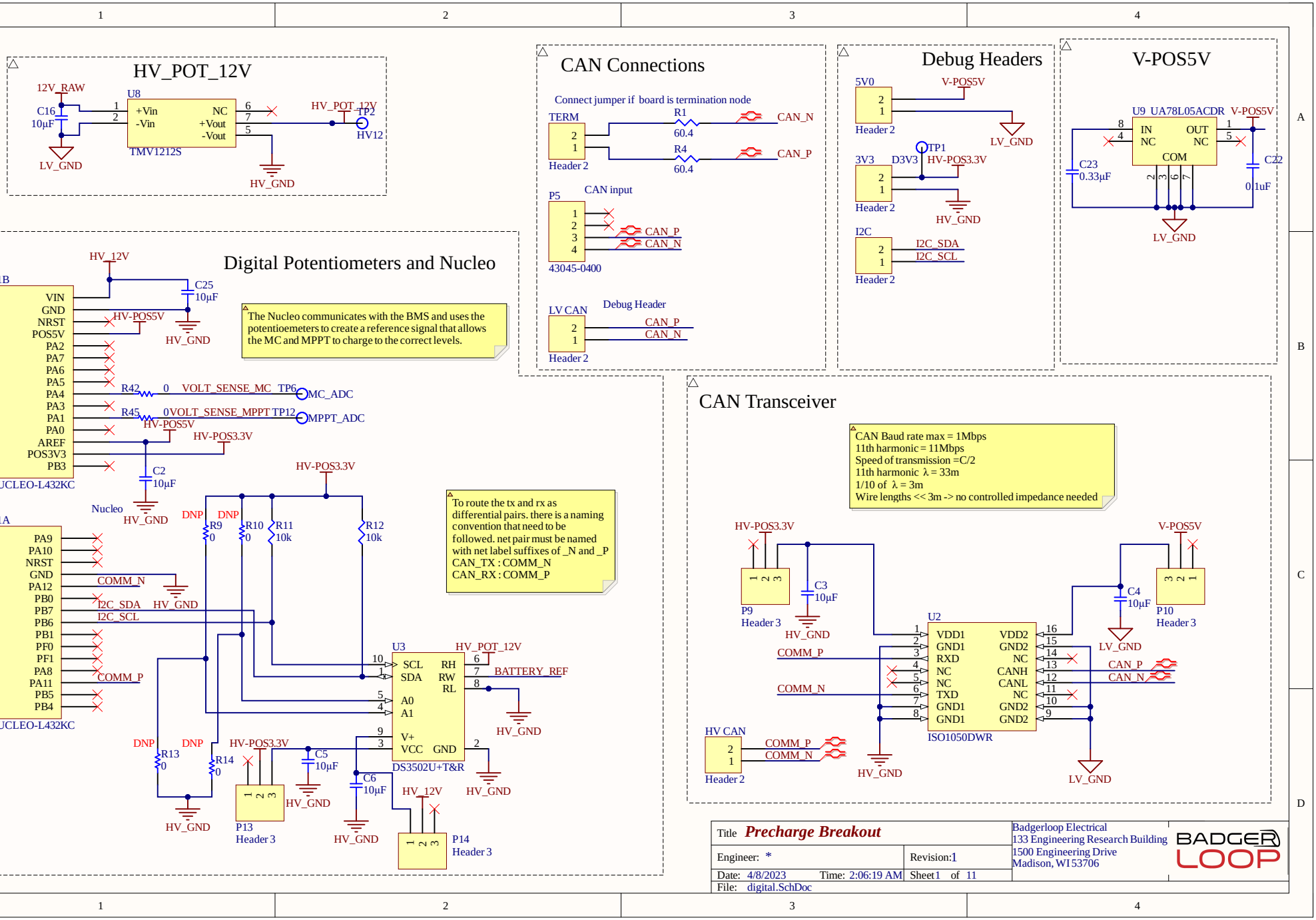
HV_POT_12V
12V_RAW
C16
10µF
U8
+Vin
-Vin
NC
+Vout
-Vout
TMV1212S
HV_POT_12V
TP2
HV12
LV_GND
HV_GND
CAN Connections
Connect jumper if board is termination node
TERM
Header 2
R1
60.4
R4
60.4
CAN_N
CAN_P
P5
CAN input
43045-0400
LV CAN
Debug Header
Debug Headers
5V0
V-POS5V
Header 2
LV_GND
TP1
3V3
D3V3
HV-POS3.3V
I2C
I2C_SDA
I2C_SCL
V-POS5V
U9 UA78L05ACDR
IN
OUT
NC
COM
C23
0.33µF
C22
0.1uF
Digital Potentiometers and Nucleo
U1B
VIN
GND
NRST
POS5V
PA2
PA7
PA6
PA5
PA4
PA3
PA1
PA0
AREF
POS3V3
PB3
NUCLEO-L432KC
C25
10µF
HV-POS5V
HV_12V
The Nucleo communicates with the BMS and uses the potentioemeters to create a reference signal that allows the MC and MPPT to charge to the correct levels.
R42
0
VOLT_SENSE_MC
TP6
MC_ADC
R45
0
VOLT_SENSE_MPPT
TP12
MPPT_ADC
HV-POS3.3V
C2
10µF
Nucleo
U1A
PA9
PA10
NRST
GND
PA12
PB0
PB7
PB6
PB1
PF0
PF1
PA8
PA11
PB5
PB4
NUCLEO-L432KC
COMM_N
I2C_SDA
I2C_SCL
COMM_P
DNP
R9
0
R10
0
R11
10k
R12
10k
R13
0
R14
0
U3
SCL
SDA
A0
A1
V+
VCC
RH
RW
RL
GND
DS3502U+T&R
BATTERY_REF
C5
10µF
C6
10µF
P13
Header 3
P14
Header 3
To route the tx and rx as differential pairs. there is a naming convention that need to be followed. net pair must be named with net label suffixes of _N and _P
CAN_TX : COMM_N
CAN_RX : COMM_P
CAN Transceiver
CAN Baud rate max = 1Mbps
11th harmonic = 11Mbps
Speed of transmission =C/2
11th harmonic λ = 33m
1/10 of λ = 3m
Wire lengths << 3m -> no controlled impedance needed
P9
Header 3
C3
10µF
C4
10µF
P10
Header 3
U2
VDD1
GND1
RXD
NC
NC
TXD
GND1
GND1
VDD2
GND2
NC
CANH
CANL
NC
GND2
GND2
ISO1050DWR
HV CAN
Header 2
CAN_P
CAN_N
Title
Precharge Breakout
Engineer: *
Revision:1
Date: 4/8/2023
Time: 2:06:19 AM
Sheet1 of 11
File: digital.SchDoc
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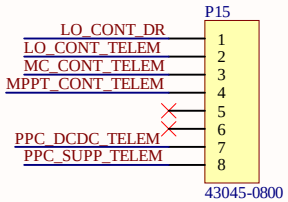
Madison, WI53706
BADGER LOOP

Test Signals

Verify All The Signals

Low Voltage Input and Output



MH1
Mounting Hole
MH2
Mounting Hole
MH3
Mounting Hole
MH4
Mounting Hole
MH5
Mounting Hole

Title	***Precharge Breakout***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:19 AM	Sheet 2 of 11
File: connectors.SchDoc		

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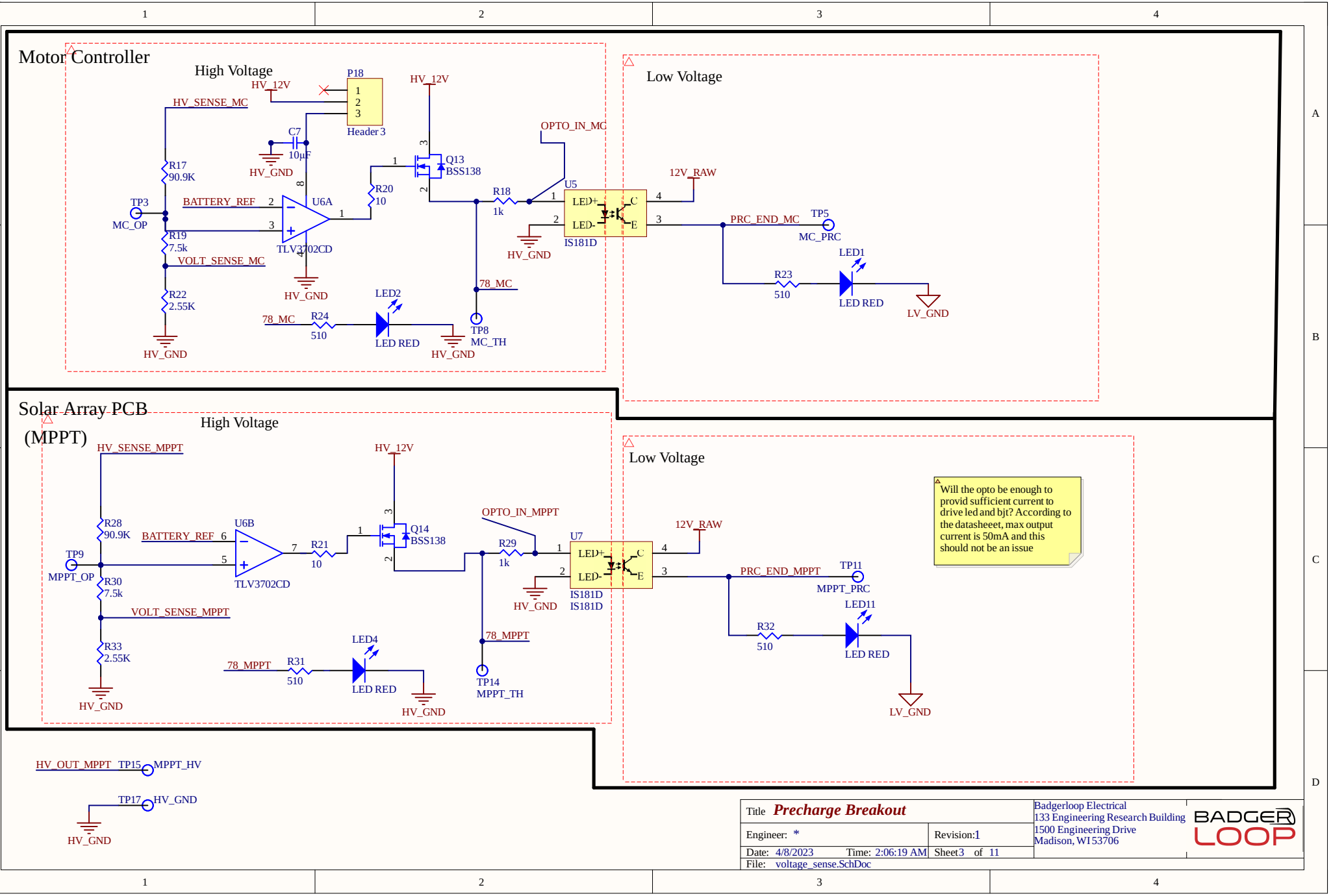
Motor Controller
High Voltage
HV_12V
P18
Header 3
HV_SENSE_MC
C7
10µF
HV_GND
R17
90.9K
TP3
MC_OP
BATTERY_REF
U6A
TLV3702CD
R19
7.5k
VOLT_SENSE_MC
R22
2.55K
HV_GND
Q13
BSS138
R20
10
OPTO_IN_MC
R18
1k
U5
IS181D
78_MC
LED2
78_MC
R24
510
LED RED
TP8
MC_TH
HV_GND
Low Voltage
12V_RAW
PRC_END_MC
TP5
MC_PRC
LED1
R23
510
LED RED
LV_GND
Solar Array PCB
(MPPT)
High Voltage
HV_SENSE_MPPT
HV_12V
R28
90.9K
BATTERY_REF
U6B
TLV3702CD
TP9
MPPT_OP
R30
7.5k
VOLT_SENSE_MPPT
R33
2.55K
HV_GND
Q14
BSS138
R21
10
OPTO_IN_MPPT
R29
1k
U7
IS181D
IS181D
78_MPPT
LED4
78_MPPT
R31
510
LED RED
TP14
MPPT_TH
HV_GND
Low Voltage
Will the opto be enough to provid sufficient current to drive led and bjt? According to the datasheeet, max output current is 50mA and this should not be an issue
12V_RAW
PRC_END_MPPT
TP11
MPPT_PRC
LED11
R32
510
LED RED
LV_GND
HV_OUT_MPPT
TP15
MPPT_HV
TP17
HV_GND
HV_GND
Title Precharge Breakout
Engineer: *
Revision:1
Date: 4/8/2023
Time: 2:06:19 AM
Sheet3 of 11
File: voltage_sense.SchDoc
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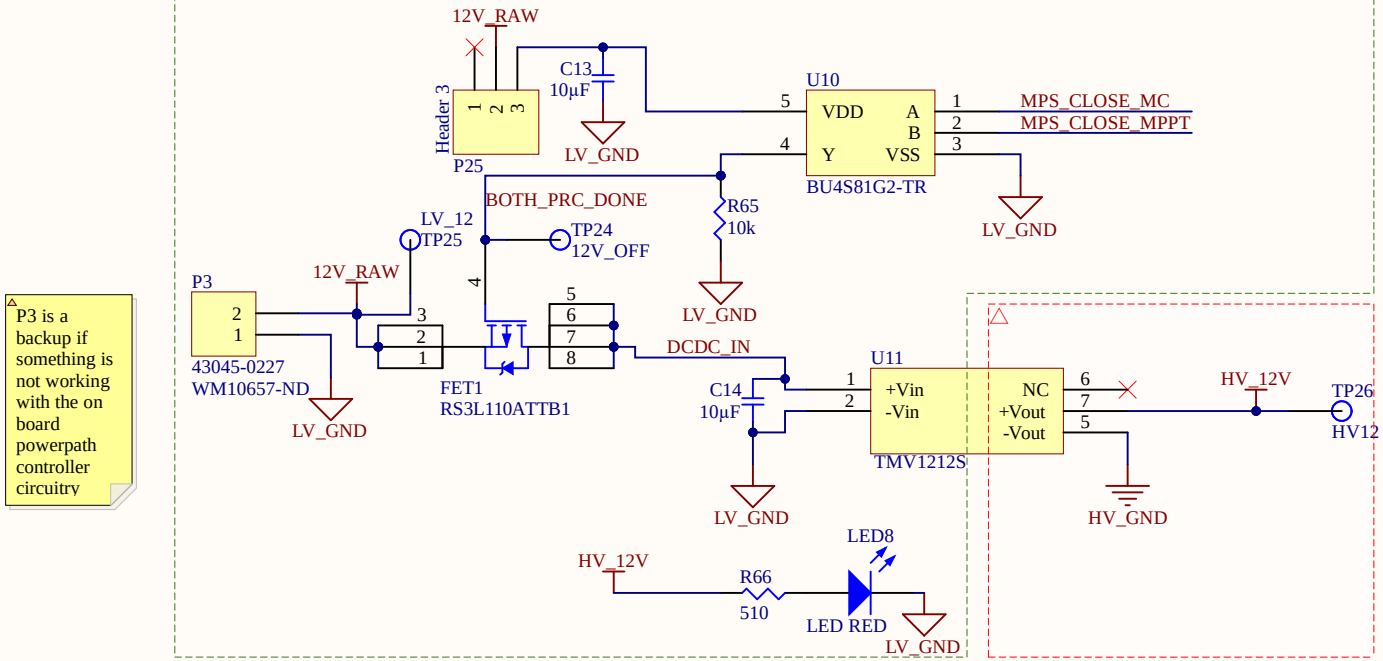
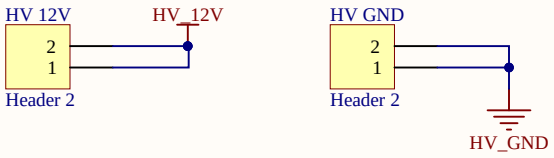
12V DC-DC Converter (Low Voltage Power)

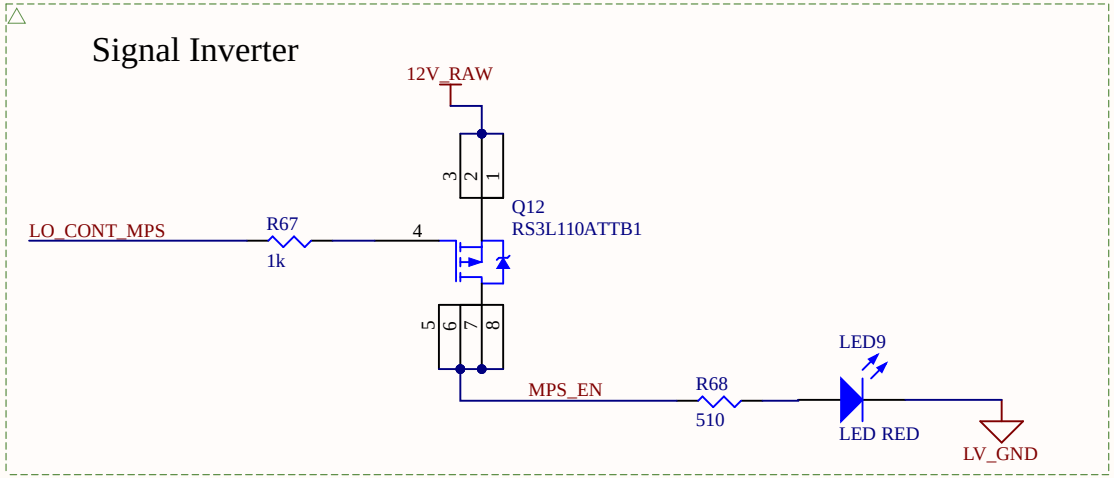


P3 is a backup if something is not working with the on board powerpath controller circuitry

Debug Header

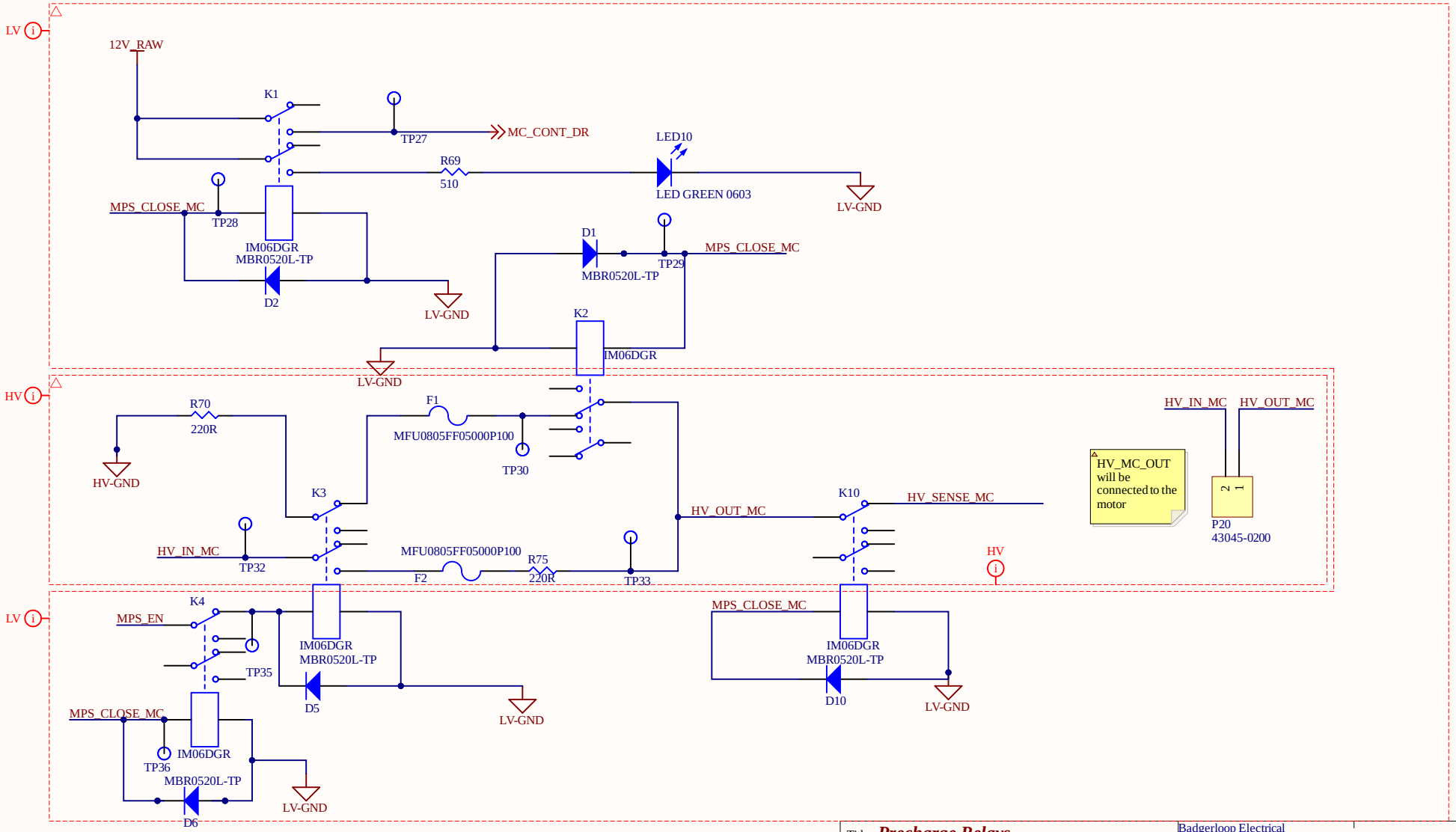


Title		
Size: A	Number	Revision
Date: 4/08/2023		Sheet of
File: C:\Users\..\12V dc-dc converter.SchDoc		Drawn By:



Title		
Size: A	Number	Revision
Date: 4/08/2023		Sheet of
File: C:\Users\..\inverter.SchDoc		Drawn By:

Motor Controller Precharge Relays



Title	***Precharge Relays***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:20 AM	Sheet 6 of 11
File: motor_controller_relays.SchDoc		

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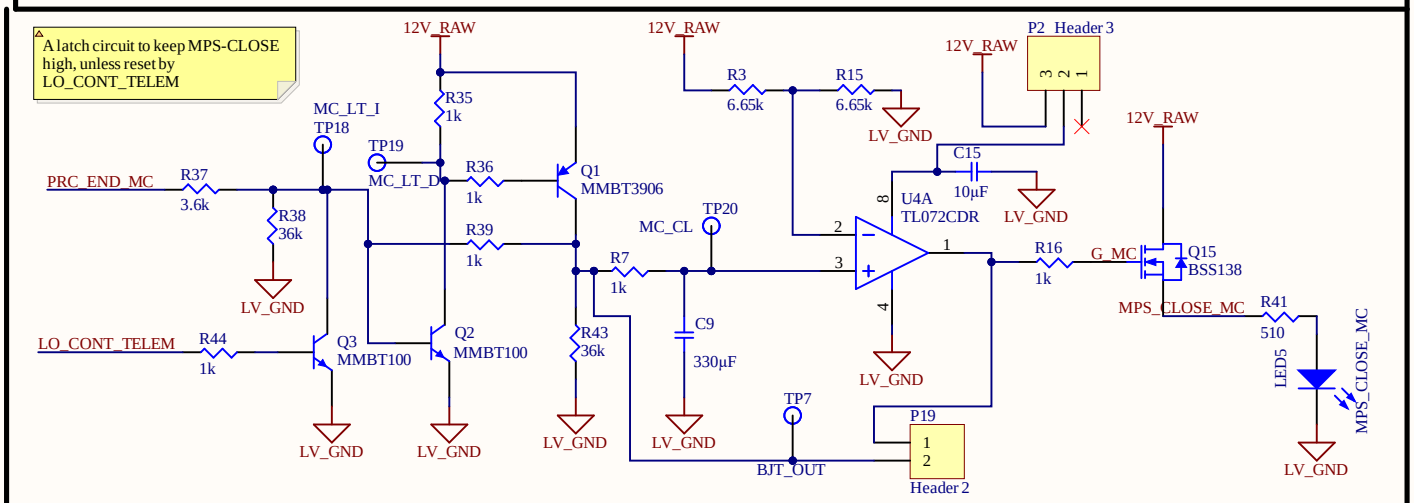
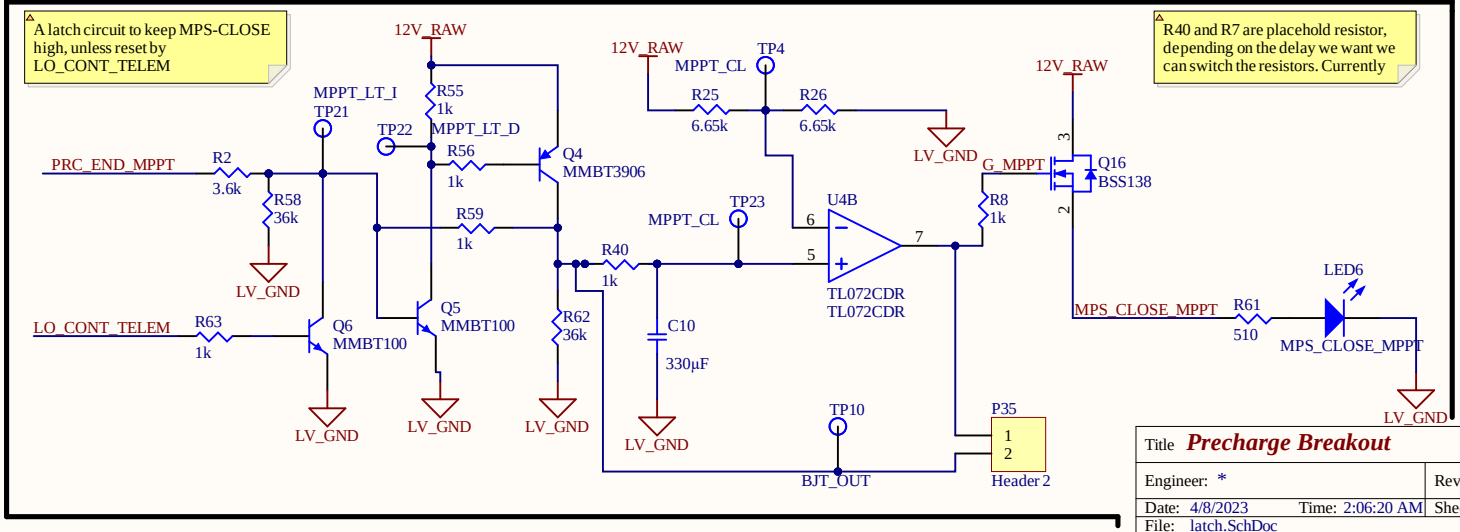
Option #1

Motor Controller



Solar Array PCB (MPPT)



Title	***Precharge Breakout***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:20 AM	Sheet 7 of 11
File: latch.SchDoc		

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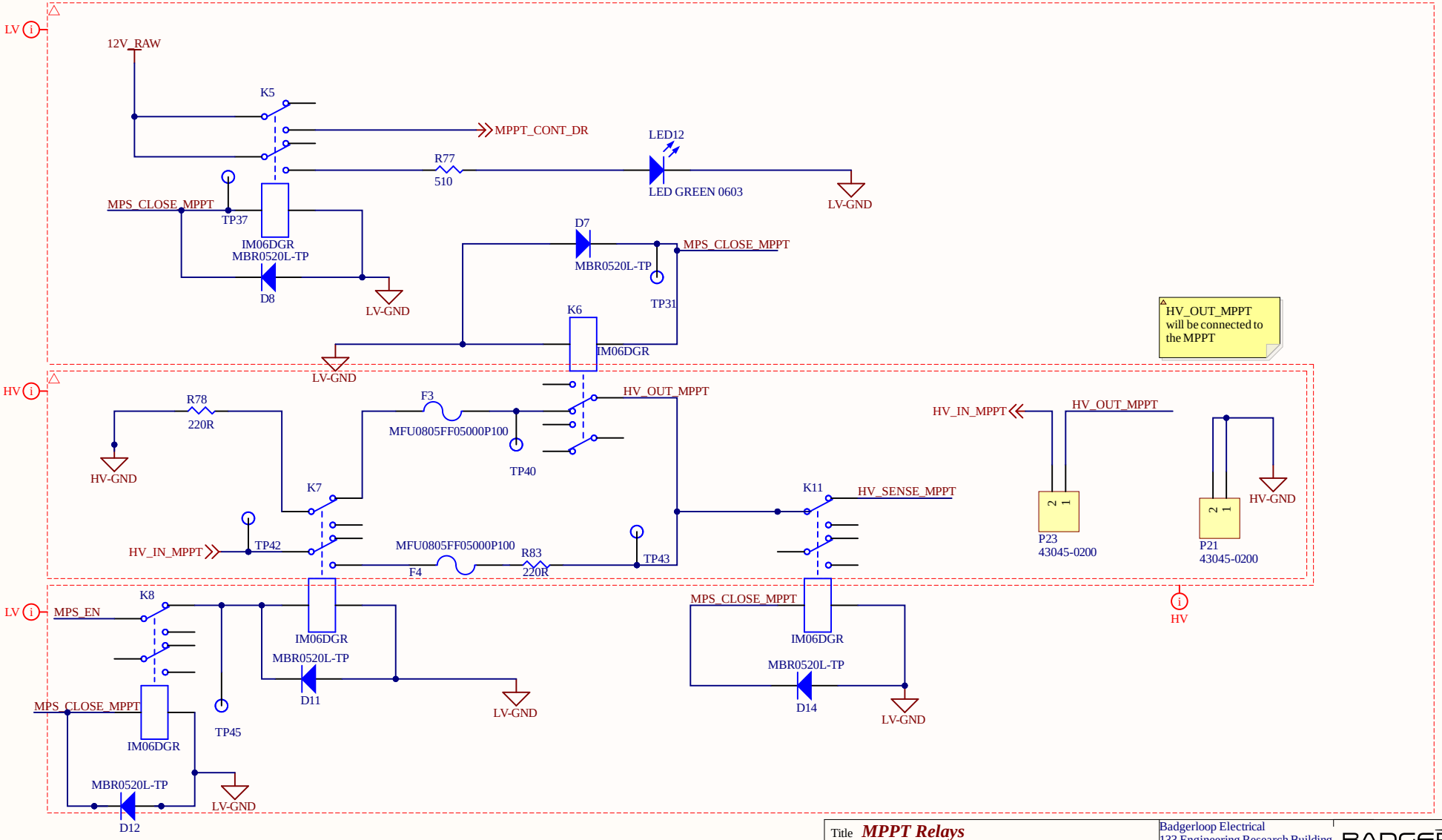
MPPT Precharge Relays



Title	***MPPT Relays***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:20 AM	Sheet 8 of 11
File: mppt_relays.SchDoc		

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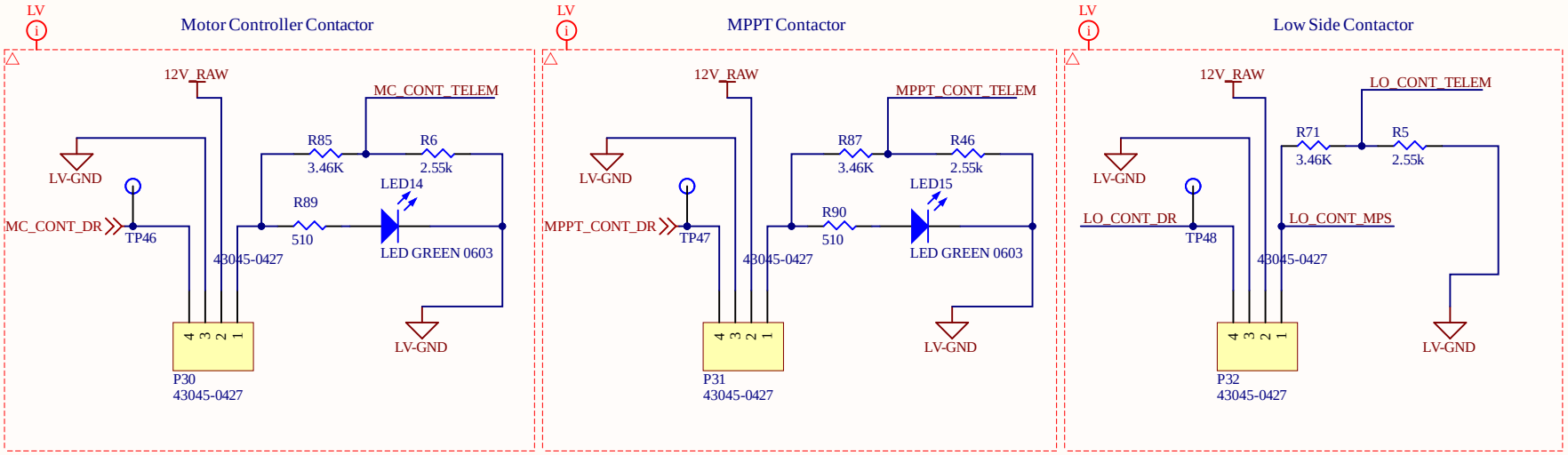
Main Power Switch



Title	***Main Power Switch***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:20 AM	Sheet 9 of 11
File: main_power_switch.SchDoc		

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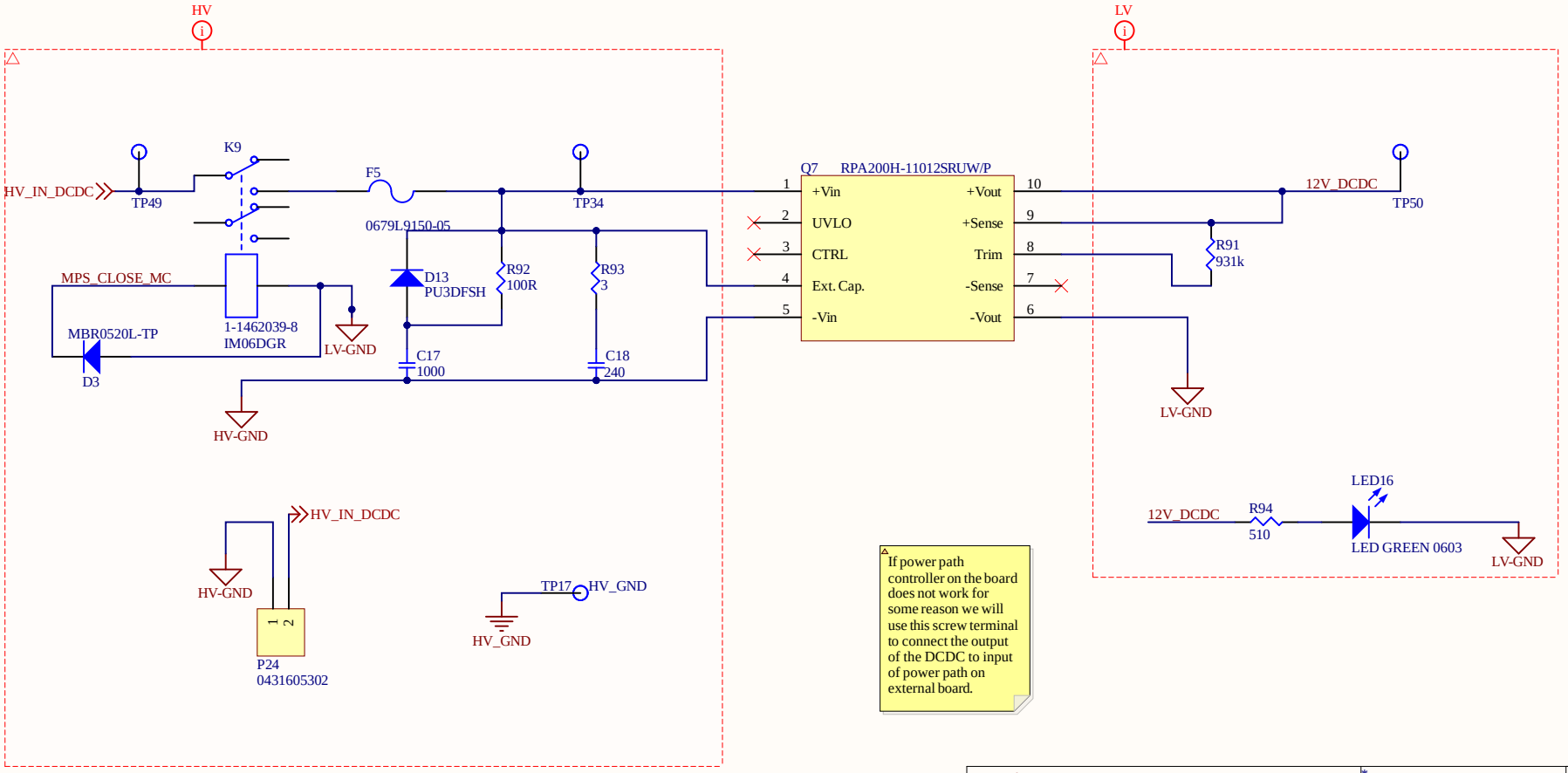
DC-DC Converter



Title *		
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:20 AM	Sheet10 of 11
File: dc_dc_converter.SchDoc		

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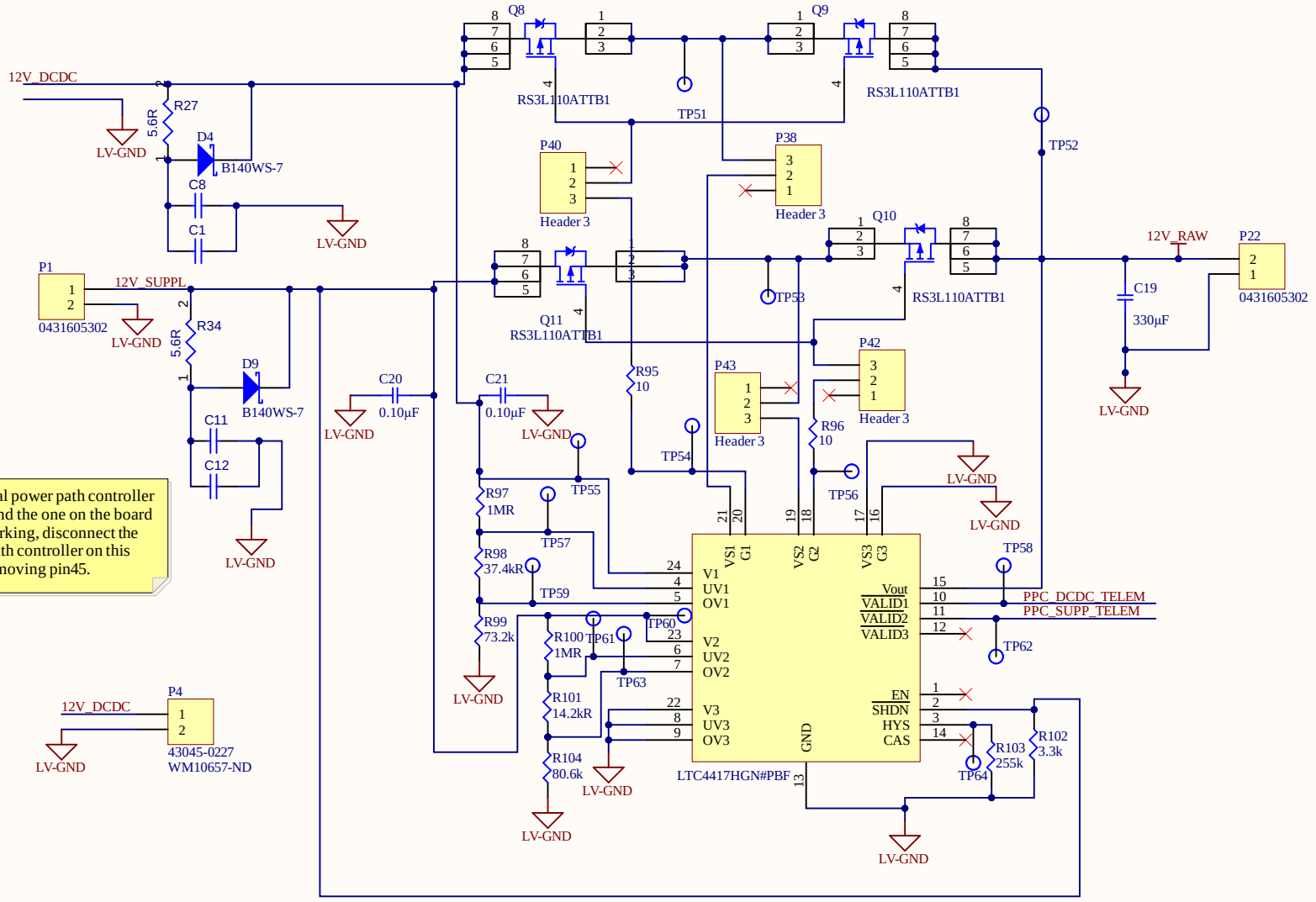
Powerpath Controller



Title	***Power Path Controller***	
Engineer: *		Revision:*
Date: 4/8/2023	Time: 2:06:21 AM	Sheet 11 of 11
File:	powerpath_controller.SchDoc	

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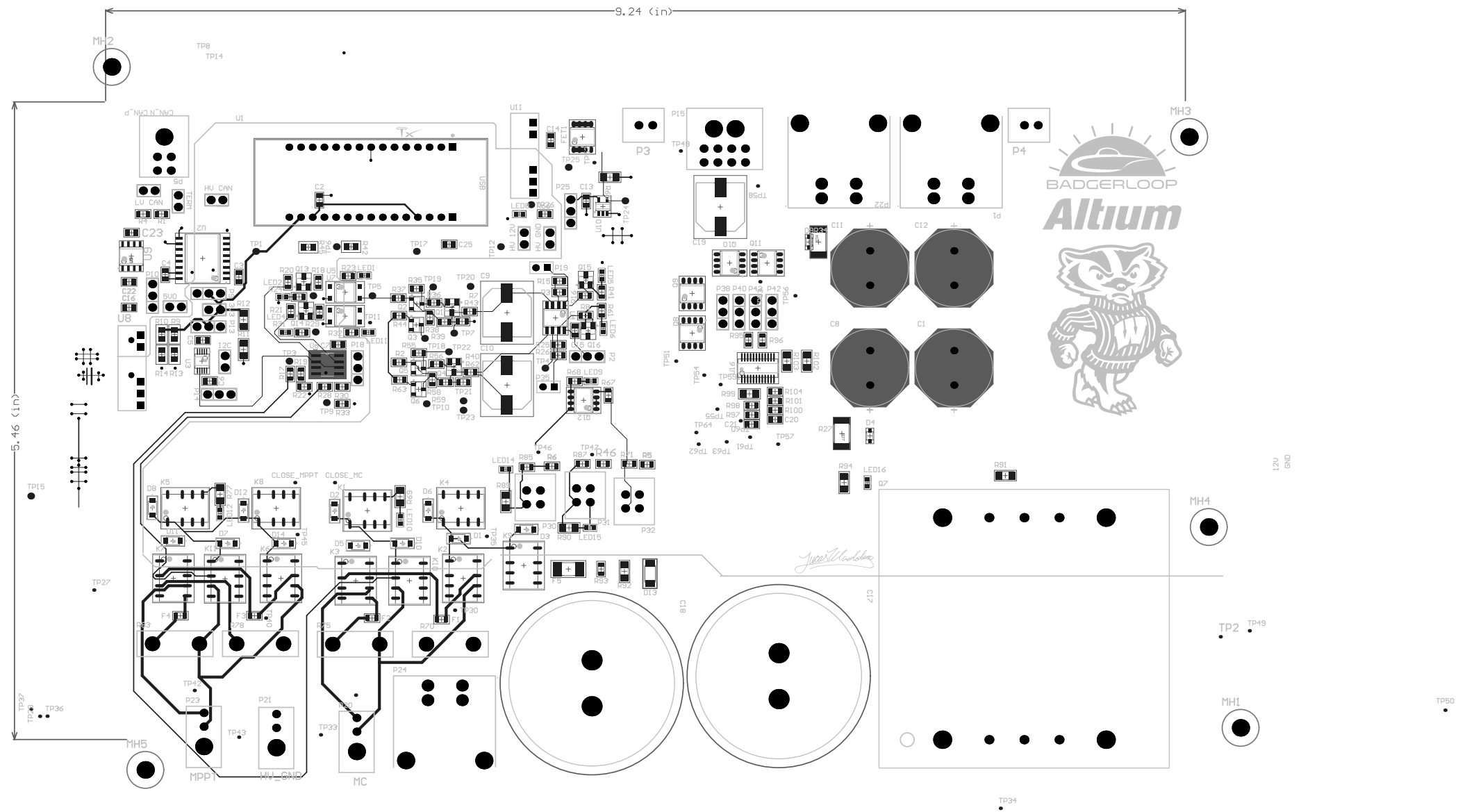
9.24 (in)
5.46 (in)
MH1
MH2
MH3
MH4
MH5
P3
P4
BADGERLOOP
Altium
MPPT
HV_GND
MC
CLOSE_MPPT
CLOSE_MC