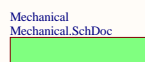
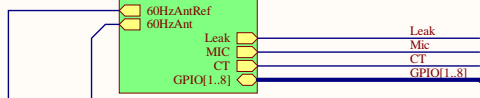
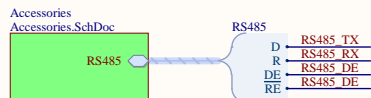
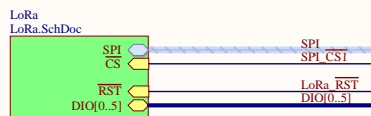
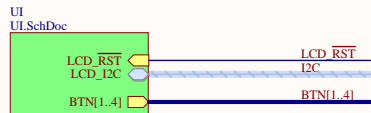
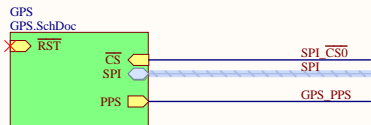
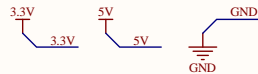
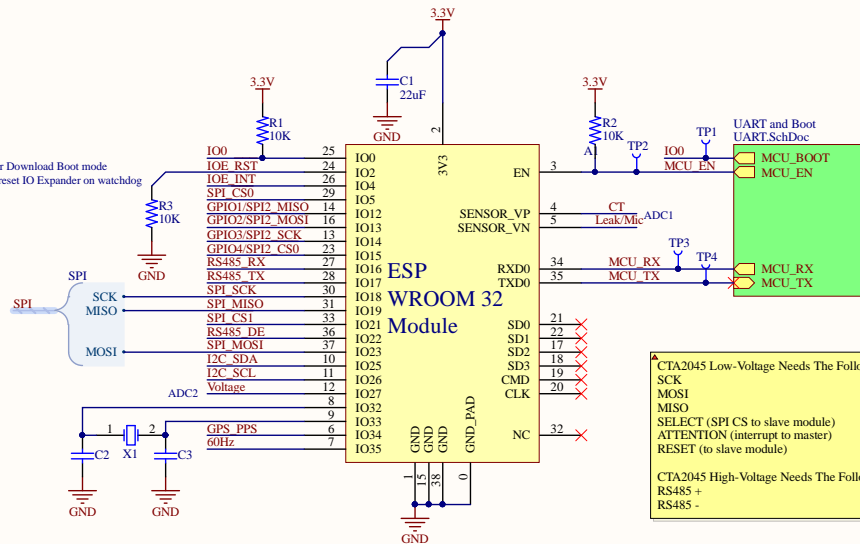


Peripherals Mapping
U0(UART 0) - Debug/Prgrm
U2(UART 2) - RS485 CEA2045
VSP1(SPI3) - GPS and LCD (can do UART to GPS if desired)

Naming The Power Nets



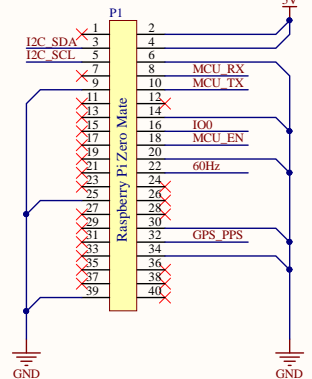
Need low for Download Boot mode
and used to reset IO Expander on watchdog



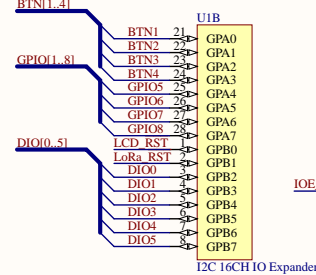
CTA2045 Low-Voltage Needs The Following:
SCK
MOSI
MISO
SELECT (SPI CS to slave module)
ATTENTION (interrupt to master)
RESET (to slave module)

CTA2045 High-Voltage Needs The Following:
RS485 +
RS485 -

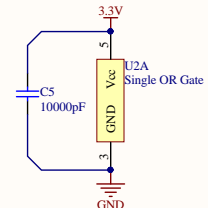
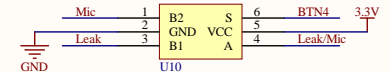
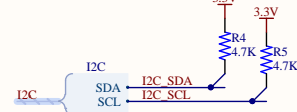
TODO:
* Replace Crystal and crystal caps with own part - check crystal caps values



IO Expander

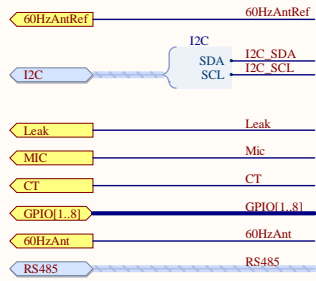


I2C Pullups



Title		
Main		
Size	Number	Revision
B		1.1
Date:	5/21/2018	Sheet of
File:	C:\Users\Main\SchDoc	Drawn By: Craig Hesling

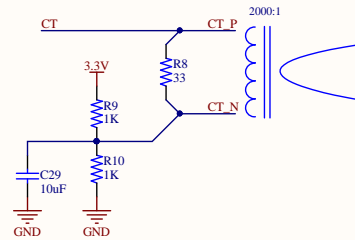
Main Board Interface



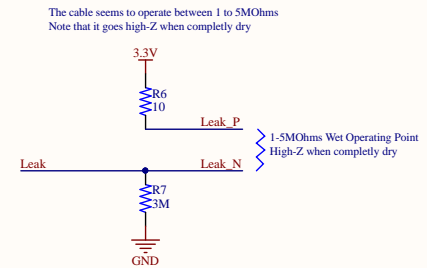
The accessories interface was designed around being able to run a CTA2045 Low Power interface (SPI + 2 IO pins) and two relays.

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

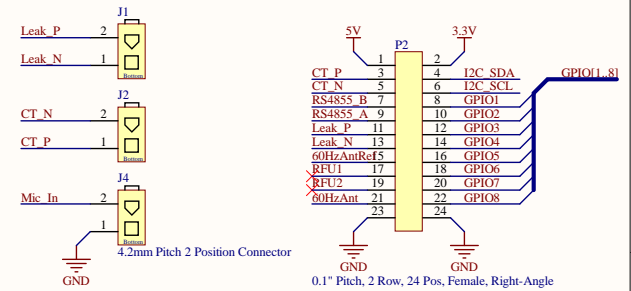
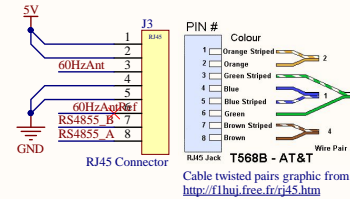
Current Transformer



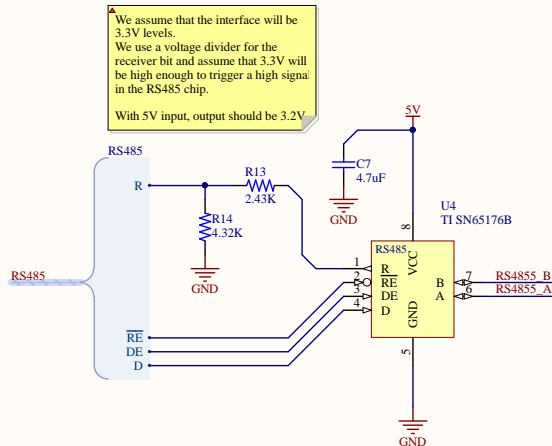
Leak Detection Cable



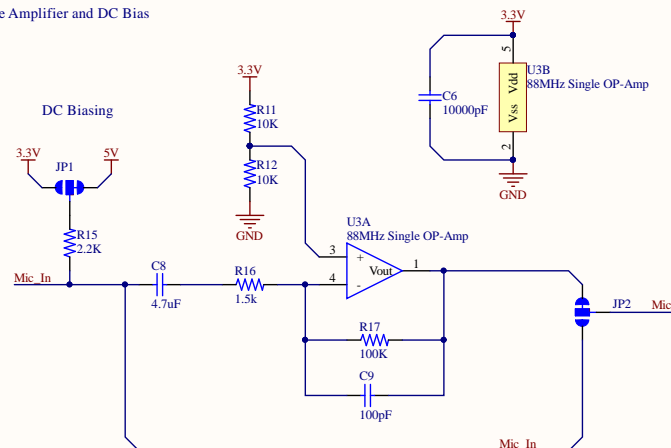
Accessory Ports



RS485 Transceiver



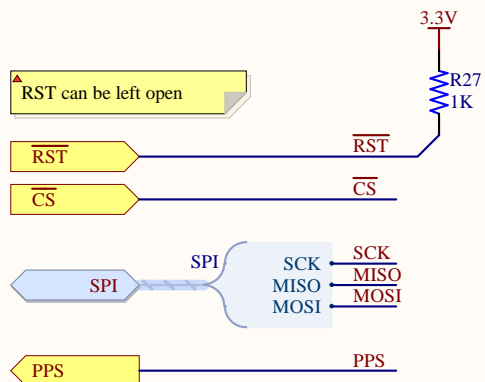
Microphone Amplifier and DC Bias



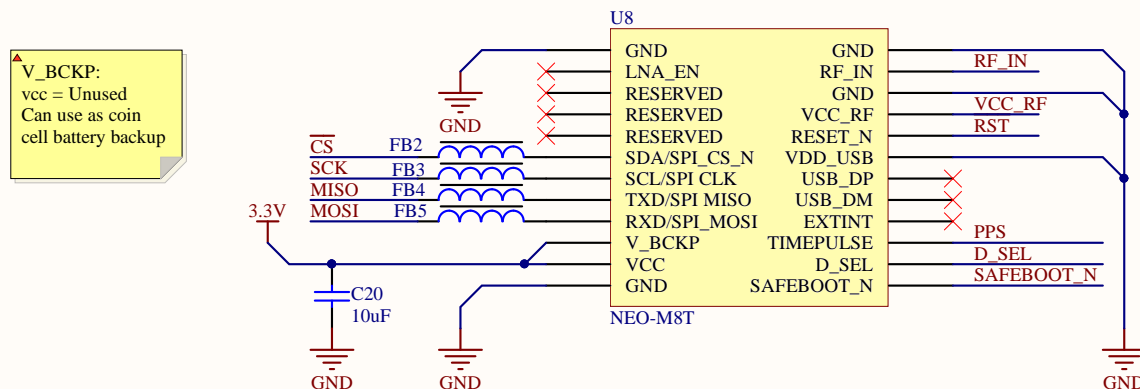
JASON COHN/REUTERS

Title		
Accessories		
Size	Number	Revision
B		1.3
Date:	5/21/2018	Sheet of
File:	C:\Users\...\Accessories.SchDoc	Drawn By: Craig Hesling & Anh Luong

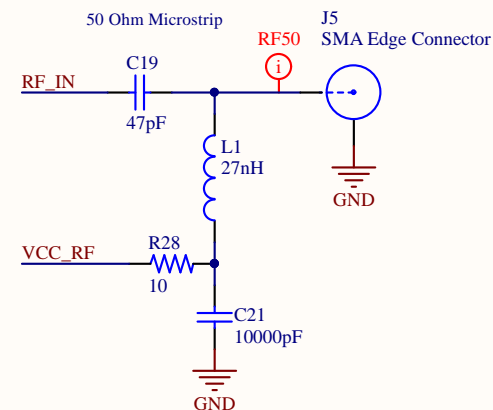
A



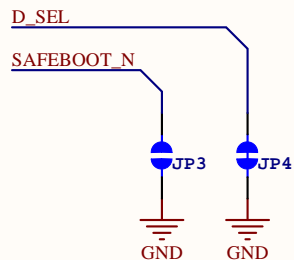
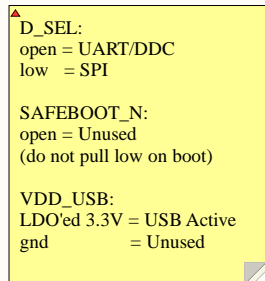
B



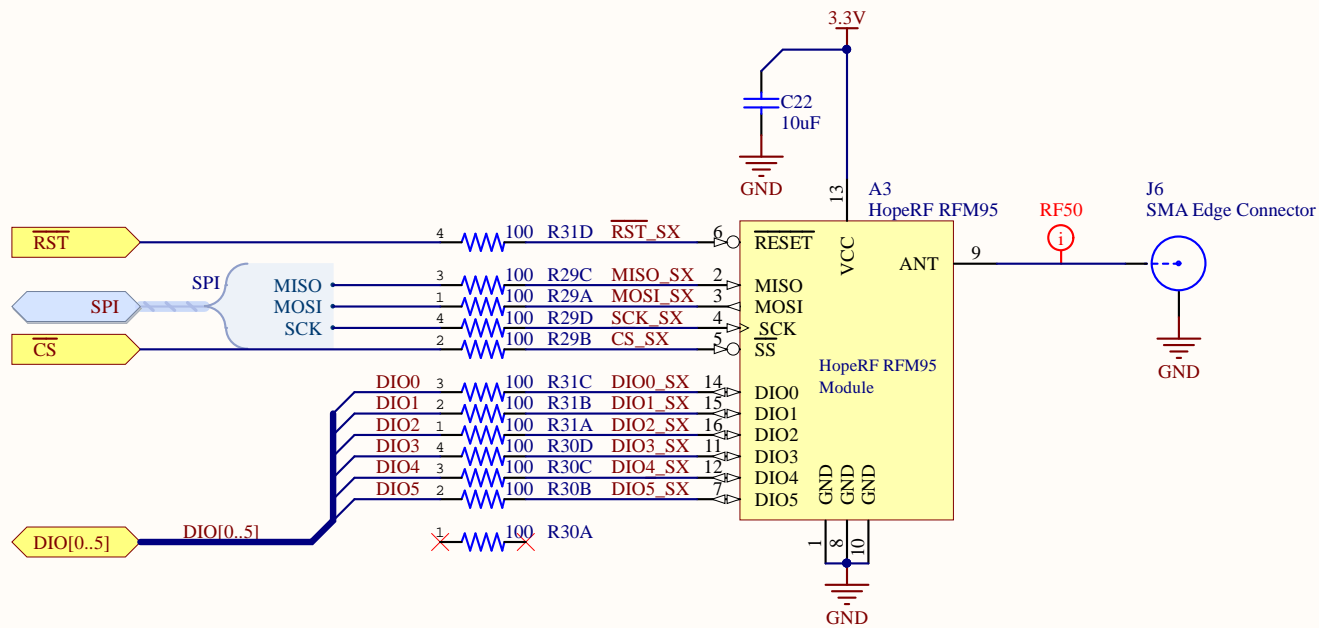
C



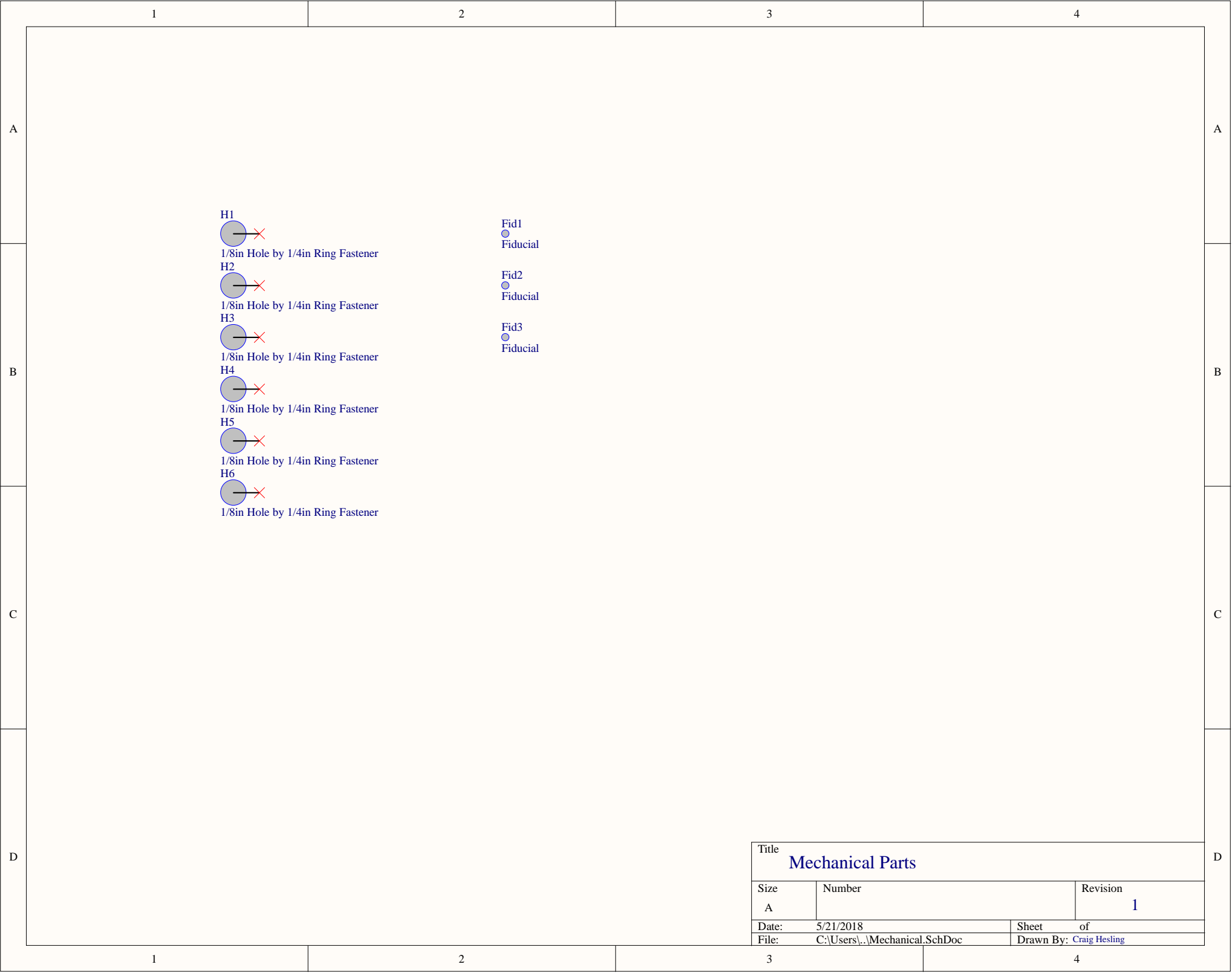
D



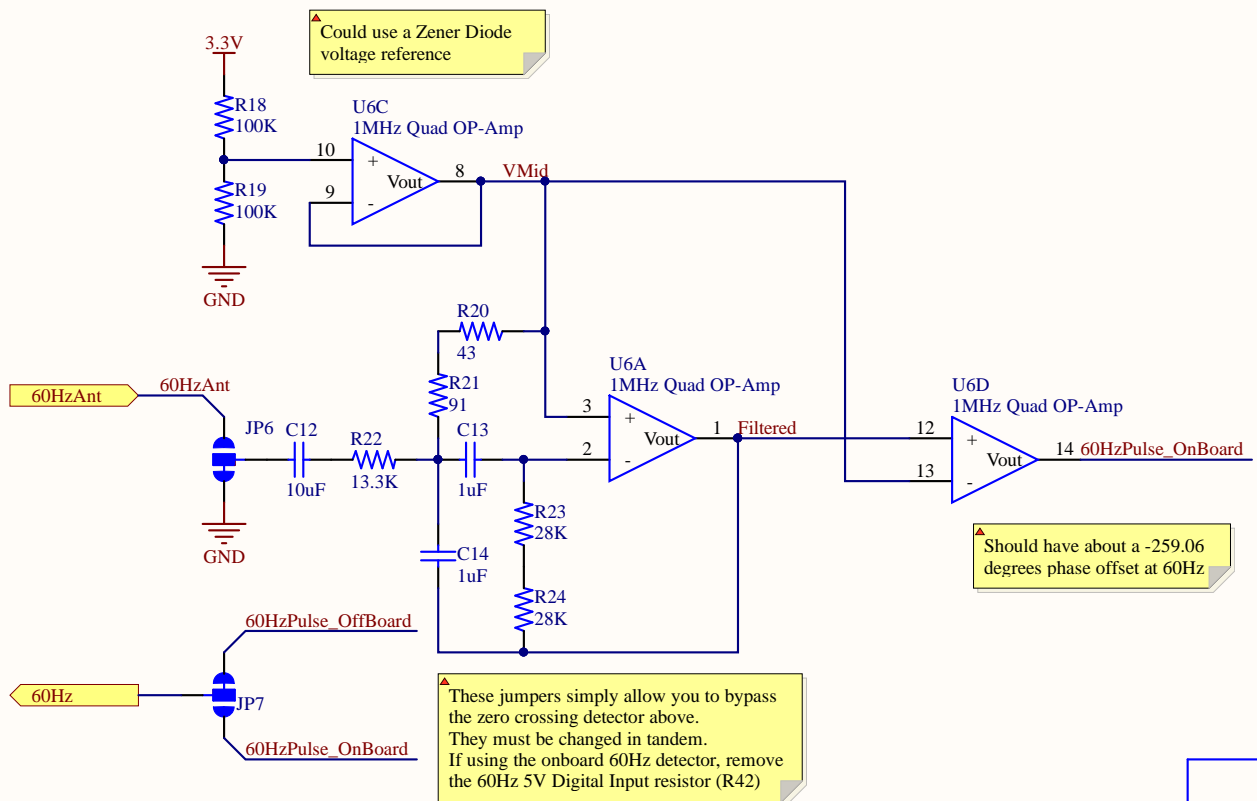
Title GPS		
Size A	Number	Revision 1
Date:	5/21/2018	Sheet of
File:	C:\Users\...\GPS.SchDoc	Drawn By: Craig Hesling



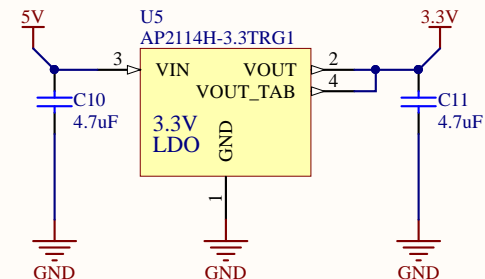
Title			LoRa	
Size	Number		Revision	
A			1	
Date:	5/21/2018		Sheet	of
File:	C:\Users\...\LoRa.SchDoc		Drawn By: Craig Hesling	



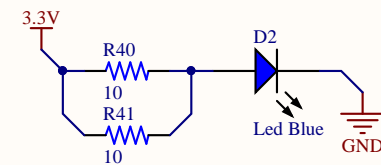
60Hz Zero Crossing Pulse



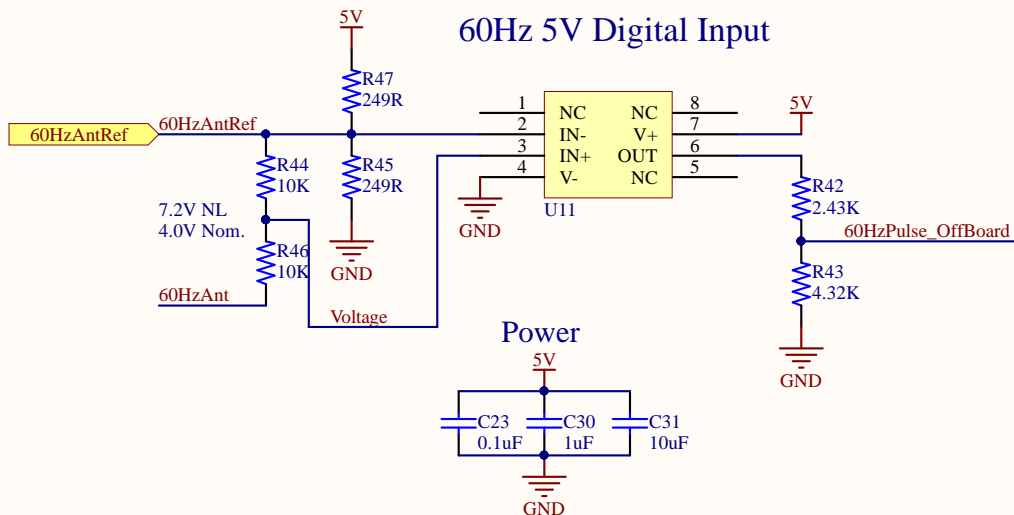
3.3V Regulation



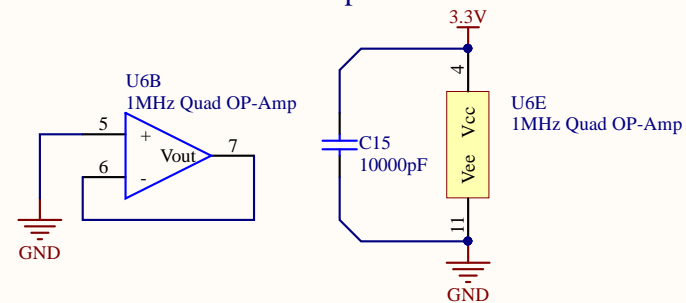
VREG Status Indicator



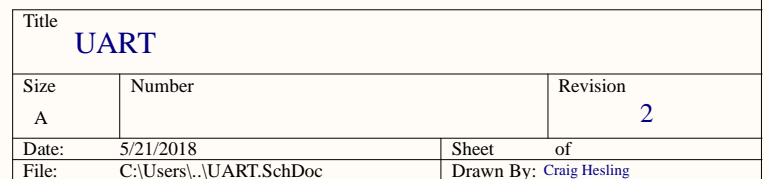
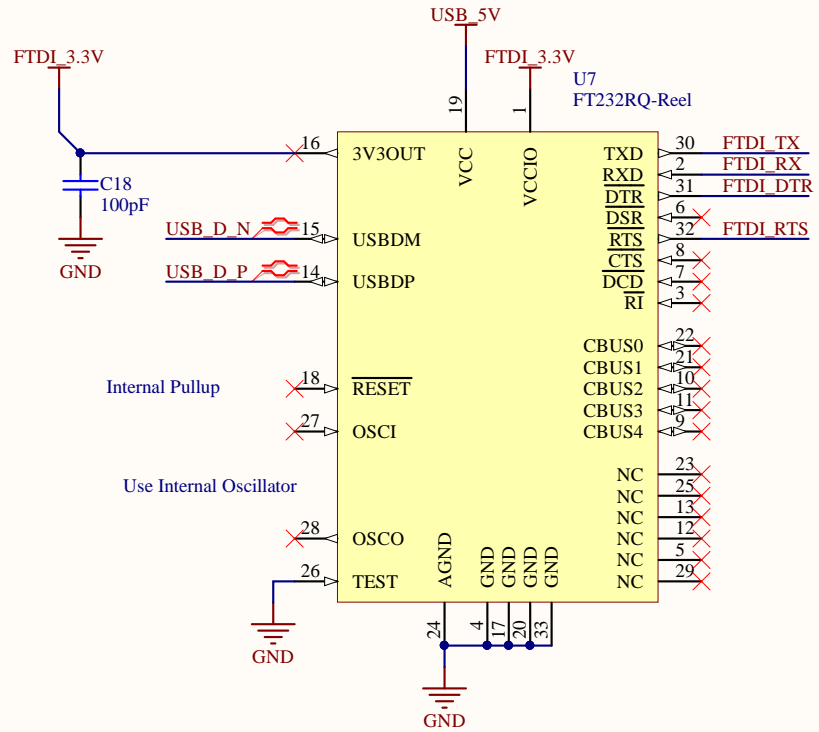
60Hz 5V Digital Input

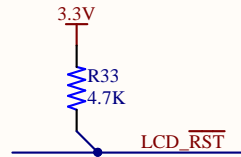
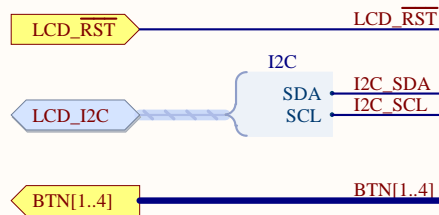


Unused OP-Amp



Title		
Size	Number	Revision
A		1.1
Date:	5/21/2018	Sheet of
File:	C:\Users\...\Power.SchDoc	Drawn By: Craig Hesling





$$R1 = [(V_{out} - 3V) - 0V] / 10\mu A$$

$$R1 = [(12.0985V - 3V) - 0V] / 10\mu A$$

$$R1 = 909.853k\Omega$$

Using V_{out_min} , V_{out_max} , and the 910kOhm 1% tolerance, we have the following:

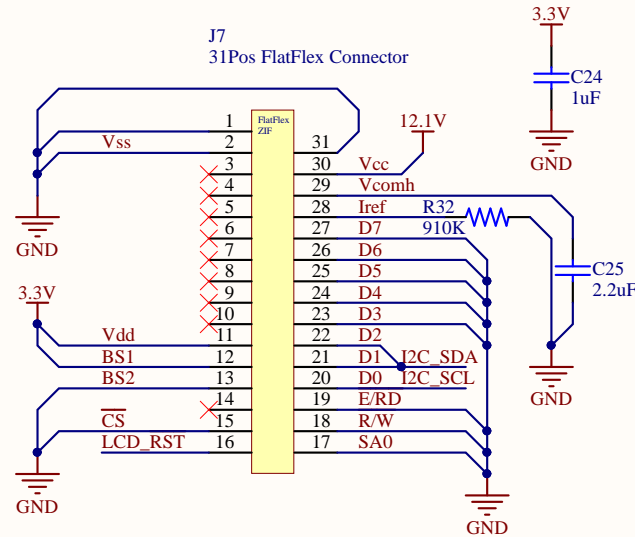
$$I_{ref_min} = [(V_{out_min} - 3V) - 0V] / (910k\Omega * (1+.01))$$

$$I_{ref_min} = 9.66523 \mu A$$

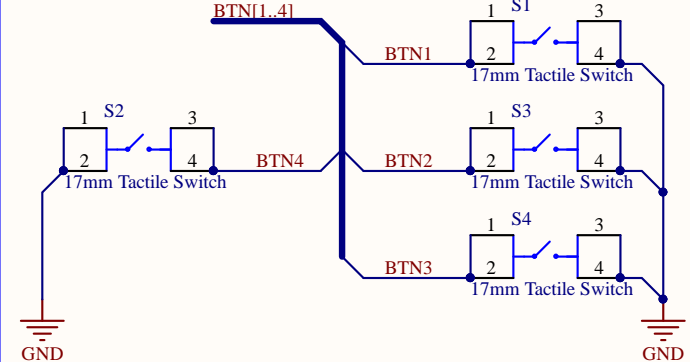
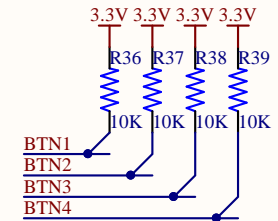
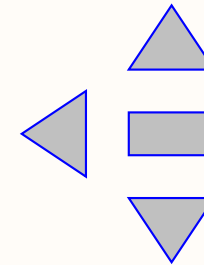
$$I_{ref_max} = [(V_{out_max} - 3V) - 0V] / (910k\Omega * (1-.01))$$

$$I_{ref_max} = 10.3431 \mu A$$

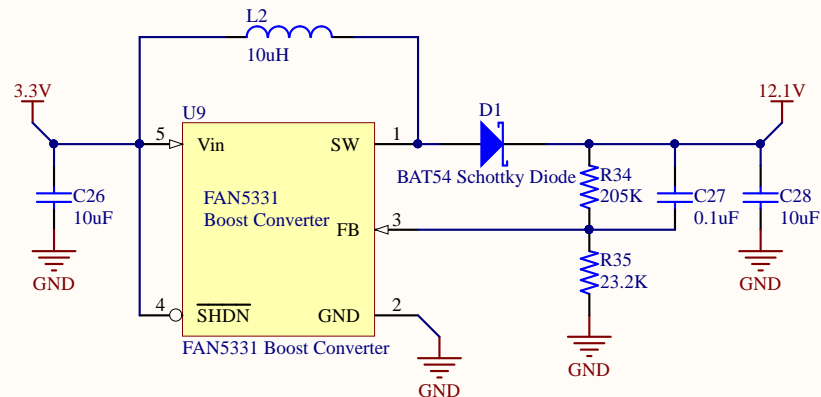
I_{ref_min} and I_{ref_max} are within 10uA+-2uA.



Display Navigation Buttons



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



$$V_{out} = 1.23V * (1 + 205k/23.2k)$$

$$V_{out} = 12.0985V$$

Using the resistor's 1% tolerance, we have the following:

$$V_{out_min} = 1.23V * [1 + (205k * (1-.01)) / (23.2k * (1+.01))]$$

$$V_{out_min} = 11.8833V$$

$$V_{out_max} = 1.23V * [1 + (205k * (1+.01)) / (23.2k * (1-.01))]$$

$$V_{out_max} = 12.3181V$$

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

Title

User Interface

Size

A

Number

Date: 5/21/2018

File: C:\Users\...\UI.SchDoc

Revision

1.1

Sheet of

Drawn By: Craig Hesling

