

# RFCAT

## N32

VERSION 1.2

Amplified nRF52832 dev kit for long range, high bandwidth and mesh applications

### KEY FEATURES



Skyworks RFX2401C PA & LNA with 18.9dBm TX gain and 11dBm RX gain



Loaded with Adafruit NRF52 bootloader supporting OTA, FreeRTOS and Arduino



CP2102N USB to UART bridge allowing for quick programming and debug



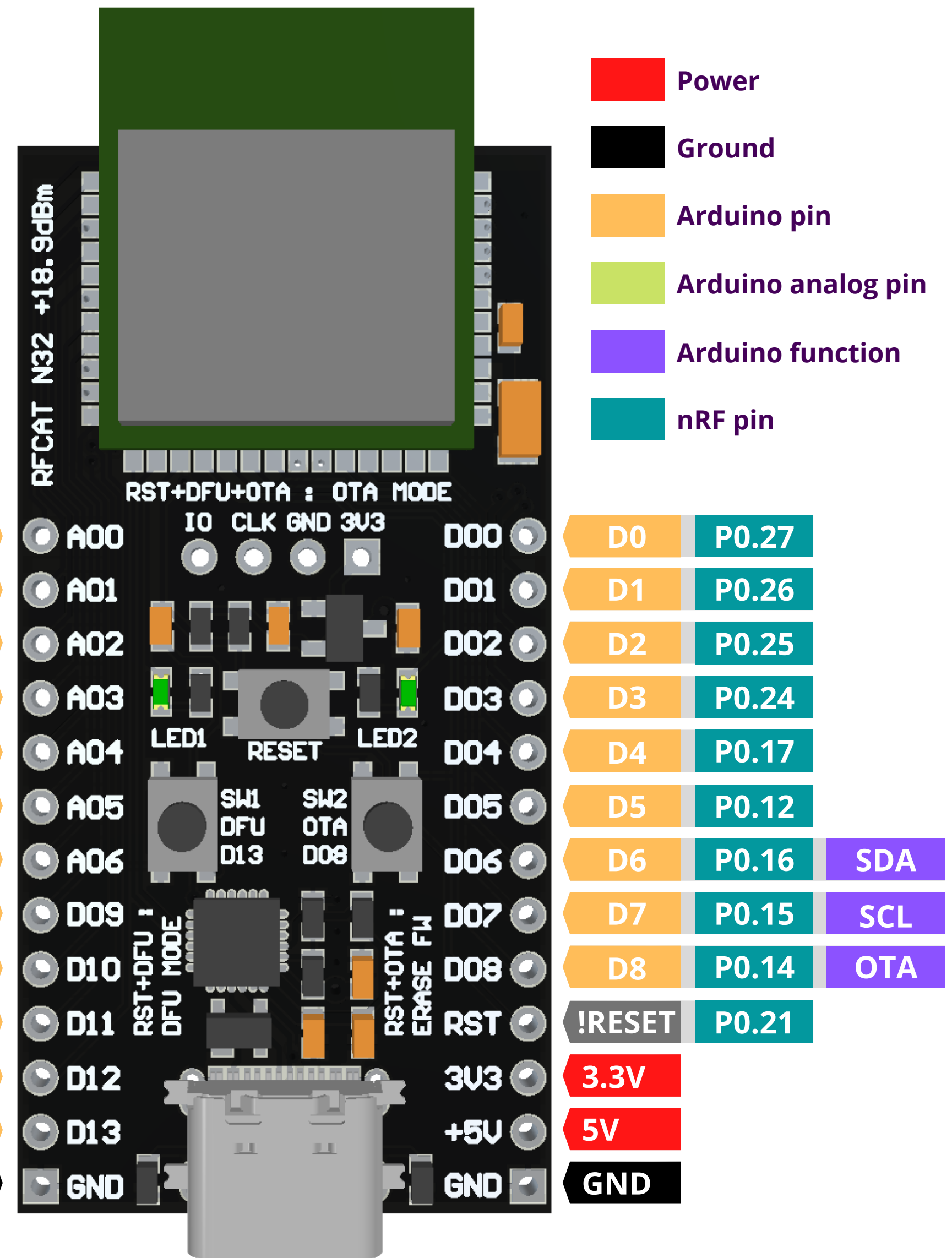
21 GPIOs, 7 ADC pins, 3 buttons and 2 LEDs for easy interaction and debug

### RF TRANSMISSION POWER COMPARISON



- Power
- Ground
- Arduino pin
- Arduino analog pin
- Arduino function
- nRF pin

A0	AIN4	P0.28	D24
A1	AIN5	P0.29	D25
A2	AIN6	P0.30	D26
A3	AIN0	P0.02	D27
A4	AIN2	P0.04	D28
A5	AIN1	P0.03	D29
A6	AIN3	P0.05	D30
	MISO	P0.08	D9
	MOSI	P0.06	D10
	SCK	P0.07	D11
	SS	P0.01	D12
	DFU	P0.00	D13
	GND		



USB type C

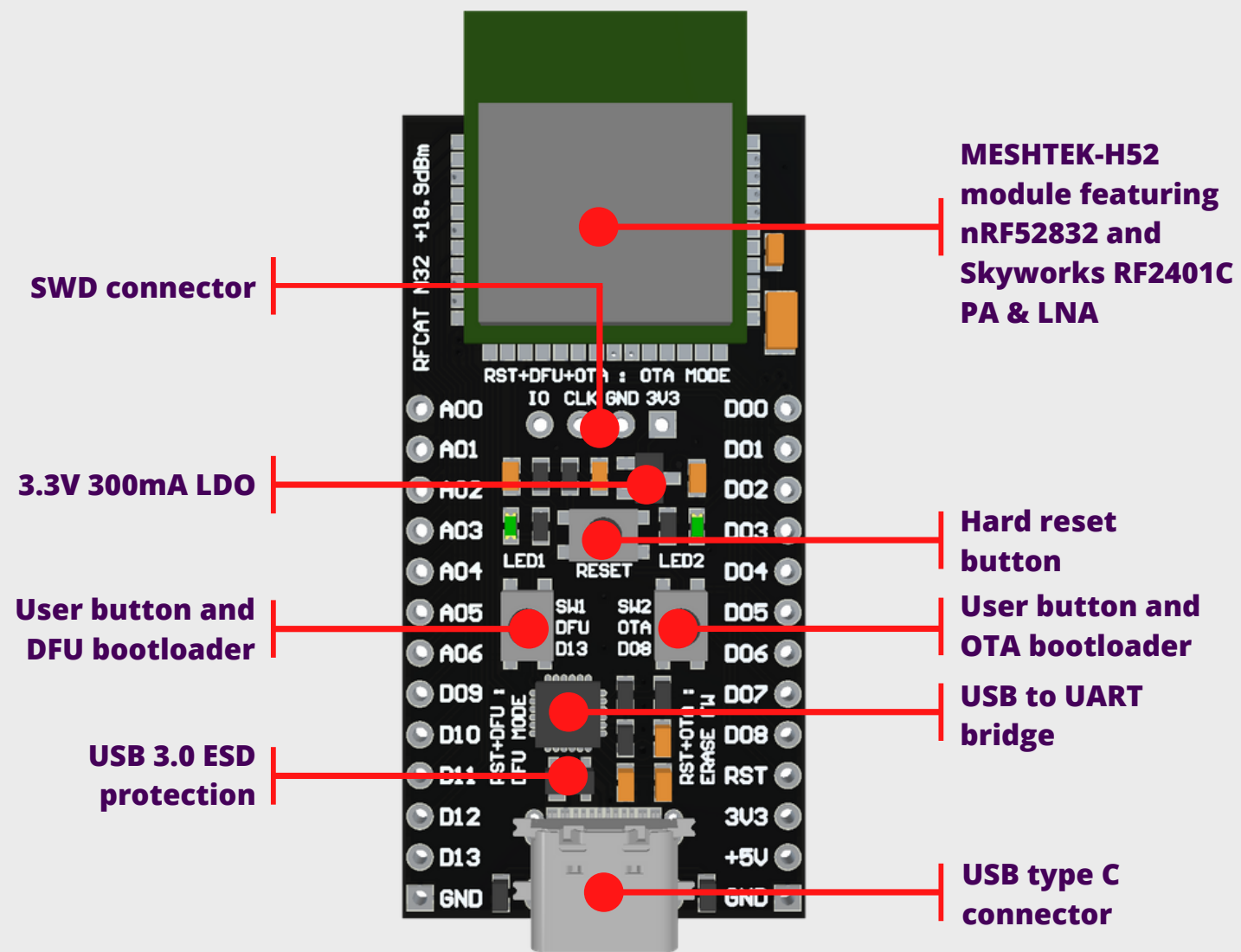


MADE WITH



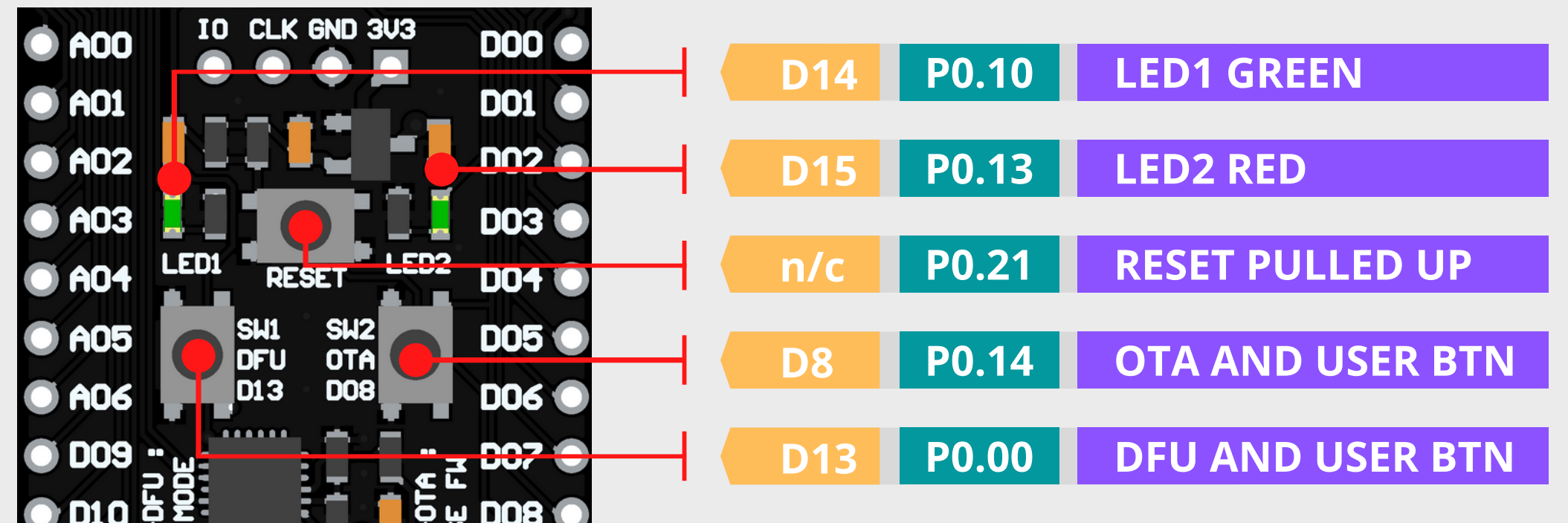
IN DENMARK

## FRONT VIEW



# BOARD OVERVIEW

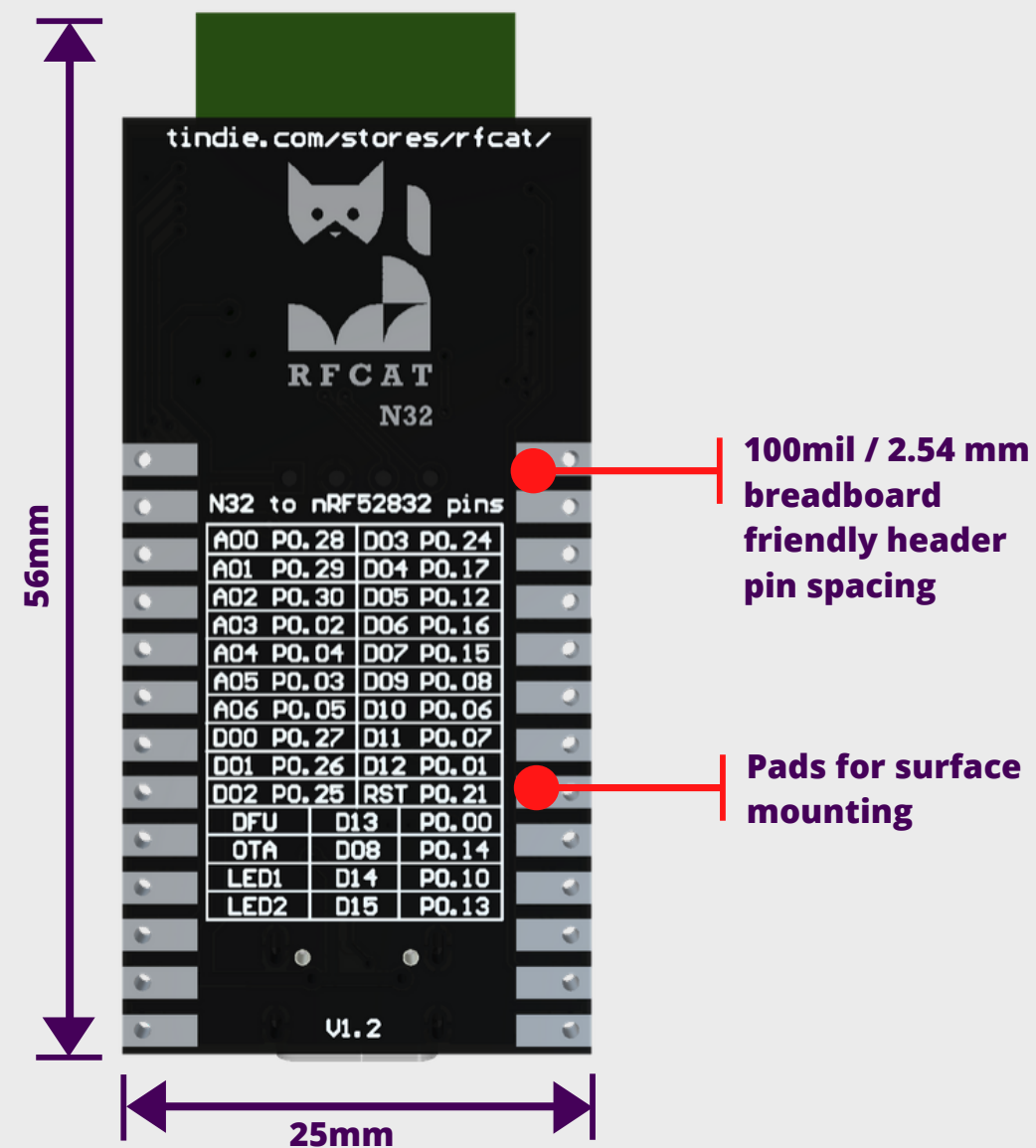
## LEDS AND BUTTONS



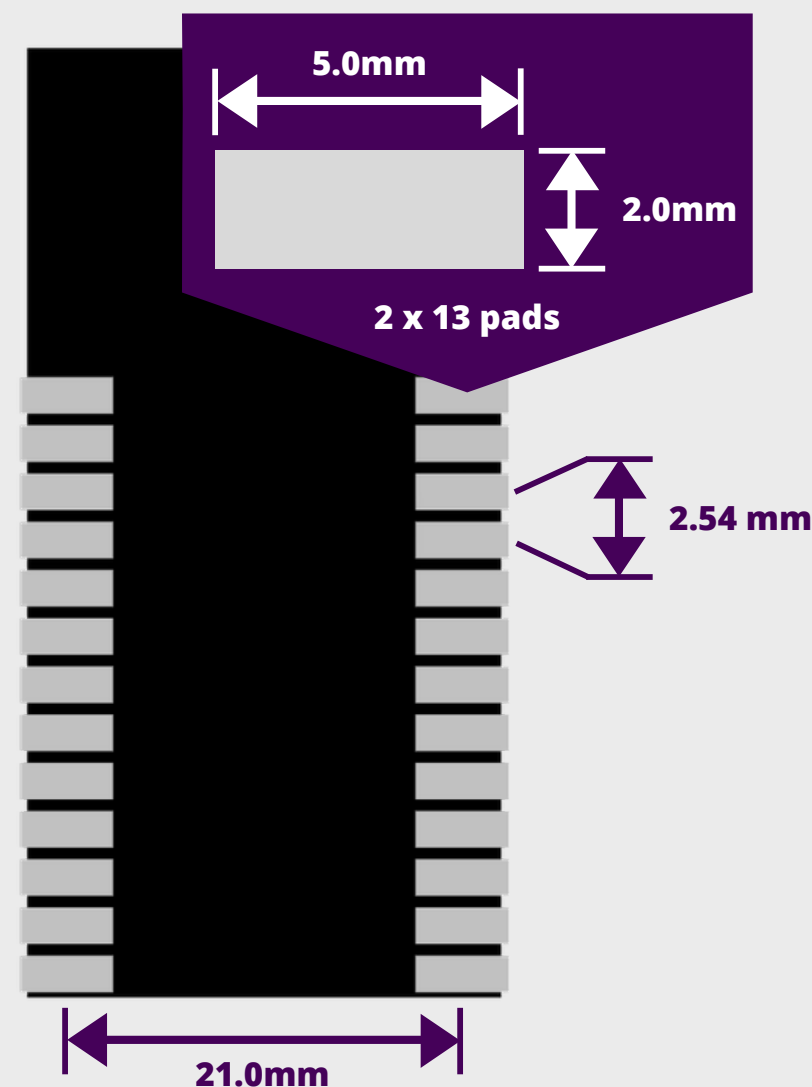
## SIDE VIEW



## BACK VIEW



## PCB LAND PATTERN



## ELECTRICAL

### 5V PIN

POWERED BY USB. CAN BE POWERED DIRECTLY VIA THE PIN.  
MAX INPUT VOLTAGE: 5.25V

### 3.3V PIN

POWERED BY THE 3.3V REG. CAN BE POWERED DIRECTLY VIA THE PIN.  
MAX INPUT VOLTAGE: 3.5V

### GPIO PINS

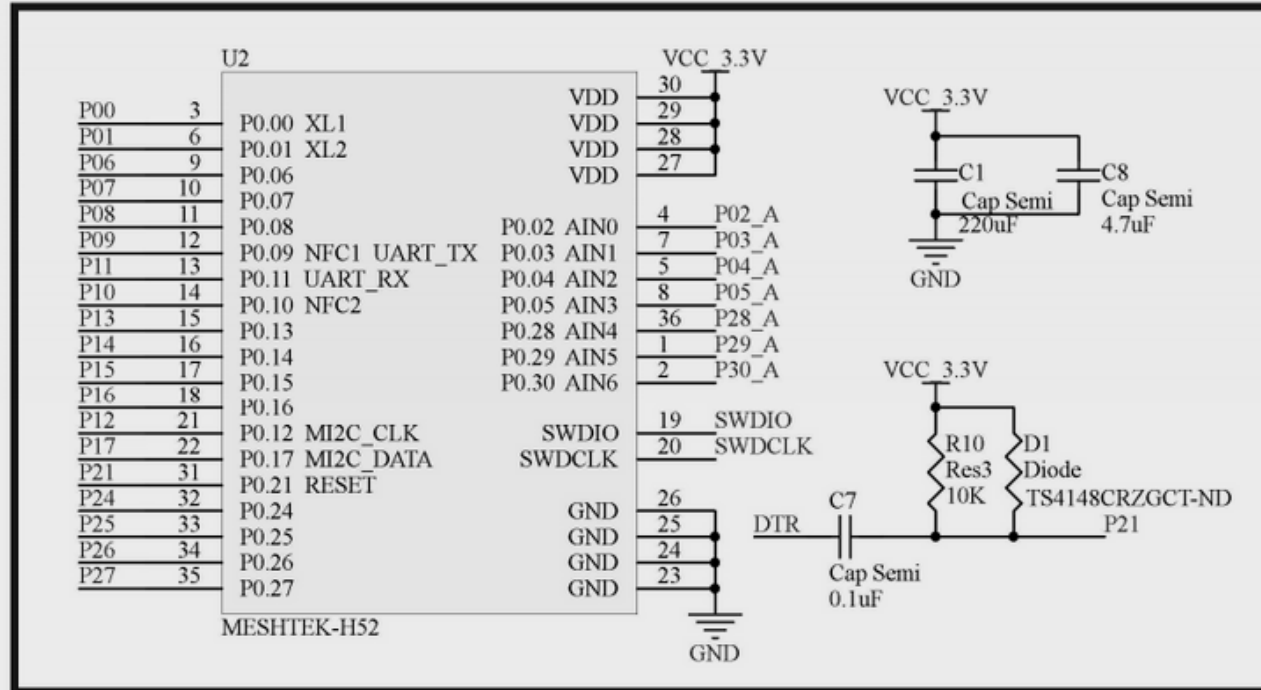
MAX 10mA PER GPIO PIN  
MAX 30mA FOR ENTIRE PACKAGE

### LOW POWER CONSUMPTION

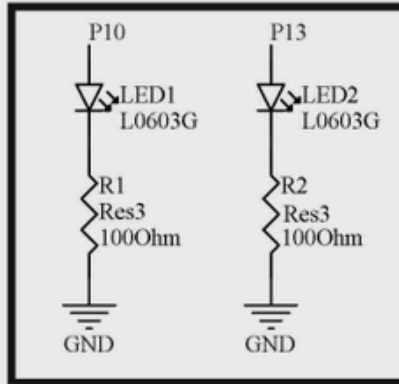
USB TO SERIAL BRIDGE IS ONLY POWERED BY 5V OR USB. LOW POWER CONSUMPTION CAN BE ACHIEVED BY POWERING THE RFCAT N32 DIRECTLY BY SUPPLYING THE 3.3V PIN WITH 3.3V.

# SCHEMATIC VIEW

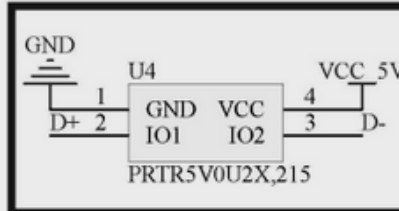
## Microcontroller



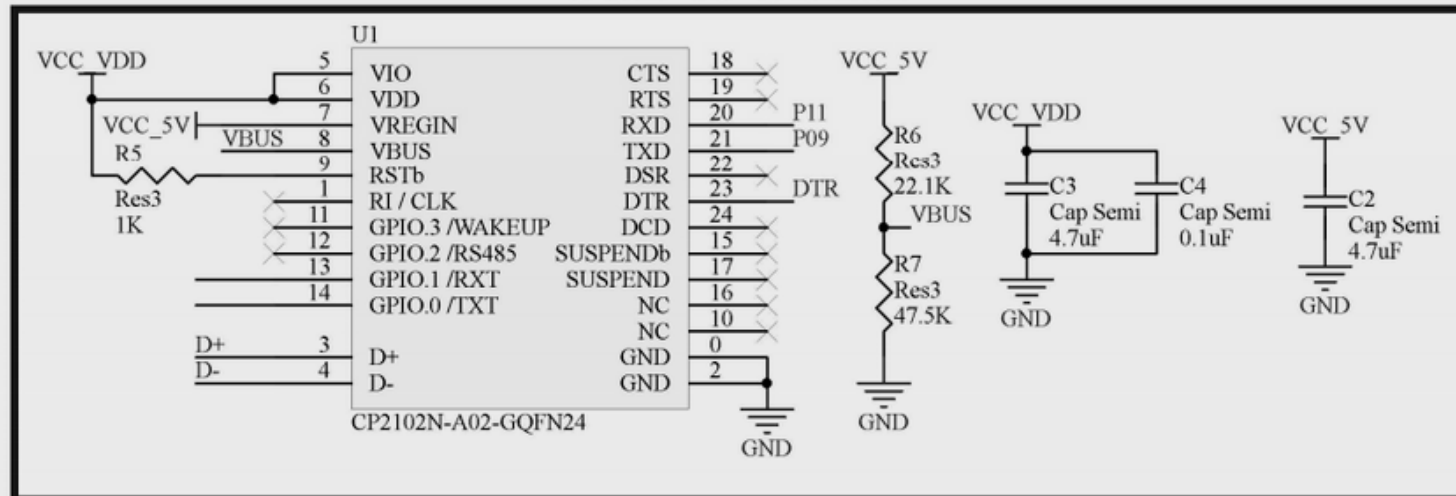
## LEDs



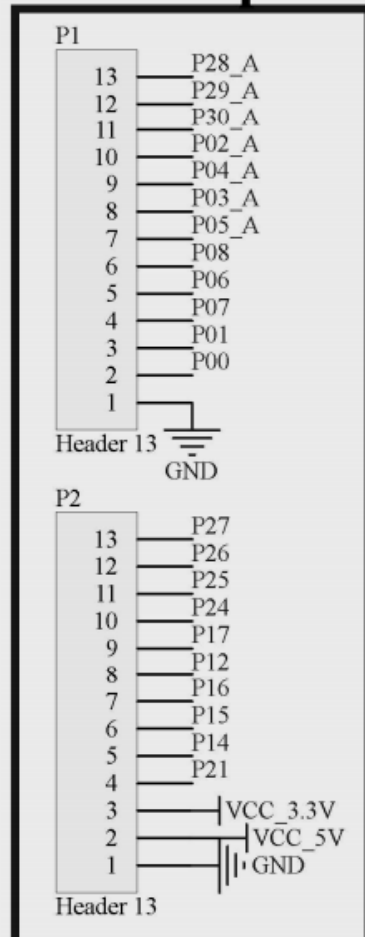
## ESD Protection



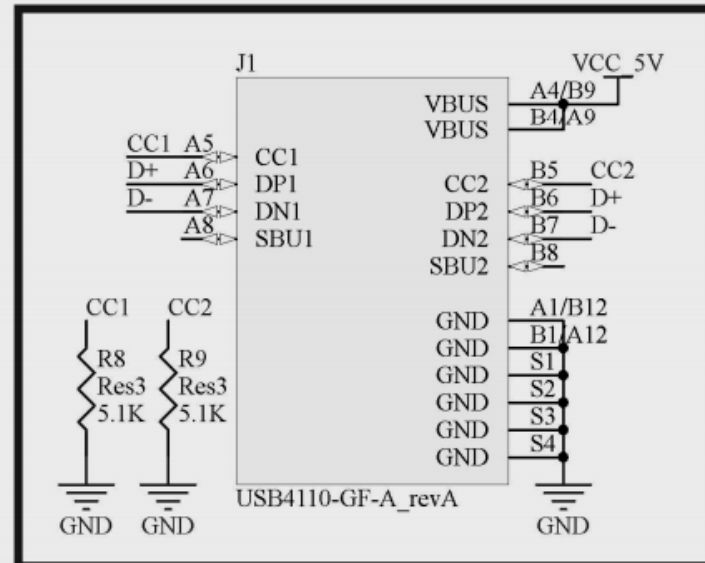
## USB to UART



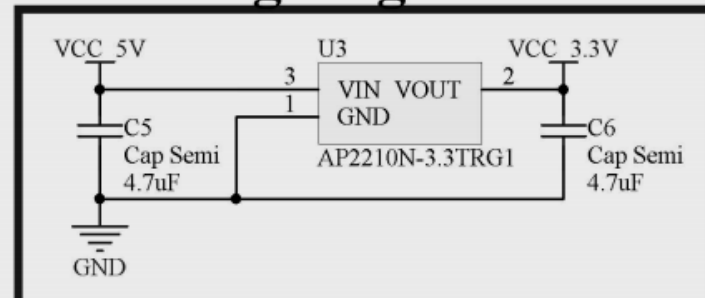
## Header pins



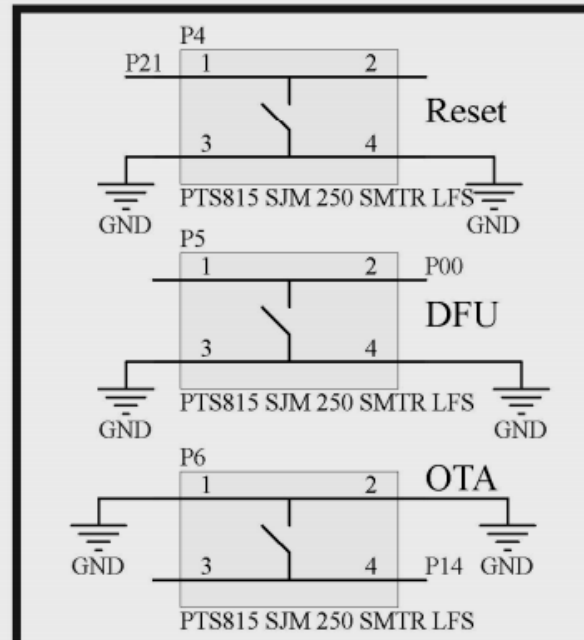
## USB connector



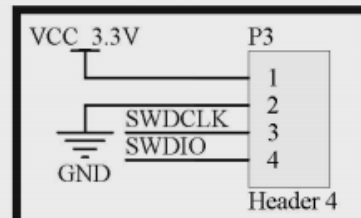
## Voltage regulator



## Buttons



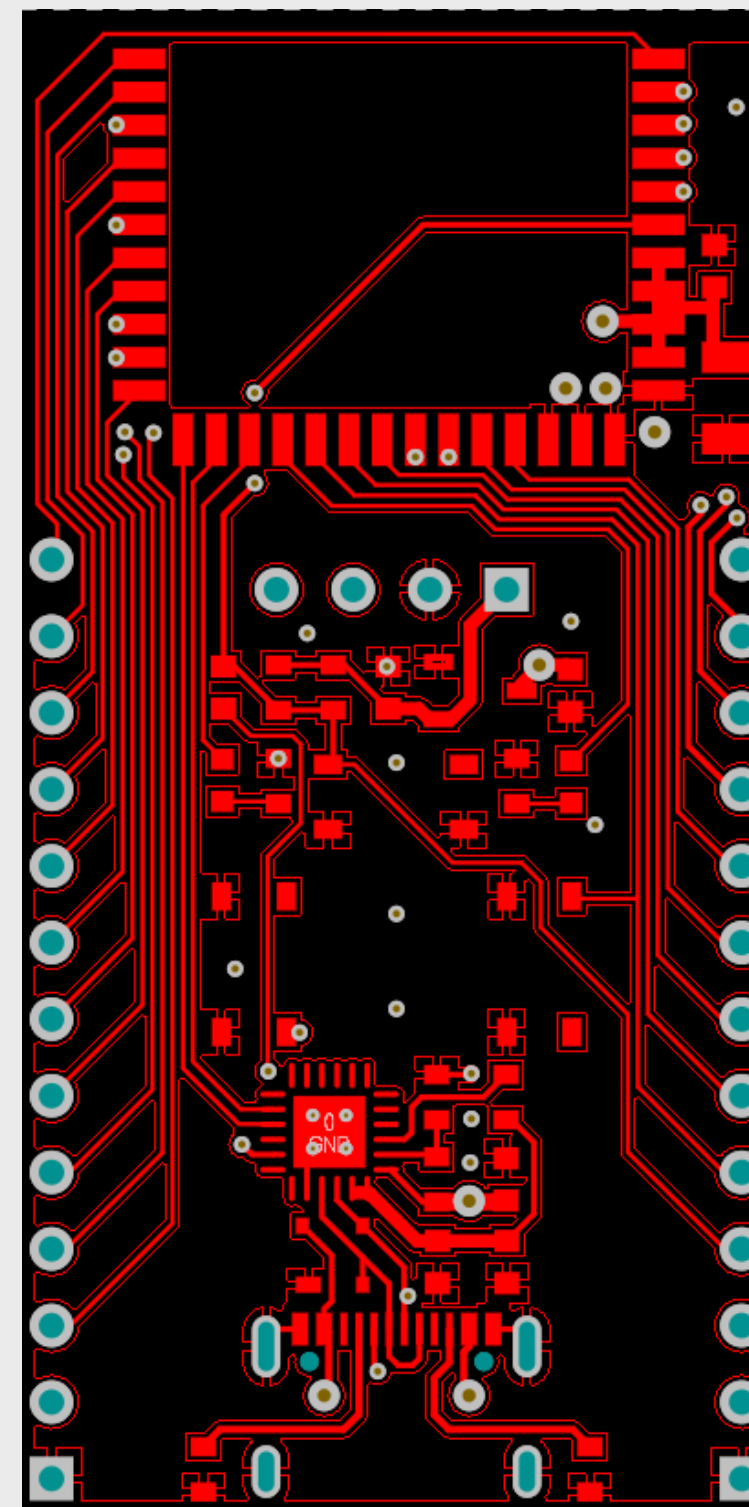
## SWD header



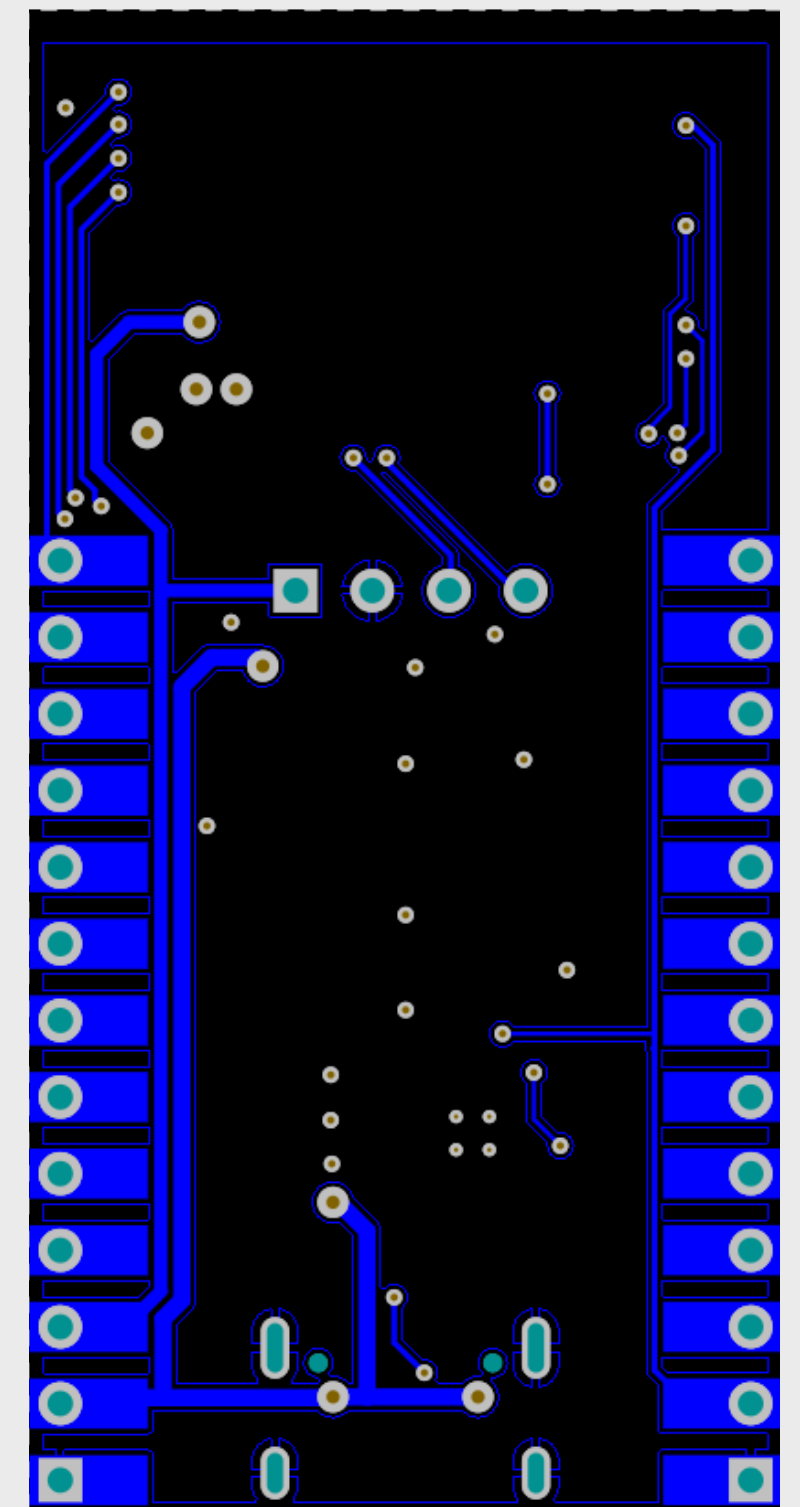
# SCHEMATICS AND PCB

## PCB VIEW

### TOP VIEW



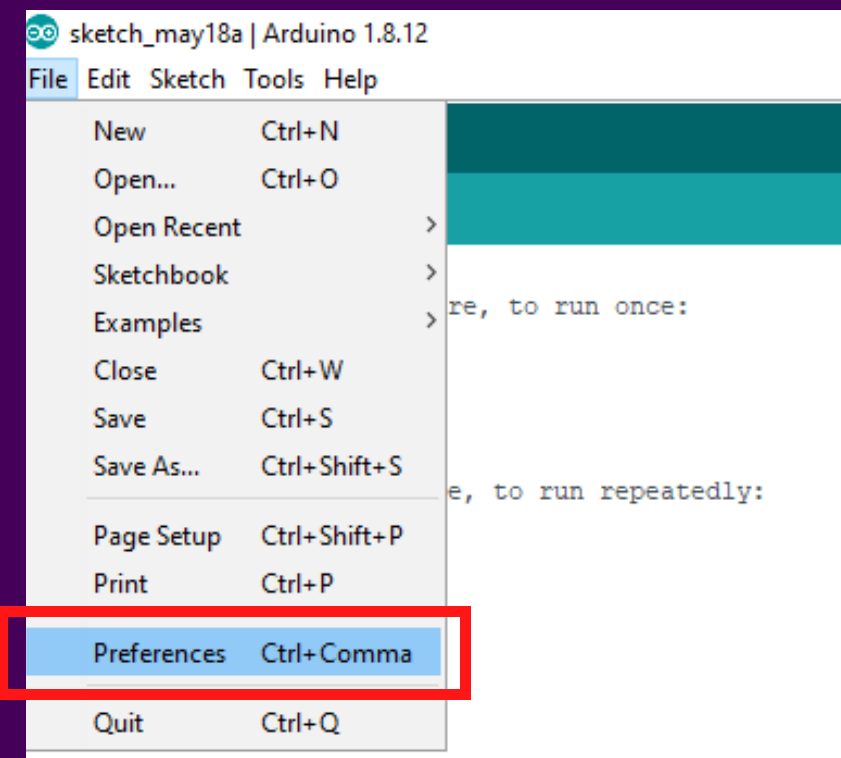
### BOTTOM VIEW



# ARDUINO SETUP

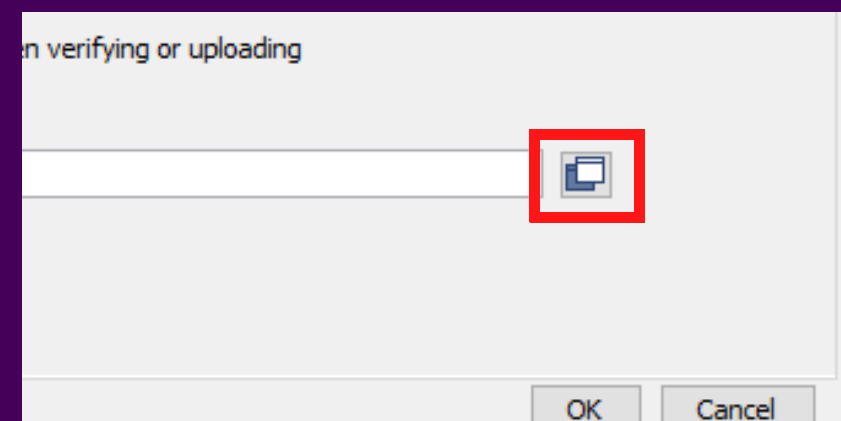
## STEP 1

OPEN ARDUINO, VERSION 1.8 OR HIGHER. CLICK ON FILE, THEN CLICK ON PREFERENCES.



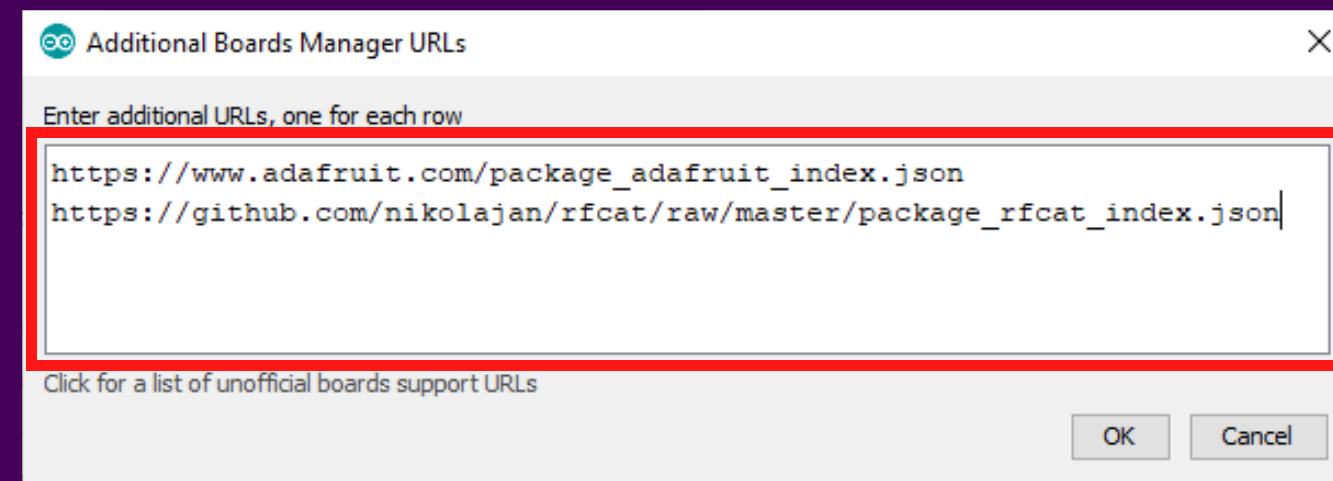
## STEP 2

CLICK ON THE ICON NEXT TO ADDITIONAL BOARDS MANAGER URLS.



## STEP 3

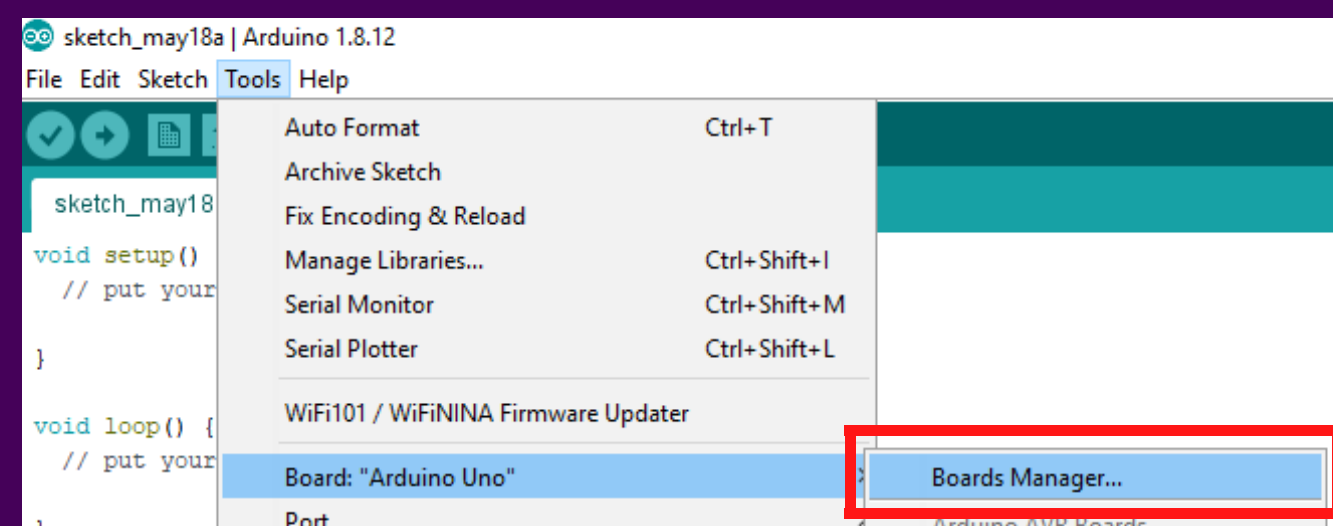
COPY AND PASTE THE URLS TO THE RIGHT INSIDE THE TEXT FIELD AND CLICK OK.



[https://www.adafruit.com/package\\_adafruit\\_index.json](https://www.adafruit.com/package_adafruit_index.json)  
[https://github.com/nikolajan/rfcat/raw/master/package\\_rfcat\\_index.json](https://github.com/nikolajan/rfcat/raw/master/package_rfcat_index.json)

## STEP 4

CLICK ON TOOLS, BOARD AND THEN BOARD MANAGER.

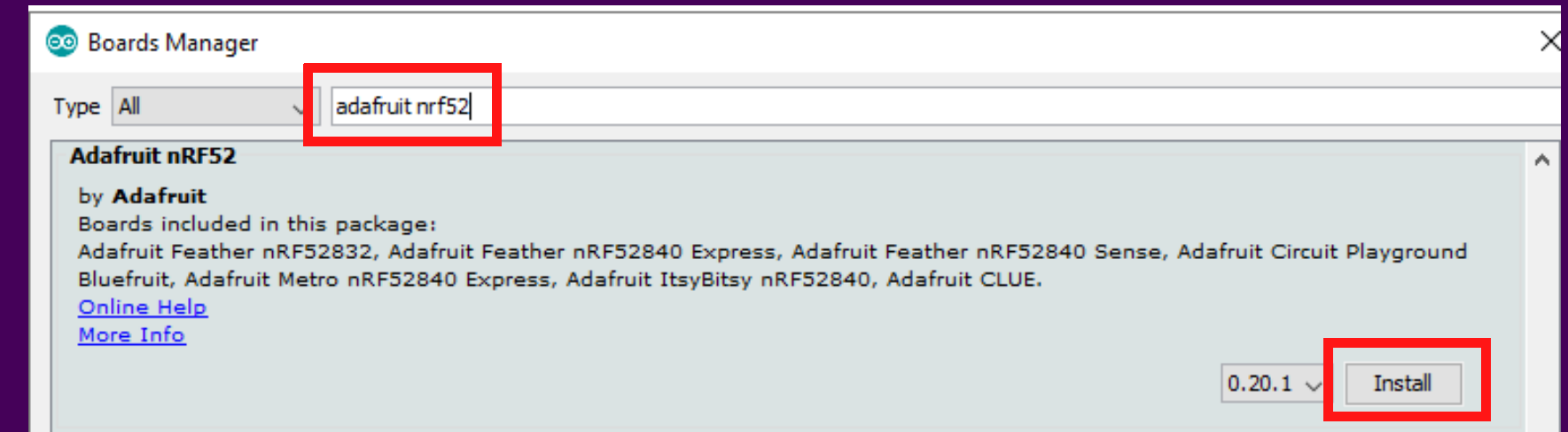
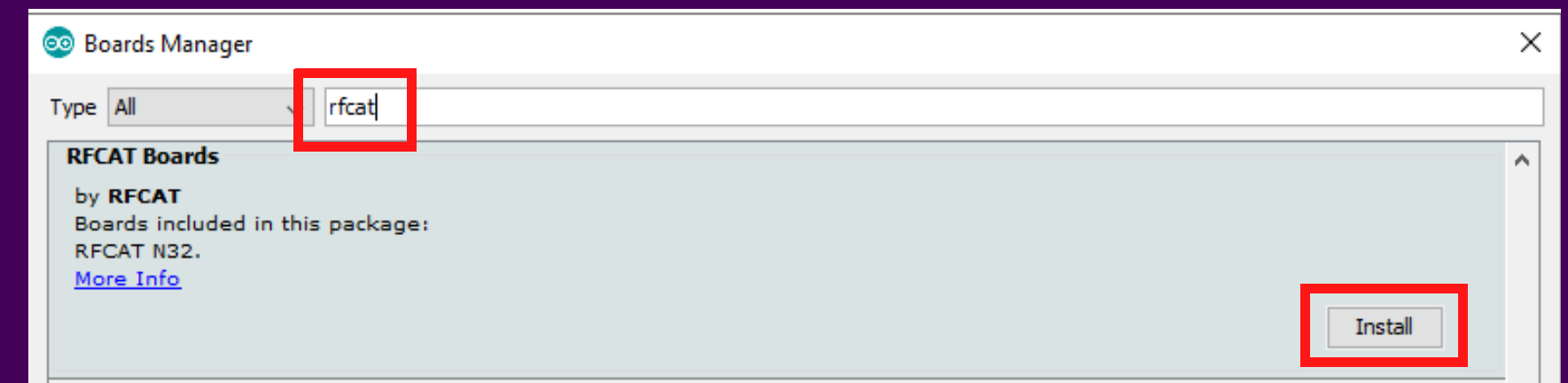


## STEP 5

SEARCH FOR "RFCAT" AND CLICK INSTALL. WAIT FOR THE INSTALLER TO FINISH.

THEN SEARCH FOR "ADAFRUIT NRF52" AND CLICK INSTALL. WAIT FOR THE INSTALLER TO FINISH.

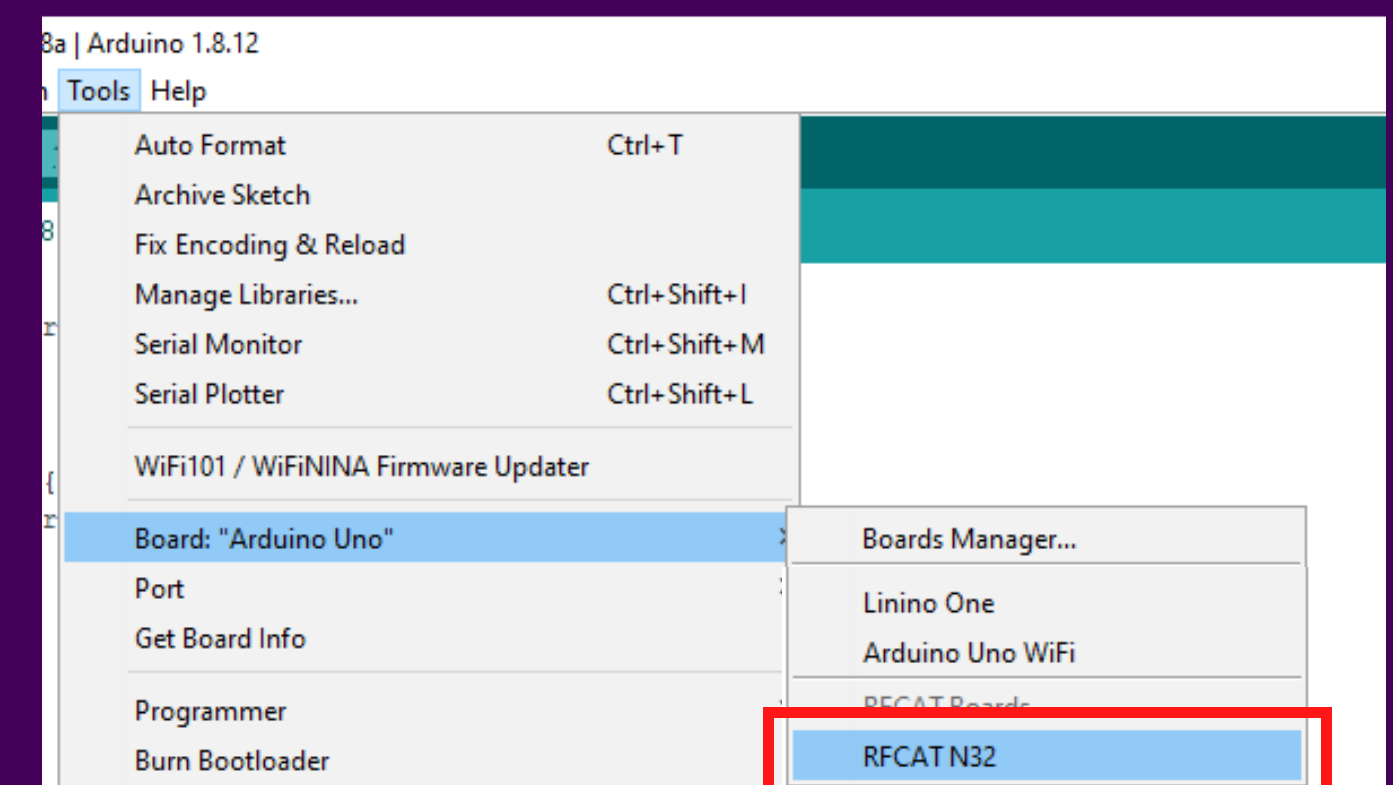
FINALLY CLOSE THE BOARDS MANAGER WINDOW.



## STEP 6

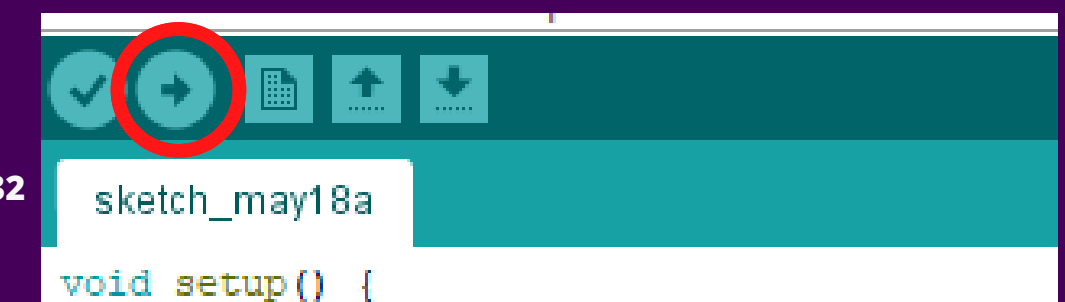
CLICK ON TOOLS, BOARD AND THEN CHOOSE THE RFCAT N32 BOARD.

BE AWARE THAT THE BOARD MIGHT BE IN THE BOTTOM OF THE LIST.



## All done

THE SETUP IS NOW DONE, AND YOUR ARDUINO IS CONFIGURED FOR THE RFCAT N32 BOARD. WRITE YOUR CODE AND COMPILE & UPLOAD YOUR CODE USING THE ARROW.



# BOOTLOADER AND CODE

## BOOTLOADER AND BUTTONS

THE RFCAT N32 COMES PRE-LOADED WITH THE ADAFRUIT NRF52 BOOTLOADER PRECONFIGURED TO MATCH THE FUNCTIONALITY OF THE RFCAT N32 HARDWARE.

THE BOARD HAS A RESET-ON-DTR SYSTEM IMPLEMENTED, WHICH ALLOWS THE MICROCONTROLLER TO ENTER DFU FIRMWARE UPDATE STATE DIRECTLY USING THE USB TO UART SYSTEM. THIS MEANS THAT YOU WILL BE ABLE TO UPLOAD FIRMWARE DIRECTLY FROM ARDUINO WITHOUT HAVING TO PERFORM A MANUAL RESET.

THE RFCAT N32 ALSO FEATURES 3 BUTTONS, WHICH HAS THE FOLLOWING FUNCTIONALITIES IN REGARDS TO THE BOOTLOADER FUNCTIONS:

**RST + DFU: DFU MODE**  
**RST + OTA: ERASE FW**  
**RST + DFU + OTA: OTA MODE**

WHEN THE BUTTONS ARE NOT USED IN COMBINATION WITH THE RESET BUTTON, THEN BOTH THE OTA AND DFU BUTTONS CAN BE USED IN THE APPLICATION CODE AS ONE SEES FIT.

THE OTA AND DFU BUTTONS DO NOT HAVE ANY PULL OR DECOUPLING. THE RESET BUTTON IS BOTH DECOUPLED AND PULLED HIGH.

## PA AND LNA INITIALIZATION CODE

IN ORDER TO USE THE PA AND LNA THE FOLLOWING CODE HAS TO BE ADDED TO THE SETUP() FUNCTION. THIS CODE HAS TO BE RUN BEFORE ANY ADVERTISING FUNCTIONS ARE INITIATED. IT IS RECOMMENDED TO RUN THE CODE AS THE FIRST THING IN THE SETUP() FUNCTION.

IF THIS CODE IS NOT ADDED THEN THE RADIO POWER OUTPUT OF THE RFCAT N32 WILL BE VERY LOW, AND NOT USEFUL FOR ANY REAL APPLICATIONS.

```
uint32_t err_code;

nrf_gpio_cfg_output(23);
nrf_gpio_pin_clear(23); //
nrf_gpio_cfg_output(22);
nrf_gpio_pin_clear(22); //

// Configure SoftDevice PA/LNA assist
ble_opt_t opt;
memset(&opt, 0, sizeof(ble_opt_t));
// Common PA/LNA config
opt.common_opt.pa_lna.gpiote_ch_id = 0; // GPIOTE channel
opt.common_opt.pa_lna.ppi_ch_id_clr = 1; // PPI channel for pin clearing
opt.common_opt.pa_lna.ppi_ch_id_set = 0; // PPI channel for pin setting

// PA config
opt.common_opt.pa_lna.pa_cfg.active_high = 1; // Set the pin to be active high
opt.common_opt.pa_lna.pa_cfg.enable = 1; // Enable toggling
opt.common_opt.pa_lna.pa_cfg.gpio_pin = 23; // The GPIO pin to toggle

// LNA config
opt.common_opt.pa_lna.lna_cfg.active_high = 1; // Set the pin to be active high
opt.common_opt.pa_lna.lna_cfg.enable = 1; // Enable toggling
opt.common_opt.pa_lna.lna_cfg.gpio_pin = 22; // The GPIO pin to toggle

err_code = sd_ble_opt_set(BLE_COMMON_OPT_PA_LNA, &opt);
//Serial.println(err_code); //optional
```

**FIND MORE INFORMATION ON**

[github.com/nikolajan/rfcats](https://github.com/nikolajan/rfcats)

[tindie.com/stores/rfcats](https://tindie.com/stores/rfcats)