S32K144 EVB 使用说明
S32K144 EVB USER GUIDE

SECURE CONNECTIONS
FOR A SMARTER WORLD

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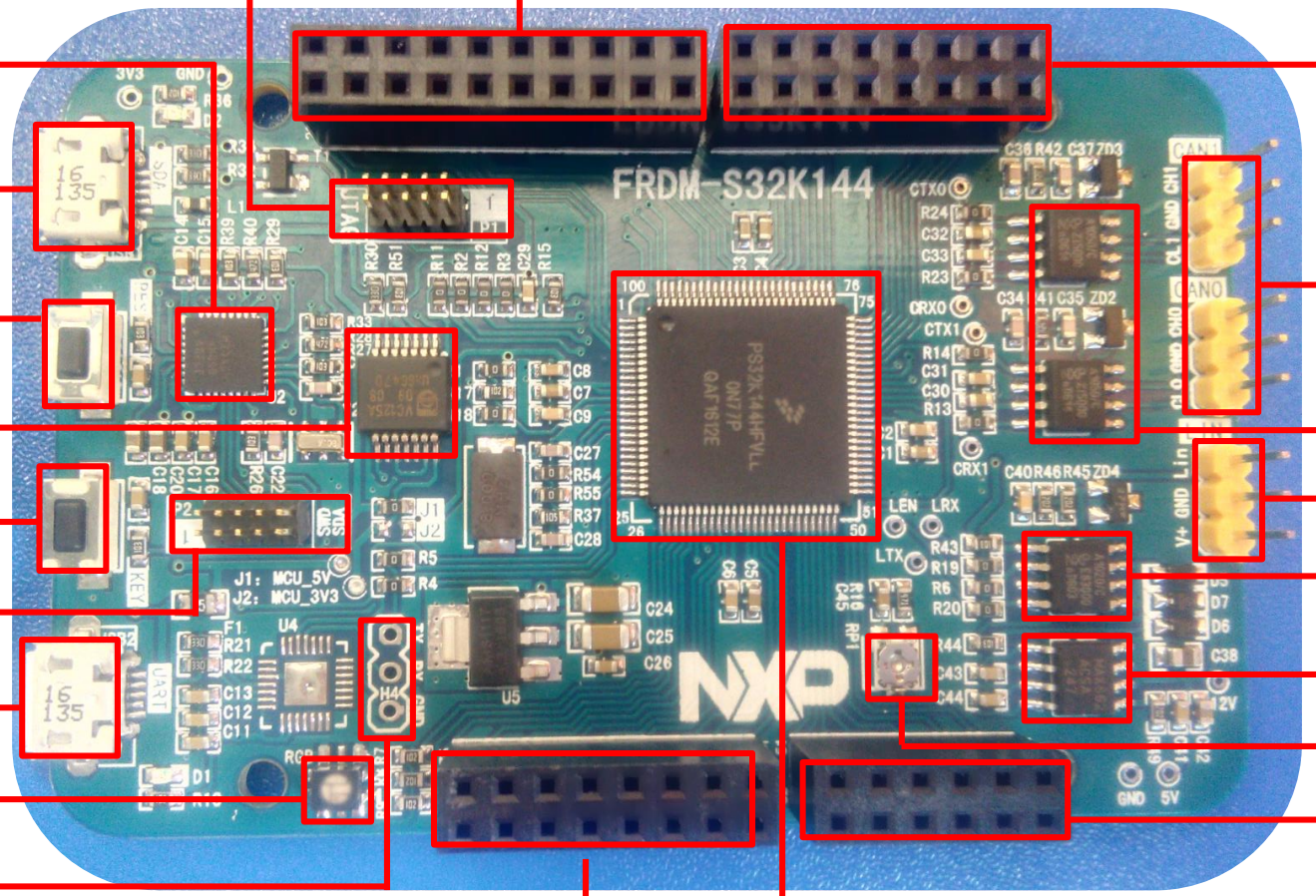
S32K144 EVB

介绍Introduction



JTAG接口

Open SDA 芯片

SDA Micro_USB接口

重启按键reset

VC125A

用户按键user button

SWD接口

Micro_USB接口

RGB LED灯

UART

J7

J8

CAN

TJA1050

LIN

TJA1020

MAX662

电位器

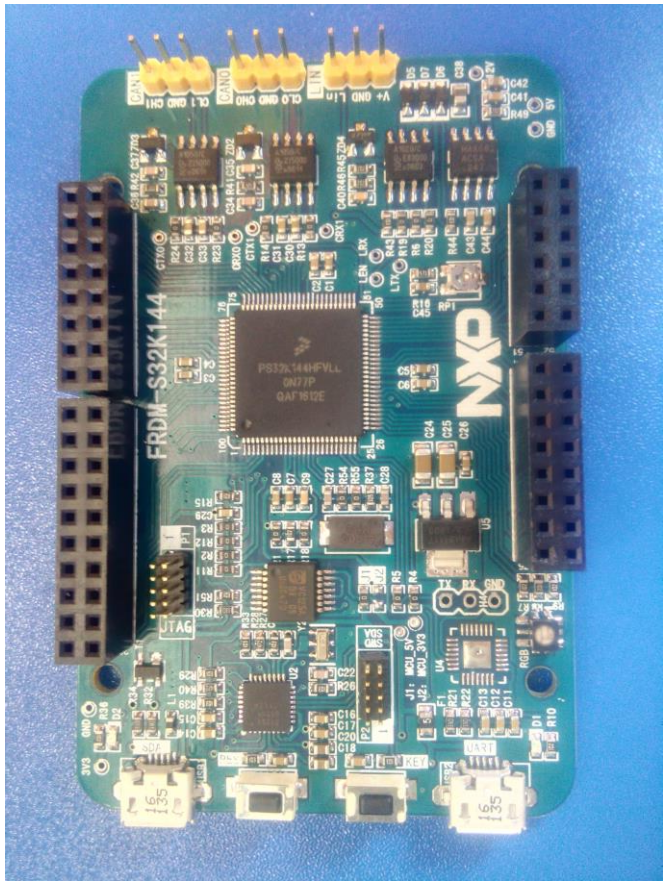
J10

MCU PS32K144

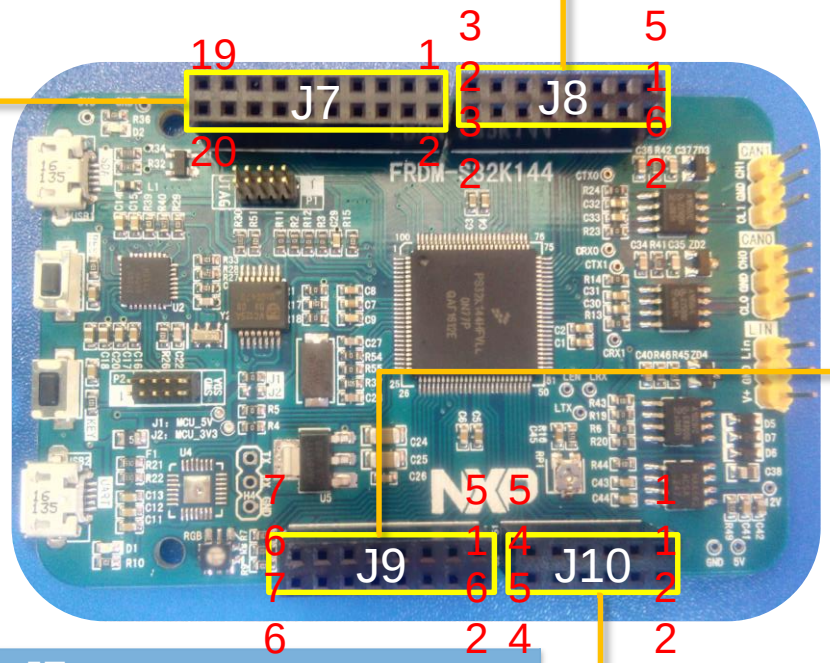
J9

特点Features

- 芯片 PS32K144HFT0VLLT 封装 LQFP100
- 规格与 Arduino™ 引脚布局兼容 *Compatible with Arduino*
- 可轻松访问 MCU I/O *Easy to access MCU I/O*
- 芯片上可以连接 UART 、SCI 和 SPI
- 可精确测量电压和模拟的电位计
- 三色 LED *RGB LED*
- USBDM 调试接口*debug port*
- 1路LIN接口 *1ch LIN*
- 2路CAN接口 *2ch CAN*
- 电源选项 *power option:*
  - Micro USB
  - 外部 5V电源 *external 5V power supply*



S32K144引脚映射Pinout



J7			
1	PTA17	2	PTE6
3	PTA16	4	PTE2
5	PTA15	6	PTA11
7	PTA14	8	PTA9
9	PTA13	10	PTA8
11	PTA12	12	PTE15
13	GND	14	PTE16
15	AREF	16	PTE11
17	PTE0	18	PTD1
19	PTE1	20	PTD0

J8			
21	PTA2/RX	22	PTD3
23	PTA3/TX	24	PTD2
25	PTB17/PWM	26	PTB11
27	PTB16/PWM	28	PTB10
29	PTB15/PWM	30	PTB9
31	PTB14/PWM	32	PT8
33	PTB13/PWM	34	PTA1
35	PTB12/PWM	36	PTA0

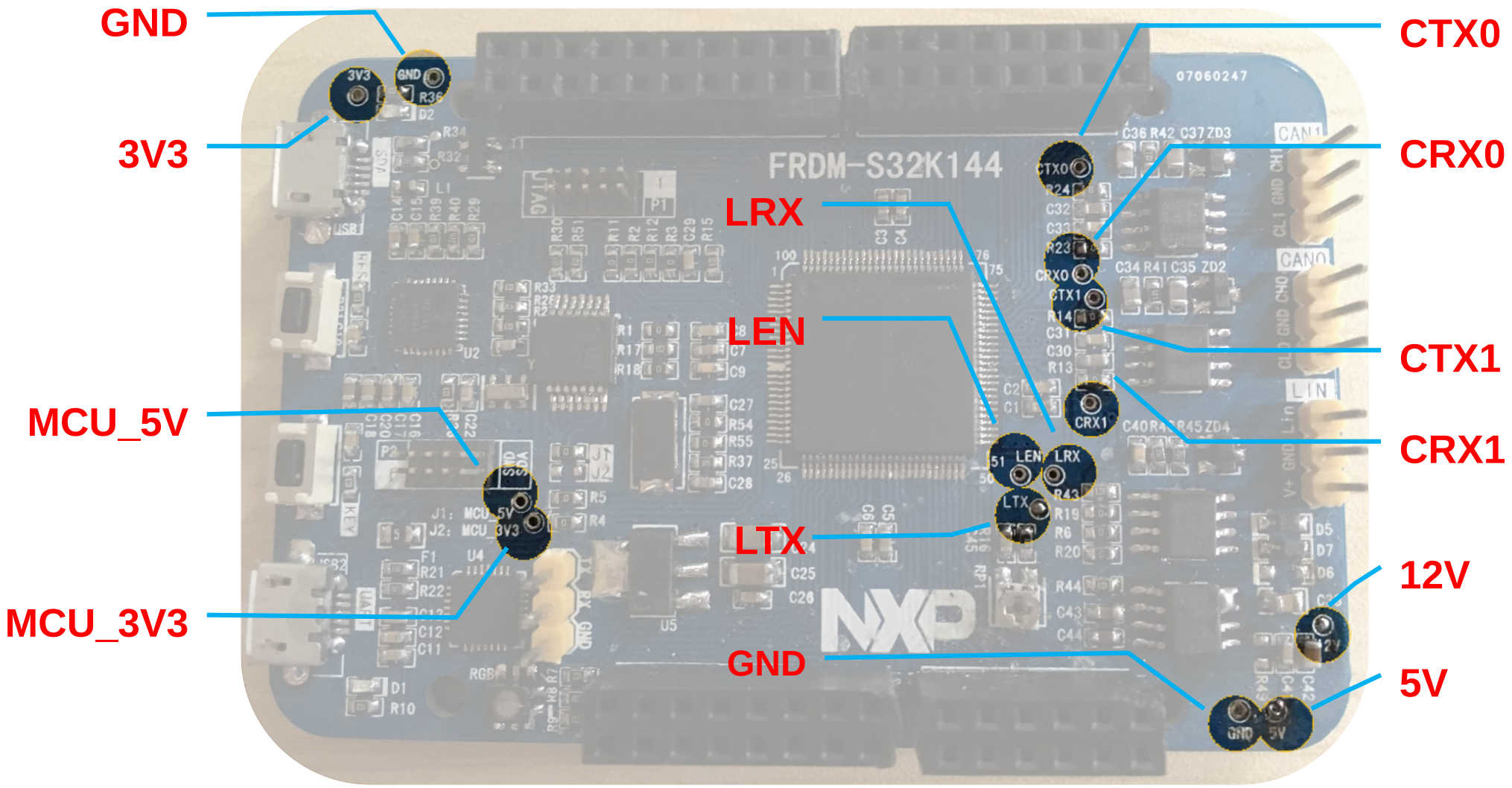
J9			
61	PTD9	62	VIN
63	PTC0	64	GND
65	PTC1	66	GND
67	PTD10	68	VCC
69	PTD12	70	3V3
71	PTD5	72	RST_TGTMCU
73	PTC2	74	VCC
75	PTC3	76	NC

J10			
41	PTC11	42	PTA7/AD
43	PTC10	44	PTA6/AD
45	PTC12	46	PB0/AD
47	PTC13	48	PTB1/AD
49	PTB2	50	PTC14/AD
51	PTB3	52	PTC15/AD

S32K144模块引脚映射Pinout

模块Module		引脚Pinout	备注Note
RGB三色LED灯	R红灯	PTB4	
	G绿灯	PTB5	
	B蓝灯	PTE8	
电位器potentiometer		PTD4(ADC1_SE6)	
KEY		PTD15	
USB_UART	USB_UART_TX	PTD14(LPUART3_TX)	
	USB_UART_RX	PTD13 (LPUART3_RX)	
OpenSDA_UART	OpenSDA_UART_TX	PTC7(LPUART1_TX)	
	OpenSDA_UART_RX	PTC6(LPUART1_RX)	
CAN	CAN0_TX	PTE5(CAN0_TX)	
	CAN0_RX	PTE4 (CAN0_RX)	
	CAN1_TX	PTC17(CAN2_TX)	
	CAN1_RX	PTC16 (CAN2_RX)	
LIN	SBC_LIN_TX	PTD7(LPUART2_TX)	
	SBC_LIN_RX	PTD6 (LPUART2_RX)	
	LIN_En	PTD11(LPUART2_CTS)	
JTAG	JTAG_TMS	PTA4 (JTAG_TMS)	
	JTAG_TCLK	PTC4(SWD_CLK)	
	JTAG_TDO	PTA10(JTAG_TDO)	
	JTAG_TDI	PTC5(JTAG_TDI)	
	RST_TGTMCU	PTA5(JTAG_TRST)	

S32K144测试点Test point

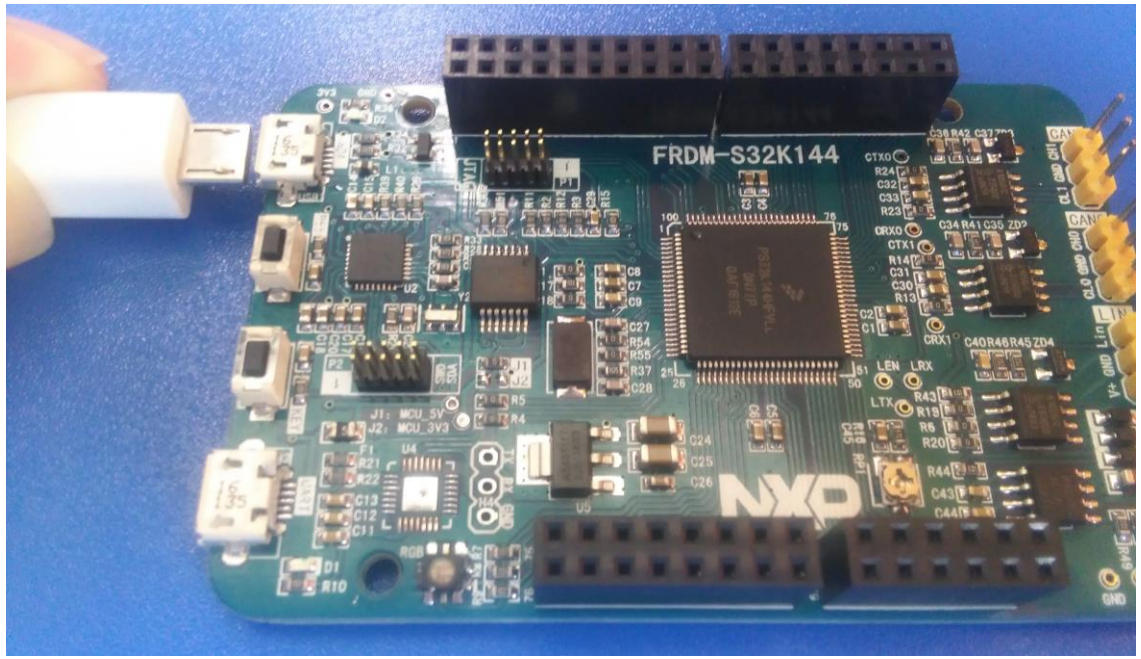


使用说明
INSTRUCTIONS

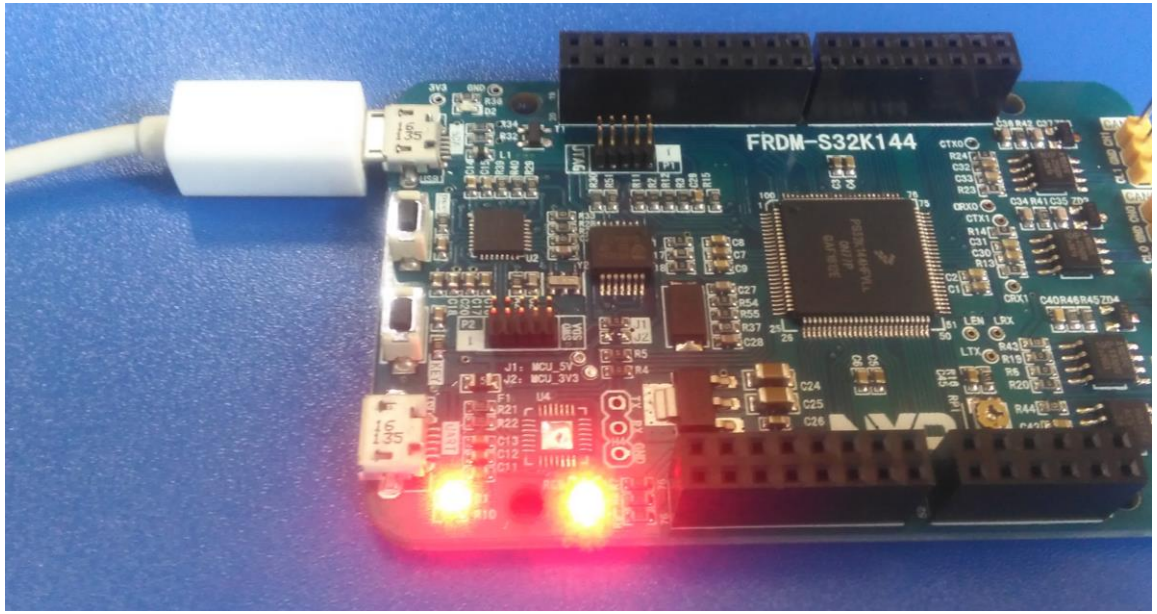
1.供电Power Supply

实验板有两种供电方式选择：
Two options for power supply

- 使用OPEN SDA或者UART的Micro USB接口供电
- 使用外部供电接口供电External 5V power supply
  - 当使用外部供电接口供电时，需要在板子右下角标注有“5V”和“GND”的测试点引出导线连接到电源上。Connect the “5V” and “GND” test point to power supply



MCU预下载了测试程序，供电正常
MCU工作时，RGB三色LED灯会闪烁。
RGB LED will twinkle if MCU work normal



2.安装驱动Install driver

- 使用USB线连接电脑，电脑会识别设备并安装Open SDA驱动。
  OpenSDA will be installed automated when connect to computer with USB cable

- 若电脑之前安装过Open SDA驱动，则可以直接识别设备。If OpenSDA driver already installed, it will identify the device directly

- 若驱动安装失败，请下载最新版Open SDA驱动安装。
  If it is fail to install the driver, please download the latest Open SDA drivers

OpenSDA介绍
OpenSDA introduction

OpenSDA是一种内置在多款恩智浦评估板中的串行调试器。它是计算机(或其他USB主机)和嵌入式目标处理器之间的桥梁，只需通过一根简单的USB线缆，便可用它进行调试、闪存编程和串行通信。

OpenSDA硬件包含一个采用Kinetis® K20微控制器(MCU)的电路和一个集成式USB控制器。在软件方面，它集成了大容量存储设备引导加载程序，可以快速、轻松地加载OpenSDA应用，例如闪存编程器、运行控制调试接口、串行至USB转换器等。

OpenSDA is the built-in serial debug in the EVBs. It is the bridge of computer and embedded processor which support to debug, flash program and serial communicate by a simple USB cable.

OpenSDA hardware include a circuit based on Kinetis® K20 and integrated USB controller. About the software, it integrates bootloader for big volume memories to easier and faster the OpenSDA application loading, such as Flash programmer, debug port and serial to USB converter.

OpenSDA有两个版本：原始版本为OpenSDAv1，新版本是OpenSDAv2。OpenSDAv2使用与原始版本OpenSDAv1解决方案完全相同的硬件电路，并仍可通过一根USB线缆提供调试器、拖放式闪存编程器及虚拟串行端口。

OpenSDA has two versions: the original version is OpenSDAv1 and new version is OpenSDAv2. the two version use the same hardware circuit and support debug, flash programmer and virtual serial port.

设置OpenSDA firmware

- 如果要用USB线直接进行调试，需要更换OpenSDA firmware. The original OpenSDA firmware in this S32K EVB is from MBED which is not supported by S32DS, thus we need to change to PEmicro OpenSDA firmware.
  - 拔下USB线Unplug the USB cable (if attached).
  - 按住Reset按钮不放Press and hold the Reset button.
  - 将板卡和主机连上USB线Plug in a USB cable from a USB Host to the OpenSDA USB port.
  - 释放RESET/Bootloader按钮Release the RESET/Bootloader button.
  - 在主机文件系统上会看到一个叫BOOTLOADER 的可移除驱动A removable driver will be visible in the host file system with a volume label of BOOTLOADER.
  - 将附件中的“DEBUG-FRDM-K64F_Pemicro_v108a_for_OpenSDA_v2.0.bin” 拖拽或拷贝到驱动中Drag/drop or copy/paste attached firmware “DEBUG-FRDM-K64F_Pemicro_v108a_for_OpenSDA_v2.0.bin” into the removable drive.
  - 拔下USB线然后重新插入Unplug the USB cable and plug it in again.
  - 应用可以正常工作了The OpenSDA application should now be running.

S32DS编译环境
S32 Design Studio

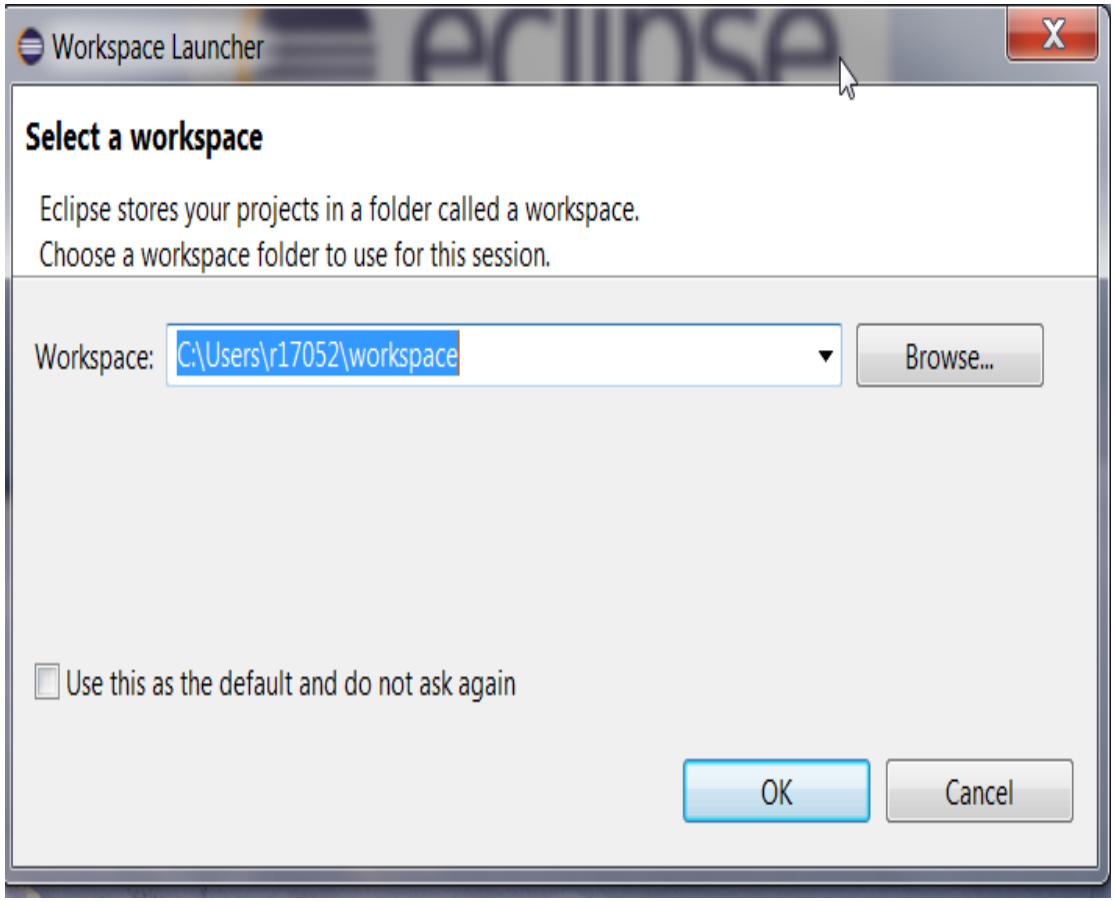
S32DS（S32 Design Studio IDE）是一套附送的汽车和超可靠MCU集成开发环境，为您的设计提供编辑、编译和调试功能。S32 Design Studio基于包括Eclipse IDE、GNU编译器套装(GCC)和GNU调试器(GDB)等免费开源软件，为设计人员提供了一种不限制代码大小的简便开发工具。S32 Design Studio IDE中集成了器件初始化工具和其他恩智浦软件开发工具，提供全面支持环境，可节省时间并帮助快速启动应用开发。 The S32 Design Studio IDE is a complimentary integrated development environment for Automotive and Ultra-Reliable MCUs that enables editing, compiling and debugging of your designs. Based on free, open-source software including Eclipse IDE, GNU Compiler Collection (GCC) and GNU Debugger (GDB), the S32 Design Studio IDE offers designers a straightforward development tool with no code-size limitations. Device Initialization Tool and other NXP® software development tools are integrated in the S32 Design Studio IDE to provide a comprehensive enablement environment that saves time and helps start application development quickly.

下载地址Download：http://www.nxp.com/products/microcontrollers-and-processors/arm-processors/s32-arm-processors-microcontrollers/s32-design-studio-ide:S32DS

新建S32DS工程
Create a New Project in S32DS

1.新建工作区Select a Workspace

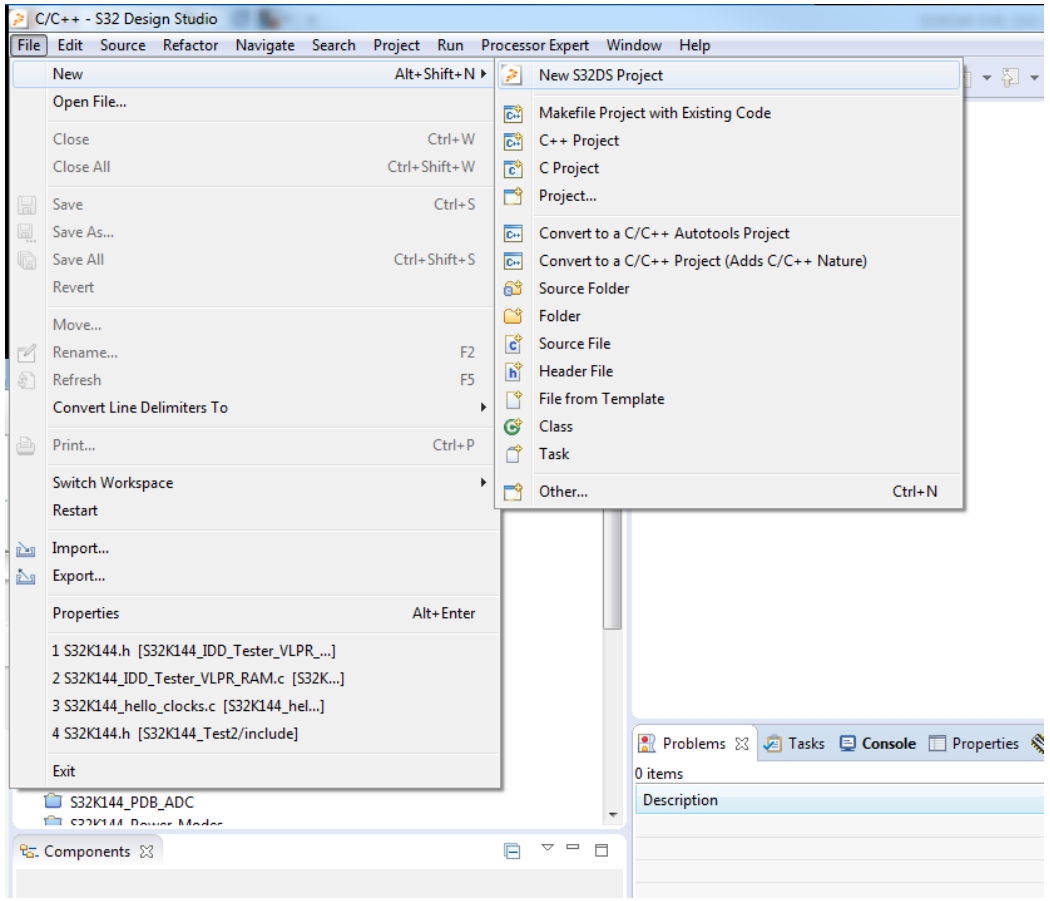
- 运行程序：单击“S32 Design Studio for ARM v1.0”图标运行程序Start program: Click on “S32 Design Studio for ARM v1.0” icon
- 首次使用软件需要新建一个工作区： Select workspace
  - 使用默认值或者点击“Browse”自定义工作区名称及其路径Choose default or click “Browse” to specify new one
  - 建议：取消勾选“Use this as the default and do not ask again” Uncheck the box “Use this as the default and do not ask again”
  - 点击“OK”完成。Click OK



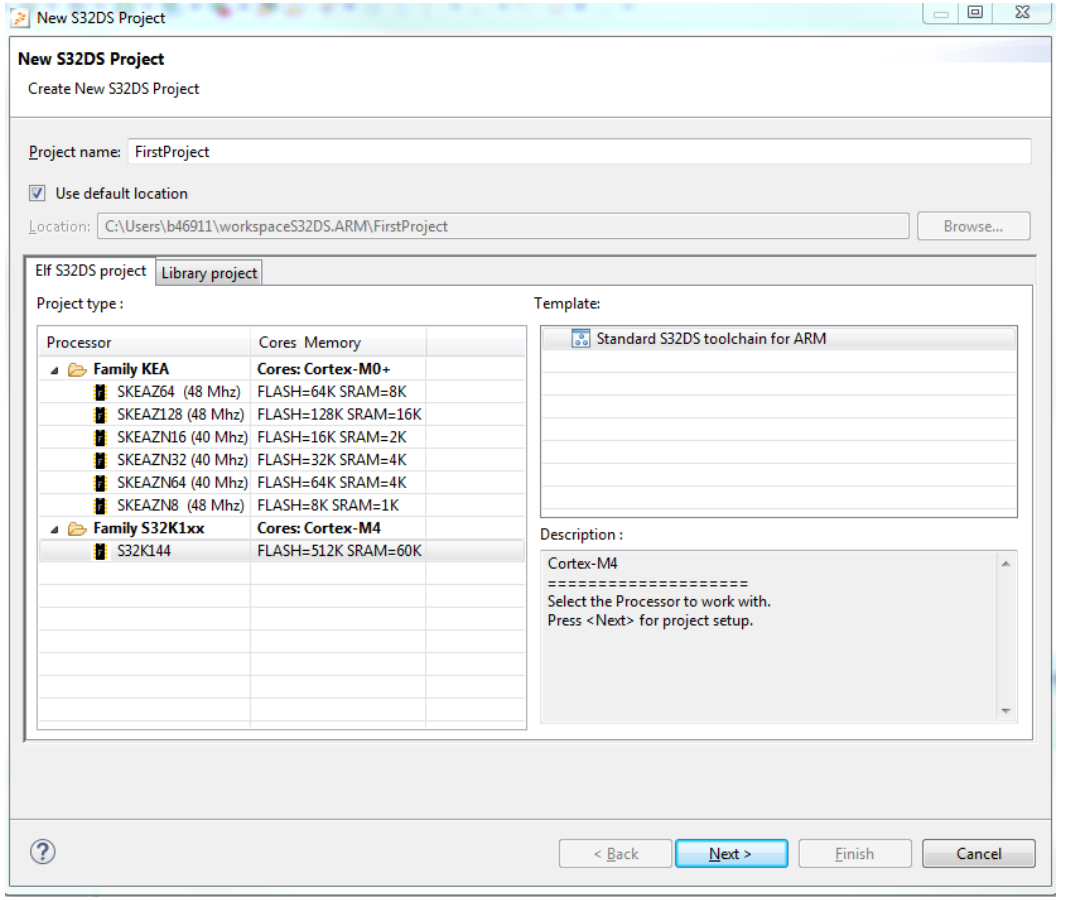
2.新建工程Create New Project

工作区创建完成后，需要新建一个工程：create new project

- File>New>New S32DS Project

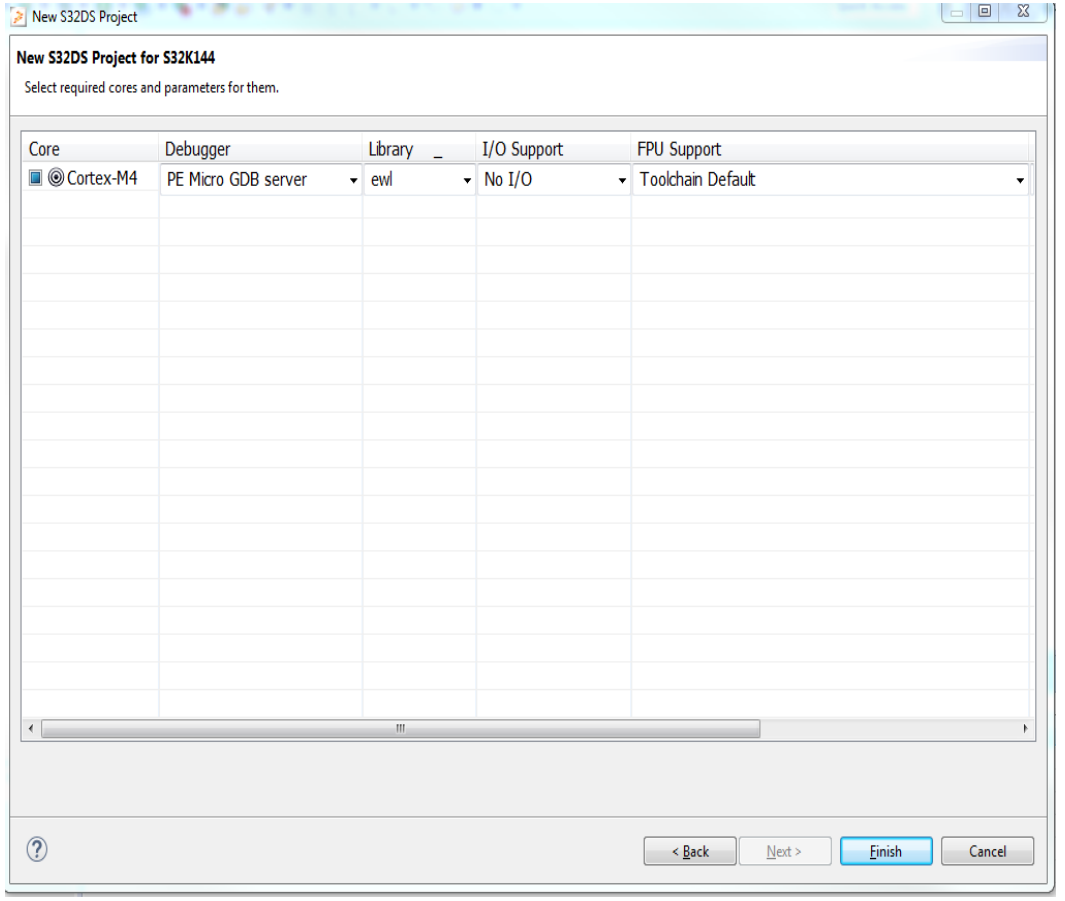


- 填写工程名Fill Project Name
- 选择工程类型Select Project Type
  从可执行文件或库文件夹内选择Select from inside executable or library folder
- 点击“Next”，进行下一步



- 选择调试器和库Select Debugger Support and Library Support

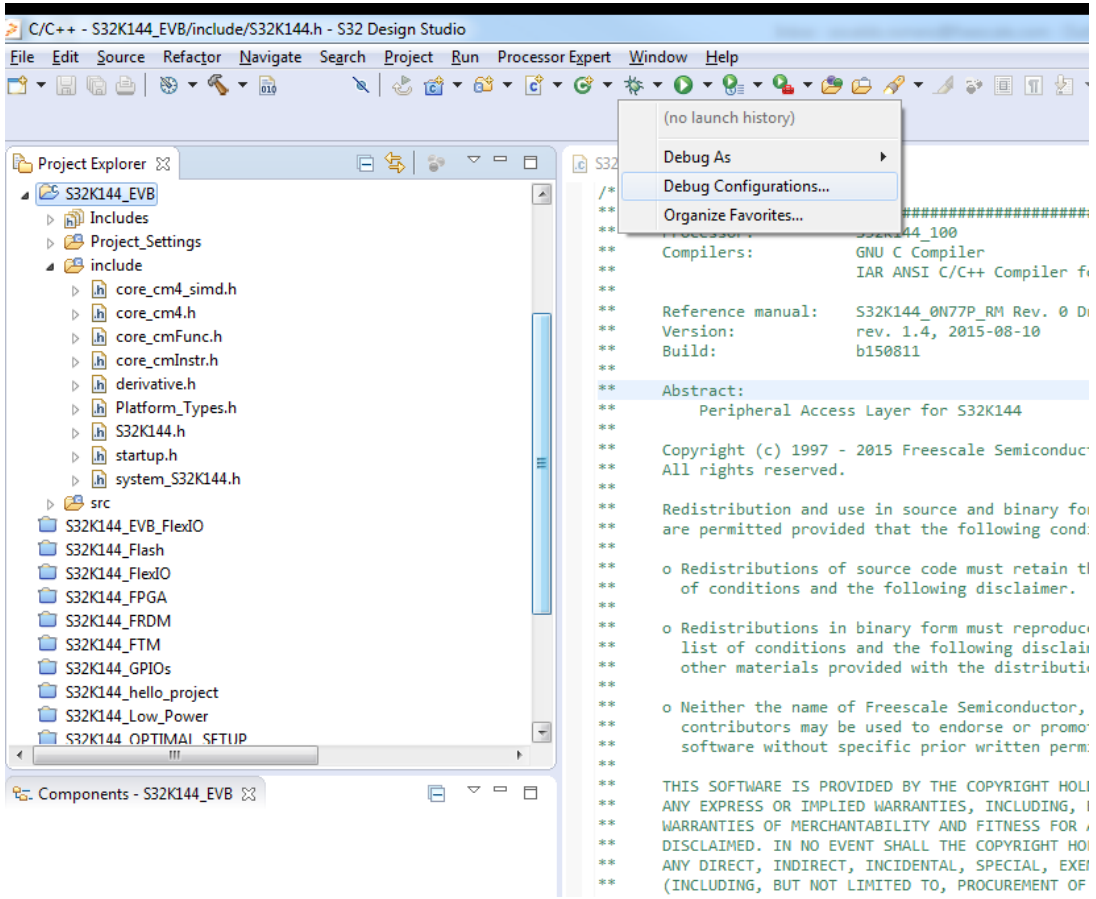
- 单击“Finish”，完成工程创建 Click Finish



3.OPEN SDA 配置OpenSDA Configuration

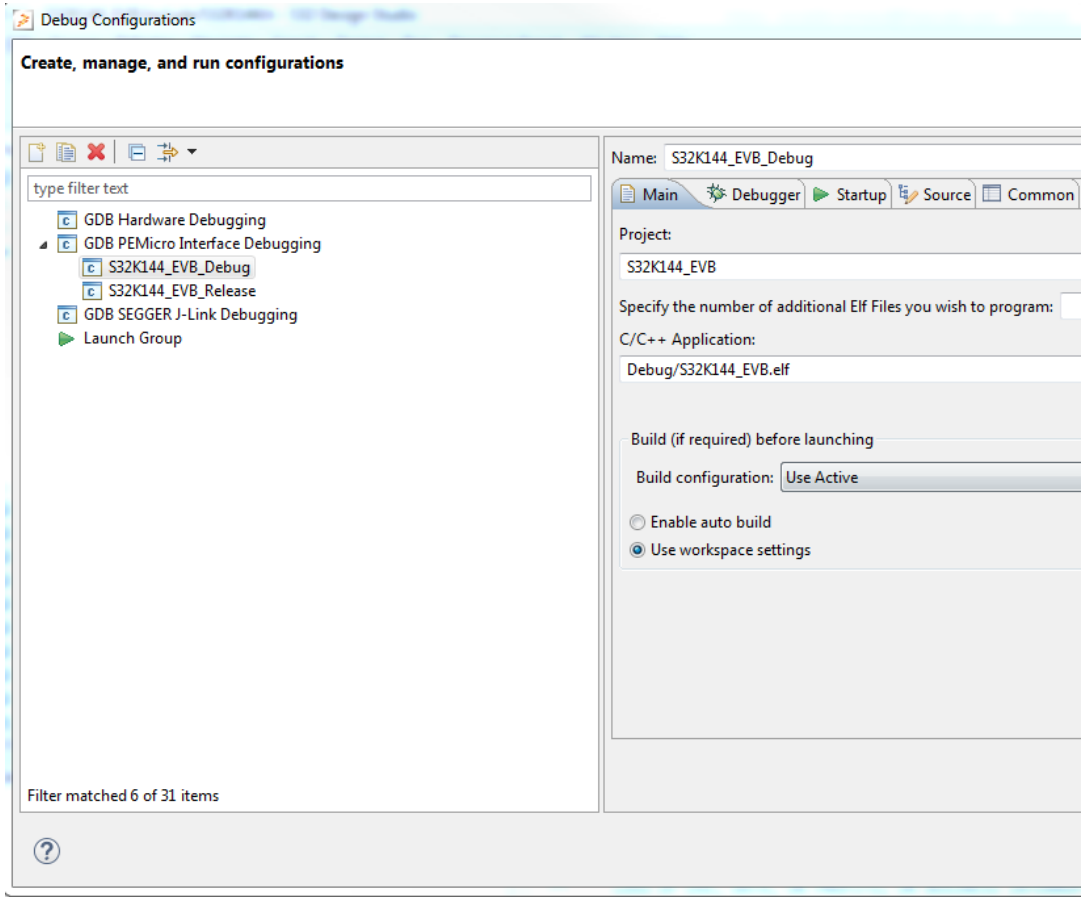
要使用Open SDA调试项目，必须在调试配置里选择Open SDA： To Debug your project with OpenSDA, it is necessary to select the OpenSDA in the Debug Configuration

- 选择项目，单击“Debug Configuration” Select your project, and click on debug configuration

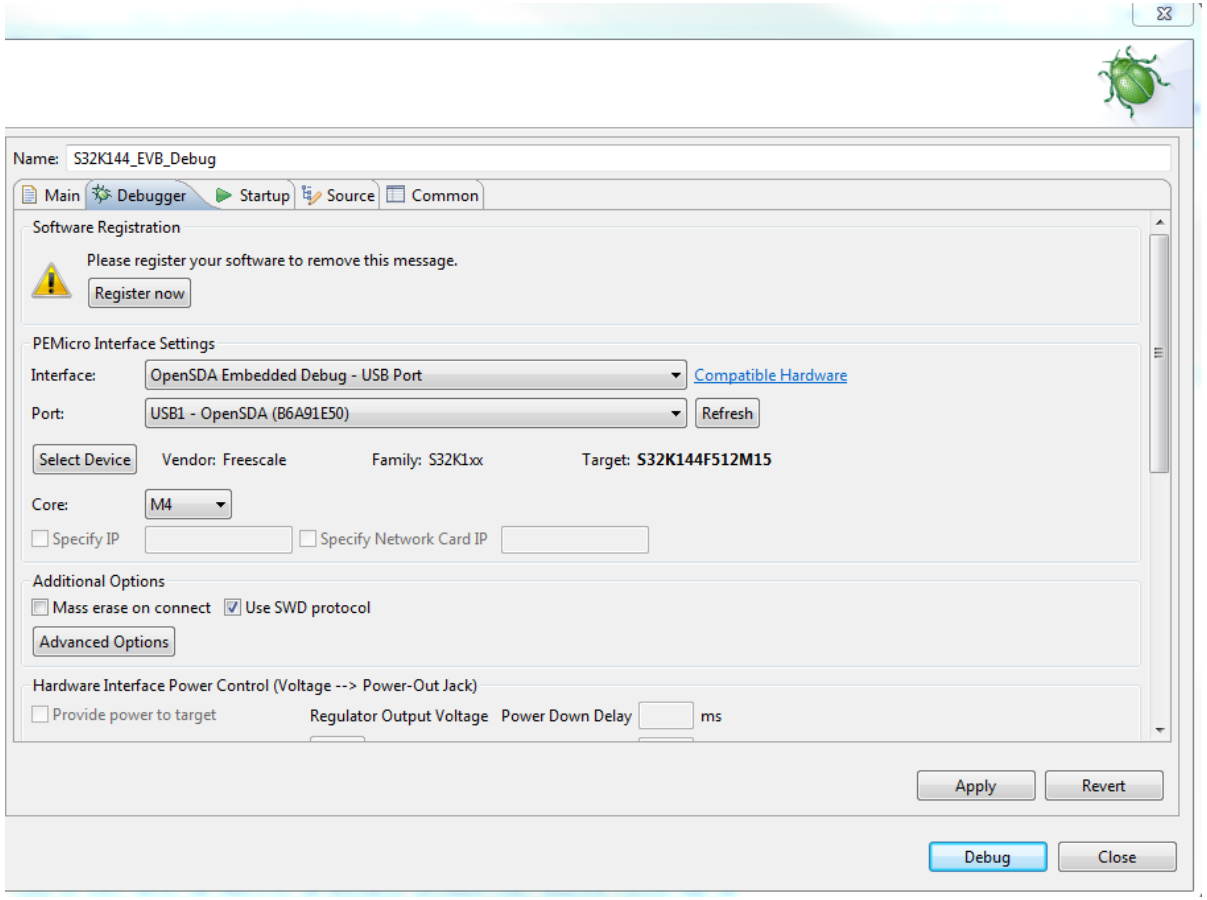


- 在“GDB PEMicro Interface Debugging”下选择调试配置
  Select the Debug configuration under GDB PEMicro Interface Debugging

- 单击“Debugger”选项卡Click on Debugger tab



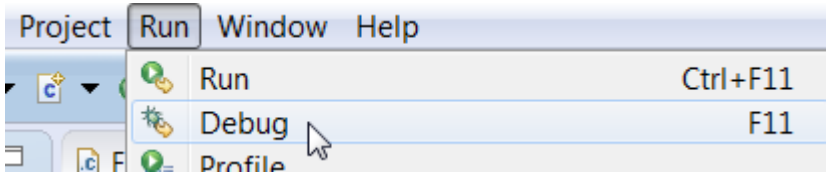
- 在“Interface”里选择OpenSDA作为接口，如果电脑连接了调试器，相应的信息应该出现在“Port”里
  Select OpenSDA as the interface, if your board is plugged should appear in the Port field
- 单击“Apply”应用配置
- 单击“Debug”完成配置Click Apply and debug to finish

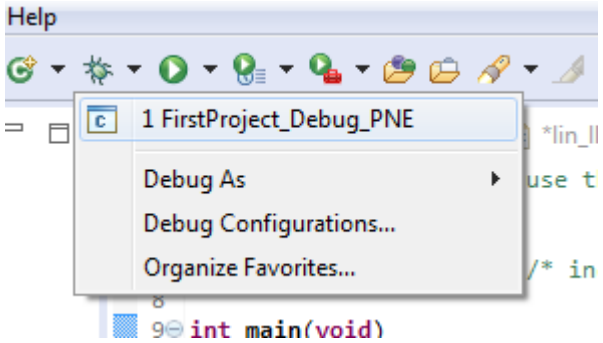


调试工具
Debug

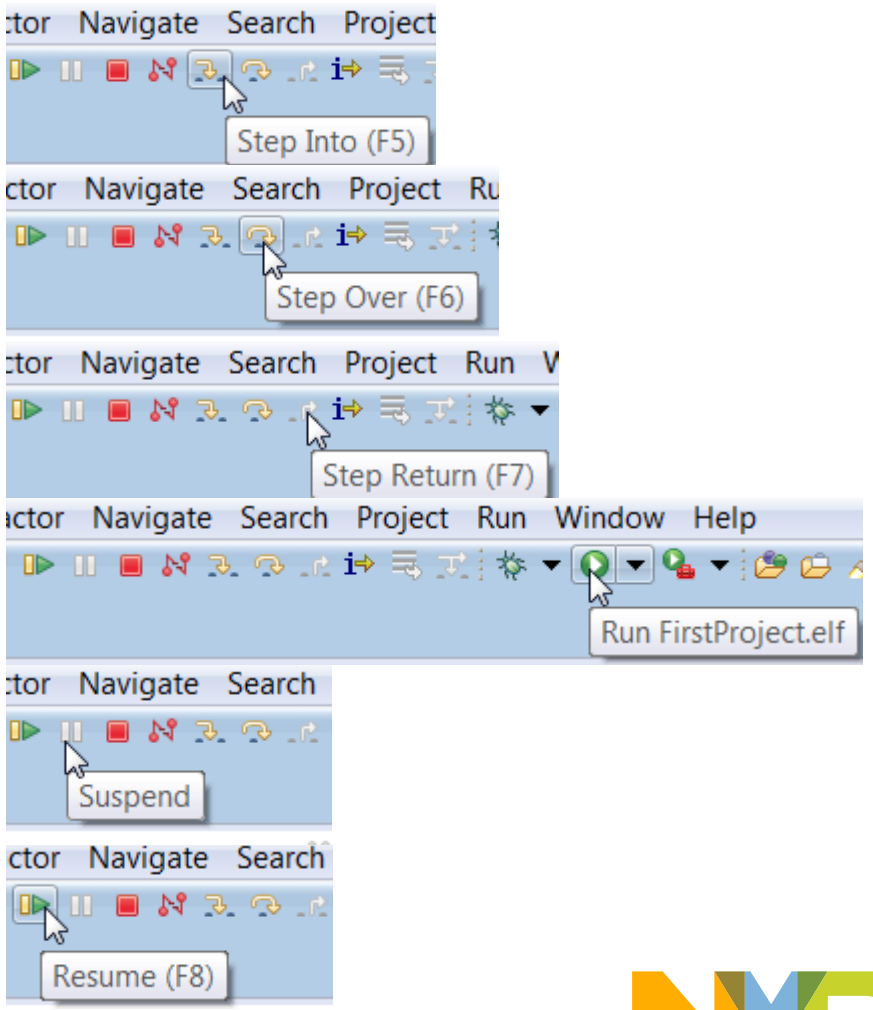
1.开始调试Starting the Debugger

- 启动调试器：调试器配置完成后，有三种方式来启动调试器 Three options to start debugger
  - Run>Debug
  - 按键盘“F11”键hit F11
  - 点击debug图标的下拉箭头，然后选择..._debug.elf目标Click on pull down arrow for bug icon and select …_debug.elf target





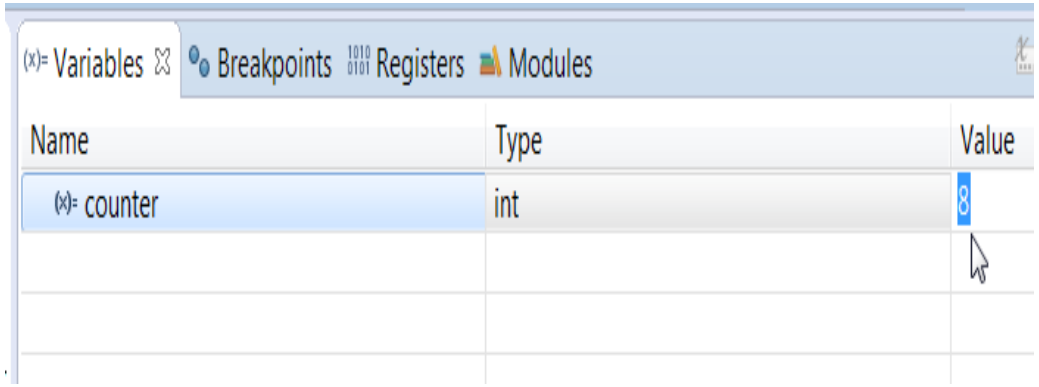
- Step Into (F5)
- Step Over (F6)
- Step Return (F7)
- Run
- Suspend
- Resume (F8)



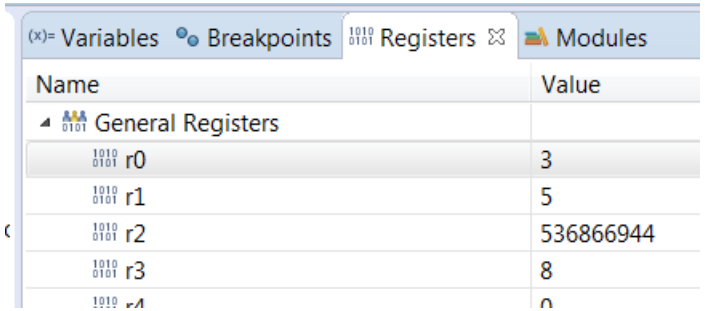
2.查看更改变量View & Alter Variables

- 查看“Variables”选项卡中的变量
  View variables in “Variables” tab.

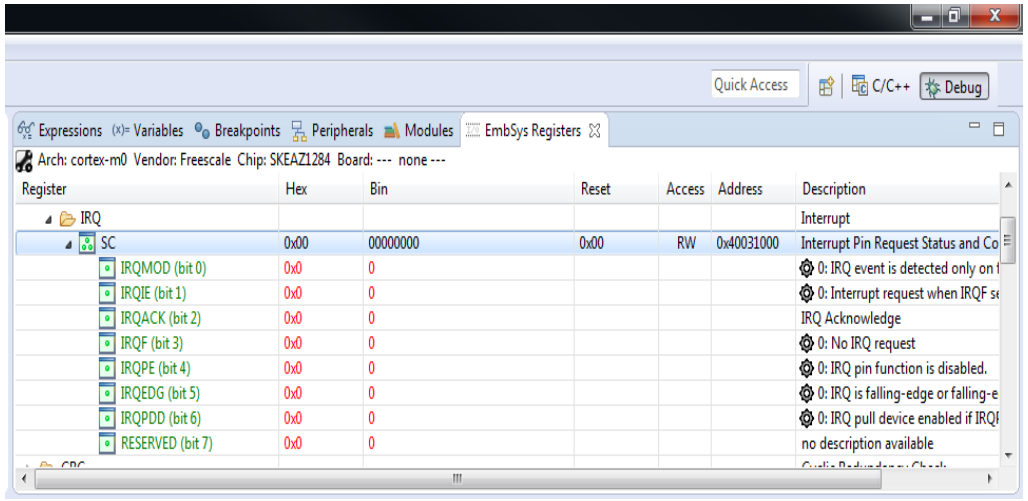
- 选择一个变量，更改变量值Click on a value to allow typing in a different value



- 在“Registers”选项卡中查看CPU寄存器，选择一个变量，更改变量值View CPU registers in the “Registers” tab. Click on a value to allow typing in a different value



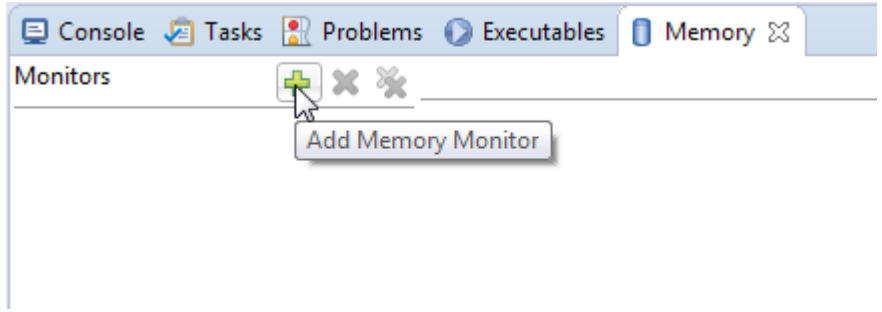
- 查看外设寄存器“EmbSys Registers”标签View peripheral registers in the EmbSys Registers tab

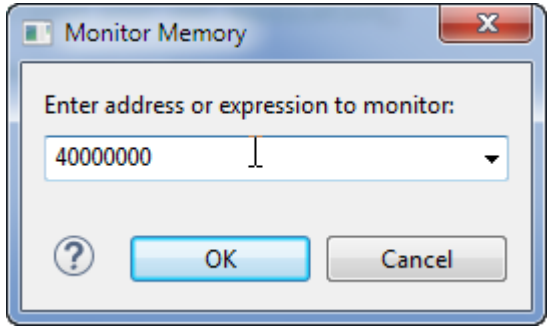


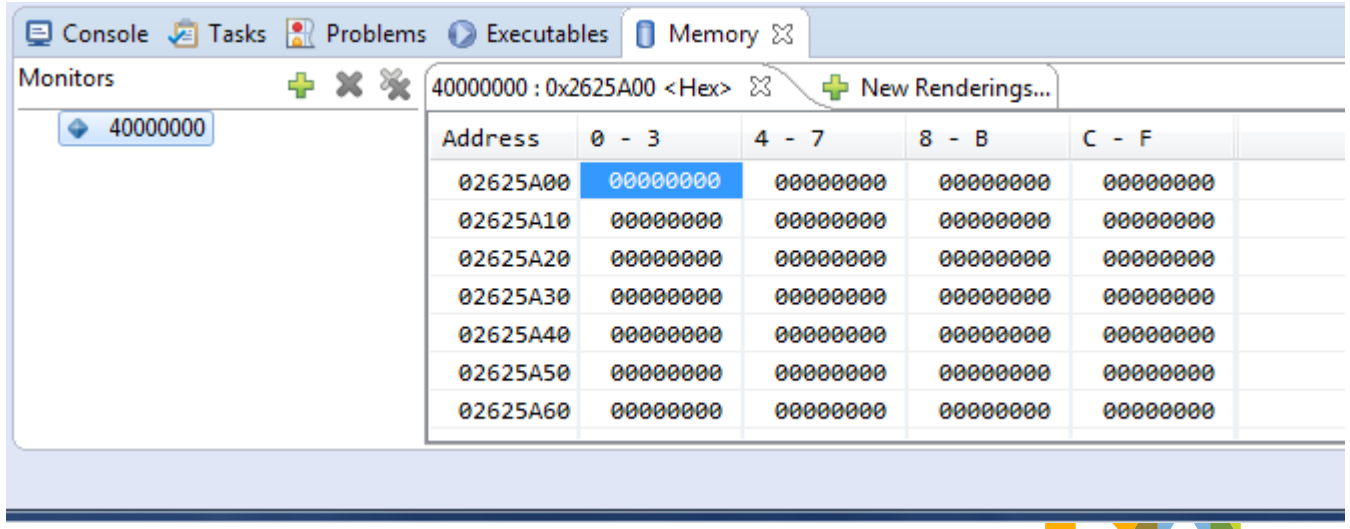
- 添加内存监视器Add Memory Monitor

选择启动地址：40000000 Select Base Address
to Start at : 40000000

- 查看内存View Memory

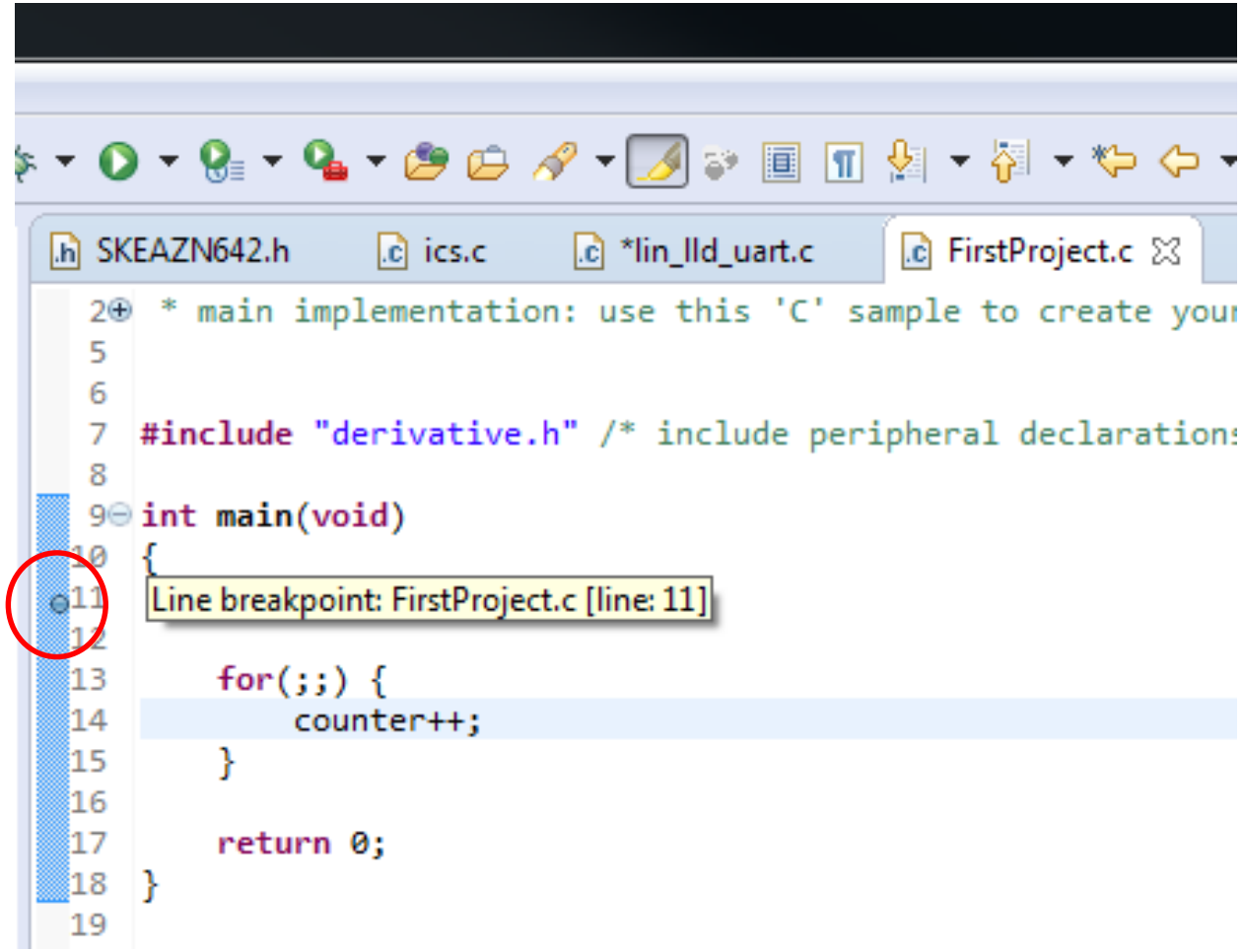






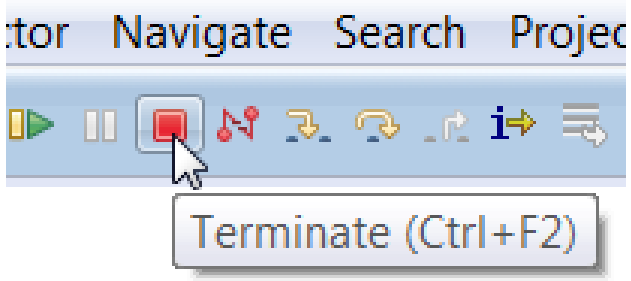
3.添加断点 Breakpoints

- 在需要添加断点的程序前单击即可添加断点Add Breakpoint: Point and Click
  - 淡蓝色圆点代表断点调试light blue dot represents debugger breakpoint



4.终止仿真Reset & Terminate Debug Session

- 终止仿真Terminate Debug
  - 点击终止按钮 click Terminate button
  - 按键盘Ctrl+ F2 press keyboard Ctl+F2()



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