1. Description

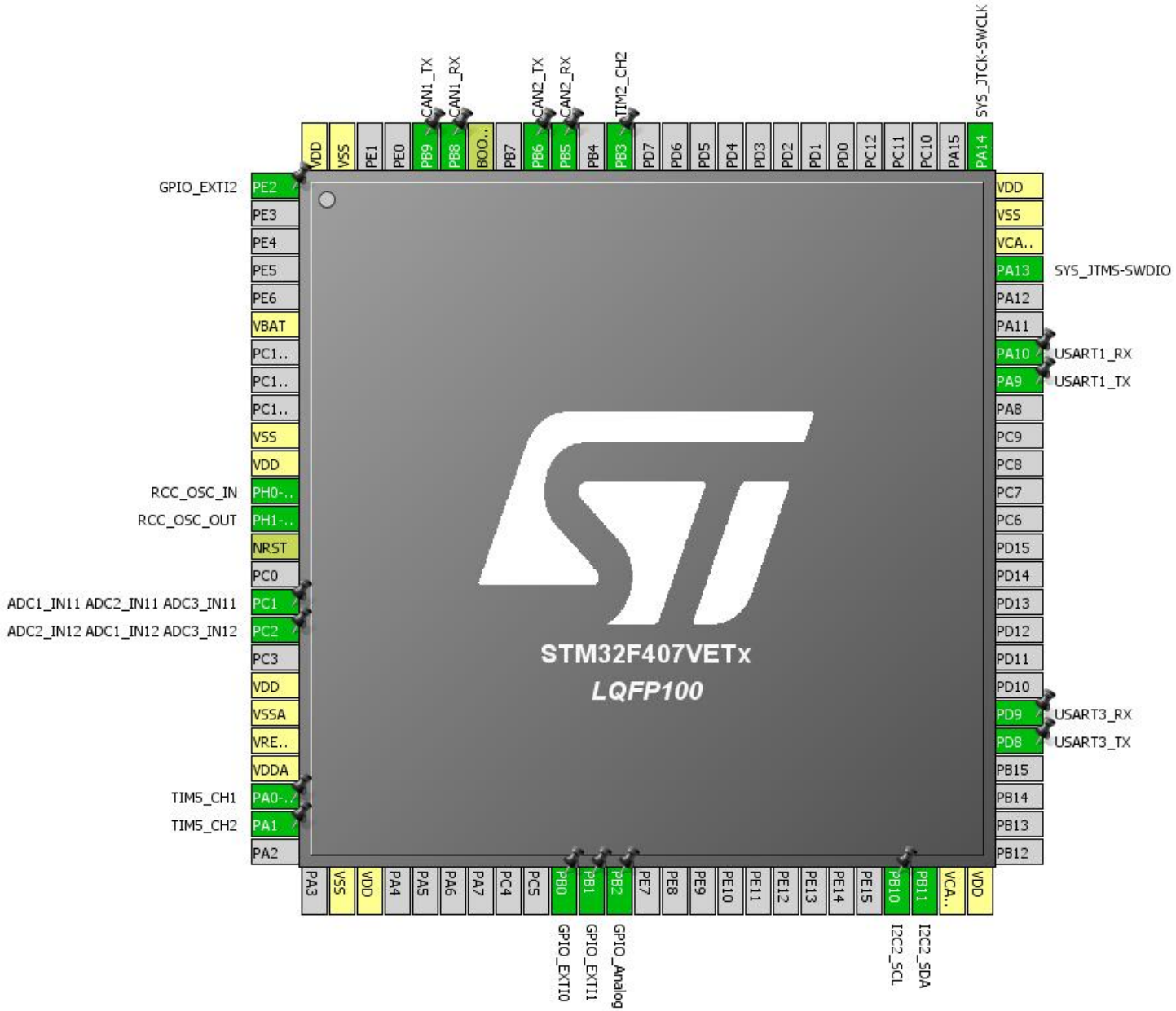
1.1. Project

Project Name	RoboCon2017V2
Board Name	RoboCon2017V2.0
Generated with:	STM32CubeMX 4.18.0
Date	01/17/2017

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F407/417
MCU name	STM32F407VETx
MCU Package	LQFP100
MCU Pin number	100

2. Pinout Configuration



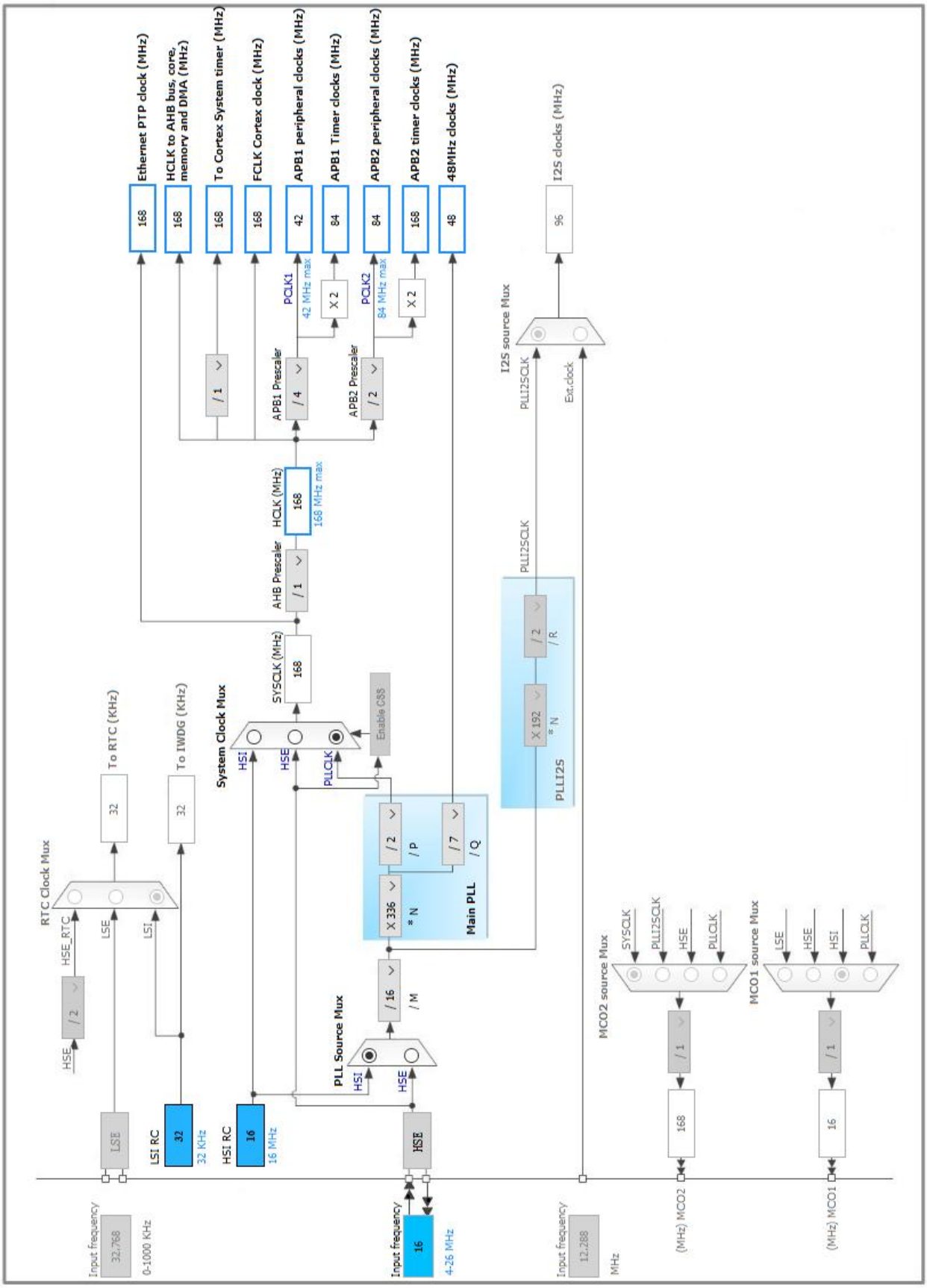
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2	I/O	GPIO_EXTI2	
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
12	PH0-OSC_IN	I/O	RCC_OSC_IN	
13	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
14	NRST	Reset		
16	PC1	I/O	ADC1_IN11, ADC2_IN11, ADC3_IN11	
17	PC2	I/O	ADC2_IN12, ADC1_IN12, ADC3_IN12	
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
23	PA0-WKUP	I/O	TIM5_CH1	
24	PA1	I/O	TIM5_CH2	
27	VSS	Power		
28	VDD	Power		
35	PB0	I/O	GPIO_EXTI0	
36	PB1	I/O	GPIO_EXTI1	
37	PB2 *	I/O	GPIO_Analog	
47	PB10	I/O	I2C2_SCL	
48	PB11	I/O	I2C2_SDA	
49	VCAP_1	Power		
50	VDD	Power		
55	PD8	I/O	USART3_TX	
56	PD9	I/O	USART3_RX	
68	PA9	I/O	USART1_TX	
69	PA10	I/O	USART1_RX	
72	PA13	I/O	SYS_JTMS-SWDIO	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
89	PB3	I/O	TIM2_CH2	

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
91	PB5	I/O	CAN2_RX	
92	PB6	I/O	CAN2_TX	
94	BOOT0	Boot		
95	PB8	I/O	CAN1_RX	
96	PB9	I/O	CAN1_TX	
99	VSS	Power		
100	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. IPs and Middleware Configuration

5.1. ADC1

mode: IN11

mode: IN12

5.1.1. Parameter Settings:

ADCs_Common_Settings:	
Mode	Independent mode
ADC_Settings:	
Clock Prescaler	PCLK2 divided by 4
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion
ADC_Regular_ConversionMode:	
Number Of Conversion	1
External Trigger Conversion Edge	None
Rank	1
Channel	**Channel 12 ***
Sampling Time	3 Cycles
ADC_Injected_ConversionMode:	
Number Of Conversions	0
WatchDog:	
Enable Analog WatchDog Mode	false

5.2. ADC2

mode: IN11

mode: IN12

5.2.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 4
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	1
External Trigger Conversion Edge	None
Rank	1
Channel	**Channel 12 ***
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.3. ADC3

mode: IN11

mode: IN12

5.3.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 4
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled

DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	1
External Trigger Conversion Edge	None
Rank	1
Channel	**Channel 12 ***
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.4. CAN1

mode: Mode

5.4.1. Parameter Settings:

Bit Timings Parameters:

Prescaler (for Time Quantum)	**3 ***
Time Quantum	**71.42857142857143 ***
Time Quanta in Bit Segment 1	**9 Times ***
Time Quanta in Bit Segment 2	**4 Times ***
Time for one Bit	1000
ReSynchronization Jump Width	1 Time

Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

Advanced Parameters:

Operating Mode	Normal

5.5. CAN2

mode: Mode

5.5.1. Parameter Settings:

Bit Timings Parameters:

Prescaler (for Time Quantum)	**3 ***
Time Quantum	**71.42857142857143 ***
Time Quanta in Bit Segment 1	**9 Times ***
Time Quanta in Bit Segment 2	**4 Times ***
Time for one Bit	1000
ReSynchronization Jump Width	1 Time

Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

Advanced Parameters:

Operating Mode	Normal

5.6. CRC

mode: Activated

5.7. I2C2

I2C: I2C

5.7.1. Parameter Settings:

Master Features:

I2C Speed Mode	**Fast Mode ***
I2C Clock Speed (Hz)	400000
Fast Mode Duty Cycle	Duty cycle Tlow/Thigh = 2

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

5.8. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

5.8.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	5 WS (6 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulatror Voltage Scale	Power Regulator Voltage Scale 1

5.9. RNG

mode: Activated

5.10. SYS

Debug: Serial Wire

Timebase Source: SysTick

5.11. TIM2

Channel2: PWM Generation CH2

5.11.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	0
Internal Clock Division (CKD)	No Division

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)

PWM Generation Channel 2:

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

5.12. TIM5

Combined Channels: Encoder Mode

5.12.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	0
Internal Clock Division (CKD)	No Division

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 and TI2 ***
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division

Input Filter	0

5.13. USART1

Mode: Asynchronous

5.13.1. 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

5.14. USART3

Mode: Asynchronous

5.14.1. 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

*** 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	PC1	ADC1_IN11	Analog mode	No pull-up and no pull-down	n/a	
	PC2	ADC1_IN12	Analog mode	No pull-up and no pull-down	n/a	
ADC2	PC1	ADC2_IN11	Analog mode	No pull-up and no pull-down	n/a	
	PC2	ADC2_IN12	Analog mode	No pull-up and no pull-down	n/a	
ADC3	PC1	ADC3_IN11	Analog mode	No pull-up and no pull-down	n/a	
	PC2	ADC3_IN12	Analog mode	No pull-up and no pull-down	n/a	
CAN1	PB8	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PB9	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
CAN2	PB5	CAN2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PB6	CAN2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
I2C2	PB10	I2C2_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	
	PB11	I2C2_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	
RCC	PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
TIM2	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
TIM5	PA0-WKUP	TIM5_CH1	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	**Very High**	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	**Very High ***	
USART3	PD8	USART3_TX	Alternate Function Push Pull	Pull-up	**Very High ***	
	PD9	USART3_RX	Alternate Function Push Pull	Pull-up	**Very High ***	
GPIO	PE2	GPIO_EXTI2	External Interrupt Mode with Rising edge trigger detection	**Pull-up ***	n/a	
	PB0	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	**Pull-up ***	n/a	
	PB1	GPIO_EXTI1	External Interrupt Mode with Rising edge trigger detection	**Pull-up ***	n/a	
	PB2	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	

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 line0 interrupt	true	0	0
EXTI line1 interrupt	true	0	0
EXTI line2 interrupt	true	0	0
ADC1, ADC2 and ADC3 global interrupts	true	0	0
CAN1 TX interrupts	true	0	0
CAN1 RX0 interrupts	true	0	0
CAN1 RX1 interrupt	true	0	0
CAN1 SCE interrupt	true	0	0
USART1 global interrupt	true	0	0
USART3 global interrupt	true	0	0
TIM5 global interrupt	true	0	0
CAN2 TX interrupts	true	0	0
CAN2 RX0 interrupts	true	0	0
CAN2 RX1 interrupt	true	0	0
CAN2 SCE interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM2 global interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
HASH and RNG global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F407/417
MCU	STM32F407VETx
Datasheet	022152_Rev7

7.2. Parameter Selection

Temperature	25
Vdd	3.3

7.3. 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	3
Cells in parallel	1

8. Software Project

8.1. Project Settings

Name	Value
Project Name	RoboCon2017V2.0
Project Folder	C:\Users\irvn\Desktop\Robocon\RoboCon2017
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.13.1

8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	Copy all used libraries into the project folder
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)	Yes