Project: Card and Key Reader

In this project, we will interface the RFID-RC522 RFID module with the ESP32. We will create a "Key Scanner" that reads the unique ID (UID) of an RFID card or key fob and displays it in the Serial Monitor.

1. Connections

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ESP32 Pin	RC522 Pin	Description
3.3V	**3.3V**	Power (Do NOT use 5V)
GND	**GND**	Ground
GPIO 5	**SDA (SS)**	Slave Select
GPIO 18	**SCK**	Serial Clock
GPIO 23	**MOSI**	Master Out Slave In
GPIO 19	**MISO**	Master In Slave Out
GPIO 22	**RST**	Reset Pin

2. Libraries that are needed to be downloaded

You need to install this one library from the Arduino Library Manager.
Go to Tools > Manage Libraries and install:

1. **MFRC522** by GithubCommunity

3. Code

How it works

The code initializes the SPI bus and the MFRC522 module. It constantly polls for the presence of a new card. When a card is detected, it reads the UID (Unique Identifier), which acts as the "Primary Key" (p) for that specific card, and prints it in Hexadecimal format.

Steps to connect

1. Wire the RC522 to the ESP32 as per the table.
2. Select your ESP32 board and click **Upload (arrow button)**.
3. Open the **Serial Monitor** and set the baud rate to **115200**.

Code

```
#include <SPI.h>
#include <MFRC522.h>

#define SS_PIN  5
#define RST_PIN 22

// a = Aim: Identify RFID Card UID and display in Serial Monitor
MFRC522 rfid(SS_PIN, RST_PIN);

void setup() {
  Serial.begin(115200);
  SPI.begin();           // Init SPI bus
  rfid.PCD_Init();       // Init MFRC522

  Serial.println("Place your RFID card near the reader...");
}

void loop() {
  // Reset the loop if no new card present on the sensor/reader.
  if (!rfid.PICC_IsNewCardPresent())
    return;

  // Verify if the UID has been read
  if (!rfid.PICC_ReadCardSerial())
    return;

  Serial.print("Card UID (p): ");
  String content = "";
  for (byte i = 0; i < rfid.uid.size; i++) {
     Serial.print(rfid.uid.uidByte[i] < 0x10 ? " 0" : " ");
     Serial.print(rfid.uid.uidByte[i], HEX);
  }

  Serial.println();
  Serial.println("Access Granted / Scanned Successfully");

  // Halt PICC
  rfid.PICC_HaltA();
  // Stop encryption on PCD
  rfid.PCD_StopCrypto1();

  delay(1000); // Wait 1 second before next scan
}
```

4. What to expect

- ✓ When the code is running, the Serial Monitor will wait for a card.
- ✓ As soon as you tap an RFID card or fob, you will see a unique 4-byte or 7-byte ID (for example, something like, `3F 4A 12 88`).
- ✓ If the sensor is not responding, ensure the 3.3V pin is providing enough current, I.e. the connections are not loose; the RC522 is sensitive to power fluctuations.