



1. Description

1.1. Project

Project Name	STM32F411-i2s-prototype
Board Name	custom
Generated with:	STM32CubeMX 6.6.1
Date	09/23/2022

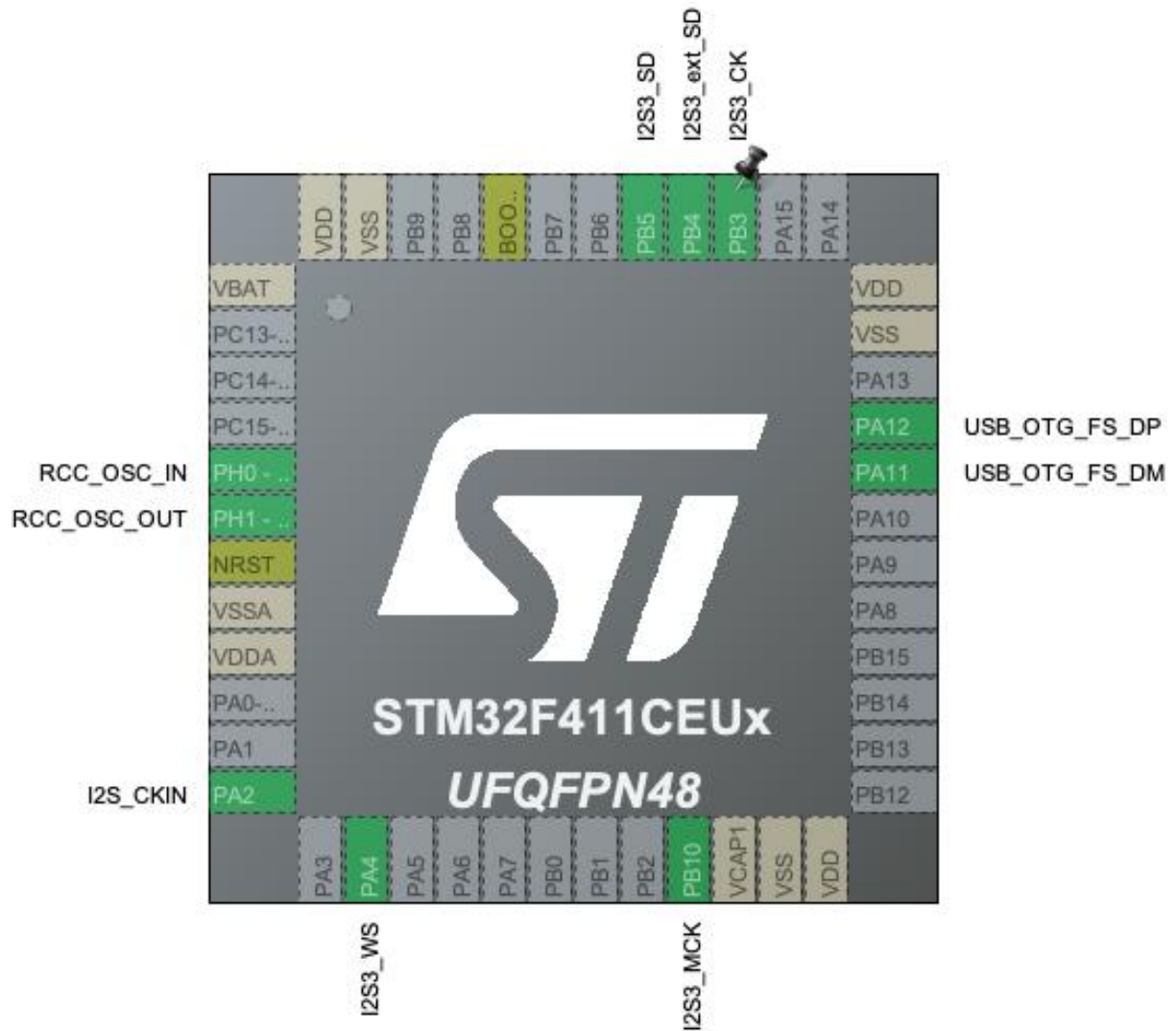
1.2. MCU

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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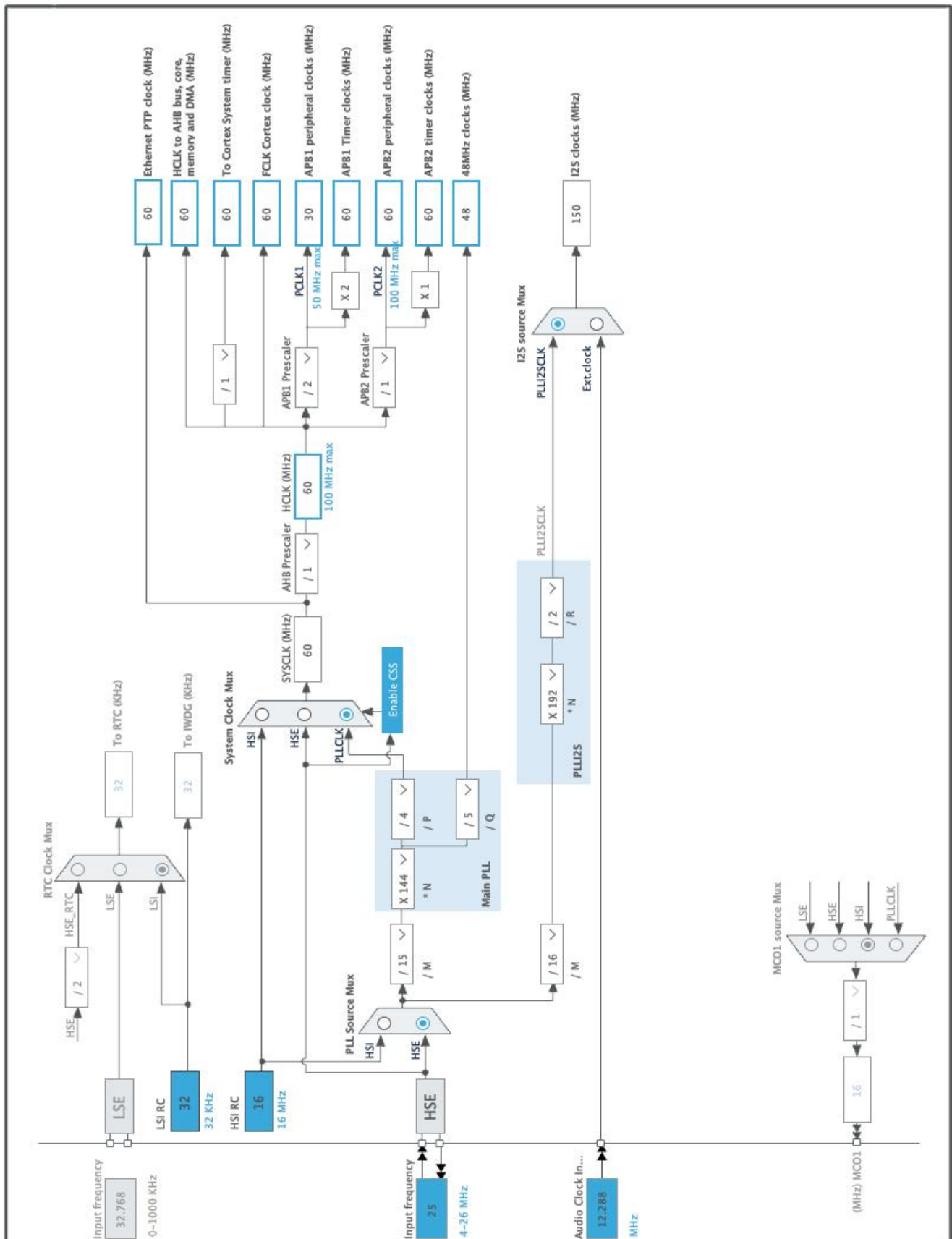
2. Pinout Configuration



3. Pins Configuration

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
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		
12	PA2	I/O	I2S_CKIN	
14	PA4	I/O	I2S3_WS	
21	PB10	I/O	I2S3_MCK	
22	VCAP1	Power		
23	VSS	Power		
24	VDD	Power		
32	PA11	I/O	USB_OTG_FS_DM	
33	PA12	I/O	USB_OTG_FS_DP	
35	VSS	Power		
36	VDD	Power		
39	PB3	I/O	I2S3_CK	
40	PB4	I/O	I2S3_ext_SD	
41	PB5	I/O	I2S3_SD	
44	BOOT0	Boot		
47	VSS	Power		
48	VDD	Power		

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	STM32F411-i2s-prototype
Project Folder	/Users/pschatzmann/STM32CubeIDE/workspace_1.10.1/Audio
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.27.1
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	Yes
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	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_DMA_Init	DMA
4	MX_I2S3_Init	I2S3
5	MX_USB_DEVICE_Init	USB_DEVICE

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F411
MCU	STM32F411CEUx
Datasheet	DS10314_Rev6

6.2. Parameter Selection

Temperature	25
Vdd	1.7

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

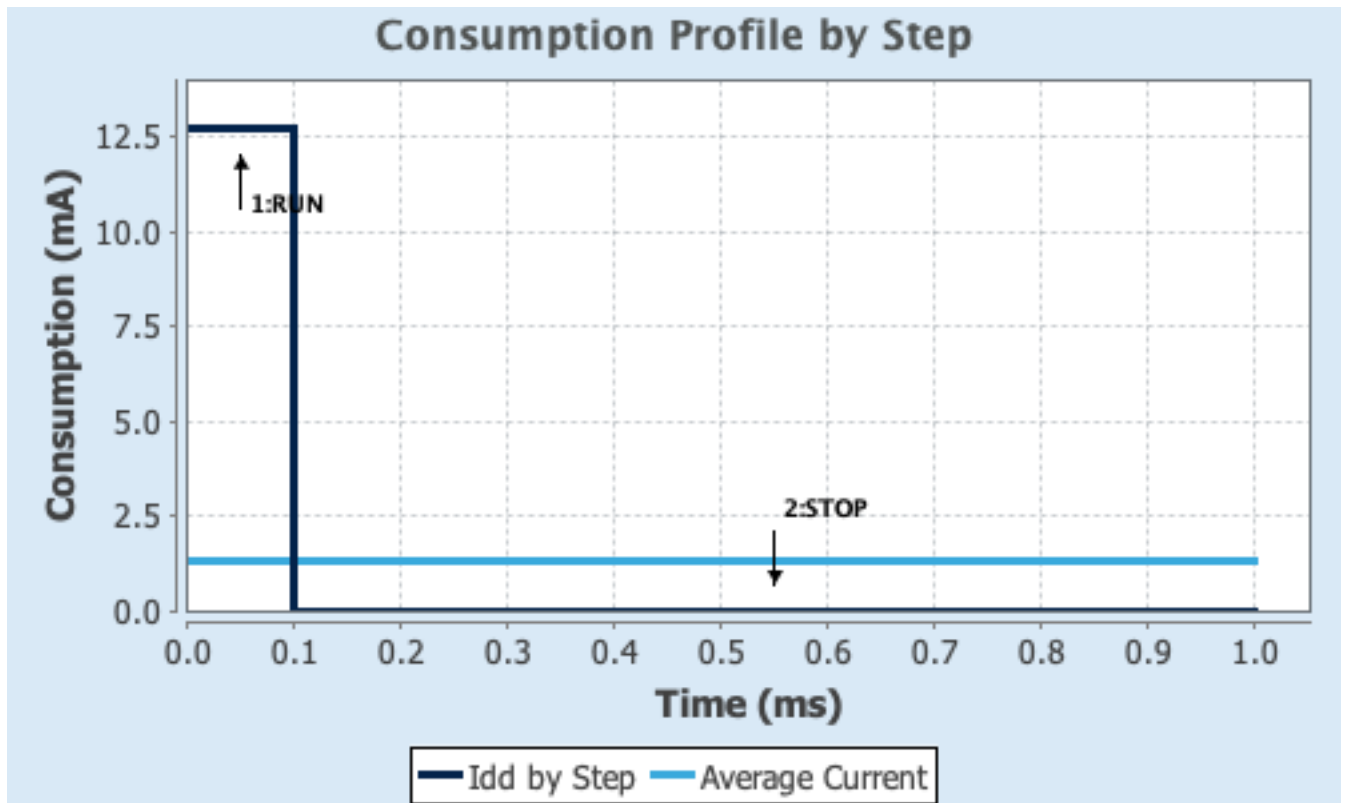
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
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

6.5. Results

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

6.6. Chart



7. Peripherals and Middlewares Configuration

7.1. I2S3

Mode: Full-Duplex Master

mode: Master Clock Output

7.1.1. Parameter Settings:

Generic Parameters:

Transmission Mode	Mode Master Transmit
Communication Standard	I2S Philips
Data and Frame Format	16 Bits Data on 16 Bits Frame
Selected Audio Frequency	8 KHz
Real Audio Frequency	8.026 KHz *
Error between Selected and Real	0.32 % *

Clock Parameters:

Clock Source	I2S PLL Clock
Clock Polarity	Low

7.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

mode: Audio Clock Input (I2S_CKIN)

7.2.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	1 WS (2 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
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7.3. SYS

Timebase Source: SysTick

7.4. USB_OTG_FS

Mode: Device_Only

7.4.1. Parameter Settings:

Speed	Device Full Speed 12MBit/s
Low power	Disabled
Link Power Management	Disabled
VBUS sensing	Disabled
Signal start of frame	Disabled

7.5. USB_DEVICE

Class For FS IP: Communication Device Class (Virtual Port Com)

7.5.1. 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

Class Parameters:

USB CDC Rx Buffer Size	2048
USB CDC Tx Buffer Size	2048

7.5.2. 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)	STM32 Virtual ComPort
CONFIGURATION_STRING (Configuration Identifier)	CDC Config

INTERFACE_STRING (Interface Identifier)

CDC 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
I2S3	PA4	I2S3_WS	Alternate Function Push Pull	No pull-up and no pull-down	High *	
	PB10	I2S3_MCK	Alternate Function Push Pull	No pull-up and no pull-down	High *	
	PB3	I2S3_CK	Alternate Function Push Pull	No pull-up and no pull-down	High *	
	PB4	I2S3_ext_SD	Alternate Function Push Pull	No pull-up and no pull-down	High *	
	PB5	I2S3_SD	Alternate Function Push Pull	No pull-up and no pull-down	High *	
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	
	PA2	I2S_CKIN	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USB_OTG_FS	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	

8.2. DMA configuration

DMA request	Stream	Direction	Priority
I2S3_EXT_RX	DMA1_Stream0	Peripheral To Memory	High *
SPI3_TX	DMA1_Stream5	Memory To Peripheral	High *

I2S3_EXT_RX: DMA1_Stream0 DMA request Settings:

Mode: **Circular ***
 Use fifo: **Enable ***
 FIFO Threshold: **Half Full ***
 Peripheral Increment: Disable
 Memory Increment: **Enable ***
 Peripheral Data Width: **Half Word ***
 Memory Data Width: **Half Word ***
 Peripheral Burst Size: Single
 Memory Burst Size: Single

SPI3_TX: DMA1_Stream5 DMA request Settings:

Mode: **Circular ***
 Use fifo: **Enable ***
 FIFO Threshold: **Half Full ***
 Peripheral Increment: Disable
 Memory Increment: **Enable ***
 Peripheral Data Width: **Half Word ***
 Memory Data Width: **Half Word ***
 Peripheral Burst Size: Single
 Memory Burst Size: Single

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	0	0
System tick timer	true	15	0
DMA1 stream0 global interrupt	true	0	0
DMA1 stream5 global interrupt	true	0	0
SPI3 global interrupt	true	0	0
USB On The Go FS global interrupt	true	0	0
FPU global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC 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	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true
DMA1 stream0 global interrupt	false	true	true
DMA1 stream5 global interrupt	false	true	true
SPI3 global interrupt	false	true	true
USB On The Go FS global interrupt	false	true	true
FPU global interrupt	false	true	false

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

Middleware

USB_DEVICE ✓

System Core

DMA ✓

GPIO ✓

NVIC ✓

RCC ✓

SYS ✓

Analog

Timers

Connectivity

USB_FS ✓

Multimedia

I2S3 ✓

Computing

10. Docs & Resources

Type	Link
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
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Training Material	https://www.st.com/resource/en/sales_guide/sg_sc2154.pdf
Flyers	https://www.st.com/resource/en/flyer/flnucleolrwan.pdf
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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/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf
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