



1. Description

1.1. Project

Project Name	tasksaple
Board Name	NUCLEO-F446ZE
Generated with:	STM32CubeMX 6.2.1
Date	06/01/2021

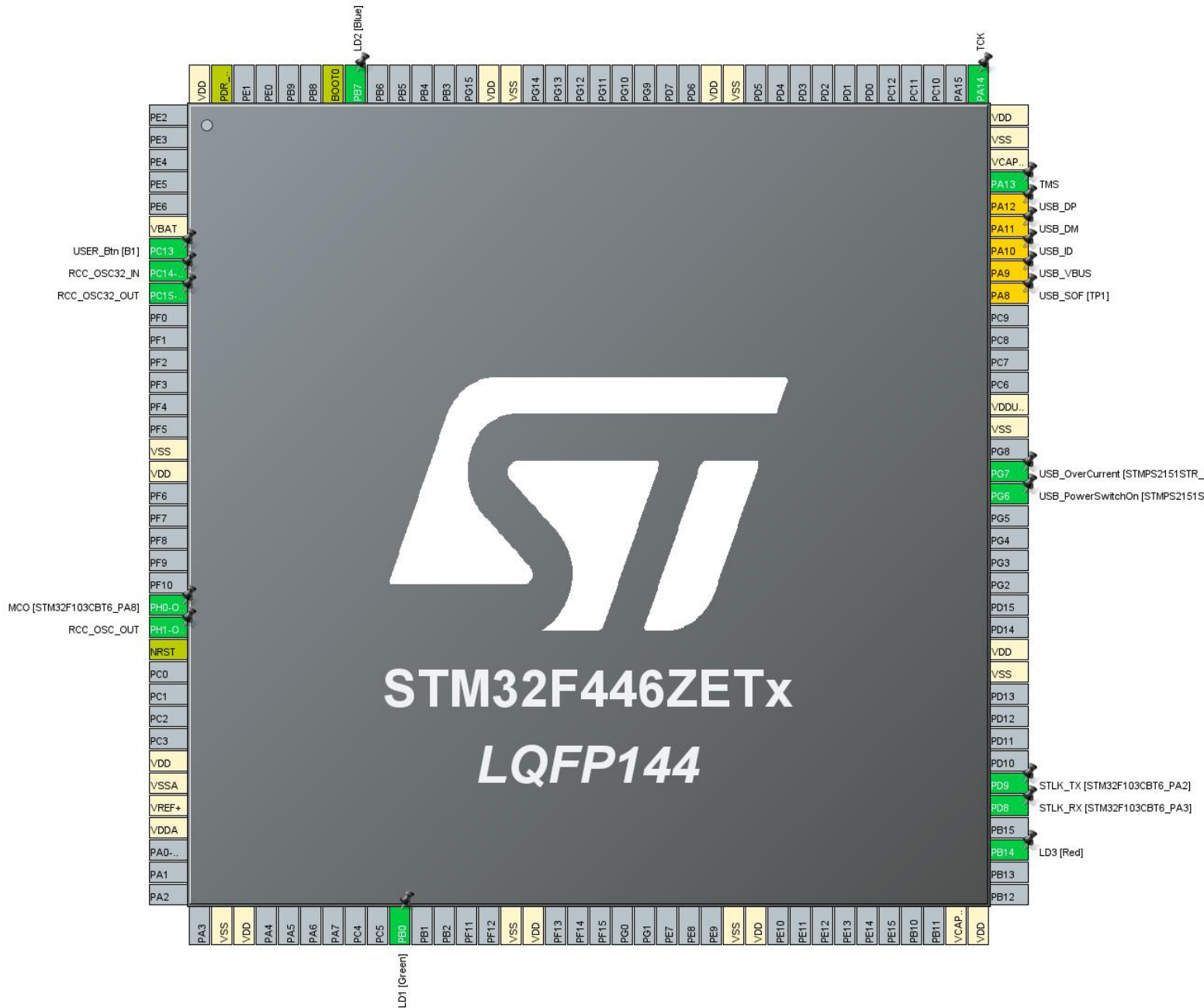
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F446
MCU name	STM32F446ZETx
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

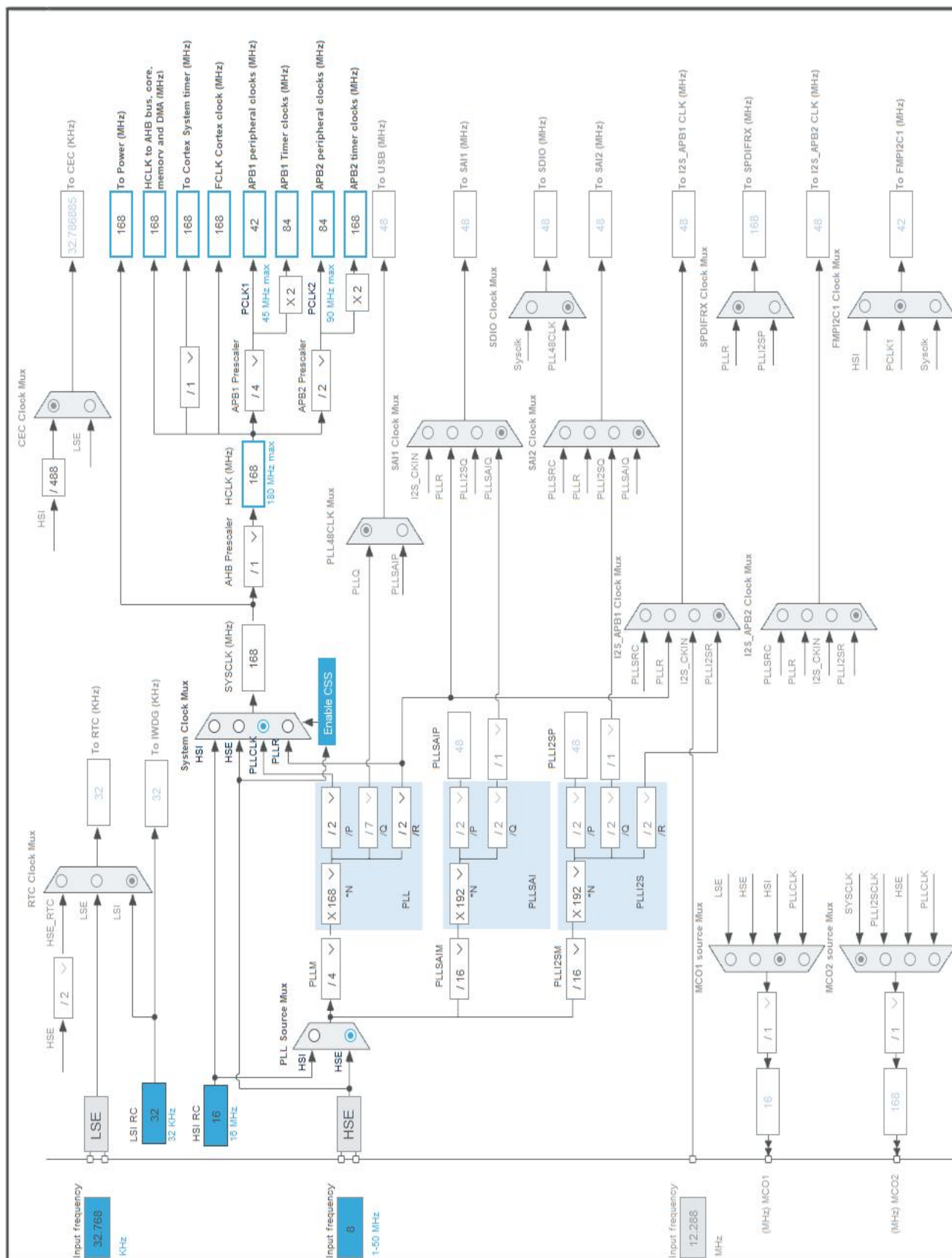
Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
7	PC13	I/O	GPIO_EXTI13	USER_Btn [B1]
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
16	VSS	Power		
17	VDD	Power		
23	PH0-OSC_IN	I/O	RCC_OSC_IN	MCO [STM32F103CBT6_PA8]
24	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
25	NRST	Reset		
30	VDD	Power		
31	VSSA	Power		
32	VREF+	Power		
33	VDDA	Power		
38	VSS	Power		
39	VDD	Power		
46	PB0 *	I/O	GPIO_Output	LD1 [Green]
51	VSS	Power		
52	VDD	Power		
61	VSS	Power		
62	VDD	Power		
71	VCAP_1	Power		
72	VDD	Power		
75	PB14 *	I/O	GPIO_Output	LD3 [Red]
77	PD8	I/O	USART3_TX	STLK_RX [STM32F103CBT6_PA3]
78	PD9	I/O	USART3_RX	STLK_TX [STM32F103CBT6_PA2]
83	VSS	Power		
84	VDD	Power		
91	PG6 *	I/O	GPIO_Output	USB_PowerSwitchOn [STMP2151STR_EN]
92	PG7 *	I/O	GPIO_Input	USB_OverCurrent [STMP2151STR_FAULT]
94	VSS	Power		
95	VDDUSB	Power		
100	PA8 **	I/O	USB_OTG_FS_SOF	USB_SOF [TP1]

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
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	I/O	SYS_JTMS-SWDIO	TMS
106	VCAP_2	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14	I/O	SYS_JTCK-SWCLK	TCK
120	VSS	Power		
121	VDD	Power		
130	VSS	Power		
131	VDD	Power		
137	PB7 *	I/O	GPIO_Output	LD2 [Blue]
138	BOOT0	Boot		
143	PDR_ON	Reset		
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

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	tasksaple
Project Folder	D:\freertos\stmworkspace\tasksaple
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.26.1
Application Structure	Advanced
Generate Under Root	Yes
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	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

5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_USART3_UART_Init	USART3

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F446
MCU	STM32F446ZETx
Datasheet	DS10693_Rev6

6.2. Parameter Selection

Temperature	25
Vdd	3.3

6.3. 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

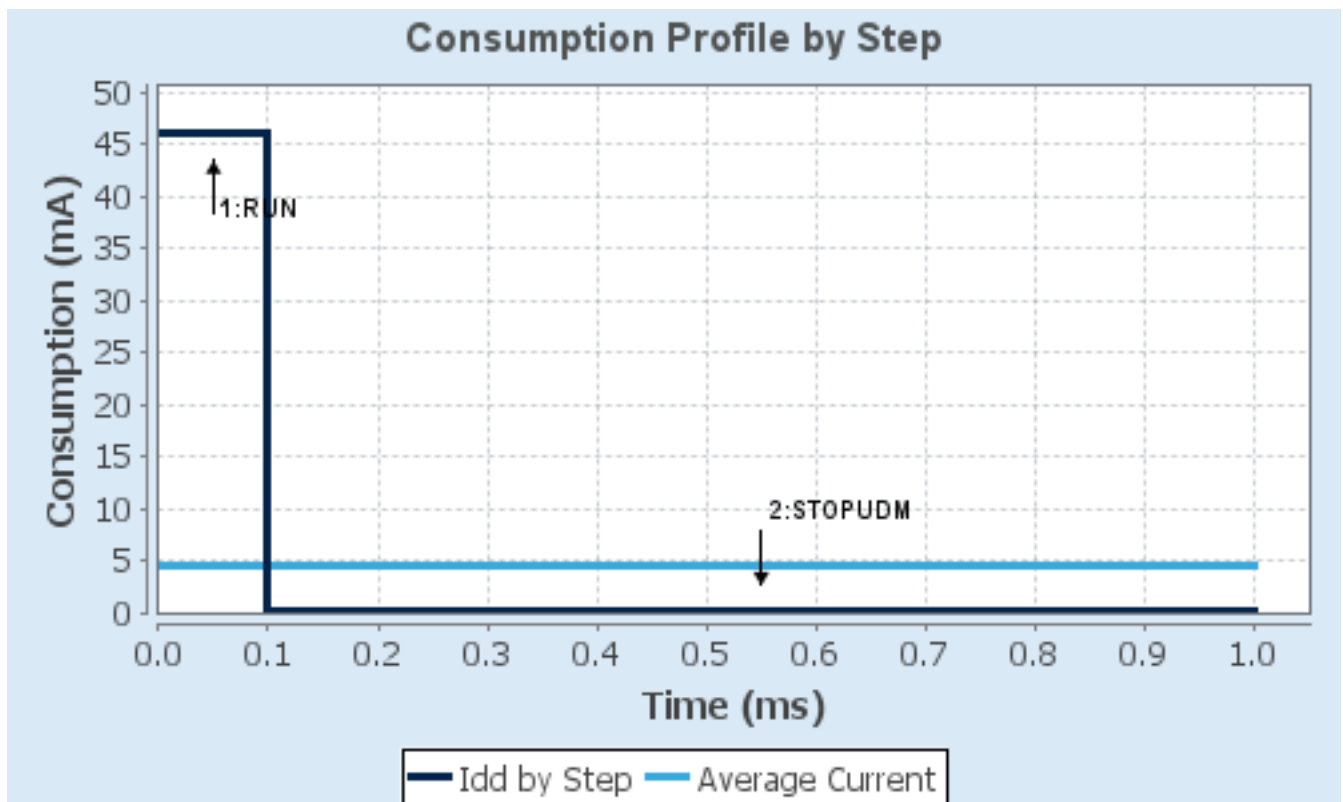
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP UDM (Under Drive)
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	RAM/FLASH/REGON/ART/P REFETCH	n/a
CPU Frequency	180 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator LP Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	46 mA	55 μ A
Duration	0.1 ms	0.9 ms
DMIPS	225.0	0.0
Ta Max	99.99	104.99
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	4.65 mA
Battery Life	1 month	Average DMIPS	225.0 DMIPS

6.6. Chart



7. *Peripherals and Middlewares Configuration*

7.1. RCC

High Speed Clock (HSE): BYPASS Clock Source

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.1.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	5 WS (6 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
TIM Prescaler Selection	Disabled
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
Power Over Drive	Disabled

7.2. SYS

Debug: Serial Wire

Timebase Source: TIM6

7.3. USART3

Mode: Asynchronous

7.3.1. 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

7.4. FREERTOS

Interface: CMSIS_V1

7.4.1. Config parameters:

API:

FreeRTOS API CMSIS v1

Versions:

FreeRTOS version 10.3.1

CMSIS-RTOS version 1.02

MPU/FPU:

ENABLE_MPU Disabled

ENABLE_FPU Disabled

Kernel settings:

USE_PREEMPTION Enabled

CPU_CLOCK_HZ SystemCoreClock

TICK_RATE_HZ 1000

MAX_PRIORITIES 7

MINIMAL_STACK_SIZE 128

MAX_TASK_NAME_LEN 16

USE_16_BIT_TICKS Disabled

IDLE_SHOULD_YIELD Enabled

USE_MUTEXES Enabled

USE_RECURSIVE_MUTEXES Disabled

USE_COUNTING_SEMAPHORES Disabled

QUEUE_REGISTRY_SIZE 8

USE_APPLICATION_TASK_TAG Disabled

ENABLE_BACKWARD_COMPATIBILITY Enabled

USE_PORT_OPTIMISED_TASK_SELECTION Enabled

USE_TICKLESS_IDLE Disabled

USE_TASK_NOTIFICATIONS Enabled

RECORD_STACK_HIGH_ADDRESS Disabled

Memory management settings:

Memory Allocation Dynamic / Static

TOTAL_HEAP_SIZE 15360

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	Disabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

Software timer definitions:

USE_TIMERS	Disabled
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Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

Added with 10.2.1 support:

MESSAGE_BUFFER_LENGTH_TYPE	size_t
USE_POSIX_ERRNO	Disabled

7.4.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Disabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Disabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Disabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Disabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	Disabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled
uxTaskGetStackHighWaterMark2	Disabled

7.4.3. 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

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
RCC	PC14-OSC32_IN	RCC_OSC32_IN	n/a	n/a	n/a	
	PC15-OSC32_OUT	RCC_OSC32_OUT	n/a	n/a	n/a	
	PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	MCO [STM32F103CBT6_PA8]
	PH1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	TMS
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	TCK
USART3	PD8	USART3_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	STLK_RX [STM32F103CBT6_PA3]
	PD9	USART3_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	STLK_TX [STM32F103CBT6_PA2]
Single Mapped Signals	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	Input mode	No pull-up and no pull-down	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
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USB_DP
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	USER_Btn [B1]
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD1 [Green]
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD3 [Red]
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_PowerSwitchOn [STMP2151STR_EN]
	PG7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	USB_OverCurrent [STMP2151STR_FAULT]
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [Blue]

8.2. DMA configuration

nothing configured in DMA service

8.3. NVIC configuration

8.3.1. 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
Pre-fetch 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
TIM6 global interrupt and DAC1, DAC2 underrun error interrupts	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
USART3 global interrupt	unused		
EXTI line[15:10] interrupts	unused		
FPU global interrupt	unused		

8.3.2. 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
Pre-fetch 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
TIM6 global interrupt and DAC1, DAC2 underrun error interrupts	false	true	true

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

Middleware					
FREERTOS 					
System Core	Analog	Timers	Connectivity	Multimedia	Computing
DMA			USART3 		
GPIO 					
IIVIC 					
RCC 					
SYS 					

10. Docs & Resources

Type	Link
Datasheet	http://www.st.com/resource/en/datasheet/DM00141306.pdf
Reference manual	http://www.st.com/resource/en/reference_manual/DM00135183.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00046982.pdf
Errata sheet	http://www.st.com/resource/en/errata_sheet/DM00155929.pdf
Application note	http://www.st.com/resource/en/application_note/CD00167594.pdf
Application note	http://www.st.com/resource/en/application_note/CD00211314.pdf
Application note	http://www.st.com/resource/en/application_note/CD00249778.pdf
Application note	http://www.st.com/resource/en/application_note/CD00259245.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264321.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264342.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00024853.pdf
Application note	http://www.st.com/resource/en/application_note/DM00040802.pdf
Application note	http://www.st.com/resource/en/application_note/DM00040808.pdf
Application note	http://www.st.com/resource/en/application_note/DM00042534.pdf
Application note	http://www.st.com/resource/en/application_note/DM00046011.pdf
Application note	http://www.st.com/resource/en/application_note/DM00072315.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073742.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073853.pdf
Application note	http://www.st.com/resource/en/application_note/DM00080497.pdf
Application note	http://www.st.com/resource/en/application_note/DM00081379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00115714.pdf
Application note	http://www.st.com/resource/en/application_note/DM00129215.pdf
Application note	http://www.st.com/resource/en/application_note/DM00154959.pdf
Application note	http://www.st.com/resource/en/application_note/DM00160482.pdf

Application note http://www.st.com/resource/en/application_note/DM00161778.pdf

Application note http://www.st.com/resource/en/application_note/DM00213525.pdf

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Application note http://www.st.com/resource/en/application_note/DM00296349.pdf

Application note http://www.st.com/resource/en/application_note/DM00327191.pdf

Application note http://www.st.com/resource/en/application_note/DM00354244.pdf

Application note http://www.st.com/resource/en/application_note/DM00373474.pdf

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Application note http://www.st.com/resource/en/application_note/DM00725181.pdf