使用外部訊號當作HXT時鐘源

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

代碼簡述	本範例代碼使用外部訊號當作HXT時鐘源並且經除頻後輸出至CLKO腳位
BSP 版本	M480 Series BSP CMSIS V3.04.000
開發平台	NuMaker-PFM-M487 Ver 3.0

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1 功能介紹

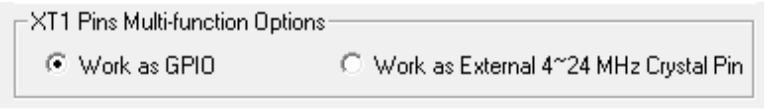
1.1 簡介

在此範例程式，從XT1_IN(PF.3)輸入方波當作HXT的時鐘源，並經除頻後輸出至CLKO(PC.13)給其他周邊元件使用，以實現同步不同元件之間頻率的功能。而此時XT1_OUT可當作GPIO使用。

開啟此功能必須設定configuration暫存器的CFGXT1 (CONFIG0[27])，即為HXT使用外部時鐘源模式。其暫存器介紹如下。

[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開發環境進行此設定，流程為Project → Options for Target → Utilities → Settings → Configure，並在以下圖示勾選Work as GPIO。

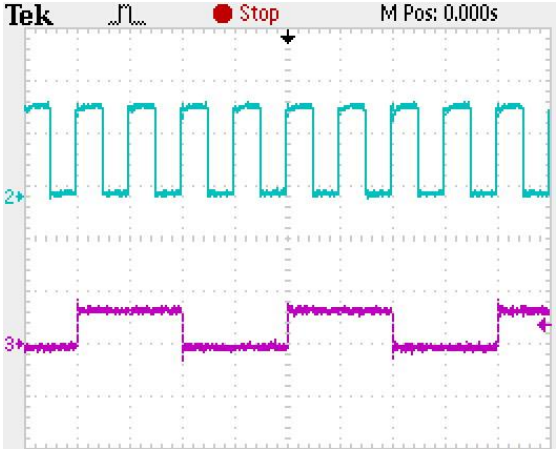


1.2 執行結果

首先需要移除NuMaker-PFM-M487上晶振，並使用示波器擷取XT1_IN(PF.3)和CLKO(PC.13)的訊號。

藍色線(CH2)為輸入XT1_IN之1KHz方波。

紫色線(CH3)為CLKO輸出之250Hz方波。



2 代碼介紹

首先把外部高速晶振所需要用的腳位(XT1_OUT, XT1_IN)設定為GPIO輸入模式，並且開啟外部高速晶振；接著設定輸出時鐘CLKO為HXT除四，其程式碼如下：

```
    /* 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 軟體與硬體環境

- **軟體環境**
  - BSP 版本
    - M480 Series BSP CMSIS V3.04.000
  - IDE 版本
    - Keil uVersion 5.26
- **硬體環境**
  - 電路元件
    - NuMaker-PFM-M487 or other M480 Development Board
  - 示意圖

    從XT1_IN(PF.3)輸入方波作為HXT的時鐘源，並輸出至CLKO腳位(PC.13)。

4 目錄資訊

- 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 如何執行範例程式

1. 根據目錄資訊章節進入 ExampleCode 路徑中的 KEIL 資料夾，雙擊 HXT_ExtClk.uvproj
2. 進入編譯模式介面
   a. 編譯
   b. 下載代碼至記憶體
   c. 進入 / 離開除錯模式
3. 進入除錯模式介面
   a. 執行代碼

6 修訂紀錄

Date	Revision	Description
Oct. 1, 2019	1.00	1. 初始發布.

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