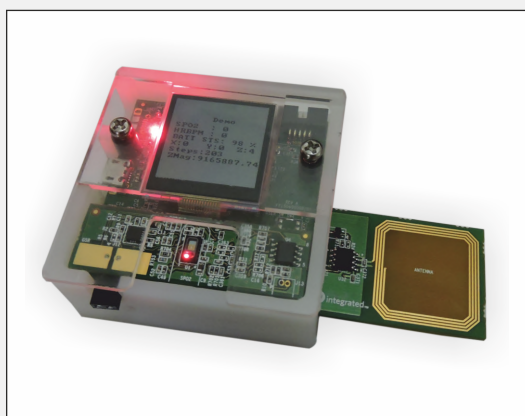


# Designing a Product on Module for Health and Wellness Applications

## Introduction

This case study showcases Mistral's expertise in designing a small form factor, powerful medical sensing product on module (PoM) for health and wellness application.

Mistral's expertise in designing intelligent and powerful platforms for designs across domains like wearable electronics, medical and assistive technology, home automation, industrial automation, infotainment and biometrics helped in realizing the customer's vision of the platform.



Designing a small form factor, powerful product on module for medical sensing applications



## The Requirement

To design and develop a small form factor, powerful evaluation platform with a host of sensors to detect and monitor vital health statistics like temperature, blood pressure, heart rate/blood oxygen level and footstep counts. The development also included an Android application to display the readings captured by the PoM on a standard Android phone/tablet.

## Solution Provided

Mistral designed a small footprint, battery operated Product on Module (PoM) built around an ARM Cortex M3 based MCU consisting of a base board and a pluggable application module with I/O features like I2C, SPI and Op-Amp connections which were interfaced to sensors. The dual board architecture is a modular approach making it convenient to customize the wellness PoM according to end application and requirements. An additional pluggable NFC card was included to establish authenticated auto Bluetooth connection with an NFC capable tablet/phone. Mistral designed the solution consisting of hardware, firmware, integrated sensors and the android application.

The Product on Module is built around an ARM Cortex M3 based MCU with the following features and interfaces:

### CPU features

- ▶ ARM Cortex M3 32Bit RISC CPU @ 24 MHz
- ▶ 256KB Flash Memory
- ▶ 32KB SRAM
- ▶ 16Bit ADC @ 500 kbps
- ▶ Four DACs
- ▶ Four Op-Amps
- ▶ USB 2.0

### I/O interfaces

- ▶ NFC
- ▶ Bluetooth Smart (BT 4.0)
- ▶ Memory LCD
- ▶ UART
- ▶ USB

### Sensor interfaces

- ▶ SpO2
- ▶ Ambient temperature (RTD)
- ▶ Galvanic Skin Response
- ▶ Accelerometer.

### The Challenges

- ▶ As the product on module is a portable device, longevity of the battery had to be ensured. Mistral's engineering team analyzed the Bluetooth 4.0 Beacon signals to evaluate accurate power consumption pattern of the Wellness PoM achieving continuous operation of up to 35 hours.
- ▶ The module involved a new type of memory LCD interface which has power saving capabilities. Rendering of the display for power saving was a challenge.
- ▶ For reliable communication between the Android device displaying the parameters and the wellness product on module, Standard BT profiles had to be customized for transfer of medical application data.

### Key Achievements

- ▶ Delivered a small form factor solution while using a simple microcontroller platform to achieve processor intensive tasks, thereby meeting customer requirements.

- ▶ Provided complete end-to-end scalable solution which included Hardware Design, Firmware and Application Development.
- ▶ Achieved accuracy and sensitivity of vital parameters which is at par with the leading sensor brands available in the market.
- ▶ The mechanical enclosure for the module was ergonomically designed and was delivered to the customer in a record span of time.

### Customer Benefits

- ▶ The Wellness PoM helped the customer reduce the time to market of the final Wellness Product.
- ▶ Helped the customer in showcasing the capability of its Microcontroller portfolio in powering/handling a fully-fledged wearable medical product for the consumer market.
- ▶ As Wellness PoM adopts dual board architecture, the customer can easily customize and develop the application board for other medical and industrial applications.



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