XT32H05x

XT32 microcontroller Advanced Timer (TIMA) Application notes

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Revision History

Release	Date	Author	Summary of Change
V0.0.0	26/10/2023	Shirling Liu	Initial

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1 Introduce

This application note serves as a comprehensive guide for software developers, offering essential information on timer/PWM configurations for advanced timer (TIM1 and TIM2). It covers fundamental concepts and provides guidelines to ensure proper utilization of basic timers in software development projects. Whether you're a beginner or an experienced developer, this document will equip you with the necessary knowledge and best practices to effectively configure and utilize timer in your applications.

1.1 Required peripherals

This application involves PADI module, GPIO, and TIM1 module.

Table 1. Modules in example

Sub-module	Peripheral use	Note
PADI	4 ports as GPIO	
TIM1	Generate base timer	
GPIO	LEDs show the TIMA interrupt callback state	

1.2 Compatible devices

This example is compatible with the devices in Table 2.

Table 2. Device list

Product	EVB
XT32H050	XB002823

2 Design description

2.1 Feature overview

XT32H0 microcontroller has two advanced timers, TIM1 and TIM2. These timers include the following features:

- 16-bit up, down, up and down auto-load counter
- Up to 6 independent channels for PWM/Output compare/Input capture.
- Complementary outputs with programmable dead-time
- 2 bidirectional break inputs
- Trigger input for external clock
- Interrupts generator
- Configure by DMA

2.2 Design steps

Here, the example uses the channel 1-4 of advanced timer 1 (TIM1) to generate PWM output signal.

1. Set TIM1 source clock and clock divider.
2. Configure base timer parameters of TIM1: counter mode, period, prescaler, clock-division.
3. Enable advanced timer1 (TIM1) UDT Interrupt。
4. Start the advanced timer 1(TIM1) to generate a 1KHz timer.

2.3 Design considerations

2.4 Software flowchart

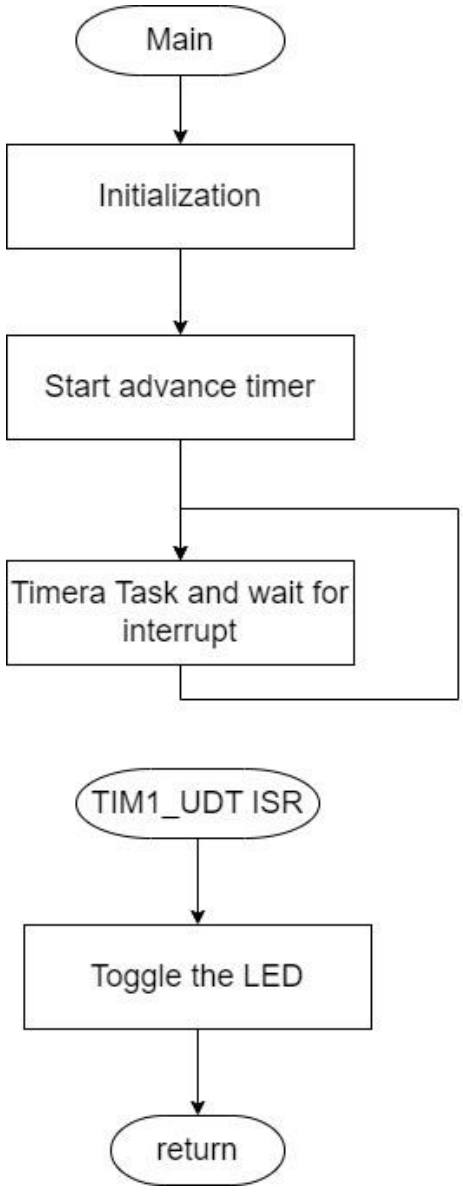

Figure 1. Application flow

2.5 Reference code

Configure Peripheral TIM1.

```
  /* Initialize TIMA */
  htima1.Instance = TIM1;
  htima1.Init.Prescaler = PRESCALER_VALUE;
  htima1.Init.Period    = PERIOD_VALUE_1MS;
  htima1.Init.CounterMode = TIM_COUNTERMODE_UP;
  htima1.Init.ClockDivision = TIM_CLOCKDIVISION_DIV1;
  htima1.Init.RepetitionCounter = 0;
  htima1.Init.AutoReloadPreload = TIM_AUTORELOAD_PRELOAD_DISABLE;
  if (HAL_TIM_Base_Init(&htima1) != HAL_OK)
  {
    Error_Handler();
  }
```

Enable TIM1 CC interrupt code:

```
static void XT_Nvic_Init(void)
{
    HAL_NVIC_SetPriority(TIM1_UDT_IRQn, 2, 0);
    HAL_NVIC_EnableIRQ(TIM1_UDT_IRQn);

    HAL_NVIC_SetPriority(TIM1_TRG_IRQn, 2, 0);
    HAL_NVIC_EnableIRQ(TIM1_TRG_IRQn);
}
```

Start the advanced timer 1(TIM1) to generate a base 1 kHz timer.

```
void XT_TIM1_Start(void )
{
    if (HAL_TIM_Base_Start_IT(&htima1) != HAL_OK)
    {
        /*Error_Handler*/
    }
}
```

2.6 Additional resources

- XT32H0xxB--reference manual