



1. Description

1.1. Project

Project Name	stm32f411.exti.hook.on
Board Name	custom
Generated with:	STM32CubeMX 6.12.0
Date	09/25/2024

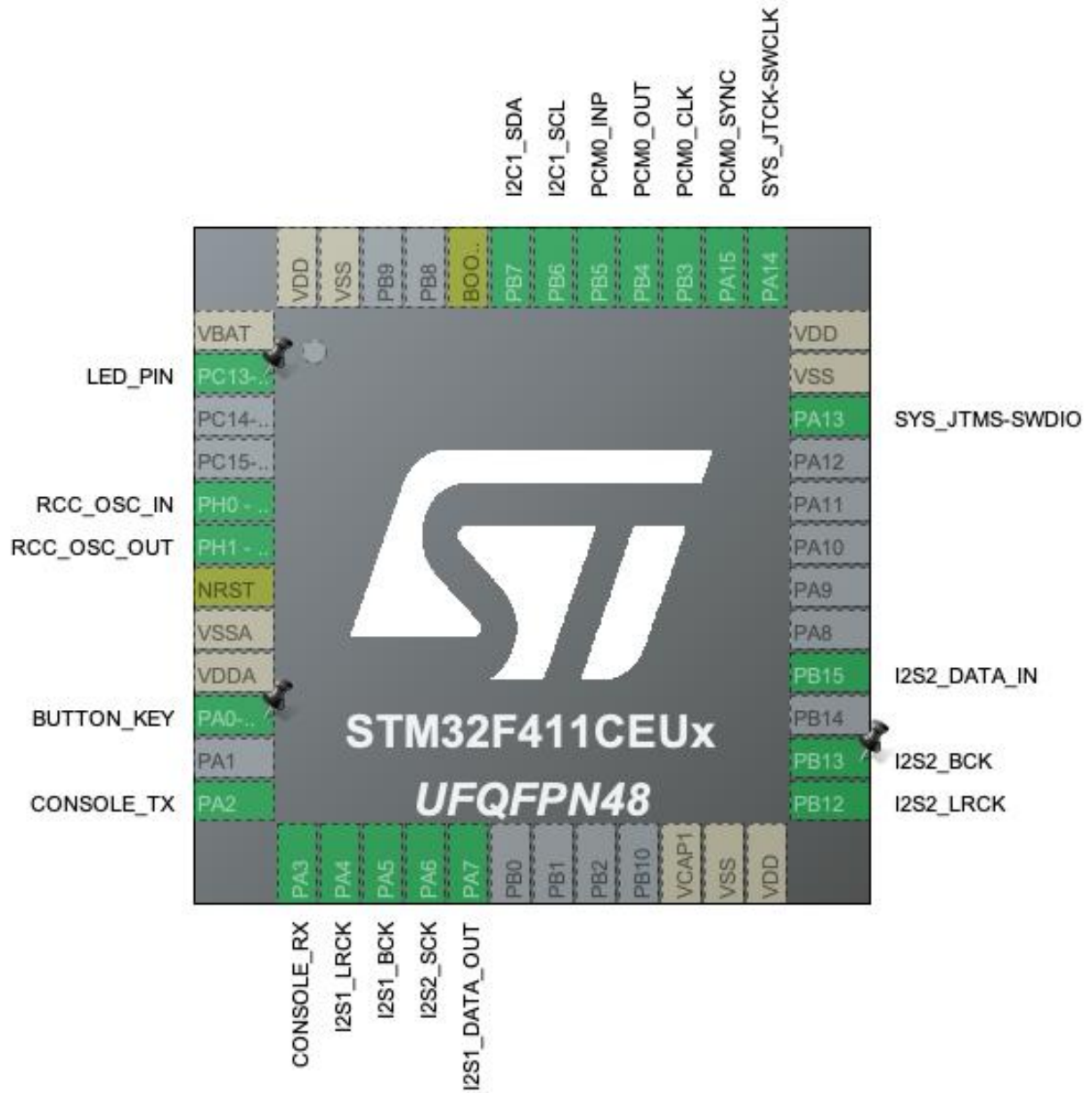
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F411
MCU name	STM32F411CEUx
MCU Package	UFQFPN48
MCU Pin number	48

1.3. Core(s) information

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

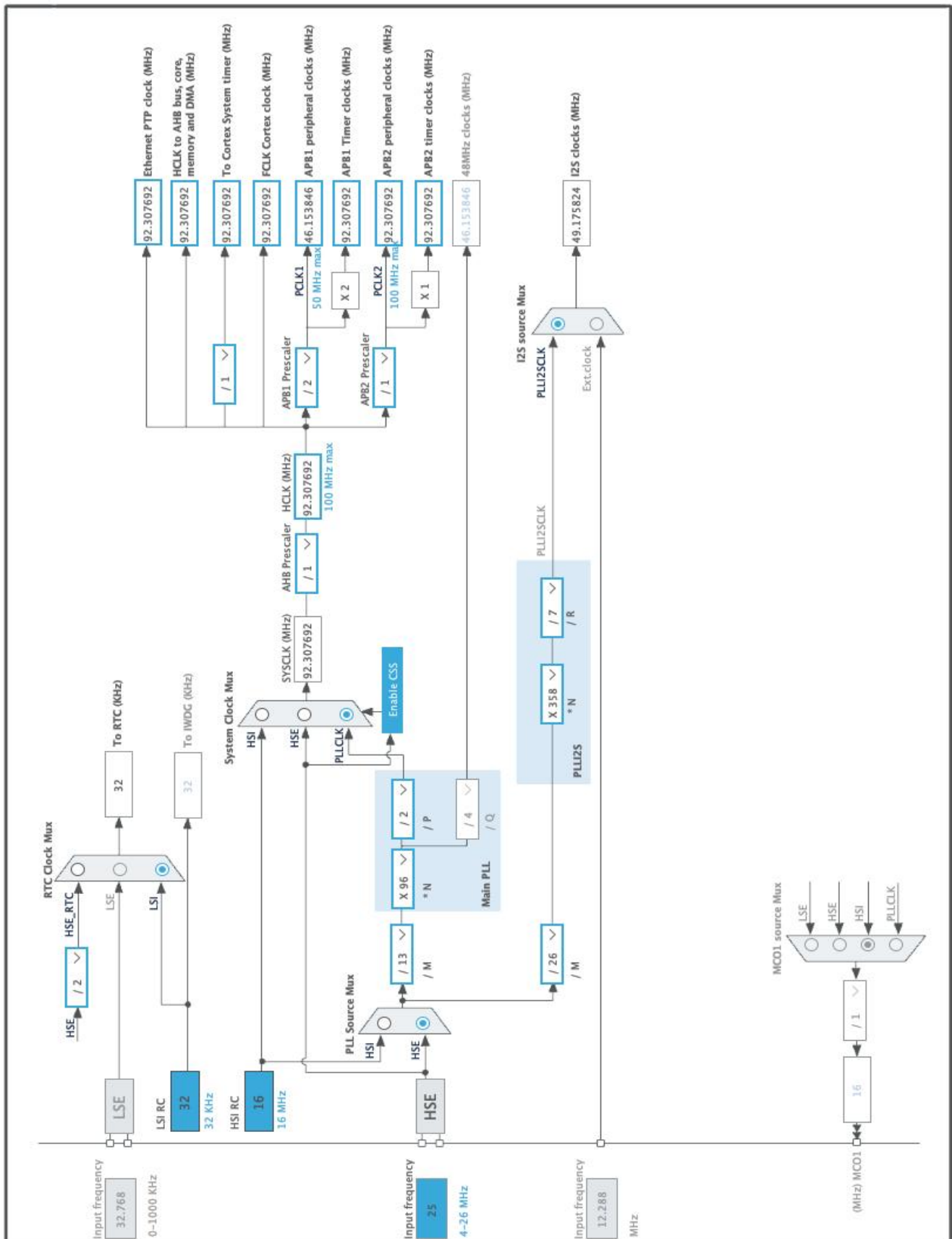


3. Pins Configuration

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP *	I/O	GPIO_Output	LED_PIN
5	PH0 - OSC_IN	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0-WKUP	I/O	GPIO_EXTI0	BUTTON_KEY
12	PA2	I/O	USART2_TX	CONSOLE_TX
13	PA3	I/O	USART2_RX	CONSOLE_RX
14	PA4	I/O	I2S1_WS	I2S1_LRCK
15	PA5	I/O	I2S1_CK	I2S1_BCK
16	PA6	I/O	I2S2_MCK	I2S2_SCK
17	PA7	I/O	I2S1_SD	I2S1_DATA_OUT
22	VCAP1	Power		
23	VSS	Power		
24	VDD	Power		
25	PB12	I/O	I2S2_WS	I2S2_LRCK
26	PB13	I/O	I2S2_CK	I2S2_BCK
28	PB15	I/O	I2S2_SD	I2S2_DATA_IN
34	PA13	I/O	SYS_JTMS-SWDIO	
35	VSS	Power		
36	VDD	Power		
37	PA14	I/O	SYS_JTCK-SWCLK	
38	PA15	I/O	I2S3_WS	PCM0_SYNC
39	PB3	I/O	I2S3_CK	PCM0_CLK
40	PB4	I/O	I2S3_ext_SD	PCM0_OUT
41	PB5	I/O	I2S3_SD	PCM0_INP
42	PB6	I/O	I2C1_SCL	
43	PB7	I/O	I2C1_SDA	
44	BOOT0	Boot		
47	VSS	Power		
48	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	STM32F4
Line	STM32F411
MCU	STM32F411CEUx
Datasheet	DS10314_Rev6

1.2. Parameter Selection

Temperature	25
Vdd	1.7

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

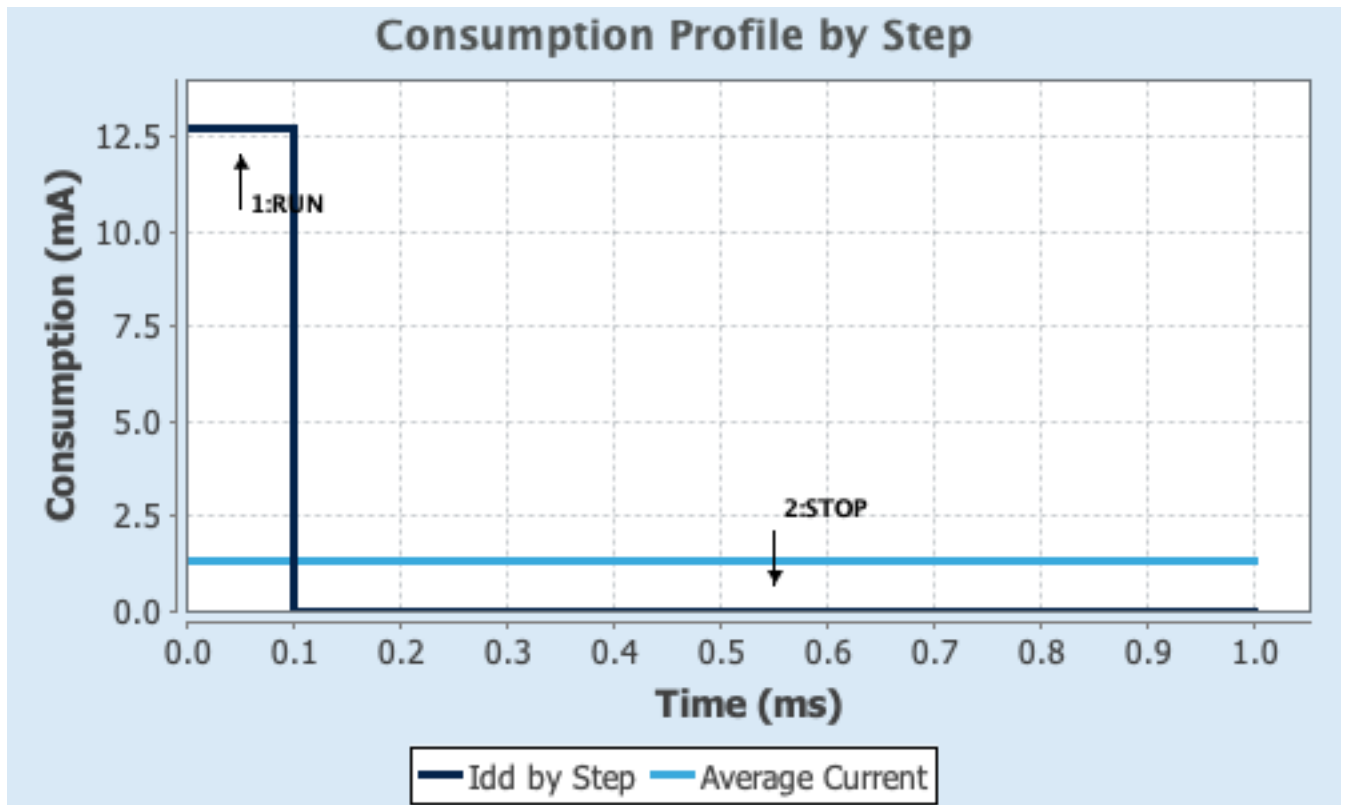
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	1.7	1.7
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	SRAM	n/a
CPU Frequency	100 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LPLV Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	12.7 mA	9 μ A
Duration	0.1 ms	0.9 ms
DMIPS	125.0	0.0
Ta Max	104.31	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	1.28 mA
Battery Life	3 months, 19 days, 6 hours	Average DMIPS	125.0 DMIPS

1.6. Chart



2. Software Project

2.1. Project Settings

Name	Value
Project Name	stm32f411.exti.hook.on.fds_i2s3
Project Folder	/Users/user/Projects/stm32f411.exti.hook.on.fds_i2s3
Toolchain / IDE	Makefile
Firmware Package Name and Version	STM32Cube FW_F4 V1.28.1
Application Structure	Advanced
Generate Under Root	No
Do not generate the main()	No
Minimum Heap Size	0x800
Minimum Stack Size	0x1200

2.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Add necessary library files as reference in the toolchain project configuration file
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	Yes

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_USART2_UART_Init	USART2
5	MX_I2S1_Init	I2S1
6	MX_I2S2_Init	I2S2
7	MX_RTC_Init	RTC
8	MX_I2C1_Init	I2C1
9	MX_I2S3_Init	I2S3

3. Peripherals and Middlewares Configuration

3.1. I2C1

I2C: I2C

3.1.1. Parameter Settings:

Master Features:

I2C Speed Mode	Standard Mode
I2C Clock Speed (Hz)	100000

Slave Features:

Clock No Stretch Mode	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	16 *
General Call address detection	Disabled

3.2. I2S1

Mode: Half-Duplex Master

3.2.1. Parameter Settings:

Generic Parameters:

Transmission Mode	Mode Master Transmit
Communication Standard	I2S Philips
Data and Frame Format	24 Bits Data on 32 Bits Frame *
Selected Audio Frequency	48 KHz *
Real Audio Frequency	48.023 KHz *
Error between Selected and Real	0.04 % *

Clock Parameters:

Clock Source	I2S PLL Clock
Clock Polarity	Low

3.3. I2S2

Mode: Half-Duplex Master

mode: Master Clock Output

3.3.1. Parameter Settings:

Generic Parameters:

Transmission Mode
Communication Standard
Data and Frame Format
Selected Audio Frequency
Real Audio Frequency
Error between Selected and Real

Mode Master Receive *

I2S Philips
24 Bits Data on 32 Bits Frame *
48 KHz *
48.023 KHz *
0.04 % *

Clock Parameters:

Clock Source
Clock Polarity

I2S PLL Clock
Low

3.4. I2S3

Mode: Full-Duplex Slave

3.4.1. Parameter Settings:

Generic Parameters:

Transmission Mode
Communication Standard
Data and Frame Format
Selected Audio Frequency
Real Audio Frequency
Error between Selected and Real

Mode Slave Receive *

I2S Philips
24 Bits Data on 32 Bits Frame *
48 KHz *
48.023 KHz *
0.04 % *

Clock Parameters:

Clock Source
Clock Polarity

I2S PLL Clock
Low

3.5. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.5.1. Parameter Settings:

System Parameters:

VDD voltage (V)
Instruction Cache
Prefetch Buffer

3.3
Enabled
Enabled

Data Cache	Enabled
Flash Latency(WS)	3 WS (4 CPU cycle)
RCC Parameters:	
HSI Calibration Value	16
TIM Prescaler Selection	Enabled *
HSE Startup Timeout Value (ms)	120 *
LSE Startup Timeout Value (ms)	5000
Power Parameters:	
Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

3.6. RTC

mode: Activate Clock Source

3.6.1. Parameter Settings:

General:

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

3.7. SYS

Debug: Serial Wire

Timebase Source: SysTick

3.8. USART2

Mode: Asynchronous

3.8.1. 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	8 Samples *

*** 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	Pull-up *	Very High *	
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up *	Very High *	
I2S1	PA4	I2S1_WS	Alternate Function Push Pull	No pull-up and no pull-down	High *	I2S1_LRCK
	PA5	I2S1_CK	Alternate Function Push Pull	No pull-up and no pull-down	High *	I2S1_BCK
	PA7	I2S1_SD	Alternate Function Push Pull	No pull-up and no pull-down	High *	I2S1_DATA_OUT
I2S2	PA6	I2S2_MCK	Alternate Function Push Pull	No pull-up and no pull-down	High *	I2S2_SCK
	PB12	I2S2_WS	Alternate Function Push Pull	No pull-up and no pull-down	Low	I2S2_LRCK
	PB13	I2S2_CK	Alternate Function Push Pull	No pull-up and no pull-down	High *	I2S2_BCK
	PB15	I2S2_SD	Alternate Function Push Pull	No pull-up and no pull-down	Medium *	I2S2_DATA_IN
I2S3	PA15	I2S3_WS	Alternate Function Push Pull	No pull-up and no pull-down	High *	PCM0_SYNC
	PB3	I2S3_CK	Alternate Function Push Pull	No pull-up and no pull-down	High *	PCM0_CLK
	PB4	I2S3_ext_SD	Alternate Function Push Pull	No pull-up and no pull-down	High *	PCM0_OUT
	PB5	I2S3_SD	Alternate Function Push Pull	No pull-up and no pull-down	Medium *	PCM0_INP
RCC	PH0 - OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1 - OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	CONSOLE_TX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	CONSOLE_RX
GPIO	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_PIN
	PA0-WKUP	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	Pull-down *	n/a	BUTTON_KEY

4.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI1_TX	DMA2_Stream2	Memory To Peripheral	Low
SPI2_RX	DMA1_Stream3	Peripheral To Memory	Low
I2S3_EXT_TX	DMA1_Stream5	Memory To Peripheral	Low
SPI3_RX	DMA1_Stream0	Peripheral To Memory	Low

SPI1_TX: DMA2_Stream2 DMA request Settings:

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

SPI2_RX: DMA1_Stream3 DMA request Settings:

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

I2S3_EXT_TX: DMA1_Stream5 DMA request Settings:

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

SPI3_RX: DMA1_Stream0 DMA request Settings:

Mode:	Circular *
Use fifo:	Disable
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
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	2	3
Debug monitor	true	2	3
Pendable request for system service	true	1	3
System tick timer	true	3	3
PVD interrupt through EXTI line 16	true	1	3
Flash global interrupt	true	2	1
RCC global interrupt	true	2	3
EXTI line0 interrupt	true	0	0
DMA1 stream0 global interrupt	true	0	0
DMA1 stream3 global interrupt	true	0	0
DMA1 stream5 global interrupt	true	0	0
I2C1 event interrupt	true	0	0
I2C1 error interrupt	true	0	0
SPI1 global interrupt	true	3	2
SPI2 global interrupt	true	3	2
USART2 global interrupt	true	1	1
SPI3 global interrupt	true	0	0
DMA2 stream2 global interrupt	true	0	0
FPU global interrupt	true	3	1

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
Pre-fetch 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

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
PVD interrupt through EXTI line 16	true	true	true
Flash global interrupt	true	true	true
RCC global interrupt	true	true	false
EXTI line0 interrupt	false	true	true
DMA1 stream0 global interrupt	false	true	true
DMA1 stream3 global interrupt	true	true	true
DMA1 stream5 global interrupt	false	true	true
I2C1 event interrupt	true	true	true
I2C1 error interrupt	true	true	true
SPI1 global interrupt	true	true	true
SPI2 global interrupt	true	true	true
USART2 global interrupt	true	true	true
SPI3 global interrupt	true	true	true
DMA2 stream2 global interrupt	true	true	true
FPU global interrupt	true	true	false

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

Middleware

System Core

Analog

Timers

Connectivity

Multimedia

Computing

DMA ✓

RTC ✓

I2C1 ✓

I2S1 ✓

GPIO ✓

USART2 ✓

I2S2 ✓

NVIC ✓

I2S3 ✓

RCC ✓

SYS ✓

6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f411_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f411_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f4-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
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32h7rs-lines-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/flstm32f4x1.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/flstm32trust.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/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/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/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-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/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3997-audio-playback-and-recording-using-the-stm32f4discovery-stmicroelectronics.pdf

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Application Notes https://www.st.com/resource/en/application_note/an4031-using-the-stm32f2-stm32f4-and-stm32f7-series-dma-controller-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf

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used-in-the-stm32-bootloader-stmicroelectronics.pdf

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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/an4616-migrating-from-stm32f401-and-stm32f411-lines-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4646-peripheral-interconnections-on-stm32f401-and-stm32f411-lines-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

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Application Notes https://www.st.com/resource/en/application_note/an4850-stm32-mcus-spreadspectrum-clock-generation-principles-properties-and-implementation-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

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stmicroelectronics.pdf

- Application Notes https://www.st.com/resource/en/application_note/an5027-interfacing-pdm-digital-microphones-using-stm32-mcus-and-mpus-stmicroelectronics.pdf
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- Application Notes https://www.st.com/resource/en/application_note/an5036-guidelines-for-thermal-management-on-stm32-applications-stmicroelectronics.pdf
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oscillator-design-on-stm8afals-and-stm32-mcusmpus-
stmicroelectronics.pdf

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& Software

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