Digital Pulse Oximeter System Datasheet

1. General Description

The Digital Pulse Oximeter System is one that can track heart rate and oxygen saturation, giving averages for a given period of time or direct feedback. Built on top of an Arduino shield, which offers an OLED display, sensor, LEDs, and switches. The device is powered by USB; however, it can also be powered by a battery, making it available in many conditions.

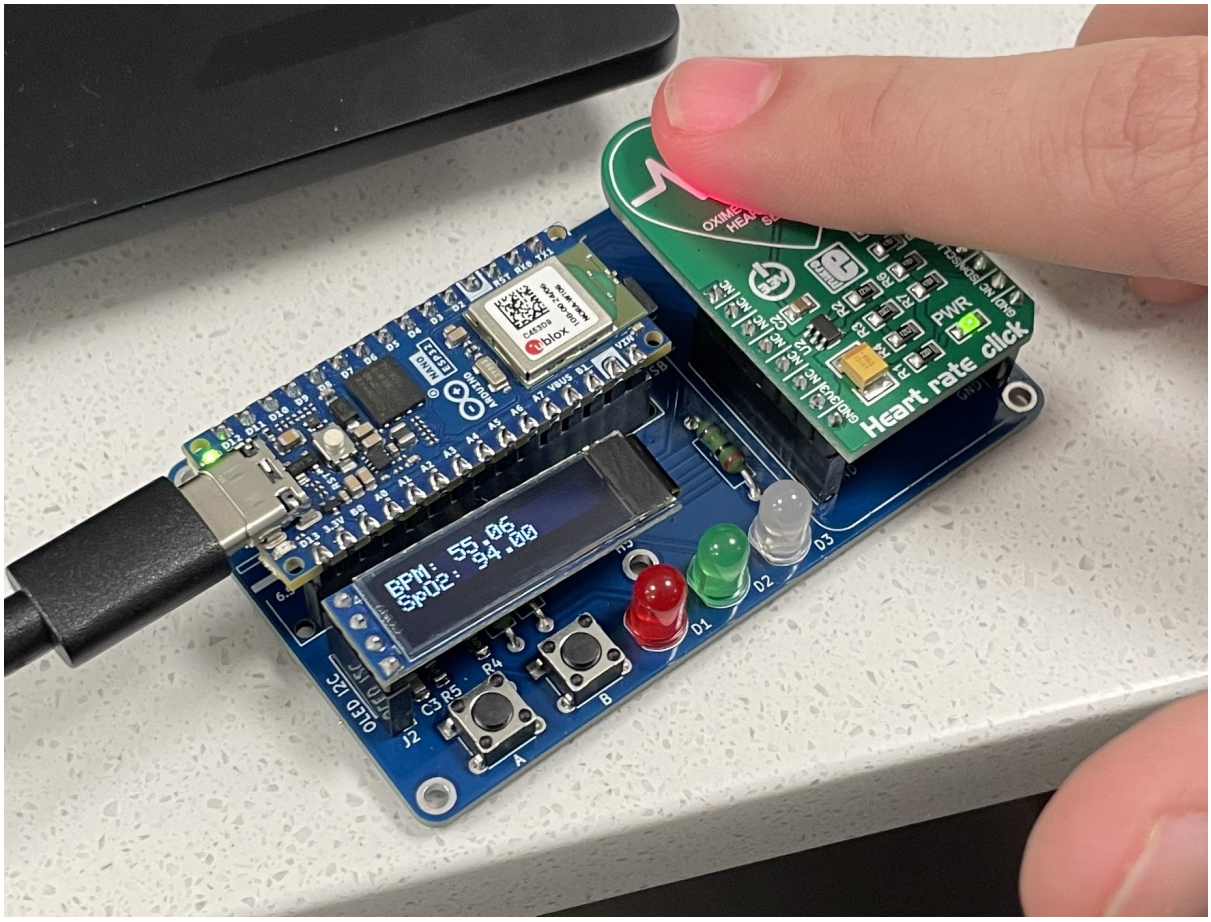

Figure 1: Fully Assembled Digital Pulse Oximeter System - Heart rate and SpO2 displayed on the OLED.

2. Specifications

2.1 Electrical

- Operating Voltage: 3.3V
- Current Consumption: Unclear, mostly OLED and sensor.

2.2 Mechanical

- Device Dimensions: 75.00 x 45.00 x 20.00 mm (excluding USB cable).
- OLED Display Dimensions: 33.00 x 10.00 x 2.45mm.

2.3 Environmental

- Material: Recyclable PCB, Arduino ESP32, MAX30100, Midas 96x16 OLED
- Design Considerations: Components which allow for repairing and constant upgrades, promoting a longer life cycle and a sustainable system.
- Environmental Standards: Designed with RoHS compliance in mind minimzing hazardous substances. EPEAT standards advise for the use of environmentally friendly design and material selection in the process of manufacturing

3. Key Performance Metrics

Metric	**Value**	**Unit**
SpO2 Detection Range	70%–100%	Percent
Heart Rate Detection Range	0–250	bpm
Operating Temperature Range	-40 to +85	°C
Sensor Resolution	Up to 16	Bits
Sampling Rate	50–1000	Hz
Power Consumption	600–1200	µA
LED Wavelengths	660 (Red), 880 (IR)	nm

Table 1: Key performance metrics of the MAX30100.

4. Interfaces and Connections

Interfaces

- Sensor (MAX30100): I2C
- OLED (Mdias 96x16): I2C

Connections

- OLED
- MAX30100
- Arduino onto the Arduino Shield
- LED 1,2,3
- Switches - SW1 and SW2

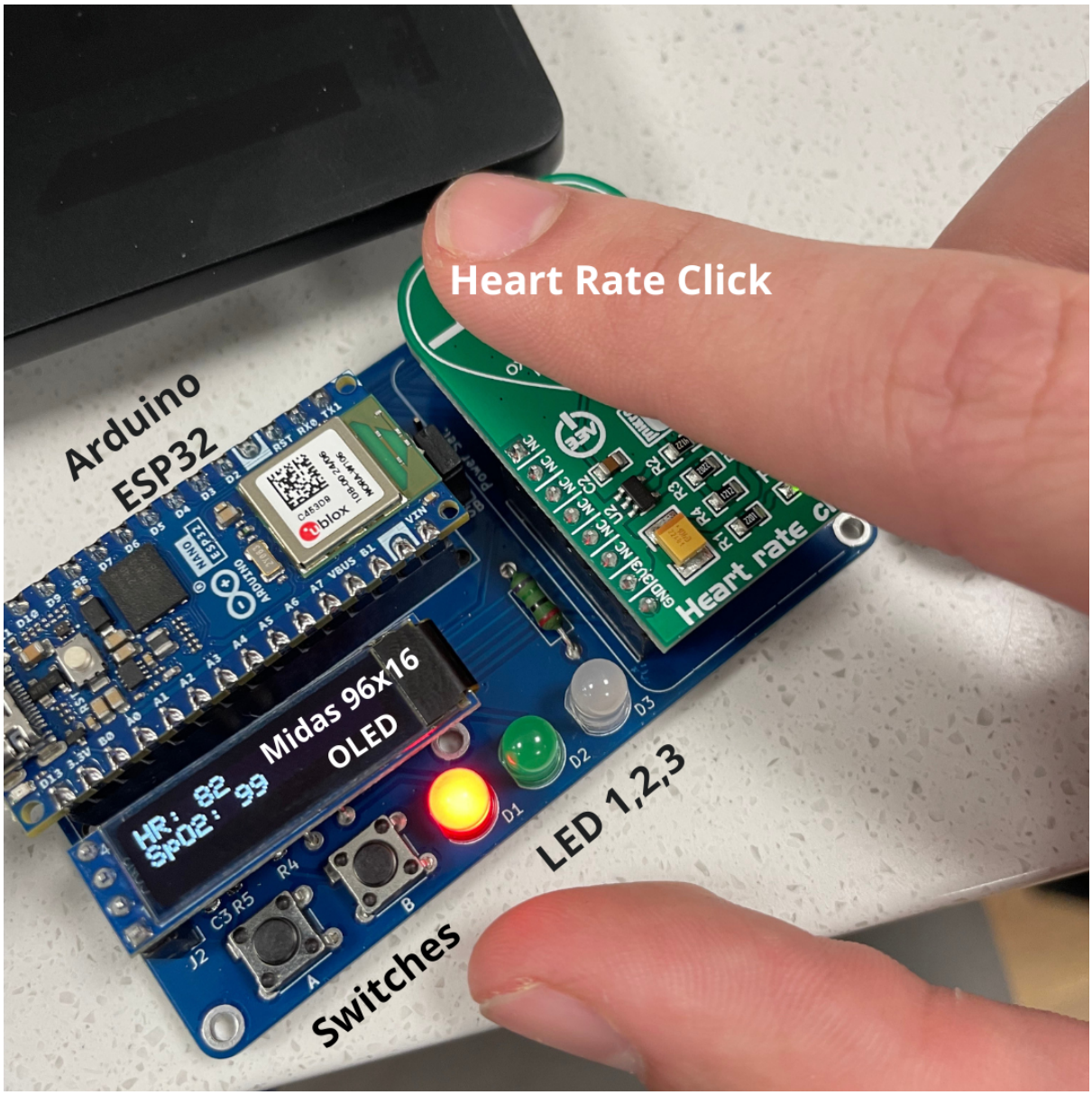

Figure 2: Annotated PCB with Connection Points.

LED and Switch Configuration

- **RED_LED:** A3
- **GREEN_LED:** A2
- **BI_LED_R:** A7
- **BI_LED_A:** D3
- **SWITCH_1:** A0
- **SWITCH_2:** B1 [1]

5. Functional Block Diagram

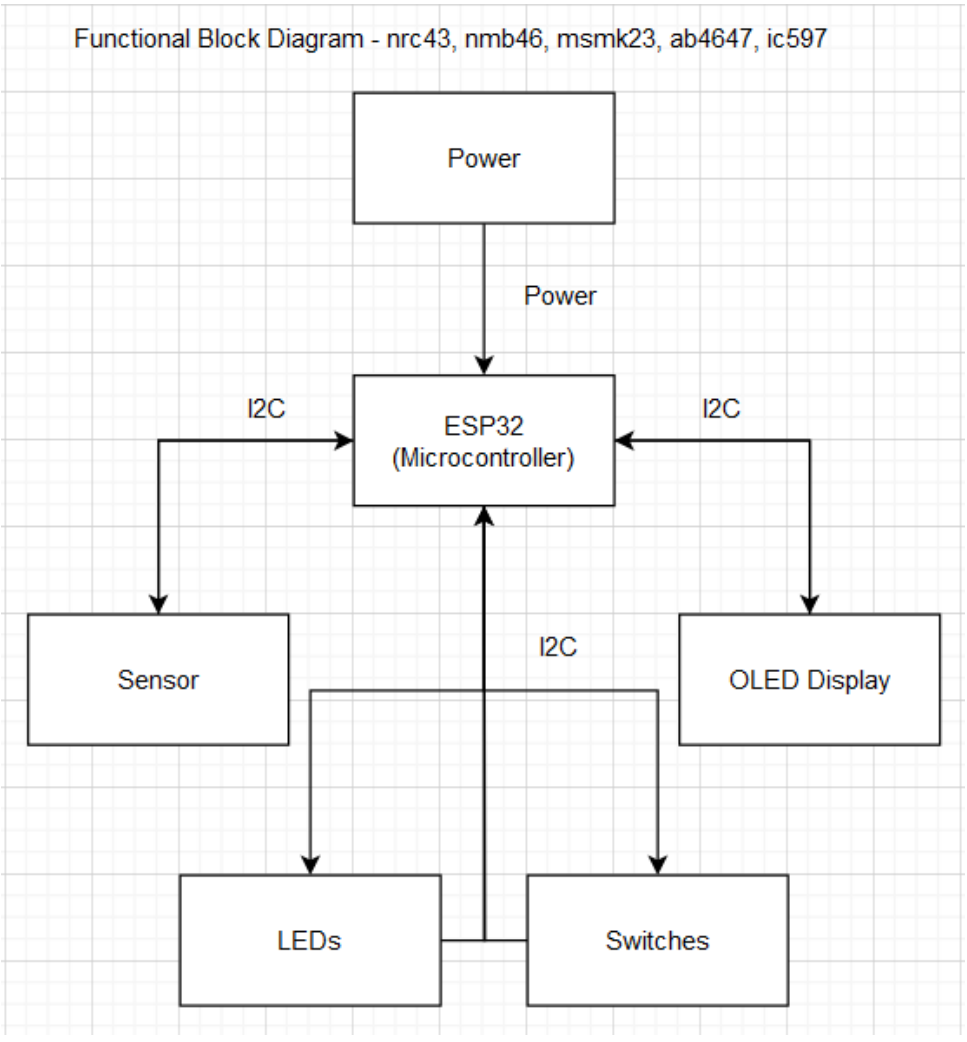

Figure 3: Functional Block Diagram of Digital Pulse Oximeter System

[1]The second switch is connected to the Bootloader B1, therefore if you want to utilize this switch you must reset the Bootloader - not recommended.

6. Revision Control

- **Version:** 1.1
- **Date:** 08/01/2024
- **Changes:** Connected OLED and Heart Rate Click Board interfaces onto the PCB.

7. Safety and Standard Compliance

Safety

- Non-invasive to the skin and is designed for low-power usage (3.3V).

Compliance

- RoHS compliance with no hazardous substances.

8. Troubleshooting

Common Issues

- **OLED not displaying:**
  - Check I^2C connections. Verify address is 0x3D or 0x3C.
- **Inconsistent sensor readings:**
  - Ensure proper finger placement.
  - Minimize ambient light interference.
- **No power to the heart click boards:**
  - Check USB connection.
  - Try using a different cable or heart click board.

References

- https://www.mikroe.com/heart-rate-click
- https://download.mikroe.com/documents/datasheets/MAX30100%20DS%20.pdf
- https://docs.arduino.cc/resources/datasheets/ABX00083-datasheet.pdf
- https://docs.rs-online.com/6a95/A700000007964316.pdf
- https://www.analog.com/media/en/technical-documentation/data-sheets/max30100.pdf

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Appendix

A. Electrical Schematic

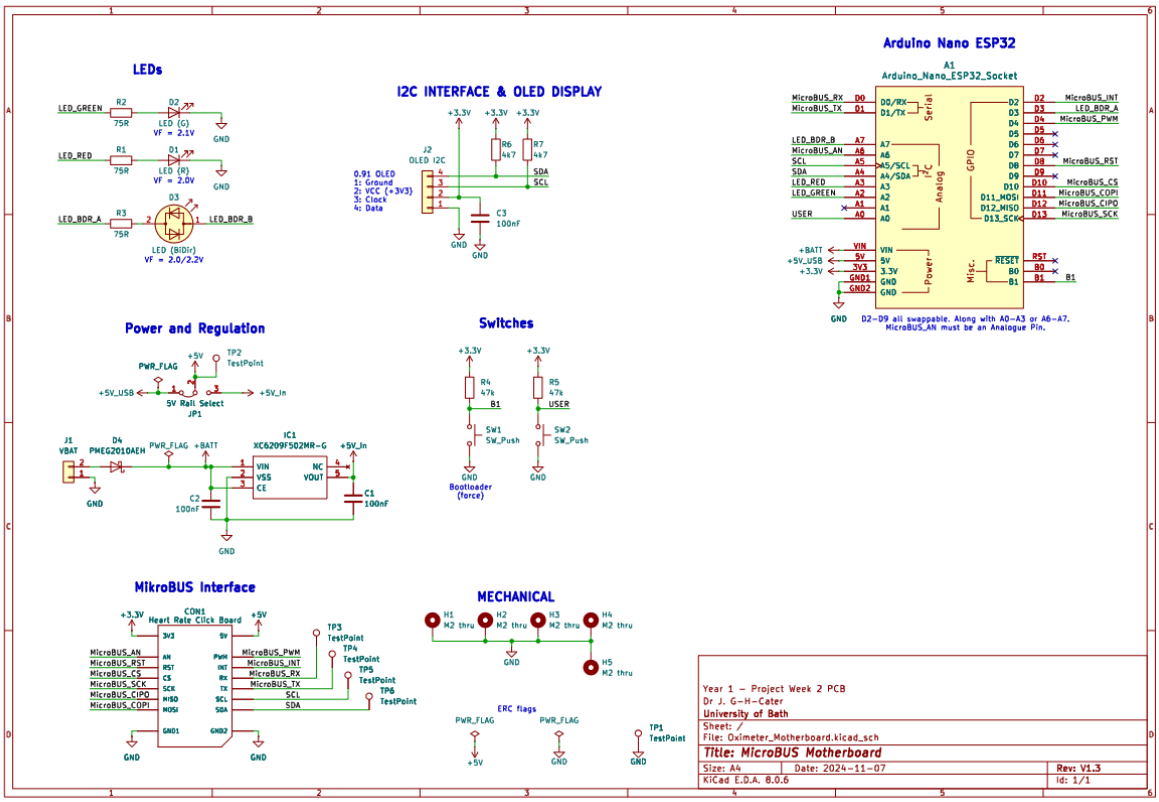

Figure 4: Electrical Schematic of the Digital Pulse Oximeter System.