



## 1. Description

### 1.1. Project

Project Name	hands_on_main_app
Board Name	NUCLEO-L4A6ZG
Generated with:	STM32CubeMX 6.12.1
Date	11/15/2024

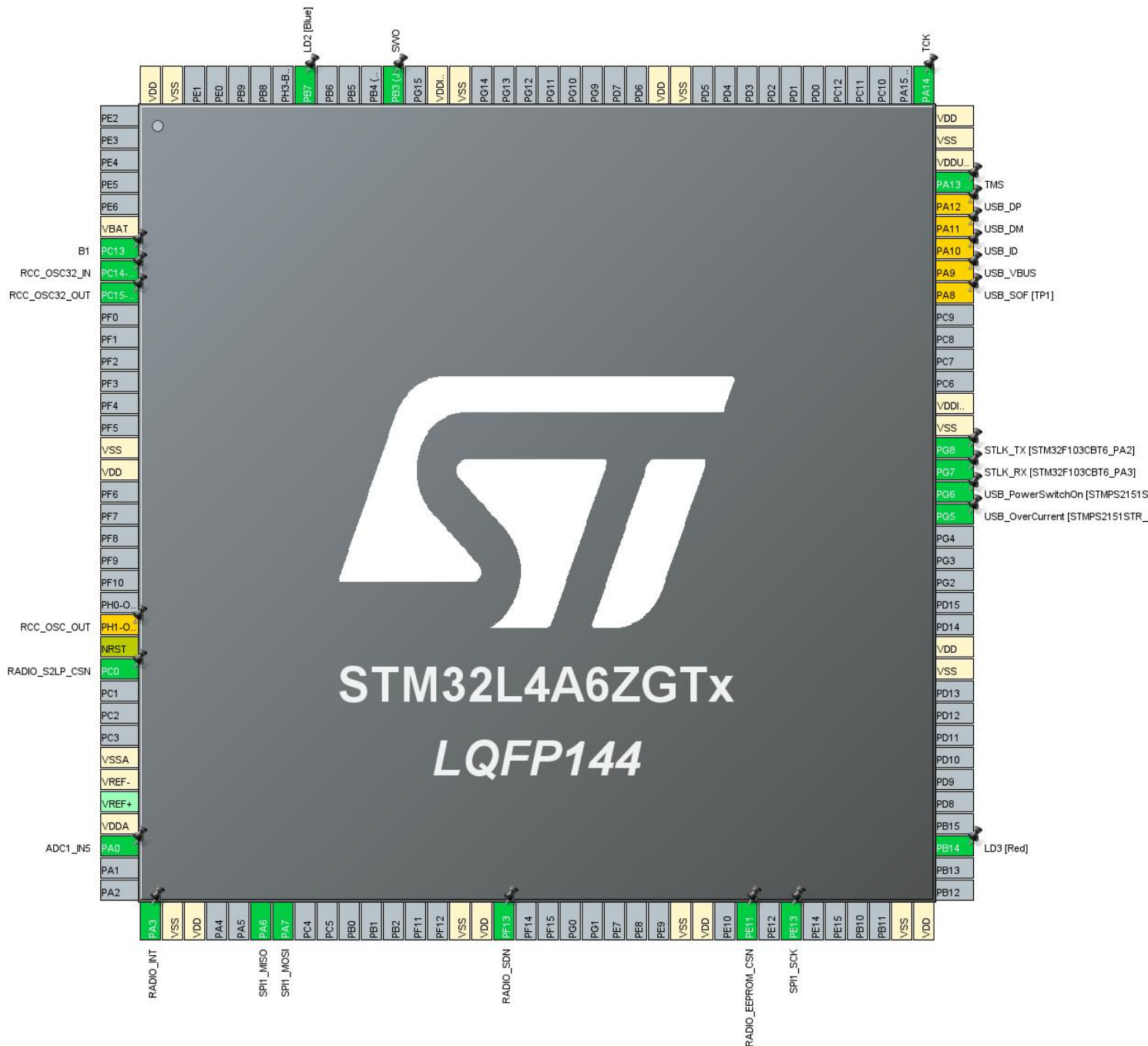
### 1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L4A6ZGTx
MCU Package	LQFP144
MCU Pin number	144

### 1.3. Core(s) information

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



### 3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
7	PC13	I/O	GPIO_EXTI13	B1
8	PC14-OSC32_IN (PC14)	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT (PC15)	I/O	RCC_OSC32_OUT	
16	VSS	Power		
17	VDD	Power		
24	PH1-OSC_OUT (PH1) *	I/O	RCC_OSC_OUT	
25	NRST	Reset		
26	PC0 **	I/O	GPIO_Output	RADIO_S2LP_CSN
30	VSSA	Power		
31	VREF-	Power		
33	VDDA	Power		
34	PA0	I/O	ADC1_IN5	
37	PA3	I/O	GPIO_EXTI3	RADIO_INT
38	VSS	Power		
39	VDD	Power		
42	PA6	I/O	SPI1_MISO	
43	PA7	I/O	SPI1_MOSI	
51	VSS	Power		
52	VDD	Power		
53	PF13 **	I/O	GPIO_Output	RADIO_SDN
61	VSS	Power		
62	VDD	Power		
64	PE11 **	I/O	GPIO_Output	RADIO_EEPROM_CSN
66	PE13	I/O	SPI1_SCK	
71	VSS	Power		
72	VDD	Power		
75	PB14 **	I/O	GPIO_Output	LD3 [Red]
83	VSS	Power		
84	VDD	Power		
90	PG5 **	I/O	GPIO_Input	USB_OverCurrent [STMPS2151STR_FAULT]
91	PG6 **	I/O	GPIO_Output	USB_PowerSwitchOn [STMPS2151STR_EN]
92	PG7	I/O	LPUART1_TX	STLK_RX [STM32F103CBT6_PA3]

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
93	PG8	I/O	LPUART1_RX	STLK_TX [STM32F103CBT6_PA2]
94	VSS	Power		
95	VDDIO2	Power		
100	PA8 *	I/O	USB_OTG_FS_SOF	USB_SOF [TP1]
101	PA9 *	I/O	USB_OTG_FS_VBUS	USB_VBUS
102	PA10 *	I/O	USB_OTG_FS_ID	USB_ID
103	PA11 *	I/O	USB_OTG_FS_DM	USB_DM
104	PA12 *	I/O	USB_OTG_FS_DP	USB_DP
105	PA13 (JTMS/SWDIO)	I/O	SYS_JTMS-SWDIO	TMS
106	VDDUSB	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14 (JTCK/SWCLK)	I/O	SYS_JTCK-SWCLK	TCK
120	VSS	Power		
121	VDD	Power		
130	VSS	Power		
131	VDDIO2	Power		
133	PB3 (JTDO/TRACESWO)	I/O	SYS_JTDO-SWO	SWO
137	PB7 **	I/O	GPIO_Output	LD2 [Blue]
143	VSS	Power		
144	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



## 1. Power Consumption Calculator report

### 1.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x6
MCU	STM32L4A6ZGTx
Datasheet	DS11584_Rev2

### 1.2. Parameter Selection

Temperature	25
Vdd	3.0

### 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

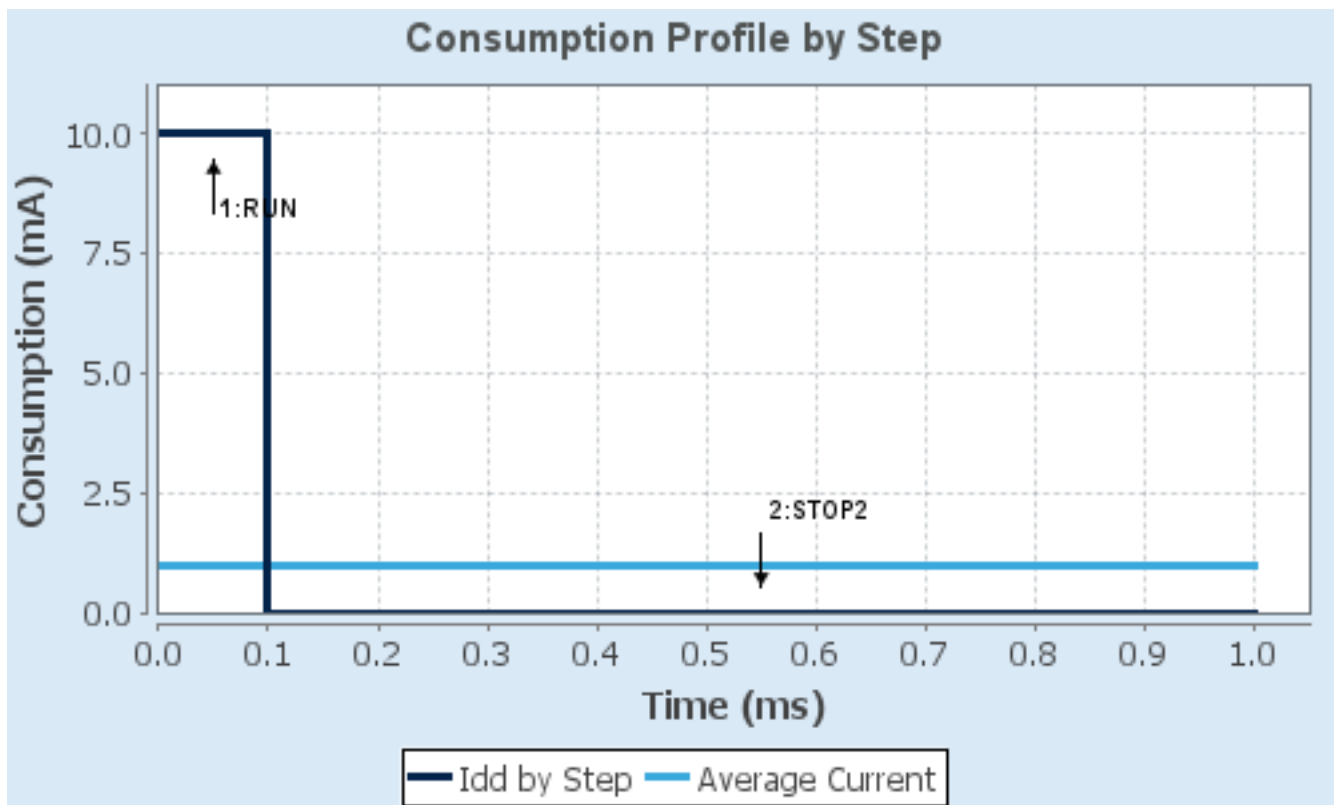
<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP2
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-High	NoRange
<b>Fetch Type</b>	FLASH	n/a
<b>CPU Frequency</b>	80 MHz	0 Hz
<b>Clock Configuration</b>	HSE BYP PLL Flash-ON	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	10 mA	2.69 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	100.0	0.0
<b>Ta Max</b>	104.04	105
<b>Category</b>	In DS Table	In DS Table

#### 1.5. Results

Sequence Time	1 ms	Average Current	1 mA
Battery Life	4 months, 19 days, 3 hours	Average DMIPS	100.0 DMIPS

#### 1.6. Chart





## 2. Software Project

### 2.1. Project Settings

Name	Value
Project Name	hands_on_main_app
Project Folder	C:\Users\loict\Nextcloud\Portable UCL\Master\LELEC2102
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L4 V1.17.0
Application Structure	Advanced
Generate Under Root	Yes
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 only the necessary library files
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)	Yes
Enable Full Assert	No

### 2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO
2	MX_DMA_Init	DMA
3	SystemClock_Config	RCC
4	MX_LPUART1_UART_Init	LPUART1
5	MX_SPI1_Init	SPI1
6	MX_TIM3_Init	TIM3
7	MX_ADC1_Init	ADC1

## 3. Peripherals and Middlewares Configuration

### 3.1. ADC1

#### IN5: IN5 Single-ended

##### 3.1.1. Parameter Settings:

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###### ADCs\_Common\_Settings:

Mode Independent mode

###### ADC\_Settings:

Clock Prescaler

**Asynchronous clock mode divided by 10 \***

Resolution

ADC 12-bit resolution

Data Alignment

Right alignment

Scan Conversion Mode

Disabled

Continuous Conversion Mode

Disabled

Discontinuous Conversion Mode

Disabled

DMA Continuous Requests

**Enabled \***

End Of Conversion Selection

End of single conversion

Overrun behaviour

Overrun data preserved

Low Power Auto Wait

Disabled

###### ADC\_Regular\_ConversionMode:

Enable Regular Conversions

Enable

Enable Regular Oversampling

Disable

Number Of Conversion

1

External Trigger Conversion Source

**Timer 3 Trigger Out event \***

External Trigger Conversion Edge

Trigger detection on the rising edge

Rank

1

Channel

Channel 5

Sampling Time

2.5 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

## 3.2. LPUART1

### Mode: Asynchronous

#### 3.2.1. 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
Single Sample	Disable

##### Advanced Features:

Auto Baudrate Mode	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

## 3.3. RCC

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

#### 3.3.1. Parameter Settings:

##### System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

##### RCC Parameters:

HSI Calibration Value	64
MSI Calibration Value	0
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

##### Power Parameters:

Power Regulator Voltage Scale

Power Regulator Voltage Scale 1

### 3.4. SPI1

**Mode: Full-Duplex Master**

#### 3.4.1. Parameter Settings:

##### **Basic Parameters:**

Frame Format	Motorola
Data Size	<b>8 Bits *</b>
First Bit	MSB First

##### **Clock Parameters:**

Prescaler (for Baud Rate)	<b>4 *</b>
Baud Rate	<b>12.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

##### **Advanced Parameters:**

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software

### 3.5. SYS

**Debug: Trace Asynchronous Sw**

**Timebase Source: SysTick**

### 3.6. TIM3

**Clock Source : Internal Clock**

#### 3.6.1. Parameter Settings:

##### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>23 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>195 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

##### **Trigger Output (TRGO) Parameters:**

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
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Trigger Event Selection TRGO

**Update Event \***

**\* 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	PA0	ADC1_IN5	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	
LPUART1	PG7	LPUART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	STLK_RX [STM32F103CBT6_PA3]
	PG8	LPUART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	STLK_TX [STM32F103CBT6_PA2]
RCC	PC14-OSC32_IN (PC14)	RCC_OSC32_IN	n/a	n/a	n/a	
	PC15-OSC32_OUT (PC15)	RCC_OSC32_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 *	
	PE13	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
SYS	PA13 (JTMS/SWDIO)	SYS_JTMS-SWDIO	n/a	n/a	n/a	TMS
	PA14 (JTCK/SWCLK)	SYS_JTCK-SWCLK	n/a	n/a	n/a	TCK
	PB3 (JTDO/TRACESWO)	SYS_JTDO-SWO	n/a	n/a	n/a	SWO
Single Mapped Signals	PH1-OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	
	PA8	USB_OTG_FS_SOF	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USB_SOF [TP1]
	PA9	USB_OTG_FS_VBUS	n/a	n/a	n/a	USB_VBUS
	PA10	USB_OTG_FS_ID	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USB_ID
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	Very High	USB_DM

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	USB_DP
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	B1
	PC0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>Very High</b> *	RADIO_S2LP_CSN
	PA3	GPIO_EXTI3	<b>External Interrupt Mode with Falling edge trigger detection</b>	No pull-up and no pull-down	<b>n/a</b>	RADIO_INT
	PF13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RADIO_SDN
	PE11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RADIO_EEPROM_CSN
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD3 [Red]
	PG5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	USB_OverCurrent [STMPS2151STR_FAULT]
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_PowerSwitchOn [STMPS2151STR_EN]
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [Blue]



## 4.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA1_Channel1	Peripheral To Memory	Low

### ADC1: DMA1\_Channel1 DMA request Settings:

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

### 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
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
EXTI line3 interrupt	true	0	0
DMA1 channel1 global interrupt	true	1	0
TIM3 global interrupt	true	0	0
EXTI line[15:10] interrupts	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		
SPI1 global interrupt	unused		
LPUART1 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
Prefetch 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 line3 interrupt	false	true	true
DMA1 channel1 global interrupt	false	true	true
TIM3 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

Security

Computing

DMA



ADC1



TIM3



LPUART1



GPIO



SP1



NVIC



RCC



SYS



## 6. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32l4_bsd.zip">https://www.st.com/resource/en/bsdl_model/stm32l4_bsd.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l4_svd.zip">https://www.st.com/resource/en/svd/stm32l4_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>
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>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/microcontrollers-stm32l4-series-product-overview.pdf">https://www.st.com/resource/en/product_presentation/microcontrollers-stm32l4-series-product-overview.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/flstm32l4.pdf">https://www.st.com/resource/en/flyer/flstm32l4.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/flstmcsuite.pdf">https://www.st.com/resource/en/flyer/flstmcsuite.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32gui.pdf">https://www.st.com/resource/en/flyer/flstm32gui.pdf</a>
Magazine Articles	<a href="https://www.st.com/resource/en/magazine/design-elektronik_august2017.pdf">https://www.st.com/resource/en/magazine/design-elektronik_august2017.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>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf">https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf</a>

Product Certifications	<a href="https://www.st.com/resource/en/certification_document/sesip-2000002-01-st2.pdf">https://www.st.com/resource/en/certification_document/sesip-2000002-01-st2.pdf</a>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/psa-certificate_stm32l4.pdf">https://www.st.com/resource/en/certification_document/psa-certificate_stm32l4.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-and-mpus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3154-can-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3154-can-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3155-uart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3155-uart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4555-getting-started-with-stm32l4-series-and-stm32l4-series-hardware-development-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4555-getting-started-with-stm32l4-series-and-stm32l4-series-hardware-development-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4612-migrating-from-stm32l1-series-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4612-migrating-from-stm32l1-series-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4616-migrating-from-">https://www.st.com/resource/en/application_note/an4616-migrating-from-</a>

stm32f401-and-stm32f411-lines-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf

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Application Notes [https://www.st.com/resource/en/application\\_note/an4629-adc-hardware-oversampling-for-microcontrollers-of-the-stm32-l0-and-l4-series-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an4629-adc-hardware-oversampling-for-microcontrollers-of-the-stm32-l0-and-l4-series-stmicroelectronics.pdf)

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