

TMR Uses RPR Register to Generate PWM Waves

Introduction

This sample code is based on AT32F421 demonstrating how to generate the specified number of PWM waves in one-cycle mode with the help of AT32 advanced timer's repetition period register (TMRx_RPR) .

This example uses TMR1 to generate the specified number of PWM waves. When TMRx_RPR is a non-zero value, repetition counter decrements upon overflow, without overflow event generated. When the counter is counted down to 0, an overflow event is generated. In one-cycle mode, the timer counter will stop counting when an overflow event occurs, loading the specified number of PWM waves into TMRx_RPR register.

In the example, users need to press "USER" button to generate the specified number of PWM waves. The reason for this is that "USER" button is under loop detection of main function. TMR1 starts counting only after USER is pressed. TMR1 automatically stops in one-cycle mode after the generation of the specified number of PWM waves, until USER button is pressed again before TMR1 re-starts counting.

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	AT32 all series
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List of major peripherals used:

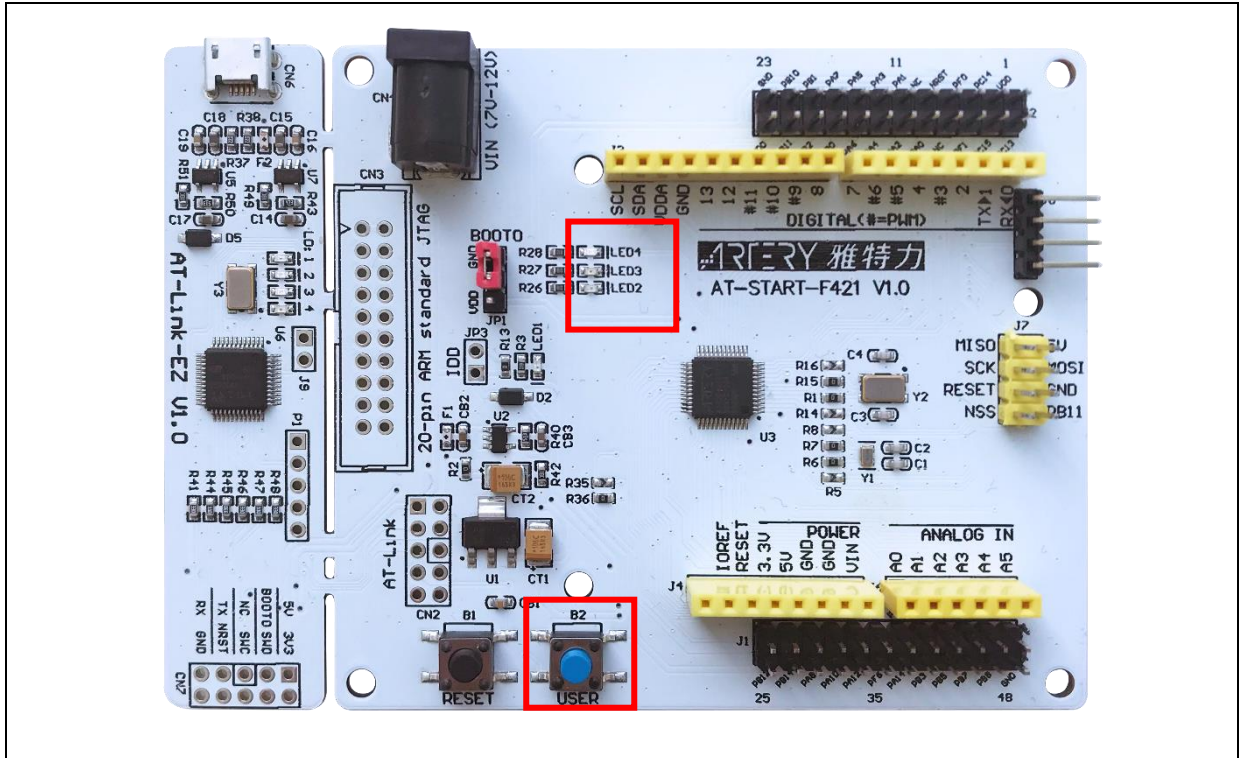
Peripherals	TIMER
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1 Quick start

1.1 Hardware resources

- 1) AT-START-F421 V1.x evaluation board
- 2) Logic analyzer or oscilloscope

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



1.2 Software resources

- 1) AT32F421, and AT32F421_Firmware_Library_V2.x.x (BSP)
- 2) Initialize the board, start loop detection in main() function. TMR1 starts counting as long as USER button is pressed
- 3) TMR settings:
 - Enable TMR1 channel 1 to generate PWM

TMR channel	GPIO pin	Duty cycle
TMR1_CH1	PA8	50%

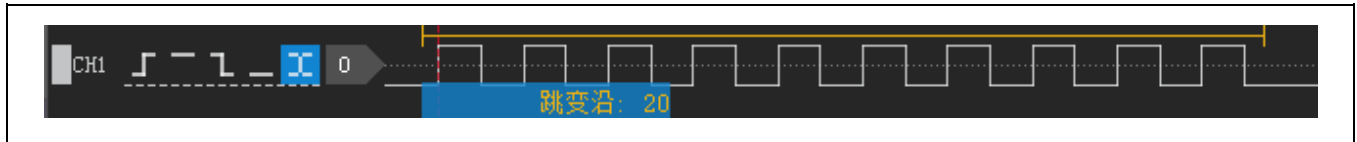
 - Set TMR1 as one-cycle mode. As long as USER is detected to be pressed, a specified number of PWM waves are generated, stopping TMR1 counting until next time USER button is pressed. To put it simply, users can enable timer counter at the location where they need PWM output.
- 4) Users can modify "#define PWM_NUM 10" in main.c to configure their desired number of PWM waves. Noted that this number should not exceed the upper threshold set by TMRx_RPR register.

Note: All of projects are built based on Keil 5. For the need to run them 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) Connect GPIO pin (PA8) corresponding to TMR1 channel 1 to a logic analyzer or oscilloscope
- 2) Open SourceCode\SC0088_SourceCode\utilities\SC0088_Demo\mdk_v5\rpr_pwm_output, compile and download it to the evaluation board
- 3) Press USER button to capture PWM waveforms.

Figure 2. LA-captured waveforms



2 Revision history

Table 1. Document revision history

Date	Revision	Changes
2022.04.29	2.0.0	Initial release
2022.08.12	2.0.1	Added the description that TMR stops counting in one-cycle mode

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