
STM32
CubeMX

1. Description

1.1. Project

Project Name	O32controller_FW
Board Name	custom
Generated with:	STM32CubeMX 6.8.1
Date	06/25/2023

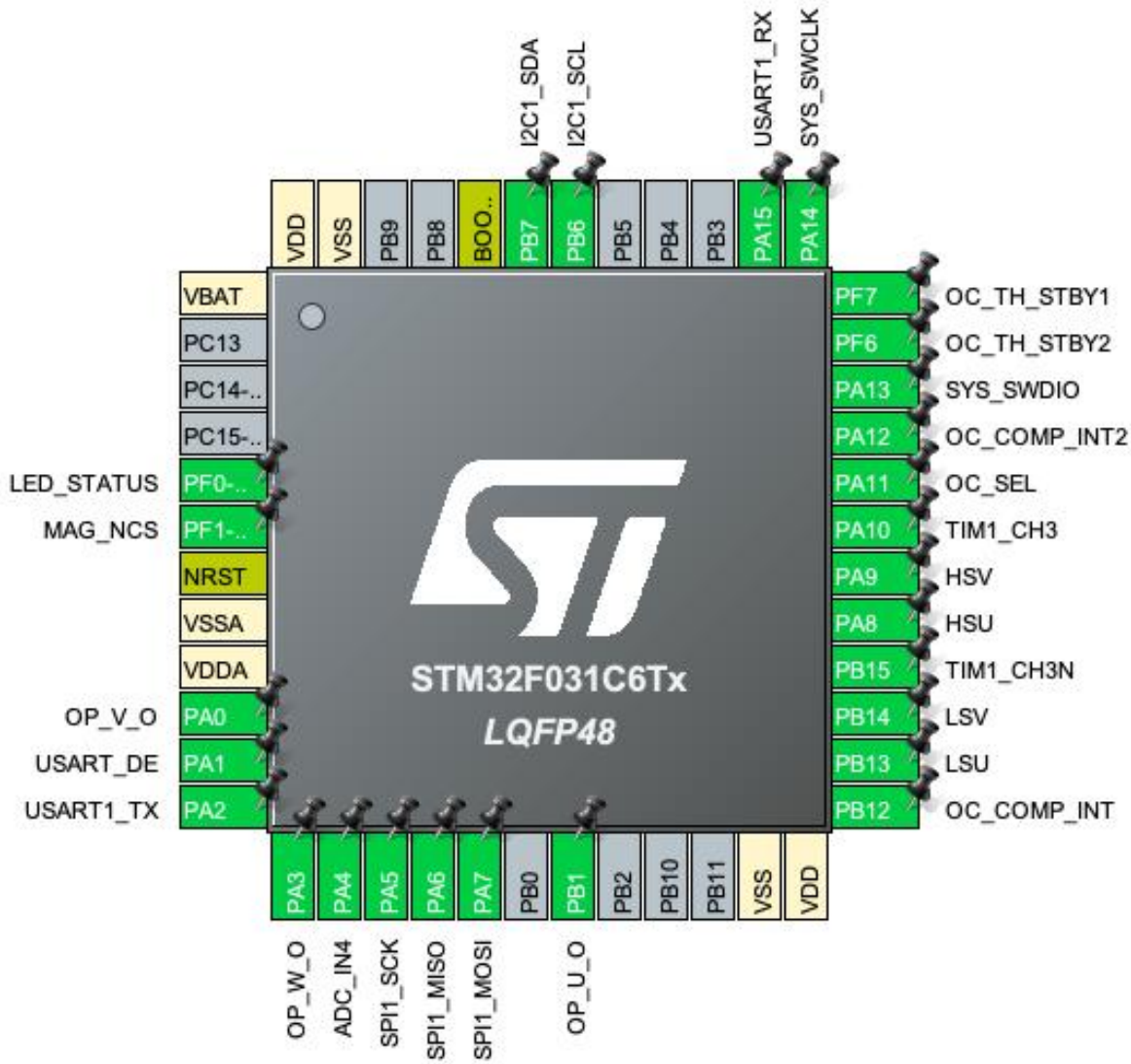
1.2. MCU

MCU Series	STM32F0
MCU Line	STM32F0x1
MCU name	STM32F031C6Tx
MCU Package	LQFP48
MCU Pin number	48

1.3. Core(s) information

Core(s)	Arm Cortex-M0

2. Pinout Configuration

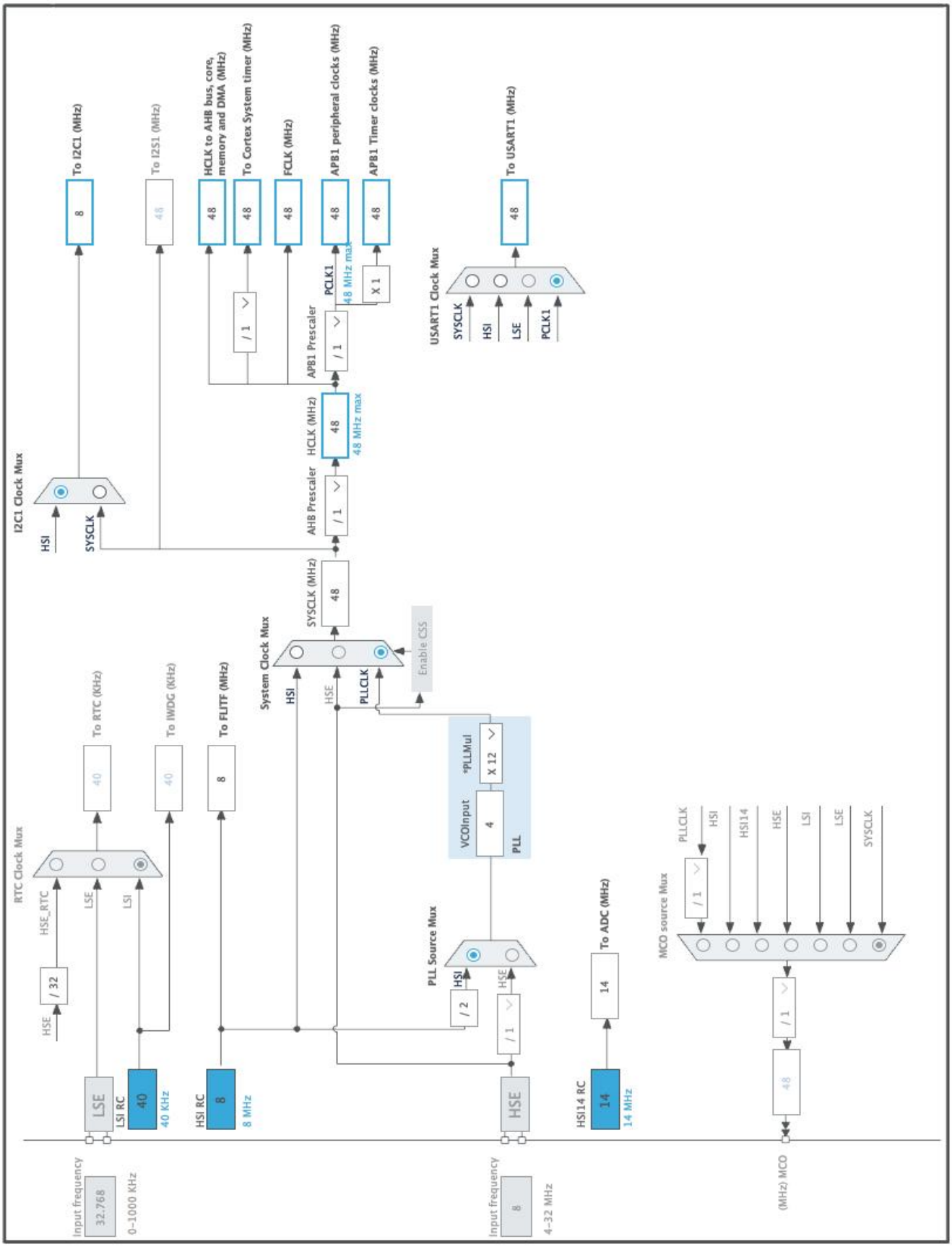


3. Pins Configuration

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
5	PF0-OSC_IN *	I/O	GPIO_Output	LED_STATUS
6	PF1-OSC_OUT *	I/O	GPIO_Output	MAG_NCS
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0	I/O	ADC_IN0	OP_V_O
11	PA1 *	I/O	GPIO_Output	USART_DE
12	PA2	I/O	USART1_TX	
13	PA3	I/O	GPIO_Analog, ADC_IN3	OP_W_O
14	PA4	I/O	ADC_IN4	
15	PA5	I/O	SPI1_SCK	
16	PA6	I/O	SPI1_MISO	
17	PA7	I/O	SPI1_MOSI	
19	PB1	I/O	GPIO_Analog, ADC_IN9	OP_U_O
23	VSS	Power		
24	VDD	Power		
25	PB12	I/O	TIM1_BKIN	OC_COMP_INT
26	PB13	I/O	TIM1_CH1N	LSU
27	PB14	I/O	TIM1_CH2N	LSV
28	PB15	I/O	TIM1_CH3N	
29	PA8	I/O	TIM1_CH1	HSU
30	PA9	I/O	TIM1_CH2	HSV
31	PA10	I/O	TIM1_CH3	
32	PA11 *	I/O	GPIO_Input	OC_SEL
33	PA12	I/O	TIM1_ETR	OC_COMP_INT2
34	PA13	I/O	SYS_SWDIO	
35	PF6 *	I/O	GPIO_Output	OC_TH_STBY2
36	PF7 *	I/O	GPIO_Output	OC_TH_STBY1
37	PA14	I/O	SYS_SWCLK	
38	PA15	I/O	USART1_RX	
42	PB6	I/O	I2C1_SCL	
43	PB7	I/O	I2C1_SDA	
44	BOOT0	Boot		
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	O32controller_FW
Project Folder	/Users/chris/Code/STM32CubeIDE/O32controller_FW
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F0 V1.11.4
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_I2C1_Init	I2C1
5	MX_ADC_Init	ADC
6	MX_SPI1_Init	SPI1
7	MX_TIM1_Init	TIM1
8	MX_USART1_UART_Init	USART1
9	MX_TIM2_Init	TIM2

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F0
Line	STM32F0x1
MCU	STM32F031C6Tx
Datasheet	DS10111_Rev6

6.2. Parameter Selection

Temperature	25
Vdd	3.6

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

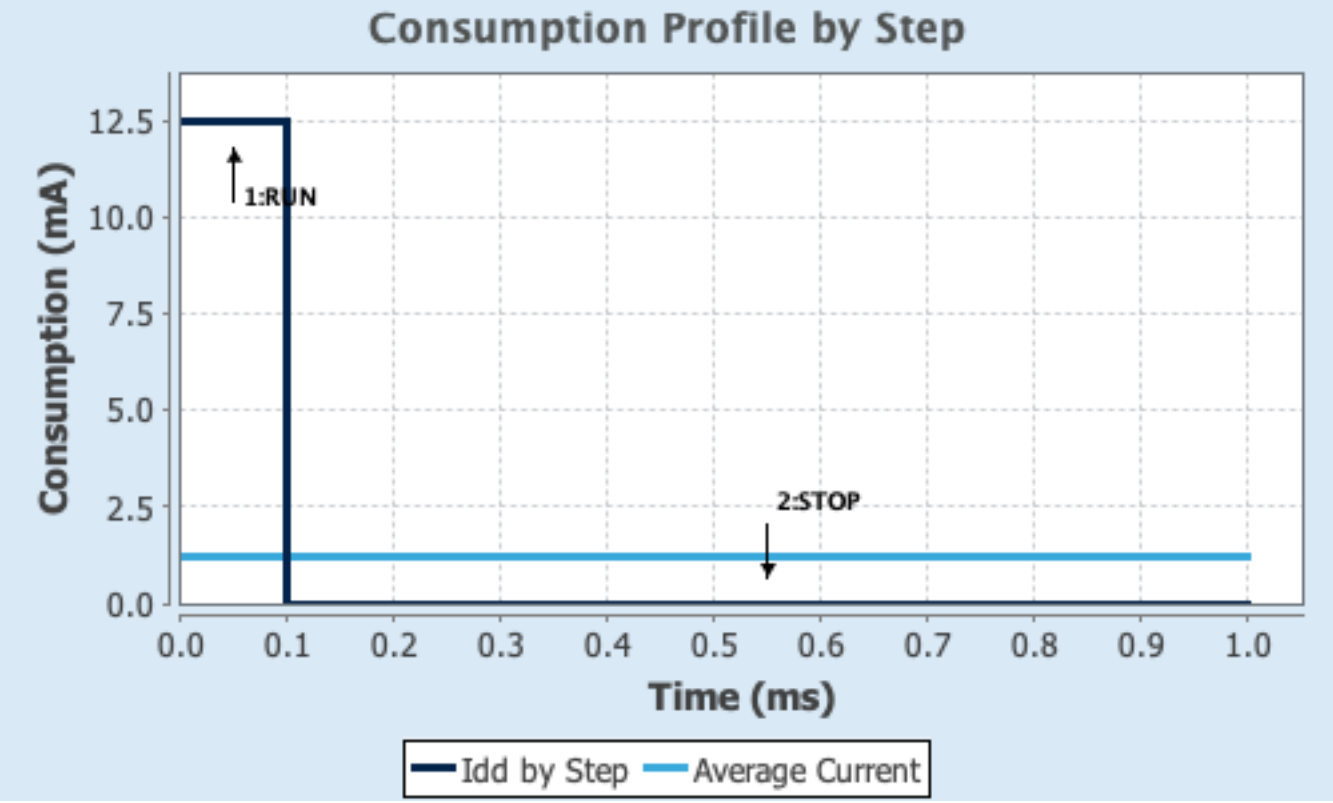
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.6	3.6
Voltage Source	Battery	Battery
Range	No Scale	No Scale
Fetch Type	FLASH	n/a
CPU Frequency	48 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LP
Clock Source Frequency	8 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	12.45 mA	6.6 µA
Duration	0.1 ms	0.9 ms
DMIPS	0.0	0.0
Ta Max	102.53	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	1.25 mA
Battery Life	3 months, 21 days, 15 hours	Average DMIPS	0.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
12.5
10.0
7.5
5.0
2.5
0.0
1:RUN
2:STOP
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

7. Peripherals and Middlewares Configuration

7.1. ADC

mode: IN0

mode: IN3

mode: IN4

mode: IN9

mode: Temperature Sensor Channel

mode: Vrefint Channel

7.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	Asynchronous clock mode
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Conversion Mode	Forward
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data preserved
Low Power Auto Wait	Disabled
Low Power Auto Power Off	Disabled

ADC_Regular_ConversionMode:

Sampling Time	1.5 Cycles
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None

WatchDog:

Enable Analog WatchDog Mode	false
Low Threshold	0

7.2. I2C1

I2C: I2C

7.2.1. Parameter Settings:

Timing configuration:

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	0x2000090E

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	**9 ***

7.3. RCC

7.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Prefetch Buffer	Enabled
Flash Latency(WS)	1 WS (2 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
HSI14 Calibration Value	16
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

7.4. SPI1

Mode: Full-Duplex Master

7.4.1. Parameter Settings:

Basic Parameters:

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

Clock Parameters:

Prescaler (for Baud Rate)	**16 ***
Baud Rate	**3.0 MBits/s ***
Clock Polarity (CPOL)	**High ***

Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software

7.5. SYS

mode: Debug Serial Wire

Timebase Source: SysTick

7.6. TIM1

Slave Mode: Gated Mode

Trigger Source: ETR1

Clock Source : Internal Clock

Channel1: PWM Generation CH1 CH1N

Channel2: PWM Generation CH2 CH2N

Channel3: PWM Generation CH3 CH3N

mode: Activate-Break-Input

7.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**2 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**512 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable
Slave Mode Controller	Gated Mode

Trigger Output (TRGO) Parameters:

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

Break And Dead Time management - BRK Configuration:

BRK State	**Disable ***
BRK Polarity	High

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
Dead Time	**10 ***

Trigger:

Trigger Polarity	**Inverted ***
Trigger Prescaler	Prescaler not used
Trigger Filter (4 bits value)	0

PWM Generation Channel 1 and 1N:

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

PWM Generation Channel 2 and 2N:

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

PWM Generation Channel 3 and 3N:

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

7.7. TIM2

Clock Source : Internal Clock

7.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**47999 ***
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**1000 ***
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	Reset (UG bit from TIMx_EGR)

7.8. USART1

Mode: Asynchronous

7.8.1. Parameter Settings:

Basic Parameters:

Baud Rate	**115200 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable

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**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC	PA0	ADC_IN0	Analog mode	No pull-up and no pull-down	n/a	OP_V_O
	PA3	ADC_IN3	Analog mode	No pull-up and no pull-down	n/a	OP_W_O
	PA4	ADC_IN4	Analog mode	No pull-up and no pull-down	n/a	
	PB1	ADC_IN9	Analog mode	No pull-up and no pull-down	n/a	OP_U_O
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	**High ***	
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	**High ***	
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
SYS	PA13	SYS_SWDIO	n/a	n/a	n/a	
	PA14	SYS_SWCLK	n/a	n/a	n/a	
TIM1	PB12	TIM1_BKIN	Alternate Function Push Pull	No pull-up and no pull-down	Low	OC_COMP_INT
	PB13	TIM1_CH1N	Alternate Function Push Pull	No pull-up and no pull-down	Low	LSU
	PB14	TIM1_CH2N	Alternate Function Push Pull	No pull-up and no pull-down	Low	LSV
	PB15	TIM1_CH3N	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	HSU
	PA9	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	HSV
	PA10	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA12	TIM1_ETR	Alternate Function Push Pull	No pull-up and no pull-down	Low	OC_COMP_INT2
USART1	PA2	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
	PA15	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
GPIO	PF0-OSC_IN	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_STATUS
	PF1-OSC_OUT	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MAG_NCS
	PA1	GPIO_Output	Output Push Pull	**Pull-down ***	Low	USART_DE
	PA3	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	OP_W_O
	PB1	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	OP_U_O
	PA11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	OC_SEL
	PF6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OC_TH_STBY2
	PF7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OC_TH_STBY1

8.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC	DMA1_Channel1	Peripheral To Memory	Low

ADC: DMA1_Channel1 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
System service call via SWI instruction	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	3	0
DMA1 channel 1 interrupt	true	0	0
TIM2 global interrupt	true	0	0
I2C1 event global interrupt / I2C1 wake-up interrupt through EXTI line 23	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC interrupt	unused		
TIM1 break, update, trigger and commutation interrupts	unused		
TIM1 capture compare interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt / USART1 wake-up interrupt through EXTI line 25	unused		

8.3.2. NVIC Code generation

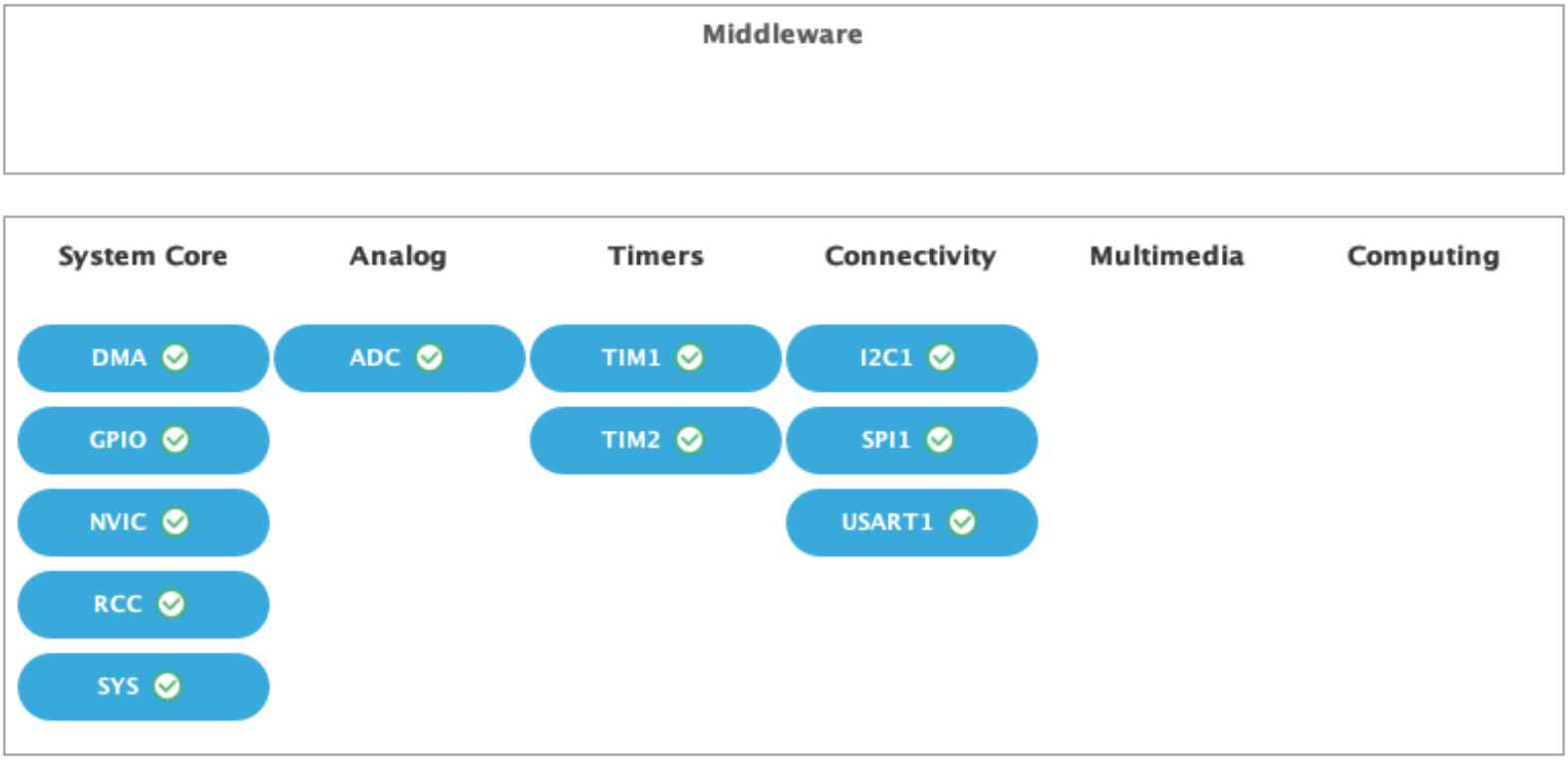
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
System service call via SWI instruction	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true
DMA1 channel 1 interrupt	false	true	true
TIM2 global interrupt	false	true	true
I2C1 event global interrupt / I2C1 wake-up interrupt through EXTI line 23	false	true	true

*** User modified value**

9. System Views

9.1. Category view

9.1.1. Current



10. Docs & Resources

Type	Link
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f0_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f0_svd.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f0_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f0_svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/gt_stm32f0-l0.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/sales_guide/sg_sc2155.pdf
Brochures	https://www.st.com/resource/en/brochure/breveco0518.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32f0.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstmcsuite.pdf
Flyers	https://www.st.com/resource/en/flyer/fldpstpfc11120.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
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/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-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/an3236-increase-the-number-of-touchkeys-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3371-using-the-hardware-realtime-clock-rtc-in-stm32-f0-f2-f3-f4-and-l1-series-of-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3960-esd-considerations-for-touch-sensing-applications-on-mcus-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/an4067-calibrating-stm32f0x1-stm32f0x2-and-stm32f0x8-lines-internal-rc-oscillators-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4080-getting-started-with-stm32f0x1x2x8-hardware-development-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4088-migrating-between-stm32f1-and-stm32f0-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4099-implementation-of-transmitters-and-receivers-for-infrared-remote-control-protocols-with-mcus-of-the-stm32f0-and-stm32f3-series-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/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/an4299-improve-conducted-noise-robustness-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4310-sampling-capacitor-selection-guide-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4312-design-with-surface-sensors-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4316-tuning-a-touch-sensing-application-on-mcus-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/an4617-migrating-between-stm32f0-and-stm32l0-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/an4705-migration-guidelines-from-pic18-to-stm32f0-series-with-software-expansion-for-stm32cube-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4735-stm32cube-firmware-examples-for-stm32f0-series-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/an4908-stm32-usart-automatic-baud-rate-detection-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
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