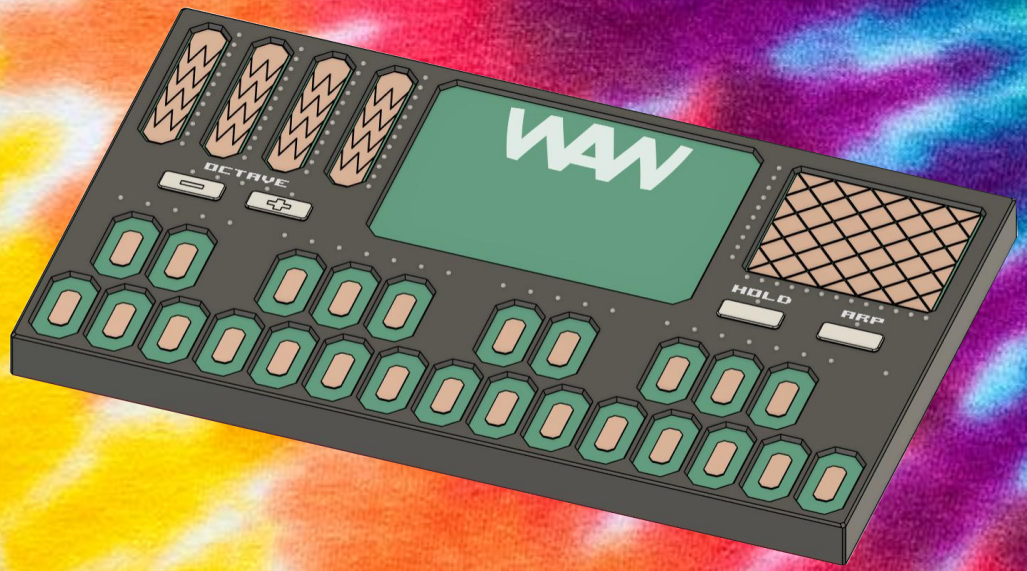
TERRITORIAL ACKNOWLEDGEMENT

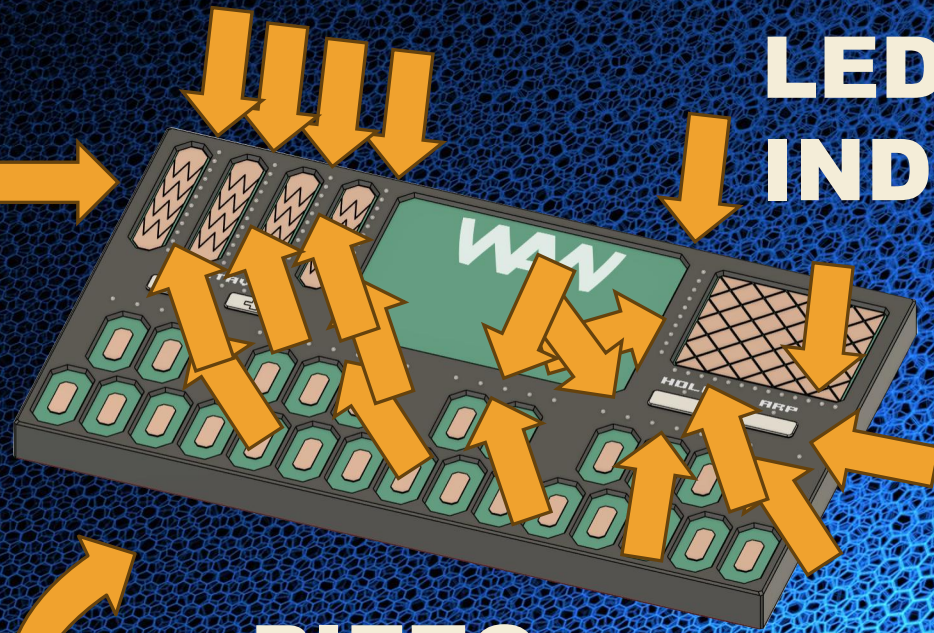
Camosun College serves the communities of southern Vancouver Island and the southern Gulf Islands that are located in the territories of the Lək̓ʷəŋən (Songhees and Kosapsum), Malahat, Pacheedaht, Scia'new, T’Sou-ke and W̱SÁNEĆ (Pauquachin, Tsartlip, Tsawout, Tseycum) peoples.

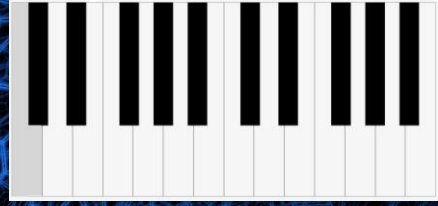
WAW



MTP – 25K

WHAT ARE WE COVERING?

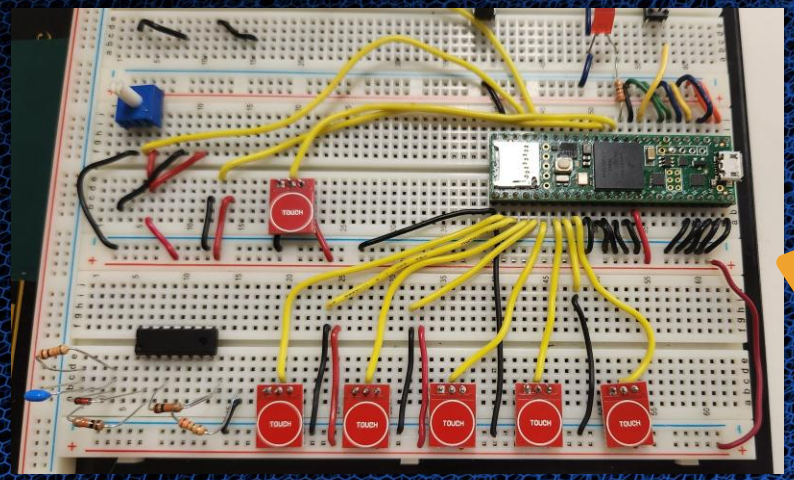


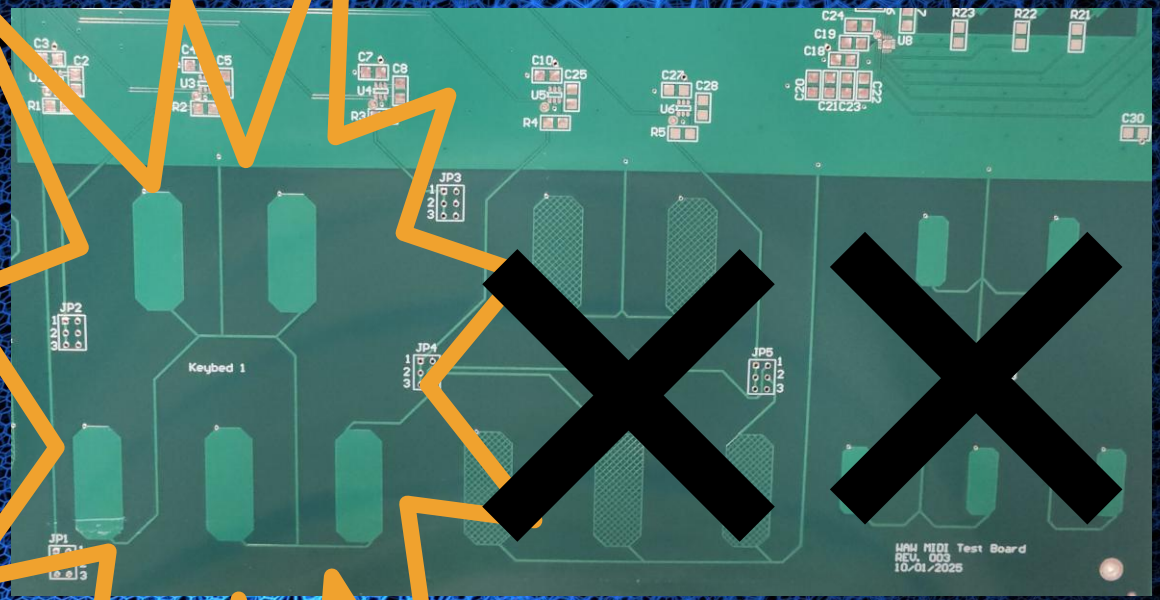


THEORY

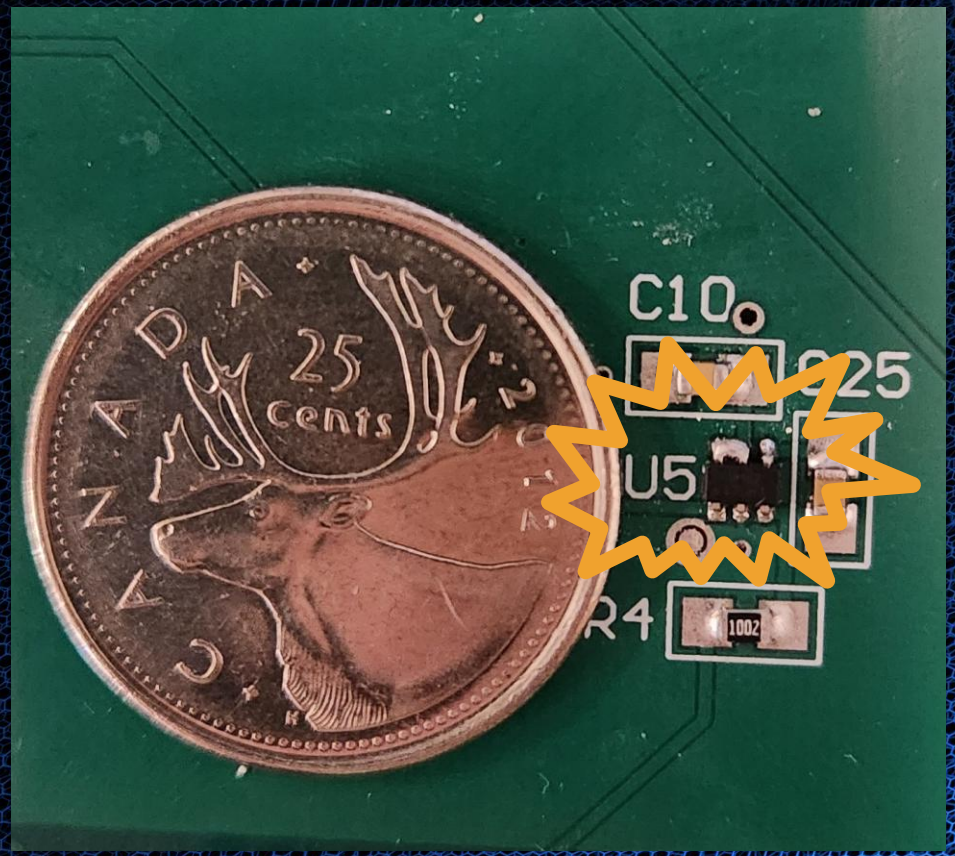
MIDI CHARLIEPLEXING I2C

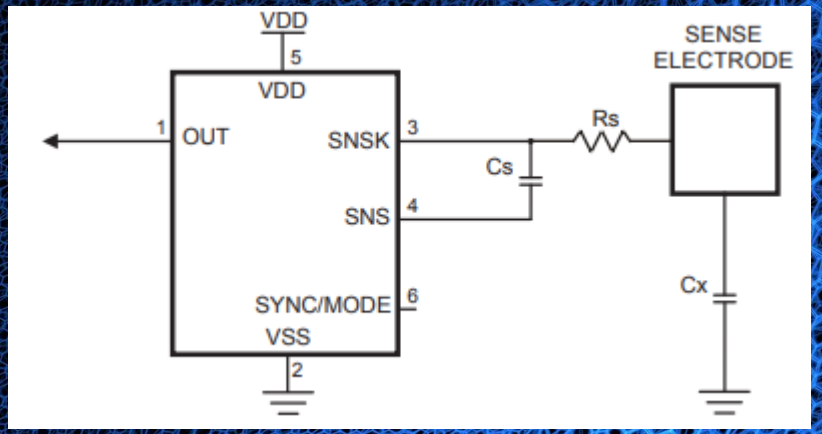
EVOLUTION OF OUR: TOUCH SENSORS



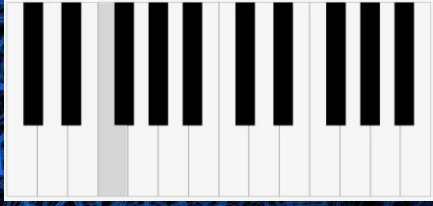


AT42QT1010 (SENSOR CHIP)



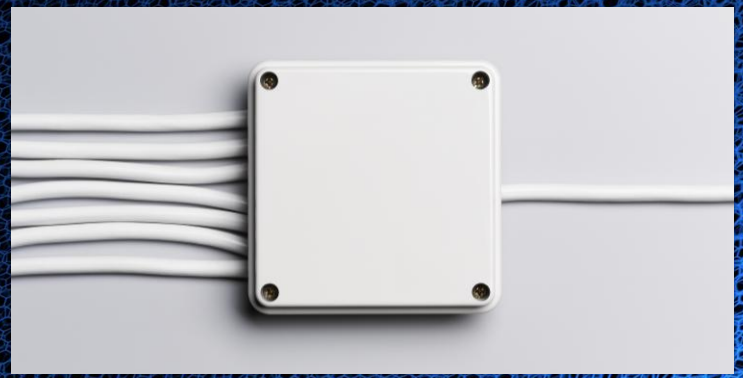


Designed for human interfaces
Pins 5 & 6 = Fast mode:
– keep pins high & Response speed is key



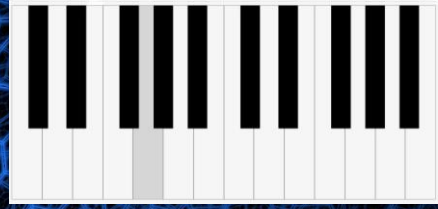
GPIO EXPANDERS

25 touch button pins



4 pins

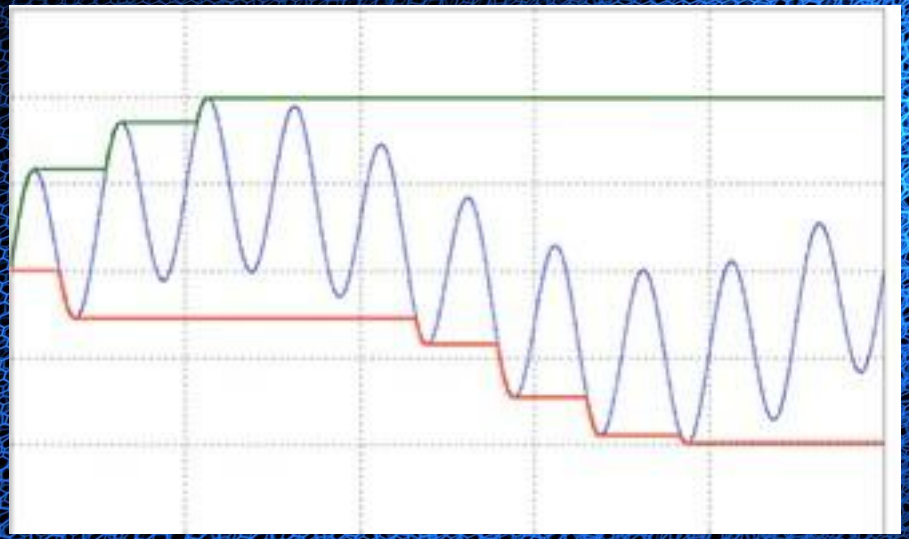
Communicates over I2C



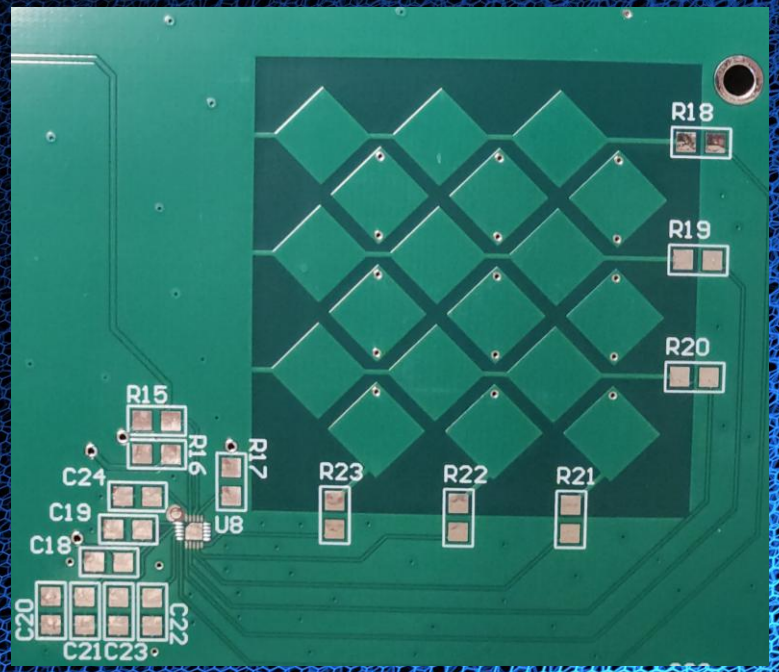
PIEZO SENSORS

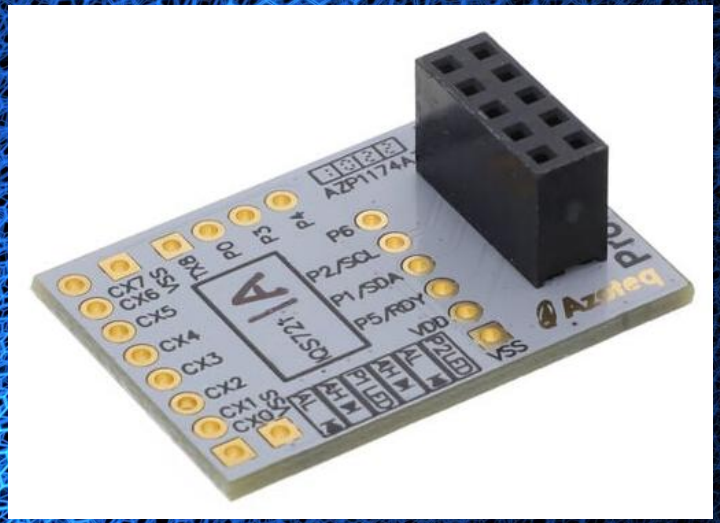
OR

PEAK DETECTOR:

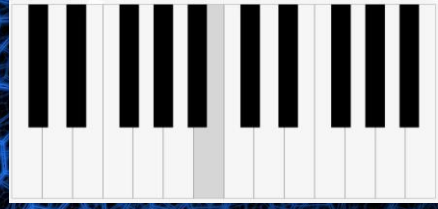


MODULATORS



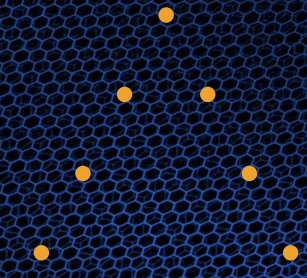


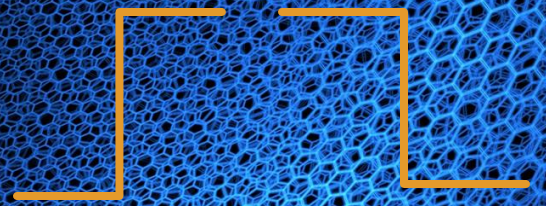
IQS7211AEV01

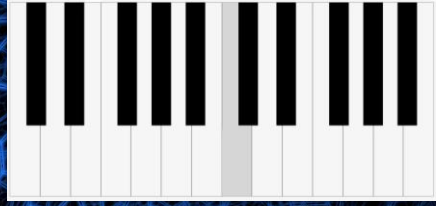


WHAT DO THE BUTTONS DO?

ARPEGGIATOR HOLD OCTAVE UP/ DOWN SHIFT







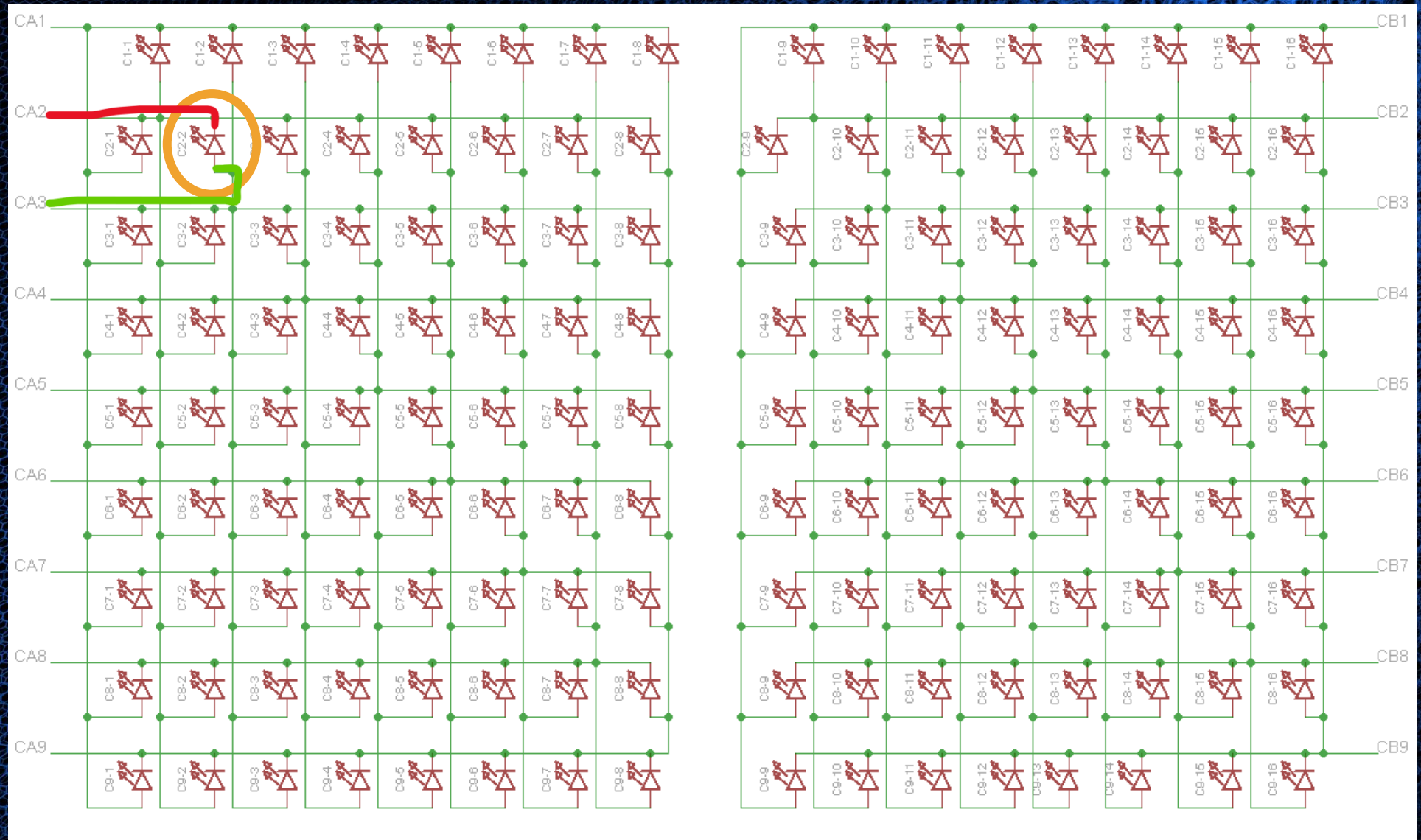
LED INDICATORS

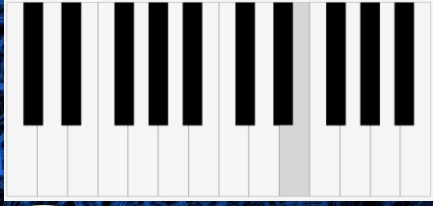
RUN LEDs IN SERIES? ✗ TOO EXPENSIVE FOR OUR POWER BUDGET

MATRIX? ✗ NOT ENOUGH PINS

CHARLIEPLEXING? ✓
- ENOUGH PINS
- FITS THE BUDGET

CHARLIEPLEXING





HARDWARE INTERACTIONS

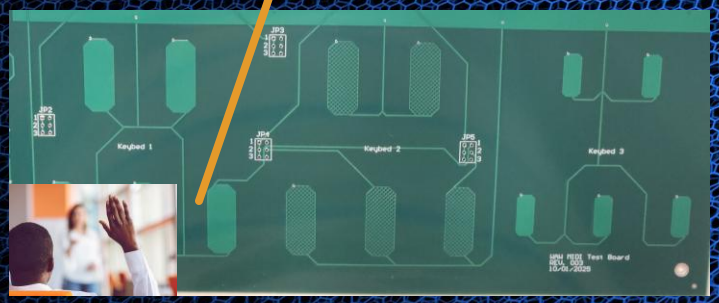
STEM

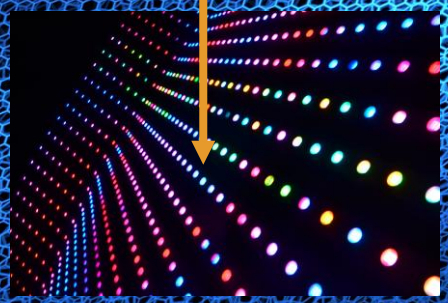
TEENSY

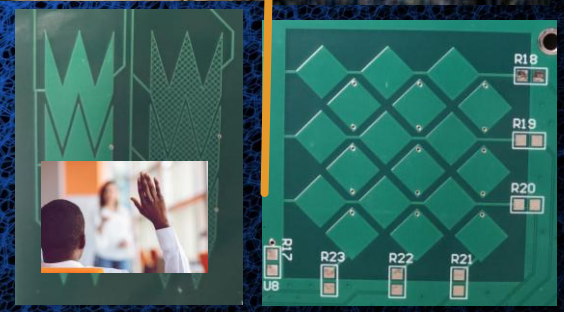
MCP23017 (GPIO EXPANDERS)

IS31FL3731 (CHARLIEPLEXOR)

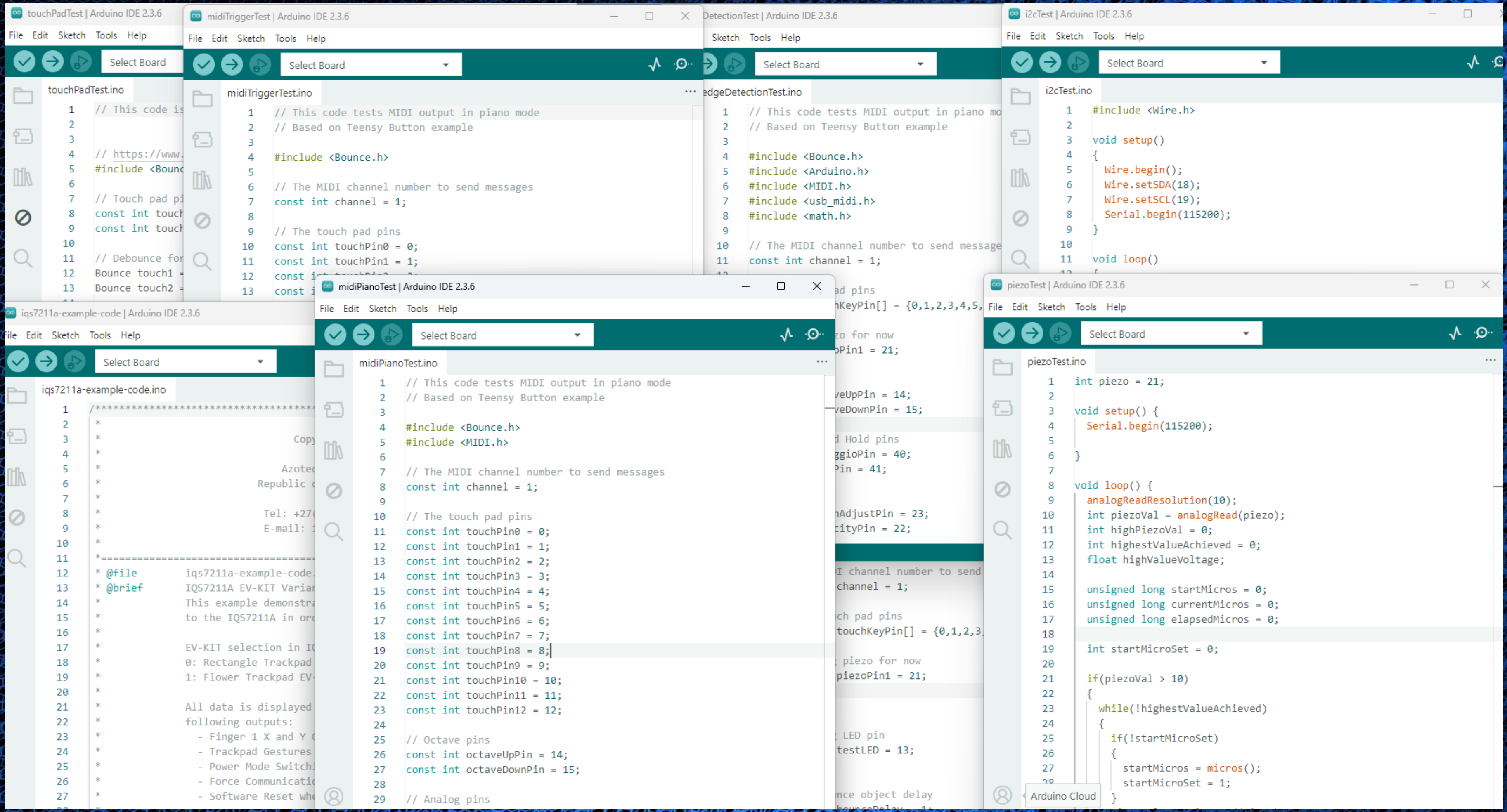
IQS7211 (MODULATION SURFACES)



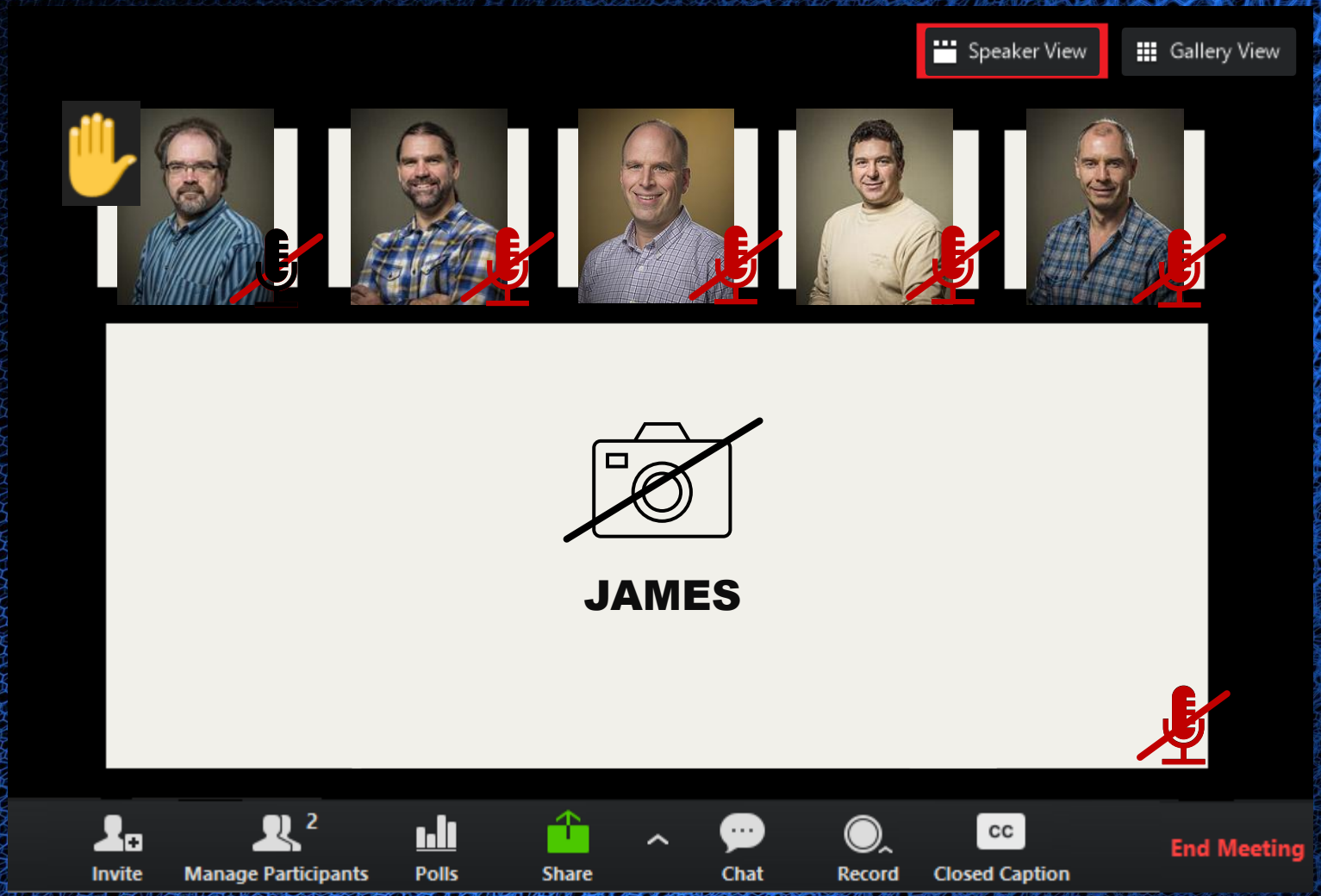


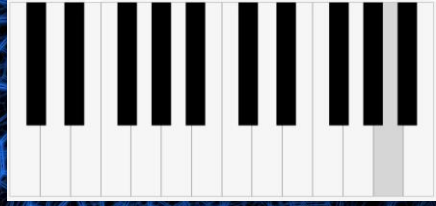


TEST CODE


touchPadTest | Arduino IDE 2.3.6
midiTriggerTest | Arduino IDE 2.3.6
DetectionTest | Arduino IDE 2.3.6
i2cTest | Arduino IDE 2.3.6
iqs7211a-example-code | Arduino IDE 2.3.6
midiPianoTest | Arduino IDE 2.3.6
piezoTest | Arduino IDE 2.3.6
File Edit Sketch Tools Help
Select Board
midiTriggerTest.ino
// This code tests MIDI output in piano mode
// Based on Teensy Button example
#include <Bounce.h>
// The MIDI channel number to send messages
const int channel = 1;
// The touch pad pins
const int touchPin0 = 0;
const int touchPin1 = 1;
i2cTest.ino
#include <Wire.h>
void setup()
{
Wire.begin();
Wire.setSDA(18);
Wire.setSCL(19);
Serial.begin(115200);
}
void loop()
midiPianoTest.ino
// This code tests MIDI output in piano mode
// Based on Teensy Button example
#include <Bounce.h>
#include <MIDI.h>
// The MIDI channel number to send messages
const int channel = 1;
// The touch pad pins
const int touchPin0 = 0;
const int touchPin1 = 1;
const int touchPin2 = 2;
const int touchPin3 = 3;
const int touchPin4 = 4;
const int touchPin5 = 5;
const int touchPin6 = 6;
const int touchPin7 = 7;
const int touchPin8 = 8;
const int touchPin9 = 9;
const int touchPin10 = 10;
const int touchPin11 = 11;
const int touchPin12 = 12;
// Octave pins
const int octaveUpPin = 14;
const int octaveDownPin = 15;
// Analog pins
piezoTest.ino
int piezo = 21;
void setup() {
Serial.begin(115200);
}
void loop() {
analogReadResolution(10);
int piezoVal = analogRead(piezo);
int highPiezoVal = 0;
int highestValueAchieved = 0;
float highValueVoltage;
unsigned long startMicros = 0;
unsigned long currentMicros = 0;
unsigned long elapsedMicros = 0;
int startMicroSet = 0;
if(piezoVal > 10)
{
while(!highestValueAchieved)
{
if(!startMicroSet)
{
startMicros = micros();
startMicroSet = 1;
}
Arduino Cloud

I2C & INTERRUPTS





TIMELINE AND PROJECT

WHAT WE'VE DONE:

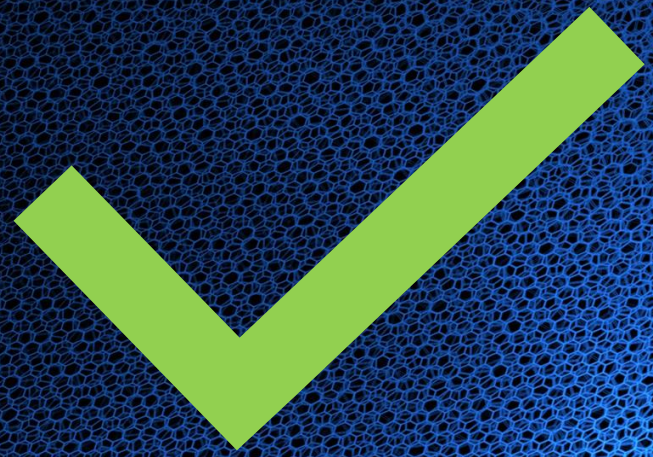
- Touch sensor keys and modulator circuits
- Piezo circuits & peak detectors
- Final PCB order
- Sending MIDI signals from key presses & buttons
- Octave and hold features

WHATS LEFT:

- Working out LED wiring
- Finalizing enclosure design
- Modulator tuning
- Hierarchy of priority for interrupts/polling
- Arpeggiator, tempo indicator, and modes

BUDGET

Parts before semester	Subtotal	$104.67
Order #1	Subtotal	$78.92
Order #2	Subtotal	$26.20
Order #3	Subtotal	$45.07
Order #4	Subtotal	$1.10
Order #5	Subtotal	$5.11
Order #6	Subtotal	$55.86
Grand Total		$316.93

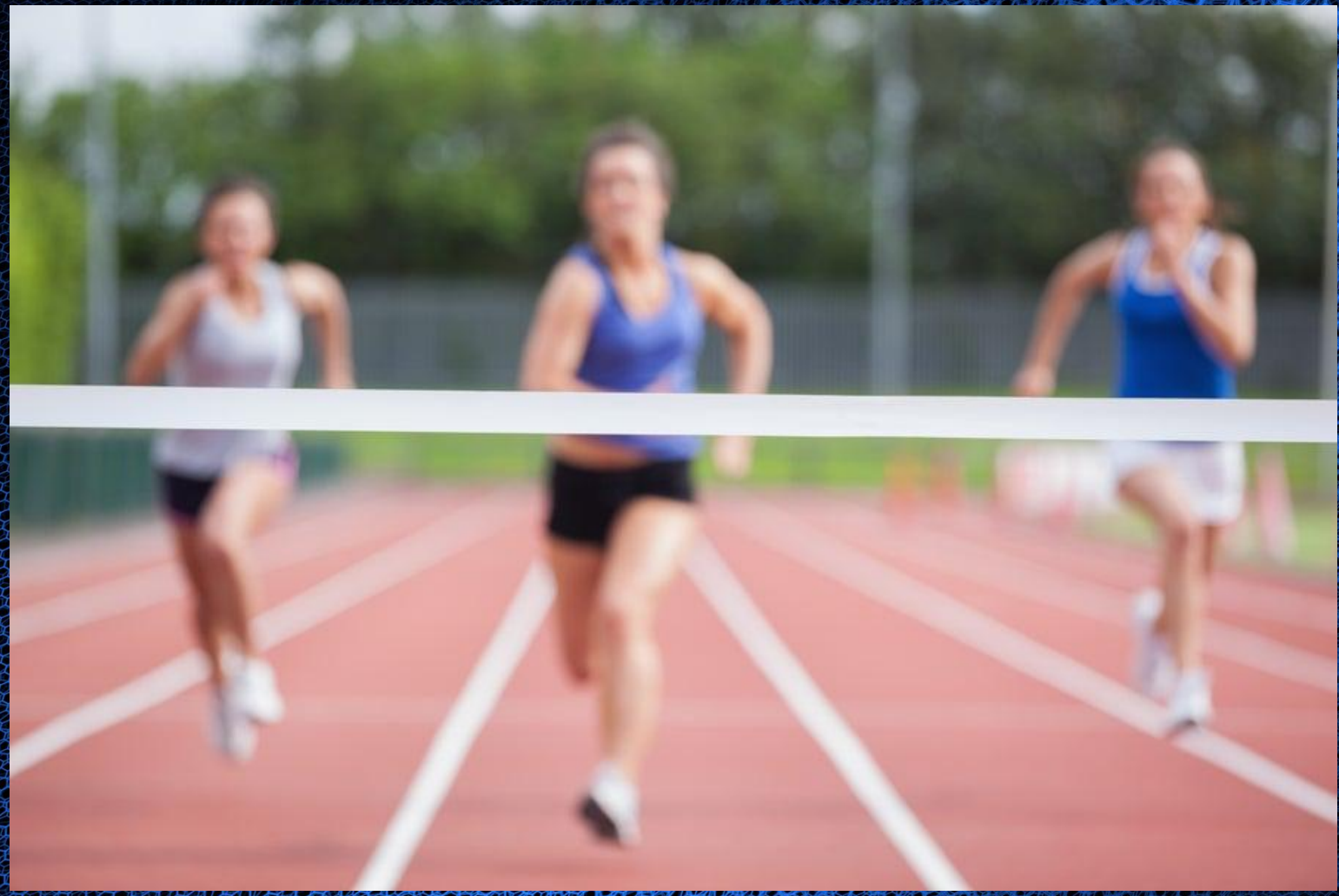


WHATS LEFT TO ORDER?

Resistors

Capacitors

CONCLUSION



QUESTIONS?

REFERENCES

- Capacitive touch module TTP-223
- AT42QT1010 Data Sheet
- Electrical Engineering Technology - Marine & Industrial, Diploma | Camosun College
- IQS7211AEV01-S.jpg (2093×2093)
- DiagonalTouchscreen - Charlieplexing – Wikipedia
- Adafruit Learning System