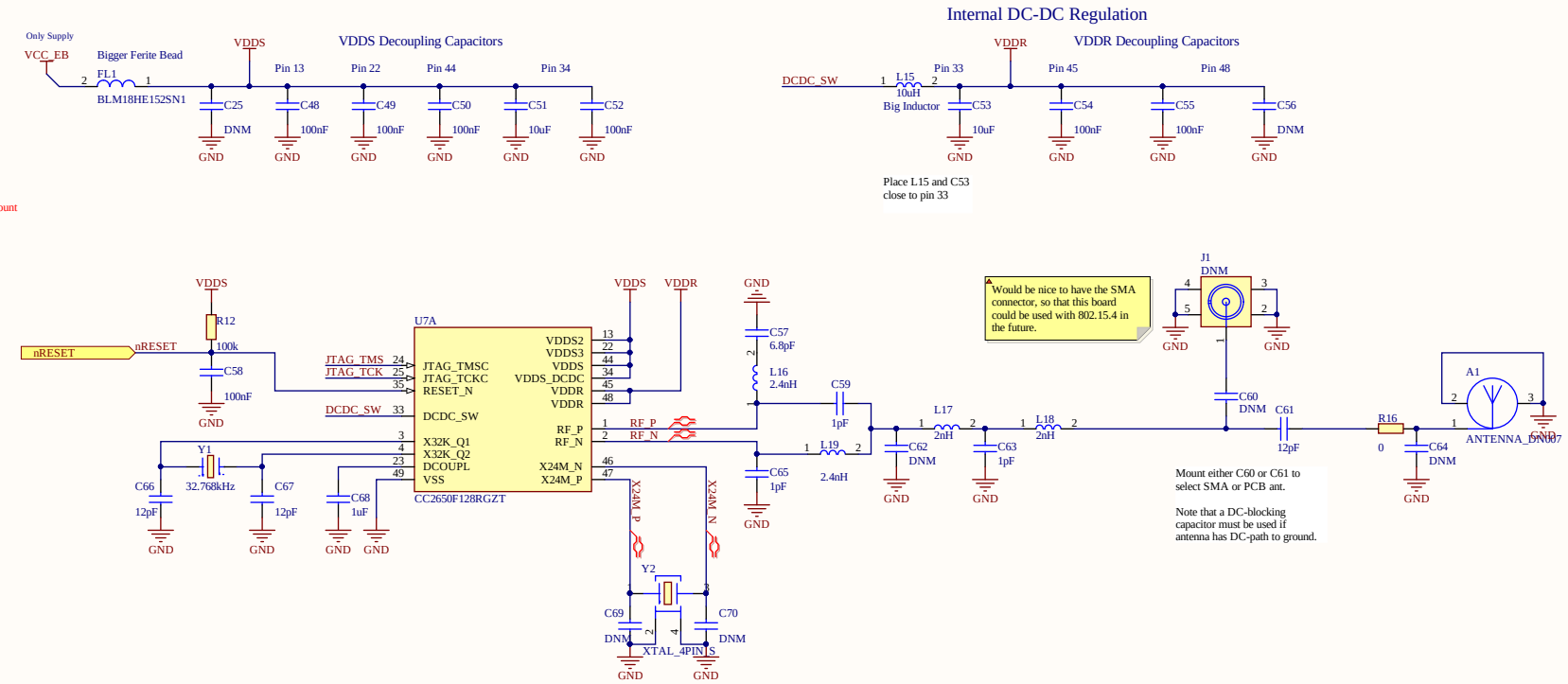


Title	TI CC2650 Radio and MCU
Size	A3
Number	
Revision	1
Date:	7/1/2016
Sheet	of
File:	C:\Users\..\CC2650MCURadio.SchDoc
Drawn By:	Craig Hesling

TODO: Connect USB Shielding

P2
609-4613-1-ND

Shield6
Shield5
Shield4
Shield3
Shield2
Shield1
GND
ID
D+
D-
VCC
Pin5
Pin4
Pin3
Pin2
Pin1
USB_D_P
USB_D_N

GND
L20
62 Ω
1
2
USB_5V

C71
100pF
C72
100pF
GND
GND

FTDI_VIO
VIO used for CBUS and UART IO

U8
FT232RQ-Reel

FTDI_3V3
C73
100pF
GND

Interface

USB_5V
FTDI_3V3
FTDI_VIO

UART
UART
FTDI_RX
FTDI_TX
FTDI_RTS
FTDI_CTS
FTDI_DTR

CBUS[0..4]
CBUS[0..4]

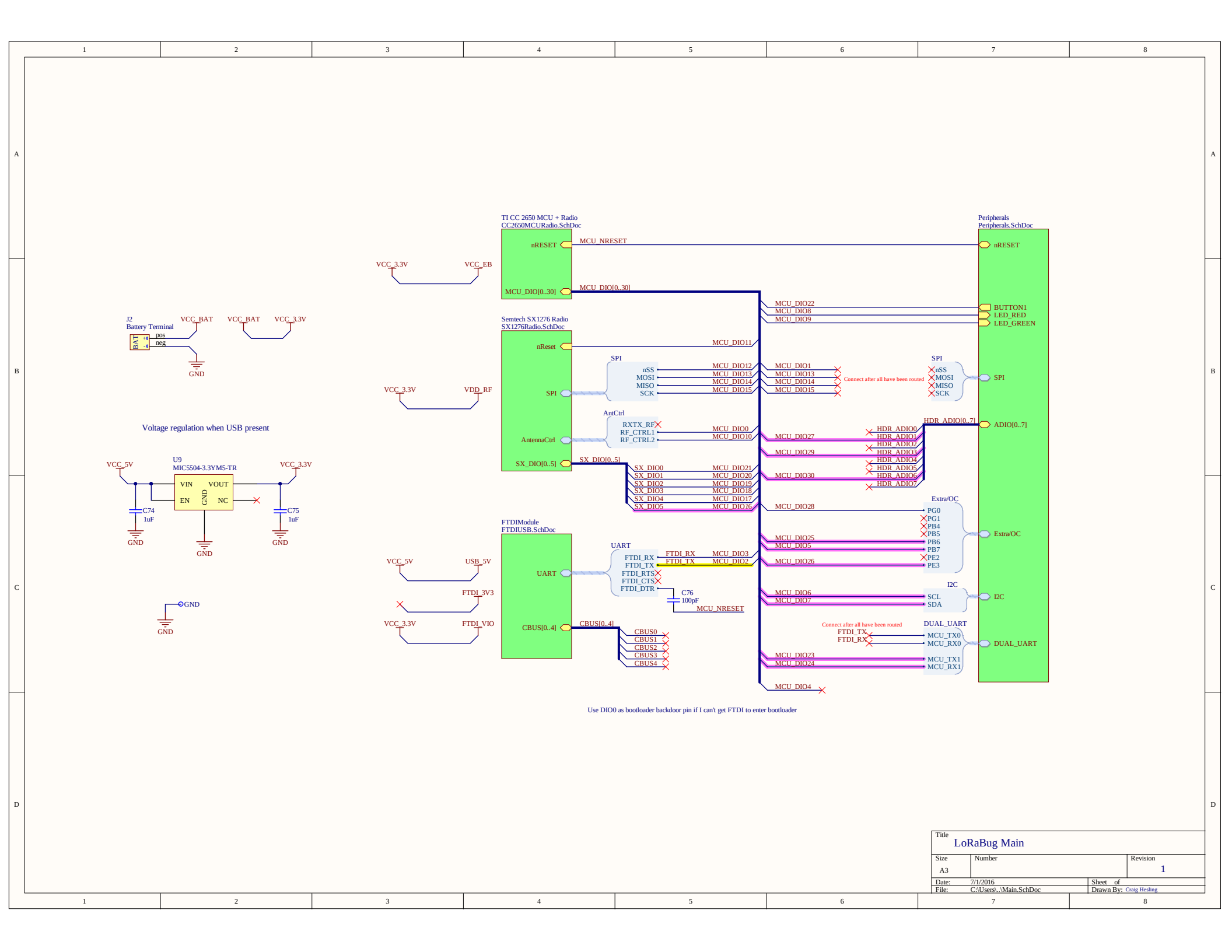
USB_D_N
USB_D_P
Internal Pullup
Use Internal Oscillator

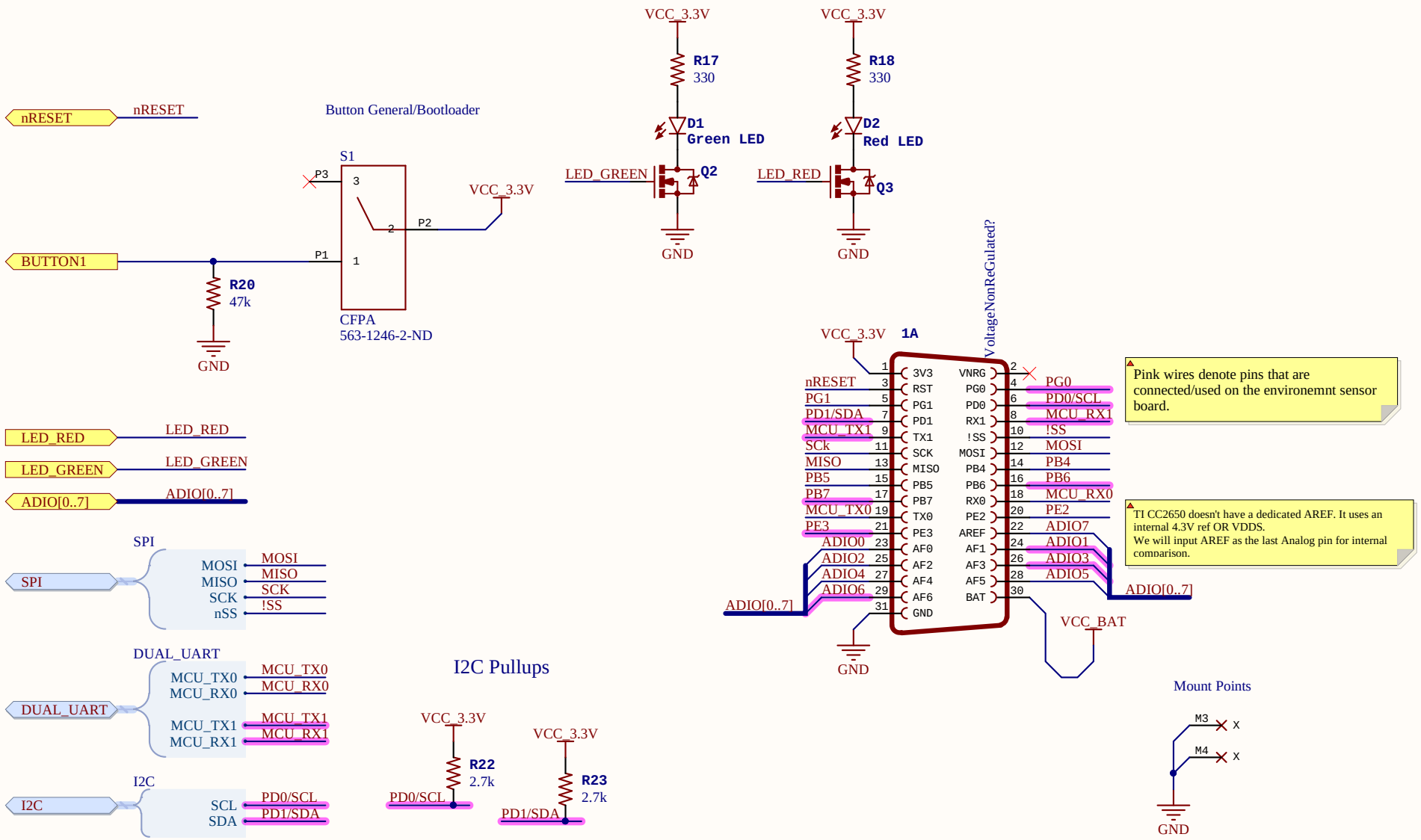
16 3V3OUT
19 VCC
1 VCCIO
15 USBDM
14 USBDP
18 RESET
27 OSCI
28 OSCO
26 TEST
AGND
GND
24
4
17
20
33

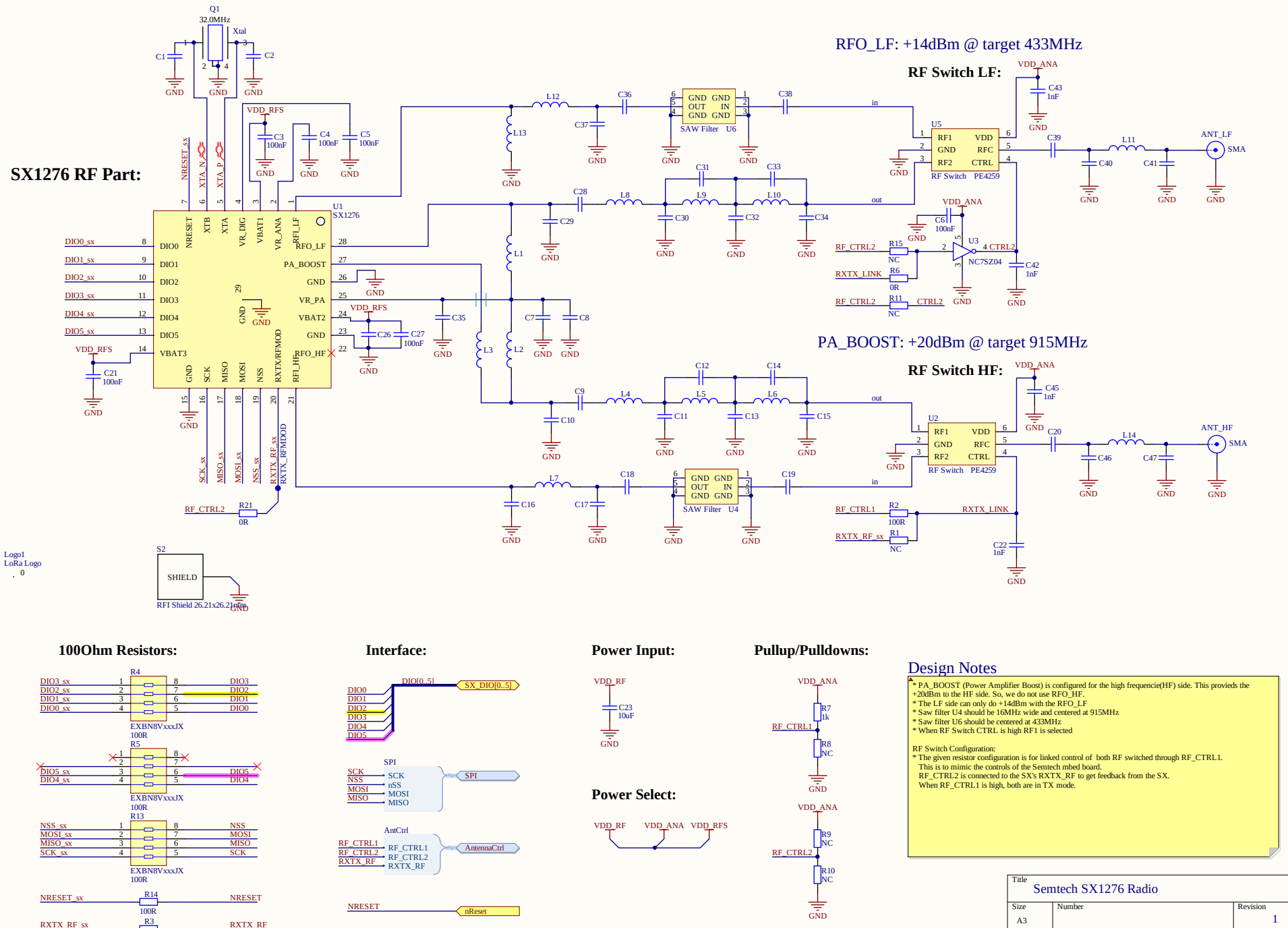
30 TXD FTDI_TX
2 RXD FTDI_RX
31 DTR FTDI_DTR
6 DSR
32 RTS FTDI_RTS
8 CTS FTDI_CTS
7 DCD
3 RI
22 CBUS0
21 CBUS1
10 CBUS2
11 CBUS3
9 CBUS4
23 NC
25 NC
13 NC
12 NC
5 NC
29 NC

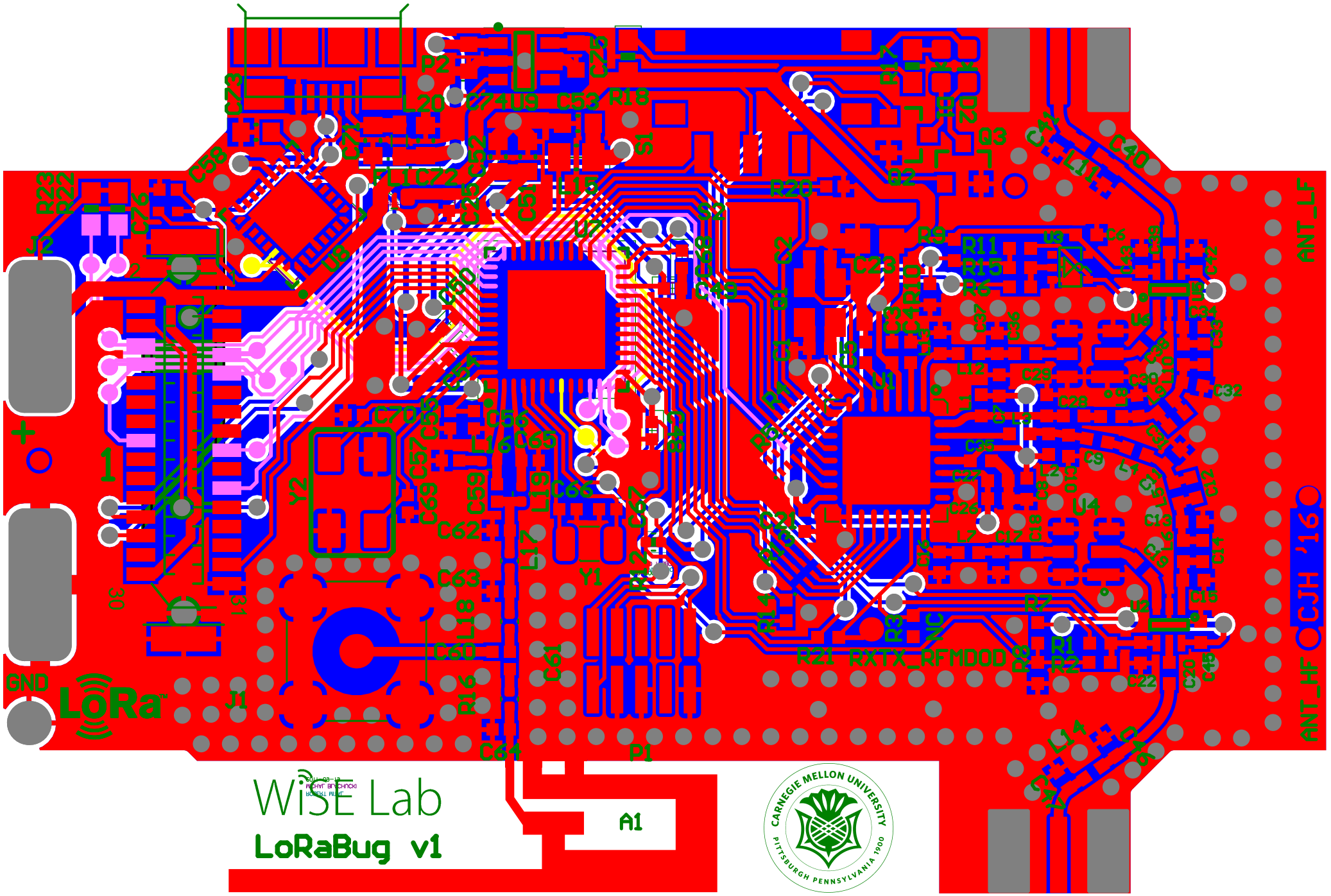
GND
GND

Title: FTDI USB		
Size: A	Number:	Revision: 1
Date: 7/1/2016		Sheet of
File: C:\Users\..\FTDIUSB.SchDoc		Drawn By: Craig Hesling


J2
Battery Terminal
BAT
+
-
pos
neg
VCC_BAT
VCC_BAT
VCC_3.3V
GND
Voltage regulation when USB present
VCC_5V
U9
MIC5504-3.3YM5-TR
VIN
VOUT
EN
GND
NC
C74
1uF
C75
1uF
VCC_3.3V
GND
GND
GND
TI CC 2650 MCU + Radio
CC2650MCURadio.SchDoc
nRESET
MCU_NRESET
VCC_3.3V
VCC_EB
MCU_DIO[0..30]
MCU_DIO[0..30]
Semtech SX1276 Radio
SX1276Radio.SchDoc
nReset
MCU_DIO11
SPI
nSS
MOSI
MISO
SCK
MCU_DIO12
MCU_DIO13
MCU_DIO14
MCU_DIO15
VCC_3.3V
VDD_RF
AntCtrl
RXTX_RF
RF_CTRL1
RF_CTRL2
AntennaCtrl
MCU_DIO0
MCU_DIO10
SX_DIO[0..5]
SX_DIO[0..5]
SX_DIO0
SX_DIO1
SX_DIO2
SX_DIO3
SX_DIO4
SX_DIO5
MCU_DIO21
MCU_DIO20
MCU_DIO19
MCU_DIO18
MCU_DIO17
MCU_DIO16
FTDIModule
FTDIUSB.SchDoc
UART
FTDI_RX
FTDI_TX
FTDI_RTS
FTDI_CTS
FTDI_DTR
FTDI_RX
FTDI_TX
MCU_DIO3
MCU_DIO2
VCC_5V
USB_5V
FTDI_3V3
VCC_3.3V
FTDI_VIO
C76
100pF
MCU_NRESET
CBUS[0..4]
CBUS[0..4]
CBUS0
CBUS1
CBUS2
CBUS3
CBUS4
MCU_DIO22
MCU_DIO8
MCU_DIO9
MCU_DIO1
MCU_DIO13
MCU_DIO14
MCU_DIO15
Connect after all have been routed
MCU_DIO27
MCU_DIO29
MCU_DIO30
MCU_DIO28
MCU_DIO25
MCU_DIO5
MCU_DIO26
MCU_DIO6
MCU_DIO7
Connect after all have been routed
FTDI_TX
FTDI_RX
MCU_DIO23
MCU_DIO24
MCU_DIO4
Peripherals
Peripherals.SchDoc
nRESET
BUTTON1
LED_RED
LED_GREEN
SPI
nSS
MOSI
MISO
SCK
HDR_ADIO[0..7]
ADIO[0..7]
HDR_ADIO0
HDR_ADIO1
HDR_ADIO2
HDR_ADIO3
HDR_ADIO4
HDR_ADIO5
HDR_ADIO6
HDR_ADIO7
Extra/OC
PG0
PG1
PB4
PB5
PB6
PB7
PE2
PE3
I2C
SCL
SDA
DUAL_UART
MCU_TX0
MCU_RX0
MCU_TX1
MCU_RX1
Use DIO0 as bootloader backdoor pin if I can't get FTDI to enter bootloader
Title
LoRaBug Main
Size
A3
Number
Revision
1
Date:
7/1/2016
Sheet of
File:
C:\Users\..\Main.SchDoc
Drawn By:
Craig Hesling


nRESET
nRESET
Button General/Bootloader
S1
P3
3
2
P2
VCC_3.3V
BUTTON1
P1
1
R20
47k
GND
CFPA
563-1246-2-ND
VCC_3.3V
R17
330
D1
Green LED
LED_GREEN
Q2
GND
VCC_3.3V
R18
330
D2
Red LED
LED_RED
Q3
GND
LED_RED
LED_GREEN
ADIO[0..7]
SPI
SPI
MOSI
MISO
SCK
nSS
MOSI
MISO
SCK
!SS
DUAL_UART
DUAL_UART
MCU_TX0
MCU_RX0
MCU_TX1
MCU_RX1
MCU_TX0
MCU_RX0
MCU_TX1
MCU_RX1
I2C
I2C
SCL
SDA
PD0/SCL
PD1/SDA
Extra/OC
Extra/OC
PG0
PG1
PB4
PB5
PB6
PB7
PE2
PE3
PG0
PG1
PB4
PB5
PB6
PB7
PE2
PE3
I2C Pullups
VCC_3.3V
R22
2.7k
PD0/SCL
VCC_3.3V
R23
2.7k
PD1/SDA
VCC_3.3V
1A
VoltageNonReGulated?
1
3V3
nRESET
3
RST
PG1
5
PG1
PD1/SDA
7
PD1
MCU_TX1
9
TX1
SCk
11
SCK
MISO
13
MISO
PB5
15
PB5
PB7
17
PB7
MCU_TX0
19
TX0
PE3
21
PE3
ADIO0
23
AF0
ADIO2
25
AF2
ADIO4
27
AF4
ADIO6
29
AF6
31
GND
ADIO[0..7]
GND
2
VNRG
PG0
4
PG0
PD0
6
PD0/SCL
RX1
8
MCU_RX1
!SS
10
!SS
MOSI
12
MOSI
PB4
14
PB4
PB6
16
PB6
RX0
18
MCU_RX0
PE2
20
PE2
AREF
22
ADIO7
AF1
24
ADIO1
AF3
26
ADIO3
AF5
28
ADIO5
BAT
30
ADIO[0..7]
VCC_BAT
Pink wires denote pins that are connected/used on the environemnt sensor board.
TI CC2650 doesn't have a dedicated AREF. It uses an internal 4.3V ref OR VDDS.
We will input AREF as the last Analog pin for internal comparison.
Mount Points
M3
X
M4
X
GND
Title
Peripherals
Size
A
Number
Revision
1
Date:
7/1/2016
Sheet of
File:
C:\Users\..\Peripherals.SchDoc
Drawn By:
Craig Hesling


SX1276 RF Part:
RFO_LF: +14dBm @ target 433MHz
RF Switch LF:
PA_BOOST: +20dBm @ target 915MHz
RF Switch HF:
Q1
32.0MHz
Xtal
U1
SX1276
U5
RF Switch PE4259
U2
RF Switch PE4259
U3
NC7SZ04
SAW Filter U6
SAW Filter U4
ANT_LF
ANT_HF
SMA
VDD_ANA
VDD_RFS
VDD_RF
GND
RF_CTRL2
RXTX_LINK
RF_CTRL1
RXTX_RF_sx
SHIELD
RFI Shield 26.21x26.21mm
Logo1
LoRa Logo
100Ohm Resistors:
Interface:
Power Input:
Pullup/Pulldowns:
Power Select:
SPI
AntCtrl
nReset
Design Notes
* PA_BOOST (Power Amplifier Boost) is configured for the high frequencie(HF) side. This provieds the +20dBm to the HF side. So, we do not use RFO_HF.
* The LF side can only do +14dBm with the RFO_LF
* Saw filter U4 should be 16MHz wide and centered at 915MHz
* Saw filter U6 should be centered at 433MHz
* When RF Switch CTRL is high RF1 is selected
RF Switch Configuration:
* The given resistor configuration is for linked control of both RF switched through RF_CTRL1.
This is to mimic the controls of the Semtech mbed board.
RF_CTRL2 is connected to the SX's RXTX_RF to get feedback from the SX.
When RF_CTRL1 is high, both are in TX mode.
Title
Semtech SX1276 Radio
Size
A3
Number
Revision
1
Date: 7/1/2016
Sheet of
File: C:\Users\..\SX1276Radio.SchDoc
Drawn By: Craig Hesling


WiSE Lab
LoRaBug v1
A1
CARNEGIE MELLON UNIVERSITY
PITTSBURGH PENNSYLVANIA 1900
ANT_LF
ANT_HF
GND
LoRa