



1. Description

1.1. Project

Project Name	joystick
Board Name	NUCLEO-L4R5ZI-P
Generated with:	STM32CubeMX 6.15.0
Date	11/13/2025

1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4R5/S5
MCU name	STM32L4R5ZITxP
MCU Package	LQFP144
MCU Pin number	144

1.3. Core(s) information

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



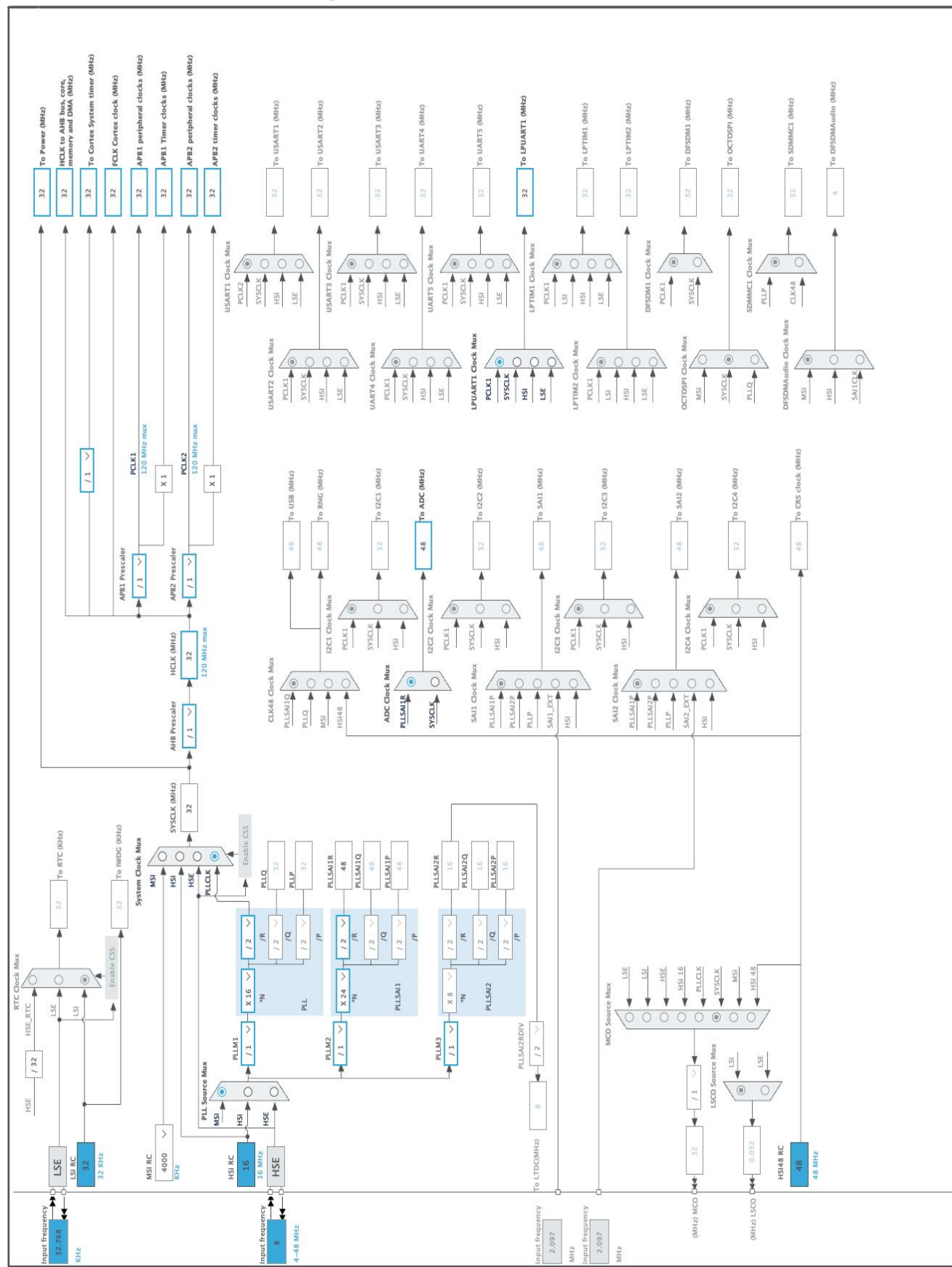
3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
7	PC13	I/O	GPIO_EXTI13	
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		
23	PH0-OSC_IN (PH0)	I/O	RCC_OSC_IN	
24	PH1-OSC_OUT (PH1)	I/O	RCC_OSC_OUT	
25	NRST	Reset		
26	PC0	I/O	ADC1_IN1	
27	PC1	I/O	ADC1_IN2	
30	VSSA	Power		
31	VREF-	Power		
33	VDDA	Power		
34	PA0	I/O	TIM2_CH1	
38	VSS	Power		
39	VDD	Power		
48	PB2	I/O	GPIO_EXTI2	
51	VSS	Power		
52	VDD	Power		
61	VSS	Power		
62	VDD	Power		
70	VDD12	Power		
71	VSS	Power		
72	VDD	Power		
83	VSS	Power		
84	VDD	Power		
92	PG7	I/O	LPUART1_TX	
93	PG8	I/O	LPUART1_RX	
94	VSS	Power		
95	VDDIO2	Power		
106	VDDUSB	Power		
107	VSS	Power		
108	VDD	Power		
120	VSS	Power		
121	VDD	Power		

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
130	VSS	Power		
131	VDDIO2	Power		
136	PB7 *	I/O	GPIO_Output	
142	VDD12	Power		
143	VSS	Power		
144	VDD	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	STM32L4R5/S5
MCU	STM32L4R5ZITxP
Datasheet	DS12023_Rev0

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

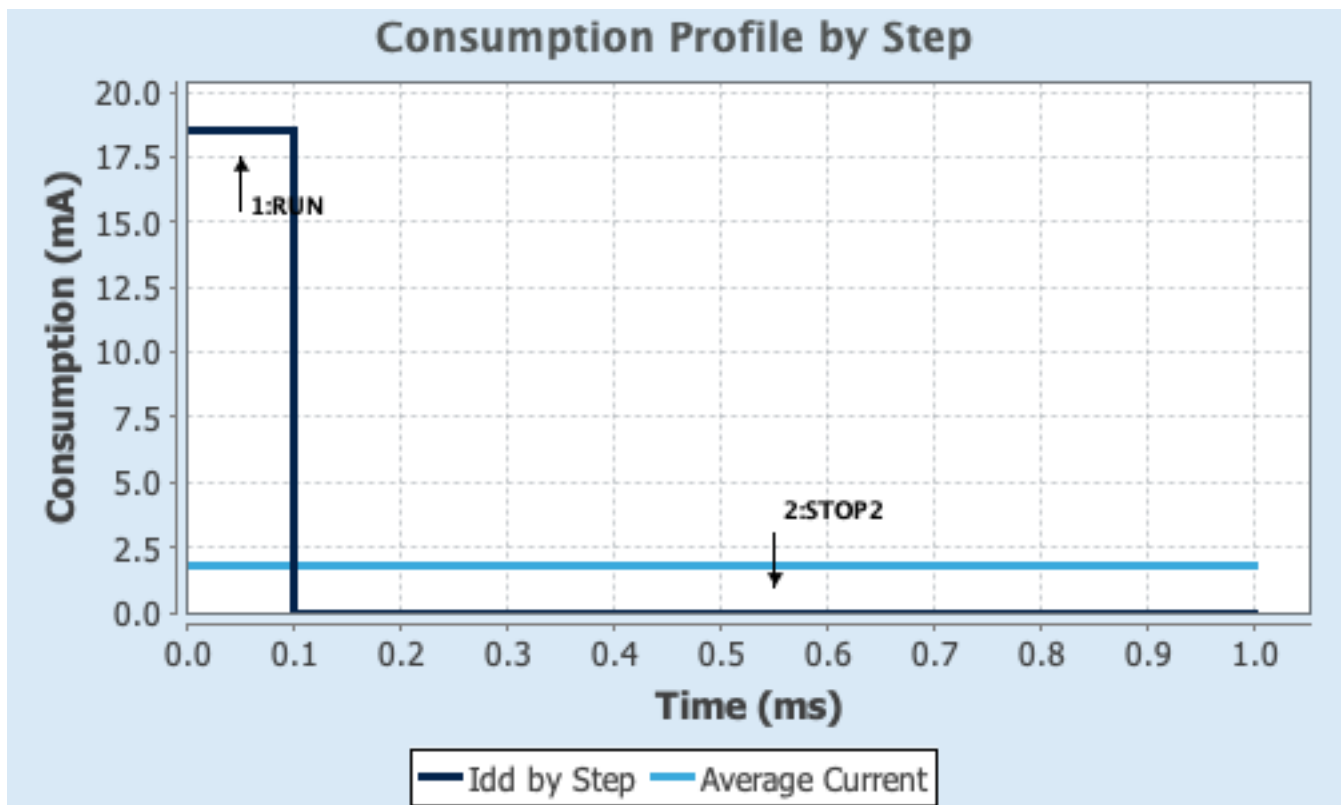
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP2
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-Boost	NoRange
Fetch Type	FLASH-SingleBank	n/a
CPU Frequency	120 MHz	0 Hz
Clock Configuration	HSE BYP PLL ART	ALL CLOCKS OFF
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	18.5 mA	2.55 μ A
Duration	0.1 ms	0.9 ms
DMIPS	150.0	0.0
Ta Max	103.22	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	1.85 mA
Battery Life	2 months, 15 days, 11 hours	Average DMIPS	150.0 DMIPS

1.6. Chart



2. Software Project

2.1. Project Settings

Name	Value
Project Name	joystick
Project Folder	/Users/sophieyang/Documents/GitHub/eecs-373-final/joystick
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	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

2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_ADC1_Init	ADC1
4	MX_LPUART1_UART_Init	LPUART1
5	MX_TIM2_Init	TIM2

3. Peripherals and Middlewares Configuration

3.1. ADC1

IN1: IN1 Single-ended

IN2: IN2 Single-ended

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 32 *

ADC 10-bit resolution *

Right alignment

Disabled

Disabled

Disabled

Disabled

End of single conversion

Overrun data preserved

Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions

Enable Regular Oversampling

Number Of Conversion

External Trigger Conversion Source

External Trigger Conversion Edge

Rank

Channel

Sampling Time

Offset Number

Enable

Disable

1

Regular Conversion launched by software

None

1

Channel 1

47.5 Cycles *

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
Prescaler	1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

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

High Speed Clock (HSE): Crystal/Ceramic Resonator

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)	1 WS (2 CPU cycle)

RCC Parameters:

HSI Calibration Value	64
MSI Calibration Value	0

MSI Auto Calibration	Disabled
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. SYS

Timebase Source: SysTick

3.5. TIM2

Channel1: Input Capture direct mode

3.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	4294967295
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)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

*** 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	PC0	ADC1_IN1	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	
	PC1	ADC1_IN2	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 *	
	PG8	LPUART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
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	
	PH0-OSC_IN (PH0)	RCC_OSC_IN	n/a	n/a	n/a	
	PH1-OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	
TIM2	PA0	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	PB2	GPIO_EXTI2	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

4.2. DMA configuration

nothing configured in DMA service

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 line2 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 global interrupt	unused		
TIM2 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 line2 interrupt	false	true	true
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 ✓	TIM2 ✓	LPUART1 ✓			
GPIO ✓						
NVIC ✓						
RCC ✓						
SYS ✓						

6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32l4plus_bsd.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32l4plus_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32l4plus-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
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Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32l4plus-series-product-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32ulp.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32l4plus.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/psa-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
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waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf

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& Software

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for related Tools
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Application Notes https://www.st.com/resource/en/application_note/an4657-stm32-in-application-programming-iap-using-the-usart-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4736-how-to-calibrate-stm32l4-series-microcontrollers-internal-rc-oscillator-stmicroelectronics.pdf
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