

MetaFridge Solar Power Board

This is the solar power board from New Horizons' MetaFridge vaccine refrigerator system and associated technologies. One implementation of this system in a PQS-prequalified vaccine refrigerator is the Aucma CFD-50 SDD.

As of 2025-07-30, Tokitae LLC has abandoned any pursuit of patent protection for the MetaFridge system and makes no claim to enforce any patent rights related to this implementation (US patent 10,707,683B2). This dedication ensures that the community can freely use and build upon the system.

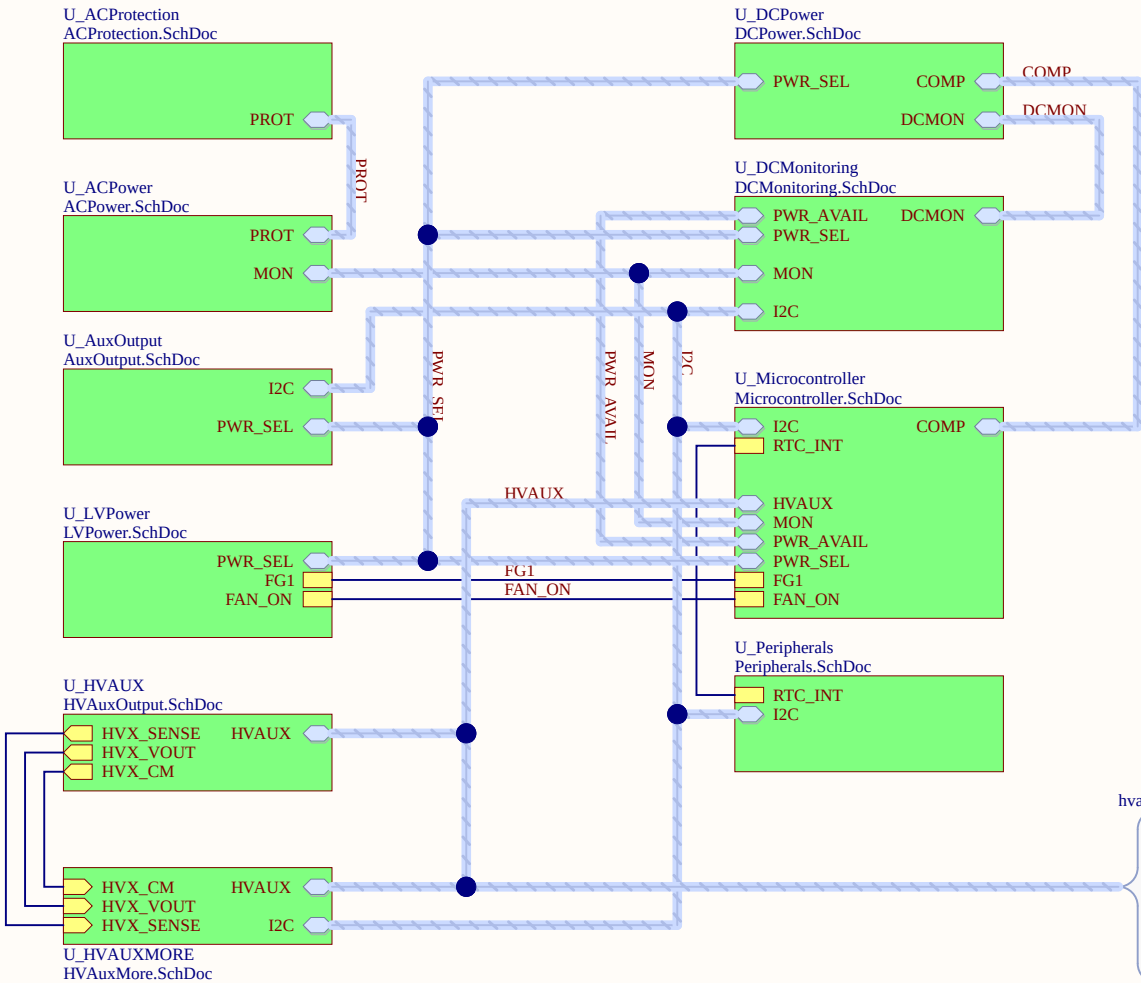
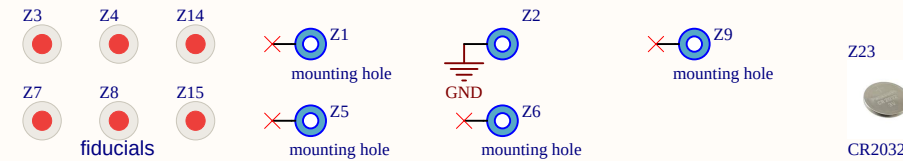
Please refer to the description of the motivations and operation of the circuit, which should be part of the materials of this package. If you did not receive these materials, the whole package may be downloaded from <https://docs.2to8.cc>.

License

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Jumpers for PCOMP, nRESET, and PWR_SEL headers.



Revision Information:

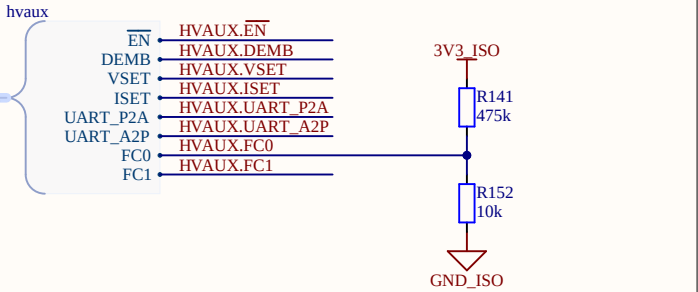
Rev. 4.0 many changes from R3.8; see change log.
Rev. 4.1 documentation changes, no boards built.

Connectivity:

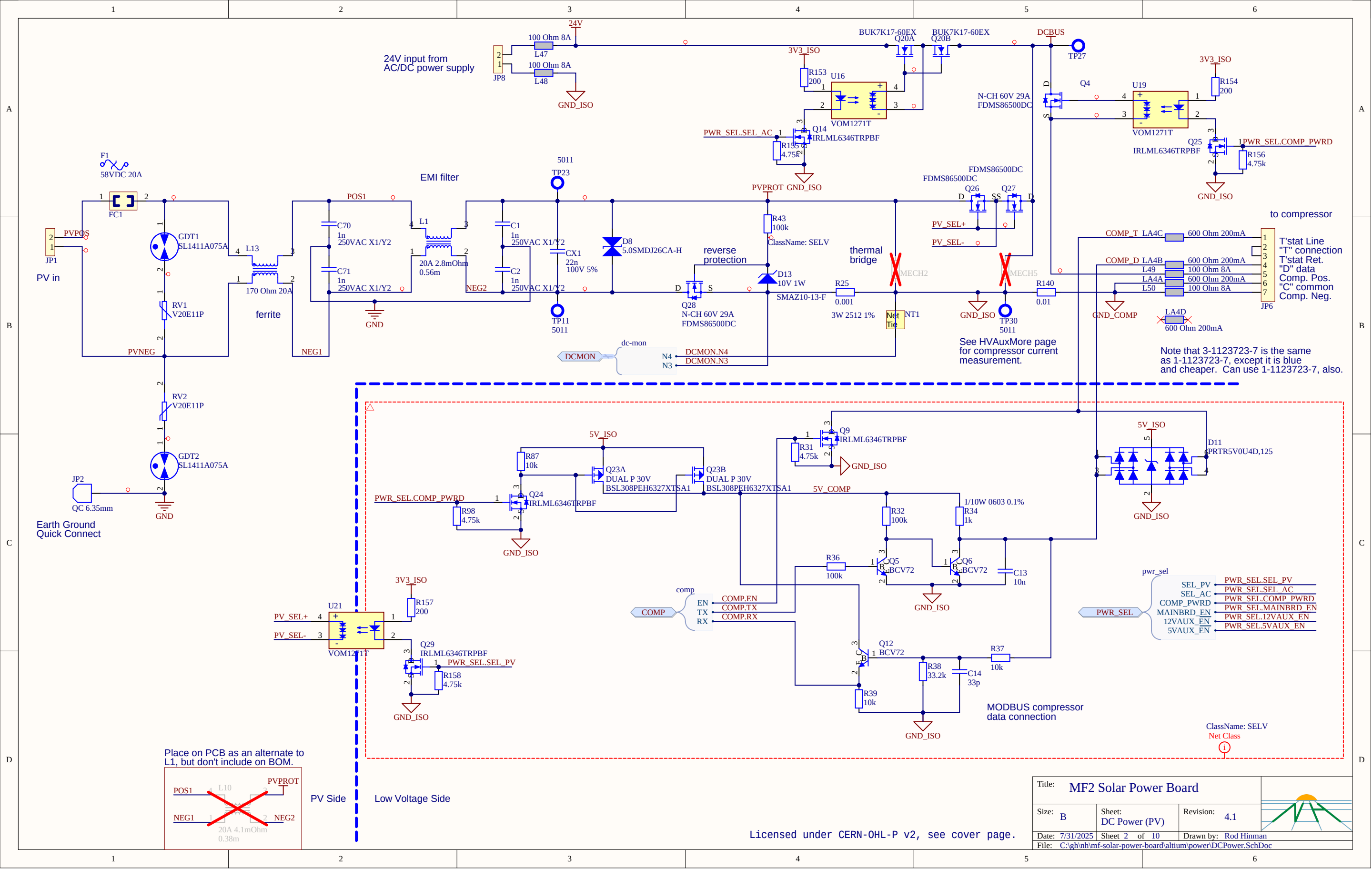
Hierarchical design (ports are sheet connectors
power ports are global, but net labels are local to the sheet)

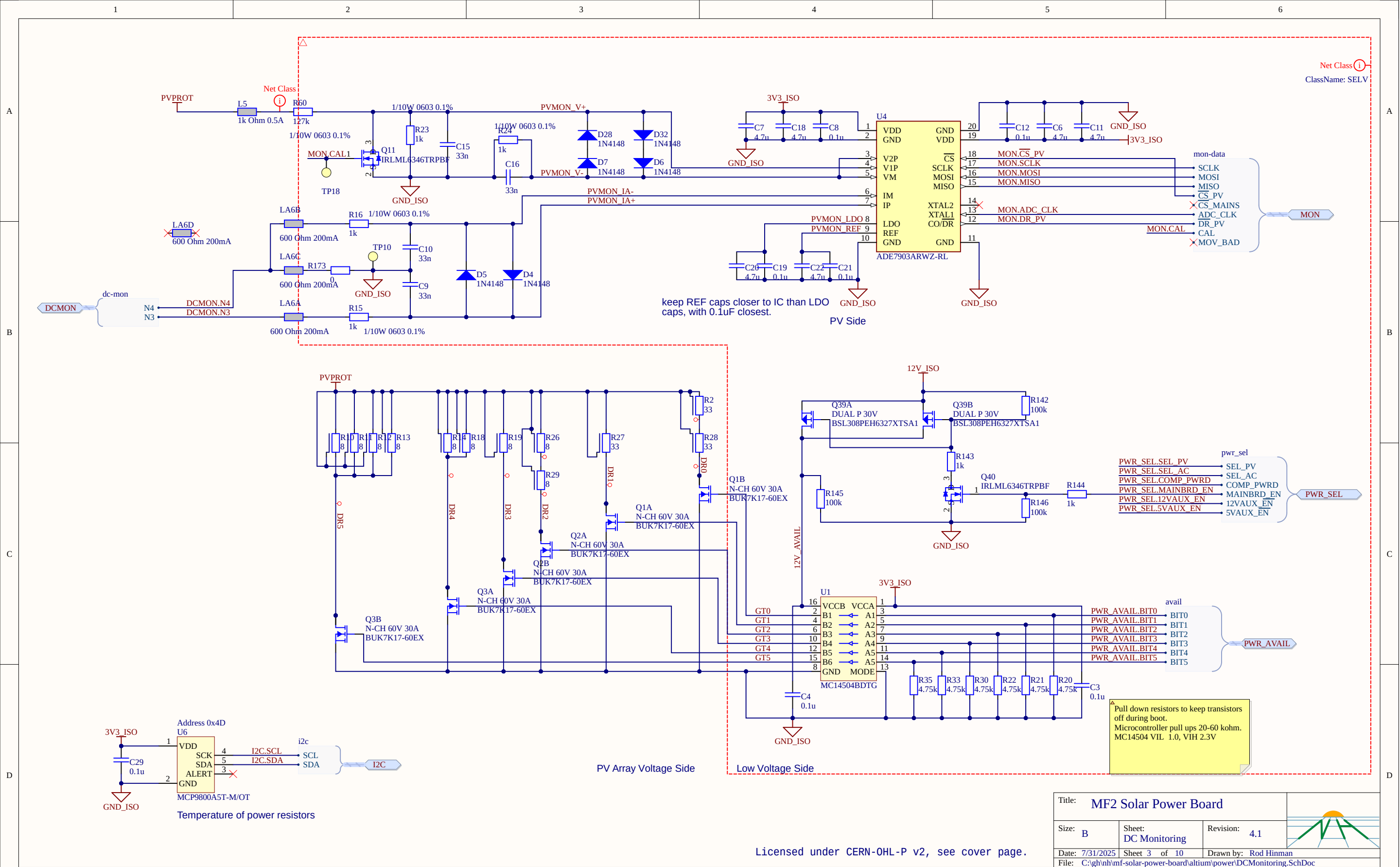
Power port names take priority if they are attached to a net.

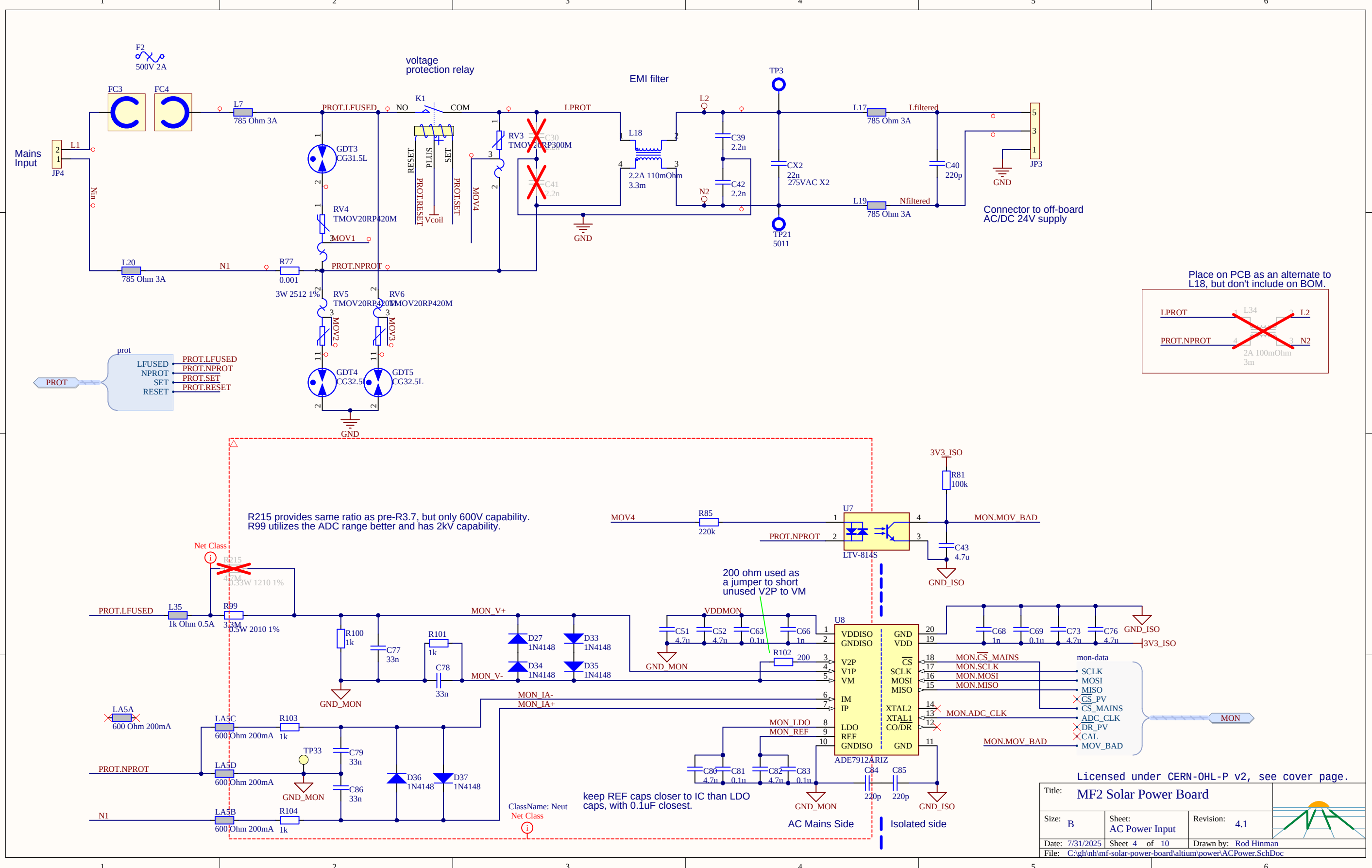
Hardware Revision Determination					
Microcontroller reads HVAUX.FC0 as an analog pin during boot, and uses the value to determine what version of hardware it is running on. Each built version should have its own set of resistors, with divider ratios spaced 2% apart.					
Rev	Divider	R141(top)	R152(bottom)	Comment	
3.x	0	N/A	10k	Were on HVAuxMore.sch	
4.0	0.021	475k	10k		
4.1	0.021	475k	10k	(same, because never built)	

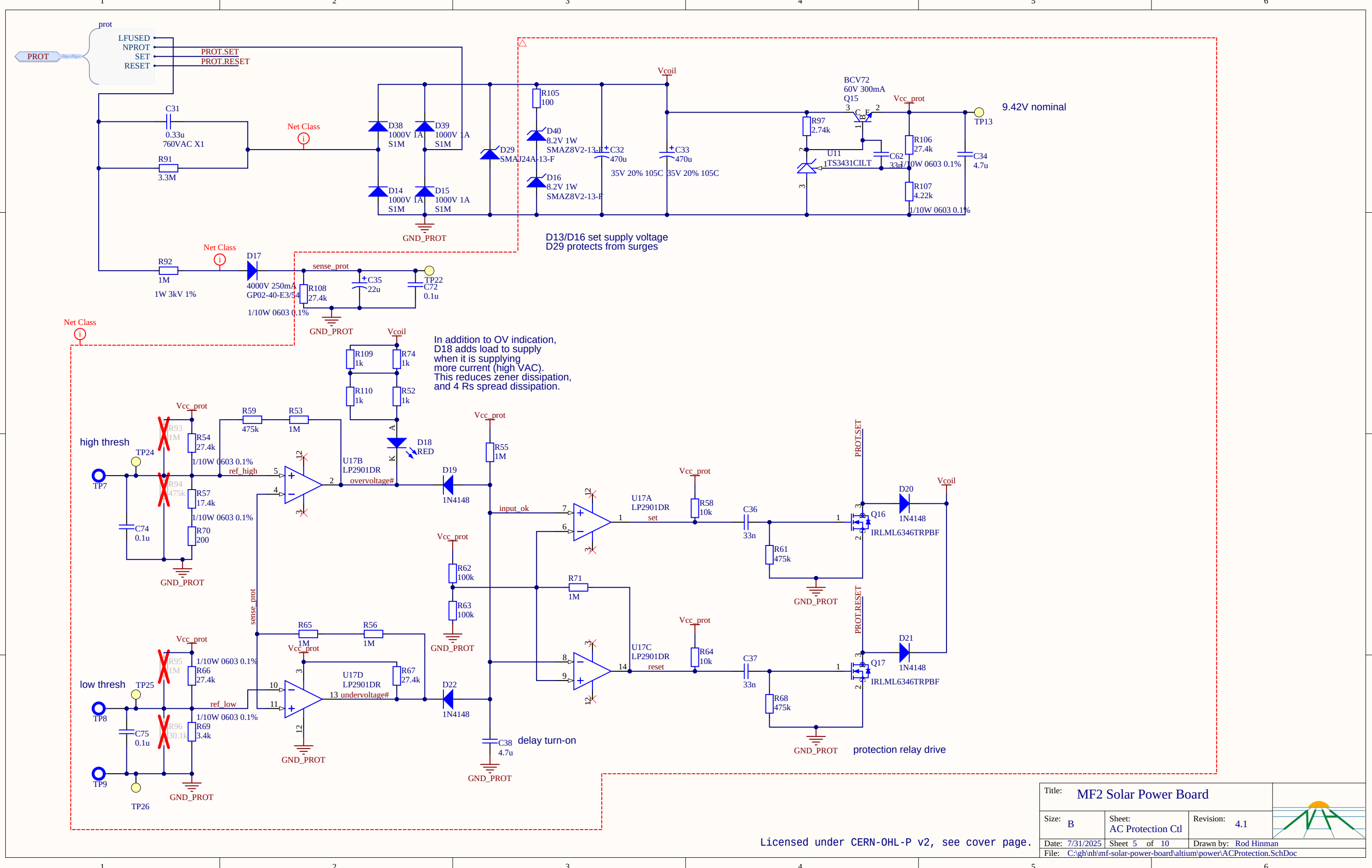


Title: MF2 Solar Power Board			
Size: B	Sheet: Cover Page	Revision: 4.1	
Date: 7/31/2025	Sheet 1 of 10	Drawn by: Rod Himman	
File: C:\gh\nh\mf-solar-power-board\altium\power\Cover.SchDoc			









These diodes fairly high leakage.
100k ensures worst case reverse
leakage doesn't overvoltage 24V supply.

Sets UVLO
around 10V

from main board
VBAT_UNREG

Might want to use FET switching
for better low voltage performance.

Fuse 1.1A hold current, 2.2A trip current at 23C.
Resistance between 40 mohm and 180 mohm at 23C. Thermal derating means we want current
≤ 75% of hold rating = 0.83A at 50-60C.

Fan typical current is 0.55A, maximum is 0.72A.

Fuse voltage drop is about 0.1V at maximum
resistance and typical current. Fan maximum
current is less than thermally derated fuse.

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Title: MF2 Solar Power Board			
Size: B	Sheet: LV Power	Revision: 4.1	
Date: 7/31/2025	Sheet 6 of 10	Drawn by: Rod Hinman	
File: C:\gh\nh\mf-solar-power-board\altium\power\LVPower.SchDoc			

Safety Isolated Low Voltage Side



A

A

B

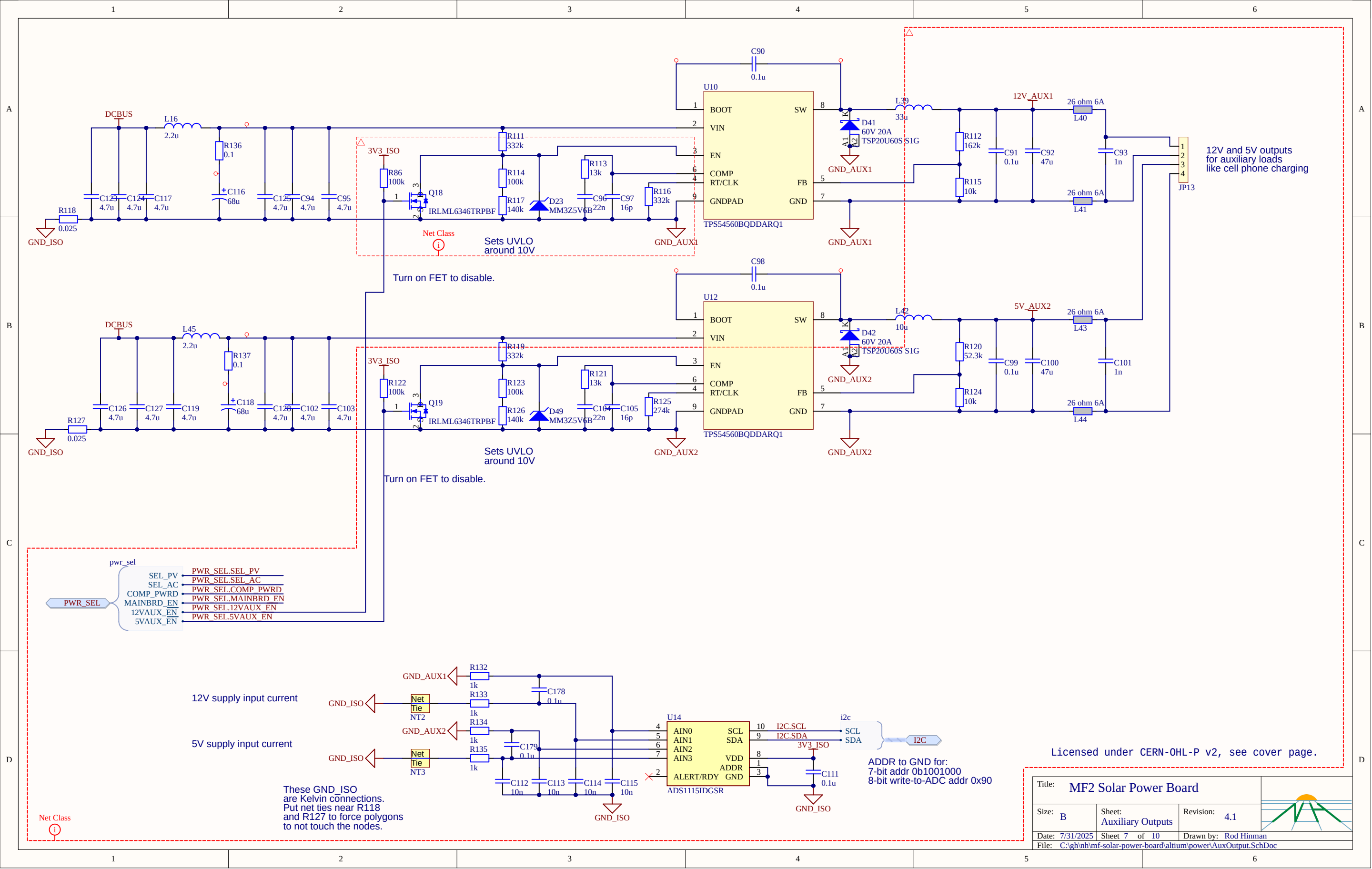
B

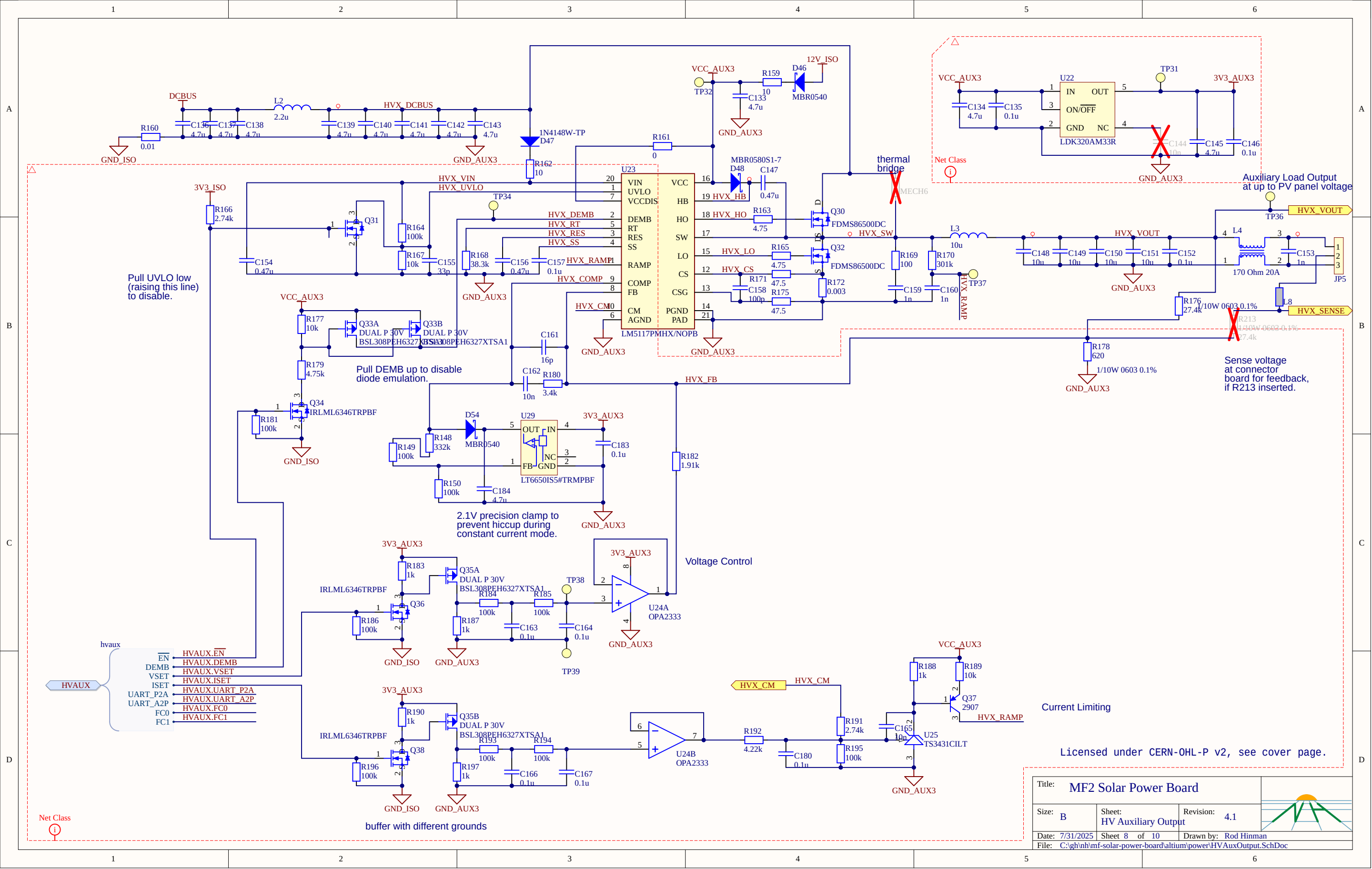
C

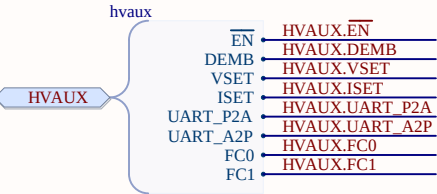
C

D

D



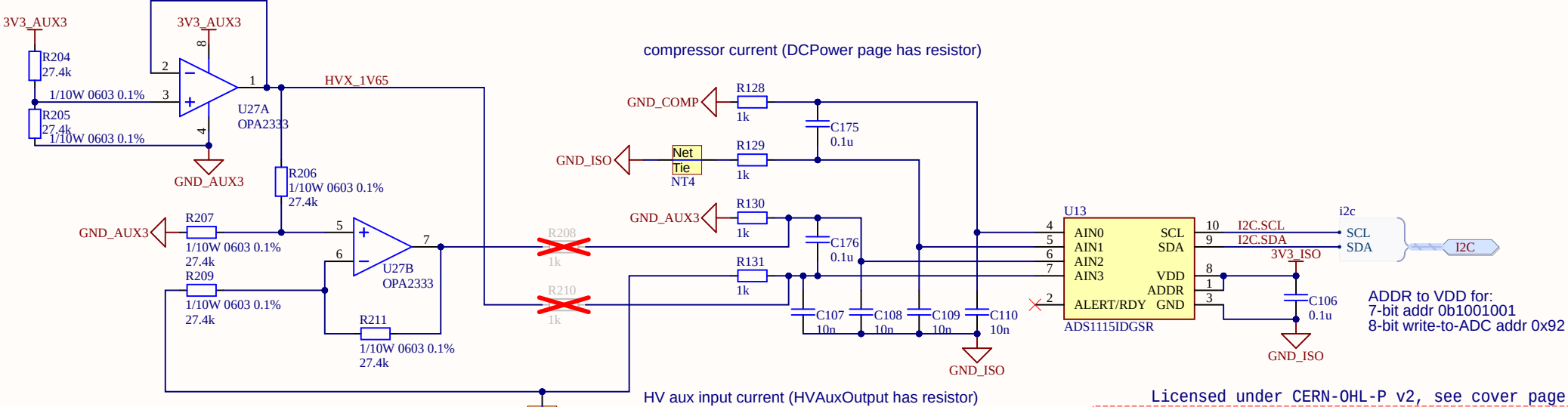
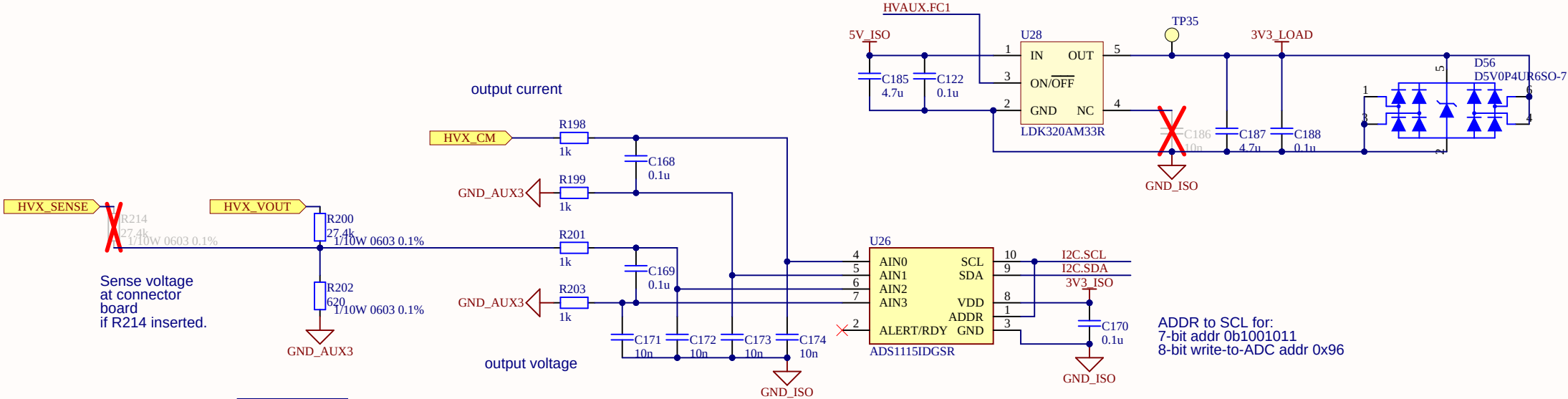
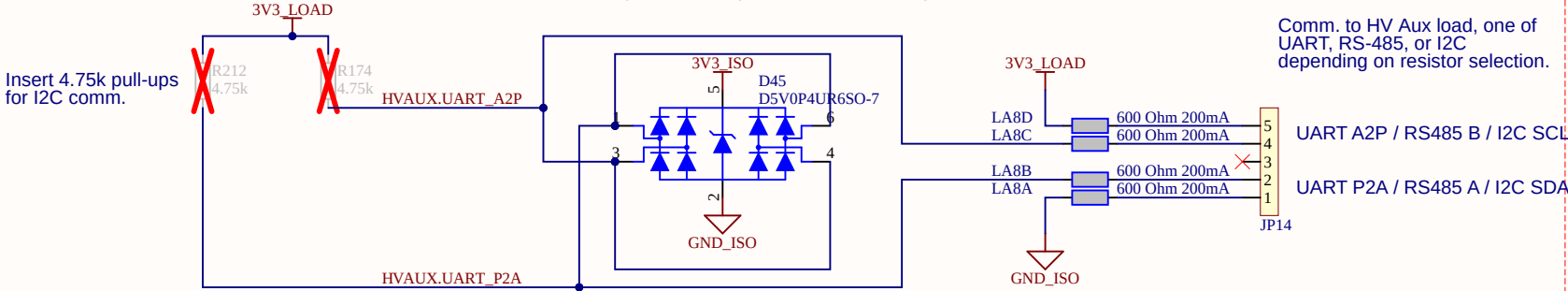




Optional I2C pulled up with load, so as to not back-power load micro.

TVS connected to 3V3 ISO, as that node will always be powered. This way, TVS won't pull down our micro's pins.

Comm. to HV Aux load, one of UART, RS-485, or I2C depending on resistor selection.



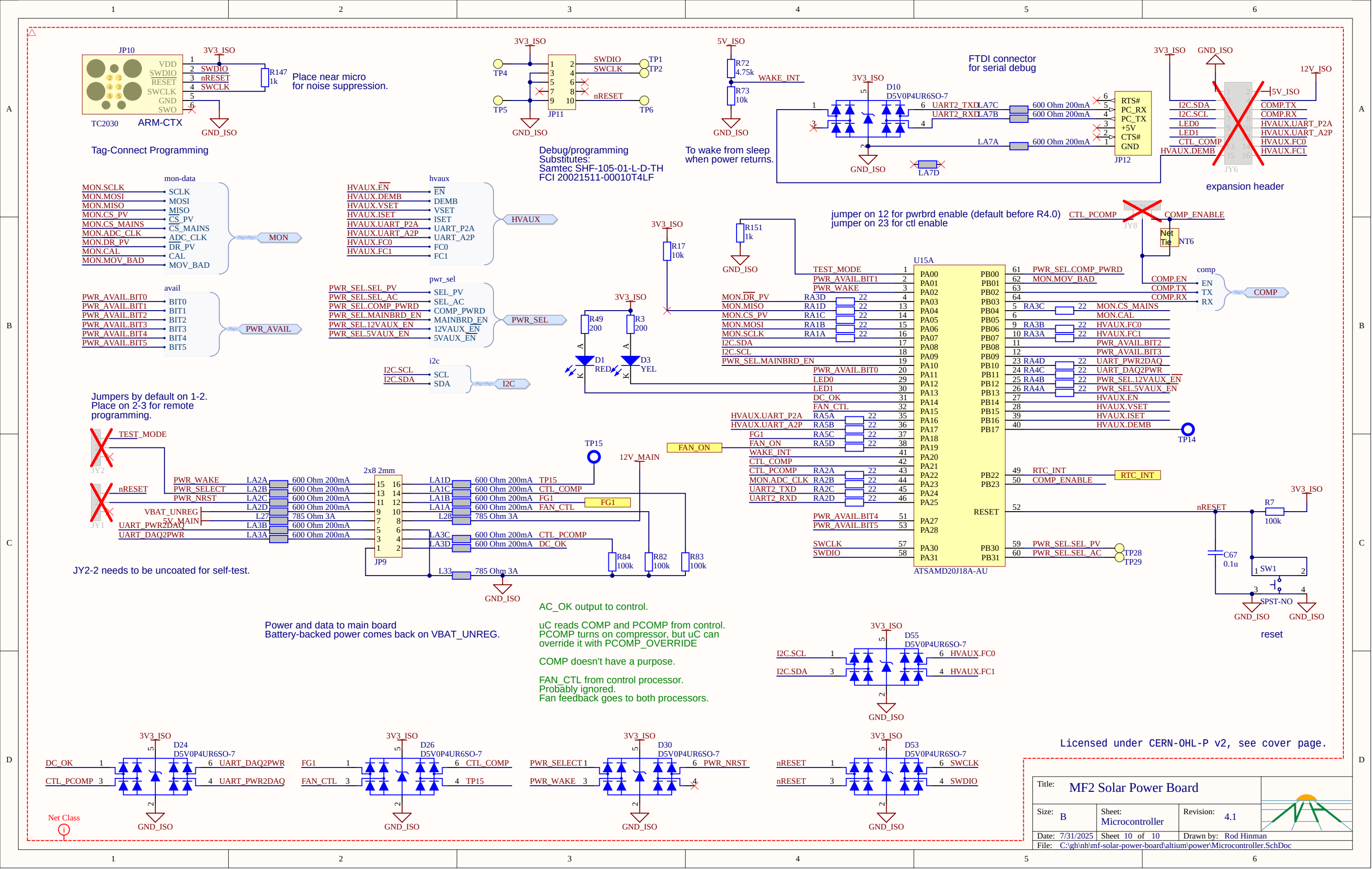
Amp and offset option, esp. for reverse current flow.

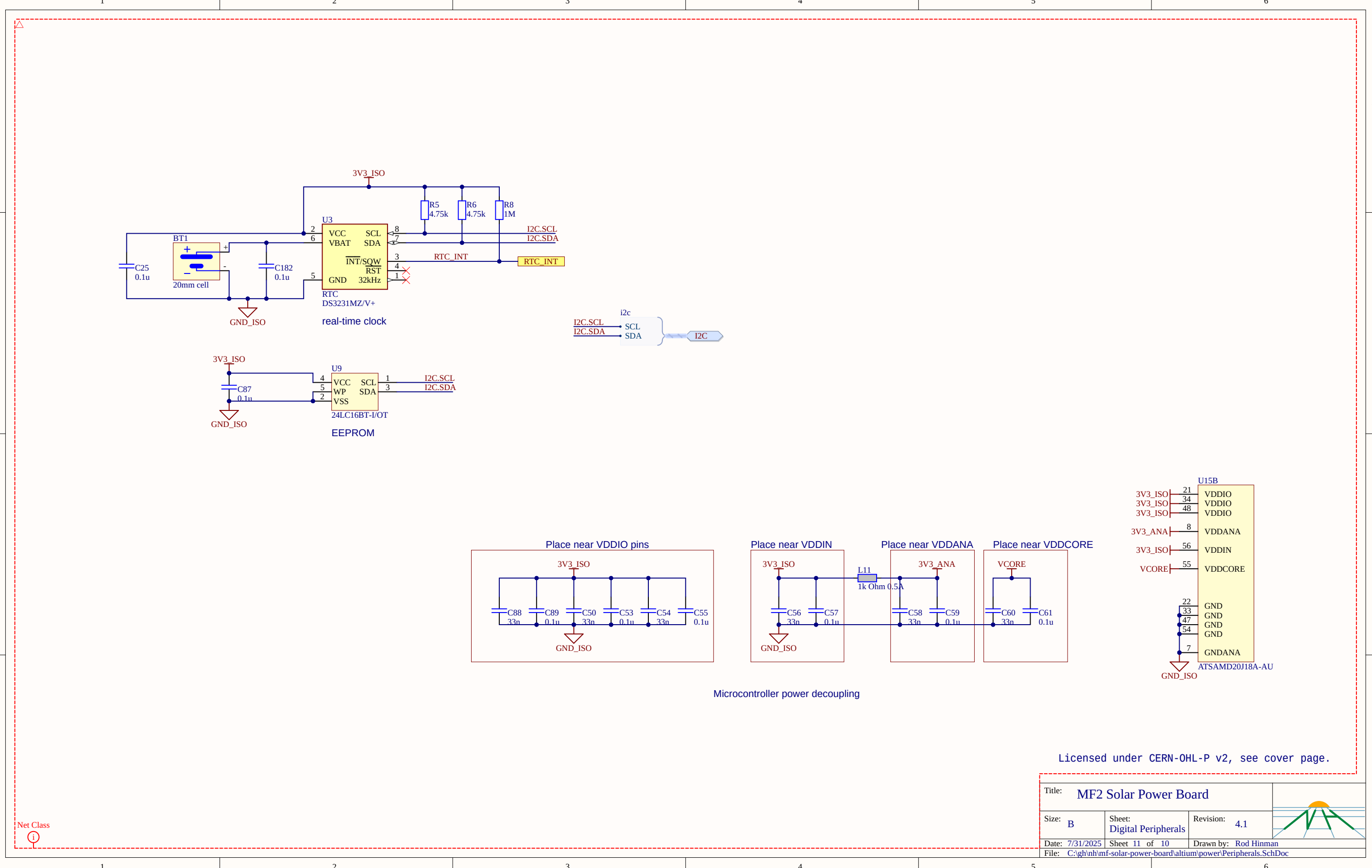
These GND_ISO are Kelvin connections. Put net ties near R140 and R160 to force polygons to not touch the nodes.

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Title: MF2 Solar Power Board			
Size: B	Sheet: HV Auxiliary Other	Revision: 4.1	
Date: 7/31/2025	Sheet 9 of 10	Drawn by: Rod Hinman	
File: C:\gh\nh\mf-solar-power-board\altium\power\HVAuxMore.SchDoc			





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Title: MF2 Solar Power Board			
Size: B	Sheet: Digital Peripherals	Revision: 4.1	
Date: 7/31/2025	Sheet 11 of 10	Drawn by: Rod Hinman	
File: C:\gh\nh\mf-solar-power-board\altium\power\Peripherals.SchDoc			