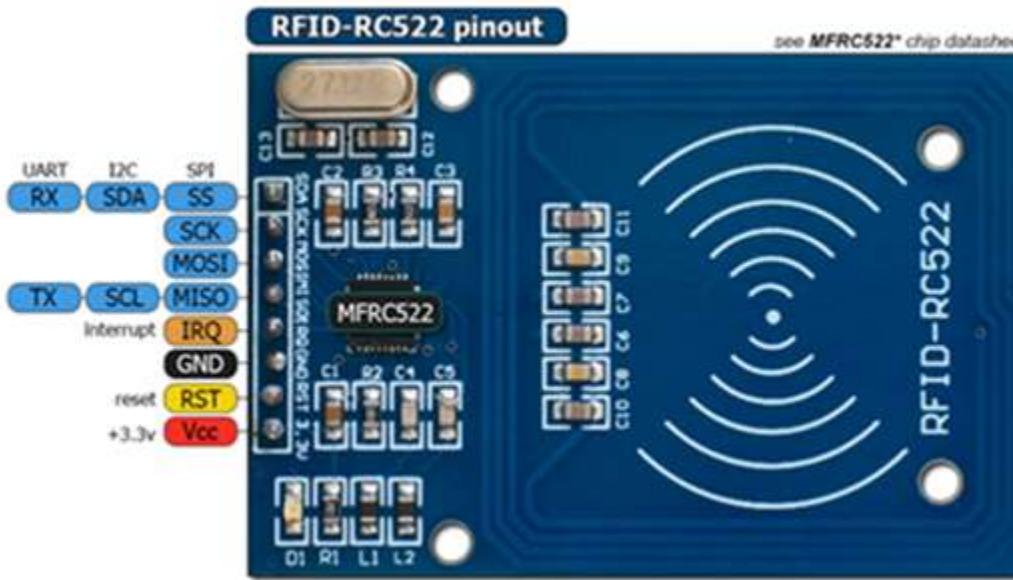




RFID ID u EEPROM-u identifikatora

MFRC522 RFID

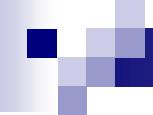
MFRC-522 RC522 13.56Mhz SPI RFID Writer Reader Wireless modul



MFRC522 Chip IC radna frekvencija: 13.56MHz, Brzina razmjene podataka: Max. 10Mbit/s

Podržava mifare1 S50 identifikatore

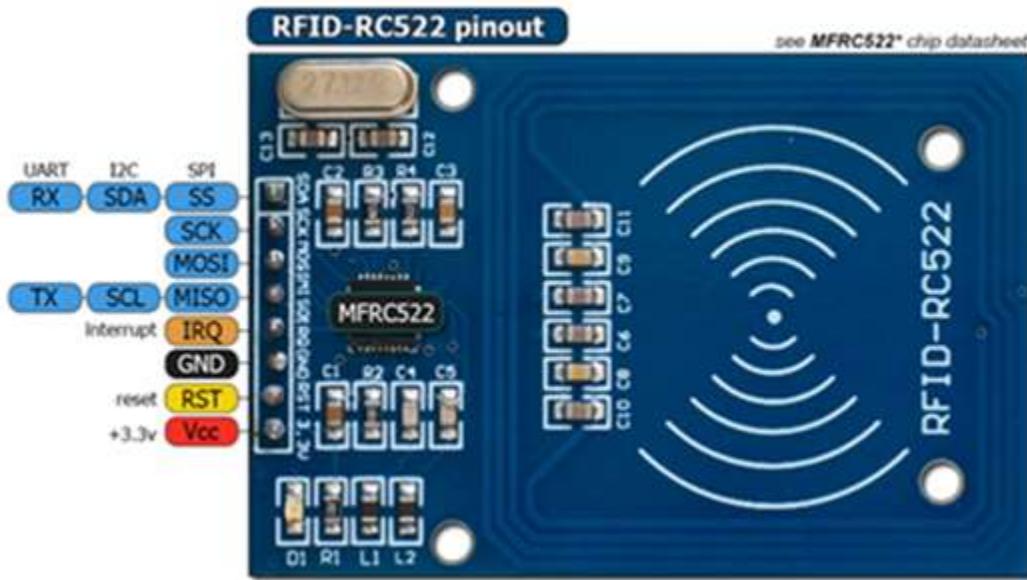
Dimenzije: 40mm × 60mm



RFID IDENTIFIKATORI

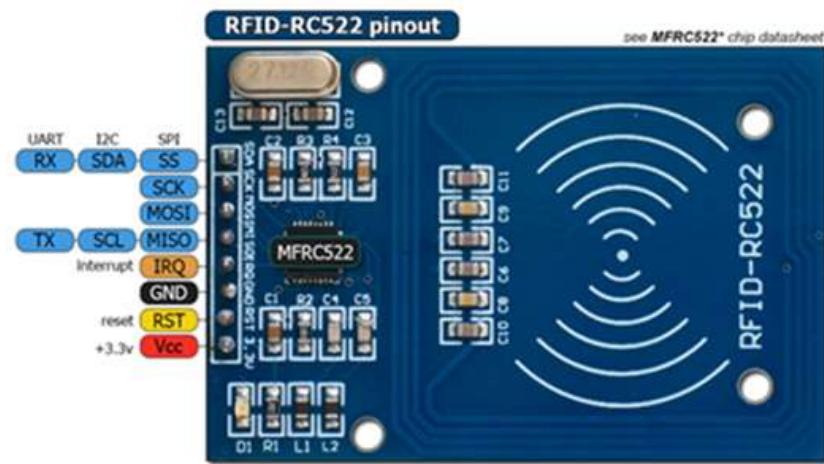
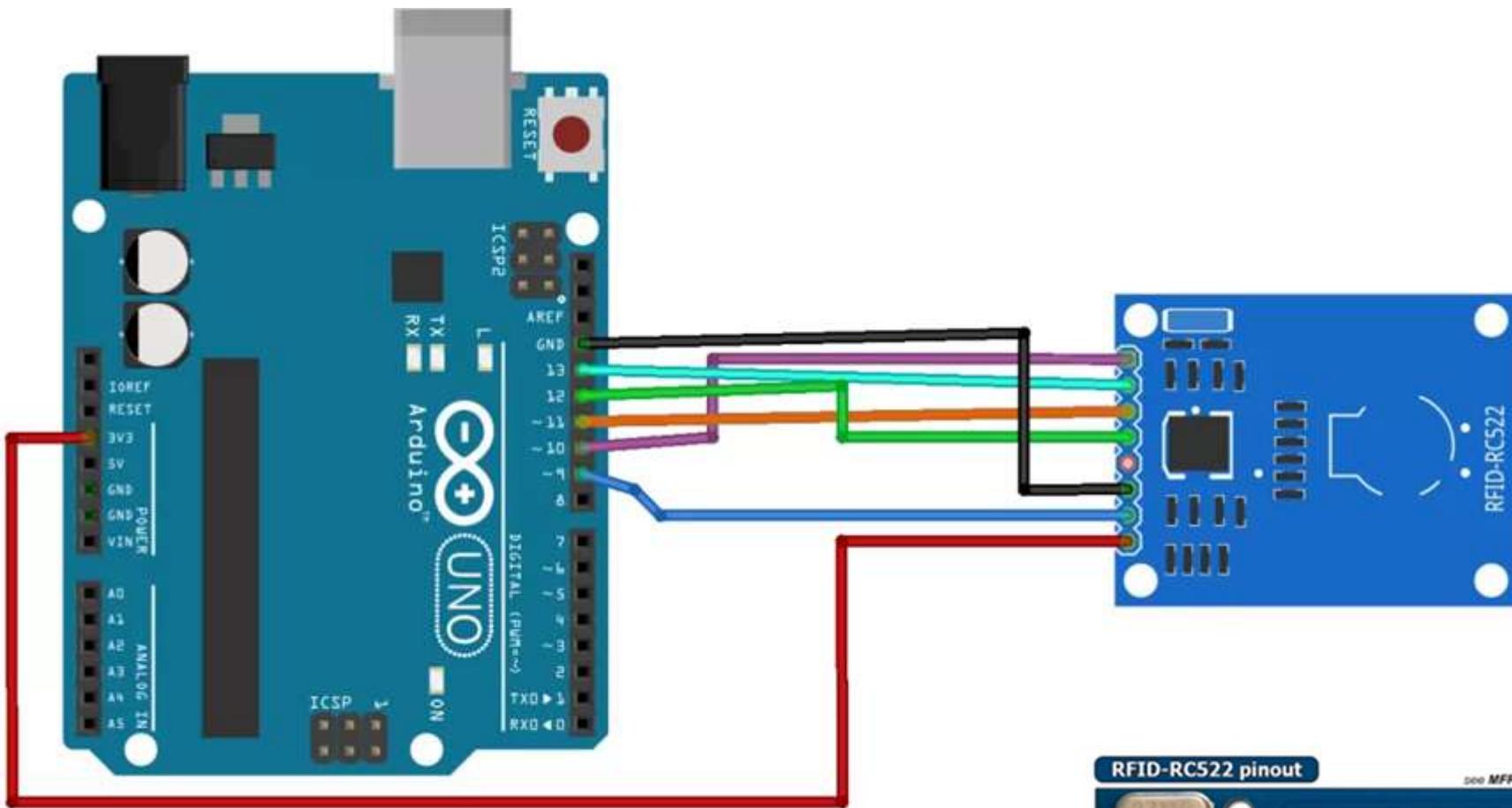


POVEZIVANJE SA ARDUINO UNO



| Pin čitača | Pin Arduino Uno |
|------------|-----------------|
| SDA | 10 |
| SCK | 13 |
| MOSI | 11 |
| MISO | 12 |
| IRQ | nepovezano |
| GND | GND |
| RST | 9 |
| 3.3V | 3.3V |

POVEZIVANJE SA ARDUINO UNO



INSTALIRANJE BIBLIOTEKE

Za rad sa MFRC522 čitačem iz Arduino razvojnog okruženja potrebno je instalirati biblioteku, koja se može preuzeti sa linka:

<https://github.com/miguelbalboa/rfid>

Za instaliranje biblioteke potrebno je odraditi sljedeća tri koraka:

Dodajte biblioteku selektovanjem Add ZIP u SKETCH meniju, INCLUDE Library opcija.

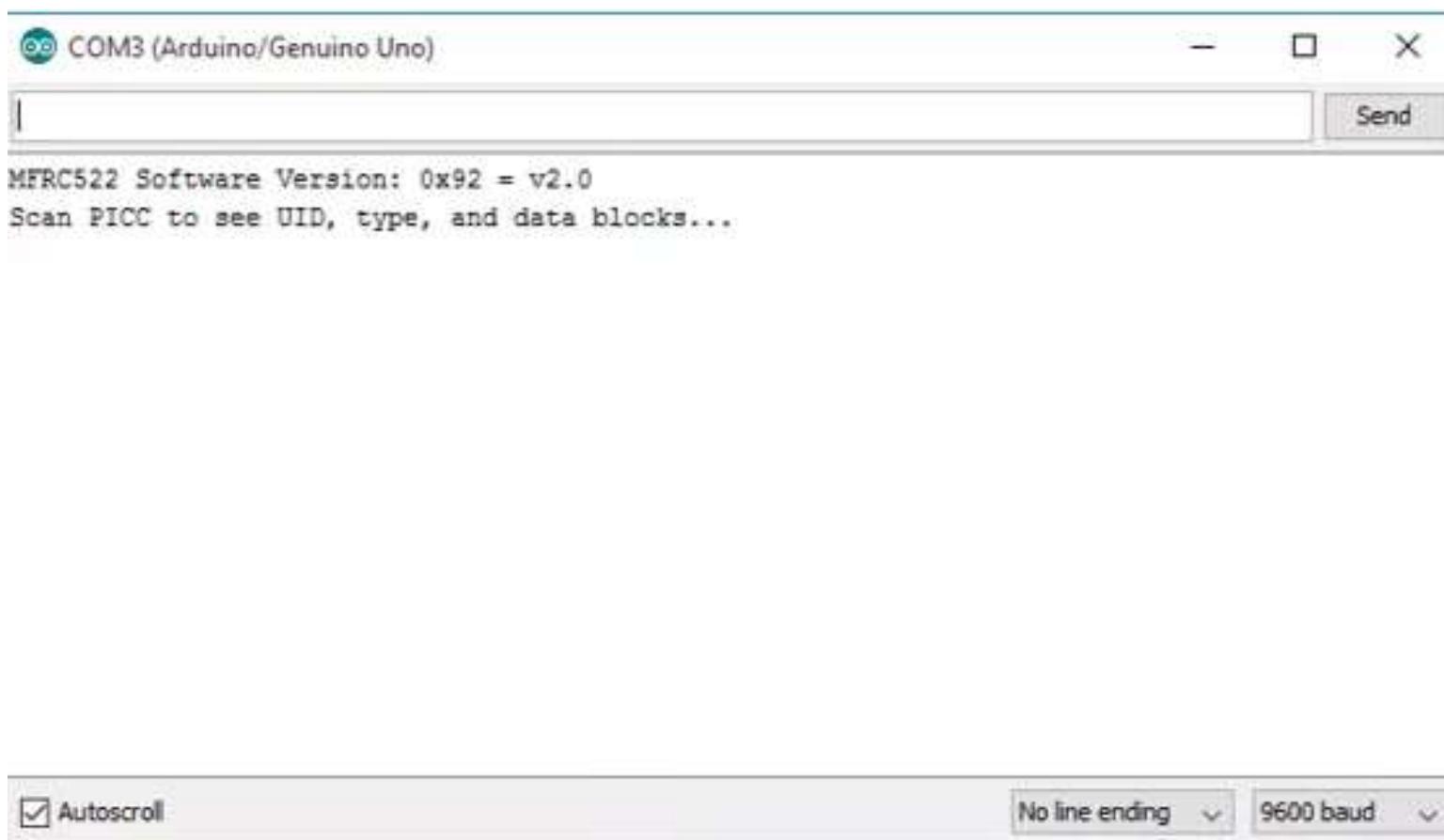
Otvoriti arduino IDE

Zatim, selektovati .zip fajl sa lokacije na kojoj je fajl sačuvan.

Detaljnije informacije o biblioteci mogu se vidjeti na adresi:

http://www.neilkolban.com/esp32/docs/cpp_utils/html/class_m_f_r_c522.html
<https://github.com/miguelbalboa/rfid/blob/master/doc/rfidmifare.doc>

DUMPINFO



DUMPINFO

COM3 (Arduino/Genuino Uno)

MFRC522 Software Version: 0x92 = v2.0
Scan PICC to see UID, type, and data blocks...

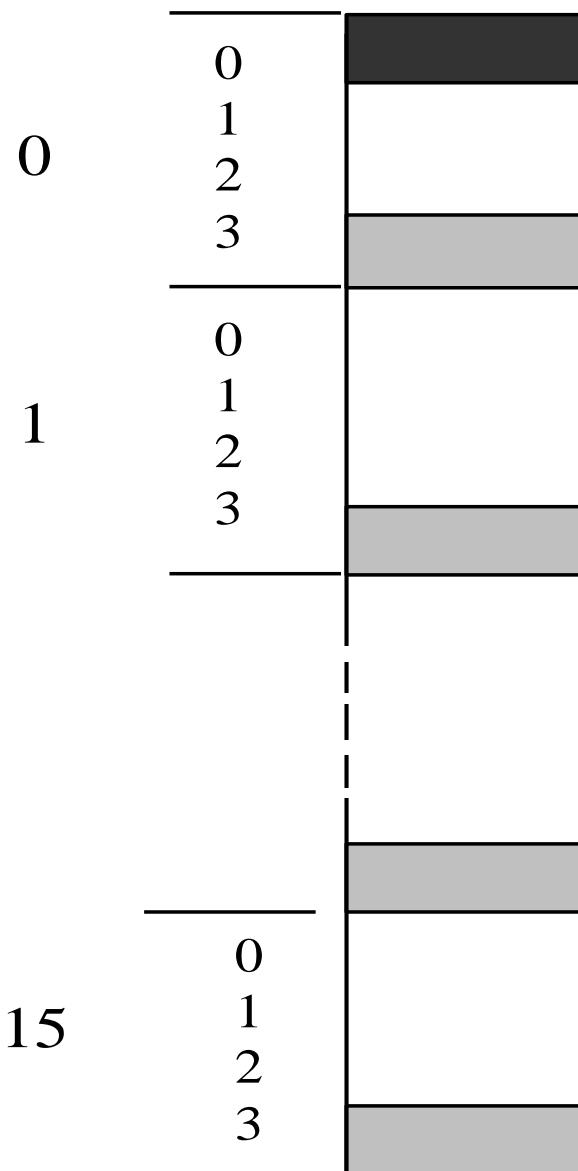
Card UID: BD 31 15 2B

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 | [0 0 1] | |
| | 62 | 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 | [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 | 00 | FF | 07 | 80 | 69 | 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 | 00 | FF | 07 | 80 | 69 | 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 | [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 | [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] | |
| | 44 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | [0 0 0] | |
| 10 | 43 | 00 | 00 | 00 | 00 | 00 | 00 | FF | 07 | 80 | 69 | FF | FF | FF | FF | FF | [0 0 1] | |
| | 42 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | [0 0 0] | |
| | 41 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | [0 0 0] | |
| | 40 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | [0 0 0] | |
| 9 | 39 | 00 | 00 | 00 | 00 | 00 | 00 | FF | 07 | 80 | 69 | FF | FF | FF | FF | FF | [0 0 1] | |
| | 38 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | [0 0 0 1] | |

MIFARE MF1ICS50 KARTICA

Blok dijagram EEPROM-a kartice



Kontrolni blok

Blok za podatke
proizvođača

Blok podataka

16 sektora sa po četiri bloka.

Jedan blok sadrži 16 bajtova.

MIFARE MF1ICS50 KARTICA

Kontrolni blok

| Bit No. | 7 6 5 4 3 2 1 0 | X ... Sector No. (0 to 15) Y ... Block No. (0 to 3) |
|----------|------------------------|--|
| Byte No. | | |
| 0 | | |
| 1 | | |
| 2 | KEYSECXA | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | ACCESS CONDITIONS | bit# 7 6 5 4 3 2 1 0 → C2X3_b C2X2_b C2X1_b C2X0_b C1X3_b C1X2_b C1X1_b C1X0_b → C1X3 C1X2 C1X1 C1X0 C3X3_b C3X2_b C3X1_b C3X0_b → C3X3 C3X2 C3X1 C3X0 C2X3 C2X2 C2X1 C2X0 → BX7 BX6 BX5 BX4 BX3 BX2 BX1 BX0 |
| 8 | | |
| 9 | | |
| 10 | | _b stands for inversion; e.g. C1X0_b=INV(C1X0) |
| 11 | | |
| 12 | KEYSECXB (optional) | |
| 13 | | |
| 14 | | |
| 15 | | |

C1XY do C3XY, Y $\in\{0,1,2,3\}$ – bitovi kojima se određuju ulovi pristupa svakom pojedinom bloku sektora.

Upisani su dva puta radi sigurnosti.

MIFARE MF1ICS50 KARTICA

Uslovi pristupa kontrolnom bloku

| C1X3 | C2X3 | C3X3 | KEYSECXA | | ACCESS COND. | | KEYSECXB | |
|------|------|------|----------|-------|--------------|-------|----------|-------|
| | | | read | write | read | write | read | write |
| 0 | 0 | 0 | never | key A | key A | never | key A | key A |
| 0 | 1 | 0 | never | never | key A | never | key A | never |
| 1 | 0 | 0 | never | key B | key A B | never | never | key B |
| 1 | 1 | 0 | never | never | key A B | never | never | never |
| 0 | 0 | 1 | never | key A | key A | key A | key A | key A |
| 0 | 1 | 1 | never | key B | key A B | key B | never | key B |
| 1 | 0 | 1 | never | never | key A B | key B | never | never |
| 1 | 1 | 1 | never | never | key A B | never | never | never |

key A|B znači ključ A ili kluč B. Kada se **key B** može pročitati **ne** može služiti kao ključ.

Uslovi pristupa blokovima podataka

| C1XY | C2XY | C3XY | read | write |
|------|------|------|---------------------|----------------------|
| 0 | 0 | 0 | keyA B ¹ | key A B ¹ |
| 0 | 1 | 0 | keyA B ¹ | never |
| 1 | 0 | 0 | keyA B ¹ | key B ¹ |
| 1 | 1 | 0 | keyA B ¹ | key B ¹ |
| 0 | 0 | 1 | keyA B ¹ | never |
| 0 | 1 | 1 | key B ¹ | key B ¹ |
| 1 | 0 | 1 | key B ¹ | never |
| 1 | 1 | 1 | never | never |

Predefinisane vrijednosti

- C1X0, C2X0, C3X0 = 0 0 0 block 0 (data block)
- C1X1, C2X1, C3X1 = 0 0 0 block 1 (data block)
- C1X2, C2X2, C3X2 = 0 0 0 block 2 (data block)
- C1X3, C2X3, C3X3 = 0 0 1 block 3 (Sector Trailer)

MIFARE MF1ICS50 KARTICA

Proizvođački blok – BLOK 0

Prvi blok memorije kartice je rezervisan za podatke proizvođača, kao što je 32-bitni serijski broj. Ovaj blok se može samo čitati.

| byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | byte |
|------|---------------|---|---|---|----|---|---|---|---|-------------------|----|----|----|----|----|----|------|
| | Serial number | | | | CB | | | | | manufacturer data | | | | | | | |

CB: “serial number check byte”

CB = byte 0 ^ byte 1 ^ byte 2 ^ byte 3 (^ ... XOR)

Blokovi podataka

Sadrže promjenjive podatke.

(blocks 1,2 / 4,5,6 / 8,9,10 / 12,13,14 / 16,17,18 / 20,21,22 / 24,25,26 / 28,29,30 / 32,33,34 / 36,37,38 / 40,41,42 / 44,45,46 / 48,49,50 / 52,53,54 / 56,57,58 / 60,61,62)

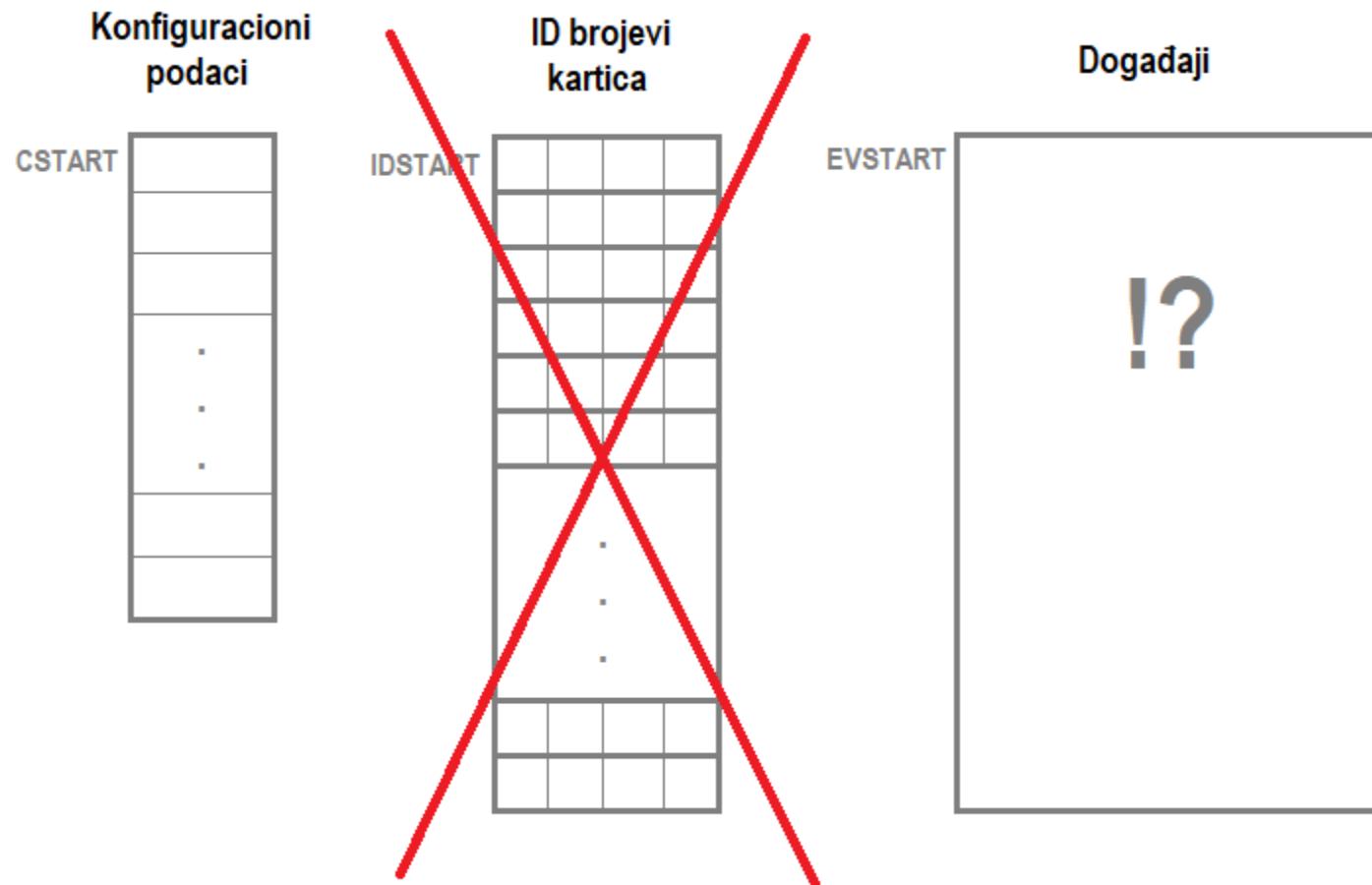
Kontrolni blokovi

| byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | byte |
|------|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|------|
| | | | | | | | FF | 07 | 80 | xx | | | | | | | |

(blocks 3 / 7 / 11 / 15 / 19 / 23 / 27 / 31 / 35 / 39 / 43 / 47 / 51 / 55 / 59 / 63)

Vrijednost 9-tog bajta u svakom kontrolnom bloku nije definisana.

ID u EEPROM IDENTIFIKATORA



READ WRITE EXAMPLE

ReadAndWrite | Arduino 1.8.12

File Edit Sketch Tools Help

New Ctrl+N
Open... Ctrl+O
Open Recent
Sketchbook Examples
Close Ctrl+W
Save Ctrl+S
Save As... Ctrl+Shift+S
Page Setup Ctrl+Shift+P
Print Ctrl+P
Preferences Ctrl+Comma
Quit Ctrl+Q

Robot Control
Robot Motor
SD
Servo
SpacebrewYun
Stepper
Temboo
RETIRED

Examples for Arduino Uno
EEPROM
SoftwareSerial
SPI
Wire

Examples from Custom Libraries
Adafruit Fingerprint Sensor Library
Adafruit Unified Sensor
Arduino-LiquidCrystal-I2C-library-master
DHT sensor library
IRremote
LiquidCrystal_I2C
MFRC522
AccessControl
ChangeUID
DumplInfo
firmware_check
FixBrickedUID
MifareClassicValueBlock
MinimallInterrupt
Ntag216_AUTH
ReadWrite
ReadNUID

```
/*
 * Main loop.
 */
void loop() {
    // Reset the loop
    if ( ! mfrc522.P
        return;

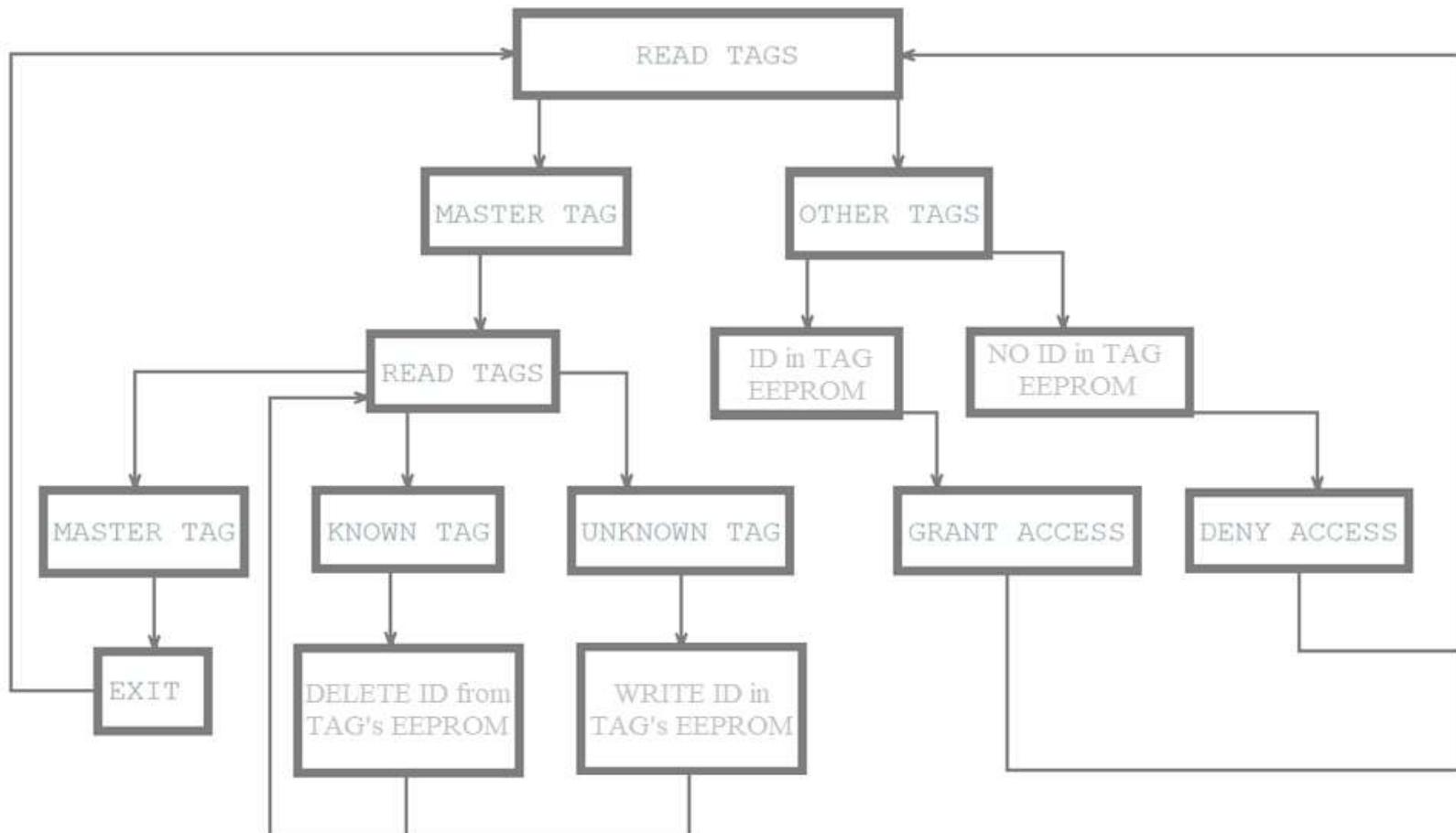
    // Select one of
    if ( ! mfrc522.P
        return;

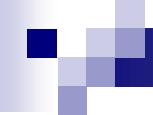
    // Show some det
    Serial.print(F("
dump_byte_array(mfrc522.uid.uidByte, mfrc522.u
Serial.println();
Serial.print(F("PICC type: "));
MFRC522::PICC_Type piccType = mfrc522.PICC_Get
Serial.println(mfrc522.PICC_GetTypeName(piccTy

    // Check for compatibility
}
```

DIJAGRAM TOKA

Modifikovanje skeča sa pedhodnog časa, tako da se uslov pristupa nalazi u bloku EEPROM-a kartice.





ZA VJEŽBU

1. Uslov pristupa na strani čitača, čuvati u konfiguracionom fajlu EEPROM-a. Preuzeti ga iz EEPROM-a neposredno po startovanju uređaja i prikazati na serijskom monitoru. Maksimalna dužina uslova pristupa je 16 bajtova **(2-1 poen)**.
2. Uslov pristupa zadavati putem serijskog monitora **(2-1 poen)**.

I ovoga puta poeni riješenih zadataka se sabiraju!