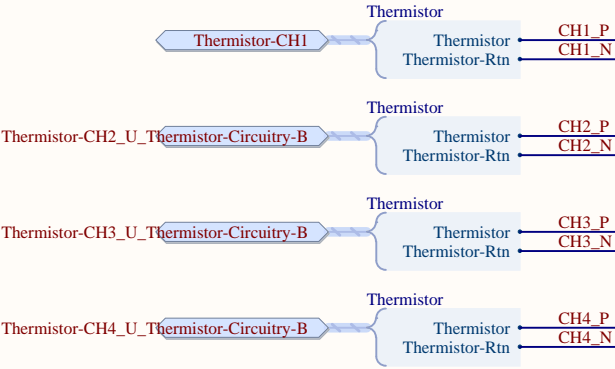
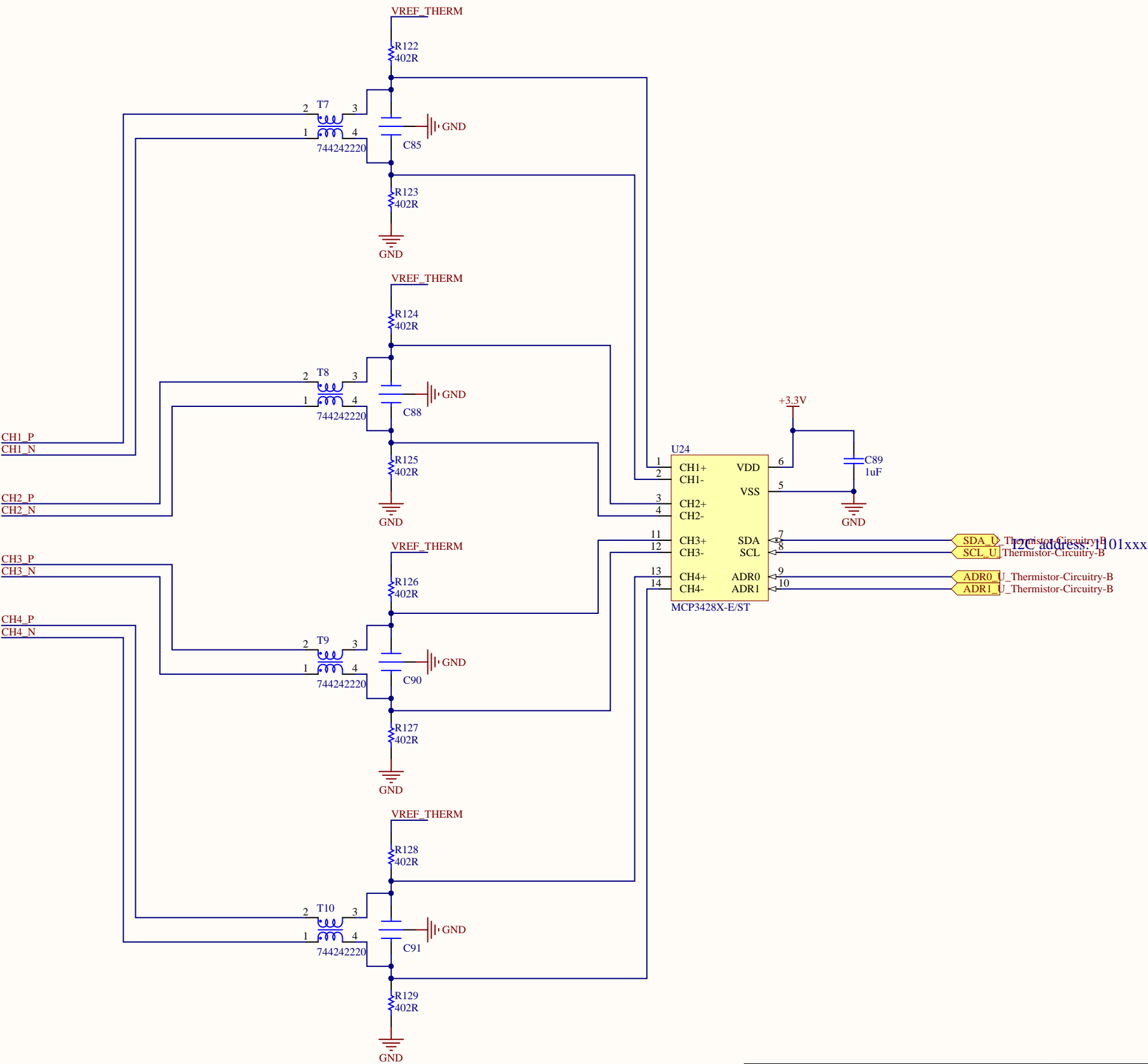
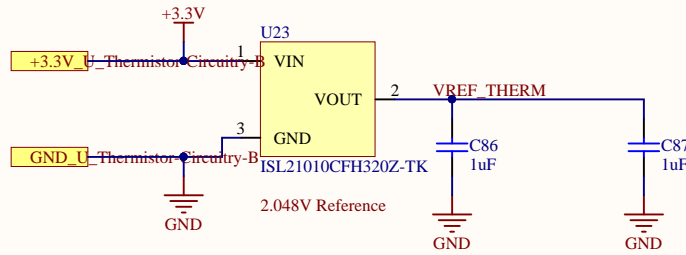
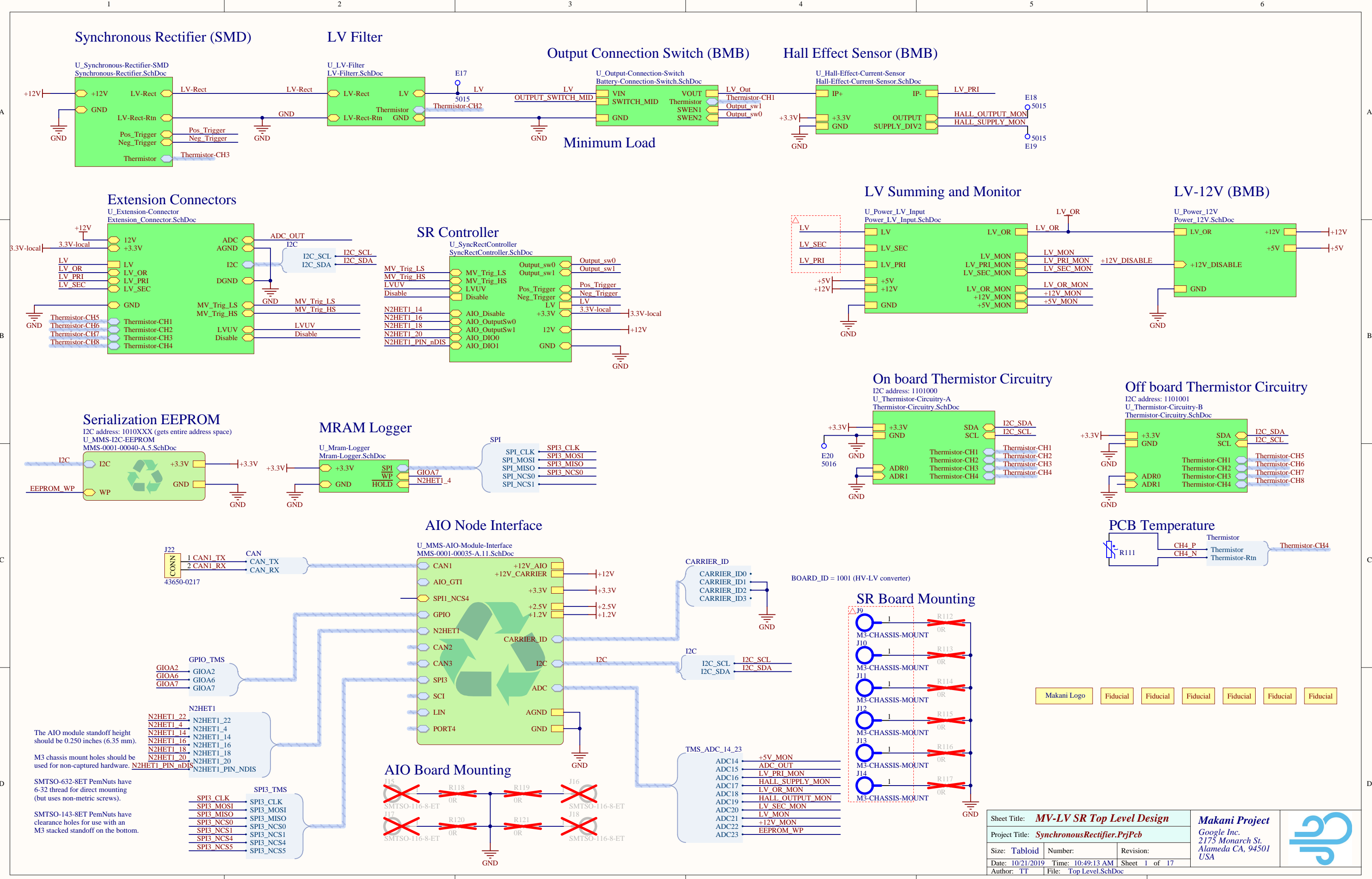


Thermistor Circuitry





AIO Node Interface

U_MMS-AIO-Module-Interface
MMS-0001-00035-A.11.SchDoc

CAN1

AIO_GT1

SPI1_NCS4

GPIO

N2HET1

CAN2

CAN3

SPI3

SCI

LIN

PORT4

+12V_AIO

+12V_CARRIER

+3.3V

+2.5V

+1.2V

CARRIER_ID

I2C

ADC

AGND

GND

CAN1

AIO_GT1

SPI1_NCS4

GPIO

N2HET1

CAN2

CAN3

SPI3

SCI

LIN

PORT4

+12V_AIO

+12V_CARRIER

+3.3V

+2.5V

+1.2V

CARRIER_ID

I2C

ADC

AGND

GND

CARRIER_ID

CARRIER_ID0

CARRIER_ID1

CARRIER_ID2

CARRIER_ID3

GND

I2C

I2C_SCL

I2C_SDA

I2C_SCL

I2C_SDA

TMS_ADC_14_23

ADC14

ADC15

ADC16

ADC17

ADC18

ADC19

ADC20

ADC21

ADC22

ADC23

+5V_MON

ADC_OUT

LV_PRI_MON

HALL_SUPPLY_MON

LV_OR_MON

HALL_OUTPUT_MON

LV_SEC_MON

LV_MON

+12V_MON

EEPROM_WP

PCB Temperature

R111

CH4_P

CH4_N

Thermistor

Thermistor-Rtn

Thermistor-CH4

SR Board Mounting

J9

J10

J11

J12

J13

J14

M3-CHASSIS-MOUNT

M3-CHASSIS-MOUNT

M3-CHASSIS-MOUNT

M3-CHASSIS-MOUNT

M3-CHASSIS-MOUNT

M3-CHASSIS-MOUNT

R112

R113

R114

R115

R116

R117

0R

0R

0R

0R

0R

0R

GND

AIO Board Mounting

J15

J16

J17

J18

SMTSO-116-8-ET

SMTSO-116-8-ET

SMTSO-116-8-ET

SMTSO-116-8-ET

R118

R119

R120

R121

0R

0R

0R

0R

GND

GPIO_TMS

GIOA2

GIOA6

GIOA7

N2HET1

N2HET1_22

N2HET1_4

N2HET1_14

N2HET1_16

N2HET1_18

N2HET1_20

N2HET1_PIN_nDIS

N2HET1_PIN_NDIS

SPI3_TMS

SPI3_CLK

SPI3_MOSI

SPI3_MISO

SPI3_NCS0

SPI3_NCS1

SPI3_NCS4

SPI3_NCS5

SPI3_CLK

SPI3_MOSI

SPI3_MISO

SPI3_NCS0

SPI3_NCS1

SPI3_NCS4

SPI3_NCS5

The AIO module standoff height should be 0.250 inches (6.35 mm).

M3 chassis mount holes should be used for non-captured hardware.

SMTSO-632-8ET PemNuts have 6-32 thread for direct mounting (but uses non-metric screws).

SMTSO-143-8ET PemNuts have clearance holes for use with an M3 stacked standoff on the bottom.

Sheet Title: **MV-LV SR Top Level Design**

Project Title: **SynchronousRectifier.PrjPcb**

Size: **Tabloid** Number: Revision:

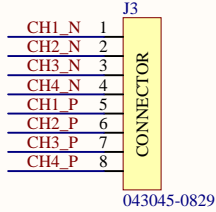
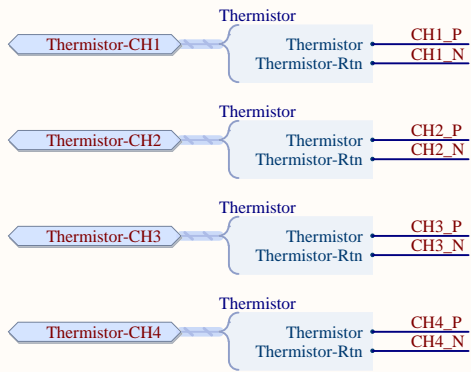
Date: **10/21/2019** Time: **10:49:13 AM** Sheet **1** of **17**

Author: **TT** File: **Top Level.SchDoc**

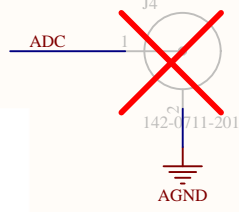
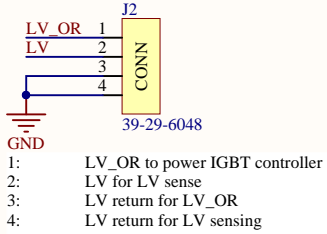
Makani Project

Google Inc.
2175 Monarch St.
Alameda CA, 94501
USA

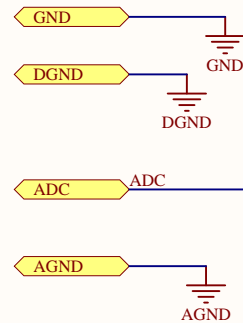
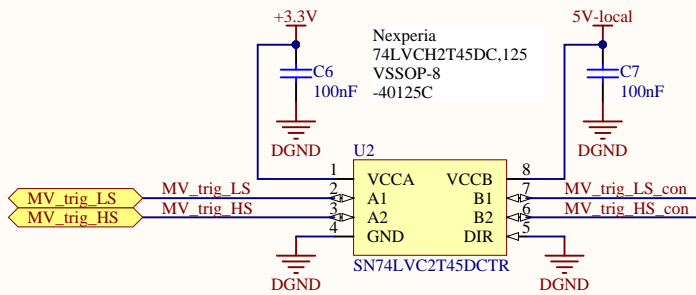
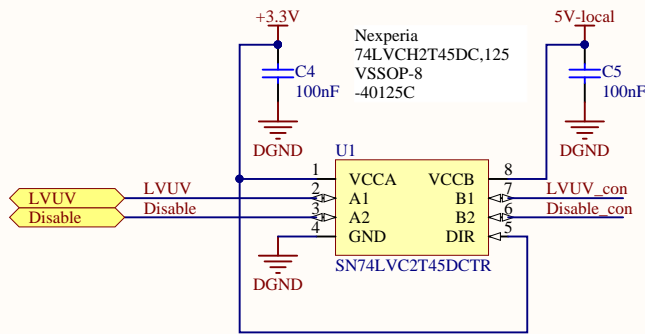
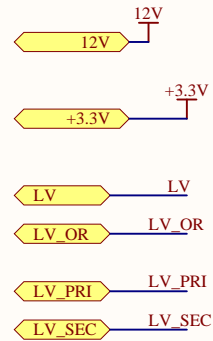
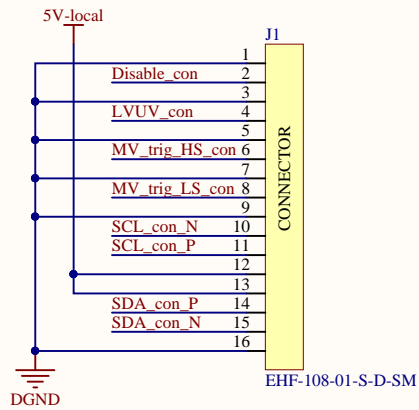




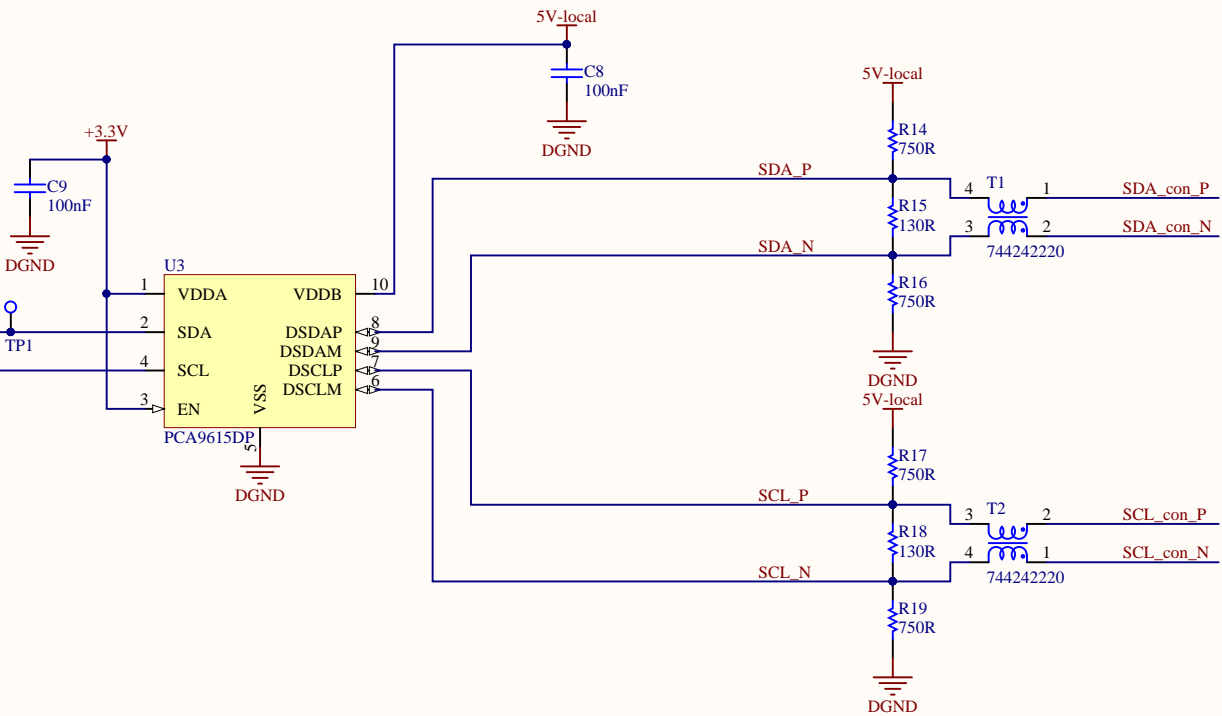
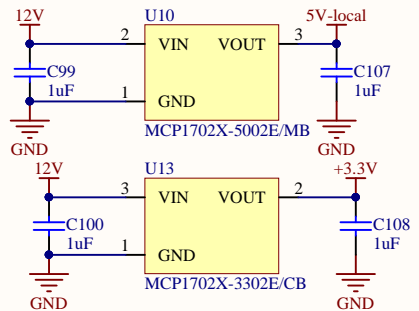
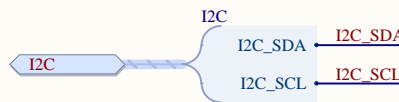
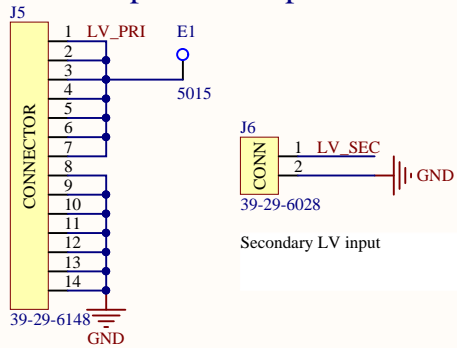
IGBT Controller connector (LV)



IGBT Controller connector (signal)

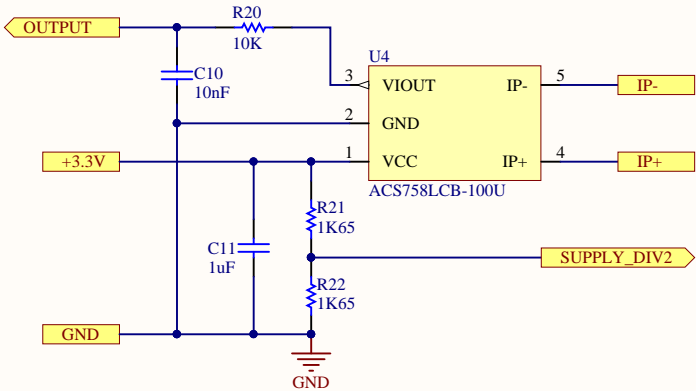


LV input and output



Sheet Title: *		
Project Title: SynchronousRectifier.PrjPcb		
Size: Tabloid	Number:	Revision:
Date: 10/21/2019	Time: 10:49:13 AM	Sheet 2 of 17
Author: *	File: Extension_Connector.SchDoc	

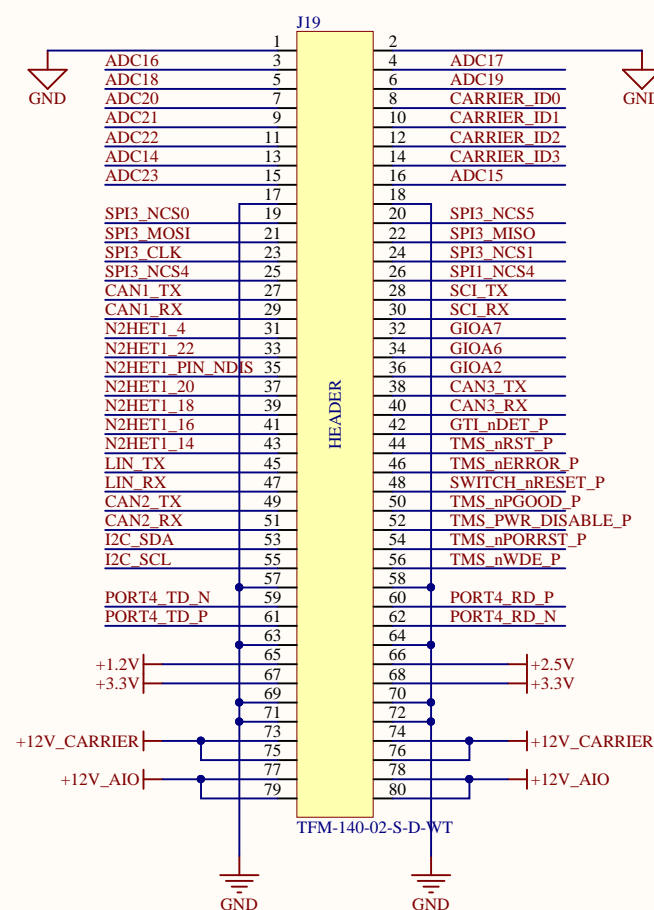
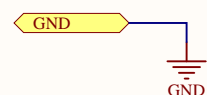
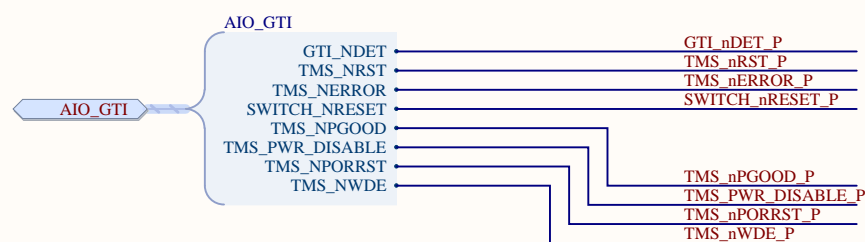
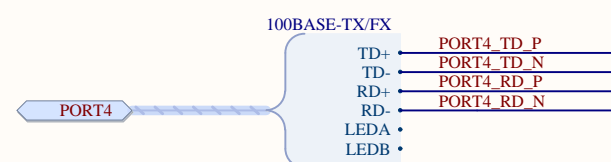
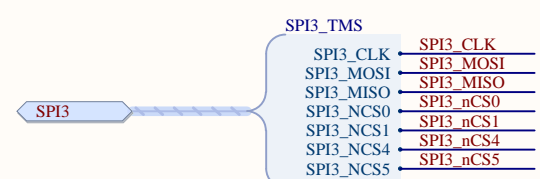
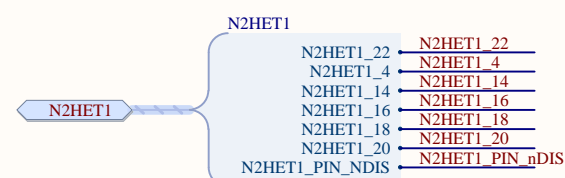




AIO filter: 51 Ohm 1nF, f0 =3.12MHz

10 kOhm 10nF, f0 =1.59kHz

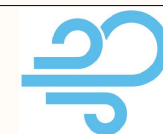
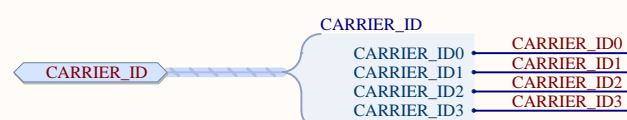
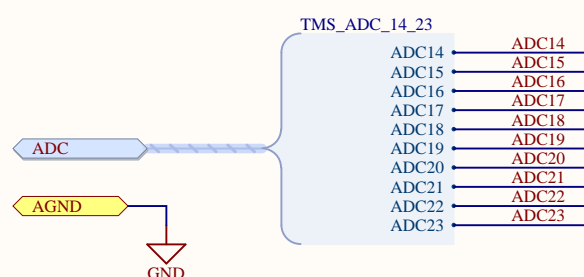
Hall Effect Sensor



CARRIER_ID encodes the type of carrier board.
Pins should be grounded (0) or left floating (1).
No carrier board = 1111

NOTES ON POWER

- +1.2V: For monitoring only.
- +2.5V: For PORT4 ethernet bias and monitoring only.
- +3.3V: Limit current to 250 mA (needs verification).
- +12V_CARRIER: Supplied by the carrier board to the AIO board.
- +12V_AIO: Supplied by the AIO board to the carrier board.

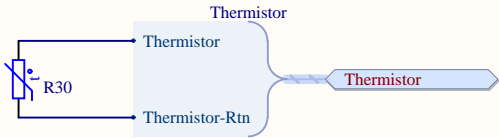
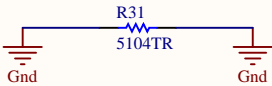
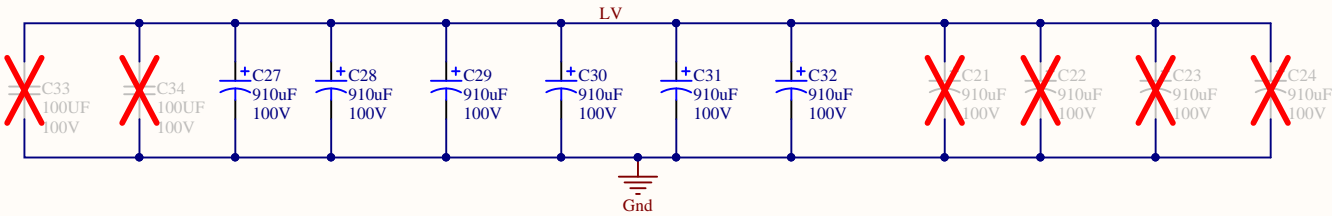


Film Cap 1(R60EW61005000K)
100uF 100V, 37.5mm, 41.50mm x 20.00mm x 41mm, -55°C ~ 105°C, PE&PET, \$12.57

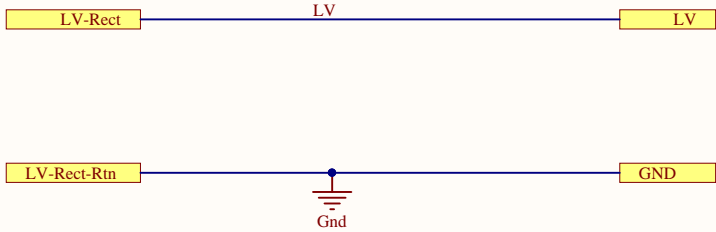
Film Cap 2 (B32526R3686K) CMP-0174-00328-1
68uF 250V, 37.5mm, 28.0mm x 42.5mm x 41.5mm, -55°C ~ 125°C, PE&PET, \$21.03

Film Cap 3(C4ATDBW5600A30J) CMP-0192-00004-2
60uF 250V, 52.5mm, 57.50mm x 35.00mm x 50mm, -40°C ~ 85°C, PP, \$11.17

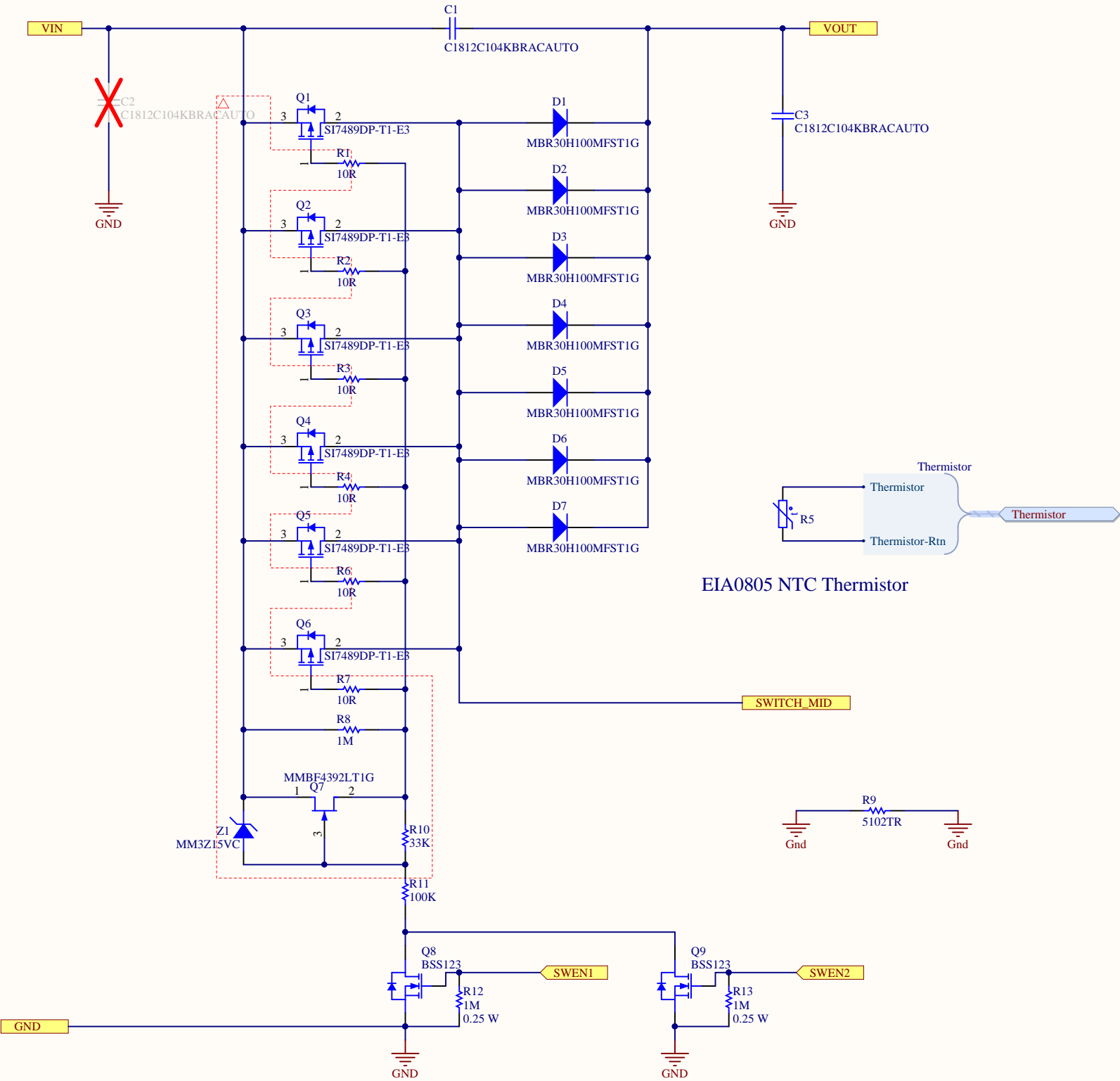
Al Cap (EGPD101ELL911MM40H)
910uF 100V, 7.5mm, 18.0mm x 41.5mm, 2000 Hrs @ 135°C, \$4.51

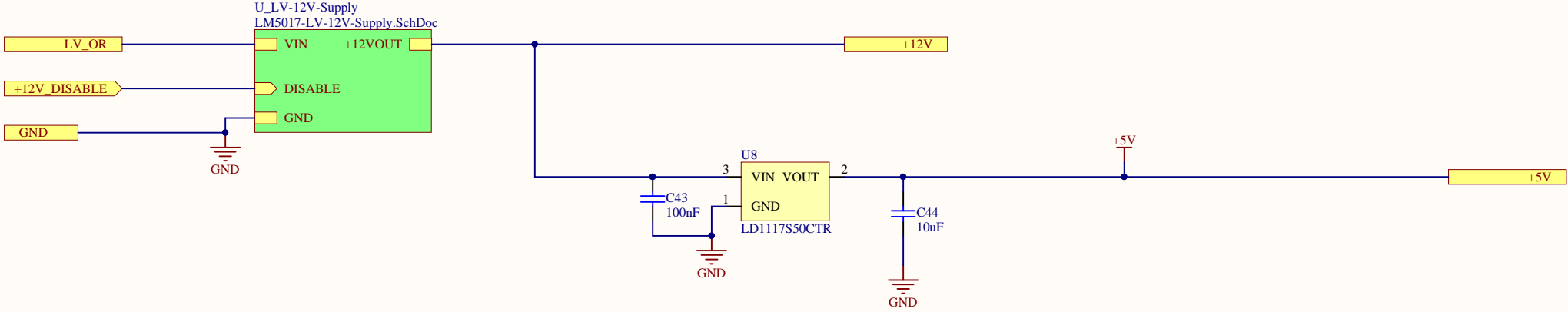


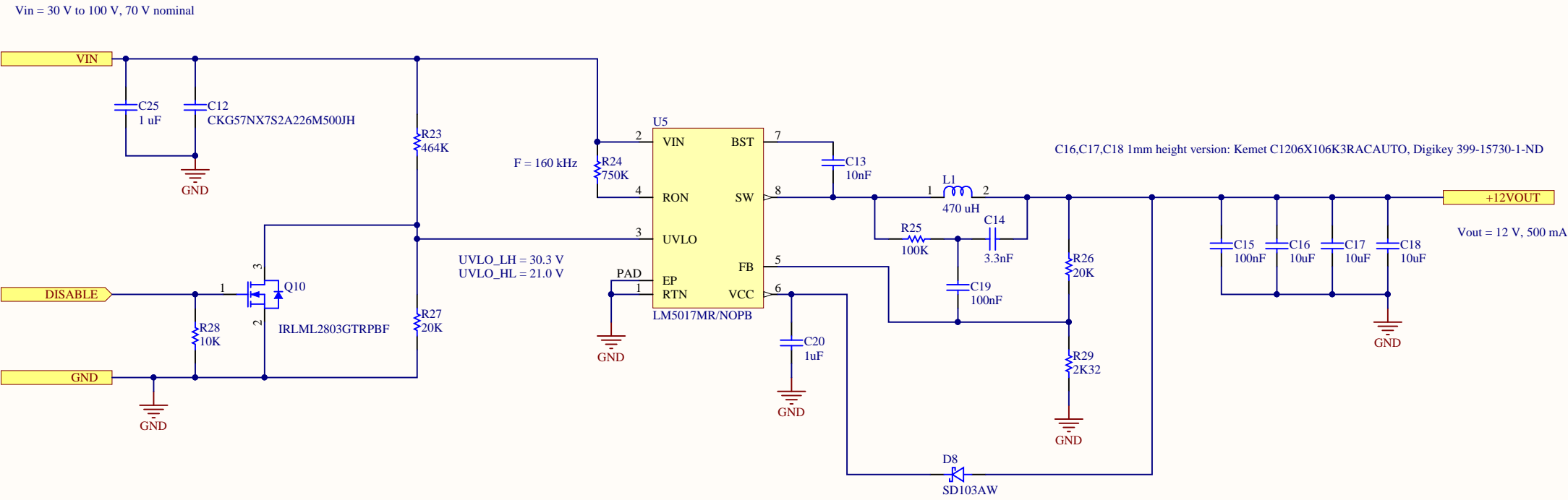
EIA1206 NTC Thermistor



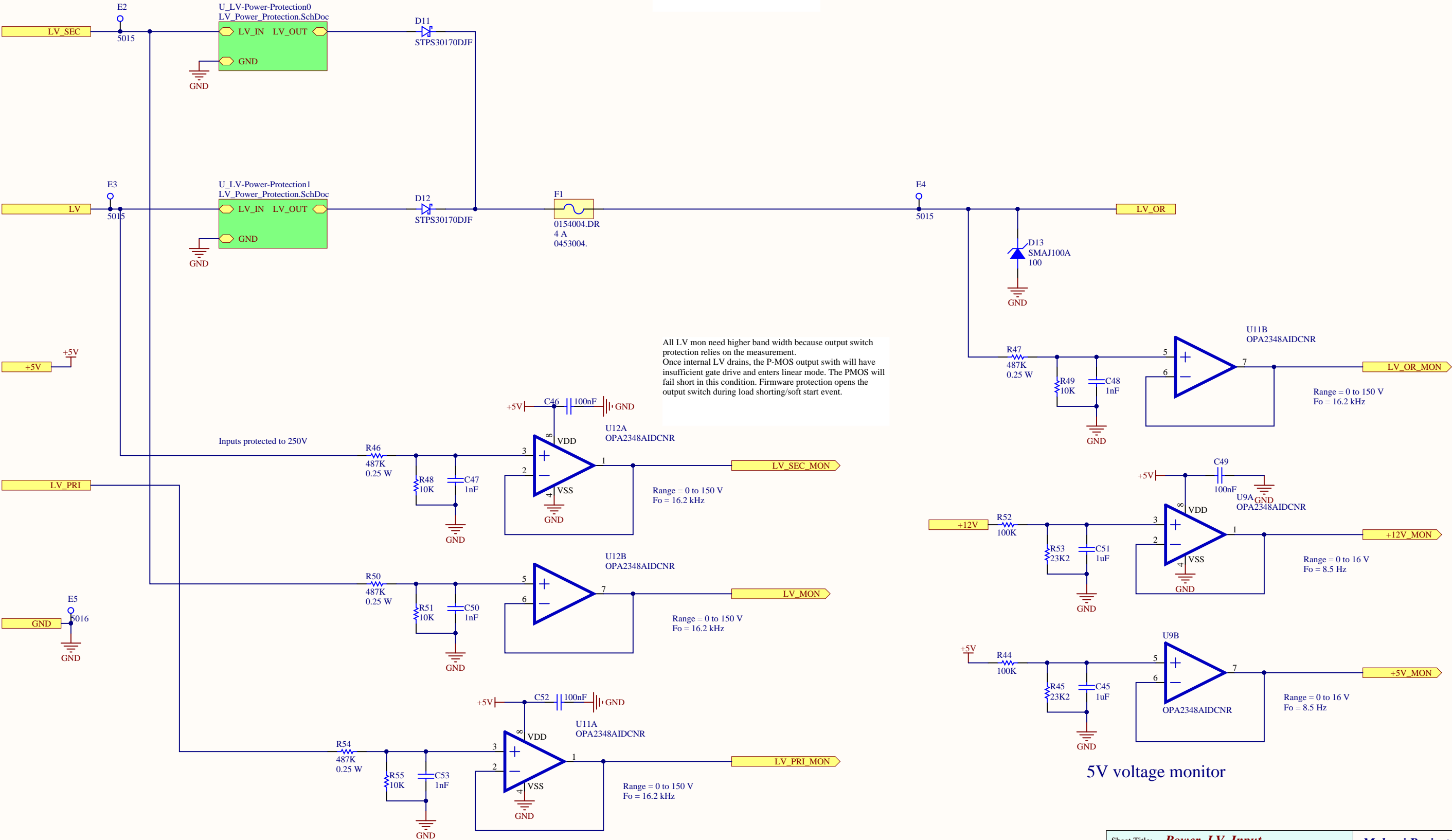
Battery Connection Switch





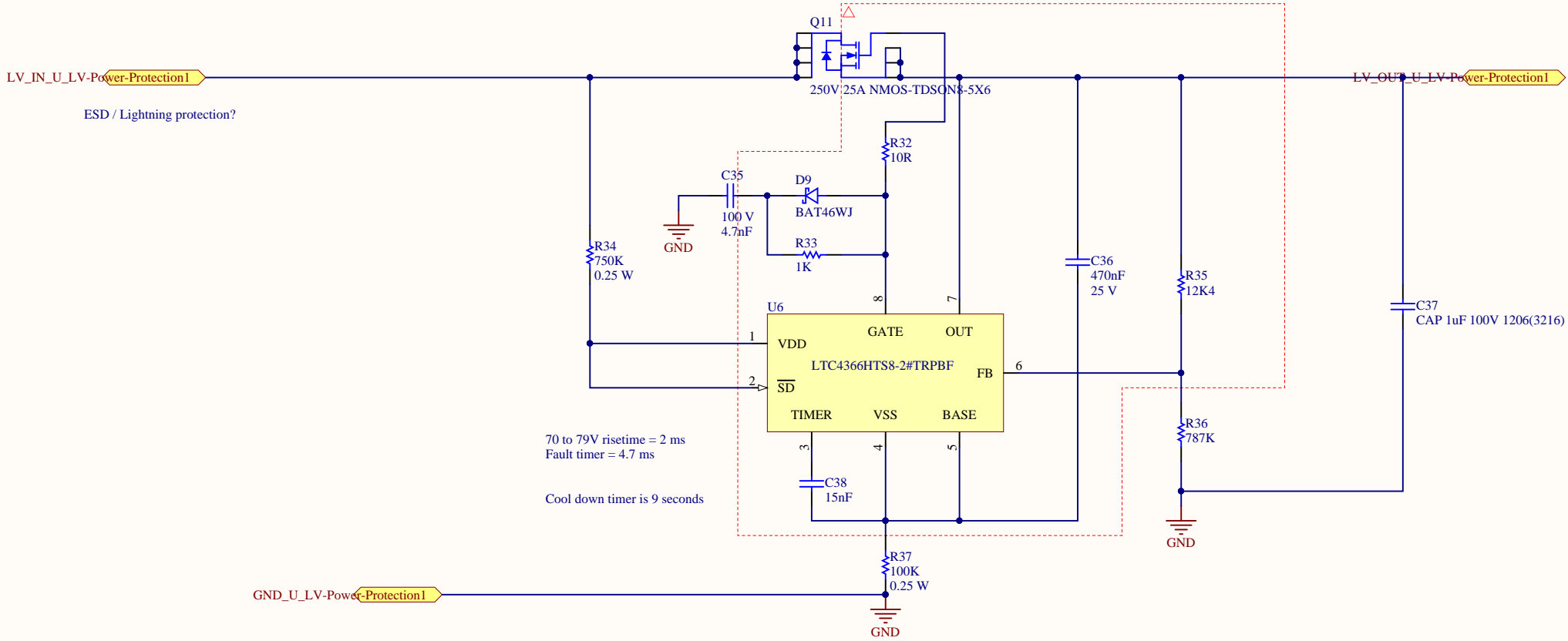


Power LV input:
Modified based on
BMB-AIO-Carrier version AB



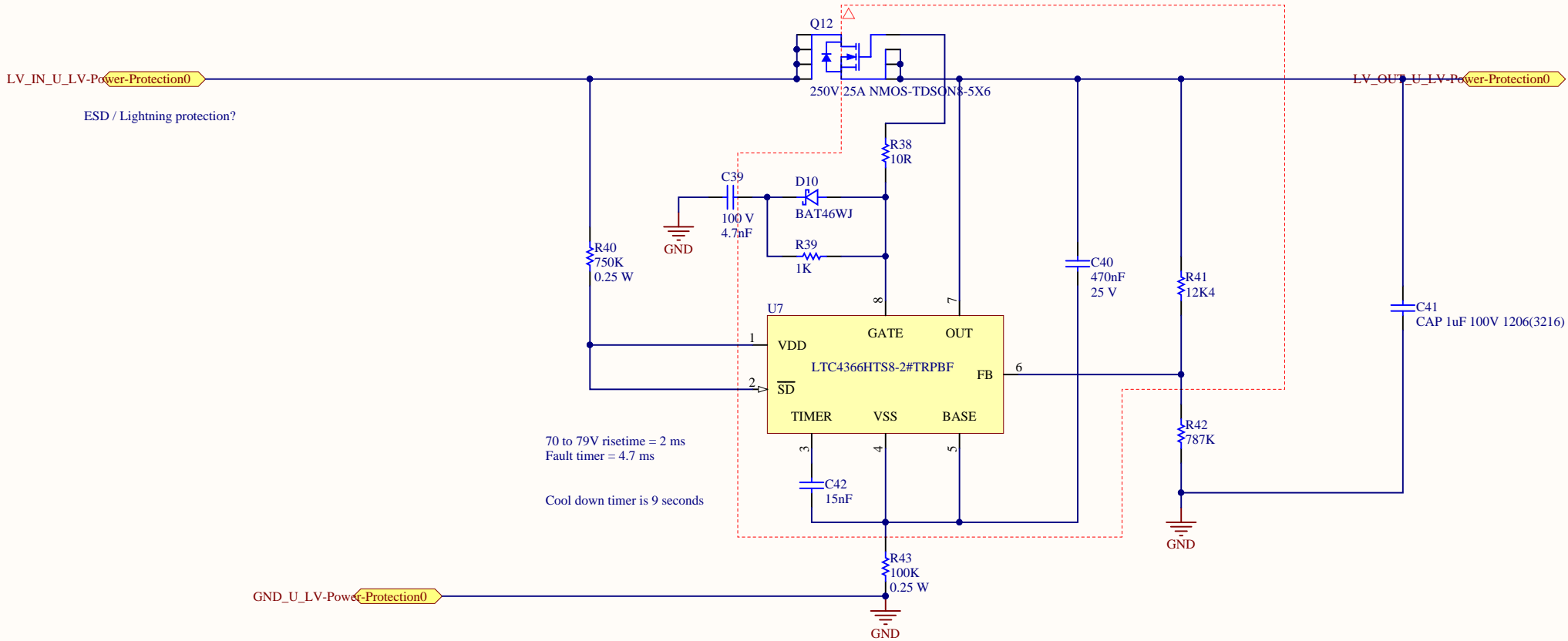
Maximum transient overvoltage = 200 V
Maximum continuous voltage = 87.5 V
Minimum voltage = 31 V

Output clamp voltage = 89.2 V (min = 87.5 V, max = 91.0 V)

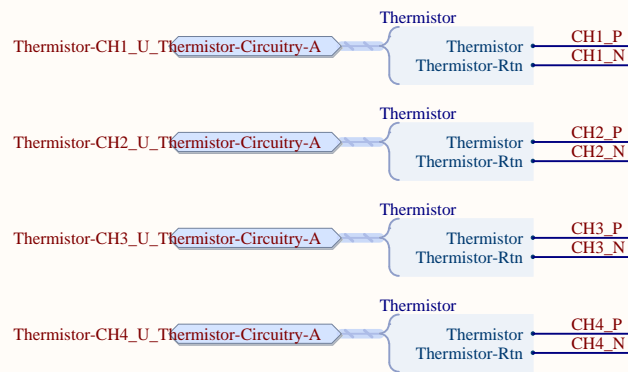
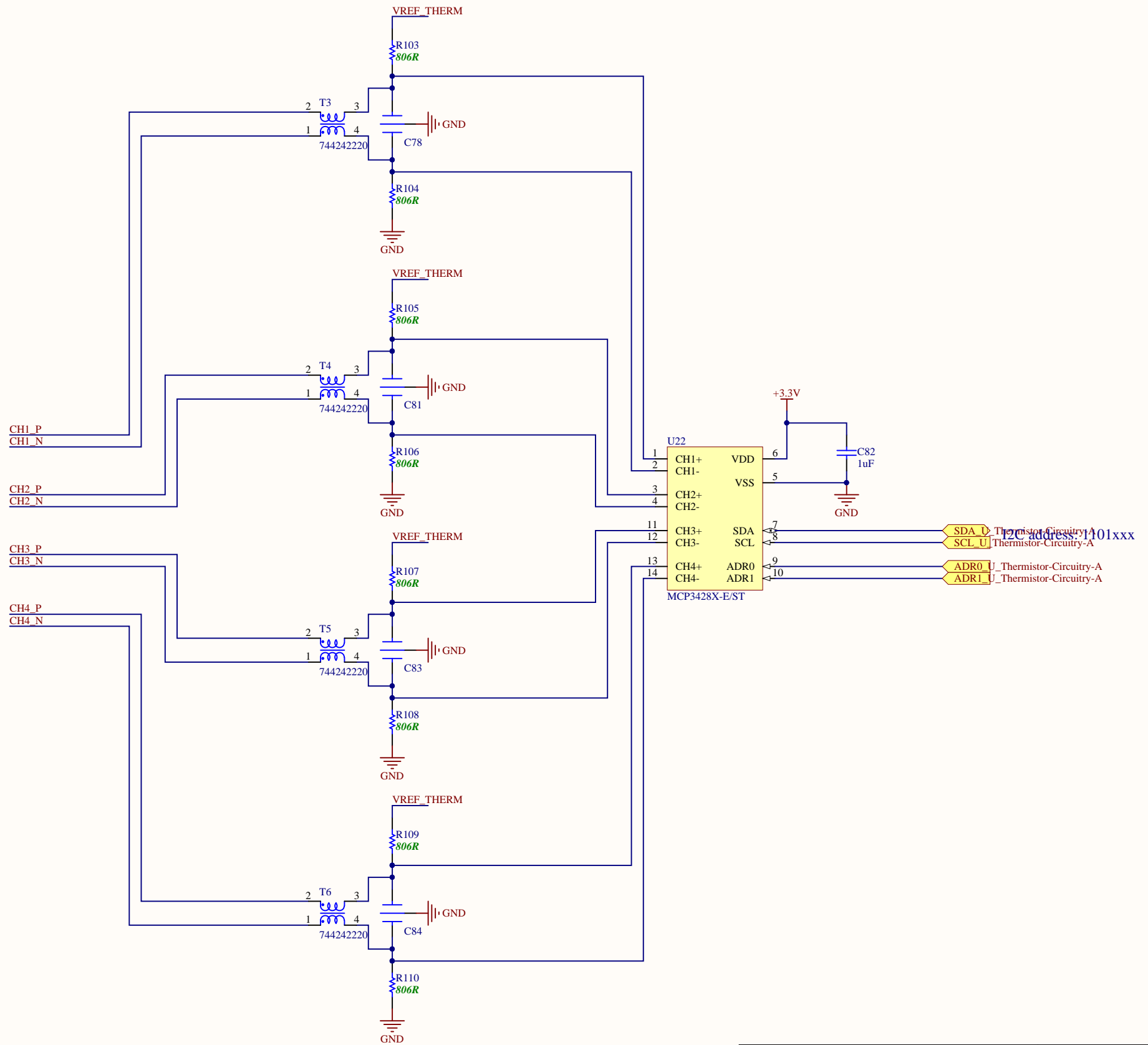
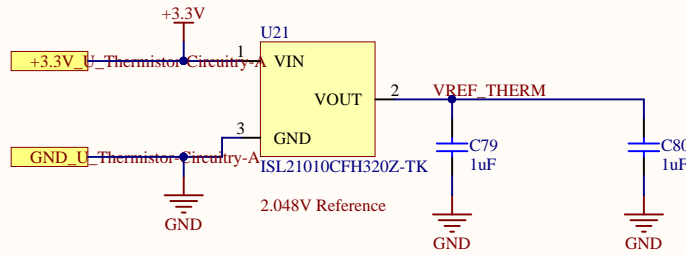



Maximum transient overvoltage = 200 V
Maximum continuous voltage = 87.5 V
Minimum voltage = 31 V

Output clamp voltage = 89.2 V (min = 87.5 V, max = 91.0 V)



Thermistor Circuitry



Sheet Title: <i>Thermistor-Circuitry</i>			<i>Makani Project</i> Google Inc. 2175 Monarch St. Alameda CA, 94501 USA	
Project Title: <i>SynchronousRectifier.PrjPcb</i>				
Size: Tabloid	Number:	Revision:		
Date: 10/21/2019	Time: 10:49:14 AM	Sheet 20 of 17		
Author: *	File: Thermistor-Circuitry.SchDoc			

