



1. Description

1.1. Project

Project Name	Armuro
Board Name	NUCLEO-L432KC
Generated with:	STM32CubeMX 6.14.1
Date	07/15/2025

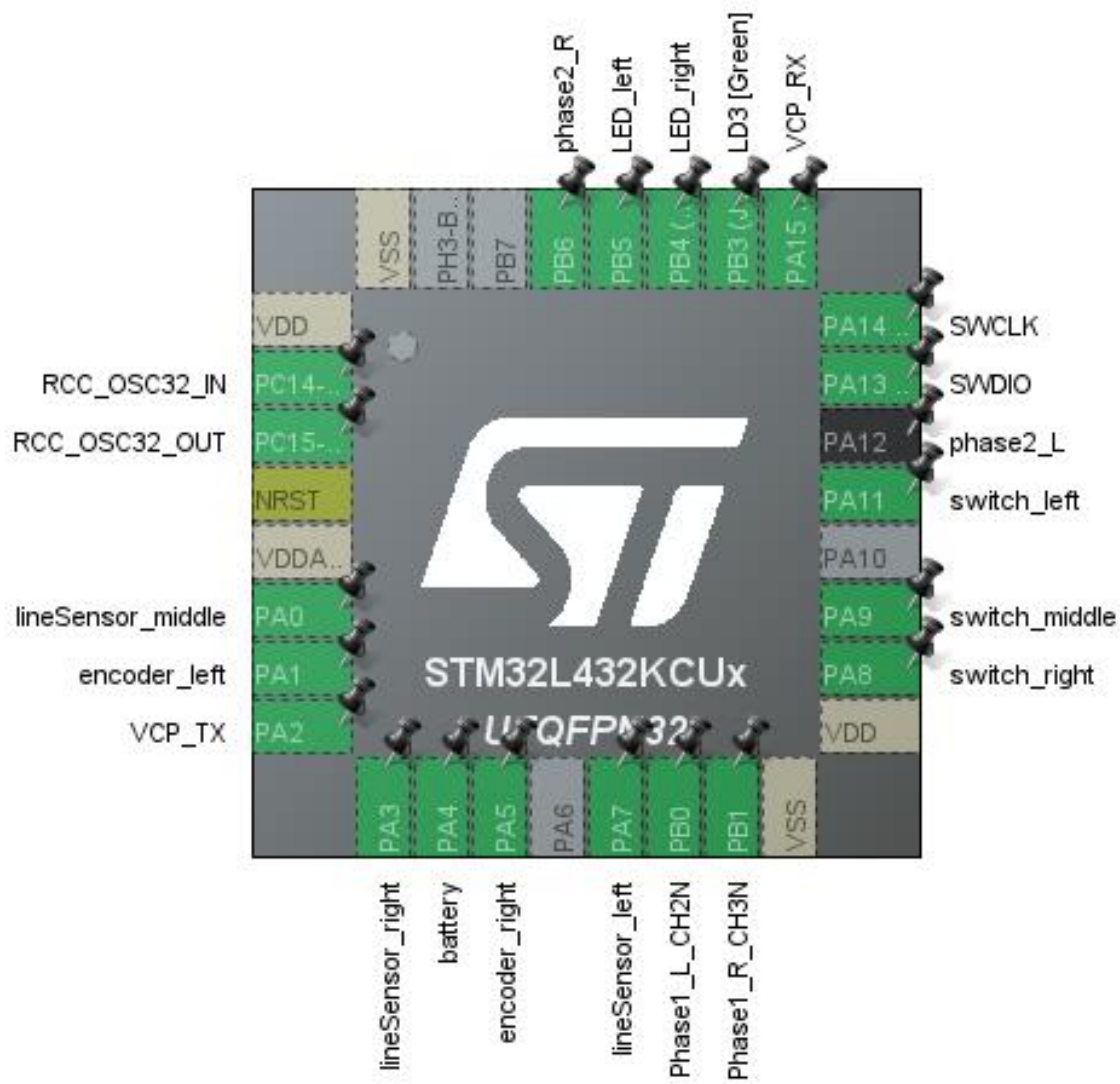
1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x2
MCU name	STM32L432KCUx
MCU Package	UFQFPN32
MCU Pin number	32

1.3. Core(s) information

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

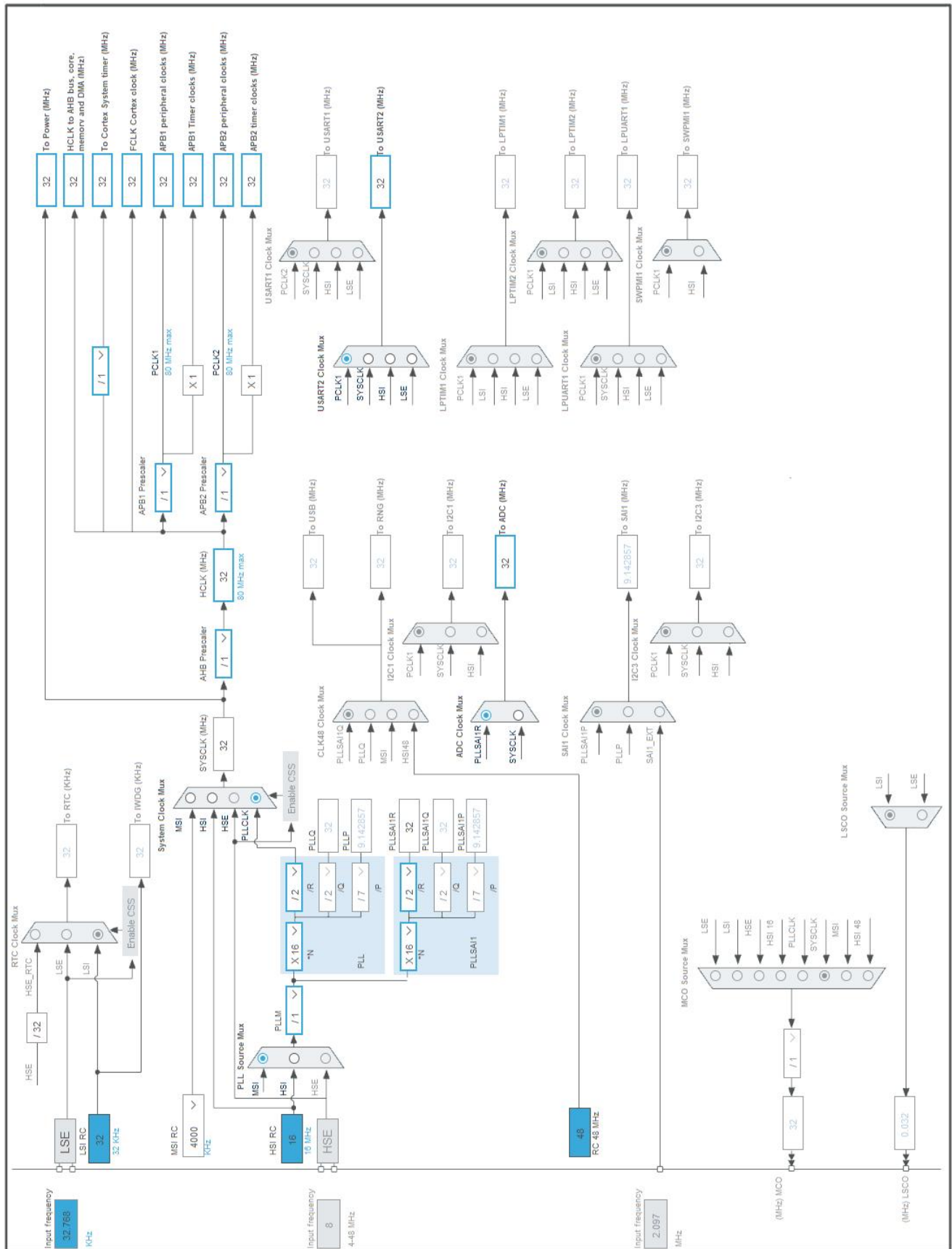


3. Pins Configuration

Pin Number UFQFPN32	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VDD	Power		
2	PC14-OSC32_IN (PC14)	I/O	RCC_OSC32_IN	
3	PC15-OSC32_OUT (PC15)	I/O	RCC_OSC32_OUT	
4	NRST	Reset		
5	VDDA/VREF+	Power		
6	PA0	I/O	ADC1_IN5	lineSensor_middle
7	PA1	I/O	ADC1_IN6	encoder_left
8	PA2	I/O	USART2_TX	VCP_TX
9	PA3	I/O	ADC1_IN8	lineSensor_right
10	PA4	I/O	ADC1_IN9	battery
11	PA5	I/O	ADC1_IN10	encoder_right
13	PA7	I/O	ADC1_IN12	lineSensor_left
14	PB0	I/O	TIM1_CH2N	Phase1_L_CH2N
15	PB1	I/O	TIM1_CH3N	Phase1_R_CH3N
16	VSS	Power		
17	VDD	Power		
18	PA8 *	I/O	GPIO_Input	switch_right
19	PA9 *	I/O	GPIO_Input	switch_middle
21	PA11 *	I/O	GPIO_Input	switch_left
22	PA12 *	I/O	GPIO_Output	phase2_L
23	PA13 (JTMS-SWDIO)	I/O	SYS_JTMS-SWDIO	SWDIO
24	PA14 (JTCK-SWCLK)	I/O	SYS_JTCK-SWCLK	SWCLK
25	PA15 (JTDI)	I/O	USART2_RX	VCP_RX
26	PB3 (JTDO-TRACESWO) *	I/O	GPIO_Output	LD3 [Green]
27	PB4 (NJTRST) *	I/O	GPIO_Output	LED_right
28	PB5 *	I/O	GPIO_Output	LED_left
29	PB6 *	I/O	GPIO_Output	phase2_R
32	VSS	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x2
MCU	STM32L432KCUx
Datasheet	DS11451_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

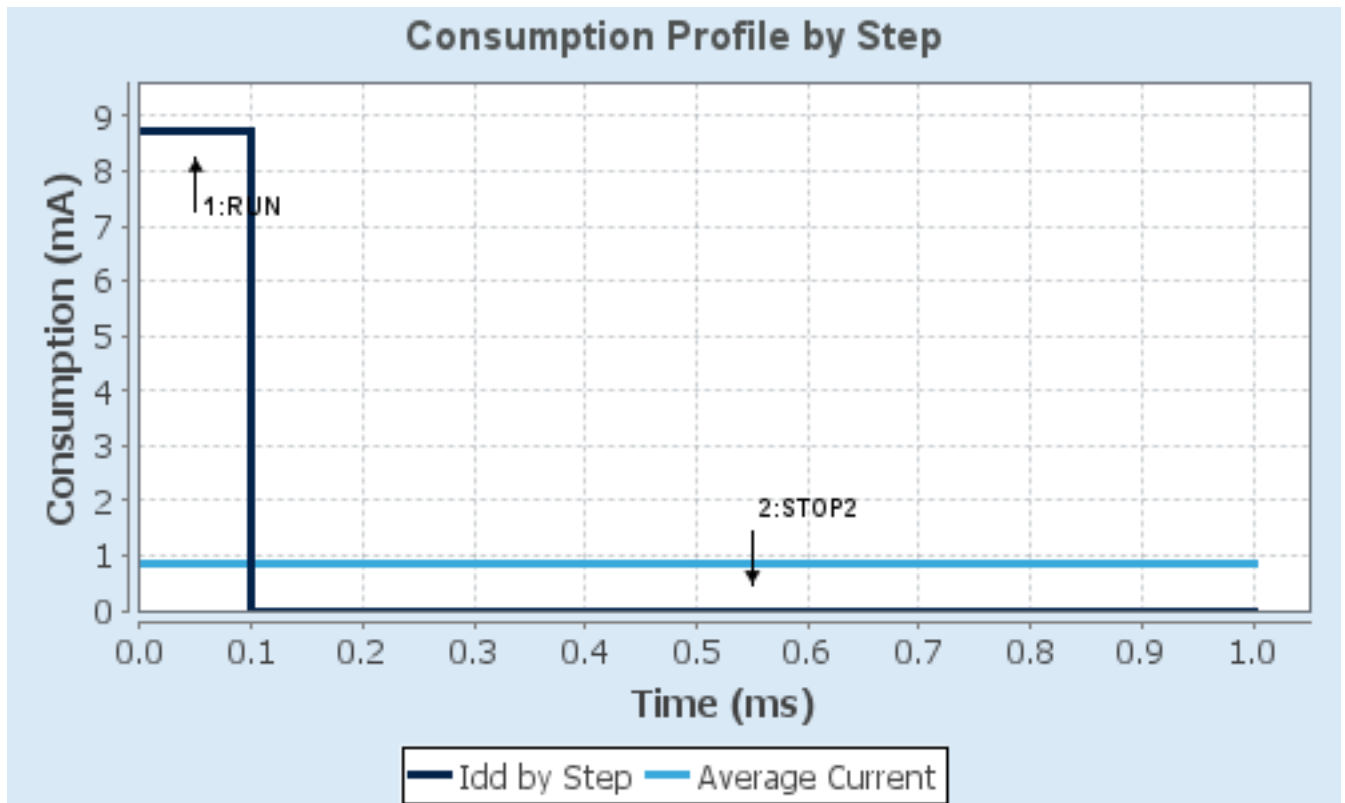
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP2
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-High	NoRange
Fetch Type	SRAM2	n/a
CPU Frequency	80 MHz	0 Hz
Clock Configuration	HSE BYP PLL	ALL CLOCKS OFF
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	8.71 mA	1.06 μ A
Duration	0.1 ms	0.9 ms
DMIPS	100.0	0.0
Ta Max	103.98	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	871.95 μ A
Battery Life	5 months, 9 days, 16 hours	Average DMIPS	100.0 DMIPS

1.6. Chart



2. Software Project

2.1. Project Settings

Name	Value
Project Name	Armuro
Project Folder	C:\Users\lenar\Documents\unistuff\SS25\Mobile Roboter\RoboBoy
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L4 V1.18.1
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)	No
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_USART2_UART_Init	USART2
5	MX_ADC1_Init	ADC1
6	MX_TIM1_Init	TIM1

3. Peripherals and Middlewares Configuration

3.1. ADC1

IN5: IN5 Single-ended

IN6: IN6 Single-ended

IN8: IN8 Single-ended

IN9: IN9 Single-ended

IN10: IN10 Single-ended

mode: IN12

3.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler

Resolution

Data Alignment

Scan Conversion Mode

Continuous Conversion Mode

Discontinuous Conversion Mode

DMA Continuous Requests

End Of Conversion Selection

Overrun behaviour

Low Power Auto Wait

Asynchronous clock mode divided by 4 *

ADC 12-bit resolution

Right alignment

Enabled

Enabled *

Disabled

Disabled

End of sequence of conversion *

Overrun data preserved

Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions

Enable

Enable Regular Oversampling

Disable

Number Of Conversion

6 *

External Trigger Conversion Source

Regular Conversion launched by software

External Trigger Conversion Edge

None

Rank

1

Channel

Channel 5

Sampling Time

2.5 Cycles

Offset Number

No offset

Rank

2 *

Channel

Channel 6 *

Sampling Time

2.5 Cycles

Offset Number

No offset

Rank

3 *

Channel

Channel 8 *

Sampling Time

2.5 Cycles

Offset Number	No offset
<u>Rank</u>	4 *
Channel	Channel 9 *
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	5 *
Channel	Channel 10 *
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	6 *
Channel	Channel 12 *
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. RCC

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

3.2.1. Parameter Settings:

System Parameters:	
VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	1 WS (2 CPU cycle)
RCC Parameters:	
HSI Calibration Value	16
MSI Calibration Value	0
MSI Auto Calibration	Enabled
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

LSE Drive Capability

LSE oscillator low drive capability

Power Parameters:

Power Regulator Voltage Scale

Power Regulator Voltage Scale 1

3.3. SYS

Debug: Serial Wire

Timebase Source: SysTick

3.4. TIM1

Clock Source : Internal Clock

Channel2: PWM Generation CH2N

Channel3: PWM Generation CH3N

3.4.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 bits value)	0
auto-reload preload	Enable *

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High
BRK Filter (4 bits value)	0
BRK Sources Configuration	
- Digital Input	Disable
- COMP1	Disable
- COMP2	Disable

Break And Dead Time management - BRK2 Configuration:

BRK2 State	Disable
BRK2 Polarity	High
BRK2 Filter (4 bits value)	0
BRK2 Sources Configuration	

- Digital Input	Disable
- COMP1	Disable
- COMP2	Disable

Break And Dead Time management - Output Configuration:

Automatic Output State	Disable
Off State Selection for Run Mode (OSSR)	Disable
Off State Selection for Idle Mode (OSSI)	Disable
Lock Configuration	Off

Clear Input:

Clear Input Source	Disable
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PWM Generation Channel 2N:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CHN Polarity	High
CHN Idle State	Reset

PWM Generation Channel 3N:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CHN Polarity	High
CHN Idle State	Reset

3.5. USART2

Mode: Asynchronous

3.5.1. 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
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**

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	lineSensor_middle
	PA1	ADC1_IN6	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	encoder_left
	PA3	ADC1_IN8	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	lineSensor_right
	PA4	ADC1_IN9	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	battery
	PA5	ADC1_IN10	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	encoder_right
	PA7	ADC1_IN12	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	lineSensor_left
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	
SYS	PA13 (JTMS-SWDIO)	SYS_JTMS-SWDIO	n/a	n/a	n/a	SWDIO
	PA14 (JTCK-SWCLK)	SYS_JTCK-SWCLK	n/a	n/a	n/a	SWCLK
TIM1	PB0	TIM1_CH2N	Alternate Function Push Pull	No pull-up and no pull-down	Low	Phase1_L_CH2N
	PB1	TIM1_CH3N	Alternate Function Push Pull	No pull-up and no pull-down	Low	Phase1_R_CH3N
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	VCP_TX
	PA15 (JTDI)	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	VCP_RX
GPIO	PA8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	switch_right
	PA9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	switch_middle
	PA11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	switch_left
	PA12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	phase2_L
	PB3 (JTDO-TRACESWO)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD3 [Green]
	PB4 (NJTRST)	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_right
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_left

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	phase2_R

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: **Word ***
Memory Data Width: **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
DMA1 channel1 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 global interrupt	unused		
TIM1 break interrupt and TIM15 global interrupt	unused		
TIM1 update interrupt and TIM16 global interrupt	unused		
TIM1 trigger and commutation interrupts	unused		
TIM1 capture compare interrupt	unused		
USART2 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
DMA1 channel1 global interrupt	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 ✓	TIM1 ✓	USART2 ✓			
GPIO ✓						
NVIC ✓						
RCC ✓						
SYS ✓						

6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32l4_bsd.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32l4_svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers_b-l462e-cell1_discovery_cellular_kit_product_overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32l4-series-product-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32ulp.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32l4.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Magazine Articles	https://www.st.com/resource/en/magazine/design-elektronik_august2017.pdf
Magazine Articles	https://www.st.com/resource/en/magazine/design-elektronik_october2016.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf
Product	https://www.st.com/resource/en/certification_document/sesip-2000002-

Certifications	01-st2.pdf
Product	https://www.st.com/resource/en/certification_document/psa-
Certifications	certificate_stm32l4.pdf
Security Bulletin	https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3155-uart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4555-getting-started-with-stm32l4-series-and-stm32l4-series-hardware-development-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4612-migrating-from-stm32l1-series-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4616-migrating-from-stm32f401-and-stm32f411-lines-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4621-stm32l4-and-stm32l4-ultralowpower-features-overview-stmicroelectronics.pdf
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

- Application Notes https://www.st.com/resource/en/application_note/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4655-virtually-increasing-the-number-of-serial-communication-peripherals-in-stm32-applications-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4726-stm32cube-firmware-examples-for-stm32l4-series-and-stm32l4-series-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4729-stm32l0l4-firewall-overview-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4730-using-the-firewall-embedded-in-stm32l0l4l4-series-mcus-for-secure-access-to-sensitive-parts-of-code-and-data-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4746-optimizing-power-and-performance-with-stm32l4-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
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- Application Notes https://www.st.com/resource/en/application_note/an4803-highspeed-si-simulations-using-ibis-and-boardlevel-simulations-using-hyperlynx-si-on-stm32-mcus-and-mpus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4809-migrating-between-stm32l0-series-and-stm32l4-series--stm32l4-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4821-migrating-from-stm32f405415-line-and-stm32f407417-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4831-migrating-from-stm32f2x5-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf

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- Application Notes https://www.st.com/resource/en/application_note/an4832-migrating-from-stm32f303-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4989-stm32-microcontroller-debug-toolbox-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4990-getting-started-with-sigmadelta-digital-interface-on-applicable-stm32-microcontrollers-stmicroelectronics.pdf
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- Application Notes https://www.st.com/resource/en/application_note/an4760-quadspi-interface-on-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4899-stm32-microcontroller-gpio-hardware-settings-and-lowpower-consumption-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an5612-esd-protection-of-stm32-mcus-and-mpus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4991-how-to-wake-up-an-stm32-microcontroller-from-lowpower-mode-with-the-usart-or-the-lpuart-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4838-introduction-to-memory-protection-unit-management-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4879-introduction-to-usb-hardware-and-pcb-guidelines-using-stm32-mcus-stmicroelectronics.pdf

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Application Notes https://www.st.com/resource/en/application_note/an5225-introduction-to-usb-typec-power-delivery-for-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4777-how-to-optimize-power-consumption-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4894-how-to-use-eeeprom-emulation-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5537-how-to-use-adc-oversampling-techniques-to-improve-signal-tonoise-ratio-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5036-guidelines-for-thermal-management-on-stm32-applications-stmicroelectronics.pdf

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