Power Regulation
Power Regulation.SchDoc

Microcontroller
Microcontroller.SchDoc

SEL
SEL[0..7]
UART_TX/IRQ_IN
UART_RX/IRQ_OUT
SPI_MOSI
SPI_MISO
SPI_CLK
SPI_CS_NFC

All RF traces after matching network 50 ohms

RFID Reader
RFID Reader.SchDoc

UART_TX/IRQ_IN
UART_RX/IRQ_OUT
SPI_MOSI
SPI_MISO
SPI_CLK
SPI_CS_NFC
INTERFACE_PIN
ANTENNA1
ANTENNA2

Switch Network
Switch Network.SchDoc

SEL
RF_SEL
RF

RF[0..11]

Antenna Connectors
Antenna Connectors.SchDoc

RF
ANTENNA_N

Copied from ST app note DB2382 Rev 5

Figure out what this is in the app note - jumper to DC ground?

Table 4. **Select serial communication interface selection table**

Pin	SPI interface
SSI_0	1
SSI_1	0

Jumpers and NCs are from app note

EMI filter + matching network
27 ohm Zdiff to 50 ohm TL / trace

Should these really be tied to ground?

Wrong crystal frequency LOL, should be 27.12 MHz +/- 14 kHz

U? ST25R95-VMD5T

Y? ABM3B-13.560MHZ-10-1-U-T

CBU[3C] INTERFACE_PIN

CBU[3C], Microcontroller[5A] SPI_MISO
CBU[3C], Microcontroller[5A] SPI_MOSI
CBU[3C], Microcontroller[5A] SPI_CLK
CBU[3C], Microcontroller[5A] SPI_CS_NFC

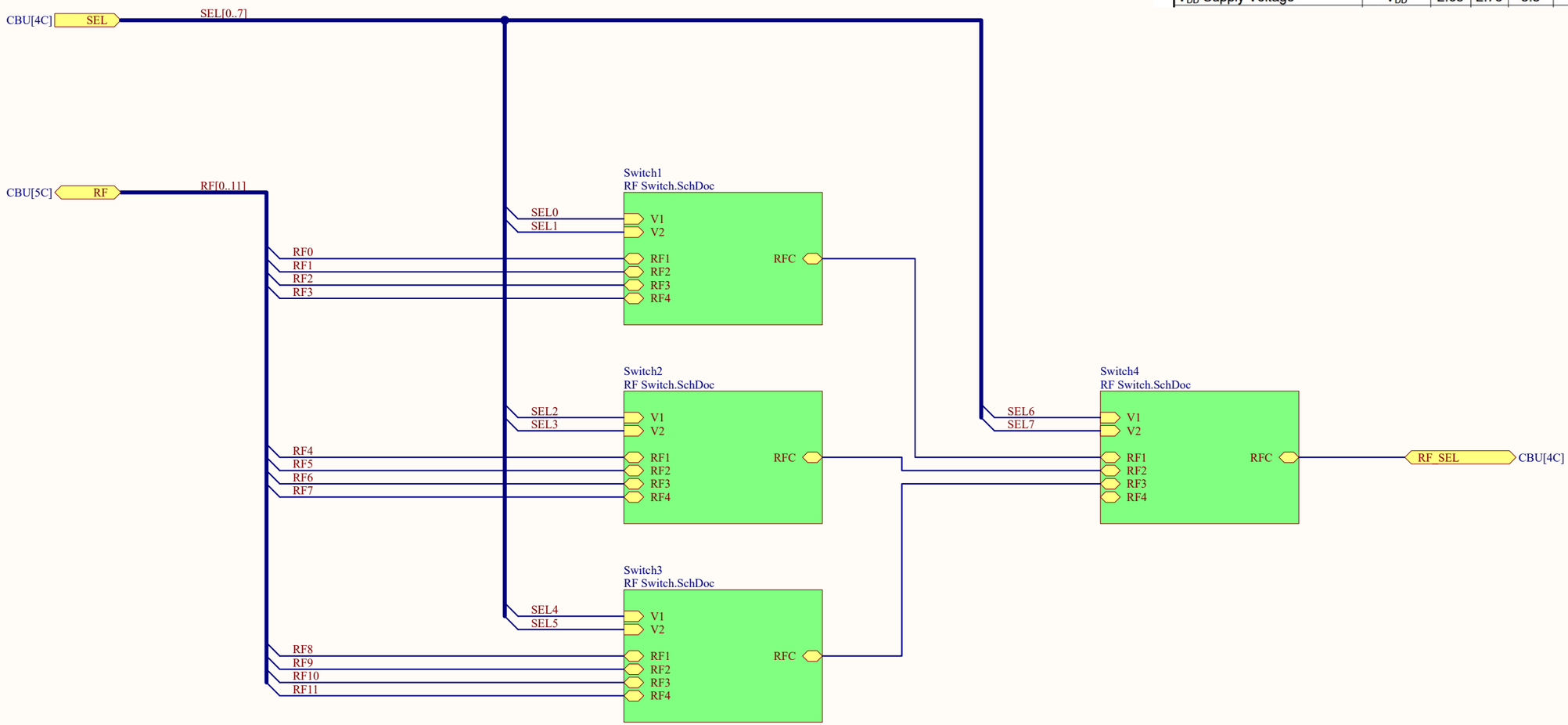
CBU[3C], Microcontroller[5A] UART_RX/IRQ_OUT
CBU[3C], Microcontroller[5A] UART_TX/IRQ_IN

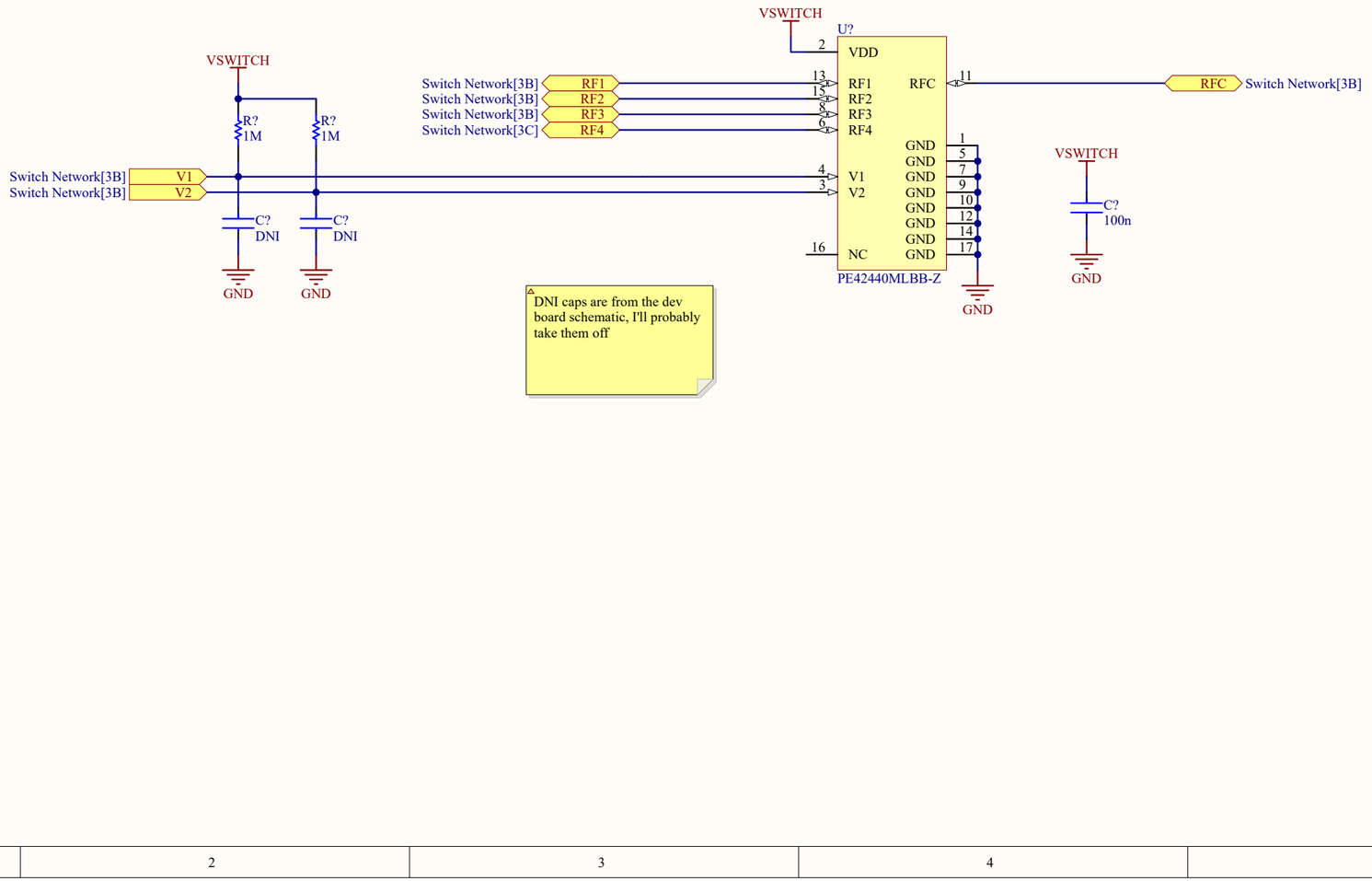
ANTENNA1 CBU[4C]
ANTENNA2 CBU[4C]

I thought about making a circuit to translate a 4-bit select line to the switch network, but letting the micro handle the swtiching logic in software is only 8 wires

Datasheet says 2.75 nominal, 3.3 max
Might need to add another vreg for this, or lower the 3v3 to 3V

Parameter	Symbol	Min	Typ	Max	Units
V_{DD} Supply Voltage	V_{DD}	2.65	2.75	3.3	V




VSWITCH
R?
1M
R?
1M
Switch Network[3B] V1
Switch Network[3B] V2
C?
DNI
C?
DNI
GND
GND
VSWITCH
U?
2
VDD
Switch Network[3B] RF1
Switch Network[3B] RF2
Switch Network[3B] RF3
Switch Network[3C] RF4
13
15
8
6
RF1
RF2
RF3
RF4
RFC
11
RFC Switch Network[3B]
4
3
V1
V2
16
NC
GND
1
5
7
9
10
12
14
17
PE42440MLBB-Z
GND
VSWITCH
C?
100n
GND
DNI caps are from the dev board schematic, I'll probably take them off

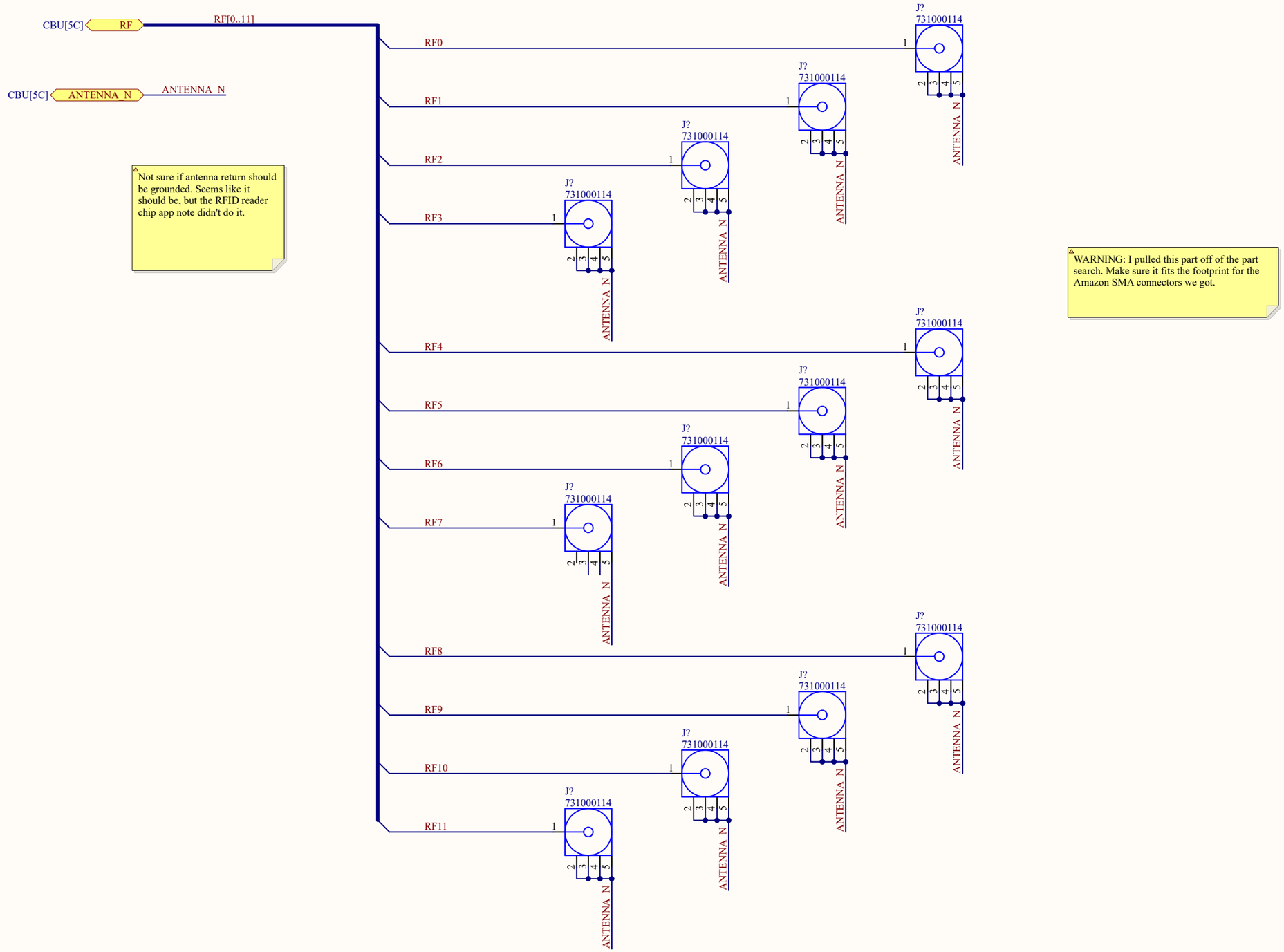
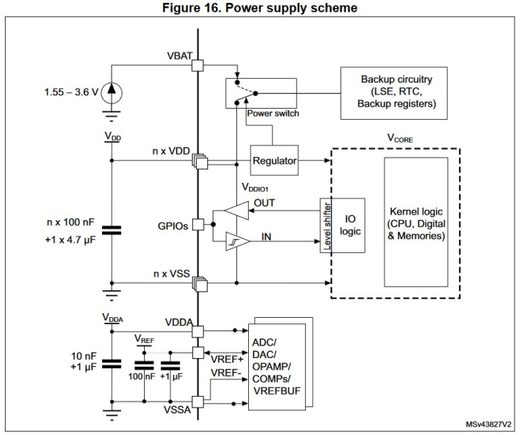
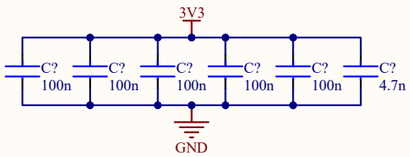
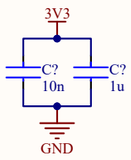

CBU[5C]
RF
RF[0..11]
CBU[5C]
ANTENNA_N
ANTENNA_N
Not sure if antenna return should be grounded. Seems like it should be, but the RFID reader chip app note didn't do it.
RF0
RF1
RF2
RF3
RF4
RF5
RF6
RF7
RF8
RF9
RF10
RF11
J?
731000114
1
2
3
4
5
ANTENNA_N
WARNING: I pulled this part off of the part search. Make sure it fits the footprint for the Amazon SMA connectors we got.

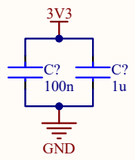
Figure 16. Power supply scheme

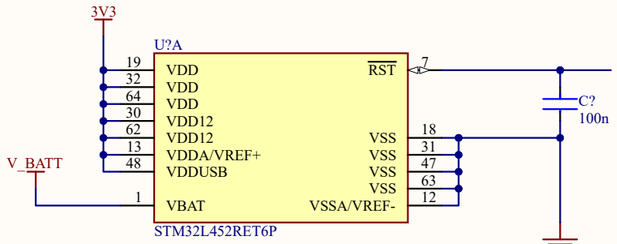


Each power supply pair (V_{DD}/V_{SS}, V_{DDA}/V_{SSA} etc.) must be decoupled with filtering ceramic capacitors as shown above. These capacitors must be placed as close as possible to, or below, the appropriate pins on the underside of the PCB to ensure the good functionality of the device.



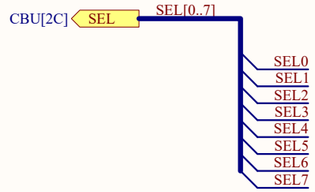






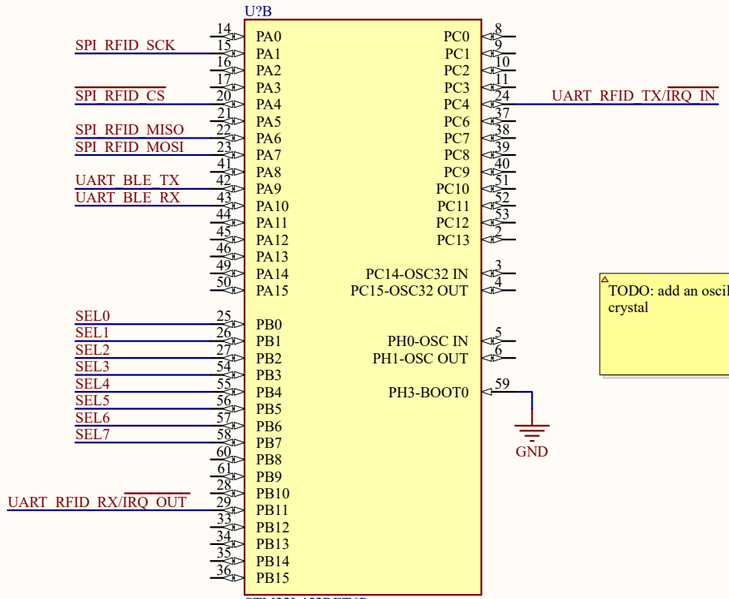
max V_BATT = 4.8V
-> 4.8/3 = 1.6V < 3.3V

TODO: put a NO button here to ground
I'm really lazy

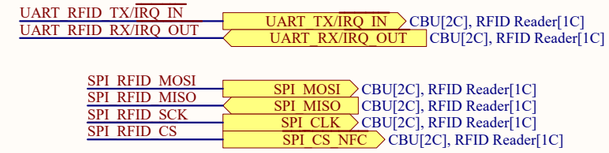


Note: peripheral mappings still not final
I might swap things around to make layout easier

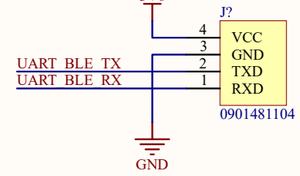
SPI RFID: SPI1
UART BLE: USART1
UART RFID (prob not used): USART3

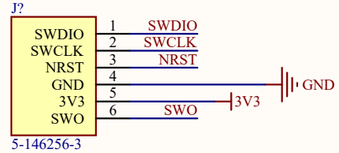


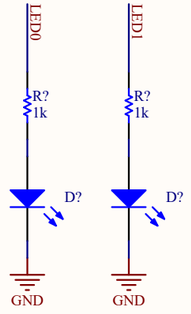
TODO: add an oscillator / crystal

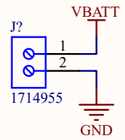


TODO: add jumpers to flip tx/rx
Check lab manual / datasheets to make sure tx/rx is correct









Assuming 3x AA batteries, 1.3V - 1.6V absolute range, VBATT = 3.9V - 4.8V

BLE requires 3.6V min, highest operating voltage

Adjustable Operation

The output voltage can be set by using a resistor divider as shown in Figure 1 with a range of 1.25 to 10 V. The appropriate resistor divider can be found by solving the equation below. The recommended current through the resistor divider is from 10 µA to 100 µA. This can be accomplished by selecting resistors in the kΩ range. As result, the I_{adj}*R2 becomes negligible in the equation and can be ignored.

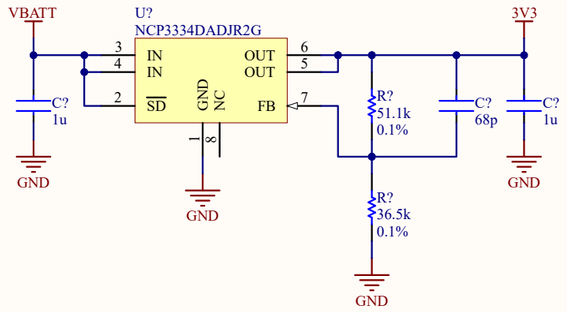
$$V_{out} = 1.25 * \left(1 + \frac{R1}{R2}\right) + I_{adj} * R2 \qquad \text{(eq. 1)}$$

Example:
For V_{out} = 2.9 V, can use R_1 = 36 kΩ and R_2 = 27 kΩ.

$$1.25 * \left(1 + \frac{36\ k\Omega}{27\ k\Omega}\right) = 2.91\ V \qquad \text{(eq. 2)}$$

51.1k/31.2k ->3.297V
500 mA max output

Change R2 to 36.5 to get 3V output

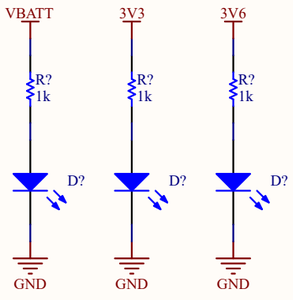


The RFID reader app note used 3v3, but I think this is supposed to be 3v, which works with the micro and fits in the rf switch vdd range better

Not sure how 3V micro bus works with a 3v3 programmer, check datasheet carefully

To be safe maybe i'll leave the micro at 3V3 and just add a 3rd reg for 3V lol

TODO: change this to 3V?



51.1k/27.1k ->3.607V