



1. Description

1.1. Project

Project Name	FaderWing
Board Name	custom
Generated with:	STM32CubeMX 6.7.0
Date	02/08/2023

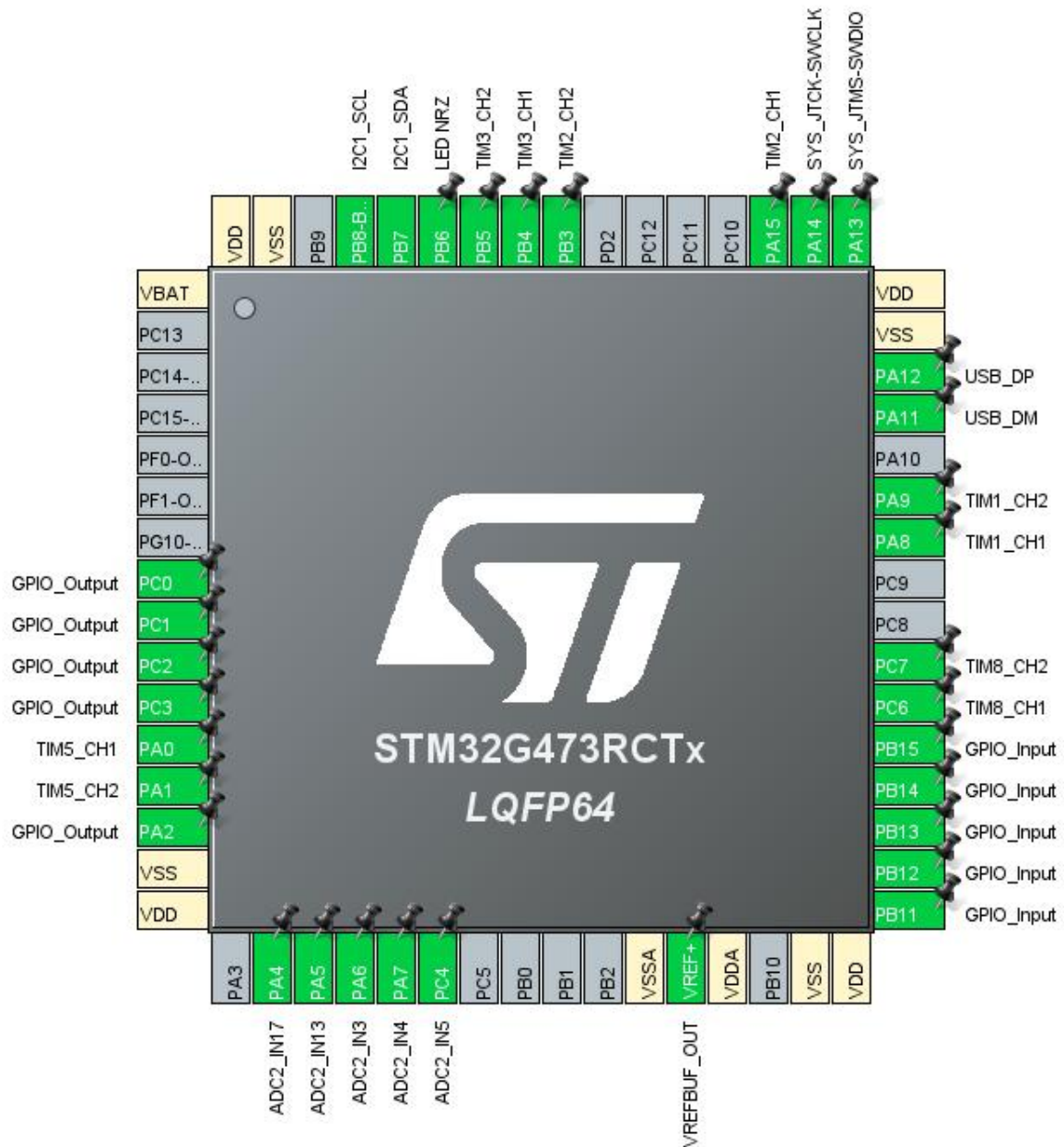
1.2. MCU

MCU Series	STM32G4
MCU Line	STM32G4x3
MCU name	STM32G473RCTx
MCU Package	LQFP64
MCU Pin number	64

1.3. Core(s) information

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



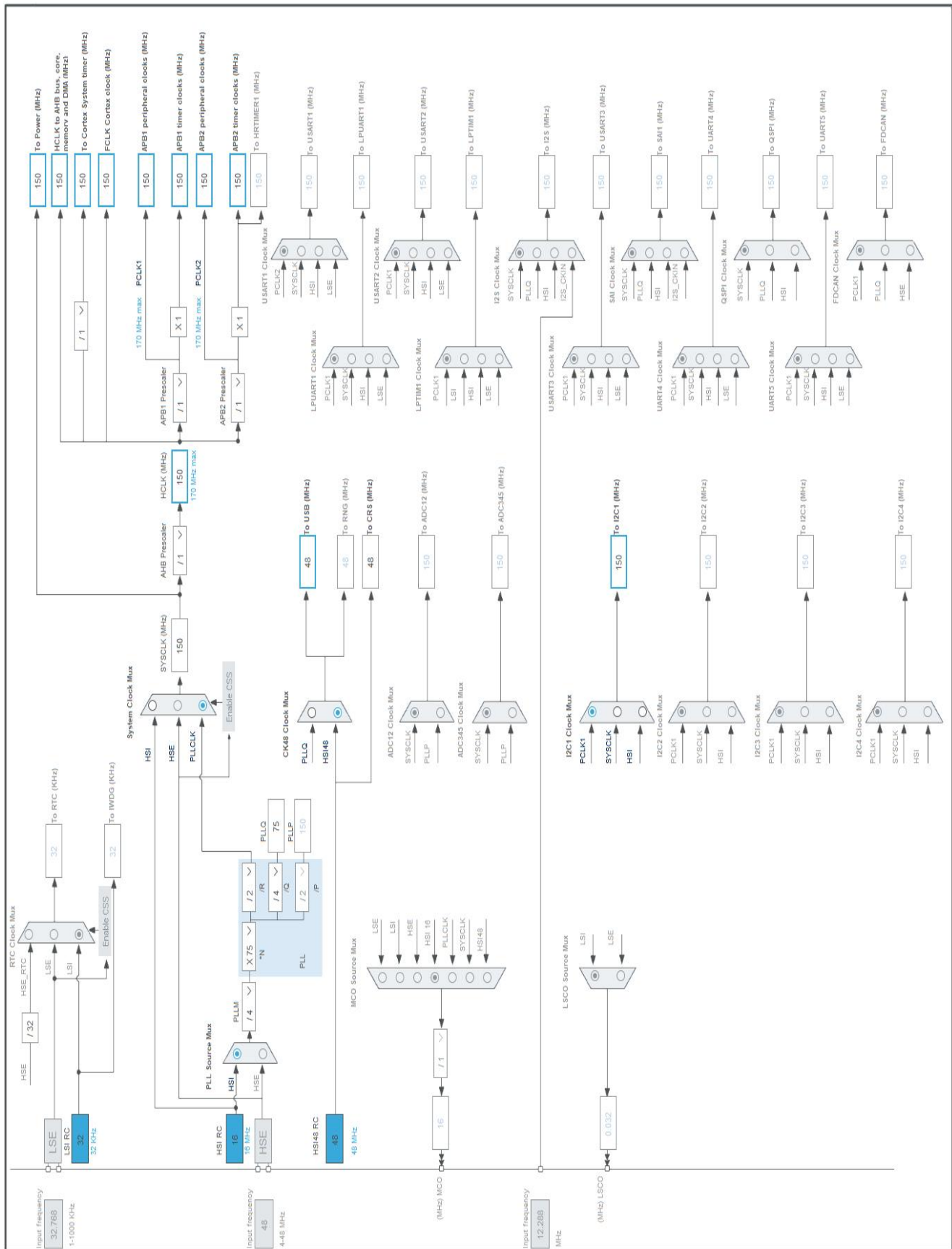
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
8	PC0 *	I/O	GPIO_Output	
9	PC1 *	I/O	GPIO_Output	
10	PC2 *	I/O	GPIO_Output	
11	PC3 *	I/O	GPIO_Output	
12	PA0	I/O	TIM5_CH1	
13	PA1	I/O	TIM5_CH2	
14	PA2 *	I/O	GPIO_Output	
15	VSS	Power		
16	VDD	Power		
18	PA4	I/O	ADC2_IN17	
19	PA5	I/O	ADC2_IN13	
20	PA6	I/O	ADC2_IN3	
21	PA7	I/O	ADC2_IN4	
22	PC4	I/O	ADC2_IN5	
27	VSSA	Power		
28	VREF+	MonoIO	VREFBUF_OUT	
29	VDDA	Power		
31	VSS	Power		
32	VDD	Power		
33	PB11 *	I/O	GPIO_Input	
34	PB12 *	I/O	GPIO_Input	
35	PB13 *	I/O	GPIO_Input	
36	PB14 *	I/O	GPIO_Input	
37	PB15 *	I/O	GPIO_Input	
38	PC6	I/O	TIM8_CH1	
39	PC7	I/O	TIM8_CH2	
42	PA8	I/O	TIM1_CH1	
43	PA9	I/O	TIM1_CH2	
45	PA11	I/O	USB_DM	
46	PA12	I/O	USB_DP	
47	VSS	Power		
48	VDD	Power		
49	PA13	I/O	SYS_JTMS-SWDIO	
50	PA14	I/O	SYS_JTCK-SWCLK	
51	PA15	I/O	TIM2_CH1	

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
56	PB3	I/O	TIM2_CH2	
57	PB4	I/O	TIM3_CH1	
58	PB5	I/O	TIM3_CH2	
59	PB6	I/O	TIM4_CH1	LED NRZ
60	PB7	I/O	I2C1_SDA	
61	PB8-BOOT0	I/O	I2C1_SCL	
63	VSS	Power		
64	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	FaderWing
Project Folder	C:\Users\Venus\Desktop\DIY FaderWing\FaderWing
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	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)	Yes
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_ADC2_Init	ADC2
4	MX_TIM1_Init	TIM1
5	MX_TIM2_Init	TIM2
6	MX_TIM3_Init	TIM3
7	MX_USB_Device_Init	USB_DEVICE
8	MX_TIM5_Init	TIM5
9	MX_TIM8_Init	TIM8
10	MX_I2C1_Init	I2C1
11	MX_TIM4_Init	TIM4

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32G4
Line	STM32G4x3
MCU	STM32G473RCTx
Datasheet	DS12712_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

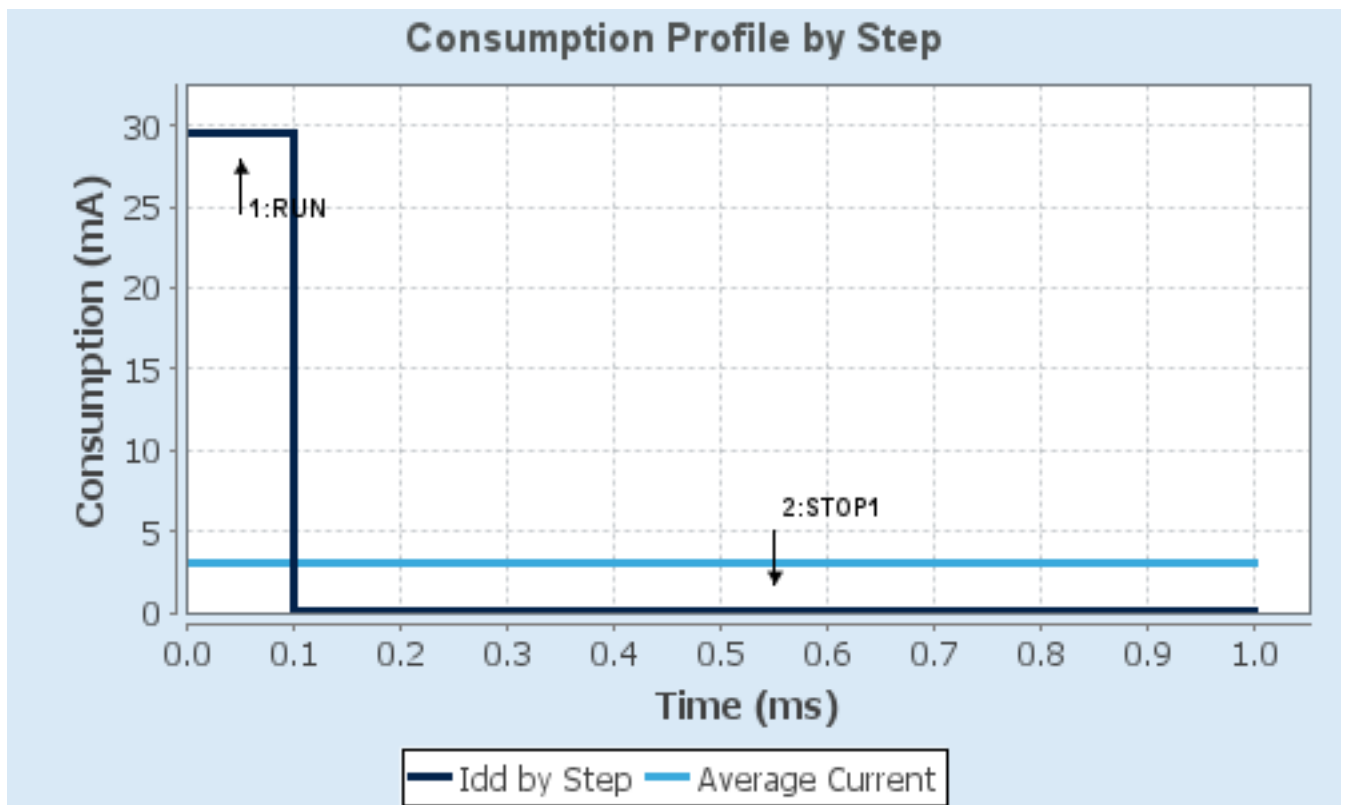
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP1
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-Boost	NoRange
Fetch Type	FLASH/DualBank/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	29.5 mA	80.5 μ A
Duration	0.1 ms	0.9 ms
DMIPS	213.0	0.0
Ta Max	124.25	129.98
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	3.02 mA
Battery Life	1 month, 16 days, 9 hours	Average DMIPS	212.5 DMIPS

6.6. Chart



7. Peripherals and Middlewares Configuration

7.1. ADC2

IN3: IN3 Single-ended

IN4: IN4 Single-ended

IN5: IN5 Single-ended

IN13: IN13 Single-ended

mode: IN17 Single-ended

7.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Clock Prescaler Synchronous clock mode divided by 4

Resolution ADC 12-bit resolution

Data Alignment Right alignment

Gain Compensation 0

Scan Conversion Mode Disabled

End Of Conversion Selection End of single conversion

Low Power Auto Wait Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

DMA Continuous Requests Disabled

Overrun behaviour Overrun data preserved

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

Rank 1

Channel **Channel 17 ***

Sampling Time 2.5 Cycles

Offset Number No offset

ADC_Injected_ConversionMode:

Enable Injected Conversions Disable

Analog Watchdog 1:

Enable Analog WatchDog1 Mode false

Analog Watchdog 2:

Enable Analog WatchDog2 Mode false

Analog Watchdog 3:

Enable Analog WatchDog3 Mode false

7.2. I2C1

I2C: I2C

7.2.1. 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	0x20C0EDFF *

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

7.3. RCC

CRS SYNC: USB_FS

7.3.1. Parameter Settings:

System Parameters:

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

CRS Parameters:

CRS Synchro Divider	1
CRS Synchro Polarity	Active on rising edge
CRS Synchro Reload Value Type	Automatic

CRS Synchro frequency (Hz)	1000
Error limit Value	34
HSI48 Calibration Value	32

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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7.4. SYS

Debug: Serial Wire

VREFBUF Mode: Internal voltage reference

Timebase Source: SysTick

mode: save power of non-active UCPD - deactive Dead Battery pull-up

7.4.1. Parameter Settings:

Voltage_Reference_Buffer_Settings:

Trimming Mode	Factory Trimming
Internal Voltage reference scale	SCALE 0: around 2.048 V

7.5. TIM1

Combined Channels: Encoder Mode

7.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 bits value)	0
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
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Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode TI1
Slave Mode Preload Activation	Disable
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.6. TIM2

Combined Channels: Encoder Mode

7.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 32 bits value)	4294967295
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode TI1
Slave Mode Preload Activation	Disable
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge

IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.7. TIM3

Combined Channels: Encoder Mode

7.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode T11
Slave Mode Preload Activation	Disable

____ Parameters for Channel 1 ____

Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

____ Parameters for Channel 2 ____

Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.8. TIM4

Channel1: PWM Generation CH1

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
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Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)

Clear Input:

Clear Input Source	Disable
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PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.9. TIM5

Combined Channels: Encoder Mode

7.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 32 bits value)	4294967295
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode TI1
Slave Mode Preload Activation	Disable
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	

Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.10. TIM8

Combined Channels: Encoder Mode

7.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 bits value)	0
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

Encoder:

Encoder Mode	Encoder Mode T11
Slave Mode Preload Activation	Disable

____ Parameters for Channel 1 ____

Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

____ Parameters for Channel 2 ____

Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.11. USB

mode: Device (FS)

7.11.1. 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

7.12. USB_DEVICE

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

7.12.1. 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)	Disabled *
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message
USBD_LPM_ENABLED (Link Power Management)	0: Link Power Management not supported *

7.12.2. 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 *
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PRODUCT_STRING (Product Identifier)

CONFIGURATION_STRING (Configuration Identifier)

INTERFACE_STRING (Interface Identifier)

STM32 Custom Human interface

Custom HID Config

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
ADC2	PA4	ADC2_IN17	Analog mode	No pull-up and no pull-down	n/a	
	PA5	ADC2_IN13	Analog mode	No pull-up and no pull-down	n/a	
	PA6	ADC2_IN3	Analog mode	No pull-up and no pull-down	n/a	
	PA7	ADC2_IN4	Analog mode	No pull-up and no pull-down	n/a	
	PC4	ADC2_IN5	Analog mode	No pull-up and no pull-down	n/a	
I2C1	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PB8-BOOT0	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
SYS	VREF+	VREFBUF_OUT	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	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA9	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM2	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM3	PB4	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB5	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM4	PB6	TIM4_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	LED NRZ
TIM5	PA0	TIM5_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM8	PC6	TIM8_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC7	TIM8_CH2	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	PC0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	

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	15	0
USB low priority interrupt remap	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		
ADC1 and ADC2 global interrupt	unused		
USB high priority interrupt remap	unused		
TIM1 break interrupt and TIM15 global interrupt	unused		
TIM1 update interrupt and TIM16 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM17 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
TIM4 global interrupt	unused		
I2C1 event interrupt / I2C1 wake-up interrupt through EXTI line 23	unused		
I2C1 error interrupt	unused		
TIM8 break interrupt	unused		
TIM8 update interrupt	unused		
TIM8 trigger and commutation interrupts	unused		
TIM8 capture compare interrupt	unused		
TIM5 global interrupt	unused		
CRS global interrupt	unused		
FPU global interrupt	unused		

8.3.2. NVIC Code generation

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

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

Middleware							
USB_DEVICE ✓							
System Core	Analog	Timers	Connectivity	Multimedia	Security	Computing	Utilities
DMA	ADC2 ✓	TIM1 ✓	I2C1 ✓				
GPIO ✓		TIM2 ✓	USB ✓				
IVVIC ✓		TIM3 ✓					
RCC ✓		TIM4 ✓					
SYS ✓		TIM5 ✓					
		TIM8 ✓					

10. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32g4_bsd1.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
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32g4_bsd1.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/microcontrollers_stm32g4_series_product_overview.pdf
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
Training Material	https://www.st.com/resource/en/marketing_training/smpres_stm32g4_er.pdf
Training Material	https://www.st.com/resource/en/sales_guide/sg_sc2155.pdf
Training Material	https://www.st.com/resource/en/training_certification/faecp_stm32g4_edr.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/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.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/an2548-using-the-stm32f0f1f3gxlx-series-dma-controller-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/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-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/an4013-stm32-crossseries-timer-overview-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/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-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
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