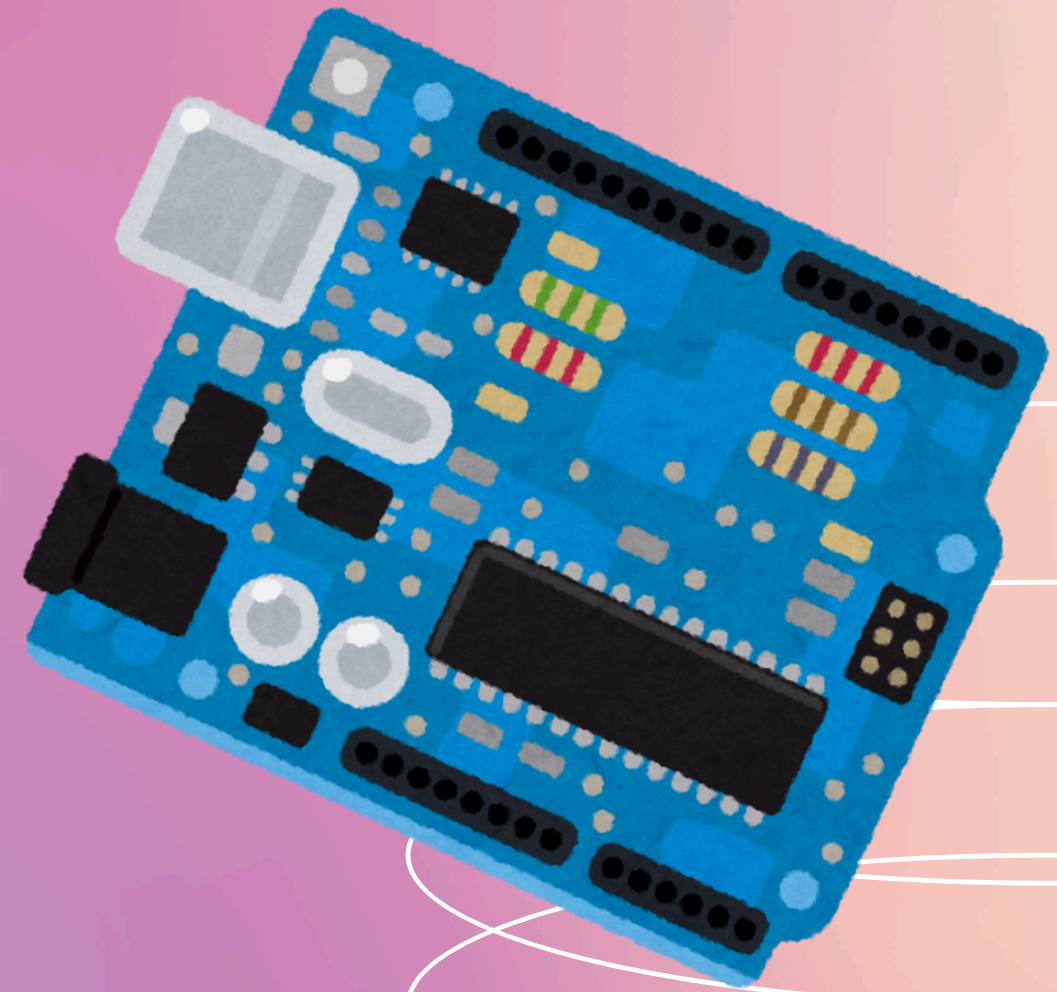


Uso de Tags RFID con Arduino

Marta Díaz Artigot



¿Qué es RFID?

La tecnología RFID o identificación por radiofrecuencia (Radio Frequency Identification) es un sistema de almacenamiento y recuperación de datos remotos capaz de identificar objetos a través de un identificador único gracias a ondas de radio.

Elementos

Etiquetas RFID

Dispositivos pequeños que contienen antenas para recibir y responder a peticiones por radiofrecuencia de un emisor-receptor RFID.

Lector RFID

Recibe una señal de radio y la transmite de un modo comprensible para un ordenador en el que se recopila la información.

¿Cómo Funciona?

La etiqueta RFID se coloca cerca del lector RFID que genera un campo electromagnético que hace que los electrones se muevan a través de la antena de la etiqueta y posteriormente alimenten el chip.

El chip alimentado es capaz de enviar la información almacenada en la etiqueta RFID a través de la radiofrecuencia (retrodispersión).

La retrodispersión es detectada e interpretada por el lector RFID que luego envía los datos a un ordenador o un microcontrolador como el que tiene Arduino.

Estructura de la Memoria de una Etiqueta RFID

COM4

Enviar

Firmware Version: 0x91 = v1.0

Scan PICC to see UID, SAK, type, and data blocks...

Card UID: 61 08 19 34

Card SAK: 08

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	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	62	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	61	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
14	59	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	58	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	57	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	56	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
13	55	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]

☒ Autoscroll

☐ Mostrar marca temporal

Sin ajuste de línea

9600 baudio

Limpiar salida

Sectores

Bloques

Datos

Trailer

COM4

Enviar

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	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	62	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	61	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
14	59	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	58	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	57	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	56	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
13	55	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	54	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	53	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	52	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
12	51	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	49	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	48	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
11	47	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	46	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]
	45	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[0 0 0]

☒ Autoscroll ☐ Mostrar marca temporal Sin ajuste de línea 9600 baudio Limpiar salida

COM4

Enviar

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	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	62	00	00	Key A	00	00	00	Acces	00	00	U	00	00	Key B	00	00		[0 0 0]
	61	00	00	00	00	00	00	Conditions	00	00	00	00	00	00	00	00		[0 0 0]
	60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
14	59	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	58	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	57	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	56	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
13	55	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	54	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	53	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	52	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
12	51	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	49	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	48	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
11	47	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[0 0 1]
	46	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]
	45	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		[0 0 0]

☒ Autoscroll
 ☐ Mostrar marca temporal
 Sin ajuste de línea
 9600 baudio
 Limpiar salida

El lector necesita conocer la clave que se está utilizando para leer y escribir información

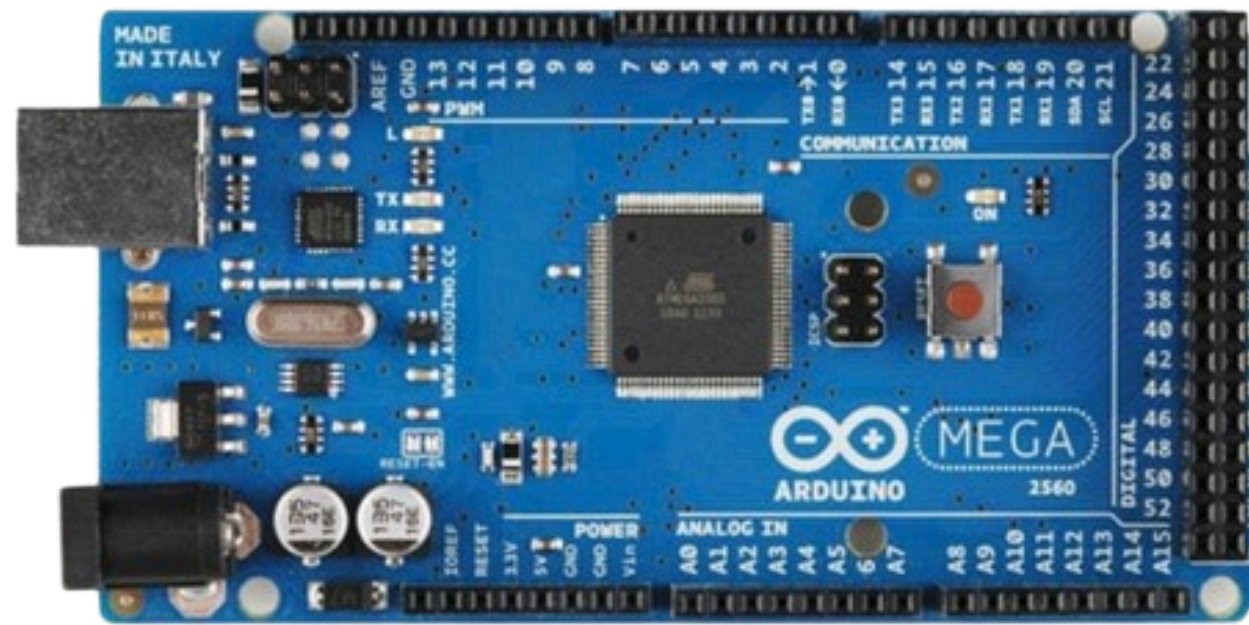
Sobrescribir el
bloque del fabricante
puede bloquear
permanentemente la
tarjeta o etiqueta
RFID

The image shows a hex editor window with a table of data. The table has two main sections: 'UID' and 'Información fabricante'. The 'UID' section contains 4 bytes of data, and the 'Información fabricante' section contains 8 bytes of data. The data is organized into rows, each with a 4-byte UID field and an 8-byte manufacturer information field. The last row is highlighted in yellow and purple. The window has a title bar with standard OS controls and a status bar at the bottom with settings like 'Autoscroll', 'Mostrar marca temporal', 'Sin ajuste de línea', '9600 baudio', and 'Limpiar salida'.

		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
1	7	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[	0	0	1]							
10	6	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
9	5	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
8	4	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
1	3	00	00	00	00	00	00	FF	07	80	69	FF	FF	FF	FF	FF	FF	[	0	0	1]							
	2	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
	1	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	[	0	0	0]							
0	0	61	08	19	34	44	08	04	00	01	5F	63	8E	B1	25	D6	1D	[	0	0	0]							
		UID								Información fabricante																			

Implementación con Arduino

- Módulo RFID RC522
- Etiquetas RFID
- Arduino Mega
- Librería RFID para MFRC522



```
→ Arduino Mega or Mega 2560
```

LIBRARY MANAGER

rc522

Type: All

Topic: All

MFRC522 by GithubCommunity
1.4.11 installed

Arduino RFID Library for MFRC522 (SPI) Read/Write a RFID Card or Tag using the ISO/IEC 14443A/MIFARE...
[More info](#)

1.4.11 REMOVE

DumpInfo.ino

```
46 void setup() {
47   Serial.begin(9600); // Initialize serial communications with
48   while (!Serial);    // Do nothing if no serial port is opened
49   SPI.begin();        // Init SPI bus
50   mfrc522.PCD_Init();  // Init MFRC522
51   delay(4);           // Optional delay. Some board do need more tim
52   mfrc522.PCD_DumpVersionToSerial(); // Show details of PCD - M
53   Serial.println(F("Scan PICC to see UID, SAK, type, and data bl
54 }
55
56 void loop() {
57   // Reset the loop if no new card present on the sensor/reader.
58   if ( ! mfrc522.PICC_IsNewCardPresent()) {
59     return;
60 }
```

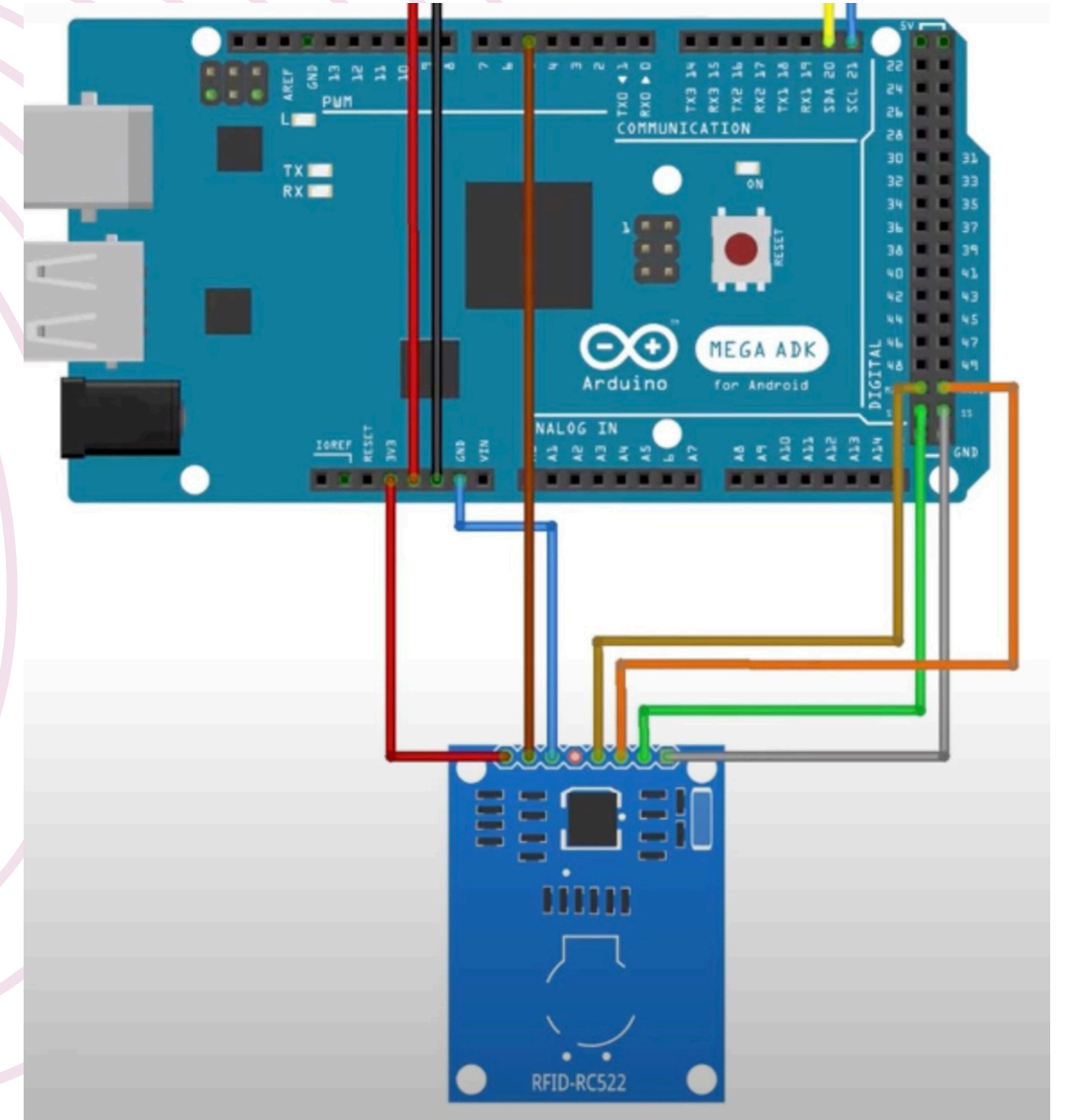
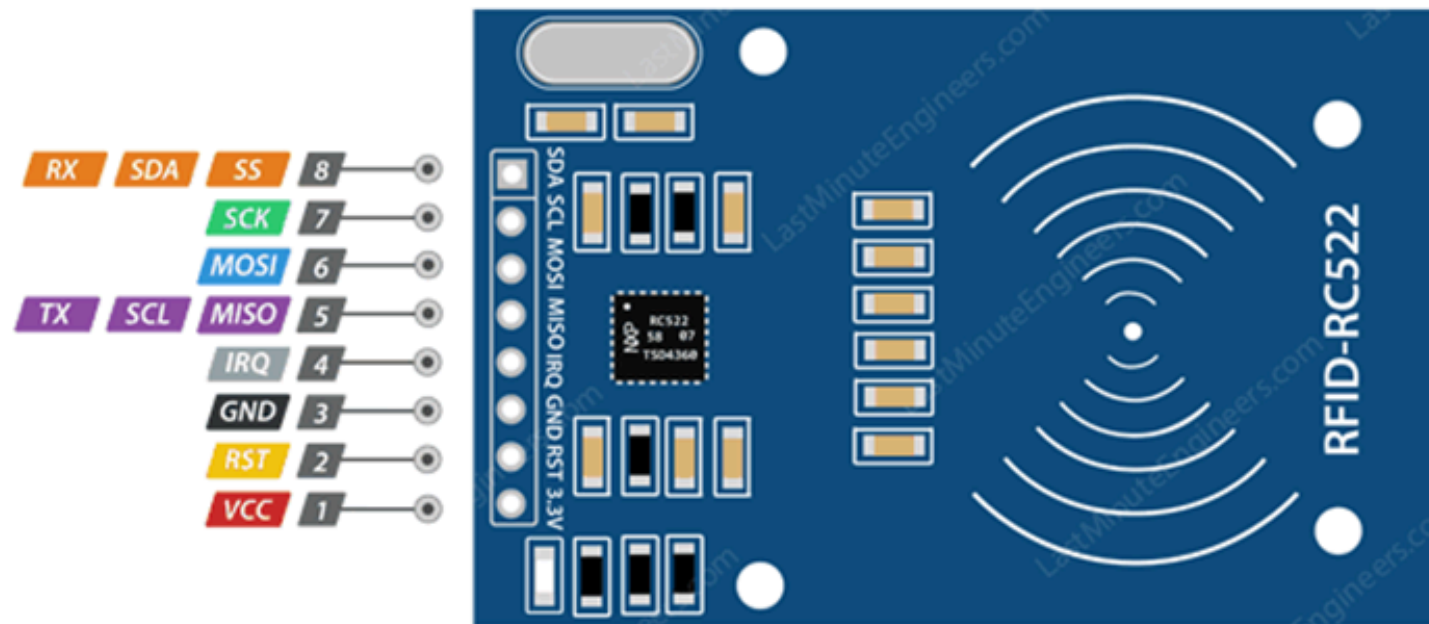
Layout

* Typical pin layout used:

	MFRC522	Arduino	Arduino	Arduino	Arduino	Arduino
	Reader/PCD	Uno/101	Mega	Nano v3	Leonardo/Micro	Pro Micro
Signal	Pin	Pin	Pin	Pin	Pin	Pin
RST/Reset	RST	9	5	D9	RESET/ICSP-5	RST
SPI SS	SDA(SS)	10	53	D10	10	10
SPI MOSI	MOSI	11 / ICSP-4	51	D11	ICSP-4	16
SPI MISO	MISO	12 / ICSP-1	50	D12	ICSP-1	14
SPI SCK	SCK	13 / ICSP-3	52	D13	ICSP-3	15

* More pin layouts for other boards can be found here: <https://github.com/miguelbalboa/rfid#pin-layout>

*/



Ejemplo DumpInfo

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

#define RST_PIN      5           // Configurable, see typical pin layout above
#define SS_PIN       53          // Configurable, see typical pin layout above

MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance

void setup() {
  Serial.begin(9600); // Initialize serial communications with the PC
  while (!Serial);    // Do nothing if no serial port is opened (added for Arduinos based on ATMEGA32U4)
  SPI.begin();        // Init SPI bus
  mfrc522.PCD_Init();  // Init MFRC522
  delay(4);           // Optional delay. Some board do need more time after init to be ready, see Readme
  mfrc522.PCD_DumpVersionToSerial(); // Show details of PCD - MFRC522 Card Reader details
  Serial.println(F("Scan PICC to see UID, SAK, type, and data blocks..."));
}

void loop() {
  // Reset the loop if no new card present on the sensor/reader. This saves the entire process when idle.
  if ( ! mfrc522.PICC_IsNewCardPresent()) {
    return;
  }

  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial()) {
    return;
  }

  // Dump debug info about the card; PICC_HaltA() is automatically called
  mfrc522.PICC_DumpToSerial(&(mfrc522.uid));
}
```

Etiqueta Encriptada

Card UID: 7A ED C8 B8

Card SAK: 08

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.																

Etiqueta No Encriptada

Card UID: A9 75 AD 99

Card SAK: 08

PICC type: MIFARE 1KB

[illegible]

```

9 // Lista de UID permitidos
10 byte allowedUIDs[][4] = {
11     {0x27, 0xA4, 0x7F, 0x60}, // UID 1: 27 A4 7F 60
12     //{0xA9, 0x75, 0xAD, 0x99}, // UID 2: A9 75 AD 99 (para acceso denegado)
13 };
14
15
34 // Seleccionar una tarjeta
35 if (!mfr522.PICC_ReadCardSerial()) {
36     return;
37 }
38
39 // Verificar si el UID de la tarjeta está en la lista de permitidos
40 bool isAllowed = false;
41 for (int i = 0; i < sizeof(allowedUIDs) / sizeof(allowedUIDs[0]); i++) {
42     if (memcmp(mfr522.uid.uidByte, allowedUIDs[i], mfr522.uid.size) == 0) {
43         isAllowed = true;
44         break;
45     }
46 }
47
48 // Procesamiento según el acceso permitido
49 if (isAllowed) {
50     // UID permitido: proceder a la lectura o autenticación
51     mfr522.PICC_DumpToSerial(&(mfr522.uid));
52 } else {
53     // UID no permitido: denegar acceso
54     Serial.print(F("Acceso denegado para UID: "));
55     for (byte i = 0; i < mfr522.uid.size; i++) {
56         Serial.print(mfr522.uid.uidByte[i], HEX);
57         if (i < mfr522.uid.size - 1) {
58             Serial.print(" ");
59         }
60     }
61 }
62 Serial.println();
63 }
64 }

```

Filtro de Tags
RFID por UID

Etiqueta Permitida

```
Escanee PICC para verificar el acceso...
Card UID: 27 A4 7F 60
Card SAK: 08
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  00 00 00 00 00 00 FF 07 80 69 FF FF FF FF FF FF [ 0 0 1 ]
          62  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
          61  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
          60  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
  14      59  00 00 00 00 00 00 FF 07 80 69 FF FF FF FF FF FF [ 0 0 1 ]
          58  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
          57  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
          56  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [ 0 0 0 ]
```

Etiqueta No Permitida

```
Acceso denegado para UID: A9 75 AD 99
Acceso denegado para UID: A9 75 AD 99
Acceso denegado para UID: A9 75 AD 99
Acceso denegado para UID: A9 75 AD 99
```