PWM 触发 PWM

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	当 PWMA channel 0 输出高电平时， 使能 PWMA channel 2 输出波形
BSP 版本	NUC230/240 Series BSP v3.01.002
开发平台	NUC240VE3AN NuEdu Board V2.0

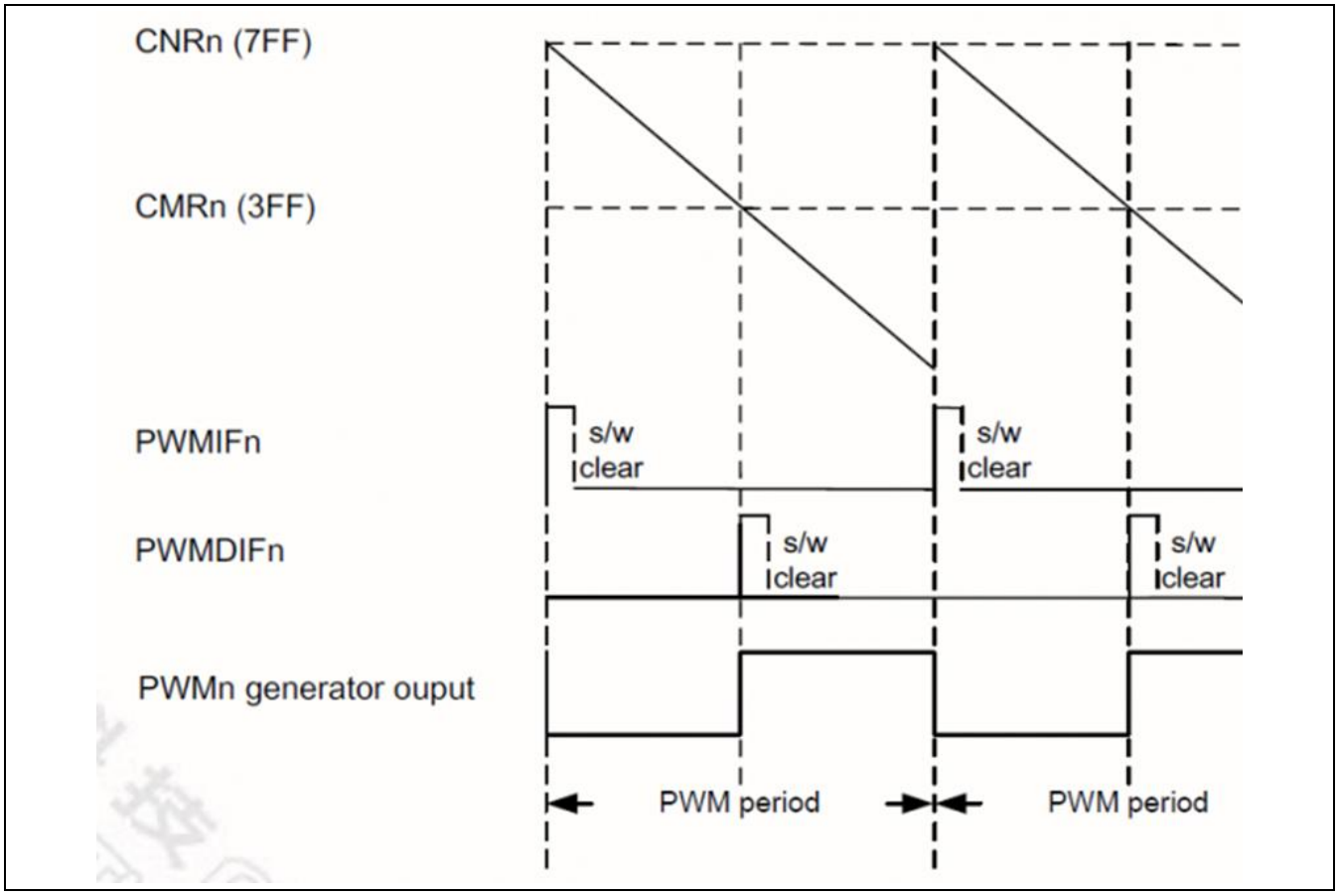
1 功能介绍

1.1 简介

此范例程序是利用 PWMA 信道 0 来触发 PWMA 通道 2。当通道 0 输出高电平时，会使能通道 2 输出波形，而当通道 0 输出低电平时，会禁能通道 2 输出波形，此时通道 2 会输出低电平。

1.2 原理

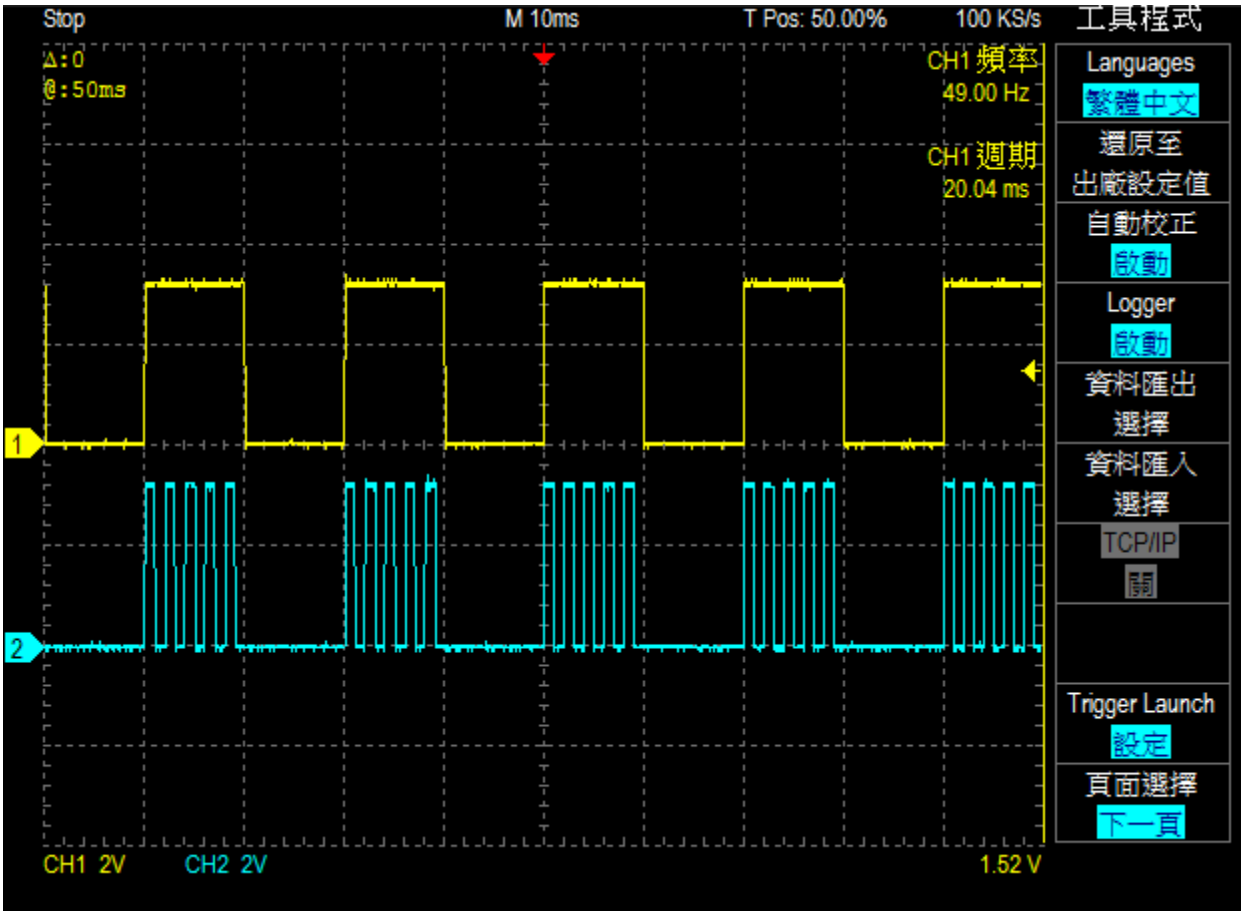
实作会使用到 PWMA 的两个中断，占空比中断和周期中断。由TRM所提供的中断示意图，如下图所示：



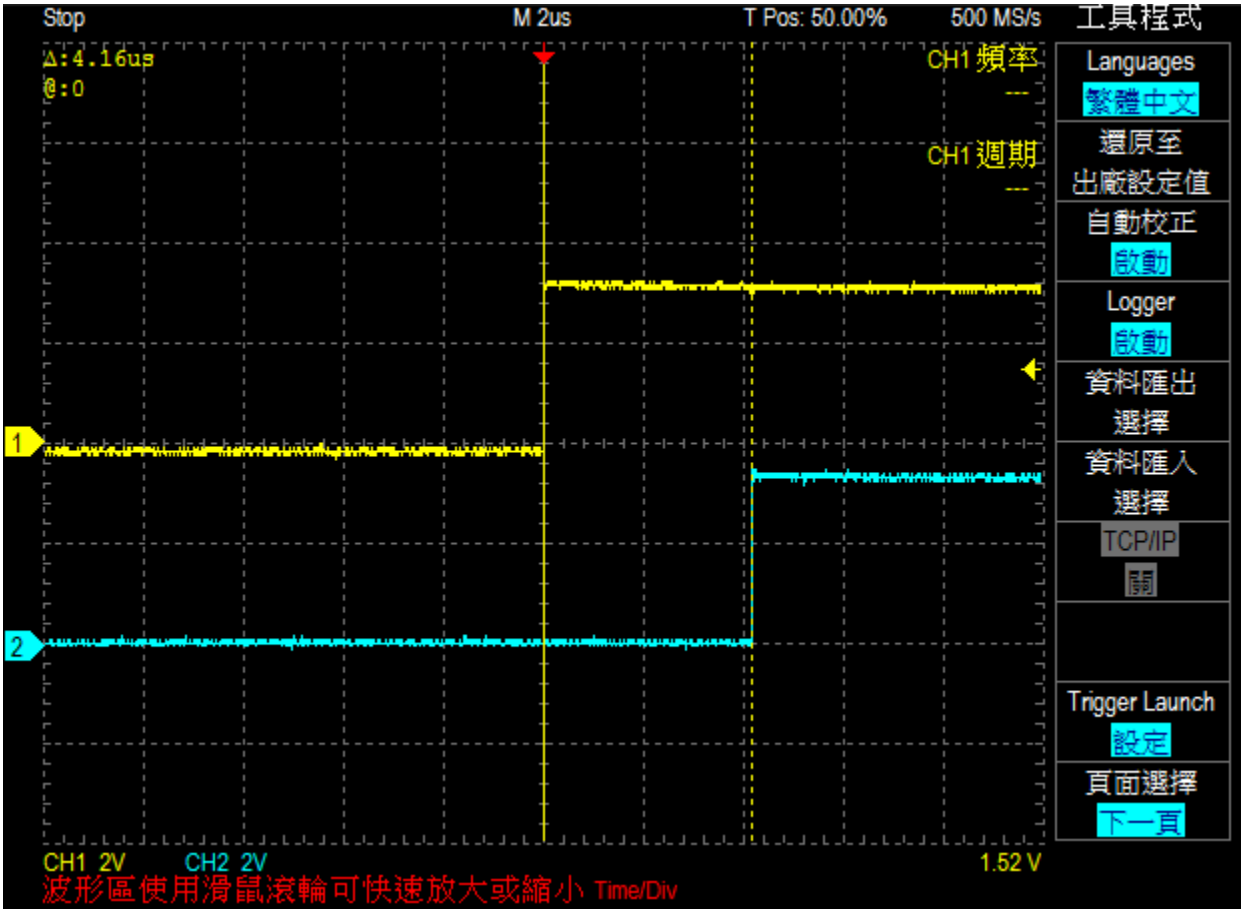
PDR register 是用来显示当前 PWM 信道的计数值，当 PWMA 通道 0 的PDR register 的值重载为 CNR register 的值时,会产生周期中断；当 PDR register 的值等于CMR register 的值时，可以产生占空比中断。我们可以使用这两个中断。当发生占空比中断进入中断处理的时候，就可以使能 PWMA 通道 2；当发生周期中断进入中断处理的时候，则可以禁能 PWMA 通道 2 。

1.3 执行结果

实际产生的波形如下：
黄色为 PWMA 信道 0, 频率 50 赫兹, 占空比 50；
蓝色为 PWMA 信道 2, 频率 500 赫兹, 占空比 50。



但是两个通道之间是会有一点延迟，大约是 4.16 us，如下图所示。


Stop
M 2us
T Pos: 50.00%
500 MS/s
工具程式
Δ:4.16us
@:0
CH1 頻率

CH1 週期

Languages
繁體中文
還原至
出廠設定值
自動校正
啟動
Logger
啟動
資料匯出
選擇
資料匯入
選擇
TCP/IP
關
Trigger Launch
設定
頁面選擇
下一頁
1
2
CH1 2V
CH2 2V
1.52 V
波形區使用滑鼠滾輪可快速放大或縮小 Time/Div

2 代码介绍

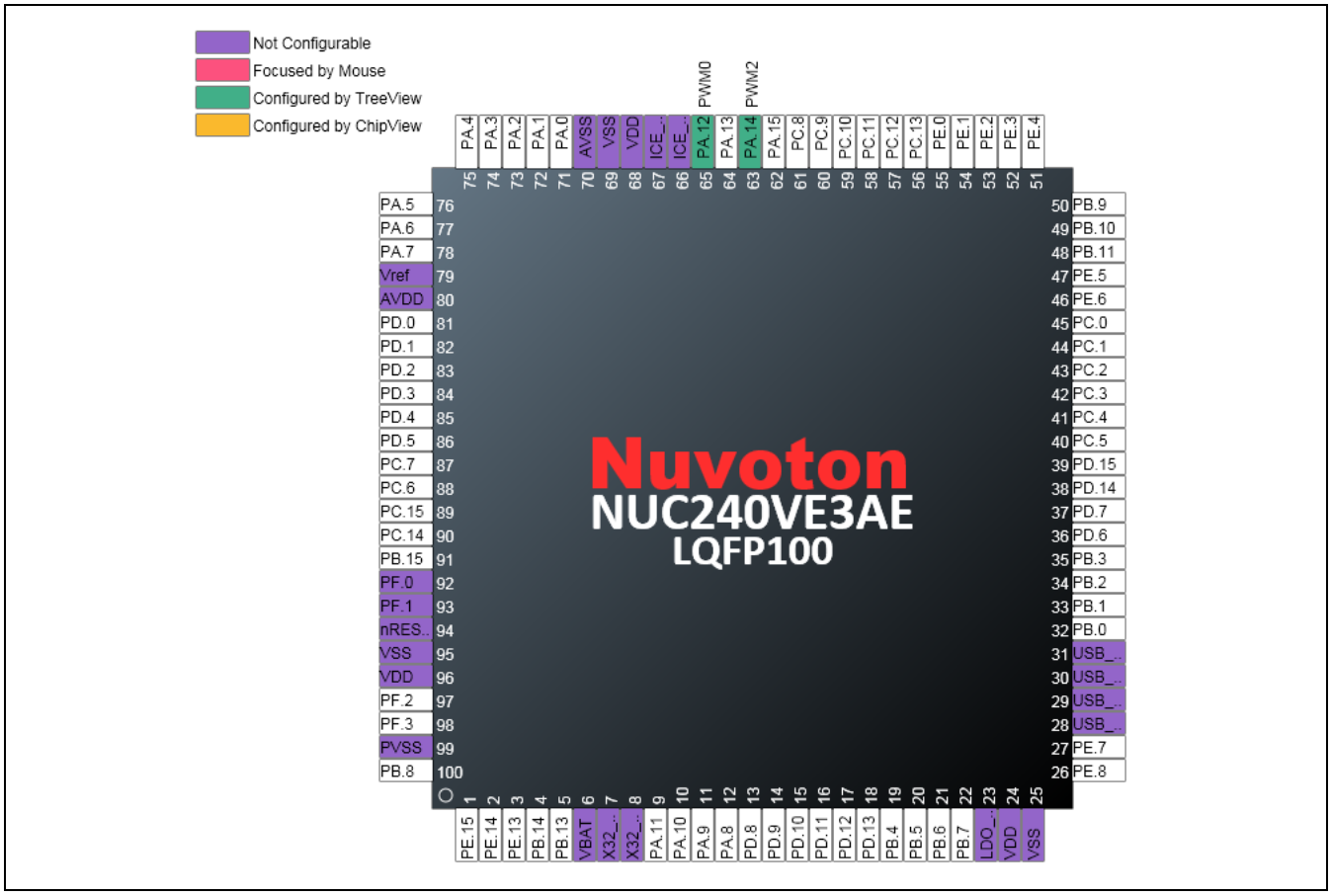
范例程序如下：

```
/* PWMA IRQ handler */
void PWMA_IRQHandler(void)
{
    /* Check period interrupt of PWMA channel 0 */
    if (PWM_GetPeriodIntFlag(PWMA, 0))
    {
        /* Stop PWMA channel 2 */
        PWMA->PCR &= ~PWM_PCR_CH2EN_Msk;
        /* Clear period interrupt flag of PWMA channel 0 */
        PWM_ClearPeriodIntFlag(PWMA, 0);
    }

    /* Check duty interrupt of PWMA channel 0 */
    if (PWM_GetDutyIntFlag(PWMA, 0))
    {
        /* Stat PWMA channel 2 */
        PWMA->PCR |= PWM_PCR_CH2EN_Msk;
        /* Clear duty interrupt flag of PWMA channel 0 */
        PWM_ClearDutyIntFlag(PWMA, 0);
    }
}

/*---------------------------------------------------------------------------------------------*/
/*  Main Function                                                                              */
/*---------------------------------------------------------------------------------------------*/
int32_t main(void)
{
    /* Unlock protected registers */
    SYS_UnlockReg();

    /* Init System, IP clock and multi-function I/O */
    SYS_Init();

    /* Lock protected registers */
    SYS_LockReg();

    /* set PWMA channel 0 and channel 2 output configuration */
```

```
    /* PWMA channel 0: output frequency is 50 Hz, and duty cycle is 50% */
    PWM_ConfigOutputChannel(PWMA, PWM_CH0, 50, 50);
    /* PWMA channel 2: output frequency is 500 Hz, and duty cycle is 50% */
    PWM_ConfigOutputChannel(PWMA, PWM_CH2, 500, 50);

    /* PWMA channel 2 output polar inverse */
    PWMA->PCR |= 0x00020000;

    /* Enable PWM Output path for PWMA channel 0 and channel 2 */
    PWM_EnableOutput(PWMA, 0x5);

    /* Enable PWM channel 0 period interrupt and duty interrupt */
    PWMA->PIER = PWM_PIER_PWMIE0_Msk | PWM_PIER_PWMDIE0_Msk;

    /* Enable PWMA NVIC interrupt */
    NVIC_EnableIRQ(PWMA_IRQn);

    /* Start PWM */
    PWM_Start(PWMA, 0x5);

    while (1);

}
```

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - NUC230/240 Series BSP v3.01.002
  - IDE 版本
    - Keil uVersion 5.26
- 硬件环境
  - 电路组件
    - NUC240VE3AN NuEdu Board V2.0
  - 示意图
    - PWM0: PA12, 为 PWMA channel 0 的输出脚位
    - PWM2: PA14, 为 PWMA channel 2 的输出脚位



4 目录信息

- EC_ NUC240_PWM_Trigger_PWM _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 NUC240_PWM_Trigger_PWM.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
Jul. 30, 2019	1.00	1. 初始发布.

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