# 1. Introduction to Testing Platform

Development Board : CH32F103C8T6 and CH32F203C8T6 Board

MCU : CH32F103C8T6 \ CH32F203C8T6

Frequency : 72MHz(F103) \ 144MHz(F203)

# 2. Pin connection instructions

This module can be directly plugged into the CH32F103C8T6 and CH32F203C8T6 development boards, as shown in the following figure:

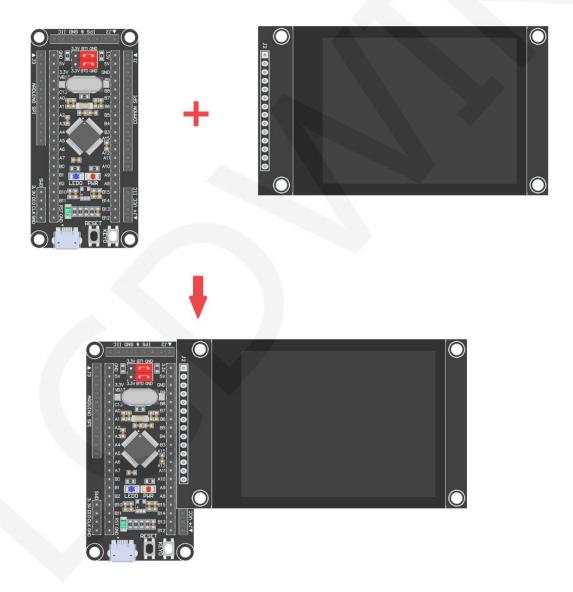


Figure 1: Module Inline CH32F103C8T6 Development Board

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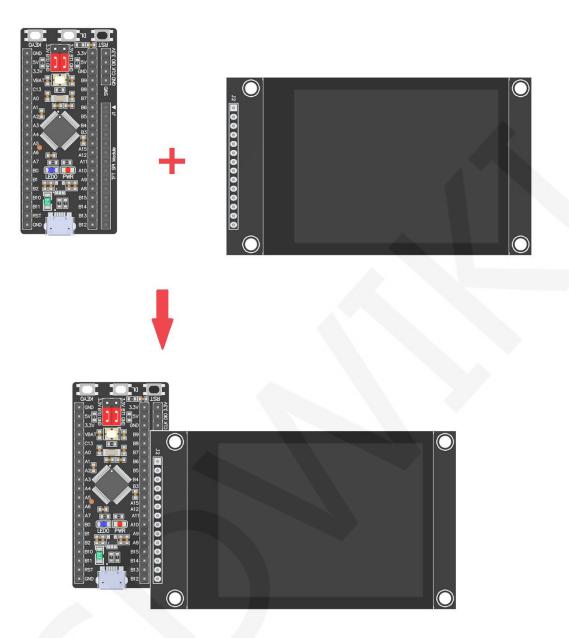


Figure 2: Module Inline CH32F203C8T6 Development Board

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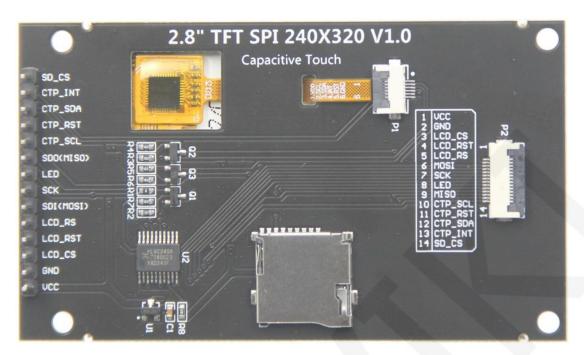


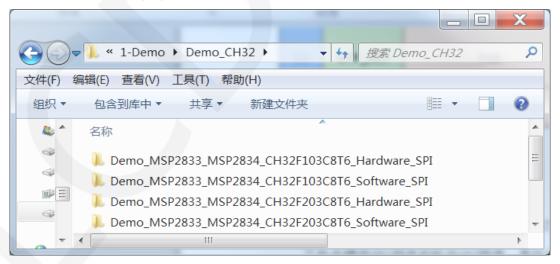
Figure 3 Module Back Pins

CH32F103C8T6/CH32F203C8T6 Test Program Pin Direct Insertion							
Number	Module pins	Corresponding CH32F103/CH32F203 development board wiring pins	Remarks				
1	vcc	5V	LCD power positive				
2	GND	GND	LCD Power ground				
3	LCD_CS	PB9	LCD selection control signal, Low level active				
4	LCD_RST	PB8	LCD reset control signal, Low level reset				
5	LCD_RS	PB7	LCD command / data selection control signal High level: data, low level: command				
6	SDI(MOSI)	PA7	SPI bus write data signal(SD card and LCD screen used together)				
7	SCK	PA5	SPI bus clock signal(SD card and LCD screen used together)				
8	LED	PB6	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)				
9	SDO(MISO)	PA6	SPI bus read data signal (SD card and LCD screen used together)				

			Capacitive touch screen IIC bus clock
10	CTP_SCL	PB5	signal (modules without touch screens do
			not need to be connected)
			Capacitor touch screen reset control signal,
11	CTP_RST	PA10	low-level reset (modules without touch
			screens do not need to be connected)
			Capacitive touch screen IIC bus data signal
12	CTP_SDA	PA9	(modules without touch screens do not
		need to be connected)	
			Capacitor touch screen IIC bus touch
			interrupt signal, when generating touch,
13	CTP_INT	PA8	input low level to the main control (modules
			without touch screens do not need to be
			connected)
			SD card selection control signal, low level
14	SD_CS	NC	active (without SD card function, can be
			disconnected)

## 3. Demo Function Description

This set of sample programs includes two types of MCU programs, CH32F103C8T6 and CH32F203C8T6. Each MCU program also includes hardware SPI programs and software SPI programs, which are located in Demo\_ Under the CH32 directory, as shown in the following figure:



The sample program includes the following test items:

- A. Main interface display;
- B. Read the display screen ID and GRAM color values;

- C. Simple screen swiping;
- D. Drawing and filling of rectangles;
- E. Draw and fill a circle;
- F. Triangle drawing and filling;
- G. English display;
- H. Chinese display;
- I. Image display;
- J. Dynamic digital display;
- K. Rotating display;
- L. Capacitive touch screen (including touch buttons and handwritten lines);

Example program display direction switching instructions:

Found macro definition USE\_HORIZONTAL in LCD. h, as shown in the following:

#define USE_HORIZONTAL 0//	////// 定义液	/用尸配直区/////// 【晶屏顺时针旋转方向	0-0度旋转,	/////////////////////////////////////	//// 2-180度旋转,	3-270度放
USE_HORIZONTAL	0	//0°rotate				
USE_HORIZONTAL	1	//90°rotate				
USE_HORIZONTAL	2	//180°rotate				
USE_HORIZONTAL	3	//270°rotate				

# 4. Demo Usage Instructions

### Installing development tool software

Firstly, you need to install the development tool software, which uses Keil5.

Please refer to the online download and installation methods for yourself.

### ♦ Installing Device Library

After installing the keil5 software, it is necessary to install the CH32 device library (omitted if already installed), and the download address is as follows:

CH32F103C8T6: https://www.wch.cn/downloads/CH32F103EVT\_ZIP.html

CH32F203C8T6: https://www.wch.cn/downloads/CH32F20xEVT\_ZIP.html

After downloading the official information package, unzip it and find the pack file in

the EVT\PUB directory, as shown in the following figure:

CH32F103C8T6's pack:



CH32F203C8T6's pack:

	AND BE				X
<b>GO</b> -	▶ « CH32F20xEVT → EVT → PUB	•	47	搜索 P	<b>P</b>
文件(F) 编	辑(E) 查看(V) 工具(T) 帮助(H)				
组织▼	17. 〒 新建文件夹		•		0
*	名称		修改E	明	
	📜 CH32F20x Evaluation Board Referen	2022	/11/30	15:24	
	🔁 CH32F20xSCH.pdf	2022	/9/26 1	0:52	
	🄁 CH32F20x评估板说明书.pdf	2022	/11/30	15:21	
	Keil.WCH32F2xx_DFP.1.0.2.pack		2022	/5/24 1	1:03
 ▼ ₹					Þ
	Keil.WCH32F2xx_DFP.1.0.2.pack uVision Software Pack				

Double click on the pack file and follow the prompts to install.

## ♦ Compiling Programs

After the library installation is completed, open the **PROJECT** directory under the sample program, locate the **uvprojx** file, double-click to open the sample project, as shown in the following figure:

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文件(F) 编	辑(E) 查看(V) 工具(T) 帮助(H)			
组织 ▼	₩ 打开 • 新建文件夹			0
<b>*</b>	名称 startup_ch32f10x.lst	修改日期 2023/5/31 17:51	类型 LST 文件	大小 41
8	TOUCH.map	2023/5/31 17:51	MAP文件	103
<b>*</b>	TOUCH.uvguix.Administrator TOUCH.uvoptx	2023/5/31 18:16 2023/5/18 10:29	ADMINISTRATO UVOPTX 文件	173 14
	TOUCH.uvprojx	2023/5/3 16:30	礦ision5 Project	24 👻
	TOUCH.uvprojx 修改日期: 2023/5/3 16:30 礦ision5 Project 大小: 23.3 KB	11 创建日期: 202	23/5/29 11:16	4

After opening the sample project, you can make modifications to the project code (or not). After the modifications are completed, click the compile button to compile the code. The following prompt appears, indicating successful compilation, as shown in the following figure:

😨 G:\project\2.8inch\2.8inch_common_spi_ctp\2.8inch_SPI_Module_ILI9341_MSP2833	X
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help	
📄 😂 🛃 🕼 👗 🔤 🛍 🦃 🗠 🔶 🥐 隆 🎊 🎊 澤 寧 //// //// 💌 Touch_Init 🔍 🗟 🖉	n 🗕 🗸 -
🔗 🕮 🕮 🗧 🔣 🗱 TOUCH 🔤 🔊 🛔 🗟 🔶 🥎 🌚	
Project 🗜 🖬 📄 main.c	▼ ×
<ul> <li>● ** Project: TOUCH</li> <li>● TOUCH</li> <li>● USER</li> <li>● USER</li> <li>● Project ③Books ① Functi 0, Templ</li> </ul>	10
Build Output	д 🗵
<pre>*** Using Compiler 'V5.06 update 6 (build 750)', folder: 'D:\Keil_v5\ARM\ARMCC\Bin' Build target 'TOUCH' "\OBJ\TOUCH.axf" - 0 Error(s), 0 Warning(s). Build Time Elapsed: 00:00:01</pre>	*
	-
4	

## ♦ Download and Run Programs

The development board supports SWD download, USB download, and serial port

download

When downloading SWD, ST Link or WCH Link downloaders can be used.

Here is an introduction to SWD download. For other download methods, please refer

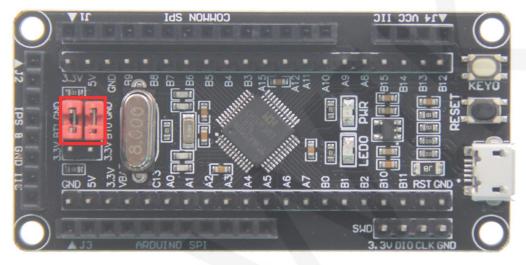
to the documentation in the development board documentation package or consult the internet.

The steps for downloading SWD are as follows (using the CH32F103C8T6

development board as an example):

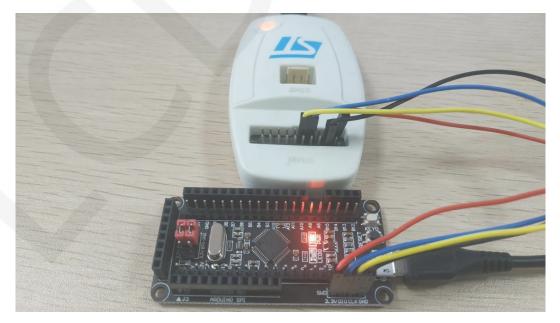
A. Firstly, ensure that the BT0 and BT1 pins of the MCU remain low, as shown in the following figure:

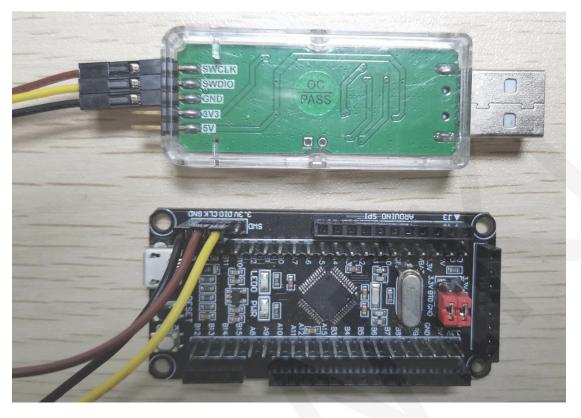
The BT0 and BT1 pins of CH32F103C8T6 are connected to GND using jump caps.



B. Find the SWD interface of the development board and connect it one by one with the pins of the emulator (theoretically, any emulator that supports the SWD protocol supports it), as shown in the following figure:

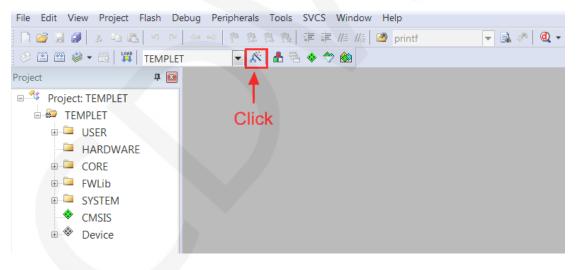
### Connect to ST-Link:





**Connect to WCH-Link:** 

C. Open the KEIL tool software and click the button shown in the following figure:



D. Click the **Debug** button in the pop-up interface, and then select the emulator in

Use.

If using **ST-Link**, please select **ST-LINK Debugger** 

If using WCH-Link, please select CMSIS-DAP Debugger

As shown in the following figure:

```
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```

## Using ST-Link:

Options for Target 'TEMPLET'	
Device   Target   Output   Listing   User   C/C++   Asm	Linker Debug Utilities
C Use Simulator with restrictions Settings	Euse: ST-Link Debugger     Signum Systems JTAGjet     J-LINK / J-TRACE Cortex
Image: Construction of Construction     Image: Construction of Construction       Initialization File:     Image: Construction of Construction	Iversity     ULINK Pro Cortex Debugger       NULink Debugger       Initializatio       SILabs UDA Debugger       ST-Link Debugger       CMSIS-DAP Debugger
Restore Debug Session Settings Breakpoints   Toolbox Watch Windows & Performance Analyzer Memory Display   System Viewer	CMSIS-DAP Debugger Models Cortex-M Debugger PEMicro Debugger INKplus Debugger Watch Windows Memory Display System Viewer
CPU DLL: Parameter:	Driver DLL: Parameter:
SARMCM3.DLL -REMAP	SARMCM3.DLL
Dialog DLL: Parameter:	Dialog DLL: Parameter:
DCM.DLL -pCM3	TCM.DLL -pCM3
	Warn if outdated Executable is loaded
Warn if outdated Executable is loaded	
	iewer Description Files

## Using WCH-Link:

Options for Target 'TEMPLET'						
Device   Target   Output   Listing   User   C/C++   Asm	Linker Debug Utilities					
C Use <u>Simulator</u> <u>with restrictions</u> <u>Settings</u> ☐ Limit Speed to Real-Time	Œ Use: CMSIS-DAP Debugger					
<ul> <li>✓ Load Application at Startup</li> <li>✓ Run to main()</li> <li>Initialization File:</li> </ul>	VLINK Pro Cortex Debugger NULink Debugger Initializatio SiLabs UDA Debugger ST-I ink Debugger					
Restore Debug Session Settings Breakpoints   Toolbox Watch Windows & Performance Analyzer Memory Display   System Viewer	CMSIS-DAP Debugger       Edit         Models Cortex-M Debugger       PEMicro Debugger         PEMicro Debugger       TIXDS Debugger         Watch Windows       System Viewer					
CPU DLL: Parameter:	Driver DLL: Parameter:					
SARMCM3.DLL -REMAP	SARMCM3.DLL					
Dialog DLL: Parameter:	Dialog DLL: Parameter:					
DCM.DLL -pCM3	TCM.DLL -pCM3					
Warn if outdated Executable is loaded Manage Component Viewer Description Files						
OK Can	cel Defaults Help					

E. Power on the development board and click the **Settings** button next to Use (as shown in the previous operation). The following interface will pop up, indicating that the emulator has successfully connected:

Cortex-M Target Driver Setup	
Debug Trace Flash Download	
Debug Adapter Unit: ST-LINK/V2	SW Device       SWDIO     IDCODE       Ox1BA0     ARM CoreSight SW-DP
Serial 53FF71067766485259261681 Version: V2 FW: V2J31S7 Check version on sta Target Com Port SW Clock Req: 4 MHz Selecter 4 MHz	Automatic Detectic     ID CODE:     Manuel Configurati     Add     Delete     Update     IR len:     AP:
Debug Connect & Reset Options Connect: Normal Veset: Autodet V Reset after Conn Stop after	
	<b>确定 取消</b> 应用(A)

## ST-Link connection successful:

#### WCH-Link connection successful:

CMSIS-DAP Cortex-M Target Driver Setup						
Debug Trace Flash Download Pack						
CMSIS-DAP - JTAG/SW Adapter	-SW Dev	vice				
WCH CMSIS-DAP		IDCODE	Device Name		Move	
Serial No: 0001A0000000	SWDIO	⊙ 0x2BA01477	ARM CoreSight SW-DP		Up	
Firmware Version: 2.0.0			•		Down	
Firmware version. 2.0.0						
SWJ Port SW -	Aug	Successfu	lly connected			
Max Clock: 10MHz 💌		nual Config	Device Name:			
	Ado	Delete	Update	AP	: 0x00	
Debug						
Connect & Reset Options			Cache Options	-Download Options-		
	: SYSRE	SETREQ (I 💌	Cache Code	Verify Code Dov		
Reset after Connect	op after Re	set	I v Cache Menory		1511	
		ОК	Cancel		Help	

F. Click the Flash Download button to enter the flash settings interface, as shown in the following figure (if flash has been selected, this step can be omitted): If you want the program to automatically run after successful download, you need to check Reset and Run. Otherwise, after successful download, you need to press the reset button or power off to restart before running the program.

Cortex-M Target Driver Setup
Debug Trace Flash Download
Download Function C Erase Full C Program C Do not Erase Sector: Verify C Do not Erase Verify C Do not Erase Verify C Do not Erase I Reset and Run
Programming Algorithm           Description         Device Size         Device Type         Address Range
add Remove
<b>确定 取消</b> 应用( <u>A</u> )

G. Click on the Add button (as shown in the above figure) to select flash. Generally, the first one is selected (the algorithm has already been processed), and once it is selected, click on the Add button below to exit, as shown below:

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CH32F1xx_64 Flash64kOn-chip FlashDevice Family PackageSTM32F10x Flash Options16BOn-chip FlashDevice Family PackageAM29x128 Flash16MExt. Flash 16-bitMDK CoreK8P5615UQA Dual Flash64MExt. Flash 32-bitMDK CoreLPC18xx/43xx MX25V8038MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0324MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL032 SP4MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreMIMXRT105x EcoXiP Flash8MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
AM29x128 Flash16MExt. Flash 16-bitMDK CoreK8P5615UQA Dual Flash64MExt. Flash 32-bitMDK CoreLPC18xx/43xx MX25V8038MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0324MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL032 SP4MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreMIMXRT105x EcoXiP Flash8MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
K8P5615UQA Dual Flash64MExt. Flash 32-bitMDK CoreLPC18xx/43xx MX25V8038MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0324MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL032 SP4MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreMIMXRT105x EcoXiP Flash8MExt. Flash 16-bitMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
LPC18xx/43xx MX25V8038MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0324MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0648MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreM29W640FB Flash8MExt. Flash 16-bitMDK CoreMIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
LPC18xx/43xx S25FL0324MExt. Flash SPIMDK CoreLPC18xx/43xx S25FL0648MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreM29W640FB Flash8MExt. Flash 16-bitMDK CoreMIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
LPC18xx/43xx S25FL0648MExt. Flash SPIMDK CoreLPC407x/8x S25FL032 SP4MExt. Flash SPIMDK CoreLPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreM29W640FB Flash8MExt. Flash 16-bitMDK CoreMIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
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LPC5460x MT25QL128 S16MExt. Flash SPIMDK CoreM29W640FB Flash8MExt. Flash 16-bitMDK CoreMIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
M29W640FB Flash8MExt. Flash 16-bitMDK CoreMIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
MIMXRT105x EcoXiP Flash4MExt. Flash SPIMDK CoreRC28F640J3x Dual Flash16MExt. Flash 32-bitMDK CoreS29GL064N Dual Flash16MExt. Flash 32-bitMDK Core
RC28F640J3x Dual Flash 16M Ext. Flash 32-bit MDK Core S29GL064N Dual Flash 16M Ext. Flash 32-bit MDK Core
S29GL064N Dual Flash 16M Ext. Flash 32-bit MDK Core
S29JL032H_BOT Flash 4M Ext. Flash 16-bit MDK Core
S29JL032H_TOP Flash 4M Ext. Flash 16-bit MDK Core
Selected Flash Algorithm File:
::\Keil_v5\ARM\PACK\Keil\WCH32F1xx_DFP\1.0.0\Flash\CH32F1xx_64.FLM

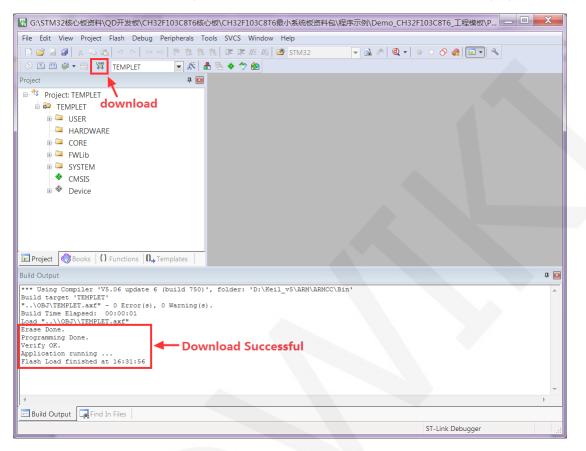
H. Click the **OK** button and the **OK** button to exit the settings interface, as shown in

the following figure:

	et Driver Setup <sub>:e</sub> Flash Down!	load		
-Download	<ul> <li>Erase Full</li> <li>Erase Sect</li> </ul>	. Cl 🔽 Program cor: 🔽 Verify ase 🔽 Reset and Run	RAM for Algorithm :art: 0x20000000 ize: 0	)x1000
Descrip	ng Algorithm —	Device Size De	vice Type Address Range	
	x_64 Flash		chip Flash 08000000H - 0800FFFF	H
			:art: ize:	
		Add	Remove	
			确定	取消 应用(4)

I. Click the download button to download the program, and the following prompt

will appear, indicating successful download, as shown in the following figure:



J. If the display module displays characters and graphics normally, it indicates that

the program has run successfully.