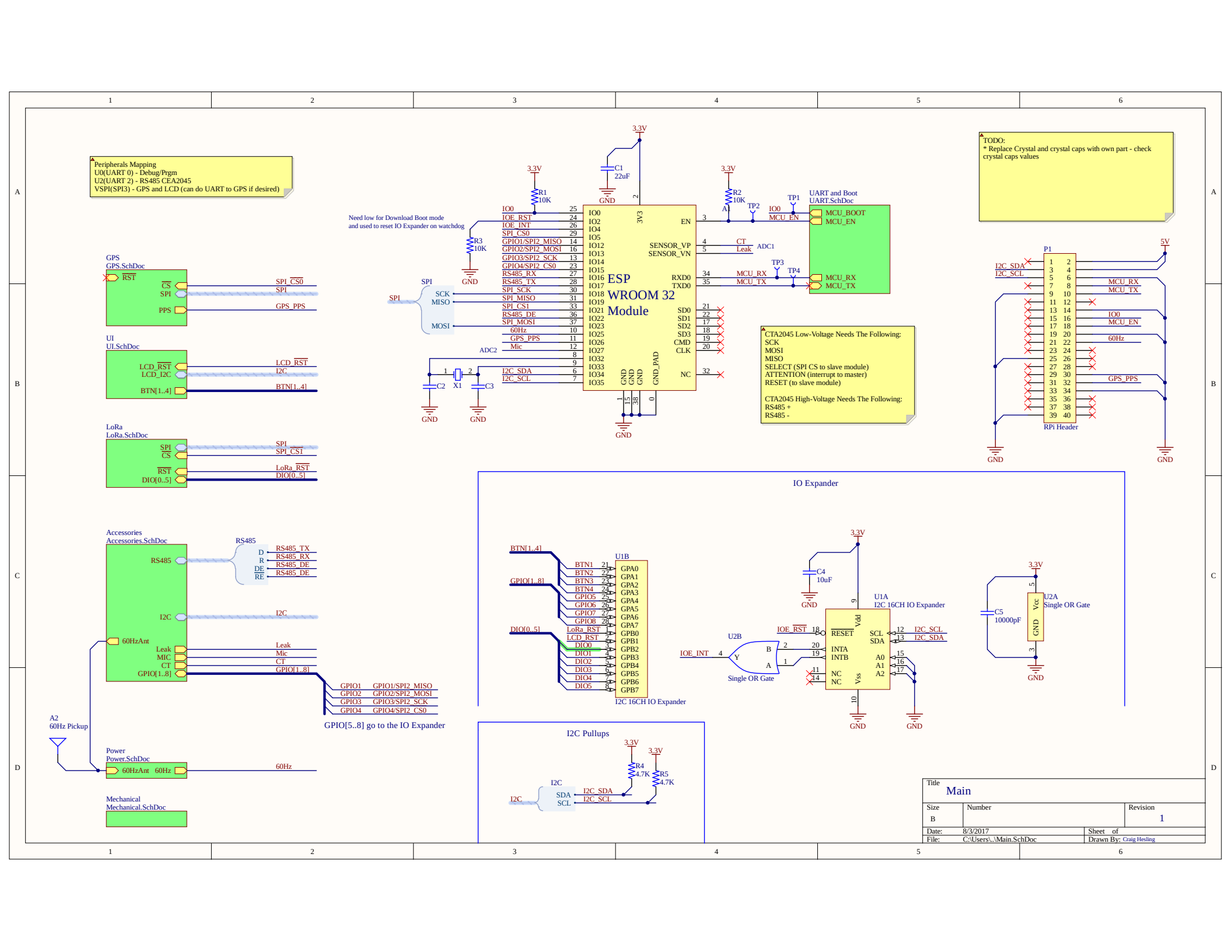
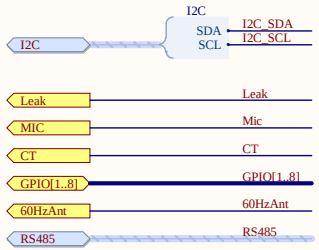

Peripherals Mapping
U0(UART 0) - Debug/Prgm
U2(UART 2) - RS485 CEA2045
VSPI(SPI3) - GPS and LCD (can do UART to GPS if desired)
TODO:
* Replace Crystal and crystal caps with own part - check crystal caps values
GPS
GPS.SchDoc
UI
UI.SchDoc
LoRa
LoRa.SchDoc
Accessories
Accessories.SchDoc
Power
Power.SchDoc
Mechanical
Mechanical.SchDoc
A2
60Hz Pickup
GPIO[5..8] go to the IO Expander
Need low for Download Boot mode
and used to reset IO Expander on watchdog
ESP
WROOM 32
Module
UART and Boot
UART.SchDoc
CTA2045 Low-Voltage Needs The Following:
SCK
MOSI
MISO
SELECT (SPI CS to slave module)
ATTENTION (interrupt to master)
RESET (to slave module)
CTA2045 High-Voltage Needs The Following:
RS485 +
RS485 -
RPi Header
IO Expander
I2C 16CH IO Expander
Single OR Gate
I2C Pullups
Title
Main
Size
B
Number
Revision
1
Date:
8/3/2017
Sheet of
File:
C:\Users\..\Main.SchDoc
Drawn By:
Craig Hesling

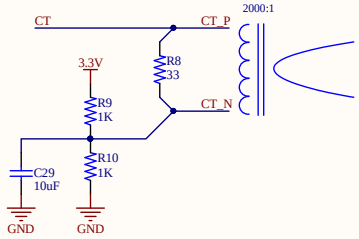
Main Board Interface



The accessories interface was designed around being able to run a CTA2045 Low Power interface(SPI + 2 IO pins) and two relays.

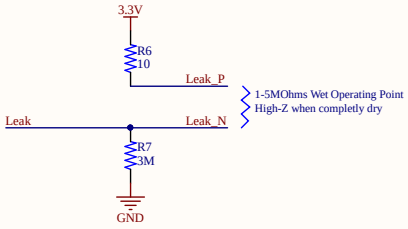
Other potentially useful protocols, like I2C, RS485, and sensor controls have also been exposed into the header.

Current Transformer

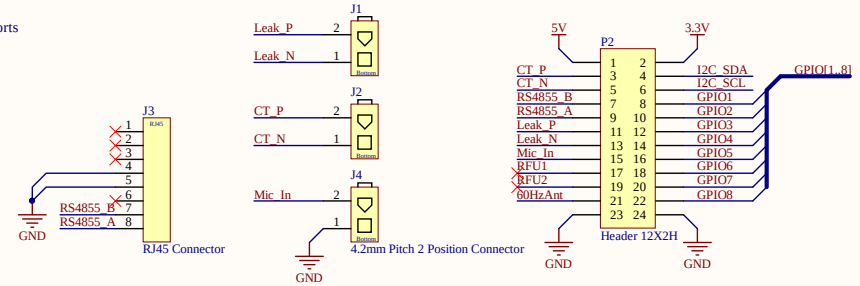


Leak Detection Cable

The cable seems to operate between 1 to 5MOhms
Note that it goes high-Z when completly dry



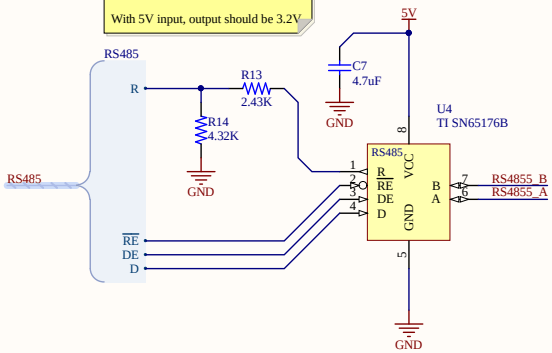
Accessory Ports



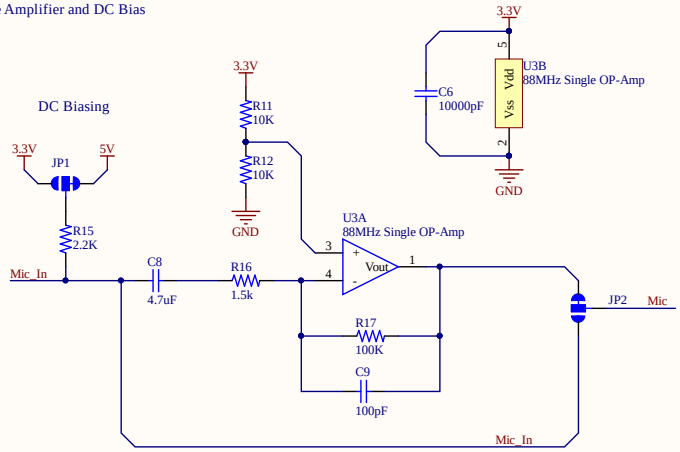
RS485 Tranceiver

We assume that the interface will be 3.3V levels.
We use a voltage divider for the receiver bit and assume that 3.3V will be high enough to trigger a high signa in the RS485 chip.

With 5V input, output should be 3.2V



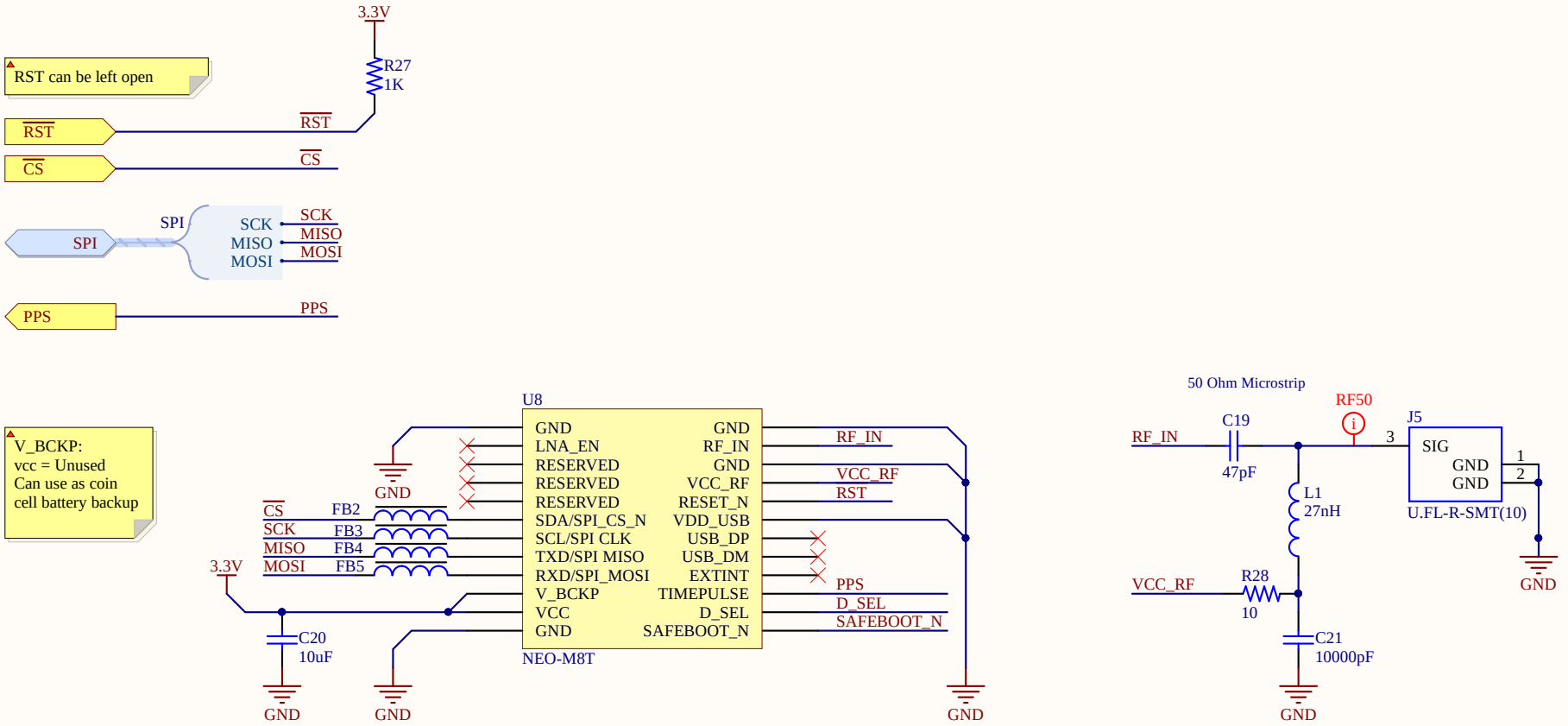
Microphone Amplifier and DC Bias



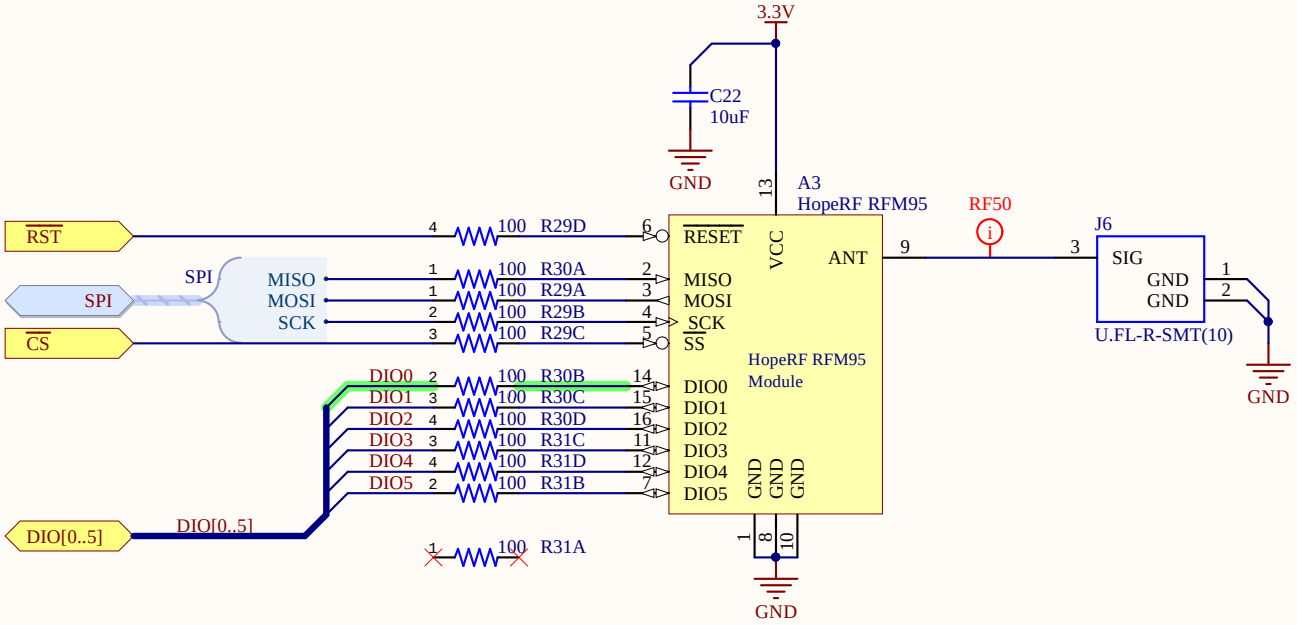
Cannot open file C:\Users\admin\Downloads\Rubber_Duck_(8374802487).jpg

By Eva Rinaldi - Rubber Duck, CC BY-SA 2.0,
https://commons.wikimedia.org/w/index.php?curid=24788549

Title: Accessories		
Size: B	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\Accessories.SchDoc		Drawn By: Craig Hesling



Title: GPS		
Size: A	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\GPS.SchDoc		Drawn By: Craig Hesling



Title: LoRa		
Size: A	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\LoRa.SchDoc		Drawn By: Craig Hesling

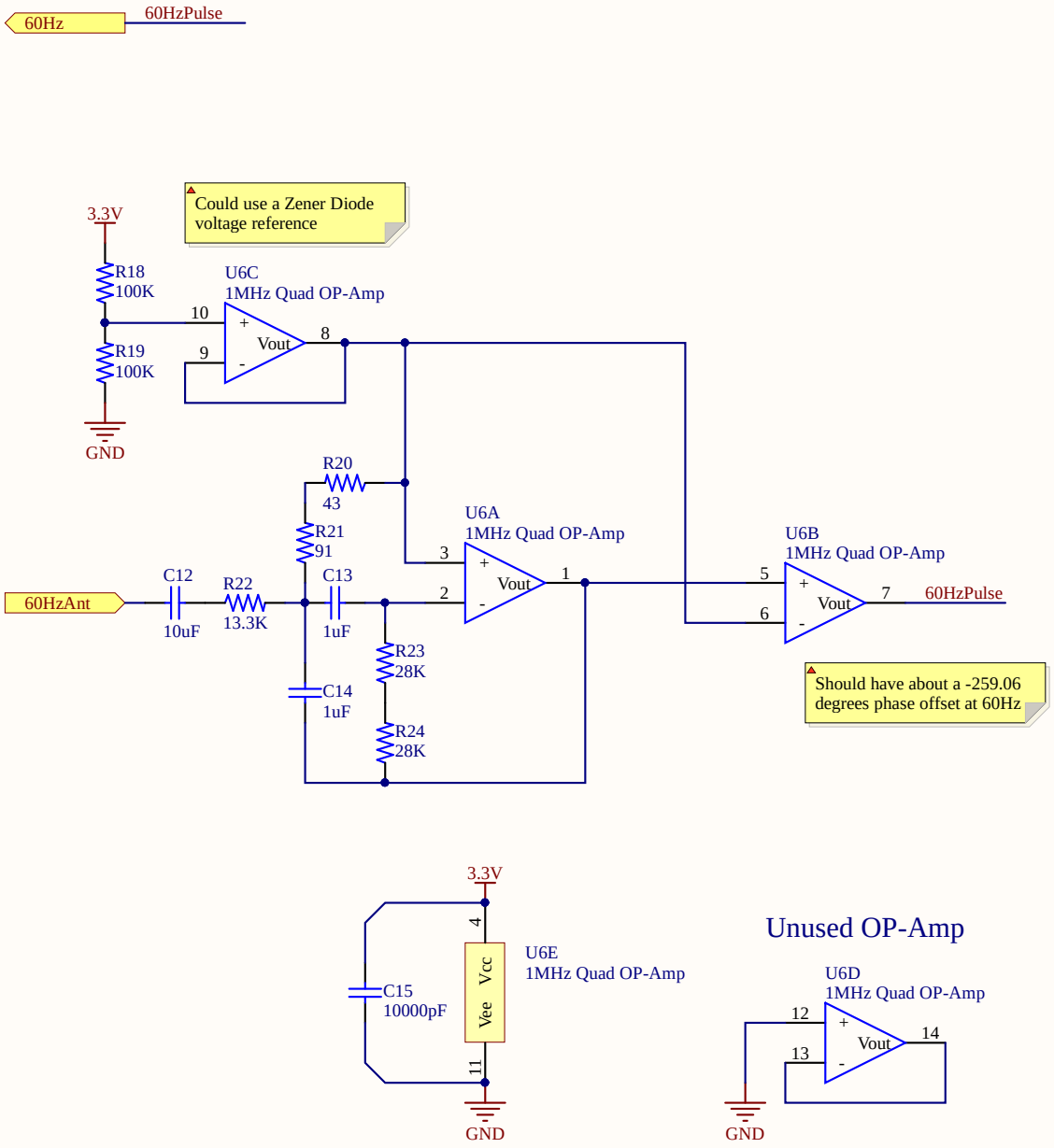
H1

AO Smith Enclosure

AO Smith Water Heater Enclosure

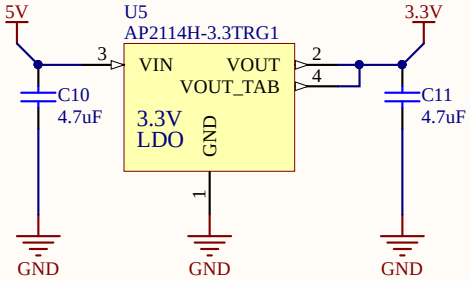
Title: Mechanical Parts		
Size: A	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\Mechanical.SchDoc		Drawn By: Craig Hesling

60Hz Zero Crossing Pulse

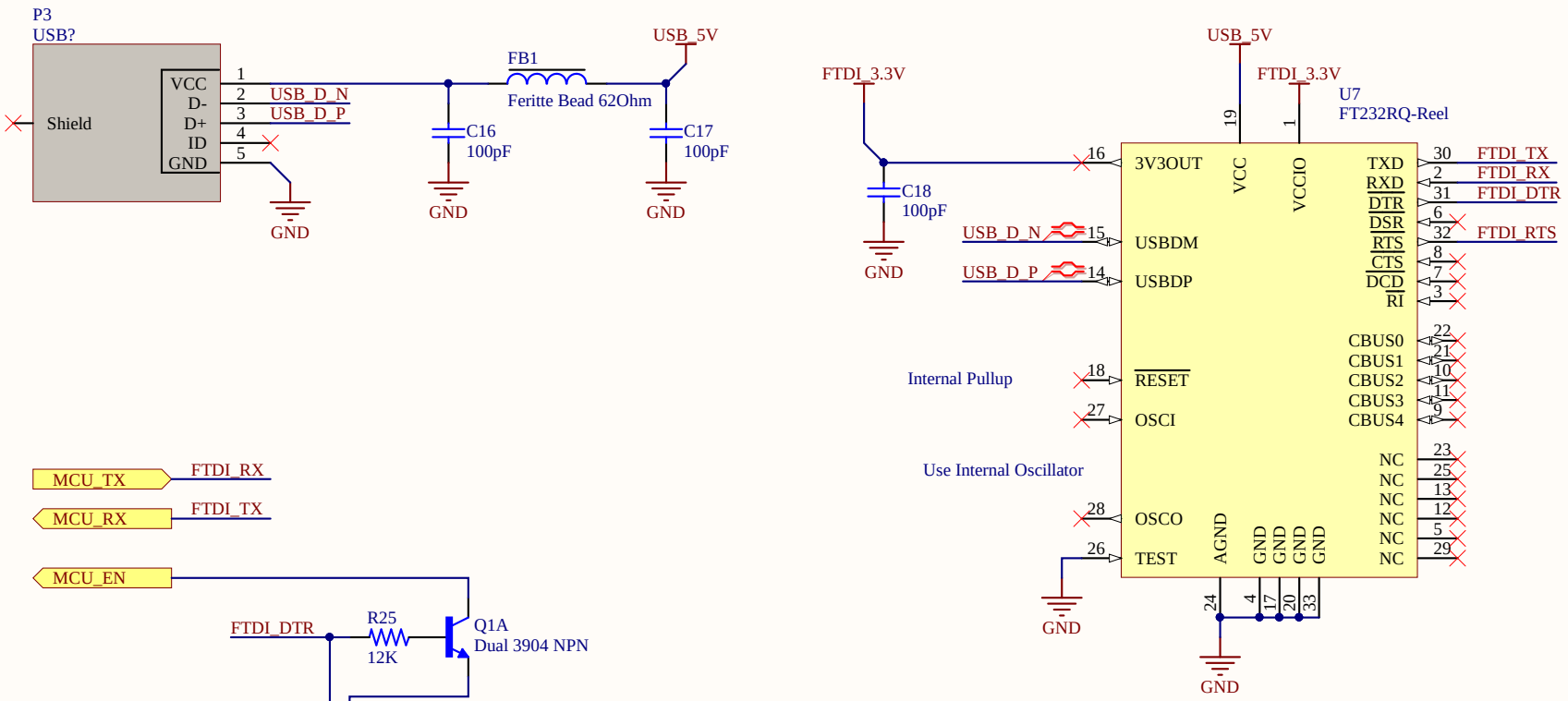


Unused OP-Amp

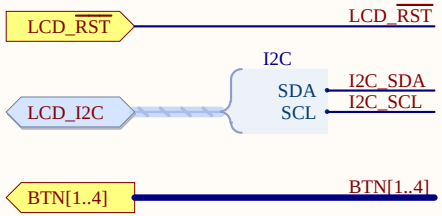
3.3V Regulation

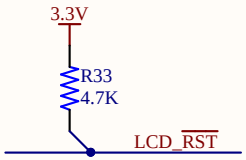


Title: Power		
Size: A	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\Power.SchDoc		Drawn By: Craig Hesling



Title: UART		
Size: A	Number:	Revision: 2
Date: 8/3/2017		Sheet of
File: C:\Users\..\UART.SchDoc		Drawn By: Craig Hesling





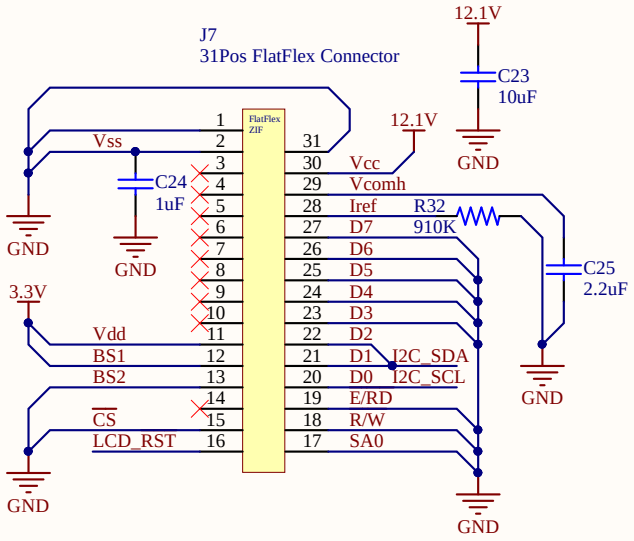
R1 = [(Vout - 3V) - 0V] / 10uA
R1 = [(12.0985V - 3V) - 0V] / 10uA
R1 = 909.853kOhms

Using Vout_min, Vout_max, and the 910kOhm 1% tolerance, we have the following:

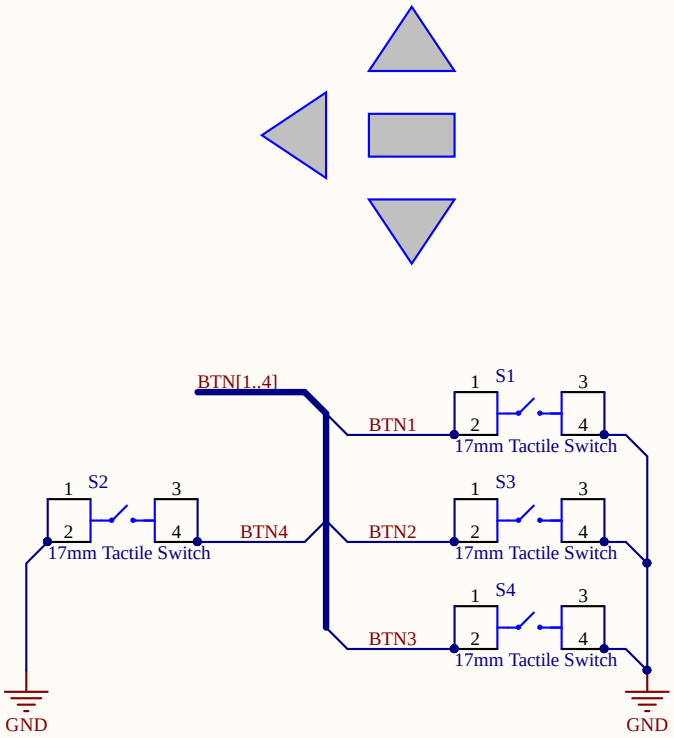
Iref_min = [(Vout_min - 3V) - 0V] / (910kOhm * (1+.01))
Iref_min = 9.66523 uA

Iref_max = [(Vout_max - 3V) - 0V] / (910kOhm * (1-.01))
Iref_max = 10.3431 uA

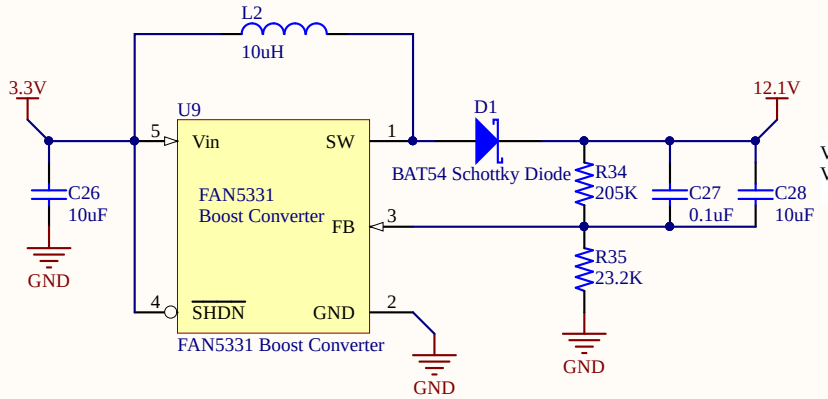
Iref_min and Iref_max are within 10uA+-2uA.



Display Navigation Buttons



This is the boost converter for the OLED's display 12.1V supply.



Vout = 1.23V * (1 + 205k/23.2k)
Vout = 12.0985V

Using the resistor's 1% tolerance, we have the following:
Vout_min = 1.23V * [1 + (205k * (1-.01)) / (23.2k * (1+.01))]
Vout_min = 11.8833V

Vout_max = 1.23V * [1 + (205k * (1+.01)) / (23.2k * (1-.01))]
Vout_max = 12.3181V

https://learn.adafruit.com/assets/27580

Title: User Interface		
Size: A	Number:	Revision: 1
Date: 8/3/2017		Sheet of
File: C:\Users\..\UI.SchDoc		Drawn By: Craig Hesling