

A

A

B

B

C

C

D

D

# 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

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



Revision:1

Date: 1/18/2022 Time: 1:10:20 PM Sheet 1 of 8

File: cover.SchDoc

# Connectors

A

A

B

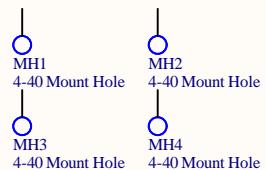
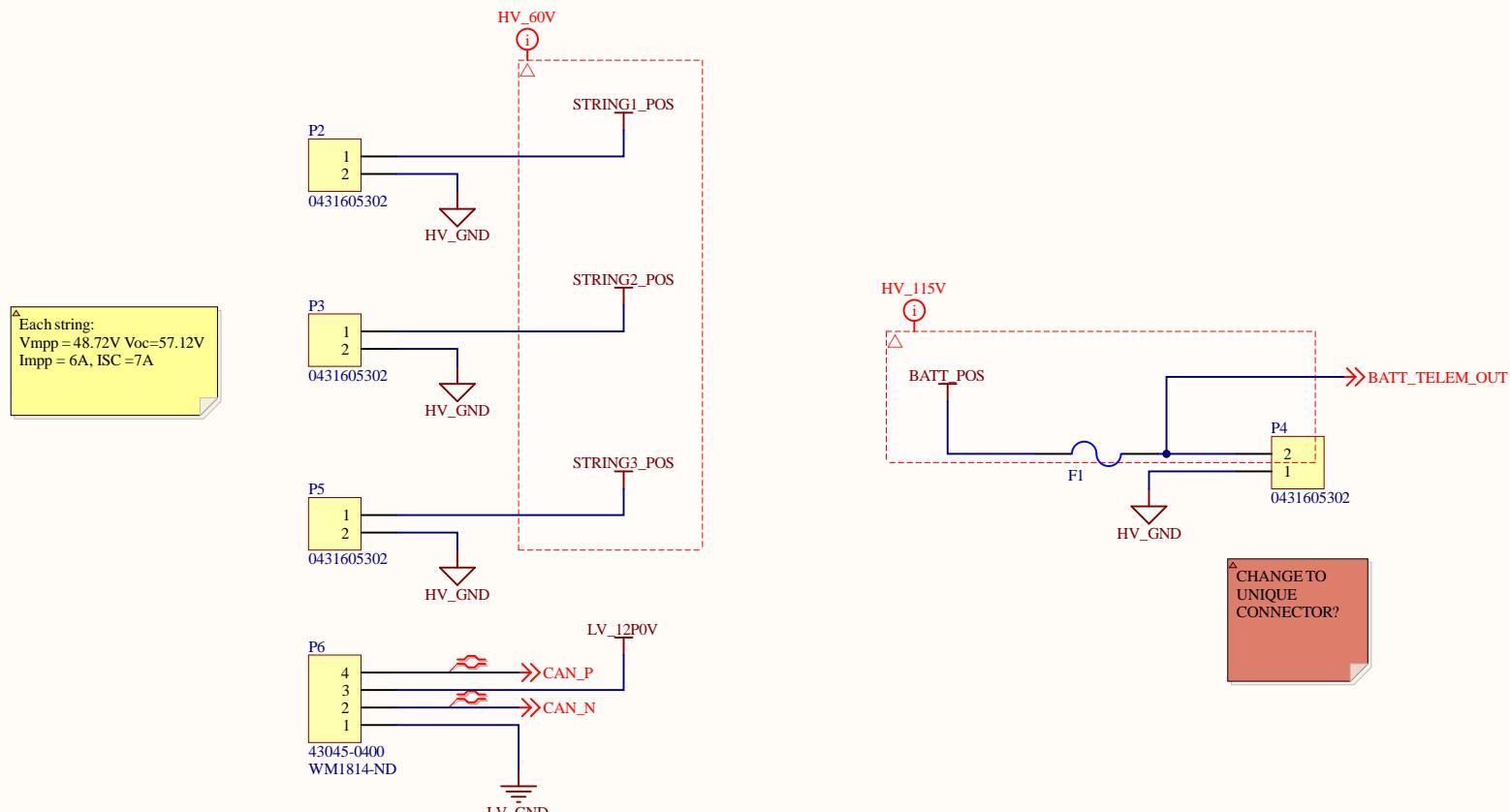
B

C

C

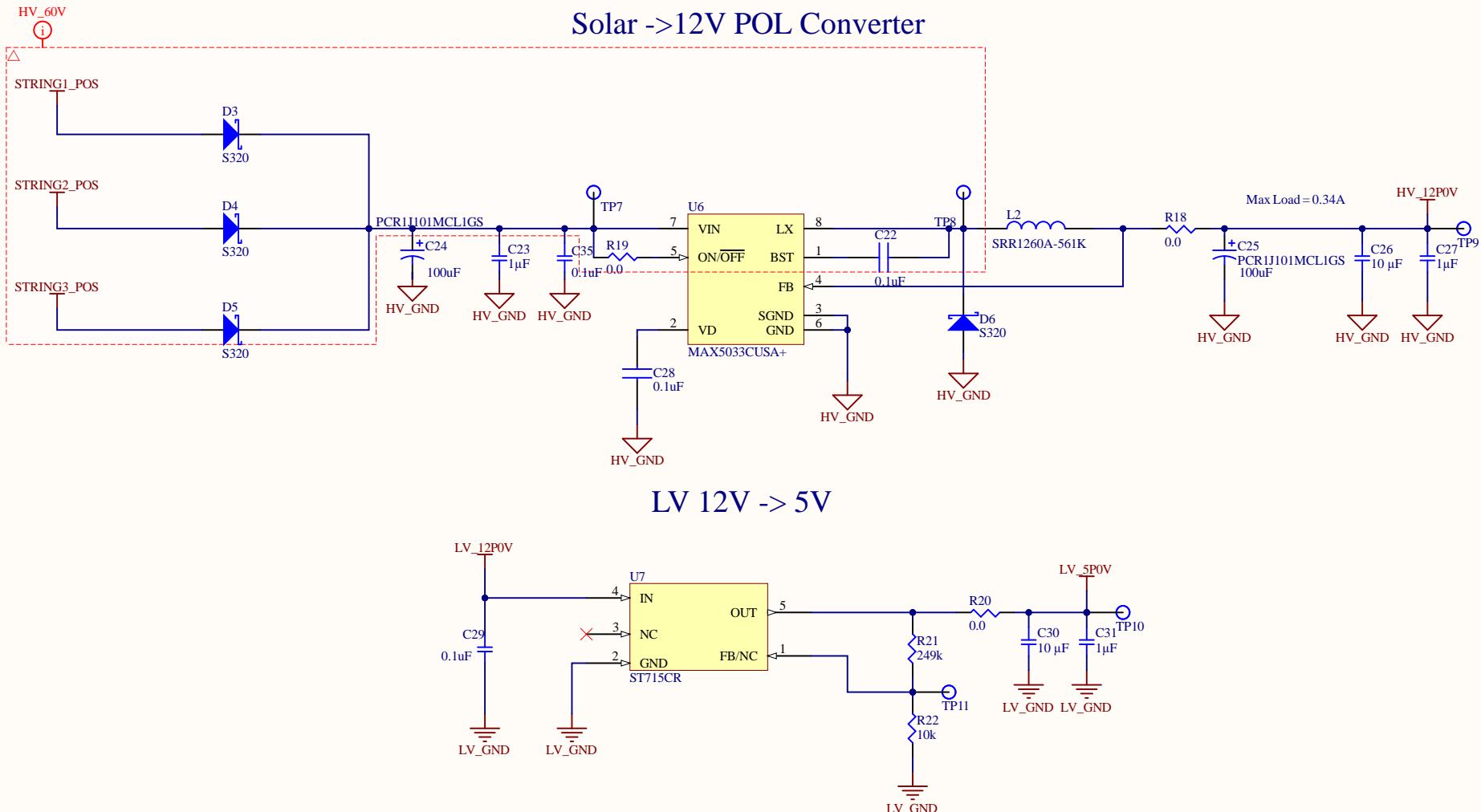
D

D



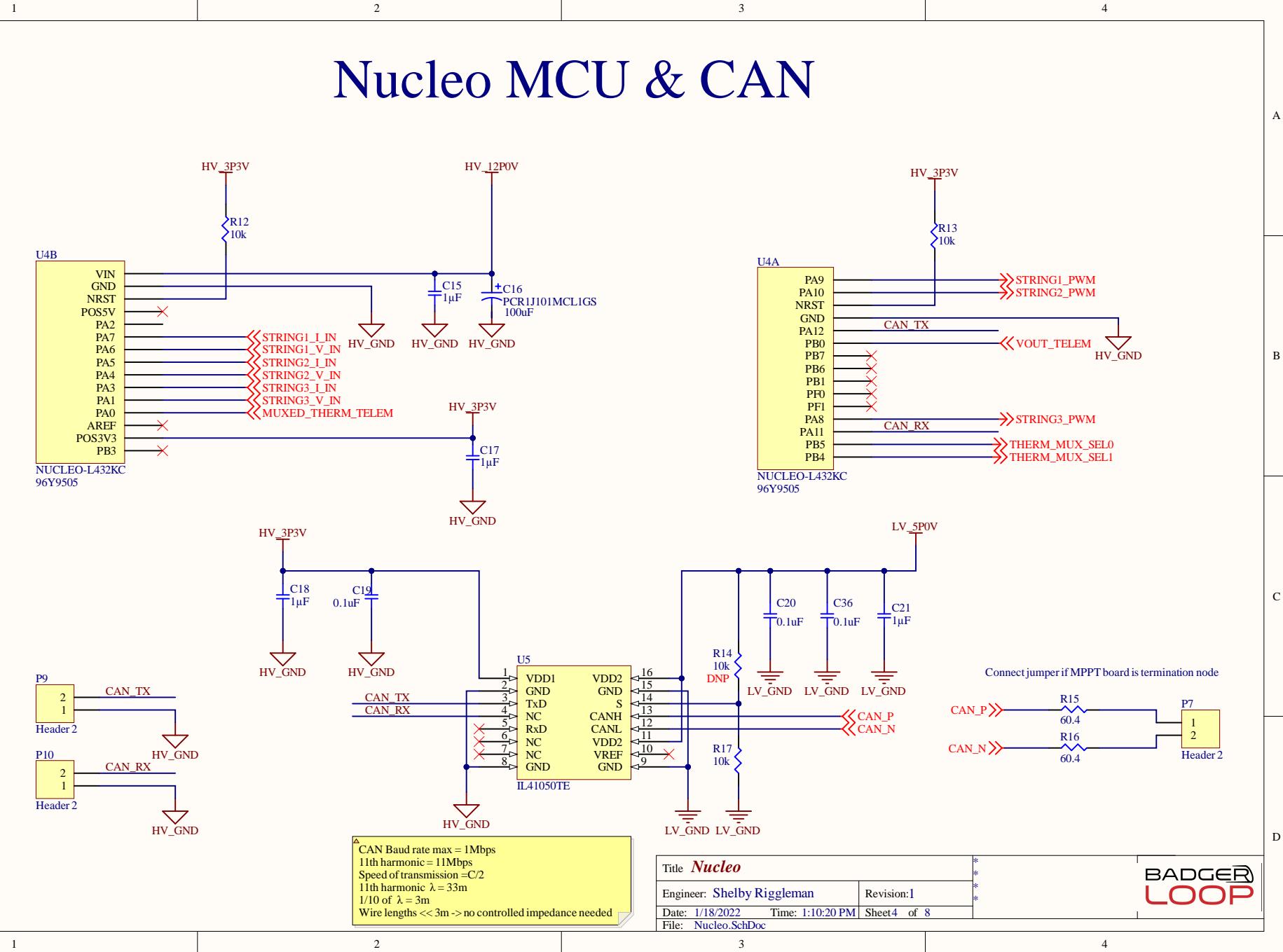
Title <b>Connectors</b>	
Engineer: Shelby Riggelman	Revision: 1
Date: 1/18/2022	Time: 1:10:20 PM
File: Connectors.SchDoc	Sheet 2 of 8

# Point of Load Converters

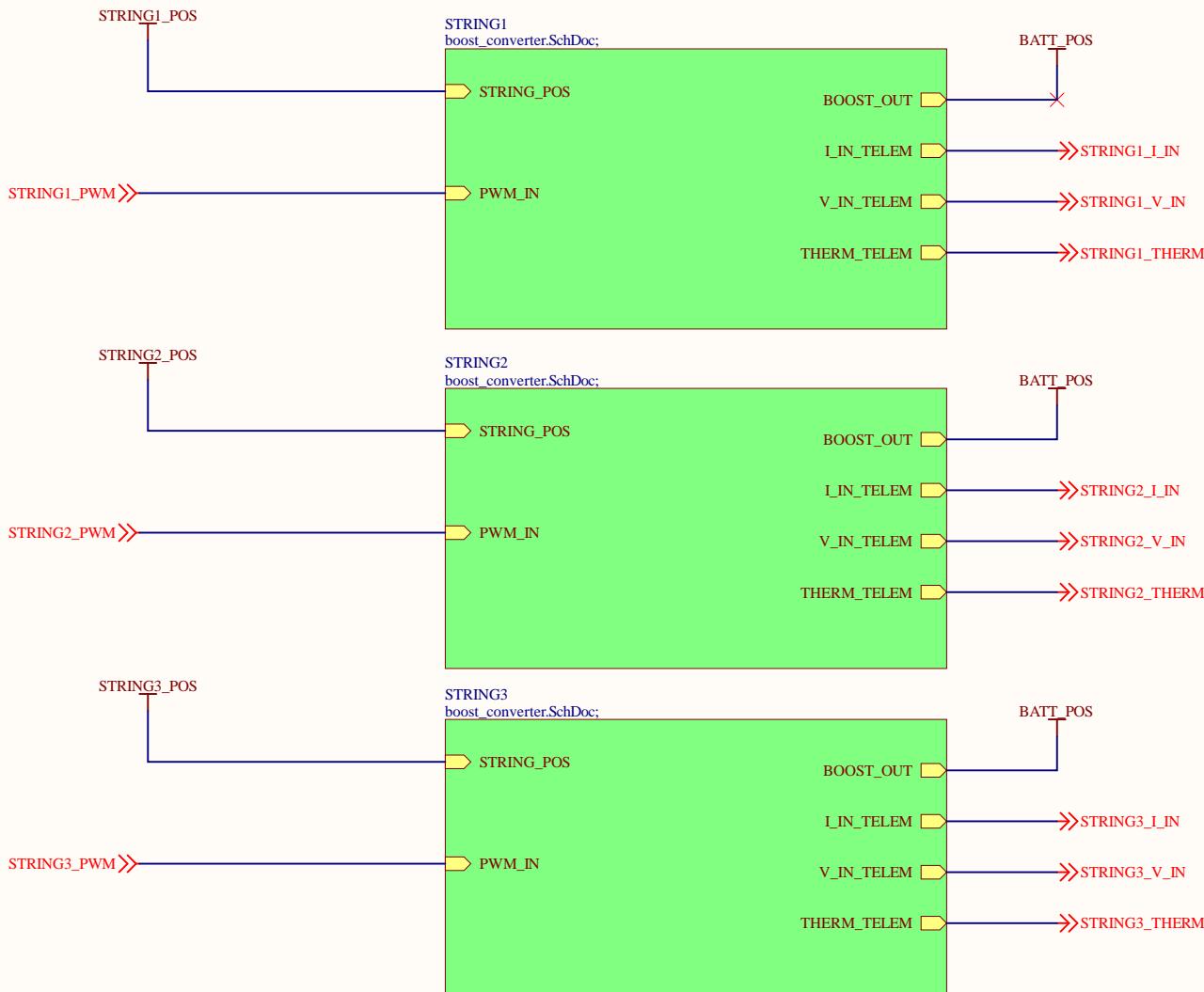


Title <i>Point of load converters</i>	
Engineer: Shelby Riggelman	Revision: 1
Date: 1/18/2022	Time: 1:10:20 PM
File: POL_converter.SchDoc	Sheet 3 of 8

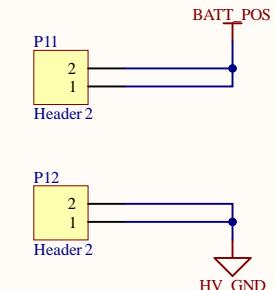
**BADGER  
LOOP**



# Solar Strings MPPTs



Debug Headers



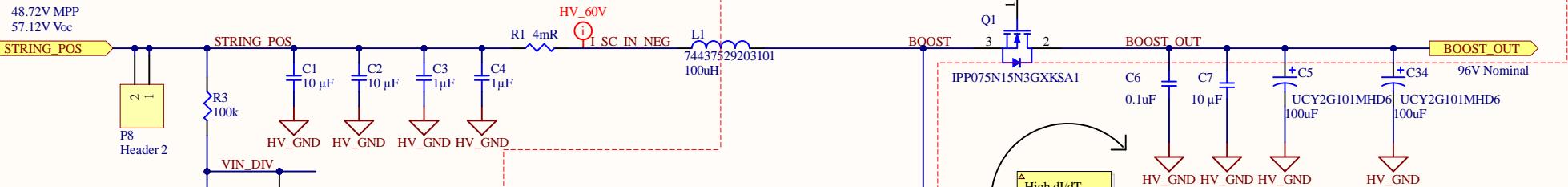
Title <b>Boost Strings</b>	
Engineer: Shelby Riggelman	Revision: 1
Date: 1/18/2022	Time: 1:10:21 PM
File: solar_boost_strings.SchDoc	Sheet 5 of 8

**BADGER**  
**LOOP**

# Solar Boost Converter

1 2 3 4

A



A

B

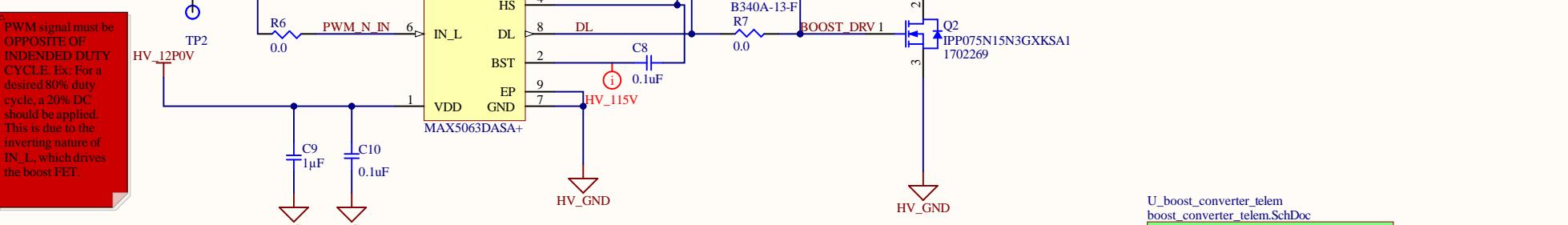
**△** PWM signal must be OPPOSITE OF INDENDED DUTY CYCLE. Ex: For a desired 80% duty cycle, a 20% DC should be applied. This is due to the inverting nature of IN\_L, which drives the boost FET.

Makes inverted PWM signal in case using different gate driver w/ no inverting input for IN\_L

PWM\_IN → Q3 ZVN4106FTA DNP → HV\_GND

HV\_3P3V → R8 10k → DNP → PWM\_N\_IN → TP3

**△** Populate both parts for MIC4103 alt. part.



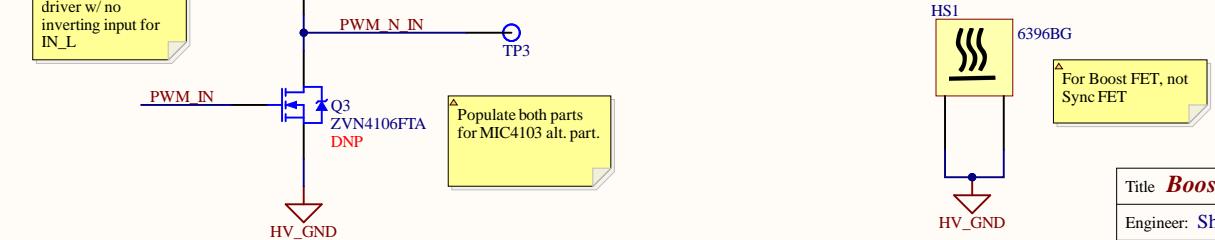
B

C



C

D



Title **Boost Converter**

Engineer: Shelby Rigggleman

Date: 1/18/2022

File: boost\_converter.SchDoc

Revision: 1

Time: 1:10:21 PM

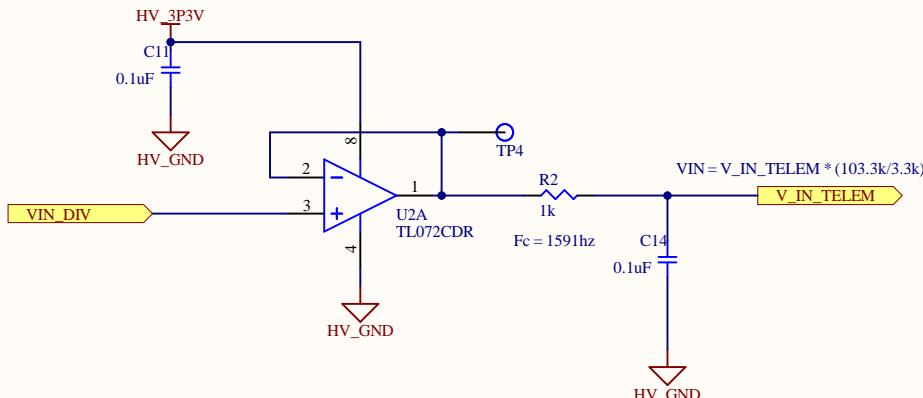
Sheet 6 of 8

**BADGER LOOP**

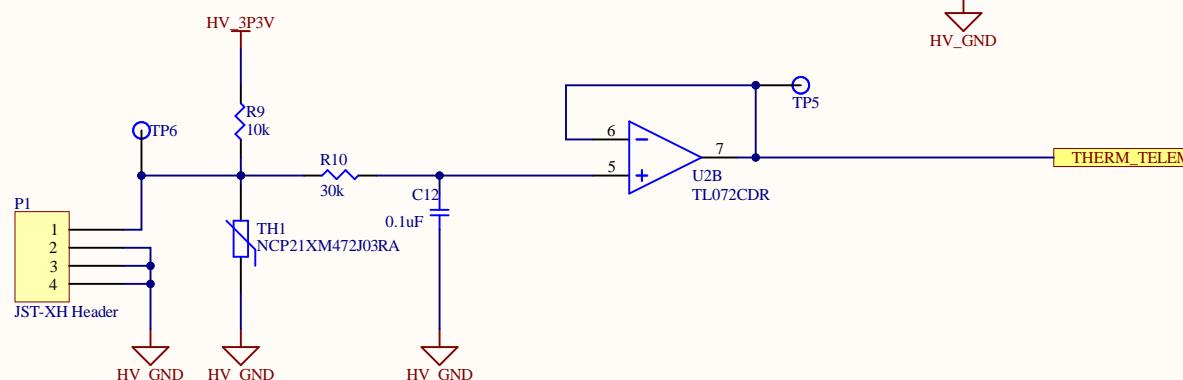
1 2 3 4

# Solar Boost Converter Telemetry

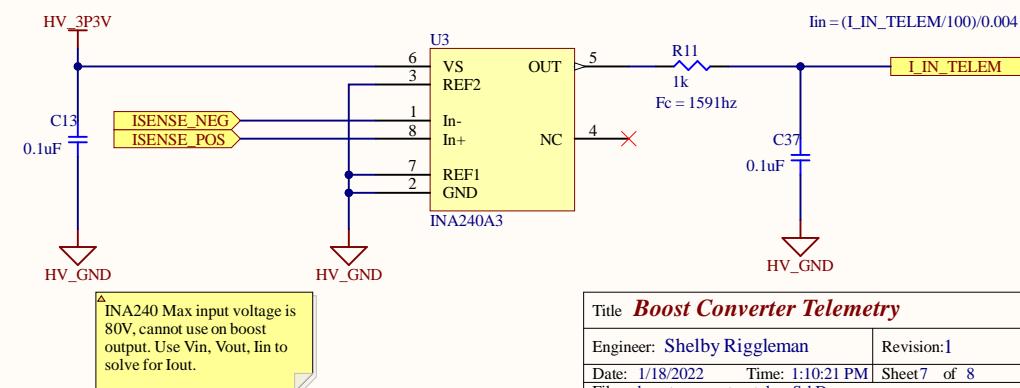
## String Input Voltage



## Thermistor Output



## String Input Current



Title **Boost Converter Telemetry**

Engineer: Shelby Riggelman

Revision: 1

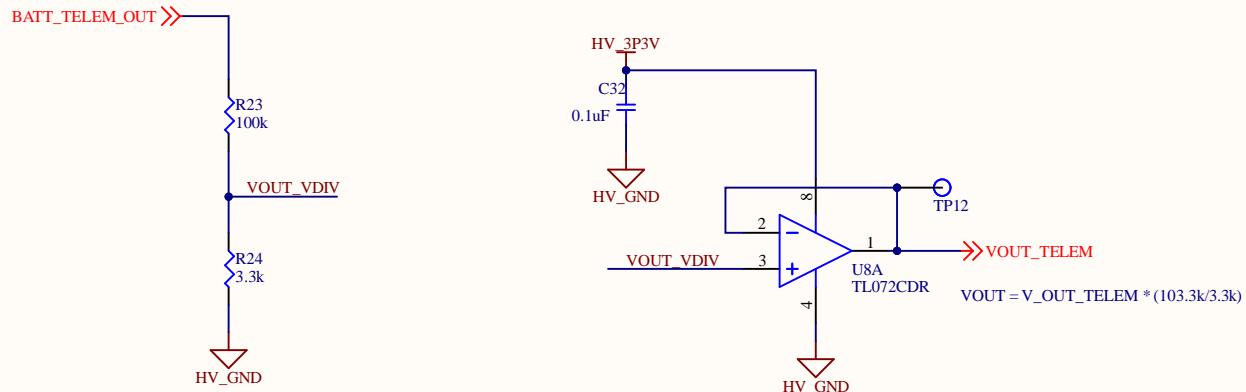
Date: 1/18/2022 Time: 1:10:21 PM

File: boost\_converter\_telem.SchDoc

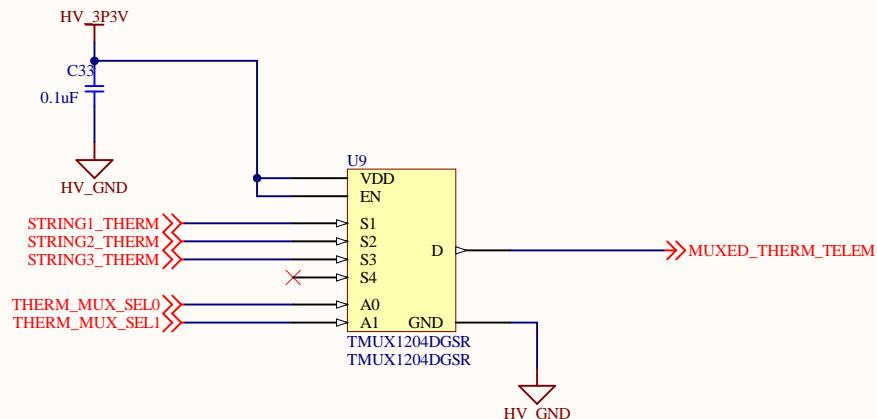
**BADGER**  
**LOOP**

# Global Telemetry

## Output (Battery) Voltage



## String Thermistor Telem (Muxed)

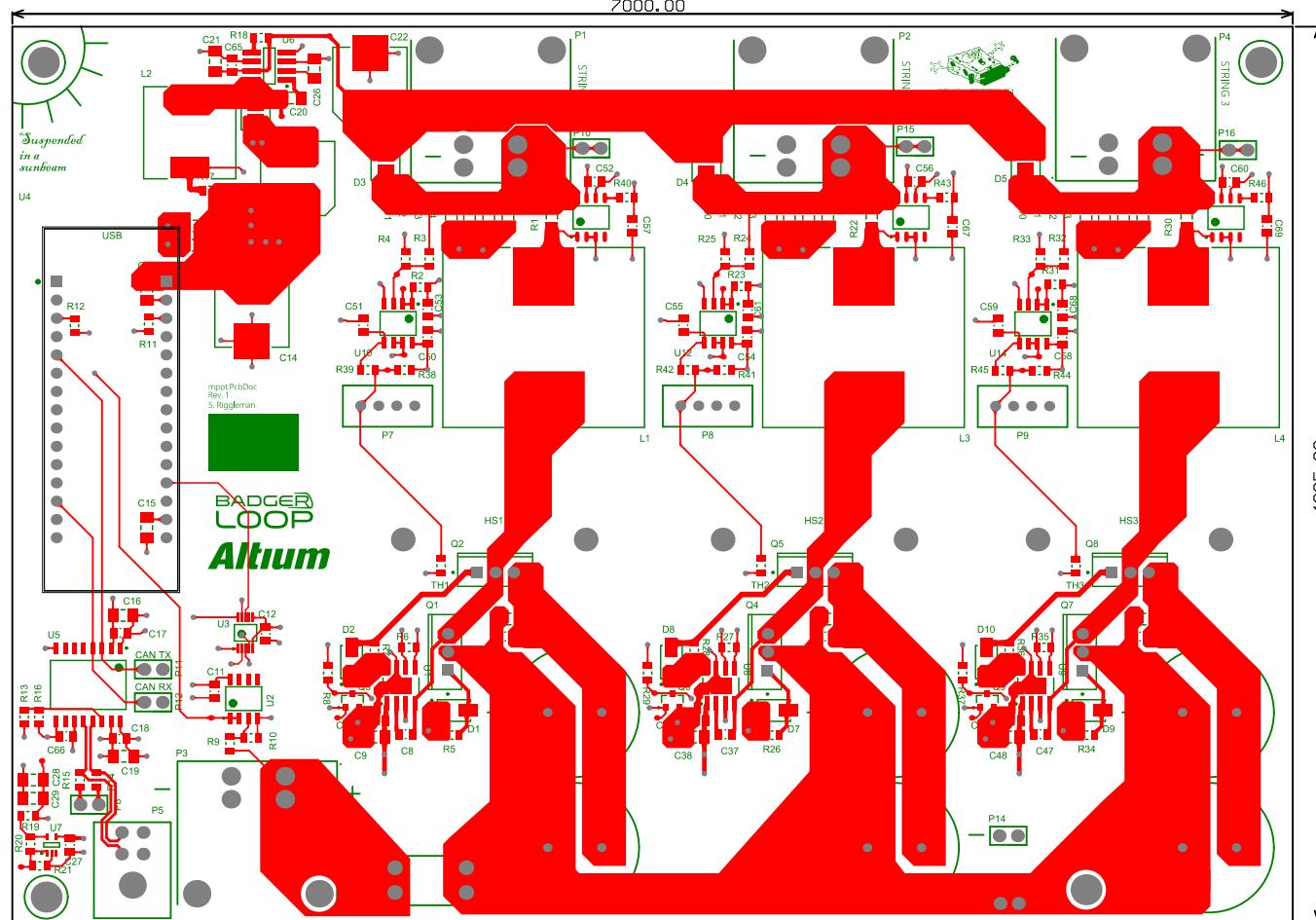


Title <b>Global Telemetry</b>	
Engineer: Shelby Riggelman	Revision: 1
Date: 1/18/2022	Time: 1:10:22 PM
File: global_telem.SchDoc	Sheet 8 of 8

**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				

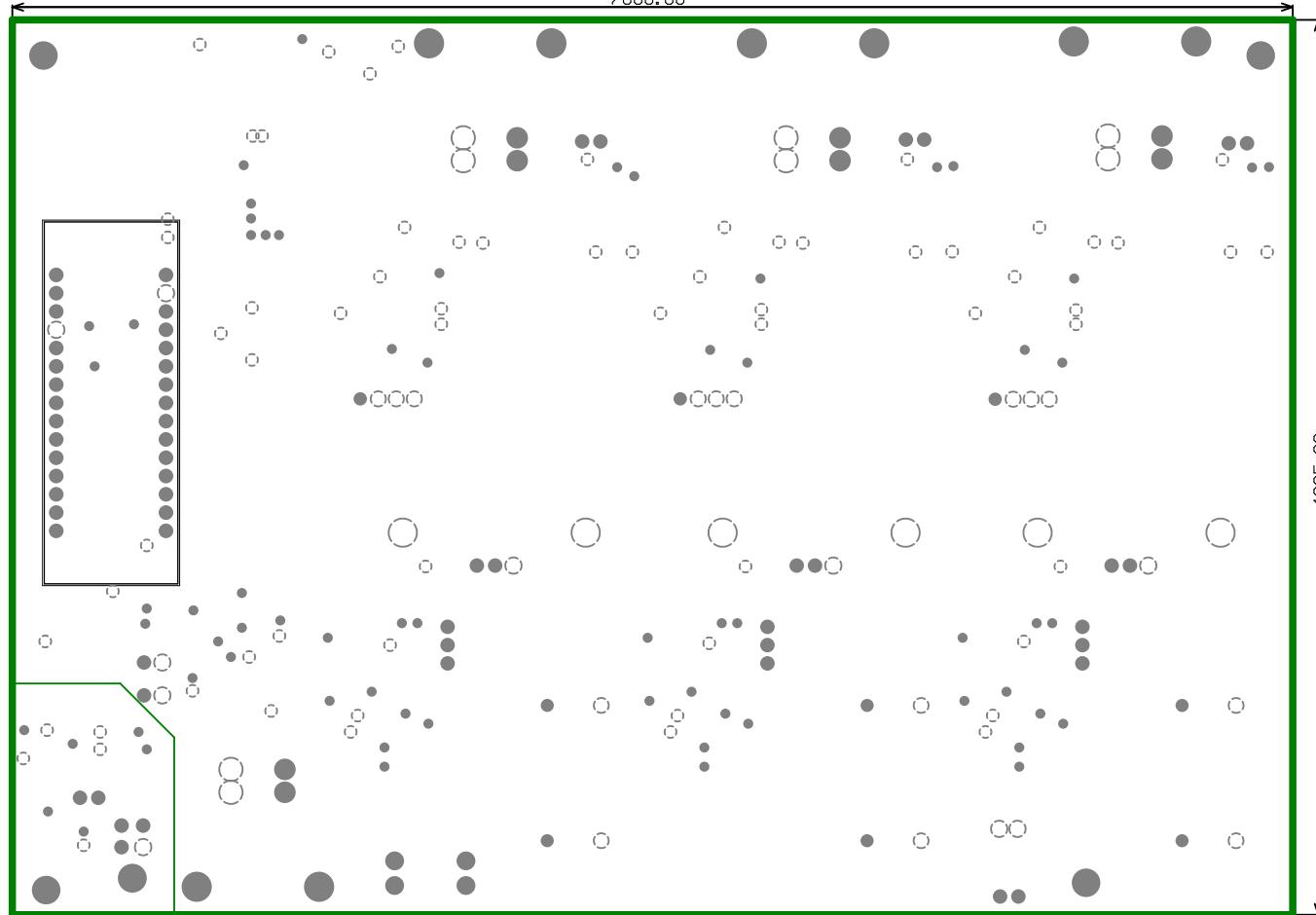
Total board thickness: 24.56mil



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

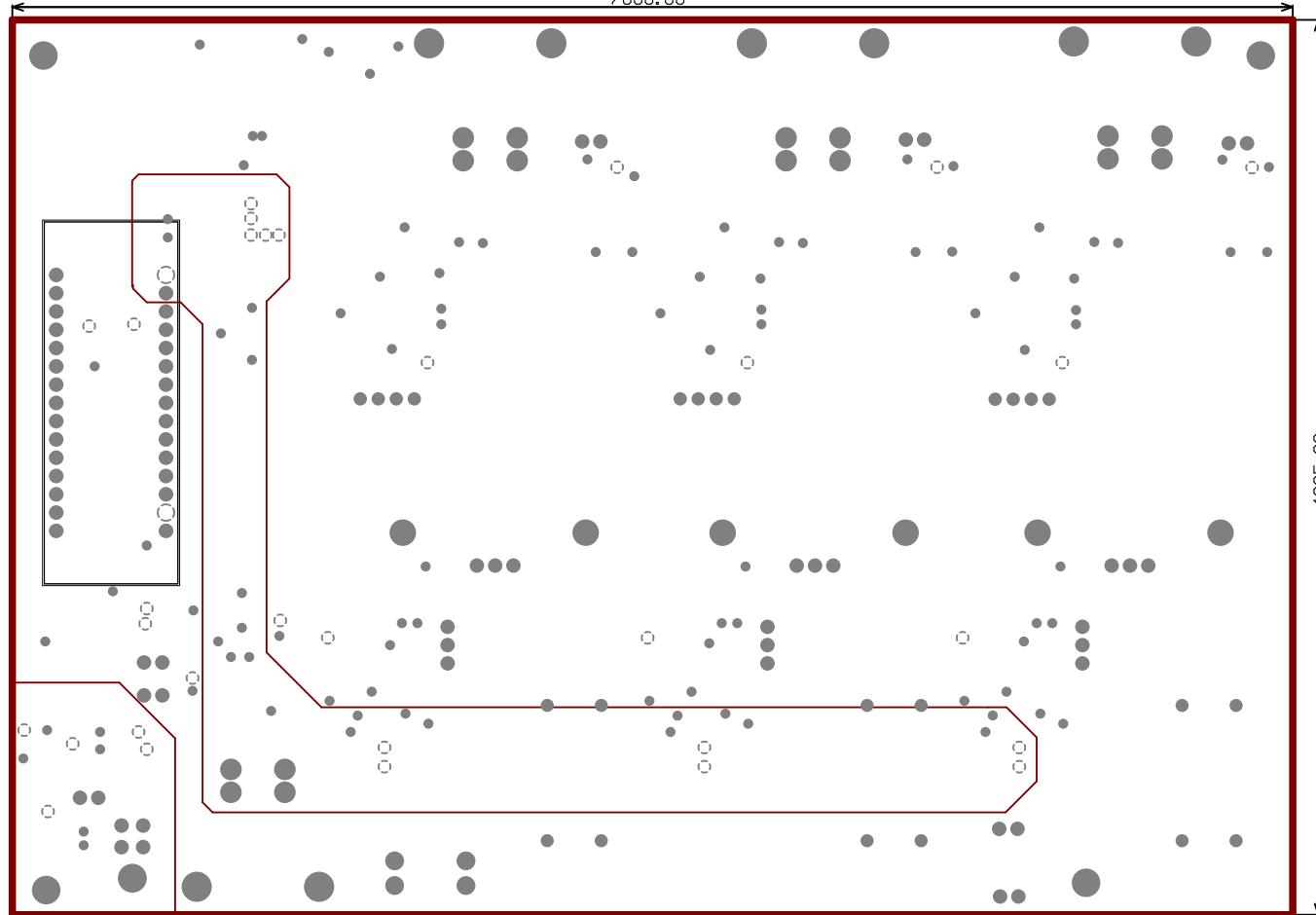
2000.00



Layer	Name	Material	Thickness	Constant	Board Layer Stack
	Top Overlay				
	Top Solder	Solder Resist	0.40mil	3.5	
1	Top Layer		1.40mil		
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	Bottom Solder	Solder Resist	0.40mil	3.5	
	Bottom Overlay				

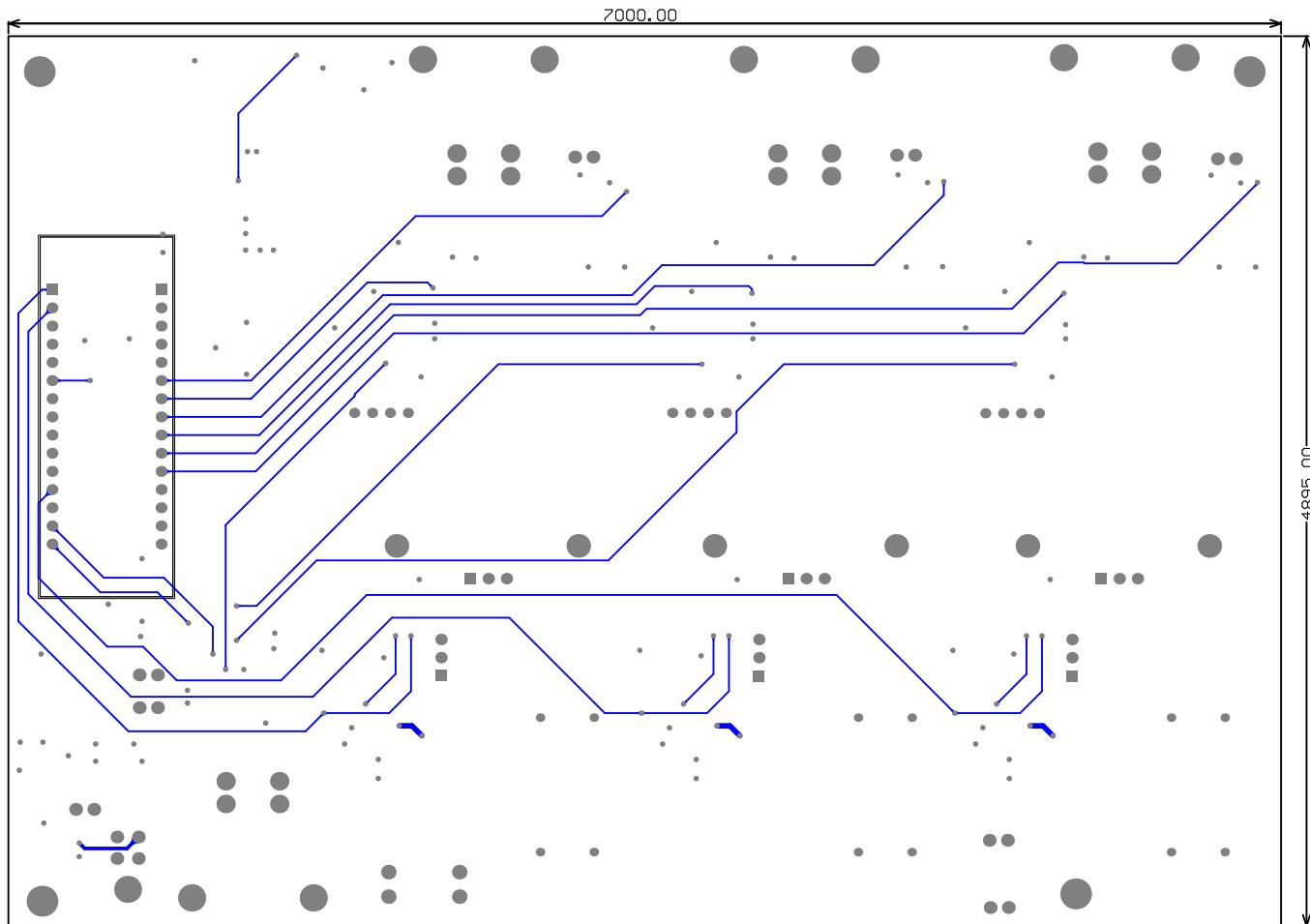
Total board thickness: 24.56mil

2000.00



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	Bottom Overlay				

Total board thickness: 24.56mil



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4	Bottom Layer		1.40mil		
	Bottom Solder	Solder Resist	0.40mil	3.5	
	Bottom Overlay				

Total board thickness: 24.56mil

7000.00

