
STM32
CubeMX

1. Description

1.1. Project

Project Name	uvdensitometer
Board Name	custom
Generated with:	STM32CubeMX 6.12.1
Date	11/22/2024

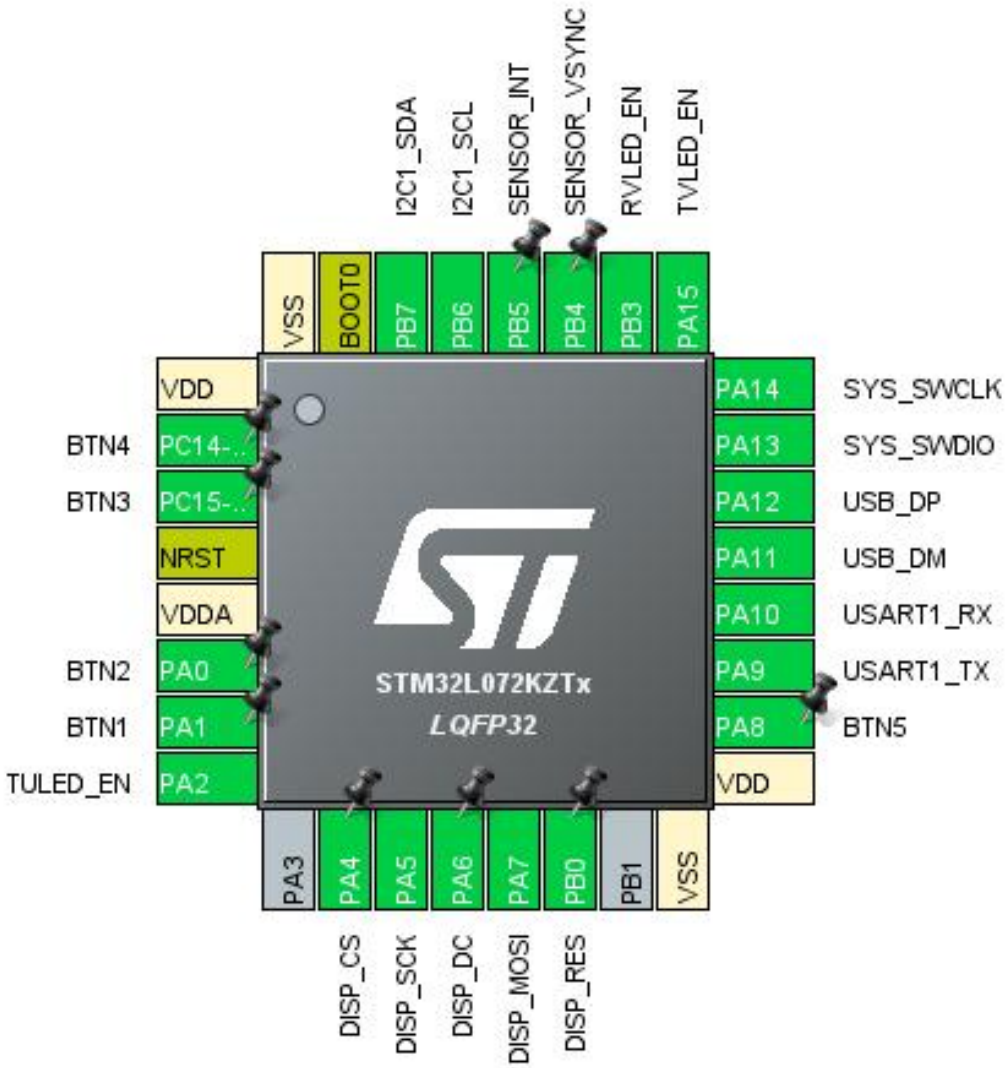
1.2. MCU

MCU Series	STM32L0
MCU Line	STM32L0x2
MCU name	STM32L072KZTx
MCU Package	LQFP32
MCU Pin number	32

1.3. Core(s) information

Core(s)	Arm Cortex-M0+

2. Pinout Configuration

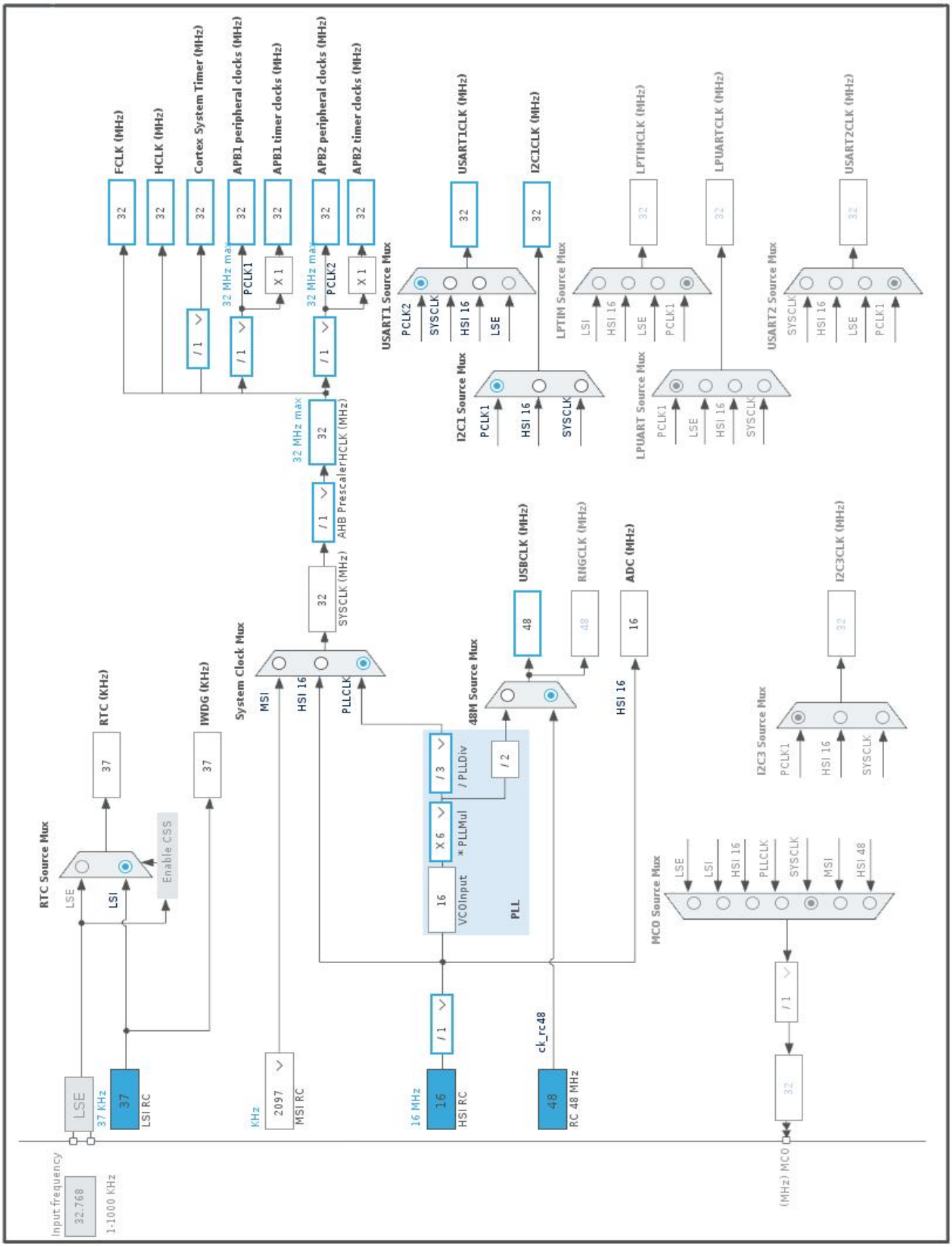


3. Pins Configuration

Pin Number LQFP32	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VDD	Power		
2	PC14-OSC32_IN	I/O	GPIO_EXTI14	BTN4
3	PC15-OSC32_OUT	I/O	GPIO_EXTI15	BTN3
4	NRST	Reset		
5	VDDA	Power		
6	PA0	I/O	GPIO_EXTI0	BTN2
7	PA1	I/O	GPIO_EXTI1	BTN1
8	PA2	I/O	TIM2_CH3	TULED_EN
10	PA4 *	I/O	GPIO_Output	DISP_CS
11	PA5	I/O	SPI1_SCK	DISP_SCK
12	PA6 *	I/O	GPIO_Output	DISP_DC
13	PA7	I/O	SPI1_MOSI	DISP_MOSI
14	PB0 *	I/O	GPIO_Output	DISP_RES
16	VSS	Power		
17	VDD	Power		
18	PA8	I/O	GPIO_EXTI8	BTN5
19	PA9	I/O	USART1_TX	
20	PA10	I/O	USART1_RX	
21	PA11	I/O	USB_DM	
22	PA12	I/O	USB_DP	
23	PA13	I/O	SYS_SWDIO	
24	PA14	I/O	SYS_SWCLK	
25	PA15	I/O	TIM2_CH1	TVLED_EN
26	PB3	I/O	TIM2_CH2	RVLED_EN
27	PB4 *	I/O	GPIO_Output	SENSOR_VSYNC
28	PB5	I/O	GPIO_EXTI5	SENSOR_INT
29	PB6	I/O	I2C1_SCL	
30	PB7	I/O	I2C1_SDA	
31	BOOT0	Boot		
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	STM32L0
Line	STM32L0x2
MCU	STM32L072KZTx
Datasheet	DS10689_Rev5

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

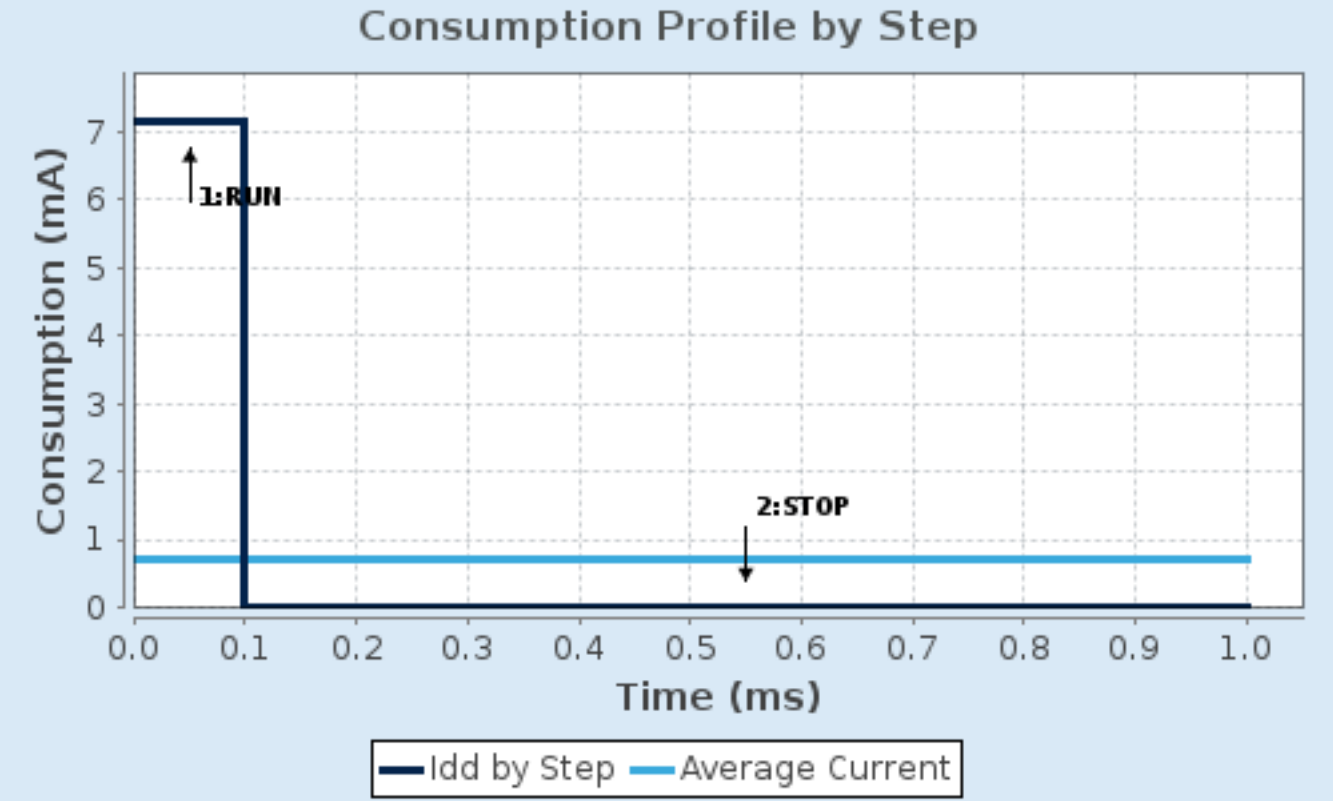
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-High	NoRange
Fetch Type	FLASH	n/a
CPU Frequency	32 MHz	0 Hz
Clock Configuration	HSI PLL	ALL CLOCKS OFF
Clock Source Frequency	16 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	7.15 mA	430 nA
Duration	0.1 ms	0.9 ms
DMIPS	30.0	0.0
Ta Max	103.71	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	715.39 µA
Battery Life	1 month, 10 days, 7 hours	Average DMIPS	30.4 DMIPS

1.6. Chart


Consumption Profile by Step
Consumption (mA)
0
1
2
3
4
5
6
7
1:RUN
2:STOP
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

2. Software Project

2.1. Project Settings

Name	Value
Project Name	uvdensitometer
Project Folder	/home/octo/devel/densitometer-cube/uvfirmware_a
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

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)	Yes
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_DMA_Init	DMA
4	MX_ADC_Init	ADC
5	MX_CRC_Init	CRC
6	MX_I2C1_Init	I2C1
7	MX_SPI1_Init	SPI1
8	MX_TIM2_Init	TIM2
9	MX_USART1_UART_Init	USART1
10	MX_USB_DEVICE_Init	USB_DEVICE
11	MX_IWDG_Init	IWDG

Rank	Function Name	Peripheral Instance Name
12	MX_RTC_Init	RTC

3. Peripherals and Middlewares Configuration

3.1. ADC

mode: Temperature Sensor Channel

mode: Vrefint Channel

3.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	**Asynchronous clock mode divided by 1 ***
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Direction	Forward
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	**Enabled ***
DMA Continuous Requests	**Enabled ***
End Of Conversion Selection	End of single conversion
Overrun behaviour	**Overrun data overwritten ***
Low Power Auto Wait	Disabled
Low Frequency Mode	Disabled
Auto Off	Disabled
Oversampling Mode	**Enabled ***
Right Bit Shift	No bit shift
Ratio	**Oversampling ratio 16x ***
Triggered Mode	Single trigger

ADC_Regular_ConversionMode:

Sampling Time	**160.5 Cycles ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None

WatchDog:

Enable Analog WatchDog Mode	false

3.2. CRC

mode: Activated

3.2.1. Parameter Settings:

Basic Parameters:

Default Polynomial State	Enable
Default Init Value State	Enable

Advanced Parameters:

Input Data Inversion Mode	None
Output Data Inversion Mode	Disable
Input Data Format	Bytes

3.3. I2C1

I2C: I2C

3.3.1. Parameter Settings:

Timing configuration:

I2C Speed Mode	**Fast Mode ***
I2C Speed Frequency (KHz)	400
Rise Time (ns)	**250 ***
Fall Time (ns)	100
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	**0x00B0122A ***

Slave Features:

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

3.4. IWDG

mode: Activated

3.4.1. Parameter Settings:

Watchdog Clocking:

IWDG counter clock prescaler	4
IWDG window value	4095
IWDG down-counter reload value	4095

3.5. RCC

3.5.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Buffer Cache	Enabled
Prefetch	Disabled
Preread	Enabled
Flash Latency(WS)	1 WS (2 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
MSI Calibration Value	0
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

3.6. RTC

mode: Activate Clock Source

mode: WakeUp

3.6.1. Parameter Settings:

General:

Hour Format	Hourformat 24
Asynchronous Predivider value	127
Synchronous Predivider value	255

Wake UP:

Wake Up Clock	RTCCLK / 16
Wake Up Counter	0

3.7. SPI1

Mode: Transmit Only Master

3.7.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	**16.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

3.8. SYS

mode: Debug Serial Wire

Timebase Source: TIM6

3.9. TIM2

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

3.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**127 ***
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	Reset (UG bit from TIMx_EGR)

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	**64 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (16 bits value)	

	64 *
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

3.10. USART1

Mode: Asynchronous

3.10.1. 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

3.11. USB

mode: Device (FS)

3.11.1. Parameter Settings:

Basic Parameters:

Speed	Full Speed 12MBit/s
Physical interface	Internal Phy

Power Parameters:

Low Power	**Enabled ***
Link Power Management	**Enabled ***

3.12. FREERTOS

Interface: CMSIS_V2

3.12.1. Config parameters:

API:

FreeRTOS API	CMSIS v2

Versions:

FreeRTOS version	10.2.1
CMSIS-RTOS version	2.00

MPU/FPU:

ENABLE_MPU	Disabled
ENABLE_FPU	Disabled

Kernel settings:

USE_PREEMPTION	Enabled
CPU_CLOCK_HZ	SystemCoreClock
TICK_RATE_HZ	1000
MAX_PRIORITIES	56
MINIMAL_STACK_SIZE	128
MAX_TASK_NAME_LEN	16
USE_16_BIT_TICKS	Disabled
IDLE_SHOULD_YIELD	Enabled
USE_MUTEXES	Enabled
USE_RECURSIVE_MUTEXES	Enabled
USE_COUNTING_SEMAPHORES	Enabled
QUEUE_REGISTRY_SIZE	8
USE_APPLICATION_TASK_TAG	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Disabled
USE_TICKLESS_IDLE	Disabled
USE_TASK_NOTIFICATIONS	Enabled
RECORD_STACK_HIGH_ADDRESS	Disabled

Memory management settings:

Memory Allocation	Dynamic / Static
TOTAL_HEAP_SIZE	3072
Memory Management scheme	heap_4

Hook function related definitions:

USE_IDLE_HOOK	Disabled
USE_TICK_HOOK	Disabled
USE_MALLOC_FAILED_HOOK	Disabled
USE_DAEMON_TASK_STARTUP_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	Disabled

Run time and task stats gathering related definitions:

GENERATE_RUN_TIME_STATS	Disabled
USE_TRACE_FACILITY	Enabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

Software timer definitions:

USE_TIMERS	Enabled
TIMER_TASK_PRIORITY	2
TIMER_QUEUE_LENGTH	10
TIMER_TASK_STACK_DEPTH	256

Added with 10.2.1 support:

MESSAGE_BUFFER_LENGTH_TYPE	size_t
USE_POSIX_ERRNO	Disabled

3.12.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Enabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Enabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled

uxTaskGetStackHighWaterMark	Enabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Enabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	Enabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled
uxTaskGetStackHighWaterMark2	Disabled

3.12.3. Advanced settings:

Newlib settings (see parameter description first):

USE_NEWLIB_REENTRANT	**Enabled ***

Project settings (see parameter description first):

Use FW pack heap file	Enabled

3.13. USB_DEVICE

Class For FS IP: Communication Device Class (Virtual Port Com)

3.13.1. Parameter Settings:

Basic Parameters:

USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	1
USBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration)	1
USBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)	512
USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message

Class Parameters:

USB CDC Rx Buffer Size	1024
USB CDC Tx Buffer Size	1024

3.13.2. Device Descriptor:

Device Descriptor:

VID (Vendor IDentifier)	1155
LANGID_STRING (Language Identifier)	English(United States)
MANUFACTURER_STRING (Manufacturer Identifier)	STMicroelectronics

Device Descriptor FS:

PID (Product IDentifier)	22336

PRODUCT_STRING (Product Identifier)	STM32 Virtual ComPort
CONFIGURATION_STRING (Configuration Identifier)	CDC Config
INTERFACE_STRING (Interface Identifier)	CDC Interface

*** User modified value**

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DISP_SCK
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DISP_MOSI
SYS	PA13	SYS_SWDIO	n/a	n/a	n/a	
	PA14	SYS_SWCLK	n/a	n/a	n/a	
TIM2	PA2	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	TULED_EN
	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	TVLED_EN
	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	RVLED_EN
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USB	PA11	USB_DM	n/a	n/a	n/a	
	PA12	USB_DP	n/a	n/a	n/a	
GPIO	PC14-OSC32_IN	GPIO_EXTI14	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	BTN4
	PC15-OSC32_OUT	GPIO_EXTI15	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	BTN3
	PA0	GPIO_EXTI0	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	BTN2
	PA1	GPIO_EXTI1	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	BTN1
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_CS
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_DC
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_RES
	PA8	GPIO_EXTI8	**External Interrupt Mode with Rising/Falling edge**	No pull-up and no pull-down	n/a	BTN5

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB4	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	Low	SENSOR_VSYNC
	PB5	GPIO_EXTI5	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	SENSOR_INT

4.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC	DMA1_Channel1	Peripheral To Memory	Low

ADC: DMA1_Channel1 DMA request Settings:

Mode:	Normal
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
System service call via SWI instruction	true	0	0
Pendable request for system service	true	3	0
System tick timer	true	3	0
RTC global interrupt through EXTI lines 17, 19 and 20 and LSE CSS interrupt through EXTI line 19	true	3	0
EXTI line 0 and line 1 interrupts	true	3	0
EXTI line 4 to 15 interrupts	true	3	0
DMA1 channel 1 interrupt	true	3	0
TIM2 global interrupt	true	3	0
TIM6 global interrupt and DAC1/DAC2 underrun error interrupts	true	3	0
USB event interrupt / USB wake-up interrupt through EXTI line 18	true	3	0
PVD interrupt through EXTI line 16	unused		
Flash and EEPROM global interrupt	unused		
RCC and CRS global interrupt	unused		
ADC, COMP1 and COMP2 interrupts (COMP interrupts through EXTI lines 21 and 22)	unused		
I2C1 event global interrupt / I2C1 wake-up interrupt through EXTI line 23	unused		
SPI1 global interrupt	unused		
USART1 global interrupt / USART1 wake-up interrupt through EXTI line 25	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
System service call via SWI instruction	false	false	false
Pendable request for system service	false	false	false
System tick timer	false	false	true
RTC global interrupt through EXTI lines 17, 19 and 20 and LSE CSS interrupt through EXTI line 19	false	true	true
EXTI line 0 and line 1 interrupts	false	true	true

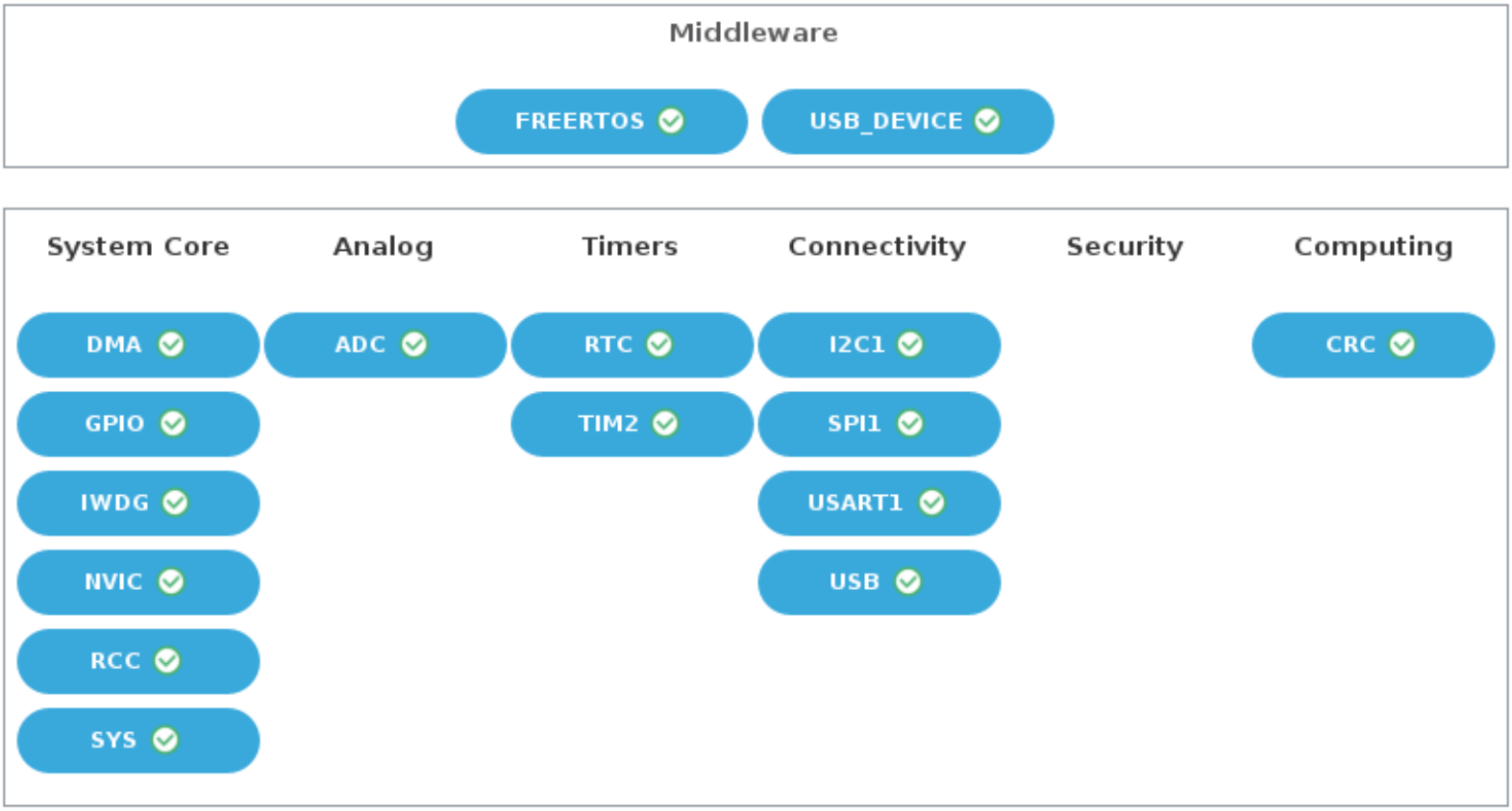
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
EXTI line 4 to 15 interrupts	false	true	true
DMA1 channel 1 interrupt	false	true	true
TIM2 global interrupt	false	true	true
TIM6 global interrupt and DAC1/DAC2 underrun error interrupts	false	true	true
USB event interrupt / USB wake-up interrupt through EXTI line 18	false	true	true

*** User modified value**

5. System Views

5.1. Category view

5.1.1. Current



6. Docs & Resources

Type	Link
IBIS models	https://www.st.com/resource/en/ibis_model/stm32l0_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32l0-svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/gt_stm32f0-l0.pdf
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-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32l0-series-product-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32l0.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32ulp.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_october2016.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/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-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-usart-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/an4445-stm32l0xx-ultralow-power-features-overview-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4467-getting-started-with-stm32l0xx-hardware-development-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4617-migrating-between-stm32f0-and-stm32l0-microcontrollers-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/an4654-migrating-between-stm32l1-and-stm32l0-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/an4718-how-to-design-a-vbat-system-based-on-stm32l0l1-series-with-external-components-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4725-stm32cube-mcu-package-examples-for-stm32l0-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/an4750-handling-of-soft-errors-in-stm32-applications-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4776-generalpurpose-timer-cookbook-for-stm32-microcontrollers-stmicroelectronics.pdf
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