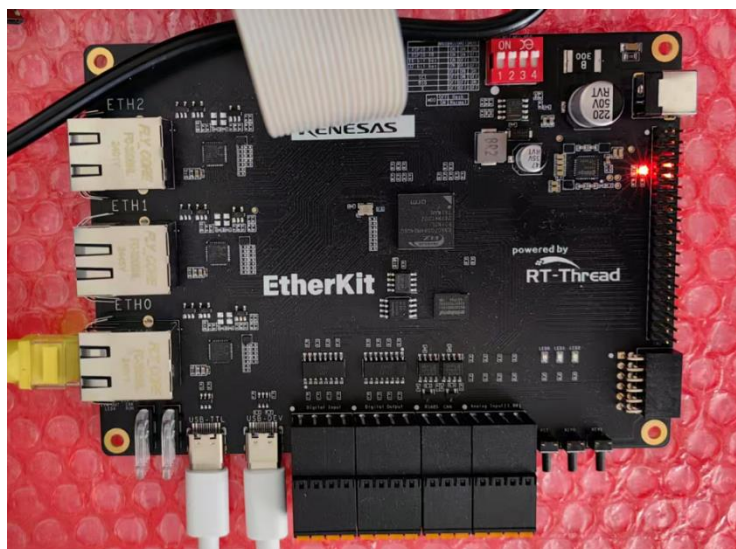


RZN2L ADC 例程操作手册-----基于 Etherkit 开发板

简介

本应用笔记介绍了基于 RZ/N2 Etherkit 开发板的 ADC 例程操作。分别介绍 IDE IAR 和 E2studio 软件下的操作。



| | |
|--|---|
| 开发工具 <ul style="list-style-type: none"> • IDE: IAR EW for Arm 9.50.2 E2studio 2024-01.1 • FSP: RZ/N2 FSP V2.0 • 仿真器: Jlink V12 | 实验材料 <ul style="list-style-type: none"> • Etherkit 开发板 • Jlink 仿真器, 需支持瑞萨 R52 内核 |
|--|---|

实验部分

| | |
|--------------------------|---|
| 1.硬件设置及软件安装 | 2 |
| 2 .IAR 环境工程介绍..... | 3 |
| 3 .E2studio 环境工程介绍 | 9 |

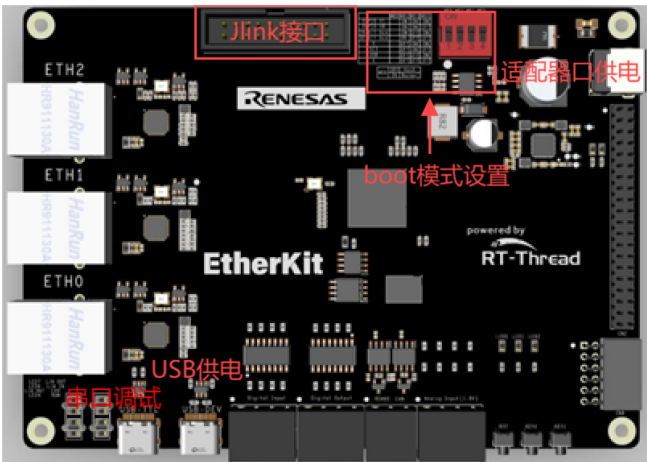
1 .硬件设置及软件安装

本节 EtherKit 开发板硬件设置。

1.1

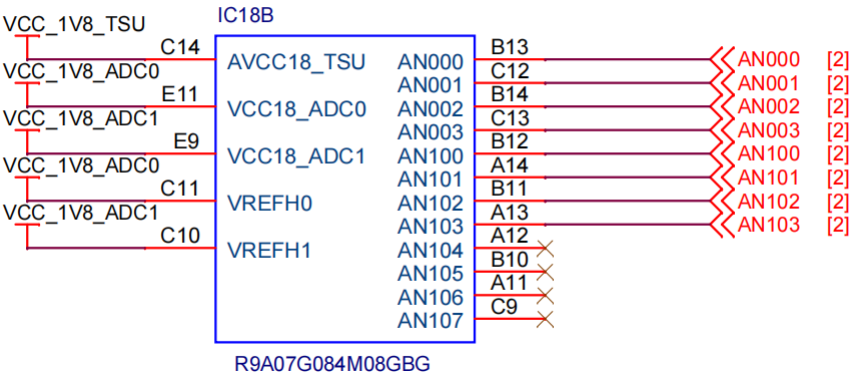
开发板设置：

- 供电：可选 USB 供电或适配器供电
- Boot 模式设置：推荐 xSPI0 x1 boot mode
- Jlink v12
- USB 线一根接串口调试



1.2

硬件原理图：



如上图 EtherKit 上留有 Analog Input 8 通道接口分别连接到单片机的 adc0、adc1 的通道 0、1、2、3；（注意，Analog Input 的耐压范围为 0~1.8v）；

本节完

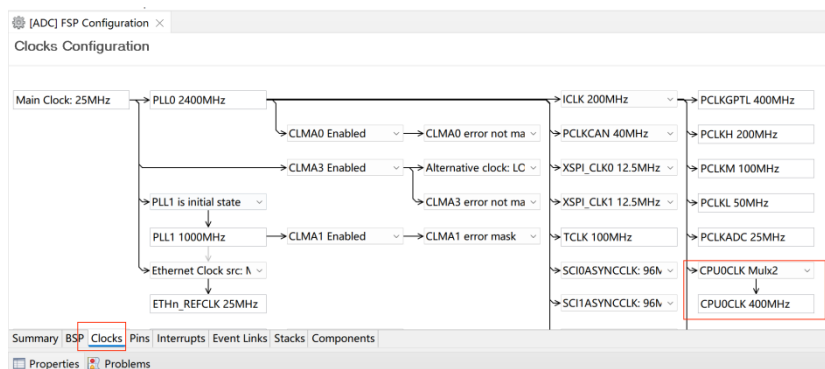
2 .IAR 环境工程介绍

本节介绍 IAR 环境下 ADC 工程。

2.1

● 打开 FSP 新建工程：ADC

1. 主时钟设置 400MHZ



2. 新建 r_adc Stack

➤ 配置 Unit0 通道 0 continues scan mode

Stacks Configuration

Threads: HAL/Common, g_ioport I/O Port (r_ioport), Memory config check, g_adc0 ADC (r_adc)

Objects: g_ioport I/O Port (r_ioport), Memory config check, g_adc0 ADC (r_adc)

Summary | BSP | Clocks | Pins | Interrupts | Event Links | **Stacks** | Components

Properties | Problems

g_adc0 ADC (r_adc)

| Property | Value |
|--|-------------------------------------|
| Module g_adc0 ADC (r_adc) | |
| General | |
| Name | g_adc0 |
| Unit | 0 |
| Clear after read | On |
| Mode | Continuous Scan |
| Double-trigger | Disabled |
| Input | |
| Channel Scan Mask (channel availability varies by MCU) | |
| Channel 0 | <input checked="" type="checkbox"/> |
| Channel 1 | <input type="checkbox"/> |
| Channel 2 | <input type="checkbox"/> |
| Channel 3 | <input type="checkbox"/> |
| Channel 4 | <input type="checkbox"/> |
| Channel 5 | <input type="checkbox"/> |
| Channel 6 | <input type="checkbox"/> |
| Channel 7 | <input type="checkbox"/> |
| Group B Scan Mask (channel availability varies by MCU) | |

➤ 开中断，设置回调函数 adc_callback

Summary | BSP | Clocks | Pins | Interrupts | Event Links | **Stacks** | Components

Properties | Problems

g_adc0 ADC (r_adc)

| Property | Value |
|--|----------------------------------|
| Common | |
| Parameter Checking | Default (BSP) |
| Multiplex Interrupt | Disabled |
| Module g_adc0 ADC (r_adc) | |
| General | |
| Input | |
| Interrupts | |
| Normal/Group A Trigger | Software |
| Group B Trigger | Disabled |
| Group Priority (Valid only in Group Scan Mode) | Group A cannot interrupt Group B |
| Callback | adc_callback |
| Scan End Interrupt Priority | Priority 16 |
| Scan End Group B Interrupt Priority | Disabled |
| Scan End Group C Interrupt Priority | Disabled |
| ELC | |
| Pins | |
| ADTRG0# | <unavailable> |

➤ 选择 RZN2L Customer User Board (xSPI0 X1 boot mode)

FSP Configuration

Board Support Package Configuration

Device Selection

FSP version:

2.0.0

Board:

RZN2L Custom User Board (xSPI0 x1 boot mode)

...

Device:

R9A07G084M04GBG

...

Core:

CR52_0

...

RTOS:

No RTOS

...

Board Details

RZN2L Custom User Board (xSPI0 x1 boot mode)

Summary

BSP

Clocks

Pins

Interrupts

Event Links

Stacks

Components

➤ 设置串口 0，用于 log 输出

The screenshot displays the STM32CubeIDE interface for configuring the HAL/Common Stacks. The 'Threads' panel on the left lists the components: HAL/Common, g_ioport I/O Port (r_ioport), Memory config check, g_adc0 ADC (r_adc), and g_uart0 UART (r_sci_uart). The 'Objects' panel on the right shows the g_uart0 UART (r_sci_uart) component selected. The 'Summary' panel at the bottom provides a detailed view of the configuration for g_uart0 UART (r_sci_uart), including properties like Parameter Checking, FIFO Support, DMAC Support, Flow Control Support, Multiplex Interrupt, and Pins. The 'Console' panel on the right shows the output of the RZ/N FSP command, including the note 'Note: The ne' and the command 'RZ/N FSP'.

➤ 配置 XSPI0

Select Pin Configuration

Export to CSV file

Configure Pin Driver Warnings

R9A07G084M08BGB.pincfg

[Manage configurations...](#)

☒ Generate data:

g_bsp_pin_cfg

Pin Selection

Type filter text

>

Connectivity:ETHER_ESC

>

Connectivity:ETHER_ETH

>

Connectivity:ETHER_ETHSW

>

Connectivity:ETHER_GMAC

>

Connectivity:ILIC

>

Connectivity:PHOSTIF

>

Connectivity:SCI

>

Connectivity:SHOSTIF

>

Connectivity:SPI

>

Connectivity:USB_HS

>

Connectivity:XSPIO

>

XSPIO0

>

XSPIO1

>

Debug:JTAG/SWD

>

Debug:TRACE

>

Delta signalF:DSMIF

>

ExBus:BSC

>

Interrupt:IRQ

>

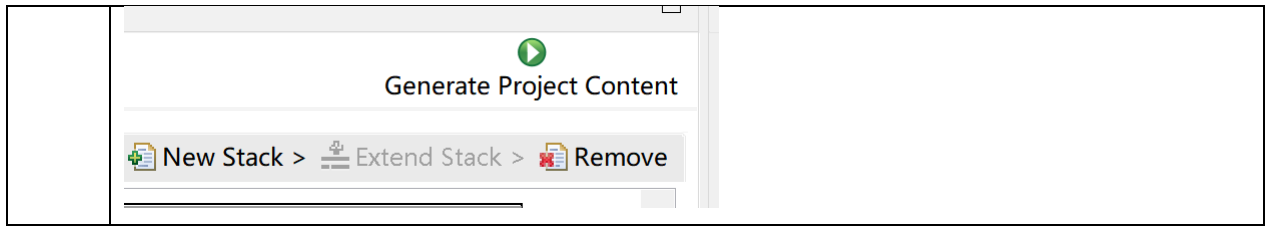
System:CGC

Pin Configuration

| Name | Value | Lock | Link |
|---------------------|--------------|------|------|
| Pin Group Selection | Mixed | | |
| Operation Mode | Custom(1.8V) | | |
| Input/Output | | | |
| XSPIO_CKN | None | | |
| XSPIO_CKP | ✓ P14_6 | | |
| XSPIO_CS0# | ✓ P15_7 | | |
| XSPIO_CS1# | None | | |
| XSPIO_DS | None | | |
| XSPIO_ECS0# | None | | |
| XSPIO_ECS1# | None | | |
| XSPIO_INT0# | None | | |
| XSPIO_INT1# | None | | |
| XSPIO_IO0 | ✓ P14_7 | | |
| XSPIO_IO1 | ✓ P15_0 | | |
| XSPIO_IO2 | None | | |
| XSPIO_IO3 | None | | |
| XSPIO_IO4 | None | | |

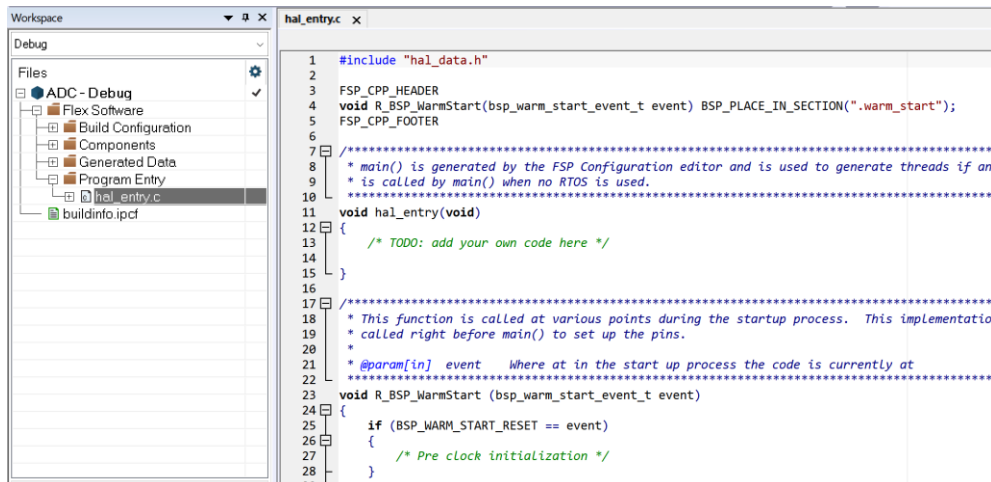
Module name: XSPIO

➤ 点击: [Generate Project Content](#) 生成代码



2.2

- 打开生成的代码

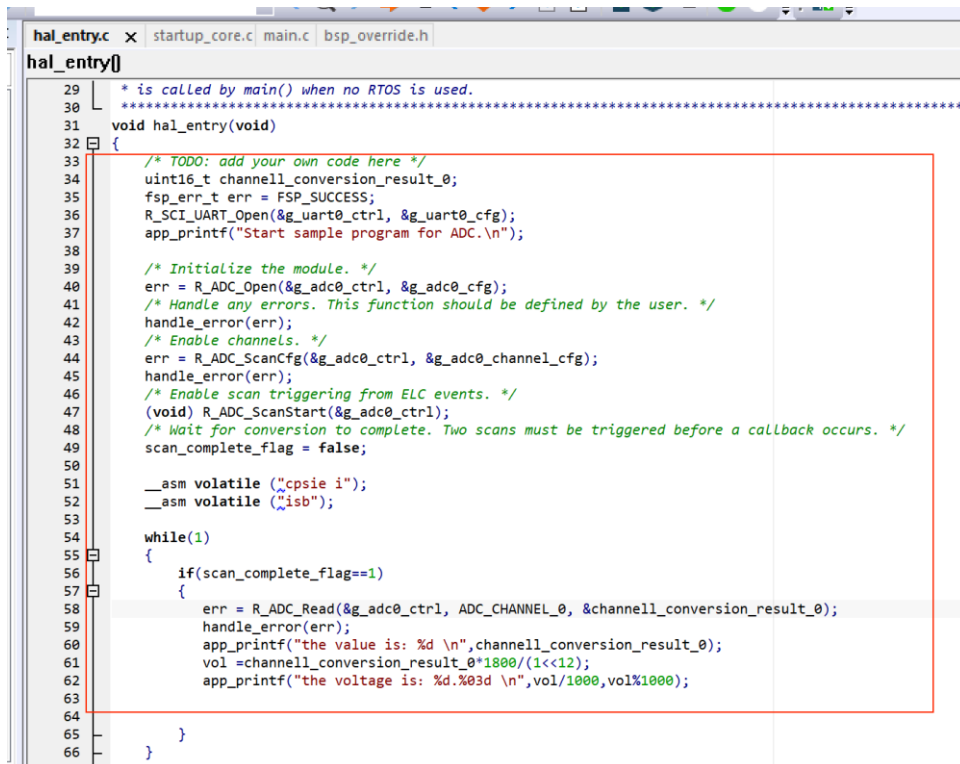


```

1  #include "hal_data.h"
2
3  FSP_CPP_HEADER
4  void R_BSP_WarmStart(bsp_warm_start_event_t event) BSP_PLACE_IN_SECTION(".warm_start");
5  FSP_CPP_FOOTER
6
7  /*
8   * main() is generated by the FSP Configuration editor and is used to generate threads if an
9   * is called by main() when no RTOS is used.
10  */
11
12  void hal_entry(void)
13  {
14      /* TODO: add your own code here */
15  }
16
17  /*
18   * This function is called at various points during the startup process. This implementation
19   * called right before main() to set up the pins.
20   *
21   * @param[in] event Where at in the start up process the code is currently at
22   */
23  void R_BSP_WarmStart (bsp_warm_start_event_t event)
24  {
25      if (BSP_WARM_START_RESET == event)
26      {
27          /* Pre cLock initialization */
28      }
29  }

```

- 仿真器由 Ijet 切换为 Jlink
- 编写用户代码



```

29  /* is called by main() when no RTOS is used.
30  */
31  void hal_entry(void)
32  {
33      /* TODO: add your own code here */
34      uint16_t channel_conversion_result_0;
35      fsp_err_t err = FSP_SUCCESS;
36      R_SCI_UART_Open(&g_uart0_ctrl, &g_uart0_cfg);
37      app_printf("Start sample program for ADC.\n");
38
39      /* Initialize the module. */
40      err = R_ADC_Open(&g_adc0_ctrl, &g_adc0_cfg);
41      /* Handle any errors. This function should be defined by the user. */
42      handle_error(err);
43      /* Enable channels. */
44      err = R_ADC_ScanCfg(&g_adc0_ctrl, &g_adc0_channel_cfg);
45      handle_error(err);
46      /* Enable scan triggering from ELC events. */
47      (void) R_ADC_ScanStart(&g_adc0_ctrl);
48      /* Wait for conversion to complete. Two scans must be triggered before a callback occurs. */
49      scan_complete_flag = false;
50
51      __asm volatile ("cpsie i");
52      __asm volatile ("isb");
53
54      while(1)
55      {
56          if(scan_complete_flag==1)
57          {
58              err = R_ADC_Read(&g_adc0_ctrl, ADC_CHANNEL_0, &channel_conversion_result_0);
59              handle_error(err);
60              app_printf("the value is: %d \n", channel_conversion_result_0);
61              vol = channel_conversion_result_0*1800/(1<<12);
62              app_printf("the voltage is: %.03d \n", vol/1000, vol*1000);
63          }
64      }
65  }
66
67

```

- 回调函数编写

```

void adc_callback(adc_callback_args_t * p_args)
{
    scan_complete_flag = true;
}

```

- Rebuild All---编译工程 无报错

uild

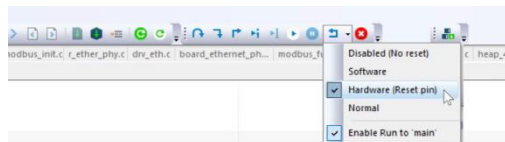
Messages

Total number of errors: 0
Total number of warnings: 0
Resolving dependencies...
Build succeeded

2.3

● Download and Debug ---下载程序

1. USB 串口调试接电脑
2. Jlink 正确连接，板子上电
3. 下载工程到开发板，进入仿真界面
4. Debug 复位设置为 Hardware



5. 打开串口助手，观察 log
6. 全速运行代码，可以看到采样值和电压值

SSCOM V5.13.1 串口/网络数据调试器,作者:大虾丁丁,2618058@qq.com. QQ群: 52502449

通讯端口 串口设置 显示 发送 多字符串 小工具 帮助 联系作者 大虾电子网

```
the voltage is: 1.794
the value is: 4095
the voltage is: 1.799
the value is: 4086
the voltage is: 1.795
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4095
the voltage is: 1.799
the value is: 4088
the voltage is: 1.796
```

清除窗口 打开文件 发送文件 停止

端口号 COM10 USB-SERIAL CH340

打开串口 更多串口设置

RTS DTR 波特率: 115200

为了更好地发展SSCOM软件
请您注册嘉立创结尾客户

发送

▲QQ群满员了,没有第二个群. ★台宙高性价比4G模块 ★RT-Thread中国人的开源免费操作系统

本节完

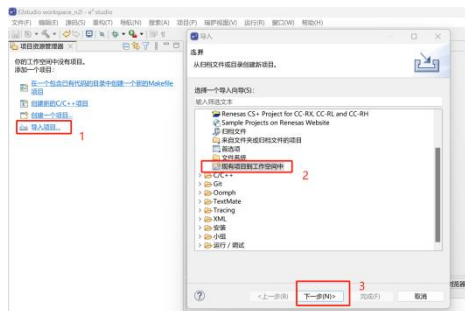
3 .E2studio 环境工程介绍

本节介绍使用 E2studio 环境 RTC 工程。

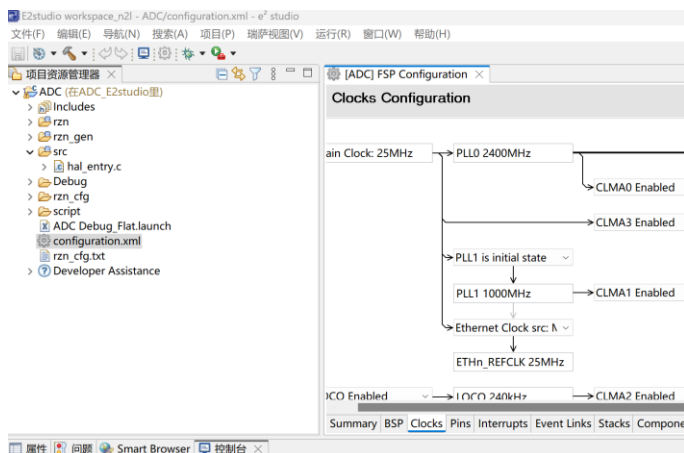
3.1

- 打开 E2studio，导入工程

1. 选择 文件--导入--下一步：



2. 浏览--指定到工程文件夹---完成--打开工程



3.2

新建 r_adc Stack

- 配置 Unit0 通道 0 continues scan mode

acks Configuration

HAL/Common Stacks

g_ioport I/O Port (r_ioport) Memory config check g_adc0 ADC (r_adc)

adc0 ADC (r_adc)

| 属性 | 值 |
|--|-------------------------------------|
| Module g_adc0 ADC (r_adc) | |
| General | |
| Name | g_adc0 |
| Unit | 0 |
| Clear after read | On |
| Mode | Continuous Scan |
| Double-trigger | Disabled |
| Input | |
| Channel Scan Mask (channel availability varies by MCU) | |
| Channel 0 | <input checked="" type="checkbox"/> |
| Channel 1 | <input type="checkbox"/> |
| Channel 2 | <input type="checkbox"/> |
| Channel 3 | <input type="checkbox"/> |

- 开中断，设置回调函数 adc_callback

HAL/Common Stacks

g_ioport I/O Port (r_ioport) Memory config check g_adc0 ADC (r_adc)

0 ADC (r_adc)

| 属性 | 值 |
|--|----------------------------------|
| Common | |
| Parameter Checking | Default (BSP) |
| Multiplex Interrupt | Disabled |
| Module g_adc0 ADC (r_adc) | |
| General | |
| Input | |
| Interrupts | |
| Normal/Group A Trigger | Software |
| Group B Trigger | Disabled |
| Group Priority (Valid only in Group Scan Mode) | Group A cannot interrupt Group B |
| Callback | adc_callback |
| Scan End Interrupt Priority | Priority 16 |
| Scan End Group B Interrupt Priority | Disabled |
| Scan End Group C Interrupt Priority | Disabled |
| ELC | |
| Pins | |
| ADTRG0# | <unavailable> |

- 选择 RZN2L Customer User Board (xSPI0 X1 boot mode)

[ADC] FSP Configuration ×

Board Support Package Configuration

Device Selection

FSP version: 2.0.0

Board: RZN2L Custom User Board (xSPI0 x1 boot mode)

Device: R9A07G084M04GBG

Core: CR52_0

RTOS: No RTOS

Board Details

RZN2L Custom User Board (xSPI0 x1 boot mode)

Summary **BSP** Clocks Pins Interrupts Event Links Stacks Components

Properties Problems

➤ 设置串口 0，用于 log 输出

Stacks Configuration

Generate Project Content

Threads

New Thread Remove

HAL/Common

g_ioport I/O Port

Memory config check

Objects

New Object Remove

g_uart0 UART (r_sci_uart)

Add DMAC Driver for Transmission

Add DMAC Driver for Reception (Int)

Summary **BSP** Clocks Pins Interrupts Event Links **Stacks** Components

属性 问题 Smart Browser 控制台

g_uart0 UART (r_sci_uart)

| Settings | 属性 | 值 |
|----------|----------------------------------|-------|
| API Info | Module g_uart0 UART (r_sci_uart) | |
| | General | |
| | Baud | |
| | Flow Control | |
| | Extra | |
| | Interrupts | |
| | Pins | |
| | CTS0# | None |
| | CTS_RTS_SS0# | None |
| | RXD_MISO0 | P16_6 |
| | TXD_MOSI0 | P16_5 |

➤ 配置 XSPI0

Select Pin Configuration

Export to CSV file Configure Pin Driver Warnings

R9A07G084M04GBG.pincfg Manage configurations...

Generate data: g_bsp_pin_cfg

Pin Selection

Type filter text

- Connectivity:ETHER_GMAC
- Connectivity:IIC
- Connectivity:PHOSTIF
- Connectivity:SCI
- Connectivity:SHOSTIF
- Connectivity:SPI
- Connectivity:USB_HS
- Connectivity:XSPI
- XSPI0
- XSPI1
- Debug:JTAG/SWD
- Debug:TRACE
- Delta signalF:DSMIF
- ExBus:BSC
- Interrupt:IRQ
- System:CGC

Pin Configuration

| Name | Value | Lock | Link |
|---------------------|--------------|------|------|
| Pin Group Selection | Mixed | | |
| Operation Mode | Custom(1.8V) | | |
| Input/Output | | | |
| XSPI0_CKN | None | | |
| XSPI0_CKP | P14_6 | | |
| XSPI0_CS0# | P15_7 | | |
| XSPI0_CS1# | None | | |
| XSPI0_DS | None | | |
| XSPI0_ECS0# | None | | |
| XSPI0_INT0# | None | | |
| XSPI0_INT1# | None | | |
| XSPI0_IO0 | P14_7 | | |
| XSPI0_IO1 | P15_0 | | |

Module name: XSPI0

➤ 编译工程，无报错

| | |
|-----|---|
| |  <p>CDT Build Console [ADC] Extracting support files... 10:41:54 **** 项目ADC配置Debug的增量构建 **** make -r --output-sync -j22 all arm-none-eabi-size --format=berkeley "ADC.elf" text data bss dec hex filename 11008 5220 30884 47112 b808 ADC.elf 10:41:54 Build Finished. 0 errors, 0 warnings. (took 173ms)</p> |
| 3.3 | <ul style="list-style-type: none"> ● 下载代码到开发板 <p>E2studio 在线仿真下载, 全速运行</p> |
| 3.4 | <ul style="list-style-type: none"> ● 全速运行代码, 可以看到采样值和电压值  <p>SSSCOM V5.13.1 串口/网络数据调试器,作者:大虾丁丁,2618058@qq.com. QQ群: 52502449</p> <p>通讯端口 串口设置 显示 发送 多字符串 小工具 帮助 联系作者 大虾电子网</p> <pre>the voltage is: 1.794 the value is: 4095 the voltage is: 1.799 the value is: 4086 the voltage is: 1.795 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4095 the voltage is: 1.799 the value is: 4088 the voltage is: 1.796</pre> <p>清除窗口 打开文件 发送文件 停止</p> <p>端口号 COM10 USB-SERIAL CH340 <input type="checkbox"/> HEX显示 <input type="checkbox"/> 保存数据 <input type="checkbox"/> 接收数据到文件 <input type="checkbox"/> H</p> <p><input checked="" type="checkbox"/> 加时间戳和分包显示, 超时时间: 20 ms 第 1</p> <p><input type="checkbox"/> RTS <input type="checkbox"/> DTR 波特率: 115200</p> <p>为了更好地发展SSSCOM软件 请您注册嘉立创结尾客户</p> <p>发送</p> <p>▲Q群满员了, 没有第二个群. ★合由高性价比4G模块 ★RT-Thread中国人的开源免费操作系统</p> |

本节完