CH32F103 Evaluation Board Reference
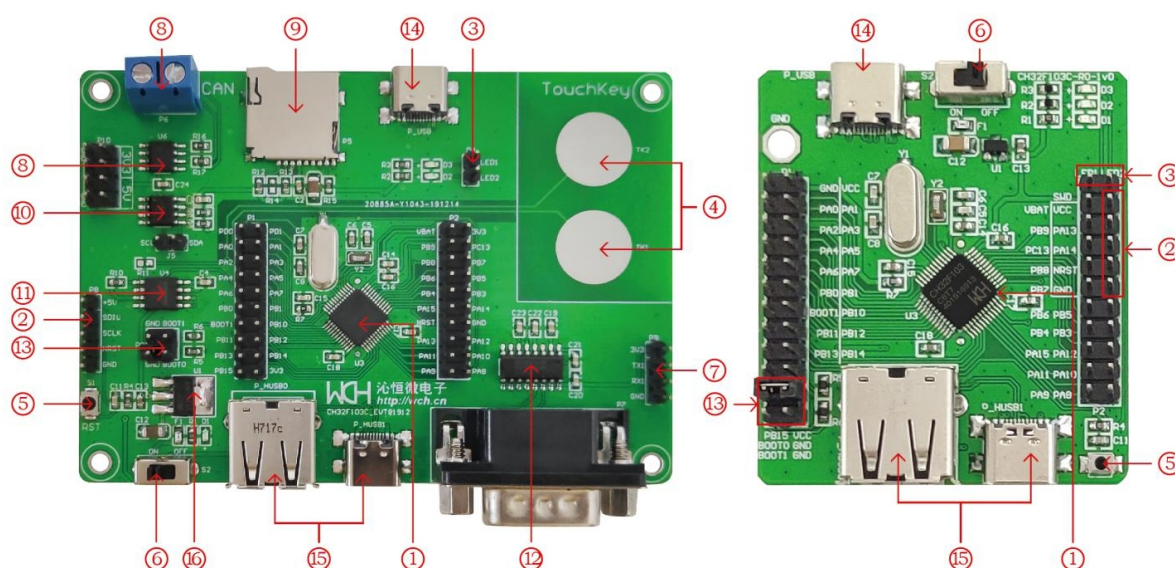
Version: V1.5

https://wch-ic.cnom

1. Overview

This evaluation board is applied to the development of CH32F103 chip, supports our official WCH-Link download simulation or other SWD simulation tools download simulation, and provides the chip resources related to the application reference examples and demonstrations.

2. Evaluation board hardware

Please refer to the CH32F103SCH.pdf document for the schematic of the evaluation board.

CH32F103 Evaluation Board

Descriptions

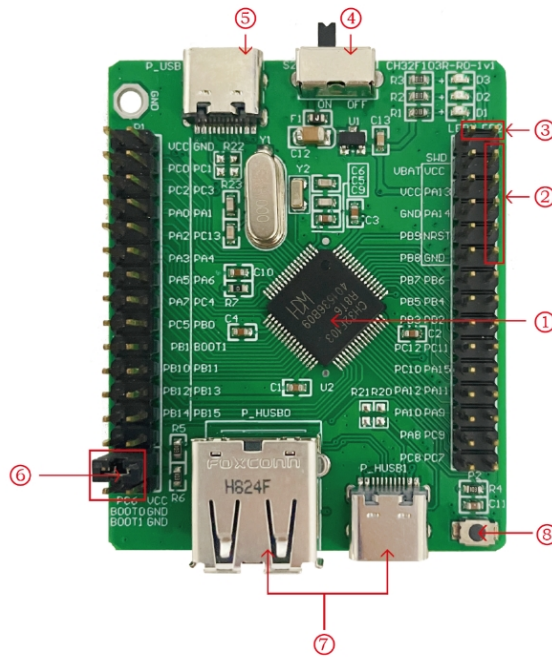|			
1.Main control MCU	5.Reset button	9.SD card holder	13.Boot mode configuration
2.SWD interface	6.Power switch	10.EEPROM chip	14.USB slave interface
3.LED	7.Serial port 1	11.SPI FLASH memory chip	15.USB master-slave interface
4.Touch button	8.CAN interface	12.RS232 level conversion chip	16. Voltage regulator chip

The CH32F103 evaluation board comes with the following resources.

Motherboard - CH32F103EVT

1. Main control MCU: CH32F103C8T6

2. SWD interface: for download, simulation debugging

3. LED: Connected to the main chip I/O port through P4 pins for control

4. Touch button: Connect the main chip touch button channel 0, channel 1

5. Button S1: Reset button for external manual reset of the power supply switch

6. Switch S2: Used to disconnect or connect external 5V power supply or USB power supply

7. Serial port 1: Connect to the main chip URAT1 interface to demonstrate the serial port transceiver function

8. CAN chip U6: Connect to the main chip CAN interface to demonstrate CAN bus functions

9. SD card holder P5: Connect to SPI1 interface to demonstrate the operation of TF card through SPI interface

10. EEPROM chip U2: Connect to the I2C interface and connects to the I/O of the main chip via J5

11. Serial Flash memory U4: Connect SPI1 interface to demonstrate operation of Flash memory

12. RS232 level conversion chip U5: for converting TTL signals from serial port to RS232 signals

13. Boot mode configuration: Select the boot mode when the chip is powered on by configuring BOOT0/1

14. USB interface P_USB: USB communication interface of the main chip, only Device function

15. USB interface P_HUSB: USB communication interface of the host chip, with Host and Device functions

16. Forward low dropout voltage regulator chip U1: used to realize the conversion of 5V voltage to 3.3V supply voltage available to the chip

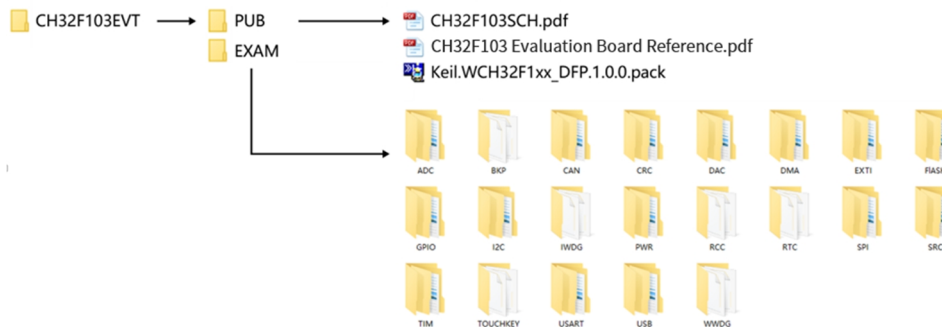CH32F103 Evaluation Board

Descriptions

1.Main control MCU	3.LED pins	5. USB interface P_USB	7. USB interface P_HUSB
2.SWD interface	4.Switch S2	6. Boot mode configuration	8.Button S1

Motherboard - CH32F103R-R0

1. Main control MCU : CH32F103R8T6

2. SWD interface: for downloading, emulation and debugging

3. LED pins: connected to the main chip IO port through P4 pins for control

4. Switch S2: used to cut off or connect external 5V power supply or USB power supply

5. USB interface P_USB: USB communication interface of the main chip, only Device function

6. Boot mode configuration: select the boot mode when the chip is powered on by configuring BOOT0/1

7. USB interface P_HUSB: USB communication interface of the main chip, with Host and Device functions

8. Button S1: reset button, used for external manual reset power switch

3. Software Development

3.1 EVT package directory structure

Description.

PUB folder: Provides evaluation board manuals, schematics for evaluation versions, and chip support package library files.

EXAM folder: Provides software development drivers and corresponding examples for the CH32F103 controller, categorized by peripherals. Each type of peripheral folder contains one or more functional application routines folders.
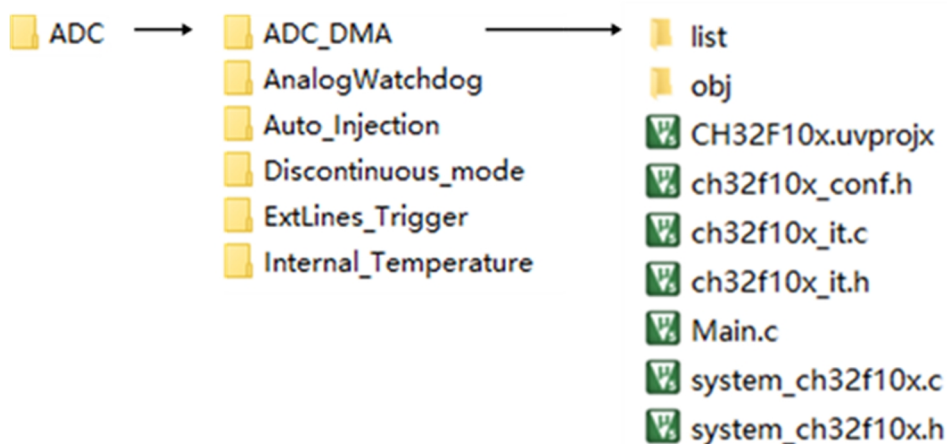
3.2 Open Project - MDK5

The MDK5 project file is provided in the CH32EVT development kit for each application routine, and the user can simply open it by default without additional configuration.

3.2.1 Project file location

1. Startup file: located under "CH32F103EVT\EXAM\SRC\Startup".
2. Core system header file: located under "CH32F103EVT\EXAM\SRC\CMSIS".
3. Peripheral driver source file: located under "CH32F103EVT\EXAM\SRC\StdPeriphDriver".
4. Peripheral driver header file: located under "CH32F103EVT\EXAM\SRC\StdPeriphDriver\inc".
5. Serial debug and system delay source files: located under "CH32F103EVT\EXAM\SRC\Debug".

3.2.2 Basic peripheral application routines

The basic peripheral routines are located in the "CH32F103EVT\EXAM" directory, which is divided into different folders according to different peripherals. Each peripheral folder provides a demonstration project of the function of this peripheral, take the "ADC" folder as an example.

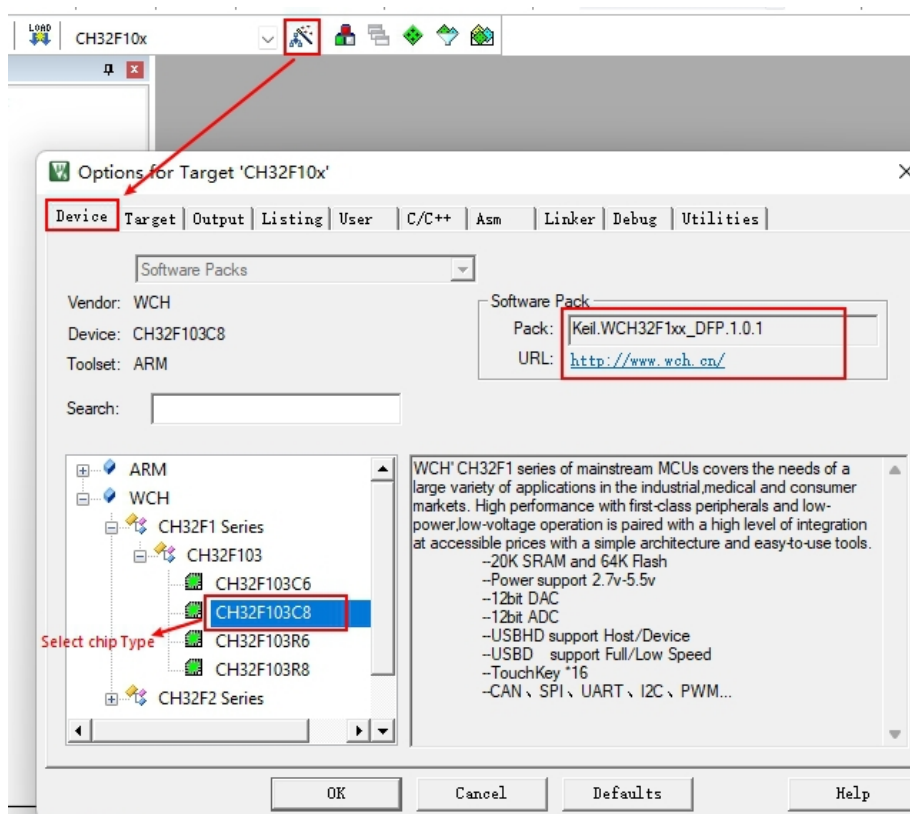As shown above, "ADC" means ADC basic function demo, double click in this folder to open the project "

   ".

3.3 Compile Software Configuration

CH32F103 is a Cortex-M3 core MCU that supports MDK compilation environment. If you want to recreate a project, you need to pay attention to some software configurations. The following is an example of MDK5 to illustrate these configuration options.
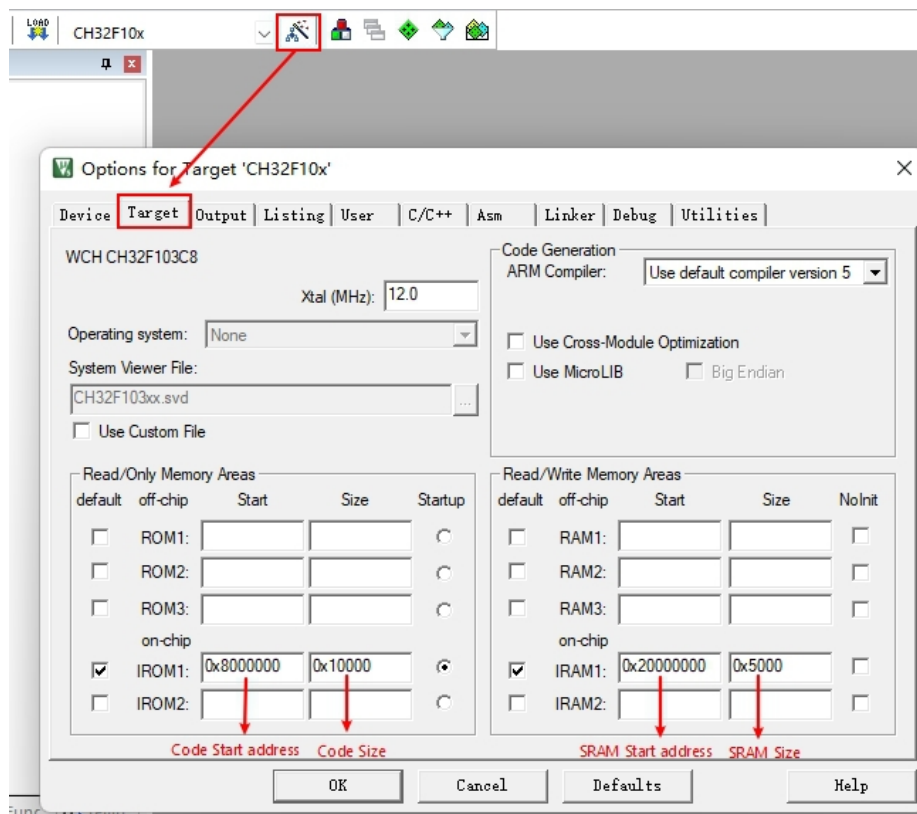
3.3.1 Chip model selection

First, select Keil.WCH32F1xx_DFP. x. x. x. pack in the "CH32F103EVT\PUB" directory and click Install. Next, select the chip model, as follows.
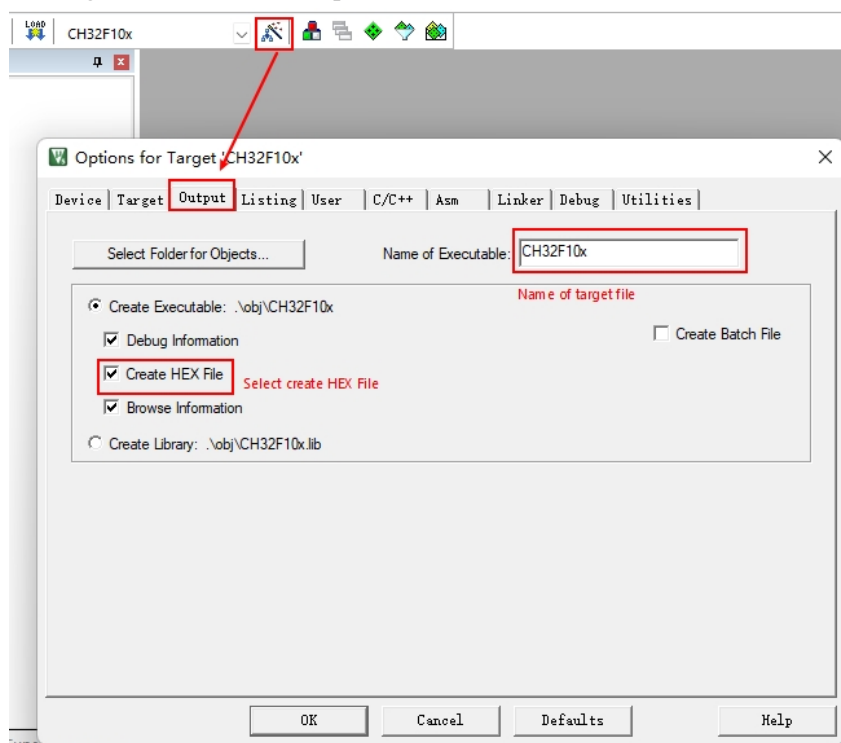
3.3.2 Code and RAM configuration

CH32F103 program start address: 0x8000000, capacity limit 64K (0x10000); CH32F103 SRAM start address: 0x20000000, capacity limit 20K (0x5000).
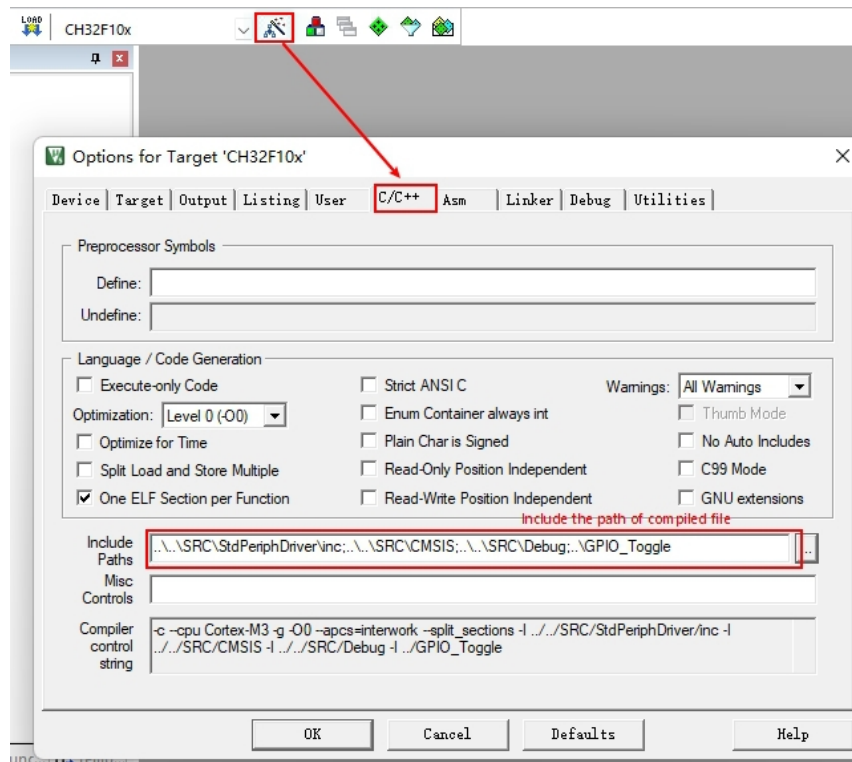

3.3.3 Exporting target files

We support burning .hex and .bin files, according to the configuration shown below, the project will output the target file .hex for burning after successful compilation.

3.3.4 Exporting target files

Any files that are not self-contained by the system software need to inform the compiler of their location, i.e. add the compiled file path, as shown below.
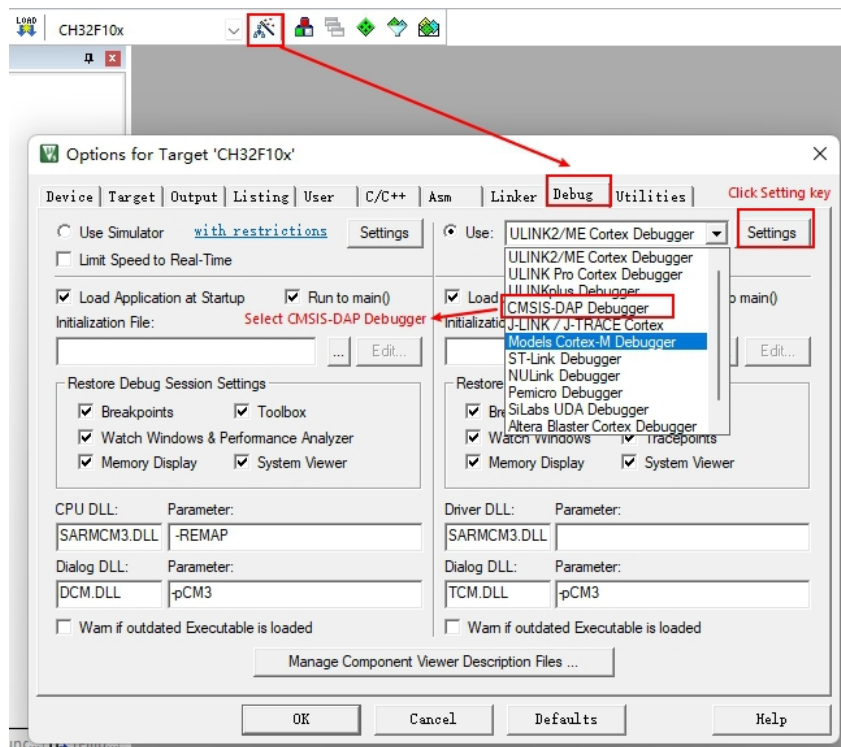

The projects already provided in the EVT package have the relevant configuration saved and the user opens the project directly. If the user re-creates the project himself, he needs to confirm the project configuration according to the necessary points mentioned above.
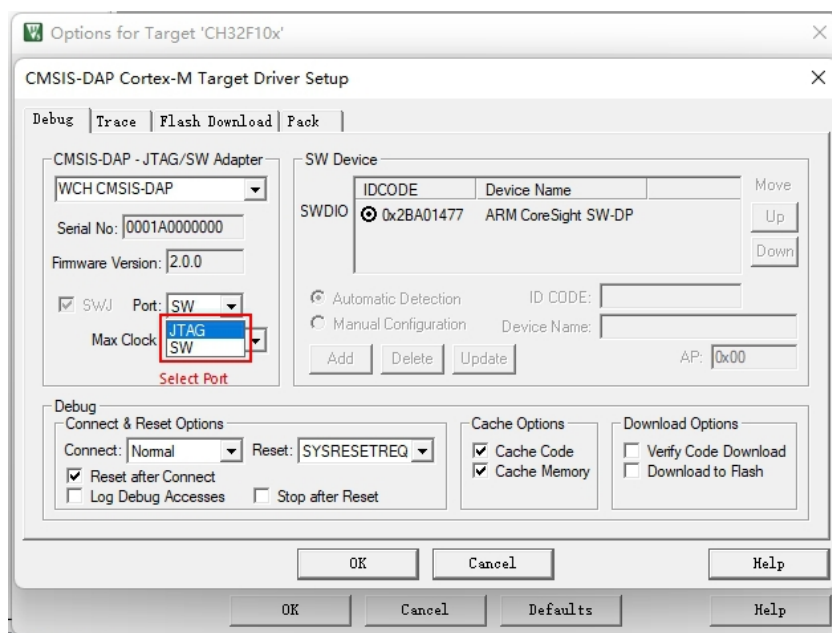
4. Debugger download and simulation

Keil-ARM mode-WinUSB device use conditions: Keil V5.25 and above; ARM-CMSIS V5.3.0 and above. If you use Keil-V5.25 or below, you can update WCH-Link firmware to V2.3 (this version DAP for HID devices), WCH-LinkE does not support Keil-V5.25 or below.
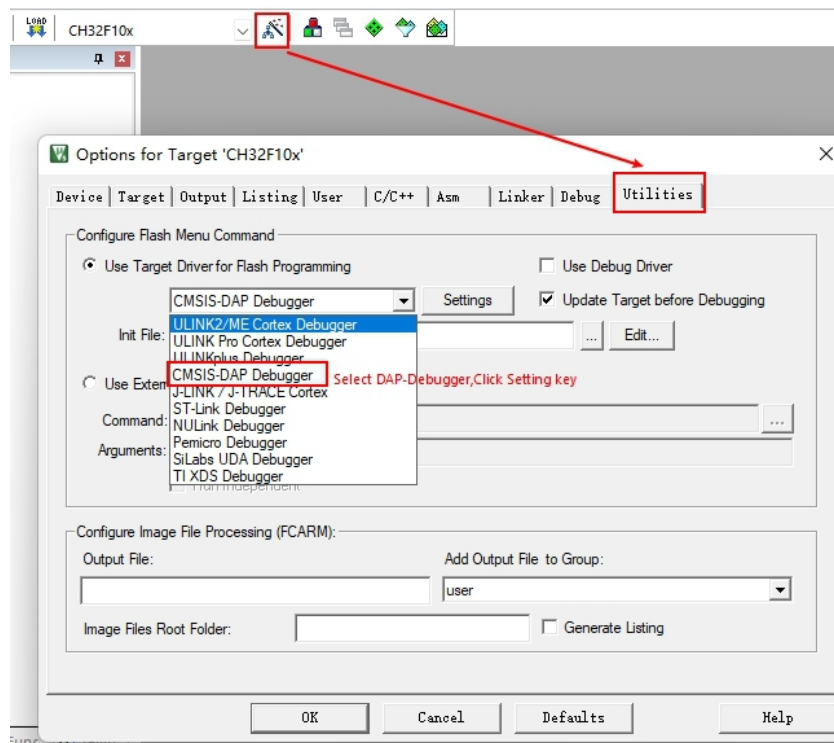
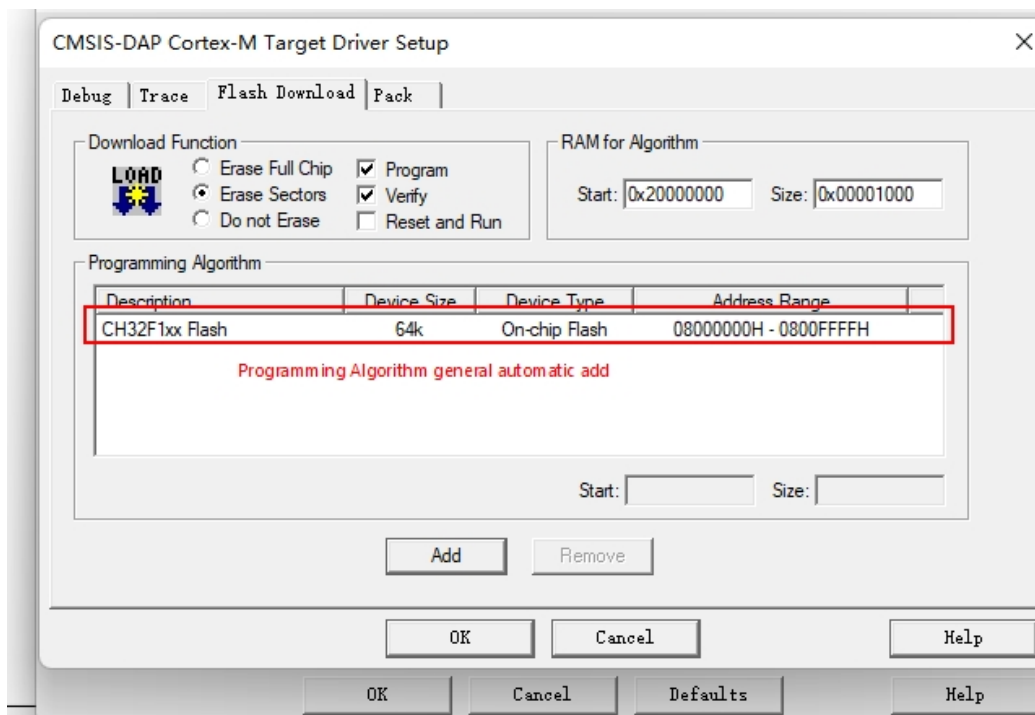## 4.1 Connecting Emulator Models
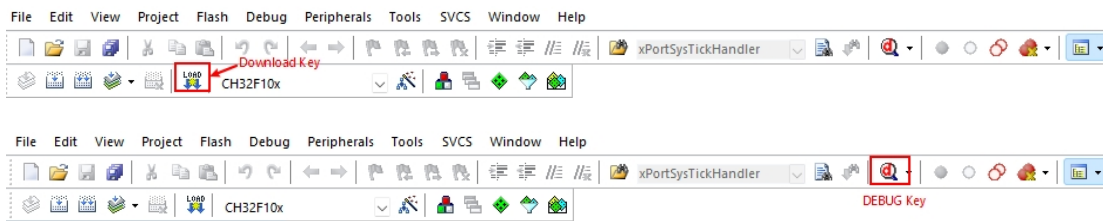

4.2 PORT Selection

4.3 Target Driver Selection

4.4 Adding algorithm files

4.5 Download and debugging

4.5.1 Toolbar description

Click debug, and the debugging tool is shown in the following figure.

1-Reset: Its function is equivalent to the reset button on the hardware, the code will be executed again from the beginning after pressing it once.

2-Execute to the breakpoint: used to quickly execute to the breakpoint, if you don't need to watch how each step is executed, but quickly execute to a certain place of the program to view the result, you can put a breakpoint at the place to view the result.

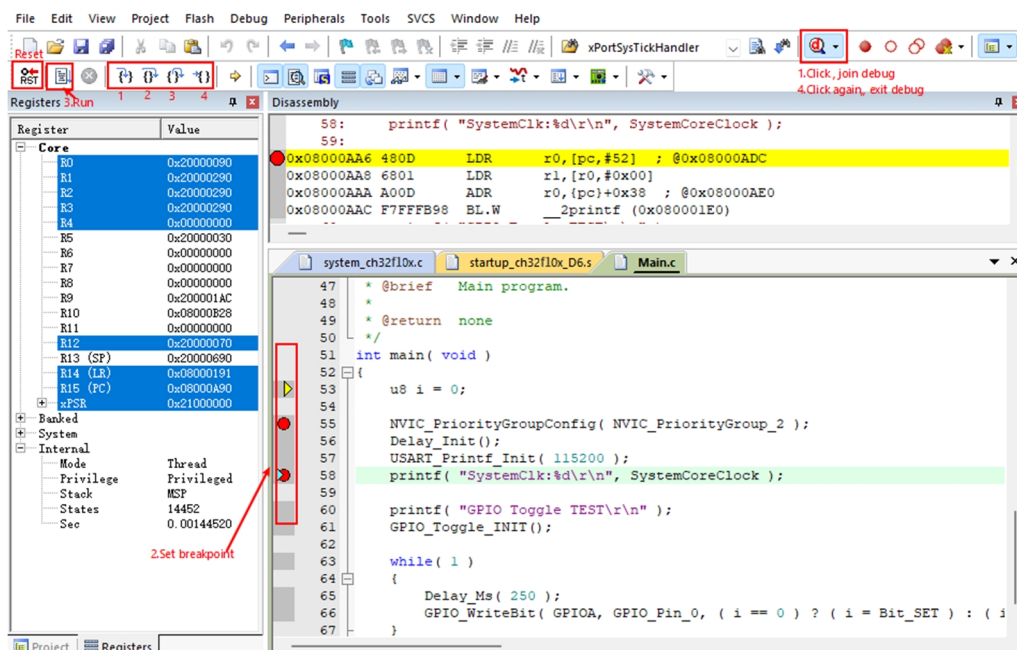3 - Stop execution: Stop the program to enter single-step debugging mode.

4-Single-step debugging: used to implement the execution to a function inside.

5 - Step-by-step debugging: When you come across a function again, you can execute it in a single step through this button without entering this function in a single step.
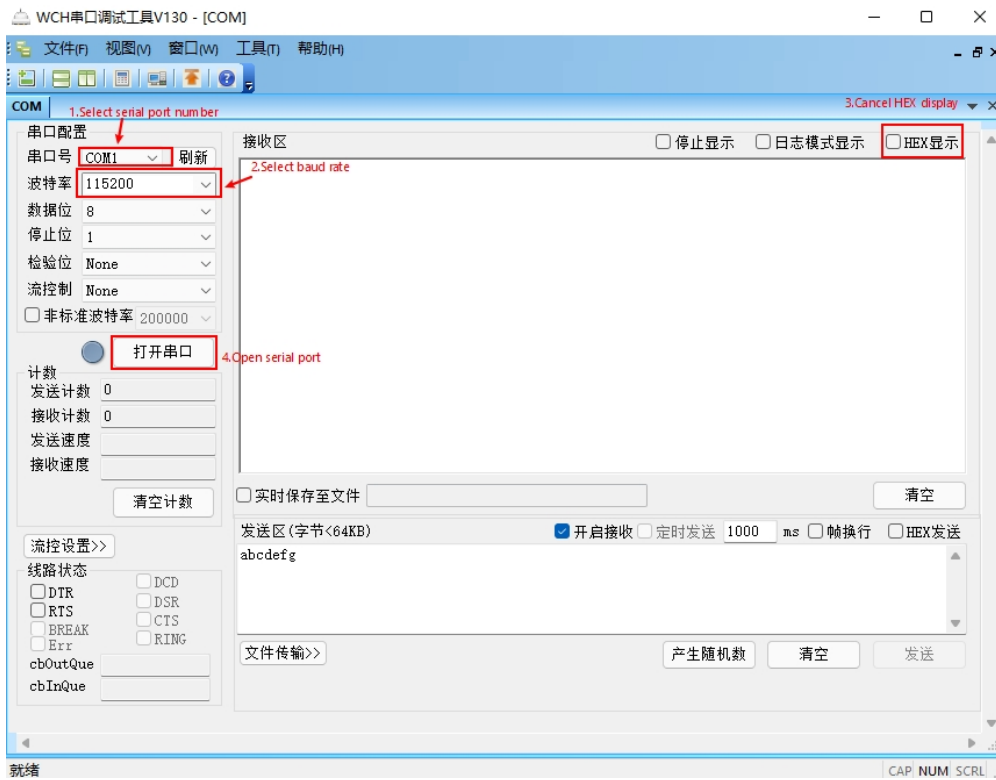
6 - Jump out debugging: When entering the single-step debugging of this function, this button directly executes the rest of the function and jumps out of the function to the position where the function was called.

4.5.2 Commissioning use

The debugging interface is described in 4.5.1, and the following figure shows the debugging interface.
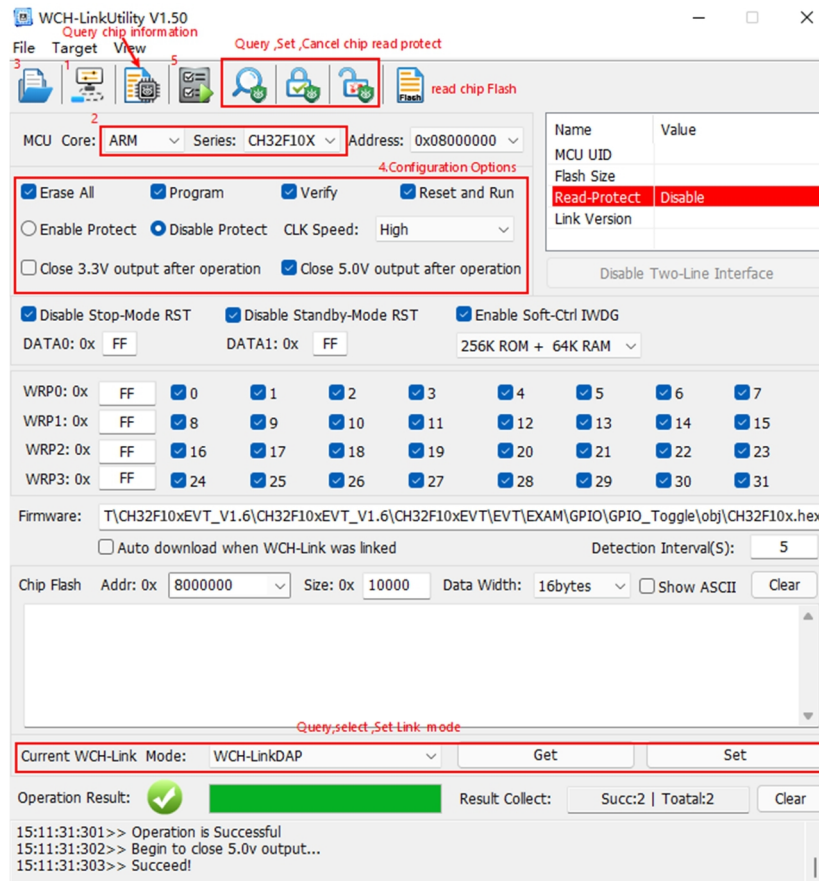
Take the ADC_DMA program in EVT as an example, single-step debugging is applied, the debugging position is displayed by cursor, and the serial assistant is applied to view the result. The result of single-step operation is shown in the figure below.

5. WCH-LinkUtility.exe Download

The download process for the chip using the WCH-LinkUtility tool is:

1)   Connect WCH-Link

2)   Select chip information

3)   Add firmware

4)   If the chip is read protected, you need to release the chip read protection.
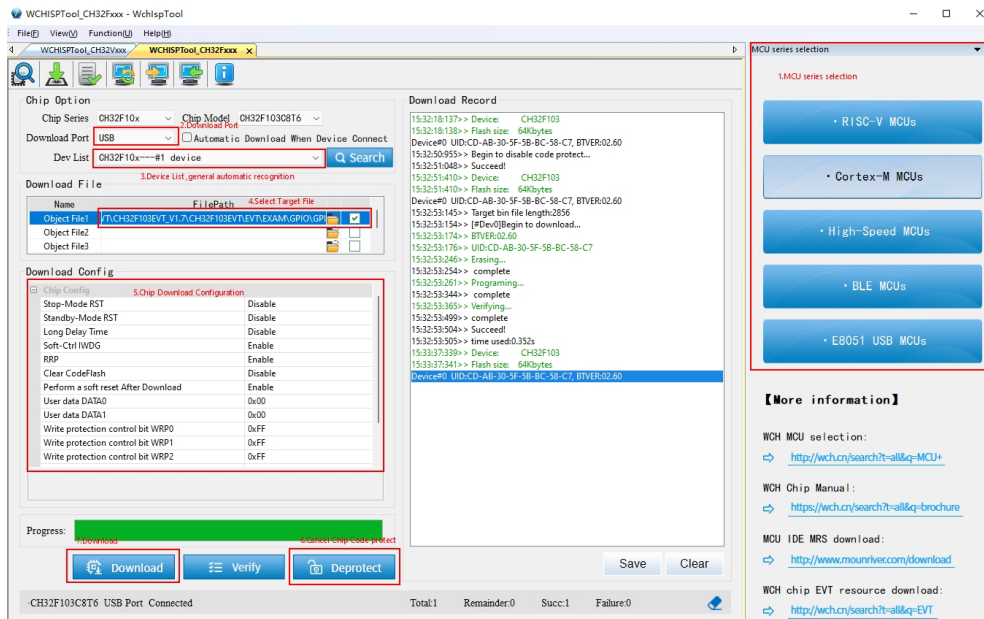
5)   Execute

6. WCHISPTool.exe Download

The WCHISPTool tool is used to download the chip, supporting both USB and serial port. The USB pins are PB6 (DM), PB7 (DP), and the serial port pins are PA9 (TX), PA10 (RX). The download process is:

1) BOOT0 to VCC and BOOT1 to ground, connected to PC via serial or USB.

2) Open the WCHISPTool tool, select the appropriate download method, choose to download the firmware, check the chip configuration and click on download.

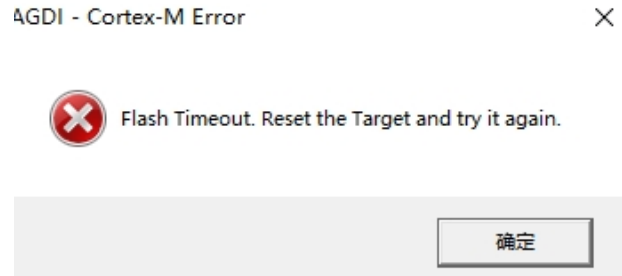3) BOOT0 is grounded, re-powered and running the APP program.

The WCHISPTool tool interface is shown in the following figure.

1. Select MCU series and chip models.

2. Select the USB or serial port download method.

3. Identifying the device, generally automatically, and if it fails to do so, it needs to be selected manually.

4. Select the firmware, choose the downloaded .hex or .bin target program file.

5. Configure the download according to the requirements

6. Click Download.

7. Statement of Attention

1) If you use WCH-Link for downloading, you need to set Link to ARM mode, that is, the CON indicator is lit, if CON is not lit, refer to the WCH-Link instruction for the specific switching mode method.

2) If the following error is reported for the program download, the ISP tool should be used to unprotect it. see the instructions in Chapter 6 for the ISP tool.

Detailed inquiries\questions can be logged in the following.

WCH official website: https://www.wch-ic.com/

WCH-LINK instructions for use: https://www.wch-ic.com/downloads/WCH-LinkUserManual_PDF.html