

1 2 3 4

A


BRAKING IO

B

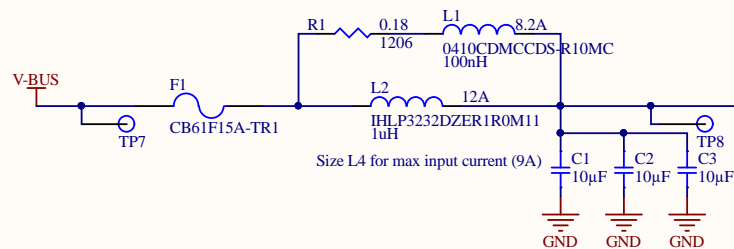
POD 5

C

REV 1

Title <i>Braking IO PCB</i>		Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706		
Engineer:		Revision:		
Date: 9/8/2019	Time: 6:53:06 PM	Sheet	of	
File: braking_io.SchDoc				

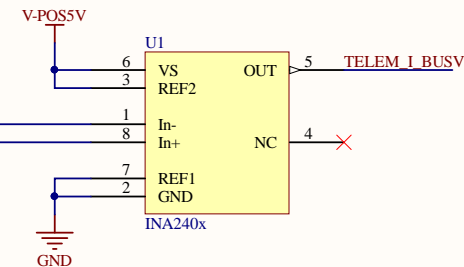
should change upstream fuse to be higher current rating than downstream.



BUS_FILTER

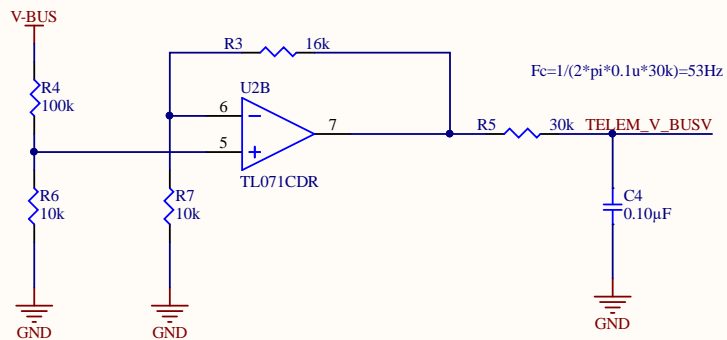
Filter design reference: <http://www.ti.com/lit/an/snva538/snva538.pdf>
<http://ece.colorado.edu/~rwe/papers/APEC99.pdf>

Max current draw: 9A -> $9A \cdot 0.01\Omega = 0.09V$
 INA Gain: 200V/V -> 4.0V at Max current
 Power: $I^2 \cdot R = 4A \cdot 0.01 = 0.04W$



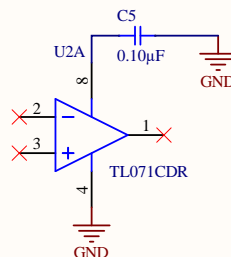
CURRENT TELEM


Max current draw: 9A -> $9A \cdot 0.002\Omega = 0.018V$
 INA Gain: 200V/V -> 3.6V at Max current
 Power: $I^2 \cdot R = 4A \cdot 0.01 = 0.04W$

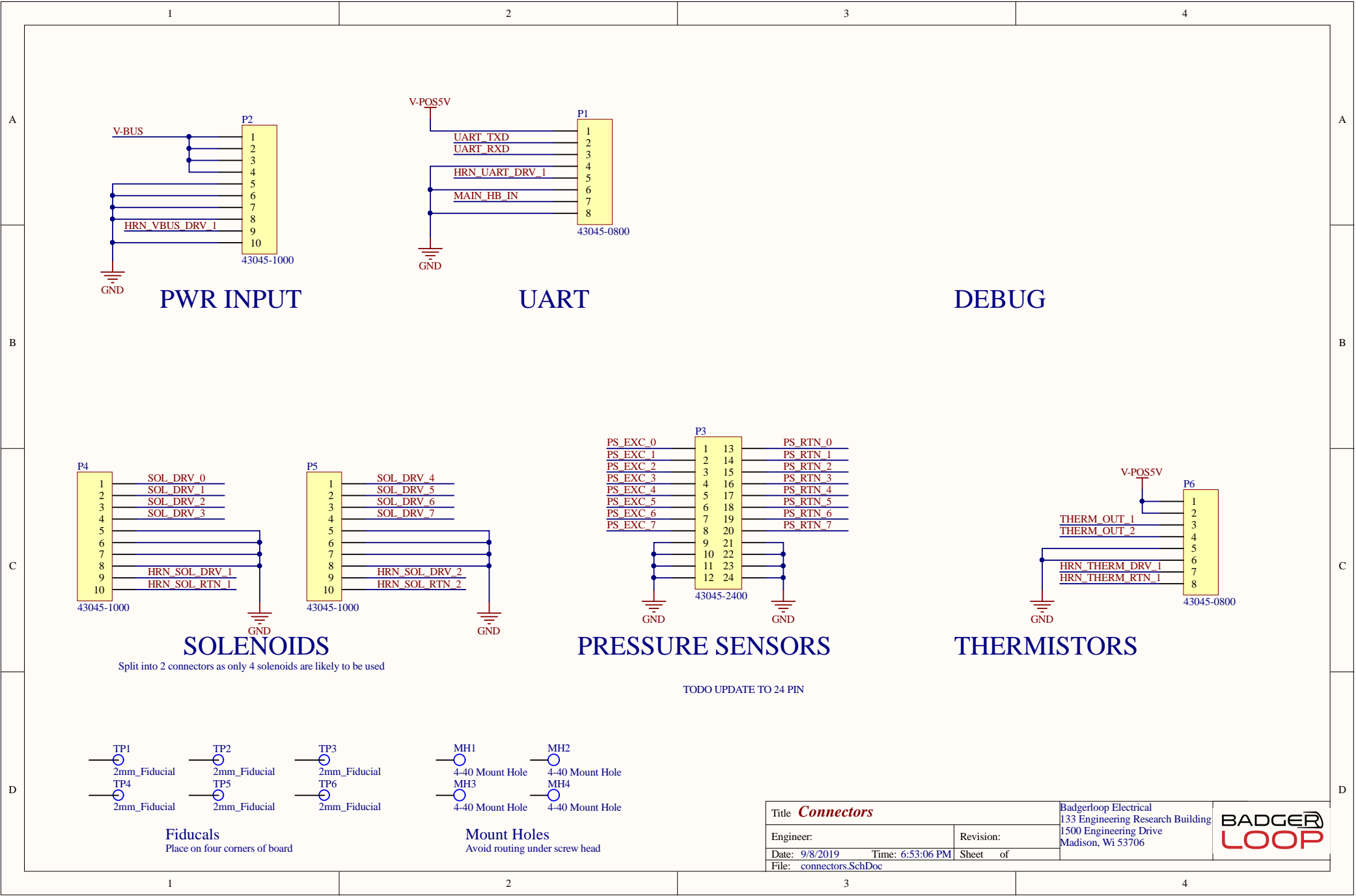


GAIN: 1.6V/V
 MIN BUS VOLTAGE: 20V -> 1.82V
 MIN BUS VOLTAGE: 28V -> 2.54V

VOLTAGE TELEMETRY

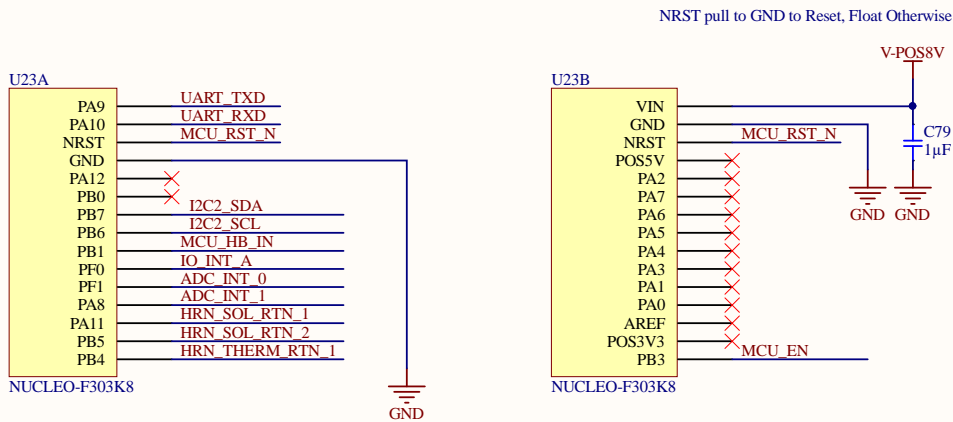


Title			Badgerloop Electrical		
Engineer:			133 Engineering Research Building		
Revision:			1500 Engineering Drive		
Date: 9/8/2019			Madison, WI 53706		
Time: 6:53:06 PM					
File: bus_filter.SchDoc			Sheet of		

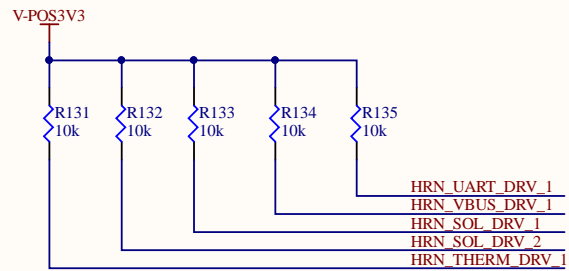


Title Connectors		Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706	
Engineer:	Revision:	Sheet of	
Date: 9/8/2019	Time: 6:53:06 PM		
File: connectors.SchDoc			

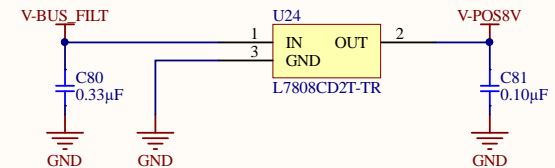




MCU BREAKOUT

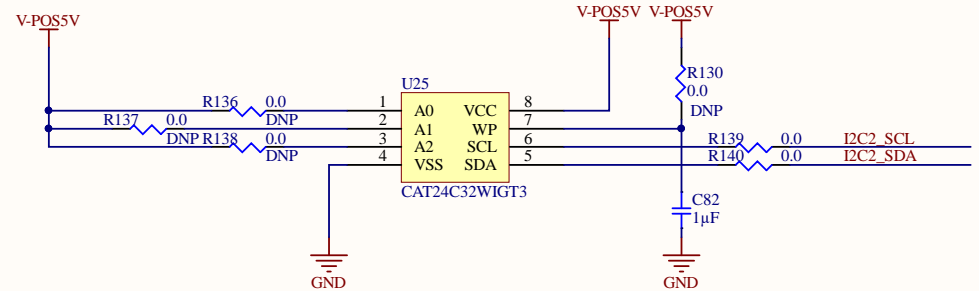


HARNESS ID



Fixed output, 1A Max (MCU 800mA Max)

8V LDO



I2C Address: 0x50h

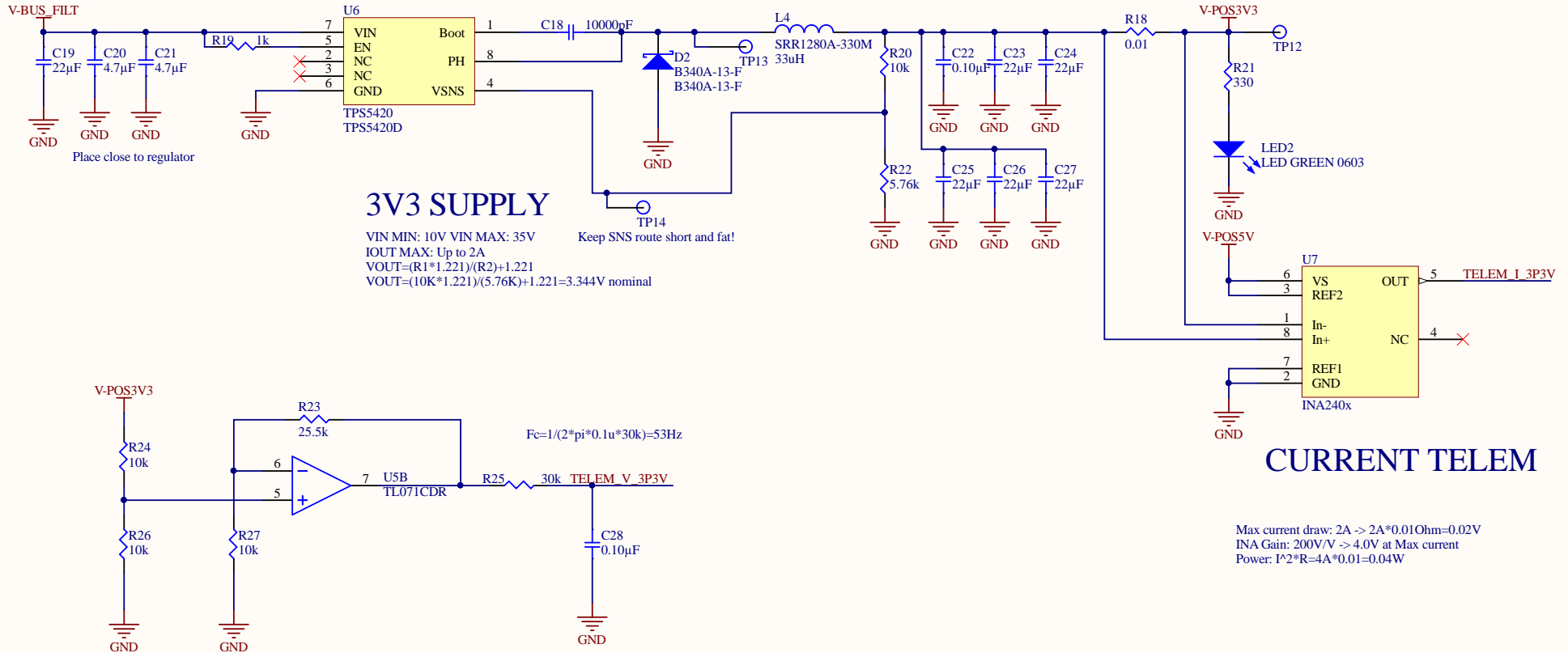
I2C EEPROM


Title Microcontroller		Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706	
Engineer:	Revision:		
Date: 9/8/2019	Time: 6:53:06 PM		
File: mcu.SchDoc	Sheet of		

Notes:
Follow layout reference design
Place bypass caps close to regulator
Keep hot loops as short as possible
Possible to replace ceramic bulk cap with a tantalum.

Replace with Tantalum?
Place close to regulator
See https://github.com/badgerloop-software/hardware/tree/master/braking_io/design

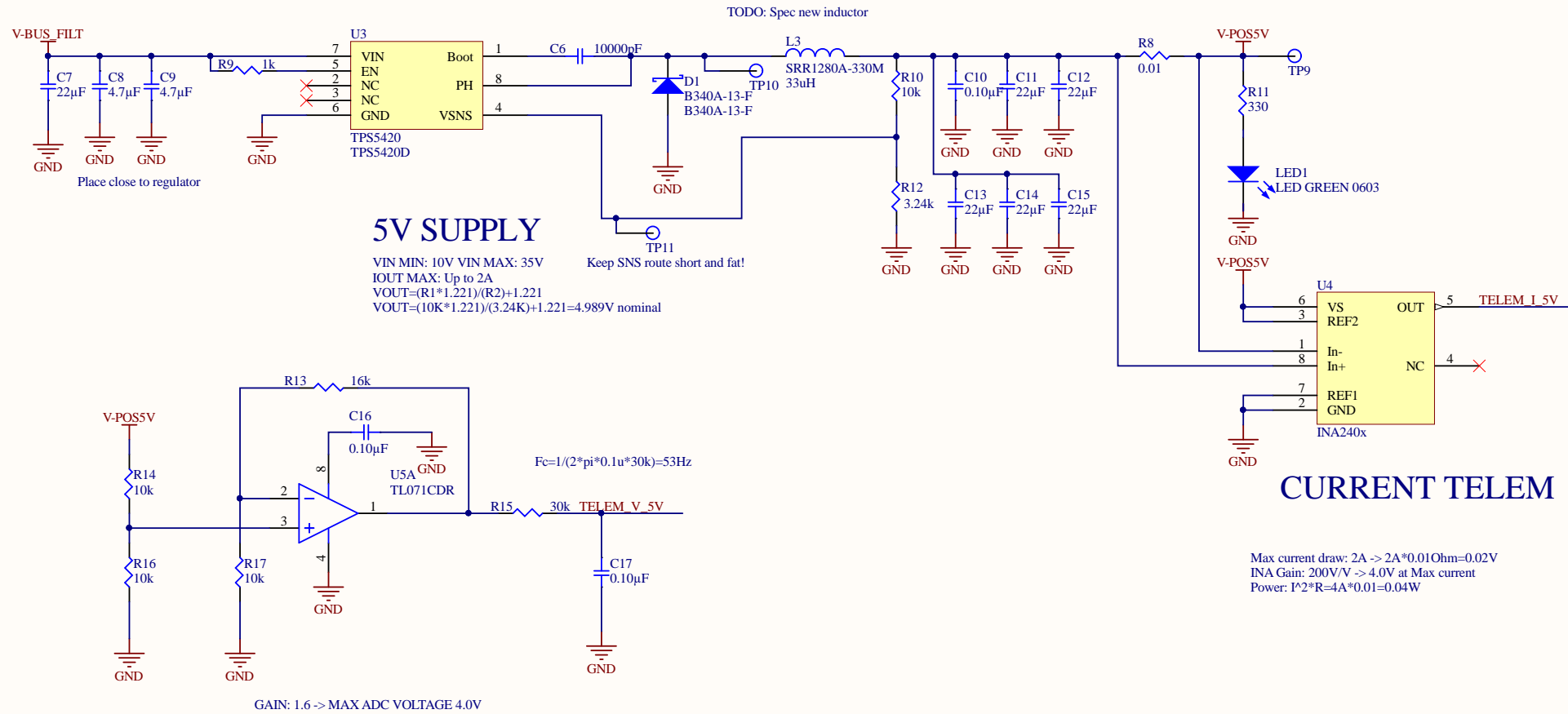
TODO: Spec new inductor




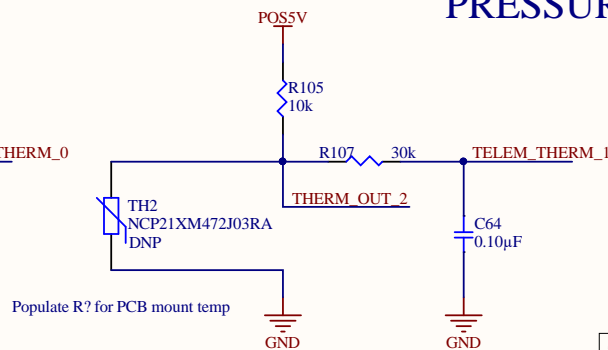
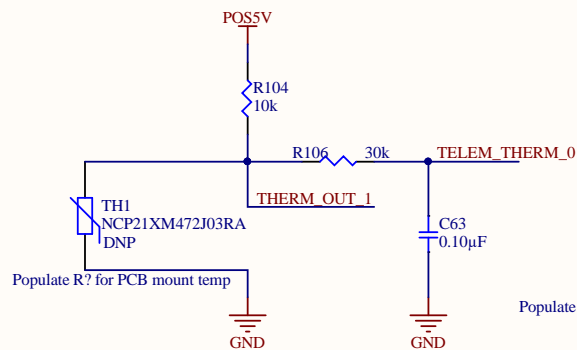
Title 3V3 SUPPLY			Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706	
Engineer:		Revision:		
Date: 9/8/2019	Time: 6:53:06 PM	Sheet of		
File: power 3V3.SchDoc				

Notes:
 Follow layout reference design
 Place bypass caps close to regulator
 Keep hot loops as short as possible
 Possible to replace ceramic bulk cap with a tantalum.

Replace with Tantalum?
 Place close to regulator
 See https://github.com/badgerloop-software/hardware/tree/master/braking_io/design




Title		Badgerloop Electrical		
Engineer:		133 Engineering Research Building		
Date: 9/8/2019	Time: 6:53:07 PM	1500 Engineering Drive		
File: power_5V.SchDoc		Madison, WI 53706		
Revision:		Sheet of		



TEMPERATURE

PS-EXC 0 R102 0.0
PS-RTN 0 R103 DNP
DNP 0.0
P8
1
2
3
Header 3
GND

Title <i>Pressure Sensors</i>		Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706		
Engineer:	Revision:			
Date: 9/8/2019	Time: 6:53:07 PM	Sheet	of	
File: pressure.SchDoc				

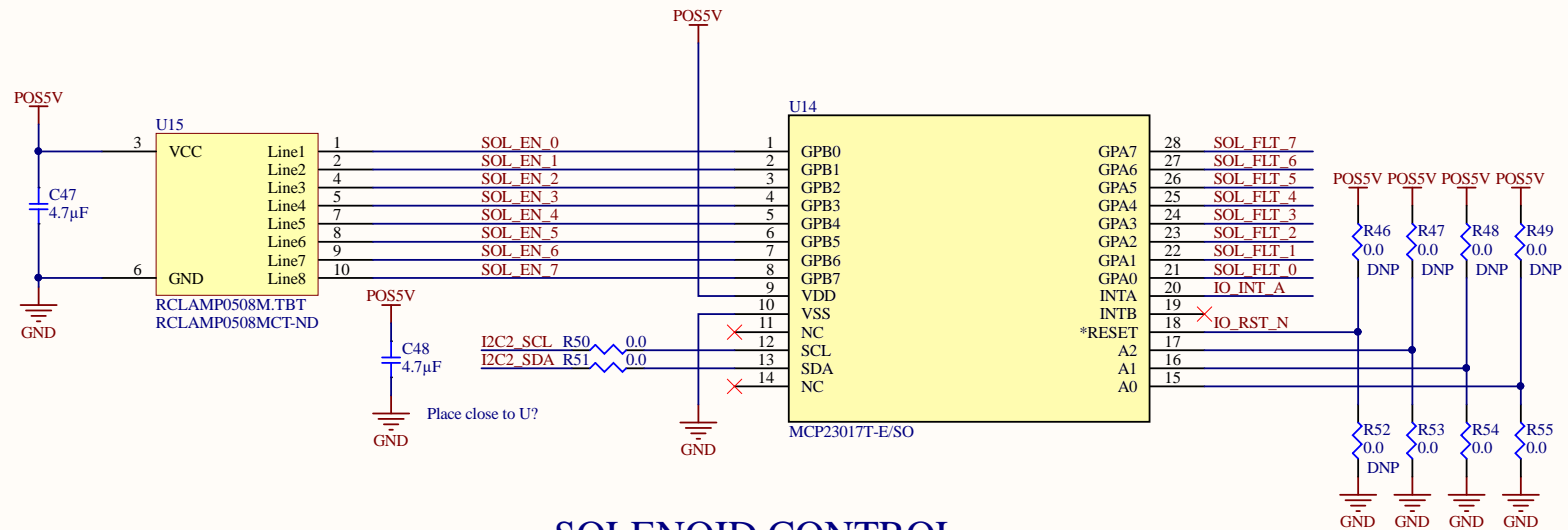


1

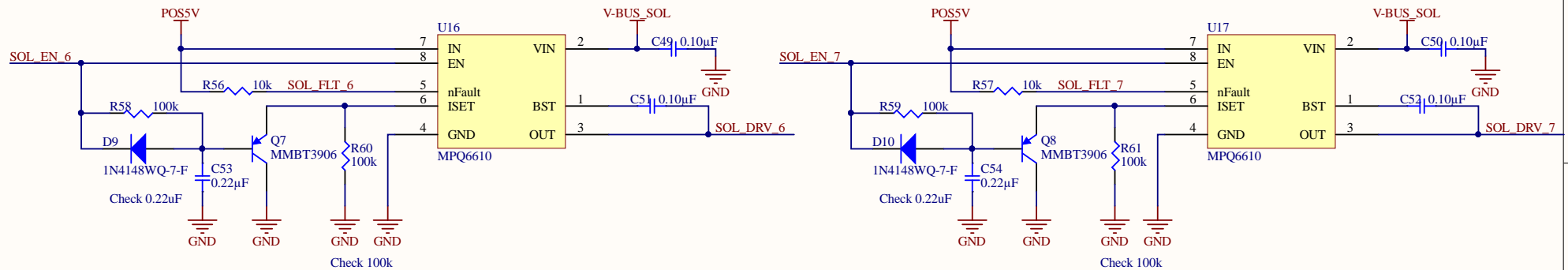
2

3

4



SOLENOID DRIVE

Title **Solenoid Control**

Engineer:

Date: 9/8/2019

File: solenoid_drv.SchDoc

Revision:

Sheet of

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

1

2

3

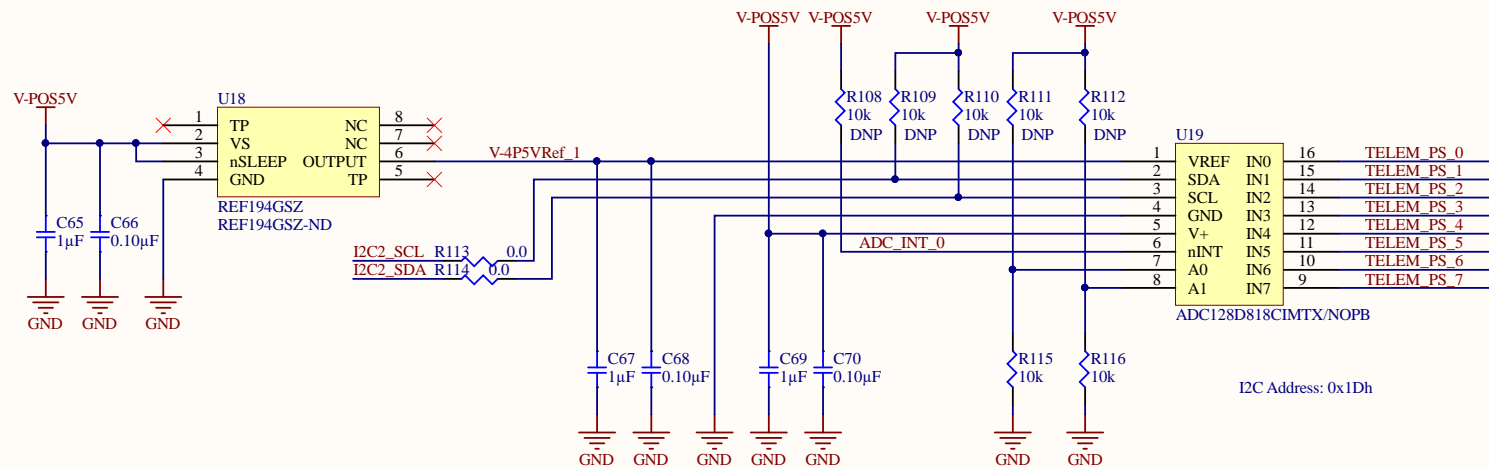
4

1

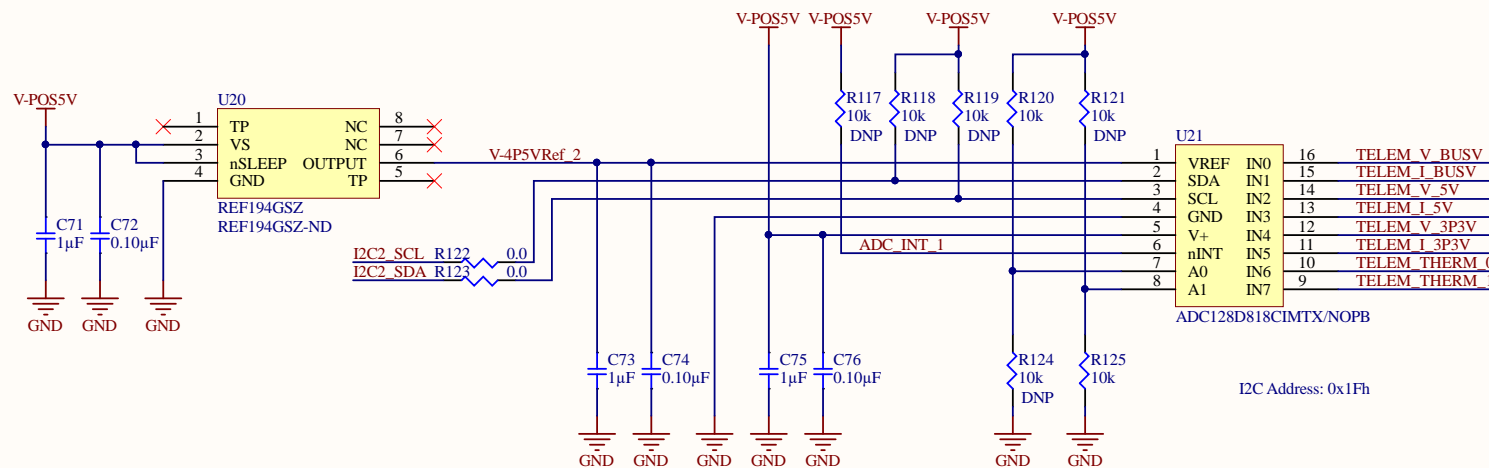
2

3


4



PRESSURE



RAIL AND TEMPERATURE

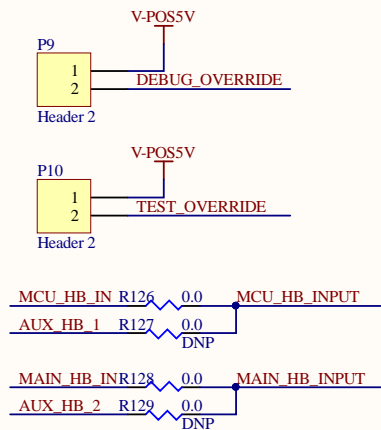
Title			Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, Wi 53706		
Engineer:		Revision:			
Date: 9/8/2019	Time: 6:53:07 PM	Sheet of			
File: telemetrv_adc.SchDoc					

1

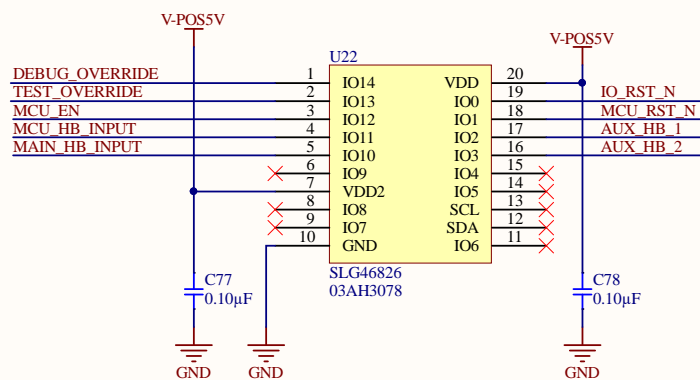
2

3

4



DEBUG



WATCHDOG AND RESET CONTROLLER

IO pin selection is arbitrary. Can be adjusted internally for better layout
Currently- Inputs on Left, outputs on right

Modes of operation:

Debug: EN signal is always on when SLG has power

Populate Jumper 1

Test: 10Hz signal internal signal is recirculated to mimic heartbeat

Populate Jumper 2

Operation: U? expects 10Hz heartbeat. If no heartbeat for 1s after 20s Power on reset

MCP RST_N will fall and MCU RST_N will pulse for 200ms

Silego Image here:

<https://github.com/badgerloop-software/hardware/blob/master/silego/watchdog.gp6>

Silego Image PDF Outputs:

Title Watchdog		Badgerloop Electrical 133 Engineering Research Building 1500 Engineering Drive Madison, WI 53706	
Engineer:	Revision:	Sheet of	
Date: 9/8/2019	Time: 6:53:08 PM		
File: watchdog_SchDoc			

**BADGER
LOOP**