MS32C001 series
32-bit ARM® Cortex®-M0+ microcontroller
HAL 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_MultichannelSwitch

此样例演示了 ADC 的多通道切换转换。

This example demonstrates the channel switching for an ADC.

1.3 ADC_SingleConversion_TriggerSW_Polling

此样例演示了 ADC 的软件触发和轮询功能。

This example demonstrates the software triggering and polling functions of ADC.

1.4 ADC_SingleConversion_TriggerTimer_IT

此样例演示了 ADC 的 TIM 触发和中断的功能。

This example demonstrates the TIM trigger and interrupt functions of ADC.

1.5 ADC_TempSensor

此样例演示了 ADC 的 Tempsensor 的采样功能。

This sample demonstrates the sampling function of ADC's Tempsensor.

1.6 ADC_VrefbufAndVre2P5

此样例演示了 ADC 的通道 4 采样功能和 VREFBUF 的功能，通过 VREFBUF 推算出通道 4 的输入电压。

This sample demonstrates the channel 4 sampling function of the ADC and the function of VREFBUF, from which the input voltage of channel 4 is deduced.

1.7 ADC_VrefbufAndVrefint

此样例演示了 ADC 的 VREFINT 采样功能和 VREFBUF 的功能，通过 VREFINT 推算出 VREFBUF 的电压。

This example demonstrates the VREFINT sampling function and VREFBUF function of ADC, and calculates the voltage of VREFBUF through VREFINT.

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, where each falling edge on the PA0 pin generates an interrupt, and the LED light in the interrupt function flips once.

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 example demonstrates the function of waking up an MCU through the PA6 pin. After downloading the program and running it, the LED light is constantly on; After pressing the user button, the LED light is in a constant dark state and the MCU enters STOP mode; After pulling down the PA6 pin, the MCU wakes up and the LED light is in a flashing state.

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 example mainly demonstrates the FAST IO output function of GPIO, which can achieve a single cycle flip 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 250ms 翻转一次 LED 引脚电平，运行程序，可以看到 LED 灯以 2Hz 的频率闪烁。

This example demonstrates the GPIO output mode, configuring the LED pin to be in digital output mode, and flipping the LED pin level every 250ms. Running the program, you can see that the LED light flashes at a frequency of 2Hz.

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 钟，程序能一直正常运行（LED 灯闪烁），如果喂狗时间超过 1s 钟，程序会一直复位（LED 灯熄灭）。

This example demonstrates the IWDG watchdog function, configuring the watchdog overload count value, resetting after counting for 1 second, and then adjusting each time The feeding time of the dog (code in the main function while loop) can be observed that if the feeding time is less than 1 second each time, the program Can continue to operate normally (LED flashing), if the dog feeding time exceeds 1 second, the program will continue to reset (LED light off).

6 LPTIM

6.1 LPTIM_OnceMode_WakeUp_WFE

此样例演示了 LPTIM 单次模式事件唤醒 STOP 模式。

This example demonstrates the LPTIM single mode event 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.

6.3 LPTIM_Wakeup_WFE

此样例演示了 LPTIM 连续模式事件唤醒 STOP 模式。

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

6.4 LPTIM_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.

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 example demonstrates using GPIO event wake-up in sleep mode.

7.2 PWR_SLEEP_WFI

此样例演示了在 sleep 模式下，使用 GPIO 中断唤醒。

This example demonstrates using GPIO interrupt wake-up in sleep mode.

7.3 PWR_STOP_WFE

此样例演示了在 stop 模式下，使用 GPIO 事件唤醒。

This example demonstrates using GPIO event wake-up in stop mode.

7.4 PWR_STOP_WFI

此样例演示了在 stop 模式下，使用 GPIO 中断唤醒。

This example demonstrates using GPIO interrupt wake-up in stop mode.

8 RCC

8.1 RCC_HSEBypassOutput

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_HSIOutput

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_LSEOutput

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_LSIOutput

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_6Step

此样例演示了使用 TIM1 产生“六步 PWM 信号”，每间隔 1ms 在 SysTick 中断中触发换向，实现无刷电机的换向。

This example demonstrates the use of TIM1 to generate a "six step PWM signal", which triggers commutation in the SysTick interrupt every 1ms to achieve commutation of a brushless motor.

9.2 TIM1_InputCapture

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.

9.3 TIM1_InputCapture_XORCh1Ch2Ch3

此样例演示了 TIM1 的三通道异或输入捕获功能。配置 PA0、PA3、PA4 为通道 1、通道 2、通道 3 的输入引脚。每当有一个引脚电平变化时会触发捕获中断，并在中断处理中翻转 LED。

This example demonstrates the three channel XOR input capture function of TIM1. Configure PA0, PA3, and PA4 as input pins for channels 1, 2, and 3. Whenever a pin level changes, a capture interrupt is triggered and the LED is flipped during interrupt processing.

9.4 TIM1_OC_Toggle

此样例演示了 TIM1 的输出比较模式。将捕获/比较通道 1（CH1）的输出映射到 PA5，开启捕获/比较通道 1（CH1）并设置为比较输出翻转模式。

This example demonstrates the output comparison mode of TIM1. Map the output of capture/compare channel 1 (CH1) to PA5, turn on capture/compare channel 1 (CH1), and set it to compare output flipping mode.

9.5 TIM1_PWM

本例程输出 4 路 PWM，通道 1 的占空比为 20%，通道 2 为 40%，通道 3 为 60%，通道 4 为 80%本例程周期为 24000000/2000/1200=10Hz。

This routine outputs 4 PWM channels, with a duty cycle of 20% for channel 1, 40% for channel 2, 60%

for channel 3, and 80% for channel 4 The cycle of this routine is 24000000/2000/1200=10Hz.

9.6 TIM1_Update_IT

此样例演示了 TIM1 的更新中断功能，在更新中断中翻转 LED。

This example demonstrates the update interrupt function of TIM1, flipping the LED during the update interrupt.