使用外部讯号当作HXT时钟源

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	本范例代码使用外部讯号当作HXT时钟源并且经除频后输出至CLKO脚位
BSP 版本	M480 Series BSP CMSIS V3.04.000
开发平台	NuMaker-PFM-M487 Ver 3.0

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1 功能介绍

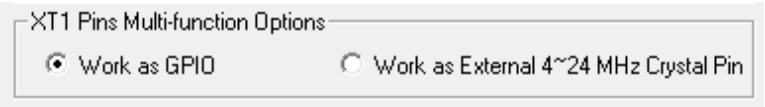
1.1 简介

在此范例程序，从外部脚位XT1_IN(PF.3)输入方波当作HXT的时钟源，并经除频后输出至CLKO(PC.13)给其他周边组件使用，以实现同步不同组件之间频率的功能。而此时XT1_OUT可当作GPIO使用。

开启此功能必须设定configuration缓存器的CFGXT1 (CONFIG0[27])，即为HXT使用外部时钟源模式。其缓存器介绍如下。

[27]	**CFGXT1**	**HXT Mode Selection** 0 = HXT work as external clock mode. PF.3 is configured as external clock input pin. 1 = HXT work as crystal mode. PF.2 and PF.3 are configured as external high speed crystal (HXT) pins. **Note:** When CFGXT1 = 0, PF.3 MFP should be set as GPIO mode. The DC characteristic of XT1_IN is the same as GPIO.

可使用KEIL开发环境进行此设定，流程为Project → Options for Target → Utilities → Settings → Configure，并在以下图示勾选Work as GPIO。

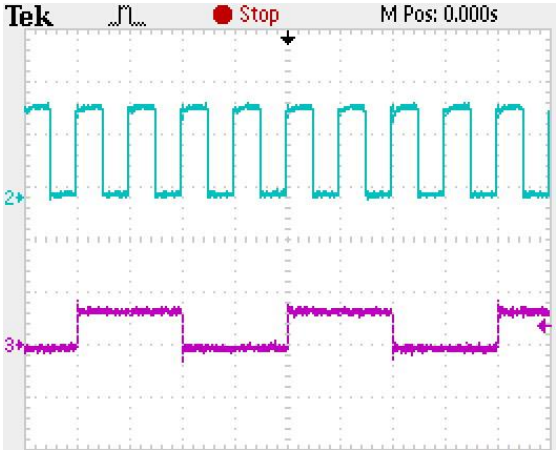


1.2 执行结果

首先需要移除NuMaker-PFM-M487上晶振，并使用示波器撷取XT1_IN(PF.3)和CLKO(PC.13)的讯号。

蓝色线(CH2)为输入XT1_IN之1KHz方波。

紫色线(CH3)为CLKO输出之250Hz方波。



2 代码介绍

首先把外部高速晶振所需要用的脚位(XT1_OUT，XT1_IN)设定为GPIO输入模式，并且开启外部高速晶振；接着设定输出时钟CLKO为HXT除四，其程序代码如下：

```
    /* Set GPIO operation mode */
    GPIO_SetMode(PF, (BIT2|BIT3),  GPIO_MODE_INPUT);

    /* Set GPF multi-function pins for XT1 IN and OUT */
    SYS->GPF_MFPL &= ~(SYS_GPF_MFPL_PF3MFP_Msk | SYS_GPF_MFPL_PF2MFP_Msk);
    SYS->GPF_MFPL |= (SYS_GPF_MFPL_PF3MFP_GPIO | SYS_GPF_MFPL_PF2MFP_GPIO);

    /* Enable HXT clock */
    CLK_EnableXtalRC(CLK_PWRCTL_HXTEN_Msk);

    /* Wait for HXT clock ready */
    CLK_WaitClockReady(CLK_STATUS_HXTSTB_Msk);

    /* Set core clock as HCLK_CLOCK */
    CLK->CLKSEL0 = (CLK->CLKSEL0 & (~CLK_CLKSEL0_HCLKSEL_Msk)) | CLK_CLKSEL0_HCLKSEL_HXT;

    /* Output selected clock to CKO, CKO Clock = HCLK / 2^(1 + 1) */
    CLK_EnableCKO(CLK_CLKSEL1_CLKOSEL_HXT, 1, 0);

    /* Set PC multi-function pins for CLKO(PC.13) */
    SYS->GPC_MFPH &= ~SYS_GPC_MFPH_PC13MFP_Msk;
    SYS->GPC_MFPH |= SYS_GPC_MFPH_PC13MFP_CLKO;
```

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - M480 Series BSP CMSIS V3.04.000
  - IDE 版本
    - Keil uVersion 5.26
- 硬件环境
  - 电路组件
    - NuMaker-PFM-M487 or other M480 Development Board
  - 示意图

    从XT1_IN(PF.3)输入方波作为HXT的时钟源，并输出至CLKO脚位(PC.13)。

4 目录信息

- EC_M480_ HXT_ExtClk _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 HXT_ExtClk.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
Oct. 1, 2019	1.00	1. 初始发布.

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