

AT32 timer external clock mode B + Suspend mode

Introduction

This sample code is based on AT32F403A. It is used to demonstrate how to use AT32 MCU's external clock mode B and suspend mode.

In this sample case, PWM generated by TMR8 serves as an external clock signal of TMR3 and TMR4. Both TMR3 and TMR4 run in Suspend mode. The connected TMR3_CH1 with TMR4_CH2 is used as an input of Suspend mode. The TMR3 starts counting at input high, and the TMR4 starts counting at input low. As there is no TMR8 available on AT32415, users can set TMR1 or connect with an external PMW signal source when using this sample code.

Note: This sample code is written based on Artery's V2.x.x BSP. For other versions of BSP, users should pay attention to the differences in use.

Applicable products:

Product series	AT32F403
	AT32F403A
	AT32F407
	AT32F413
	AT32F415
	AT32F435
	AT32F437

List of major peripherals used:

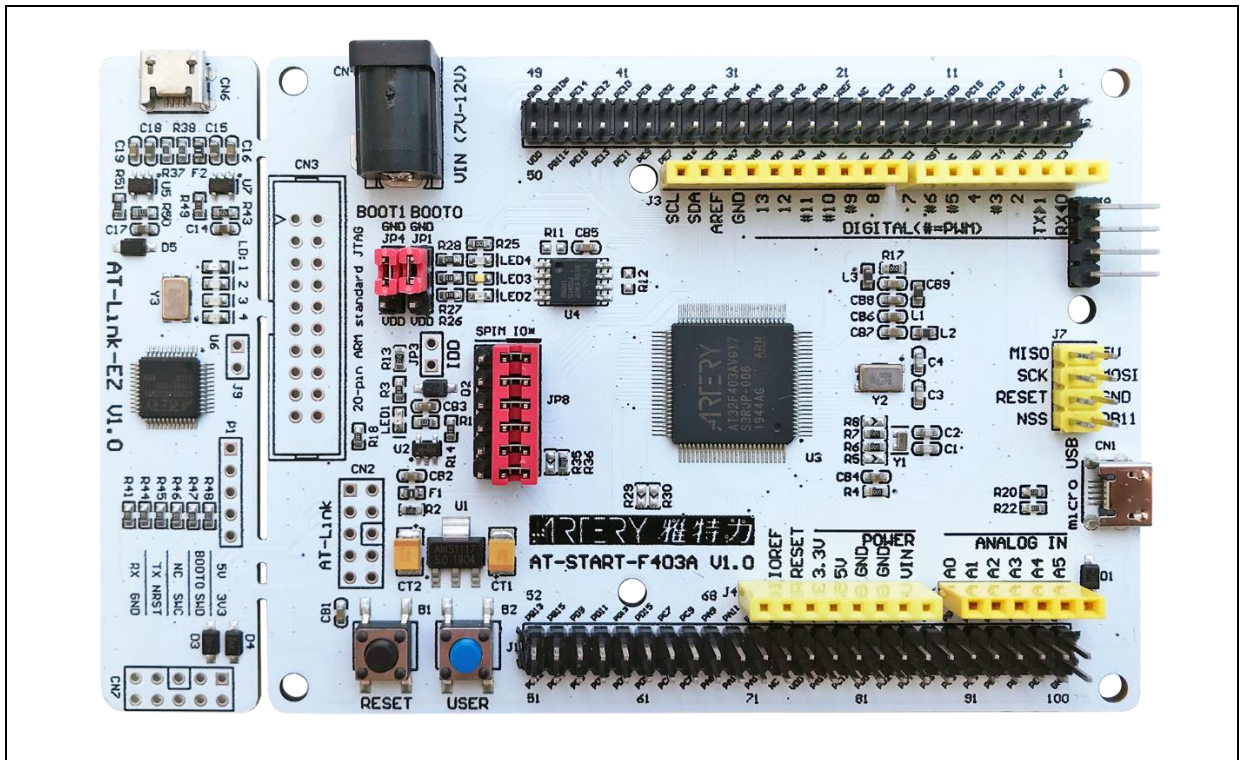
Peripherals	TIMER
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1 Quick start

1.1 Hardware resources

- 1) AT-START-F403A V1.x evaluation board
- 2) Serial output PA9 (via AT-Link-EZ)
- 3) DuPont line

Figure 1. AT-START-F403A V1.0 evaluation board



1.2 Software resources

- 1) AT32F403A MCU and AT32F403A_407_Firmware_Library_V2.0.6 (BSP version)
- 2) TMR settings:
 - TMR3/TMR4 is set in slave mode: external clock mode B + Suspend mode
 - TMR8_CH1(PC6) outputs PWM to TMR3_EXT(PD2) and TMR4_EXT(PE0), and it is used as an external clock of TMR3 and TMR4
 - When TMR3_CH1 (PA6) and TMR4_CH2(PB7) are connected with high levels, TMR3 starts counting, and LED3 toggles once upon an overflow event.
 - When TMR3_CH1(PA6) and TMR4_CH2(PB7) are connected with low levels, TMR4 starts counting, and LED4 toggles once upon an overflow event
 - When the levels are different on TMR3_CH1(PA6) and TMR4_CH2(PB7), LED2 is always ON, and a serial interface reports an error
- 3) Messages are output to PC via PA9 (USART1_TX). The current TMR's CNT value can also be output to PC by pressing a blue USER button on AT-START board.

Note: All of projects are built based on Keil 5. For the need to run in other compiling environments, user can make simple adjustments according to AT32xxx_Firmware_Library_V2.x.x\project\at_start_xxx\templates.

1.3 Example case

- 1) Hardware connection
 - Connect PD2 (TMR3_EXT) to PE0 (TMR4_EXT)
 - Connect PA6 (TMR3_CH1) to PB7 (TMR4_CH2)
 - Connect PC6 (TMR8_CH1) that generates PWM wave to PD2 (TMR3_EXT) and PE0 (TMR4_EXT) and use it as an external clock of TMR3 and TMR4. Also users can connect with an external clock source.
 - Apply low/high level to PA6(TMR3_CH1) and PB7(TMR4_CH2). Download program and check.
- 2) Open `SourceCode\SC0002_SourceCode\utilities\SC0002_Demo\mdk_v5\counter.uvprojx`, compile it and download to the evaluation board.
- 3) View print information via a serial interface:
 - After reset, print prompt information
 - When different levels are applied to PA6 (TMR3_CH1) and PB7 (TMR4_CH2), LED2 is always ON. After pressing "USER" button, the message "Make sure that PA6 & PB7 is connected with the same electrical level" will be displayed via a serial interface.
 - When PA6 (TMR3_CH1) and PB7 (TMR4_CH2) are connected with low levels, TMR4 starts counting, and LED4 blinks. After pressing "USER" button, the current level information and TMR4 counting value will be displayed via a serial interface
 - When PA6 (TMR3_CH1) and PB7 (TMR4_CH2) are connected high levels, TMR3 start counting and LED3 blinks. After pressing "USER" button, the current level information and TMR3 counting value will be displayed via a serial interface.

Figure 2. Information print

```
Make sure that PA6 & PB7 is connected with the same electrical level.
Make sure that PD2 & PE0 is connected with external signal Pls.
Press the USER key to get the working TMR counter value.

Make sure that PA6 & PB7 is connected with the same electrical level.

Low Level Hang, TMR4 Counter= 31499
Low Level Hang, TMR4 Counter= 60345
High Level Hang, TMR3 Counter= 30706
High Level Hang, TMR3 Counter= 22283
```

2 Revision history

Table 1. Document revision history

Date	Revision	Changes
2022.01.20	2.0.0	Initial release

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