1. Description

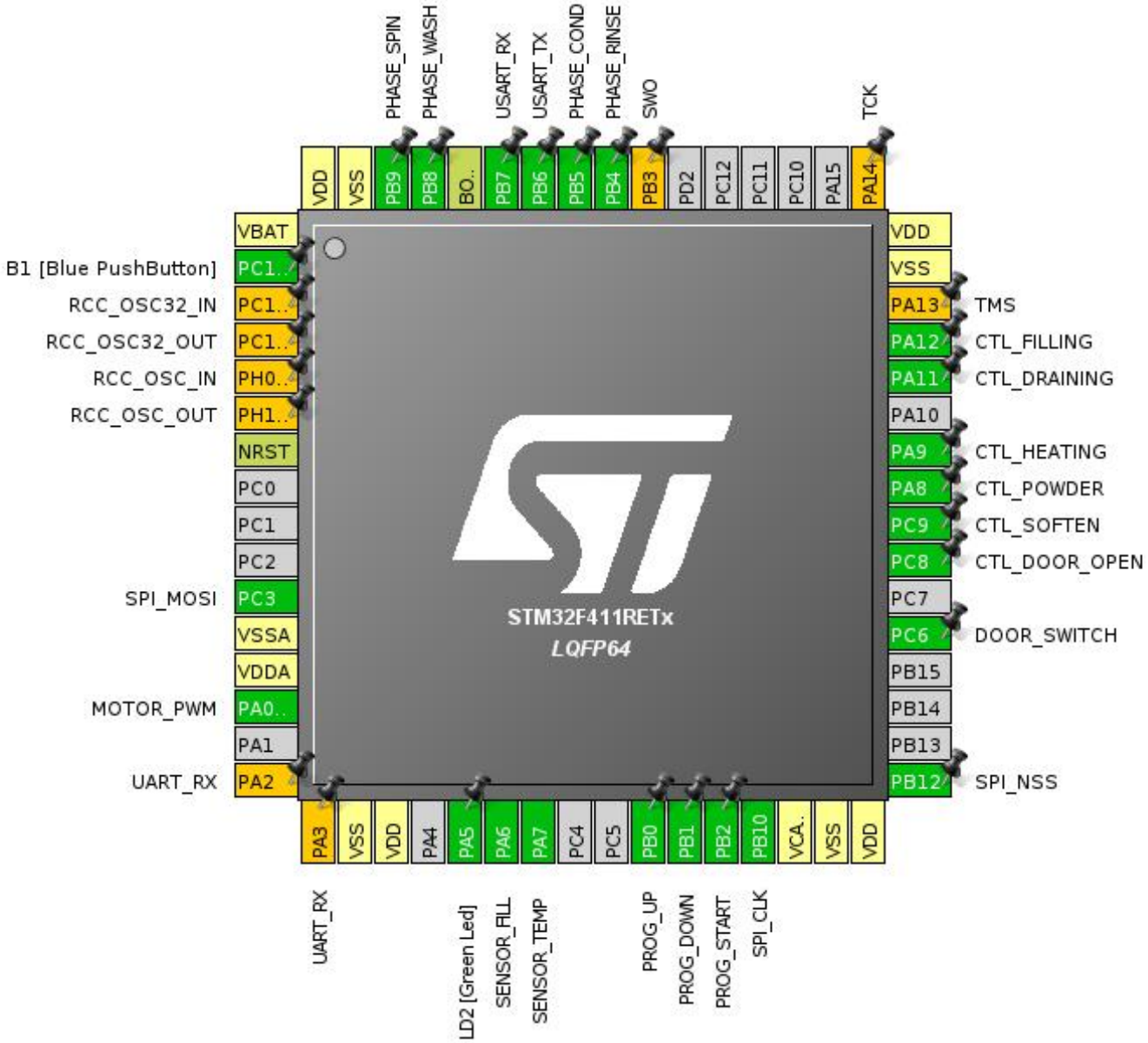
1.1. Project

Project Name	nucleo-f411re
Board Name	NUCLEO-F411RE
Generated with:	STM32CubeMX 4.25.1
Date	06/04/2018

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F411
MCU name	STM32F411RETx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



3. Pins Configuration

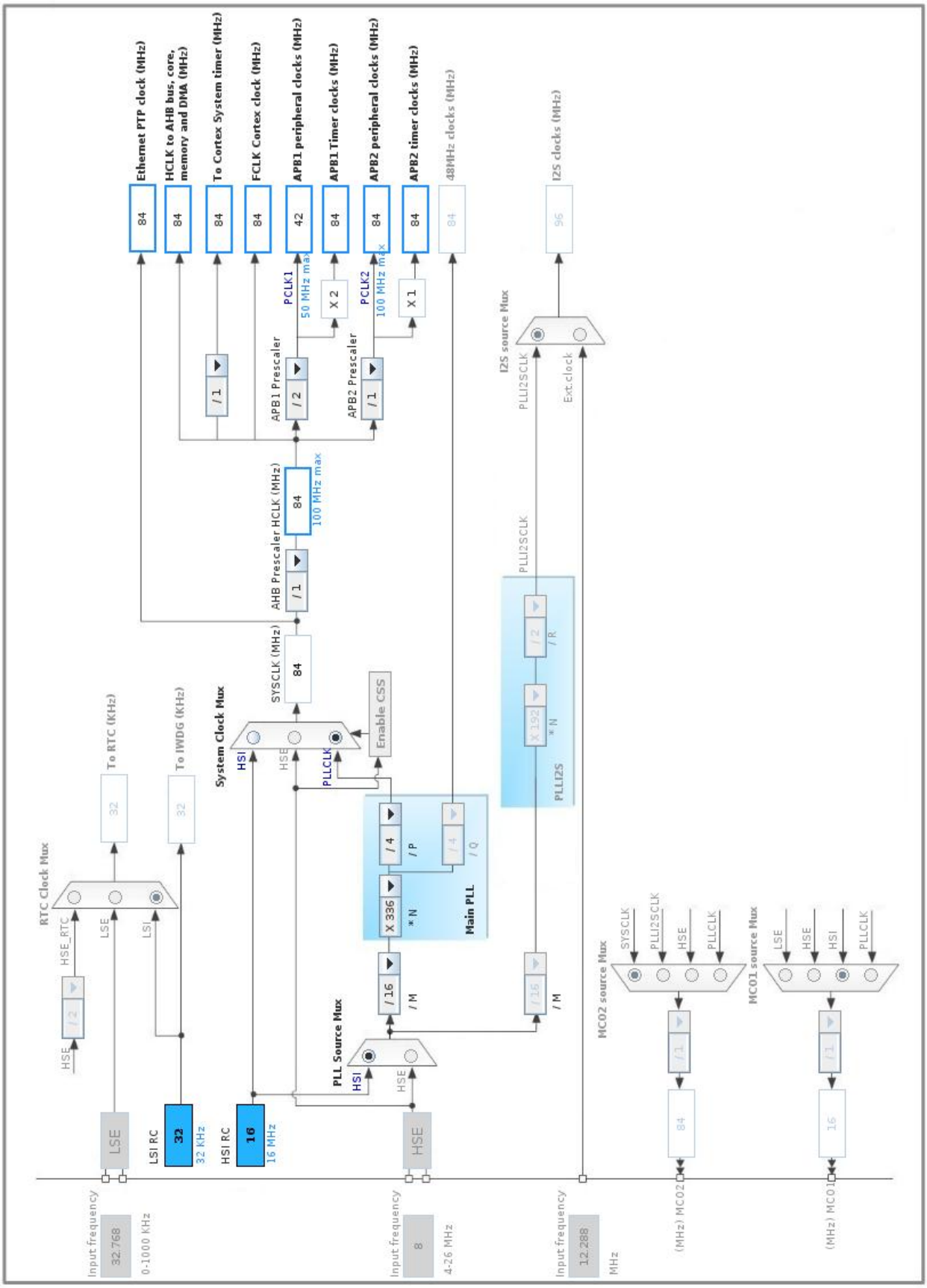
Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP	I/O	GPIO_EXTI13	B1 [Blue PushButton]
3	PC14-OSC32_IN *	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT *	I/O	RCC_OSC32_OUT	
5	PH0 - OSC_IN *	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT *	I/O	RCC_OSC_OUT	
7	NRST	Reset		
11	PC3	I/O	SPI2_MOSI	SPI_MOSI
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP	I/O	TIM2_CH1	MOTOR_PWM
16	PA2 *	I/O	USART2_TX	UART_RX
17	PA3 *	I/O	USART2_RX	UART_RX
18	VSS	Power		
19	VDD	Power		
21	PA5 **	I/O	GPIO_Output	LD2 [Green Led]
22	PA6	I/O	ADC1_IN6	SENSOR_FILL
23	PA7	I/O	ADC1_IN7	SENSOR_TEMP
26	PB0	I/O	GPIO_EXTI0	PROG_UP
27	PB1	I/O	GPIO_EXTI1	PROG_DOWN
28	PB2	I/O	GPIO_EXTI2	PROG_START
29	PB10	I/O	SPI2_SCK	SPI_CLK
30	VCAP1	Power		
31	VSS	Power		
32	VDD	Power		
33	PB12 **	I/O	GPIO_Output	SPI_NSS
37	PC6 **	I/O	GPIO_Input	DOOR_SWITCH
39	PC8 **	I/O	GPIO_Output	CTL_DOOR_OPEN
40	PC9 **	I/O	GPIO_Output	CTL_SOFTEN
41	PA8 **	I/O	GPIO_Output	CTL_POWDER
42	PA9 **	I/O	GPIO_Output	CTL_HEATING
44	PA11 **	I/O	GPIO_Output	CTL_DRAINING
45	PA12 **	I/O	GPIO_Output	CTL_FILLING
46	PA13 *	I/O	SYS_JTMS-SWDIO	TMS
47	VSS	Power		
48	VDD	Power		

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
49	PA14 *	I/O	SYS_JTCK-SWCLK	TCK
55	PB3 *	I/O	SYS_JTDO-SWO	SWO
56	PB4 **	I/O	GPIO_Output	PHASE_RINSE
57	PB5 **	I/O	GPIO_Output	PHASE_COND
58	PB6	I/O	USART1_TX	USART_TX
59	PB7	I/O	USART1_RX	USART_RX
60	BOOT0	Boot		
61	PB8 **	I/O	GPIO_Output	PHASE_WASH
62	PB9 **	I/O	GPIO_Output	PHASE_SPIN
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. IPs and Middleware Configuration

5.1. ADC1

mode: IN6

mode: IN7

5.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	**PCLK2 divided by 8 ***
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	**Enabled ***
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	**Enabled ***
Number Of Discontinuous Conversions	1
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	**2 ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 6
Sampling Time	**480 Cycles ***
Rank	**2 ***
Channel	**Channel 7 ***
Sampling Time	**480 Cycles ***

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.2. SPI2

Mode: Transmit Only Master

5.2.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**256 ***
Baud Rate	**164.062 KBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

5.3. SYS

Timebase Source: TIM1

5.4. TIM2

Channel1: PWM Generation CH1

5.4.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**499 ***
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**999 ***
Internal Clock Division (CKD)	No Division

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable

CH Polarity	High

5.5. USART1

Mode: Asynchronous

5.5.1. Parameter Settings:

Basic Parameters:

Baud Rate	115200
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

5.6. FREERTOS

mode: Enabled

5.6.1. Config parameters:

Versions:

FreeRTOS version	9.0.0
CMSIS-RTOS version	1.02

Kernel settings:

USE_PREEMPTION	Enabled
CPU_CLOCK_HZ	SystemCoreClock
TICK_RATE_HZ	1000
MAX_PRIORITIES	7
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	Disabled
QUEUE_REGISTRY_SIZE	8

USE_APPLICATION_TASK_TAG	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Enabled
USE_TICKLESS_IDLE	Disabled
USE_TASK_NOTIFICATIONS	Enabled

Memory management settings:

Memory Allocation	Dynamic
TOTAL_HEAP_SIZE	**8192 ***
Memory Management scheme	heap_4

Hook function related definitions:

USE_IDLE_HOOK	Disabled
USE_TICK_HOOK	Disabled
USE_MALLOC_FAILED_HOOK	Disabled
USE_DAEMON_TASK_STARTUP_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	Disabled

Run time and task stats gathering related definitions:

GENERATE_RUN_TIME_STATS	Disabled
USE_TRACE_FACILITY	Disabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

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

5.6.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	**Enabled ***

vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Disabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Disabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Disabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	Disabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled

*** User modified value**

6. System Configuration

6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA6	ADC1_IN6	Analog mode	No pull-up and no pull-down	n/a	SENSOR_FILL
	PA7	ADC1_IN7	Analog mode	No pull-up and no pull-down	n/a	SENSOR_TEMP
SPI2	PC3	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	SPI_MOSI
	PB10	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	SPI_CLK
TIM2	PA0-WKUP	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	MOTOR_PWM
USART1	PB6	USART1_TX	Alternate Function Push Pull	Pull-up	**Very High ***	USART_TX
	PB7	USART1_RX	Alternate Function Push Pull	Pull-up	**Very High ***	USART_RX
Single Mapped Signals	PC14-OSC32_IN	RCC_OSC32_IN	n/a	n/a	n/a	
	PC15-OSC32_OUT	RCC_OSC32_OUT	n/a	n/a	n/a	
	PH0 - OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1 - OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	UART_RX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	UART_RX
	PA13	SYS_JTMS-SWDIO	n/a	n/a	**n/a**	TMS
	PA14	SYS_JTCK-SWCLK	n/a	n/a	**n/a**	TCK
	PB3	SYS_JTDO-SWO	n/a	n/a	**n/a**	SWO
GPIO	PC13-ANTI_TAMP	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	B1 [Blue PushButton]
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [Green Led]
	PB0	GPIO_EXTI0	**External Interrupt**	No pull-up and no pull-down	n/a	PROG_UP

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
			Mode with Falling edge trigger detection			
	PB1	GPIO_EXTI1	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	PROG_DOWN
	PB2	GPIO_EXTI2	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	PROG_START
	PB12	GPIO_Output	Output Push Pull	**Pull-up ***	Low	SPI_NSS
	PC6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DOOR_SWITCH
	PC8	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_DOOR_OPEN
	PC9	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_SOFTEN
	PA8	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_POWDER
	PA9	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_HEATING
	PA11	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_DRAINING
	PA12	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	CTL_FILLING
	PB4	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	PHASE_RINSE
	PB5	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	PHASE_COND
	PB8	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	PHASE_WASH
	PB9	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	PHASE_SPIN

6.2. DMA configuration

nothing configured in DMA service

6.3. 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
Pre-fetch 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 line0 interrupt	true	5	0
EXTI line1 interrupt	true	5	0
EXTI line2 interrupt	true	5	0
ADC1 global interrupt	true	5	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM2 global interrupt	unused		
SPI2 global interrupt	unused		
USART1 global interrupt	unused		
EXTI line[15:10] interrupts	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F411
MCU	STM32F411RETx
Datasheet	026289_Rev6

7.2. Parameter Selection

Temperature	25
Vdd	null

8. Software Pack Report

9. Software Project

9.1. Project Settings

Name	Value
Project Name	nucleo-f411re
Project Folder	/home/mike/dev/washing-machine-hal-f411re
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F4 V1.21.0

9.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	Copy only the necessary library files
Generate peripheral initialization as a pair of '.c/.h' files	No
Backup previously generated files when re-generating	No
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No