XHSC 小华半导体
XIAOHUA SEMICONDUCTOR

32-bit Microcontrollers

MCU Development Tools for HC32F460 Series

user manual

Rev2.0 August 2023

Applicable objects

Product Series	Product Model
F Series	**HC32F460**

This manual uses the *HC32F460PETB* as an example.

declaration Ming Dynasty (1368-1644)

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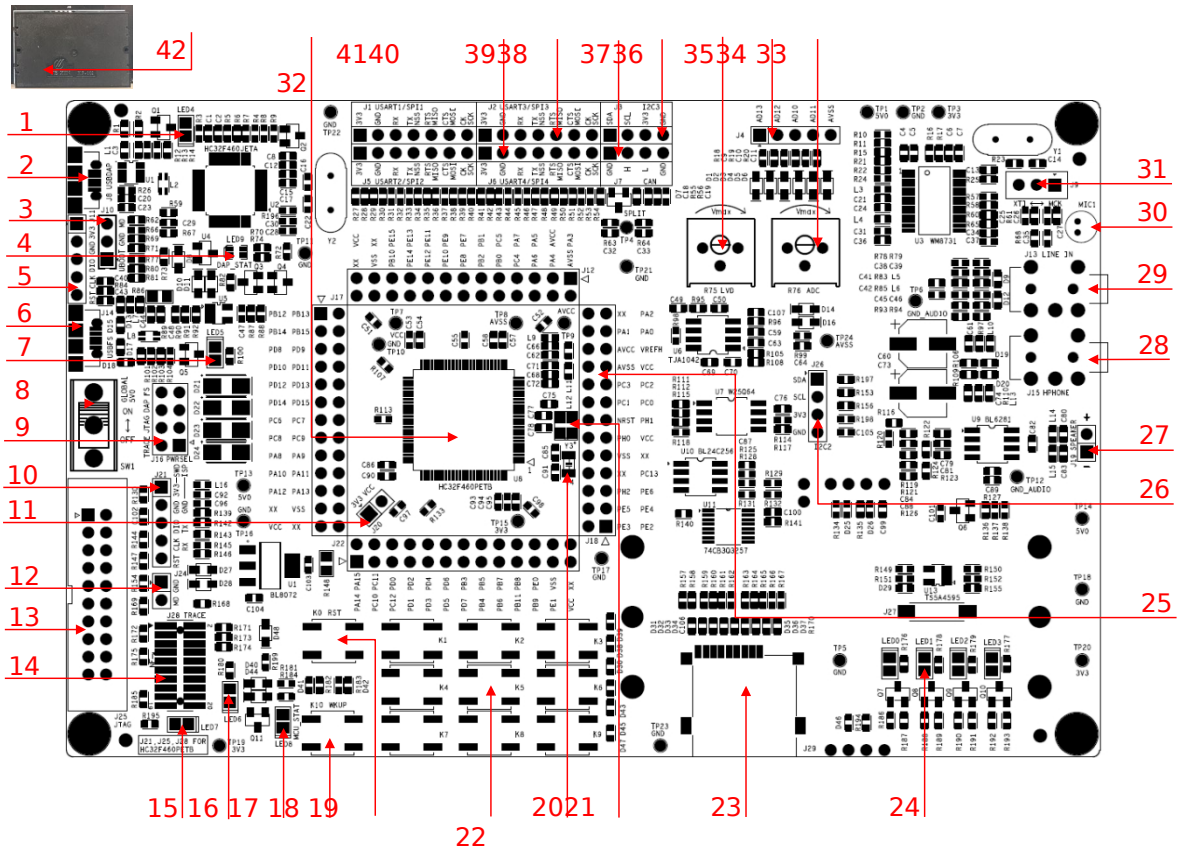
1 summarize

1.1 Introduction to Development Tools

This series Evaluation Board (hereinafter referred to as EVB) is a development tool based on the HC32F460PETB-LQFP100 chip design and includes the on-board CMSIS DAP; the EVB provides the necessary peripheral configurations for evaluating the HC32F460.

1.2 Introduction to Circuit Board Components



1	USBFS VBUS Indicator	**2**	Micro-USB (USBFS)
3	Mode selection jumper (HC32F460JETA)	**4**	DAP Status Indicator
5	SWD Interface (HC32F460JETA)	**6**	Micro-USB (USBDAP)
7	USBDAP VBUS Indicator	**8**	Full board power switch
9	Power channel selection (5V0)	**10**	SWD Interface (HC32F460PETB)
11	HC32F460PETB Power Jumpers	**12**	Mode selection jumper (HC32F460PETB)
13	JTAG Interface	**14**	TRACE interface
15	JTAG Power Indicator	**16**	TRACE Power Indicator
17	MCU Status Indicator	**18**	wake-up call button
19	reset button	**20**	Matrix Keyboard
21	32.768KHz crystal	**22**	8MHz Crystal
23	TF CARD Interface	**24**	User indicator *4
25	MCU pin test pins*4	**26**	OLED Interface
27	speaker connector	**28**	3.5mm headphone jack
29	3.5mm LINE IN connector	**30**	microphones
31	AUDIO CODEC Clock Source Selection Dip Switch	**32**	ADC potentiometer
33	ADC Interface	**34**	LVD Potentiometer
35	I2C interface	**36**	CAN Interface
37	USART3/ SPI3 Interface	**38**	USART4/ SPI4 Interface
39	USART1/ SPI1 Interface	**40**	USART3/ SPI3 Interface
41	HC32F460PETB	**42**	SMART CARD Interface

2 hardware circuit

2.1 Circuit Specifications

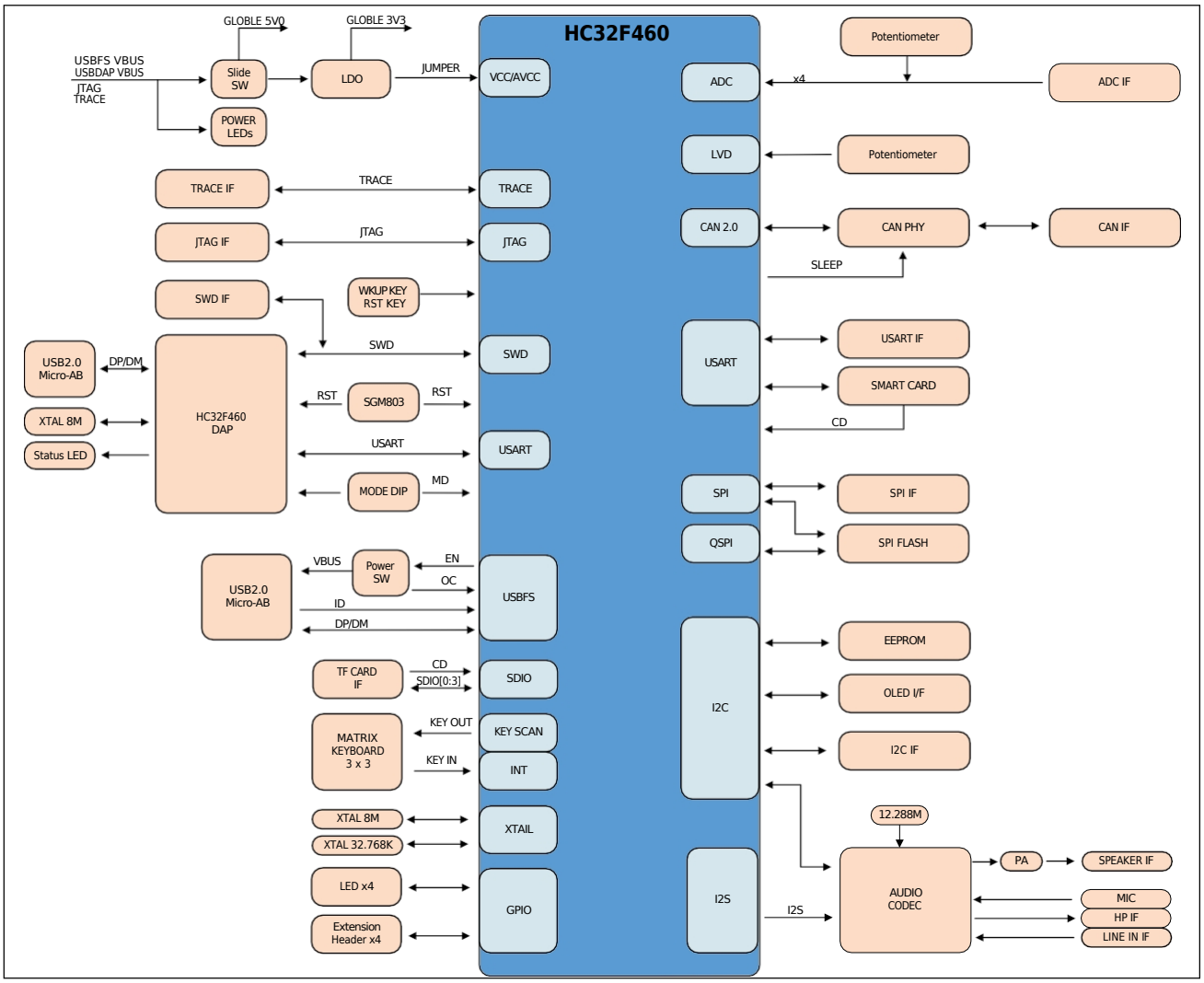
The MCU supports a wide voltage range (1.8~3.6V) and a wide temperature range (-40~105°C). During use, please ensure that the operating conditions do not exceed the absolute maximum ratings.

2.2 Hardware Description

It is recommended to go to Siu Wah Semiconductor's official website https://www.xhsc.com.cn to find the corresponding chip model and download the schematic diagram.

2.2.1 System Overview

The EVB hardware system is shown below:



2.2.2 electric power source

The EVB uses the MICRO USB connector to power the whole board, please make sure the USB host has enough power supply capacity. Toggle switch SW1 is used to control the power on/off of the whole board.

2.2.3 debugging interface

The EVB is configured with SWD, JTAG, TRACE interfaces and on-board DAP, and users can select the interface for debugging according to actual needs.

2.2.4 independent keypad

The EVB is configured with 2 independent buttons, 1 reset button and 1 wake-up button. They are connected to the MCU via the pins in the table below:

silkscreen	Pins/Functions
K0	NRST/Reset Button
K10	PB1/Wakeup button

2.2.5 indicator light

The EVB is configured with 10 indicators, namely the power indicator, status indicator and user indicator.

silkscreen	Pins/Functions
LED0	PD3/Red Indicator
LED1	PD4/Green Indicator
LED2	PD5/Yellow indicator
LED3	PD6/Blue Indicator
LED4	VBUS_FS Indicator
LED5	VBUS_DAP indicator
LED6	TRACE Power Indicator
LED7	JTAG Power Indicator
LED8	MCU Status Indicator
LED9	DAP Status Indicator

2.2.6 test pin

The EVB is configured with four sets of 2*13 test pins that connect to the MCU pins to provide user test or extended functionality.

2.2.7 clocks

The EVB is configured with two external clocks, a 32.768KHz secondary crystal and an 8MHz primary crystal.

2 sets of crystals are connected to the MCU through the pins in the following table:

silkscreen	Pins/Functions	Connecting Peripherals
Y1	PH0/ XTAL_OUT	8MHz Main Crystal
	PH1/ XTAL_IN	
Y2	PC15/ XTAL32_IN	32.768KHz secondary crystal
	PC14/ XTAL32_OUT	

2.2.8 Matrix Keyboard

The EVB is configured with a 3x3 matrix keypad that provides the user with 9 key functions.

2.2.9 UART

The EVB is configured with a 4-group UART interface through which it communicates with an external UART system.

The UART interface pin connections are shown below:

silkscreen	Pins/Functions
J1	PC4/ USART1_RX
	PA7/ USART1_TX
	PC5/ USART1_RTS
	PB0/ USART1_CTS
	PA8/ USART1_CK
J5	PA3/ USART2_RX
	PA2/ USART2_TX
	PA1/ USART2_RTS
	PA0/ USART2_CTS
	PD7/ USART2_CK
J2	PC13/ USART3_RX
	PH2/ USART3_TX
	PE0/ USART3_RTS
	PE1/ USART3_CTS
	PB15/ USART3_CK
J6	PB9/ USART4_RX
	PE6/ USART4_TX
	PE5/ USART4_RTS
	PE4/ USART4_CTS
	PE3/ USART4_CK

2.2.10 I2C

The EVB is equipped with a 32768*8bit on-board EEPROM chip, BL24C256, which can be used for I2C function testing.

The EVB is configured with a Group 1 I2C interface through which it communicates with external I2C systems.

The I2C interface pin connections are shown below:

silkscreen	Pins/Functions
J3	PE15/ I2C3_SCL
	PB5/ I2C3_SDA

2.2.11 SPI

The EVB is configured with a 4-group SPI interface, through which the function of communicating with an external SPI system is performed.

The SPI interface pin connections are shown below:

silkscreen	Pins/Functions
J1	PA7/ SPI1_NSS
	PC5/ SPI1_MISO
	PB0/ SPI1_MOSI
	PA8/ SPI1_SCK
J5	PA2/ SPI2_NSS
	PA1/ SPI2_MISO
	PA0/ SPI2_MOSI
	PD7/ SPI2_SCK
J2	PH2/ SPI3_NSS
	PE0/ SPI3_MISO
	PE1/ SPI3_MOSI
	PB15/ SPI3_SCK
J6	PE6/ SPI4_NSS
	PE5/ SPI4_MISO
	PE4/ SPI4_MOSI
	PE3/ SPI4_SCK

2.2.12 QSPI

The EVB is configured with an 8MB on-board QSPI FLASH chip, W25Q64, which can be used for QSPI function testing.

2.2.13 TF CARD

The EVB is configured with one TF CARD interface, through which the TF CARD read/write function is realized. The TF CARD interface pin functions are shown below:

silkscreen	Pins/Functions
J29	PC8/ SDIO_D0
	PC9/ SDIO_D1
	PC10/ SDIO_D2
	PC11/ SDIO_D3
	PC12/ SDIO_CLK
	PD2/ SDIO_CMD

2.2.14 SMART CARD

The EVB is configured with one SMART CARD interface, through which the SMART CARD read/write function is realized.

The SMART CARD interface pin functions are shown below:

silkscreen	Pins/Functions
J20	PA0/ RESET
	PA1/ PWR_EN
	PA2/ USART2_TX
	PA3/ USART2_RX
	PD7/ USART2_CK
	PE7/ CARD_DETECT

2.2.15 USB

The EVB is configured with two Micro-USB ports, through which the entire board can be powered by 5V0.

The MCU supports USBFS function with full-speed PHY integrated inside the chip.

The EVB provides an on-board USB power supply chip, TPS2051BD, to power the device when acting as a host.

2.2.16 CAN

The EVB is equipped with an on-board CAN PHY chip, TJA1042T/3, which supports the CAN2.0B function and provides a CAN interface through which it realizes the function of communicating with the external CAN system.

2.2.17 AUDIO

The EVB is configured with one Audio Codec chip, WM8731SEDS, and Audio PA chip, BL6281, and provides an on-board MIC,
3.5mm headphone jack and Line in connector as well as a speaker jack for recording and audio input and output.

2.2.18 OLED

The EVB is configured with one OLED interface through which the OLED display function is realized.

The OLED interface pin functions are shown below:

silkscreen	Pins/Functions
J26	PD0/ I2C2_SCL
	PD1/ I2C2_SDA

2.2.19 analog function

The EVB is configured with a 5-pin analog functional pinout containing 4 ADC

input channels for ADC functional testing. The EVB is configured with 2 adjustable potentiometers for ADC and LVD functionality testing, connected to the MCU via the pins in the table below:

silkscreen	Pins/Functions	Connecting Peripherals
R76	PC0/ ADC12_IN10	10KΩ adjustable potentiometer
R75	PB2/ PVD2EXINP	10KΩ adjustable potentiometer

2.2.20 Needle jumpers and toggle switch settings

The status of the jumpers and toggle switches need to be confirmed before powering up, and the settings are as follows:

silkscreen	functionality	set up	default (setting)
J20	MCU Power Consumption Test	Short-circuit: MCU normal power supply	short circuit
		Disconnect: MCU power consumption test with meter pens connected in series	
J10	DAP Mode Selection	Short pin 12: DAP enters UBOOT mode to upgrade its own firmware.	turn off (electric switch)
		Short pin 23: DAP enters ISP mode to upgrade its own firmware.	
		Disconnect: DAP enters USER mode	
J24	MCU Mode Selection	Short-circuit: BOOT mode	turn off (electric switch)
		Disconnect: USER mode	
J9	AUDIO clock selection	Toggle to right: use external crystal	right side
		Toggle to left: use MCK	

2.2.21 pin multiplexing

Some of the MCU pins on the EVB are multiplexed to multiple peripheral modules, it should be noted that this results in modules with multiplexed pins not being able to be used at the same time: when the TRACE interface is used, the USART4/ SPI4(J6) interface cannot be used;

When the SMART CARD is used, the USART2/ SPI2(J5) interface cannot be used. Pin multiplexing is shown below:

PIN	USART4	SPI4	TRACE
PE3	CK	SCK	TRACED0
PE4	CTS	MOSI	TRACED1
PE5	RTS	MISO	TRACED2
PE6	TX	NSS	TRACED3

PIN	USART2	SPI2	SMART CARD
PA3	RX	-	RX

PA2	TX	NSS	TX
PA1	RTS	MISO	PWR_EN
PA0	CTS	MOSI	RESET
PD7	CK	SCK	CLK

3 driver library

This series of chips support third-party IDE development, mainly support IAR and Keil MDK and other mainstream development environments, please refer to "Siu Wah Semiconductor Familiarize yourself with the configuration and use of the "MCU Development Environment Usage" document.

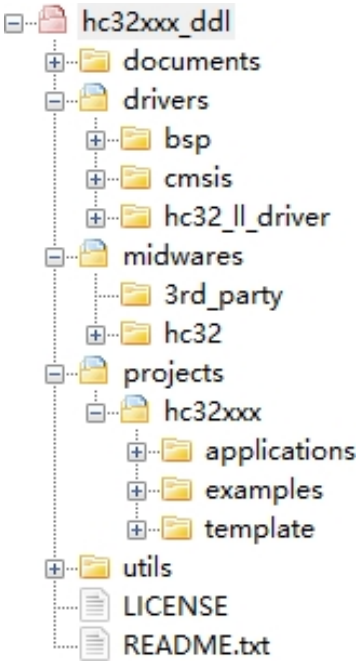
After familiarizing yourself with the IDE development tools, please go to the Siu Wah Semiconductor official website https://www.xhsc.com.cn to find the corresponding chip model. **HC32F460PETB**, download driver library and samples:

3.1 hc32f460_ddl_SHA512

The SHA512 hash of hc32f460_ddl.

3.2 hc32f460_ddl

Examples of the main structure of the driver library and sample support packages can be found in the following figure (the specific composition is based on the actual DDL support package used)



Documents:

This directory provides chm files containing code comments,

data structures, API descriptions, and so on. drivers:

This directory mainly includes the BSP code of the development board, CMSIS files, APIs used for each IP operation, header files of data structures and source files, which can be used directly by users for their own applications or to familiarize themselves with the operation of the underlying registers.

Midwares:

This directory contains mainly header and source files configured for the implementation of specialized functions, as well as files provided by third parties.

PROJECTS:

The catalog mainly includes the use routines of common functions of each IP (both IAR and Keil development tools are supported) and advanced applications. Users can use this sample to quickly familiarize themselves with the implementation of common functions of each IP and the use of driver libraries, which can be directly downloaded, debugged and run in conjunction with the accompanying hardware demo boards of this series of chips.

utils:

This directory mainly includes some auxiliary tools and scripts.

3.3 hc32f460_template

The template mainly provides the system minimum project corresponding to this series of MCUs. Users who wish to develop their own application programs (including drivers for special needs)for a specific model of chip do not need to build a project from scratch, but can directly use the template to directly develop application-related drivers or applications.

3.4 IDE Support Packages

The IDE support package mainly provides pack files for the Keil MDK for this chip.

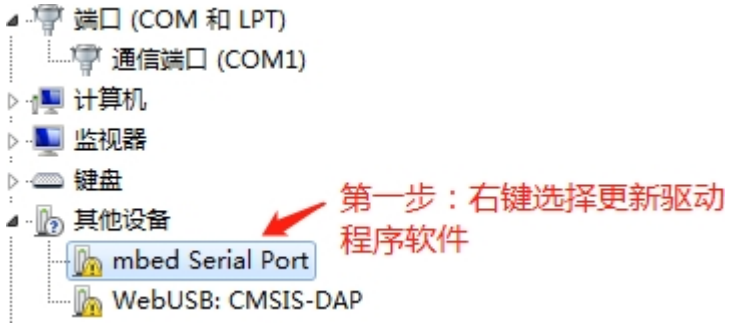
Attention:

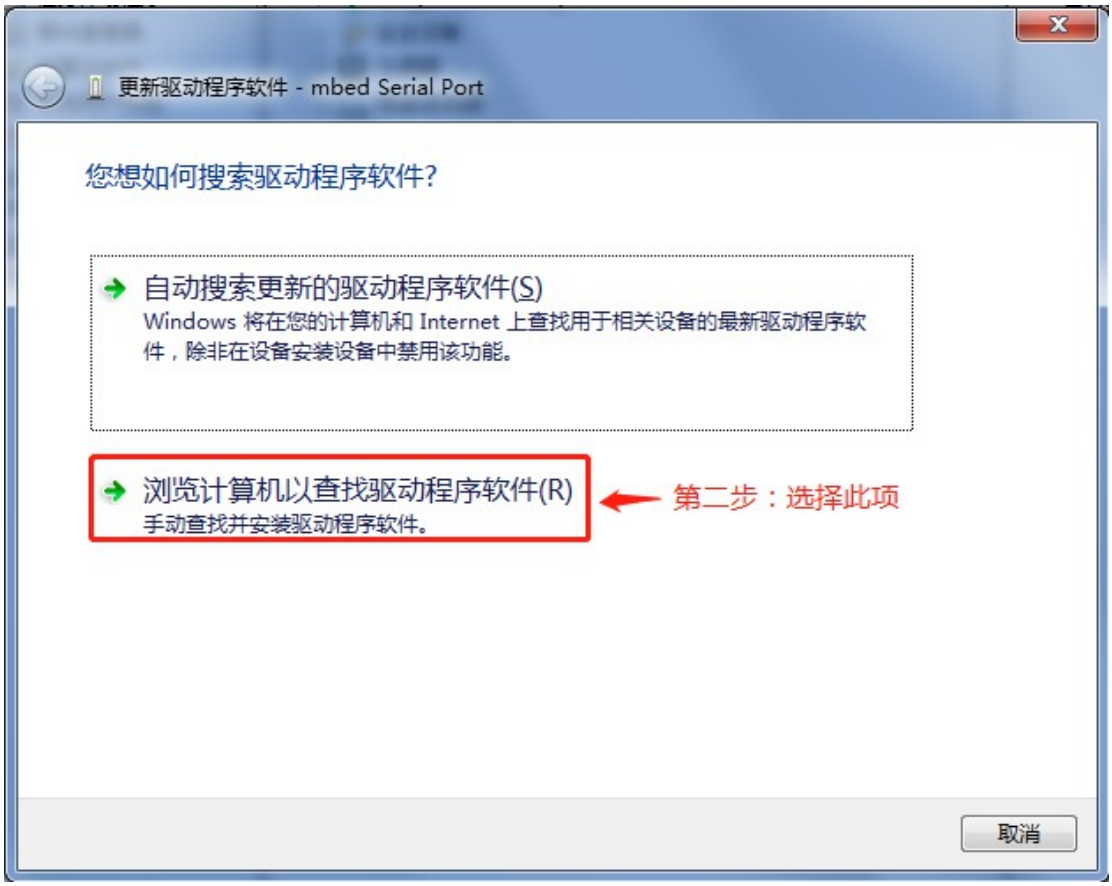
When using *Keil* as a development tool for debugging and downloading, you need to make sure that the *Keil* tool support package for this series of chips is installed correctly, or copy the <storage *directory*>:\mcu\MDK**.FLM* file to the *Keil* installation path (<installation *directory*>:\Keil\ARM\Flash\) of your personal computer and configure and select the appropriate *.FLM file for the chip you are using in the Keil project configuration download option. *Keil* Project Configuration download option to configure and select the appropriate *.*FLM* file for the chip you are using.

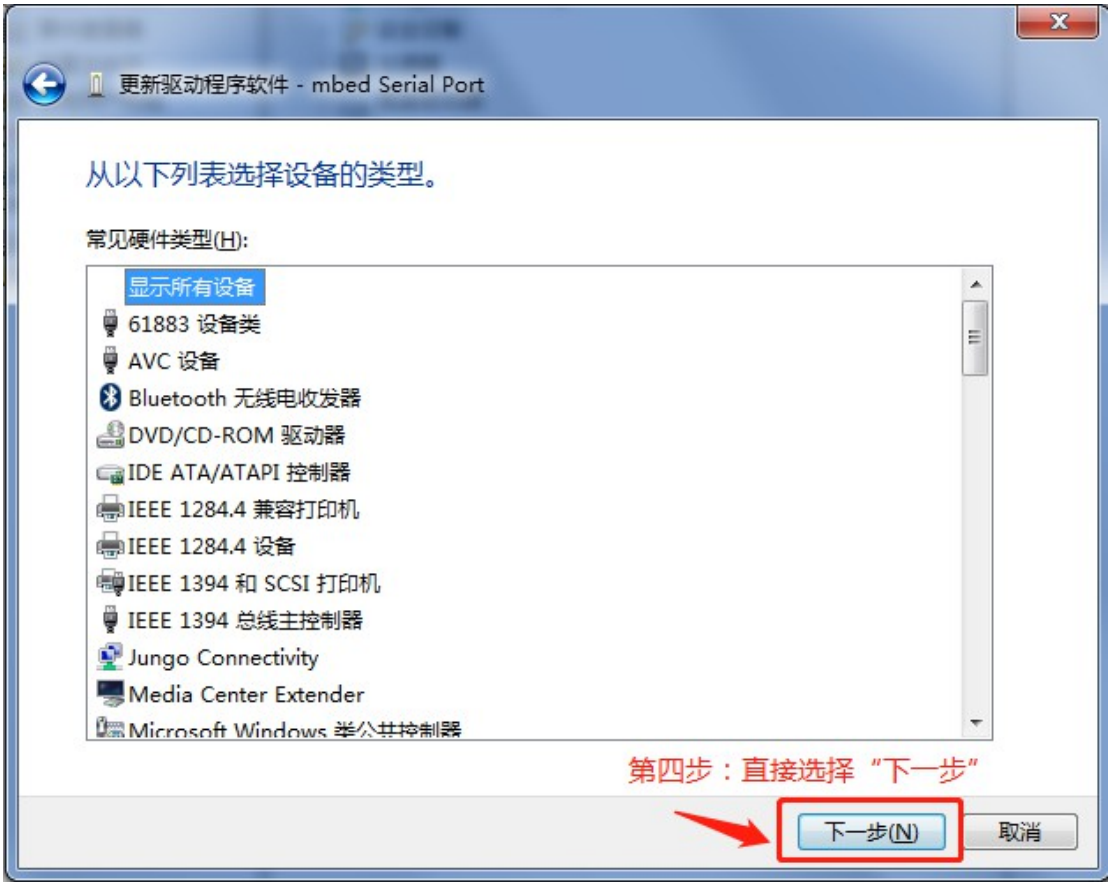
4 Tool Use

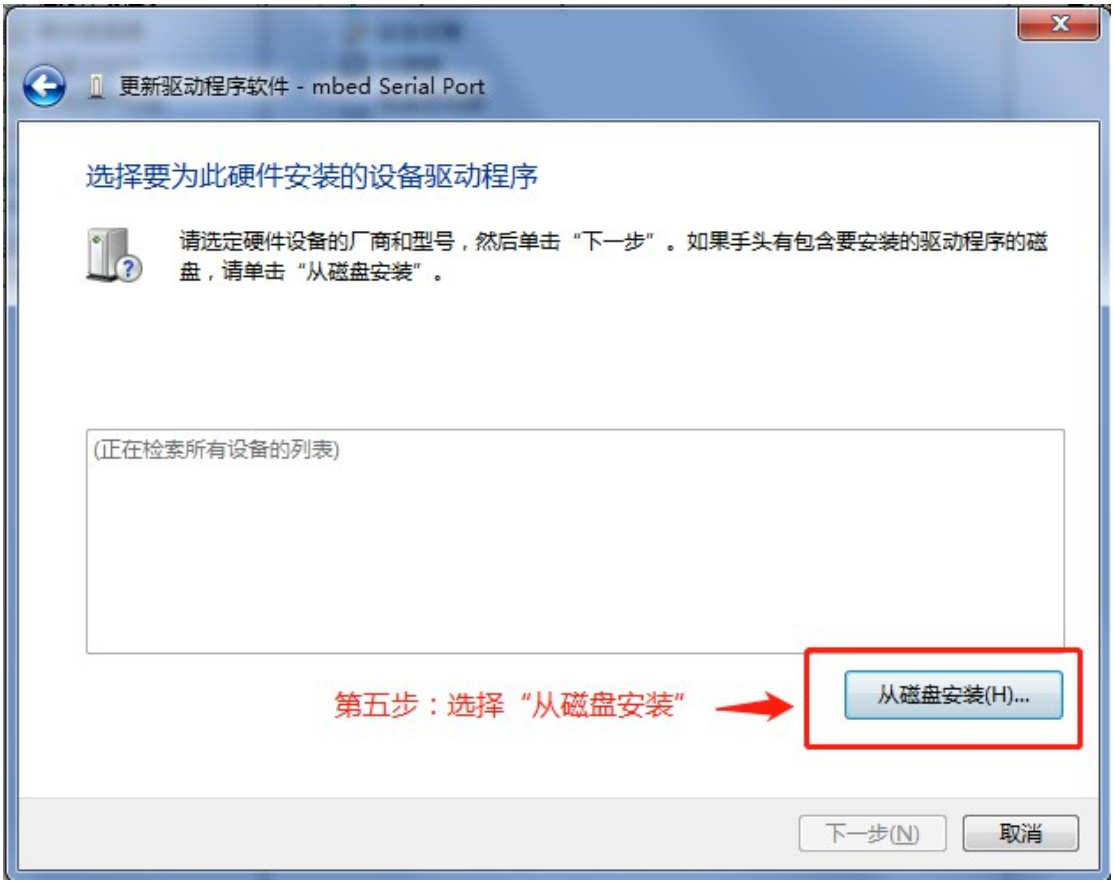
4.1 Debugging Instructions

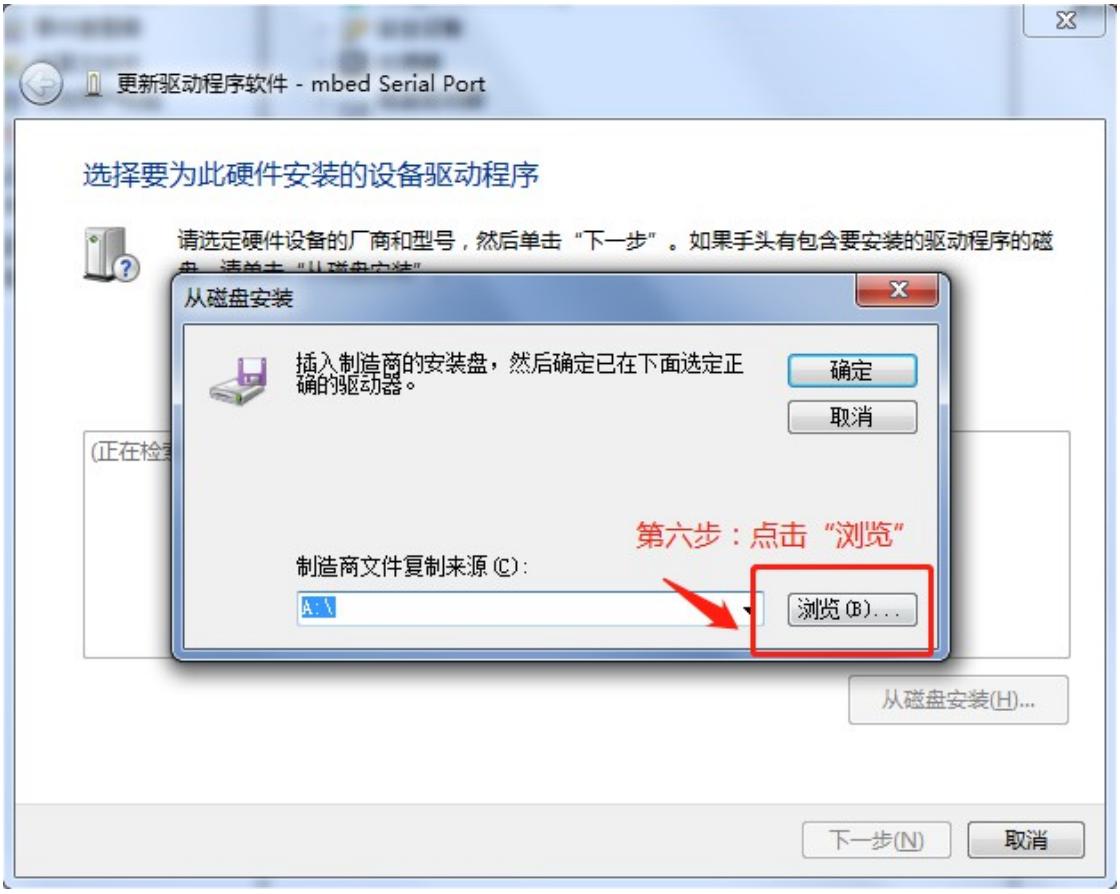
To realize the serial port function through CMSIS DAP, if the computer OS is Win7, you need to install the virtual serial port driver first (Win10 can ignore this step) Please contact the relevant technical support personnel to obtain the virtual serial port driver vcom_driver_xhsc file, and then open the device manager and follow the steps below to install it:






更新驱动程序软件 - mbed Serial Port
从以下列表选择设备的类型。
常见硬件类型(H):
显示所有设备
61883 设备类
AVC 设备
Bluetooth 无线电收发器
DVD/CD-ROM 驱动器
IDE ATA/ATAPI 控制器
IEEE 1284.4 兼容打印机
IEEE 1284.4 设备
IEEE 1394 和 SCSI 打印机
IEEE 1394 总线主控制器
Jungo Connectivity
Media Center Extender
第四步：直接选择“下一步”
下一步(N)
取消


更新驱动程序软件 - mbed Serial Port
选择要为此硬件安装的设备驱动程序
请选定硬件设备的厂商和型号，然后单击“下一步”。如果手头有包含要安装的驱动程序的磁盘，请单击“从磁盘安装”。
(正在检索所有设备的列表)
第五步：选择“从磁盘安装”
从磁盘安装(H)...
下一步(N)
取消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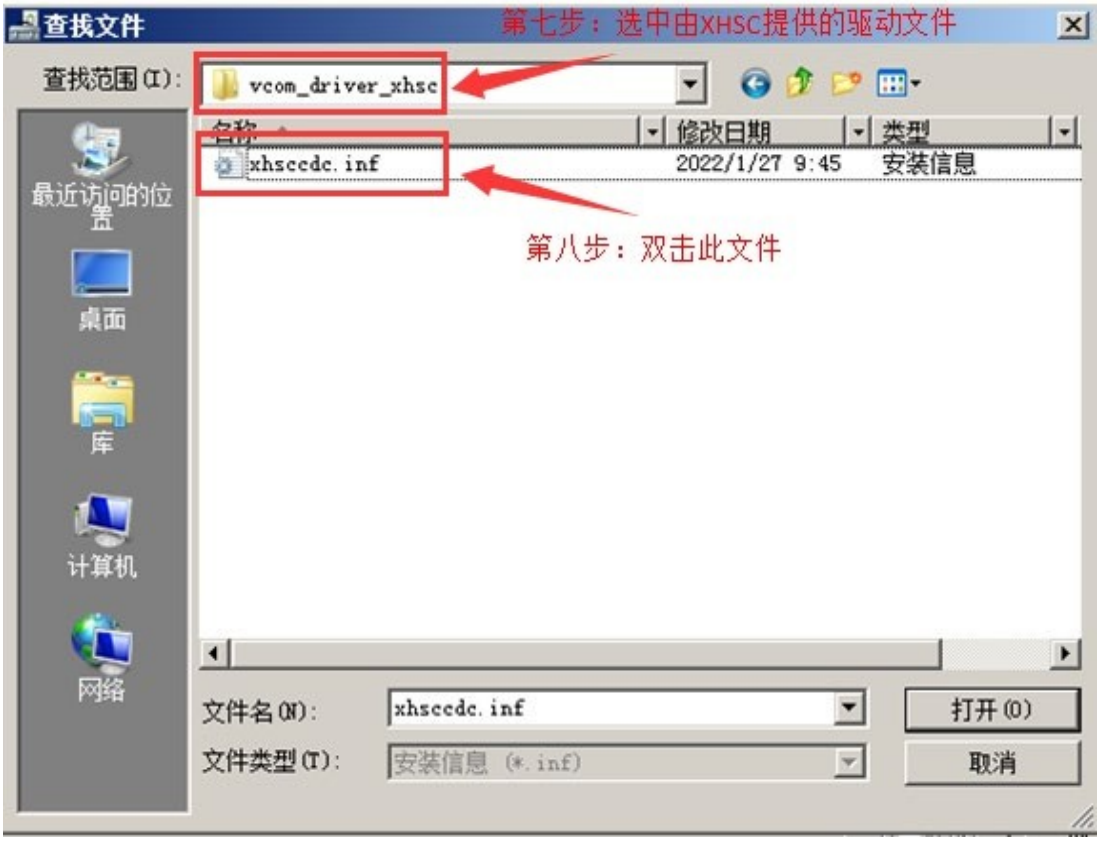
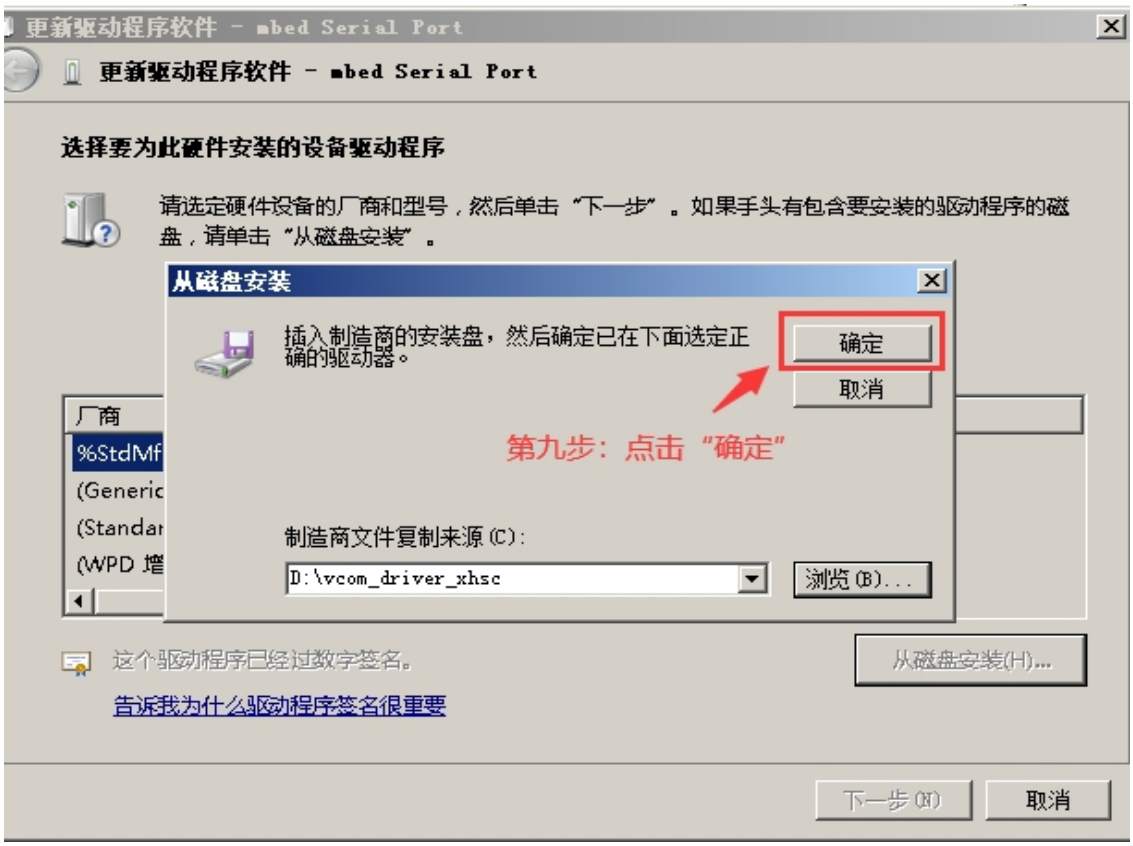
选择要为此硬件安装的设备驱动程序
请选定硬件设备的厂商和型号，然后单击“下一步”。如果手头有包含要安装的驱动程序的磁
从磁盘安装
插入制造商的安装盘，然后确定已在下面选定正确的驱动器。
确定
取消
第六步：点击“浏览”
制造商文件复制来源(C):
A:\
浏览(B)...
从磁盘安装(H)...
下一步(N)
取消


查找文件
第七步：选中由XHSC提供的驱动文件
查找范围(I):
vcom_driver_xhsc
名称
修改日期
类型
xhscedc.inf
2022/1/27 9:45
安装信息
第八步：双击此文件
最近访问的位置
桌面
库
计算机
网络
文件名(N):
xhscedc.inf
打开(O)
文件类型(T):
安装信息 (*.inf)
取消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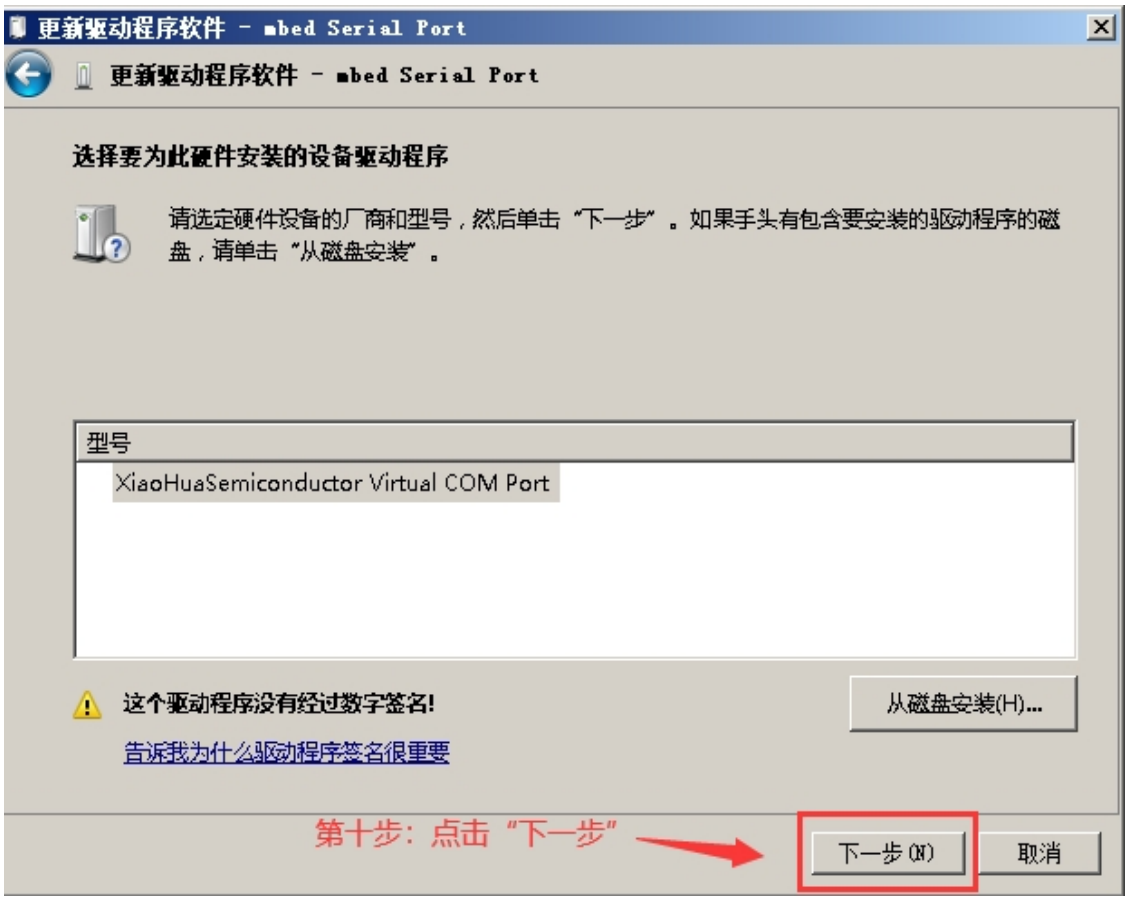
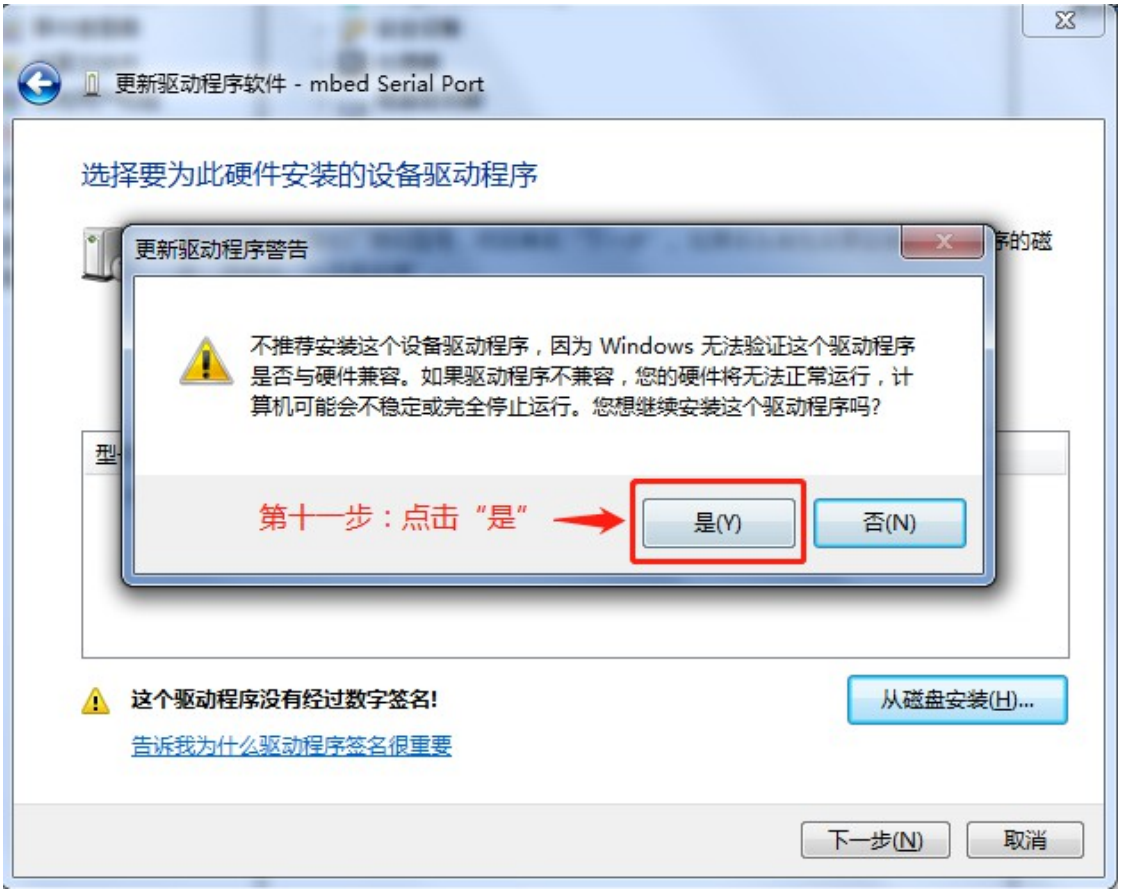
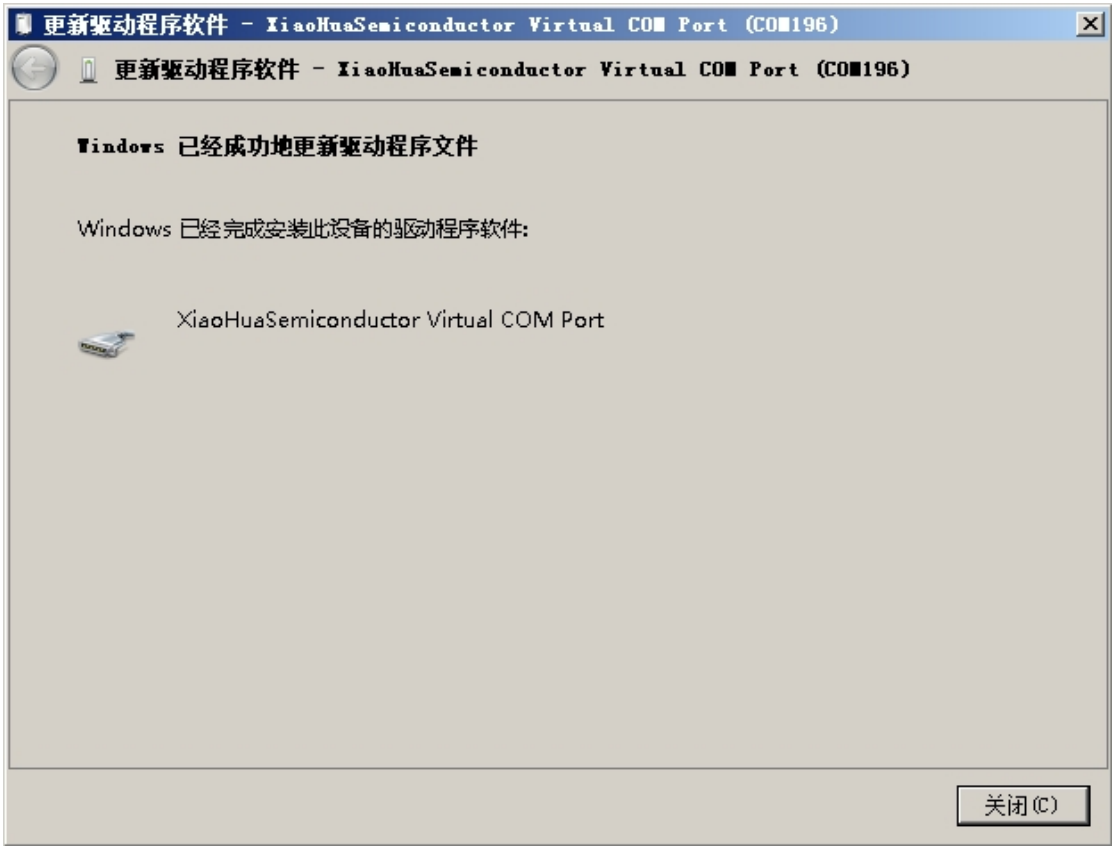
更新驱动程序软件 - mbed Serial Port
选择要为此硬件安装的设备驱动程序
请选定硬件设备的厂商和型号，然后单击“下一步”。如果手头有包含要安装的驱动程序的磁盘，请单击“从磁盘安装”。
从磁盘安装
插入制造商的安装盘，然后确定已在下面选定正确的驱动器。
确定
取消
第九步：点击“确定”
厂商
%StdMf
(Generic
(Standar
(WPD 增
制造商文件复制来源(C):
D:\vcom_driver_xhsc
浏览(B)...
这个驱动程序已经过数字签名。
从磁盘安装(H)...
告诉我为什么驱动程序签名很重要
下一步(N)
取消


更新驱动程序软件 - mbed Serial Port
更新驱动程序软件 - mbed Serial Port
选择要为此硬件安装的设备驱动程序
请选定硬件设备的厂商和型号，然后单击“下一步”。如果手头有包含要安装的驱动程序的磁盘，请单击“从磁盘安装”。
型号
XiaoHuaSemiconductor Virtual COM Port
这个驱动程序没有经过数字签名!
从磁盘安装(H)...
告诉我为什么驱动程序签名很重要
第十步：点击“下一步”
下一步(N)
取消



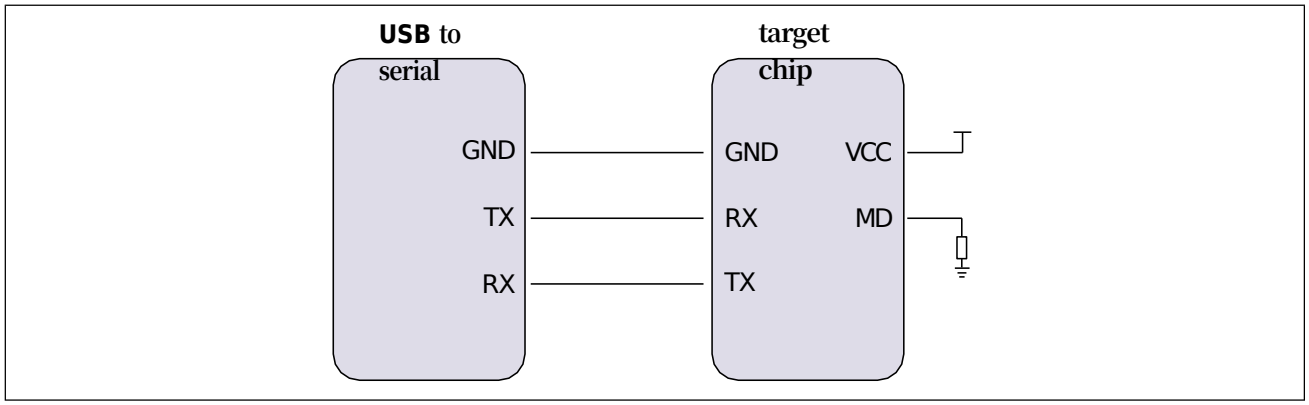
The driver will start to install, and the following screen will be displayed after a few seconds, which means it is installed correctly:



4.2 Program Burning

HC32F460 series MCUs can be programmed by Siu

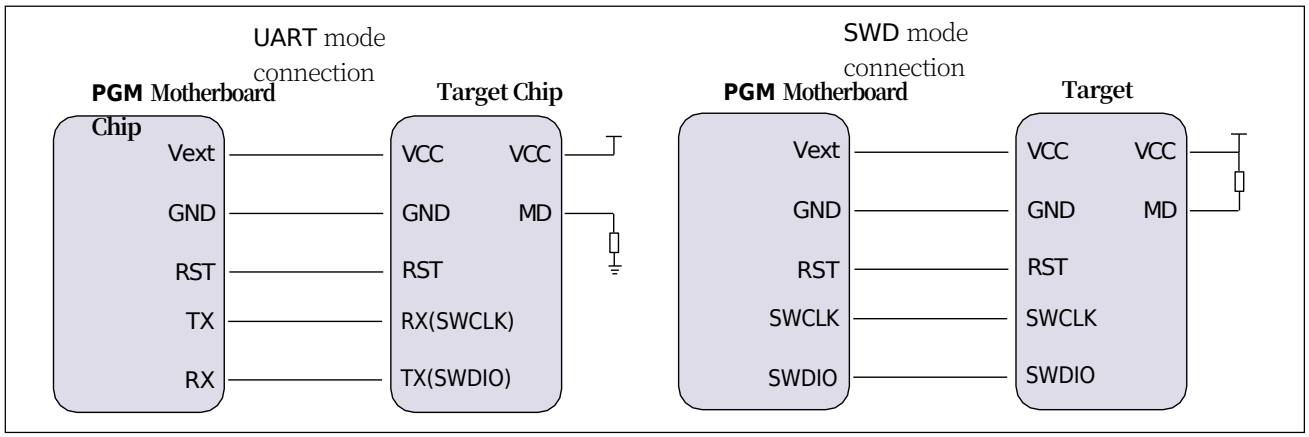
Wah programmer. The in-circuit programmer



supports UART mode and the wiring is shown in

the following figure:

The offline programmer supports UART mode and SWD mode, and the wiring is shown in the figure below:



For the specific programming process, please go to the Siu Wah Semiconductor official website https://www.xhsc.com.cn to find the corresponding chip model and refer to the Siu Wah programmer information for operation.

Version Revision Record

version number	revision date	revision
Rev1.0	2020/11/20	First Edition Release.
Rev1.1	2022/07/15	Company Logo updated.
Rev2.0	2023/08/07	Modify the hardware description and modify the ddl file structure.