CEC Continuing Education Center

DesignNews

Designing, Building and Coding Custom Raspberry Pi RP2040 Arduino Devices

Day 3:

The RP2040, Arduino and BLE

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Webinar Logistics

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Fred Eady

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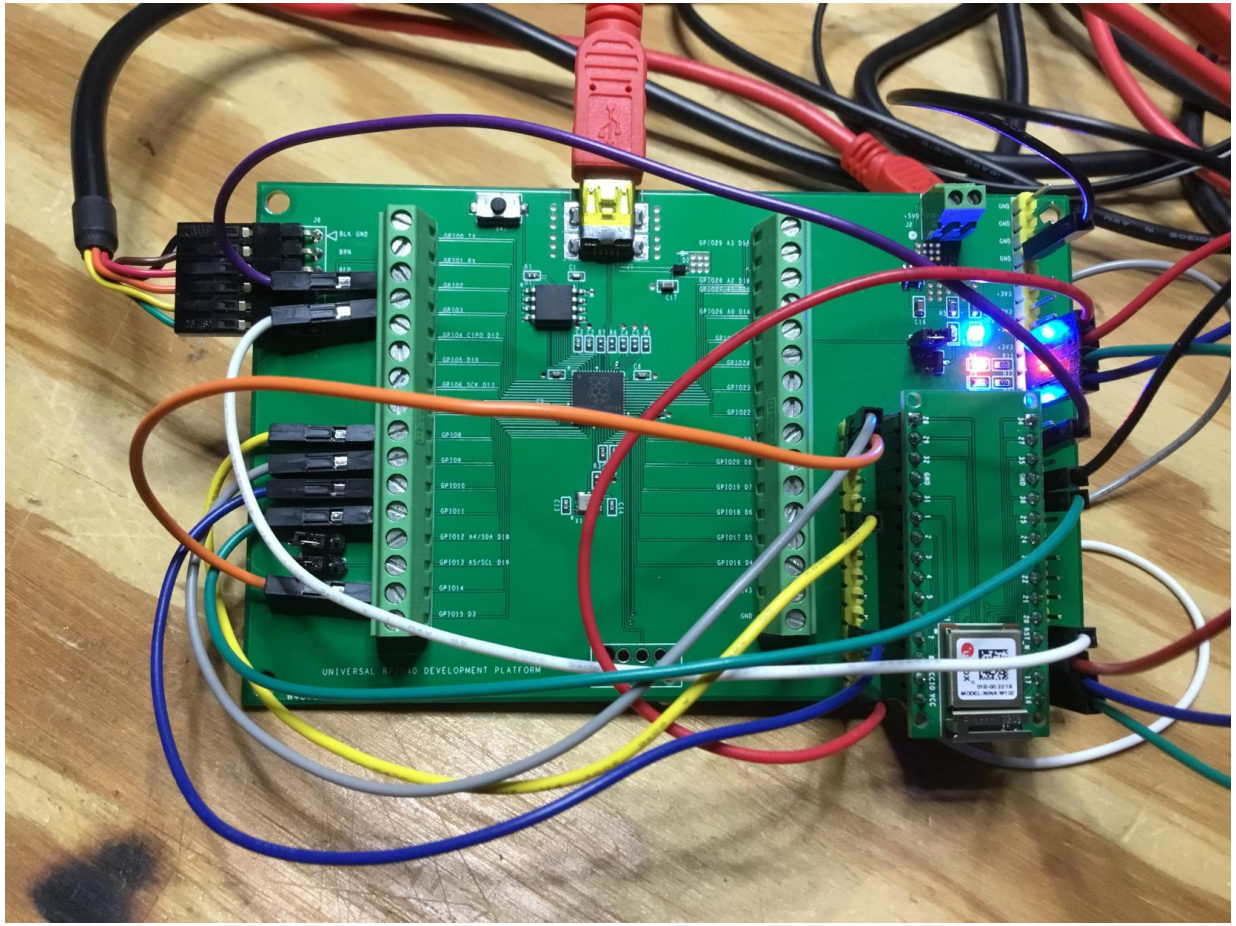
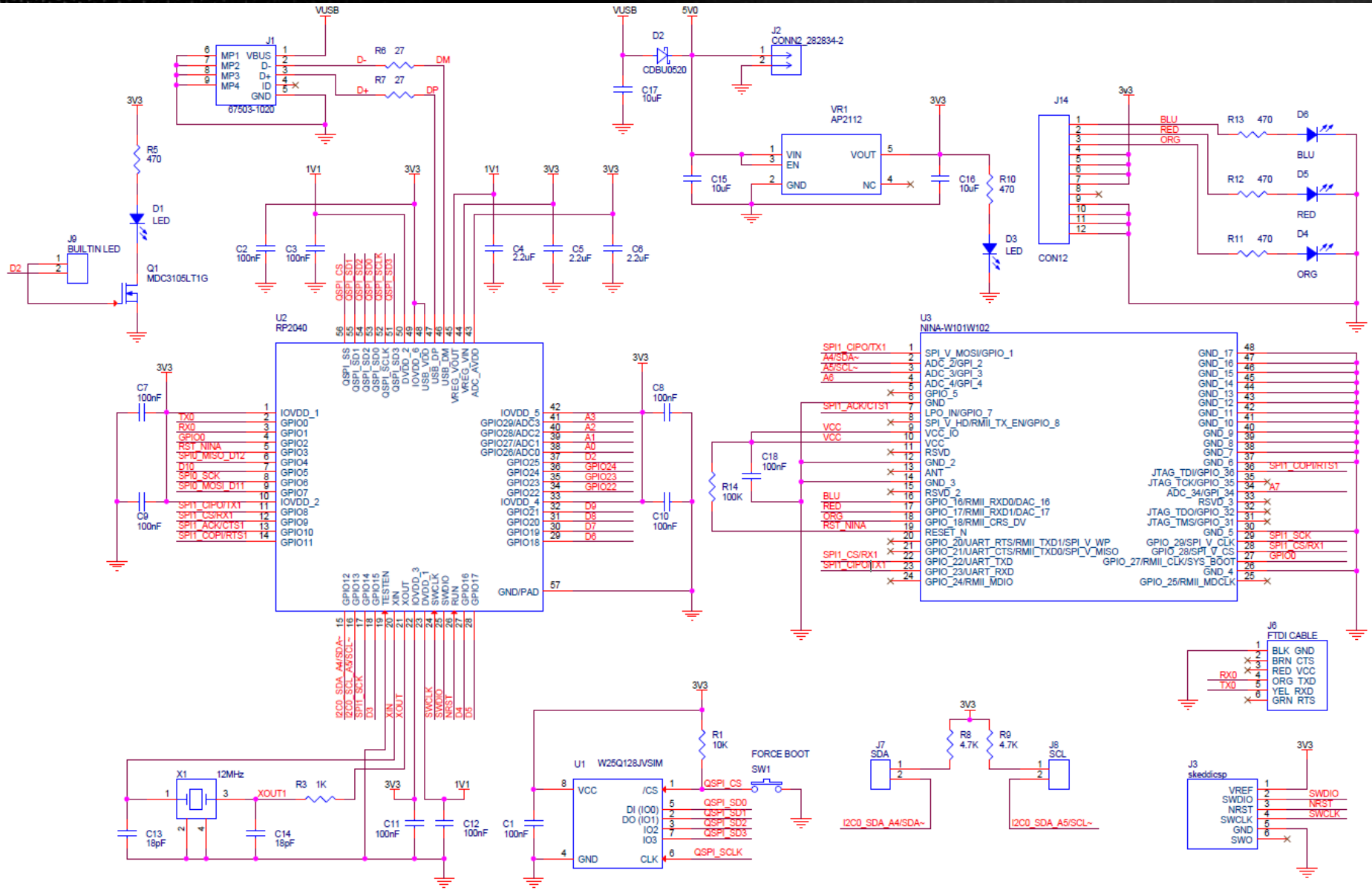
AGENDA

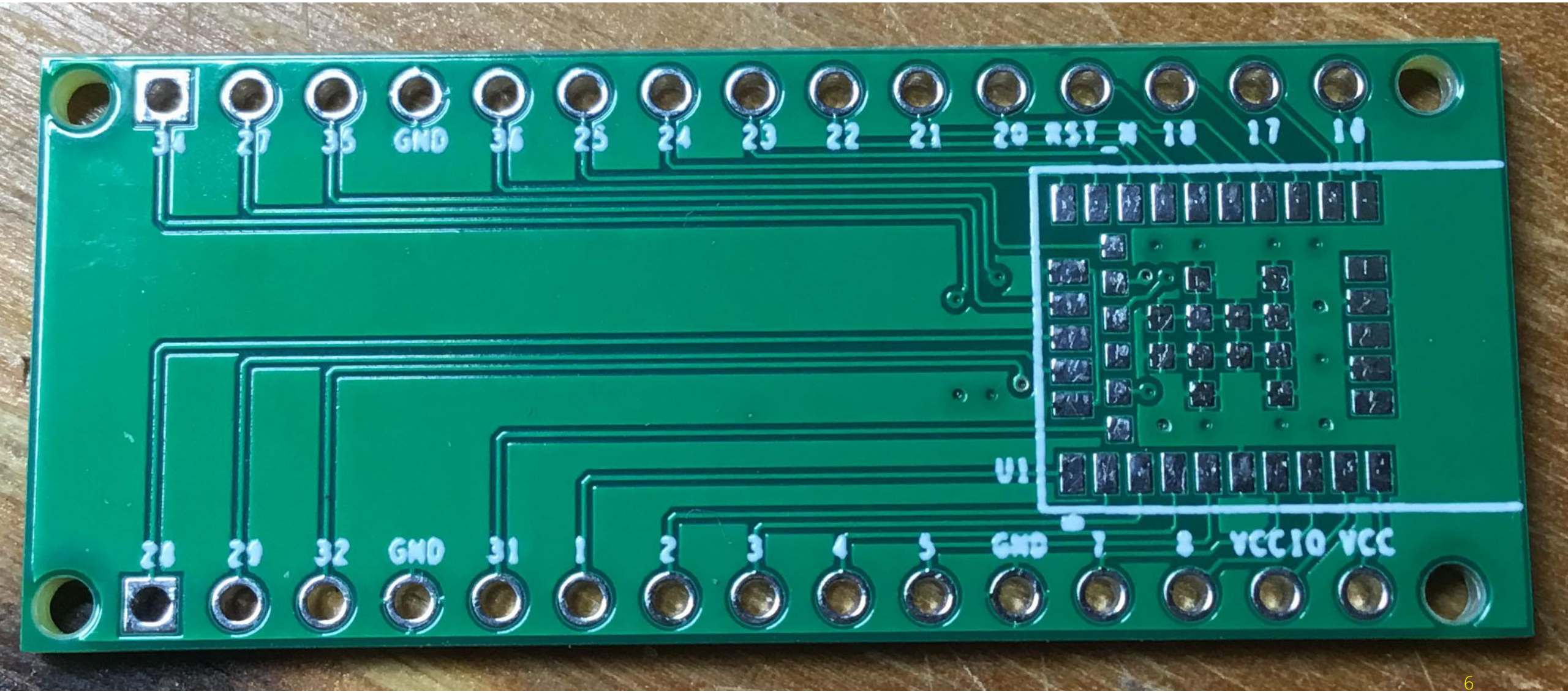
- RP2040 Arduino BLE Hardware
- u-blox Frankenstein
- Arduino BLE On Your Phone



RP2040 Arduino BLE Hardware Design



RP2040 Arduino BLE Hardware Design



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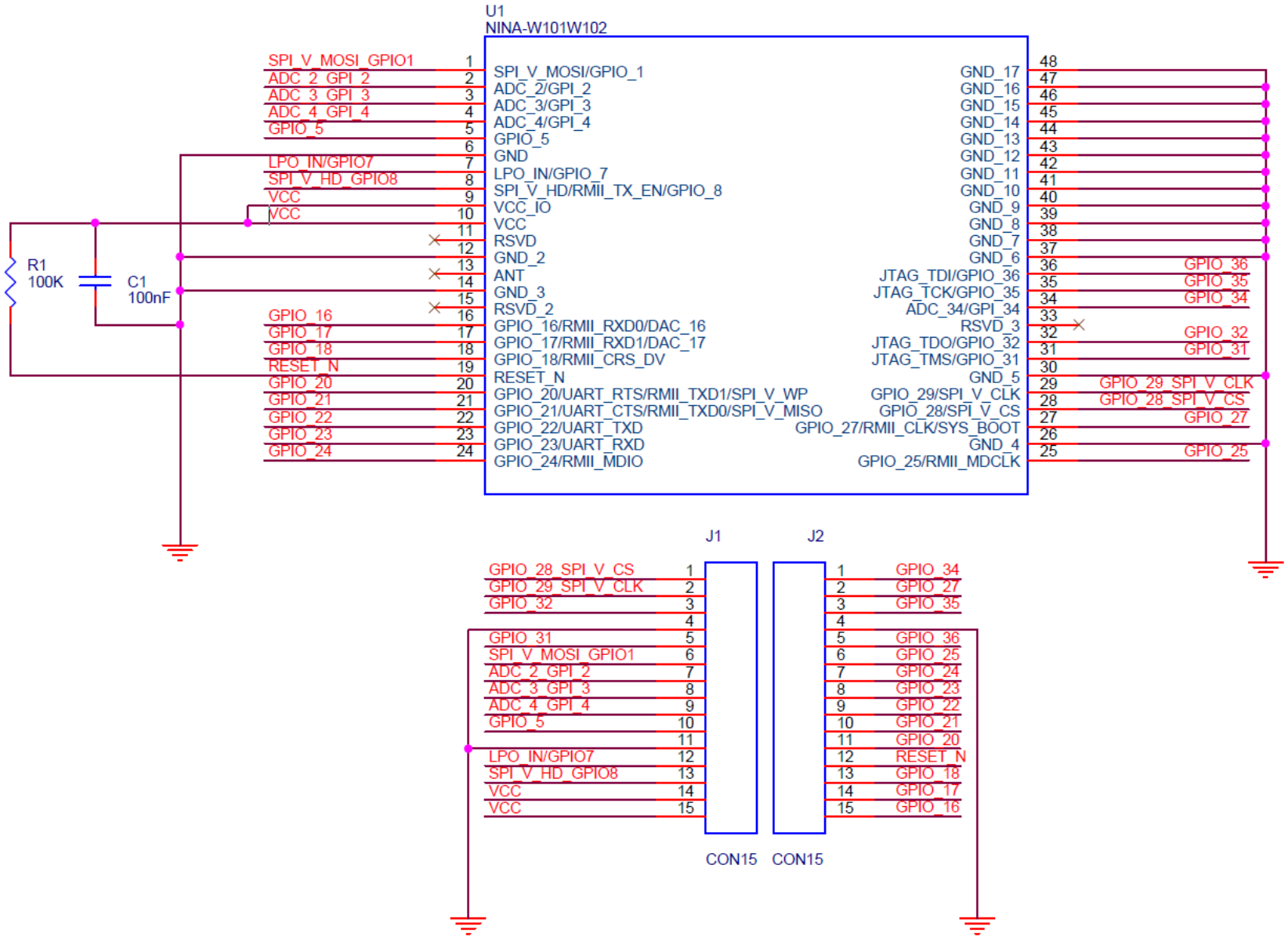

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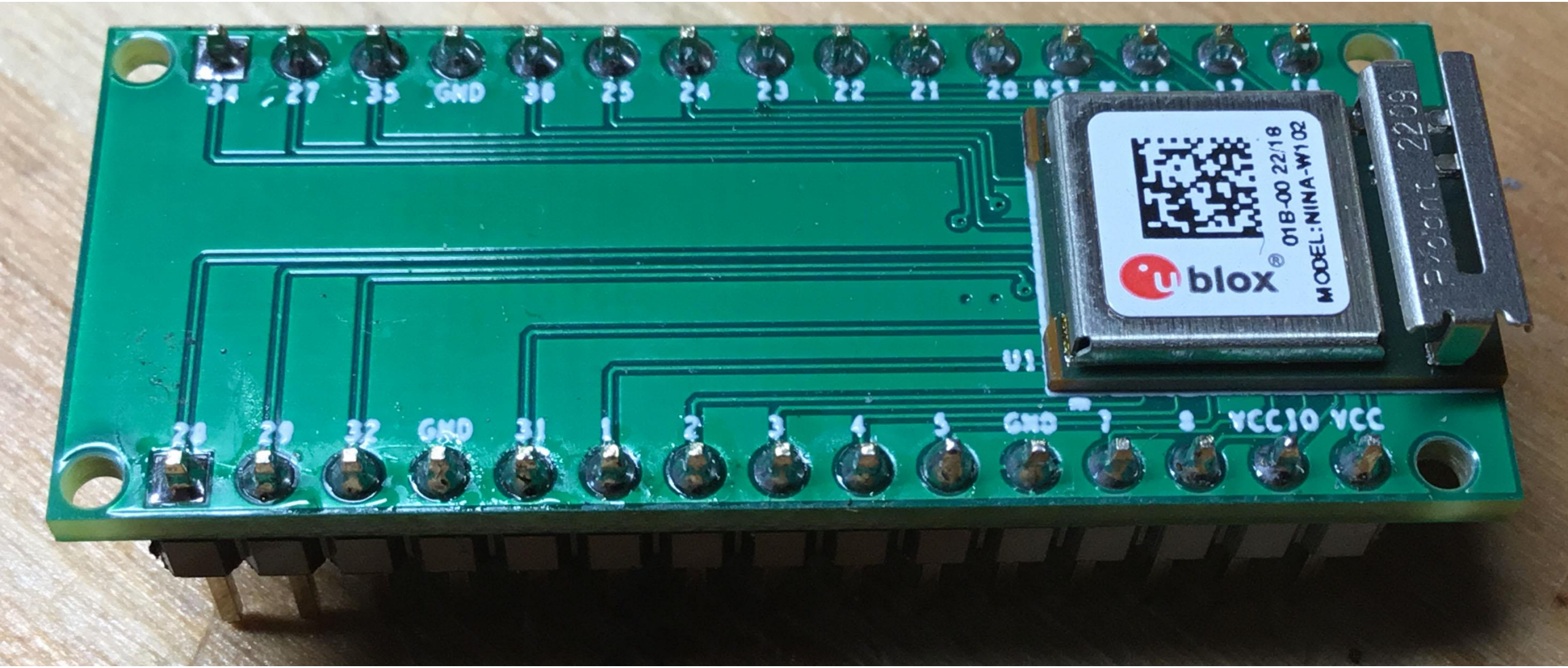
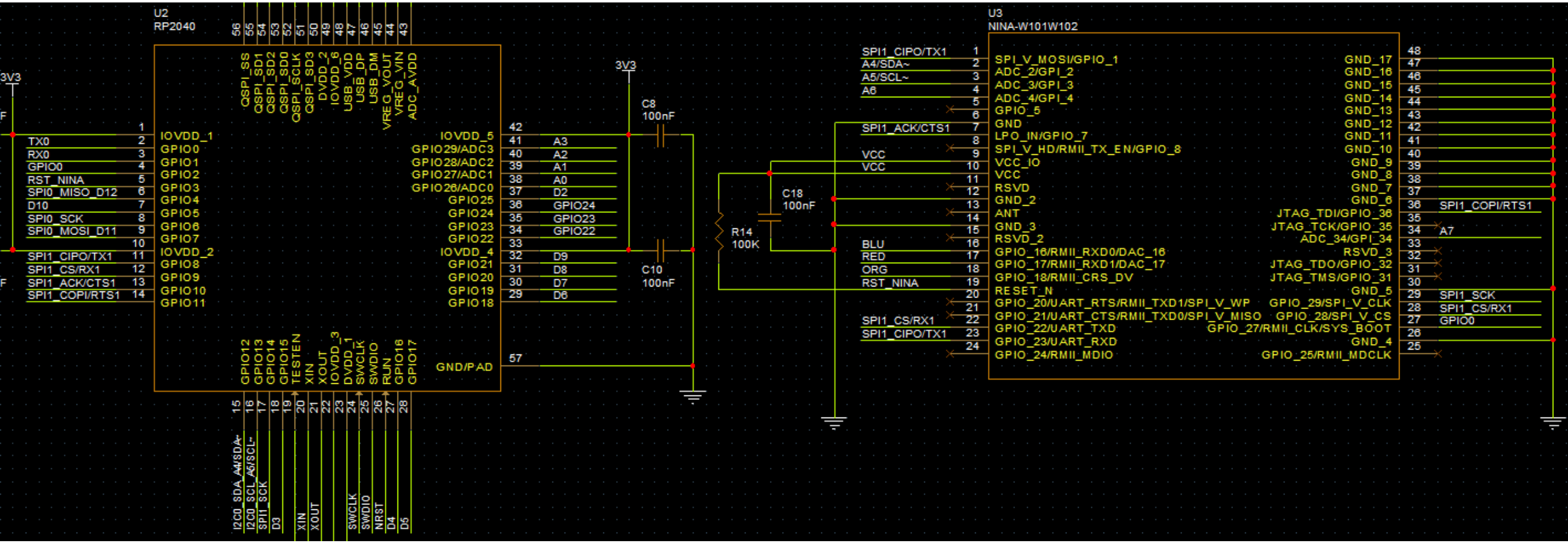


RP2040 Arduino BLE Hardware Design



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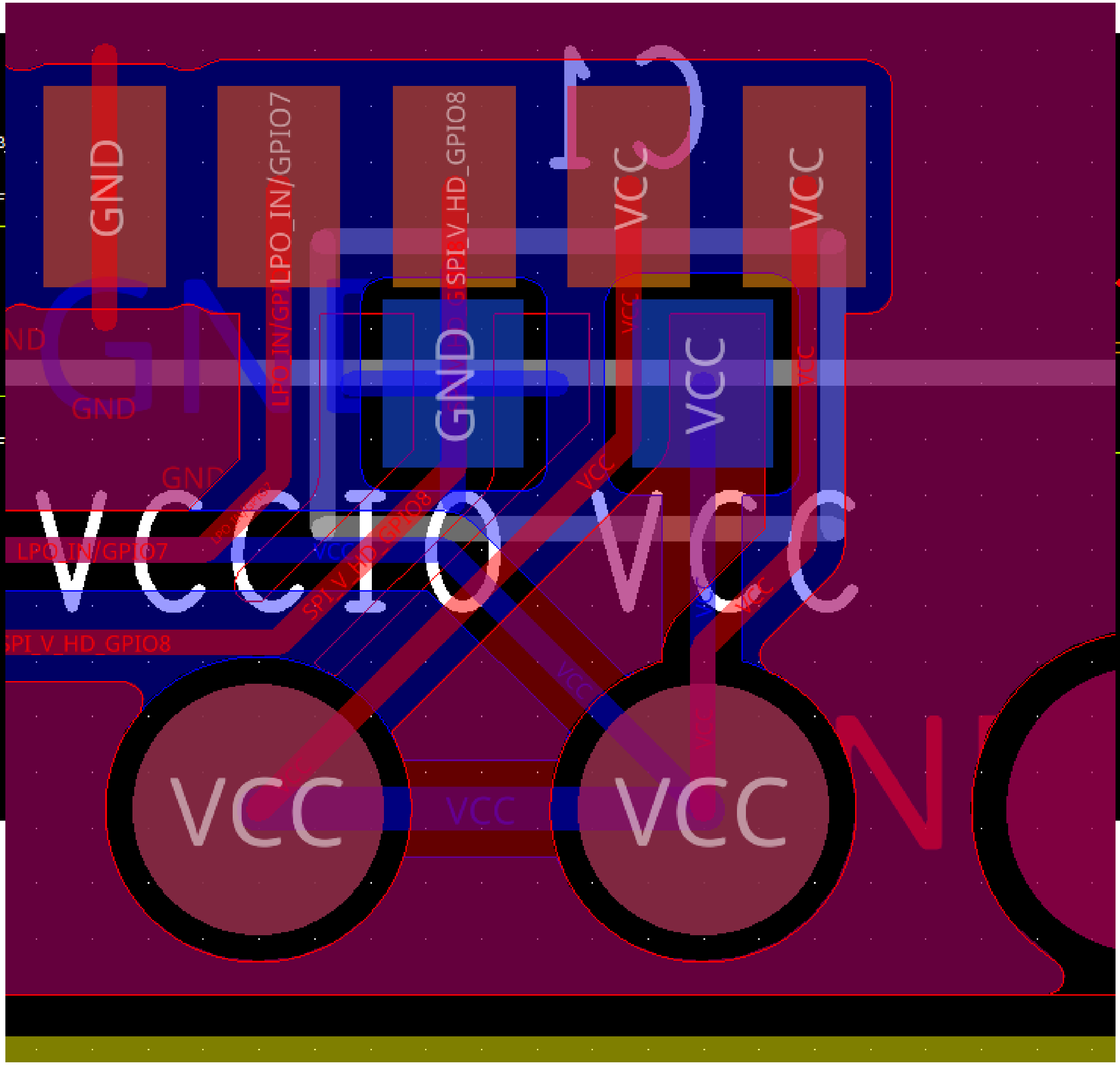
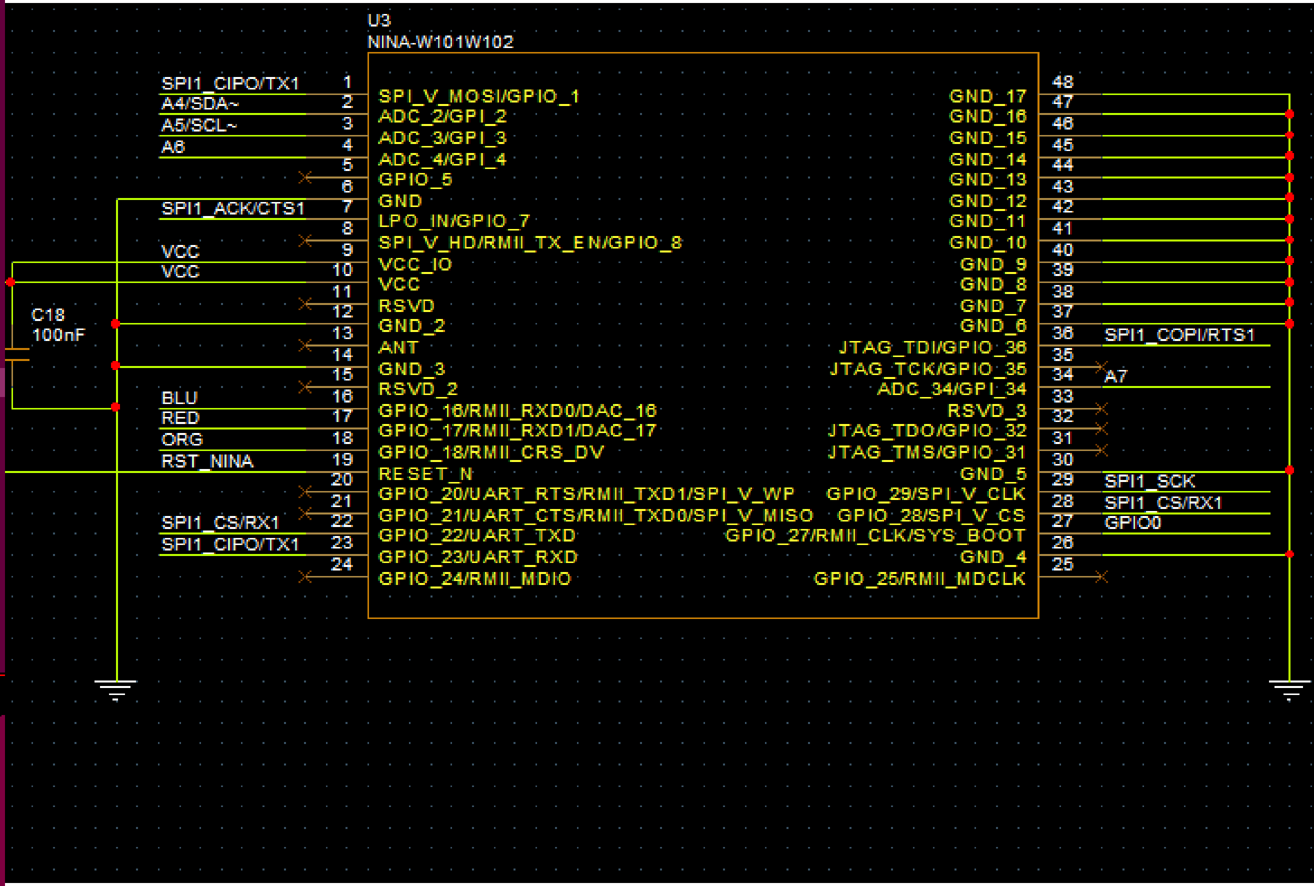
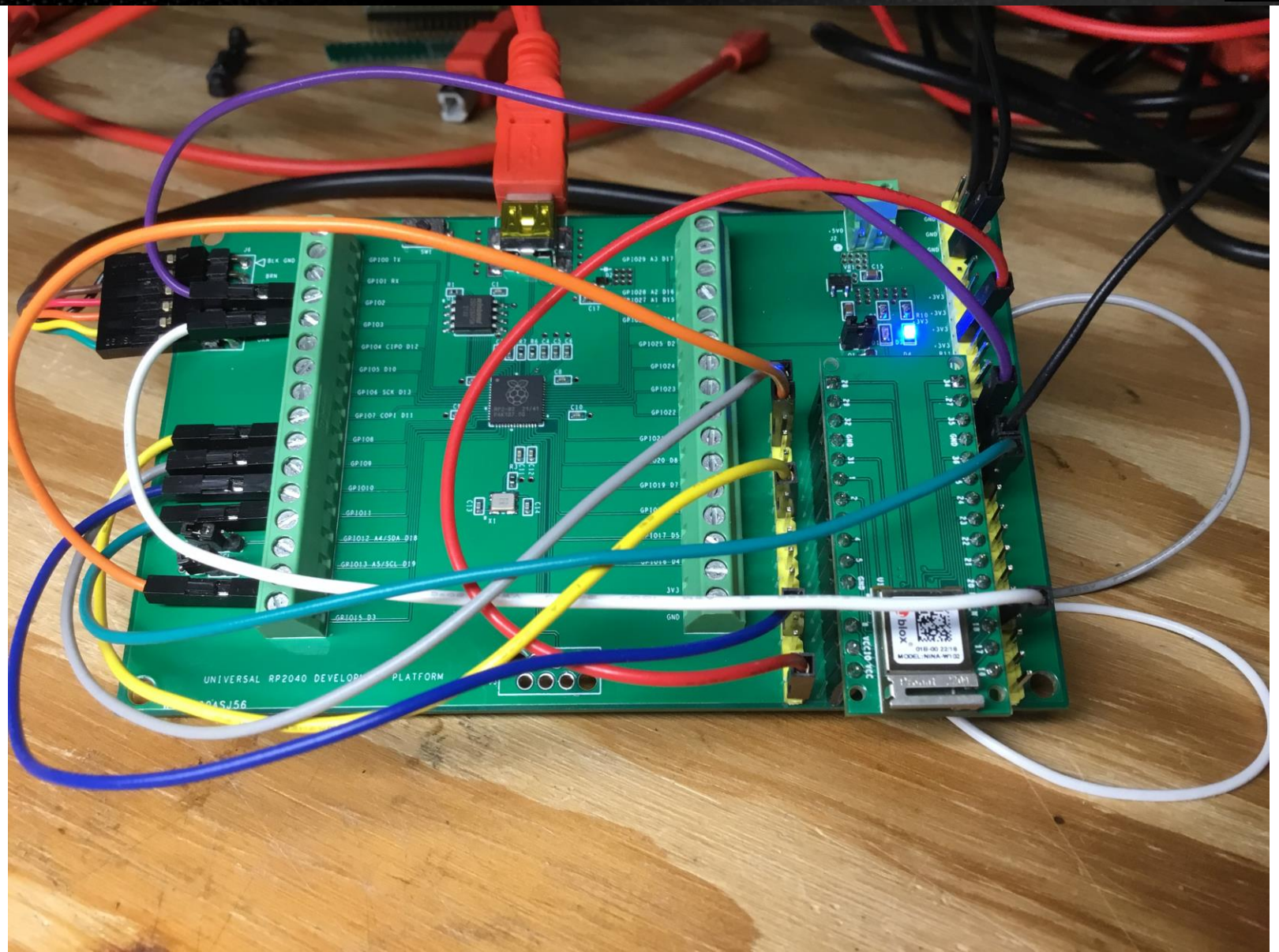
RP2040 Arduino BLE Hardware Design

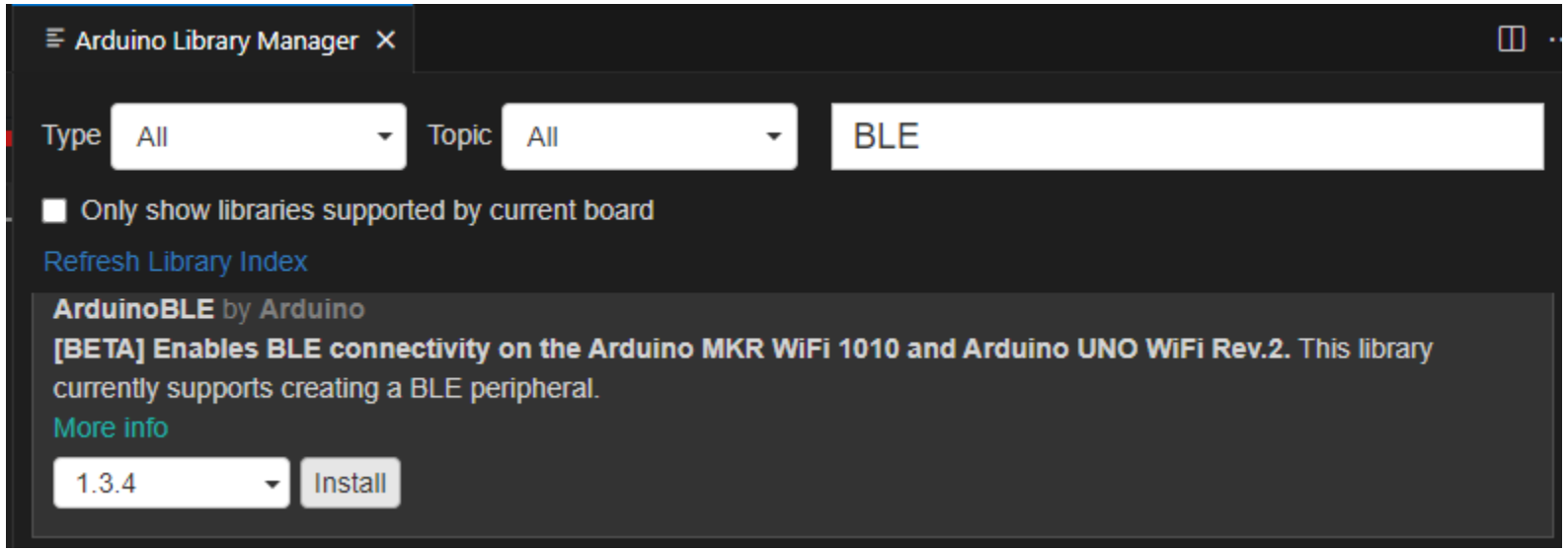


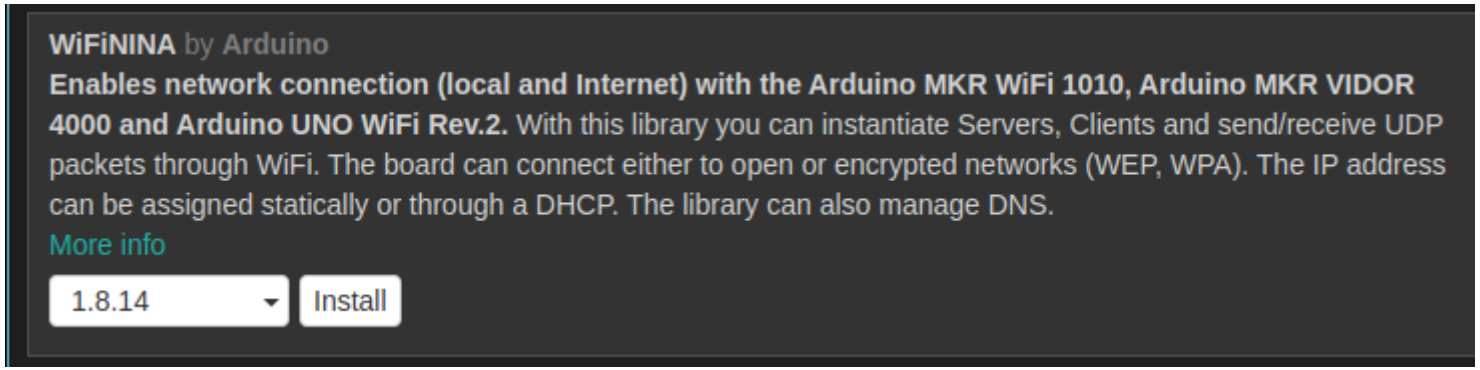


RP2040 Arduino BLE Hardware Design

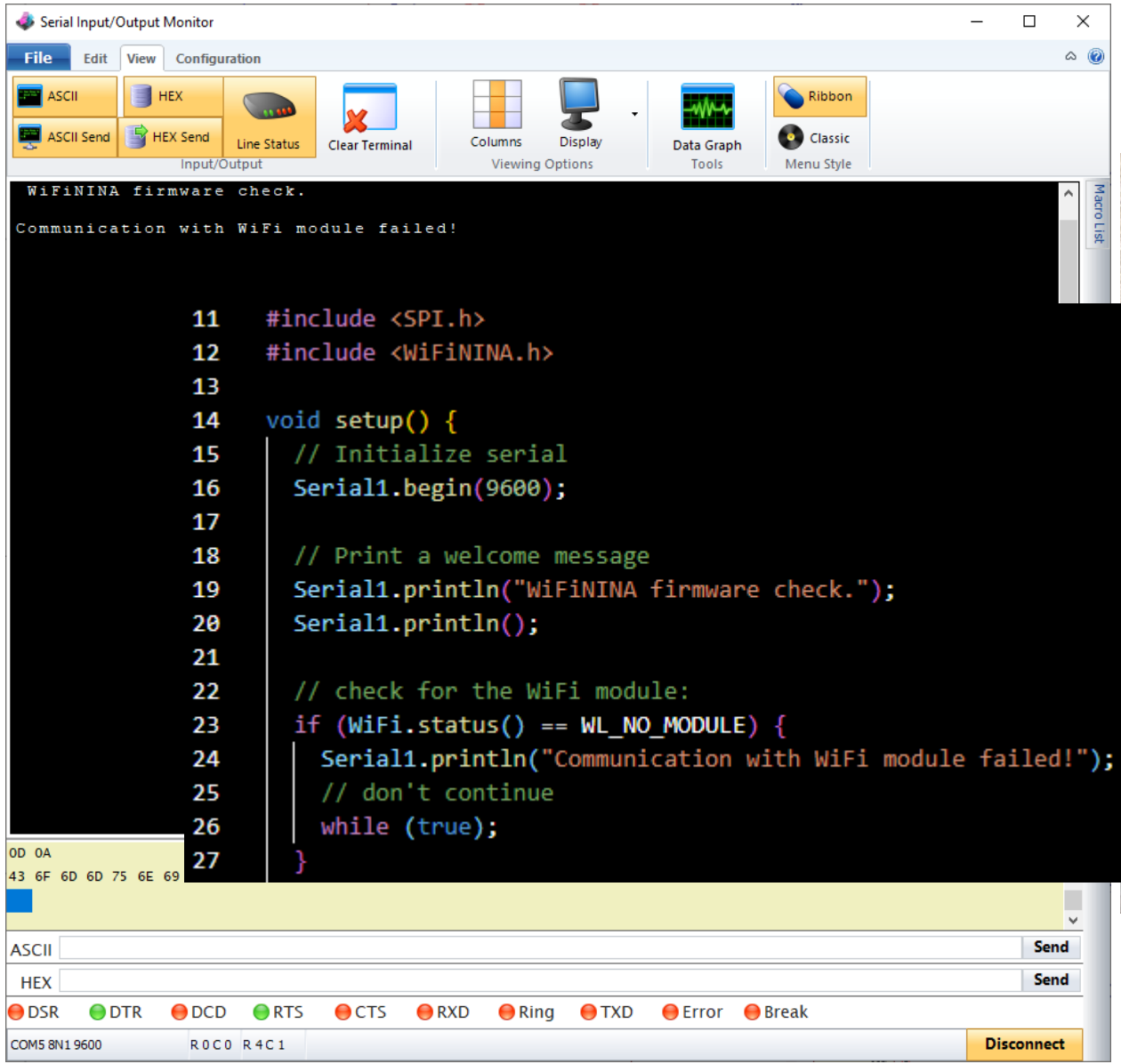


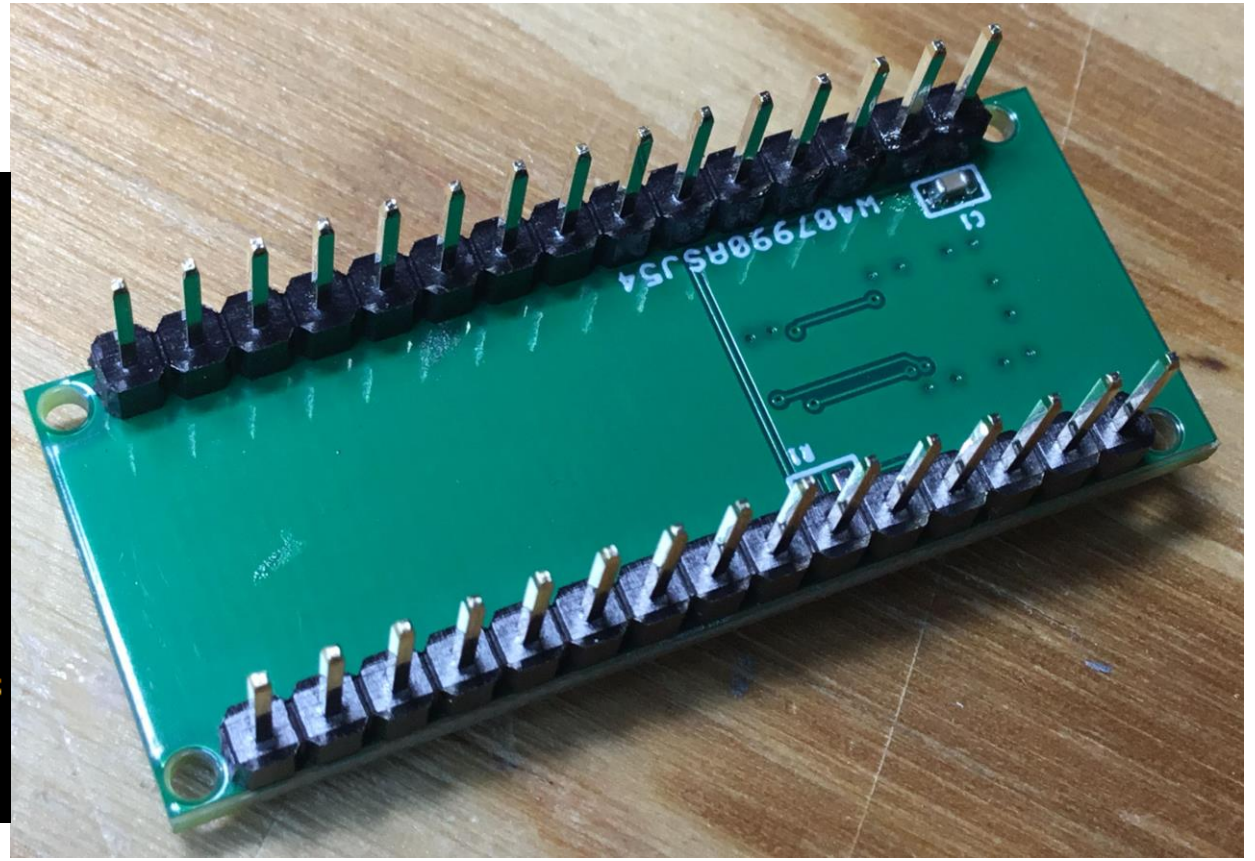
Load the Arduino BLE and Wi-Fi Libraries



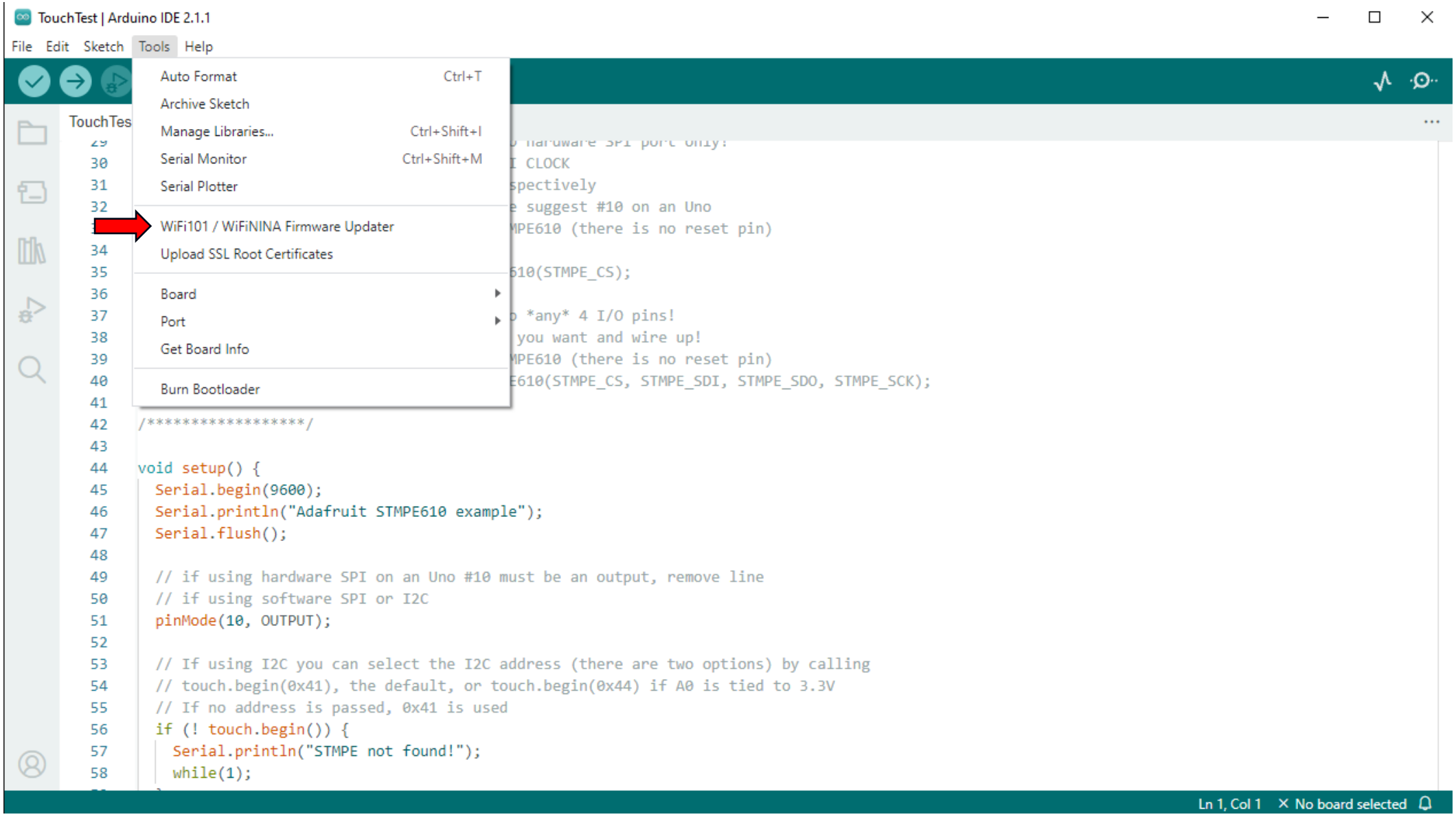


Pins Up - The Monster Is Dead





Give Life to the Monster



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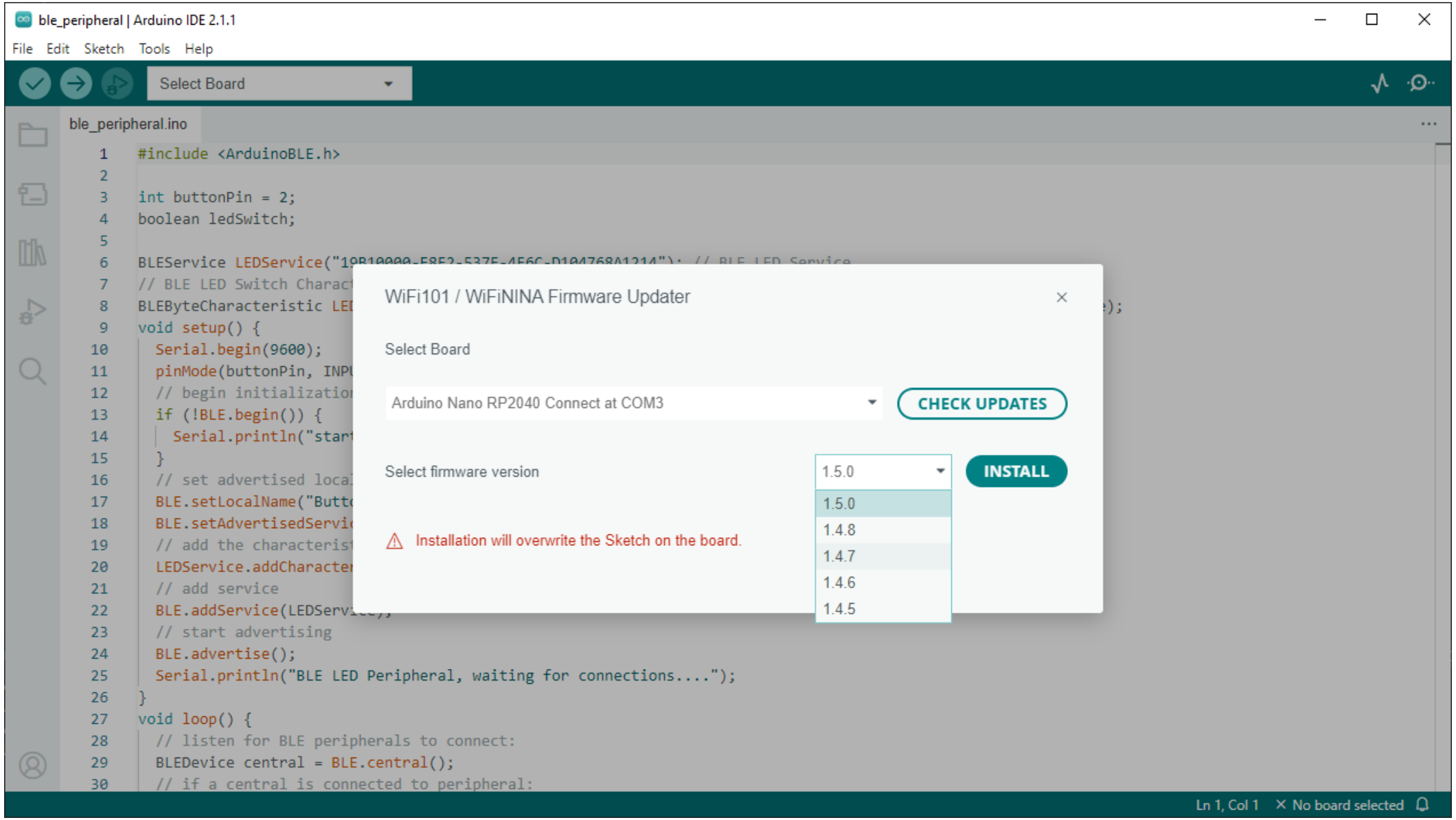
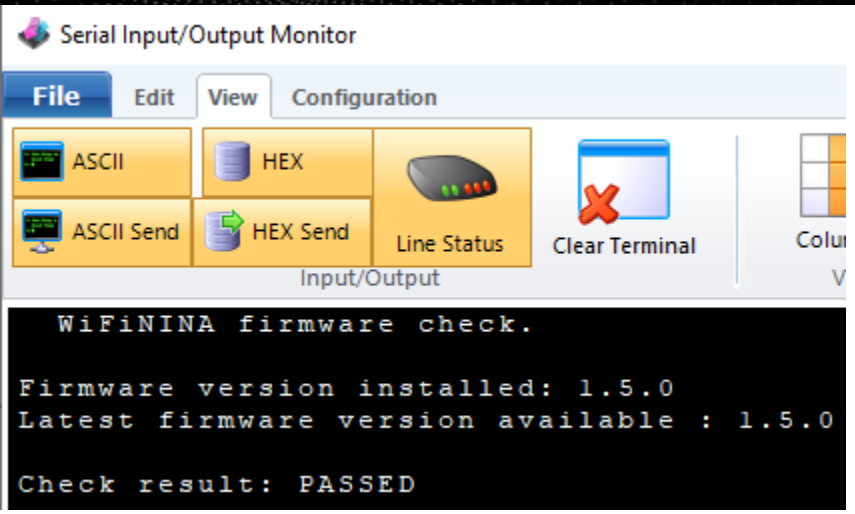
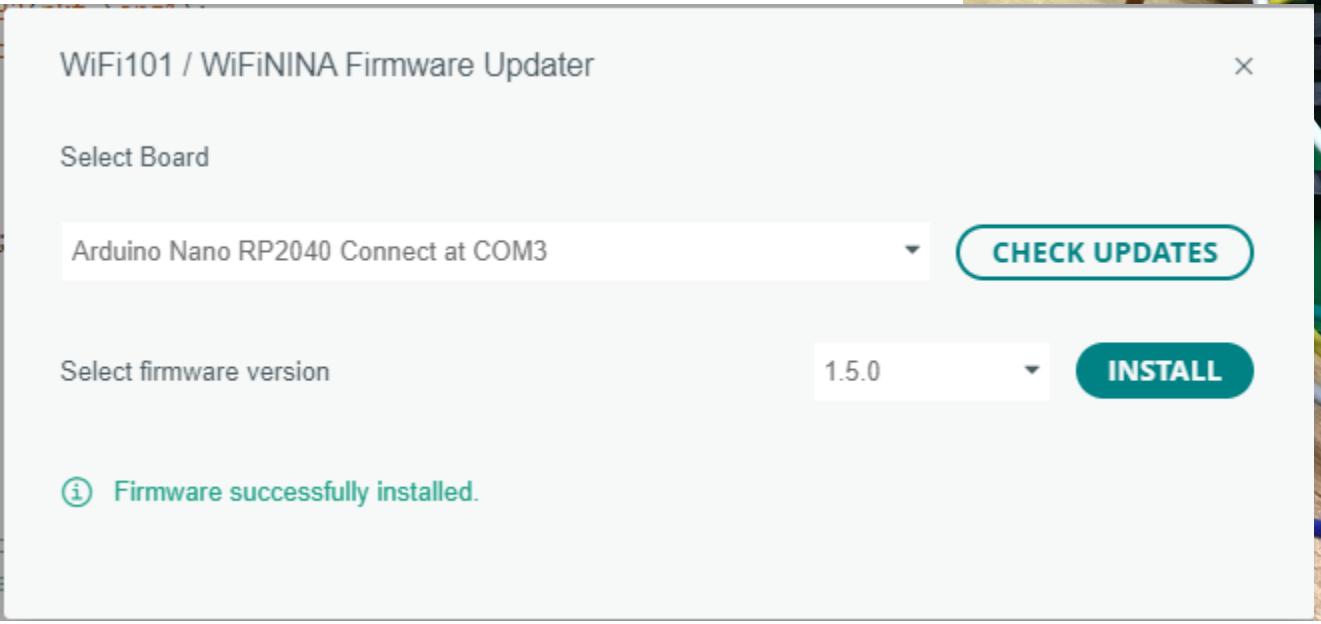
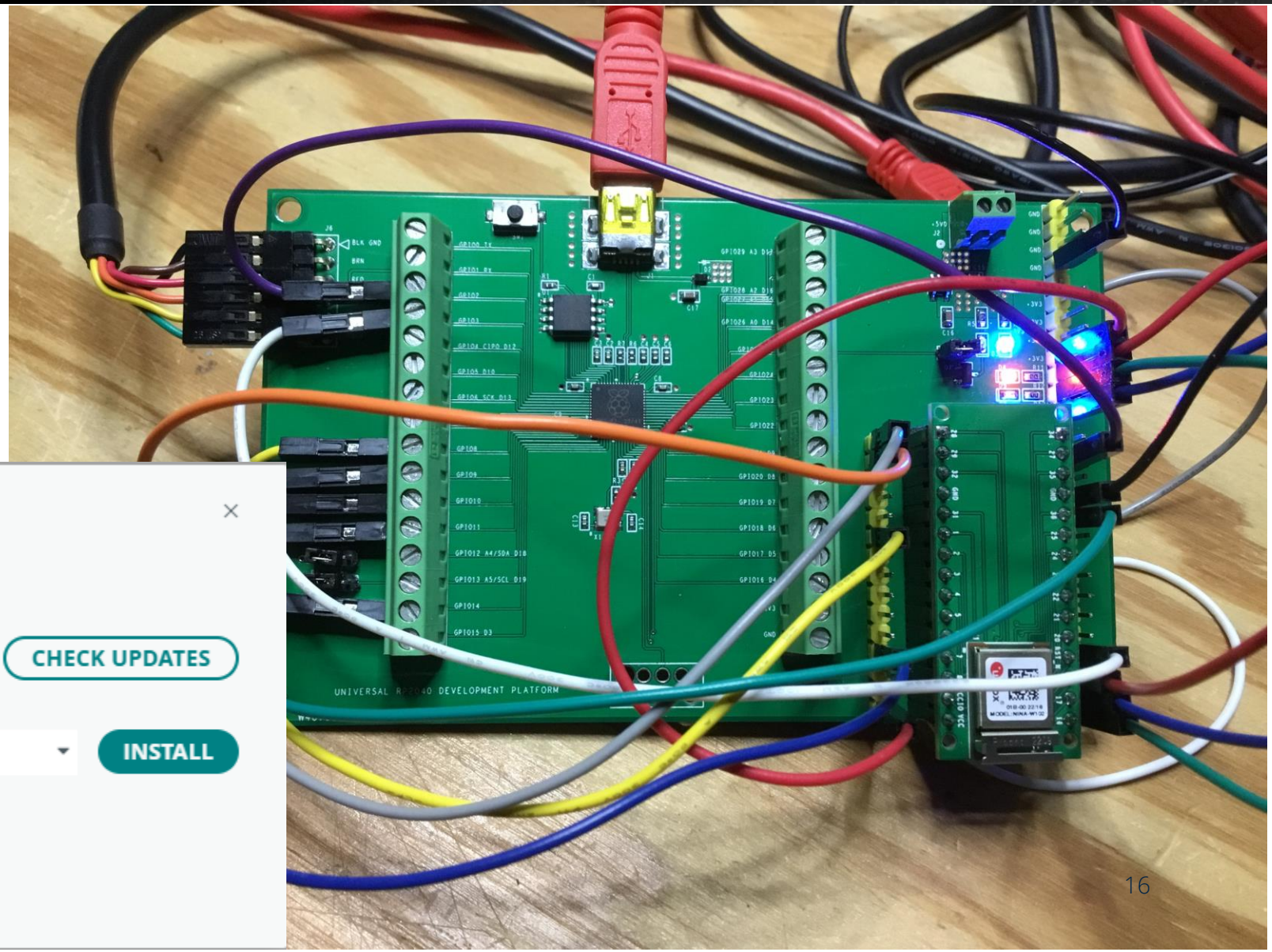


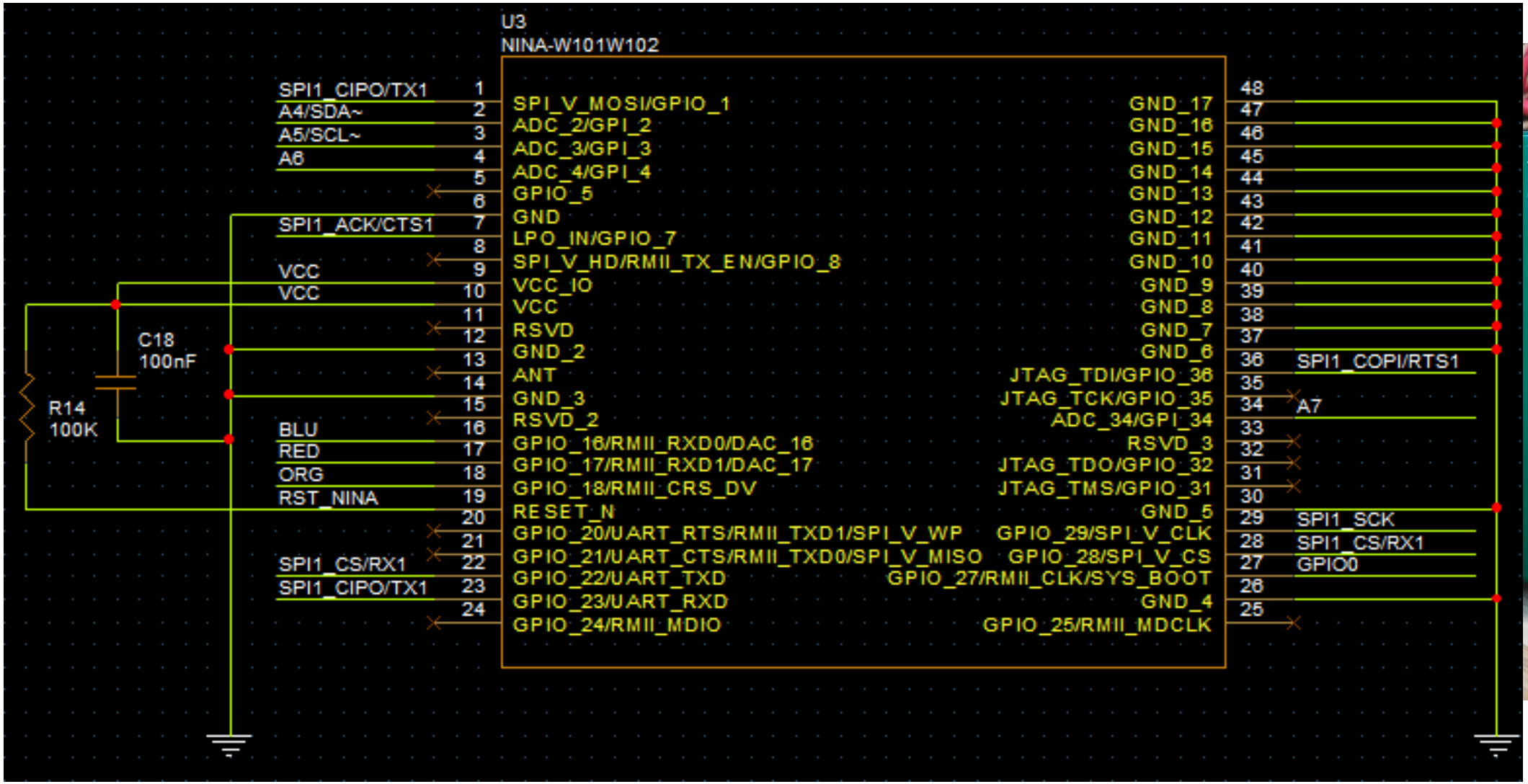
Give Life to the Monster

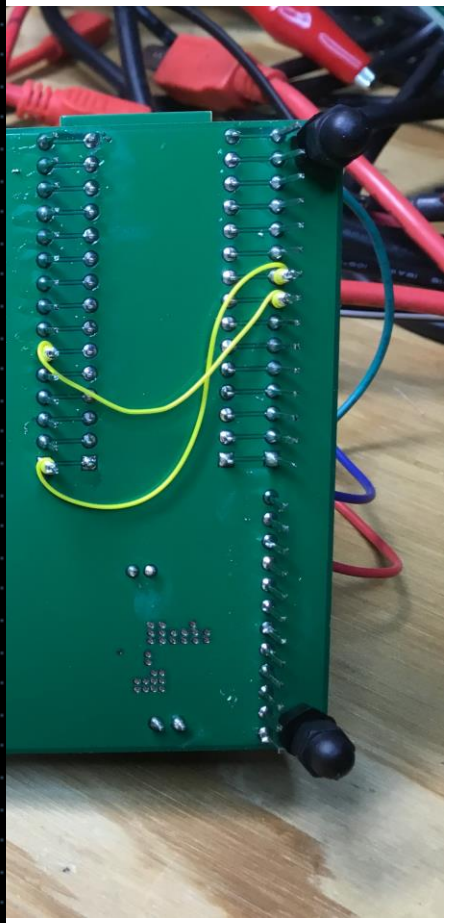






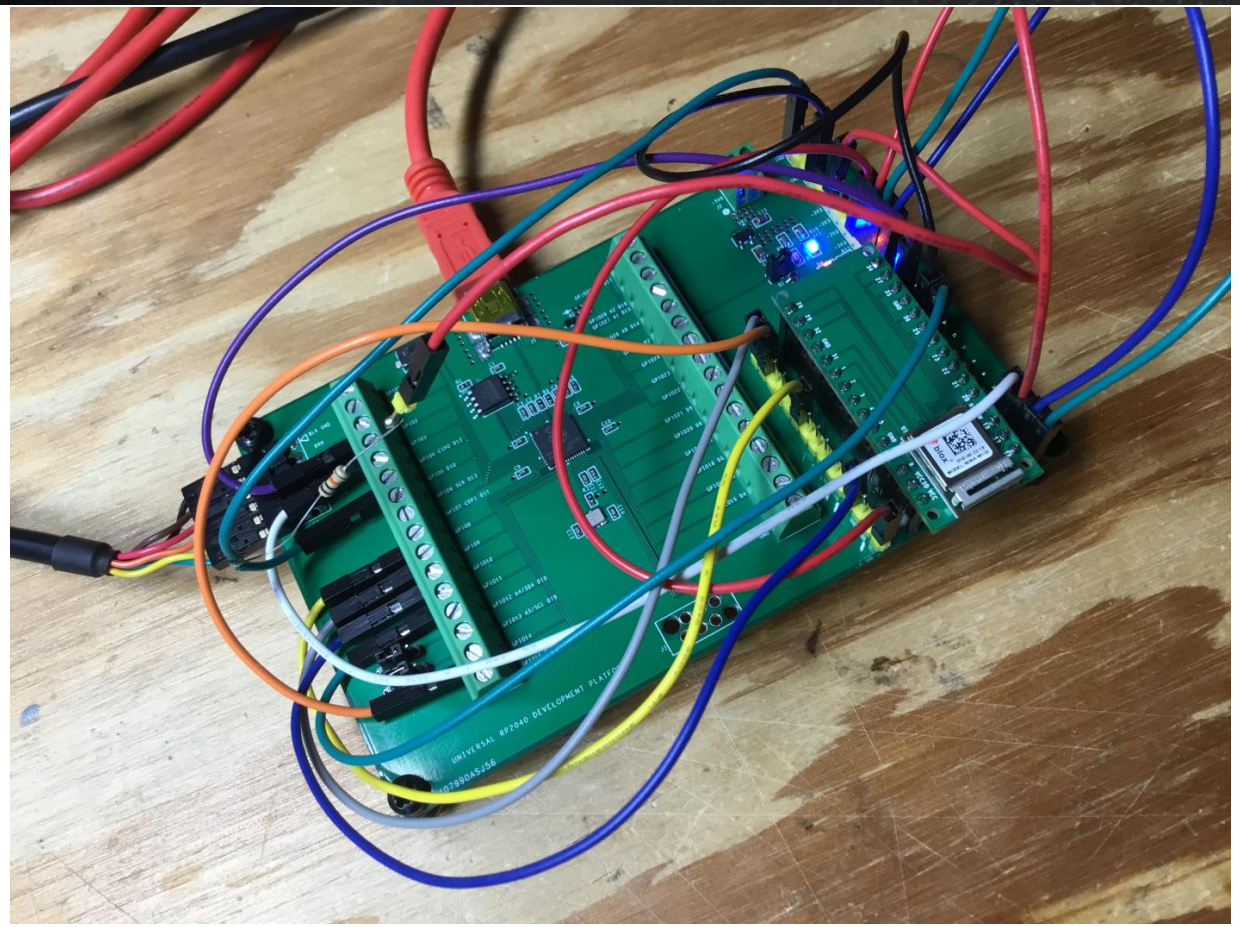
Arduino BLE Setup





Arduino BLE Setup

```
#include <ArduinoBLE.h>

const int ledPin = LED_BUILTIN; // set ledPin to on-board LED (D2 - RP2050 GPIO25)
const int buttonPin = 10;       // set buttonPin to digital pin 10 (D10 - RP2050 GPIO5)

BLEService ledService("19B10010-E8F2-537E-4F6C-D104768A1214"); // create service
// create switch characteristic and allow remote device to read and write
BLEByteCharacteristic ledCharacteristic("19B10011-E8F2-537E-4F6C-D104768A1214", BLERead | BLEWrite | BLENotify);
// create button characteristic and allow remote device to get notifications
BLEByteCharacteristic buttonCharacteristic("19B10012-E8F2-537E-4F6C-D104768A1214", BLERead | BLENotify);

void setup() {
  Serial1.begin(9600);
  while (!Serial1);

  pinMode(ledPin, OUTPUT);    // configure the LED pin as an output
  pinMode(buttonPin, INPUT);  // configure the button pin as an input

  // BLE initialization
  if (!BLE.begin()) {
    Serial1.println("Starting Bluetooth® - Low Energy module failed!");
    while (1);
  }

  // set the local name peripheral advertises
  BLE.setLocalName("BTNLED");
  // set the UUID for the service this peripheral advertises:
  BLE.setAdvertisedService(ledService);

  // add the characteristics to the service
  ledService.addCharacteristic(ledCharacteristic);
  ledService.addCharacteristic(buttonCharacteristic);

  // add the service
  BLE.addService(ledService);

  ledCharacteristic.writeValue(0);
  buttonCharacteristic.writeValue(0);

  // start advertising
  BLE.advertise();

  Serial1.println("Bluetooth® device active, waiting for connections...");
}
```

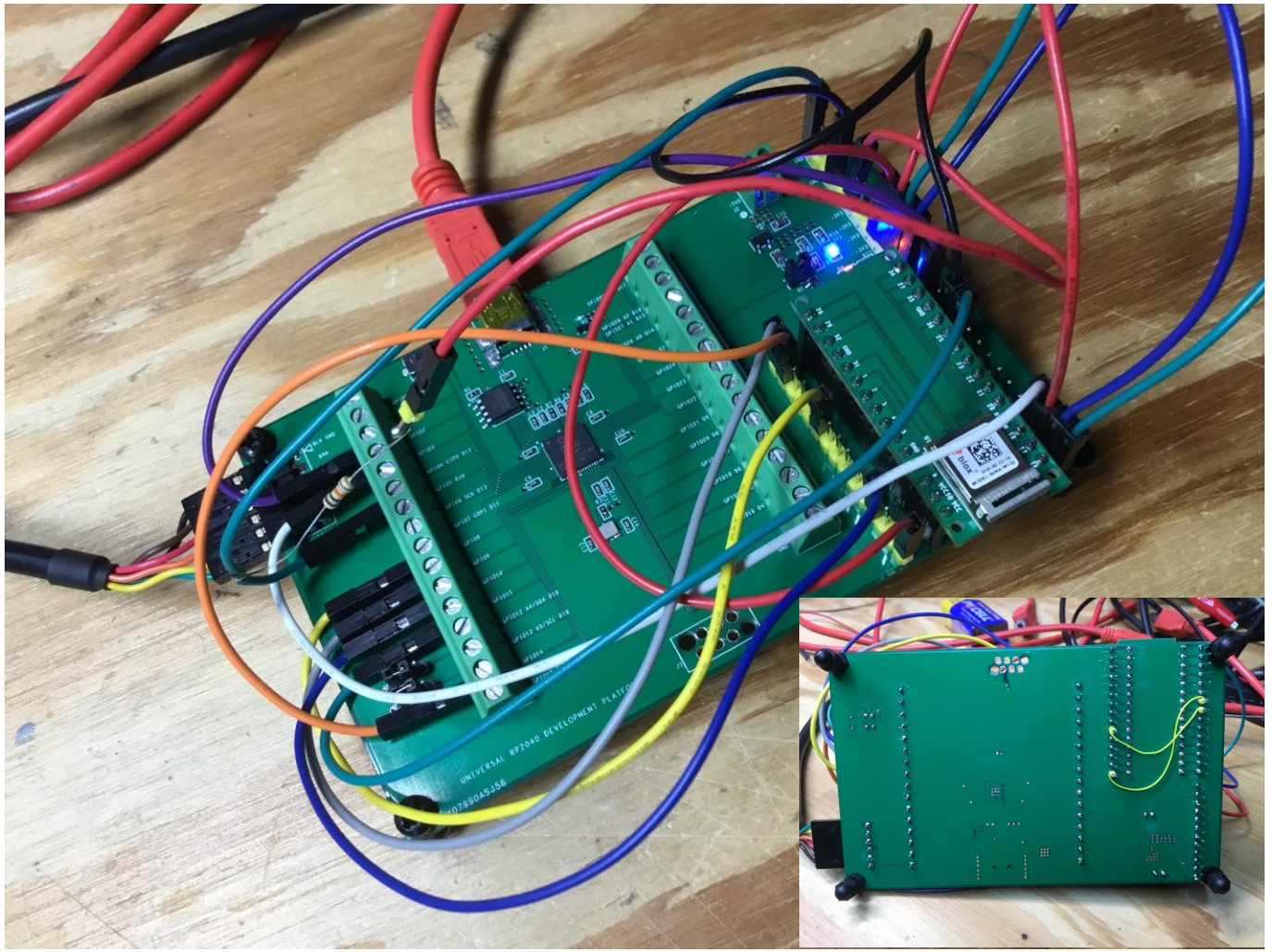


```
// D8 - D13
{ p20,        NULL, NULL, NULL },    // D8
{ p21,        NULL, NULL, NULL },    // D9
{ p5,         NULL, NULL, NULL },    // D10
{ p7,         NULL, NULL, NULL },    // D11 / SPITX
{ p4,         NULL, NULL, NULL },    // D12 / SPIRX
{ p6,         NULL, NULL, NULL },    // D13 / SPICLK / LEDB
```

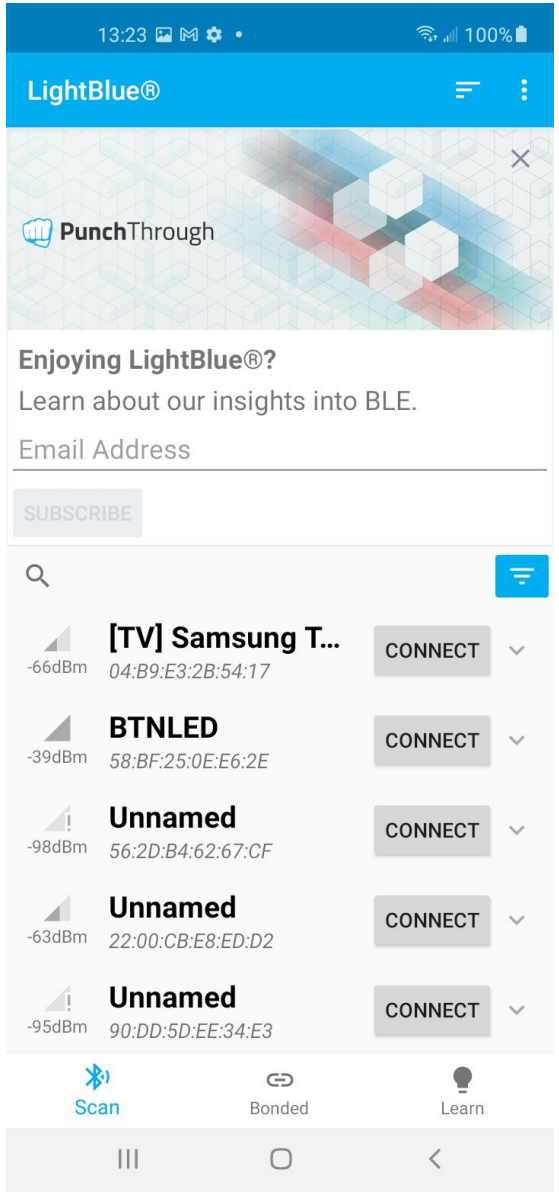
buttonPin

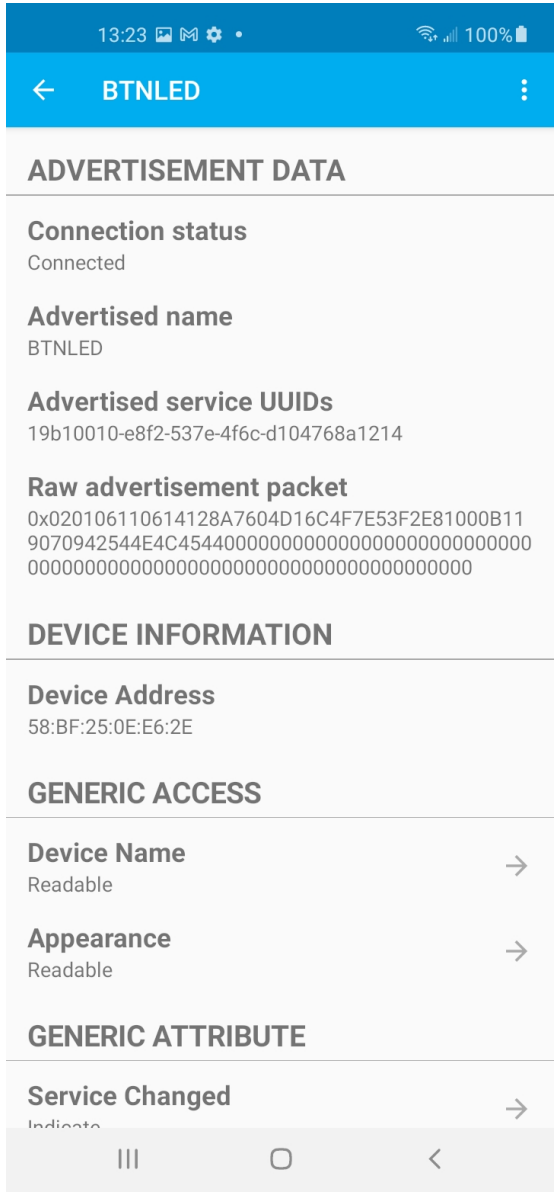
Arduino BLE Loop

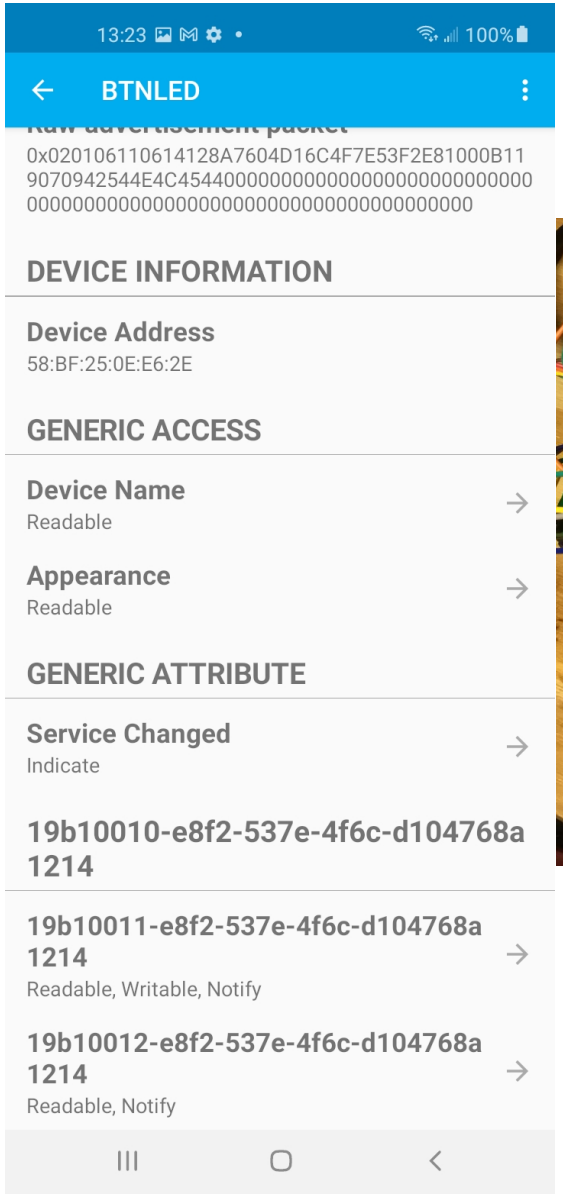
```
65  void loop() {
66    // Poll for Bluetooth® Low Energy events
67    BLE.poll();
68
69    // read the current button pin state
70    char buttonValue = digitalRead(buttonPin);
71
72    // has the value changed since the last read
73    bool buttonChanged = (buttonCharacteristic.value() != buttonValue);
74
75    if (buttonChanged) {
76      // button state changed, update characteristics
77      ledCharacteristic.writeValue(buttonValue);
78      buttonCharacteristic.writeValue(buttonValue);
79    }
80
81    if (ledCharacteristic.written() || buttonChanged) {
82      // central has written to characteristic
83      // or button state has changed..Update LED
84      if (ledCharacteristic.value()) {
85        Serial1.println("LED on");
86        digitalWrite(ledPin, HIGH);
87      } else {
88        Serial1.println("LED off");
89        digitalWrite(ledPin, LOW);
90      }
91    }
92  }
```

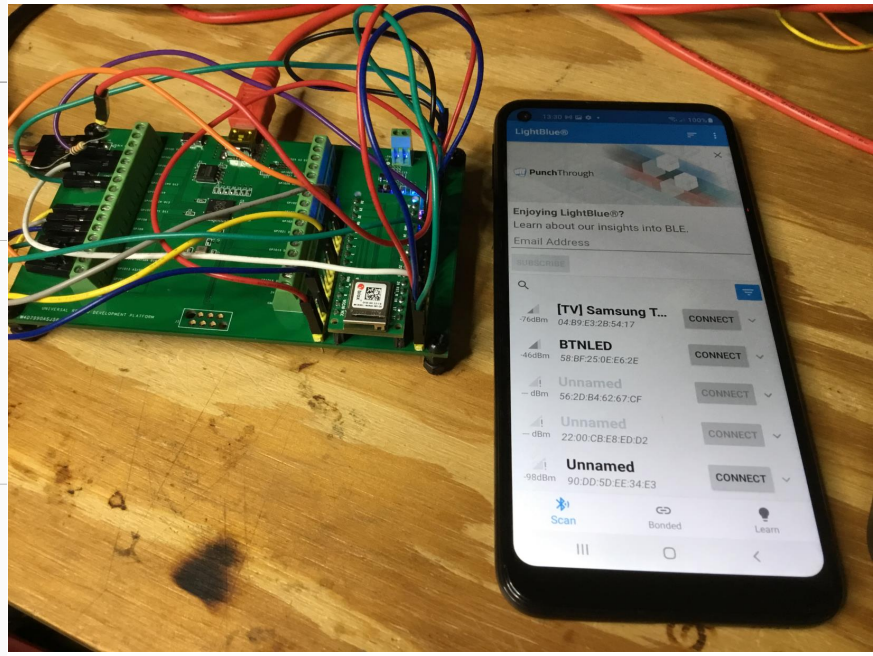


Arduino BLE First Contact

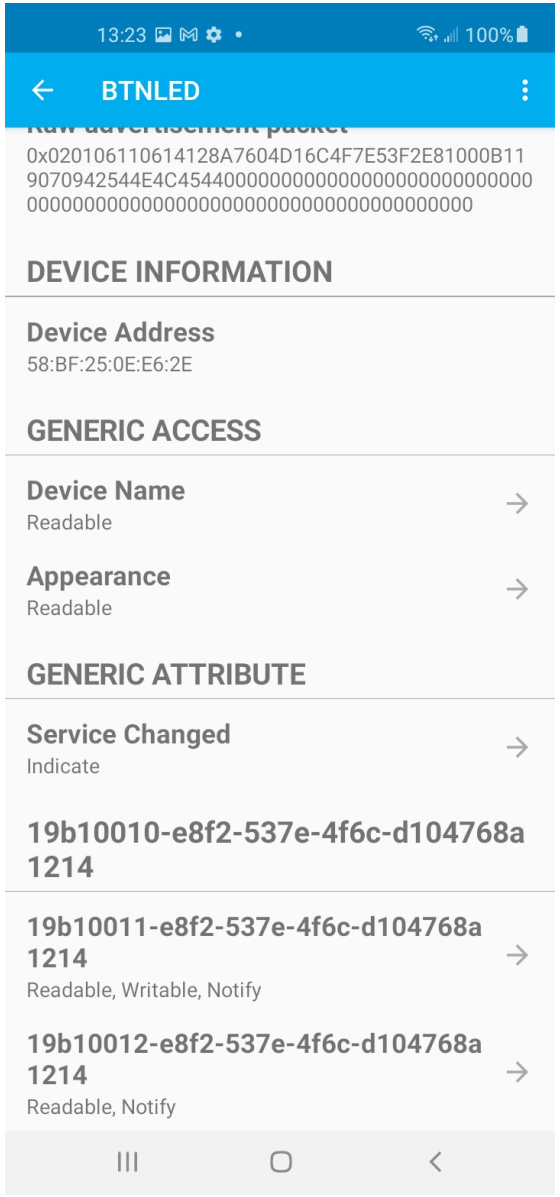


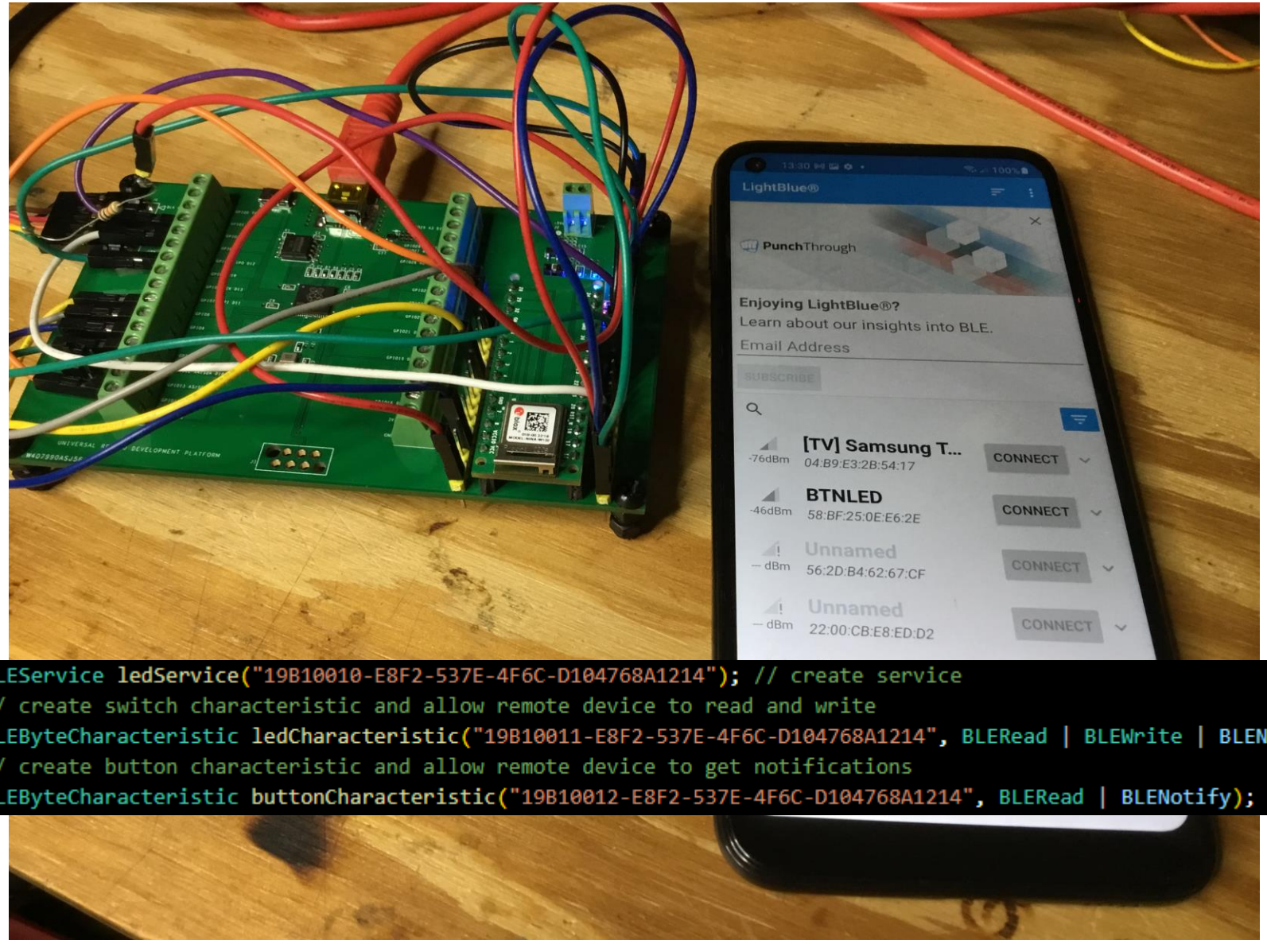






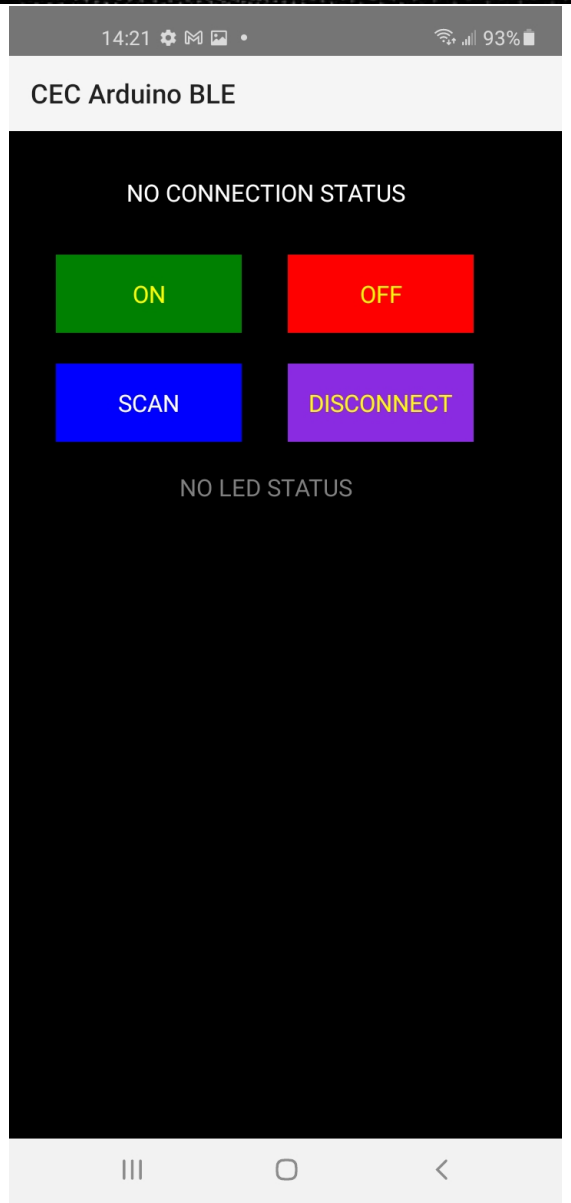
Arduino BLE First Contact

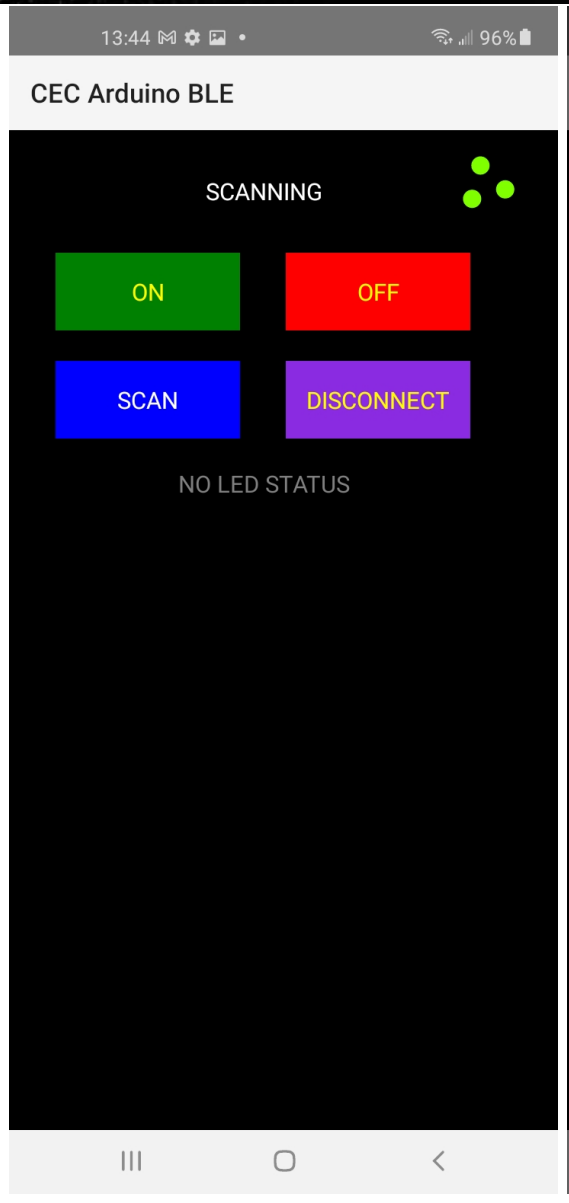


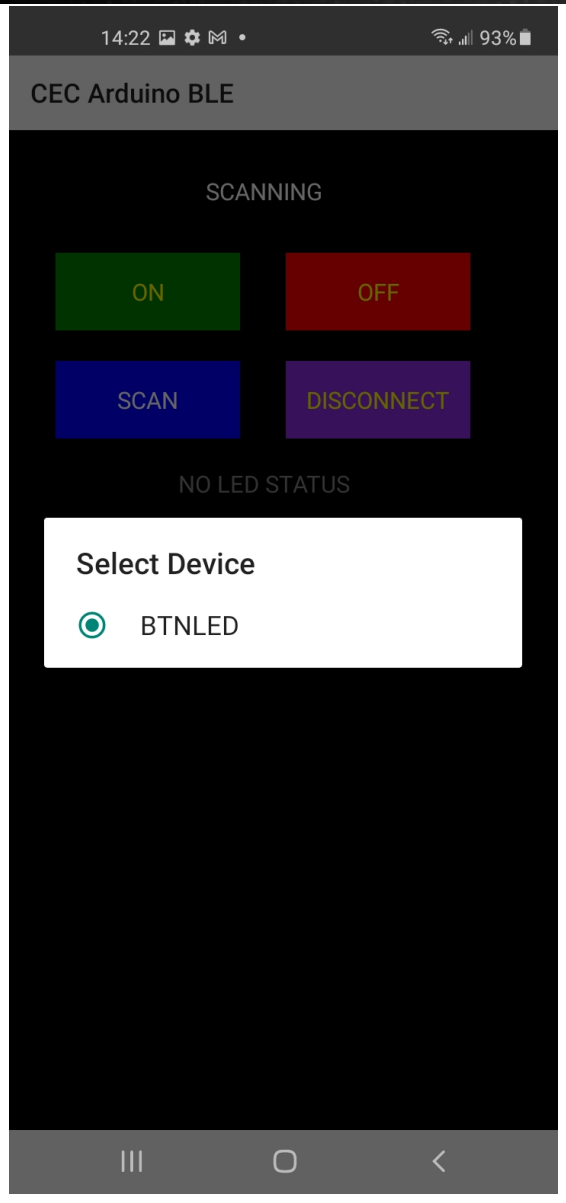


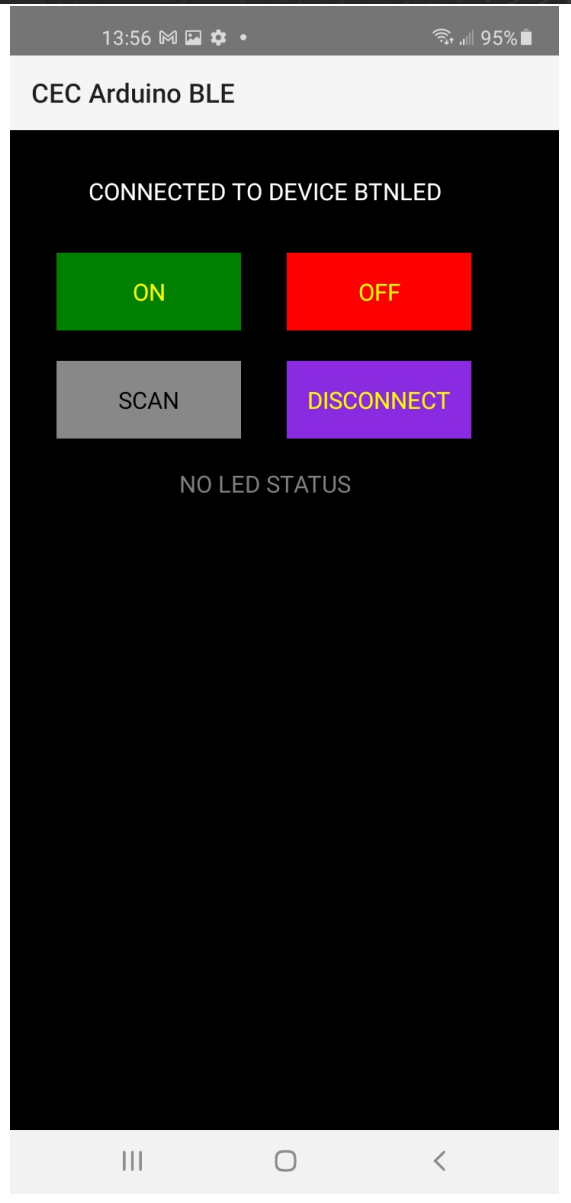

```
25  BLEService ledService("19B10010-E8F2-537E-4F6C-D104768A1214"); // create service
26  // create switch characteristic and allow remote device to read and write
27  BLEByteCharacteristic ledCharacteristic("19B10011-E8F2-537E-4F6C-D104768A1214", BLERead | BLEWrite | BLENotify);
28  // create button characteristic and allow remote device to get notifications
29  BLEByteCharacteristic buttonCharacteristic("19B10012-E8F2-537E-4F6C-D104768A1214", BLERead | BLENotify);
```

Arduino/B4A BLE Remote Control App

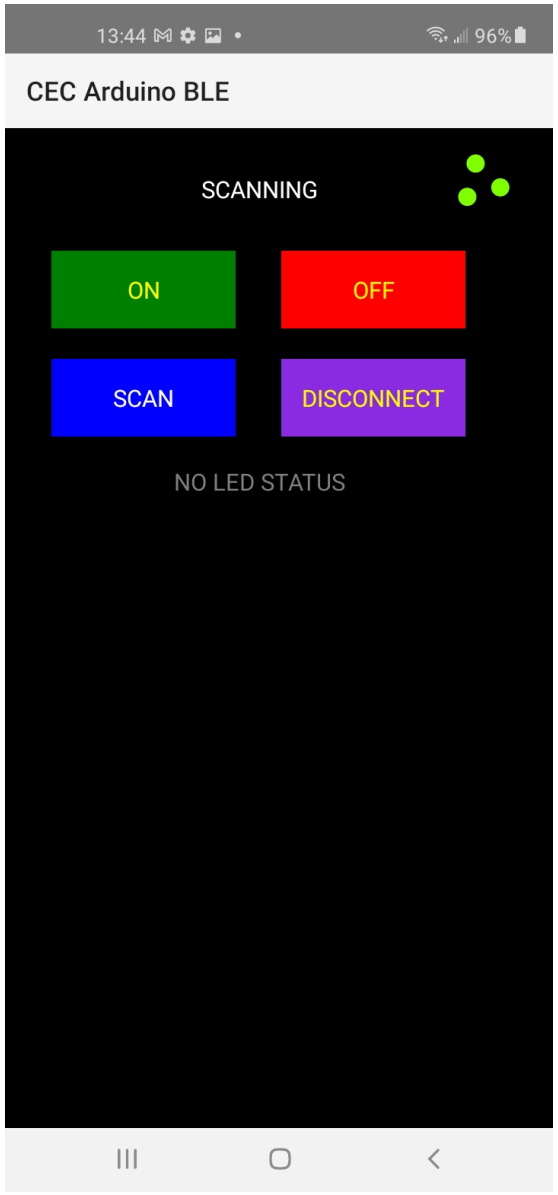


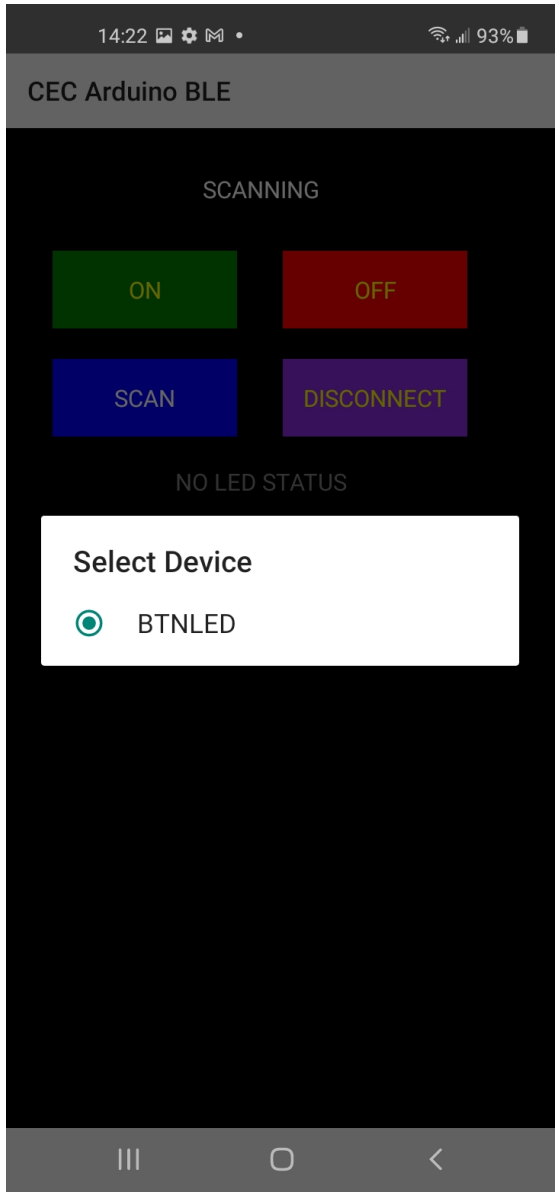


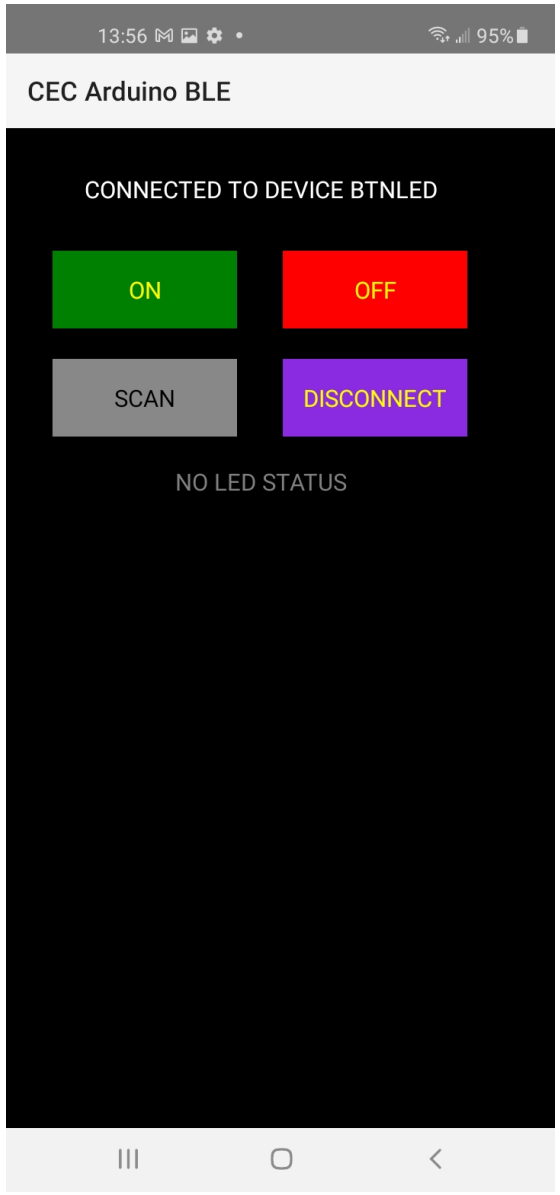




Arduino/B4A BLE Remote Control App

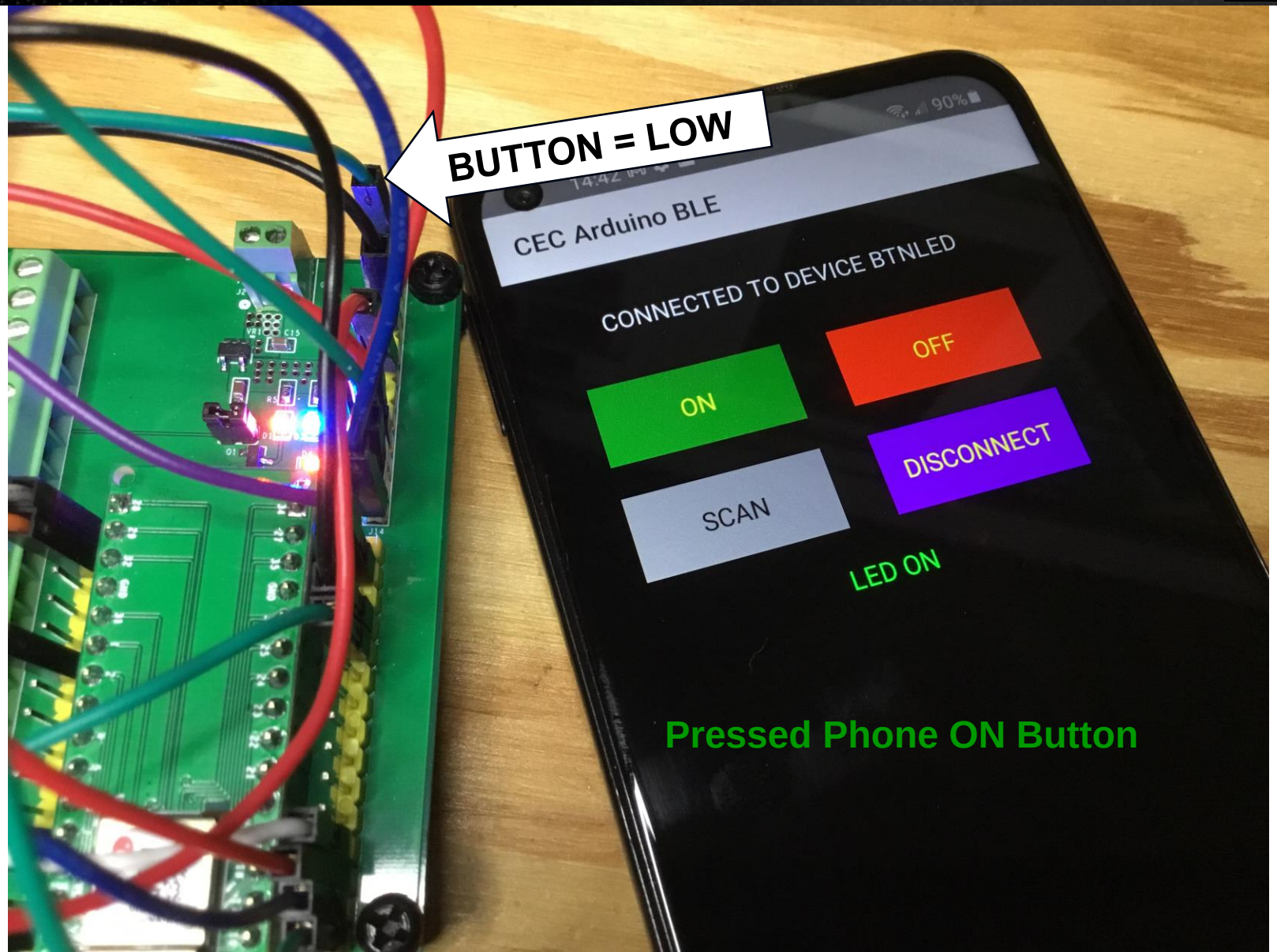




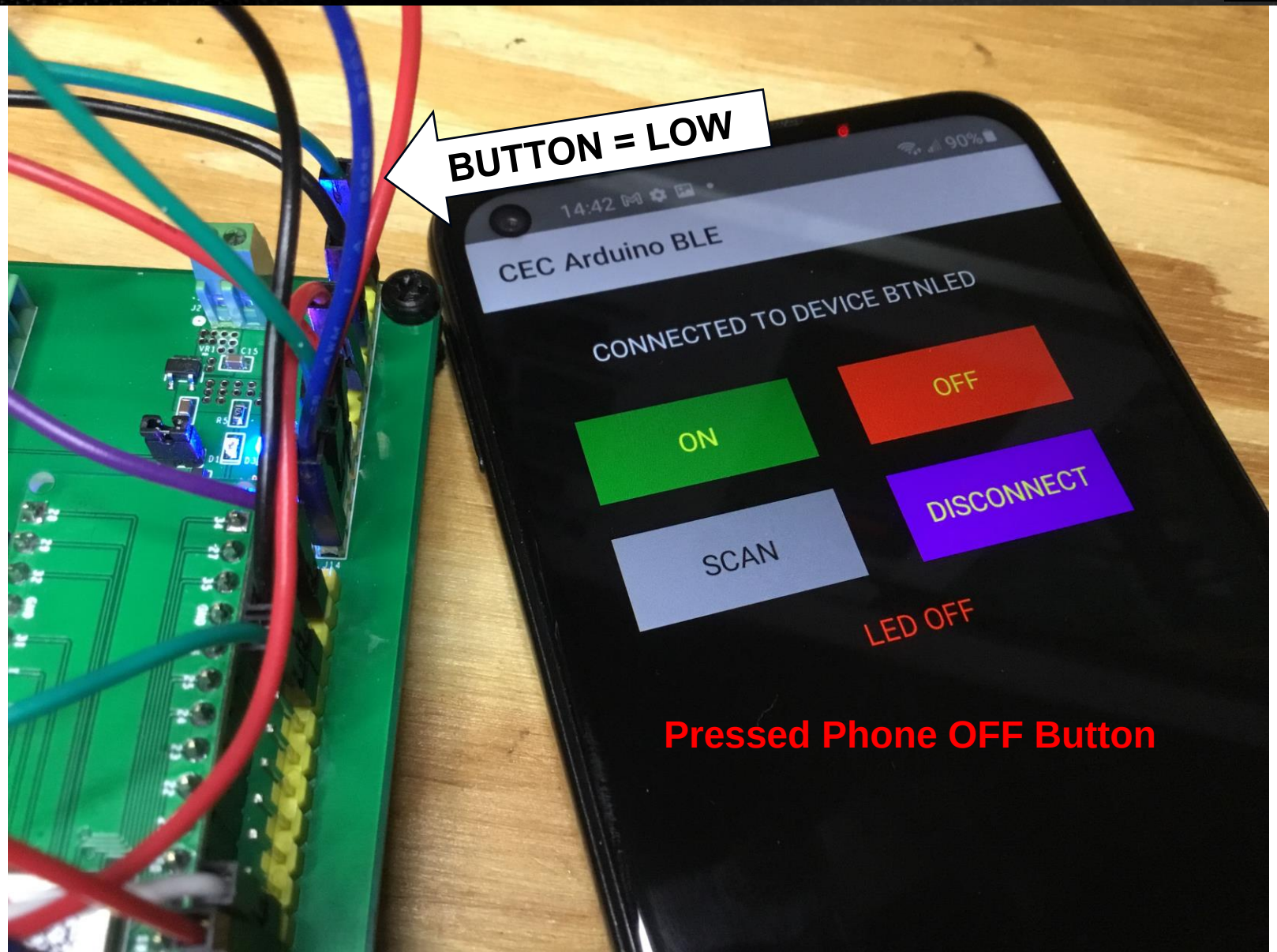



```
Device found:
Device found: [TV] Samsung TU700D 43 TV
Device found: BTNLED
Device found:
Device found:
Device found:
Device found:
Device found:
Device found:
Connect to: 58:BF:25:0E:E6:2E
Discovering services.
Connected
Setting descriptor. Success = true
writing descriptor: true
UUID: 00001800-0000-1000-8000-00805f9b34fb
UUID: 00001801-0000-1000-8000-00805f9b34fb
UUID: 19b10010-e8f2-537e-4f6c-d104768a1214
```

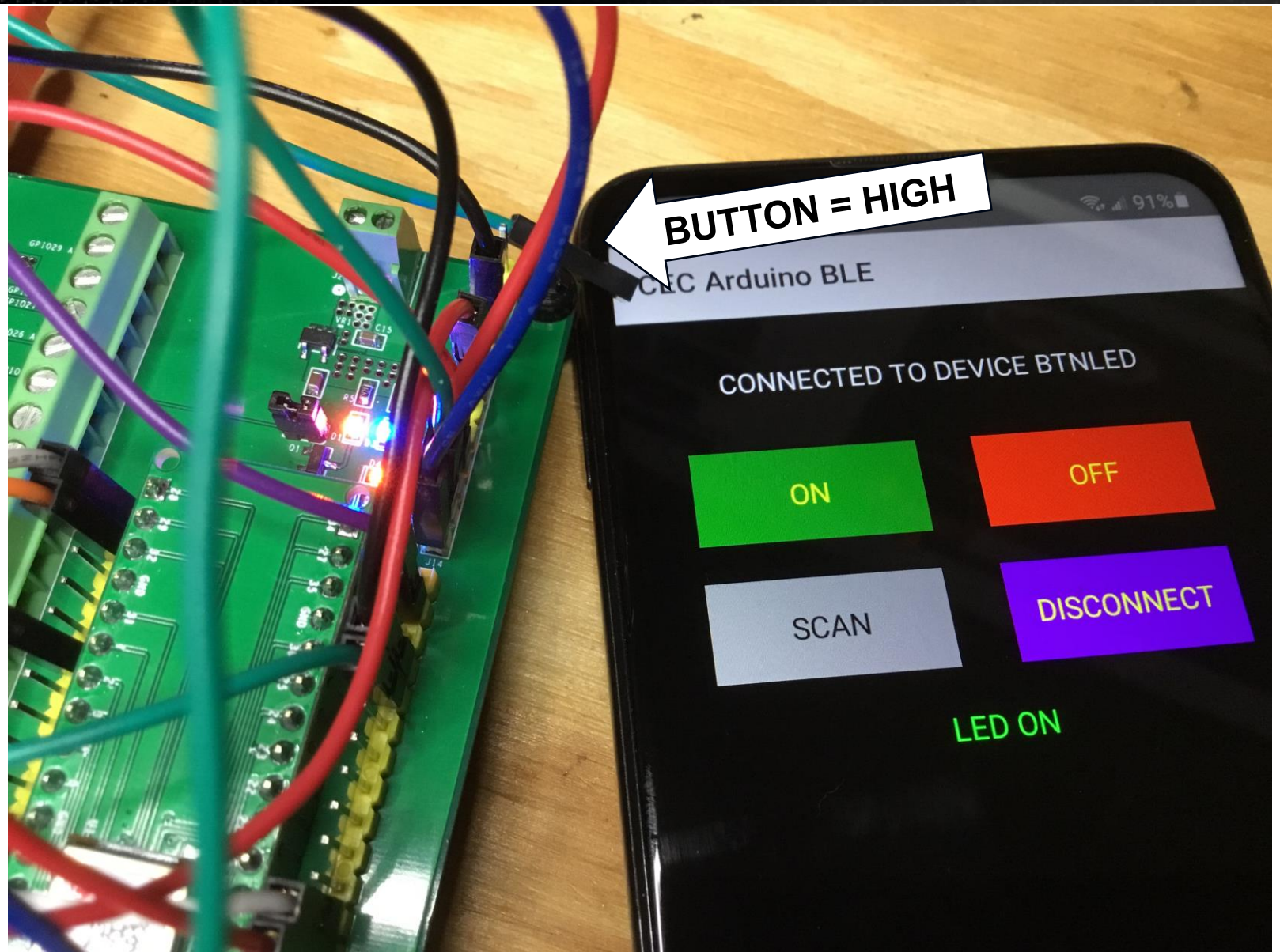
Arduino/B4A BLE Remote Control App



Arduino/B4A BLE Remote Control App

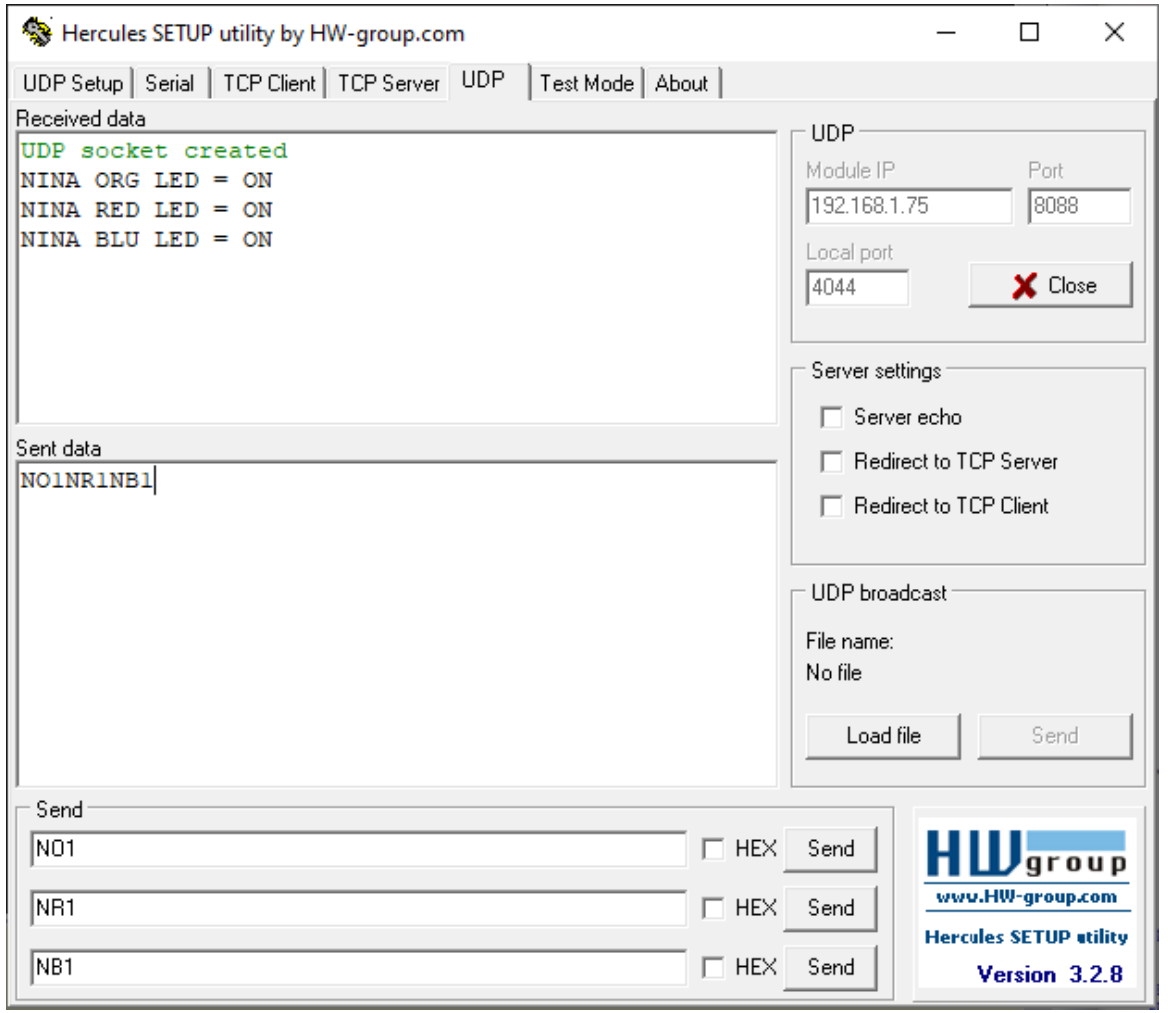


Arduino/B4A BLE Remote Control App



Thank you for attending!!!

MORE TO COME..



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