling capacitors

- Decoupling capacitors on the top of the module