

## 1. Description

### 1.1. Project

Project Name	breath-analyzer
Board Name	custom
Generated with:	STM32CubeMX 5.6.1
Date	06/03/2020

### 1.2. MCU

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

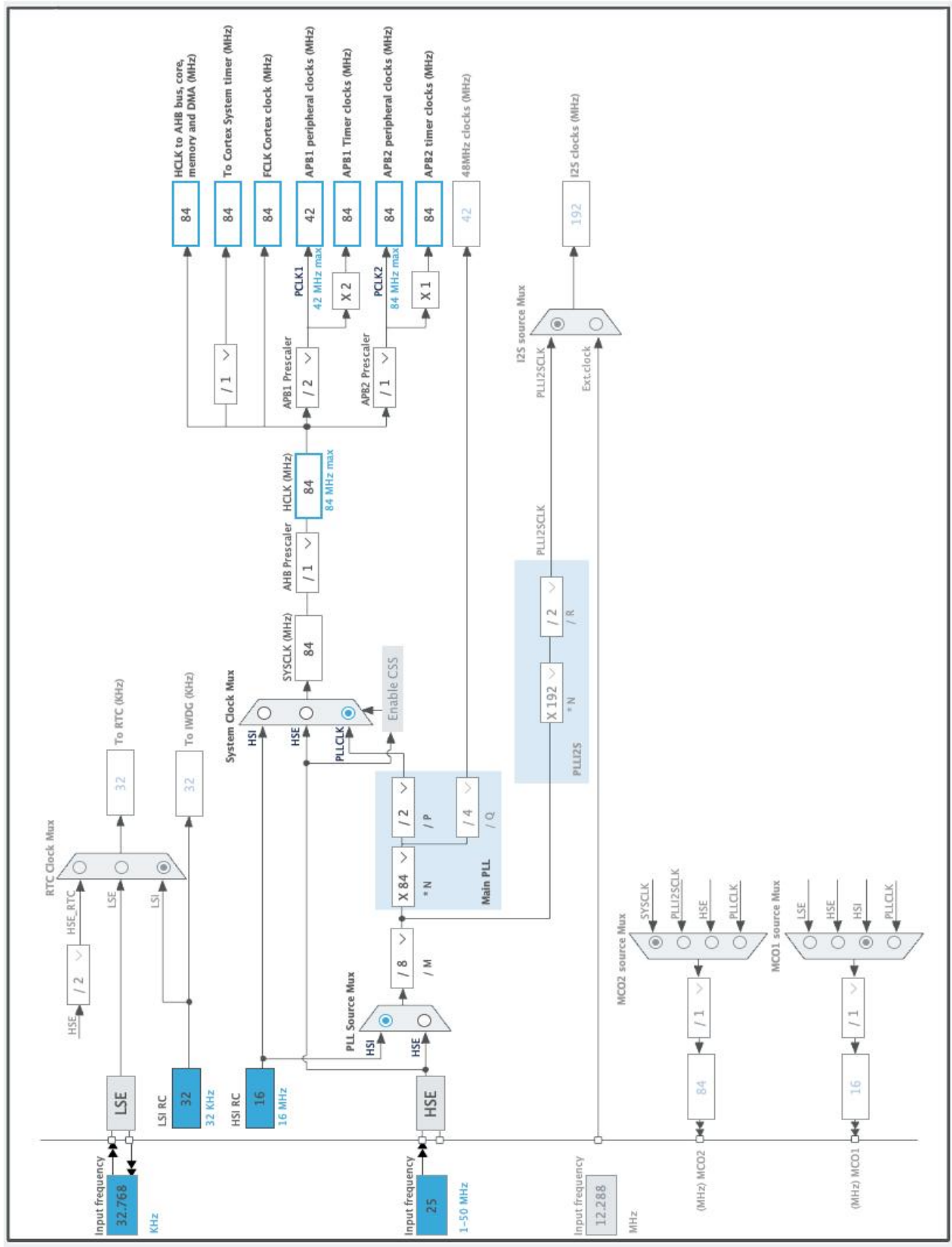


### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP	I/O	GPIO_EXTI13	
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		
11	PC3	I/O	ADC1_IN13	
12	VSSA/VREF-	Power		
13	VREF+	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		
21	PA5 *	I/O	GPIO_Output	GreenLED
22	PA6	I/O	SPI1_MISO	
23	PA7	I/O	SPI1_MOSI	
30	VCAP1	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	breath-analyzer
Project Folder	/Users/venkatadineshjakkampudi/Documents/projects/breath-analyzer
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.24.2

### 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
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	STM32F401
MCU	STM32F401RETx
Datasheet	025644_Rev3

### 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

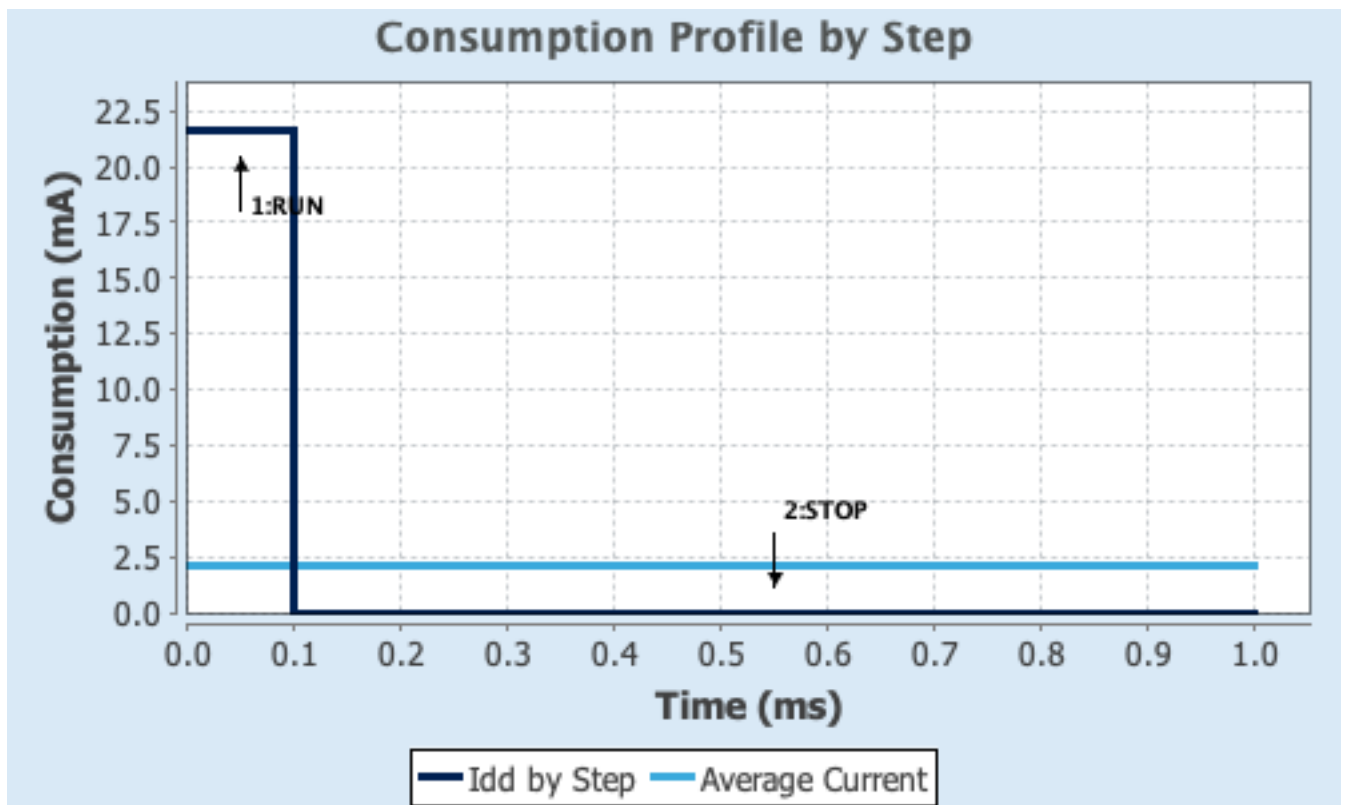
### 6.4. Sequence

<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>	Scale2-Medium	No Scale
<b>Fetch Type</b>	FLASH/ART/PREFETCH	n/a
<b>CPU Frequency</b>	84 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	Regulator_LPLV 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>	21.6 mA	10 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	105.0	0.0
<b>Ta Max</b>	101.44	105
<b>Category</b>	In DS Table	In DS Table

## 6.5. RESULTS

Sequence Time	1 ms	Average Current	2.17 mA
Battery Life	2 months, 4 days, 8 hours	Average DMIPS	105.0 DMIPS

## 6.6. Chart





## 7. IPs and Middleware Configuration

### 7.1. ADC1

mode: IN13

#### 7.1.1. Parameter Settings:

##### 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	Disabled
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 13
Sampling Time	3 Cycles

##### ADC\_Injected\_ConversionMode:

Number Of Conversions	0
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##### WatchDog:

Enable Analog WatchDog Mode	false
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### 7.2. GPIO

### 7.3. RCC

High Speed Clock (HSE): BYPASS Clock Source

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

#### 7.3.1. 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 2
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## 7.4. SPI1

**Mode: Full-Duplex Master**

### 7.4.1. Parameter Settings:

#### Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

#### Clock Parameters:

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

#### Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

## 7.5. SYS

**Debug: Serial Wire**

**Timebase Source: SysTick**

## 7.6. USART2

**Mode: Asynchronous**

### 7.6.1. Parameter Settings:

#### Basic Parameters:

Baud Rate	115200
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Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

#### Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

## 7.7. STMicroelectronics.X-CUBE-BLE1.4.4.0

### mode: WirelessJjBlueNRGAaMS

#### 7.7.1. Parameter Settings:

##### Log & Debug:

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
ADC1	PC3	ADC1_IN13	Analog mode	No pull-up and no pull-down	n/a	
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	<b>Very High</b> *	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PB3	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
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	<b>Very High</b> *	
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
GPIO	PC13-ANTI_TAMP	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	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	
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GreenLED
	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 line0 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		
ADC1 global interrupt	unused		
SPI1 global interrupt	unused		
USART2 global interrupt	unused		
FPU global interrupt	unused		

\* User modified value

9. Predefined Views - Category view : Current

Middleware

Additional Software

X-CUBE-BLE1

System Core	Analog	Timers	Connectivity	Multimedia	Computing
DMA	ADC1		SPI1		
GPIO			USART2		
NVIC					
RCC					
SYS					

## 10. Software Pack Report

### 10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	X-CUBE-BLE1	4.4.0	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 Class : Wireless Group : Application Variant : SampleApp Version : 4.4.0