



## 1. Description

### 1.1. Project

Project Name	FC32-Main
Board Name	custom
Generated with:	STM32CubeMX 6.5.0
Date	06/26/2022

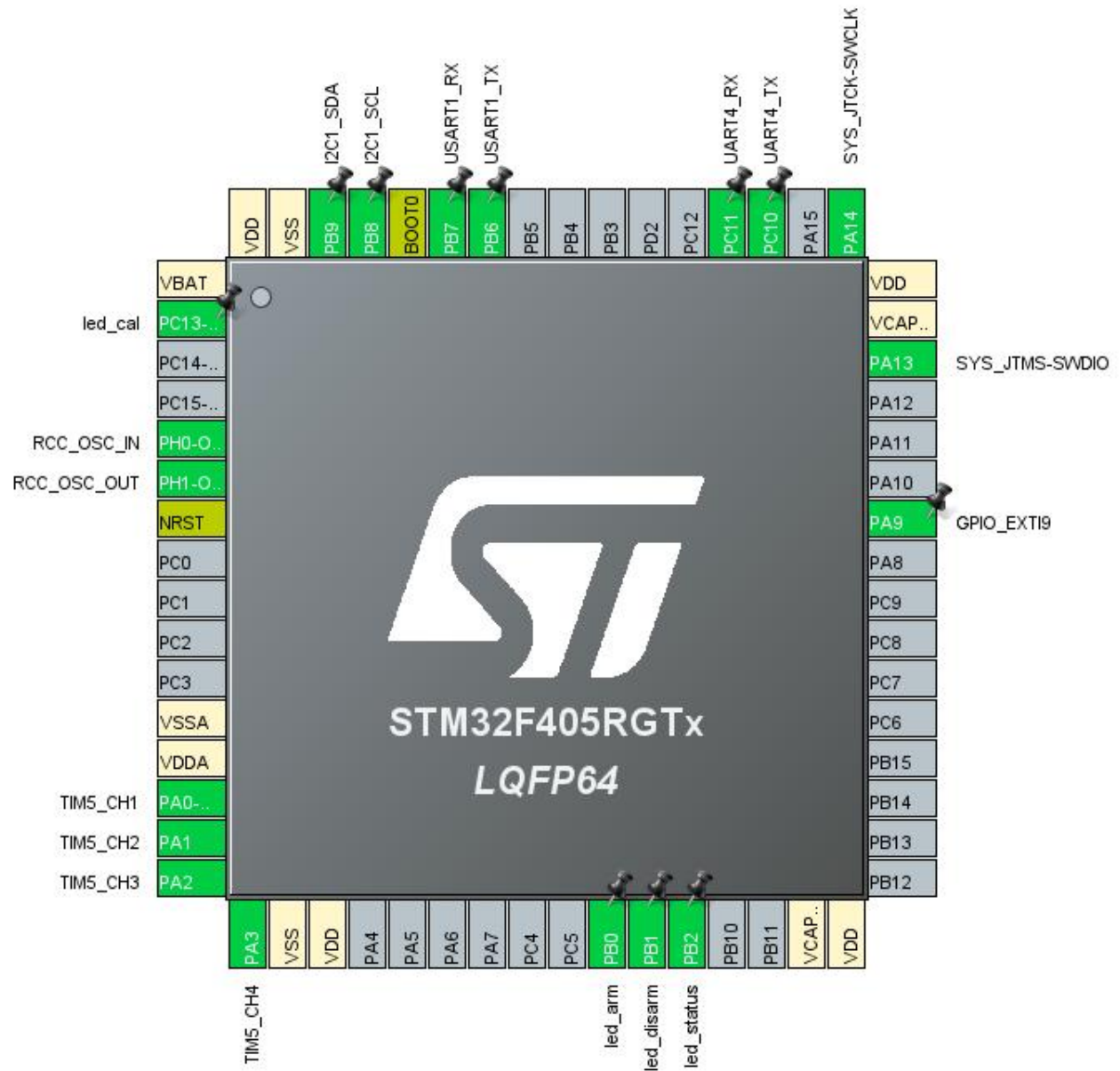
### 1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F405/415
MCU name	STM32F405RGTx
MCU Package	LQFP64
MCU Pin number	64

### 1.3. Core(s) information

Core(s)	Arm Cortex-M4
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## 2. Pinout Configuration

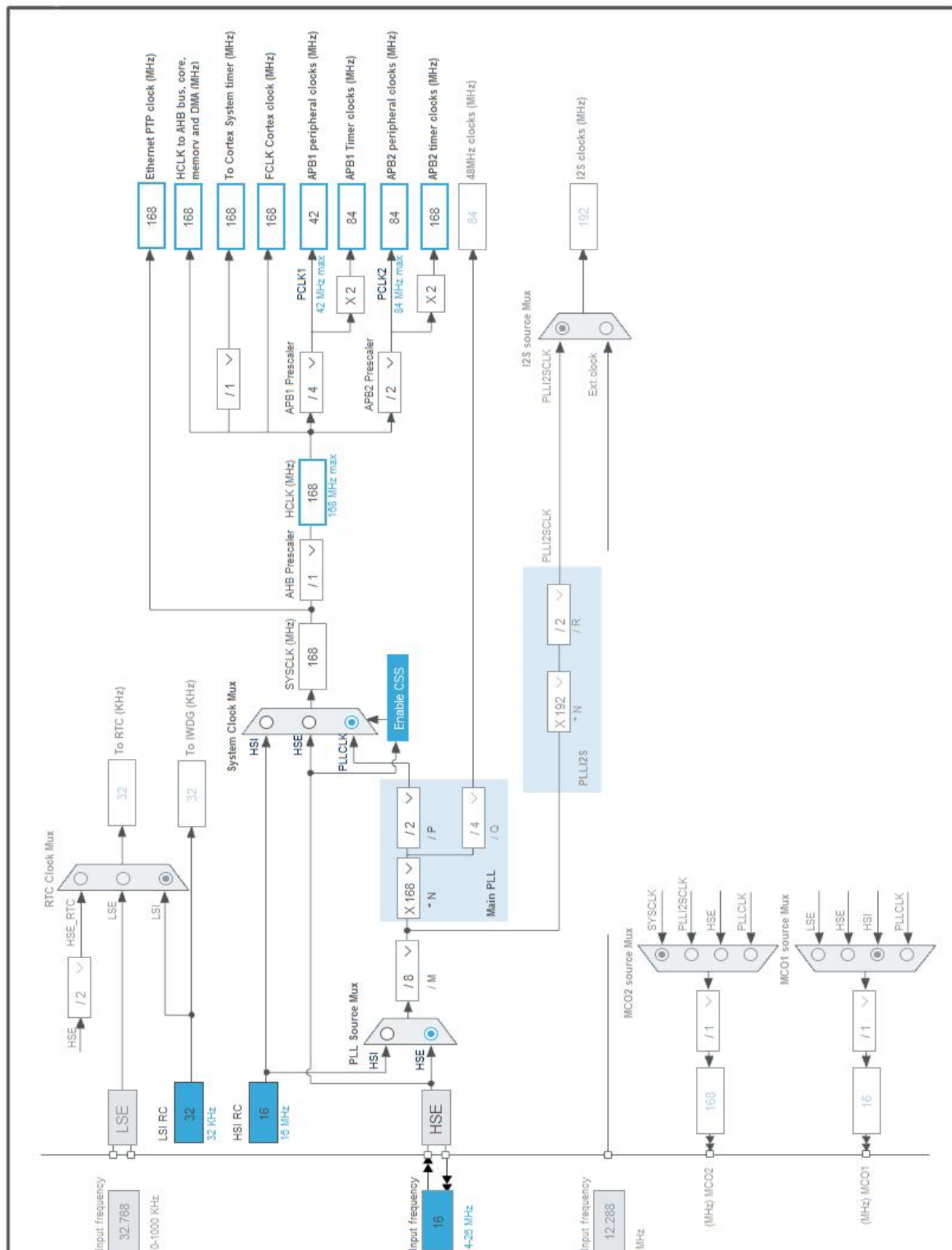


### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP *	I/O	GPIO_Output	led_cal
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		
14	PA0-WKUP	I/O	TIM5_CH1	
15	PA1	I/O	TIM5_CH2	
16	PA2	I/O	TIM5_CH3	
17	PA3	I/O	TIM5_CH4	
18	VSS	Power		
19	VDD	Power		
26	PB0 *	I/O	GPIO_Output	led_arm
27	PB1 *	I/O	GPIO_Output	led_disarm
28	PB2 *	I/O	GPIO_Output	led_status
31	VCAP_1	Power		
32	VDD	Power		
42	PA9	I/O	GPIO_EXTI9	
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VCAP_2	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
51	PC10	I/O	UART4_TX	
52	PC11	I/O	UART4_RX	
58	PB6	I/O	USART1_TX	
59	PB7	I/O	USART1_RX	
60	BOOT0	Boot		
61	PB8	I/O	I2C1_SCL	
62	PB9	I/O	I2C1_SDA	
63	VSS	Power		
64	VDD	Power		

\* The pin is affected with an I/O function

## 4. Clock Tree Configuration



## 5. Software Project

### 5.1. Project Settings

Name	Value
Project Name	FC32-Main
Project Folder	D:\STM_Projects\FC32-Main
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.27.0
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

### 5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	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
Keep User Code when re-generating	Yes
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No
Enable Full Assert	No

### 5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_TIM5_Init	TIM5
4	MX_I2C1_Init	I2C1
5	MX_TIM13_Init	TIM13
6	MX_TIM14_Init	TIM14
7	MX_UART4_Init	UART4
8	MX_USART1_UART_Init	USART1
9	MX_TIM10_Init	TIM10



## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F405/415
MCU	STM32F405RGTx
Datasheet	DS8626_Rev8

### 6.2. Parameter Selection

Temperature	25
Vdd	3.3

### 6.3. 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	1
Cells in parallel	1



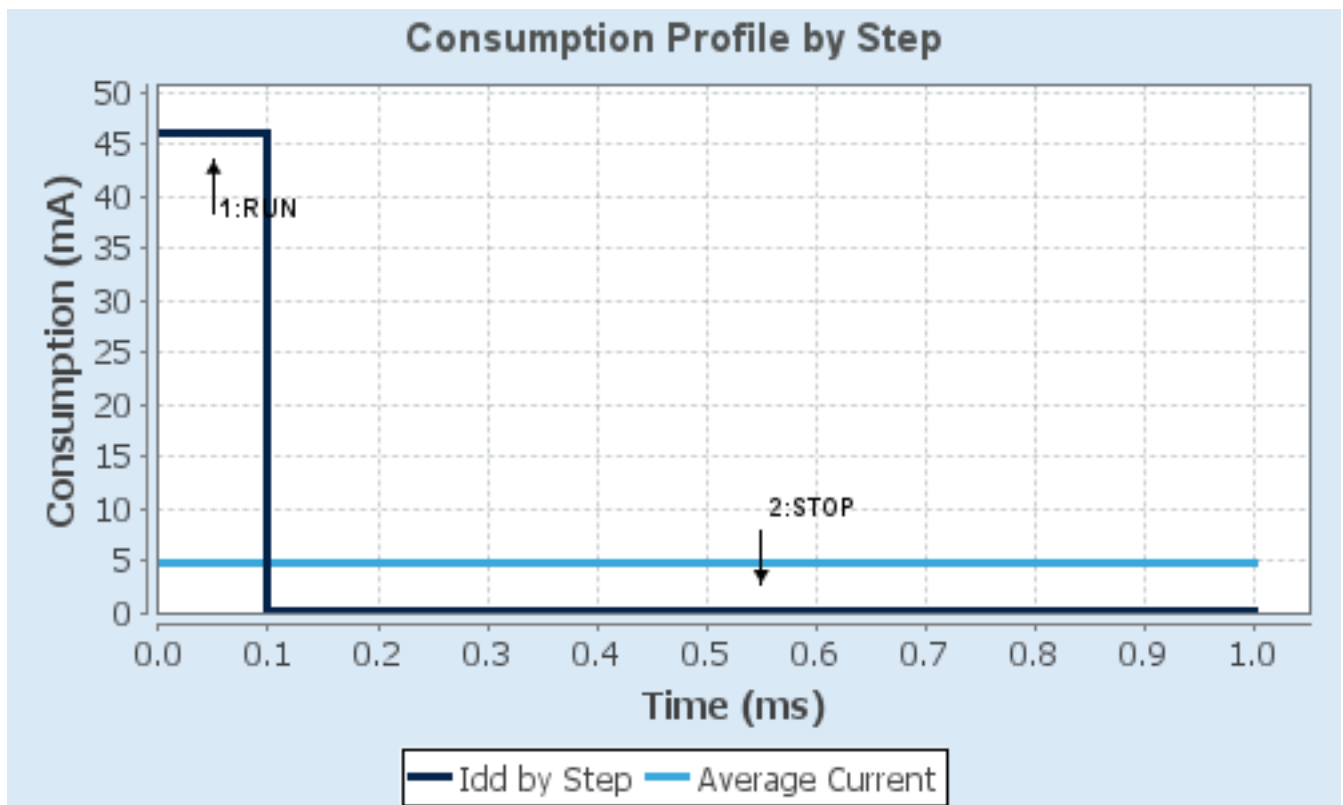
#### 6.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP
<b>Vdd</b>	3.3	3.3
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Scale1-High	No Scale
<b>Fetch Type</b>	FLASH	n/a
<b>CPU Frequency</b>	168 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	Regulator LP Flash-PwrDwn
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	46 mA	280 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	210.0	0.0
<b>Ta Max</b>	98.02	104.96
<b>Category</b>	In DS Table	In DS Table

#### 6.5. Results

Sequence Time	1 ms	Average Current	4.85 mA
Battery Life	29 days, 4 hours	Average DMIPS	210.0 DMIPS

#### 6.6. Chart



## 7. *Peripherals and Middlewares Configuration*

### 7.1. I2C1

#### I2C: I2C

##### 7.1.1. Parameter Settings:

###### Master Features:

I2C Speed Mode	<b>Fast Mode *</b>
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

### 7.2. RCC

#### High Speed Clock (HSE): Crystal/Ceramic Resonator

##### 7.2.1. 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 Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

###### Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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### 7.3. SYS

#### Debug: Serial Wire

## Timebase Source: SysTick

### 7.4. TIM5

**mode: Clock Source**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

#### 7.4.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>840-1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>2000-1 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

##### 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
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

##### PWM Generation Channel 2:

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

##### PWM Generation Channel 3:

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

##### PWM Generation Channel 4:

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

## 7.5. TIM10

**mode: Activated**

### 7.5.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>84-1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>100-1 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

## 7.6. TIM13

**mode: Activated**

### 7.6.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>84-1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	65535
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

## 7.7. TIM14

**mode: Activated**

### 7.7.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>84-1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	65535

Internal Clock Division (CKD)  
auto-reload preload

No Division  
Disable

## 7.8. UART4

**Mode: Asynchronous**

### 7.8.1. 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

## 7.9. USART1

**Mode: Asynchronous**

### 7.9.1. Parameter Settings:

#### **Basic Parameters:**

Baud Rate	<b>57600 *</b>
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**

## 8. System Configuration

### 8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB8	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	<b>Very High</b> *	
	PB9	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	<b>Very High</b> *	
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	
TIM5	PA0-WKUP	TIM5_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA2	TIM5_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA3	TIM5_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
UART4	PC10	UART4_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PC11	UART4_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
USART1	PB6	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PB7	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
GPIO	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	led_cal
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	led_arm
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	led_disarm
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	led_status
	PA9	GPIO_EXTI9	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	

### 8.2. DMA configuration

nothing configured in DMA service





### 8.3. NVIC configuration

#### 8.3.1. NVIC

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	15	0
EXTI line[9:5] interrupts	true	0	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
UART4 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
USART1 global interrupt	unused		
TIM8 update interrupt and TIM13 global interrupt	unused		
TIM8 trigger and commutation interrupts and TIM14 global interrupt	unused		
TIM5 global interrupt	unused		
FPU global interrupt	unused		

#### 8.3.2. NVIC Code generation

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
EXTI line[9:5] interrupts	false	true	true
TIM1 update interrupt and TIM10 global interrupt	false	true	true
UART4 global interrupt	false	true	true

\* User modified value

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current

#### Middleware

#### System Core

#### Analog

#### Timers

#### Connectivity

#### Multimedia

#### Security

#### Computing

DMA

TIM5



I2C1



GPIO



TIM10



UART4



NVIC



TIM13



USART1



RCC



TIM14



SYS



## 10. Docs & Resources

Type	Link
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf">https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf">https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf</a>
Training Material	<a href="https://www.st.com/resource/en/sales_guide/sg_sc2154.pdf">https://www.st.com/resource/en/sales_guide/sg_sc2154.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flnucleolrwan.pdf">https://www.st.com/resource/en/flyer/flnucleolrwan.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32nucleo.pdf">https://www.st.com/resource/en/flyer/flstm32nucleo.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstmcsuite.pdf">https://www.st.com/resource/en/flyer/flstmcsuite.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf">https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf</a>
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Application Notes	<a href="https://www.st.com/resource/en/application_note/an2945-stm8s-and-">https://www.st.com/resource/en/application_note/an2945-stm8s-and-</a>

stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-stmicroelectronics.pdf

Application Notes [https://www.st.com/resource/en/application\\_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-stmicroelectronics.pdf)

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