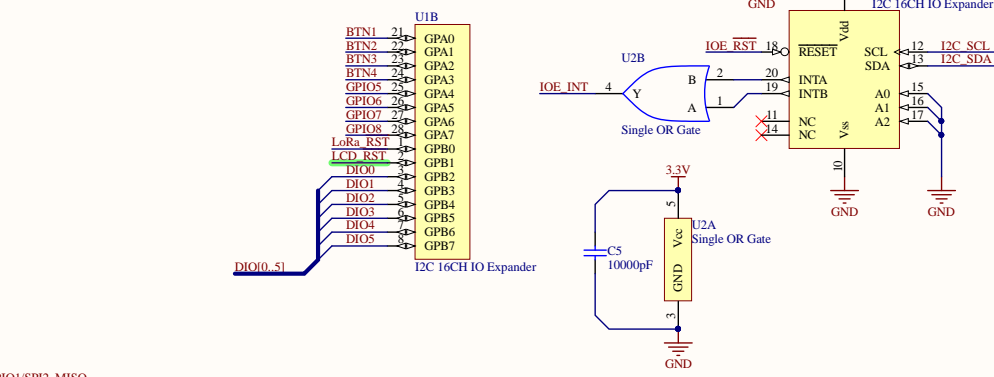
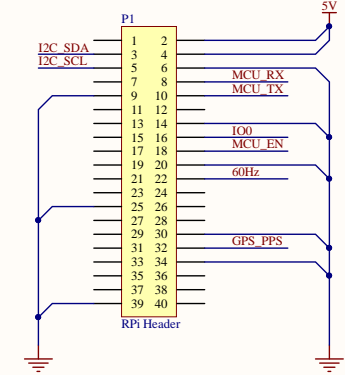
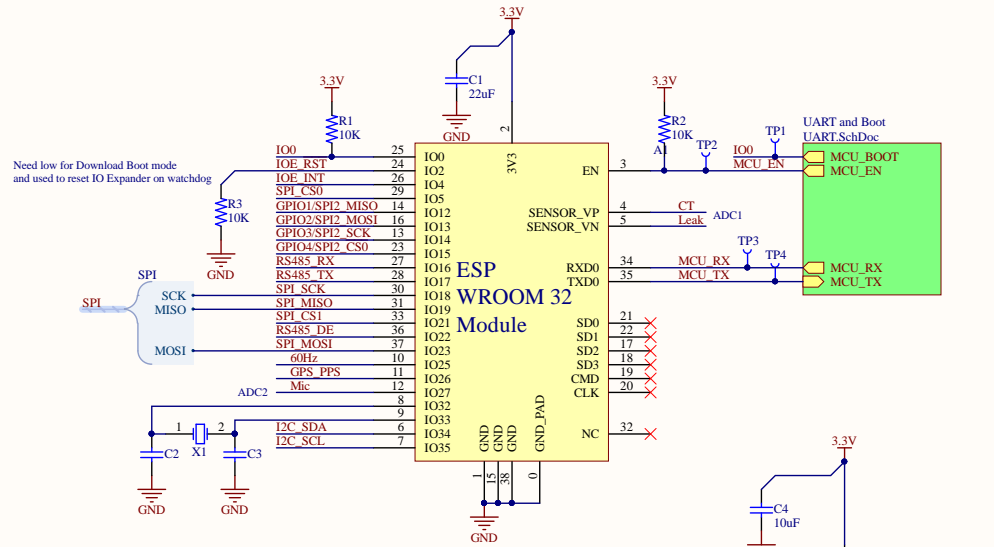
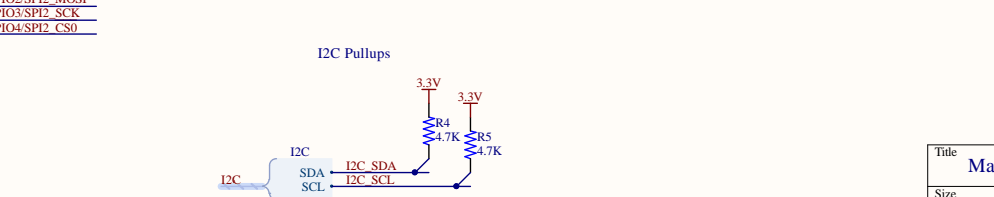


Peripherals Mapping
 U0(UART 0) - Debug/Prgrm
 U2(UART 2) - RS485 CEA2045
 VSP1(SPI3) - GPS and LCD (can do UART to GPS if desired)

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

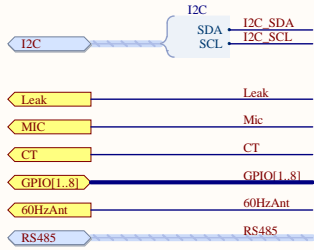


CTA2045 Low-Voltage Needs The Following:
 SCK
 MOSI
 MISO
 SELECT (SPI CS to slave module)
 ATTENTION (interrupt to master)
 RESET (to slave module)
 CTA2045 High-Voltage Needs The Following:
 RS485 +
 RS485 -



Title Main		
Size B	Number	Revision 1
Date: 7/31/2017	Sheet of	
File: C:\Users\Main\SchDoc	Drawn By: Craig Hesling	

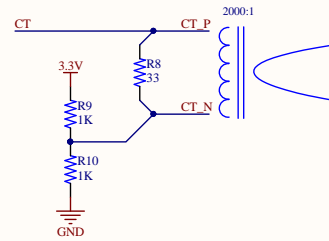
Main Board Interface



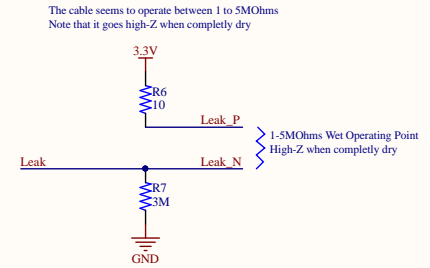
The accessories interface was designed around being able to run a CTA2045 Low Power interface (SPI + 2 IO pins) and two relays.

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

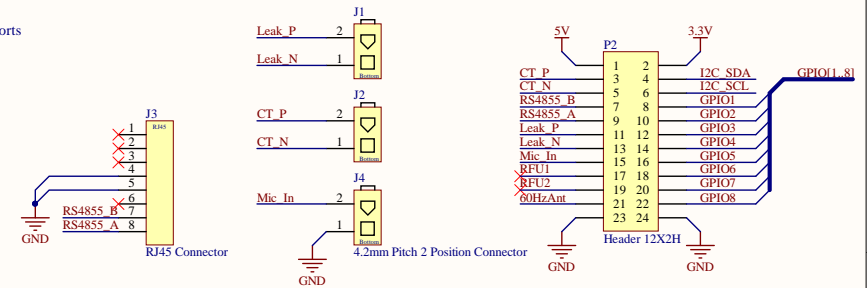
Current Transformer



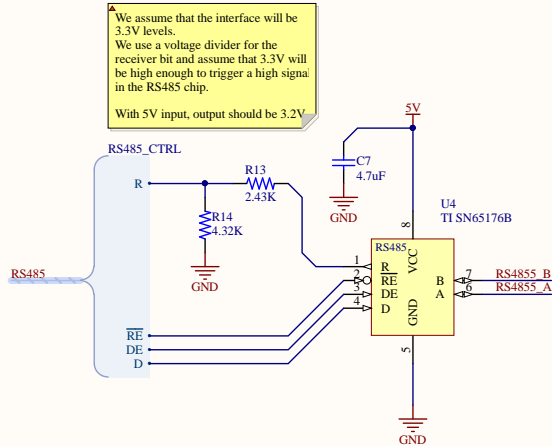
Leak Detection Cable



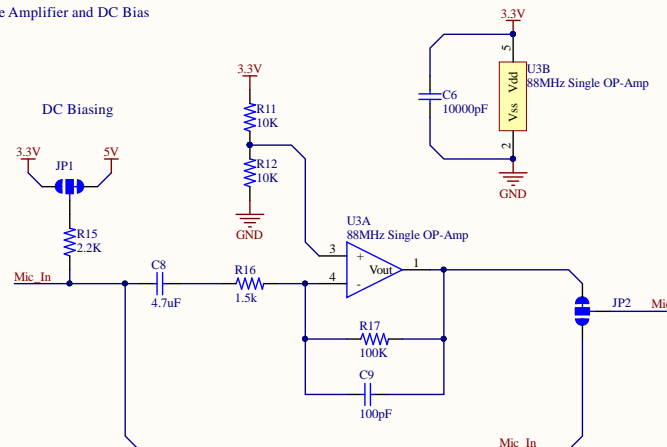
Accessory Ports



RS485 Transceiver



Microphone Amplifier and DC Bias

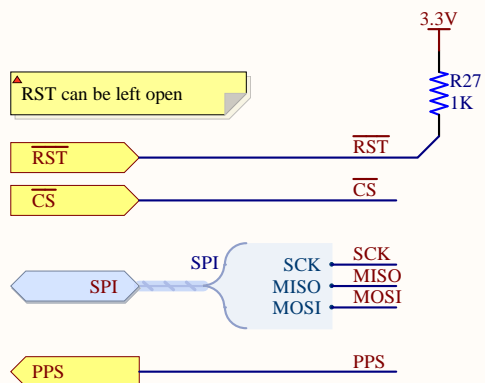


By Eva Rinaldi - Rubber Duck, CC BY-SA 2.0,
<https://commons.wikimedia.org/w/index.php?curid=24788549>

Title Accessories		
Size B	Number	Revision 1
Date: 7/31/2017	Sheet of	
File: C:\Users\...\Accessories.SchDoc	Drawn By: Craig Hesling	

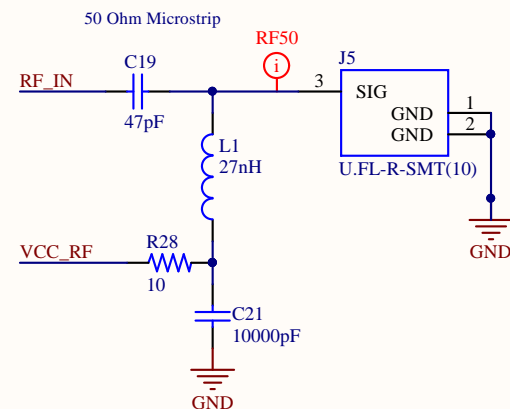
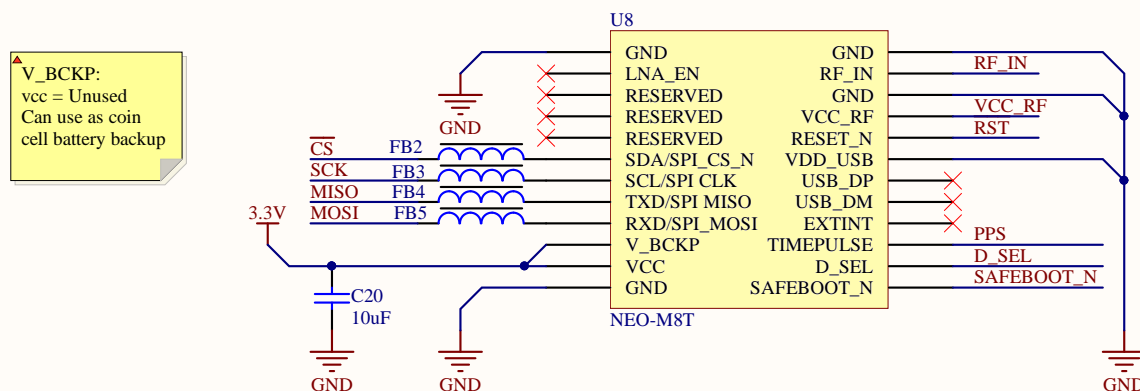
A

A



B

B



C

C

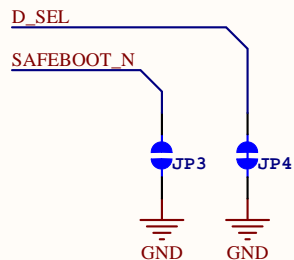
D

D

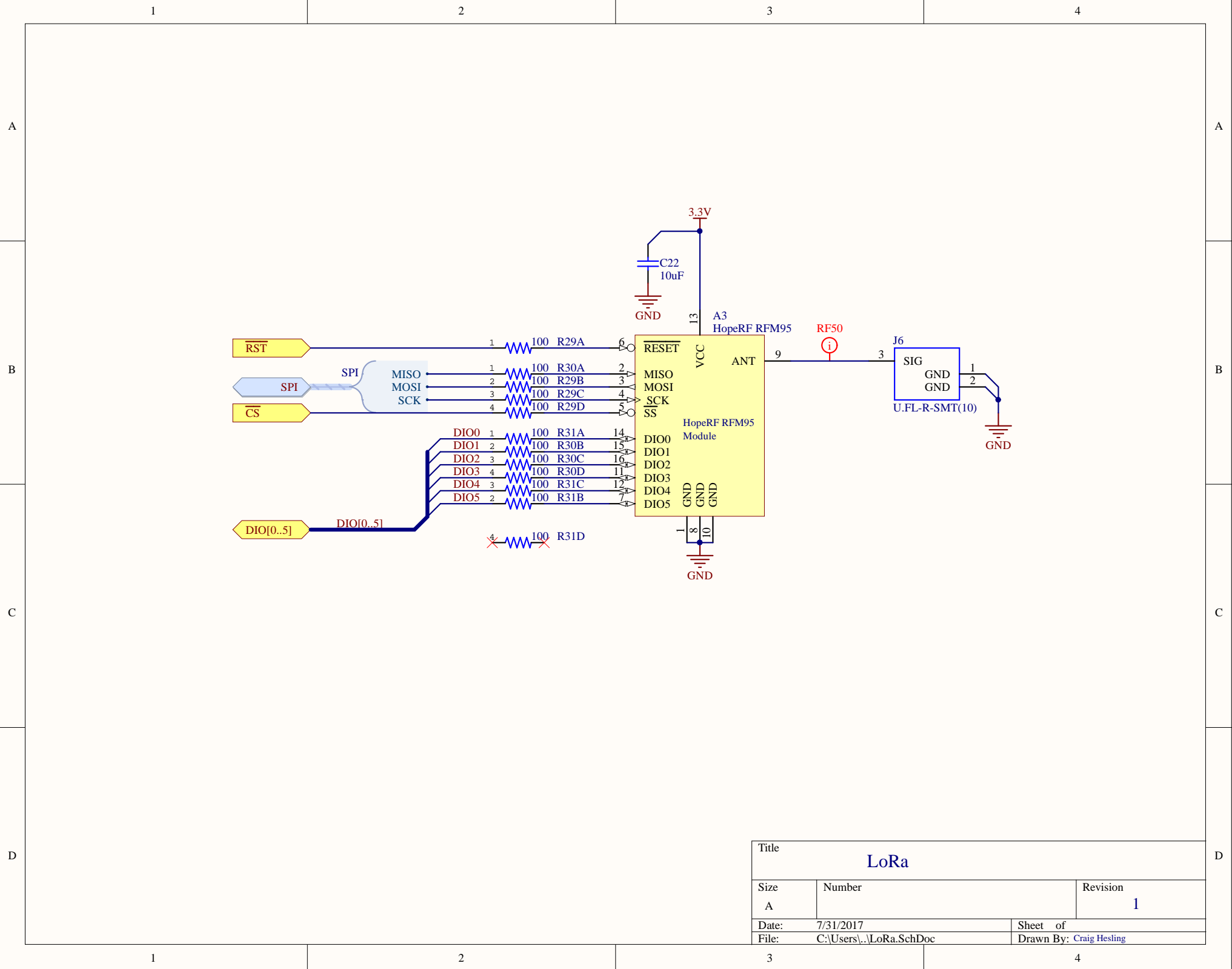
D_SEL:
open = UART/DDC
low = SPI

SAFEBOOT_N:
open = Unused
(do not pull low on boot)

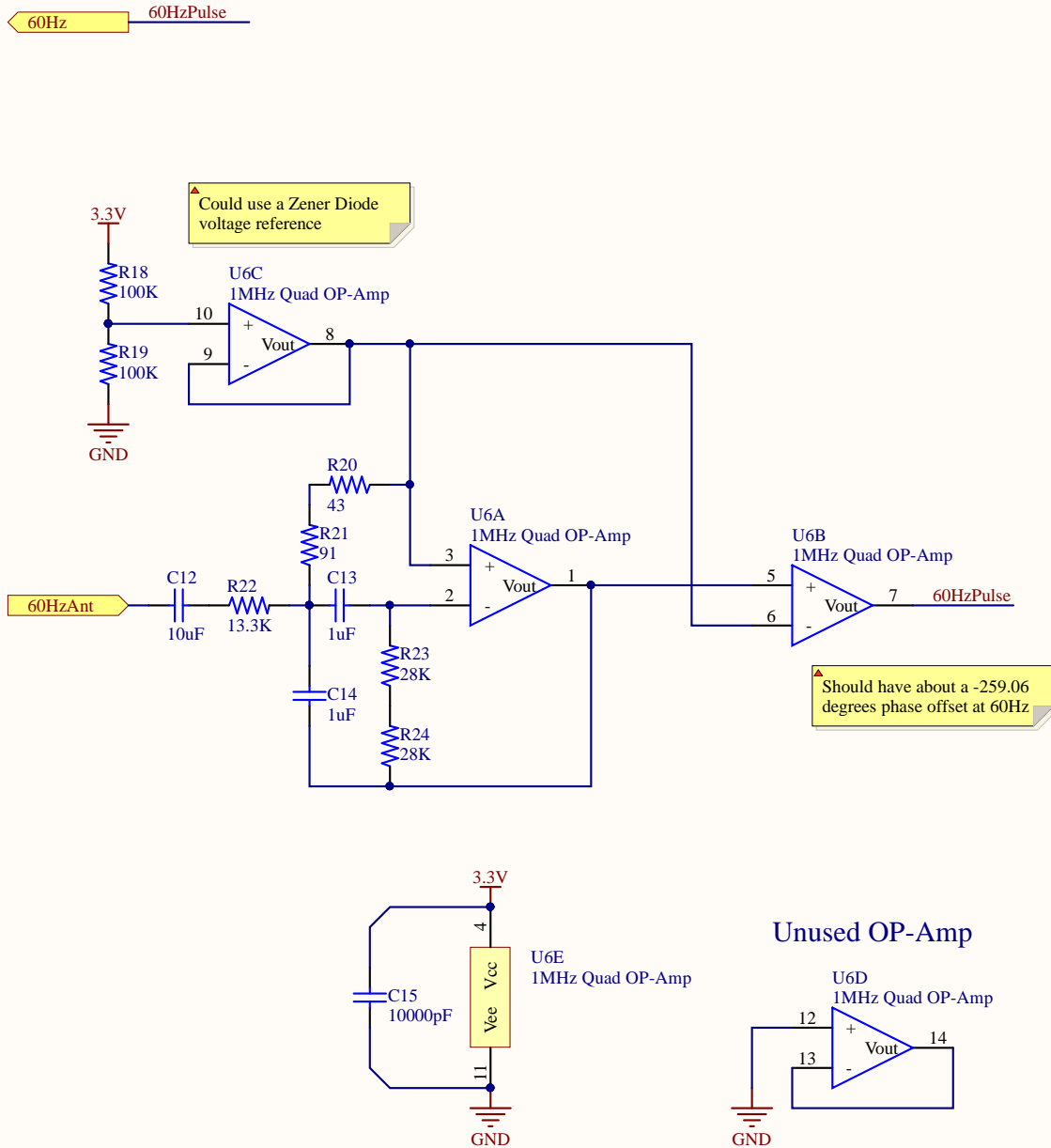
VDD_USB:
LDO'ed 3.3V = USB Active
gnd = Unused



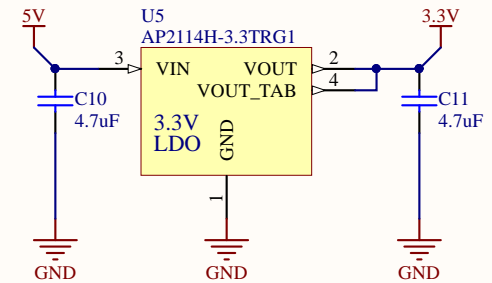
Title GPS		
Size A	Number	Revision 1
Date:	7/31/2017	Sheet of
File:	C:\Users\...\GPS.SchDoc	Drawn By: Craig Hesling



60Hz Zero Crossing Pulse



3.3V Regulation



Title

Power

Size

A

Number

Revision

1

Date: 7/31/2017

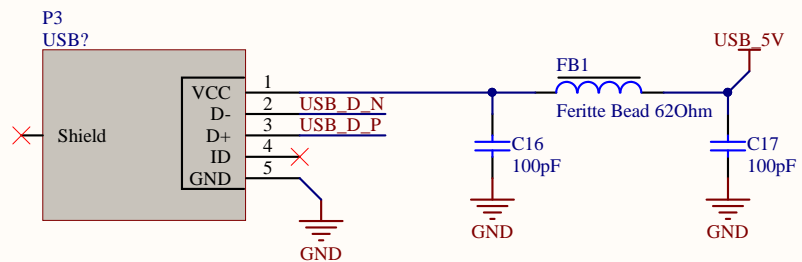
Sheet of

File: C:\Users\...\Power.SchDoc

Drawn By: Craig Hesling

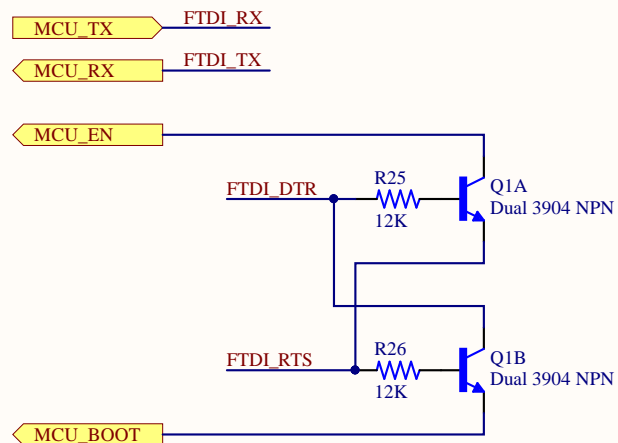
A

A



B

B

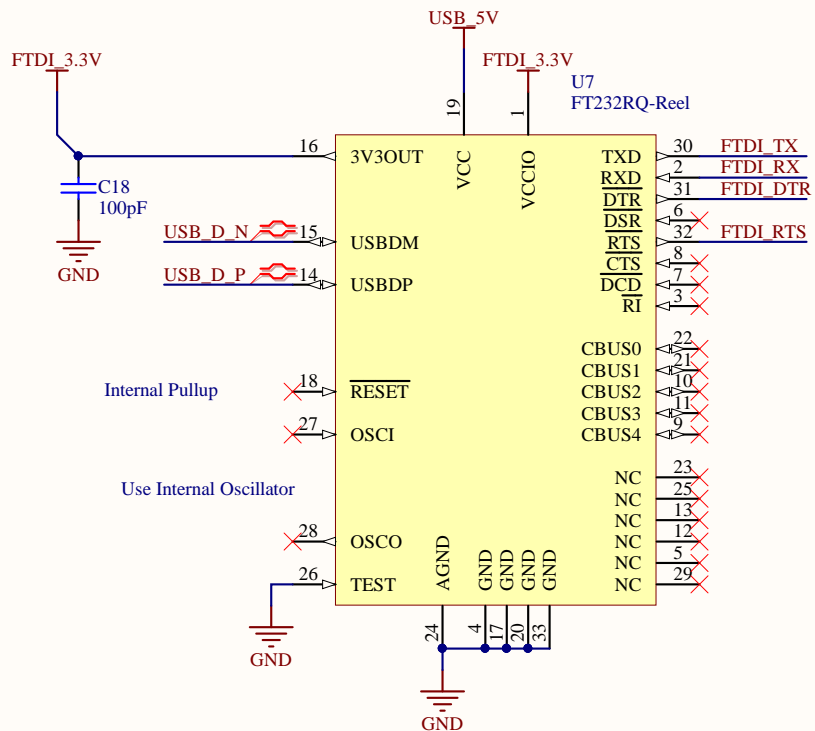


C

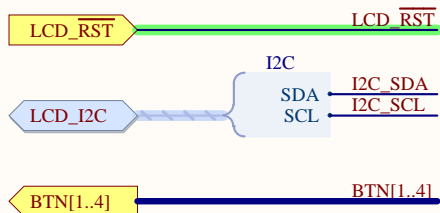
C

D

D



Title			Revision
UART			
Size	Number	Revision	
A		2	
Date:	7/31/2017	Sheet	of
File:	C:\Users\...\UART.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:

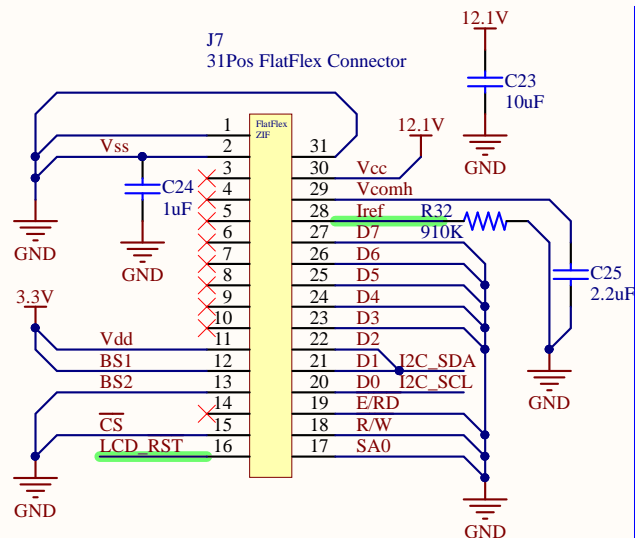
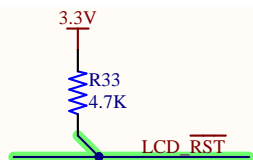
$$I_{ref_min} = [(V_{out_min} - 3V) - 0V] / (910k\Omega * (1+.01))$$

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

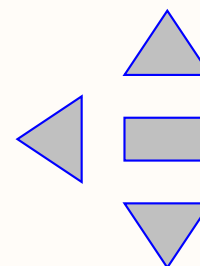
$$I_{ref_max} = [(V_{out_max} - 3V) - 0V] / (910k\Omega * (1-.01))$$

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

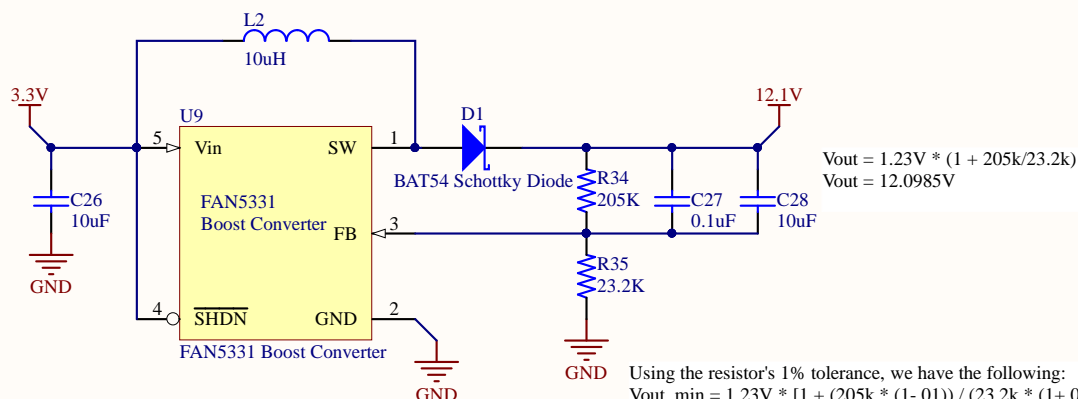
I_{ref_min} and I_{ref_max} are within $10\mu A \pm 2\mu A$.



Display Navigation Buttons



This is the boost converter for the OLED 13V display voltage.



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

$$V_{out} = 12.0985V$$

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

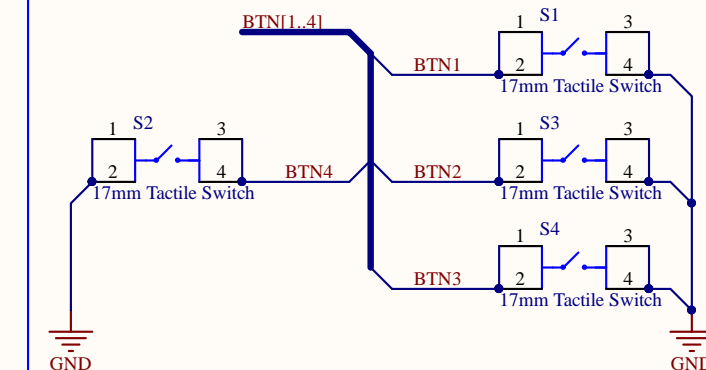
$$V_{out_min} = 1.23V * [1 + (205k * (1-.01)) / (23.2k * (1+.01))]$$

$$V_{out_min} = 11.8833V$$

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

$$V_{out_max} = 12.3181V$$

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



Title		
User Interface		
Size	Number	Revision
A		1
Date:	7/31/2017	Sheet of
File:	C:\Users\...\UI.SchDoc	Drawn By: Craig Hesling