1. Description

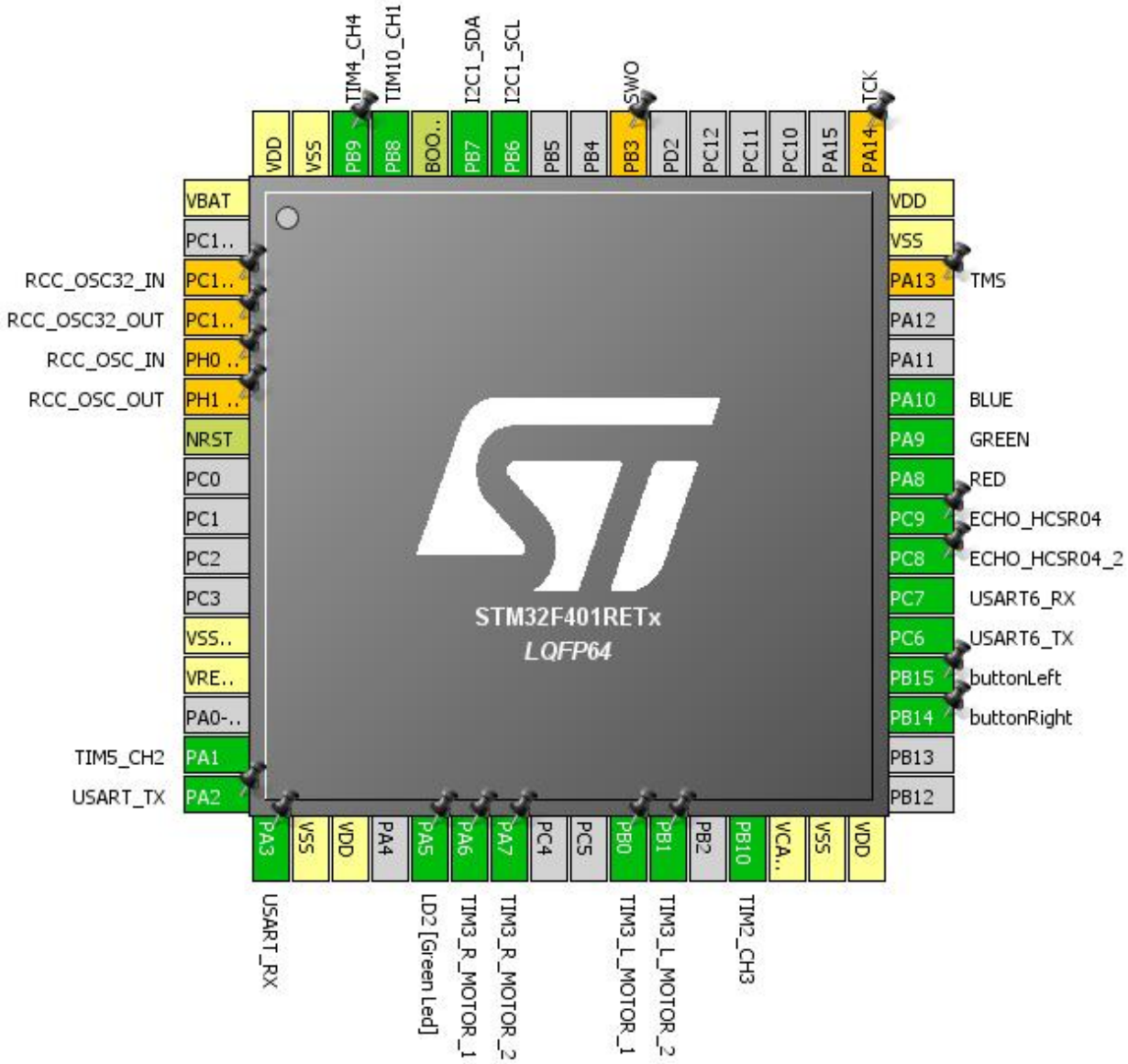
1.1. Project

Project Name	Inbyggda-system-projekt-grupp-5
Board Name	NUCLEO-F401RE
Generated with:	STM32CubeMX 4.20.1
Date	03/11/2019

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F401
MCU name	STM32F401RETx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



3. Pins Configuration

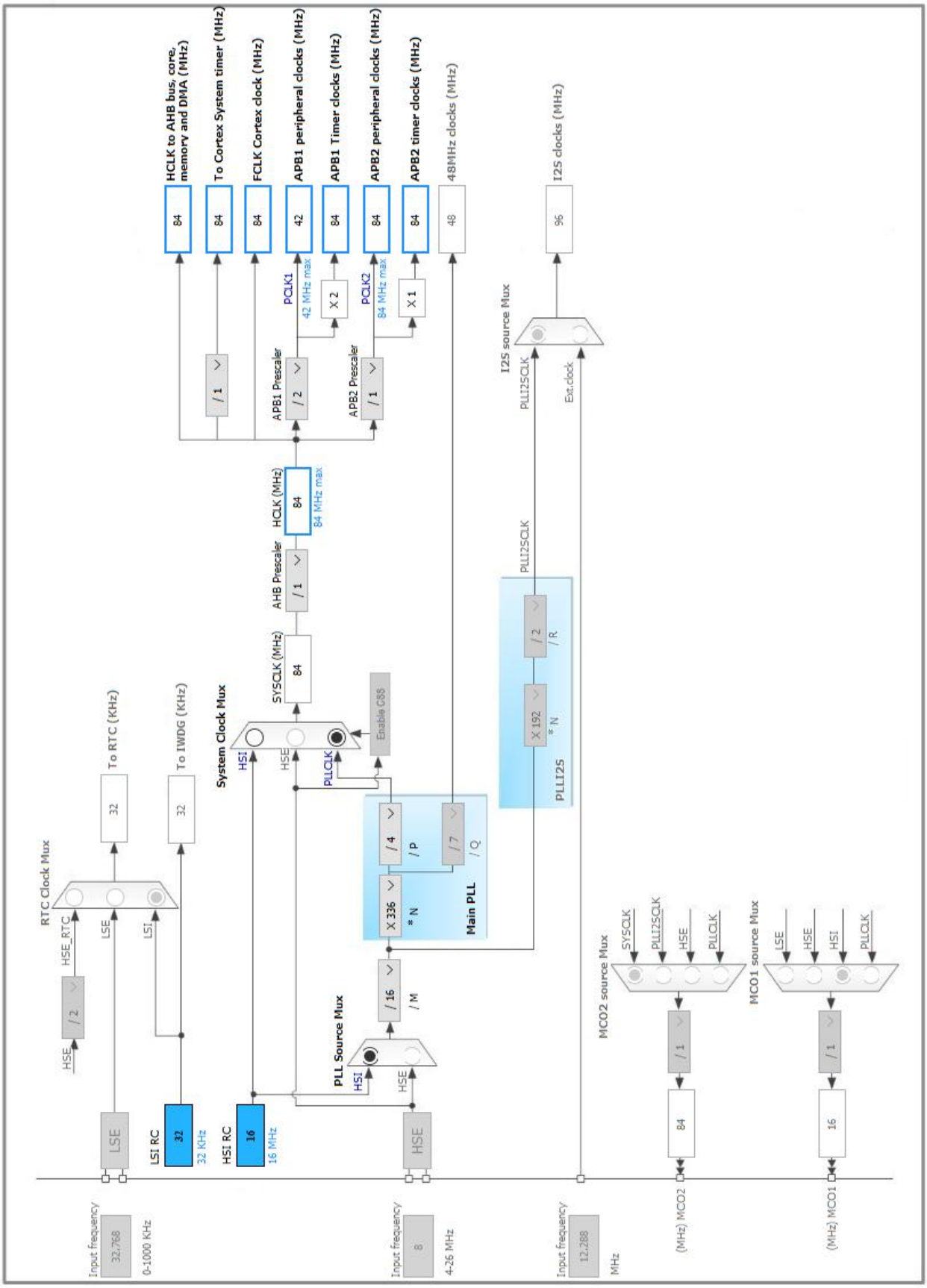
Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
3	PC14-OSC32_IN *	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT *	I/O	RCC_OSC32_OUT	
5	PH0 - OSC_IN *	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT *	I/O	RCC_OSC_OUT	
7	NRST	Reset		
12	VSSA/VREF-	Power		
13	VREF+	Power		
15	PA1	I/O	TIM5_CH2	
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]
22	PA6	I/O	TIM3_CH1	TIM3_R_MOTOR_1
23	PA7	I/O	TIM3_CH2	TIM3_R_MOTOR_2
26	PB0	I/O	TIM3_CH3	TIM3_L_MOTOR_1
27	PB1	I/O	TIM3_CH4	TIM3_L_MOTOR_2
29	PB10	I/O	TIM2_CH3	
30	VCAP1	Power		
31	VSS	Power		
32	VDD	Power		
35	PB14	I/O	GPIO_EXTI14	buttonRight
36	PB15	I/O	GPIO_EXTI15	buttonLeft
37	PC6	I/O	USART6_TX	
38	PC7	I/O	USART6_RX	
39	PC8	I/O	GPIO_EXTI8	ECHO_HCSR04_2
40	PC9	I/O	GPIO_EXTI9	ECHO_HCSR04
41	PA8	I/O	TIM1_CH1	RED
42	PA9	I/O	TIM1_CH2	GREEN
43	PA10	I/O	TIM1_CH3	BLUE
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	SYS_JTDO-SWO	SWO

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
58	PB6	I/O	I2C1_SCL	
59	PB7	I/O	I2C1_SDA	
60	BOOT0	Boot		
61	PB8	I/O	TIM10_CH1	
62	PB9	I/O	TIM4_CH4	
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. SYS

Timebase Source: SysTick

5.3. TIM1

Clock Source : Internal Clock
Channel1: PWM Generation CH1
Channel2: PWM Generation CH2
Channel3: PWM Generation CH3

5.3.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**1291-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**255-1 ***
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)

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High

Break And Dead Time management - Output Configuration:

Automatic Output State	Disable
Off State Selection for Run Mode (OSSR)	Disable
Off State Selection for Idle Mode (OSSI)	Disable
Lock Configuration	Off

PWM Generation Channel 1:

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

PWM Generation Channel 2:

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

PWM Generation Channel 3:

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

5.4. TIM2

Clock Source : Internal Clock

Channel3: PWM Generation CH3

5.4.1. 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 3:

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

5.5. TIM3

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

5.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**2100 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**100-1 ***
Internal Clock Division (CKD)	**Division by 4 ***

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 1:

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

PWM Generation Channel 2:

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

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

5.6. TIM4

mode: Clock Source

Channel4: PWM Generation CH4

5.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**100-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**50000-1 ***
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 4:

Mode	PWM mode 1
Pulse (16 bits value)	**9 ***
Fast Mode	Disable
CH Polarity	High

5.7. TIM5

mode: Clock Source

Channel2: PWM Generation CH2

5.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**168-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**50000-1 ***
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)	**5 ***
Fast Mode	Disable
CH Polarity	High

5.8. TIM9

mode: Clock Source

5.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**42000-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**100-1 ***
Internal Clock Division (CKD)	No Division

5.9. TIM10

mode: Activated

Channel1: PWM Generation CH1

5.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**25-1 ***
Counter Mode	Up

Counter Period (AutoReload Register - 16 bits value)	**64615-1 ***
Internal Clock Division (CKD)	No Division

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	**3846 ***
Fast Mode	Disable
CH Polarity	High

5.10. TIM11

mode: Activated

5.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**84-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**10000-1 ***
Internal Clock Division (CKD)	No Division

5.11. USART2

Mode: Asynchronous

5.11.1. 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

5.12. USART6

Mode: Asynchronous

5.12.1. Parameter Settings:

Basic Parameters:

Baud Rate	**9600 ***
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
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	**Very High** *	
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	**Very High** *	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	RED
	PA9	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	GREEN
	PA10	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	BLUE
TIM2	PB10	TIM2_CH3	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	TIM3_R_MOTOR_1
	PA7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	TIM3_R_MOTOR_2
	PB0	TIM3_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	TIM3_L_MOTOR_1
	PB1	TIM3_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	TIM3_L_MOTOR_2
TIM4	PB9	TIM4_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM5	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM10	PB8	TIM10_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART2	PA2	USART2_TX	Alternate Function Push Pull	*	Low	USART_TX
	PA3	USART2_RX	Alternate Function Push Pull	*	Low	USART_RX
USART6	PC6	USART6_TX	Alternate Function Push Pull	Pull-up	**Very High** *	
	PC7	USART6_RX	Alternate Function Push Pull	Pull-up	**Very High** *	
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	
	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	TMS
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	TCK

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	SWO
GPIO	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [Green Led]
	PB14	GPIO_EXTI14	External Interrupt Mode with Rising edge trigger detection	**Pull-up ***	n/a	buttonRight
	PB15	GPIO_EXTI15	External Interrupt Mode with Rising edge trigger detection	**Pull-up ***	n/a	buttonLeft
	PC8	GPIO_EXTI8	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	ECHO_HCSR04_2
	PC9	GPIO_EXTI9	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	ECHO_HCSR04

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[9:5] interrupts	true	0	0
TIM1 break interrupt and TIM9 global interrupt	true	0	0
EXTI line[15:10] interrupts	true	0	0
USART6 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC 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		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
TIM4 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
USART2 global interrupt	unused		
TIM5 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F401
MCU	STM32F401RETx
Datasheet	025644_Rev3

7.2. Parameter Selection

Temperature	25
Vdd	null

8. Software Project

8.1. Project Settings

Name	Value
Project Name	Inbyggda-system-projekt-grupp-5
Project Folder	C:\Users\Andreas Svensson\Documents\Skola\Inbyggda och mobila
Toolchain / IDE	TrueSTUDIO
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	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