NUC123 as HID RFMouse through RF24L01

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	本範例代碼是 NUC123 通過 RF24L01 應用於無線鼠標
BSP Version	NUC123Series_BSP_CMSIS_v3.01.001
Hardware	NuTiny-EVB-123-LQFP64 V1.0

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1 功能描述

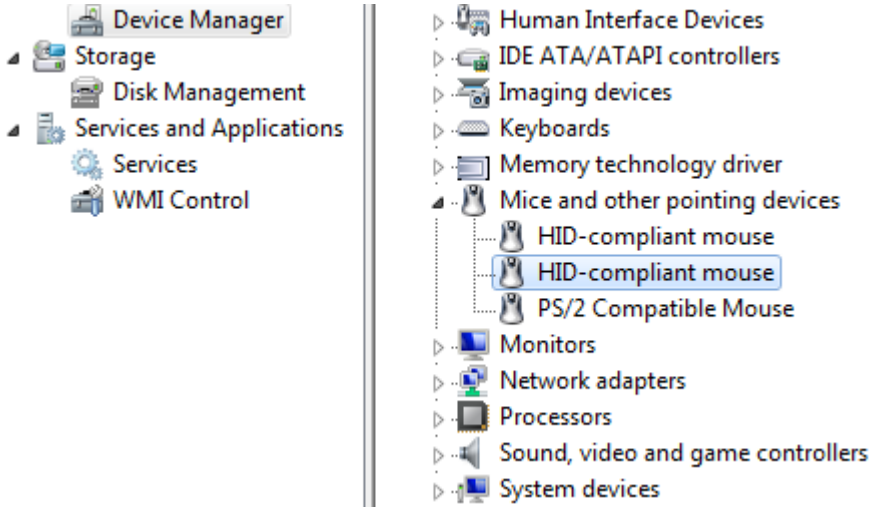
1.1 簡介

本範例代碼使用 SPI0 接口初始化 RF24L01,並使它作為接收模式，接收發送端發來的數據，當接收到 RF 數據後經過處理把對應的數據轉化成鼠標的移動方向值，通過 USB 把數據上傳 PC，控制鼠標的動作

使用一個定時器做記錄，如果50MS未收到數據，則進行跳頻一次

使用 IRQ(外部 GPIO)中斷，來檢測是否有收到數據，如果收到數據，則會產生 IRQ 中斷，在 IRQ 中斷裏，如果檢測到接收數據標誌，就去讀取數據，如果第壹個數據是 0xAA，則取判斷第二字節數據，並把它存到 RF 按鍵變量

1.2 執行結果



2 代碼描述

初始化 RF24L01 並設置為接收模式：

```
    void ifnnrf_rx_mode(void)
    {
       power_off();
     CE=0;
            SPI_Write_Buf(WRITE_REG + RX_ADDR_P0, TX_ADDRESS, TX_ADR_WIDTH); // Use the same address on the RX device as the TX device

            SPI_RW_Reg(WRITE_REG + EN_AA, 0x01);      // Enable Auto.Ack:Pipe0
            SPI_RW_Reg(WRITE_REG + EN_RXADDR, 0x01);  // Enable Pipe0
            SPI_RW_Reg(WRITE_REG + RF_CH, iCurCH);        // Select RF channel 40
            SPI_RW_Reg(WRITE_REG + RX_PW_P0, TX_PLOAD_WIDTH); // Select same RX payload width as TX Payload width
            SPI_RW_Reg(WRITE_REG + RF_SETUP, 0x27);   // TX_PWR:0dBm, Datarate:2Mbps, LNA:HCURR
            SPI_RW_Reg(WRITE_REG + CONFIG, 0x0f);     // Set PWR_UP bit, enable CRC(2 bytes) & Prim:RX. RX_DR enabled..

            CE = 1; // Set CE pin high to enable RX device

      //  This device is now ready to receive one packet of 16 bytes payload from a TX device sending to address
      //  '3443101001', with auto acknowledgment, retransmit count of 10, RF channel 40 and datarate = 2Mbps.

    }
```

接收 RF 數據 ：

```
void EINT0_IRQHandler(void)
{
      uint8_t u8_Status=0;
   /* For PB14, clear the INT flag */

   GPIO_CLR_INT_FLAG(PB, BIT14);
      u8_Status=SPI_Read(RF_STATUS);

       if(u8_Status&STA_MARK_TX)
       {

       }
       else if((u8_Status&STA_MARK_RX))
       {
```

```
                SPI_Read_Buf(RD_RX_PLOAD,rx_buf,TX_PLOAD_WIDTH);
                  if (rx_buf[0] == 0xAA) {
              uTestRevKey=rx_buf[1];
            } else if (rx_buf[0] == 0x55)  {
              uTestRevCount1++;
            }
            rx_buf[0] = 0;
                        uRevFlag = 1;
          }

          SPI_RW_Reg(WRITE_REG+RF_STATUS,0xff);

}
```

將數據通過 USB 上傳到 PC ：

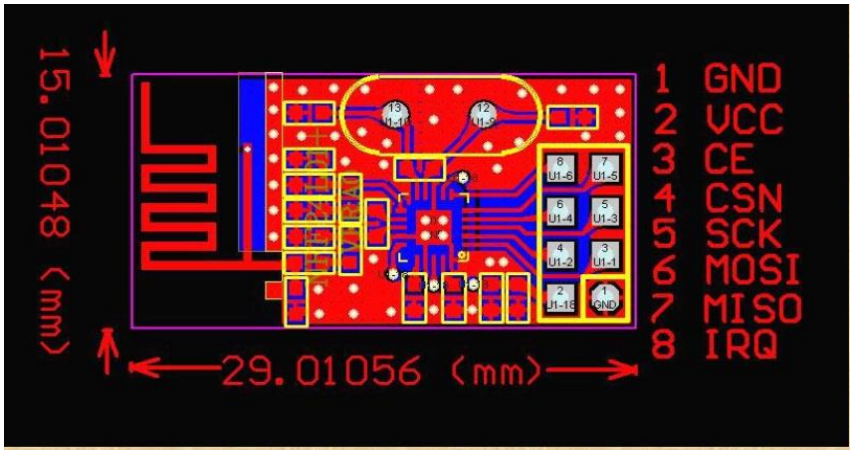
```
if (g_u8EP2Ready)
   {
      buf = (int8_t *)(USBD_BUF_BASE + USBD_GET_EP_BUF_ADDR(EP2));
      mouse_mode ^= 1;

      if (mouse_mode)
      {
         if (move_len > 14)
         {
            /* Update new report data */
            /* To control Y axis */
            if ((u32Reg & 1))
               buf[2] = -16;
            else if ((u32Reg & 2))
               buf[2] = 16;

            /* To control X axis */
            if ((u32Reg & 0x4))
               buf[1] = -16;
            else if ((u32Reg & 0x8))
               buf[1] = 16;

            /* Mouse key */
            u32MouseKey = 0;
```

```
            if ((u32Reg & 0x10))
                u32MouseKey |= 1; /* Left key */

            if ((u32Reg & 0x20))
                u32MouseKey |= 2; /* Right key */

            /* Update new report data */
            buf[0] = u32MouseKey;
            buf[3] = 0x00;
            move_len = 0;
        }
    }
    else
    {
        buf[0] = buf[1] = buf[2] = buf[3] = 0;
    }

    move_len++;
    g_u8EP2Ready = 0;
    /* Set transfer length and trigger IN transfer */
    USBD_SET_PAYLOAD_LEN(EP2, 4);
}
```

3 軟件和硬件環境

- **軟件環境**
  - BSP 版本
    - NUC123Series_BSP_CMSIS_v3.01.001
  - IDE 版本
    - Keil uVersion 4.6
- **硬件環境**
  - 電路元件
    - NuTiny-EVB-123-LQFP64 V1.0
    - RF24L01
  - 示意圖

RF24L01 模塊示意圖



硬件連接采用 NuTiny-EVB-123-LQFP64 SPI0 與 RF24L01 模組連接

VCC	↔	VCC（PIN2）
GPIO (PB.8)	↔	CE（PIN3）
SPI_SS0 (PC.0)	↔	CSN（PIN4）
SPI_CLK0 (PC.1)	→	SCK（PIN5）
SPI_MOSI_0(PC.3)	↔	MOSI（PIN6）
SPI_MISO_0(PC.2)	↔	MISO(PIN7)
INT(PB.14)	←	IRQ(PIN8)
GND	↔	GND(PIN1)
NUC123		RF24L01

4 目錄信息

- EC_NUC123_HID_RFMouse_With_RF24L01_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 NUC123_HID_RFMouse_With_RF24L01.uvproj。
2. 進入編譯
   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.18, 2019	1.00	1. 初始發佈

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