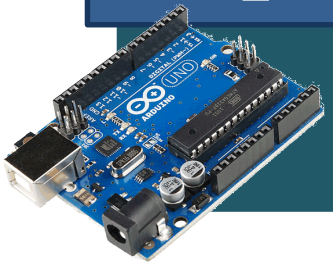
2022년 IoT기반 스마트 솔루션 개발자 양성과정



Firmware [펌웨어]

19-RFID-RC522

담당 교수 : 유근택

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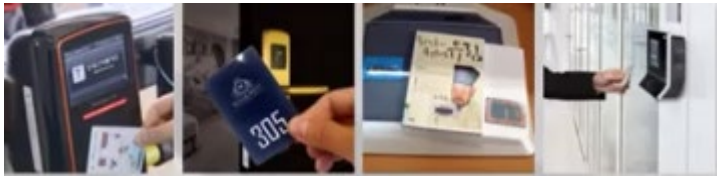
RFID(Radio Frequency IDentification)

RFID 란?

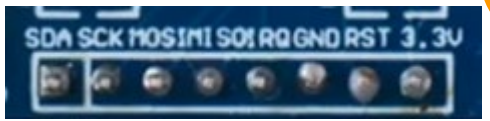
무선주파수를 이용한 **자동인식**기술, **태그**안의 **ID데이터**를 **저장**하고, **리더**와 **안테나**를 이용해 태그가 부착된 사물을 **관리, 판독, 추적**하는 기술

실생활 사용되는 예



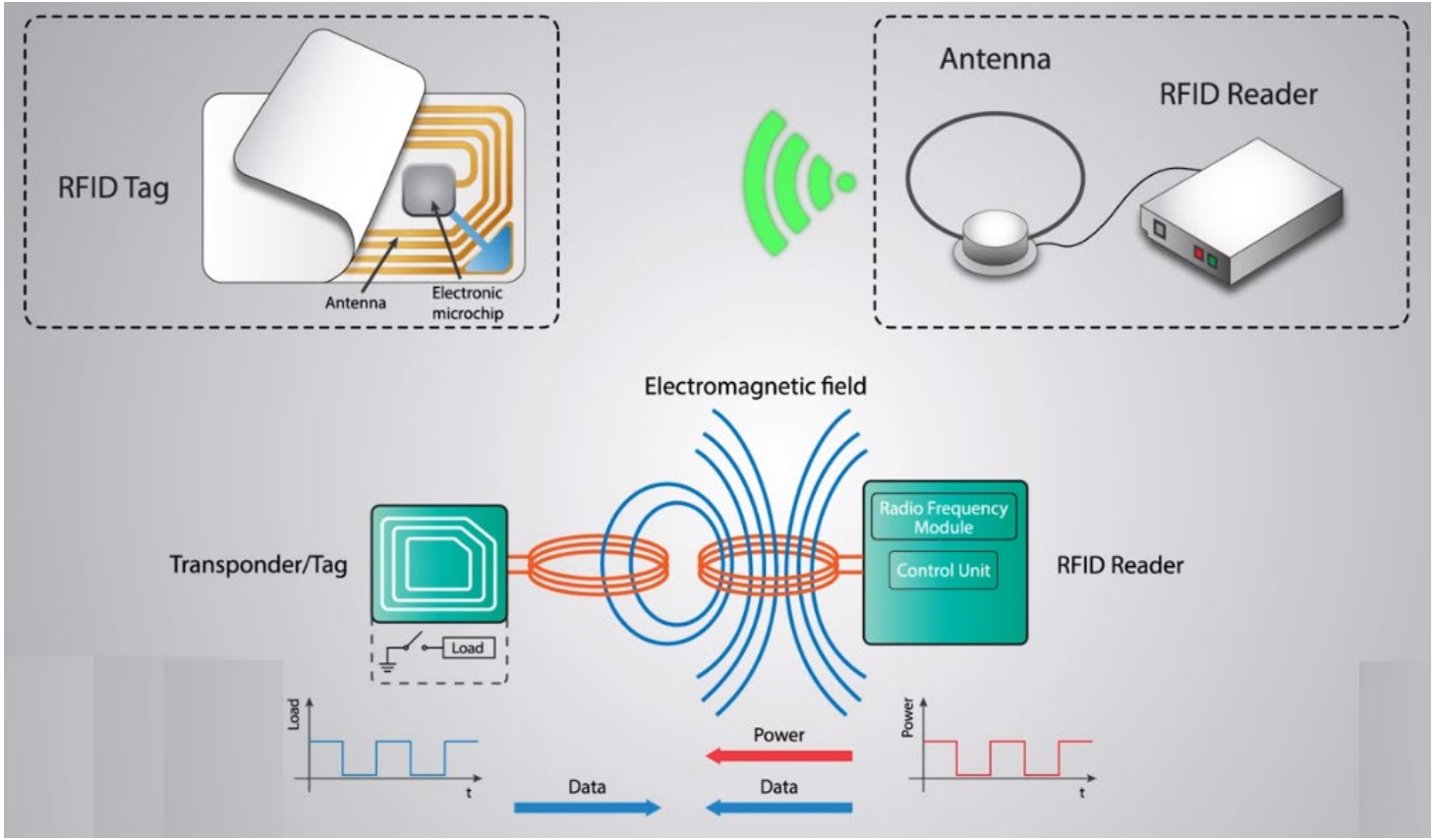
RFID 원리

회로구성 방법



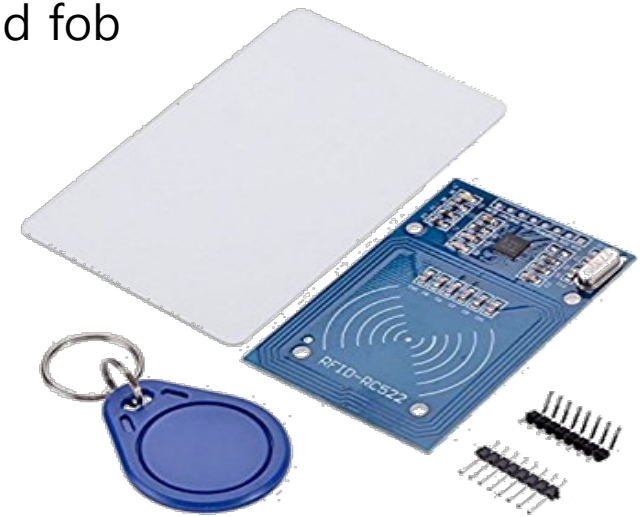
-SDA : 디지털 10 -IRQ : NC
-SCK : 디지털 13 -GND : GND(-)
-MOSI : 디지털 11 -RST : 디지털 9
-MISO : 디지털 12 -3.3V : 3.3V(+)

RFID 원리

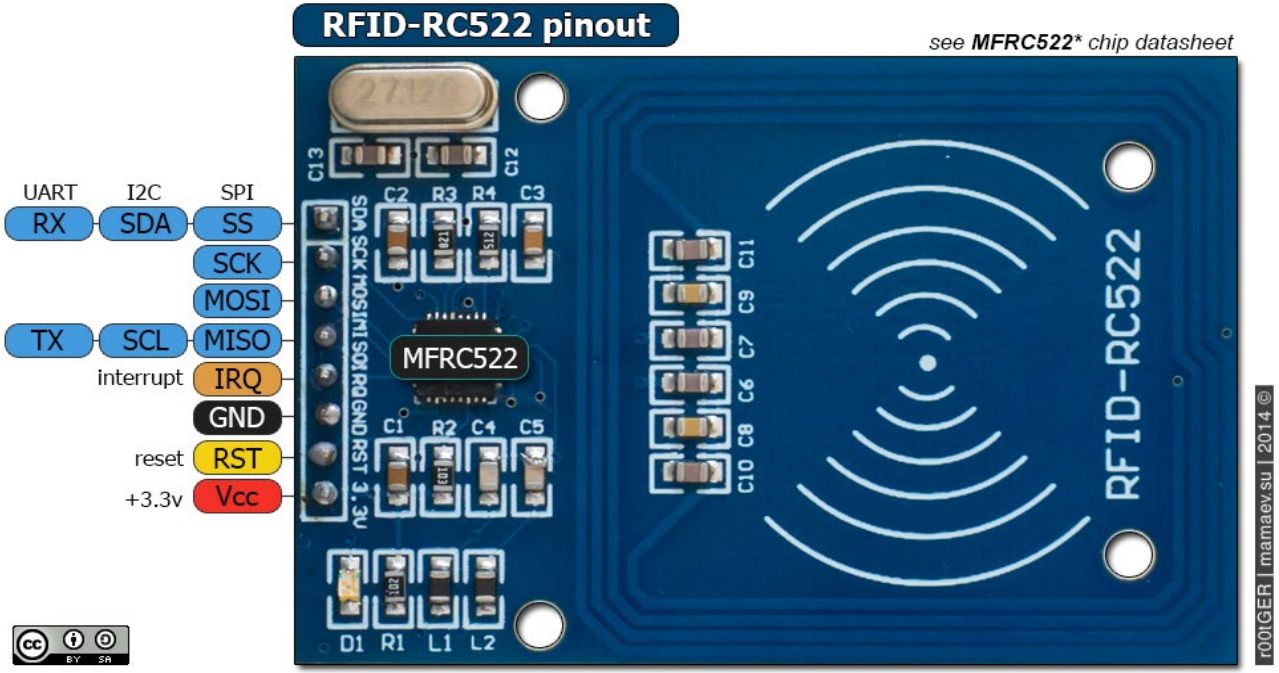

RFID Tag
Antenna
Electronic microchip
Antenna
RFID Reader
Electromagnetic field
Transponder/Tag
Load
Radio Frequency Module
Control Unit
RFID Reader
Load
t
Power
Data
Data
Power
t

RFID-RC522

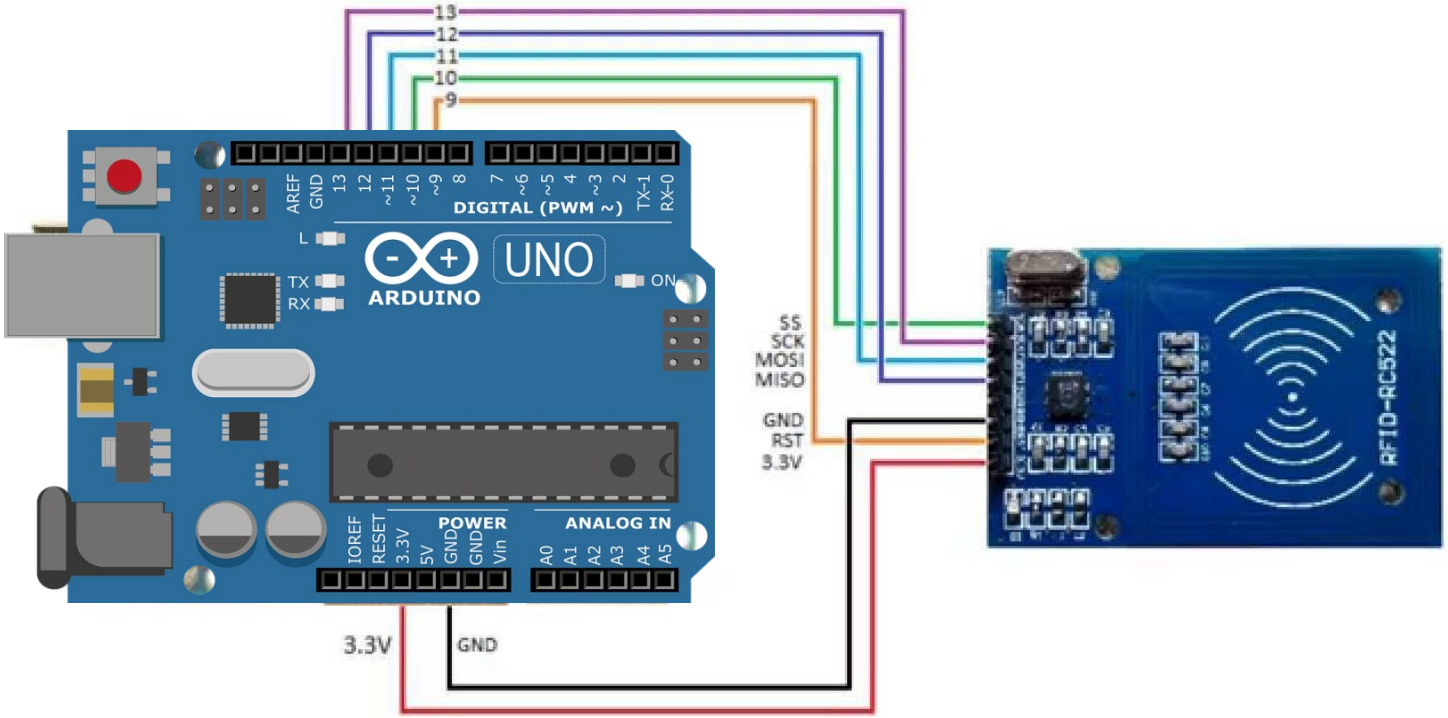
- MFRC522 chip based board
- Operating frequency: 13.56MHz
- Supply Voltage: 3.3V
- Current: 13-26mA
- Read Range: Approx 3cm with supplied card and fob
- SPI Interface
- Max Data Transfer Rate: 10Mbit / s
- Dimensions: 60mm × 39mm



RFID-RC522

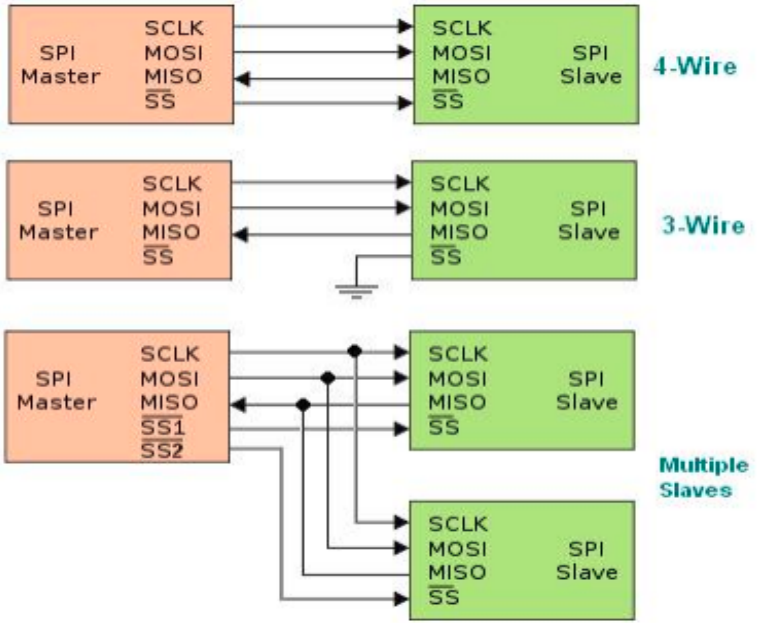

RFID-RC522 pinout
see MFRC522* chip datasheet
UART
I2C
SPI
RX
SDA
SS
SCK
MOSI
TX
SCL
MISO
interrupt
IRQ
GND
reset
RST
+3.3v
Vcc
MFRC522
RFID-RC522
r00tGER | mamaev.su | 2014 ©

결선도


13
12
11
10
9
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM ~)
L
TX
RX
ARDUINO
UNO
ON
POWER
ANALOG IN
IOREF
RESET
3.3V
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5
3.3V
GND
SS
SCK
MOSI
MISO
GND
RST
3.3V
RFID-RC522

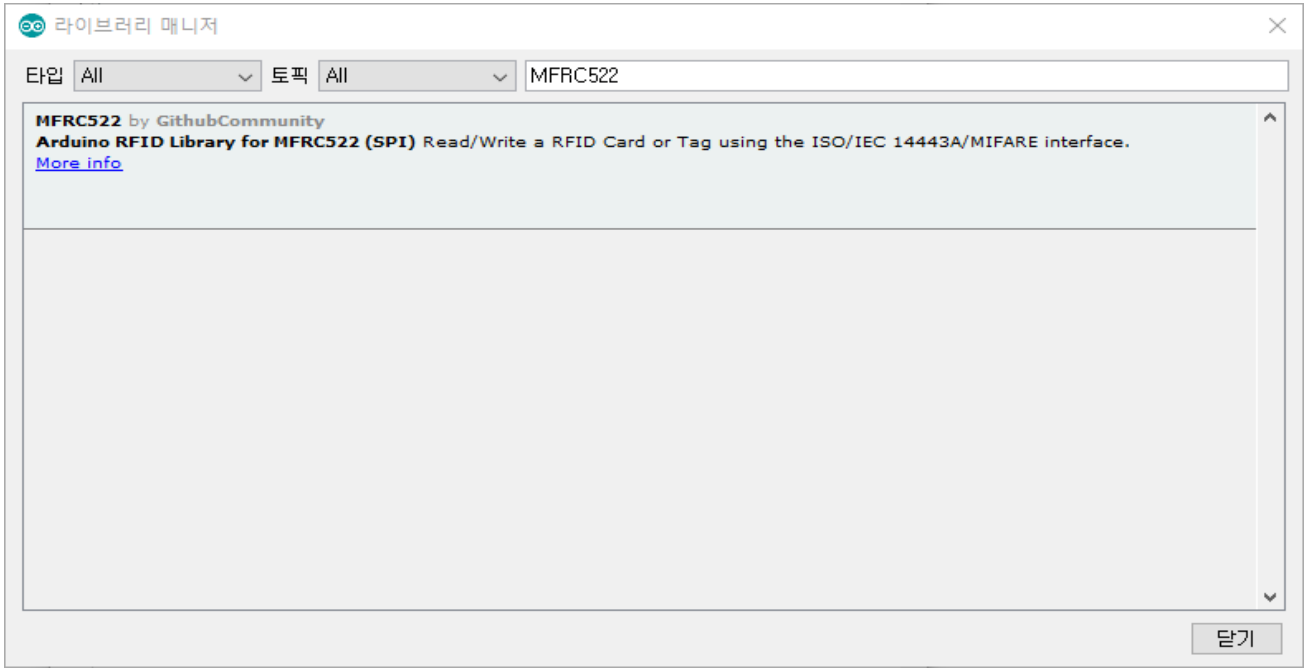
SPI 통신

- Serial Peripheral Interface
  - 전이중 통신
  - 전송 회로가 없음
  - 단순한 회로
  - 프로토콜 유연성



라이브러리 추가

- MFRC522

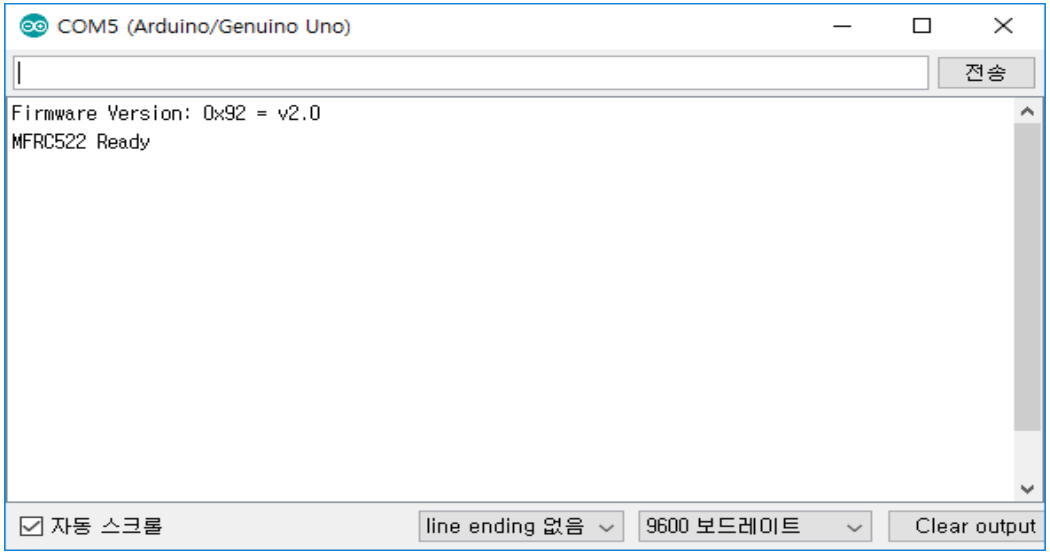


MFRC522-PCD

- PCD(Proximity Coupling Device, Contactless Reader) : RFID 리더
- PICC(Proximity Intergrated Circuit, Contactless Card) : RFID 태그

```
#include <SPI.h>
#include <MFRC522.h>
#define SS_PIN 10
#define RST_PIN 9

 MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup( ) {
  Serial.begin(9600);
  SPI.begin();
  mfrc522.PCD_Init();
  mfrc522.PCD_DumpVersionToSerial();
  Serial.println("MFRC522 Ready");
}

void loop( ) {
  // put your main code here, to run repeatedly:
}
```

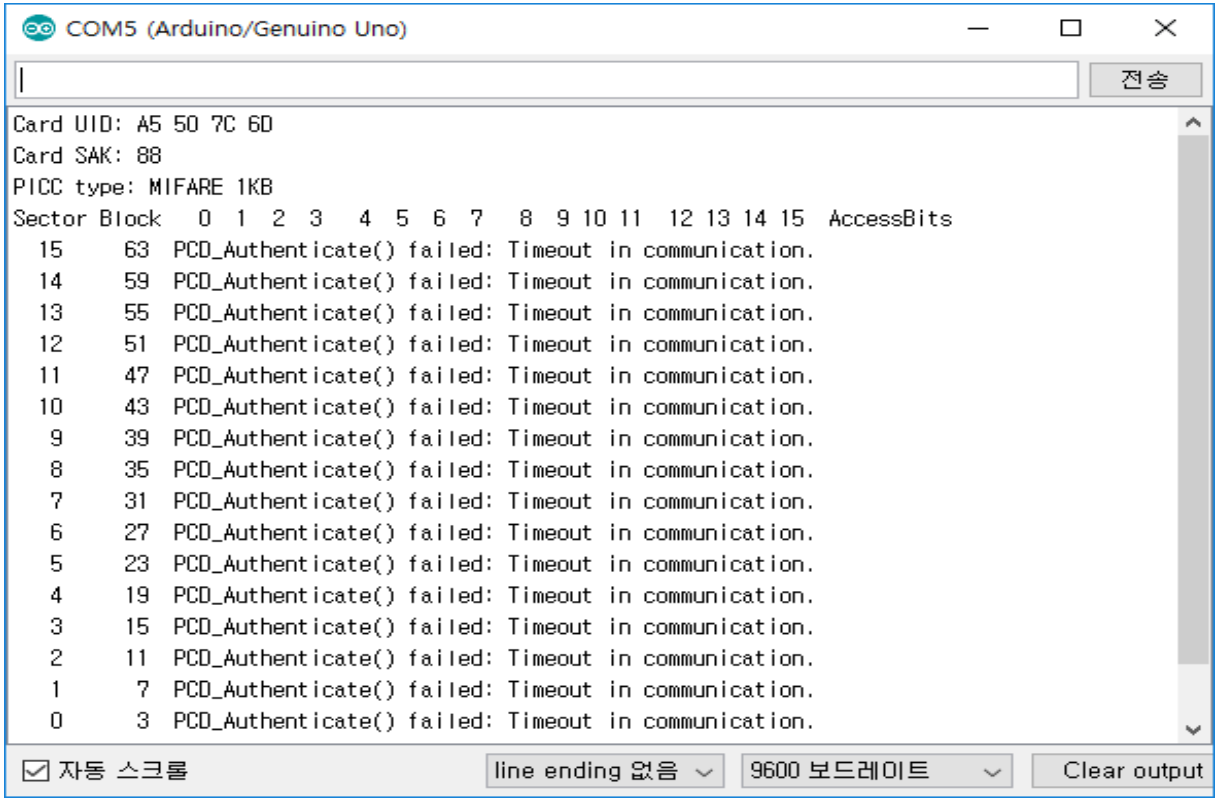
MFRC522-PCD 결과



MFRC522-Dump

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

#define SS_PIN 10
#define RST_PIN 9

 MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup( ) {
  Serial.begin(9600);
  SPI.begin();
  mfrc522.PCD_Init();
  Serial.println("MFRC522 Ready");
}

void loop( ) {
  if ( !mfrc522.PICC_IsNewCardPresent( ) ) {  return;  }
  if ( !mfrc522.PICC_ReadCardSerial( ) ) {  return;  }
  mfrc522.PICC_DumpToSerial( &( mfrc522.uid));
}
```

Dump 결과


COM5 (Arduino/Genuino Uno)
전송
Card UID: A5 50 7C 6D
Card SAK: 88
PICC type: MIFARE 1KB
Sector Block 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 AccessBits
15 63 PCD_Authenticate() failed: Timeout in communication.
14 59 PCD_Authenticate() failed: Timeout in communication.
13 55 PCD_Authenticate() failed: Timeout in communication.
12 51 PCD_Authenticate() failed: Timeout in communication.
11 47 PCD_Authenticate() failed: Timeout in communication.
10 43 PCD_Authenticate() failed: Timeout in communication.
9 39 PCD_Authenticate() failed: Timeout in communication.
8 35 PCD_Authenticate() failed: Timeout in communication.
7 31 PCD_Authenticate() failed: Timeout in communication.
6 27 PCD_Authenticate() failed: Timeout in communication.
5 23 PCD_Authenticate() failed: Timeout in communication.
4 19 PCD_Authenticate() failed: Timeout in communication.
3 15 PCD_Authenticate() failed: Timeout in communication.
2 11 PCD_Authenticate() failed: Timeout in communication.
1 7 PCD_Authenticate() failed: Timeout in communication.
0 3 PCD_Authenticate() failed: Timeout in communication.
자동 스크롤
line ending 없음
9600 보드레이트
Clear output

MFRC522-UID

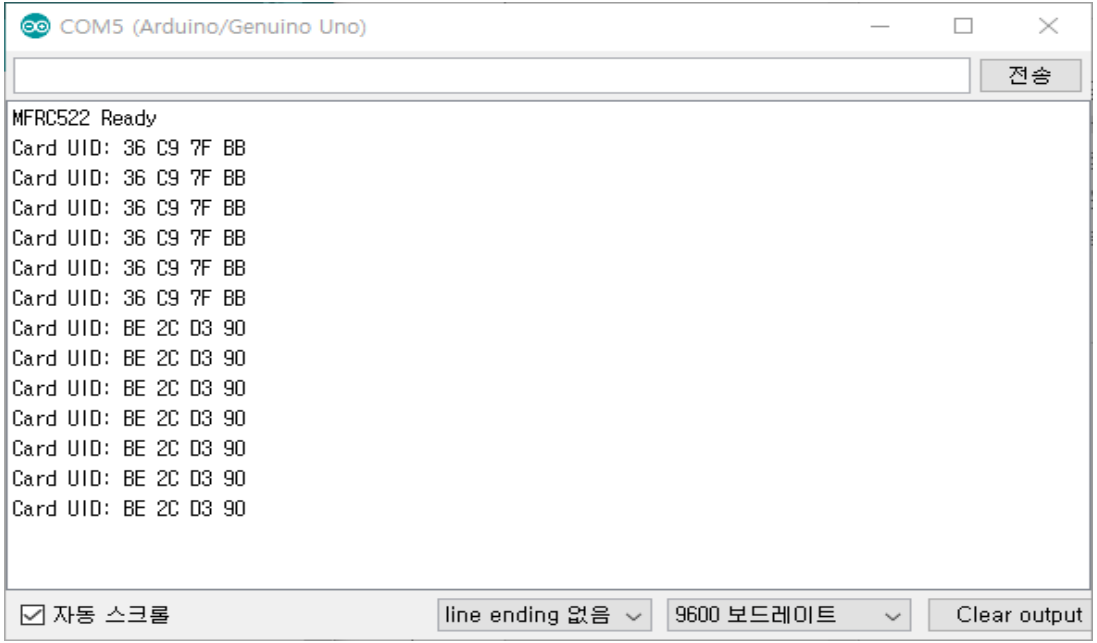
- UID : 카드 고유 번호
- UID : 16진수 4자리

```
#include <SPI.h>
#include <MFRC522.h>
#define SS_PIN 10
#define RST_PIN 9
 MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup( ) {
  Serial.begin(9600);
  SPI.begin();
  mfrc522.PCD_Init();
  Serial.println("MFRC522 Ready");
}
```

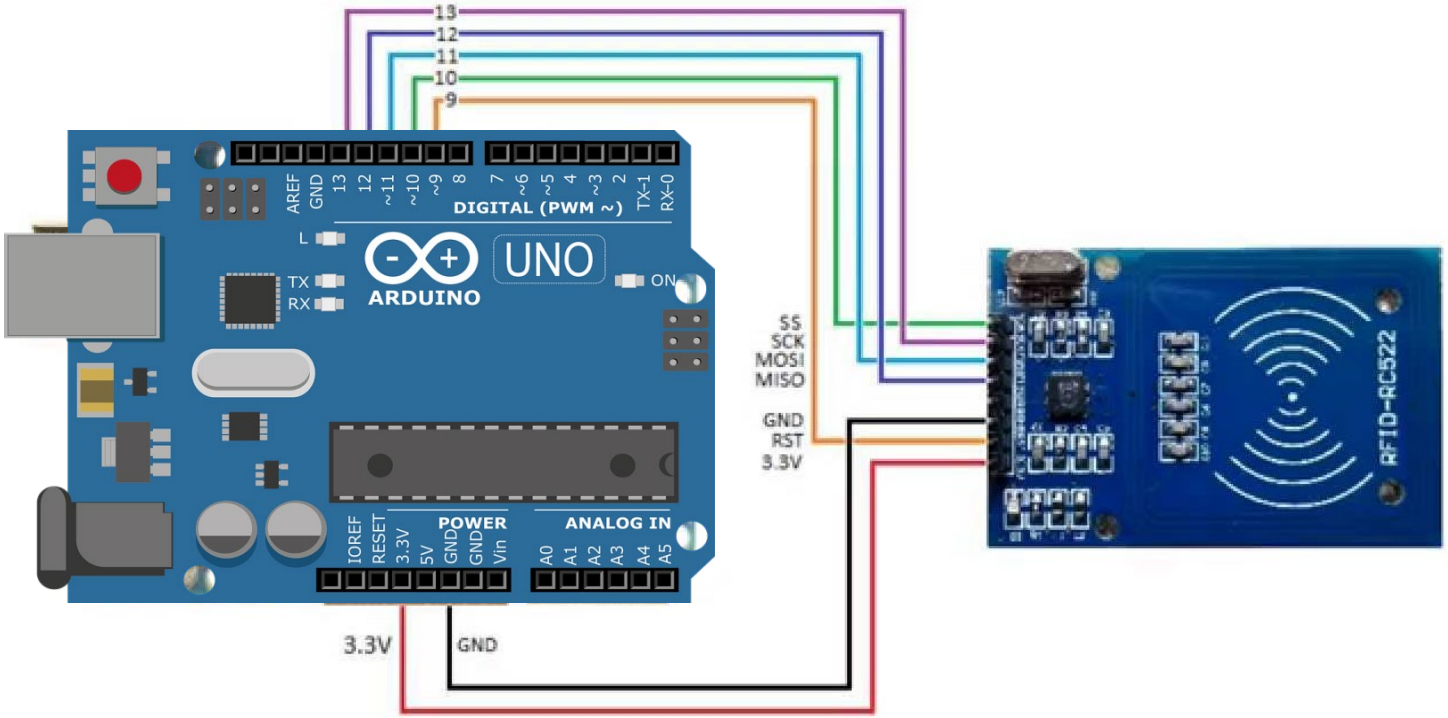
```
void loop( ) {
  if ( !mfrc522.PICC_IsNewCardPresent( ) ) {  return;  }
  //if ( !mfrc522.PICC_ReadCardSerial( ) ) {  return;  }

  Serial.print("Card UID:");
  for (byte k = 0; k < mfrc522.uid.size; k++) {
    Serial.print(mfrc522.uid.uidByte[k] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[k], HEX);
  }
  Serial.println();
}
```

UID 결과

- Card UID: xx xx xx xx
- UID : Hex Value



UID Check 결선도

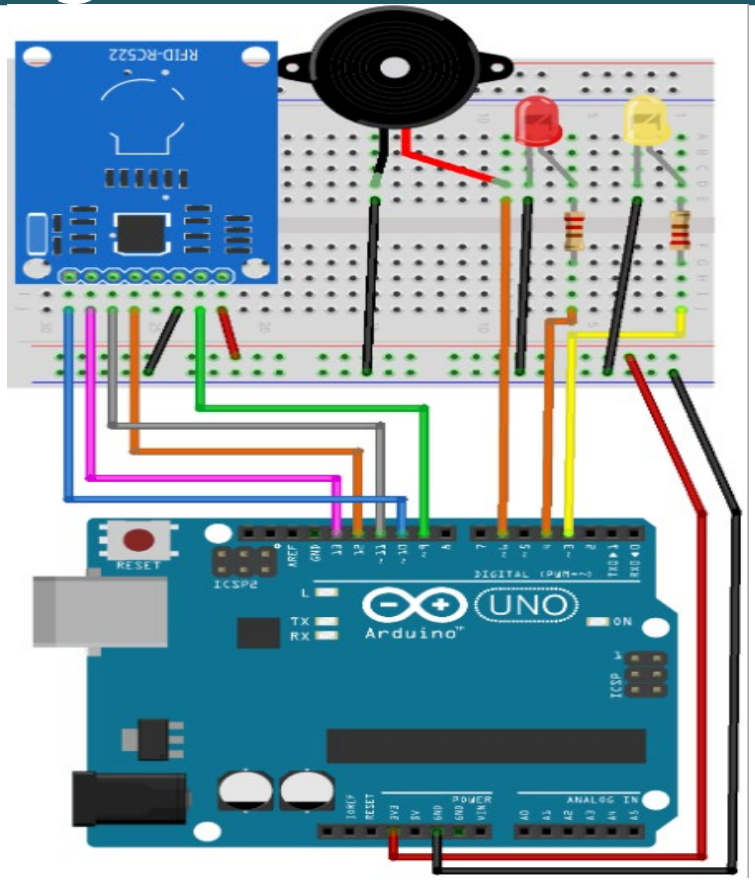


MFRC522-UID Check

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

#define SS_PIN 10
#define RST_PIN 9

 MFRC522 mfrc522(SS_PIN, RST_PIN);
 byte SetID[8]={0xD4,0xDF,0x06,0x85};

void setup( ) {
  Serial.begin(9600);
  SPI.begin( );
  mfrc522.PCD_Init( );
  Serial.println("MFRC522 Ready");
}
```

```
void loop( ) {
  if ( !mfrc522.PICC_IsNewCardPresent( ) ) {  return;  }
  if ( !mfrc522.PICC_ReadCardSerial( ) ) {  return;  }

  Serial.print("Card Chaeck:");
  for (byte k = 0; k < mfrc522.uid.size; k++) {
    if (SetID[k] != mfrc522.uid.uidByte[k]) {
      Serial.println("Failue");
      return;
    }
  }
  Serial.println("Ok");
}
```

Tag-check 결선도



MFRC522-UID Check3

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

#define SS_PIN 10
#define RST_PIN 9

MFRC522 mfrc522(SS_PIN, RST_PIN);
int LED_Y = 3;
int LED_R = 4;
int buzzer =6;

void setup(){
Serial.begin(9600);
SPI.begin();

pinMode(LED_Y,OUTPUT);
pinMode(LED_Y,OUTPUT);
pinMode(buzzer,OUTPUT);
}
void loop(){
 if ( !mfrc522.PICC_IsNewCardPresent( )
|| !mfrc522.PICC_ReadCardSerial( ) ) {  delay(500);
return;  }
If(mfrc.uid.uidByte[0]==244 &&
mfrc.uid.uidByte[1]==181 &&
mfrc.uid.uidByte[2]==249 &&
mfrc.uid.uidByte[0]==233){
digitalWrite(LED_Y,HIGH);
digitalWrite(LED_R,LOW);
Serial.println("Hello, Eduino~");
Tone(6,523,100);
delay(500);
} else{
digitalWrite(LED_R,HIGH);
digitalWrite(LED_Y,LOW);
Serial.println("Who are you?");
Tone(6,523,100);
delay(300);
Tone(6,523,100);
delay(500);
}
```