

# STM32 CubeMX

## 1. Description

### 1.1. Project

Project Name	PDU_FT23
Board Name	custom
Generated with:	STM32CubeMX 6.7.0
Date	03/19/2023

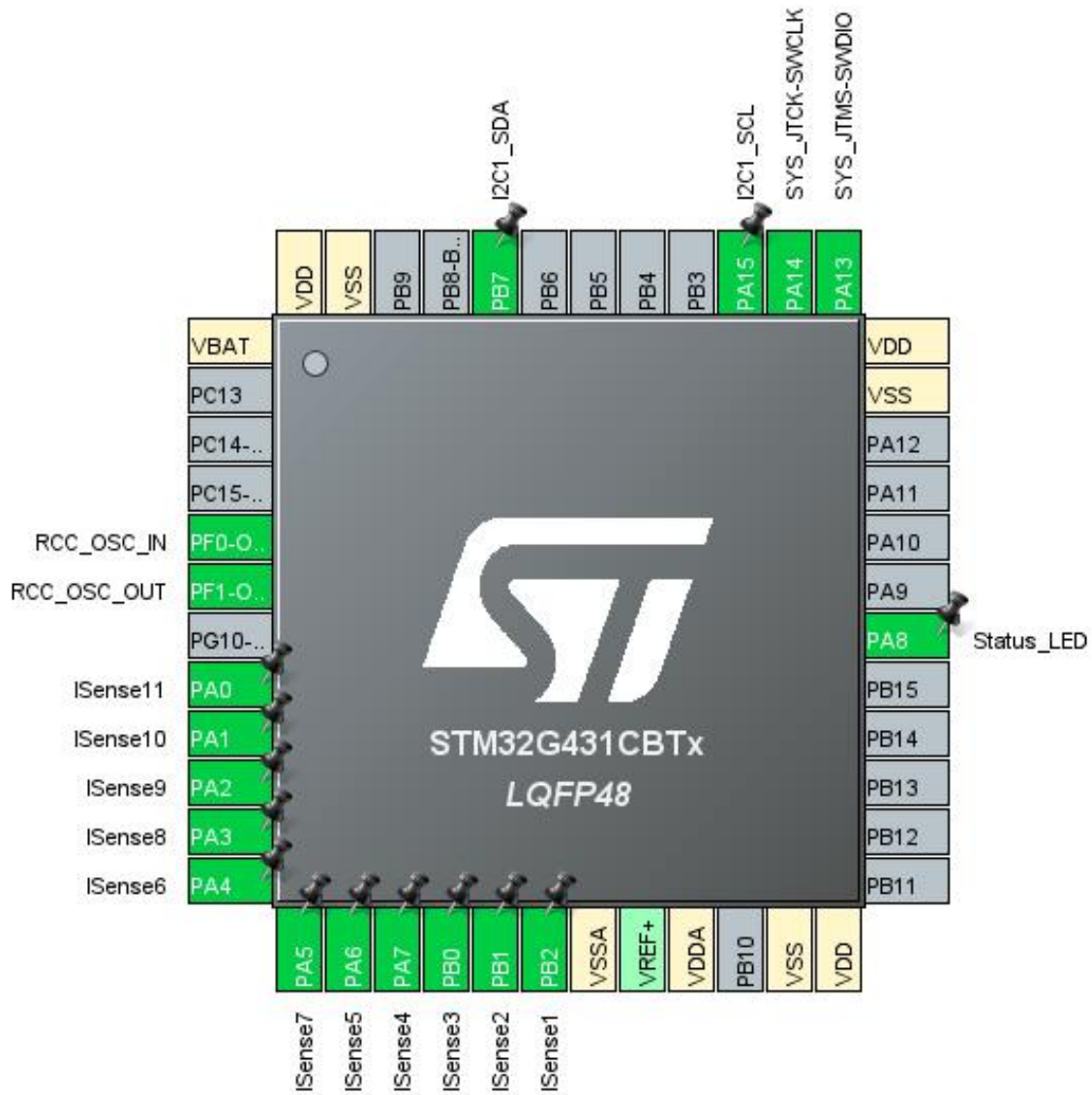
### 1.2. MCU

MCU Series	STM32G4
MCU Line	STM32G4x1
MCU name	STM32G431CBT <sub>x</sub>
MCU Package	LQFP48
MCU Pin number	48

### 1.3. Core(s) information

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

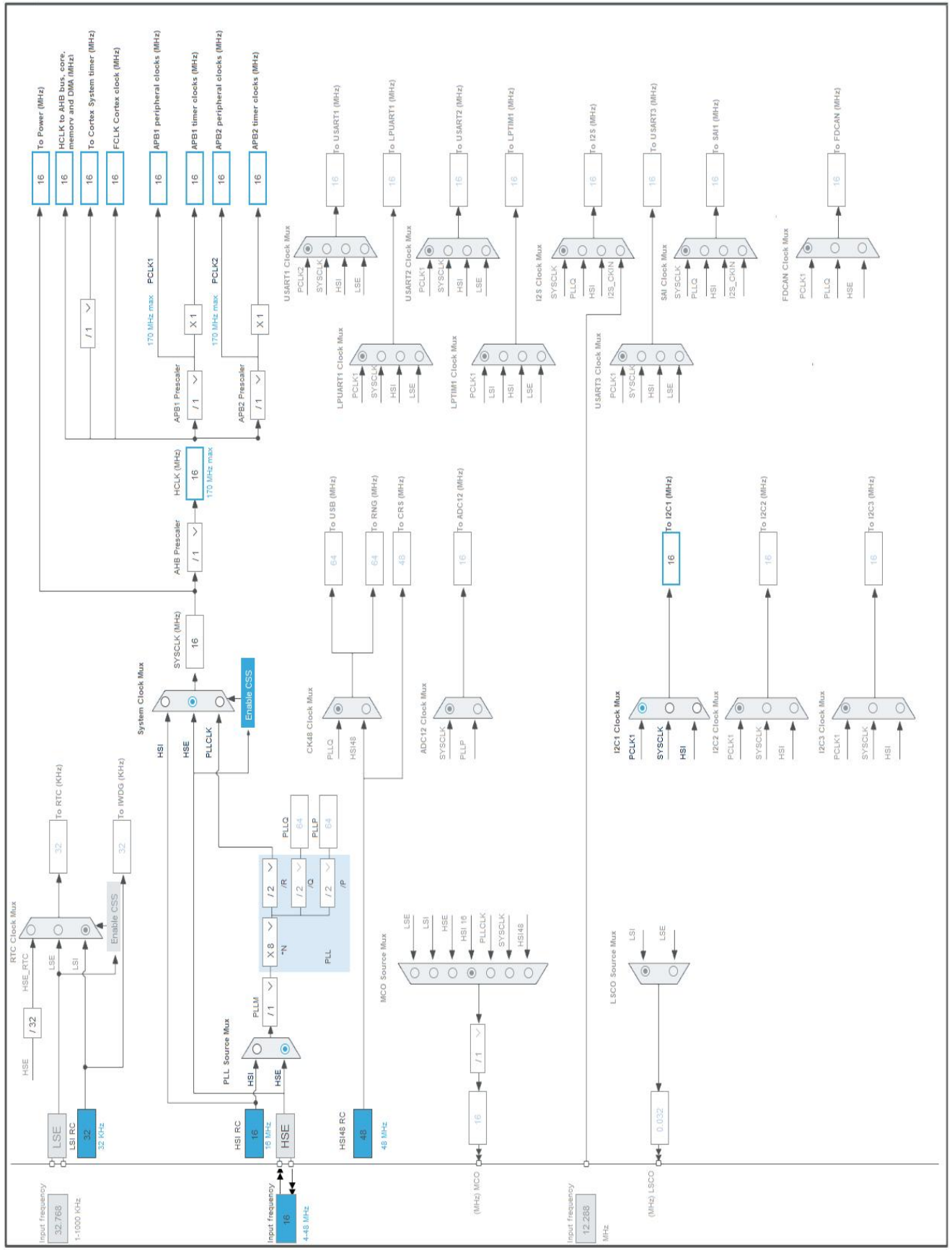


### 3. Pins Configuration

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
5	PF0-OSC_IN	I/O	RCC_OSC_IN	
6	PF1-OSC_OUT	I/O	RCC_OSC_OUT	
8	PA0	I/O	ADC2_IN1	ISense11
9	PA1	I/O	ADC2_IN2	ISense10
10	PA2	I/O	ADC1_IN3	ISense9
11	PA3	I/O	ADC1_IN4	ISense8
12	PA4	I/O	ADC2_IN17	ISense6
13	PA5	I/O	ADC2_IN13	ISense7
14	PA6	I/O	ADC2_IN3	ISense5
15	PA7	I/O	ADC2_IN4	ISense4
16	PB0	I/O	ADC1_IN15	ISense3
17	PB1	I/O	ADC1_IN12	ISense2
18	PB2	I/O	ADC2_IN12	ISense1
19	VSSA	Power		
21	VDDA	Power		
23	VSS	Power		
24	VDD	Power		
30	PA8 *	I/O	GPIO_Output	Status_LED
35	VSS	Power		
36	VDD	Power		
37	PA13	I/O	SYS_JTMS-SWDIO	
38	PA14	I/O	SYS_JTCK-SWCLK	
39	PA15	I/O	I2C1_SCL	
44	PB7	I/O	I2C1_SDA	
47	VSS	Power		
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	PDU_FT23
Project Folder	C:\Users\max\STM32CubeIDE\workspace_1.4.0\PDU_FT23
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_G4 V1.5.1
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	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_DMA_Init	DMA
4	MX_ADC1_Init	ADC1
5	MX_ADC2_Init	ADC2
6	MX_TIM7_Init	TIM7
7	MX_I2C1_Init	I2C1

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32G4
Line	STM32G4x1
MCU	STM32G431CBTx
Datasheet	DS12589_Rev0

### 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

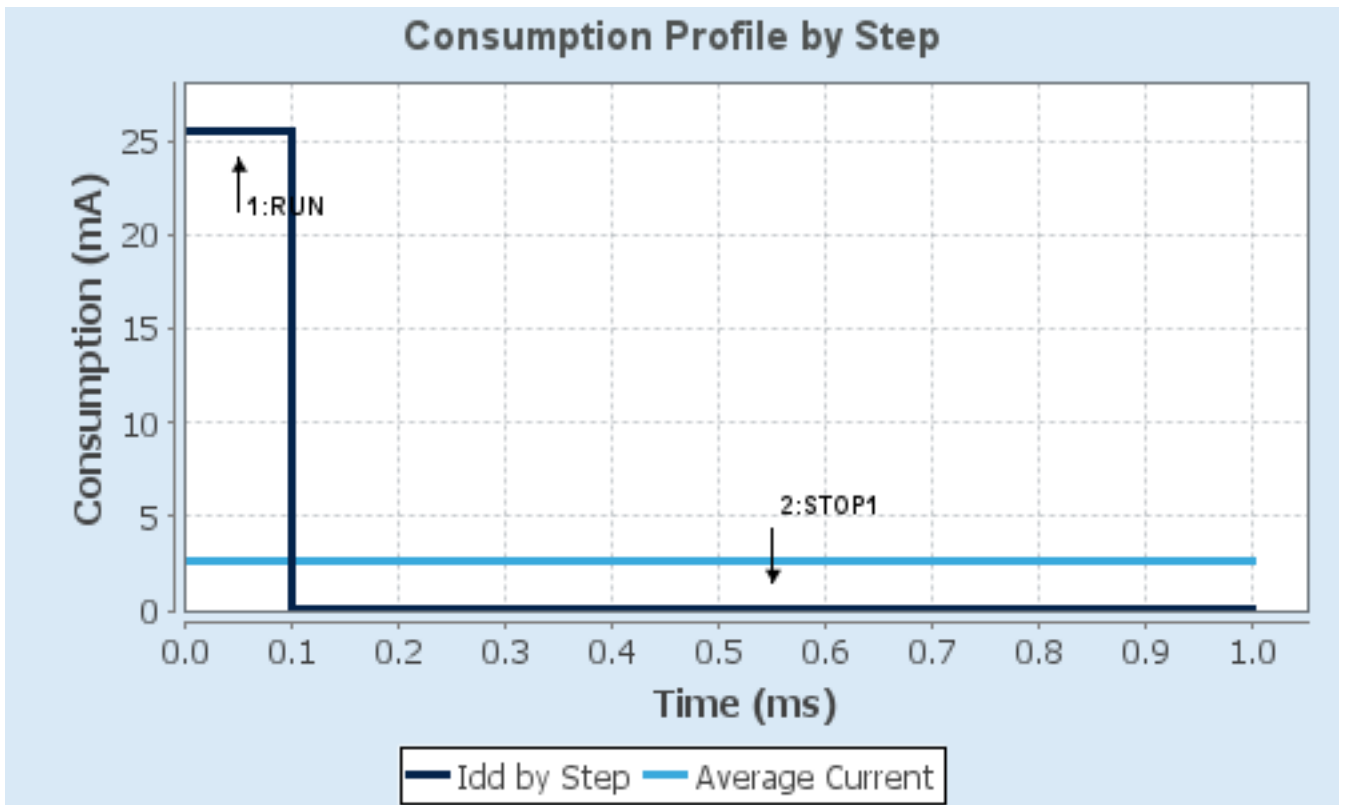
<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP1
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-Boost	NoRange
<b>Fetch Type</b>	FLASH/ART	NA
<b>CPU Frequency</b>	170 MHz	0 Hz
<b>Clock Configuration</b>	HSE BYP PLL	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	25.5 mA	59 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	213.0	0.0
<b>Ta Max</b>	124.26	129.99
<b>Category</b>	In DS Table	In DS Table

#### 6.5. Results

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

#### 6.6. Chart





## 7. Peripherals and Middlewares Configuration

### 7.1. ADC1

**IN3: IN3 Single-ended**

**IN4: IN4 Single-ended**

**mode: IN12**

**mode: IN15**

**mode: Temperature Sensor Channel**

**mode: Vbat Channel**

**mode: Vrefint Channel**

#### 7.1.1. Parameter Settings:

##### **ADCs\_Common\_Settings:**

Mode Independent mode

##### **ADC\_Settings:**

Clock Prescaler Synchronous clock mode divided by 2

Resolution ADC 12-bit resolution

Data Alignment Right alignment

Gain Compensation 0

Scan Conversion Mode Enabled

End Of Conversion Selection **End of sequence of conversion \***

Low Power Auto Wait Disabled

Continuous Conversion Mode **Enabled \***

Discontinuous Conversion Mode Disabled

DMA Continuous Requests **Enabled \***

Overrun behaviour **Overrun data overwritten \***

##### **ADC\_Regular\_ConversionMode:**

Enable Regular Conversions Enable

Enable Regular Oversampling Disable

Number Of Conversion **7 \***

External Trigger Conversion Source **Timer 7 Trigger Out event \***

External Trigger Conversion Edge Trigger detection on the rising edge

Rank 1

Channel Channel 3

Sampling Time 2.5 Cycles

Offset Number No offset

Rank **2 \***

Channel **Channel 4 \***

Sampling Time 2.5 Cycles

Offset Number	No offset
<u>Rank</u>	<b>3 *</b>
Channel	<b>Channel 12 *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>4 *</b>
Channel	<b>Channel 15 *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>5 *</b>
Channel	<b>Channel Temperature Sensor *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>6 *</b>
Channel	<b>Channel Vbat *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>7 *</b>
Channel	<b>Channel Vrefint *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<b>ADC_Injected_ConversionMode:</b>	
Enable Injected Conversions	Disable
<b>Analog Watchdog 1:</b>	
Enable Analog WatchDog1 Mode	false
<b>Analog Watchdog 2:</b>	
Enable Analog WatchDog2 Mode	false
<b>Analog Watchdog 3:</b>	
Enable Analog WatchDog3 Mode	false

## 7.2. ADC2

**IN1: IN1 Single-ended**

**IN2: IN2 Single-ended**

**IN3: IN3 Single-ended**

**mode: IN4**

**IN12: IN12 Single-ended**

## IN13: IN13 Single-ended mode: IN17 Single-ended

### 7.2.1. Parameter Settings:

#### ADCs\_Common\_Settings:

Mode Independent mode

#### ADC\_Settings:

Clock Prescaler Synchronous clock mode divided by 2

Resolution ADC 12-bit resolution

Data Alignment Right alignment

Gain Compensation 0

Scan Conversion Mode Enabled

End Of Conversion Selection **End of sequence of conversion \***

Low Power Auto Wait Disabled

Continuous Conversion Mode **Enabled \***

Discontinuous Conversion Mode Disabled

DMA Continuous Requests **Enabled \***

Overrun behaviour **Overrun data overwritten \***

#### ADC\_Regular\_ConversionMode:

Enable Regular Conversions Enable

Enable Regular Oversampling Disable

Number Of Conversion **7 \***

External Trigger Conversion Source **Timer 7 Trigger Out event \***

External Trigger Conversion Edge Trigger detection on the rising edge

Rank 1

Channel Channel 1

Sampling Time 2.5 Cycles

Offset Number No offset

Rank **2 \***

Channel **Channel 2 \***

Sampling Time 2.5 Cycles

Offset Number No offset

Rank **3 \***

Channel **Channel 3 \***

Sampling Time 2.5 Cycles

Offset Number No offset

Rank **4 \***

Channel **Channel 4 \***

Sampling Time 2.5 Cycles

Offset Number	No offset
<u>Rank</u>	<b>5 *</b>
Channel	<b>Channel 12 *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>6 *</b>
Channel	<b>Channel 13 *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<u>Rank</u>	<b>7 *</b>
Channel	<b>Channel 17 *</b>
Sampling Time	2.5 Cycles
Offset Number	No offset
<b>ADC_Injected_ConversionMode:</b>	
Enable Injected Conversions	Disable
<b>Analog Watchdog 1:</b>	
Enable Analog WatchDog1 Mode	false
<b>Analog Watchdog 2:</b>	
Enable Analog WatchDog2 Mode	false
<b>Analog Watchdog 3:</b>	
Enable Analog WatchDog3 Mode	false

### 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	0x00303D5B

###### **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. RCC

### High Speed Clock (HSE): Crystal/Ceramic Resonator

#### 7.4.1. Parameter Settings:

##### System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	0 WS (1 CPU cycle)

##### RCC Parameters:

HSI Calibration Value	64
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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##### Peripherals Clock Configuration:

Generate the peripherals clock configuration	TRUE
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## 7.5. SYS

### Debug: Serial Wire

## 7.6. TIM7

### mode: Activated

#### 7.6.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>400 *</b>
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value )	65535
auto-reload preload	Disable

##### Trigger Output (TRGO) Parameters:

Trigger Event Selection

**Update Event \***

**\* 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	PA2	ADC1_IN3	Analog mode	No pull-up and no pull-down	n/a	ISense9
	PA3	ADC1_IN4	Analog mode	No pull-up and no pull-down	n/a	ISense8
	PB0	ADC1_IN15	Analog mode	No pull-up and no pull-down	n/a	ISense3
	PB1	ADC1_IN12	Analog mode	No pull-up and no pull-down	n/a	ISense2
ADC2	PA0	ADC2_IN1	Analog mode	No pull-up and no pull-down	n/a	ISense11
	PA1	ADC2_IN2	Analog mode	No pull-up and no pull-down	n/a	ISense10
	PA4	ADC2_IN17	Analog mode	No pull-up and no pull-down	n/a	ISense6
	PA5	ADC2_IN13	Analog mode	No pull-up and no pull-down	n/a	ISense7
	PA6	ADC2_IN3	Analog mode	No pull-up and no pull-down	n/a	ISense5
	PA7	ADC2_IN4	Analog mode	No pull-up and no pull-down	n/a	ISense4
	PB2	ADC2_IN12	Analog mode	No pull-up and no pull-down	n/a	ISense1
I2C1	PA15	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PB7	I2C1_SDA	Alternate Function Open Drain	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	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
GPIO	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Status_LED



## 8.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC2	DMA1_Channel1	Peripheral To Memory	Low
ADC1	DMA1_Channel2	Peripheral To Memory	Low

### ADC2: DMA1\_Channel1 DMA request Settings:

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

### ADC1: DMA1\_Channel2 DMA request Settings:

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

### 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	15	0
DMA1 channel1 global interrupt	true	0	0
DMA1 channel2 global interrupt	true	0	0
ADC1 and ADC2 global interrupt	true	0	0
TIM7 global interrupt	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/38/39/40/41		unused	
Flash global interrupt		unused	
RCC global interrupt		unused	
I2C1 event interrupt / I2C1 wake-up interrupt through EXTI line 23		unused	
I2C1 error 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	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
ADC1 and ADC2 global interrupt	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
TIM7 global interrupt	false	true	true

\* User modified value

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current

Middleware

System Core

Analog

Timers

Connectivity

Multimedia

Security

Computing

Utilities

DMA ✓

ADC1 ✓

TIM7 ✓

I2C1 ✓

GPIO ✓

ADC2 ✓

NVIC ✓

RCC ✓

SYS ✓

## 10. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32g4_bsdل.zip">https://www.st.com/resource/en/bsdl_model/stm32g4_bsdل.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32g4_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32g4_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32g4_svd.zip">https://www.st.com/resource/en/svd/stm32g4_svd.zip</a>
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32g4_bsdل.zip">https://www.st.com/resource/en/bsdl_model/stm32g4_bsdل.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32g4_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32g4_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32g4_svd.zip">https://www.st.com/resource/en/svd/stm32g4_svd.zip</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/microcontrollers_stm32g4_series_product_overview.pdf">https://www.st.com/resource/en/product_presentation/microcontrollers_stm32g4_series_product_overview.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf">https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf">https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-usb-c-pd-solutions-presentation.pdf">https://www.st.com/resource/en/product_presentation/stm32-usb-c-pd-solutions-presentation.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf</a>
Training Material	<a href="https://www.st.com/resource/en/marketing_training/smpres_stm32g4_er.pdf">https://www.st.com/resource/en/marketing_training/smpres_stm32g4_er.pdf</a>
Training Material	<a href="https://www.st.com/resource/en/sales_guide/sg_sc2155.pdf">https://www.st.com/resource/en/sales_guide/sg_sc2155.pdf</a>
Training Material	<a href="https://www.st.com/resource/en/training_certification/faecp_stm32g4_edr.pdf">https://www.st.com/resource/en/training_certification/faecp_stm32g4_edr.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32g4.pdf">https://www.st.com/resource/en/flyer/flstm32g4.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32nucleo.pdf">https://www.st.com/resource/en/flyer/flstm32nucleo.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>

Flyers	<a href="https://www.st.com/resource/en/flyer/fldpstpfc11120.pdf">https://www.st.com/resource/en/flyer/fldpstpfc11120.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3155-usart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3155-usart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4232-getting-started-with-analog-comparators-for-stm32f3-series-and-stm32g4-series-devices-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4232-getting-started-with-analog-comparators-for-stm32f3-series-and-stm32g4-series-devices-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an4296-use-stm32f3stm32g4-ccm-sram-with-iar-embedded-workbench-keil-mdkarm-">https://www.st.com/resource/en/application_note/an4296-use-stm32f3stm32g4-ccm-sram-with-iar-embedded-workbench-keil-mdkarm-</a>

stmicroelectronics-stm32cubeide-and-other-gnubased-toolchains-  
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