唤醒时延迟进入中断服务

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	使用 TIMER 唤醒系统并延迟进入中断服务，先执行主程式。
BSP 版本	M051 Series BSP CMSIS v3.01.002
开发平台	NuTiny-EVB-M051_V3.0

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 功能介绍

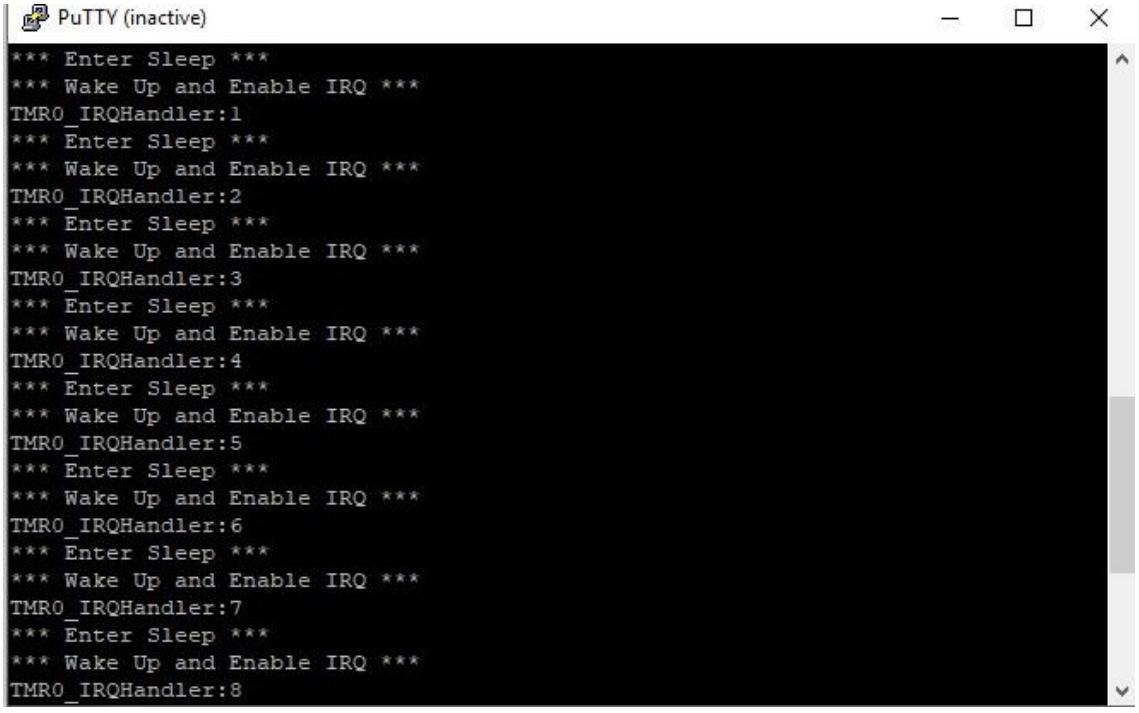
1.1 简介

正常情况下，省电模式被唤醒时，会先进入中断服务程式，再执行唤醒后主程式尚未执行的部分。此范例是透过ARM提供的指令，让系统在省电模式被唤醒后，延迟进入中断服务，先执行主程式，再执行中断服务程式的实现。

1.2 原理

首先设定计数器(TIMER0)的周期计数中断模式与中断唤醒。开启计数器后，使用ARM提供的禁用中断指令，然后系统进入省电模式。等待计数器计数周期到，产生中断唤醒系统后，使用ARM提供的启用中断指令来进入中断服务程序。

1.3 执行结果



2 代码介绍

TIMER 中断服务程式，清除中断旗标与唤醒旗标，印出进入中断服务程式的次数：

```
void TMR0_IRQHandler(void)
{
    if (TIMER_GetIntFlag(TIMER0) == 1)
    {
        /* Clear Timer0 time-out interrupt flag */
        TIMER_ClearIntFlag(TIMER0);
        TIMER_ClearWakeupFlag(TIMER0);

        g_au32TMRINTCount[0]++;
        printf("TMR0_IRQHandler:%d\n", g_au32TMRINTCount[0]);
    }
}
```

设定 TIMER 唤醒功能与对应的中断服务程式，以此唤醒系统：

```
/* Open Timer0 frequency to 1 Hz in periodic mode, and enable interrupt */
TIMER_Open(TIMER0, TIMER_PERIODIC_MODE, 1);
TIMER_EnableInt(TIMER0);
TIMER_EnableWakeup(TIMER0);
/* Enable Timer0 NVIC */
NVIC_EnableIRQ(TMR0_IRQn);
/* Start Timer0 counting */
TIMER_Start(TIMER0);
```

使用中断服务开关指令并印出程式执行的时间点：

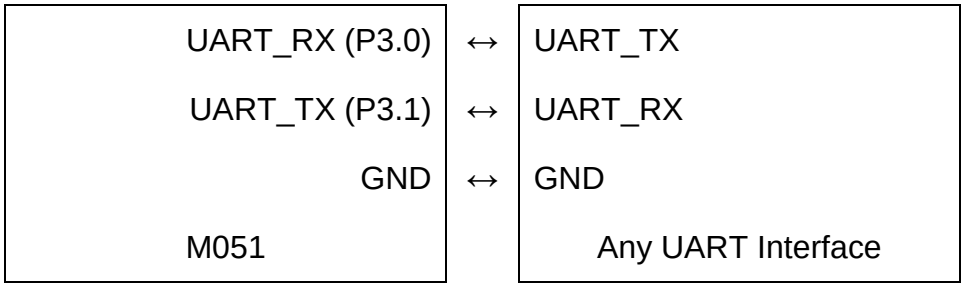
```
    __disable_irq();

    printf("*** Enter Sleep ***\n");
    UART_WAIT_TX_EMPTY(UART0);
    CLK_PowerDown();

    printf("*** Wake Up and Enable IRQ ***\n");
    __enable_irq();
```

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - M051 Series BSP CMSIS v3.01.002
  - IDE 版本
    - Keil uVersion 5.26
- 硬件环境
  - 电路组件
    - NuTiny-EVB-M051_V3.0
  - 示意图



4 目录信息

EC_M051_Pending_IRQ_On_WakeUp_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 M051_Pending_IRQ_On_WakeUp.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
Aug. 30, 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.