
STM32
CubeMX

1. Description

1.1. Project

Project Name	stm32genscope
Board Name	NUCLEO-G431KB
Generated with:	STM32CubeMX 6.10.0
Date	12/31/2023

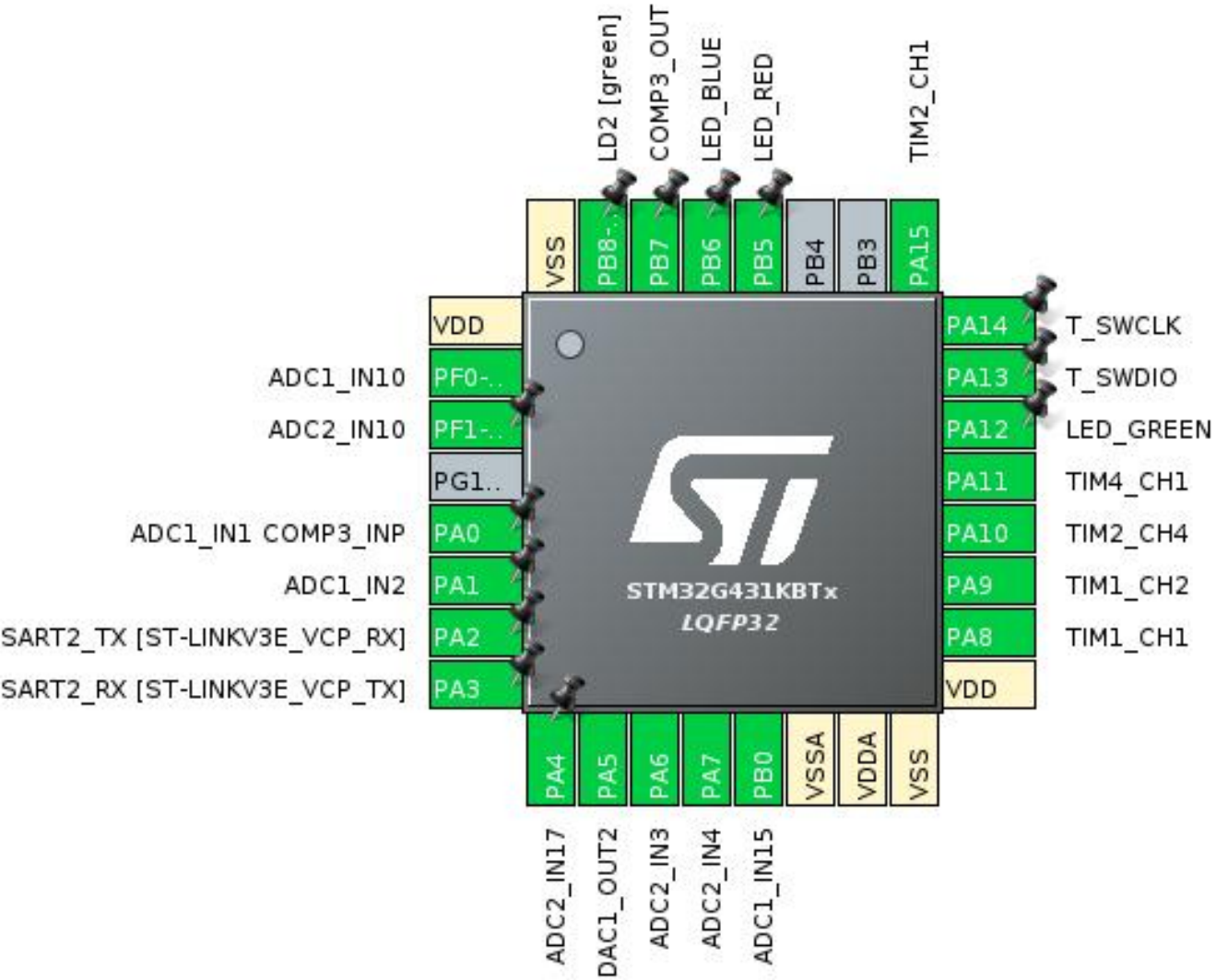
1.2. MCU

MCU Series	STM32G4
MCU Line	STM32G4x1
MCU name	STM32G431KBTx
MCU Package	LQFP32
MCU Pin number	32

1.3. Core(s) information

Core(s)	ARM Cortex-M4

2. Pinout Configuration

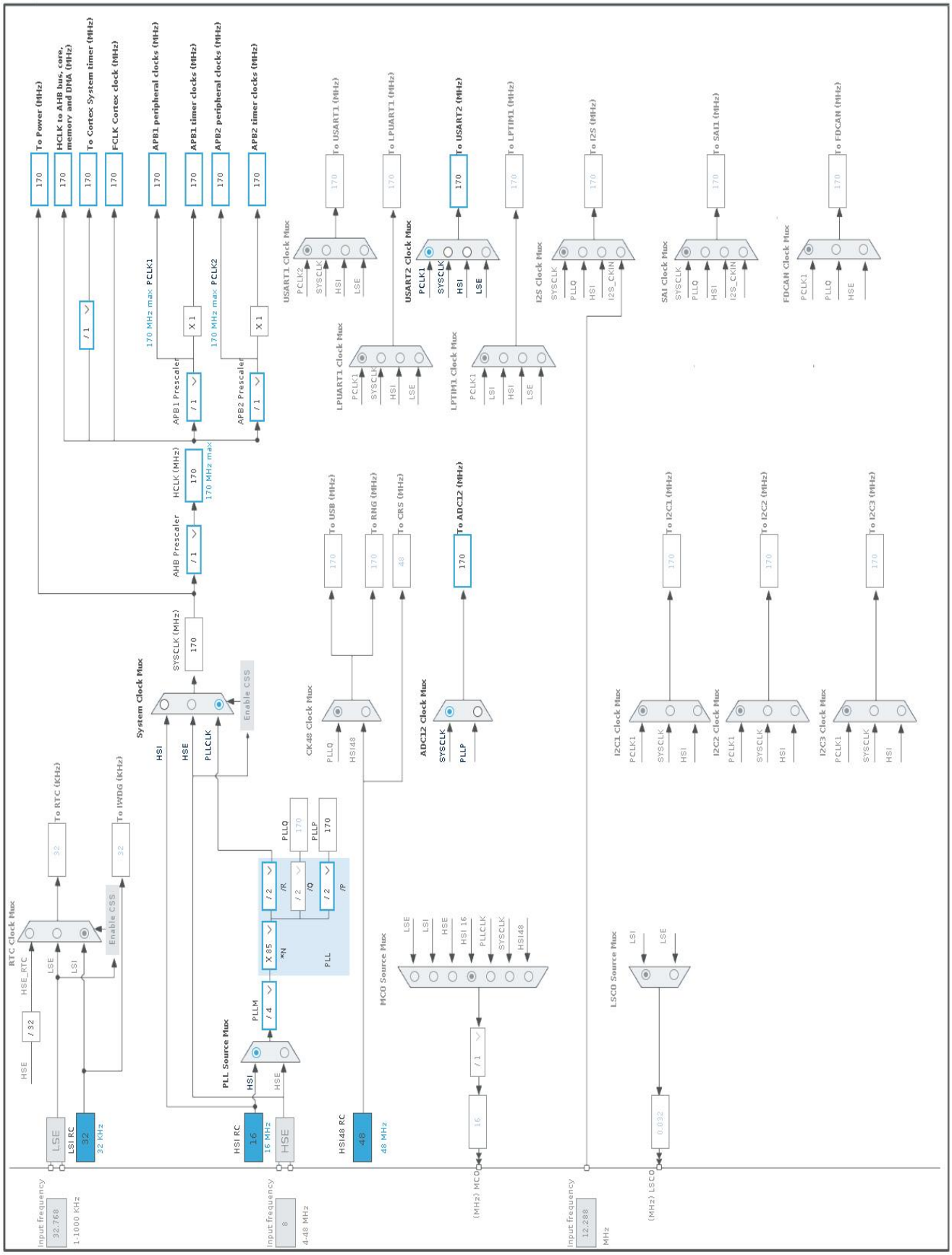


3. Pins Configuration

Pin Number LQFP32	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VDD	Power		
2	PF0-OSC_IN	I/O	ADC1_IN10	
3	PF1-OSC_OUT	I/O	ADC2_IN10	
5	PA0	I/O	ADC1_IN1, COMP3_INP	
6	PA1	I/O	ADC1_IN2	
7	PA2	I/O	USART2_TX	USART2_TX [ST-LINKV3E_VCP_RX]
8	PA3	I/O	USART2_RX	USART2_RX [ST-LINKV3E_VCP_TX]
9	PA4	I/O	ADC2_IN17	
10	PA5	I/O	DAC1_OUT2	
11	PA6	I/O	ADC2_IN3	
12	PA7	I/O	ADC2_IN4	
13	PB0	I/O	ADC1_IN15	
14	VSSA	Power		
15	VDDA	Power		
16	VSS	Power		
17	VDD	Power		
18	PA8	I/O	TIM1_CH1	
19	PA9	I/O	TIM1_CH2	
20	PA10	I/O	TIM2_CH4	
21	PA11	I/O	TIM4_CH1	
22	PA12 *	I/O	GPIO_Output	LED_GREEN
23	PA13	I/O	SYS_JTMS-SWDIO	T_SWDIO
24	PA14	I/O	SYS_JTCK-SWCLK	T_SWCLK
25	PA15	I/O	TIM2_CH1	
28	PB5 *	I/O	GPIO_Output	LED_RED
29	PB6 *	I/O	GPIO_Output	LED_BLUE
30	PB7	I/O	COMP3_OUT	
31	PB8-BOOT0 *	I/O	GPIO_Output	LD2 [green]
32	VSS	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	stm32genscope
Project Folder	/home/andrei/STM32CubeIDE/workspace_1.14.0/stm32genscope
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_G4 V1.5.0
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_USART2_UART_Init	USART2
5	MX_ADC1_Init	ADC1
6	MX_ADC2_Init	ADC2
7	MX_TIM4_Init	TIM4
8	MX_TIM2_Init	TIM2
9	MX_DAC1_Init	DAC1
10	MX_TIM6_Init	TIM6
11	MX_TIM1_Init	TIM1

Rank	Function Name	Peripheral Instance Name
12	MX_COMP3_Init	COMP3
13	MX_DAC3_Init	DAC3

1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32G4
Line	STM32G4x1
MCU	STM32G431KBTx
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

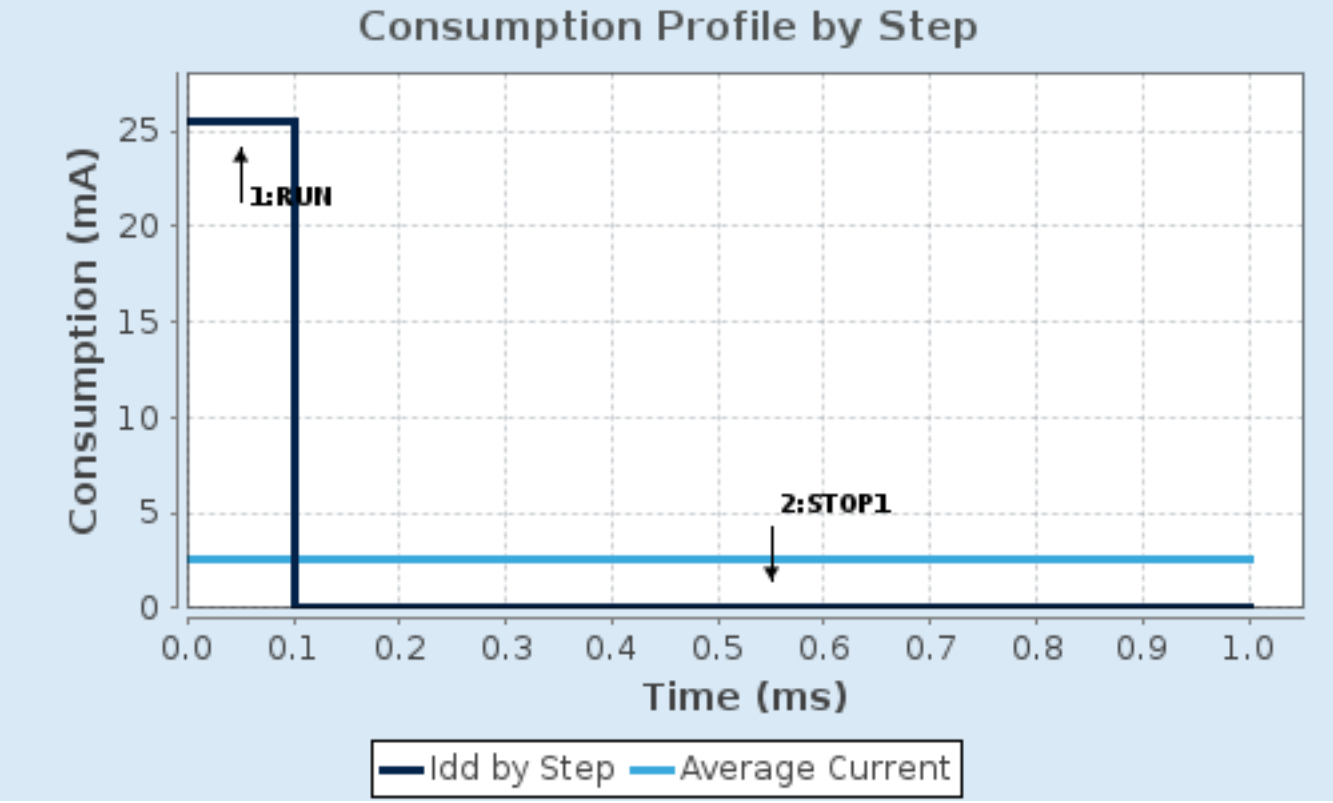
1.4. Sequence

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	124.19	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
Consumption (mA)
25
20
15
10
5
0
1:RUN
2:STOP1
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

2. Peripherals and Middlewares Configuration

2.1. ADC1

IN1: IN1 Single-ended

IN2: IN2 Single-ended

mode: IN10

mode: IN15

2.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	**Dual regular simultaneous mode only ***
DMA Access Mode	DMA access mode enabled
Delay between 2 sampling phases	1 Cycle

ADC_Settings:

Clock Prescaler	**Asynchronous clock mode divided by 8 ***
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	Disabled
Overrun behaviour	Overrun data preserved

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable
Number Of Conversion	**4 ***
External Trigger Conversion Source	**Timer 1 Trigger Out event 2 ***
External Trigger Conversion Edge	**Trigger detection on the falling edge ***
Rank	1
Channel	Channel 1
Sampling Time	**640.5 Cycles ***
Offset Number	No offset
Rank	**2 ***
Channel	**Channel 10 ***
Sampling Time	**640.5 Cycles ***
Offset Number	No offset

Rank	**3 ***
Channel	**Channel 15 ***
Sampling Time	**640.5 Cycles ***
Offset Number	No offset
Rank	**4 ***
Channel	**Channel 2 ***
Sampling Time	**640.5 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

2.2. ADC2

IN3: IN3 Single-ended

mode: IN4

mode: IN10

mode: IN17 Single-ended

2.2.1. Parameter Settings:

ADCs_Common_Settings:	
Mode	**Dual regular simultaneous mode only ***
DMA Access Mode	DMA access mode enabled
Delay between 2 sampling phases	1 Cycle
ADC_Settings:	
Clock Prescaler	**Asynchronous clock mode divided by 8 ***
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	Disabled
Overrun behaviour	Overrun data preserved

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable
Number Of Conversion	**4 ***
Rank	1
Channel	Channel 3
Sampling Time	**640.5 Cycles ***
Offset Number	No offset
Rank	**2 ***
Channel	**Channel 4 ***
Sampling Time	**640.5 Cycles ***
Offset Number	No offset
Rank	**3 ***
Channel	**Channel 17 ***
Sampling Time	**640.5 Cycles ***
Offset Number	No offset
Rank	**4 ***
Channel	**Channel 10 ***
Sampling Time	**640.5 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

2.3. COMP3

mode: Input [+]

Input [-]: DAC3 OUT1

mode: ExternalOutput

2.3.1. Parameter Settings:

Basic Parameters:

Trigger Mode	**Rising Edge Event ***
Hysteresis Level	**Level 70mV ***

Output Configuration:

Blanking Source	None
Output Polarity	**COMP output on GPIO is inverted ***

2.4. DAC1

OUT2 mode: Connected to external pin and to on chip-peripherals

2.4.1. Parameter Settings:

DAC Out2 Settings:

Mode selected	Normal Mode
Output Buffer	Enable
DAC High Frequency	Mode Automatic
DMA Double Data	Disable
Signed Format	Disable
Trigger	**Timer 6 Trigger Out event ***
Trigger2	None
Wave generation mode	Disabled
User Trimming	Factory trimming

2.5. DAC3

mode: OUT1 mode

2.5.1. Parameter Settings:

DAC Out1 Settings:

Mode selected	Normal Mode
Output Buffer	Disable
DAC High Frequency	Mode Automatic
DMA Double Data	Disable
Signed Format	Disable
Trigger	None
Trigger2	None
User Trimming	Factory trimming

2.6. RCC

2.6.1. 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)

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

2.7. SYS

Debug: Serial Wire
Timebase Source: SysTick
mode: save power of non-active UCPD - deactive Dead Battery pull-up

2.8. TIM1

Slave Mode: Trigger Mode
Trigger Source: TI1FP1
Clock Source : Internal Clock
Channel2: PWM Generation CH2
mode: One Pulse Mode

2.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**170-1 ***
Counter Mode	Up
Dithering	Disable

Counter Period (AutoReload Register - 16 bits value)	**20000 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 bits value)	0
auto-reload preload	Disable
Slave Mode Controller	Trigger Mode

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	**Output Compare (OC2REF) ***

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High
BRK Filter (4 bits value)	0
BRK Sources Configuration	
- Digital Input	Disable
- COMP1	Disable
- COMP2	Disable
- COMP3	Disable
- COMP4	Disable

Break And Dead Time management - BRK2 Configuration:

BRK2 State	Disable
BRK2 Polarity	High
BRK2 Filter (4 bits value)	0
BRK2 Sources Configuration	
- Digital Input	Disable
- COMP1	Disable
- COMP2	Disable
- COMP3	Disable
- COMP4	Disable

Break And Dead Time management - Output Configuration:

Automatic Output State	Disable
Off State Selection for Run Mode (OSSR)	Disable
Off State Selection for Idle Mode (OSSI)	Disable
Lock Configuration	Off

Clear Input:

Clear Input Source	Disable

Trigger:

Trigger Polarity	Rising Edge
Trigger Filter (4 bits value)	0

PWM Generation Channel 2:

Mode	PWM mode 1

Pulse (16 bits value)	**10000 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	**Low ***
CH Idle State	Reset

2.9. TIM2

Slave Mode: Trigger Mode

Trigger Source: TI1FP1

Clock Source : Internal Clock

Channel4: PWM Generation CH4

mode: One Pulse Mode

2.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	**Down ***
Dithering	Disable
Counter Period (AutoReload Register - 32 bits value)	**170000 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable
Slave Mode Controller	Trigger Mode

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	**Output Compare (OC4REF) ***

Clear Input:

Clear Input Source	Disable

Trigger:

Trigger Polarity	Rising Edge
Trigger Filter (4 bits value)	0

PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (32 bits value)	**17000 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	**Low ***

2.10. TIM4

Clock Source : Internal Clock

Channel1: PWM Generation CH1

2.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**1700-1 ***
Counter Mode	**Down ***
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	**14000 ***
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	**Update Event ***

Clear Input:

Clear Input Source	Disable

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	**500 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

2.11. TIM6

mode: Activated

2.11.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**170-1 ***
Counter Mode	Up
Dithering	Disable
Counter Period (AutoReload Register - 16 bits value)	**10 ***
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Trigger Event Selection	**Update Event ***

2.12. USART2

Mode: Asynchronous

2.12.1. Parameter Settings:

Basic Parameters:

Baud Rate	**9600 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	**8 Samples ***
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	**Enable ***
Txfifo Threshold	**3 quarts full configuration ***
Rxfifo Threshold	**3 quarts full configuration ***

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

*** User modified value**

3. System Configuration

3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PF0-OSC_IN	ADC1_IN10	Analog mode	No pull-up and no pull-down	n/a	
	PA0	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	
	PA1	ADC1_IN2	Analog mode	No pull-up and no pull-down	n/a	
	PB0	ADC1_IN15	Analog mode	No pull-up and no pull-down	n/a	
ADC2	PF1-OSC_OUT	ADC2_IN10	Analog mode	No pull-up and no pull-down	n/a	
	PA4	ADC2_IN17	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	
COMP3	PA0	COMP3_INP	Analog mode	No pull-up and no pull-down	n/a	
	PB7	COMP3_OUT	Alternate Function Push Pull	No pull-up and no pull-down	Low	
DAC1	PA5	DAC1_OUT2	Analog mode	No pull-up and no pull-down	n/a	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	T_SWDIO
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	T_SWCLK
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	PA10	TIM2_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM4	PA11	TIM4_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	USART2_TX [ST-LINKV3E_VCP_RX]
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	USART2_RX [ST-LINKV3E_VCP_TX]
GPIO	PA12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_GREEN
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_RED
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_BLUE
	PB8-BOOT0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD2 [green]

3.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA1_Channel1	Peripheral To Memory	Low
DAC1_CH2	DMA1_Channel2	Memory To Peripheral	Low

ADC1: DMA1_Channel1 DMA request Settings:

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

DAC1_CH2: DMA1_Channel2 DMA request Settings:

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

3.3. NVIC configuration

3.3.1. 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	0	0
DMA1 channel1 global interrupt	true	4	0
DMA1 channel2 global interrupt	true	4	0
TIM1 update interrupt and TIM16 global interrupt	true	0	0
TIM1 capture compare interrupt	true	0	0
TIM2 global interrupt	true	0	0
TIM4 global interrupt	true	5	0
USART2 global interrupt / USART2 wake-up interrupt through EXTI line 26	true	1	0
TIM6 global interrupt, DAC1 and DAC3 channel underrun error interrupts	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		
TIM1 break interrupt and TIM15 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM17 global interrupt	unused		
COMP1, COMP2 and COMP3 interrupts through EXTI lines 21, 22 and 29	unused		
FPU global interrupt	unused		

3.3.2. 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

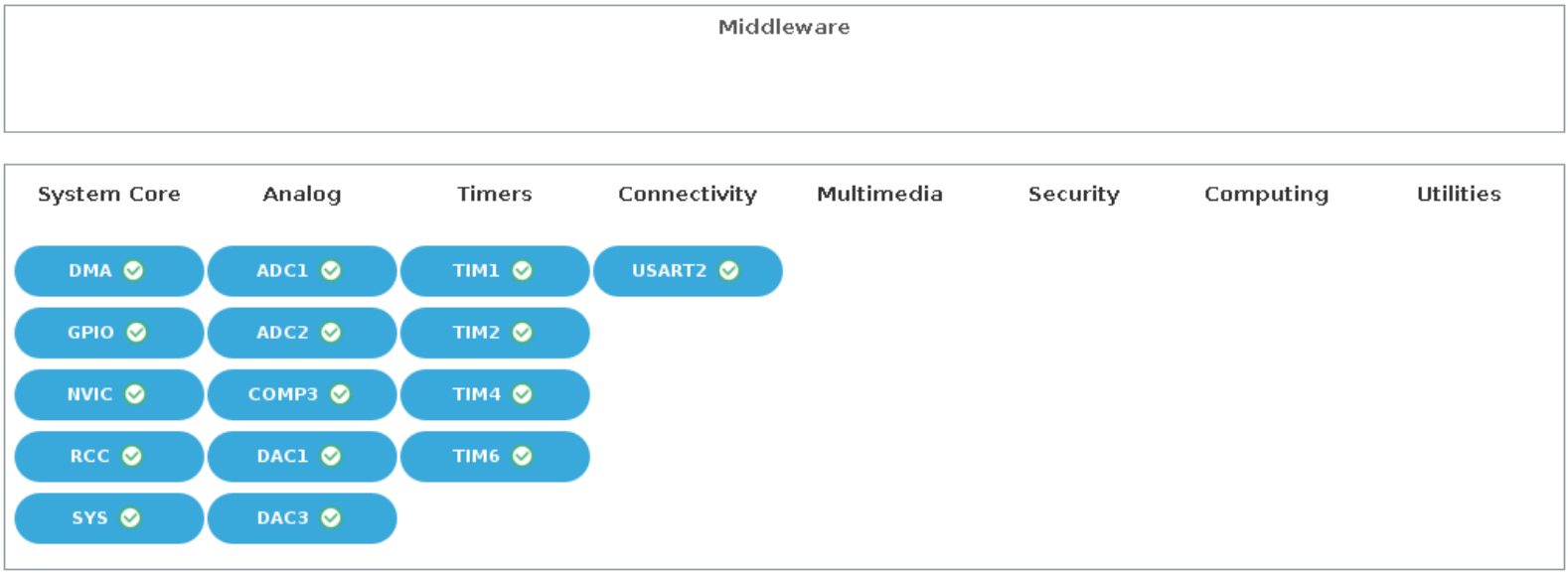
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Prefetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable 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
TIM1 update interrupt and TIM16 global interrupt	false	true	true
TIM1 capture compare interrupt	false	true	true
TIM2 global interrupt	false	true	true
TIM4 global interrupt	false	true	true
USART2 global interrupt / USART2 wake-up interrupt through EXTI line 26	false	true	true
TIM6 global interrupt, DAC1 and DAC3 channel underrun error interrupts	false	true	true

*** User modified value**

4. System Views

4.1. Category view

4.1.1. Current



5. 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/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
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-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/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/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/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/an4277-using-stm32-device-pwm-shutdown-features-for-motor-control-and-digital-power-conversion-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/an4635-minimization-of-

	power-consumption-using-lpuart-for-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
Application Notes	https://www.st.com/resource/en/application_note/an4750-handling-of-soft-errors-in-stm32-applications-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4759-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4776-generalpurpose-timer-cookbook-for-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4803-highspeed-si-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
Application Notes	https://www.st.com/resource/en/application_note/an5027-interfacing-pdm-digital-microphones-using-stm32-mcus-and-mpus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5036-thermal-management-guidelines-for-stm32-applications-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5093-getting-started-with-stm32g4-series--hardware-development-boards-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5224-stm32-dmamux-the-dma-request-router-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5306-operational-amplifier-opamp-usage-in-stm32g4-series-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5310-guideline-for-using-analog-features-of-stm32g4-series-versus-stm32f3-series-devices-stmicroelectronics.pdf
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/an5405-fdcan-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5543-enhanced-methods-to-handle-spi-communication-on-stm32-devices-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/an5690-vrefbuf-peripheral-applications-and-trimming-technique-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/an5156-introduction-to-stm32-microcontrollers-security-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2548-using-the-stm32f0f1f3cxgxlx-series-dma-controller-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
Application Notes	https://www.st.com/resource/en/application_note/an5348-introduction-to-

	fdcan-peripherals-for-stm32-product-classes-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4230-random-number-generation-validation-using-nist-statistical-test-suite-for-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5225-introduction-to-usb-typec-power-delivery-for-stm32-mcus-and-mpus-stmicroelectronics.pdf
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/an2834-how-to-optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5816-how-to-build-stm32-lpbam-application-using-stm32cubemx-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 for related Tools & Software	https://www.st.com/resource/en/application_note/an1202_freertos_guide-freertos-guide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an1602_semihosting_in_truestudio-how-to-do-semihosting-in-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an1801_stm32cubeprogrammer_in_truestudio-installing-stm32cubeprogrammer-in-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/atollic_editing_keyboard_shortcuts-atollic-editing-keyboard-shortcuts-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/iar_to_atollic_truestudio_migration_guide-truestudio-for-arm-migration-guide-iar-embedded-workbench-to-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/stm32cubemx_installation_in_truestudio-stm32cubemx-installation-in-truestudio-stmicroelectronics.pdf

Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4435-guidelines-for-obtaining-ulcsaiec-607301603351-class-b-certification-in-any-stm32-application-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4635-minimization-of-power-consumption-using-lpuart-for-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4657-stm32-inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4759-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4841-digital-signal-processing-for-stm32-microcontrollers-using-cmsis-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5054-secure-programming-using-stm32cubeprogrammer-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5056-integration-guide-for-the-xcubesbsfu-stm32cube-expansion-package-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5305-digital-filter-implementation-with-the-fmac-using-stm32cubeg4-mcu-package-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5315-stm32cube-firmware-examples-for-stm32g4-series-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5345-highbrightness-rgb-led-control-using-the-bg474edpow1-discovery-kit-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	https://www.st.com/resource/en/application_note/an5361-getting-started-

for related Tools & Software	with-projects-based-on-dualcore-stm32h7-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5394-getting-started-with-projects-based-on-the-stm32l5-series-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5418-how-to-build-a-simple-usbpd-sink-application-with-stm32cubemx-stmicroelectronics.pdf
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/an5496-buck-voltage-mode-with-the-bg474edpow1-discovery-kit-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5497-buck-current-mode-with-the-bg474edpow1-discovery-kit-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	https://www.st.com/resource/en/application_note/an5788-stm32-digital-power-pid-and-iir-filters-for-smps-control-design-and-comparison-on-

& Software	bg414edpow1-discovery-kit-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4502-stm32-smbuspmbus-expansion-package-for-stm32cube-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5952-how-to-use-cmake-in-stm32cubeide-stmicroelectronics.pdf
Errata Sheets	https://www.st.com/resource/en/errata_sheet/es0431-stm32g431xx441xx-device-errata-stmicroelectronics.pdf
Datasheet	https://www.st.com/resource/en/datasheet/dm00507199.pdf
Programming Manuals	https://www.st.com/resource/en/programming_manual/pm0214-stm32-cortexm4-mcus-and-mpus-programming-manual-stmicroelectronics.pdf
Reference Manuals	https://www.st.com/resource/en/reference_manual/rm0440-stm32g4-series-advanced-armbased-32bit-mcus-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1163-description-of-wlcsp-for-microcontrollers-and-recommendations-for-its-use-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1204-tape-and-reel-shipping-media-for-stm32-microcontrollers-in-bga-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1205-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-fpn-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1206-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-qfp-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1207-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-so-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1208-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-tssop-and-ssop-packages-stmicroelectronics.pdf
Technical Notes	https://www.st.com/resource/en/technical_note/tn1433-reference-device-

& Articles	marking-schematics-for-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf
User Manuals	https://www.st.com/resource/en/user_manual/um3167-stm32g4-series-ulcsaiec-607301603351-selftest-library-user-guide-stmicroelectronics.pdf