存取備用暫存器

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

代碼簡述	寫/讀備用暫存器
BSP 版本	NUC230/240 Series BSP CMSIS v3.01.002
開發平台	NuTiny–EVB–NUC240 V1.2

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1 功能介紹

1.1 簡介

此範例程式將示範如何存取備用暫存器。

1.2 原理

RTC 模塊配有 80 字節備用暫存器，可用於存儲重要的資料或信息數據，這些數據也將同時處於 VBAT 電源區域中，即使系統核心斷電，這些數據也會保留。

在訪問備用暫存器之前，使用者需要先初始化 RTC 模塊後並啟用備用暫存器功能。
下圖 1-1 顯示在範例程式內存取備用暫存器的流程。

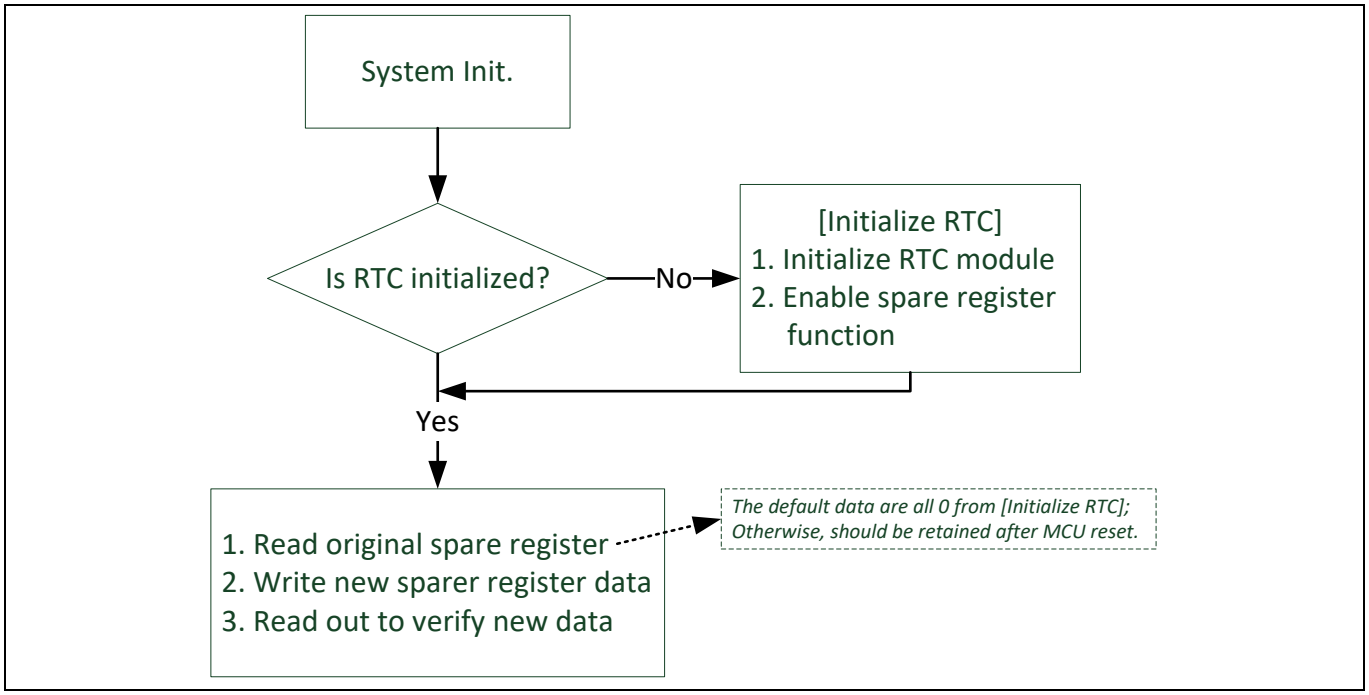

圖 1-1 存取備用暫存器的流程

1.3 執行結果

系統初次上電後的執行結果可經由串口鮑率 115200 的輸出到 PC 做顯示，如下圖 1-2 所示。

```
CPU @ 72000000 Hz

Initialize RTC module done.

Read original spare register are:
 SPARE_REGISTER[ 0] = 0.
 SPARE_REGISTER[ 1] = 0.
 SPARE_REGISTER[ 2] = 0.
 SPARE_REGISTER[ 3] = 0.
 SPARE_REGISTER[ 4] = 0.
 SPARE_REGISTER[ 5] = 0.
 SPARE_REGISTER[ 6] = 0.
 SPARE_REGISTER[ 7] = 0.
 SPARE_REGISTER[ 8] = 0.
 SPARE_REGISTER[ 9] = 0.
 SPARE_REGISTER[10] = 0.
 SPARE_REGISTER[11] = 0.
 SPARE_REGISTER[12] = 0.
 SPARE_REGISTER[13] = 0.
 SPARE_REGISTER[14] = 0.
 SPARE_REGISTER[15] = 0.
 SPARE_REGISTER[16] = 0.
 SPARE_REGISTER[17] = 0.
 SPARE_REGISTER[18] = 0.
 SPARE_REGISTER[19] = 0.

Write new spare registe are:
 SPARE_REGISTER[ 0] = 100.
 SPARE_REGISTER[ 1] = 101.
 SPARE_REGISTER[ 2] = 102.
 SPARE_REGISTER[ 3] = 103.
 SPARE_REGISTER[ 4] = 104.
 SPARE_REGISTER[ 5] = 105.
 SPARE_REGISTER[ 6] = 106.
 SPARE_REGISTER[ 7] = 107.
 SPARE_REGISTER[ 8] = 108.
 SPARE_REGISTER[ 9] = 109.
 SPARE_REGISTER[10] = 110.
 SPARE_REGISTER[11] = 111.
 SPARE_REGISTER[12] = 112.
 SPARE_REGISTER[13] = 113.
 SPARE_REGISTER[14] = 114.
 SPARE_REGISTER[15] = 115.
 SPARE_REGISTER[16] = 116.
 SPARE_REGISTER[17] = 117.
 SPARE_REGISTER[18] = 118.
 SPARE_REGISTER[19] = 119.

 Compare spare registers data ... Pass!!
```

圖 1-2 初始化 RTC 模塊的執行結果

在圖 1-3 顯示出程序執行的結果為在 MCU 復位後不需要為存取備用暫存器而再一次初始化 RTC 模塊。

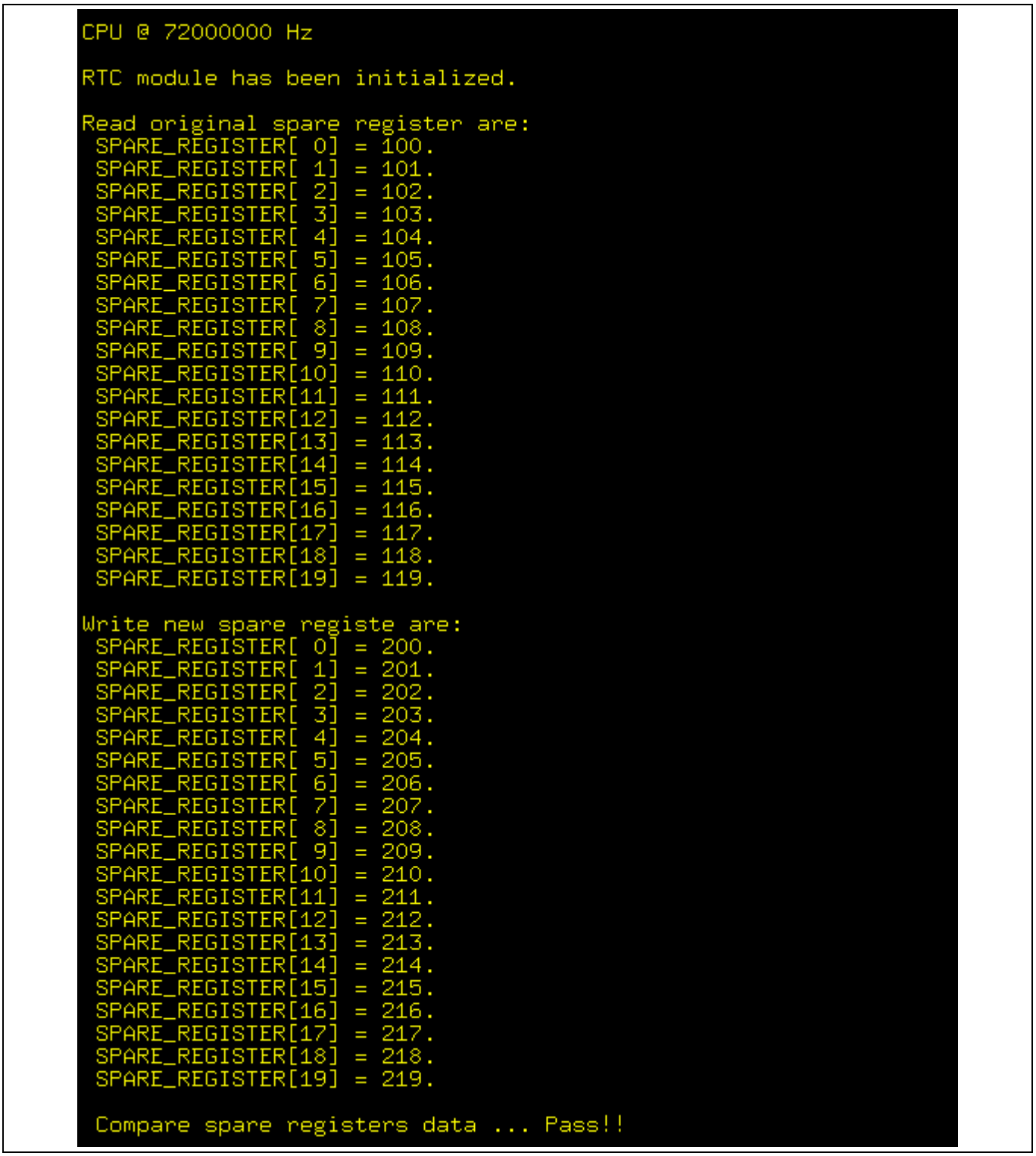

圖 1-3 MCU 復位後的執行結果

2 代碼介紹

初始化並啟用 RTC 模塊。

```
/* Check if RTC module has initialized or not */
if(RTC->INIR == RTC_INIR_ACTIVE_Msk)
{
    printf("RTC module has been initialized.\n\n");
}
else
{
    i = (SystemCoreClock / 10);
    /* Initialize RTC module */
    while(1)
    {
        RTC->INIR = RTC_INIT_KEY;
        if(RTC->INIR == RTC_INIR_ACTIVE_Msk)
            break;
        if(i-- == 0)
        {
            printf("\nInitialize RTC fail.\n\n");
            while(1) {}
        }
    }
    printf("Initialize RTC module done.\n\n");

    /* Enable spare register */
    RTC_EnableSpareRegister();
}
```

讀出備用暫存器內的數據，並分配一個新的初始值以產生後續要寫入備用暫存器內的數據。

```
/* Read original spare register data */
printf("Read original spare register are:\n");
for(i=0; i<20; i++)
{
    RTC_WaitAccessEnable();
    u32SPRData = RTC_READ_SPARE_REGISTER(i);
    printf(" SPARE_REGISTER[%2d] = %d.\n", i, u32SPRData);
}
```

```
    RTC_WaitAccessEnable();
    u32InitData = (((RTC_READ_SPARE_REGISTER(0)/100) + 1) * 100);
    if(u32InitData > 900)
        u32InitData = 0;
```

將新的數據寫入備用暫存器內，並讀出來做驗證寫入是否正確。

```
    /* Write new spare register data */
    printf("\n");
    printf("Write new spare registe are:\n");
    for(i=0; i<20; i++)
    {
        RTC_WaitAccessEnable();
        RTC_WRITE_SPARE_REGISTER(i, (i+u32InitData));
    }

    /* Verify spare register data */
    for(i=0; i<20; i++)
    {
        RTC_WaitAccessEnable();
        u32SPRData = RTC_READ_SPARE_REGISTER(i);
        if(u32SPRData != (i+u32InitData))
        {
            printf(" SPARE_REGISTER[%2d] = %d.\n", i, u32SPRData);
            printf(" Get spare register Fail!! \n");
            while(1) {}
        }
        else
        {
            printf(" SPARE_REGISTER[%2d] = %d.\n", i, u32SPRData);
        }
    }
```

3 軟體與硬體環境

● 軟體環境

- ■ BSP 版本
  - ◆ NUC230/240 Series BSP CMSIS v3.01.002
- ■ IDE 版本
  - ◆ Keil uVersion 5.28

● 硬體環境

- ■ 電路元件
  - ◆ NuTiny–EVB–NUC240 V1.2
- ■ 示意圖
  - ◆ 將 NUC240 UART TX (PB.1) 引腳連接到 PC UART RX，以在 PC 上顯示示例代碼的執行結果。

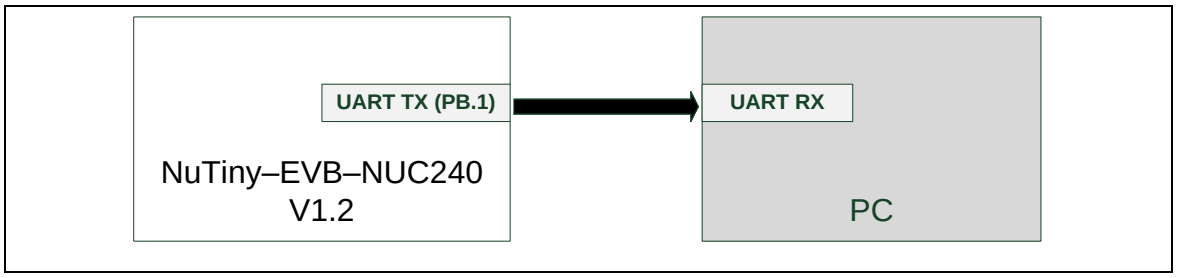

圖 3-1 NUC240 UART TX 和 PC UART RX 連接

4 目錄資訊

- EC_NUC240_SpareRegister_Access_V1.00
  - Library — Sample code header and source files
    - CMSIS — Cortex® Microcontroller Software Interface Standard (CMSIS) by Arm® Corp.
    - Device — CMSIS compliant device header file
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code

5 如何執行範例程式

1. 根據目錄資訊章節進入 ExampleCode 路徑中的 KEIL 資料夾，雙擊 SpareRegister_Access.uvproj。
2. 進入編譯模式介面
   a. 編譯
   b. 下載代碼至記憶體
   c. 進入 / 離開除錯模式
3. 進入除錯模式介面
   a. 執行代碼

6 修訂紀錄

Date	Revision	Description
Jul 26, 2019	1.00	1. 初始發布。

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