

Abstract geometric lines in the top-left corner of the slide, consisting of several overlapping, irregular polygons and lines that create a complex, layered effect.

# KITCHEN TIMER

Shooq Alasousi

Embedded Systems-Spring23

Dr. Goncalo Martins

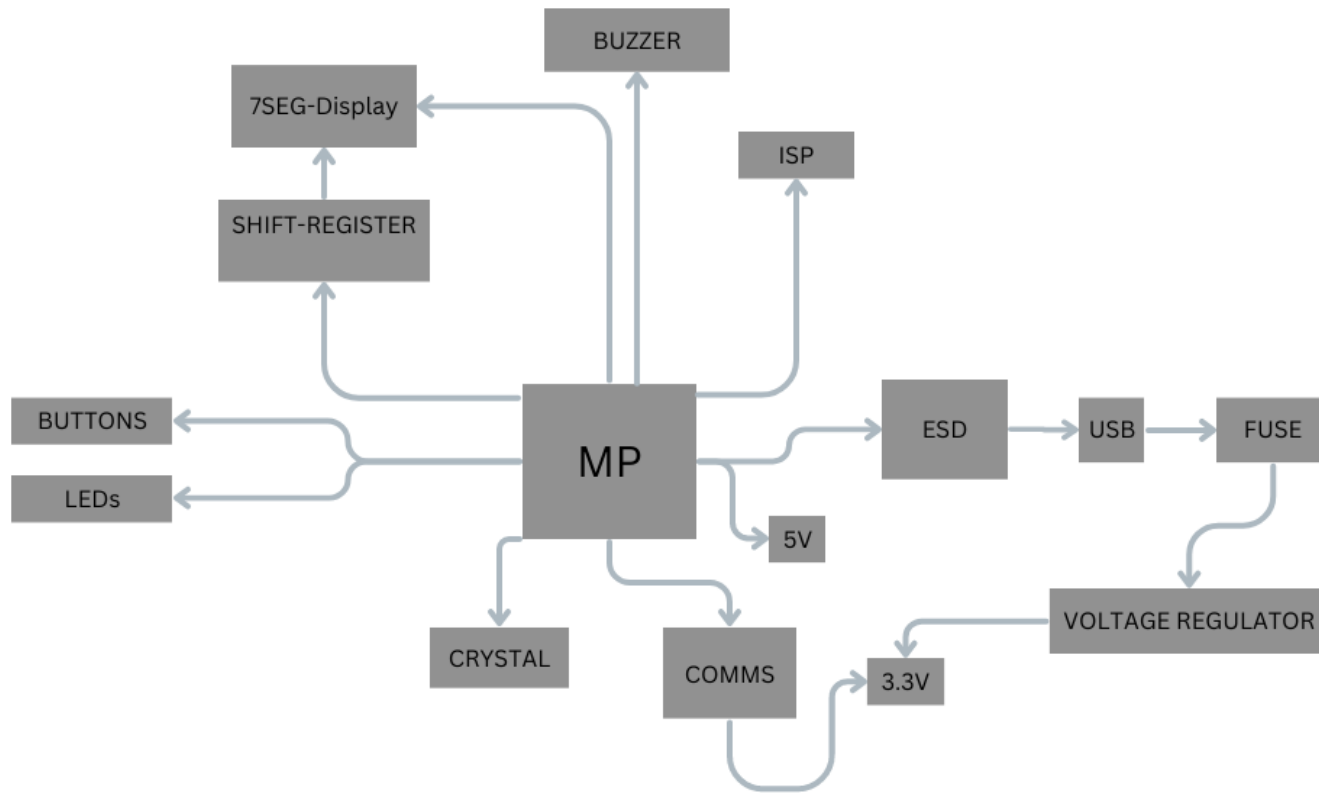
3<sup>rd</sup> May, 2023

# SLIDE CONTENTS:

- Project Requirements
- System Design
  - Block Diagram
- Component Selection
- Build Prototype
  - Arduino shield description
- PCB Design
  - Schematics, PCB layout
- Software Development
  - Code, Block Diagrams
- Enclosure Design
  - TinkerCad Model

# PROJECT REQUIREMENTS

- The system shall include all the components in the Design diagram including:
  - Buzzer, LEDS, Buttons, shift-Register, 7Segment-Display
- The project shall include both HW and SW development
- The project shall contain schematic and PCB designs
- The project shall use the components in the selection list
- The project shall use less cost as possible
- The project shall be finished within the time constraints



# SYSTEM DESIGN

This is the block diagram for the Kitchen timer project. It was used for guidance when creating the schematic in kiCad.

It has:

- A 7Segment-Display.
- Crystal
- 2 buttons
- 2 LEDS
- Buzzer
- Capacitors
- Voltage Regulator
- Resistors
- 5V and 3.3V power

# COMPONENTS SELECTION

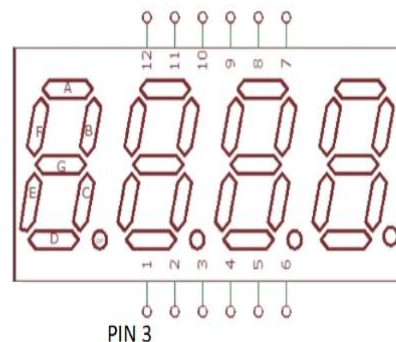
Placed	References	Value	Footprint	Quantity
1	C1, C4, C5	0.1uF	C_0603_16	8
2	C2, C3	22p	C_0603_16	2
3	C9, C13	1uF	C_0603_16	2
4	C8	10uF	C_0805_20	1
5	C14	2.2uF	C_0603_16	1
6	C15	10nF	C_0603_16	1
7	R5, R6, R7	100	R_0805_20	8
8	R1, R2	10k	R_0805_20	2
9	R3, R4	330	R_0805_20	2
10	R13, R17	10k	R_0603_16	2
11	R14, R15	22	R_0603_16	2
12	R16	1k	R_0603_16	1
13	D1, D2, D3	LED	LED_0805_20	3
14	U1	CA56-12EV	CA56-12EV	1
15	U2	74HC595	TSSOP-16	1
16	U3	ATmega32	TQFP-44	1
17	U4	USBL6-2	SOT-23-6	1
18	U5	LP2985-3.3	SOT-23-5	1
19	Y1	16MHz	Crystal_SMD	1
20	F1	PTCSMD	Fuse_1812	1
21	S1, S2	PTS125SM	PTS125_SMD	2
22	LS1	Speaker	Buzzer_1206	1
23	S3	PTS526	PTS526_SMD	1
24	J1	AVR-ISP-6	PinSocket_6	1
25	J2	USB_B_Mi	USB_Mini-I	1
26	J3	ESP_Conn	PinSocket_6	1

## Components:

- Arduino Uno (Optional) / Arduino Mega (Preference) Qt: 1
- 7-Segment Display (Sparkfun) (\$1.60) Qt: 1
- Shift Register 8-Bit (SN74HC595) (Sparkfun) (\$1.05) Qt: 1
- Buttons (Sparkfun) (\$0.55/unit) Qt: 2
- LEDs Qt: 2
- Resistors
- Capacitors
- Mini Speaker (Sparkfun) (\$2.10)
- ESP8266 (Amazon) (\$9 for 3 units)
- Voltage Regulator

**Total costed less than \$60**

- The Arduino Uno schematic that was used to further create our KiCad schematic.



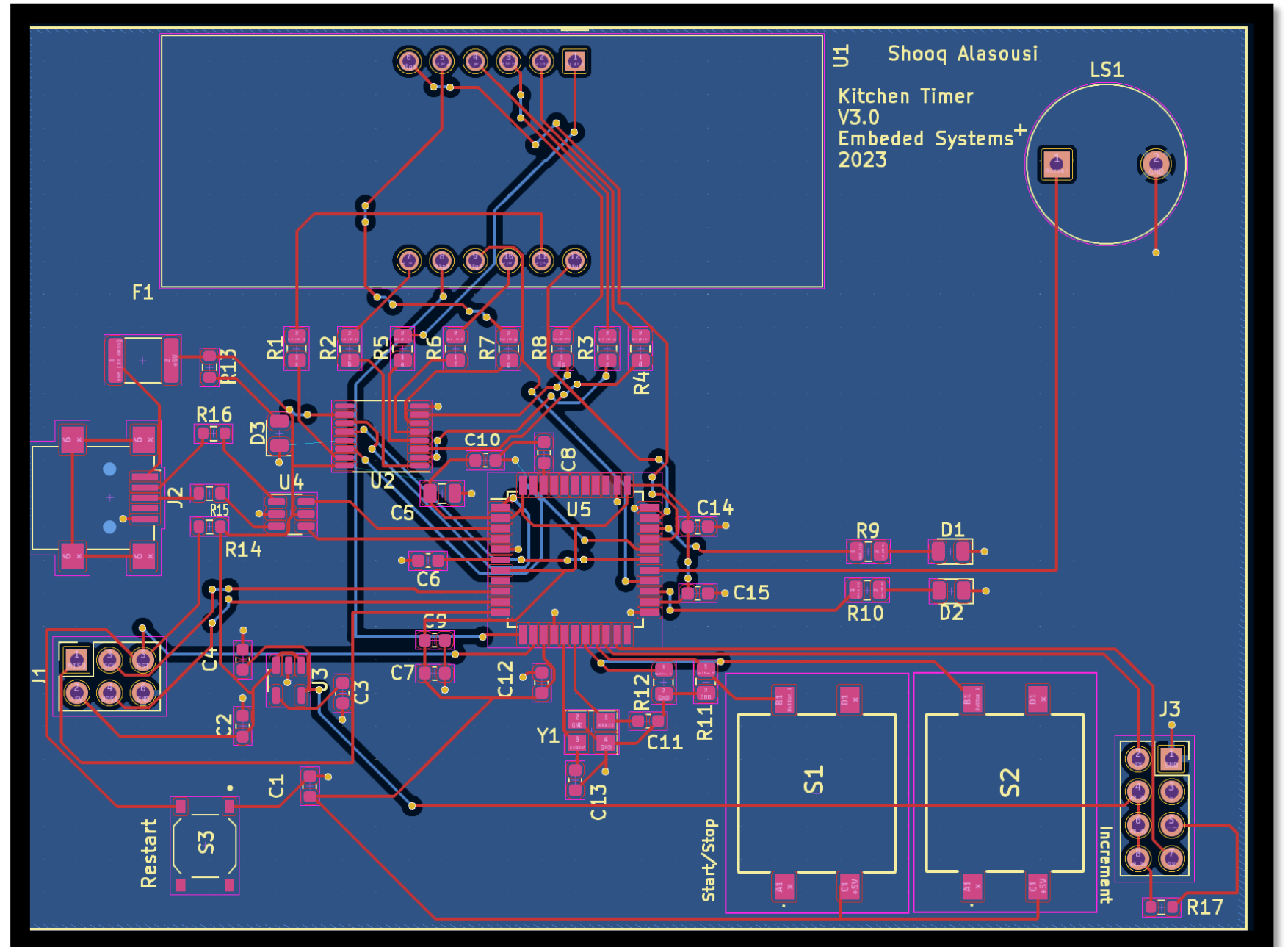
- This Schematic was created using KiCad.



# PCB DESIGN

## PCB LAYOUT

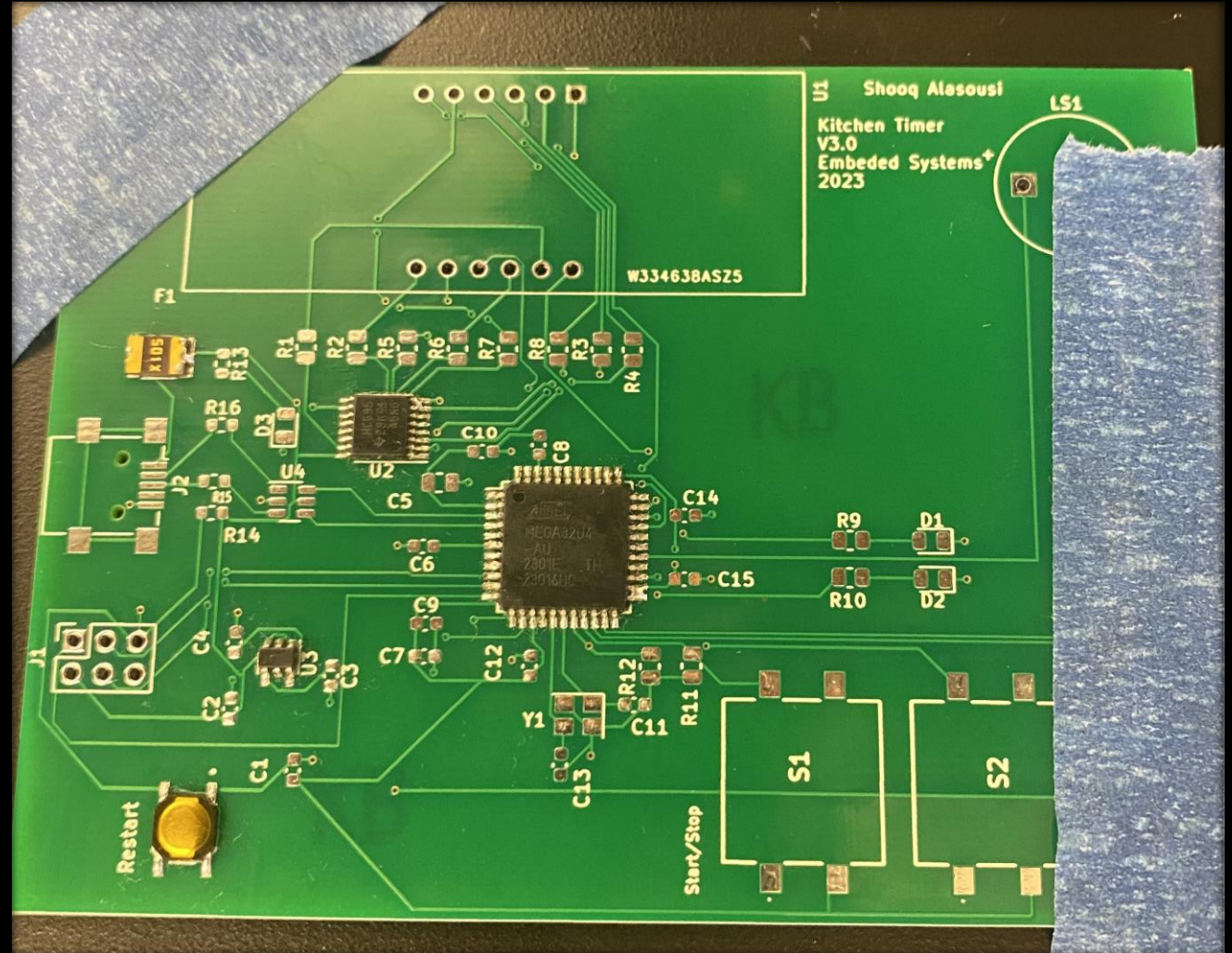
- This PCB Layout was created using KiCad and the previous schematic



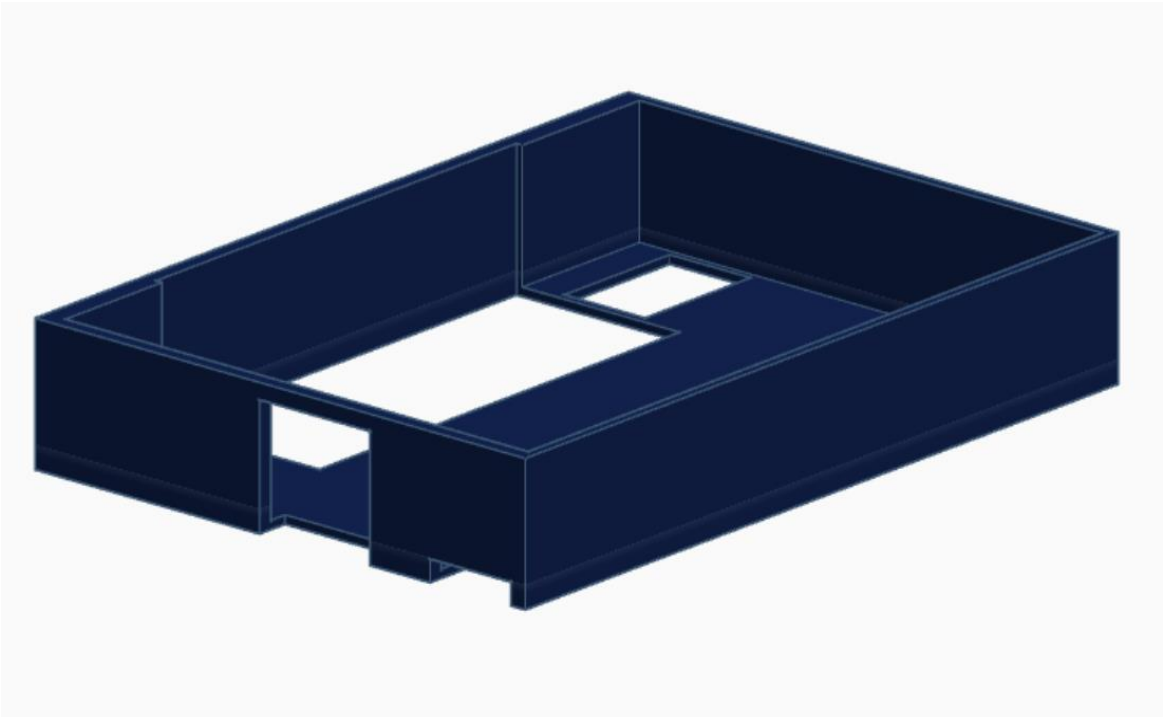


# ASSEMBLY

- The assembly process went smoothly, however it took more time and patience than expected.
- It was also interesting that the process of soldering was personally very therapeutic.
- I have so far soldered the fuse F1 and all the capacitors(not shown in picture), the voltage regulator, shift register and the microcontroller.
- The rest of the components shall be soldered during summer or fall quarter.



# ENCLOSURE DESIGN



- The Enclosure model was created in TinkerCad