

RF-2423U

2.4G High-Performance Low-Power Wireless USB MCU Module

1、 Introduction

After RF-2400 cost-effective wireless modules, INHAOS launches the RF-2410 series modules. RF-2410 series modules is a SOB (System On Board) module based on RF-2400 modules adding MCU. RF-2410 series modules is a cost-effective module with more powerful and convenient RF solutions.

[Now we upgrade RF-2410 to RF-2423, RF-2423 use BK2423 SOC, the biggest difference is BK-2423 support 250Kbps air rate which can be improve RF performance and reduce power consumption.](#)

RF-2423U uses Silicon labs C8051F321 MCU as the main control unit. To facilitate the users to update firmware, the RF-2423U has a built-in USB Bootloader, the user can download the application firmware very easily via USB.

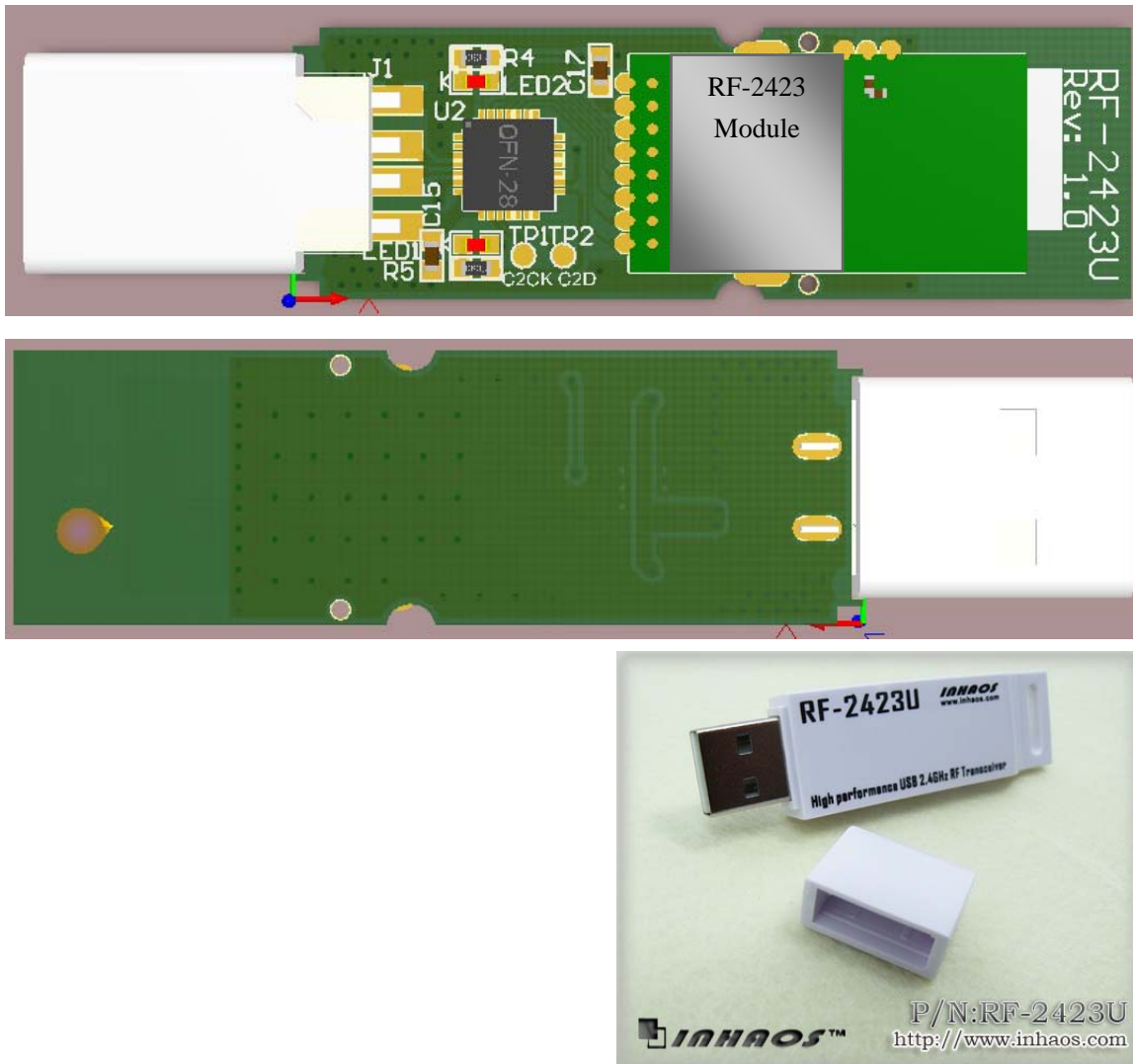
[The bootloader is suitable both RF-2410U and RF-2423U.](#)

RF-2423U is major for providing a channel connected to a PC of INHAOS RF-2423 products. RF-2423U can be widely used for data transmission, wireless data collection and other fields. Users can even directly use RF-2423U as part of the product to solve the wireless data and PC connectivity problems.

2、 Feature

- Adopt BK-2423 chip, can be connected to any of RF-2400/RF-2410 and RF-2423 series products
- Adopt C8051F321 MCU, 25MIPS, 16KB Flash, 1280B RAM
- The Nano Dongle Compact design for easy portability
- Built-in Bootloader, you can download the firmware directly via the USB
- Built-in 3 bytes UID (Unique ID) for each units and user can used the ID as a product identification
- Matured C8051F321 development environment, with rich reference resource, and easy development
- INHAOS will release a number of utility application FW for this module
- High cost-effective

3、 Physical picture of RF-2400 module



4、 Applications

- Wireless serial port
- Adding RF function on existing system
- Wireless audio and video transmission
- Wireless DAQ (data acquisition)
- Low-cost, low-power wireless network
- Wireless sensor nodes (WSN)

5、Schematic Circuit Diagram

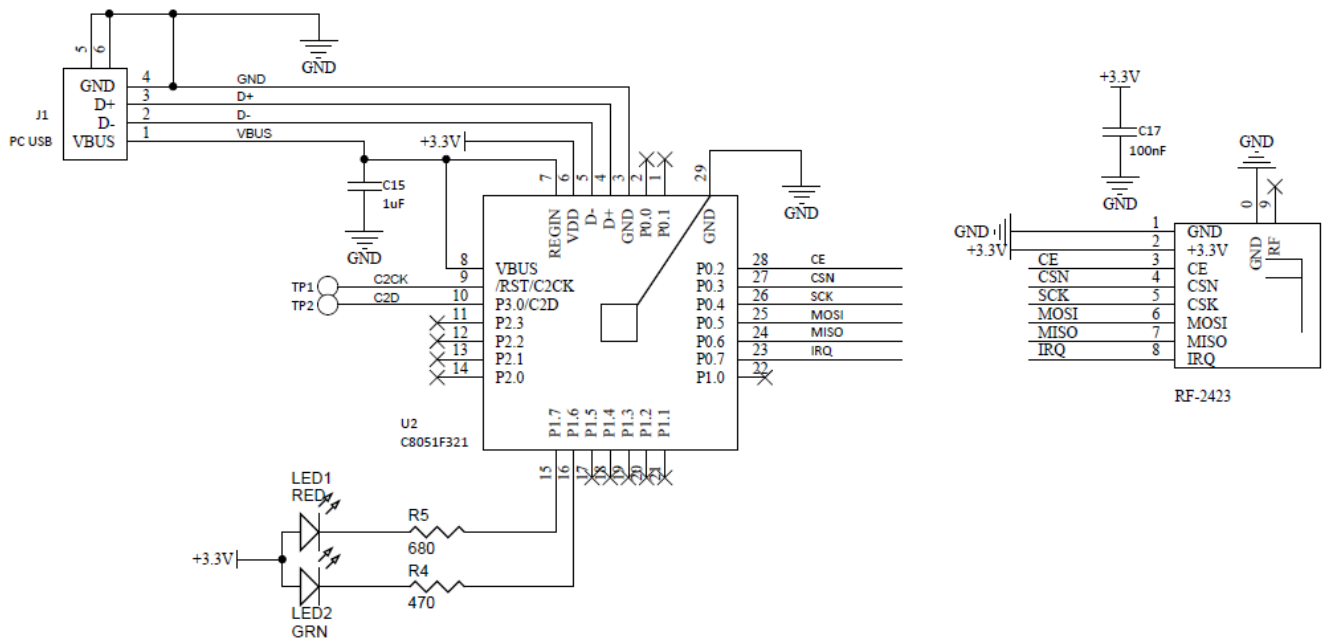


Figure 6-1: RF-2410U schematic circuit diagram

6、Keil C51 environment option

Standard 51 core of C8051, development environment as follows:

- o Software compiling environment: KeilC51
- o Emulator: U-EC6

Bootloader firmware had used some flash storage, the mapping as below:

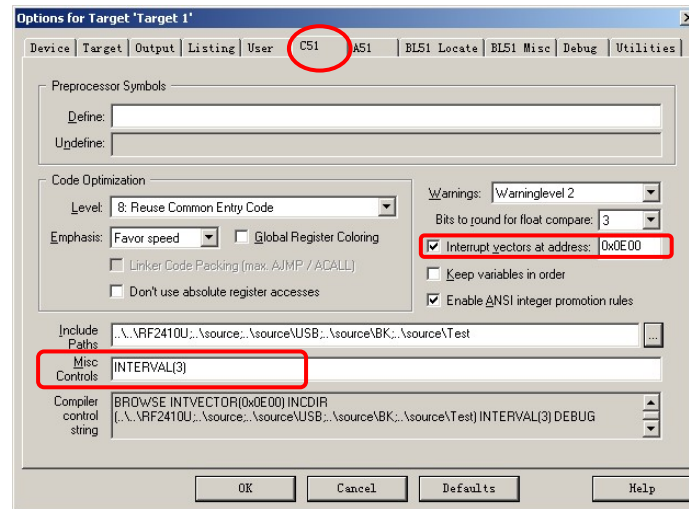
Bootloader Block1	: 0x0000-0x0DFF
APP FW Interrupt Vector	: 0x0E00-0x0E3F
APP FW	: 0x0E40-0x3BF6
APP FW USB Interrupt Vector	: 0x3BF7-0x3BF9
UID	: 0x3BFA-0x3BFC
APP FW RESET Vector	: 0x3BFD-0x3BFF
Bootloader Block 2	: 0x3C00-0x3DFE

That means user need to limit App firmware within 11,703 Bytes (0x0E40 – 0x3BF6).

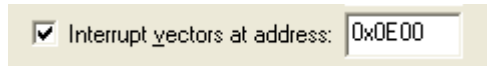
0 x 3DFF	Reserve
0 x 3DFE	Bootloader Block 2
0 x 3C00	APP FW RESET Vector
0 x 3BFD	UID
0 x 3BFC	APP FW USB Interrupt Vector
0 x 3BFA	APP FW
0 x 3BF9	APP FW Interrupt Vector
0 x 3BF7	APP FW
0 x 3BF6	APP FW
0 x 0E40	APP FW Interrupt Vector
0 x 0E3F	APP FW
0 x 0E00	APP FW Interrupt Vector
0 x 0DFF	Bootloader Block 1
0 x 0000	Bootloader Block 1

User must to do some special setting when programming App firmware , to suit the above mentioned address mapping, for example with KeilC51 , the compiling environment option as below:

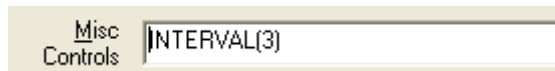
■ C51page option:



Checked “Interrupt Vector At Address” box, and set to “0x0E00”;

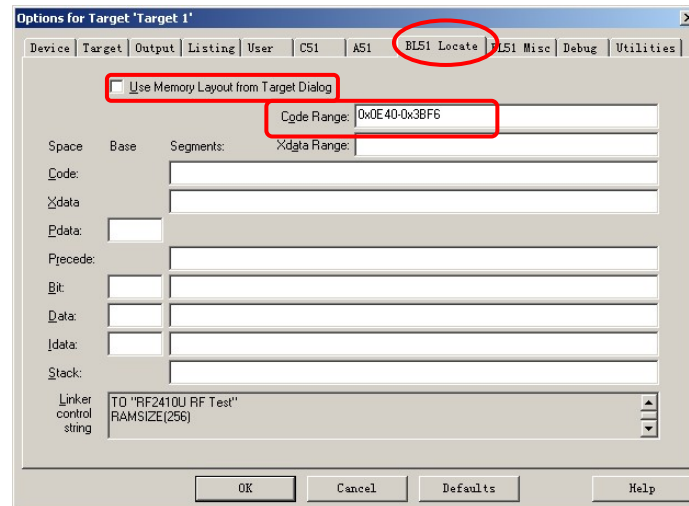


Set “MISC Controls” to: “INTERVAL(3)”

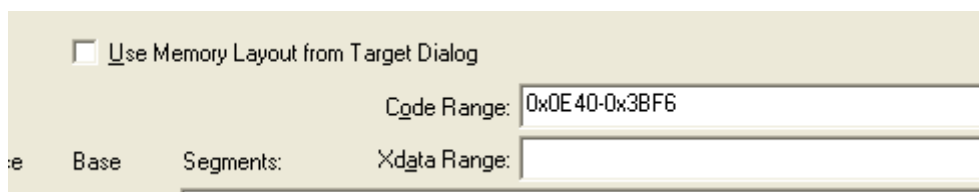


This option will point all of the interrupt vector start from address 0x0E00 and set the interval to 3 bytes.

■ BL51 Locate page option:



Uncheck “Use Memory Layout from Target Dialog” box, fill “Code Range” with “0x0E40-0X3BF6”.

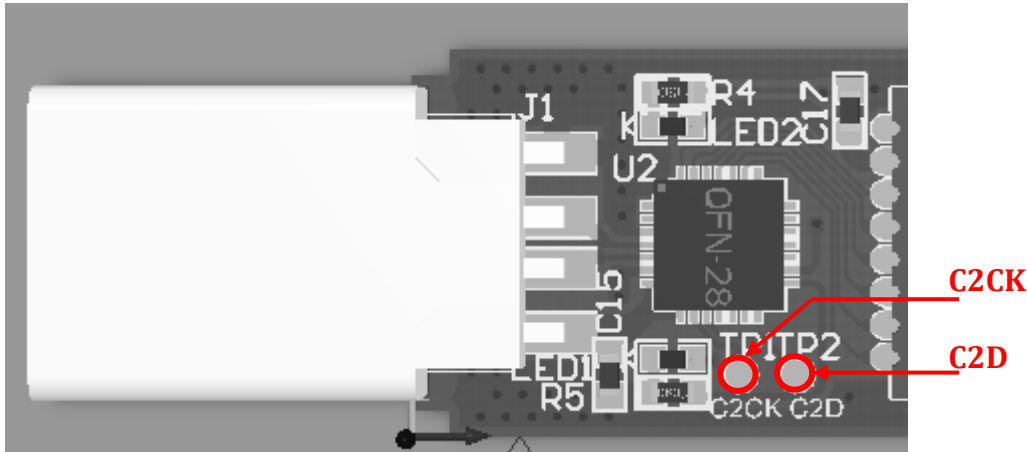


This option will limit App firmware address range to "0x0E40-0xEBF6".

7、 Emulator (U-EC6) setup

Standard 51 core of C8051, development environment as follows:

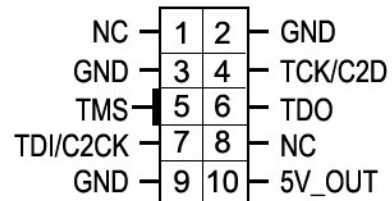
- o Software compiling environment: KeilC51
- o Emulator: U-EC6



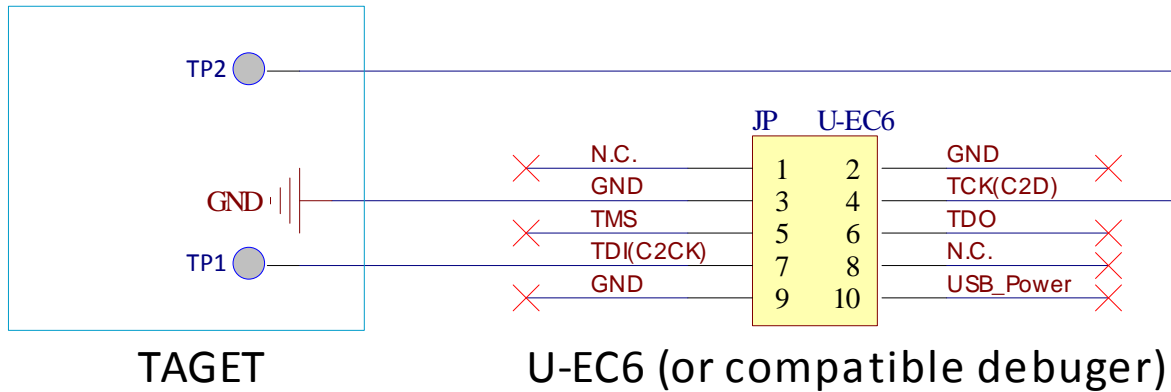
The picture shows the C8051F321 programming interface. If you need to simulate, you can solder a cable on the test point of the PCB, and connect to the emulator to achieve simulation.

By using the Connector of 10Pin (2x5Pin) ,U-EC6 connects to the target board, which 10Pin defined as follows:

Pin #	Description
1,8	Not Connected
2,3,9	GND (Ground)
4	TCK (C2D)
5	TMS
6	TDO
7	TDI (C2CK)
10	USB Power



When using, the C2 interface (C2D, C2CK, GND) is for software debugging and programming. See the relationship between the target board and debugger



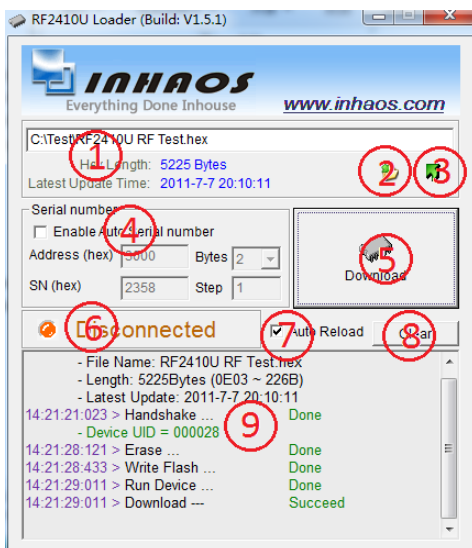
Notes:

we will not release bootloader firmware, so be careful when using with emulator. If you erase the bootloader firmware, you can send the unit back to us, and we will burn-in a new bootloader .With the transportation fee charges on you.

8、 Use of Bootloader

RF-2423U has a built-in Bootloader for user to download application firmware. Bootloader communicates with PC via HID. after RF-2423U power on, MCU will first enter the bootloader area, and waits 2 seconds after HID enumeration.If no PC command within 2 seconds,it will jump to the application area to run user program.

Before downloading new firmware, you need to start the PC software "RF-2410U Loader", set the parameters and click "Download" button, and then plug the RF-2423U into PC, to ensure that the RF-2423U can receive the download command when staying in boot.



RF-2423U Loader software provides a PC-download interface, RF-2423U Loader runs on the Windows.

1, Hex File information (File Name / length / last update)

2, Open Hex, click this button to browse and open a new Hex file.

3, Reload, click this button to reload the Hex file with shown path.

4, Serial number setting, In the case of mass programming, the user may want to burn each product a unique serial number in a fixed location of the program. RF-2423U Loader allows the user to set the address, length, start and step values of the serial number. If this option is checked, each time a successful download, the serial number will be increase by step value.

Each unit have it's own UID, user also can read the UID by specified address and used for serial number , in this case please uncheck the "Enable Auto serial number" box.

5, Download, When pressing this button, the program began to download data to the RF-2423U.

6, Device status, after the device plug into PC, it will entry bootloader area first and stay few seconds(approximately 2s after bootloader enumerated), in the meantime, the status will be Green and show UID here. After succeed downloading or timeout , the unit will left bootloader area jump to App area, the status will be yellow and show "Disconnected". Note if no App FW in App area , device will stay in bootloader area.

7, Auto reload, When checked, each time the user presses the "Download", the software will re-open the Hex to ensure data downloaded is the latest. It's very effective in debugging.

8, Clear, click this button to clear message box.

9, Message box, all operation message are displayed in this area

★Note: When using, set the programming options and click the "Download" button first. then plug the RF-2423U into PC, this step is very importance to ensure that the RF-2423U can receive the download command when staying in boot.

9、 About UID

RF-2423U has a built-in globally unique serial number of 3Bytes. In the USB Bootloader, the product is enumerated as a HID device, and the UID would become the USB Series number.

Users can find this UID by the following methods :

- 1, Both the front and back cover has the UID,consisting of 6 characters.This unit of character is UID of Hex-type



- 2, Start the PC "RF-2410U Loader", users can read the UID from the software.

When writing the application software, the users can get UID by read address (0x3BFA-0X3BFC), and use this UID, UID High byte is in address 0x3BFA.For example, if a product's address is 0x000002, then the data read

are:

No.	Address (Hex)	Value (Hex)
1	0 x 3BFA	0 x 00
2	0 x 3BFB	0 x 00
3	0 x 3BFC	0 x 02

10、Parameter

No.	Parameter	Symbol	Unit	condition	Min	typical	Max	Note
1	Voltage Supply	VDD	V		4.75	5	5.25	
2	Current	IDD	mA	continued transmit RF carrier at 0dBm	TBD	35	TBD	Depending on mode
3	USB rate	FUSB	Mbps			12		USB2.0 full speed
4	RF output frequency	FOP	MHz		2400	---	2527	
5	Air Data rate	RFSK	bps		250K	---	2M	
6	RF Output power	PRF	dBm		-40		3	
7	Receive sensitivity	RXSENS	dBm	1E-3 BER sensitivity (1Mbps)	---	-90	---	
	Receive sensitivity	RXSENS	dBm	1E-3 BER sensitivity (2Mbps)	---	-87	---	
8	Storage Temperature	STEMP	°C		-20		+80	
9	Temperature	TEMP	°C		+5		+45	

11、Revision History

Version	Date	Author	Description
V10	2011-6-24	Momo Wen	For RF-2410U First release
V10	2013-5-14	Momo Wen	For RF-2423U First release

Declare

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We also can undertake the following services:

Electronic product design
Brand components acting
Embedded development kit, Circuit module

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