NUC123 as HID RFMouse through RF24L01

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	本范例代码是 NUC123 通过 RF24L01 应用于无线鼠标
BSP Version	NUC123Series_BSP_CMSIS_v3.01.001
Hardware	NuTiny-EVB-123-LQFP64 V1.0

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

1 功能描述

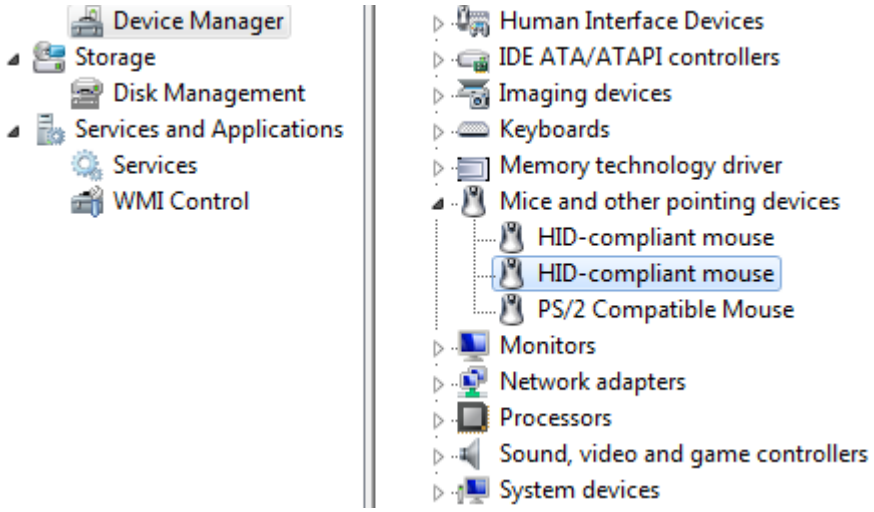
1.1 简介

本范例代码使用 SPI0 接口初始化 RF24L01,并使它作为接收模式，接收发送端发来的数据，当接收到 RF 数据后经过处理把对应的数据转化成鼠标的移动方向值，通过 USB 把数据上传 PC，控制鼠标的动作。

使用一个定时器做记录，如果50MS未收到数据，则进行跳频一次。

使用 IRQ(外部 GPIO)中断，来检测是否有收到数据，如果收到数据，则会产生 IRQ 中断，在 IRQ 中断里，如果检测到接收数据标志，就去读取数据，如果第一个数据是 0xAA，则取判断第二字节数据，并把它存到 RF 按键变量

1.2 执行结果



2 代码描述

初始化 RF24L01 并设置为接收模式：

```
    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 数据：

```
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);

}
```

将数据通过 USB 上传到 PC：

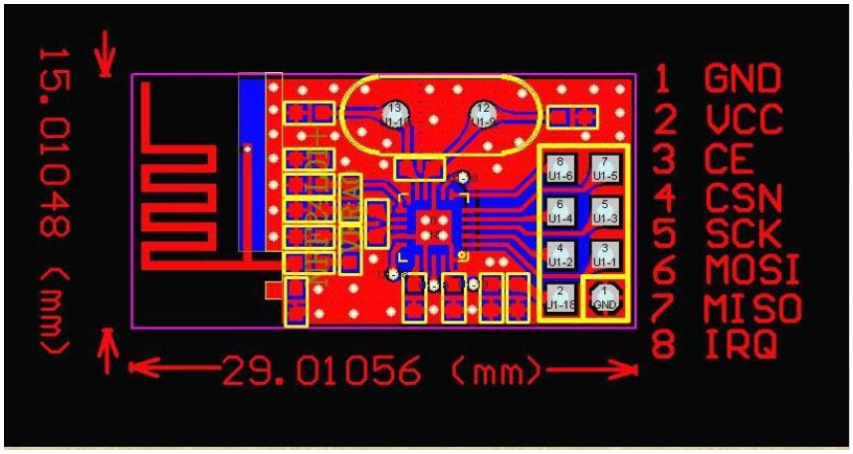
```
if (g_u8EP2Ready)
   {
      buf = (int8_t *)(USBD_BUF_BASE + USBD_GET_EP_BUF_ADDR(EP2));
      mouse_mode ^= 1;

      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 软件和硬件环境

- **软件环境**
  - BSP 版本
    - NUC123Series_BSP_CMSIS_v3.01.001
  - IDE 版本
    - Keil uVersion 4.6
- **硬件环境**
  - 电路元件
    - NuTiny-EVB-123-LQFP64 V1.0
    - RF24L01
  - 示意图

RF24L01 模块示意图。



硬件连接采用 NuTiny-EVB-123-LQFP64 SPI0 与 RF24L01 模组连接

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 目录信息

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 如何执行示例代码

1. 根据目录信息章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 NUC123_HID_RFMouse_With_RF24L01.uvproj。
2. 进入编译模式界面
   a. 编译
   b. 下载代码到内存
   c. 进入/离开除错模式
3. 进入除错模式界面
   a. 执行代码

6 修订纪录

Date	Revision	Description
Oct.18, 2019	1.00	1. 初始发布.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.