用NUC200控制讀卡器PN512

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	本範例代碼使用 NUC200 SPI 接口控制讀卡器 PN512
BSP Version	NUC200 Series BSP CMSIS v3.00.004
Hardware	NuTiny-EVB-NUC200-LQFP100 V1.0

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1 功能描述

本範例代碼使用 NUC200 的 SPI0 初始化讀卡器 PN512，使用 NXP NFC 模塊的 Framework 實現對 PN512 的初始化和讀取卡片信息，通過串口將卡片信息打印出來。

本範例可以檢測並顯示卡的類型和 UID 信息。

該讀卡器支持 ISO/IEC 14443B，ISO/IEC 14443B。

2 代碼描述

首先配置 SPI0 用於於 PN512 進行通訊：

```
    phStatus_t phbalReg_Stub_OpenPort(
                                      phbalReg_Stub_DataParams_t * pDataParams
                                      )
    {
        /* Select HCLK as the clock source of SPI0 */
        CLK_SetModuleClock(SPI0_MODULE, CLK_CLKSEL1_SPI0_S_HCLK, MODULE_NoMsk);
        /* Enable SPI0 peripheral clock */
        CLK_EnableModuleClock(SPI0_MODULE);
        /* Setup SPI0 multi-function pins */
        GPIO_PIN_DATA(PORT2, PIN_SSEL) = SSEL_DEASR;  // CS on
        GPIOSetDir( PORT2, PIN_SSEL, SET_OUT );
        SYS->GPC_MFP = SYS_GPC_MFP_PC1_SPI0_CLK | SYS_GPC_MFP_PC2_SPI0_MISO0 |
SYS_GPC_MFP_PC3_SPI0_MOSI0;
        SYS->ALT_MFP = SYS_ALT_MFP_PC1_SPI0_CLK | SYS_ALT_MFP_PC2_SPI0_MISO0 |
SYS_ALT_MFP_PC3_SPI0_MOSI0;
        /* Configure as a master, clock idle low, 32-bit transaction, drive output on
falling clock edge and latch input on rising edge. */
        /* Set IP clock divider. SPI clock rate = 1MHz */
        SPI_Open(SPI0, SPI_MASTER, SPI_MODE_0, 8, 1000000);//10Mhz
        SPI_EnableFIFO(SPI0,4,4);


        return PH_ADD_COMPCODE(PH_ERR_SUCCESS, PH_COMP_BAL);
    }
```

初始化讀取不同卡片的循環組件：

```
phStatus_t DiscLoopInit( phacDiscLoop_Sw_DataParams_t   *pDataParams )    /* DataParams
representing the discovery loop */
{
    phStatus_t status;


    /* Set for poll and listen mode */
    status = phacDiscLoop_SetConfig( pDataParams,
        PHAC_DISCLOOP_CONFIG_MODE,
        DISCOVERY_MODE );
    CHECK_SUCCESS(status);


    /* Set for detection of TypeA, TypeB and Type F tags */
    status = phacDiscLoop_SetConfig(
        pDataParams,
```

```
        PHAC_DISCLOOP_CONFIG_DETECT_TAGS,
        POLL_TYPE
        );

    status = phacDiscLoop_SetConfig(pDataParams, PHAC_DISCLOOP_CONFIG_PAUSE_PERIOD_MS,
1000);
    CHECK_SUCCESS(status);

    /* Set number of polling loops to 5 */
    status = phacDiscLoop_SetConfig(pDataParams, PHAC_DISCLOOP_CONFIG_NUM_POLL_LOOPS, 5);
    CHECK_SUCCESS(status);

    /* Configure felica discovery */
    /* Set the system code to 0xffff */
    status = phacDiscLoop_SetConfig(pDataParams, PHAC_DISCLOOP_CONFIG_TYPEF_SYSTEM_CODE,
0xffff);
    CHECK_SUCCESS(status);
    /* Set the maximum number of Type F tags to be detected to 3 */
    status = phacDiscLoop_SetConfig(pDataParams, PHAC_DISCLOOP_CONFIG_TYPEF_DEVICE_LIMIT,
3);
    CHECK_SUCCESS(status);
    /* Set the polling limit for Type F tags to 5 */
    status = phacDiscLoop_SetConfig(pDataParams, PHAC_DISCLOOP_CONFIG_TYPEF_POLL_LIMIT,
5);
    CHECK_SUCCESS(status);
    /* Assign ATR response */
    discLoop.sTypeFTargetInfo.sTypeF_P2P.pAtrRes = bAtr_Res;
    /* Set ATR response length */
    status = phacDiscLoop_SetConfig(pDataParams,
PHAC_DISCLOOP_CONFIG_TYPEF_P2P_ATR_RES_LEN, bAtr_ResLength);
    }
```

循環檢測識別卡片類型和讀取卡片信息：

```
phStatus_t DiscLoopDemo( phacDiscLoop_Sw_DataParams_t  *pDataParams )
{
    phStatus_t    status=0;
    uint16_t      wTagsDetected=0;
    uint32_t      loop = 0;
    uint16_t      wNumberOfTags=0;
    uint8_t       bGtLen=0;    /* Gt length */
    PH_UNUSED_VARIABLE(bGtLen);
```

```
    while(1)
    {
        DEBUG_PRINTF1("Ready to detect.\n");

    status = phhalHw_FieldOff(pHal);
        status = phacDiscLoop_Start(pDataParams);

        if ((status & PH_ERR_MASK) == PH_ERR_SUCCESS)
        {
            /* Get the tag types detected info */
            status = phacDiscLoop_GetConfig(pDataParams,
PHAC_DISCLOOP_CONFIG_TAGS_DETECTED, &wTagsDetected);

            if (((status & PH_ERR_MASK) != PH_ERR_SUCCESS) || wTagsDetected ==
PHAC_DISCLOOP_NO_TAGS_FOUND)
            {
                phhalHw_FieldReset(&hal);
                continue;
            }
            DEBUG_PRINTF1 ("\n");

            LedOn();
            if (PHAC_DISCLOOP_CHECK_ANDMASK(wTagsDetected, PHAC_DISCLOOP_TYPEA_DETECTED))
            {
                if (wTagsDetected & PHAC_DISCLOOP_TYPEA_DETECTED_TAG_P2P)
                {
                    /* If Type F tag with P2P capability was discovered, do and P2P
exchange */
                  DEBUG_PRINTF1("\nType A with P2P has been detected");

                    status = phOsal_Timer_Wait(&osal, 1, 1000);
                    CHECK_SUCCESS(status);

                    status = phhalHw_FieldReset(&hal);
                    CHECK_SUCCESS(status);

                    /* Start the next polling cycle */
                    continue;
                }
                /* Get the number of Type A tags detected */
                status = phacDiscLoop_GetConfig(pDataParams,
PHAC_DISCLOOP_CONFIG_TYPEA_NR_TAGS_FOUND, &wNumberOfTags);
```

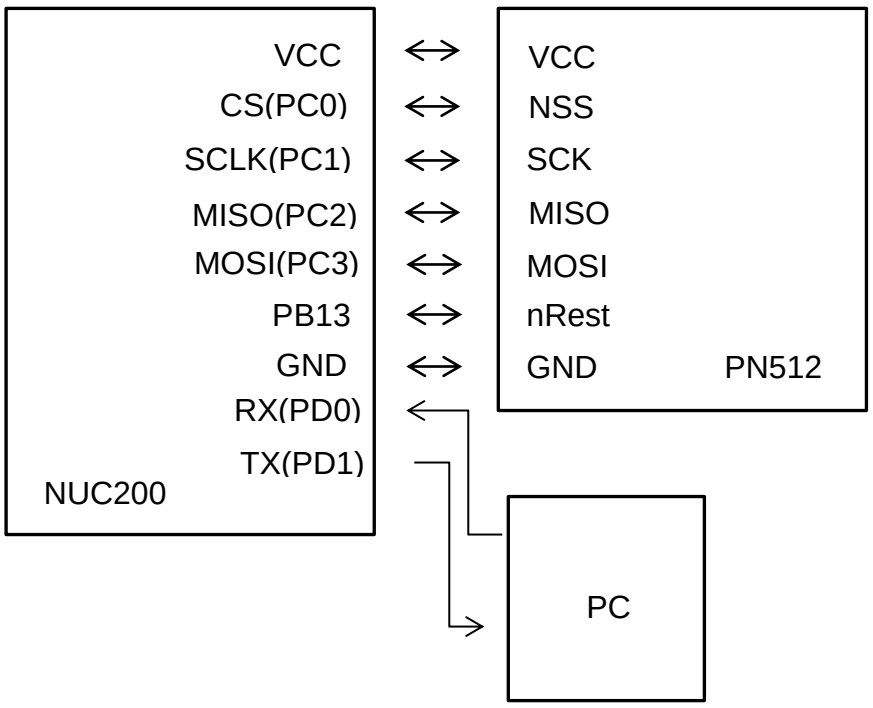
```
                CHECK_SUCCESS(status);


                /* Loop through all the Type A tags detected and print their UIDs */
                for (loop = 0; loop < wNumberOfTags; loop++)
                {
                 DEBUG_PRINTF1 ("\nCard %d",loop + 1);
                 DEBUG_PRINTF1 ("\nUID: ");
                 PRINT_BUFF(
                        pDataParams->sTypeATargetInfo.aTypeA_I3P3[loop].aUid,
                        pDataParams->sTypeATargetInfo.aTypeA_I3P3[loop].bUidSize
                        );
                 if(loop == 0)
                 {
                          DEBUG_PRINTF1("\nAtqa:");
                          PRINT_BUFF(
                              pDataParams->sTypeATargetInfo.aTypeA_I3P3[loop].aAtqa,
                              2
                              );
                          DEBUG_PRINTF1("\nSak:");
                          PRINT_BUFF(
                              pDataParams->sTypeATargetInfo.aTypeA_I3P3[loop].aSak,
                              1
                              );
                          DEBUG_PRINTF1 ("\n");
}
```

3 軟件和硬件環境

- **軟件環境**
  - BSP 版本
    - NUC200 Series BSP CMSIS v3.00.004
  - IDE 版本
    - Keil uVersion 4.6
- **硬件環境**
  - 電路元件
    - NuTiny-EVB-NUC200-LQFP100 V1.0
    - PN512
  - 示意圖

NUC200使用SPI0來與 PN512進行通訊，由PN512檢測並讀取卡片信息給NUC200，然後使用UART0來上報數據到PC端打印。



4 目錄信息

EC_NUC200_NFC_Card_Reader_PN512_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
ThirdParty	
PNEV512B-LPC1227-LPC1769-P2P_Classic_Polling-SPI-I2C	NXP Reader Library Framework

5 如何執行示例代碼

1. 根據目錄信息章節進入 ExampleCode 路徑中的 KEIL 文件夾，雙擊 “NUC200_NFC_Card_Reader_PN512”
2. 進入編譯模式界面
   a. 編譯
   b. 下載代碼到內存
   c. 進入/離開除錯模式
3. 進入除錯模式界面
   a. 執行代碼

6 修訂記錄

Date	Revision	Description
Oct.12, 2019	1.00	1. 初始發佈.

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