



Fremont Micro Devices

StarterKit 开发板入门



Rev1.1 www.fremontmicro.com

Revision history

Date	Revision	Describe
27-Jan-2022	1.0	Initial
08-Aug-2022	1.1	开发板图片改为 1.5 版本,增加新建库工程



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1.StarterKit 开发板简介

StarterKit 开发板是公司在基于主芯片 FT32F072x8 的基础上,开发了一款 Demo 板,目的在于初学者更易于上手,有经验的工程师便于方案验证。

该开发板带有 CMS IS DAP 调试器, 在验证主芯片 FT32F072x8 功能时, 不需要额外再加调试器。 使用时, 把左边 USB 口(J4) 接上电脑的 USB 口, 打开 KEIL 工程文件, 在 OPTION->DEBUG 里选 CMS IS-DAP Debugger 即可进行下载仿真调试。

下图为 StarterKit 开发板实物图







本开发板可提供如下功能测试、实验。

序号	模块	功能说明
1	复位开关	对 MCU 复位
2	USB 从机接口	可实现虚拟串口等
3	OLED 接口	I2C 驱动接口
4	按键 KEY1、KEY2	按键响应
5	LED 灯 LED1、LED2、LED3、LED4	LED 指示灯



6	RTC 时钟	外接 32. 768KHz RTC 时钟
7	FT24C02A	120 接口
8	FT25C16A	SPI 接口
9	A/D采样接口	调节电位器,AD 值随之变化
10	USART	串口1、串口2
11	ТОИСН	TOUCH1、TOUCH2
12	PWM	可设置为不同的占空比、周期等
13	IRTIM	红外收发功能

2.下载 pack 包

2.1. 下载 pack 包路径一

通过 keil 官方网站 https://www.keil.com/dd2/pack/ 下载



 Embedded Artists IMX RT1062 Developers Kit Board Support Pack EmbeddedOffice Flexible Safety RTOS EmCraft Board Support Pack for STM32F7-SOM-based boards FMD 	BSP 1.0.2 1.0.0 BSP 1.0.0 SP 1.0.0 SP 1.0.0 SP 1.0.0 SP 1.0.0 SP 1.0.0 SP 1.0.2 SP 1.0.2 S
EmbeddedOffice Flexible Safety RTOS EmCraft Board Support Pack for STM32F7-SOM-based boards FMD	1.0.0 ¥ BSP 1.0.0 ¥
	1.0.0 오 BSP 1.0.0 오
EmCraft Board Support Pack for STM32F7-SOM-based boards FMD	BSP 1.0.0 👤
Board Support Pack for STM32F7-SOM-based boards FMD	BSP 1.0.0 👤
FMD	
FremontMicro FT32F0 Series Device Support and Examples BSP	DFP New 1.0.4
 Version: 1.0.4 (2022-01-21) FMD.FT32F0xx_DFP.1.0.4.pack Modify the system clock configuration Added: Devices FT32F032K8B, FT32F032G8B. Added: FT32F032x8.h files. Added: Devices FT32F072RBATx, FT32F072CBAT7. Added: DIV Driver files. Updated: documentation. 	2 Download
 Version: 1.0.2 (2021-10-22) FMD.FT32F0xx_DFP.1.0.2.pack Added: Touch library. Demo is also included. Added: Starter-kit-072 board description and examples. Updated: documentation. 	± Download
Version: 1.0.1 (2021-08-03) FMD.FT32F0xx_DFP.1.0.1.pack Updated FT32Driver files.	🛨 Download
Version: 1.0.0 (2021-07-14) FMD.FT32F0xx_DFP.1.0.0.pack First Release version of FT32F0 Device Family Pack.	Download
FMSH	
FMSH ARM Cortex-M0 Device Family Pack	DFP 3.0.2 👤
Geehy	

找到 FMD, 下载最新 pack 包。

2.2. 下载 pack 包路径二

通过https://www.fremontmicro.com/upload/tools/pack/FMD.FT32F0xx_DFP.1.0.5.pack下载,选择最新版本下载。





3. StarterKit 开发板资料

3.1 安装 pack 包

双击 pack 包, 默认安装即可。

Pack Unzip: FMD FT32F0xx_DFP 1.0.5	\times
Welcome to Keil Pack Unzip Release 1/2022	
This program installs the Software Pack:	
FMD FT32F0xx_DFP 1.0.5	
FremontMicro F132FU Series Device Support and Examples	
Destination Folder	1
C:\Users\Administrator\AppData\Local\Arm\Packs\FMD\FT32F0xx_DFP\1.0.5	
Keil Pack Unzip	_
Pack already installed. << Back Next>> Cancel Click "Next" to replace. Cancel Cancel Cancel	

图 4

3.2 开发板资料路径



安装完 pack 包后,在路径 C:\Users\Administrator\AppData\Local\Arm\Packs\FMD\FT32F0xx_DFP

\1.0.5\Boards\FMD\Starter-kit-072 中, 找到文件夹 Doc 和 Examples, 如图 5 所示, 在文件夹 Doc 里有开发板 原理图、StarterKit 开发板入门等详细资料,在文件夹 Examples 里有 FT32F072 的外设工程例程。



4.开发环境配置及工程创建

4.1 建立 Keil 工程

4.1.1 Keil 程序下载和安装

Setup MDK-ARM V5.29	×
Welcome to Keil MDK-ARM	
Release 11/2019	
This SETUP program installs:	
MDK-ARM V5.29	
This SETUP program may be used to update a p However, you should make a backup copy befor	revious product installation. re proceeding.
It is recommended that you exit all Windows prog	rams before continuing with SETUP.
Follow the instructions to complete the product in	istallation.
— Keil MDK-ARM Setup ————	
	ZZ Back Nevt SS Cancel

一路默认配置即可。

4.1.2 查看 Pack 包

在安装完 Keil 后,点击下图图标。



I\KEIL\TouchPro_Test_SourceCodeV1.0.1\BoardDemo.uvprojx - µVision [Non-Commercial Use License]
Peripherals Tools SVCS Window Help
← ⇒ ?? ?\$?\$?\$?\$?\$ /# /# /# wartsend
$\mathbf{\lambda}$

进入后可以看到 FMD 的芯片选型

Pack Installer - C:\Users\Administrat	or\AppData\Local\Arm\Packs	OD ARD AND		Author Author A	ABDC Auto		3 23
File Packs Window Help							
Device: FMD - FT32F072R8ATx							
4 Devices Boards		4	4	Packs Examples			Þ
Search: - ×	8		p;	ack	Action	Description	
Device /	Summary		1 👳	Device Specific	1 Pack	FT32F072R8ATx selected	-
E All Devices	8597 Devices			-FMD::FT32F0xx_DFP	🔅 Install	FremontMicro FT32F0 Series Device Support and Examples	
ABOV Semiconductor	30 Devices			1.0.1 (2021-08-03)	🖄 Unpack	FremontMicro FT32F0 Series Device Support and Examples	
 Active-Semi 	17 Devices			Previous		FMD::FT32F0xx_DFP - Previous Pack Versions	
Ambig Micro	10 Devices		6	Generic	51 Packs		
Amiccom	5 Devices			Alibaba::AliOSThings	🚸 Install	AliOS Things software pack	
Analog Devices	15 Devices			Arm-Packs::PKCS11	📀 Install	OASIS PKCS #11 Cryptographic Token Interface	
APEXMIC	25 Devices			Arm-Packs::Unity	🔅 Install	Unit Testing for C (especially Embedded Software)	
- 🕈 ARM	58 Devices			ARM::AMP	🔅 Install	Software components for inter processor communication (Asymmetric	c Multi
AutoChips	53 Devices			ARM::CMSIS	💠 Up to date	CMSIS (Common Microcontroller Software Interface Standard)	
- Cmsemicon	32 Devices			ARM::CMSIS-Driver	🔶 Up to date	CMSIS Drivers for external devices	
Cvpress	931 Devices			ARM::CMSIS-Driver_Va	📀 Install	CMSIS-Driver Validation	
P Pialog Semiconductor	15 Devices			ARM::CMSIS-FreeRTOS	🔶 Up to date	Bundle of FreeRTOS for Cortex-M and Cortex-A	
ELAN ELAN	1 Device			ARM::CMSIS-RTOS_Va	🔅 Install	CMSIS-RTOS Validation	
H- 🖉 EtaCompute	3 Devices		1		🐵 Install	ARM mbed Client for Cortex-M devices	
E IND	9 Devices			ARM::mbedCrypto	🚸 Install	ARM mbed Cryptographic library	
FT32F0 Series	9 Devices			ARM::mbedTLS	Install+	ARM mbed Cryptographic and SSL/TLS library	
H 1 FT32E030	6 Devices			ARM::minar	🚸 Install	mbed OS Scheduler for Cortex-M devices	
FT32F072	3 Devices			-ARM::PSA	Install	PSA (Platform Security Architecture)	
# 1 FT32E072C8	1 Device			ARM::TFM	Install+	Trusted Firmware-M (TF-M) reference implementation of Arm's Platfor	rm Sec
E 132F072R8	2 Devices			ARM::TFM-Test	Install+	Trusted Firmware-M (TF-M) Tests	
CI ET32E07288ATx	ARM Cortex-M0 72 MHz 8 kB RAM 64 kB ROM			ARM::V2M_MPS3_SSE	Install+	ARM V2M-MPS3 TF-M Platform Support pack.	
- ET32E072B8BTx	ARM Cortex-M0, 72 MHz 8 kB RAM, 64 kB ROM			ASN::Filter_Designer	🚸 Install	Intuitive graphical FIR/IIR digital filter designer	
H- 9 Geeby	54 Devices			EmbeddedOffice::Flexi	📀 Install	Flexible Safety RTOS	
+ 🧳 GigaDevice	293 Devices			Keil::ARM_Compiler	🔶 Up to date	Keil ARM Compiler extensions for ARM Compiler 5 and ARM Compiler	6
H- Goodix	22 Devices			Keil::iMXRT105x_MWP	Install+	NXP i.MX RT 1051/1052 MDK-Middleware examples and CMSIS-Drivers	,
HDSC	75 Devices		•	H Keil::iMXRT1060 MWP	Install+	NXP i.MX RT 1061/1062 MDK-Middleware examples and CMSIS-Drivers	•
Output							

如上图所示,则已经安装了 FMD pack 包。如果没有安装 pack 包或没有下载 pack 包,按第2 章去下载和第3章安装。

4.1.3 新建 Keil 工程

回到 keil 主界面, 然后新建一个工程。



µVision [Non-Commercial Use License]		and the party of the local	the Branger C. Married	
e Edit View Project Flash Debug Peripherals Tools SVCS W	indow Help			
) 🖆 🗟 🦉 🌮 🍋 🖾 🖉 🤄 🗢 😓 🖗 🗐 🖉 🗎 🗑	🗉 🗊 //🗄 🛛 📴 usartsend 🔍 👻] 🗟 🌾 🔍 + 😐 🔿 🎯 + 🔲 🖛	4	
- = = × = × = = = = + ≤ = = = = = = = = = = = = = =	> 🐡 🏟			
ect 🌻 🖬				
6				
Create New Project				
			▼ 4 搜索 桌面	٩
组织 ▼ 新建文件夹				
		N		
マモン	库 系统文件夹	Administrator 系统文件夹		
💹 最近访问的位置	计算机 系统文件来			E
	频为HIRC微调 - 根据条件取值	FT32F0xx_SPI		
	▼↓↓ 文件夹	X14×		
	FT6100_iic	GPIO_IN_FLASH		
	文件夹	▲ 文件夹		
		>		
文件名(N):				
保存类型①:Proj	ect Files (*.uvproj; *.uvprojx)			
			(俘存(5)	取消
● 隐藏文件夹			(C) THM	

选择具体的芯片型号。

Device	
	Software Packs
Vendor:	FMD
Device:	FT32F072R8ATx
Toolset:	ARM
Search	
	Des <u>cription</u> :
	MD FT32F0 Series FT32F0 Series FT32F030 FT32F072C8 FT32F072C8 FT32F072C8 FT32F072C8 FT32F072C8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8 FT32F072R8BT Thicroelectronics FT32F072R8 FT32F072R8BT Thicroelectronics FT32F072R8 FT3FF

然后勾选需要用到的模块,注意必须勾选 CMS IS->CORE 选项,



A Ch 1070	Sel.	Variant	Version	Description	
				Cortex Microcontroller Software Interface Components	
CORE	v		5.5.0	CMSIS-CORE for Cortex-M, SC000, SC300, ARMv8-M, ARMv8.1-M	
DSP		Source	1.9.0-dev	CMSIS-DSP Library for Cortex-M, SC000, and SC300	
NN Lib			3.0.0	CMSIS-NN Neural Network Library	
🖪 🚸 RTOS (API)			1.0.0	CMSIS-RTOS API for Cortex-M, SC000, and SC300	
🗄 🚸 RTOS2 (API)			2.1.3	CMSIS-RTOS API for Cortex-M, SC000, and SC300	
💠 CMSIS Driver				Unified Device Drivers compliant to CMSIS-Driver Specifications	
💠 Compiler		ARM Compiler	1.6.0	Compiler Extensions for ARM Compiler 5 and ARM Compiler 6	
💠 Device		StdDriverOne	1.0.1	All peripheral APIs are selectable as individual components.	
Startup	V		1.0.1	System Startup for FremontMicro	
🖃 💠 FT32Driver					
ADC	~		1.0.1	Analog-to-digital converter (ADC) driver	
COMMON	~		1.0.1	Common driver	
COMP	v		1.0.1	Analog Comparator (COMP) driver	
CRC	~		1.0.1	CRC calculation unit (CRC) driver	
CRS	~		1.0.1	Clock recovery system (CRS) driver	
DAC	~		1.0.1	Digital-to-analog converter (DAC) driver	
DEBUG	v		1.0.1	Debug MCU (DEBUG) driver	
- ØMA	~		1.0.1	DMA controller (DMA) driver	
EXTI	~		1.0.1	External interrupts and events (EXTI) controller	
	~		1.0.1	Embedded Flash memory driver	
GPIO	v		1.0.1	General-purpose I/O (GPIO) driver	
	_				1
idation Output		Description			

点击 ok 后,就可以在主界面看到工程文件列表了。

😨 C:\Users\Administrator\Desktop\test\test.uvprojx - μV	/ision [Non-Commercial Use License]
<u>File Edit View Project Flash Debug Peripherals</u>	Iools SVCS Window Help
🗋 😂 🖬 🐉 🕹 🛍 🖄 🗠 😭	微微微 ; 淳 涯 版 20 usartsend 🕞 🗟 ※ 🍳 • 🔍 ⊙ 🔗 🍕 • 🔲 🔹
🖉 🎱 🎬 🗳 🕶 🤐 🕌 🙀 🛛 Target 1	🔊 🕹 🕾 🔶 🏠
Project 📮 📔	
🖃 쓚 Project: test	
🖮 🔊 Target 1	
- 🔁 Source Group 1	
💠 CMSIS	
🗄 🗇 Device	
 — FT32f0xx_adc.c (FT32Driver:ADC) 	
 — FT32f0xx_comp.c (FT32Driver:COMP) 	
— FT32f0xx_crc.c (FT32Driver:CRC)	
— FT32f0xx_crs.c (FT32Driver:CRS)	
— FT32f0xc_dac.c (FT32Driver:DAC)	
- FT32f0xc_debug.c (FT32Driver:DEBUG)	
- FT32f0xx_dma.c (FT32Driver:DMA)	
 FT32f0xx_exti.c (FT32Driver:EXTI) 	
FT32f0xx_flash.c (FT32Driver:FLASH)	
FT32f0xx_gpio.c (FT32Driver:GPIO)	
- FT32f0xx_i2c.c (FT32Driver:I2C)	
FT32f0xx_iwdg.c (FT32Driver:IWDG)	
FT32f0xx_misc.c (FT32Driver:MISC)	
FT32f0xx_opa.c (FT32Driver:OPA)	
FT32f0xx_pwr.c (FT32Driver:PWR)	
FT32f0xc_rcc.c (FT32Driver:RCC)	
FT32f0xc_rtc.c (FT32Driver:RTC)	
 — FT32f0xc_spi.c (FT32Driver:SPI) 	
FT32f0xx_syscfg.c (FT32Driver:SYSCFG)	
ft32f0xx_conf.h (FT32Driver:COMMON)	
startup_ft32f072xb.s (Startup)	
system_ft32f0xx.c (Startup)	

最后添加我们自己的工程文件进去,就可以编译调试了。



4.2 建立 IAR 工程

4.2.1 程序下载和 DEBUG 环境配置

(1)、使用 IAR 开发 FMD FT32FOXX 系列 MCU 前, 需配置下载和 DEBUG 环境:

(2)、将FT 文件夹添加到目录 C:\Program Files (x86)\IAR Systems\EmbeddedWorkbench 8.2\arm\config\flashloader (注意此为默认路径);

📕 🖓 📕 🔻 flashloa	ıder							-	×
文件 主页 共享	查看								~ ?
★ 自 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	 ▲ 剪切 ■ 复制路径 ■ 粘贴快捷方式 	移动到 复制到 🕴	制除 重命名	□ 新建项目・ □ 轻松访问・ 新建 文件夹	 ✓ ✓	■ 全部选择● 全部取消● 反向选择			
剪贴板		组织	_	新建	打开	选择			
$\leftarrow \rightarrow \cdot \uparrow \downarrow \sub$	IAR Systems >	Embedded Work	bench 8.2 >	arm → config → flash	loader	, U ,0	搜索"flashloader"		
1 11 141 141	名称	~		修改日期	类型	大小			^
☞ 快速访问	Actives	Semi		2021/5/26 14:52	文件夹				
泉田	Ambig	Micro		2021/5/26 14:52	文件夹				
- 下载	Analoo	Devices		2021/5/26 14:52	文件夹				
文档	Cypres	s		2021/5/26 14:53	文件夹				
■ 图片 ジ	* Epson			2021/5/26 14:52	文件夹				
.Download	FT	>		2021/7/12 15:07	文件夹				
📜 perl	Fujitsu			2021/5/26 14:52	文件夹				
STM32F0xx DFF	HDSC			2021/5/26 14:52	文件夹				
LISER	Holtek			2021/5/26 14:52	文件夹				
OSER	Infineo	'n		2021/5/26 14:52	文件夹				
🤜 此电脑	📕 Lapis			2021/5/26 14:53	文件夹				
🥩 网络	📕 Linear			2021/5/26 14:52	文件夹				

(3) 注意 FT 文件必须保存在 IAR 安装路径的 flashloader 文件夹下



4.2.2 安装 CMSIS-Pack

(1) 首先,点击图示的按钮。

IAR Embedded Workben	h IDE			_	
File Edit View Project To	ols Wi	ndow	Help		
i 🗅 🗅 🔛 🕋 🔚 🛛 🗶 🗈	ן ום נ	D C	- < Q, > ⇆ म्म < 📮 > 🛃 📓 🖷 🛛) • • • • • • • • • • • • • • • • • • •	
Workspace	•	џх			
	1	~			
Files	\$	•		``	
Des de				Chinese Circultured (CT	
кеаду			Lh 14, Col 55	Chinese Simplified (GB	2512) 大与 .::

(2) 接下来,要求新建工作空间 WorkSpace,并保存

IAR Embedded Workbench IDE		– – × .
File Edit View Project Tools Window	Help - < Q, > \$⇒ ⊨≣ < Q > ₹ .	
Workspace + 4 ×	[
	Save Workspace As	×
	\leftarrow \rightarrow \checkmark \uparrow \blacksquare « TEMp \rightarrow IARTEST4 \checkmark	ひ /♡ 搜索"IARTEST4"
	组织 ▼ 新建文件夹	8== - (?)
	A IARTEST1 A 名称 A	修改日期
	IARTEST2	与搜索条件匹配的顶
	OneDrive	
	📃 此电脑	
	KINGSTON (E:)	
	2013_64_CN v <	>
	文件名(N):	~
	保存类型(T): Workspace Files (*.eww)	~
	▲ 隐藏文件夹	保存(S) 取消
Ready	Ln 1	4, Col 55 Chinese Simplified (GB2312) 大写:



(3) 然后,正式进入包管理界面。首先将我们需要的 CMSIS 进行安装。

			,
IAR Embedded Workbench CMSIS Manager		-	- 🗆 ×
File Edit CMSIS Manager Window Help			
		Quick A	ccess 🕴 😰 🔍
	 🌺 Pac 🛛 📕 Dev 🖪 Bo 📑 Exa.	📮 Co 🤇	🥘 Err 🦳 🗖
) 🖻 🖗 🔶	🐸 🕍 🕐 🔻
	Pack	Action	Description
	Device Specific		
	 Generic 		Software Packs
	<		>
	1		
	<		>

(4)选择 CMSIS Manager->Import Existing Packs, 安装我们需要的FMD. FT32F0xx_DFP. 1. x. x. pack, 安装完成后不要关闭此界面。





IAR Embedded Workbench CMSIS Manager		– – X
File Edit CMSIS Manager Window Help		
		Quick Access
	- 8	🛞 Pac 📓 Dev 📓 Bo 📑 Exa 💷 Co 🕺 👰 Err 🖓 🗖
		CMSIS Pack Manager
		C:/USerS/I/ApDUATA/Local/lemp/ocrbbc5.tmp/src/Device_tunc5.r A Loading device: FT32F0 Series/FT32F030/FT32F030K6
		C:/Users/1/AppData/Local/Temp/ocr86E5.tmp/src/Device_funcs.r
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_tuncs.r C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		Loading device: FT32F0 Series/FT32F030/FT32F030F6
		FMD:169 C:/Users/1/AppData/Local/Temp/ocrB6E5_tmp/spc/Device_funcs_r
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		FMD:169
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r C:/Users/1/AppData/Local/Temp/ocrB6E5_tmp/src/Device_funcs_r
		Loading device: FT32F0 Series/FT32F072/FT32F072C8
		FMD:169
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_tuncs.r C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		C:/Users/1/AppData/Local/Temp/ocrB6E5.tmp/src/Device_funcs.r
		Pack has been converted.
		v
		< >



4.2.3 新建 CMSIS Pack 工程

(1) IAR 主界面, 然后新建一个工程。

1 TT - IAR Emb	edde	ed Workbench IDE		-		×
File Edit View	Pro	ject Tools Window Help				
0000	G	Add Files	C < Q > 毎 HE < Q > I ▷ ■ 0 = 0 → □ 品。			
Vorkspace		Add Group				
	œ	Import File List				
Files	1	Add Project Connection				
		East Configurations				
	×	Remove				
	U	Create New Project				
	0	Add Existing Project				
	0	Options Alt+F7				
		Version Control System	•			
	0	Make F7				
	B	Compile Ctrl+F7				
		Rebuild All				
	a	Clean				
	6	Batch build F8				
		C-STAT Static Analysis	•			
	0	Stop Build Ctrl+Break				
	0	Download and Debug Ctrl+D				
		Debug without Downloading				
	3	Attach to Running Target				
	0	Make & Restart Debugger Ctrl+R				
	C	Restart Debugger Ctrl+Shift+R				
		Download	•			
		SFR Setup				
		CMSIS-Manager			-	1

(2)选择 Empty CMSISPack project, 然后保存工程, 记住这个位置要在 WorkSpace 目录下新 建一个目录,不能和 WorkSpace 同目录。注意 CMSISPack 工程一定要建在 CMSISPack WorkSpace 下, 若从新建CMSISPack 工程开始,则在建工程的同时自动先添加 WorkSpace。



TT - IAR Embedded Workbench IDE File Edit View Project Tools Window TO TO TOOL TOOL TOOL TOOL TOOL TOOL TOO	Help	< > • • • • • • • • • • • • • • • • • •	- 0 X
F Tool chain: Arm Project templates: Emply project Image: Second sec	 ④ 另存为 ← → ◇ ↑	✓ ひ 2 提案"IARTEST4" ● 提案"IARTEST4" ● 第次日期 2021/8/3 16:41 2021/8/3 16:41	× ? 类型 文件3 文件4
Description: Create an empty project and configure CMSISF	● OneDrive ■ 此电脑 ■ KINGSTON (E:) > < 文件名(N): 保存类型(T): Project Files (*.ewp)		`
	▲ 隐藏文件夹	保存(S) 取消	

(3) 点击保存后会弹出(若没有马上弹出要稍等一会儿) Select Device。这里使用了 FT32F072C8ATx

IAR Embedded Wor	Select device			□ ×	- 🗆 X
File Edit CMSIS Man	^e Select Device				ick Access
	Device: FT32F072C8ATx Vendor: FMD Pack: FMD.FT32F0xx_DFP.1.0.0	CPU: Max. Clock: Memory:	ARM Cortex-M0 72 MHz 8 kB RAM, 64 kB ROM		※ ● Err □ ※ ● Err □ src/Device_funcs.r ∧ ≥ 2F030K6
	URL: http://www.keil.com/dd2/fmd/ft32f0 Search:	FPU: Endian:	none Little-endian	~	<pre>src/Device_funcs.r src/Device_funcs.r</pre>
	 FMD FT32F0 Series FT32F030 FT32F072 FT32F072C8 FT32F072C8 FT32F072C8ATx FT32F072R8 Geehy STMicroelectronics 	FT32 is a 3 consumptic powered b core,which application speed men Frequency Single-cyc NVIC with and 4 prior	2-bit high performance, low on universal microcontroller y the ARM Cortex-M0 RISC targeted at various MCU areas.FT32 family integrates nory and powerful enhanced y up to 72MHZ cle hardware multiplier 32 interrupt vectors, 2 watc ity levels	power ^ family shigh I I/O. hpoint	src/Device_Tuncs.r 2F030F6 src/Device_funcs.r src/Device_funcs.r 2F072R8 src/Device_funcs.r src/Device_funcs.r src/Device_funcs.r 2F072C8
Ĩr		SWD deb breakpoint 7 Timers:	ug interface, 4 hardware s bit advanced-control timer	v	<pre>src/Device_funcs.r src/Device_funcs.r src/Device_funcs.r</pre>
	0		ОК	Cancel	> >



(4) 然后开始配置 Option, 首先 General Options, Library 选择 Nomal 或者 Full, 为了使用

Options for node "Test1"					×
Category: General Options Static Analysis Runtime Checking C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator CADI CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link	Library O Target Library: Normal None Normal Full Custom Configuratio \$TOOLKIT_D	ptions 2 Output	MISRA-C:2004 Library Configuration Description: Use the normal configur runtime library. No local no file descriptor suppo printf and scanf, and no Pub_Config_Normal.h	MISRA-C:1998 Library Options 1 ration of the C/C++ le interface, C locale, ort, no multibytes in hex floats in strtod.	
PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	 Library low ○ None ● Semihosta ○ IAR break 	level interfa	ace implementation stdout/stderr Via semihosting Via SWO	CMSIS	
			OK	Cancel	

printf 函数, 需要勾选 Full 如下所示的提示框。

(5) 然后将我们需要的库文件和 Startup 添加进去。

								Quick Access	E I
Test1.rteconfig 🔯					- 8	🛞 Packs 📓 Devices 📓 Boards 🌁 Examples 🖳 Cons	ole 🕴 🥙 Error Log		-
	ilve				(?) 🔡		÷ ÷ ≤ 🖬 🖬	1 = 🔍 🚽 🖸	
						CDT Build Console [Test1]			
onware Components	Sel.	Variant	vendor	Version	Description	16:58:49 **** Updating project Test1			
E FISZEU/2CBATX		CtdD-iOra	FMD	100	ARM Cortex-MU 72 MF	Project updated successfully			
ET22Driver		Stabhverone	FIVID	1.0.0	All peripheral APIS are	16:58:49 **** Updating project Test1			
ADC					Analog to digital conve	Project updated successfully			
COMMON					Common driver				
COMP.					Analog Comparator (C)				
CBC					CRC calculation unit (CF				
CRS					Clock recovery system				
2 DAC	Π				Digital-to-analog conve				
2 DEBUG					Debug MCU (DEBUG) c				
DMA					DMA controller (DMA)				
EXTI					External interrupts and				
FLASH					Embedded Flash memc				
@ GPIO					General-purpose I/O (C				
♀ 12C					Inter-integrated circuit				
IWDG					Independent watchdog				
MISC					Independent NVIC (MIS				
OPA					Operational amplifier ((v				
					>				
alidation Output				Description					
					>		激活 Wind	dows	





(6)添加之后如下所示。

9 FMDT - IAR Embedded Workbench IDE - Arm 8.32.1		- 0	Х
File Edit View Project Simulator Tools Window Help			
1 1 🛛 🗬 🚔 🗶 🖺 🗂 I D C 🗌 🔷 🗸	Q > 5 HE		
Workspace	▼ ‡ X	main.c x FLASH_DRIVER.C	
Debug	~		
Files	• • •	/mumumumumumumumumumumumumumumumumumumu	
H ■ BFLASH_DRIVERC Het BFLASH_DRIVERL Het BFLASH_DRIVERL Het BFLASH_DRIVERL Het B main. Het B main.		<pre>vid Belayss(uint8_t t) uniped int dalay = 10000;</pre>	
E FMD StdDriverOne Device.FT32Driver.IWDG 1.0.0	• •	int main(void)	
test1			>
Build			• ‡
Messages		File Line)
		激活 Windows _{转到"说题} "以删杀 Windows。	
Build Debug Log			_
Ready		Errors 0, Warnings 0 大引 数字 改	5

(7) 然后添加我们自己的文件进去,同时将启动文件添加进工程。

a 🌢 test1 - Debug *		/**************************************	
□ □ Options □ □ □	 > CC_1.0.0 FIO_1.0.0 Add Files Add Files Add Files Add Group T_T.10.0 YFL10.0 YFL10.0	<pre>vii Delques(mist0, t t) musigned int delug = 10000; epile(t) for(:delug/0; delug)</pre>	,
set as Active			v 0
Messages		Fie	Line



(a)将头文件路径添加进工程

Options for node "boarddemo"

alegoly.	-	20			Fa	ctory Settings
Seneral Options	🗌 🗆 Multi-file Compila	ltion				
itatic Analysis	🗆 Discard Unu	ised Publics				
Runtime Checking						
C/C++ Compiler	MISRA-C:	1998	Encodings		Extra O	ptions
Assembler	Language 1	Language 2	Code	Optim	nizations	Output
Output Converter	Lict	Preprocessor	Diag	nortice	MICD	A C-2004
Custom Build	LISL	reprocessor	Diag	IOSUCS	IVIISI	A-C.2004
Build Actions						
Linker	□ Ignore stand	lard include directo	ories			
Debugger	Additional incl	luda diractorias: (a				
Simulator	Additional Incl	iude directories. (o	ne per inte)			
CADI	SCMSIS PAC	\$CMSIS_PACK_DEVICE_INCLUDES\$				
	\$CIVIDID_FAC	L DEVICE_INCLUD	1E23			
CMSIS DAP	\$CMSIS_PAC	K_INCLUDES\$	E2\$			
CMSIS DAP GDB Server	\$CMSIS_PAC	K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		
CMSIS DAP GDB Server I-jet/JTAGjet	\$CMSIS_PAC	K_DEVICE_INCLUD K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace	\$CMSIS_PAC	K_DEVICE_INCLOD K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		~
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris	\$CMSIS_PAC	K_DEVICE_INCLUD K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		~
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link	\$CMSIS_PAC	K_DEVICE_INCLUD K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		~
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro	\$CMSIS_PAC	K_DEVICE_INCLUD K_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK	Preinclude file	K_DEVICE_INCLUD K_INCLUDES\$ ROJECT\boardden	io\User\Inc	lude		~
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver	Preinclude file	K_DEVICE_INCLUDES\$ ROJECT\boardden	no\User\Inc	lude		· ·
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET	Preinclude file	K_DEVICE_INCLUDES\$ ROJECT\boardden :: ols: (one per line) K_DEVICE_DEFINE!	no\User\Inc	reprocesso	r output to	file
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CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file Defined symb \$CMSIS_PAC C_BOARD_P	K_DEVICE_INCLUDES\$ ROJECT\boardden e: ols: (one per line) K_DEVICE_DEFINE!	no\User\Inc	reprocesso	r output to comments	file
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file Preinclude file CMSIS_PAC	K_DEVICE_INCLUDES\$ ROJECT\boardden e: ols: (one per line) K_DEVICE_DEFINE:	no\User\Inc	reprocesso Preserve Generate	r output to comments e #line dire	file ctives
CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file CMSIS_PAC CMSIS_PAC Preinclude file Defined symb \$CMSIS_PAC _RTE_	K_DEVICE_INCLUDES\$ ROJECT\boardden e: ols: (one per line) K_DEVICE_DEFINE:	no\User\Inc	reprocesso Preserve Generate	r output to comments #line dire	file ctives

(b)编译之后 debug, 需要配置 options, 添加对应芯片的 ICF 文件

sphore for house board		•			
		$\leftarrow \rightarrow = \uparrow \square$ « 1.0.0 \cdot .iar \cdot config \cdot linker	v õ	.○ 搜索*linker*	
Category:	Factory Settings	组织 ▼ 新建文件夹		100	- 🔳 😡
General Options Statz: Analysis Runtime Checking C/C++ Compiler Assembler Output Converter Custom Build Build Actors Linker Debugger Simulator CABI Oblis DAP COB Server CABI Debugger Simulator Simulator Sim	#define Diagnostics Checksum Encodings Extra Options Config Library Input Optimizations Advanced Output List Linker configuration file Override default SICMSIS_PACK_PATH_FMD#FT32F0xx_DFP#1.0.0(\$\sian\configuration Image: Configuration Image: Configuration	★ 快速访问 名称 東面 F132F030C8.icf 下花 F132F030F8.icf 文档 F132F030K8.icf F132F030K8.icf F132F030K8.icf F132F030K8.icf F132F030K8.icf F132F030K8.icf F132F030K8.icf ● perf F132F072C8.icf ● bitle F132F072R8.icf ● bitle ● bitle ● bitle ● bitle ● bitle ● bitle	侍次日時 2021/8/510:26 2021/8/510:26 2021/8/510:26 2021/8/510:26 2021/8/510:26 2021/8/510:26	보다 오件 ICF 오件 ICF 오件 ICF 오件 ICF 오件 ICF 오件 ICF 오件 ICF 오件	大小 4 4 4 4 4 4 4 4
ST-LINK Third-Party Driver		文件名(N): FT32F072R8.icf		lcf Files (*.icf)	
TI MSP-FET TI XDS				打开(0)	取消

 \times



Options for node "boarddemo"

Category.		Facto	ry Settings
General Options Static Analysis Runtime Checking C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator CADI CMSIS DAP GDB Server I-jet/JTAGjet J-Link/J-Trace TI Stellaris Nu-Link PE micro	Setup Download Images Extra Op Driver	otions Multicore Plugins un to main	
ions for node "BoardProject"	×	****	
ions for node "BoardProject"	× ? ● 打开	****	
egory:	× ↑ ●打开 Factors ← → ~	************************************	v
ions for node "BoardProject" legory: neral Options tritte: Analysis ntime: Checking (C.4.4. Comeller	● 打开 Factor 年 → 一 组织 ▼	************************************	~
ions for node "BoardProject" legoy: neral Options tic Analysis ntime Checking (C++ Compiler ssembler uutput Converter ustom Build uild Actions nker estugger Smulator CADI CADI CADI CADI CADI CADI CADI CADI	Ioad Images Extra Options Multicore Plugins nload ownload bader(s) le default.board file DLKIT_DIR\$\config\flashloader\FT\FlashFT32F0xx L	**************************************	◆ 修改日期 2021/8/5

(c)添加之前拷贝到 IAR 根目录下 FT 文件夹内的 board file

(d) 至此,可以顺利编译、下载、调试。

4.2.4 新建库工程

(1) 建立 workspace

点击 File->New Workspace, 再点击 Save Workspace as...,如下图:

×



Save Workspace	As							×
← → • ↑ <mark> </mark>	« A	DC > ADC_BasicExa	mple > EWARM	~	Ō		M中搜索	
组织 ▼ 新建文件	*夹							?
 □ 此电脑 ③ 3D 对象 圖 视频 ■ 復片 ① 文档 ④ 文档 ● 下载 〕 音乐 □ 桌面 ▲ 本地磁盘 (C:) □ 本地磁盘 (D:) 	<	名称	2	修改日期	月 己的项。	类型		大小
文件名(N): 保存类型(T):	FT32 Work	F072xx cspace Files (*.eww)						~
▲ 隐藏文件夹						保存(<u>S</u>)	取	肖

填入 FT32F072xx 后,并保存。

(2)建立 Project

点击 Project->Create New Project,如下图:

Create New Pro	oject	×
<u>T</u> ool chain:	Arm ~	
Project templates	; project , C++ with exceptions and RTTI) , C++ with exceptions and RTTI) Ily built executable , C++ with exceptions and RTTI) CMSISPack project	
Description:		
Creates an empty	y project.	
	OK Car	ncel



选中图中 Empty Project 项,点击 OK,然后填入项目名 FT32F072xx,再保存即可。如下图:

I 32F0/2xx - IAR Embedde	d Workbench IDE - A	rm 9.30.1					
<u>File E</u> dit <u>V</u> iew <u>P</u> roject <u>S</u> imu	lator <u>T</u> ools <u>W</u> indow	<u>H</u> elp					
i 🗅 🗅 🔛 🕋 🔚 🕹 🛍	D C		• < Q >	\$ ►E <	🛛 🗲 🕻 🕻	🖪 🟮 🚥 🚺	▶ ●]: #]
Workspace	▼ ↓ ×						
Debug	~						
Files	0						
FT32F072xx - Debug	~						
FT32F072xx							
Debug Log							
Log							
Mon Aug 08, 2022 16:02:53	: IAR Embedded Wo	orkbench 9.30.1 (D:\Pr	ogram Files\IA	R Systems\E	mbedded Work	bench 9.1\arm	\bin\armPROC.i

(3) 为项目添加文件

(a) Add Group

鼠标放在项目名上, 点击右键->add->Add Group, 如下图



填入要建立的 Group name: CMSIS,依次建立 FT32F0xx_Drv,User 如下图:



FT32F072xx - IAR Embedded Workl	pench IDE - Arm 9.30.1
<u>File Edit View Project Simulator To</u>	ools <u>W</u> indow <u>H</u> elp
i 🗅 🗅 🔛 🕋 📇 🕹 🛍 🗂 💐	· C
Workspace 👻	Ф ×
Debug	*
Files	•
E • FT32F072xx - Debug *	v
	-
FT32F072xx	

(b) 分别添加具体文件

选中某一 Group name,如 CMSIS,鼠标右键,add->Files,如下图:



Browse							×
← → • ↑ <mark>-</mark> •	« CMS	IS > FT32F0xx > source	~	ō	Q	在 source 中搜索	
组织 ▼ 新建文件	夹						
🔜 此电脑	^	名称	修改日期	3		类型	大小
🧊 3D 对象		startup_FT32f030.s	2021/8/	6 9:42		S 文件	
📑 视频		startup_FT32f072.s	2022/5/	30 19:3	3	S 文件	
图片		system_ft32f0xx.c	2022/5/	18 18:2	26	C文件	
🔮 文档							
🖊 下载							
🎝 音乐							
三. 桌面							
🏪 本地磁盘 (C:)							
本地磁盘 (D:)							
🛫 fmd (\\192.168	в.						
🗯 d (\\192.168.8.	× <						:
3	文件名([N): "system_ft32f0xx.c" "startup_FT32f072.s"		~	Sou	rce Files (*.c; *.cp	o; *.cc; *.ł ~
					ŧ	打开(0)	取消

把"system_ft32f0xx.c" "startup_FT32f072.s"添加到 CMSIS 中,其它类似。全部文件添加后下图:

FT32F072xx - IAR Embedded Workbench IDE - Arm 9.30	1
<u>File Edit View Project Simulator Tools Window H</u> elp	
i 🗅 🖸 🔛 🖨 📙 📈 🛍 🗂 😓 🖒 👘	- < Q > \$ H < Q > Q M = Q
Workspace 🔻 🗭 🗙	
Debug ~	
Files	
□ ● FT32F072xx - Debug *	
I I I I I I I I I I I I I I I I I I I	
Here FT32F0xx_Drv	
└──	
bsp_ADC_BasicExample.c	
main.c	
P	

(4) 设置配置

选中工程名->options,如下图:



Runtime Checking	Library Configurat	ion	Library Op	tions 1	Library Options 2
Assembler	Target	32-bit		64-bit	Output
Output Converter Custom Build Build Actions	Processor variant				
Linker	Core	Cortex-N	13	~	
Debugger Simulator CADI	् <u>D</u> evice	None			E +
CMSIS DAP GDB Server	ං CMSIS- <u>P</u> ack	None			
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver	Execution mode © 32-bit ○ 64-bit				
TI MSP-FET TI XDS					

(a) 选择芯片型号

General Options->Target->Device->FMD->FMD FT32F072RBA, 如下图:



ategory: General Options							
tatic Analysis Luntime Checking							
C/C++ Compiler	Library Configura	tion I	ibrary Opt	ions 1	Library C)ptions 2	
Assembler	Target	32-bit		64-bit		Output	
Output Converter							
Custom Build	Processor variant	t					
Linker	Core	Cortex-M	0	~			
Debugger	Cole	contex m				_	
Simulator	Device	FMD FT32	F072RBA		E.		
CADI							
CMSIS DAP	○ CMSIS-Pack	None					
GDB Server							
I-jet							
	Execution mode						
Nu-Link	© 32-bit						
PE micro							
ST-LINK	0 64-bit						
Third-Party Driver							
TI MSP-FET							
TI XDS							

(b) 指定头文件目录

C/C++ Compiler->Preprocessor,如下图:



Lategory:	F	actory Settings		
General Options	Multi-file Compilation			
Static Analysis	Discard Unused Publics			
Runtime Checking				
C/C++ Compiler	Language 1 Language 2 Code Optimizations	Output		
Assembler	List Preprocessor Diagnostics Encodings Ex	tra Options		
Output Converter				
Custom Build	Discourse steam devel in all radio discretario a			
Build Actions	□ ignore standard include directories			
Linker	Additional include directories: (one per line)			
Debugger				
Simulator	<pre>\$PROJ_DIR\$\\\\\FT32F0xx_Library\CMSIS\FT32F0xx\Includ ^ \$PROJ_DIR\$\\\\\FT32F0xx_Library\FT32F0xx_Standard_Peri \$PROJ_DIR\$\\USER\Include</pre>			
CADI				
CMSIS DAP				
CDP Conver				
GDD Server	\$PROJ_DIR\$\\\\\FI32F0xx_Library\RTE			
I-jet	\$PROJ_DIR\$\\\\\FI32F0xx_Library\RTE	~		
I-jet J-Link/J-Trace	\$PROJ_DIR\$\\\\F132F0xx_Library\R1E	~		
I-jet J-Link/J-Trace TI Stellaris	\$PROJ_DIR\$\\\\F132F0xx_Library\R1E Preinclude file:	~		
I-jet J-Link/J-Trace TI Stellaris Nu-Link	\$PROJ_DIR\$\\\\F132F0xx_Library\R1E Preinclude file:	~ 		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro	\$PROJ_DIR\$\\\\F132F0xx_Library\R1E Preinclude file:	~ 		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK	\$PROJ_DIR\$\\\\F132F0xx_Library\R1E Preinclude file:	~ 		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver	Preinclude file: Defined symbols: (one per line) FT32F072xB	o file		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET	Preinclude file: Defined symbols: (one per line) FT32F072xB RTE	o file		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file: Defined symbols: (one per line) FT32F072xB	o file		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file: Defined symbols: (one per line) FT32F072xB RTE_ Qenerate #line dired	o file ts ectives		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file: Defined symbols: (one per line) FT32F072xB RTE_	o file ts ectives		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file: Defined symbols: (one per line) FT32F072xB RTE_	o file ts ectives		
I-jet J-Link/J-Trace TI Stellaris Nu-Link PE micro ST-LINK Third-Party Driver TI MSP-FET TI XDS	Preinclude file: Defined symbols: (one per line) FT32F072xB _RTE_ Openerate #line direction	o file ts ectives		

(c) 选择调试器

Debugger->Setup->Driver,如下图:

×



Category:	Factory Setting:
General Options Static Analysis	
Runtime Checking	Setup Download Imagos Multicore Extra Ontions Division
Assembler	Setup Download Images Multicore Extra Options Plugins
Output Converter	
Custom Build	<u>D</u> river ☑ <u>R</u> un to
Build Actions	Simulator
Linker	Sindator Inali
Debugger	Simulator
Simulator	
CADI	
CMSIS DAP	Liet
GDB Server	I-link/I-Trace
I-jet	TI Stellaris
J-Link/J-Trace	Nu-Link
TI Stellaris	PE micro
Nu-Link	ST-LINK
PE micro	Third-Party Driver
SI-LINK	TI MSP-FET
Third-Party Driver	TI XDS i\debugger\FMD\FT32F072RBA.ddf
11 ADS	
	OK Cancel

5. 工程实例

5.1 LED 点灯工程实例

在 LED 点灯工程实例中,对 GP10 口的 PB0、PB1、PB2、PB3 输出电平置高置低,使 LED 灯的二极管导通(灯亮)或截止(灯灭),在灯亮和灯灭分别延时一段时间,就会看到闪灯的效果。



5.2 电路图



如上图所示, LED 灯 D2 的正极接 3.3V, 负极端接控制端 LED1, 当 LED1 输出电压为高(3.3V) 时, 二极管 D2 不导通, 故灯灭, 当 LED1 输出电压为低(0V)时, 二极管 D2 导通, 故灯亮。

5.3 建立 LED 工程

打开 KE IL 软件,请按 2.1.3 的步骤,建立 LED 工程,这里就不赘述。如下图



点击箭头处,编译软件,如下图:



<u>File Edit View Project Flash Debug</u>	9 Peripherals <u>T</u> ools <u>S</u> VCS <u>W</u> indow <u>H</u> elp					
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🛛 🍪 🛗 🥔 - 🔜 🕅 Target 1	jet 1 🔍 🔊 📩 🖶 🔶 🐡 🏟					
Project 📮 🗵	🖸 main.c 🚺 ft32f0xx, it.c 🗋 system_ft32f0xx,c 🍄 ft32f072x8.h 🗋 startup_ft32f072xb.s 📄 bsp_led.c 📄 bsp_led.h					
E Project: LED	32 /*!< At this stage the microcontroller clock setting is already configured,					
🖨 💭 Target 1	33 this is done through SystemInit() function which is called from startup					
🖨 🤭 USER	34 file (startup_ft32f0xx.s) before to branch to application main.					
di 🗋 main c	35 To reconfigure the default setting of SystemInit() function, refer to					
	36 system_ft32f0xx.c file					
tts2f0xx_it.c	37 */					
bsp_led.c	38 -					
CMSIS	39 /* Initialize LED-related GPIO */					
🗄 💠 Device	40 Leaconig(LED);					
	41 LedConfig(LED2);					
	43 LedConfig(LED3),					
	44					
	45 while (1)					
	46 🗄 🚺					
	47 LedToggle(LED1);					
	48 DelayNms (300);					
	49					
	50 LedToggle(LED3);					
	51 DelayNms (300);					
	52					
	53					
	51 Lettoggle (LED4);					
	56 Delaymin (500);					
	57 LedToggle(LED2);					
	58 DelayNms (300);					

5.4 调试下载



点击上图此处, 弹出 option 菜单, 如下图:

🗑 Options for Target 'Target 1'	🖌 🖌
Device Target Output Listing User C/C++	Asm Linker Debug Vtilities
○ Use Simulator with restrictions Settings □ Limit Speed to Real-Time	⊡se: CMSIS-DAP Debugger Settings Setting
Load Application at Startup Run to main() Initialization File: Edit	Load Application at Startup Initialization File: Edit
Restore Debug Session Settings Image: Breakpoints Image: Toolbox Image: Watch Windows & Performance Analyzer Image: Memory Display Image: System Viewer	Restore Debug Session Settings Image: Breakpoints Image: Toolbox Image: Watch Windows Image: Memory Display Image: System Viewer

在上图中选择 Debug,再在 User 下拉框中选 CMSIS-DAP Debugger,并点击 Settings,弹出如下图目 标驱动设置项。



CMSIS-DAP Cortex-M Target Driver Setup				×	
Debug Trace Flash Download H	Pack				
CMSIS-DAP - JTAG/SW Adapter	SW Dev		Device Name	·	Move
Serial No: 2021-10-28	SWDIO	⊙ 0x0BB11477	ARM CoreSight SV	V-DP	Up Down
Max Clock: 10MHz	C Aut C Mar Add	tomatic Detection nual Configuration	ID CODE: Device Name: pdate	AP: 0x0	0
Debug Connect & Reset Options Download Options Connect: Normal Reset: Autodetect Image: Cache Options Image: Cache Options Image: Connect: Reset: Autodetect Image: Cache Options Image: Cache Options Image: Cache Options Image: Connect: Reset: Autodetect Image: Cache Options Image: Cache Options					
	0	ок	Cancel		Help

在上图中,红框里能出现的项,表示,设备与调试器已经连上,可以正常下载、调试程序。 点击下图中国红框处,调试器就可以调试了。

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<u>File Edit View Project Flash D</u> ebu	ug Peripherals	Iools SVCS Window Help
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roject 📮 🗵	Disassembly	
Project: LED	0x08000	590 F7FFF68 BL.W LedToggle (0x080003A4)
🖨 🔊 Target 1	48:	DelayNms(300);
i i i i i i i i i i i i i i i i i i i	49:	
i de Dinamin e	Cx08000	594 20FF MOVS r0,#0xFF
main.c	0x08000	596 302D ADDS F0,F0,F0,F0,F0
H TS2f0xx_it.c	0x08000	Jose F/FFFF5 BL.WSEMINOSCHO_TEFF4F9_LUNCCION (0x08000226)
B bsp_led.c	<	
CMSIS	D mair	ac http://www.it.c http://www.it.c. http
😐 🗇 Device		The state of the s
	37	~/
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	40	Indianize hep-related Grid -/
	41	LedConfig(LEDI),
	42	LedConfig(LED2).
	43	LedConfig (LEDd) :
	44	
	45	while (1)
	46 6	
	47	LedToggle(LED1);
	48	DelayNms(300);
	49	
	50	LedToggle(LED3);
	51	DelayNms (300);
	52	
	53	
	54	Delautre (DDP);
	55	Deraymus (300);
	57	LedToggle(LED2).
	58	DelavNms(300):

如上图,运行程序,设置断点调试。至此,一个简单的工程从建立,到下载,调试,运行,就介绍到此,其它更多具体的实例工程详见 DEMO program 文件包。



6. 联系信息

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