NUC240使用I²C驱动DS3231

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	本范例代码使用NUC240的I²C驱动DS3231
BSP 版本	NUC230_240 Series BSP CMSIS v3.01.001
开发平台	NuEdu-EVB-NUC240 v1.0

1 功能介绍

1.1 简介

本范例代码使用I²C接口，去读写DS3231缓存器，达成显示时钟功能。本范例提供了2个API，让使用者呼叫：

API	功能
void DS3231_RTC_Write(uint8_t u8Reg, uint8_t u8Value)	写入DS3231缓存器
uint8_t DS3231_RTC_Read(uint8_t u8Reg)	读取DS3231缓存器

1.2 原理

DS3231特点如下：

- 是低成本、高精度 I²C 实时时钟(RTC)。
- 保存秒、分、时、星期、日期、月和年信息。
- I²C 界面。
- 0~40 ℃范围内，精度正负 2 ppm；-40~85 ℃范围内，精度正负 3.5 ppm。

1.3 执行结果

NUC240开发版的PA9 (SCK)连接至DS3231的SCL；PA8 (SDA)连接至DS3231的SDA。编译项目并进入除错模式执行代码，DS3231时间数值会打印在串口窗口 UART #1。

```
19/11/5 15: 58: 02
19/11/5 15: 58: 03
19/11/5 15: 58: 04
19/11/5 15: 58: 05
19/11/5 15: 58: 06
19/11/5 15: 58: 07
19/11/5 15: 58: 08
19/11/5 15: 58: 09
19/11/5 15: 58: 10
19/11/5 15: 58: 11
19/11/5 15: 58: 12
19/11/5 15: 58: 13
19/11/5 15: 58: 14
```

2 代码介绍

2.1 写入 DS3231 缓存器值

DS3231_RTC_Write此函式主要工作为写入DS3231缓存器的值，在初始化时可利用此函式来设定起始的时间。

```
void DS3231_RTC_Write(uint8_t u8Reg, uint8_t u8Value)
{
    /* DS3231 I2C slave address */
    g_u8DeviceAddr = 0x68;

    /* DS3231 address map */
    g_au8TxData[0] = u8Reg;

    /* Write data to DS3231 */
    g_au8TxData[1] = dec_to_bcd(u8Value);
    g_u8DataLen = 0;
    g_u8EndFlag = 0;

    /* I2C function to write data to slave */
    s_I2C0HandlerFn = (I2C_FUNC)I2C_MasterTx;

    /* I2C as master sends START signal */
    I2C_SET_CONTROL_REG(I2C0, I2C_I2CON_STA);

    /* Wait I2C Tx Finish */
    while (g_u8EndFlag == 0);

    g_u8EndFlag = 0;
}
```

2.2 读取 DS3231 缓存器值

DS3231_RTC_Read 此函式主要工作为读取DS3231缓存器的值，本范例程序在主程序中更新最新读取的时间。

```
uint8_t DS3231_RTC_Read(uint8_t u8Reg)
{
```

```
    /* DS3231 I2C slave address */
    g_u8DeviceAddr = 0x68;

    /* DS3231 address map */
    g_au8TxData[0] = u8Reg;

    g_u8DataLen = 0;
    g_u8EndFlag = 0;

    /* I2C function to read data from slave */
    s_I2C0HandlerFn = (I2C_FUNC)I2C_MasterRx;

    /* I2C as master sends START signal */
    I2C_SET_CONTROL_REG(I2C0, I2C_I2CON_STA);

    /* Wait I2C Rx Finish */
    while (g_u8EndFlag == 0);

    g_u8EndFlag = 0;

    return bcd_to_dec(g_u8RxData);
}
```

3 软件与硬件环境

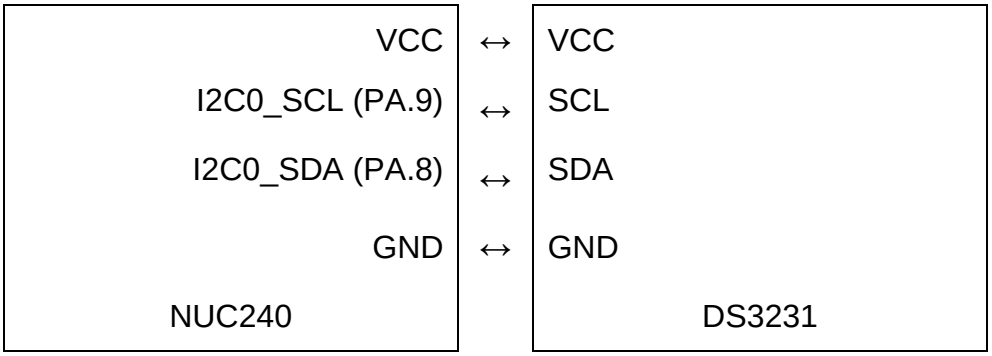
● 软件环境

- ■ BSP 版本
  - ◆ NUC230_240 Series BSP CMSIS v3.01.001
- ■ IDE 版本
  - ◆ Keil uVersion 4.74

● 硬件环境

- ■ 电路组件
  - ◆ NuEdu-EVB-NUC240 V1.0
  - ◆ DS3231
- ■ 示意图

NUC240使用I^{2}C脚位读写DS3231的缓存器值。



4 目录信息

- EC_ NUC240_I2C_DS3231_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
    - NuEdu — Library for NuEdu-SDK-NUC240 board
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code

5 如何执行范例程序

1. 根据目录信息章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 NUC240_I2C_DS3231.uvproj。
2. 进入编译模式接口
   a. 编译
   b. 下载代码至内存
   c. 进入 / 离开除错模式
3. 进入除错模式接口
   a. 执行代码

6 修订纪录

Date	Revision	Description
Nov. 1, 2019	1.00	1. 初始发布

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