



1. Description

1.1. Project

Project Name	Fob
Board Name	custom
Generated with:	STM32CubeMX 6.12.1
Date	11/07/2024

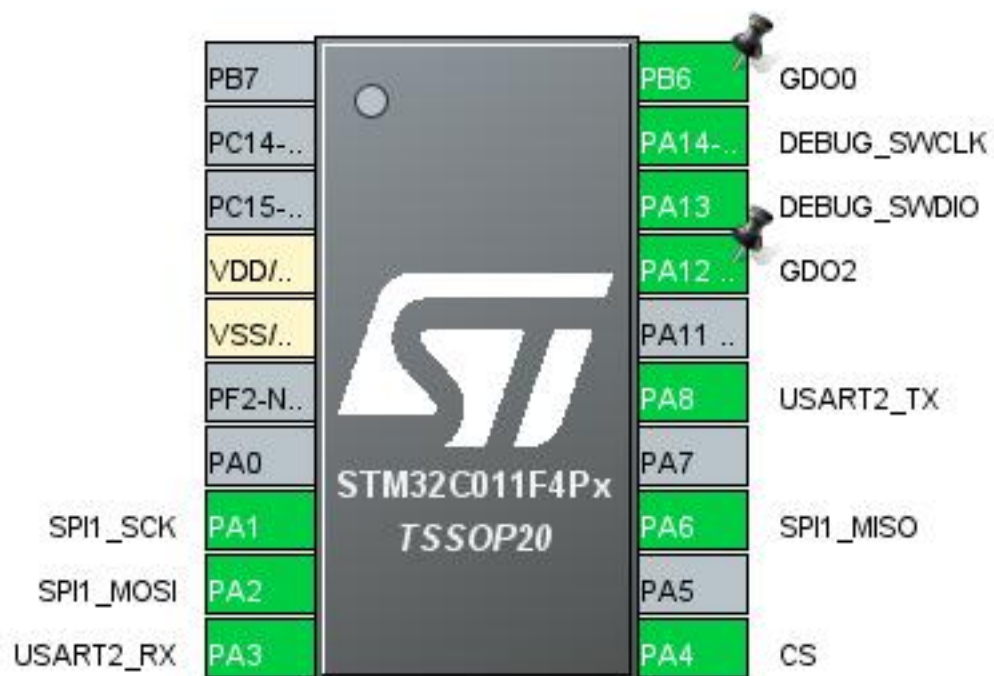
1.2. MCU

MCU Series	STM32C0
MCU Line	STM32C0x1
MCU name	STM32C011F4Px
MCU Package	TSSOP20
MCU Pin number	20

1.3. Core(s) information

Core(s)	ARM Cortex-M0+
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2. Pinout Configuration

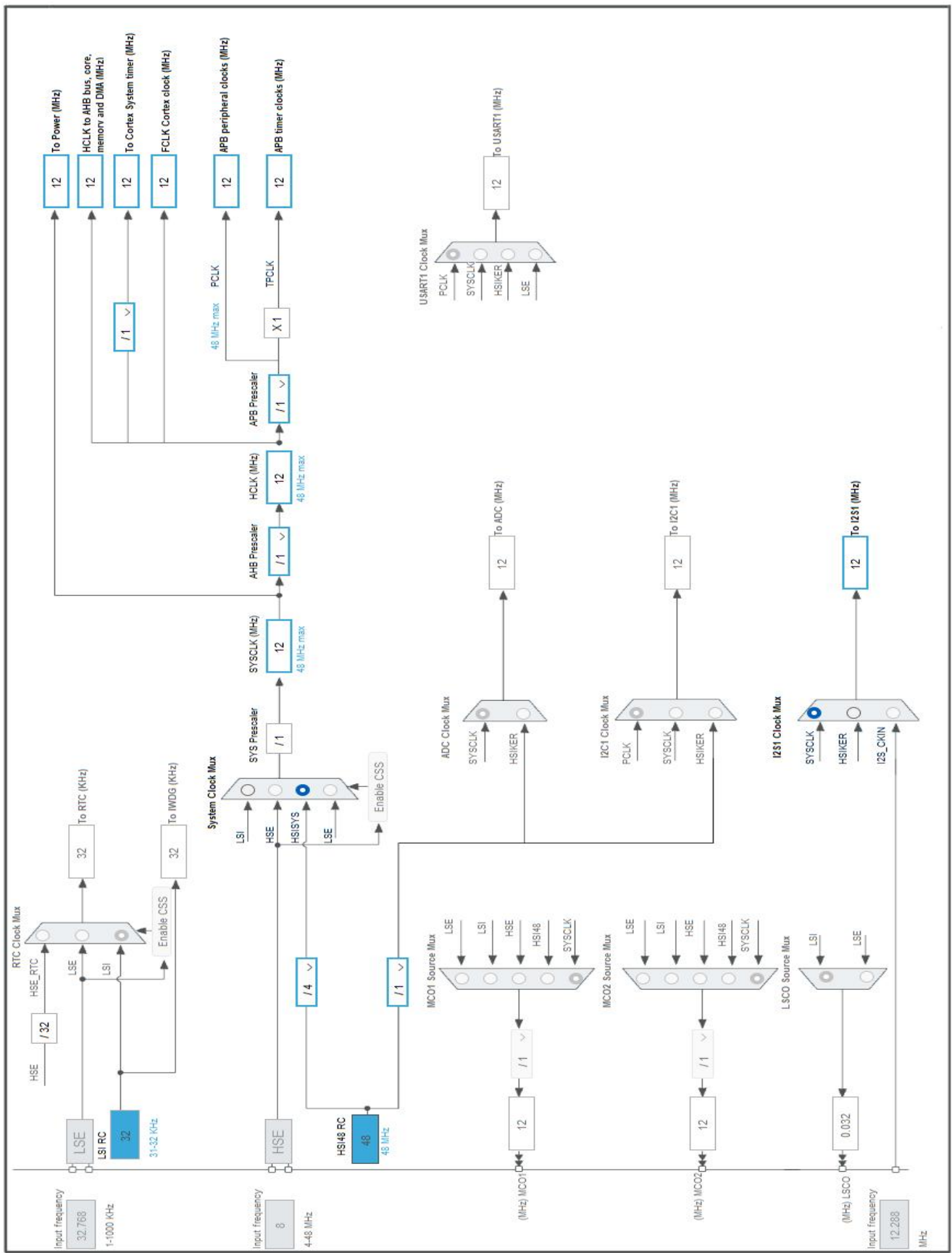


3. Pins Configuration

Pin Number TSSOP20	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
4	VDD/VDDA	Power		
5	VSS/VSSA	Power		
8	PA1	I/O	SPI1_SCK	
9	PA2	I/O	SPI1_MOSI	
10	PA3	I/O	USART2_RX	
11	PA4	I/O	SPI1_NSS	CS
13	PA6	I/O	SPI1_MISO	
15	PA8	I/O	USART2_TX	
17	PA12 [PA10]	I/O	GPIO_EXTI12	GDO2
18	PA13	I/O	DEBUG_SWDIO	
19	PA14-BOOT0	I/O	DEBUG_SWCLK	
20	PB6 *	I/O	GPIO_Input	GDO0

* The pin is affected with an I/O function

4. Clock Tree Configuration



1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32C0
Line	STM32C0x1
MCU	STM32C011F4Px
Datasheet	DS00000_Rev0

1.2. Parameter Selection

Temperature	25
Vdd	3.0

1.3. Battery Selection

Battery	Li-SOCL2(AAA700)
Capacity	700.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	10.0 mA
Max Pulse Current	30.0 mA
Cells in series	1
Cells in parallel	1

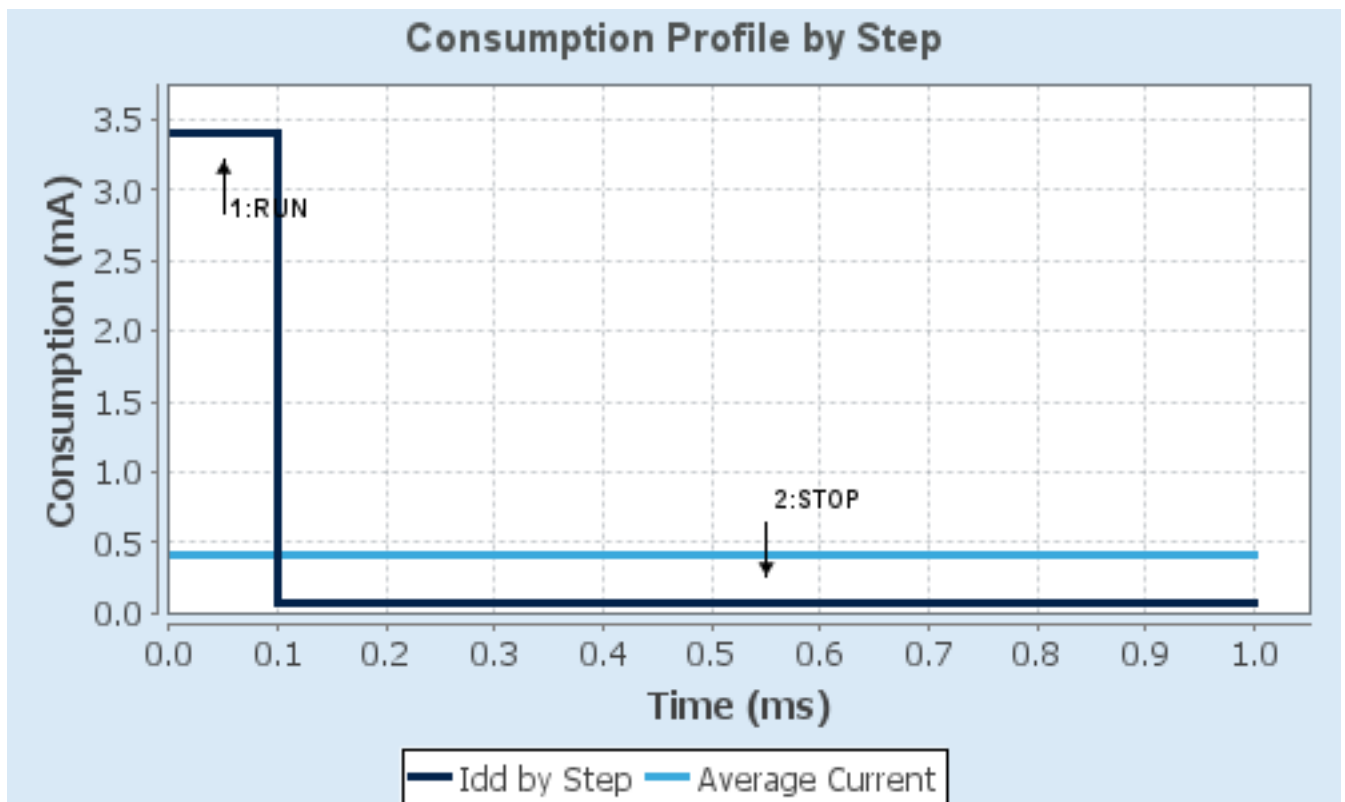
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	NaN/SMPS	NaN/SMPS
Fetch Type	FLASH/PREFETCH	Flash-PowerDownSleep
CPU Frequency	48 MHz	0 Hz
Clock Configuration	HSE	ALL CLOCKS OFF
Clock Source Frequency	48 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	3.4 mA	73.5 μ A
Duration	0.1 ms	0.9 ms
DMIPS	60.0	0.0
Ta Max	104.53	104.99
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	406.15 μ A
Battery Life	2 months, 10 days, 20 hours	Average DMIPS	60.0 DMIPS

1.6. Chart



2. Software Project

2.1. Project Settings

Name	Value
Project Name	Fob
Project Folder	C:\Users\mggam\OneDrive\Documents\UIUC\Senior\ECE 445\FobCode\Fob
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_C0 V1.2.0
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

2.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Add necessary library files as reference in the toolchain project configuration file
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)	No
Enable Full Assert	No

2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_SPI1_Init	SPI1
4	MX_USART2_UART_Init	USART2

3. Peripherals and Middlewares Configuration

3.1. DEBUG

mode: Debug

3.2. RCC

3.2.1. 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

3.3. SPI1

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

3.3.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	6.0 MBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Output Hardware

3.4. SYS

Timebase Source: SysTick

3.5. USART2

Mode: Asynchronous

3.5.1. 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
ClockPrescaler	1

Advanced Features:

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

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
DEBUG	PA13	DEBUG_SWDIO	n/a	n/a	n/a	
	PA14-BOOT0	DEBUG_SWCLK	n/a	n/a	n/a	
SPI1	PA1	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA2	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA4	SPI1_NSS	Alternate Function Push Pull	No pull-up and no pull-down	Low	CS
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART2	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA8	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
GPIO	PA12 [PA10]	GPIO_EXTI12	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	GDO2
	PB6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	GDO0

4.2. DMA configuration

nothing configured in DMA service

4.3. NVIC configuration

4.3.1. 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
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line 4 to 15 interrupts	unused		
SPI1 interrupt	unused		
USART2 interrupt	unused		

4.3.2. 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

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

Middlewares

System Core	Analog	Timers	Connectivity	Multimedia	Computing	Trace and Debug	Power and Thermal
CORTEX_M0+			SPI1			DEBUG	
DMA			USART2				
GPIO							
NVIC							
RCC							
SYS							

6. Docs & Resources

Type	Link
IBIS models	https://www.st.com/resource/en/ibis_model/stm32c0-ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32c0-svd.zip
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_software_development_tools.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32c0-series-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-entry-level-graphics.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/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/fldpstpfc11120.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32c0.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

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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/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

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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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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/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/an5775-migration-of-applications-from-the-stm8l-and-stm8s-series-to-the-stm32c0-series-microcontrollers-stmicroelectronics.pdf

- Application Notes https://www.st.com/resource/en/application_note/an5673-getting-started-with-stm32c0-series-hardware-development-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an5780-migration-of-applications-from-atmega328-family-to-stm32c0-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an5857-using-xcuberccalib-software-to-calibrate-stm32c0-series-internal-rc-oscillator-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/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-eeeprom-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/an5036-guidelines-for-thermal-management-on-stm32-applications-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an2548-introduction-to-dma-controller-for-stm32-mcus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4013-introduction-to-timers-for-stm32-mcus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4277-how-to-use-pwm-shutdown-for-motor-control-and-digital-power-conversion-on-stm32-mcus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4759-introduction-to-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-mcus-stmicroelectronics.pdf
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& Software

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& Software

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& Software

Application Notes https://www.st.com/resource/en/application_note/atollic_editing_keyboard_for_related_Tools_shortcuts-atollic-editing-keyboard-shortcuts-stmicroelectronics.pdf
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& Software

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& Software

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& Software

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& Software

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& Software

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& Software

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Errata Sheets	https://www.st.com/resource/en/errata_sheet/es0569-stm32c011x4x6-device-errata-stmicroelectronics.pdf
Datasheet	https://www.st.com/resource/en/datasheet/dm00836008.pdf
Programming Manuals	https://www.st.com/resource/en/programming_manual/pm0223-stm32-cortexm0-mcus-programming-manual-stmicroelectronics.pdf
Reference Manuals	https://www.st.com/resource/en/reference_manual/rm0490-stm32c0x1-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
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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
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User Manuals	https://www.st.com/resource/en/user_manual/um3119-stm32c0-series-iec-60730-selftest-library-user-guide-stmicroelectronics.pdf
User Manuals	https://www.st.com/resource/en/user_manual/um3066-stm32c0-series-safety-manual-stmicroelectronics.pdf