

## 1. Description

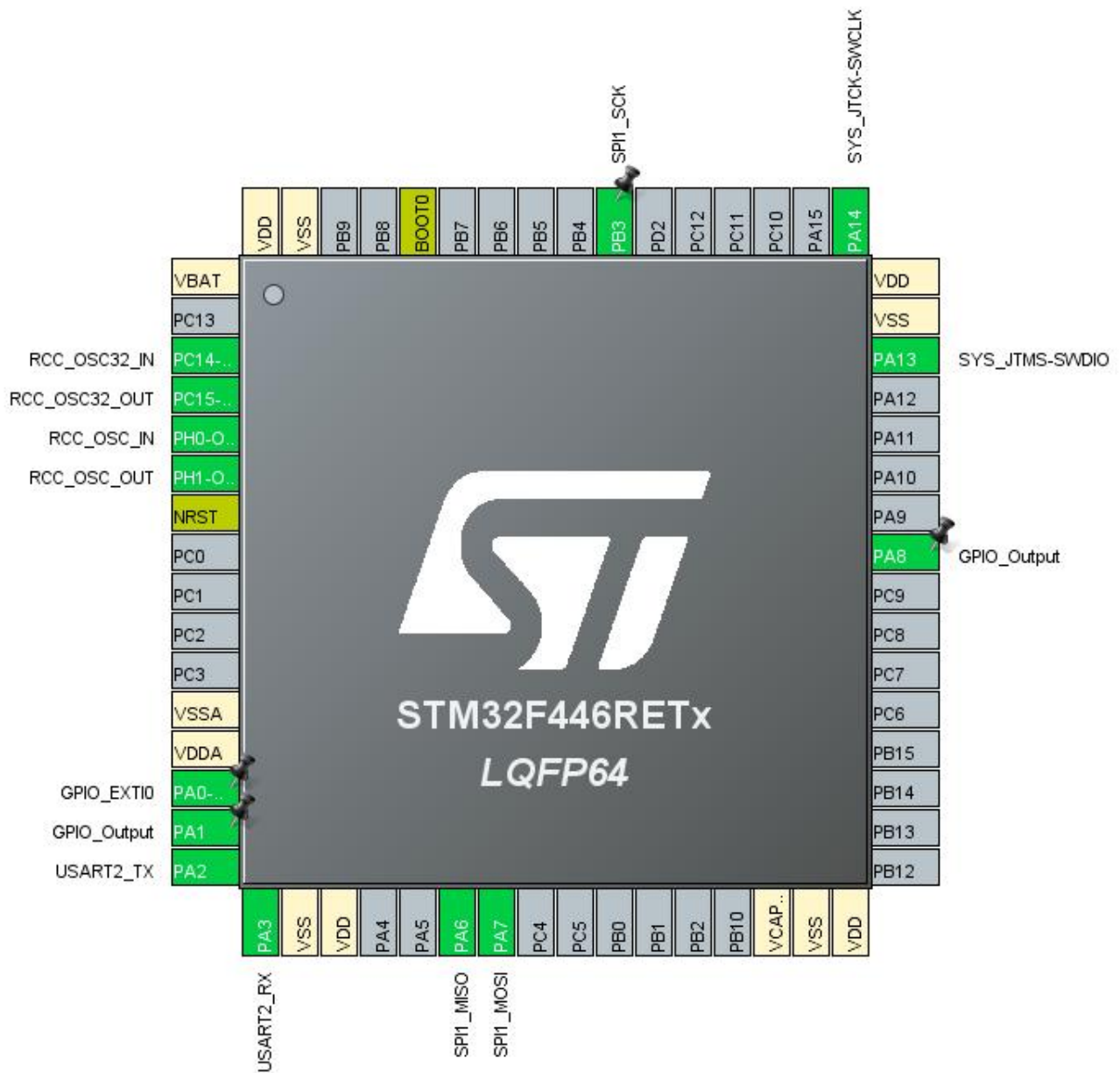
### 1.1. Project

Project Name	05_SendingDataToClient
Board Name	NUCLEO-F446RE
Generated with:	STM32CubeMX 5.6.0
Date	11/21/2020

### 1.2. MCU

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

## 2. Pinout Configuration

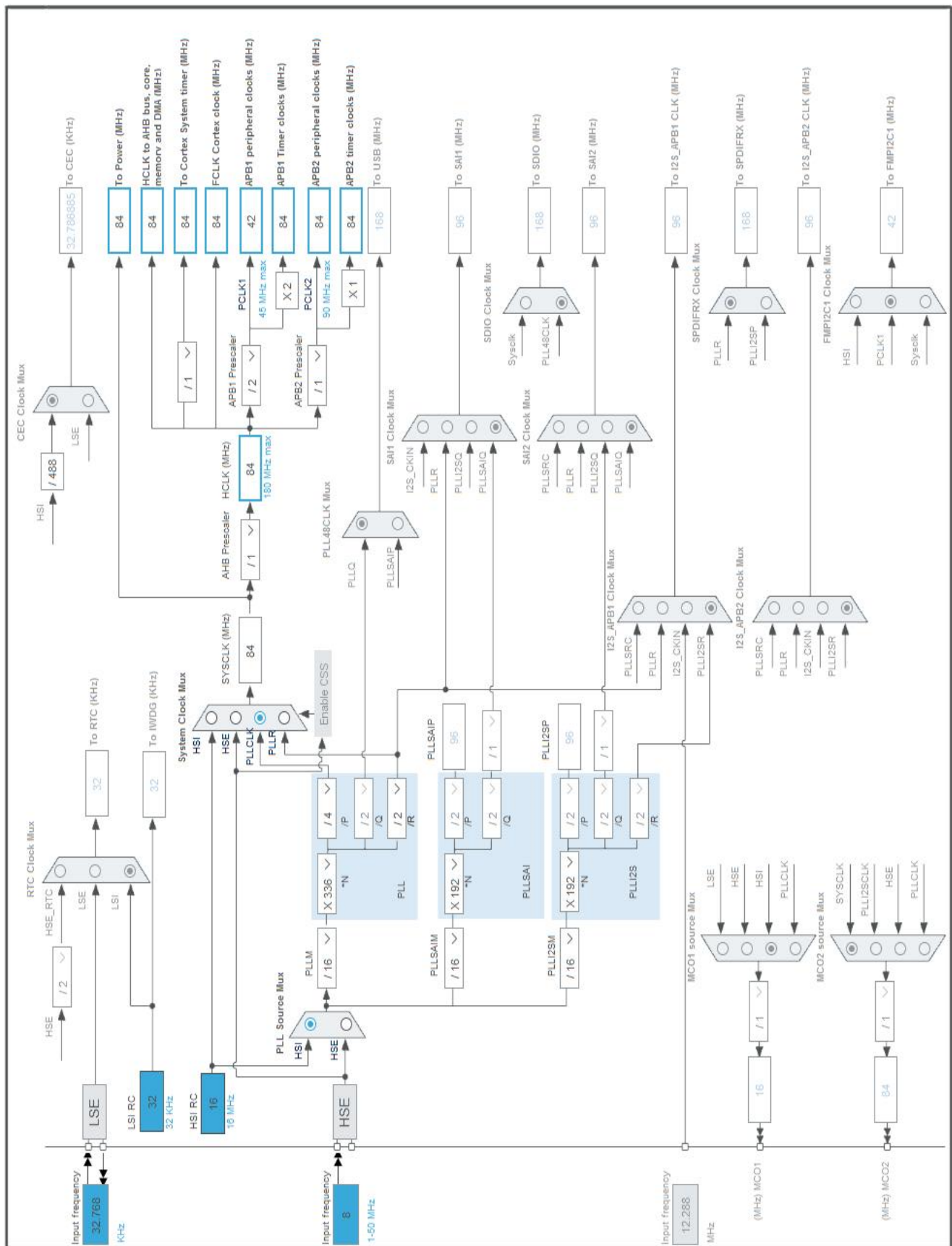


### 3. Pins Configuration

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	Power		
13	VDDA	Power		
14	PA0-WKUP	I/O	GPIO_EXTI0	
15	PA1 *	I/O	GPIO_Output	
16	PA2	I/O	USART2_TX	
17	PA3	I/O	USART2_RX	
18	VSS	Power		
19	VDD	Power		
22	PA6	I/O	SPI1_MISO	
23	PA7	I/O	SPI1_MOSI	
30	VCAP_1	Power		
31	VSS	Power		
32	VDD	Power		
41	PA8 *	I/O	GPIO_Output	
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VSS	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
55	PB3	I/O	SPI1_SCK	
60	BOOT0	Boot		
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	05_SendingDataToClient
Project Folder	L:\BLE\Bluetooth_Low_Energy\05_SendingDataToClient
Toolchain / IDE	MDK-ARM V5.27
Firmware Package Name and Version	STM32Cube FW_F4 V1.25.2

### 5.2. 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
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F446
MCU	STM32F446RETx
Datasheet	027107_Rev6

### 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

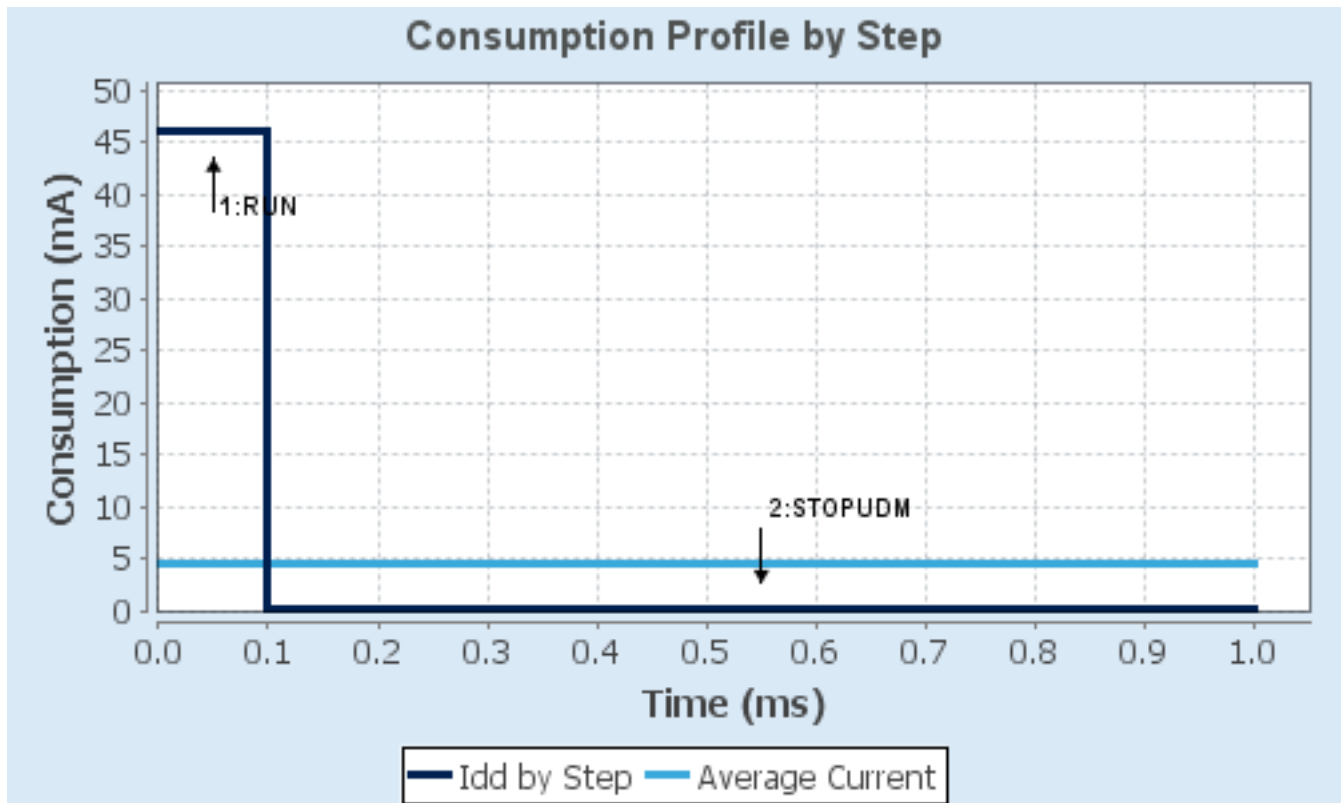
### 6.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP 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

## 6.5. RESULTS

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

## 6.6. Chart





## 7. IPs and Middleware Configuration

### 7.1. GPIO

### 7.2. RCC

**High Speed Clock (HSE): BYPASS Clock Source**

**Low Speed Clock (LSE) : 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)	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

### 7.3. SPI1

**Mode: Full-Duplex Master**

#### 7.3.1. Parameter Settings:

##### Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

##### Clock Parameters:

Prescaler (for Baud Rate)	<b>16 *</b>
Baud Rate	<b>5.25 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

**Advanced Parameters:**

CRC Calculation	Disabled
NSS Signal Type	Software

## 7.4. SYS

**Debug: Serial Wire**

**Timebase Source: SysTick**

## 7.5. USART2

**Mode: Asynchronous**

### 7.5.1. 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

## 7.6. STMicroelectronics.X-CUBE-BLE1.5.0.0

**mode: WirelessJjBlueNRGAaMS**

### 7.6.1. Parameter Settings:

**Log & Debug:**

BLE1_DEBUG	No debug message (0)
PRINT_CSV_FORMAT	CSV format message print disabled (0)

**HCI Basic Parameters:**

HCI_READ_PACKET_SIZE	128 Bytes reserved for HCI Read Packet
HCI_MAX_PAYLOAD_SIZE	128 Bytes reserved for HCI Max Payload

**Connection Parameters (for expert users):**

Scan Interval (SCAN_P)	16384
Scan Window (SCAN_L)	16384
Supervision Timeout (SUPERV_TIMEOUT)	60
Min Connection Period (CONN_P1)	40

Max Connection Period (CONN_P2)	40
Min Connection Length (CONN_L1)	2000
Max Connection Length (CONN_L2)	2000
Advertising Type (ADV_DATA_TYPE)	Connectable Undirected Advertising (ADV_IND)
Min Advertising Interval (ADV_INTERV_MIN)	2048
Max Advertising Interval (ADV_INTERV_MAX)	4096
Min Connection Event Interval (L2CAP_INTERV_MIN)	9
Max Connection Event Interval (L2CAP_INTERV_MAX)	20
Timeout Multiplier (L2CAP_TIMEOUT_MULTIPLIER)	600

**\* User modified value**

## 8. System Configuration

### 8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
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	
SPI1	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PB3	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
GPIO	PA0-WKUP	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

### 8.2. DMA configuration

nothing configured in DMA service

### 8.3. 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 0 interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
SPI1 global interrupt	unused		
USART2 global interrupt	unused		
FPU global interrupt	unused		

\* User modified value

## ***9. Predefined Views - Category view : Current***

## 10. Software Pack Report

### 10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	X-CUBE-BLE1	5.0.0	Class : Wireless Group : Controller Version : 4.4.0 Class : Wireless Group : HCI_TL Variant : Basic Version : 4.4.0 Class : Wireless Group : HCI_TL_INTERFACE Variant : UserBoard Version : 4.4.0 Class : Wireless Group : Utils Version : 4.4.0