



1. Description

1.1. Project

Project Name	SKnob
Board Name	custom
Generated with:	STM32CubeMX 6.0.0
Date	08/02/2020

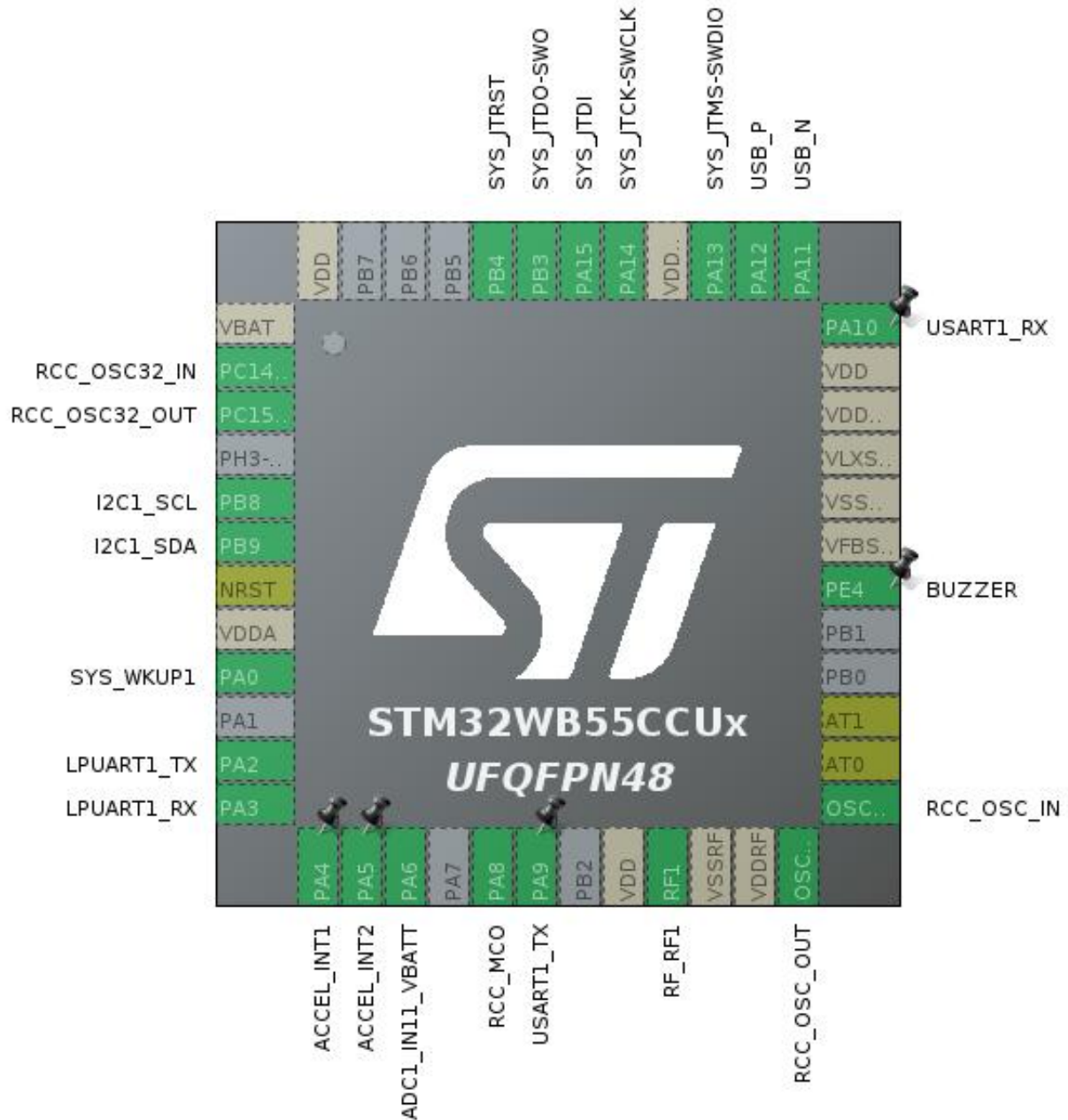
1.2. MCU

MCU Series	STM32WB
MCU Line	STM32WBx5
MCU name	STM32WB55CCUx
MCU Package	UFQFPN48
MCU Pin number	48

1.3. Core(s) information

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



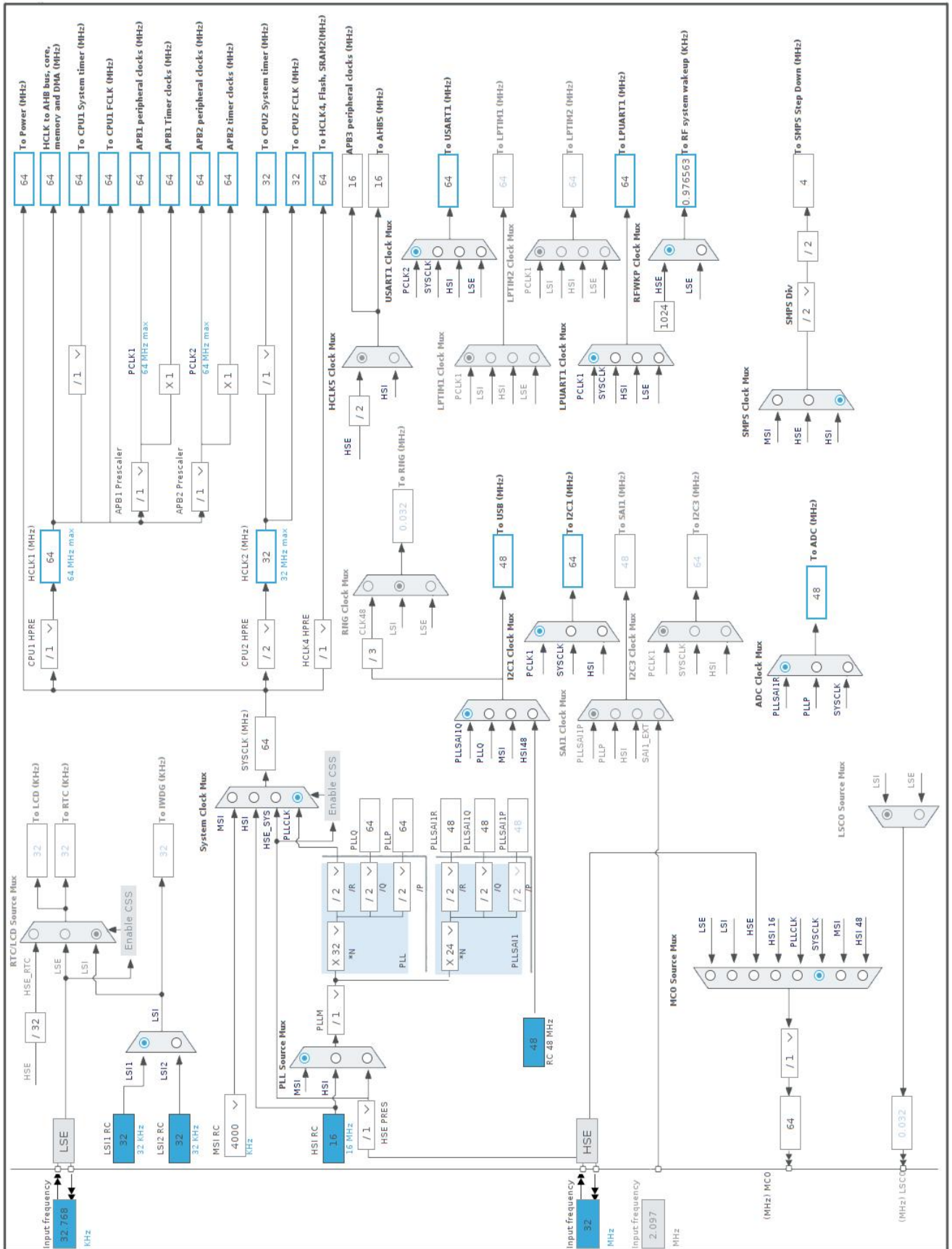
3. Pins Configuration

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
3	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
5	PB8	I/O	I2C1_SCL	
6	PB9	I/O	I2C1_SDA	
7	NRST	Reset		
8	VDDA	Power		
9	PA0	I/O	SYS_WKUP1	
11	PA2	I/O	LPUART1_TX	
12	PA3	I/O	LPUART1_RX	
13	PA4 *	I/O	GPIO_Input	ACCEL_INT1
14	PA5 *	I/O	GPIO_Input	ACCEL_INT2
15	PA6	I/O	ADC1_IN11	ADC1_IN11_VBATT
17	PA8	I/O	RCC_MCO	
18	PA9	I/O	USART1_TX	
20	VDD	Power		
21	RF1	MonolO	RF_RF1	
22	VSSRF	Power		
23	VDDRF	Power		
24	OSC_OUT	MonolO	RCC_OSC_OUT	
25	OSC_IN	MonolO	RCC_OSC_IN	
26	AT0	NC		
27	AT1	NC		
30	PE4 *	I/O	GPIO_Output	BUZZER
31	VFBSMPS	Power		
32	VSSSMPS	Power		
33	VLXSMPS	Power		
34	VDDSMPS	Power		
35	VDD	Power		
36	PA10	I/O	USART1_RX	
37	PA11	I/O	USB_DM	USB_N
38	PA12	I/O	USB_DP	USB_P
39	PA13	I/O	SYS_JTMS-SWDIO	
40	VDDUSB	Power		
41	PA14	I/O	SYS_JTCK-SWCLK	
42	PA15	I/O	SYS_JTDI	

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
43	PB3	I/O	SYS_JTDO-SWO	
44	PB4	I/O	SYS_JTRST	
48	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	SKnob
Project Folder	/home/luis/Projects/PCB/kicad/SKnob/firmware/SKnob
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_WB V1.8.0
Application Structure	Basic
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	IP Instance Name
1	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_I2C1_Init	I2C1
4	MX_USART1_UART_Init	USART1
5	MX_USB_Device_Init	USB_DEVICE
6	MX_ADC1_Init	ADC1
7	MX_RF_Init	RF
8	MX_LPUART1_UART_Init	LPUART1

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32WB
Line	STM32WBx5
MCU	STM32WB55CCUx
Datasheet	DS11929_Rev3

6.2. Parameter Selection

Temperature	25
Vdd	3.0

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

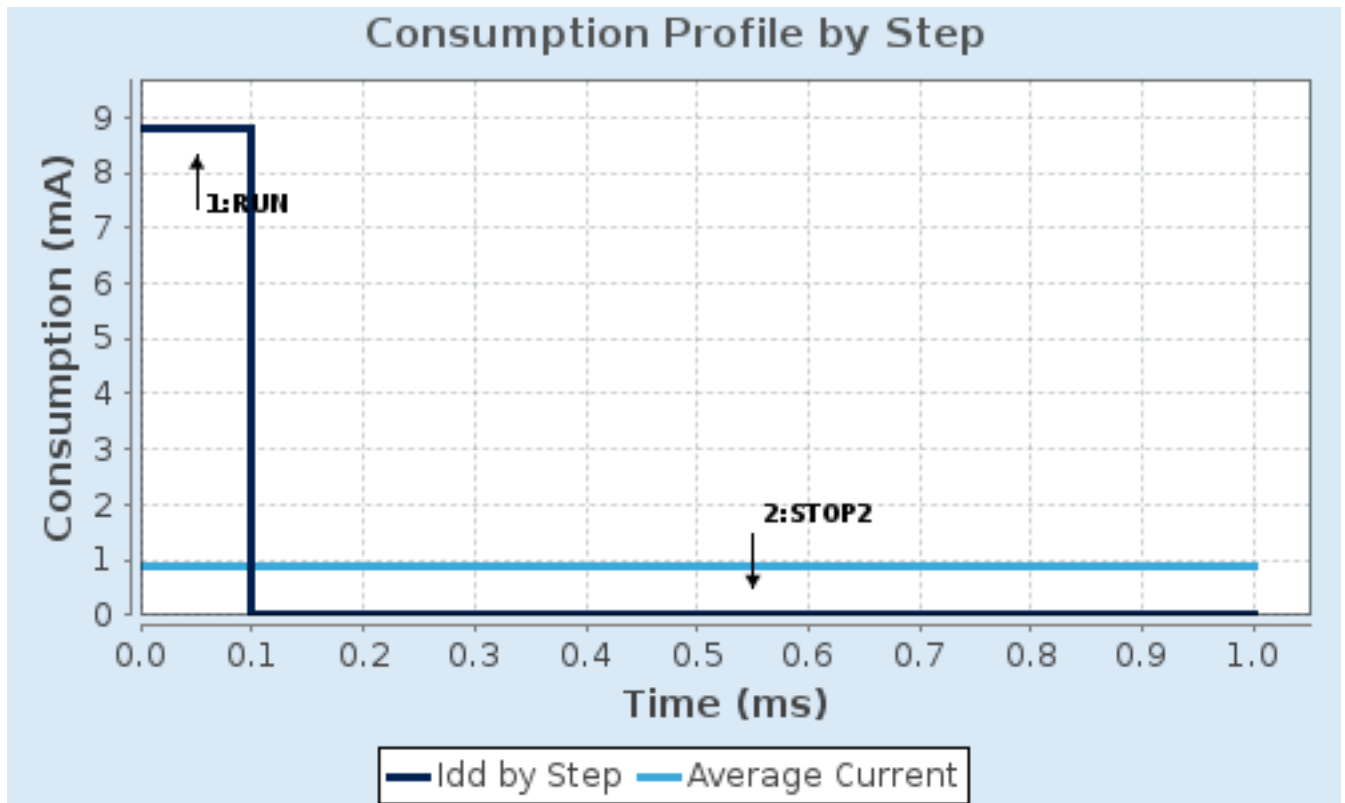
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP2
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-High	NoRange/SMPS
Fetch Type	SRAM1 Flash-PowerDown	FLASH/ART/CACHE/BLE
CPU Frequency	64 MHz	0 Hz
Clock Configuration	HSI PLL Regulator_ON	ALL CLOCKS OFF BLE Regulator_ON
Clock Source Frequency	16 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	8.8 mA	1 nA
Duration	0.1 ms	0.9 ms
DMIPS	80.0	0.0
Ta Max	104.34	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	880 μ A
Battery Life	5 months, 8 days, 5 hours	Average DMIPS	8.0 DMIPS

6.6. Chart



7. IPs and Middleware Configuration

7.1. ADC1

IN11: IN11 Single-ended

mode: Vbat Channel

7.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	Asynchronous clock mode divided by 1
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data preserved
Low Power Auto Wait	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable
Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
<u>Rank</u>	1
Channel	Channel 11
Sampling Time	2.5 Cycles
Offset Number	No offset

ADC_Injected_ConversionMode:

Enable Injected Conversions	Disable
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Analog Watchdog 1:

Enable Analog WatchDog1 Mode	false
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Analog Watchdog 2:

Enable Analog WatchDog2 Mode	false
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Analog Watchdog 3:

Enable Analog WatchDog3 Mode	false
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7.2. GPIO

7.3. I2C1

I2C: I2C

7.3.1. Parameter Settings:

Timing configuration:

Custom Timing	Disabled
I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	0
Fall Time (ns)	0
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	0x10707DBC *

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

7.4. LPUART1

Mode: Asynchronous

7.4.1. Parameter Settings:

Basic Parameters:

Baud Rate	209700
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Single Sample	Disable
Prescaler	clock /1
Fifo Mode	FIFO mode disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

Advanced Features:

TX Pin Active Level Inversion	Disable
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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

7.5. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

mode: Master Clock Output

7.5.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	3 WS (4 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
MSI Calibration Value	0
MSI Auto Calibration	Enabled
MSI State	Enabled
HSI State	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
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Peripherals Clock Configuration:

Generate the peripherals clock configuration	TRUE
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7.6. RF

mode: Activate RF1

7.7. SYS

Debug: JTAG (5 pins)

mode: System Wake-Up 1

Timebase Source: TIM17

7.8. USART1

Mode: Asynchronous

7.8.1. 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
ClockPrescaler	clock /1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

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

7.9. USB

mode: Device (FS)

7.9.1. Parameter Settings:

Basic Parameters:

Speed	Full Speed 12MBit/s
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Physical interface	Internal Phy
Sof Enable	Disabled

Power Parameters:

Low Power	Disabled
Link Power Management	Disabled
Battery Charging	Disabled

7.10. FREERTOS

Interface: CMSIS_V2

7.10.1. Config parameters:

API:

FreeRTOS API	CMSIS v2
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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
OVERRIDE_DEFAULT_TICK_CONFIGURATION	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

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

7.10.2. 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

7.10.3. Advanced settings:

Newlib settings (see parameter description first):

USE_NEWLIB_REENTRANT Disabled

Project settings (see parameter description first):

Use FW pack heap file Enabled

7.11. USB_DEVICE

Class For FS IP: Custom Human Interface Device Class (HID)

7.11.1. Parameter Settings:

Class Parameters:

CUSTOM_HID_FS_BINTERVAL	0x5 *
USBD_CUSTOM_HID_REPORT_DESC_SIZE (Total length for Report descriptor (IN ENDPOINT))	2
USBD_CUSTOMHID_OUTREPORT_BUF_SIZE (Maximum report buffer size (OUT ENDPOINT))	2

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
USBD_LPM_ENABLED (Link Power Management)	1: Link Power Management supported

7.11.2. 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)	22352 *
PRODUCT_STRING (Product Identifier)	STM32 Custom Human interface
CONFIGURATION_STRING (Configuration Identifier)	Custom HID Config
INTERFACE_STRING (Interface Identifier)	Custom HID Interface

* User modified value

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA6	ADC1_IN11	Analog mode	No pull-up and no pull-down	n/a	ADC1_IN11_VBATT
I2C1	PB8	I2C1_SCL	Alternate Function Open Drain	Pull-up	Low	
	PB9	I2C1_SDA	Alternate Function Open Drain	Pull-up	Low	
LPUART1	PA2	LPUART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA3	LPUART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
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	
	PA8	RCC_MCO	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
	OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
RF	RF1	RF_RF1	n/a	n/a	n/a	
SYS	PA0	SYS_WKUP1	n/a	n/a	n/a	
	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA15	SYS_JTDI	n/a	n/a	n/a	
	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	
	PB4	SYS_JTRST	n/a	n/a	n/a	
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	Alternate Function Push Pull	No pull-up and no pull-down	Low	USB_N
	PA12	USB_DP	Alternate Function Push Pull	No pull-up and no pull-down	Low	USB_P
GPIO	PA4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ACCEL_INT1
	PA5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ACCEL_INT2
	PE4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BUZZER

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
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
USB low priority interrupt, USB wake-up interrupt through EXTI line 28	true	0	0
TIM1 trigger and commutation interrupts and TIM17 global interrupt	true	0	0
PVD/PVM0/PVM2 interrupts through EXTI lines 16/31/33	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1 global interrupt	unused		
USB high priority interrupt	unused		
CPU2 SEV interrupt through EXTI line 40 and PWR CPU2 HOLD wake-up interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
USART1 global interrupt	unused		
LPUART1 global interrupt	unused		
PWR switching on the fly, end of BLE activity, end of 802.15.4 activity, end of critical radio phase interrupt	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	true	true	false
Hard fault interrupt	true	true	false
Memory management fault	true	true	false
Prefetch fault, memory access fault	true	true	false
Undefined instruction or illegal state	true	true	false

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
System service call via SWI instruction	true	false	false
Debug monitor	true	true	false
Pendable request for system service	true	false	false
System tick timer	true	false	false
USB low priority interrupt, USB wake-up interrupt through EXTI line 28	true	true	true
TIM1 trigger and commutation interrupts and TIM17 global interrupt	true	true	true

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

Middleware

FREERTOS ✓

USB_DEVICE ✓

System Core

DMA

GPIO ✓

NVIC ✓

RCC ✓

SYS ✓

Analog

ADC1 ✓

Timers

Connectivity

I2C1 ✓

LPUART1 ✓

RF ✓

USART1 ✓

USB ✓

Multimedia

Security

Computing

Utilities

10. Software Pack Report

10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	FreeRTOS	0.0.1	Class : CMSIS Group : RTOS2 SubGroup : FreeRTOS Version : 10.2.0 Class : RTOS Group : Core Version : 10.2.0
STMicroelectronics	USB_DEVICE	3.0.0	Class : USB Group : USB Device SubGroup : Custom HID FS Version : 3.0

11. Docs & Resources

Type	Link
Datasheet	http://www.st.com/resource/en/datasheet/DM00344191.pdf
Reference manual	http://www.st.com/resource/en/reference_manual/DM00318631.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00046982.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00104451.pdf
Errata sheet	http://www.st.com/resource/en/errata_sheet/DM00383256.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/CD00264342.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00042534.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/DM00081379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00085385.pdf
Application note	http://www.st.com/resource/en/application_note/DM00087593.pdf
Application note	http://www.st.com/resource/en/application_note/DM00151811.pdf
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Application note	http://www.st.com/resource/en/application_note/DM00355687.pdf

Application note http://www.st.com/resource/en/application_note/DM00311483.pdf
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Application note http://www.st.com/resource/en/application_note/DM00704246.pdf