



**ZAS ROBOTICS**  
**BUILD THE FUTURE**

# Communication Creativity Board Documentation(v1.0)

1. Overview.....	3
2. Power Supply Block.....	4
3. ESP32 Microcontroller Block.....	5
4. LoRa Module.....	9
5. NRF24L01 Module.....	10
6. OLED Display.....	12
7. RFID Module .....	14
8. SD Card Module.....	16
9. Rotary Encoder.....	17
10. Free Connectors.....	18
11. Input DC Jack.....	19
12. ON/OFF Switch.....	20
13. Mini Breadboard.....	21
14. Potentiometer.....	22
15. Basic Electronics Components .....	23

# 1. Overview

The ZAS Robotics Communication Creative Board is an advanced communication-focused learning platform built around the ESP32-WROOM-32 microcontroller.

It is designed for students, beginners, and educators to explore modern wireless communication technologies such as LoRa, NRF24L01 (2.4 GHz), RFID/NFC, along with essential peripherals like the OLED Display, SD Card Module, Potentiometer, Rotary Encoder, and basic electronics circuits.

This board exposes all ESP32 pins through convenient headers, enabling clean, plug-and-play connectivity without soldering.

It offers a complete training experience for learning IoT, wireless communication, embedded systems, and sensor/data logging applications.

The board contains 14 structured hardware blocks, each with a dedicated function to simplify learning and experimentation.

1. ESP32
2. LoRa Module
3. NRF24L01 Module
4. OLED Display
5. RFID Module
6. SD Card Module
7. Rotary Encoder
8. Free Connectors
9. Power Block
10. Input DC Jack
11. ON/OFF Switch
12. Mini Breadboard
13. Potentiometer
14. Basic Electronics Components

Each block is explained in detail in the following sections.

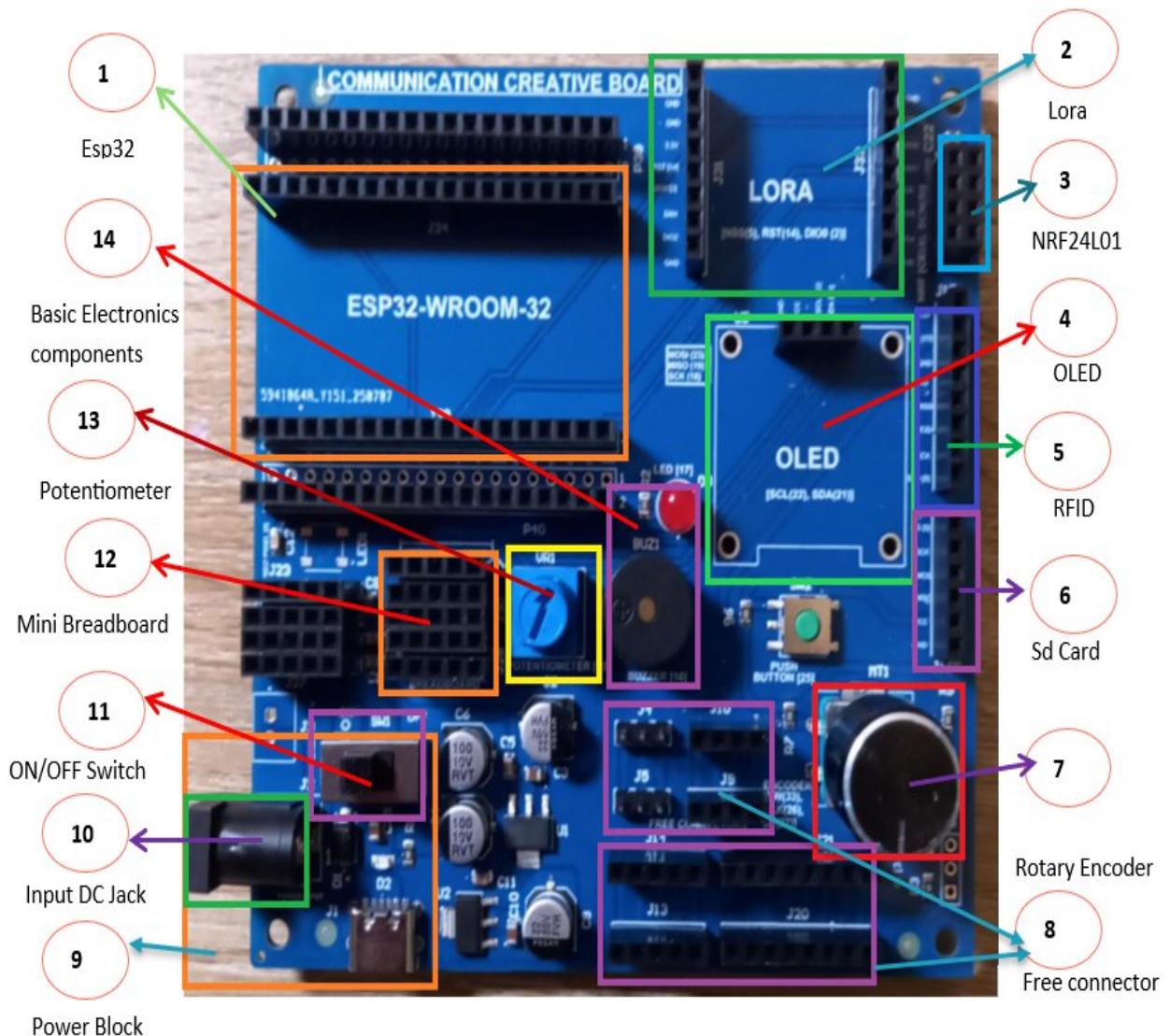


Figure 1. ZAS Robotics Sensors Creative Board Functional Block Diagram

## 2. Power Supply Block

The power block is shown in the following Figure. 2

The creativity board can be powered by:

- DC jack (5v to 7.4v) or

- USB-C Cable (5v)
- JST XH Battery Connector (3.7v to 7.4v)

In addition, the board also has an on/off switch to control the power input to the board.

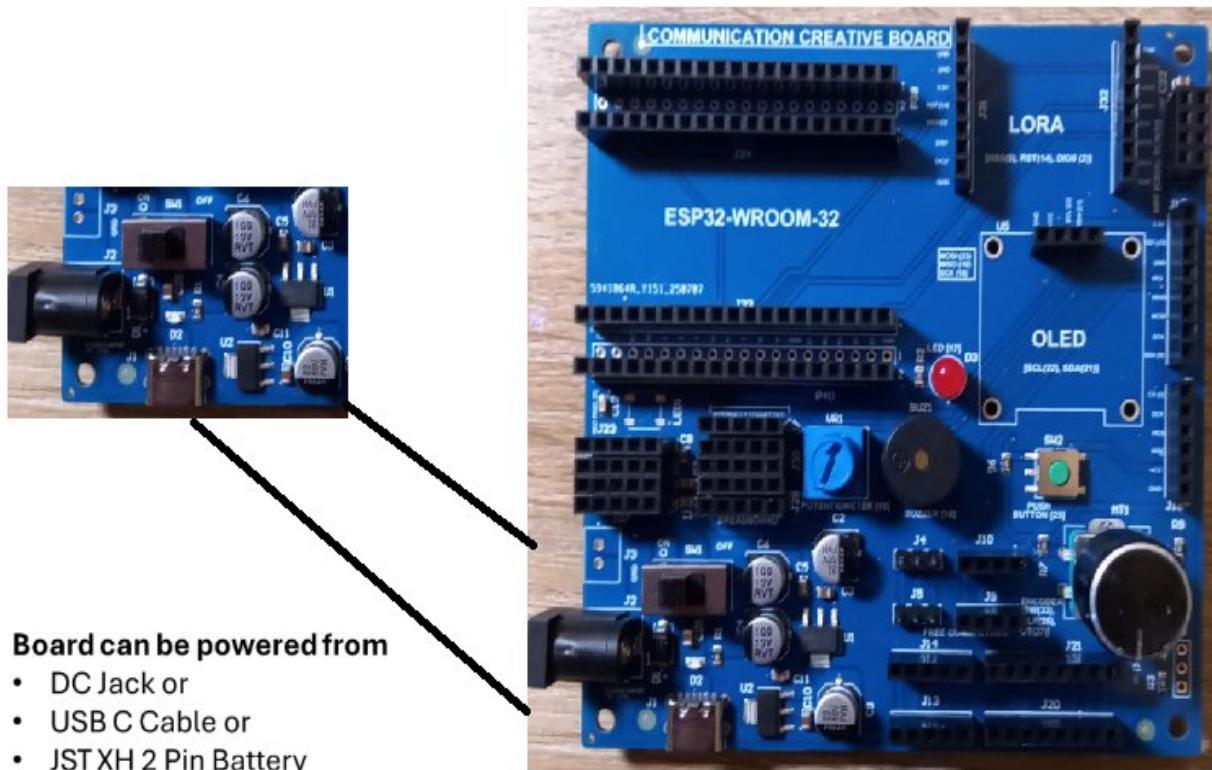


Figure 2. ZAS Robotics Communication Creative Board – Power Supply Block

### 3. ESP32 Microcontroller Block

*Insert snipped image here*

The ESP32-WROOM-32 module is the main processing unit of the Communication Board. It provides:

- Dual-core 32-bit processor
- Integrated WiFi + Bluetooth
- High-speed GPIO

- Multiple analog inputs
  - I<sup>2</sup>C, SPI, UART communication support
  - PWM control
  - Low-power IoT capabilities

This board exposes the **full ESP32 pin header**, enabling easy connection to sensors, displays, wireless modules, and prototyping circuits.

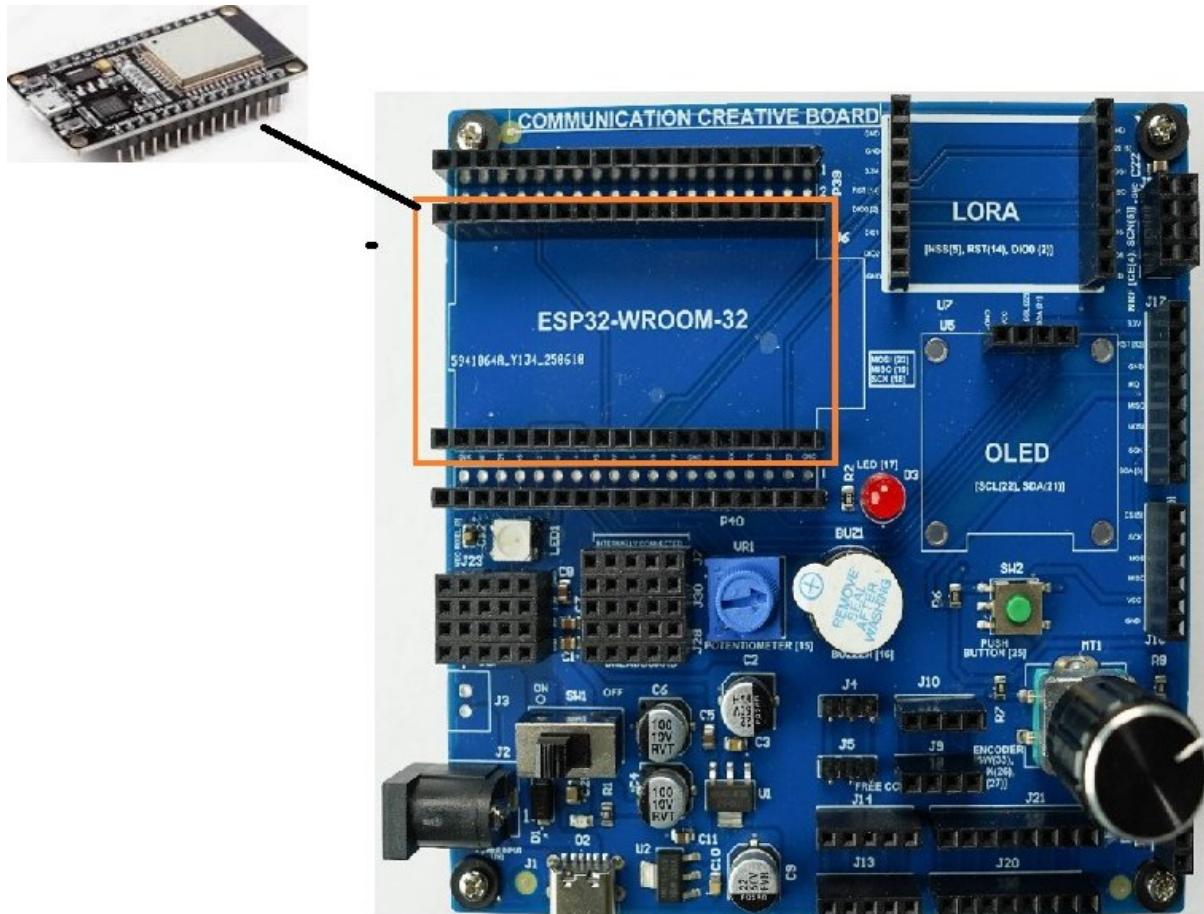


Figure 3. ZAS Robotics Communication Creative Board – ESP32 Microcontroller Block (unmounted )



Figure 4. ZAS Robotics Communication Creative Board – ESP32 Microcontroller Block (mounted)

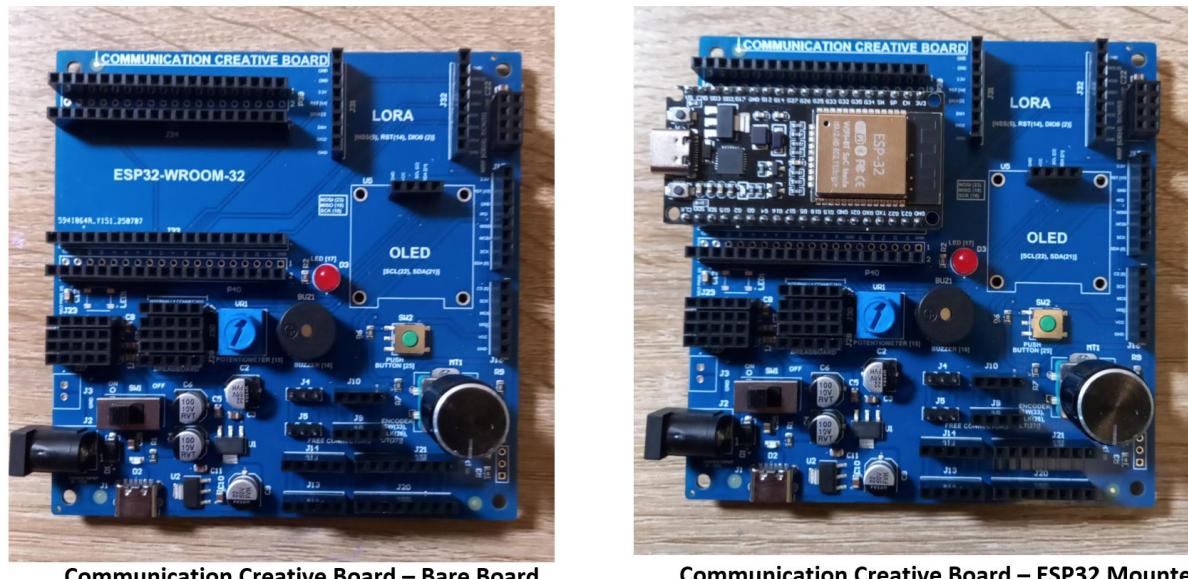


Figure 2. ZAS Robotics Communication Creative Board – ESP32 Microcontroller Block

<b>Pin Number</b>	<b>Function</b>	<b>ESP32 Description (Pins 38)</b>
1-2	GND	Ground
3	3V3	3.3V power supply
4-5	EN	Chip enable. Active high.
6-7	VP, VN	Voltage for the internal Hall sensor
8-9	IO34, IO35	Analog input (no pullup/pulldown)
10-11	IO32, IO33	General purpose IO with DAC
12-13	IO25, IO26	General purpose IO with DAC
14-23	IO14-IO23	General purpose IO
24-25	IO13, IO12	General purpose IO (used for boot mode sel.)
26-27	IO9, IO10	General purpose IO (not exposed in all mods)
28-29	IO11, IO0	General purpose IO (used for boot mode sel.)
30	GND	Ground
31	5V	5V power supply
32-33	TX0, RX0	UART0
34-35	IO1, IO3	UART0; IO1 (TX), IO3 (RX)
36-37	IO21, IO19	General purpose IO
38	IO18	General purpose IO

## 4. LoRa Module

Designed for long-range wireless communication experiments using **SX1278-based LoRa modules**.

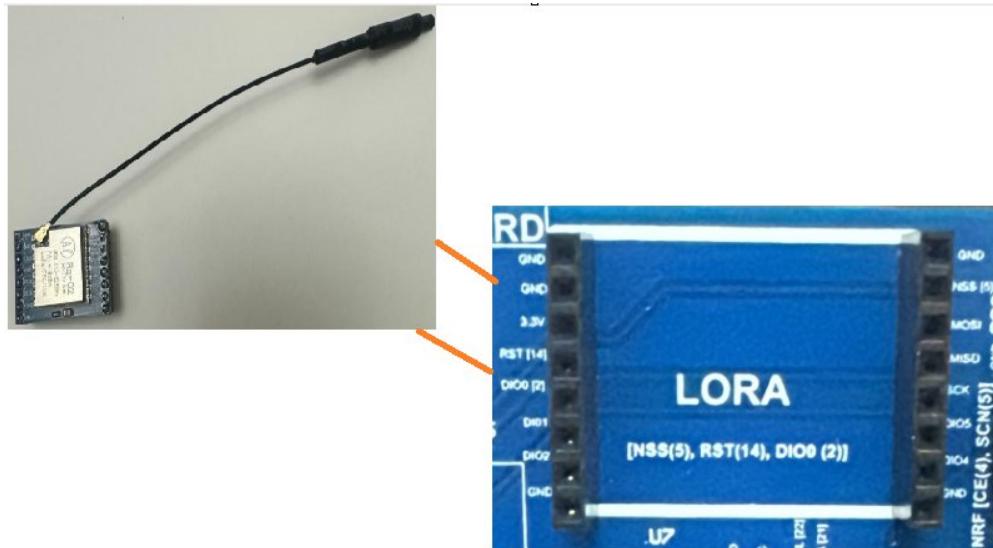


Figure 5. ZAS Robotics Communication Creative Board – LoRa Module

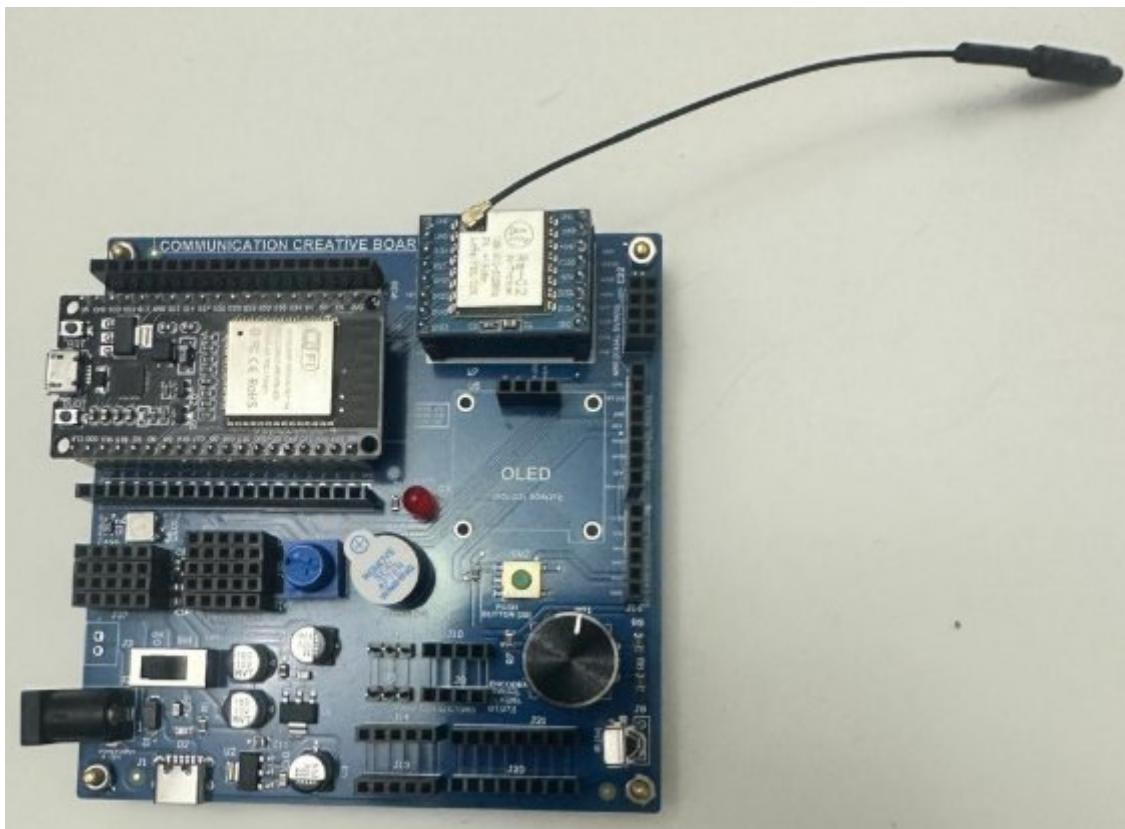


Figure 2. ZAS Robotics Communication Creative Board – LoRa Module (Mounted)

Lora Pin's	ESP32
GND	GND
GND	GND
3V	3V
RST	14
DI00	2
NSS	5
MOSI	23
MISO	19
SCK	18

## 5. NRF24L01 Module

Supports 2.4 GHz wireless communication using the NRF24L01 module.

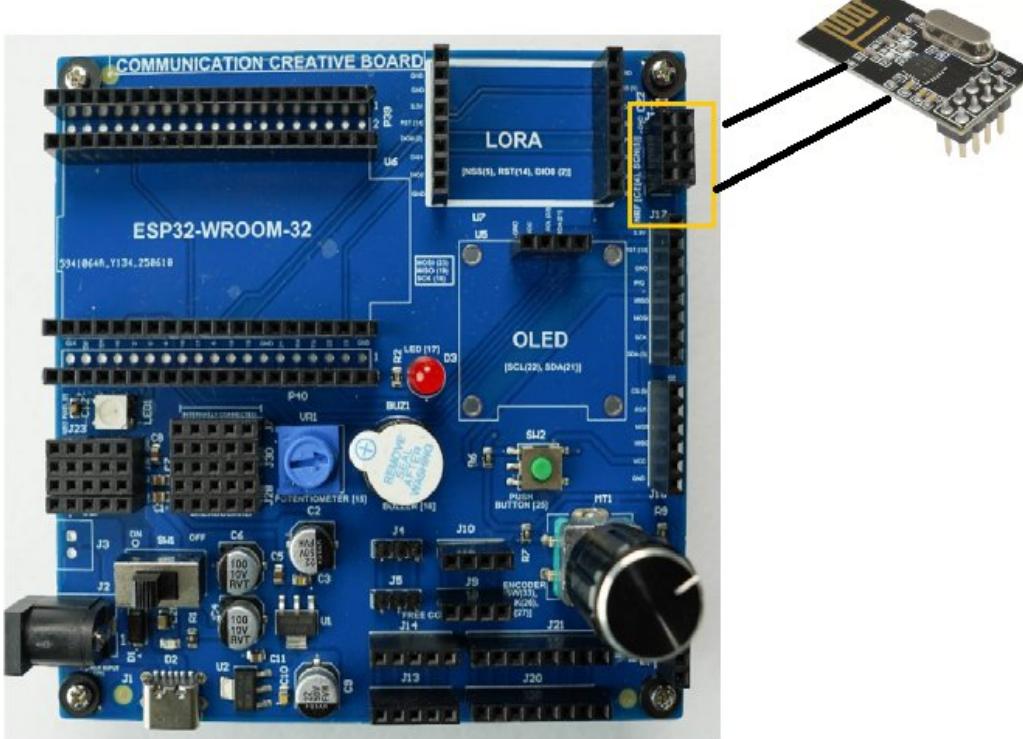


Figure 6. ZAS Robotics Communication Creative Board – NRF24L01 Module

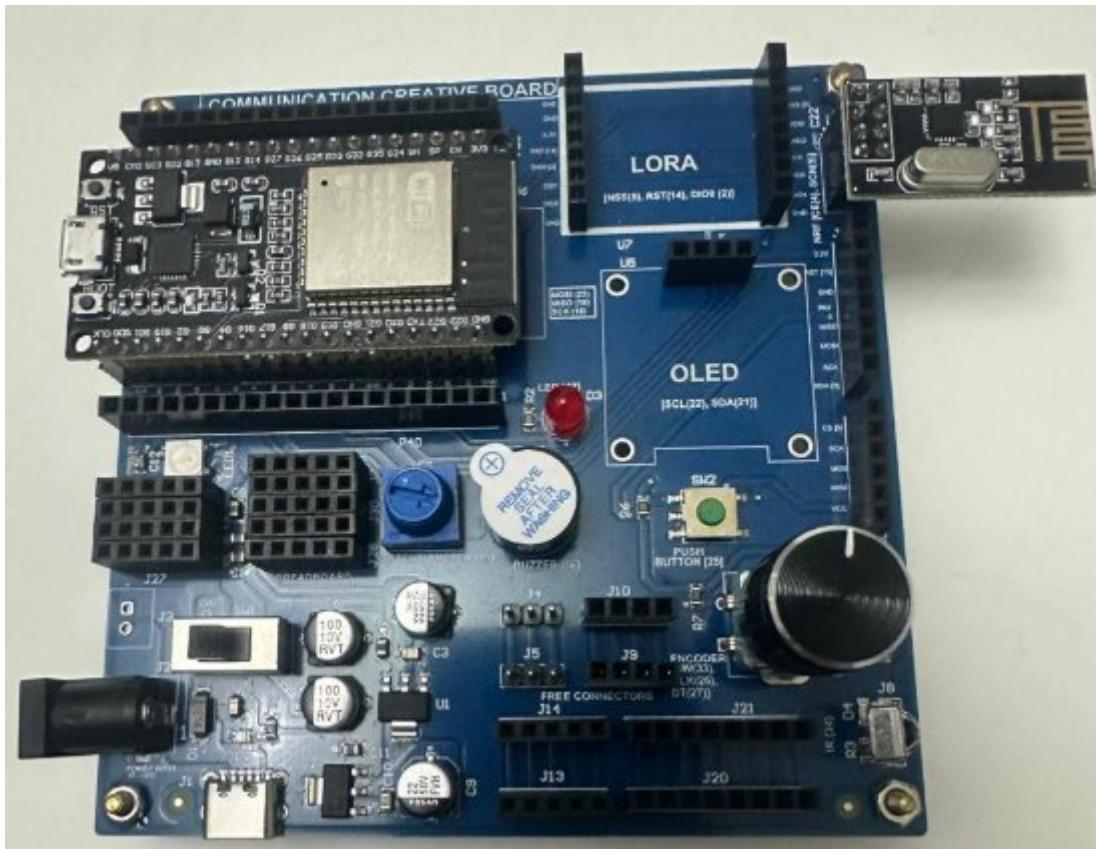


Figure 7. ZAS Robotics Communication Creative Board – NRF24L01 Module (mounted)

NRF24 Pin	ESP32 Connection
VCC	3.3V
GND	GND
CE	GPIO 4
CSN	GPIO 5
SCK	GPIO 18
MOSI	GPIO 23
MISO	GPIO 19
IRQ	Not used

## 6. OLED Display

A 0.96" I<sup>2</sup>C OLED display for text, sensor data, and debugging output.

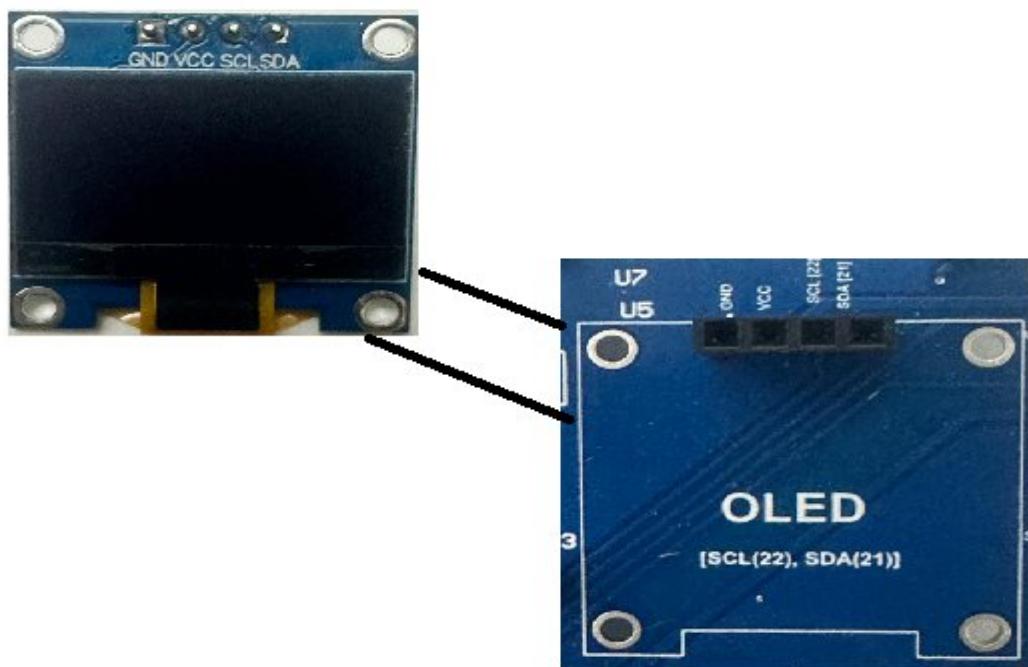


Figure 8. ZAS Robotics Communication Creative Board – OLED Display

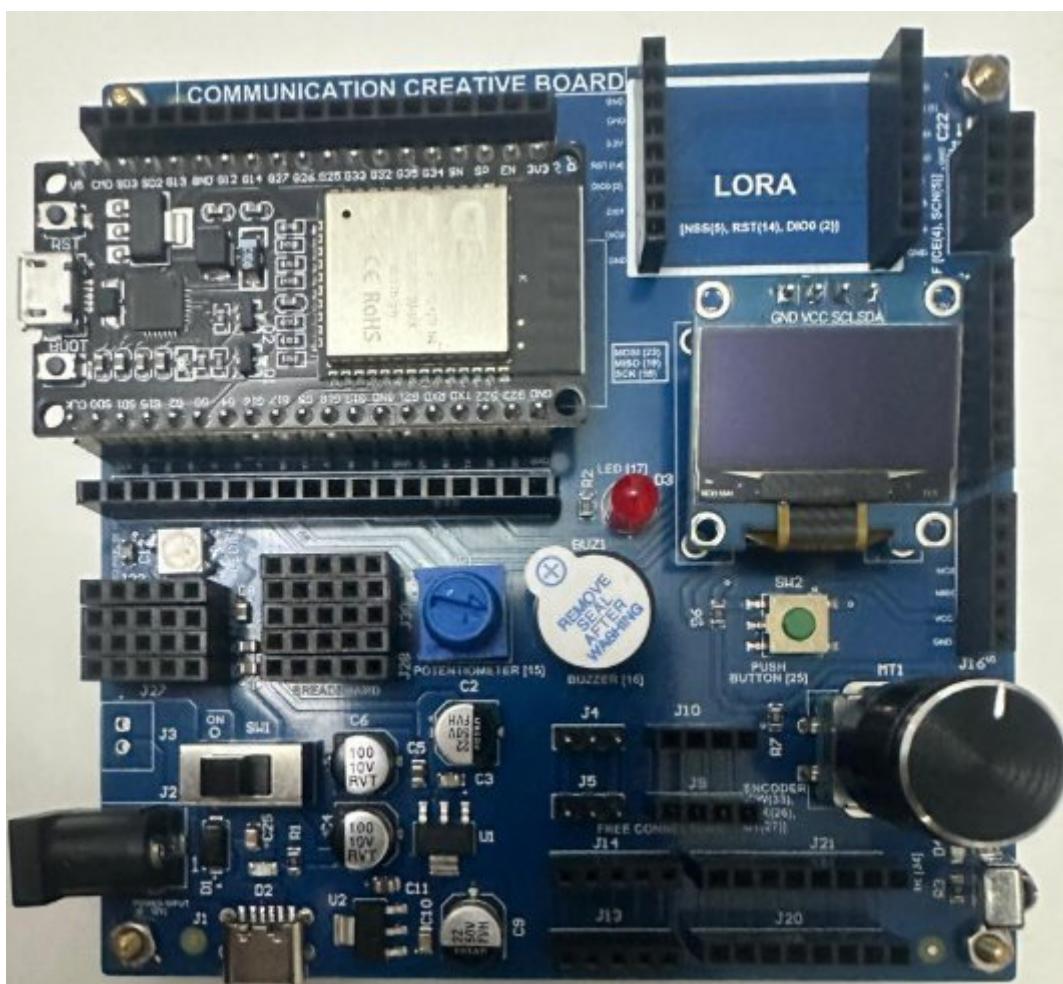


Figure 9. ZAS Robotics Communication Creative Board – OLED Display (Mounted)

NRF24 Pin	ESP32 Connection
VCC	3.3V
GND	GND
SCL	22
SDA	21

## 7. RFID Module

Supports MFRC522 RFID/NFC Module for card/tag scanning.

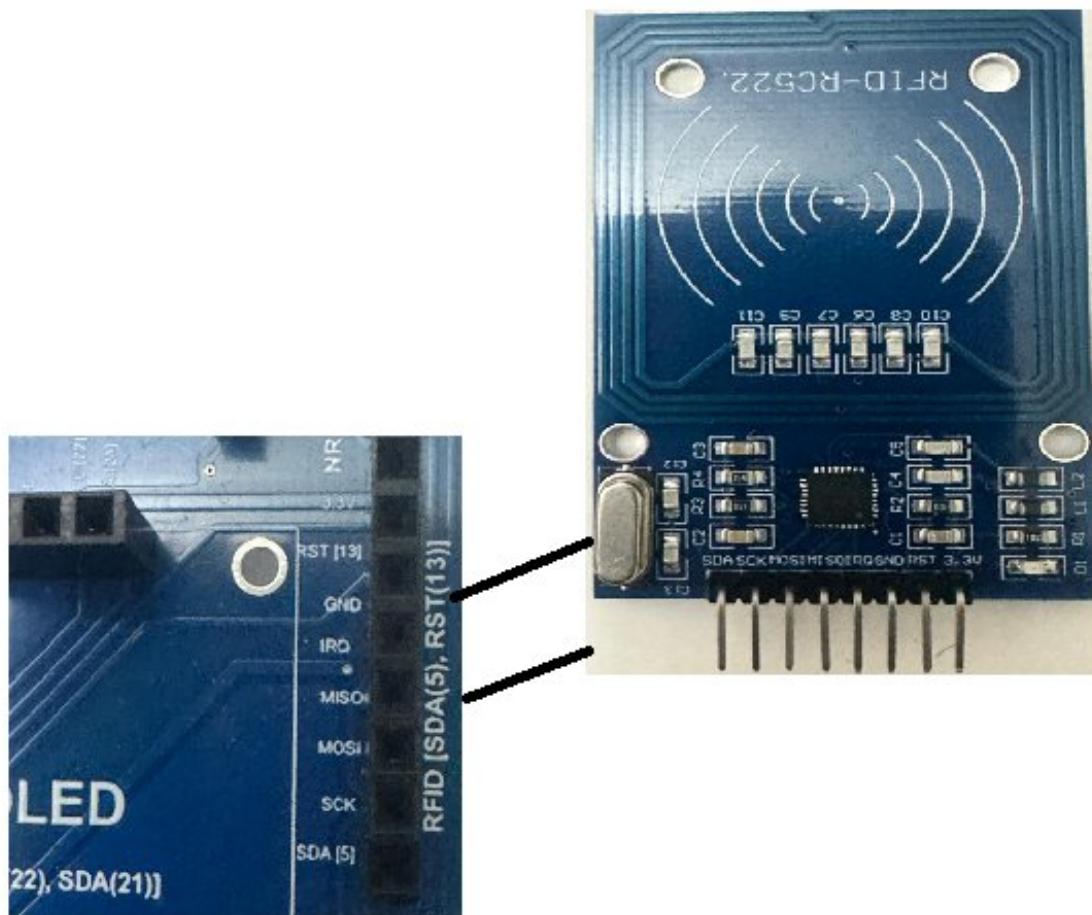


Figure 10. ZAS Robotics Communication Creative Board – RFID Module

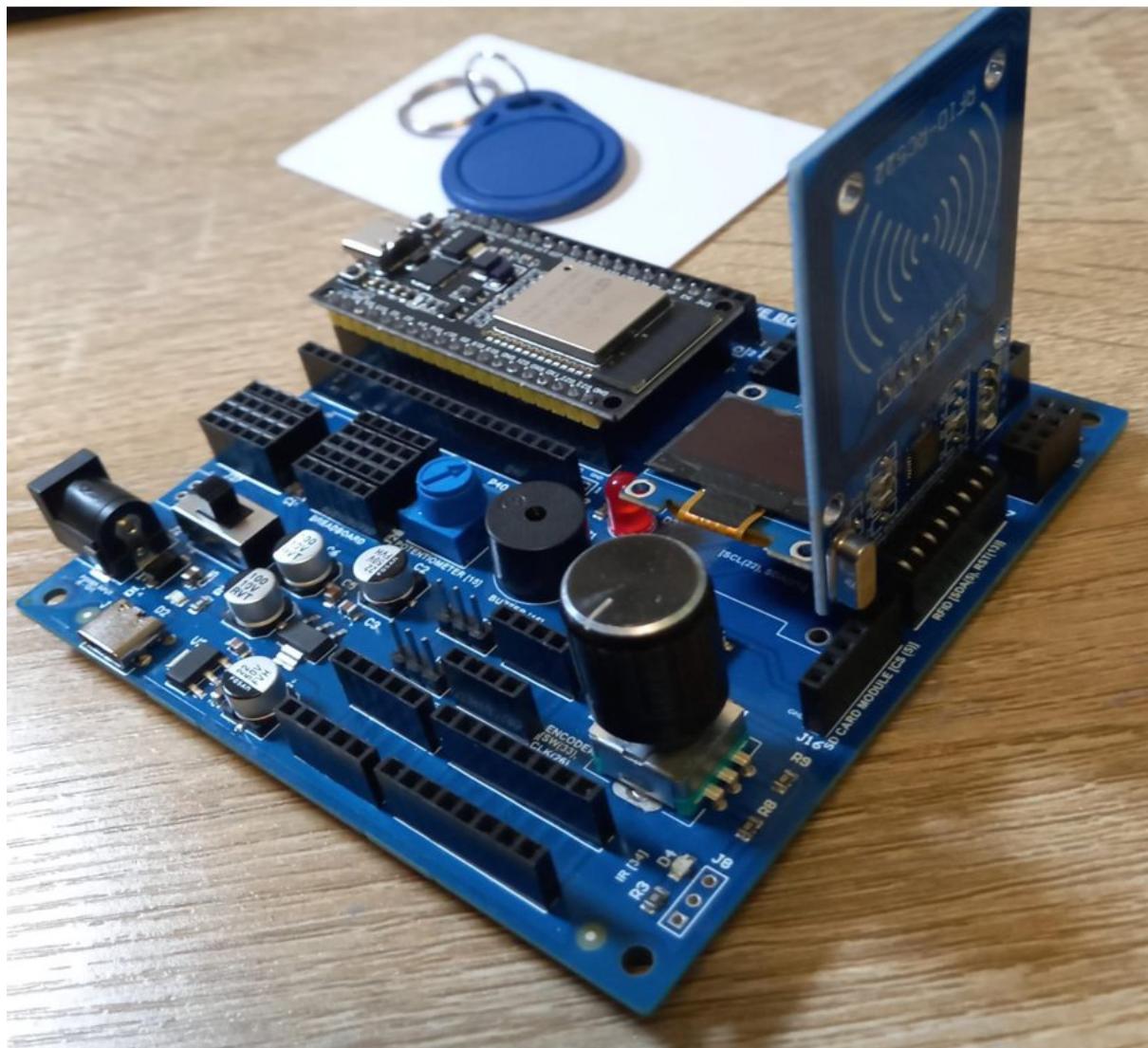


Figure 11. ZAS Robotics Communication Creative Board – RFID Module(mounted)

RFID Pin	ESP32 Pin
VCC	3.3V
GND	GND
RST	GPIO 13
SDA / SS	GPIO 5
SCK	GPIO 18

<b>MOSI</b>	GPIO 23
<b>MISO</b>	GPIO 19
<b>IRQ</b>	Not used

## 8. SD Card Module

Used for data logging, sensor recording, IoT data storage, etc.

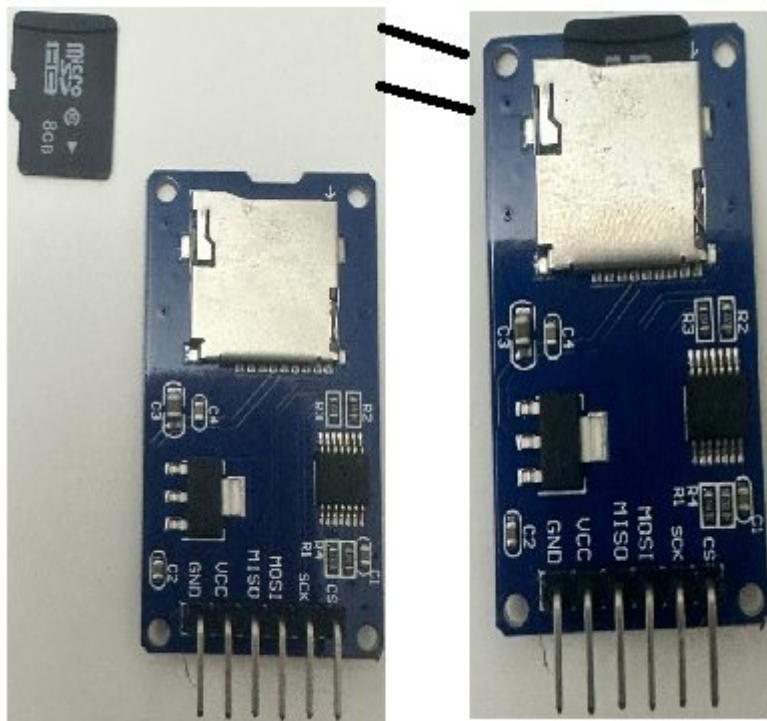


Figure 12. ZAS Robotics Communication Creative Board – MicroSD Card Adapter

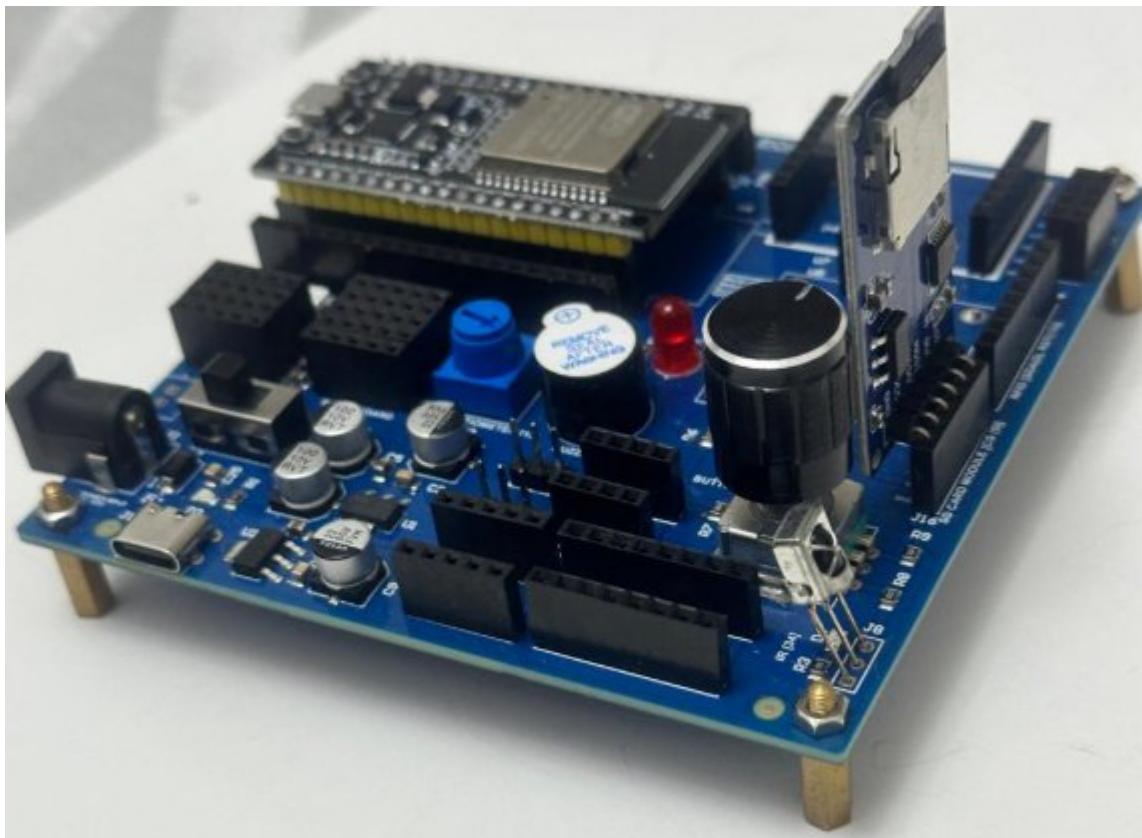


Figure 13. ZAS Robotics Communication Creative Board – MicroSD Card Adapter(mounted)

## 9. Rotary Encoder

Mechanical encoder used for:

- Menu navigation
- Speed control
- Direction control
- Angle detection

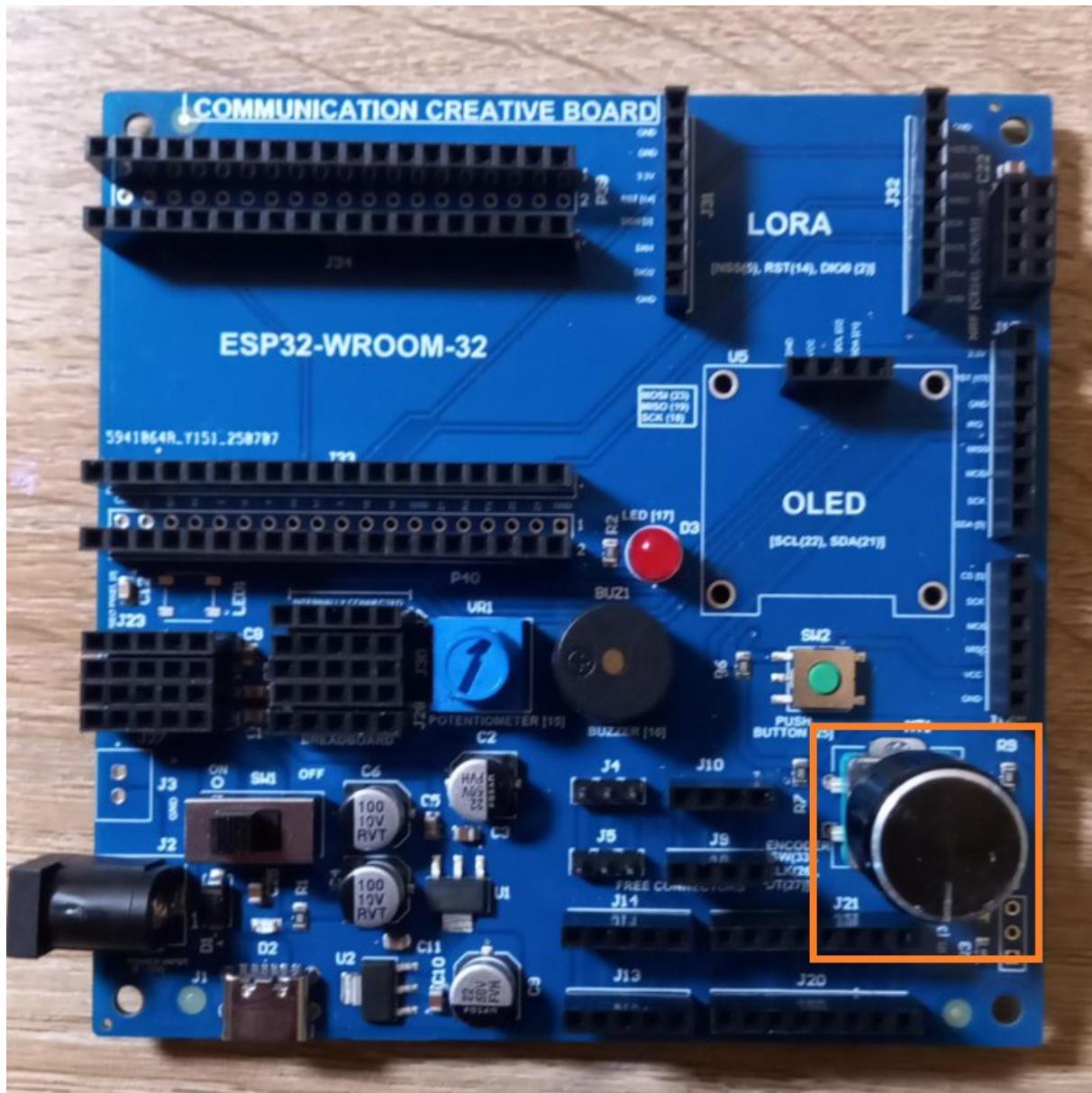


Figure 14. ZAS Robotics Communication Creative Board – Rotary Encoder

Encoder Pin	ESP32
CLK	GPIO 17
DT	GPIO 16
SW	GPIO 15

## 10. Free Connectors

General-purpose connectors for custom modules, sensors, jump wires, or prototype circuits.

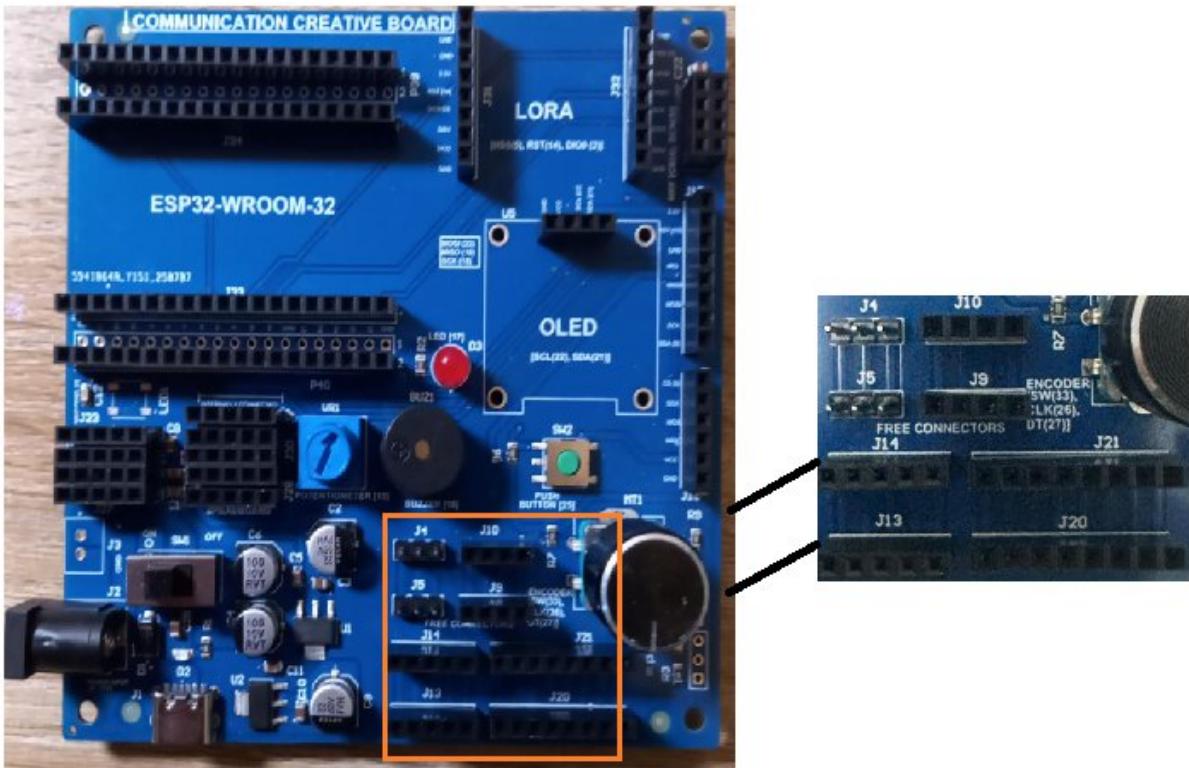


Figure 15. ZAS Robotics Communication Creative Board – Free Connectors

## 11. Input DC Jack

External power input for supplying regulated voltage to the ESP32 board and peripherals.

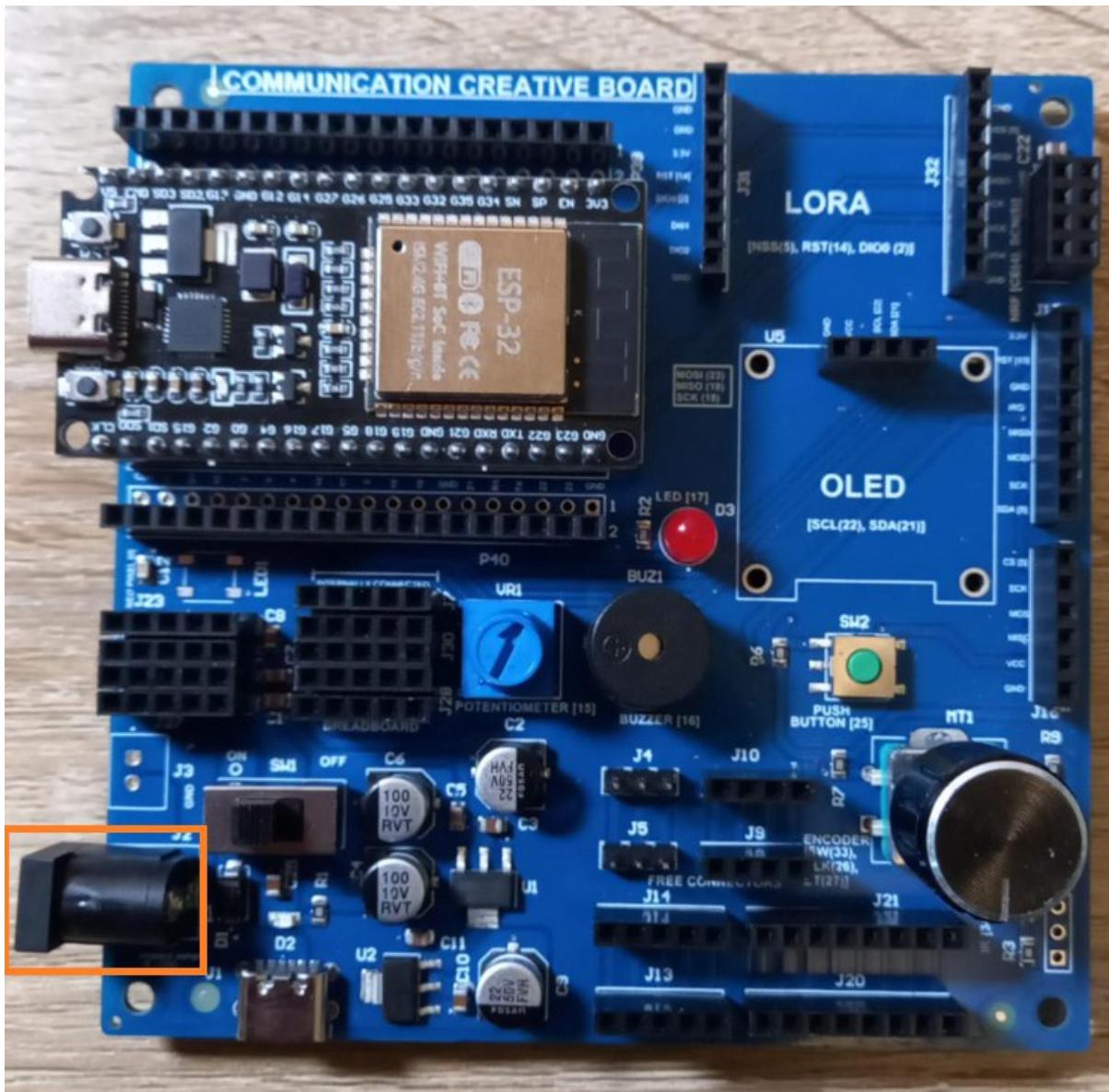


Figure 16. ZAS Robotics Communication Creative Board – Input DC Jack

## 12. ON/OFF Switch

Master power switch for safe operation, allowing users to turn off the board without unplugging cables.

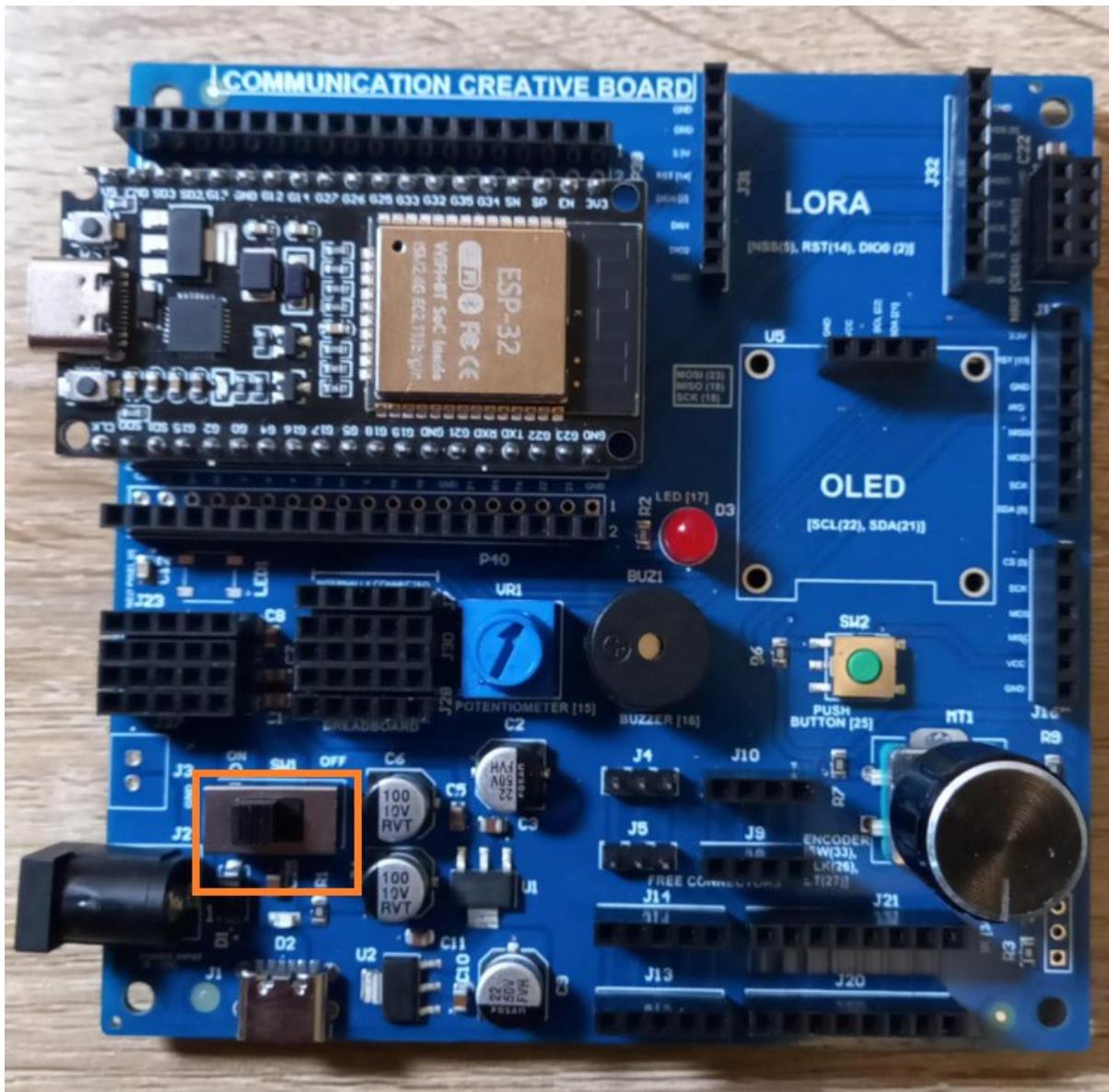


Figure 17. ZAS Robotics Communication Creative Board – ON/OFF Switch

## 13. Mini Breadboard

A prototyping area for user-built circuits, sensors, resistors, LEDs, etc.

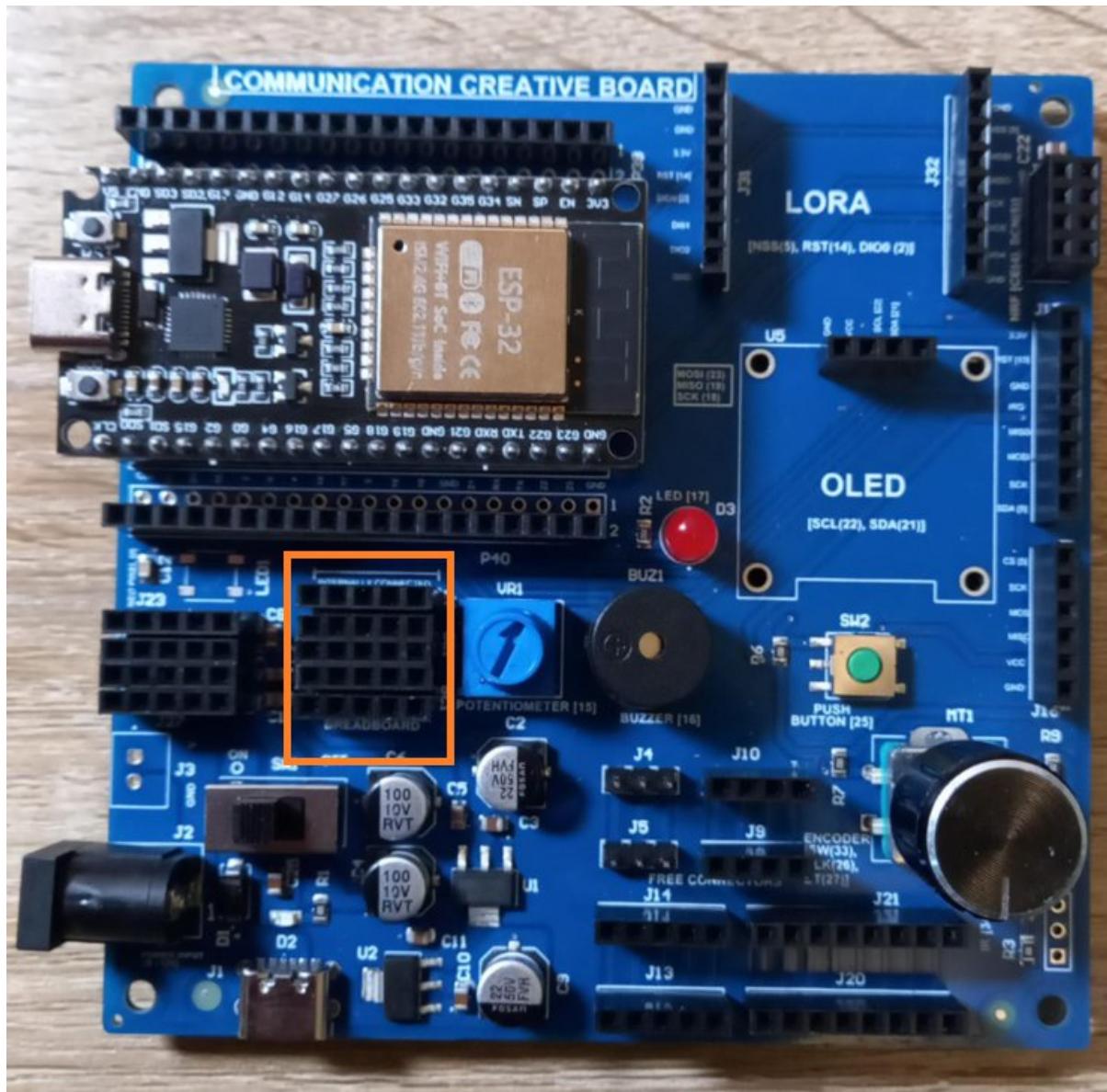


Figure 18. ZAS Robotics Communication Creative Board – Mini Breadboard

## 14. Potentiometer

Analog input used for:

- ADC learning
  - Volume/speed control
  - Threshold setting in programs

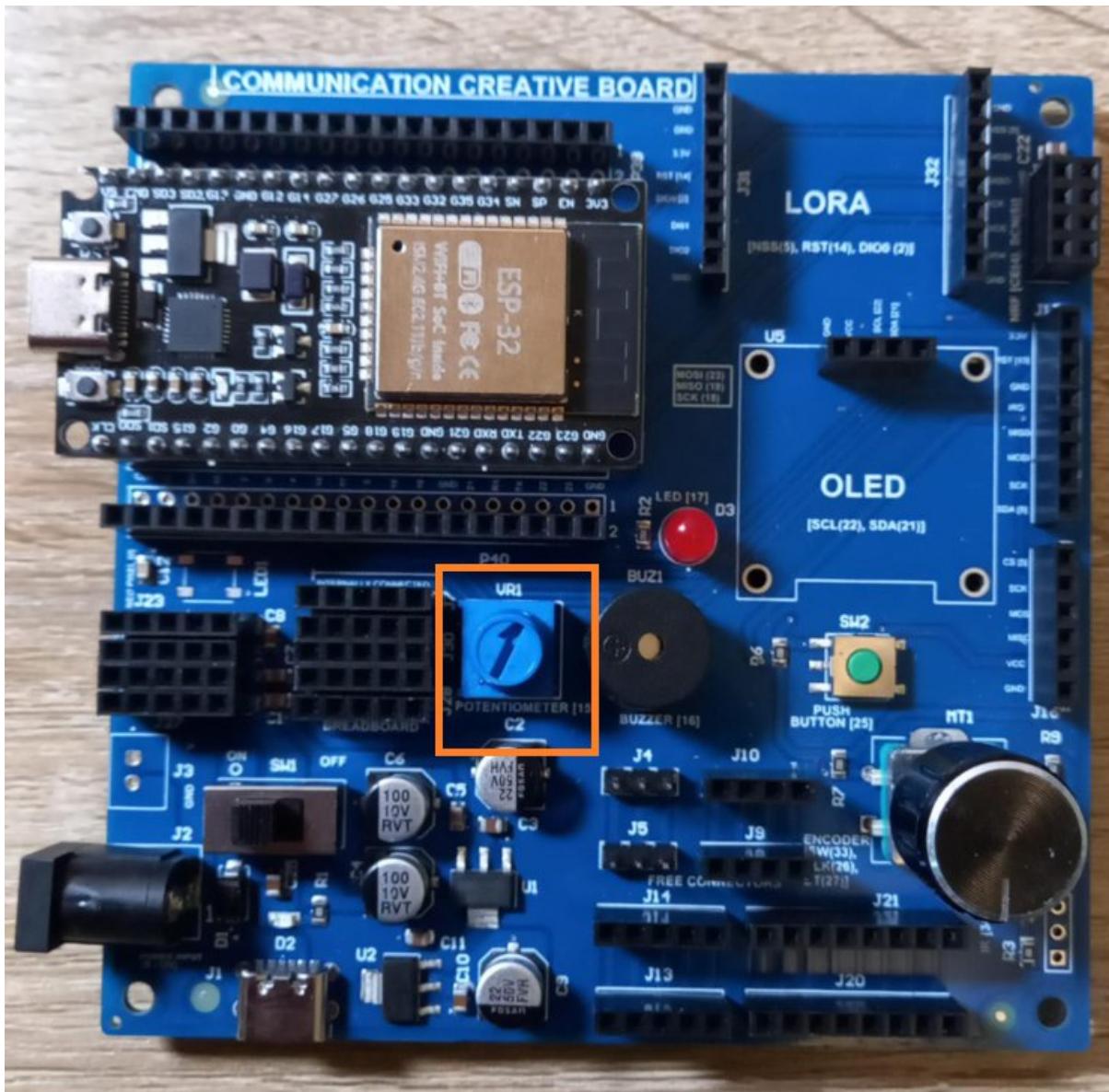


Figure 19. ZAS Robotics Communication Creative Board – Potentiometer

Pin	ESP32
OUT	A0 / GPIO 34

## 15. Basic Electronics Components

Includes LEDs, test points, active buzzer, small circuits for basic electronics and embedded programming practice.



Figure 20. ZAS Robotics Communication Creative Board – Basic Electronics Components

Component	ESP32
LED	17
Buzzer	16