

Week 3: Embedded Programming

Board Preparations & Initial Tests

Quentin had prepared custom boards for us in this exercise (full introduction here <https://quentinbolsee.pages.cba.mit.edu/qpad-page/>) and I had limited soldering experience so I decided to practice and start with the easier board, QPAD-xiao. The loose parts that make up the board were the Seeed Studio Xiao RP2040, OLED screen, and (2) 10k resistors. Alan described my soldering as “chaotic” and though there weren’t many parts, this was still tricky in that I was creating shorts left and right due my poor soldering that created bridges in unwanted areas. These were later fixed with some desoldering wick that Anthony and Harrison had shown me.

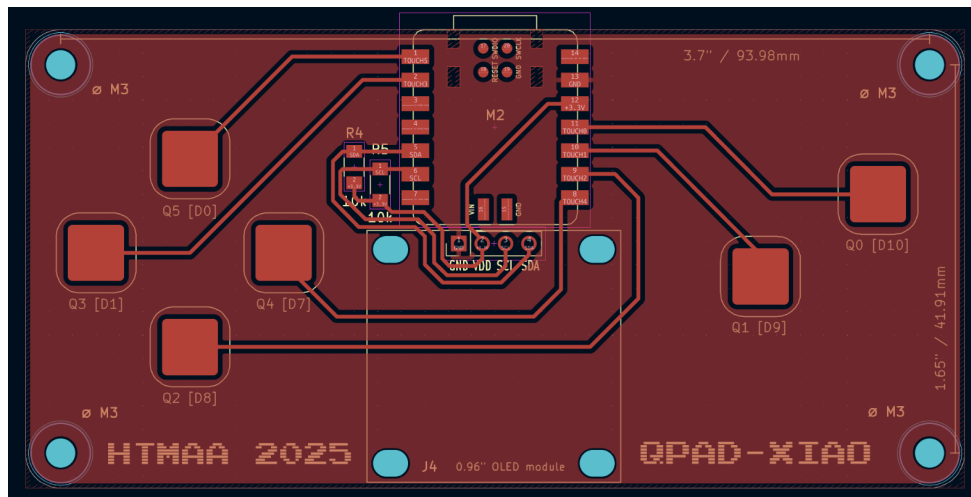
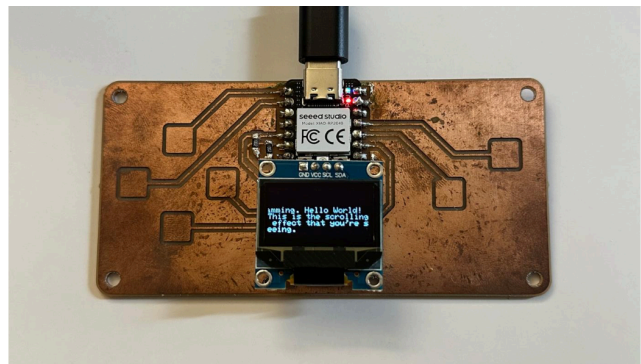
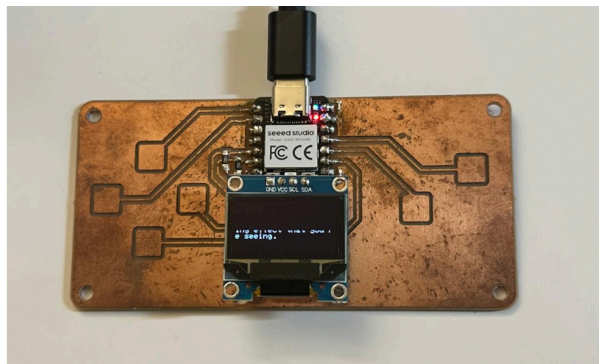


Image courtesy of Quentin for QPAD-xiao with RP2040

<https://quentinbolsee.pages.cba.mit.edu/qpad-page/>



QPAD-xiao board in action with scrolling effect across screen

Note to make sure the cable that you’re using to connect to your board is NOT a charging cable or else the port won’t be able to detect it at all.

(code file attached below)

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 64 // OLED display height, in pixels
#define SCREEN_ADDRESS 0x3C

Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);

int x; // x position for scrolling
const char message[] = "Week 3 embedded programming. Hello World! This is the scrolling effect
that you're seeing. "; // extra spaces for gap between loops
int textWidth;

void setup() {
  Serial.begin(115200);
  delay(50);

  if(!display.begin(SSD1306_SWITCHCAPVCC, SCREEN_ADDRESS)) {
    for(;;); // Don't proceed if display init fails
  }

  display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);

  textWidth = strlen(message) * 6; // 6 pixels per character
  x = -textWidth; // start off-screen to left
}

void loop() {
  display.clearDisplay();
  display.setCursor(x, 25);
  display.print(message);
  display.display();

  // Move text to the right
  x++;
  if (x > SCREEN_WIDTH) {
    x = -textWidth; // reset to loop continuously
  }

  delay(30); // smaller = faster scrolling
}
```

Then I practiced my soldering with the new QPAD21 that arrived and due to the smaller scale, I used the soldering heat gun for most of it. The loose parts that make up the board were the ATSAM21E18, OLED screen, (3) 10k resistors, (1) 1k resistor, (2) 1 uF capacitors, 3.3V regulator, 10-pin SWD header, and micro-B USB connector.

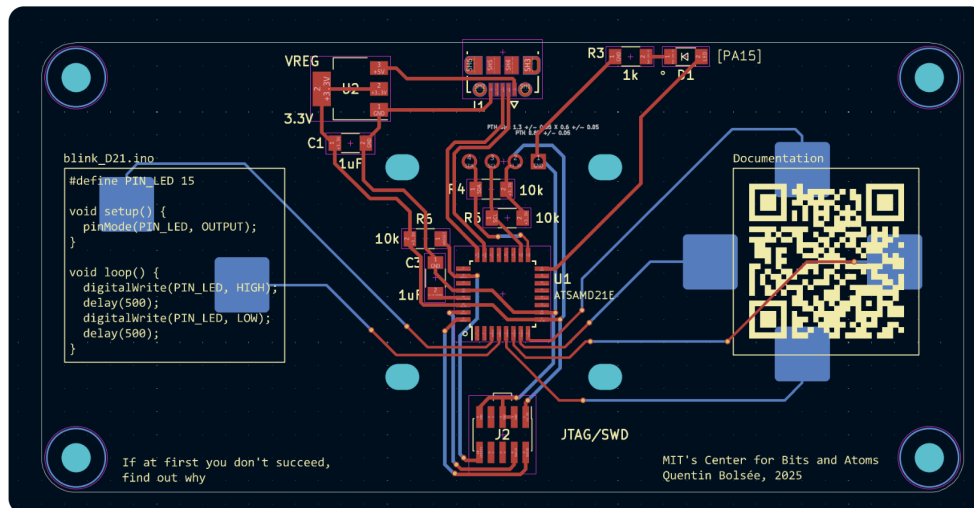
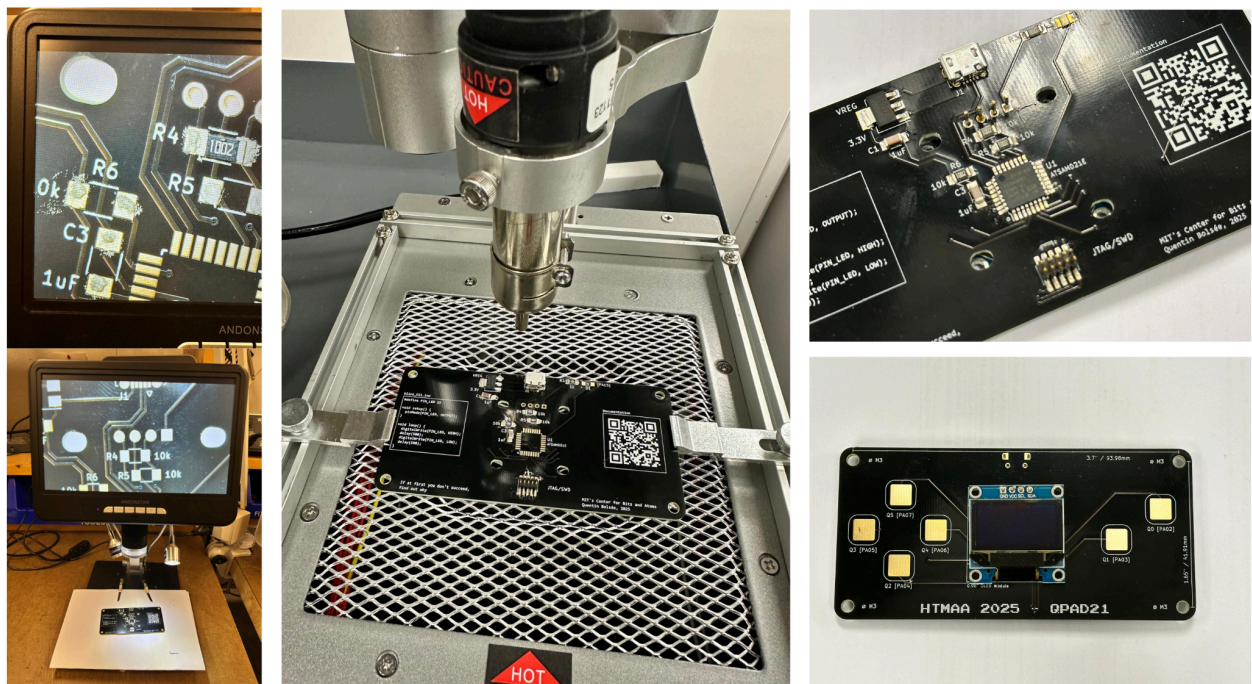


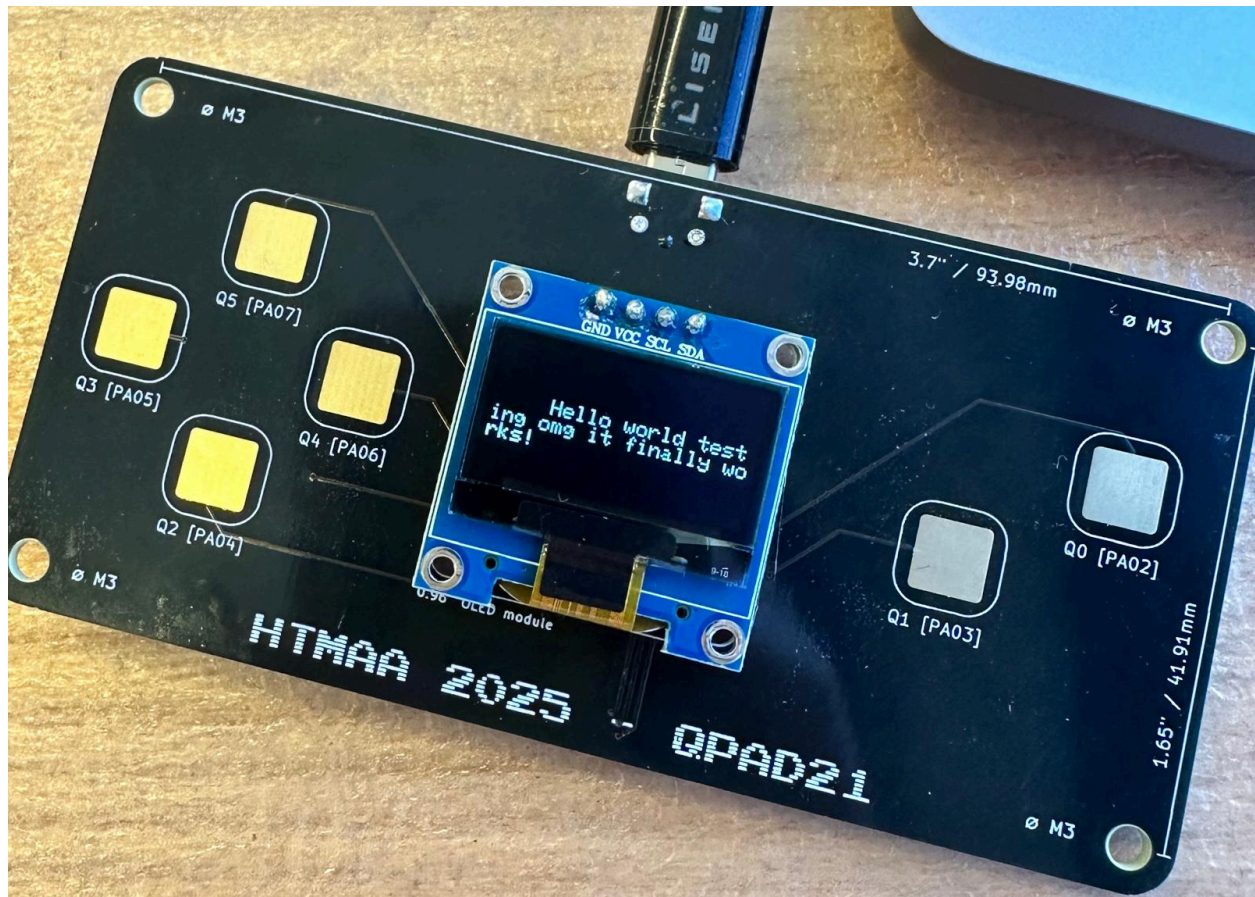
Image courtesy of Quentin for QPAD21 with ATSAM21E18

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Used solder paste in areas needed to be soldered before bringing it to the heat bed. The heat gun's temperature should ideally be between 270-290 degrees. Note: do NOT use the heat gun on the OLED as it will melt the screen. Do the soldering manually last for it.

This was my second QPAD21 board that finally worked due to Anthony's help in guiding me through fixing my solders. Since I was bridging in my previous Xiao pad, I ended up soldering less than recommended for this board so my connections weren't secure.



Text display