Declaration of authorship

Krzysztof Rudnicki
Student Number: 307585

May 12, 2022

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

Krzysztof Rudnicki, 307585

May 24, 2022

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 mm × 10 mm dimensions, compared to apple watch display of 34 mm by 40 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 μ 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 dedicaded 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 uA, supply voltage compatible wit microcontroller (3.3 V) and datasheet not in japanese. [3]

Digital compass For the compass I used HMC5883L with compatible voltage, low power consumption of 100 μ A, compatiblity with battery powered applications according to datasheet and small size

Battery For the battery I choose LTC-7PMP with capacity of 1500 mA, output voltage of 3.5 V and small size (according to datasheet it is a perfect match for space saving requirements) [5]

Power supply For power supply I choose LTC3525-3.3 with high 95 % efficiency, desirable output voltage of 3.3 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