1. Description

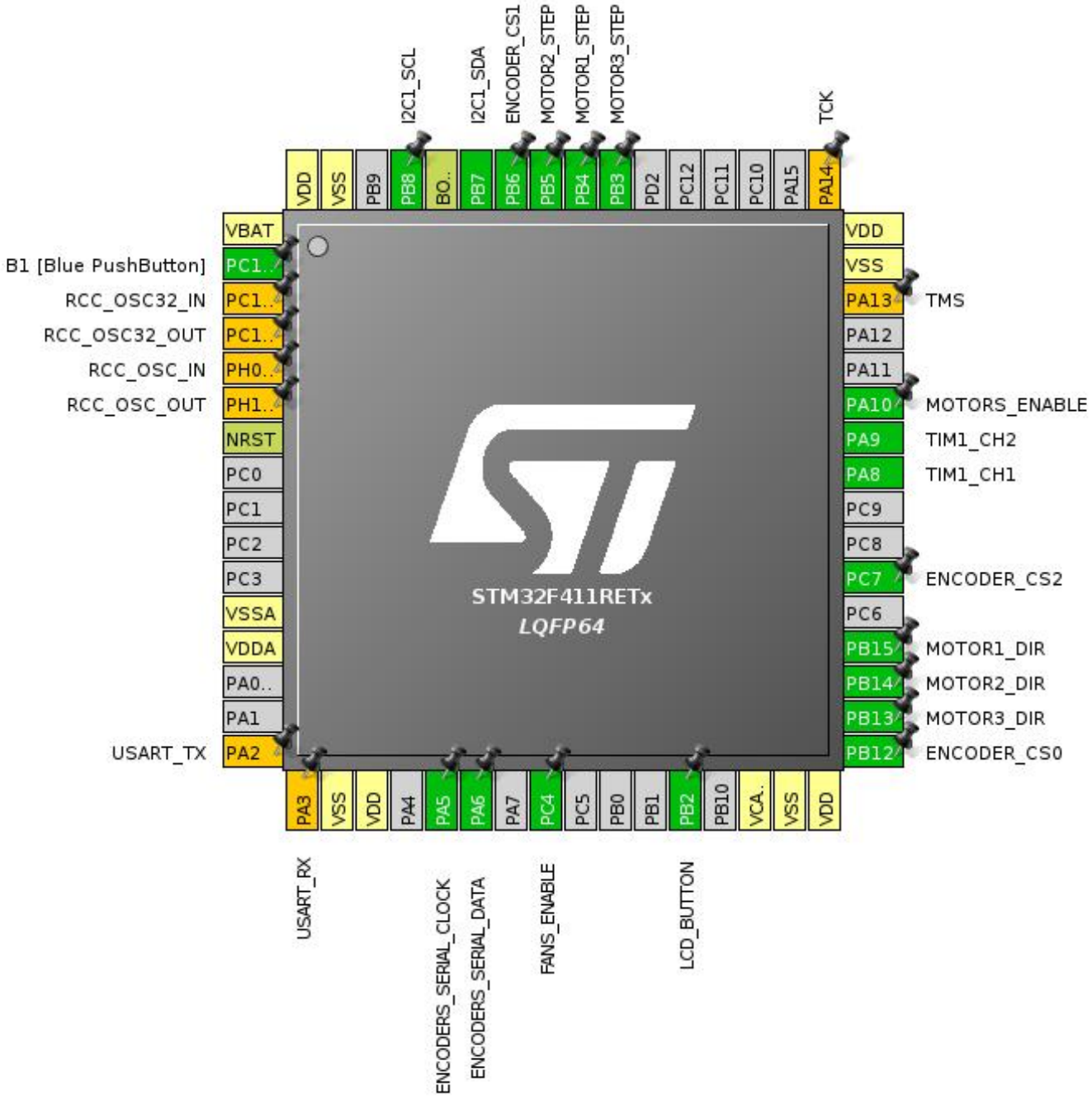
1.1. Project

Project Name	robot_main
Board Name	NUCLEO-F411RE
Generated with:	STM32CubeMX 4.22.1
Date	12/07/2017

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

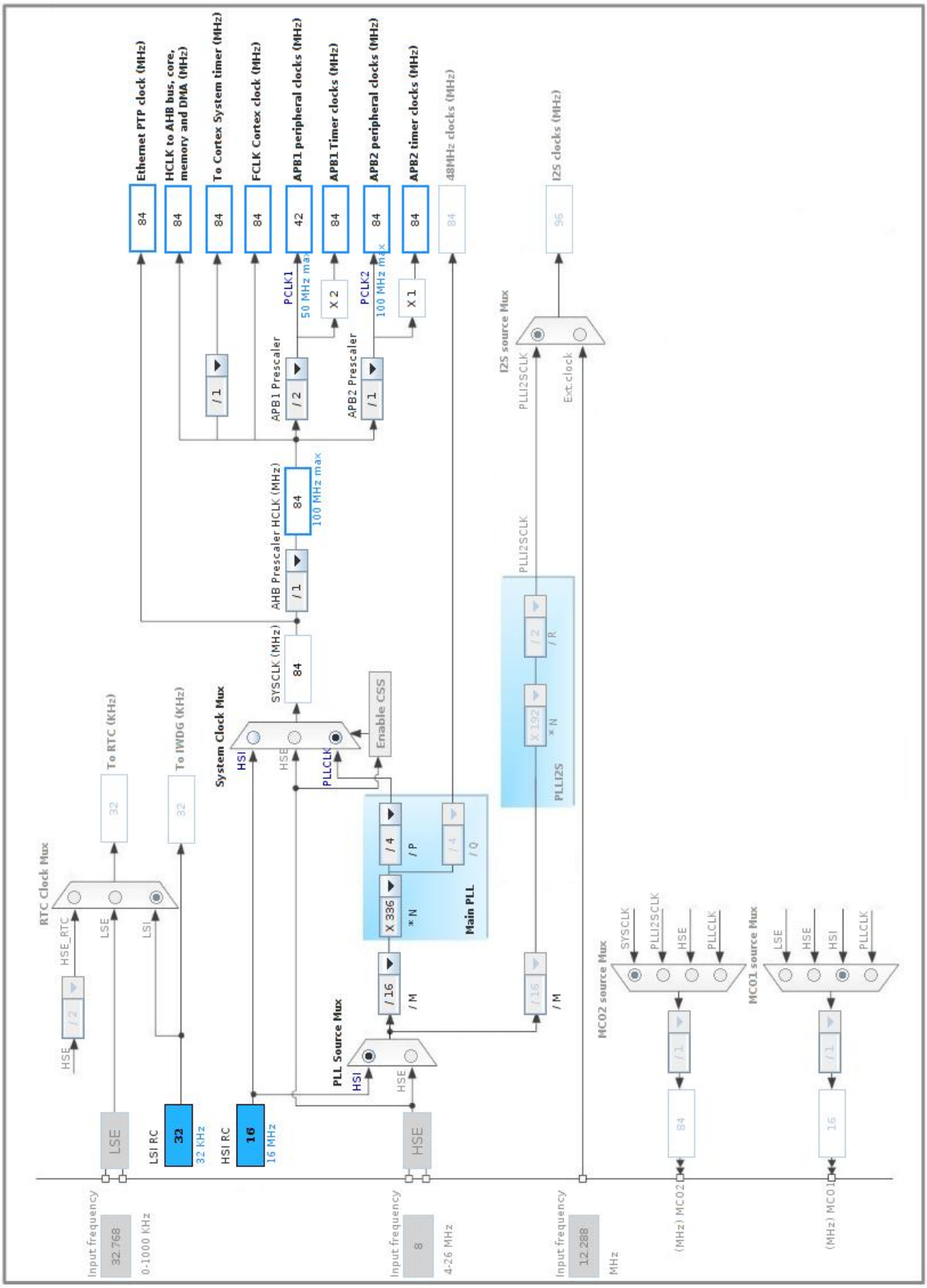
Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP	I/O	GPIO_EXTI13	B1 [Blue PushButton]
3	PC14-OSC32_IN *	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT *	I/O	RCC_OSC32_OUT	
5	PH0 - OSC_IN *	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT *	I/O	RCC_OSC_OUT	
7	NRST	Reset		
12	VSSA	Power		
13	VDDA	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	SPI1_SCK	ENCODERS_SERIAL_CLOCK
22	PA6	I/O	SPI1_MISO	ENCODERS_SERIAL_DATA
24	PC4 **	I/O	GPIO_Output	FANS_ENABLE
28	PB2	I/O	GPIO_EXTI2	LCD_BUTTON
30	VCAP1	Power		
31	VSS	Power		
32	VDD	Power		
33	PB12 **	I/O	GPIO_Output	ENCODER_CS0
34	PB13 **	I/O	GPIO_Output	MOTOR3_DIR
35	PB14 **	I/O	GPIO_Output	MOTOR2_DIR
36	PB15 **	I/O	GPIO_Output	MOTOR1_DIR
38	PC7 **	I/O	GPIO_Output	ENCODER_CS2
41	PA8	I/O	TIM1_CH1	
42	PA9	I/O	TIM1_CH2	
43	PA10 **	I/O	GPIO_Output	MOTORS_ENABLE
46	PA13 *	I/O	SYS_JTMS-SWDIO	TMS
47	VSS	Power		
48	VDD	Power		
49	PA14 *	I/O	SYS_JTCK-SWCLK	TCK
55	PB3 **	I/O	GPIO_Output	MOTOR3_STEP
56	PB4 **	I/O	GPIO_Output	MOTOR1_STEP

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
57	PB5 **	I/O	GPIO_Output	MOTOR2_STEP
58	PB6 **	I/O	GPIO_Output	ENCODER_CS1
59	PB7	I/O	I2C1_SDA	
60	BOOT0	Boot		
61	PB8	I/O	I2C1_SCL	
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. I2C1

I2C: I2C

5.1.1. Parameter Settings:

Master Features:

I2C Speed Mode	Standard Mode
I2C Clock Speed (Hz)	100000

Slave Features:

Clock No Stretch Mode	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0
General Call address detection	Disabled

5.2. SPI1

Mode: Receive Only Master

5.2.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	**16 Bits ***
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**256 ***
Baud Rate	**328.125 KBits/s ***
Clock Polarity (CPOL)	**High ***
Clock Phase (CPHA)	**2 Edge ***

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

5.3. SYS

Timebase Source: SysTick

5.4. TIM1

Combined Channels: Encoder Mode

5.4.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	0
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0

Trigger Output (TRGO) Parameters:

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode TI1
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	**5 ***
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	**5 ***

*** User modified value**

6. System Configuration

6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	
	PB8	I2C1_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	ENCODERS_SERIAL_CLOCK
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	ENCODERS_SERIAL_DATA
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA9	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
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 ***	USART_TX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	USART_RX
	PA13	SYS_JTMS-SWDIO	n/a	n/a	**n/a**	TMS
	PA14	SYS_JTCK-SWCLK	n/a	n/a	**n/a**	TCK
GPIO	PC13-ANTI_TAMP	GPIO_EXTI13	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	B1 [Blue PushButton]
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	FANS_ENABLE
	PB2	GPIO_EXTI2	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	LCD_BUTTON
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENCODER_CS0

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR3_DIR
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR2_DIR
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR1_DIR
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENCODER_CS2
	PA10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTORS_ENABLE
	PB3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR3_STEP
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR1_STEP
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MOTOR2_STEP
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENCODER_CS1

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	0	0
System tick timer	true	0	0
EXTI line[15:10] interrupts	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line2 interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM1 update interrupt and TIM10 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM11 global interrupt	unused		
TIM1 capture compare interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	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 Project

8.1. Project Settings

Name	Value
Project Name	robot_main
Project Folder	/home/kamil/RobotFirmware/robot_main
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F4 V1.16.0

8.2. 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	Yes
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