R-DB001 (RFID 13.56 MHz Development Board) Manual

H-2 Technik UG (haftungsbescgränkt)

www.h-2technik.com

Version Information

Version	Date	Modified By	Introduction
1.0	11.2017	Kim	

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1. Overview

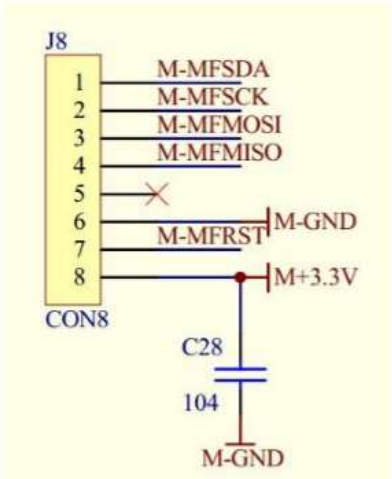
This development board is suitable for developing all of applications using 125KHz (ID), 13,6MHz (IC), 900MHZ RFID cards. The 13.6 MHz card reader module is based on MFRC522, which is delivered in shipping package. The other two kinds of module (reader) for 125K, 900MHz are optional.

The Type of MCU on based board is STC89LE52RC (8bit) processor (Documentation to download). On base board there are rich of peripheral resources:1x relay,1xLED, 1xbuzzer, 4x4 matrix keyboard, 1x reset button, LCD interface, PL2303 (USB to UART) is integrated as programming interface. In addition, there is an IoT (10-pin) interface to facilitate data exchange with our other IoT modules. Output can be displayed in LCD12864 which is delivered in shipping package too.

1.1 STC89LE52RC Microprocessor

STC89LE52RC is 8051 based microcontroller with 6T (6-Clock) high-speed core, dual DPTR, 32-36 I/O lines, 3 Timer/Counters, 8Kbytes flash ROM, 512 bytes data RAM, on-chip EEPROM, UART, WDT, IST/IAP.

1.2 RC522 IC Module

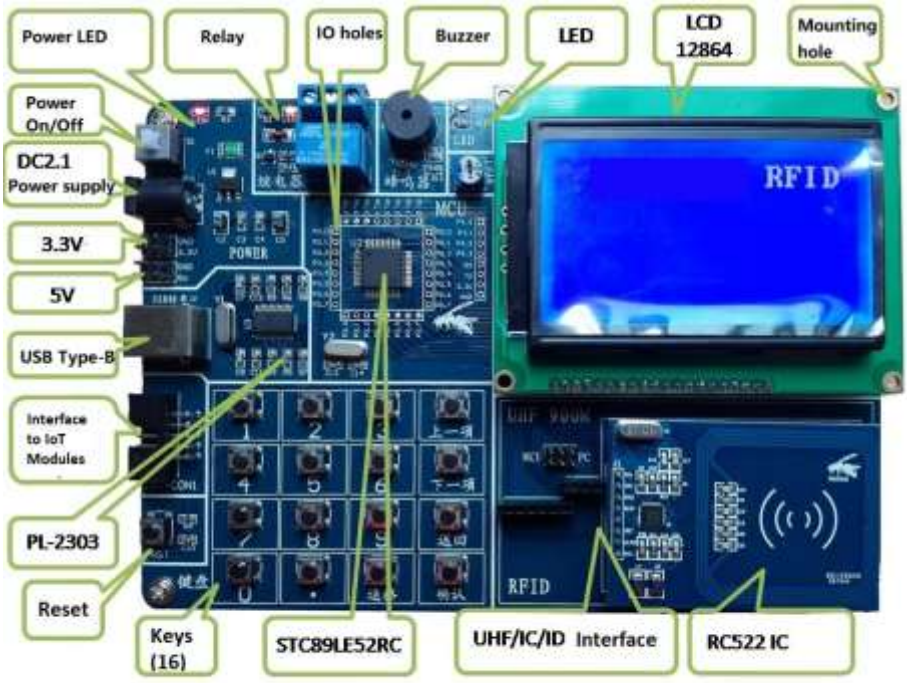


Pins Definition

Features	
Size	6 x 4 cm
Chip	RC522
Working current	13~26mA (3.3V DC)
Idle current	10~13mA(3.3V DC)
Sleep current	<80 uA
Peak current	<30mA
Working frequency	13.56MHz
Reading distance	0~60 mm(mifare1 Card)
Interface	SPI
Transmission rate	max. 10Mbit/s
Type of RFID Card	Mifare1 S50; Mifare1 S70; Mifare UltraLight; Mifare Pro, ;Mifrae Desfire

1.2 Base Board

- Size of base board: 18x12.5cm
- IC Module: RC522 (13.56MHz) - ID and UHF Module are optional
- USB TTL function: PL-2303
- Power supply: 5V DC (USB Type-B and DC2.1)
- Microcontroller: STC89LE52RC
- LCD (12864) interface
- IOs: all IOs of Microcontroller available
- Resource: 16 x Matrix-Key, 1 Reset Button, 1 x Relay, 1 x Buzzer
- Indicator: Power LED
- Interface to other IoT Modules (z.B. Bluetooth, Zigbee)
- Compatible with UHF Module, which is optional



2 Software Installation

2.1 IDE

To programming on MCU STC89LE52RC, which is completely compatible with 8051 CPU, you need to install <Keil uVersion 4> or upper version. Download link as following:
https://www.keil.com/demo/eval/armv4.htm

2.2 PL2303 Driver

Downloading application program is achieved through integrated PL2303. The driver of PL2303 has to be installed (on windows OS) firstly.

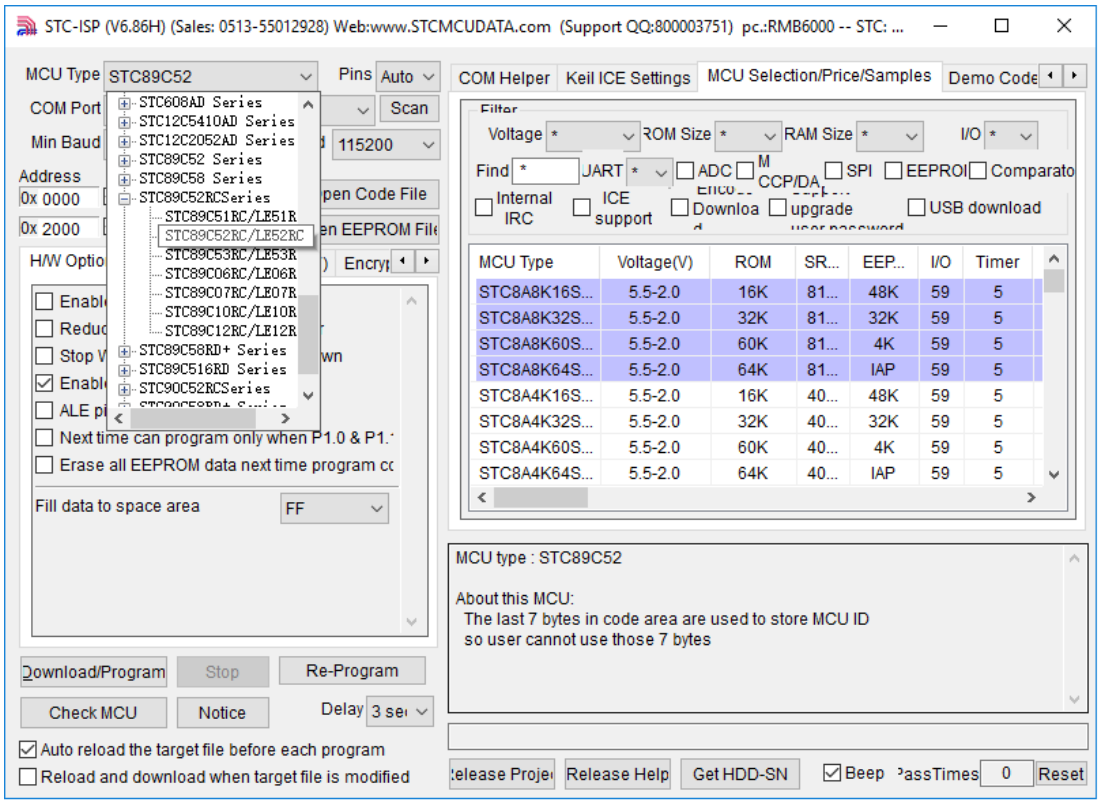
In shipping package there is USB Cable, which is used to download program as well as power supply.

PL2303 driver download link as following:

https://www.h-2technik.com/online/webee/RFID/Tool/PL2303_driver.exe

2.3 STC Program downloader

User program can be downloaded to target MCU (STC89LE52RC) using “STC-ISP-xxx” tool, which is standard downloader from the same producer as MCU.



You can download this tool from following link: http://www.stcmicro.com/rar/stc-isp6.85.rar

3 How to download user program

3.1 Prepare download

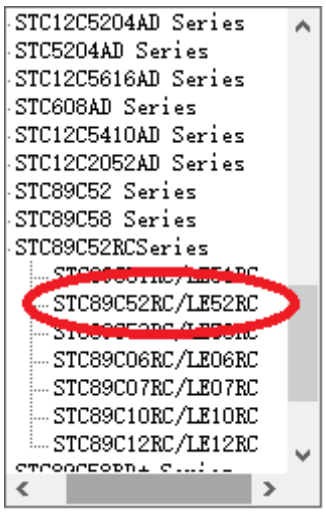
After user application has been compiled successfully in “Keil uVersion”, Hex or bin file are generated in project folder.

If PL2303 driver has been installed, the download cable (in shipping package) is connected to computer as well, you will find the COM port number in device manager. Please note this COM port.

3.2 Downloading user application

1.)Now you can start “STC-ISP-xxx.exe”.

2.)In dropdown box “MCU Type” you select MCU model.

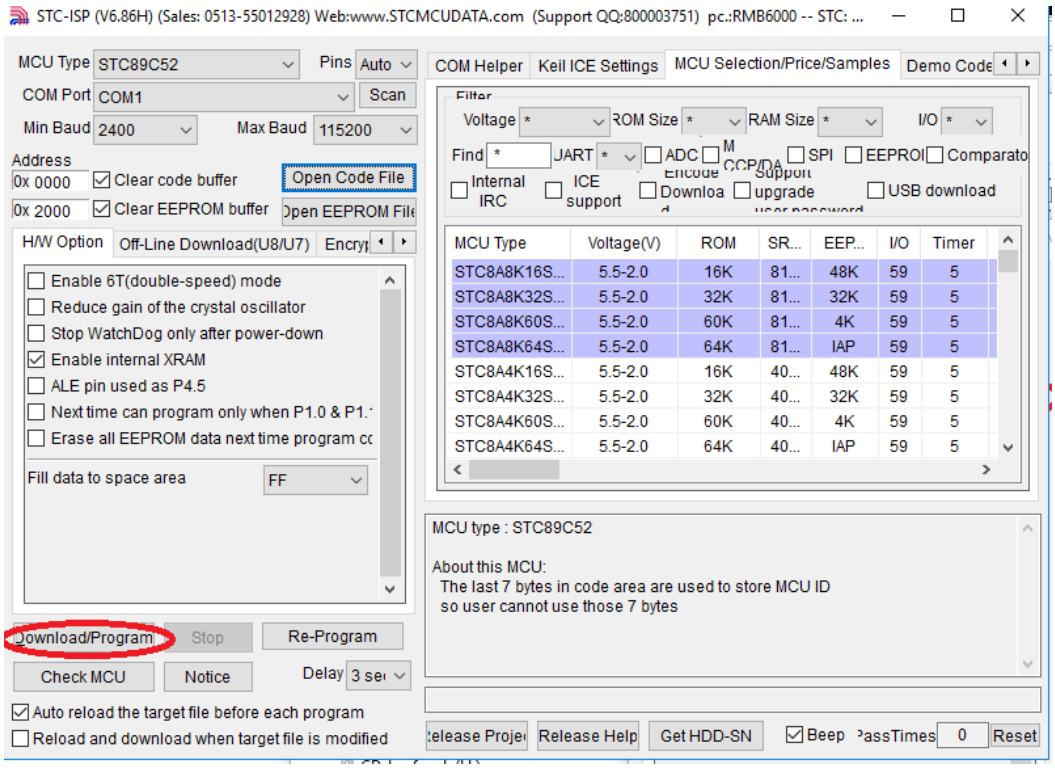


3.)From dropdown box “Select COM” you can select the COM port which you noted in step 3.1.

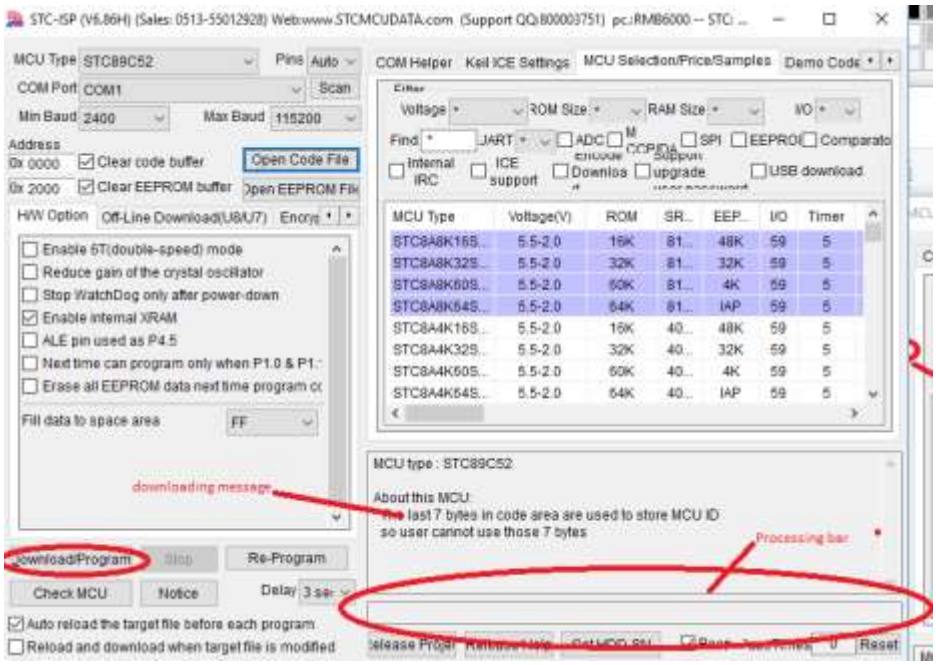
4.) clicking button “open code file” to select “Hex” or “Bin” file from project folder which is to be downloaded.

5.) To make sure the based board is switched off.

6.) Clicking “Download/Program” to start downloading.



7.) Please switch on base board. The downloading is now starting. The processing bar shows status of downloading. Downloading message shows in a message box as well.



***Notice: If project is rebuildet, please repeat from step 4.) to perform new download.**

There is a video clip (https://youtu.be/5krYMdSCbqI) in YOUTUBE indicating this process.

4 Application example

4.1 Switch on/off Relay

In this example, the key „1“ is used to trigger relay, key „2“ resets relay. LED shows the status of relay.

You can download complete project (with detail comments) from link https://www.h-2technik.com/online/webee/RFID/example/led.zip.

In this sample project, some important files are described below shortly:

- led.c → main function
- beep.c→control output (e.g. Relay on/off, led on/off)
- key.c→detecting key stroke

Program starts from main function in “led.c”. After about 500ms delay and hardware self-testing (with yellow background in source code below), it begins an infinite loop waiting for key stroke. If Key “1” is pressed, relay and led are turned on; if Key “2” is pressed, relay and led are resetted.

```
void Delay_ms(int ms)          //delay ±xms
{
   unsigned int i,j;
            for(i=ms;i>0;i--)
              for(j=220;j>0;j--);
}
void init_all(void)   //init
{
            EA = 0;             //disable interrup
            //init_timer(); //not used
            EA = 1;             //enable interrupt
}
void main()
{
             unsigned char key;
            Delay_ms(500);   //stable hardware
            init_all();    //init all resources
            relay_OFF();         //close relay
            LED_BLINK_1();    //led test
            beep1();     //beep test
            while(1){
                        key=key_scan(); //detecting key board operation
                        if  (key==1) {  //key "1" pressed
                                    relay_ON();   //trigger Relay
                                    LED_ON();     //turn on LED
                        }
                        if  (key==2) {  //key "2" pressed
                                    relay_OFF();  //reset Relay
                                    LED_OFF();    //turn off LED
                        }

            }

}
```

4.2 Testing LCD

In this example, the key value is to be displayed in LCD after it is pressed. The complete project package can be downloaded from link https://www.h-2technik.com/online/webee/RFID/example/lcd.zip.

LCD displays key values as below (as number key is being pressed, LED is turned on for 1 second):

Comparing to first led example, there are two new source files “lcd12864.c” and “lcd12864.h”.

The method that detects key pressed event is “key_scan”. If one of number keys has been pressed (0~9), its value is displayed in LCD by calling method “display3”.

```
void display3(uchar a,uchar b,uchar c)

{

    lcd_pos(a,b);    //address

    lcd_wdat(c);     //display text

}
```

“lcd_wdat” and “write_cmd” are two very important methods in file “lcd12864.c”. All operation on LCD use these two methods. You can modify them in your application.

4.3 Read RFID (IC) Card

As last example project, we show you how to read the IC Card Serial-Nr using RC522 Module, which is shipped in package. The complete project package can be downloaded from link https://www.h-2technik.com/online/webee/RFID/example/RFID_read_card.zip.

Please connect the RC522 card shipped in package to the main board (8 pins-female connector marked IC 13M). In shipping package, there are two IC Cards (with different Serial number) for testing.

After program is downloaded to MCU, main board is switched on, you can put one of IC card on the RC522 Module. The Card Serial number is read out and displayed on LCD with acoustic signal (see picture below).

The important methods of RC522 module are collected in file “rc522.c”.

Following piece code shows basic procedure of how to implement this goal.

→detecting reachable RFID Tag (method: PcdRequest)

→performing anti-collision and selecting card (method: PcdAnticoll)

→other operation (e.g. reading/writing data)

```
INT8U IC_READ( void )
{
  INT8U ID_ASC[8],i;
        //searching reachable card, its type returned
       if( PcdRequest( PICC_REQIDL, Card_type ) != MI_OK )
        {
                //searching reachable card, its type returned
                if( PcdRequest( PICC_REQIDL, Card_type ) != MI_OK )
                { return FALSE;
                }
        }
        if( PcdAnticoll( Card_SN ) != MI_OK ) //anti-collition, return card SN
        {       bWarn = 1;

                return FALSE;   }

        bPass = 1;
        send_bytes(Card_type,2);
        send_bytes(Card_SN,4);
        for(i=0;i<4;i++) //convert Card ID to ASCII

        {

         if(Card_SN[i]/16>9)     ID_ASC[i*2]=Card_SN[i]/16+'7';

           else ID_ASC[i*2]=Card_SN[i]/16+'0';


          if(Card_SN[i]%16>9)   ID_ASC[i*2+1]=Card_SN[i]%16+'7';

           else ID_ASC[i*2+1]=Card_SN[i]%16+'0';

        }

        display2(3,0,"ID: ",4); //display Card number

        display2(3,2,ID_ASC,8);

        return TRUE;
`
```

4.4 Other example project

If other example projects or source code are required, please contact us contact@h-2technik.com.