Electronic hardware design for the CareRing system.

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# System Overview

\*The ESP32-S3-DEVKITC-1U-N8R8 dev. Board will be used instead of ESP32-S3-WROOM-1-N4 Module during initial development stage. The ESP32 module will be tested with example or verified code after PCB Prototype is manufactured.

\*All module compatible with 3.3V to 5V power input.

Sleep:  
Pressure Sensor #1

Movement:  
PIR Motion Sensor #1

Cloud Server:  
Adafruit Server

Entry:  
Door Reed switch #1

Sound:  
 I²S mic #1

ESP32-S3 Module/ DevKit Room #1

Buttons:  
Mood/Emergency  
#1

Power Adapter:  
PSU module  
#1

Local Hub:  
ESP32(“lite”-Hub) or Raspberry Pi(Richer Dev)

App:  
iOS/Android

ESP32-S3 Module/ DevKit Room #2

ESP32-S3 Module/ DevKit Room #3…... etc.

(Optional)

Data Storage:  
SD card

# Component List

## Main Hub

Raspberry Pi 4 Model B

## Each Room

|  |  |  |  |
| --- | --- | --- | --- |
| Manufacturer Part Number | Description | Manufacturer | Quantity |
| ESP32-S3-WROOM-1U-N8R8 | ESP32-S3 Development Board | Espressif Systems | 1-3 |
| ESP32-S3-WROOM-1-N4 | ESP32-S3 Module (On board Antenna) | Espressif Systems | 1-3 |
| 101020060 | PIR MOTION SENSOR | Seeed Technology Co., Ltd | 1-3 |
| n.a | 4PCS 50KG HX711 Pressure Sensor Module | DAOKAI | 1-3 |
| 375 | MAGNETIC CONTACT SWITCH (Door Sensor) | Adafruit Industries LLC | 1 |
| ICS-43434 | MICROPHONE MEMS DIGITAL I2S OMNI | TDK InvenSense | 1 |
| WR9HA2000USBCFMEDR6W | Power Adaptor (5V 2A output) | GlobTek, Inc. | 1 |
| TLV1117LV33DCYR | IC REG LINEAR 3.3V 1A SOT-223-4 | Texas Instruments | 1-3 |
| D6C90 F2 LFS | SWITCH PUSH SPST-NO 0.1A 32V | C&K | 1-3 |

## Other and optional components

ABS enclosure + mounting tape/screws ×3

Passives/ESD parts, headers, JST leads, screw terminals

Optional:

0.96″ OLED (SSD1306, I²C) ×3

# Module Communication Diagram

## Movement Module: PIR Motion Sensor

GPIO Direct Connect: Logic 0 or 1

ESP32-S3 Module/ DevKit Room #1

Movement:  
PIR Motion Sensor #1

**Number of GPIO used: 1**

### Functions:

Detect Human Movement, measure the frequency and time length a person has moved/stayed/through a specific area. Provide core data to MCU.

## Door Module: Reed Switch Sensor

GPIO Direct Connect: Logic 0 or 1

Reed Switch Sensor #1

ESP32-S3 Module/ DevKit Room #1

**Number of GPIO used: 1**

### Functions:

Detect Door Status, measure opened/closed frequency and time length. Provide core data to MCU.

## Sound Module: I²S mic

I2S Serial Port (3 GPIOs)

Sound:  
 I²S mic #1

ESP32-S3 Module/ DevKit Room #1

**Number of GPIO used: 3**

Pin 1: SCK  
Pin 2: SD  
Pin 3: WS

## Mood/Emergency Module: Push Buttons

Button:  
 Mood/Emergency #1

GPIO Direct Connect: Logic 0 or 1

ESP32-S3 Module/ DevKit Room #1

**Number of GPIO used: 1-3 ( Direct connect when buttons less than 4)**

## Sleep Module

Sleep:  
Pressure Sensor #1

GPIO (“Half SPI”, output only)

ESP32-S3 Module/ DevKit Room #1

**Number of GPIO used:2**

Pin 1: DT (DataOut)  
Pin 2: SCK (Clock)

# Schematic

# PCB Layout