

## Declaration of authorship

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I declare that this piece of work which is the basis for recognition of achieving learning outcomes in the (Microprocessor Systems) EMISY course was completed on my own

# EMISY Project 21 Portable Compass

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## **1 Analysis of the project**

### **1.1 Discussion of project requirements**

We need to create a simple portable compass circuit  
It should:

- Use energy-saving power modes of microcontroller
- Be battery powered
- Be portable (cellphone/wrist watch)
- Communicate using graphical OLED display and two buttons keyboard

### **1.2 Discussion of solution**

## **2 Detailed circuit diagram**

## **3 Diagram**

### **3.1 Diagram itself**

### **3.2 Diagram description**

#### **3.2.1 How to make the project**

### 3.2.2 Microcontroller

I decided to use STM32L082CZ from STM32L0 line

**Relatively small** Up to  $10\text{ mm} \times 10\text{ mm}$  dimensions, compared to apple watch display of  $34\text{ mm}$  by  $40\text{ mm}$  for smaller version. [1] 111th page

**Square** It is shaped in a square which also simplifies portability [1] 111th page

**Power saving** STM32L0 line was designed specifically for low power consumption with power consumption as low as  $0.29\text{ }\mu\text{ A}$  in Standby mode [1] 1st page

**Consumer devices** This microcontroller comes from STM32LOx2 line prepared to be used in consumer devices [2]

**Ease of use** USB compatible microcontroller and dedicated debug port allows for swift code creation. [1] 1st page

### 3.2.3 All other components

**Oled display** For OLED display I decided to go with NHD-2.7-12864WDY3. It was an OLED display found on mouser webpage with lowest operating supply current of  $180\text{ }\mu\text{A}$ , supply voltage compatible with microcontroller ( $3.3\text{ V}$ ) and datasheet not in japanese. [3]

**Digital compass** For the compass I used HMC5883L with compatible voltage, low power consumption of  $100\text{ }\mu\text{ A}$ , compatibility with battery powered applications according to datasheet and small size

**Battery** For the battery I choose 2x LR44R series battery, with output voltage of  $1.5\text{ V}$  compatible with voltage regulator ( $3\text{ V}$  in series), compatible battery chemistry of Alkaline,  $150\text{ mAh}$  capacity for single battery and compact coin cell shape. [5]

**Voltage Regulator** For voltage regulator I choose LTC3525-3.3 with high 95 % efficiency, desirable output voltage of  $3.3\text{ V}$ , low profile and tiny package, it is also available in kicad by default [6]

## **4 Draft of the microcontroller firmware**

### **4.1 Block diagram**

### **4.2 Description of the algorithm**

## **References**

- [1] STM32LO82CZ datasheet
- [2] Consumer Device STM32LOx2 Line
- [3] OLED datasheet
- [4] Magnetometer datasheet
- [5] Battery
- [6] Voltage regulator