Use external signal as HXT clock source

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	This sample code uses the external signal as the HXT clock source and is divided and output to the CLKO pin.
BSP Version	M480 Series BSP CMSIS V3.04.000
Hardware	NuMaker-PFM-M487 Ver 3.0

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1 Function Description

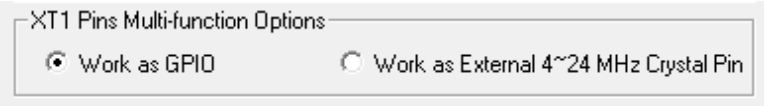
1.1 Introduction

In this example program, the input square wave to XT1_IN (PF.3) is used as the clock source of HXT, and after frequency division, it is output to CLKO (PC.13) for use by other peripheral components to synchronize the frequency between different components. At this time, XT1_OUT can be used as GPIO.

To enable this function, the CFGXT1 (CONFIG0[27]) of the configuration register must be set. It is described below.

[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.

You can use the KEIL development environment to make this setting. The process is Project → Options for Target → Utilities → Settings → Configure, and check Work as GPIO.



1.2 Demo Result

First, users should remove the crystal on the NuMaker-PFM-M487 board.

The demo result is shown as figure as follows.

CH2 is a square wave with a frequency of 1KHz input from HXT_IN.

CH3 is a square wave with a frequency of 250Hz input from CKO.

2 Code Description

First set the HXT pin (XT1_OUT, XT1_IN) to the GPIO input mode, and turn on HXT; then set the output clock CLKO to HXT divided by four, the code is as follows:

```
/* 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 Software and Hardware Environment

Software environment

- BSP version
  - M480 Series BSP CMSIS V3.04.000
- IDE version
  - Keil uVersion 5.26

Hardware environment

- Circuit components
  - NuMaker-IoT-M487 or other M480 Development Board
- Diagram

The square wave is input from the XT1_IN (PF.3) as the clock source of the HXT and output to the CLKO pin (PC.13).

4 Directory Information

- 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 How to Execute Example Code

1. Browsing into sample code folder by Directory Information (section 4) and double click HXT_ExtClk.uvproj
2. Enter Keil compile mode
   a. Build
   b. Download
   c. Start/Stop debug session
3. Enter debug mode
   a. Run

6 Revision History

Date	Revision	Description
Oct. 1, 2019	1.00	1. Initially issued.

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