### 1 主题

基于 SS5 环境开箱体验 FG23-DK2600A 开发套件。

### 2 摘要

本次测试基于 Silicon Labs 公司的 FG23-DK2600A 开发套件,搭建相应的 IDE 环境,使用工程向导生成闪 灯测试代码并编译下载运行,体验和验证整个开发环境。

FG23-DK2600A 是一款紧凑、功能丰富的开发平台,内含一颗带段式液晶控制器、LEESE、脉冲计数器等 实用功能的基于 xG23 512kB 闪存的 SoC——EFR32FG23B010F512IM48,板上集成了调试和数据包追踪、虚拟 COM 端口、SEGGER J-Link 调试器、SMC 连接器(套件内附一根 868MHz 天线和一根 915MHz)、5 位 7 段数码液晶显示屏、Si7021 温湿度传感器、LC 传感器、LED 灯、按键、纽扣电池座等资源。

因为只有一个开发板,暂时无法进行无线通信的测试,本次体验将重点放在硬件和软件环境的搭建,为 后续的开发测试打基础。

### 3 试验过程

### 3.1 开箱

该套件外包装盒标签上打印的版本号是 A01,实际上开发板上激光打印的是 A02。总的印象是小巧玲珑, 功能强大,不足之处是无线测试本该至少两块板子,但该套件只配备了一块。





## 3.2 安装 Simplicity Studio v5

Simplicity Studio 是集成所有 Silicon Labs 技术、SoC 和模块的统一开发环境, 提供对特定目标设备的 Web 和 SDK 资源的访问; 软件和硬件配置工具; 具有行业标准代码编辑器、编译器和调试器的集成开发环境(IDE)。 借助 Simplicity Studio, 用户可获得全套高级增值工具, 用于网络分析和代码相关能耗分析。目前最新的版本 是 SS 5, 可适用 Windows、Mac、Linux 等操作系统。

我的 PC 是 Windows10 (64 位)环境, 安装过程如下:

1) 下载 iso 包, 直接进入或者解压 iso 包, 运行 setup 程序;



2) 同意协议;

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4)开始安装;

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5) 安装完成, 运行;



6) 同意协议, 江湖规矩;

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7) 接下来会出现 Silicon Labs 账户登录的界面,如果已经在该网站注册账户,可以直接用已有账户登录,如 果没有可以注册一个,方便一些资料和工具的下载,也便于在技术社区进行交流,因为 Simplicity Studio 是一 个整合的平台,资源比较多。当然,也可以先跳过这一步。建议还是登录一下或者注册一下。

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Log In - 65M	Terms and Conditions Create an Account Forgot password? (?) Why log in?	© 2022 Silicon Labs

8) 随后将开始一些组件、SDK、驱动等资源的下载和安装;

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	welcome to Simplicity Studio
	Everything you need to develop, research, and configure devices for IoT applications.
	Get Started
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因为没有连接任何设备,所以还看不到任何连接信息,如下图,



9) 下面要选择技术安装选项了,也就是对应不同的产品线,如果硬盘空间不紧张,都选上吧,如果要勤俭持 家,那就先选第一项,随后点击"Next"进入安装过程;

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10) 来到安装包选项,对该环境不熟悉的,建议还是"Auto",简单省事,

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	<b>dvanced</b> lect this option to customize installed development packages based on your requirements.		
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如果嫌"Auto"太 easy, 可以进入"Advanced"自由放飞自己,



还是江湖规矩,同意一下,就可以顺利进入安装;

Installation Manage	r	log In -
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	THIS MASTER SOFTWARE LICENSE AGREEMENT ("AGREEMENT") GO THE LICENSED MATERIALS. INSTALLING, COPYING OR OTHERWISE UN INDICATES YOUR ACCEPTANCE OF THE TERMS OF THIS AGREEMENT WHETHER YOU CLICK THE "ACCEPT" BUTTON. IF YOU DO NOT AGREE AND CONDITIONS OR IF YOU ARE NOT AUTHORIZED TO ACCEPT THE LICENSE ON BEHALF OF YOUR EMPLOYER, DECLINE THE LICENSE TER THE SOFTWARE OR DOCUMENTATION. THESE TERMS GOVERN YOUR THE LICENSED MATERIALS THAT YOU DOWNLOAD NOW OR IN THE FU SUCH ADDITIONAL SOFTWARE MADE AVAILABLE TO YOU THROUGH MATERIALS YOU HAVE SELECTED, AND ALL UPDATES AND VERSIONS Software Bound by this Agreement	VERNS YOUR USE OF JSING THE SOFTWARE, REGARDLESS OF WITH THESE TERMS TERMS OF THIS RMS AND DO NOT USE CONTINUED USE OF UTURE, INCLUDING THE LICENSED S OF SUCH
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Resources Learn some tips and tricks to help you ramp up using Simplicity Studio	
Simplicity Studio User's Guide The official Simplicity Studio 5 User's Guide	Open
Training and Tutorials Our collection of Simplicity Studio training and tutorial videos	Start
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Silicon Labs Community Where users come together to learn, get help, and grow their skills	Join
Cancel	

11) 安装完成, 需要重新启动一下开发环境;

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Silicon Labs Community Where users come together to learn, get help, and grow their skills	Join
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12) 如果后续补充安装其他 package, 过程是类似的。

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	Version 20180802	
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Simplicity Studio User's Guide	Open
Training and Tutorials Our collection of Simplicity Studio training and tutorial videos	Start
- <b>`ç`- Tips and Tricks</b> Useful tips and tricks to help you optimize your tools setup	Start
Silicon Labs Community Where users come together to learn, get help, and grow their skills	Join
Cancel	

## 3.3 安装 J-Link 驱动

如果我们的电脑上之前没有安装过 J-Link 的驱动,单单安装 Simplicity Studio 并没有将 FG23-DK2600A 板载的 J-Link 调试器驱动安装进去,至少我的电脑是这种情况。检查 J-Link 的驱动是否安装成功,可以打开操作系统的设备管理器,看看端口那一组是否有如下图所示的设备,即 JLink CDC 串口,如果没有,说明需要手动安装驱动。驱动可以从网络上下载通用的版本,我这次体验使用的是 JLink\_Windows\_V616i。

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> 👖 声音、视频和游戏控制器		
> 🕕 鼠标和其他指针设备		
> 🏺 通用串行总线控制器		~

安装成功以后,将 FG23-DK2600A 使用套件中提供的 USB 连接线连接到电脑,运行 Simplicity Studio v5 就可以看到相关设备信息,如下图。

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	Get Started Select a connected device or search for a product by name to see available documentation, example p
	Connected Devices All Products
	Connected Devices  J-Link (000440259329) (ID: 000440259329)
	Recent Projects

### 3.4 闪烁板载 LED

开箱体验最简单的就是闪灯了, 这是满世界都喜欢做的事, 我也不例外, 何况该板子上面已经预留有 LED。 在 Debug Adapters 栏中, 点击选中该设备, 即"EFR32FG23 Dev Kit Board (ID:.....)", 在右侧窗口将显示 相关的资源, 比如概览、样例工程和演示、文档等等。这里很想吐槽的是, 这个线路板的原理图在网站上的 产品页面中没有单独给出原理图链接, 只给了一个简单的操作说明手册, 它的原理图需要从下面这个设备信 息页面的 Board 栏 View Documents 下拉框中去选择获取,而且是藏在一个 zip 包中,比较意外。。。



EFR32FG23 Dev Kit Board (BRD2600A Rev A01)

 View Documents

 Zipped document archive for BRD2600A-A02

Telelelelelelele

接下来,将使用很方便的项目向导功能,创建一个闪灯的示例工程。切换到"example projects & demos" 页面,可以看到目前所提供的所有样例工程,可能以下面两种页面形式展示,



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Pf Debug Adapters         Image: Control of the state of the sta	J-Link (000440259329) overview example projects & dem	(ID: 000440259329) b documentation compatible tools		
	Run a pre-compiled demo or create a new pre-	ject based on a software example. In writen communication occurs in botin directions between the Sink and the Sensor(s) nodes. The P80 pushbutton can be used to enable or disable sleep, combined with changing the VCOM option 'Enable reception when sleeping'.	receives reports of sensor nodes joing to its network.	
	Example Projects Solution Examples What are Demo and Example Projects?  Provider Caser Filter Gecko SDK Suite v3 2.3 (53)	Flex (RAIL) - Empty Example The RAIL Empty project is a barebone RAIL app that can be a basis of a proprietary solutions. This comes prepared with a Single PHY radio configurator and a basic callback function for RAIL. With one click this barenells asmple app can be run on an OS, currently MicriumOS and FreeRTOS is supported.	Flex (RAIL) - Energy Mode This is a customizable Energy Mode sample application. To control the sample app please use the CLI interface over UART. Through CLI you can change the energy mode during different take of the sample app. Nike Idle, sending or receiving. To get started send the help' command over CLI. To enter in Idle mode with different energy levels send 'idle x' where x	CREATE
My Products     Core product terms     Aupril (1)     None Specified (2)     PRODUCTION (50)	Quality     Quer Filter     ALPHA (1)     None Specified (2)     PRODUCTION (50)	Flex (RAIL) - RAILtest The RAILtest application (RAILtest) provides a simple tool for testing the radia and the functionality of the RAIL library via CLI. For more advanced usage, developers must write software against the RAIL library and create a custom radio configuration.	Platform - Blink Bare-metal This example project shows how to blink an LED in a bare metal configuration.	
		Platform - Blink Kernel FreeRTOS This example project shows how to blink an LED using a FreeTTOS kernel task. The blink kask can be created using either dynamic or static memory allocation for the task stack and tcb.	Platform - Blink Kernel Micrium OS This crample project shows how to blink an LED using a Micrium OS kernel task.	CREATE
		Platform - Blink PWM This example project uses the PWM driver that uses a TIMER	Platform - DMADRV Bare-metal This example project shows how to use DMADRV driver to	

可以选择导出项目保存的磁盘路径, oto:www.sexe-simplicity.stution\*

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angmanibamehong@qq.com			3581	4 of 421M	© 2022 Silicon L

选择资源文件的链接方式,比如拷贝所有的源文件,或者直接链接到文件源,

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生成后展开该工程项目,就看到下面这个样子,

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它也有图形化的引脚配置工具,

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在项目选项里,还可以配置编译工具,这个比较有专业性,需要对相关 ARM 工具链有一定了解,实在不知道

### 只能搜索,

S v5_workspace - blink_baremetal/blink_baremetal.slcp - Simplicity Studio™			- ā ×
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我使用的是这个工具链,



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之前体验中,总是卡在这个画面无法进入 debug,其实就是因为 J-Link 驱动没有正确安装,



正确安装后看到的是下面这样子的,

然后看看闪灯的主程序吧, 很规范的代码风格,



编译不用说了,比较简单的事情,跟很多开发环境类似,编译成功后,可以直接将 hex 文件下载到器件上, 先在 hex 文件上右键打开菜单,选择 Flash to Device,

#### 🛿 v5\_workspace - blink\_baremetal\_halo/main.c - Simplicity Studio™

File Edit Source Refactor Navigate Search Project Run Window Help

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<ul> <li>Blink_baremetal_halo [GNU ARN</li> <li>Binaries</li> <li>blink_baremetal_halo.axf</li> <li>blink_baremetal_halo.bin</li> <li>blink_baremetal_halo.bex</li> <li>blink_baremetal_halo</li> <li>blink_baremetal_ha</li></ul>	/ v10.2.1 - Default] [EFR32FG23 [arm/le] [unknown/le] [unknown/le] New Open Show In Open With	B010F512IN Alt+Shift+W >	<pre>     /*********************************</pre>
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▷ <mark>In</mark> app.h	Delete Move Rename	Delete F2	<pre>#include "sl_component_catalog.h" #include "sl_system_init.h" #include "app.h" #if defined(SL_CATALOG_POWER_MANAGER_PRESE</pre>
▷ 10 main.c B blink_baremetal_halo.er	Import	>	<pre>#include "sl_power_manager.h" #endif #id defined(SL_CATALOG_KERNEL_RESENT)</pre>
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۰ ۲	Run As Debug As	> >	<pre>#endif // SL_CATALOG_KERNEL_PRESENT @ int main(void)</pre>
■ Debug Adapters × E Outli ▶ ♥ EFR32FG23 Dev Kit Board	Profile As Team Compare With Replace With	> > >	<pre>i     // Initialize Silicon Labs device, syste     // Note that if the kernel is present, p     // this call.     sl_system_init();</pre>
	Browse Files Here Open Command Line Here		<pre>// Initialize the application. For examp // task(s) if the kernel is present. app_init();</pre>
	Flash to Device		#if defined(SL CATALOG KERNEL PRESENT)
	Properties	Alt+Enter	<pre>// Start the kernel. Task(s) created in s1_system kernel_start(); #else // SL_CATALOG_KERNEL_PRESENT while (1) {</pre>

打开了烧录窗口, 直接 program 即可,

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然后,就可以看到运行结果了。

# 4 分析

总体来说,开箱体验还是比较容易上手的。问题容易出现在 J-Link 驱动的安装、Simplicity Studio 组件及 补丁包的自定义选择,需要对工具比较熟悉才建议进行高级选项,否则还是建议自动安装。另外,可能因为 网络的原因,有时候相关资源信息的载入和下载比较缓慢。个人感觉针对该套件或者说针对该器件相关资源 还是不够丰富,比如器件的各种外设的例程、无线通信的例程等。

卸载 Simplicity Studio v5 后如果在原先的路径下重新安装,需先将原有的整个文件夹卸载并删除后才能进行,否则安装程序无法进行,也不能覆盖,尤其是后期安装了比较多的 package 后。这个其实应该改进。

# 5 视频

见附件压缩包, "视频1"是出厂所带的演示程序的效果, "视频2"是本次体验建立的工程的运行效果。