1. Description

1.1. Project

Project Name	DoubleMotorDriver
Board Name	custom
Generated with:	STM32CubeMX 4.26.0
Date	03/09/2019

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F401
MCU name	STM32F401RBTx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration

STM32F401RBTx
LQFP64
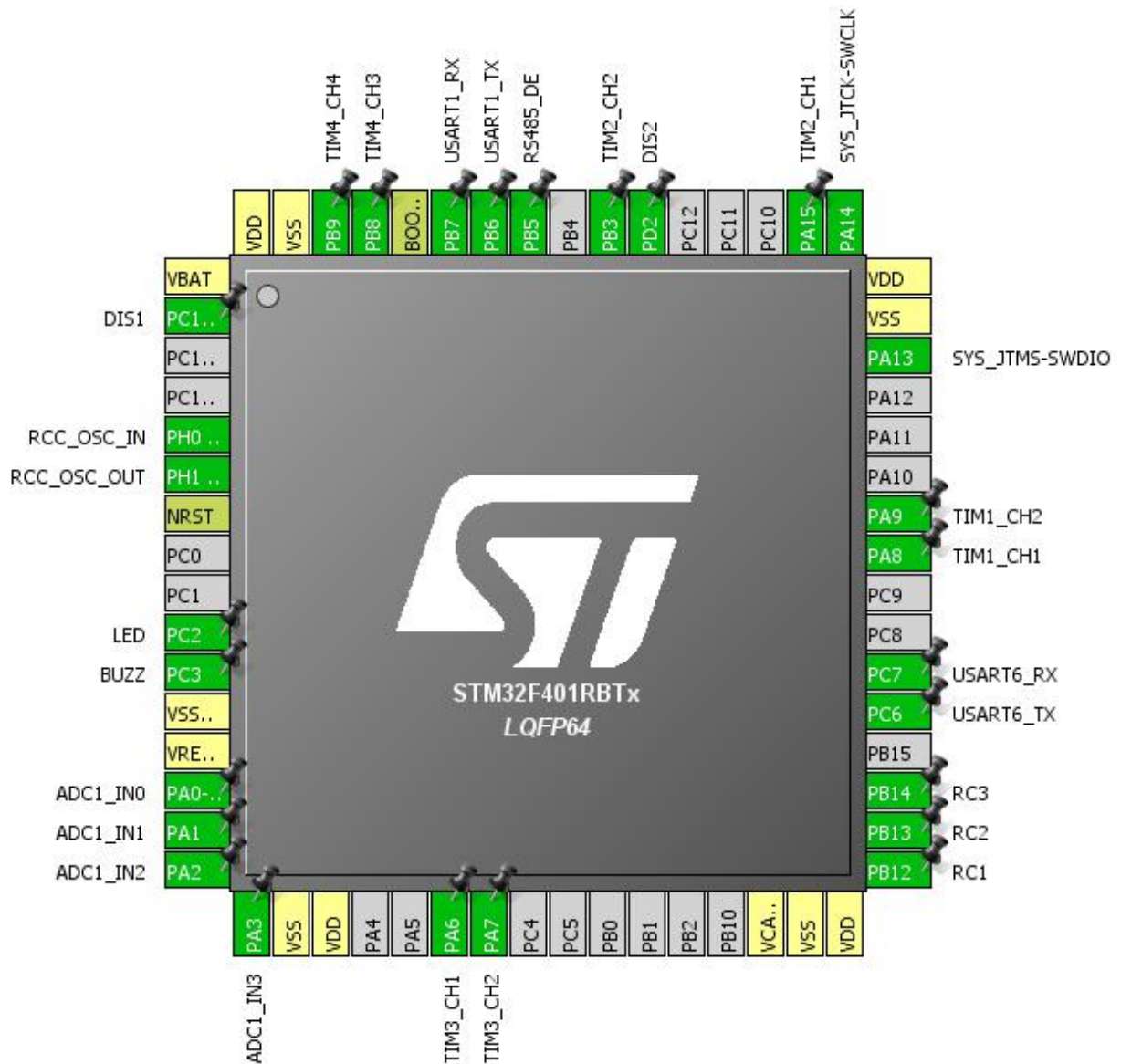
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP *	I/O	GPIO_Output	DIS1
5	PH0 - OSC_IN	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
10	PC2 *	I/O	GPIO_Output	LED
11	PC3 *	I/O	GPIO_Output	BUZZ
12	VSSA/VREF-	Power		
13	VREF+	Power		
14	PA0-WKUP	I/O	ADC1_IN0	
15	PA1	I/O	ADC1_IN1	
16	PA2	I/O	ADC1_IN2	
17	PA3	I/O	ADC1_IN3	
18	VSS	Power		
19	VDD	Power		
22	PA6	I/O	TIM3_CH1	
23	PA7	I/O	TIM3_CH2	
30	VCAP1	Power		
31	VSS	Power		
32	VDD	Power		
33	PB12	I/O	GPIO_EXTI12	RC1
34	PB13 *	I/O	EVENTOUT	RC2
35	PB14	I/O	GPIO_EXTI14	RC3
37	PC6	I/O	USART6_TX	
38	PC7	I/O	USART6_RX	
41	PA8	I/O	TIM1_CH1	
42	PA9	I/O	TIM1_CH2	
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VSS	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
50	PA15	I/O	TIM2_CH1	
54	PD2 *	I/O	GPIO_Output	DIS2
55	PB3	I/O	TIM2_CH2	
57	PB5 *	I/O	GPIO_Output	RS485_DE
58	PB6	I/O	USART1_TX	

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
59	PB7	I/O	USART1_RX	
60	BOOT0	Boot		
61	PB8	I/O	TIM4_CH3	
62	PB9	I/O	TIM4_CH4	
63	VSS	Power		
64	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration
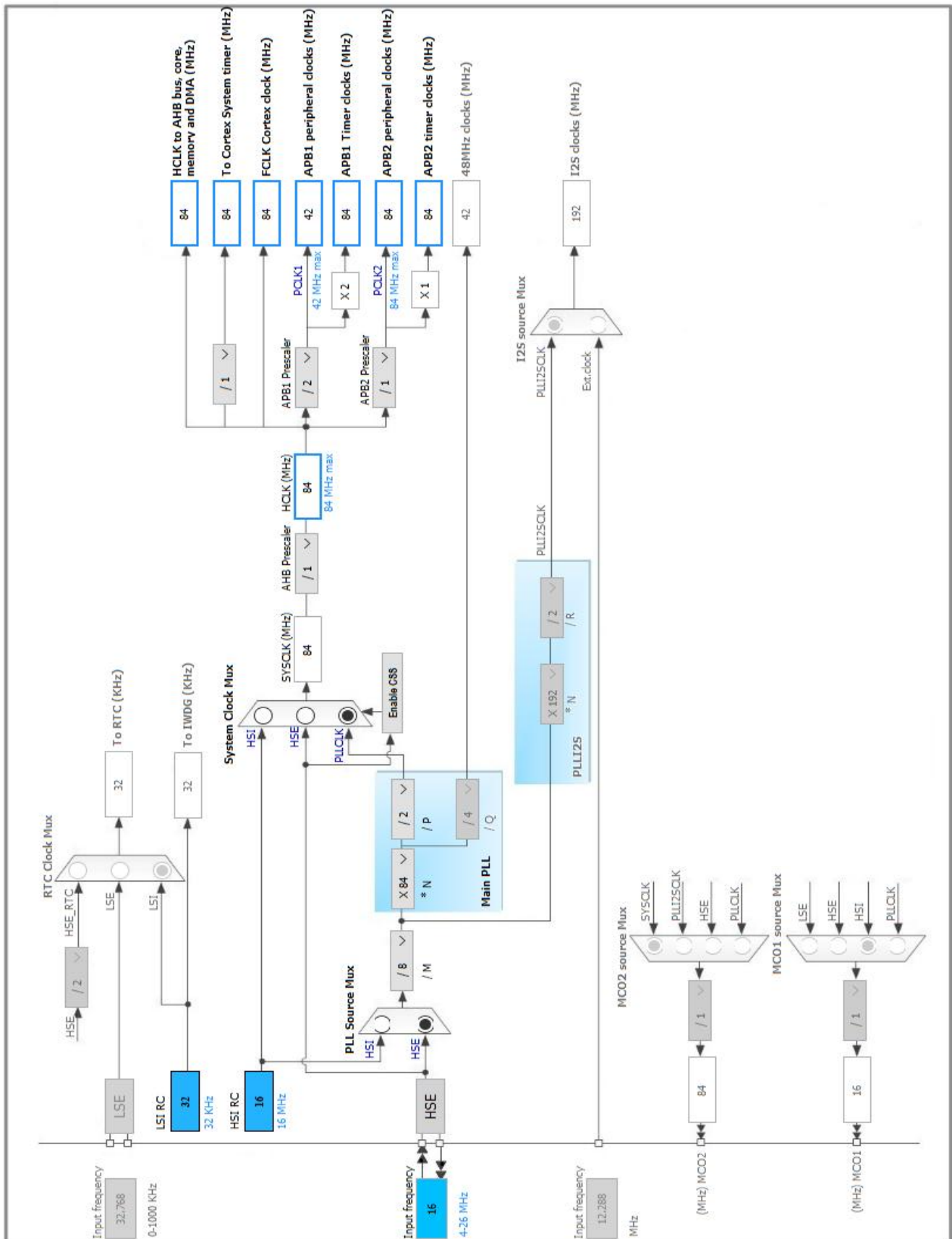
5. IPs and Middleware Configuration

5.1. ADC1

mode: IN0

mode: IN1

mode: IN2

mode: IN3

mode: Temperature Sensor Channel

5.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	**PCLK2 divided by 6 ***
Resolution	**10 bits (13 ADC Clock cycles) ***
Data Alignment	Right alignment
Scan Conversion Mode	**Enabled ***
Continuous Conversion Mode	**Enabled ***
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	**Enabled ***
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	**5 ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 0
Sampling Time	**480 Cycles ***
Rank	**2 ***
Channel	**Channel 1 ***
Sampling Time	**480 Cycles ***
Rank	**3 ***
Channel	**Channel 2 ***
Sampling Time	**480 Cycles ***
Rank	**4 ***
Channel	**Channel 3 ***
Sampling Time	**480 Cycles ***
Rank	**5 ***
Channel	**Channel Temperature Sensor ***

Sampling Time	**480 Cycles ***

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator
5.2.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
TIM Prescaler Selection	Disabled
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulatror Voltage Scale	Power Regulator Voltage Scale 2

5.3. SYS

Debug: Serial Wire
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)	**65535 ***

Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0

Trigger Output (TRGO) Parameters:

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

Encoder:

Encoder Mode	**Encoder Mode TI1 and TI2 ***

_____ Parameters for Channel 1 _____

Polarity	**Falling 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 ***

5.5. TIM2

Channel1: PWM Generation CH1
Channel2: PWM Generation CH2
5.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**47 ***
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**102 ***
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

PWM Generation Channel 2:

Mode	PWM mode 1

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

5.6. TIM3

Combined Channels: Encoder Mode

5.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**65535 ***
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)

Encoder:

Encoder Mode	**Encoder Mode TI1 and TI2 ***
____ Parameters for Channel 1 ____	
Polarity	**Falling 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 ***

5.7. TIM4

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

5.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**47 ***

Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**102 ***
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 3:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

5.8. TIM10

mode: Activated

5.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**199 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**83 ***
Internal Clock Division (CKD)	No Division

5.9. USART1

Mode: Asynchronous

5.9.1. Parameter Settings:

Basic Parameters:

Baud Rate	**57600 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	**Receive Only ***
Over Sampling	16 Samples

5.10. USART6

Mode: Asynchronous

5.10.1. Parameter Settings:

Basic Parameters:

Baud Rate	**57600 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	**Transmit Only ***
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	PA0-WKUP	ADC1_IN0	Analog mode	No pull-up and no pull-down	n/a	
	PA1	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	
	PA2	ADC1_IN2	Analog mode	No pull-up and no pull-down	n/a	
	PA3	ADC1_IN3	Analog mode	No pull-up and no pull-down	n/a	
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	
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	
TIM2	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM3	PA6	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM4	PB8	TIM4_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB9	TIM4_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART1	PB6	USART1_TX	Alternate Function Push Pull	Pull-up	**Very High** *	
	PB7	USART1_RX	Alternate Function Push Pull	Pull-up	**Very High** *	
USART6	PC6	USART6_TX	Alternate Function Push Pull	Pull-up	**Very High** *	
	PC7	USART6_RX	Alternate Function Push Pull	Pull-up	**Very High** *	
GPIO	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DIS1
	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED
	PC3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BUZZ
	PB12	GPIO_EXTI12	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	RC1
	PB13	EVENTOUT	Alternate Function Push Pull	No pull-up and no pull-down	Low	RC2
	PB14	GPIO_EXTI14	External Interrupt Mode with	No pull-up and no pull-down	n/a	RC3

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
			Rising edge trigger detection			
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DIS2
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RS485_DE

6.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA2_Stream0	Peripheral To Memory	**Medium ***
USART1_RX	DMA2_Stream2	Peripheral To Memory	**Very High ***

ADC1: DMA2_Stream0 DMA request Settings:

Mode:	**Circular ***
Use fifo:	Disable
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	Half Word
Memory Data Width:	Half Word

USART1_RX: DMA2_Stream2 DMA request Settings:

Mode:	**Circular ***
Use fifo:	Disable
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	Byte
Memory Data Width:	Byte

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
TIM1 update interrupt and TIM10 global interrupt	true	1	0
TIM1 trigger and commutation interrupts and TIM11 global interrupt	true	2	0
USART1 global interrupt	true	3	0
DMA2 stream0 global interrupt	true	6	0
DMA2 stream2 global interrupt	true	0	0
USART6 global interrupt	true	4	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1 global interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
TIM4 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	STM32F401
MCU	STM32F401RBTx
Datasheet	024738_Rev8

7.2. Parameter Selection

Temperature	25
Vdd	null

8. Software Project

8.1. Project Settings

Name	Value
Project Name	DoubleMotorDriver
Project Folder	D:\localRepo\RobotController\RobotController\Embedded\DoubleMotorDriver
Toolchain / IDE	EWARM
Firmware Package Name and Version	STM32Cube FW_F4 V1.21.0

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	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

9. Software Pack Report