SPI使用PDMA傳輸

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

代碼簡述	SPI 使用 PDMA 傳輸資料範例代碼
BSP 版本	NUC123Series_BSP_CMSIS_v3.01.001
開發平台	NuTiny-EVB-123-LQFP64 Ver1.0

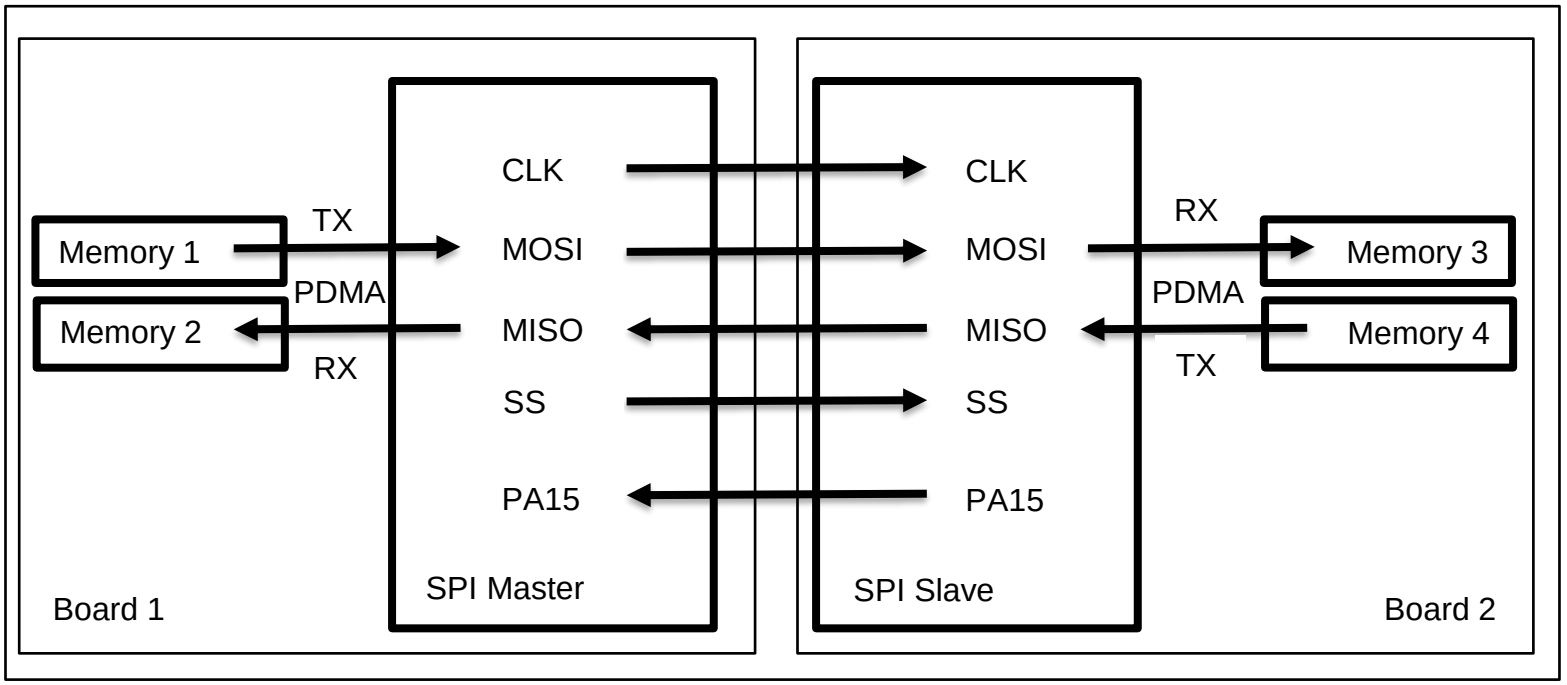
1 功能介紹

1.1 簡介

使用兩張板子，一張板子為SPI Master使用PDMA與另一張板子為SPI Slave使用PDMA，兩張板子互相傳輸資料。

1.2 原理

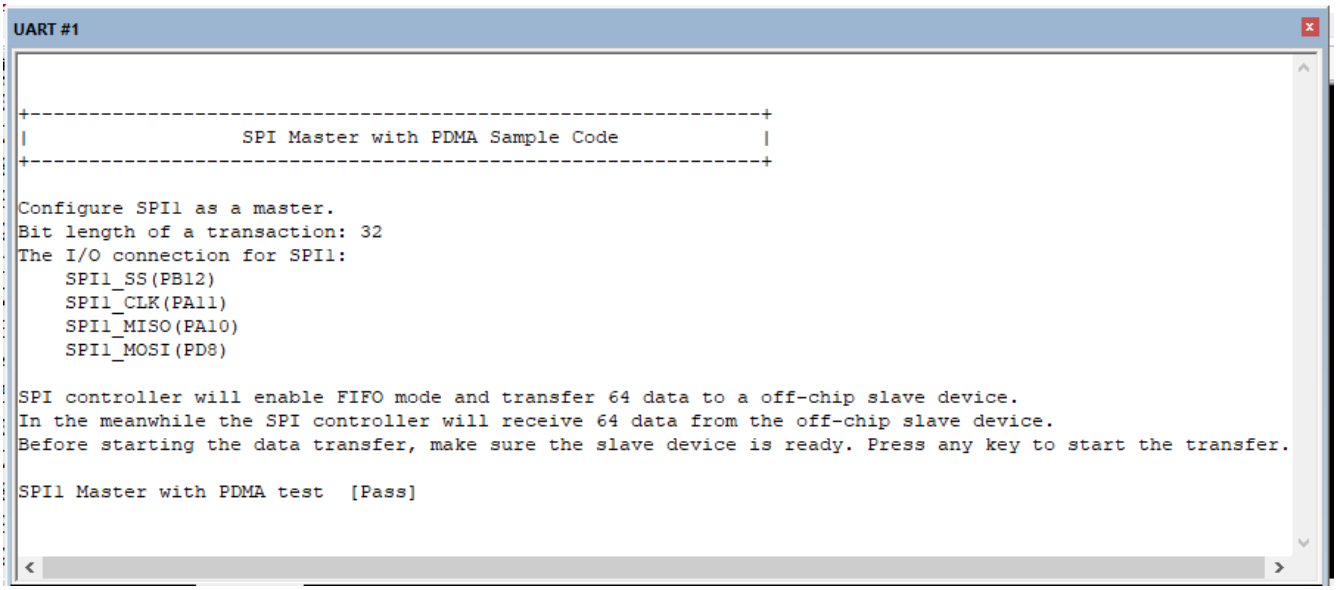
拿一張版子當作SPI1 Master使用PDMA Basic模式搬運資料到TX並使用PDMA Basic模式將RX資料搬到記憶體，另一塊板子做為SPI1 Slave也使用PDMA搬運資料TX與RX的資料，利用PA15作為兩塊板子的同步訊號，程式會比對資料正確性，並輸出傳輸結果。



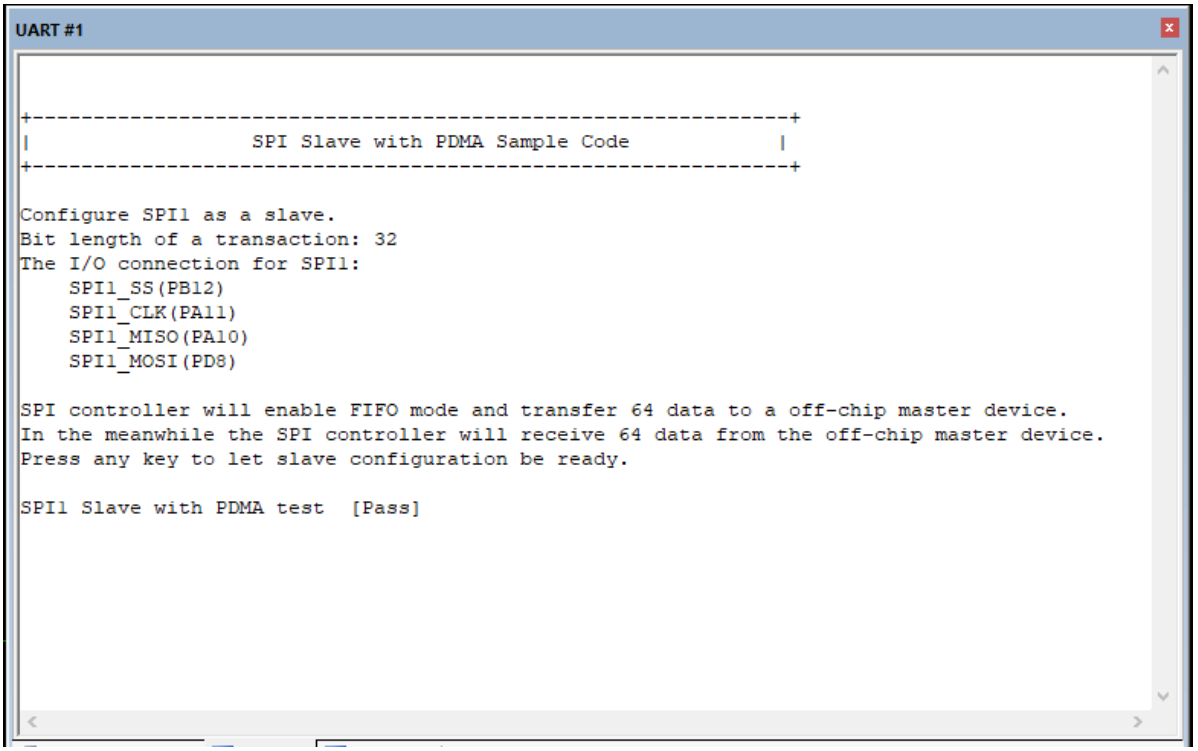
1.3 執行結果

執行結果，以及打印資料。

SPI Master傳輸結果如下



SPI Slave 傳輸結果如下



2 代碼介紹

SPI1 Master 使用 PDMA Basic 模式傳輸：

```
    /* Set SPI TX with PDMA configuration */
    PDMA_Open(1 << DMA_SPI1_TX);
    PDMA_SetTransferCnt(DMA_SPI1_TX, PDMA_WIDTH_8, PDMA_TEST_LENGTH);
    PDMA_SetTransferAddr(DMA_SPI1_TX, (uint32_t)u8SrcArray, PDMA_SAR_INC,
    (uint32_t)&SPI1->TX[0], PDMA_DAR_FIX);
    PDMA_EnableInt(DMA_SPI1_TX, PDMA_IER_BLKD_IE_Msk);
    PDMA2->CSR = (PDMA2->CSR & ~(PDMA_CSR_MODE_SEL_Msk) | (0x2 << PDMA_CSR_MODE_SEL_Pos));

    /* Set SPI RX with PDMA configuration */
    PDMA_Open(1 << DMA_SPI1_RX);
    PDMA_SetTransferCnt(DMA_SPI1_RX, PDMA_WIDTH_8, PDMA_TEST_LENGTH);
    PDMA_SetTransferAddr(DMA_SPI1_RX, (uint32_t)&SPI1->RX[0], PDMA_SAR_FIX,
    (uint32_t)u8DestArray, PDMA_DAR_INC);
    PDMA_EnableInt(DMA_SPI1_RX, PDMA_IER_BLKD_IE_Msk);
    PDMA3->CSR = (PDMA3->CSR & ~(PDMA_CSR_MODE_SEL_Msk) | (0x1 << PDMA_CSR_MODE_SEL_Pos));
    PDMA_GCR->PDSSR0 = 0x0FF2301;

    NVIC_EnableIRQ(PDMA_IRQn);

    /* Enable PDMA trigger function */
    PDMA_Trigger(DMA_SPI1_RX);
    PDMA_Trigger(DMA_SPI1_TX);

    /* Wait for slave */
    while (PA15 == 0);

    /* Enable SPI master DMA function */
    SPI_TRIGGER_RX_PDMA(SPI1);
    SPI_TRIGGER_TX_PDMA(SPI1);
```

SPI1 Slave 使用 PDMA Basic 模式傳輸：

```
    /* Set SPI TX with PDMA configuration */
    PDMA_Open(1 << DMA_SPI1_TX);
    PDMA_SetTransferCnt(DMA_SPI1_TX, PDMA_WIDTH_8, PDMA_TEST_LENGTH);
    PDMA_SetTransferAddr(DMA_SPI1_TX, (uint32_t)SrcArray, PDMA_SAR_INC,
    (uint32_t)&SPI1->TX[0], PDMA_DAR_FIX);
    PDMA_EnableInt(DMA_SPI1_TX, PDMA_IER_BLKD_IE_Msk);
    PDMA2->CSR = (PDMA2->CSR & ~(PDMA_CSR_MODE_SEL_Msk) | (0x2 << PDMA_CSR_MODE_SEL_Pos));

    /* Set SPI RX with PDMA configuration */
    PDMA_Open(1 << DMA_SPI1_RX);
    PDMA_SetTransferCnt(DMA_SPI1_RX, PDMA_WIDTH_8, PDMA_TEST_LENGTH);
    PDMA_SetTransferAddr(DMA_SPI1_RX, (uint32_t)&SPI1->RX[0], PDMA_SAR_FIX,
    (uint32_t)DestArray, PDMA_DAR_INC);
    PDMA_EnableInt(DMA_SPI1_RX, PDMA_IER_BLKD_IE_Msk);
    PDMA3->CSR = (PDMA3->CSR & ~(PDMA_CSR_MODE_SEL_Msk) | (0x1 << PDMA_CSR_MODE_SEL_Pos));
    PDMA_GCR->PDSSR0 = 0x0FF2301;

    NVIC_EnableIRQ(PDMA_IRQn);

    /* Enable PDMA trigger function */
    PDMA_Trigger(DMA_SPI1_RX);
    PDMA_Trigger(DMA_SPI1_TX);
```

```
    /* Enable SPI slave PDMA function */
    SPI_TRIGGER_RX_PDMA(SPI1);
    SPI_TRIGGER_TX_PDMA(SPI1);

    /* Sync with Master */
    PA15 = 1;
```

3 軟體與硬體環境

- **軟體環境**
  - BSP 版本
    - NUC123Series_BSP_CMSIS_v3.01.001
  - IDE 版本
    - Keil uVersion 5.26
- **硬體環境**
  - 電路元件
    - NuTiny-EVB-123-LQFP64 Ver1.0

4 目錄資訊

- EC_NUC123_SPI_WITH_PDMA_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
    - SmartcardLib — Smartcard library binary and header file
    - StdDriver — All peripheral driver header and source files
    - UsbHostLib — USB host library source code
  - 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 NUC123_SPI_WITH_PDMA_Master.uvproj 與 NUC123_SPI_WITH_PDMA_Slave.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
Sep. 20, 2019	1.00	1. 初始發佈.

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