



## 1. Description

### 1.1. Project

Project Name	ConveyorBelt
Board Name	NUCLEO-F446RE
Generated with:	STM32CubeMX 6.14.0
Date	09/28/2025

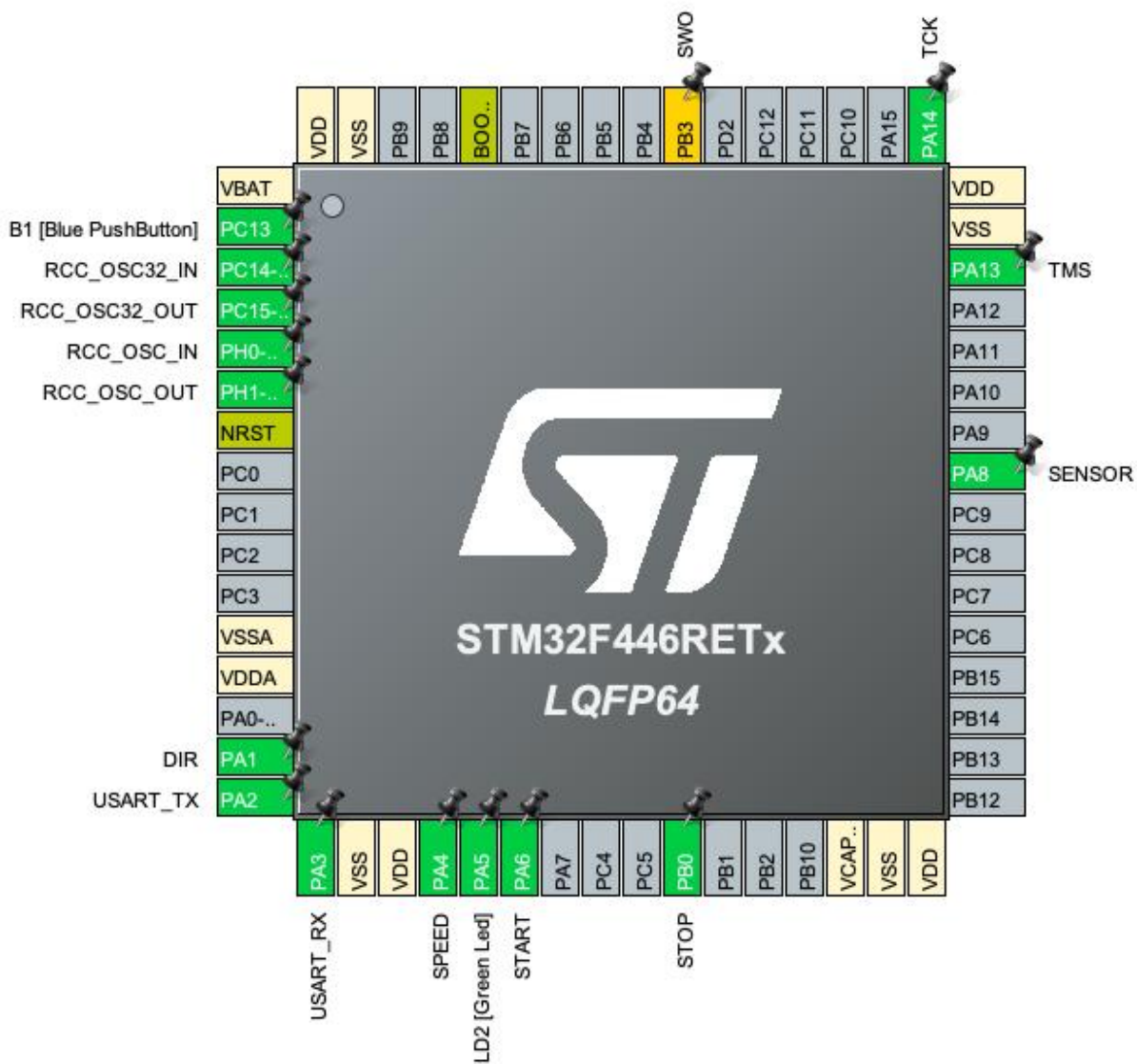
### 1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F446
MCU name	STM32F446RETx
MCU Package	LQFP64
MCU Pin number	64

### 1.3. Core(s) information

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



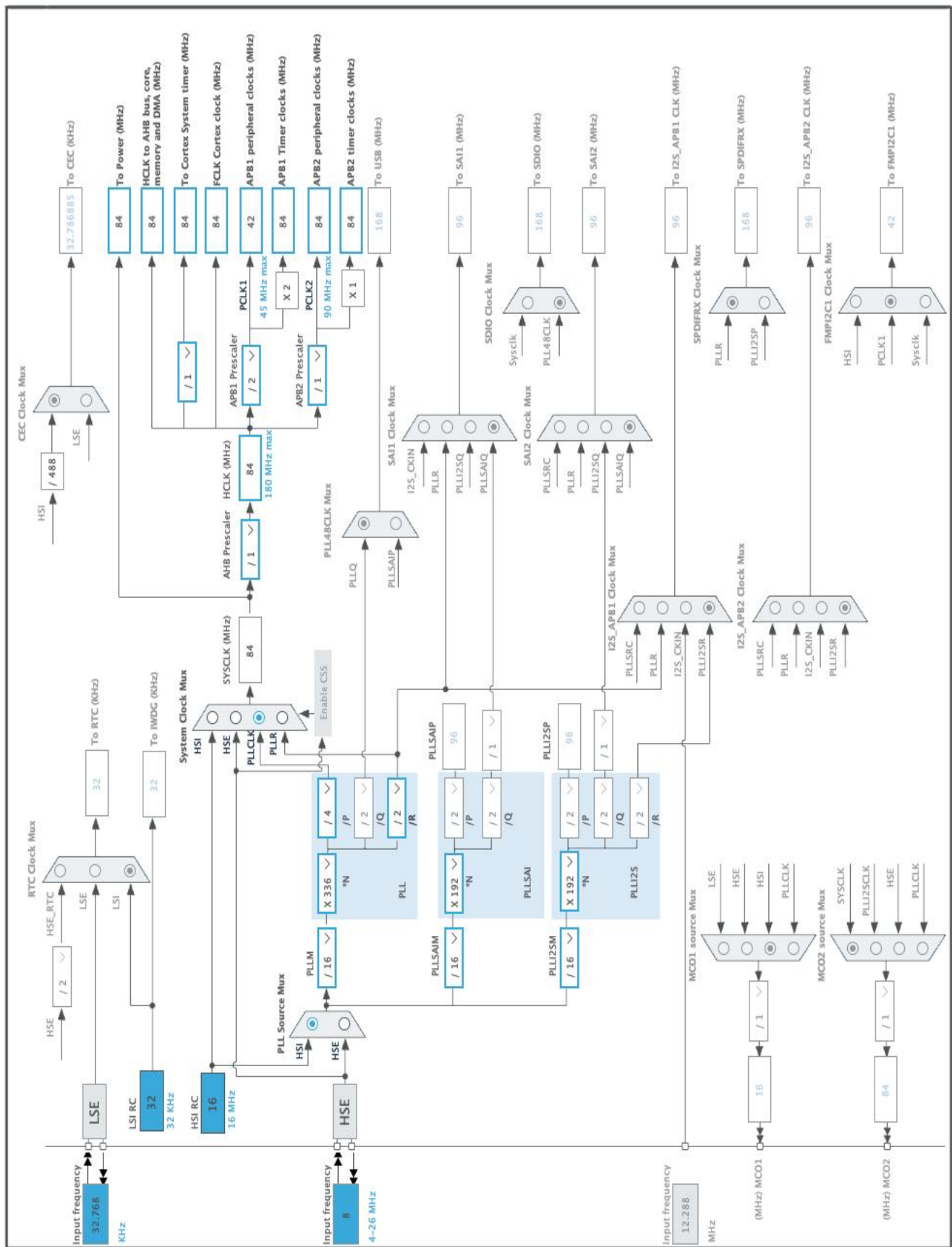
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13	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		
15	PA1	I/O	GPIO_EXTI1	DIR
16	PA2	I/O	USART2_TX	USART_TX
17	PA3	I/O	USART2_RX	USART_RX
18	VSS	Power		
19	VDD	Power		
20	PA4	I/O	ADC1_IN4	SPEED
21	PA5 *	I/O	GPIO_Output	LD2 [Green Led]
22	PA6	I/O	GPIO_EXTI6	START
26	PB0	I/O	GPIO_EXTI0	STOP
30	VCAP_1	Power		
31	VSS	Power		
32	VDD	Power		
41	PA8	I/O	GPIO_EXTI8	SENSOR
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
60	BOOT0	Boot		
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



## 1. Power Consumption Calculator report

### 1.1. Microcontroller Selection

Series	STM32F4
Line	STM32F446
MCU	STM32F446RETx
Datasheet	DS10693_Rev6

### 1.2. Parameter Selection

Temperature	25
Vdd	3.3

### 1.3. 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

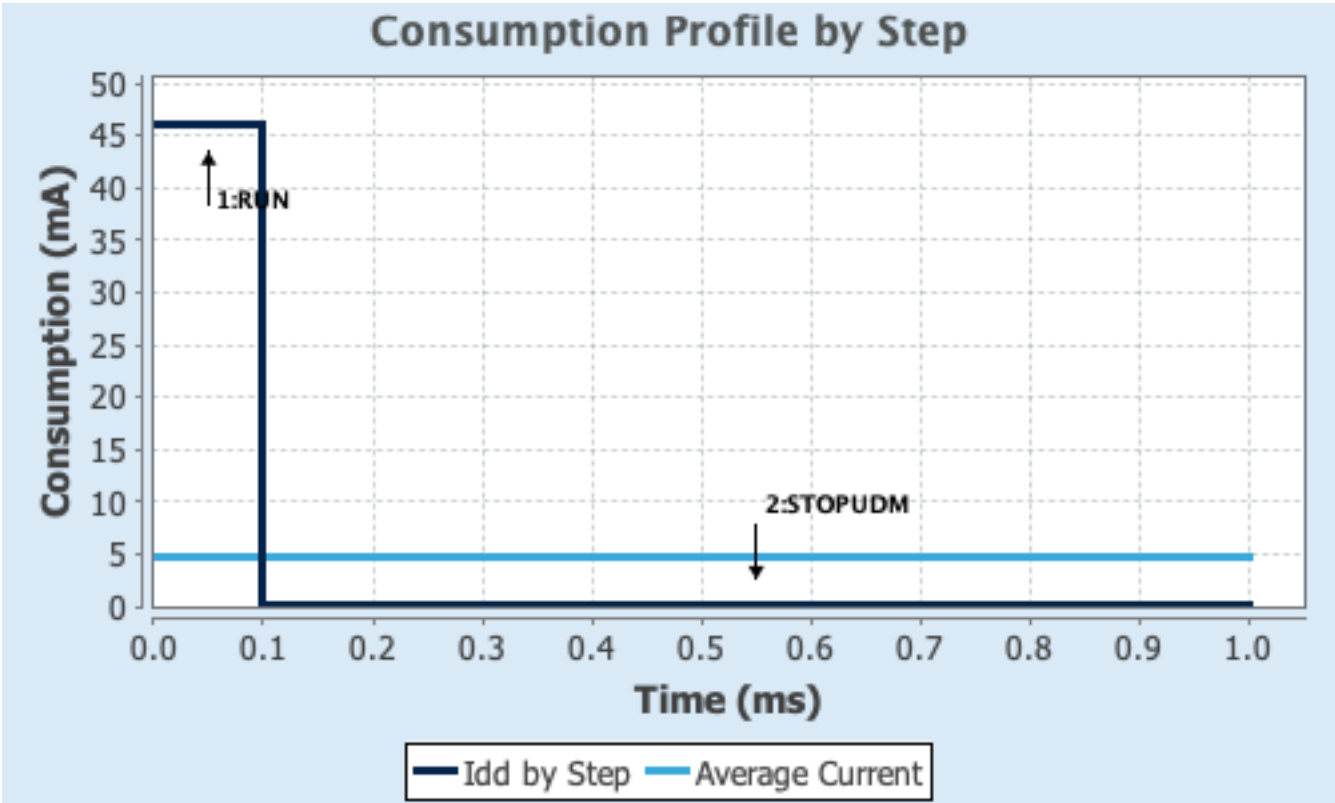
#### 1.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP UDM (Under Drive)
<b>Vdd</b>	3.3	3.3
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Scale1-High	No Scale
<b>Fetch Type</b>	RAM/FLASH/REGON/ART/P REFETCH	n/a
<b>CPU Frequency</b>	180 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	55 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	225.0	0.0
<b>Ta Max</b>	98.02	104.99
<b>Category</b>	In DS Table	In DS Table

#### 1.5. Results

Sequence Time	1 ms	Average Current	4.65 mA
Battery Life	1 month	Average DMIPS	225.0 DMIPS

#### 1.6. Chart





## 2. Software Project

### 2.1. Project Settings

Name	Value
Project Name	ConveyorBelt
Project Folder	/Users/luissilva/Documents/STM32/ConveyorBelt
Toolchain / IDE	CMake
Firmware Package Name and Version	STM32Cube FW_F4 V1.28.2
Application Structure	Advanced
Generate Under Root	No
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

### 2.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	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
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

### 2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_ADC1_Init	ADC1
4	MX_USART2_UART_Init	USART2

## 3. Peripherals and Middlewares Configuration

### 3.1. ADC1

**mode: IN4**

#### 3.1.1. 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 **Enabled \***

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 Source Regular Conversion launched by software

External Trigger Conversion Edge None

Rank 1

Channel Channel 4

Sampling Time 3 Cycles

##### **ADC\_Injected\_ConversionMode:**

Number Of Conversions 0

##### **WatchDog:**

Enable Analog WatchDog Mode false

### 3.2. RCC

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

**Low Speed Clock (LSE) : Crystal/Ceramic Resonator**

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

**Power Parameters:**

Power Regulator Voltage Scale Power Regulator Voltage Scale 3  
Power Over Drive Disabled

### 3.3. SYS

**Debug: Serial Wire**

**Timebase Source: SysTick**

### 3.4. USART2

**Mode: Asynchronous**

#### 3.4.1. 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

## 4. System Configuration

### 4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA4	ADC1_IN4	Analog mode	No pull-up and no pull-down	n/a	SPEED
RCC	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	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	TMS
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	TCK
USART2	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
Single Mapped Signals	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	SWO
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Falling edge trigger detection	No pull-up and no pull-down	n/a	B1 [Blue PushButton]
	PA1	GPIO_EXTI1	External Interrupt Mode with Rising/Falling edge	Pull-down *	n/a	DIR
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [Green Led]
	PA6	GPIO_EXTI6	External Interrupt Mode with Rising/Falling edge	Pull-down *	n/a	START
	PB0	GPIO_EXTI0	External Interrupt Mode with Rising/Falling edge	Pull-down *	n/a	STOP
	PA8	GPIO_EXTI8	External Interrupt Mode with Rising/Falling edge	Pull-down *	n/a	SENSOR

#### **4.2. DMA configuration**

nothing configured in DMA service

### 4.3. NVIC configuration

#### 4.3.1. 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	0	0
EXTI line 0 interrupt	true	0	0
EXTI line 1 interrupt	true	0	0
ADC1, ADC2 and ADC3 interrupts	true	0	0
EXTI line[9:5] interrupts	true	0	0
USART2 global interrupt	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		
FPU global interrupt	unused		

#### 4.3.2. 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
EXTI line 0 interrupt	false	true	true
EXTI line 1 interrupt	false	true	true
ADC1, ADC2 and ADC3 interrupts	false	true	true
EXTI line[9:5] interrupts	false	true	true
USART2 global interrupt	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
EXTI line[15:10] interrupts	false	true	true

\* User modified value

## 5. System Views

### 5.1. Category view

#### 5.1.1. Current

Middleware

System Core	Analog	Timers	Connectivity	Multimedia	Computing
DMA	ADC1		USART2		
GPIO					
NVIC					
RCC					
SYS					



## 6. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32f446_bsdl.zip">https://www.st.com/resource/en/bsdl_model/stm32f446_bsdl.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32f446_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32f446_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32f4-svd.zip">https://www.st.com/resource/en/svd/stm32f4-svd.zip</a>
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>
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Presentations	<a href="https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf">https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf</a>
Brochures	<a href="https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf">https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.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/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>
Security Bulletin	<a href="https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-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/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-">https://www.st.com/resource/en/application_note/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-</a>

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- 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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User Manuals	<a href="https://www.st.com/resource/en/user_manual/um3461-stm32f4-series-ulcsaiec-607301603351-selftest-library-user-guide-stmicroelectronics.pdf">https://www.st.com/resource/en/user_manual/um3461-stm32f4-series-ulcsaiec-607301603351-selftest-library-user-guide-stmicroelectronics.pdf</a>