MS32C001 series
32-bit ARM® Cortex®-M0+ microcontroller
REG Library Sample Manual

1 ADC

1.1 ADC_AnalogWatchdog

此样例演示了 ADC 的模拟看门狗功能，当开启看门狗的通道的电压值不在设定的上下限中，会进入看门狗中断。

This example demonstrates the analog watchdog function of ADC. When the voltage value of the channel that opens the watchdog is not within the set upper or lower limits,Will enter watchdog interrupt.

1.2 ADC_ContinuousConversionSW_Trig_IT

此样例演示了 ADC 的软件触发和连续转换功能。

This example demonstrates the software triggering and continuous conversion functions of ADC.

1.3 ADC_SingleConversionHW_Trig

此样例演示了 ADC 通过 TIM 每隔 1s 触发 ADC 采样。

This example demonstrates how the ADC triggers ADC sampling every 1 second through TIM.

1.4 ADC_SingleConversionSW_Trig

此样例演示了 ADC 的软件触发单次采样的功能。

This example demonstrates the software triggered single sampling function of ADC

1.5 ADC_TemperatureSensor

此样例演示了 ADC 的温度采样功能。

This example demonstrates the temperature sampling function of ADC

1.6 ADC_Vrebuf

此样例演示了通过 ADC 的 Vrefbuf 的功能，通过 Vrefbuf 电压去采样。

This example demonstrates the function of using ADC's Vref buf to sample through the Vref buf voltage.

1.7 ADC_Vrefint

此样例演示了 ADC 的 vrefint 功能,通过采样 vrefint 计算出 VCC。

This example demonstrates the vrefint function of ADC, which calculates VCC by sampling vrefint.

1.8 ADC_WaitMode

此样例演示了 ADC 的等待功能,每次读取上次的数据后才会开始新的转换。

This example demonstrates the waiting function of ADC, which only starts a new conversion after reading the last data.

2 EXTI

2.1 EXTI_ToggleLed_IT

此样例演示了 GPIO 外部中断功能，PA0 引脚上的每一个下降沿都会产生中断，中断函数中 LED 灯会翻转一次。

This example demonstrates the GPIO external interrupt function, each falling edge on the PA0 pin will generate an interrupt, and the LED will toggle once in the interrupt handle function.

2.2 EXTI_WakeUp_Event

此样例演示了通过 PA6 引脚唤醒 MCU 的功能。下载程序并运行后，LED 灯处于常亮状态；按下用户按键后，LED 灯处于常暗状态，且 MCU 进入 STOP 模式；拉低 PA6 引脚后，MCU 唤醒，LED 灯处于闪烁状态。

This sample demonstrates the function to wake up the MCU via the PA6 pin. After downloading the program and running, the LED remains on; After pressing the user button, the LED remains off, and the MCU enters the STOP mode; After pulling down the PA6 pin, the MCU wakes up and the LED light is toggling.

3 FLASH

3.1 FLASH_OptionByteWrite_RST

此样例演示了通过软件方式将 RESET 引脚改为普通 GPIO。

This example demonstrates changing the RESET pin to regular GPIO through software.

3.2 FLASH_PageEraseAndWrite

此样例演示了 flash page 擦除和 page 写功能。

This example demonstrates the flash page erase and page write functions.

3.3 FLASH_SectorEraseAndWrite

此样例演示了 flash sector 擦除和 page 写功能。

This example demonstrates the flash sector erase and page write functions.

4 GPIO

4.1 GPIO_FastIO

本样例主要展示 GPIO 的 FAST IO 输出功能，FAST IO 速度可以达到单周期翻转速度。

This sample demonstrates the FAST IO output function of GPIO, and the FAST IO speed can reach the single cycle toggled speed.

4.2 GPIO_Toggle

此样例演示了 GPIO 输出模式，配置 LED 引脚为数字输出模式，并且每隔 100ms 翻转一次 LED 引脚电平，运行程序，可以看到 LED 灯闪烁。

This sample demonstrates the GPIO output mode, configure the LED pin as digital output mode and toggle the LED pin level every 100ms, run the program,you can see the LED toggle.

5 IWDG

5.1 IWDG_RESET

此样例演示了 IWDG 看门狗功能，配置看门狗重载计数值，计数 1s 后复位，然后通过调整每次喂狗的时间（main 函数 while 循环中代码），可以观察到，如果每次喂狗时间小于 1s，程序能一直正常运行（LED 灯闪烁），如果喂狗时间超过 1s，程序会一直复位（LED 灯不亮）。

This sample demonstrates the IWDG watchdog function.Configure the watchdog to count for 1s and then reset.By adjusting the time of each feed dog(code in the while loop of the main function), it can be observed following situation: if each dog feeding time is less than 1s, the program can always run normally(LED toggle). if the dog feeding time is more than 1s, the program will always reset (LED off)

6 LPTIM

6.1 LPTIM_ContinusMode_Wakeup_WFI

此样例演示了 LPTIM 连续模式中断唤醒 STOP 模式。

This example demonstrates the LPTIM continuous mode interrupt wake-up STOP mode.

6.2 LPTIM_OnceMode_WakeUp_WFI

此样例演示了 LPTIM 单次模式中断唤醒 STOP 模式。

This example demonstrates the LPTIM single mode interrupt wake-up STOP mode.

7 PWR

7.1 PWR_SLEEP_WFE

此样例演示了在 sleep 模式下，使用 GPIO 事件唤醒。

This sample demonstrates waking up in sleep mode using GPIO events.

7.2 PWR_SLEEP_WFI

此样例演示了在 sleep 模式下，使用 GPIO 中断唤醒。

This sample demonstrates waking up in sleep mode using GPIO interrupt.

7.3 PWR_STOP_WFE

此样例演示了在 stop 模式下，使用 GPIO 中断唤醒。

This sample demonstrates waking up from stop mode using GPIO interrupt.

7.4 PWR_STOP_WFI

此样例演示了在 stop 模式下，使用 GPIO 中断唤醒。

This sample demonstrates waking up from stop mode using GPIO interrupt.

8 RCC

8.1 RCC_HSE_Bypass_Output

此样例演示了时钟输出功能，可输出 HSE 波形。

This example demonstrates the clock output function, which can output HSE waveforms.

8.2 RCC_HSI_Output

此样例配置系统时钟为 HSI，并通过 MCO（PA07）引脚输出。

This example configures the system clock as HSI and outputs it through the MCO (PA07) pin.

8.3 RCC_LSE_Output

此样例使能 LSE，并通过 MCO（PA07）引脚输出。

This sample enables LSE and outputs it on the MCO (PA07) pin.

8.4 RCC_LSI_Output

此样例使能 LSI，并通过 MCO（PA07）引脚输出。

This sample enables the LSI and is output via the MCO (PA07) pin.

9 TIM

9.1 TIM1_EncoderInterface

此样例演示了 TIM1 的编码器接口功能，配置 PA3 和 PA5 作为编码信号的输入引脚，根据 PA3 和 PA5 输入信号的边沿和电平会对计数方向（CR1 寄存器中的 DIR 位），计数器值（CNT 寄存器）做出相应的改变。

This sample demonstrates the encoder interface function of TIM1. PA3 and PA5 are configured as the input pins for encoding signals, and according to the edges and levels of the input signals of PA3 and PA5, the counting direction (DIR bit in the CR1 register) and the counter value (CNT register) will be changed accordingly.

9.2 TIM1_ETR_ClearingOCREF

此样例演示了 TIM1 的 ETR 输入清除 OCxREF 信号功能，PB3 检测 ETR 信号的高低电平，PA5 输出 PWM 信号，当 PB3 检测到高电平时清除 OCxREF 信号，PA5 输出恒为低电平；当 PB3 检测到低电平时 PA5 正常输出 PWM 信号。

This sample demonstrates the TIM1's function of clearing the OCxREF signal at an external event. PB3 detects the high and low levels of the ETR signal and PA5 outputs the PWM signal; when PB3 detects a high level it clears the OCxREF signal and PA5 outputs a constant low level; when PB3 detects a low level PA5 outputs the PWM signal normally.

9.3 TIM1_InputCapureOnTI1

此样例演示了 TIM1 的输入捕获功能，配置 PA0 作为输入捕获引脚，PA0 每检测到一个上升沿触发捕获中断,在捕获中断回调函数中翻转 LED 灯。

This example demonstrates the input capture function of TIM1, where PA0 is configured as the input capture pin. Every time PA0 detects a rising edge, it triggers a capture interrupt and flips the LED light in the capture interrupt callback function.

9.4 TIM1_OnePulseMode

此样例演示了 TIM1 的单脉冲模式。当 CH1 (PA0)引脚上的上升沿触发计数器开始计数时，当计数值与 CCR2 匹配时，CH2 (PA03)输出高电平，直到计数器溢出，CH2 再次输出低电平。计数器溢出后，定时器停止工作。本例程中脉冲宽度为 3us。

This sample demonstrates the single pulse mode of TIM1. When the rising edge is detected on CH1 (PA0) pin, the counter starts counting. When the counter value matches CCR2, CH2 (PA03) outputs a high level until the counter overflows. After the counter overflows, CH2 outputs a low level and the timer stops working. The pulse width in this example is 3us.

9.5 TIM1_OutputCompare

此样例演示了 TIM1 的输出比较功能，配置 PA5 作为输出比较引脚，PA5 输出的信号 1ms 翻转一次电平。

This sample demonstrates the output comparison function of TIM1, configuring PA5 as the output comparison pin, and the signal output from PA5 flips the level once in 1ms.

9.6 TIM1_PWM_CenterAligned

此样例演示了 TIM1 的 PWM 输出功能（中央对齐模式），配置 PA5 作为 PWM 输出引脚，PA5 输出的 PWM 信号周期为 2ms，占空比为 50%。

This sample demonstrates the PWM output function (center-aligned mode) of TIM1. PA5 is configured as the PWM output pin, and PA5 outputs a PWM signal with a period of 2ms and a duty cycle of 50%.

9.7 TIM1_PWM_EdgeAligned

此样例演示了 TIM1 的 PWM 输出功能，配置 PA5 作为 PWM 输出引脚，PA5 输出的 PWM 信号周期为 1ms，占空比为 50%。

This sample demonstrates the PWM output function of TIM1, configuring PA5 as the PWM output pin, and PA5 outputs a PWM signal with a period of 1ms and a duty cycle of 50%.

9.8 TIM1_PWM_Input

此样例演示了 TIM1 的 PWM 信号输入捕获功能，配置 PA0 作为输入捕获引脚，同时将信号传到通道 1 和通道 2，其中通道 1 检测信号的上升沿，通道 2 检测信号的下降沿，上升沿同时作为 CNT 复位清零的触发信号。上升沿和下降沿触发记录到 CCR1 和 CCR2 中的 CNT 的值经过计算后得出信号的频率和占空比会通过 Frequency 和 DutyCycle 两变量展现出来。

This sample demonstrates the PWM signal input capture function of TIM1, configuring PA0 as the input capture pin, and transmitting the signal to channel 1 and channel 2 at the same time, in which channel 1 detects the rising edge of the signal, and channel 2 detects the falling edge of the signal, and the rising edge is used as the trigger signal for the reset and clearing of the CNT at the same time. The rising and falling edge triggers are recorded into CCR1 and CCR2 and the value of CNT is calculated to get the frequency and duty cycle of the signal which will be shown by the two variables Frequency and DutyCycle.

9.9 TIM1_SlaveExtClkMode2andTriggerMode

此样例演示了 TIM1 的外部时钟模式 2 加从模式触发模式的组合。当 CH1 (PA0)引脚上的下降触发计数

器开始计数时，当计数值与 ARR 匹配时，LED 进行翻转.

This example demonstrates the combination of TIM1's External Clock Mode 2 with Slave Mode Trigger Mode. When a falling edge trigger on the CH1 (PA0) pin initiates the counter to start counting, the LED toggles when the counter value matches the ARR (Auto-Reload Register) value.

9.10 TIM1_SlaveGatingUpcounter

此样例演示了 TIM1 的从模式门控模式。当 CH2 (PA3)引脚上的输入高电平时计数器开始计数，LED 开始闪烁，输入低电平时计数器停止计数，LED 停止闪烁

This example demonstrates the slave mode gated mode of TIM1. When the input on the CH2 (PA3) pin is high, the counter starts counting, causing the LED to begin blinking. When the input is low, the counter stops counting, and the LED stops blinking.

9.11 TIM1_SlaveTriggeringOnTI2

此样例演示了 TIM1 的从模式触发模式。当 CH2 (PA3)引脚上的上升沿触发计数器开始计数时，当计数值与 ARR 匹配时，LED 进行翻转.

This example demonstrates the slave mode trigger mode of TIM1. When a rising edge on the CH2 (PA3) pin triggers the counter to start counting, the LED toggles when the counter value matches the ARR (Auto-Reload Register).

9.12 TIM1_UpcounterOnEach2RisingEdgesOnETR

此样例演示了 TIM1 的外部时钟模式 2 功能，配置 PB3 作为输入捕获引脚，PB3 每检测到 200 个上升沿触发更新中断，在更新中断回调函数中翻转 LED 灯。

This sample demonstrates the external clock mode 2 function of the TIM1, configuring PB3 as the input capture pin, with PB3 detecting every 200 rising rising edge, PB3 triggers the update interrupt and flips the LED in the update interrupt callback function.

9.13 TIM1_UpcounterOnRisingEdgeOnTI1

此样例演示了 TIM1 的外部时钟模式 1 功能，配置 PA5 作为输入捕获引脚，PA5 每检测到 100 个上升沿触发更新中断，在更新中断回调函数中翻转 LED 灯。

This sample demonstrates the external clock mode 1 function of the TIM1, configuring PA5 as the input capture pin, with PA5 detecting every 100 rising rising edge, PA5 triggers the update interrupt and flips the LED in the update interrupt callback function.