



## 1. Description

### 1.1. Project

Project Name	Switching_Tool_Prototype
Board Name	custom
Generated with:	STM32CubeMX 6.10.0
Date	03/25/2024

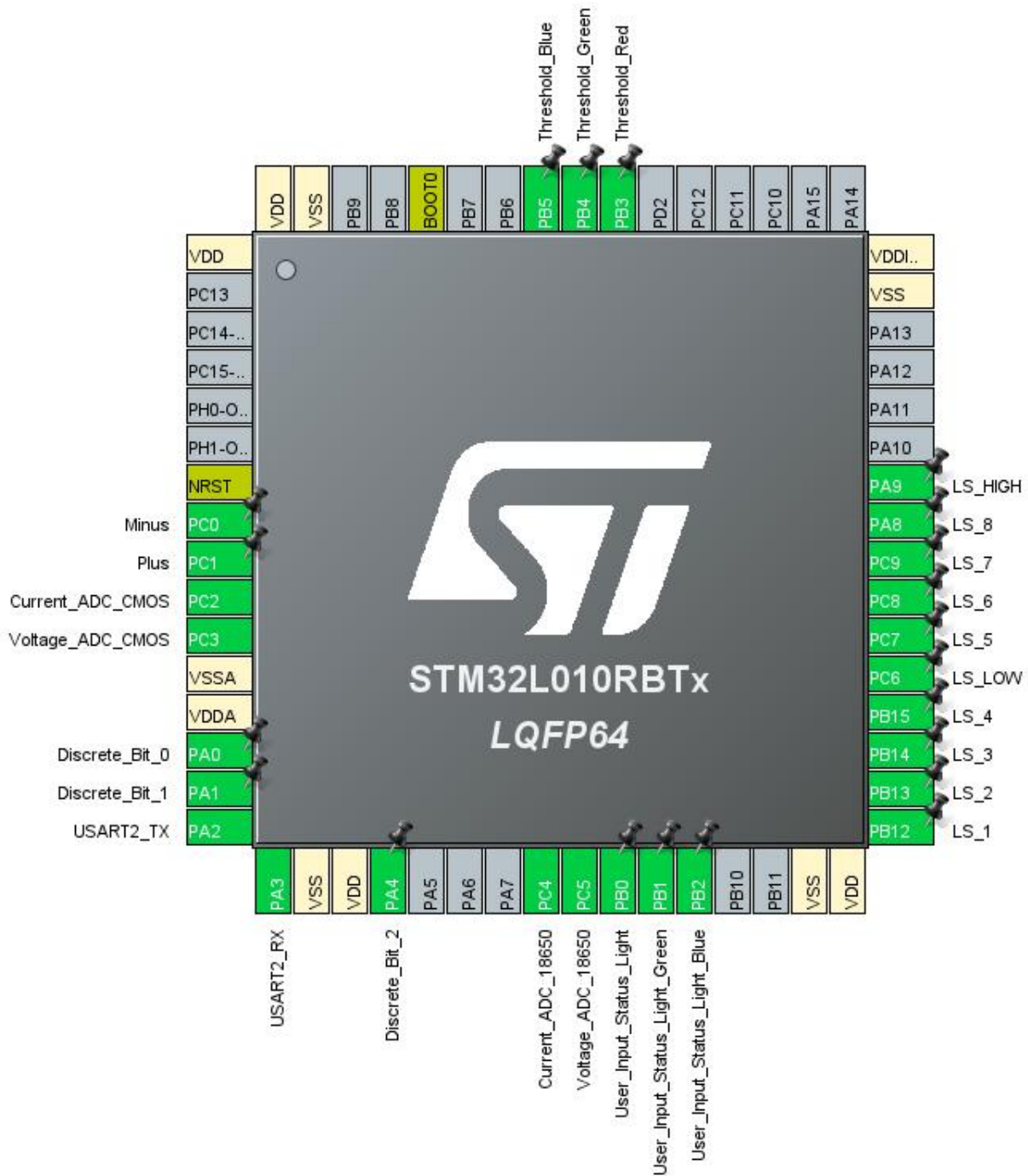
### 1.2. MCU

MCU Series	STM32L0
MCU Line	STM32L0x0 Value Line
MCU name	STM32L010RBTx
MCU Package	LQFP64
MCU Pin number	64

### 1.3. Core(s) information

Core(s)	Arm Cortex-M0+
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## 2. Pinout Configuration



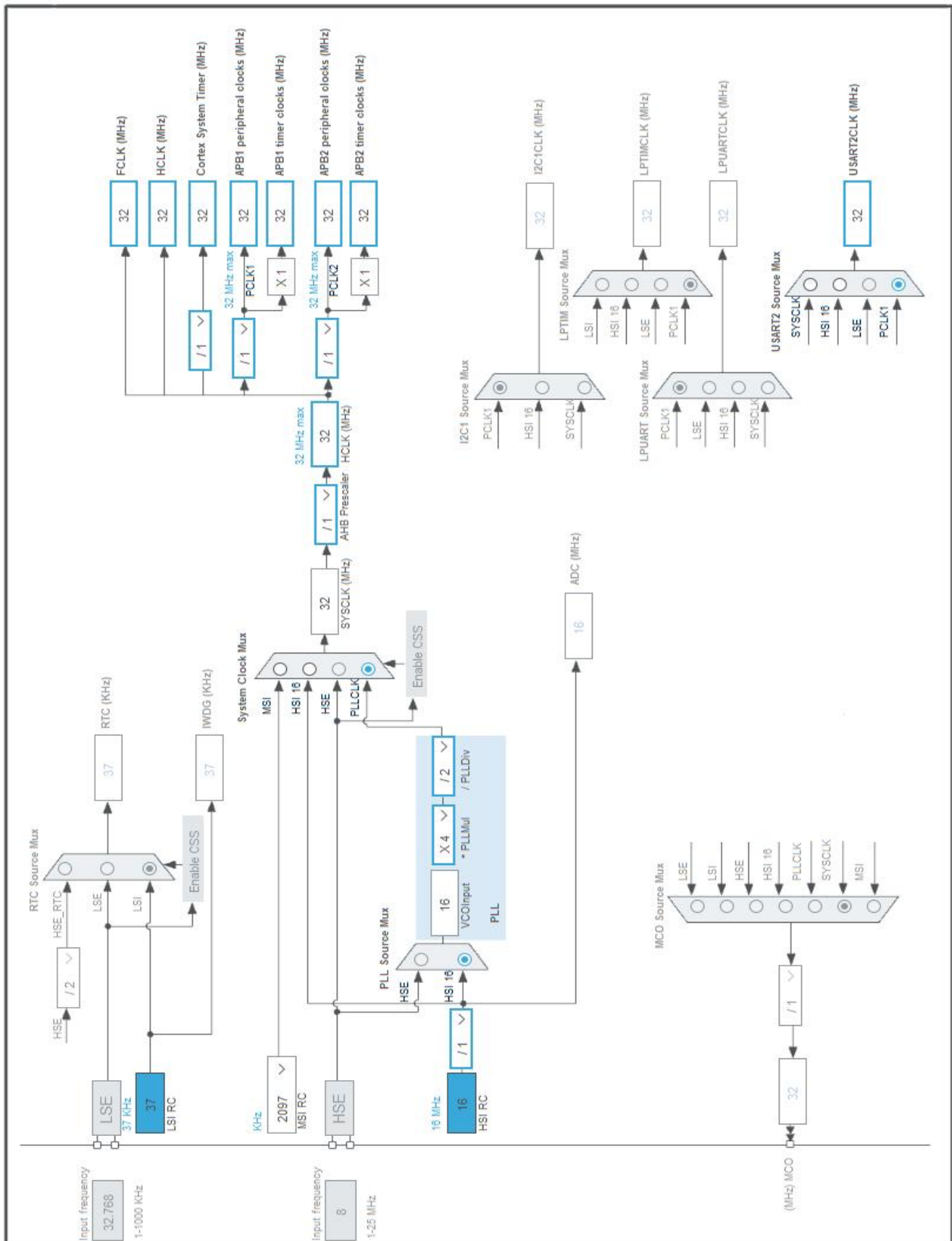
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VDD	Power		
7	NRST	Reset		
8	PC0 *	I/O	GPIO_Input	Minus
9	PC1 *	I/O	GPIO_Input	Plus
10	PC2	I/O	ADC_IN12	Current_ADC_CMOS
11	PC3	I/O	ADC_IN13	Voltage_ADC_CMOS
12	VSSA	Power		
13	VDDA	Power		
14	PA0 *	I/O	GPIO_Output	Discrete_Bit_0
15	PA1 *	I/O	GPIO_Output	Discrete_Bit_1
16	PA2	I/O	USART2_TX	
17	PA3	I/O	USART2_RX	
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	Discrete_Bit_2
24	PC4	I/O	ADC_IN14	Current_ADC_18650
25	PC5	I/O	ADC_IN15	Voltage_ADC_18650
26	PB0 *	I/O	GPIO_Output	User_Input_Status_Light
27	PB1 *	I/O	GPIO_Output	User_Input_Status_Light_Gr een
28	PB2 *	I/O	GPIO_Output	User_Input_Status_Light_Bl ue
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	LS_1
34	PB13 *	I/O	GPIO_Output	LS_2
35	PB14 *	I/O	GPIO_Output	LS_3
36	PB15 *	I/O	GPIO_Output	LS_4
37	PC6 *	I/O	GPIO_Output	LS_LOW
38	PC7 *	I/O	GPIO_Output	LS_5
39	PC8 *	I/O	GPIO_Output	LS_6
40	PC9 *	I/O	GPIO_Output	LS_7
41	PA8 *	I/O	GPIO_Output	LS_8
42	PA9 *	I/O	GPIO_Output	LS_HIGH
47	VSS	Power		
48	VDDIO2	Power		

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
55	PB3 *	I/O	GPIO_Output	Threshold_Red
56	PB4 *	I/O	GPIO_Output	Threshold_Green
57	PB5 *	I/O	GPIO_Output	Threshold_Blue
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	Switching_Tool_Prototype
Project Folder	C:\Users\zlink\OneDrive\Documents\GitHub\Low_Powered_STM32_Project\Switc
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L0 V1.12.2
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	No
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_ADC_Init	ADC
4	MX_USART2_UART_Init	USART2

## 1. Power Consumption Calculator report

### 1.1. Microcontroller Selection

Series	STM32L0
Line	STM32L0x0 Value Line
MCU	STM32L010RBTx
Datasheet	DS12319_Rev1

### 1.2. Parameter Selection

Temperature	25
Vdd	3.0

### 1.3. Battery Selection

Battery	Li-SOCL2(AAA700)
Capacity	700.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	10.0 mA
Max Pulse Current	30.0 mA
Cells in series	1
Cells in parallel	1



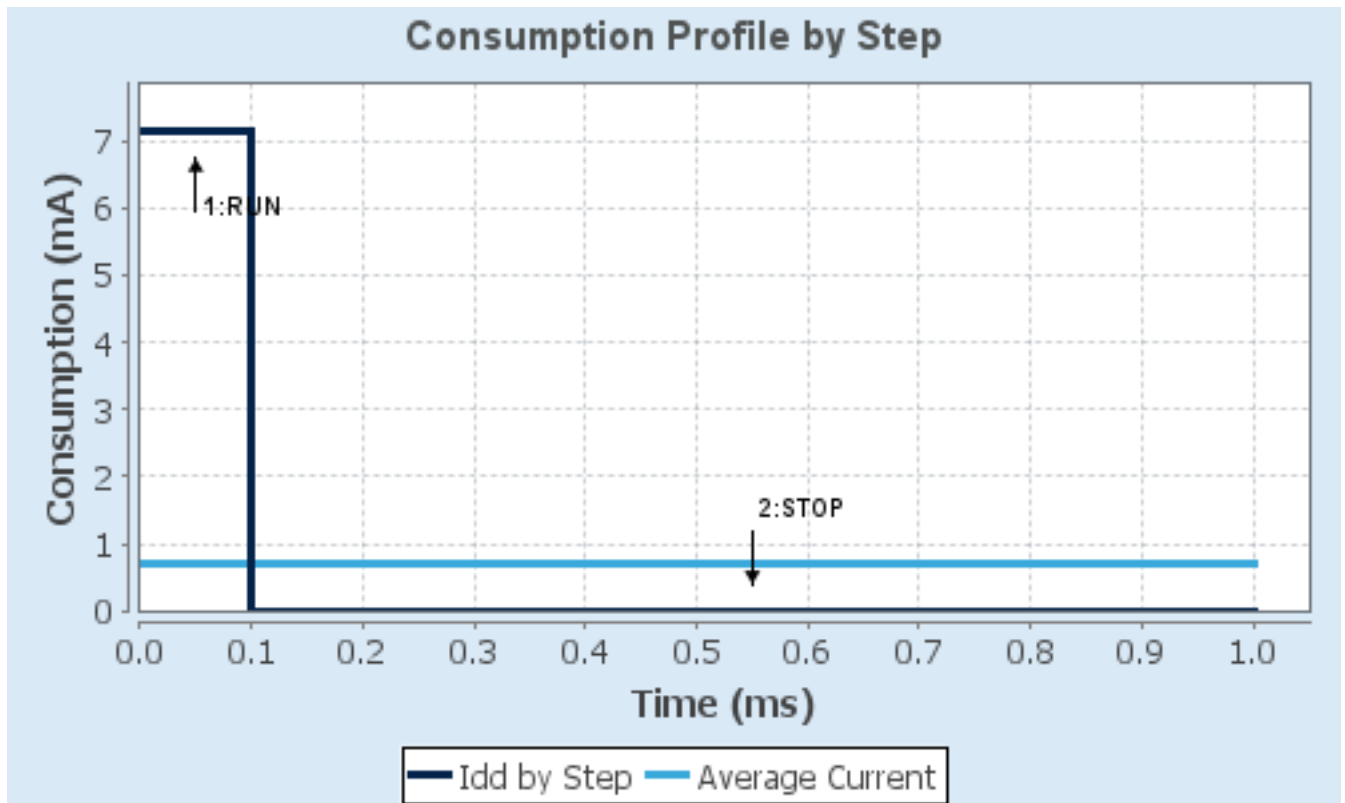
#### 1.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-High	NoRange
<b>Fetch Type</b>	FLASH	n/a
<b>CPU Frequency</b>	32 MHz	0 Hz
<b>Clock Configuration</b>	HSI PLL	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	16 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	7.15 mA	430 nA
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	30.0	0.0
<b>Ta Max</b>	104.01	105
<b>Category</b>	In DS Table	In DS Table

#### 1.5. Results

Sequence Time	1 ms	Average Current	715.39 $\mu$ A
Battery Life	1 month, 10 days, 7 hours	Average DMIPS	30.4 DMIPS

#### 1.6. Chart



## 2. Peripherals and Middlewares Configuration

### 2.1. ADC

mode: IN12

mode: IN13

mode: IN14

mode: IN15

#### 2.1.1. Parameter Settings:

##### ADC\_Settings:

Clock Prescaler

Resolution

Data Alignment

Scan Direction

Continuous Conversion Mode

Discontinuous Conversion Mode

DMA Continuous Requests

End Of Conversion Selection

Overrun behaviour

Low Power Auto Wait

Low Frequency Mode

Auto Off

Oversampling Mode

**Synchronous clock mode divided by 4 \***

ADC 12-bit resolution

Right alignment

Forward

**Enabled \***

Disabled

Disabled

End of single conversion

Overrun data preserved

Disabled

Disabled

Disabled

Disabled

##### ADC\_Regular\_ConversionMode:

Sampling Time

External Trigger Conversion Source

External Trigger Conversion Edge

**160.5 Cycles \***

Regular Conversion launched by software

None

##### WatchDog:

Enable Analog WatchDog Mode

false

### 2.2. RCC

#### 2.2.1. Parameter Settings:

##### System Parameters:

VDD voltage (V)

Buffer Cache

Prefetch

Preread

3.3

Enabled

Disabled

Enabled

Flash Latency(WS)	1 WS (2 CPU cycle)
<b>RCC Parameters:</b>	
HSI Calibration Value	16
MSI Calibration Value	0
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000
<b>Power Parameters:</b>	
Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

## 2.3. SYS

**Timebase Source: SysTick**

## 2.4. USART2

**Mode: Asynchronous**

### 2.4.1. Parameter Settings:

<b>Basic Parameters:</b>	
Baud Rate	115200
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1
<b>Advanced Parameters:</b>	
Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable
<b>Advanced Features:</b>	
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**

### 3. System Configuration

#### 3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC	PC2	ADC_IN12	Analog mode	No pull-up and no pull-down	n/a	Current_ADC_CMOS
	PC3	ADC_IN13	Analog mode	No pull-up and no pull-down	n/a	Voltage_ADC_CMOS
	PC4	ADC_IN14	Analog mode	No pull-up and no pull-down	n/a	Current_ADC_18650
	PC5	ADC_IN15	Analog mode	No pull-up and no pull-down	n/a	Voltage_ADC_18650
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	PC0	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	Minus
	PC1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	Plus
	PA0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Discrete_Bit_0
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Discrete_Bit_1
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Discrete_Bit_2
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	User_Input_Status_Light
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	User_Input_Status_Light_Green
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	User_Input_Status_Light_Blue
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_1
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_2
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_3
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_4
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_LOW
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_5
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_6
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_7
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_8
	PA9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LS_HIGH
	PB3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Threshold_Red
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Threshold_Green
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Threshold_Blue

#### 3.2. DMA configuration

nothing configured in DMA service



### 3.3. NVIC configuration

#### 3.3.1. NVIC

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable Interrupt	true	0	0
Hard fault interrupt	true	0	0
System service call via SWI instruction	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	3	0
Flash and EEPROM global interrupt	unused		
RCC global interrupt	unused		
ADC global interrupt	unused		
USART2 global interrupt / USART2 wake-up interrupt through EXTI line 26	unused		

#### 3.3.2. 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
System service call via SWI instruction	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true

\* User modified value

## 4. System Views

- 4.1. Category view
- 4.1.1. Current

Middleware

System Core

DMA

GPIO

IVIC

RCC

SYS

Analog

ADC

Timers

Connectivity

USART2

Computing



## 5. Docs & Resources

Type	Link
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l0_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l0_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l0_svd.zip">https://www.st.com/resource/en/svd/stm32l0_svd.zip</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/gt_stm32f0-l0.pdf">https://www.st.com/resource/en/product_presentation/gt_stm32f0-l0.pdf</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>
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>
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/brstm32l0.pdf">https://www.st.com/resource/en/brochure/brstm32l0.pdf</a>
Brochures	<a href="https://www.st.com/resource/en/brochure/brstm32ulp.pdf">https://www.st.com/resource/en/brochure/brstm32ulp.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32l0vline.pdf">https://www.st.com/resource/en/flyer/flstm32l0vline.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>
Magazine Articles	<a href="https://www.st.com/resource/en/magazine/design-elektronik_october2016.pdf">https://www.st.com/resource/en/magazine/design-elektronik_october2016.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-">https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-</a>

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- Application Notes [https://www.st.com/resource/en/application\\_note/an2867-oscillator-design-guide-for-stm8afals-stm32-mcus-and-mpus-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2867-oscillator-design-guide-for-stm8afals-stm32-mcus-and-mpus-stmicroelectronics.pdf)
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- Application Notes [https://www.st.com/resource/en/application\\_note/an3960-esd-considerations-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3960-esd-considerations-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf)
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- Application Notes [https://www.st.com/resource/en/application\\_note/an4729-stm32l0l4-firewall-overview-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an4729-stm32l0l4-firewall-overview-stmicroelectronics.pdf)
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Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1204-tape-and-reel-shipping-media-for-stm32-microcontrollers-in-bga-packages-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1204-tape-and-reel-shipping-media-for-stm32-microcontrollers-in-bga-packages-stmicroelectronics.pdf</a>
Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1205-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-fpn-packages-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1205-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-fpn-packages-stmicroelectronics.pdf</a>
Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1206-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-qfp-packages-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1206-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-qfp-packages-stmicroelectronics.pdf</a>
Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1207-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-so-packages-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1207-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-so-packages-stmicroelectronics.pdf</a>
Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1208-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-tssop-and-ssop-packages-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1208-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-tssop-and-ssop-packages-stmicroelectronics.pdf</a>
Technical Notes & Articles	<a href="https://www.st.com/resource/en/technical_note/tn1433-reference-device-marking-schematics-for-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf">https://www.st.com/resource/en/technical_note/tn1433-reference-device-marking-schematics-for-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf</a>