REPORT OF THE LAB 1

1. **Team no :2**
2. **Members of the team :**

   Mallam Sreya Reddy,Jyoti Prakash,Harshali Gawade,Badal Singh,Azmeera Thirupathi,Ajay Sharma,Shubham Chaurasia

3. **Title** : Adopting an SOC based to designing handheld medical devices
4. **IC Architecture** : System On Chip(SOC)

5. **Abstract**

Designing embedded devices for medical applications involves balancing specifications such as cost, power efficiency, size, and regulatory compliance, particularly under FDA guidelines. The use of System-on-Chip (SoC) architectures has emerged as a promising solution to streamline this process by integrating multiple components into a single chip, thus reducing design complexity and enhancing reliability. The advantages of SoC-based designs, including reduced component counts, simplified power management, and improved noise immunity. By facilitating quicker development cycles and easier modifications, SoC architectures are particularly beneficial for creating handheld medical devices like blood glucose monitors and blood pressure monitors. Despite potential higher costs for low-volume applications, the overall benefits—such as enhanced design flexibility and adherence to FDA regulations—make SoC a compelling choice for the future of medical device development.

6. **Block diagram of medical device:**

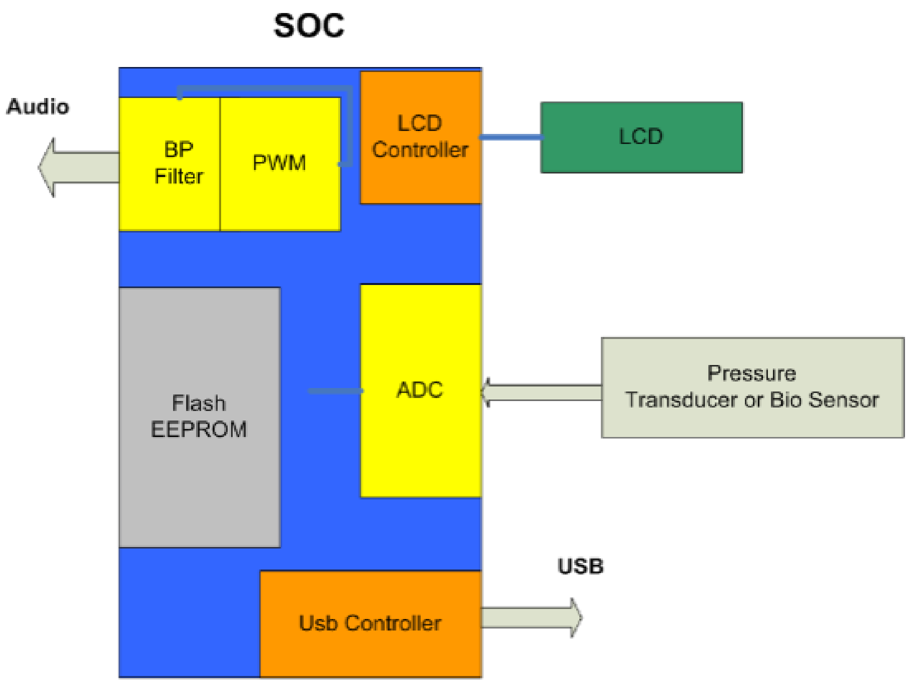

Figure 4: SOC based design

7. **Functional Description:**

System Requirements and Specifications

1.1 Define System Requirements:

- Determine the types of bio-sensors to be used (e.g., heart rate, glucose level).
- Specify the desired sampling rate and resolution of the ADC (Analog-to-Digital Converter).
- Identify noise characteristics and filtering requirements.
- Define data transfer rates and protocols for the USB interface.
- Establish memory requirements for data storage.
- Define power consumption targets and management strategies.
- Identify any additional processing needs (e.g., data compression, encryption).

1.2 Develop System Specifications:

- Create detailed specifications for each system component, including ADC resolution, filter characteristics, USB interface specifications, memory size and type, and power management features.

2. System Design

2.1 Analog Front-End (AFE) Design:

- Design the bio-sensor interface circuitry to condition the analog signals.
- Implement amplifiers and buffers to ensure proper signal levels for the ADC.

2.2 ADC Design:

- Select an appropriate ADC architecture (e.g., SAR, Delta-Sigma) based on resolution and speed requirements.
- Design the ADC circuit and integrate it with the analog front-end.

2.3 Digital Signal Processing:

- Design digital filters (e.g., FIR, IIR) to reduce noise in the digitized signal.
- Implement additional digital signal processing algorithms as required (e.g., baseline correction, peak detection).

2.4 USB Interface Design:

- Design the USB interface circuit to enable data transfer between the ASIC and an external monitor or computer.
- Ensure compliance with USB standards .

8. Features of Proposed Solution:

- Integration of Multiple Functions**:** PSoC integrates various peripheral components (e.g., ADCs, filters) onto a single chip, reducing component count and PCB space.

- Reconfigurability: Developers can modify device functionality at runtime, allowing for easier design changes and feature updates.

- Power Management**:** PSoCs offer features that can be disabled when not in use, improving power efficiency.

- Noise Immunity**:** The reduced number of external components minimizes noise interference in signal processing.

- Simplified Development**:** PSoC architectures streamline interface management, making it easier to create device drivers and APIs.

- Compliance and Reliability**:** Using a single chip simplifies adherence to FDA regulations, ensuring long-term availability of the device's components.

- Cost-Effectiveness for Volume Production**:** PSoCs can be more cost-effective when flexibility and programmability are prioritized over traditional ASIC solutions.