1. Description

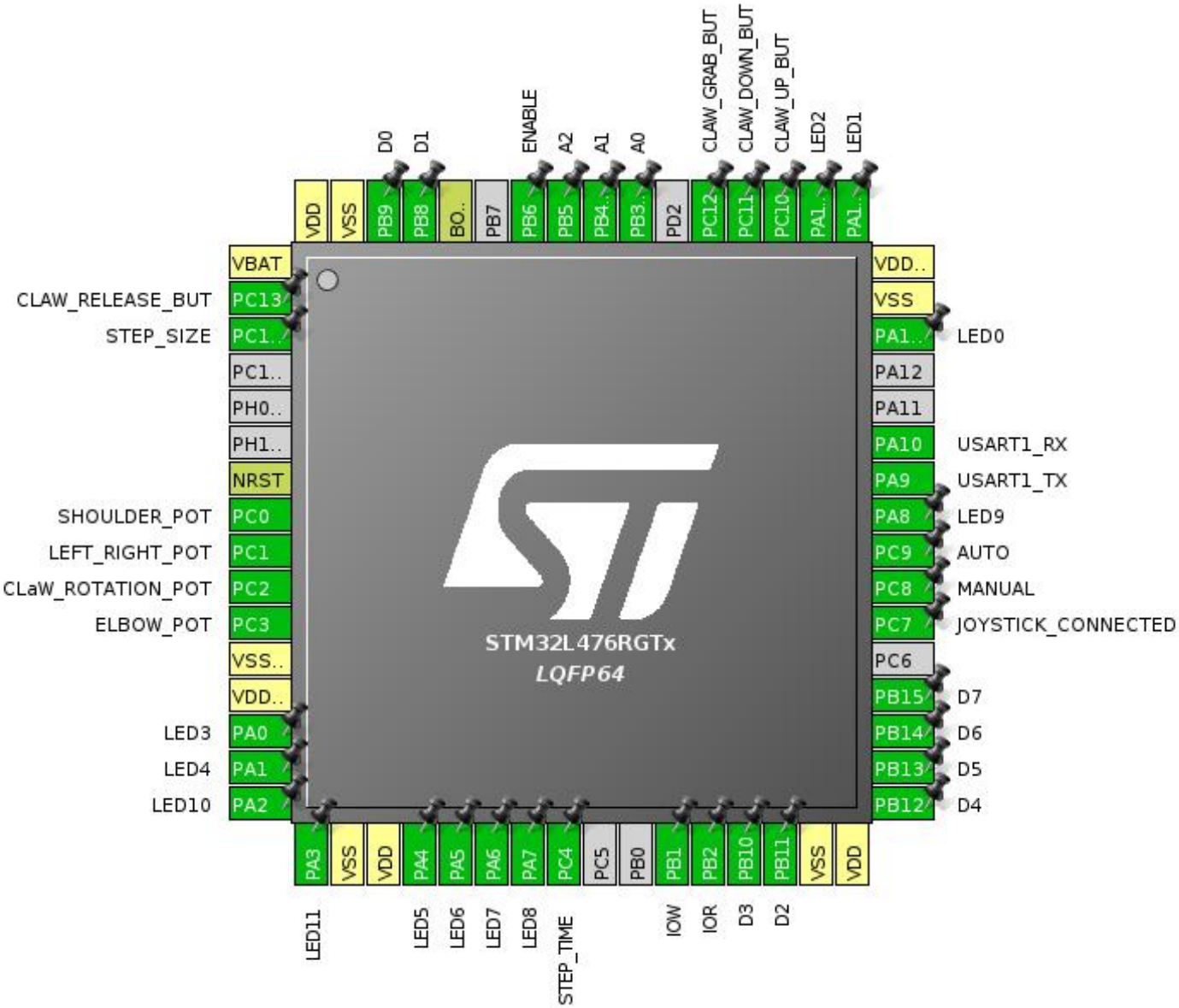
1.1. Project

Project Name	ROBKO 01
Board Name	ROBKO 01
Generated with:	STM32CubeMX 4.22.0
Date	02/10/2018

1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L476RGTx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



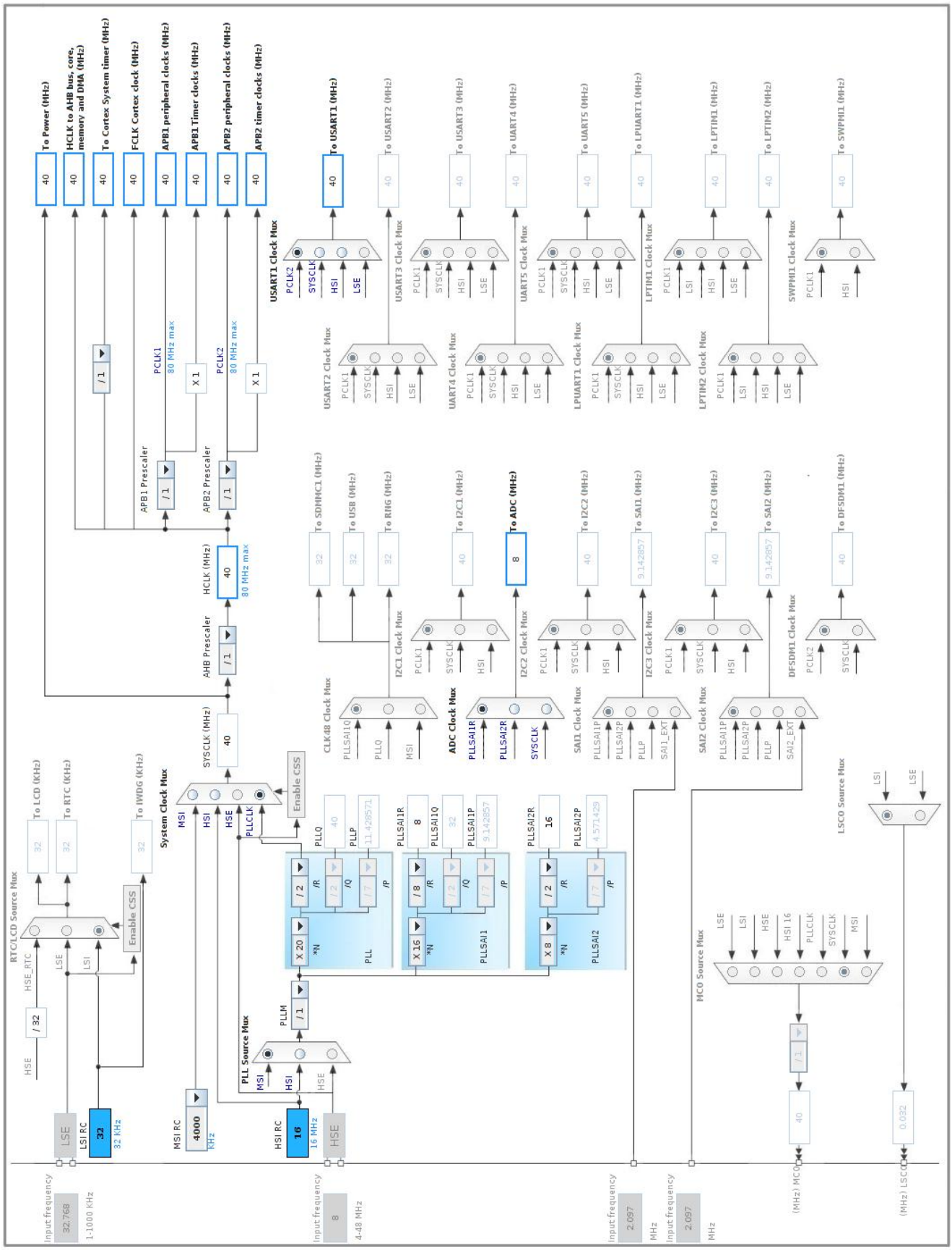
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13 *	I/O	GPIO_Input	CLAW_RELEASE_BUT
3	PC14-OSC32_IN (PC14) *	I/O	GPIO_Input	STEP_SIZE
7	NRST	Reset		
8	PC0	I/O	ADC1_IN1	SHOULDER_POT
9	PC1	I/O	ADC1_IN2	LEFT_RIGHT_POT
10	PC2	I/O	ADC1_IN3	CLaW_ROTATION_POT
11	PC3	I/O	ADC1_IN4	ELBOW_POT
12	VSSA/VREF-	Power		
13	VDDA/VREF+	Power		
14	PA0 *	I/O	GPIO_Output	LED3
15	PA1 *	I/O	GPIO_Output	LED4
16	PA2 *	I/O	GPIO_Output	LED10
17	PA3 *	I/O	GPIO_Output	LED11
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	LED5
21	PA5 *	I/O	GPIO_Output	LED6
22	PA6 *	I/O	GPIO_Output	LED7
23	PA7 *	I/O	GPIO_Output	LED8
24	PC4 *	I/O	GPIO_Input	STEP_TIME
27	PB1 *	I/O	GPIO_Output	IOW
28	PB2 *	I/O	GPIO_Output	IOR
29	PB10 *	I/O	GPIO_Output	D3
30	PB11 *	I/O	GPIO_Output	D2
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Input	D4
34	PB13 *	I/O	GPIO_Input	D5
35	PB14 *	I/O	GPIO_Input	D6
36	PB15 *	I/O	GPIO_Input	D7
38	PC7 *	I/O	GPIO_Input	JOYSTICK_CONNECTED
39	PC8 *	I/O	GPIO_Input	MANUAL
40	PC9 *	I/O	GPIO_Input	AUTO
41	PA8 *	I/O	GPIO_Output	LED9
42	PA9	I/O	USART1_TX	

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
43	PA10	I/O	USART1_RX	
46	PA13 (JTMS-SWDIO) *	I/O	GPIO_Output	LED0
47	VSS	Power		
48	VDDUSB	Power		
49	PA14 (JTCK-SWCLK) *	I/O	GPIO_Output	LED1
50	PA15 (JTDI) *	I/O	GPIO_Output	LED2
51	PC10 *	I/O	GPIO_Input	CLAW_UP_BUT
52	PC11 *	I/O	GPIO_Input	CLAW_DOWN_BUT
53	PC12 *	I/O	GPIO_Input	CLAW_GRAB_BUT
55	PB3 (JTDO-TRACESWO) *	I/O	GPIO_Output	A0
56	PB4 (NJTRST) *	I/O	GPIO_Output	A1
57	PB5 *	I/O	GPIO_Output	A2
58	PB6 *	I/O	GPIO_Output	ENABLE
60	BOOT0	Boot		
61	PB8 *	I/O	GPIO_Output	D1
62	PB9 *	I/O	GPIO_Output	D0
63	VSS	Power		
64	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. IPs and Middleware Configuration

5.1. ADC1

IN1: IN1 Single-ended

IN2: IN2 Single-ended

IN3: IN3 Single-ended

IN4: IN4 Single-ended

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	Asynchronous clock mode divided by 1
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Conversion Mode	Enabled
Continuous Conversion Mode	**Enabled ***
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	**Enabled ***
End Of Conversion Selection	End of single conversion
Overrun behaviour	**Overrun data overwritten ***
Low Power Auto Wait	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable
Number Of Conversion	**4 ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 1
Sampling Time	**92.5 Cycles ***
Offset Number	No offset
Rank	**2 ***
Channel	**Channel 2 ***
Sampling Time	**92.5 Cycles ***
Offset Number	No offset

Rank	**3 ***
Channel	**Channel 3 ***
Sampling Time	**92.5 Cycles ***
Offset Number	No offset
Rank	**4 ***
Channel	**Channel 4 ***
Sampling Time	**92.5 Cycles ***
Offset Number	No offset

ADC_Injected_ConversionMode:

Enable Injected Conversions	Disable

Analog Watchdog 1:

Enable Analog WatchDog1 Mode	false

Analog Watchdog 2:

Enable Analog WatchDog2 Mode	false

Analog Watchdog 3:

Enable Analog WatchDog3 Mode	false

5.2. SYS

Timebase Source: SysTick

5.3. USART1

Mode: Asynchronous

5.3.1. Parameter Settings:

Basic Parameters:

Baud Rate	115200
Word Length	**9 Bits (including Parity) ***
Parity	**Odd ***
Stop Bits	**2 ***

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable

Advanced Features:

Auto Baudrate	Disable

TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

*** User modified value**

6. System Configuration

6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PC0	ADC1_IN1	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	SHOULDER_POT
	PC1	ADC1_IN2	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	LEFT_RIGHT_POT
	PC2	ADC1_IN3	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	CLaW_ROTATION_POT
	PC3	ADC1_IN4	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	ELBOW_POT
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	**High ***	
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	**High ***	
GPIO	PC13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	CLAW_RELEASE_BUT
	PC14-OSC32_IN (PC14)	GPIO_Input	Input mode	**Pull-down ***	n/a	STEP_SIZE
	PA0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED3
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED4
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED10
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED11
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED5
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED6
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED7
	PA7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED8
	PC4	GPIO_Input	Input mode	**Pull-down ***	n/a	STEP_TIME
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IOW
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IOR
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	D3
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	D2
	PB12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	D4
	PB13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	D5
	PB14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	D6
	PB15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	D7
	PC7	GPIO_Input	Input mode	**Pull-down ***	n/a	JOYSTICK_CONNECTED
	PC8	GPIO_Input	Input mode	**Pull-down ***	n/a	MANUAL
	PC9	GPIO_Input	Input mode	**Pull-down ***	n/a	AUTO

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED9
	PA13 (JTMS-SWDIO)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED0
	PA14 (JTCK-SWCLK)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED1
	PA15 (JTDI)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED2
	PC10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	CLAW_UP_BUT
	PC11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	CLAW_DOWN_BUT
	PC12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	CLAW_GRAB_BUT
	PB3 (JTDO-TRACESWO)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	A0
	PB4 (NJTRST)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	A1
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	A2
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENABLE
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	D1
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	D0

6.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA1_Channel1	Peripheral To Memory	**Medium ***

ADC1: DMA1_Channel1 DMA request Settings:

Mode:	**Circular ***
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	Half Word
Memory Data Width:	Half Word

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
Prefetch 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
DMA1 channel1 global interrupt	true	0	0
USART1 global interrupt	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1 and ADC2 interrupts	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x6
MCU	STM32L476RGTx
Datasheet	025976_Rev4

7.2. Parameter Selection

Temperature	25
Vdd	3.6

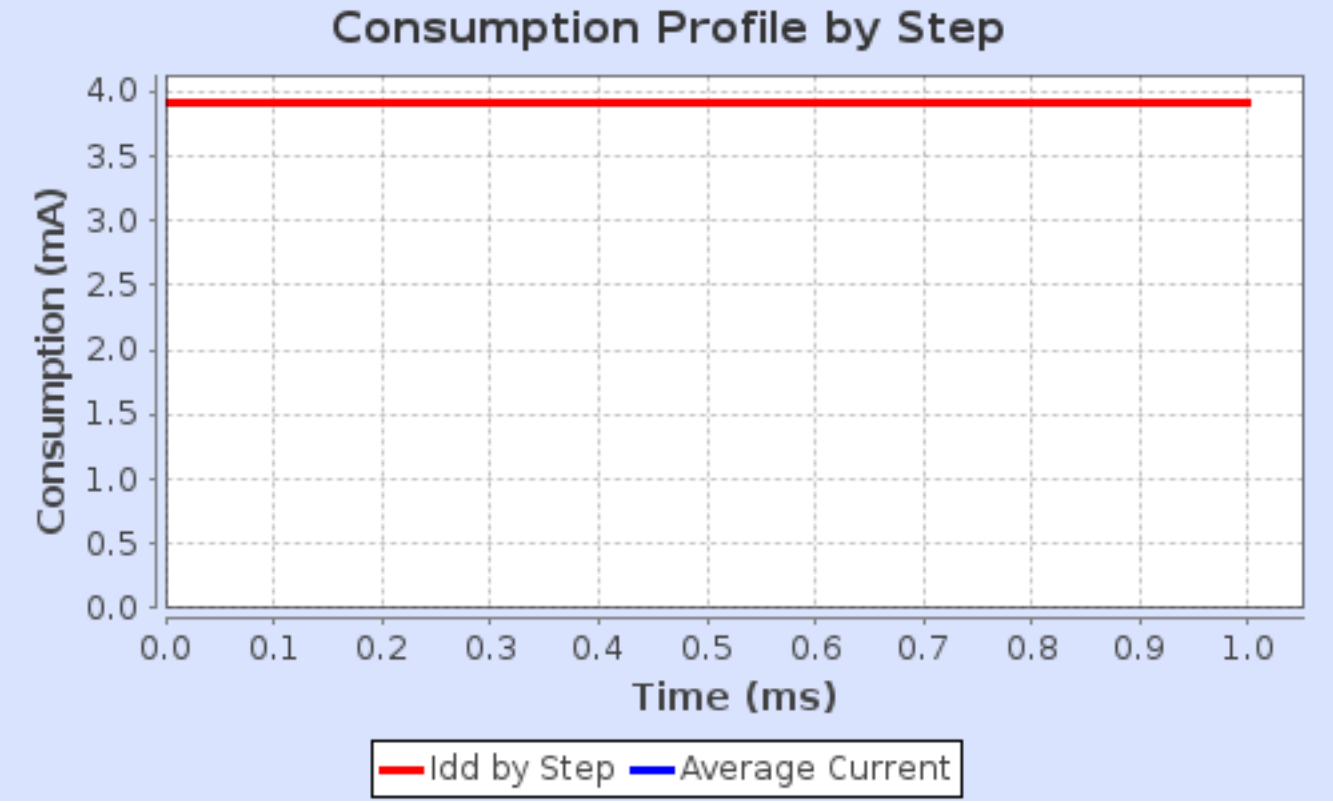
7.3. Sequence

Step	Step1
Mode	RUN
Vdd	3.6
Voltage Source	Battery
Range	Range2-Medium
Fetch Type	FLASH/ART/Cache
Clock Configuration	HSE
Clock Source Frequency	26 MHz
CPU Frequency	26 MHz
Peripherals	ADC1:fs_1_Msps DAC1:OUT1-Buffer_ON-Middle_code GPIOA GPIOB GPIOC
Additional Cons.	0 mA
Average Current	3.92 mA
Duration	1 ms
DMIPS	32.5
Ta Max	104.36
Category	In DS Table

7.4. RESULTS

Sequence Time	1 ms	Average Current	3.92 mA
Battery Life	0	Average DMIPS	32.5 DMIPS

7.5. Chart



8. Software Project

8.1. Project Settings

Name	Value
Project Name	ROBKO 01
Project Folder	/home/cartogan/Desktop/ROBKO 01
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_L4 V1.8.1

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