STM32 CubeMX

1. Description

1.1. Project

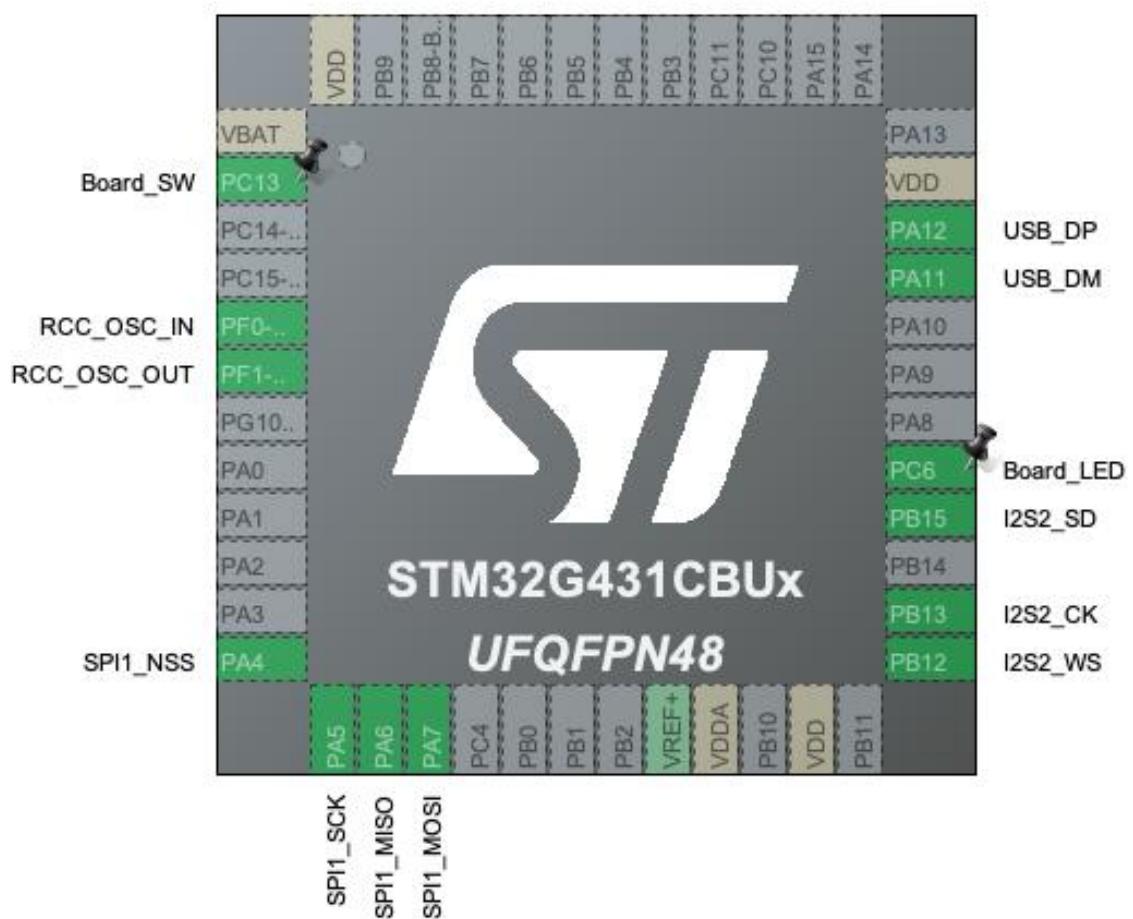| Project Name	minimal_synth_G431_Device
Board Name	custom
Generated with:	STM32CubeMX 6.14.1
Date	06/22/2025

1.2. MCU

MCU Series	STM32G4
MCU Line	STM32G4x1
MCU name	STM32G431CBUx
MCU Package	UFQFPN48
MCU Pin number	48

1.3. Core(s) information

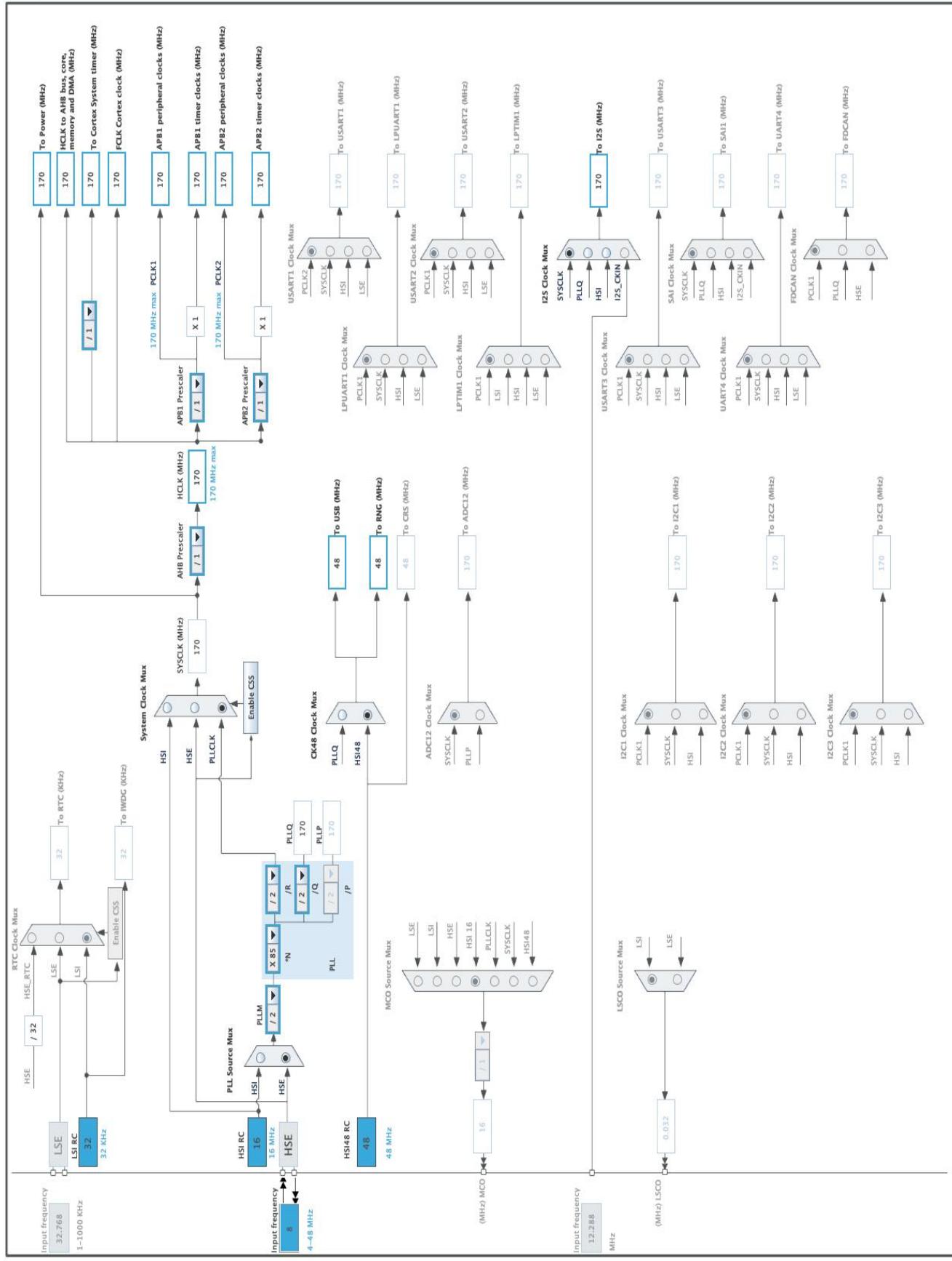| Core(s)	ARM Cortex-M4

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 *	I/O	GPIO_Input	Board_SW
5	PF0-OSC_IN	I/O	RCC_OSC_IN	
6	PF1-OSC_OUT	I/O	RCC_OSC_OUT	
12	PA4	I/O	SPI1_NSS	
13	PA5	I/O	SPI1_SCK	
14	PA6	I/O	SPI1_MISO	
15	PA7	I/O	SPI1_MOSI	
21	VDDA	Power		
23	VDD	Power		
25	PB12	I/O	I2S2_WS	
26	PB13	I/O	I2S2_CK	
28	PB15	I/O	I2S2_SD	
29	PC6 *	I/O	GPIO_Output	Board_LED
33	PA11	I/O	USB_DM	
34	PA12	I/O	USB_DP	
35	VDD	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	STM32G4
Line	STM32G4x1
MCU	STM32G431CBUx
Datasheet	DS12589_Rev0

1.2. Parameter Selection

Temperature	25
Vdd	3.0

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
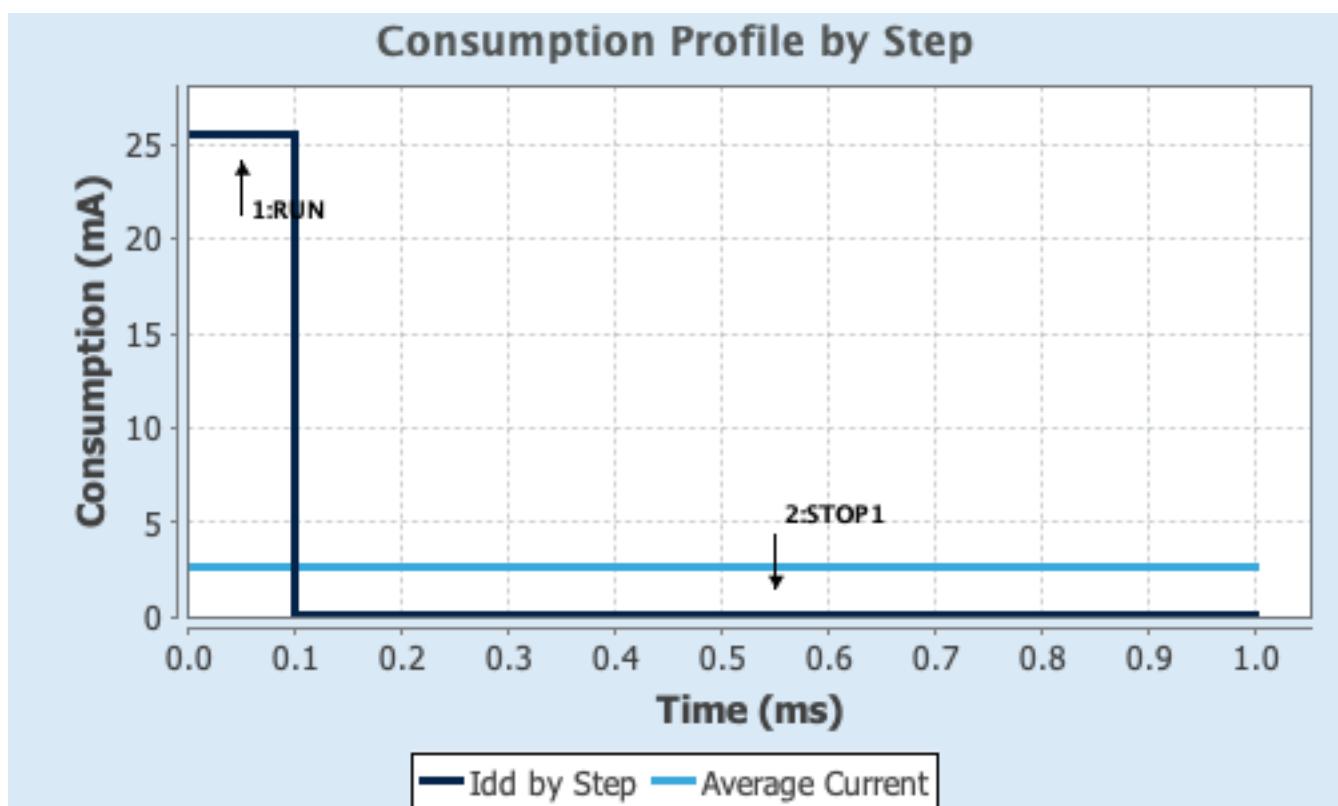
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP1
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-Boost	NoRange
Fetch Type	FLASH/ART	NA
CPU Frequency	170 MHz	0 Hz
Clock Configuration	HSE BYP PLL	ALL CLOCKS OFF
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	25.5 mA	59 µA
Duration	0.1 ms	0.9 ms
DMIPS	213.0	0.0
Ta Max	127.71	129.99
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	2.6 mA
Battery Life	1 month, 23 days, 22 hours	Average DMIPS	212.5 DMIPS

1.6. Chart

Consumption Profile by Step

2. Software Project

2.1. Project Settings

Name	Value
Project Name	minimal_synth_G431_Device
Project Folder	/Users/omurakosuke/Documents/STM32/minimal_synth_G431_Device
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_G4 V1.6.1
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)	No
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_USB_Device_Init	USB_DEVICE
5	MX_I2S2_Init	I2S2
6	MX_SPI1_Init	SPI1
7	MX_CORDIC_Init	CORDIC
8	MX_RNG_Init	RNG

3. Peripherals and Middlewares Configuration

3.1. CORDIC

mode: Activated

3.2. I2S2

Mode: Half-Duplex Master

3.2.1. Parameter Settings:

Generic Parameters:

Transmission Mode	Mode Master Transmit
Communication Standard	**MSB First (Left Justified) ***
Data and Frame Format	16 Bits Data on 16 Bits Frame
Selected Audio Frequency	**32 KHz ***
Real Audio Frequency	**32.003 KHz ***
Error between Selected and Real	**0.0 % ***

Clock Parameters:

Clock Polarity	Low

3.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	**Enabled ***
Data Cache	Enabled
Flash Latency(WS)	4 WS (5 CPU cycle)

RCC Parameters:

HSI Calibration Value	64
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1 boost

Peripherals Clock Configuration:

Generate the peripherals clock configuration	TRUE

3.4. RNG
mode: Activated
3.4.1. Parameter Settings:

Clock Error Detection	Enable

3.5. SPI1
Mode: Full-Duplex Slave
Hardware NSS Signal: Hardware NSS Input Signal
3.5.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	**8 Bits ***
First Bit	MSB First

Clock Parameters:

Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Input Hardware

3.6. SYS
Timebase Source: SysTick
mode: save power of non-active UCPD - deactive Dead Battery pull-up

3.7. USB
mode: Device (FS)
3.7.1. Parameter Settings:

Basic Parameters:

Speed	Full Speed 12MBit/s
Physical interface	Internal Phy

Sof Enable	Disabled

Power Parameters:

Low Power	Disabled
Link Power Management	Disabled
Battery Charging	Disabled

3.8. USB_DEVICE

Class For FS IP: Audio Device Class

3.8.1. 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
USBD_LPM_ENABLED (Link Power Management)	1: Link Power Management supported

Class Parameters:

USBD_AUDIO_FREQ (Audio sample frequency rate)	22100

3.8.2. 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)	**STM32MIDIDevice ***
CONFIGURATION_STRING (Configuration Identifier)	AUDIO Config
INTERFACE_STRING (Interface Identifier)	AUDIO 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
I2S2	PB12	I2S2_WS	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB13	I2S2_CK	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB15	I2S2_SD	Alternate Function Push Pull	No pull-up and no pull-down	Low	
RCC	PF0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PF1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PA4	SPI1_NSS	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA7	SPI1_MOSI	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	PC13	GPIO_Input	Input mode	**Pull-down ***	n/a	Board_SW
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Board_LED

4.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI2_TX	DMA1_Channel1	Memory To Peripheral	Low
SPI1_RX	DMA1_Channel2	Peripheral To Memory	**High ***

SPI2_TX: DMA1_Channel1 DMA request Settings:

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

SPI1_RX: DMA1_Channel2 DMA request Settings:

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

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
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	15	0
DMA1 channel1 global interrupt	true	2	0
DMA1 channel2 global interrupt	true	1	0
USB low priority interrupt remap	true	2	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/38/39/40/41	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
USB high priority interrupt remap	unused		
SPI1 global interrupt	unused		
SPI2 global interrupt	unused		
FPU global interrupt	unused		
RNG global interrupt	unused		
CORDIC interrupt	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
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	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true
DMA1 channel1 global interrupt	false	true	true
DMA1 channel2 global interrupt	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
USB low priority interrupt remap	false	true	true

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

Middleware
USB_DEVICE ⊘

Software Packs

System Core	Analog	Timers	Connectivity	Multimedia	Security	Computing	Utilities
DMA ⊘			SPI1 ⊘	I2S2 ⊘	RNG ⊘	CORDIC ⊘	
GPIO ⊘			USB ⊘				
NVIC ⊘							
RCC ⊘							
SYS ⊘							

6. Software Pack Report

6.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	X-CUBE-ALGOBUILD	1.4.0	Class : DSP Library Group : DSP Library Version : 1.4.0

7. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32g4_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32g4_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32g4_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-usb-c-pd-solutions-presentation.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-stm32g4-series-product-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/flstm32g4.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Flyers	https://www.st.com/resource/en/flyer/fldpstpfc11120.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/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/an4232-getting-started-
with-analog-comparators-for-stm32f3-series-and-stm32g4-series-devices-
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/an4296-use-
stm32f3stm32g4-ccm-sram-with-iar-embedded-workbench-keil-mdkarm-
stmicroelectronics-stm32cubeide-and-other-gnubased-toolchains-
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/an4655-virtually-
increasing-the-number-of-serial-communication-peripherals-in-stm32-
applications-stmicroelectronics.pdf

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errors-in-stm32-applications-stmicroelectronics.pdf

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timer-cookbook-for-stm32-microcontrollers-stmicroelectronics.pdf

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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/an4989-stm32-
microcontroller-debug-toolbox-stmicroelectronics.pdf

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digital-microphones-using-stm32-mcus-and-mpus-stmicroelectronics.pdf

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Application Notes https://www.st.com/resource/en/application_note/an5315-stm32cube-firmware-examples-for-stm32g4-series-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5346-stm32g4-adc-use-tips-and-recommendations-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5094-migrating-between-stm32f334303-lines-and-stm32g431xxg474xxg491xx-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5738-stm32g4-series-lifetime-estimates-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4899-stm32-microcontroller-gpio-hardware-settings-and-lowpower-consumption-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5612-esd-protection-of-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4991-how-to-wake-up-an-stm32-microcontroller-from-lowpower-mode-with-the-usart-or-the-lpuart-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4838-introduction-to-memory-protection-unit-management-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5325-how-to-use-the-cordic-to-perform-mathematical-functions-on-stm32-mcus-stmicroelectronics.pdf

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Application Notes   https://www.st.com/resource/en/application_note/an4894-how-to-use-
                    eeprom-emulation-on-stm32-mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5537-how-to-use-adc-
                    oversampling-techniques-to-improve-signaltonoise-ratio-on-stm32-mcus-
                    stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5036-guidelines-for-
                    thermal-management-on-stm32-applications-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5405-how-to-use-
                    fdcan-bootloader-protocol-on-stm32-mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5978-introduction-to-
                    mb1971-llc-hat-12-v-to-75-v1-a-for-f334-g474-nucleo-board-
                    stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5690-how-to-use-
                    vrefbuf-peripheral-on-stm32-mcus-and-mpus-stmicroelectronics.pdf

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                    random-number-generation-validation-using-the-nist-statistical-test-suite-
                    for-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an2548-introduction-to-
                    dma-controller-for-stm32-mcus-stmicroelectronics.pdf

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                    timers-for-stm32-mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4277-how-to-use-
                    pwm-shutdown-for-motor-control-and-digital-power-conversion-on-stm32-
                    mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4635-how-to-
                    optimize-lpuart-power-consumption-on-stm32-mcus-
                    stmicroelectronics.pdf

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                    using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-
                    tamp-with-stm32-mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4908-getting-started-
                    with-usart-automatic-baud-rater-detection-for-stm32-mcus-
                    stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5156-introduction-to-
security-for-stm32-mcus-stmicroelectronics.pdf

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dmamux-for-stm32-mcus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5543-guidelines-for-
enhanced-spi-communication-on-stm32-mcus-and-mpus-
stmicroelectronics.pdf

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fdcan-peripherals-for-stm32-mcus-stmicroelectronics.pdf

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optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf

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recommendations-and-package-information-for-leadfree-ecopack2-mcus-
and-mpus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4435-guidelines-for-
for related Tools   obtaining-ulcsaiec-607301603351-class-b-certification-in-any-stm32-
& Software   application-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4657-stm32-
for related Tools   inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf
& Software

Application Notes   https://www.st.com/resource/en/application_note/an4841-digital-signal-
for related Tools   processing-for-stm32-microcontrollers-using-cmsis-stmicroelectronics.pdf
& Software

Application Notes   https://www.st.com/resource/en/application_note/an5056-integration-
for related Tools   guide-for-the-xcubesbsfu-stm32cube-expansion-package-
& Software   stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5305-digital-filter-
for related Tools   implementation-with-the-fmac-using-stm32cubeg4-mcu-package-
& Software   stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5315-stm32cube-
for related Tools   firmware-examples-for-stm32g4-series-stmicroelectronics.pdf
& Software

Application Notes   https://www.st.com/resource/en/application_note/an5345-highbrightness-
for related Tools   rgb-led-control-using-the-bg474edpow1-discovery-kit-

& Software	stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5360-getting-started-with-projects-based-on-the-stm32mp1-series-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5361-getting-started-with-projects-based-on-dualcore-stm32h7-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5426-migrating-graphics-middleware-projects-from-stm32cubemx-540-to-stm32cubemx-550-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5464-position-control-of-a-threephase-permanent-magnet-motor-using-xcubemcsdk-or-xcubemcsdkful-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5564-getting-started-with-projects-based-on-dualcore-stm32wl-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5698-adapting-the-xcubestl-functional-safety-package-for-stm32-iec-61508-compliant-to-other-safety-standards-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5731-stm32cubemx-and-stm32cubeide-threadsafe-solution-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5785-boost-voltage-mode-on-bg474edpow1-discovery-kit-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5788-stm32-digital-power-pid-and-iir-filters-for-smps-control-design-and-comparison-on-bg414edpow1-discovery-kit-stmicroelectronics.pdf

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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4635-how-to-optimize-lpuart-power-consumption-on-stm32-mcus-stmicroelectronics.pdf
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