

MPPT Solar Converter

SOLAR CAR 2021

REV 2

^A
Rev 2 firmware changes:

- Boost enable signal must be applied on pin PB7 once booted up
- Voltage Output transfer function is: $V_{OUT} = V_{OUT_TELEM} * (1010000/10000)$
- String input current transfer function is: $I_{in} = (I_{IN_TELEM}/20)/0.01$
- If over voltage fault occurs, can be cleared manually with button or with toggling pin PB_6 (fault will re-latch if fault still present after clear signal removed)
- Discharging output capacitance to get unplugged board to storage state can be accomplished by turning PB1 low (takes tens of seconds).

Title **COVER**

Engineer: Shelby Riggleman

Revision: 1

Date: 4/20/2022 Time: 12:10:47 PM Sheet 1 of 10

File: cover.SchDoc

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



Connectors

A

A

B

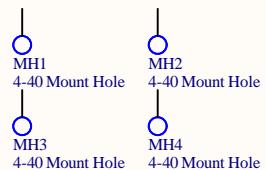
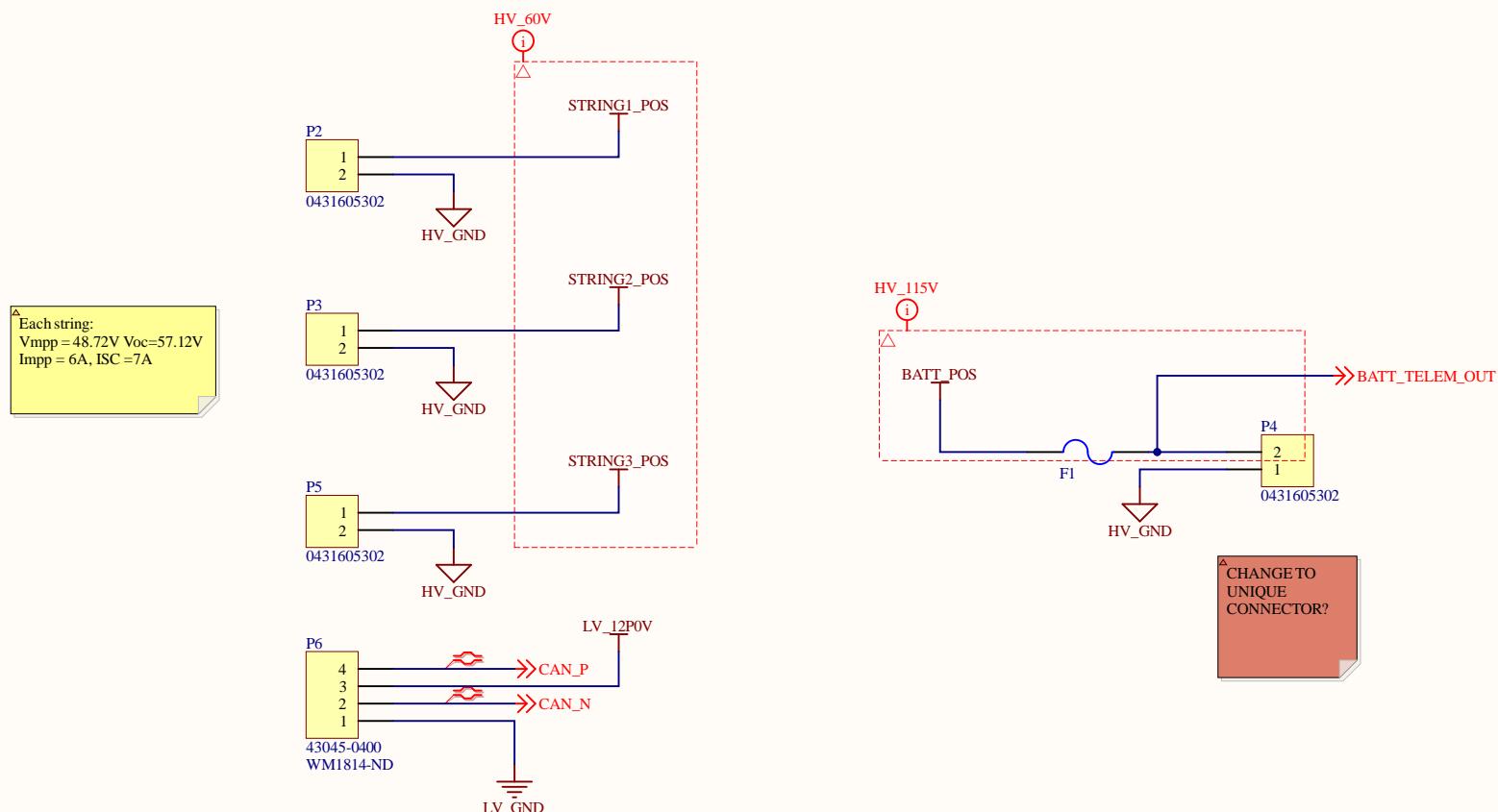
B

C

C

D

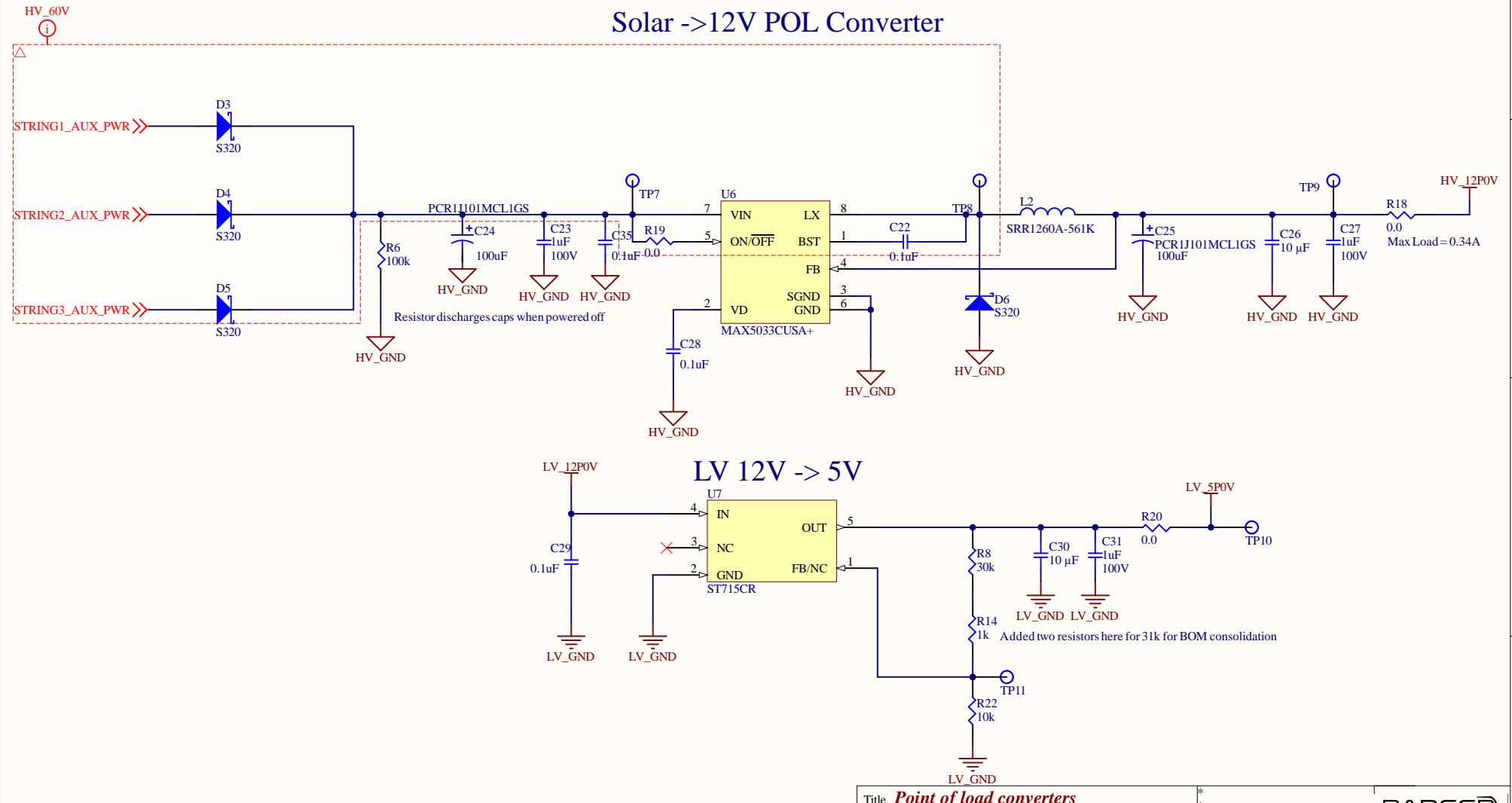
D



Title <i>Connectors</i>	
Engineer: Shelby Riggelman	Revision: 1
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File: Connectors.SchDoc	Sheet 2 of 10

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LOOP

Point of Load Converters



Nucleo MCU & CAN

A

B

C

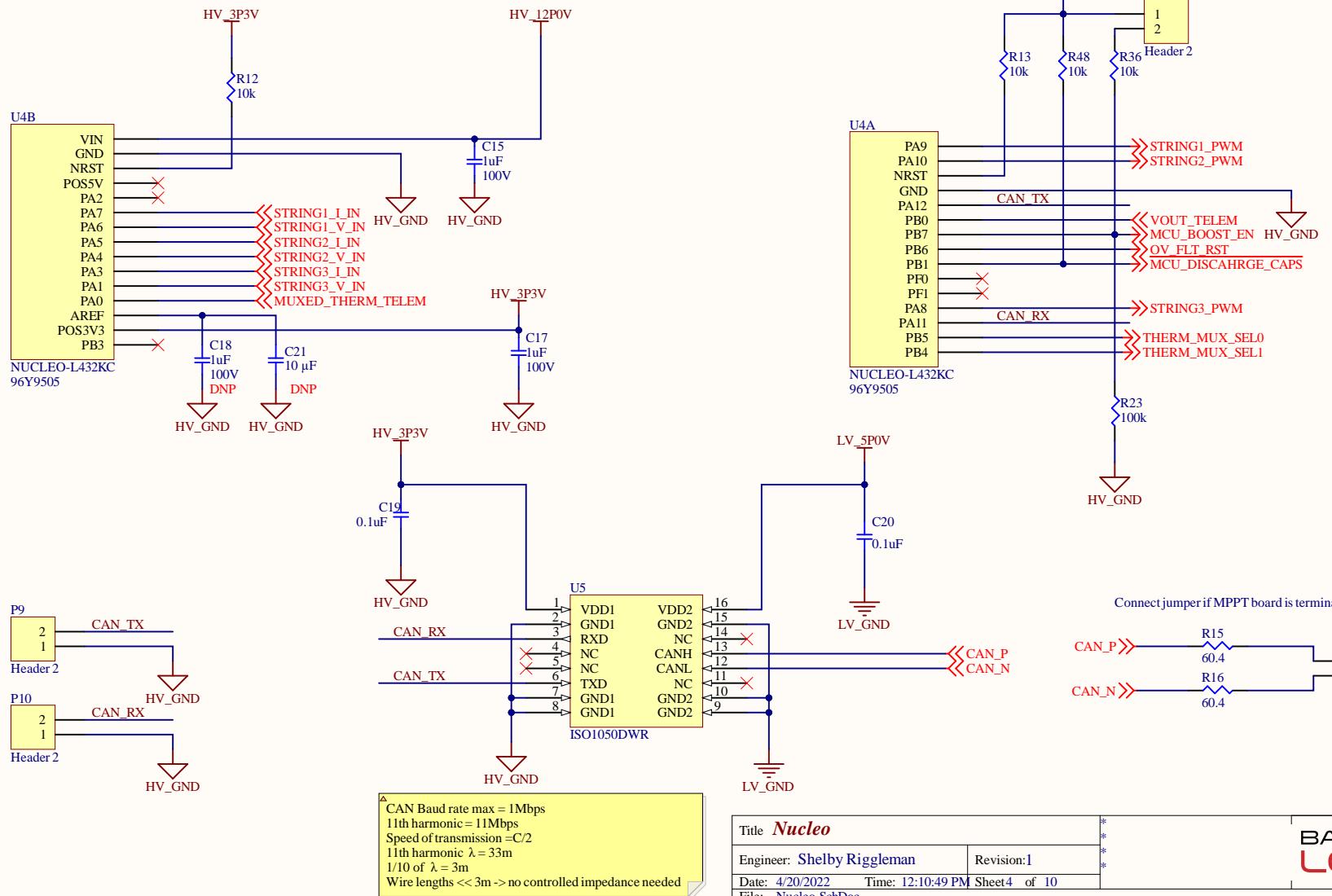
D

A

B

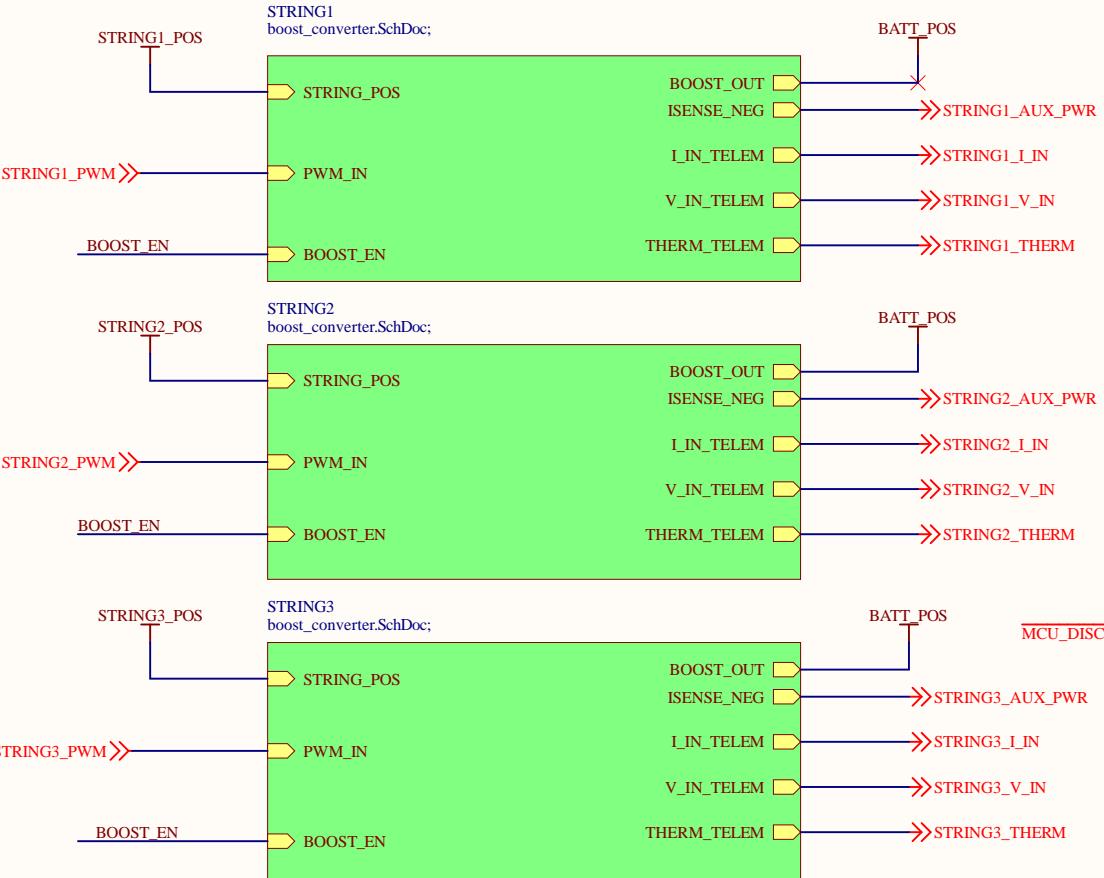
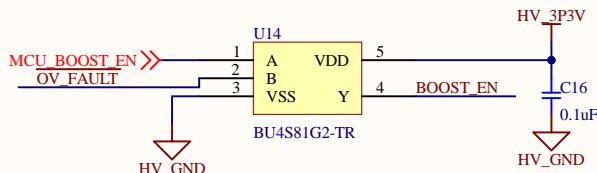
C

D

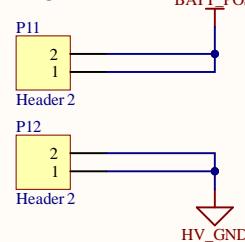


Solar Strings MPPTs

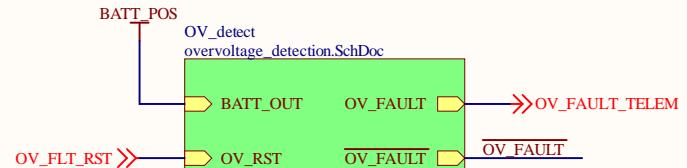
Boost Enable Signal (All)



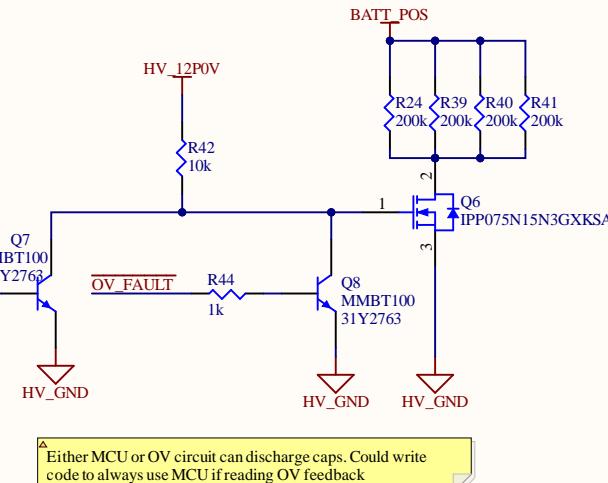
Debug Headers



Ovvoltage Detection



Overvoltage Discharge



Title **Boost Strings**

Engineer: Shelby Riggelman

Revision: 1

Date: 4/20/2022

Time: 12:10:49 PM

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File: solar_boost_strings.SchDoc

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LOOP

Solar Boost Converter

1

2

3

4

A

B

C

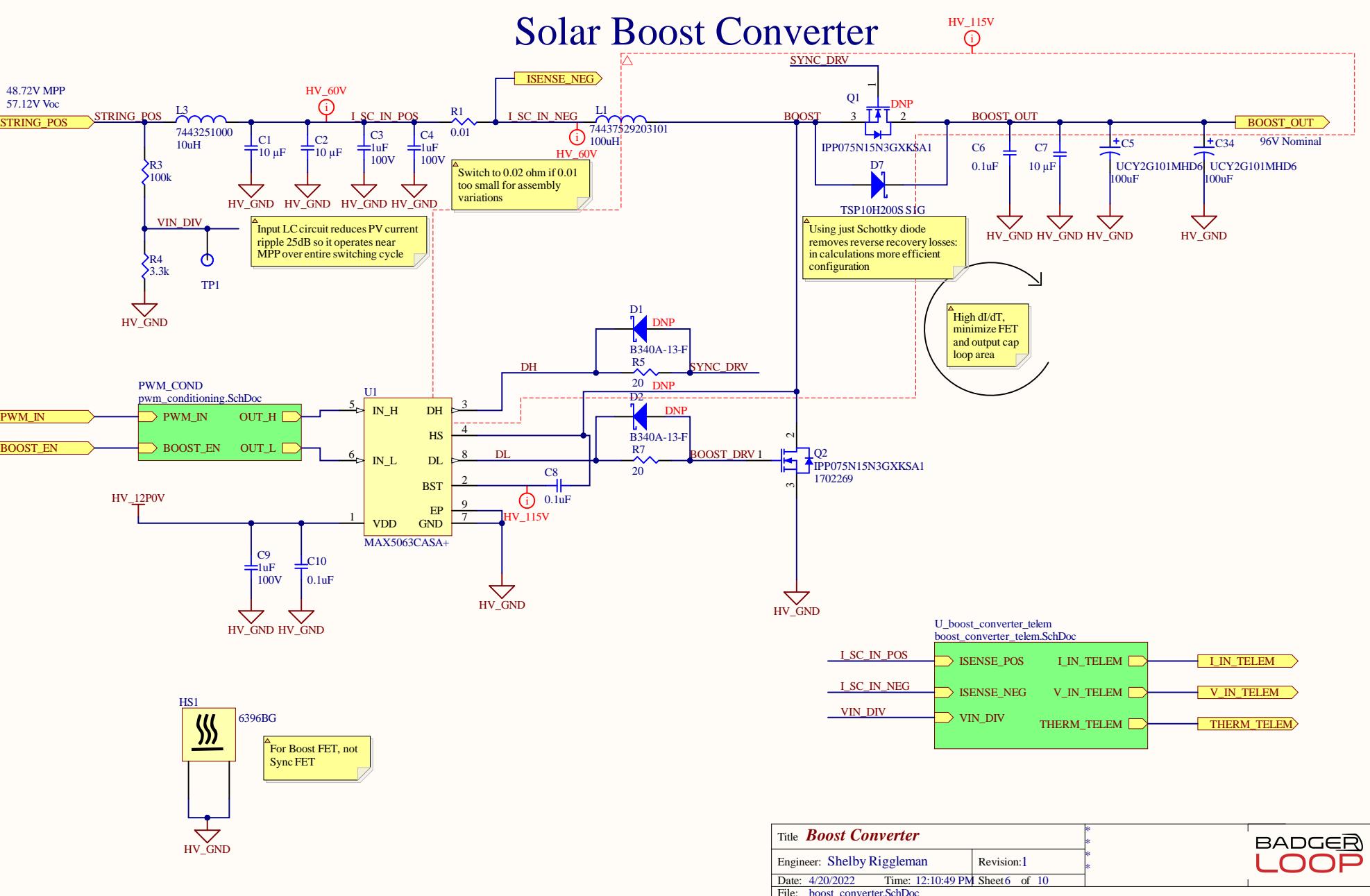
D

A

B

C

D



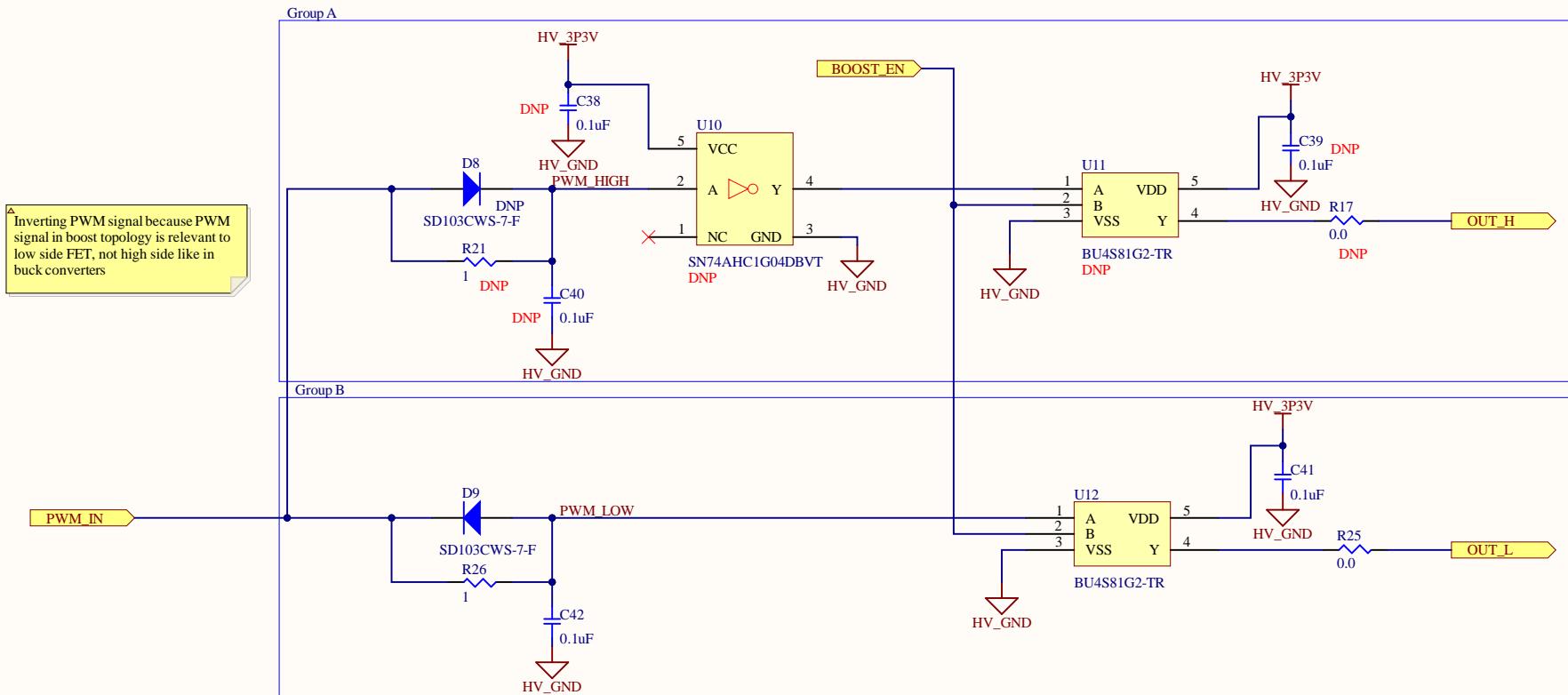
1

2

3

4

PWM Conditioning



Gate Driver	Sync. Config (2 FETS):	Async. Config (FET + Diode)
MAX5063A/MAX5063C	Populate all components	DNP Group A, or remove OUT_H resistor Short out PWM_LOW RC resistor
MIC4102	DNP Group B, or remove OUT_L resistor Short out PWM_HIGH RC resistor	DNP Group B, or remove OUT_L resistor Short out PWM_HIGH RC resistor
MIC4103	Populate all components	DNP Group A, or remove OUT_H resistor Short out PWM_LOW RC resistor

Title **PWM Conditioning**

Engineer: Shelby Riggelman

Revision: 1

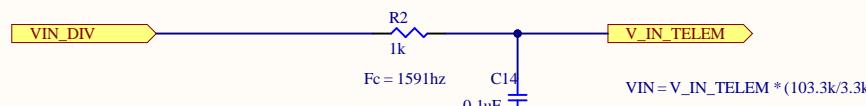
Date: 4/20/2022 Time: 12:10:50 PM Sheet 7 of 10

File: pwm_conditioning.SchDoc

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LOOP

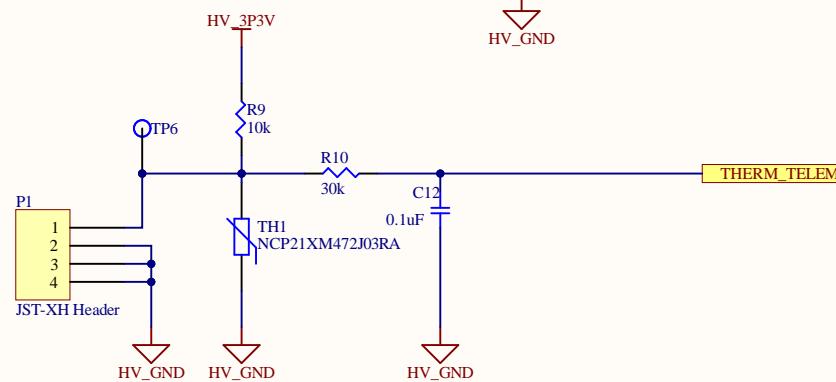
Solar Boost Converter Telemetry

String Input Voltage



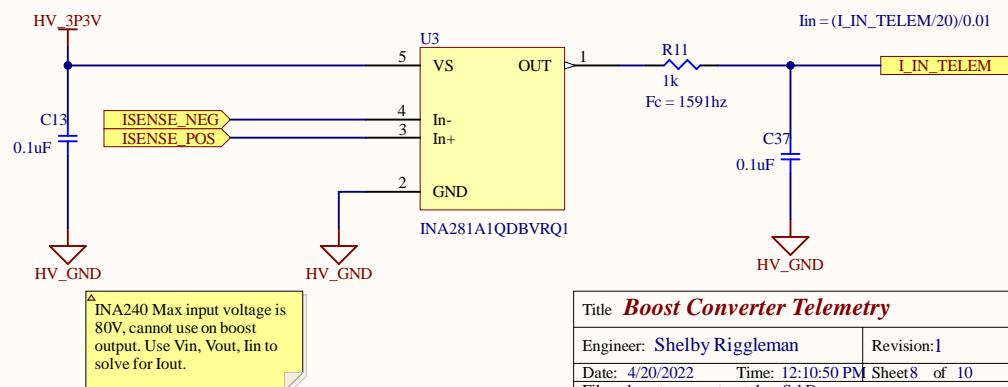
△ UPDATE COMPONENTS TO CREATE CORNER FREQUENCY HIGHER THAN CONTROL LOOP UPDATE RATE UPON TESTING

Thermistor Output



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

String Input Current



Title **Boost Converter Telemetry**

Engineer: Shelby Riggelman Revision: 1

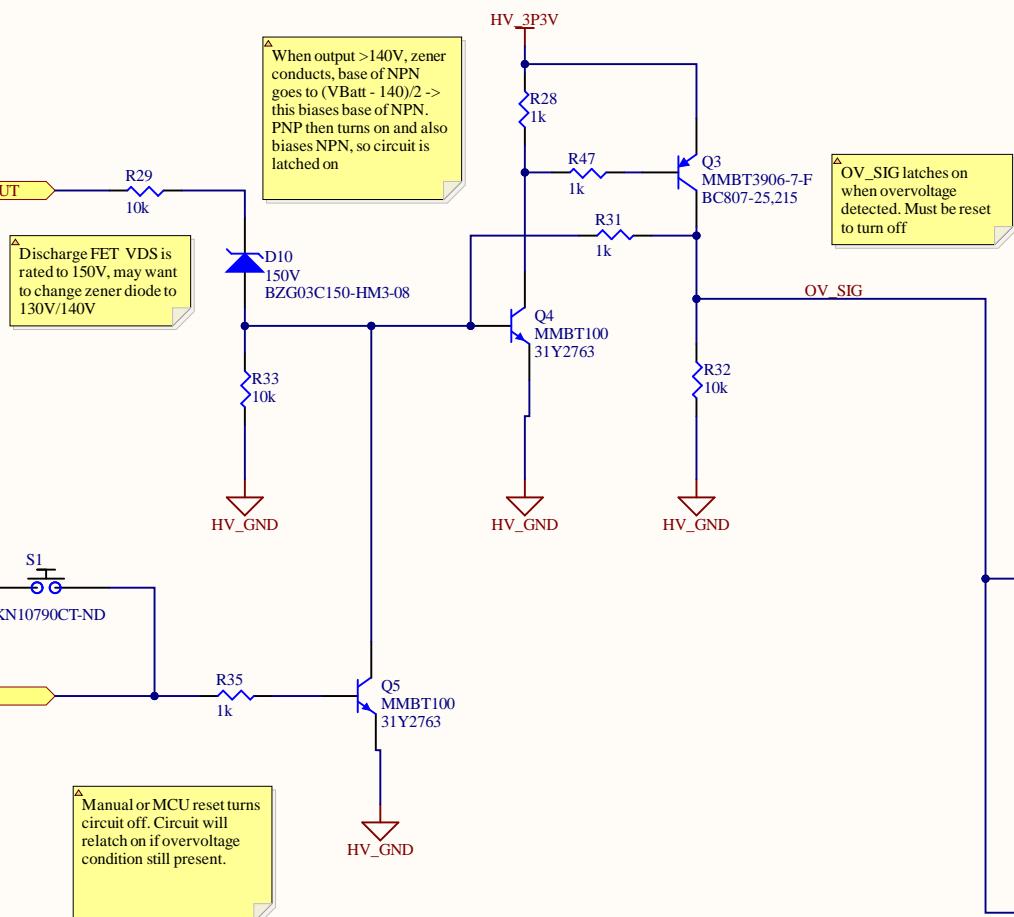
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File: boost_converter_telem.SchDoc

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LOOP

Overvoltage Detection

A

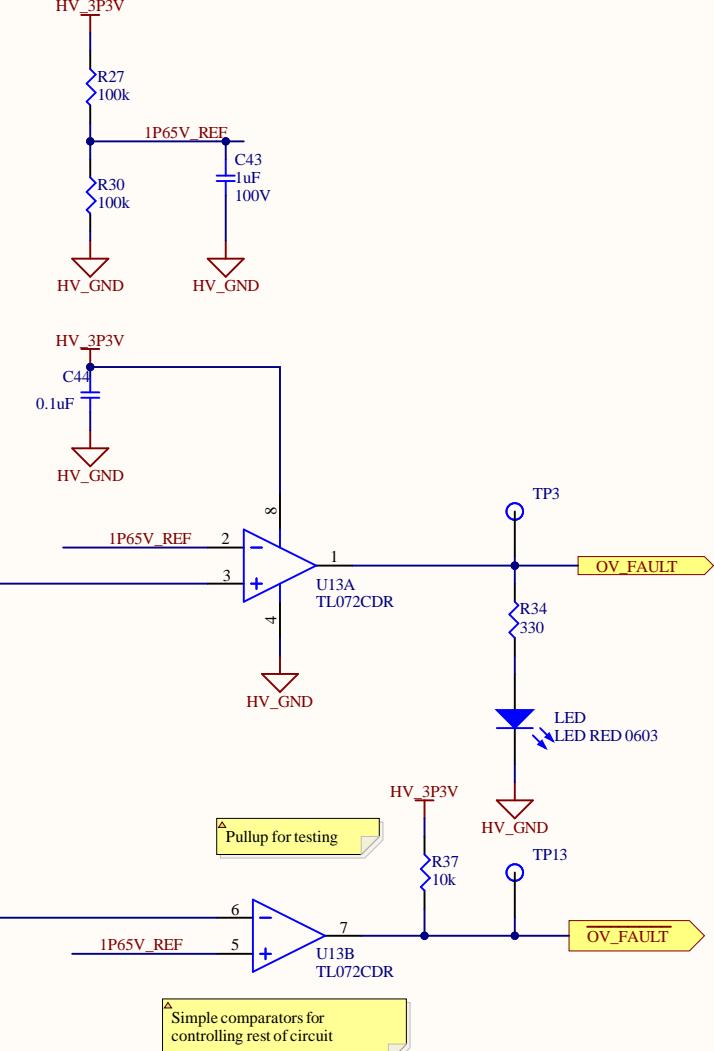


A

B

C

D

Title **Over-Voltage Detection**

Engineer: Shelby Riggelman

Revision: 1

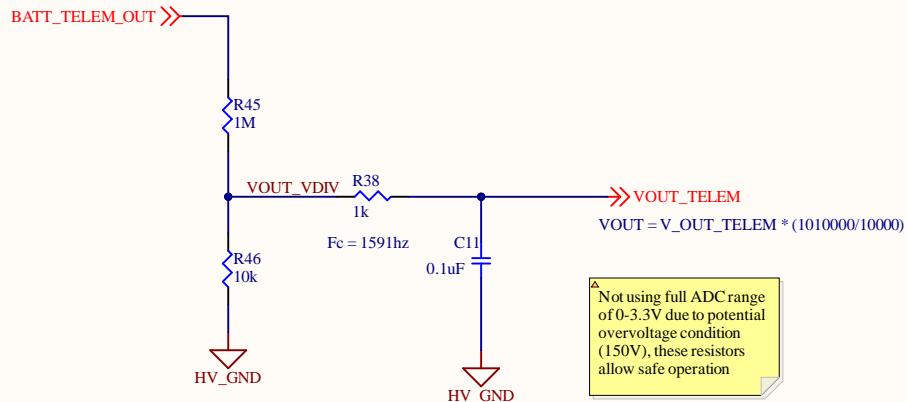
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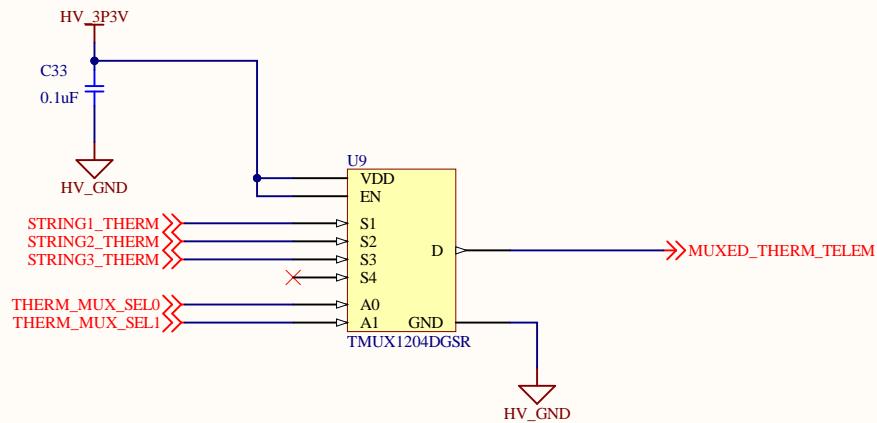
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LOOP

Global Telemetry

Output (Battery) Voltage



String Thermistor Telem (Muxed)



Title Global Telemetry	
Engineer: Shelby Riggelman	Revision: 1
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File: global_telem.SchDoc	

BADGER
LOOP

