

SensActDCMctrl Configuration

Hardware:

- SensActNucleo64 Demonstration Panel
- NUCLEO-F401RE Microcontroller Panel
- X-NUCLEO-IHM04A1 DC Motor Controller (Arduino connector)
- Two AMS AS5047U magnetic On-Axis Rotary Position Sensor
 - RPM measurement on the rear shaft: Quadrature AB signals
 - Absolute Angle measurement on the front shaft: SPI

USART / UART Communication

UART2 (USART2)

Application: Virtual COM Port (VCM) by using USB port of Nucleo STLINK

Mode: Asynchronous

Mode		Asynchronous
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Baud Rate	Bits/s	921 600
Word Length		8
Parity		None
Stop Bits		1
Data Direction		Receive and Transmit
Over Sampling		16 Samples

Interrupt		5
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Timers

Timer10 (TIM10) 16-bit

Application: Base Loop Timer

Clock Source	Activated	yes
One Pulse Mode		off

Prescaler (PSC)	APB2 clock 84MHz	84
Counter Mode		Up
Counter Period (AutoReload Register)		1000
Internal Clock Division (CKD)		No Division
Auto-reload preload		Disable
	Counting Freq. [kHz]	1

Global Interrupt		2
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Trigger Output (TRGO) Parameters		
Master/Slave Mode (MSM bit)		Disable
Trigger Event Selection		Reset

Timer2 (TIM2) 32-bit

Application: RPS Measurement based on Quadrature A signal

Clock Source		Internal Clock
Channel 1		Input Capture direct mode
One Pulse Mode		Off

Prescaler (PSC)	APB1 clock 84MHz	0
Counter Mode		Up
Counter Period (AutoReload Register)		4294967295
Internal Clock Division (CKD)		No Division
Auto-reload preload		Disable
	Counting Frequency [MHz]	84

Global Interrupt		1
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Trigger Output (TRGO) Parameters		
Master/Slave Mode (MSM bit)		Disable
Trigger Event Selection		Reset
<i>Input Capture Channel 1</i>		
Polarity Selection		Rising Edge
IC Selection		Direct
Prescaler Division Ratio		No division
Input Filter (4 bits value)		4

Signals	Portbit	Per. function	Default	Max. output speed	Pullup/down
RPSM_QA	PA15	TIM2_CH1	n. a.	Very High	no

Timer3 (TIM3) 16-bit

Application: DC Motor PWM Control

Clock Source		Internal Clock
Channel 1		PWM Generation CH1
Channel 2		PWM Generation CH2
One Pulse Mode		Off

Prescaler (PSC)	APB1 clock 84 MHz	0
Counter Mode		Center Aligned mode 1
Counter Period (AutoReload Register)		2048
Internal Clock Division (CKD)		No Division
Auto-reload preload		Disable
	Counting Freq. [kHz]	41 015.625
	PWM frequency [kHz]	20 507.8125

Global Interrupt		-
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Trigger Output (TRGO) Parameters		
Master/Slave Mode (MSM bit)		Disable
Trigger Event Selection		Reset
<i>PWM Generation Channel 1</i>		
Mode		PWM mode 1
Pulse (32 bits value)		0
Output Compare preload		Enable
Fast Mode		Disable
CH Polarity		High
<i>PWM Generation Channel 2</i>		
Mode		PWM mode 1
Pulse (32 bits value)		0
Output Compare preload		Enable
Fast Mode		Disable
CH Polarity		High

Signals	Portbit	Per. function	Default	Max. output speed	Pullup/down
DCMC_IN1_A	PB4	TIM3_CH1	n. a.	High	no
DSMC_IN2_A	PB5	TIM3_CH2	n. a.	High	no

Timer4 (TIM4) 16-bit**Application:** Triggering ADC Measurement

Clock Source		Internal Clock
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Prescaler	APB1 clock 84 MHz	84-1
Counter Mode		Up
Counter Period (AutoReload Register)		100-1
Internal Clock Division (CKD)		No Division
auto-reload preload		Disable
	Counting Frequency [kHz]	10

Trigger Output (TRGO) Parameters		
Master/Slave Mode (MSM bit)		Disable
Trigger Event Selection		Update Event

Global Interrupt		-
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Triggered Peripheral	ADC: start measurement	10 kHz
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SPI Communication

SPI2

Application: Handling AS4047U (AMS) 14-Bit On-Axis Magnetic Rotary Position Sensor

Op. Mode		Full Duplex Master
Hardware NSS Signal		Disable

Frame Format		Motorola
Data Size		8 Bits
First Bit		MSB First
Prescaler (for Baud Rate)	APB1 clock 42 MHz	8
	Baud Rate [MBits/s]	5.250
Clock Polarity (CPOL)		Low
Clock Phase (CPHA)		2 Edge
CRC Calculation		Disabled
NSS Signal Type		Software
Global Interrupt		-

Signals	Portbit	Per. function	Default	Max. output speed	Pullup/down
ASENS_SCK	PB10	SPI2_SCK	n.a.	Very High	Ext. pullup
ASENS_MOSI	PC3	SPI2_MOSI	n.a.	Very High	no
ASENS_MISO	PC2	SPI2_MISO	n.a.	Very High	no
ANGS_NSS	PA6	GPIO_Output	High	High	no
RPMS_NSS	PC0	GPIO_Output	High	High	no

Analog Peripherals

ADC1

Application: Analog Voltage Measurement

Channel	Function	Port I/O	Designation
IN14	Potentiometer 1 Voltage	PC4	VPOT1_IN14
IN15	Potentiometer 1 Voltage	PC5	VPOT2_IN14
IN7	Motor Voltage	PA7	PSENSE_IN7

Clock Prescaler		PCLK2 divided by 4
Resolution		12 bits (15 ADC Clock cycles)
Data Alignment		Right alignment
Scan Conversion Mode		Enabled
Continuous Conversion Mode		Disabled
Discontinuous Conversion Mode		Disabled
DMA Continuous Request		Disabled
End of Conversion Selection	EOC flag at the	end of all conversions
ADC Injected Conversion Mode		
Number of Conversion		3
External Trigger Source		Timer 4 Trigger Out event
External Trigger Edge		Rising Edge
Injected Conversion Mode		None

Injected Rank	Channel	Sampling Time	Injected Offset
1	IN14	28 cycles	0
2	IN15	28 cycles	0
3	IN7	28 cycles	0

ADC1 global Interrupt		4
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GPIO

GPIO_EXTI

Port bit	Function	Signal	INT	Mode
PC9	GPIO_EXTI9	USR_SW1	6	Rising/Falling Edge
PA11	GPIO_EXTI11	USR_SW2	6	Rising/Falling Edge
PB12	GPIO_EXTI12	USR_SW3	6	Rising/Falling Edge
PB15	GPIO_EXTI15	USR_SW4	6	Rising/Falling Edge
PB14	GPIO_EXTI14	USR_SW5	6	Rising/Falling Edge
PB13	GPIO_EXTI13	USR_SW6	6	Rising/Falling Edge

GPIO

Port bit	Function	Signal	Mode	Max. output speed	Level
PA0	Input	DCMC_IN1_B	No PullUp/Down	n.a.	-
PA1	Input	DCMC_IN2_B	No PullUp/Down	n.a.	-
PA4	Output Pushpull	RPSM_QB	No PullUp/Down	High	Low
PA6	Output Pushpull	ANGS_NSS	No PullUp/Down	High	High
PA8	Output Pushpull	YEL5_LED	No PullUp/Down	Low	Low
PA9	Output Pushpull	YEL6_LED	No PullUp/Down	Low	Low
PA10	Output Pushpull	DCMC_EN_A	No PullUp/Down	Low	Low
PA12	Output Pushpull	YEL3_LED	No PullUp/Down	Low	Low
PB0	Output Pushpull	PS_LED_R	No PullUp/Down	Low	Low
PB1	Output Pushpull	YEL1_LED	No PullUp/Down	Low	Low
PB2	Output Pushpull	YEL2_LED	No PullUp/Down	Low	Low
PB3	Output Pushpull	PS_LED_G	No PullUp/Down	Low	Low
PC0	Output Pushpull	RPMS_NSS	No PullUp/Down	High	High
PC1	Output Pushpull	DCMC_EN_B	No PullUp/Down	Low	Low
PC6	Output Pushpull	RED_LED	No PullUp/Down	Low	Low
PC7	Output Pushpull	GREEN_LED	No PullUp/Down	Low	Low
PC8	Output Pushpull	YEL7_LED	No PullUp/Down	Low	Low
PC13	Output Pushpull	YEL4_LED	No PullUp/Down	Low	Low

NVIC

Interrupt	Usage	Priority
TIM2 global interrupt	RPS Measurement	1
TIM1 update and TIM10 global interrupt	Realizing basic program cycle period	2
ADC1 global interrupts	ADC Measurement	4
USART2 global interrupt	Virtual COM Port	5
EXTI Line [9:5] interrupt	User switches	6
EXTI Line [15:10] interrupt	User switches	6