

## 1. Description

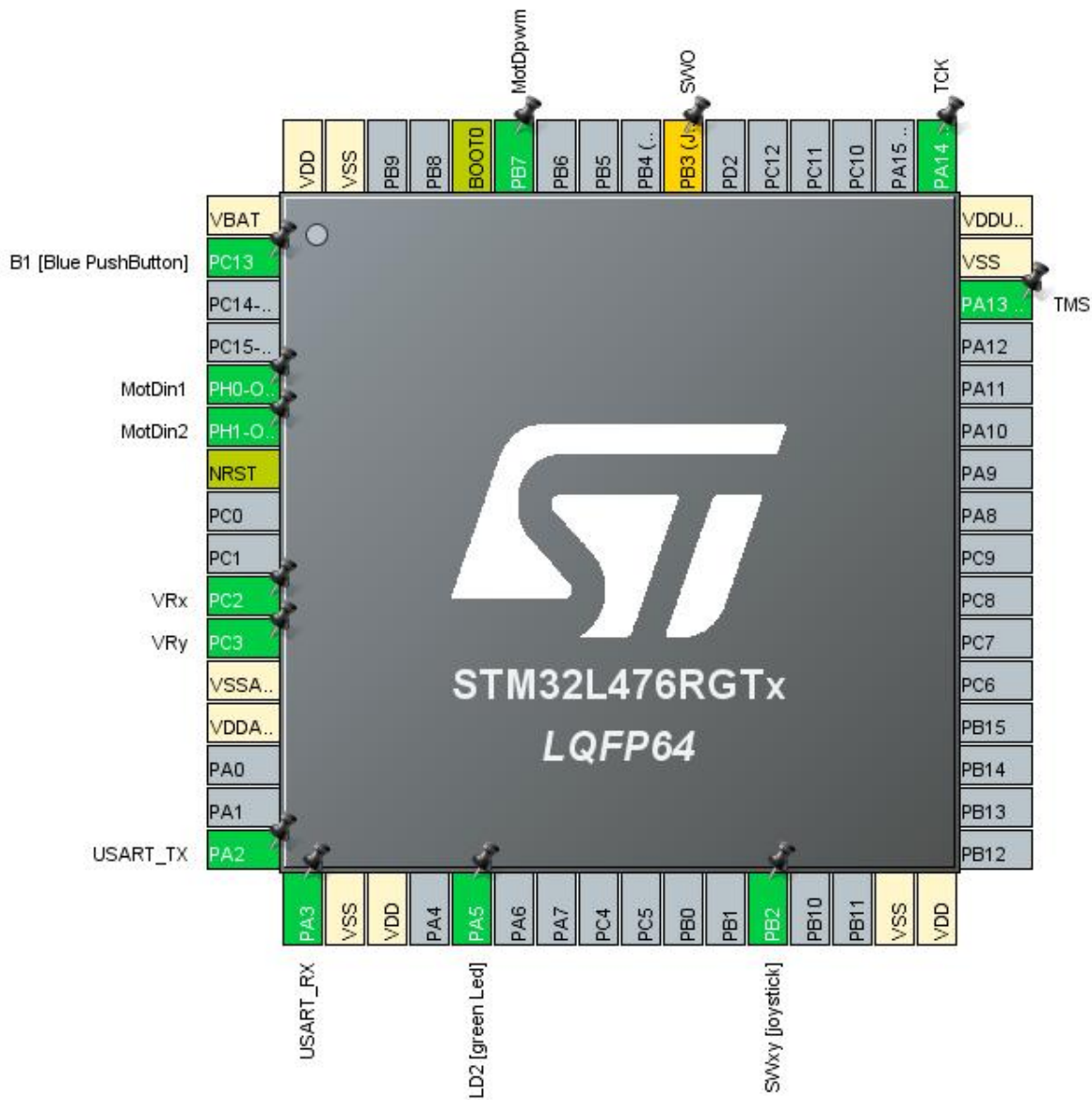
### 1.1. Project

Project Name	yRobot
Board Name	NUCLEO-L476RG
Generated with:	STM32CubeMX 5.6.0
Date	09/23/2020

### 1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L476RGTx
MCU Package	LQFP64
MCU Pin number	64

## 2. Pinout Configuration



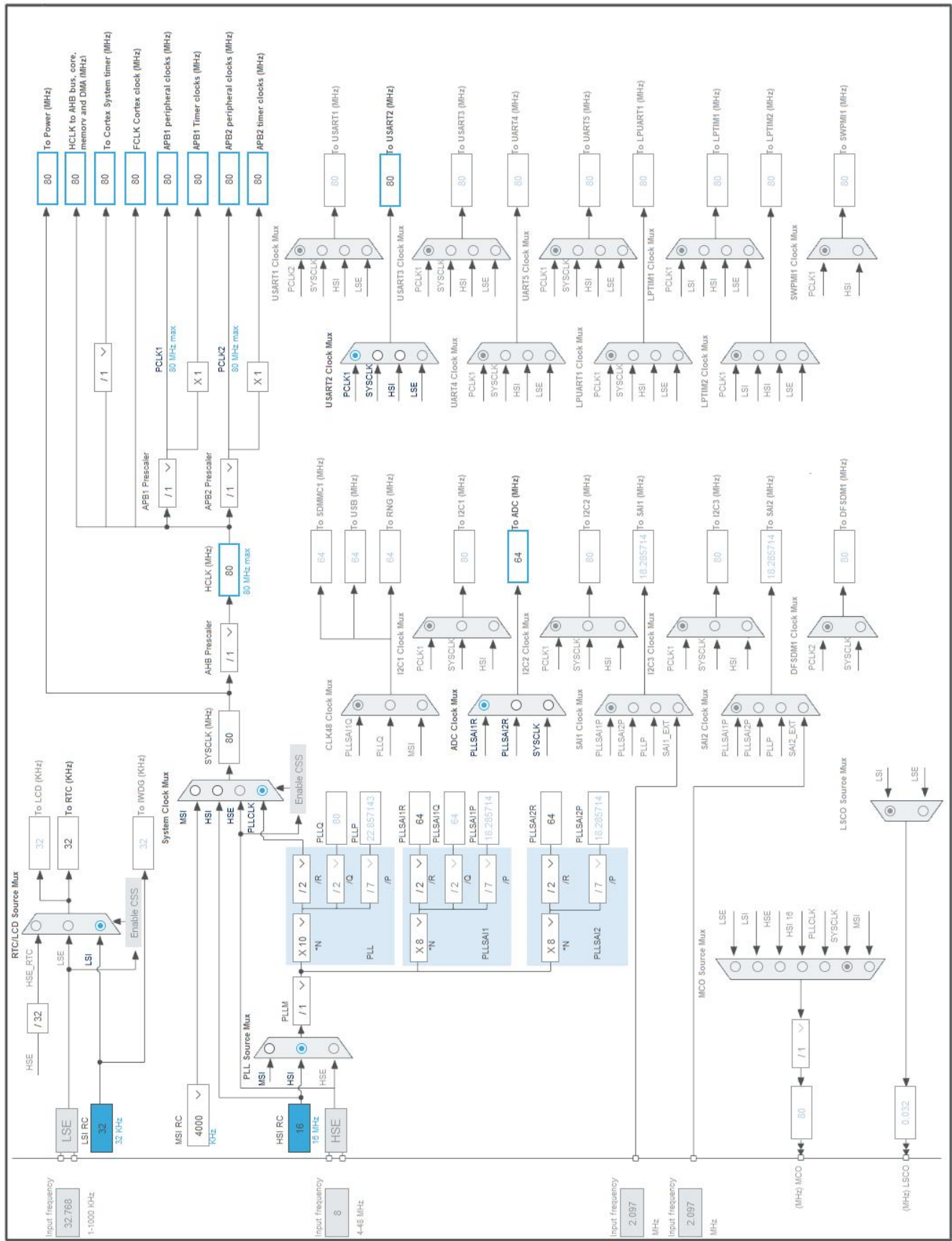
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13	I/O	GPIO_EXTI13	B1 [Blue PushButton]
5	PH0-OSC_IN (PH0) *	I/O	GPIO_Output	MotDin1
6	PH1-OSC_OUT (PH1) *	I/O	GPIO_Output	MotDin2
7	NRST	Reset		
10	PC2	I/O	ADC1_IN3	VRx
11	PC3	I/O	ADC1_IN4	VRy
12	VSSA/VREF-	Power		
13	VDDA/VREF+	Power		
16	PA2	I/O	USART2_TX	USART_TX
17	PA3	I/O	USART2_RX	USART_RX
18	VSS	Power		
19	VDD	Power		
21	PA5 *	I/O	GPIO_Output	LD2 [green Led]
28	PB2	I/O	GPIO_EXTI2	SWxy [joystick]
31	VSS	Power		
32	VDD	Power		
46	PA13 (JTMS-SWDIO)	I/O	SYS_JTMS-SWDIO	TMS
47	VSS	Power		
48	VDDUSB	Power		
49	PA14 (JTCK-SWCLK)	I/O	SYS_JTCK-SWCLK	TCK
55	PB3 (JTDO-TRACESWO) **	I/O	SYS_JTDO-SWO	SWO
59	PB7	I/O	TIM4_CH2	MotDpwm
60	BOOT0	Boot		
63	VSS	Power		
64	VDD	Power		

\* The pin is affected with an I/O function

\*\* The pin is affected with a peripheral function but no peripheral mode is activated

## 4. Clock Tree Configuration



## 5. Software Project

### 5.1. Project Settings

Name	Value
Project Name	yRobot
Project Folder	D:\GitDepots\yRobot
Toolchain / IDE	TrueSTUDIO
Firmware Package Name and Version	STM32Cube FW_L4 V1.15.1

### 5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy only the necessary library files
Generate peripheral initialization as a pair of '.c/.h' files	Yes
Backup previously generated files when re-generating	Yes
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	Yes

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x6
MCU	STM32L476RGTx
Datasheet	025976_Rev4

### 6.2. Parameter Selection

Temperature	25
Vdd	3.0

### 6.3. Battery Selection

Battery	Li-SOCL2(A3400)
Capacity	3400.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	100.0 mA
Max Pulse Current	200.0 mA
Cells in series	1
Cells in parallel	1

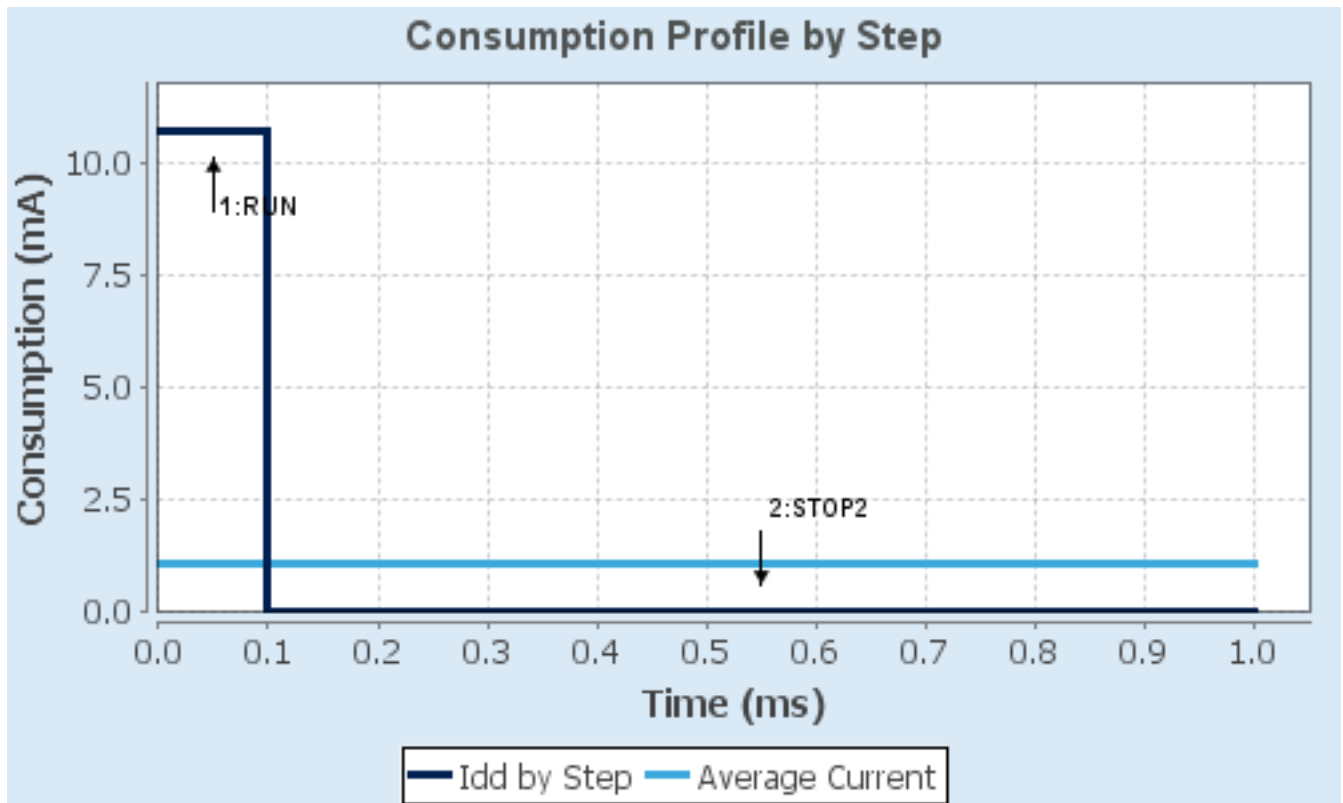
### 6.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP2
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-High	NoRange
<b>Fetch Type</b>	SRAM2	n/a
<b>CPU Frequency</b>	80 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	10.7 mA	1.18 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	100.0	0.0
<b>Ta Max</b>	103.56	105
<b>Category</b>	In DS Table	In DS Table

## 6.5. RESULTS

Sequence Time	1 ms	Average Current	1.07 mA
Battery Life	4 months, 10 days, 3 hours	Average DMIPS	100.0 DMIPS

## 6.6. Chart





## 7. IPs and Middleware Configuration

### 7.1. ADC1

**IN3: IN3 Single-ended**

**IN4: IN4 Single-ended**

#### 7.1.1. Parameter Settings:

##### ADCs\_Common\_Settings:

Mode Independent mode

##### ADC\_Settings:

Clock Prescaler Asynchronous clock mode divided by 1

Resolution ADC 12-bit resolution

Data Alignment Right alignment

Scan Conversion Mode Enabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode **Enabled \***

Number Of Discontinuous Conversions 1

DMA Continuous Requests **Enabled \***

End Of Conversion Selection **End of sequence of conversion \***

Overrun behaviour Overrun data preserved

Low Power Auto Wait Disabled

##### ADC\_Regular\_ConversionMode:

Enable Regular Conversions Enable

Enable Regular Oversampling Disable

Number Of Conversion **2 \***

External Trigger Conversion Source **Timer 1 Trigger Out event \***

External Trigger Conversion Edge Trigger detection on the rising edge

Rank 1

Channel Channel 3

Sampling Time **6.5 Cycles \***

Offset Number No offset

Rank **2 \***

Channel **Channel 4 \***

Sampling Time **6.5 Cycles \***

Offset Number No offset

##### ADC\_Injected\_ConversionMode:

Enable Injected Conversions Disable

##### Analog Watchdog 1:

Enable Analog WatchDog1 Mode false

### Analog Watchdog 2:

Enable Analog WatchDog2 Mode false

### Analog Watchdog 3:

Enable Analog WatchDog3 Mode false

## 7.2. GPIO

## 7.3. RTC

**mode: Activate Clock Source**

**mode: Activate Calendar**

**Alarm A: Internal Alarm A**

### 7.3.1. Parameter Settings:

#### General:

Hour Format Hourformat 24  
Asynchronous Predivider value 127  
Synchronous Predivider value 255

#### Calendar Time:

Data Format BCD data format  
Hours **12 \***  
Minutes 0  
Seconds 0  
Day Light Saving: value of hour adjustment Daylightsaving None  
Store Operation **Storeoperation Set \***

#### Calendar Date:

Week Day **Saturday \***  
Month **August \***  
Date 1  
Year **20 \***

#### Alarm A:

Hours **12 \***  
Minutes **12 \***  
Seconds **1 \***  
Sub Seconds 0  
Alarm Mask Date Week day **Enable \***  
Alarm Mask Hours **Enable \***

Alarm Mask Minutes	<b>Enable *</b>
Alarm Mask Seconds	Disable
Alarm Sub Second Mask	All Alarm SS fields are masked.
Alarm Date Week Day Sel	Date
Alarm Date	1

## 7.4. SYS

### Debug: Serial Wire

### Timebase Source: TIM6

## 7.5. TIM1

### Clock Source : Internal Clock

#### 7.5.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>19999 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>1999 *</b>
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	<b>Enable *</b>

##### Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	<b>Update Event *</b>
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

## 7.6. TIM4

### Channel2: PWM Generation CH2

#### 7.6.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>8000-1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>100-1 *</b>
Internal Clock Division (CKD)	No Division

auto-reload preload	Disable
<b>Trigger Output (TRGO) Parameters:</b>	
Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)
<b>Clear Input:</b>	
Clear Input Source	Disable
<b>PWM Generation Channel 2:</b>	
Mode	PWM mode 1
Pulse (16 bits value)	<b>5 *</b>
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

## 7.7. USART2

### Mode: Asynchronous

#### 7.7.1. Parameter Settings:

<b>Basic Parameters:</b>	
Baud Rate	<b>921600 *</b>
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1
<b>Advanced Parameters:</b>	
Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable
<b>Advanced Features:</b>	
Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

## 7.8. FREERTOS

### Interface: CMSIS\_V2

#### 7.8.1. Config parameters:

##### API:

FreeRTOS API CMSIS v2

##### Versions:

FreeRTOS version 10.2.1

CMSIS-RTOS version 2.00

##### MPU/FPU:

ENABLE\_MPU Disabled

ENABLE\_FPU Disabled

##### Kernel settings:

USE\_PREEMPTION Enabled

CPU\_CLOCK\_HZ SystemCoreClock

TICK\_RATE\_HZ **100 \***

MAX\_PRIORITIES 56

MINIMAL\_STACK\_SIZE 128

MAX\_TASK\_NAME\_LEN 16

USE\_16\_BIT\_TICKS Disabled

IDLE\_SHOULD\_YIELD Enabled

USE\_MUTEXES Enabled

USE\_RECURSIVE\_MUTEXES Enabled

USE\_COUNTING\_SEMAPHORES Enabled

QUEUE\_REGISTRY\_SIZE 8

USE\_APPLICATION\_TASK\_TAG **Enabled \***

ENABLE\_BACKWARD\_COMPATIBILITY **Disabled \***

USE\_PORT\_OPTIMISED\_TASK\_SELECTION Disabled

USE\_TICKLESS\_IDLE **Built in functionality enabled \***

USE\_TASK\_NOTIFICATIONS Enabled

RECORD\_STACK\_HIGH\_ADDRESS **Enabled \***

##### Memory management settings:

Memory Allocation Dynamic / Static

TOTAL\_HEAP\_SIZE **27000 \***

Memory Management scheme heap\_4

##### Hook function related definitions:

USE\_IDLE\_HOOK **Enabled \***

USE\_TICK\_HOOK Disabled

USE\_MALLOC\_FAILED\_HOOK Disabled

USE_DAEMON_TASK_STARTUP_HOOK	Enabled *
CHECK_FOR_STACK_OVERFLOW	Option2 *

#### Run time and task stats gathering related definitions:

GENERATE_RUN_TIME_STATS	Enabled *
USE_TRACE_FACILITY	Enabled
USE_STATS_FORMATTING_FUNCTIONS	Enabled *

#### Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

#### Software timer definitions:

USE_TIMERS	Enabled
TIMER_TASK_PRIORITY	2
TIMER_QUEUE_LENGTH	10
TIMER_TASK_STACK_DEPTH	256

#### Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

#### Added with 10.2.1 support:

MESSAGE_BUFFER_LENGTH_TYPE	size_t
USE_POSIX_ERRNO	Disabled

### 7.8.2. Include parameters:

#### Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Enabled *
vTaskSuspend	Enabled
vTaskDelayUntil	Enabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Enabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Enabled *
uxTaskGetStackHighWaterMark	Enabled
xTaskGetCurrentTaskHandle	Enabled *
eTaskGetState	Enabled
xEventGroupSetBitFromISR	Disabled

xTimerPendFunctionCall	Enabled
xTaskAbortDelay	Disabled
xTaskGetHandle	<b>Enabled *</b>
uxTaskGetStackHighWaterMark2	Disabled

### 7.8.3. Advanced settings:

#### **Newlib settings (see parameter description first):**

USE_NEWLIB_REENTRANT	Disabled
----------------------	----------

#### **Project settings (see parameter description first):**

Use FW pack heap file	Enabled
-----------------------	---------

\* User modified value

## 8. System Configuration

### 8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PC2	ADC1_IN3	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	VRx
	PC3	ADC1_IN4	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	VRy
SYS	PA13 (JTMS-SWDIO)	SYS_JTMS-SWDIO	n/a	n/a	n/a	TMS
	PA14 (JTCK-SWCLK)	SYS_JTCK-SWCLK	n/a	n/a	n/a	TCK
TIM4	PB7	TIM4_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	MotDpwm
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USART_TX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USART_RX
Single Mapped Signals	PB3 (JTDO-TRACESWO)	SYS_JTDO-SWO	n/a	n/a	n/a	SWO
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Falling edge trigger detection	No pull-up and no pull-down	n/a	B1 [Blue PushButton]
	PH0-OSC_IN (PH0)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MotDin1
	PH1-OSC_OUT (PH1)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MotDin2
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [green Led]
	PB2	GPIO_EXTI2	External Interrupt Mode with Falling edge trigger detection	Pull-up *	n/a	SWxy [joystick]



## 8.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA1_Channel1	Peripheral To Memory	<b>Medium *</b>

### ADC1: DMA1\_Channel1 DMA request Settings:

Mode: **Circular \***  
Peripheral Increment: Disable  
Memory Increment: **Enable \***  
Peripheral Data Width: **Word \***  
Memory Data Width: **Word \***

### 8.3. NVIC configuration

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Prefetch fault, memory access fault	true	0	0
Undefined instruction or illegal state	true	0	0
System service call via SWI instruction	true	0	0
Debug monitor	true	0	0
Pendable request for system service	true	15	0
System tick timer	true	15	0
EXTI line2 interrupt	true	5	0
DMA1 channel1 global interrupt	true	5	0
ADC1 and ADC2 interrupts	true	5	0
TIM1 trigger and commutation interrupts and TIM17 global interrupt	true	5	0
USART2 global interrupt	true	5	0
EXTI line[15:10] interrupts	true	5	0
RTC alarm interrupt through EXTI line 18	true	5	0
TIM6 global interrupt, DAC channel1 and channel2 underrun error interrupts	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt and TIM15 global interrupt	unused		
TIM1 update interrupt and TIM16 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM4 global interrupt	unused		
FPU global interrupt	unused		

\* User modified value

## 9. Predefined Views - Category view : Current

### Middleware

FREERTOS 

### System Core

### Analog

### Timers

### Connectivity

### Multimedia

### Security


### Computing

DMA 

ADC1 

RTC 

USART2 

GPIO 

TIM1 

NVIC 

TIM4 

RCC 

SYS 

## 10. Software Pack Report

### 10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	FreeRTOS	0.0.1	Class : RTOS Group : Core Version : 10.2.0