



1. Description

1.1. Project

Project Name	system-controller-program
Board Name	custom
Generated with:	STM32CubeMX 6.11.0
Date	05/21/2024

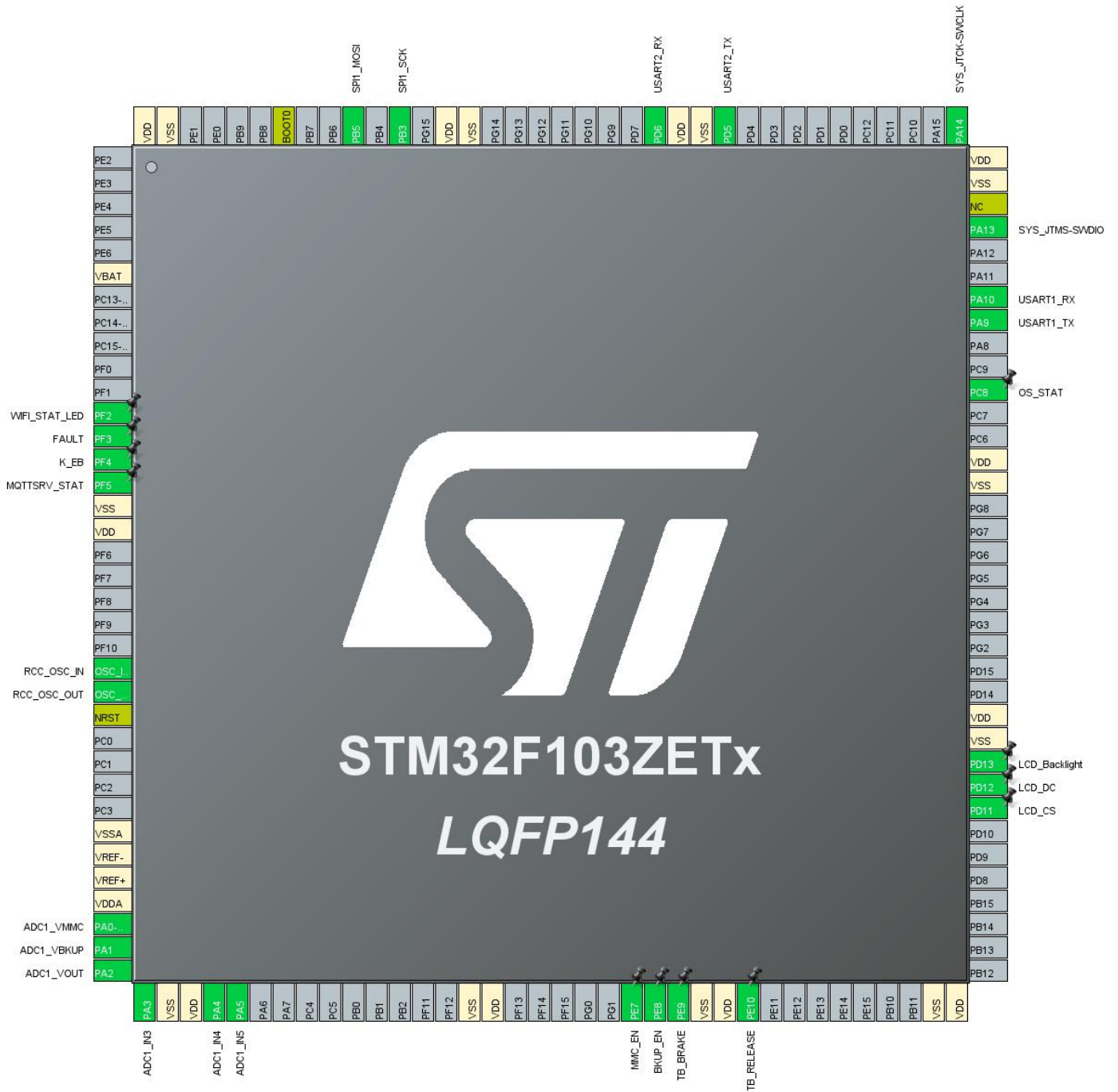
1.2. MCU

MCU Series	STM32F1
MCU Line	STM32F103
MCU name	STM32F103ZETx
MCU Package	LQFP144
MCU Pin number	144

1.3. Core(s) information

Core(s)	Arm Cortex-M3
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2. Pinout Configuration



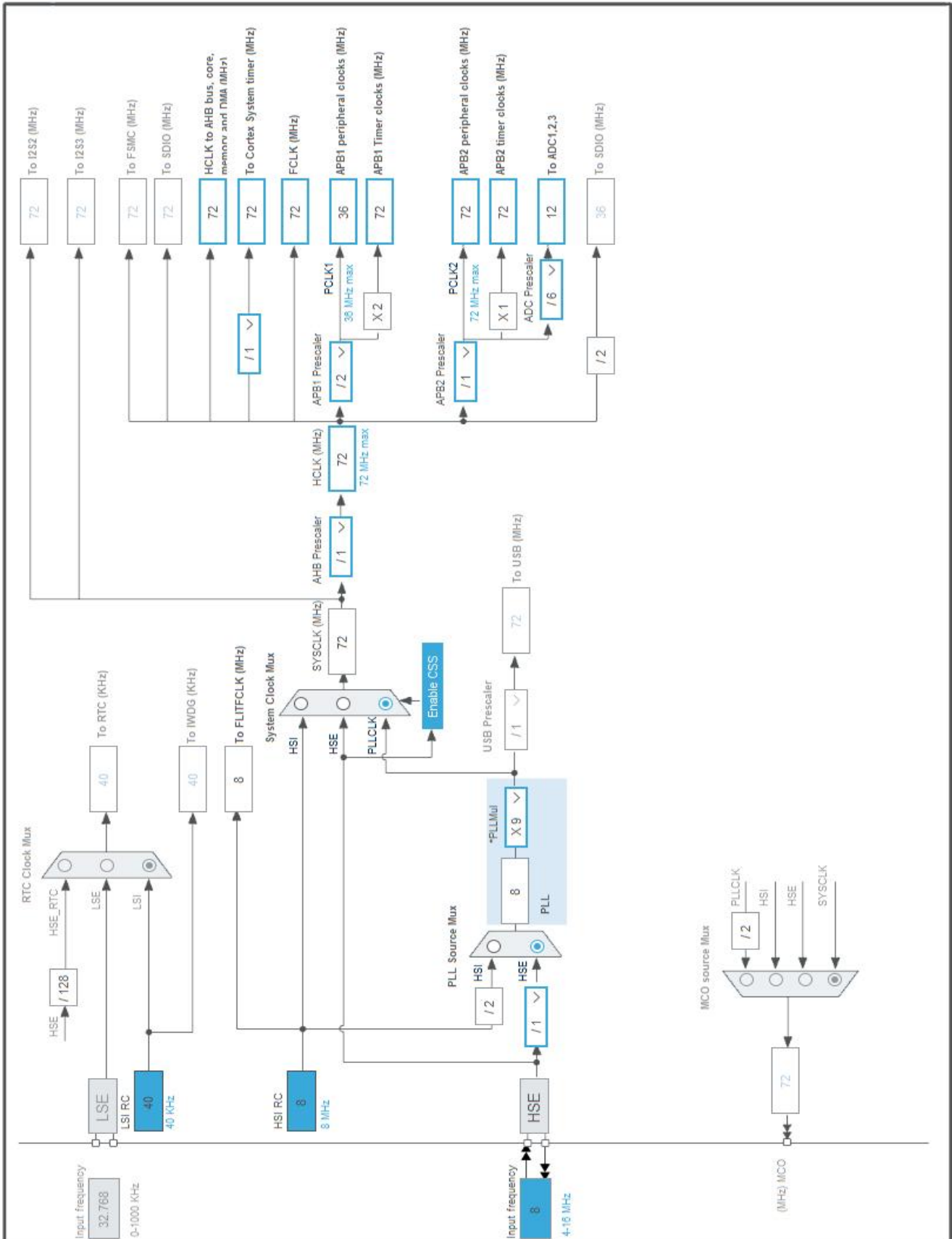
3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
12	PF2 *	I/O	GPIO_Output	WIFI_STAT_LED
13	PF3 *	I/O	GPIO_Output	FAULT
14	PF4 *	I/O	GPIO_Input	K_EB
15	PF5 *	I/O	GPIO_Output	MQTTSRV_STAT
16	VSS	Power		
17	VDD	Power		
23	OSC_IN	MonoIO	RCC_OSC_IN	
24	OSC_OUT	MonoIO	RCC_OSC_OUT	
25	NRST	Reset		
30	VSSA	Power		
31	VREF-	Power		
32	VREF+	Power		
33	VDDA	Power		
34	PA0-WKUP	I/O	ADC1_IN0	ADC1_VMMC
35	PA1	I/O	ADC1_IN1	ADC1_VBKUP
36	PA2	I/O	ADC1_IN2	ADC1_VOUT
37	PA3	I/O	ADC1_IN3	
38	VSS	Power		
39	VDD	Power		
40	PA4	I/O	ADC1_IN4	
41	PA5	I/O	ADC1_IN5	
51	VSS	Power		
52	VDD	Power		
58	PE7 *	I/O	GPIO_Output	MMC_EN
59	PE8 *	I/O	GPIO_Output	BKUP_EN
60	PE9 *	I/O	GPIO_Output	TB_BRAKE
61	VSS	Power		
62	VDD	Power		
63	PE10 *	I/O	GPIO_Output	TB_RELEASE
71	VSS	Power		
72	VDD	Power		
80	PD11 *	I/O	GPIO_Output	LCD_CS
81	PD12 *	I/O	GPIO_Output	LCD_DC
82	PD13 *	I/O	GPIO_Output	LCD_Backlight
83	VSS	Power		

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
84	VDD	Power		
94	VSS	Power		
95	VDD	Power		
98	PC8 *	I/O	GPIO_Output	OS_STAT
101	PA9	I/O	USART1_TX	
102	PA10	I/O	USART1_RX	
105	PA13	I/O	SYS_JTMS-SWDIO	
106	NC	NC		
107	VSS	Power		
108	VDD	Power		
109	PA14	I/O	SYS_JTCK-SWCLK	
119	PD5	I/O	USART2_TX	
120	VSS	Power		
121	VDD	Power		
122	PD6	I/O	USART2_RX	
130	VSS	Power		
131	VDD	Power		
133	PB3	I/O	SPI1_SCK	
135	PB5	I/O	SPI1_MOSI	
138	BOOT0	Boot		
143	VSS	Power		
144	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	system-controller-program
Project Folder	D:\Senior Design Repos\system-controller-program
Toolchain / IDE	MDK-ARM V5.32
Firmware Package Name and Version	STM32Cube FW_F1 V1.8.5
Application Structure	Advanced
Generate Under Root	No
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	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

5.3. 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_ADC1_Init	ADC1
5	MX_USART1_UART_Init	USART1
6	MX_USART2_UART_Init	USART2
7	MX_SPI1_Init	SPI1

1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32F1
Line	STM32F103
MCU	STM32F103ZETx
Datasheet	DS5792_Rev12

1.2. Parameter Selection

Temperature	25
Vdd	3.3

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

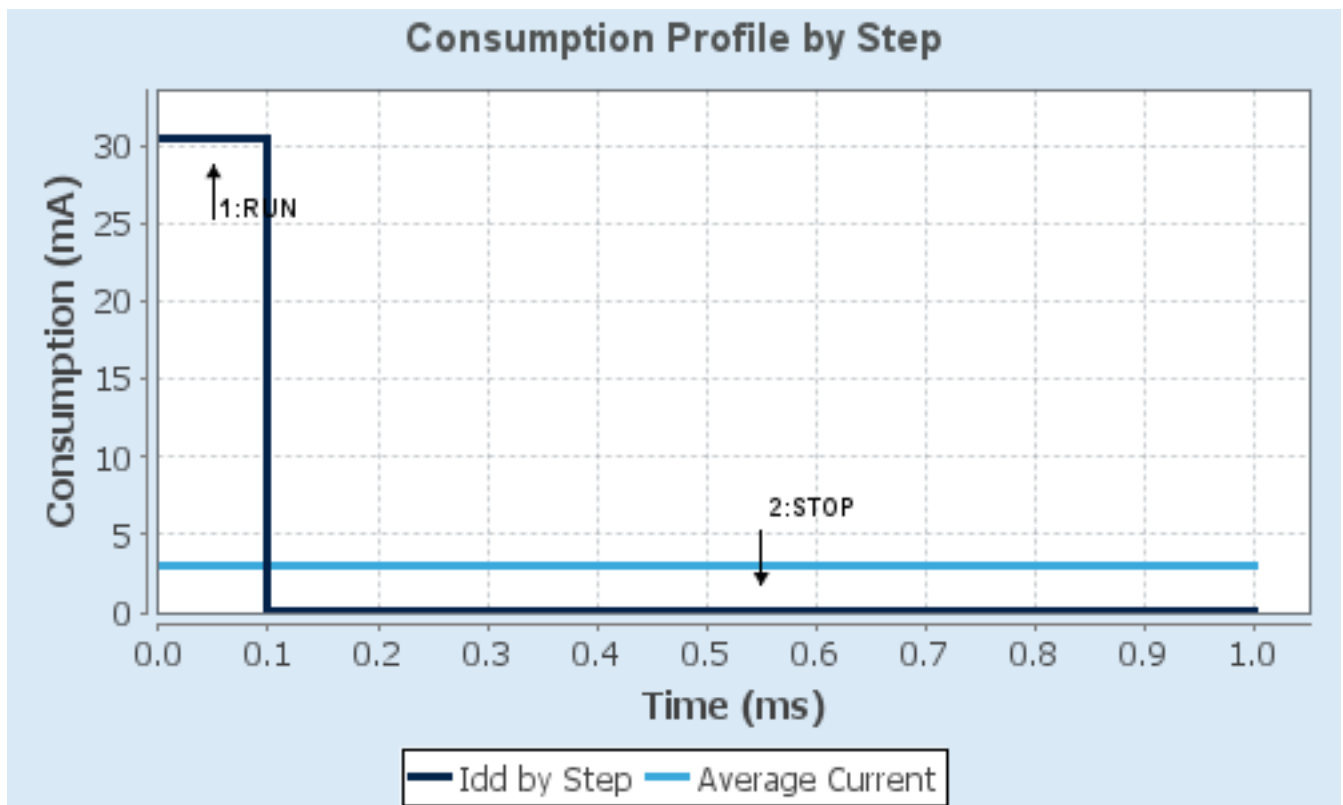
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	No Scale	No Scale
Fetch Type	FLASH	n/a
CPU Frequency	72 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator LP
Clock Source Frequency	8 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	30.5 mA	25 μ A
Duration	0.1 ms	0.9 ms
DMIPS	90.0	0.0
Ta Max	101.98	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	3.07 mA
Battery Life	1 month, 15 days, 15 hours	Average DMIPS	61.0 DMIPS

1.6. Chart



2. Peripherals and Middlewares Configuration

2.1. ADC1

mode: IN0

mode: IN1

mode: IN2

mode: IN3

mode: IN4

mode: IN5

2.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Data Alignment Right alignment

Scan Conversion Mode Enabled

Continuous Conversion Mode **Enabled ***

Discontinuous Conversion Mode Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions Enable

Number Of Conversion **6 ***

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel Channel 0

Sampling Time **41.5 Cycles ***

Rank **2 ***

Channel **Channel 1 ***

Sampling Time **41.5 Cycles ***

Rank **3 ***

Channel **Channel 2 ***

Sampling Time **28.5 Cycles ***

Rank **4 ***

Channel **Channel 3 ***

Sampling Time **41.5 Cycles ***

Rank **5 ***

Channel **Channel 4 ***

Sampling Time **41.5 Cycles ***

Rank **6 ***

Channel	Channel 5 *
Sampling Time	41.5 Cycles *
ADC_Injected_ConversionMode:	
Enable Injected Conversions	Disable
WatchDog:	
Enable Analog WatchDog Mode	false

2.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

2.2.1. Parameter Settings:

System Parameters:

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

RCC Parameters:

HSI Calibration Value	16
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

2.3. SPI1

Mode: Half-Duplex Master

2.3.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	4 *
Baud Rate	18.0 MBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

2.4. SYS

Debug: Serial Wire

Timebase Source: TIM1

2.5. USART1

Mode: Asynchronous

2.5.1. 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

2.6. USART2

Mode: Asynchronous

2.6.1. 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

2.7. FREERTOS

Interface: CMSIS_V2

2.7.1. Config parameters:

API:

FreeRTOS API CMSIS v2

Versions:

FreeRTOS version 10.0.1

CMSIS-RTOS version 2.00

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 **32768** *
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

Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY 15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY 5

2.7.2. 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

2.7.3. Advanced settings:

Newlib settings (see parameter description first):

USE_NEWLIB_REENTRANT Disabled

Project settings (see parameter description first):

Use FW pack heap file Enabled

* User modified value

3. System Configuration

3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA0-WKUP	ADC1_IN0	Analog mode	n/a	n/a	ADC1_VMMC
	PA1	ADC1_IN1	Analog mode	n/a	n/a	ADC1_VBKUP
	PA2	ADC1_IN2	Analog mode	n/a	n/a	ADC1_VOUT
	PA3	ADC1_IN3	Analog mode	n/a	n/a	
	PA4	ADC1_IN4	Analog mode	n/a	n/a	
	PA5	ADC1_IN5	Analog mode	n/a	n/a	
RCC	OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PB3	SPI1_SCK	Alternate Function Push Pull	n/a	High *	
	PB5	SPI1_MOSI	Alternate Function Push Pull	n/a	High *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	n/a	High *	
	PA10	USART1_RX	Input mode	No pull-up and no pull-down	n/a	
USART2	PD5	USART2_TX	Alternate Function Push Pull	n/a	High *	
	PD6	USART2_RX	Input mode	Pull-up *	n/a	
GPIO	PF2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	WIFI_STAT_LED
	PF3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	FAULT
	PF4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	K_EB
	PF5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MQTTSRV_STAT
	PE7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MMC_EN
	PE8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BKUP_EN
	PE9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TB_BRAKE
	PE10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TB_RELEASE
	PD11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	LCD_CS
	PD12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	LCD_DC
	PD13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	LCD_Backlight
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OS_STAT

3.2. DMA configuration

DMA request	Stream	Direction	Priority
USART1_RX	DMA1_Channel5	Peripheral To Memory	High *
USART2_RX	DMA1_Channel6	Peripheral To Memory	High *
ADC1	DMA1_Channel1	Peripheral To Memory	High *
USART2_TX	DMA1_Channel7	Memory To Peripheral	High *
USART1_TX	DMA1_Channel4	Memory To Peripheral	High *

USART1_RX: DMA1_Channel5 DMA request Settings:

Mode: Normal
Peripheral Increment: Disable
Memory Increment: **Enable ***
Peripheral Data Width: Byte
Memory Data Width: Byte

USART2_RX: DMA1_Channel6 DMA request Settings:

Mode: Normal
Peripheral Increment: Disable
Memory Increment: **Enable ***
Peripheral Data Width: Byte
Memory Data Width: Byte

ADC1: DMA1_Channel1 DMA request Settings:

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

USART2_TX: DMA1_Channel7 DMA request Settings:

Mode: Normal
Peripheral Increment: Disable
Memory Increment:

Enable *

Peripheral Data Width: Byte

Memory Data Width: Byte

USART1_TX: DMA1_Channel4 DMA request Settings:

Mode: Normal

Peripheral Increment: Disable

Memory Increment: **Enable ***

Peripheral Data Width: Byte

Memory Data Width: Byte

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
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	15	0
System tick timer	true	15	0
DMA1 channel1 global interrupt	true	5	0
DMA1 channel4 global interrupt	true	5	0
DMA1 channel5 global interrupt	true	5	0
DMA1 channel6 global interrupt	true	5	0
DMA1 channel7 global interrupt	true	5	0
ADC1 and ADC2 global interrupts	true	5	0
TIM1 update interrupt	true	15	0
USART1 global interrupt	true	5	0
USART2 global interrupt	true	5	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
SPI1 global interrupt	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
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	false	false
Debug monitor	false	true	false
Pendable request for system service	false	false	false
System tick timer	false	false	true
DMA1 channel1 global interrupt	false	true	true
DMA1 channel4 global interrupt	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
DMA1 channel5 global interrupt	false	true	true
DMA1 channel6 global interrupt	false	true	true
DMA1 channel7 global interrupt	false	true	true
ADC1 and ADC2 global interrupts	false	true	true
TIM1 update interrupt	false	true	true
USART1 global interrupt	false	true	true
USART2 global interrupt	false	true	true

* User modified value

4. System Views

4.1. Category view

4.1.1. Current

Middleware					
FREERTOS					
System Core	Analog	Timers	Connectivity	Multimedia	Computing
DMA	ADC1		SPI1		
GPIO			USART1		
IIVIC			USART2		
RCC					
SYS					

5. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f1_bsd1.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f1_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-stm32-family-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstmcsuite.pdf
Flyers	https://www.st.com/resource/en/flyer/fldpstpfc11120.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/1239988349.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf
Application Notes	https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-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/an2586-getting-started-with-stm32f10xxx-hardware-development-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/an2784-using-the-highdensity-stm32f10xxx-fsmc-peripheral-to-drive-external-memories-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3095-stevalisv002v1-stevalisv002v2-3-kw-gridconnected-pv-system-based-on-the-stm32f103xx-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3108-stlm75-firmware-library-for-the-stm32f10x-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/an3128-stm32-embedded-graphic-objectstouchscreen-library-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3154-can-protocol-used-in-the-stm32-bootloader-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/an3165-digital-pfc-and-dual-foc-mc-integration-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3364-migration-and-

compatibility-guidelines-for-stm32-microcontroller-applications-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3422-migration-of-microcontroller-applications-from-stm32f1-to-stm32l1-series-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3427-migrating-a-microcontroller-application-from-stm32f1-to-stm32f2-series-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3429-stm32-proprietary-code-protection-overview-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4070-250-w-grid-connected-microinverter-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4076-two-or-three-shunt-resistor-based-current-sensing-circuit-design-in-3phase-inverters-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4088-migrating-between-stm32f1-and-stm32f0-series-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4228-migrating-from-stm32f1-series-to-stm32f3-series-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4277-using-stm32-device-pwm-shutdown-features-for-motor-control-and-digital-power-conversion-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/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-microntrrollers-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/an4724-stm32cube-firmware-examples-for-stm32f1-series-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
- 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/an4904-migration-of-microcontroller-applications-from-stm32f1-series-to-stm32f4-access-lines-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4908-stm32-usart-automatic-baud-rate-detection-stmicroelectronics.pdf
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