2. STM32 development environment build

2.1 Introduction to STM32CubeIDE

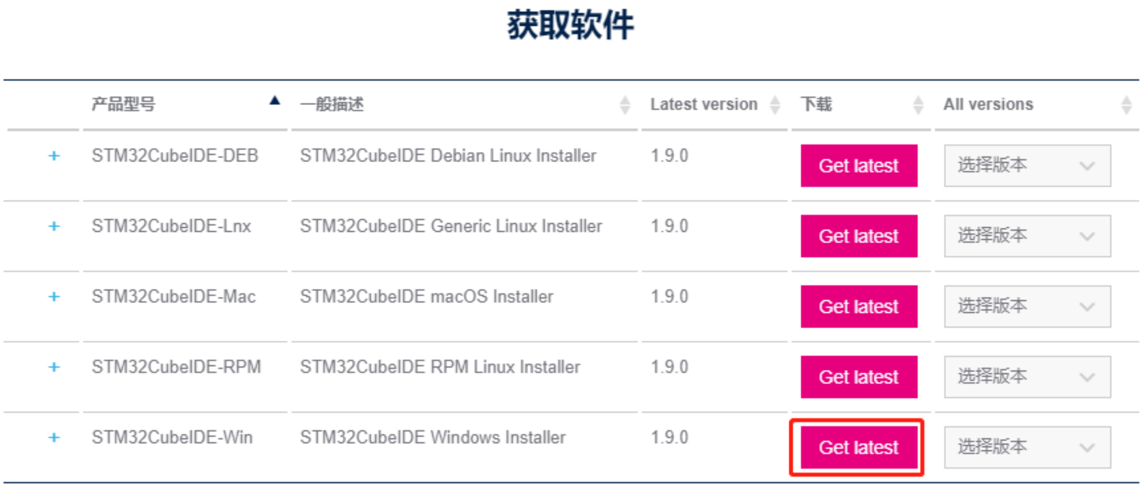
STM32CubeIDE is an all-in-one multi-operating system development tool, an advanced C/C++ development platform with peripheral configuration, code generation, code compilation and debugging for STM32 microcontrollers and microprocessors. It is based on the Eclipse®/CDT™ framework and the GCC tool chain for development, as well as GDB for debugging. It can select an STM32 microprocessor and then create a project and generate the initialization code to support graphical configuration of STM32 clocks and pins and other content, support for the mainstream platforms of Windows, Linux, Mac, very powerful and practical features.

2.2 Download the installation package

Open the following link with your computer browser:

https://www.st.com/zh/development-tools/stm32cubeide.html

Download according to the computer system, here to Win10 system to install version 1.9.0 as an example, select the latest version to download.

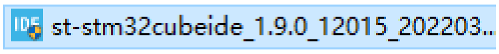


获取软件

	产品型号	一般描述	Latest version	下载	All versions
+	STM32CubeIDE-DEB	STM32CubeIDE Debian Linux Installer	1.9.0	Get latest	选择版本
+	STM32CubeIDE-Lnx	STM32CubeIDE Generic Linux Installer	1.9.0	Get latest	选择版本
+	STM32CubeIDE-Mac	STM32CubeIDE macOS Installer	1.9.0	Get latest	选择版本
+	STM32CubeIDE-RPM	STM32CubeIDE RPM Linux Installer	1.9.0	Get latest	选择版本
+	STM32CubeIDE-Win	STM32CubeIDE Windows Installer	1.9.0	Get latest	选择版本

If you have an account on my.st.com, you can log in and download the software directly. If you don't want to log in now, just provide your name and email address in the form below to download the software.

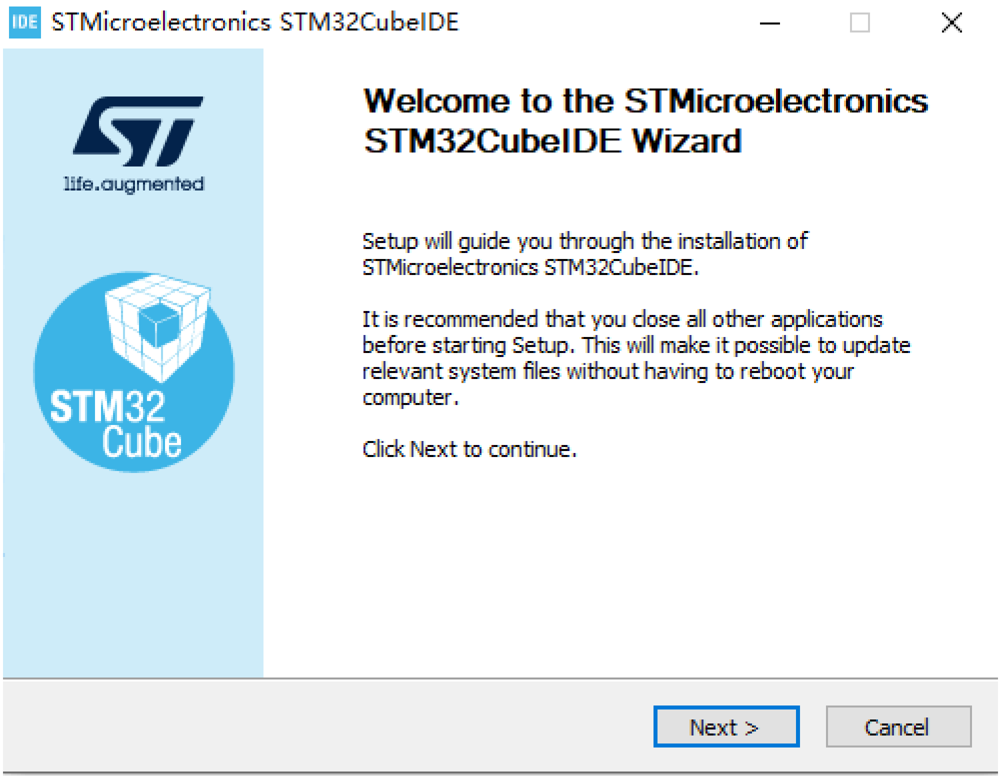
Unzip the downloaded file, and unzip the path without Chinese.



st-stm32cubeide_1.9.0_12015_202203..

2.3 Starting Installation

Double click to open the installation package. Then just follow the tutorial.



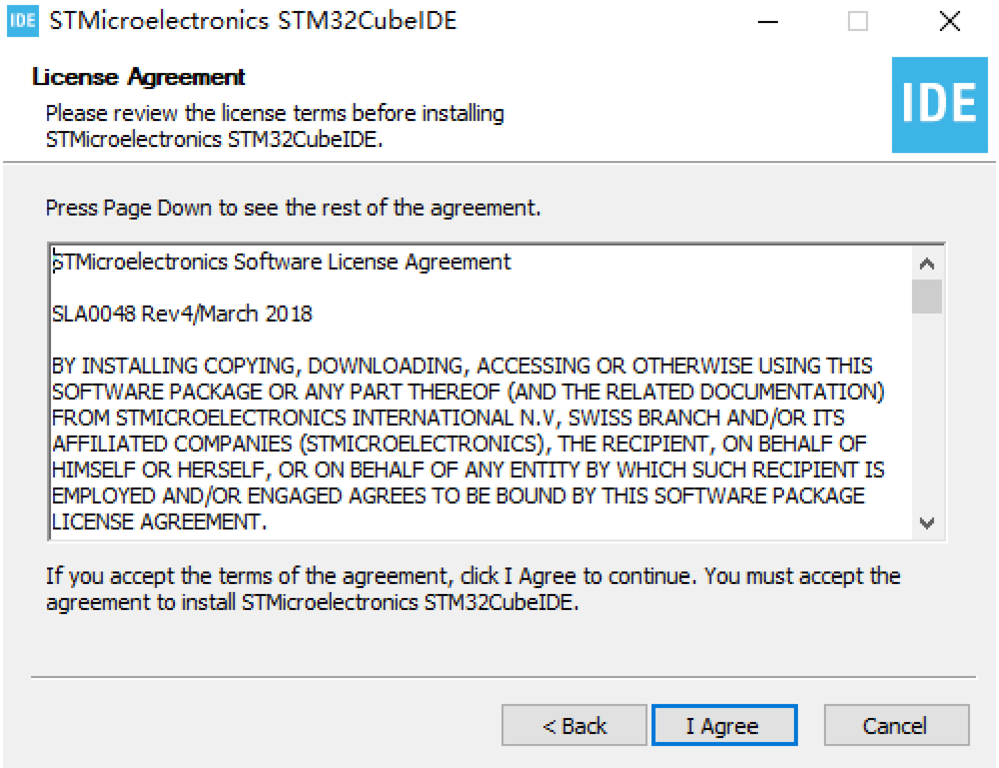
STMicroelectronics STM32CubeIDE

Welcome to the STMicroelectronics STM32CubeIDE Wizard

Setup will guide you through the installation of STMicroelectronics STM32CubeIDE.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.



STMicroelectronics STM32CubeIDE

License Agreement

Please review the license terms before installing STMicroelectronics STM32CubeIDE.

Press Page Down to see the rest of the agreement.

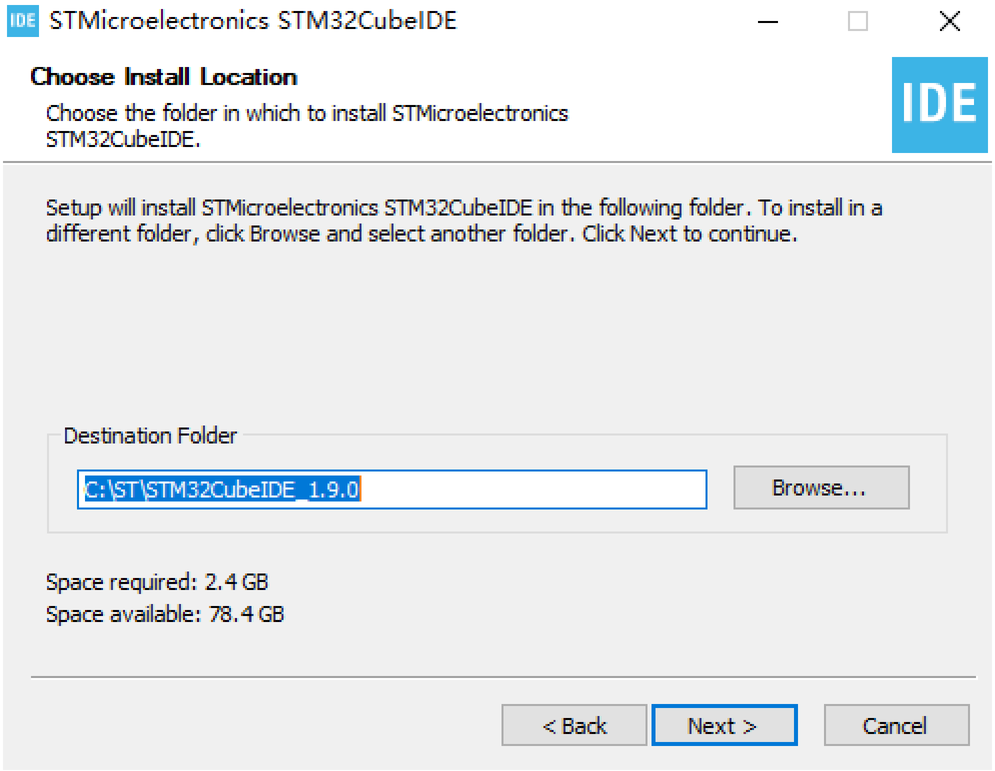
STMicroelectronics Software License Agreement

SLA0048 Rev4/March 2018

BY INSTALLING COPYING, DOWNLOADING, ACCESSING OR OTHERWISE USING THIS SOFTWARE PACKAGE OR ANY PART THEREOF (AND THE RELATED DOCUMENTATION) FROM STMICROELECTRONICS INTERNATIONAL N.V, SWISS BRANCH AND/OR ITS AFFILIATED COMPANIES (STMICROELECTRONICS), THE RECIPIENT, ON BEHALF OF HIMSELF OR HERSELF, OR ON BEHALF OF ANY ENTITY BY WHICH SUCH RECIPIENT IS EMPLOYED AND/OR ENGAGED AGREES TO BE BOUND BY THIS SOFTWARE PACKAGE LICENSE AGREEMENT.

If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install STMicroelectronics STM32CubeIDE.

Installation path can be modified according to the actual self, pay attention to do not have Chinese.



STMicroelectronics STM32CubeIDE

Choose Install Location

Choose the folder in which to install STMicroelectronics STM32CubeIDE.

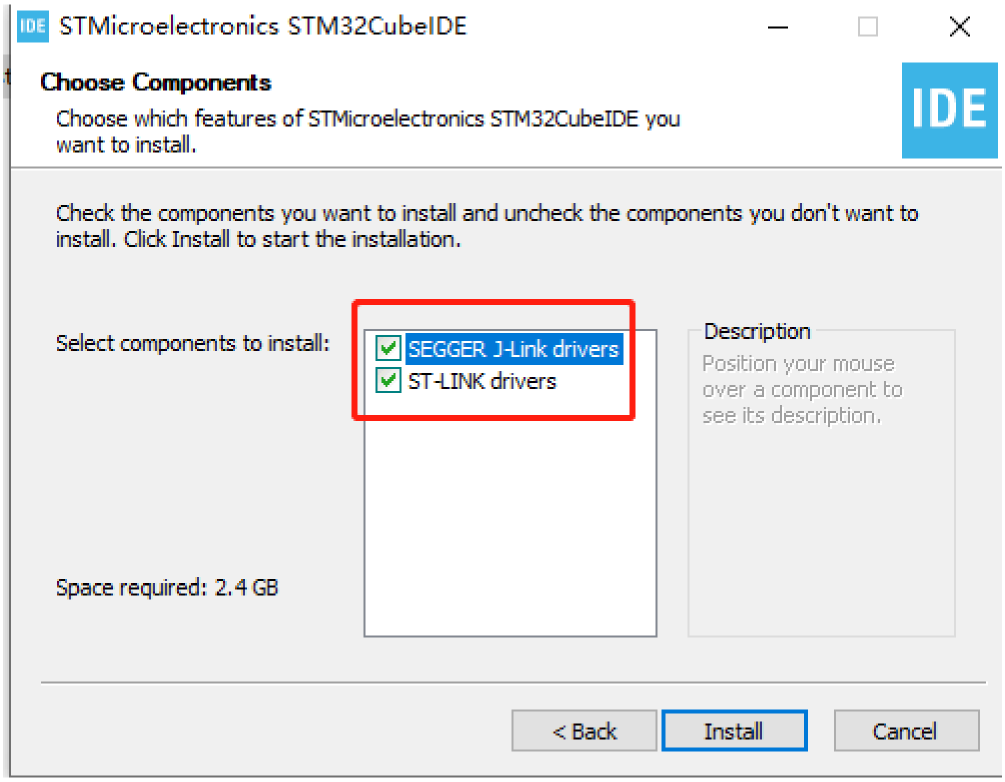
Setup will install STMicroelectronics STM32CubeIDE in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.

Destination Folder: C:\ST\STM32CubeIDE_1.9.0

Space required: 2.4 GB

Space available: 78.4 GB

Check the driver and then click Install to install it.



STMicroelectronics STM32CubeIDE

Choose Components

Choose which features of STMicroelectronics STM32CubeIDE you want to install.

Check the components you want to install and uncheck the components you don't want to install. Click Install to start the installation.

Select components to install:

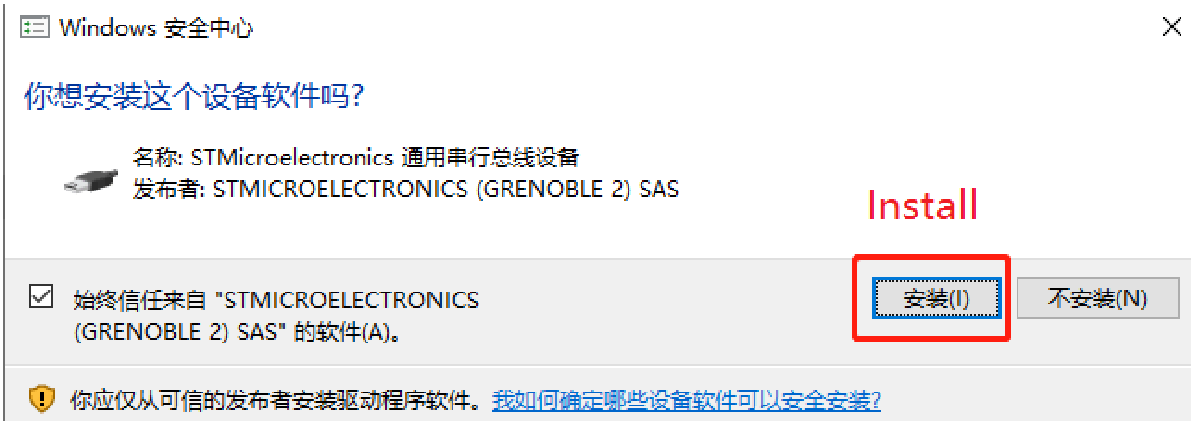
☑ SEGGER J-Link drivers

☑ ST-LINK drivers

Description

Position your mouse over a component to see its description.

Space required: 2.4 GB



Windows 安全中心

你想安装这个设备软件吗?

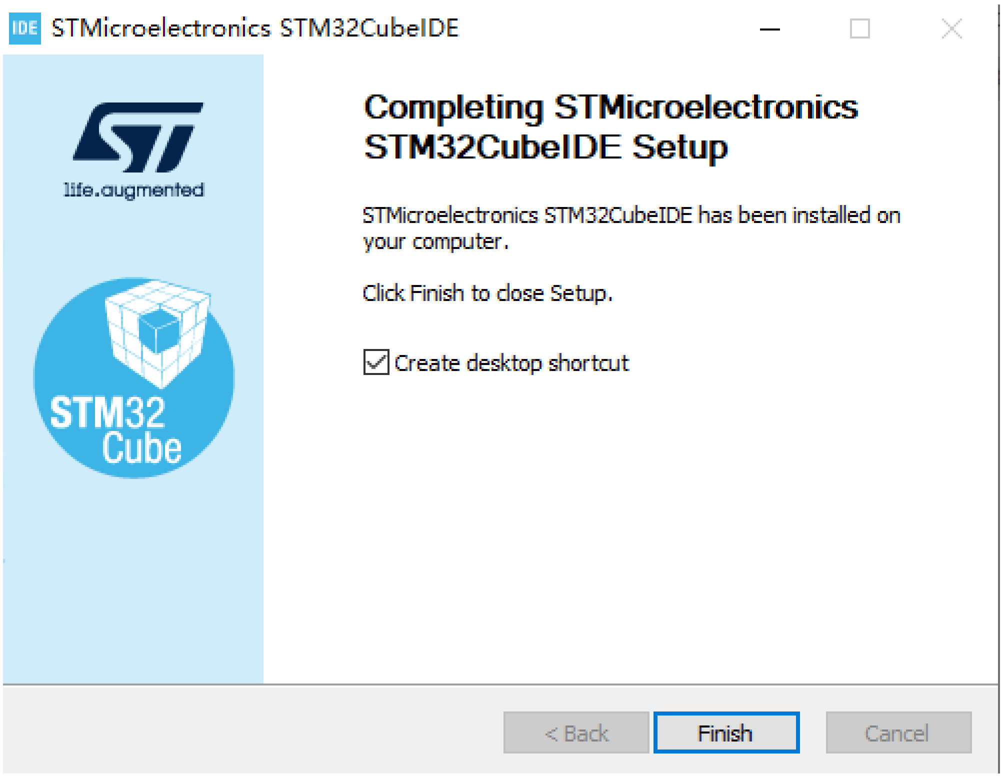
名称: STMicroelectronics 通用串行总线设备

发布者: STMICROELECTRONICS (GRENOBLE 2) SAS

☑ 始终信任来自 "STMICROELECTRONICS (GRENOBLE 2) SAS" 的软件(A)。

你应仅从可信的发布者安装驱动程序软件。我如何确定哪些设备软件可以安全安装?

Next just wait for the installation to complete.



STMicroelectronics STM32CubeIDE

Completing STMicroelectronics STM32CubeIDE Setup

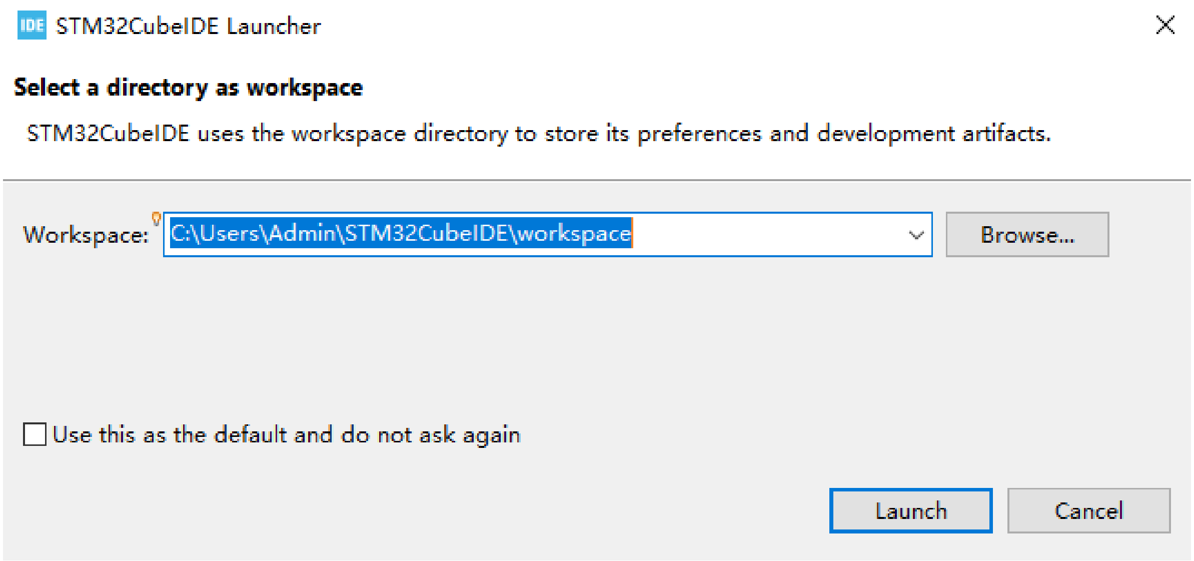
STMicroelectronics STM32CubeIDE has been installed on your computer.

Click Finish to close Setup.

☑ Create desktop shortcut

2. 4. New project

1. Double-click the desktop shortcut to open STM32CubeIDE, you need to select the workspace, save the path can be based on the actual choice of other paths (do not bring Chinese).



STM32CubeIDE Launcher

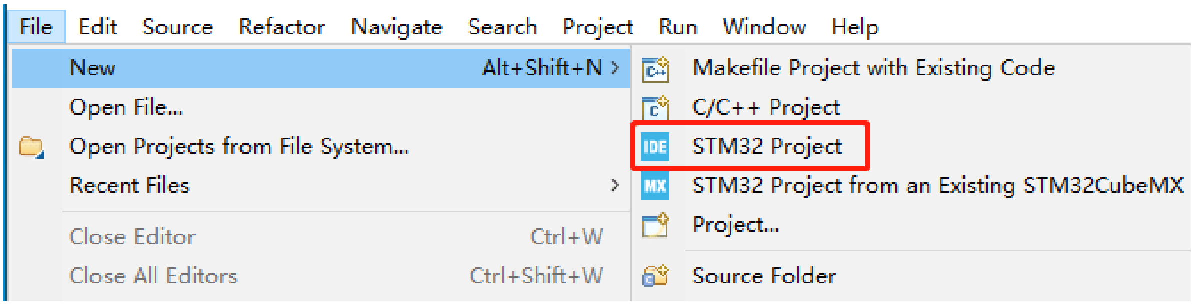
Select a directory as workspace

STM32CubeIDE uses the workspace directory to store its preferences and development artifacts.

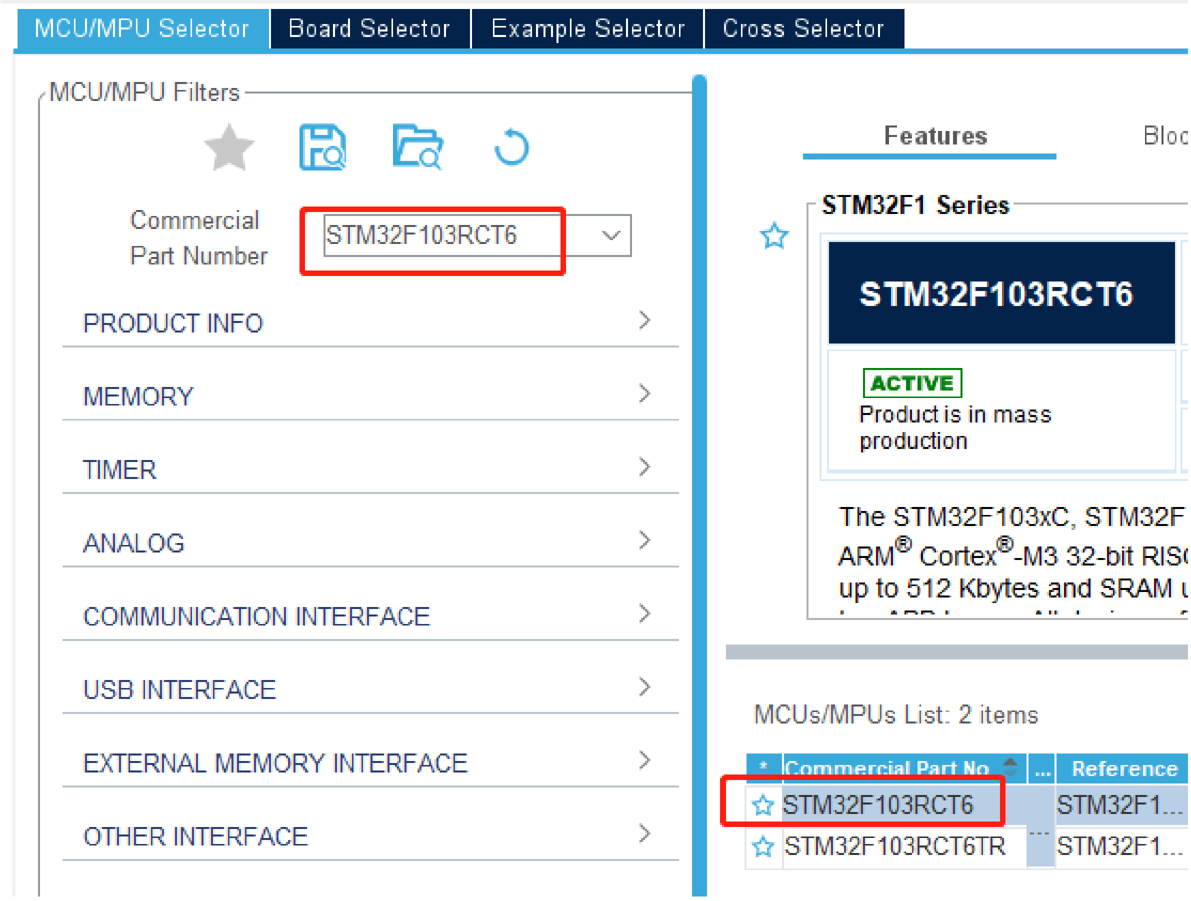
Workspace: C:\Users\Admin\STM32CubeIDE\workspace

□ Use this as the default and do not ask again

2. Click File->New->STM32 Project.



3. Search and select the chip STM32F103RCT6, then click Next in the lower right corner to go to the next step.



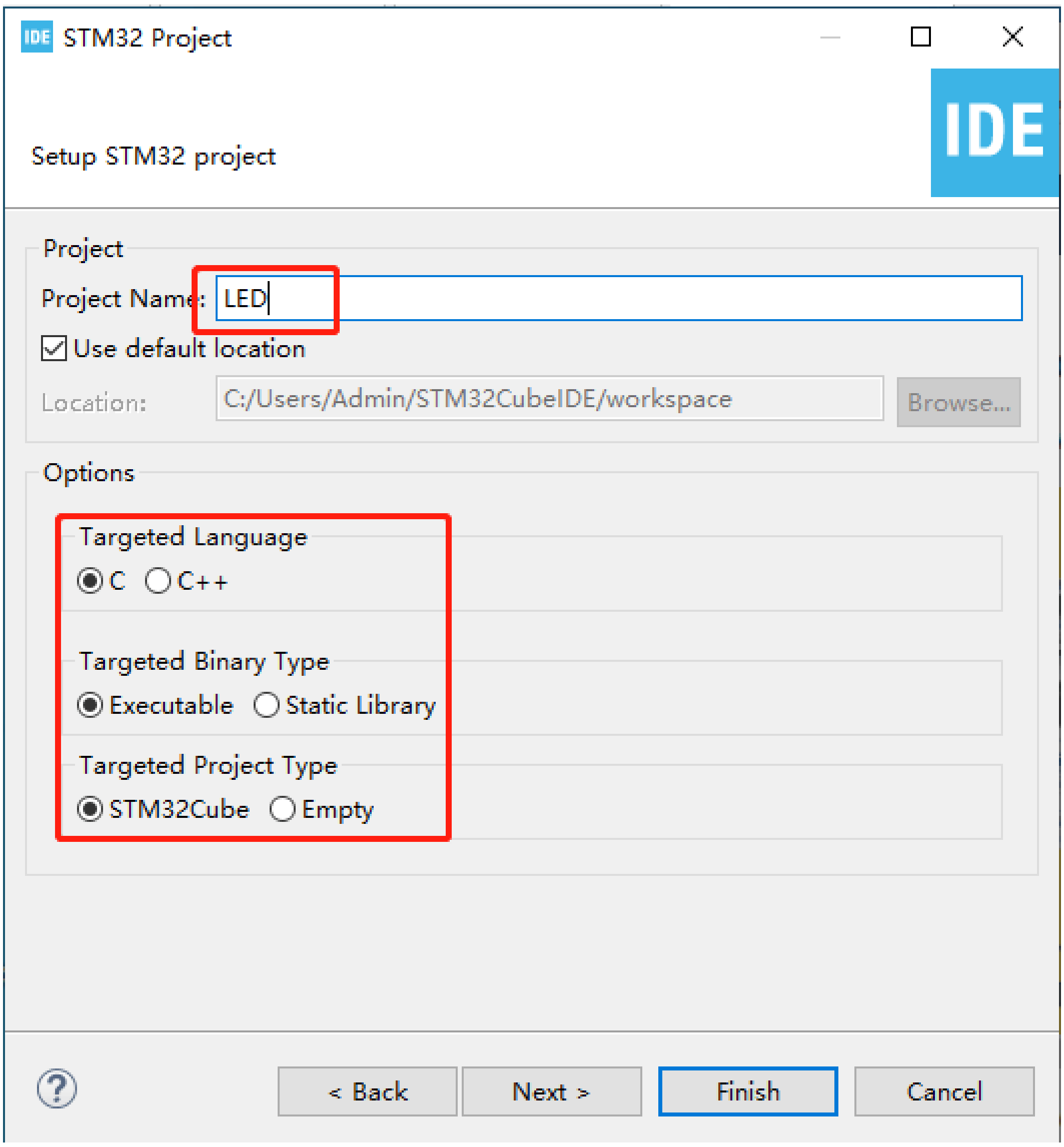
Commercial Part Number: STM32F103RCT6

The STM32F103xC, STM32F
ARM® Cortex®-M3 32-bit RIS
up to 512 Kbytes and SRAM u

MCUs/MPUs List: 2 items

*	Commercial Part No	...	Reference
☆	STM32F103RCT6		STM32F1...
☆	STM32F103RCT6TR	...	STM32F1...

4. Enter the name of the project, here to LED as an example, other parameters can be default.



STM32 Project

Setup STM32 project

Project

Project Name: LED

☑ Use default location

Location: C:/Users/Admin/STM32CubeIDE/workspace

Options

Targeted Language

● C ○ C++

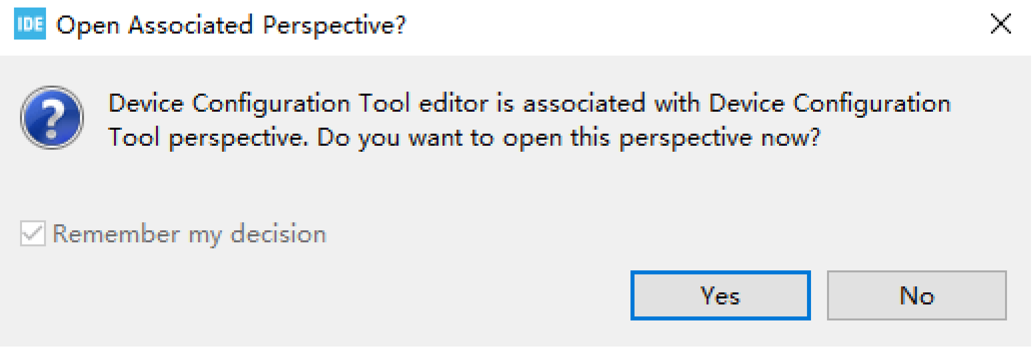
Targeted Binary Type

● Executable ○ Static Library

Targeted Project Type

● STM32Cube ○ Empty

5. Click Yes and the graphical content will be loaded at this point.

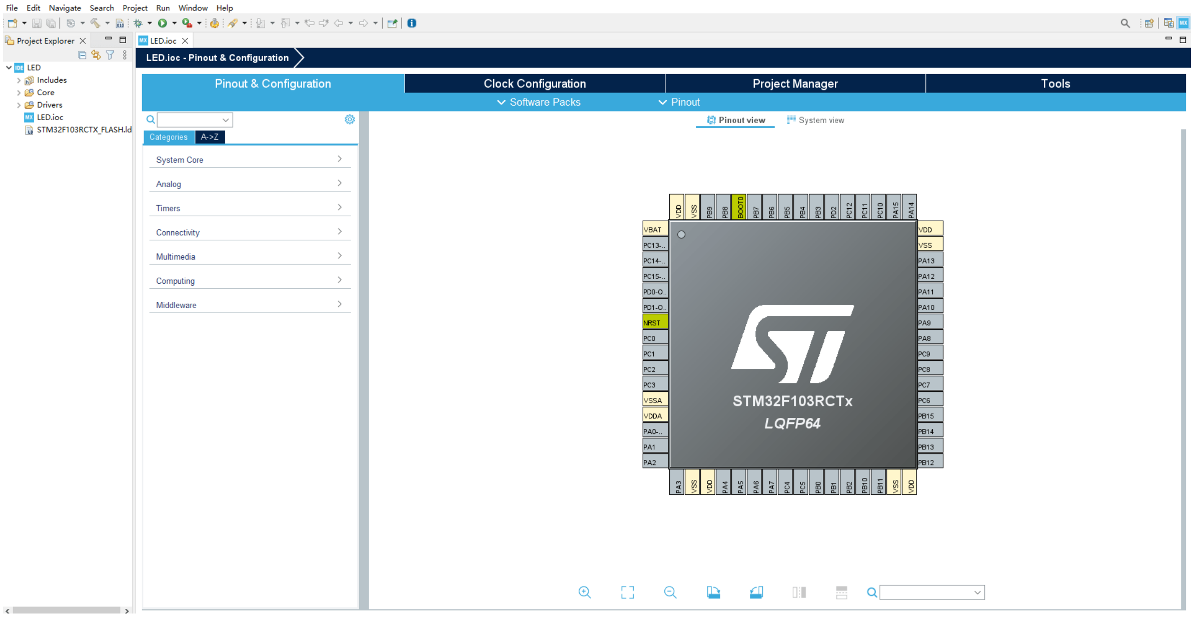


Open Associated Perspective?

Device Configuration Tool editor is associated with Device Configuration Tool perspective. Do you want to open this perspective now?

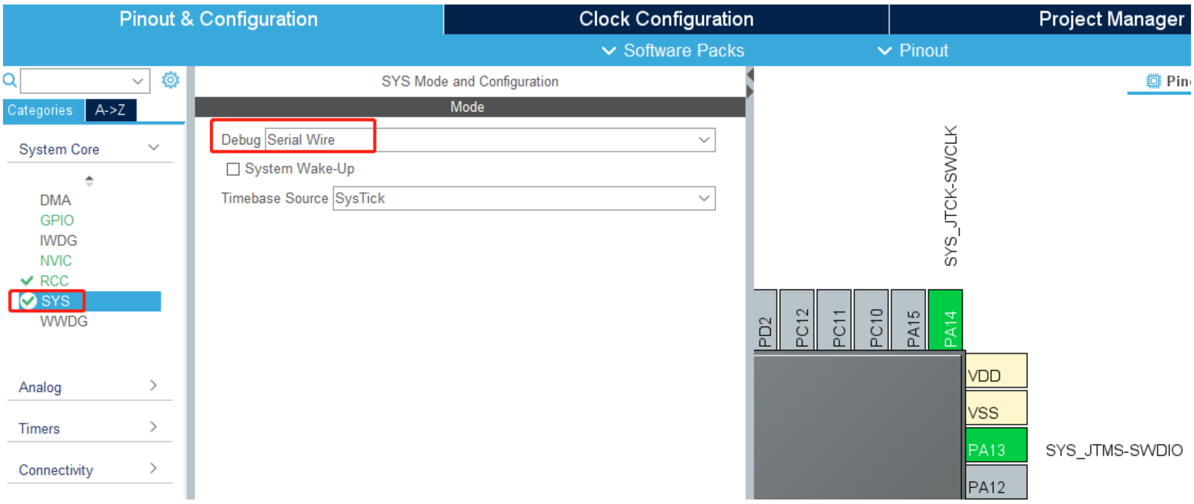
☑ Remember my decision

When completed, it is shown below:



2.5 Pin configuration

1. First of all, you need Debug information, under Pinout&Configuration, click SYS->Debug to select Serial Wire.

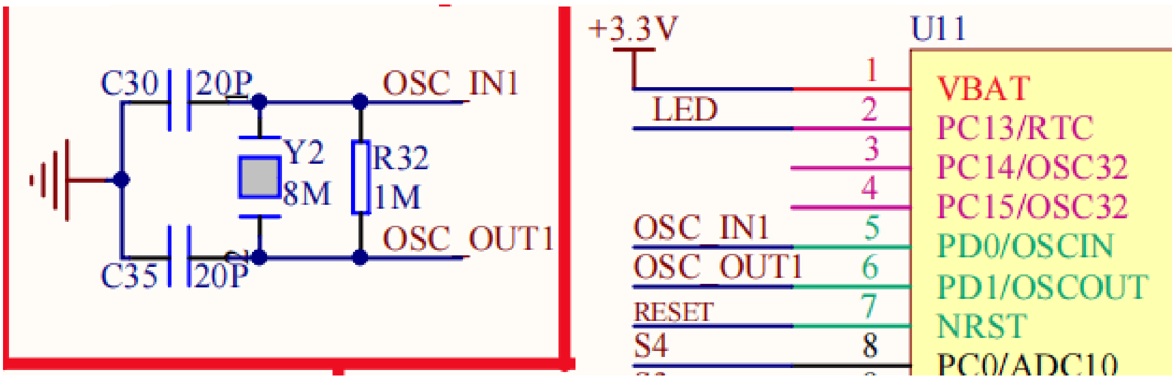


Debug Serial Wire

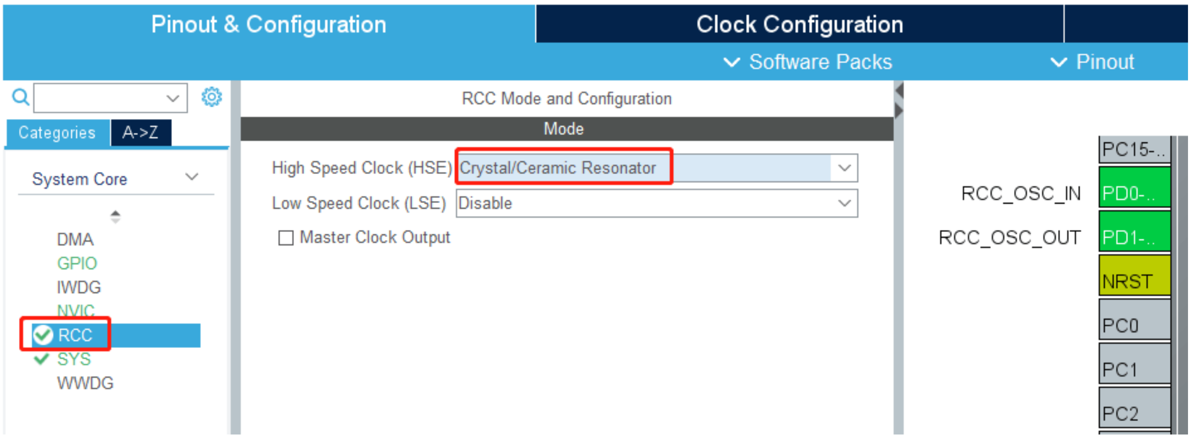
□ System Wake-Up

Timebase Source SysTick

2. Modify the system clock of STM32, according to the schematic diagram, we can see that the external crystal is 8M frequency.



In Pinout&Configuration select RCC->HSE select Crystal/Ceramic Resonator where HSE is the external clock and LSE is the internal clock, using the external clock can be more stable and efficient than the internal clock.



RCC Mode and Configuration

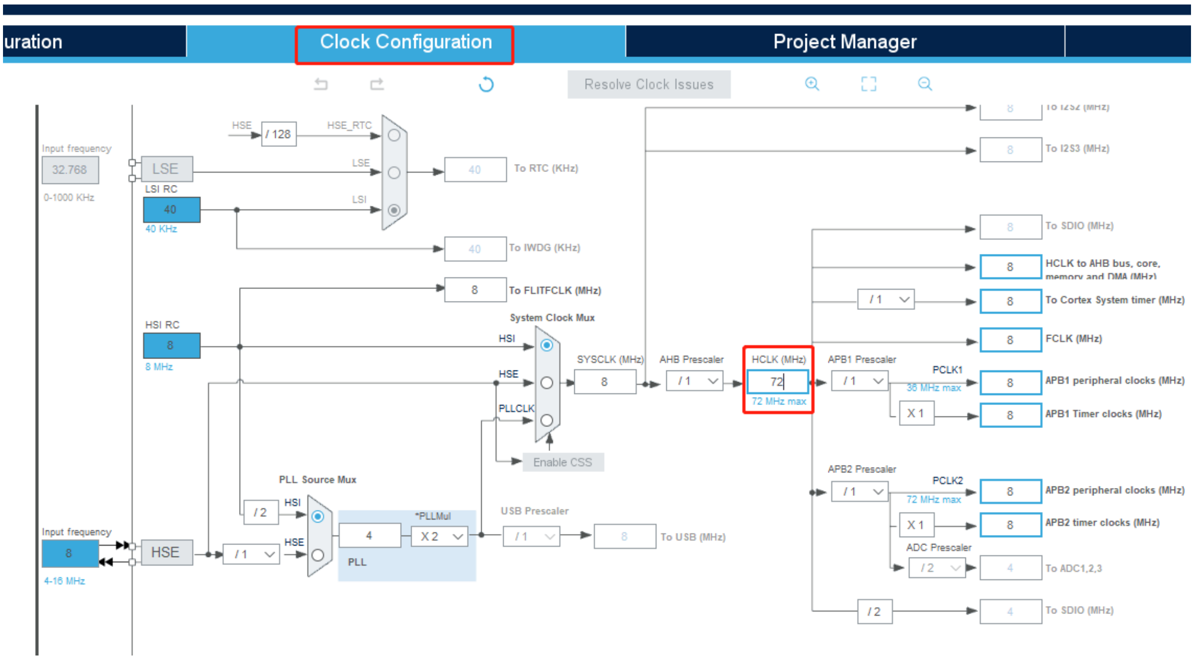
Mode

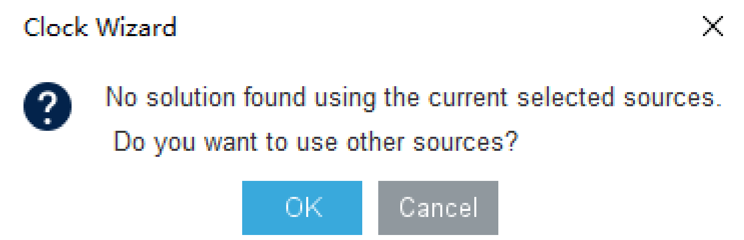
High Speed Clock (HSE) Crystal/Ceramic Resonator

Low Speed Clock (LSE) Disable

□ Master Clock Output

Switch to Clock Configuration to modify the frequency of HCLK to 72 and press Enter to confirm.

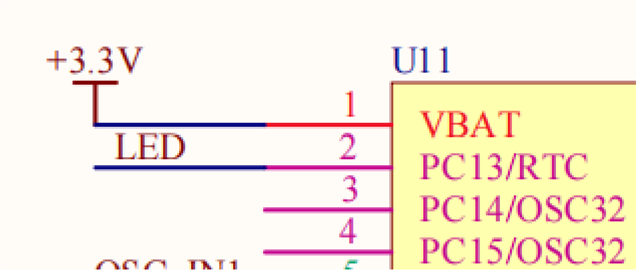




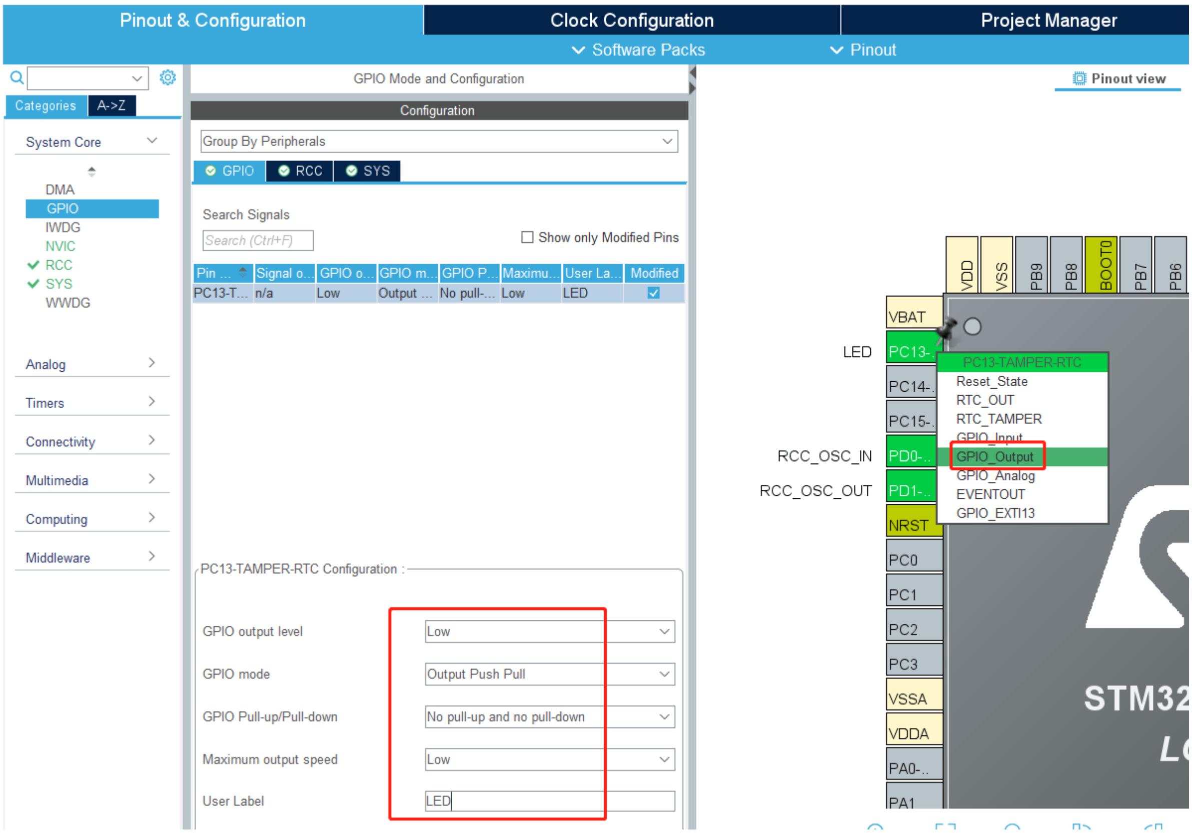
Clock Wizard

No solution found using the current selected sources.
Do you want to use other sources?

3. Increase the LED pin configuration, from the schematic diagram it can be seen that the LED is connected to the PC13 pin.



Set the PC13 pin to GPIO_Output, and for convenience here change the Label to LED.

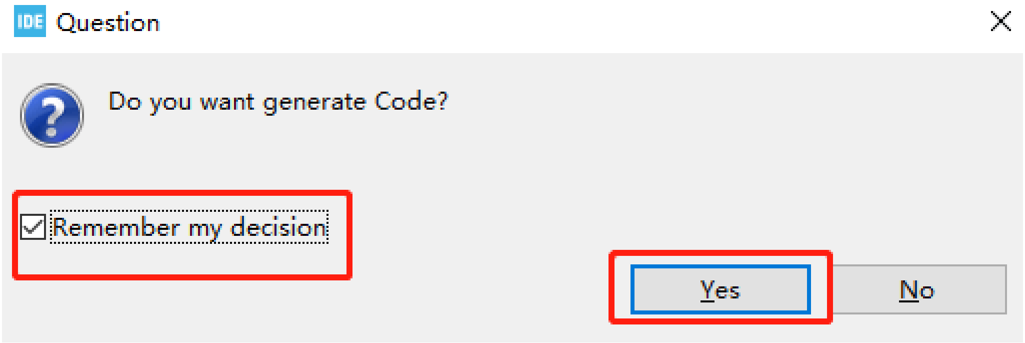


Pin ...	Signal o...	GPIO o...	GPIO m...	GPIO P...	Maximu...	User La...	Modified
PC13-T...	n/a	Low	Output ...	No pull-...	Low	LED	☑

PC13-TAMPER-RTC Configuration :

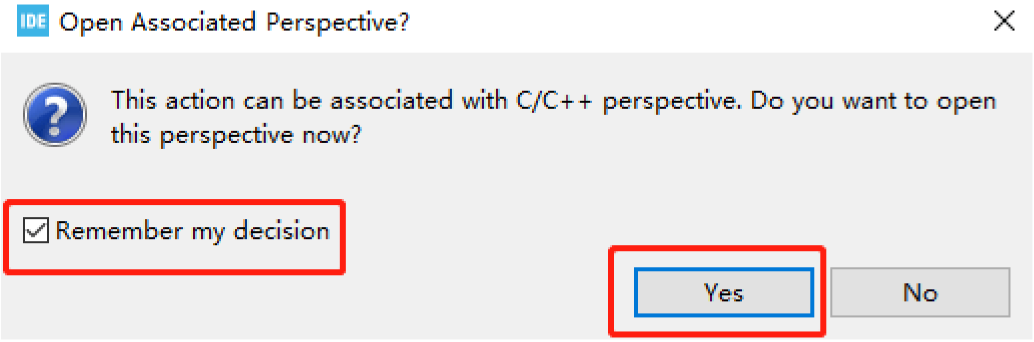
GPIO output level	Low
GPIO mode	Output Push Pull
GPIO Pull-up/Pull-down	No pull-up and no pull-down
Maximum output speed	Low
User Label	LED

Then press Ctrl+S to save, check Remember my decision, and click Yes. This will automatically generate the code every time you save.



Do you want generate Code?

☑ Remember my decision



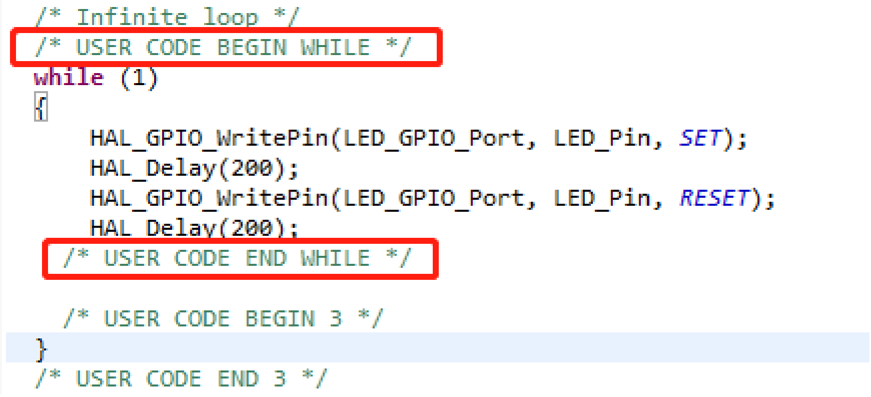
This action can be associated with C/C++ perspective. Do you want to open this perspective now?

☑ Remember my decision

2.6. Writing the code

1. Since the previous step of graphical configuration has generated the initialization code of the system, we only need to add the functions to be implemented.

Find the main function in the main.c file and add the control LED under while (1). The function is to flash the LED every two hundred milliseconds. Press Ctrl+S to save the code.



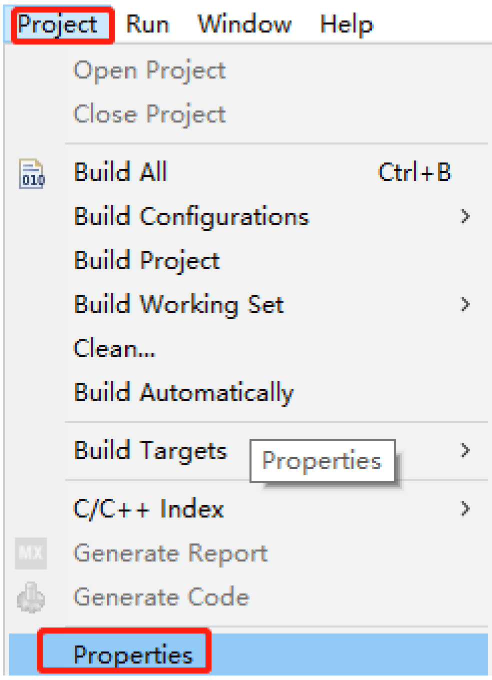
```
/* Infinite loop */
/* USER CODE BEGIN WHILE */
while (1)
{
    HAL_GPIO_WritePin(LED_GPIO_Port, LED_Pin, SET);
    HAL_Delay(200);
    HAL_GPIO_WritePin(LED_GPIO_Port, LED_Pin, RESET);
    HAL_Delay(200);
  /* USER CODE END WHILE */

  /* USER CODE BEGIN 3 */
}
/* USER CODE END 3 */
```

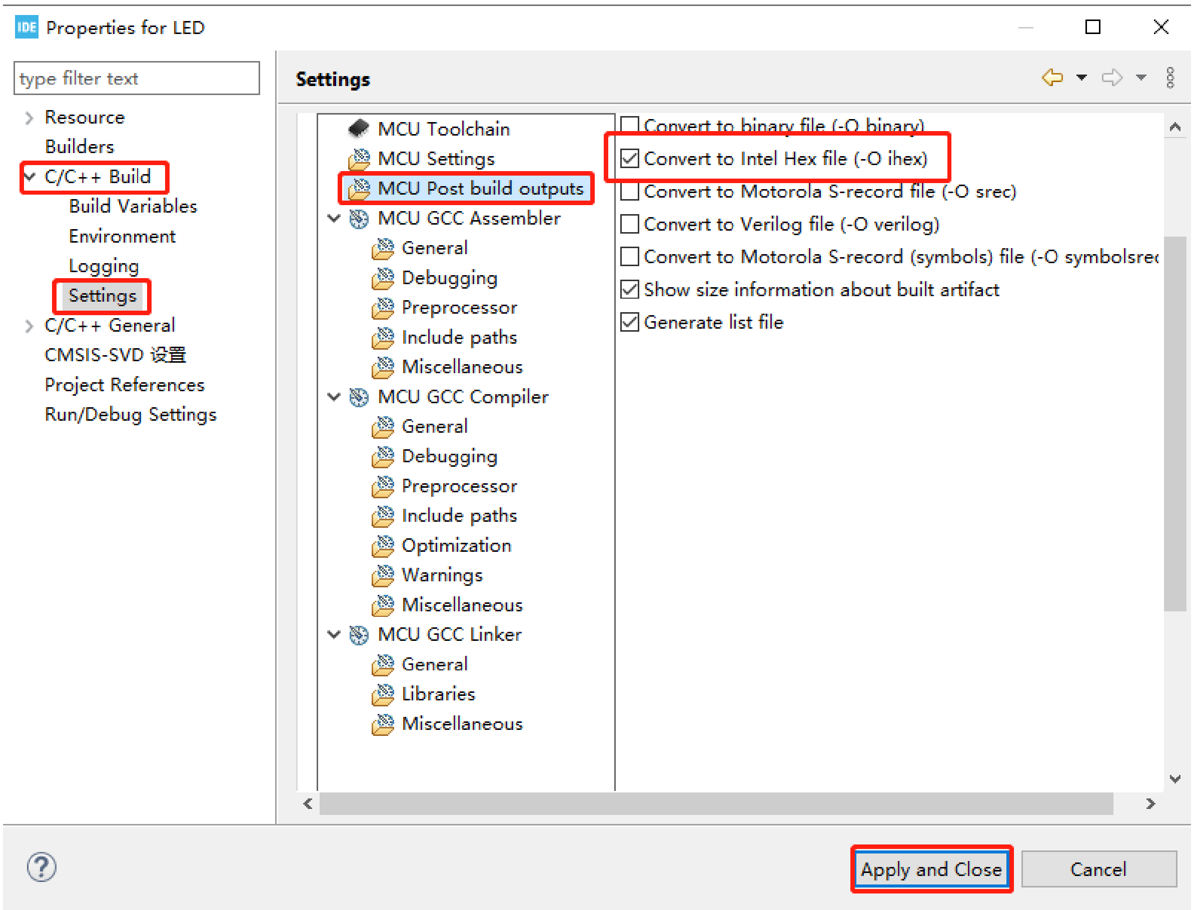
Note: The code content should be added between USER CODE BEGIN and USER CODE END. Otherwise, the code content will be overwritten next time when you generate the code through the graphical tool, but it will not be overwritten if you add it between USER CODE BEGIN and USER CODE END. Don't write Chinese comments in it, it may be messy.

2. 7 Compile the program

1. Add the function of generating HEX files.

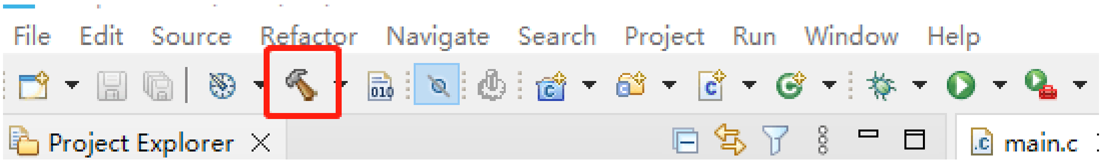
Click Project->Properties->C/C++ Build->Settings->MCU Post build outputs in order, and then tick the box in front of Convert to Intel Hex file(-O ihex), as shown below.



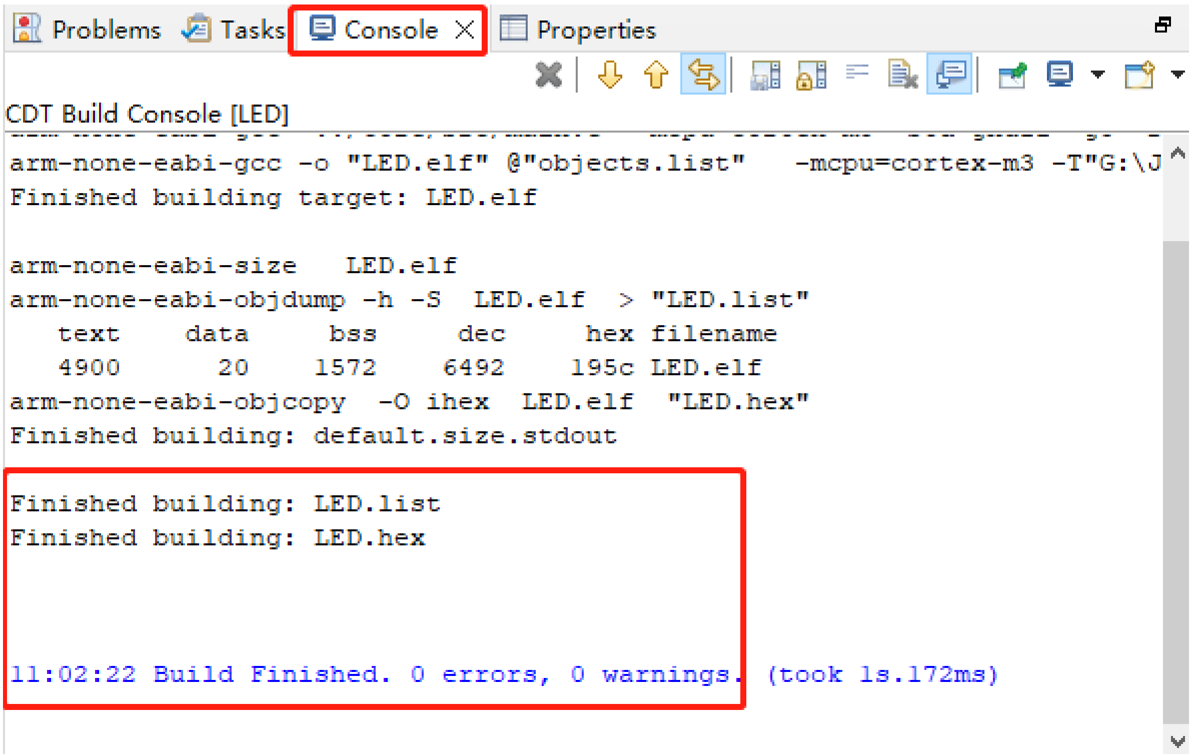


□ Convert to binary file (-O binary)
☑ Convert to Intel Hex file (-O ihex)
□ Convert to Motorola S-record file (-O srec)
□ Convert to Verilog file (-O verilog)
□ Convert to Motorola S-record (symbols) file (-O symbolsrec
☑ Show size information about built artifact
☑ Generate list file

2. Click the hammer in the toolbar to start compiling the project.


File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer
main.c

STM32CubeIDE will pop up the Console console, see compile 0 error, 0 warning means compile successfully. As shown in the figure below, the project generates a file named LED.hex, and this file is saved in the Debug folder of the project directory.



CDT Build Console [LED]

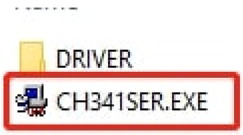
```
arm-none-eabi-gcc -o "LED.elf" @"objects.list"   -mcpu=cortex-m3 -T"G:\J
Finished building target: LED.elf

arm-none-eabi-size   LED.elf
arm-none-eabi-objdump -h -S  LED.elf  > "LED.list"
   text    data     bss     dec     hex filename
   4900      20    1572    6492    195c LED.elf
arm-none-eabi-objcopy  -O ihex  LED.elf  "LED.hex"
Finished building: default.size.stdout

Finished building: LED.list
Finished building: LED.hex



11:02:22 Build Finished. 0 errors, 0 warnings. (took 1s.172ms)
```

2.8. Burning program

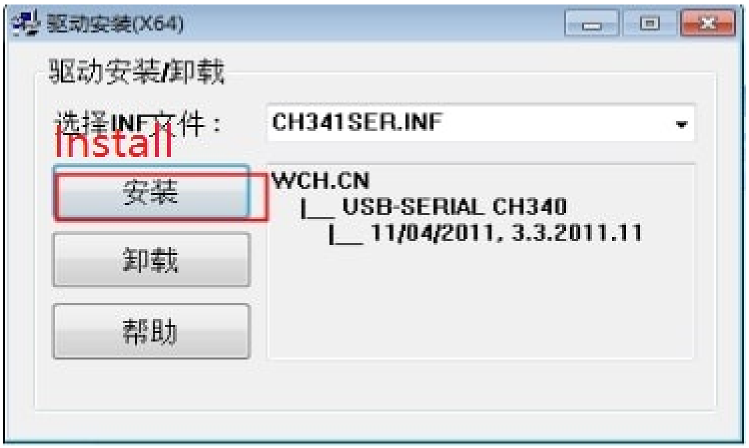
1.Install CH340 driver

As the USB communication of Rosmaster expansion board uses CH340 chip, so you need to install the driver of CH340 chip, if your computer has already installed CH340 driver, you don't need to repeat the installation.

Unzip this course material in the [Uart drive (CH340).zip], double-click to open the CH341SER.EXE program



Click Install and the installation will be prompted as successful when it is complete.



选择INF文件： CH341SER.INF

```
WCH.CN
 |__ USB-SERIAL CH340
   |__ 11/04/2011, 3.3.2011.11
```

2. Download burning software

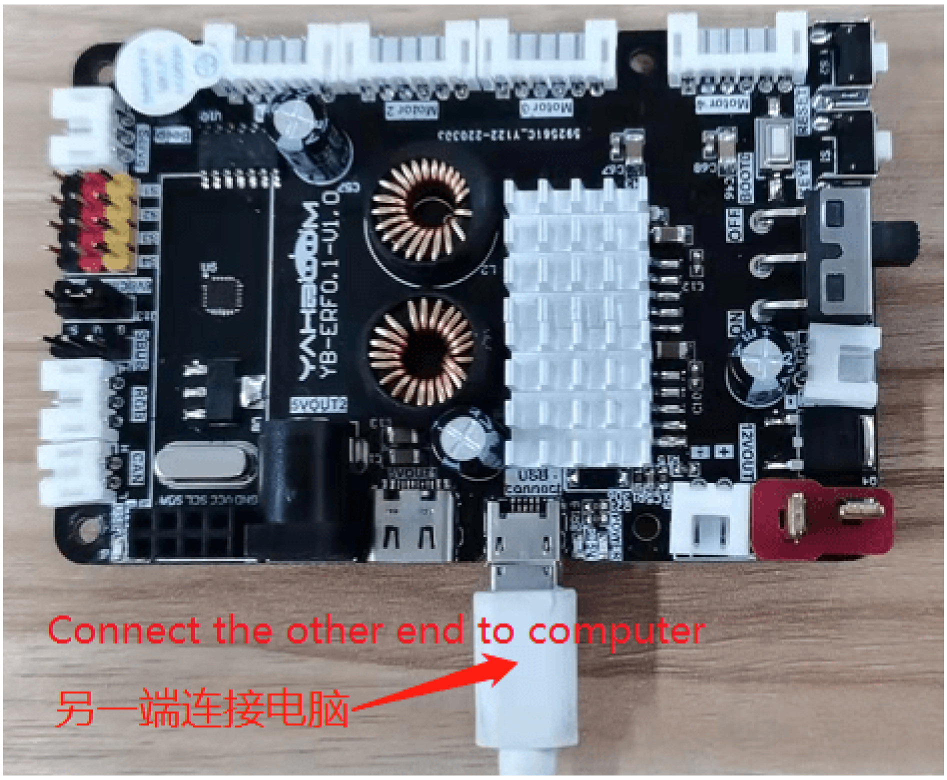
This burning Rosmaster expansion board MCU firmware need to use mcuisp (or flymcu) burning software, please go to http://www.mcuisp.com download mcuisp (or flymcu) burning software; you can also directly use the information provided in the mcuisp software.

mcuisp software is a green version of the software, do not need to install, double-click to open to use.

3.Connecting the device

Before connecting the Rosmaster to your computer, unplug the micro USB cable and power cable that connects the expansion board to the Jetson Nano.

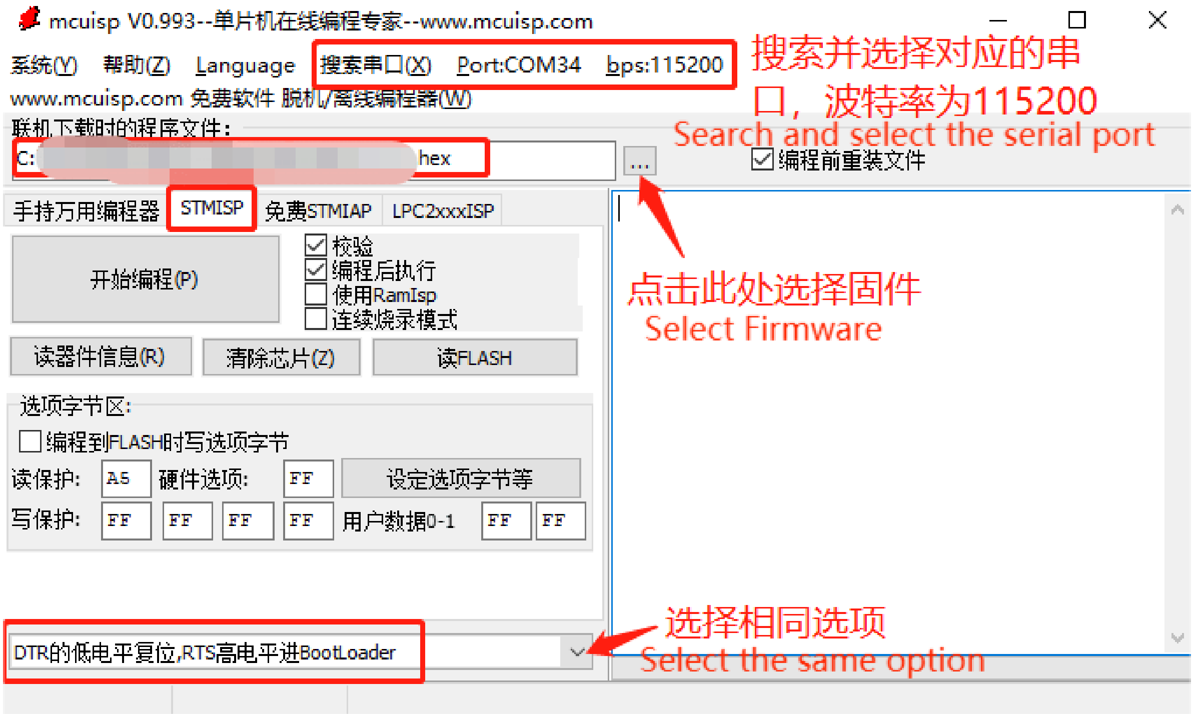
Plug one end of the USB cable into the USB port of your computer and the other end into the Micro USB port of the Rosmaster expansion board.



Connect the other end to computer

另一端连接电脑

4. Configure the burning software



mcuisp V0.993--单片机在线编程专家--www.mcuisp.com
系统(Y) 帮助(Z) Language
www.mcuisp.com 免费软件 脱机/离线编程器(W)
手持万用编程器 STMISP 免费STMIAP LPC2xxxISP
开始编程(P)
读器件信息(R) 清除芯片(Z) 读FLASH
设定选项字节等

搜索串口(X) Port:COM34 bps:115200

搜索并选择对应的串口，波特率为115200

Search and select the serial port

联机下载时的程序文件：

C: hex

☑编程前重装文件

点击此处选择固件

Select Firmware

☑校验
☑编程后执行
□使用RamIsp
□连续烧录模式

选项字节区：
□编程到FLASH时写选项字节
读保护: A5 硬件选项: FF
写保护: FF FF FF FF 用户数据0-1 FF FF

DTR的低电平复位,RTS高电平进BootLoader

选择相同选项

Select the same option

When searching serial ports, if there are more than one serial port number, and you can't confirm which one is Rosmaster's. Solution 1: Unplug the other USB port and search again; Solution 2: Unplug the USB cable of Rosmaster first, click Search Serial Port, write down the serial port number searched, plug in the USB cable of Rosmaster, search the serial port again, and compare before and after two times, the newly added serial port number is the serial port number of Rosmaster.

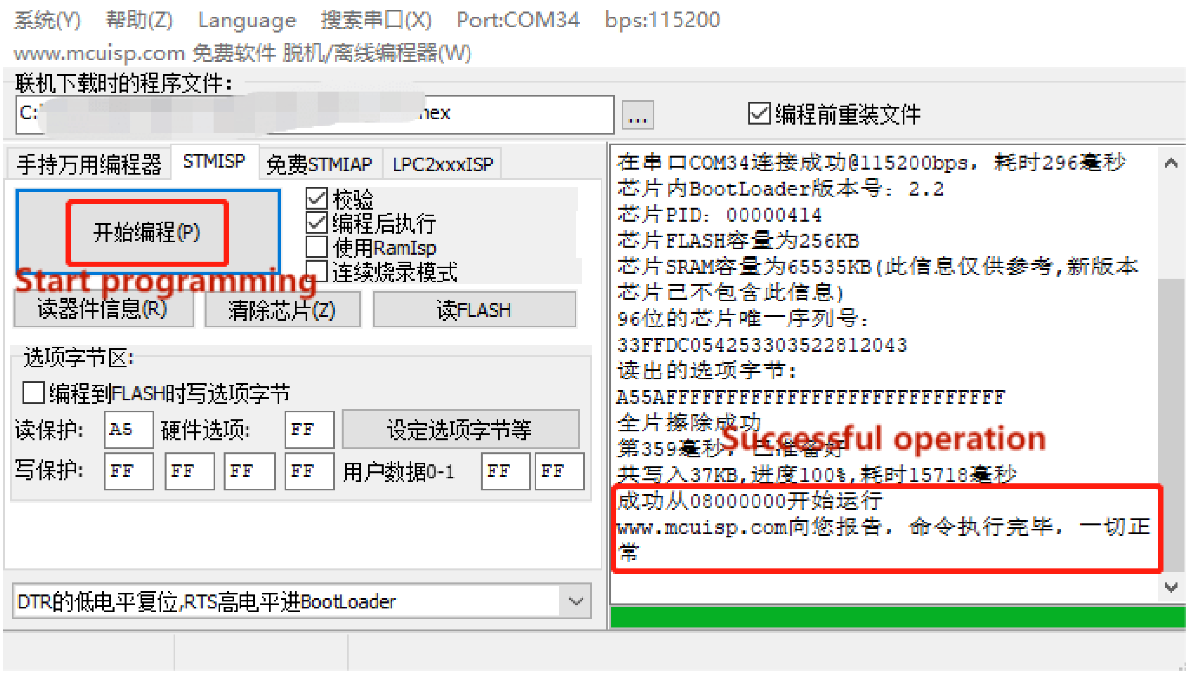
To select the firmware, you need to select the LED.hex file in the Debug folder of the project directory.

Finally, the bottom of the configuration selection, be sure to select [DTR's low level reset, RTS high level into the BootLoader] option, otherwise it may lead to download failure.

3. Burning Program

Please first put the microcontroller on the expansion board into the burn mode:

First press and hold the BOOT0 key on the expansion board, then press the RESET key, and finally release the BOOT0 key.



联机下载时的程序文件：

C:[redacted]

☑编程前重装文件

☑校验
☑编程后执行
□使用RamIsp
□连续烧录模式

选项字节区：

□编程到FLASH时写选项字节

读保护: A5 硬件选项: FF

写保护: FF FF FF FF 用户数据0-1 FF FF

DTR的低电平复位,RTS高电平进BootLoader

```
在串口COM34连接成功@115200bps，耗时296毫秒
芯片内BootLoader版本号：2.2
芯片PID：00000414
芯片FLASH容量为256KB
芯片SRAM容量为65535KB(此信息仅供参考,新版本
芯片已不包含此信息)
96位的芯片唯一序列号：
33FFDC054253303522812043
读出的选项字节：
A55AFFFFFFFFFFFFFFFFFFFFFFFFFFFF
全片擦除成功
第359毫秒，已准备好
共写入37KB,进度100%,耗时15718毫秒
成功从08000000开始运行
www.mcuisp.com向您报告，命令执行完毕，一切正
常
```

Click [Start Programming], the mcuisp burning software will burn the firmware we chose in the previous step to the microcontroller on Rosmaster's expansion board. When the prompt [Successfully run www.mcuisp.com Reporting to you. from 08000000, the command is executed, everything is normal] appears on the right side, it means the download is successful.

Note:

① Before you start burning, please make sure that the serial port number of Rosmaster is accessible, that is, no serial assistant occupies it.

② Rosmaster into the burning mode of operation, first press and hold the BOOT0 key on the expansion board, then press the RESET key, and finally release the BOOT0 key.

2.9. Program Phenomena

The LED on the expansion board flashes every 200 milliseconds.