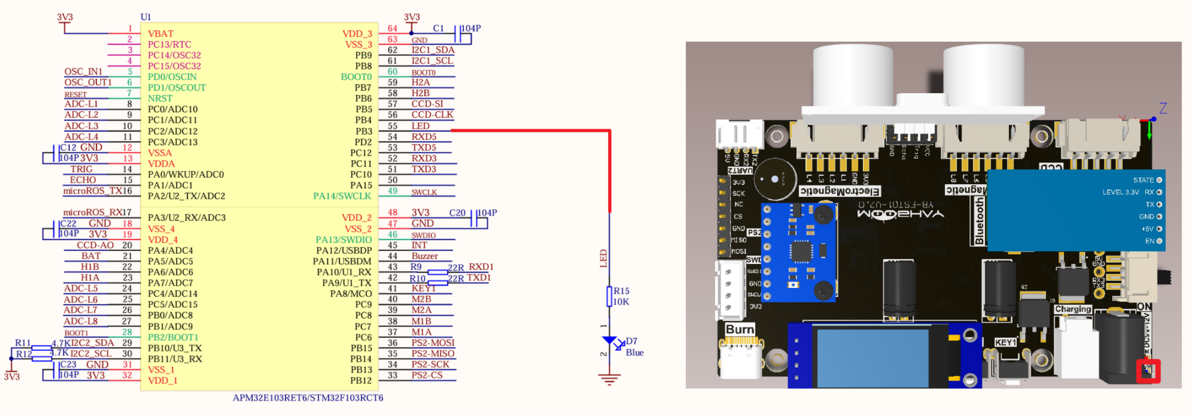
Basic timer

The tutorial demonstrates how to use the basic timer (TIM6) to control the onboard LED on the development board to flash.

```
The tutorial only introduces the standard library project code
```

Hardware connection



Peripherals	Development board	Description
LED	PB3	The anode of the LED is connected to the development board PB3, and the cathode is connected to the development board GND

Control principle

Use the timing function of TIM6 on the STM32F103RCT6 development board

Use the GPIO output function to control the LED and implement the timing function through the basic timer.

- **Basic timer**

Use the timing function of TIM6 on the STM32F103ZET6 development board

Timer type	Basic timer
Timer name	TIM6, TIM7

Timer type	Basic timer
Counter bit number	16
Counting mode	Incrementing
Prescaler coefficient	1-65536
Generate DMA request	Yes
Capture/compare channel	0
Complementary output	None
Clock frequency	72MHz (maximum)
Mount bus	APB1

> **Time base unit**

Register	Function
Counter register (TIMx_CNT)	Current count value of the counter
Prescaler register (TIMx_PSC)	Set the scaler coefficient (1-65536)
Auto-reload register (TIMx_ARR)	Counter count boundary and reload value

> **Timing formula**

$$T(s) = \frac{(ARR+1)*(PSC+1)}{TIM\_CLK(Hz)}$$

Parameter	Meaning
T(s)	Timing time, in seconds
ARR	Auto-reload value
PSC	Prescaler coefficient
TIM_CLK	Timer clock, in Hz

Timing time for this project: 10ms

$$T(s) = \frac{(ARR+1)*(PSC+1)}{TIM\_CLK(Hz)} = \frac{(99+1)*(7199+1)}{72000000(Hz)} = 0.01s$$

Software configuration

Software code

Configure the timing function of the basic timer TIM6, without configuring specific pins.

```
Product supporting materials source code path: Attachment → Source code summary →
1.Base_Course → 7.Base_Time
```

Control function

The tutorial only briefly introduces the code, you can open the project source code to read it.

TIM6_Init

```
void TIM6_Init(void)
{
    TIM_TimeBaseInitTypeDef TIM_TimeBaseStructure;
    NVIC_InitTypeDef NVIC_InitStructure;
    RCC_APB1PeriphClockCmd(RCC_APB1Periph_TIM6, ENABLE); //Enable the timer clock
    TIM_TimeBaseStructure.TIM_Prescaler = 7199; //Prescaler
    TIM_TimeBaseStructure.TIM_Period = 99; //Set the counter auto-reload value
    TIM_TimeBaseInit(TIM6, &TIM_TimeBaseStructure);
    TIM_ClearFlag(TIM6, TIM_FLAG_Update); //Clear the update flag of TIM
    TIM_ITConfig(TIM6, TIM_IT_Update, ENABLE);

    //Interrupt priority NVIC settings
    NVIC_InitStructure.NVIC_IRQChannel = TIM6_IRQn; //TIM6 interrupt
    NVIC_InitStructure.NVIC_IRQChannelPreemptionPriority = 4; //Preempt priority level 4
    NVIC_InitStructure.NVIC_IRQChannelSubPriority = 2; //From priority level 2
    NVIC_InitStructure.NVIC_IRQChannelCmd = ENABLE; //IRQ channel is enabled
    NVIC_Init(&NVIC_InitStructure); //Initialize NVIC registers

    TIM_Cmd(TIM6, ENABLE);
}
```

TIM6_IRQHandler

```
void TIM6_IRQHandler(void)
{
    if (TIM_GetITStatus(TIM6, TIM_IT_Update) != RESET) //Check whether TIM update interrupt occurs
    {
        TIM_ClearITPendingBit(TIM6, TIM_IT_Update); //Clear TIMx update interrupt flag
        led_count++; //LED service display flag
        cotrol_led();//Light service 3 seconds within the light flash 3 times
    }
}
```

cotrol_led

```
void cotrol_led(void)
{
    if(!led_flag)
    {
        if(led_count>300)//3S
        {
            led_count = 0;
            led_flag = 1;
        }
    }
```

```
else
{
    if(led_count>20)//200ms
    {
        led_count = 0;
        LED = !LED;//State inversion
        led_twinkle_count++;
    if(led_twinkle_count == 6)
    {
        LED = 0;
        led_twinkle_count = 0;
        led_flag = 0;
    }
}
}
```

Experimental phenomenon

The Base_Time.hex file generated by the project compilation is located in the OBJ folder of the Base_Time project. Find the Base_Time.hex file corresponding to the project and use the FlyMcu software to download the program into the development board.

After the program is successfully downloaded: the LED flashes three times every 3 seconds.