

CH32V00X Evaluation Board Reference

Version: V1.1

<https://wch-ic.com>

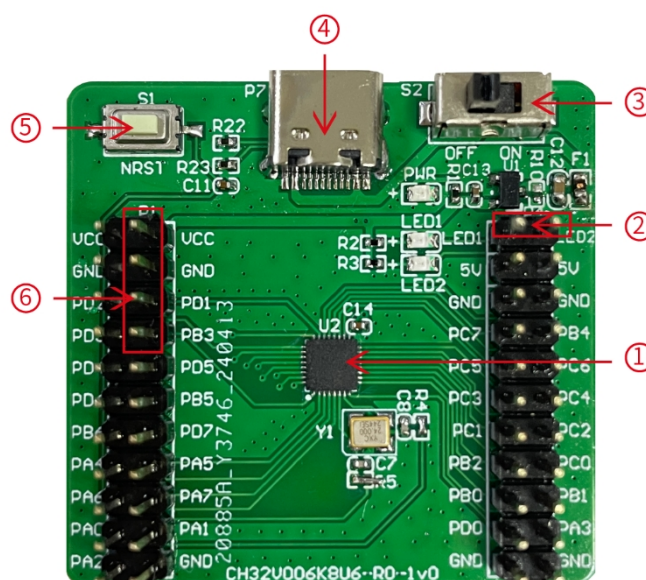
1. Overview

This evaluation board is applied to the development of the CH32V00X chip. The IDE uses the MounRiver compiler, supported only by MRS1.92 and above, with the option of independent WCH-Link for emulation and download, and provides reference examples and demonstrations of applications related to chip resources.

2. Evaluation Board Hardware

Please refer to the CH32V00XSCH.pdf document for the schematic of the evaluation board.

CH32V006 Evaluation Board



Description

- | | | |
|---------------------|-----------------|------------------------|
| 1. Main control MCU | 2. LED pin | 3. Power switch |
| 4. USB-C interface | 5. Reset button | 6. SDI debug interface |

The above CH32V006 evaluation board comes with the following resources.

Motherboard - CH32V006K8U6-R0-1V0

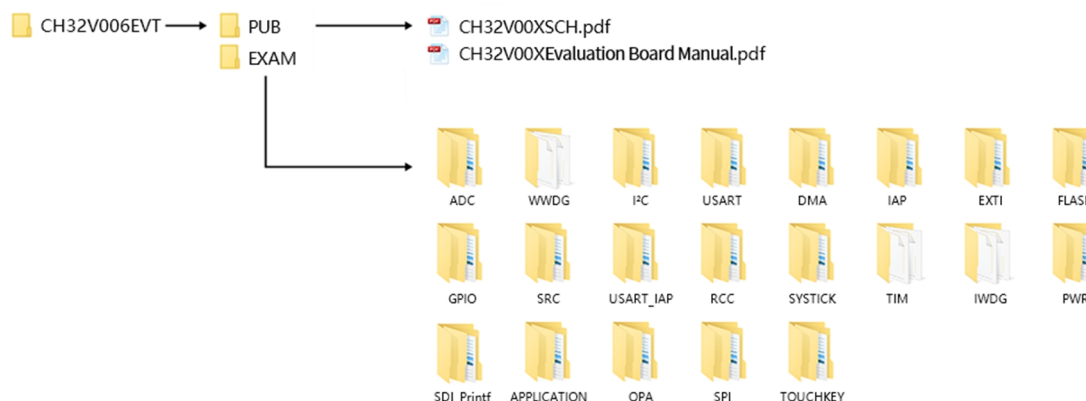
1. Main control MCU: CH32V006K8U6
2. LED pin: LED pin for connecting chip IO port.
3. Power switch S2: used to select cut off or connect external 5V USB interface power supply.
4. USB-C interface: power supply only, no USB function.
5. Reset button S1: used for external manual reset of the main MCU, need to configure the user option byte register RST_MODE bit to be non-11b to enable the multiplexing function.
6. SDI debug interface: used for downloading and simulation debugging.

Tips: In order to adapt to the download and debugging of SDI interfaces of different packages, the debugging interface of CH32V00X series chips supports free configuration; you can choose single-line debugging or dual-line

debugging. Debugging interface pins PD1 (SWIO), PB3 (SWCLK 2-wire debugging optional)

3. Software Development

3.1 EVT Package Directory Structure



Description:

PUB folder: Provide evaluation board manuals, evaluation board schematics.

EXAM folder: Provide software development drivers and corresponding examples for the CH32V00X controller, grouped by peripheral. Each type of peripheral folder contains one or more functional application routines folders.

3.2 IDE Use-MounRiver

Download MounRiver_Studio, double click to install it, and you can use it after installation. (MounRiver_Studio instructions are available at the path: MounRiver\MounRiver_Studio\ MounRiver_Help.pdf and MounRiver_ToolbarHelp.pdf)

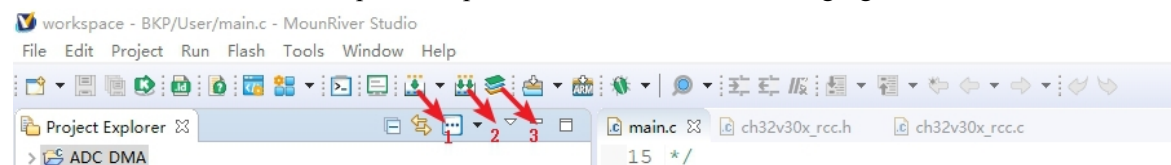
3.2.1 Open Project

➤ Open project:

- 1) Double-click project file directly with the suffix name .wvproj under the corresponding project path.
- 2) Click File in MounRiver IDE, click Load Project, select the .project file under the corresponding path, and click Confirm to apply it.

3.2.2 Compilation

MounRiver contains three compilation options, as shown in the following figure.



Compile option 1 is Incremental Build, which compiles the modified parts of the selected project.

Compile option 2 is ReBuild, which performs a global compilation of the selected project.

Compile option 3 is All Build, which performs global compilation for all projects.

3.2.3 Download/Simulation

➤ Download

1) Debugger download

Connect to the hardware via WCH-Link (see WCH-Link instructions for details, path: MounRiver\MounRiver_Studio\ WCH-Link instructions.pdf), click the Download button on the IDE, and select Download in the pop-up interface, as shown in the figure below.



1 for querying the chip read protection status.

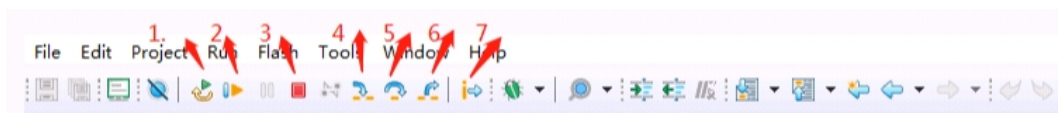
2 for setting the chip read protection and re-powering the configuration to take effect.

3 for lifting the chip read protection and re-powering the configuration to take effect.

➤ Simulation

1) Toolbar description

Click Debug button in the menu bar to enter the download, see the image below, the download toolbar.

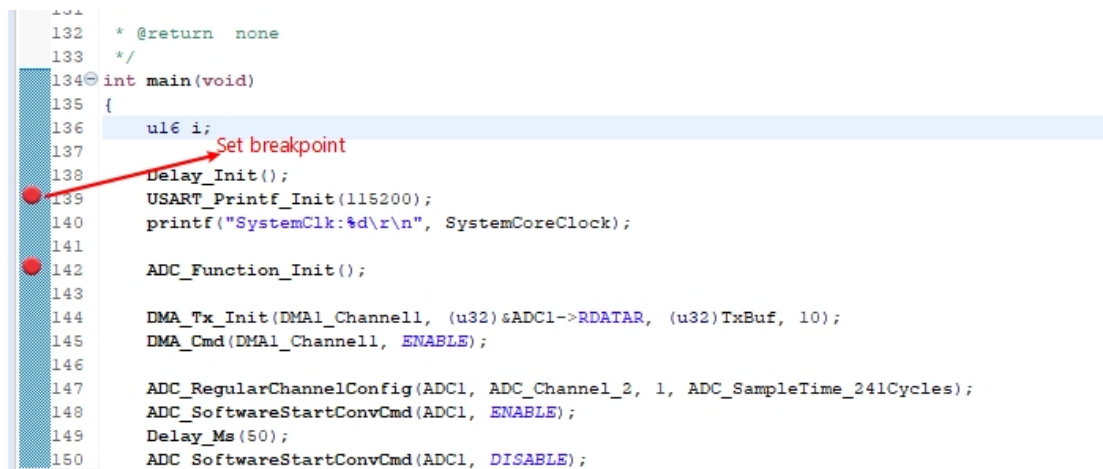


Detailed functions are as follows.

- (1) Reset: After reset, the program returns to the very beginning.
 - (2) Continue: Click to continue debugging.
 - (3) Terminate: Click to exit debugging.
 - (4) Single-step jump-in: Each time you tap a key, the program runs one step and encounters a function to enter and execute.
 - (5) Single-step skip: jump out of the function and prepare the next statement.
 - (6) Single-step return: return the function you jumped into
- Instruction set single-step mode: click to enter instruction set debugging (need to use with 4, 5 and 6 functions).

2) Set breakpoints

Double-click on the left side of the code to set a breakpoint, double click again to cancel the breakpoint, set the breakpoint as shown in the following figure;



3) Interface display

(1) Instruction set interface

Click on the instruction set single-step debugging can enter the instruction debugging, to single-step jump in for example, click once to run once, the running cursor will move to view the program running, the instruction set interface is shown as follows.

```

Disassembly
Enter location here
00000540: auipc    a1, 0x20000
00000544: addi     a1, a1, -1344 # 0x20000000 <APBAHBPresc
00000548: addi     a2, gp, -2024
0000054c: bgeu     a1, a2, 0x560 <handle_reset+56>
00000550: lw       t0, 0(a0)
00000554: sw       t0, 0(a1)
00000558: addi     a0, a0, 4
0000055a: addi     a1, a1, 4
0000055c: bltu     a1, a2, 0x550 <handle_reset+40>
00000560: addi     a0, gp, -2024
00000564: addi     a1, gp, -2004
00000568: bgeu     a0, a1, 0x576 <handle_reset+78>
0000056c: sw       zero, 0(a0)
00000570: addi     a0, a0, 4
00000572: bltu     a0, a1, 0x56c <handle_reset+68>
00000576: li       t0, 31
00000578: csrw     0xbc0, t0
0000057c: li       t0, 11
0000057e: csrw     0x804, t0
00000582: lui      t0, 0x6
00000586: addi     t0, t0, 136 # 0x6088
0000058a: csrs     mstatus, t0
0000058e: auipc    t0, 0x0
  
```

(2) Program running interface

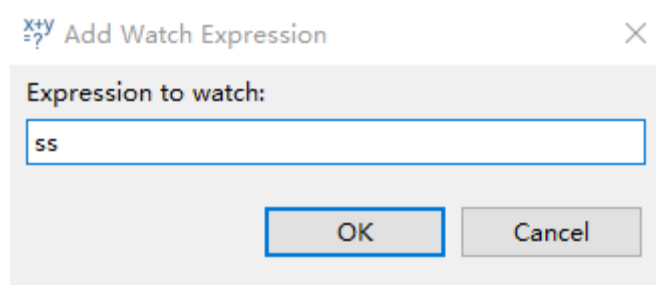
It can be used with instruction set single-step debugging, still take single-step jumping in as an example, click once to run once, the running cursor will move to view the program running, the program running interface is shown as follows.

```

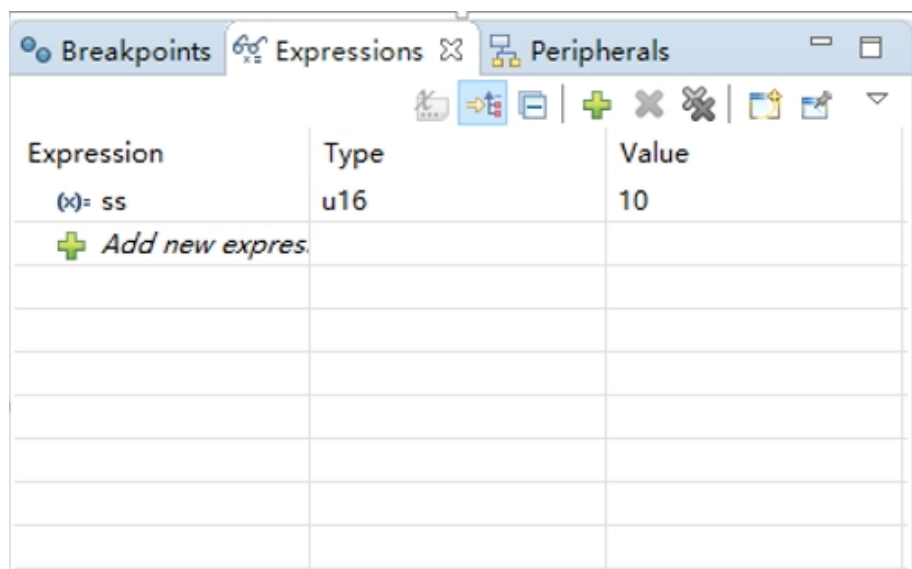
47  * @return none
48  */
49  int main(void)
50  {
51      u8 i = 0;
52
53      NVIC_PriorityGroupConfig(NVIC_PriorityGroup_2);
54      Delay_Init();
55      USART_Printf_Init(115200);
56      printf("SystemClk:%d\r\n", SystemCoreClock);
57
58      printf("GPIO Toggle TEST\r\n");
59      GPIO_Toggle_INIT();
60
61      while(1)
62      {
63          Delay_Ms(250);
64          GPIO_WriteBit(GPIOD, GPIO_Pin_0, (i == 0) ? (i = Bit_SET) : (i = Bit_RESET));
65      }
66  }
67
  
```

4) Variables

Hover over the variable in the source code to display the details, or select the variable and right-click add watch expression

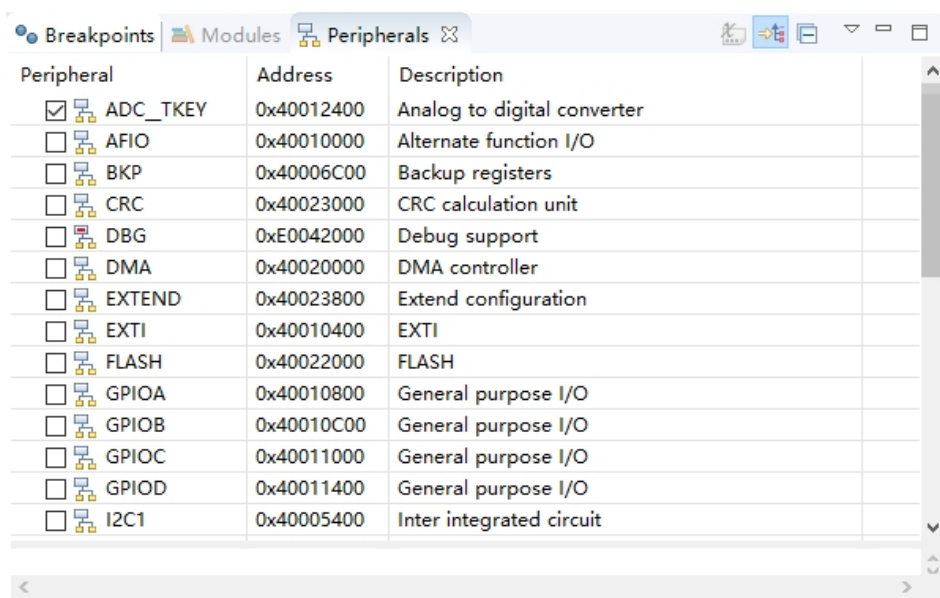


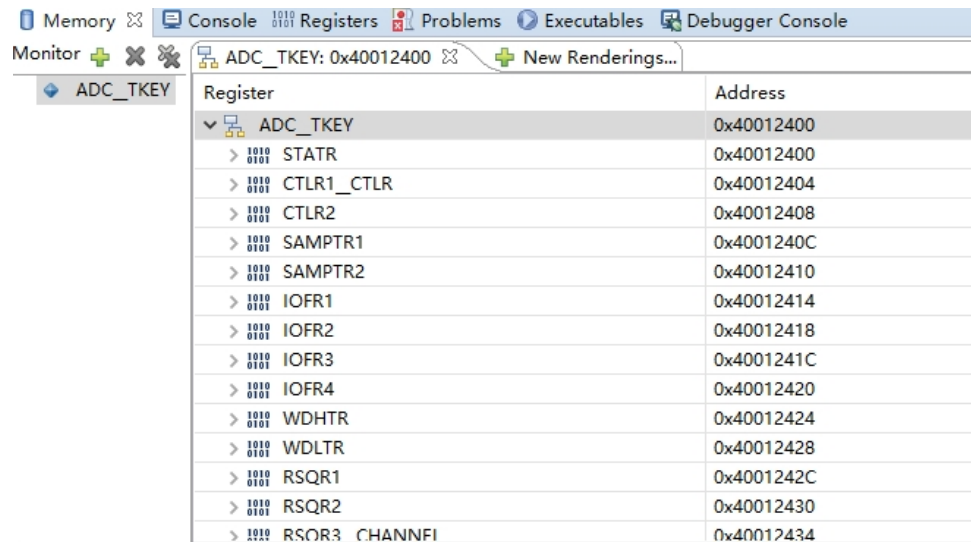
Fill in the variable name, or just click OK to add the variable you just selected to the pop-up.



5) Peripheral registers

In the lower left corner of IDE interface Peripherals interface shows a list of peripherals, tick the peripherals will display its specific register name, address, value in the Memory window.

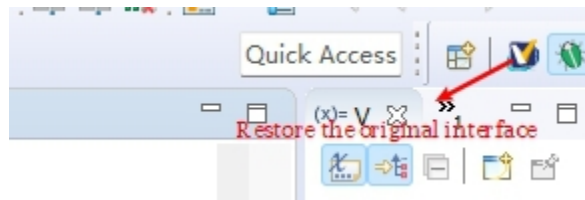




Register	Address
ADC_TKEY	0x40012400
STATR	0x40012400
CTLR1_CTLR	0x40012404
CTLR2	0x40012408
SAMPTR1	0x4001240C
SAMPTR2	0x40012410
IOFR1	0x40012414
IOFR2	0x40012418
IOFR3	0x4001241C
IOFR4	0x40012420
WDHTR	0x40012424
WDLTR	0x40012428
RSQR1	0x4001242C
RSQR2	0x40012430
RSQR3_CHANNELFI	0x40012434

Note:

(1) When debugging, click the icon in the upper right corner to enter the original interface.

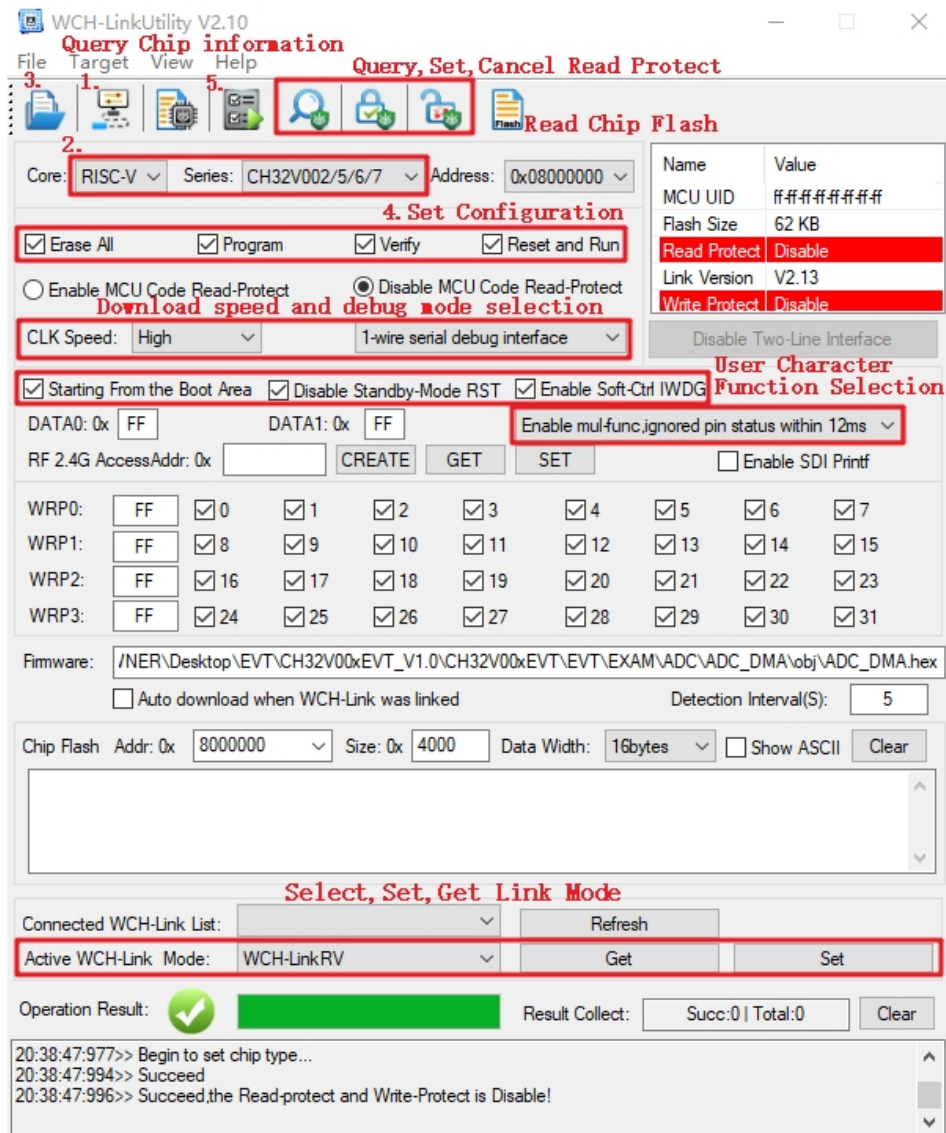


(2) For documentation to access the compiler, click F1 to access the help documentation for detailed instructions.

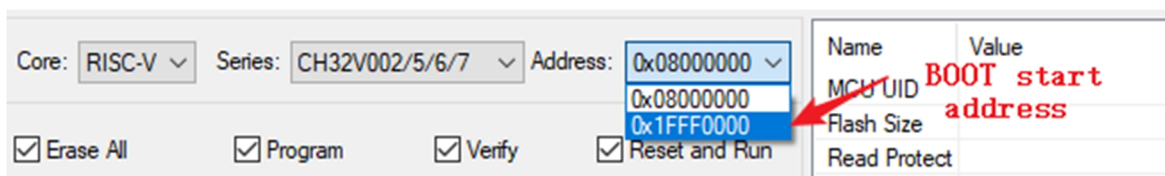
4. WCH-LinkUtility.exe Download

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



In addition, the download address of this series of chips can be configured, where 0x08000000 is the normal download address; 0x1FFF0000 is the BOOT start address, and the size of the BOOT area is (3K+256). For example, to download the BOOT code, you need to set the Address to 0x1FFF0000, and then follow steps 3, 4, and 5 to add the firmware, select the configuration, and execute the download.

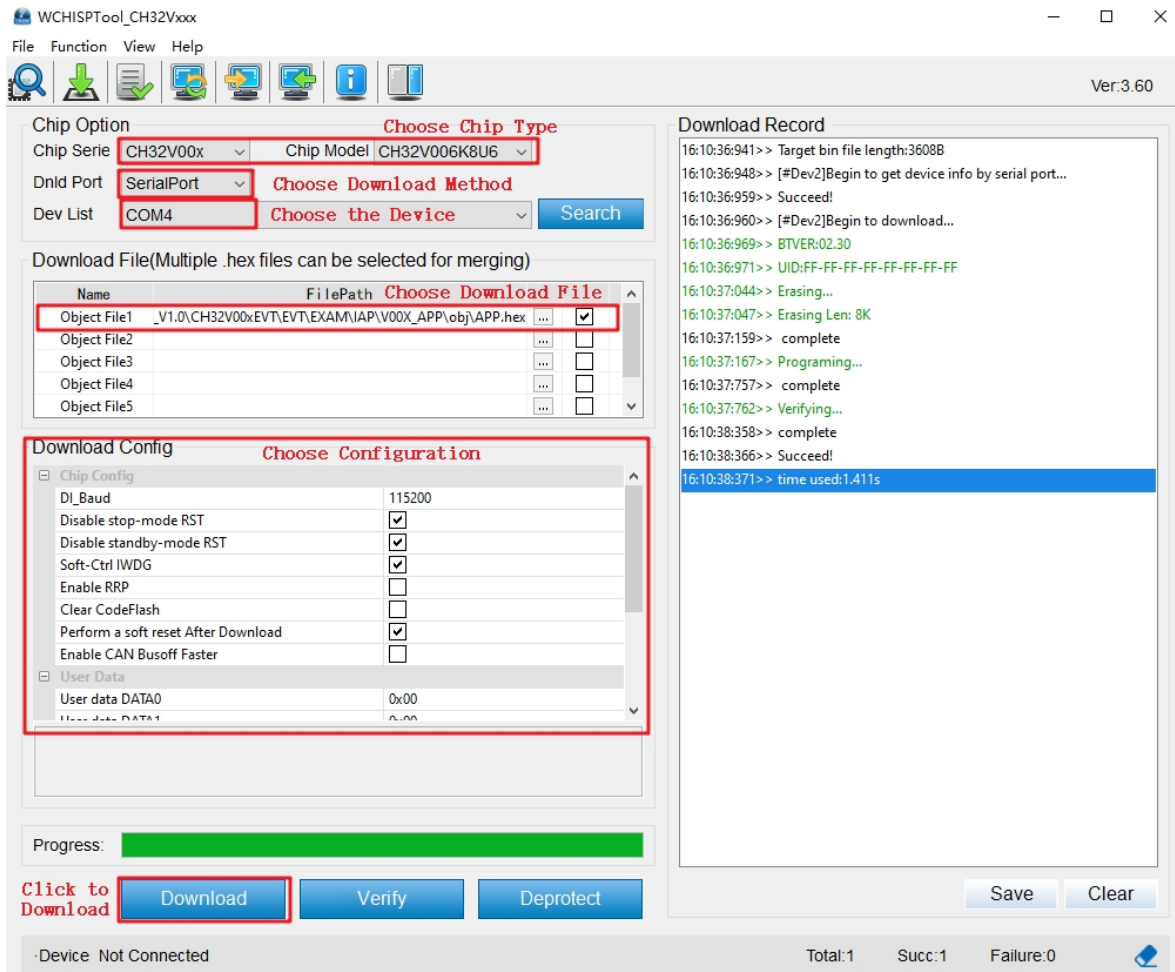


5. WCHISPTool.exe Download

Use WCHISPTool to download the chip, only support serial port download mode. This tool is only used for IAP upgrade, the IAP program is solidified in the BOOT, users can jump to the BOOT by executing in the user area and use this tool to realize IAP upgrade. Refer to the IAP routines in EVT for the specific implementation method.

Usually, the serial port used to download the program in BOOT mode is USART1, pin PD5 (TX), PD6 (RX); the pin does not exist in some packages (QFN12), and the specific chip model (CH32V002D4U6, CH32V005D6U6), and the serial port of the BOOT at this time is PD0 (TX), PD1 (RX).

The WCHISPTool tool interface is shown in the following figure.



1. Select MCU series and chip model
2. Select the serial port download mode
3. Identify the device, usually automatically, if it fails to identify, you need to select manually
4. Select the firmware, select the downloaded .hex or .bin target program file
5. Configure the download according to the requirements
6. Click download

6. Statement of Attention

- 1) If you use WCH-Link to download, refer to WCH-Link instructions for specific switching mode.
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/products/WCH-Link.html>