MPPT Solar Converter

SOLAR CAR 2021

REV 1

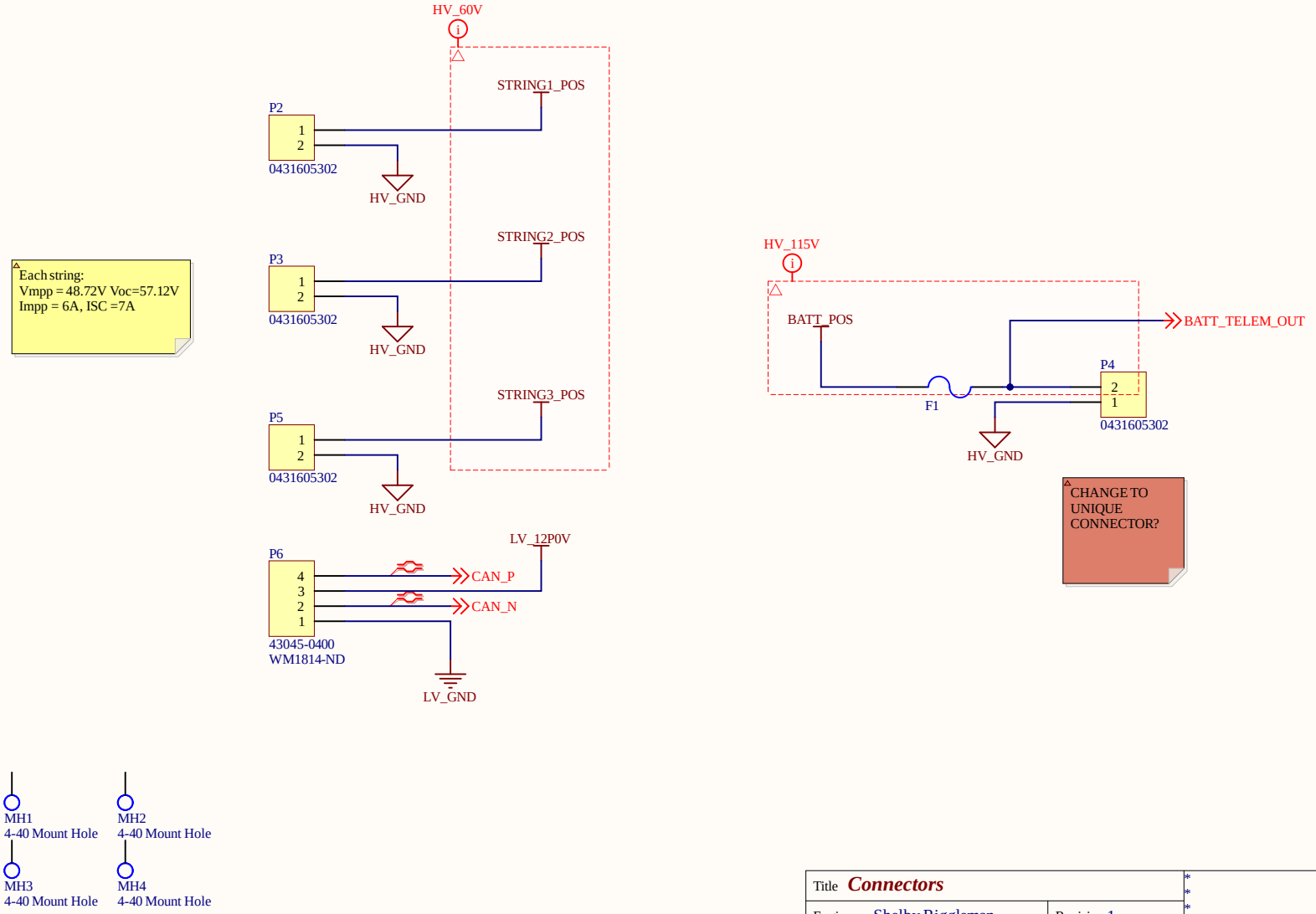
Rev 1 Biggest Risks:
1. MCU Control Implementation
2. HV Arcing
3. Thermal

Title	***COVER***	
Engineer: Shelby Riggleman		Revision: 1
Date: 1/16/2022	Time: 9:24:08 PM	Sheet 1 of 8
File: cover.SchDoc		

Badgerloop Electrical
133 Engineering Research Building
1500 Engineering Drive
Madison, Wi 53706

BADGER LOOP

Connectors

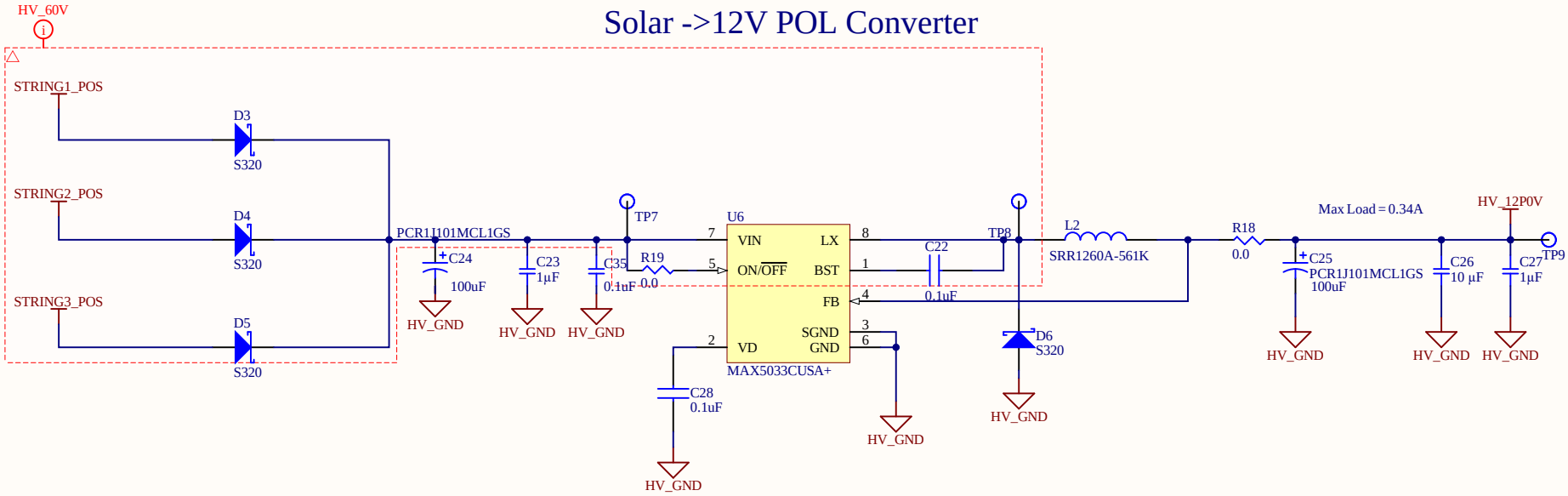


Title	*Connectors*	
Engineer: Shelby Riggleman		Revision:1
Date: 1/16/2022	Time: 9:24:08 PM	Sheet 2 of 8
File: Connectors.SchDoc		

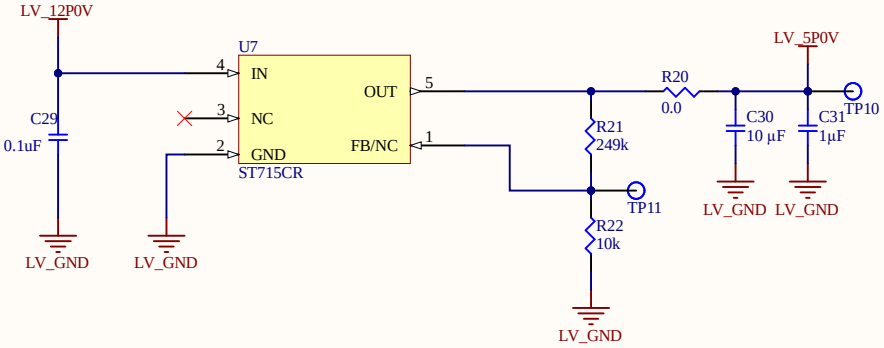
BADGER LOOP

Point of Load Converters

Solar ->12V POL Converter



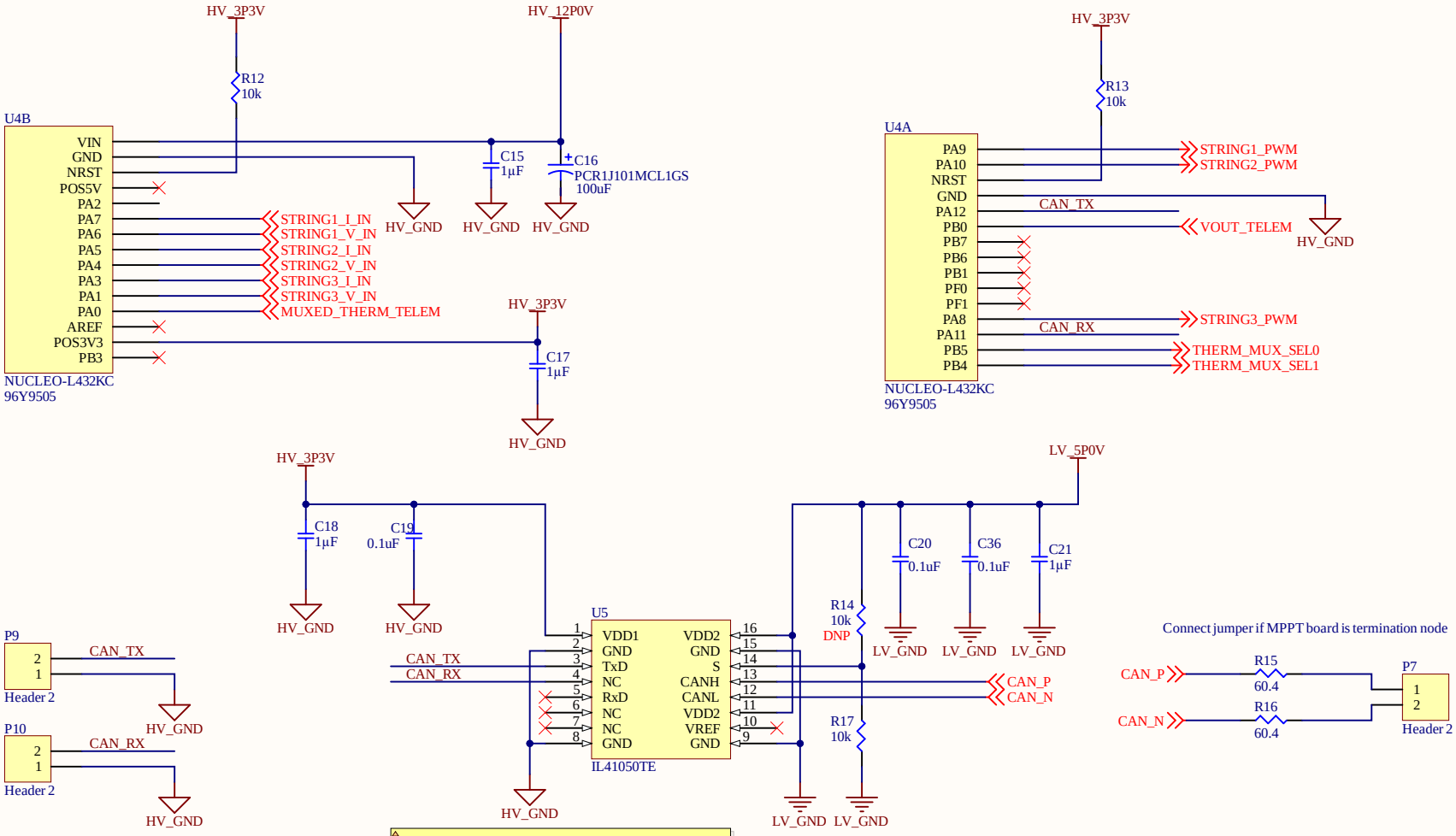
LV 12V -> 5V



Title	***Point of load converters***	
Engineer: Shelby Riggleman		Revision:1
Date: 1/16/2022	Time: 9:24:08 PM	Sheet3 of 8
File: POL_converter.SchDoc		

BADGER LOOP

Nucleo MCU & CAN



Solar Strings MPPTs

STRING1_POS

STRING1
boost_converter.SchDoc;

STRING_POS
PWM_IN
BOOST_OUT
I_IN_TELEM
V_IN_TELEM
THERM_TELEM

BATT_POS
STRING1_I_IN
STRING1_V_IN
STRING1_THERM
STRING1_PWM

STRING2_POS

STRING2
boost_converter.SchDoc;

STRING_POS
PWM_IN
BOOST_OUT
I_IN_TELEM
V_IN_TELEM
THERM_TELEM

BATT_POS
STRING2_I_IN
STRING2_V_IN
STRING2_THERM
STRING2_PWM

STRING3_POS

STRING3
boost_converter.SchDoc;

STRING_POS
PWM_IN
BOOST_OUT
I_IN_TELEM
V_IN_TELEM
THERM_TELEM

BATT_POS
STRING3_I_IN
STRING3_V_IN
STRING3_THERM
STRING3_PWM

Debug Headers

BATT_POS

P11
2
1
Header 2

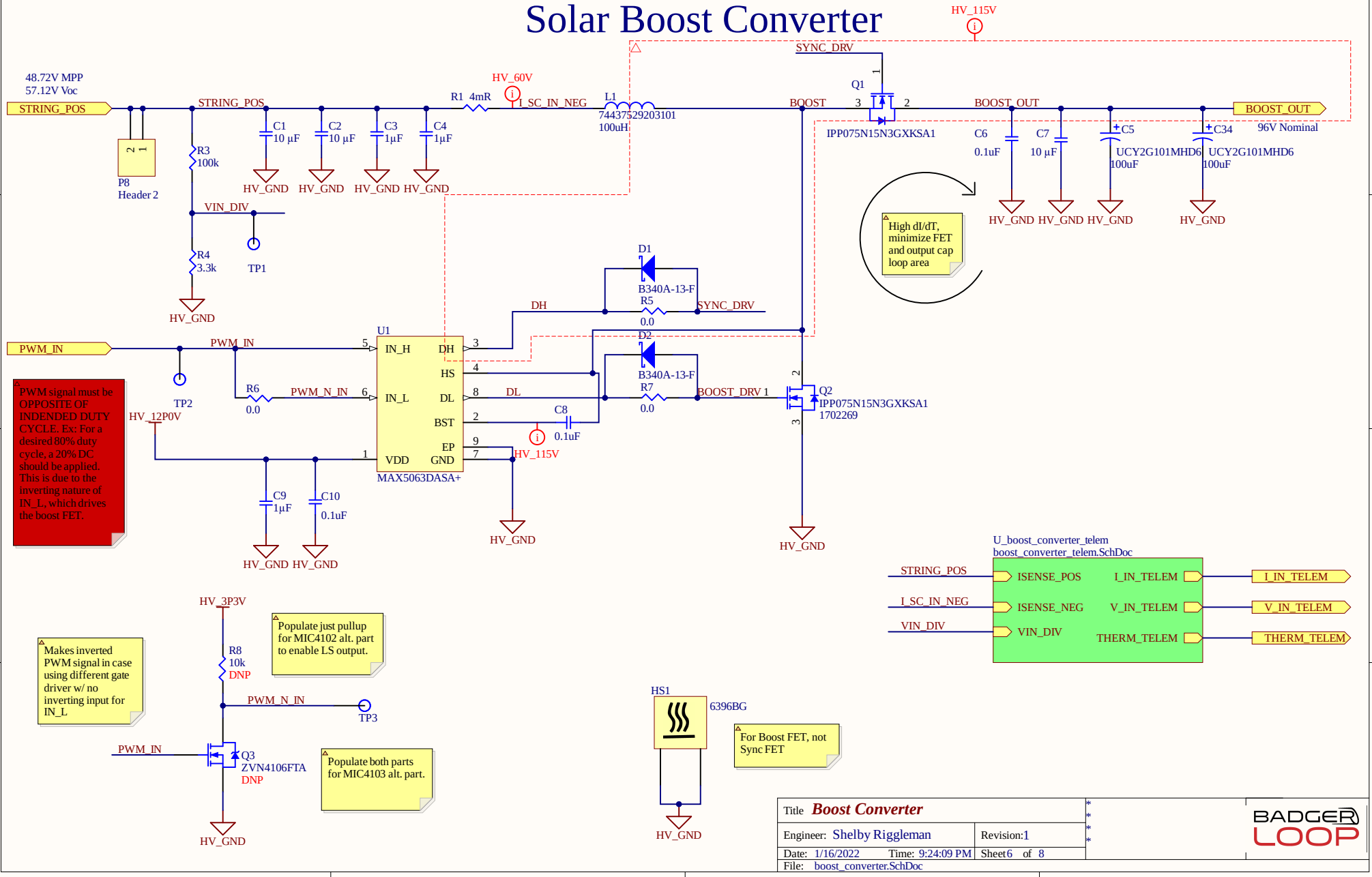
P12
2
1
Header 2

HV_GND

Title	***Boost Strings***	
Engineer: Shelby Riggleman		Revision:1
Date: 1/16/2022	Time: 9:24:09 PM	Sheet 5 of 8
File: solar_boost_strings.SchDoc		

BADGER LOOP

Solar Boost Converter

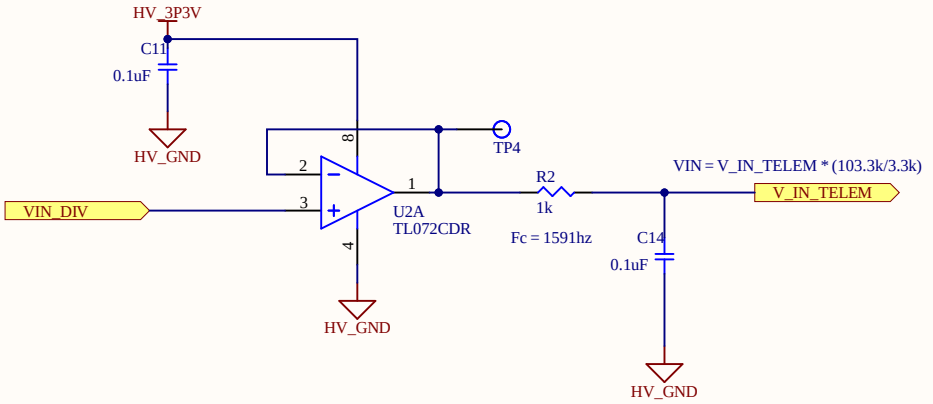


Title	**Boost Converter**
Engineer:	Shelby Riggleman
Revision:	1
Date:	1/16/2022 Time: 9:24:09 PM
Sheet	6 of 8
File:	boost_converter.SchDoc

BADGER LOOP

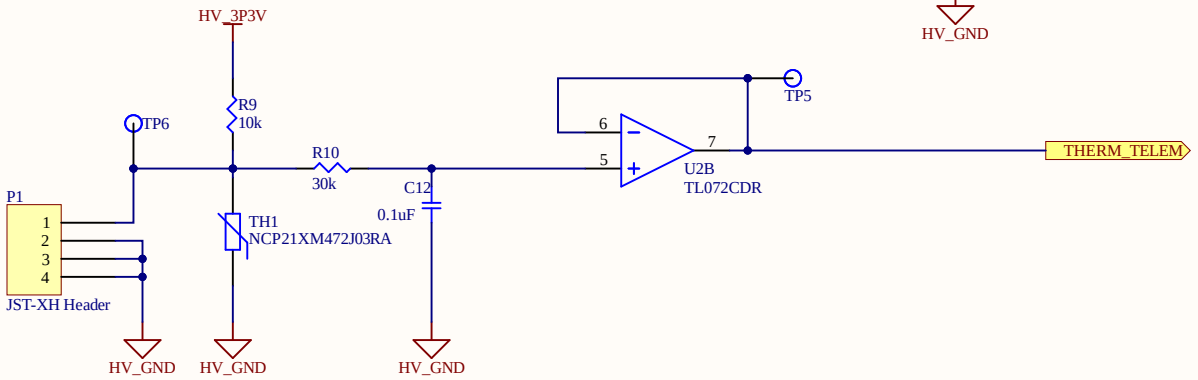
Solar Boost Converter Telemetry

String Input Voltage

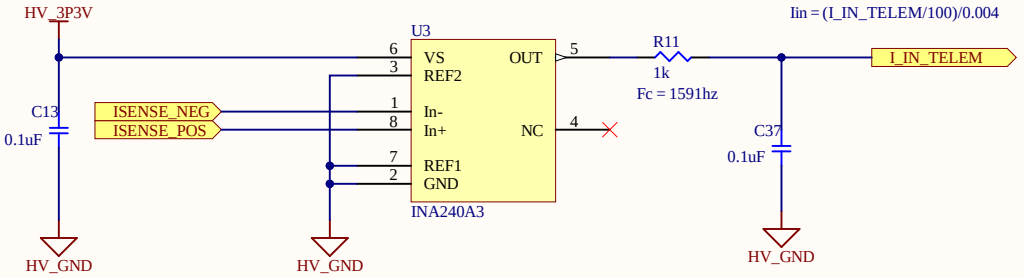


UPDATE COMPONENTS TO CREATE CORNER FREQUENCY HIGHER THAN CONTROL LOOP UPDATE RATE UPON TESTING

Thermistor Output



String Input Current



UPDATE COMPONENTS TO CREATE CORNER FREQUENCY HIGHER THAN CONTROL LOOP UPDATE RATE UPON TESTING

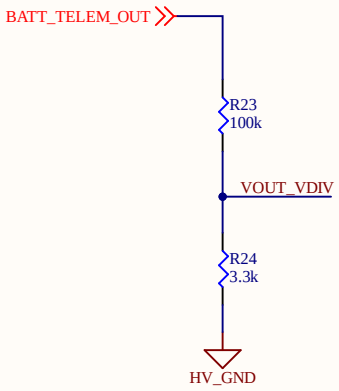
INA240 Max input voltage is 80V, cannot use on boost output. Use Vin, Vout, Iin to solve for Iout.

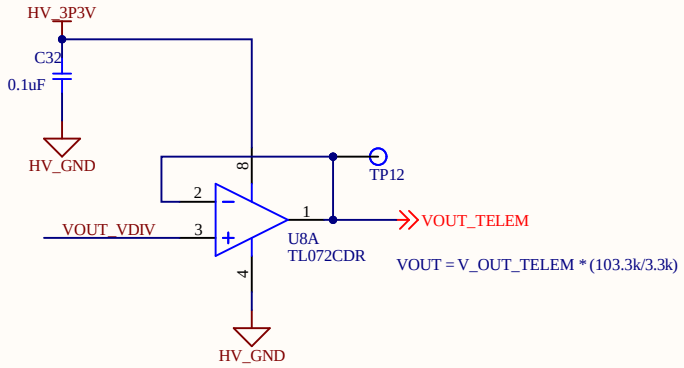
Title	*Boost Converter Telemetry*	
Engineer: Shelby Riggleman		Revision:1
Date: 1/16/2022	Time: 9:24:09 PM	Sheet 7 of 8
File: boost_converter_telem.SchDoc		

BADGER LOOP

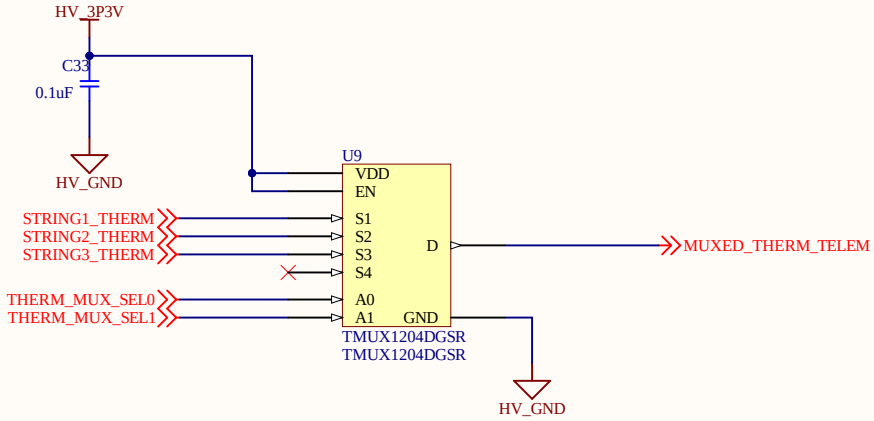
Global Telemetry

Output (Battery) Voltage





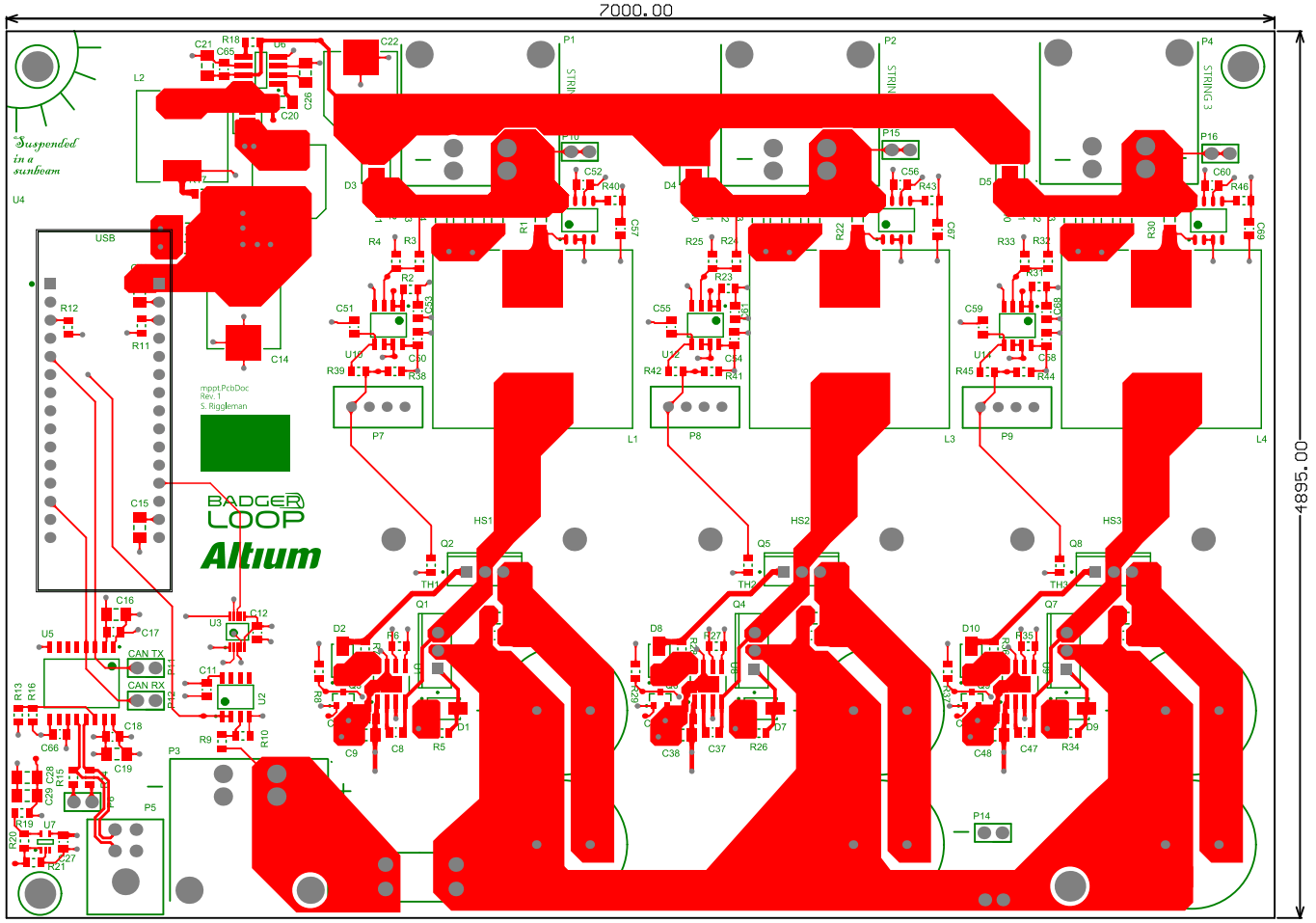
String Thermistor Telem (Muxed)



Title	***Global Telemetry***	
Engineer: Shelby Riggleman		Revision:1
Date: 1/16/2022	Time: 9:24:10 PM	Sheet8 of 8
File: global_telem.SchDoc		

BADGER LOOP

Layer	Name	Material	Thickness	Constant	Board Layer Stack
	Top Overlay				
	Top Solder	Solder Resist	0.40mil	3.5	
1	Top Layer		1.40mil		
	Dielectric 2	PP-006	2.80mil	4.1	
2	Layer 1	CF-004	1.38mil		
	Dielectric 1	FR-4	12.60mil	4.8	
3	Layer 2	CF-004	1.38mil		
	Dielectric 3	PP-006	2.80mil	4.1	
4	Bottom Layer		1.40mil		
	Bottom Solder	Solder Resist	0.40mil	3.5	
	Bottom Overlay				
Total board thickness:			24.56mil		



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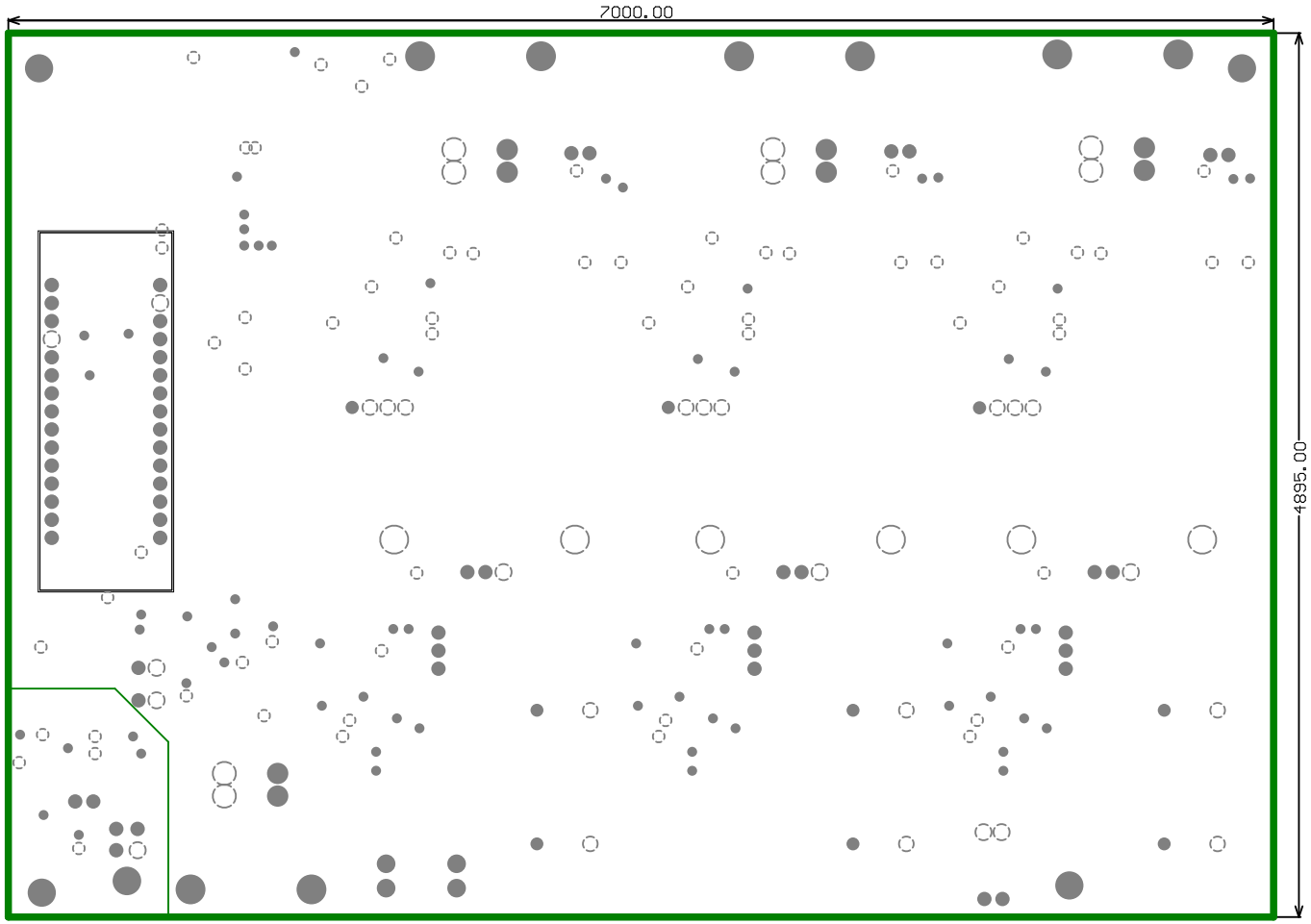

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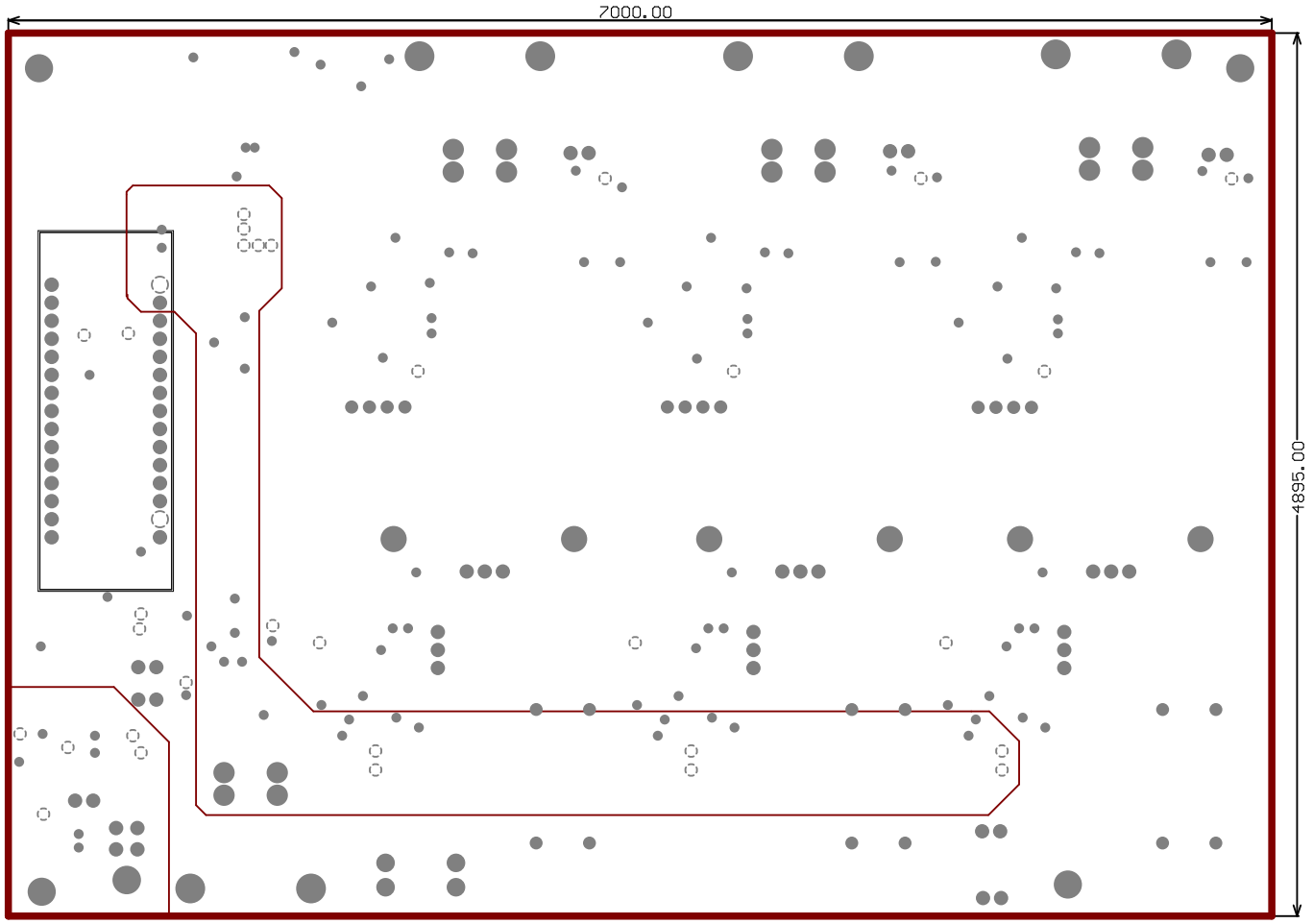

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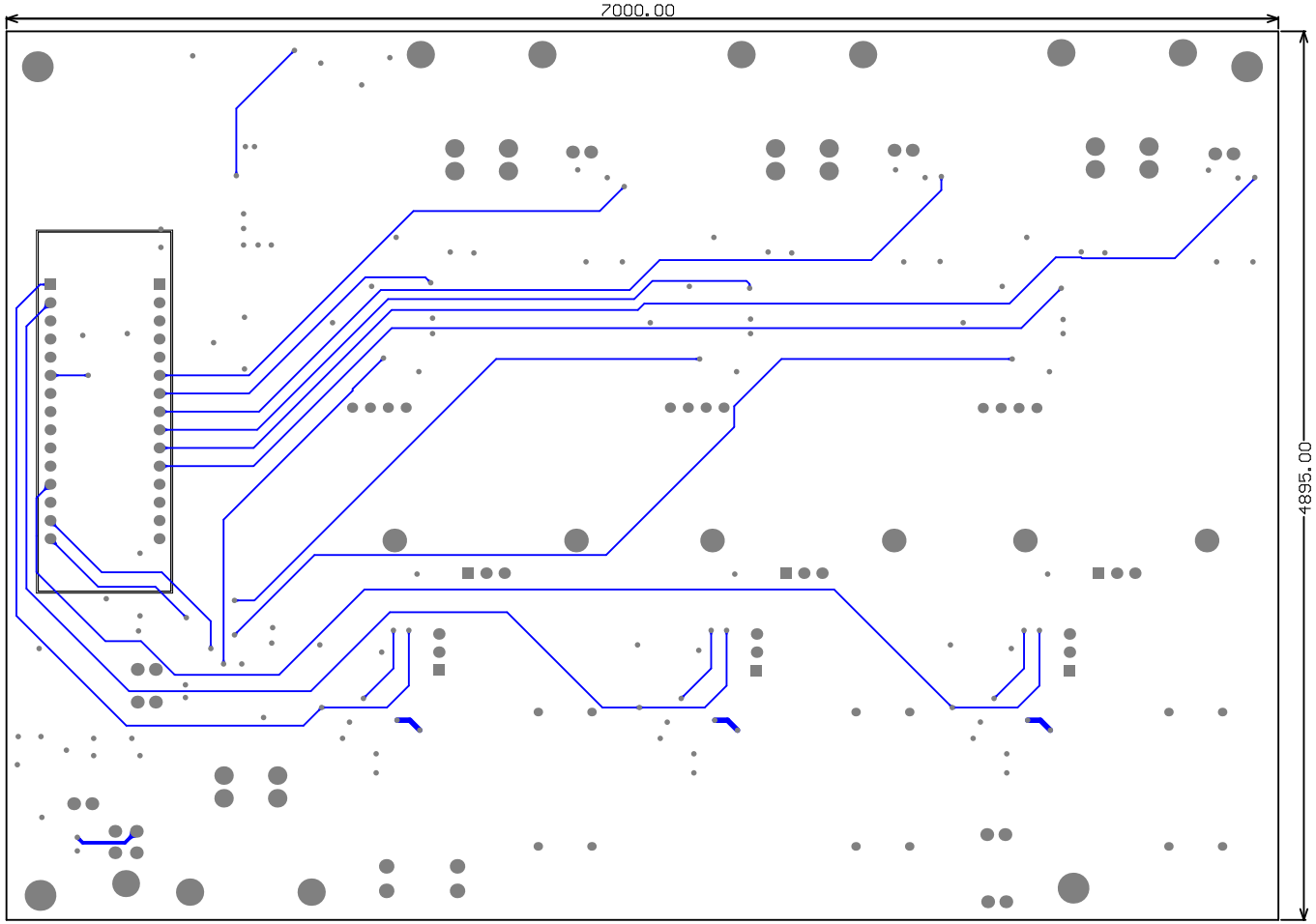

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