STM32F107 ARM-CM3 Board
User Guide

Rev. 1.0

Release: 4/20/2010

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Revision history

Rev	Date	Description
1.0	4/20/2010	Initial version

Catalog

Chapter 1 Overview

1.1 The Microcontroller Introduction

The STM32F107 incorporates the high performance ARM® Cortex™-M3 32-bit RISC core operating at a 72 MHz frequency, high speed embedded memories (Flash memory up to 256 Kbytes and SRAM up to 64 Kbytes), and an extensive range of enhanced I/Os and peripherals connected to two APB buses. All devices offer two 12-bit ADCs, four general-purpose 16-bit timers plus a PWM timer, as well as standard and advanced communication interfaces: up to two I2Cs, three SPIs, two I2Ss, five USARTs, an USB OTG FS and two CANs. Ethernet is available on the STM32F107.
The STM32F107 operates in the –40 to +105 °C temperature range, from a 2.0 to 3.6 V power supply. A comprehensive set of power-saving mode allows the design of low-power applications.

Peripherals(1)		STM32F105Rx			STM32F107Rx		STM32F105Vx			STM32F107Vx	
Flash memory in Kbytes		64	128	256	128	256	64	128	256	128	256
SRAM in Kbytes		20	32	64	48	64	20	32	64	48	64
Ethernet		No			Yes		No			Yes	
Timers	General-purpose	4									
	Advanced-control	1									
	Basic	2									
Communication interfaces	SPI(I^2S)(2)	3(2)			3(2)		3(2)			3(2)	
	I^2C	2			1		2			1	
	USART	5									
	USB OTG FS	Yes									
	CAN	2									
GPIOs		51					80				
12-bit ADC Number of channels		2 16									
12-bit DAC Number of channels		2 2									
CPU frequency		72 MHz									
Operating voltage		2.0 to 3.6 V									
Operating temperatures		Ambient temperatures: –40 to +85 °C /–40 to +105 °C Junction temperature: –40 to + 125 °C									
Package		LQFP64					LQFP100				

1.2 Hardware resources list

- STM32F107 ARM 32-bit Cortex™-M3 CPU, 72 MHz maximum frequency
- An Ethernet interface
- A 3.2-inch large-screen 320 * 240
- An RS232 connection socket (DB9)
- SPI interface
- IIC interface
- LCD interface

TFT-LCD
- Resistive touch screen , with professional high-precision touch screen controller chip
- 4 LED light tube, a power supply LED
- Low Power, Stereo CODEC w/Headphone & Speaker Amps
- A speaker
- A standard 3.5mm headphone jack
- A five-way joystick
- A mini-type USB socket, support for USB OTG
- Three GPIO buttons
- A RESET button
- 2 CAN connection sockets
- A Micro SD card connector
- IIC interface connects to external EEPROM
- ADC and DAC Module
- One way analog input potentiometer
- Four 7 sections of numerical code tubes
- An ultra compact low-power three axes linear accelerometer
- Support Touch Screen Controller Port expansion
- A JTAG/SWD debug interface(20pin)
- Own CPU power measurement circuit specifically designed for low-power applications
- Power Supply: USB powered

1.3 Software resources list

Project Name	Function Description
8leds	Use the 8leds to display different digital.
ADC1_DMA	Use the ADC1 and DMA to transfer continuously converted data from ADC1 to memory.
BKP_Backup_Data	This example shows how to store user data in the Backup data registers.
CAN_Normal_single_board	Configure CAN2 to send and CAN1 to receive CAN frames in normal mode. The sent frames are used to control LEDs by pressing key push button.
CAN_Normal_two_board	CAN peripheral to send and receive frames in normal mode(need two boards).
DAC_TwoChannels_Triangle Wave	This example describes how to use two DAC channels to generate two different signals with triangle waves on each DAC Channel output.
EMAC_Test	Network interface functional test
EXTI	This example shows how to configure an external interrupt line.
FLASH_Program	This example provides a description of how to program the STM32F10x FLASH.
GPIO_IOToggle	This example describes how to use GPIO BSRR (Port bit set/reset register) and BRR (Port bit reset register) for IO toggling.
I2C_EEPROM	This example provides a basic example of how to use the I2C software library and an associate I2C EEPROM driver to communicate with an I2C EEPROM device

IWDG	This example shows how to reload at regulate period the IWDG counter using the SysTick interrupt.
LCD	Using the LCD display pictures and test touchscreen
Lib_DEBUG	This example demonstrates how to declare dynamic peripherals pointers used for Debug mode.
NVIC_VectorTable_Relocation	This example describes how to set the CortexM3 vector table in a specific address other than default using the NVIC_SetVectorTable function
PWR_STANDBY	This example shows how to enter the system to STANDBY mode and wake-up from this mode using: external RESET, RTC Alarm or WKUP pin.
RCC	This example shows how to configure the System clock(SYSCLK) to have different frequencies:24MHz, 36MHz, 48MHz, 56MHz and 72MHz
RTC_Calendar	it demonstrates how to setup the RTC peripheral, in terms of prescale and interrupts, to be used to keep time and to generate Second interrupt.
OS_Test	Traffic program based on a RTX Kernel that controls a traffic light.
	UCOSII 2.8.6
SDcard	This example provides a description of how to initialize the SD card on Embest_STM3210C board then write and read 512 bytes from the SD card, then verify them.
SysTick	This example shows how to configure the SysTick to generate a time base equal to 1 ms. The system clock is set to 72 MHz, the SysTick is clocked by the AHB clock (HCLK).
USART_HyperTerminal_Interrupt	This example provides a description of how to use the EVAL_COM1 transmit and receive interrupts to communicate with the Hyper Terminal.
USB_Test	It Contains four sub-routines, Audio_Streaming JoyStickMouse, Mass_Storage and Virtual_COM_Port
WWDG	This example shows how to update at regulate period the WWDG counter using the Early Wakeup interrupt (EWI).

Chapter 2 Getting Started

2.1 Documents Description

File name / Item	Description	Attribute
STM32F107_Board_ UserManualV1.0.pdf	This document	671KB
EM_STM3210C Board Schematic.pdf	Development board schematic	128KB
STM32F105_107xx Datasheet.pdf	Datasheet of STM32F105_107xx	981KB
STM32F105_107xx Reference Manual.pdf	Reference Manual of STM32F105_107xx	1.05MB
Other PDF documents	Introduce other modules in the board, such as Audio, CAN…	1.8MB

2.2 Version Information

- The version of the development tools: MDK4.01
- The version of the ST Library: V3.1.2

2.3 Hardware resource requirements

When we test STM32F107 BOARD, PC recommended the following configuration:

- 2.0GHz (or higher) of the CPU
- 512M RAM
- 2 USB interfaces
- A serial interface
- Windows XP operating system
- KEIL Integrated Development Environment installed

2.4 Preparations

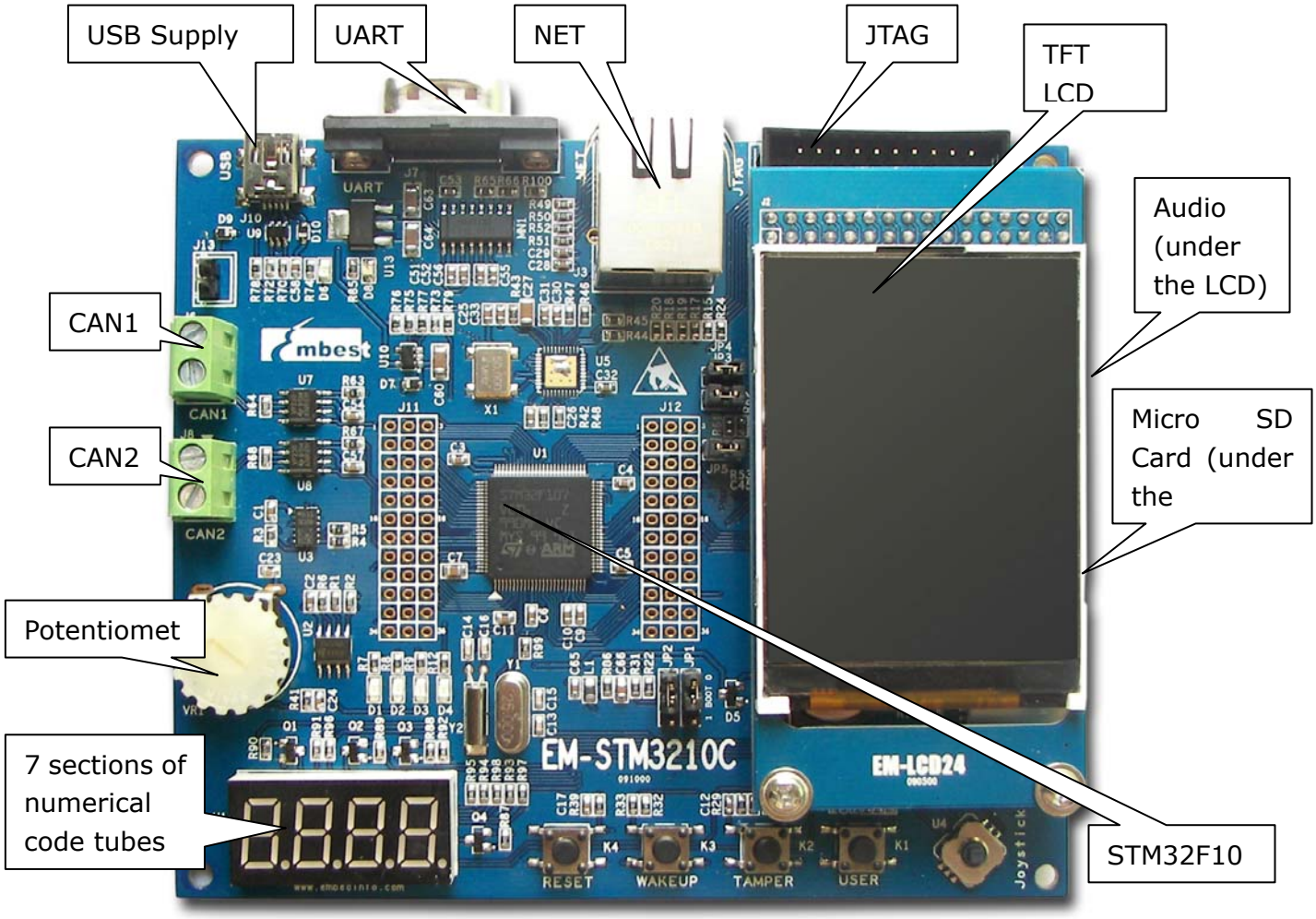
- Jumper Settings: Jumper use the default sets, no need to change.
- Serial Connection: Connect com of board and the com of PC through serial port cable.
- LCD Connection: The LCD screen inserted in the LCD interface of board.
- USB Connection: Using USB cable, one end plugged into the USB port on the board, the other end connected to PC.
- SD Card Connection: Connect Micro SD to SD socket on the board.
- JTAG Debugger Connection：One end connected to JTAG interface on the board，the other end connected to PC.
- Serial Port Receive Settings: In the PC, run HyperTerminal serial communication

program, select the serial port used and set the following parameters (to set status: Baud rate (115200), data bits (8 bits), stop bits (1 bit), parity bit (no), data flow control (no)).

- Network Connection: Through the crossover cable provided connect J3 interface on the board and the network interface of PC side.

Chapter 3 STM32F107 Board Introduction

3.1 Board Interface Overview



J1	Micro SD Card	U6	Lower-power CODEC chip
J2	JTAG Interface	U7	CAN Transceivers
J3	NET Interface	U8	CAN Transceivers
J4	Audio Line Out	U9	USB very low capacitance ESD protection
J5	Audio Analog IN	U10	Enhanced single channel power switches
J6	CAN1	U11	Touch Screen Controller
J7	UART	U12	2.5V Voltage adjustor
J8	CAN2	U13	3.3V Voltage adjustor
J9	LCD	U14	7 sections of numerical code tubes
J10	USB MINI AB Interface	D1	LED1
J11	Processor External Round Cable	D2	LED2
J12	Processor External Round Cable	D3	LED3

J13	Control GND Jumper	D4	LED4
U1	STM32F107 Chip	K1	User Button
U2	Serial I^2C BUS EEPROM	K2	Tamper Button
U3	MEMS motion sensor	K3	Wakeup Button
U4	JoyStick Button	K4	Reset Button
U5	Ethernet Transceiver		

3.2 Jumpers Settings

ID	Name	Default Settings	Note
JP1	BOOT0	Close (1-2)	Choose Start-up mode cooperating with JP2
JP2	BOOT0	Close (1-2)	Choose Start-up mode cooperating with JP1
JP3	MICBIAS	Close	Microphone DC bias voltage control signal corresponding to AIN3A
JP4	MICBIAS	Close	Microphone DC bias voltage control signal corresponding to AIN3B
JP5	SPKR/HP	Close	Speaker / Headphone output options

3.3 Hardware Interface Introduction

3.3.1 JTAG

A standard 20-pin JTAG connector is implemented on the STM32F107 BOARD for any ARM JTAG Emulator, such as ULINIK2, JLink, CoLink…

3.3.2 Micro SD Card

A Mini SD Card Interface is implemented on this Board; it can only be used by Mini SD Card and it transports data with SPI mode.

3.3.3 Ethernet

A Physical Layer Transceiver DP83848J (U5) and an integrated RJ45 interface are implemented in this Board, and it supports both 10BASE-T and 100BASE-TX Ethernet protocol, which ensures compatibility and interoperability with all other standard based Ethernet solutions.

3.3.4 Audio

The STM32F107 Board through a CS42L52 low-power stereo audio codec chip to connect the I2C port and a DAC channel in STM32F107. The CS42L52 is a highly integrated, low power stereo CODEC with headphone and Class D speaker amplifiers.
STM32F107 BOARD supports stereo audio playback, and CS42L52 sets the parameters through I2C bus. The speaker and headphone can automatically switch between through corresponding pin.

In addition, CS42L52 can also support the MIC input, encodes the input sound signal into the digital signal microcontroller can identify.

3.3.5 CAN

There are 2 controller area network (CAN) transceivers in this board, and they both use SN65HVD230D controller chip. Each CAN transceiver is designed to provide differential transmit capability to the bus and differential receive capability to a CAN controller a speeds up to 1 Mbps.

3.3.6 UART

The Universal Asynchronous Receiver Transmitter features a 9-pin UART that can be used for communication and trace purposes. It offers an ideal channel for ISP downloading.

3.3.7 LCD & Touch Screen Controller

STM32F107 BOARD provides a 320*240 size TFT LCD with a Touch Screen Controller. This LCD uses a ILI9325 driver IC and represents a pixel with 16 bits. Touch Screen uses a 8-bit STMPE811 control chip and we can get the touch-screen data through I2C interface.

3.3.8 Mini USB Port

A USB Mini AB interface is implemented to transport USB data, and it also supports USB-OTG full speed.
In addition, supply 5V voltage to the Board through this USB port.

3.3.9 EEPROM

A 64kbit EEPROM is connected to the I2C bus in STM32F107 BOARD.

3.3.10 MEMS motion sensor

There is a MEMS motion sensor which uses the LIS302DL chip. The LIS302DL is an ultra compact low-power three axes linear accelerometer. It includes a sensing element and an IC interface able to provide the measured acceleration to the external world through I2C serial interface.

3.3.11 JoyStick Button & others Buttons

STM32F107 BOARD provides a JoyStick button, and it has the UP, DOWN, LEFT, RIGHT and ENSURE function.
In addition, the board also provides RESET, WAKEUP, TAMPER and USER buttons. RESET button is used to reset the processor; WAKEUP connects with PA0 pin, it is used to wakeup the processor when it is sleep; TAMPER and USER respectively connect with PC13 and PB7 pins, they can be used for user input.

3.3.12 7 sections of numerical code tubes

The Board has four 7 sections of numerical code tubes. They can be used to display time, data or other numbers.

3.3.13 LED

STM32F107 BOARD provides 4 LEDs D1, D2, D3 and D4, they respectively connect with PE2, PE3, PE4 and PE5 IO pins, and they can be used for user output.

Chapter 4 Software Resources Introduction

There are 25 test examples in the CD-ROM provided which are built under the Keil RealView MDK environment. The directory of storing these test examples is 03-software\examples. You can find 27 folders in this directory. The Libraries and Utilities are common source files and head files. The other 25 items are all test cases used to test the peripherals or functions of the STM32F107 Board.

Test cases' functions, most of those are easy to understand, but need to explain just that 24-USB_Test. There are four projects in the directory 03-software\Examples\24-USB_Test\USB_DEVICE\Project. They are Audio Streaming, JoyStick Mouse, Mass Storage and Virtual COM Port, all of which are used to test USB function of STM32F107 Board. You can get the details about testing introductions and phenomenon from the readme.txt files in the projects or get them by view the STM32F107 BOARD UserManual V1.0.doc documents.

Note: The evaluation edition of RealView MDK we provided in the CD-ROM of the board might be not able to compile all of test programs we offer, because it has only 32KB code limitation. If you would like to purchase the authorized edition of RealView MDK of Keil, please contact Keil Inc. directly or his distributors in the world.

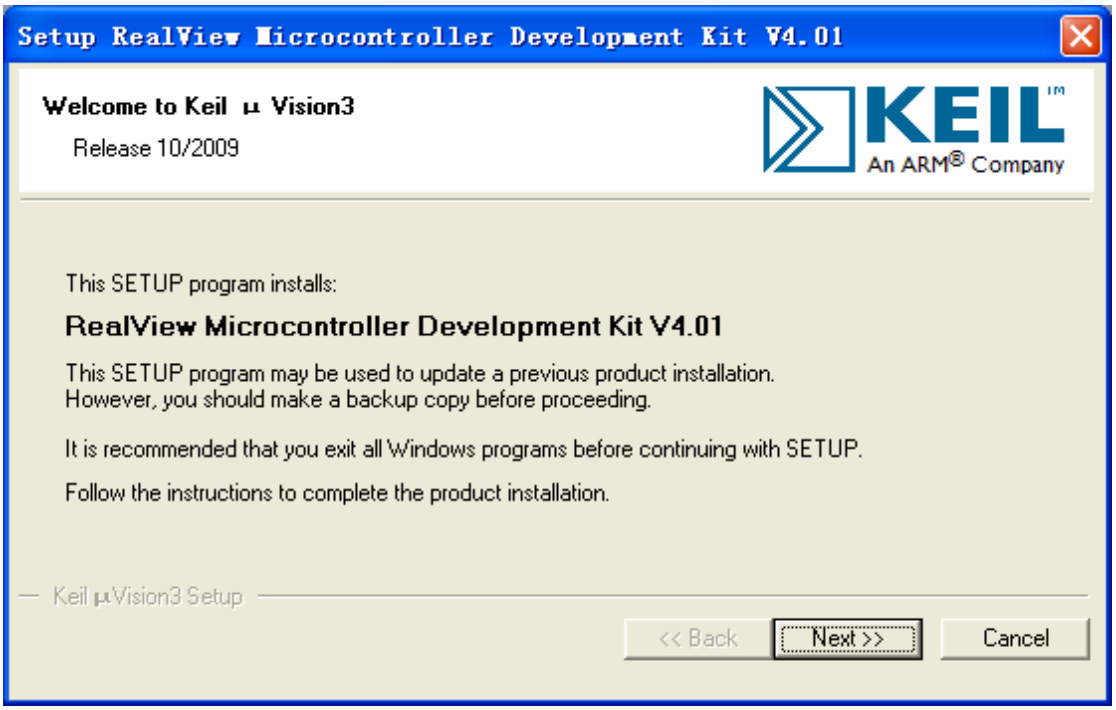
Chapter 5 Software development and examples

5.1 MDK Introduction

RealView MDK Development Suite is the latest software development tool of ARM Limited Corporation for Embedded Processors. MDK4.01 integrates the most advanced technology in this industry, including µVision4 IDE and RealView RVCT4.0 Compiler; RealView MDK supports ARM7, ARM9 and the latest Cortex-M3 Core Processor. It has a configuration wizard for startup code and integrates flash program module, powerful device simulation, performance analyzer and so on. You can obtain the free evaluation edition of MDK software from the CD released with STM32F107 Board in the directory of 04-tools\RealviewMDK, or you can download the latest evaluation version of RealView MDK for free of charge from Keil website www.keil.com. Double click the installation file setup.exe; finish Keil µVision4 installation under the guidance of the installation wizard.

Note: If you want to purchase the authorized RealView MDK, please contact Keil Inc. directly or his distributors in the world.

The installation interface as follows:



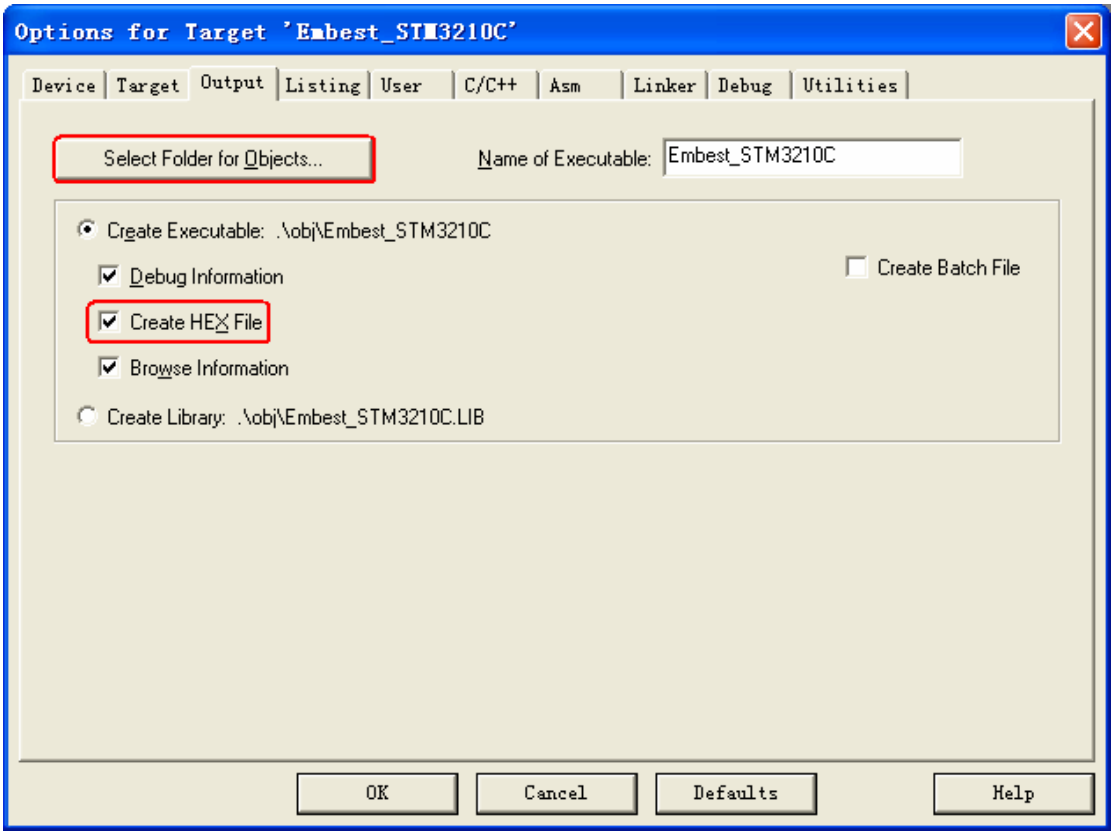
5.2 Compiler routine

5.2.1 Open a routine

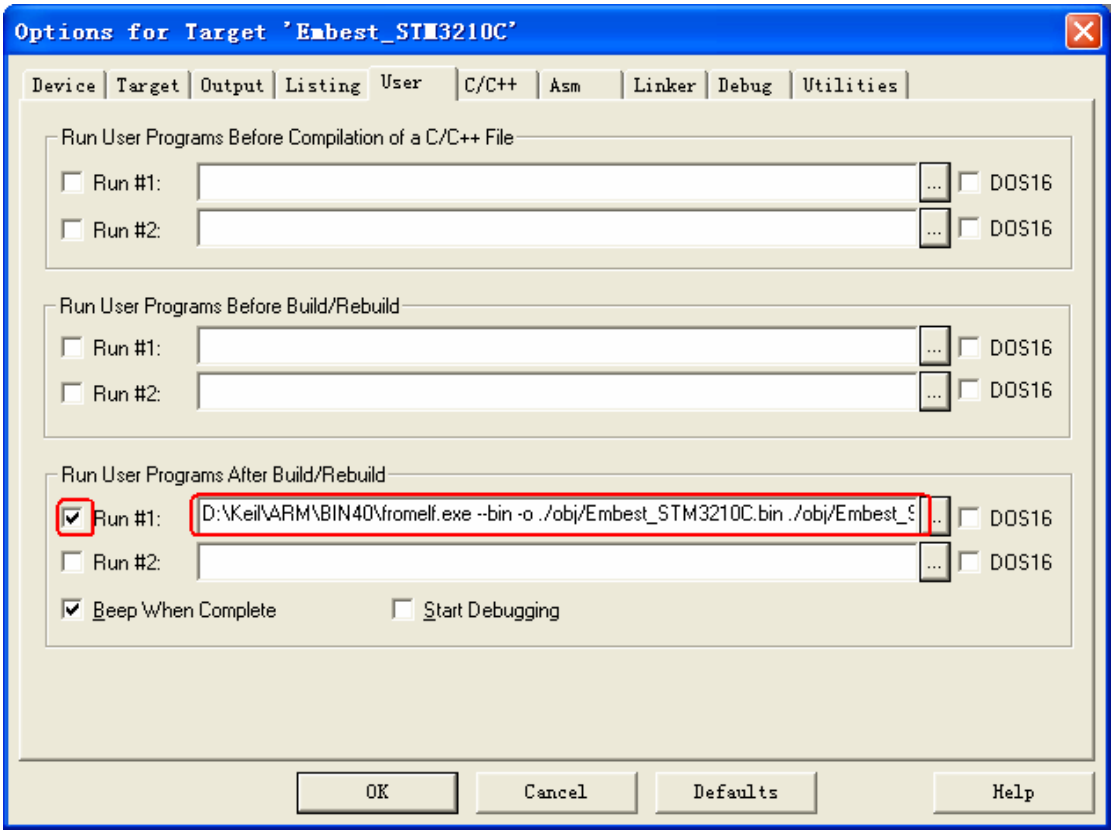
Enter in the folder of 03-software\Examples; Open the Embest_STM3210C.uvproj file in the project directory of one routine. For example: \03-software\Examples\01-8leds\project\Embest_STM3210C.uvproj.

5.2.2 Compiler the routine

1) If you need the .hex format file, then you can configure MDK to build the hex file, Click Select Folder for Object… to specify the hex file's output directory. Or you can skip this step.

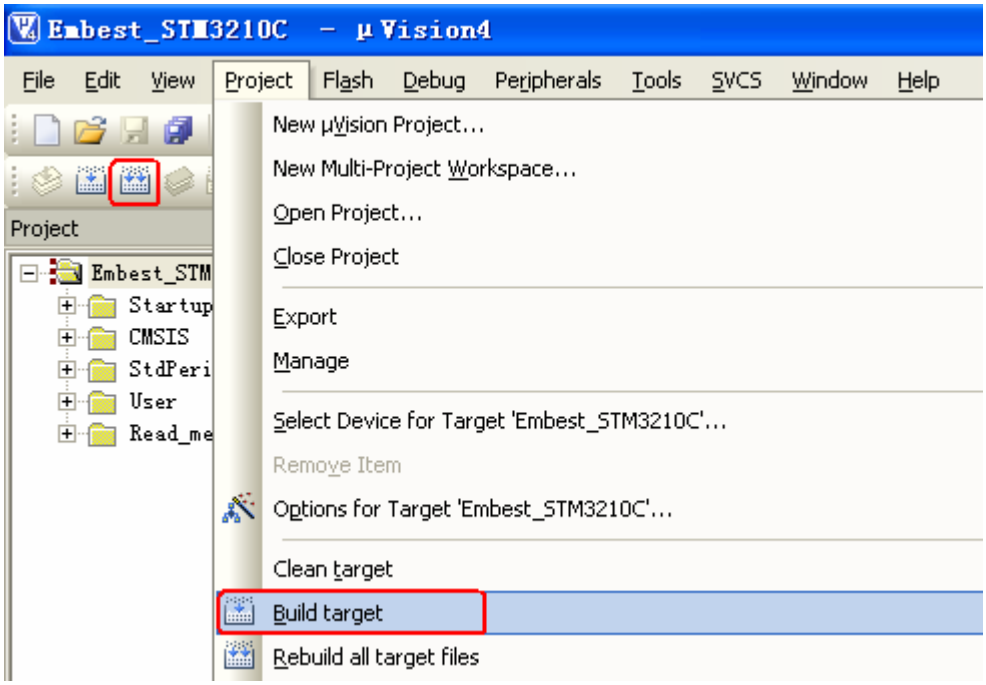


2) If you need the .bin format file, then you can configure MDK to build the bin file. Or you can skip this step.



- D:\Keil\ARM\BIN40\fromelf.exe specify the path of fromelf.exe, it will convert axf file to bin file
- --bin –o export bin file
- ./obj/Embest_STM3210C.bin the directory and file name of the bin file you want to create
- ./obj/Embest_STM3210C.axf the directory and file name of the axf file you want to convert

3) Click project->build, or click the shortcut button to build the routine.



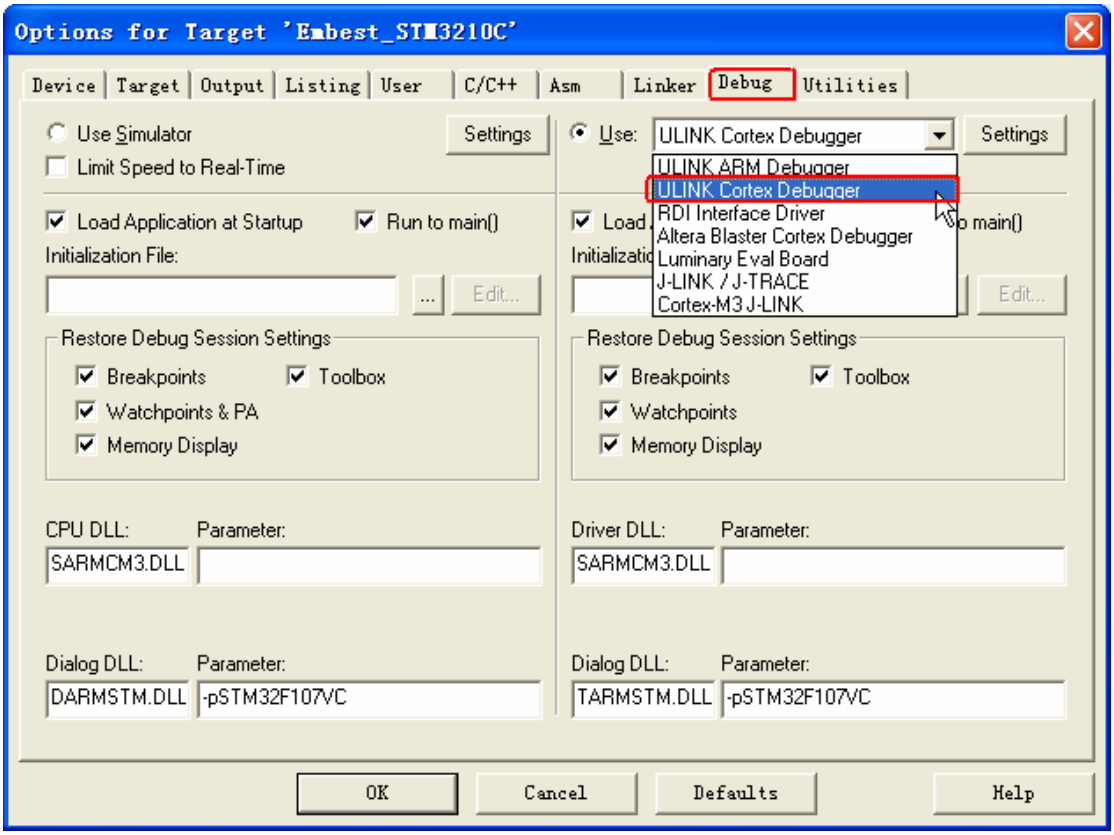
5.3 Debug and Download the routine using Emulator

The precondition for the next steps is that you have bought or owned a corresponding hardware Emulator.

5.3.1 Debug and Download the routine using ULINK2

1. Debug the routin using ULINK2

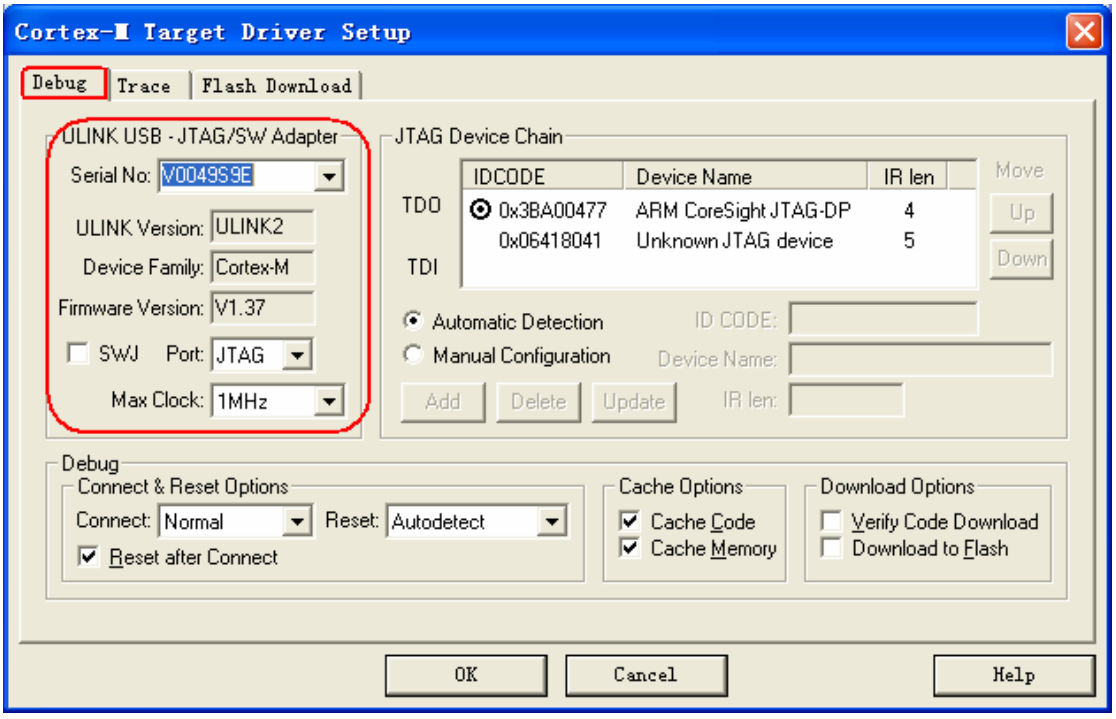
1) Choose Emulator



2) Check the ULINK2, optional.

When ULINK2 connects to the Development Board, if the RUN and COM indicator lights first change to blue and then go out, and the USB indicator light has always been red, this proves that ULINK2 is no problem.

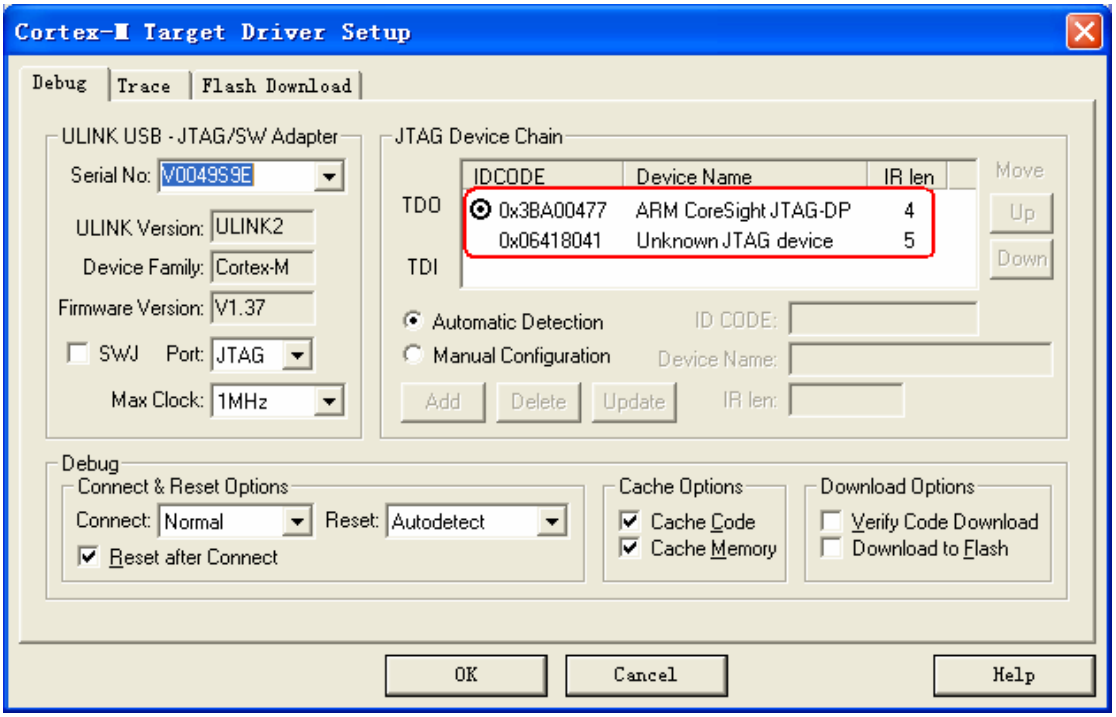
In addition, you can use the next way to check ULINK2. Click the Settings button in the Debug TAB, if the red marked part appears, it proves that ULINK2 is no problem.



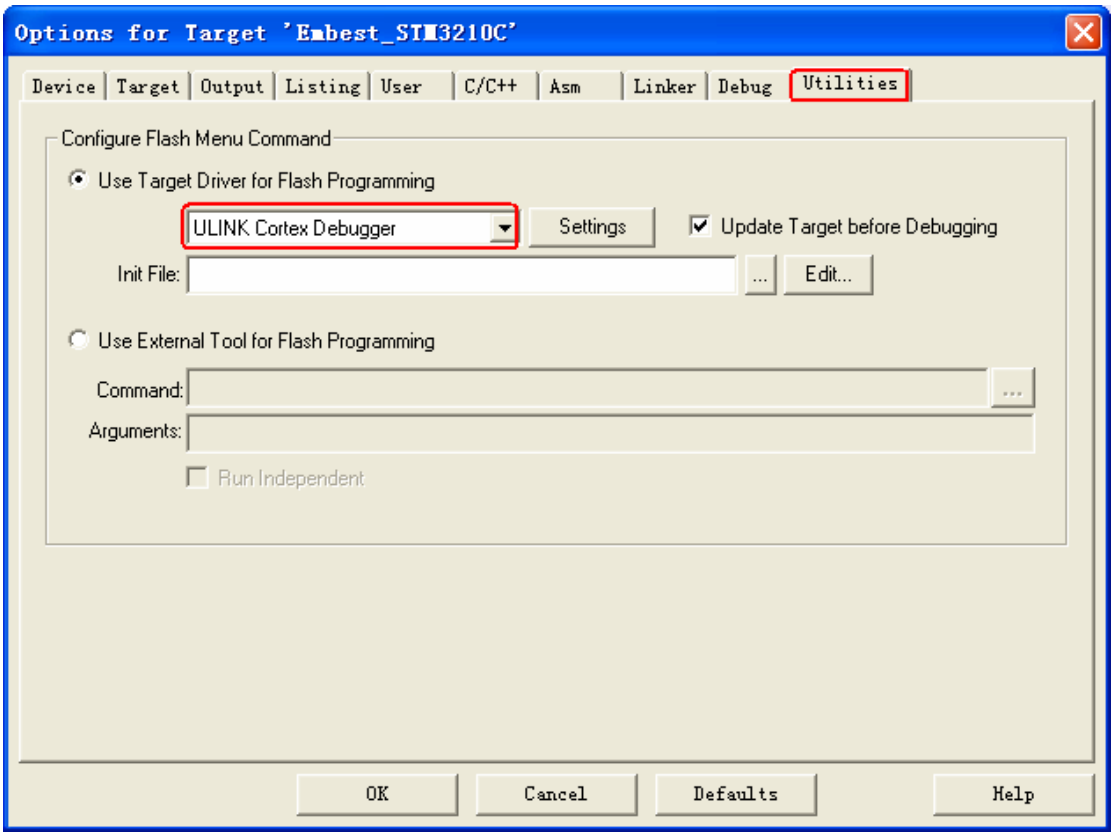
3) Check that whether ULINK2 can detect the development board or not, optional.

Click the Settings button in the Debug TAB, if the red marked part appears, it proves that

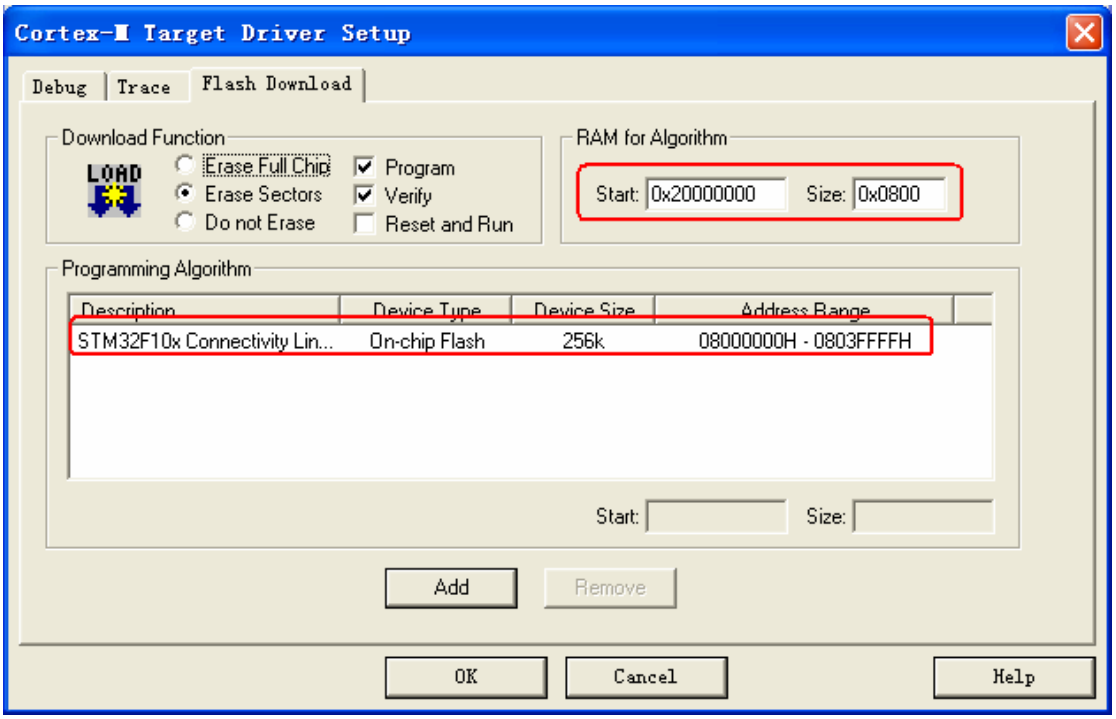
ULINK2 has detected the development board.



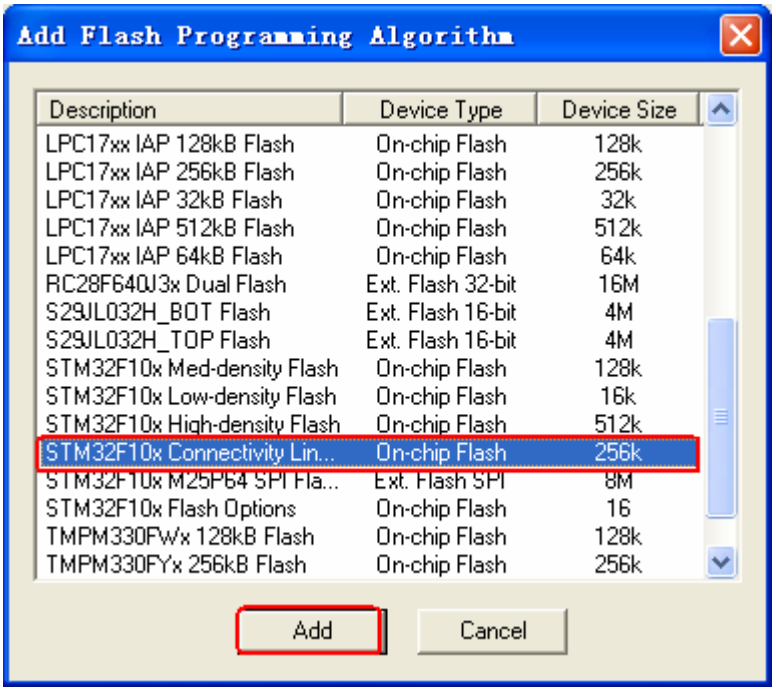
4) Set the Flash Programmer, configure the Utilities TAB.



Then click Settings button, it appears:

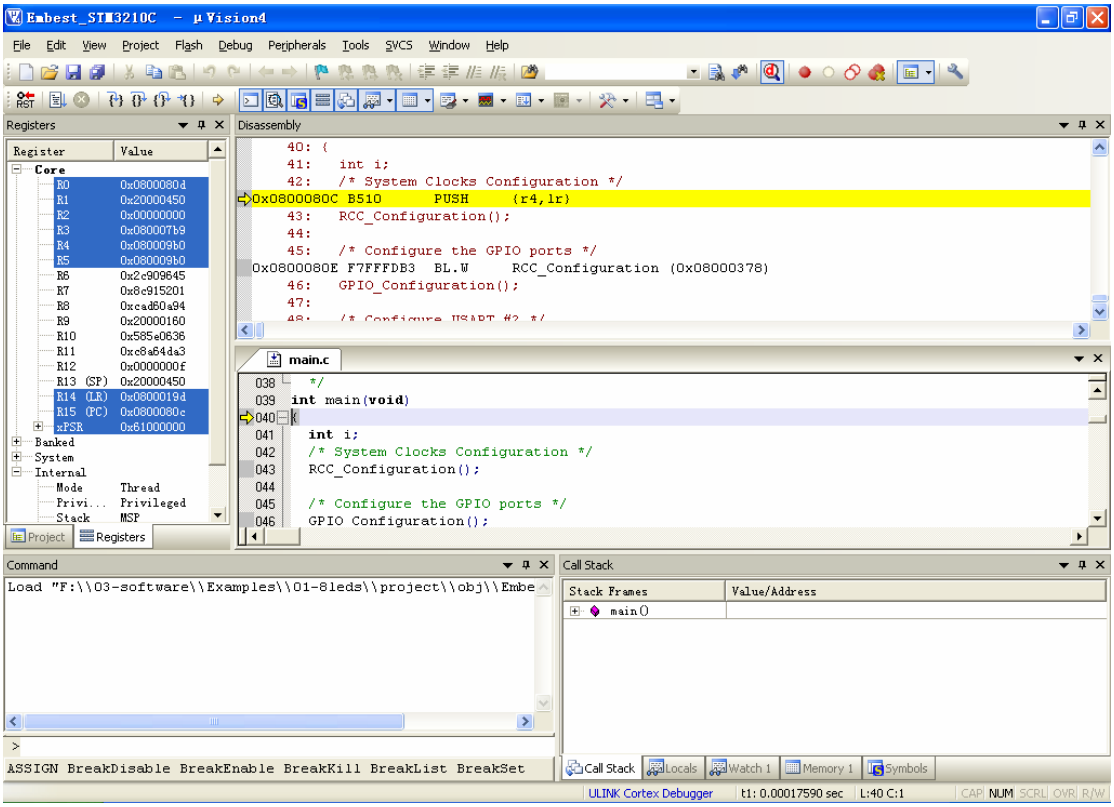


If nothing is in the Programming Algorithm, then you should add the corresponding Flash programming algorithm by clicking the Add button, as follows:



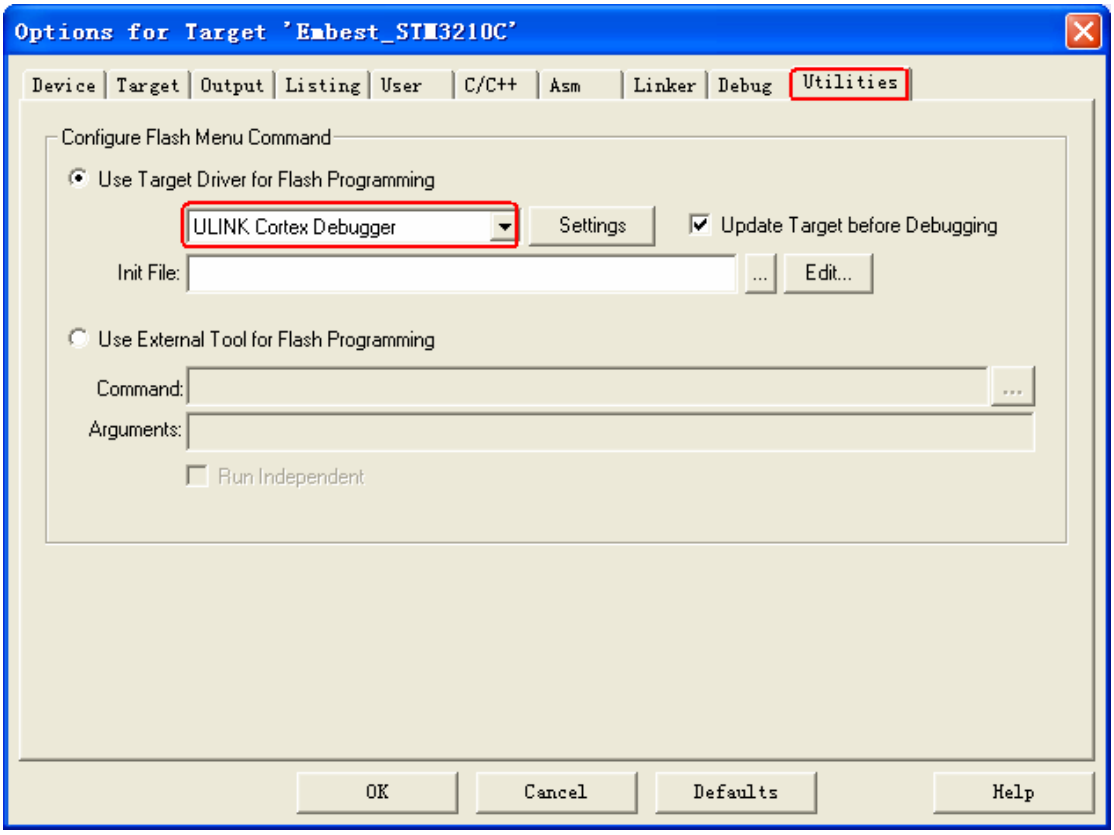
After you choose a Flash Programming Algorithm, then Click Add button.

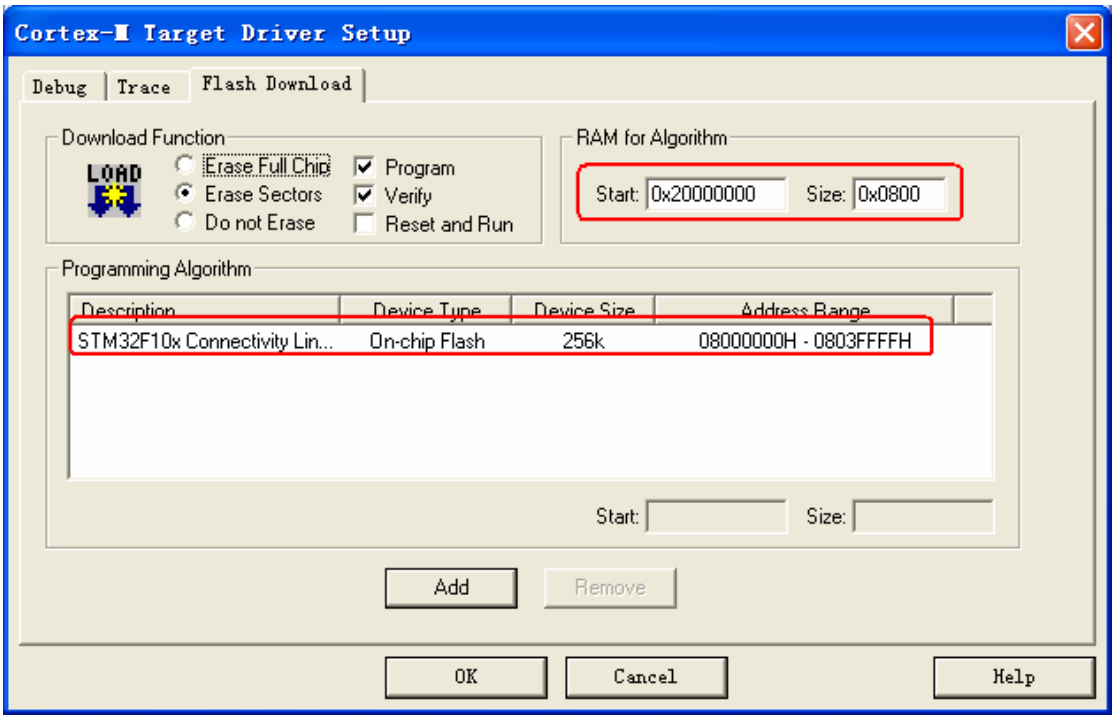
5) Start to Debug the routine by clicking shortcut button  or clicking Debug->Start/Stop Debug Session, the status of the debug as follows:



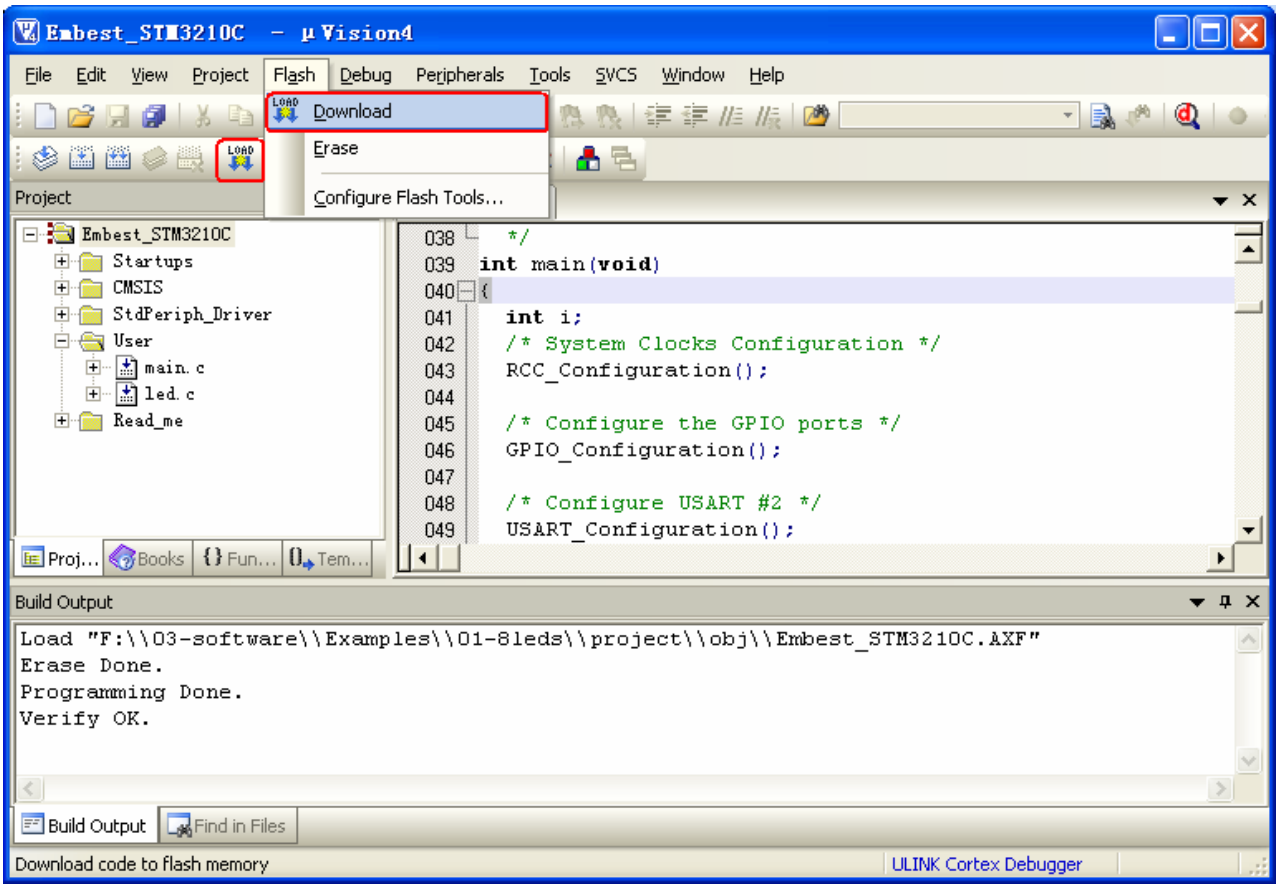
2. Download the routine using ULINK2

1) Check the Flash Programmer's setting





2) Start to Download by click Flash->Download or the shortcut button as follows:

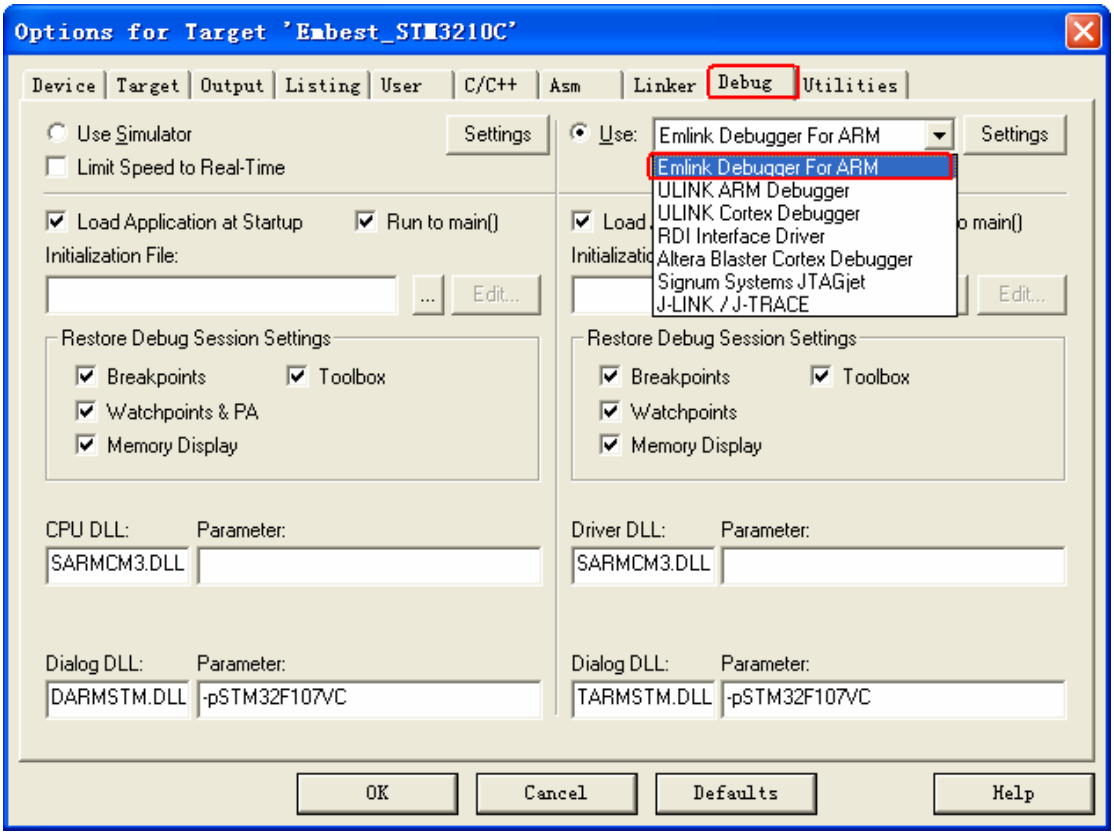


5.3.2 Download and Debug the routine using Emlink JTAG Emulator

1. Debug the routine using Emlink JTAG Emulator

1) Install the Emlink for MDK driver.

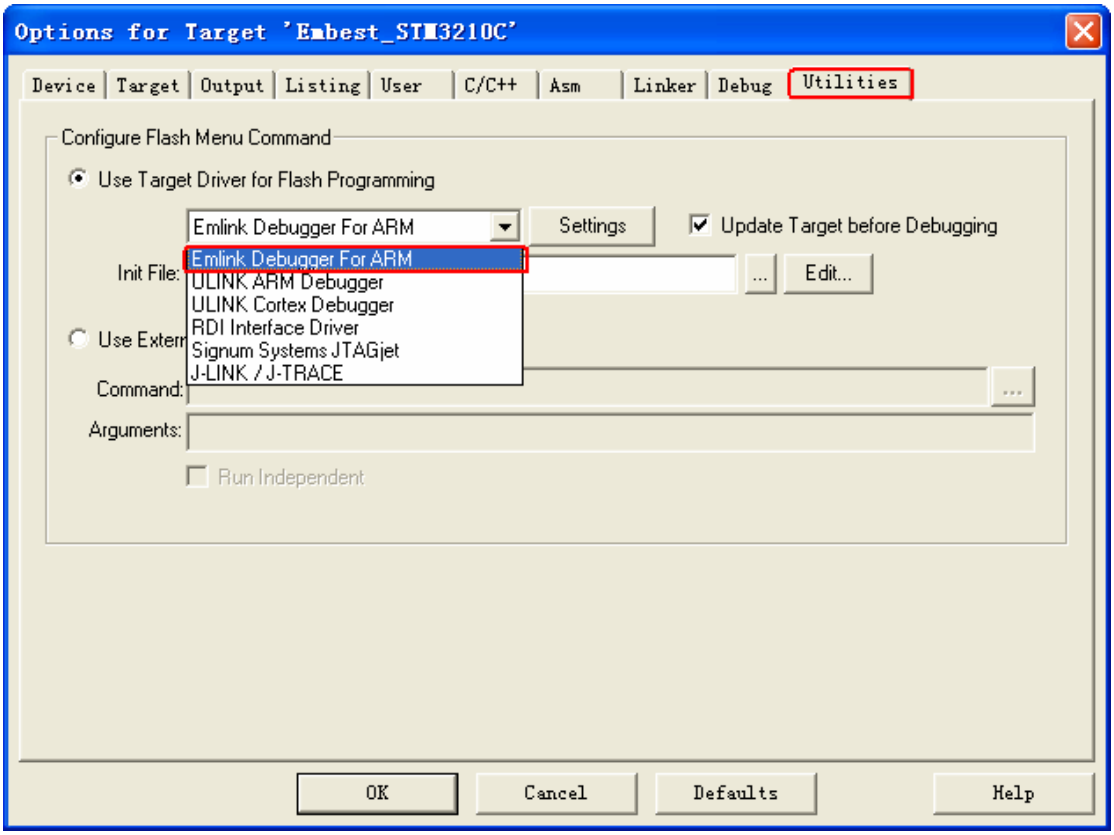
2) Choose the Emulator.



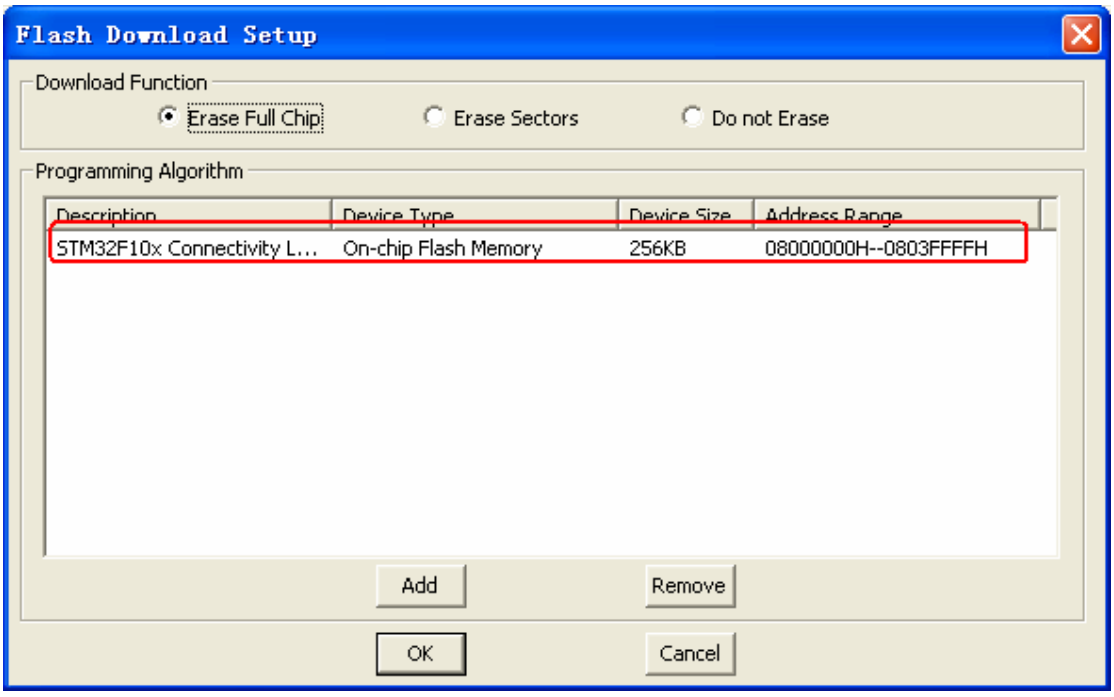
3) Click the Settings button to configure Emlink, as follows:

4) Set the Flash Programmer.

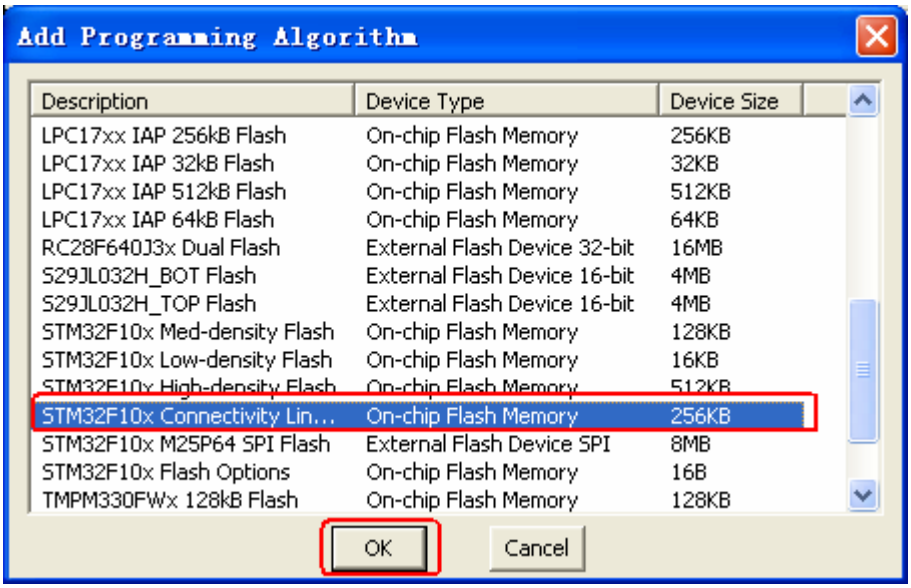
Configure the Utilities TAB, as follows:



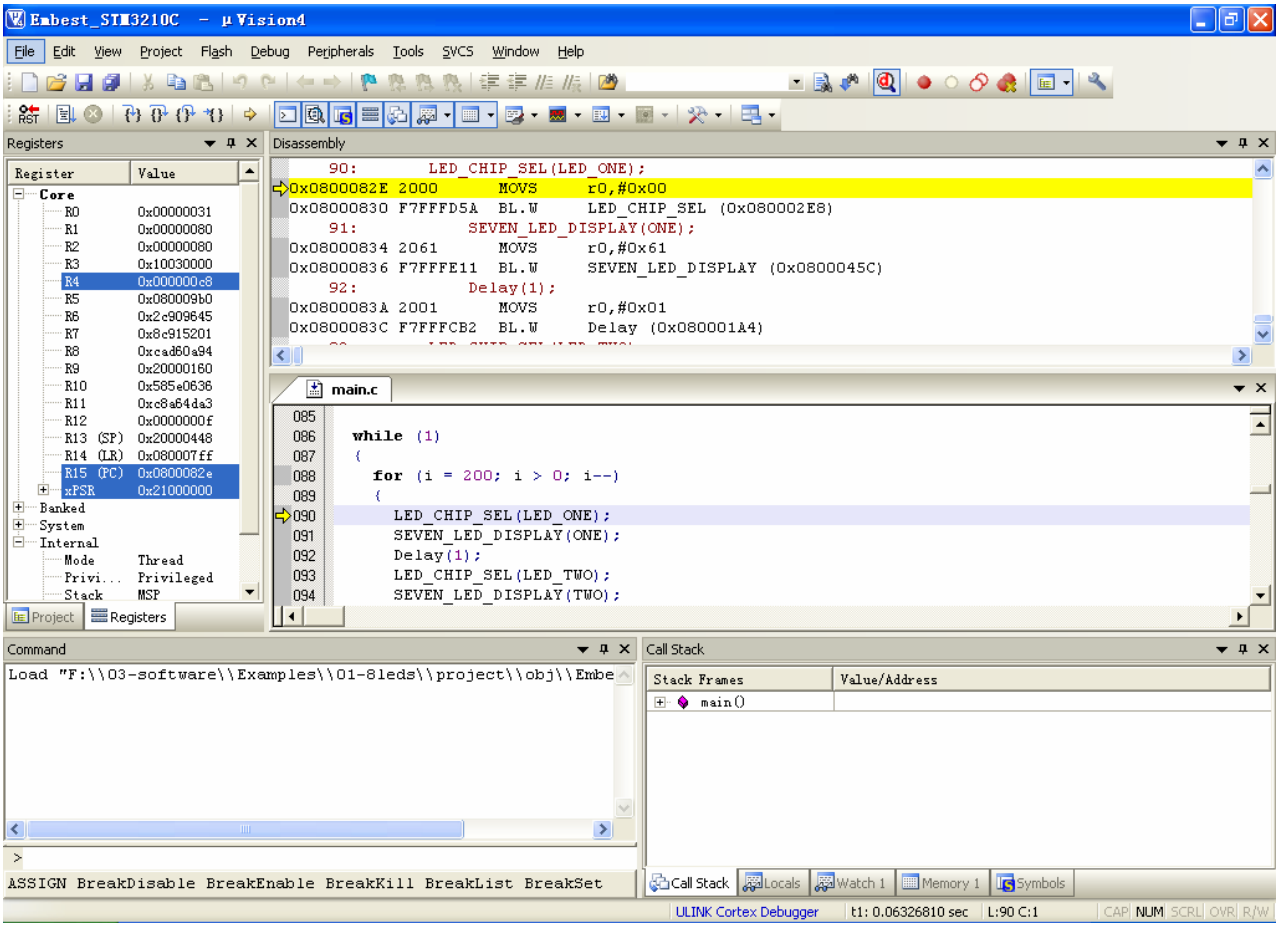
Then click the Settings buttons, it will show the next Dialog.



If nothing is in the Programming Algorithm, then you should add the corresponding Flash programming algorithm by clicking the Add button, as follows:

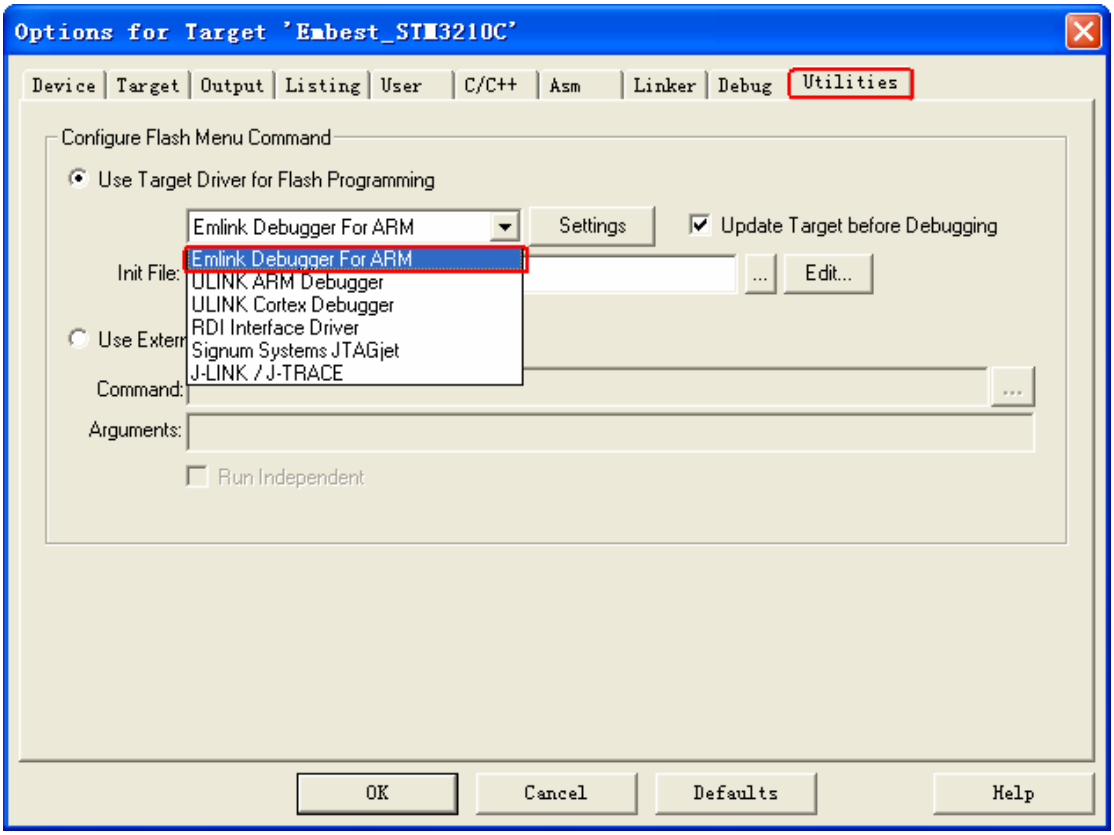


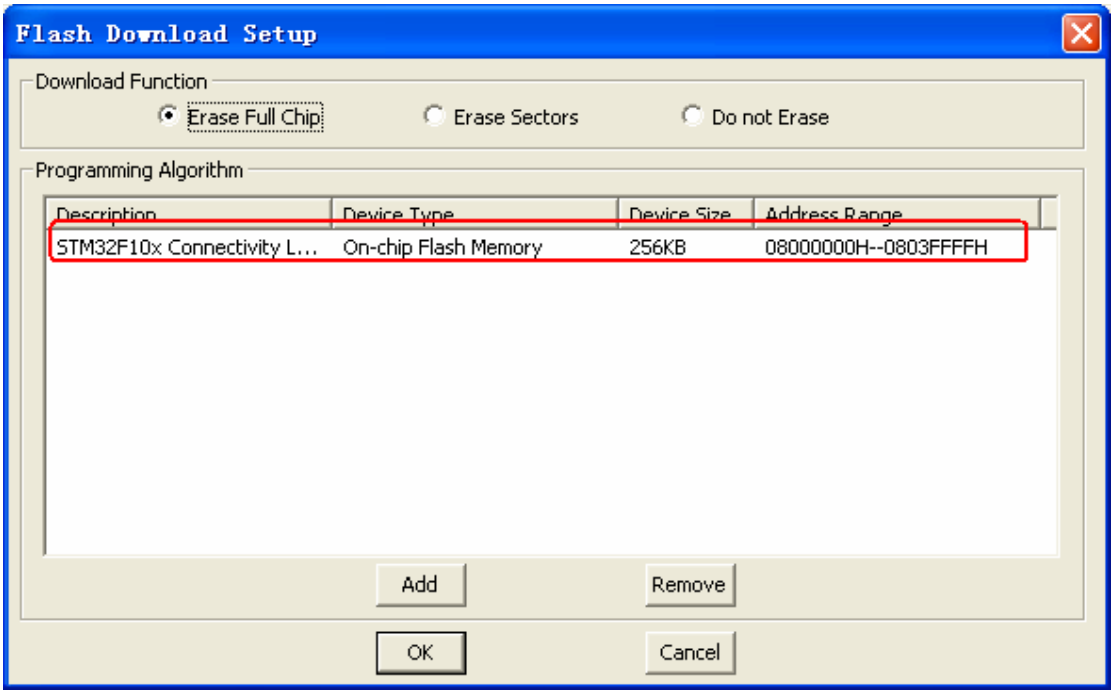
5) Start to debug the routine by clicking the shortcut button  or clicking Debug->Start/Stop Debug Session, the status of the debug is as follows:



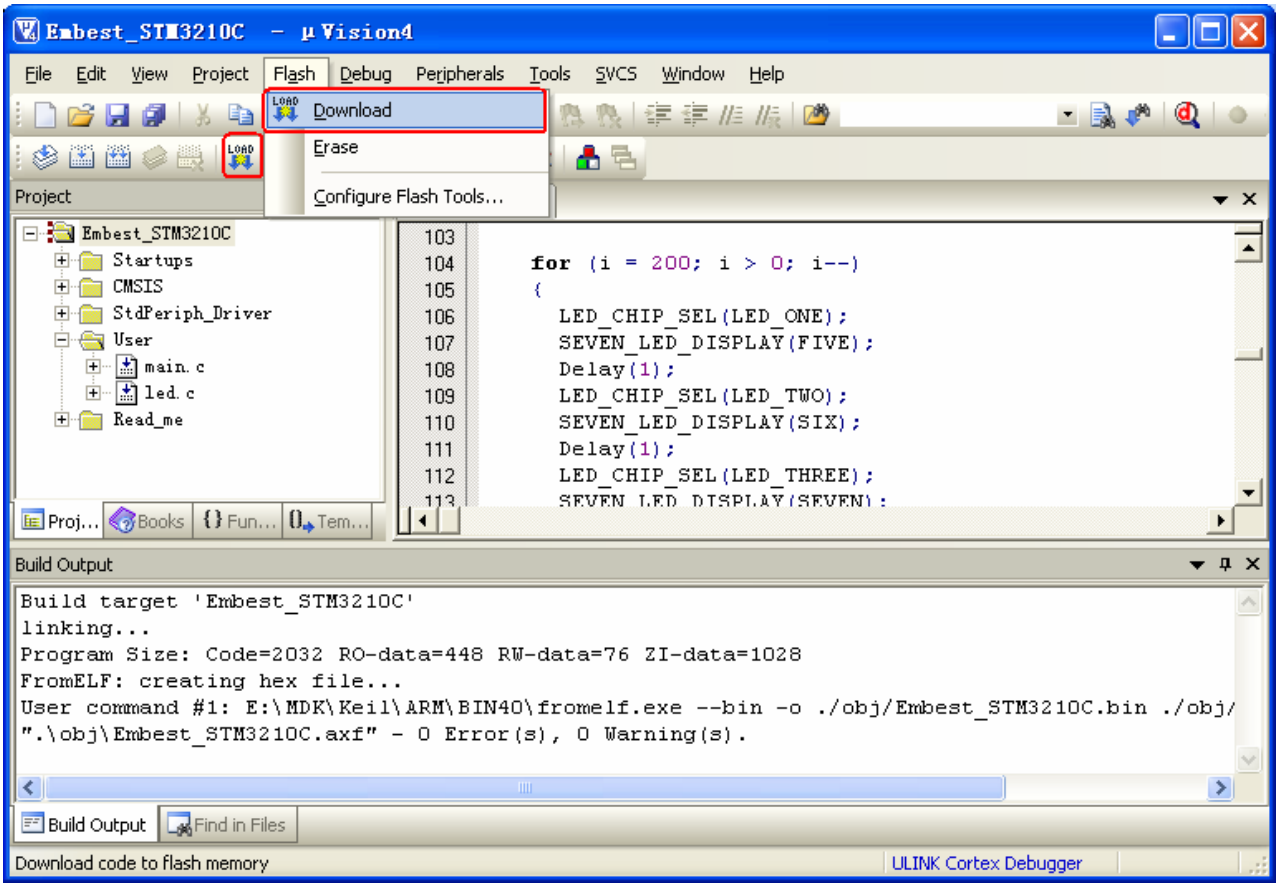
2. Download the routine using Emlink

1) Check the Flash Programmer's setting.





2) Start to download by clicking Flash->Download or the shortcut button, as follows:


Embest_STM3210C - µVision4
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Download
Erase
Configure Flash Tools...
Project
Embest_STM3210C
Startups
CMSIS
StdPeriph_Driver
User
main.c
led.c
Read_me
103 for (i = 200; i > 0; i--)
104 {
105 LED_CHIP_SEL(LED_ONE);
106 SEVEN_LED_DISPLAY(FIVE);
107 Delay(1);
108 LED_CHIP_SEL(LED_TWO);
109 SEVEN_LED_DISPLAY(SIX);
110 Delay(1);
111 LED_CHIP_SEL(LED_THREE);
Proj... Books Fun... Tem...
Build Output
Build target 'Embest_STM3210C'
linking...
Program Size: Code=2032 RO-data=448 RW-data=76 ZI-data=1028
FromELF: creating hex file...
User command #1: E:\MDK\Keil\ARM\BIN40\fromelf.exe --bin -o ./obj/Embest_STM3210C.bin ./obj/
".\obj\Embest_STM3210C.axf" - 0 Error(s), 0 Warning(s).
Build Output
Find in Files
Download code to flash memory
ULINK Cortex Debugger

Appendix A: After-sale Service

Embest is at your service, and we have special Technical Support Engineers to provide support and consultation of our products and services in forms of telephone, E-mail, Fax and website.

- TEL: +86-755-25621715
- FAX: +86-755-25616057
- E-mail for Technical Support: support.en@embedinfo.com

Website: you can leave your questions at http://www.embedinfo.com/en/Request.asp, and then our technical support engineers will get back to you as soon as possible.