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

# 1 ADC

## 1.1 ADC_MultichannelSwitch

此样例演示了 ADC 的多通道切换。

This sample demonstrates the multichannel switching of ADC.

## 1.2 ADC_SingleConversion_TriggerTimer_AWD

此样例演示了 ADC 的模拟看门狗功能，当开启模拟看门狗通道的电压值超过上下限时，会进入看门狗中断。

This sample demonstrates the analog watchdog function of the ADC, which enters the watchdog interrupt when the voltage value of the channel that opens the analog watchdog exceeds the upper and lower limit.

## 1.3 ADC_SingleConversion_TriggerTimer_IT

此样例演示了 ADC 的 TIM 触发和中断的功能。

This sample demonstrates the TIM triggr function and IT function of the ADC.

## 1.4 ADC_SingleConversion_TriggerTimer_Polling

此样例演示了 ADC 的 TIM 触发和轮询的功能。

This sample demonstrates the TIM triggr function and polling function of the ADC.

## 1.5 ADC_Temperature_Init

此样例演示了 ADC 的 Tempsensor 功能。

This sample demonstrates the Tempsensor function of the ADC.

## 1.6 ADC_VrefintAndVrefbuf2P5_Init

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_VrefintAndVrefbuf_Init

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 sample demonstrates the ADC's VREFINT sampling function and the VREFBUF function,which calculates the voltage of VREFBUF from VREFINT.

# 2 EXTI

## 2.1 EXTI_ToggleLed_IT_Init

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 sample demonstrates the change of the RESET pin to a normal GPIO by software.

## 3.2 FLASH_PageEraseAndWrite

此样例演示了 flash page 擦除和 page 写功能。

This sample 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 sample 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.

## 4.3 GPIO_Toggle_Init

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_ContinuousMode_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.

## 6.2 LPTIM_ContinuousMode_WakeUp_WFI

此样例演示了 LPTIM 连续模式中断唤醒 STOP 模式。

This sample demonstrates waking up from stop mode by LPTIM(contiunus mode) interrupt request.

## 6.3 LPTIM_OnceMode_WakeUp_WFE

此样例演示了 LPTIM 单次模式事件唤醒 STOP 模式。

This sample demonstrates waking up from stop mode by LPTIM(single mode) event request.

## 6.4 LPTIM_OnceMode_WakeUp_WFI

此样例演示了 LPTIM 单次模式中断唤醒 STOP 模式。

This sample demonstrates waking up from stop mode by LPTIM(single mode) interrupt request.

# 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 事件唤醒。

This sample demonstrates waking up in stop mode using GPIO event.

## 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 sample demonstrates the clock output function, which can output HSE waveforms.

## 8.2 RCC_HSI_Output

此样例演示了时钟输出功能，可输出 HSI 波形。

This sample demonstrates the clock output function, which can output HSi waveforms.

## 8.3 RCC_LSE_Output

此样例演示了时钟输出功能，可输出 LSE 波形。

This sample demonstrates the clock output function, which can output LSE waveforms.

## 8.4 RCC_LSI_Output

此样例演示了时钟输出功能，可输出 LSI 波形。

This sample demonstrates the clock output function, which can output LSI waveforms.

# 9 TIM

## 9.1 TIM1_6Step_Init

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 sample demonstrates how TIM1 can be used to generate a "six-step PWM signal." The commutation is triggered in the SysTick interrupt every 1ms to realize the commutation of the brushless motor.

## 9.2 TIM1_InputCapture_Init

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 每检测到一个下降沿触发捕获中断在捕获中断回调函数中翻转 LED 灯。

This sample demonstrates the input capture function of TIM1.Configure PA0 as input capture pin,Whenever PA0 detects a falling edge it triggers a capture interrupt and toggle the LED 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 sample demonstrates the 3 channels XOR input capture function of TIM1. Configure PA0 、PA3 、PA4 as CH1 、CH2 、CH3 input pin.Whenever pin of any of the three pin (PA0\PA3\PA4) detects a polarity change it triggers a capture interrupt and toggle the LED in the capture interrupt callback function.

## 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 sample demonstrates the output compare function of TIM1.CH1 map to PA5,and set CH1 as output compare channel and in toggle mode

## 9.5 TIM1_OC_Toggle_IT

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，并使能比较中断，在中断中翻转 LED。

This sample demonstrates the output compare function of TIM1.CH1 map to PA5,and set CH1 as output compare channel and in toggle mode.Enable compare interrupt and toggle LED in interrupt callback.

## 9.6 TIM1_PWM3CH_Init

此样例演示了使用 TIM1 PWM2 模式输出三路频率为 10Hz 占空比分别为 25%、50%、75%的 PWM 波形。

This sample demonstrates how to use TIM1 PWM2 mode to output three 10Hz frequency PWM waveform with duty cycles of 25%, 50% and 75% separately

## 9.7 TIM1_TimeBase_Init

此样例演示了 TIM1 的更新中断功能，在更新中断中翻转 LED。

This sample demonstrates the UPDATE interrupt function , LED toggled when the update interrupt is generated.