SinoMCU 应用笔记

AN2103

MS32F031A6

评估板入门指南

V1.0





MS32F031A6 评估板入门指南

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1 适用范围

1.1 适用产品

本文档适用于以下产品: MS32F031A6。

1.2 适用系统

本文档适用于上述产品的评估板(Evaluation Board 或 EV 板);同系列产品评估板操作,本文件有参考价值。

1.3 说明

文中提及的调试器操作仅供参考,以实际使用的调试器说明书为准。

- 2 **评估板入门**
 - 2.1 资源需求

2.1.1 调试器及 EV 板

(1) 调试器

理论上针对 Cortex-M 内核的通用调试器均可使用(除各厂家针对相应品牌的调试器)。 已测试的调试器如下,根据需求选择其中一种。

序号	调试器	图片	备注
1.	J-Link	J-Link P-Link m. seger. cm	外部 5V 或 3.3V 为 MCU 供电。
2.	DAP-Link	ARM mbed Arro DAPLink Maint	调试时,可使用调试器 3.3V 或外部 3.3V 为 MCU供电。
3.	Fire Debugger		调试时,调试器默认未输 出 3.3V,外部 3.3V 为 MCU供电。



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	(2) 评估板	
序	名称	图片
号		
1.	MS32F031A6 EV 板 LQFP48pin	
		••• ••••••••••••••••••••••••••••••••••

注: 若需要评估 LQFP 32pin 器件, 需要将 U1 拆下, 焊接 U3。

2.1.2 EV 板跳线说明

EV 板(V1.1)接口及跳线简要说明如下,具体可参考原理图及 PCB 设计文件:

	标识	说明		默认
	USB1	MicroUSB	供电	
	USB2	Type-C 6pin	供电	
	IP14	GND	可用于测试	
1	JP15	MCU VDD	可用于测试	
1	JP1	5V or 3.3V	供电电压选择	3.3V
	JP3	VDD to MCU power	MCU 供电选择	短接
1	JP11	MCU power to MCU DVDD	DVDD 供电	SB13 短接
	JP5	MCU power to MCU VDDA and analog	VDDA 供电	SB12 短接
	IP4	MCU power to MCU VBAT	VBAT 供电	SB11 短接
	JP6	Boot0 选择	0: Flash 驱动	0
	JP10	R8 分压与 PA1 连接	ADC 例程信号源	短接
	JP2	VDDA to R8	VDDA 向 R8 供电	短接
	JP8	LED1 与 PB6 连接	可断开,其它 I0 控制 LED 等	短接
	JP9	LED2 与 PB7 连接	可断开,其它 I0 控制 LED 等	短接
	P1	调试器接口	供电不要冲突	
	P2	UART 信号接口		
	CN1	GPIO 及电源		
	CN2	GPIO 及电源		



注:运行例程时,参考 readme 文件的说明,进行跳线设置。

- 2.1.3 软件
- (1) 开发环境:

目前例程支持 Keil® MDK。本文使用的版本为 5.36.0.0 Lite 版本(32K 代码限制)。下载 地址: https://www.keil.com/download/product/。

Attps://www.keil.com/download/product/ La ■ → ☆ ■ ③
Select a product from the list below to download the latest version.
MDK AArm Version 5.36 (September 2021) Development environment for Cortex and Arm devices.
C251 Version 5.60 (May 2018) Development tools for all 80251 devices. C166 Version 7.57 (May 2018) Development tools for C166, XC166, & XC2000 MCUs.
(2) Demo Code (例程):
通过 Sino MCU 官网获取,例程信息: "MS32F0x1_Periph_Lib_Example" (名称以正式 发布为准),外设例程路径 "\proj\MS32F031_EV 板\"。
DemoCode
MS32F0x1 C library; EV ADC、EXTI、GPIO、I2C、 OPAMP、PWR、RCC、TIMER、USART
2.2 开发环境验证
2.2.1 软件安装
双击下载后的 MDK 安装文件 MDK536.EXE ,参照一般软件方式安装,可以修改
安装路径(建议不要有中文和空格)。
安装完成后,打开在菜单栏中点选"Help"→"About uVision"查看软件信息。
E:\workspace\sino_demo\SINO_MS32F031_Demo_BlinkLED_V0.1\proj\demo.uvprojx - µVision [Non-Commercial Use License File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
□ 😂 🛃 🗿 👃 ங 🛍 🖉 (*) ← → 陀 偽 偽 優 (幸 幸 / 🎯 µVision Help
😵 🖾 📽 - 🗮 🙀 BlinkLED 🔤 🔊 📥 🖶 🔶 🕎 😚 Open Books Window Simulated Peripherals for 'ARMCMO'
Project 4 I main.c Contact Support
BlinkLED 2 Check for Update
tartur 4 Author : sino-FAE-1
About µVision
Wision V5.36.0.0 Copyright (C) 2021 ARM Ltd and ARM Germany GmbH. All rights reserved.
Toolchain:MDK-Lite Version: 5.36.0.0Toolchain Path:D:VPrograms'Keil_v5VARMVARMCC/BinC Compiler:Armcc.exeV5.06 update 7 (build 960)Assembler:Armasm.exeV5.06 update 7 (build 960)Linker/Locator:ArmLink.exeV5.06 update 7 (build 960)Library Manager:ArmAr.exeV5.06 update 7 (build 960)Hex Converter:FromElf.exeV5.06 update 7 (build 960)CPU DLL:SARMCM3.DLLV5.36.0.0Dialog DLL:TARMCM1.DLLV1.14.4.0Target DLL:CMSIS_AGDI.dllV1.33.0.0Dialog DLL:TARMCM1.DLLV1.14.4.0



2.2.2 硬件连接

在介绍调试器和评估板连接前,分别了解调试器接口信号及评估板调试相关的接口信号。 J-Link 调试器接口信号(使用 SWD 接口):



MS32F031A6 EV 板调试接口(P1)信号:



(1) 使用 J-Link 调试器,评估板

EV 板跳线可默认 (JP1 短接到 3.3V),也可以根据需求 JP1 短接到 5V; USB1 或者 USB2 供电; EV 板通过 P1-1 输入到 J-Link 的 1 脚 V_{Tref}。

J-Linl	、调试器	MS32F031A6	评估板
引脚	信号	信号	引脚
1	VTref 🔶	VDD_MCU	P1-1
4	GND	GND	P1-4
7	SWDIO	SWDIO	P1-2
9	SWCLK	SWCLK	P1-3

(2) 使用 DAP-Link 调试器,可使用 DAP-Link 的 3.3V 对评估板进行供电,建议此时断开 JP3(D4 灯不亮),连接关系如下:

DAF	P-Link 调试器	MS32F031A6	评估板
引脚	信号	信号	引脚
3	VCC (3.3V)	VDD_MCU	P1-1
5	SWDIO	SWDIO	P1-2
7	SWCLK	SWCLK	P1-3
9	GND	GND	P1-4



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此时,不支持 MCU 5V 供电(图中的 DAP-Link 无电平转换电路);若评估版 5V 供电, 需要使用电平转换电路连接调试器,并断开调试器 3 脚 VCC (3.3V) 与 EV 板的 P1-1 的连接。

Fire Debugger 参考 DAP-Link 进行信号连接(文中测试的 Fire Debugger 未输出 3.3V)。

2.2.3 验证

(1) 使用 J-Link 调试器

解压"Demo Code",并打开 Keil 工程(MS32F0x1_Periph_Lib_Example\proj\MS32F031_EV \GPIO\GPIO_Toggle,双击 GPIO_Toggle.uvprojx);在工程上点击"右键",选择"options for Target";



在新打开的窗口中选择"Debug",调试器选择"J-Link/J-TRACE Cortex",点击"Settings";



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vice larger our	put Listing Oser C/C++	Asm Linker Debus Offifities
Use Simulator	with restrictions Settings	Use: J-LINK / J-TRACE Cortex Settings
Limit Speed to Rea	al-Time	
Load Application a	t Startup 🔽 Run to main()	✓ Load Application at Startup ✓ Run to main()
nitialization File:		Initialization File:
	<u>Edit</u>	Edt
Restore Debug Sess	ion Settings	Restore Debug Session Settings
✓ Breakpoints	Toolbox	✓ Breakpoints ✓ Toolbox
Watch Window	vs & Performance Analyzer	✓ Watch Windows ✓ Tracepoints
Memory Display	y 🔽 System Viewer	I ✓ Memory Display I ✓ System Viewer
PUDLL: Para	ameter:	Driver DLL: Parameter:
SARMCM3.DLL	EMAP	SARMCM3.DLL
)ialog DLL: Para	ameter:	Dialog DLL: Parameter:
DARMCM1.DLL	MO	TARMCM1.DLL pCM0
Warn if outdated E	xecutable is loaded	Wam if outdated Executable is loaded
	Manage Component V	lewer Description Files

在打开的窗口中, "SW Device"下 ID CODE 有信息,连接关系 OK;若无信息,检查调试器和评估板的信号连接、JTAG Port 为 SW、降低最大速率 MAX、MCU 最小外围电路、查阅调试器说明书,确认1 脚信号。

L2	Debug Trace Flash Download	⊢SW Device	
n. Li	SN: 4294967295	IDCODE Device Name SWDI Ø 0x0BB11477 ARM CoreSight SW-DP	Move
E E	FW : J-Link ARM V8 compiled No Port: Max SW 1 MHz	Automatic Detection ID CODE: Manual Configuration Device Name:	
	Auto Clk	Add Delete Update IR len:	

操作步骤基本一致,在 Debug 页面选择 "CMSIS-DAP Debugger";

地址: 广州市黄埔区科学大道 18 号 A 栋 1001 室 电话: 020-82512136 传真: 020-82512136

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	Options for Target 'GPIO_Toggle' X	
	Device Target Output Listing User C/C++ Asm Linker Debug Utilities	
	C Use Simulator with restrictions Settings C Use: CMSIS.DAP Debugger	
	□ Limit Speed to Real-Time	
	Image: Load Application at Startup Image: Run to main() Image: Load Application at Startup Image: Run to main()	
	Initialization File:	
	De ter Debes Carine Callera	
	Restore Debug Session Settings	
	I Watch Windows & Performance Analyzer I I Watch Windows I Tracepoints	
	Image: Weight of the system Viewer Image: Weight of the system Viewer Image: Weight of the system Viewer Image: Weight of the system Viewer	
	CPUDL: Parameter Driver DL: Parameter	
	SARMCM3.DLL -REMAP	
	Dialog DLL: Parameter: Dialog DLL: Parameter:	
	DARMCM1.DLL pCM0 TARMCM1.DLL pCM0	
	Warn if outdated Executable is loaded Warn if outdated Executable is loaded	
	Manage Component Viewer Description Files	
	OK Cancel Defaults Help	
	CMSIS-DAP Cortex-M Target Driver Setup	
	Debug Trace Flash Download	
	CMSIS-DAP - JTAG/SW Adapter	
	IDCODE Device Name Move	
	SWDIO Ox0BB11477 ARM CoreSight SW-DP	
	Einware Version: 110	
	SWJ Port: SW C Manual Configuration Device Name:	
	Max Clock: 10MHz Add Delete Update AP: 0x00	
	Connect & Reset Options Cache Options Download Options	
	Connect: Normal Reset: Autodetect Connect: Normal Connect: No	
	Reset after Connect Log Debug Accesses Stop after Reset	
	OK Cancel Help	
2.2.4 Pack 安美	装及使用	
联系 Sino MCU	U 获取"Sinomcu.MS32F0xx DFP.1.0.0.pack"	
Sinomcu.MS32F0xx	(_DFP.1.0.0.pack 双击安装。	
	Pack Unzip: Sinomcu MS32F0xx_DFP 1.0.0	
	Malaana ta Kail Daala Ulasia	
	Welcome to Kell Pack Unzip	
	Helease TU/2021	
	i nis program installs the Software Plack:	
	Sinomou MS32F0xx_DFP 1.0.0 Sinomou MS32F0 Series Device Support Drivers and Evamples	
	Sinonica Mooznu penes pearce pupplit, privers and EXamples	
	Destination Folder	
	D:\Program Files\Keil v5\ARM\PACK\Sinomcu\MS32F0xx DFP\1.0.0	

新建工程时 Device 选择"MS32F031A6A0xx"。



Build 成功后,第一次下载或者调试时,报错"Error: Flash Download failed",如下图。



i. 参考 2.2.3 节, | "options for Target" → "Debug" → "Settings" "Flash Download" → "Add".

- Download Function		BAM for Algor	ithm	
Control C	 ✓ Program ✓ Verify ✓ Reset and Ru 	Start: 0x20	000000 Size: 0x00001000	
Programming Algorithm				_
Description	Device Size	Device Type	Address Range	-
		Start:	Size:	
	Add	Remove		
"MS32F031 32kB	Flash" .			
"MS32F031 32kB	Flash";			
"MS32F031 32kB	Flash";			×
"MS32F031 32kB	Flash";			×
"MS32F031 32kB d Flash Programming Alg	Flash"; jorithm Flash Size	Device Type	Origin	×
MS32F031 32kB	Flash"; porithm Flash Size 32k	Device Type On-chip Flash	Origin Device Family Package	×
MS32F031 32kB	Flash"; jorithm Flash Size 32k 16B	Device Type On-chip Flash On-chip Flash	Origin Device Family Package Device Family Package	×
MS32F031 32kB	Flash"; jorithm Flash Size 32k 16B 16M	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit	Origin Device Family Package Device Family Package MDK Core	×
MS32F031 32kB	Flash"; jorithm Flash Size 32k 16B 16M 64M	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 32-bit	Origin Device Family Package Device Family Package MDK Core MDK Core	×
MS32F031 32kB dd Flash Programming Alg Description MS32F031 32kB Rash MS32F0xx Rash Options MS32F0xx Rash Options M29x128 Rash K8P5615UQA Dual Rash LPC18xx/43xx MX25V8035F	Flash"; porithm Flash Size 32k 16B 16M 64M 8M	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 32-bit Ext. Flash SPI	Origin Device Family Package Device Family Package MDK Core MDK Core MDK Core	×
MS32F031 32kB Id Flash Programming Alg Description MS32F031 32kB Rash MS32F0xx Rash Options M29x128 Rash K8P5615UQA Dual Rash K8P5615UQA Dual Rash PC18xx/43xx MX25V8035F PC18xx/43xx S25FL032 SP	Flash"; jorithm Flash Size 32k 16B 16M 64M 8M 4M	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 16-bit Ext. Flash 32-bit Ext. Flash SPI Ext. Flash SPI	Origin Device Family Package Device Family Package MDK Core MDK Core MDK Core MDK Core	×
"MS32F031 32kB dd Flash Programming Alg Description MS32F031 32kB Rash MS32F0xx Rash Options M29x128 Rash K8P5615UQA Dual Rash PC18xx/43xx MX25V8035F PC18xx/43xx S25FL032 SP PC18xx/43xx S25FL034 SP	Flash"; jorithm Flash Size 32k 16B 16M 64M 8M 4M 8M	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 32-bit Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI	Origin Device Family Package Device Family Package MDK Core MDK Core MDK Core MDK Core MDK Core	×
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"MS32F031 32kB d Flash Programming Alg Description S32F031 32kB Flash IS32F0xx Flash Options M29x128 Flash S25615UQA Dual Flash PC18xx/43xx S25FL032 SP PC18xx/43xx S25FL032 SP PC18xx/43xx S25FL032 SPIFI PC5460x MT25QL128 SPIFI 129W640FB Flash IIMXRT105x EcoXiP Flash C28F640J3x Dual Flash 25FL128S_V2C 29GL064N Dual Flash 29JL032H_BOT Flash 29JL032H_BOT Flash	Flash"; porithm Flash Size 32k 16B 16M 64M 8M 4M 16M 16M 16M 16M 16M 16M 16M 16	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 32-bit Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash 16-bit Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash SPI Ext. Flash 16-bit Ext. Flash 16-bit Ext. Flash 16-bit	Origin Device Family Package Device Family Package MDK Core	
"MS32F031 32kB d Flash Programming Alg bescription S32F031 32kB Flash S32F0xx Flash Options M29x128 Flash 8P5615UQA Dual Flash PC18xx/43xx X25V8035F PC18xx/43xx X25FL032 SP PC18xx/43xx S25FL032 SP.FI PC45460x MT25QL128 SPIFI 29W640FB Flash IMXRT105x EcoXiP Flash C28F640J3x Dual Flash 25FL128S_V2C 29GL064N Dual Flash 25FL128S_V2C 29GL064N Dual Flash 29JL032H_BOT Flash 29JL032H_TOP Flash Programs\Keil_v5\Am\Packs\	Flash"; porithm Flash Size 32k 16B 16M 64M 8M 4M 16M 16M 16M 16M 16M 16M 16M 16	Device Type On-chip Flash On-chip Flash Ext. Flash 16-bit Ext. Flash 32-bit Ext. Flash SPI Ext. Flash 16-bit Ext. Flash 16-bit Ext. Flash 16-bit	Origin Device Family Package Device Family Package MDK Core MDK Core	

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ng Trace - Flash Downlos	1d			
IOWNIOAd Function C Erase Full Chip Frase Sectors C Do not Erase rogramming Algorithm	 ✓ Program ✓ Verify ✓ Reset and F 	RAM for A Start: 0	Ngorithm x20000000 Size: 0x0000100	0
Description	Device Size	Device Type	Address Range	
MS32F031 32kB Flash	32k	On-chip Flash	08000000H - 08007FFFH	

2.3 工程设置注意点

2.3.1 生成 bin 文件

在 "options for Target ……"中的 "User"选项卡下勾选 "After Build/Rebuild,Run#1"; 指令: fromelf --bin -o "\$L@L.bin" "#L"。

evice Target Output Listin	ng User C/C++ Asm Linker Debug	Vtilit	ies	
Command Items	User Command		Stop on Exi	S
Before Compile C/C++ File				
- 🗌 Run #1		1	Not Specified	
Run #2		13	Not Specified	
Before Build/Rebuild				
🗌 🗌 Run #1		13	Not Specified	
Run #2		12	Not Specified	Г
After Build/Rebuild				
	fromelfbin -o "\$L@L.bin" "#L"	12	Not Specified	
Run #2		13	Not Specified	

2.3.2 器件型号宏定义

在"options for Target ……"中的"C/C++"选项卡下"Preprocessor Symbols"定义器件型 号"MS32F031"。

2.3.3 代码编译优化

在 "options for Target ……"中的 "C/C++" 选项卡下 "Optimization": 根据需求设置(若 代码空间足够,可不开优化即-O0)。



reprocessor Symbols						
Define: MS32F031						
Undefine:						
Language / Code Generation						
Execute-only Code	Strict ANSIC Warnings: All W	amings 👻				
Optimization: Level 0 (-00) 💌	Enum Container always int	humb Mode				
Optimize for Time	I Plain Char is Signed □ No	o Auto Includes				
Split Load and Store Multiple	☐ Read-Only Position Independent ☐ CS	99 Mode				
One ELF Section per Function	☐ Read-Write Position Independent ☐ GI	NU extensions				
IncludeDevice\ms32f0x	x\source\ms32f0xx\include;\\\Device\CMSIS;\\\.\li	brary\ms32f				
Misc						
Controls						
Compiler -ccpu Cortex-M0 -D_E control -1///Device/ms32fl	c -cpu Cortex-M0 -D_EVAL -D_MICROLIB -g -O0 -apcs=interwork -split_sections -signed_chars -1///Device/ms32f0xx/source/ms32f0xx/include -1///Device/CMSIS -1					

2.3.4 头文件查找路径设置

.∖system .∖user

在"options for Target"中的"C/C++"选项卡下"Include Paths"后面的"...";

	Prenncessor Symbols	ser of the series of the serie	s 0000	
	Define: MS32F031			
	Language / Code Generation			
	Execute-only Code	Strict ANSI C	Warnings:	All Warnings 💌
	Optimization: Level 0 (-00)	Enum Container always int		Thumb Mode
	Optimize for Time	Plain Char is Signed		No Auto Includes
	Split Load and Store Multiple	Read-Only Position Independent		C99 Mode
	☑ One ELF Section per Function	Read-Write Position Independent		GNU extensions
	Jacobude			2. pro-
	Paths Misc Controls	source/ms32f0xx/include;///Device/	CMSIS;\	\\\ibrary\ms32f
	Althouge	source/ms32f0xx/include;///Device/ AL -DMICROLIB -g -O0apcs=interwork x/source/ms32f0xx/include -1/././Devi	CMSIS;\' split_sectio ice/CMSIS	N.VVibraryVms32f
	Paths Misc Controls Compiler control string 0K	source/ms32f0xx/include;///Device/ AL-D_MICROLIB-g-00apcs=interwork x/source/ms32f0xx/include -1/././Devi Cancel Defaul	cMSIS;\.: split_section ice/CMSIS	\Vibrary\ms32f nssigned_chars ∧ -I ∨ Kelp
、击"新致	Include Paths Misc Controls Compiler control string 主、删除、路径上移动	source\ms32f0xx\include:\\\Device\ AL-D_MICROLIB-g-00-apcs=interwork- x/source/ms32f0xx/include-1/././Devi Cancel Defaul 、路径下移"进行设置	cMSIS:\' split_section ice/CMSIS ts	\\\ibrary\ms32f [ns -signed_chars ∧ -I ∨ Kelp
京击"新到 Fo	Include Paths Misc Controls Compiler control string	source/ms32f0xx/include:///Device/ AL-D_MICROLIB-g-00-apcs=interwork- x/source/ms32f0xx/include-1/././Devi Cancel Defaul 、路径下移"进行设置	cMSIS;\. split_section ice/CMSIS ts ts	<pre>\\ibray\ms32f ns -signed_chars ^ Kelp ? ×</pre>



2.3.5 J-Link 提示 unkown

使用 DemoCode 时,打开工程,工程属性中更换调试器为 J-Link,若出现如下信息 "MS32F031 is unknown to this version.....";鼠标点击"O.K."后,选择"manufacturer: unspecified"、"Cortex-M0"(Core 输入 M0 后回车),确认即可。

The celecte	d devrice "MS32E03	146407WV je unk	mown to this	version of t	he T-link softwar	
THE SELECCE	d device mostros	INDADEWA IS UIK	mown co chrs	version or c	ne j Link Sortwar	c.
Please make Proper devi for flash d	sure that at lea ce selection is r ownload or unlimi	st the core J-Li equired to use t ted flash breakp	nk shall conn he J-Link int oints.	ect to, is s ernal flash	elected. loaders	
For some de	vices which requi	re a special han	dling, select	ion of the c	orrect device is	important. O.K.
SEGGER J-Link V	7.52c - Target devi	ce settings			tisilo multur e	
elected Device: C	ortex-wo		1		Little Endian •	Core #0
Manufacturer	Device	Core	NumCores	Flash Size		2
~	Filter	MO 🗸	Filter	Filter		
Upenecified	Cortex-M0	Cortex-M0	1	-		
unspectited			4	1 Children		
Unspecified	Cortex-M0+	Cortex-M0	1			
Unspecified AMS	Cortex-M0+ AS7000	Cortex-M0 Cortex-M0	1	- 32 KiB		

2.4 用户程序开发

用户可借助 DemoCode 中外设例程熟悉外设的使用,外设例程中的 readme 文件简要的介绍了例程的使用方法。

基于例程进行开发的基本步骤如下:

- a) 调用 Library 中相关外设文件提供的函数对外设进行操作,如 USART 根据库中 "ms32f0xx_usart.c、ms32f0xx_usart.h"文件提供的函数进行初始化等操作;
- b) 用户编写程序文件, 如 USART1_CFG.c 放在工程的 "user" 目录下; 并在 Keil 工程中 添加.c 文件;
- c) 在 "system_define.h" 中添加#include 用户的.h 文件, 如 "USART1_CFG.h";



 d) 若使用中断,需要在"ms32f0xx_it.c"中添加中断服务函数,函数名要和 "startup_ms32f031.s"中保持一致;编写对应的 callback 函数,并在中断服务函数中 调用 callback 函数,可以参考例程 UART_printf_loop_RX_IT。



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3 修订记录

版本	修订日期	修订内容
V1.0	2021-12-08	/